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SUBDIVISIONS AND SITE PLANS

CITY OF CLARENCE-ROCKLAND

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INTRODUCTION

PART 1 INTRODUCTION

1.1 GENERAL CONSIDERATIONS

The general intent of this document, along with various City By-Laws, is to provide guidance and clear directions for Owners, developers and Engineers seeking to pursue development opportunities in the City of Clarence-Rockland. This in turn should minimize surprises, allow for efficient and expedient design and construction of various projects, and promote consistency and quality in the design of infrastructure throughout the City.

This document will also identify design criteria considered as minimum guidelines by the City under typical conditions. Generally, no variance will be allowed for minimum guidelines contained in this document. Deviation from some guidelines may however be possible at the discretion of the City or Council through a special request. Onus will be on Owner to justify deviation from these guidelines.

This document is meant to be a 'living document' which may be amended or modified as required. Note that that the City By-Laws and policies and other application regulations take precedence over this manual should there be a conflict.

City should be contacted if any section of this document is unclear or if additional information is needed.

1.2 DEFINITIONS & ABBREVIATIONS

"AODA" shall mean the "Accessibility for Ontarians with Disabilities Act";

"AWWA" shall mean the "American Water Works Association";

"CCTV" shall mean "Closed-Circuit Television" inspection of sewers;

"Chief Building Official (CBO)" shall mean the senior officer of the Construction Division of the Infrastructure and Planning Department or his/her designate;

"Conservation Authority (CA)" shall mean the "South Nation Conservation";

"City" shall mean the Corporation of the City of Clarence-Rockland and includes its successors and assigns and its officers, employees, agents, contractors and subcontractors;

"City Engineer" means the Director of Infrastructure and Planning of the Corporation of the City of Clarence-Rockland for the time being or such other person or persons designated;

"City Specifications or Standards" means the detailed description of construction materials, workmanship and standards of Works to be carried out by the Owner as prescribed by the City in this manual and its amendment from time to time by the City;

"City Treasurer" shall mean the Treasurer of the Corporation of the City of Clarence-Rockland for the time being or such other person or persons so designated;

"Council" shall mean the Council of the Corporation of the City of Clarence-Rockland;

"CSA" shall mean the "Canadian Standards Association";

"CUP" shall mean "Composite Utility Plan";

"Director, Infrastructure and Planning Department" shall mean the senior officer of the Infrastructure and Planning Department or his or her designate;

"Easement" shall mean the legal right acquired by contract to pass over, along, upon or under the lands of another;

"ECA" shall mean "Environmental Compliance Approval" as issued by the MOECC;

"Engineer" shall mean a professional holding a license or temporary license to practice engineering in the province of Ontario, holding a Certificate of Authorization from Professional Engineers Ontario, and having valid professional liability insurance;

"ESA" shall mean "Electrical Safety Authority";

"Final Acceptance" is achieved when passed as a By-law by Council;

"HDPE" shall mean "high density polyethylene";

"kPa" shall mean "kilopascal" (1,000 N/m^2);

"LID" shall mean "Low Impact Development";

"Landscape Architect" shall mean a landscape architect in good standing with the Ontario Association of Landscape Architects or the Canadian Society of Landscape Architects;

"Letter of Credit" shall mean an irrevocable letter of credit provided by the Owner to the City, as issued by a bank or similar institution;

"LPAT" shall mean the "Local Planning Appeal Tribunal";

"Maintain" includes repair, replace, reinstate and/or keep operational;

"MAH" shall mean the "Ministry of Municipal Affairs and Housing";

"MOECC" shall mean the "Ministry of the Environment and Climate Change"

"MRD" shall mean "maximum relative density" of asphalt;

"MTO" shall mean the "Ministry of Transportation";

"NFPA" shall mean the "National Fire Protection Association";

"OCWA" shall mean "Ontario Clean Water Agency";

"OBC" shall mean the Ontario Building Code;

"OMAFRA" shall mean the "Ontario Ministry of Agriculture, Food and Rural Affairs";

"OPSD" shall mean "Ontario Provincial Standard Drawings" as published by the MTO (latest edition) available online at:
http://www.raqsa.mto.gov.on.ca/techpubs/OPS.nsf/OPSHomepage

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http://www.raqsa.mto.gov.on.ca/techpubs/OPS.nsf/OPSHomepage

"OTM" shall mean "Ontario Traffic Manual" as published by the MTO (latest edition) available online at: http://www.mto.gov.on.ca/english/publications/mto-research-library-online-catalogue.shtml

"Owner" shall mean the person or company proposing and undertaking the proposed project, its heirs, executors, administrators, successors and assigns or agents thereof or contractor or sub-contractor carrying out the Works for or on behalf of the Owner;

"PEO" shall mean "Professional Engineers Ontario";

"psi" shall mean "pounds per square inch";

