SUBDIVISON AGREEMENT

THIS AGREEMENT made on the _____day of _____, 2024

BETWEEN:

EDWARDSBURGH DEVELOPMENT INC.

("the **OWNER**")

-and-

THE CORPORATION OF THE TOWNSHIP OF EDWARDSBURGH/CARDINAL

("the **MUNICIPALITY**")

WHEREAS the Owner is the registered owner of land ("the Lands") described in Schedule "A" and has applied to the Municipality pursuant to the *Planning Act*, for approval to subdivide and develop the Lands in accordance with a plan of subdivision (the "Plan of Division") to be registered with respect to the Lands.

AND WHEREAS approval of the Plan of Subdivision has been given on the condition that the Owner enters into this Agreement with the Municipality in accordance with section 51(26) of the *Planning Act*, RSO 1990, c. P. 13, as amended.

AND WHEREAS subsection 51(26) of the *Planning Act* permits the registration of this Agreement against the Lands to which it applies and provides that the Municipality may enforce the terms and conditions of this Agreement against the Owner and any subsequent owner of the Lands.

AND WHEREAS the subdivision shall be built in two (2) phases.

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the Municipality approving the registration of the Plan of Subdivision, the covenants hereinafter expressed and for other good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, the parties hereto covenant and agree as follows:

1. DEFINITIONS:

1.1 In this Agreement:

(a) "**Maintain**" includes replace and repair.

(b) "**Owner**" means Edwardsburgh Development Inc. and any assignor or successor and includes an individual, partnership, corporation or other entity, and any agent or contractor of the foregoing carrying out Works for the Owner.

(c) "**Plan**", "**Plan of Subdivision**" or "**Subdivision**" means the proposed Plan of Subdivision submitted to the United Counties of Leeds and Grenville by the Owner for approval on July 21, 2021, and includes the lands described in Schedule "A" and shown in Schedule "I."

(d) "**Municipality**" or "**Municipal**" means the Corporation of the Township of Edwardsburgh/Cardinal.

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(e) "**Municipal Official**" is any employee, contractor, or agent, that has been expressly designated by the Corporation of the Township of Edwardsburgh/Cardinal (and only those so expressly designated) for the purposes of this Agreement. A Municipal Official shall also include any employee, contractor or agent of the United Counties of Leeds and Grenville for matters impacting the new road intersections with the County Road and anything within the County Road allowance.

(f) "**Works**" includes those services and other Works listed in Schedule "B" of this Agreement.

(g) "**O.P.S.S.**" means "Ontario Provincial Specifications, Standards and Drawings".

(h) "**MECP**" means the Ministry of the Environment, Conservation and Parks.

(i) "**Lands**" means the real property described in Schedule "A" and shown on the Plan of Subdivision attached hereto as Schedule "B."

(j) "**Consulting Engineer**" means Advance Engineering and any firm of engineers retained by the Owner and approved by the Municipality.

(k) "**Engineer**" means Greer Galloway Consulting Engineers or such other firm of engineers as may be retained by the Municipality for any purpose relating to this agreement.

(l) "**County**" or "**United Counties**" means the United Counties of Leeds and Grenville.

(m) **"Sanitary CLI-ECA"** means the Municipal sewage management collection system CLI ECA Number 155-W601 issued on July 27th, 2022 to the Township of Edwardsburgh/Cardinal.

(n) **"Storm CLI-ECA"** means the Municipal stormwater management collection system CLI ECA Number 155-S701 issued on July 27th, 2022 to the Township of Edwardsburgh/Cardinal.

(o) **"Municipal Drinking Water Licence"** or **"MDWL"** means Cardinal Water System, Licence Number: 155-102, Issue Number: 4, Dated October 22, 2021.

(p) **"Certificate of Assumption"** means a certificate issued by the Municipal Official in accordance with section 20 of this agreement in the form attached hereto as Schedule "S."

2. SCHEDULES

2.1 The following schedules attached hereto are incorporated into this Agreement by reference and are deemed to be an integral part thereof:

a. SCHEDULE "A" DESCRIPTION OF THE LANDS

b. SCHEDULE "B" PLAN OF SUBDIVISION
Approved copy of the Plan (S-1)

c. SCHEDULE "C" WORKS TO BE PROVIDED BY THE OWNER

d. SCHEDULE "D" ESTIMATED COSTS OF THE WORK
Cost Estimate

e. SCHEDULE "E" FINANCIAL REQUIREMENTS

f. SCHEDULE "F" DESIGN CRITERIA AND SPECIFICATIONS
Notes and Specifications (N-1)
Details (D-1 to D-5 inclusive)

g. SCHEDULE "G" LOT GRADING AND DRAINAGE
Grading & Drainage Plan (GR-1 to GR-3 inclusive)
Earthwork Plan (EW-1)
Geotechnical Report

h. SCHEDULE "H" STORMWATER MANAGEMENT

& EROSION AND SEDIMENT CONTROL
Stormwater Management Plan
Erosion & Sediment Control Plan (ES-1)
Pond Plan (PND)
Sormceptor EF Sizing Report

i. **SCHEDULE "I" SERVICING PLANS AND PUMPING STATION**
Site Servicing Report
General Plan of Services (GSP-1, GSP-2)
Plan & Profile Street A, B, C, Pathway (PP-1 to 6 inclusive)
Wastewater Pumping Station & Forcemain Design Report
Pumping Station Plans (PS-1 to 4 inclusive, A1, M1, E1)

j. **SCHEDULE "J" STREET SIGNAGE AND LIGHTING**
Traffic Signage Plan (SIG-1)
Photometric Plan (PH-1)

k. **SCHEDULE "K" LANDSCAPING**
Landscaping Plan (LS-1)

l. **SCHEDULE "L" COMPOSITE UTILITY PLAN**
Composite Utility Plan (CUP-1 to 3 inclusive)
Utility Crossings (CR-1, CR-3)
Hydro One Plan
Enbridge Plan

m. **SCHEDULE "M" NOISE ASSESSMENT**
Rail Noise Assessment

n. **SCHEDULE "N" EASEMENTS AND LAND DEDICATIONS**

o. **SCHEDULE "O" PARKLAND DEVELOPMENT SPECIFICATIONS**

p. **SCHEDULE "P" ENGINEERING CONSULTANT(S)**

q. **SCHEDULE "Q" UNITED COUNTIES OF LEEDS AND GRENVILLE CONDITIONS**

r. **SCHEDULE "R" WORK SCHEDULE**
Schedule of Works

s. **SCHEDULE "S" CERTIFICATE OF ASSUMPTION**

3. LANDS

3.1 The lands to which this Agreement shall apply are the lands described in Schedule "A" annexed hereto and shown on the Plan of Subdivision annexed hereto as Schedule "B".

4. SCOPE OF THE WORK

4.1 The Owner covenants and agrees to construct and install all of the Works, more particularly set out in Schedule "C" hereto annexed, in compliance with the Work Schedule set out in Schedule “R.” The said Works shall be completed at the expense of the Owner in a good and workmanlike manner and to the satisfaction of the Municipal Official.

4.2 The Owner shall comply with, and implement any and all reports, as updated and modified, such updates and modifications having been approved by the Municipal Official, that were supplied in support of the Owner’s application for approval of the Subdivision.

5. PROSECUTION OF THE WORK

5.1 The Work shall proceed in a good and workmanlike manner, and to the satisfaction of the Municipal Official. If, in the opinion of the Municipal Official, the Owner is not prosecuting or causing to be prosecuted the Works required in connection with this Agreement within the specified time, or is improperly performing the Works, or should the Owner neglect or abandon any of the Works before completion, or unreasonably delay same so that the conditions of this Agreement are being violated, carelessly executed, or performed in bad faith, or should the Owner neglect or fail to renew or again perform such work as may be rejected by the Municipal Official as being or having become defective or unsuitable, or should the Owner fail to carry out any maintenance required under this Agreement, or should the Owner in any manner, in the opinion of the Municipal Official, make default in the performance of any of the terms of this Agreement, then in any such case, the Municipal Official shall promptly notify the Owner and its surety, in writing, of such default, failure, delay or neglect, and if such notification be without satisfactory answer for ten (10) calendar days after such notice, then in that case the Municipal Official shall thereupon have full authority and power to purchase such materials, tools, and machinery and to employ such workmen as in his/her opinion shall be required for the proper completion of the said work at the cost and expense of the Owner. In cases of emergency, in the opinion of the Municipal Official, such work may be done without notice. The cost of such work shall be calculated by the Municipal Official whose decision shall be final. It is understood and agreed that such costs shall be subject to an additional management fee of TWENTY-FIVE PERCENT (25%) of the labour and material value including HST or any other taxes thereon.

5.2 All of the Works shall be installed strictly in accordance with the specifications approved by the Municipal Official and as specified in this Agreement. The Owner

shall obtain all such permits as may be required to carry out the Works from the Municipality and/or the Province of Ontario.

5.3 The Owner further covenants and agrees that it is responsible for the design and supervision of construction of the roads, drains, water & sewer services in the Subdivision, but such design and supervision shall be subject to the approval of the Municipal Official. The Owner shall employ competent engineers currently registered by the Association of the Professional Engineers of Ontario, and who are expressly approved by the Municipal Official:

(a) To design;

(b) To prepare the necessary specifications for the Works;

(c) To obtain the necessary approvals for the Works in conjunction with the Municipality;

(d) To supervise the construction of the Works;

(e) To maintain all records or construction relating to the Works;

(f) To prepare and furnish all plans and drawings of the Works;

(g) To prepare and deliver “as-built” drawings for the Works prior to final acceptance by the Municipality;

(h) To complete any additional work as may be required by the Municipal Official.

The Owner shall furnish, at its own cost, all plans, specifications, calculations, contours or other information pertaining to the Works, which may be required by the Municipal Official so that he/she is able to properly, as determined in his/her sole discretion, review the design and supervision of the Works. No contract shall be awarded, and no work commenced or continued without prior written approval of the design and supervision of the Works by the Municipal Official, which approval shall not be unreasonably withheld. If for any reason the Owner commences work prior to obtaining Municipal approval, such approval may be granted retroactively but only where all required inspections can be completed. The Municipality shall be under no obligation to inspect or approve Works commenced without approval, and the Owner shall take all such steps as may be requested by the Municipality to facilitate any inspections.

5.4 It is understood and agreed that examination and acceptance of drawings, specifications and contract documents by the Municipal Official does not relieve the Owner of its obligations to carry out all Works required under this Agreement strictly in accordance with standard engineering requirements.

5.5 The Owner shall be responsible for payment of all professional and quasi-professional fees and disbursements reasonably incurred by the Municipality in the determination of the nature and extent of the Works to be supplied and installed under and pursuant to this Agreement, in the negotiation and settlement of this Agreement and the enforcement hereof and in the performance by the Municipality of its rights and obligations hereunder or in connection with the preparation and enactment of relevant land use by-laws, and such fees shall include, without necessarily being limited to, engineering, planning and legal fees and costs. The parties understand that fees incurred may increase in the event of unforeseen circumstances. However, the obligation of the Owner shall remain limited to reasonable fees in the circumstances. The Owner agrees to reimburse the Municipality for reasonable costs incurred by a Municipal Official for inspections, reviews, etc. throughout the construction of the Works.The hourly rates charged for professional services will be provided by the Municipality upon the Owner's request. All fees payable by the Owner to the Municipality shall be paid within TEN (10) days of invoice.

5.6 The Owner agrees to submit to the Municipal Official, if requested, copies of all executed contracts relating to the construction of the Works.

5.7 The Municipal Official shall have the right, at all times, to inspect the installation of the Works. If at any time the Municipal Official is of the opinion that the Works are not being carried out in accordance with approved plans and specifications or in accordance with good engineering practices, he/she may stop all or any part of the work until it has been placed in satisfactory condition.

5.8 The Municipal Official may have any qualitative or quantitative tests made of any materials which have been or are proposed to be used in the construction of any of the Works required by this Agreement, or may require soil tests to be carried out, and the cost of such tests shall be paid by the Owner within TEN (10) days of the account being rendered by the Municipality.

6. ROADS

6.1 All roads in the Subdivision shall be constructed to the satisfaction of the Municipal Official and, in particular, the Owner shall provide two (2) lifts of asphalt, concrete curbs and gutters in accordance with OPSS on streets A, B, and C as shown on the Plan attached hereto at Schedule "B" and in accordance with the specifications shown in Schedule "F" and profiles in Schedule "I".

6.2 No paving of any street or section thereof shall be commenced until all underground Works, save and except for natural gas, have been installed, tested and approved by the Municipal Official; with CCTV work completed.

6.3 Where work is performed on existing roads outside the Subdivision, such roads shall be reinstated to the satisfaction of the Municipal Official.

6.4 Following the installation of the base course of asphalt, the Municipality shall carry out required maintenance of the roads in the Subdivision at the Owner's expense until assumed. Maintenance shall not, in any way be construed as assumption or granting of final approval or assumption of liability.

6.5 Following the installation of the base course of asphalt, the Municipality shall plow the roads within the Subdivision at the Municipality's expense. The Owner shall be responsible for damage sustained by Municipal snow removal equipment during snow removal operations until assumed. Municipal snow removal operations shall not, in any way, be construed as assumption or granting of final approval or assumption of liability.

6.6 Upon assumption by the Municipality of the underground services, walkways, landscaping, and fencing, the Owner shall convey Block H as shown on the Plan to the Municipality.

7. SANITARY SEWER WORKS

7.1 The Owner agrees to construct a sanitary sewer system which system shall include house connections from the sanitary sewers to the street line to service the lands in the Subdivision according to the design specifications set out in Schedules “F” and “I” of this Agreement. The Owner further agrees to Maintain such sewers, including the clearing of any blockage, until they are assumed by the Municipality. The construction and installation of all such sewers shall be in accordance with MECP and Sanitary CLI-ECA design standards. The said sewers shall be constructed to an outlet according to designs approved by the Municipal Official and the MECP. A CCTV shall be submitted by the Owner to the Municipal Official.

7.2 The Owner shall construct a pumping station on Block B as shown on the Plan and report attached at Schedule “I.”

7.3 The Owner acknowledges and agrees that building permits will not be issued for the development of individual Lots in Phase 2 until the pumping station has been installed and placed in service to the satisfaction of the Municipality.

8. WATERMAINS

8.1 The Owner agrees to construct a water main system as provided for in Schedule "F" hereof and as provided for in the general plan of services located at Schedule “I”, which system shall include hydrants, valves, valve boxes and house water service connections from the water main to the street line to service all lots in the Subdivision and according to MECP and Municipal Drinking Water Licence

("MDWL") design standards. The Owner shall provide the Municipality with copies of all MECP approvals and complete all required forms under the MDWL.

8.2 The Owner shall sub-contract and pay all related costs for tracer wire, swabbing, hydrostatic testing and disinfection of water mains. The Municipality must be on site to observe, confirm and document that all activities comply with the 2020 MECP Disinfection Procedure. The Owner must provide at a minimum, 72 hours' notice to the Municipality prior to the commencement of commissioning activities. The Municipality is responsible for the collection and submission of all microbiological samples prior to commissioning of the water mains. Only certified operators employed with the Municipality can operate water main valves during and post connection into the drinking water system. The Owner will be provided water meters and transponders by the Municipality. The Owner will be invoiced and shall pay the costs of the water meters and transponders. The Owner shall contract and pay the costs to install the water meters.

8.3 Upon completion of the installation of all watermains, hydrants, and water services, the Owner shall provide the Municipality with mylar(s) of the "as-built" plan(s), certified under seal by a professional engineer, showing the location of the watermains, hydrants and services. Electronic files shall also be submitted to the Municipality and the United Counties of Leeds and Grenville.

9. STORMWATER MANAGEMENT

9.1 The Owner shall implement all aspects of the stormwater site management plan set out in Schedule "H" attached hereto.

9.2 The stormwater site management, lot grade and drainage plan shall be prepared to the satisfaction of the Municipality, the South Nation Conservation Authority and the United Counties of Leeds and Grenville.

9.3 The Owner agrees that upon completion of all stormwater management Works, it shall provide the Municipal Official and the South Nation Conservation Authority with certification from a professional engineer that all measures have been implemented in conformity with the approved stormwater site management, lot grade and drainage plan.

9.4 Prior to the commencement of construction of any phase of the Subdivision (roads, utilities and off-site works, etc.), the Owner agrees to:

(a) have a professional engineer prepare an erosion and sediment control plan appropriate for site conditions in accordance with the current best management practices;

(b) have this plan reviewed and approved by the Municipality and the South Nation Conservation Authority;

(c) monitor the effectiveness of and maintain the erosion and sedimentation control works as necessary, and;

(d) provide certification to the Municipality and the South Nation Conservation through a professional engineer that the plan has been implemented and continuously maintained.

10. GRADING

10.1 The Owner shall implement all aspects of the Grade Control Plan set out in Schedule “G.” It is agreed between the parties hereto that the Grade Control Plan may be amended from time to time by the Owner with the prior written approval of the Municipal Official and such approval shall not be withheld except for sound engineering reasons. The Owner shall be responsible for registering on the title of all lots affected the amended Grade Control Plan. The Owner shall be responsible for rough grading of the lands such that the material excavated for the foundation of all buildings shall be equal to the material required to complete the lot grading in accordance with the approved Lot Grading Plan.

10.2 The Owner agrees to submit a "Rough Lot Grading" Certificate prepared by the Consulting Engineer or Ontario Land Surveyor that certifies that the rough lot grading matches the requirements set out herein prior to the issuance of building permits. The Owner further agrees to establish ground elevation at foundation wall, consistent with the Grade Control Plan prior to foundation excavation. In all cases, the Owner will maintain, at its own expense, sufficient interim drainage and outlets to provide adequate drainage until pavement has been constructed and accepted by the Municipality. This will include the installation and removal of culverts when required by the Municipal Official or the Consulting Engineer.

11. HOUSE CONNECTIONS

11.1 All portions of water, storm sewer, sump pump and sanitary sewer connections from water and sewer mains, to the limit of the roads, shall be installed according to the specifications set out in Schedule "F" attached hereto and forming part of this Agreement, and shall be subject to the approval of the Municipal Official. Any connections which will involve the tunnelling or cutting of the traveled or graded portion of any road shall be made before constructing the granular base course of the roads. All connections made through any drainage ditch shall be made in such a manner that the ditch is restored to the designed grade and cross-section.

11.2 No person, except the Municipal Official, shall open or close any valve in the street mains or abuse or interfere with them in any manner. No hydrants may be used by the Owner or any other person for water needed during construction.

12. FISHERIES:

12.1 The Owner acknowledges that the unnamed watercourse is considered either direct or indirect Fish Habitat as per Section 35 of the *Fisheries Act*.

12.2 The Owner shall establish a 30 metre “no touch/no development” setback of the unnamed watercourse, on both sides as shown on the Plan attached at Schedule “B.”

12.3 Subject to the requirements of Schedule “H,” the Owner agrees not to interfere in any way with any existing drain or water course, without written permission from the South Nation Conservation Authority. The Owner agrees that granting such permission shall not relieve the Owner of responsibility for any damage caused by such interference and the Owner shall indemnify the Municipality in relation to any claims against the Municipality relating to such damage, provided that the Municipality shall give the Owner, at the Owner's sole cost, the opportunity to defend any such claim.

13. NOISE ATTENUATION:

13.1 the Owner agrees to install a noise barrier for Phase 1 in accordance with subsection (a) below and further that for Phase 2 for lots 1 and 46-52 inclusive that the noise attenuation and warning requirements be in accordance with subsections (b) to (d) inclusive:

(a) A treed earth berm for noise attenuation purposes shall be constructed as part of Phase 1 and constructed to the satisfaction of the Municipality.

(b) All residential units shall be equipped with forced air heating with central air conditioning.

(c) That Warning Clause Type C, in accordance with the following, shall be included on all Lease and Purchase and Sale Agreements.

Type C: *"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant’s discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."*

(d) Bedroom and living room windows and exterior doors on the north, east and west facades of lots 1 and 47-52, and the north and west facades of lot 46 will require a minimum Sound Transmission Class (STC), being outdoor noise levels minus the targeted indoor noise level, of 30 or higher. Exterior wall components of north, east and west facades of lots 1 and 47-52, and the north

and west façade of lot 46 will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data. Detailed STC calculations will be completed prior to building permit application for each unit type and submitted to the Township with the building permit application.

13.2 the Owner agrees for Phase 2 for Lots 1 and 47-52 inclusive that Warning Clause Type B, as follows, will be included in all Lease and Purchase and Sale Agreements. This provision is in addition to those noise attenuation and warning requirements detailed in section 13.1 of this Agreement:

Type B: *"Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing road traffic (rail traffic) (air traffic) may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."*

13.3 The Owner agrees that where structural noise mitigation measures are required in residential units, it shall provide, prior to final building inspection, certification to the Municipality, through a professional engineer, that the noise control measures have been implemented.

13.4 Rooftop HVAC equipment shall not be installed on any units located in the Subdivision.

13.5 The Owner acknowledges and agrees that building permits will not be issued for the development of individual lots in Phase 2 until the treed earth berm has been constructed to the satisfaction of the Municipality in accordance with clause 13.1(a).

14. CN RAIL:

14.1 The Owner shall construct and maintain a safety berm (Phase 1) parallel to the CN railway and a chain link fence (Phase 2) in accordance with the Plan located at Schedule "K."

14.2 The following clause should be inserted in all development agreements, offers to purchase, and agreements of Purchase and Sale or Lease for each dwelling unit within 300m of the railway right-of-way:

"*Warning: Canadian National Railway Company or its assigns or successors in interest has or have a right-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect*

the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). CNR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."

14.3 An environmental easement for operational noise and vibration emissions, registered against the subject property shall be granted in favour of CN.

14.4 The Owner shall enter into an Agreement with CN stipulating how CN's concerns will be resolved.

15. LANDSCAPING

15.1 The Owner shall install landscaping in accordance with Schedule "K".

15.2 All sodded areas shall be maintained by regular grass cutting and shall be graded and sodded to allow for normal grass cutting operations in order to present and maintain a neat, clean, and orderly appearance. The Subject Lands shall always be compliant with the Municipality's Clean Yards By-law.

15.3 The Owner shall replace at its sole expense any growth landscaping which dies within one (1) year of assumption or two (2) years of planting, whichever is the greater.

15.4 The Owner agrees to insert the following language in all Lease and Purchase and Sale Agreements for lots in the Subdivision:

(a) The general maintenance and upkeep of all ditches and drains within the subdivision are the responsibility of the property owner (buyer);

(b) Grass cutting along the roadside within the subdivision is the responsibility of the owner (buyer).

16. SCHOOLS

16.1 The Owner agrees to insert the following language in all Lease and Purchase and Sale Agreements for lots in the Subdivision:

(a) "*The vendor makes no representation or warranties regarding which school children residing in this subdivision may attend, or that transportation will be provided by the school board*."

17. STREET NAMES and SIGNAGE

17.1 The Owner covenants and agrees that all streets shown on the Plan of Subdivision shall be named as provided in Schedule “J”. The Owner shall pay for and the Municipality, or the Owner acting on the instructions of the Municipality, shall supply and erect the street name signs, and civic address signs. Additionally, the Owner covenants and agrees to supply and erect any other signs that may be required in the Subdivision such as but not limited to dead end, no exit, speed restrictions, or curve. The Municipality shall invoice the Owner for the cost of the supply and installation of such signs, unless such signs are ordered and installed by the Owner in accordance with the directions of the Municipality.

18. STREET LIGHTING

18.1 The Owner agrees to install street lighting as provided for in Schedule "L" in accordance with the specifications set out in Schedule "L” and forming part of this Agreement.

18.2 The Owner shall arrange with Hydro One and the local cable, gas and telephone companies for the underground installation of services to the Subdivision and for the provision of required easements with respect to such installations.

19. ENBRIDGE GAS

19.1 The Owner shall install all utilities, including gas lines, in accordance with the Composite Utility Plan located at Schedule “L.”

19.2 The Owner shall grade all streets to final elevation prior to the installation of any gas lines and provide Enbridge Gas Distribution Inc. with the necessary field survey information for the installation of the gas lines. As far as possible, the natural gas distribution system will be located in the road allowance. In the event that this is not possible, the Owner will provide easements at no cost to Enbridge Gas Distribution Inc.

19.3 The Owner shall pay any costs involved in installing or relocating any services, including hydro, cable, gas and telephone required by the construction of the Works in the Subdivision.

20. ACCEPTANCE OF WORKS

20.1 The Owner covenants to Maintain all Works installed pursuant to this Agreement for a period of ONE (1) year after preliminary approval thereof by the Municipal Official provided that preliminary approval shall not be unreasonably withheld.

20.2 The Owner covenants to restore any faulty workmanship or materials or any damage done by the Owner or persons claiming title from the Owner during construction of Works or buildings on the land relating to any services and Works required to be installed pursuant to this Agreement.

20.3 The Owner shall not apply to the Municipality for a Certificate of Assumption until at least one (1) year after the final lift of asphalt has been placed.

20.4 Before applying for a Certificate of Assumption for the Works or any part thereof, the Owner shall supply the Municipality with a statutory declaration that all accounts for work and materials have been paid, except normal guarantee holdbacks for accounts the Owner has paid to contractors, suppliers, etc., and that there are no claims for liens or otherwise in connection with such work done or materials supplied for or on behalf of the Owner.

20.5 The performance by the Owner for its obligations under this Agreement, to the satisfaction of the Municipal Official, shall be a condition precedent to the acceptance of the said Works by the Municipality.

20.6 When the Municipal Official is satisfied that the Works set out in this Agreement, or any part thereof, and any other or additional Works which may have been required by the Municipal Official, have been executed in accordance with this Agreement including the schedules attached hereto, and is also satisfied that all Municipal accounts have been paid and maintenance requirements met, he/she will forthwith present a report to the Council of the Municipality stating that the work or any part thereof has been completed satisfactorily and the roads are in the required condition to be assumed by the Municipality. Acceptance of any of the Works or part thereof shall be evidenced by a Certificate of Assumption issued by the Municipal Official.

20.7 Upon the acceptance resolution being passed by Council and the issuance of a Certificate of Assumption, ownership of the Works shall vest in the Municipality and the Owner shall have no claim or rights thereto, other than those accruing to it as Owner of the land abutting on streets on which the Works were installed.

20.8 The Owner covenants and agrees that it shall not dump nor permit to be dumped any fill or debris on, or will promptly remove any fill from, any public lands without the written consent of the Municipal Official.

20.9 The Owner agrees to Maintain the Lands in a condition acceptable to the Municipality. Lots which are or become unsightly to the public shall be cleaned up by the Owner; otherwise, such steps may be taken by a Municipal Official as necessary to restore the lots using the security provided in this Agreement.

21. BUILDING PERMITS

21.1 Building permits may be issued by the Chief Building Official, subject to other requirements of the Municipality, to construct structures on lots within the Subdivision when:

(a) The Municipal Official has issued a letter indicating preliminary acceptance of the storm water management system, sanitary sewer system and watermains;

(b) The Plan of Subdivision, easements and land dedications have been registered;

(c) The base course of asphalt has received preliminary approval from the Municipal Official.

22. INITIAL PERMITS FOR MODEL HOMES

22.1 Provided that the Owner is not in default of any terms hereunder, and notwithstanding section 21 of this agreement, the Owner shall be allowed for temporary building permits to commence construction of up to four (4) model homes, but shall not convey any lot, nor allow any model homes to be occupied until the requirements of section 21 of this agreement have been met to the satisfaction of the Municipal Official.

23. FINANCIAL REQUIREMENTS

23.1 The Owner shall deposit with the Municipality a sufficient sum in cash or a letter of credit in accordance with the financial requirements of this Agreement as set out in Schedule "E" attached hereto and forming part of this Agreement to guarantee the construction and installation of the Works and to ensure that the Municipality is not liable for hold backs and costs under the *Construction Act*, R.S.O. 1990, c. C. 30 in respect of the Works and this Agreement. In the event that some Works or some part of the Works are constructed by a Municipal Official pursuant to this Agreement, or in the event that the Owner fails to pay the cost of any of the Works, or in the event of other default of this Agreement, the Municipality may draw upon the cash or Letter of Credit for the amount of its estimate of the cost to correct any defect prior to assuming the Works in accordance with this Agreement.

23.2 If the Owner provides cash or equivalent, the Municipality shall place the deposit in an interest-bearing account, and interest shall accrue to the Owner. The Municipality makes no guarantees or representations as to the interest rates that may be available at the time the funds are deposited.

23.3 The Owner shall provide engineering supervision and administration for all work required and/or contemplated by this Agreement. The Municipality shall provide such additional engineering review and inspection, as deemed necessary, and the costs of such review and inspection shall be paid for by the Owner. The Owner shall reimburse the Municipality for reasonable costs incurred by Municipal staff for these services throughout the construction of the development.

23.4 Upon the issuance of a Certificate of Assumption in accordance with section 20 of this agreement by the Municipal Official, the Owner shall be entitled to have released, by the Municipality to the Owner, all cash, principal and interest being held by it under this Agreement.

23.5 The Owner agrees that the Municipality may enforce, as the Owner's attorney, any performance bond given by any contractor to the Owner under any agreement for the construction of any Works, provided that this shall not constitute an assignment of such performance bond. Where the Municipality deems that there has been default by such contractor, the Municipality shall notify the Owner and the Owner shall proceed to enforce its bond within FOURTEEN (14) days or within such further time as the Municipality may allow, failing which the Municipality may proceed to enforce such bond as the Owner's attorney and at the Owner's expense.

23.6 The Owner acknowledges that up to $20,000.00 of the cash or letter of credit required by this agreement may also be used by the Municipality to secure works or services required by the United Counties of Leeds and Grenville.

24. LAND DEDICATIONS AND EASEMENTS

24.1 At no cost to the Municipality, the Owner shall obtain and grant, transfer and convey unto the Municipality the easements and lands described in Schedule “N” attached hereto and forming part of this Agreement and any other drainage or environmental easements which may be required. The deeds for lands and easements shall be delivered to the Municipal solicitor by the Owner immediately following registration of the Plan. The cost of the registration shall be paid by the Owner. The Municipality shall cooperate with the Owner in acquiring easements outside the Subdivision. The Owner further covenants and agrees to convey all required easements as may be required for electrical services, internet, gas, telephone and cablevision facilities to the satisfaction of the appropriate authority. The Owner shall also enter into separate agreements, if required, with the suppliers of any utility or service. The Owner shall provide a copy of the Reference Plan showing all easements upon registration of the Plan.

25. INSURANCE

25.1 The Owner shall provide the following insurance on or before the execution of this Agreement. The insurance policy shall be with AM Best Rated A or better insurers and acceptable to the Municipality. Should any policies be changed, lapsed or cancelled, notification in writing shall be provided to the Municipality and/or the United Counties of Leeds and Grenville at least 30 days prior to the effective date.

(a) Commercial Liability Insurance

Commercial General Liability insurance issued in the amount of not less than $10,000,000 per occurrence and in aggregate for any alleged and/or negligent acts by the Owners and those parties which the Owner is legally liable with respect to their obligations under this Agreement. Such insurance shall include but not limited to bodily injury, property damage, products and completed operations, broad form owners & contractors protective, contingent employer's liability, contractual liability, cross and several liability. The policy shall include shoring, blasting, excavating, underpinning, demolition, pile driving, caisson work and work below ground including tunnelling and grading. This policy shall be primary and noncontributory.

The policy shall provide coverage against claims for all damage or injury including death to any person or persons, or for damages to any property of the Municipality, the United Counties of Leeds and Grenville, or any other public or private property resulting from or arising out of any alleged and/or negligent act on the part of the Owner, their officers, employees, contractors, sub-contractors or those parties which they are legally responsible arising from the construction, installation or maintenance of any Work to be performed upon public rights-of-way pursuant to this Agreement. The policy shall include products and completed operations coverage for 24 months and shall be maintained in full force until final acceptance of the Work by the Municipality and/or the United Counties of Leeds and Grenville.

The Owner shall provide evidence of WSIB prior to commencement of work and during the duration of the project.

The policy shall add the Municipality, the United Counties of Leeds and Grenville, and their agents as Additional Insured.

Any Deductible shall be the sole responsibility of the Owner and the Municipality and/or the United Counties of Leeds and Grenville shall bear no responsibility for the deductible.

(b) Automobile Liability Insurance

Automobile Liability Insurance with respect to owned or leased vehicles used directly or indirectly in the performance of the Works covering liability for bodily injury, death and damage to property with a limit of not less than $5,000,000 inclusive for each and every loss.

Prior to commencement of work, the Owner shall furnish to the Municipality with a certificate of insurance evidencing the above noted insurance. The Municipality reserves the right to request certified copies of the policies confirming the aforementioned insurance. The insurance policy will be in a

form and with a company which are, in all respects, acceptable to the Municipality.

Approval of the insurance shall not relieve or decrease the liability of the Owner hereunder.

(c) Professional Liability Insurance

Should the Work involve professional design, the Owner shall ensure that any Professionals hired shall carry Professional Liability Insurance in the amount not less than $5,000,000.00 providing coverage for acts, errors and omissions arising from their professional services performed under this Agreement. The policy SIR/deductible shall not exceed $100,000.00 per claim and if the policy has an aggregate limit, the amount of the aggregate shall be double the required per claim limit. The policy shall be renewed for 3 years after contract termination. A certificate of insurance evidencing renewal is to be provided each and every year. The Municipality has the right to request that an Extended Reporting Endorsement be purchased by the Owner at the Owner's sole expense.

(d) Environmental Liability Insurance

At the discretion of the Municipality, the Owner may be required to purchase an Environmental Policy to cover injury to or physical damage to tangible property including loss of use of tangible property, or the prevention, control, repair, cleanup or restoration of environmental impairment of lands, the atmosphere or any water course or body of water on a sudden and accidental basis and on a gradual release. The policy shall include bodily injury, including sickness, disease, shock, mental anguish, and mental injury. The policy is to be renewed for 3 years after project completion and a Certificate of Insurance evidencing renewal shall be filed with the Municipality. The Municipality has the right to request that an Extended Reporting Endorsement be purchased by the Owner at the Owner's sole expense.

(e) Indemnification

The Owner shall defend, indemnify and save harmless the Municipality, its elected officials, officers, employees, contractors and agents from and against any and all claims of any nature, actions, causes of action, losses, expenses, fines, debts, costs (including legal costs), interest or damages of every nature and kind whatsoever, including but not limited to bodily injury, sickness, disease or death or to damage to or destruction of tangible property including loss of revenue or incurred expense resulting from disruption of service, arising out of or allegedly attributable to the negligence, acts, errors, omissions, misfeasance, nonfeasance, fraud or willful misconduct of the owner, its directors, officers, employees,

contractors, subcontractors, and those parties whom they are legally responsible in law with or in any way related to the delivery or performance of this Agreement. This indemnity shall be in addition to and not in lieu of any insurance to be provided by the Owner in accordance with this Agreement and shall survive this Agreement.

The Owner agrees to defend, indemnify and save harmless the Municipality, its elected officials, officers, employees, and agents from and against any and all claims of any nature, actions, causes of action, losses, expenses, fines, debts, costs (including legal costs), interest or damages of every nature and kind whatsoever arising out of or related to the Owners status with WSIB. This indemnity shall be in addition to and not in lieu of any proof of WSIB status and compliance to be provided by the Owner in accordance with this Agreement, and shall survive this Agreement.

26. USE OF WORKS

26.1 The Owner agrees that the Works referred to herein may be used by the Municipality for the purpose for which such Works are designed and such use shall not be deemed an acceptance of the Works by the Municipality nor shall such use in any way relieve the Owner of its obligations with respect to the construction and maintenance of such Works.

26.2 The Owner hereby grants the Municipality, its employees, agents or designates, the right and licence to enter the Lands at any time or from time to time for the purpose of making emergency repairs to any of the said Works. Such entry and repair shall not be deemed an acceptance of any of the Works by the Municipality nor an assumption by the Municipality of any liability in connection therewith nor a release from the Owner of any of its obligations under this Agreement.

27. ZONING AND BUILDING RESTRICTIONS

27.1 The Municipality shall regulate, by by-law, the zoning and building standards within the boundaries of the Lands. It is understood and agreed that nothing in this Agreement shall relieve the Owner of the obligation to comply, at all times, including during construction, with relevant zoning and building bylaws, as well as all Federal and Provincial legislation including the *Ontario Building Code*.

27.2 The Owner hereby agrees that this Agreement shall be registered on title to the Lots and Blocks contained in the Plan of Subdivision at the expense of the Owner.

28. INTEREST

28.1 Interest shall be paid at the current fixed rate, as set from time to time, and shall be payable by the Owner to Municipality on all sums of money payable to the Municipality herein which are not paid and received on the due date calculated from such due date.

29. SUBDIVIDING LOTS

29.1 The Owner covenants and agrees that it shall not subdivide any lot on the Plan of Subdivision except with the prior approval of United Counties of Leeds and Grenville, and in accordance with proper planning principles.

30. NOTICES

30.1 Any notice, report, direction, request or other documentation required or permitted to be given to either party hereto shall be in writing and shall be given by personal service, telex, telegram, telecopier or by envelope, to be addressed as follows:

(a) To EDWARDSBURGH DEVELOPMENTS INC.
C/O JANSEN LAW
PO BOX 820
215 VAN BUREN STREET
KEMPTVILLE ON K0G 1J0

(b) To THE CORPORATION OF THE TOWNSHIP OF EDWARDSBURGH/CARDINAL
PO BOX 129
18 CENTRE STREET
SPENCERVILLE, ON K0E 1X0
TEL: (613) 658-3055

30.2 Any party may by notice in writing, advise the other parties hereto, of a new address for notice, which shall then be used by the party to whom it is addressed.

30.3 Any notice, report, direction, request or other document delivered personally, by telex, by facsimile, by telegram, by telecopier in accordance herewith shall be deemed to have been received by and given to the addressee on the day of delivery or transmission. Any notice, report, direction, request or other document mailed as aforesaid shall be deemed to have been received by and given to the addressee on the third (3rd) business day following the date of mailing, provided that for such purposes no day during which there shall be a strike or other occurrence which shall interfere with normal mail service shall be considered a business day.

31. SUBSEQUENT PARTIES

31.1 This Agreement and everything contained herein shall ensure to the benefit of and be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns.

32. COMPLIANCE WITH CONDITIONS:

32.1 Notwithstanding anything else contained herein, the Owner agrees that it shall comply in all respects with the conditions contained in the Revised Notice of Decision of the United Counties of Leeds & Grenville dated February 24, 2022 and attached hereto as Appendix "P".

IN WITNESS WHEREOF the parties hereto have executed this agreement as at the date first set out above.

SIGNED, SEALED AND DELIVERED

THE CORPORATION OF THE TOWNSHIP OF EDWARDSBURGH/CARDINAL

Per: Tory Deschamps

_____
Mayor

Per: Sean Nicholson

_____
Chief Administrative Officer

(*We have the authority to bind the corporation*)

EDWARDSBURGH DEVELOPMENT INC.

Per: David Simpson

_____
President

(*I have the authority to bind the corporation*)

SCHEDULE "A"

DESCRIPTION OF THE LANDS

PT LT 7 CON 1 Edwardsburgh; Edwardsburgh/Cardinal [PIN 68153-0243]

SCHEDULE "B"

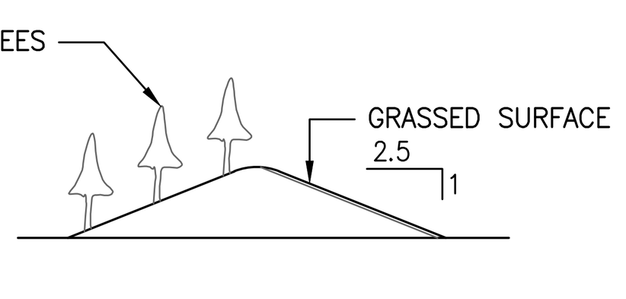
PLAN OF SUBDIVISION

Attached:

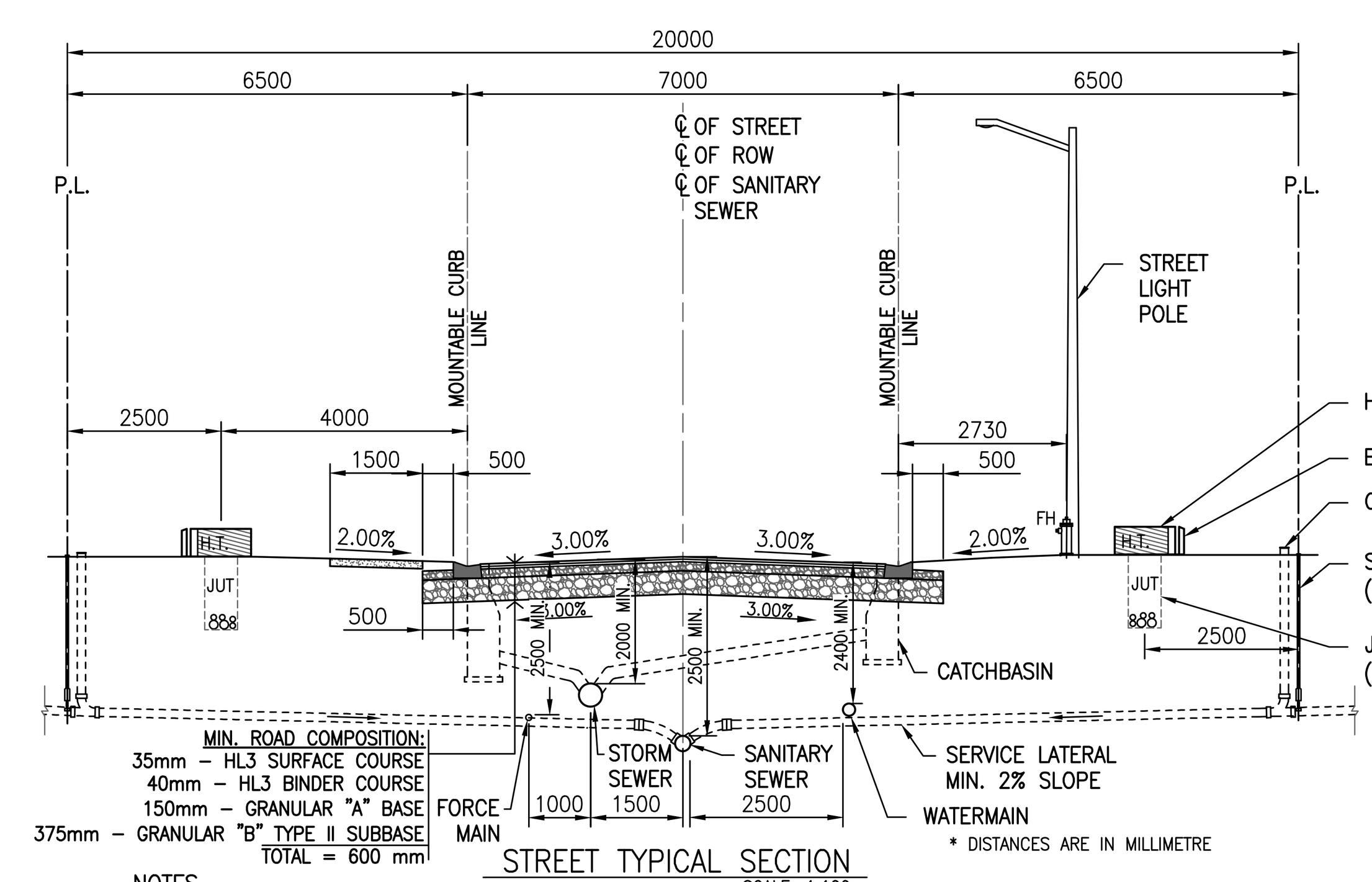
- **Draft Plan of Subdivision (S-1) February 6, 2024**

LEGEND

PROPERTY BOUNDARY	FENCE
PHASING LIMITS	EXISTING WATERMAIN
STORMWATER FACILITY	EXISTING STORM SEWER
LOT LIMITS	EXISTING SANITARY SEWER
SETBACK LINE	EXISTING HYDRO LINE
EASEMENT	EXISTING GAS MAIN
CONTOUR LINE	EXISTING BELL LINE
TEST PIT (TP)	



BERM SECTION
SCALE: 1:250



STREET TYPICAL SECTION
SCALE: 1:100

NOTES
1. ROAD COMPOSITION AS PER GEOTECHNICAL REPORT.
2. THIS SECTION IS NOT FINAL AS UTILITIES ARE TO BE STUDIED LATER.
3. FUTURE IMPROVEMENT: 0.5 m PAVED BOULEVARD AND 1.5 SIDEWALK.
4. 3-PARTY JOINT USE TRENCH: HYDRO ONE, BELL AND CABLE.
5. CATCH BASIN TYPE SHALL SUIT MOUNTABLE CURB (OPSD 600.100).
6. AT CATCH BASIN AND HYDRANT LOCATIONS, THE GAS MAIN SHALL HAVE A MINIMUM 0.5 m CLEARANCE FROM STRUCTURES.
7. FIRE HYDRANTS TO BE LOCATED ON THE WATERMAIN SIDE OF THE STREET.
8. TREES SHALL BE PLANTED INSIDE PRIVATE PROPERTIES AND NOT IN THE ROW.
9. SANITARY AND STORM LATERAL SHALLS BE EQUIPED WITH BACKWATER VALVLES.

TABLE OF LOTS

LOT No.	AREA (m²)
1	591.28
2	549.99
3	550.00
4	550.00
5	550.00
6	550.00
7	549.99
8	591.28
9	648.41
10	784.38
11	807.94
12	750.35
13	567.27
14	478.01
15	475.43
16	476.25
17	467.12
18	518.71
19	747.26
20	1044.25
21	640.83
22	540.22
23	1100.63
24	686.17
25	506.60
26	465.00
27	465.00

TABLE OF LOTS

LOT No.	AREA (m²)
28	465.00
29	465.00
30	465.00
31	465.00
32	465.00
33	465.00
34	465.00
35	465.00
36	465.00
37	465.00
38	465.00
39	465.00
40	465.00
41	465.00
42	465.00
43	465.00
44	465.00
45	465.00
46	507.31
47	554.75
48	554.75
49	554.75
50	554.75
51	554.75
52	554.75
53	668.60
54	668.60

TABLE OF LOTS

LOT No.	AREA (m²)
55	668.60
56	668.60
57	606.70
58	545.53
59	545.53
60	545.53
61	606.70
62	668.60
63	668.60
64	668.60
65	668.60
66	554.50
67	499.54
68	499.54
69	499.54
70	554.50
71	611.98
72	592.92
73	559.34
74	523.67
75	488.01
76	489.90
77	485.32
78	485.56
79	484.36
80	528.85
81	528.85

TABLE OF LOTS

LOT No.	AREA (m²)
82	484.36
83	484.36
84	474.25
85	491.88
86	487.42
87	515.83
88	544.24
89	572.64
90	601.05
91	536.50
92	483.73
93	483.73
94	483.73
95	523.96

TABLE OF BLOCKS

BLOCK No.	AREA (m²)
BLOCK A	32492.21
BLOCK B	397.71
BLOCK C	58.27
BLOCK D	38.97
BLOCK Da	23.67
BLOCK E	647.19
BLOCK F	1039.96
BLOCK G	626.92
BLOCK H	283.10

ZONING COMPLIANCE

RESIDENTIAL FIRST DENSITY R – SINGLE FAMILY DWELLINGS OF LOT AREAS NOT LESS THAN 465 m^2 AND LOT FRONTAGES NOT LESS THAN 15 m FOR FULLY SERVICED LOTS.

NOTES:
- PROPOSED SIDEWALK AT BOTH SIDES OF STREET A.
- CHAIN-LINK FENCES SHALL BE INSTALLED ALONG NORTH AND WEST PROPERTY LINES AND ALONG BOTH SIDES OF THE PATHWAY.
- HYDRO, MUNICIPAL WATERMAIN AND SANITARY SEWERS WERE IDENTIFIED ALONG COUNTY ROAD 22.
- TREE PLANTING FOR NOISE BERM TO BE DESIGNED LATER.

PHASING:

PHASE 1 CONSISTS OF:
- BLOCK A INCLUDING THE STORMWATER MANAGEMENT STRUCTURE AND NOISE BERM
- STREET A
- STREET B SOUTH OF STREET A
- FIFTY NINE (59) LOTS

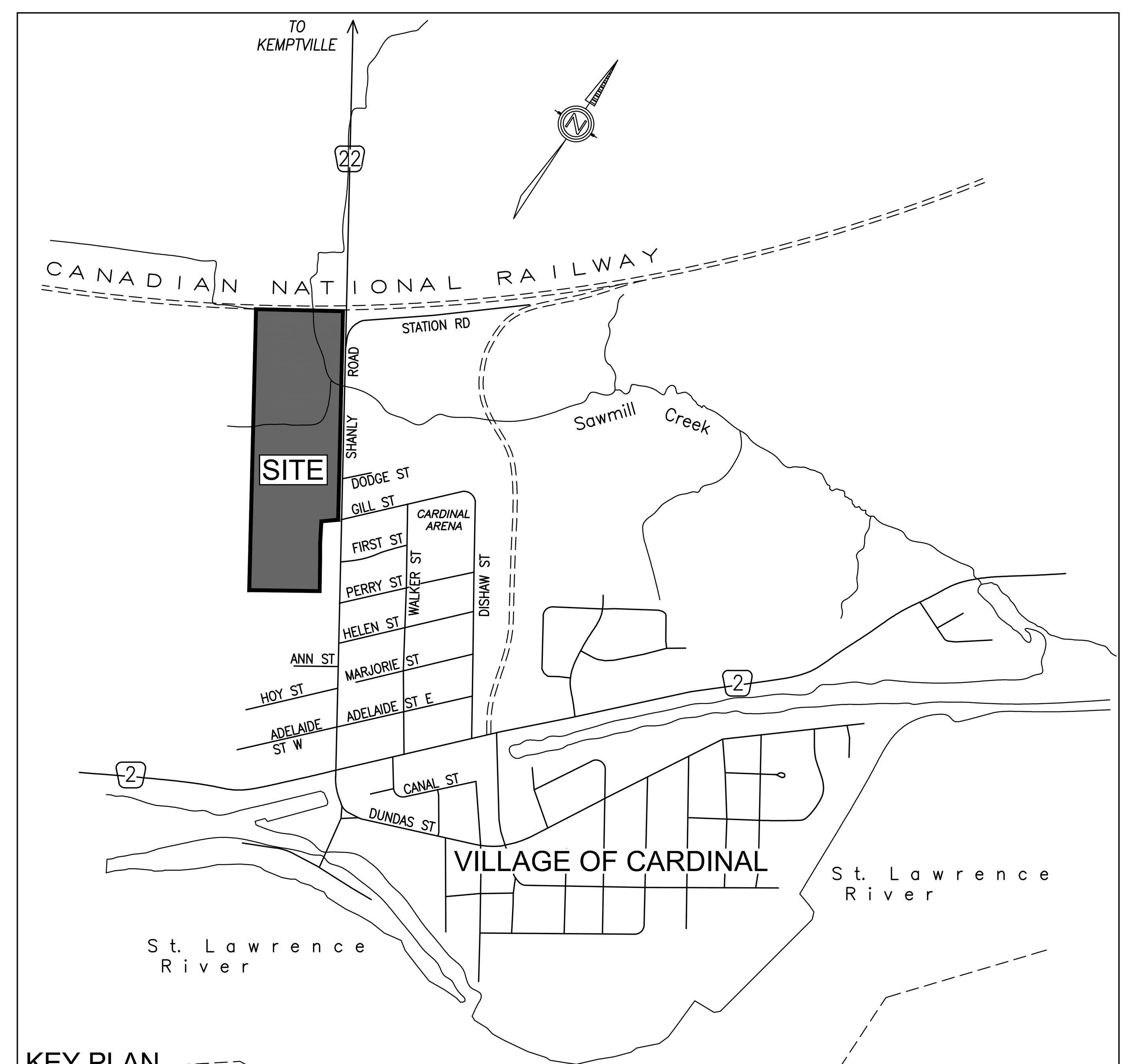
PHASE 2 CONSISTS OF:
- STREET C
- THE REMAINDER OF STREET B
- THIRTY SIX (36) LOTS

BLOCKS:
BLOCK A: OPEN SPACE – STORMWATER CONTROL FACILITY
BLOCK B: SANITARY PUMPING STATION
BLOCK C: 0.30 m RESERVE ON COUNTY ROAD
BLOCKS D & Da: 0.30 m RESERVE ON COUNTY ROAD
BLOCK E: RIGHT-OF-WAY FOR FUTURE ROAD (SOUTH)
BLOCK F: PARKLAND DEDICATION
BLOCK G: RIGHT-OF-WAY FOR FUTURE ROAD (WEST)
BLOCK H: 6m-WIDE WALKWAY AND A PASSAGE FOR UTILITIES & SERVICING – PAVED TO THE SATISFACTION OF THE TOWN-OWNERSHIP TO BE TRANSFERRED TO THE TOWN

TOTAL PROPERTY AREA = 109,274.9 SQ.M = 10.9275 ha

CONTENT REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT:

(17) The applicant shall provide the approval authority with the prescribed information and material and as many copies as may be required by the approval authority of a draft plan of the proposed subdivision drawn to scale and showing,
(a) the boundaries of the land proposed to be subdivided, certified by an Ontario land surveyor; AS SHOWN ON DRAFT PLAN.
(b) the locations, widths and names of the proposed highways within the proposed subdivision and of existing highways on which the proposed subdivision abuts; AS SHOWN ON DRAFT PLAN.
(c) on a small key plan, on a scale of not less than one centimetre to 100 metres, all of the land adjacent to the proposed subdivision that is owned by the applicant or in which the applicant has an interest, every subdivision adjacent to the proposed subdivision and the relationship of the boundaries of the land to be subdivided to the boundaries of the township lot or other original grant of which the land forms the whole or part; AS SHOWN ON DRAFT PLAN.
(d) the purpose for which the proposed lots are to be used; RESIDENTIAL (SINGLE-FAMILY), ONE BLOCK FOR A PUMPING STATION, 2 PARKS, A STORMWATER MANAGEMENT FACILITY AND TWO BLOCKS FOR FUTURE ROAD EXTENSION TOWARDS SOUTH AND WEST AS SHOWN ON DRAFT PLAN.
(e) the existing uses of all adjoining lands; RESIDENTIAL TO THE SOUTH, RURAL TO THE WEST, RAILWAY ROW TO THE NORTH AND COUNTY ROAD 22 TO THE EAST AS SHOWN IN DRAFT PLAN.
(f) the approximate dimensions and layout of the proposed lots; AS SHOWN ON DRAFT PLAN.
(a.1) if any affordable housing units are being proposed, the shape and dimensions of each proposed affordable housing unit and the approximate location of each proposed affordable housing unit in relation to other proposed residential units; N/A.
(g) natural and artificial features such as buildings or other structures or installations, railways, highways, watercourses, drainage ditches, wetlands and wooded areas within or adjacent to the land proposed to be subdivided; AS SHOWN ON DRAFT PLAN.
(h) the availability and nature of domestic water supplies; AVAILABLE VIA MUNICIPAL WATERMAIN AT COUNTY ROAD No. 22.
(i) the nature and porosity of the soil; BROWN MOIST AND STIFF CLAYED SILT RANGING IN THICKNESS BETWEEN 2.4 TO 3.3 m.
(j) existing contours or elevations as may be required to determine the grade of the highways and the drainage of the land proposed to be subdivided; AS SHOWN ON DRAFT PLAN.
(k) the municipal services available or to be available to the land proposed to be subdivided; SANITARY SEWER, WATER SUPPLY ARE AVAILABLE. BELL, HYDRO AND GAS ARE ALSO IN THE IMMEDIATE AREA and
(l) the nature and extent of any restrictions affecting the land proposed to be subdivided, including restrictive covenants or easements. NOISE EASEMENT FOR CN RAILWAY: 300 METRES FROM CN ROW LIMIT. 4.5 METRES DRAINAGE EASEMENT FOR ADJACENT LAND. 4 METRE EASEMENT FOR HYDRO ONE ALONG SHANLY RD. 4 METRES EASEMENT FOR HYDRO ONE ALONG COYNTY RD.



KEY PLAN
Not To Scale

UNITED COUNTIES OF LEEDS AND GRENVILLE
PART OF LOT 7, CONCESSION 1
GEOGRAPHIC TOWN OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL
COUNTY OF GRENVILLE

LEGAL INFORMATION

LEGAL INFORMATION PROVIDED BY IBW SURVEYORS.
PROJECT # A-026727. PLAN I5R-12193.

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY IBW SURVEYORS.
FILE No. A-026727-TOPO. SURVEY DATED APRIL 28, 2021.

ELEVATIONS:
ELEVATION SHOWN ON THIS PLAN ARE GEODETIC AND REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD28) BY DIRECT MEASUREMENT TO REAL TIME NETWORK.

GEOTECHNICAL REPORT

REFER TO GEOTECHNICAL INVESTIGATION REPORT No. 21C350, DATED MAY 31, 2021, PREPARED BY ST. LAWRENCE TESTING & INSPECTION CO. LTD.. INFORMATION PRESENTED IN THESE DRAWINGS HAS BEEN INTERPOLATED FROM THE GEOTECHNICAL REPORT AND ACCURACY IS NOT GUARANTEED. CONTRACTORS ARE ADVISED TO READ THE GEOTECHNICAL REPORT AND ASSUME THEIR OWN CONCLUSIONS.

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJOINING LANDS ARE CORRECTLY SHOWN.

DATED — RON M. JASON (ONTARIO LAND SURVEYOR)

OWNER'S CERTIFICATE

I, EDWARDSBURGH DEVELOPMENTS LTD., BEING THE REGISTERED OWNER, HEREBY AUTHORIZE ADVANCE ENGINEERING TO PREPARE AND SUBMIT THIS PLAN OF SUBDIVISION TO THE UNITED COUNTIES OF LEEDS AND GRENVILLE FOR REVIEW AND APPROVAL.

April 03, 2024 — DATED
SIGNATURE

SUBJECT TO THE CONDITIONS, IF ANY SET FORTH IN MY LETTER DATED ...., 202 ,

THIS DRAFT PLAN IS APPROVED BY THE UNITED COUNTIES OF LEEDS AND GRENVILLE UNDER SECTION 51 OF THE PLANNING ACT THIS .... DAY OF ...., 202 .

CHERIE MILLS
MANAGER OF PLANNING SERVICES
UNITED COUNTIES OF LEEDS AND GRENVILLE

No.	REVISION / ISSUE	DATE MM/DD/YY
8	UPDATE STREET NAMES AND PS	02/06/24
7	TOWNSHIP COMMENTS – 06-30-23	07/25/23
6	DRAINAGE EASEMENT	05/16/23
5	UPDATED CROSS SECTION	08/04/22

0 10 20 METRES

PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 02/06/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL , ON

APPLICANT:
Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata
613-282-5601

TITLE:

DRAFT PLAN OF SUBDIVISION

SCALE: 1:750	DRAWING No.: S-1
DRAFTED BY:	
PROJECT No.: 0114	
DATE: 02/06/24	

114-3-draft.dwg
4 29 2024

SCHEDULE "C"

WORKS TO BE PROVIDED BY THE OWNER

1. ROADS, CURBS AND PATHWAY

As set out in Schedule "I" and specifications provided in Schedule "F"

2. STORMWATER MANAGEMENT SYSTEM AND DETENTION BASIN

As set out in Schedule "H"

3. SANITARY SEWER SYSTEM AND PUMPING STATION

As set out in Schedule "I" and specifications provided in Schedule "F"

4. WATER SYSTEM

As set out in Schedule "I" and specifications provided in Schedule "F"

5. STREET LIGHTING and UTILITY SERVICE

As set out in Schedule "L."

6. STREET SIGNS

As set out in Schedule "J."

7. LANDSCAPING

As set out in Schedule "K."

8. PARK DEVELOPMENT

As set out in Schedule "N."

9. NOISE ATTENUATION MEASURES

As required by section 13 to 14 of this agreement and as shown in Schedule "M" and Schedule "K."

10. SAFETY BERM AND CHAIN LINK FENCE

As required by section 14 of this agreement and as shown in Schedule "K."

11. LOT GRADING

As per Schedule "G."

12. COMMUNITY MAIL BOXES

As required by Canada Post and as shown in Schedule "F."

NOTE: As constructed drawings of all installations shall be given to the Municipality (one print and one digital copy) complete with types of pipe and fittings including all fixture hydrant makes, streetlight makes, etc. before assumption by the Municipality.

SCHEDULE "D"

ESTIMATED COST OF WORK

Attached:

- **Cost Estimate provided by Edwardsburgh Developments Inc. May 8, 2024**

Edwardsburgh Developments Ltd.

Lockmaster's Meadow Subdivision (Phase 1 & 2), Shanly Rd, Cardinal ON

Lockmaster's Meadow Subdivision – On-Site Work

ESTIMATE					
No.	**Description**	**Unit**	**Quantity**	**Unit Price**	**Total**
II	**General – Subdivision**				
1	Mobilization/Demobilization	LS			$65,000.00
2	Erosion Control, Maintenance, Sediment Removal	LS			
3	Site Clearing	LS			
4	Site Trailer/Office	LS			
5	Watermain, fittings, appurtenances & Service Lines	LS			$528,395.00
6	Force main and fittings	LS			$505,588.00
7	Sanitary Sewer & Laterals	LS			
8	Storm Sewer & Laterals, Subdrains inc. Stormceptor	LS			$492,015.00
9	Supply & Place Granular B Type II	TONN			$480,000.00
10	Supply & Place 150mm Granular A	TONN			
11	Supply & Install Concrete Mountable Curb	m			$175,000.00
12	Street Lighting and Signage	LS			$28,000.00
13	Topsoil Removal - Earth Excavation – ROW	m^3			$175,000.00
14	Earth Berm, Stormwater Pond & Outlet Structure	LS			
15	Utility Trenches: Hydro, Gas, Bell, Street Lighting, Ducts	m			
16	Rough Lot Grading, Swales, Parks	LS			
	Total Price for Above- General Items:				**$2,448,998.00**
II	**Pumping Station**				
1	Concrete Wet Well	LS			
2	Pumping & Accessories	LS			
3	Generator Building	LS			
4	Generator, Electrical and SCADA	LS			
	Total Price for Pumping Station:				**$334,900.00**
III	**Pavement**				
1	Supply & Place HL8	TONN			$200,000.00
2	Supply & Place HL3 – Surface	TONN			$225,000.00
	Total Price for Pavement:				**$425,000.00**
	Total:				**$3,208,898.00**
IV	**Contingency**				
	Contingency				**$300,000.00**
	Sub-Total:				**$3,508,898.00**
	GST (13%)				**$456,156.74**
	Total:				**$3,965,054.74**

Cost per metre of Road: $4,956

SCHEDULE "E"

FINANCIAL REQUIREMENTS

Prior to the signing of this Agreement, the Developer shall pay to the Municipality the following deposit(s) and fee(s):

1. DEPOSIT / LETTER OF CREDIT

The Owner shall deposit, per clause 23, cash, certified cheque, or letter of credit in a form satisfactory to the Municipality's solicitor in the amount of $ 2,000,000.00 two million dollars. If a letter of credit is provided it may not expire or be terminated without the written authorization of the Municipality.

The Owner shall further cause to be registered a first charge against not less than 2 lots within the subdivision in favour of the Municipality. The lots to be provided as security shall be selected by the Owner and may be replaced from time to time with other lots of a similar size and location. The Charge shall be in satisfactory form to the solicitor for the Municipality acting reasonably.

In the event that the Works remaining to be completed have a value of less than the security required, the Municipality shall provide discharges of one or more lots. The amount of security required shall be determined in the sole and unfettered discretion of the Municipality.

The cash or Letter of Credit shall remain in place until 50% of the total works has reached the substantial completion benchmark as deemed by the municipality. The owner may request to the municipality upon reaching the benchmark, to have the cash or letter of credit reduced to $1,000,000.00 one million dollars. The reduced cash or letter of credit shall remain in place until the entire works reach substantial completion. Following substantial completion, the cash or letter of credit and lots will be returned as per section 23 excluding costs for the second layer of asphalt that will be returned once the roads are assumed by the Municipality into their road network.

2. INSPECTION FEE

The Owner shall pay sewer and water connection inspection fees as set out in the current fees by-law.

The Owner shall pay the Municipality engineering review and inspection fees as may be incurred and as set out in Clause 5.4 and 5.5 of this Agreement.

The Owner shall reimburse the Municipality for all reasonable costs incurred by its staff for inspections, reviews, and administration of this development. These costs will be invoiced to Edwardsburgh Development Inc. by the Municipality and payable within thirty (30) days from the invoice date.

SCHEDULE "F"

DESIGN CRITERIA AND SPECIFICATIONS

1. ROADWAYS AND CURBS

All roadways and curbs shall be constructed in accordance with the latest edition of the Ontario Provincial Standard Specifications and Drawings (OPSS and OPSDs), in accordance with the requirements of the Municipality and in accordance with the approved drawings and specifications.

A walkway connecting Shanly Road and Street B on Block H, as shown in Schedule “I”, shall be constructed in accordance with the approved drawings and specifications.

Fill shall not be placed within the ROW in excess of 300mm per lift. Prior to the placement of any new material, native soil should be proof rolled and observed by the Geotechnical Consultant. All imported structural material and all material to be reused in the ROW shall be approved by the Geotechnical Consultant prior to placement.

Concrete curbs shall be in accordance with OPSD 600.100 “mountable curb with narrow gutter” with provisions made for curb depression at driveways.

The final lift of asphalt for streets in phase 1 shall not be placed and compacted until 80% of the homes for phase 1 are completed. Likewise, the final lift of asphalt for streets in phase 2 shall not be placed and compacted until 80% of the homes for phase 2 are completed.

2. WATERMAINS AND WATER SERVICES

All watermains, water services and related appurtenances are to be constructed in accordance with the latest edition of the OPSS and OPSDs, relevant AWWA specifications, the Certificate of Approval as issued by the Ministry of the Environment, and the approved drawings. All new watermains and water services are to be hydrostatically tested as described in the OPSS and to be disinfected and tested for bacteriological presence as described in AWWA C651-99. The swabbing, hydrostatic testing and disinfection testing will be completed by the Owner with Municipal oversight to ensure compliance with the MECP disinfection procedure.

If pumping exceeds 50,000L per day, a permit to take water must be obtained. Pumping records are to be maintained for the duration of construction to document whether or not this amount is exceeded. Any discharge to the

municipal sewer is to be shown to be in compliance with the sewer use bylaw and written approval shall be obtained by the Municipality prior to any such discharge.

Tracer wire testing is required as part of the commissioning process. The Owner shall ensure this is completed by their Contractor prior to backfilling.

Water Meters shall be obtained from the Municipality at the cost of the Owner, and are to be installed by the Owner during construction, and must be inspected and approved by the Municipality prior to activating any new water service.

The Municipality shall ensure that water service is available on the south side of County Road #22 within a reasonable time. Such water service shall have a proper shut off valve installed.

The Owner agrees to pay the Municipality the following rate per connection for access to water:

$1,500.00 per unit

3. SANITARY AND STORM SEWERS

Storm and sanitary sewers shall be installed to comply with the Municipality's Consolidated Linear Infrastructure Environmental Compliance Approvals (CLI ECA) requirements; the MECP publication "Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval", as amended, and in accordance with the approved drawings and specifications herein.

The storm and sanitary sewer systems shall comply with the inspection and testing requirements set out in the MECP publication "Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval", as amended, and documentation of the inspection and testing results shall be submitted to the Municipality. CCTV for sanitary sewers is required to be submitted to the Municipality.

All sewers shall be installed with pipe laser and checked with level instrument prior to backfilling.

The Owner agrees to pay the Municipality the following rates per connection for access to sanitary sewer:

$1,500.00 per unit.

4. COMMUNITY MAIL BOXES

The Owner covenants and agrees to provide the Municipality with evidence that satisfactory arrangements, financial and otherwise, have been made with Canada Post Corporation for the installation of Community Mail Boxes (CMB) as required by Canada Post Corporation and as shown on the approved Plan. The Owner further covenants and agrees to provide notice to prospective purchasers of the location of the CMB and that home mail delivery will be provided via CMB, provided the Owner has paid for the activation and equipment installation of the CMB.

Attached:

- **General Notes and Specifications (N1) December 1, 2023**
- **Details (D1 to D5 inclusive) February 6, 2024**

UNITED COUNTIES OF LEEDS AND GRENVILLE

VILLAGE OF CARDINAL

*****

LOCKMASTER' S MEADOW SUBDIVISION

ROADS, SEWERS & WATERMAINS

PART OF LOT 7, CONCESSION 1
GEOGRAPHIC TOWN OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL
COUNTY OF GRENVILLE
ADDRESS: COUNTY RD No. 22
CARDINAL, ONTARIO

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 EARL GREY DRIVE
KANATA, ON K2T 1C1
613-282-5601

CONSULTANT:

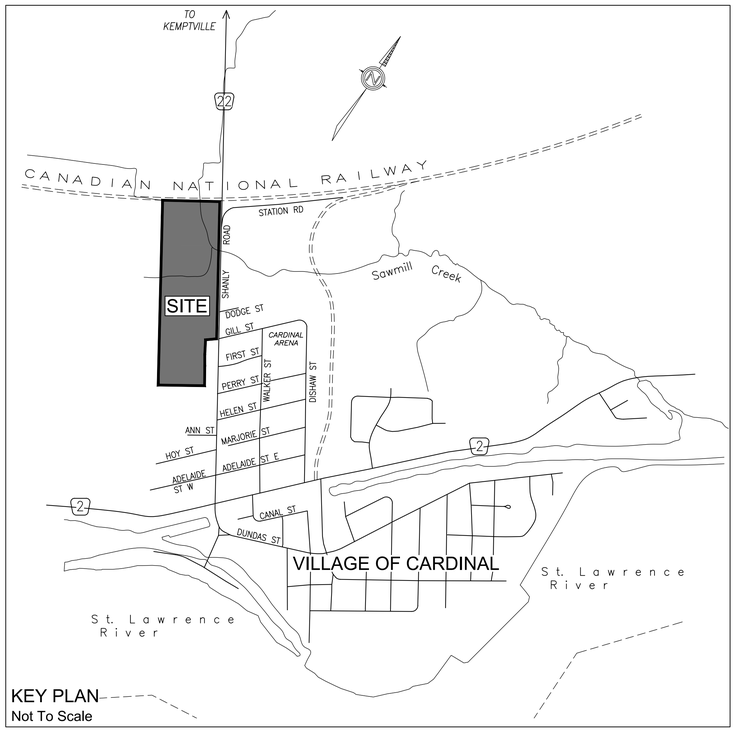
ADVANCE ENGINEERING
Civil - Municipal - Structural
613-986-170

PROJECT No. 114

APRIL 2024

LIST OF DRAWINGS

No.	INDEX	TITLE	REV. No.	DATE
1	CS-1	COVER SHEET - LIST OF DRAWINGS	5	04-22-2024
2	N-1	GENERAL NOTES AND SPECIFICATIONS	5	12-01-2023
3	S-1	DRAFT PLAN OF SUBDIVISION	8	02-06-2024
4	GSP 1	GENERAL SERVICES PLAN PHASE 1	8	02-06-2024
5	GSP 2	GENERAL SERVICES PLAN PHASE 2	8	02-06-2024
6	PP-1	PLAN & PROFILE STREET A - STATION 0+000 TO 0+169	8	02-06-2024
7	PP-2	PLAN & PROFILE STREET B - STATION 0+000 TO 0+375	8	02-06-2024
8	PP-3	PLAN & PROFILE STREET B - STATION 0+375 TO 0+670	8	02-06-2024
9	PP-4	PLAN & PROFILE STREET B - STATION 0+670 TO 0+796.2	8	02-06-2024
10	PP-5	PLAN & PROFILE STREET C & PATHWAY	8	02-06-2024
11	PP-6	PLAN & PROFILE COUNTY RD 22	8	02-06-2024
12	GR-1	GRADING AND DRAINAGE PLAN PHASE 1	7	02-06-2024
13	GR-2	GRADING AND DRAINAGE PLAN PHASE 2	7	02-06-2024
14	GR-3	GRADING AND DRAINAGE PLAN DETAILS	7	02-06-2024
15	D-1	DETAILS SHEET 1	5	02-06-2024
16	D-2	DETAILS SHEET 2	5	02-06-2024
17	D-3	DETAILS SHEET 3	5	02-06-2024
18	D-4	DETAILS SHEET 4	5	02-06-2024
19	D-5	DETAILS SHEET 5	5	02-06-2024
21	ES-1	EROSION AND SEDIMENT CONTROL PLAN	6	02-06-2024
20	LS-1	LANDSCAPE PLAN	3	09-05-2023
20	CUP 1/3	COMPOSITE UTILITY PLAN PHASE 1	4	07-25-2023
20	CUP 2/3	COMPOSITE UTILITY PLAN PHASE 2	4	07-25-2023
20	CUP 3/3	COMPOSITE UTILITY PLAN DETAILS	4	07-25-2023
22	PND	POND PLAN	4	02-06-2024
23	SIG-1	TRAFFIC SIGNAGE PLAN	1	09-06-2023
24	EW-1	EARTHWORKS PLAN	1	02-06-2024



KEY PLAN
Not To Scale

GENERAL NOTES AND SPECIFICATIONS:

1. ALL WORKS AND MATERIALS SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF THE CITY OF OTTAWA, AND ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS), AS AMENDED BY THE CITY OF OTTAWA. REFER TO THE LATEST MS–22.15 AND MW–19.15 FOR APPROVED PRODUCTS AND MATERIAL TO BE USED FOR WATERMAIN AND SANITARY AND STORM SEWERS.
2. ALL WORKS TO BE IN ACCORDANCE WITH TOWNSHIP OF EDWARDSBURGH CARDINAL BY–LAWS, INCLUDING BY–LAW No. 2013–69.
3. ALL SANITARY AND STORM WORKS SHALL COMPLY WITH THE TOWNSHIP'S CLI–ECA REQUIREMENTS AND THE MECP DESIGN CRITERIA FOR SANITARY SEWERS, STORM SEWERS AND FORCEMAINS DATED MAY 31, 2023 OR AS REVISED; AND THE MECP DESIGN GUIDELINES FOR SEWAGE WORKS, 2008, AS AMENDED FROM TIME TO TIME.
4. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
5. ALL CONSTRUCTION SIGNAGE MUST CONFORM TO THE M.T.O. MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (LATEST AMENDMENT).
6. THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION, TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
7. ANY CONFLICTS WITH EXISTING SERVICES AND/OR UTILITIES SHALL BE REPORTED TO THE ENGINEER FOR REVIEW & ADVICE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
8. RELOCATION OF EXISTING SERVICES AND/OR UTILITIES SHALL BE AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER AT THE EXPENSE OF THE DEVELOPER.
9. THE SUPPORT OF ALL UTILITIES SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
10. ANY AREAS BEYOND THE LIMIT OF THE SITE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION AT THE CONTRACTOR'S EXPENSE.
11. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.
12. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SPECIFIED. PIPE SIZES ARE IN MILLIMETRE. PIPE/CULVERT SECTION SIZES REFER TO INSIDE DIMENSIONS.
13. THERE WILL BE NO SUBSTITUTION OF MATERIALS UNLESS PRIOR WRITTEN APPROVAL BY VILLAGE OF CARDINAL HAS BEEN OBTAINED.
14. ALL BOREHOLES SHOWN ON THE DRAWINGS ARE FOR INFORMATION ONLY. REFER TO GEOTECHNICAL INVESTIGATION REPORT BY ST LAWRENCE TESTING & TESTING INSPECTION CO. LTD. DATED MAY 31, 2021, FOR ADDITIONAL DETAILS REGARDING MATERIAL AND CONSTRUCTION SPECIFICATIONS. IN CASE OF DISCREPANCIES BETWEEN THESE SPECIFICATIONS AND THE GEOTECHNICAL RECOMMENDATIONS, FOLLOW THE GEOTECHNICAL.
15. SHOULD DEEPLY BURIED ARCHAEOLOGICAL REMAINS BE FOUND ON THE PROPERTY DURING CONSTRUCTION ACTIVITIES, THE HERITAGE OPERATIONS UNIT OF THE ONTARIO MINISTRY OF CULTURE MUST BE NOTIFIED IMMEDIATELY.
16. CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REVIEW WITH THE VILLAGE OF CARDINAL PRIOR TO ANY TREE CUTTING.
17. VEGETATION REMOVAL WHERE REQUIRED SHOULD TAKE PLACE OUTSIDE OF THE SPRING AND SUMMER ACTIVE SEASON (TYPICALLY APRIL 1 TO SEPTEMBER 30).
18. SHOULD ANY SPECIES AT RISK BE DISCOVERED THROUGHOUT THE CONSTRUCTION PERIOD, THE LOCAL MECP DISTRICT SHOULD BE CONTACTED IMMEDIATELY.
19. DURING CONSTRUCTION, SHOULD THE GROUNDWATER VOLUME OF PUMPING EXCEED 50,000 LITRES PER DAY, A PERMIT TO DEWATER SHOULD BE OBTAINED. SUITABLE FILTRATION WILL BE REQUIRED BEFORE DISCHARGING GROUNDWATER INTO SEWERS.
20. PERMIT WILL BE NEED TO BE OBTAINED FROM THE VILLAGE FOR ROAD CUTS.
21. ALL WATER CUSTOMERS SUPPLIED BY A WATERMAIN TO BE SHUT DOWN SHALL BE NOTIFIED BY THE CONTRACTOR AT LEAST 24 HOURS IN ADVANCE OF THE SHUT DOWN OR AS DIRECTED BY VILLAGE OF CARDINAL STAFF.
22. EXCESS SOILS MANAGEMENT SHALL COMPLY WITH O. REG. 406/19 ONSITE AND EXCESS SOIL MANAGEMENT. CONTRACTOR SHALL FILE A NOTICE AT RPRA "EXCESS SOIL REGISTRY" PRIOR TO EXCAVATION.
23. SHOP DRAWINGS: CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR REVIEW FOR ALL STRUCURES SHOWING EXACT DETAILS.
24. CONTRACTOR SHALL PERFORM LEAKAGE TESTING, IN THE PRESENCE OF THE ENGINEER, FOR SANITARY AND STORM SEWERS IN ACCORDANCE WITH OPSS 410 AND OPSS 407. CONTRACTOR SHALL PERFORM VIDEO INSPECTION OF ALL SEWERS. A COPY OF THE VIDEO AND INSPECTION REPORT SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW.
25. CLAY SEALS TO BE INSTALLED AS PER OPSS 1205 AND OPSD 802.095 AS INDICATED ON THE GENERAL PLAN OF SERVICES PLAN. CLAY LAYERS TO BE COMPACTED TO A MINIMUM OF 95% SPMDD.
26. ALL SEWERS CONSTRUCTED WITH GRADES 0.50% OR LESS, SHALL BE INSTALLED WITH PIPE LASER AND CHECKED WITH LEVEL INSTRUMENT PRIOR TO BACKFILLING.
27. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADDITIONAL BEDDING OR ADDITIONAL STRENGTH PIPE IF THE MAXIMUM TRENCH WIDTH, AS SPECIFIED BY OPSD, IS EXCEEDED.
28. ALL PVC PIPES AND RUBBER GASKETED JOINTS SHALL CONFORM TO THE REQUIREMENTS OF OPSS 1841 AND OPSD 806.040 & 806.060 WITH REGARD TO MAXIMUM FILL/COVER.

WATER SUPPLY:

1. WATERMAIN SHALL BE PVC MINIMUM DR 18 WITH GASKETED JOINTS EQUAL TO AWWA C–900, C–905 & C–907 CLASS 150, OR APPROVED EQUAL.
2. SPATIAL SEPARATION: A MINIMUM HORIZONTAL SEPARATION OF 2.5 m MUST BE MAINTAINED BETWEEN WATERMAIN AND SANITARY OR STORM SEWERS. WATER SERVICES SHALL COMPLY WITH OBC 7.3.5.7.. IN A COMMON TRENCH, THE WATER SERVICE SHALL BE PLACED ON A SHELF AT ONE SIDE OF THE TRENCH WITH A MINIMUM VERTICAL CLEARANCE OF 0.5 m ABOVE THE SANITARY PIPE.
3. WATERMAIN TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W17 OR OPSD 802.010, UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE AS SPECIFIED BY PROJECT GEOTECHNICAL ENGINEER.
4. MINIMUM DEPTH OF COVER FOR MAIN AND SERVICE CONNECTION FROM TOP OF PIPE TO FINISHED GRADE IS 2.4 m. WHEN LESS COVER, PROVIDE INSULATION AGAINST FROST AS PER OTTAWA DETAIL W22 OR OPSD 1109.03. INSULATION SHALL BE 275 kPa (40 psi). WATERMAIN SHALL BE AT LEAST 1.1 m BELOW BOTTOM OF ROAD SIDE DITCH.
5. THE DEPTH OF WATER SERVICES AT PROPERTY LINE SHOULD BE A MINIMUM OF 2.2 m AND A MAXIMUM OF 2.6 m. THE DISTANCE BETWEEN THE GROUND ELEVATION AND THE TOP OF THE ROD SHOULD BE BETWEEN 0.5 m AND 1.0 m.
6. SERVICE CONNECTION SHALL BE 25 mm DIA. TYPE K SOFT COPPER. INSTALL AS PER OPSD 1104.010. 50 mm DIAMETER SHALL BE USED FOR PARK SERVICES AND PUMPING STATION.
7. WATER SERVICES SHALL BE MARKED WITH A "50 mm x 100 mm", EXTENDING FROM THE INVERT TO 1.0 m ABOVE GRADE PAINTED BLUE. STAND POSTS/SHUT–OFFS SHALL BE INSTALLED AT THE PROPERTY LINE.
8. CATHODIC PROTECTION IS REQUIRED ON ALL PVC WATERMAIN AND METALLIC FITTINGS, RESTRAINERS AND HYDRANTS AS PER OPSD 1109.011 OR OTTAWA STD. W40.
9. ALL SACRIFICIAL ANODES SHALL CONFORM TO A.S.T.M. B–418 TYPE II AND SHALL BE MADE OF HIGH GRADE ELECTROLYTIC ZINC, 99.99%.
10. ALL WELD CONNECTIONS TO BE COATED WITH "TC MASTIC" OR APPROVED EQUIVALENT.
11. FOR ALL ANODES CONNECTED TO NEW PIPE, FITTINGS OR TO EXISTING METALLIC WATERMAINS, A CADWELDER AND CA–15 OR EQUIVALENT CARTRIDGE SHALL BE USED. ANODE INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS.
12. CONTRACTOR TO SUPPLY HYDRANT EXTENSION TO ADJUST THE LENGTH OF HYDRANT BARREL.
13. FIRE HYDRANTS TO BE IN ACCORDANCE WITH AWWA A502 LATEST EDITION. ACCEPTED MODELS: CLOW CANADA M–67/M93 BRIGADIER, McAVITY M67B OR CONCORD D67–M WITH PUMPER NOZZLE OUTLETS OR EQUIVALENT. HYDRANTS TO BE PAINTED YELLOW WITH A RED CAP. VILLAGE TO BE CONTACTED DURING CONSTRUCTION TO CONFIRM IF DRAIN HOLES ARE TO BE PLUGGED OR REMAIN OPEN.
14. FIRE HYDRANTS SHALL BE INSTALLED AS PER OPSD 1105.10 AND AT LEAST 1.5 m FROM EDGE OF DRIVEWAYS. CITY OF OTTAWA STD. W19 MAY BE USED.
15. TAPPING FOR SERVICE CONNECTION SHALL BE DONE WITH FULL OPERATING PRESSURE IN THE MAIN. CONNECTION TO MAIN AT ANGLE OF 15 DEGREE TO 45 DEGREE FROM HORIZONTAL C/W WITH SADDLE.
16. PROVIDE CURB–STOP AND BOX AT PROPERTY LINE ON THE STREET SIDE. CURB–STOP SHALL NOT BE IN DRIVEWAY OR FUTURE SIDEWALK.
17. PVC WATERMAIN SHALL BE INSTALLED WITH A 10 GAUGE STRANDED COPPER TWU OR RWU TRACER WIRE IN ACCORDANCE WITH CITY OF OTTAWA STD. W36.
18. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS AND BLOW–OFFS AND NOZZLES REQUIRED FOR TESTING AND DISINFECTION OF THE WATERMAIN.
19. INSULATION FOR WATERMAIN CROSSING OVER AND BELOW SEWER SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. W25.2 AND W25, RESPECTIVELY, WHERE WATERMAIN COVER IS LESS THAN 2.4 m.
20. WHERE THE SEPARATION BETWEEN SERVICES AND MANHOLES IS LESS THAN 1.2 m, WATER SERVICES ARE TO BE INSULATED AS PER CITY OF OTTAWA STD. W23.
21. THE MINIMUM VERTICAL CLEARANCE BETWEEN WATERMAIN AND SEWER / UTILITY IS 0.25 m FOR CROSSING OVER THE SEWER, AS PER CITY STD W25.2. FOR CROSSING UNDER SEWER, THE MINIMUM VERTICAL CLEARANCE IS 0.50 m AS PER CITY STD. W25. FOR CROSSING UNDER SEWER, ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS IS REQUIRED TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING. THE LENGTH OF WATER PIPE SHALL BE CENTRED AT THE POINT OF CROSSING SO THAT THE JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.
22. VALVE IN BOXES SHALL BE INSTALLED AS PER CITY OF OTTAWA STD. W24.
23. ALL PLUGS, CAPS, TEES AND BENDS SHALL BE MECHANICALLY RESTRAINED AS PER MANUFACTURERS SPECIFICATIONS. RESTRAINTS SHALL MEET UNI–B–13–92.
24. VALVES SHALL BE RESILIENT–SEATED AS OPER AWWA C509 AND SHALL OPEN COUNTER–CLOCKWISE. VALVES SHALL BE SUPPLIED BY MUELLER, CANADA VALVE, McAVITY CLOW OR APPROVED EQUIVALENT.
25. VALVE BOXES SHALL BE A 130 mm DIAMETER SLIDE VALVE BOX COMPLETE WITH CASE IRON CAP AS SUPPLIED BY BIBBY–SITE–CROIX OR APPROVED EQUIVALENT.
26. PIPE BARREL BENDING DEFLECTION SHALL NOT BE ALLOWED. PIPE JOINT DEFLECTIONS ARE DISCOURAGED, HOWEVER, IF ABSOLUTELY NECESSARY, THE MAXIMUM ALLOWABLE PIPE JOINT DEFLECTION SHALL BE 50% OF THE MANUFACTURER'S SPECIFICATIONS.
27. TRACER WIRE IS TO BE INSTALLED ON ALL NEW PVC WATERMAIN PIPE FOR LOCATING PURPOSES. A SOLID 10 GAUGE T.W.U. COPPER WIRE IS TO BE INSTALLED ALONG THE PIPE, STRAPPED TO THE PIPE AT 6 METRE INTERVALS. JOINTS IN THE WIRE BETWEEN VALVES ARE NOT PERMITTED.
28. THE INSPECTOR MAY TEST THE TRACING WIRE FOR CONDUCTIVITY. IF THE TRACING WIRE IS NOT CONTINUOUS FROM VALVE TO VALVE. THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, REPLACE OR REPAIR THE WIRE.
29. OPERATION OF EXISTING WATERMAINS SHALL BE BY VILLAGE OF CARDINAL STAFF ONLY.
30. WATERMAIN IN FILL AREA OR IN PREVIOUSLY DISTURBED GROUND TO BE INSTALLED WITH RESTRAINED JOINTS AS PER CITY OF OTTAWA STD. W25.5 AND W25.6.
31. THRUST BLOCKING OF WATERMAIN TO BE INSTALLED AS PER CITY OF OTTAWA STD. W25.3 AND W25.4.
32. FOR STUBS DESIGNED FOR FUTURE WATERMAIN CONNECTION, THE END OF THE PIPE SHOULD BE CAPPED TO MAKE IT WATERTIGHT AND THRUST RESTRAINT ADDED ACCORDING TO CITY STANDARD.
33. ALL WATER SERVICES CROSSING SEWERS ARE TO BE INSTALLED AS PER CITY OF OTTAWA STD. W38.
34. VALVE CHAMBER COVER TO BE SET FLUSH WITH BASE COURSE ASPHALT AND ADJUSTED TO FINAL GRADE PRIOR TO INSTALLING TOP LIFT OF ASPHALT.

SANITARY SEWERS:

1. SANITARY SEWER PIPE SHALL BE PVC MINIMUM SDR 35, IPEX "RING–TITE" OR EQUIVALENT, AS PER CSA STANDARD B182.2 (LATEST AMENDMENT), WITH A MINIMUM PIPE STIFFNESS OF 320 kPa.
2. SANITARY FORCEMAIN SHALL BE PVC MINIMUM DR 26.
3. SANITARY SEWER TRENCH AND BEDDING SHALL BE AS PER CITY OF OTTAWA STD. S6 AND S7, CLASS 'B' BEDDING OR OPSD 802.010 UNLESS OTHERWISE NOTED.
4. MINIMUM COVER FOR SEWER MAIN BELOW ROAD CENTRELINE IS 2.5 m. WHEN LESS COVER, PROVIDE INSULATION FROST PROTECTION AS PER OTTAWA DETAIL W22 OR ONTARIO STANDARDS OPSS 1605 AND OPSD 1109.030. INSULATION SHALL BE 275 kPa (40 psi).
5. ALL SANITARY LATERALS ARE TO BE PVC SDR 28 CONFORM TO CSA B182.2, W/ RUBBER GASKET JOINT, IPEX "RING–TITE" (OR EQUIVALENT), ANY COLOUR EXCEPT WHITE AND MARKED WITH A 50 mm x 100 mm WOODEN MARKER, EXTENDING FROM THE INVERT TO 1.0 m ABOVE GRADE PAINTED RED. SINGLE CONNECTIONS SHALL BE 135 mm DIAMETER.
6. SERVICE CONNECTION SHALL BE LAID AT 1–2 % SLOPE AND 2.15 m MIN. AND 2.75 m MAX. DEEP BELOW FINISHED GRADE AT PROPERTY LINE.
7. SERVICE CONNECTION SHALL BE TERMINATED AT 1.5 – 3.0 m INSIDE THE LOT.
8. SANITARY MANHOLES TO BE AS PER OPSD 701.010. BENCHING IN MANHOLES AS PER OPSD 701.021. GRANULAR BACKFILL AROUND MANHOLES SHALL BE COMPACTED BY MECHANICAL MEANS TO A MINIMUM OF 95% SPD.
9. SANITARY MANHOLE FRAME AND COVERS SHALL BE AS PER OPSD. 401.010 TYPE A.
10. SAFETY PLATFORMS WHEN REQUIRED SHALL BE AS PER OPSD 404.020.
11. MANHOLE COVER TO BE SET FLUSH WITH BASE COURSE ASPHALT AND ADJUSTED TO FINAL GRADE PRIOR TO INSTALLING TOP LIFT OF ASPHALT.
12. FOR SANITARY MANHOLES, DEPENDING ON THE ELEVATION OF THE GROUNDWATER TABLE, AND BASED ON THE RECOMMENDATION OF THE PROJECT GEOTECHNICAL CONSULTANT, CRETEX SEALS, OR A SIMILAR PRODUCT, SHALL BE INSTALLED IN THE FIRST PRE–CAST MANHOLE SECTION TO JUST BELOW THE MANHOLE FRAME TO PREVENT INFILTRATION.

STORM SEWER:

1. MAINTENANCE HOLES, CATCH BASINS, PIPES, CHAMBERS TO BE AS PER OPSD. MATERIAL USED SHALL BE APPROVED BY THE VILLAGE.
2. POLYVINYL CHLORIDE (PVC) PIPE SHALL BE SDR 35 AND MEET THE CANADIAN STANDARD ASSOCIATION REQUIREMENT C.S.A. B182.2 AS NOTED WITHIN OPSS 1841. THE BASIC MATERIAL USED IN MANUFACTURING THIS PIPE SHALL HAVE A CELL CLASSIFICATION OF 12454–B OR 12454–C OR ASTM STANDARD D–3034 AND OPSS 18. PVC PIPE MAXIMUM ALLOWABLE DEFLECTION OF MAIN SEWER IS 5%.
3. ALL STORM LATERALS SHALL BE PVC SDR 28 TO CSA B182.2, WHITE IN COLOUR AND MARKED WITH A 50 x 100 mm WOODEN MARKER EXTENDING FROM THE INVERT TO 1.0 m ABOVE GRADE PAINTED GREEN. HOUSE CONNECTIONS SHALL BE 2.0 m MIN. BELOW FINISHED GRADE AT PROPERTY LINE WHERE POSSIBLE. SINGLE CONNECTIONS SHALL BE 100 mm DIAMETER.
4. STORM SEWERS WITH DIAMETERS LARGER THAN 375mm SHALL BE HDPE, N–12, OR REINFORCED CONCRETE IN ACCORDANCE WITH CSA A257.2 (LATEST AMENDMENT), MINIMUM CLASS 65–D.
5. STORM MANHOLES TO BE AS PER OPSS 1351 AND OPSD 701.010–701.081 (INCLUSIVELY). ADJUSTMENT UNITS: PRECAST CONCRETE TO OPSD 704.010, PARGED OR SEALED PER OPSS 407. MAXIMUM 3 ADJUSTMENTS UNITS PER STRUCTURE.
6. PRECAST CONCRETE CATCH BASINS SHALL CONFORM TO OPSD 705.010 IN ROAD AND OPSD 705.030 IN GRASSED AREA.
7. CATCH BASIN FRAME AND GRATE AS PER OPSD DETAILS 400.010 AND 610.010 IN ROAD AND 403.010 IN GRASSED AREA.
8. THE COMPACTION OF ALL BEDDING AND COVER MATERIAL SHALL BE 95% STANDARD PROCTOR OR BETTER. MAXIMUM COVER SHALL BE IN ACCORDANCE WITH OPSD 806.040 AND 806.060. SPECIAL CARE MUST BE GIVEN TO CONTOURING THE BEDDING MATERIAL TO CONFORM WITH THE PIPE BOTTOM AND PROJECTING BELLS, ALONG WITH PROPER COMPACTION OF THE HAUNCHES IN ORDER TO PROVIDE EVEN SUPPORT THROUGHOUT THE PIPE.
9. ALL STORM SEWER MANHOLES SHALL BE CONSTRUCTED WITH A 300 mm SUMP. CATCHBASINS AND CATCHBASIN MANHOLES SHALL BE CONSTRUCTED WITH A 600 mm SUMP UNLESS OTHERWISE NOTED.
10. DOUBLE CATCHBASINS SHALL BE IN ACCORDANCE WITH OPSD 705.020.
11. SINGLE AND DOUBLE CATCHBASIN LEADS SHALL BE 200 AND 250 mm DIAMETER (MIN.), RESPECTIVELY, AT 1.0% SLOPE (MIN.) UNLESS OTHERWISE NOTED.
12. CONTRACTOR SHALL ENSURE THAT CATCHBASINS ARE INSTALLED AT THE LOW POINT OF SAG CURB WORKS.
13. PROVIDE SUB–DRAINS OF 150 mm HDPE PERFORATED BELOW CURBS AS PER OPSS 405, 140 AND 18. SUBDRAINS TO HAVE POSITIVE OUTLET TO STORM SEWERS.
14. THE MINIMUM DIAMETER FOR REAR LOT PERFORATED PIPE IS 250 mm, REFER TO OTTAWA STD. S29 FOR DETAIL, UNLESS OTHERWISE NOTED.
15. FOR TWO OR MORE REAR LOT CATCH BASINS CONNECTED IN SERIES, THE LEAD FROM THE LAST REAR LOT CB TO THE STORM SEWER SHALL BE SOLID PIPE.
16. RLCB LEAD DRAINAGE EASEMENTS SHOULD BE 2.4 m WIDE AND CLEAR OF ANY ROOF OVERHANGS AND FOOTINGS.
17. PROVIDE MOUNTABLE CONCRETE CURB AS PER OPSD 600.100.
18. STORM PIPES TO BE CONNECTED OBVERT TO OBVERT WHEN DOWNSTREAM PIPE IS HIGHER THAN UPSTREAM PIPE. A MINIMUM DROP OF 75 mm IS TO BE MAINTAINED.
19. ALL SEWERS ARE TO HAVE AN UNDISTURBED BASE.
20. STORM SERVICE CONNECTIONS SHALL BE EXTENDED A MINIMUM OF 2.0 m BEYOND THE PROPERTY LINE AND CAPPED TO ALLOW FOR FUTURE CONNECTION.

ROADWORK SPECIFICATIONS:

1. ALL TOPSOIL AND ORGANIC MATERIAL SHALL BE STRIPPED WITHIN THE ROAD ALLOWANCE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
2. PAVEMENT DESIGN TYPE AS PER GEOTECHNICAL REPORT:

LOCAL ROADS (STREET A, STREET B, STREET C)

– 40 mm ASPHALT HL3 (TOP COURSE)
– 40 mm ASPHALT HL8 (BASE COURSE)
– 150 mm GRANULAR 'A' COMPACTED TO 100%
– 375 mm GRANULAR B' TYPE II COMPACTED TO 100% SPD

605 mm TOTAL THICKNESS

PAVED WALKWAY

– 50 mm ASPHALT HL3
– 150 mm GRANULAR 'A' COMPACTED TO 100%
– 250 mm GRANULAR 'B' TYPE II COMPACTED TO 100% SPD

450 mm TOTAL THICKNESS

PAVEMENT FOR INDIVIDUAL DRIVEWAY

– 25 mm OF HL3 ASPHALT
– 50 mm OF HL8 ASPHALT
– 150 mm COMPACTED DEPTH OF GRANULAR 'A'

3. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. R10 AND OPSD 509.010, OPSS 310.
4. ALL GRANULAR 'A' AND GRANULAR 'B' MATERIALS QC TESTING SHALL BE UNDERTAKEN BY THE CONTRACTOR AS PER RELEVANT OPSS SPECIFICATIONS AND THE RESULTS OF THE QA TESTING WILL DETERMINE THE ACCEPTANCE OR REJECTION Of PLACED MATERIALS.
5. GRANULAR 'A' AND GRANULAR 'B' TYPE II TO MEET OR EXCEED OPSS 1010 AND SHALL BE QUARRIED BEDROCK OR RECYCLED MATERIAL.
6. GRANULAR 'A' SHALL BE PLACED TO A MINIMUM THICKNESS OF 300 mm AROUND ALL STRUCTURES WITHIN PAVEMENT AREA.
7. ANY AREAS WITHIN THE R–O–W– WHICH REQUIRE FILL IN EXCESS OF 300 m ARE SUBJECT TO COMPACTION TESTS AND SUCH TESTS MUST SHOW A MIN. COMPACTION OF 95% S.P.D. AT ALL DEPTHS.
8. ALL GRANULAR FOR ROADS SHALL BE COMPACTED TO A MINIMUM OF 98% STANDARD PROCTOR DENSITY AND TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER.
9. SUB–EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'B' COMPACTED IN MAXIMUM 300 mm LIFTS.
10. THE BEDDING AND COVER FOR ALL SERVICES SHOULD BE 150 mm OF GRANULAR 'A' COMPACTED AT 95% STANDARD PROCTOR DENSITY.
11. ALL OF THE EXISTING SOIL CAN BE REUSED IN THE TRENCHES, PROVIDED THE SOIL IS MOIST. WHERE THE TRENCHES WILL BE WITHIN THE ROADWAYS, THE TRENCH BACKFILL MUST BE RAMPED DOWN IN 300 mm LIFTS TO 95% STANDARD PROCTOR DENSITY.
12. WHERE THERE ARE TRENCHES WITHIN THE ROADWAYS, THE TRENCH SURFACE MUST BE RECOMPACTED TO 95% STANDARD PROCTOR DENSITY BEFORE PLACING ANY GRANULARS.
13. ALL HOT LAID ASPHALTIC CONCRETE SHALL MEET OR EXCEED OPSS 1150.
14. THE ASPHALT TO BE PLACED AND COMPACTED IN 2 LIFTS TO 96% MARSHALL DENSITY. THIS IS TO ALLOW HAVING A PAVED STREET BEFORE CONSTRUCTION OF THE HOUSES, FOLLOWED BY A SECOND COURSE NEAR THE END OF CONSTRUCTION.
15. ASPHALT WEAR COURSE SHALL NOT BE PLACED UNTIL THE VIDEO INSPECTION OF SEWERS Sc NECESSARY REPAIRS HAVE BEEN CARRIED OUT TO THE SATISFACTION OF THE ENGINEER.
16. A GEOTECHNICAL ENGINEER IS TO INSPECT ALL PAVEMENT STRUCTURES.

DRIVEWAYS:

1. RESIDENTIAL DRIVEWAY APRONS SHALL BUTT UP TO CONCRETE CURB.
2. DRIVEWAY ENTRANCES SHALL BE AS PER OPSD 351.010.
3. COMPACTION OF SUBGRADE SHALL BE INSPECTED BY A GEOTECHNICAL ENGINEER PRIOR TO PLACEMENT OF GRANULAR BASE.

UTILITIES:

1. REFER TO COMPOSITE UTILITY PLAN FOR MORE DETAILS AND NOTES.
2. TRANSFORMERS AND PEDESTALS SHALL BE LOCATED BETWEEN HOUSES AND TOWNHOUSE BUILDING BLOCKS TO AVOID ENCUMBERING AND PREVENTING THE PLANTING OF TREES.
3. ALL PEDESTALS TO BE INSTALLED IN LINE WITH HYDRO TRANSFORMERS OR ON SIDE OF TRENCH AWAY FROM ROAD.
4. THE BASE OF A HYDRO TRANSFORMER MUST BE LOCATED A MINIMUM OF 2.0 m FROM THE EDGE OF A DRIVEWAY.
5. REQUIREMENTS FOR PROTECTIVE BOLLARDS AT TRANSFORMERS SHALL BE DETERMINED BY HYDRO ONE ON A CASE BY CASE BASIS.
6. SERVICE LATERALS MUST BE LOCATED A MINIMUM OF 3.0 m FROM THE BASE OF A HYDRO TRANSFORMER.
7. HYDRO TRANSFORMER AND SIDEWALKS ARE TO BE LOCATED ON OPPOSITE SITE OF THE R–O–W– WHERE POSSIBLE.
8. STREET LIGHTS AND SIDEWALKS ARE TO BE LOCATED ON OPPOSITE SIDES OF THE R–O–W– WHERE POSSIBLE.
9. AT CATCH BASIN AND HYDRANT LOCATIONS, THE GAS MAIN SHALL HAVE A MINIMUM 0.5 m CLEARANCE FROM STRUCTURES.
10. JOINT USE TRENCH TO HAVE A MINIMUM COVER AS PER GOVERNING AUTHORITY.
11. PRIMARY HYDRO DUCTS & COMMUNICATION DUCTS (ENCASED) TYPICALLY REQUIRED ON ONE SIDE OF R–O–W– ONLY. PROVIDE 1.0 m COVER ON ALL CONCRETE ENCASED DUCTS.
12. 1.5 m CLEARANCE TO BE MAINTAINED AROUND WATER SERVICE POST.
13. STREET LIGHT CABLE SHALL BE PLACED IN JOINT USE TRENCH. STREET LIGHT CABLE SHALL BE AT SAME OFFSET AS STREET LIGHTS WHEN JOINT USE TRENCH NOT CONSTRUCTED.
14. TRAFFIC DUCT ALTERNATIVE PLACEMENT LOCATIONS ARE:

1–JOINT USE TRENCH LOCATION, OR

2–SAME OFFSET AS STREETLIGHT POLES IN A SEPARATE TRENCH.

15. FOUR PARTY TRENCH OPTION REQUIRES THE AGREEMENT OF ALL UTILITIES.
16. THE DEVELOPER SHALL SUPPLY AND INSTALL DUCTS FOR UTILITY CROSSINGS AT INTERSECTIONS AS REQUIRED.
17. PRESCRIBED ORDER OF INSTALLATION: SEWERS AND WATERMAINS; HYDRANTS; WATER, STORM AND SANITARY SERVICE LATERALS; UTILITY STRUCTURES; GRANULAR BASE AND SUBBASE; WATERMAIN COMMISSIONING; SEWER TESTING AND VIDEO INSPECTION; ASPHALT FIRST LIFT; JOINT USE UTILITY TRENCH; GAS MAINS; UTILITY LOT SERVICES; STREET LIGHTING AND TREES. ASPHALT SURFACE COURSE AFTER 50% OF THE HOUSES HAVE BEEN CONSTRUCTED.
18. PRESCRIBED ORDER OF INSTALLATION MAY VARY DEPENDING UPON CIRCUMSTANCES AS APPROVED BY AN AUTHORIZED REPRESENTATIVE.

GRADING SPECIFICATIONS:

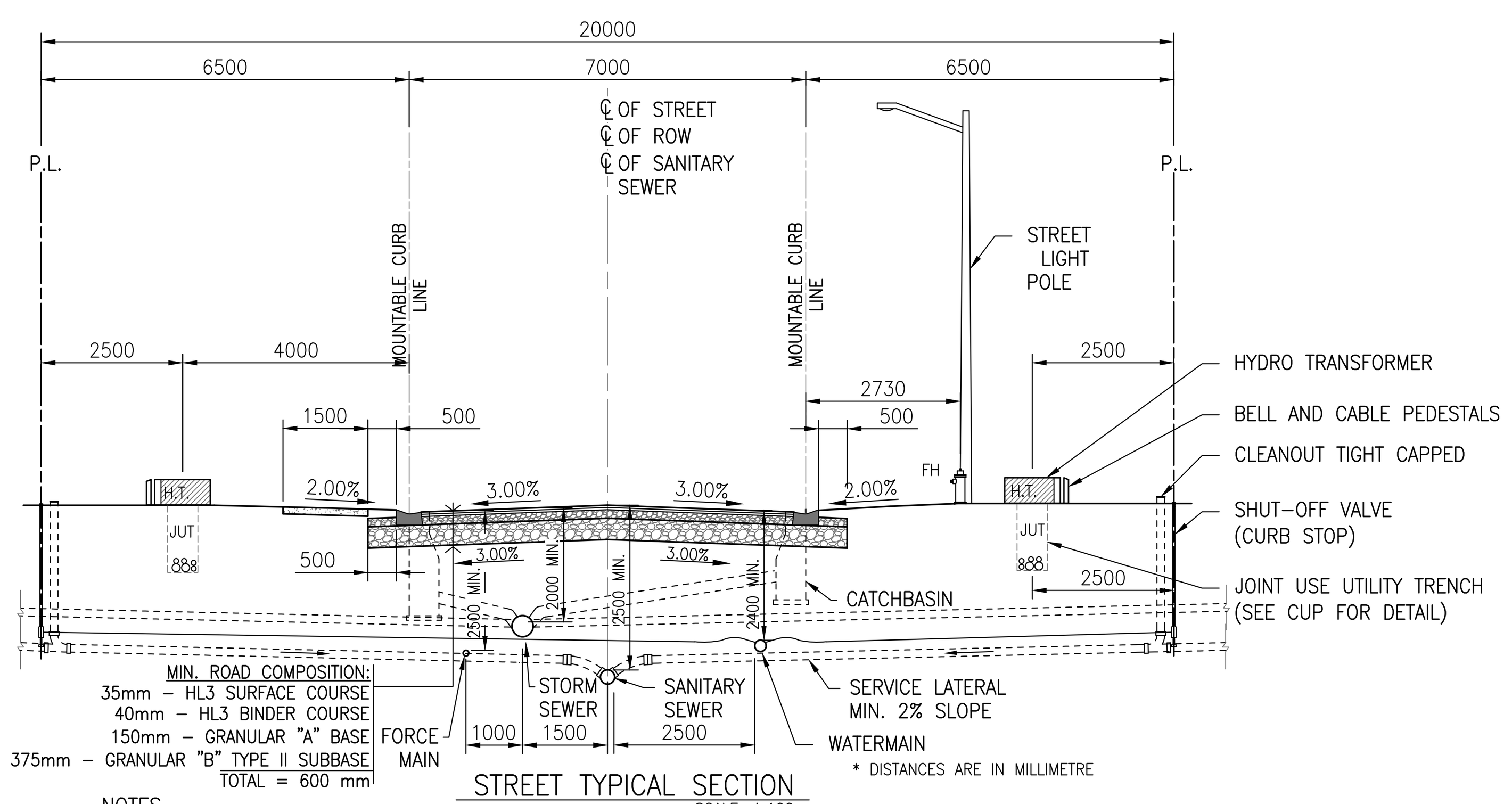
1. ALL GRADING TO CONFORM TO VILLAGE OF CARDINAL STANDARDS AND SPECIFICATIONS.
2. EXISTING ELEVATIONS WITH ABUTTING PROPERTIES SHALL BE MATCHED.
3. NO EXCESS DRAINAGE TO BE DIRECTED TOWARDS ADJACENT PROPERTIES.
4. A FLAT AREA HAVING A WIDTH OF 0.6 m SHALL BE PROVIDED AT THE BOUNDARY LIMITS OF ADJACENT DEVELOPED PROPERTIES IN ORDER THAT THE EXISTING BOUNDARY ELEVATIONS WILL BE MAINTAINED.
5. GRADING WITHING LOTS GRADING SHALL BE 2% TO 7%.
6. ALL SWALES SHALL BE 0.15–0.30 m DEEP WITH 3: 1 SIDE SLOPES UNLESS OTHERWISE INDICATED. THE MINIMUM LONGITUDINAL SLOPE IS 1% AND 1.5% WITH INSTALLATION OF SUBDRAIN OR WITHOUT, RESPECTIVELY.
7. ALL EXTERNAL SITE AREAS DISTURBED BY THE ACTIVITIES OF THE CONTRACTOR SHALL BE RESTORED TO EXISTING CONDITION OR BETTER AND TO THE SATISFACTION OF THE TOWN. GRASSED AREAS SHALL BE RESTORED BY PLACING 150mm TOPSOIL AND ACTIVELY GROWING No.1 NURSERY SOD.
8. TOPSOIL IN FILL AREAS TO BE STRIPPED. ALL FILL MATERIAL SHALL BE APPROVED FOR SUITABILITY BY THE GEOTECHNICAL ENGINEER PRIOR TO ANY FILLING OR REUSE OF EXCAVATED MATERIAL. APPROVED FILL MATERIAL SHALL BE COMPACTED TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER.
9. PAVEMENT GRADES (MINIMUM 0.50%, MAXIMUM 5%)
10. SLOPES IN LANDSCAPE AREAS AND ON BERMS SHALL NOT EXCEED 3 HORIZONTAL TO 1 VERTICAL WITH MAXIMUM VERTICAL ELEVATION NOT IN EXCESS OF THE APPLICABLE VILLAGE STANDARDS.
11. GRADING WITHIN 2 m OF THE BUILDING SHALL BE MAINTAINED AT 2% SLOPE OR HIGHER.
12. ALL ROOF DOWNSPOUTS SHALL DISCHARGE TO THE GROUND ONTO SPLASH PADS.
13. ALL FILL (NOT ON MUNICIPAL ROADWAY) SHALL BE PLACED AND COMPACTED TO 95% STD. PROCTOR DENSITY M MAXIMUM 0.20m LIFTS TO SUBGRADE. FILL SHALL BE COMPACTED TO 95% SPD AS DIRECTED BY THE CONSULTANT.
14. UNLESS OTHERWISE SHOWN ON THE GRADING AND/OR EROSION SEDIMENT CONTROL PLAN, PROPOSED STOCKPILING OF TOPSOIL DURING CONSTRUCTION WILL BE REQUIRED THE DEVELOPER'S ENGINEER TO PROVIDE THE LOCATION AND HEIGHT OF STOCKPILED TOPSOIL. TOPSOIL MUST BE STABLE AND SEEDED TO ESTABLISHED A TEMPORARY VEGETATIVE COVER AND TO PREVENT EROSION.
15. ALL TOPSOIL STOCKPILE LOCATIONS ARE SUBJECT TO VILLAGE APPROVAL.

RETAINING WALLS:

1. RETAINING WALL TYPE TO BE SPECIFIED BY PROJECT LANDSCAPE ARCHITECT AT LOCATIONS, AS SPECIFIED ON THE GRADING PLAN.
2. ALL RETAINING WALLS SHALL BE ARMOUR STONE UNLESS NOTED OTHERWISE.
3. ALL TYPICAL RETAINING WALLS GREATER THAN 1.0 m HEIGHT ARE TO BE DESIGNED, APPROVED AND STAMPED BY A STRUCTURAL ENGINEER.
4. FENCES OR RAILINGS ARE REQUIRED FOR WALLS HIGHER THAN 0.6 m.

MISCELLANEOUS:

1. ALL STORM AND SANITARY SERVICES TO BE EQUIPPED WITH APPROVED BACKWATER VALVES.
2. WATER AND SANITARY SERVICE CONNECTIONS SHALL NOT BE UNDER A DRIVEWAY.
3. EXACT ELEVATIONS FOR CONNECTIONS SHALL BE VERIFIED BY CONTRACTOR AND APPROVED BY VILLAGE AUTHORITY. COORDINATE WITH VILLAGE WATER WORKS FOR ALL SERVICE CONNECTION.
4. PRIOR TO ANY FILLING OR REUSE OF EXCAVATED MATERIAL. APPROVED FILL MATERIAL SHALL BE COMPACTED TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER.
5. TRAFFIC SIGNS SHALL BE APPROVED BY THE VILLAGE OF CARDINAL.
6. REFER TO LANDSCAPE PLAN AND EROSION AND SEDIMENT CONTROL PLAN FOR MORE RELATED SPECIFICATIONS.
7. REFER TO PUMPING STATION DRAWINGS FOR RELATED DETAILS AND SPECIFICATIONS.



STREET TYPICAL SECTION
SCALE: 1:100

NOTES
1. ROAD COMPOSITION AS PER GEOTECHNICAL REPORT.
2. REFER TO COMPOSITE UTILITY PLAN AND HYDRO ONE PLANS FOR UTILITY DETAILS.
3. FUTURE IMPROVEMENT: 0.5 m PAVED BOULEVARD AND 1.5 SIDEWALK.
4. 4–PARTY JOINT USE TRENCH: HYDRO ONE, ENBRIDGE GAS, BELL AND CABLE.
5. CATCH BASIN TYPE SHALL SUIT MOUNTABLE CURB (OPSD 600.100).
6. AT CATCH BASIN AND HYDRANT LOCATIONS, THE GAS MAIN SHALL HAVE A MINIMUM 0.5 m CLEARANCE FROM STRUCTURES.
7. FIRE HYDRANTS TO BE LOCATED ON THE WATERMAIN SIDE OF THE STREET.
8. TREES SHALL BE PLANTED INSIDE PRIVATE PROPERTIES AND NOT IN THE ROW.
9. SANITARY AND STORM LATERAL SHALL BE EQUIPPED WITH BACKWATER VALVES.

UNITED COUNTIES OF LEEDS AND GRENVILLE
PART OF LOT 7, CONCESSION 1
GEOGRAPHIC TOWN OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL
COUNTY OF GRENVILLE

LEGAL INFORMATION

LEGAL INFORMATION PROVIDED BY IBW SURVEYORS. PROJECT # A–026727. PLAN I5R–12193.

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY IBW SURVEYORS. FILE No. A–026727–TOPO. SURVEY DATED APRIL 28, 2021.

GEOTECHNICAL REPORT

REFER TO GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT No. 21C350, DATED MAY 31, 2021, PREPARED BY ST. LAWRENCE TESTING & INSPECTION CO. LTD.. INFORMATION PRESENTED IN THESE DRAWINGS HAS BEEN INTERPOLATED FROM THE GEOTECHNICAL REPORT AND ACCURACY IS NOT GUARANTEED. CONTRACTORS ARE ADVISED TO READ THE GEOTECHNICAL REPORT AND ASSUME THEIR OWN CONCLUSIONS.

USE AND INTERPRETATION OF DRAWINGS
UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THIS DRAWING SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

No.	REVISION / ISSUE	DATE MM/DD/YY
5	TOWNSHIP COMMENTS – 10–18–23	12/01/23
4	TOWNSHIP COMMENTS – 06–30–23	07/25/23
3	TOWNSHIP COMMENTS	05/15/23
2	PEER REVIEW COMMENTS	08/04/22
1	OWNER / APPROVAL	03/10/22

PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 12/01/23 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

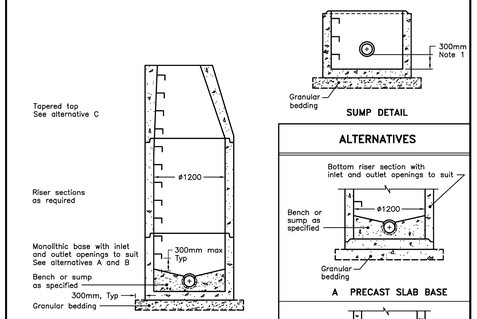
Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

GENERAL NOTES & SPECIFICATIONS

SCALE: VARIES
DRAFTED BY:
PROJECT No.: 0114
DATE: 12/01/2023
DRAWING No.: N-1

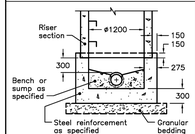
4.21.2024 114-2-specs.dwg MM-Grayscale-36X24.ctb ISO full bleed B1 (1000.00 x 707.00 MM)



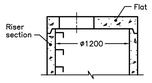
SUMP DETAIL

ALTERNATIVES

A PRECAST SLAB BASE



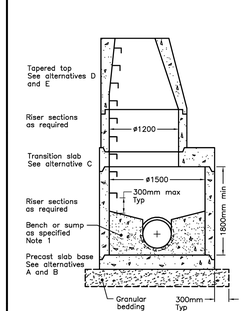
B CAST-IN-PLACE BASE



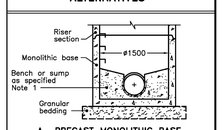
C PRECAST FLAT CAP

NOTES:
1 The sump is measured from the lowest invert.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, or 701.032.
C Structure exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
D Pipe support according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

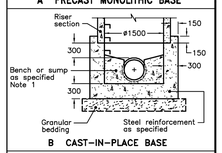
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 5
PRECAST CONCRETE MAINTENANCE HOLE 1200mm DIAMETER		OPSD 701.010



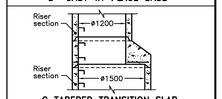
ALTERNATIVES



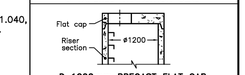
A PRECAST MONOLITHIC BASE



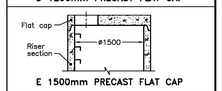
B CAST-IN-PLACE BASE



C TAPERED TRANSITION SLAB



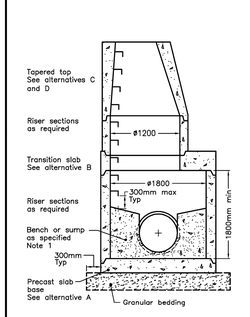
D 1200mm PRECAST FLAT CAP



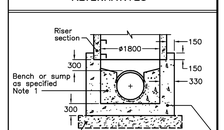
E 1500mm PRECAST FLAT CAP

NOTES:
1 For sump detail, see OPSD 701.010.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, 701.040, 701.041, 703.011, 703.021, and 706.010.
C Structures exceeding 5.0m in depth shall include safety platform according to OPSD 404.020 or 404.021.
D Pipe support shall be according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

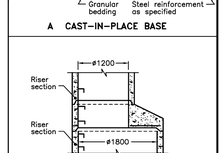
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 5
PRECAST CONCRETE MAINTENANCE HOLE 1500mm DIAMETER		OPSD 701.011



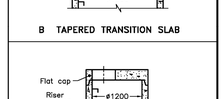
ALTERNATIVES



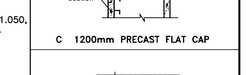
A CAST-IN-PLACE BASE



B TAPERED TRANSITION SLAB



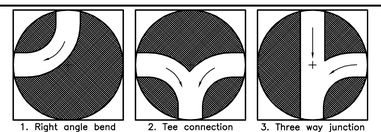
C 1200mm PRECAST FLAT CAP



D 1800mm PRECAST FLAT CAP

NOTES:
1 For sump detail, see OPSD 701.010.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, 701.050, 701.051, 703.012, 703.022, and 706.020.
C Structures exceeding 5.0m in depth shall include safety platform according to OPSD 404.020 or 404.022.
D Pipe support shall be according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 5
PRECAST CONCRETE MAINTENANCE HOLE 1800mm DIAMETER		OPSD 701.012

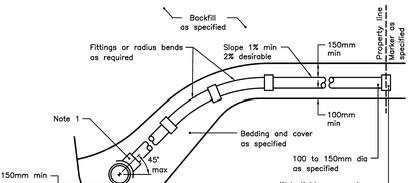


MAXIMUM SIZE HOLE IN THE WALL IN PRECAST RISER SECTIONS

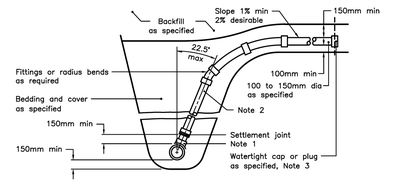
Maintenance Hole Diameter	No. 1–4	No. 5 and 6	No. 8	No.7	
				Inlet Hole	Outlet Hole
1200	700	860	780	700	860
1500	860	1220	960	860	1170
1800	1220	1485	1220	1220	1485
2400	1485	2020	1760	1485	2020
3000	1930	2450	2300	1930	2450
3600	2470	3085	2730	2470	3085

NOTES:
1 Slopes shall be maintained from the outlet hole opening for top of benching.
A Concrete for benching shall be 30MPa.
B When benching is hand–finshed, it shall be given wood float finish, channel shall be given steel trowel finish.
C Benching slope and height shall be as specified.
D When specified, maintenance holes that are 1200mm in diameter with a uniform channel for 200 or 250mm pipe may be prebenched at the manufacturer with standardized benching slope and channel orientation.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 4
MAINTENANCE HOLE BENCHING AND PIPE OPENING ALTERNATIVES		OPSD 701.021



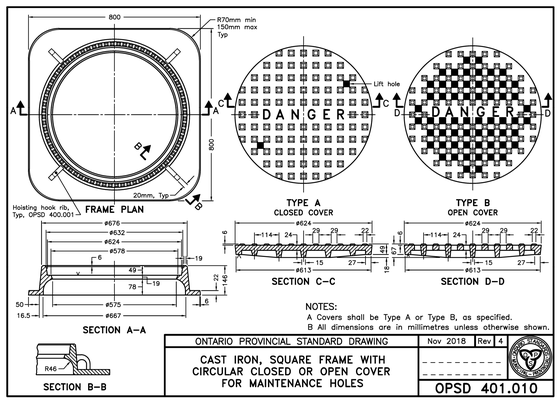
CONNECTION WITHOUT VERTICAL RISER



CONNECTION WITH VERTICAL RISER

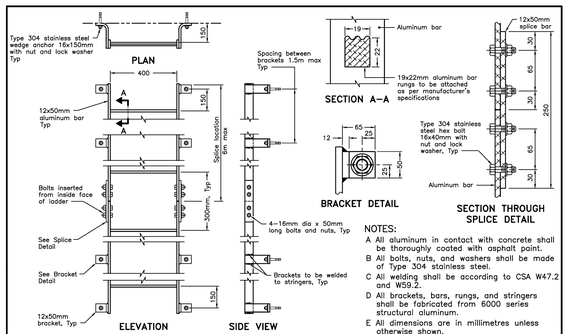
NOTES:
1 Sewer service connections to the main pipe sewer shall be made using factory made tees, strap–on–saddles, or other approved saddles.
2 Vertical risers shall be as specified.
3 Cap or plug at property line shall be adequately braced.
A Maintenance holes shall be used at the main sewer to connect service connections greater than 200mm.
B For new construction, saddles shall be installed on the main pipe before that pipe is laid.
C Approved cut–in tool shall be used for field made connections.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev 4
SEWER SERVICE CONNECTIONS FOR MAIN PIPE SEWER		OPSD 1006.010



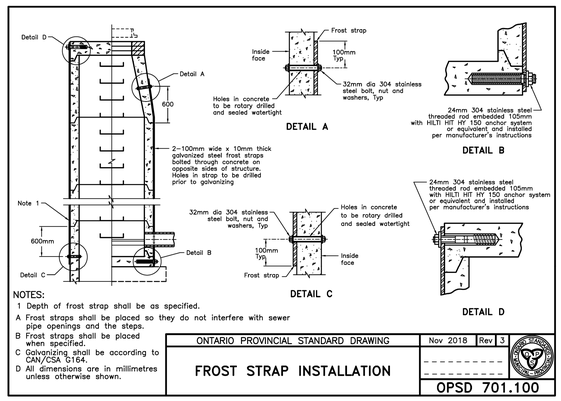
NOTES:
A Covers shall be Type A or Type B, as specified.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 4
CAST IRON, SQUARE FRAME WITH CIRCULAR CLOSED OR OPEN COVER FOR MAINTENANCE HOLES		OPSD 401.010



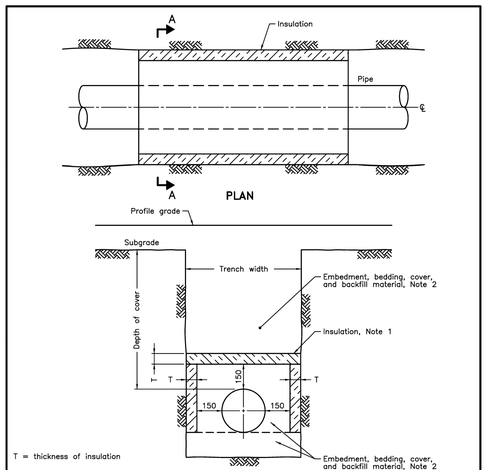
NOTES:
A All aluminum in contact with concrete shall be thoroughly coated with asphalt paint.
B All bolts, nuts, and washers shall be made of Type 304 stainless steel.
C All welding shall be according to CSA W47.2 and W59.2.
D All brackets, bars, rungs, and stringers shall be fabricated from 6000 series structural aluminum.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
ALUMINUM LADDER FOR MAINTENANCE HOLES		OPSD 406.010



NOTES:
1 Depth of frost strap shall be as specified.
A Frost straps shall be placed so they do not interfere with sewer pipe openings and the steps.
B Frost straps shall be placed when specified.
C Galvanizing shall be according to CAN/CSA G164.
D All dimensions are in millimetres unless otherwise shown.

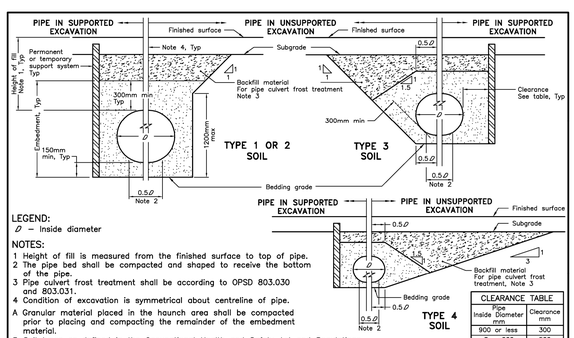
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
FROST STRAP INSTALLATION		OPSD 701.100



SECTION A–A
TYPICAL PIPE INSULATION DETAIL

NOTES:
1 The insulation material shall be extruded polystyrene according to OPSS 1605 with a minimum compressive strength of 275 kPa.
2 Pipe embedment or bedding, cover, and backfill shall be according to:
a) Flexible OPSD 802.010, 802.013, 802.020, and 802.023.
b) Rigid – OPSD 802.030, 802.031, 802.032, 802.033, 802.050, 802.051, 802.052, and 802.053.
A Minimum insulation thickness shall be 50mm.
B Joints shall be staggered for multiple insulation sheets.
C This OPSD is to be read in conjunction with OPSD 3090.100 and 3090.101.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2020	Rev 1
INSULATION FOR SEWERS AND WATERMAINS IN SHALLOW TRENCHES		OPSD 1109.030

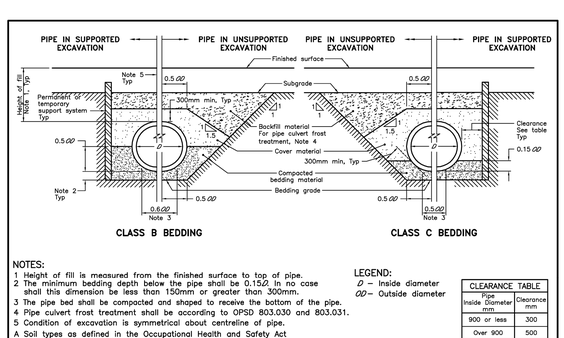


LEGEND:
Ø – inside diameter

NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.
A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.
B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
C All dimensions are in metres unless otherwise shown.

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3
FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION		OPSD 802.010

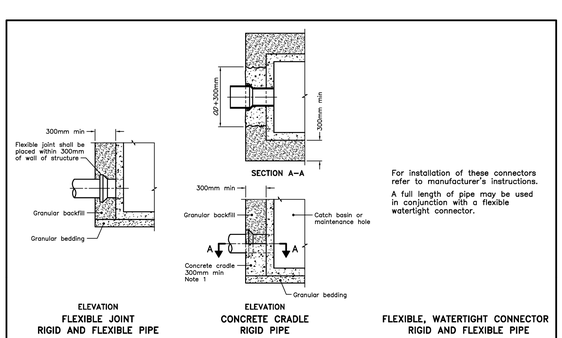


NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be 0.15Ø in no case shall this dimension be less than 150mm or greater than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
5 Condition of excavation is symmetrical about centreline of pipe.
A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
B All dimensions are in metres unless otherwise shown.

LEGEND:
Ø – Inside diameter
ØØ– Outside diameter

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 3
RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 3 SOIL – EARTH EXCAVATION		OPSD 802.031



NOTES:
1 Pipe shall be supported with concrete or unshrinkable fill to the first pipe joint.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2016	Rev 4
SUPPORT FOR PIPE AT CATCH BASIN OR MAINTENANCE HOLE		OPSD 708.020

No.	REVISION / ISSUE	DATE MM/DD/YY
5	DETAILS UPDATE	02/06/24
4	DETAILS UPDATE	12/01/23
3	DETAILS UPDATE	07/25/23
2	PEER REVIEW COMMENTS	08/04/22
1	INITIAL ISSUE	06/23/22

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ADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
02/06/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

DETAILS - 1

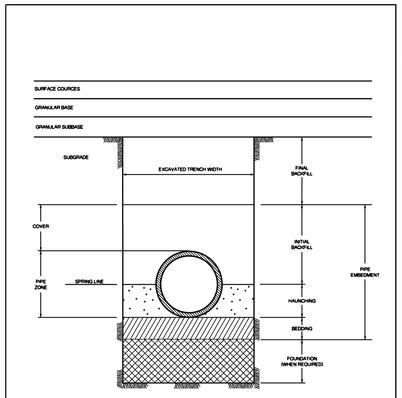
SCALE: N/A

DRAFTED BY:

PROJECT No.: 0114

DATE: 02/06/2024

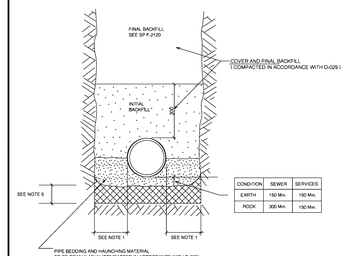
DRAWING No.: D-1



NOTES

1. ANY REFEREES IN THE STANDARD TO "BACKFILL" TO BE INTERPRETED AS "FINAL BACKFILL"
2. ANY REFERENCES IN THE STANDARD TO "BEDDING" TO BE INTERPRETED AS "PIPE EMBEDMENT".

STANDARD TRENCH TERMINOLOGY	DATE: MARCH 2008
	REV. DATE:
	DWG. No.: S5



CONDITION	SEWER	SERVICES
EARTH	150 Min.	150 Min.
ROCK	300 Min.	150 Min.

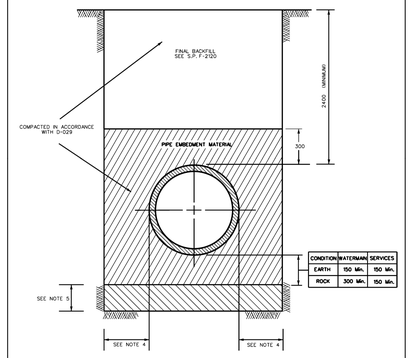
NOTES:

1.

PIPE INSIDE DIAMETER (mm)	CLEARANCE (mm)
900 OR LESS	CONC 450 PVC 450
OVER 900	500

2. FINAL BACKFILL - APPROVED NATIVE MATERIAL OR SELECT SUBGRADE IN ACCORDANCE WITH F-2120.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
4. INITIAL BACKFILL MATERIAL CONCRETE PIPE - GRANULAR 'A' OR GRANULAR 'B' MATERIAL WITH 100% PASSING THE 37.5mm SIEVE - PVC PIPE - GRANULAR 'A'
5. WHEN APPROVED BY THE CONTRACT ADMINISTRATOR, POOR SOILS SHALL BE EXCAVATED TO CREATE A FOUNDATION THAT SHALL BE FILLED TO THE BOTTOM OF THE BEDDING WITH GRANULAR 'B'.

SINGLE TRENCH (SEWER & SEWER SERVICES)	DATE: MAY 2001
	REV. DATE: MARCH 2019
	DWG No.: S6



CONDITION	WATERMAIN	SERVICES
EARTH	150 Min.	150 Min.
ROCK	300 Min.	150 Min.

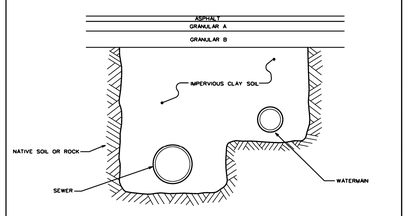
NOTES:

1. PIPE EMBEDMENT MATERIAL - GRANULAR 'A'.
2. FINAL BACKFILL - APPROVED NATIVE MATERIAL OR SELECT SUBGRADE IN ACCORDANCE WITH F-2120
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
4.

OUTSIDE DIA. (mm)	CLEARANCE (mm)
900 or LESS	450
OVER 900	500

5. WHEN APPROVED BY THE CONTRACT ADMINISTRATOR, POOR SOILS SHALL BE EXCAVATED TO CREATE A FOUNDATION THAT SHALL BE FILLED TO THE BEDDING WITH GRANULAR 'B'.

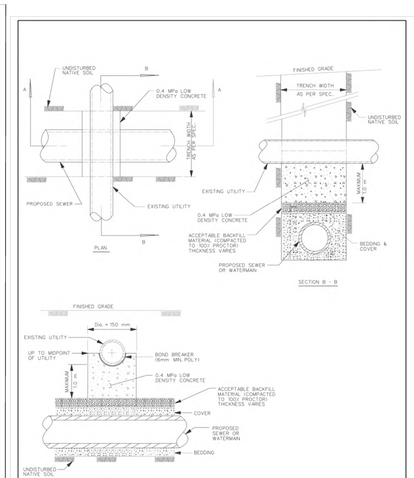
STANDARD TRENCH DETAIL	DATE: MAY 2001
	REV. DATE: MARCH 2016
	DWG. No.: W17



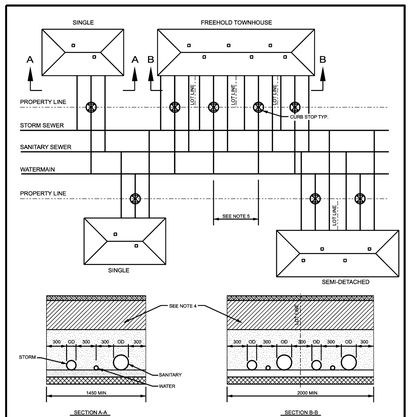
NOTES:

1. CLAY SEAL TO EXTEND FROM BOTTOM OF TRENCH EXCAVATION TO UNDERSIDE OF ROAD STRUCTURE.
2. CLAY SEAL TO EXTEND FULL TRENCH WIDTH TO EXISTING NATIVE SOILS WITH A MINIMUM THICKNESS OF 1.0m ALONG PIPES.
3. CLAY SEAL TO BE LOCATED SO THAT NO PIPE JOINTS ARE WITHIN THE CLAY SEAL MATERIAL.

CLAY SEAL FOR PIPE TRENCHES	DATE: MAY 2001
	REV. DATE: MARCH 2006
	DWG. No.: SB



SUPPORT DETAIL FOR EXISTING UTILITY CROSSING SEWER OR WATERMAIN TRENCH	DATE: MAY 2001
	REV. DATE: NONE
	DWG. No.: S10



NOTES:

1. NO HORIZONTAL BENDS IN RIGHT-OF-WAY UNLESS OTHERWISE APPROVED BY THE CITY. MAXIMUM OF TWO 22.5° HORIZONTAL BENDS FOR SANITARY AND STORM SERVICES.
2. 1% MINIMUM SANITARY AND STORM SERVICE GRADIENT WITH 2% PREFERRED.
3. STORM SERVICE LATERAL SHALL BE LOCATED TO THE LEFT OF SANITARY SERVICE LATERAL WHEN LOOKING AT THE STRUCTURE FROM THE STREET. SERVICE SIZES IN CONFORMANCE WITH S11.
4. SEE S7 FOR PIPE FOUNDATION, EMBEDMENT AND FINAL BACKFILL REQUIREMENTS.
5. MULTIPLE TAPS WITH SADDLES IN PVC WATERMAIN SHALL BE STAGGERED AND MINIMUM 600mm APART.
6. ELEVATION OF SERVICES VARIABLE DEPENDING ON GRADIENT AND/OR DEPTH OF COVER.
7. ALL DIMENSIONS ARE IN MILLIMETRES.

N.T.S.

TYPICAL SINGLE, SEMI-DETACHED AND TOWNHOUSE INDIVIDUAL LOT SERVICING	DATE: MARCH 2011
	REV. DATE: MARCH 2019
	DWG. No.: S11.3

SECTION A - A

NOTES:

FOR WATERMAIN 100mm (NOMINAL) TO 400mm (NOMINAL)

1. BARREL TO INVERT SEPARATION (D) SHALL BE 500mm MINIMUM.
2. THRUST BLOCKS FOR MAINS LARGER THAN 400mm (NOMINAL) SHALL BE PER SPECIAL DESIGN.
3. FOR 300mm (NOMINAL) AND 400mm (NOMINAL) MAINS, BENDS SHALL BE MAX. 22° 30'.
4. CONCRETE FOR THRUST BLOCKS SHALL BE 20 MPa.
5. REFER TO W26.6 FOR RESTRAINED LENGTH REQUIREMENTS.
6. REFER TO W26.5 AND W26.4 FOR THRUST BLOCK REQUIREMENTS.
7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
8. DESIGNED TO MEET THE INTENT OF THE MOE WATERMAIN DESIGN CRITERIA JUNE 2012.

WATERMAIN CROSSING BELOW SEWER	DATE: MAY 2001
	REV. DATE: MARCH 2013
	DWG. No.: W25

SECTION A - A

NOTES:

FOR WATERMAIN 100mm (NOMINAL) TO 400mm (NOMINAL)

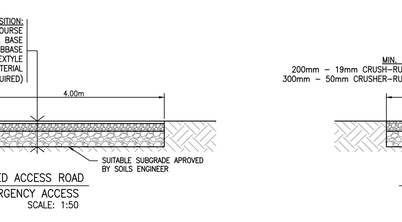
1. BARREL TO BARREL SEPARATION (D) SHALL BE 250mm MINIMUM.
2. THRUST BLOCKS FOR MAINS LARGER THAN 400mm (NOMINAL) SHALL BE PER SPECIAL DESIGN.
3. FOR 300mm (NOMINAL) AND 400mm (NOMINAL) MAINS, BENDS SHALL BE MAX. 22° 30'.
4. CONCRETE FOR THRUST BLOCKS SHALL BE 20 MPa.
5. REFER TO W26.6 FOR RESTRAINED LENGTH REQUIREMENTS.
6. REFER TO W26.5 AND W26.4 FOR THRUST BLOCK REQUIREMENTS.
7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
8. DESIGNED TO MEET THE INTENT OF THE MOE WATERMAIN DESIGN CRITERIA JUNE 2012.

WATERMAIN CROSSING OVER SEWER	DATE: MAY 2001
	REV. DATE: MARCH 2013
	DWG. No.: W25.2

NOTES:

1. WHERE SEWER IS AT SAME ELEVATION AS WATERMAIN, SERVICES CAN BE INSTALLED OVER THE SEWER WITH A MINIMUM OF 2.4m COVER
2. WHERE THE 2.4m MINIMUM COVER IS NOT POSSIBLE THE SERVICE SHALL BE INSTALLED 300mm BELOW SEWER.
3. FOR OPEN ENDED STRUCTURES SUCH AS CATCH BASIN LEADS, CULVERTS, ETC., INSTALLATION SHALL BE IN ACCORDANCE WITH DETAIL W23.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.

SERVICE INSTALLATION AT SEWER CROSSING	DATE: MAY 2001
	REV. DATE: NONE
	DWG. No.: W38



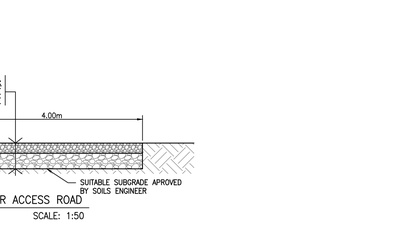
INSULATION REFERENCE TABLE	
D DISTANCE FROM C.B. OR M.H. WALL	T2 REQUIRED INSULATION THICKNESS (mm)
2400 - 1800 mm.	50 mm
1800 - 1500 mm.	75 mm
1500 - 1200 mm.	100 mm
1200 - 900 mm.	125 mm

NOTES

FOR WATERMAINS & SERVICES IN PROXIMITY TO CATCHBASINS MAINTENANCE HOLES, CULVERTS ETC.

1. INSULATION SHALL EXTEND 1000 mm EACH WAY FROM THE ENDS OF THE STRUCTURE, FINALLESS TO THE WATERMAIN.
2. STAGGER JOINTS OF MULTIPLE SHEETS.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
4. INSULATION CAN BE AT EITHER LOCATION OR BOTH.

THERMAL INSULATION OF WATER-MAINS AT OPEN STRUCTURES	DATE: MAY 2001
	REV. DATE: FEB 2004
	DWG. No.: W23

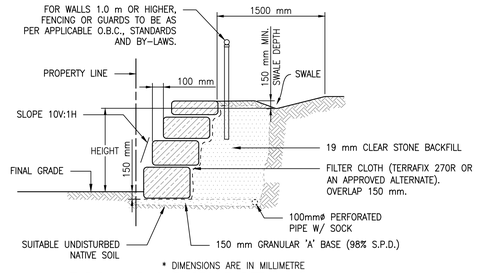


NOTES

FOR WATERMAINS 400mm DIA. OR LESS.

1. THE UNSUPPORTED LENGTH OF THE WATERMAIN SHALL NOT EXCEED 1000mm.
2. TEMPORARY SUPPORT FOR WATERMAINS 600mm DIA. AND GREATER, REQUIRE SPECIAL DESIGN.
3. STRAPS MUST MEET THE REQUIREMENTS OF THE O.H.S.A. CHAINS ARE NOT PERMITTED.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.

TEMPORARY SUPPORT FOR EXISTING WATERMAIN	DATE: MAY 2001
	REV. DATE: NONE
	DWG. No.: W28



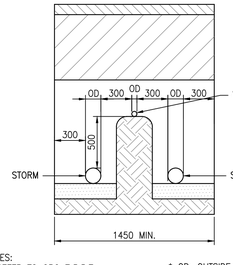
* DIMENSIONS ARE IN MILLIMETRE

TYPICAL ARMOUR STONE RETAINING WALLL

SCALE: 1:25

NOTES:

1. ALL WALLS TO BE APPROVED BY THE TOWN PRIOR TO CONSTRUCTION.
2. ARMOUR STONE CONSISTS OF SQUARED NATURAL LIMESTONE SUPPLIED BY AN ACCEPTABLE QUARRY.
3. ARMOUR STONE SHALL BE PLACED WITH TIGHT JOINTS NOT EXCEEDING 75 mm. STAGGER JOINTS ON SUBSEQUENT COURSES. FILL GAPS BETWEEN ARMOUR STONE TO ELIMINATE POTENTIAL SETTLEMENT OR WASHOUT PROBLEMS.
4. WALLS 1.0 m OR HIGHER MUST BE DESIGNED AND STAMPED BY A STRUCTURAL ENGINEER.
5. RETAINING WALLS TO BE CONSTRUCTED ON HIGHER PROPERTY.
6. HEIGHT OF WALL SHALL BE MEASURED FROM BOTTOM OF WALL AND AT 1.5 m METER BEHIND WALL.
7. SUCCESSIVE WALLS OF 1.0 m OR LESS IN HEIGHT SHALL BE CONSIDERED AS A SINGLE WALL WHEN:
   a) THE SPACING IS LESS THAN 1.5m BETWEEN TWO WALLS; OR
   b) THE GRADING IS GREATER THAN 5% BETWEEN TWO WALLS.