"PVC" shall mean "polyvinyl chloride";

"SPMDD" shall mean "standard proctor maximum dry density";

"SNC" shall mean "South Nation Conservation";

"Subdivision" refers to the division of a parcel of land into three or more lots;

"Surveyor" shall mean a professional land surveyor designated as an Ontario Land Surveyor (OLS) by the Association of Ontario Land Surveyors (AOLS);

"TAC" shall mean the "Transportation Association of Canada";

"USGPM" shall mean "U.S. gallons per minute";

"Works" means those services, installations, structures, buildings and other works listed in and required for the proposed development;

"WSIB" shall mean "Workplace Safety and Insurance Board";

1.3 GENERAL RESPONSIBILITIES OF THE OWNER

At its own cost, the Owner will be required to employ competent Engineers in good standing with PEO and having valid professional liability insurance to design, supervise and construct any and all infrastructure required, which includes site-specific infrastructure and may also include off-site improvements.

Again at its own cost, the Owner will be responsible to obtain all necessary approvals from the City and all other relevant senior approving authorities, and pay for reasonable fees and disbursements incurred by the City, including but not limited to planning fees, legal fees, engineering/peer review fees, SNC review fees, inspections, testing, etc.

1.4 PRE-CONSULTATION

Early pre-consultation with the City and with the City's review team is mandatory for subdivision and site plan projects. Modifications to the drawings are to be anticipated, therefore detailed engineering drawings are not required nor expected at this stage.

Pre-consultation will help to identify requirements early in the process, expedite subsequent steps and will identify the nearest infrastructure, possible servicing options and available capacities.

1.5 RELEVANT LEGISLATION & DESIGN GUIDELINES

Applicable legislation, design guidelines and policies include, but are not limited to, the documents listed below. When this manual does not discuss a specific issue or section, refer to the application legislation, design guidelines and policies below.

Although the versions listed below were current at the time of writing this manual, updates may have occurred, and/or new documents may come into force or be published. The onus will be on the Owner to obtain and meet the requirements of the latest version of said documents.

1.5.1 Provincial Legislation

- Occupational Health and Safety Act and Regulations
- Ontario Building Code
- Ontario Planning Act
- Ontario Highway Traffic Act
- Ontario Water Resources Act
- Accessibility for Ontarians with Disabilities Act

1.5.2 Policies & Design Guidelines, MOECC

- Design Guidelines for Sewage Works, 2008 (MOECC)
- Design Guidelines for Drinking-Water Systems, 2008 (MOECC)
- Procedures to Govern Separation of Sewers and Watermains (MOE Procedure F-6-1)
- Stormwater Management Planning and Design Manual, 2003 (MOECC)

1.5.3 Policies & Design Guidelines, MTO

- Drainage Management Manual, 1995-1997
- Gravity Pipe Design Guidelines, 2007
- Ontario Provincial Standard Drawings (OPSD), latest version

- Ontario Provincial Standard Specifications (OPSS), latest version
- Ontario Traffic Manual, latest version
- Roadside Safety Manual, 1993

1.5.4 Policies & Design Guidelines, OMAFRA

- Minimum Distance Separation (MDS) Document (2017)

1.5.5 Policies & Design Guidelines, MAH

- Provincial Policy Statement (2014)

1.5.6 Policies & Design Guidelines, Others

- TAC Geometric Design Guide for Canadian Roads (1999)
- Ottawa Sewer Design Guidelines (2012)
- Ottawa Design Guidelines – Water Distribution (2010)

1.6 RELEVANT CITY POLICIES & BY-LAWS

Applicable City By-Laws and policies include, but are not limited to, the following as amended. Versions below were current at the time of writing this manual. Again, the onus will be on the Owner to obtain and meet the requirements of the latest version of said City By-Laws and policies.

- Civic Addressing By-Law (2005-74)
- Clearing of Land By-Law (2001-16)
- Construction of Private Entrances By-Law (2017-44)
- Development Charges By-Law (2015-13)
- Fence and Privacy Screens (2016-96)
- Fire Routes By-Law (2008-74)
- Noise By-Law (1999-55)
- Open Air Fire By-Law (2017-92)
- Parkland By-Law (2018-61)
- Road Cut By-Law (2002-29)
- Roadside Drainage Infill Policy (2005-165)
- Roadway Lighting Policy (2017)
- Security Deposit By-Law (2007-19, amended by 2010-99)
- Signs By-Law (2015-160)
- Site Plan Control By-Law (2013-05)
- Use and Care of Streets By-Law (2003-26)
- User Fees and Charges By-Law (2015-176)
- Waste Material By-Law (1998-57)
- Water Use By-Law (2000-43)
- Zoning By-Law (2016-10)

The latest City By-Laws and policies may be found on the City's website at: http://clarence-rockland.com/index.php/en/city-hall/municipal-by-laws

1.7 RELEVANT OFFICIAL PLANS

There are three Official Plans which govern the development within the City. At the highest level is the Official Plan of the United Counties of Prescott and Russell, which directs the development of all areas of the City and is the only Official Plan in effect for the rural areas and villages of Clarence-Creek, Hammond, Cheney, Clarence Point and St-Pascal.