NOTES:

- REFER TO OBC 7.3.5.7.,
- PROVIDE INSULATION WHERE REQUIRED

* OD: OUTSIDE DIAMETER

* ALL DIMENSIONS ARE IN MILLIMETRES

TRENCH FOR A SINGLE HOUSES

SCALE: 1:25

PAVED ACCESS ROAD

EMERGENCY ACCESS

SCALE: 1:50

GRANULAR ACCESS ROAD

SCALE: 1:50

5	DETAILS UPDATE	02/06/24
4	DETAILS UPDATE	12/01/23
3	DETAILS UPDATE	07/25/23
2	PEER REVIEW COMMENTS	08/04/22
1	INITIAL ISSUE	06/23/22
No.	REVISION / ISSUE	DATE MM/DD/YY

PREPARED BY:

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ADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
02/06/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

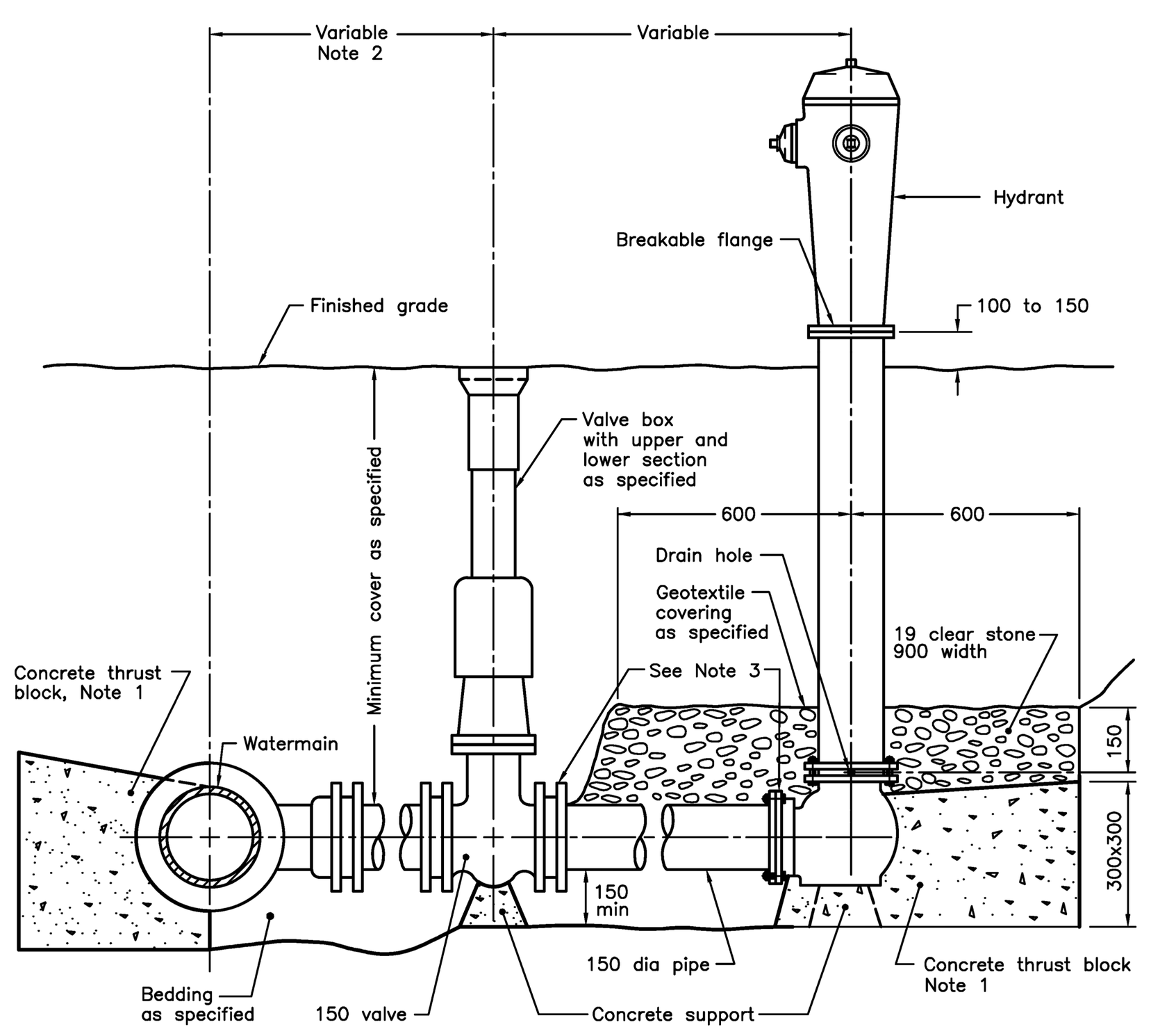
APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

DETAILS - 2

SCALE: N/A	DRAWING No.: D-2
DRAFTED BY:	
PROJECT No.: 0114	
DATE: 02/06/2024	

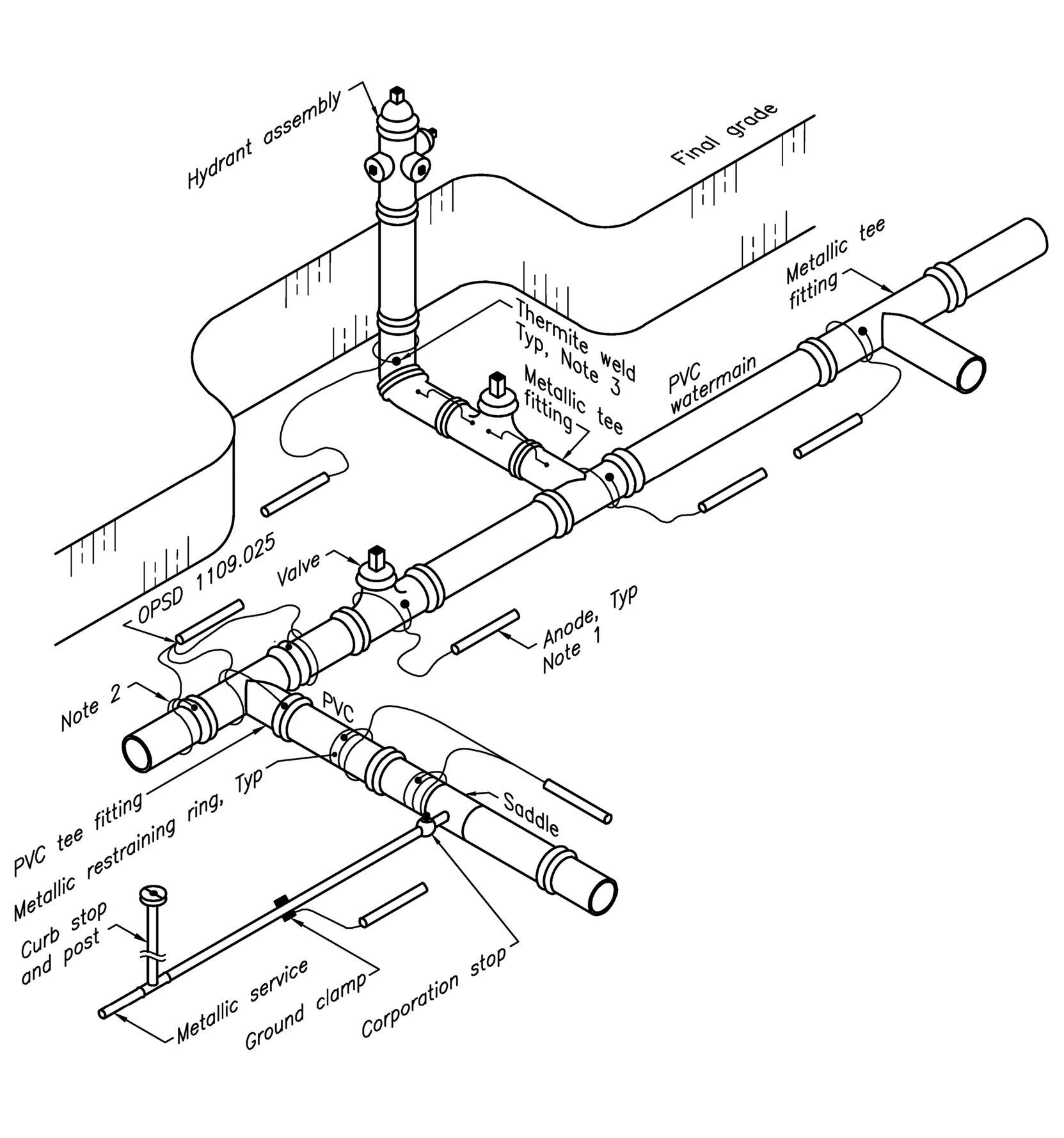


NOTES:
1 All concrete thrust blocks shall be poured against undisturbed ground.
2 When specified, for watermains 400mm and less, locate valve within 1.0m of centreline of watermain. Retaining and restraining devices shall be utilized. For watermains 600mm and over, bolt valve with flanged end directly to flanged tee.
3 Retaining and restraining devices shall be as specified.
A Bond breaker shall be used between the concrete and the fittings and appurtenances.
B Bolts and nuts for buried flange to flange connections shall be stainless steel.
C When required, flange of standpipe extensions shall not be in frost zone.
D This OPSD shall be read in conjunction with OPSD 1103.010 and 1103.020.
E Backfill material within 500mm of service box shall be native or imported, as specified.
F Tracer wire shall be installed as specified.
G All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 3

HYDRANT INSTALLATION

OPSD 1105.010

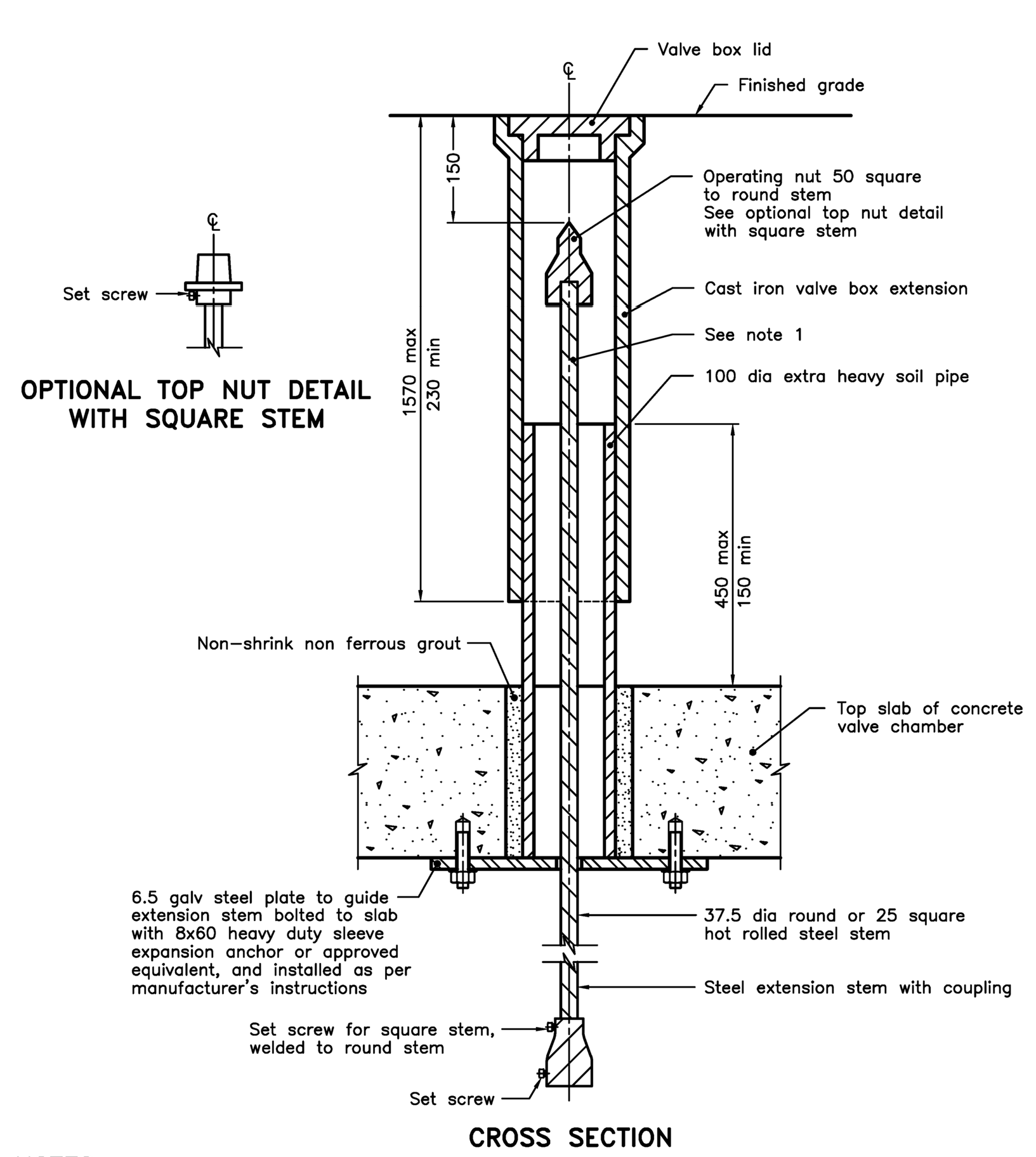


NOTES:
1 Anode shall be placed at least 1.0m away from the water system pipe and appurtenances and as deep as the bottom of the pipe and appurtenances or as specified in Contract Documents.
2 Anode connecting wire shall be loosely wrapped around pipes and fittings and knotted.
3 Protective coating shall be applied to all thermite welds.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2020 | Rev 3

CATHODIC PROTECTION FOR PVC WATERMAIN SYSTEMS

OPSD 1109.011

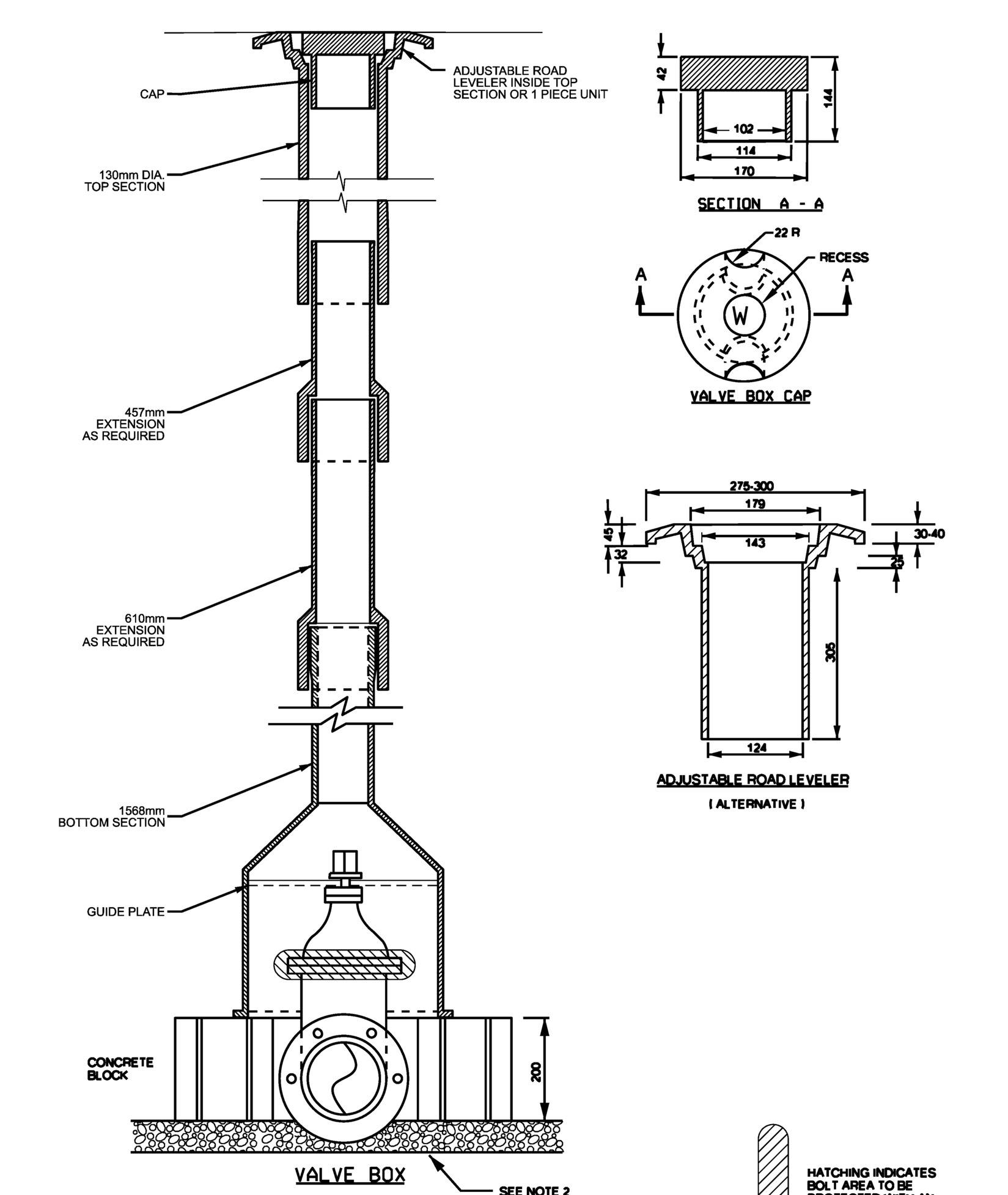


NOTES:
1 Either the square or round stem shall be used with specified connections.
A Valve stem and valve shall be placed plumb.
B Stem guide is required if the unsupported length exceeds 2.0m.
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 4

VALVE OPERATOR

OPSD 1101.020



NOTES:

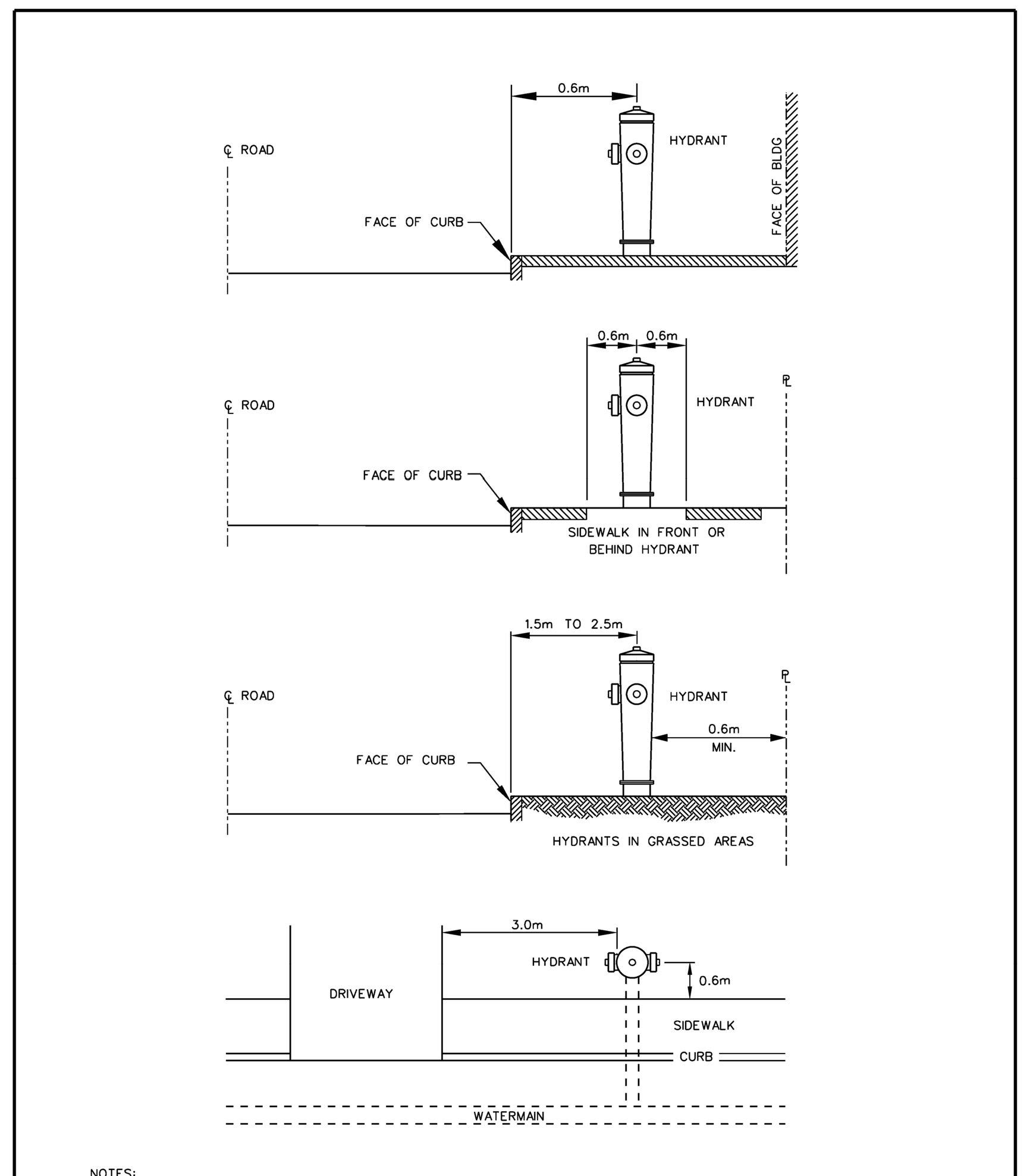
FOR AUXILIARY, SERVICES AND ISOLATION VALVES.

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. FOR 200 AND 250mm VALVES, ADD BEDDING BELOW THE CONCRETE BLOCKS AS REQUIRED TO RAISE BELL HIGH ENOUGH TO PREVENT CONTACT WITH THE VALVE BONNET.

Ottawa

VALVE BOX ASSEMBLY

DATE: MAY 2001
REV. DATE: MARCH 2019
DWG. No.: W24

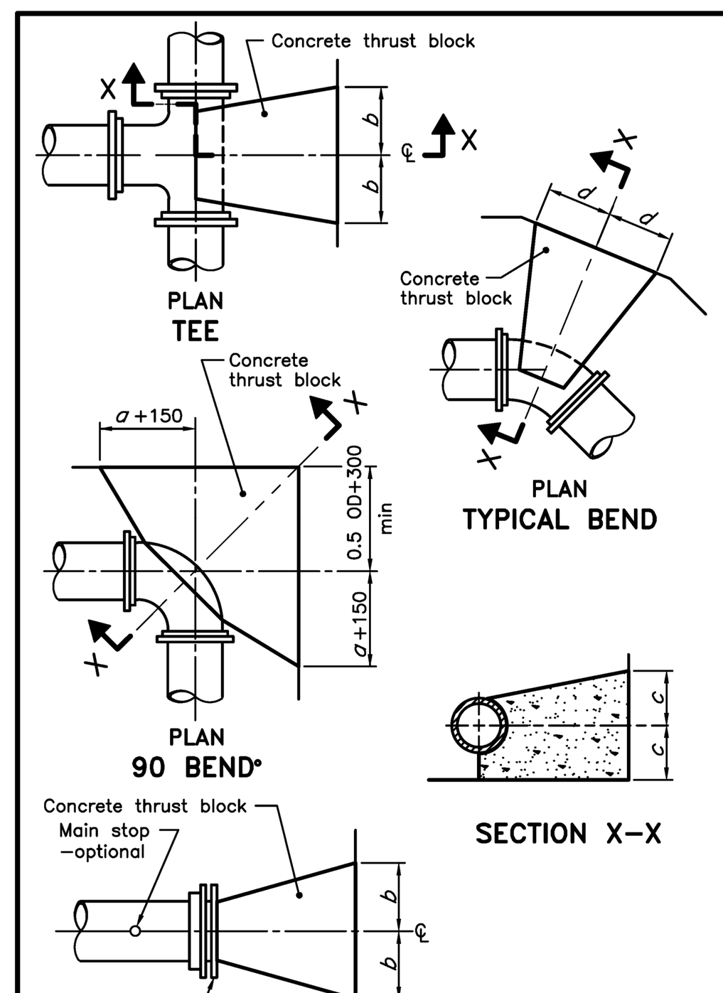


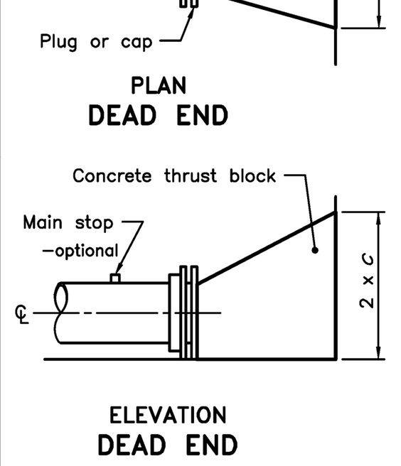
NOTES:
1. REFER TO CONSTRUCTION SPECIFICATION F-4414

Ottawa

HYDRANT LOCATION

DATE: MAY 2001
REV. DATE: MARCH 2013
DWG. No.: W18





SOILS WITH TYPICAL BEARING STRENGTH OF 100 TO 199 kPa

PIPE DIA	Dimensions a	b	c	d
100	150	250	200	200
150	250	400	250	300
200	400	550	300	450
250	500	650	400	500
300	650	800	450	650
350	700	900	550	700
400	900	1050	600	850

SOILS WITH TYPICAL BEARING STRENGTH OF 200 TO 299 kPa

PIPE DIA	Dimensions a	b	c	d
100	150	200	150	150
150	250	250	200	200
200	400	350	250	300
250	500	450	300	350
300	650	500	350	400
350	700	600	400	500
400	900	750	400	600

SOILS WITH TYPICAL BEARING STRENGTH OF 300 kPa AND OVER

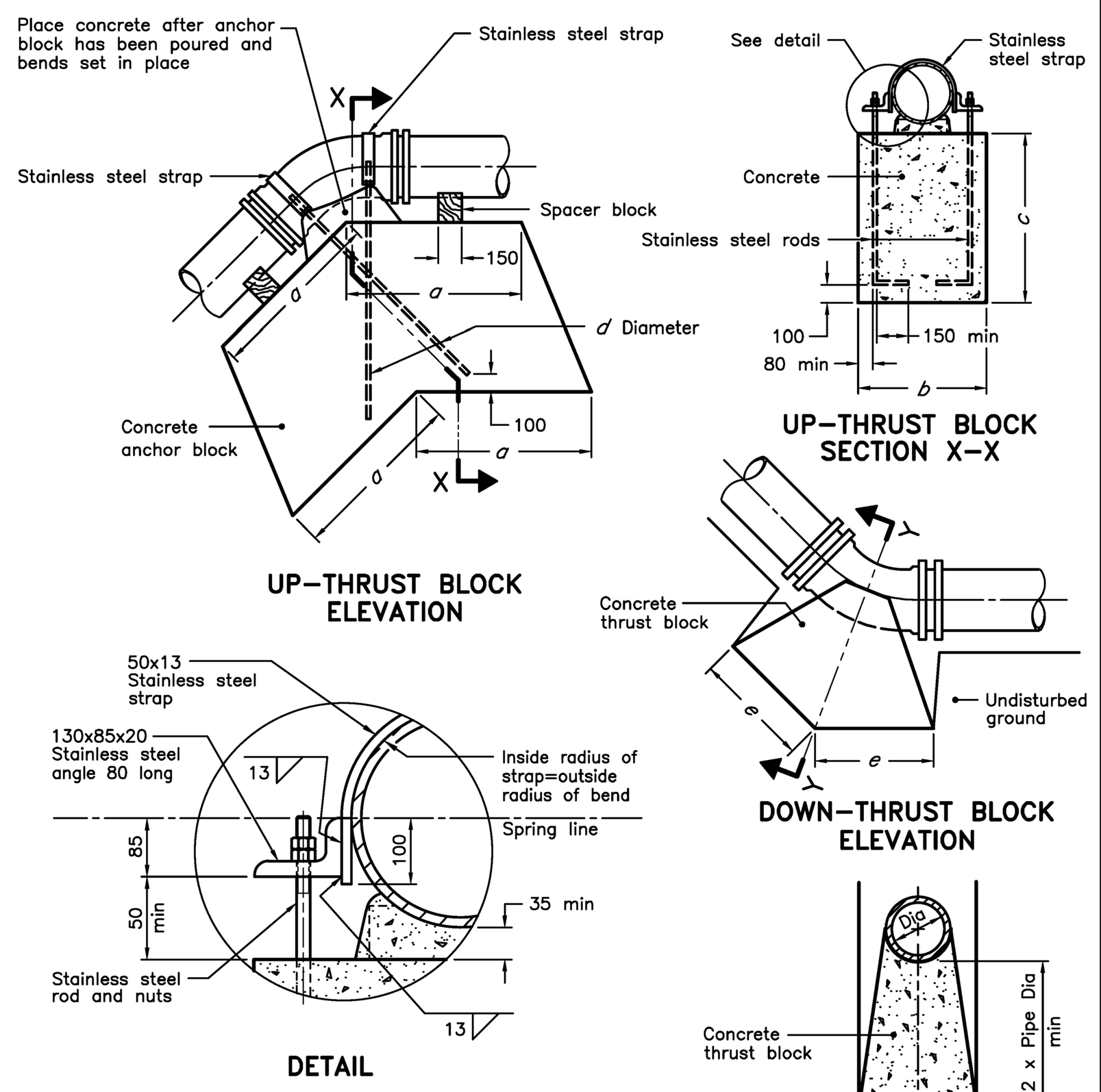
PIPE DIA	Dimensions a	b	c	d
100	150	150	150	150
150	250	200	200	200
200	400	300	200	250
250	500	400	250	300
300	650	450	300	300
350	700	550	350	350
400	900	650	350	450

NOTES:
A Concrete shall be placed to within 50mm of the face of the bell.
B Bond breaker shall be used between concrete and fittings.
C The thrust block dimensions meet or exceed the MECP Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit.
D The assumptions made for the above calculations are:
– Maximum operating pressure of 690 kPa,
– Maximum surge pressure with a flow velocity change of 0.6 m/s of 790 kPa for Class 52 DI pipe and 240 kPa for PVC pipe.
E The tables apply to both ductile iron and PVC pipe. When one length exceeded the other, the longer length was used.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 3

CONCRETE THRUST BLOCKS FOR TEES, PLUGS, AND HORIZONTAL BENDS

OPSD 1103.010



NOTES:
A Concrete shall be placed to within 50mm of the face of the bell.
B Bond breaker shall be used between concrete and fittings.
C This blocking is for bends up to 45° for up-thrust and 90° for down-thrust.
D This OPSD shall be read in conjunction with OPSD 1103.021.
E All stainless steel to be type 316.
F Stainless steel rods and nuts to be designed based on actual watermain diameter and surge pressure.
G All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 4

CONCRETE THRUST BLOCKS FOR VERTICAL BENDS

OPSD 1103.020

SOILS WITH TYPICAL BEARING STRENGTH OF 100 TO 199 kPa

PIPE DIA	Note 1 a	b	c	d	e
100	450	600	750	13	150
150	600	900	900	13	300
200	600	900	1500	13	450
250	900	900	1500	20	600
300	1200	900	1650	20	800
350	1200	1200	1650	25	1000
400	1300	1300	1750	30	1000

SOILS WITH TYPICAL BEARING STRENGTH OF 200 TO 299 kPa

PIPE DIA	Note 1 a	b	c	d	e
100	450	600	750	13	150
150	600	900	900	13	300
200	600	900	1500	13	450
250	900	900	1500	20	600
300	1200	900	1650	20	800
350	1200	1200	1650	25	1000
400	1300	1300	1750	30	1000

SOILS WITH TYPICAL BEARING STRENGTH OF 300 kPa AND OVER

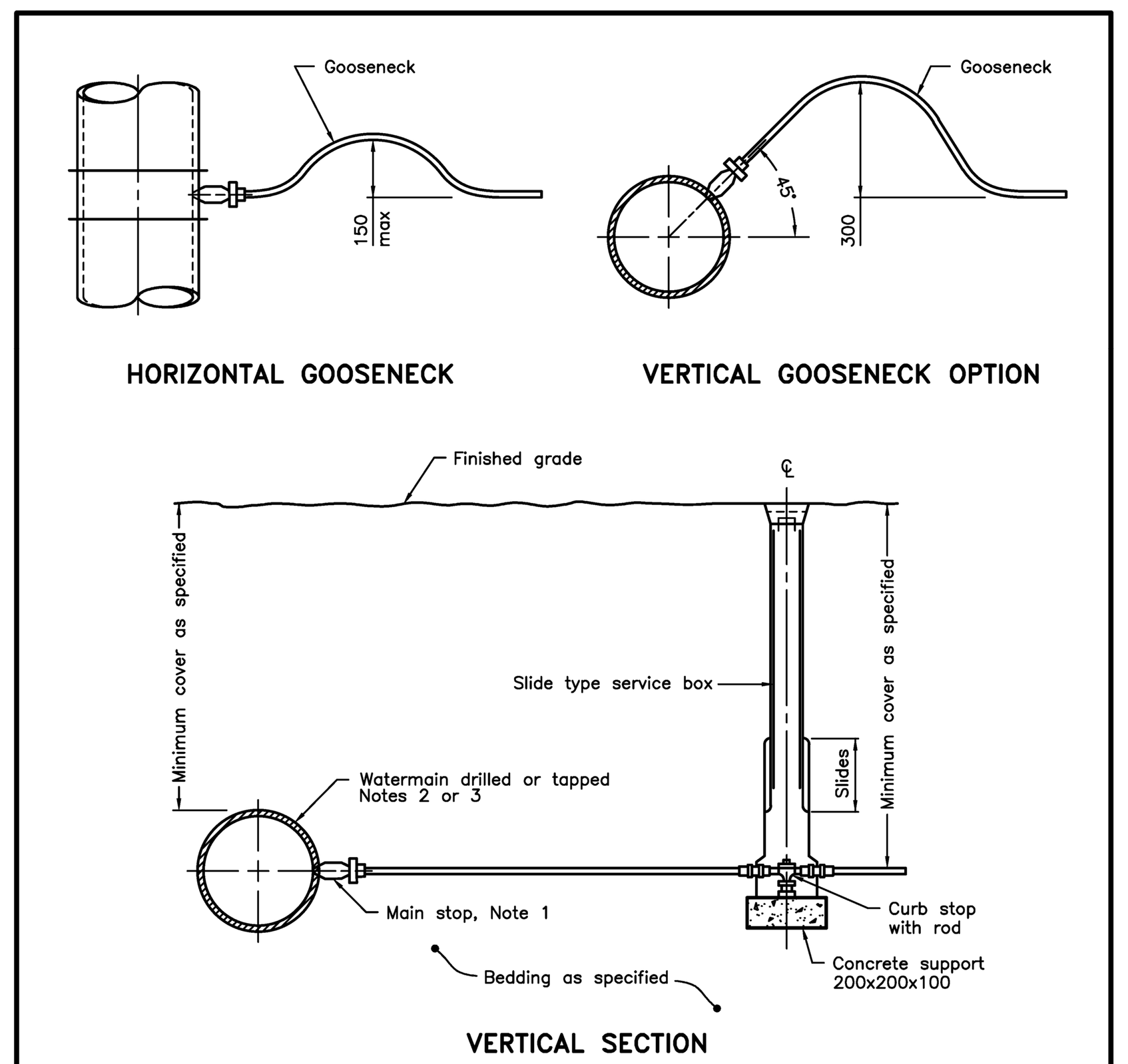
PIPE DIA	Note 1 a	b	c	d	e
100	450	600	750	13	150
150	600	900	900	13	300
200	600	900	1500	13	450
250	900	900	1500	20	600
300	1200	900	1650	20	800
350	1200	1200	1650	25	1000
400	1000	1300	1750	30	1000

NOTES:
1 The dimensions are as specified in OPSD 1103.020.
A The above thrust block dimensions meet or exceed the MECP Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit.
B The assumptions made for the above calculations are as follows:
– Maximum operating pressure of 690 kPa,
– Maximum surge pressure with a flow velocity change of 0.6 m/s of 790 kPa for Class 52 DI pipe and 240 kPa for PVC pipe.
C The tables apply to both ductile iron and PVC pipe. When one length exceeded the other, the longer length was used.
D This OPSD shall be read in conjunction with OPSD 1103.020.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 1

DIMENSION TABLES FOR CONCRETE THRUST BLOCKS FOR VERTICAL BENDS

OPSD 1103.021

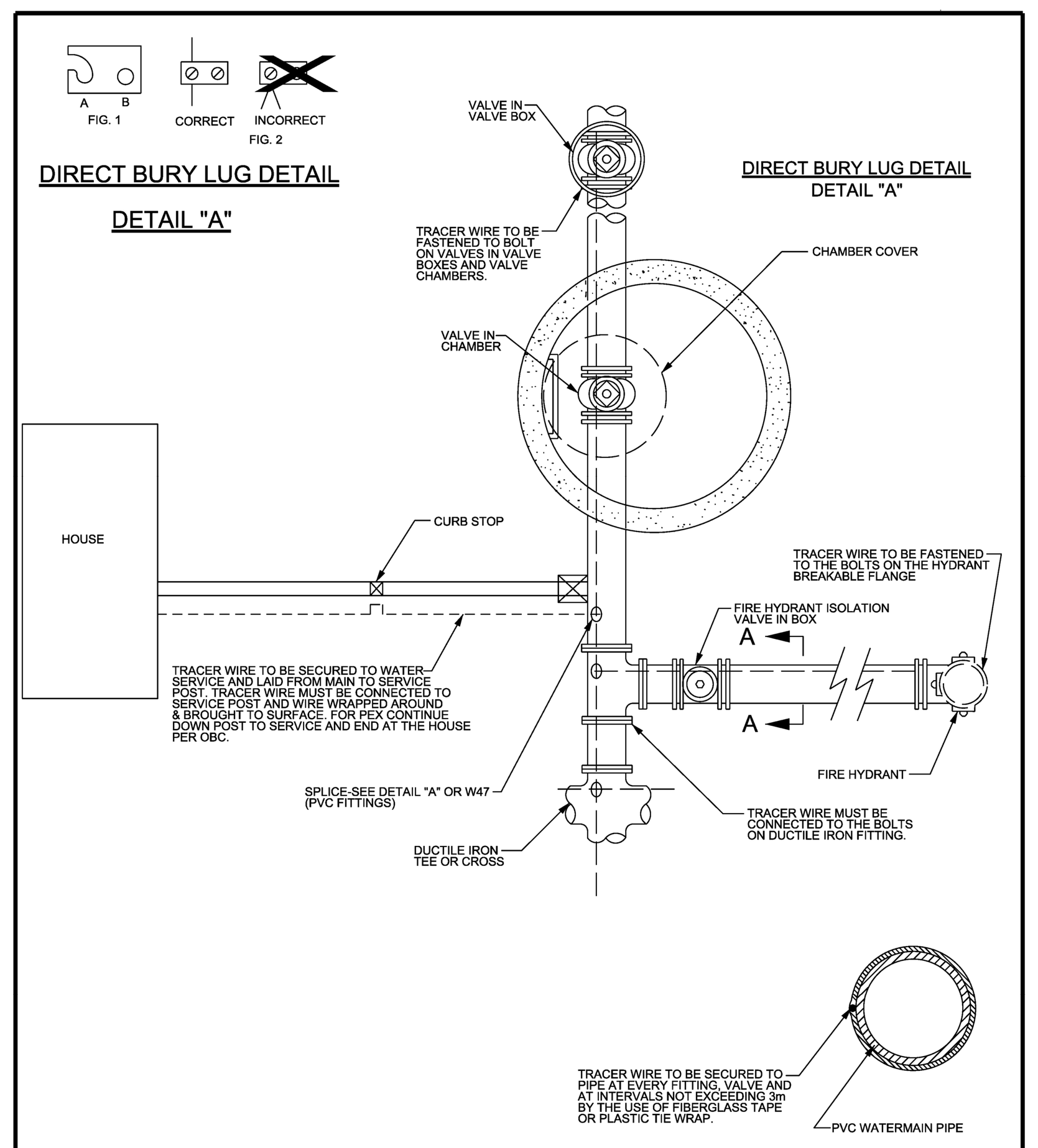


NOTES:
1 For plastic service pipes, install main stop at 15° above horizontal with a minimum 1.2m long gooseneck.
2 Direct tap ductile iron pipe with approved tool with standard AWWA inlet thread.
3 Service connections to plastic watermains shall be made using service saddles or factory made tees.
A When specified, the vertical gooseneck option shall be used.
B Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.
C All water services shall be installed 90° to the longitudinal axis of the watermain.
D Backfill material within 500mm of service box shall be native or imported, as specified.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 4

WATER SERVICE CONNECTION
19 and 25mm DIAMETER SIZES

OPSD 1104.010



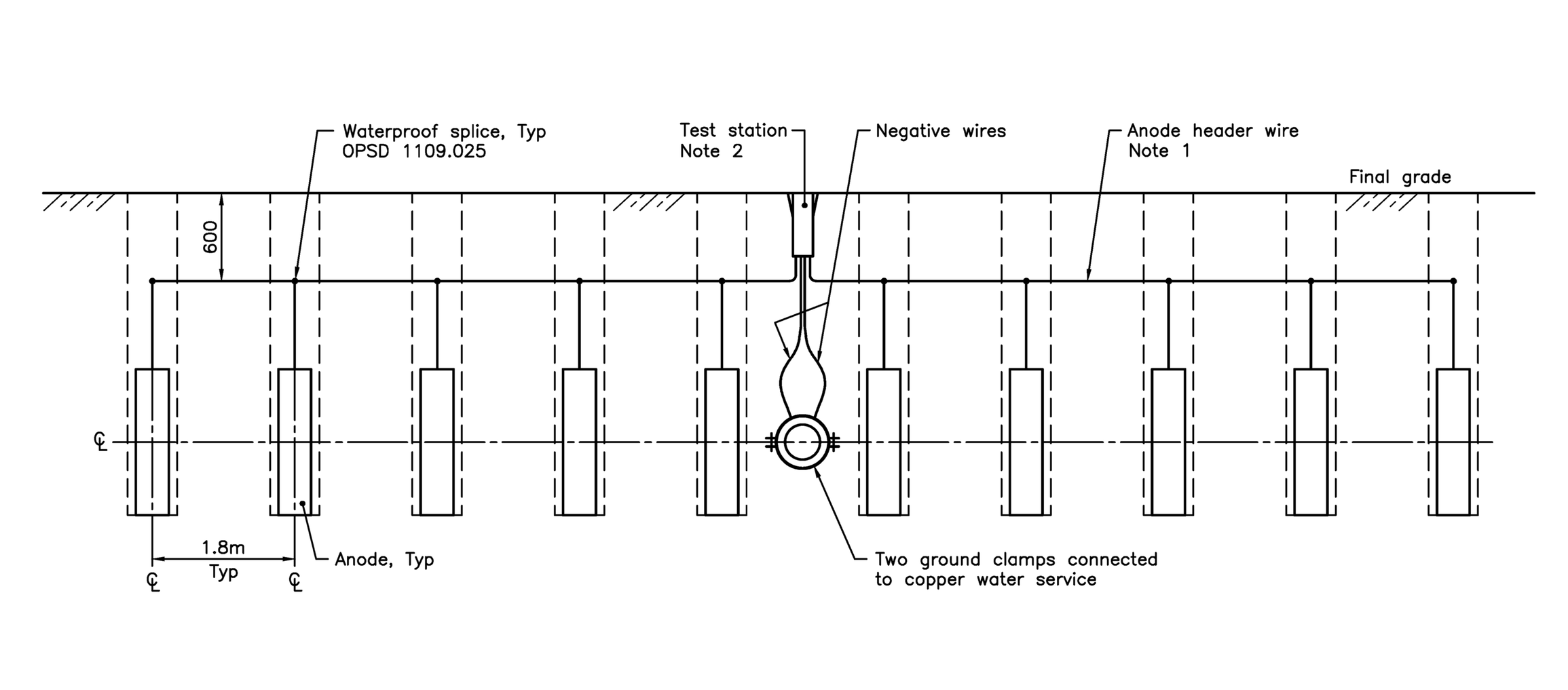
NOTES:
1. ALL CONNECTIONS MUST BE WATERPROOFED.
2. SPLICING OF MAIN TRACER WIRE IS NOT ALLOWED UNLESS SPECIFIED OR APPROVED.
3. TRACER WIRE CONTINUITY OF CURRENT MUST BE TESTED AND VERIFIED.
4. FOR PVC TO DUCTILE IRON CONNECTIONS, THE TRACER MUST BE ATTACHED TO THE DUCTILE IRON PIPE BY CADWELD.
5. FOR SPLICES WITH DIRECT BURY LUGS STRIP BOTH UNCUT MAIN AND CUT TAP WIRE TO WIDTH OF LUG (16mm). PLACE MAIN WIRE INTO SIDE A (FIG. 1) AND TAP WIRE INTO SIDE B. TORQUE EACH SCREW TO 35 LB-IN. REMOVE SEALANT COVER AND DISCARD. CLOSE HOUSING, ALIGNING WIRES UNTIL HOUSING LID IS FULLY LATCHED.

N.T.S.

Ottawa

TRACER WIRE INSTALLATION

DATE: MAY 2001
REV. DATE: MARCH 2014
DWG. No.: W36

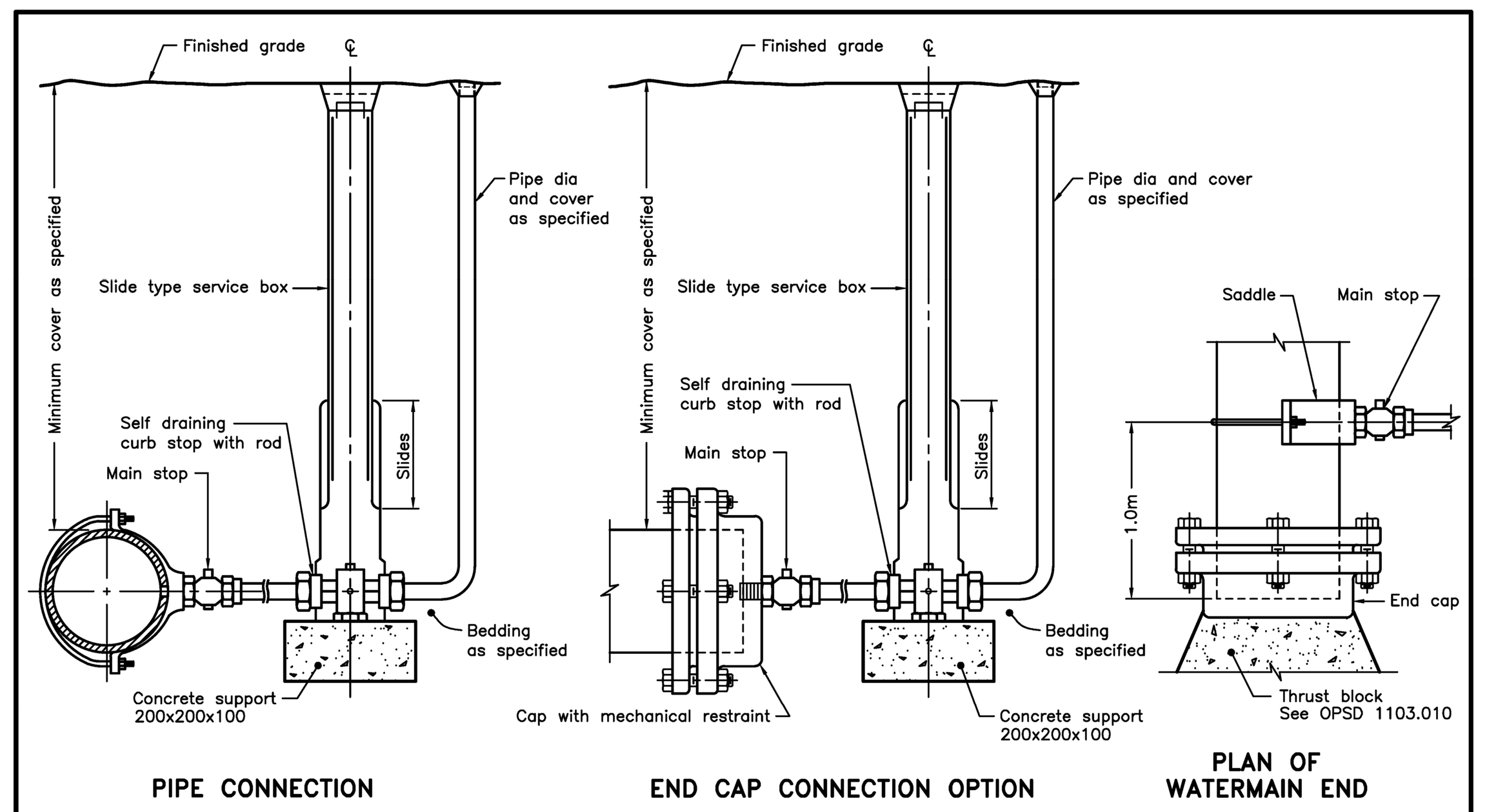


NOTE:
1 Header wire shall not be cut during splicing.
2 Test station shall be flush-mounted or pole-mounted, as specified.
A Wiring detail in test station shall be according to OPSD.1109.010.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2020 | Rev 2

VERTICAL ANODE BANK AT SERVICE

OPSD 1109.015

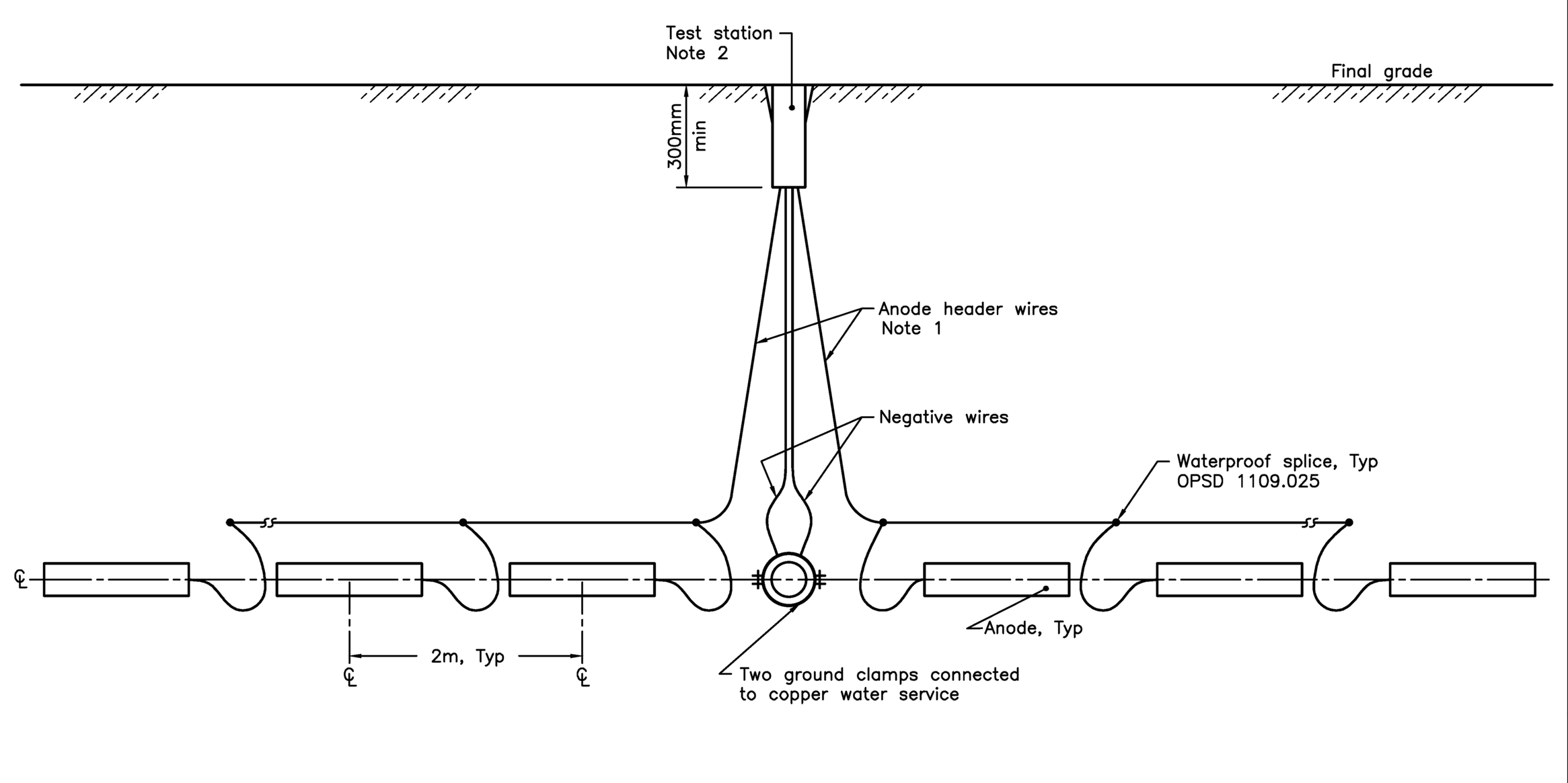


NOTES:
A Backfill material within 500mm of service box shall be native or imported, as specified.
B Refer to applicable regulations for end of pipe treatment.
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2018 | Rev 3

BLOW OFF INSTALLATION

OPSD 1104.030



NOTE:
1 Header wire shall not be cut during splicing.
2 Test station shall be flush-mounted or pole-mounted, as specified.
A Wiring detail in test station shall be according to OPSD.1109.010.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING | Nov 2020 | Rev 2

HORIZONTAL ANODE BANK AT SERVICE

OPSD 1109.014

No.	REVISION / ISSUE	DATE MM/DD/YY
5	DETAILS UPDATE	02/06/24
4	DETAILS UPDATE	12/01/23
3	DETAILS UPDATE	07/25/23
2	PEER REVIEW COMMENTS	08/04/22
1	INITIAL ISSUE	06/23/22

PREPARED BY:

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ÆADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
02/06/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

DETAILS - 3

SCALE: N/A

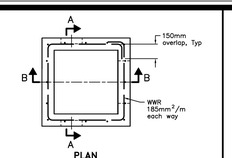
DRAWING No.: D-3

DRAFTED BY:

PROJECT No.: 0114

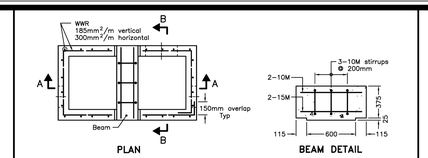
DATE: 02/06/2024

ALTERNATE STANDARD HEIGHTS	
ALTERNATIVE	DIMENSION
A	1980
B	1830
C	1520
D	1380



NOTES:
1 Outlet hole size 525mm diameter maximum, location as required.
2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
A Centre reinforcing in base slab and walls ±20mm.
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
C Frame, grate, and adjustment units shall be installed according to OPSD 708.020.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

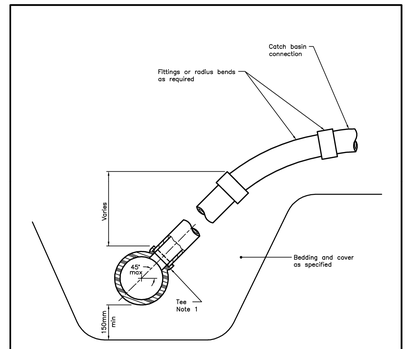
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2019	Rev 4
PRECAST CONCRETE CATCH BASIN 600x600mm		
OPSD 705.010		



NOTES:
1 Outlet hole size 525mm diameter maximum, location as required.
2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
3 Minimum clearance between beam recess and hole for pipe shall be 300mm or minimum clearance can be 150mm with addition of two 15M size rebar on 45 degree diagonal.
A Centre reinforcing in base slab and walls ±20mm.
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
D Pipe support shall be according to OPSD 708.020.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

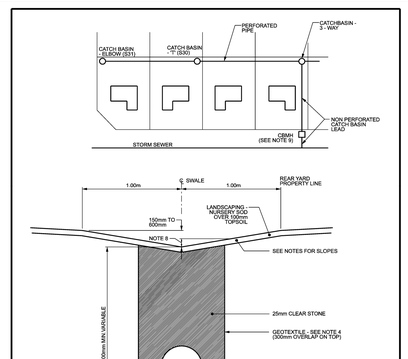
ALTERNATE STANDARD HEIGHTS	
ALTERNATIVE	DIMENSION
A	1980
B	1830
C	1680

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2019	Rev 4
PRECAST CONCRETE TWIN INLET CATCH BASIN 600 x 1450mm		
OPSD 705.020		



NOTES:
1 For catch basin connections 300mm in diameter or less, factory made tees shall be used.
A For catch basin connections greater than 300mm in diameter, maintenance holes shall be used at the main sewer.
B All dimensions are in millimetres unless otherwise shown.

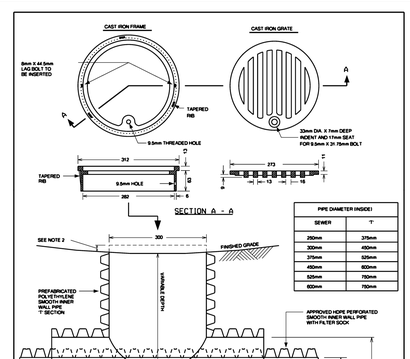
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2016	Rev 3
CATCH BASIN CONNECTION FOR FLEXIBLE MAIN PIPE SEWER		
OPSD 708.030		



NOTES:
1. SIDE SLOPE OF SWALE - MIN. 1.5%, MAX. 3:1.
2. LONGITUDINAL SLOPE OF SWALE WITHOUT PERFORATED PIPE 1.5% MIN.
3. LONGITUDINAL SLOPE OF SWALE WITH PERFORATED PIPE 0.5% MIN. WITH 1% OR GREATER PREFERRED.
4. UNDER DRIVEWAYS NON PERFORATED PIPE TO BE USED WITH 75mm BEDDING AND BACKFILLED WITH APPROVED NATIVE MATERIAL.
5. CB "T" TO BE SPACED ABOUT EVERY 20 TO 25m AND LOCATED 1m OFF REAR YARD AND SIDE YARD PROPERTY LINES.
6. CB ELBOW TO BE AT UPPER ENDS OF PERFORATED PIPE AND LOCATED 1m OFF REAR YARD AND SIDE YARD PROPERTY LINES.
7. GEOTEXTILE SHALL BE APPROVED NON-WOVEN CLASS 1 OR AS SPECIFIED.
8. MAXIMUM REAR YARD WATER DEPTH IS 300mm.
9. A STANDARD CATCHBASIN NO DEEPER THAN 2.4m OR A CATCHBASIN MAINTENANCE HOLE. STANDARD FRAMES C/W PERFORATED OR SOLID COVER AS SPECIFIED. STANDARD CATS AS SPECIFIED

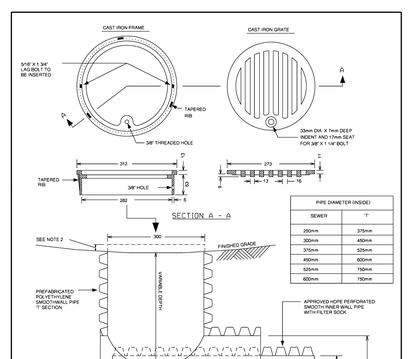
N.T.S.

Ottawa	PERFORATED PIPE INSTALLATION FOR REAR YARD AND LANDSCAPING APPLICATIONS	DATE: MARCH 2007
		REV. DATE: MARCH 2019
		DWG. No.: S30



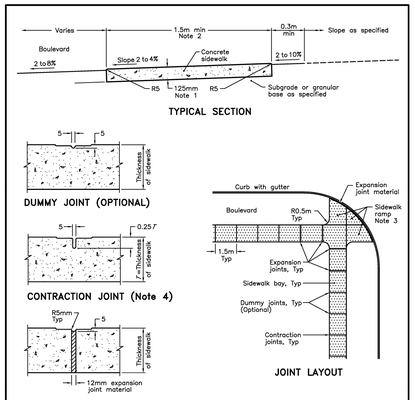
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
2. FOR DITCHED PIPE APPLICATIONS, TOP OF CB SHALL BE MIN. 5cm ABOVE BOTTOM OF THE DITCH/SWALE AND BE LOCATED MIN. 2m FROM EDGE OF PAVEMENT.
3. WHEN NON PERFORATED PIPE IS USED, MATCH THE "I"s HORIZONTAL OPENING DIAMETERS TO THE PIPE DIAMETER AND CONNECT WITH MANUFACTURER'S RECOMMENDED CONNECTION SLEEVE.
4. SEE MS-22.15 FOR ALTERNATE APPROVED FITTING MANUFACTURERS.

Ottawa	CATCH BASIN - 'I' FOR REAR YARD, DITCHED PIPE AND LANDSCAPING APPLICATIONS	DATE: MARCH 2007
		REV. DATE: MARCH 2019
		DWG. No.: S30



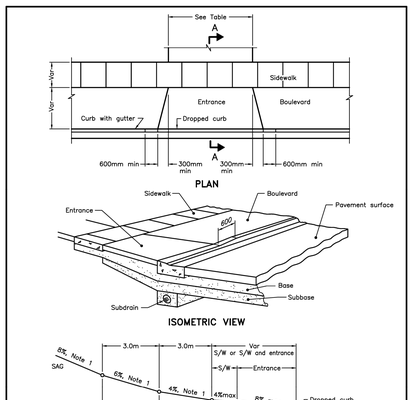
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
2. FOR DITCHED PIPE APPLICATIONS, TOP OF CB SHALL BE MIN. 5cm ABOVE BOTTOM OF THE DITCH/SWALE AND BE LOCATED MIN. 2m FROM EDGE OF PAVEMENT.
3. WHEN NON PERFORATED PIPE IS USED, MATCH THE "I"s HORIZONTAL OPENING DIAMETERS TO THE PIPE DIAMETER AND CONNECT WITH MANUFACTURER'S RECOMMENDED CONNECTION SLEEVE.
4. SEE MS-22.15 FOR ALTERNATE APPROVED FITTING MANUFACTURERS.

Ottawa	CATCH BASIN - ELBOW FOR REAR YARD, DITCHED PIPE AND LANDSCAPING APPLICATIONS	DATE: MARCH 2007
		REV. DATE: MARCH 2019
		DWG. No.: S31



NOTES:
1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
2 Sidewalk width shall be wider when specified.
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.033, and 310.039.
4 Contraction Joint may be tooled or sawcut.
A All dimensions are in millimetres unless otherwise shown.

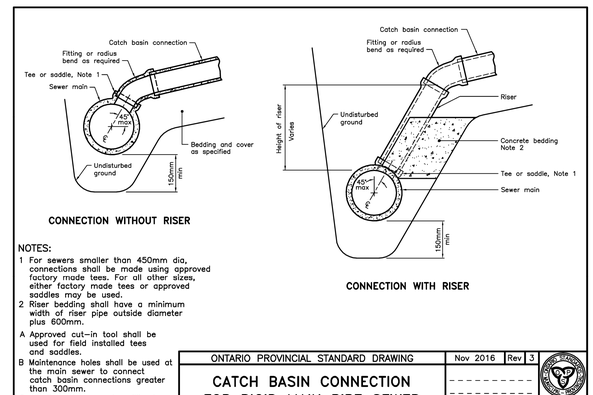
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2019	Rev 3
CONCRETE SIDEWALK		
OPSD 310.010		



DRIVEWAY DIMENSIONS				
LAND USE	WIDTH m			
	Single		Double	
	min	max	min	max
Residential	3.0	4.3	6.0	7.3

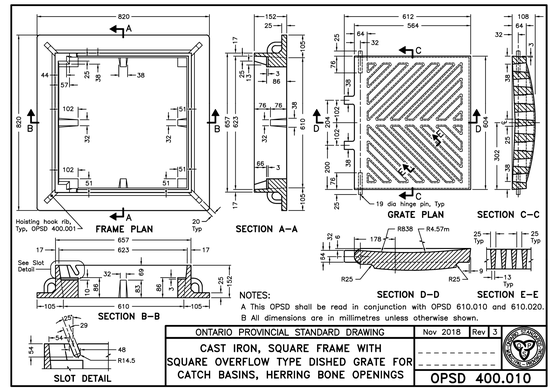
NOTES:
1 Maximum upgrade shall be 10%.
2 Maximum downgrade shall be 8%.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 2
URBAN RESIDENTIAL ENTRANCE		
OPSD 351.010		



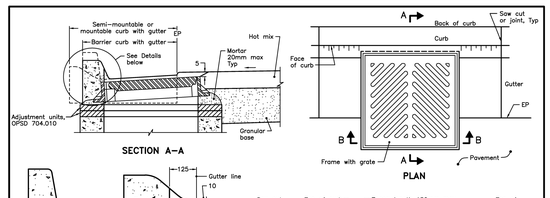
NOTES:
1 For sewers smaller than 450mm dia, connections shall be made using approved factory made tees. For all other sizes, either factory made tees or approved saddles may be used.
2 Riser bedding shall have a minimum width of riser pipe outside diameter plus 600mm.
A Approved cut–in tool shall be used for field installed tees and saddles.
B Maintenance holes shall be used at the main sewer to connect catch basin connections greater than 300mm.
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2016	Rev 3
CATCH BASIN CONNECTION FOR RIGID MAIN PIPE SEWER		
OPSD 708.010		



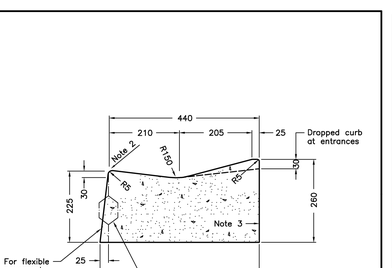
NOTES:
A This OPSD shall be read in conjunction with OPSD 610.010 and 610.020.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
CAST IRON, SQUARE FRAME WITH SQUARE OVERFLOW TYPE DISHED GRATE FOR CATCH BASINS, HERRING BONE OPENINGS		
OPSD 400.010		



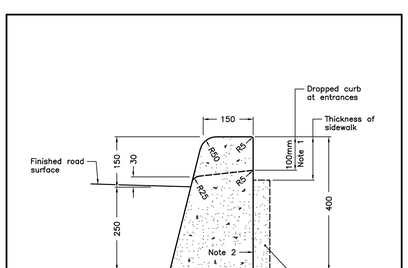
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 2
CATCH BASIN FRAME WITH GRATE INSTALLATION AT CURB WITH GUTTER		
OPSD 610.010		



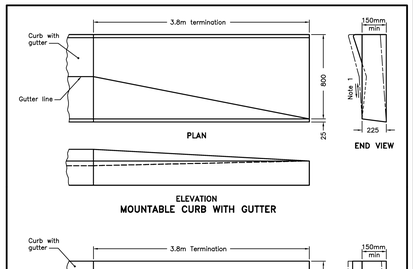
NOTES:
1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.
2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.
3 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
CONCRETE MOUNTABLE CURB WITH NARROW GUTTER		
OPSD 600.100		



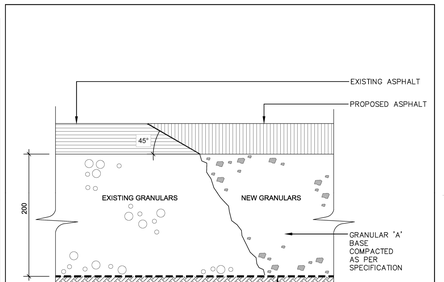
NOTES:
1 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
2 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
CONCRETE BARRIER CURB		
OPSD 600.110		



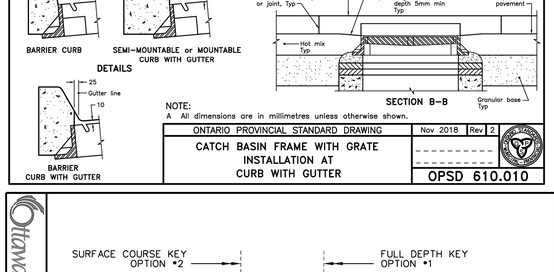
NOTES:
1 Slope shall match existing shoulder.
A This drawing shall be read in conjunction with OPSD 600 series curb with gutter drawings.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
METHOD OF TERMINATION FOR CONCRETE CURB WITH GUTTER		
OPSD 608.010		



NOTE:
1.SLOPE OF PAVEMENT TO MEET/MATCH EXISTING GRADES AT JUNCTION. REFER TO GRADING PLAN FOR NEW CROSS SLOPE.
2.REMOVE CONTAMINATED GRANULARS

Ottawa	TITLE: ASPHALT REINSTATEMENT	DATE: JAN 2015
		REV:
		DWG No: R25



NOTES
1. ALL EXISTING ASPHALT TO BE SAW CUT.
2. UNLESS SPECIFIED ELSEWHERE, SURFACE COURSE ASPHALT SUPERPAVE 12.5mm LEVEL B (PG58-34) AND BASE COURSE ASPHALT SUPERPAVE 19.0mm LEVEL B (PG58-34) IS TO BE USED.
3. UNLESS SPECIFIED ELSEWHERE, WHERE EXISTING PAVEMENT STRUCTURE EXCEEDS 350mm IN DEPTH, ASPHALT REINSTATEMENT SHALL BE 150mm AND GRANULAR "A" FOR THE REMAINDER.
4. UNLESS SPECIFIED ELSEWHERE, WHERE AN UNDERLYING LAYER OF CONCRETE PAVEMENT EXISTS, REINSTATEMENT SHALL CONSIST OF 150mm OF SUPERPAVE 19.0mm LEVEL B (PG58-34) COMPACTED IN LIFTS.
5. UNLESS SPECIFIED ELSEWHERE, HOT MIX ASPHALT PLACEMENT AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH F-3130.

Ottawa	STANDARD TRENCH REINSTATMENT IN PAVED SURFACE	DWG No.: R10	DATE: MARCH 2017

No.	REVISION / ISSUE	DATE MM/DD/YY
5	DETAILS UPDATE	02/06/24
4	DETAILS UPDATE	12/01/23
3	DETAILS UPDATE	07/25/23
2	PEER REVIEW COMMENTS	08/04/22
1	INITIAL ISSUE	06/23/22

PREPARED BY:
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ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 02/06/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

DETAILS - 4

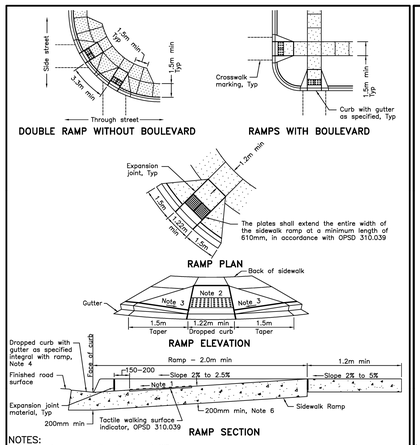
SCALE: N/A

DRAFTED BY:

PROJECT No.: 0114

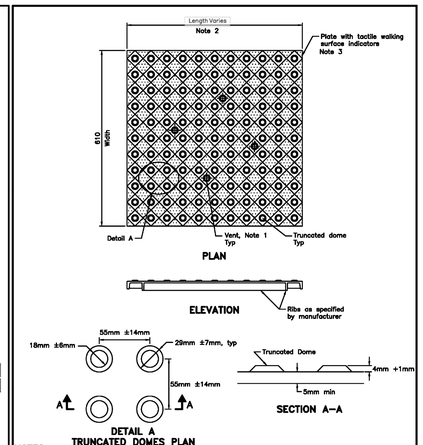
DATE: 02/06/2024

DRAWING No.: D-4



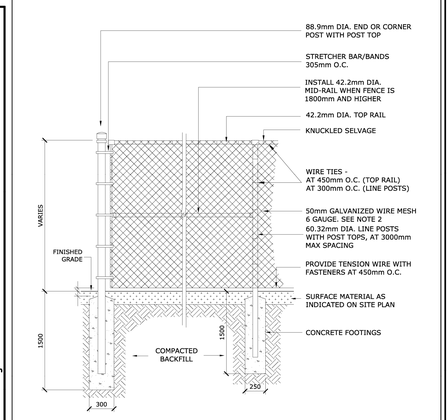
NOTES:
1 Slope of ramp shall not exceed 8%.
2 Cross slope of ramp shall not exceed 2% in either direction.
3 Cross slope of flared side of ramp shall not exceed 8%.
4 Dropped curb at ramp shall be modified to eliminate 30 mm step at gutter line.
5 Minimum thickness of ramp is 200mm. Minimum thickness of sidewalk and flared sides adjacent to ramp is 150mm.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2019	Rev 1
CONCRETE SIDEWALK RAMPS AT UNSIGNALIZED INTERSECTIONS		
		OPSD 310.033



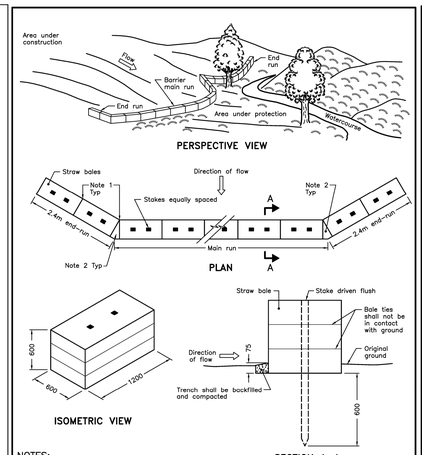
NOTES:
1 Vents shall be as specified by the manufacturer.
2 Length of plate may be increased to suit the curb depression width.
3 Material of plate shall be as specified in Contract Documents.
A Adjacent cast iron plates shall be permanently connected using a locking mechanism and any hardware shall be hot dipped galvanized.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2019	Rev 1
CONCRETE SIDEWALK RAMPS TACTILE WALKING SURFACE INDICATORS COMPONENT		
		OPSD 310.039



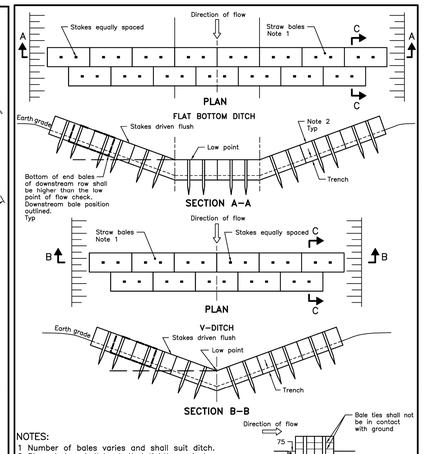
NOTES:
1. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
2. IF FENCE IS TO BE BLACK VINYL, THE FENCE SHOULD BE 9 GAUGE GALVANIZED WIRE CORE WITH BLACK VINYL COATING TO PROVIDE A TOTAL OF 6 GAUGE THICKNESS
3. POSTS, RAILS AND ALL OTHER HARDWARE SHOULD BE ELECTROSTATIC PAINTED
4. CONCRETE FOOTING SHALL BE CSA 30MPa CLASS F-1

Ottawa	TITLE: CHAINLINK FENCE	DATE: FEB 2013
		REV: FEB 2019
		DWG No: F9



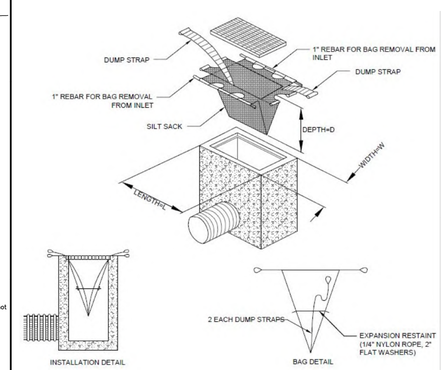
NOTES:
1 Straw bales shall be butted tightly against adjoining bales to prevent sediment flow through barrier.
2 Fill and compact gaps with loose straw.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev 3
LIGHT–DUTY STRAW BALE BARRIER		
		OPSD 219.100



NOTES:
1 Number of bales varies and shall suit ditch.
2 Straw bales shall be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.
A Fill and compact gaps with loose straw.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev 3
STRAW BALE FLOW CHECK DAM		
		OPSD 219.180



INLET SEDIMENT CONTROL DEVICE
N.T.S.

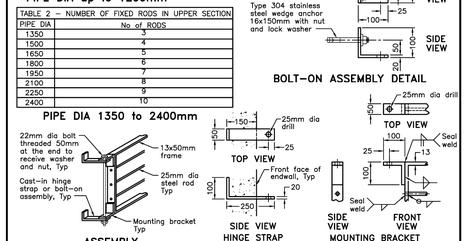
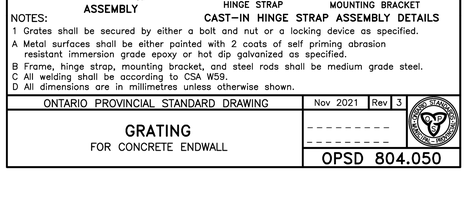


TABLE 1 – NUMBER OF RODS IN FRAME	
PIPE DIA	No of RODS
450	1
525	1
600	2
675	3
750	3
825	4
900	4
975	5
1050	6
1200	7

PIPE DIA up to 1200mm

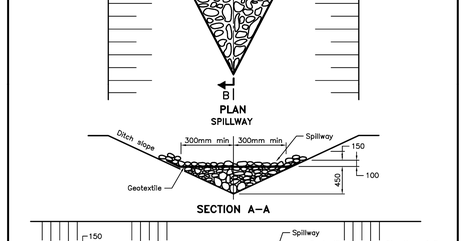
TABLE 2 – NUMBER OF FIXED RODS IN UPPER SECTION	
PIPE DIA	No of RODS
1350	3
1500	4
1650	5
1800	6
1950	7
2100	8
2250	9
2400	10

PIPE DIA 1350 to 2400mm



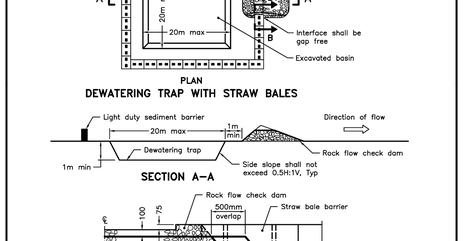
NOTES:
1 Grates shall be secured by either a bolt and nut or a locking device as specified.
A Metal surfaces shall be either painted with 2 coats of self priming abrasion resistant immersion grade epoxy or hot dip galvanized as specified.
B Frame, hinge strap, mounting bracket, and steel rods shall be medium grade steel.
C All welding shall be according to CSA W59.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev 3
GRATING FOR CONCRETE ENDWALL		
		OPSD 804.050



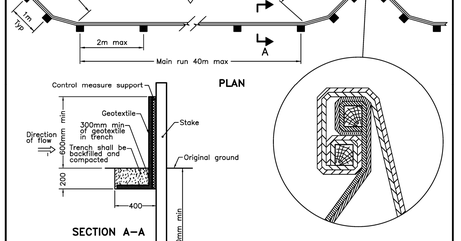
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
TEMPORARY ROCK FLOW CHECK DAM V–DITCH		
		OPSD 219.210



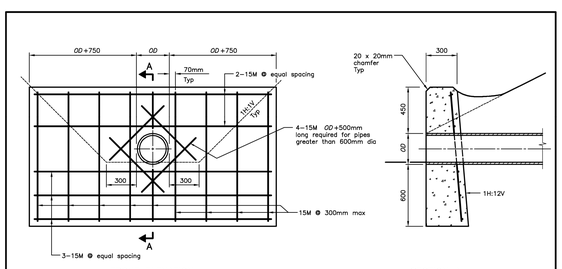
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
SEDIMENT TRAP FOR DEWATERING		
		OPSD 219.240



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

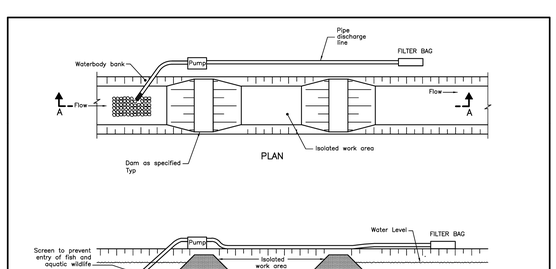
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev 3
HEAVY–DUTY SILT FENCE BARRIER		
		OPSD 219.130



LEGEND:
OD – Outside diameter of pipe

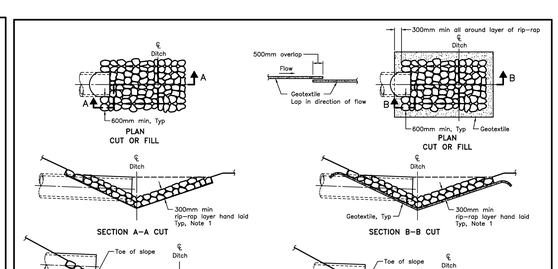
NOTES:
A This OPSD to be read in conjunction with OPSD 3940.150.
B If a steel grate is required, refer to OPSD 804.05.
C Class of concrete: 30MPa.
D Cover to reinforcing bars 70mm ± 20mm.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2017	Rev 2
CONCRETE HEADWALL FOR PIPE LESS THAN 900mm DIAMETER		
		OPSD 804.030



NOTE:
A Schematic only.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev 1
TEMPORARY FLOW PASSAGE SYSTEM PUMPING AND PIPING		
		OPSD 221.020



NOTES:
1 The thickness of the rip–rap layer shall be at least 1.5 times the rip–rap mean diameter.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
GENERAL RIP–RAP LAYOUT FOR SEWER AND CULVERT OUTLETS		
		OPSD 810.010

No.	REVISION / ISSUE	DATE MM/DD/YY
5	DETAILS UPDATE	02/06/24
4	DETAILS UPDATE	12/01/23
3	DETAILS UPDATE	07/25/23
2	PEER REVIEW COMMENTS	08/04/22
1	INITIAL ISSUE	06/23/22

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REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
02/06/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

DETAILS - 5

SCALE:	DRAWING No.:
N/A	D-5
DRAFTED BY:	
PROJECT No.: 0114	
DATE: 02/06/2024	

SCHEDULE "G"

LOT GRADING AND DRAINAGE

For the lands set out in Schedule "A," the Owner agrees to implement and maintain the objectives and criteria of the Grading and Drainage Plan (GR-1 to GR-3 inclusive), prepared by Advance Engineering, stamped and dated July 31, 2024.

For the lands set out in Schedule "A," the Owner agrees to implement and maintain the objectives and criteria of the Earthwork Plan, prepared by Advance Engineering, stamped and dated June 18, 2024.

For the lands set out in Schedule "A," the Owner agrees to implement and maintain the objectives and criteria of the Subsurface Geotechnical Report, prepared by St. Lawrence Testing, stamped and dated May 31, 2021.

ROUGH LOT GRADING

Rough lot grading shall be completed for all lots prior to acceptance of the Works by the Municipality and the release of all security. Such grading may be completed in stages if approved by the Municipality. Nothing contained herein shall prevent the owner from stockpiling clean fill and/or topsoil on any lot so long as such storage does not interfere in any way with the drainage of water within the Subdivision.

EXCESS SOIL MANAGEMENT

The Owner shall be responsible for ensuring that any material removed from the site meets the requirements of O. Reg. 406/19 On-Site and Excess Soil Management.

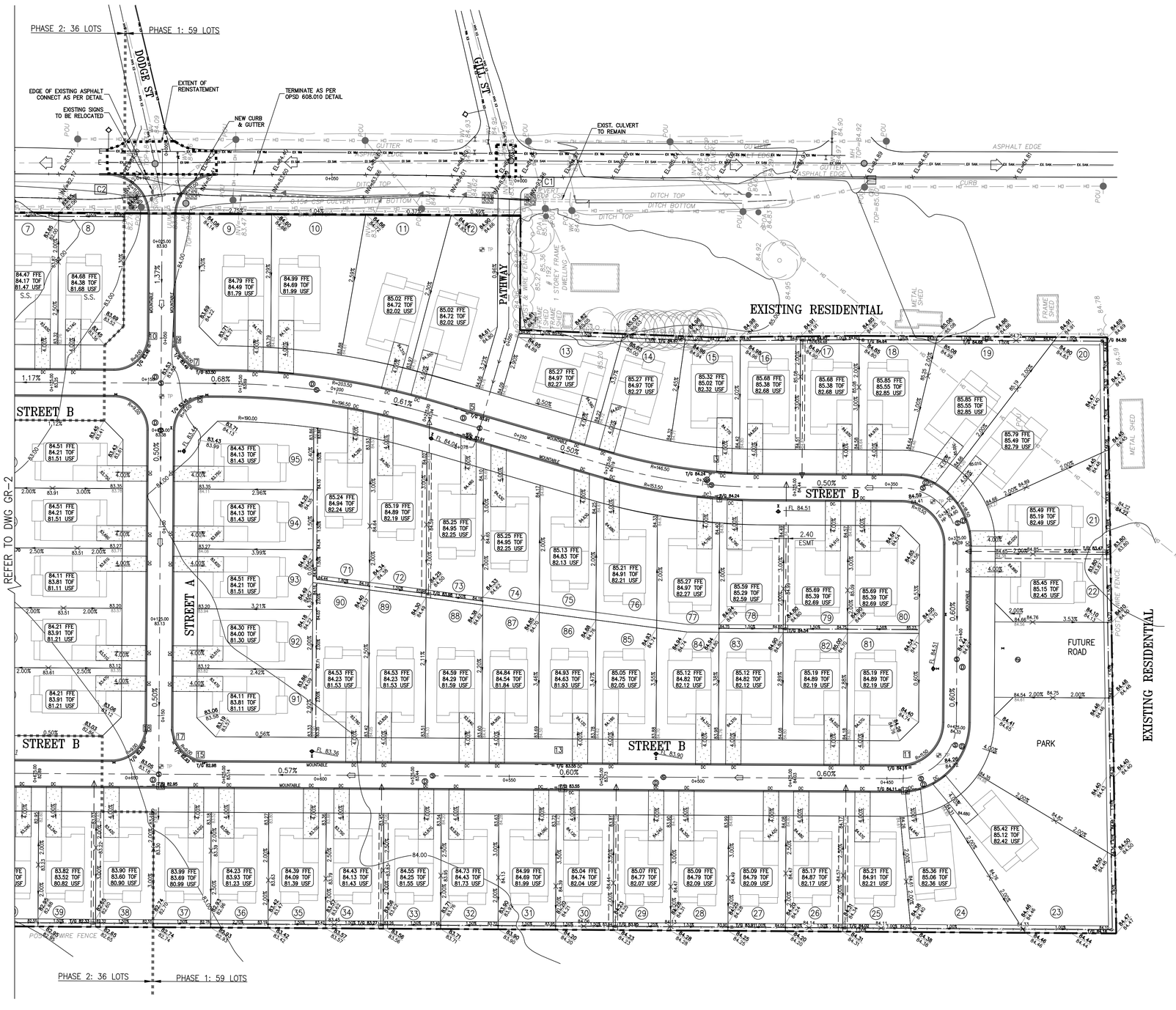
MAINTENANCE OF LOT GRADING AND DRAINAGE

These restrictions shall run with and be binding upon the Lands. The Grantees, in respect to the herein described lands, shall maintain proper grades and levels thereon in accordance with the approved Lot Grading and Drainage Plan, prepared by Advance Engineering, stamped and dated February 6, 2024 in order to ensure that no back yard, side yard, or front yard accumulation of storm water occurs on the land or neighbouring lands. Future maintenance of drainage Works shall be completed by the Municipality and costs charged back to benefiting properties as a local improvement.

In the event that the Grantees do not maintain the proper grades and levels herein referred to, or in the event that they impede any drained system or pattern on the herein described lands or neighbouring lands, they shall be responsible for the curing of any problems resulting thereto and costs arising out of same.

Attached:

- **Grading and Drainage Plans**
  - **Phase 1 (GR1) July 31, 2024**
  - **Phase 2 (GR2) July 31, 2024**
  - **Details (GR3) July 31, 2024**
- **Earthwork Plan (EW1) June 18, 2024**
- **Geotechnical Subsurface Investigation Report May 31, 2024**



0 10 20 METRES

LEGEND:

- LOT NUMBER
- PROPERTY LIMIT
- LOT LINE
- SETBACK LINE
- CULVERT
- PROP. RETAINING WALL
- CONTOUR (84.00)
- PROPOSED TERRACING
- TOP OF SLOPE
- EXIST. MAJOR OVERLAND FLOW DIRECTION
- PROPOSED SURFACE DRAINAGE PATTERN (1 %)
- HIGH POINT
- PROPOSED GRADING ELEVATION (82.50)
- EXISTING GRADE ELEVATION (82.60)
- TOP OF GRATE ELEVATION T/G 84.00
- PROPOSED SWALE
- SWALE INVERT (82.30 IN)
- PROPOSED CURB
- CURB & DEPRESSED CURB (DC / BARRIER / MOUNTABLE)
- PROPOSED DRIVEWAY (1.5m CONC. SIDEWALK)
- PROPOSED CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE OPSD 701.010
- TEE CATCHBASIN STD S30
- PERFORATED PIPE
- ELBOW CATCHBASIN STD S31
- PROPOSED SANITARY SEWER (SAN)
- PROPOSED WATERMAIN (WM)
- PROPOSED STORM SEWER (STM)
- PROP. CHAINLINK FENCE

BUILDING INFORMATION

GARAGE ELEVATION	84.84 GAR
FINISHED FLOOR ELEVATION	85.29 FFE
TOP OF FOUNDATION ELEVATION	84.99 TOF
UNDERSIDE OF FOOTING ELEVATION	82.29 USF
NUMBER OF RISERS	6
WALKOUT UNITS	W.O.
LOTS WITH FILL EXCEEDING 1.2m REQUIRE SPECIAL DESIGN	S.S.
GARAGE ELEVATION	82.00G

No.	REVISION / ISSUE	DATE MM/DD/YY
8	PLANS UPDATE – WEST DRAINAGE	07/31/24
7	PLANS UPDATE	02/06/24
6	PLANS UPDATE	09/05/23
5	REVIEW COMMENTS – 06–30–2023	07/25/23
4	REVIEW COMMENTS – BERM LAYOUT	05/16/23
1	OWNER / APPROVAL	03/10/22

PREPARED BY:

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ADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
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07/31/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

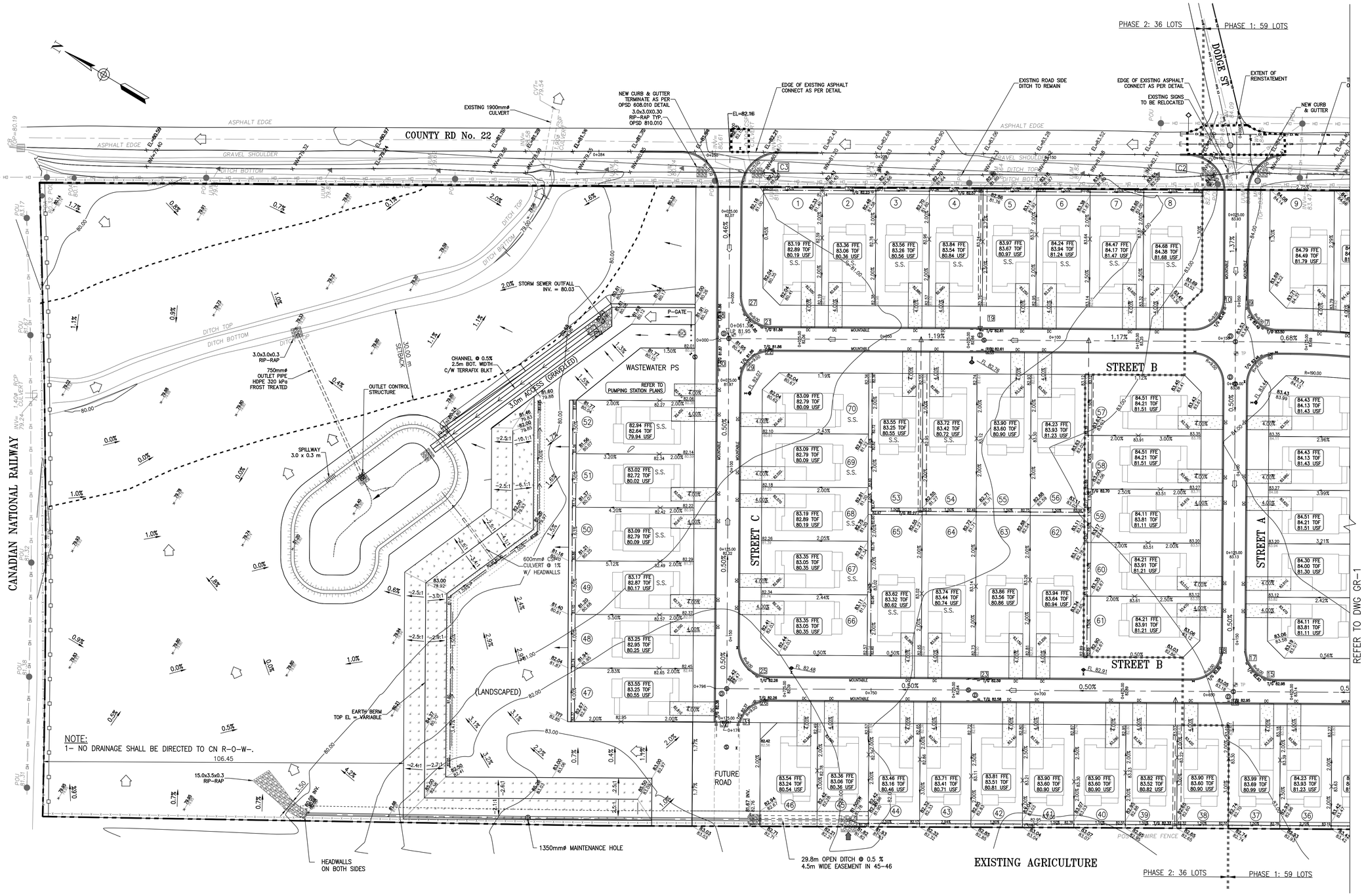
APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

GRADING & DRAINAGE PLAN PH-1

SCALE: 1:500	DRAWING No.: GR-1
DRAFTED BY:	
PROJECT No.: 0114	
DATE: 07/31/24	



LEGEND:

- LOT NUMBER (#)
- PROPERTY LIMIT
- LOT LINE
- SETBACK LINE
- CULVERT
- PROP. RETAINING WALL
- CONTOUR 84.00
- PROPOSED TERRACING
- TOP OF SLOPE
- EXIST. MAJOR OVERLAND FLOW DIRECTION
- PROPOSED SURFACE DRAINAGE PATTERN 1 %
- HIGH POINT
- PROPOSED GRADING ELEVATION 82.00 / EXISTING GRADE ELEVATION 82.50
- TOP OF GRATE ELEVATION T/G 84.00
- PROPOSED SWALE
- SWALE INVERT 82.50 IN
- PROPOSED CURB
- CURB & DEPRESSED CURB DC BARRIER MOUNTABLE
- PROPOSED DRIVEWAY 1.5m CONC. SIDEWALK
- PROPOSED CATCHBASIN
- PROPOSED CATCHBASIN MANHOLE OPSD 701.010
- TEE CATCHBASIN STD S30
- PERFORATED PIPE
- ELBOW CATCHBASIN STD S31
- PROPOSED SANITARY SEWER SAN
- PROPOSED WATERMAIN WM
- PROPOSED STORM SEWER STM
- PROP. CHAINLINK FENCE

BUILDING INFORMATION

GARAGE ELEVATION	84.84 GAR
FINISHED FLOOR ELEVATION	85.29 FFE
TOP OF FOUNDATION ELEVATION	84.99 TOF
UNDERSIDE OF FOOTING ELEVATION	82.29 USF
NUMBER OF RISERS	6
WALKOUT UNITS	W.O.
LOTS WITH FILL EXCEEDING 1.2m REQUIRE SPECIAL DESIGN	S.S.
GARAGE ELEVATION	82.00G

No.	REVISION / ISSUE	DATE MM/DD/YY
8	PLANS UPDATE – WEST DRAINAGE	07/31/24
7	PLANS UPDATE	02/06/24
6	PLANS UPDATE	09/05/23
5	REVIEW COMMENTS – 06-30-2023	07/25/23
4	REVIEW COMMENTS – BERM LAYOUT	05/16/23
1	OWNER / APPROVAL	03/10/22

PREPARED BY:

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07/31/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

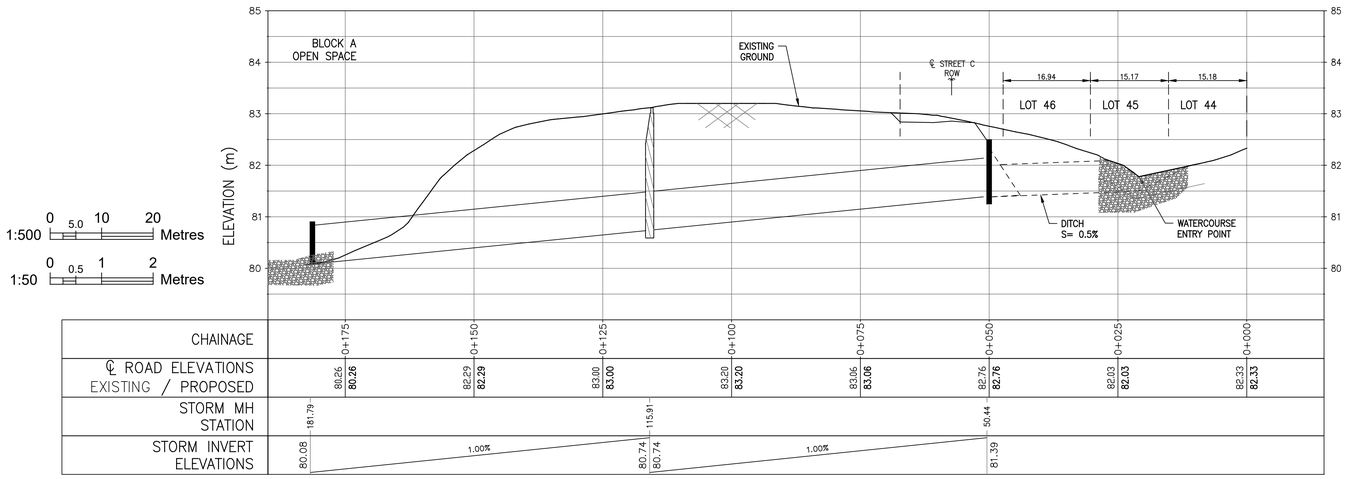
APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

GRADING & DRAINAGE PLAN PH-2

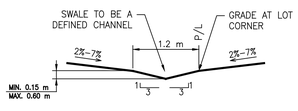
SCALE: 1:500	DRAWING No.: GR-2
DRAFTED BY:	
PROJECT No.: 114	
DATE: 02/06/24	



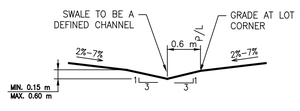
DRAINAGE WEST LAND PROFILE STA. -0+015 TO STA. 0+190
SCALE: H = 1:500 / V = 1:50

CULVERT SCHEDULE

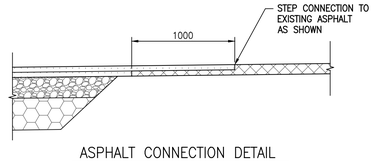
ID	DIA (mm)	LENGTH (m)	SLOPE	MATERIAL	INV. IN	INV. OUT	COVER (m)
C1	450	9.1	−0.50%	REINFORCED CONCRETE	78.56	78.60	0.50 m
C2	450	13.5	−0.50%	REINFORCED CONCRETE	78.60	78.67	0.40 m
C3	600	14.5	−5.00%	REINFORCED CONCRETE	78.60	79.32	0.95 m
CLVT 1	750	65.5	1.00%	REINFORCED CONCRETE	81.39	80.74	<Pipe_Data:Pipe_Cover>
CLVT2	750	65.9	1.00%	REINFORCED CONCRETE	80.74	80.08	<Pipe_Data:Pipe_Cover>



REAR SWALE SECTION
SCALE: 1:25



TYPICAL SWALE SECTION
SCALE: 1:25



ASPHALT CONNECTION DETAIL
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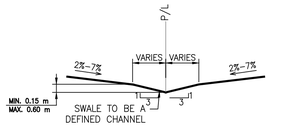

SIDE SWALE SECTION
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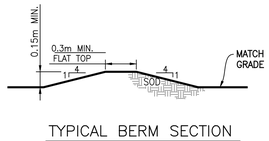

TYPICAL BERM SECTION
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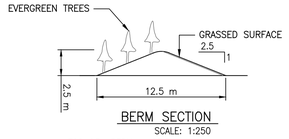

BERM SECTION
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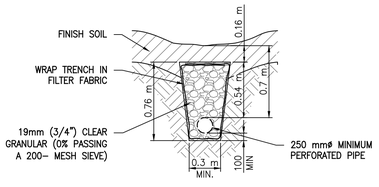
TOP OF BERM : 83.5



SUB-DRAIN DETAIL
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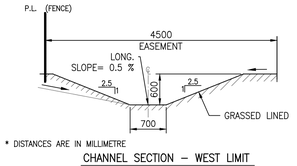

* DISTANCES ARE IN MILLIMETRE

CHANNEL SECTION - WEST LIMIT
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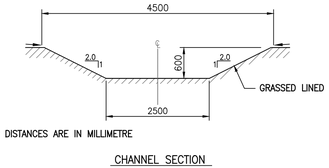


* DISTANCES ARE IN MILLIMETRE

CHANNEL SECTION
SCALE: 1:50

No.	REVISION / ISSUE	DATE MM/DD/YY
8	PLANS UPDATE - WEST DRAINAGE	07/31/24
7	PLANS UPDATE	02/06/24
6	PLANS UPDATE	09/05/23
5	REVIEW COMMENTS - 06-30-2023	07/25/23
4	REVIEW COMMENTS - BERM LAYOUT	05/16/23
1	OWNER / APPROVAL	03/10/22

PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
07/31/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

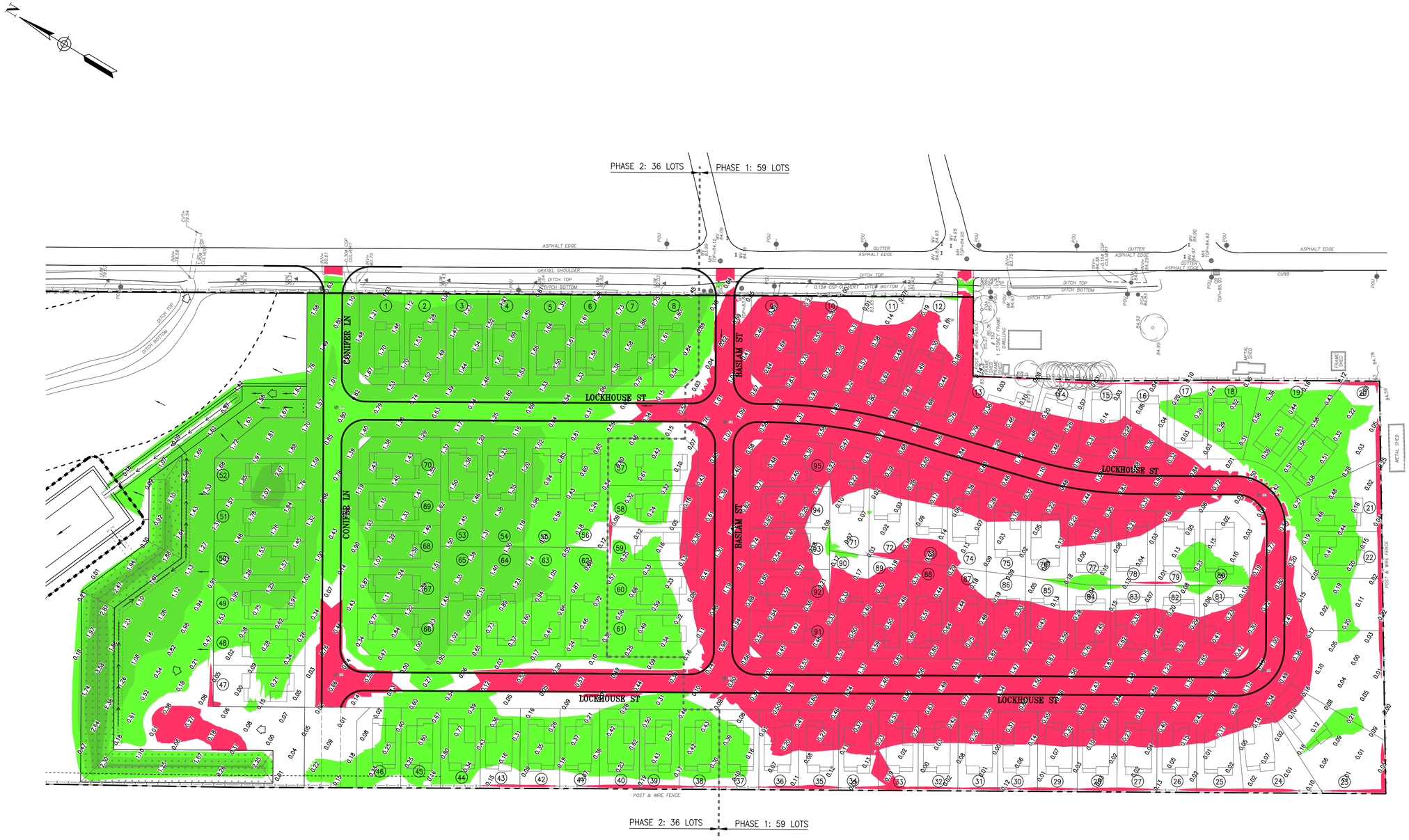
APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

GRADING & DRAINAGE PLAN DETAILS

SCALE: VARIES
DRAWING No.: GR-3
DRAFTED BY:
PROJECT No.: 0114
DATE: 07-31-24



0 7.5 15 30
1:750 Metres

NOTE:
1- CUT/FILL DEPTH IN METRE
2- ELEVATION GRID: 10 m x 10 m
3- ELEVATIONS IN RIGHT-OF-WAY: DATUM SURFACE
4- LOT GRADING: FINISHED GRADE
5- EXCESS SOILS MANAGEMENT SHALL COMPLY WITH O. REG. 406/19 ONSITE AND EXCESS SOIL MANAGEMENT. CONTRACTOR SHALL FILE A NOTICE AT RPRA "EXCESS SOIL REGISTRY" PRIOR TO EXCAVATION.

ELEVATION TABLE LEGEND

NUMBER	MINIMUM ELEVATION	MAXIMUM ELEVATION	COLOUR
1	-0.872 m	-0.150 m	
2	0.150 m	1.000 m	
3	1.000 m	2.000 m	
4	2.000 m	4.000 m	

No.	REVISION / ISSUE	DATE MM/DD/YY
1	TOWNSHIP REVIEW (06-14-2024)	06/18/24
1	OWNER / REVIEW	02/06/24

PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com

PROJECT NAME AND ADDRESS:
LOCKMASTER'S MEADOW
CARDINAL

APPLICANT:
Edwardsburgh Developments Ltd.
Address

TITLE:
EARTHWORK PLAN

SCALE:
DRAWING No.: EW 1
DRAFTED BY:
PROJECT No.:
DATE: 06-18-24

ANSI A (8.50 x 11.00 Inches) ---- EARTHWORK PLAN ---- 11.2.2023

St. Lawrence Testing & Inspection Co. Ltd.

P.O. Box 997, Cornwall, ON, Canada K6H 5V1
814 Second Street W., Phone (613) 938-2521
E-mail: slt@ontarioeast.net Fax (613) 938-7395

May 31, 2021

Mr. David Simpson
Edwardsburgh Development Inc.
434-300 Earl Gray Dr.
Kanata, ON
K2T 1C1

RE: Lockmaster's Meadow, Cardinal, ON
Geotechnical Subsurface Investigation
Report No. 21C350

Dear Mr. Simpson:

In accordance with verbal and e-mail instructions received from you, this report is submitted, outlining the results of a geotechnical subsurface investigation carried out at the site on Shanley Rd, South of the CN Main Line, in Cardinal, ON

A) DESCRIPTION OF FIELD WORK & STRATIGRAPHY

After receiving the approval, we sent you a plan showing the proposed borehole locations. We then contacted Ron Jason Surveying to lay out the boreholes in the field.

After the stakes were placed in the field by Ron Jason Surveying, we called for service locates. Drilling and sampling took place on April 7, 2021 using a CME 55 track mounted auger drill from E.O.D.D. of Hawkesbury, ON. Supervision was by the undersigned geotechnical engineer.

A total of 7 boreholes were put down as noted on the sketch. Most boreholes were put down to 4.6m. or to refusal if above this. One borehole was advanced to 5.18m. The borehole next to Shanley Rd. was advanced to 2.1m. The boreholes were advanced by split spoon sampling. Standard Penetration tests were conducted along with the split spoon sampling. The recovered samples were placed in glass jars for later detailed lab classification and washed gradation tests. The results are found in the attached borehole logs and washed gradation sheets.

We had one of our staff return on April 8, 2021 to measure the water levels in each borehole.

A sketch is attached showing the borehole locations. Also attached are a topographic map of the whole area and a colour map showing the location in relation to the Town of Cardinal.

B) STRATIGRAPHY

The stratigraphy is fairly similar throughout.

The general stratigraphy is a brown, moist, stiff clayey silt overlying a brown to grey, moist, compact to dense silty sand and gravel till.

There is a brown, moist loose silt and sand stratum noted at Boreholes 4 and 7 below the topsoil. This extends to 0.91m. at Borehole 4 and 1.58m. at Borehole 7.

The clayey silt is noted throughout the property below the topsoil at the other boreholes and below the silt and sand at Boreholes 4 and 7. The clayey silt is mainly stiff, but is occasionally hard, at Boreholes 5 and 6.

Underlying the clayey silt is a brown, moist, compact to dense silty sand and gravel till. This was noted at 2.7m. at Borehole 1, 3.7m. at Borehole 2, 2.9m. at Borehole 5 and 2.6m. at Borehole 6. The sand and gravel till was not reached at Boreholes 3 and 4.

Borehole 7 was only advanced to 2.1m. for the pavement design information, to connect the new street on to Shanley Rd.

For the specific stratigraphy at each borehole, the borehole logs should be referred to.

C) GEOTECHNICAL DISCUSSION

1) General

It is our understanding that it is proposed to build a residential subdivision at this property. It would appear to be 94 lots in the prepared plan.

2) Services

The soil throughout is a Type 2 to Type 3 soil from a trench perspective. As such, normal trenches can be used. The bottom 1.2m. can be vertical. Above 1.2m., the side slopes must be cut back to a 1 to 1 side slope.

The bedding and cover for all services should be 150mm. of Granular "A" compacted at 95% Standard Proctor Density.

All of the existing soil can be reused in the trenches, provided the soil is moist. Where the trenches will be within the roadways, the trench backfill must be ramped down in 300mm. lifts to 95% Standard Proctor Density.

3) Roadways

Where there are trenches within the roadways, the trench surface must be recompacted to 95% Standard Proctor Density before placing any granulars. Where there is topsoil at the surface, this should be removed over the full width of the roadway.

The granular subbase should consist of 375mm. of Granular "B" Type 2 and compacted to 100% Standard Proctor Density. The granular base should consist of 150mm. of Granular "A", compacted to 100% Standard Proctor Density.

The asphalt should consist of 75mm. of HL3, placed and compacted in 2 lifts to 96% Marshall Density. This is to allow having a paved street before construction of the houses, followed by a second course near the end of construction.

4) House Foundations

The bearing capacity at Boreholes 1, 2, 3 and 7 is in the 50KPa S.L.S. range. The bearing capacity at Boreholes 4, 5 and 6 is in the 100Kpa S.L.S. range.

Where the bearing is 75KPa S.L.S. or higher, standard footings will be applicable. The site seismic factor is Site Class D throughout.

It is recommended that a bearing capacity evaluation be done of each house when the footings are being dug in order to provide the proper recommended footing size.

D) CONSTRUCTION CONTROL

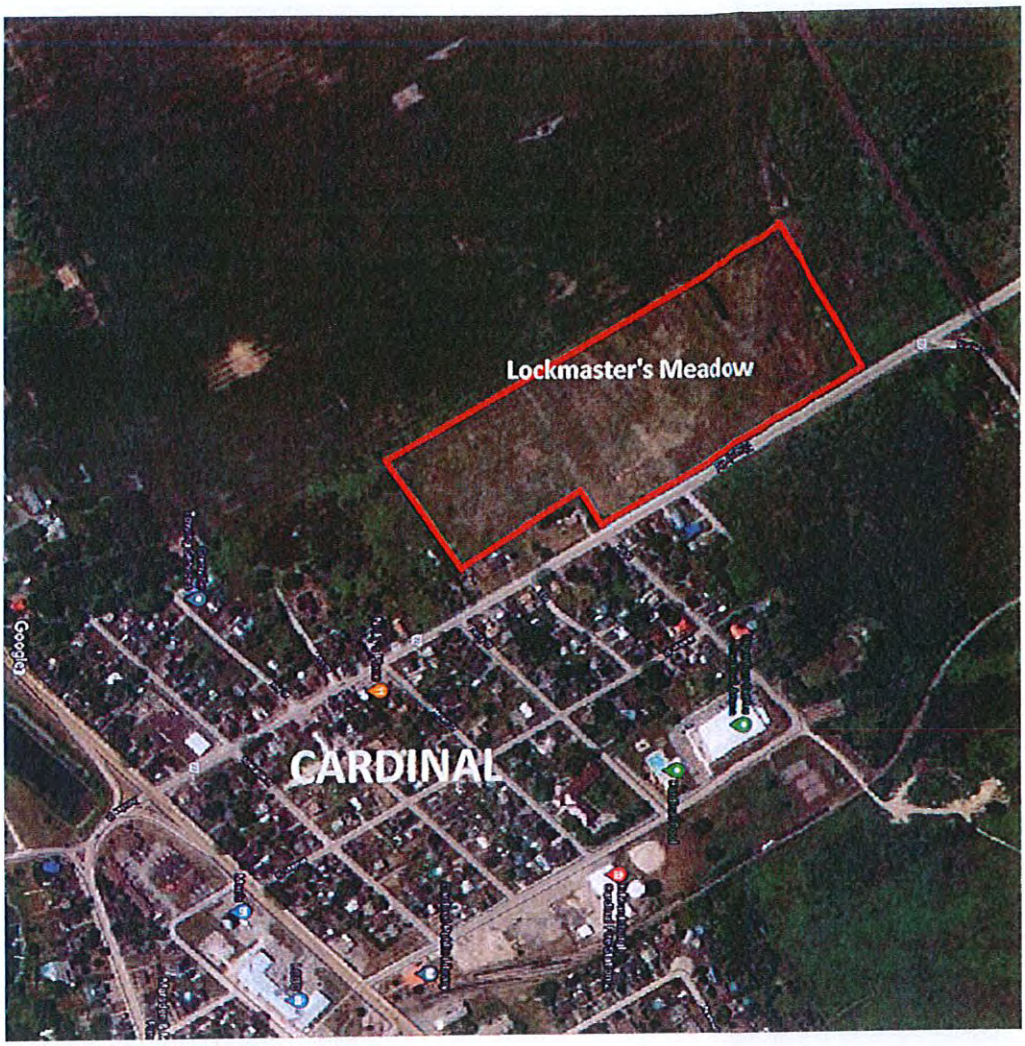
In order to ensure that the recommendations of this report are adhered to, it is recommended that our firm be retained to inspect, test, and report accordingly.

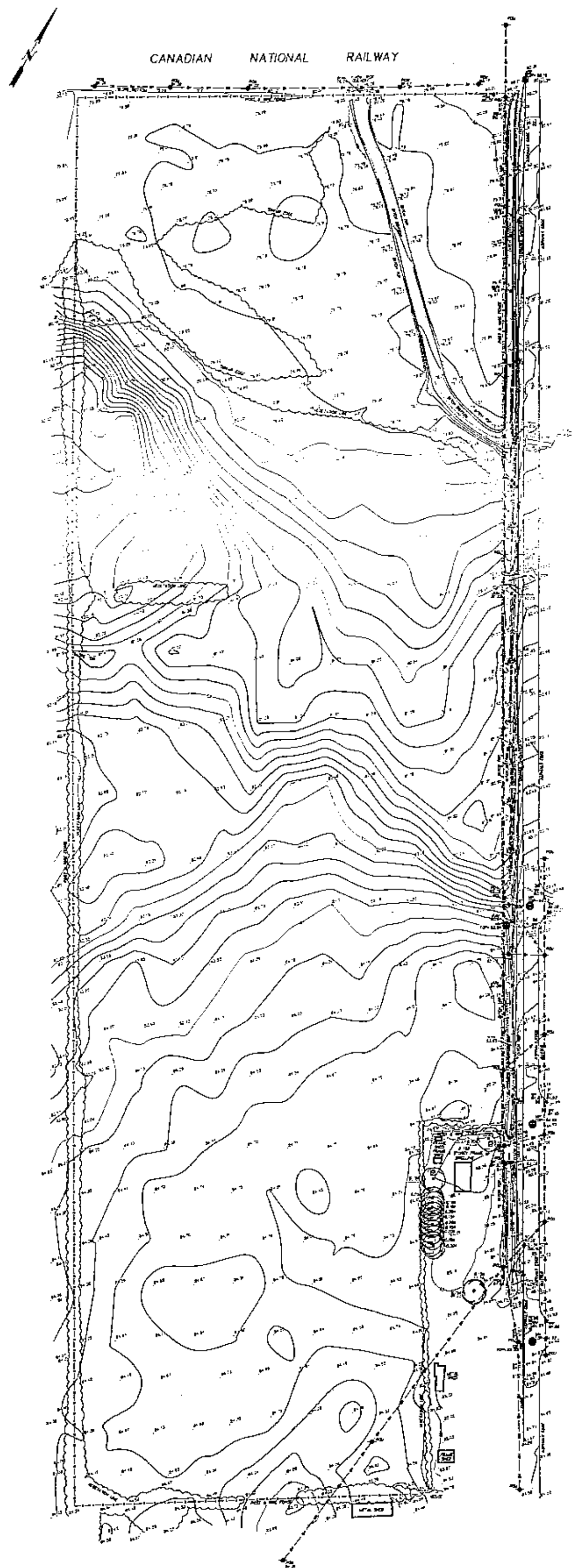
Respectfully submitted
ST. LAWRENCE TESTING & INSPECTION CO. LTD.

G.G. McIntee, P. Eng.
GGM:mhm

Attachments

Attachment "C"
Site Location Map





KEY PLAN — NOT TO SCALE

IMAGERY
AERIAL IMAGERY SHOWN IS FOR ILLUSTRATIVE PURPOSES ONLY AND MAY NOT DEPICT CURRENT FEATURES.

TOPOGRAPHIC BASE PLAN OF LOT 7, CONCESSION 1

GEOGRAPHIC TOWNSHIP OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL

SCALE 1 : 750 METRES

COORDINATES

CONTOURS

ELEVATIONS

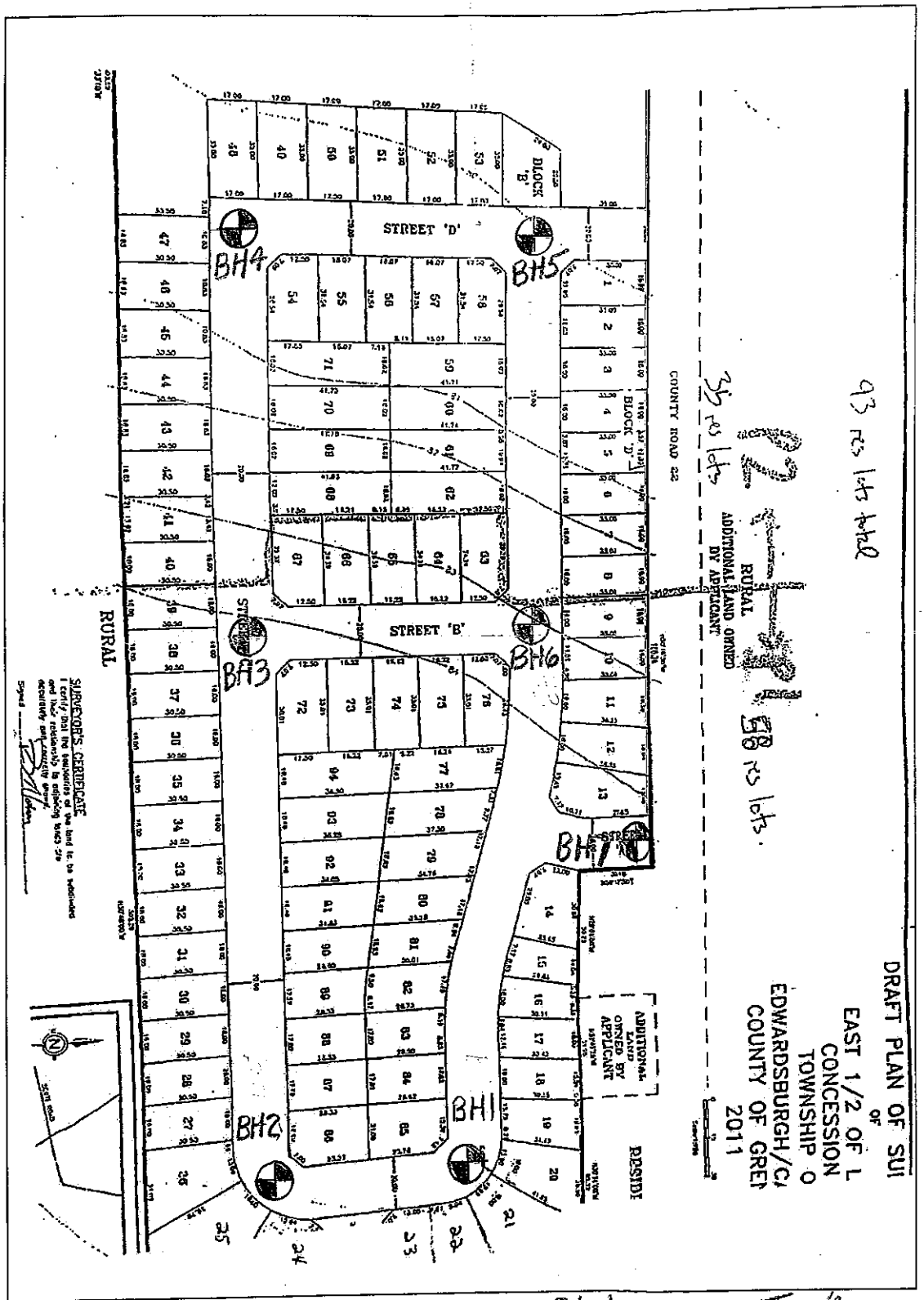
LEGEND

DENOTES SPOT ELEVATION

CAUTION
THIS IS NOT A PLAN OF SURVEY AND SHALL NOT BE USED EXCEPT FOR THE PURPOSE INDICATED IN THE TITLE BLOCK. THE WORK AND DRAWINGS HEREIN WERE COMPLETED FOR THE EXCLUSIVE USE OF OUR CLIENT AND NO LIABILITY IS ASSUMED TO ANY THIRD PARTIES OR SUBSEQUENT OWNERS.

IBW SURVEYORS

Attachment "A"
Draft Plan of Subdivision



St. Lawrence Testing
Report No 21C350
May 2021

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 1

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS: WATER CONTENT & ATTERBERG LIMITS. WP W WL
0		200mm. Topsoil									
		Clayey Silt									
		Brown, moist, stiff		78 ▽							
1											
						SS	1	100	3		
2											
	2.74	Sand and Gravel Till									
		Brown, moist, silty,									
3		compact to dense				SS	2	75	30		
4											
	4.57	Termination of borehole									
5											

DYNAMIC PENETRATION TEST BLOWS PER FOOT.. .K ...
0 20 40 60 80

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 2

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION / DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED
0		230mm. Topsoil								
		Clayey Silt								
		Brown, moist, stiff, with some sand below 3.0m.		1.11 ▽						
1										
						SS	1	75	3	
2										
						SS	2	100	11	
3										
	3.68	Sand and Gravel Till								
		Brown, moist, silty, compact to dense								
4										
	4.57	Termination of borehole								
5										

LAB TEST RESULTS

WATER CONTENT & ATTERBERG LIMITS. WP W WL

DYNAMIC PENETRATION TEST BLOWS PER FOOT.. .K...

0 20 40 60 80

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350
BOREHOLE NO. 3
CASING HF Auger
DATUM

CLIENT Edwardsburgh Development Inc.
LOCATION Shanley Rd. South of CN Rail Cardinal, ON
DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021

DEPTH	ELEVATION / DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS: WATER CONTENT & ATTERBERG LIMITS (WP — W — WL) / DYNAMIC PENETRATION TEST BLOWS PER FOOT (0 20 40 60 80)
0		230 mm. Topsoil									
		Clayey Silt									
		Brown, moist, stiff becoming grey below 3.3m.		.70							
1											
					X	SS	1	100	4		
2											
3					X	SS	2	75	4		
4											
					X	SS	3	100	6		
5											
	5.18	Termination of borehole									

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 4

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION / DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED
0		150mm. Topsoil Silty Sand Brown, Moist, loose		.78						
1	.91	Clayey Silt Brown, moist, stiff, becoming grey below 3.1m.				SS	1	100	7	
2										
3						SS	2	70	9	
4										
5	4.57	Termination of borehole								

LAB TEST RESULTS

WATER CONTENT & ATTERBERG LIMITS. WP W WL

DYNAMIC PENETRATION TEST BLOWS PER FOOT.. .K ...

0 20 40 60 80

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 5

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS: WATER CONTENT & ATTERBERG LIMITS. WP W WL
0		180mm. Topsoil Clayey Silt Brown, moist, hard		.73 ▽							
1											
2						SS	1	100	16		
3	2.92	Sand and Gravel Till Grey, moist, silty, compact to dense				SS	2	65	10		
4											
5	4.57	Termination of borehole									

DYNAMIC PENETRATION TEST BLOWS PER FOOT. . .K . . .
0 20 40 60 80

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 210350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 6

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS
0		250mm. Topsoil									
		Clayey Silt									
		Brown, moist, hard									
				1.16 ▽							
1											
						SS	1	100	10		
2											
	2.64	Sand and Gravel Till									
		Brown, moist, silty, dense									
3						SS	2	75	50+		
	3.30	Sampler and auger refusal									
4											
5											

WATER CONTENT & ATTERBERG LIMITS. WP W WL

DYNAMIC PENETRATION TEST BLOWS PER FOOT.. .K . . .

0 20 40 60 80

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 7

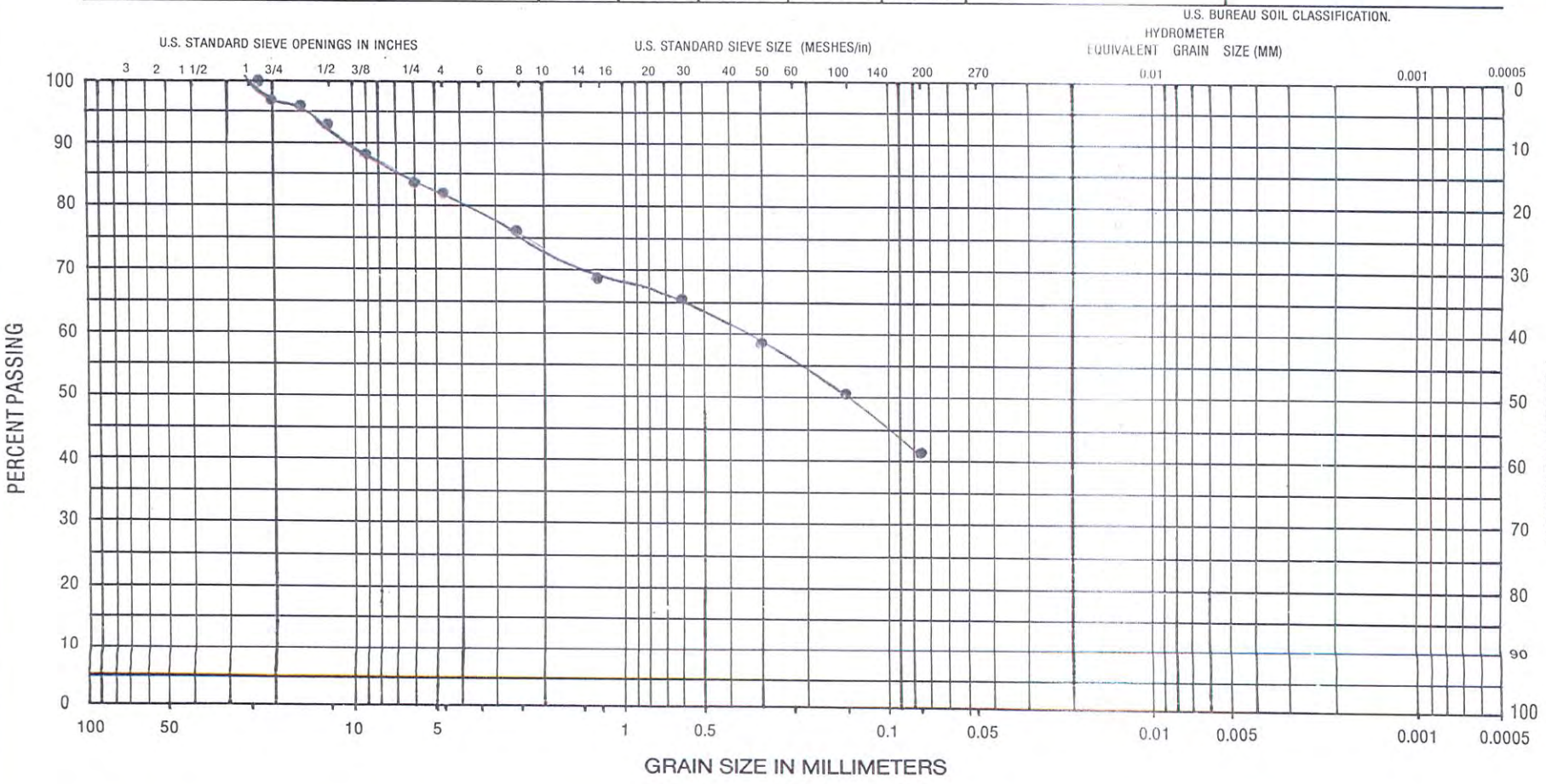
LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS: WATER CONTENT & ATTERBERG LIMITS. WP W WL	DYNAMIC PENETRATION TEST BLOWS PER FOOT. . .K . . . 0 20 40 60 80
0		150mm. Topsoil										
		Silt and Sand		.61								
		Brown, moist, loose				SS	1	40	6			
1												
	1.58	Clayey Silt				SS	2	70	4			
		Brown, moist, stiff										
2												
	2.13	Termination of borehole										
3												
4												
5												

APPENDIX

GRAVEL		FINE GRAVEL	SAND				SILT	CLAY
			Coarse	Medium	Fine	Very Fine		



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

UNIFIED CLASSIFICATION (ASTM D 2487)

BOREHOLE No.	SAMPLE No.	DEPTH	DESCRIPTION
1	2	3.1 to 3.7m.	Silty sand and gravel

St. Lawrence Testing & Inspection Co. Ltd.

GRAIN SIZE DISTRIBUTION

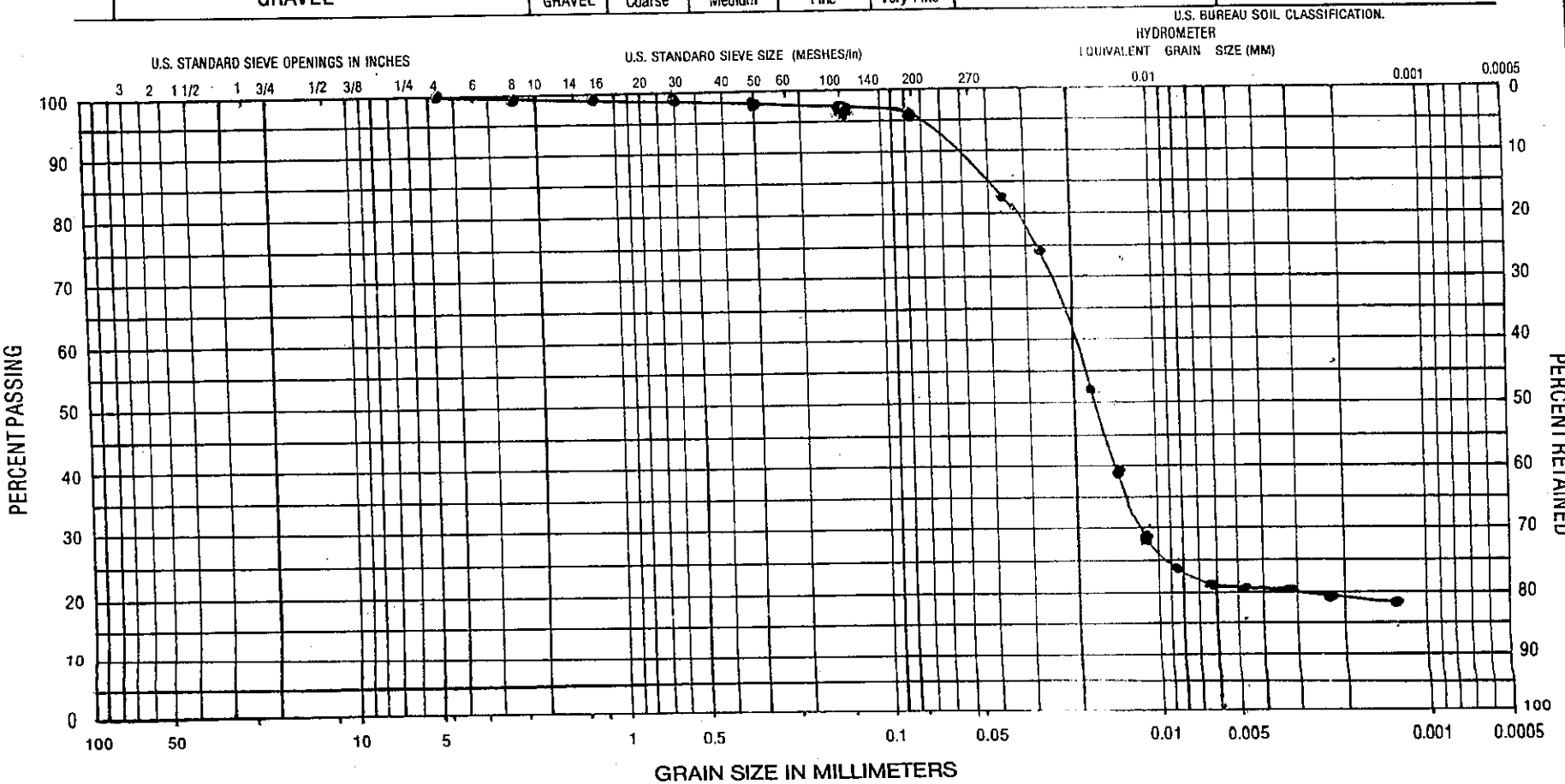
REPORT NO. 21C350

St. Lawrence Testing & Inspection Co. Ltd.

GRAIN SIZE DISTRIBUTION

REPORT NO. 210350

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		Coarse	Medium	Fine	Very Fine		



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

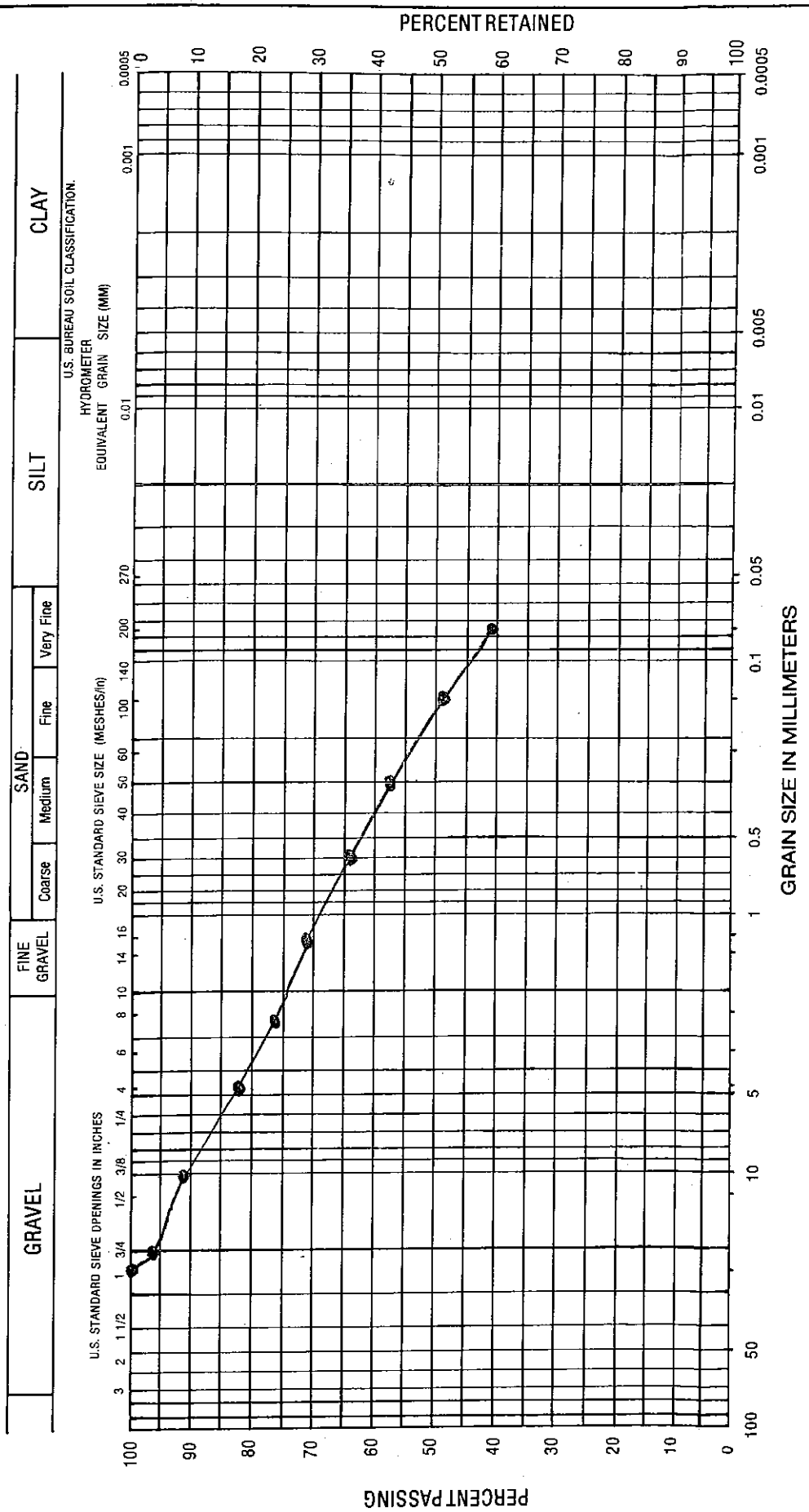
UNIFIED CLASSIFICATION (ASTM D 2487)

BOREHOLE No.	SAMPLE No.	DEPTH	DESCRIPTION
3	1	1.5 to 2.1m.	Clayey silt

St. Lawrence Testing & Inspection Co. Ltd.

GRAIN SIZE DISTRIBUTION

REPORT NO. 21C350



UNIFIED CLASSIFICATION (ASTM D 2487)

GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

BOREHOLE No. 5

SAMPLE No. 2

DEPTH 3.1 to 3.7m.

DESCRIPTION Silty sand and gravel

SCHEDULE "H"

STORMWATER MANAGEMENT PLAN & EROSION AND SEDIMENT CONTROL

For the lands set out in Schedule "A", the Owner agrees to implement and maintain the objectives and criteria of the Stormwater Management Report, prepared by Advance Engineering Ltd., stamped and dated July 31, 2024; and the Pond Plan prepared by Advance Engineering Ltd., stamped and dated July 31, 2024.

For the lands set out in Schedule "A", the Owner agrees to implement and maintain the objectives and criteria of the Erosion and Sediment Control Plan, prepared by Advance Engineering, stamped and dated February 6, 2024, during the course of developing the lands in accordance with this Agreement.

NEIGHBOURING PROPERTIES

No disturbance is permitted outside of the subject property boundaries without written permission from the property owner.

STORMCEPTOR

A Stormceptor shall be installed upstream of the detention structure to achieve the required stormwater quality.

Attached:

- **Stormwater Management Report July 31, 2024**
- **Pond Plan (PND) July 31, 2024**
- **Erosion and Sediment Control Plan (ES1) February 6, 2024**
- **Stormceptor EF Sizing Report November 12, 2022**

Township of Edwardsburgh/Cardinal

STORMWATER MANAGEMENT REPORT

PROJECT: LOCKMASTER'S MEADOW SUBDIVISION (95 Single-Detached Lots)

ADDRESS: COUNTY ROAD 22 (SHANLY ROAD), CARDINAL, ON

PREPARED FOR:
Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, Ontario K2T 1C1

PREPARED BY:
Advance Engineering Ltd. Ottawa, ON
(613) 986 9170

Date	*Revision / Issue*
July 31, 2024	SNC Comments about 2nd Watercourse
June 19, 2024	SNC Review Comments – June 14, 2024
March 05, 2024	Update HGL – Neighbouring Land Drainage
April 03, 2023	SNC Review Comments
December 09, 2022	Peer Review Comments
March 09, 2022	Issued for Subdivision Application

TABLE OF CONTENTS

List of Appendices:
A - Location – Figures B - Geotechnical Report (2021) C - Stormwater Design D - ICD and Stormceptor Details
E - Watercourse in Neighbouring Land
Related Report: - Site Servicing Report by Advance Engineering Ltd.
List of Related Drawings:

S-1 – Draft Plan of Subdivision GSP-1&2 General Services Plan PP-1 TO PP-5 - Plan & Profile - Streets A, B, C & Pathway	GR-1 - Grading and Drainage Plan ES-1 - Erosion and sediment Control Plan PND - Pond Plan

1.0 INTRODUCTION

Edwardsburgh Developments Ltd. has retained *Advance Engineering Ltd.* to provide a stormwater management study, a site grading and drainage plan and an erosion and sediment control plan for the proposed subdivision of 95 single detached lots. The report provides information and assumptions used in the design of the drainage system and storm sewer and should be read in conjunction with the design drawings prepared by *Advance Engineering Ltd.*.The project is located off County Road No.22 (Shanly Road), in the north west part of the village of Cardinal, Ontario. This report is prepared in support of a subdivision application by the applicant.

1.1 OBJECTIVE AND STRATEGY

The objective of the stormwater management study is to develop a strategy that will:

- Identify and mitigate potential stormwater runoff negative impacts on the receiving watercourses from the proposed development area.
- Address the concerns from the review agencies including the Township of Edwardsburgh/Cardinal, the United Counties of Leeds and Grenville, Ministry of Environment, Conservation and Parks (MECP), South Nation Conservation (SNC) and Canadian National (CN) regarding stormwater management solutions for quantity and quality controls as well as erosion and sediment control.
- Design an appropriate site drainage system for safe operational use while minimizing post-development stormwater runoff.
- Determine the location and size of stormwater management components and structures located within the site.

The stormwater management will meet the requirements and criteria set out by South Nation Conservation Authority (SNC), Township of Edwardsburgh/Cardinal, and MECP in terms of applying quantity and quality controls. The City of Ottawa "*Sewer Design Guidelines-2012"* has been used in the drainage design. *"Stormwater Management Planning and Design Manual" by* the Ministry of the Environment, Conservation and Parks (MECP) has been used for stormwater management. The report will cover Phase 1 and Phase 2 of the project.

1.2 SITE DESCRIPTION

The proposed development is on a single parcel of land. It is located off the west side of County Road No. 22, village of Cardinal, Township of Edwardsburgh / Cardinal, Ontario (Figure-1, **Appendix A**). The legal description of the property is: "*Part of Lot 7, Concession 1, Geographic Township of Edwardsburgh, Township of Edwardsburgh / Cardinal, County of Grenville".* The site is bounded as follows:

- County Road 22 (Shanley Road) and three residential dwelling units to the east,
- CN railway to the north,
- vacant agriculture land to the west, and
- residential dwellings to the south.

The subject property is approximately 10.9275 hectares (27 acres) with a rectangular shape of 600 m in length and 180 m in width approximately. Currently, the property is vacant, undeveloped and covered

with short grass and pasture. The property is not currently serviced, however municipal water, sanitary sewers, gas main, telecom and hydro lines have been identified in the immediate area of the site.

1.3 BACKGROUND AND LAND USE

The original draft plan of the proposed subdivision was approved on April 24, 2013 (*File No. 07-T-10005).* In 2021, changes have been applied to the draft plan. A copy of the updated agreement conditions is attached in **Appendix B**.

The site has never been developed and has always been a green field. The current zoning of the subject property is "Residential First Density R1" that allows single family dwellings of lot areas not less than 465 m^2 and lot frontages not less than 15 m for fully serviced lots.

The site has been surveyed by *Ron M. Jason Surveying Ltd.*. A topographic survey dated April 28, 2021, has been provided by *IBM surveyors*.

A copy of the report outlining the results of the geotechnical subsurface investigation carried out by *St. Lawrence Testing & Inspection Co. Ltd.* is attached in **Appendix B**.

1.3 PROPOSED DEVELOPMENT AND PHASING

The proposed development, as shown in the updated Draft Plan of Subdivision, consists of the construction of paved roadways, sanitary and storm sewers, watermains and utilities (gas, Bell and Hydro) to service the proposed 95 detached lots.

The two phases of the project are:

- Phase 1: comprises 59 lots and a dedicated parkland located in the south side of the property.
- Phase 2: consists of developing the remaining 36 lots in the north side of the subdivision.

The total gross area of phase 1 is 4.74 ha and 2.96 ha of phase 2. There is an open space shown as Block A on the Draft Plan with an area of 3.25 ha where the stormwater management facility will be constructed. An earth berm topped with trees will be constructed in the open space to act as a noise barrier between the subdivision and CN railway.

ROADWAY DESIGN

The subdivision has two road intersections with County Road No. 22 to the east. Two reserved ROWs for future street extensions are located at the south and north-west of the property. A 6 m wide pathway is planned between Street B and County Rd 22.

All subdivision streets (Baslam St, Lockhouse St and Conifer Ln) will be constructed as per the typical road cross-section shown on the Draft Plan. The proposed 20-metre right-of-way will have a 7-metre asphalt pavement and mountable curbs. A sidewalk will be constructed at the subdivision entrances.

Roadway pavement structure consists of (from top to bottom) 35 mm asphalt wear course (HL3), 40 mm asphalt base course (HL3), 150 mm base (Granular A) and 375 mm subbase (Granular B – Type II), with total thickness of 600 mm.

2.0 EXISTING CONDITIONS

2.1 TOPOGRAPHY / GEOLOGY

The site is generally well graded and has a uniform slope from south to the north. The highest grades are located to the south and the lowest grades to the north. Elevations are between 79.00 and 84.50 m (Geodetic Vertical Datum).

According to the geotechnical report *No. 21C350* prepared by *St. Lawrence Testing & Inspection Co. Ltd.* (Appendix B), the stratigraphy of the soil is fairly similar throughout the site. The parcel is covered by a surficial layer of topsoil ranging in thickness between 0.15 m to 0.25 m, underlain by a brown moist and stiff clayed silt ranging in thickness between 2.4 to 3.3 m. Underlying the clayey-silt layer is a brown, moist, compact to dense silty sand and gravel till.
The groundwater table was observed at the seven boreholes at depths ranging from 0.61 m to 1.17 m from existing grade. Groundwater flows toward the St. Lawrence River located approximately 700 m south of the site. Clayed silt and sandy silt have a moderate percolation rate.

2.1 EXISTING DRAINAGE CONDITIONS

The site is located within the sub-watershed of *Sawmill Creek*. There is no storm water sewer in the immediate area of the subdivision.
Under existing conditions, the majority of the site area drains south to north towards the existing unnamed watercourse that outlets into *Sawmill Creek*.
Watercourse 1: the watercourse crosses the site from north to east. It is approximately 170 m long, 4 m wide and 0.5 to 1 m deep. There is a 1400 mm dia. RCP culvert at the inlet (under CN railway, invert elevation is 79.24), and a1900 mm dia. CSP culvert at the outlet (under County Rd 22, invert elevation is 78.58). The capacity of the outlet culvert is estimated at 7 m^3/s using Manning's equation.
Watercourse 2: the watercourse drains an estimated are of 17 hectares approximately split between the subdivision site and the west neighbouring land which is outside the urban zone. According to data obtained from *Ontario Watershed Information Tool* website, the watercourse is approximately 750 m long. It joints watercourse 1 near the Cty Rd culvert. Refer to **Appendix E** for detailed information about watersheds. 4 m wide and 0.5 to 1 m deep. There is a 1400 mm dia.
There is a swamp near the watercourse (proposed Block A) where water is ponding and soil exhibits signs of regular saturation due to periodic inundation.
Smaller ditch culverts have been identified along the county road west side adjacent to the property. No stormwater flows from the site directly into county road ditches.
Existing site drainage conditions and patterns have been illustrated in Drawing ST-1, **Appendix C**.

3.0 PROPOSED STORMWATER MANAGEMENT AND DRAINAGE

3.1 DESIGN CRITERIA

- Minor system drainage: designed for the 5 year storm event without street ponding; stormwater captured and conveyed via the proposed storm sewer network (street and rear yard catchbasins, manholes and pipes) to the proposed stormwater facility. ICDs will be installed to prevent surcharging the sewer during major events.
- Major System: uses the road cross-section as an open channel for overland flows during major events. Runoff rate is controlled on-site to the 5-year release rate. Temporary storage will be provided in the stormwater management detention structure.
- Quantity control: post-development runoffs to match pre-development runoffs for the 1 or 5 and the 100 year storm events.
- Quality control: an "Enhanced" level of treatment with minimum 80% of TSS (total suspended solids) removal is required for the minor system drainage as per MECP guidelines.
- No surface drainage shall be directed toward neighbouring properties or County Road 22.

- *Canadian National Railway:* no drainage shall be directed toward the CN right-of-way and no adverse effect from the development stormwater management shall impact the CN right-of-way.
- Hydraulic Grade Lines (HGL) for 100-year event to be kept at least 300 mm below the underside of footing elevations of the proposed dwelling units. Otherwise houses will be equipped with sump pumps.
- Erosion and sediment control: Low Impact Development (LID) measures are required to retain, detain or infiltrate the first 5 mm of runoff from post-development impervious areas.
- Culverts at the entrances of the subdivision to be designed for 25 year storm event and shall be subject to approval by the County.
- Runoff from the adjacent agriculture land at the west limit will be diverted to the open space. It has not been included in the calculation of the detention structure.
- The large watershed draining north to south is beyond the scope of this study.

3.2 QUANTITY CONTROL REQUIREMENTS

Quantity control target is to limit the maximum post-development runoff rate discharged from the site for all storm events, up to and including the 100-year design storm, to that of the pre-development flow rates. Runoff in excess will be temporarily stored on site and discharged gradually into the watercourse. The Rational Method is used to estimate the pre-development and post-development runoffs.

3.2.1 Runoff Coefficient

Runoff Coefficient C

Surface Type	C*
Impervious: Rooftop-Asphalt Pavement-Driveway	0.9
Road Shoulders	0.7
Grass-Cultivated-Pasture	0.2-0.4

* For Q_{100yr} add 25% to C value. For Q_{25yr} add 10% to C value
* Table 5.7 *Ottawa Sewer Design Guidelines – October 2012*

Table 1: Runoff Coefficient C

Post-development average runoff coefficient has been estimated at **0.56** (0.64 for 100 year events) and impervious ratio at 0.43 based on the surface nature and the maximum impervious surfaces permitted by the current Zoning. Minimum lot area is 465 m^2 and maximum lot coverage is 30% with driveways 6 m wide. Refer to **Appendix C** for detailed calculations of perviousness ratio and weighted runoff coefficient for post-development condition.

3.2.2 Rainfall Intensity

Rainfall peak intensity formulas for the City of Ottawa have been used.

* 2 year rainfall intensity: $I_2 = (732.951)/((T_c + 6.199)^{0.810})$; where T_c = time of concentration in min
* 5 year rainfall intensity: $I_5 = (998.071)/((T_c + 6.053)^{0.814})$
* 25 year rainfall intensity: $I_{25} = (1402.884)/((T_c + 6.018)^{0.819})$
* 100 year rainfall intensity: $I_{100} = (1735.688)/((T_c + 6.014)^{0.82})$

* *Time of concentration:* depending mainly on soil roughness, terrain slope, rainfall intensity and longest runoff path. The farthest points to the outlet (watercourse) are 495 m for per-development and 520 m

for post-development (including 40 m overland flow). Several formulas resulted in different values of Tc (see **Appendix C).** A conservative estimation for Tc is **20 min** for pre-development and **15 min** for post-development. Rainfall Intensity will be:

Pre-development: I_2 **= 52.03 mm/hr** ; I_5 **= 70.25 mm/hr** ;I_{100} **= 119.25 mm/hr**

Post-development: I_2 **= 61.77 mm/hr** ; I_5 **= 83.56 mm/hr** ;I_{100} **= 142.89 mm/hr**

3.2.3 Drainage Areas And Runoff Calculations

Pre-development and post-development drainage areas are shown in the drawings **ST-1** and **ST-2** in **Appendix C** and are summarized as follows in Table 2 and Table 3:

Pre-development:

The topography of the site generally has a uniform slope between 0.5 % and 2 % from south to north toward the watercourse as shown in drawing ST-1, **Appendix C**. The site surface is 100% pervious and is used as a fallow / cultivated land.

I/ PRE-DEVELOPMENT RUNOFF CALCULATION

Catchment	ID	Area (ha)	Percent of Total Area	C*	A x C (ha)	C relative	Q 2-year (L/s)	Q 5-year (L/s)	Q 100-year (L/s)
Subdivision Area	A1	7.6725	70.21	0.3	2.3018	0.21	332.9	449.5	959.4
Block A and C	A2	3.2550	29.79	0.3	0.9765	0.09	141.2	190.7	407.0
TOTAL SITE AREA		10.9275	100%		3.2783		474	640	1,366

Table 2 – Pre-Development (Existing) Drainage Areas

Post-development:

Storm water of the subdivision will be captured and conveyed via underground storm sewer to a proposed detention structure in the open space (Block A). Excess flow beyond pre-development levels will be stored and will eventually be discharged through an outfall into the existing watercourse.

The housing area is approximately 7.6732 ha (A1-A43). The runoff in the open space beyond the earth berm will remain uncontrolled and will outlet directly into the watercourse.

Table 3 summarizes post-development drainage areas breakdown.

II/ POST-DEVELOPMENT RUNOFF CALCULATION

Catchment	ID	Area (ha)	Percent of Total Area (%)	C	A x C (ha)	C relative	Q 2-year (L/s)	Q 5-year (L/s)	Q 100-year (L/s)	$Q_{req'd}$ by Control Measure (L/s)	
										CONT.	UNC.
Subdivision	A1 to A36 & A38 to A44	8.1368	74.46	0.56	4.5566	0.417	782.4	1,058.4	2,069	2,069	
Open Space	A45	2.6716	24.45	0.30	0.8015	0.073	137.6	186.2	398		398
Uncontrolled Area	A37	0.1191	1.09	0.56	0.0667	0.006	11.5	15.5	30		30
TOTAL		10.9275	100%		5.4248		932	1,260	2,497	2,069	428

Table 3: Proposed Post-Development Drainage Areas

3.2.4 Allowable Release Rates

Post-development allowable release rates are calculated using the Rational Formula for controlled areas. A45 drainage area is not included in the calculation since it is unaltered. The difference in runoff generated by A37 is considered in the calculation to. Table 4 summarizes

post-development allowable release rates.

Post-Dev. n-y Release Rate From A1 to A44		<	Pre-Dev. n-y Rate From A1 to A44	
Post-Dev. n-y Release Rate From A1 to A36 and A38 to A44 (Pond)		<	Pre-Dev. n-y Rate From A1 to A36 and A38 to A44 (-) Difference Post Dev and Pre Dev of A37	
2y	782.4	controlled to	353.1 - (11.5-5.2)	346.8
5y	1,058.4		467.7 – (15.5-7.0)	468.2
100y	2263.0		1017.5 – (33-14.9)	1,002.1

Table 4: Proposed Post-Development Drainage Areas

As requested by the Conservation Authority, post-development flow rates will match per-condition levels. These rates represent approximately 7% and 15% of the capacity of the existing culvert for the 5 y and 100 y events.

3.2.5 Proposed On-Site Storage

It is proposed a detention basin with an outlet control structure at the north side of the site. (Refer to **Appendix C and Pond Plan** for all details)**.**

- Bottom length, Bottom width and depth: ~ 45m, 15m, 1.5m; a maximum volume capacity of 1500 m^3.
- Maximum interior embankment slopes: 3:1.
- Minimum 0.3 m freeboard to embankment crest.
- Emergency spillway on the watercourse side.
- Minimum setback from watercourse: 30 m.
- 2 x 2 x 0.4 m Riprap apron at inlet location as per OPSD and scour protection at outfall.
- A concrete outlet control structure with an opening (orifice) and a rectangular weir will be installed inside the pond as per details.
- A chain-link fence will be installed surrounding the pond for safety purpose, a

3.2.6 Hydrological and hydraulic modelling

EPA SWMM 5.2 has been used for the hydrological modelling of storm water using different design storms and hydrographs for pre-development and post-development conditions. The 4-hour Chicago Storm derived from Ottawa IDFs generates the highest peaks. Refer to **Appendix C** for all details. SWMM has been used in pond routing and sizing of an orifice and a weir designed to limit post-development peak flows to those of pre-development levels.

Infiltration losses for catchment areas have been modelled using Horton's infiltration equation and default values provided by City of Ottawa guidelines. Horton's Equation: $f(t) = fc + (fo – fc)e^{-k(t)}$; where: initial infiltration rate: fo = 76.2 mm/hr; final infiltration rate: fc = 13.2 mm/hr; decay Coefficient: k = 4.14/hr. Equivalent width and imperviousness ratio have been assigned to each sub-basin. Imp(%)= (C-0.2) / 0.7

Hydrology Toolbox 5.4 has has been used for various hydraulic designs and capacity estimations.

3.2.7 Hydraulic Grade Line

SWMM hydrodynamic routing method has been used to determine the maximum hydraulic grade lines in storm sewer during major events. ICDs in catchbasins and catchbasin-manholes are designed to keep the HGL low in the main sewer. Maximum HGL table is exhibited in **Appendix C**. For the minor system, the HGL is maintained lower than obverts of sewer pipes. For the 100y event, the HGL is still near the obverts levels. In no case the HGL is above ground. Underside footings of future buildings will be kept above HGL by at least 0.3 m. For houses located downstream, foundation drains will be disconnected from the storm sewer to prevent basement flooding. All houses will be equipped with backwater valves for storm and sanitary connections.

3.2.8 Major System

The additional runoff exceeding the proposed sewer capacity designed for 5 year return period will flow overland in open roads. Major system capacity is estimated at 2.0 m^3/s at 0.5 % road slope and 0.2 m depth based on Manning's equation for open channel. The 12.5 m wide path, adjacent to Block B, is part of the major system route. Overland flow depth is not expected to exceed 0.3 m in all roads. Refer to **Appendix C** for major system details.

3.2.9 Flow Restriction

ICDs with diameters varying from 55 to 127 mm will be installed inside catchbasins and catchbasin-manholes as per the City of Ottawa specifications.

3.3 QUALITY CONTROL REQUIREMENTS

Enhanced level of treatment (80% of TSS removal) is required to protect receiving waters. It will be achieved by the installation of a Stormceptor EFO12 by Imbrium or equivalent **(Appendix C)**.
Moreover, LID measures and Best Management Practices (BMPs) will be implemented such as:
- Flattened grassed areas will increase the travel time and provide some quality enhancement to the stormwater before it reaches receiving sewer.
- All roof leaders from buildings shall be directed away from buildings toward the landscaped areas and grassed swales in order to promote infiltration.
- Vegetated or enhanced swales: helps by tracking pollutants such as heavy metals, lowering peak flows and reducing erosion.
- Sub-drains where low grades improve the quality of released water and increases infiltration.
- Storing water temporarily helps clean stormwater and control sediments.

3.4 DRAINAGE OF NEIGHBOURING LAND

3.4.1 Watershed Delineation and Parameters

The DEM surface and contours of the neighbouring land have been obtained from LiDar data downloaded from Ontario Geo-hub website. The watercourse contributing watershed is delineated using ridge-lines and flow-lines. The portion of the watershed located within the developed site will be urbanized and therefore considered when designing the storm sewer. The area left from the property line to the highest point (90.24) is approximately 9.17 ha. The entry point is located at Lot 45 rear line and has an elevation of 81.50.

Ontario Watershed Information Tool (OWIT) also provides watershed boundaries with less accuracy. Refer to **Appendix E** for watershed maps and parameters.

Using OWIT, the two watersheds contributing to both watercourses that drain to the culvert outlet are:

	A (ha)	Width (m)	Longest Path (m)
Watershed 1	476.37	1,200	4,480
Watershed 2	17.01	176	750
Watershed 1+2	493.38	1,200	4,480

Table 5: Watershed Information

The large watershed draining north to south contains 1.047 km^2 of lakes/wetlands.

3.4.2 Peak Flows Estimation

Since the risk of flooding or topping could affect residential properties, the design of the culvert will be based on the Rational Method for 100 year event.

Runoff coefficient: C= 0.25 for 5 year event and 0.313 for 25 and 100 year events.

Time of Concentration: Using Airport and Bransby-Williams formulas: Tc = 25 min.

Rainfall Intensity:
where T_c = time of concentration in min
* 5 year rainfall intensity: $I_5 = (998.071)/((T_c + 6.053)^{0.814})$
* 25 year rainfall intensity: $I_{25} = (1402.884)/((T_c + 6.018)^{0.819})$
* 100 year rainfall intensity: $I_{100} = (1735.688)/((T_c + 6.014)^{0.82})$

Peak Flows: Calculated peak flows are as follow:

	5-YEAR	25-YEAR	100-YEAR
Tc (min) =	25	25	25
$I_{5\text{-}25\text{-}100}$ (mm/hr) =	60.90	84.22	103.85
A (ha)=	9.1795	9.1795	9.1795
C=	0.250	0.313	0.313
Qp (L/s)	388.5	672.7	829.5

Table 6: Peak Flows

An additional flow of 32.5 L/s from drainage area A37 (A= 0.1191 ha, Tc = 10 min, C= 0.55), is included in the design of the trapezoidal channel and culvert pipe.

3.4.3 Culvert Design

The design of the trapezoidal open channel is performed using Manning's equation for a lined channel.

The design of the culvert is performed using HY8 using inlet control, the culvert will be a concrete pipe one barrel diameter 750 mm or two barrels 500 mm diameter with a minimum slope of 1.0%. Headwater elevation for the required flow is 82.35 for the 750 diameter culvert.

Culvert hydraulics have been checked using software simulations with Chicago storm distributions.

The HGL remains lower than the pipe obvert. Lot grading elevation at the west bank of the ditch is 82.42 which is above high water levels in the ditch during 100 year events.

Construction Measures:

A side tapered headwall shall be constructed at the inlet of pipe culvert.

Erosion protection measure shall be implemented at:

- the inlet of the open channel.
- along the open channel.
- the inlet and outlet of culvert pipe.

Refer to **Appendix E** for design details and to the grading plan for other details.

The drainage easement will be accessible from the right of way and will be dedicated to the Township.

4.0 EROSION AND SEDIMENT CONTROL MEASURES

The purpose of Erosion and Sediment Control (ESC) measures is to mitigate the adverse environmental impacts caused by the release of silt-laden stormwater runoff into receiving sewers and watercourses and to ensure that sediment is contained within the site. Temporary ESC measures will be implemented and maintained during construction period as specified in related drawings and in accordance with the requirements of latest provincial standards *OPSS 805.* They will be maintained in good order until vegetation has been re-established on the site.

4.1 TEMPORARY SEDIMENT CONTROL MEASURES

- Temporary silt fencing shall be placed prior to topsoil stripping and for the duration of the construction around the perimeter of the site and adjacent to any disturbed areas and surrounding topsoil stockpiles in order to prevent sediment from entering into the watercourse. It shall be inspected regularly and after every rainfall event for rips or tears, broken stakes, structural failure. Accumulated sediment/silt shall be removed when it reaches 50% of the height of the fence.
- Mud-mats shall be constructed at all locations of access/egress to and from the site.
- Straw bale and rock check dams shall be installed in any temporary drainage ditches required during the construction period.
- All exposed soil and disturbed slopes shall be stabilized as soon as possible with a seed and mulch application
- No construction activity or machinery shall intrude beyond the silt/snow fence or limit of construction area. All construction vehicles shall leave the site at designated locations.
- All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance from leaving the site or entering the water (silt, petroleum products, etc.).
- Stockpiles of soil shall be set back of at least 15 m from any watercourse and stabilized against erosion as soon as possible.
- Erosion problem can be mitigated by reducing the peak flow rate, decreasing the duration of storm flows, minimizing the volume of runoff, and implementing Low-Impact Development (LID) techniques in new construction.

4.2 CONSTRUCTION SEQUENCING

The schedule of construction activities with respect to sediment controls are as follows:

- Installation of silt fences prior to any other activities on the site.
- Construction of temporary mud-mats at all construction access/egress.
- Installation of site servicing and underground utilities.

- Disposal of all the surplus excavated materials off site.
- Construction of roadways.
- Restoration / re-vegetation of disturbed areas either with temporary measures such as mulch or seeding or with final landscape and paving materials.
- All re-graded areas that are not occupied by buildings, sidewalks, or driveways shall be top-soiled and sodded/seeded immediately after completion of final grading operations.
- Erosion controls shall be kept in place and functional until the site is stabilized (lot grading and sodding complete).

4.3 INSPECTION & MAINTENANCE OF ALL THE EROSION AND SEDIMENT CONTROLS

Shall be undertaken with the following frequency:

- On a weekly basis
- After every rainfall event
- After significant snow melt events
- Prior to forecast rainfall events
- If damaged control measures are found, they should be repaired and/or replaced within 48 hrs.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This report addresses the stormwater management and erosion control for the proposed residential subdivision development. The conclusions and recommendations are as follows:

- The 30m setback for the unnamed watercourse in the north side of the site is to be considered a no-touch zone and existing vegetation is to be retained in perpetuity to protect terrestrial and aquatic habitats.
- The release of post-development stormwater will be controlled to the pre-development levels for all storm events up to and including the 100-y event. Post-development excess of stormwater will be stored in the proposed detention basin located in the open space (Block A) to be conceded to the Village of Cardinal.
- Downstream capacity is not expected to be affected by the development since expected post-development peak flows do not exceed the current peak flows under undeveloped conditions.
- No negative impact is expected on the existing County Rd culvert since the storm flow generated from the developed site will be kept at pre-development levels.
- The watercourse at the site west side shall be detoured to the open space.
- A Stormceptor will be installed upstream the detention structure to achieve the required storm water quality. Lot level LID measures such as flattened lot grading and directing downspouts to lawns will also help improve water quality.
- The majority of foundation drains surrounding future buildings will be connected directly to the storm sewer. When 100-y HGL is higher than foundation elevations and to protect basements against flooding, foundation drains shall not be connected directly to the storm sewer. Flow collecting in the foundation drain shall be pumped to the surface or to a sewer extension using a sump pump.
- Backwater valves shall be installed on all sanitary and storm laterals.
- No drainage will be directed to County Road or neighbouring properties.
- No drainage will be directed to Canadian National righ-of-way.
- Culverts shall be installed at entrances of the subdivision with a minimum slope of 0.5% with rip-rap at both ends.
- Road and yard catchbasins shall be equipped with inlet control devices (ICD).
- The owner understands that it is his duty to keep stormwater management control structures in good working order until transfer of ownership to the Village of Cardinal.
- All outlets to watercourses and open ditches require a permit from the Conservation Authority prior to any development of the lot, including grading and placement of fill.
- During all construction activities, erosion and sedimentation shall be controlled as outlined in this report and as shown in related drawings.

Respectfully submitted,

Mongi Mabrouk M.Eng., P.Eng.

Advance Engineering Ltd.

APPENDICES

Appendix A
- Figure 1: Site Location

Appendix B
- Geotechnical Report
- Letter from SNC, dated October, 2010

Appendix C
- Drawing ST-1: Pre-development Drainage Areas
- Drawing ST-1: Post-development Drainage Areas
- Runoff Coefficient Calculations
- Time of Concentration Tc
- Design Storm Calculations
- Allowable Release Rate
- Required Storage Calculation

Appendix D
- ICD
- Stormceptor

Appendix E
- Watercourse of West Neighbouring Land
- Watershed Parameters
- Hydraulic Design

APPENDIX - A

FIGURE - 1

No.	REVISION / ISSUE	DATE: MM/DD/YY
1	INITIAL ISSUE	03/10/22

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

CARDINAL, ONTARIO

APPLICANT:

EDWARDSBURGH DEVELOPMENTS
OTTAWA

TITLE:

SITE LOCATION

PREPARED BY:
ADVANCE ENGINEERING
Mongi Mabrouk P.Eng.
Phone: 613-986-9170
Email: eng.services.ca@gmail.com

SCALE: N.T.S. | DATE: 3/14/22 | DRAWING No.: A0

Aerial view of the subject site

Photo taken on April 07, 2021

APPENDIX - B

St. Lawrence Testing & Inspection Co. Ltd.

P.O. Box 997, Cornwall, ON, Canada K6H 5V1
814 Second Street W., Phone (613) 938-2521
E-mail: slt@ontarioeast.net Fax (613) 938-7395

May 31, 2021

Mr. David Simpson
Edwardsburgh Development Inc.
434-300 Earl Gray Dr.
Kanata, ON
K2T 1C1

RE: Lockmaster's Meadow, Cardinal, ON
Geotechnical Subsurface Investigation
Report No. 21C350

Dear Mr. Simpson:

In accordance with verbal and e-mail instructions received from you, this report is submitted, outlining the results of a geotechnical subsurface investigation carried out at the site on Shanley Rd, South of the CN Main Line, in Cardinal, ON

A) DESCRIPTION OF FIELD WORK & STRATIGRAPHY

After receiving the approval, we sent you a plan showing the proposed borehole locations. We then contacted Ron Jason Surveying to lay out the boreholes in the field.

After the stakes were placed in the field by Ron Jason Surveying, we called for service locates. Drilling and sampling took place on April 7, 2021 using a CME 55 track mounted auger drill from E.O.D.D. of Hawkesbury, ON. Supervision was by the undersigned geotechnical engineer.

A total of 7 boreholes were put down as noted on the sketch. Most boreholes were put down to 4.6m. or to refusal if above this. One borehole was advanced to 5.18m. The borehole next to Shanley Rd. was advanced to 2.1m. The boreholes were advanced by split spoon sampling. Standard Penetration tests were conducted along with the split spoon sampling. The recovered samples were placed in glass jars for later detailed lab classification and washed gradation tests. The results are found in the attached borehole logs and washed gradation sheets.

We had one of our staff return on April 8, 2021 to measure the water levels in each borehole.

A sketch is attached showing the borehole locations. Also attached are a topographic map of the whole area and a colour map showing the location in relation to the Town of Cardinal.

B) STRATIGRAPHY

The stratigraphy is fairly similar throughout.

The general stratigraphy is a brown, moist, stiff clayey silt overlying a brown to grey, moist, compact to dense silty sand and gravel till.

There is a brown, moist loose silt and sand stratum noted at Boreholes 4 and 7 below the topsoil. This extends to 0.91m. at Borehole 4 and 1.58m. at Borehole 7.

The clayey silt is noted throughout the property below the topsoil at the other boreholes and below the silt and sand at Boreholes 4 and 7. The clayey silt is mainly stiff, but is occasionally hard, at Boreholes 5 and 6.

Underlying the clayey silt is a brown, moist, compact to dense silty sand and gravel till. This was noted at 2.7m. at Borehole 1, 3.7m. at Borehole 2, 2.9m. at Borehole 5 and 2.6m. at Borehole 6. The sand and gravel till was not reached at Boreholes 3 and 4.

Borehole 7 was only advanced to 2.1m. for the pavement design information, to connect the new street on to Shanley Rd.

For the specific stratigraphy at each borehole, the borehole logs should be referred to.

C) GEOTECHNICAL DISCUSSION

1) General

It is our understanding that it is proposed to build a residential subdivision at this property. It would appear to be 94 lots in the prepared plan.

2) Services

The soil throughout is a Type 2 to Type 3 soil from a trench perspective. As such, normal trenches can be used. The bottom 1.2m. can be vertical. Above 1.2m., the side slopes must be cut back to a 1 to 1 side slope.

The bedding and cover for all services should be 150mm. of Granular "A" compacted at 95% Standard Proctor Density.

All of the existing soil can be reused in the trenches, provided the soil is moist. Where the trenches will be within the roadways, the trench backfill must be ramped down in 300mm. lifts to 95% Standard Proctor Density.

3) Roadways

Where there are trenches within the roadways, the trench surface must be recompacted to 95% Standard Proctor Density before placing any granulars. Where there is topsoil at the surface, this should be removed over the full width of the roadway.

The granular subbase should consist of 375mm. of Granular "B" Type 2 and compacted to 100% Standard Proctor Density. The granular base should consist of 150mm. of Granular "A", compacted to 100% Standard Proctor Density.

The asphalt should consist of 75mm. of HL3, placed and compacted in 2 lifts to 96% Marshall Density. This is to allow having a paved street before construction of the houses, followed by a second course near the end of construction.

4) House Foundations

The bearing capacity at Boreholes 1, 2, 3 and 7 is in the 50KPa S.L.S. range. The bearing capacity at Boreholes 4, 5 and 6 is in the 100Kpa S.L.S. range.

Where the bearing is 75KPa S.L.S. or higher, standard footings will be applicable. The site seismic factor is Site Class D throughout.

It is recommended that a bearing capacity evaluation be done of each house when the footings are being dug in order to provide the proper recommended footing size.

D) CONSTRUCTION CONTROL

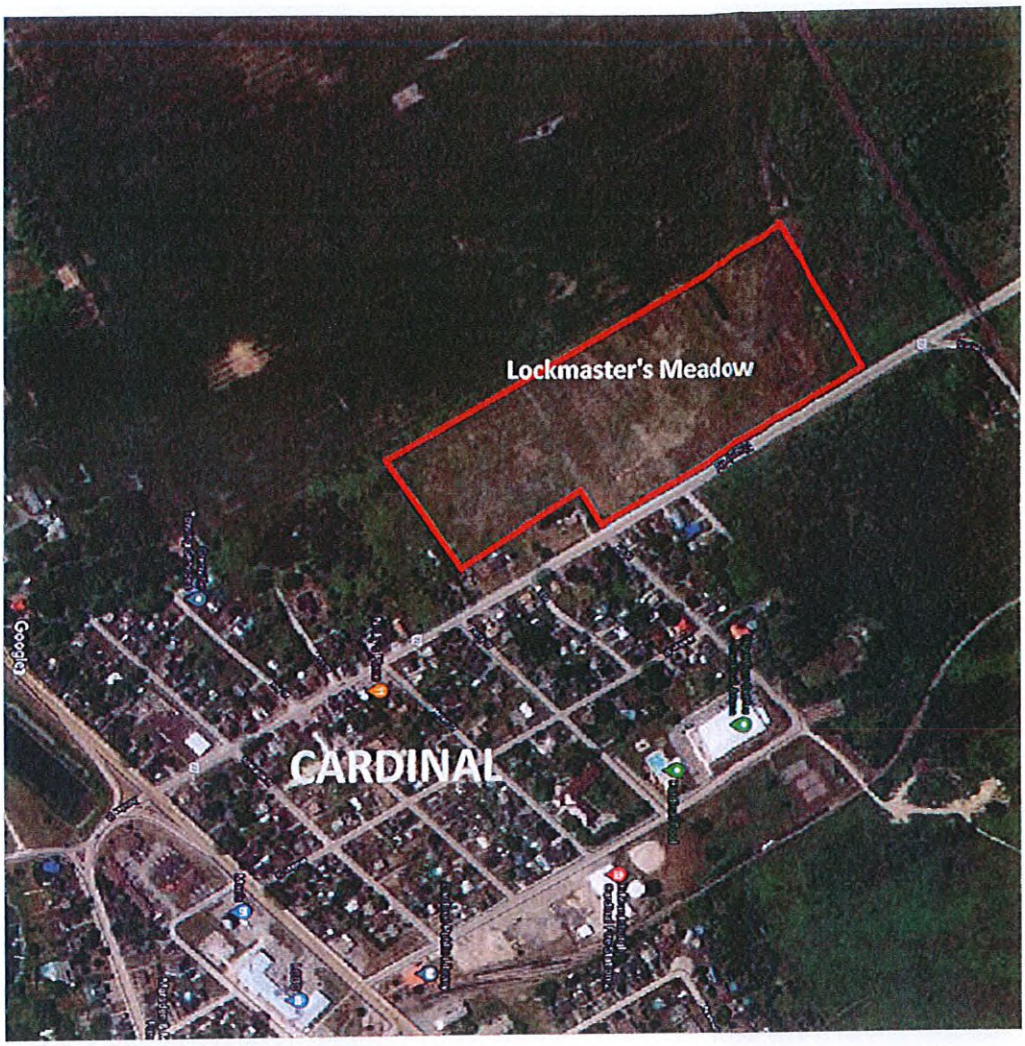
In order to ensure that the recommendations of this report are adhered to, it is recommended that our firm be retained to inspect, test, and report accordingly.

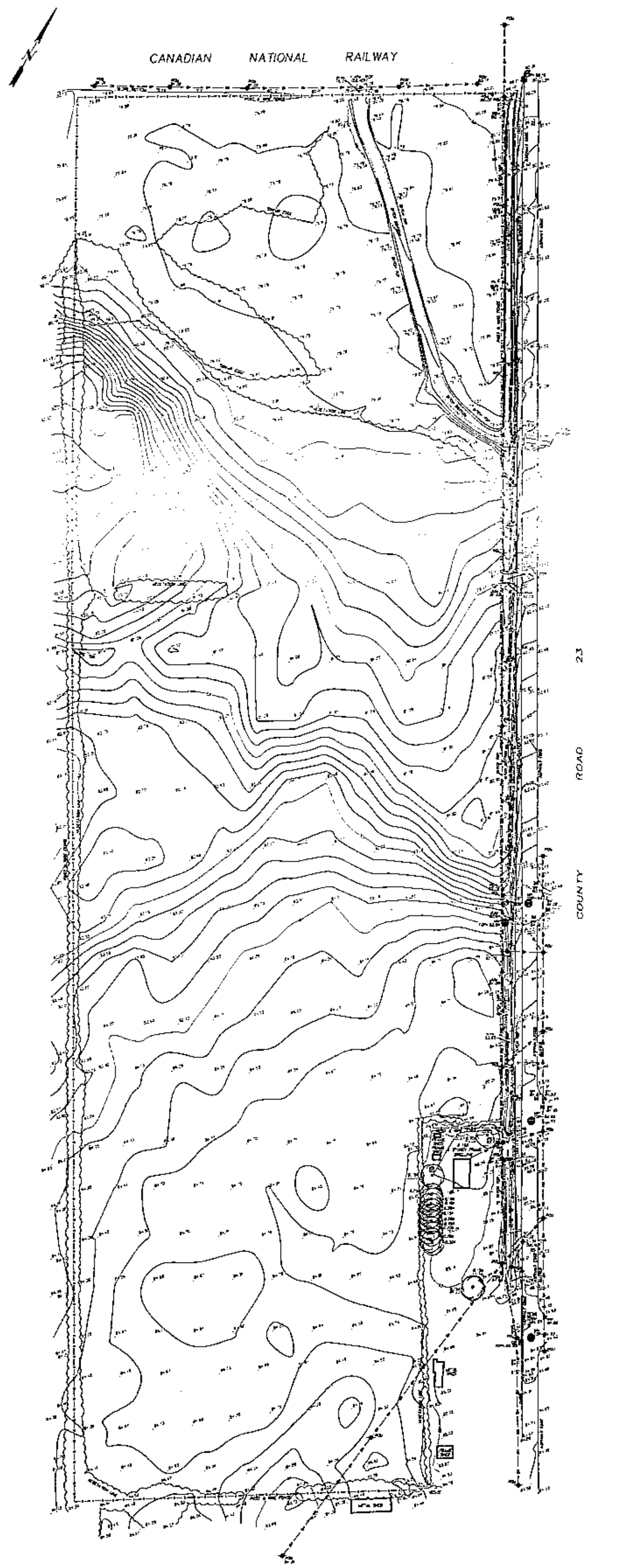
Respectfully submitted
ST. LAWRENCE TESTING & INSPECTION CO. LTD.

G.G. McIntee, P. Eng.
GGM:mhm

Attachments

Attachment "C"
Site Location Map





KEY PLAN — NOT TO SCALE

IMAGERY
AERIAL IMAGERY SHOWN IS FOR ILLUSTRATIVE PURPOSES ONLY AND MAY NOT DEPICT CURRENT FEATURES.

TOPOGRAPHIC BASE PLAN OF
LOT 7, CONCESSION 1
GEOGRAPHIC TOWNSHIP OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL

SCALE 1 : 750 METRES

COORDINATES

CONTOURS

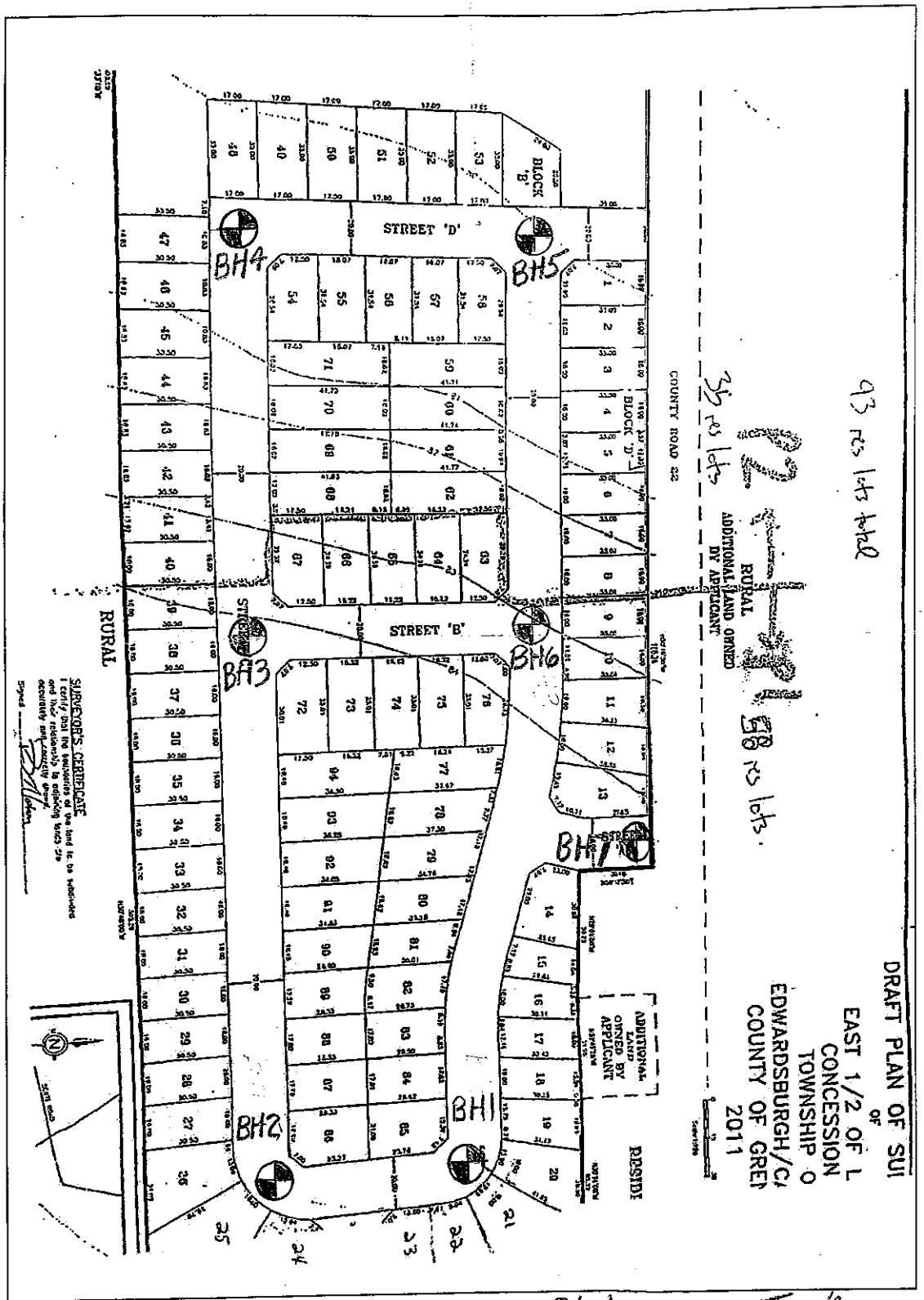
ELEVATIONS

LEGEND
- DENOTES UTILITY POLE
- DENOTES SPOT ELEVATION

CAUTION
THIS IS NOT A PLAN OF SURVEY AND SHALL NOT BE USED EXCEPT FOR THE PURPOSE INDICATED IN THE TITLE BLOCK. THE WORK AND DRAWINGS HEREIN WERE COMPLETED FOR THE EXCLUSIVE USE OF OUR CLIENT AND NO LIABILITY IS ASSUMED TO ANY THIRD PARTIES OR SUBSEQUENT OWNERS.

IBW SURVEYORS

Attachment "A"
Draft Plan of Subdivision



St. Lawrence Testing
Report No 21C350
May 2021

(Old Layout)

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 1

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS: WATER CONTENT & ATTERBERG LIMITS. WP W WL
0		200mm. Topsoil									
		Clayey Silt									
		Brown, moist, stiff		78 ▽							
1											
						SS	1	100	3		
2											
	2.74	Sand and Gravel Till									
		Brown, moist, silty,									
3		compact to dense									
						SS	2	75	30		
4											
	4.57	Termination of borehole									
5											

DYNAMIC PENETRATION TEST BLOWS PER FOOT.. .K ...
0 20 40 60 80

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 2

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION / DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS: WATER CONTENT & ATTERBERG LIMITS. WP W WL
0		230mm. Topsoil Clayey Silt Brown, moist, stiff, with some sand below 3.0m.		1.11 ▽							
1											
2						SS	1	75	3		
3						SS	2	100	11		
4	3.68	Sand and Gravel Till Brown, moist, silty, compact to dense									
5	4.57	Termination of borehole									

DYNAMIC PENETRATION TEST BLOWS PER FOOT.. .K...
0 20 40 60 80

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350
BOREHOLE NO. 3
CASING HF Auger
DATUM

CLIENT Edwardsburgh Development Inc.
LOCATION Shanley Rd. South of CN Rail Cardinal, ON
DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021

DEPTH	ELEVATION / DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS: WATER CONTENT & ATTERBERG LIMITS (WP — W — WL) / DYNAMIC PENETRATION TEST BLOWS PER FOOT (0 20 40 60 80)
0		230 mm. Topsoil									
		Clayey Silt									
		Brown, moist, stiff becoming grey below 3.3m.		.70							
1											
					X	SS	1	100	4		
2											
3					X	SS	2	75	4		
4											
					X	SS	3	100	6		
5											
	5.18	Termination of borehole									

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 4

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION / DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS: WATER CONTENT & ATTERBERG LIMITS. WP W WL
0		150mm. Topsoil Silty Sand Brown, Moist, loose		.78 ▽							
1	.91	Clayey Silt Brown, moist, stiff, becoming grey below 3.1m.				SS	1	100	7		
2											
3						SS	2	70	9		
4											
5	4.57	Termination of borehole									

DYNAMIC PENETRATION TEST BLOWS PER FOOT.. .K ...
0 20 40 60 80

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 5

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

SOIL PROFILE					SAMPLES					LABORATORY TESTS PERFORMED	LAB TEST RESULTS
DEPTH	ELEVATION / DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE		WATER CONTENT & ATTERBERG LIMITS. WP W WL
0		180mm. Topsoil Clayey Silt Brown, moist, hard		.73 ▽							DYNAMIC PENETRATION TEST BLOWS PER FOOT. . .K . . . 0 20 40 60 80
1											
2						SS	1	100	16		
3	2.92	Sand and Gravel Till Grey, moist, silty, compact to dense				SS	2	65	10		
4											
5	4.57	Termination of borehole									

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 210350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 6

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS: WATER CONTENT & ATTERBERG LIMITS. WP W WL
0		250mm. Topsoil									
		Clayey Silt									
		Brown, moist, hard									
1				1.16 ▽							
						SS	1	100	10		
2											
	2.64	Sand and Gravel Till									
		Brown, moist, silty, dense				SS	2	75	50+		
3	3.30	Sampler and auger refusal									
4											
5											

DYNAMIC PENETRATION TEST BLOWS PER FOOT.. .K . . .
0 20 40 60 80

APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

OFFICE BOREHOLE RECORD

REPORT NO. 21C350

CLIENT Edwardsburgh Development Inc. BOREHOLE NO. 7

LOCATION Shanley Rd. South of CN Rail Cardinal, ON CASING HF Auger

DATE OF BORING April 7, 2021 DATE OF WL READING April 8, 2021 DATUM

DEPTH	ELEVATION DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	SAMPLES: CONDITION	TYPE	NUMBER	RECOVERY	N - VALUE	LABORATORY TESTS PERFORMED	LAB TEST RESULTS: WATER CONTENT & ATTERBERG LIMITS. WP W WL	DYNAMIC PENETRATION TEST BLOWS PER FOOT. . .K . . . 0 20 40 60 80
0		150mm. Topsoil		.61 ▽								
		Silt and Sand Brown, moist, loose				SS	1	40	6			
1												
	1.58	Clayey Silt Brown, moist, stiff				SS	2	70	4			
2												
	2.13	Termination of borehole										
3												
4												
5												

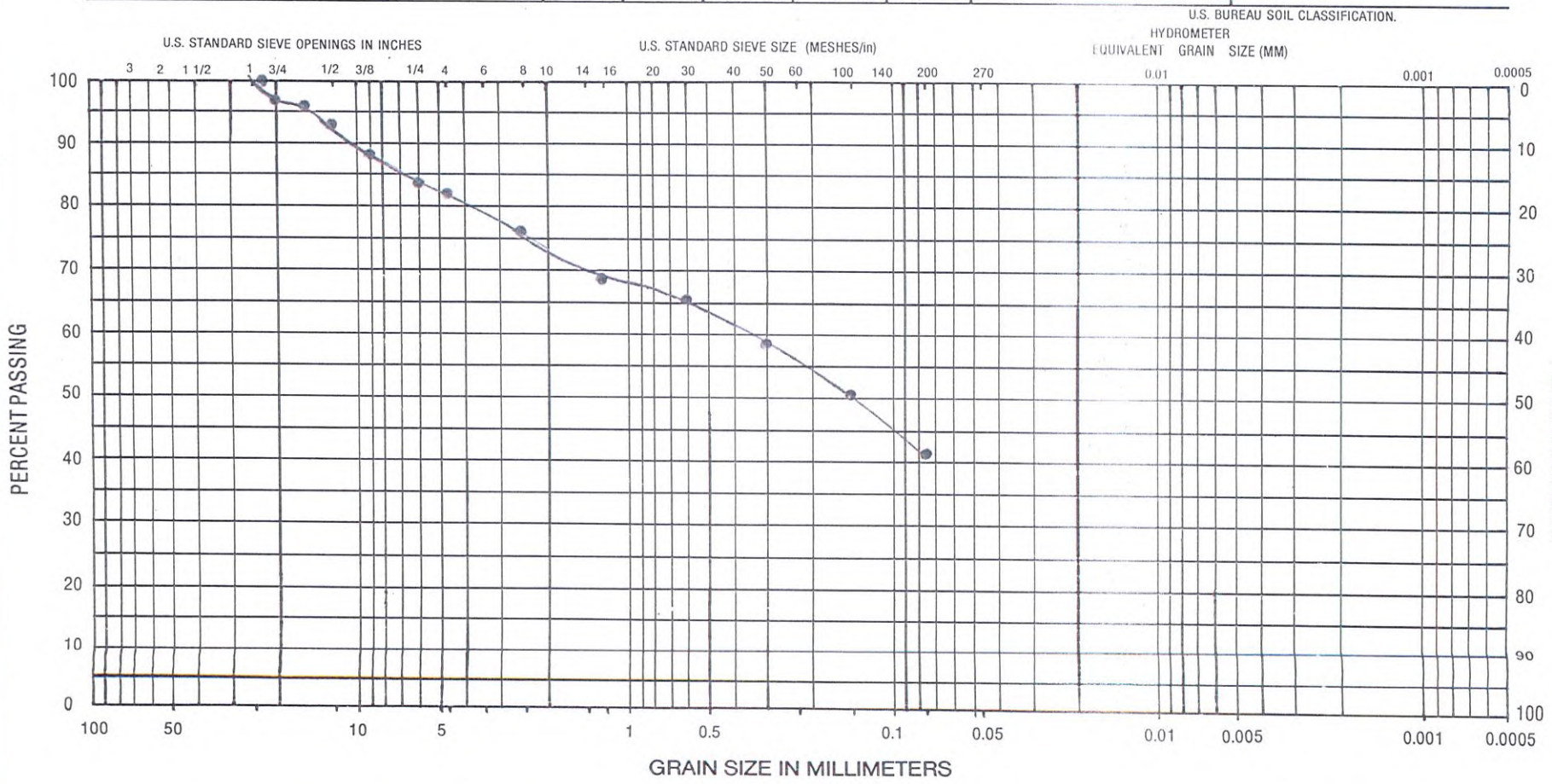
APPENDIX

St. Lawrence Testing & Inspection Co. Ltd.

GRAIN SIZE DISTRIBUTION

REPORT NO. 21C350

GRAVEL		FINE GRAVEL	SAND				SILT	CLAY
			Coarse	Medium	Fine	Very Fine		



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

UNIFIED CLASSIFICATION (ASTM D 2487)

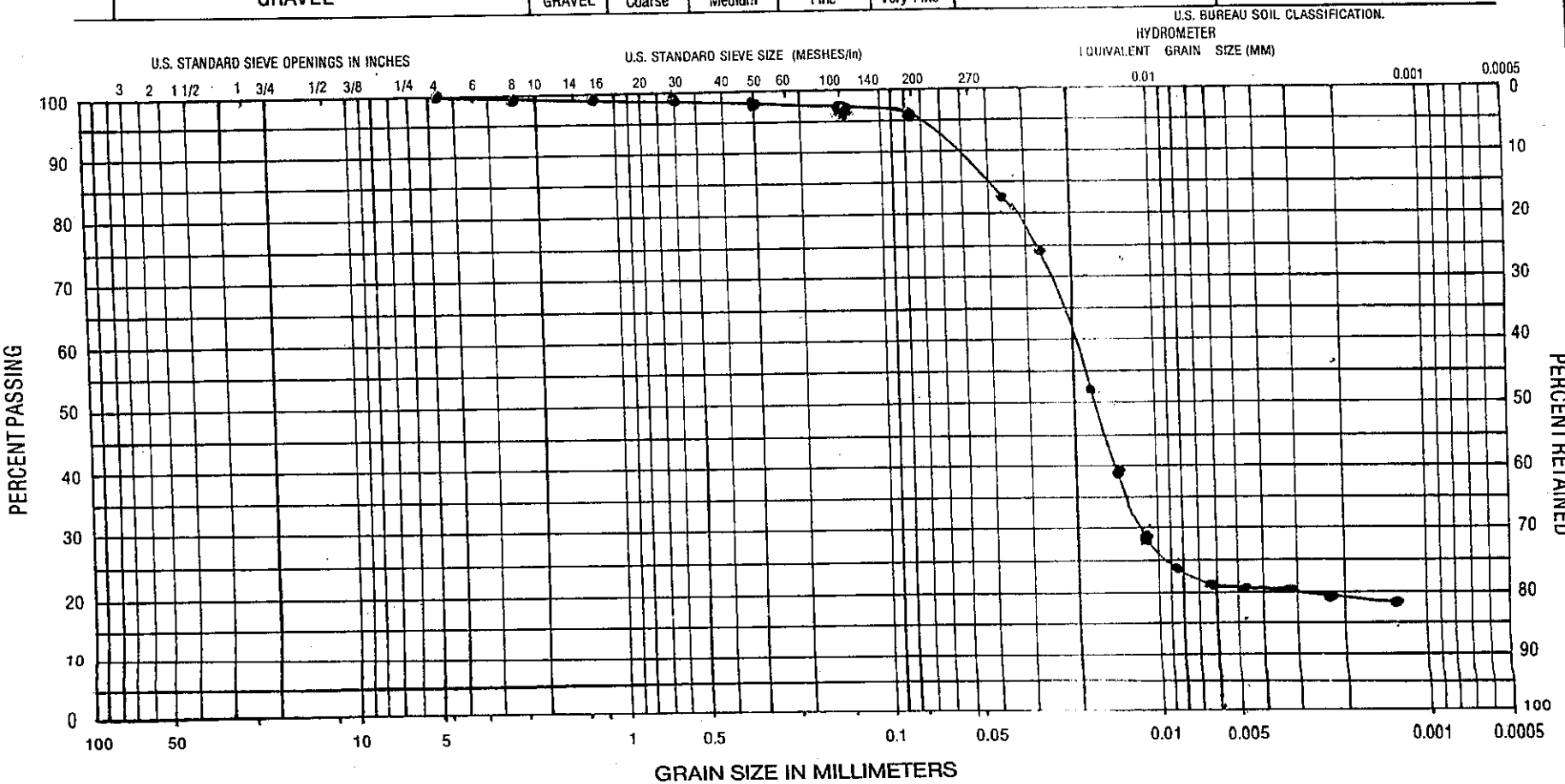
BOREHOLE No.	SAMPLE No.	DEPTH	DESCRIPTION
1	2	3.1 to 3.7m.	Silty sand and gravel

St. Lawrence Testing & Inspection Co. Ltd.

GRAIN SIZE DISTRIBUTION

REPORT NO. 210350

GRAVEL	FINE GRAVEL	SAND				SILT	CLAY
		Coarse	Medium	Fine	Very Fine		



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

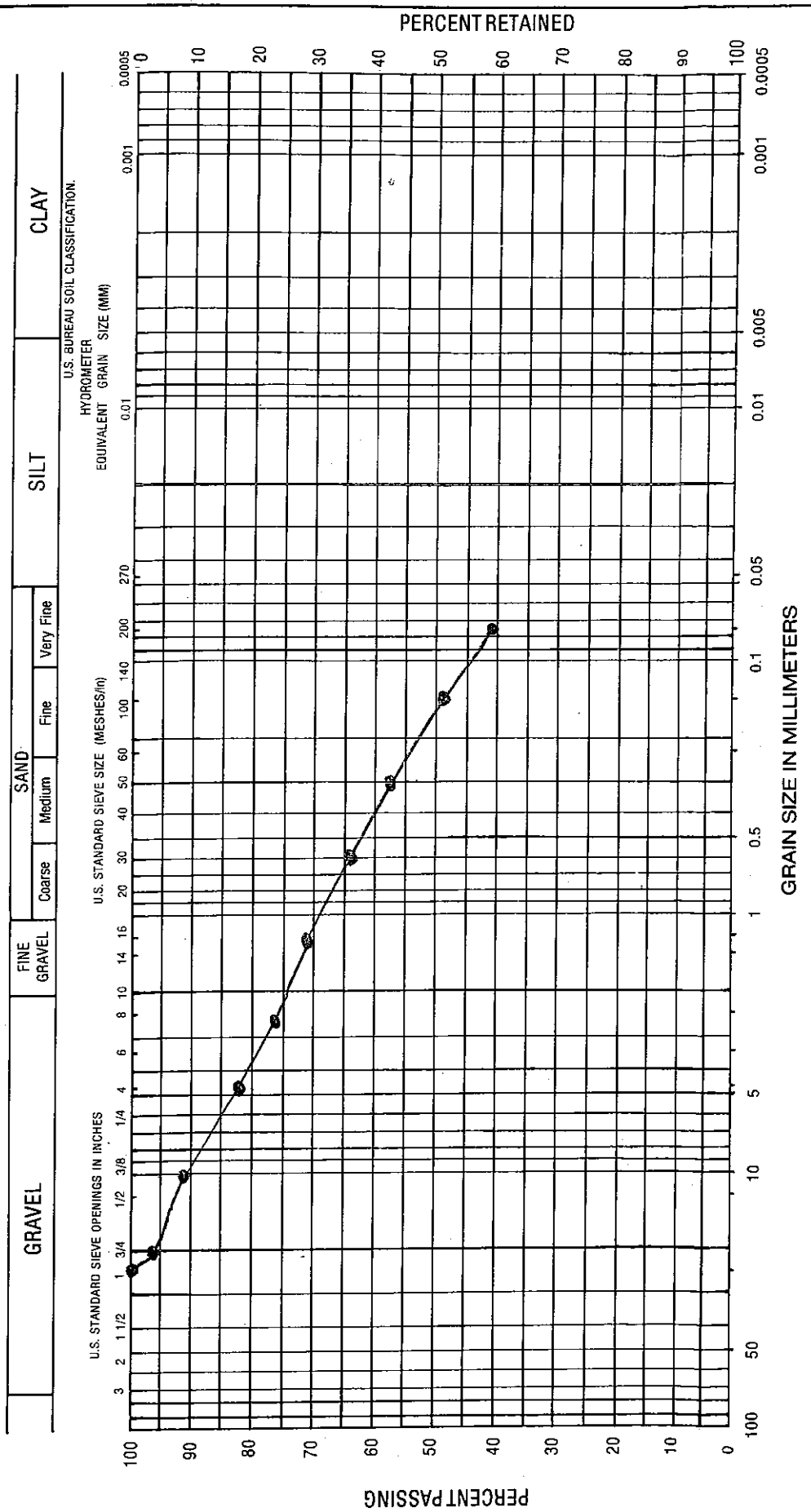
UNIFIED CLASSIFICATION (ASTM D 2487)

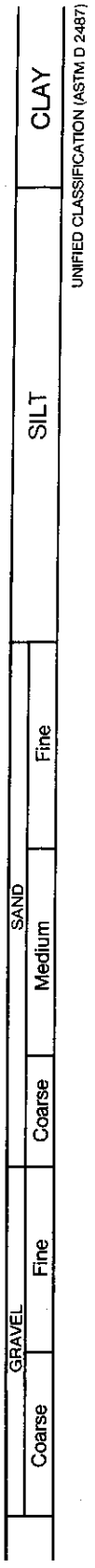
BOREHOLE No.	SAMPLE No.	DEPTH	DESCRIPTION
3	1	1.5 to 2.1m.	Clayey silt

St. Lawrence Testing & Inspection Co. Ltd.

GRAIN SIZE DISTRIBUTION

REPORT NO.
21C350





BOREHOLE No.
5

SAMPLE No.
2

DEPTH
3.1 to 3.7m.

DESCRIPTION
Silty sand and gravel

SOUTH NATION CONSERVATION
DE LA NATION SUD




Tel: (613) 984-2948 • Fax: (613) 984-2872 • Toll Free: 1-877-984-2948 • 38 rue Victoria Street, Finch, ON K0C 1K0 • www.nation.on.ca

Via Email Transmission

October 12, 2010

Sandy Hay
County Planner
UCLG
25 Central Ave. West, Suite 100
Brockville, ON K6V 4N6

RE: Draft Plan of Subdivision Conditions
Edwardsburgh Cardinal Developments Ltd.
Village of Cardinal
Lot 7, Concession 1
Former Edwardsburgh Township
United Counties of Leeds & Grenville

Dear Mr. Hay,

South Nation Conservation (SNC) has received and reviewed the Draft Plan of Subdivision, prepared by Eastern Engineering Group Inc., dated June 28, 2010 for the above noted subdivision. It is understood from the Plan of Subdivision that it is proposed ninety-three (93) lots intended for single detached dwelling units, one (1) block intended for Park/Open Space, one (1) road and one (1) block for a stormwater management facility. Further, the entire development will be serviced by the municipal water and sanitary sewer networks.

In our review, SNC considered the environmental impacts of the proposed subdivision on the local environment, as outlined under Sections 2.1 (Natural Heritage), 2.2 (Water Quality and Quantity) and 3.1 (Natural Hazards) of the Provincial Policy Statement (March 1, 2005) issued under Section 3 of the Planning Act and the Edwardsburgh Cardinal Official Plan (OP).

Watercourse

An unnamed watercourse enters the property from the north from under the CN Railway proceeds south, takes a turn and exits the property on the east side via a culvert under County Road #22. SNC staff confirmed by a site visit on October 4, 2010 that the unnamed watercourse has potential for fish habitat.

Upon preliminary review of the proposed development, SNC finds no reason to object to the proposed subdivision. SNC kindly recommends that the following statements be included as conditions of subdivision draft plan approval:

Stormwater Management

1. The owner agrees to prepare and submit a Storm Water Management Plan and describe how it is to be implemented in accordance with the current Storm water Management Best Management Practices to the satisfaction of the Township of Edwardsburgh Cardinal, the United Counties of Leeds and Grenville and South Nation Conservation. The plan should address both water quality and quantity concerns. The plan should consider proposed on-lot controls to reduce the rate of runoff and minimize contaminant transportation. Models, assumptions and calculations of pre and post development runoff are to be included with this submission.

Sediment and Erosion Control

2. The owner agrees to prepare and submit a Sediment and Erosion Control Plan, appropriate to the site conditions, prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and indicate how it is to be implemented during all the phases of the site preparation and construction in accordance with the current Best Management Practices for Erosion and Sediment Control to the satisfaction of the Township of Edwardsburgh Cardinal, the United Counties of Leeds and Grenville and South Nation Conservation.

Lot Grading and Drainage

3. The owner agrees to prepare and submit a Lot Grading and Drainage Plan and indicate how it is to be implemented to the satisfaction of Township of Edwardsburgh Cardinal, the United Counties of Leeds and Grenville and South Nation Conservation.

Fisheries

4. The Owner acknowledges that the Unnamed watercourse is considered either direct or indirect Fish Habitat, as per Section 35 of the *Fisheries Act.*

5. The Owner agrees to establish a 30 metre "No touch/No Development" setback of the Unnamed watercourse, on both sides, measured from the top of the average annual highwater mark. The final approved plan of subdivision shall clearly show this setback. Any deviation from this setback shall be to the satisfaction of the Township of Edwardsburgh Cardinal, the United Counties of Leeds and Grenville and South Nation Conservation.

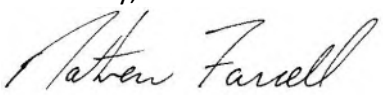
6. The Owner acknowledges that South Nation Conservation is under agreement with the Department of Fisheries and Oceans Canada to screen all works that are in or adjacent to water. In accordance with Section 35 of the *Fisheries Act*, the Harmful Alteration, Disruption or Destruction (HADD) of fish habitat is prohibited. The impacts that any such works may have on a fish habitat, whether directly adjacent to the site or downstream, will necessitate a review by South Nation Conservation and may require approval of the Department of Fisheries and Oceans Canada.

Subdivision Agreement

7. The subdivision agreement shall contain wording acceptable to South Nation Conservation that the above noted conditions (under 1-7) will be implemented.

I trust the above meets your present requirements, but should you have any questions, please feel free to call the office.

Yours truly,



Nathan Farrell
Watershed Planner
nfarrell@nation.on.ca
877-984-2948 ext. 302

c.c. Debra McKinstry Township of Edwardsburgh Cardinal

APPENDIX - C

OUTLET 1 @ INV. 78.58

PH-2 PH-1

COUNTY ROAD 22

COUNTY ROAD No. 22

EXISTING UNNAMED WATERCOURSE

EXISTING RESIDENTIAL

CANADIAN NATIONAL RAILWAY

CANADIAN NATIONAL RAILWAY

EXISTING RESIDENTIAL

FUTURE PARK

A2
BLOCK A & BLOC C
3.2550 ha

A1
7.6725 ha

A= 9.17 ha
UNCONTROLLED
Qp= 829 L/s 100y

VACANT LAND (RURAL)

PH-2 PH-1

TOTAL SUB-CATCHMENT AREA = 10.9275 ha
100% GRASSED AND PERVIOUS

LEGEND:

DRAINAGE PATTERN — 2 %

EXIST. MAJOR OVERLAND FLOW DIRECTION

CONTOUR — 80.00

EXIST. DITCH AND CULVERT — CSP CULVERT

PHASING LIMITS

PROPERTY BOUNDARY

No.	REVISION / ISSUE	DATE MM/DD/YY
3	OPEN SPACE AREA	06/19/24
2	PEER REVIEW COMMENTS	11/08/22
1	INITIAL ISSUE	03/10/22

ADVANCE ENGINEERING
eng.services.ca@gmail.com

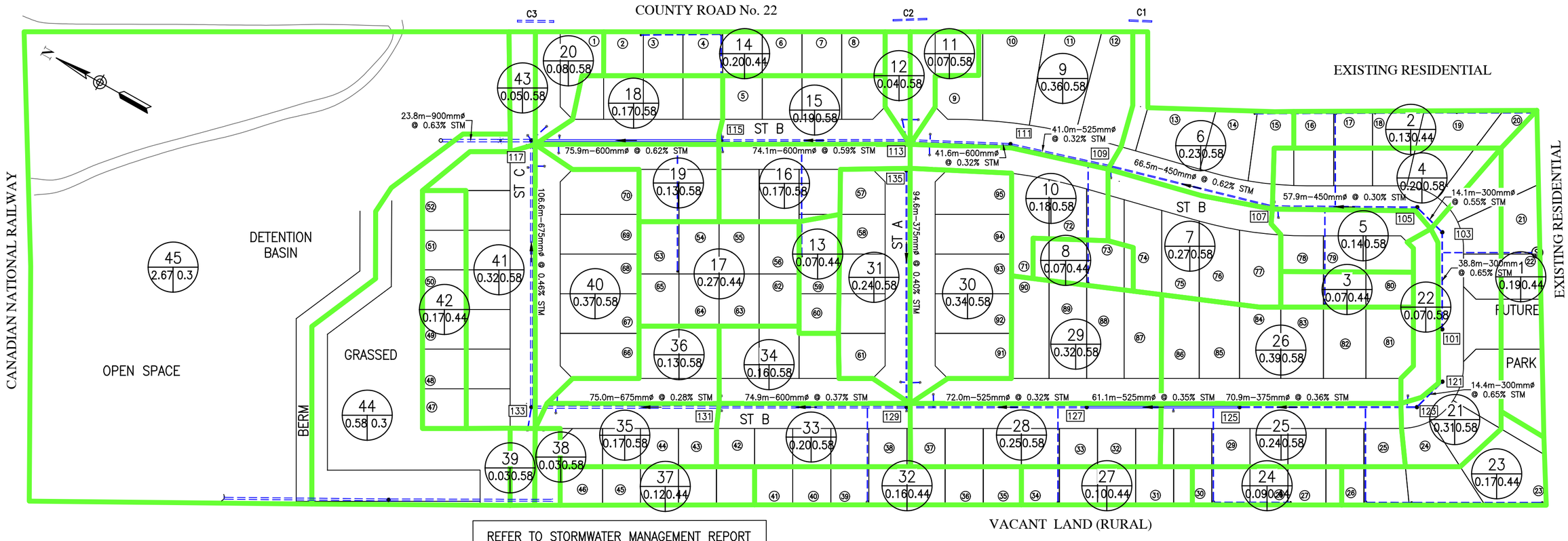
APPLICANT:
EDWARDSBURGH DEVELOPMENTS LTD.

PROJECT NAME AND ADDRESS:
LOCKMASTER'S MEADOW SUBDIVISION
COUNTY RD No. 22, CARDINAL, ON

TITLE:
PRE-DEVELOPMENT DRAINAGE AREAS

SCALE: 1:1250
DRAFTED BY:
PROJECT No.: 0114
DATE: 6/19/24

DRAWING No.: ST-1



REFER TO STORMWATER MANAGEMENT REPORT FOR DETAILS ABOUT WEST WATERCOURSE

TABLE OF DRAINAGE AREAS

DA #	AREA (ha)	RUNOFF COEF. "C"	TOC	OUTLET
1	0.1855	0.44	10 min	101
2	0.1336	0.44	10 min	105
3	0.0748	0.44	10 min	105
4	0.2038	0.58	10 min	3
5	0.1376	0.58	10 min	4
6	0.2324	0.58	10 min	5
7	0.2735	0.58	10 min	6
8	0.0709	0.44	10 min	109
9	0.3564	0.58	10 min	7
10	0.1775	0.58	10 min	8
11	0.0680	0.58	10 min	9
12	0.0375	0.58	10 min	10
13	0.0738	0.44	10 min	113
14	0.1978	0.44	10 min	115
15	0.1867	0.58	10 min	19
16	0.1747	0.58	10 min	20
17	0.2674	0.44	10 min	119
18	0.1676	0.58	10 min	21
19	0.1328	0.58	10 min	22
20	0.0848	0.58	10 min	27
21	0.3133	0.58	10 min	12
22	0.0692	0.58	10 min	11
23	0.1666	0.44	10 min	123
24	0.0911	0.44	10 min	123
25	0.2445	0.58	10 min	14
26	0.3912	0.58	10 min	13
27	0.1042	0.44	10 min	127
28	0.2532	0.58	10 min	16
29	0.3162	0.58	10 min	15
30	0.3435	0.58	10 min	17
31	0.2449	0.58	10 min	18
32	0.1626	0.44	10 min	129
33	0.1954	0.58	10 min	24
34	0.1642	0.58	10 min	23
35	0.1662	0.58	10 min	26
36	0.1306	0.58	10 min	25
37	0.1191	0.44	10 min	Uncontrolled
38	0.0310	0.58	10 min	31
39	0.0305	0.58	10 min	32
40	0.3664	0.58	10 min	29
41	0.3189	0.58	10 min	30
42	0.1657	0.44	10 min	Pond
43	0.0477	0.58	10 min	28
44	0.5827	0.3	10 min	Pond
45	2.6716	0.3	10 min	uncontrolled

LEGEND:

STORM DRAINAGE BOUNDARY

DRAINAGE AREA NUMBER

AREA IN HECTARES

RUNOFF COEFFICIENT

FUTURE DEVELOPMENT

EXTERNAL 2.78AC = 2.78AC=14.00

EXTERNAL TIME OF CONCENTRATION Tc=14.5 min

EXTERNAL BLENDED RUNOFF COEFFICIENT C=0.70

No.	REVISION / ISSUE	DATE MM/DD/YY
7	UPDATE WEST WATERCOURSE	07/31/24
6	UPDATE	06/19/24
2	PEER REVIEW COMMENTS	11/08/22
1	INITIAL ISSUE	03/10/22

ADVANCE ENGINEERING
eng.services.ca@gmail.com

APPLICANT: EDWARDSBURGH DEVELOPMENTS LTD.

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY RD No. 22, CARDINAL, ON

TITLE:

POST-DEVELOPMENT DRAINAGE AREAS

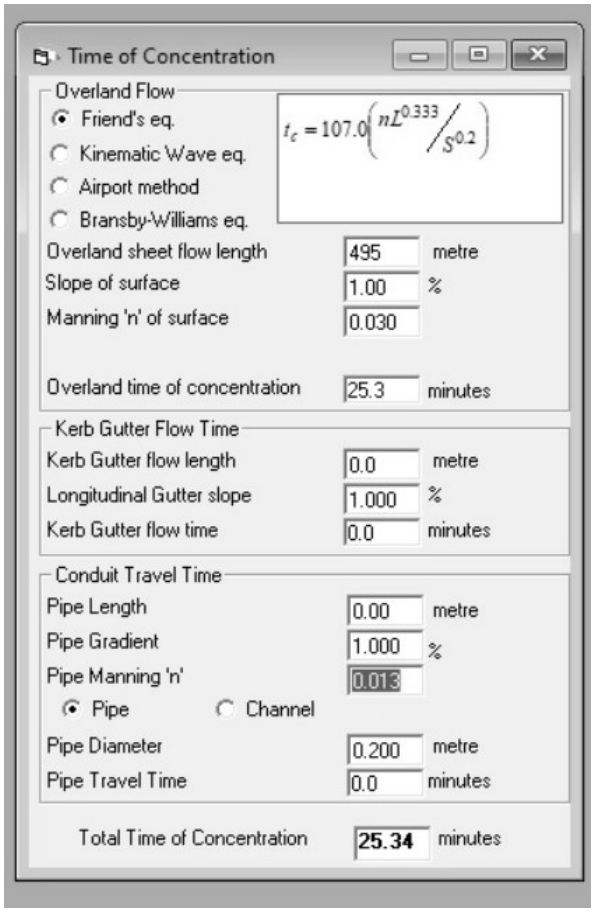
SCALE: 1:1250

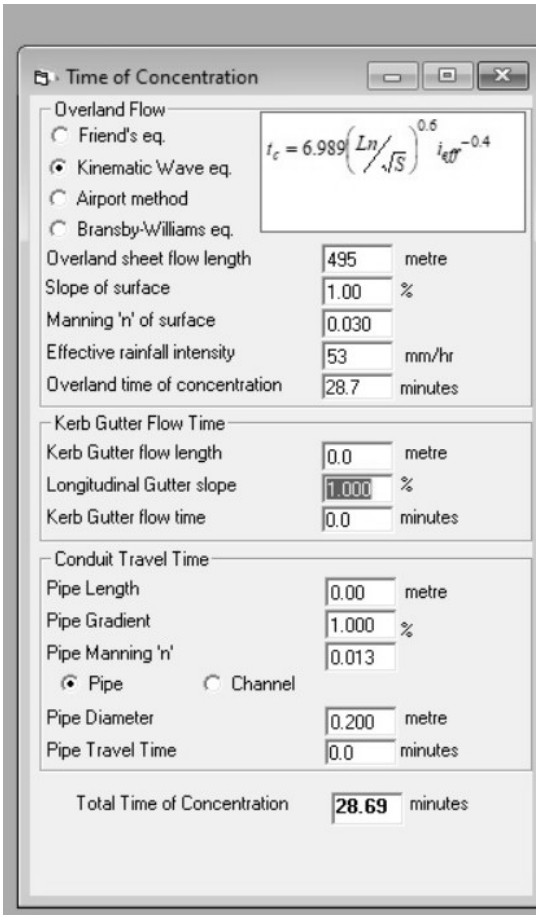
DRAFTED BY:

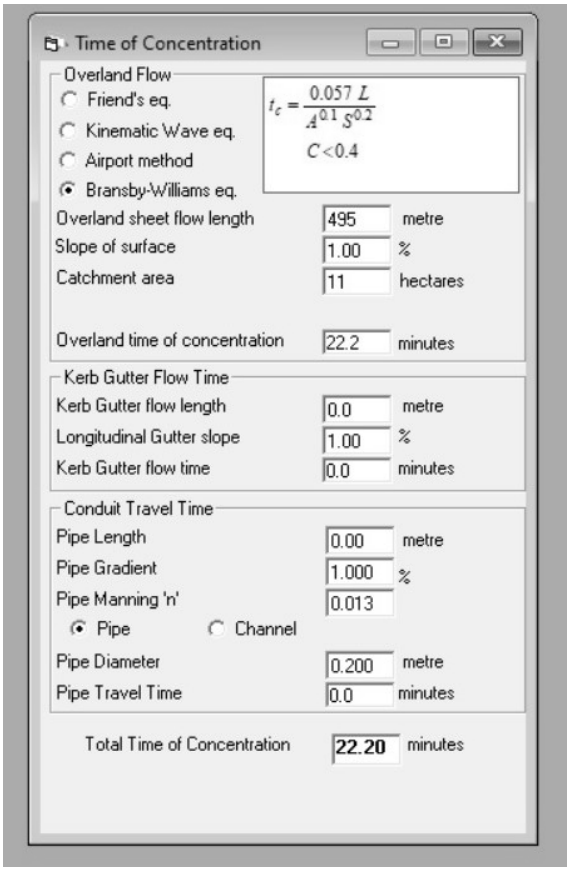
PROJECT No.: 0114

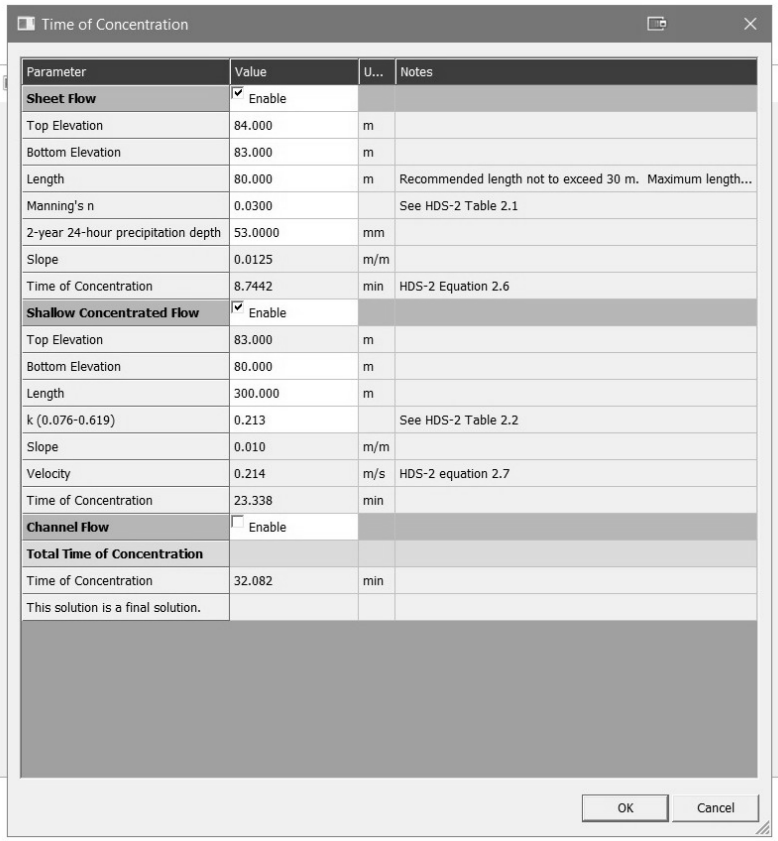
DATE: 06-19-2024

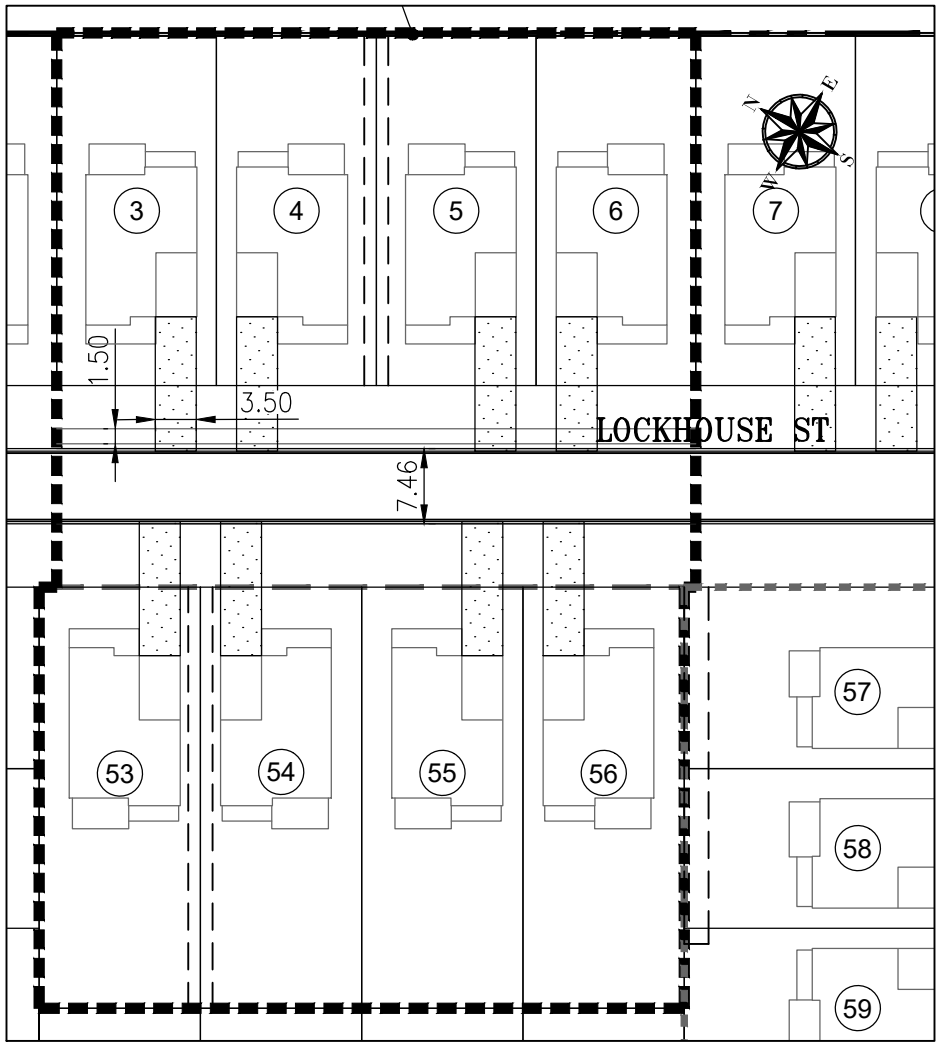
DRAWING No.: ST-2


Time of Concentration
Overland Flow
Friend's eq.
Kinematic Wave eq.
Airport method
Bransby-Williams eq.
$t_c = 107.0\left(nL^{0.333}/S^{0.2}\right)$
Overland sheet flow length 495 metre
Slope of surface 1.00 %
Manning 'n' of surface 0.030
Overland time of concentration 25.3 minutes
Kerb Gutter Flow Time
Kerb Gutter flow length 0.0 metre
Longitudinal Gutter slope 1.000 %
Kerb Gutter flow time 0.0 minutes
Conduit Travel Time
Pipe Length 0.00 metre
Pipe Gradient 1.000 %
Pipe Manning 'n' 0.013
Pipe Channel
Pipe Diameter 0.200 metre
Pipe Travel Time 0.0 minutes
Total Time of Concentration 25.34 minutes


Time of Concentration
Overland Flow
Friend's eq.
Kinematic Wave eq.
Airport method
Bransby-Williams eq.
$t_c = 6.989\left(Ln/\sqrt{S}\right)^{0.6} i_{eff}^{-0.4}$
Overland sheet flow length 495 metre
Slope of surface 1.00 %
Manning 'n' of surface 0.030
Effective rainfall intensity 53 mm/hr
Overland time of concentration 28.7 minutes
Kerb Gutter Flow Time
Kerb Gutter flow length 0.0 metre
Longitudinal Gutter slope 1.000 %
Kerb Gutter flow time 0.0 minutes
Conduit Travel Time
Pipe Length 0.00 metre
Pipe Gradient 1.000 %
Pipe Manning 'n' 0.013
Pipe Channel
Pipe Diameter 0.200 metre
Pipe Travel Time 0.0 minutes
Total Time of Concentration 28.69 minutes


Time of Concentration
Overland Flow
Friend's eq.
Kinematic Wave eq.
Airport method
Bransby-Williams eq.
$t_c = \frac{0.057\,L}{A^{0.1}\,S^{0.2}}$
$C < 0.4$
Overland sheet flow length 495 metre
Slope of surface 1.00 %
Catchment area 11 hectares
Overland time of concentration 22.2 minutes
Kerb Gutter Flow Time
Kerb Gutter flow length 0.0 metre
Longitudinal Gutter slope 1.00 %
Kerb Gutter flow time 0.0 minutes
Conduit Travel Time
Pipe Length 0.00 metre
Pipe Gradient 1.000 %
Pipe Manning 'n' 0.013
Pipe Channel
Pipe Diameter 0.200 metre
Pipe Travel Time 0.0 minutes
Total Time of Concentration 22.20 minutes


Time of Concentration
Parameter | Value | U... | Notes
Sheet Flow | Enable
Top Elevation | 84.000 | m
Bottom Elevation | 83.000 | m
Length | 80.000 | m | Recommended length not to exceed 30 m. Maximum length...
Manning's n | 0.0300 | See HDS-2 Table 2.1
2-year 24-hour precipitation depth | 53.0000 | mm
Slope | 0.0125 | m/m
Time of Concentration | 8.7442 | min | HDS-2 Equation 2.6
Shallow Concentrated Flow | Enable
Top Elevation | 83.000 | m
Bottom Elevation | 80.000 | m
Length | 300.000 | m
k (0.076-0.619) | 0.213 | See HDS-2 Table 2.2
Slope | 0.010 | m/m
Velocity | 0.214 | m/s | HDS-2 equation 2.7
Time of Concentration | 23.338 | min
Channel Flow | Enable
Total Time of Concentration
Time of Concentration | 32.082 | min
This solution is a final solution.
OK
Cancel



NOTES
* DISTANCES ARE IN METRE

IMPERVIOUSNESS RATIO
AND WEIGHTED WEIGHTED RUNOFF COEFFICIENT (1:750)
(DRIVEWAY WIDTH 3.5m AND 6.0m)

TOTAL DRAINAGE AREA = 6161.4 m^2
TOTAL AREA OF THE 8 LOTS = 4893 m^2
TOTAL AREA OF THE 8 ROOFS (MAX OF 30%) = 0.30 x 4893 = 1467.90 m^2
TOTAL AREA OF THE 8 DRIVEWAYS = 8 x 12.50 x 3.50 (MAX. WIDTH)= 350.00 m^2
AREA OF STREET PAVEMENT = 63.4 x 7.46 = 473 m^2
AREA OF FUTURE SIDEWALK = 63.4 x 1.5 = 95 m^2

Runoff Coefficient and Imperviousness Ratio 3.5m DW			
SURFACE	AREA (m^2)	Runoff Coeff. C	
		2-5 year	100 year
Roof Area	1467.9	0.9	1.0
Driveways	**350**	0.9	1.0
Paved road – Asphalt	473	0.9	1.0
Sidewalk	95	0.9	1.0
Total Impervious Area	**2385.9**		
Total Catchment Area	**6161.4**		
Total Pervious Area	**3775.5**	**0.3**	**0.375**
Weighted C (Cavg)		**0.53**	**0.62**
Imperviousness %		**39%**	

Runoff Coefficient and Imperviousness Ratio 6.0m DW			
SURFACE	AREA (m^2)	Runoff Coeff. C	
		2-5 year	100 year
Roof Area	1467.9	0.9	1.0
Driveways	**600**	0.9	1.0
Paved road – Asphalt	473	0.9	1.0
Sidewalk	95	0.9	1.0
Total Impervious Area	**2635.9**		
Total Catchment Area	**6161.4**		
Total Pervious Area	**3525.5**	**0.3**	**0.375**
Weighted C (Cavg)		**0.56**	**0.64**
Imperviousness %		**43%**	

Project: PROPOSED SUBDIVISION - COUNTY ROAD 22 - VILLAGE OF CARDINAL - ON

RUNOFF CALCULATIONS – RATIONAL METHOD

$Q_{2,5,25,100\text{-yr}} = 2.78\ C\ I_{2,5,25,100\text{-yr}}\ A$

Rainfall Intensity I (mm/hr)

		Pre-Dev.	Post-Dev.
	Tc (min) =	**20**	**15**
2 year	I_2 =	52.03	61.77
5 year	I_5 =	70.25	83.56
25 year	I_{25} =	97.26	97.26
100 year	I_{100} =	119.95	142.89

Runoff Coefficient C

Surface Type	C*
Impervious: Rooftop-Asphalt Pavement-Driveway	0.9
Road Shoulders	0.7
Grass-Cultivated-Pasture	0.2-0.4

* For Q_{100yr} add 25% to C value. For Q_{25yr} add 10% to C value.
* Table 5.7 *Ottawa Sewer Design Guidelines – October 2012*

I/ PRE-DEVELOPMENT RUNOFF CALCULATION

Catchment	ID	Area (ha)	Percent of Total Area	C*	A x C (ha)	C relative	Q 2-year (L/s)	Q 5-year (L/s)	Q 100-year (L/s)
Subdivision Area	**A1**	7.6725	70.21	0.3	2.3018	0.21	**332.9**	**449.5**	**959.4**
Block A and C	**A2**	3.2550	29.79	0.3	0.9765	0.09	141.2	190.7	407.0
TOTAL SITE AREA		10.9275	100%		3.2783		**474**	**640**	**1,366**
						Weighted C (C_{avg})=	**0.300**	**0.300**	**0.375**
						Calculation using C_{avg} :Q (L/s)=	**474**	**640**	**1366**

II/ POST-DEVELOPMENT RUNOFF CALCULATION

Catchment	ID	Area (ha)	Percent of Total Area (%)	C	A x C (ha)	C relative	Q 2-year (L/s)	Q 5-year (L/s)	Q 100-year (L/s)	Q_{100y} by Control Measure (L/s)	
										CONT.	UNC.
Subdivision	**A1 to A36 & A38 to A44**	8.1368	74.46	0.56	4.5566	0.417	782.4	1,058.4	**2,069**	**2,069**	
Open Space	**A45**	2.6716	24.45	0.30	0.8015	0.073	137.6	186.2	**398**		**398**
Uncontrolled Area	**A37**	0.1191	1.09	0.56	0.0667	0.006	11.5	15.5	**30**		**30**
TOTAL		10.9275	100%		5.4248		**932**	**1,260**	**2,497**	**2,069**	**428**
						Weighted C (C_{avg})=	**0.50**			**2,497**	

C= 0.64 instead of 0.56 for 100 y events

III/ ALLOWABLE RELEASE RATE IN DETENTION BASIN

A45: is unaltered and uncontrolled, therefore it is removed from the calculation of the storage
A37: is altered and uncontrolled, it is post development runoff is considered in the calculation of the storage

PRE-DEVELOPMENT RUNOFF TO BE MATCHED BY POST-DEVELOPMENT

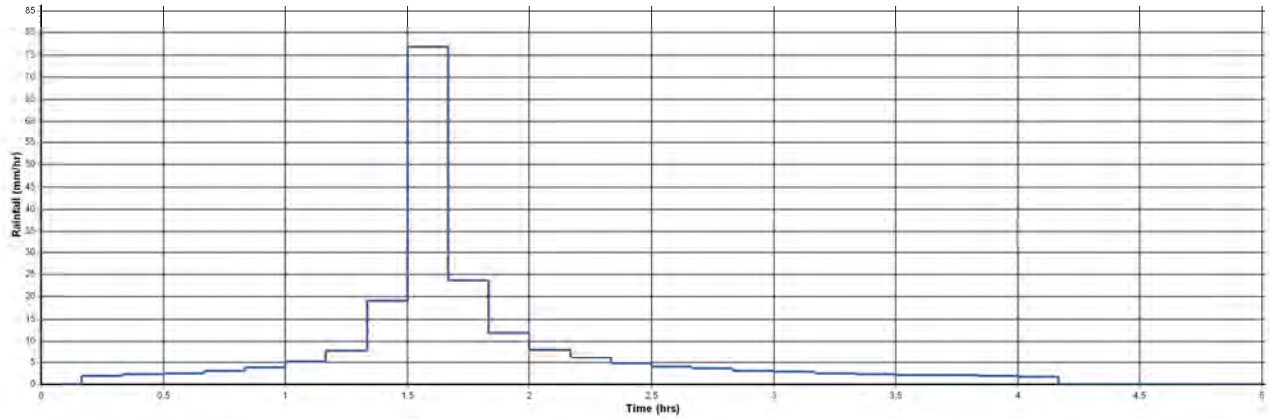
Catchment	ID	Area (ha)	Percent of Total Area	C*	A x C (ha)	C relative	Q 2-year (L/s)	Q 5-year (L/s)	Q 100-year (L/s)
Subdivision Area	**A1 to A36 & A38 to A44**	8.1368	98.56	0.3	2.4410	0.30	**353.1**	**476.7**	**1,017.5**
Uncontrolled Area	**A37**	0.1191	1.44	0.3	0.0357	0.00	**5.2**	**7.0**	**14.9**
TOTAL SITE AREA		8.2559	100%		2.4768		**358**	**484**	**1,032**
						Weighted C (C_{avg})=	**0.300**	**0.300**	**0.375**
						Calculation using C_{avg} :Q (L/s)=	**358**	**484**	**1032**

Post-Dev. n-y Release Rate From A1 to A44		**<**	**Pre-Dev. n-y Rate From A1 to A44**	
Post-Dev. n-y Release Rate From A1 to A36 and A38 to A44 (Pond)		**<**	**Pre-Dev. n-y Rate From A1 to A36 and A38 to A44 (-) Difference Post Dev and Pre Dev of A37**	
2y	782.4	controlled to	353.1 - (11.5-5.2)	346.8
5y	1,058.4		467.7 – (15.5-7.0)	468.2
100y	2263,0		1017.5 – (33-14.9)	1,002.1

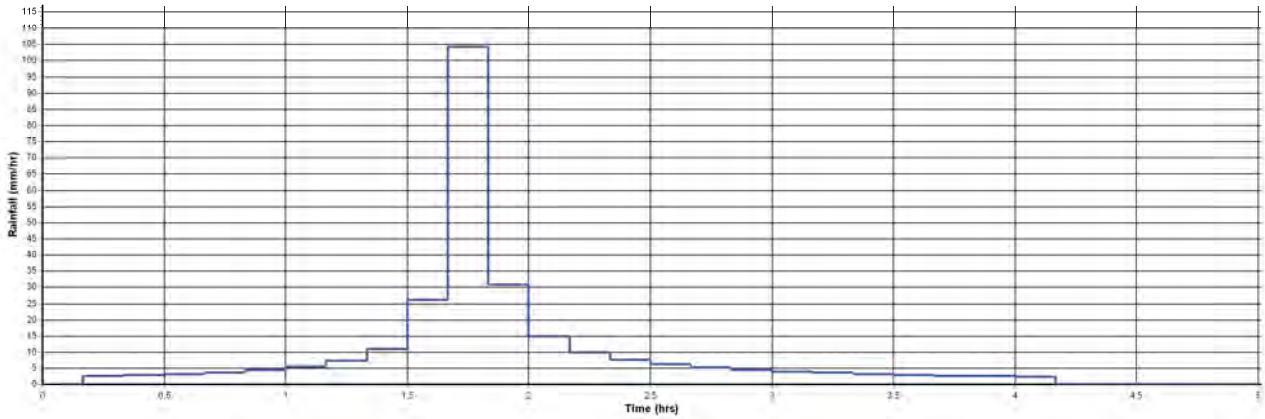
June 2024

DESIGN STORMS USED IN SWMM MODEL SIMULATION

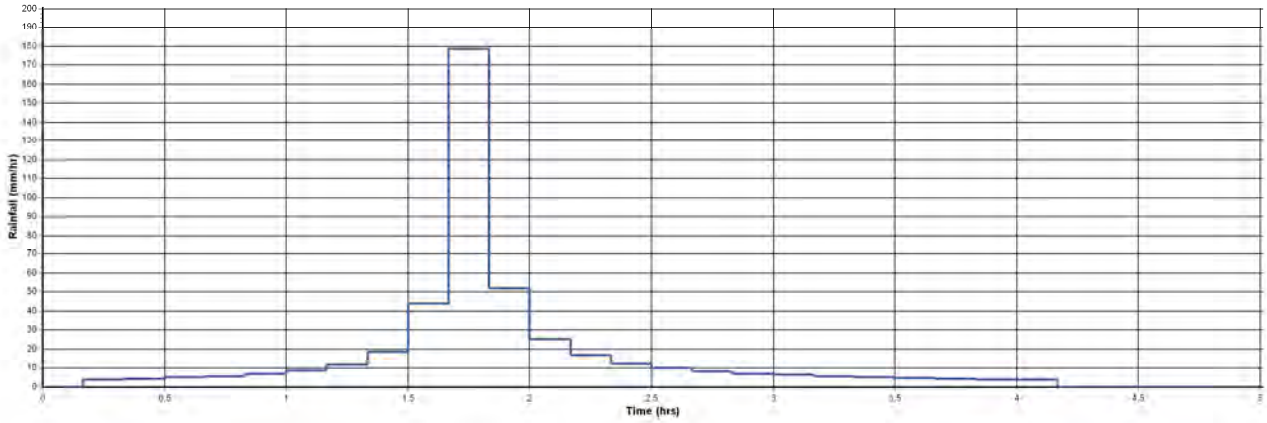
CHICAGO STORM 4 HOURS 2-YEAR



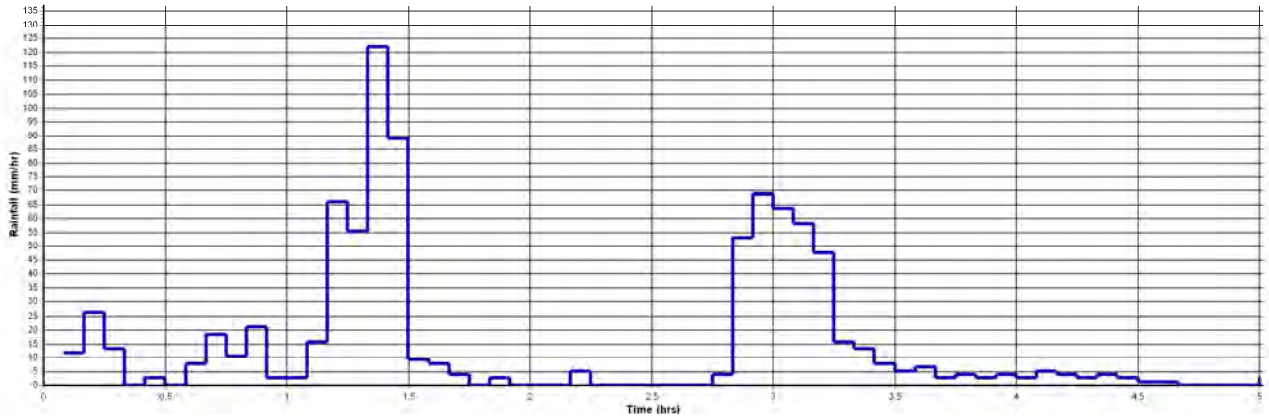
CHICAGO STORM 4 HOURS 5-YEAR



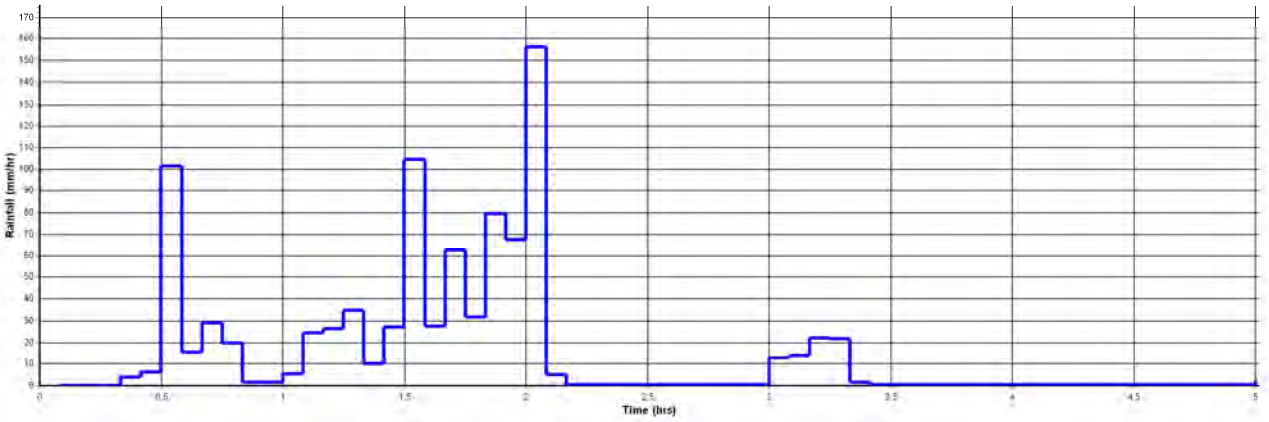
CHICAGO STORM 4 HOURS 100-YEAR



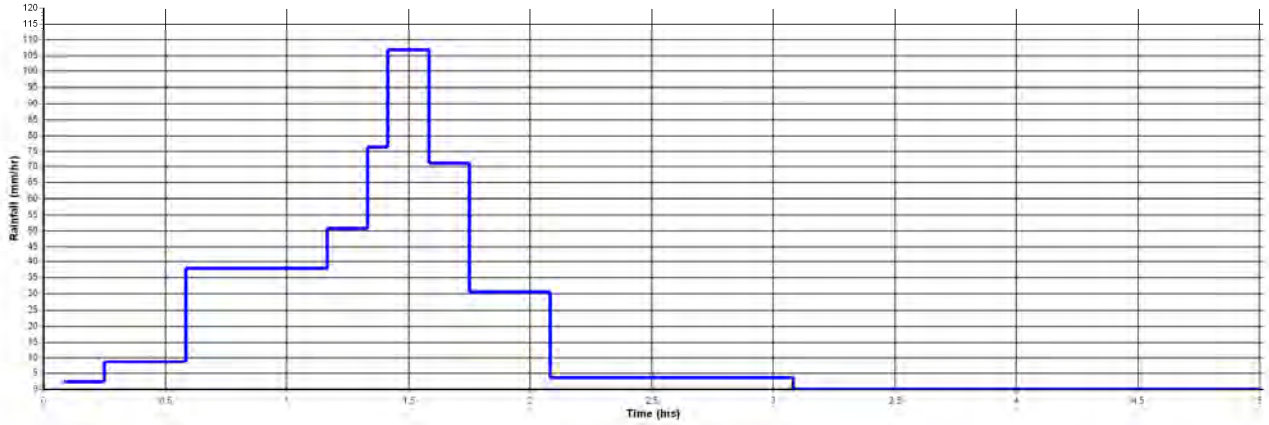
HISTORIC STORM AUG 8 1996



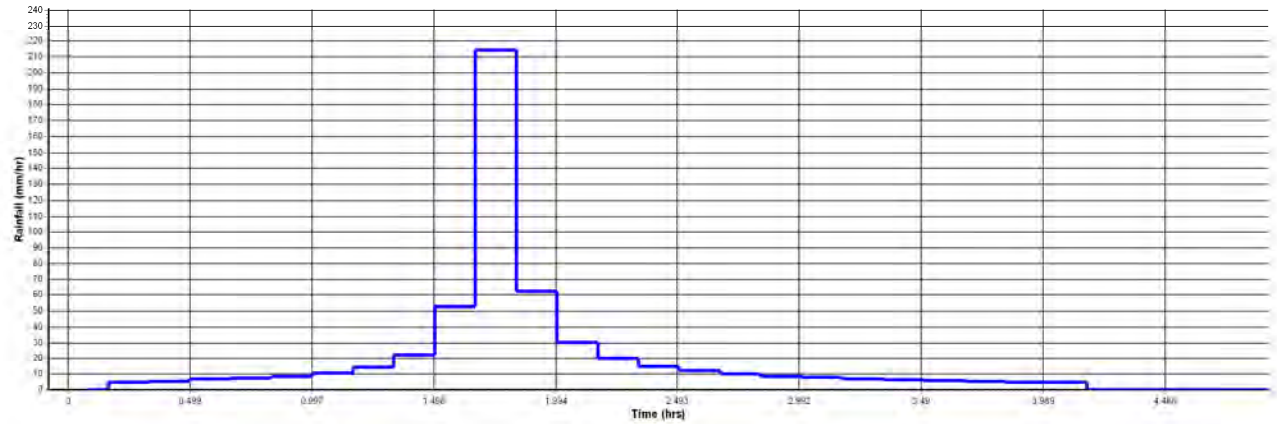
HISTORIC STORM AUG 4 1988



HISTORIC STORM JUL 1 1979



CHICAGO STORM 4HRS 100-Y + 20%



LOCKMASTER SUBDIVISION

PRE-DEVELOPMENT – POST DEVELOPMENT RUNOFFS

Catchment Area = 8.1368 ha, Area A45 not included

HYDROLOGY METHOD	2-YEAR (L/s)	5-YEAR (L/s)	100-YEAR (L/s)	100-YEAR +20% (L/s)	NOTES
I/ PRE-DEVELOPMENT					
RATIONAL METHOD	353.1	476.7	1017.5		C=0.3, C(100)=0.375 T=20
CHICAGO STORM 3-HRS		244.2	1465.8		AREA= 8.1368 ha 0% IMPERVIOUS EQ. WIDTH=950 m SLOPE= 2% DIRECT LINK
CHICAGO STORM 4-HRS	**11.0**	**168.2**	**1017.5**		
CHICAGO STORM 6-HRS			1623.0		
HISTORIC STORM JULY1, 79			1437.3		
HISTORIC STORM AUGUST 8, 96			747.7		
SCS 100 – 24 HRS			896.6		
II/ POST-DEVELOPMENT					
RATIONAL METHOD	782.4	1058.4	2069.0		C = 0.56 C(100)= 0.64 T=15
CHICAGO STORM 3-HRS		837.2	1824.7		AREA= 8.1368 ha 43% IMPERVIOUS EQ. WIDTH=430 m SLOPE= 2% DIRECT LINK
CHICAGO STORM 4-HRS	**565.3**	**898.9**	**2096.9**	2543.6	
CHICAGO STORM 6-HRS			1898.1		
HISTORIC STORM JULY1, 79			1457.0		
HISTORIC STORM AUGUST 8, 96			989.3		
SCS 100 – 24 HRS			1127.1		
MAXIMUM STORM	565.3	898.9	2096.9		

Parameters used in SSA input

Split Drainage (Ref Lot 32)

Drainage Area	Imperviousness %	No Depression in Imp. %	Imp. To Perv. %
Rear Yard	27	100	100
Front Yard	59	33	33

Back to Front Drainage (Ref Lot 87)

Drainage Area	Imperviousness %	No Depression in Imp. %	Imp. To Perv. %
Rear & Front Yard	42	54	54

PRE-DEVELOPMENT – POST DEVELOPMENT OUTFALL DISCHARGE

HYDROLOGY METHOD	2-YEAR (L/s)	5-YEAR (L/s)	100-YEAR (L/s)
I/ PRE-DEVELOPMENT			
RATIONAL METHOD	353.1	476.7	1017.5
CHICAGO STORM 4-HRS	**11.0**	**168.2**	**1017.5**
II/ POST-DEVELOPMENT			
RATIONAL METHOD – NO RESTRICT	782.4	1058.4	2069.0
CHICAGO STORM 4-HRS (I)	**214.2**	**371.6**	**939.0**
TARGET PRE-DEVELOPMENT (RM) (II)	346.8	468.2	1002.1
DIFFERENCE (CHICAGO STORM) (I)-(II)	-132.6	-96.6	-63.1

POND:

BOTTOM ELEV. = 79.4

STORM EVENT	2-Y EVENT	5-Y EVENT	100-Y EVENT
REQUIRED STORAGE VOLUME cu.m	356.4	574.7	1180.9
MAX. SWEL (SURFACE WATER ELEVATION)	79.87	80.12	80.70
WATER DEPTH IN POND	0.47 m	0.72 m	1.30 m

OUTLET STRUCTURE DESIGN (RECTANGULAR):

I/ 2 – RECTANGULAR ORIFICES 300 x 300 mm
CREST ELEV. = 79.4
ORIFICE COEFFICIENT = 0.616
II/ 1 – RECTANGULAR WEIR 1.2 x 0.3 m
CREST INVERT ELEV. = 80.0
DISCHARGE COEFFICIENT = 1.84
III/ CULVERT HDPE
DIAMETER = 750 mm
SLOPE = 0.60%
IV/ SPILLWAY 3.0 x 0.2 m (RECT. WEIR)
CREST INVERT ELEV. = 81.1
DISCHARGE COEFFICIENT = 1.84

HYDROLOGICAL MODELING AND CATCHMENT PROPERTIES

Infiltration losses modeled using Horton's infiltration equation

$f(t) = f_c + (f_o - f_c)e^{-k(t)}$

Initial infiltration rate:	76.2 mm/hr
Final infiltration rate:	13.2 mm/hr
Decay Coefficient:	K = 4.14 /hr
Depression Storage:	
Pervious areas:	4.67 mm
Impervious areas:	1.57 mm
N-Pervious:	0.015
N-Impervious:	0.15 (Post) and 0.20 (Pred)

Width of catchment Catchment width: Area / Longest flow path

Default values for the City of Ottawa have been used.

Lockmaster Meadow Subdivision
Dry Pond Storage Stages

Contour Elevation	Depth (Head) (m)	Contour Area (sq.m)	Storage Volume (cu.m)
79.40	**0**	716.28	0
79.50	**0.1**	751.81	73.4
79.60	**0.2**	788.35	150.41
79.70	**0.3**	825.46	231.1
79.80	**0.4**	863.12	315.53
79.90	**0.5**	901.34	403.75
80.00	**0.6**	940.11	495.82
80.10	**0.7**	979.44	591.8
80.20	**0.8**	1019.33	691.74
80.30	**0.9**	1059.77	795.7
80.40	**1**	1100.77	903.73
80.50	**1.1**	1142.33	1015.89
80.60	**1.2**	1184.45	1132.23
80.70	**1.3**	1227.12	1252.81
80.80	**1.4**	1270.34	1377.68
80.90	**1.5**	1314.13	1506.9

Parameters used in SSA input

Manning's Roughness for Overland Flow	
Land Surface Type	**Manning n**
Urban:	
Concrete, Asphalt, or Gravel	0.005 - 0.015
Average Grass Cover	0.40
Rural Residential (1 - 10 acre lots, maintenance or grazing assumed)	0.40
Urban Residential (maintained lawns assumed, with effects of landscaping, driveways, roofs included in combined value):	
1 - 3 building units/acre	0.30
3 - 10 building units/acre	0.20
> 10 building units/acre	0.15
Commercial/Industrial (effects of landscaping, driveways, roofs included in combined value)	0.11
Grass:	
Average Grass Cover	0.40
Poor Grass Cover, Moderately Rough Surface	0.30 - 0.40
Light Turf	0.20
Dense Turf	0.17 - 0.80
Dense Grass	0.17 - 0.30
Bermuda Grass	0.30 - 0.48
Dense Shrubbery and Forest Litter	0.40
Natural:	
Short Grass Prairie	0.10 - 0.20
Poor Grass Cover, Moderately Rough Surface	0.30 - 0.40
Sparse Vegetation	0.05 - 0.13
Oak Grasslands, Open Grasslands	0.60
Dense Cover of Trees and Bushes	0.80
Rangeland:	
Typical	0.13
No Debris Cover	0.09 - 0.34
20% Debris Cover	0.05 - 0.25
Woods:	
Light Underbrush	0.40
Dense Underbrush	0.80
Rural Residential (1 - 10 acre lots, maintenance or grazing assumed)	0.40
Cultivated Areas:	
Bare Packed Soil (free of stone)	0.10
Fallow (no residue)	0.05
Conventional Tillage:	
No Residue	0.06 - 0.12
With Residue	0.16 - 0.22
Chisel Plow:	
No Residue	0.06 - 0.12
With Residue	0.10 - 0.16
Fall Disking (with residue)	0.30 - 0.50
No Till:	
No Residue Cover	0.04 - 0.10
20 - 40% Residue Cover	0.07 - 0.17
60 - 100% Residue Cover	0.17 - 0.47
Rural Residential (1 - 10 acre lots, maintenance or grazing assumed)	0.40

Sources:
-USACE, 1998, HEC-1 Flood Hydrograph Package User's Manual, Hydrologic Engineering Center, Davis, CA
-Soil Conservation Service, 1986, Urban Hydrology for Small Watersheds, Technical Release 55, U.S. Department of Agriculture, Washington, DC

Table for Manning n for Overland Flow for Various Surfaces

SCS Soil Group	f0 (mm.hour)	fc (mm/hour)	k (1/hour)
A	250	25.4	2
B	200	12.7	2
C	125	6.3	2
D	76	2.5	2

Orifice Coefficients

Orifice Coefficients

Orifice Shape	C
Circular	0.614
Triangular	0.615
Square with Vertical Walls	0.616
Rectangular	
Side ratio of 4:1, long side in vertical direction	0.626
Side ratio of 4:1, long side in horizontal direction	0.627
Side ratio of 10:1, long side in vertical direction	0.637
Side ratio of 10:1, long side in horizontal direction	0.637

Source: Brater and King, 1976.

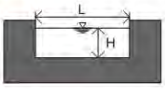
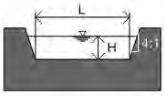
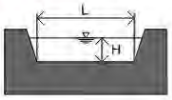
Infiltration Rates

Typical Infiltration Rates

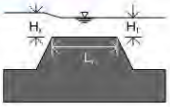
Surface	Infiltration	
	US Units	Metric Unit
Dry Soils (with Little or no Vegetation):		
Sandy Soils	5.00 in/hr	127 mm/hr
Loam Soils	3.00 in/hr	76 mm/hr
Clay Soils	1.00 in/hr	25 mm/hr
Dry Soils (with Dense Vegetation):		
Sandy Soils	10.00 in/hr	254 mm/hr
Loam Soils	6.00 in/hr	152 mm/hr
Clay Soils	2.00 in/hr	51 mm/hr
Moist Soils (with Little or no Vegetation, which have Drained but not Dried Out, i.e., Field Capacity):		
Sandy Soils	1.50 in/hr	38 mm/hr
Loam Soils	1.00 in/hr	25 mm/hr
Clay Soils	0.30 in/hr	8 mm/hr
Moist Soils (with Dense Vegetation, which have Drained but not Dried out, i.e., Field Capacity):		
Sandy Soils	3.50 in/hr	89 mm/hr
Loam Soils	2.00 in/hr	51 mm/hr
Clay Soils	0.70 in/hr	18 mm/hr
Moist Soils (Close to Saturation) :		
Use value close to Minimum Infiltration Rate (see below)		
Moist Soils (with Little or no Vegetation, which have Partially Dried Out, i.e., Field Capacity):		
Sandy Soils	2.00 - 3.30 in/hr	51 - 84 mm/hr
Loam Soils	1.20 - 2.00 in/hr	30 - 51 mm/hr
Clay Soils	0.40 - 0.70 in/hr	10 - 18 mm/hr
Moist Soils (with Dense Vegetation, which have Partially Dried Out, i.e., Field Capacity):		
Sandy Soils	4.00 - 6.50 in/hr	102 - 165 mm/hr
Loam Soils	2.50 - 4.00 in/hr	64 - 101 mm/hr
Clay Soils	0.80 - 1.30 in/hr	20 - 33 mm/hr

Table for Horton Infiltration Rates For Various Soils

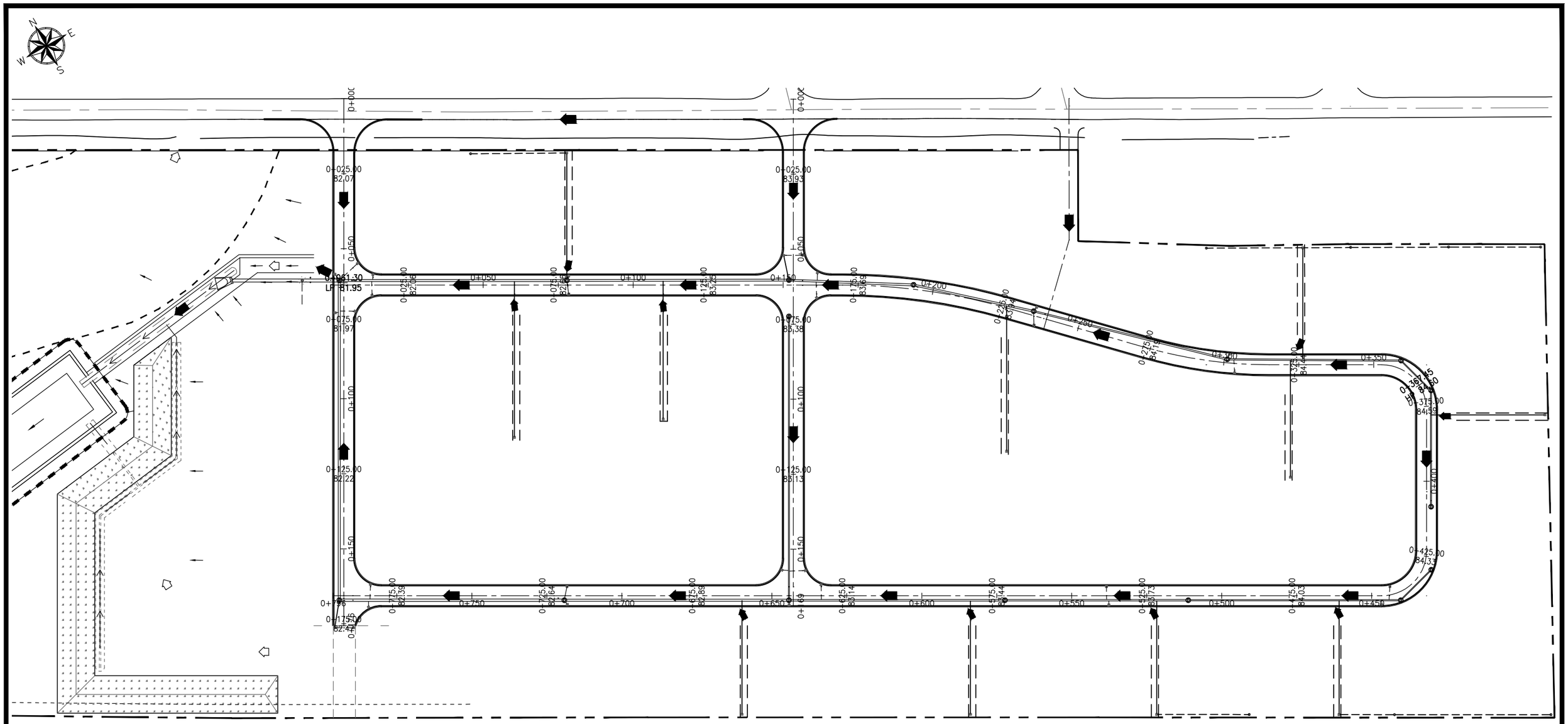
Sharp Crested

Weir Type	Equation	Coefficients
Rectangular	 Contracted: $Q = C(L - 0.1iH)H^{3/2}$ Suppressed: $Q = CLH^{3/2}$	US Units: C = 3.33 Metric Units: C = 1.840 i = Number of Contractions
V-Notch (Triangular)	 $Q = C\tan\frac{\theta}{2}H^{\frac{5}{2}}$	US Units: C = 2.40 - 2.80 Metric Units: C = 1.35 - 1.55
Cipoletti	 $Q = CLH^{3/2}$	US Units: C = 3.367 Metric Units: C = 1.840
Trapezoidal	 $Q = C_w LH^{\frac{3}{2}} + C_{ws}\tan\frac{\theta}{2}H^{\frac{5}{2}}$	US Units: C_w = 3.33 C_{ws} = 1.84 Metric Units: C_w = 2.40 - 2.80 C_{ws} = 1.35 - 1.55

Broad Crested

Weir Type	Equation	Coefficients
Broad (Side View)	 $Q = CL_c H_1^{3/2}$	US Units: C = 2.63 - 3.40 Metric Units: C = 1.45 - 1.88

Source:
(1)Gupta, R. S., Hydrology and Hydraulic Systems, Second Edition, Waveland Press, Long Grove, Illinois.
(2)Streeter, V. L. and Wylie, E. B., Fluid Mechanics, Second Edition, McGraw-Hill, New York, New York.



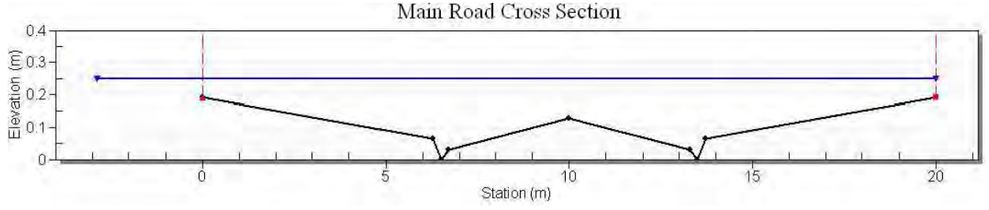
LEGEND

84.00 ELEVATION

OVERLAND FLOW – MAJOR SYSTEM

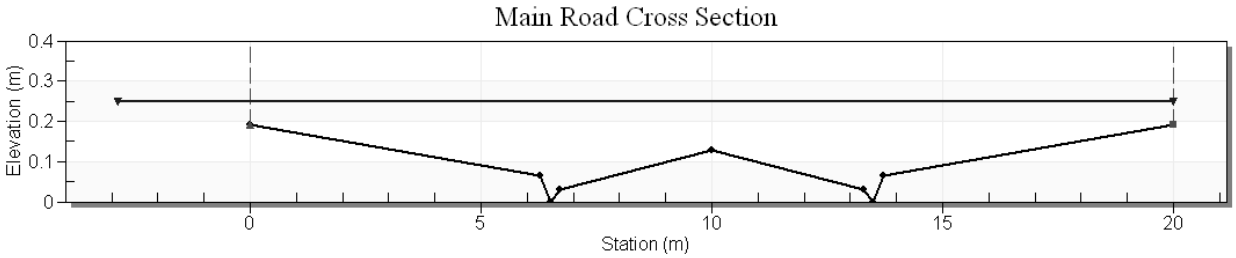
LP: LOW POINT (SAG)
HP: HIGH POINT (CREST)

Main Road Cross Section



PROJECT NAME AND ADDRESS: LOCKMASTER'S MEADOW SUBDIVISION CARDINAL	DRAWING TITLE: STORMWATER MAJOR SYSTEM	SCALE: 1:1500 DATE: 02-06-2024	DRAWING No.: ST-3

MAJOR SYSTEM DESIGN



User-Defined Cross S...

Channel File

Browse for Existing .TW File — Import...

Channel

Slope of Channel: 0.0050 m/m

Number of Cross-sec: 9

Irregular Channel Cross-Section

No.	Station (m)	Elevation (m)	Manning n
1	0.000	0.192	0.0350
2	6.270	0.065	0.0130
3	6.508	0.000	0.0130
4	6.710	0.030	0.0130
5	10.000	0.129	0.0130
6	13.290	0.030	0.0350
7	13.500	0.000	0.0350
8	13.730	0.065	0.0350
9	20.000	0.192	

Plot — Plot Manning's n values

OK — Cancel

Main Rd Cross Section

Type: Cross Section — Define...

Side Slope 1 (Z1): 0.0 H : 1V

Side Slope 2 (Z2): 0.0 H : 1V

Channel Width (B): 8.49999996 (m)

Pipe Diameter (D): 0.60000001 (m)

Longitudinal Slope: 0.005 (m/m)

Manning's Roughness: 0.0189

Enter Flow: 2.887 (cms)

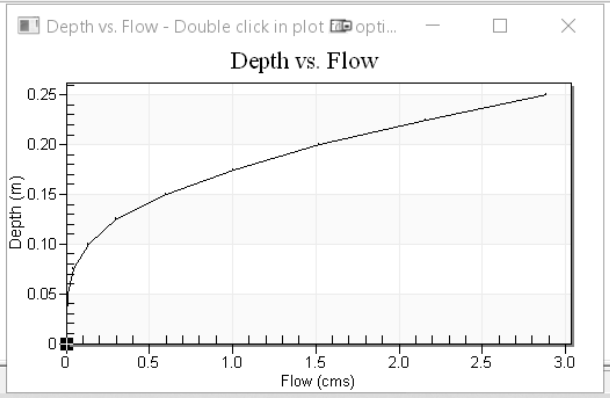
Enter Depth: 0.250 (m)

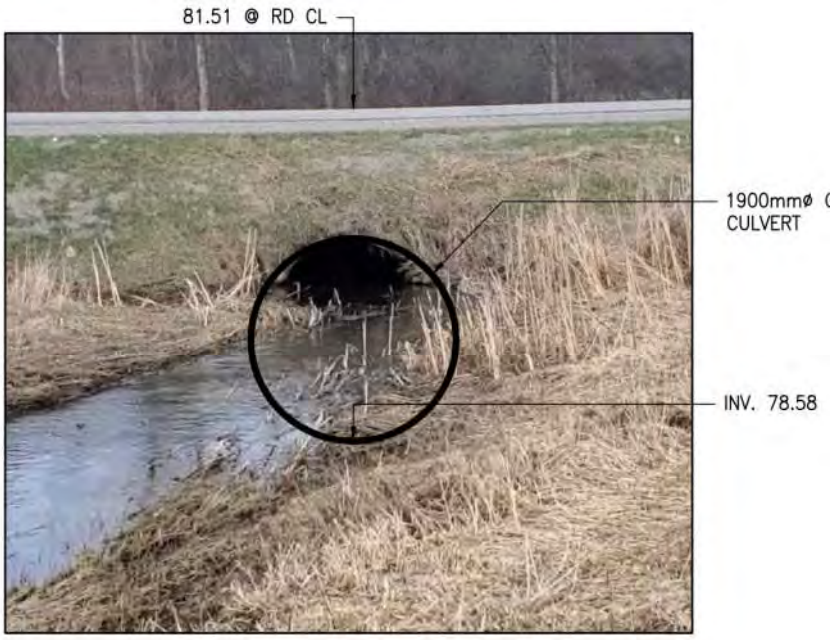
Calculate

Plot... — Compute Curves...

Parameter	Value	Units
Flow	2.887	cms
Depth	0.250	m
Area of Flow	2.844	m^2
Wetted Perimeter	20.144	m
Hydraulic Radius	0.141	m
Average Velocity	1.015	m/s
Top Width (T)	20.000	m
Froude Number	0.859	
Critical Depth	0.236	m
Critical Velocity	1.123	m/s
Critical Slope	0.006...	m/m
Critical Top Width	20.000	m
Calculated Max Shear...	12.253	N/m...
Calculated Avg Shear...	6.920	N/m...
Composite Manning's...	Lotter...	

OK — Cancel





CTY RD CULVERT – UPSTREAM SIDE

Type: Circular Define...

Side Slope 1 (Z1): 3.0 H : 1V

Side Slope 2 (Z2): 3.0 H : 1V

Channel Width (B): 0.0 (m)

Pipe Diameter (D): 1.9000000 (m)

Longitudinal Slope: 0.01 (m/m)

Manning's Roughness: 0.0240

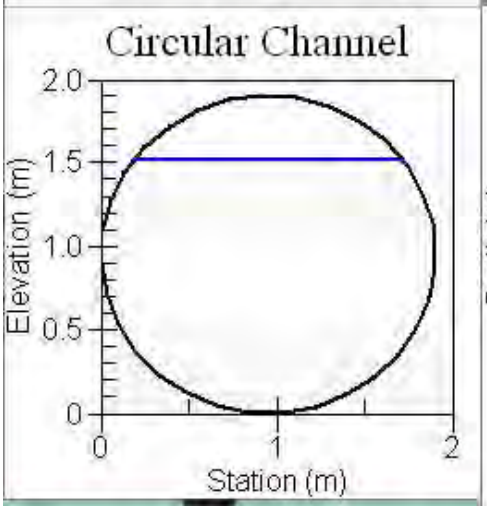
Enter Flow: 7.000 (cms)

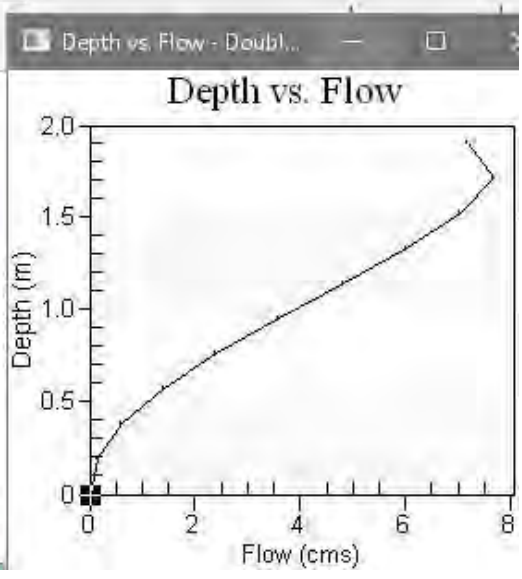
Enter Depth: 1.513 (m)

Calculate

Plot... Compute Curves...

Parameter	Value	Units
Flow	7.000	cms
Depth	1.513	m
Area of Flow	2.422	m^2
Wetted Perimeter	4.191	m
Hydraulic Radius	0.578	m
Average Velocity	2.891	m/s
Top Width (T)	1.530	m
Froude Number	0.733	
Critical Depth	1.299	m
Critical Velocity	3.389	m/s
Critical Slope	0.01439	m/m
Critical Top Width	1.767	m
Calculated Max Shear Stress	148.345	N/m^2
Calculated Avg Shear Stress	56.640	N/m^2





12M Cross Section

Type: Rectangular — Define...

Side Slope 1 (Z1):	0.0	H : 1V
Side Slope 2 (Z2):	0.0	H : 1V
Channel Width (B):	12.5	(m)
Pipe Diameter (D):	0.60000001	(m)
Longitudinal Slope:	0.005	(m/m)
Manning's Roughness:	0.0350	

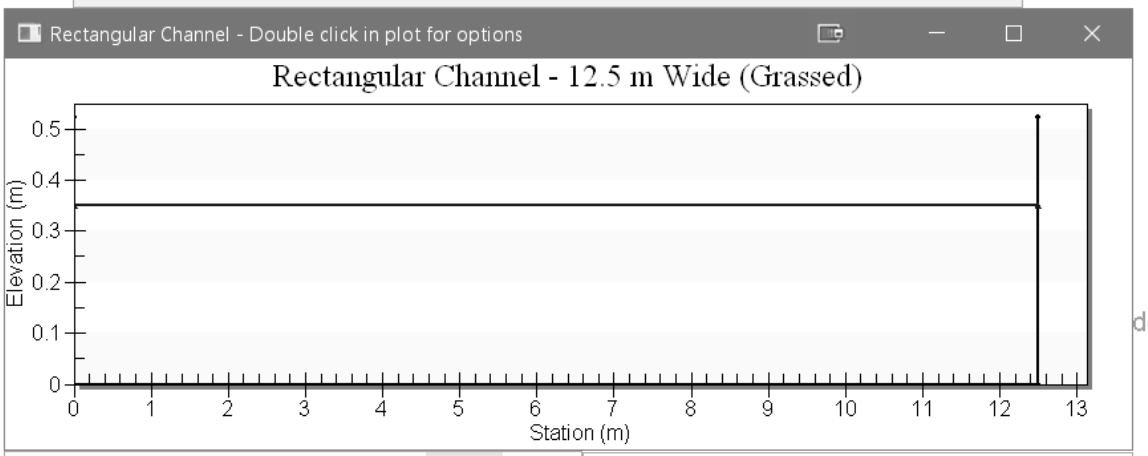
Enter Flow:	4.233	(cms)
Enter Depth:	0.350	(m)

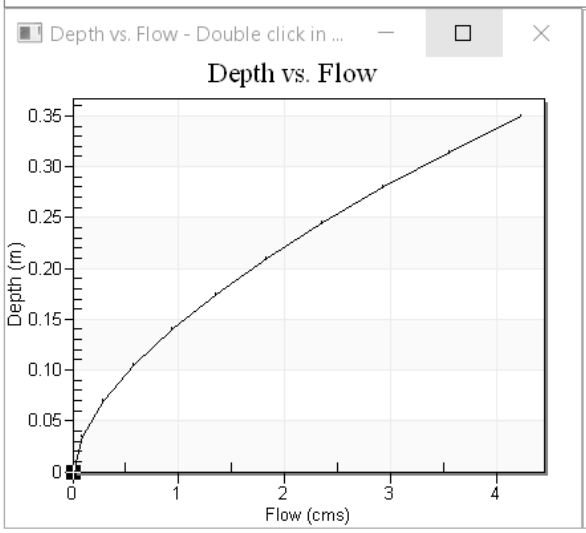
Calculate

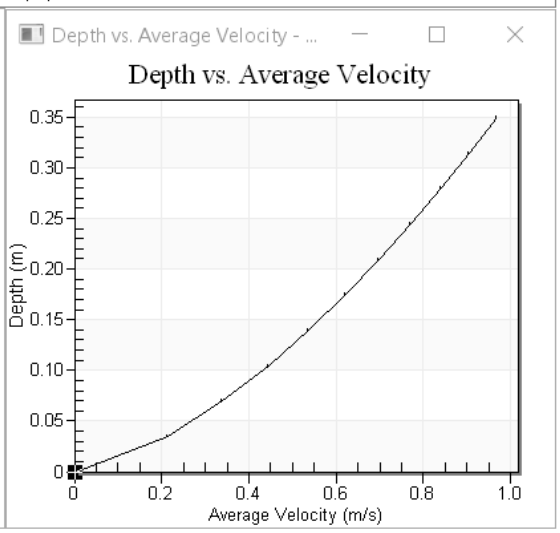
Plot... Compute Curves...

Parameter	Value	Units
Flow	4.233	cms
Depth	0.350	m
Area of Flow	4.375	m^2
Wetted Perimeter	13.200	m
Hydraulic Radius	0.331	m
Average Velocity	0.968	m/s
Top Width (T)	12.500	m
Froude Number	0.522	
Critical Depth	0.227	m
Critical Velocity	1.492	m/s
Critical Slope	0.020...	m/m
Critical Top Width	12.500	m
Calculated Max Shear...	17.154	N/m...
Calculated Avg Shear...	16.244	N/m...

OK Cancel







Type: Circular | Define...

Side Slope 1 (Z1):	3.0	H : 1V
Side Slope 2 (Z2):	3.0	H : 1V
Channel Width (B):	0.0	(m)
Pipe Diameter (D):	3	(m)
Longitudinal Slope:	0.01	(m/m)
Manning's Roughness:	0.0130	

Enter Flow: 1.947 (cms)

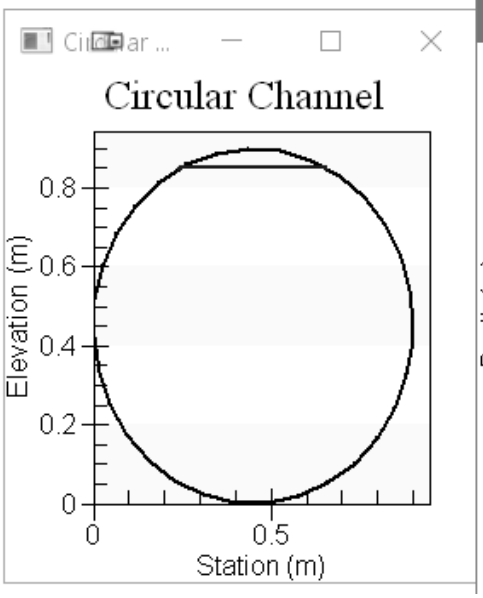
Enter Depth: 0.850 (m)

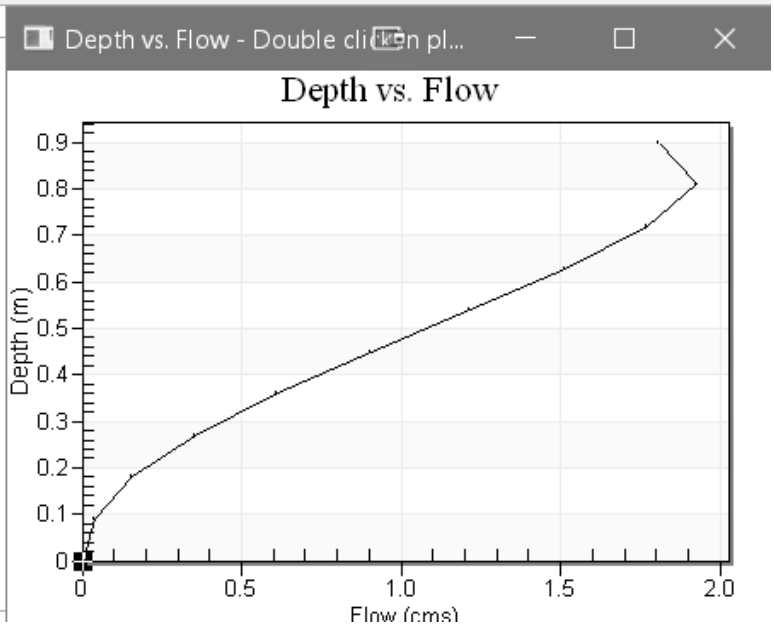
Calculate

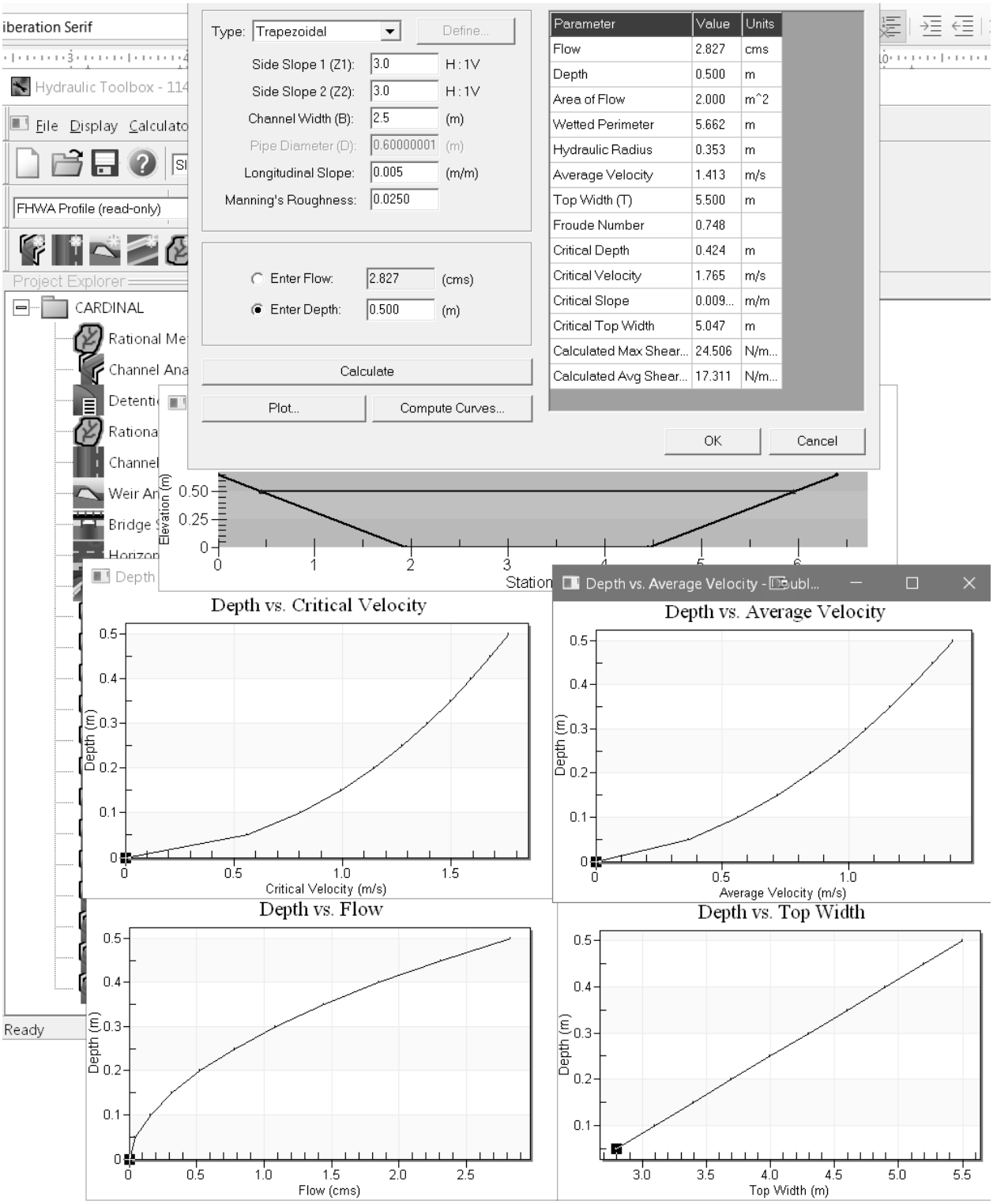
Plot... | Compute Curves...

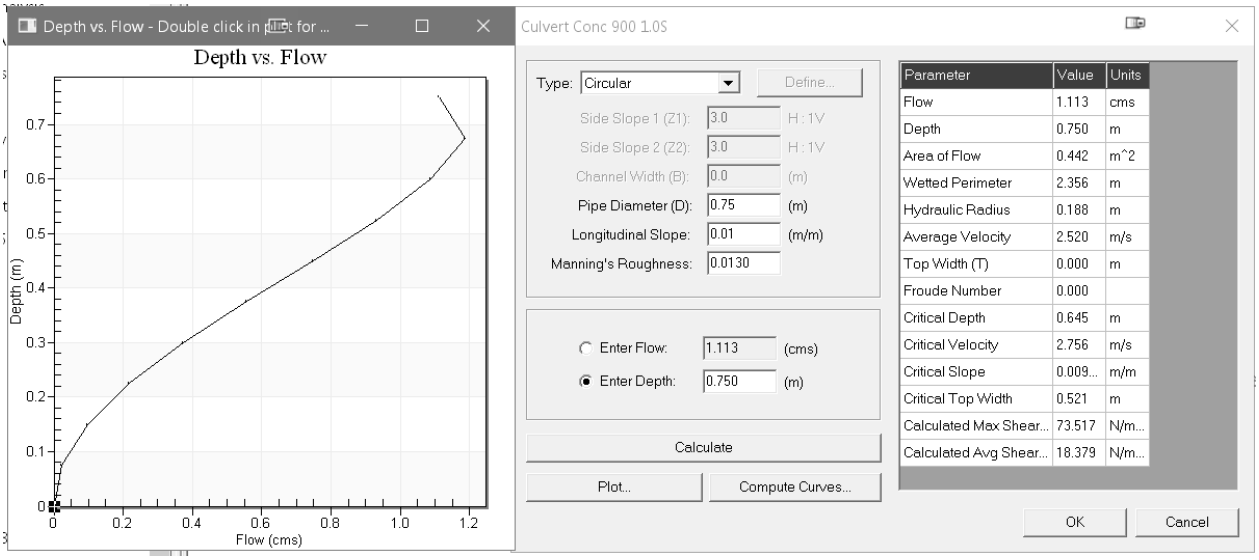
Parameter	Value	Units
Flow	1.947	cms
Depth	0.850	m
Area of Flow	0.622	m^2
Wetted Perimeter	2.399	m
Hydraulic Radius	0.259	m
Average Velocity	3.129	m/s
Top Width (T)	0.412	m
Froude Number	0.813	
Critical Depth	0.803	m
Critical Velocity	3.248	m/s
Critical Slope	0.010...	m/m
Critical Top Width	0.557	m
Calculated Max Shear...	83.319	N/m...
Calculated Avg Shear...	25.424	N/m...

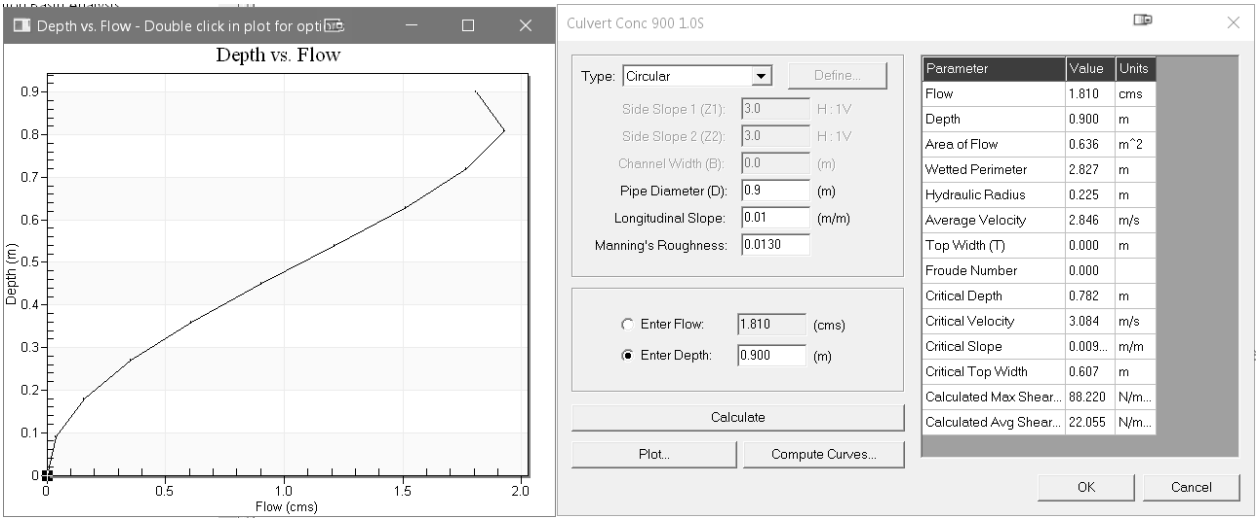
OK | Cancel






Type: Trapezoidal
Define...
Side Slope 1 (Z1): 3.0 H : 1V
Side Slope 2 (Z2): 3.0 H : 1V
Channel Width (B): 2.5 (m)
Pipe Diameter (D): 0.60000001 (m)
Longitudinal Slope: 0.005 (m/m)
Manning's Roughness: 0.0250
Enter Flow: 2.827 (cms)
Enter Depth: 0.500 (m)
Calculate
Plot...
Compute Curves...
OK
Cancel
Parameter | Value | Units
Flow | 2.827 | cms
Depth | 0.500 | m
Area of Flow | 2.000 | m^2
Wetted Perimeter | 5.662 | m
Hydraulic Radius | 0.353 | m
Average Velocity | 1.413 | m/s
Top Width (T) | 5.500 | m
Froude Number | 0.748 |
Critical Depth | 0.424 | m
Critical Velocity | 1.765 | m/s
Critical Slope | 0.009... | m/m
Critical Top Width | 5.047 | m
Calculated Max Shear... | 24.506 | N/m...
Calculated Avg Shear... | 17.311 | N/m...
Project Explorer
CARDINAL
Ready
Elevation (m)
Station
Depth vs. Critical Velocity
Depth (m)
Critical Velocity (m/s)
Depth vs. Average Velocity
Average Velocity (m/s)
Depth vs. Flow
Flow (cms)
Depth vs. Top Width
Top Width (m)


Depth vs. Flow - Double click in plot for ...
Depth vs. Flow
Depth (m)
Flow (cms)
Culvert Conc 900 1.0S
Type: Circular
Define...
Side Slope 1 (Z1): 3.0 H : 1V
Side Slope 2 (Z2): 3.0 H : 1V
Channel Width (B): 0.0 (m)
Pipe Diameter (D): 0.75 (m)
Longitudinal Slope: 0.01 (m/m)
Manning's Roughness: 0.0130
Enter Flow: 1.113 (cms)
Enter Depth: 0.750 (m)
Calculate
Plot...
Compute Curves...
OK
Cancel
Parameter | Value | Units
Flow | 1.113 | cms
Depth | 0.750 | m
Area of Flow | 0.442 | m^2
Wetted Perimeter | 2.356 | m
Hydraulic Radius | 0.188 | m
Average Velocity | 2.520 | m/s
Top Width (T) | 0.000 | m
Froude Number | 0.000
Critical Depth | 0.645 | m
Critical Velocity | 2.756 | m/s
Critical Slope | 0.009... | m/m
Critical Top Width | 0.521 | m
Calculated Max Shear... | 73.517 | N/m...
Calculated Avg Shear... | 18.379 | N/m...