The City also has two Official Plans which direct development and growth for specific areas of the City. These are the Rockland Official Plan which directs the future development of the urban area of Rockland, and the Bourget Official Plan which directs the future development of the village of Bourget.

The Official Plans may be found on the following websites:

Rockland & Bourget:

http://clarence-rockland.com/index.php/en/planning.

Prescott-Russell:

http://www.en.prescott-russell.on.ca/services/planning_and_forestry/official_plan

SUBDIVISIONS

PART 2 GENERAL REQUIREMENTS

2.1 OFF-SITE IMPROVEMENTS

In some cases, off-site improvements may be required to support proposed development. These may consist of water or sewer extensions, upsizing or reconstruction of existing infrastructure, construction of new turning lanes, sidewalk and/or roadway extensions, new pumping stations, modifications to existing pumping stations, etc.

Additionally, the design of new sanitary sewers, storm sewers and/or watermains may need to consider the ultimate flows or demands permitted by the zoning expected from the tributary area. Cost sharing may be possible if the improvements benefit other parties or as part of a development charge study.

The need for off-site improvements will be evaluated on a case-by-case basis. Pre-consultation with the City will serve to serve to establish what off-site improvements, if any, will be required to support the proposed project.

Owner may be required to complete capacity studies where information is not available, and Owner will be responsible for costs related to design, construction, inspection, etc.

2.2 APPROVALS & AGREEMENTS

The Owner is responsible to pay for and obtain all necessary approvals, such as:

- clearance letter or other approvals from CA (as required),
- Environmental Compliance Approval (ECA) from MOECC as required (for sanitary sewers, storm sewers, stormwater management facilities, ditch filling in rural subdivision, etc.),
- approvals from the County as required,
- all other necessary approvals from other approving authorities, such as, but not limited to utility companies (Bell, Vidéotron, Enbridge), Canada Post, etc. as may be required.

The Owner will also be required to enter into a Subdivision Agreement with City. In some cases, the United Counties of Prescott & Russell may also enter into the same agreement.

Note that City sign-off is required on ECA application. City will only sign-off once the drawings and reports have been reviewed and once review comments have been addressed.

2.3 DESIGN DRAWINGS

The Owner shall provide at its own cost all plans which may be required by the City and/or other senior approving authorities. General drawing requirements are as follows:

- Drawings must be in metric units and to scale,
- Printed on Architectural D (24" x 36"), A1 (594 mm x 841 mm) or other similar format. Drawings on Architectural E (36" x 48"), A0 format (841 mm x 1,189 mm) or similar large format will not be accepted.
- Must include legend, north arrow, street names, and name of Owner,
- Must include version/revision history,
- All final drawings must be stamped and signed by an Engineer,
- must be clear and concise.

More specifically, the following drawings are required for all subdivision projects:

- Cover sheet with key project information,
- Overall site plan showing entire project, easements, phasing, and legal boundary information,
- Plan & profiles for all roadways, scale of 1:250 or 1:500 (horizontal) and 1:50 (vertical) with finished grades at spacing of 12.5 m,
- Plan & profiles for all rear-yard catch basins, scale of 1:250 or 1:500 (horizontal) and 1:50 (vertical) – if applicable,
- Grade Control Plan at a scale of 1:500 or larger, showing:
    - Existing contours and final elevations at all lot corners,
    - Final elevations at the centre line of each road at a spacing of 12.5 meters or less,
    - Final elevations at all intersections,
    - Finished ground elevation at the building line,
    - Finished first floor elevation,
    - The finished elevation of all critical points such as catch basins, beyond the street line,
    - Finished elevation for top of foundation wall and underside of footing,
    - Existing elevation of the top of foundation wall and finished grading at neighbouring dwellings (if applicable),
    - Arrows indicating direction of flow of all surface water,
    - Location and details of all swales,
    - Location and details of all surface water outlets,
    - Detailed requirements shown on Drawings,
    - Details of all Works to be carried out upon the lands,
    - High groundwater water table elevation with date measured,
    - Temporary benchmarks.
- Ponding plan showing overland flow routes, and ponding water elevations for the major storm event,
- Storm & sanitary catchment area plan showing the respective infrastructure,
- Roadway line painting drawing including all relevant details, and showing all street signs,
- Details and OPSD's including all relevant details and enlargements as required
- Street lighting including location of street lights, wire routing and all relevant details & OPSD's,

- Composite utility plan (CUP) including location of servicing trenches, easements, location of transformers, pedestals, conduits, existing utility poles, etc.
- Landscaping plan prepared by a landscape architect.

2.4 DESIGN REPORTS & STUDIES

The Owner shall again provide at its own cost all design reports and studies which may be required by the City and/or other senior approving authorities. General report requirements are as follows:

- Must be clear and concise,
- Must include all necessary calculations and supporting information,
- Final reports and reports submitted as part of a Site Plan Control application must be stamped and signed by an Engineer,
- Include sketches as required.

2.5 SUBMITTALS

The Owner will be required to submit directly to senior approving authorities as required. The submittal requirements of the senior approving authority will apply for such submissions.

With regards to submissions for City review/approval, the following requirements will apply.

2.5.1 Draft Plan of Subdivision

Draft Plans of Subdivision are to be submitted to the City Planner and shall include the following:

- the original and 10 copies of the completed application form,
- application fees,
- cover letter or Planning Rationale describing the application and outlining reasons for its support and justification,
- a recent survey plan and/or reference plan,
- 30 folded copies of the draft plan,
- 1 copy of the draft plan on "mylar 8½" X 11" paper,
- a PDF copy of the draft plan and of all other documents submitted, on DVD or USB drive,
- 3 copies of any additional supporting information (see application form),
- a copy of the Deed of Land,
- a signed letter of Undertaking for a possible LPAT appeal.

2.5.2 Detail Design

Detail design drawings and reports for City review/approval are to be submitted to the Director, Infrastructure and Planning Department and shall include the following:

- 3 hard copies of all drawings and reports,
- a PDF copy of all drawings on DVD or USB drive,
- final PDF drawing approved for construction must include City stamp.

2.6 TYPICAL PROJECT & REVIEW PROCESS

The typical flow chart attached in Appendix "A" illustrates the typical project design & review process for subdivision projects. Note that this flow chart is intended as general guidelines and may vary from project to project.

2.7 CITY REVIEWS & PEER REVIEWS

City will review all drawings and reports submitted and will provide comments. In some cases, the review may also or instead include a technical peer review completed by an impartial third-party consulting firm selected by the City.

Owner will be responsible for all costs related to reviews and/or peer review.

In case of any disagreement between the Owner's Engineer and the consulting firm conducting the peer review, the City will be the final authority. The Owner is encouraged to submit high-quality and thorough documents to facilitate and expedite reviews. Incomplete submissions or submissions found to contain excessive omissions or errors may be returned without review or comments.

2.8 FINANCIAL REQUIREMENTS

Prior to the registration of the Draft Plan, the Owner will be required to pay to the City:

- anticipated expenses to the City for administrative, legal, planning and engineering staff for consideration of the proposed plan and to negotiation, execution and performance of the Subdivision Agreement, as per User Fees and Charges By-Law.
- All costs and expenses of the City relating to the preparation, processing and obtaining approval of any Zoning By-Law(s), of Official Plan and/or Zoning By-Law Amendment(s).
- any outstanding local improvement frontage charges, outstanding municipal property taxes or other charges.

Owner will also be required to pay the full cost and expense of the following items if the City incurs any cost:

- The full cost and expense of testing,
- The full cost and expense of restoration and reinstatement of Works,
- The full cost and expense of maintenance of the Works installed prior to final acceptance of the Works by the City,
- Any costs and expenses incurred by the City as a result of any damage to equipment (except for normal wear and tear) while engaged in providing maintenance or restoration of the Works.

It is the Owner's responsibility to verify which financial requirements are applicable to the proposed development. Refer to the User Fees and Charges By-Law for more information.

2.9 PERFORMANCE DEPOSIT

The Owner will also be required to provide a performance deposit prior to the signing of the Subdivision Agreement with the City. The purpose of this deposit is to ensure that the City is able to complete the Works in the event that the Owner is unable to proceed with the completion, or to address deficiencies.

Performance deposit must consist of cash, certified cheque or an irrevocable Letter of Credit issued by a bank will be required prior to the signing of the Subdivision Agreement. Bonding will not be accepted.

Performance deposit will be required for 100% of the value of the Works, based on the Engineer's estimate. Unit prices are to be reflective of current market conditions and the City reserves the right to review the estimate and unit prices.

Lastly, the performance deposit may be reduced as construction advances, subject to a Letter of Credit reduction application as discussed in Section 5.20.

PART 3 PLANNING REQUIREMENTS

The following section discusses planning requirements pertaining to subdivision projects. It is meant to summarize the common requirements of applicable Official Plans, and other applicable City By-Laws, such as the Zoning By-Law, and is by no means an exhaustive reference.

Where there are any conflicts, the applicable documents take precedence over this manual.

3.1 LOT SIZE & OTHER REQUIREMENTS

All new lots shall have frontage on a public road that is open and maintained year-round by either the City or a Condominium Corporation. Furthermore, the division of land must not result in the landlocking of any parcel of land.