Depth vs. Flow - Double click in plot for opti
Depth vs. Flow
Depth (m)
Flow (cms)
Culvert Conc 900 1.0S
Type: Circular
Define...
Side Slope 1 (Z1): 3.0 H : 1V
Side Slope 2 (Z2): 3.0 H : 1V
Channel Width (B): 0.0 (m)
Pipe Diameter (D): 0.9 (m)
Longitudinal Slope: 0.01 (m/m)
Manning's Roughness: 0.0130
Enter Flow: 1.810 (cms)
Enter Depth: 0.900 (m)
Calculate
Plot...
Compute Curves...
OK
Cancel
Parameter | Value | Units
Flow | 1.810 | cms
Depth | 0.900 | m
Area of Flow | 0.636 | m^2
Wetted Perimeter | 2.827 | m
Hydraulic Radius | 0.225 | m
Average Velocity | 2.846 | m/s
Top Width (T) | 0.000 | m
Froude Number | 0.000
Critical Depth | 0.782 | m
Critical Velocity | 3.084 | m/s
Critical Slope | 0.009... | m/m
Critical Top Width | 0.607 | m
Calculated Max Shear... | 88.220 | N/m...
Calculated Avg Shear... | 22.055 | N/m...

Project: Lockmaster's Meadow Subdivision

Ottawa Sewer Guidelines Model

STORM SEWER DESIGN CALCULATION SHEET (RATIONAL METHOD)

Return frequency = 5 years

LOCATION				RUNOFF FLOW							SEWER DESIGN								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Street Name	From JUNC.	To JUNC.	Catchment	Indiv Area (ha)	Indiv R (See tables)	Indiv. 2.78 AR	Accum. 2.78 AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Peak Flow Q_p (m^3/s)	Pipe Nominal Dia. (mm)	Pipe Actual Int. Dia. (mm)	Type of Pipe	Slope s %	Length (m)	Pipe Capacity Q_f (m^3/s)	Full Flow Velocity V_f (m/s)	Time of Flow (min)	Q_p / Q_f %
Street B	101	103	A1	0.1855	0.56	0.29	0.29	10.00	104.2	**0.030**	300	300	DR35	0.65	38.8	0.078	1.10	**0.59**	**39%**
Street B	103	105		0.0000	0.56	0.00	0.29	10.59	101.2	**0.029**	300	300	DR35	0.55	14.1	0.072	1.01	**0.23**	**41%**
Street B	105	107	A2	0.1336	0.56	0.21	0.50	10.82	100.1	**0.061**	450	457	Conc.	0.30	57.9	0.163	0.99	**0.97**	**38%**
			A3	0.0748	0.56	0.12	0.61												
Street B	107	109	A4	0.2038	0.56	0.32	0.93	11.79	95.6	**0.109**	450	457	Conc.	0.62	66.5	0.234	1.43	**0.78**	**47%**
			A5	0.1376	0.56	0.21	1.14												
Street B	109	111	A6	0.2324	0.56	0.36	1.51	12.57	92.3	**0.189**	525	533	Conc.	0.32	41.0	0.253	1.14	**0.60**	**74%**
			A7	0.2735	0.56	0.43	1.93												
			A8	0.0709	0.56	0.11	2.04												
Street B	111	113	A9	0.3564	0.56	0.55	2.60	13.17	90.0	**0.259**	600	610	Conc.	0.32	41.6	0.363	1.24	**0.56**	**71%**
			A10	0.1775	0.56	0.28	2.87												
Street B	113	115	A11	0.0680	0.56	0.11	2.98	13.73	87.9	**0.277**	600	610	Conc.	0.59	74.1	0.493	1.69	**0.73**	**56%**
			A12	0.0375	0.56	0.06	3.04												
			A13	0.0738	0.56	0.11	3.15												
Street B	115	117	A14	0.1978	0.56	0.31	3.46	14.46	85.3	**0.419**	600	610	Conc.	0.62	75.9	0.505	1.73	**0.73**	**83%**
			A15	0.1867	0.56	0.29	3.75												
			A16	0.1747	0.56	0.27	4.02												
			A17	0.2674	0.56	0.42	4.44												
			A18	0.1676	0.56	0.26	4.70												
			A19	0.1328	0.56	0.21	4.91												
Street B	121	123	_	0.0000	0.56	0.00	0.00	10.00	104.2	**0.000**	300	300	DR35	0.65	14.4	0.078	1.10	**0.22**	**0%**
Street B	123	125	A21	0.3133	0.56	0.49	0.49	10.22	103.1	**0.088**	375	381	DR35	0.36	70.9	0.110	0.96	**1.23**	**80%**
			A22	0.0692	0.56	0.11	0.60												
			A23	0.1666	0.56	0.26	0.85												
Street B	125	127	A24	0.0911	0.56	0.14	1.00	11.45	97.1	**0.193**	525	533	Conc.	0.35	61.1	0.265	1.19	**0.86**	**73%**
			A25	0.2445	0.56	0.38	1.38												
			A26	0.3912	0.56	0.61	1.99												
Street B	127	129	A27	0.1042	0.56	0.16	2.15	12.30	93.4	**0.247**	525	533	Conc.	0.32	72.0	0.253	1.14	**1.06**	**97%**
			A29	0.3162	0.56	0.49	2.64												
Street A	135	129	A30	0.3435	0.56	0.53	0.53	10.00	104.2	**0.095**	375	381	DR35	0.40	94.6	0.116	1.01	**1.55**	**83%**
			A31	0.2449	0.56	0.38	0.92												
				AT NODE 129			3.56	13.36	89.3	**0.317**									
Street B	129	131	A28	0.2532	0.56	0.39	3.95	13.36	89.3	**0.375**	600	610	Conc.	0.37	74.9	0.390	1.34	**0.93**	**96%**
			A32	0.1626	0.56	0.25	4.20												
Street B	131	133	A33	0.1954	0.56	0.30	4.51	14.29	85.9	**0.449**	675	686	Conc.	0.28	75.0	0.464	1.26	**0.99**	**97%**
			A34	0.1642	0.56	0.26	4.76												
			A35	0.1662	0.56	0.26	5.02												
			A36	0.1306	0.56	0.20	5.23												
Street C	133	117	A38	0.0310	0.56	0.05	5.27	15.29	82.6	**0.528**	675	686	Conc.	0.46	106.6	0.595	1.61	**1.10**	**89%**
			A39	0.0305	0.56	0.05	5.32												
			A40	0.3664	0.56	0.57	5.89												
			A41	0.3189	0.56	0.50	6.39												

				AT NODE 117														
STREET B					**FROM 115**		4.91	14.46	85.3									
STREET C					**FROM 133**		6.39	16.39	79.3									
						TOTAL	11.30											
Street C	**117**	**119 stc**	**A20**	**0.0848**	**0.56**	0.13	11.43	16.39	79.3	**0.912**	900	914	Conc.	0.65	12.4	1.521	2.32	**0.09**	**60%**
			A43	**0.0477**	**0.56**	0.07	11.50											
				AT NODE 119														
PARK	**119**	**121**		**0.0000**	**0.56**	0.00	11.50	**16.48**	79.056	**0.909**	900	914	Conc.	0.63	23.8	1.497	2.28	**0.17**	**61%**
							at outfall	16.656	78.564	**0.904**									
			CHECK TOTAL CATCHMENT																
			AREA=	**7.3885**	**ha**		NOTE: CONCRETE TRAPEZOIDAL CHANNELS COULD BE USED INSTEAD OF CONCRETE PIPES IN PARK AND LEADING TO THE DETENTION POND.											
			I=	**78.563**	**mm/hr**														
			C=	**0.56**															
			Qp=	**2.78*C*I*A=**	**0.904 m³/s**														

Definitions:
Q = Peak Flow in Litres per Second (L/s)
Q = 2.78 *A*I*R , where
Q = Peak Flow in Litres per Second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R= Runoff Coefficient

Q_{full} = 23.976 x $D^{8/3}$ x $S^{1/2}$ (for n = 0.013, D in metres)

Notes:
1- Manning formula used to calculate flow capacities
2- Hydraulic Toolbox software was used to calculate capacities and depths of flows
3- No projected carryover flow from east and west sides of the property
4- Minimum Tc is 10 min as per Ottawa Design Guidelines
5- Minimum permissible velocity in sewer: 0.76 m/s
6- Full flow velocity: V_{full} = 30.527 x $D^{2/3}$ x $S^{1/2}$ (for n = 0.013, D in metres)
7- The maximum flowing full velocity shall not be greater than 3.65 m/s.
8- Manholes shall be placed at the upstream end of each line, changes in size and material, at pipe
9- Manholes may be either pre-cast or poured/cast-in-place and shall be designed and constructed in accordance with Ontario Provincial Standard Drawings (OPSD) and Specifications.
10- All leads from catchbasins shall be 200 mm diameter PVC pipes

Hydraulic Design
Roughness coefficient (n) in Manning equation:
PVC Pipe (DR35): n = 0.013
Concrete Pipe: n = 0.013
Concrete Culvert (smooth): n= 0.013
Grassed Channel: n=0.035

Rainfall Intensity Curves for Ottawa:
5 year rainfall intensity: $I_5 = (998.071)/((T_c + 6.053)^{0.814})$
25 year rainfall intensity: $I_{25} = (1402.884)/((T_c + 6.018)^{0.819})$
50 year rainfall intensity: $I_{50} = (1569.58)/((Tc + 6.014)^{0.82})$
100 year rainfall intensity: $I_{100} = (1735.688)/((Tc + 6.014)^{0.82})$

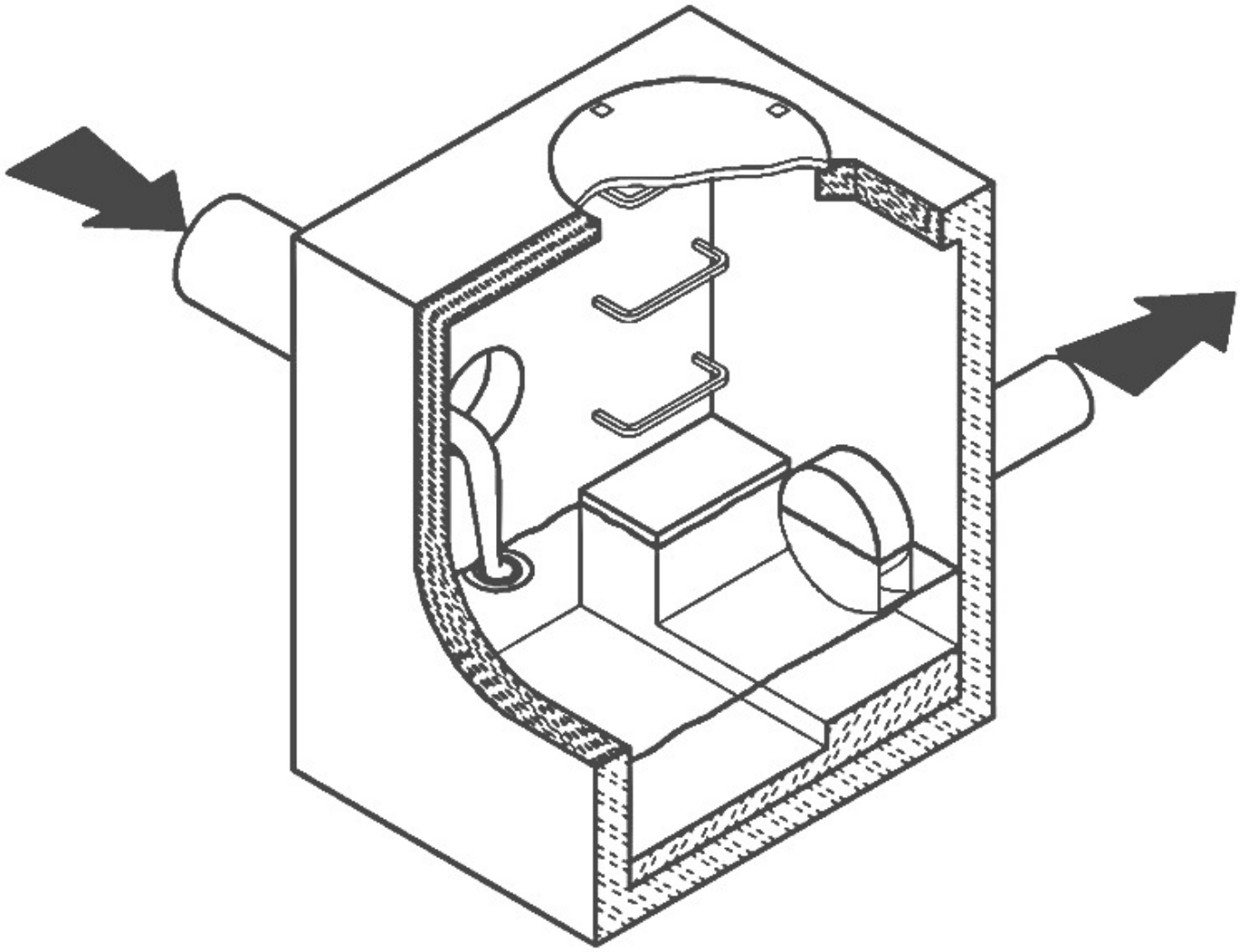
Street Names
Street A: Balsam St
Street B: Lockhouse St
Street C: Conifer Ln

APPENDIX - D

CSO/STORMWATER MANAGEMENT

HYDROVEX® VHV / SVHV

Vertical Vortex Flow Regulator



JOHN MEUNIER

APPLICATIONS

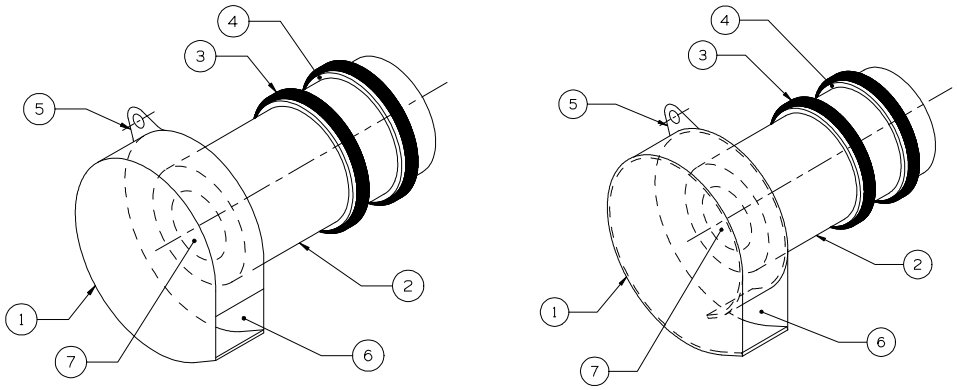
One of the major problems of urban wet weather flow management is the runoff generated after a heavy rainfall. During a storm, uncontrolled flows may overload the drainage system and cause flooding. Due to increased velocities, sewer pipe wear is increased dramatically and results in network deterioration. In a combined sewer system, the wastewater treatment plant may also experience significant increases in flows during storms, thereby losing its treatment efficiency.

A simple means of controlling excessive water runoff is by controlling excessive flows at their origin (manholes). **John Meunier Inc.** manufactures the **HYDROVEX® VHV / SVHV** line of vortex flow regulators to control stormwater flows in sewer networks, as well as manholes.

The vortex flow regulator design is based on the fluid mechanics principle of the forced vortex. This grants flow regulation without any moving parts, thus reducing maintenance. The operation of the regulator, depending on the upstream head and discharge, switches between orifice flow (gravity flow) and vortex flow. Although the concept is quite simple, over 12 years of research have been carried out in order to get a high performance.

The **HYDROVEX® VHV / SVHV** Vertical Vortex Flow Regulators **(refer to Figure 1)** are manufactured entirely of stainless steel, and consist of a hollow body (**1**) (in which flow control takes place) and an outlet orifice (**7**). Two rubber "O" rings (**3**) seal and retain the unit inside the outlet pipe. Two stainless steel retaining rings (**4**) are welded on the outlet sleeve to ensure that there is no shifting of the "O" rings during installation and use.

1. **BODY**
2. **SLEEVE**
3. **O-RING**
4. **RETAINING RINGS (SQUARE BAR)**
5. **ANCHOR PLATE**
6. **INLET**
7. **OUTLET ORIFICE**



VHV ***SVHV***

FIGURE 1: HYDROVEX® VHV-SVHV VERTICAL VORTREX FLOW REGULATORS

ADVANTAGES

- The **HYDROVEX® VHV / SVHV** line of flow regulators are manufactured entirely of stainless steel, making them durable and corrosion resistant.
- Having no moving parts, they require minimal maintenance.
- The geometry of the **HYDROVEX® VHV / SVHV** flow regulators allows a control equal to an orifice plate, having a cross section area 4 to 6 times smaller. This decreases the chance of blockage of the regulator, due to sediments and debris found in stormwater flows. **Figure 2** illustrates the comparison between a regulator model 100 SVHV-2 and an equivalent orifice plate. One can see that for the same height of water, the regulator controls a flow approximately four times smaller than an equivalent orifice plate.
- Installation of the **HYDROVEX® VHV / SVHV** flow regulators is quick and straightforward and is performed after all civil works are completed.
- Installation requires no special tools or equipment and may be carried out by any contractor.
- Installation may be carried out in existing structures.

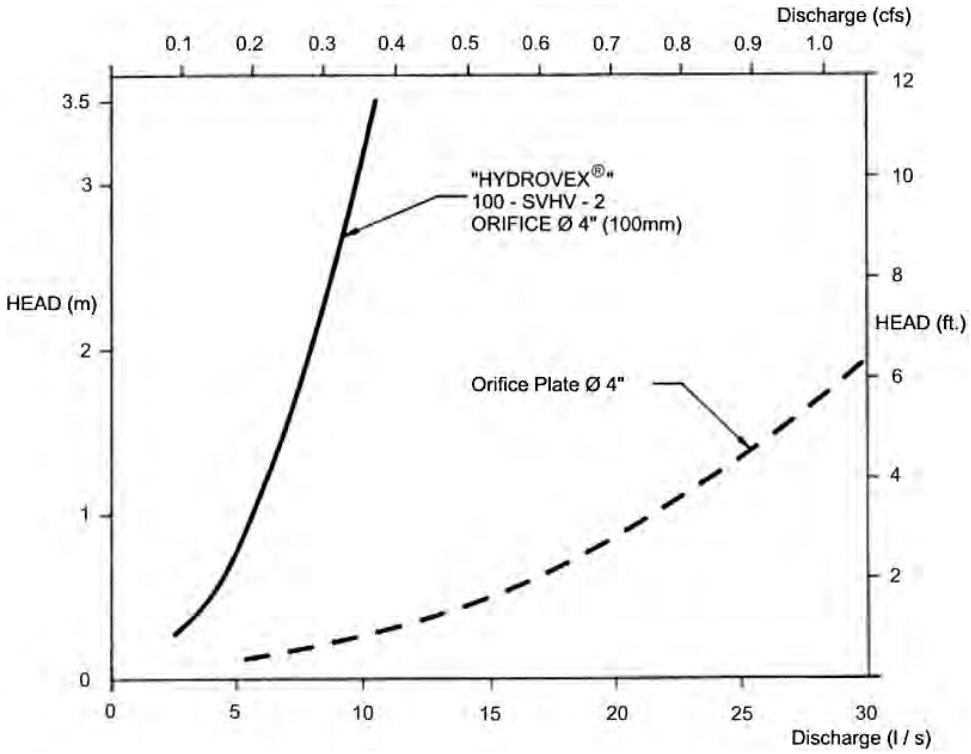


FIGURE 2: DISCHARGE CURVE SHOWING A HYDROVEX® FLOW REGULATOR VS AN ORIFICE PLATE

SELECTION

Selection of a **VHV or SVHV** regulator can be easily made using the selection charts found at the back of this brochure (see **Figure 3)**. These charts are a graphical representation of the maximum upstream water pressure (head) and the maximum discharge at the manhole outlet. The maximum design head is the difference between the maximum upstream water level and the invert of the outlet pipe. All selections should be verified by John Meunier Inc. personnel prior to fabrication.

Example:

✓ Maximum design head	2m (6.56 ft.)
✓ Maximum discharge	6 L/s (0.2 cfs)
✓ Using **Figure 3** - VHV	model required is a **75 VHV-1**

INSTALLATION REQUIREMENTS

All **HYDROVEX® VHV / SVHV** flow regulators can be installed in circular or square manholes. **Figure 4** gives the various minimum dimensions required for a given regulator. ***It is imperative to respect the minimum clearances shown to ensure easy installation and proper functioning of the regulator.***

SPECIFICATIONS

In order to specify a **HYDROVEX®** regulator, the following parameters must be defined:

- The model number (ex: 75-VHV-1)
- The diameter and type of outlet pipe (ex: 6" diam. SDR 35)
- The desired discharge (ex: 6 l/s or 0.21 CFS)
- The upstream head (ex: 2 m or 6.56 ft.) *
- The manhole diameter (ex: 36" diam.)
- The minimum clearance "H" (ex: 10 inches)
- The material type (ex: 304 s/s, 11 Ga. standard)

* ***Upstream head is defined as the difference in elevation between the maximum upstream water level and the invert of the outlet pipe where the HYDROVEX® flow regulator is to be installed.***

PLEASE NOTE THAT WHEN REQUESTING A PROPOSAL, WE SIMPLY REQUIRE THAT YOU PROVIDE US WITH THE FOLLOWING:

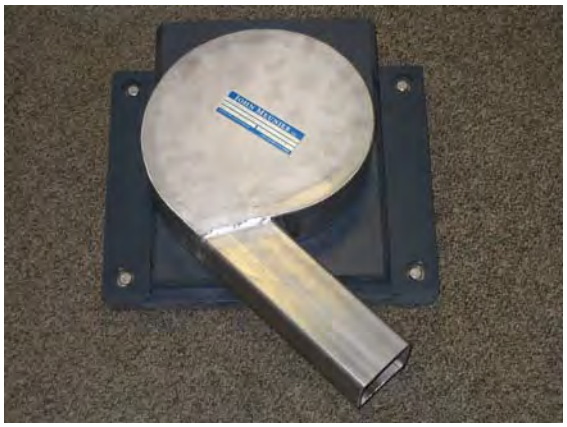
- ***project design flow rate***
- ***pressure head***
- ***chamber's outlet pipe diameter and type***

Typical VHV model in factory

OPTIONS

FV – SVHV (mounted on sliding plate)

VHV-1-O (standard model with odour control inlet)



FV – VHV-O (mounted on sliding plate with odour control inlet)

VHV with Gooseneck assembly in existing chamber without minimum release at the bottom

VHV with air vent for minimal slopes

HYDROVEX®

VHV Vertical Vortex Flow Regulator

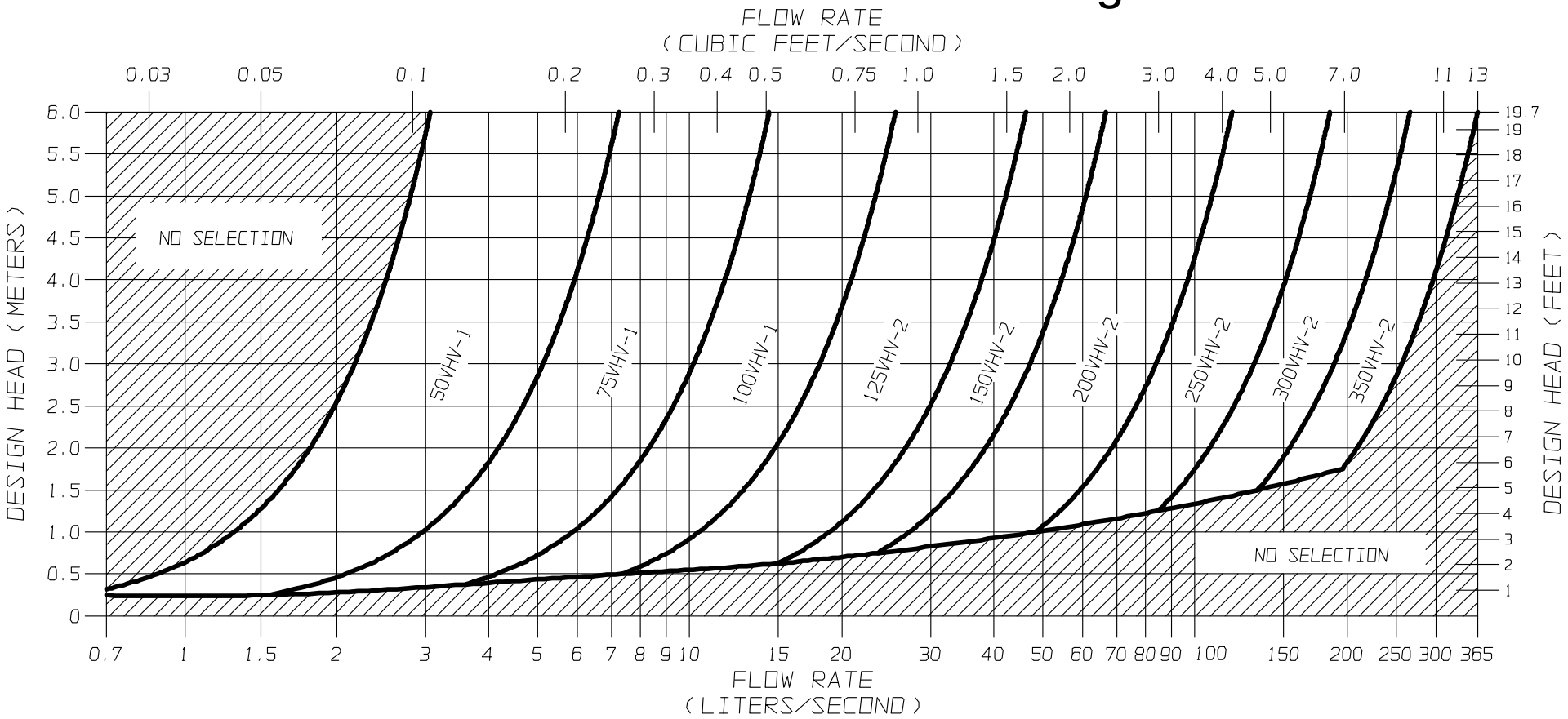
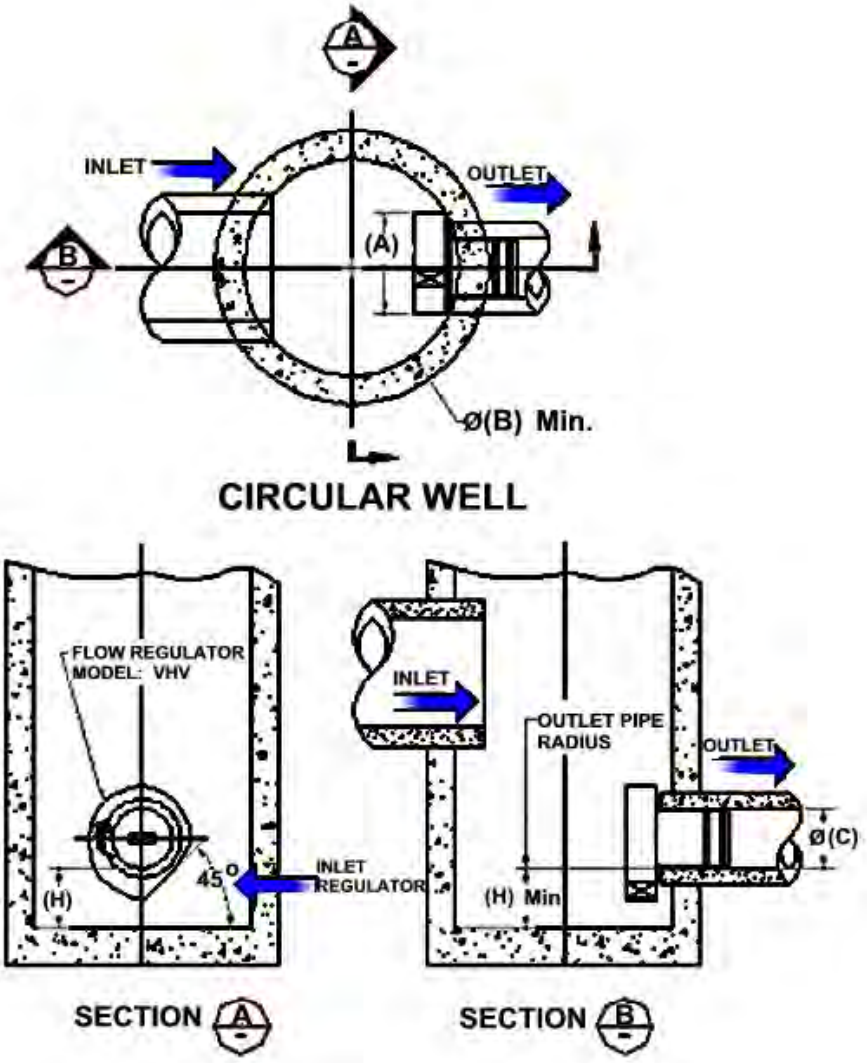


FIGURE 3 - VHV

JOHN MEUNIER

FLOW REGULATOR TYPICAL INSTALLATION IN CIRCULAR MANHOLE
FIGURE 4 (MODEL VHV)

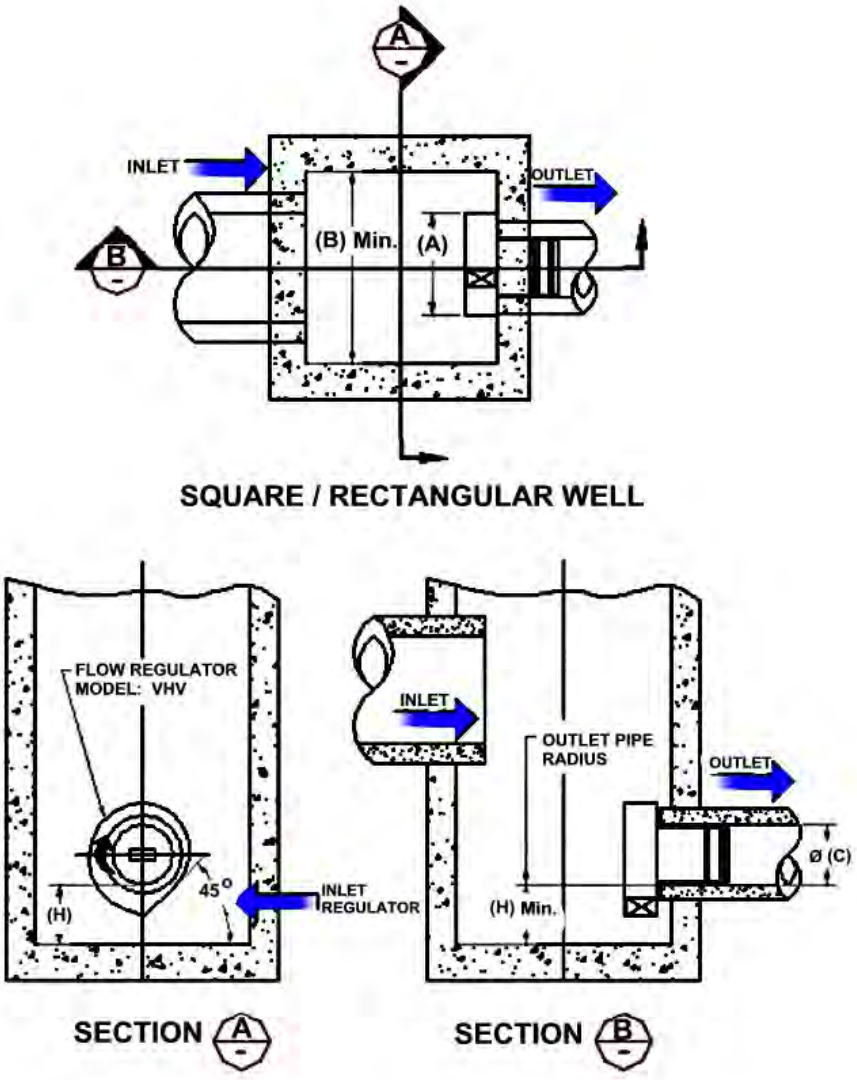
Model Number	Regulator Diameter		Minimum Manhole Diameter		Minimum Outlet Pipe Diameter		Minimum Clearance	
	A (mm)	**A** (in.)	**B** (mm)	**B** (in.)	**C** (mm)	**C** (in.)	**H** (mm)	**H** (in.)
50VHV-1	150	6	600	24	150	6	150	6
75VHV-1	250	10	600	24	150	6	150	6
100VHV-1	325	13	900	36	150	6	200	8
125VHV-2	275	11	900	36	150	6	200	8
150VHV-2	350	14	900	36	150	6	225	9
200VHV-2	450	18	1200	48	200	8	300	12
250VHV-2	575	23	1200	48	250	10	350	14
300VHV-2	675	27	1600	64	250	10	400	16
350VHV-2	800	32	1800	72	300	12	500	20



FLOW REGULATOR TYPICAL INSTALLATION IN SQUARE MANHOLE
FIGURE 4 (MODEL VHV)

Model Number	Regulator Diameter		Minimum Chamber Width		Minimum Outlet Pipe Diameter		Minimum Clearance	
	A (mm)	**A** (in.)	**B** (mm)	**B** (in.)	**C** (mm)	**C** (in.)	**H** (mm)	**H** (in.)
50VHV-1	150	6	600	24	150	6	150	6
75VHV-1	250	10	600	24	150	6	150	6
100VHV-1	325	13	600	24	150	6	200	8
125VHV-2	275	11	600	24	150	6	200	8
150VHV-2	350	14	600	24	150	6	225	9
200VHV-2	450	18	900	36	200	8	300	12
250VHV-2	575	23	900	36	250	10	350	14
300VHV-2	675	27	1200	48	250	10	400	16
350VHV-2	800	32	1200	48	300	12	500	20

NOTE: ***In the case of a square manhole, the outlet flow pipe must be centered on the wall to ensure enough clearance for the unit.***



INSTALLATION

The installation of a **HYDROVEX®** regulator may be undertaken once the manhole and piping is in place. Installation consists of simply fitting the regulator into the outlet pipe of the manhole. **John Meunier Inc.** recommends the use of a lubricant on the outlet pipe, in order to facilitate the insertion and orientation of the flow controller.

MAINTENANCE

HYDROVEX® regulators are manufactured in such a way as to be maintenance free; however, a periodic inspection (every 3-6 months) is suggested in order to ensure that neither the inlet nor the outlet has become blocked with debris. The manhole should undergo periodically, particularly after major storms, inspection and cleaning as established by the municipality

GUARANTY

The **HYDROVEX®** line of **VHV / SVHV** regulators are guaranteed against both design and manufacturing defects for a period of 5 years. Should a unit be defective, **John Meunier Inc.** is solely responsible for either modification or replacement of the unit.

John Meunier Inc.
ISO 9001 : 2008

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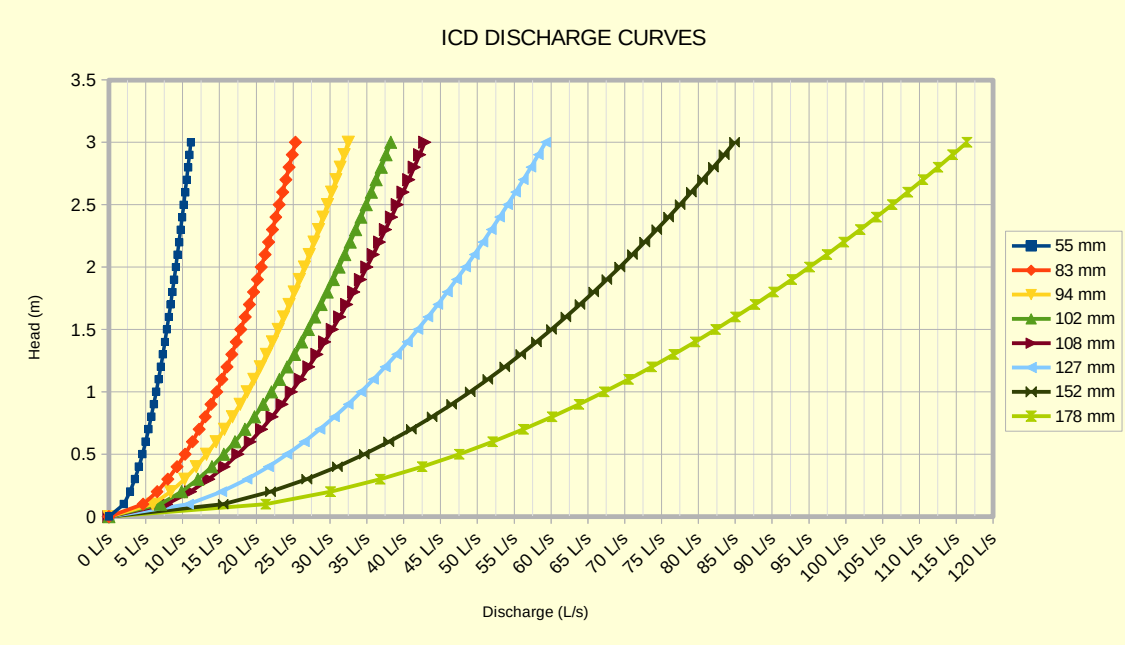
Revised: 2011-05-03


ICD DISCHARGE CURVES
Head (m)
3.5
3
2.5
2
1.5
1
0.5
0
0 L/s
5 L/s
10 L/s
15 L/s
20 L/s
25 L/s
30 L/s
35 L/s
40 L/s
45 L/s
50 L/s
55 L/s
60 L/s
65 L/s
70 L/s
75 L/s
80 L/s
85 L/s
90 L/s
95 L/s
100 L/s
105 L/s
110 L/s
115 L/s
120 L/s
Discharge (L/s)
55 mm
83 mm
94 mm
102 mm
108 mm
127 mm
152 mm
178 mm

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

06/26/2024

Province:	Ontario
City:	CARDINAL
Nearest Rainfall Station:	KINGSTON
Climate Station Id:	6104142
Years of Rainfall Data:	20

Site Name:	Lockmaster SUBDIVISION

Drainage Area (ha):	7.388
Runoff Coefficient 'c':	0.56

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	120.45
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	
Estimated Average Annual Sediment Volume (L/yr):	3080

Project Name:	LOCKMASTER'S MEADOW
Project Number:	114
Designer Name:	M Mabrouk
Designer Company:	Engineer
Designer Email:	eng.services.ca@gmail.com
Designer Phone:	613-986-9170
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	43
EFO6	60
EFO8	71
EFO10	78
EFO12	83

Recommended Stormceptor EFO Model: EFO12

Estimated Net Annual Sediment (TSS) Load Reduction (%): 83

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

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Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.1	8.1	5.75	345.0	33.0	100	8.1	8.1
1.00	18.9	27.0	11.50	690.0	66.0	100	18.9	27.0
2.00	16.7	43.7	23.00	1380.0	131.0	92	15.4	42.4
3.00	11.6	55.3	34.50	2070.0	197.0	84	9.8	52.2
4.00	10.6	65.9	46.01	2760.0	263.0	80	8.5	60.7
5.00	6.8	72.8	57.51	3450.0	329.0	78	5.3	66.0
6.00	5.2	78.0	69.01	4141.0	394.0	74	3.9	69.9
7.00	3.3	81.3	80.51	4831.0	460.0	71	2.3	72.2
8.00	3.6	84.9	92.01	5521.0	526.0	68	2.5	74.7
9.00	2.1	87.0	103.51	6211.0	592.0	65	1.4	76.0
10.00	2.4	89.4	115.02	6901.0	657.0	64	1.5	77.6
11.00	1.4	90.7	126.52	7591.0	723.0	64	0.9	78.4
12.00	1.9	92.6	138.02	8281.0	789.0	63	1.2	79.6
13.00	1.4	94.0	149.52	8971.0	854.0	63	0.9	80.5
14.00	0.7	94.7	161.02	9661.0	920.0	62	0.4	80.9
15.00	0.7	95.4	172.52	10351.0	986.0	62	0.4	81.4
16.00	0.5	95.9	184.03	11042.0	1052.0	60	0.3	81.7
17.00	0.3	96.2	195.53	11732.0	1117.0	59	0.2	81.8
18.00	0.3	96.4	207.03	12422.0	1183.0	57	0.2	82.0
19.00	0.0	96.4	218.53	13112.0	1249.0	56	0.0	82.0
20.00	0.6	97.1	230.03	13802.0	1314.0	54	0.3	82.3
21.00	0.3	97.4	241.53	14492.0	1380.0	53	0.2	82.5
22.00	0.0	97.4	253.04	15182.0	1446.0	51	0.0	82.5
23.00	0.0	97.4	264.54	15872.0	1512.0	48	0.0	82.5
24.00	0.0	97.4	276.04	16562.0	1577.0	47	0.0	82.5
25.00	0.0	97.4	287.54	17252.0	1643.0	45	0.0	82.5
30.00	0.9	98.3	345.05	20703.0	1972.0	37	0.3	82.8
35.00	1.1	99.4	402.56	24153.0	2300.0	32	0.4	83.2
40.00	0.6	100.0	460.07	27604.0	2629.0	28	0.2	83.4
45.00	0.0	100.0	517.57	31054.0	2958.0	25	0.0	83.4
Estimated Net Annual Sediment (TSS) Load Reduction =								**83 %**

Climate Station ID: 6104142 *Years of Rainfall Data*: 20

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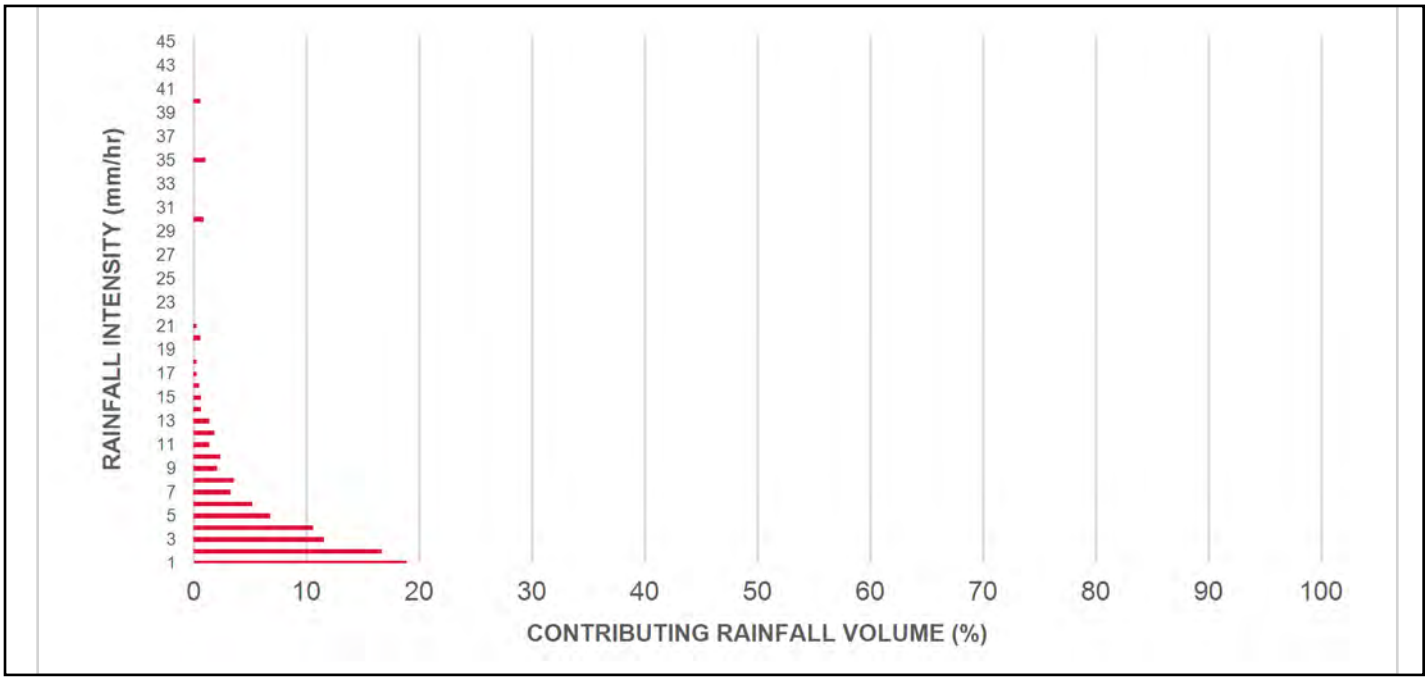
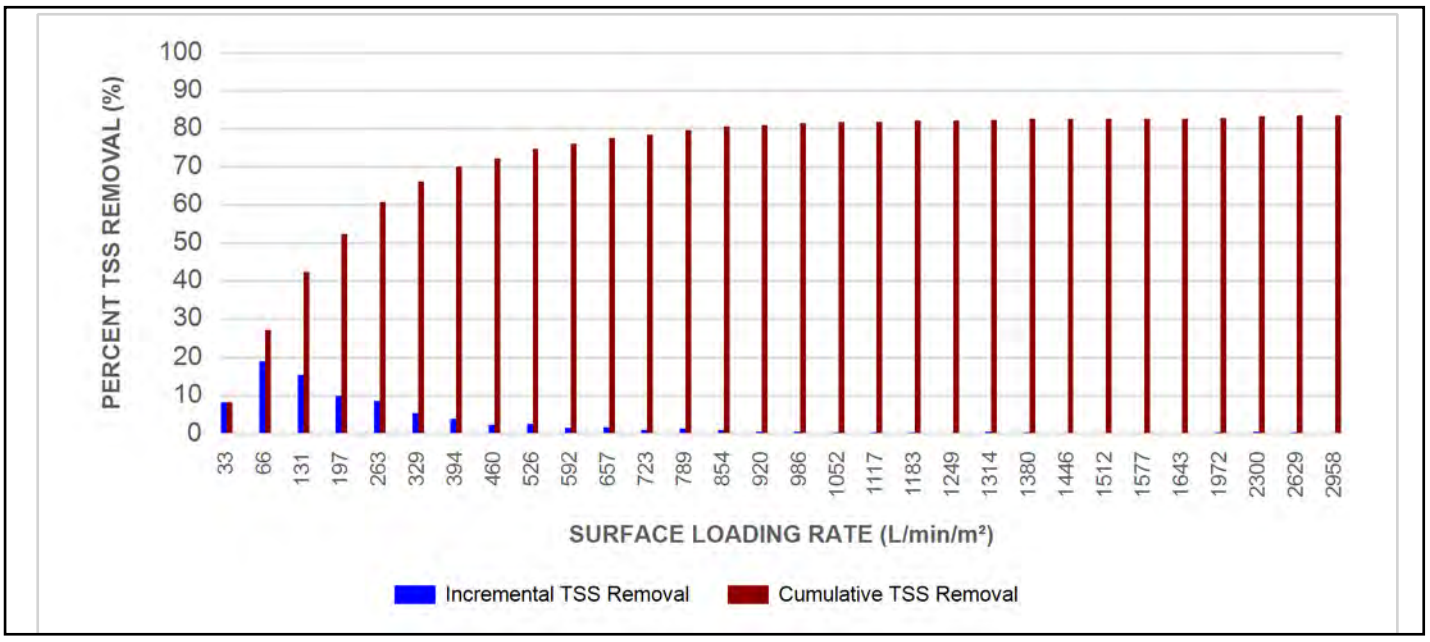
RAINFALL DATA FROM KINGSTON RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

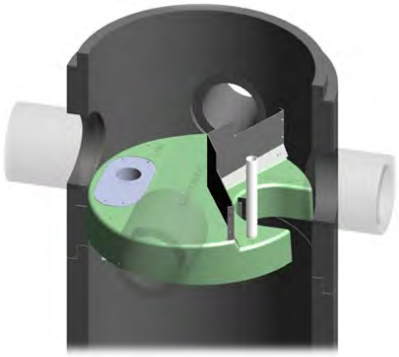
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

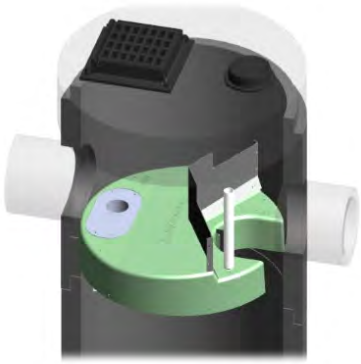
DESIGN FLEXIBILITY

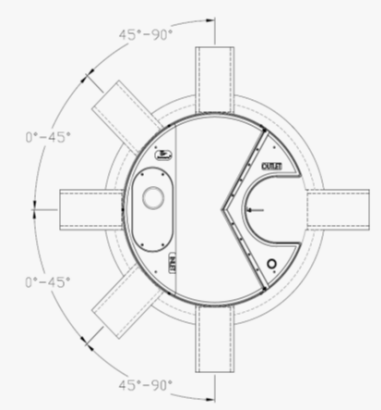
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

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STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit** S**eparators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

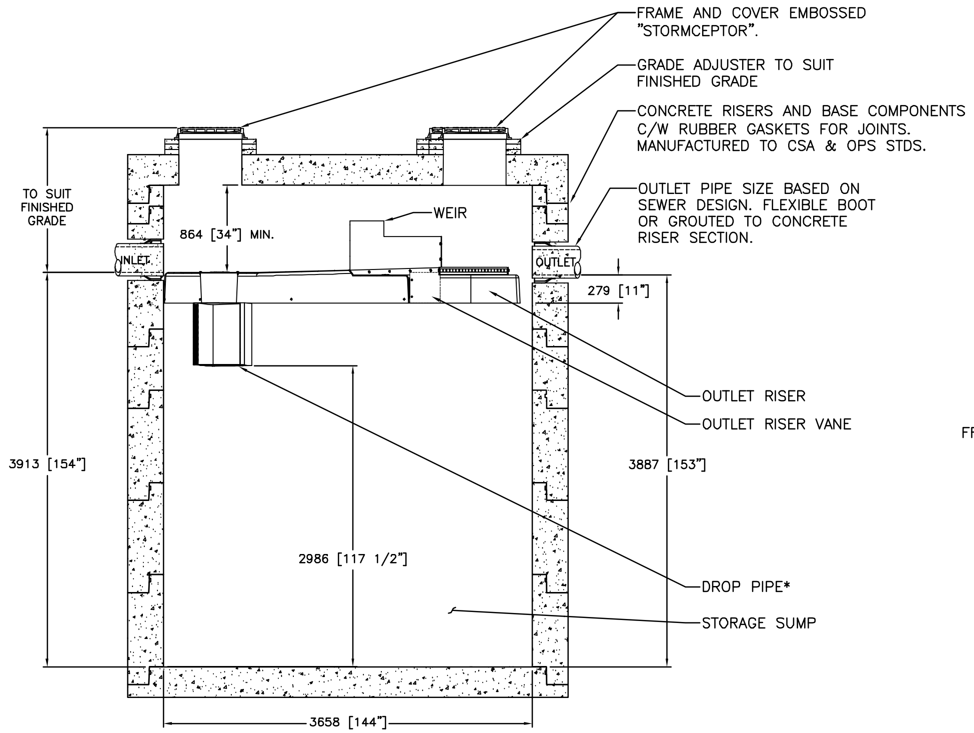
3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

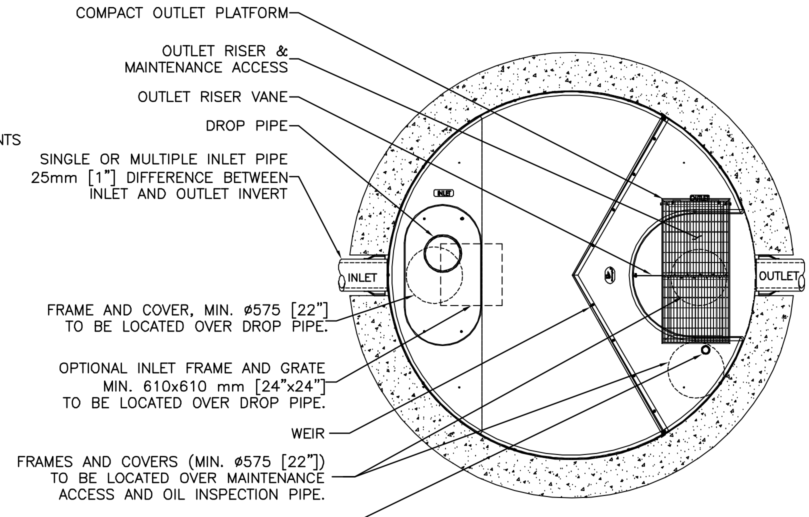
assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

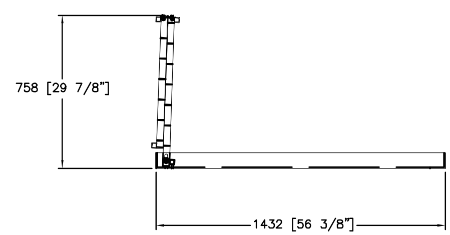
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW



PLAN VIEW

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF12 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO12 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EF12-C				
STRUCTURE ID					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
0	5/26/17	INITIAL RELEASE	JSK
1	6/8/18	OUTLET PLATFORM	JSK
####	####	####	####
####	####	####	####
####	####	####	####

Stormceptor® EF

SCALE = NTS

imbrium

DATE: 7/17/2018	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: ML
PROJECT No.: EF12-C	SEQUENCE No.: *
SHEET: 1 OF 1	

I:\IMBRIUM\PRODUCTS\STORMCEPTOR EFO DRAWINGS & DETAILS\STANDARD DETAILS\COMPACT PLATFORMS\EF12-C-DETAIL.DWG 4/12/2019 11:17 AM

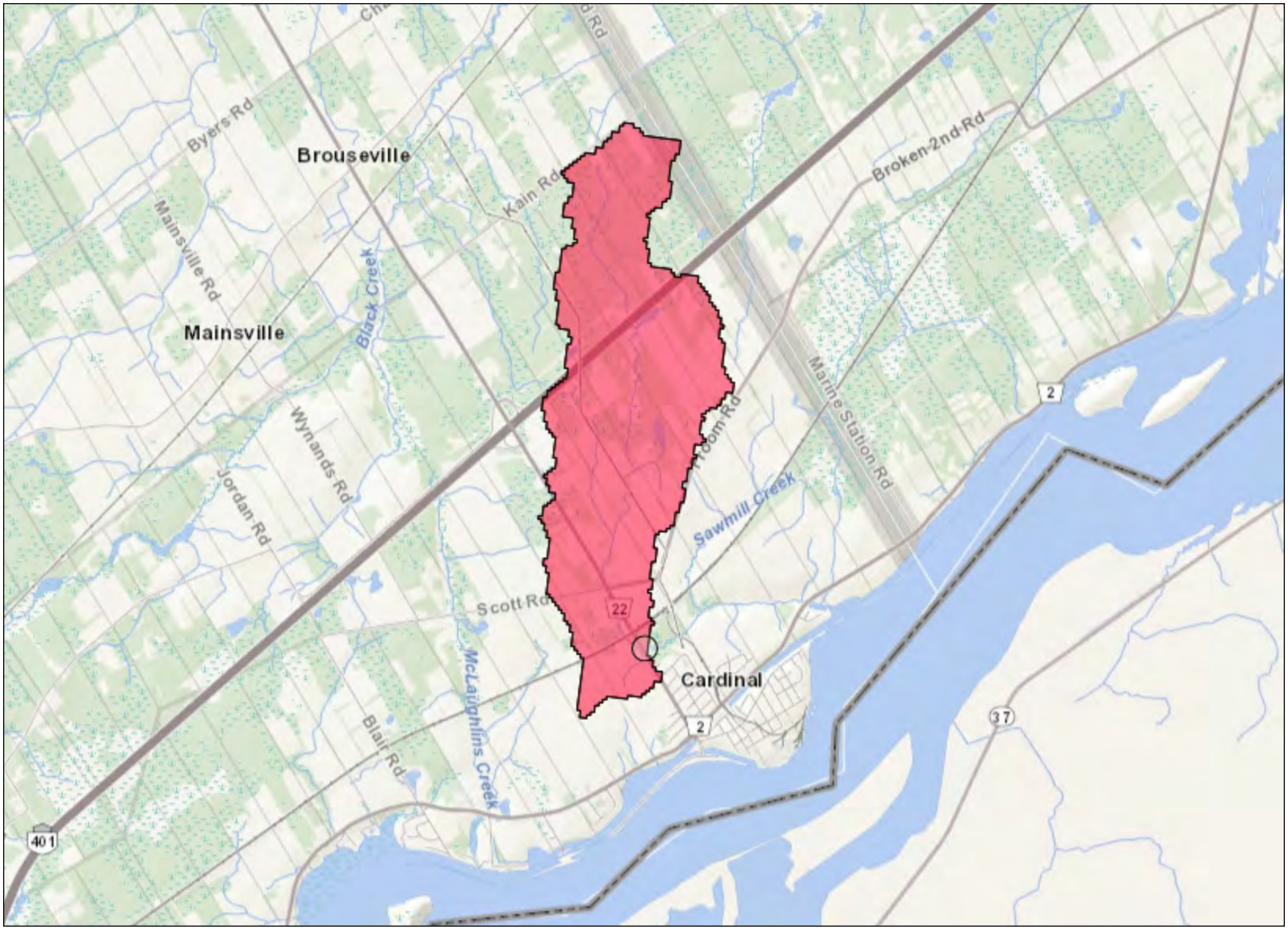
APPENDIX - E

MINISTRY OF NATURAL RESOURCES AND FORESTRY

Ontario Watershed Information Tool

CTY RD Culvert Watershed

Notes:
Both Watercourses



Legend

- Assessment Parcel
- Secondary Watershed
- Tertiary Watershed
- Quaternary Watershed
- Great Lakes - St. Lawrence Basin
- Hudson - James Bay Basin
- Nelson River Basin
- Hydrometric Monitoring Station
- Diversions
- Waterbody Outlet
- Conservation Authority Dam
- Provincial Dam
- Federal Dam
- OPG Dam
- Other Dam
- Virtual Flow Segment

Land Cover Compilation

- Other
- Cloud/Shadow
- Clear Open Water
- Turbid Water
- Shoreline
- Mudflats
- Marsh
- Swamp
- Fen
- Bog
- Heath
- Sparse Treed
- Treed Upland
- Deciduous Treed
- Mixed Treed
- Coniferous Treed
- Plantations - Treed Cultivated
- Hedge Rows
- Disturbance
- Open Cliff and Talus
- Alvar
- Sand Barren and Dune
- Open Tallgrass Prairie
- Tallgrass Savannah
- Tallgrass Woodland
- Sand/Gravel/Mine Tailings/Extraction
- Bedrock
- Community/Infrastructure
- Agriculture and Undifferentiated Rural Land Use

2.6 0 km 1.30 2.6

Scale: 1 : 51,240

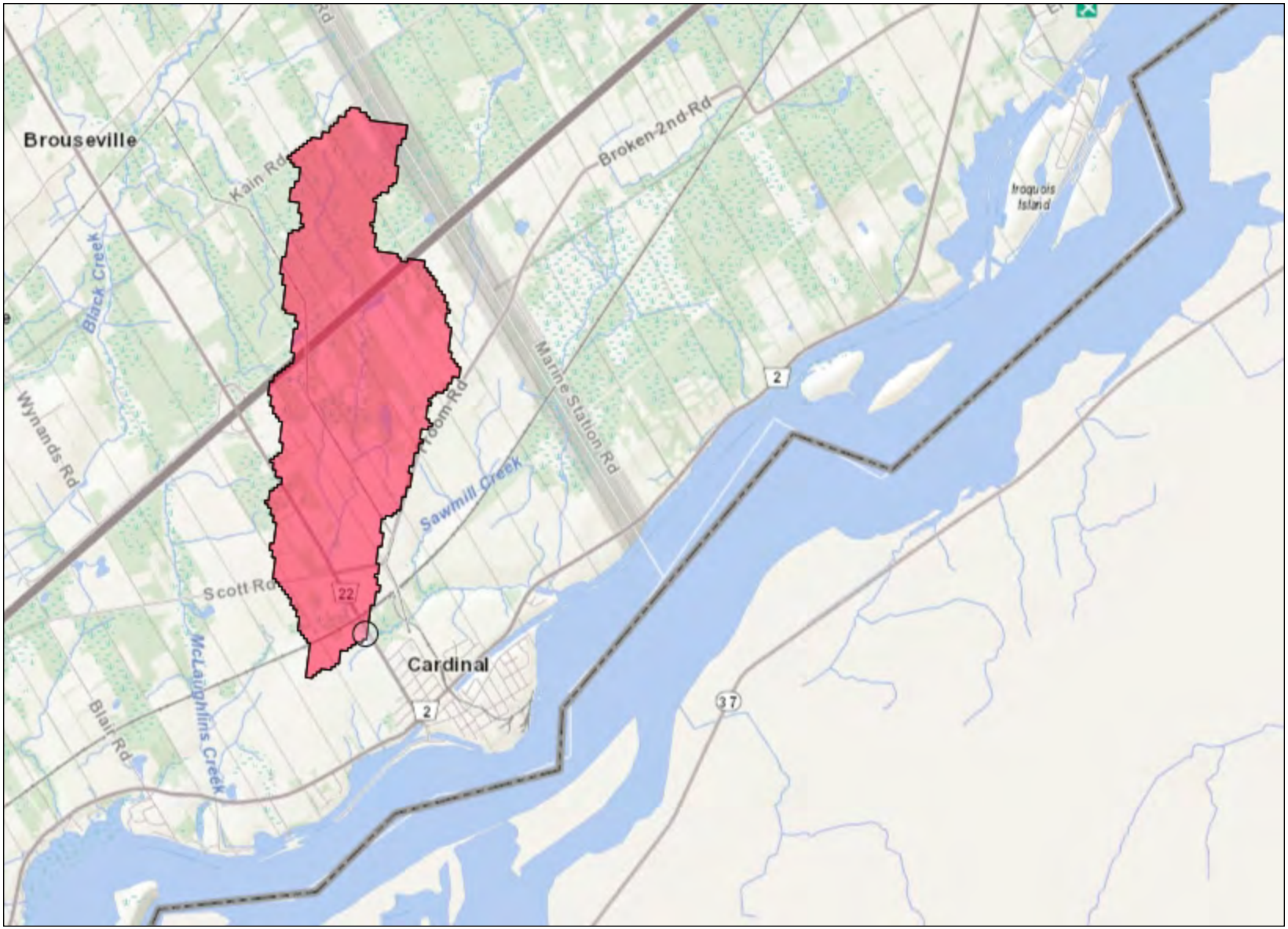
Projection: Web Mercator

MINISTRY OF NATURAL RESOURCES AND FORESTRY

Ontario Watershed Information Tool

North Watercourse Watershed

Notes:



Legend

- Assessment Parcel
- Secondary Watershed
- Tertiary Watershed
- Quaternary Watershed
- Great Lakes - St. Lawrence Basin
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- Disturbance
- Open Cliff and Talus
- Alvar
- Sand Barren and Dune
- Open Tallgrass Prairie
- Tallgrass Savannah
- Tallgrass Woodland
- Sand/Gravel/Mine Tailings/Extraction
- Bedrock
- Community/Infrastructure
- Agriculture and Undifferentiated Rural Land Use

2.6 0 km 1.30 2.6

Scale: 1 : 51,242

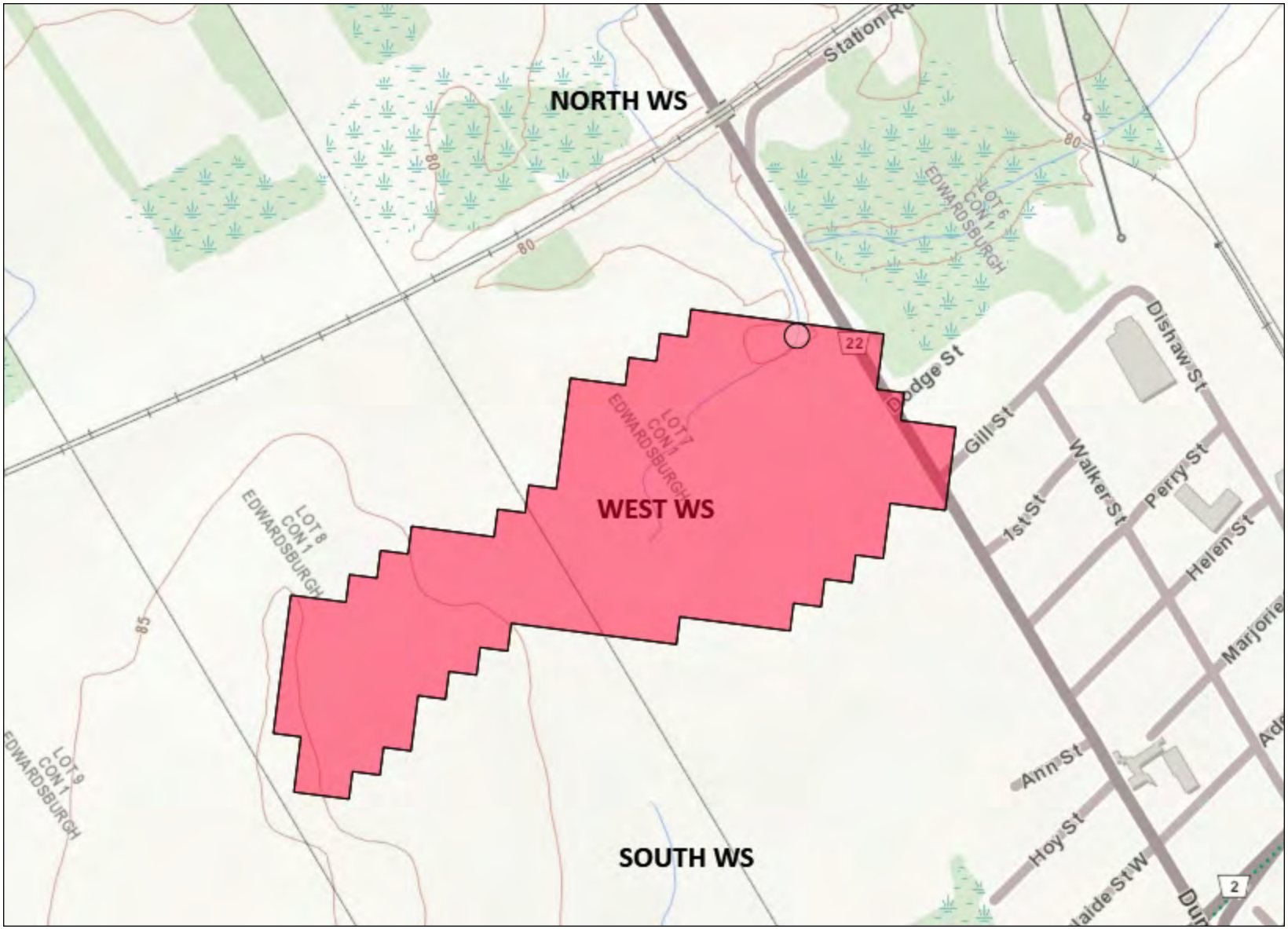
Projection: Web Mercator

MINISTRY OF NATURAL RESOURCES AND FORESTRY

Ontario Watershed Information Tool

West Watercourse Watershed

Notes:



Legend

- Assessment Parcel
- Secondary Watershed
- Tertiary Watershed
- Quaternary Watershed
- Great Lakes - St. Lawrence Basin
- Hudson - James Bay Basin
- Nelson River Basin
- Hydrometric Monitoring Station
- Diversions
- Waterbody Outlet
- Conservation Authority Dam
- Provincial Dam
- Federal Dam
- OPG Dam
- Other Dam
- Virtual Flow Segment

Land Cover Compilation

- Other
- Cloud/Shadow
- Clear Open Water
- Turbid Water
- Shoreline
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- Open Tallgrass Prairie
- Tallgrass Savannah
- Tallgrass Woodland
- Sand/Gravel/Mine Tailings/Extraction
- Bedrock
- Community/Infrastructure
- Agriculture and Undifferentiated Rural Land Use

0.3 0 km 0.16 0.3

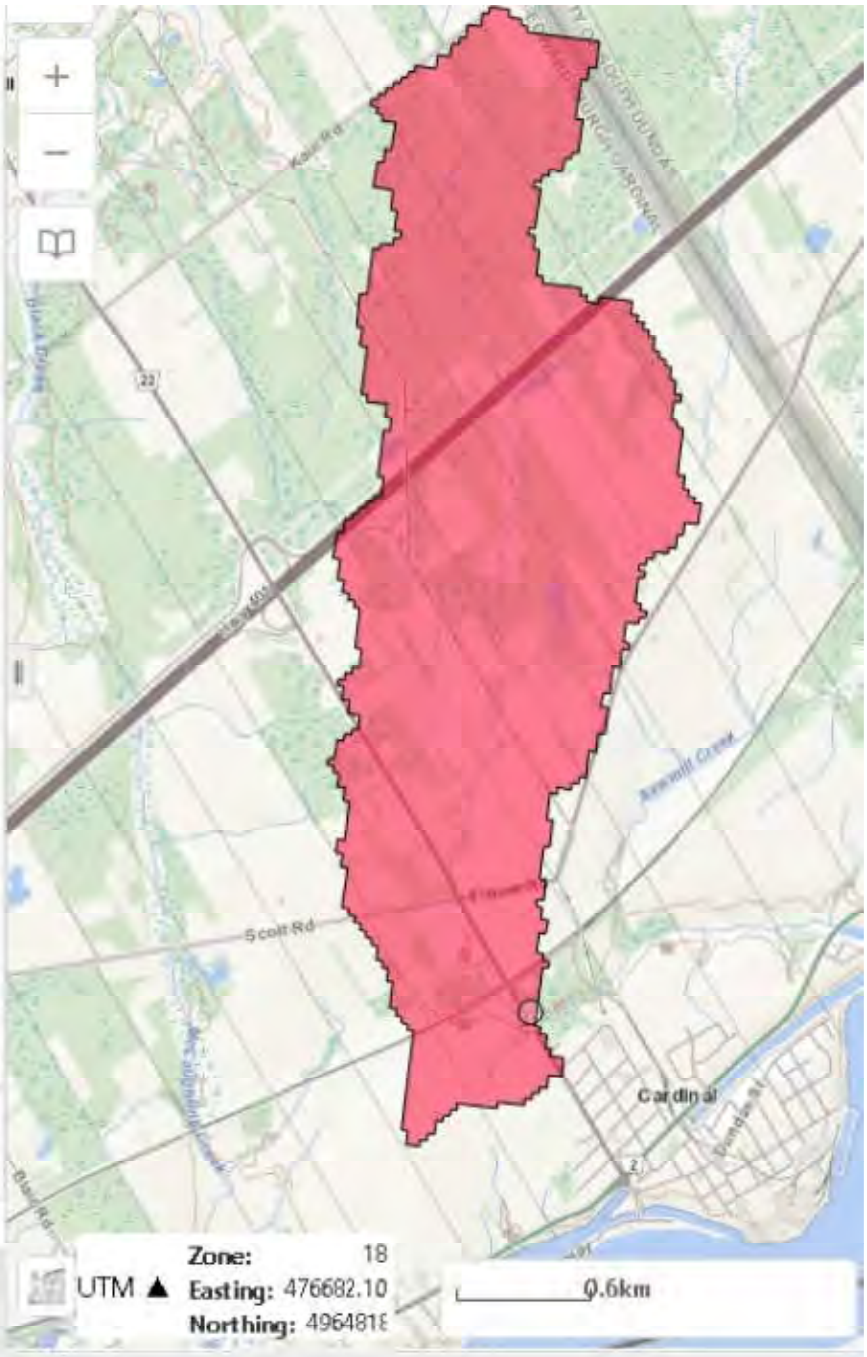
Scale: 1 : 6,407

Projection: Web Mercator

CULVERT OUTLET (BOTH WATERSHEDS)

Drainage Area (km²)	4.952
Shape Factor ()	7.236
Length of Main Channel (km)	5.986
Maximum Channel Elevation (m)	89.450
Minimum Channel Elevation (m)	77.640
Slope of Main Channel (m/km)	1.970
Slope of Main Channel (%)	0.197
Area Lakes/Wetlands (km²)	1.047
Area - Lakes (km²)	0.027
Area - Wetlands (km²)	1.020
Mean Elevation (m)	85.647
Maximum Elevation (m)	97.043
Mean Slope (%)	2.005
Annual Mean Temperature (°C)	6.800
Annual Precipitation (mm)	956.000

Watershed Name	On/Off	Delete
Watershed 1	☑	✗

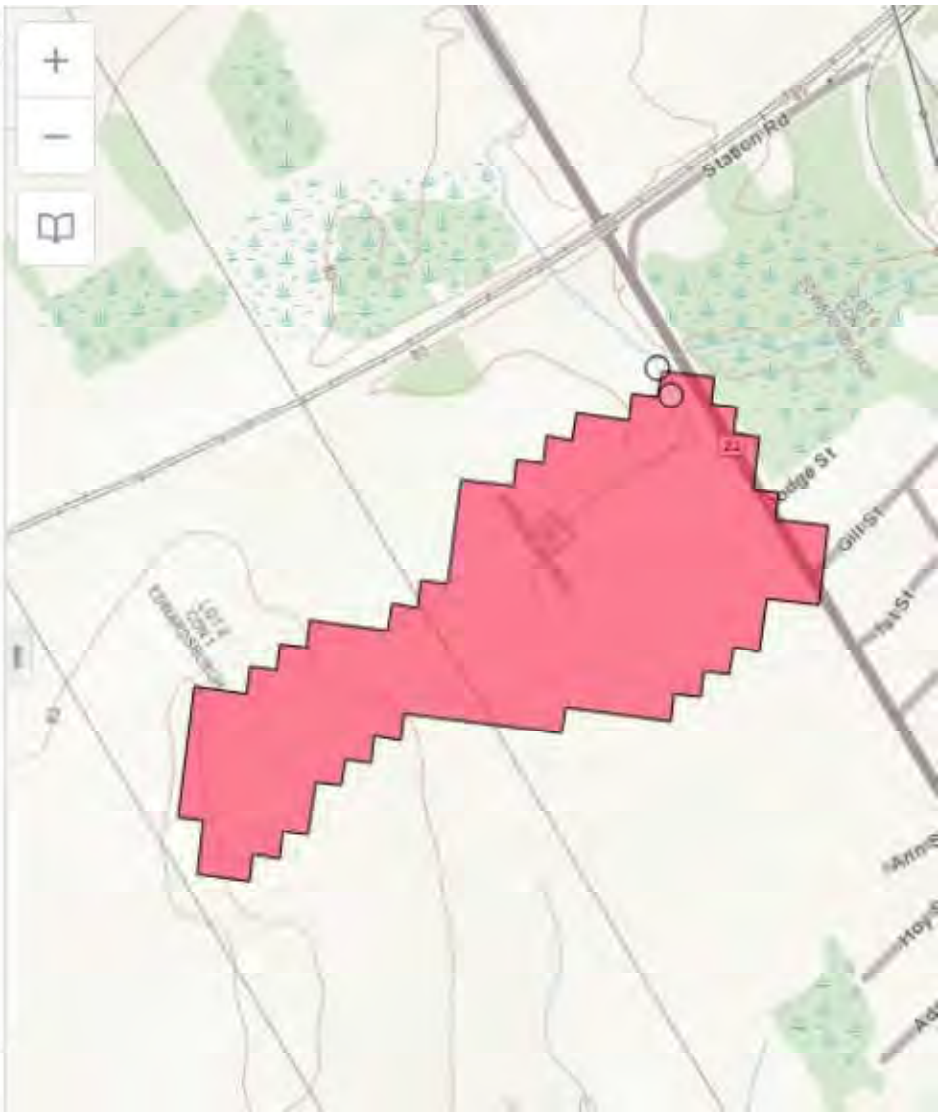


SOURCE: OWIT

WEST WATERSHED

Drainage Area (km²)	0.170
Shape Factor ()	4.308
Length of Main Channel (km)	0.856
Maximum Channel Elevation (m)	89.810
Minimum Channel Elevation (m)	78.410
Slope of Main Channel (m/km)	13.320
Slope of Main Channel (%)	1.332
Area Lakes/Wetlands (km²)	0.000
Area - Lakes (km²)	0.000
Area - Wetlands (km²)	0.000
Mean Elevation (m)	83.914
Maximum Elevation (m)	89.812
Mean Slope (%)	1.872
Annual Mean Temperature (°C)	6.900
Annual Precipitation (mm)	960.000

Calculate All



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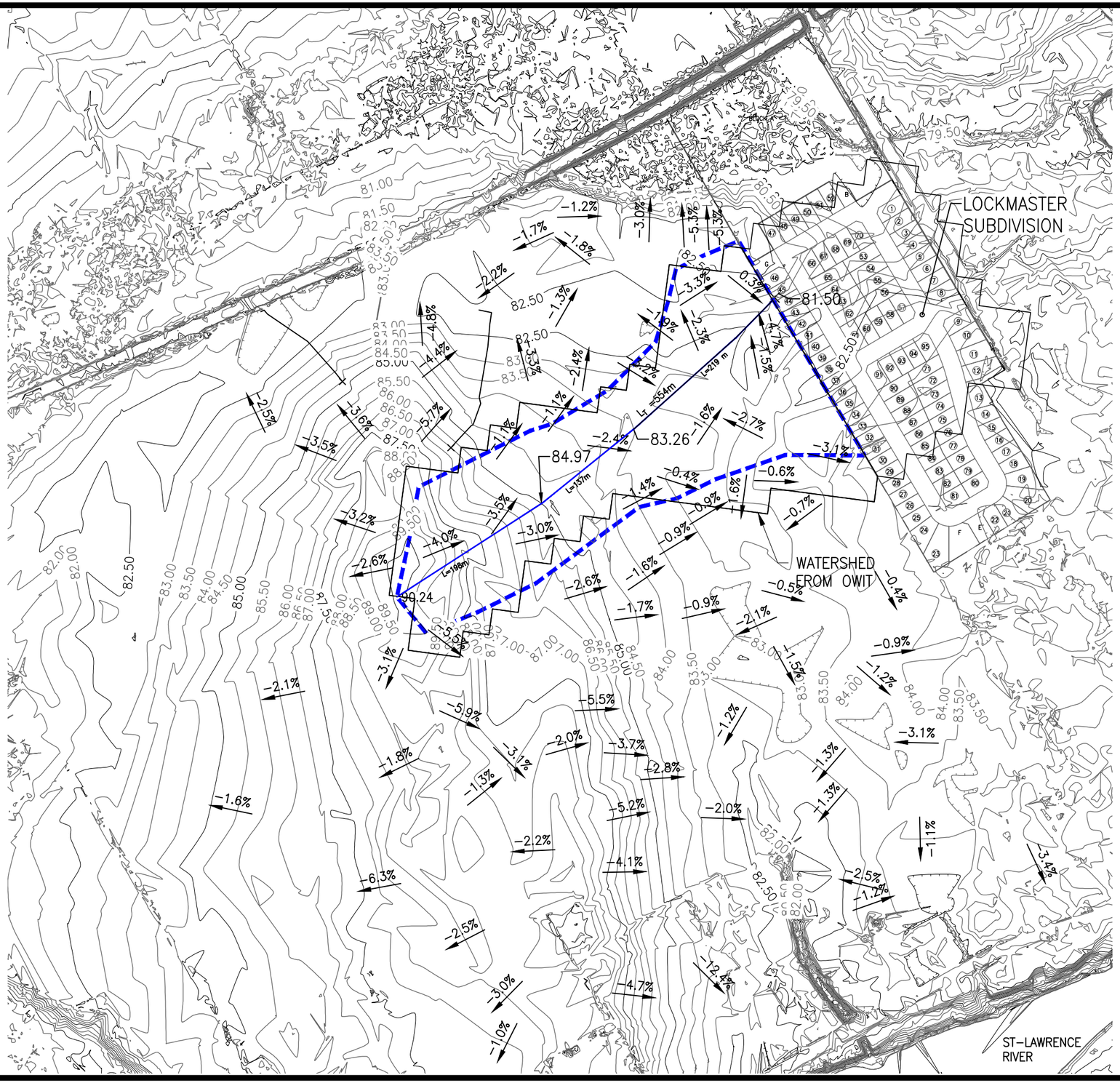


0 50 100 200

1:5000 Metres

SURFACE EXTRACTED FROM LIDAR FILE ON GEOHUB
WATERSHED AREA: A= 9.1795 HECTARE
LONGEST PATH : L= 554 m
AVERAGE SLOPE: (90.24-81.50)/554= 1.58%
Tc= SEE EXCEL SPREADSHEET
RUNOFF COEFFICIENT: SEE EXCEL SPREADSHEET
RAINFALL INTENSITIES: SEE EXCEL SPREADSHEET
RUNOFF PEAKS: SEE EXCEL SPREADSHEET

PROJECT AND DRAWING TITLE:	SCALE:	DRAWING No.:
LOCKMASTER SUBDIVISION WATERSHED PLAN	1:5000 DATE: 07-26-2024	WS1

114-snc lidar-2024-2_ilc.dwg

Time of Concentration:

I/ AIRPORT FORMULA

To be used when C < 0.40

$$t_c = \frac{3.26(1.1 - C)L^{0.5}}{(s^{0.33})}$$ where:

t_c is the time of concentration (min)

s is the average slope of the watershed (%)

L is the length of the watershed (m)

C is the runoff coefficient

To be used when C < 0.40

S= 1.58

C= 0.30

L= 554 m

t_c = **52.8 min**

II/ BRANSBY-WILLIAMS FORMULA

To be used when C > 0.40

tc= 0.057 L/ (A^0.1 S^0.2) where:

t_c is the time of concentration (min)

s is the average slope of the watershed (%)

L is the length of the watershed (m)

A is the area of the watershed (ha)

S (%)= 1.58

A= 9.18

L= 544 m

t_c = **22.7 min**

WEST WATERCOURSE
NEIGHBOURING LAND AREA = 9.17 ha
Rational Method

$Q_{5\text{-}25\text{-}100yr} = 2.78\ C\ I_{5\text{-}25\text{-}100yr}\ A$

	5-YEAR	25-YEAR	100-YEAR
Tc (min) =	25	25	25
$I_{5\text{-}25\text{-}100}$ (mm/hr) =	60.90	84.22	103.85
A (ha)=	9.1795	9.1795	9.1795
C=	0.250	0.313	0.313
Qp (L/s)	**388.5**	**672.7**	**829.5**

BOTH WATERSHEDS DRAINING INTO CULVERT

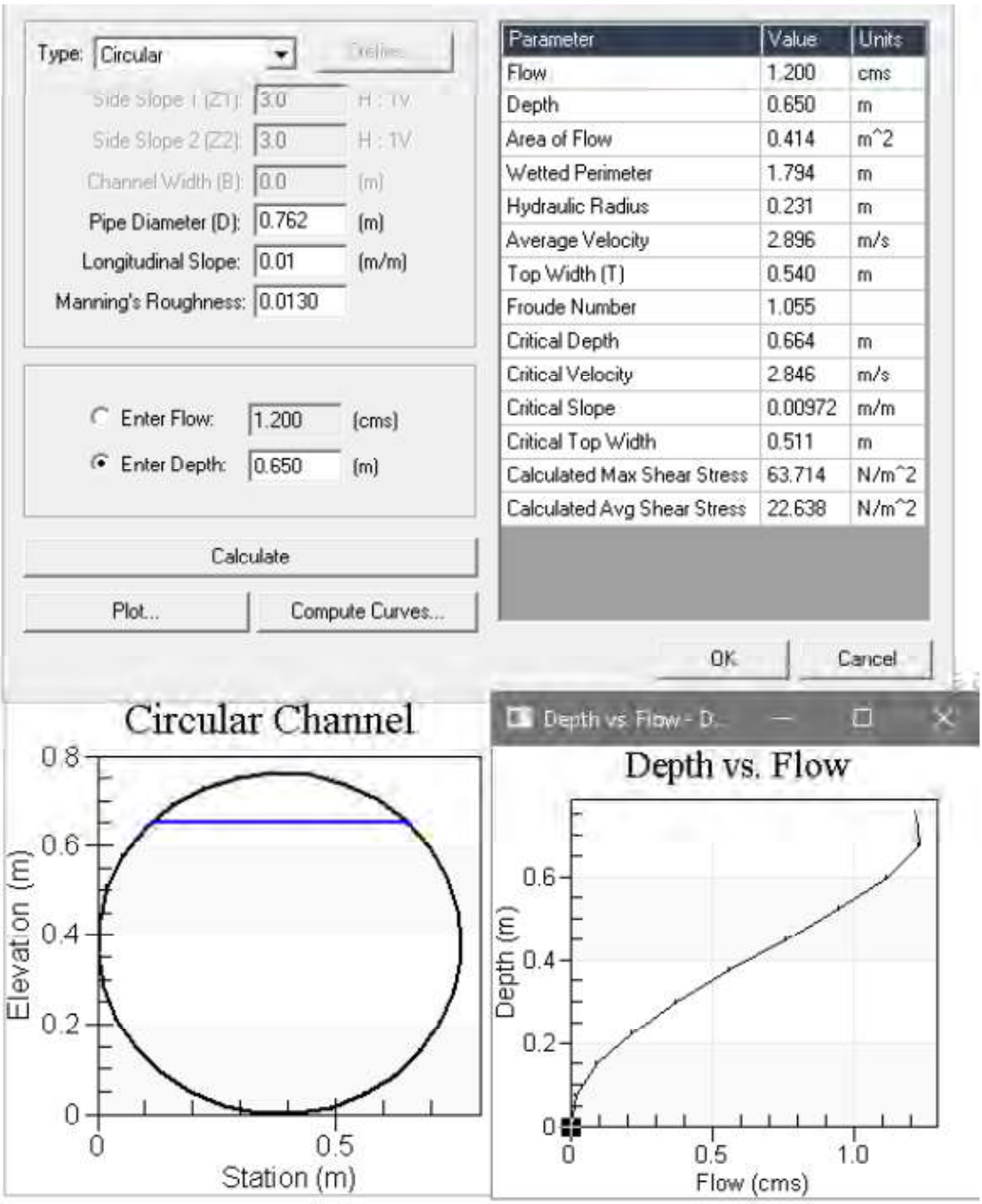
	A (ha)	Width (m)	Longest Path (m)
Watershed 1	476.37	1,200	4,480
Watershed 2	17.01	176	750
Watershed 1+2	493.38	1,200	4,480

DRAINAGE EASEMENT
5 Rear Yards
Rational Method

$Q_{5yr} = 2.78\ C\ I_{5yr}\ A$

$Q_{100yr} = 2.78\ C\ I_{100yr}\ A$

	5-YEAR	100-YEAR
Tc (min) =	10	10
$I_{5\text{-}100}$ (mm/hr) =	104.19	178.56
A (ha)=	0.1191	0.1191
C=	0.440	0.550
I (mm/hr) =	104.19	178.56
Qp (L/s)	**15.18**	**32.52**



WEST WATERCOURSE DRAIN - CULVERT

Type: Trapezoidal

Side Slope 1 (Z1): 2.5 H : 1V

Side Slope 2 (Z2): 2.5 H : 1V

Channel Width (B): 0.7000000 (m)

Pipe Diameter (D): 0.0 (m)

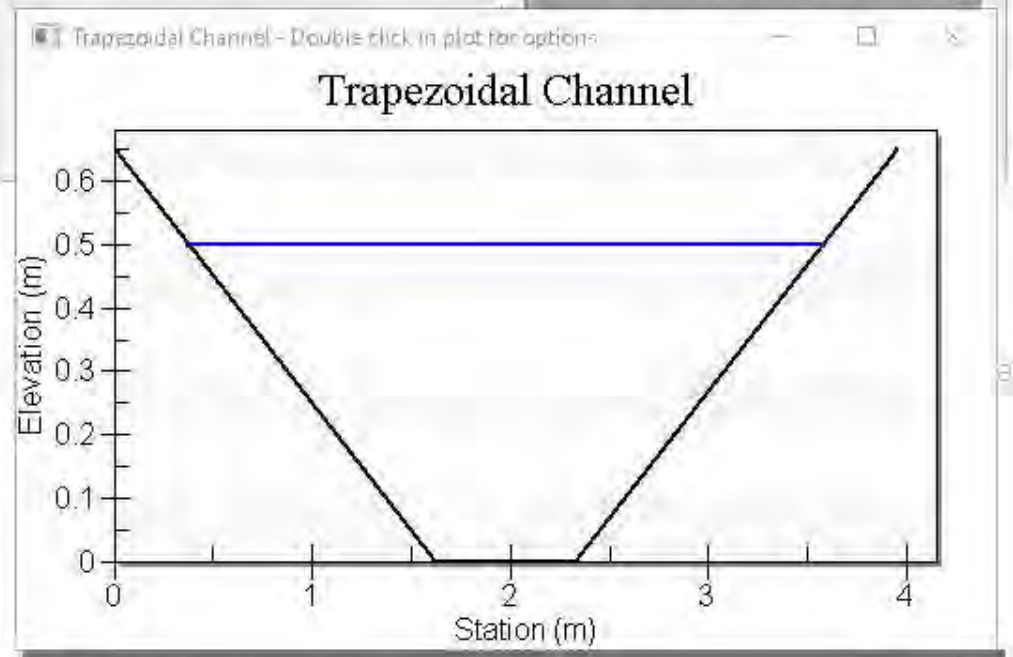
Longitudinal Slope: 0.005 (m/m)

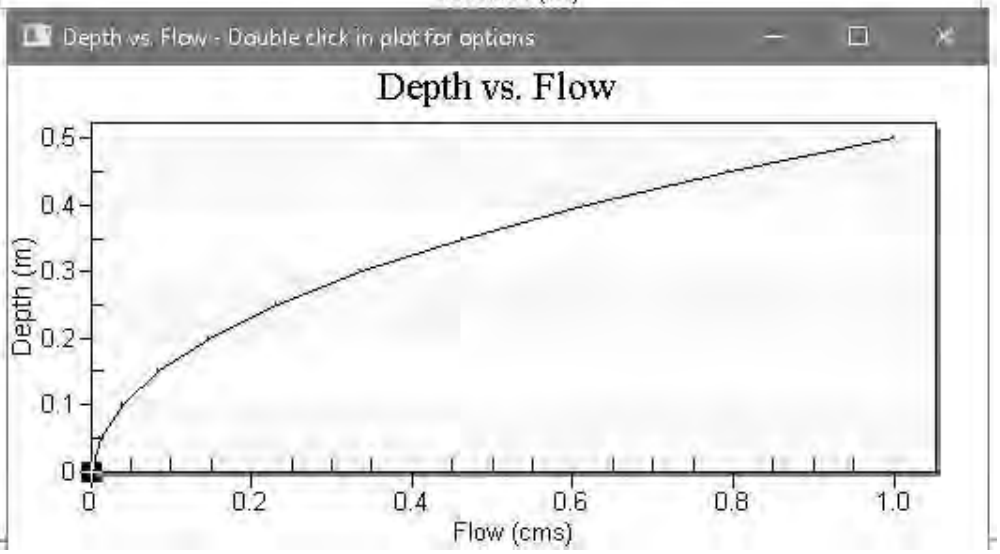
Manning's Roughness: 0.0300

Enter Flow: 1.001 (cms)

Enter Depth: 0.500 (m)

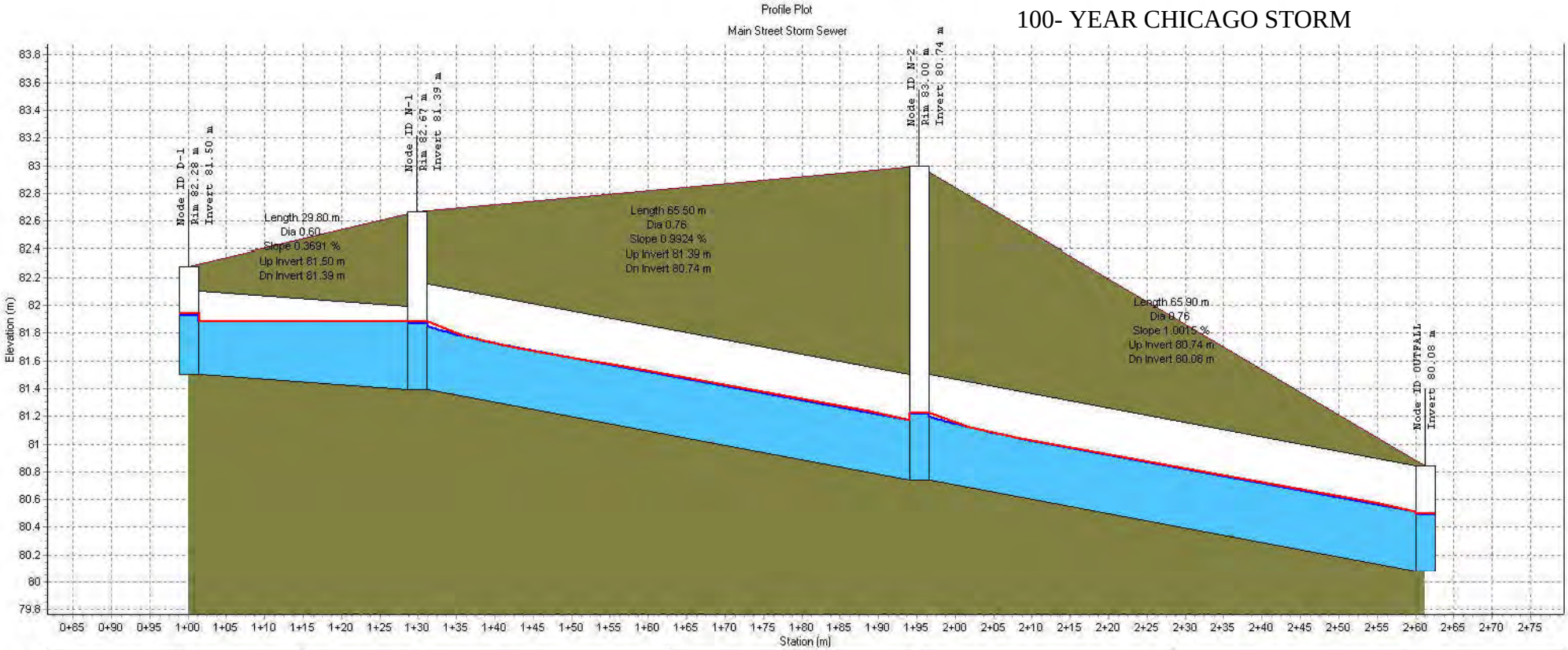
Parameter	Value	Units
Flow	1.001	cms
Depth	0.500	m
Area of Flow	0.975	m^2
Wetted Perimeter	3.393	m
Hydraulic Radius	0.287	m
Average Velocity	1.027	m/s
Top Width (T)	3.200	m
Froude Number	0.594	
Critical Depth	0.387	m
Critical Velocity	1.550	m/s
Critical Slope	0.01519	m/m
Critical Top Width	2.635	m
Calculated Max Shear Stress	24.506	N/m^2
Calculated Avg Shear Stress	14.085	N/m^2





WEST WATERCOURSE DRAIN - OPEN CHANNEL

100- YEAR CHICAGO STORM



Node ID:	D-1	N-1	N-2	OUTFALL
Rim (m):	82.28	82.67	83.00	
Invert (m):	81.50	81.39	80.74	80.08
Min Pipe Cover (m):	0.18	0.52	1.50	
Max HGL (m):	81.94	81.88	81.23	80.50

Link ID:	DITCH-IN-4.5m	P-1	P-2	
Length (m):	29.80	65.50	65.90	
Dia ():	0.60	0.76	0.76	
Slope (%):	0.3691	0.9924	1.0015	
Up Invert (m):	81.50	81.39	80.74	
Dn Invert (m):	81.39	80.74	80.08	
Max Q (lps):	686.15	684.57	684.21	
Max Vel (m/s):	0.83	2.21	2.41	
Max Depth (m):	0.47	0.49	0.45	

Autodesk® Storm and Sanitary Analysis 2016 - Version 13.0.94 (Build 0)

****
Project Description
****
File Name 114-Neighb-Land-RM.SPF
Description ..... LOCKMASTER'S MEADOW SUBDIVISION

****
Analysis Options
****
Flow Units ..... LPS
Subbasin Hydrograph Method. EPA SWMM
Infiltration Method ..... Horton
Link Routing Method ..... Hydrodynamic
Storage Node Exfiltration.. Constant flow
Starting Date MAR-10-2024 00:00:00
Ending Date MAR-10-2024 12:00:00
Antecedent Dry Days 0.0
Report Time Step 00:10:00
Wet Time Step 00:05:00
Dry Time Step 01:00:00
Routing Time Step ..... 5.00 sec

****
Element Count
****
Number of rain gages 1
Number of subbasins 2
Number of nodes 4
Number of links 3
Number of pollutants 0
Number of land uses 0

****
Subbasin Summary
****

Subbasin ID	Total Area hectares	Equiv. Width m	Imperv. Area %	Average Slope %	Raingage
{DA-1}.37	0.12	55.22	34.00	1.0000	-
Sub-01	9.18	578.51	0.00	1.5000	-

****
Node Summary
****

Node ID	Element Type	Invert Elevation m	Maximum Elev. m	Ponded Area m²	External Inflow
D-1	JUNCTION	81.50	82.28	50.00	
N-1	JUNCTION	81.39	82.67	100.00	
N-2	JUNCTION	80.74	83.00	15.00	
OUTFALL	OUTFALL	80.08	80.84	0.00	

****
Link Summary
****

Link	From Node	To Node	Element	Length	Slope	Manning's

ID			Type	m	%	Roughness
DITCH-IN-4.5m	D-1	N-1	CHANNEL	29.8	0.3691	0.0200
P-1	N-1	N-2	CONDUIT	65.5	0.9924	0.0130
P-2	N-2	OUTFALL	CONDUIT	65.9	1.0015	0.0130

****
Cross Section Summary
****

Link ID	Shape	Depth/ Diameter	Width	No. of Barrels	Cross Sectional Area	Full Flow Hydraulic Radius	Design Flow Capacity
		m	m		m²	m	LPS
DITCH-IN-4.5m	TRAPEZOIDAL	0.60	3.70	1	1.32	0.34	1937.31
P-1	CIRCULAR	0.76	0.76	1	0.46	0.19	1157.04
P-2	CIRCULAR	0.76	0.76	1	0.46	0.19	1162.36

****
Transect Summary
****

Transect XS-01

Area:

0.0003	0.0011	0.0026	0.0046	0.0072
0.0103	0.0140	0.0183	0.0232	0.0287
0.0347	0.0413	0.0484	0.0562	0.0645
0.0734	0.0828	0.0929	0.1035	0.1146
0.1264	0.1391	0.1532	0.1688	0.1858
0.2043	0.2242	0.2455	0.2684	0.2926
0.3183	0.3455	0.3740	0.4038	0.4345
0.4661	0.4985	0.5318	0.5660	0.6011
0.6370	0.6738	0.7115	0.7501	0.7896
0.8299	0.8711	0.9132	0.9562	1.0000

Hrad:

0.0231	0.0462	0.0693	0.0924	0.1155
0.1386	0.1618	0.1849	0.2080	0.2311
0.2542	0.2773	0.3004	0.3235	0.3466
0.3697	0.3928	0.4159	0.4390	0.4621
0.4853	0.5071	0.5253	0.5406	0.5539
0.5657	0.5765	0.5866	0.5962	0.6056
0.6149	0.6241	0.6335	0.6590	0.6849
0.7101	0.7344	0.7581	0.7811	0.8035
0.8253	0.8465	0.8672	0.8874	0.9072
0.9265	0.9455	0.9640	0.9822	1.0000

Width:

0.0129	0.0259	0.0388	0.0518	0.0647
0.0777	0.0906	0.1036	0.1165	0.1295
0.1424	0.1553	0.1683	0.1812	0.1942
0.2071	0.2201	0.2330	0.2460	0.2589
0.2718	0.3027	0.3353	0.3680	0.4007
0.4334	0.4660	0.4987	0.5314	0.5641
0.5967	0.6294	0.6621	0.6828	0.7027
0.7225	0.7423	0.7621	0.7820	0.8018
0.8216	0.8414	0.8612	0.8811	0.9009
0.9207	0.9405	0.9604	0.9802	1.0000

Transect XS-02
Area:

0.0003	0.0011	0.0026	0.0046	0.0072
0.0103	0.0140	0.0183	0.0232	0.0287
0.0347	0.0413	0.0484	0.0562	0.0645
0.0734	0.0828	0.0929	0.1035	0.1146
0.1264	0.1391	0.1532	0.1688	0.1858
0.2043	0.2242	0.2455	0.2684	0.2926
0.3183	0.3455	0.3740	0.4038	0.4345
0.4661	0.4985	0.5318	0.5660	0.6011
0.6370	0.6738	0.7115	0.7501	0.7896
0.8299	0.8711	0.9132	0.9562	1.0000

Hrad:

0.0218	0.0435	0.0653	0.0871	0.1089
0.1306	0.1524	0.1742	0.1960	0.2177
0.2395	0.2613	0.2830	0.3048	0.3266
0.3484	0.3701	0.3919	0.4137	0.4355
0.4572	0.4529	0.4512	0.4537	0.4593
0.4675	0.4776	0.4892	0.5022	0.5162
0.5311	0.5468	0.5631	0.5897	0.6167
0.6435	0.6701	0.6964	0.7225	0.7485
0.7743	0.7999	0.8253	0.8506	0.8758
0.9009	0.9258	0.9506	0.9754	1.0000

Width:

0.0129	0.0259	0.0388	0.0518	0.0647
0.0777	0.0906	0.1036	0.1165	0.1295
0.1424	0.1553	0.1683	0.1812	0.1942
0.2071	0.2201	0.2330	0.2460	0.2589
0.2718	0.3027	0.3353	0.3680	0.4007
0.4334	0.4660	0.4987	0.5314	0.5641
0.5967	0.6294	0.6621	0.6828	0.7027
0.7225	0.7423	0.7621	0.7820	0.8018
0.8216	0.8414	0.8612	0.8811	0.9009
0.9207	0.9405	0.9604	0.9802	1.0000

Transect XS-04
Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000

0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Transect XS-05

Area:

0.0004	0.0016	0.0036	0.0064	0.0100
0.0144	0.0196	0.0256	0.0324	0.0400
0.0484	0.0576	0.0676	0.0784	0.0900
0.1024	0.1156	0.1296	0.1444	0.1600
0.1764	0.1936	0.2116	0.2304	0.2500
0.2704	0.2916	0.3136	0.3364	0.3600
0.3844	0.4096	0.4356	0.4624	0.4900
0.5184	0.5476	0.5776	0.6084	0.6400
0.6724	0.7056	0.7396	0.7744	0.8100
0.8464	0.8836	0.9216	0.9604	1.0000

Hrad:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

Width:

0.0200	0.0400	0.0600	0.0800	0.1000
0.1200	0.1400	0.1600	0.1800	0.2000
0.2200	0.2400	0.2600	0.2800	0.3000
0.3200	0.3400	0.3600	0.3800	0.4000
0.4200	0.4400	0.4600	0.4800	0.5000
0.5200	0.5400	0.5600	0.5800	0.6000
0.6200	0.6400	0.6600	0.6800	0.7000
0.7200	0.7400	0.7600	0.7800	0.8000
0.8200	0.8400	0.8600	0.8800	0.9000
0.9200	0.9400	0.9600	0.9800	1.0000

********** Runoff Quantity Continuity **********	Volume hectare-m	Depth mm
Total Precipitation	0.707	76.023
Evaporation Loss	0.000	0.000
Infiltration Loss	0.510	54.815
Surface Runoff	0.199	21.400
Final Surface Storage	0.000	0.001
Continuity Error (%)	-0.254	

********** Flow Routing Continuity **********	Volume hectare-m	Volume Mliters
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.199	1.990
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.199	1.990
Surface Flooding	0.000	0.000
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	-0.002	

```
  ************************************************
  EPA SWMM Time of Concentration Computations Report
  ************************************************

          Tc = (0.94 * (L^0.6) * (n^0.6)) / ((i^0.4) * (S^0.3))

          Where:

          Tc = Time of Concentration (min)
          L  = Flow Length (ft)
          n  = Manning's Roughness
          i  = Rainfall Intensity (in/hr)
          S  = Slope (ft/ft)

  ---------------------
  Subbasin {DA-1}.37
  ---------------------

          Flow length (m):                            21.55
          Pervious Manning's Roughness:              0.20000
          Impervious Manning's Roughness:            0.01500
          Pervious Rainfall Intensity (mm/hr):      19.00583
          Impervious Rainfall Intensity (mm/hr):    19.00583
          Slope (%):                                 1.00000
          Computed TOC (minutes):                      18.33

  ------------------
  Subbasin Sub-01
  ------------------

          Flow length (m):                           158.68
          Pervious Manning's Roughness:              0.20000
          Impervious Manning's Roughness:            0.01500
          Pervious Rainfall Intensity (mm/hr):      19.00583
          Impervious Rainfall Intensity (mm/hr):    19.00583
          Slope (%):                                 1.50000
          Computed TOC (minutes):                      60.43


  **********************
  Subbasin Runoff Summary
  **********************


-------------------------------------------------------------------------------------------------------
-------
  Subbasin             Total     Total     Total     Total     Total      Peak       Runoff
Time of
  ID                Rainfall     Runon     Evap.    Infil.    Runoff    Runoff  Coefficient
Concentration
                          mm        mm        mm        mm        mm       LPS               days
hh:mm:ss

-------------------------------------------------------------------------------------------------------
-------
  {DA-1}.37            76.02      0.00      0.00     35.75     41.02     44.35        0.540    0
00:18:19
  Sub-01               76.02      0.00      0.00     55.06     21.15    667.20        0.278    0
01:00:25

-------------------------------------------------------------------------------------------------------
-------


  ******************
  Node Depth Summary
```

****

Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Time Flooded minutes	Retention Time hh:mm:ss
D-1	0.04	0.44	81.94	0	02:00	0	0	0:00:00
N-1	0.04	0.49	81.88	0	02:00	0	0	0:00:00
N-2	0.04	0.49	81.23	0	02:00	0	0	0:00:00
OUTFALL	0.04	0.42	80.50	0	02:00	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow LPS	Peak Inflow LPS	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow LPS	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
D-1	JUNCTION	687.28	687.28	0	02:00	0.00		
N-1	JUNCTION	0.00	686.15	0	02:00	0.00		
N-2	JUNCTION	0.00	684.57	0	02:00	0.00		
OUTFALL	OUTFALL	0.00	684.21	0	02:00	0.00		

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow LPS	Peak Inflow LPS
OUTFALL	23.02	200.10	684.21
System	23.02	200.10	684.21

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence days	Time of Peak Flow Occurrence hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis LPS	Design Flow Capacity LPS	Ratio of Maximum Flow /Design Flow	Ratio of Maximum Depth	Total Reported Time Surcharged minutes	Condition
DITCH-IN-4.5m	CHANNEL	0	02:00	0.83	1.00	686.15	1937.31	0.35	0.78	0	Calculated
P-1	CONDUIT	0	02:00	2.21	1.00	684.57	1157.04	0.59	0.64	0	Calculated
P-2	CONDUIT	0	02:00	2.41	1.00	684.21	1162.36	0.59			

0.60 0 Calculated

****
Flow Classification Summary
****

Link	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
	--- Fraction of Time in Flow Class ----								
DITCH-IN-4.5m	0.13	0.49	0.00	0.38	0.00	0.00	0.00	0.11	0.0001
P-1	0.13	0.00	0.00	0.68	0.18	0.00	0.00	0.31	0.0001
P-2	0.14	0.00	0.00	0.63	0.23	0.00	0.00	0.38	0.0001

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

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

****
Routing Time Step Summary
****
Minimum Time Step : 5.00 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00

Analysis began on: Wed Aug 07 00:02:51 2024
Analysis ended on: Wed Aug 07 00:02:52 2024
Total elapsed time: 00:00:01

HY-8 Culvert Analysis Report

Table 1 - Project Headwater Table

Crossing Name	Culvert Name	Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	HW / D (m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Outlet Velocity (m/s)
EXIST 1900 CULVERT CTY RD	Culvert 1900mm dia.	12.00	11.08	82.07	3.49	1.863	0.56	1.15	1.67	1.26	5.99

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 5.00 cms
Design Flow: 12.00 cms
Maximum Flow: 12.00 cms

Table 2 - Summary of Culvert Flows at crossing: EXIST 1900 CULVERT CTY RD

Headwater Elevation (m)	Total Discharge (cms)	Culvert 1900mm dia. Discharge (cms)	Roadway Discharge (cms)	Iterations
80.15	5.00	5.00	0.00	1
80.29	5.70	5.70	0.00	1
80.45	6.40	6.40	0.00	1
80.61	7.10	7.10	0.00	1
80.78	7.80	7.80	0.00	1
80.96	8.50	8.50	0.00	1
81.15	9.20	9.20	0.00	1
81.36	9.90	9.90	0.00	1
81.55	10.60	10.53	0.07	7
81.66	11.30	10.84	0.46	6
82.07	12.00	11.08	0.92	5
81.51	10.39	10.39	0.00	Overtopping

Rating Curve Plot for crossing: EXIST 1900 CULVERT CTY RD

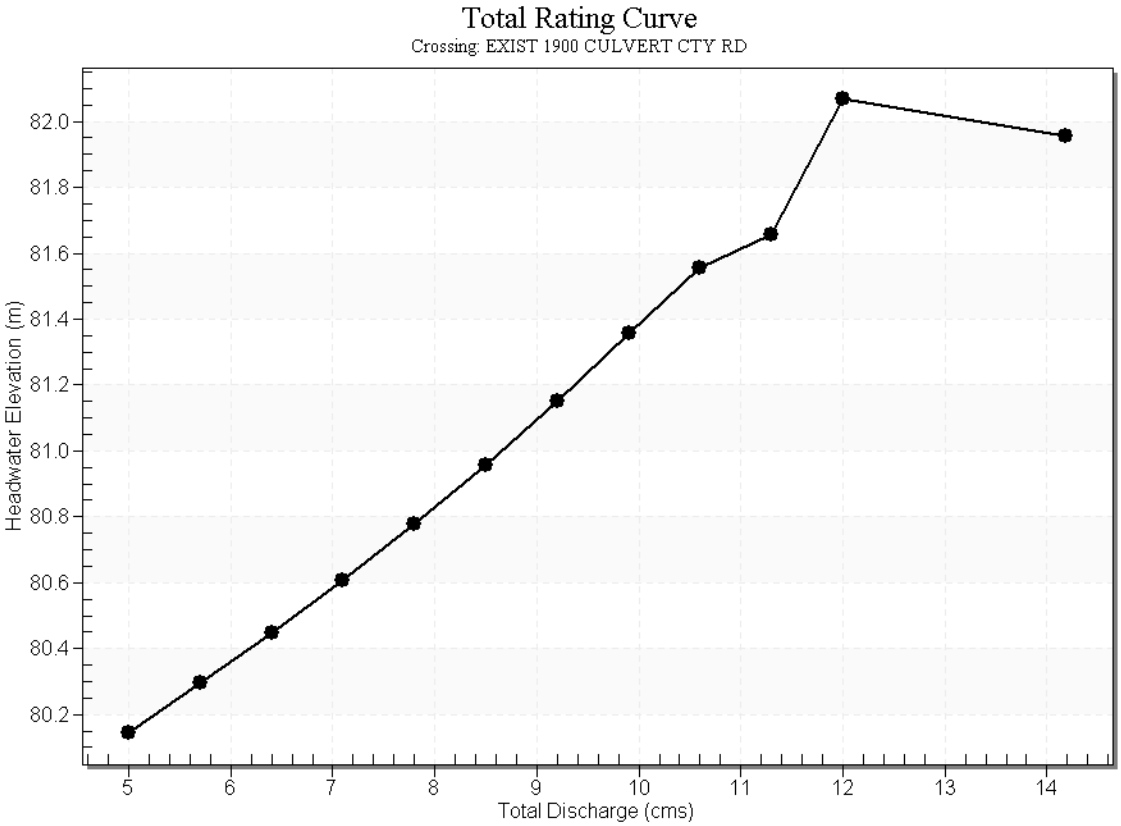


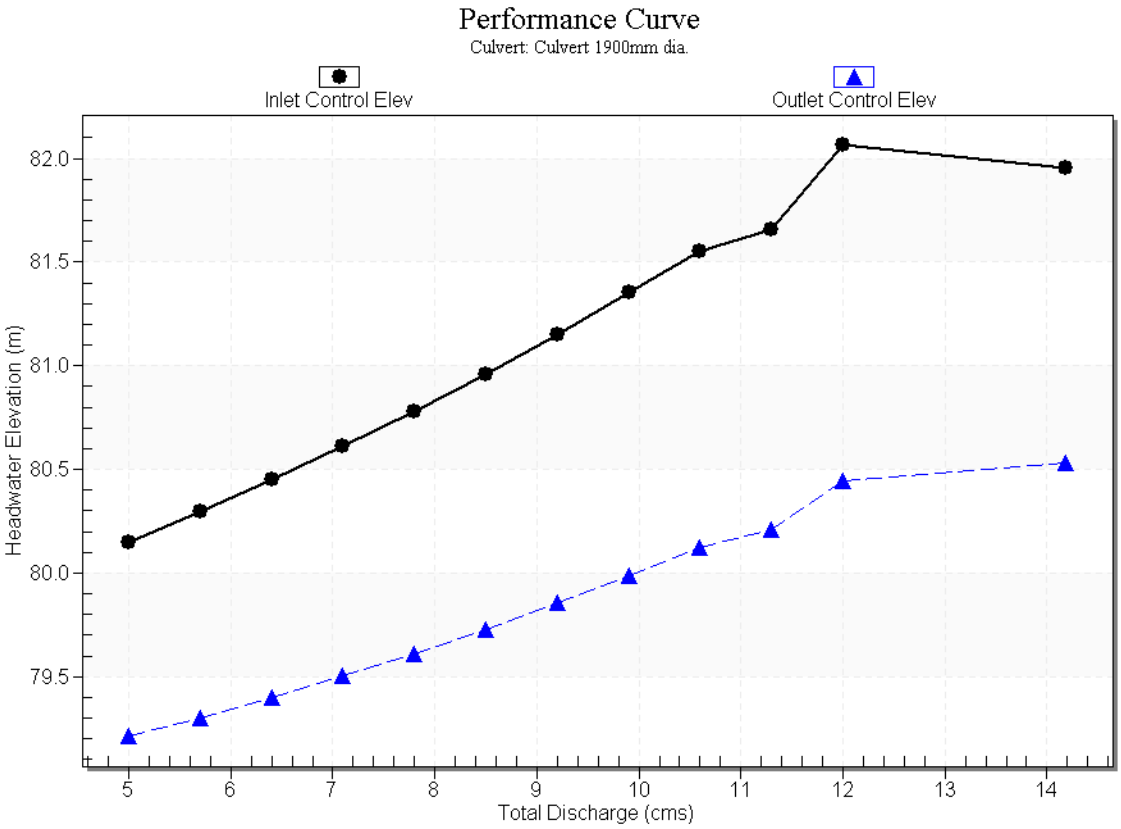
Table 3 - Culvert Summary Table: Culvert 1900mm dia.

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	HW / D (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
5.00	5.00	80.15	1.57	0.631	0.25	1-S2n	0.69	1.09	0.74	0.59	4.90	2.82
5.70	5.70	80.29	1.71	0.722	0.28	1-S2n	0.74	1.17	0.80	0.65	5.04	2.94
6.40	6.40	80.45	1.87	0.819	0.30	1-S2n	0.79	1.24	0.86	0.70	5.17	3.05
7.10	7.10	80.61	2.03	0.922	0.33	5-S2n	0.84	1.31	0.91	0.75	5.29	3.15
7.80	7.80	80.78	2.20	1.032	0.35	5-S2n	0.89	1.37	0.96	0.80	5.40	3.24
8.50	8.50	80.96	2.38	1.149	0.38	5-S2n	0.93	1.43	1.02	0.85	5.51	3.33
9.20	9.20	81.15	2.57	1.275	0.41	5-S2n	0.98	1.49	1.07	0.90	5.61	3.41
9.90	9.90	81.36	2.78	1.409	0.45	5-S2n	1.02	1.54	1.12	0.95	5.71	3.48
10.60	10.53	81.55	2.97	1.541	0.48	5-S2n	1.06	1.58	1.16	1.00	5.80	3.55
11.30	10.84	81.66	3.08	1.631	0.49	5-S2n	1.08	1.60	1.18	1.04	5.84	3.62
12.00	11.08	82.07	3.49	1.863	0.56	5-S2n	1.15	1.67	1.26	1.09	5.99	3.68
14.18	11.69	81.96	3.38	1.952	0.54	5-S2n	1.13	1.65	1.24	1.23	5.95	3.85

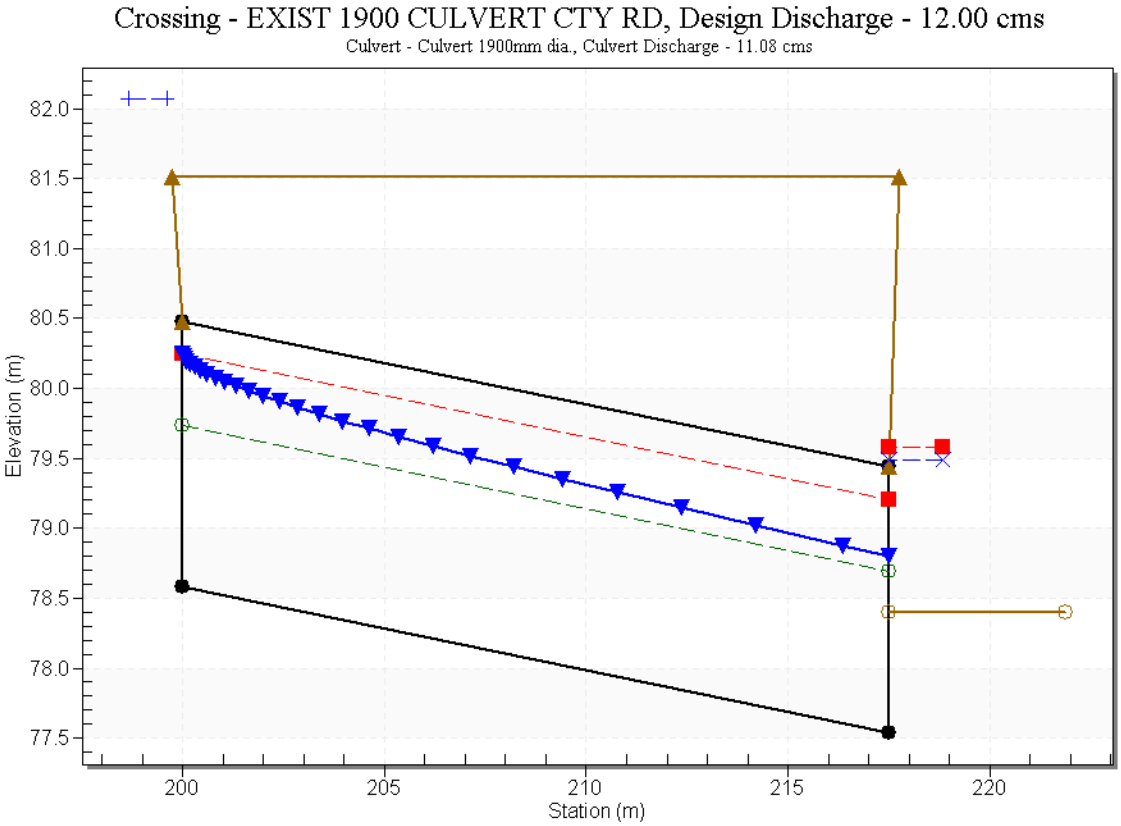
Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 78.58 m
Outlet Elevation (invert): 77.54 m
Culvert Length: 17.53 m
Culvert Slope: 0.06 m/m

Culvert Performance Curve Plot: Culvert 1900mm dia.



Water Surface Profile Plot for Culvert: Culvert 1900mm dia.



Site Data - Culvert 1900mm dia.

Site Data Option: Culvert Invert Data
Inlet Station: 200.00 m
Inlet Elevation: 78.58 m
Outlet Station: 217.50 m
Outlet Elevation: 77.54 m
Number of Barrels: 1

Culvert Data Summary - Culvert 1900mm dia.

Barrel Shape: Circular
Barrel Diameter: 1900.00 mm
Barrel Material: Corrugated Steel
Embedment: 0.00 mm
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall (Ke=0.5)
Inlet Depression: None

Tailwater Channel Data for Crossing: EXIST 1900 CULVERT CTY RD

Tailwater Channel Option: Rectangular Channel
Bottom Width: 3.00 m
Channel Slope: 0.01 m/m
Channel Manning's n: 0.0200

Channel Invert Elevation: 78.40 m

Table 4 - Downstream Channel Rating Curve (crossing: EXIST 1900 CULVERT CTY RD)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
5.00	78.99	0.59	2.82	57.90	1.17
5.70	79.05	0.65	2.94	63.30	1.17
6.40	79.10	0.70	3.05	68.52	1.17
7.10	79.15	0.75	3.15	73.61	1.16
7.80	79.20	0.80	3.24	78.58	1.16
8.50	79.25	0.85	3.33	83.44	1.15
9.20	79.30	0.90	3.41	88.22	1.15
9.90	79.35	0.95	3.48	92.92	1.14
10.60	79.40	1.00	3.55	97.56	1.14
11.30	79.44	1.04	3.62	102.12	1.13
12.00	79.49	1.09	3.68	106.64	1.13

Roadway Data for crossing: EXIST 1900 CULVERT CTY RD

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 5.00 m
Crest Elevation: 81.51 m
Roadway Surface: Paved
Roadway Top Width: 18.00 m

HY-8 Culvert Analysis Report

Table 1 - Project Headwater Table

Crossing Name	Culvert Name	Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	HW / D (m)	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Outlet Velocity (m/s)
114-WEST WATER COURSE	Culvert750 mm Conc.	0.95	0.95	82.46	0.96	0.0*	0.39	0.45	0.60	0.45	3.41

* Full Flow Headwater elevation is below inlet invert.

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 0.75 cms
Design Flow: 0.95 cms
Maximum Flow: 1.00 cms

Table 2 - Summary of Culvert Flows at crossing: 114-WEST WATERCOURSE

Headwater Elevation (m)	Total Discharge (cms)	Culvert750 mm Conc. Discharge (cms)	Roadway Discharge (cms)	Iterati
82.30	0.75	0.75	0.00	1
82.32	0.77	0.77	0.00	1
82.34	0.80	0.80	0.00	1
82.36	0.83	0.83	0.00	1
82.38	0.85	0.85	0.00	1
82.40	0.87	0.87	0.00	1
82.42	0.90	0.90	0.00	1
82.44	0.92	0.92	0.00	1
82.46	0.95	0.95	0.00	1
82.49	0.98	0.98	0.00	1
82.51	1.00	1.00	0.00	1
83.50	1.77	1.77	0.00	Overto

Rating Curve Plot for crossing: 114-WEST WATERCOURSE

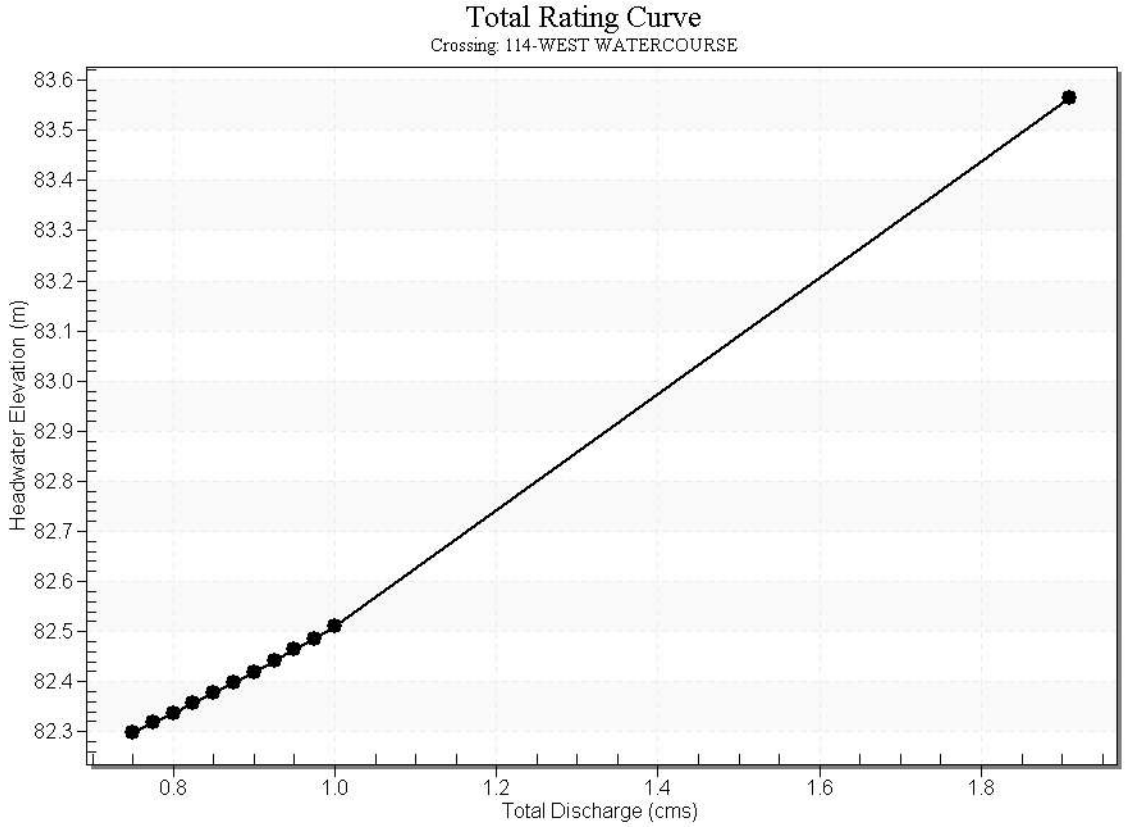


Table 3 - Culvert Summary Table: Culvert750 mm Conc.

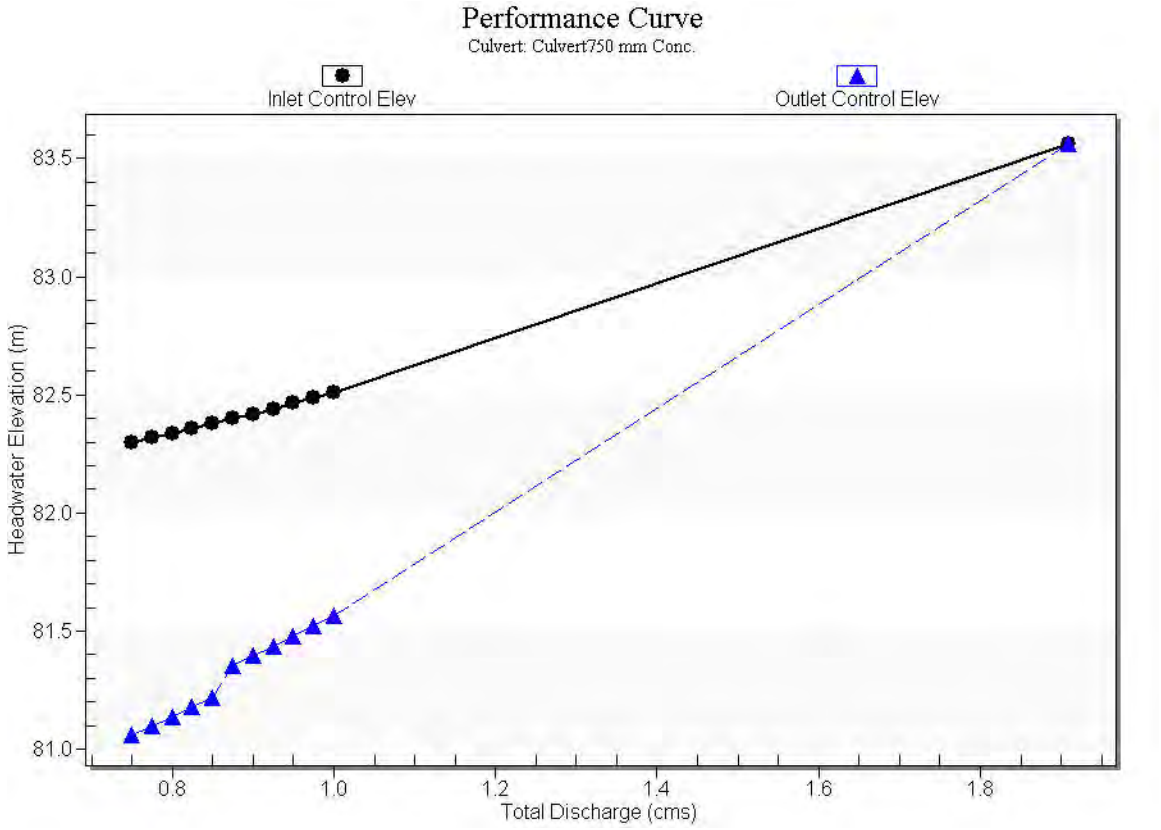
Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	HW / D (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)
0.75	0.75	82.30	0.80	0.0*	0.32	5-S2n	0.39	0.53	0.39	0.20
0.77	0.77	82.32	0.82	0.0*	0.33	5-S2n	0.40	0.54	0.40	0.21
0.80	0.80	82.34	0.84	0.0*	0.33	5-S2n	0.40	0.55	0.40	0.21
0.83	0.83	82.36	0.86	0.0*	0.34	5-S2n	0.41	0.56	0.41	0.22
0.85	0.85	82.38	0.88	0.0*	0.35	5-S2n	0.42	0.57	0.42	0.22
0.87	0.87	82.40	0.90	0.0*	0.36	5-S2n	0.43	0.58	0.43	0.22
0.90	0.90	82.42	0.92	0.0*	0.37	5-S2n	0.43	0.59	0.43	0.23
0.92	0.92	82.44	0.94	0.0*	0.38	5-S2n	0.44	0.59	0.44	0.23
0.95	0.95	82.46	0.96	0.0*	0.39	5-S2n	0.45	0.60	0.45	0.24
0.98	0.98	82.49	0.99	0.020	0.39	5-S2n	0.46	0.61	0.46	0.24
1.00	1.00	82.51	1.01	0.064	0.40	5-S2n	0.46	0.61	0.46	0.24
1.91	1.82	83.56	2.06	2.059	0.83	7-M2c	0.76	0.66	0.66	0.37

* Full Flow Headwater elevation is below inlet invert.

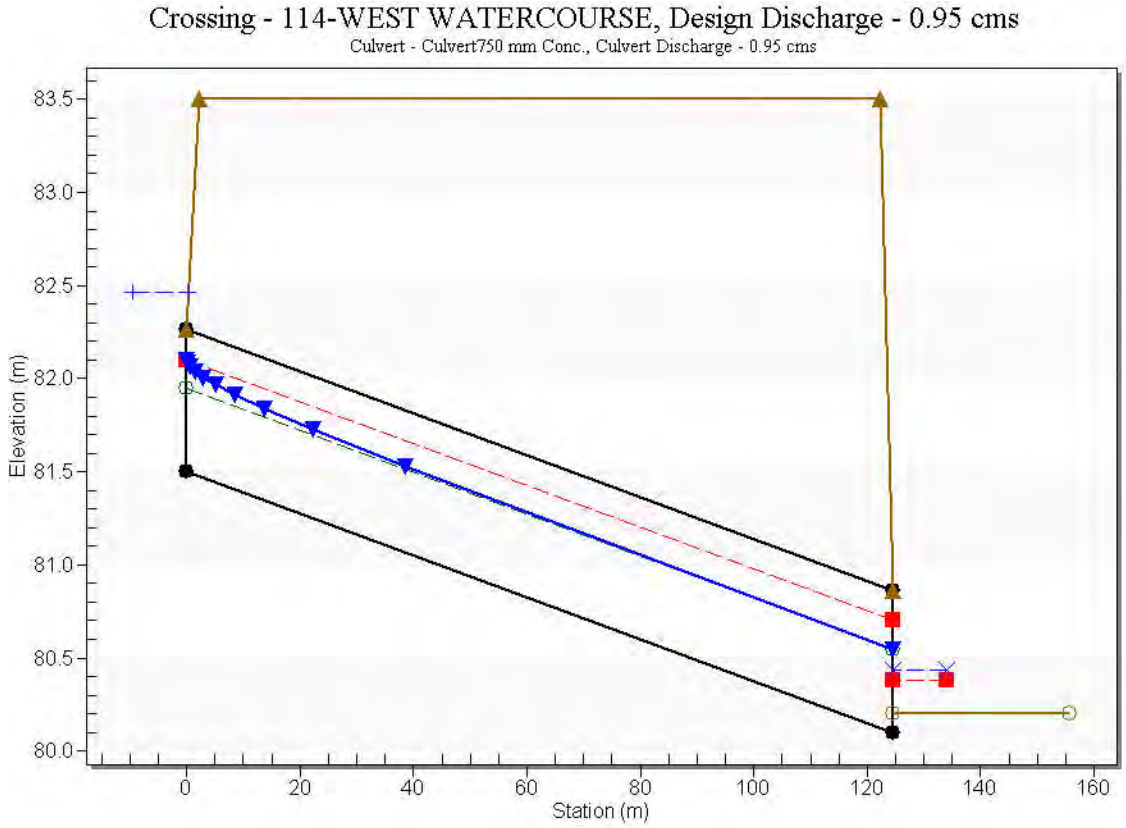
Culvert Barrel Data

Culvert Barrel Type: Straight Culvert
Inlet Elevation(invert): 81.50 m
Outlet Elevation (invert): 80.10 m
Culvert Length: 124.55 m
Culvert Slope: 0.01 m/m

Culvert Performance Curve Plot: Culvert750 mm Conc.



Water Surface Profile Plot for Culvert: Culvert750 mm Conc.



Site Data - Culvert750 mm Conc.

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 m
Inlet Elevation: 81.50 m
Outlet Station: 124.54 m
Outlet Elevation: 80.10 m
Number of Barrels: 1

Culvert Data Summary - Culvert750 mm Conc.

Barrel Shape: Circular
Barrel Diameter: 762.00 mm
Barrel Material: Concrete
Embedment: 0.00 mm
Barrel Manning's n: 0.0110
Culvert Type: Straight
Inlet Configuration: Grooved End in Headwall (Ke=0.2)
Inlet Depression: None

Tailwater Channel Data for Crossing: 114-WEST WATERCOURSE

Tailwater Channel Option: Rectangular Channel
Bottom Width: 4.00 m
Channel Slope: 0.01 m/m
Channel Manning's n: 0.0350

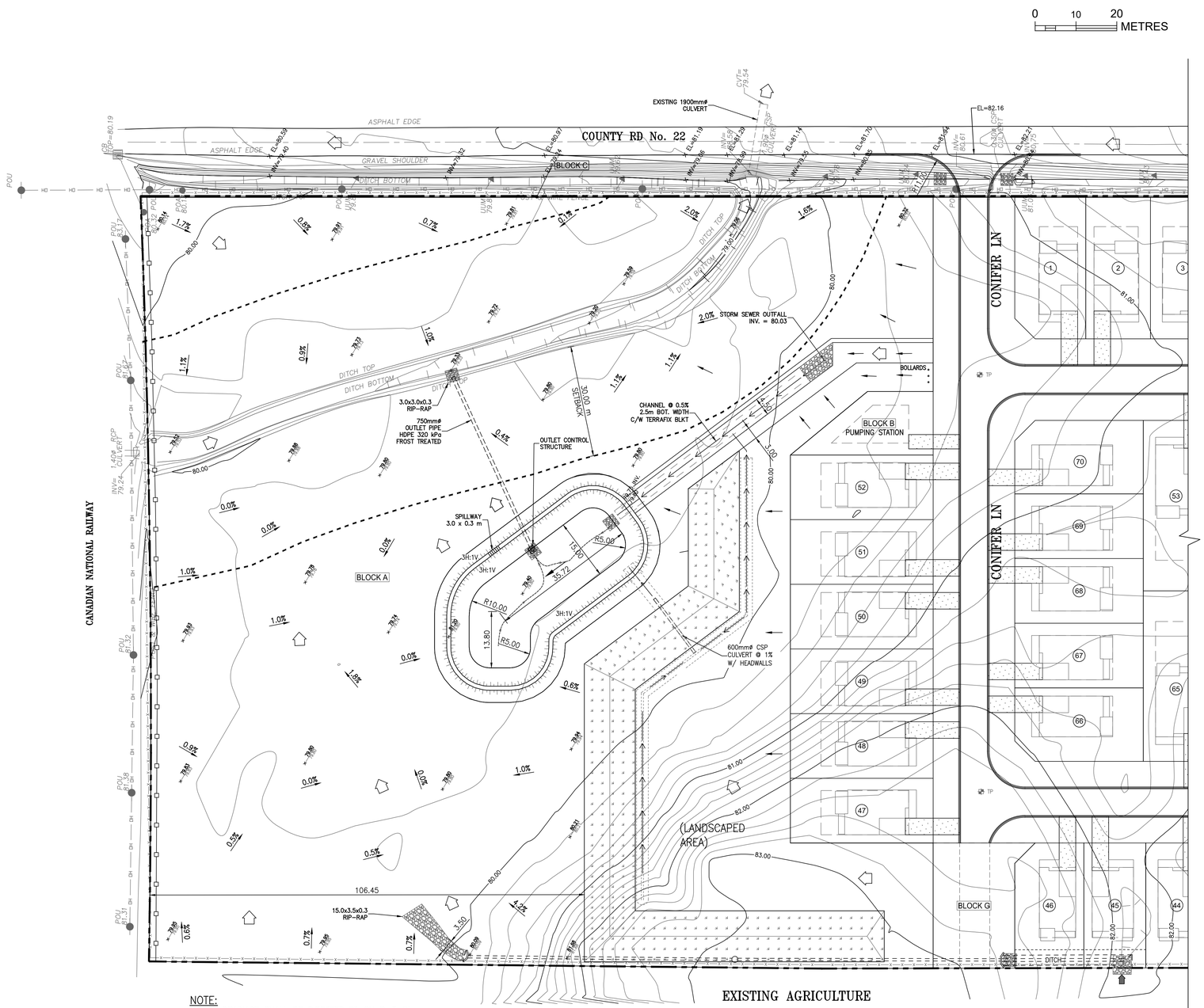
Channel Invert Elevation: 80.20 m

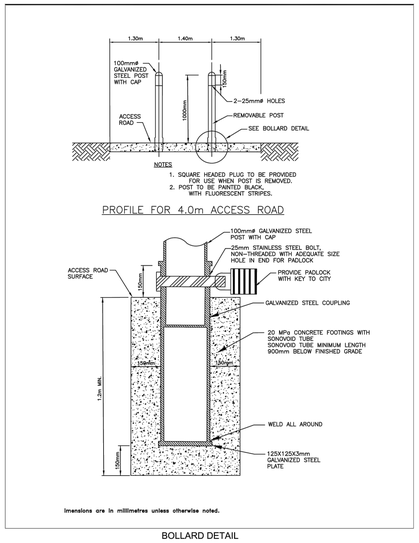
Table 4 - Downstream Channel Rating Curve (crossing: 114-WEST WATERCOURSE)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.75	80.40	0.20	0.92	19.88	0.66
0.77	80.41	0.21	0.94	20.29	0.66
0.80	80.41	0.21	0.95	20.69	0.66
0.83	80.42	0.22	0.96	21.09	0.66
0.85	80.42	0.22	0.97	21.49	0.66
0.87	80.42	0.22	0.98	21.88	0.66
0.90	80.43	0.23	0.99	22.27	0.66
0.92	80.43	0.23	1.00	22.66	0.66
0.95	80.44	0.24	1.01	23.04	0.67
0.98	80.44	0.24	1.02	23.42	0.67
1.00	80.44	0.24	1.03	23.79	0.67

Roadway Data for crossing: 114-WEST WATERCOURSE

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 4.00 m
Crest Elevation: 83.50 m
Roadway Surface: Gravel
Roadway Top Width: 120.00 m





BOLLARD DETAIL

LEGEND:

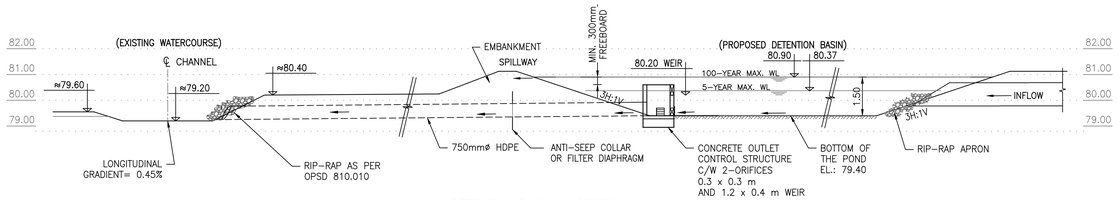
- EXISTING CULVERT — 600ø CSP
- PROPOSED DITCH AND CULVERT — 600ø CSP
- PROPOSED GRADING ELEVATION — 82.00
- EXISTING GRADE ELEVATION — 82.00
- TOP OF GRATE ELEVATION — T/G 82.00
- EXIST. MAJOR OVERLAND FLOW DIRECTION
- PROPOSED SWALE
- SWALE INVERT — 82.00 INV
- CONTOUR — 80.00
- PROPOSED TERRACING
- PROPOSED SURFACE DRAINAGE PATTERN — 1 %
- HIGH POINT
- PROPOSED CURB
- CURB & DEPRESSED CURB — DC / BARRIER / MOUNTABLE
- PROP. CHAINLINK FENCE
- NOISE BARRIER — T/W=XX.XX B/W=XX.XX
- WOOD PRIVACY BARRIER
- TREES
- HEDGES
- PROP. LANDSCAPED AREA

NOTE:

1– NO DRAINAGE SHALL BE DIRECTED TO CN R–O–W–.

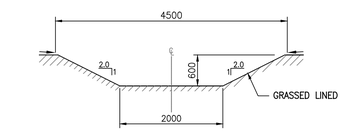
2– POND

- DIMENSIONS: 45 x 15 x 1.8 m
- MINIMUM SETBACK OF 30 m FROM THE WATERCOURSE.
- MAXIMUM INTERIOR EMBANKMENT SLOPES: 3:1, MINIMUM BOTTOM SLOPE AT 1%.
- MINIMUM 0.3 m FREEBOARD TO EMBANKMENT CREST.
- 3 m WIDE EMERGENCY SPILLWAY ON THE WATERCOURSE SIDE.
- OUTLET CONTROL STRUCTURE WITH A LOW FLOW ORIFICE AND A TRASH RACK.
- PROVIDE 2 x 2 x 0.3 m RIPRAP APRON AT INLET LOCATION AS PER OPSD AND SCOUR PROTECTION AT OUTFALL.
- A CHAIN–LINK FENCE MAY BE INSTALLED SURROUNDING THE POND FOR SAFETY PURPOSE.
- A 4m–WIDE GRAVELLED ROAD WILL PROVIDE THE ACCESS TO THE BASIN AND OUTFALL FOR MAINTENANCE.



DETENTION BASIN – SECTION

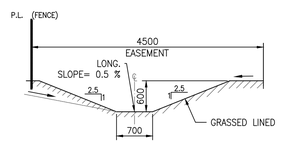
* DISTANCES ARE IN METRE SCALE: 1:100



* DISTANCES ARE IN MILLIMETRE

CHANNEL SECTION

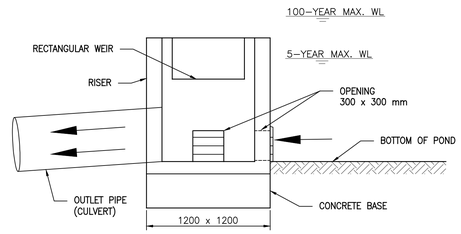
SCALE: 1:50



* DISTANCES ARE IN MILLIMETRE

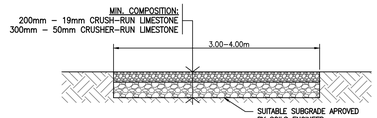
CHANNEL SECTION – WEST LIMIT

SCALE: 1:50



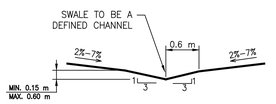
OUTLET CONTROL STRUCTURE

SCALE: 1:25



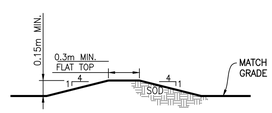
GRANULAR ACCESS ROAD

SCALE: 1:50



TYPICAL SWALE SECTION

SCALE: 1:25



TYPICAL BERM SECTION

SCALE: 1:25

No.	REVISION / ISSUE	DATE MM/DD/YY
5	POND LAYOUT UPDATE	07/31/24
1	OWNER / APPROVAL	03/10/22

PREPARED BY:

Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com

ADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 07-31-2024 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

POND PLAN

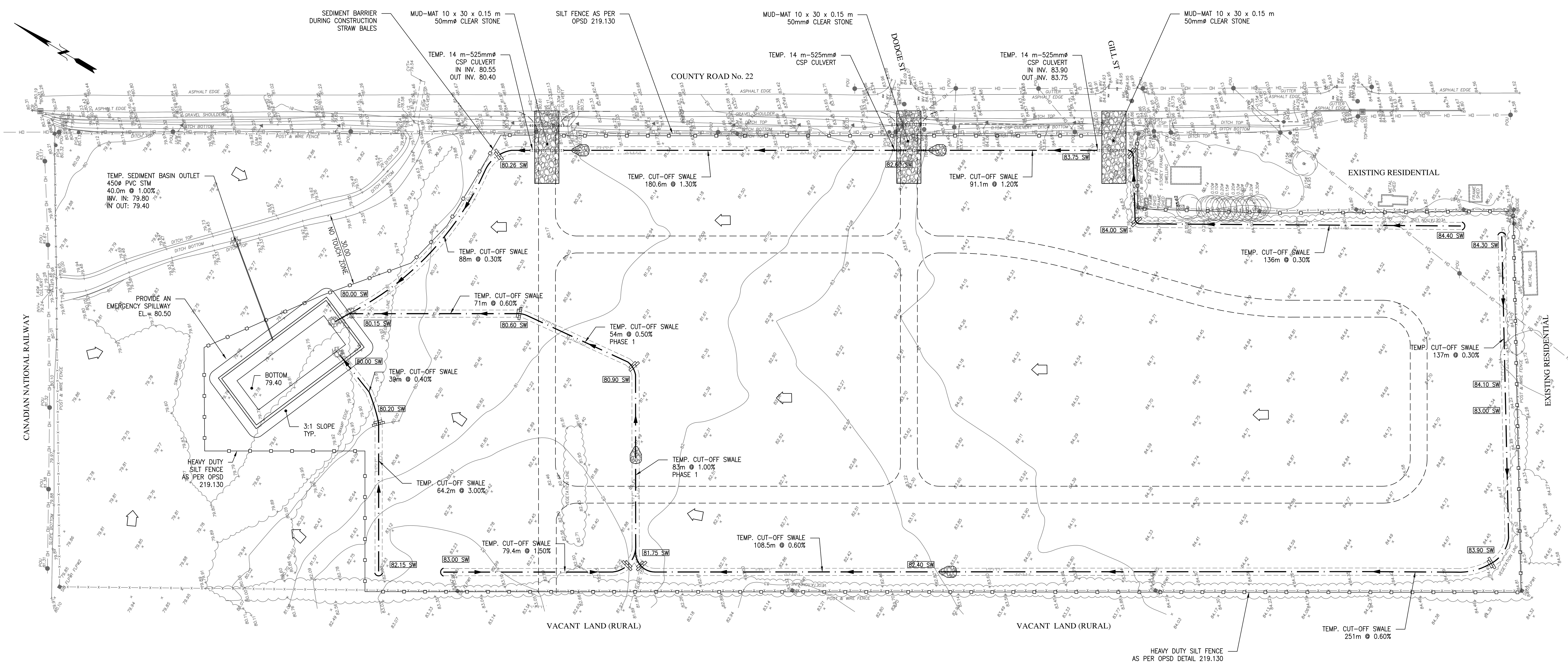
SCALE: 1:500

DRAFTED BY:

PROJECT No.: 0114

DATE: 07-31-2024

DRAWING No.: PND



UNITED COUNTIES OF LEEDS AND GRENVILLE

PART OF LOT 7, CONCESSION 1
GEOGRAPHIC TOWN OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL
COUNTY OF GRENVILLE

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY IBW SURVEYORS FILE No. A-026727-TOPO. SURVEY DATED APRIL 28, 2021.

ELEVATIONS:
ELEVATIONS SHOWN ON THIS PLAN ARE GEODETIC AND REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD28) BY DIRECT MEASUREMENT TO REAL TIME NETWORK.

GEOTECHNICAL REPORT

REFER TO GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT No. 21C350, DATED MAY 31, 2021, PREPARED BY ST. LAWRENCE TESTING & INSPECTION CO. LTD.. INFORMATION PRESENTED IN THESE DRAWINGS HAS BEEN INTERPOLATED FROM THE GEOTECHNICAL REPORT AND ACCURACY IS NOT GUARANTEED. CONTRACTORS ARE ADVISED TO READ THE GEOTECHNICAL REPORT AND ASSUME THEIR OWN CONCLUSIONS.

USE AND INTERPRETATION OF DRAWINGS

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THIS DRAWING SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

REFER TO DWG D-4 FOR MORE ESC DETAILS

No.	REVISION / ISSUE	DATE MM/DD/YY
6	POND BOTTOM ELEVATION CHANGE	02/06/24
5	REVIEW COMMENTS – 10-18-2023	12/01/23
4	REVIEW COMMENTS – 06-30-2023	07/25/23
3	SWALE ALTERATION	05/15/23
2	PEER REVIEW COMMENTS	11/07/22
1	OWNER / APPROVAL	03/10/22

LEGEND:

- PROPOSED SILT FENCE
- PROPOSED SNOW FENCE
- PROPOSED ROCK FLOW CHECK DAM
- PROPOSED STRAW BALE BARRIER
- PROPOSED STRAW BALE BARRIER WITH FILTER CLOTH
- FILTER CLOTH FOR EXISTING STRUCTURE
- PROPOSED RIP RAP TREATMENT
- EXISTING CULVERT
- DITCH AND CULVERT (500ø CSP)
- PHASING LIMITS
- PROPERTY BOUNDARY
- EXIST. MAJOR OVERLAND FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED SWALE INVERT (82.00 INV)
- CONTOUR (80.00)
- PROPOSED TERRACING
- PROPOSED SURFACE DRAINAGE PATTERN (1 %)
- HIGH POINT

EROSION AND SEDIMENT CONTROL NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR ALL INSTALLATION, MONITORING, CLEARING, REPAIR AND REMOVAL OF ALL EROSION AND SEDIMENT CONTROL MEASURES.
2. PERSONAL ON CONSTRUCTION SITE SHALL BE INFORMED OM SEDIMENT AND EROSION CONTROL MEASURES.
3. PRIOR TO TOPSOIL STRIPPING, EARTHWORKS, OR UNDERGROUND CONSTRUCTION, EROSION AND SEDIMENT CONTROLS SHALL BE IMPLEMENTED TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
4. SILT FENCE TO BE IN PLACE PRIOR TO INITIATION OF TOPSOIL STRIPPING OR PRE-GRADING OPERATIONS AND SHALL BE LOCATED TO PREVENT SURFACE RUNOFF FROM LEAVING THE SITE UNTREATED.
5. ANY DISTURBED SLOPES SHALL BE SEEDED AND MULCHED IMMEDIATELY FOLLOWING COMPLETION OF PRE-GRADING.
6. STRAW BALES OR ROCK CHECK DAMS ARE TO BE INSTALLED DOWNSTREAM IN EXISTING DRAINAGE SWALES/DITCHES BEFORE REACHING CATCH BASINS AT VAN HORNE AVENUE DURING CONSTRUCTION PERIOD.
7. STRAW BALES OR ROCK CHECK DAMS ARE TO BE USED IN ANY TEMPORARY DRAINAGE DITCHES REQUIRED DURING THE CONSTRUCTION PERIOD.
8. ALL EROSION CONTROLS ARE TO BE INSPECTED REGULARLY AND CLEARED OR REPLACED, AS SPECIFIED. PARTICULARLY, INSPECTION SHALL BE DONE ON A WEEKLY BASIS, AFTER EVERY RAINFALL EVENT, AFTER SIGNIFICANT SNOW MELTDOWN AND PRIOR TO A FORECAST OF RAINFALL EVENT.
9. EROSION CONTROLS ARE TO BE KEPT IN PLACE AND FUNCTIONAL UNTIL THE SITE IS STABILIZED (LOT GRADING AND SODDING COMPLETE).
10. TOPSOIL PILES TO BE LOCATED AWAY FROM DRAINAGE SWALES OR DITCHES AND SURROUNDED WITH SILT FENCING.
11. TOPSOIL AND/OR FILL MATERIAL NOT TO BE USED ON SITE SHALL BE DISPOSED OFF SITE IMMEDIATELY.
12. NO ALTERNATIVE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THE VILLAGE OF CARDINAL AND THE CONSERVATION AUTHORITY.
13. PROVIDE MUD-MATS OF COARSE 50 mm STONE AT SITE ENTRANCES AND MAINTAIN IN CLEAN CONDITION DURING CONSTRUCTION PERIOD.
14. CONTRACTOR IS RESPONSIBLE FOR VILLAGE ROADWAY TO BE CLEANED OF ALL SEDIMENT FROM VEHICULAR TRACKING AT THE END OF EACH WORK DAY.
15. DURING WET CONDITIONS, TIRES OF ALL VEHICLES/EQUIPMENT LEAVING THE SITE ARE TO BE SCRAPED.
16. CONSTRUCTION EQUIPMENT FUELING AND MAINTENANCE TO BE DONE AS FAR AS REASONABLY POSSIBLE FROM NATURAL FEATURES.
17. ACCUMULATED SEDIMENT TO BE REMOVED OFF SITE PRIOR TO THE REMOVAL OF SEDIMENT CONTROL FENCE.
18. UPON COMPLETION OF CONSTRUCTION WORKS SEDIMENT TRAPS AND SEDIMENT FENCES SHALL BE REMOVED. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED AS DIRECTED BY THE VILLAGE.
19. DUST CONTROL BEST MANAGEMENT MEASURES SHALL BE IMPLEMENTED TO STABILIZE SOIL FROM WIND EROSION AND REDUCE DUST GENERATED BY CONSTRUCTION ACTIVITIES. THEY MAY INCLUDE WATER SPRAYING, MULCHING, COVERING STOCKPILES WITH TRAPS, RAPID CLEANUP OF SEDIMENT DEPOSIT, ETC..
20. REFER TO SITE SERVICING AND SITE GRADING FOR DETAILS OF SITE SERVICING AND SITE DRAINAGE AND GRADE CONTROL.

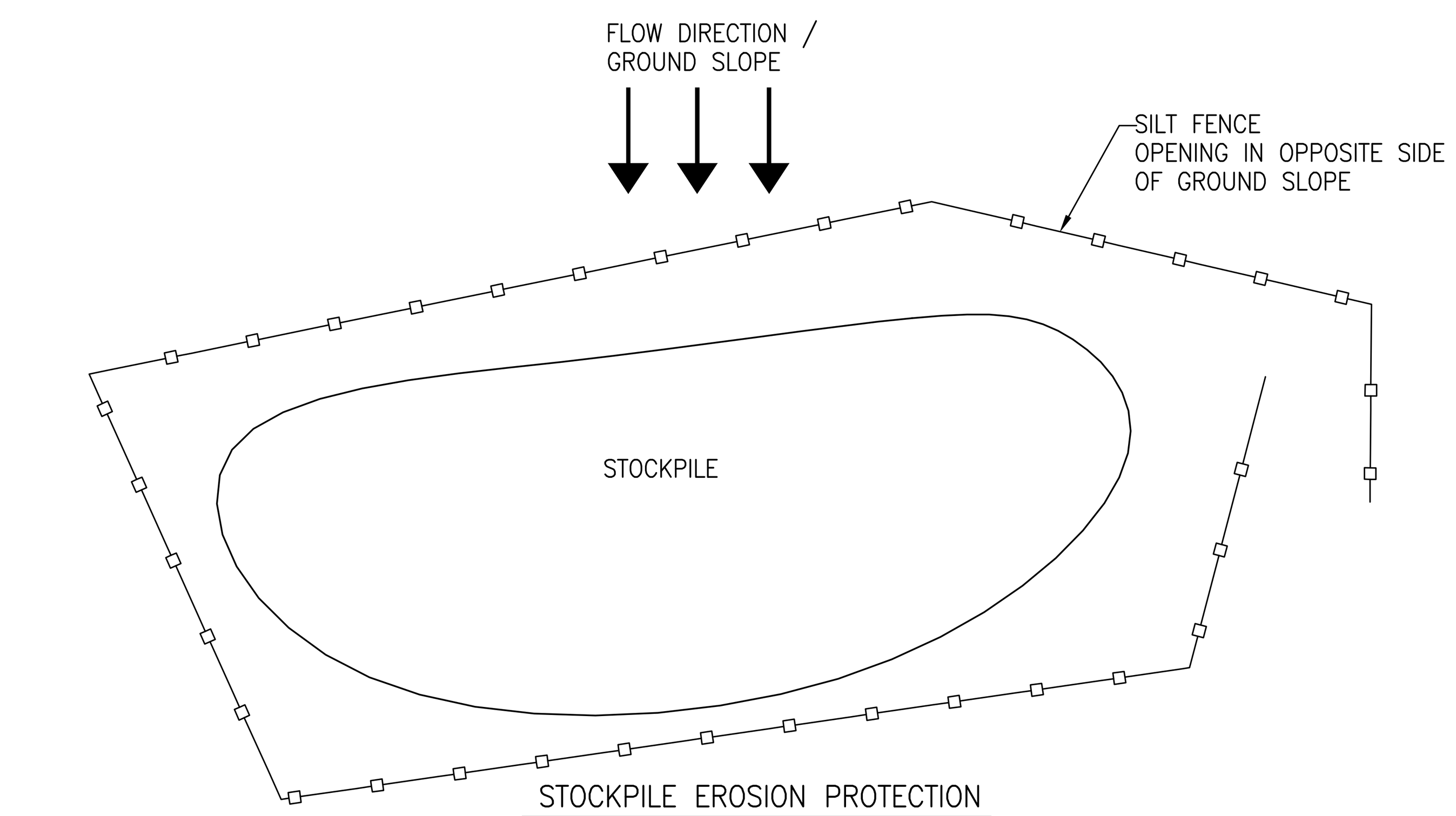
MONITORING OF SEDIMENT AND EROSION CONTROLS

DURING CONSTRUCTION, MONITORING OF CONTROL MEASURES WILL BE COMPLETED:

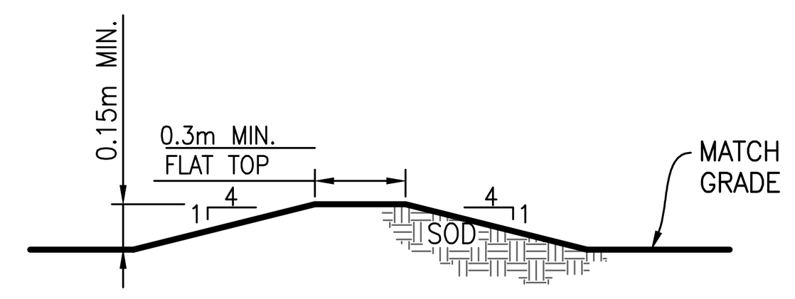
1. PRIOR TO PREDICTED RAIN EVENTS.
2. SUBSEQUENT TO RAIN EVENTS.
3. ON A DAILY BASIS.
4. AFTER SIGNIFICANT SNOWMELT EVENTS (WINTER-SPRING CONDITIONS) DURING INACTIVE CONSTRUCTION PERIODS, WHERE THE SITE IS LEFT ALONE FOR 30 DAYS OR LONGER, A MONTHLY INSPECTION SHOULD BE CONDUCTED.
5. DAILY DURING EXTENDED RAIN OR SNOWMELT PERIODS.

MAINTENANCE PROGRAM

1. ALL DAMAGED ESC MEASURES SHOULD BE REPAIRED AND/OR REPLACEMENT WITHIN 48 HOURS OF THE INSPECTION.
2. THE ENVIRONMENTAL MONITOR IS REQUIRED TO SUBMIT UPDATES TO THE CITY/CONSERVATION AUTHORITY BY EMAIL IN A TIMELY MANNER.
3. SEDIMENT SHOULD BE REMOVED FROM THE SEDIMENT CONTROL FENCING ONCE SEDIMENT HAS ACCUMULATED TO A LEVEL OF ONE-THIRD THE HEIGHT OF FENCING OR TO A HEIGHT OF 30 cm. ANY AMOUNT OF ACCUMULATED SEDIMENT SHOULD BE REMOVED PRIOR TO THE REMOVAL OF THE CONTROL MEASURES.



STOCKPILE EROSION PROTECTION
SCALE: N.T.S.



TYPICAL BERM SECTION
SCALE: 1:25

PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 02/06/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

EROSION & SEDIMENT CONTROL PLAN

SCALE: 1:750
DRAWING No.: ES-1
DRAFTED BY:
PROJECT No.: 0114
DATE: 02/06/24

4.21.2024 114-2-esc.dwg AE-MONOCHROME-36X24-COL-GREY(0240).ctb

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

11/12/2022

Province:	Ontario
City:	Cardinal
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	Lockmaster's Meadow (County Rd. 22)

Drainage Area (ha):	8.5
Runoff Coefficient 'c':	0.56

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.0

Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	

Project Name:	Lockmaster's Meadow (County Rd. 22)
Project Number:	-
Designer Name:	Brandon O'Leary
Designer Company:	Forterra
Designer Email:	brandon.oleary@forterrabp.com
Designer Phone:	905-630-0359
EOR Name:	Mongi Mabrouk
EOR Company:	Mongi Mabrouk Engineering Services
EOR Email:	eng.services.ca@gmail.com
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	40
EFO6	57
EFO8	69
EFO10	76
EFO12	82

Recommended Stormceptor EFO Model: EFO12

Estimated Net Annual Sediment (TSS) Load Reduction (%): 82

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

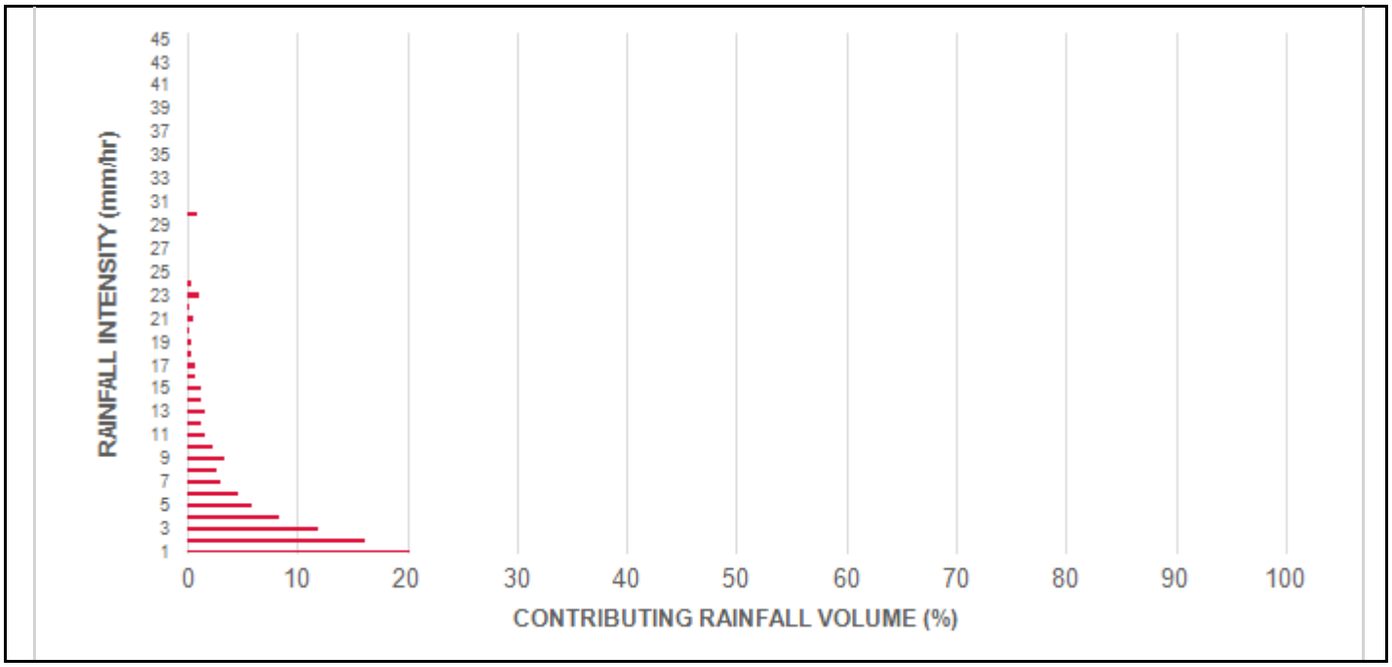
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

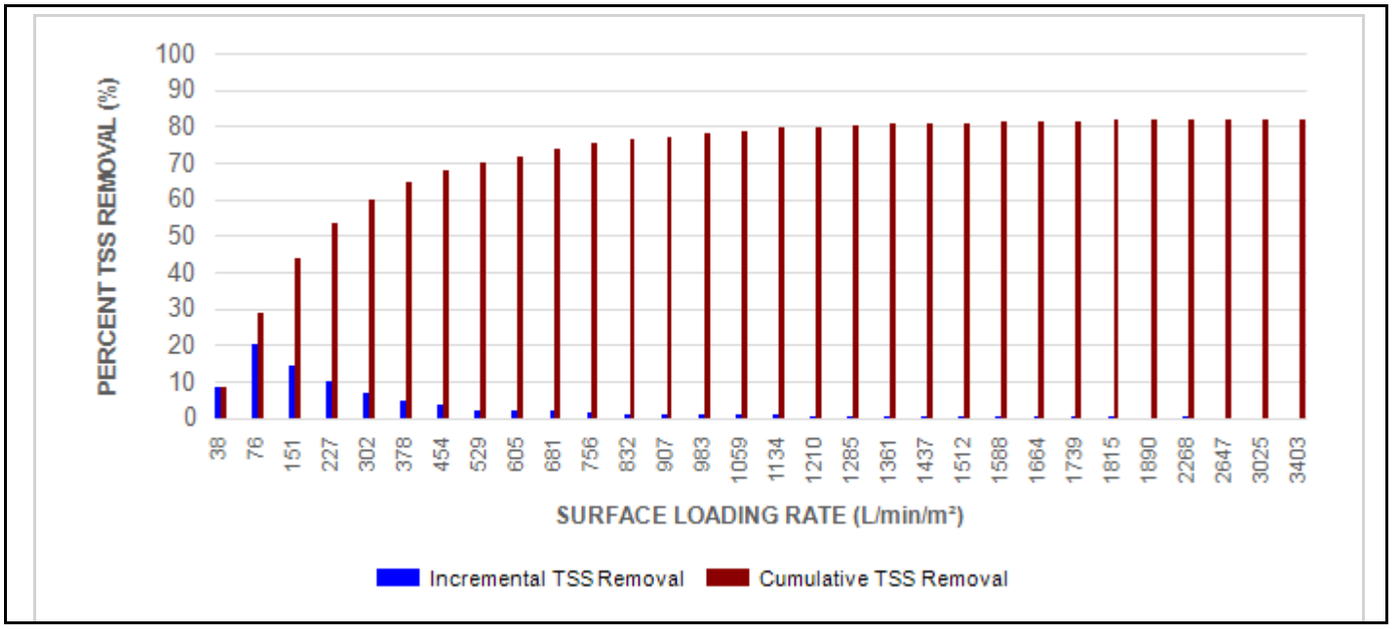
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.6	8.6	6.62	397.0	38.0	100	8.6	8.6
1	20.3	29.0	13.23	794.0	76.0	100	20.3	29.0
2	16.2	45.2	26.47	1588.0	151.0	89	14.5	43.5
3	12.0	57.2	39.70	2382.0	227.0	82	9.9	53.3
4	8.4	65.6	52.93	3176.0	302.0	78	6.6	60.0
5	5.9	71.6	66.16	3970.0	378.0	75	4.5	64.4
6	4.6	76.2	79.40	4764.0	454.0	72	3.3	67.7
7	3.1	79.3	92.63	5558.0	529.0	68	2.1	69.8
8	2.7	82.0	105.86	6352.0	605.0	65	1.8	71.6
9	3.3	85.3	119.10	7146.0	681.0	64	2.1	73.7
10	2.3	87.6	132.33	7940.0	756.0	63	1.5	75.2
11	1.6	89.2	145.56	8734.0	832.0	63	1.0	76.2
12	1.3	90.5	158.79	9528.0	907.0	62	0.8	77.0
13	1.7	92.2	172.03	10322.0	983.0	62	1.1	78.1
14	1.2	93.5	185.26	11116.0	1059.0	60	0.7	78.8
15	1.2	94.6	198.49	11910.0	1134.0	59	0.7	79.5
16	0.7	95.3	211.72	12703.0	1210.0	57	0.4	79.9
17	0.7	96.1	224.96	13497.0	1285.0	55	0.4	80.3
18	0.4	96.5	238.19	14291.0	1361.0	53	0.2	80.5
19	0.4	96.9	251.42	15085.0	1437.0	51	0.2	80.7
20	0.2	97.1	264.66	15879.0	1512.0	48	0.1	80.8
21	0.5	97.5	277.89	16673.0	1588.0	46	0.2	81.0
22	0.2	97.8	291.12	17467.0	1664.0	44	0.1	81.1
23	1.0	98.8	304.35	18261.0	1739.0	42	0.4	81.5
24	0.3	99.1	317.59	19055.0	1815.0	40	0.1	81.7
25	0.0	99.1	330.82	19849.0	1890.0	39	0.0	81.7
30	0.9	100.0	396.98	23819.0	2268.0	32	0.3	82.0
35	0.0	100.0	463.15	27789.0	2647.0	28	0.0	82.0
40	0.0	100.0	529.31	31759.0	3025.0	24	0.0	82.0
45	0.0	100.0	595.48	35729.0	3403.0	22	0.0	82.0
						Estimated Net Annual Sediment (TSS) Load Reduction =		**82 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

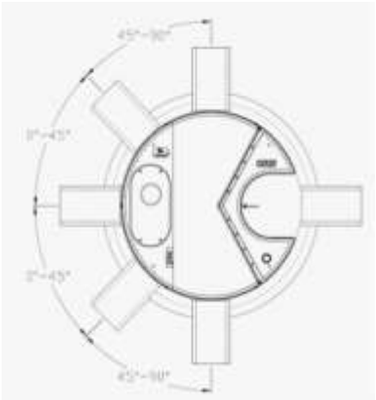
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

DESIGN FLEXIBILITY

►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.



INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in

accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

SCHEDULE "I"

SERVICING PLAN AND PUMPING STATION

For the lands set out in Schedule "A", the Owner agrees to implement the objectives and criteria of the Site Servicing Report, prepared by Advance Engineering Ltd., stamped and dated February 6, 2024; and the General Plan of Services drawings (GSP-1, GSP-2), stamped and dated February 6, 2024;

For the lands set out in Schedule "A", the Owner agrees to implement the works shown in the Street Plan and Profiles (PP-1 to PP-6 inclusive), prepared by Advance Engineering Ltd., stamped and dated February 6, 2024;

For the lands set out in Schedule "A", the Owner agrees to implement the objectives and criteria of the report titled "Wastewater Pumping Station & Forcemain Design", prepared by Advance Engineering, stamped and dated April 15, 2024; and the drawings PS-1 to PS-4 inclusive, A-1, M-1, E-1 stamped and dated April 15, 2024 and November 22, 2023.

AUTO-STANDBY GENERATOR

The Pumping Station shall include an auto-standby generator, installed on Block "B", to the satisfaction of the Municipality.

Attached:

- **Site Servicing Report February 6, 2024**
- **General Services Plan (GSP1, GSP2) February 6, 2024**
- **Plan and Profiles (PP1 to PP6 inclusive) February 6, 2024**
- **Wastewater Pumping Station and Forcemain Design April 15, 2024**
- **Pumping Station Plans**
    - **Cover Sheet List of Drawings and Key Plan (CS1) April 15, 2024**
    - **Site Plan (PS1) April 15, 2024**
    - **Section and Details (PS2) April 15, 2024**
    - **Forcemain By-Pass Chamber (PS3) April 15, 2024**
    - **Details (PS4) November 22, 2023**
    - **Plans (A1) November 22, 2023**
    - **Mechanical (M1) November 22, 2023**
    - **Electrical (E1) November 22, 2023**

SITE SERVICING REPORT

PROJECT: LOCKMASTER'S MEADOW SUBDIVISION (95 Single Family Lots)

ADDRESS: COUNTY ROAD 22 (SHANLY ROAD)
CARDINAL, ON

PREPARED FOR:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, Ontario K2T 1C1
(613) 282 5601

PREPARED BY:

Advance Engineering Ltd.
(613) 986 9170

Date	*Revision / Issue*
February 06, 2024	Update FUS 2020- Sanitary Design Sheet
August 03, 2022	Peer Review Comments
March 09, 2022	Issued for Subdivision Application

TABLE OF CONTENTS

List of Appendices:

A - Location – Figures
B - Draft Plan Agreement Conditions
- Geotechnical Report (2021)
C - Water & Sewer Design Calculations

List of Related Drawings:

S-1 – Draft Plan of Subdivision GSP - General Services Plan PP-1 TO PP-5 - Plan & Profile - Streets A, B & C GR-1&2 - Grading and Drainage Plan	ES-1 - Erosion and sediment Control Plan D1 TO D6 – Details

List of Related Reports:

- Stormwater Management Report & Pumping Station and Forcemain Design Report

1.0 INTRODUCTION

Edwardsburgh Developments Ltd. has retained *Advance Engineering Ltd.* to provide a site servicing study for the proposed residential subdivision of 95 single family lots. The report describes the existing infrastructure in the immediate area and estimates the servicing requirements for the proposed development. The adequacy of the existing sanitary sewer, watermain and stormwater infrastructure to accommodate all required flows and demands associated with the proposed development will be examined. The report also provides information and assumptions used in the design of the sanitary sewer and watermain, and should be read in conjunction with the design drawings prepared by *Advance Engineering Ltd.*.The report is prepared in support of an application for a subdivision draft plan approval by the applicant.

1.1 SITE DESCRIPTION

The proposed development is on a single parcel of land. It is located off the west side of County Road No. 22, village of Cardinal, Township of Edwardsburgh / Cardinal, Ontario (Figure-1, **Appendix A**). The legal description of the property is: "*Part of Lot 7, Concession 1, Geographic Township of Edwardsburgh, Township of Edwardsburgh / Cardinal, County of Grenville".* The subject property is bounded as follows:

- County Road 22 (Shanley Road) and three residential dwelling units to the east,
- CN railway to the north,
- vacant agriculture land to the west, and,
- residential dwellings to the south.

The subject property area is approximately 10.9274 hectares (27 acres) with a rectangular shape of approximately 600 m in length and 180 m in width. The site is currently vacant, undeveloped and covered with short grass and pasture.

1.2 BACKGROUND AND LAND USE

The original draft plan of the proposed subdivision was approved on April 24, 2013 (*File No. 07-T-10005).* In 2021, changes have been applied to the draft plan. A copy of the updated 2021 agreement conditions is attached in **Appendix B**.

The site has never been developed and has always been a green field. The current zoning of the subject property is "Residential First Density R1" that allows single family dwellings of lot areas not less than 465 m^2 and lot frontages not less than 15 m for fully serviced lots.

The site has been surveyed by *Ron M. Jason Surveying Ltd.*. A topographic survey dated April 28, 2021, has been provided by *IBM surveyors*.

A copy of the report outlining the results of the geotechnical subsurface investigation carried out by *St. Lawrence Testing & Inspection Co. Ltd.* is attached in **Appendix B**.

The Township has provided the following documents pertaining to existing water and sewer infrastructure:

- Uncommitted Reserve Capacity Study by *Stantec* – Dated November, 2022.
- Cardinal drinking water treatment plant flow summary (period: 2018-2021), Cardinal wastewater treatment plant flow summary (2018-2021) and Adelaide St pump station flow data (2018-2021).
- WWTP CofA (includes Adelaide St pump station capacity, dimensions etc.).
- Municipal drinking water system licences 3 and 4 for Cardinal.

The Township had previously approved available wastewater and drinking water capacities for "Edwardsburgh development" that represented 93 lots among a total of 221 of committed lots.

1.3 PROPOSED DEVELOPMENT AND PHASING

The proposed development, as shown in the updated Plan of Subdivision, consists of the construction of paved roadways, curbs and gutters, sanitary and storm sewers, watermains and other utilities (gas, Bell and Hydro) to service the proposed 95 detached lots. All proposed right-of-ways (ROW) are 20 m wide. The subdivision layout has two intersections with County Road No. 22 to the east. Two reserved ROWs for future street extensions are located at the south and north-west of the property. A 6 m wide pathway is planned between Street B and County Rd 22. It will also serve as a watermain easement. The site will be serviced via County Road existing infrastructure. Due to the insufficient elevations for a design of a gravity sewer, a pumping station is proposed downhill of the property (in Block B), and a pressurized forcemain will be used to discharge sewage from the pumping station into the existing sewer within County Rd 22. The sanitary sewer within the site is designed to operate under free flow condition for phase 1 and phase 2.
Storm water is conveyed to a proposed stormwater management detention basin to the north of the property (Block A) before it is discharged into the existing unnamed watercourse that crosses the property. The stormwater facility is designed to achieve mainly the required quantity control.
A noise berm will be constructed in the open space between the subdivision and CN railway.

The two phases of the project are:

- Phase 1: comprises of 59 lots and a dedicated parkland located at the south side of the property.
- Phase 2: consists of developing the remaining 36 lots in the north side of the subdivision.

The total gross area for phase 1 is 4.74 ha and for phase 2 is 2.96 ha. The open space area where the stormwater facility will be constructed is 3.23 ha.

1.4 EXISTING INFRASTRUCTURE

1.4.1 WATER

Existing municipal watermain:

There is an existing 250 mm diameter watermain identified along County Road 22 east side up to Dodge St. At the intersections with Gill St and Dodge St, the approximate elevations of the top of watermain are 83.00 m and 81.60 m respectively. For phase 1, the proposed watermain will be connected to the existing watermain via the proposed Street A and the pathway.

Available Capacities:

Based on a copy of a 2021 Municipal Drinking Water Licence provided by the Township, the treatment plant, located at Legion Way, Cardinal, has a rated capacity of 3548 m^3/day. According to 2002 *Stantec* study, the uncommitted reserve capacity of Cardinal's water treatment plant is 701 m^3/day, which is the equivalent of an additional population of 800 or 364 units.
The Township has informed us that there are currently 221 committed lots including 93 lots for Edwardsburgh development and 106 lots for Meadowlands North, located to the north of Dodge St. There are also 22 committed vacant lots. Edwardsburgh development is now 95 lots. The additional 2 lots are not expected to impact the available capacity.

An extension of 250 mm diameter watermain is to be extended north along County Rd to serve the future Meadowlands developments and the planned industrial area. Future developments nature is unknown at the time of preparation of this report, therefore their expected demands are not examined.
The village water tower is located at 4035 Dishaw St and has a capacity of 1938 m^3.

1.4.2 WASTEWATER

Existing municipal sewer: There is a manhole (MH-135) located at the intersection of County Rd 22 and Gill St. From MH-135, a 250 mm dia. PVC DR 35 pipe runs south along County Road 22, and a 250 mm dia. pipe, sloped at 0.94 %, runs east along Gill St. The south and east invert elevations at MH-135 are 82.72 m and 82.11 m respectively. The capacity of Gill St sewer is estimated at 58 L/s using Manning's Formula (Refer to calculations in **Appendix-C)**. There is a second manhole (MH-140) at the intersection of County Rd 22 and Dodge St into which are connected two pipes: a 200 mm dia. pipe coming from Dodge St and a 250 mm dia. pipe sloped at 0.28% running south to MH-135. The south invert elevation is 82.42 m and the full capacity of the sewer is estimated at 31 L/s. Also, two 200 mm dia. capped pipes are connected to MH-140; one is directed north along the road and the other west adjacent to the site. The proposed force-main will be connected to the capped pipe at this intersection.

Available Capacities:

The subdivision generated wastewater will be conveyed to Adelaide St pumping station via County Rd, Gill St, and Walker St. According to 2002 *Stantec* study, Adelaide St PS has a reserve capacity of 35 L/s, the equivalent of more than a population of a 1000 persons or 454 dwelling units. The uncommitted reserve capacity of the wastewater treatment plant at John St is 701 m^3/day, which is the equivalent of an additional population of 800 or 364 units.
The village has a committed capacity for 201 lots, including 93 lots for Edwardsburgh development and 106 lots for Meadowlands North located to the north of Dodge St. There are also 22 committed vacant lots.

1.4.3 STORMWATER

The site is located in the sub-watershed of *Sawmill Creek*. There is no storm water sewer in the immediate area of the subdivision. Storm water will be captured and conveyed to a detention pond in the open space at the north side of the site. Excess flow will be discharged into existing watercourse running from north to east.
Hydro, Bell telecommunications and gas main were identified at County Rd 22. Utility service connections to the developed site will be coordinated with the appropriate utility companies prior to construction.

2.0 WATER SERVICING

2.1 DESIGN CRITERIA

The water demand for the proposed development was calculated based on *Ottawa Design Guidelines - Water Distribution* and subsequent technical bulletins as follows:

- Population: 323 person (residential occupancy for single family dwelling = 3.4 person per unit)
- Average daily demand per capita per day = 350 L/pers./day
- Peaking factor for maximum daily demand = 3.6

- Peaking factor for peak hourly demand = 5.4

  Peak factors are calculated by interpolating the values in Table 3-3 of the MOECP "*Design Guidelines for Drinking-Water Systems",* for water systems serving fewer than 500 persons.

- Required Fire Flow (RFF) demand: calculated as per the Ontario Building Code (OBC), A-3.2.5.7 Division B, Building Code Compendium, and cross-referenced with the 2020 version of the Fire Underwriter's Survey (FUS).

- System pressures requirements:

Pressure Check	Minimum Pressure		Maximum Pressure	
	(kPa)	(psi)	(kPa)	(psi)
Normal Use	345	50	552	80
Peak Hour Demand	276	40	552	80
Maximum Day and Fire Flow	140	20	552	80
Maximum pressure at any point in occupied areas			552	80
Maximum pressure at any point in unoccupied areas			689	100

Table -1 System Pressure Requirements

- Proposed Watermain:

  150 mm diameter PVC Class 150 DR 18 – Roughness Coefficient C = 100

  200 mm diameter PVC Class 150 DR 18 – Roughness Coefficient C = 110

2.2 PROPOSED SERVICING AND CALCULATIONS

2.2.1 DOMESTIC WATER DEMAND

Domestic water demands are summarized as follows (Refer to **Appendix C** for full calculations):

	Phase 1	Phase 2	Total
Population Density: 3.4 pers. per unit	3.4	3.4	3.4
Number of homes	59	36	95
Population in capita	200.6	122.4	323.0
Average Demand Volume Per Capita in L/c/day	350	350	350
Total Average Demand Volume in m3/day	70.2	42.8	113.1
Maximum Daily Demand (3.6 x Average) in m3/day*	252.8	154.2	407.0
Maximum Hourly Demand (5.4 x Average Daily) in m3/day*	379.1	231.3	610.5
Maximum Hourly Water Flow Required in L/s	**4.39**	**2.68**	**7.07**

Table -2 Anticipated Domestic Water Demand

2.2.2 FIRE FLOW DEMAND

1- Ontario Building Code (OBC), A-3.2.5.7 Division B, Building Code Compendium:

Minimum water supply required in Litres: $Q = K.V.S_{tot}$ where:

Q: minimum water supply in litres

K: water supply coefficient from Table 1
V: total building volume in cubic metres
S_{tot}: total of spatial coefficient values from property line exposures on all sides as obtained from the formula: $S_{tot} = 1 + (S_{side1} + S_{side2} + S_{side3} + \text{... etc.})$; S_{tot} need not exceed 2.0.

A minimum of water supply flow rate for firefighting shall be 2 700 L/min.

2- Required Basic Fire Flow (FUS 2020 – PART II. 1): $F = 220\ C\ A^{0.5}$ where

F: required fire flow in litres per minute
C: coefficient related to the type of construction
A: the total floor area in m^2

Adjustments to the calculated fire flow may be made based on occupancy, sprinkler protection and exposure to other structures. The final fire flow shall not exceed 45,000 L/min nor be less than 2,000 L/min.

The specific details of future buildings were not available at the time of preparation for this report, therefore, an estimate for the building materials, fire separations, and contents have been assumed based on experience for typical single home subdivision developments. Combustible wood frame construction with limited combustible occupancy and no sprinkler have been assumed in our calculation. An average lot size with a maximum of 30% lot coverage, as permitted by current zoning By-law, has been considered. Expositions were calculated based on permitted setbacks. Refer to spreadsheets in **Appendix C** for full calculations using both methods.

FUS 2020 calculation method has resulted in fire flow demand of **7,000 L/min (117 L/s).**

Proposed Fire Hydrants:

The maximum spacing between the proposed fire hydrants is 125 m as per Table 4.9 of Ottawa Guidelines. All new hydrants are assumed to be Class AA with rated capacity of 5,700 L/min. The critical area for the RFF supply is north zone where elevations are around 85.00. A plan showing 45 m radius circles centered on each hydrants is attached in **Appendix B**.

EPANET Hydraulic Analysis:

Using anticipated domestic water demand and RFF, the software runs simulations to assess headlosses and velocities within the proposed watermain. New fire hydrants have been checked according to Appendix I: "Guidelines on Coordination of Hydrant Placement with Required Fire Flow" of Technical Bulletin ISTB-2018-02, in which the aggregate fire flow capacity of all fire hydrants within 150 m of a building shall not be less than the required fire flow (7,000 L/min). This is done by assigning a 5,700 L/min flow to all hydrants located within 75 m from the test property and a 3,800 L/min flow to all hydrants with a distance more than 75 m but less than 150 m. Refer to Appendix B for critical lots and blocks results. For example, Lot 1 has 2 hydrants within 75 m and 2 hydrants within 150 m. Lot 58 has 1 hydrants within 75 m and 3 hydrants within 150 m.

EPANET models under maximum day and RFF demand condition and assuming a pressure of 350 kPa at County Rd watermain are exhibited in (**Appendix C)**. The results of the hydraulic simulation remain comparable to the existing watermain in the area. Residual pressure is kept above 140 kPa and velocities less than 5 m/s.

We recommend hydrant flow tests for two hydrants within County Rd. Also, a pressure check shall be conducted at the completion of phase 2 in order to determine if pressure control is required for lots located at low elevations.

2.3 CONCLUSION

The anticipated water demand is summarized as follows:

	Phase 1	Phase 2	Total
Maximum Day Demand in L/s	2.9	1.8	4.7
Peak Hour Demand in L/s	4.4	2.7	7.1
Fire Flow Demand in L/s **	117.0	117.0	117.0
Maximum Day Demand plus Fire Flow Demand in L/s	119.9	118.8	121.7

Table -3 Summary of Anticipated Water Demand

It is proposed to provide water supply within the subdivision through a new 150 and 200 mm diameter PVC Class 150 DR 18 in the shape of two loops. The proposed watermain will be connected to the existing 250 mm diameter watermain at County Rd 22 at two locations as shown in the General Services Plan. Water supply for fire fighting will be delivered to the fire hydrants through the municipal system.

Under normal use, pressure shall be kept between 345 kPa (50 psi)and 552 kPa (80 psi). For peak hour demand pressure shall be greater than 276 kPa (40 psi) and lower than 552 kPa (80 psi). Residual pressure for fire flow and maximum day demand shall be kept greater than 140 kPa (20 psi).

An isolation valve will be installed at the intersection of County Rd and the pathway.

3.0 SANITARY SERVICING

3.1 DESIGN CRITERIA

Using the *Ottawa Sewer Design Guidelines,* sanitary sewage flow for the proposed development is estimated as follows:

- Population: Residential occupancy for single family housing = 3.4 persons per unit (Ottawa Guidelines, Table 4.2) 95 units x 3.4 pers. /unit = 323 persons (Phases 1 & 2)
- Peak Flow Design Calculation:

  - Average daily flow per capita = 350 L/pers./day
  - Average daily flow – Dry weather = 323 pers. x 350 L/pers./day = 1.69 L/s
  - Harmon's Residential Peaking Factor = 1 + (14 / (4 + (P / 1000)$^{0.5}$)) (Max.= 4; Min.= 2)
  - Wet weather infiltration contribution (Extraneous): 0.28 L/s/effective gross ha
  - Dry weather infiltration contribution (Extraneous): 0.05 L/s/effective gross ha

  Gross residential area includes lots, roadways and pumping station. Block A (open space, park and pond) is not included.

3.2 PROPOSED SERVICING AND CALCULATIONS

The total peak design flow rate is the sum of the peak dry weather flow rate as generated by population and land use for the design contributing area plus all extraneous flow allowances. Detailed calculations for sanitary flows are exhibited in **Appendix C**. Results are summarized in the following table 4:

Design Parameter	Flow (m^3/day)	Flow (L/s)
Average Dry Weather Flow Rate	146.2	1.69
Peak Dry Weather Flow Rate	423.2	4.90
Peak Wet Weather Flow Rate	608.6	7.04

Table -4 Summary of Sanitary Flows

The total peak sanitary flow rate from the proposed development represents 22.4 **%** of the capacity of the existing 250 mm diameter sewer (31.5 L/s) running north to south along County Road.

3.3 CONCLUSION

1200 mm manholes and 200 mm diameter PVC DR 35 sanitary sewer with a minimum pipe slope of 0.32% are proposed within the subdivision. Refer to **Appendix C** for the sanitary sewer design sheet. The gravity sewer will outlet into the pumping station (Block B). A proposed 150 mm diameter force-main will discharge into the existing municipal sanitary sewer at County Rd 22 as shown in General Plan of Services.

The maximum distance between manholes is 120 m. The hydraulic grade line is at least 0.3 m below footings.

All sanitary laterals shall be 135 mm diameter DR 28 PVC pipes with minimum 1% slopes. Backwater valves shall be installed on all sanitary and storm laterals.

The sanitary design is also able to accommodate the servicing of second dwelling units in all lots.

Sewage discharges will be domestic in type and in compliance with the *City of Ottawa Sewer Use By-law* and *Ontario Building Code (OBC).*

4.0 STORMWATER AND STORMWATER MANAGEMENT

The quantity control target is to limit the maximum post-development runoff rate discharged from the site for all storm events, up to and including the 100-year design storm, to that of the 5-year pre-development flow rate for a 5-year design storm event. Runoff in excess of the 5-year pre-development flow rate will be temporarily stored on site in a detention basin and discharged gradually into the existing watercourse that outlets into *Sawmill Creek*. The pond is designed to function for both phases.

The quality control consists of an enhanced level of treatment (80% of TSS removal) by on-site measures to protect receiving waters.

Refer to the "Stormwater Management Report" for detailed analysis and calculations of quantity, quality and storage requirements.

5.0 CONCLUSION AND RECOMMENDATIONS

The preceding report has been prepared to support the development of a subdivision composed of 95 single family lots. The conclusions are as follows:

- Based on estimated water demand, and upon confirmation by the Village of Cardinal of acceptable boundary conditions, the existing 250 mm diameter watermain within County Road 22 has sufficient water supply capacity to support the proposed development.
- The watermain system is able to maintain a minimum pressure of 140 kPa at ground level at all points in the distribution system under maximum day demand plus fire flow conditions. The Village fire department must review the fire flow requirement design.
- The proposed watermain within the subdivision will be of 150 mm and 200 mm diameter PVC DR 18. Water services shall be 25 mm diameter Type K soft copper or Cross-linked Polyethylene.
- The proposed extension of 250 mm diameter watermain north along County Rd 22 will be used to connect the future development of Meadowlands North.
- The proposed sanitary sewer will be a 200 mm diameter DR 35 and 1200 mm diameter manholes as per OPSD 701.010. The sewage will be conveyed gravitationally to the pumping station from which it will be pumped through a proposed 150 mm diameter forcemain into the existing sewer within County Rd 22. The existing sanitary sewer has adequate capacity to convey the estimated wastewater generated from the development.
- Stormwater will be conveyed via a proposed separate storm sewer within the right-of-ways to a proposed on-site stormwater management structure where quality and quantity control will be achieved. Discharge flow rates will match the pre-development levels.
- Service connections shall comply with the OPSD standards.
- Hydro, gas main and telecommunication lines have been identified at the intersection of County Rd 22 and Gill St. Connections to the development will be coordinated with authorities having jurisdictions prior to construction.

Respectfully submitted,

Mongi Mabrouk M.Eng., P.Eng.

Advance Engineering Ltd.

Phone: 613-986-9170

APPENDICES

Appendix A
- Figure 1: Site Location
- Zoning By-law Schedule

Appendix B
- Draft Plan Agreement

Appendix C
- Domestic Water Supply Calculations
- Fire Flow Calculations
- Sanitary Sewer Calculations

APPENDIX - A

FIGURE - 1

No.	REVISION / ISSUE	DATE: MM/DD/YY
1	INITIAL ISSUE	03/10/22

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

CARDINAL, ONTARIO

APPLICANT:

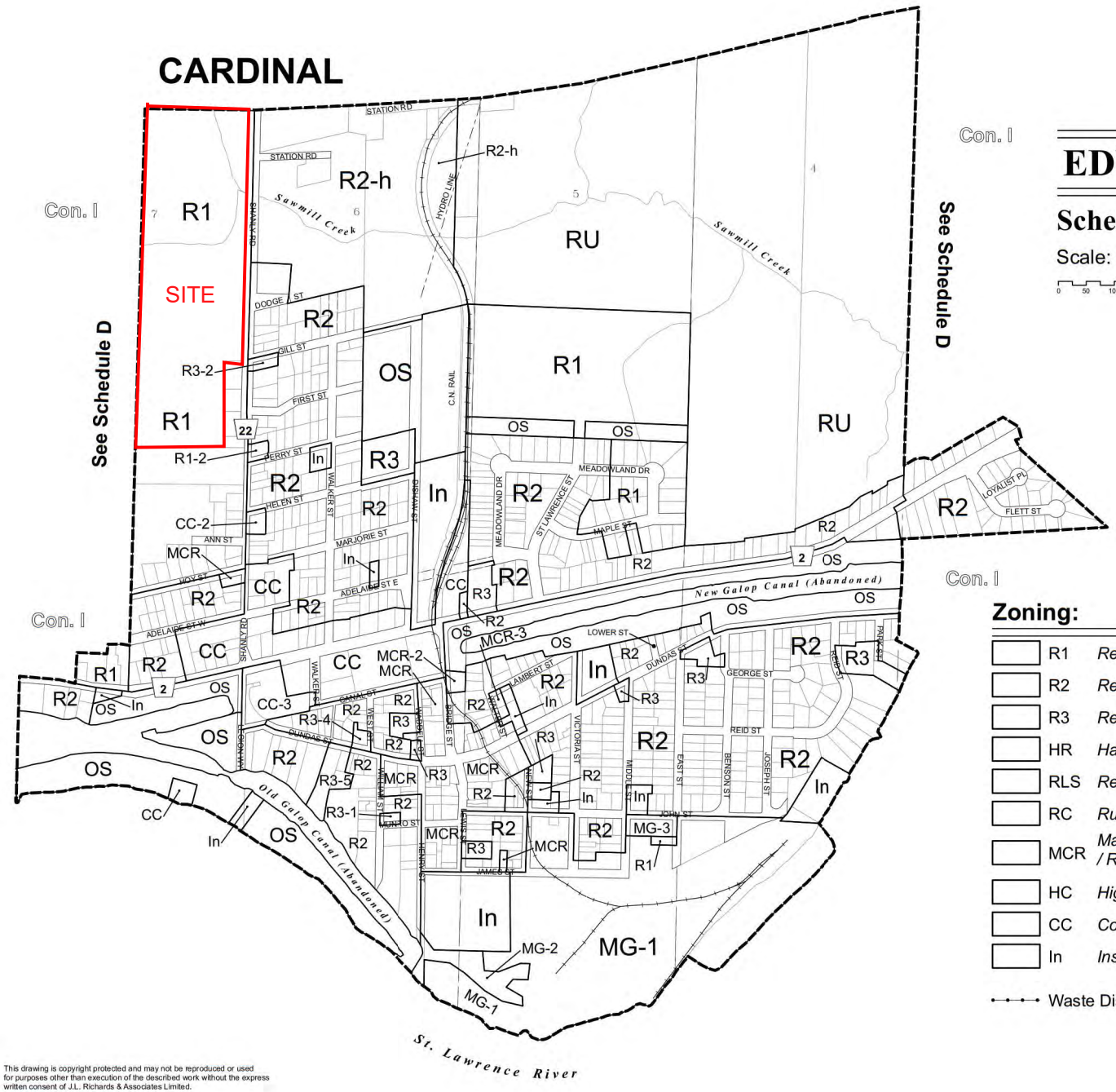
EDWARDSBURGH DEVELOPMENTS
OTTAWA

TITLE:

SITE LOCATION

PREPARED BY:
ADVANCE ENGINEERING
Mongi Mabrouk P.Eng.
Phone: 613-986-9170
Email: eng.services.ca@gmail.com

SCALE: N.T.S. | DATE: 3/14/22 | DRAWING No.: A0



Zoning By-law No. 2012-35
Township of
EDWARDSBURGH / CARDINAL

Schedule B

Scale: 1:5,000

0 50 100 200 300 Meters

N

Legend:

- 44 County Road
- Sub-Schedule Boundary
- Railway
- Railway (Abandoned)
- Utility Line
- Open Road Allowance
- Unopened Road Allowance
- Drainage
- Lot Line
- Parcel Fabric

Zoning:

R1	*Residential First Density*	
R2	*Residential Second Density*	
R3	*Residential Third Density*	
HR	*Hamlet Residential*	
RLS	*Residential Limited Service*	
RC	*Rural Commercial*	
MCR	*Main Street Commercial / Residential*	
HC	*Highway Commercial*	
CC	*Community Commercial*	
In	*Institutional*	
Waste Dispiosal 500m Influence Area		
MG	*General Industrial*	
MP	*Industrial Park*	
MR	*Rural Industrial*	
MX	*Mineral Extraction*	
OS	*Open Space*	
A	*Agricultural*	
RU	*Rural*	
WD	*Waste Disposal*	
EP-w	*Environmental Protection - Wetland*	
EP-f	*Environmental Protection - Flood Plain*	
-h	*Holding*	

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

Data Source: Source Data has been provided by the Ministry of Natural Resources, Township of Edwardsburgh/Cardinal and the United Counties of Leeds and Grenville.

Adopted: 25-June-2012
Print Date: 14-Jun-2012
JLR No.: 25114
Path: P:\25000\25114 - Edwardsburgh Cardinal\25114 - Updated Zoning By-law\JLR DWG\PLAN\25114_Schedule B_C.mxd

APPENDIX - B

Applicant:	**Edwardsburgh Developments Inc.**	**Date of Original Decision:**	April 24, 2013
File:	**07-T-10005 (Lockmaster's Meadow)**	**Date of Revised Decision:**	February 24, 2022
Municipality:	Township of Edwardsburgh Cardinal	**Date of Notice:**	February 25, 2022
Location:	Lot 7, Con. 1, County Road 22	**Last Date of Appeal:**	March 17, 2022
		Lapsing Date:	February 25, 2025

Conditions of Draft Approval

1. That this approval applies to the Draft Plan of Subdivision in Lot 7, Concession 1, Township of Edwardsburgh Cardinal, County of Grenville, prepared by Advance Engineering dated December 7, 2021 which shows a total of 95 residential lots, Block A for open space, a safety fence, a stormwater retention pond, noise attenuation barrier and safety barrier, Block B for a sanitary pumping station, Blocks C, D, and Da for 0.3 m reserves, Block E for future road purposes, Block F for parkland, Block G for future road purposes and Block H for a walkway and utility corridor.

2. That a minimum of 10 metres from both sides of the centre line of the Streets shown on the draft plan shall be shown and dedicated as public highways on the final plan.

3. That Block E and Block G, as shown on the draft plan, shall be conveyed to and held in trust, by the Township of Edwardsburgh Cardinal until the extension of the road allowance.

4. That Block A, as shown on the draft plan, shall be conveyed to the Township of Edwardsburgh Cardinal subject to the terms and conditions of the Township.

5. That the streets shall be named to the satisfaction of the Township.

6. The subdivision shall be built in two phases. Phase 1 consists of Block A including the safety fence, stormwater management pond, noise barrier and safety barrier, Street A, Street B south-east of Street A, a total of fifty-nine (59) residential lots, being lots 9-37, 57-61 and 71-95, including Blocks C, D and Da as 0.3 m reserves, Block E as a future roadway block, Block F as parkland dedication, and Block H as a walkway and utility corridor, as shown on the draft plan. Phase 2 consists of Street C, the remainder of Street B, the remaining thirty-six (36) units, being lots 1-8, 38-56 and 62-70, Block B for a sanitary pumping station and Block G as a future roadway connection.

7. That the Owner enter into a subdivision agreement between the Owner and the Township to the satisfaction of the Township and that the Owner covenants and agrees that the executed subdivision agreement between the Owner and the Municipality shall be registered against the lands to which it applies once the plan of subdivision has been registered. It is noted that the subdivision agreement

will be prepared when the final design plans (i.e. servicing, stormwater management, road design, berm design, etc.) have been reviewed and accepted and/or are in the final stages of review and acceptance by the Township.

Parkland

8. That Block F, as shown on the draft plan, shall be conveyed to the Township of Edwardsburgh Cardinal as part of Parkland Dedication subject to the terms and conditions of the Township.

9. That the developer, as part of Parkland Dedication, convey a cash-in-lieu payment to the Township.

10. All Owner obligations associated with Block F must be completed in Phase 1 to the satisfaction of the Township of Edwardsburgh Cardinal.

11. It is the responsibility of the Owner to fill with clean earth fill, compact and level Block F accordingly, providing for positive surface drainage to the satisfaction of the Township of Edwardsburgh Cardinal.

12. The Owner shall grade areas of parkland where necessary to the satisfaction of the Township of Edwardsburgh Cardinal, so as to provide a uniform surface, free of debris, necessary to establish a safe clean and maintainable surface. Block F shall be graded in accordance with the approved Grading Plan for the Plan of Subdivision. No storage of building materials, including granular or topsoil will be permitted on Block F.

Zoning

13. That prior to final approval by the Counties, the Counties is to be advised by the Township of Edwardsburgh Cardinal that this proposed subdivision conforms to the zoning by-law in effect and that any zoning issues identified are appropriately satisfied through an amendment to the Township Zoning By-Law. It is noted that the Township is currently preparing a new Zoning By-Law. To clear this condition, a plan noting lot area and lot frontage for each proposed lot will be required based on the definitions of the Zoning By-law in effect at the time of final approval.

Servicing - General

14. That the Owner agrees in writing to satisfy all the requirements, financial and otherwise, of the Township of Edwardsburgh Cardinal concerning the provision of roads, installation of services, drainage and other relevant features (such as lighting, etc.).

15. That such easements as may be required for utility or drainage purposes shall be granted to the appropriate authority.

16. The Owner acknowledges their responsibility to obtain all of the required approvals for the pumping station to be constructed on Block B.

17. Notwithstanding what may be illustrated on the approved draft plan, that the final subdivision agreement plans show and subdivision agreement contain a clause whereby the Owner agrees to provide two lifts of asphalt, concrete curbs and gutters, in accordance with OPSS, on Streets A, B and C to the satisfaction of the Township of Edwardsburgh Cardinal.

18. That the plans show and subdivision agreement contain a clause whereby the Owner agrees to provide underground electrical servicing to the satisfaction of the Township of Edwardsburgh Cardinal.

19. That the subdivision agreement include terms satisfactory to the Township indicating Block H, as shown on the draft plan, shall be conveyed to the Township upon Township acceptance of the underground services, walkway, landscaping and fencing.

Water and Sewer Works

20. The Owner shall submit detailed municipal servicing plans, prepared by a Civil Engineer licensed in the Province of Ontario, to the Township of Edwardsburgh Cardinal and the United Counties of Leeds and Grenville (Counties'). All water and sewer works to be located on the County Road right-of-way shall be subject to approval from the Counties' Roads Department at the time of detailed design.

21. The Owner acknowledges and agrees that building permits will not be issued for the development of individual Lots in Phase 2 until the pumping station has been installed and placed in service to the satisfaction of the Township of Edwardsburgh Cardinal.

22. The Owner shall design and construct all necessary watermains and the details of services and meters to the satisfaction of the Township of Edwardsburgh Cardinal. The Owner acknowledges that the servicing plan shall include a watermain stub to Block E and Block G. The Owner shall pay all related costs, including the cost of connection, inspection and sterilization by Township personnel, as well as the supply and installation of water meters by the Township.

23. Upon completion of the installation of all watermains, hydrants and water services, the Owner shall provide the Township with mylar(s) of the "as-built" plan(s), certified under seal by a Professional Engineer, showing the location of the watermains, hydrants and services. Electronic files are also required in order for them to be added to the Township GIS system. The United Counties require digital files in .dwg and pdf format.

Stormwater Management

24. That prior to final plan approval, the Owner shall prepare a final stormwater site management plan and lot grade and drainage plan which shall be consistent with the report entitled "Preliminary Stormwater Management Report" prepared by Eastern Engineering Group Inc. signed July 13, 2010. The final stormwater site management plan shall address the South Nation Conservation review comments dated October 12, 2010. The Plan shall describe how stormwater management is to be implemented in accordance with the current Stormwater Management Best Management Practices and should address both water quality and quantity concerns. Models, assumptions and calculations of pre-and post-development runoff are to be included in this submission. The final report shall be prepared to the satisfaction of the Township of Edwardsburgh Cardinal, South Nation Conservation and the United Counties of Leeds and Grenville. Consideration shall be had to condition 41.

25. Post-development stormwater flows at the County Road culvert shall equal pre-development flows.

26. That prior to final plan approval, the Owner shall prepare and submit a Sediment and Erosion Control Plan, appropriate to the site conditions, prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and indicate how it is to be implemented during all phases of the site preparation and construction in accordance with the current Best Management Practices for Erosion and Sediment Control to the satisfaction of the Township of Edwardsburgh Cardinal and South Nation Conservation.

27. That the Subdivision Agreement contain a clause whereby the Owner agrees that upon completion of all stormwater works, to provide certification to the Township of Edwardsburgh Cardinal and South Nation Conservation, through a professional engineer, that all measures have been implemented in conformity with the approved stormwater site management plan.

28. That the Subdivision Agreement contains a clause whereby prior to the commencement of construction of any phase of the subdivision (roads, utilities and off-site works, etc.), the Owner agrees to:

    a. have a professional engineer prepare an erosion and sediment control plan appropriate for site conditions in accordance with the current best management practices;
    b. have this plan reviewed and approved by the Township of Edwardsburgh Cardinal and South Nation Conservation;
    c. monitor the effectiveness of and maintain the erosion and sedimentation control works as necessary, and;
    d. provide certification to the Township of Edwardsburgh Cardinal and South Nation Conservation through a professional engineer that the plan has been implemented.

Fisheries

29. The Owner acknowledges that the unnamed watercourse is considered either direct or indirect Fish Habitat as per Section 35 of the *Fisheries Act*.

30. The Owner shall establish a 30 metre "no touch/no development" setback of the unnamed watercourse, on both sides, measured from the top of the average annual highwater mark. The final approved plan of subdivision shall clearly show this setback. The berm required under condition 32.a. shall be located outside of this 30 metre setback. Any deviation from this setback shall be to the satisfaction of the Township of Edwardsburgh Cardinal and South Nation Conservation.

31. The subdivision agreement with the Township will indicate that in accordance with Section 35 of the *Fisheries Act*, the Harmful Alteration, Disruption or Destruction (HADD) of fish habitat is prohibited. The impacts that any such works may have on a fish habitat, whether directly adjacent to the site or downstream, may require approval of the Department of Fisheries and Oceans Canada.

Noise Attenuation and Warnings

32. That the subdivision agreement between the Owner and the Township contain the following provisions with wording acceptable to the Township of Edwardsburgh Cardinal, wherein the Owner agrees to install a noise barrier for Phase 1 in accordance with subsection a. below and further that for Phase 2 for lots 1, 46-52 and 66-70 inclusive that the noise attenuation and warning requirements be in accordance with subsections b. to d. inclusive:

    a. A treed earth berm for noise attenuation purposes shall be constructed as part of Phase 1. Notwithstanding what may be illustrated in the approved draft plan, the berm shall be designed and constructed to the satisfaction of the Township of Edwardsburgh Cardinal. No portion of the noise attenuation berm shall be located on the County Road right-of-way.

        Note: This berm may be designed in such a way as to also meet condition 37.

    b. All units shall be equipped with forced air heating with central air conditioning.

    c. That Warning Clause Type D, in accordance with the following, shall be included on all Lease and Purchase and Sale Agreements.

        Type D: "This dwelling has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the Municipality's and the Ministry of Environment's noise criteria."

d. Bedroom windows facing north will require a minimum Sound Transmission Class (STC), being outdoor noise levels minus the targeted indoor noise level, of 26. Living room windows facing north will require a minimum STC of 21. Exterior wall components of north facades will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data. Detailed STC calculations will be completed prior to building permit application for each unit type and submitted to the Township with the building permit application.

33. That the subdivision agreement between the Owner and the Township contain provisions with wording acceptable to the Township of Edwardsburgh Cardinal, wherein the owner agrees for Phase 2 for Lots 46-52 inclusive that Warning Clause Type A, as follows, will be included in all Lease and Purchase and Sale Agreements. This provision is in addition to those noise attenuation and warning requirements detailed in condition 32:

    Type A: "Purchasers/tenants are advised that sound levels due to increasing rail traffic may occasionally interfere with some outdoor activities as the sound levels may exceed the sound level limits of the Township and the Ministry of the Environment, Conservation and Parks."

34. That the subdivision agreement between the Owner and the Township contain the following provision with wording acceptable to the Township of Edwardsburgh Cardinal, wherein the Owner agrees where structural mitigation measures are required the Owner shall provide, prior to final building inspection, certification to the Township of Edwardsburgh Cardinal, through a Professional Engineer, that the noise control measures have been implemented in accordance with the approved study.

35. That the subdivision agreement between the Owner and the Township contain provisions with wording acceptable to the Township of Edwardsburgh Cardinal, wherein the Owner agrees for all lots that rooftop HVAC equipment shall be prohibited.

36. The Owners acknowledges and agrees that building permits will not be issued for the development of individual lots in Phase 2 until the treed earth berm has been constructed to the satisfaction of the Township of Edwardsburgh Cardinal.

<u>CN Rail</u>

For Phase 1, conditions 37 and 42 shall apply:

37. A safety berm parallel to the railway rights-of-way with returns at the ends shall be installed between any publically accessible open space lands and the railway. The berm shall be 2.5 metres above

grade at the property line, with side slopes not steeper than 2.5 to 1. The location may be moved and height of the berm may be reduced proportionally to the distance separating the designated open space area from the north property line. Past the 120m setback from the property line there will be no requirements for a berm. For example, if the park area accessible to the public is to be located at 60 metres from the CN right of way, the required berm should be 1.25 metres tall. The safety berm and its characteristics and the limits of the park area accessible to the public shall be appropriately illustrated on the plan.

Note: This berm may be designed in such a way as to also meet condition 32.

For Phase 2, conditions 38 to 44 shall apply:

38. The Owner shall install and maintain a chain link fence of minimum 1.83 metre height along the mutual property line (being the north-west lot line of Block A). The safety fence and its characteristics must be illustrated in the plan.

39. Since the development is partially located within 300 metres of the CN main line, the Owner shall engage a consultant to undertake an analysis of noise. Subject to the review of the noise report, the Railway may consider other measures recommended by an approved Noise Consultant. CN will review the Noise report and will determine if mitigation measures will be required to be implemented by the Owner.

40. The following clause should be inserted in all development agreements, offers to purchase, and agreements of Purchase and Sale or Lease of each dwelling unit within 300 m of the railway right-of-way:

> "Warning: Canadian National Railway Company or its assigns or successors in interest has or have a rights-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). CNR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."

41. Any proposed alterations to the existing drainage pattern affecting railway property must receive prior concurrence from the Railway and be substantiated by a drainage report to the satisfaction of the Railway. The drainage plan indicates that all storm waters from the developments will be

directed to a pond and then into an existing ditch flowing away from CN property. However, CN will require a technical memo prepared by the project engineer explaining the design concept and confirming that all storm waters will be directed away from the CN right of way.

42. The Owner shall through restrictive covenants to be registered on title and all agreements of purchase and sale or lease provide notice to the public that the safety berm, fencing and noise isolation measures implemented are not to be tampered with or altered and further that the Owner shall have sole responsibility for and shall maintain these measures to the satisfaction of CN.

43. The Owner shall enter into an Agreement with CN stipulating how CN's concerns will be resolved and will pay CN's reasonable costs in preparing and negotiating the agreement.

44. The Owner shall be required to grant CN an environmental easement for operational noise and vibration emissions, registered against the subject property in favour of CN (within 300 metres from CN right of way).

Landscaping/Streetscaping

45. The Owner agrees to provide additional planting where necessary to provide a buffer between the existing properties and Lots 13-20 inclusive on the draft plan of subdivision, to the satisfaction of the Township of Edwardsburgh Cardinal.

Street Lighting

46. The Owner shall design and construct all necessary street lighting, interior and exterior to the subdivision, to the satisfaction of the Township of Edwardsburgh Cardinal. The Owner shall pay all related costs, including the cost of connection and inspection by Township personnel and/or the hydro authority.

47. The Owner agrees to provide streetlights on Street A and C, where the streets intersect with the Counties Road. Lighting shall be designed and installed under the guidance, requirements and to the satisfaction of the Counties. The Owner shall pay all related costs.

Grass Cutting, Ditch Maintenance and Schools

48. That the subdivision agreement between the Owner and the municipality and the Offers of Purchase and Sale Agreements and Deeds contain the following provisions with wording acceptable to the Township of Edwardsburgh Cardinal, wherein the Owner agrees:

a. That the general maintenance and upkeep of all ditches and drains within the subdivision be the responsibility of the property owner.

b. That grass cutting along the roadside within the subdivision be the responsibility of the property owner.

49. That the subdivision agreement between the Owner and the Township contain a provision that Agreements of Purchase and Sale indicate that it will not be possible to guarantee which school children residing in this subdivision may attend, and that transportation will be provided in accordance with the policy of the governing school board.

County Road Access and Widening

50. The Owner covenants and agrees that the subdivision agreement will contain clauses whereby the Owner covenants and agrees:

a. that they will design and construct the intersection of all roads within the Plan of Subdivision that intersect the County Road to the satisfaction of the United Counties of Leeds and Grenville.

b. to pay all expenses including those for drawing preparation, utility relocations, fees, security, road work, construction supervision, engineering and administrative costs for the modification of any intersection.

c. to obtain an entrance permit and/or enter into an agreement with the United Counties of Leeds and Grenville, to the satisfaction of the United Counties of Leeds and Grenville respecting the conditions of accessing the Counties road/road allowance prior to undertaking any work within the Counties road allowance.

d. to transfer Blocks C, D and Da to the United Counties of Leeds and Grenville at the Owner's cost for the purpose of a reserve to restrict access onto the Counties road. The lands shall be free of any encumbrances.

51. Road widening shall be deeded to the United Counties of Leeds and Grenville along the lot frontage which abuts County Road 22 as per Section 6.2.2 (d) of the Counties Official Plan. The road allowance should be 26.2 metres. Should sufficient allowance exist, a letter from a surveyor would meet the Counties' needs. Should the allowance not meet minimum desired right-of-way, an appropriate dedication (1/2 the desired allowance width, measured from the centerline of the current road) will be required to be incorporated into the final plan. All lands transferred for road purposes shall be free and clear from any encumbrances.

Hydro Installations

52. The Owner shall request a connection cost assessment from Hydro One and from Rideau St. Lawrence Distribution Inc. Should the cost assessment result in Hydro One supporting a Service Area Amendment, the Owner shall arrange for Rideau St. Lawrence Distribution Inc. to be the Hydro Electric Commission (i.e., provider).

53. The Owner shall arrange with the relevant Hydro Electric Commission for the installation of such services to the subdivision and for the provision of easements with respect to such installations. The Owner shall pay any cost involved in relocating any existing services required by the construction of works in the subdivision.

54. That prior to final plan approval by the Counties, the Owner shall enter into a Servicing Agreement with the relevant Hydro Electric Commission.

Enbridge Gas

55. That the subdivision agreement between the Owner and the Township contain the following to the satisfaction of the Township:

    a. The developer is responsible for preparing a composite utility plan that allows for the safe installation of all utilities, including required separation between utilities;

    b. Streets are to be constructed in accordance with composite utility plans previously submitted and approved by all utilities;

    c. The developer shall grade all streets to final elevation prior to the installation of the gas lines and provide Enbridge Gas Distribution Inc. with the necessary field survey information for the installation of the gas lines; and

    d. It is understood that the natural gas distribution system will be installed within the proposed road allowance. In the event this is not possible, easements will be provided at no cost to Enbridge Gas Distribution Inc.

Canada Post

56. The Owner shall consult with Canada Post to determine the locations of lay-bys for postal boxes outside of the County road allowance. The location of lay-bys, as agreed between the Owner and Canada Post, will be subject to the final approval of the Township.

Subdivision Agreement

57. That the subdivision agreement between the Owner and the Township contain wording acceptable to South Nation Conservation.

Traffic Impact Study

58. That prior to final approval by the Counties', the Owner shall submit a Traffic Impact Study addressing the impact of traffic from this development. The Traffic Impact Study shall be written to the satisfaction of the Township of Edwardsburgh Cardinal.

Clearance of Conditions

59. That prior to registration of the final plan, the United Counties of Leeds and Grenville is to be advised by the Township of Edwardsburgh Cardinal that Conditions 2-58, inclusive, have been satisfied.

60. That prior to registration of the final plan, the United Counties of Leeds and Grenville is to be advised by South Nation Conservation that Conditions 24, 26-28 inclusive, 30 and 57 have been satisfied.

61. That prior to registration of the final plan, the United Counties of Leeds and Grenville is to be advised by CN Rail that Conditions 37-44 have been satisfied.

62. That prior to final approval, the United Counties' subdivision approval authority is to be advised by the United Counties' Public Works Department that Conditions 20, 24, 25, 47, 50 and 51 have been satisfied.

NOTES TO DRAFT APPROVAL

1. It is the applicant's responsibility to fulfill the conditions of draft approval and to ensure that the required clearance letters are forwarded by the appropriate agencies to the United Counties of Leeds and Grenville and copied to the Township of Edwardsburgh Cardinal quoting File No. **07-T-10005**.
2. It is suggested that the Township register the subdivision agreement as provided by Section 51(26) of the Planning Act, R.S.O. 1990 against the land to which it applies, as notice to prospective purchasers.

3. All measurements in subdivision final plans must be presented in metric units.

4. If final approval is not given by the lapsing date, and no extensions have been granted pursuant to Section 51(33), then draft approval shall lapse pursuant to Section 51(32) of the *Planning Act*.

5. It is the responsibility of the Owner to request an extension of the draft plan approval. A request for extension should be made at least 60 days before the draft plan approval lapses. No extension can be given after the lapsing date. The request should include the reasons for requesting the extension, progress/status and the applicable fees.

Clearances Are Required From the Following Agencies

Township of Edwardsburgh Cardinal
18 Centre Street, P.O. Box 129
Spencerville, ON, K0E 1X0

South Nation Conservation
38 Victoria Street, P.O. Box 29
Finch, ON, K0C 1K0

Director of Public Works
United Counties of Leeds and Grenville
25 Central Ave. W., Suite 100
Brockville, ON, K6V 4N6

CN Business Development and Real estate
1 Administration Road
Concord, ON, L4K 1B9
c/o WSP
proximity@cn.ca
T : 1-438-459-9190
1600, René-Lévesque Ouest, 11e étage
Montreal (Quebec)
H3H 1P9 CANADA

APPENDIX - C

PROPOSED SINGLE FAMILY SUBDIVISION – PHASES 1 & 2
ANTICIPATED WATER DEMAND

I- DESIGN CRITERIA

	Phase 1	Phase 2	Total
Population Density: 3.4 pers. per unit	3.4	3.4	3.4
Number of homes	59	36	95
Population in capita	200.6	122.4	323.0
Average Demand Volume Per Capita in L/c/day	350	350	350
Total Average Demand Volume in m3/day	70.2	42.8	113.1
Maximum Daily Demand (3.6 x Average) in m3/day*	252.8	154.2	407.0
Maximum Hourly Demand (5.4 x Average Daily) in m3/day*	379.1	231.3	610.5
Maximum Hourly Water Flow Required in L/s	**4.39**	**2.68**	**7.07**

* Peak factors of 3.6 and 5.4 for maximum daily demand and maximum hourly demand from Table 3-3 of the MOE Design Guidelines for Drinking-Water Systems for population fewer than 500 persons.

II- SUMMARY

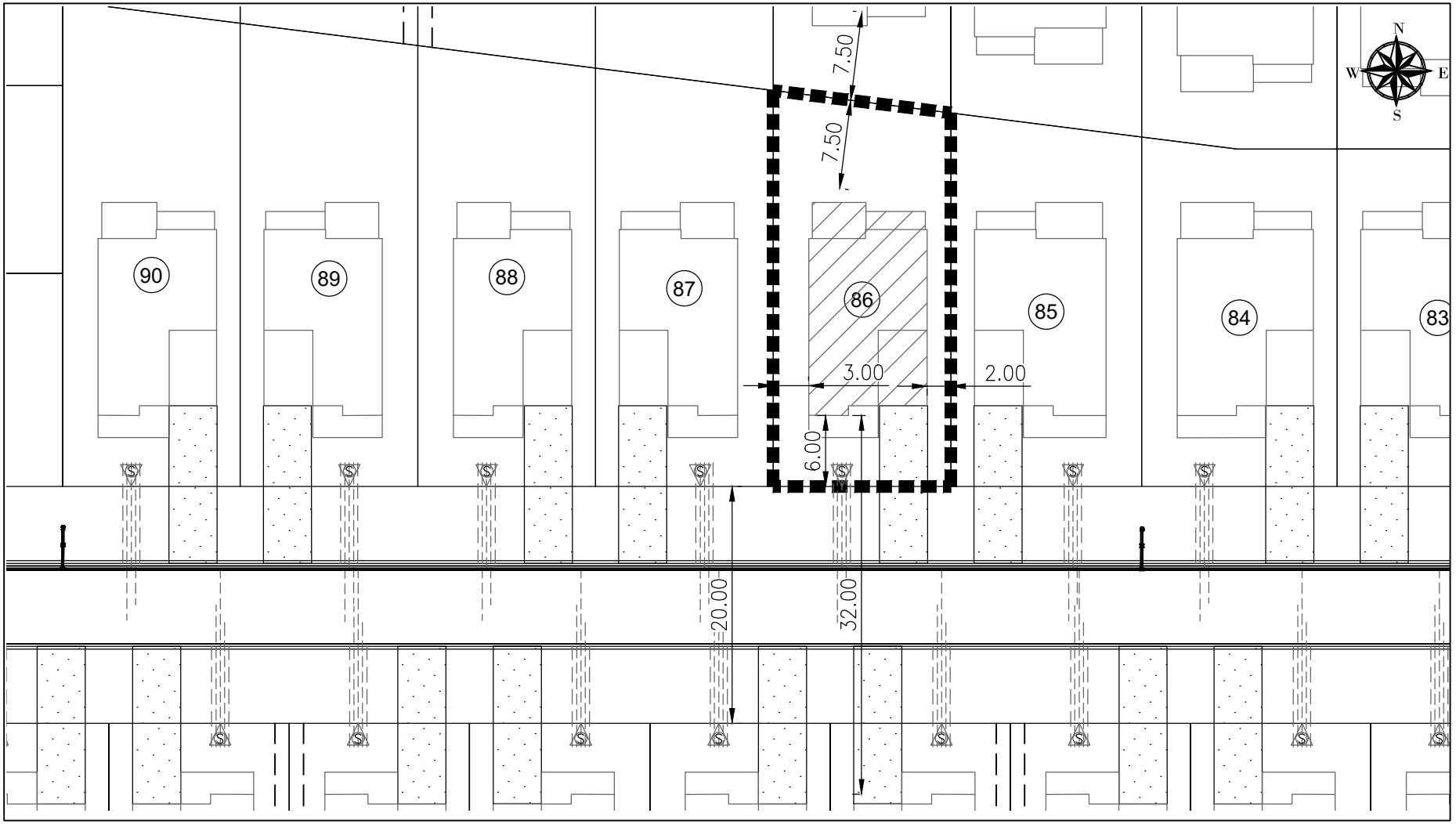
	Phase 1	Phase 2	Total
Maximum Day Demand in L/s	2.9	1.8	4.7
Peak Hour Demand in L/s	4.4	2.7	7.1
Fire Flow Demand in L/s **	117.0	117.0	117.0
Maximum Day Demand plus Fire Flow Demand in L/s	119.9	118.8	121.7

** Refer to Fire Flow Calculation Sheet

III- PRESSURE REQUIREMENTS

Pressure Check	Minimum Pressure		Maximum Pressure	
	(kPa)	(psi)	(kPa)	(psi)
Normal Use	**345**	**50**	**552**	**80**
Peak Hour Demand	**276**	**40**	**552**	**80**
Maximum Day and Fire Flow	**140**	**20**	**552**	**80**
Maximum pressure at any point in occupied areas			**552**	**80**
Maximum pressure at any point in unoccupied areas			**689**	**100**

* Proposed watermain pipes: 150 mm and 200 mm diameter DR 18
* C_{hazen} is 100 and 110 for 150 mm and 200 mm respectively
* Proposed 10 fire hydrants; maximum distance between fire hydrants= 125 m



AS PER ZONING BY–LAW (R1):
MAXIMUM BUILDING FOOTPRINT: 30% OF LOT AREA
MINIMUM SETBACKS: AS SHOWN

LOT 86 AREA = 487.42 m^2
30% OF LOT AREA = 146.23 m^2

ZONING: R1
MIN. LOT AREA: 465 m^2
MIN. FRONTAGE: 15 m
MIN. FRONT YARD: 6 m
MIN. REAR YARD: 7.5 m
MIN. SIDE YARD: 2 OR 3 m (EXT. SY: 6 m)
MAX. HEIGHT: 10 m
MAXIMUM BUILDING FOOTPRINT = 30% OF LOT AREA

NOTES
* DISTANCES ARE IN METRE
* PLAN NORTH SHOWN IS NOT THE GEOGRAPHIC NORTH

TYPICAL SINGLE FAMILY LOT LAYOUT USED FOR FIRE FLOW DEMAND ESTIMATION (1:500)

Ontario Building Code 2012 (OBC), Appendix A, division B, A-3.2.5.7

Water supply for firefighting: $Q = K.V.S_{tot}$

Q = minimum supply of water available in litres (L)

K = water supply coefficient for residential occupancy C and combustible construction A-3.2.5.7 Table 1

V = total building volume in cubic metres

S_{tot} = total of spatial coefficient values from property line exposure on all sides, to a maximum of 2.0

$S_{tot} = 1 + (S_{side1} + S_{side2} + S_{side3} + \ldots \text{ etc.})$

Typical single family house

Average Building Height =	9.0 m
Building Footprint =	146 m²
Total Building A Volume V =	1 314 m³

K from A-3.2.5.7 Table 1 = 23 Building of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating.

* **$S_{tot} = 1 + (S_{side1} + S_{side2} + S_{side3} + \ldots \text{ etc.})$ As per figure 1**

		$S_{side\ i}$
Exposure Distance N =	15.0 m	0
Exposure Distance S =	32.0 m	0
Exposure Distance E =	4.0 m	0.5
Exposure Distance W =	6.0 m	0.5
Total Spatial Coefficient =		**2**

Minimum supply of water in litres Q = **60 444 L**

For Q < 108 000 L

Required Minimum Water Supply Flow Rate as per Table 2, A-3.2.5.7 :

2 700 L/min at a minimum pressure of 140 kPa

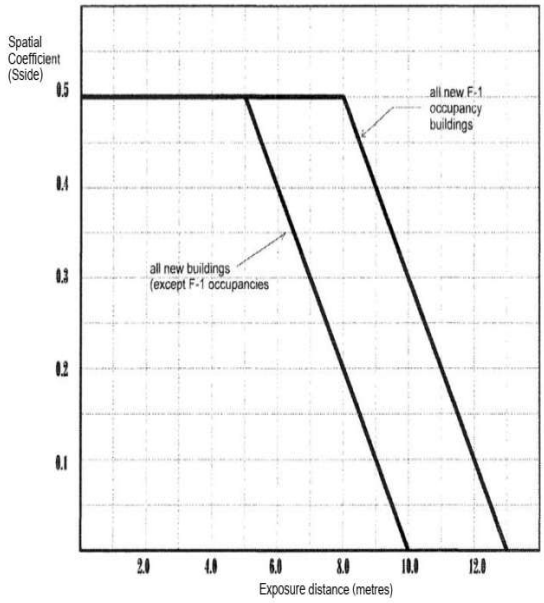


Figure 1
Spatial Coefficient vs Exposure Distance

Further clarification of intent and sample problems and solutions are contained in the "Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code". This guideline may be obtained through the Office of the Fire Marshal's web site at: "www.ofm.gov.on.ca"

Lockmaster's Meadow Subdivision

Fire Flow Protection according to the Fire Underwriters Survey (FUS) Guidelines 2020

Typical single family lot – Lot width 15 m

Required Basic Fire Flow (FUS – PART II) $RFF = 220C\sqrt{A}$

Where: **RFF**: required fire flow in litres per minute; **C**: construction coefficient related to the type of construction
A: total effective floor area (effective building area) in sq.m

		Option	Charge		
A	**Type of Construction**	Type V Wood Frame Construction	**1.5**	**Type V Wood Frame Construction**	**1.5**
		Type IV-A Mass Timber Construction	**0.8**		
		Type IV-B Mass Timber Construction	**0.9**		
		Type IV-C Mass Timber Construction	**1.0**		
		Type IV-D Mass Timber Construction	**1.5**		
		Type III Ordinary Construction	**1.0**		
		Type II Noncombustible Construction	**0.8**		
		Type I Fire Resistive Construction	**0.6**		
	Ground Floor Area				**146.0 m³**
B	Second Floor Area				**146.0 m³**
	Total Effective Floor Area A				**292.0 m³**
C	**Fire Flow F = 220 C A $^{0.5}$**				**5 639 L/min**
				Rounded to the nearest 1,000 L/min RFF =	**6 000 L/min**

		Option	Charge		
D	**Occupancy Adjustment**	Non-Combustible	**-25%**	**Limited-Combustible**	**-15%**
		Limited-Combustible	**-15%**		
		Combustible	**0%**		
		Free Burning	**15%**		
		Rapid Burning	**20%**		
	Occupancy Adjustment				**- 900 L/min**
	Fire Flow				**5 100 L/min**

		Option	Charge		
E	**Sprinkler Protection**	None	**0%**	**None**	**0%**
		Automatic Sprinkler Protection (NFPA 13)	**30%**		
		Water Supply is Standard for System & Hose Lines	**10%**		
		Fully Supervised System	**10%**		
		Additional Reduction	**0%**		
				Sprinkler Reduction	**000 L/min**

F Exposures

North Side	Subject Building and Exposed Building Fully Protected with Automatic Sprinkler Systems		No
	Exposed Building Fully Protected with Automatic Sprinkler Systems		No
	Exposed Wall Length		**10.0 m**
	Exposed Wall Height in Number of Storeys		**2**
	Length-Height Factor of Exposed Wall		**20**
	Distance to the Exposure		**15.0 m**
Construction Type of Exposed Wall (FUS 2020 – Table 6 – page 31)	**Options**		**Charge**
	Type V Wood Frame Construction	**Type V Wood Frame Construction**	**10%**
	Type III-IV w/ unprotected openings		
	Type III-IV w/o protected openings		
	Type I-II w/ unprotected openings		
	Type I-II w/o protected openings		

East Side			
	Subject Building and Exposed Building Fully Protected with Automatic Sprinkler Systems		No
	Exposed Building Fully Protected with Automatic Sprinkler Systems		No
	Exposed Wall Length		**20.0 m**
	Exposed Wall Height in Number of Storeys		**2**
	Length-Height Factor of Exposed Wall		**40**
	Distance to the Exposure		**4.0 m**
Construction Type of Exposed Wall (FUS 2020 – Table 6 – page 31)	**Options**		**Charge**
	Type V Wood Frame Construction	**Type V Wood Frame Construction**	**16%**
	Type III-IV w/ unprotected openings		
	Type III-IV w/o protected openings		
	Type I-II w/ unprotected openings		
	Type I-II w/o protected openings		

South Side			
	Subject Building and Exposed Building Fully Protected with Automatic Sprinkler Systems		No
	Exposed Building Fully Protected with Automatic Sprinkler Systems		No
	Exposed Wall Length		**10.0 m**
	Exposed Wall Height in Number of Storeys		**2**
	Length-Height Factor of Exposed Wall		**20**
	Distance to the Exposure		**32.0 m**
Construction Type of Exposed Wall (FUS 2020 – Table 6 – page 31)	**Options**		**Charge**
	Type V Wood Frame Construction	**Type V Wood Frame Construction**	**0%**
	Type III-IV w/ unprotected openings		
	Type III-IV w/o protected openings		
	Type I-II w/ unprotected openings		
	Type I-II w/o protected openings		

West Side			
	Subject Building and Exposed Building Fully Protected with Automatic Sprinkler Systems		No
	Exposed Building Fully Protected with Automatic Sprinkler Systems		No
	Exposed Wall Length		**20.0 m**
	Exposed Wall Height in Number of Storeys		**2**
	Length-Height Factor of Exposed Wall		**40**
	Distance to the Exposure		**6.0 m**
Construction Type of Exposed Wall (FUS 2020 – Table 6 – page 31)	**Options**		**Charge**
	Type V Wood Frame Construction	**Type V Wood Frame Construction**	**21%**
	Type III-IV w/ unprotected openings		
	Type III-IV w/o protected openings		
	Type I-II w/ unprotected openings		
	Type I-II w/o protected openings		

	Total charge for exposures =	**47%**
	Total adjustment for exposures =	**2 397 L/min**
G	Adjusted Fire Flow (D)-(E)+(F) =	**7 497 L/min**
	Rounded to the nearest 1,000 L/min RFF =	**7 000 L/min**

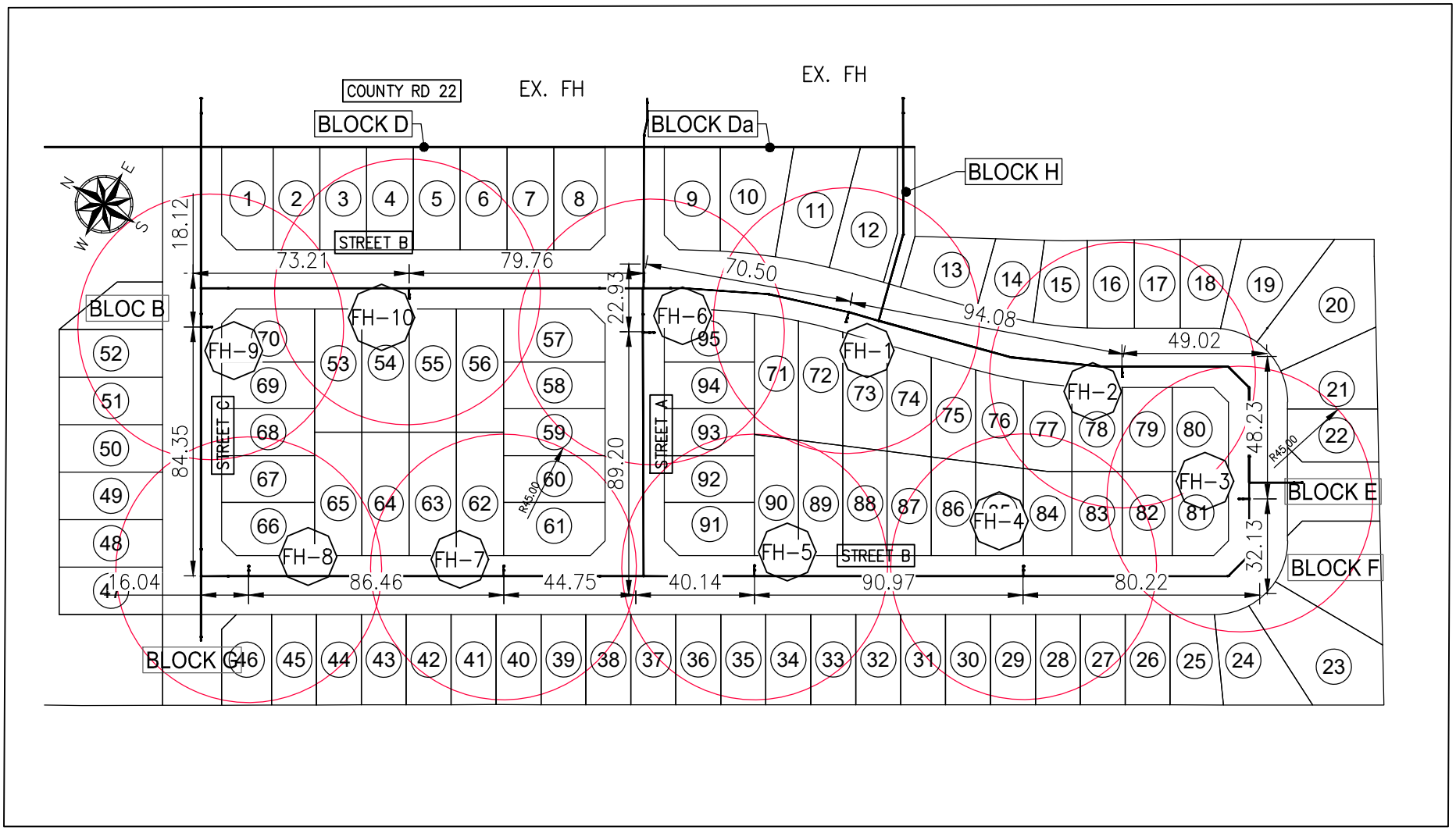
Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)
2. Second storey assumed to have floor area equal to first floor area.

Fire Hydrant Spacing and Required Fire Flow

LOT/BLOCK	Number of FH WITHIN 75 m	Number of FH WITHIN 150 m	Available Fire Flow
	5 700 L/min	3 800 L/min	L/min
1	2	2	19,000
8	2	3	22,800
15	2	2	19,000
20	2	1	15,200
24	2	1	15,200
36	2	2	19,000
46	2	2	19,000
58	1	3	17,100
75	2	2	19,000

* 5,700 and 3,800 L/min from Table 1 – Annex I – Technical Bulletin ISTB-2018-02



NOTES

* DISTANCES ARE IN METRE

PROPSOED SUBDIVISION

FIRE HYDRANT LAYOUT (SCALE: 1:2000)

CLOW CANADA - M-67 / M93 BRIGADIER FIRE HYDRANT SPECIFICATION

TESTING AND DESIGN SPECIFICATIONS (PER AWWA C502 / NSF /ULC & FM)

1. Hydrant shall be manufactured in accordance with AWWA C502 latest revision
2. Hydrant Has been certified by **UL** in accordance with the **ANSI/NSF 61 and ANSI/NSF 372** (LEAD CONTENT VERIFICATION OF PRODUCTS INCONTACT WITH POTABLE WATER)
3. Hydrant shall be designed for 250 *PSI* working pressure and tested to 500 *PSI* hydrostatic pressure.
4. Hydrant shall be rated for 250 *PSI*. **FM** working pressure and 200 *PSI*. **ULC** working pressure.
5. Hydrant shall be a compression type, dry barrel design with centre operating stem construction.
6. The O-ring seating surface on the upper stem shall be constructed of stainless steel.
7. Epoxy coating to be applied to interior and exterior of hydrant shoe for corrosion protection.
8. Hydrant shall be manufactured with operating nut and integral thrust collar made of bronze. A Delrin washer bearing shall be located above thrust collar for ease of hydrant operation.
9. Hydrant shall have a lower valve assembly that fully encapsulates the lower operating rod threads. This allows for increased corrosion resistance and ease of disassembly.
10. Intermediate section shall be ductile iron. (AWWA C110 – 08)

STANDARD HYDRANT FEATURES

1. Body style: Round
2. Hydrant shall have an internally lubricated bronze operating nut with O-ring seals. Operating nut shall be of the Hydra-lubeTM design to ensure self lubrication during operation.
3. Hydrant hose nozzles shall be mechanically locked into place by an external allen screw, and have O-ring seals.
4. Hydrant Lower rod shall be 1-1/4" in sq.
5. Hydrant shall have a main valve opening of 5-1/4".
6. Hydrant shall be a traffic model, complete with safety flanges and stem coupling. Upper body can be rotated 360 degrees to adjust pumper direction.
7. Hydrant shall be manufactured with a lower valve plate that bottoms out in the shoe for maximum opening.
8. Hydrant shall be backed by manufacturer's 12 year limited warranty
9. Hydrant shall be the Clow Canada Brigadier as manufactured by Clow Canada.

OPTIONAL HYDRANT FEATURES

1. 2hose or 2hose & one pumper upper body
2. AVAILABLE INLETS:
   150mm (6") Mechanical Joint (ANSI A-21.11) INCLUDING THRUST BLOCKS & MECHANICAL RESTRAINTS
   150mm (6") Online chamber flanged (ANSI B16.1 Class 125) for (AWWA C110 – 08) tee
   200mm (8") Mechanical Joint (ANSI A-21.11)
   200mm (8") Online chamber flanged (ANSI B16.1 Class 125) for (AWWA C110 – 08) tee
   150mm (6") flanged (ANSI B16.1 Class 125)
   150mm (6") flanged (ANSI B16.1 Class 250)
   150mm (6") Tyton (AWWA C111/A21.11)

3. All standard inlets available in CAST IRON ASTM A126 Class B
   Or Ductile Iron ASTM A536 (65-45-12)
4. Hydra-lube operating nut – see standard shapes on submittal drawing – 1¼" SQ.
5. Two 65mm (2.5") hose nozzles - threads on nozzle ends to suit national, provincial or municipal standard or STORZ quick connect
6. One 114mm (4.5") pumper nozzle - threads on nozzle ends to suit national, provincial or municipal standard
7. 100mm (4") or 125mm (5") STORZ quick connect pumper nozzle.
8. Nozzle caps to suit – see standard shapes on submittal drawing.
9. Two external .375" NPT plugs in inlet @ 180 degrees / one internal .25" NPT plug
10. Hose & pumper nozzle cap chains
11. Hydrants painted / coated to suit national, provincial or municipal standard per AWWA C502 / AWWA C550

MAXIMUM DAY + REQUIRED FIRE FLOW

REQUIRED FIRE FLOW:

8000 L/min AT NODE J11

ELEVATIONS ARE APPROXIMATE AND AT GROUND LEVEL

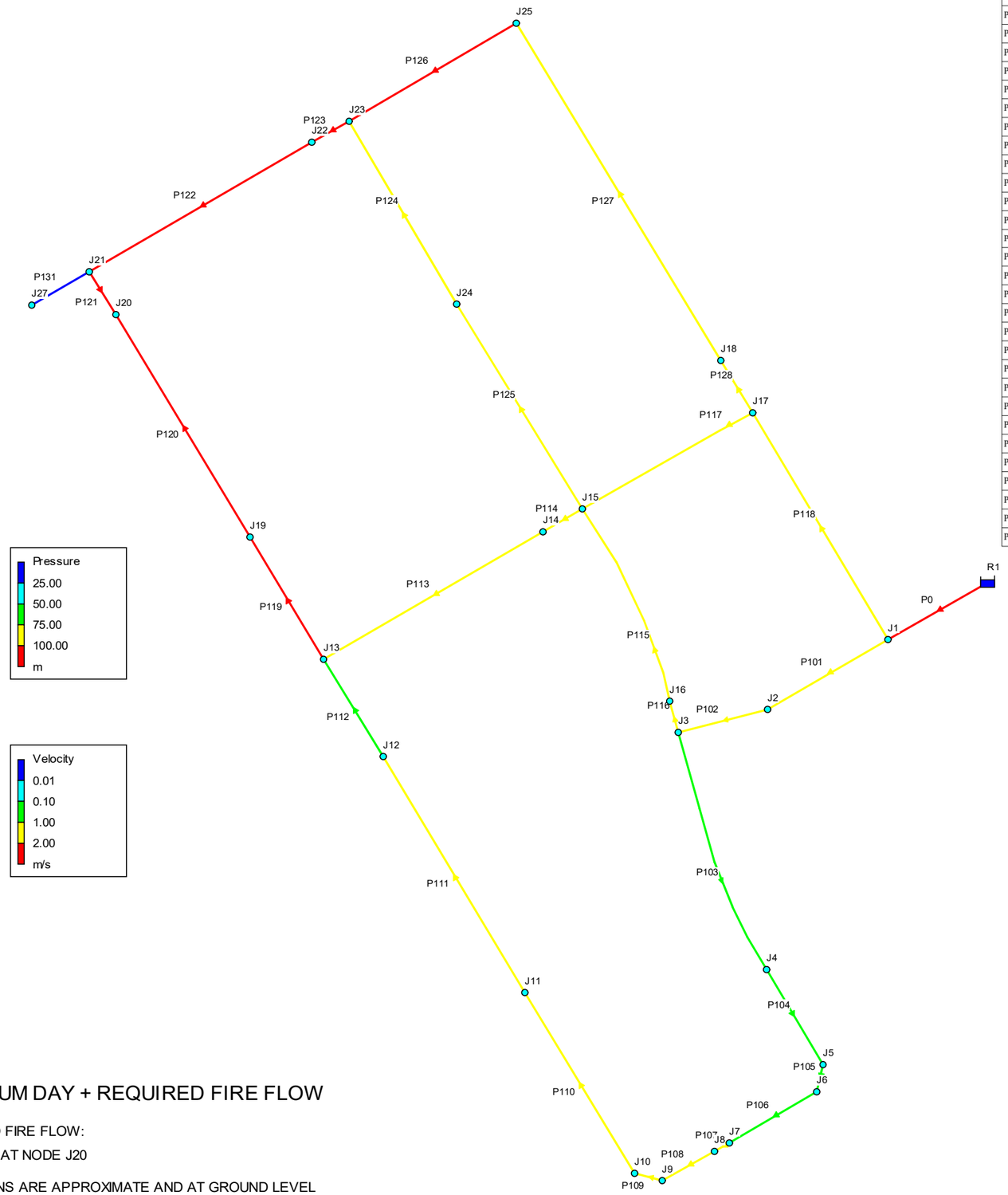
FIRE HYDRANTS ARE LOCATED AT J4, J8, J11, J12, J14, J16, J19, J20, J22, J24

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Unit Headloss m/km	Friction Factor
Pipe P131	21.86	204	110	0.00	0.00	0.00	0.000
Pipe P116	10.88	155	100	1.42	0.08	0.10	0.053
Pipe P115	70.34	155	100	1.42	0.08	0.10	0.053
Pipe P125	79.39	155	100	-7.83	0.41	2.33	0.041
Pipe P124	70.48	155	100	-8.23	0.44	2.55	0.041
Pipe P128	20.39	250	110	38.41	0.78	3.62	0.029
Pipe P127	130.20	250	110	-38.41	0.78	3.62	0.029
Pipe P122	84.45	204	110	29.73	0.91	6.06	0.029
Pipe P121	16.61	200	110	29.48	0.94	6.57	0.029
Pipe P123	13.82	200	110	29.73	0.95	6.67	0.029
Pipe P126	63.58	204	110	38.41	1.18	9.74	0.028
Pipe P118	87.21	250	110	65.91	1.34	9.83	0.027
Pipe P117	64.11	155	100	27.50	1.46	23.85	0.034
Pipe P119	47.26	155	100	28.83	1.53	26.03	0.034
Pipe P120	86.05	155	100	29.28	1.55	26.79	0.034
Pipe P113	82.93	155	100	36.20	1.92	39.68	0.033
Pipe P114	14.95	155	100	-36.20	1.92	39.68	0.033
Pipe P106	33.18	204	110	-69.72	2.13	29.38	0.026
Pipe P105	9.29	204	110	-69.87	2.14	29.50	0.026
Pipe P104	36.44	204	110	-70.02	2.14	29.62	0.026
Pipe P103	84.21	204	110	-70.32	2.15	29.85	0.026
Pipe P102	30.00	204	110	72.19	2.21	31.34	0.026
Pipe P101	45.89	204	110	72.19	2.21	31.34	0.026
Pipe P0	0.1	250	110	-138.10	2.81	38.70	0.024
Pipe P111	91.09	155	100	64.38	3.41	115.27	0.030
Pipe P112	37.51	155	100	64.73	3.43	116.43	0.030
Pipe P110	69.91	155	100	-69.52	3.68	132.90	0.030
Pipe P109	9.46	155	100	-69.72	3.70	133.61	0.030
Pipe P108	19.53	155	100	-69.72	3.70	133.61	0.030
Pipe P107	5.63	155	100	-69.72	3.70	133.61	0.030

Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m
Resvr R1	120	-138.10	120.00	0.00
Junc J11	84.48	133.90	98.86	14.38
Junc J10	84.83	0.20	108.15	23.32
Junc J9	84.92	0.00	109.41	24.49
Junc J12	83.84	0.35	109.36	25.52
Junc J8	85.06	0.00	112.02	26.96
Junc J7	84.91	0.00	112.78	27.87
Junc J6	84.95	0.15	113.75	28.80
Junc J5	84.92	0.15	114.02	29.10
Junc J13	83.51	0.30	113.73	30.22
Junc J4	84.85	0.30	115.10	30.25
Junc J19	83.15	0.45	114.96	31.81
Junc J14	83.76	0.00	117.02	33.26
Junc J3	84.29	0.45	117.62	33.33
Junc J16	84.21	0.00	117.62	33.41
Junc J15	83.87	0.55	117.61	33.74
Junc J2	84.48	0.00	118.56	34.08
Junc J24	83.19	0.40	117.79	34.60
Junc J20	82.52	0.20	117.26	34.74
Junc J27	82.52	0.00	117.37	34.85
Junc J21	82.41	0.25	117.37	34.96
Junc J17	84.11	0.00	119.14	35.03
Junc J1	84.92	0.00	120.00	35.08
Junc J18	83.92	0.00	119.06	35.14
Junc J22	82.09	0.00	117.88	35.79
Junc J23	81.99	0.45	117.97	35.98
Junc J25	82.11	0.00	118.59	36.48



MAXIMUM DAY + REQUIRED FIRE FLOW

REQUIRED FIRE FLOW:

8000 L/min AT NODE J20

ELEVATIONS ARE APPROXIMATE AND AT GROUND LEVEL

FIRE HYDRANTS ARE LOCATED AT J4, J8, J11, J12, J14, J16, J19, J20, J22, J24

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Unit Headloss m/km	Friction Factor
Pipe P131	21.86	204	110	0.00	0.00	0.00	0.000
Pipe P106	33.18	204	110	-19.69	0.60	2.83	0.031
Pipe P105	9.29	204	110	-19.84	0.61	2.86	0.031
Pipe P104	36.44	204	110	-19.99	0.61	2.91	0.031
Pipe P103	84.21	204	110	-20.29	0.62	2.99	0.031
Pipe P112	37.51	155	100	-18.54	0.98	11.49	0.036
Pipe P111	91.09	155	100	-18.89	1.00	11.90	0.036
Pipe P110	69.91	155	100	-19.49	1.03	12.61	0.036
Pipe P107	5.63	155	100	-19.69	1.04	12.85	0.036
Pipe P108	19.53	155	100	-19.69	1.04	12.85	0.036
Pipe P109	9.46	155	100	-19.69	1.04	12.85	0.036
Pipe P117	64.11	155	100	22.07	1.17	15.88	0.035
Pipe P124	70.48	155	100	22.75	1.21	16.78	0.035
Pipe P125	79.39	155	100	23.15	1.23	17.34	0.035
Pipe P114	14.95	155	100	-23.24	1.23	17.47	0.035
Pipe P113	82.93	155	100	23.24	1.23	17.47	0.035
Pipe P116	10.88	155	100	24.87	1.32	19.80	0.035
Pipe P115	70.34	155	100	24.87	1.32	19.80	0.035
Pipe P101	45.89	204	110	45.61	1.40	13.39	0.028
Pipe P102	30.00	204	110	45.61	1.40	13.39	0.028
Pipe P127	130.20	250	110	-70.42	1.43	11.12	0.027
Pipe P128	20.39	250	110	70.42	1.43	11.12	0.027
Pipe P118	87.21	250	110	92.49	1.88	18.42	0.025
Pipe P126	63.58	204	110	70.42	2.15	29.93	0.026
Pipe P120	86.05	155	100	-41.03	2.17	50.05	0.032
Pipe P119	47.26	155	100	-41.48	2.20	51.07	0.032
Pipe P0	0.1	250	110	-138.10	2.81	38.70	0.024
Pipe P122	84.45	204	110	92.72	2.84	49.81	0.025
Pipe P121	16.61	200	110	92.47	2.94	54.58	0.025
Pipe P123	13.82	200	110	92.72	2.95	54.86	0.025

Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m
Resvr R1	120	-138.10	120.00	0.00
Junc J20	82.52	133.50	108.94	26.42
Junc J27	82.52	0.00	109.85	27.33
Junc J21	82.41	0.25	109.85	27.44
Junc J19	83.15	0.45	113.25	30.10
Junc J22	82.09	0.00	114.05	31.96
Junc J13	83.51	0.30	115.66	32.15
Junc J12	83.84	0.35	116.09	32.25
Junc J11	84.48	0.60	117.18	32.70
Junc J24	83.19	0.40	116.00	32.81
Junc J23	81.99	0.45	114.81	32.82
Junc J10	84.83	0.20	118.06	33.23
Junc J9	84.92	0.00	118.18	33.26
Junc J14	83.76	0.00	117.11	33.35
Junc J8	85.06	0.00	118.43	33.37
Junc J15	83.87	0.55	117.37	33.50
Junc J7	84.91	0.00	118.50	33.59
Junc J6	84.95	0.15	118.60	33.65
Junc J5	84.92	0.15	118.62	33.70
Junc J4	84.85	0.30	118.73	33.88
Junc J18	83.92	0.00	118.16	34.24
Junc J17	84.11	0.00	118.39	34.28
Junc J16	84.21	0.00	118.76	34.55
Junc J25	82.11	0.00	116.72	34.61
Junc J3	84.29	0.45	118.98	34.69
Junc J2	84.48	0.00	119.38	34.90
Junc J1	84.92	0.00	120.00	35.08

PEAK HOUR DEMAND

ELEVATIONS ARE APPROXIMATE AND AT GROUND LEVEL

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s	Unit Headloss m/km	Friction Factor
Pipe P131	21.86	204	110	0.00	0.00	0.00	0.000
Pipe P119	47.26	155	100	0.30	0.02	0.01	0.066
Pipe P111	91.09	155	100	0.50	0.03	0.01	0.062
Pipe P124	70.48	155	100	-0.93	0.05	0.05	0.056
Pipe P125	79.39	155	100	1.21	0.06	0.07	0.054
Pipe P106	33.18	204	110	-3.78	0.12	0.13	0.040
Pipe P121	16.61	200	110	3.78	0.12	0.15	0.040
Pipe P112	37.51	155	100	2.37	0.13	0.26	0.049
Pipe P105	9.29	204	110	-4.58	0.14	0.19	0.039
Pipe P120	86.05	155	100	2.71	0.14	0.33	0.048
Pipe P110	69.91	155	100	-2.71	0.14	0.33	0.048
Pipe P116	10.88	155	100	2.72	0.14	0.33	0.048
Pipe P115	70.34	155	100	2.72	0.14	0.33	0.048
Pipe P122	84.45	204	110	5.12	0.16	0.23	0.038
Pipe P123	13.82	200	110	5.12	0.16	0.26	0.038
Pipe P104	36.44	204	110	-5.38	0.16	0.26	0.038
Pipe P128	20.39	250	110	8.46	0.17	0.22	0.036
Pipe P127	130.20	250	110	-8.46	0.17	0.22	0.036
Pipe P113	82.93	155	100	3.69	0.20	0.58	0.046
Pipe P114	14.95	155	100	-3.69	0.20	0.58	0.046
Pipe P108	19.53	155	100	-3.78	0.20	0.60	0.046
Pipe P107	5.63	155	100	-3.78	0.20	0.60	0.046
Pipe P109	9.46	155	100	-3.78	0.20	0.60	0.046
Pipe P103	84.21	204	110	-6.99	0.21	0.41	0.036
Pipe P126	63.58	204	110	8.46	0.26	0.59	0.035
Pipe P117	64.11	155	100	5.12	0.27	1.06	0.044
Pipe P118	87.21	250	110	13.58	0.28	0.53	0.034
Pipe P101	45.89	204	110	12.12	0.37	1.15	0.034
Pipe P102	30.00	204	110	12.12	0.37	1.15	0.033
Pipe P0	0.1	250	110	-25.70	0.52	1.67	0.030

PROPOSED SINGLE FAMILY SUBDIVISION – PHASE 1&2
SANITARY SEWER DESIGN

1- DESIGN FLOW CALCULATION

$Q_d = (M \cdot q \cdot P / 86.4) + I \cdot A$ Where:

Q_d = Peak Design Flow (L/s)

M = Peaking Factor (Max = 4; Min = 1.5)

q = Average Daily Flow per capita per day (L/c/day)

P = Population = 2.7 capita per townhouse

I = Infiltration Contribution (0.28 L/s/eff. gross ha)

A = Gross Drainage Area (ha)

A (ha) =	**7.6677**	ha (Phase 1&2 covered)	
q (L/c/day) =	**350**	L/c/day	
Number of Lots	**95**	Units	
Single Family Population =	**3.4**	Capita per unit	
Population =	**323**	Capita	
M (Harmon's Peaking Factor) =	**3.45**	M= 1+(14/(4+P^0.5))k = **3.45**	k: Correction Factor (0.8)
Extraneous Flow 0.28 x A (L/s) =	2.15	L/s	
Extraneous Flow 0.05 x A (L/s) =	0.38	L/s	As per Technical Bulletin

Average Dry Weather Flow Rate	**ADWF =**	**1.69**	L/s
Peak Dry Weather Flow Rate	**PDWF =**	**4.90**	L/s
Peak Wet Weather Design Flow Rate	**Q_d (L/s) =**	**7.04**	L/s
	Q_d (m^3/day) =	**608.64**	m^3/day

2- EXISTING SEWER CAPACITY CALCULATION – COUNTY RD

a- PIPE AT COUNTY RD 22 / GILL ST

Manning's Equation
$Q = 1/n . A . R^{2/3} . S^{1/2}$

D (mm) =	**250**		
A (m^2) =	0.0491		
n =	**0.013**	Manning Coefficient	
R (m) =	0.06	Hydraulic Radius (m)	
S =	**0.96%**	Slope (%)	
	$Q = 1/n * A * R^{2/3} * S^{1/2}$		
Full Pipe Capacity Q_f (m^3/s)=	**0.0583**	m^3/s = **58.3**	L/s
V_f (m/s)=	**1.19**	m/s	

- Anticipated sewage flow from subdivision contribution represents:

12.1% of the existing sewer capacity.

b- PIPE AT COUNTY RD 22 / DODGE ST

D (mm) =	**250**		
A (m^2) =	0.0491		
n =	**0.013**	Manning Coefficient	
R (m) =	0.06	Hydraulic Radius (m)	
S =	**0.28%**	Slope (%)	
	$Q = 1/n * A * R^{2/3} * S^{1/2}$		
Full Pipe Capacity Q_f (m^3/s)=	**0.0315**	m^3/s = **31.5**	L/s
V_f (m/s)=	**0.64**	m/s	

- Anticipated sewage flow from subdivision contribution represents:

22.4% of the existing sewer capacity.

Project: Residential Single Family Subdivision - County Road 22 - Village of Cardinal

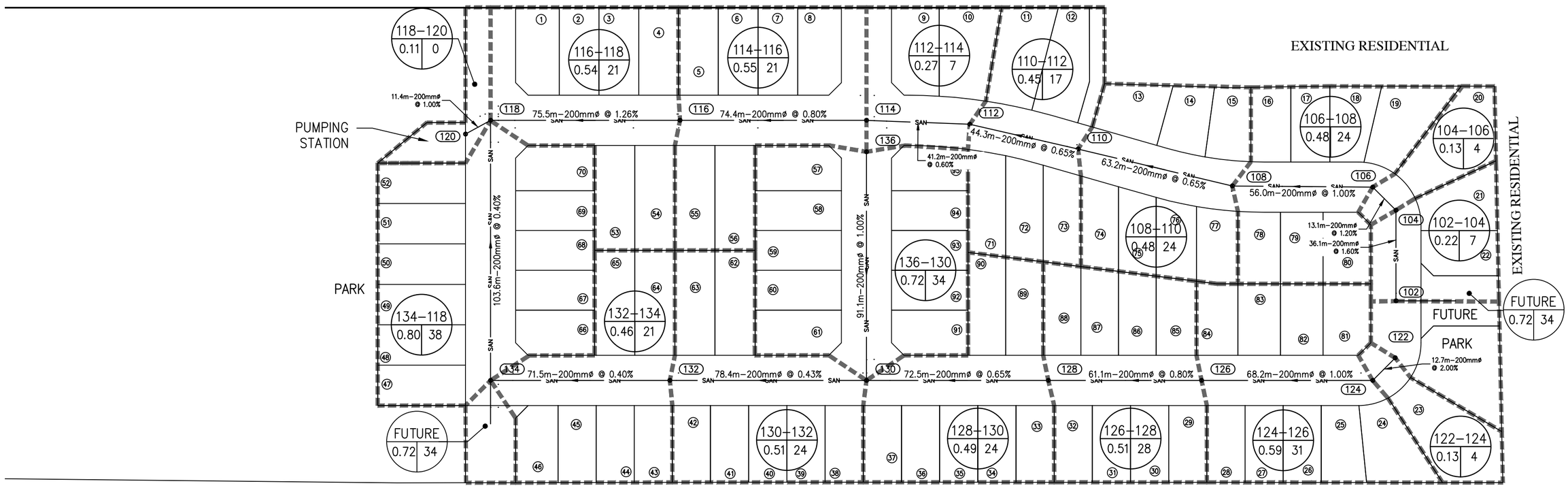
NOTES:

Refer to sanitary sewer calculation sheet for all sewer segments within the subdivision
Minimum diameter for sanitary main sewer: 200 mm (8")
Maximum velocity = 3 m/s
Minimum velocity = 0.6 m/s
Minimum depth of cover 2.5 m from crown of sewer to finished grade
Minimum vertical clearance between sewer and watermain is 0.5 m if sewer above
Minimum horizontal clearance between sewer and watermain is 2.5 m
Special treatment of manholes and pipe if high groundwater level
Maximum spacing of manholes 120 m
Drops at manholes: 30 mm (straight sewer) and 0.6 (45 to 90 deg sewer)
Pipe material: PVC DR of 35 320 kPa or equivalent
Manholes: precast or poured concrete as per OPSD standards
Bedding: as per OPSD standards and geotechnical

GRAPH USED TO DETERMINE ACTUAL FLOW DEPTH AND VELOCITY

Q/Q_{full}	h/D	v/v_{full}	R/D	Q/Q_{full}	h/D	v/v_{full}	R/D
0.095	0.205	0.64	0.1233	0.610	0.568	1.04	0.2697
0.100	0.211	0.65	0.1265	0.620	0.575	1.04	0.2715
0.105	0.216	0.66	0.1291	0.630	0.581	1.05	0.2731
0.110	0.221	0.67	0.1317	0.640	0.587	1.05	0.2745
0.115	0.226	0.68	0.1343	0.650	0.594	1.05	0.2762
0.120	0.231	0.69	0.1369	0.660	0.600	1.05	0.2776
0.125	0.236	0.69	0.1395	0.670	0.607	1.06	0.2793
0.130	0.241	0.70	0.1421	0.680	0.613	1.06	0.2806
0.135	0.245	0.71	0.1441	0.690	0.620	1.06	0.2821
0.140	0.250	0.72	0.1466	0.700	0.626	1.06	0.2834
0.145	0.255	0.72	0.1491	0.710	0.633	1.06	0.2848
0.150	0.259	0.73	0.1511	0.720	0.640	1.07	0.2862
0.155	0.263	0.74	0.1531	0.730	0.646	1.07	0.2874
0.160	0.268	0.74	0.1556	0.740	0.653	1.07	0.2887
0.165	0.272	0.75	0.1575	0.750	0.660	1.07	0.2900
0.170	0.276	0.76	0.1595	0.760	0.667	1.07	0.2912
0.175	0.281	0.76	0.1619	0.770	0.675	1.07	0.2925
0.180	0.285	0.77	0.1638	0.780	0.682	1.07	0.2936
0.190	0.293	0.78	0.1676	0.790	0.689	1.07	0.2947
0.200	0.301	0.79	0.1714	0.800	0.697	1.07	0.2958
0.210	0.309	0.80	0.1751	0.805	0.701	1.08	0.2964
0.220	0.316	0.81	0.1784	0.810	0.705	1.08	0.2969
0.230	0.324	0.82	0.1820	0.815	0.709	1.08	0.2974
0.240	0.331	0.83	0.1851	0.820	0.713	1.08	0.2979
0.250	0.339	0.84	0.1887	0.825	0.717	1.08	0.2984
0.260	0.346	0.85	0.1918	0.830	0.721	1.08	0.2989
0.270	0.353	0.86	0.1948	0.835	0.725	1.08	0.2993
0.280	0.360	0.86	0.1978	0.840	0.729	1.07	0.2997
0.290	0.367	0.87	0.2007	0.845	0.734	1.07	0.3002
0.300	0.374	0.88	0.2037	0.850	0.738	1.07	0.3006
0.310	0.381	0.89	0.2066	0.855	0.742	1.07	0.3010
0.320	0.387	0.89	0.2090	0.860	0.747	1.07	0.3014
0.330	0.394	0.90	0.2118	0.865	0.751	1.07	0.3018
0.340	0.401	0.91	0.2146	0.870	0.756	1.07	0.3022
0.350	0.407	0.92	0.2170	0.875	0.761	1.07	0.3025
0.360	0.414	0.92	0.2197	0.880	0.766	1.07	0.3028
0.370	0.420	0.93	0.2220	0.885	0.770	1.07	0.3031
0.380	0.426	0.93	0.2243	0.890	0.775	1.07	0.3033
0.390	0.433	0.94	0.2269	0.895	0.781	1.07	0.3036
0.400	0.439	0.95	0.2291	0.900	0.786	1.07	0.3038
0.410	0.445	0.95	0.2313	0.905	0.791	1.07	0.3040
0.420	0.451	0.96	0.2334	0.910	0.797	1.07	0.3041
0.430	0.458	0.96	0.2359	0.915	0.803	1.06	0.3042
0.440	0.464	0.97	0.2380	0.920	0.808	1.06	0.3043
0.450	0.470	0.97	0.2401	0.925	0.814	1.06	0.3043
0.460	0.476	0.98	0.2420	0.930	0.821	1.06	0.3043
0.470	0.482	0.99	0.2441	0.935	0.827	1.06	0.3042
0.480	0.488	0.99	0.2461	0.940	0.834	1.05	0.3040
0.490	0.494	1.00	0.2481	0.945	0.841	1.05	0.3037
0.500	0.500	1.00	0.2500	0.950	0.849	1.05	0.3033
0.510	0.506	1.00	0.2519	0.955	0.856	1.05	0.3029
0.520	0.512	1.01	0.2538	0.960	0.865	1.04	0.3022
0.530	0.519	1.01	0.2559	0.965	0.874	1.04	0.3014
0.540	0.525	1.02	0.2577	0.970	0.883	1.04	0.3004
0.550	0.531	1.02	0.2595	0.975	0.894	1.03	0.2989
0.560	0.537	1.02	0.2612	0.980	0.905	1.03	0.2972
0.570	0.543	1.03	0.2629	0.985	0.919	1.02	0.2946
0.580	0.550	1.03	0.2649	0.990	0.935	1.02	0.2908
0.590	0.556	1.03	0.2665	0.995	0.956	1.01	0.2844
0.600	0.562	1.04	0.2681	1.000	1.000	1.00	0.2500

COUNTY ROAD No. 22



LEGEND:

SANITARY DRAINAGE BOUNDARY

UPSTREAM MH TO DOWNSTREAM MH — 101–102 / 0.79 | 61

AREA IN HECTARES

POPULATION

FUTURE DEVELOPMENT

AREA (Ha) — A= 1.00 Ha

POPULATION — POP= 34

FLOW (m^3/s) — Q= 0.010 m3/s

MAINTENANCE HOLE — 200mmø SAN — MH101

CAP

No.	REVISION / ISSUE	DATE MM/DD/YY
5	PIPE SLOPES UPDATE	02/06/24
3	BERM LAYOUT CHANGE	03/16/23
2	PEER REVIEW COMMENTS	11/08/22
1	INITIAL ISSUE	03/10/22

ADVANCE ENGINEERING
eng.services.ca@gmail.com

APPLICANT:
EDWARDSBURGH DEVELOPMENTS LTD.

PROJECT NAME AND ADDRESS:
LOCKMASTER'S MEADOW SUBDIVISION
COUNTY RD No. 22, CARDINAL, ON

TITLE:
SANITARY DRAINAGE AREAS

SCALE: 1:1250
DRAFTED BY:
PROJECT No.: 0114
DATE: 02/06/2024

DRAWING No.: SA-1

SANITARY SEWER DESIGN CALCULATION SHEET

Refer to Drawing SA-1 for sanitary sewer system layout

Manning's n = 0.013

LOCATION				RESIDENTIAL AREA AND POPULATION								INFILTRATION		FLOW	PROPOSED SANITARY SEWER DESIGN									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Location Street	Manhole No.		Catch-ment	Number of Dwelling Units		Individual		Cumulative		Peaking Factor (M)	Pop. Peak Flow Q_p	Acc. Area	Peak Infiltration Flow Q_i	Peak Design Flow Q_d	Pipe Length L	Pipe Diameter d	Pipe Type	Slope s	Pipe Capacity Q_f	Full Flow Velocity V_f	Flow Check >0.6 m/s <3.0 m/s	% Full	Flow Depth	Actual Flow Velocity V_p @ Q_d
	From MH	To MH		Semi-Detached (2.7)	Single Family (3.4)	Pop. (Cap)	Area (ha)	Pop. (Cap)	Area (ha)		(L/s)	(ha)	0.33*Area	(L/s)	(m)	(mm)		%	(L/s)	(m/s)		%	(mm)	(m/s)
	At Node MH 102 From Future Development (South):							34.0	0.7200	4.00	0.44	0.7200	0.24	**0.68**										
Street B	**102**	**104**	SAN 1		2	7.0	0.2227	41.0	0.9427	4.00	0.53	0.9427	0.31	**0.84**	36.1	203	DR35	**1.60**	43.2	**1.33**	**OK**	2.0%	20	0.53
Street B	**104**	**106**	SAN 2		1	4.0	0.1286	45.0	1.0713	4.00	0.58	1.0713	0.35	**0.94**	13.1	203	DR35	**1.20**	37.4	**1.16**	**OK**	2.5%	22	0.49
Street B	**106**	**108**	SAN 3		7	24.0	0.4797	69.0	1.551	4.00	0.89	1.5510	0.51	**1.41**	56.0	203	DR35	**1.00**	34.1	**1.05**	**OK**	4.1%	28	0.52
Street B	**108**	**110**	SAN 4		7	24.0	0.4796	93.0	2.0306	4.00	1.21	2.0306	0.67	**1.88**	63.3	203	DR35	**0.65**	27.5	**0.85**	**OK**	6.8%	36	0.50
Street B	**110**	**112**	SAN 5		5	17.0	0.4512	110.0	2.4818	4.00	1.43	2.4818	0.82	**2.24**	44.4	203	DR35	**0.65**	27.5	**0.85**	**OK**	8.2%	39	0.51
Street B	**112**	**114**	SAN 6		2	7.0	0.2689	117.0	2.7507	4.00	1.52	2.7507	0.91	**2.42**	41.3	203	DR35	**0.60**	26.4	**0.82**	**OK**	9.2%	42	0.51
Street B	**114**	**116**	SAN 7		6	21.0	0.5478	138.0	3.2985	4.00	1.79	3.2985	1.09	**2.88**	74.4	203	DR35	**0.80**	30.5	**0.94**	**OK**	9.4%	42	0.61
Street B	**116**	**118**	SAN 8		6	21.0	0.5384	159.0	3.8369	4.00	2.06	3.8369	1.27	**3.33**	75.5	203	DR35	**1.26**	38.3	**1.18**	**OK**	8.7%	41	0.73
Street B	**122**	**124**	SAN 9		1	4.0	0.1337	4.0	0.1337	4.00	0.05	0.1337	0.04	**0.10**	12.7	203	DR35	**2.00**	48.3	**1.49**	**OK**	0.2%	8	0.30
Street B	**124**	**126**	SAN 10		9	31.0	0.5923	35.0	0.726	4.00	0.45	0.726	0.24	**0.69**	68.2	203	DR35	**1.00**	34.1	**1.05**	**OK**	2.0%	20	0.42
Street B	**126**	**128**	SAN 11		8	28.0	0.5122	63.0	1.2382	4.00	0.82	1.2382	0.41	**1.23**	61.1	203	DR35	**0.80**	30.5	**0.94**	**OK**	4.0%	28	0.46
Street B	**128**	**130**	SAN 12		7	24.0	0.4881	87.0	1.7263	4.00	1.13	1.7263	0.57	**1.70**	72.5	203	DR36	**0.65**	27.5	**0.85**	**OK**	6.2%	34	0.47
Street A	**136**	**130**	SAN 13		10	34.0	0.7187	34.0	0.7187	4.00	0.44	0.7187	0.24	**0.68**	91.1	203	DR35	**1.00**	34.1	**1.05**	**OK**	2.0%	20	0.42
			At Node MH 130 From MH 128 and MH 136:								1.57	2.4450	0.81	**2.38**										
Street B	**130**	**132**	SAN 14		7	24.0	0.5132	145.0	2.9582	4.00	1.88	2.9582	0.98	**2.86**	78.4	203	DR35	**0.43**	22.4	**0.69**	**OK**	12.8%	49	0.48
Street B	**132**	**134**	SAN 15		6	21.0	0.4593	166.0	3.4175	4.00	2.15	3.4175	1.13	**3.28**	71.5	203	DR35	**0.40**	21.6	**0.67**	**OK**	15.2%	54	0.48
	At Node MH 134 From Future Development Street C:							34.0	0.72	4.00	0.44	0.7200	0.24	**0.68**										
Street C	**134**	**118**	SAN 16		11	38.0	0.7999	238.0	4.9374	4.00	3.09	4.9374	1.63	**4.71**	103.6	203	DR35	**0.40**	21.6	**0.67**	**OK**	21.8%	65	0.54
			At Node MH 118 From MH 116 and MH 134:								5.15	8.7743	2.90	**8.04**										
Street B	**118**	**120**	SAN 17		0	0.0	0.0942	397.0	8.8685	4.00	10.29	8.8685	2.93	**13.22**	24.4	203	DR35	**1.00**	34.1	**1.05**	**OK**	38.7%	88	0.99
		PS		Total	95	329																		

Design Parameters:

q = Average daily per capita flow — 280 L/day per capita (Ottawa Sewer Guidelines)

q_i = Unit of peak extraneous flow — 0.28 + 0.05 = 0.33 L/effect. Gross ha.s

M = Residential peaking factor — $M = 1 + (14 / (4+\sqrt{P})) * K$ (Harmon Equation Max.=4)

P: Population in 1000

K: Correction factor = 0.8

Q_p = Peak population flow (L/s) — $Q_p = P \times q \times M / 86.4$ (L/s)

Q_i = Peak extraneous flow (L/s) — $Q_i = q_i \times A$ (L/s) A = Area in hectares

Q_d = Peak design flow (L/s) — $Q_d = Q_p + Q_i$ (L/s)

Dry weather flow (DWF):

Average DWF = AWF (all land uses) + DWGWI (all land uses)

Peak DWF = AWF (res) x M + AWF (ICI) + DWGWI (all land uses)

Where: AWF = Average Wastewater Flow

DWGWI = Dry Weather Ground Water Infiltration

Res = Residential ICI = Institutional Commercial Industrial

Population per single family house 3.4 (Ottawa Sewer Guidelines)

Notes:

1. Minimum diameter for sanitary gravity sewer: 200 mm (8")
2. Minimum velocity = 0.6 m/s
3. Maximum velocity = 3 m/s
4. Minimum depth of cover 2.5 m from crown of sewer to finished grade
5. Minimum vertical clearance between sewer and watermain is 0.15 m and 0.5 m if sewer above
6. Minimum horizontal clearance between sewer and watermain is 2.5 m
7. Pipe material: PVC DR 35 320 KPa or equivalent
8. Sewer bedding: As per OPSD standard 802.010 or as specified by the geotechnical engineer
9. Special treatment of manholes and pipe if high groundwater level
10. Manhole inner diameter: 1200 mm
11. Maximum spacing between manholes: 120 m
12. Drops at manholes: 30 mm for straight sewer and 60 mm for sewer at 45 to 90 deg
13. Manholes: Precast or poured concrete as per OPSD
14. Minimum diameter for individual service connections (PVC DR 28): 100 mm (4") w/ min grade 1% (preferred 2%)
15. Use tees or wyes, strap-on-saddles for connections to main sewer

SANITARY SEWER DESIGN CALCULATION SHEET

DESIGN CONSIDERING 2 DWELLING UNITS PER LOT

Refer to Drawing SA-1 for sanitary sewer system layout

Manning's n = 0.013

LOCATION				RESIDENTIAL AREA AND POPULATION								INFILTRATION		FLOW	PROPOSED SANITARY SEWER DESIGN								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Location Street	Manhole No. From MH	Manhole No. To MH	Catch-ment	Number of Dwelling Units Semi-Detached (2.7)	Number of Dwelling Units Single Family (3.4)	Individual Pop. (Cap)	Individual Area (ha)	Cumulative Pop. (Cap)	Cumulative Area (ha)	Peaking Factor (M)	Pop. Peak Flow Q_P (L/s)	Acc. Area (ha)	Peak Infiltration Flow Q_i 0.33*Area	Peak Design Flow Q_d (L/s)	Pipe Length L (m)	Pipe Diameter d (mm)	Pipe Type	Slope s %	Pipe Capacity Q_f (L/s)	Full Flow Velocity V_f (m/s)	Flow Check >0.6 m/s <3.0 m/s	% Full %	Flow Depth (mm)	Actual Flow Velocity V_p@ Q_d (m/s)
	At Node MH 102 From Future Development (South):							68.0	0.7200	4.00	0.88	0.7200	0.24	**1.12**										
Street B	**102**	**104**	SAN 1		4	14.0	0.2227	82.0	0.9427	4.00	1.06	0.9427	0.31	**1.37**	36.1	203	DR35	**1.60**	43.2	1.33	OK	3.2%	25	0.61
Street B	**104**	**106**	SAN 2		2	8.0	0.1286	90.0	1.0713	4.00	1.17	1.0713	0.35	**1.52**	13.1	203	DR35	**1.20**	37.4	1.16	OK	4.1%	28	0.58
Street B	**106**	**108**	SAN 3		14	48.0	0.4797	138.0	1.551	4.00	1.79	1.5510	0.51	**2.30**	56.0	203	DR35	**1.00**	34.1	1.05	OK	6.7%	36	0.60
Street B	**108**	**110**	SAN 4		14	48.0	0.4796	186.0	2.0306	4.00	2.41	2.0306	0.67	**3.08**	63.3	203	DR35	**0.65**	27.5	0.85	OK	11.2%	46	0.56
Street B	**110**	**112**	SAN 5		10	34.0	0.4512	220.0	2.4818	4.00	2.85	2.4818	0.82	**3.67**	44.4	203	DR35	**0.65**	27.5	0.85	OK	13.3%	50	0.60
Street B	**112**	**114**	SAN 6		4	14.0	0.2689	234.0	2.7507	4.00	3.03	2.7507	0.91	**3.94**	41.3	203	DR35	**0.60**	26.4	0.82	OK	14.9%	53	0.60
Street B	**114**	**116**	SAN 7		12	42.0	0.5478	276.0	3.2985	4.00	3.58	3.2985	1.09	**4.67**	74.4	203	DR35	**0.80**	30.5	0.94	OK	15.3%	54	0.68
Street B	**116**	**118**	SAN 8		12	42.0	0.5384	318.0	3.8369	4.00	4.12	3.8369	1.27	**5.39**	75.5	203	DR35	**1.26**	38.3	1.18	OK	14.1%	52	0.84
Street B	**122**	**124**	SAN 9		2	8.0	0.1337	8.0	0.1337	4.00	0.10	0.1337	0.04	**0.15**	12.7	203	DR35	**2.00**	48.3	1.49	OK	0.3%	8	0.34
Street B	**124**	**126**	SAN 10		18	62.0	0.5923	70.0	0.726	4.00	0.91	0.7260	0.24	**1.15**	68.2	203	DR35	**1.00**	34.1	1.05	OK	3.4%	26	0.50
Street B	**126**	**128**	SAN 11		16	56.0	0.5122	126.0	1.2382	4.00	1.63	1.2382	0.41	**2.04**	61.1	203	DR35	**0.80**	30.5	0.94	OK	6.7%	36	0.54
Street B	**128**	**130**	SAN 12		14	48.0	0.4881	174.0	1.7263	4.00	2.26	1.7263	0.57	**2.83**	72.5	203	DR36	**0.65**	27.5	0.85	OK	10.3%	44	0.55
Street A	**136**	**130**	SAN 13		20	68.0	0.7187	68.0	0.7187	4.00	0.88	0.7187	0.24	**1.12**	91.1	203	DR35	**1.00**	34.1	1.05	OK	3.3%	25	0.49
			At Node MH 130 From MH 128 and MH 136:								3.14	2.4450	0.81	**3.94**										
Street B	**130**	**132**	SAN 14		14	48.0	0.5132	290.0	2.9582	4.00	3.76	2.9582	0.98	**4.74**	78.4	203	DR35	**0.43**	22.4	0.69	OK	21.2%	64	0.55
Street B	**132**	**134**	SAN 15		12	42.0	0.4593	332.0	3.4175	4.00	4.30	3.4175	1.13	**5.43**	71.5	203	DR35	**0.40**	21.6	0.67	OK	25.2%	70	0.56
	At Node MH 134 From Future Development Street C:							68.0	0.72	4.00	0.88	0.7200	0.24	**1.12**										
Street C	**134**	**118**	SAN 16		22	76.0	0.7999	476.0	4.9374	4.00	6.17	4.9374	1.63	**7.80**	103.6	203	DR35	**0.40**	21.6	0.67	OK	36.1%	85	0.62
			At Node MH 118 From MH 116 and MH 134:								10.29	8.7743	2.90	**13.19**										
Street B	**118**	**120**	SAN 17		0	0.0	0.0942	794.0	8.8685	4.00	20.59	8.8685	2.93	**23.51**	24.4	203	DR35	**1.00**	34.1	1.05	OK	68.9%	125	1.14
		PS		Total	190	658																		

Design Parameters:

q = Average daily per capita flow — 280 L/day per capita (Ottawa Sewer Guidelines)

q_i = Unit of peak extraneous flow — 0.28 + 0.05 = 0.33 L/effect. Gross ha.s

M = Residential peaking factor — $M = 1 + (14 / (4+\sqrt{P})) * K$ (Harmon Equation Max.=4)

P: Population in 1000

K: Correction factor = 0.8

Q_p = Peak population flow (L/s) — $Q_p = P \times q \times M / 86.4$ (L/s)

Q_i = Peak extraneous flow (L/s) — $Q_i = q_i \times A$ (L/s) A = Area in hectares

Q_d = Peak design flow (L/s) — $Q_d = Q_p + Q_i$ (L/s)

Dry weather flow (DWF):

Average DWF = AWF (all land uses) + DWGWI (all land uses)

Peak DWF = AWF (res) x M + AWF (ICI) + DWGWI (all land uses)

Where: AWF = Average Wastewater Flow

DWGWI = Dry Weather Ground Water Infiltration

Res = Residential ICI = Institutional Commercial Industrial

Population per single family house 3.4 (Ottawa Sewer Guidelines)

Notes:

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2 . Minimum velocity = 0.6 m/s
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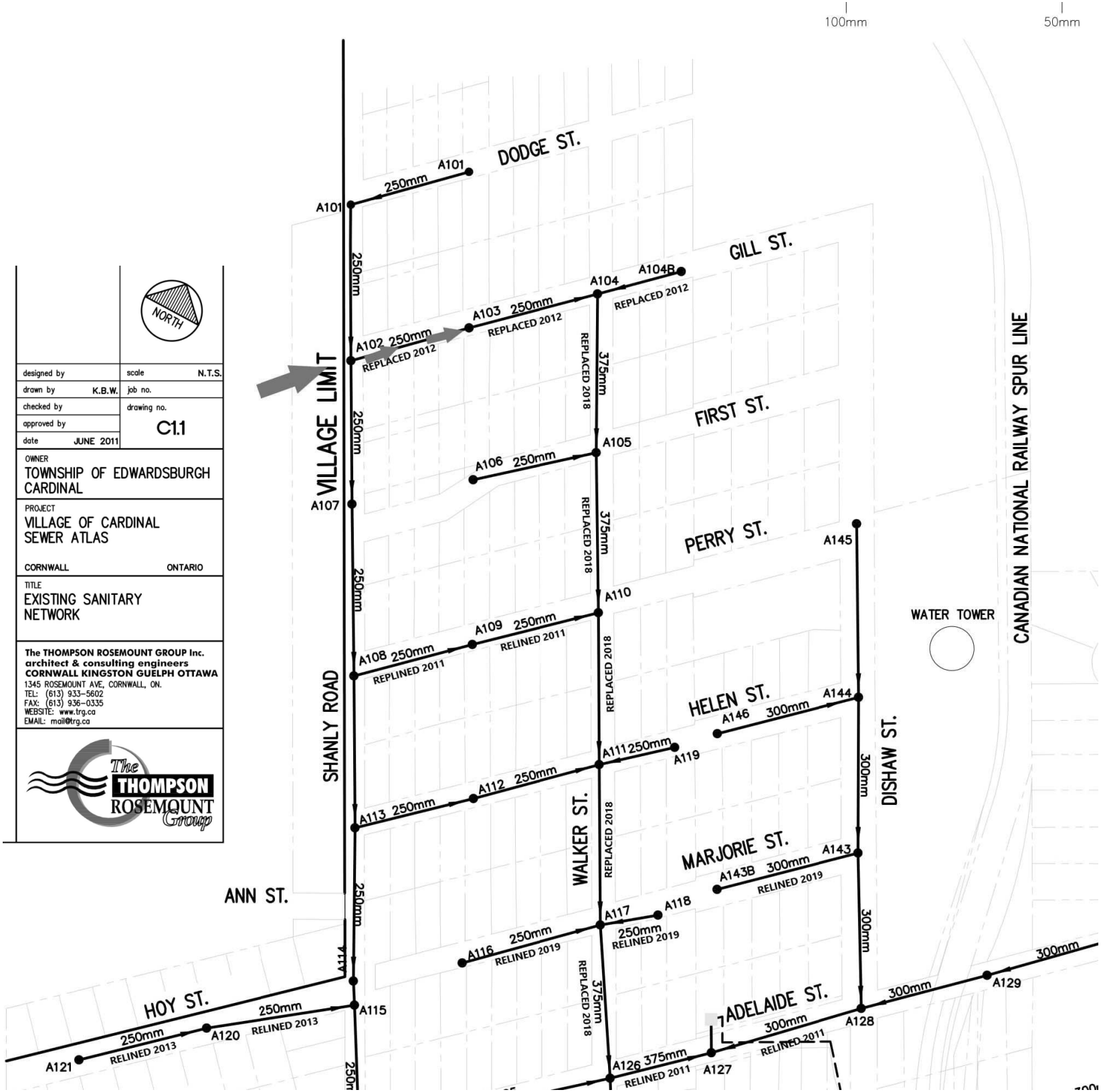
4 . Minimum depth of cover 2.5 m from crown of sewer to finished grade
5 . Minimum vertical clearance between sewer and watermain is 0.15 m and 0.5 m if sewer above
6 . Minimum horizontal clearance between sewer and watermain is 2.5 m
7 . Pipe material: PVC DR 35 320 KPa or equivalent
8 . Sewer bedding: As per OPSD standard 802.010 or as specified by the geotechnical engineer
9 . Special treatment of manholes and pipe if high groundwater level
10 . Manhole inner diameter: 1200 mm
11 . Maximum spacing between manholes: 120 m
12 . Drops at manholes: 30 mm for straight sewer and 60 mm for sewer at 45 to 90 deg
13 . Manholes: Precast or poured concrete
14 . Minimum diameter for individual service connections (PVC DR 28): 100 mm (4") w/ min grade 1% (preferred 2%)
15 . Use tees or wyes, strap-on-saddles for connections to main sewer


100mm
50mm
NORTH
designed by
drawn by K.B.W.
checked by
approved by
date JUNE 2011
scale N.T.S.
job no.
drawing no.
C1.1
OWNER
TOWNSHIP OF EDWARDSBURGH CARDINAL
PROJECT
VILLAGE OF CARDINAL SEWER ATLAS
CORNWALL ONTARIO
TITLE
EXISTING SANITARY NETWORK
The THOMPSON ROSEMOUNT GROUP Inc.
architect & consulting engineers
CORNWALL KINGSTON GUELPH OTTAWA
1345 ROSEMOUNT AVE, CORNWALL, ON.
TEL: (613) 933-5602
FAX: (613) 936-0335
WEBSITE: www.trg.ca
EMAIL: mail@trg.ca
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SHANLY ROAD
WALKER ST.
DISHAW ST.
CANADIAN NATIONAL RAILWAY SPUR LINE
WATER TOWER
A101
A102
A103
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A104B
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250mm
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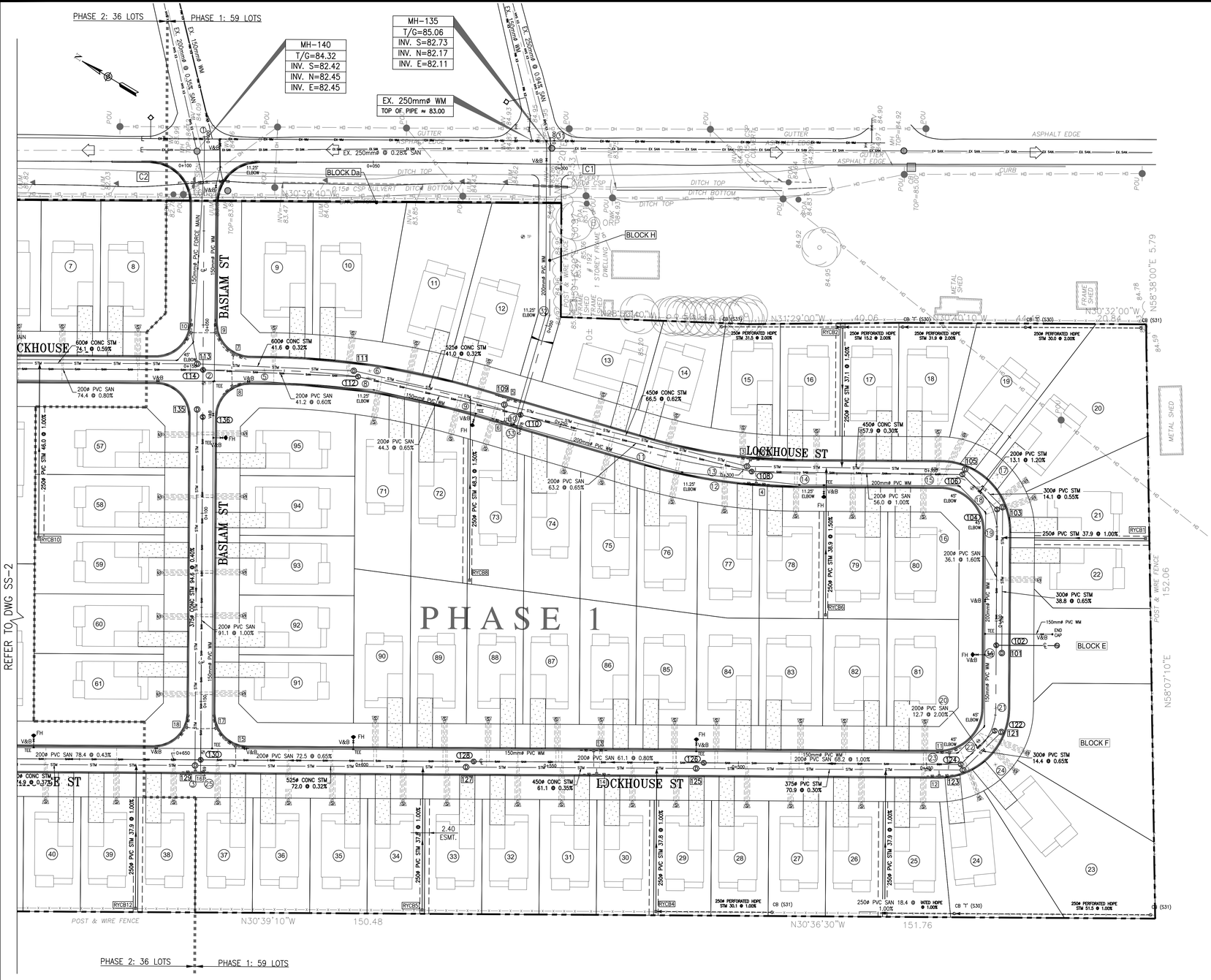
REPLACED 2012
REPLACED 2018
RELINED 2011
RELINED 2013
RELINED 2019



PHASE 2: 36 LOTS PHASE 1: 59 LOTS

SANITARY MANHOLE TABLE - INNER DIAMETER = 1200mm

MANHOLE	DETAILS	HEIGHT (m)
102	RIM = 84.44 SUMP = 82.00 INV IN = 82.00 INV OUT = 82.94	RIM TO SUMP = 2.44
104	RIM = 84.57 SUMP = 82.34 INV IN = 82.36 INV OUT = 82.34	RIM TO SUMP = 2.23
106	RIM = 84.56 SUMP = 82.15 INV IN = 82.18 INV OUT = 82.15	RIM TO SUMP = 2.41
108	RIM = 84.32 SUMP = 81.57 INV IN = 81.59 INV OUT = 81.57	RIM TO SUMP = 2.75
110	RIM = 84.01 SUMP = 81.14 INV IN = 81.16 INV OUT = 81.14	RIM TO SUMP = 2.88
112	RIM = 83.79 SUMP = 80.83 INV IN = 80.85 INV OUT = 80.83	RIM TO SUMP = 2.97
114	RIM = 83.53 SUMP = 80.56 INV IN = 80.58 INV OUT = 80.56	RIM TO SUMP = 2.97
116	RIM = 82.70 SUMP = 79.95 INV IN = 79.97 INV OUT = 79.95	RIM TO SUMP = 2.75
118	RIM = 81.95 SUMP = 78.95 INV IN = 79.00 INV IN = 79.00 INV OUT = 78.95	RIM TO SUMP = 3.00
122	RIM = 84.28 SUMP = 82.14 INV OUT = 82.14	RIM TO SUMP = 2.14
124	RIM = 84.20 SUMP = 81.87 INV IN = 81.89 INV OUT = 81.87	RIM TO SUMP = 2.33
126	RIM = 83.83 SUMP = 81.17 INV IN = 81.19 INV OUT = 81.17	RIM TO SUMP = 2.66
128	RIM = 83.46 SUMP = 80.65 INV IN = 80.68 INV OUT = 80.65	RIM TO SUMP = 2.81
130	RIM = 83.05 SUMP = 80.11 INV IN = 80.18 INV IN = 80.18 INV OUT = 80.11	RIM TO SUMP = 2.94
132	RIM = 82.66 SUMP = 79.75 INV IN = 79.77 INV OUT = 79.75	RIM TO SUMP = 2.91
134	RIM = 82.42 SUMP = 79.41 INV IN = 79.46 INV IN = 79.43 INV OUT = 79.41	RIM TO SUMP = 3.01
136	RIM = 83.38 SUMP = 81.09 INV OUT = 81.09	RIM TO SUMP = 2.29

STORM MANHOLE TABLE

MANHOLE	ELEVATIONS	HEIGHT (m)	INNER DIA. (mm)	TYPE	DETAILS	MAX. HGL (m)
101	RIM = 84.38 ; SUMP = 82.43 INV OUT (NE)= 82.73	RIM TO SUMP = 1.95	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.87
103	RIM = 84.52 ; SUMP = 82.15 INV IN (SW)= 82.48 INV OUT (N)= 82.45	RIM TO SUMP = 2.37	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.60
105	RIM = 84.51 ; SUMP = 81.90 INV IN (S)= 82.37 INV OUT (NW)= 82.20	RIM TO SUMP = 2.61	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.43
107	RIM = 84.29 ; SUMP = 81.70 INV IN (SE)= 82.03 INV IN (E)= 82.89 INV OUT (N)= 82.00	RIM TO SUMP = 2.59	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.23
109	RIM = 83.95 ; SUMP = 81.19 INV IN (S)= 81.58 INV IN (E)= 82.56 INV IN (SW)= 82.51 INV OUT (N)= 81.49	RIM TO SUMP = 2.76	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.87
111	RIM = 83.74 ; SUMP = 80.96 INV IN (S)= 81.36 INV OUT (NW)= 81.26	RIM TO SUMP = 2.78	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.71
113	RIM = 83.47 ; SUMP = 80.80 INV IN (SE)= 81.13 INV IN (NE)= 81.58 INV OUT (NW)= 81.10	RIM TO SUMP = 2.67	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.65
115	RIM = 82.77 ; SUMP = 80.26 INV IN (SE)= 80.66 INV IN (E)= 81.27 INV IN (W)= 81.21 INV IN (NE)= 81.05 INV OUT (NW)= 80.56	RIM TO SUMP = 2.51	1350	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.54
117	RIM = 81.90 ; SUMP = 79.48 INV IN (SE)= 80.03 INV IN (SW)= 80.06 INV IN (E)= 80.38 INV IN (NE)= 80.50 INV OUT (NW)= 79.78	RIM TO SUMP = 2.42	1800	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.41
119 STC	RIM = 81.30 ; SUMP = 79.40 INV IN (SE)= 79.70 INV OUT (NW)= 79.70	RIM TO SUMP = 1.90	2550	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.35
121	RIM = 84.23 ; SUMP = 82.05 INV OUT (W)= 82.35	RIM TO SUMP = 2.17	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.35
123	RIM = 84.15 ; SUMP = 81.86 INV IN (E)= 82.26 INV OUT (NW)= 82.16	RIM TO SUMP = 2.29	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.38
125	RIM = 83.77 ; SUMP = 81.55 INV IN (SE)= 81.95 INV OUT (NW)= 81.85	RIM TO SUMP = 2.22	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.13
127	RIM = 83.41 ; SUMP = 81.20 INV IN (SE)= 81.64 INV OUT (NW)= 81.50	RIM TO SUMP = 2.21	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.78
129	RIM = 83.00 ; SUMP = 80.87 INV IN (SE)= 81.27 INV IN (NE)= 81.23 INV IN (SW)= 81.61 INV OUT (NW)= 81.17	RIM TO SUMP = 2.13	1500	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.63
131	RIM = 82.62 ; SUMP = 80.52 INV IN (SE)= 80.89 INV IN (E)= 81.18 INV IN (S)= 81.24 INV OUT (NW)= 80.82	RIM TO SUMP = 2.10	1500	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.56
133	RIM = 82.38 ; SUMP = 80.25 INV IN (SE)= 80.61 INV IN (W)= 81.51 INV OUT (NE)= 80.55	RIM TO SUMP = 2.13	1800	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.51
135	RIM = 83.35 ; SUMP = 81.31 INV OUT (SW)= 81.61	RIM TO SUMP = 2.04	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.45

CULVERT SCHEDULE

ID	DIA (mm)	LENGTH (m)	SLOPE	MATERIAL	INV. IN	INV. OUT	COVER (m)
C1	450	9.1	-0.50%	REINFORCED CONCRETE	83.87	83.92	0.50 m
C2	450	13.5	2.06%	REINFORCED CONCRETE	83.32	83.04	0.40 m
C3	600	14.5	5.00%	REINFORCED CONCRETE	80.11	79.39	0.95 m

UNITED COUNTIES OF LEEDS AND GRENVILLE
PART OF LOT 7, CONCESSION 1
GEOGRAPHIC TOWN OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL
COUNTY OF GRENVILLE

TOPOGRAPHIC INFORMATION

ELEVATIONS:
ELEVATION SHOWN ON THIS PLAN ARE GEODETIC AND REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD28) BY DIRECT MEASUREMENT TO REAL TIME NETWORK.