Size and shape of any lot created will need to be appropriate for the proposed use and shall confirm to the provisions of the Zoning By-Law. Such requirements are too numerous to list in this manual - refer to the appropriate section of the Zoning By-Law for details.

Separation distances for land uses as set out in the Official Plans and Zoning By-Law must also be met.

The creation of a lot having access only to a County road will generally be discouraged and will be subject to the approval of the United Counties of Prescott & Russell.

Driveways for corner lots shall be located along the interior side lot line and will not be permitted in an exterior side yard.

At corner lots, provide sight triangles (daylight) based on intersecting roadway classification as per the requirements below:

- Public lanes to local roads: 3 m x 3 m,
- Local road to local road: 3 m x 3 m,
- Local road to collector road: 5 m x 5 m,
- Collector road to collector road: 5 m x 5 m,
- Collector road to arterial road: 5 m x 5 m,
- Arterial road to arterial road: 5 m x 5 m,
- Proposed roadways intersecting County Road 17: to be determined by UCPR.

3.2 SUPPORTING STUDIES & REPORTS

The Owner may be required to submit any of, but not limited to, the following supporting studies at the time of the submission of an application, in accordance with the policies outlined in the relevant Official Plan and/or accepted professional standards and/or guidelines as applicable:

a) Retail Market Impact Study,
b) Municipal Financial Impact Assessment,

c) Urban Design Strategy,
d) Land and/or Marine Archaeological Impact Assessment,
e) Hydrogeological Study,
f) Groundwater Impact Assessment,
g) Environmental Impact Study (EIS),
h) Record of Site Condition (RSC),
i) Phase I Environmental Site Assessment (ESA),
j) Site Screening Questionnaire, where a Phase 1 Environmental Site Assessment is not required,
k) Noise and/or Vibration Study,
l) Transportation Impact Study,
m) Parking Study,
n) Geotechnical Study,
o) Servicing Options Report,
p) Stormwater Management Plan,
q) Planning Rationale Report,
r) Heritage; Impact Assessment,
s) Archaeological Assessment,
t) Lighting Study,
u) Architectural Design and Massing Drawings that address Signature Architecture and Tall Building Guidelines,
v) Shadow Study, and/or
w) Other studies relevant to the development and lands impacted by the proposed development approval application.

As previously mentioned, pre-consultation with the City and County is mandatory and will serve to establish which studies will be required to support the proposed project.

3.3 PARKLAND

Parkland is to be provided as per the requirements of the Parkland By-Law 2018-61.

3.4 PHASING

For larger projects, Owner is to determine phasing based on expected sales.

Phasing and any temporary Works such as cul-de-sacs, ditches, etc. are to be shown on design drawings. City will review proposed phasing to avoid temporary dead-ends as much as possible.

City reserves the right to require that Works of future phases be done as part of an earlier phase (for example, looping of a watermain or construction of a second vehicular access).

3.5 EASEMENTS

Temporary easements will be required for all other infrastructure constructed on property to be part of future phase(s) or to remain property of Owner.

Permanent easements will be required for infrastructure not located within right-of-ways. Generally, 2.4 m wide easements will be required along swales with subdrains, but only when the subdrain is equal to or larger than 200 mm in diameter.

Likewise, minimum 3.0 m wide easements are required for sewers, watermains and/or utilities not in right-of-way, or wider depending on the depth and/or diameter of the sewer. Geotechnical conditions may also require the use of a wider easement.

Minimum 6.0 m wide easements (or blocks) are required for access to stormwater management ponds, outlets & ditches of stormwater management facilities, pumping stations and similar infrastructure.

3.6 BLOCKS

Blocks will be required for parkland, road widenings, stormwater management facilities, walkways, accesses or other property to be transferred to the City.

Likewise, 0.3 m reserves will be required at dead-ends and open side(s) of a right-of-way.

3.7 STREET NAMES

Street names to be proposed by Owner and will be reviewed by City. Street names shall be shown on drawings.

Street names shall be in accordance with Prescott and Russell 9-1-1 Protocol (latest edition). Generally, the following standards shall be followed in naming streets:

- New street names shall not be identical or sound similar to existing street names within the United Counties of Prescott & Russell,
- Street names shall be short (under 12 letters, if possible), concise and preferably one word,
- Street names should have a simple spelling and easy pronunciation in both English and French,
- Special characters, such as hyphens, apostrophes, periods or commas should be avoided,
- Prefixes such as north, south, etc. should be avoided,
- Numbers or letters used as street names should be avoided,
- Incongruous, offensive names or names with a double-meaning shall not be used,
- Selection of street names of similar nature or category is encouraged within a subdivision or neighbourhood,
- Personal names of living individuals shall be avoided unless they have historical significance,
- Pluralized road names should be avoided,
- Suffixes shall be related to the type and importance of the street (i.e. the suffix,
- ‘boulevard’ should not be attached to a minor residential street),

- Advisory committee will recommend street names if Owner does not submit its preferred names.