GEOTECHNICAL REPORT

REFER TO GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT No. 216350, DATED MAY 31, 2021, PREPARED BY ST. LAWRENCE TESTING & INSPECTION CO. LTD., INFORMATION PRESENTED IN THESE DRAWINGS HAS BEEN INTERPOLATED FROM THE GEOTECHNICAL REPORT AND ACCURACY IS NOT GUARANTEED. CONTRACTORS ARE ADVISED TO READ THE GEOTECHNICAL REPORT AND ASSUME THEIR OWN CONCLUSIONS.

USE AND INTERPRETATION OF DRAWINGS

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THIS DRAWING SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

0 5.0 10 20
1:500 Metres

STREET NAMES:
- STREET A: BALSAM ST
- STREET B: LOCKHOUSE ST
- STREET C: CONIFER LN

No.	REVISION / ISSUE	DATE MM/DD/YY
8	PLANS UPDATE- ELEVATIONS CHANGE	02/06/24
6	TOWNSHIP COMMENTS - 06-30-23	07/25/23
5	TOWNSHIP COMMENTS	05/16/23
4	TOWNSHIP COMMENTS	02/28/23
3	PEER REVIEW COMMENTS - ADD STM SEWER	01/09/23
1	OWNER / APPROVAL	03/10/22

PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
02/06/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

GENERAL SERVICES PLAN PHASE 1

SCALE: 1:500
DRAFTED BY:
PROJECT No.: 0114
DATE: 02-06-2024
DRAWING No.: GSP1

LEGEND:

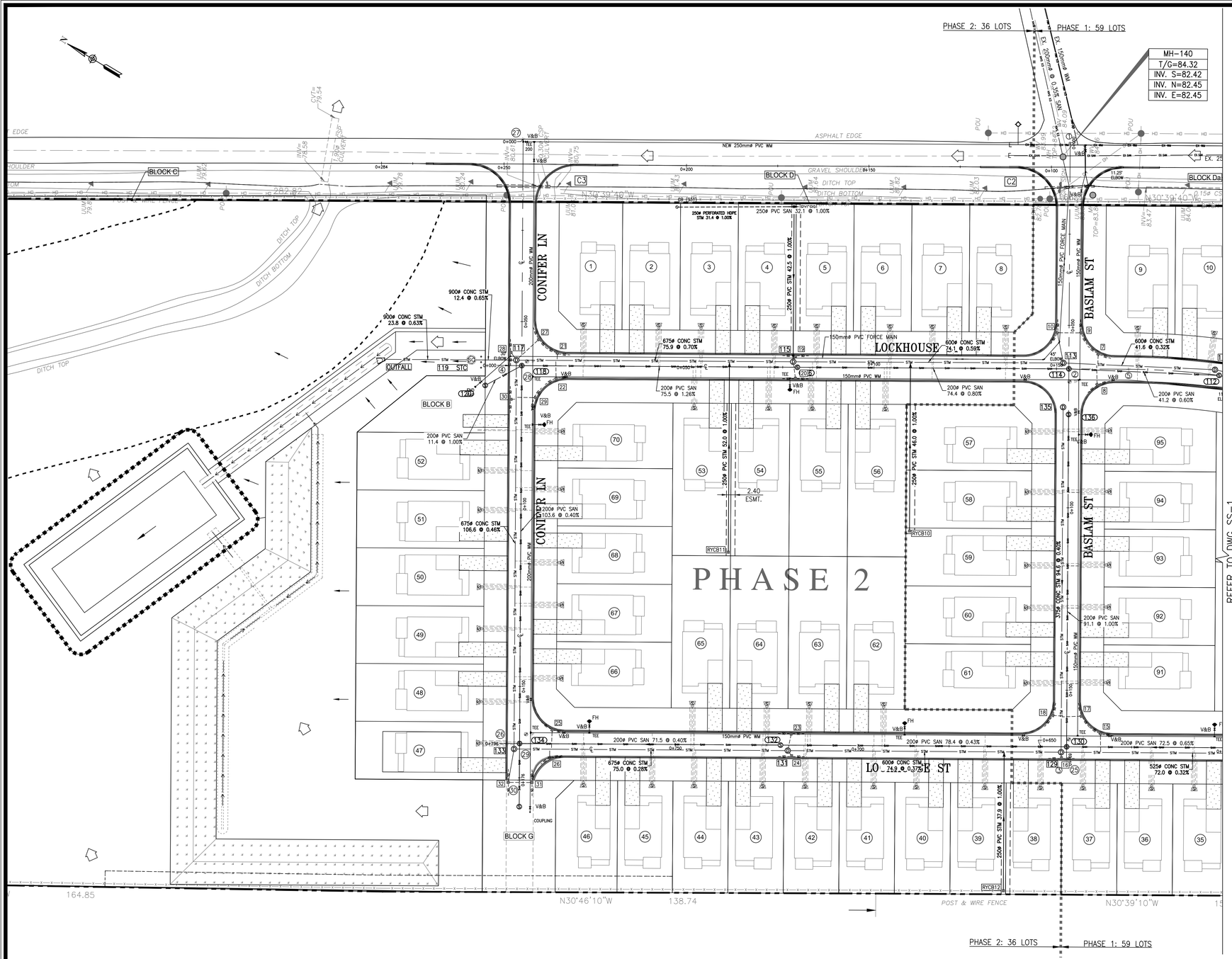
- PROPERTY BOUNDARY
- PHASING LIMITS
- STORMWATER FACILITY
- LOT LINE
- SETBACK LINE
- EASEMENT
- EXISTING WATERMAIN
- EXISTING STORM SEWER
- EXISTING SANITARY SEWER
- EXISTING HYDRO LINE
- EXISTING GAS MAIN
- EXISTING BELL LINE
- PROPOSED WATERMAIN
- PROPOSED FORCEMAIN
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- EXIST. MANHOLE (AS-BUILT DWGS) MHSA-1
  TOP GRATE ELEVATION 84.00
  INVERT ELEVATION 82.00
- PROPOSED SANITARY MANHOLE 1200mm
- EXISTING SANITARY MANHOLE
- PROPOSED STORM (DRAINAGE) MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED CATCH BASIN 600 x 600 CB
- EXISTING CATCH BASIN CB
- PROPOSED REAR YARD CATCH BASIN RC
- EXISTING CULVERT
- DRIVEWAY
- SIDEWALK
- TEST PIT (TP) AS PER GEOTECHNICAL REPORT
- PROPOSED HYDRO LINE
- PROPOSED GAS MAIN
- PROPOSED BELL LINE
- EXISTING 150mmø PERFORATED SUBDRAIN
- EXISTING ROAD DITCH LINE
- EXISTING WATER/SANITARY SERVICE CONNECTION
- PROPOSED CATCHBASIN
- PROPOSED CATCHBASIN-MANHOLE OPSD 701.010
- TEE CATCHBASIN STD S30
- PERFORATED PIPE
- ELBOW CATCHBASIN STD S31
- PROPOSED FIRE HYDRANT
- EXISTING FIRE HYDRANT
- FIRE HYDRANT FLANGE ELEVATION FL. 84.00
- PROPOSED WATER VALVE & BOX V&B
- EXISTING WATER VALVE WV
- PROPOSED PIPE STUB
- EXISTING PIPE STUB W/ CAP

WATERMAIN:
- CROSS
- 45° BEND
- LATERAL
- HYDRANT, VALVE & VB
- TEE
- VALVE & VC V&C
- VALVE & VB V&B
- 22.5° BEND
- 11.25° BEND
- REDUCER
- CAP

SANITARY:
- MAINTENANCE HOLE 200mmø SAN S 101
- CAP
- SINGLE SERVICE LOCATION SAN, STM & WM

HYDRO/UTILITY POLE HP
FINISHED FLOOR ELEVATION FFE
UNDERSIDE FOOTING ELEVATION USF
ROOF DRAINAGE DIRECTION
SIDEWALK S/W
INVERT, OBVERT, SOUTH, NORTH, WEST, EAST I,O,S,N,W,E

ISO full bleed B1 (1000.00 x 707.00 MM)
114-2-gps-prof.dwg
5.3.2024



CATCHBASIN / CATCHBASIN-MANHOLE TABLE

ID	ELEVATIONS	HEIGHT (m)	TYPE	DETAILS	ICD DIA. (mm)
3	T/G = 84.24 ; SUMP = 82.33 INV OUT (W)= 82.93	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
4	T/G = 84.24 ; SUMP = 82.33 INV OUT (NE)= 82.93	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
5	T/G = 83.90 ; SUMP = 82.00 INV OUT (W)= 82.60	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
6	T/G = 83.91 ; SUMP = 82.00 INV OUT (NE)= 82.60	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
7	T/G = 83.50 ; SUMP = 81.59 INV OUT (SW)= 82.19	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
8	T/G = 83.46 ; SUMP = 81.55 INV OUT (NE)= 82.15	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
9	T/G = 83.49 ; SUMP = 81.58 INV OUT (NW)= 82.18	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	55
10	T/G = 83.46 ; SUMP = 81.20 INV IN (SE)= 82.05 INV OUT (SW)= 81.80	RIM TO SUMP = 2.26	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	55
11	T/G = 84.14 ; SUMP = 82.23 INV OUT (SW)= 82.83	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
12	T/G = 84.11 ; SUMP = 82.20 INV OUT (NE)= 82.80	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
13	T/G = 83.56 ; SUMP = 81.65 INV OUT (SW)= 82.25	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
14	T/G = 83.57 ; SUMP = 81.66 INV OUT (NE)= 82.26	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
15	T/G = 82.98 ; SUMP = 81.07 INV OUT (SW)= 81.67	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
16	T/G = 82.95 ; SUMP = 81.04 INV OUT (NE)= 81.64	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
17	T/G = 82.93 ; SUMP = 81.02 INV OUT (NW)= 81.62	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
18	T/G = 82.89 ; SUMP = 80.99 INV OUT (SE)= 81.59	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83

CATCHBASIN / CATCHBASIN-MANHOLE TABLE

ID	ELEVATIONS	HEIGHT (m)	TYPE	DETAILS	ICD DIA. (mm)
19	T/G = 82.61 ; SUMP = 80.70 INV OUT (W)= 81.30	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
20	T/G = 82.61 ; SUMP = 80.70 INV OUT (NE)= 81.30	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
21	T/G = 81.86 ; SUMP = 79.95 INV OUT (SW)= 80.55	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
22	T/G = 81.86 ; SUMP = 79.95 INV OUT (NE)= 80.55	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
23	T/G = 82.58 ; SUMP = 80.67 INV OUT (W)= 81.27	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
24	T/G = 82.58 ; SUMP = 80.68 INV OUT (N)= 81.28	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
25	T/G = 82.26 ; SUMP = 80.68 INV OUT (SW)= 81.28	RIM TO SUMP = 1.59	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
26	T/G = 82.26 ; SUMP = 80.66 INV OUT (NE)= 81.24	RIM TO SUMP = 1.60	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
27	T/G = 81.85 ; SUMP = 79.95 INV OUT (W)= 80.55	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	83
28	T/G = 81.86 ; SUMP = 79.96 INV OUT (SW)= 80.56	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	55
29	T/G = 81.86 ; SUMP = 79.95 INV OUT (NW)= 80.55	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	102
30	T/G = 81.88 ; SUMP = 79.97 INV OUT (SE)= 80.57	RIM TO SUMP = 1.91	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	102
31	T/G = 82.77 ; SUMP = 81.27 INV OUT (NW)= 81.87	RIM TO SUMP = 1.50	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	55
32	T/G = 82.79 ; SUMP = 81.10 INV IN (SE)= 81.74 INV OUT (E)= 81.70	RIM TO SUMP = 1.69	OPSD 705.010	GRATE: 400.010 SUMP: 0.600 m	55

CATCHBASIN / CATCHBASIN-MANHOLE TABLE

ID	ELEVATIONS	HEIGHT (m)	TYPE	DETAILS	ICD DIA. (mm)
RYCB1	T/G = 83.47 ; SUMP = 82.76 INV OUT (NW)= 83.06	RIM TO SUMP = 0.71	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	152
RYCB2	T/G = 84.62 ; SUMP = 82.64 INV IN (SE)= 83.00 INV IN (NW)= 83.10 INV OUT (SW)= 82.94	RIM TO SUMP = 1.98	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	83
RYCB3	T/G = 84.02 ; SUMP = 82.56 INV IN (SE)= 82.86 INV OUT (NE)= 82.86	RIM TO SUMP = 1.46	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	83
RYCB4	T/G = 83.95 ; SUMP = 82.34 INV IN (SE)= 82.64 INV OUT (NE)= 82.64	RIM TO SUMP = 1.61	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	83
RYCB5	T/G = 83.27 ; SUMP = 82.08 INV OUT (NE)= 82.38	RIM TO SUMP = 1.19	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	83
RYCB6	T/G = 84.50 ; SUMP = 82.82 INV OUT (NE)= 83.12	RIM TO SUMP = 1.68	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	83
RYCB8	T/G = 83.97 ; SUMP = 82.43 INV OUT (NE)= 82.73	RIM TO SUMP = 1.54	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	55
RYCB9	T/G = 82.57 ; SUMP = 81.17 INV IN (NW)= 81.47 INV OUT (SW)= 81.47	RIM TO SUMP = 1.40	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	83
RYCB10	T/G = 82.70 ; SUMP = 81.41 INV OUT (NE)= 81.71	RIM TO SUMP = 1.29	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	83
RYCB11	T/G = 82.38 ; SUMP = 81.37 INV OUT (NE)= 81.67	RIM TO SUMP = 1.01	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	127
RYCB12	T/G = 82.50 ; SUMP = 81.59 INV OUT (NE)= 81.89	RIM TO SUMP = 0.91	OPSD 705.010	GRATE: 400.020 SUMP: 0.300 m	83

UNITED COUNTIES OF LEEDS AND GRENVILLE
PART OF LOT 7, CONCESSION 1
GEOGRAPHIC TOWN OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL
COUNTY OF GRENVILLE

TOPOGRAPHIC INFORMATION

ELEVATIONS:
ELEVATION SHOWN ON THIS PLAN ARE GEODETIC AND REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD28) BY DIRECT MEASUREMENT TO REAL TIME NETWORK.

GEOTECHNICAL REPORT

REFER TO GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT No. 21C350, DATED MAY 31, 2021, PREPARED BY ST. LAWRENCE TESTING & INSPECTION CO. LTD.. INFORMATION PRESENTED IN THESE DRAWINGS HAS BEEN INTERPOLATED FROM THE GEOTECHNICAL REPORT AND ACCURACY IS NOT GUARANTEED. CONTRACTORS ARE ADVISED TO READ THE GEOTECHNICAL REPORT AND ASSUME THEIR OWN CONCLUSIONS.

USE AND INTERPRETATION OF DRAWINGS

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THIS DRAWING SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

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1:500 Metres

STREET NAMES:
- STREET A: BALSAM ST
- STREET B: LOCKHOUSE ST
- STREET C: CONIFER LN

No.	REVISION / ISSUE	DATE MM/DD/YY
8	PLANS UPDATE- ELEVATIONS CHANGE	02/06/24
6	TOWNSHIP COMMENTS - 06-30-23	07/25/23
5	TOWNSHIP COMMENTS	05/16/23
4	TOWNSHIP COMMENTS	02/28/23
3	PEER REVIEW COMMENTS - ADD STM SEWER	01/09/23
1	OWNER / APPROVAL	03/10/22

PREPARED BY:
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ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
02/06/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

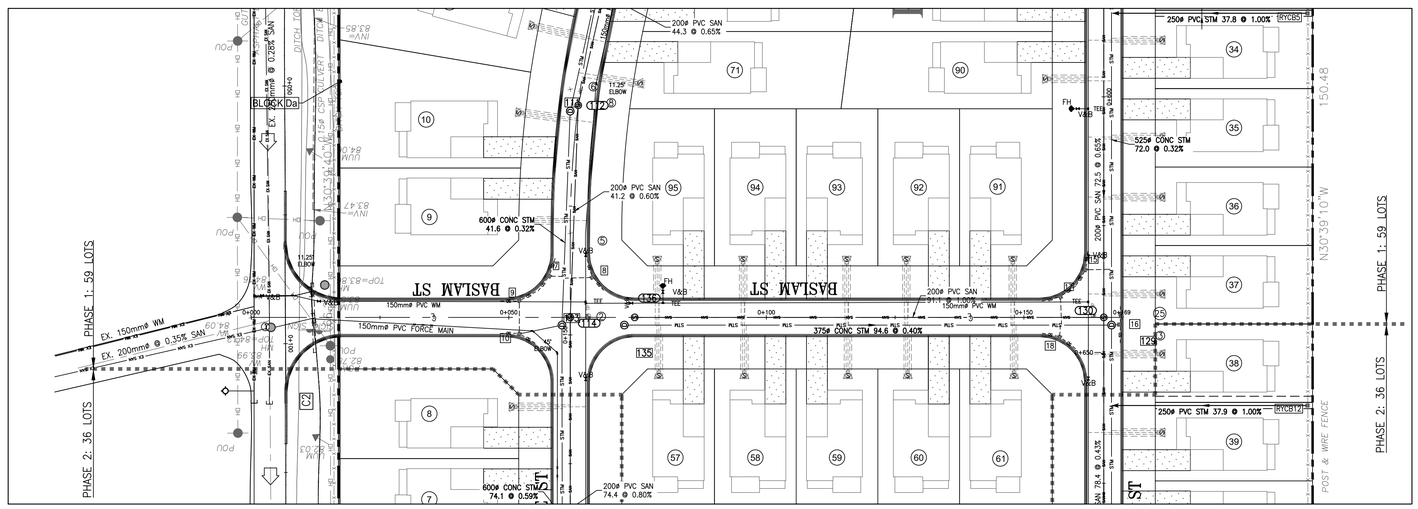
Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

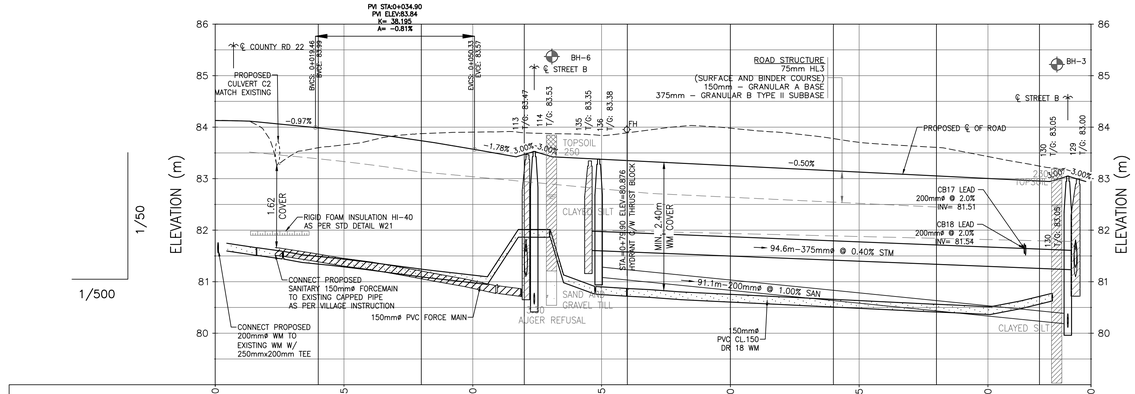
TITLE:

GENERAL SERVICES PLAN PHASE 2

SCALE: 1:500
DRAFTED BY:
PROJECT No.: 0114
DATE: 02-06-2024
DRAWING No.: GSP2

ISO full bleed B1 (1000.00 x 707.00 MM)
114-2-gps-prof.dwg
5.3.2024





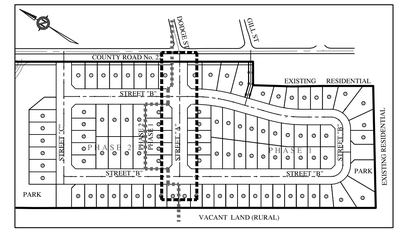
STREET A PROFILE STA. 0+000 TO STA. 0+170
SCALE: H = 1:500 / V = 1:50

SANITARY MANHOLE TABLE - INNER DIAMETER = 1200mm

MANHOLE	DETAILS	HEIGHT (m)
102	RIM = 84.44 SUMP = 82.00 INV IN = 82.00 INV OUT = 82.94	RIM TO SUMP = 2.44
104	RIM = 84.57 SUMP = 82.34 INV IN = 82.36 INV OUT = 82.34	RIM TO SUMP = 2.23
106	RIM = 84.56 SUMP = 82.15 INV IN = 82.18 INV OUT = 82.15	RIM TO SUMP = 2.41
108	RIM = 84.32 SUMP = 81.57 INV IN = 81.59 INV OUT = 81.57	RIM TO SUMP = 2.75
110	RIM = 84.01 SUMP = 81.14 INV IN = 81.16 INV OUT = 81.14	RIM TO SUMP = 2.88
112	RIM = 83.79 SUMP = 80.83 INV IN = 80.85 INV OUT = 80.83	RIM TO SUMP = 2.97
114	RIM = 83.53 SUMP = 80.56 INV IN = 80.58 INV OUT = 80.56	RIM TO SUMP = 2.97
116	RIM = 82.70 SUMP = 79.95 INV IN = 79.97 INV OUT = 79.95	RIM TO SUMP = 2.75
118	RIM = 81.95 SUMP = 78.95 INV IN = 79.00 INV IN = 79.00 INV OUT = 78.95	RIM TO SUMP = 3.00
122	RIM = 84.28 SUMP = 82.14 INV OUT = 82.14	RIM TO SUMP = 2.14
124	RIM = 84.20 SUMP = 81.87 INV IN = 81.89 INV OUT = 81.87	RIM TO SUMP = 2.33
126	RIM = 83.83 SUMP = 81.17 INV IN = 81.19 INV OUT = 81.17	RIM TO SUMP = 2.66
128	RIM = 83.46 SUMP = 80.65 INV IN = 80.68 INV OUT = 80.65	RIM TO SUMP = 2.81
130	RIM = 83.05 SUMP = 80.11 INV IN = 80.18 INV IN = 80.18 INV OUT = 80.11	RIM TO SUMP = 2.94
132	RIM = 82.66 SUMP = 79.75 INV IN = 79.77 INV OUT = 79.75	RIM TO SUMP = 2.91
134	RIM = 82.42 SUMP = 79.41 INV IN = 79.46 INV IN = 79.43 INV OUT = 79.41	RIM TO SUMP = 3.01
136	RIM = 83.38 SUMP = 81.09 INV OUT = 81.09	RIM TO SUMP = 2.29

STORM MANHOLE TABLE

MANHOLE	ELEVATIONS	HEIGHT (m)	INNER DIA. (mm)	TYPE	DETAILS	MAX. HGL (m)
101	RIM = 84.38 ; SUMP = 82.43 INV OUT (NE)= 82.73	RIM TO SUMP = 1.95	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.87
103	RIM = 84.52 ; SUMP = 82.15 INV IN (SW)= 82.48 INV OUT (N)= 82.45	RIM TO SUMP = 2.37	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.60
105	RIM = 84.51 ; SUMP = 81.90 INV IN (S)= 82.37 INV OUT (NW)= 82.20	RIM TO SUMP = 2.61	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.43
107	RIM = 84.29 ; SUMP = 81.70 INV IN (SE)= 82.03 INV IN (E)= 82.89 INV OUT (N)= 82.00	RIM TO SUMP = 2.59	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.23
109	RIM = 83.95 ; SUMP = 81.19 INV IN (S)= 81.58 INV IN (E)= 82.56 INV IN (SW)= 82.51 INV OUT (N)= 81.49	RIM TO SUMP = 2.76	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.87
111	RIM = 83.74 ; SUMP = 80.96 INV IN (S)= 81.36 INV OUT (NW)= 81.26	RIM TO SUMP = 2.78	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.71
113	RIM = 83.47 ; SUMP = 80.80 INV IN (SE)= 81.13 INV IN (NE)= 81.58 INV OUT (NW)= 81.10	RIM TO SUMP = 2.67	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.65
115	RIM = 82.77 ; SUMP = 80.26 INV IN (SE)= 80.66 INV IN (E)= 81.27 INV IN (SW)= 81.21 INV IN (NE)= 81.05 INV OUT (NW)= 80.56	RIM TO SUMP = 2.51	1350	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.54
117	RIM = 81.90 ; SUMP = 79.48 INV IN (SE)= 80.03 INV IN (SW)= 80.06 INV IN (E)= 80.38 INV IN (NE)= 80.50 INV OUT (NW)= 79.78	RIM TO SUMP = 2.42	1800	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.41
119 STC	RIM = 81.30 ; SUMP = 79.40 INV IN (SE)= 79.70 INV OUT (NW)= 79.70	RIM TO SUMP = 1.90	2550	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.35
121	RIM = 84.23 ; SUMP = 82.05 INV OUT (W)= 82.35	RIM TO SUMP = 2.17	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.35
123	RIM = 84.15 ; SUMP = 81.86 INV IN (E)= 82.26 INV OUT (NW)= 82.16	RIM TO SUMP = 2.29	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.38
125	RIM = 83.77 ; SUMP = 81.55 INV IN (SE)= 81.95 INV OUT (NW)= 81.85	RIM TO SUMP = 2.22	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	82.13
127	RIM = 83.41 ; SUMP = 81.20 INV IN (SE)= 81.64 INV OUT (NW)= 81.50	RIM TO SUMP = 2.21	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.78
129	RIM = 83.00 ; SUMP = 80.87 INV IN (SE)= 81.27 INV IN (NE)= 81.23 INV IN (SW)= 81.61 INV OUT (NW)= 81.17	RIM TO SUMP = 2.13	1500	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.63
131	RIM = 82.62 ; SUMP = 80.52 INV IN (SE)= 80.89 INV IN (E)= 81.18 INV IN (S)= 81.24 INV OUT (NW)= 80.82	RIM TO SUMP = 2.10	1500	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.56
133	RIM = 82.38 ; SUMP = 80.25 INV IN (SE)= 80.61 INV IN (W)= 81.51 INV OUT (NE)= 80.55	RIM TO SUMP = 2.13	1800	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.51
135	RIM = 83.35 ; SUMP = 81.31 INV OUT (SW)= 81.61	RIM TO SUMP = 2.04	1200	OPSD 701.010	COVER: 401.010 SUMP: 0.300 m	81.45



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STREET NAMES:
- STREET A: BALSAM ST
- STREET B: LOCKHOUSE ST
- STREET C: CONIFER LN

No.	REVISION / ISSUE	DATE MM/DD/YY
8	PLANS UPDATE- ELEVATIONS CHANGE	02/06/24
6	TOWNSHIP COMMENTS - 06-30-23	07/25/23
5	TOWNSHIP COMMENTS	05/16/23
4	TOWNSHIP COMMENTS	02/28/23
3	PEER REVIEW COMMENTS - ADD STM SEWER	01/09/23
1	OWNER / APPROVAL	03/10/22

PREPARED BY:
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Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 02/06/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

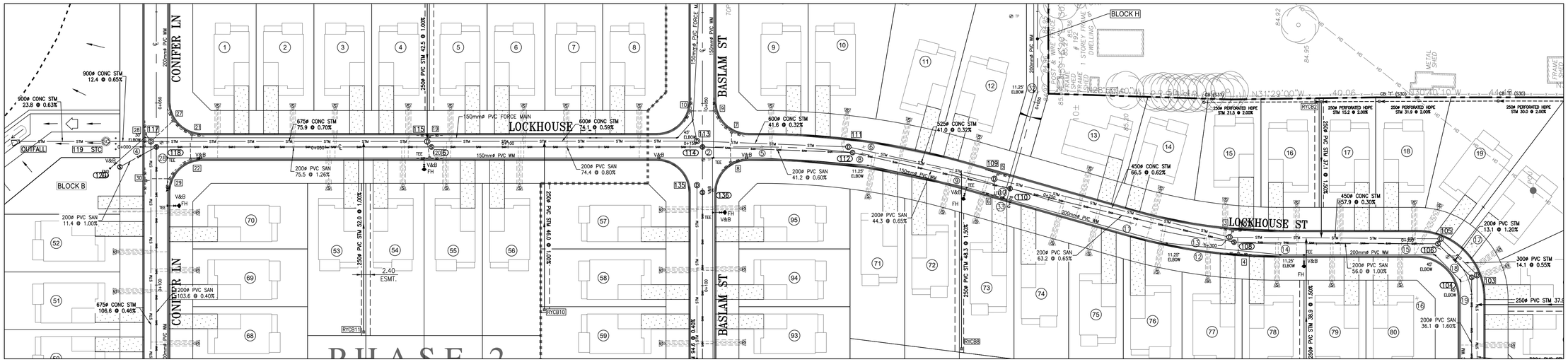
Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

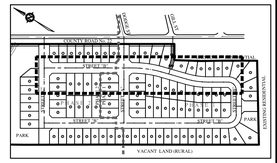
TITLE:

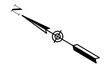
PLAN & PROFILE STREET A

STA. 0+000 TO STA. 0+169

SCALE: 1:500-1:50
DRAWING No.: PP-1
DRAFTED BY:
PROJECT No.: 0114
DATE: 02-06-2024







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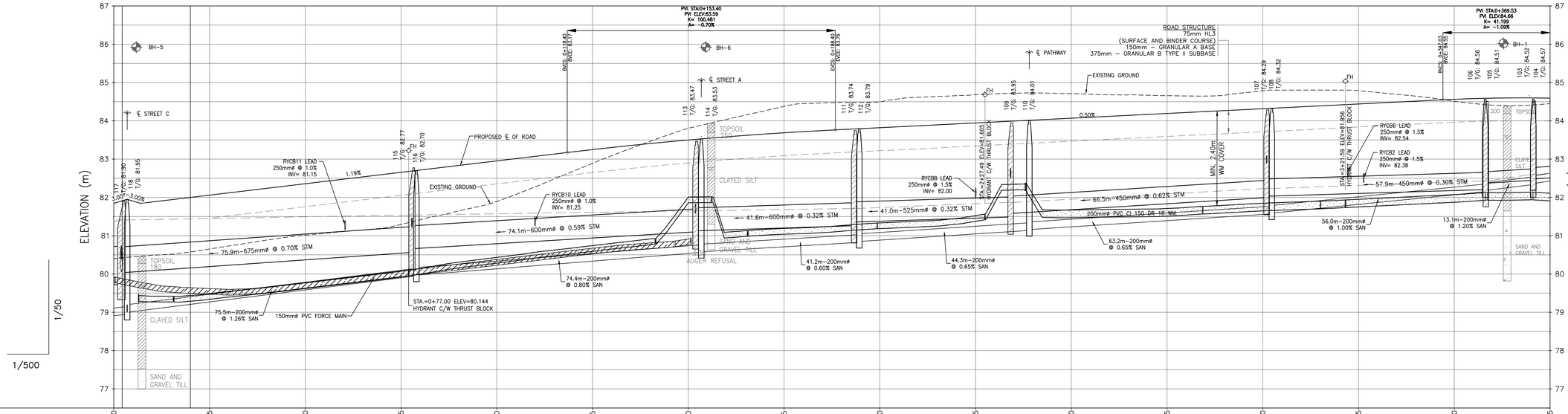
1:50 0 0.5 1 2 Metres



CHAINAGE	0+000	0+025	0+050	0+075	0+100	0+125	0+150	0+175	0+200	0+225	0+250	0+275	0+300	0+325	0+350	0+375
℄ ROAD ELEVATIONS EXISTING	80.40	80.65	81.02	81.30	81.89	82.89	83.81	84.38	84.49	84.68	84.71	84.66	84.78	84.79	84.51	84.45
℄ ROAD ELEVATIONS PROPOSED	81.84	82.06	82.36	82.66	82.95	83.25	83.50	83.69	83.82	83.94	84.07	84.19	84.32	84.44	84.56	84.59
TOP OF WATERMAIN	79.44	79.51	79.81	80.12	80.43	80.73	81.97	81.20	81.37	81.53	81.69	81.78	81.86	81.97	82.09	82.12
TOP OF FORCEMAIN		79.64	79.80	80.09	80.38	80.67	80.92									
SANITARY MH STATION	3.50 (STREET B)			79.00 (STREET B)			153.40 (STREET B)		194.65 (STREET B)		239.05 (STREET B)		302.36 (STREET B)		358.08 (STREET B)	370.64 (STREET B)
SANITARY INVERT ELEVATIONS	79.00 78.84 78.95 1.00%		1.26%	79.95 79.97	0.80%		80.56 80.58	0.60%	80.83 80.85	0.65%	81.14 81.16	0.65%	81.57 81.59	1.00%	82.15 82.18	1.20% 82.34
STORM MH STATION	60.57 (STREET C)		60.40 (STREET B)	77.85 (STREET B)		110.00 (STREET B)	151.90 (STREET B)		193.32 (STREET B)	225.05 (STREET B)	234.17 (STREET B)	271.30 (STREET B)	301.01 (STREET B)	322.20 (STREET B) 326.34 (STREET B)	358.24 (STREET B)	82.36 82.94 1.60% 370.64 (STREET B)
STORM INVERT ELEVATIONS	80.03 79.70 79.78 0.65%	0.70%		80.56 80.66 81.47 81.05 1.00%	0.59%		81.10 81.13	0.32%	81.26 81.36	0.32%	81.49 81.58	0.62%	82.00 82.03	0.30%	82.20 82.37	0.55% 82.45
MAX. HGL (m)	81.41			81.54			81.65		81.71		81.87		82.23		82.43	82.48 82.60 0.65%
VERTICAL GEOMETRY	3.00% -3.00%		1.19%			PVI STA.= 0+153.40 CURVE LENGTH=70.00m K= 100.481 HP STA.= 0+188.4 EL.= 83.76			0.50%					PVI STA.= 0+369.53 CURVE LENGTH=45.00m K= 41.199 HP STA.= 0+367.4 EL.= 84.60			
HORIZONTAL GEOMETRY	L=153.40m			PI EASTING= 469146.6857 PI NORTHING= 4959887.2659	L=16.34m	L=55.48m – R=200.00m DELTA = 15.8950 PI EASTING= 469169.2587 PI NORTHING= 4959849.1881	L=13.82m	PI EASTING= 469179.8960 PI NORTHING= 4959808.8279	L=34.41m	L=41.61m – R=150.00m DELTA = 15.8950 PI EASTING= 469194.0036 PI NORTHING= 4959755.3007		L=37.52m		L=23.56m – R=15.00m DELTA = 90.0000 PI EASTING= 469231.4660 PI NORTHING= 4959692.1064	

STREET B PROFILE STA. 0+000 TO STA. 0+375
SCALE: H = 1:500 / V = 1:50

STREET NAMES:
STREET A: BALSAM ST
STREET B: LOCKHOUSE ST
STREET C: CONIFER LN

No.	REVISION / ISSUE	DATE MM/DD/YY
8	PLANS UPDATE- ELEVATIONS CHANGE	02/06/24
6	TOWNSHIP COMMENTS – 06–30–23	07/25/23
5	TOWNSHIP COMMENTS	05/16/23
4	TOWNSHIP COMMENTS	02/28/23
3	PEER REVIEW COMMENTS – ADD STM SEWER	01/09/23
1	OWNER / APPROVAL	03/10/22

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ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
02/06/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

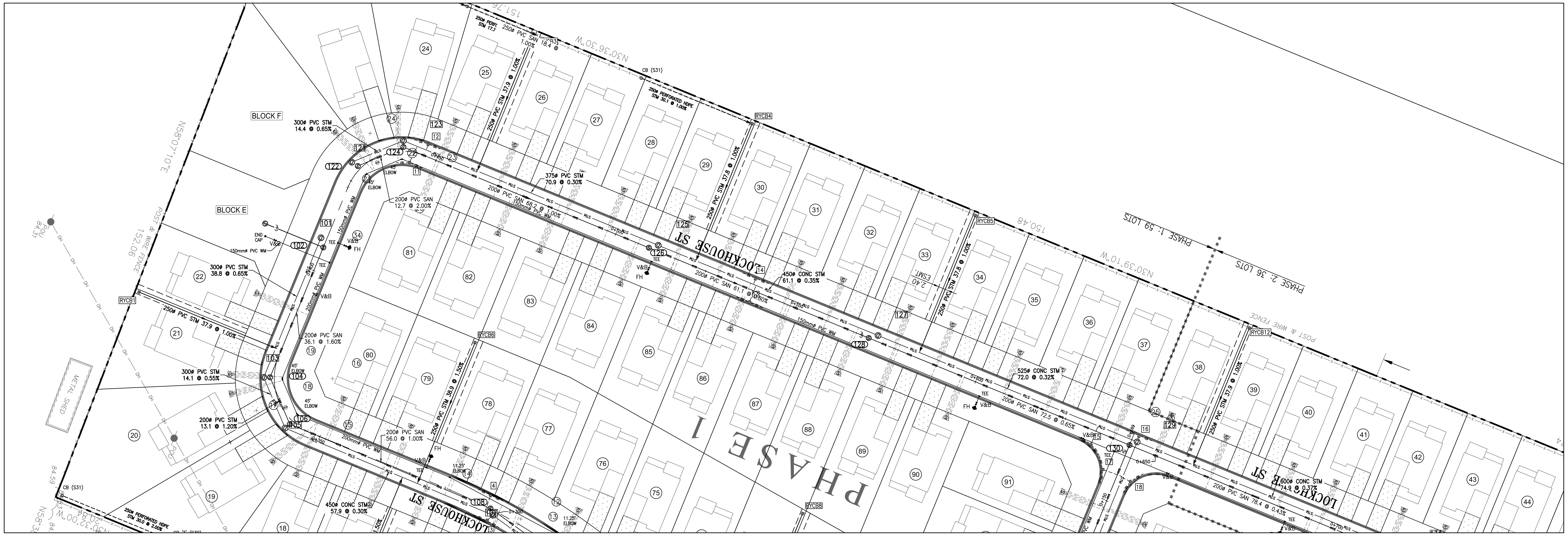
Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

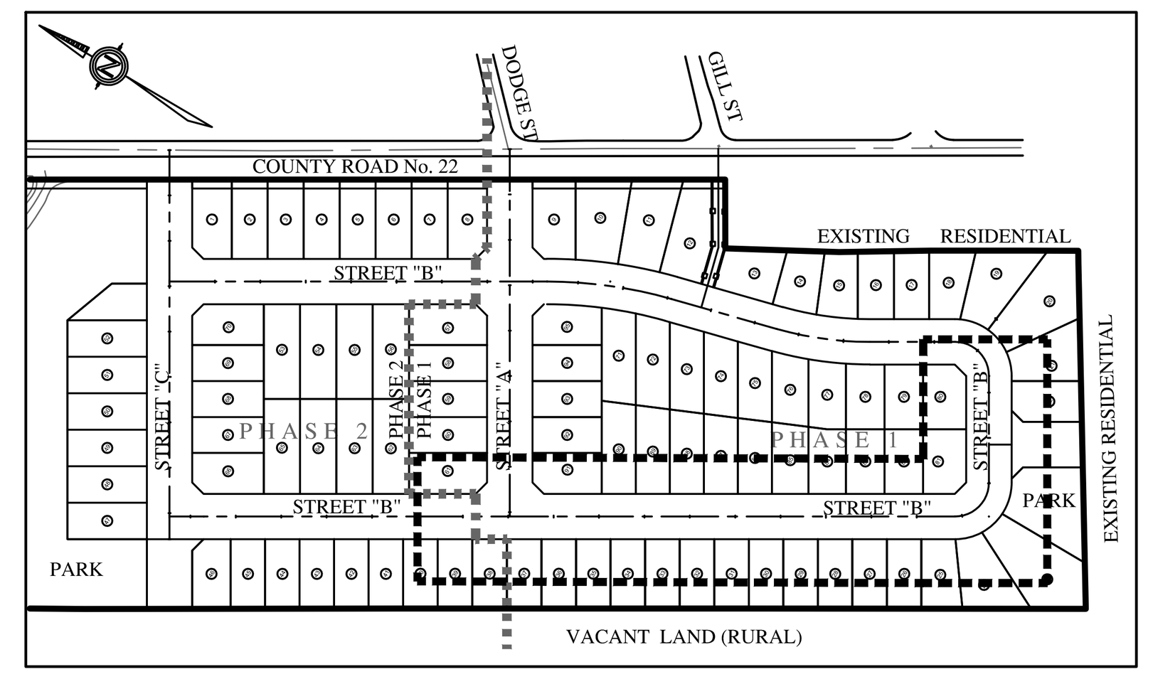
TITLE:

PLAN & PROFILE STREET B

STA. 0+000 TO STA. 0+375

SCALE: 1:500-1:50
DRAWING No.: PP-2
DRAFTED BY:
PROJECT No.: 0114
DATE: 02-06-2024





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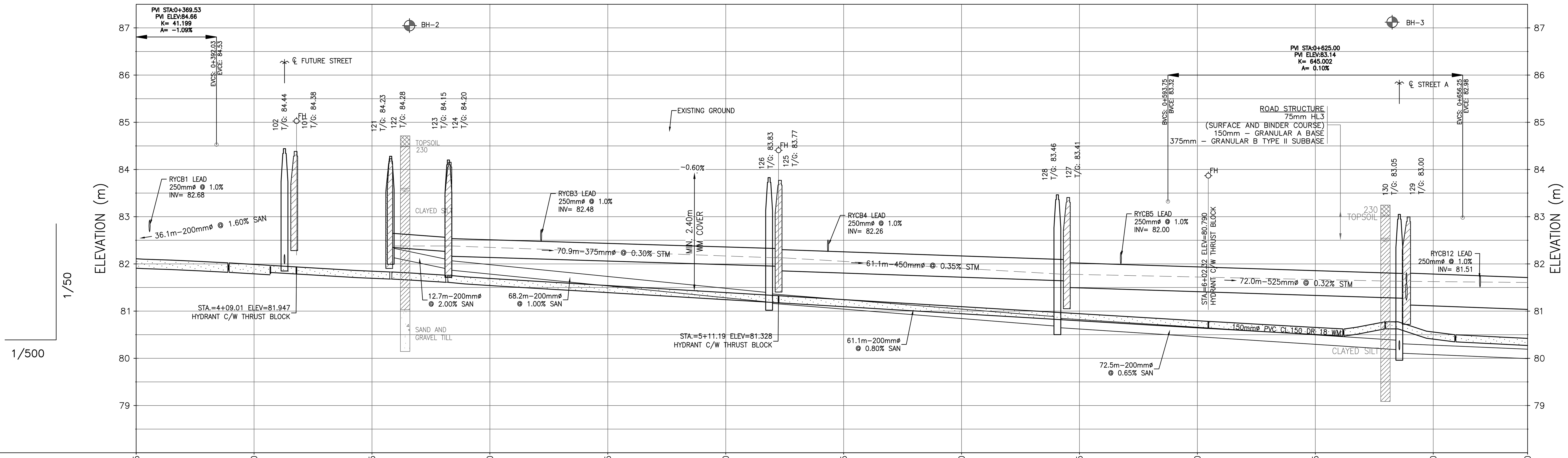
1:50 — 0, 0.5, 1, 2 Metres

STREET NAMES:
- STREET A: BALSAM ST
- STREET B: LOCKHOUSE ST
- STREET C: CONIFER LN



CHAINAGE	0+375	0+400	0+425	0+450	0+475	0+500	0+525	0+550	0+575	0+600	0+625	0+650	0+670
℄ ROAD ELEVATIONS EXISTING / PROPOSED	84.45 / 84.59	84.67 / 84.48	84.71 / 84.33	84.71 / 84.18	84.80 / 84.03	84.66 / 83.88	84.62 / 83.73	84.37 / 83.58	84.27 / 83.44	83.85 / 83.29	83.53 / 83.14	82.98 / 83.01	82.61 / 82.91
TOP OF WATERMAIN		81.99	81.85	81.70	81.55	81.39	81.24	81.10	80.95	80.80	80.66	80.53	80.42

SANITARY MH STATION	406.45 (STREET B); 428.96 (STREET B); 441.21 (STREET B); 509.20 (STREET B); 570.31 (STREET B); 642.81 (STREET B)
SANITARY INVERT ELEVATIONS	82.36; 1.60%; 82.94; 82.14; 2.00%; 81.89; 81.87; 1.00%; 81.19; 81.17; 0.80%; 80.68; 80.65; 0.65%; 80.18; 80.11; 0.43%; 79.77
STORM MH STATION	377.85 (STREET B); 408.51 (STREET B); 428.65 (STREET B); 441.19 (STREET B); 460.86 (STREET B); 511.20 (STREET B); 521.68 (STREET B); 572.31 (STREET B); 583.78 (STREET B); 644.31 (STREET B); 659.92 (STREET B)
STORM INVERT ELEVATIONS	82.48; 0.65%; 82.73; 82.35; 0.65%; 82.26; 82.16; 0.30%; 81.95; 81.85; 0.35%; 81.64; 81.50; 0.32%; 81.27; 81.17; 0.37%; 80.89
MAX. HGL (m)	82.87; 81.35; 82.38; 82.13; 81.78; 81.63
VERTICAL GEOMETRY	PVI STA.= 0+369.53, CURVE LENGTH=45.00m, K= 41.199, HP STA.= 0+367.4, EL.= 84.60; -0.60%; PVI STA.= 0+625.00, CURVE LENGTH= 62.50m, K= 645.0, LP STA.= 0+656.2, EL.= 82.98; -0.50%
HORIZONTAL GEOMETRY	L=23.56m - R=15.00m, DELTA = 90.0000; L=46.98m; L=23.56m - R=15.00m, DELTA = 90.0000, PI EASTING= 469165.2438, PI NORTHING= 4959652.8490; L=196.11m; PI EASTING= 469057.5893, PI NORTHING= 4959834.4483; L=153.40m

STREET B PROFILE STA. 0+375 TO STA. 0+670
SCALE: H = 1:500 / V = 1:50

No.	REVISION / ISSUE	DATE MM/DD/YY
8	PLANS UPDATE– ELEVATIONS CHANGE	02/06/24
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4	TOWNSHIP COMMENTS	02/28/23
3	PEER REVIEW COMMENTS – ADD STM SEWER	01/09/23
1	OWNER / APPROVAL	03/10/22

PREPARED BY:
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Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 02/06/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

PLAN & PROFILE STREET B

STA. 0+375 TO STA. 0+670

SCALE: 1:500-1:50
DRAFTED BY:
PROJECT No.: 0114
DATE: 02-06-2024
DRAWING No.: PP-3

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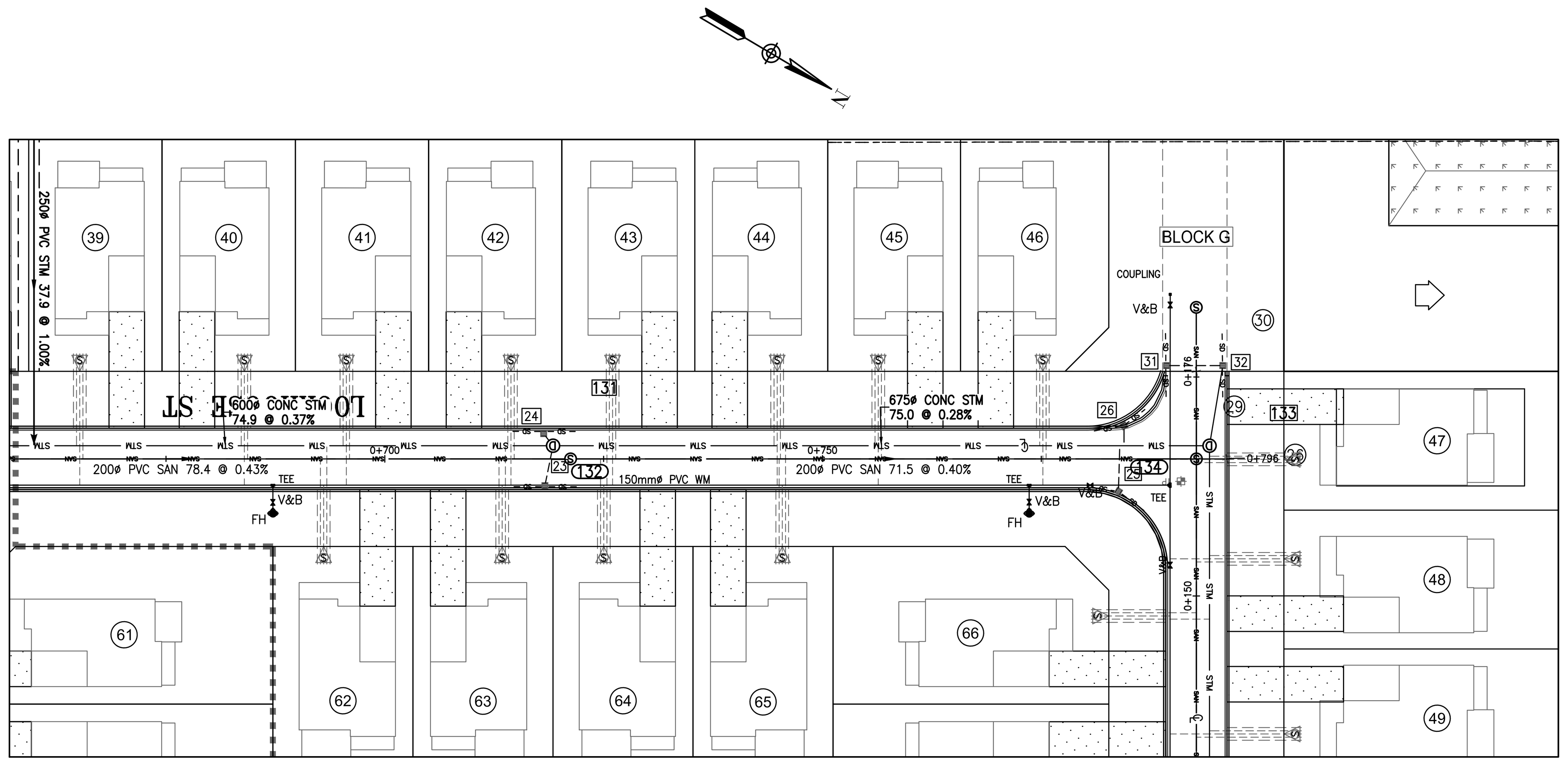
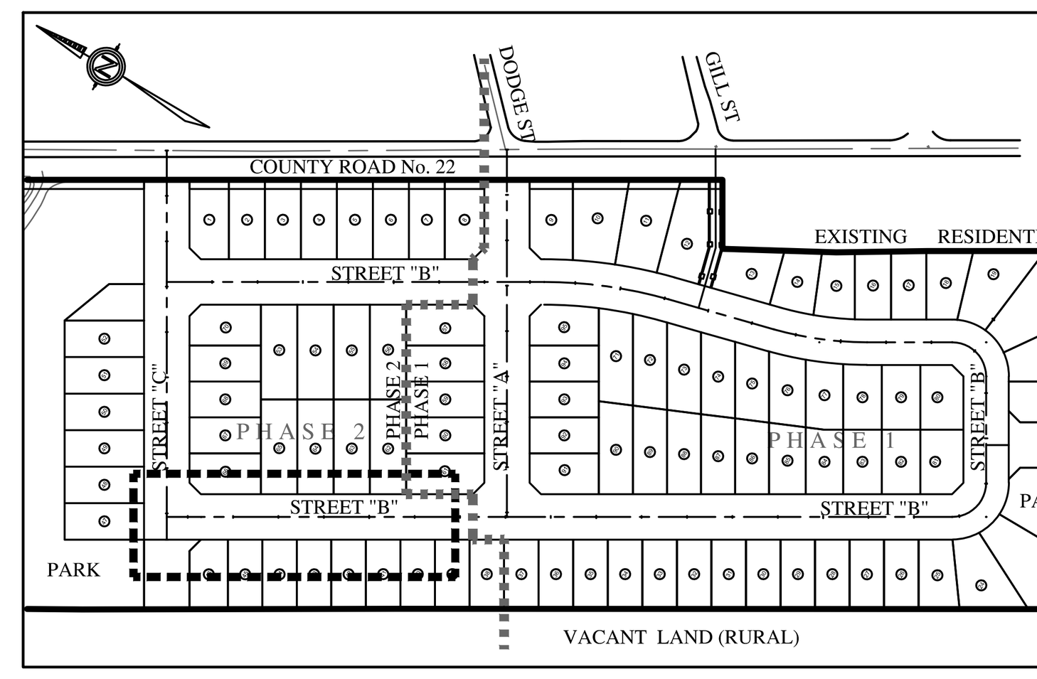
5.3.2024





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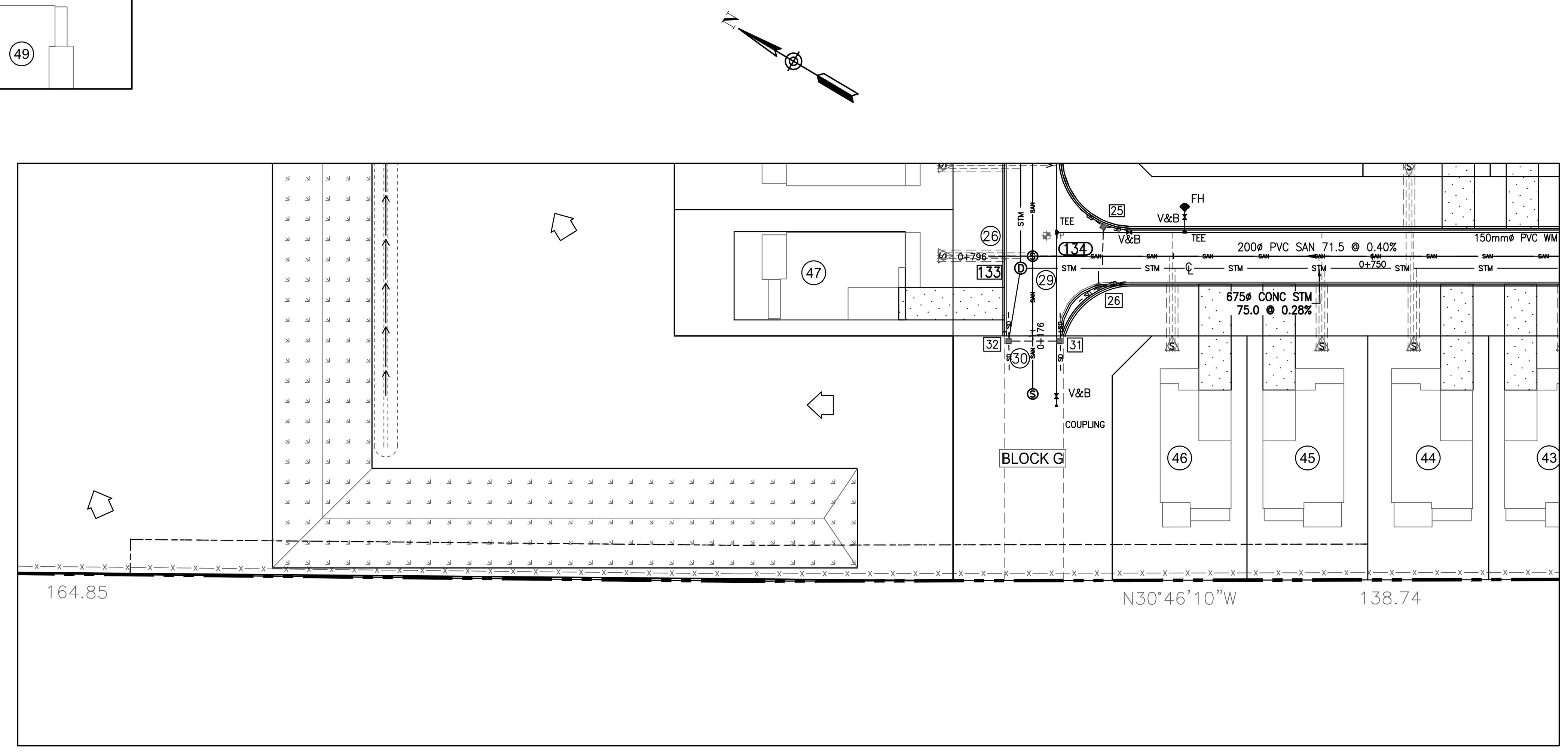
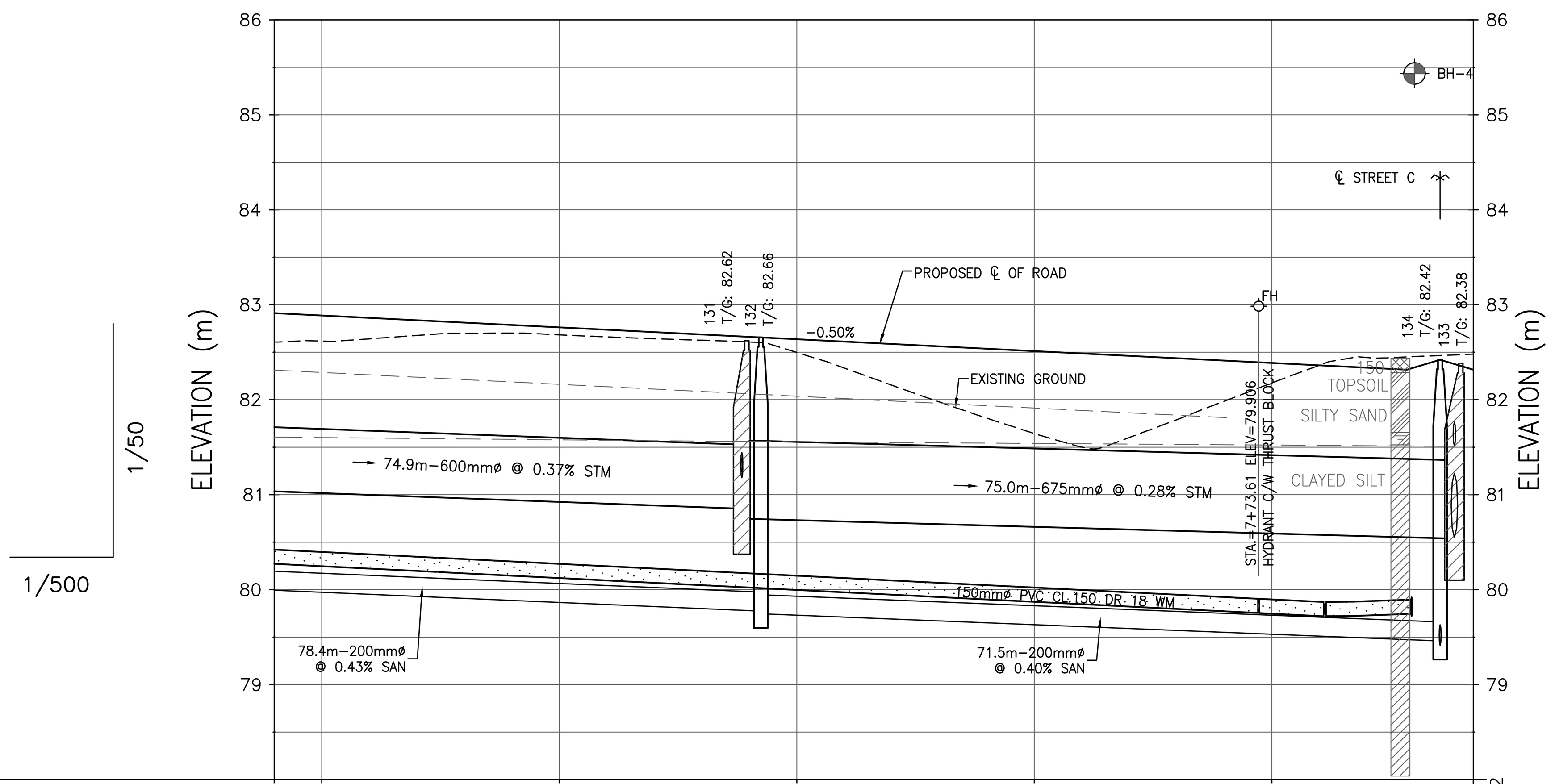
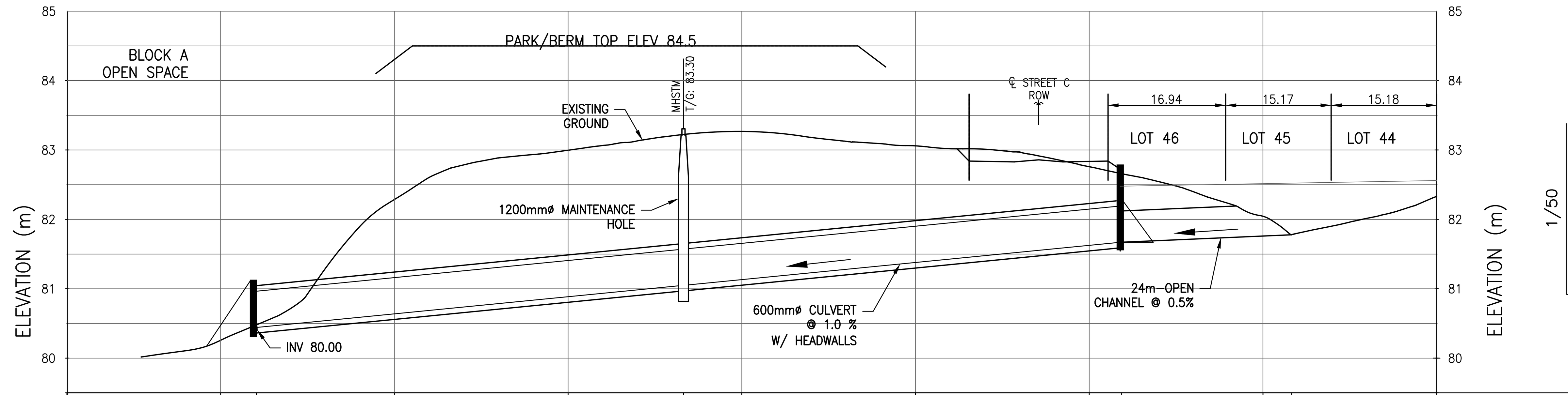


STREET NAMES:
- STREET A: BALSAM ST
- STREET B: LOCKHOUSE ST
- STREET C: CONIFER LN



CHAINAGE	0+670	0+675	0+700	0+725	0+750	0+775	0+796.2
℄ ROAD ELEVATIONS EXISTING / PROPOSED	82.61 / 82.91	82.62 / 82.89	82.68 / 82.76	82.50 / 82.64	81.64 / 82.51	82.18 / 82.39	82.48 / 82.32
TOP OF WATERMAIN		80.40	80.28	80.16	80.03	79.90	79.90
SANITARY MH STATION				721.21 (STREET B)			792.71 (STREET B)
SANITARY INVERT ELEVATIONS	80.11	0.43%		79.77 / 79.75	0.40%		79.46
STORM MH STATION				719.21 (STREET B)			794.21 (STREET B)
STORM INVERT ELEVATIONS	81.17	0.37%		80.89 / 80.82	0.28%		80.61
MAX. HGL (m)				81.56			81.51
VERTICAL GEOMETRY			-0.50%				3.00% / -3.00%
HORIZONTAL GEOMETRY	PI EASTING= 469057.5893 PI NORTHING= 4959834.4483			L=153.40m			

STREET B PROFILE STA. 0+670 TO STA. 0+796
SCALE: H = 1:500 / V = 1:50



CHAINAGE	0+200	0+175	0+170.1	0+150	0+125	0+108.4	0+100	0+075	0+050	0+045.5	0+025	0+020.9	0+000
℄ GROUND ELEVATIONS EXISTING / PROPOSED		80.25 / 80.25		82.29 / 82.29	83.00 / 83.00	83.22 / 83.22	83.27 / 83.27	83.06 / 83.06	82.76 / 82.76		82.05 / 82.05	81.78 / 81.78	
STORM INVERT ELEVATIONS			80.44	1.00%		80.06	1.00%			81.67	0.50%	81.78	

DRAINAGE PROFILE STA. 0+000 TO STA. 0+200
SCALE: H = 1:500 / V = 1:50
(WEST PROPERTY)

No.	REVISION / ISSUE	DATE MM/DD/YY
8	PLANS UPDATE– ELEVATIONS CHANGE	02/06/24
6	TOWNSHIP COMMENTS – 06-30-23	07/25/23
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3	PEER REVIEW COMMENTS – ADD STM SEWER	01/09/23
1	OWNER / APPROVAL	03/10/22

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Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 02/06/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

PLAN & PROFILE STREET B

STA. 0+670 TO STA. 0+796.2
DRAINAGE PROFILE

SCALE: 1:500-1:50
DRAFTED BY:
PROJECT No.: 0114
DATE: 02-06-2024
DRAWING No.: PP-4

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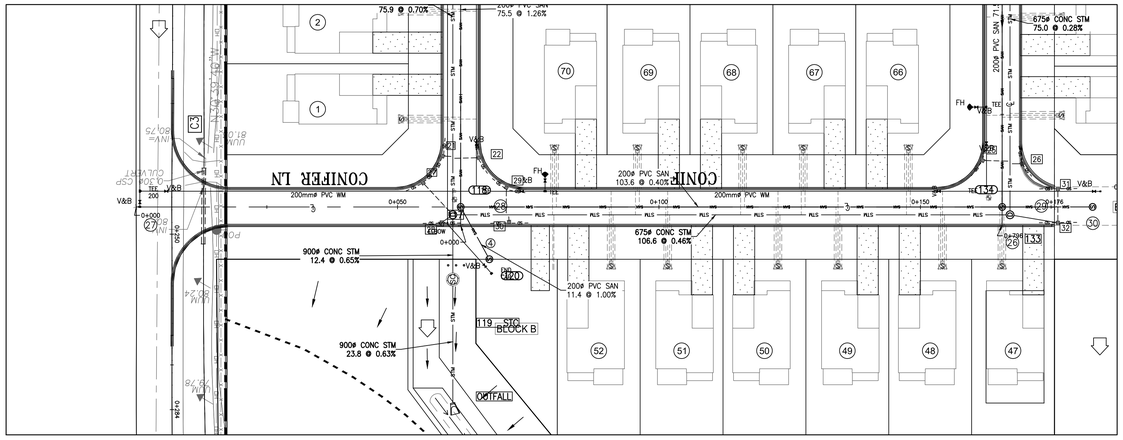
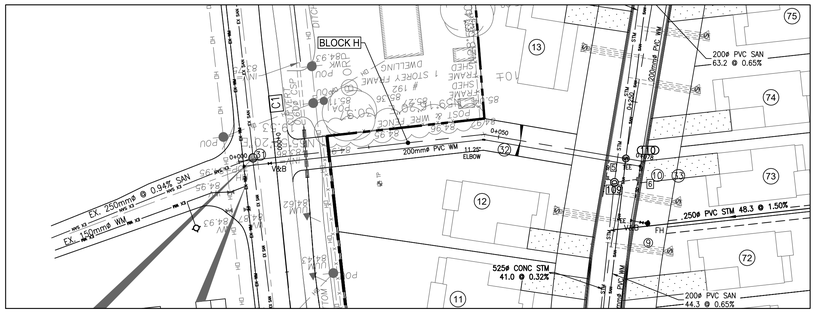
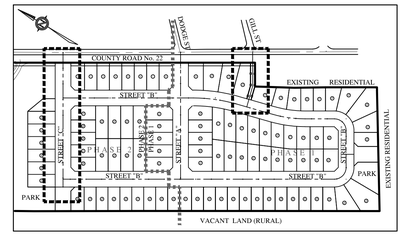
5.3.2024







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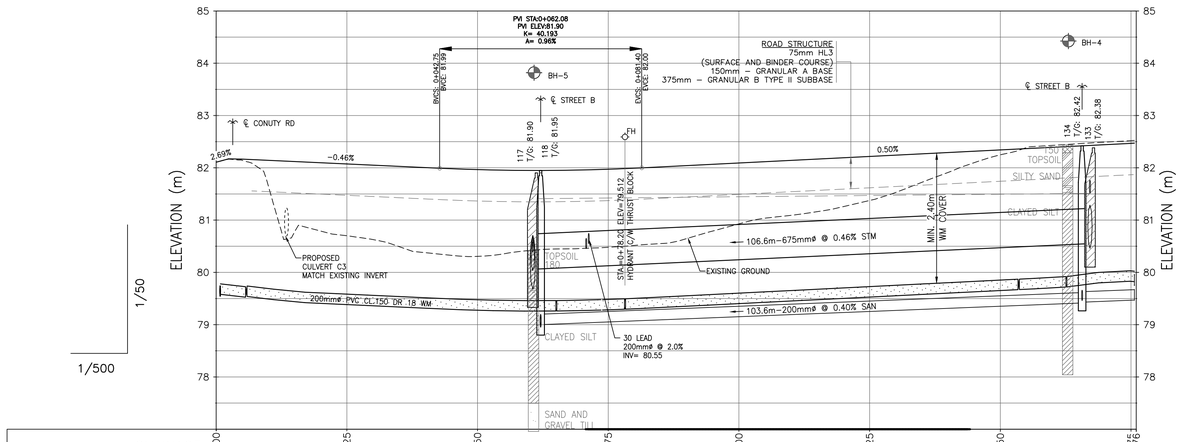
0 0.5 1 2
1:50 Metres



CHAINAGE	0+000	0+025	0+050	0+075	0+100	0+125	0+150	0+176
℄ ROAD ELEVATIONS EXISTING	80.78	80.31	80.48	80.93	81.38	82.25	82.52	
℄ ROAD ELEVATIONS PROPOSED	82.07	81.97	81.97	82.09	82.22	82.34	82.47	
TOP OF WATERMAIN	79.78	79.58	79.46	79.50	79.58	79.73	79.86	79.92
SANITARY MH STATION				3.50 (STREET B)				792.71 (STREET B)
SANITARY INVERT ELEVATIONS				79.00		0.40%		79.41 / 79.43 / 0.40% / 79.50
STORM MH STATION				60.57 (STREET C)	2.64 (STREET B)			794.21 (STREET B)
STORM INVERT ELEVATIONS				80.06		0.46%		80.55
MAX. HGL (m)				81.41				81.51
VERTICAL GEOMETRY	2.69%	-1.14%	~0.46%	PVI STA.= 0+062.08 CURVE LENGTH= 38.65m K= 40.2 LP STA.= 0+061.3 EL.= 81.95		0.50%		
HORIZONTAL GEOMETRY		L=62.07m		PI EASTING= 469070.2452 PI NORTHING= 4960016.2111		L=103.58m		PI EASTING= 468981.1488 PI NORTHING= 4959963.3935

CHAINAGE	0+000	0+025	0+050	0+075	0+078.2
℄ ROAD ELEVATIONS EXISTING	84.93	84.84	84.88	84.73	
℄ ROAD ELEVATIONS PROPOSED	84.93	84.76	84.52	84.40	
TOP OF WATERMAIN	82.52	82.37	82.24	82.38	82.38

PATHWAY 1 PROFILE STA. 0+000 TO STA. 0+078
SCALE: H = 1:500 / V = 1:50

STREET NAMES:
- STREET A: BALSAM ST
- STREET B: LOCKHOUSE ST
- STREET C: CONIFER LN

No.	REVISION / ISSUE	DATE MM/DD/YY
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1	OWNER / APPROVAL	03/10/22

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Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
02/06/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

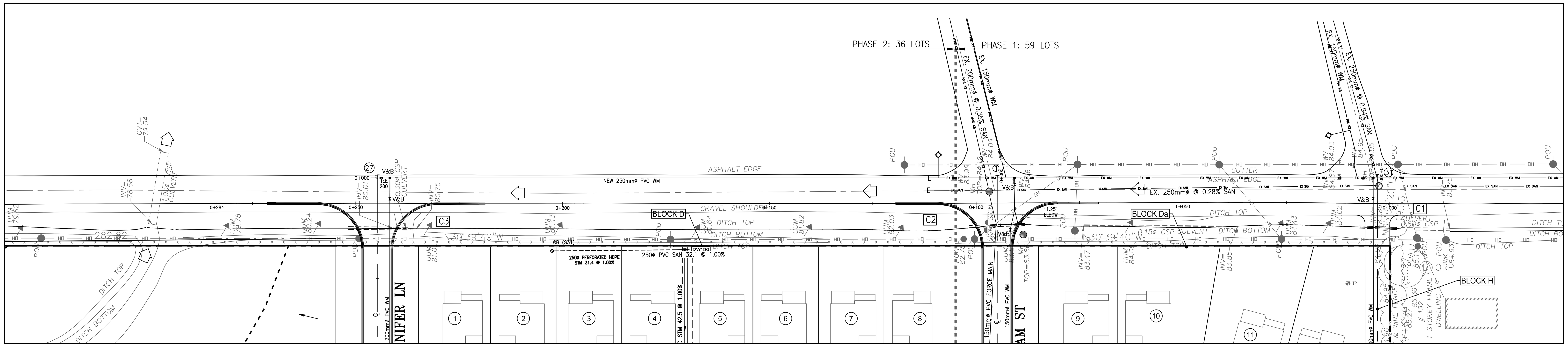
APPLICANT:

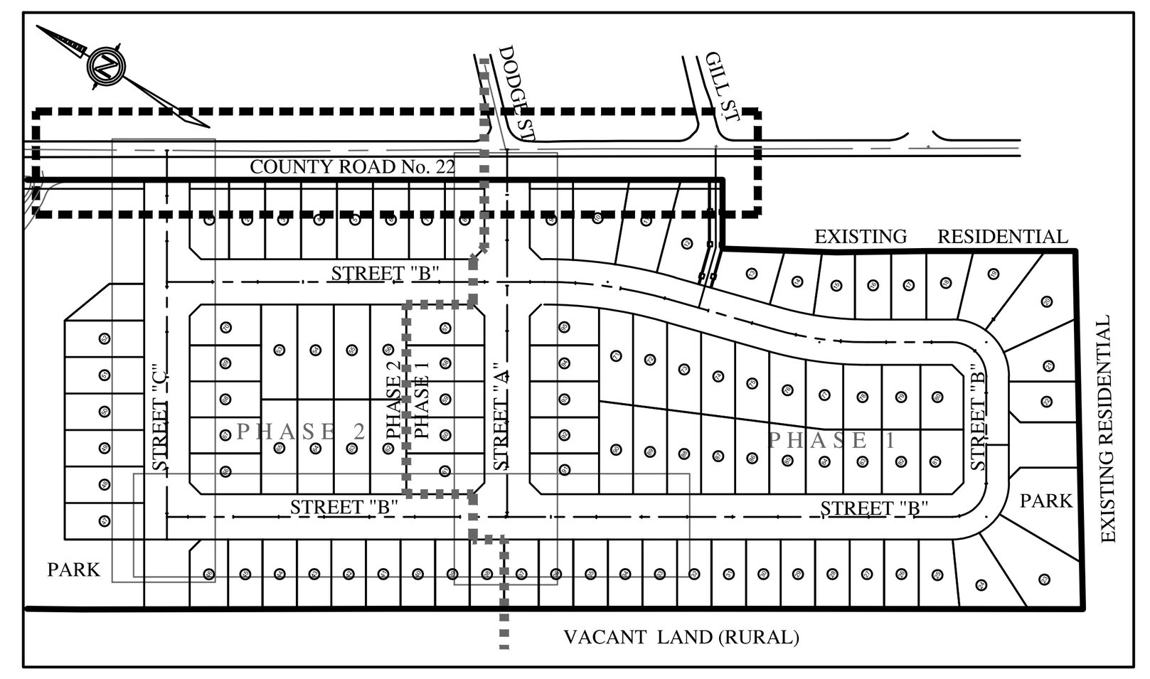
Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

PLAN & PROFILE STREET C & PATHWAY 1

SCALE: 1:500-1:50
DRAWING No.: PP-5
DRAFTED BY:
PROJECT No.: 0114
DATE: 02-06-2024





1:500 — 0, 5.0, 10, 20 Metres

1:50 — 0, 0.5, 1, 2 Metres

STREET NAMES:
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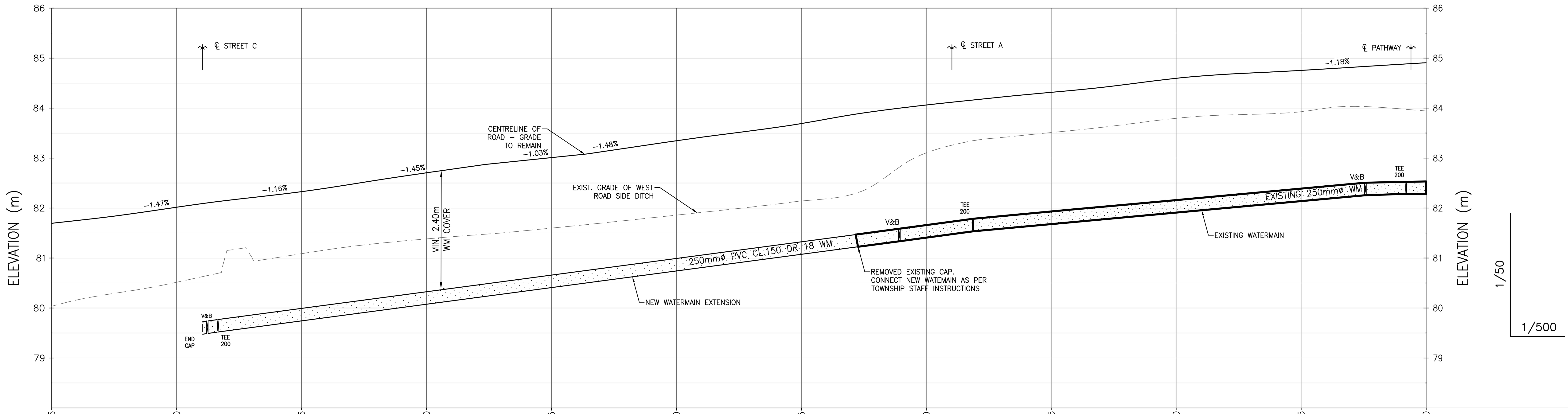
- STREET B: LOCKHOUSE ST
- STREET C: CONIFER LN



CHAINAGE	0+275	0+250	0+225	0+200	0+175	0+150	0+125	0+100	0+075	0+050	0+025	0+000
℄ ROAD ELEVATIONS EXISTING / PROPOSED	81.69 / 81.69	82.02 / 82.02	82.33 / 82.33	82.70 / 82.70	83.01 / 83.01	83.35 / 83.35	83.69 / 83.69	84.06 / 84.06	84.31 / 84.31	84.59 / 84.59	84.75 / 84.75	84.91 / 84.91
TOP OF WATERMAIN	79.73		79.99	80.33	80.66	80.99	81.32	81.66	81.93	82.16	82.39	82.55

COUNTY RD - 22 PROFILE STA. 0+000 TO STA. 0+275
SCALE: H = 1:500 / V = 1:50

No.	REVISION / ISSUE	DATE MM/DD/YY
8	PLANS UPDATE– ELEVATIONS CHANGE	02/06/24
6	TOWNSHIP COMMENTS – 06-30-23	07/25/23
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4	TOWNSHIP COMMENTS	02/28/23
3	PEER REVIEW COMMENTS – ADD STM SEWER	01/09/23
1	OWNER / APPROVAL	03/10/22

PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 02/06/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

PLAN & PROFILE COUNTY D 22

SCALE: 1:500-1:50

DRAFTED BY:

PROJECT No.: 0114

DATE: 02-06-2024

DRAWING No.: PP-6

Township of Edwardsburgh/Cardinal

PROJECT: LOCKMASTER'S MEADOW SUBDIVISION
(95 Single Family Lots)

ADDRESS: COUNTY ROAD 22 (SHANLY ROAD)
CARDINAL, ON

WASTEWATER PUMPING STATION & FORCEMAIN DESIGN REPORT

PREPARED FOR:
Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, Ontario K2T 1C1
(613) 282 5601

PREPARED BY:
Advance Engineering Ltd.
(613) 986 9170

Date	*Revision / Issue*
April 15, 2024	Comments by Township Dated April 12, 2024
December 06, 2023	Concrete Wet Well Instead of FRP
July 27, 2022	Issued for a Subdivision Application

TABLE OF CONTENTS

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Appendix A - Figure 1 – Pump station layout
Appendix B- Wet well and pumps design calculation
Proposed wet well, pump and generator details

List of Related Drawings:
S-1 – Draft Plan of Subdivision
GSP2 - General Services Plan
GR-2 - Grading and Drainage Plan
CUP 1,2&3 – Composite Utility Plan
Pumping Station Plans:
CS-1, PS-1, PS-2, PS-3, PS-4, A-1, M-1 and E-1

Related Report:
- Site Servicing Report
- Stormwater Management Report

1.0 INTRODUCTION

Edwardsburgh Developments Ltd. has retained *Advance Engineering Ltd.* to provide a design report for a new wastewater pumping station and a forcemain to be constructed to service a proposed residential subdivision composed of 95 single-detached lots located off County Rd 22 in the Village of Cardinal, Ontario. *Ottawa Sewer Design Guidelines* has been used in the design of the forcemain, pumping station and associated appurtenances and controls.

The proposed development, as shown in the draft plan of subdivision, consists of:

- Phase 1: 59 lots in the south side of the property.
- Phase 2: the remaining 36 lots in the north side of the subdivision.

The pumping station is required for both phases. It is located in "Block B" at the north side of the site.

The equipment installed in the Village other pumping stations has been taken in consideration in the design of the new pumping station with the goal of harmony and reducing operation and maintenance costs.

1.1 EXISTING INFRASTRUCTURE

Existing municipal sewer: There is a manhole (MH-135) located at the intersection of County Rd 22 and Gill St. From it, a 250 mm dia. PVC DR 35 pipe runs south along County Road 22 and a 250 mm dia. pipe, sloped at 0.94 %, runs east along Gill St. The south and east invert elevations at MH-135 are 82.72 m and 82.11 m respectively. The capacity of Gill St sewer is estimated at 58 L/s using Manning's Formula. There is a second manhole (MH-140) at the intersection of County Rd 22 and Dodge St to which are connected two pipes: a 200 mm dia. pipe coming from Dodge St and a 250 mm dia. pipe sloped at 0.28% running south toward MH-135. The south invert elevation is 82.42 m and the full capacity of the sewer is estimated at 31 L/s. Two 200 mm dia. capped end pipes are connected to MH-140; one is directed north along the road and the other west adjacent to the site. Wastewater from MH-135 and MH-140 flows south through Walker St to Adelaide St pumping station.

1.2 REASON FOR PUMPING STATION

Due to insufficient elevation for a gravity-based-system sewer, an underground sewage pumping station, designed for continuous operation, is proposed downstream of the property.
A pressurized forcemain will be constructed to discharge sewage effluent from the pumping station into the existing municipal sewer within County Rd 22 as shown in the servicing plans.
The sanitary sewer within the site is designed to operate under free flow condition for both phases. County Rd pavement elevation at the proposed forcemain connection is 84.12 approximately. The finished grade elevation at the pumping station wet well is 82.20.

2.0 PROPOSED WET WELL SUBMERSIBLE STATION

The proposed pumping station consist of a wet well equipped with two submersible pumps interchangeable of the same pumping capacity and each unit, operating independently, is capable of pumping at the design peak flow rate.

2.1 REQUIREMENTS

In addition to meeting the requirements of *Ottawa Sewer Design Guidelines*, the design and construction of the wastewater pumping facility must meet all the current requirements of other governmental authorities having jurisdiction, including, but not limited to, the following:

- Ontario Ministry of the Environment, Conservation and Parks
- Ontario Ministry of Labour
    i. Occupational Health and Safety Branch
    ii. Workplace Hazardous Materials Information System (WHMIS)
- Ontario Ministry of Municipal Affairs and Housing
    i. Ontario Building Code
    ii. Ontario Plumbing Code
- Ontario Gas Code
- Ontario Electrical Safety Code

Testing and commissioning plan and procedures shall be approved by the Township of Edwardsburgh/Cardinal.

2.2 DESIGN CRITERIA

2.2.1 ANTICIPATED FLOWS

- Design period: 50-year design life period for the facility structure. The pumping equipment is assumed to receive a major overhaul, involving renewal of the wearing components, at 10 year intervals or a replacement every 15 years, dependent on service conditions.
- Station design flows targets: the station is designed to handle the peak sewage flows for a 20-year development period.
- A future 5 ha hectare development has been included in the estimation of the various flows.
- Firm capacity requirement: the station must be able to pump the expected peak design flow with the largest pump out of operation.
- Using 10-year development intervals up to build-out condition, typical anticipated sanitary sewage flows, including infiltration and extraneous flow allowances are estimated as follows:

STAGING	INITIAL 2024	10 YEAR 2034	20 YEAR 2044	BUILD-OUT
DEVELOPMENT	100 % OF FLOW OF EDWARDSBURGH DEVELOPMENT	100 % OF FLOW EDWARDSBURGH DEVELOPMENT	100 % OF FLOW EDWARDSBURGH DEV. + FUTURE DEVELOP. (5 ha)	ULTIMATE DE-VELOPMENTS MAX CAPACITY
AWF (L/s)	1.31	1.31	2.52	2.52
ADWF (L/s)	1.69	1.69	3.16	3.16
PDWF (L/s)	4.90	4.90	9.34	9.34
WWF (L/s)	7.04	7.04	12.89	12.89
AWWF (L/s)	4.09	4.09	7.26	7.26
RWWF (L/s)	6.01	6.01	10.43	10.43

Table 1: SUMMARY OF PROJECTED DESIGN FLOWS BASED ON ANTICIPATED DEVELOPMENT STAGING

- AWF: Average Wastewater Flow Rate.
- ADWF: Average Dry Weather Flow Rate.
- PDWF: Peak Dry Weather Flow Rate.
- WWF: Peak Wet Weather Design Flow Rate Q_d.
- AWWF: Annual Wet Weather Flow.
- RWWF: Rare Wet Weather Flow.

The values of residential wastewater design flows are provided in Table 1 in *Ottawa Guidelines*. However, *Technical Bulletin ISTB-2018-01* has reduced the average residential flow from 350 to 280 L/c/day. For a conservative estimate we have used: 350 L/c/day, 4 for M and a correction factor of 1. Wet weather and dry weather infiltration contribution (extraneous) are respectively 0.28 and 0.05 L/s/effective gross ha.

The above-listed flow ranges of projected average, peak, and minimum daily dry weather flow, related to anticipated developments has been used to provide design guidance to address operational issues including:

i. Wastewater detention times, forcemain velocities, odour and corrosion potential: average DWF.

ii. Typical pumping requirements: average and peak DWF.

iii. Firm capacity requirements for various stages of development: peak WWF.

iv. Realistic emergency pumping requirements: annual WWF or peak WWF for rare event.

2.2.2 PUMPING SYSTEM DESIGN

- Pump type: *Flygt.*
- Number of pumps: 2 (one duty, one stand-by).
- Pump power: less than 5 kW.
- Pumps rated at: 16 L/s.
- Total Dynamic Headloss (TDH): 9.2 m.
- Net positive suction head (NPSH) required: as per manufacturer's specifications.
- Operating depth: 0.50 m.
- Number of pump starts per hour: maximum 30.
- Hazen-Williams C-V for internal piping and forcemain: as per Table 7.3 *Ottawa Guidelines.*
- Pump motor: 3-phase, 1745 RPM, 60 Hz.
- Pump impellers: shall be of a non-clog design and be capable of passing spherical solids of 75 mm diameter.
- Pump cycling: $T= V/(Q-Qin) + V/Qin$

  T = Time between pump starts (minutes)

  V = Effective wet well volume (Litres) between lead pump start and lead pump stop

  Q = Pump/station discharge capacity (L/minute), and,

  Qin = Station inflow rate (L/minute)

2.2.3 WET WELL DESIGN

- Wet well cross-sectional area: 4.52 m^2 (2.4 m diameter) using D-65 reinforced concrete pipes.
- Wet well retention time: maximum 30 minutes. Proposed 24.4 min for average DWF of 1.69 L/s.
- Wet well and forcemain total retention time: maximum 4 hours.
- Wet well operating levels: 0.50 m.
- Wet well benching: wet well floors shall have a minimum slope of 1:1 to a hopper-type bottom.
- Height of wet well: 5.0 m.
- Total wet well volume: 22.6 m^3.
- Precast concrete material.
- Inlet sewer diameter: 200 mm.
- Top wet well elevation: 82.40.
- Bottom wet well elevation: 77.10.
- Inlet sewer elevation: 78.75.
- High liquid level inside wet well: 77.90.
- Low liquid level inside wet well: 77.40.

- Outlet forcemain elevation: 80.10.
- Lowest basement elevation: 81.00,
- Corrosion Consideration: epoxy coating, aluminum, ductile iron and stainless steel.
- Vortex prevention: provided.
- Personnel opening to the wet well: minimum 0.90 x 0.75 m. The opening should give access to level controls, floats, equipment, etc.
- Access hatches and stairways: access hatch cover for all roof openings to wet well must be sealed or have sufficient overhang to prevent rainwater inflow. Equipment hatch floor openings shall be adequately sized for all intended uses. Access hatch to the pump, when open, must be protected by posts and surrounding chains. Doors and access hatches shall have suitable locking devices. Odour-tight aluminum hatch covers should be used. Non-protruding extension ladders are to be provided for entry hatch, and must be located far enough away from the walls to be able to be pulled up through the access opening and extended to a height of at least 1.0 m above the roof.
- Wet well submersible station valve vault design: a separate by-pass chamber shall house the pump check valves, surge relief valves, flow meter, force main isolating valve, bypass valve, and associated piping.
- Wet wells safety considerations: typically classified as Class I, Group D, Division I (Zone 1), or Division II (Zone 2) Hazardous Locations.
- Air Monitoring System inside the wet well: no continuous monitoring provided; the Township will use portable devises to detect the presence of gases before and during entries.
- Ventilation: natural venting. To be achieved through two 100 mm diameter vent pipes equipped with a gooseneck at the top, extending 900 mm above the top slab of the wet well. One vent pipe should extend down to within 300 mm of the obvert of the inlet pipe and the second should terminate on the underside of the roof of the wet well. Insect screens shall be provided on the vents.
- Wet Well Level Measurements and Control: Two float switches are to be provided with alarms:
  i. A high level alarm.
  ii. A low level (shut-off) alarm.

Other Considerations:

- Automated supervisory control and data acquisition (SCADA) systems with remote sensing and telemetry equipment to be provided.
- Pump and equipment removal: vehicle access via the driveway. Access hatch to be provided to allow the use of exterior mobile cranes.
- Emergency conduit to the stormwater sewer is designed using the annual wet weather flow condition and shall be above the 25-year stormwater elevation and equipped with backwater valve.
- Emergency stand-by power: natural gas.
- An external underground vault separate from the wet well and control building containing the discharge piping, valves and flow/pressure monitoring equipment.

- Wet well structural design: the wet well structure shall be designed for all anticipated loads and the walls must be designed for lateral soil and hydrostatic loads with appropriate factors of safety. The maximum allowable wet well level under emergency conditions must be indicated. In floodplains, the structure shall be checked for the 100-year flood with an allowable stress increase of 1.33. The structure shall be sized with an appropriate flotation safety factor considering only the weight of the structure and soil on its haunches with maximum groundwater levels. All conduit and pipe penetrations to the wet well shall be made watertight and corrosion proof. All forcemain, re-circulation, drain, and gravity sewer piping shall have a flexible pipe joint within 0.9 m of the wet well wall. All construction joints below grade shall be built with a water stop.

3.0 PROPOSED FORCEMAIN

Forcemain design:

- Proposed PVC DR 26 150 mm (6") diameter.
- Velocity: 0.9 to 1.5 m/s at the time of commissioning. 0.8 to 2.5 m/s over the full operating range. Proposed 0.9 m/s under average dry weather flow.
- A minimum positive slope of 0.5 %.
- Approximate length: 219 m.
- Internal length: 5 m.
- A minimum depth cover of 2 m.
- No 90-degree bends.
- A minimum horizontal clearance from watermain of 3 m.
- Tracing wires for location.
- Two isolation valves at the both ends in two valve chambers.
- Air release valve at high point.
- Forcemain outlet condition: enter the receiving manhole with a smooth flow transition to the gravity sewer system at a point not more than 0.30 m above the flow line of the receiving sewer.

4.0 CONCLUSIONS

- It is proposed to construct a concrete wet well submersible station to pump the wastewater generated by the new development into the existing sanitary sewer at County Rd/Dodge St intersection. The wet well is designed to receive and store wastewater as well as to house the submersible pumps and level monitoring equipment.

- Two pumps rated 16 L/s and TDH of 8.5 m are proposed at the commissioning and until 2034. In 2034, depending on actual development staging, upgrade to 25 L/s may be required, otherwise 16 L/s pumps remain sufficient.

- A proposed 236 m long 150 mm diameter PVC forcemain DR 18 will connect the pumping station to the receiving manhole that shall be re-benched.

- An above-grade building housing the power, control and communications equipment as well as the stand-by natural gas generator shall be built as per drawings provided.

- An external underground chamber separate from the wet well and control building containing the discharge piping, valves and flow/pressure monitoring equipment.

- An automated supervisory control and data acquisition (SCADA) system with remote sensing and telemetry equipment shall be provided as per the Township specifications.

- The existing Adelaide pumping station capacity is able to accommodate the proposed pumped flow generated from the new pumping station.

- Sewage discharges will be domestic in type and in compliance with the latest *Ontario Building Code (OBC).*

Respectfully submitted,

Mongi Mabrouk M.Eng., P.Eng.

Advance Engineering

Phone: 613-986-9170

E-mail : eng.services.ca@gmail.com

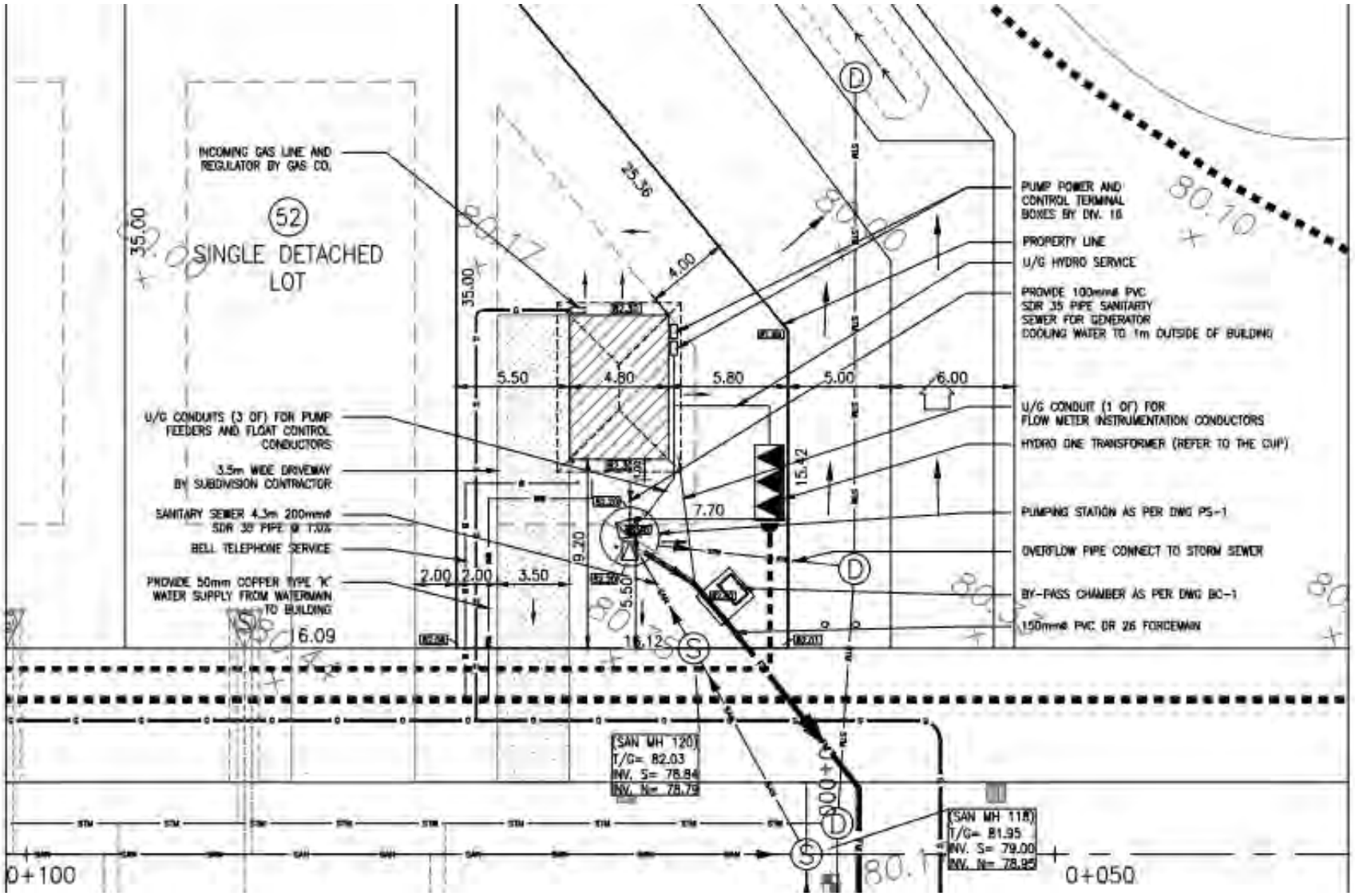
APPENDICES

Appendix A
- Figure 1: Site location and site plan

Appendix B
- Wet well and pumping design

APPENDIX - A

FORCEMAIN LAYOUT



NOTES
* DISTANCES ARE IN METRE

PROPSOED LOCKMASTER'S MEADOW SUBDIVISION – PUMPNG STATTION LOCATION

APPENDIX - B

PROJECTED DESIGN FLOWS BASED ON ANTICIPATED DEVELOPMENT STAGING

STAGING	INITIAL 2023	10 YEAR 2033	20 YEAR 2043	BUILD-OUT
DEVELOPMENT	100 % OF FLOW EDWARDSBURGH DEVELOPMENT	100 % OF FLOW EDWARDSBURGH DEVELOPMENT	100 % OF FLOW EDWARDSBURGH DEV. + FUTURE DEV. (5 ha)	ULTIMATE DEVELOPMENTS MAX CAPACITY
AWF (L/s)	1.31	1.31	2.52	2.52
ADWF (L/s)	1.69	1.69	3.16	3.16
PDWF (L/s)	4.90	4.90	9.34	9.34
WWF (L/s)	7.04	7.04	12.89	12.89
AWWF (L/s)	4.09	4.09	7.26	7.26
RWWF (L/s)	6.01	6.01	10.43	10.43

AWF: Average Wastewater Flow Rate
ADWF: Average Dry Weather Flow Rate
PDWF: Peak Dry Weather Flow Rate
WWF: Peak Wet Weather Design Flow Rate Qd
AWWF: ANNUAL WET WEATHER FLOW
RWWF: RARE WET WEATHER FLOW
* Values of residential flows as per Table 1 of Ottawa Guidelines.
** Residential flow: 350 L/c/day

HEAD LOSS Hazen-Williams Formula in Metric Units

h = 10.67 q$^{1.852}$ / (c$^{1.852}$ d$_h$$^{4.8704}$) where:

h = head loss per unit pipe (m_{h2O}/m pipe)

c = design coefficient determined for the type of pipe - the higher the factor, the smoother the pipe

q = flow rate (m^3/s)

d_h = inside hydraulic diameter (m)

Pressure drop in Pa can be calculated from the head loss by multiplying the head loss with the specific weight of liquid: $p = h\,\gamma$ where:

p = pressure loss (N/m^2, Pa) Specific weight of water at 4°C is 9810 N/m^3.

γ = *specific weight (N/m^3)*

Forcemain

	PVC	Ductile Iron	
D =	0.150	0.100	m
A =	0.0177	0.0079	m^2
Q =	0.016	0.016	m^3/s
L =	219	5	m
γ =	12,000	12,000	N/m^3
C_{HW} =	130	100	Table 7.3 *For pump selection*
**Energy Slope h_f (m) =*	*0.00631*	*0.07389*	m_{h2O}/m pipe
h total = hf L (m) =	***1.382***	***0.369***	*m* **Total= 1.8 m**
P drop =	*16.58*	*4.43*	*kPa*
V =	**0.91**	**2.04**	

II/ MINOR LOSSES: h_m= KV^2 / 2g

Minor Losses Coefficients (source SHEA)

Discharge	k Value	Qty	Sum
45° Bend	0.35	3	1.05
90° Bend	0.75	2	1.5
Tee, Run Through	0.4	0	0
Tee, as Elbow	1	1	1
Expansion	0.5	1	0.5
Coupling	0.04	2	0.08
Check Valve	3	2	6
Gate Valve Open	0.2	2	0.4
Exit	1	1	1
		Total k	**11.53**

g =	9.81	m/s^2
V =	0.91	m/s
h_m= KV^2 / 2g =	**0.48**	***m***

III/ TOTAL DYNAMIC HEADLOSS $h_{dynamic} = h_{static} + h_f + h_m$

H_{static} = **6.9 m** ***$h_{dynamic}$= 9.2 m***

Project: PROPOSED SUBDIVISION - COUNTY ROAD 22 - VILLAGE OF CARDINAL - ON

PUMPING STATION DESIGN

I/ Detention Times — Using ADWF

Wet well:		
Wet well cross-sectional area:	**4.500 m²**	
Operational height:	**0.50 m**	
Operational Volume:	**2.250 m³**	
Forcemain:		
Forcemain diameter:	0.150 m	
Pipe area:	0.0177 m²	
Qp=	16.00 L/s	
Velocity:	**0.9 m/s**	2.0 m/s inside wet well piping
Length:	220.0 m	
Pipe Volume:	**3.888 m³**	
Volume of wet well and forcemain:	**6.138 m³**	
Retention Time in wet well:	22 mn	under average dry weather flow of 1.69 L/s
Retention Time in wet well:	3 mn	under peak wet weather flow of 12.89 L/s

II/ Pumping Cycling:

T= V/(Qp-Qin) + V/Qin where:

T = Time between pump starts (minutes)
V = Effective wet well volume (Litres) between lead pump start and lead pump stop
Qp = Pump/station discharge capacity (L/minute), and,
Qin = Station inflow rate (L/minute)

Operational volume V=	2250 L		
Qp=	960.0 L/mn		
Qin=	104.1 L/mn	(1.69 L/s)	ADWF
T=	**24 mn**		
Start frequency:	**2.5**	per hour	

III/ Elevations

Top wet well elevation:	82.40
Inlet sewer elevation:	78.75
High liquid level inside wet well:	77.90
Low liquid level (pump shut-down):	77.40
Bottom level:	77.10
Forcemain outlet level:	80.10
Emergency outlet level:	80.60
Total height of wet well:	5.0 m
Total volume:	22.5 m³
Forcemain Invert elevation at Cty Rd:	84.00

FLOTATION OF WET WELL CHECK

Weight of the Structure Force

Internal Diameter	2.4	m
Well Wall Thickness	0.23	m
Wall Height	5	m
Well Base Thickness	0.3	m
Well Top Thickness	0.3	m
g=	9.8	m/s2
Water Ro=	1000	kg/m3
Concrete Density	23	kN/m3
Well Wall Section Perimeter at CL	8.3	m
Well Wall Section Area	1.9	m2
Well Wall Volume	9.502	m3
Base and Top Area	6.42	m2
Base Volume	1.927	m3
Top Volume	1.927	m3
Wall + Base + Top Volume	13.356	m3
Wall + Base + Top Weight	**307.2**	kN

Upward Buoyant Force

Elevation of GWT	**79.65**	Geotechnical report BH#5
Well Bottom Elevation	76.795	m
Submerged Height	2.855	m
Submerged Section	6.42	m2
Submerged Volume	18.341	m3
Submerged Equivalent Weight	**179.7**	kN
Safety Factor	**1.71**	

Notes: Cohesion friction ignored.
Maximum groundwater level taken as per Geotechnical report may vary.

Gmail

Eng Services <eng.services.ca@gmail.com>

Lockmaster's Subdivision - Pumping Station

Wendy Van Keulen <wvankeulen@twpec.ca> Mon, Aug 8, 2022 at 9:41 AM
To: Eng Services <eng.services.ca@gmail.com>
Cc: "elaine.mallory@uclg.on.ca" <elaine.mallory@uclg.on.ca>, "David.firstfin@sympatico.ca" <David.firstfin@sympatico.ca>, "sabbyduthie@gmail.com" <sabbyduthie@gmail.com>, Eric Wemerman <ewemerman@twpec.ca>, Gord Shaw <gshaw@twpec.ca>, Dave Grant <dsgrant@twpec.ca>

Good Morning Mongi,

Please see responses below. As discussed by phone last week, we will review the design report once it is ready with this info.

1- We are planning to propose a factory-made wet made of FRP with submersible pumps Flygt. It comes with 25 year warranty for all parts including the shell. See attached file from the manufacturer (xylem).

The Township prefers Flygt pumps to match all other stations in Cardinal. In regards to the FRP wetwell, could you include a reference (contact info and location) for a municipality that uses this?

2- The control building is not needed except for the generator. If you have any requirements, please let us know. There is a site plan appended to the report.

Please have the pump and flow controls, level transmitter systems, generator and electrical all under one roof.

3- Stand-by generator: natural gas or diesel?

Natural Gas

4- Do you have any particular requirements for the SCADA or control panel, so all Cardinal pumping stations will be harmonized?

SCADA – We have Elpro radios installed at our other stations to transmit level information back to our central SCADA system. The same would be required for the new station.

Control panel- We currently use a Greyline level and pressure transducer system at most stations in Cardinal for pump control. This would be the preferable system. We also use ABB flow meters.

Additional/Early Comments:

Please include more detail regarding the configuration of the valve chamber, perhaps an actual drawing. We would like to see a means of bypass so the wet well could be pumped down by a portable 4" pump directly to the force main, (bypass), to allow internal work in the wet well without disrupting flows or bypassing sewage to the storm system.

In section 3.0 Proposed Forcemain, it is indicated that the min size of the forcemain is 100mm and the proposed sizing is 150. It is described latter on as a 150 but we would like to see a commitment to 150mm.

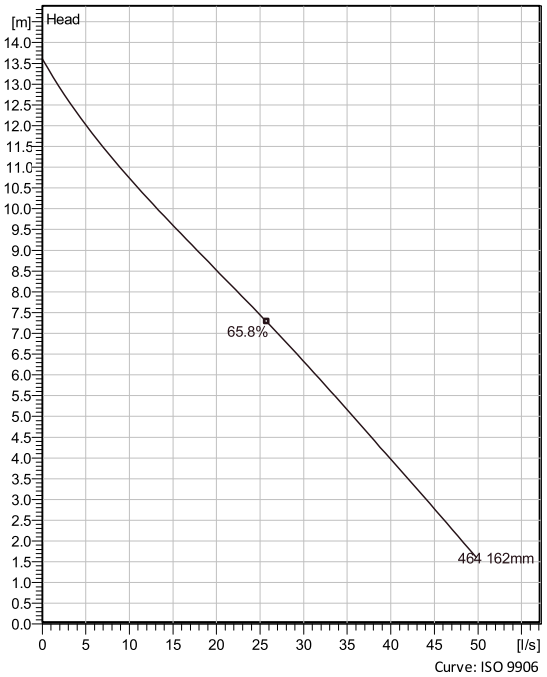
Thankyou
WendyVanKeulen

NP 3102 MT 3~ Adaptive 464

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification

Curves according to: Water, pure Water, pure [100%],277 K,999.9 kg/m³,1.5692 mm²/s



Curve: ISO 9906

Configuration

Motor number
N3102.060 18-11-4AL-W 5hp

Installation type
P - Semi permanent, Wet

Impeller diameter
162 mm

Discharge diameter
100 mm

Pump information

Impeller diameter
162 mm

Discharge diameter
100 mm

Inlet diameter
100 mm

Maximum operating speed
1745 1/min

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Stator housing material
Grey cast iron

Project	**Created by**	Eric Mondoux	
Block	**Created on**	8/2/2022	**Last update** 8/2/2022

NP 3102 MT 3~ Adaptive 464

Technical specification

Motor - General

Motor number N3102.060 18-11-4AL-W 5hp	**Phases** 3~	**Rated speed** 1745 1/min	**Rated power** 5 hp
ATEX approved No	**Number of poles** 4	**Rated current** 5.1 A	**Stator variant** 63
Frequency 60 Hz	**Rated voltage** 600 V	**Insulation class** H	**Type of Duty** S1
Version code 060			

Motor - Technical

Power factor - 1/1 Load 0.82	**Motor efficiency - 1/1 Load** 85.2 %	**Total moment of inertia** 0.0253 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.76	**Motor efficiency - 3/4 Load** 85.8 %	**Starting current, direct starting** 31 A	
Power factor - 1/2 Load 0.65	**Motor efficiency - 1/2 Load** 84.4 %	**Starting current, star-delta** 10.3 A	

Project	**Created by**	Eric Mondoux		
Block	**Created on**	8/2/2022	**Last update**	8/2/2022

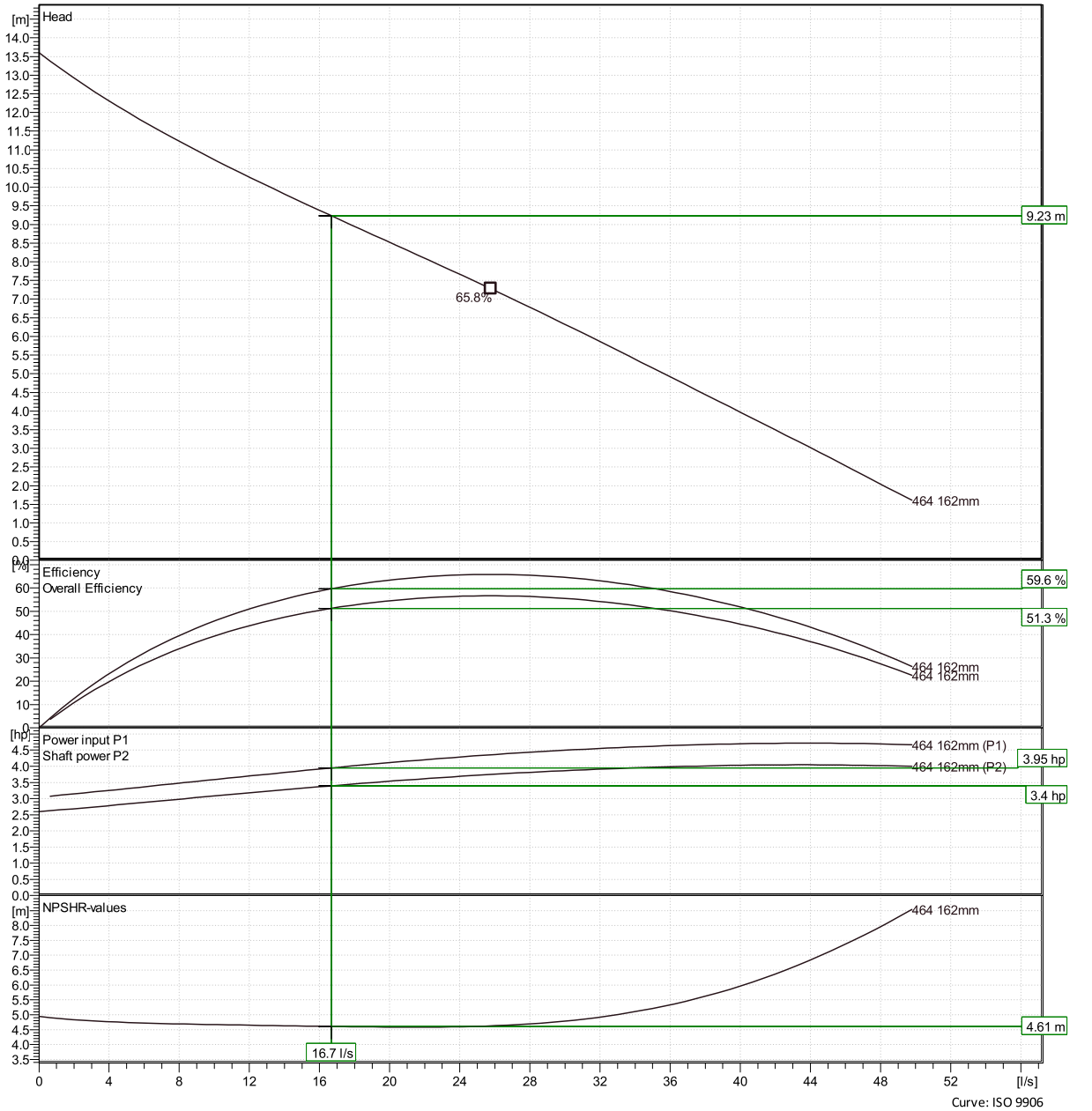
NP 3102 MT 3~ Adaptive 464

Performance curve

Duty point

Flow	Head
16.7 l/s	9.23 m

Curves according to: Water, pure Water, pure [100%],277 K,999.9 kg/m³,1.5692 mm²/s



Curve: ISO 9906

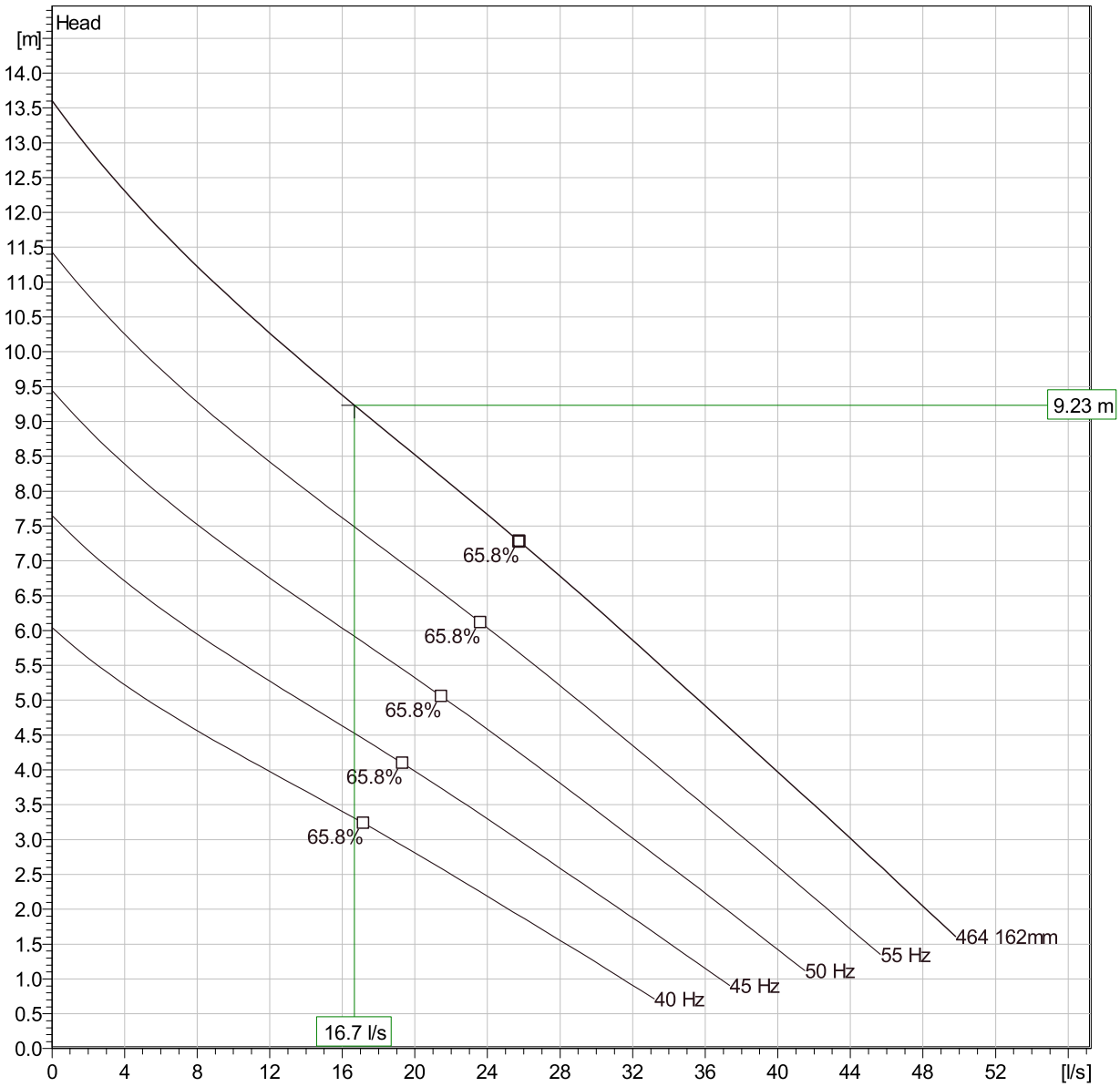
Eric Mondoux

Created on 8/2/2022 **Last update** 8/2/2022

NP 3102 MT 3~ Adaptive 464

Duty Analysis

Curves according to: Water, pure [100%] ; 277K; 999.9kg/m³; 1.5692mm²/s



Operating characteristics

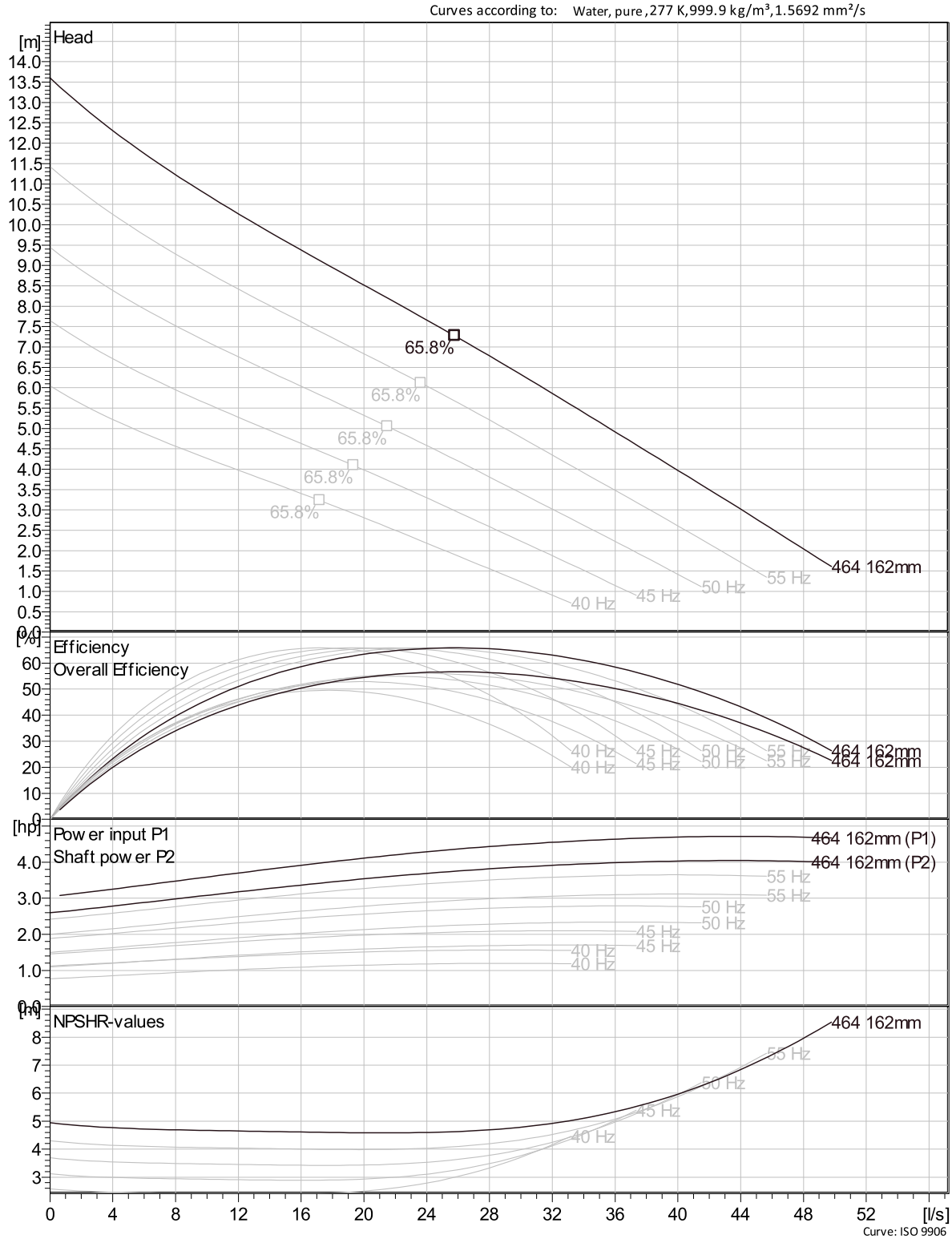
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	hp	l/s	m	hp		kWh/m³	m
1	16.7	9.23	3.4	16.7	9.23	3.4	59.6 %	0.049	4.61

Project		**Created by**	Eric Mondoux		
Block		**Created on**	8/2/2022	**Last update**	8/2/2022

NP 3102 MT 3~ Adaptive 464

VFD Curve

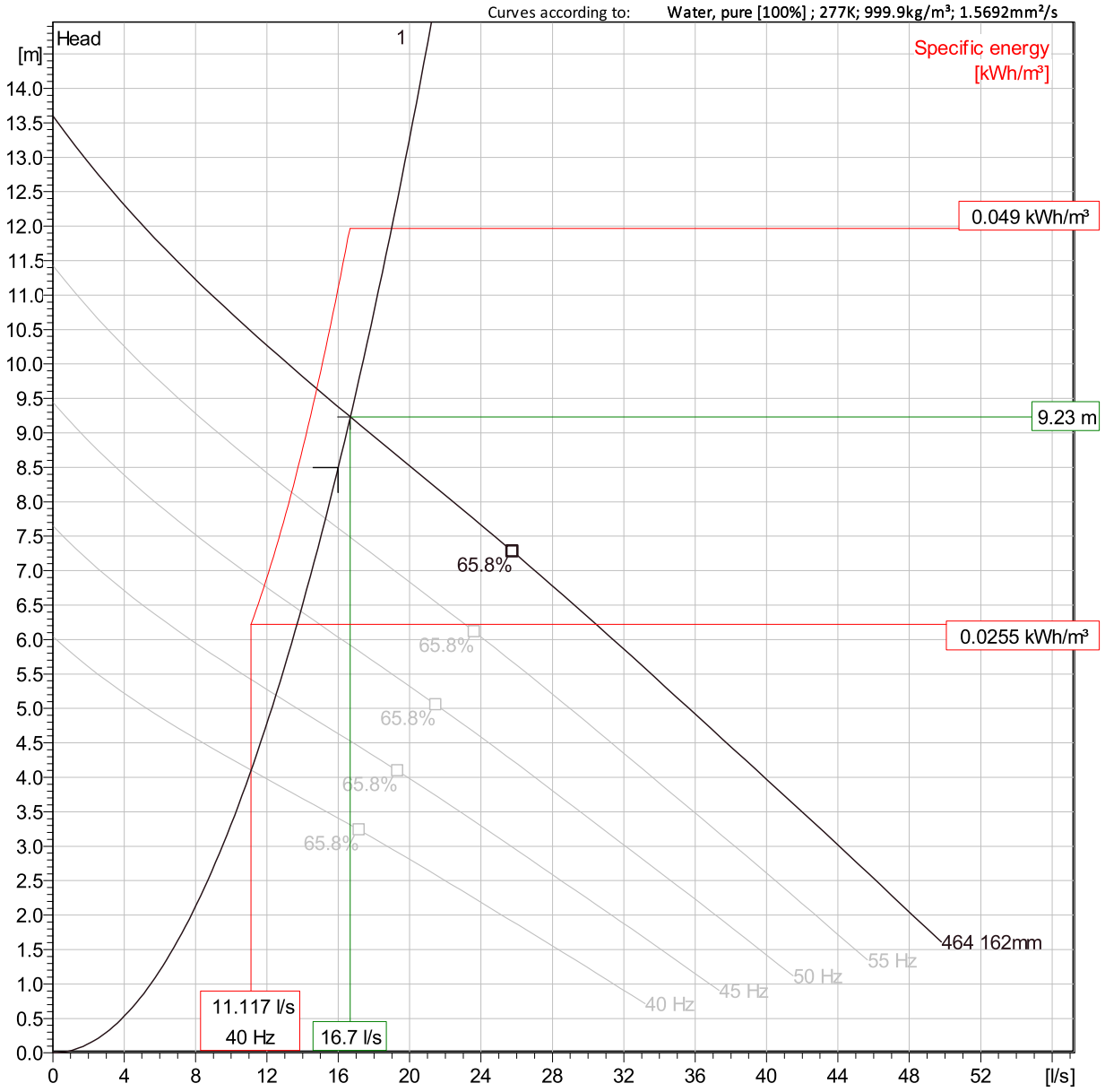
Curves according to: Water, pure ,277 K,999.9 kg/m³,1.5692 mm²/s



Project	**Created by**	Eric Mondoux	
Block	**Created on**	8/2/2022	**Last update** 8/2/2022

NP 3102 MT 3~ Adaptive 464

VFD Analysis



Operating Characteristics

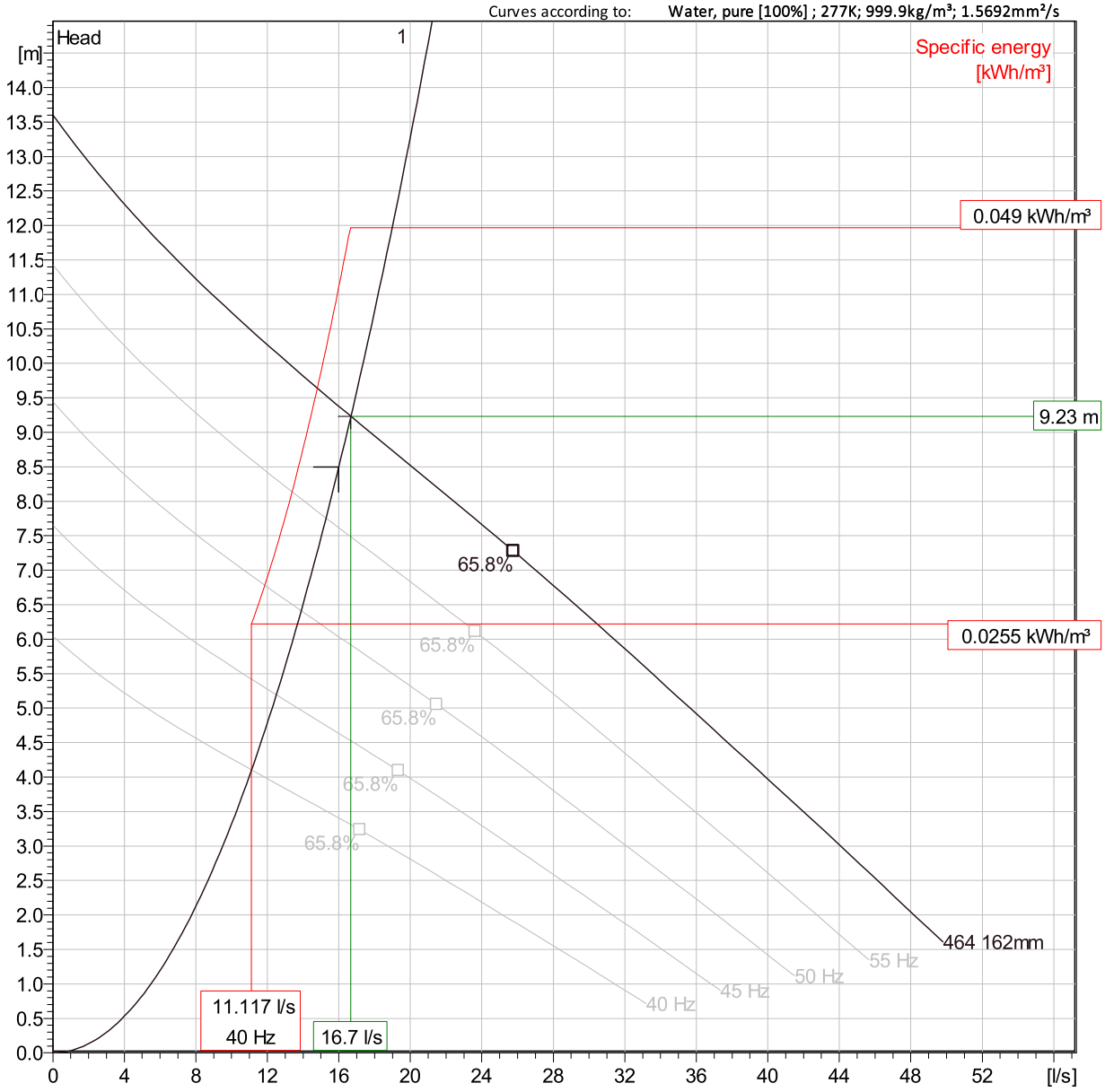
Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	hp	l/s	m	hp		kWh/m³	m
1	60 Hz	16.7	9.23	3.4	16.7	9.23	3.4	59.6 %	0.049	4.61
1	55 Hz	15.3	7.76	2.62	15.3	7.76	2.62	59.6 %	0.0419	4.01
1	50 Hz	13.9	6.41	1.96	13.9	6.41	1.96	59.6 %	0.0355	3.44
1	45 Hz	12.5	5.19	1.43	12.5	5.19	1.43	59.6 %	0.03	2.91

Project		**Created by**	Eric Mondoux		
Block		**Created on**	8/2/2022	**Last update**	8/2/2022

NP 3102 MT 3~ Adaptive 464

VFD Analysis

Curves according to: Water, pure [100%] ; 277K; 999.9kg/m³; 1.5692mm²/s



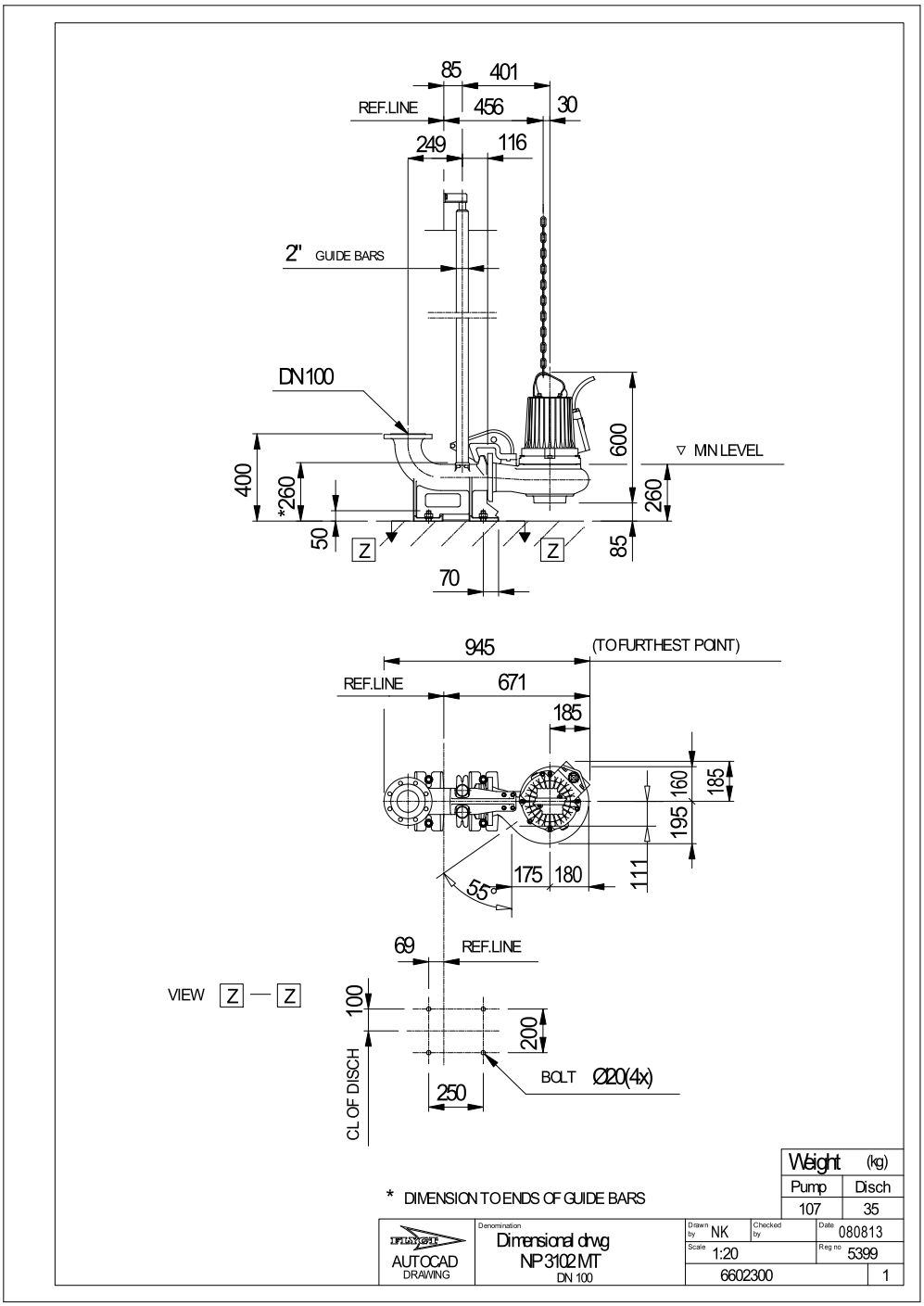
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	hp	l/s	m	hp		kWh/m³	m
1	40 Hz	11.1	4.1	1.01	11.1	4.1	1.01	59.6 %	0.0255	2.41

Project		**Created by**	Eric Mondoux		
Block		**Created on**	8/2/2022	**Last update**	8/2/2022

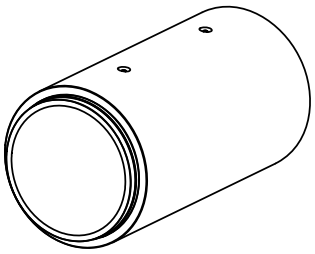
NP 3102 MT 3~ Adaptive 464

Dimensional drawing

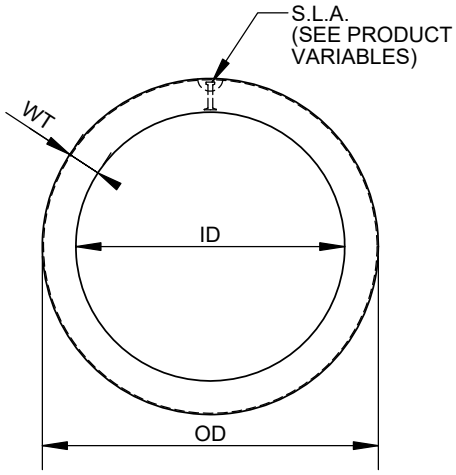


Project		**Created by**	Eric Mondoux		
Block		**Created on**	8/2/2022	**Last update**	8/2/2022

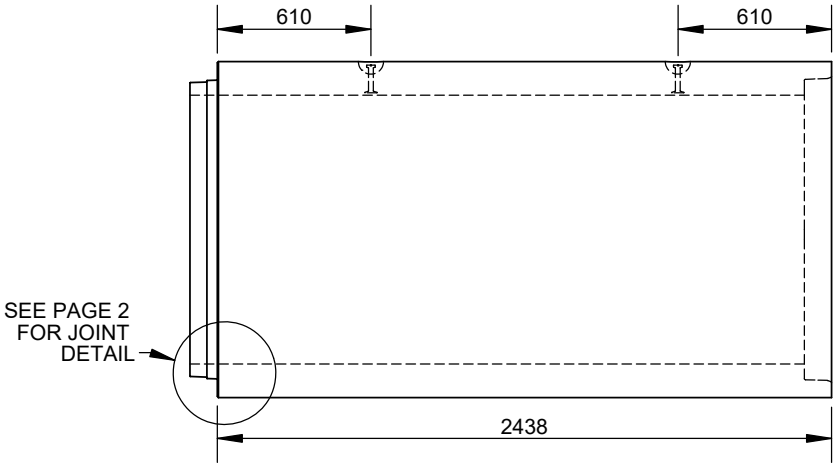
NOTES:
1. S.L.A. ON SINGLE OR DOUBLE CAGE DESIGN TO BE LOCATED ANYWHERE ON THE CIRCUMFERENCE
2. ENSURE S.L.A. RECESSES ARE FREE DRAINING WHEN STORE IN THE YARD



ISOMETRIC VIEW



TYPICAL SECTION



SIDE VIEW

PRODUCT VARIABLES

PART ID	NOMINAL SIZE	ID	OD	WT	MASS (KG)	MFG	SLA		MIN. SLING ANGLE
							SPEC.	f'c (MPa)	
PA1050X4	1050	1067	1334	133	3115	GUE	4T 3-1/2	30	60
						OAK	4T 3-1/2 DH	30	60
PA1200X48	1200	1219	1473	127 BW	3475	OAK	4T 3-1/2 DH	30	60
PA1200X49	1200	1219	1511	146 CW	3810	GUE	4T 4-1/4	30	60
PA1350X48	1350	1372	1652	140 BW	4115	OAK	4T 4-1/4 DH	30	60
PA1350X49	1350	1372	1689	159 CW	4731	GUE	4T 4-3/4	30	60
PA1500X4	1500	1524	1829	152	5180	OAK	4T 4-1/4 DH	30	60
						GUE	4T 4-3/4	35	60
PA1650X4	1650	1676	2007	165	6101	GUE	4T 4-3/4	40	60
PA1800X4	1800	1829	2184	178	6991	GUE	8T 5-3/4	30	60
PA1950X4	1950	1981	2362	191	8110	GUE	8T 5-3/4	40	60
PA2100X4	2100	2134	2540	203	9290	GUE	8T 6-1/4	30	60
PA2250X4	2250	2286	2718	216	10520	GUE	8T 6-3/4	30	60
PA2400X4	2400	2438	2896	229	11880	GUE	8T 7-1/8	30	60
PA2550X4	2550	2591	3073	241	12637	GUE	8T 7-1/8	40	60
PA2700X4	2700	2743	3251	254	14035	GUE	8T 8-1/4	40	60
PA3000X4	3000	3048	3607	279	17185	GUE	20T 10	40	60

ALL DIMENSIONS ARE IN mm
DRAWINGS ARE NOT TO SCALE
VIEWS ARE AS INSTALLED
STANDARD CLASS: 65D, 100D, 140D
LIFTING RIGGING CODE: S2S-SP
REF TO REG DWG: LH-PA02

MIN. CONC STRENGTH 30-40 MPa
BASED ON CLASS
CLEAR COVER DEPENDS ON CAGE DESIGN. REF TO CSA 257.2-14
TOLERANCES TO CSA A257.2-14

CON CAST PIPE (CCP) STANDARD DRAWING

STD. CSA 257.2 REV 2014 DOC PAXXXXX4

TITLE

REINFORCED CONCRETE PIPE
1050 - 3000 mm DIAMETER
SIZE GUIDE

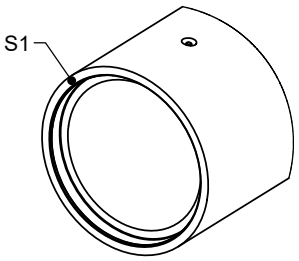
REV.	DESCRIPTION	ENG.	DATE
8	SLA UPDATE, RIGGING REF, CSA A257.2 UPDATE	RM	5APR16
7	SLA UPDATE FOR 2550	RM	7/NOV/14
6	REVIEWED, SLA NOTES	SW	17/SEP/14

DRAWN BY	CHECKED BY	DATE	FILE	PAGE
SW	CW	4/JAN/11	Pipe	1 OF 2

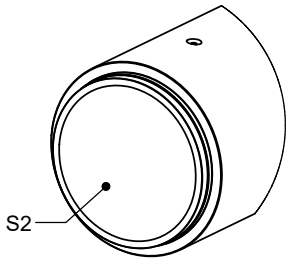
CONCAST RR 3 Guelph, ON N1H 6H9 Fax: (519) 763-1956 1-800-668-7473 www.concastpipe.com

STENCIL (S1)
(SIZE) X (CLASS)

STENCIL (S2)
(CCP-GUELPH / OCP-OAKVILLE) CSA A257.2 (SIZE) X (CLASS) TYPE HSe (DATE OF MFG)

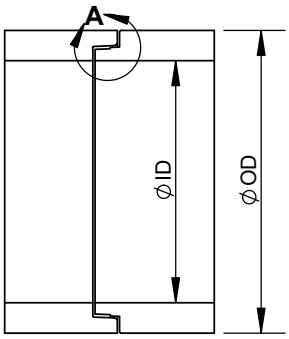


ISOMETRIC BELL END VIEW

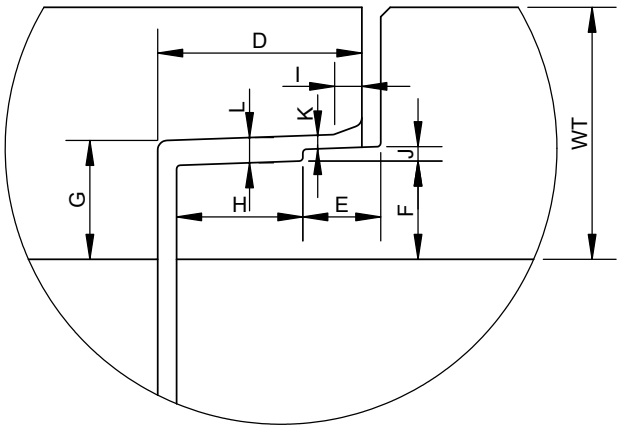


ISOMETRIC SPIGOT END VIEW

ENGINEER STAMP (IF REQUIRED)



PIPE JOINT SECTION VIEW



DETAIL A

PART ID	NOMINAL SIZE	ID	OD	WT	D	E	F	G	H	I	J	K	L
PA1050X4	1050	1067	1334	133	108.0	41.2	53.0	62.1	66.8	15.9	7.6	3.7	11.3
PA1200X48	1200	1219	1473	127 BW	108.0	44.5	53.0	62.1	63.5	19.1	7.6	3.7	11.3
PA1200X49	1200	1219	1511	146 CW	108.0	41.2	52.2	62.1	66.8	15.9	7.6	3.7	11.3
PA1350X48	1350	1372	1652	140 BW	108.0	44.5	49.3	58.4	63.5	22.2	7.6	3.7	11.3
PA1350X49	1350	1372	1689	159 CW	108.0	41.2	49.5	58.4	66.8	15.9	7.6	3.7	11.3
PA1500X4	1500	1524	1829	152	120.7	53.9	55.8	64.7	66.8	22.2	7.6	3.7	11.3
PA1650X4	1650	1676	2007	165	127.0	60.2	62.2	71.1	66.8	22.2	7.6	3.7	11.3
PA1800X4	1800	1829	2184	178	127.0	60.2	65.7	74.6	66.8	31.8	7.6	3.7	11.3
PA1950X4	1950	1981	2362	191	127.0	57.1	71.4	82.2	69.9	31.8	8.9	4.4	13.3
PA2100X4	2100	2134	2540	203	127.0	57.1	77.7	88.5	69.9	31.8	8.9	4.4	13.3
PA2250X4	2250	2286	2718	216	127.0	57.1	84.1	94.9	69.9	31.8	8.9	4.4	13.3
PA2400X4	2400	2438	2896	229	127.0	57.1	90.4	101.2	69.9	31.8	8.9	4.4	13.3
PA2550X4	2550	2591	3073	241	127.0	57.1	96.4	107.5	69.9	31.8	8.9	4.4	13.3
PA2700X4	2700	2743	3251	254	127.0	57.1	103.1	114.0	69.9	31.8	8.9	4.4	13.3
PA3000X4	3000	3048	3607	279	152.0	82.1	99.9	110.8	69.9	31.8	8.9	4.4	13.3

ALL DIMENSIONS ARE IN mm
DRAWINGS ARE NOT TO SCALE

MIN. CONC STRENGTH 30-40 MPa
BASED ON CLASS
CLEAR COVER DEPENDS ON CAGE DESIGN. REF TO CSA 257.2
TOLERANCES TO CSA A257.2

CON CAST PIPE (CCP) STANDARD DRAWING

STD. CSA 257.2 REV 2014 | DOC PAXXXXX4

TITLE

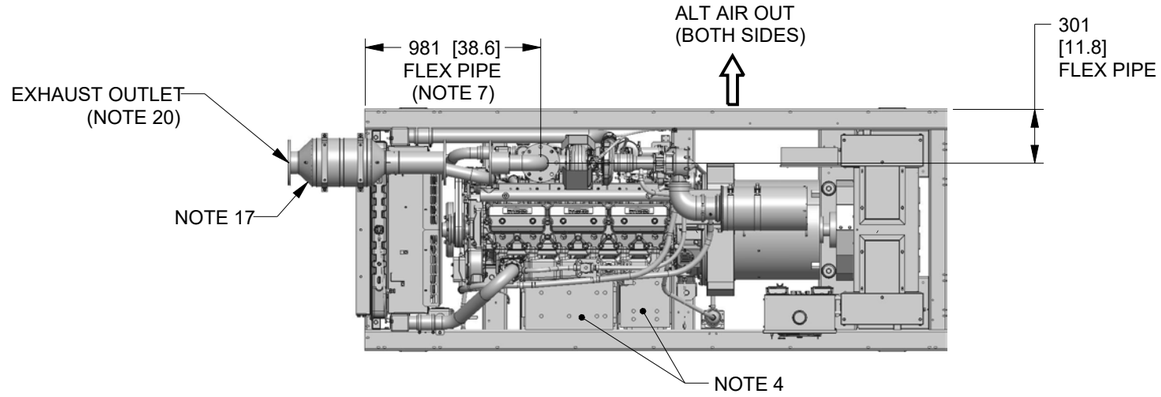
REINFORCED CONCRETE PIPE
1050 - 3000 mm DIAMETER
JOINT AND STENCILING DETAILS

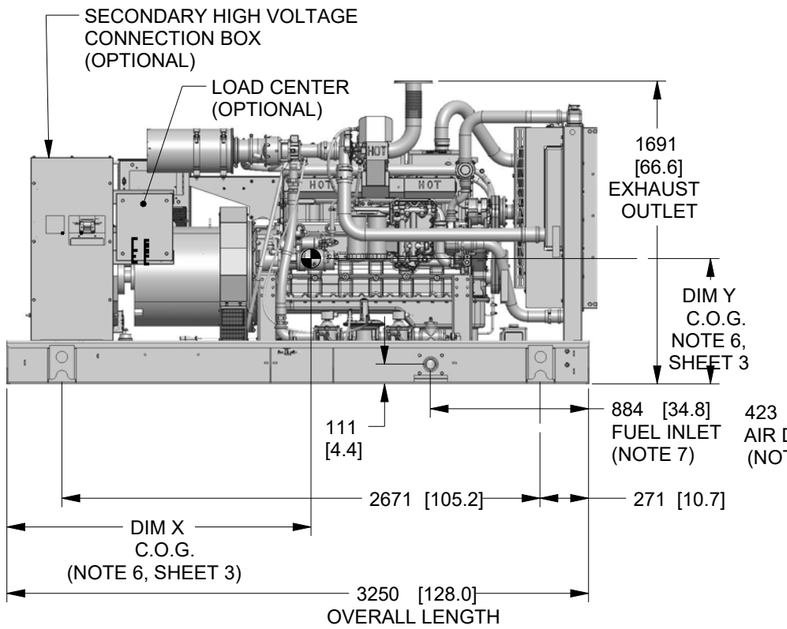
REV.	DESCRIPTION	ENG.	DATE
4	CSA A257.2-14	SW	5APR2016
3	CORRECT ERROR F AND G VALUES	SW	12/JUN/12
2	ADD ENG. STAMP	CW	19/OCT/11

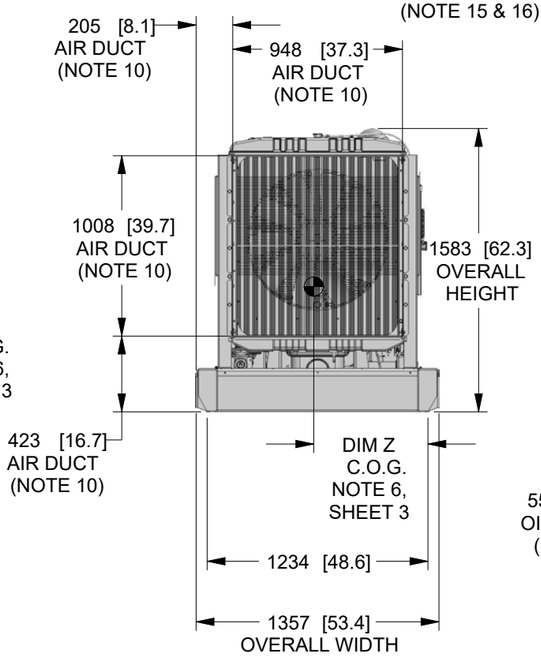
DRAWN BY	CHECKED BY	DATE	FILE	PAGE
SW	CW	4/JAN/11	Pipe	2 OF 2

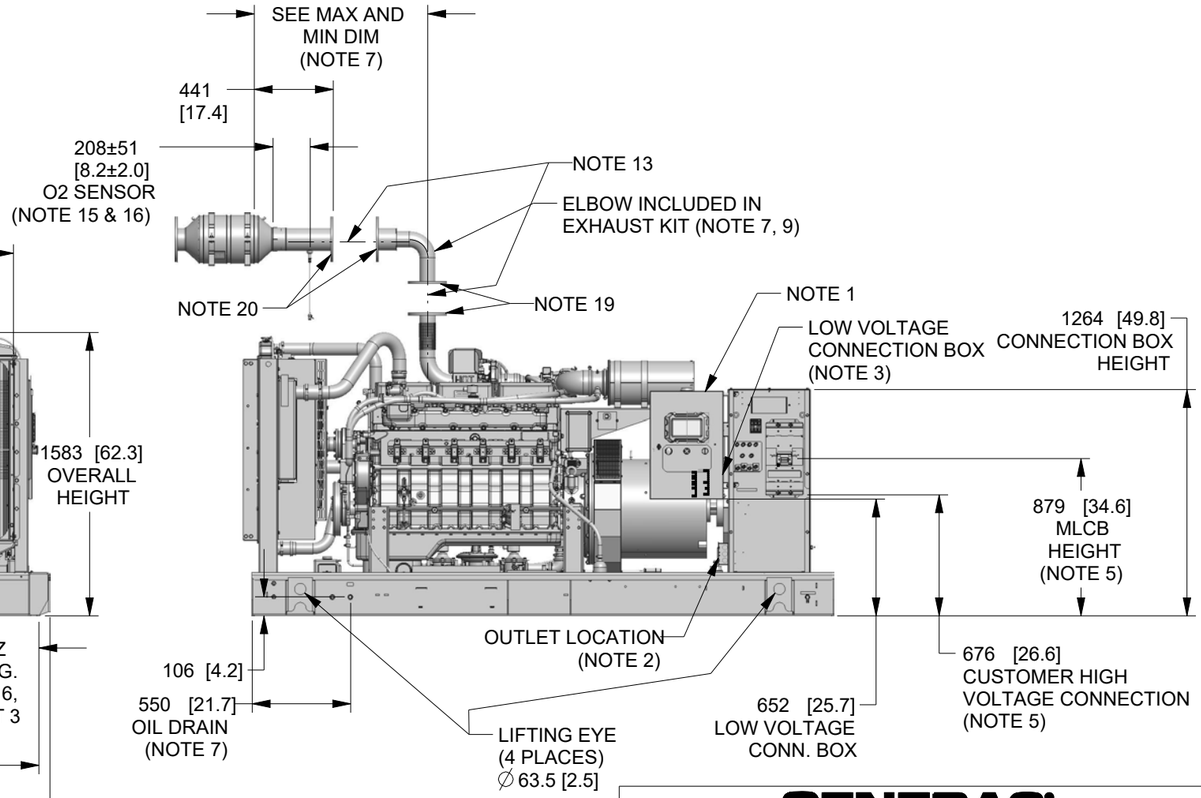
CONCAST RR 3 Guelph, ON N1H 6H9 Fax: (519) 763-1956 1-800-668-7473 www.concastpipe.com

Notes:
1. CONTROL PANEL, (OPTIONAL BATTERY CHARGER INSIDE).
2. 120V, 20A GFCI & 250V, 15A OUTLET (OPTIONAL).
3. CONNECTION POINTS FOR CONTROL WIRES PROVIDED IN THE LOW VOLTAGE CONNECTION BOX (USE LOW VOLTAGE STUB-UP AREA).
4. BATTERIES (24 VOLT NEGATIVE GROUND SYSTEM).
5. MAIN LINE CIRCUIT BREAKER (MLCB), AC LOAD LEADS & NEUTRAL CONNECTIONS (DIMENSIONS MAY VARY DUE TO UNIT CONFIGURATION)
6. CENTER OF GRAVITY AND WEIGHT MAY CHANGE DUE TO UNIT OPTIONS. FOR WEIGHT AND CENTER OF GRAVITY DATA SEE SHEET 3.
7. ENGINE SERVICE CONNECTIONS:
   INLET NATURAL GAS = 2" NPT FEMALE COUPLING
   OIL DRAIN = 1/2" NPT FEMALE COUPLING
   EXHAUST CONNECTIONS = SEE NOTE 19 & 20
   MAX:2241MM 9 (88.2"). MIN: 1631MM (64.2"). EXHAUST FLANGETO CATALYST BRICK
***** SEE GENERATOR SIZING GUIDE FOR FUEL PIPE SIZING TO SUIT APPLICATION *****
8. AUXILARY AC CONNECTION FOR UNIT OPTIONS ARE LOCATED IN HIGH VOLTAGE CONNECTION BOX, UNLESS AN OPTIONAL LOAD CENTER IS INSTALLED.
9. EXHAUST MAY BE ROTATED TO ALLOW CATALYST SILENCER TO POINT OUT TO THE RIGHT OR LEFT SIDE OF GENERATOR.
10. GENERATOR SET MUST BE INSTALLED SUCH THAT FRESH COOLING AIR IS AVAILABLE AND DISCHARGE AIR FROM THE RADIATOR IS NOT RECIRCULATED. SEE SPEC SHEET FOR MIN AIR FLOW AND MAX RESTRICTION REQURIEMENTS.
11. BOTTOM OF GENERATOR SET MUST BE ENCLOSED TO PREVENT PEST INTRUSION AND RECIRCULATION OF DISCHARGE AIR AND/OR IMPROPER COOLING AIR FLOW.
12. EXHAUST SYSTEM MAXIMUM BACK PRESSUE = 10" H2O POST SILENCER.
13. INSTALL EXHAUST BLANKETS ALONG THIS LINE. (BLANKETS NOT PROVIDED BY GENERAC)
14. CONNECT THE OPEN SET EXHAUST PER NFPA 37.
15. BLANKETS SHOULD NOT COVER OXYGEN SENSOR.
16. OXYGEN SENSOR MUST BE MOUNTED BETWEEN TURBO CHARGER AND CATALYST SILENCER INLET UPRIGHT AS SHOWN. IF ELBOW IS REQUIRED, ONLY SINGLE ELBOW MAY BE USED.
17. CATALYST SILENCER (FOR EPA UNITS) MUST BE MOUNTED IN DESCRIBED POSITION. FAILING TO FOLLOW THESE INSTRUCTIONS WHEN INSTALLING A CERTIFIED ENGINE IN A PIECE OF STATIONARY EQUIPMENT VIOLATES FEDERAL LAW 40 CFR 1068.105(b), SUBJECT TO FINES OR PENALTIES AS DESCRIBED IN THE CLEAN AIR ACT.
18. BOLTS OR STUDS USED TO MOUNT UNIT TO PAD SHALL BE 5/8 - 11 GRADE 5.
19. 3.5" EXHAUST FLANGE WITH MOUNTING HOLES AS PER ANSI/ASME B16.5 CLASS 150.
20. 5"FLANGE WITH MOUNING HOLES AS PER ANSI/ASME B16.5 CLASS 150.
21. IT IS THE RESPONSIBILITY OF THE INSTALLATION TECHNICIAN TO ENSURE THAT THE GENERATOR INSTALLATION COMPLIES WITH ALL APPLICABLE CODES, STANDARDS AND REGULATIONS.









DRAWING CREATED FROM PRO/ENGINEER 3D FILE. ECO MODIFICATION TO BE APPLIED TO SOLID MODEL ONLY.

DIMENSIONS ARE IN MILLIMETERS [INCHES]

INSTALLATION DRAWING

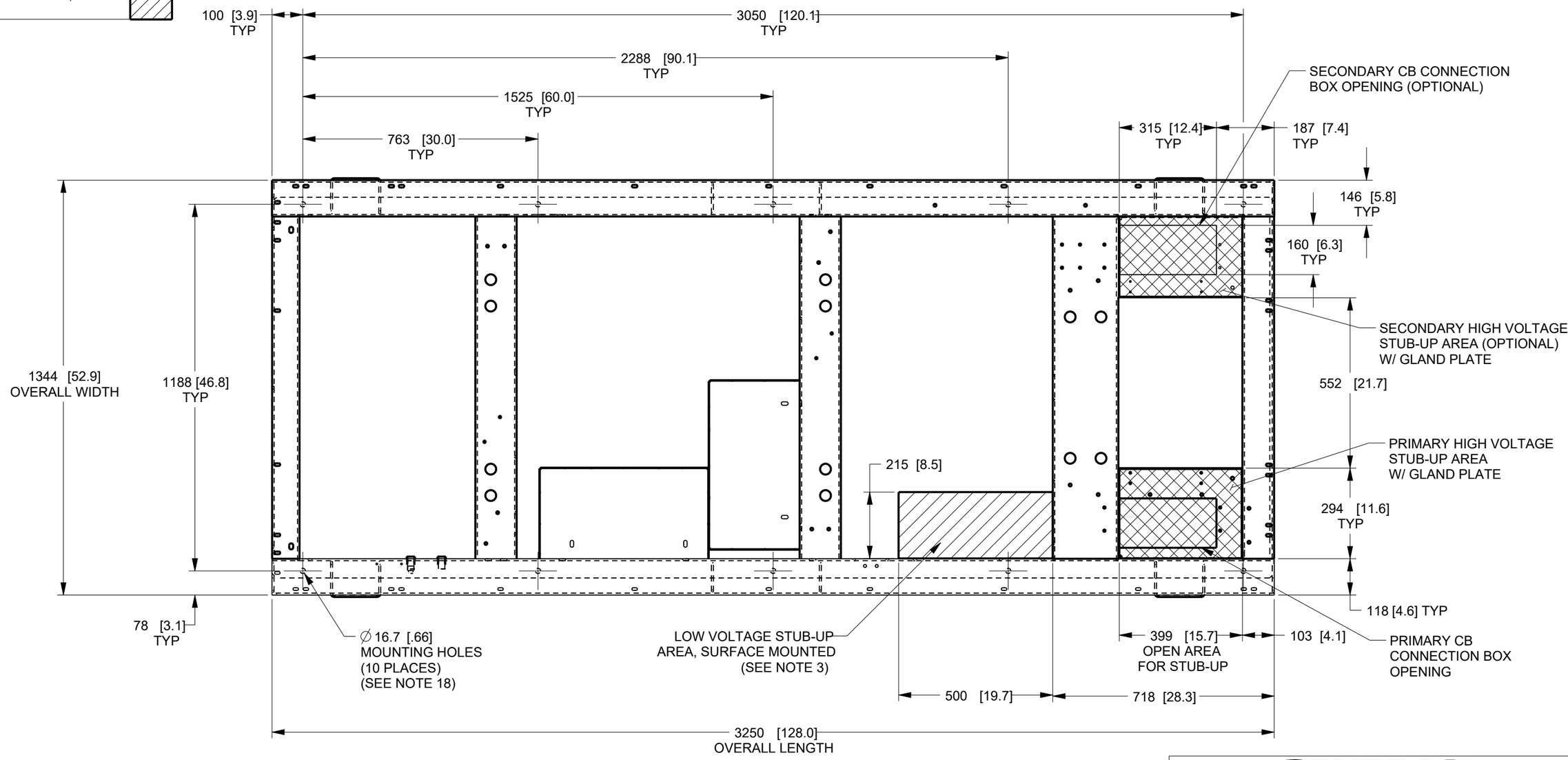
ELECTRONICALLY APPROVED
INSIDE WINDCHILL

GENERAC

TITLE
OPEN SET
G14.2L
60HZ: SG150/PG135, SG175/PG158, SG200/PG180
50HZ: SG120/PG108, SG140/PG126, SG160/PG144

ISSUE DATE: 11/26/14			
SIZE B	CAGE NO N/A	DWG NO 10000039585	REV C
SCALE 0.030	WT-KG	SHEET 1 of 3	

RECOMMENDED ELECTRICAL STUB-UP	
(HIGH VOLTAGE STUB-UP) AC LOAD LEAD CONDUIT FOR PERMANENT MAGNET EXCITATION CONNECTION BOX	
(LOW VOLTAGE STUB-UP)	



DRAWING CREATED FROM PRO/ENGINEER 3D FILE. ECO MODIFICATION TO BE APPLIED TO SOLID MODEL ONLY.

DIMENSIONS ARE IN MILLIMETERS [INCHES]

INSTALLATION DRAWING

ELECTRONICALLY APPROVED
INSIDE WINDCHILL

GENERAC

TITLE
STUB-UP VIEW
G14.2L
60HZ: SG150/PG135, SG175/PG158, SG200/PG180
50HZ: SG120/PG108, SG140/PG126, SG160/PG144

ISSUE DATE: 11/26/14			
SIZE B	CAGE NO N/A	DWG NO 10000039585	REV C
SCALE 0.075	WT-KG	SHEET 2 of 3	

OPEN SET

MODEL	VOLTAGE	WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
SG/MG 120, 150, PG/WG 108, 135	240V, ∅	2,396 kg [5,281 lbs]	1748 [68.8]	706 [27.8]	615 [24.2]
SG/MG 120, 150, PG/WG 108, 135	600V	2,439 kg [5,376 lbs]	1732 [68.2]	704 [27.7]	
SG/MG 120, 150, PG/WG 108, 135	208V, 240V, 480V	2,445 kg [5,389 lbs]	1730 [68.1]	704 [27.7]	
SG/MG 140, 175, PG/WG 126, 158	240V, ∅	2,463 kg [5,429 lbs]	1721 [67.8]	703 [27.7]	
SG/MG 140, 175, PG/WG 126, 158	600V	2,469 kg [5,442 lbs]	1719 [67.7]	703 [27.7]	
SG/MG 160, 200, PG/WG 144, 180	208V, 240V, 480V	2,477 kg [5,460 lbs]	1716 [67.6]	702 [27.6]	

NOTE:
CENTER OF GRAVITY AND WEIGHT MAY CHANGE DUE TO UNIT OPTIONS

STD ENCLOSURE, STEEL

MODEL	VOLTAGE	WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
SG/MG 120, 150, PG/WG 108, 135	240V, ∅	2,840 kg [6,261 lbs]	1843 [72.6]	777 [30.6]	577 [22.7]
SG/MG 120, 150, PG/WG 108, 135	600V	2,883 kg [6,356 lbs]	1828 [72.0]	774 [30.5]	
SG/MG 120, 150, PG/WG 108, 135	208V, 240V, 480V	2,889 kg [6,369 lbs]	1826 [71.9]	773 [30.4]	
SG/MG 140, 175, PG/WG 126, 158	240V, ∅	2,907 kg [6,409 lbs]	1818 [71.6]	772 [30.4]	
SG/MG 140, 175, PG/WG 126, 158	600V	2,913 kg [6,422 lbs]	1816 [71.5]	772 [30.4]	
SG/MG 160, 200, PG/WG 144, 180	208V, 240V, 480V	2,921 kg [6,440 lbs]	1814 [71.4]	771 [30.4]	

STD ENCLOSURE, ALUMINUM

WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
2,629 kg [5,795 lbs]	1837 [72.3]	757 [29.8]	577 [22.7]
2,672 kg [5,890 lbs]	1821 [71.7]	754 [29.7]	
2,678 kg [5,903 lbs]	1819 [71.6]	754 [29.7]	
2,696 kg [5,943 lbs]	1810 [71.3]	753 [29.6]	
2,702 kg [5,956 lbs]	1808 [71.2]	752 [29.6]	
2,710 kg [5,974 lbs]	1805 [71.1]	752 [29.6]	

L1A ENCLOSURE, STEEL

MODEL	VOLTAGE	WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
SG/MG 120, 150, PG/WG 108, 135	240V, ∅	2,978 kg [6,566 lbs]	1771 [69.7]	790 [31.1]	578 [22.8]
SG/MG 120, 150, PG/WG 108, 135	600V	3,021 kg [6,660 lbs]	1758 [69.2]	787 [31.0]	
SG/MG 120, 150, PG/WG 108, 135	208V, 240V, 480V	3,027 kg [6,674 lbs]	1757 [69.2]	786 [31.0]	
SG/MG 140, 175, PG/WG 126, 158	240V, ∅	3,045 kg [6,713 lbs]	1749 [68.9]	785 [30.9]	
SG/MG 140, 175, PG/WG 126, 158	600V	3,051 kg [6,726 lbs]	1748 [68.8]	785 [30.9]	
SG/MG 160, 200, PG/WG 144, 180	208V, 240V, 480V	3,059 kg [6,744 lbs]	1745 [68.7]	784 [30.9]	

L1A ENCLOSURE, ALUMINUM

WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
2,688 kg [5,926 lbs]	1808 [71.2]	768 [30.2]	579 [22.8]
2,731 kg [6,021 lbs]	1792 [70.6]	765 [30.1]	
2,737 kg [6,034 lbs]	1791 [70.5]	764 [30.1]	
2,755 kg [6,074 lbs]	1782 [70.2]	763 [30.0]	
2,761 kg [6,087 lbs]	1780 [70.1]	763 [30.0]	
2,769 kg [6,104 lbs]	1777 [70.0]	762 [30.0]	

L2A ENCLOSURE, STEEL

MODEL	VOLTAGE	WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
SG/MG 120, 150, PG/WG 108, 135	240V, ∅	3,085 kg [6,801 lbs]	1859 [73.2]	886 [34.9]	580 [22.8]
SG/MG 120, 150, PG/WG 108, 135	600V	3,128 kg [6,896 lbs]	1845 [72.6]	881 [34.7]	
SG/MG 120, 150, PG/WG 108, 135	208V, 240V, 480V	3,134 kg [6,909 lbs]	1843 [72.6]	881 [34.7]	
SG/MG 140, 175, PG/WG 126, 158	240V, ∅	3,152 kg [6,949 lbs]	1836 [72.3]	879 [34.6]	
SG/MG 140, 175, PG/WG 126, 158	600V	3,158 kg [6,962 lbs]	1834 [72.2]	878 [34.6]	
SG/MG 160, 200, PG/WG 144, 180	208V, 240V, 480V	3,166 kg [6,980 lbs]	1831 [72.1]	877 [34.5]	

L2A ENCLOSURE, ALUMINUM

WEIGHT	CENTER OF GRAVITY DIM X	CENTER OF GRAVITY DIM Y	CENTER OF GRAVITY DIM Z
2,734 kg [6,027 lbs]	1855 [73.0]	827 [32.6]	581 [22.9]
2,777 kg [6,122 lbs]	1839 [72.4]	823 [32.4]	
2,783 kg [6,135 lbs]	1837 [72.3]	823 [32.4]	
2,801 kg [6,175 lbs]	1829 [72.0]	821 [32.3]	
2,807 kg [6,188 lbs]	1829 [71.9]	820 [32.3]	
2,815 kg [6,206 lbs]	1824 [71.8]	820 [32.3]	

DRAWING CREATED FROM PRO/ENGINEER 3D FILE. ECO MODIFICATION TO BE APPLIED TO SOLID MODEL ONLY.

DIMENSIONS ARE IN MILLIMETERS [INCHES]

INSTALLATION DRAWING

ELECTRONICALLY APPROVED
INSIDE WINDCHILL

GENERAC

TITLE
WEIGHT AND CENTER OF GRAVITY
G14.2L
60HZ: SG150/PG135, SG175/PG158, SG200/PG180
50HZ: SG120/PG108, SG140/PG126, SG160/PG144

ISSUE DATE: 11/26/14

SIZE	CAGE NO	DWG NO	REV
B	N/A	10000039585	C

SCALE 0.016 | WT-KG | SHEET 3 of 3

UNITED COUNTIES OF LEEDS AND GRENVILLE

VILLAGE OF CARDINAL

*****

LOCKMASTER' S MEADOW SUBDIVISION

PUMPING STATION

PART OF LOT 7, CONCESSION 1
GEOGRAPHIC TOWN OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL
COUNTY OF GRENVILLE

ADDRESS: COUNTY RD No. 22
CARDINAL, ONTARIO

APPLICANT:
Edwardsburgh Developments Ltd.
434-300 EARL GREY DRIVE
KANATA, ON K2T 1C1
613-282-5601

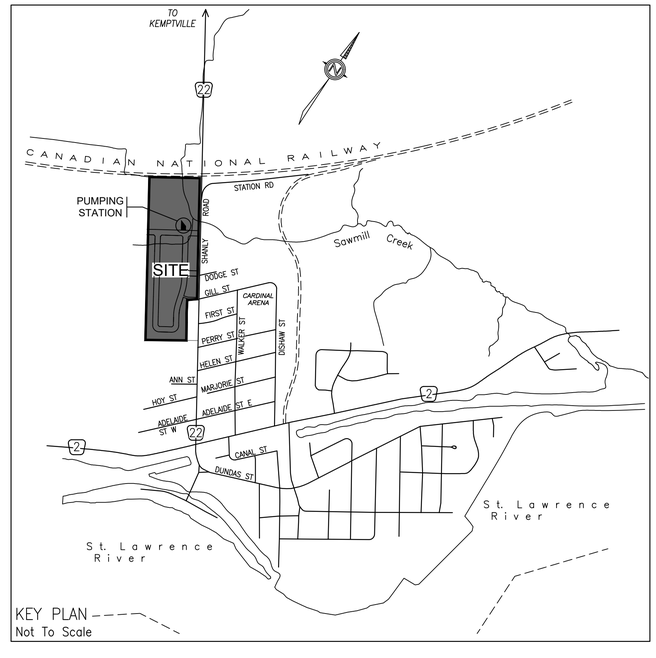
CONSULTANT:
ADVANCE ENGINEERING
Civil - Municipal - Structural
613-986-170

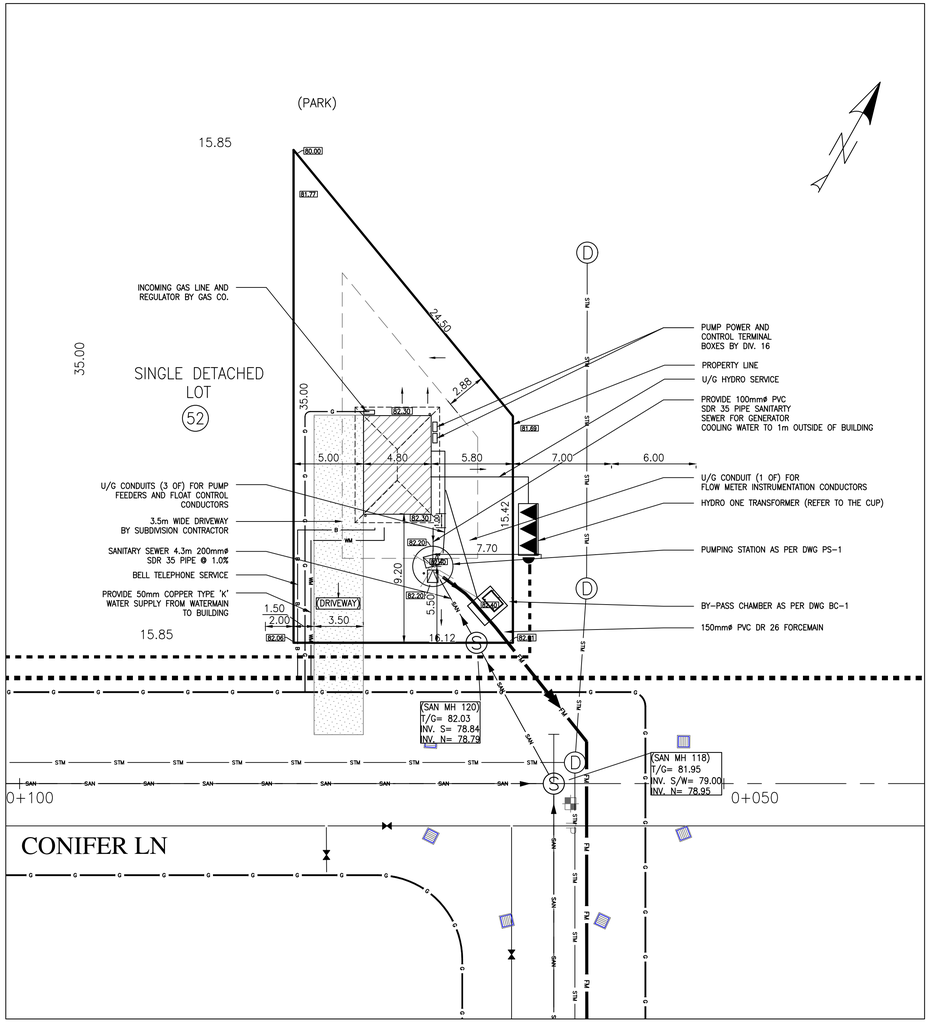
PROJECT No. 114

APRIL 2024

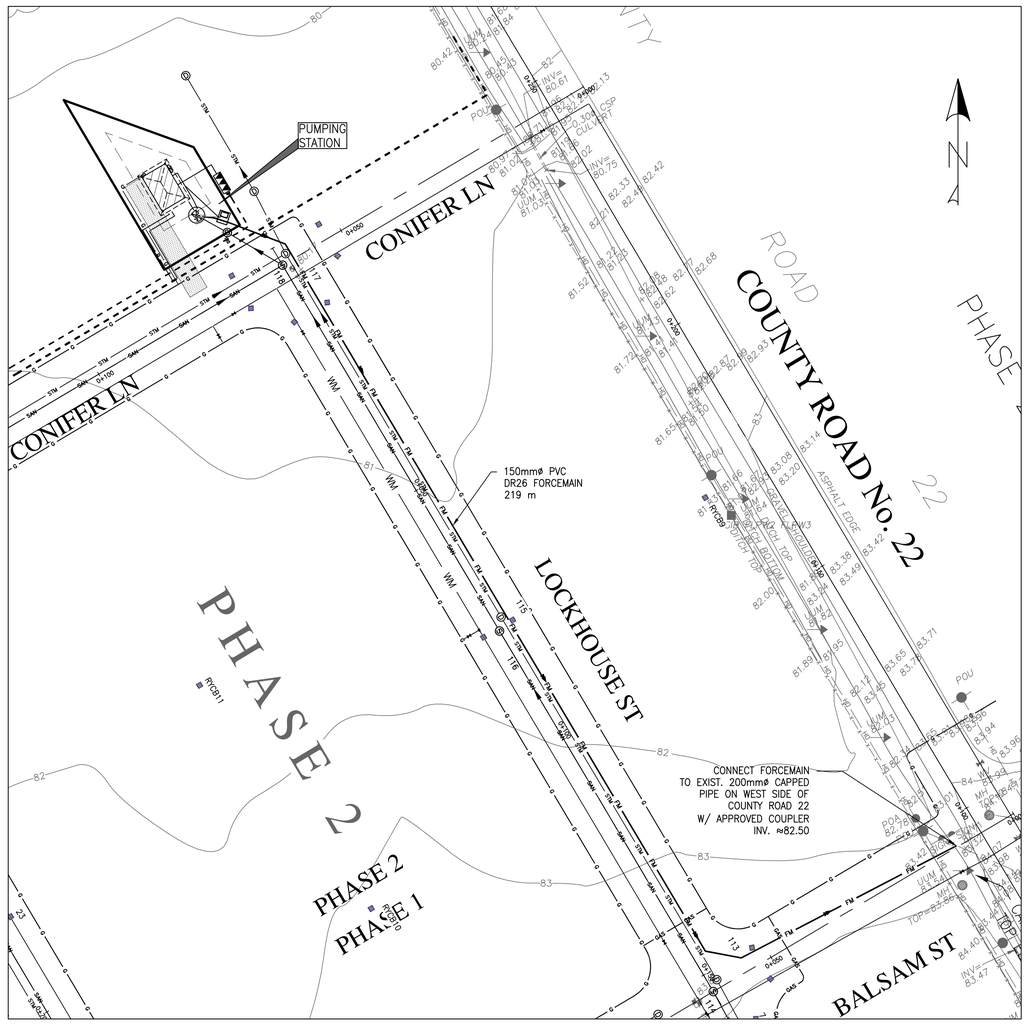
LIST OF DRAWINGS

No.	INDEX	TITLE	REV. No.	DATE
1	CS-1	COVER SHEET - LIST OF DRAWINGS & KEY PLAN	2	04-15-2024
2	PS-1	SITE PLAN AND GENERAL NOTES AND SPECIFICATIONS	2	04-15-2024
3	PS-2	PUMPING STATION WET WELL - SECTIONS AND DETAILS	2	04-15-2024
4	PS-3	PUMPING STATION FORCEMAIN BY-PASS CHAMBER	2	04-15-2024
5	PS-4	PUMPING STATION DETAILS	1	11-22-2023
6	A-1	PUMPING STATION GENERATOR BUILDING	1	11-22-2023
7	M-1	PUMPING STATION MECHANICAL PLANS	1	11-22-2023
8	E-1	PUMPING STATION ELECTRICAL PLANS	1	11-22-2023





SITE PLAN
1:200



FORCEMAIN LAYOUT
1:500

GENERAL NOTES AND SPECIFICATIONS:

1. ALL WORKS AND MATERIALS SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS).
2. ALL WORKS TO BE IN ACCORDANCE WITH TOWNSHIP OF EDWARDSBURGH/ CARDINAL BY-LAWS.
3. ALL WORKS SHALL COMPLY WITH THE TOWNSHIP'S CLI-ECA REQUIREMENTS AND THE MECP DESIGN CRITERIA FOR SANITARY SEWERS, STORM SEWERS AND FORCEMAINS DATED MAY 31, 2023 OR AS REVISED; AND THE MECP DESIGN GUIDELINES FOR SEWAGE WORKS, 2008, AS AMENDED FROM TIME TO TIME.
4. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
5. THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION, TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
6. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.
7. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SPECIFIED. PIPE SIZES ARE IN MILLIMETRE.
8. PIPE SECTION SIZES REFER TO INSIDE DIMENSIONS.
9. THERE WILL BE NO SUBSTITUTION OF MATERIALS UNLESS PRIOR WRITTEN APPROVAL BY VILLAGE OF CARDINAL HAS BEEN OBTAINED.
10. SHOULD DEEPLY BURIED ARCHAEOLOGICAL REMAINS BE FOUND ON THE PROPERTY DURING CONSTRUCTION ACTIVITIES, THE HERITAGE OPERATIONS UNIT OF THE ONTARIO MINISTRY OF CULTURE MUST BE NOTIFIED IMMEDIATELY.
11. SHOP DRAWINGS: CONTRACTOR TO SUBMIT SHOP DRAWINGS SHOWING EXCACT DETAILS FOR THE WET WELL AND THE BY-PASS VALVE CHAMBER.
12. PRECAST CONCRETE WET WELL COVER REINFORCEMENT TO BE EQUIVALENT TO OR GREATER THAN OPSD 703.023.
13. PRECAST CONCRETE WET WELL SECTIONS TO BE CLASS 65-D CONCRETE PIPE TO CSA A257.2-M1982.
14. PRECAST CONCRETE WET WELL BASE REINFORCEMENT TO BE EQUIVALENT TO OR GREATER THAN OPSD 701.061.
15. JOINTS OF PRECAST SECTIONS NOT TO BE COINCIDENT WITH OPENINGS.
16. USE MANUFACTURER'S GASKETS FOR JOINTS OF PRECAST SECTIONS.
17. PRECAST SECTIONS TO BE SEALED, GROUTED AND WATERPROOF COATED.
18. CONTRACTOR SHALL PERFORM A LEAK TEST BY FILLING THE WET WELL WITH WATER.
19. BENCHING SHALL BE 35 MPa CONCRETE.
20. FINAL ORIENTATION OF THE INFLUENT AND EFFLUENT WILL BE FIELD DETERMINED.
21. CONTRACTOR SHALL ENSURE THAT PUMPING STATION DOES NOT FLOAT OR MOVE DURING CONSTRUCTION.
22. THE ELEVATION OF THE GROUNDWATER TABLE IS AROUND 79.65 GEODETIC. CONTRACTOR TO PROVIDE DEWATERING AND SHORING PROCEDURES PRIOR TO EXCAVATION.
23. DURING CONSTRUCTION, SHOULD THE GROUNDWATER VOLUME OF PUMPING EXCEED 50,000 LITRES PER DAY, A PERMIT TO DEWATER SHOULD BE OBTAINED. SUITABLE FILTRATION WILL BE REQUIRED BEFORE DISCHARGING GROUNDWATER INTO SEWERS OR THE UNNAMED WATERCOURSE.
24. REFER TO GEOTECHNICAL INVESTIGATION REPORT BY ST LAWRENCE TESTING & TESTING INSPECTION CO. LTD. DATED MAY 31, 2021, FOR ADDITIONAL DETAILS.
25. WATER SERVICE CONNECTION SHALL BE 50 mm DIA. TYPE K SOFT COPPER. INSTALL AS PER OPSD 1104.010.
26. PROVIDE CURB-STOP AND BOX AT PROPERTY LINE ON THE STREET SIDE. CURB-STOP SHALL NOT BE IN SIDEWALK.
27. SANITARY LATERAL IS TO BE PVC SDR 28 CONFORM TO CSA B182.2, W/ RUBBER GASKET JOINT, IPEX "RING-TITE" (OR EQUIVALENT).
28. SERVICE CONNECTION SHALL BE LAID AT 1-2 % SLOPE AND 2.15 m MIN. AND 2.75 m MAX. DEEP BELOW FINISHED GRADE AT PROPERTY LINE.
29. SANITARY MANHOLES TO BE AS PER OPSD 701.010. BENCHING IN MANHOLES AS PER OPSD 701.021. GRANULAR BACKFILL AROUND MANHOLES SHALL BE COMPACTED BY MECHANICAL MEANS TO A MINIMUM OF 95% SPD.
30. SAFETY PLATFORMS SHALL BE AS PER OPSD 404.02.
31. PROVIDE AN INSTALL AN ANCHORING/MOUNT SYSTEM FOR THE TOWNSHIP PORTABLE DAVIT.
32. CRETEX SEALS, OR A SIMILAR PRODUCT, SHALL BE INSTALLED AROUND THE PRE-CAST WET WELL SECTIONS TO PREVENT INFILTRATION.

LEGEND

- SETBACK LINE
- EASEMENT
- DRIVEWAY
- TEST PIT (TP) AS PER GEOTECHNICAL REPORT — TP
- SANITARY MANHOLE — S
- STORM MANHOLE — D
- CATCH BASIN
- TOP OF GRATE ELEVATION — T/G 80.00
- PROPOSED ELEVATION / EXISTING ELEVATION — 82.00 / 82.50 / 82.00
- PROPOSED ELEVATION — 80.00 / 80.00
- PROPOSED TERRACING
- SURFACE SLOPE — 2.0%
- FLOW DIRECTION
- MAJOR OVERLAND FLOW DIRECTION
- PROPOSED SWALE GRADE — 1.5 %
- EXISTING WATERMAIN — WM
- STORM SEWER — STM
- SANITARY SEWER — SAN
- HYDRO LINE — OHW
- GAS MAIN — G
- BELL LINE — B
- FENCE

No.	REVISION / ISSUE	DATE MM/DD/YY
2	TOWNSHIP COMMENTS	04/15/24
1	INITIAL ISSUE	11/22/23

PREPARED BY:

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ADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
04/15/2024
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION 95 LOTS

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ONTARIO

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive Kanata 613-282-5601

TITLE:

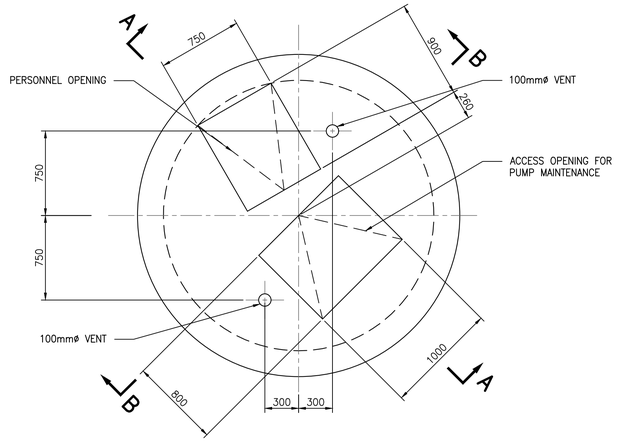
PUMPING STATION SITE PLAN

SCALE: VARIES

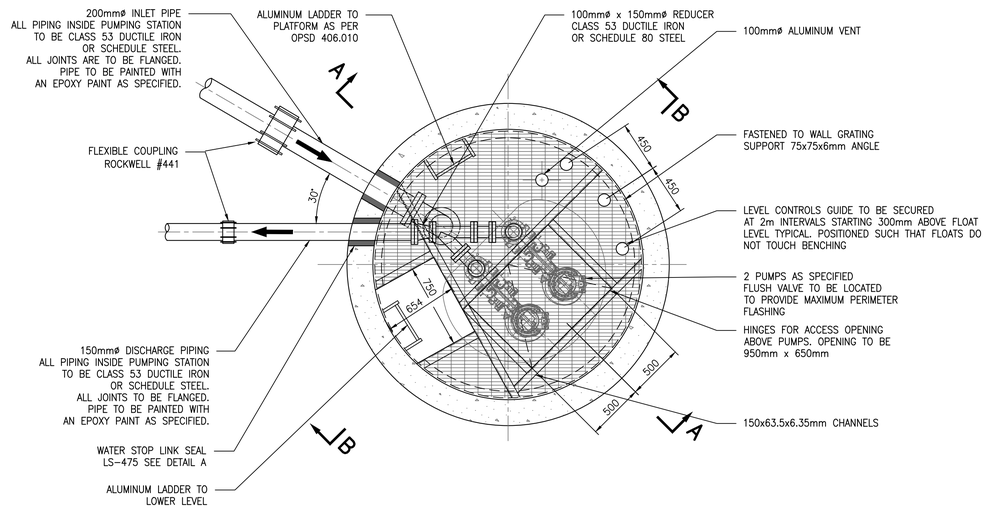
DRAFTED BY:

DATE: 04/15/24

DRAWING No.: PS-1

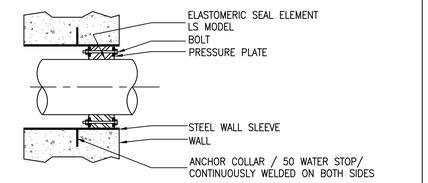


COVER PLAN
1:25



PLAN SECTION C-C
1:25

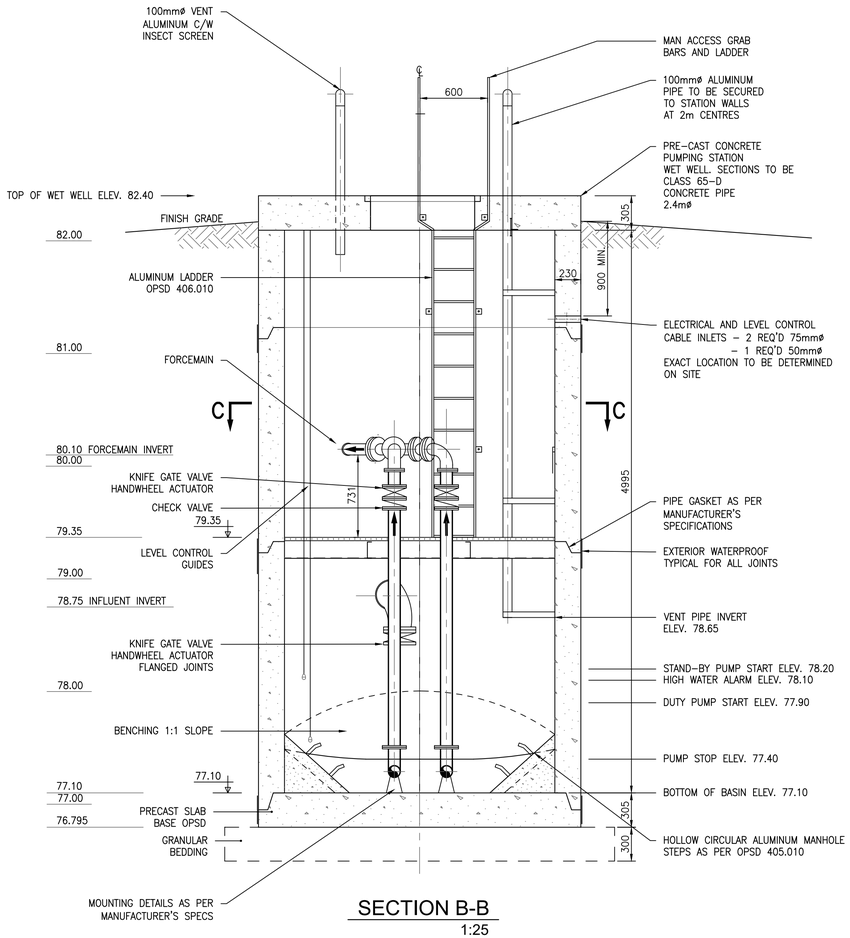
LINK-SEAL MODULAR SEALS WITH MODEL WS STEEL WALL SLEEVES
MANUFACTURED BY PIPELINE SEAL & INSULATOR, INC.



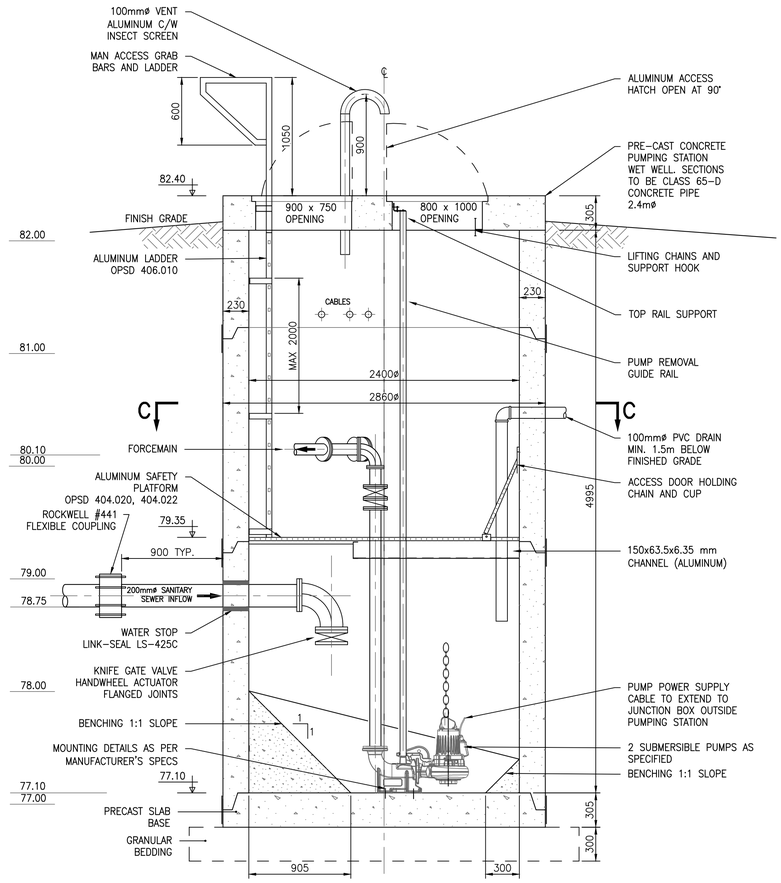
LS Model	Seal Element	Bolts/Nuts	Pressure Plate
C	EPDM (Black)	Zinc Dichromate/Organic Coated Carbon Steel Bolt	Reinforced Nylon Polymer

Sleeve Model	Description	Material
WS	Steel Wall Sleeve	Steel

NOTES:
1. ULTRASONIC AND PRESSURE TRANSDUCERS TO BE PROVIDED AS PRIMARY AND SECONDARY LEVEL CONTROLS INSIDE THE WET WEILL. FLOATS ARE THIRD BACK UP.
2. PROVIDE A BASE PLATE WITH ANCHORS FOR PORTABLE DAVIT MOUNT.



SECTION B-B
1:25



SECTION A-A
1:25

No.	REVISION / ISSUE	DATE MM/DD/YY
2	TOWNSHIP COMMENTS	04/15/24
1	INITIAL ISSUE	11/22/23

PREPARED BY:

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ADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
04/15/2024
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S
MEADOW SUBDIVISION
95 LOTS

COUNTY ROAD No. 22 (SHANLY RD),
CARDINAL, ONTARIO

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive Kanata 613-282-5601

TITLE:

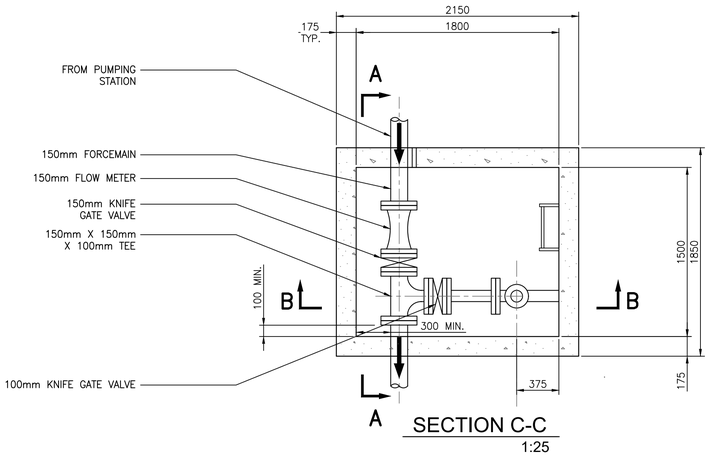
PUMPING STATION SECTIONS & DETAILS

SCALE: 1:25

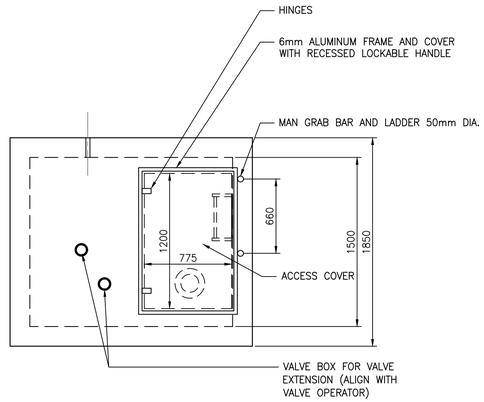
DRAFTED BY:

DATE: 04/15/24

DRAWING No.: PS-2

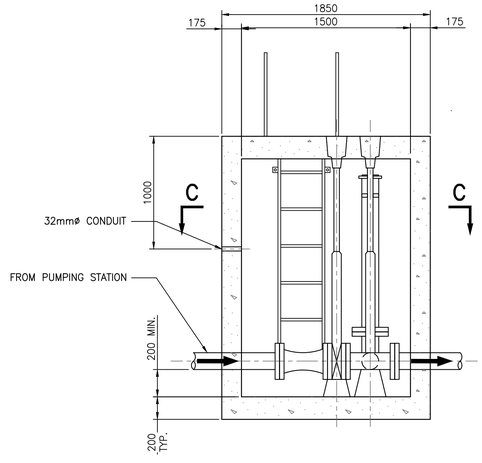


SECTION C-C
1:25

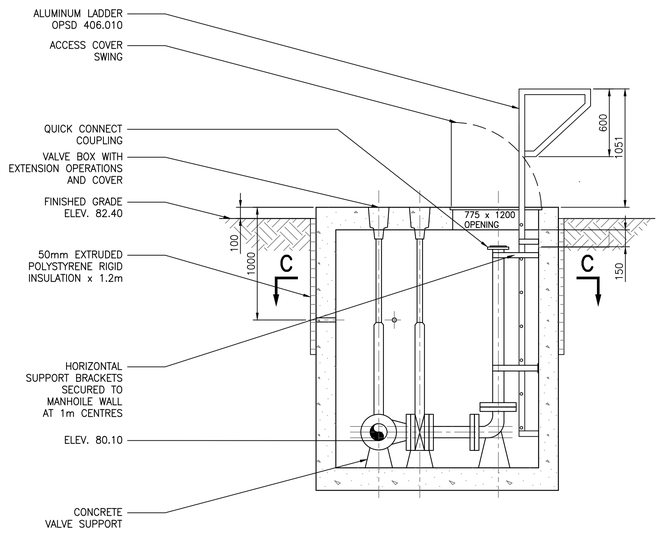


PLAN VIEW
1:25

NOTES:
1. ALL JOINTS, VALVES AND FITTINGS SHALL BE FLANGED WITH UNIFLANGE RESTRAINTS.
2. SIZE OF PIPING, VALVES AND FITTINGS TO BE SAME SIZE AS FORCEMAIN EXCEPT WHERE OTHERWISE INDICATED.
3. CONSTRUCTION AND REINFORCEMENT TO OPSD 705.
4. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE NOTED.
5. MINOR VARIATION IN THE CHAMBER DIMENSIONS MIGHT BE APPROVED IF THERE ARE BENEFITS TO THE CLIENT.



SECTION A-A
1:25



SECTION B-B
1:25

No.	REVISION / ISSUE	DATE MM/DD/YY
2	TOWNSHIP COMMENTS	04/15/24
1	INITIAL ISSUE	11/22/23

PREPARED BY:

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ADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
04/15/2024
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION
95 LOTS

COUNTY ROAD No. 22 (SHANLY RD),
CARDINAL, ONTARIO

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive Kanata 613-282-5601

TITLE:

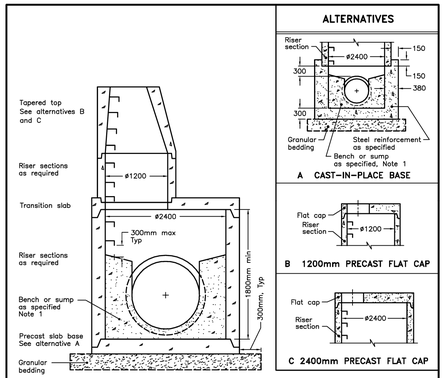
PUMPING STATION FORCEMAIN BY-PASS CHAMBER

SCALE: 1:25

DRAFTED BY:

DATE: 04-15-2024

DRAWING No.: PS-3



ALTERNATIVES

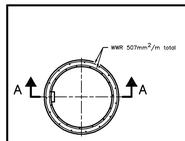
A CAST-IN-PLACE BASE

B 1200mm PRECAST FLAT CAP

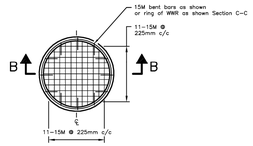
C 2400mm PRECAST FLAT CAP

NOTES:
1 For sump detail, see OPSD 701.010.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, 701.060, 701.061, 703.013, 703.023, 706.030 and 706.031.
C Structures exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
D Pipe support shall be according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

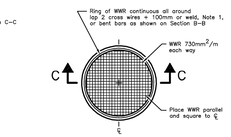
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 5
PRECAST CONCRETE MAINTENANCE HOLE 2400mm DIAMETER		
	OPSD 701.013	



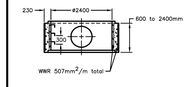
PLAN OF RISER



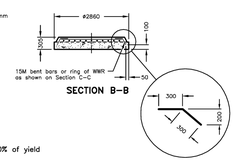
PLAN OF BASE SLAB WITH REINFORCING STEEL BARS



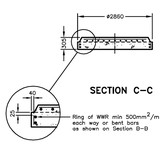
PLAN OF BASE SLAB WITH WWR



SECTION A–A



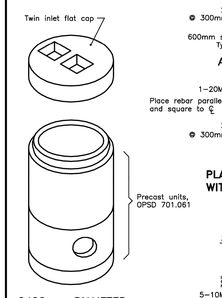
SECTION B–B



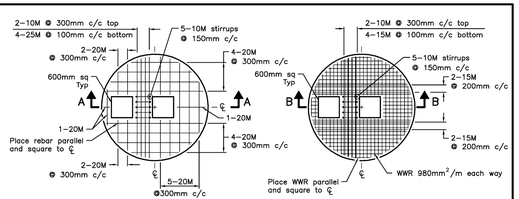
SECTION C–C

NOTES:
1 Welded splice shall develop minimum 50% of yield strength of wires.
A This OPSD shall be read in conjunction with OPSD 701.060.
B All reinforcing steel shall have 25mm minimum cover.
C Steps shall be according to OPSD 405.010 or 405.020.
D All dimensions are nominal.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 2
PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS 2400mm DIAMETER RISER AND BASE SLAB		
	OPSD 701.061	

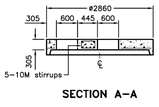


2400mm DIAMETER MAINTENANCE HOLE

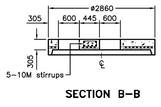


PLAN OF TWIN INLET FLAT CAP WITH REINFORCING STEEL BARS

PLAN OF TWIN INLET FLAT CAP WITH WWR



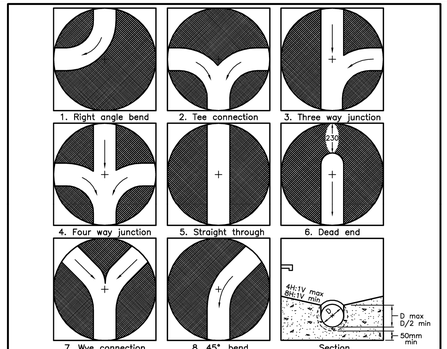
SECTION A–A



SECTION B–B

NOTES:
A All reinforcing steel shall have 25mm minimum cover.
B All dimensions are nominal.
C All dimensions are in millimetres unless otherwise shown.

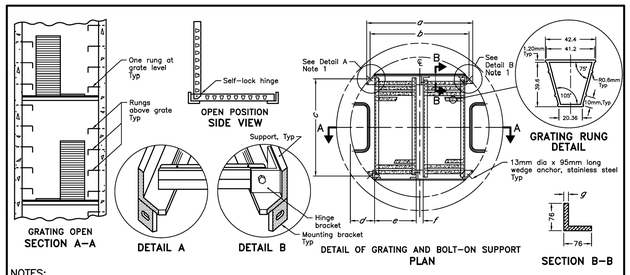
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 2
PRECAST CONCRETE TWIN INLET FLAT CAP 2400mm DIAMETER		
	OPSD 703.023	



MAXIMUM SIZE HOLE IN THE WALL IN PRECAST RISER SECTIONS					
Maintenance Hole Diameter	No. 1–4	No. 5 and 6	No. 8	No.7	
				Inlet Hole	Outlet Hole
1200	700	860	780	700	860
1500	860	1220	960	860	1170
1800	1220	1485	1220	1220	1485
2400	1485	2020	1760	1485	2020
3000	1930	2450	2300	1930	2450
3600	2470	3085	2730	2470	3085

NOTES:
1 Slopes shall be maintained from the outlet hole opening for top of benching.
A Concrete for benching shall be 30MPa.
B When benching is hand–finished, it shall be given wood float finish, channel shall be given steel trowel finish.
C Benching slope and height shall be as specified.
D When specified, maintenance holes that are 1200mm in diameter with a uniform channel for 200 or 250mm pipe may be prebenched at the manufacturer with standardized benching slope and channel orientation.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

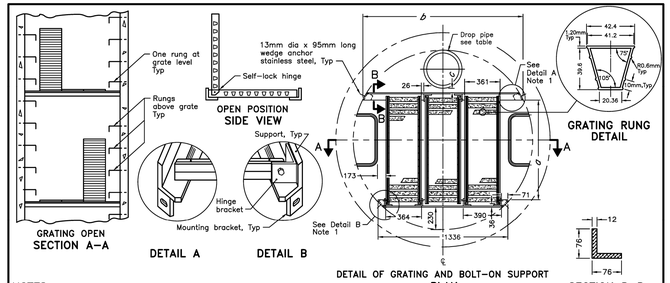
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 4
MAINTENANCE HOLE BENCHING AND PIPE OPENING ALTERNATIVES		
	OPSD 701.021	



NOTES:
1 All hinge brackets and mounting brackets shall be welded all around to support angle.
A All aluminum in contact with concrete shall be thoroughly coated with asphalt paint.
B Maintenance hole depth between 5.0m and 10.0m, grate shall be placed at midpoint. Maintenance hole depth between 10.0m and 15.0m, grates shall be placed at third–points.
C All fasteners shall be 304 stainless steel.
D All welding shall be according to CSA W47.2 and W59.2.
E All aluminum components shall be 6000 series structural aluminum.
F All dimensions are in millimetres unless otherwise shown.

MH Diameter	No of Grates	a	b	c	d	e	f	g
1200	2	900	850	850	225	352	65	10
1500	2	1128	1078	1078	311	419	65	12
1800	3	1344	1293	1293	308	360	65	12
2400	4	1774	1724	1724	401	360	65	12

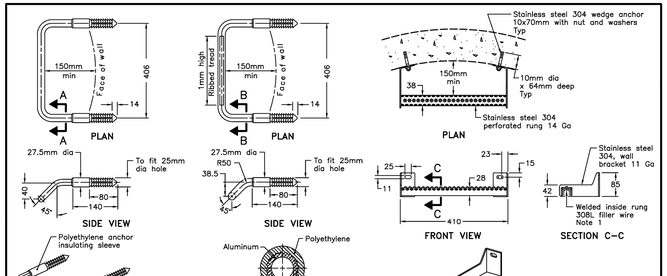
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 4
ALUMINUM SAFETY PLATFORM FOR CIRCULAR MAINTENANCE HOLES		
	OPSD 404.020	



NOTES:
1 All hinge brackets and mounting brackets shall be welded all around to support angle.
A All aluminum in contact with concrete shall be thoroughly coated with asphalt paint.
B Maintenance hole depth between 5.0m and 10.0m, grate shall be placed at midpoint. Maintenance hole depth between 10.0m and 15.0m, grates shall be placed at third–points.
C All fasteners shall be 304 stainless steel.
D All welding shall be according to CSA W47.2 and W59.2.
E All aluminum components shall be 6000 series structural aluminum.
F All dimensions are in millimetres unless otherwise shown.

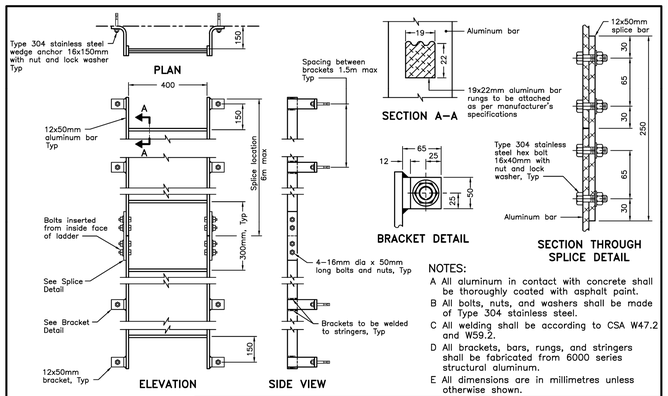
INSIDE DIA DROP PIPE	a	b	c	OUTSIDE DIA DROP PIPE, MAX
150	1218	1316	79	160
200	1218	1316	29	213
250	1150	1433	47	267
300	1082	1524	65	318
375	1014	1610	58	389

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
ALUMINUM SAFETY PLATFORM FOR 1800mm DIAMETER CIRCULAR MAINTENANCE HOLES WITH DROP PIPE		
	OPSD 404.022	



NOTE:
1 The company undertaking welded fabrication shall be certified according to CSA W47.1. All welding shall be according to CSA W59.
A All aluminum components shall be 6000 series structural aluminum.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 4
MAINTENANCE HOLE STEPS HOLLOW		
	OPSD 405.010	



NOTES:
A All aluminum in contact with concrete shall be thoroughly coated with asphalt paint.
B All bolts, nuts, and washers shall be made of Type 304 stainless steel.
C All welding shall be according to CSA W47.2 and W59.2.
D All brackets, bars, rungs, and stringers shall be fabricated from 6000 series structural aluminum.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
ALUMINUM LADDER FOR MAINTENANCE HOLES		
	OPSD 406.010	

No.	REVISION / ISSUE	DATE MM/DD/YY
1	INITIAL ISSUE	11/22/23

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ADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
11/22/23
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION 95 LOTS

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ONTARIO

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive Kanata 613-282-5601

TITLE:

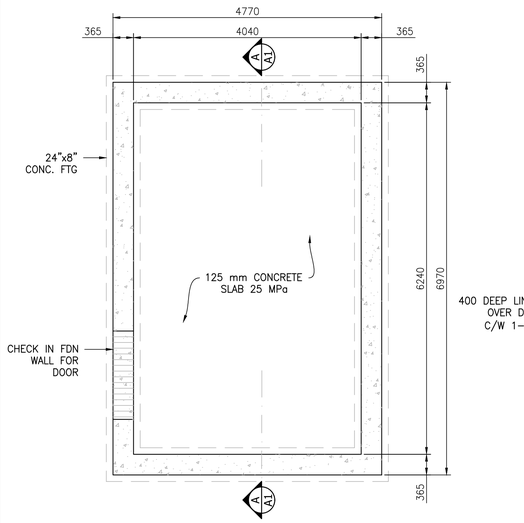
PUMPING STATION DETAILS

SCALE: VARIES

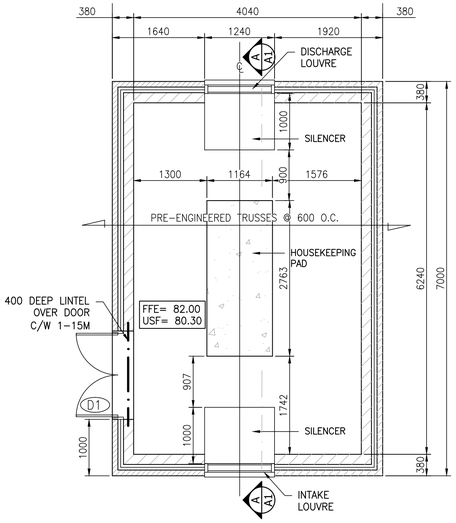
DRAFTED BY:

DATE: 11/22/23

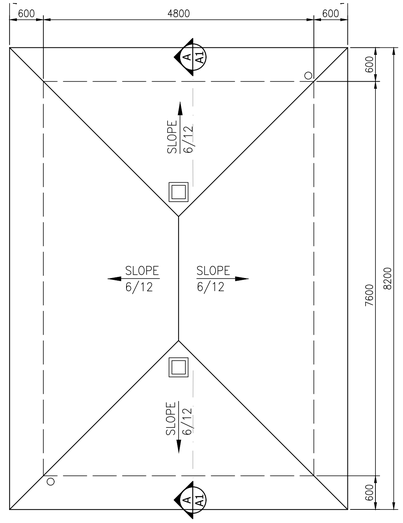
DRAWING No.: PS-4



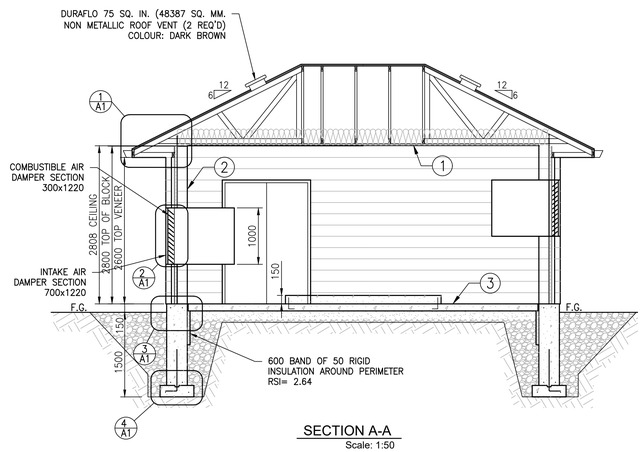
FOUNDATION PLAN
Scale: 1:50



FLOOR PLAN
Scale: 1:50



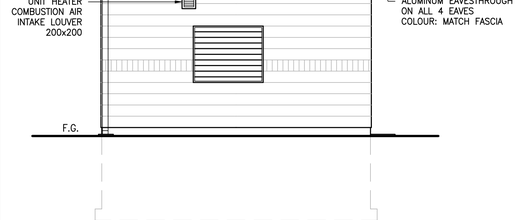
ROOF PLAN
Scale: 1:50



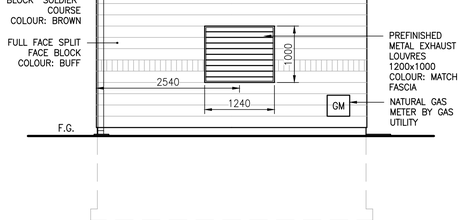
SECTION A-A
Scale: 1:50

LEGEND / NOTES:

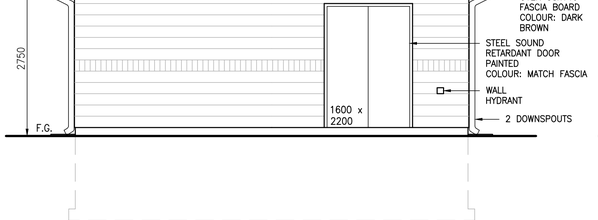
1. TYPICAL ROOF ASSEMBLY
   - 25-YEAR ASPHALT SHINGLES, 3-TAB, COLOUR: IKO EARTHTONE CEDAR
   - 15# FELT PAPER FOR EAVE PROTECTION (20 kg ROLL)
   - 13 (7/16") OSB SHEATHING C/W JOINT 'H'-CLIPS
   - PRE-ENGINEERED WOOD TRUSSES @ 600 (24") O.C.
   - R32 (RSI 5.6) MIN. FIBRE GLASS INSULATION (C/W STYROVENT)
   - 1" X 3" STRAPPING AT 400 (16") O.C.
   - 6 mil POLY VAPOUR BARRIER
   - 16 (1/2") GYPSUM BOARD (TAPED JOINTS & PAINT)
2. EXTERIOR WALL ASSEMBLY
   - MASONRY VENEER SPLIT FACE BLOCK C/W WEEP HOLES @ 800 O.C. AND VENEER TIES @ 400 O.C.
   - 50 CLEAR CAVITY
   - 50 RIGID CONSULTATION R15 (RSI 2.64)
   - BAKOR AIR-BLOC ELASTOMERIC LIQUID AIR BARRIER MEMBRANE
   - 190 SOUNDBLOX C/W CONTINUOUS VERTICAL REINFORCEMENT INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS
   - PAINT
3. FLOOR ASSEMBLY
   - 125 POURED CONCRETE SLAB 25 MPa FINISHED AND HARDENED AS SPECIFIED C/W 152x152xMW18.7xMW18.7
   - 150 GRANULAR 'A' COMPACTED TO 100 S.P.D.
   - UNDISTURBED SOIL OR GRANULAR 'B' COMPACTED IN 150 LIFTS AS PER GEOTECHNICAL



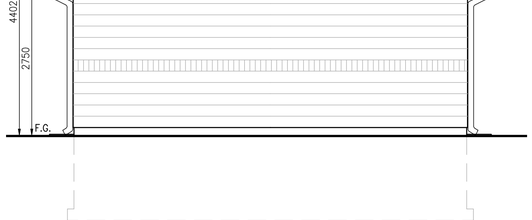
SOUTH ELEVATION
Scale: 1:50



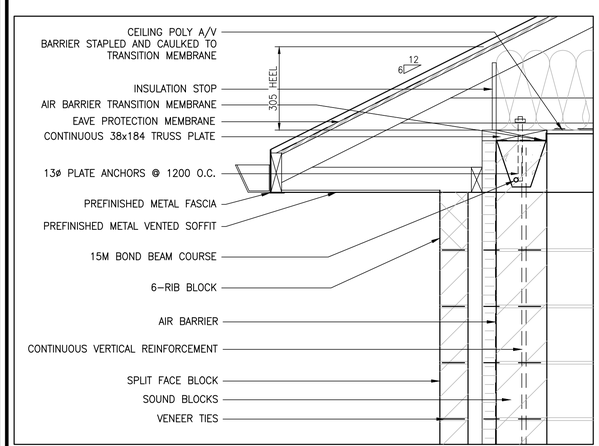
NORTH ELEVATION
Scale: 1:50



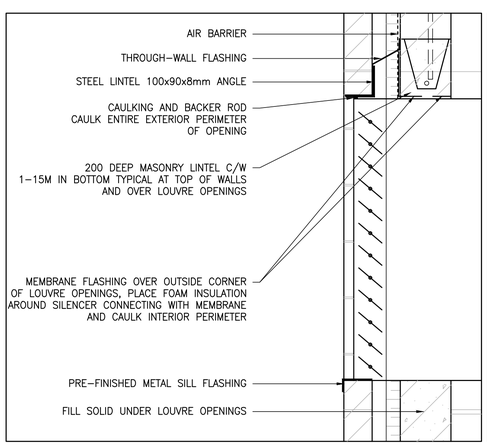
LEFT ELEVATION
Scale: 1:50



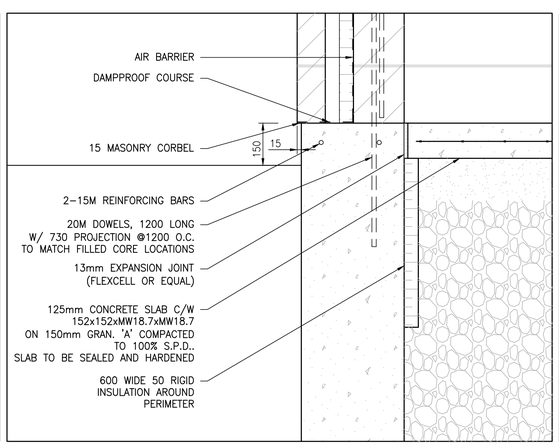
RIGHT ELEVATION
Scale: 1:50



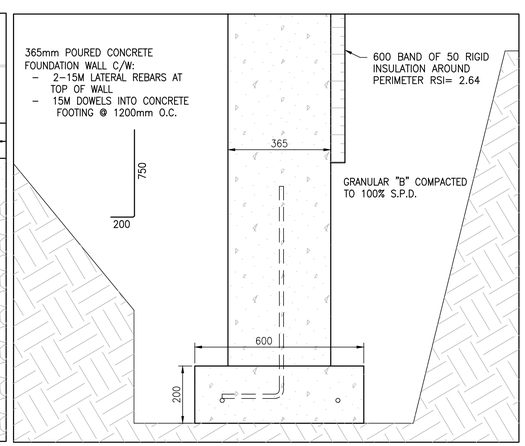
1/A1 SECTION DETAIL
1:10



2/A1 SECTION DETAIL
1:10



3/A1 SECTION DETAIL
1:10



4/A1 SECTION DETAIL
1:10

No.	REVISION / ISSUE	DATE MM/DD/YY
1	INITIAL ISSUE	11/22/23

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ADVANCE ENGINEERING

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION 95 LOTS

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ONTARIO

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive Kanata 613-282-5601

TITLE:

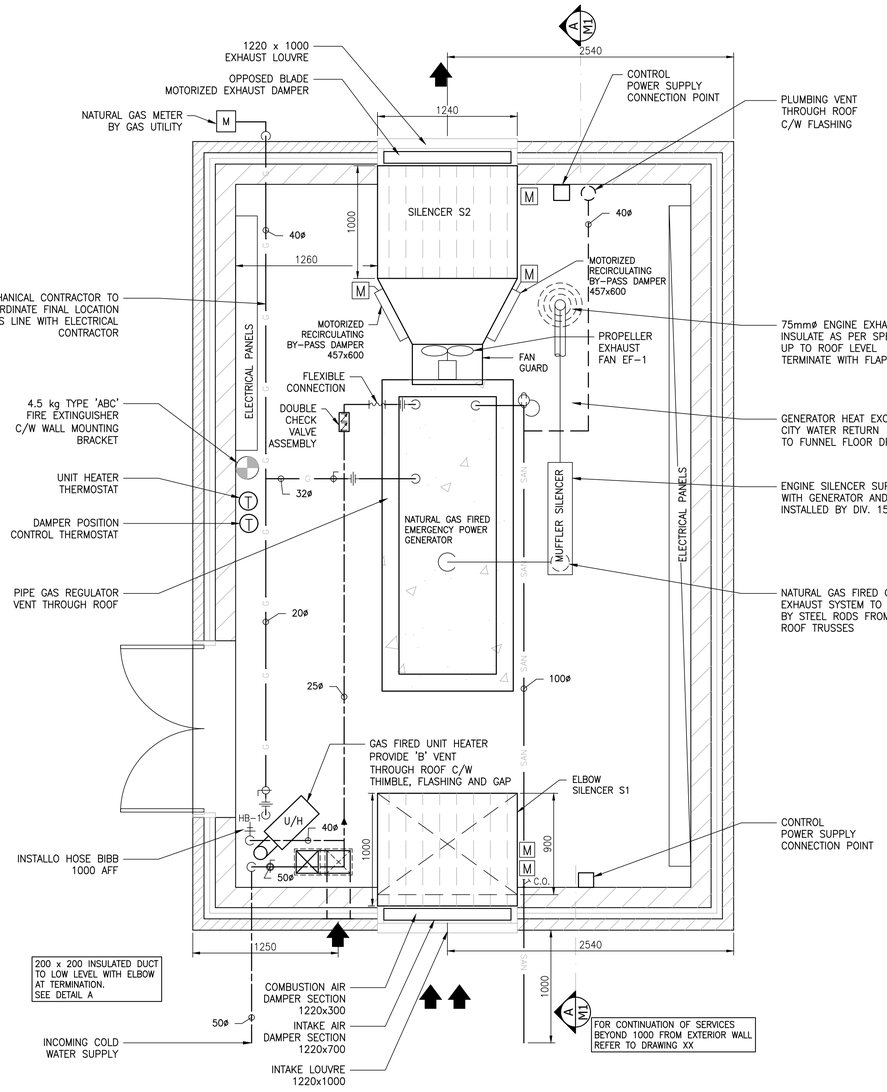
PUMPING STATION PLANS

SCALE: 1:50 - 1:10

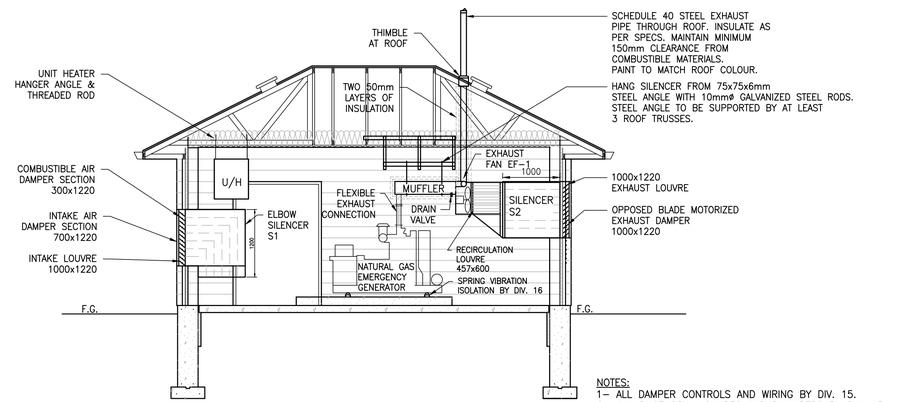
DRAFTED BY:

DATE: 11/22/23

DRAWING No.: A1

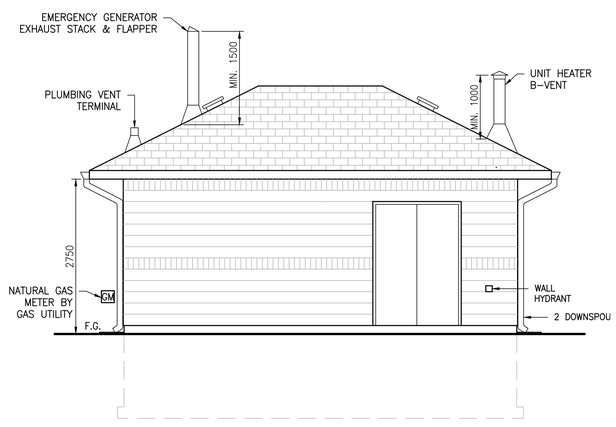


FLOOR PLAN
Scale: 1:25

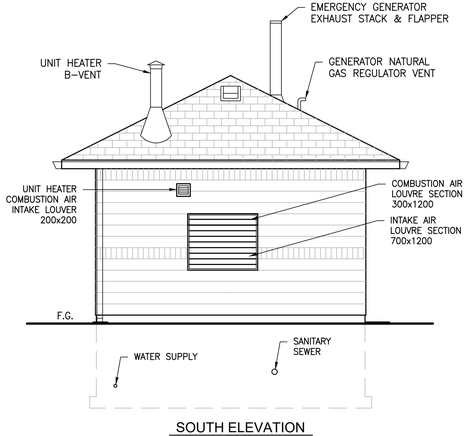


BUILDING SECTION
Scale: 1:50

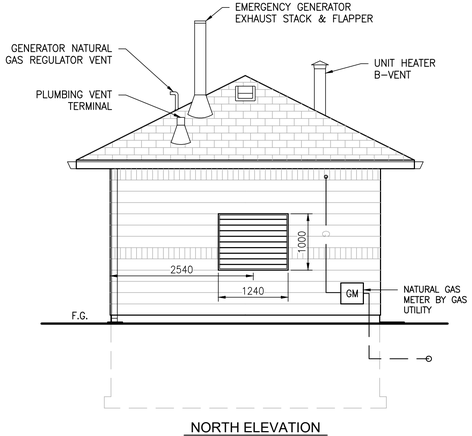
NOTES:
1- ALL DAMPER CONTROLS AND WIRING BY DIV. 15.
2- ALL DUCTWORK, LOUVRES AND DAMMPERS BY DIV. 15.
3- SILENCER AND ENGINE FLEX CONNECTION TO BE SUPPLIED WITH GENERATOR SET DIV. 16 AND INSTALLED BY DIV. 15. ALL EXHAUST PIPING BY DIV. 15.



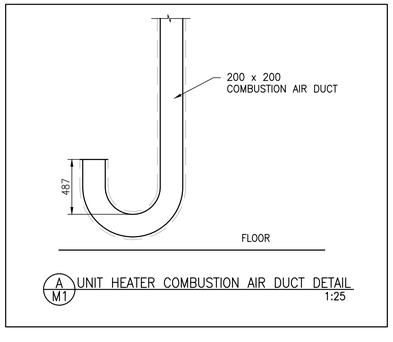
LEFT ELEVATION
Scale: 1:50



SOUTH ELEVATION
Scale: 1:50



NORTH ELEVATION
Scale: 1:50



A/M1 UNIT HEATER COMBUSTION AIR DUCT DETAIL
1:25

LEGEND:

- FIRE EXTINGUISHER
- EXHAUST FAN
- THERMOSTAT
- SHUT-OFF VALVE
- CHECK VALVE
- UNION
- FLEXIBLE PIPE CONNECTION
- FFD-1 FUNNEL FLOOR DRAIN
- C.O. CLEANOUT
- HB-1 HOSE BIBB
- M MOTORIZED DAMPERS
- G NATURAL GAS LINE
- SAN SANITARY SEWER
- SANITARY VENT
- COLD WATER
- 50ø PIPE DIAMTER

No.	REVISION / ISSUE	DATE MM/DD/YY
1	INITIAL ISSUE	11/22/23

PREPARED BY:

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ADVANCE ENGINEERING

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION
95 LOTS

COUNTY ROAD No. 22 (SHANLY RD),
CARDINAL, ONTARIO

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive Kanata 613-282-5601

TITLE:

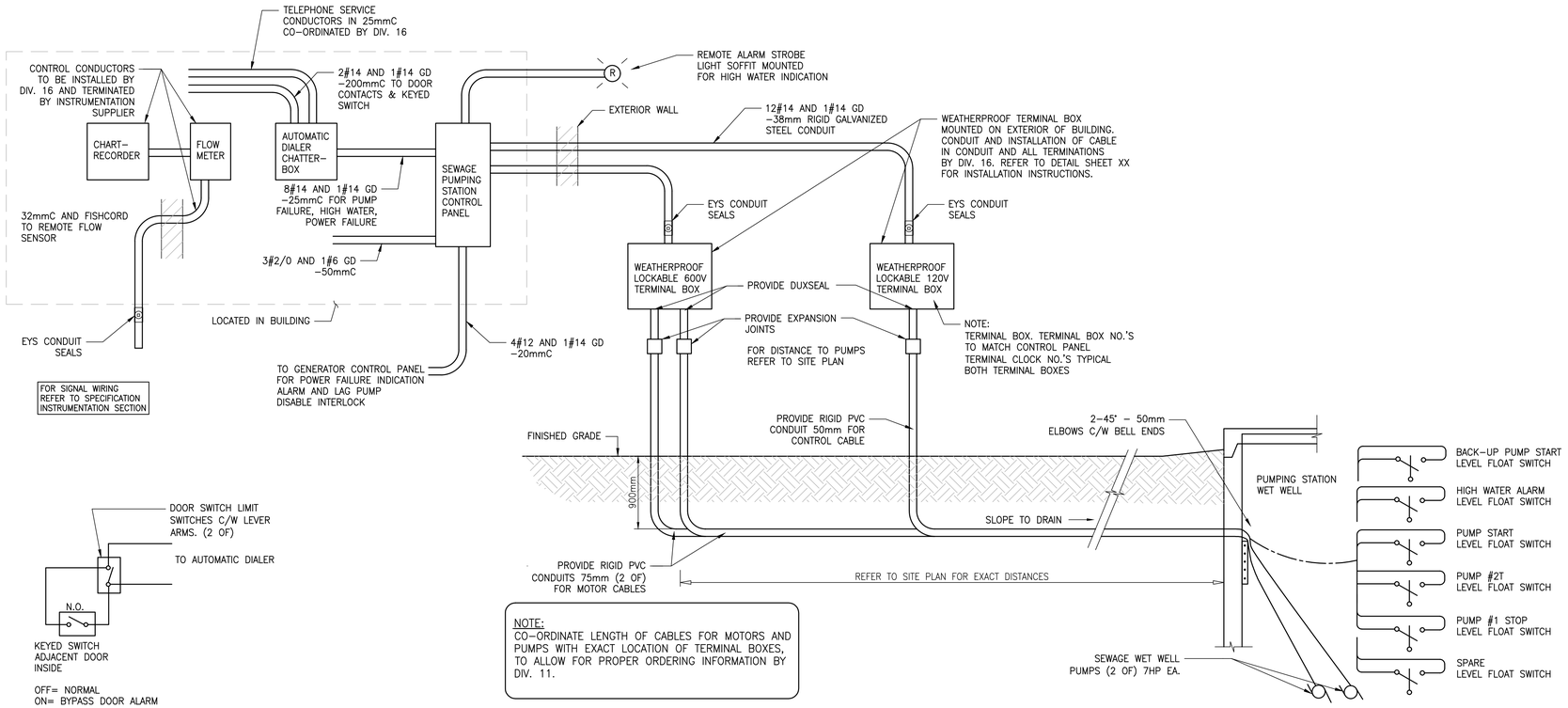
PUMPING STATION MECHANICAL PLAN

SCALE: 1:50 - 1:25

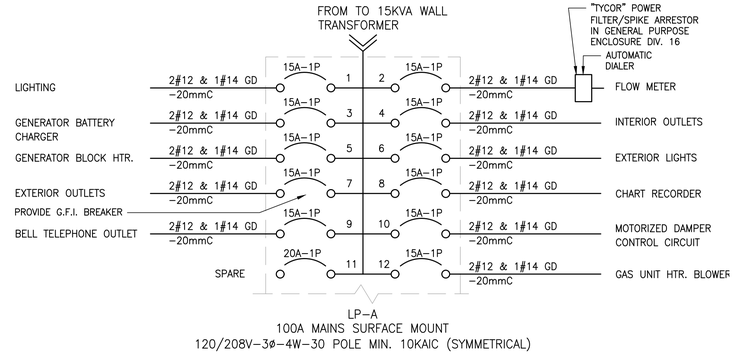
DRAFTED BY:

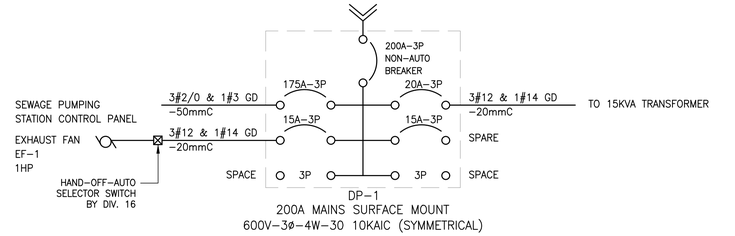
DATE: 11/22/23

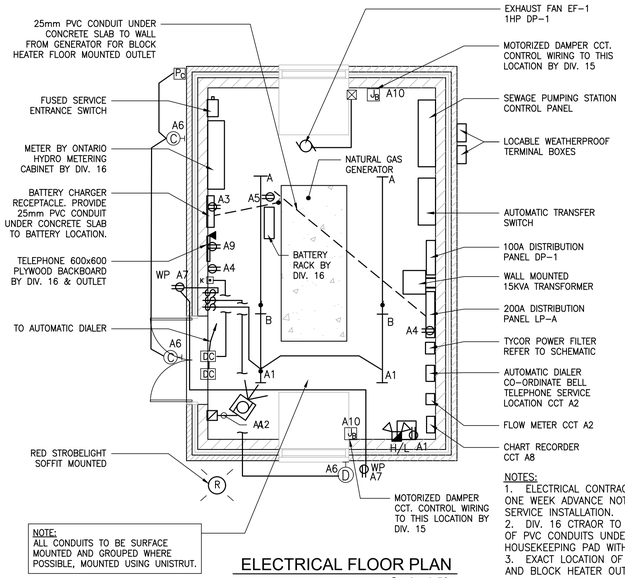
DRAWING No.: M1



ELECTRICAL EQUIPMENT SCHEMATIC
N.T.S.





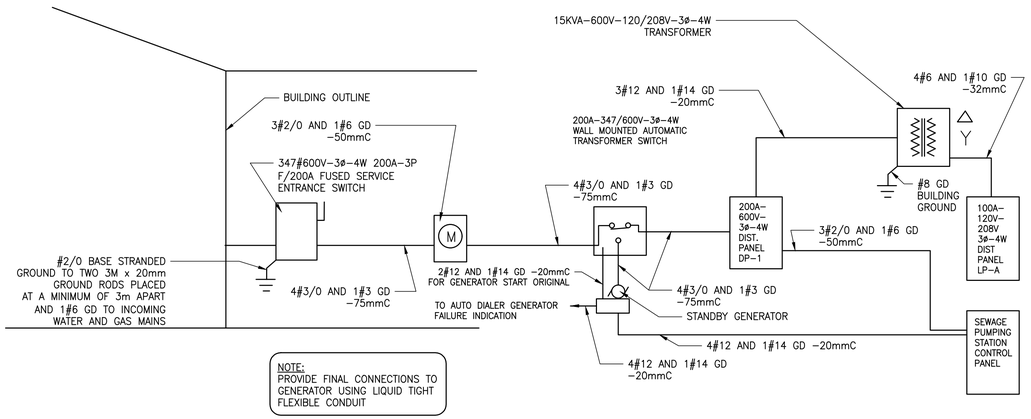


ELECTRICAL FLOOR PLAN
Scale: 1:50

NOTES:
1. ELECTRICAL CONTRACTOR TO GIVE LOCAL P.U.C. ONE WEEK ADVANCE NOTICE FOR INCOMING SERVICE INSTALLATION.
2. DIV. 16 CTRAOR TO CO-ORDINATE INSTALLATION OF PVC CONDUITS UNDER FLOOR SLAB AND GENERATOR HOUSEKEEPING PAD WITH CONCRETE POUR.
3. EXACT LOCATION OF CONDUIT FOR BATTERY CHARGER AND BLOCK HEATER OUTLET TO BE CONFIRMED WITH GENERATOR MANUFACTURE'S SHOP DRAWINGS.

ELECTRICAL LEGEND:

A	8' FLUORESCENT STRIP FIXTURE
B	4' FLUORESCENT STRIP FIXTURE
C	WALL MOUNTED HPS FIXTURE
C	SOFFIT MOUNTED FIXTURE
PC	PHOTOCELL
	EMERGENCY LIGHT
$	TOGGLE SWITCH
	DUPLEX CONVINIENCE RECEPTABLE
DC	DOOR CONTACTS 120 V LIMIT SWITCH
	MANUAL STARTER C/W THERMAL O/L'S
	COMBINATION MAGNETIC STARTER
JB	JUNCTION BOX
	TELEPHONE OUTLET
K	KEYED PUSH BUTTON STATION, LOCKABLE IN OPEN POSITION SURFACE MOUNTED IN GENERAL PURPOSE ENCLOSURE EQUAL TO SQUARE 'D' CLASS 9001
H/L	HIGH LEVEL
WP	WEATHERPROOF



200A-347/600V-3Ø-4W
SERVICE ENTRANCE SCHEMATIC
N.T.S.

No.	REVISION / ISSUE	DATE MM/DD/YY
1	INITIAL ISSUE	11/22/23

PREPARED BY:
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ADVANCE ENGINEERING

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION 95 LOTS

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ONTARIO

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive Kanata 613-282-5601

TITLE:

PUMPING STATION ELECTRICAL PLAN

SCALE: 1:50

DRAFTED BY:

DATE: 11/22/23

DRAWING No.: E1

SCHEDULE "J"

STREET SIGNAGE AND LIGHTING

Traffic signage shall be installed as per the Traffic Signage Plan (SIG-1, SIG-2), prepared by Advance Engineering Ltd., stamped and dated September 6, 2023.

STREET SIGNS

Reflectorized aluminum street signs on square perforated steel/galvanized posts shall be installed as set out in clause 16 and at the location(s) specified by the Traffic Signage Plan.

Streets shown in Schedule "B" shall be named as follows:

Street A: Balsam Street
Street B: Lockhouse Street
Street C: Conifer Lane

STREET LIGHTING

Streets shall be illuminated as per the Photometric Plan prepared by Advance Engineering, dated July 15, 2024.

The Owner agrees to install Street lighting in accordance with the Municipal requirements and in compliance with the Electrical Safety Authority's Guidelines for the Design, Installation, Operation and Maintenance of Street Lighting Assets.

The Owner agrees to provide streetlights where streets intersect with the United Counties Road as close as possible to the intersection of the road allowances, in a location approved by the United Counties. These streetlights shall be designed and installed under the guidance, requirements and to the satisfaction of the United Counties.

Unless otherwise required by the Municipality, street light poles are to be made of composite material.

Attached:

- **Traffic Signs and Pavement Markings (SIG1) June 18, 2024**
- **Existing Signs along County Road (SIG2) June 18, 2024**
- **Photometric Plan (PH1) July 15, 2024**

0 10 20 METRES

COUNTY ROAD 22

PHASE 2: 36 LOTS | PHASE 1: 59 LOTS

DODGE ST

TIPP ST

EXISTING SIGNS TO BE RELOCATED REFER TO SIG-2 DWG

℄ MARKING 150 mm SOLID YELLOW STRIPE

COUNTY RD No. 22

ASPHALT EDGE | GUTTER | GRAVEL SHOULDER | DITCH TOP | DITCH BOTTOM | CURB

BLOCK D | BLOCK Da | BLOCK H

CONIFER LN

BASLAM ST

LOCKHOUSE ST

EXISTING RESIDENTIAL

192 1 STOREY FRAME DWELLING

FRAME SHED | METAL SHED

P-GATE

BLOCK B

BLOCK E
FUTURE ROAD

PARK
BLOCK F

NO EXIT SIGN

FUTURE ROAD
BLOCK G

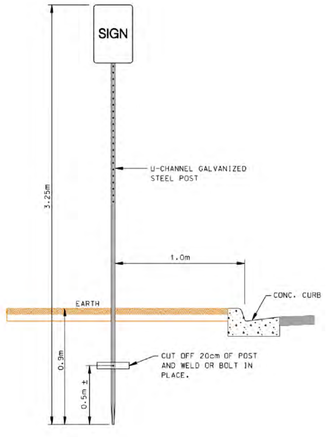
EXISTING AGRICULTURE

PHASE 2: 36 LOTS | PHASE 1: 59 LOTS

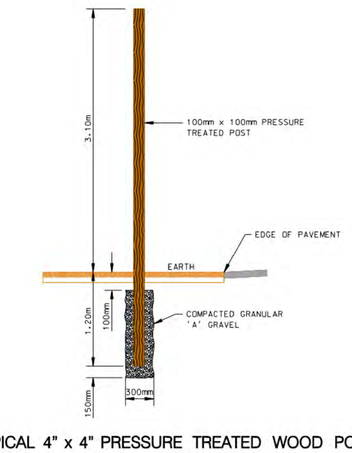
RB 90 TRP.

1. STOP SIGN 600 x 600 mm
2. 600 mm WIDE SOLID WHITE STOP LINE
3. ℄ MARKING 150 mm SOLID YELLOW STRIPE
4. 2 m WIDE PEDESTRIAN CROSSWALK W/ 100 mm WHITE STRIPES
5. "40 km/h BEGINS" SIGN
6. "STREET NAME" SIGN
7. "NO PARKING – ANY TIME -->" SIGN

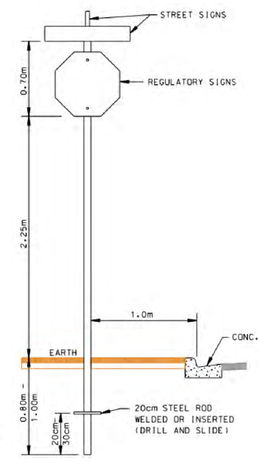
NOTE:
1. ALL HARDWARE MUST BE VANDAL PROOF.
2. BRACKETS MUST BE STAINLESS STEEL.
3. ALL NUTS AND BOLTS ARE BREAKAWAY ALUMINUM.
4. ALL DIMENSIONS ARE APPROXIMATE, REFER TO ONTARIO TRAFFIC MANUAL FOR PROPER INSTALLATION DETAILS.



U-CHANNEL POST DETAIL



TYPICAL 4" x 4" PRESSURE TREATED WOOD POST



NOTES

1. TRAFFIC SIGNS SHALL COMPLY WITH ONTARIO REGULATION 615 AS AMENDED.
2. ALL WORK SHALL CONFORM TO LATEST OPSS 703 "CONSTRUCTION SPECIFICATION FOR PERMANENT SMALL SIGNS AND SUPPORT SYSTEMS" AND OPSS.PROV 710 "CONSTRUCTION SPECIFICATION FOR PAVEMENT MARKING".
3. ALL INSTALLATIONS OF SIGNS AND MARKINGS SHALL BE CONSISTENT WITH THE ONTARIO TRAFFIC MANUAL, BOOKS 2, 4, 5, 6, 11, 15 OR AS MAY APPLY.
4. SIGN POST SHALL BE A 3.7 M U-CHANNEL GALVANIZED STEEL.
5. PAVEMENT MARKING MATERIAL, WHITE OR YELLOW, SHALL BE AT MINIMUM DOUBLE APPLICATION OF WATERBORNE TRAFFIC PAINT.
6. WATERBORNE TRAFFIC PAINT SHALL COMPLY WITH OPSS.MUNI 1716 "MATERIAL SPECIFICATIONS FOR WATER-BORNE TRAFFIC PAINT".
7. WATERBORNE ROAD PAINTS CAN BE USED FROM SPRING UNTIL LATE SUMMER/EARLY FALL AS LONG AS TEMPERATURES DO NOT DROP BELOW 0 DEGREES CELSIUS.

No.	REVISION / ISSUE	DATE MM/DD/YY
3	TOWNSHIP COMMENTS – 06–14–2024	06/18/24
2	STREET NAMES ADDED	04/15/24
1	INITIAL ISSUE	09/06/22

PREPARED BY:
Mongi Mabrouk P.Eng.
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Email: eng.services.ca@gmail.com

ADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
06/18/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

TRAFFIC SIGNS & PAVEMENT MARKINGS PLAN

SCALE: 1:500
DRAFTED BY:
PROJECT No.: 0114
DATE: 06-18-2024

DRAWING No.: SIG-1

PHOTO 2
TWO SIGNS NOT SHOWN ON THE SURVEY (NEIGHBOURHOOD WATCH COMMUNITY AND CRIME STOPPERS) TO REMAIN OR AS DIRECTED BY VILLAGE STAFF.

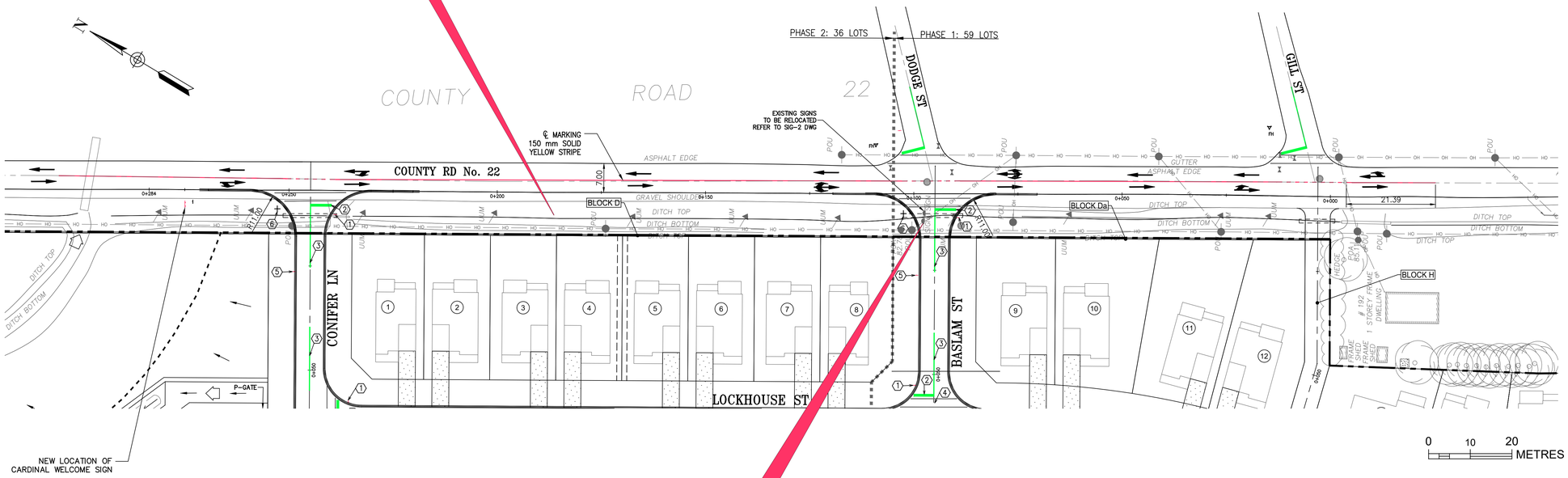

PHOTO 1
TWO SIGNS TO BE RELOCATED TO APPROXIMATELY 30 m NORTH OF CONIFER LN CENTRELINE OR AS DIRECTED BY VILLAGE STAFF.
DODGE ST SIGN TO BE INSTALLED ON TOP OF THE EXISTING STOP SIGN AT DODGE ST EDGE. A NEW SIGN POST FOR BALSAM ST TO BE PROVIDED AS SHOWN.

No.	REVISION / ISSUE	DATE MM/DD/YY
3	TOWNSHIP COMMENTS – 06–14–2024	06/18/24
2	STREET NAMES ADDED	04/15/24
1	INITIAL ISSUE	09/06/22

PREPARED BY:
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ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER
M. MABROUK
100136017
06/18/24
PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

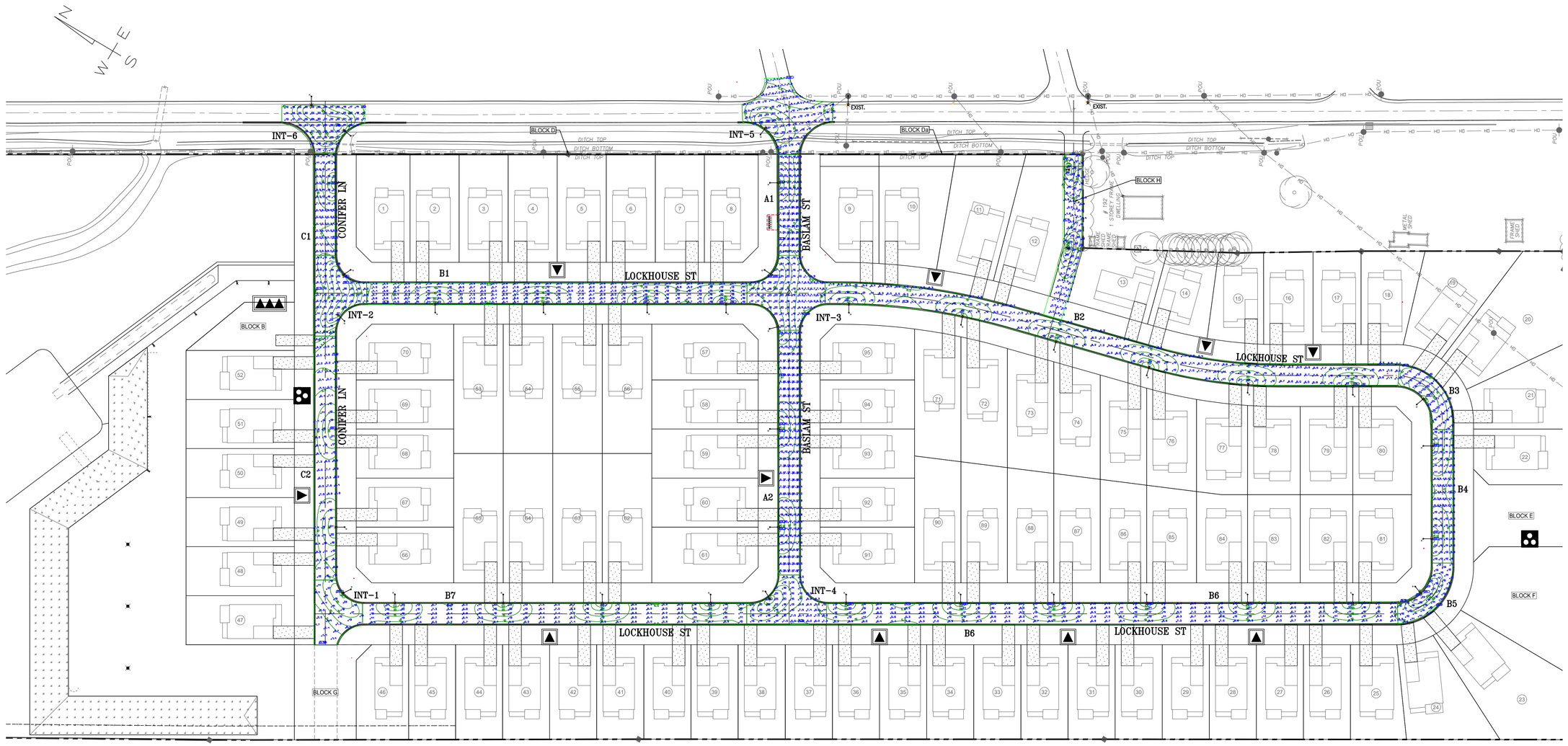
Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

EXISTING SIGNS ALONG CTY RD

SCALE: 1:500
DRAFTED BY:
PROJECT No.: 0114
DATE: 06/18/2024
DRAWING No.: SIG-2

0 10 20 METRES



NOTES

1. STREET LIGHTS EQUIPMENTS SHALL CONFORM TO THE CITY OF OTTAWA "RIGHT-OF-WAY LIGHTING POLICY", DATED SEPTEMBER 9, 2019.
2. CONCRETE POLE HANDLING AND INSTALLATION AS PER OTTAWA STD. LD0003A.
3. BRACKET AS PER OTTAWA STD. LBD001A.
4. LED LUMINAIRE SHALL BE TYP II FOR STREET SEGMENTS AND TYPE IV FOR INTERSECTIONS.
5. LED WING STYLE LUMINAIRE. HEIGHT 3.5m. OTTAWA STD. LLD004A.
6. LED SQUARE LANTERN LUMINAIRE – SIDE MOUNT AS PER LLD002B.
7. LUMINAIRE FOR WALKWAY SHALL BE FULL CUT OFF TYPE.

Ottawa Right-of-Way Lighting PoLicy September 9, 2016

Table 2.1 Recommended Average Roadway Lighting Levels

ROADWAY CLASSIFICATION	AREA CLASSIFICATION	LUMINANCE		GLARE	ILLUMINANCE	
		Average Luminance Lavg (Cd/m²)	Uniformity Ratio L_{avg} / L_{min}	Veiling Luminance Ratio L_{vmax}/ L_{avg}	Minimum Maintained Average E_{avg}(Lux)	Uniformity Ratio E_{avg}/ E_{min}
LOCAL	General Urban Area / Other	0.30	6.0	0.40	4.0	6.0

Ottawa Right-of-Way Lighting PoLicy September 9, 2016

Table 2.2 Recommended Average Lighting Levels for Intersections

INTERSECTING ROADWAY CLASSIFICATION	MINIMUM MAINTAINED AVERAGE (Lux) BY AREA CLASSIFICATION / UNIFORMITY RATIO Eavg / Emin		
	Mixed Use Centre / Central Area High	Employment / Enterprise Area Medium	General Urban Area / Other & Rural Signalized Intersections Low
ARTERIAL & LOCAL	26.0 / (6.0)	20.0 / (6.0)	13.0 / (6.0)
LOCAL & LOCAL	18.0 / (6.0)	14.0 / (6.0)	8.0 / (6.0)

ROADWAY CLASSIFICATION	Maintained Illuminance Levels	
	Average Horizontal E_{avg}(Lux)	Uniformity Ratio E_{avg}/ E_{min} (Max.)
Walkways	5.0	10.0

LEGEND

- JOINT UTILITY TRENCH (HYDRO, BELL, CABLE)
- STREET LIGHT CABLE — SL — SL —
- CONCRETE ENCASED DUCT
- HYDRO TRANSFORMER
- HYDRO POLE HP
- HYDRO POLE C/W GUY WIRE HP
- STREET LIGHT DISCONNECT SD
- STREET LIGHT POLE & COBRAHEAD LUMINAIRE
- LIGHT POLE FOR WALKWAY
- DECORATIVE LIGHT POLE
- COMMUNITY MAILBOX CMB
- BUS STOP LOCATION C/W ASPHALT BOULEVARD BUS
- TREE
- HEDGES
- FIRE HYDRANT

Luminaire list (Site 1)

Index	Manufacturer	Article name	Item number	Fitting	Luminous flux	Maintenance factor	Connected load	Quantity
1	Philips	RoadFocus LED Cobra Head – Medium (RFM), 48 LED's, 4000K CCT, TYPE R3S OPTIC,	RFM-55W48LED 4K-G2-R3S	1x (3) LEDgine ARRAY(S) DRIVEN AT 350mA	7882 lm	0.80	55.1 W	6
2	Philips	RoadFocus LED Cobra Head – Small (RFS), 40 LED's, 4000K CCT, TYPE R2M OPTIC,	RFS-35W40LED 4K-G2-R2M	1x (2) LEDgine ARRAY(S) DRIVEN AT 280mA	5471 lm	0.80	35.3 W	38

#	Name	Parameter	Min	Max	Average	Mean/Min	Max/Min
1	INT-1	Perpendicular Illuminance (Adaptive)	0.50 lx	25.6 lx	10.6 lx	21.2	51.2
		Luminance (Adaptive)	0.016 cd/m²	0.84 cd/m²	0.35 cd/m²	21.9	52.5
2	INT-2	Perpendicular Illuminance (Adaptive)	3.27 lx	28.6 lx	16.1 lx	4.92	8.75
		Luminance (Adaptive)	0.11 cd/m²	0.94 cd/m²	0.53 cd/m²	4.82	8.55
3	INT-3	Perpendicular Illuminance (Adaptive)	4.55 lx	29.5 lx	15.3 lx	3.36	6.48
		Luminance (Adaptive)	0.15 cd/m²	0.97 cd/m²	0.51 cd/m²	3.40	6.47
4	INT-4	Perpendicular Illuminance (Adaptive)	4.45 lx	26.5 lx	12.9 lx	2.90	5.96
		Luminance (Adaptive)	0.13 cd/m²	0.87 cd/m²	0.43 cd/m²	2.87	5.80
5	INT-5	Perpendicular Illuminance (Adaptive)	3.05 lx	28.7 lx	13.3 lx	4.36	9.41
		Luminance (Adaptive)	0.10 cd/m²	0.95 cd/m²	0.44 cd/m²	4.40	9.50
6	INT-6	Perpendicular Illuminance (Adaptive)	6.51 lx	36.0 lx	23.7 lx	3.64	5.53
		Luminance (Adaptive)	0.21 cd/m²	1.19 cd/m²	0.78 cd/m²	3.71	5.67
7	A1	Perpendicular Illuminance (Adaptive)	3.85 lx	23.8 lx	10.3 lx	2.82	6.52
		Luminance (Adaptive)	0.12 cd/m²	0.79 cd/m²	0.34 cd/m²	2.83	6.58
8	C1	Perpendicular Illuminance (Adaptive)	3.02 lx	23.9 lx	10.8 lx	3.51	7.91
		Luminance (Adaptive)	0.100 cd/m²	0.79 cd/m²	0.35 cd/m²	3.50	7.90
9	A2	Perpendicular Illuminance (Adaptive)	4.19 lx	23.8 lx	10.6 lx	2.53	5.68
		Luminance (Adaptive)	0.14 cd/m²	0.79 cd/m²	0.35 cd/m²	2.50	5.64
10	C2	Perpendicular Illuminance (Adaptive)	1.56 lx	23.9 lx	9.52 lx	6.10	15.3
		Luminance (Adaptive)	0.052 cd/m²	0.79 cd/m²	0.31 cd/m²	5.96	15.2
11	B1	Perpendicular Illuminance (Adaptive)	3.00 lx	24.8 lx	10.9 lx	3.63	8.27
		Luminance (Adaptive)	0.099 cd/m²	0.82 cd/m²	0.36 cd/m²	3.64	8.28
12	B2	Perpendicular Illuminance (Adaptive)	3.55 lx	24.1 lx	10.8 lx	3.04	6.79
		Luminance (Adaptive)	0.12 cd/m²	0.79 cd/m²	0.36 cd/m²	3.00	6.58
13	B3	Perpendicular Illuminance (Adaptive)	6.65 lx	25.6 lx	16.0 lx	2.41	3.85
		Luminance (Adaptive)	0.22 cd/m²	0.84 cd/m²	0.53 cd/m²	2.41	3.82
14	B4	Perpendicular Illuminance (Adaptive)	6.24 lx	24.1 lx	12.7 lx	2.04	3.86
		Luminance (Adaptive)	0.21 cd/m²	0.80 cd/m²	0.42 cd/m²	2.00	3.81
15	B5	Perpendicular Illuminance (Adaptive)	7.89 lx	25.0 lx	15.2 lx	1.90	3.13
		Luminance (Adaptive)	0.26 cd/m²	0.83 cd/m²	0.50 cd/m²	1.92	3.19
16	B6	Perpendicular Illuminance (Adaptive)	4.30 lx	24.2 lx	10.9 lx	2.53	5.63
		Luminance (Adaptive)	0.14 cd/m²	0.80 cd/m²	0.36 cd/m²	2.57	5.71
17	B7	Perpendicular Illuminance (Adaptive)	4.88 lx	23.9 lx	10.9 lx	2.23	4.90
		Luminance (Adaptive)	0.16 cd/m²	0.79 cd/m²	0.36 cd/m²	2.25	4.94
18	P1	Perpendicular Illuminance (Adaptive)	1.04 lx	97.5 lx	21.1 lx	20.3	93.8
		Luminance (Adaptive)	0.034 cd/m²	3.22 cd/m²	0.70 cd/m²	20.6	94.7

No.	REVISION / ISSUE	DATE MM/DD/YY
1	INITIAL SUBMISSION	07/15/24

PREPARED BY:

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Email: eng.services.ca@gmail.com

ADVANCE ENGINEERING

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION
95 LOTS
COUNTY ROAD No. 22 (SHANLY RD),
CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

PHOTOMETRIC PLAN

SCALE: 1:600

DRAFTED BY:

PROJECT No.: 0114

DATE: 07-15-2024

DRAWING No.: PH1

SCHEDULE "K"

LANDSCAPING

For the lands set out in Schedule "A", the Owner agrees to implement the objectives and criteria of the Landscape Plan (LS-1), prepared by Advance Engineering Ltd., stamped and dated June 18, 2024.

EARTH BERM (ACOUSTIC BARRIER)

The Owner shall ensure that an earth berm is installed as shown on the Landscape Plan (LS-1). The earth berm shall be 2.5 meters above grade at the property line, with side slopes not steeper than 2.5 to 1. Coniferous trees shall be planted on the North side of the earth berm, at a minimum height of 2.0m.

FENCING

The Owner shall install that a chain-link fence of minimum 1.83 meter height along the municipal property line as shown on the Landscape Plan (LS-1).

The Owner shall install a chain link fence along the walkway shown on Block H of the Landscape Plan (LS-1). Bollards shall be erected on the walkway in accordance with the detail shown on D-5, ensuring a minimum separation distance between the bollards of 1.2m.

CARE AND MAINTENANCE OF PLANTINGS

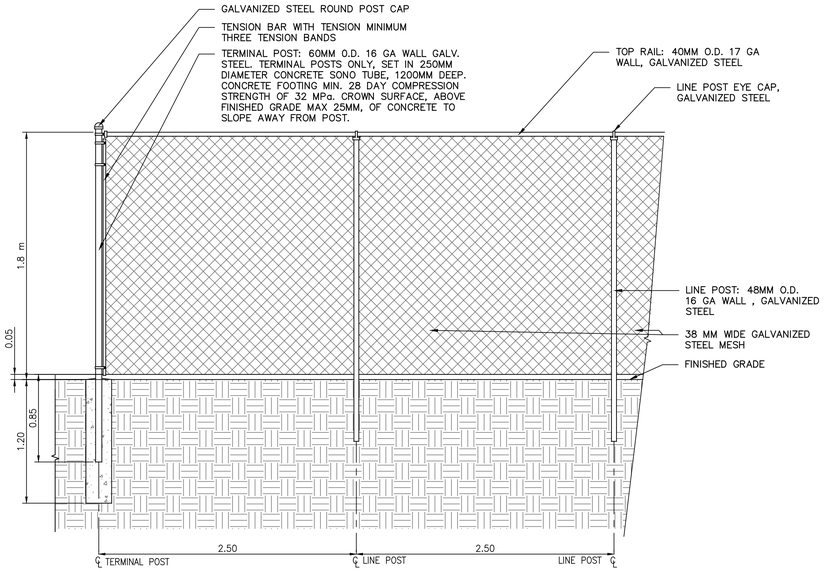
The Owner shall provide necessary care for all plantings in the Landscape Plan during the course of developing the lands in accordance with this Agreement.

The following language shall be included in all Lease and Purchase and Sale Agreements for lots 13-20, inclusive:

> The plantings along the eastern property boundary are for screening purposes and shall not be removed. The care and maintenance of the plantings is the responsibility of the property owner.

Attached:

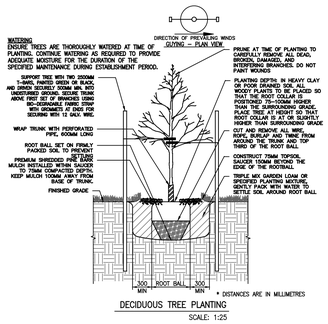
- **Landscape Plan (LS-1) June 18, 2024**



* DISTANCES ARE IN METRES

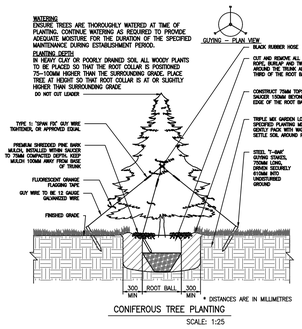
CHAIN LINK FENCE
SCALE: 1:25

NOTE:
1. CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR FENCING FOR APPROVAL.



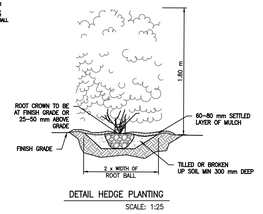
* DISTANCES ARE IN MILLIMETRES

DECIDUOUS TREE PLANTING
SCALE: 1:25



* DISTANCES ARE IN MILLIMETRES

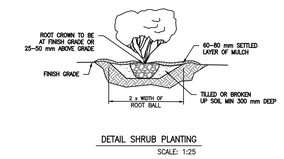
CONIFEROUS TREE PLANTING
SCALE: 1:25



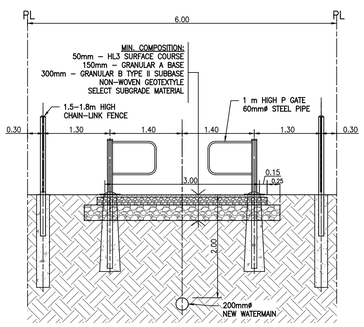
DETAIL HEDGE PLANTING
SCALE: 1:25

SHRUB PLANTING NOTES:
1. SHRUBS AS DETAILED REPRESENTS BOTH CONIFEROUS AND DECIDUOUS SPECIES.
2. PLACE MULCH TO EVEN HORIZONTAL GRADE.
3. SHRUBS PLANTED IN GROUPS SHALL BE SET IN CONTINUOUS PLANTING BEDS.
4. SHRUB BEDS TO BE BACKFILLED WITH TRIPLE MIX GARDEN LOAM PLANTING MIXTURE AS SPECIFIED TO A COMPACTED DEPTH OF 450 mm.
5. FIRMLY COMPACT BACKFILLED PLANTING MIXTURE TO ELIMINATE AIR POCKETS AND PREVENT SETTLEMENT.

WATERING
6. ENSURE SHRUBS ARE THOROUGHLY WATERED AT TIME OF PLANTING. CONTINUE WATERING AS REQUIRED TO PROVIDE ADEQUATE MOISTURE FOR THE DURATION OF THE SPECIFIED MAINTENANCE DURING ESTABLISHMENT PERIOD.

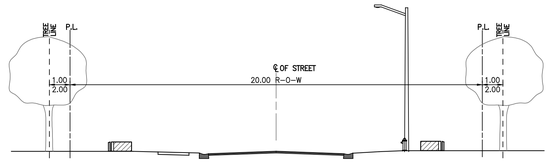


DETAIL SHRUB PLANTING
SCALE: 1:25

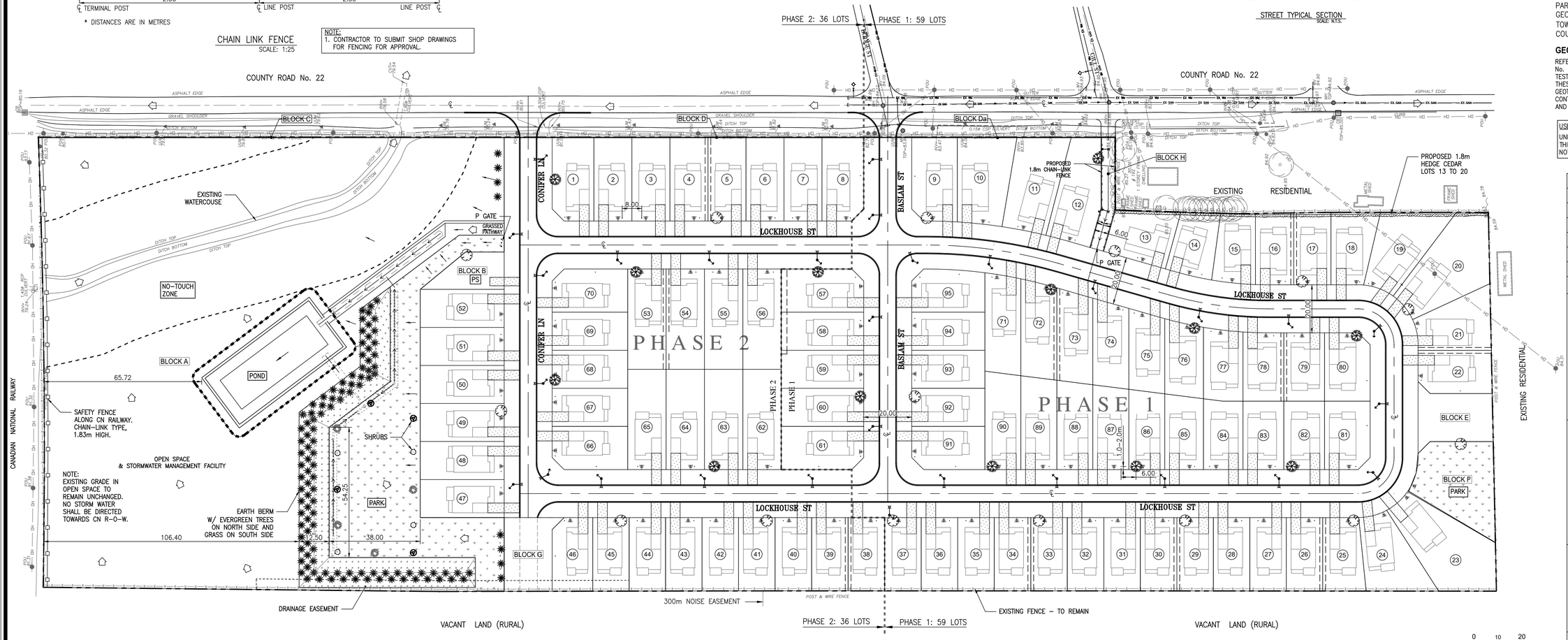


DRIVEABLE PATHWAY
SCALE: 1:50

NOTES
1. DISTANCES ARE IN METRE
2. ROAD COMPOSITION SHALL BE CONFIRMED BY THE GEOTECHNICAL ENGINEER



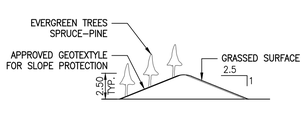
STREET TYPICAL SECTION
SCALE: N.T.S.



LEGEND:
- PROPERTY LIMIT
- LOT LINE
- SETBACK LINE
- PHASING LIMIT
- WATER, STORM AND SANITARY SERVICES
- PROPOSED LANDSCAPED AREA
- PROPOSED ASPHALT DRIVEWAY
- PROPOSED CHAIN–LINK FENCE
- PROPOSED HEDGE
- PROPOSED SHADE TREES
- PROPOSED CONIFEROUS TREE
- PROPOSED SHRUBS

GENERAL NOTES:
1. ALL LANDSCAPING WORK SHALL COMPLY WITH LATEST APPLICABLE ACTS AND BY–LAWS AND IN ACCORDANCE WITH THE REQUIREMENTS OF THE VILLAGE OF CARDINAL AND SOUTH NATION CONSERVATION AUTHORITY.
2. ALL NEW PLANTINGS SHALL INCLUDE NATIVE SPECIES OF THE AREA OF CARDINAL AREA AND SHALL BE PURCHASED FROM A LOCAL NURSERY. ALTERNATIVE TYPES OF TREES MAY BE ACCEPTED.
3. TREE REMOVAL AND REPLACEMENT SHALL COMPLY WITH THE VILLAGE REQUIREMENTS AND POLICIES.
4. PLANT MATERIAL QUALITY STANDARDS: ALL PLANT MATERIAL TO CONFORM TO THE LEVELS OF STANDARDS ESTABLISHED BY THE CANADIAN STANDARDS FOR NURSERY STOCK, EIGHTH EDITION, PUBLISHED BY THE CANADIAN NURSERY LANDSCAPE ASSOCIATION.
5. CONTRACTOR SHALL VERIFY ALL MEASUREMENTS AND DIMENSIONS AND REPORT ANY DISCREPANCIES AND/OR OMISSION PRIOR TO COMMENCEMENT OF WORK.
6. CONTRACTOR SHALL LOCALIZE AND VERIFY ALL EXISTING UNDERGROUND UTILITIES AND SERVICES LINES PRIOR TO EXCAVATION.
7. CONTRACTOR/DEVELOPER SHALL PROVIDE NECESSARY CARE FOR PLANTED TREES.
8. REFER TO EROSION AND SEDIMENT CONTROL PLAN FOR REQUIREMENTS PERTAINING TO LANDSCAPING AND SEQUENCING OF WORK.

PLANTING NOTES:
1. LOCATIONS OF TREES AND SHRUBS SHOWN ON THIS DRAWING ARE APPROXIMATE.
2. TREES SHALL BE MINIMUM 75 mm DIAMETER CALIPER AT BREAST HEIGHT AND 1.8 m MINIMUM HIGH.
3. ALL TREES SHALL BE PLANTED WITHIN PRIVATE PROPERTY AT 1.0 TO 2.0 m FROM PL.
4. EACH LOT SHALL HAVE ONE TREE. CORNER LOTS SHALL HAVE TWO TREES.
5. EXISTING TREELINE AT EAST SIDE OF THE SITE TO BE CUT BACK TO PROPERTY LINE.
6. PROVIDE PLANTING BETWEEN EXISTING PROPERTIES AND LOTS 13 TO 20 INCLUSIVE AS PER DRAFT APPROVAL CONDITION #45.
7. MINIMUM CLEARANCE FOR A TREE FROM:
   - SERVICE LINES: 2 m;
   - OVERHEAD POWER LINES: 8 m;
   - FROM A DRIVEWAY: 1.5 m;
   - FROM A JOINT UTILITY TRENCH: 0.3 m;
   - FROM A SIDEWALK: 2 m;
   - FROM ANOTHER TREE: 6 m.
8. REFER TO SITE SERVICING PLAN AND DETAILS FOR REQUIREMENTS AND LOCATIONS RELATED TO SERVICE CONNECTIONS.
9. ROAD ALLOWANCES SHALL BE FINISHED WITH GRASS SEED OR SOD.



BERM SECTION
SCALE: 1:250

TOP OF BERM : 83.5

TREE LIST:

SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	
·	ACER RUBRUM	RED MAPLE	60 mm CAL	44 UNITS
·	ACER SACCHARUM	SUGAR MAPLE	60 mm CAL	42 UNITS
	GLEDITSIA TRIACANTHOS	HONEY LOCUST	60 mm CAL	15 UNITS
	WHITE PINE	PINUSSTROBUS	2.0 m TALL	13 UNITS
	WHITE SPRUCE	PICEAGLAUCA	2.0 m TALL	113 UNITS
			TOTAL	227 UNITS

× TREE TO BE REMOVED/RELOCATED

SHRUBS LIST:

SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	QTY
	HYDRANGEA	ANNABELLE	0.8 m TALL	4 UNITS
	RUBUS ODORATUS	RASPBERRY	0.8 m TALL	4 UNITS
	CORNUS ALTERNIFOLIA	PAGODA DOGWOOD	0.8 m TALL	4 UNITS
			TOTAL	12 UNITS

UNITED COUNTIES OF LEEDS AND GRENVILLE
PART OF LOT 7, CONCESSION 1
GEOGRAPHIC TOWN OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL
COUNTY OF GRENVILLE

GEOTECHNICAL REPORT

REFER TO GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT No. 21C350, DATED MAY 31, 2021, PREPARED BY ST. LAWRENCE TESTING & INSPECTION CO. LTD.. INFORMATION PRESENTED IN THESE DRAWINGS HAS BEEN INTERPOLATED FROM THE GEOTECHNICAL REPORT AND ACCURACY IS NOT GUARANTEED. CONTRACTORS ARE ADVISED TO READ THE GEOTECHNICAL REPORT AND ASSUME THEIR OWN CONCLUSIONS.

USE AND INTERPRETATION OF DRAWINGS

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THIS DRAWING SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

No.	REVISION / ISSUE	DATE MM/DD/YY
5	UCLG COMMENTS – 06–14–2024	06/18/24
4	10 TREES ADDED – UPDATE	02/06/24
3	TOWNSHIP COMMENTS	09/05/23
2	PEER REVIEW COMMENTS	08/04/22
1	INITIAL SUBMISSION	05/27/22

PREPARED BY:
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Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 06/18/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

LANDSCAPE PLAN

SCALE: 1:750
DRAFTED BY:
PROJECT No.: 0114
DATE: 06-18-2024
DRAWING No.: LS-1

SCHEDULE "L"

COMPOSITE UTILITY PLAN

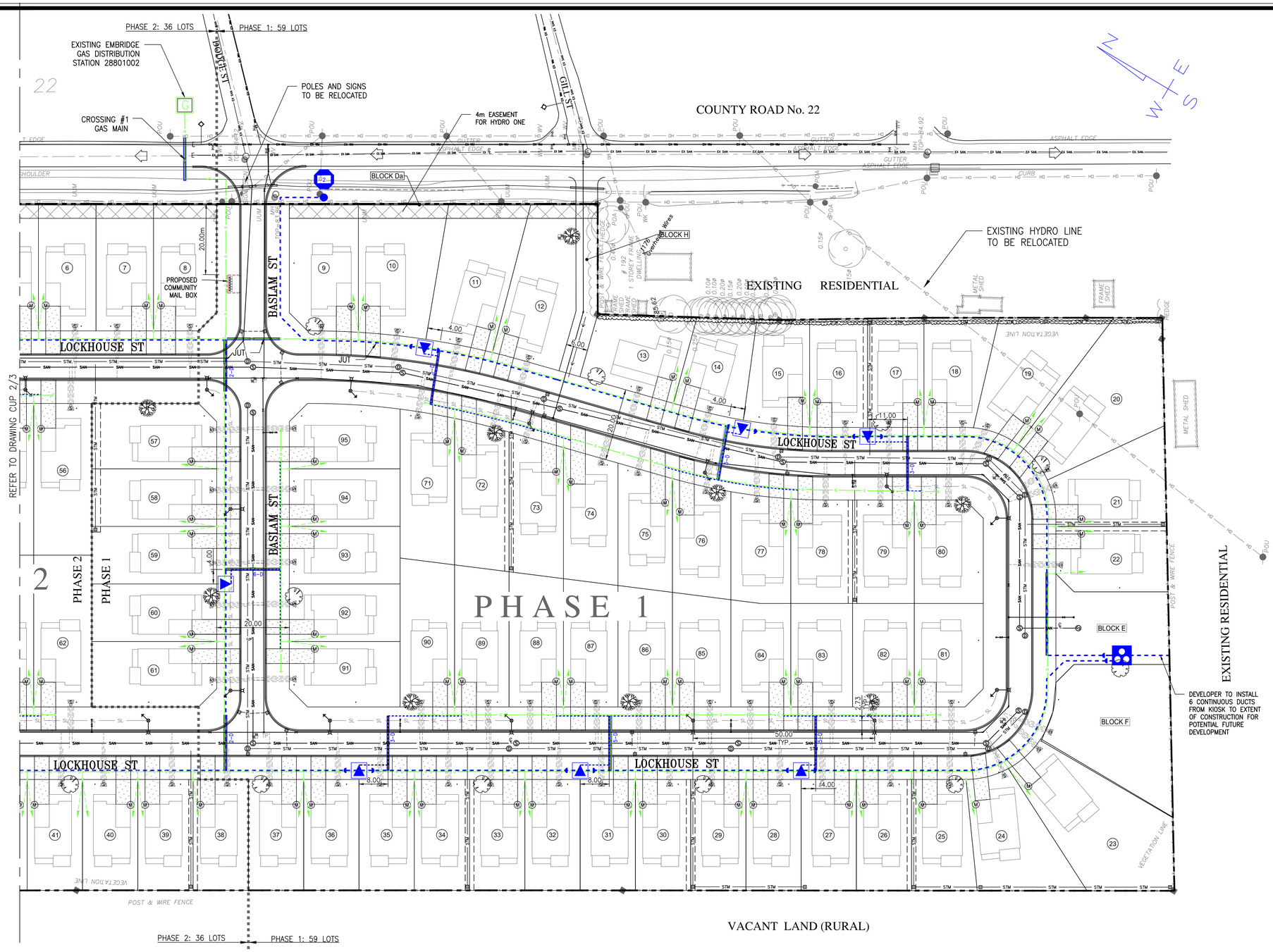
For the lands set out in Schedule “A”, the Owner agrees to implement the objectives and criteria of the Composite Utility Plan (CUP-1 to 3 inclusive), prepared by Advance Engineering Ltd., stamped and dated February 6, 2024; and the Utility Crossing Plans (CR-1, CR-2), prepared by Advance Engineering Ltd., stamped and dated February 6, 2024.