3.8 VEHICULAR/PEDESTRIAN ACCESS REQUIREMENTS

All proposed roads must be connected to existing City or County roads.

Additionally, developments of 20 units or more must include a secondary access road or emergency access as per City detail R7, HDPE-reinforced grass or other as proposed by Owner, connected to a maintained municipal road.

3.9 CIVIC ADDRESSING / SIGN

Per By-law 2005-74, Owner must post or display a municipal civic number clearly visible from the traveled portion of the highway at its own cost. Generally, the numbers shall be a minimum of 100 mm in height, shall read horizontally, and be displayed in numerical form only.

Where the main building is located at less than 15 m from the front lot line, the number or number plate is to be attached to the building per the following requirements:

- On the right-hand side of the door, at height of not less than 1.2 m and not greater than 1.8 m above the door threshold,
- If the door does not face the road, on the right-hand side of the wall facing the traveled road at 1.5 m to 2.1 m above grade,
- New or replacement numbers are to be white or silver on a dark background.

Where the main building is located at a distance greater than 15 m from the front lot line, and in rural areas, the civic address number is to be placed on a separate sign post per the following requirements:

- number plate must be of a reflective material in white or silver on reflective blue background (on both sides),
- number plate must be installed perpendicular to the highway and shall be clearly visible from the traveled portion of the highway,
- height of not less than 1.2 m,
- located 1 m from the property line and 2 m from the driveway, or in other location approved by the City.

3.10 FENCING

Owner shall pre-consult with City to establish requirements for chainlink fencing and/or wood screen fencing. All new fencing to be to the requirements of By-Law 2016-96. Generally, the following requirements apply:

- Fencing greater than 0.75 m in height is not permitted within 6 m visibility triangle at intersections,
- Fencing greater than 0.75 m in height is not permitted within 2 m visibility triangle at driveways, walkways or bicycle pathway,

- Chainlink fence or similar that can be seen through is permitted within visibility triangle,
- Privacy screens may be done,
- Fence to be installed on private property,
- Finished side must be presented toward the public street and/or neighbouring property,
- May not be installed directly on a municipal infrastructure or within easements without the prior approval of the City, and setbacks are to be clearly identified.

Height restrictions are generally as follows:

- Residential, front yard: 1.00 m,
- Residential, any other yard: 2.13 m,
- Non-residential, any yard: 3.00 m,
- Gates and decorative caps on posts may exceed height restrictions by maximum of 0.30 m and 0.15 m respectively,
- Archways forming part of an entrance may exceed the height restrictions to a maximum of 2.50 m.

Also, note that a fence permit is not required.

3.11 TREES

Owner shall plant at least one shade tree in the front yard and two trees on a corner lot (1 in front yard and 1 in side yard) of a type required by the City. Trees shall be planted within private property and not within the sight triangle.

The following type of trees will not be allowed:

- Poplar
- Alder
- Aspen
- Willow
- Elm
- Ash
- Maple of the fast growing variety

Any tree which dies within one year of planting shall be replaced by the Owner at the Owner's expense and maintained until the tree survives a full year.

3.12 NOTICE TO PURCHASERS

The City may require that Purchase and Sale Agreements for the whole or any part of a lot/block within a Plan of Subdivision contain generic and/or specific clauses.

PART 4 DESIGN REQUIREMENTS

4.1 SANITARY SEWERS

The Owner will be required to construct new sanitary sewers to service the proposed development. Where sanitary sewers are not available, the Owner will be responsible to extend the closest sanitary sewer main and connect to it or construct private septic systems. Pre-consultation with the City will serve to establish these requirements.

In any case, new combined sewers and/or connection to an existing combined sewer will not be allowed.

4.1.1 Average Flows – Domestic

Sewers are to be designed per the general requirements of MOECC Design Guidelines for Sewage Works (2008). For residential developments, an average flow of 350 L/person/day is to be used in design, along with the per unit population given in the following table:

Table 4-1 Average Persons per Unit (Residential Uses)

Unit Type	Persons per unit
Residential, single family	3.4
Residential, semi-detached	2.7
Residential, duplex	2.3
Residential, townhouse (row)	2.7
Apartment, bachelor	1.4
Apartment, 1 bedroom	1.4
Apartment, 2 bedroom	2.1
Apartment, 3 bedroom	3.1
Apartment, average	1.8

Source: City of Ottawa Design Guidelines - Water Distribution

Commercial and industrial flows will vary greatly depending on the type of development and should be calculated based on the proposed use from the OBC Table 8.2.1.3.B. where possible, or from the City of Ottawa Appendix 4-A – Daily Sewage Flow for Various Establishments (see Appendix "B") if the latter is more relevant.

If the exact type of development is not known, common allowances to be used for conceptual planning are given in the following table:

Table 4-2 Commercial & Industrial Flow Allowances

Development Type	Average Flow
Commercial, average	28 m^3/ha per day
Industrial, light	35 m^3/ha per day
Industrial, heavy	55 m^3/ha per day

Source: City of Ottawa Design Guidelines - Water Distribution

4.1.2 Average Flows - Infiltration and inflow

Design of new sanitary sewers shall also include an allowance of 0.28 L/s/hectare for infiltration and inflow.

4.1.3 Peaking Factors

For residential developments, the peaking factor calculation shall be based on the Harmon formula as given below:

$$PF = 1 + \frac{14}{4 + P^{0.5}}$$

Where: PF is the peaking factor (minimum of 2.0, maximum of 4.0)
P is the population in thousands

For commercial or institutional developments, a peaking factor of 1.5 is to be used.

Industrial peaking factor shall be determined from City of Ottawa Appendix 4-B – Peaking Factor for Industrial Areas (see Appendix "B").

4.1.4 Hydraulic Design

Sanitary sewers are to be sized using Manning formula, and a Manning roughness coefficient (n) of 0.013:

$$Q = \frac{1{,}000}{n} A R^{2/3} s^{0.5}$$

Where: Q is the flow capacity of the sewer (L/s)
n is the Manning roughness coefficient (0.013)
A is the flow cross-sectional area
R is the hydraulic radius (area of flow / wetted perimeter)
s is the slope (m/m)

The full flow velocity to be between 0.6 m/s to 3.0 m/s, and minimum slopes shall be as follows:

Table 4-3 Minimum Sewer Slopes

Nominal Sewer Size	Minimum Slope (%)
200 mm (8 inch)	0.32
250 mm (10 inch)	0.24
300 mm (12 inch)	0.186
375 mm (15 inch)	0.14
450 mm (18 inch)	0.111
525 mm and larger (21 inches and larger)	0.10

Source: City of Ottawa Sewer Design Guidelines

Oversized sewers may not be used to justify using flatter slopes, and flow is to be sub-critical where possible.

Lastly, the slope of the sanitary sewer section located at the upstream end(s) of a collection system is to be 0.65% or steeper on the first segment of pipe that serves 10 or less dwellings or units. Once that threshold has been met, a maintenance hole can be installed, and the pipe slope can be reduced.

4.1.5 Other Design Considerations

The following other general requirements apply for the design of sanitary sewers:

- Located in right-of-way per City detail X1 to X6, inclusively,
- Minimum 200 mm pipe diameter for main sewers,
- Minimum 2.5 m of cover or as demonstrated by Engineer to allow for gravity drainage of basements, where possible. Where gravity drainage of basement(s) is not possible for any given lot, Owner shall inform prospective purchasers through a clause in agreement of purchase and sale,
- Sewer and laterals to be insulated per City detail SW1 if not installed below Engineer's calculated frost depth.

The following requirements apply with regards to sanitary maintenance holes:

- Maximum spacing of 120 m for sewers smaller than 450 mm diameter,
- Maximum spacing of 150 m for sewers 450m diameter or larger,
- Any maintenance holes located outside of the road edge of asphalt shall be identified with a maintenance hole locator sign & post,
- Minimum drop between inlet/outlet inverts as follows:

Table 4-4 Minimum Drop Between Inverts at Maintenance Hole

Turn Angle Between Inlet/Outlet	**Minimum Drop Between Inverts**
0º (straight run)	Grade of sewer (0.03 m preferred)
1º - 45º	0.03 m
46º - 90º	0.06 m
Greater than 90º	Not recommended – calculate drop based on expected hydraulic losses

Source: MOE Design Guidelines for Sewage Works

4.1.6 Connection to Existing Infrastructure

All sanitary sewer mains are to be connected to existing sanitary sewers at a maintenance hole.

Where a maintenance hole exists, the connection shall be made by core drilling the existing structure to suit new sanitary sewer and making a watertight connection with a Link-Seal or hydraulic cement. The existing structure shall also be re-benched as required.

Where a maintenance does not exist, a "dog house" maintenance hole is to be installed on the existing sewer, complete with a cast-in-place base and benching.

4.1.7 Approved Materials

Sanitary sewer mains shall consist of either PVC DR 35 to CSA B182.2 (sewers 375 mm in diameter and smaller) or reinforced concrete to CSA A257.2 (sewers larger than 375 mm in diameter), minimum Class 65-D or greater as required.

Alternative pipe materials may be acceptable in some cases; pre-consult with City to review during the design stage.

Sanitary laterals are to be 125 mm in diameter PCV DR 28 to CSA B182.2, green in colour.