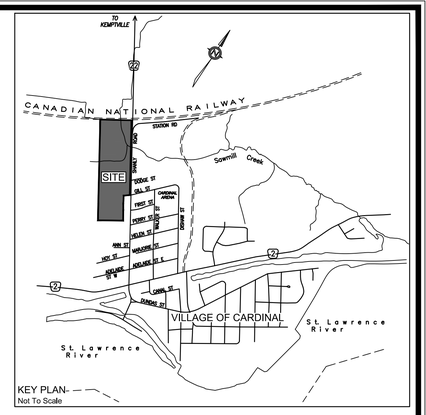
UTILITY SPECIFICATIONS

Wiring for public utilities, to be installed in the area of the Plan of Subdivision herein shall be underground and shall be installed in accordance with specifications approved by the Municipal Official and the applicable utility. Secondary power to the house shall be supplied underground.

Attached:

- **Composite Utility Plans (CUP1 to CUP3 inclusive) February 6, 2024**
- **Utility Crossings (CR1, CR2) June 18, 2024**
- **KINBG_Lockmaster Mead PH1 (Enbridge) April 8, 2024**





UNITED COUNTIES OF LEEDS AND GRENVILLE
PART OF LOT 7, CONCESSION 1
GEOGRAPHIC TOWN OF EDWARDSBURGH
TOWNSHIP OF EDWARDSBURGH/CARDINAL
COUNTY OF GRENVILLE

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY IBW SURVEYORS. FILE No. A-026727-TOPO. SURVEY DATED APRIL 28, 2021.

GEOTECHNICAL REPORT

REFER TO GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT No. 21C350, DATED MAY 31, 2021, PREPARED BY ST. LAWRENCE TESTING & INSPECTION CO. LTD., INFORMATION PRESENTED IN THESE DRAWINGS HAS BEEN INTERPOLATED FROM THE GEOTECHNICAL REPORT AND ACCURACY IS NOT GUARANTEED. CONTRACTORS ARE ADVISED TO READ THE GEOTECHNICAL REPORT AND ASSUME THEIR OWN CONCLUSIONS.

USE AND INTERPRETATION OF DRAWINGS

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THIS DRAWING SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

No.	REVISION / ISSUE	DATE MM/DD/YY
5	TOWNSHIP COMMENTS	02/06/24
4	TOWNSHIP COMMENTS JUNE 30, 2023	07/25/23
3	TOWNSHIP COMMENTS	05/15/23
2	TOWNSHIP COMMENTS	02/28/23
1	INITIAL SUBMISSION	05/27/22

PREPARED BY:

Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com

ADVANCE ENGINEERING

REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 02/06/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION 95 LOTS

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

COMPOSITE UTILITY PLAN PHASE 1

SCALE: 1:500	DRAWING No.: CUP 1/3
DRAFTED BY:	
PROJECT No.: 0114	
DATE: 02/06/24	

NOTES:

1. THE ACCURACY OF LOCATIONS OF UNDERGROUND AND ABOVE GROUND UTILITIES SHOWN ON THESE DRAWINGS IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATIONS OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
2. ALL AREAS DISTURBED BY THE CONTRACTOR DURING CONSTRUCTION WORKS SHOWN HEREIN SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER AS DETERMINED BY TOWNSHIP PUBLIC WORKS DEPARTMENT.
3. ALL WORKS TO BE IN ACCORDANCE WITH THE VILLAGE OF CARDINAL REQUIREMENTS AND SHALL BE SUBJECT TO APPROVAL BY EACH APPLICABLE UTILITY COMPANY.
4. ALL UTILITIES SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE LATEST VERSIONS OF INDUSTRY STANDARDS AND BEST PRACTICES, INCLUDING BUT NOT LIMITED TO:
   - ONTARIO REGIONAL COMMON GROUND ALLIANCE (ORCGA)
   - ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD)
   - STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA (ASCE 38-02).
5. STANDARDS: ALL UTILITIES MATERIALS AND COMPONENTS SHALL COMPLY WITH THE MOST RECENT VERSION OF ALL APPLICABLE CURRENT INDUSTRY STANDARDS AND SPECIFICATIONS FOR QUALITY MANAGEMENT AND QUALITY CONTROL, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:
   - ELECTRICAL SAFETY AUTHORITY (ESA)
   - CANADIAN STANDARDS ASSOCIATION (CSA).
6. REFER TO DRAWING 00323-22-278 BY HYDRO ONE FOR MORE DETAILS.
7. PROVIDE THE MINIMUM CLEAR SEPARATIONS BETWEEN UTILITIES AND INFRASTRUCTURE AS SHOWN IN TABLE 1B.
8. DUCT WHETHER DIRECT BURIED OR CONCRETE ENCASED, SHALL BE INSTALLED IN ACCORDANCE WITH OPSS AND OPSD, LATEST EDITION AND AS SPECIFIED BY EACH UTILITY COMPANY'S STANDARD REQUIREMENTS.
9. THE MINIMUM DEPTH OF COVER SHALL BE 0.7 m FOR UNDERGROUND UTILITIES WITHIN RIGHT-OF-WAY (ROW). THE DEPTH OF COVER FOR ANY UTILITY IS MEASURED FROM THE STREET SURFACE TO THE TOP OF THE DUCT, IF DIRECT BURIED, OR TOP OF THE CONCRETE IF THE EQUIPMENT IS CONCRETE ENCASED.
10. NO SERVICE CONNECTIONS AND APPURTENANCES SHALL BE LOCATED IN THE DRIVEWAYS.
11. ROAD CROSSINGS SHALL BE IN ACCORDANCE WITH OPSS AND OPSD AND AS SPECIFIED BY EACH UTILITY COMPANY'S STANDARD REQUIREMENTS.
12. EXCAVATION: ALL EXCAVATIONS SHALL BE DONE IN ACCORDANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS, REVISED STATUTES OF ONTARIO, 1990 CHAPTER 1 AS WELL AS INDEPENDENT UTILITY COMPANY REQUIREMENTS.
13. BEDDING, EMBEDMENT AND COVER: BEDDING, EMBEDMENT AND COVER MATERIALS SHALL BE PLACED FOR THE FULL WIDTH OF THE TRENCH AND MECHANICALLY COMPACTED TO 98% OF STANDARD PROCTOR MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698.
14. ACCORDING TO THE GEOTECHNICAL REPORT, THE SOIL THROUGHOUT THE SITE IS A TYPE 2 TO TYPE 3 SOIL FROM A TRENCH PERSPECTIVE. AS SUCH, NORMAL TRENCHES CAN BE USED. THE BOTTOM 1.2 m CAN BE VERTICAL. ABOVE 1.2 m, THE SIDE SLOPES MUST BE CUT BACK TO A 1 TO 1 SIDE SLOPE.
15. THE BEDDING AND COVER FOR ALL SERVICES SHOULD BE 150 mm OF GRANULAR 'A' COMPACTED AT 95% STANDARD PROCTOR DENSITY.
16. BACKFILL: ALL OF THE EXISTING SOIL CAN BE REUSED IN THE TRENCHES, PROVIDED THE SOIL IS MOIST. WHERE THE TRENCHES WILL BE WITHIN THE ROADWAYS, THE TRENCH BACKFILL MUST BE RAMPED DOWN IN 300 mm LIFTS TO 95% STANDARD PROCTOR DENSITY.
17. CARE SHALL BE EXERCISED DURING BACKFILL OPERATIONS SO THAT THE UTILITY (DUCTS, CONCRETE, CABLES OR IS NOT DAMAGED OR DISPLACED.
18. CANADA POST COMMUNITY MAIL BOX (CMB): PROVIDE A CULVERT ACCESS AND DEPRESSIONS FOR WHEELCHAIR ACCESS FOR THE CMB.
19. CONTRACTOR SHALL COORDINATE WITH CANADA POST ABOUT THE EXCAVATION AND THE INSTALLATION OF THE CMB PADS.
20. LOCATIONS OF CROSSINGS ARE APPROXIMATE AND SHALL BE CONFIRMED BY UTILITY COMPANIES.

LEGEND:

PROPERTY BOUNDARY
PHASING LIMITS
LOT LINE
SETBACK LINE
EASEMENT
EXISTING WATERMAIN (EX WM)
EXISTING SANITARY SEWER (EX SAN)
EXISTING HYDRO LINE (OHW)
EXISTING GAS MAIN (GAS)
EXISTING BELL LINE
PROPOSED WATERMAIN (WM)
PROPOSED FORCEMAIN (FM)
PROPOSED SANITARY SEWER (SAN)
PROPOSED STORM SEWER (STM)
PROPOSED SANITARY MANHOLE 1200mm (S)
EXISTING SANITARY MANHOLE
PROPOSED STORM MANHOLE (D)
EXISTING STORM (DRAINAGE) MANHOLE
PROPOSED CATCH BASIN 600 x 600 (CB)
PROPOSED REAR YARD CATCH BASIN (RC)
EXISTING CULVERT
PROPOSED TREE
PROPOSED WATER VALVE & BOX (V&B)
EXISTING WATER VALVE (WV)
PROPOSED FIRE HYDRANT

DRIVEWAY
FENCE
PROPOSED GAS MAIN (G)
PROPOSED BELL LINE (B)
EXISTING 150mmø PERFORATED SUBDRAIN (SD)
EXISTING ROAD DITCH LINE (D)
PROPOSED HANDHOLE FOR TELECOM (B)
PROPOSED BELL PEDESTAL
CROSSING – CONCRETE ENCAISED
PROPOSED GAS SERVICE
JOINT UTILITY TRENCH (HYDRO, BELL, CABLE)
DENOTES NUMBER OF UTILITY DUCTS (2H, 1B, 1C)
1 PHASE PAD-MOUNTED TRANSFORMER 16 KV (10 U)
SERVICE ENTRANCE HYDRO, BELL, CABLE
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3 PHASE PAD-MOUNTED TRANSFORMER (1 U)
END WALL BOX
HYDRO POLE (HP)
HYDRO POLE C/W GUY WIRE
STREET LIGHT CABLE (SL)
STREET LIGHT DISCONNECT (SD)
STREET LIGHT POLE & GROUND WIRE
COMMUNITY MAILBOX (CMB)
HYDRO METER (M)

RESIDENTIAL SUBDIVISION:

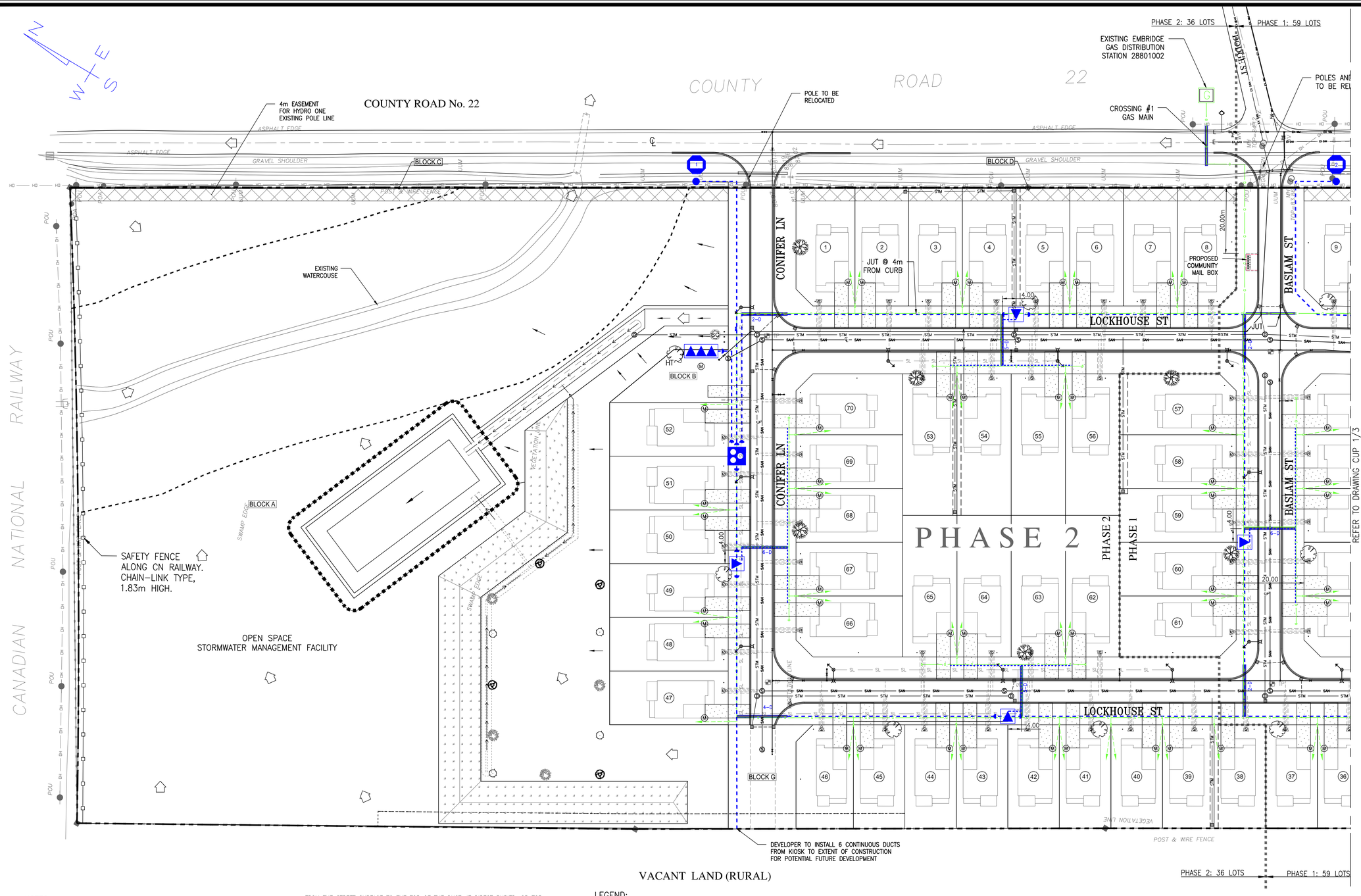
- SINGLE FAMILY LOTS: 95 UNITS
- PHASE 1: 59 LOTS
- PHASE 2: 36 LOTS
- STORMWATER MANAGEMENT/OPEN SPACE (BLOCK A)
- PUMPING STATION (BLOCK B)
- PARK (BLOCK F)

NOTE:

- REFER TO LATEST HYDRO ONE DESIGN PLAN FOR DUCT NUMBERS, CABLES TYPES AND OTHER DETAILS.

0 10 20 METRES

4.29.2024 114-2-cup.dwg AE-MONOCHROME-36X24-COL-GBR-100170240.ctb ISO full bleed B1 (1000.00 x 707.00 MM)



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LEGEND:

- PROPERTY BOUNDARY
- PHASING LIMITS
- LOT LINE
- SETBACK LINE
- EASEMENT
- EXISTING WATERMAIN (EX WM)
- EXISTING SANITARY SEWER (EX SAN)
- EXISTING HYDRO LINE (OHW)
- EXISTING GAS MAIN (GAS)
- EXISTING BELL LINE (B)
- PROPOSED WATERMAIN (WM)
- PROPOSED FORCEMAIN (FM)
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- PROPOSED STORM SEWER (STM)
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- EXISTING CULVERT
- PROPOSED TREE
- PROPOSED WATER VALVE & BOX (V&B)
- EXISTING WATER VALVE (WV)
- PROPOSED FIRE HYDRANT
- DRIVEWAY
- FENCE
- PROPOSED GAS MAIN (G)
- PROPOSED BELL LINE (B)
- EXISTING 150mmø PERFORATED SUBDRAIN (SD)
- EXISTING ROAD DITCH LINE (D)
- PROPOSED HANDHOLE FOR TELECOM (B)
- PROPOSED BELL PEDESTAL
- CROSSING – CONCRETE ENCAISED
- PROPOSED GAS SERVICE
- JOINT UTILITY TRENCH (HYDRO, BELL, CABLE)
- DENOTES NUMBER OF UTILITY DUCTS (2H, 1B, 1C)
- 1 PHASE PAD-MOUNTED TRANSFORMER 16 KV (10 U)
- SERVICE ENTRANCE HYDRO, BELL, CABLE
- 3 PHASE KIOSK (2 U)
- 3 PHASE PAD-MOUNTED TRANSFORMER (1 U)
- END WALL BOX
- HYDRO POLE (HP)
- HYDRO POLE C/W GUY WIRE (HP)
- STREET LIGHT CABLE (SL)
- STREET LIGHT DISCONNECT (SD)
- STREET LIGHT POLE & GROUND WIRE
- COMMUNITY MAILBOX (CMB)
- HYDRO METER (M)

0 10 20 METRES

No.	REVISION / ISSUE	DATE MM/DD/YY
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PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 02/06/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION
95 LOTS
COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

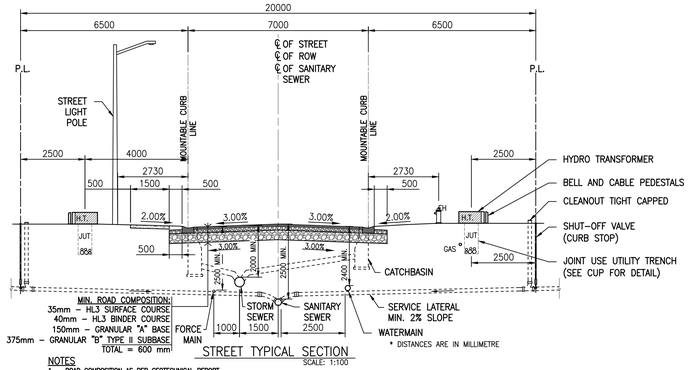
APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

COMPOSITE UTILITY PLAN PHASE 2

SCALE: 1:500
DRAFTED BY:
PROJECT No.: 0114
DATE: 02-06-2024
DRAWING No.: CUP 2/3

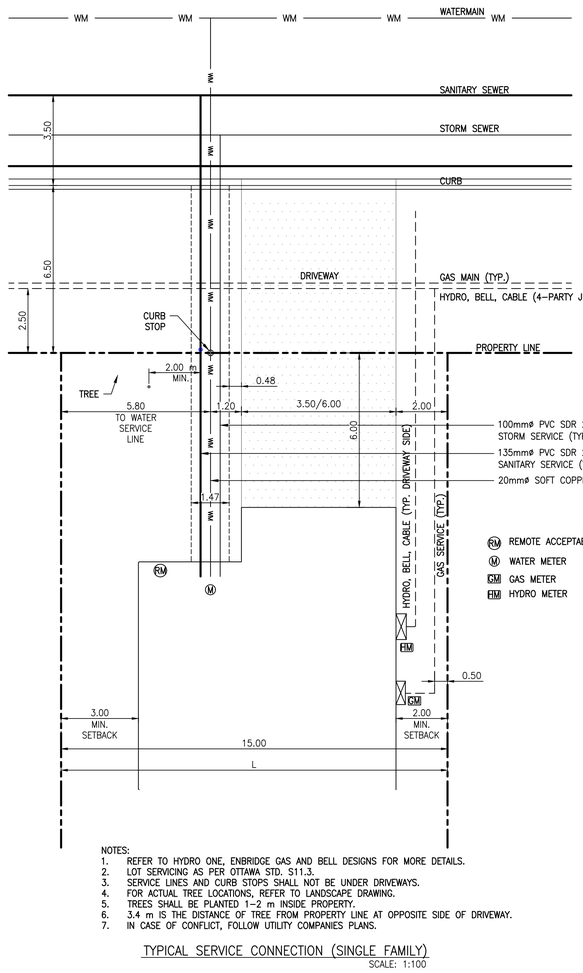


STREET TYPICAL SECTION

SCALE: 1:100

NOTES

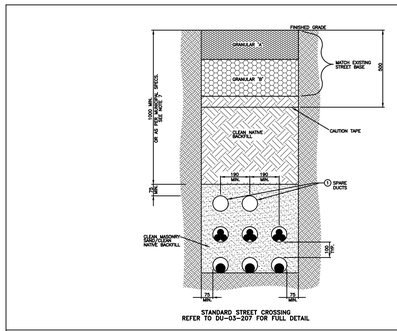
1. ROAD COMPOSITION AS PER GEOTECHNICAL REPORT.
2. REFER TO HYDRO ONE PLANS FOR MORE DETAILS.
3. FUTURE IMPROVEMENT: 0.5 m PAVED BOULEVARD & 1.5 SIDEWALK.
4. 4–PARTY JOINT USE TRENCH: HYDRO ONE, ENBRIDGE GAS, BELL AND CABLE.
5. CATCH BASIN TYPE SHALL SUIT MOUNTABLE CURB (OPSD 600.100).
6. AT CATCH BASIN AND HYDRANT LOCATIONS, THE GAS MAIN SHALL HAVE A MINIMUM 0.5 m CLEARANCE FROM STRUCTURES.



NOTES:
1. REFER TO HYDRO ONE, ENBRIDGE GAS AND BELL DESIGNS FOR MORE DETAILS.
2. LOT SERVICING AS PER OTTAWA STD. S11.3.
3. SERVICE LINES AND CURB STOPS SHALL NOT BE UNDER DRIVEWAYS.
4. FOR ACTUAL TREE LOCATIONS, REFER TO LANDSCAPE DRAWING.
5. TREES SHALL BE PLANTED 1–2 m INSIDE PROPERTY.
6. 3.4 m IS THE DISTANCE OF TREE FROM PROPERTY LINE AT OPPOSITE SIDE OF DRIVEWAY.
7. IN CASE OF CONFLICT, FOLLOW UTILITY COMPANIES PLANS.

TYPICAL SERVICE CONNECTION (SINGLE FAMILY)

SCALE: 1:100



STANDARD STREET CROSSING
REFER TO DU–03–207 FOR FULL DETAIL

NOTES:

1. ALL DIMENSIONS ARE IN mm UNLESS STATED OTHERWISE.
2. ALL SEPARATIONS AND DEPTHS OF BURIAL ARE MINIMUM.
3. IF MINIMUM DEPTH OF COVER AS NOTED IN THE ABOVE TRENCH PROFILES IS EXCEEDED, SLOPING OF TRENCH WALLS AND/OR SHORING SHALL CONFORM TO THE REQUIREMENTS SPECIFIED IN THE OCCUPATIONAL HEALTH AND SAFETY ACT.
4. ALL SECONDARY SERVICE TRENCHES ARE TO BE 3 PARTY ONLY.
5. TOP AND SIDES OF DUCTS SHALL BE SURROUNDED BY RAKED AND COMPACTED CLEAN MASONRY SAND. CLEAN NATIVE BACKFILL TO BE RAKED AND COMPACTED, AND WITHOUT STONES AND SHARP OBJECTS. REFER TO BACKFILLING DETAILS, SECTION 3C–2 OF U/G DISTRIBUTION STANDARDS v2011.
6. SECONDARY CABLES TO BE STAKED AT LOT LINE AS PER DU–03–209.2 (D4). 50 X 100mm POST AND 100mm CORRUGATED PIPE TO BE SUPPLIED AS PART OF CIVIL WORKS.
7. SECONDARY SPLICE TO BE COMPRESSION TYPE ONLY
8. IF APPLICABLE, GAS METER MUST MAINTAIN A MINIMUM SEPARATION OF 1m FROM HYDRO METER.
9. METER COMPARTMENT AND CONDUIT TO BE SURFACE MOUNTED ONLY. METER BASES RECESSED IN WALLS, ENCLOSED IN CABINETS OR OTHERWISE OBSTRUCTED ARE NOT PERMITTED.
10. INSTALL METER COMPARTMENT AS PER ELECTRICAL SAFETY CODE RULES, USE ONLY HYDRO ONE APPROVED 200A JUMBO SIZED METER COMPARTMENT CENTRE MOUNT WITH TUNNEL TYPE CONNECTORS AND HAVING THE MINIMUM DIMENSIONS OF 17"x12"X4–3/4" CONTAINING 3" KNOCKOUTS. METER BASE TO MAINTAIN 1 METER MIN. CLEARANCE FROM DISCHARGE OF ANY COMBUSTIBLE GAS RELIEF DEVICE OR VENT.
11. MINIMUM HORIZONTAL CLEARANCES BETWEEN HONI DISTRIBUTION EQUIPMENT (<50kV) & OTHER UTILITY EQUIPMENT ARE TO BE PER TABLE 1B, SECTION 3D OF THE U/G DISTRIBUTION STANDARDS v2011.

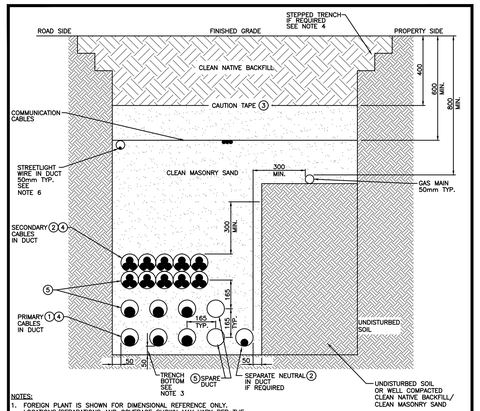
U/G TRANSFORMERS & KIOSKS:

1. BACK OF TRANSFORMER TO BE LOCATED AS PER MUNICIPAL SPECIFICATION.
2. ALL TRANSFORMERS MUST BE LOCATED AT LEAST 3m FROM SURFACE OBJECTS AND STRUCTURES, OPENINGS OR COMBUSTIBLE MATERIALS ON OPERATING SIDE, 1m ON ALL OTHER SIDES.
3. ALL PADMOUNT TRANSFORMERS ARE TO BE POSITIONED SO THAT THE ACCESS DOOR OPENS FROM THE ROAD SIDE, UNLESS OTHERWISE SPECIFIED.
4. REFER TO SECTION 9.0 OF THE U/G DISTRIBUTION STANDARDS v2011 FOR VAULT SPECIFICATIONS. ALL SINGLE PHASE PAD–MOUNTED TRANSFORMER VAULTS ARE TO BE A PRECAST CONCRETE FOUNDATION (1 PIECE) AS PER THE HONI APPROVED MATERIAL LIST.
5. PROTECTIVE BOLLARDS ARE REQUIRED IF TRANSFORMER IS LOCATED LESS THAN 1m FROM DRIVEWAY OR BACK OF CURB. (AS PER HONI DWG. DU–03–212).
6. THREE PHASE TRANSFORMERS AND KIOSKS TO BE INSTALLED AS PER HONI DRAWINGS: DU–03–210, DU–03–214, DU–03–301, DU–03–302, DU–14–101.
7. THREE PHASE TRANSFORMERS AND KIOSKS TO BE INSTALLED AS PER HONI DRAWINGS: DU–04–301, DU–04–302, DU–04–401, DU–04–402, DU–14–101.

DUCTS:

1. HYDRO DUCTS TO BE 100mm TYPE II PVC UNLESS OTHERWISE NOTED.
2. BELL ENDS TO BE PLACED ON ALL OPEN DUCT ENDS.
3. UNUSED DUCTS TO BE CAPPED, C/W 1/2" WIDE, 1/16" THICK PULLING TAPE (MULETAPE).
4. PRIMARY AND SECONDARY CONDUCTORS TO BE INDIVIDUALLY DUCTED C/W SPARE FOR PRIMARY AND INCLUDE ADDITIONAL SPARE AT SECONDARY ROAD CROSSINGS.
5. ALL DUCTS TO BE MANDRELLED AND CLEANED AFTER INSTALLATION, WITNESSED BY HYDRO ONE.
6. DUCT QUANTITIES SHOWN ARE HYDRO REQUIREMENTS ONLY.
7. MINIMUM RADIUS OF DUCT TO BE USED IS 36" UNLESS NOTED OTHERWISE.

REVISED: JUNE 2021



NOTES:
1. FOREIGN PLANT IS SHOWN FOR DIMENSIONAL REFERENCE ONLY. LOCATIONS/SEPARATIONS AND COVERAGE SHOWN MAY VARY PER THE OWNERS AND/OR MUNICIPAL STANDARDS. MINIMUM SEPARATIONS SHOWN TO HONI PLANT MUST BE MAINTAINED.
2. ALL SEPARATIONS AND DEPTHS OF BURIAL ARE MINIMUM.
3. IN THE PRESENCE OF SHARP ROCKS OR UNEVEN TERRAIN, INCREASE SAND PADDING TO 100mm.
4. CONSTRUCTION, STEPPING AND/OR SUPPORTING OF THE TRENCH WALL TO CONFORM TO THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT.
5. NON–REQUIRED CIRCUITS OR JOINT USE COMPONENTS MAY BE OMITTED PROVIDED THAT CLEARANCES AND SEPARATIONS ARE MAINTAINED. EXPRESS PRIMARY CABLES (IF PRESENT) MUST OCCUPY LOWEST POSITION IN THE DUCT BANK. SECONDARY CABLES MAY BE INSTALLED IN THE LOWER (PRIMARY) POSITIONS IF REQUIRED. SUPPLY CABLES OF ALL VOLTAGES MUST HAVE 900mm MINIMUM COVER.
6. STREETLIGHT WIRE MAY BE INSTALLED ADJACENT TO A SECONDARY CABLE DUCT SO LONG AS IT IS INSTALLED IN ITS OWN DISTINGUISHABLE DUCT (EXAMPLE: 50mm PVC/HDPE DUCT VERSUS 100mm DB2).
7. ALL DUCTS TO BE MANDRELLED AND CLEANED AFTER INSTALLATION. ALL DUCTS TO HAVE 1/2" POLYESTER PULLING TAPE INSTALLED.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED

MINIMUM COVER REQUIREMENTS	
COMPONENT	COVER
COMMUNICATION CABLES IN DUCT	600mm
STREETLIGHT WIRE IN DUCT	600mm
GAS MAIN	900mm
SECONDARY SUPPLY CABLES	900mm
PRIMARY SUPPLY CABLES	900mm

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	MM#	CABLE, PRIMARY, UNDERGROUND, 28kV OR CABLE, PRIMARY, UNDERGROUND, 46kV	A/R
2	MM#	CABLE, SECONDARY/NEUTRAL, UNDERGROUND, 0–600V	A/R
3	2000218?	TAPE, CAUTION, RED	A/R
4	MM#	DUCT, PVC, DB2	A/R
5	2000000?	TAPE, PULLING, 1/2" WIDE, POLYESTER	A/R
MM# = REFER TO SECTION 16 ONLY A/R = AS REQUIRED			

Rev. No.	Date	Revision Particulars	dwn	chd	des	upg
01	SEP 2018	GENERAL UPDATES, ALLOWANCE OF 46kV CABLES & SEPARATE NEUTRAL AND INTRODUCED MINIMUM COVER REQUIREMENTS TABLE. CHANGED TO NEW DWG. & NUMBERING FORMAT. FOR PREVIOUS REVISIONS REFER TO DU–03–206.2–80.	SO	PC	AS	PS

Drawn By: PC | Checked By: | Designed By: | Design Approved By:
Scale: N.T.S. | Date: (yyy/mm/dd) 2012/12/–– | Pole ID:

hydro One Hydro One Networks Inc.

4–PART TRENCH – POWER, COMMUNICATION, GAS & STREETLIGHT – ALL–IN–DUCT – TYPICAL UP TO 44kV

Drawing No.: DU–03–206.2–0500 | Rev. No. 01

UNDERGROUND DISTRIBUTION STANDARDS – INTERIM — SINGLE–PHASE DISTRIBUTION

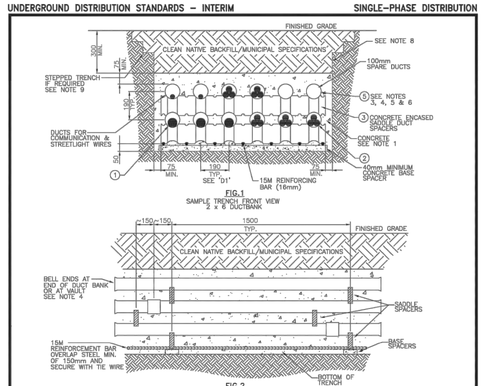
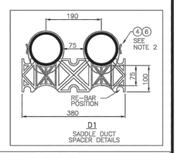


FIG.1
SAMPLE TRENCH FRONT VIEW
2 x 6 DUCTBANK

FIG.2
SAMPLE TRENCH SIDE VIEW
3 LAYERS OF DUCTBANK

NOTES:
1. CONCRETE TO HAVE A COMPRESSIVE STRENGTH OF MINIMUM 20MPa AT 28 DAYS AND BE VIBRATED AT TIME OF POURING TO REMOVE ENTRAPPED AIR.
2. SPACERS STAGGERED 150mm VERTICALLY AND BE SPACED AT EVERY 1500mm LENGTH OF DUCT. DUCTS TO BE SECURELY FASTENED TO THE SPACER VIA TIE WIRE AS SHOWN IN DETAIL "D1".
3. ALL JOINTS TO BE SOLVENT WELDED.
4. ALL DUCTS SHALL TERMINATE AT FACE OF DUCT BANK WITH BELL ENDS.
5. ALL DUCTS TO BE MENDRILLED AND CLEANED AFTER INSTALLATION. ALL DUCTS TO HAVE 1/2" POLYESTER PULLING TAPE INSTALLED.
6. NUMBER OF CABLES/DUCTS AS WELL AS THEIR ARRANGEMENT WITHIN THE DUCT BANK AS SHOWN IS REPRESENTATIVE ONLY. DUCTS/CABLES MAY BE ADDED/OMITTED AND/OR RE–ARRANGED AS REQUIRED, PROVIDED THAT CLEARANCES AND SEPARATIONS ARE MAINTAINED. OVERALL TRENCH WIDTH TO CONFORM TO MUNICIPALITY REQUIREMENTS.
7. TRENCH BOTTOM MUST BE LEVEL AND FREE OF DEBRIS.
8. FORMS REQUIRED FOR BOTH SIDES OF THE FULL LENGTH OF THE CONCRETE ENCASED DUCT STRUCTURE.
9. CONSTRUCTION, STEPPING AND/OR SUPPORTING OF THE TRENCH WALL TO CONFORM TO THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT.
10. REFER TO DU–03–206.4–0500 FOR BEND DETAILS.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED



D1
SADDLE DUCT SPACER DETAILS

PARTS LIST			
PART No.	MM No.	DESCRIPTION	QTY.
1	MM#	CABLE, PRIMARY 0–46kV, UNDERGROUND	A/R
2	MM#	CABLE, SECONDARY/NEUTRAL, UNDERGROUND, 0–600V	A/R
3	MM#	SPACER, DUCT, SADDLE	A/R
4	MM#	DUCT, PVC, DB2, 100mm	A/R
5	2000000?	TAPE, PULLING, 1/2" WIDE, POLYESTER	A/R
6	3500028?	TIE WIRE, FOR REBAR, 16 GAUGE	A/R
MM# = REFER TO SECTION 16 ONLY A/R = AS REQUIRED			

Rev. No.	Date	Revision Particulars	dwn	chd	des	upg
03	NOV 2019	ADDED NOTE #10, CHANGED MINIMUM CONCRETE COMPRESSIVE STRENGTH. UPDATED DRAWING TITLE AND FIGURE 1 AND 2 TITLES.	PC	XZ	DD	
02	SEP 2018	GENERAL UPDATES, CHANGED TO NEW DWG. & NUMBERING FORMAT. FOR PREVIOUS REVISIONS REFER TO DU–03–206.2–81.	SO	PC	AS	PS

Drawn By: PC | Checked By: | Designed By: | Design Approved By:
Scale: N.T.S. | Date: (yyy/mm/dd) 2014/12/03 | Pole ID:

hydro One Hydro One Networks Inc.

CONCRETE ENCASED DUCT BANK (4" CONDUIT) WITH PROVISION FOR REDUCED COVER UP TO 44kV

Drawing No.: DU–03–206.3–0500 | Rev. No. 03

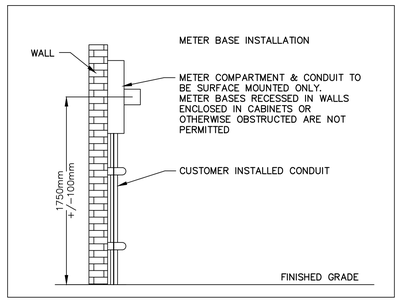
R04 ➤

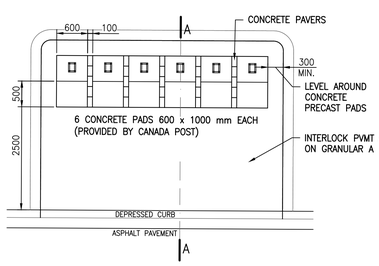
Table 1B
MINIMUM HORIZONTAL CLEARANCES
Between HONI Distribution Equipment (<50 kV) & Other Plant/Structures

Other Plant/Structures		Separation (mm)					
		Underground				Overhead	
		Primary & Secondary Cables/Ducts	Pad-mounted Equipment (Foundation)		Pole (below grade)	Conductor 0-0.75kV (note 3)	Conductor 0.751-50kV (note 3)
			Access side	Non-access Sides			
Water Plant	Water Line	300	300	300	600	-	-
	Valve Box / Chamber	300	300[1]	300[1]	600	-	-
	Hydrant	300	3000	1000	1000	-	-
Sewer Plant	Sewer Line	300	300	300	600	-	-
	Catch Basin	300	300[1]	300[1]	600	-	-
	Manhole	300	300[1]	300[1]	600	-	-
Gas	Gas Line	300[4]	300	300	600	-	-
Traffic / Street Lighting	Pole/Mast/Pillar	600	3000	1000	3000	1000	1000
	Cable or Duct	300	300	300	600	-	-
	Joint Use Pole	600	3000	1000	3000	1000	1000
	U/G Vault / Hand-hole	300	300[1]	300[1]	1000	-	-
	Control Pedestal	300	3000	150[5]	1000	-	-
Comm.	Pedestal	300	3000	150[5]	1000	-	-
	Cable (Direct Buried / Joint-Use Trench)	300 / 0[2]	300	300	600	-	-
	U/G Vault / Hand-hole	300	300[1]	300[1]	1000	-	-
Misc.	Tree (Direct Buried / Duct)	1000 / 300	3000	3000	3000	10	1000
	Building/Structure Foundation[5]	300	3000	1000	5000	-	-

[1] The specified clearance is to the outside of the ground grid of the pad-mounted equipment.
[2] Only applicable in a joint-use trench when there is 300 mm of vertical separation between the communication and supply cables.
[3] Overhead conductors are in full position of horizontal swing as calculated in DL6-109.
[4] Zero horizontal separation is allowed during cable crossing if there is 300 mm vertical clearance.
[5] Communication pedestals located within 3 m of pad-mounted supply equipment shall be bonded to the ground grid. See DU-03-214 for details.
[6] Measured from the nearest extent of the structure including footings and any associated drainage components.

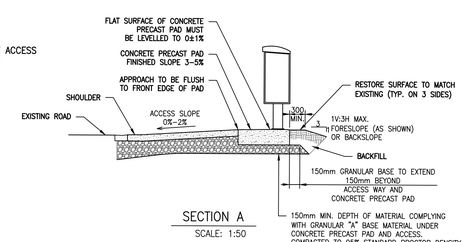
Note: The clearances are measured from the surface of the listed equipment to the closest surface of the other.





COMMUNITY MAIL BOX (PLAN VIEW)

SCALE: 1:50



SECTION A

SCALE: 1:50

No.	REVISION / ISSUE	DATE MM/DD/YY
5	TOWNSHIP COMMENTS	02/06/24
4	TOWNSHIP COMMENTS JUNE 30, 2023	07/25/23
3	TOWNSHIP COMMENTS	05/15/23
2	TOWNSHIP COMMENTS	02/28/23
1	INITIAL SUBMISSION	05/27/22

PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING
REGISTERED PROFESSIONAL ENGINEER M. MABROUK 100136017 02/06/24 PROVINCE OF ONTARIO

PROJECT NAME AND ADDRESS:

LOCKMASTER'S MEADOW SUBDIVISION 95 LOTS

COUNTY ROAD No. 22 (SHANLY RD), CARDINAL, ON

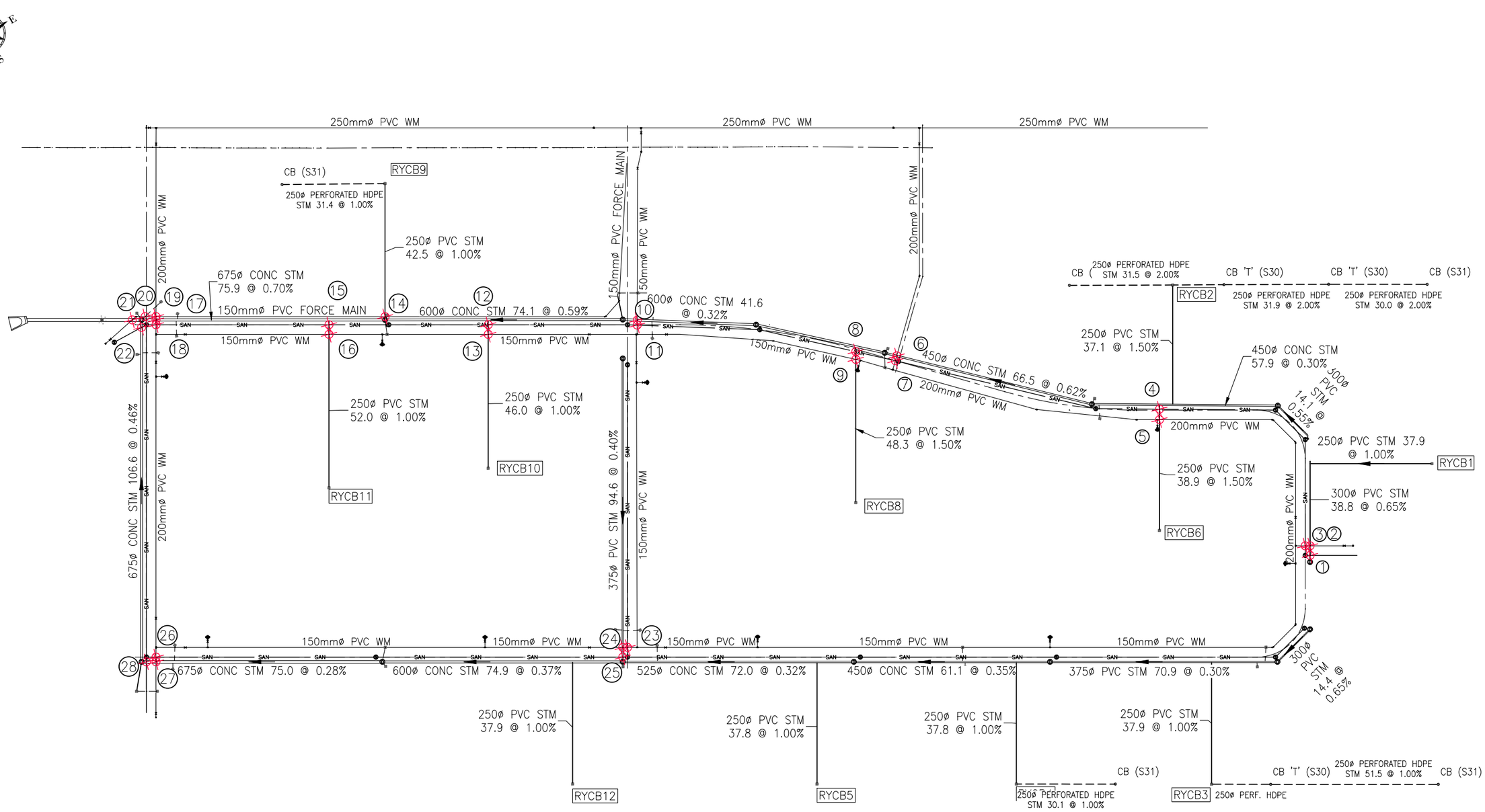
APPLICANT:

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON
613-282-5601

TITLE:

COMPOSITE UTILITY PLAN DETAILS

SCALE: Varies
DRAFTED BY:
PROJECT No.: 0114
DATE: 02-06-2024
DRAWING No.: CUP 3/3



LEGEND:

8 CROSSING ID AND LOCATION

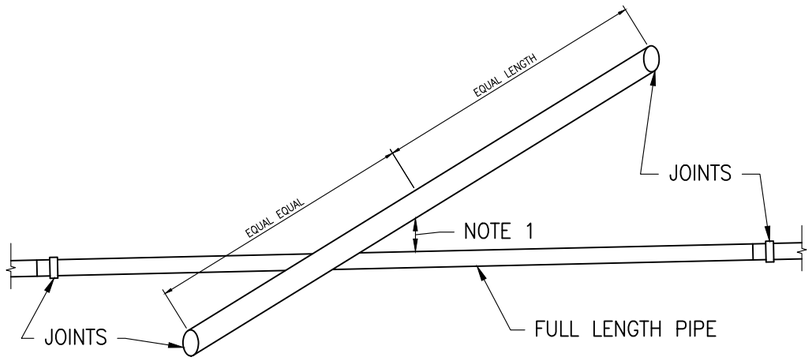
PROJECT NAME AND ADDRESS: LOCKMASTER'S MEADOW SUBDIVISION, CARDINAL	DRAWING TITLE: UTILITY CROSSINGS	SCALE: 1:1250 / DATE: 06-18-2024	DRAWING No.: CR1

UTILITY CROSSING TABLE

POINT #	TOP NETWORK	BOTTOM NETWORK	TOP ELVATION	BOTTOM ELEVATION	ELEVATION DIFFERENCE
1	114–2–STM–1	114–2–SAN	82.71	82.23	0.482 m
2	114–2–STM–1	114–2–WM	82.69	82.33	0.361 m
3	114–2–SAN	114–2–WM	82.88	82.45	0.435 m
4	114–2–STM–1	114–2–SAN	82.55	82.00	0.555 m
5	114–2–STM–1	114–2–WM	82.60	81.94	0.663 m
6	114–2–WM	114–2–STM–1	82.16	82.07	0.096 m
7	114–2–WM	114–2–SAN	82.17	81.34	0.830 m
8	114–2–STM–1	114–2–SAN	82.01	81.26	0.756 m
9	114–2–STM–1	114–2–WM	82.05	81.55	0.496 m
10	114–2–WM	114–2–STM–1	81.83	81.87	–0.039 m
11	114–2–WM	114–2–SAN	81.84	80.81	1.035 m
12	114–2–STM–1	114–2–SAN	81.26	80.42	0.833 m
13	114–2–STM–1	114–2–WM	81.29	80.52	0.762 m
14	114–2–STM–1	114–2–FM	81.05	80.42	0.636 m
15	114–2–STM–1	114–2–SAN	81.15	79.92	1.232 m
16	114–2–STM–1	114–2–WM	81.18	79.91	1.271 m
17	114–2–STM–1	114–2–WM	80.10	79.48	0.618 m
18	114–2–WM	114–2–SAN	79.27	79.24	0.031 m
19	114–2–FM	114–2–WM	79.81	79.49	0.320 m
20	114–2–STM–1	114–2–FM	80.40	79.93	0.468 m
21	114–2–STM–1	114–2–FM	79.87	79.72	0.147 m
22	114–2–STM–1	114–2–SAN	80.12	79.14	0.979 m

UTILITY CROSSING TABLE

POINT #	TOP NETWORK	BOTTOM NETWORK	TOP ELVATION	BOTTOM ELEVATION	ELEVATION DIFFERENCE
23	114–2–WM	114–2–SAN	80.57	80.42	0.153 m
24	114–2–STM–1	114–2–WM	81.24	80.69	0.550 m
25	114–2–STM–1	114–2–SAN	81.23	80.31	0.917 m
26	114–2–WM	114–2–SAN	79.73	79.68	0.048 m
27	114–2–STM–1	114–2–WM	80.48	79.93	0.545 m



NOTES:
1. VERTICAL CLEARANCES: 0.5 m BARREL TO BARREL WHEN WATERMAIN IS UNDER SEWER AND 0.25 m WHEN WATERMAIN IS ABOVE.
2. FOR WATERMAIN, THE MINIMUM DISTANCE FROM PIPE JOINTS TO THE INTERSECTION SHALL BE 3 m.
3. WHEN CROSSING EXISTING PIPES, THE NEW PIPE SHALL BE POSITIONED SO THAT ITS JOINTS ARE AT EQUAL DISTANCES FROM THE CROSSED PIPE.
4. FOR NEW CROSSINGS, BOTH PIPES SHALL BE INTERSECTED AT THEIR MID–LENGTHS AT THE CROSSING POINT.
5. PROVIDE THRUST BLOCKS FOR WATERMAIN AS SPECIFIED.

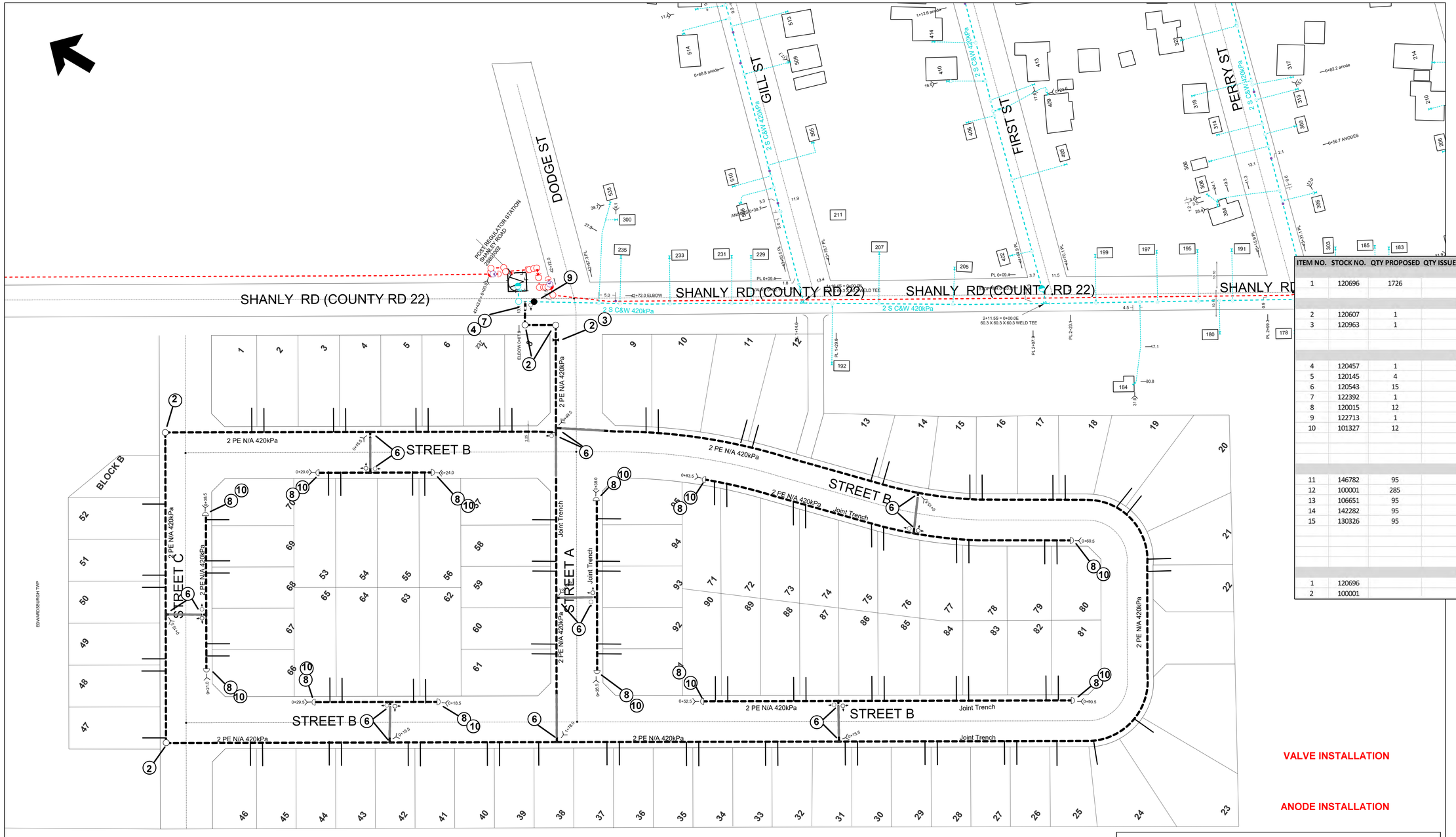
PIPE CROSSING DETAIL – JOINTS

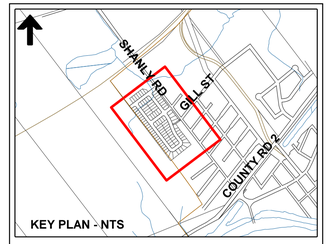
SCALE: 1:50

NOTES:
1– FOR CROSSINGS INVOLVING WATERMAIN, FOLLOW WATERMAIN TOP ELEVATIONS IN PROFILE VIEWS AS THE VALUES SHOWN IN THE CROSSING TABLE CONSIDER THE WATERMAIN A STRAIGHT LINE.
2– JOINT UTILITY TRENCH IS GENERALLY CONSTRUCTED ABOVE SEWER AND WATERMAIN PIPES.
3– SERVICE LATERALS ARE TO BE ADJUSTED ON FIELD. CONTRACTOR SHALL RECORD ALL SERVICE ELEVATIONS AT PROPERTY LINES.
4– CATCHBASIN LEADS ARE TO BE INSTALLED ABOVE WATERMAIN AND SEWER MAIN.
5– CROSSINGS OVER EXISTING PIPES TO BE AS PER OPSD.

114–2–WM: PROPOSED WATERMAIN
114–2–STM–1: PROPOSED STORM SEWER
114–2–SAN: PROPOSED SANITARY SEWER
114–2–FM: PROPOSED FORCE MAIN

PROJECT NAME AND ADDRESS:	DRAWING TITLE:	SCALE:	DRAWING No.:
LOCKMASTER'S MEADOW SUBDIVISION CARDINAL	UTILITY CROSSINGS	N/A DATE: 06-18-2024	CR2





Dist Segment Line-INS, MOP>35 AND MOP<=420,No Site-AG

Dist Segment Line-INS, MOP>35 AND MOP<=420,Site-AG

Dist Segment Line-INS, MOP>700 AND MOP<=1900,No Site-AG

Dist Segment Line-INS, MOP>700 AND MOP<=1900,Site-AG

Dist Segment Line-Proposed,No Site-AG

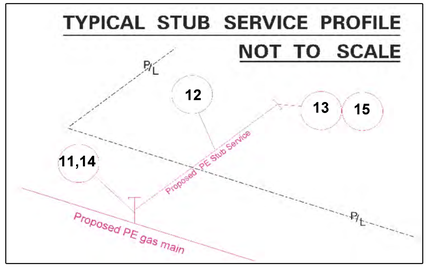
ITEM NO.	STOCK NO.	QTY PROPOSED	QTY ISSUED	SIZE	DESCRIPTION	WBS
					PIPE	
1	120696	1726		2	PIPE 2 PE COIL	5456
					VALVE	
2	120607	1		2	VALVE 2 PE	
3	120963	1			BOX VALVE STANDARD W/LOCKING LID	
					FITTING	
4	120457	1		2x2	TRANSITION 2 X 2 FITTING PAK	
5	120145	4		2xN/A	ELBOW 2 PE 90D SOCKET	
6	120543	15		2xN/A	TEE 2 PE SOCKET	
7	122392	1		2x2	TEE 2 SERVICE H17500G1750	
8	120015	12		2xN/A	CAP 2 PE SOCKET	
9	122713	1		N/AxN/A	ANODE 20-60	
10	101327	12			BOX TERMINAL	
					STUB	
11	146782	95		2x3/4	TEE,RED,2 X3/4,PLASTIC,	5352
12	100001	285		3/4	PIPE 3/4 PE COIL	5352
13	106651	95		3/4x	CAP 3/4 PE SOCKET	5352
14	142282	95			SLEEVE	5352
15	130326	95			MARKER	5352
					SCRAP	
1	120696			2	PIPE 2 PE COIL	5456
2	100001			3/4	PIPE 3/4 PE COIL	5352

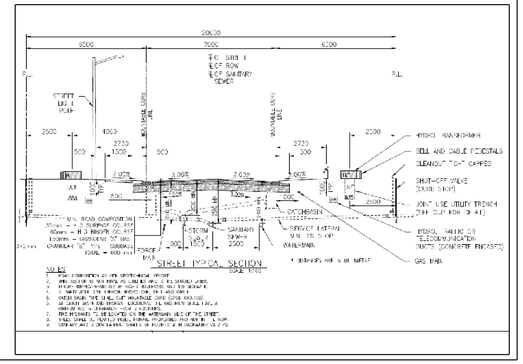
JOINT TRENCH PROJECT
REFER TO ELECTRIC JOINT TRENCH PROFILE FOR GAS MAIN AND STUBS LOCATION

VALVE INSTALLATION

ANODE INSTALLATION

TYPICAL STUB SERVICE PROFILE
NOT TO SCALE





0 10 20 30 40 50
m

SOURCE DOCUMENT INFORMATION

Qualified Individual:	Pipeline Certificate No:
Welder / Fuser:	Ticket Number:
In-Service Date:	G-Tech Update By: Date:
Testing Design Pressure:	Test Medium:
Time On:	Pressure:
Time Off:	Pressure:

REVISIONS

Date	By	App'd	Remarks

ENBRIDGE

AS - PROPOSED

Title :
KINBG_LOCKMASTER MEAD. PH1

Description :
INSTAL 1725.5 M OF NPS 2" PE AND 95 STUB SERVICES

Project # : 22-24-324	Work Management Work Order: 40695207	% SMYS :
District : EASTERN	Municipality : CARDINAL	Authorized:
Drawn By : DANTCZAK	Date Drawn : 2024/04/08	Corrosion:
Scale : 1:750	GTech # : JOBNO47197	Drawing Number 1 OF 1

SCHEDULE "M"

RAIL NOISE ASSESSMENT

For the lands set out in Schedule “A”, the Owner agrees to implement the objectives and criteria of the Rail Noise Assessment, prepared by Gradient Wind, stamped and dated November 23, 2024.

Attached:

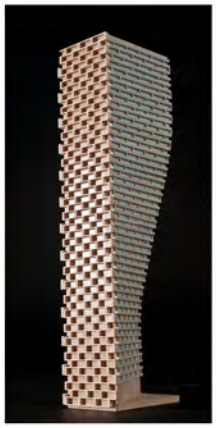
- **Rail Noise Assessment November 24, 2023**

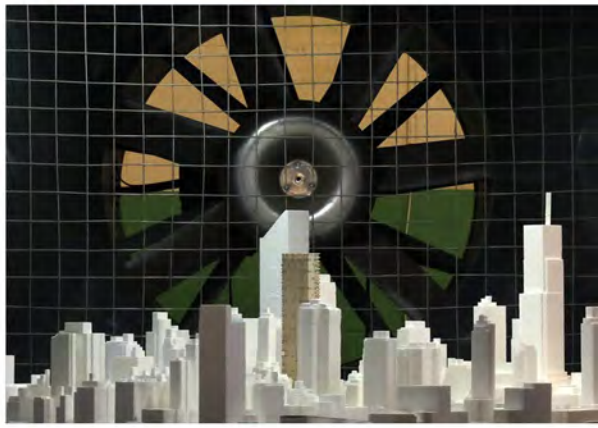
GRADIENTWIND
ENGINEERS & SCIENTISTS

RAIL NOISE ASSESSMENT

Lockmasters Meadow
Cardinal, Ontario

GRADIENT WIND REPORT: 21-139 – Rail Noise R2





November 24th, 2023

PREPARED FOR

Edwardsburgh Developments Ltd.
434-300 Earl Grey Drive
Kanata, ON K2T 1C1

PREPARED BY

Adam Bonello, B.Eng., Junior Environmental Scientist
Joshua Foster, P.Eng., Lead Engineer

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

EXECUTIVE SUMMARY

This report describes a rail noise assessment performed for a proposed residential development located off Shanly Road in Cardinal, Ontario. The development comprises of 95 lots for single-family households. A CN railway corridor approximately 175m Northwest is the major noise source for the development. Figure 1 illustrates a complete site plan with surrounding context.

The assessment is based on (i) theoretical noise prediction methods that conform to the Ministry of the Environment, Conservation and Parks (MECP); (ii) noise level criteria as specified by the MECP NPC-300 guidelines; (iii) rail traffic volumes corresponding to data obtained from CN; and (iv) site and grading plans received October 2023.

This report revision was issued to address the comments from the peer reviewer Jade Acoustics and is based on the grading package in October 2023. This report replaces Gradient Wind's previous submission (GW21-139 Rail Noise Assessment, dated October 10th, 2022)

The results of the current analysis indicate that noise levels will range between 53 and 60 dBA during the daytime period (07:00-23:00) and the nighttime period (23:00-07:00). The highest noise level (i.e., 60 dBA) occurs at the North façade of the development's Northernmost row of houses, which are nearest and most exposed to the CN railway.

The noise levels predicted due to railway traffic exceed the criteria listed in Section 4.2 for building components at certain houses, therefore, upgraded building components will be required as illustrated in Figure 4. Noise levels at the outdoor living areas (OLA) reach up to 59 dBA, since they fall below 60 dBA no further mitigation is required for these areas. Additionally, a Type A Warning Clause will be required on Lease, Purchase and Sale Agreements as specified in Figure 4 and Table 4.

Results of the calculations indicate that some buildings in the development experience noise levels at the Pane of Window which exceed 55 dBA. These buildings will require forced air heating with provisions for central air conditioning which will allow occupants to keep windows closed and maintain a comfortable living environment at their discretion. Additionally, Type C Warning Clauses will also be required in all

Lease, Purchase and Sale Agreements as summarized in Section 6. A CN specific Warning Clause is also required on all buildings within 300 m of the CN railway as seen in Figure 5.

With respect to stationary noise impacts from the buildings on the surroundings and the building itself, since the development comprises of single-family homes no rooftop HVAC equipment is expected therefore no stationary noise impacts are expected. The surroundings of the site include residential buildings and farm fields. As such, there are no significant existing stationary noise sources impacting the site.

Since all buildings in the development have a setback distance from the rail tracks greater than 75m, a vibration analysis is not required.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Edwardsburgh Developments Inc. to undertake a rail noise assessment for the proposed residential development located off Shanly Road in Cardinal, Ontario. This report summarizes the methodology, results, and recommendations related to the assessment of exterior noise levels generated by local train traffic. This report has been updated to address peer reviewer comments prepared by Jade Acoustics in their memo dated October 27th, 2023.

This assessment is based on theoretical noise calculation methods conforming to the Ministry of the Environment, Conservation and Parks (MECP)[1] guidelines. Noise calculations were based on draft site plans dated November 2020, grading drawings received November 2023, with future rail traffic volumes corresponding to data obtained from CN.

2. TERMS OF REFERENCE

The focus of this rail noise assessment is a proposed residential development located off Shanly Road in Cardinal, ON. The development is directly south of an existing CN railway. The development will comprise of 95, two-storey, single-family homes, and an earth berm along the north side of the proposed lots, obstructing the line-of-sight to the railway. On the far north of the site is a storm water management pond which will buffer the development from the railway. Figure 1 illustrates a complete site plan with surrounding context.

The source of rail noise is the CN railway directly North of the proposed development. Shanly Road is located directly east of the proposed development, however, traffic volumes on this roadway are low enough to neglect it as a noise source. Since the proposed buildings are greater than 75 m from the CN railway, a vibration assessment is not required as per *Guidelines for New Development in Proximity to Railway Operations*[2].

[1] Ontario Ministry of the Environment and Climate Change – Environmental Noise Guidelines, Publication NPC-300, Queens Pri nter for Ontario, Toronto, 2013
[2] Dialog and J.E. Coulter Associates Limited, prepared for The Federation of Canadian Municipalities and The Railway Association of Canada, May 2013

3. OBJECTIVES

The principal objectives of this study are to (i) calculate the future noise levels on the study building produced by rail traffic, and (ii) determine whether exterior noise levels exceed the allowable limits specified by the MECP Noise Control Guidelines – NPC-300 as outlined in Section 4.2 of this report.

4. METHODOLOGY

4.1 Background

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level ($2*10^{-5}$ Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4.2 Rail Noise

4.2.1 Criteria for Rail Traffic Noise

For rail traffic, the equivalent sound energy level, L_{eq}, provides a measure of the time varying noise levels, which is well correlated with the annoyance of sound. It is defined as the continuous sound level, which has the same energy as a time varying noise level over a period of time. For railway noise, the L_{eq} is commonly calculated on the basis of a 16-hour (L_{eq16}) daytime (07:00-23:00) / 8-hour (L_{eq8}) nighttime (23:00-07:00) split to assess its impact on residential buildings. The NPC-300 guidelines specify that the recommended indoor noise limit ranges (that are relevant to this study) are 40 and 35 dBA for living rooms, and sleeping quarters, respectively, as listed in Table 1.

TABLE 1: INDOOR SOUND LEVEL CRITERIA (RAIL) [3]

Type of Space	Time Period	L_{eq} (dBA)
General offices, reception areas, retail stores, etc.	07:00 – 23:00	45
Living/dining/den areas of residences, hospitals, **schools**, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, etc.	07:00 – 23:00	40
Sleeping quarters of hotels/motels	23:00 – 07:00	40
Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.	23:00 – 07:00	35

Predicted noise levels at the plane of window (POW) dictate the action required to achieve the recommended sound levels. An open window is considered to provide a 10 dBA reduction in noise, while a standard closed window is capable of providing a minimum 20 dBA noise reduction[4]. A closed window due to a ventilation requirement will bring noise levels down to achieve an acceptable indoor environment[5]. If the nighttime sound level outside the bedroom or living/dining room windows exceeds 55 dBA or the daytime sound level outside the bedroom or living/dining area windows exceeds 60 dBA, building components including windows, walls and doors, where applicable, need to be designed so that the indoor sound levels comply with the sound level limits in Table 1.

The sound level criterion for outdoor living areas (OLA) is 55 dBA, which applies during the daytime (07:00 to 23:00). When noise levels exceed 55 dBA, mitigation should be provided to reduce noise levels where technically and administratively feasible to acceptable levels at or below the criterion. When noise levels at the OLA exceed 60 dBA mitigation must be provided.

[3] Adapted from ENCG 2016 – Tables 2.2b and 2.2c
[4] Burberry, P.B. (2014). Mitchell's Environment and Services. Routledge, Page 125
[5] MECP, Environmental Noise Guidelines, NPC 300 – Part C, Section 7.8

4.2.2 Theoretical Railway Noise Predictions

Calculations were performed in MECP's STAMSON software using STEAM (Sound from Trains Environmental Analysis Method) to determine railway noise impact on the study site. Calculations were performed by treating the rail segment as a linear source of noise, and by using existing building locations as noise barriers. In addition to the railway traffic volumes summarized in Table 2, theoretical noise predictions were based on the following parameters:

- The ground surface was modelled as absorptive where grass and foliage (soft ground) are present, and as reflective where pavement and concrete are present (hard ground).
- Noise receptors were strategically placed at five (5) locations at the façades as Plane of Window (POW) receptors at the highest levels of the buildings.
- Buildings were assumed to be 2-storeys tall with a height of 6 m.
- Three (3) receptor location were chosen as OLA receptors located in backyards.
- The location of the receptors are illustrated in Figure 2.
- Rail lines were taken as welded.
- Earth Berm will be 2.5m tall (above local grade). Initial calculations were made which did not consider the benefit of the berm.
- Railway is assumed to be 1.7m above local grade.

    The rail bed is approximately the same height as the base of the utility poles with have an average grade of 81.3m as shown on the grading plan. The top of rail is to be confirmed by survey during the design phase of the subdivision. Top of rail expected to be ≈0.3m higher than rail bed at 81.6m.

4.2.3 Railway Traffic Volumes

The CN Railway line is located to the North of the development, as shown in Figure 1. This railway line serves 3 train types: freight, way freight, and passenger trains. NPC-300 dictates that noise calculations should consider future sound levels based on a railway's classification at the mature state of development. As a result, the ultimate AADT volumes are based on train count data provided by CN Railway (dated July of 2021), with a 2.5% growth rate applied for 10 years from the date of the project (2023). Table 2

summarizes the railway traffic values used for each railway segment, the number of cars, the maximum speed and the number of locomotives included in this assessment. CN Railway data can be found in Appendix A.

TABLE 2: EXTERIOR NOISE LEVELS DUE TO TRANSPORTATION SOURCES

Train Type	Projected 2031 Traffic Volumes	Speed Limit (km/h)	Number of Locomotives	Number of Cars
Freight	16/9*	89	4	140
Way Freight	1/0*	89	4	25
Passenger	15/0*	105	2	10

* Projected 2033 AADT daytime/nighttime rail traffic volumes

4.3 Indoor Noise Calculations

The difference between outdoor and indoor noise levels is the noise attenuation provided by the building envelope. According to common industry practice, complete walls and individual wall elements are rated according to the Sound Transmission Class (STC). The STC ratings of common residential walls built in conformance with the Ontario Building Code (2020) typically exceed STC 35, depending on exterior cladding, thickness and interior finish details. For example, brick veneer walls can achieve STC 50 or more. Standard commercially sided exterior metal stud walls have around STC 45. Standard good quality double-glazed non-operable windows can have STC ratings ranging from 25 to 40, depending on the window manufacturer, pane thickness and inter-pane spacing. The windows are usually the known weak point in a partition.

As per Section 4.2, when daytime noise levels (from rail sources) at the plane of the window exceed 60 dBA daytime and 55 dBA nighttime, calculations must be performed to evaluate the sound transmission quality of the building components to ensure acceptable indoor noise levels. The calculation procedure[6] considers:

- Window type and total area as a percentage of total room floor area

[6] EN 12354-3:2000 "Building Acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 3: Airborne sound insulation against outdoor sound"

- Exterior wall type and total area as a percentage of the total room floor area
- Acoustic absorption characteristics of the room
- Outdoor noise source type and approach geometry
- Indoor sound level criteria, which varies according to the intended use of a space.

Based on published research[7], exterior walls possess specific sound attenuation characteristics that are used as a basis for calculating the required STC ratings of windows in the same partition. Window STC calculations have therefore been based on the following assumptions:

- Bedrooms are assumed to be very absorptive (1.25 absorption coefficient), while living rooms are assumed to have an intermediate level of absorption (0.8 absorption coefficient).
- Exterior walls will have a minimum STC 45
- Room, window, and wall dimensions are based on the following assumptions, as detailed floor plans are not yet available:
    - Typical bedroom window is 3 m x 3 m and typical living rom is 3 m x 4 m.
    - Window will be 70% of the wall area.

STC calculations were performed based on the method developed by the National Research Council in their Building Practice Note # 56[8].

5. ENVIRONMENTAL NOISE RESULTS

5.1 Railway Traffic Noise Levels

The results of the current analysis indicate that noise levels will range between 53 and 60 dBA during the daytime period (07:00-23:00) and the nighttime period (23:00-07:00). The highest noise level (i.e., 60 dBA) occurs at the North façade of the development's Northernmost row of houses, which are nearest and most exposed to the CN railway. Noise levels in the OLA are taken without the benefit of the berm. Details of the STAMSON calculations can be found in Appendix B.

[7] CMHC, Road & Rail Noise: Effects on Housing
[8] Quirt, J.D. Controlling Sound Transmission into Buildings, National Research Council of Canada, Ottawa September 1985

TABLE 3: EXTERIOR NOISE LEVELS DUE TO TRANSPORTATION SOURCES

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	Railway Noise Level (dBA)	
			Day	Night
1	4.5	POW – North Façade – Lot 68	53	53
2	4.5	POW – North Façade – Lot 46	57	56
3	4.5	POW – North Façade – 47	60	60
4	4.5	POW – East Façade – Lot 52	57	56
5	4.5	POW – North Façade – Lot 1	57	57
6	1.5	OLA – Backyard – Lot 46	56	N/A*
7	1.5	OLA – Backyard – Lot 49	59	N/A*
8	1.5	OLA – Backyard – Lot 52	59	N/A*

*Nighttime noise levels at OLA receptors are not considered as per NPC-300.

5.2 Noise Control Measures

The noise levels predicted due to railway traffic exceed the criteria listed in Section 4.2 for building components. As discussed, the STC requirements for windows have been determined based on preliminary STC calculations, utilizing the methodology described in the NRC Building Practice Note #56. Details of these calculations, can be found in Appendix C. The STC requirements for the windows are summarized below for various lots within the development (see Figure 4), façades not listed do not require upgraded building components. Furthermore, the North facing facades where noise levels do not exceed the criteria listed in Section 4.2, standard building components combined with Ontario Building Code (OBC) requirements will be sufficient. The STC requirements for the windows are summarized below for various units within the development (see Figure 4):

- **Bedroom Windows**

(i) Bedroom windows facing North, East, West for lots 47-52 will require a minimum STC of 30.

(ii) Bedroom windows facing North for lots 46 and 1 will require a minimum STC of 30.

(iii) All other bedroom windows are to satisfy Ontario Building Code (OBC 2020) requirements.

- **Living Room Windows**

(i) Bedroom windows facing North, East, West for lots 47-52 will require a minimum STC of 30.

(ii) Bedroom windows facing North for lots 46 and 1 will require a minimum STC of 30.

(iii) All living room windows are to satisfy Ontario Building Code (OBC 2020) requirements.

- **Exterior Walls**

(i) Exterior wall components on North façades will require a minimum STC of 45, which will be achieved with brick cladding or an acoustical equivalent according to NRC test data[9].

The STC requirements apply to windows, doors, and window wall elements. A review of window supplier literature indicates that the specified STC ratings can be achieved by a variety of window systems having a combination of glass thickness and inter-pane spacing will offer the necessary sound attenuation rating. It is the responsibility of the manufacturer to ensure that the specified window achieves the required STC. This can only be assured by using window configurations that have been certified by laboratory testing. The requirements for STC ratings assume that the remaining components of the building are constructed and installed according to the minimum standards of the Ontario Building Code (OBC). The specified STC requirements also apply to swinging and/or sliding patio doors.

Results of the calculations also indicate that the development will require forced air heating with provisions for central air conditioning, which will allow occupants to keep windows closed and maintain a comfortable living environment at their discretion. In addition to ventilation requirements, Warning Clauses will also be required in all Lease, Purchase and Sale Agreements, as summarized in Section 6. Table 4 summarizes the required Warning Clause and mitigation measures for each lot.

[9] J.S. Bradley and J.A. Birta. Laboratory Measurements of the Sound Insulation of Building Façade Elements, National Research Council October 2000.

TABLE 4: NOISE CONTROL MEASURES

Lot #	Minimum STC requirements		Warning Clause	Ventilation
	Window	Wall		
1, 47-52	30	45	Type C, Type A, & CN	Forced Air Heating with AC provisions
46	30	45	Type C, & CN	Forced Air Heating with AC provisions
2-6, 41-45, 53-56, 62-70	OBC	OBC	CN	N/A

5.3 Noise Barrier Calculation

A noise barrier investigation was carried out to find the benefit of noise level reduction of applying a 2.5m tall earth berm located between the north sides of lots 47-52. .The table below outlines the resultant noise levels with the berm.

TABLE 5: NOISE BARRIER INVESTIGATION

Receptor Number	Receptor Height Above Grade (m)	Receptor Location	Daytime L_{eq} Noise Levels (dBA)	
			Without berm	With berm
6	1.5	OLA – Backyard – Lot 46	56	55
7	1.5	OLA – Backyard – Lot 49	59	56
8	1.5	OLA – Backyard – Lot 52	59	59

Through analysis of the earth berm, the berm will reduce noise levels in the backyard areas of lots 47-51 to more acceptable levels. However, the end lot 52 will not notice any change from the presence of the berm. Due to noise levels exceeding 55 dBA, lots 47-52 and 1 will require a warning clause type A on Lease, Purchase and Sale Agreements, as summarized in Section 6.

6. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The results of the noise study indicate that noise levels at certain houses exceed 55 dBA during the nighttime period (23:00-7:00), therefore, building components with a higher Sound Transmission Class (STC) rating will be required. Noise levels at certain outdoor living areas (OLA) exceed 55 dBA which will require a Warning Clause on all Lease, Purchase and Sale Agreements, as specified in Figure 4.

Results of the calculations also indicate that certain buildings in the development will require forced air heating with provisions for central air conditioning which will allow occupants to keep windows closed and maintain a comfortable living environment at the occupant's discretion, as specified in Figure 4. The following Warning Clauses will also be required to be placed on Lease, Purchase and Sale Agreements, as summarized in Table 4 and Figure 4:

Type C

> *"This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment."*

Type A

> *"Purchasers/tenants are advised that sound levels due to increasing rail traffic may occasionally interfere with some outdoor activities as the sound levels may exceed the sound level limits of the City and the Ministry of the Environment"*

In addition to NPC-300 Warning Clauses the following CN Railway Warning Clause will be required in Lease, Purchase and Sale Agreements for lots within 300m of the railway:

CN Warning Clause:

> *"Warning: Canadian National Railway Company or its assigns or successors in interest has or have a rights-of-way within 300 metres from the land the subject hereof. There may be alterations to or expansions of the railway facilities on such rights-of-way in the future including the possibility*

that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the living environment of the residents in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwelling(s). CNR will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid rights-of-way."

Off-site stationary noise impacts are not expected to be an issue since houses in the proposed development will not have rooftop HVAC equipment. The immediate surroundings of the site include residential buildings and farm fields. As such, there are no significant existing stationary noise sources impacting the site.

Since all buildings in the development have a setback distance from the rail tracks greater than 75m, a vibration analysis is not required.

Please be advised that prior to issuance of a building permit, a detailed review of the mechanical and architectural building design will be required. Additionally, an inspection of the mitigation measures, such as the earth berm, will be required prior to occupancy.

This concludes rail noise assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

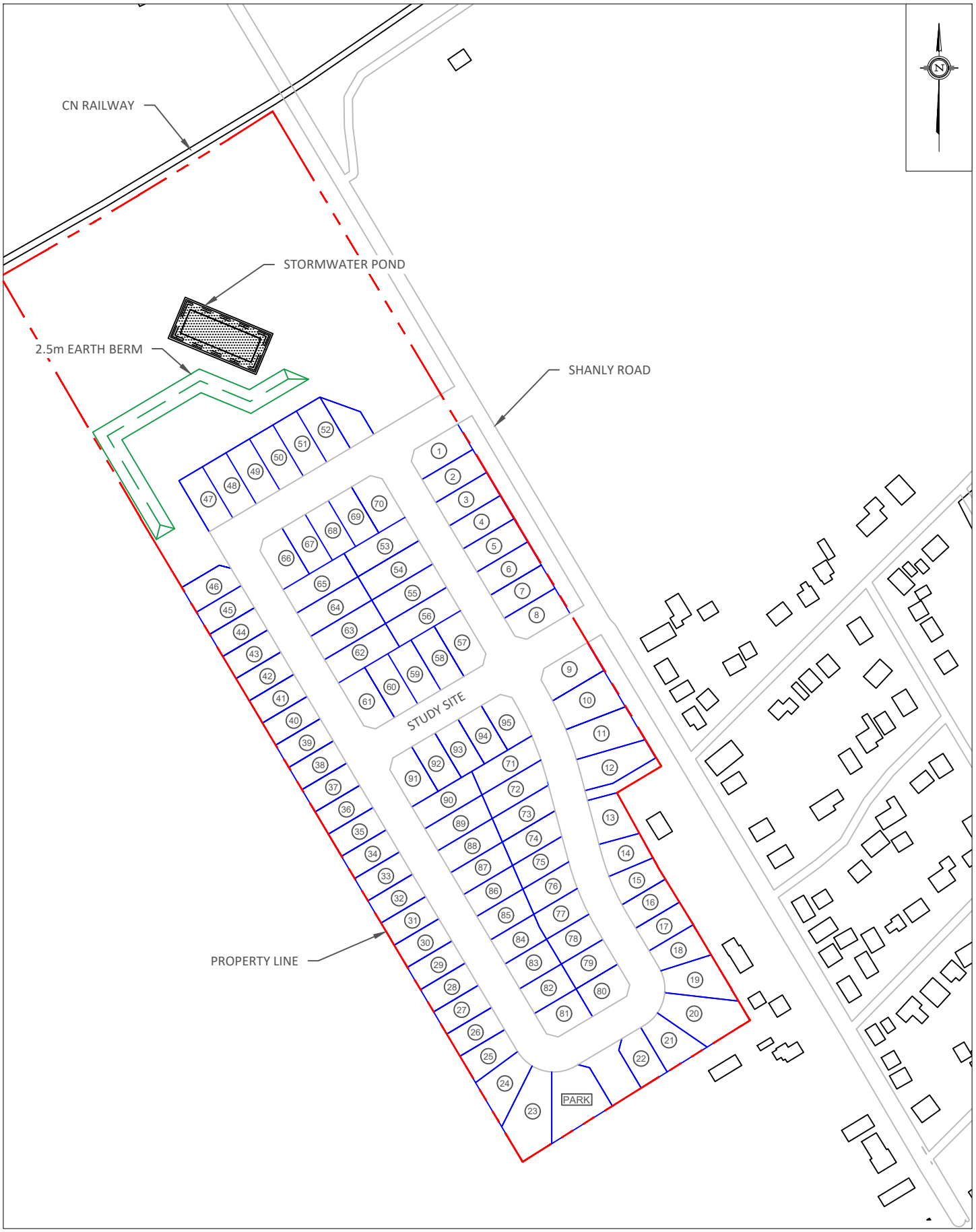
Sincerely,

Gradient Wind Engineering Inc.

Adam Bonello, B.Eng.
Junior Environmental Scientist

Joshua Foster, P.Eng.
Lead Engineer

Gradient Wind Report #21-139 – Rail Noise R2



GRADIENTWIND ENGINEERS & SCIENTISTS

127 WALGREEN ROAD , OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT	LOCKMASTER'S MEADOW, CARDINAL RAIL NOISE ASSESSMENT		
SCALE	1:3000 (APPROX.)	DRAWING NO.	GW21-139-1
DATE	NOVEMBER 24, 2023	DRAWN BY	A.B.

DESCRIPTION

FIGURE 1:
SITE PLAN AND SURROUNDING CONTEXT

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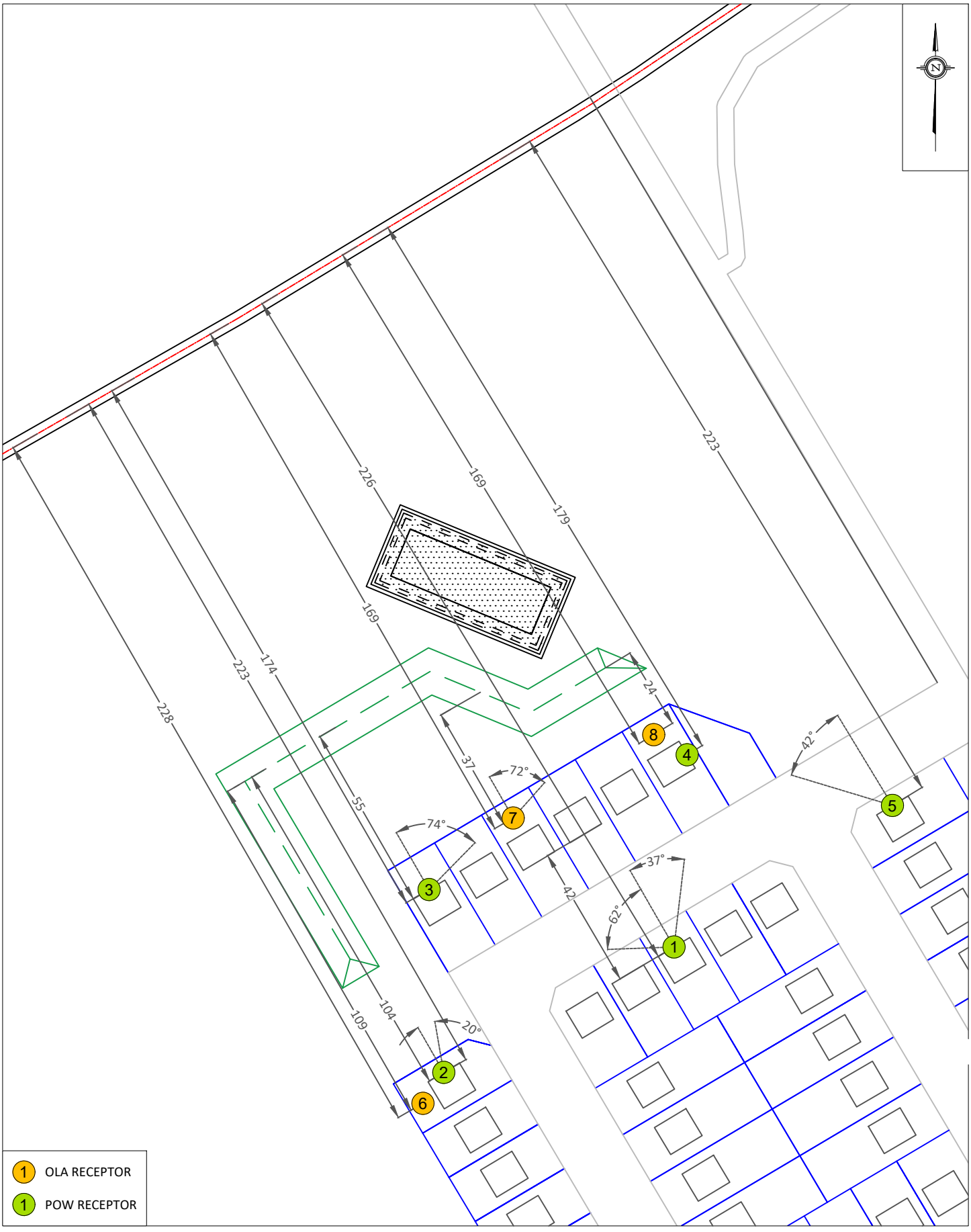
PROJECT	LOCKMASTER'S MEADOW, CARDINAL RAIL NOISE ASSESSMENT		DESCRIPTION
SCALE	1:1500 (APPROX.)	DRAWING NO. GW21-139-2	FIGURE 2: NOISE RECEPTOR LOCATIONS
DATE	NOVEMBER 24, 2023	DRAWN BY A.B.	



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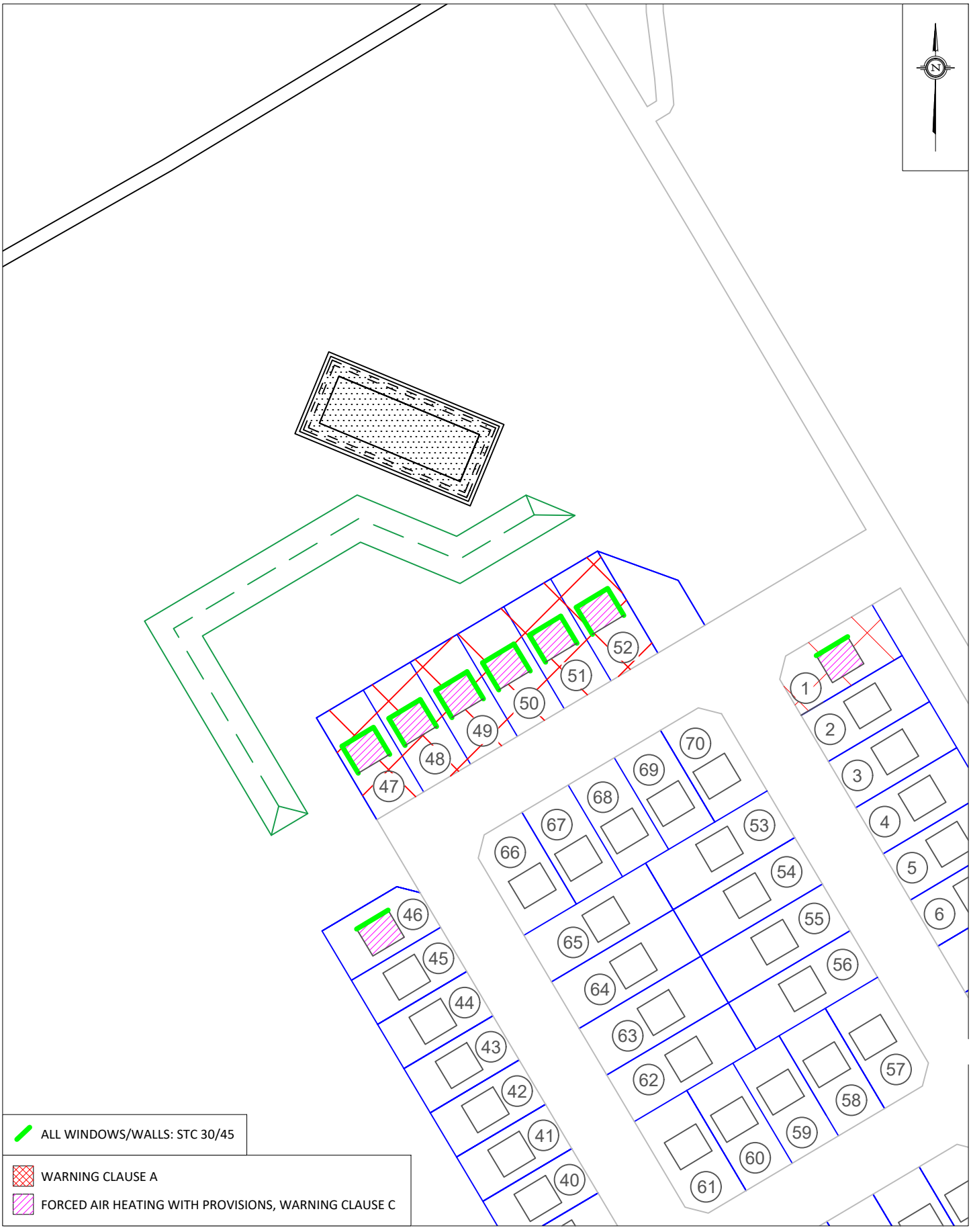
PROJECT	LOCKMASTER'S MEADOW, CARDINAL RAIL NOISE ASSESSMENT
SCALE	1:1500 (APPROX.)
DRAWING NO.	GW21-139-3
DATE	NOVEMBER 24, 2023
DRAWN BY	A.B.

DESCRIPTION

FIGURE 3:
STAMSON INPUT PARAMETERS



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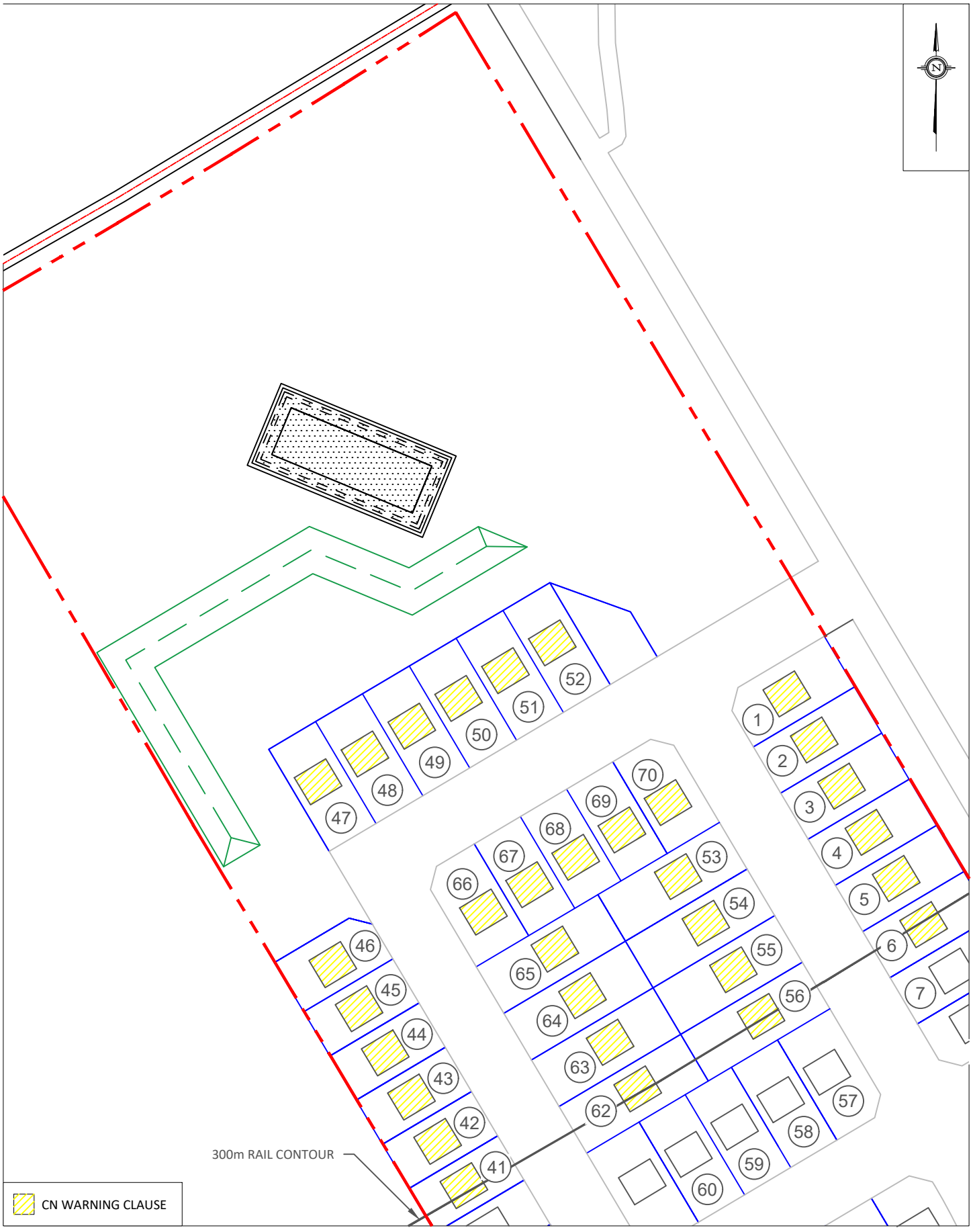
PROJECT	LOCKMASTER'S MEADOW, CARDINAL RAIL NOISE ASSESSMENT
SCALE	1:1500 (APPROX.)
DRAWING NO.	GW21-139-4
DATE	NOVEMBER 24, 2023
DRAWN BY	A.B.
DESCRIPTION	FIGURE 4: NOISE CONTROL MEASURES



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PROJECT	LOCKMASTER'S MEADOW, CARDINAL RAIL NOISE ASSESSMENT
SCALE	1:1500 (APPROX.)
DRAWING NO.	GW21-139-5
DATE	NOVEMBER 24, 2023
DRAWN BY	A.B.
DESCRIPTION	FIGURE 5: NOISE CONTROL MEASURES

APPENDIX A

RAIL TRAFFIC DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

System Engineering
Engineering Services
1 Administration Road
Concord, ON, L4K 1B9
T: 905.669.2254
F: 905.760.3406

Train Count Data

TRANSMITTAL

To: Destinataire :	GRADIENTWIND Engineers and Scientists 127 Walgreen Road Ottawa ON K0A 1L0	*Project :*	KNG – 104.96– County Road 22 , United Counties of Leeds and Greenville ON
Att'n:	Caleb Alexander	*Routing:*	caleb.alexander@gradientwind.com
From: Expéditeur :	Michael Vallins	*Date:*	2021/07/06
Cc:	Adjacent Development CN via e-mail		

☐ Urgent ☐ For Your Use ☐ For Review ☐ For Your Information ☐ Confidential

Re: Train Traffic Data – CN Kingston Subdivision near County Road 22 in United Counties of Leeds and Greenville, ON

Please find attached the requested Train Traffic Data. The application fee in the amount of **$500.00** +HST will be invoiced.

Should you have any questions, please do not hesitate to contact the undersigned at permits.gld@cn.ca.

Sincerely,

Michael Vallins P.Eng
Manager, Public Works- Easter Canada
Permits.gld@cn.ca

Date: 2021/07/06 Project Number: KNG – 104.96 – County Road 22, UC of Leeds and Greenville ON

Dear Caleb:

Re: Train Traffic Data – CN Kingston Subdivision near County Road 22 in United Counties of Leeds and Greenville, ON

The following is provided in response to Caleb's 2021/06/18 request for information regarding rail traffic in the vicinity of County Road 22 in United Counties of Leeds and Grenville ON at approximately Mile 104.96 on CN's Kingston Subdivision.

Typical daily traffic volumes are recorded below. However, traffic volumes may fluctuate due to overall economic conditions, varying traffic demands, weather conditions, track maintenance programs, statutory holidays and traffic detours that when required may be heavy although temporary. For the purpose of noise and vibration reports, train volumes must be escalated by 2.5% per annum for a 10-year period.

Typical daily traffic volumes at this site location are as follows:

***Maximum train speed is given in Miles per Hour**

	0700-2300			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	12	140	55	4
Way Freight	1	25	55	4
Passenger	11	10	65	2

	2300-0700			
Type of Train	Volumes	Max.Consist	Max. Speed	Max. Power
Freight	7	140	55	4
Way Freight	0	25	55	4
Passenger	0	10	65	2

The volumes recorded reflect westbound and eastbound freight and passenger operations on CN's Kingston Subdivision.

Except where anti-whistling bylaws are in effect, engine-warning whistles and bells are normally sounded at all at-grade crossings. There are two (2) at-grade crossings in the immediate vicinity of the study area at Mile 103.86 Marine Station Road and Mile 105.75 Farm Xing. Anti-Whistling Bylaws are not in effect at these locations. Please note that engine-warning whistles may be sounded in cases of emergency, as a safety and or warning precaution at station locations and pedestrian crossings and occasionally for operating requirements.

With respect to equipment restrictions, the gross weight of the heaviest permissible car is 286,000 lbs.

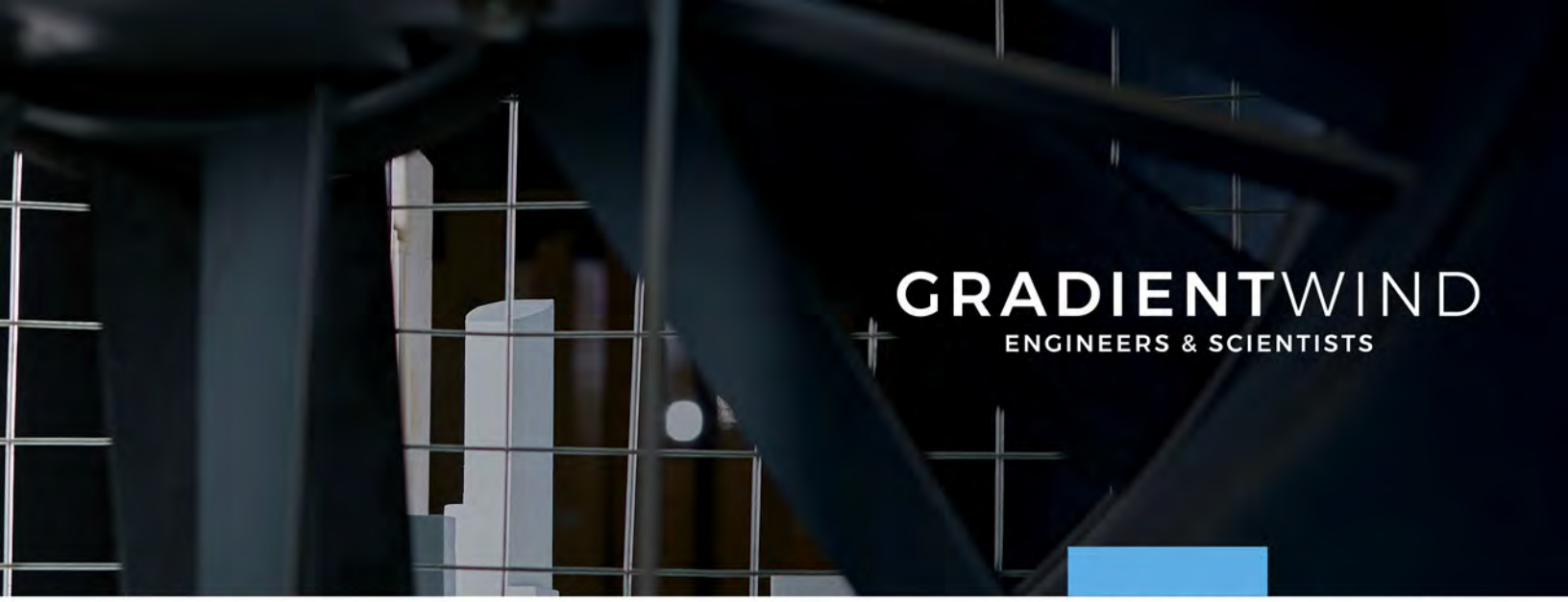
The double mainline track is considered to be continuously welded rail throughout the study area.

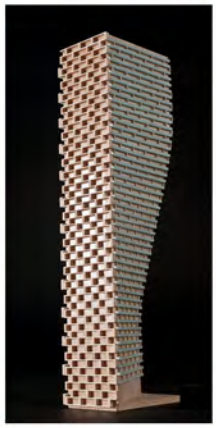
The Canadian National Railway continues to be strongly opposed to locating developments near railway facilities and rights-of-way due to potential safety and environmental conflicts. Development adjacent to the Railway Right-of-Way is not appropriate without sound impact mitigation measures to reduce the incompatibility. For confirmation of the applicable rail noise, vibration and safety standards, Adjacent Development, Canadian National Railway Properties at Proximity@cn.ca should be contacted directly.

I trust the above information will satisfy your current request.

Sincerely,

Michael Vallins P.Eng
Manager, Public Works- Easter Canada
Pemits.gld@cn.ca





APPENDIX B

STAMSON INPUT-OUTPUT DATA

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:14:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r1.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars/Train	Eng type	Cont weld
* 1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
1.	Freight	8.0/4.5	8.0/4.5	0.00	0.00
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 1 / 1	
House density	: 80 %	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 226.00 / 226.00 m	
Receiver height	: 4.50 / 4.50 m	
Topography	: 1	(Flat/gentle slope; no barrier)
Whistle Angle	: -82 deg	Track 1
Reference angle	: 0.00	

Results segment # 1: KNG (day)

LOCOMOTIVE (0.00 + 52.38 + 0.00) = 52.38 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.50	76.49	-17.61	-1.17	0.00	-5.34	0.00	52.38

WHEEL (0.00 + 44.02 + 0.00) = 44.02 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq

```
-------------------------------------------------------------------------
   -90     90   0.60  69.56 -18.85  -1.35   0.00  -5.34   0.00  44.02
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 25.91 + 0.00) = 25.91 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.50  73.89 -17.61 -25.03   0.00  -5.34   0.00  25.91
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 28.61 + 0.00) = 28.61 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -79   0.50  73.89 -17.61 -22.33   0.00  -5.34   0.00  28.61
-------------------------------------------------------------------------

Segment Leq : 53.00 dBA

Total Leq All Segments: 53.00 dBA

Results segment # 1: KNG (night)
--------------------------------

LOCOMOTIVE (0.00 + 51.99 + 0.00) = 51.99 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.50  76.10 -17.61  -1.17   0.00  -5.34   0.00  51.99
-------------------------------------------------------------------------

WHEEL (0.00 + 44.06 + 0.00) = 44.06 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.60  69.60 -18.85  -1.35   0.00  -5.34   0.00  44.06
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 23.73 + 0.00) = 23.73 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.50  71.71 -17.61 -25.03   0.00  -5.34   0.00  23.73
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 26.43 + 0.00) = 26.43 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -79   0.50  71.71 -17.61 -22.33   0.00  -5.34   0.00  26.43
-------------------------------------------------------------------------

Segment Leq : 52.65 dBA

Total Leq All Segments: 52.65 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 53.00
                           (NIGHT): 52.65
```

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:15:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r2.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	: -90.00 deg	20.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 223.00 / 223.00 m	
Receiver height	: 4.50 / 4.50 m	
Topography	: 1	(Flat/gentle slope; no barrier)
Whistle Angle	: -82 deg	Track 1
Reference angle	: 0.00	

Results segment # 1: KNG (day)

LOCOMOTIVE (0.00 + 55.89 + 0.00) = 55.89 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	20	0.50	76.49	-17.52	-3.08	0.00	0.00	0.00	55.89

WHEEL (0.00 + 47.58 + 0.00) = 47.58 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	20	0.60	69.56	-18.76	-3.23	0.00	0.00	0.00	47.58

```
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 31.37 + 0.00) = 31.37 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.50  73.89 -17.52 -24.99   0.00   0.00   0.00  31.37
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 34.11 + 0.00) = 34.11 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -79   0.50  73.89 -17.52 -22.25   0.00   0.00   0.00  34.11
-------------------------------------------------------------------------

Segment Leq : 56.53 dBA

Total Leq All Segments: 56.53 dBA

Results segment # 1: KNG (night)
--------------------------------

LOCOMOTIVE (0.00 + 55.50 + 0.00) = 55.50 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     20   0.50  76.10 -17.52  -3.08   0.00   0.00   0.00  55.50
-------------------------------------------------------------------------

WHEEL (0.00 + 47.62 + 0.00) = 47.62 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     20   0.60  69.60 -18.76  -3.23   0.00   0.00   0.00  47.62
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 29.20 + 0.00) = 29.20 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.50  71.71 -17.52 -24.99   0.00   0.00   0.00  29.20
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 31.94 + 0.00) = 31.94 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -79   0.50  71.71 -17.52 -22.25   0.00   0.00   0.00  31.94
-------------------------------------------------------------------------

Segment Leq : 56.18 dBA

Total Leq All Segments: 56.18 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.53
                           (NIGHT): 56.18
```

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:17:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r3.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 174.00 / 174.00 m	
Receiver height	: 4.50 / 4.50 m	
Topography	: 1	(Flat/gentle slope; no barrier)
Whistle Angle	: -82 deg	Track 1
Reference angle	: 0.00	

Results segment # 1: KNG (day)

LOCOMOTIVE (0.00 + 59.41 + 0.00) = 59.41 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.50	76.49	-15.91	-1.17	0.00	0.00	0.00	59.41

WHEEL (0.00 + 51.17 + 0.00) = 51.17 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.60	69.56	-17.03	-1.35	0.00	0.00	0.00	51.17

```
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 33.77 + 0.00) = 33.77 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.50  73.89 -15.91 -24.20   0.00   0.00   0.00  33.77
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 37.34 + 0.00) = 37.34 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -78   0.50  73.89 -15.91 -20.64   0.00   0.00   0.00  37.34
-------------------------------------------------------------------------

Segment Leq : 60.05 dBA

Total Leq All Segments: 60.05 dBA

Results segment # 1: KNG (night)
--------------------------------

LOCOMOTIVE (0.00 + 59.02 + 0.00) = 59.02 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.50  76.10 -15.91  -1.17   0.00   0.00   0.00  59.02
-------------------------------------------------------------------------

WHEEL (0.00 + 51.22 + 0.00) = 51.22 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.60  69.60 -17.03  -1.35   0.00   0.00   0.00  51.22
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 31.59 + 0.00) = 31.59 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.50  71.71 -15.91 -24.20   0.00   0.00   0.00  31.59
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 35.16 + 0.00) = 35.16 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -78   0.50  71.71 -15.91 -20.64   0.00   0.00   0.00  35.16
-------------------------------------------------------------------------

Segment Leq : 59.71 dBA

Total Leq All Segments: 59.71 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.05
                           (NIGHT): 59.71
```

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:18:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r4.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for
future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	0.00 deg	90.00 deg
Wood depth	0	(No woods.)
No of house rows	0 / 0	
Surface	1	(Absorptive ground surface)
Receiver source distance	179.00 / 179.00 m	
Receiver height	4.50 / 4.50 m	
Topography	1	(Flat/gentle slope; no barrier)
Whistle Angle	-82 deg	Track 1
Reference angle	0.00	

Results segment # 1: KNG (day)

LOCOMOTIVE (0.00 + 56.22 + 0.00) = 56.22 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.50	76.49	-16.10	-4.18	0.00	0.00	0.00	56.22

WHEEL (0.00 + 47.97 + 0.00) = 47.97 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
0	90	0.60	69.56	-17.23	-4.37	0.00	0.00	0.00	47.97

```
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 31.59 + 0.00) = 0.00 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0    -82   0.00  73.89   0.00 -24.20   0.00   0.00   0.00  31.59
-------------------------------------------------------------------------

Segment Leq : 56.83 dBA

Total Leq All Segments: 56.83 dBA

Results segment # 1: KNG (night)
--------------------------------

LOCOMOTIVE (0.00 + 55.83 + 0.00) = 55.83 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.50  76.10 -16.10  -4.18   0.00   0.00   0.00  55.83
-------------------------------------------------------------------------

WHEEL (0.00 + 48.01 + 0.00) = 48.01 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0     90   0.60  69.60 -17.23  -4.37   0.00   0.00   0.00  48.01
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 31.59 + 0.00) = 0.00 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
     0    -82   0.00  71.71   0.00 -24.20   0.00   0.00   0.00  31.59
-------------------------------------------------------------------------

Segment Leq : 56.49 dBA

Total Leq All Segments: 56.49 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.83
                           (NIGHT): 56.49
```

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:19:18
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r5.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	: -42.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 223.00 / 223.00 m	
Receiver height	: 4.50 / 4.50 m	
Topography	: 1	(Flat/gentle slope; no barrier)
Whistle Angle	: -82 deg	Track 1
Reference angle	: 0.00	

Results segment # 1: KNG (day)

LOCOMOTIVE (0.00 + 56.79 + 0.00) = 56.79 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-42	90	0.50	76.49	-17.52	-2.18	0.00	0.00	0.00	56.79

WHEEL (0.00 + 48.49 + 0.00) = 48.49 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-42	90	0.60	69.56	-18.76	-2.32	0.00	0.00	0.00	48.49

```
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 31.59 + 0.00) = 0.00 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -42    -82   0.00  73.89   0.00 -24.20   0.00   0.00   0.00  31.59
-------------------------------------------------------------------------

Segment Leq : 57.39 dBA

Total Leq All Segments: 57.39 dBA

Results segment # 1: KNG (night)
--------------------------------

LOCOMOTIVE (0.00 + 56.39 + 0.00) = 56.39 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -42     90   0.50  76.10 -17.52  -2.18   0.00   0.00   0.00  56.39
-------------------------------------------------------------------------

WHEEL (0.00 + 48.53 + 0.00) = 48.53 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -42     90   0.60  69.60 -18.76  -2.32   0.00   0.00   0.00  48.53
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 31.59 + 0.00) = 0.00 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -42    -82   0.00  71.71   0.00 -24.20   0.00   0.00   0.00  31.59
-------------------------------------------------------------------------

Segment Leq : 57.05 dBA

Total Leq All Segments: 57.05 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.39
                           (NIGHT): 57.05
```

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:29:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	: -90.00 deg	43.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 228.00 / 228.00 m	
Receiver height	: 1.50 / 1.50 m	
Topography	: 1	(Flat/gentle slope; no barrier)
Whistle Angle	: -82 deg	Track 1
Reference angle	: 0.00	

Results segment # 1: KNG (day)

LOCOMOTIVE (0.00 + 55.50 + 0.00) = 55.50 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	43	0.58	76.49	-18.73	-2.26	0.00	0.00	0.00	55.50

WHEEL (0.00 + 47.59 + 0.00) = 47.59 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	43	0.66	69.56	-19.62	-2.35	0.00	0.00	0.00	47.59

```
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 29.28 + 0.00) = 29.28 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.58  73.89 -18.73 -25.87   0.00   0.00   0.00  29.28
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 32.06 + 0.00) = 32.06 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -79   0.58  73.89 -18.73 -23.10   0.00   0.00   0.00  32.06
-------------------------------------------------------------------------

Segment Leq : 56.18 dBA

Total Leq All Segments: 56.18 dBA

Results segment # 1: KNG (night)
--------------------------------

LOCOMOTIVE (0.00 + 55.11 + 0.00) = 55.11 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     43   0.58  76.10 -18.73  -2.26   0.00   0.00   0.00  55.11
-------------------------------------------------------------------------

WHEEL (0.00 + 47.63 + 0.00) = 47.63 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     43   0.66  69.60 -19.62  -2.35   0.00   0.00   0.00  47.63
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 27.10 + 0.00) = 27.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.58  71.71 -18.73 -25.87   0.00   0.00   0.00  27.10
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 29.88 + 0.00) = 29.88 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -79   0.58  71.71 -18.73 -23.10   0.00   0.00   0.00  29.88
-------------------------------------------------------------------------

Segment Leq : 55.84 dBA

Total Leq All Segments: 55.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.18
                           (NIGHT): 55.84
```

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:25:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r6b.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars/Train	Eng type	Cont weld
1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	: -90.00 deg	43.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 228.00 / 228.00 m	
Receiver height	: 1.50 / 1.50 m	
Topography	: 2	(Flat/gentle slope; with barrier)
Whistle Angle	: -82 deg	Track 1
Barrier angle1	: 0.00 deg	Angle2 : 43.00 deg
Barrier height	: 2.50 m	
Barrier receiver distance	: 109.00 / 109.00 m	
Source elevation	: 81.60 m	
Receiver elevation	: 82.67 m	
Barrier elevation	: 82.50 m	
Reference angle	: 0.00	

Results segment # 1: KNG (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)

```
------------+-------------+-------------+--------------
       4.00 !        1.50 !        2.35 !        84.85
       0.50 !        1.50 !        0.68 !        83.18

LOCOMOTIVE (53.42 + 48.12 + 0.00) = 54.54 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.58  76.49 -18.73  -4.34   0.00   0.00   0.00  53.42
-------------------------------------------------------------------------
     0     43   0.44  76.49 -16.96  -6.40   0.00   0.00  -5.01  48.12
-------------------------------------------------------------------------

WHEEL (45.47 + 38.65 + 0.00) = 46.29 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.66  69.56 -19.62  -4.47   0.00   0.00   0.00  45.47
-------------------------------------------------------------------------
     0     43   0.54  69.56 -18.20  -6.45   0.00   0.00  -6.26  38.65
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 29.28 + 0.00) = 29.28 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.58  73.89 -18.73 -25.87   0.00   0.00   0.00  29.28
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 32.06 + 0.00) = 32.06 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -79   0.58  73.89 -18.73 -23.10   0.00   0.00   0.00  32.06
-------------------------------------------------------------------------

Segment Leq : 55.18 dBA

Total Leq All Segments: 55.18 dBA

Results segment # 1: KNG (night)
--------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        2.35 !        84.85
       0.50 !        1.50 !        0.68 !        83.18

LOCOMOTIVE (53.03 + 47.73 + 0.00) = 54.15 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.58  76.10 -18.73  -4.34   0.00   0.00   0.00  53.03
-------------------------------------------------------------------------
     0     43   0.44  76.10 -16.96  -6.40   0.00   0.00  -5.01  47.73
-------------------------------------------------------------------------
```

WHEEL (45.52 + 38.70 + 0.00) = 46.34 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.66	69.60	-19.62	-4.47	0.00	0.00	0.00	45.52
0	43	0.54	69.60	-18.20	-6.45	0.00	0.00	-6.26	38.70

LEFT WHISTLE (0.00 + 27.10 + 0.00) = 27.10 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-84	-82	0.58	71.71	-18.73	-25.87	0.00	0.00	0.00	27.10

RIGHT WHISTLE (0.00 + 29.88 + 0.00) = 29.88 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-82	-79	0.58	71.71	-18.73	-23.10	0.00	0.00	0.00	29.88

Segment Leq : 54.84 dBA

Total Leq All Segments: 54.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.18
(NIGHT): 54.84

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:34:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r7.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 169.00 / 169.00 m	
Receiver height	: 1.50 / 1.50 m	
Topography	: 1	(Flat/gentle slope; no barrier)
Whistle Angle	: -82 deg	Track 1
Reference angle	: 0.00	

Results segment # 1: KNG (day)

LOCOMOTIVE (0.00 + 58.49 + 0.00) = 58.49 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	76.49	-16.67	-1.33	0.00	0.00	0.00	58.49

WHEEL (0.00 + 50.64 + 0.00) = 50.64 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	69.56	-17.46	-1.46	0.00	0.00	0.00	50.64

```
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 32.28 + 0.00) = 32.28 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.58  73.89 -16.67 -24.93   0.00   0.00   0.00  32.28
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 36.10 + 0.00) = 36.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -78   0.58  73.89 -16.67 -21.12   0.00   0.00   0.00  36.10
-------------------------------------------------------------------------

Segment Leq : 59.18 dBA

Total Leq All Segments: 59.18 dBA

Results segment # 1: KNG (night)
--------------------------------

LOCOMOTIVE (0.00 + 58.10 + 0.00) = 58.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.58  76.10 -16.67  -1.33   0.00   0.00   0.00  58.10
-------------------------------------------------------------------------

WHEEL (0.00 + 50.69 + 0.00) = 50.69 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.66  69.60 -17.46  -1.46   0.00   0.00   0.00  50.69
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 30.10 + 0.00) = 30.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.58  71.71 -16.67 -24.93   0.00   0.00   0.00  30.10
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 33.92 + 0.00) = 33.92 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -78   0.58  71.71 -16.67 -21.12   0.00   0.00   0.00  33.92
-------------------------------------------------------------------------

Segment Leq : 58.84 dBA

Total Leq All Segments: 58.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.18
                           (NIGHT): 58.84
```

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:35:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r7b.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars/Train	Eng type	Cont weld
1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 169.00 / 169.00 m	
Receiver height	: 1.50 / 1.50 m	
Topography	: 2	(Flat/gentle slope; with barrier)
Whistle Angle	: -82 deg	Track 1
Barrier angle1	: -90.00 deg	Angle2 : 72.00 deg
Barrier height	: 2.50 m	
Barrier receiver distance	: 37.00 / 37.00 m	
Source elevation	: 81.60 m	
Receiver elevation	: 81.40 m	
Barrier elevation	: 81.00 m	
Reference angle	: 0.00	

Results segment # 1: KNG (day)

Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)

```
------------+-------------+-------------+--------------
       4.00 !        1.50 !        2.49 !        83.49
       0.50 !        1.50 !        1.72 !        82.72

LOCOMOTIVE (0.00 + 55.11 + 44.86) = 55.50 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     72   0.44  76.49 -15.09  -1.29   0.00   0.00  -5.00  55.11
-------------------------------------------------------------------------
    72     90   0.58  76.49 -16.67 -14.96   0.00   0.00   0.00  44.86
-------------------------------------------------------------------------

WHEEL (0.00 + 46.54 + 36.56) = 46.96 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     72   0.54  69.56 -16.20  -1.45   0.00   0.00  -5.37  46.54
-------------------------------------------------------------------------
    72     90   0.66  69.56 -17.46 -15.54   0.00   0.00   0.00  36.56
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 30.23 + 0.00) = 30.23 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.44  73.89 -15.09 -23.56   0.00   0.00  -5.00  30.23
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 33.82 + 0.00) = 33.82 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -78   0.44  73.89 -15.09 -19.98   0.00   0.00  -5.00  33.82
-------------------------------------------------------------------------

Segment Leq : 56.11 dBA

Total Leq All Segments: 56.11 dBA

Results segment # 1: KNG (night)
--------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        2.49 !        83.49
       0.50 !        1.50 !        1.72 !        82.72

LOCOMOTIVE (0.00 + 54.72 + 44.47) = 55.11 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     72   0.44  76.10 -15.09  -1.29   0.00   0.00  -5.00  54.72
-------------------------------------------------------------------------
    72     90   0.58  76.10 -16.67 -14.96   0.00   0.00   0.00  44.47
-------------------------------------------------------------------------
```

```
WHEEL (0.00 + 46.59 + 36.60) = 47.00 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     72   0.54  69.60 -16.20  -1.45   0.00   0.00  -5.37  46.59
-------------------------------------------------------------------------
    72     90   0.66  69.60 -17.46 -15.54   0.00   0.00   0.00  36.60
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 28.05 + 0.00) = 28.05 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.44  71.71 -15.09 -23.56   0.00   0.00  -5.00  28.05
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 31.64 + 0.00) = 31.64 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -78   0.44  71.71 -15.09 -19.98   0.00   0.00  -5.00  31.64
-------------------------------------------------------------------------

Segment Leq : 55.76 dBA

Total Leq All Segments: 55.76 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 56.11
                           (NIGHT): 55.76
```

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:39:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars/Train	Eng type	Cont weld
1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 169.00 / 169.00 m	
Receiver height	: 1.50 / 1.50 m	
Topography	: 1	(Flat/gentle slope; no barrier)
Whistle Angle	: -82 deg	Track 1
Reference angle	: 0.00	

Results segment # 1: KNG (day)

LOCOMOTIVE (0.00 + 58.49 + 0.00) = 58.49 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.58	76.49	-16.67	-1.33	0.00	0.00	0.00	58.49

WHEEL (0.00 + 50.64 + 0.00) = 50.64 dBA

Angle1	Angle2	Alpha	RefLeq	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	90	0.66	69.56	-17.46	-1.46	0.00	0.00	0.00	50.64

```
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 32.28 + 0.00) = 32.28 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.58  73.89 -16.67 -24.93   0.00   0.00   0.00  32.28
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 36.10 + 0.00) = 36.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -78   0.58  73.89 -16.67 -21.12   0.00   0.00   0.00  36.10
-------------------------------------------------------------------------

Segment Leq : 59.18 dBA

Total Leq All Segments: 59.18 dBA

Results segment # 1: KNG (night)
--------------------------------

LOCOMOTIVE (0.00 + 58.10 + 0.00) = 58.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.58  76.10 -16.67  -1.33   0.00   0.00   0.00  58.10
-------------------------------------------------------------------------

WHEEL (0.00 + 50.69 + 0.00) = 50.69 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90     90   0.66  69.60 -17.46  -1.46   0.00   0.00   0.00  50.69
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 30.10 + 0.00) = 30.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.58  71.71 -16.67 -24.93   0.00   0.00   0.00  30.10
-------------------------------------------------------------------------

RIGHT WHISTLE (0.00 + 33.92 + 0.00) = 33.92 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -78   0.58  71.71 -16.67 -21.12   0.00   0.00   0.00  33.92
-------------------------------------------------------------------------

Segment Leq : 58.84 dBA

Total Leq All Segments: 58.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.18
                           (NIGHT): 58.84
```

STAMSON 5.0 NORMAL REPORT Date: 24-11-2023 12:40:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: r8b.te Time Period: Day/Night 16/8 hours
Description:

Rail data, segment # 1: KNG (day/night)

Train Type	Trains (Left)	Trains (Right)	Speed (km/h)	# loc /Train	# Cars /Train	Eng type	Cont weld
1. Freight	8.0/4.5	8.0/4.5	89.0	4.0	140.0	Diesel	Yes
* 2. W Freight	0.5/0.0	0.5/0.0	89.0	4.0	25.0	Diesel	Yes
3. Passenger	7.5/0.0	7.5/0.0	105.0	2.0	10.0	Diesel	Yes

* The identified number of trains have been adjusted for future growth using the following parameters:

No	Train type: Name	Unadj. Trains Left	Unadj. Trains Right	Annual % Increase	Years of Growth
2.	W Freight	0.5/0.0	0.5/0.0	0.00	0.00

Data for Segment # 1: KNG (day/night)

Angle1 Angle2	: -90.00 deg	90.00 deg
Wood depth	: 0	(No woods.)
No of house rows	: 0 / 0	
Surface	: 1	(Absorptive ground surface)
Receiver source distance	: 169.00 / 169.00 m	
Receiver height	: 1.50 / 1.50 m	
Topography	: 2	(Flat/gentle slope; with barrier)
Whistle Angle	: -82 deg	Track 1
Barrier angle1	: -90.00 deg	Angle2 : 0.00 deg
Barrier height	: 2.50 m	
Barrier receiver distance	: 24.00 / 24.00 m	
Source elevation	: 81.60 m	
Receiver elevation	: 81.75 m	
Barrier elevation	: 80.90 m	
Reference angle	: 0.00	

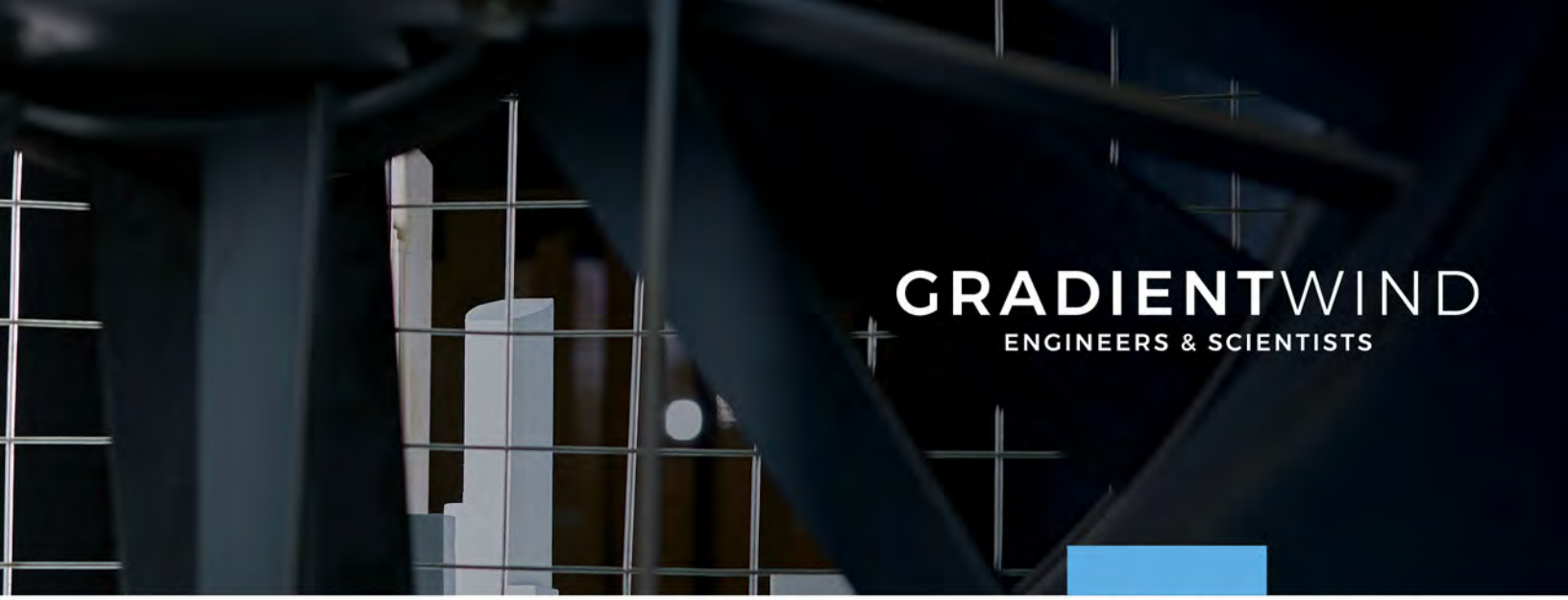
Results segment # 1: KNG (day)

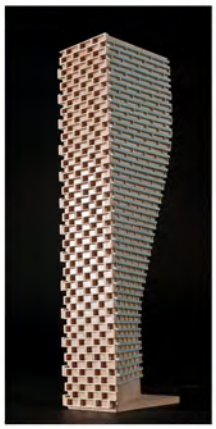
Barrier height for grazing incidence

Source Height (m)	Receiver Height (m)	Barrier Height (m)	Elevation of Barrier Top (m)

```
------------+-------------+-------------+--------------
       4.00 !        1.50 !        2.68 !        83.58
       0.50 !        1.50 !        2.19 !        83.09

LOCOMOTIVE (0.00 + 55.48 + 55.48) = 58.49 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.44  76.49 -15.09  -4.06   0.00   0.00  -4.97  52.37*
   -90      0   0.58  76.49 -16.67  -4.34   0.00   0.00   0.00  55.48
-------------------------------------------------------------------------
     0     90   0.58  76.49 -16.67  -4.34   0.00   0.00   0.00  55.48
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 44.02 + 47.63) = 49.20 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.54  69.56 -16.20  -4.26   0.00   0.00  -5.08  44.02
-------------------------------------------------------------------------
     0     90   0.66  69.56 -17.46  -4.47   0.00   0.00   0.00  47.63
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 32.28 + 0.00) = 32.28 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.44  73.89 -15.09 -23.56   0.00   0.00  -4.99  30.23*
   -84    -82   0.58  73.89 -16.67 -24.93   0.00   0.00   0.00  32.28
-------------------------------------------------------------------------

 * Bright Zone !

RIGHT WHISTLE (0.00 + 36.10 + 0.00) = 36.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -78   0.44  73.89 -15.09 -19.98   0.00   0.00  -4.99  33.83*
   -82    -78   0.58  73.89 -16.67 -21.12   0.00   0.00   0.00  36.10
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 59.01 dBA

Total Leq All Segments: 59.01 dBA

Results segment # 1: KNG (night)
--------------------------------

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier Top  (m)
------------+-------------+-------------+--------------
       4.00 !        1.50 !        2.68 !        83.58
```

```
       0.50 !        1.50 !        2.19 !        83.09

LOCOMOTIVE (0.00 + 55.09 + 55.09) = 58.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.44  76.10 -15.09  -4.06   0.00   0.00  -4.97  51.97*
   -90      0   0.58  76.10 -16.67  -4.34   0.00   0.00   0.00  55.09
-------------------------------------------------------------------------
     0     90   0.58  76.10 -16.67  -4.34   0.00   0.00   0.00  55.09
-------------------------------------------------------------------------

 * Bright Zone !

WHEEL (0.00 + 44.07 + 47.68) = 49.25 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -90      0   0.54  69.60 -16.20  -4.26   0.00   0.00  -5.08  44.07
-------------------------------------------------------------------------
     0     90   0.66  69.60 -17.46  -4.47   0.00   0.00   0.00  47.68
-------------------------------------------------------------------------

LEFT WHISTLE (0.00 + 30.10 + 0.00) = 30.10 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -84    -82   0.44  71.71 -15.09 -23.56   0.00   0.00  -4.99  28.06*
   -84    -82   0.58  71.71 -16.67 -24.93   0.00   0.00   0.00  30.10
-------------------------------------------------------------------------

 * Bright Zone !

RIGHT WHISTLE (0.00 + 33.92 + 0.00) = 33.92 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------------
   -82    -78   0.44  71.71 -15.09 -19.98   0.00   0.00  -4.99  31.65*
   -82    -78   0.58  71.71 -16.67 -21.12   0.00   0.00   0.00  33.92
-------------------------------------------------------------------------

 * Bright Zone !

Segment Leq : 58.65 dBA

Total Leq All Segments: 58.65 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.01
                           (NIGHT): 58.65
```





APPENDIX C

BPN 56 WINDOW STC CALCULATIONS

127 WALGREEN ROAD, OTTAWA, ON, CANADA K0A 1L0 | 613 836 0934
GRADIENTWIND.COM

CALCULATIONS TO REDUCE INTERIOR RAIL TRAFFIC NOISE
LOCKMASTER'S MEADOW - BEDROOM

		Rail
Outdoor Sound Level	=	60
Source Geometry Correction:	=	0
Correction For Surface Reflection:	=	3
Target Indoor Noise Level:	=	35
Required Noise Reduction:	=	28

Rail

COMPONENT: Wall A - Spandral			STC Is:	45	
Noise Spectrum Type	F				
Component Category	d	Correction: (Table 5)	10		
Room Floor Area:	9 m²			-10	dBA
Component Area:	2.43 m²				
Component / Floor (%):	27 %				
Room Absorption Category:	Very Absorptive	Correction: (Table 4 Equation)	-7		dBA
				7	
Noise Reduction If Only This Component Transmits Sound Energy:				42	dBA
		Required Noise Reduction:		28	dBA
Surplus noise reduction for comparison to Table 3				14	
Component Transmits	4 % Of Sound				

COMPONENT: Surface A Window		Required Noise Reduction Is:	28	dBA
Percentage Of Sound Energy Transmitted:	96 %	Correction: (Table 3 Equation)	0	
Room Floor Area:	9 m²			
Component Area:	5.67 m²			
Component / Floor (%):	63 %			
Room Absortion Category:	Very Absorptive	Correction: (Table 4 Equation)	-3	dBA
Noise Spectrum	F			
Component Category	b	Correction: (Table 5)	3	dBA
		Required STC Is:	28	

	Rail	Road
Wall Area	2.43	5.02
Room Floor Area	9	9
Window Area	5.67	3.08
Wall Spectrum Type	d	d
Window Spectrum Type	b	b
Noise Source Type	F	D

Absorption Level: Very Absorptive

Absorption Coefficient	0.5	1.25	Hard
	0.8		Intermediate
	1.25		Very Absorptive

Building Component		Noise Source Spectrum Type A: Large Aircraft Landing	B: Average Aircraft Noise, Railway Wheel Noise	C: Railway Wheel Noise Screened By Barrier	D: Mixed Road Traffic, Distant Aircraft	E: Road Traffic Screened By Barrier	F: Diesel Railway Locomotive
Single Exterior Door	a	-1	0	0	1	1	1
Double Exterior Door, Single Glazed Window, Openable Thin Window	b	0	1	2	2	3	3
Sealed Thin Window, Openable Thick Window	c	0	1	3	4	6	6
Sealed Thick Window, Exterior Wall, Roof/Ceiling	d	0	2	5	7	9	10

	Rail	Road
Window Value	3	2
Wall Value	10	7

Source Geometry	Correction
60 to 90 degrees	3
40 to 90 degrees	2
30 to 90 degrees	1
0 to 90 degrees	0

SCHEDULE "N"

EASEMENTS AND LAND DEDICATIONS

LAND DEDICATIONS

The Owner shall ensure that the Municipality receives a valid conveyance, free of any encumbrances, of the following lands at the Owner's expense:

1. Block A: Open space and stormwater control facility
2. Block B: Sanitary pumping station
3. Block E: Right-of-way for future road (south)
4. Block F: Parkland Dedication
5. Block G: Right-of-way for future road (west)
6. Block H: 6m-wide walkway and passage for utilities and servicing

The Owner shall ensure that the United Counties of Leeds and Grenville receives a valid conveyance, free of any encumbrances, of the following lands at the Owner's expense:

1. Block C: 0.30m reserve on County Road
2. Blocks D and Da: 0.30m reserve on County Road
3. Road widening lands: Lands along the entire frontage of County Road 22 for future road purpose, sufficient to provide 13.1 m from the centreline of the Counties road.

EASEMENTS

In addition, the Owner shall ensure that the Municipality is granted 2.4m wide easements over all proposed swales; and 4.5m wide easement over all proposed ditches and culverts as shown in the Grading and Drainage Plans (GR-1 to GR-3 inclusive).

The Owner shall ensure deeds for lots 45 and 46 shall include a note that no changes in grading are allowed and that an easement is granted to the Municipality as shown in the Grading and Drainage Plan (GR-1 to GR-3 inclusive) to allow for maintenance.

The owner shall ensure that an easement for operational noise and vibration emissions is registered against any lots within 300m of the CN right of way.

The Owner shall ensure that the Municipality is granted easement(s) over that portion of County Rd 22 wherein the water and sewer works cross through the County Road allowance. The survey and easement shall be to the satisfaction of the Counties and the Municipality and shall be at the cost of the applicant.

SCHEDULE "O"

PARKLAND DEVELOPMENT SPECIFICATIONS

The Owner agrees that Block F, as shown on the Plan, shall be conveyed to the Municipality as part of Parkland Dedication.

No building permits will be issued for phase 2 until the following owner obligations associated with Block F have been completed to the satisfaction of the Township:

It is the responsibility of the Owner to fill with clean earth fill, compact and level Block F accordingly, providing for positive surface drainage to the satisfaction of the Municipality.

The Owner shall grade areas of parkland where necessary to the satisfaction of the Municipality, so as to provide a uniform surface, free of debris, necessary to establish a safe clean and maintainable surface.

Block F shall be graded in accordance with the approved Grading Plan for the Plan of Subdivision. No storage of building materials, including granular or topsoil will be permitted on Block F.

SCHEDULE "P"

ENGINEERING CONSULTANT(S)

The following Consultant(s) will be engaged by the Owner to provide the professional engineering services for the Subdivision on the lands described under Schedule "A":

Mongi Mabrouk P.Eng.

ADVANCE ENGINEERING LTD.
527-840 SPRINGLAND DR
OTTAWA ON K1V 6L6

SCHEDULE "Q"

ADDITIONAL REQUIREMENTS OF THE UNITED COUNTIES OF LEEDS AND GRENVILLE

The Owner shall design and construct the intersection of all roads within the Plan of Subdivision that intersect the County Road to the satisfaction of the United Counties of Leeds and Grenville.

The Owner agrees to pay all expenses including those for drawing preparation, utility relocations, fees, security, road work, construction supervision, engineering and administrative costs for the modification of any intersection.

The Owner shall obtain an entrance permit and/or enter into an agreement with the United Counties of Leeds and Grenville, to the satisfaction of the United Counties of Leeds and Grenville respecting the conditions of accessing the Counties road/road allowance prior to undertaking any work within the Counties road allowance. Only one construction access shall be active at one time. If multiple accesses are to be active during construction, approval must be obtained by the road authority.

Prior to any site or earth work activity and during site work and construction on the lands or within the Counties road allowance (including but not limited to entrance construction, topsoil removal, tree removal, digging, site pre-grading, curb works, model home construction) the Owner shall:

1. Arrange an onsite (pre-construction) meeting with United Counties engineering staff with a minimum of 72 hours' notice for such meeting to review matters of Counties interests, including establishing the limits of required works

2. Arrange a video inspection of the United Counties road allowance with the United Counties staff in attendance in order to document the condition of the surface infrastructure before site works and construction. The Owner will immediately provide a copy of the preconstruction video survey to the United Counties

3. Install and maintain, to the satisfaction of the Counties, mud mats and dust control suppressants on the subdivision lands to reduce the impact of mud tracking onto the Counties road network. Mud mats shall be according to the Counties specifications and what is shown on the Erosion and Sediment Control Plan

4. Immediately sweep and clean the County Road in the case of any dirt, mud, granular or other materials being deposited on the roadway to the satisfaction of the United Counties

SCHEDULE "R"

WORK SCHEDULE

The Works shall be constructed, installed or otherwise provided in general conformance with the work schedule set out in this Schedule. If the Work is not performed in accordance with the schedule for each portion of the Works to be constructed, installed or otherwise provided, the Owner shall be considered to have failed to proceed with reasonable speed, provided however that if any portion of the Work is delayed by an unavoidable delay, and such delay is reasonable, in the opinion of the Municipality, the completion date shall be extended by the period of such delay.

No work shall be commenced on any of the Works until the designs for all the Works and soil tests have been approved by the Municipality and the Municipality may stop any work that is commenced without its approval.

Any work undertaken by the Owner prior to this Agreement coming into force shall not be approved or Assumed by the Municipality as a municipal service until such time as the Owner's Professional Engineer has advised the Municipality, in writing, that such work has been carried out in accordance with the applicable specifications, and that all requirements for Assumption have been met to the Municipality's satisfaction and the Owner has paid the Municipality all costs in its review and processing of a request to approve, Accept or Assume such Works. The Owner shall provide all the information and expose or reconstruct any portion of the Works which the Municipality may in its sole and absolute discretion require. The Municipality is under no obligation to approve, Accept or Assume any portion of the Works undertaken by the Owner prior to this Agreement coming into force or unsatisfactory in the Municipality's sole and unfettered discretion, following this Agreement coming into force.

CONTRACTOR FOR CONSTRUCTION OF WORKS

The Owner covenants and agrees not to enter into any contract for the performance of any of the Works unless the contractor has first been approved by the Municipality, which approval shall not be unreasonably withheld. The contract(s) shall provide that the Municipality may inspect the construction of all Works and shall have authority to instruct the contractor(s) or subcontractor(s) to stop work should any construction be undertaken contrary to the provisions of this Agreement or the Municipality's design criteria, standards and specifications.

COMMENCEMENT OF CONSTRUCTION

The Owner covenants and agrees, prior to the construction of any Works, including the installation of public utilities, to give to the Municipality ten (10) days advance written notice of the date upon which construction of any Works is scheduled to commence.

[Include Schedule of Works]

Meadows subdivison

#	Activity Name	Remaining Duration	Start	Finish	Units
1	**Meadows subdivison**	154	15-Jan-24	22-Aug-24	
2	**Site Preperation**	46	15-Jan-24	19-Mar-24	
3	Rough site grading	25	13-Feb-24	19-Mar-24	
4	Topsoil stripping	16	22-Jan-24	12-Feb-24	
5	Silt fence Install	5	15-Jan-24	19-Jan-24	
6	**Watermain installation**	19	13-Feb-24	11-Mar-24	
7	Connect to existing watermain	2	08-Mar-24	11-Mar-24	
8	Watermain Testing	3	05-Mar-24	07-Mar-24	
9	Water services	7	23-Feb-24	04-Mar-24	
10	250mm PVC DR 18 Watermain	2	23-Feb-24	26-Feb-24	
11	150mm PVC DR 18 Watermain	10	23-Feb-24	07-Mar-24	
12	200 PVC PVC DR 18 Watermain	7	13-Feb-24	22-Feb-24	
13	**Storm Sewer**	34	22-Apr-24	07-Jun-24	
14	Storm Sewer - CCTV Inspection	2	06-Jun-24	07-Jun-24	
15	200mm PVC DR35 Storm Sewer - CB Lead	5	30-May-24	05-Jun-24	
16	100mm PVC DR28 Storm Service (Subdivision)	7	24-May-24	03-Jun-24	
17	Rear yard catch basins	8	24-May-24	04-Jun-24	
18	StormCeptor EFO 12	3	21-May-24	23-May-24	
19	600mm x 600mm Catchbasin	7	21-May-24	29-May-24	
20	900mm Concrete Storm Sewer	2	16-May-24	17-May-24	
21	675mm Concrete Storm Sewer	5	09-May-24	15-May-24	
22	450mm Concrete Storm Sewer	3	09-May-24	13-May-24	
23	375mm PVC DR35 Storm Sewer	3	06-May-24	08-May-24	
24	300mm PVC DR35 Storm Sewer	1	06-May-24	06-May-24	
25	600mm Concrete Storm Sewer	5	02-May-24	08-May-24	
26	1800mm Storm MH	2	02-May-24	03-May-24	
27	525mm Concrete Storm Sewer	2	30-Apr-24	01-May-24	
28	1500mm Storm MH	2	30-Apr-24	01-May-24	
29	1200mm Storm MH	6	22-Apr-24	29-Apr-24	
30	**Sanitary sewers**	32	08-Mar-24	23-Apr-24	
31	Sanitary Sewer - CCTV Inspection	2	22-Apr-24	23-Apr-24	
32	Sanitary Sewer - Leak Testing	3	17-Apr-24	19-Apr-24	
33	125mm PVC DR28 Sanitary Service (Subdivision)	7	08-Apr-24	16-Apr-24	
34	1200mm Sanitary MH	4	02-Apr-24	05-Apr-24	
35	200mm PVC DR35 Sanitary Sewer	16	08-Mar-24	01-Apr-24	
36	**Roads**	39	10-Jun-24	02-Aug-24	
37	County road 22 reinstatement	4	30-Jul-24	02-Aug-24	
38	Place 40mm SP 12.5 B 58-34	3	30-Jul-24	01-Aug-24	
39	Place 40mm SP19 B 58-34	3	25-Jul-24	29-Jul-24	
40	3M Subdrain	4	11-Jul-24	16-Jul-24	
41	Concrete Curbs	5	11-Jul-24	17-Jul-24	
42	Granular A	10	11-Jul-24	24-Jul-24	
43	Granular B placement	11	25-Jun-24	10-Jul-24	
44	Prep road subgrade	11	10-Jun-24	24-Jun-24	
45	**Subcontract work**	30	11-Jul-24	22-Aug-24	
46	Fence work	15	01-Aug-24	22-Aug-24	
47	Electrical subcontractor	25	11-Jul-24	15-Aug-24	
48	Concrete Flat work	15	11-Jul-24	31-Jul-24	
49	**Pond/Berm construction**	16	11-Jul-24	01-Aug-24	
50	Head walls	4	29-Jul-24	01-Aug-24	
51	750mm HDPE Pipe	2	25-Jul-24	26-Jul-24	
52	M4 Pond outlet structure	2	23-Jul-24	24-Jul-24	
53	Pond/Berm Construction	8	11-Jul-24	22-Jul-24	

SCHEDULE "S"

CERTIFICATE OF ASSUMPTION

[date]

THE CORPORATION OF THE TOWNSHIP OF EDWARDSBURGH/CARDINAL
18 Center Street, P.O. Box 129
Spencerville, ON K0E 1X0

Attention: David Simpson
Edwardsburgh Development Inc.

Re: Certificate of Assumption
PT LT 7 CON 1 Edwardsburgh; Edwardsburgh/Cardinal
Lockmaster's Meadow Subdivision
Subdivision Application No. [**no**]

This letter certifies that I, [name of Municipal Official], being the [title] and employed by the Corporation of the Township of Edwardsburgh/Cardinal ("the Municipality") have reviewed the terms of the Subdivision Agreement dated [date] and inspected the Works as defined therein.

I hereby verify and confirm that the Works appear to have been executed in accordance with the subdivision agreement including the schedules and approved plans attached thereto. Further, I am satisfied that all Municipal accounts have been paid and all maintenance requirements met.

Accordingly, I hereby recommend to council that it assume the said Works by way of resolution or assumption by-law such that ownership of the Works vest in the Municipality.

Yours truly,

_____
[Name]
[Title]