Rigid insulation shall have a minimum compressive strength of 275 kPa (40 psi) to ASTM C578 Type VI.

The following requirements apply for sanitary maintenance holes:

- Precast concrete to OPSS 1351 and OPSD 701.010 – 701.081 (inclusively),
- Diameter as required to suit proposed sewers and angles,
- Flat caps allowed for shallow structures only,
- Adjustment units: precast concrete to OPSD 704.010, parged or sealed per OPSS 407. Minimum of 1 and maximum of 3 adjustment units per structure
- Frame: standard frame to OPSD 401.010 with adjustment units, or self-adjusting frame (C-50M-ONT/AutoStable by Bibby-Ste-Croix or equivalent),
- Cover, located outside ponding areas: circular closed cover to OPSD 401.010 (Type A),
- Cover, located within ponding areas: circular watertight per OPSD 401.030,
- Benching to OPSD 701.021,
- Safety platform to OPSD 404.020, 404.021, or 404.022 where depth is greater than 5.0 m,
- Ladder rungs to OPSD 405.010,
- Exterior drop structure to OPSD 1003.010 where drop between inverts exceeds 600 mm,
- Interior drop structures may only be done in existing maintenance holes and will be reviewed on a case-by-case basis.

4.1.8 Servicing

The Owner will be responsible to install sanitary laterals to the right-of-way property line for each unit (except for high-rise buildings). Laterals are to be temporarily capped at property line with watertight cap, and a marker post extending a minimum of 1.0 m above finished grade is to be installed at termination of laterals.

Laterals are to be installed perpendicular to the main, as shown on City detail SW2 and per OPSD 1006.010 or 1006.020.

Laterals shall have a minimum diameter of 125 mm and be installed at a minimum slope of 1% and maximum slope of 8%. A vertical riser is to be installed where maximum slope would be exceeded.

Residential laterals shall not be connected directly into maintenance holes, except in cul-de-sacs. In such case, connection should be aligned within 15 degrees of the main sewer and a 100 mm drop should be provided between inverts.

Horizontal bends on laterals greater than 22.5 degrees will not be allowed, and a maximum of two bends will be allowed per service.

Smaller diameter services are to connect to new sanitary sewer mains using pre-manufactured tees or shall connect to existing sewer mains using strap-on saddles.

For larger diameter services, connection to the sanitary sewer main shall instead be made at a maintenance hole as described in Section 4.1.6 where the service is greater than 50% of the diameter of the mainline concrete pipe, or where the lateral is 200 mm in diameter or larger.

A monitoring maintenance hole shall be required just inside the property line for all non-residential and multi-residential buildings connections from a private sewer to a City sewer.

Sump pumps and rainwater leaders may not be connected to a sanitary lateral or sewer.

4.2 STORM SEWERS & CULVERTS

The drainage system is to consist of a minor system and a major system. The minor system will consist of sewers, culverts, ditches, etc. sized to accommodate smaller, more frequent storm events (5-year return period), while the major system is to be designed to convey larger, less frequent storm events (100-year return period) and will consist of overland flow routes and may also consist of sewers, ditches, etc.

Drainage components that are part of the major system and the minor system (for example, a storm sewer located at an extensive low point of a development, where overland flow is not possible) must be designed to accommodate the major storm, and/or storage areas must be created as further discussed below.

4.2.1 Design Methods – Storm Sewers

Storm sewers shall be sized using the Rational method to accommodate the 5-year storm runoff flow, without surcharging. Ditches and overland flow routes are to be sized to accommodate the 100-year storm runoff flow as calculated from the Rational method.

Additionally, the sizing of storm sewers that are either part of the major system or that are subject to a submerged outlet is to be confirmed using a spreadsheet-based hydraulic grade line analysis (using the Darcy-Weisbach equation) to accommodate the 100-year storm runoff flow. The 100-year storm runoff flow is to be calculated from the Rational method.

Under such conditions, the maximum hydraulic grade line shall be at least 300 mm below the underside of footing elevations.

Dynamic computer models may be used in lieu of the hydraulic grade line calculation to evaluate the performance of the major system for developments larger than 5 ha or for more complex developments. Computer models however may not be used for sizing storm sewers – the Rational Method is to be used for this purpose.

Pre-consult with City to establish suitability of modeling. Acceptable modeling software consist of XPSWMM, PCSWMM, SWMM, OTTHYMO, MIDUSS. Other software may be acceptable, but must be pre-approved by the City

4.2.2 Design Methods – Culverts

All roadway cross-culverts are to be sized based on the "Culvert Hydraulics" section of the MTO Drainage Management Manual (1995-1997) using realistic/expected tailwater elevation. A minimum freeboard of 150mm is to be provided between the 100-year water elevation and centerline of road or driveway.

Design software or dynamic computer models may be used in performing calculations (CulvertMaster, Hydraflow Express, modeling software as discussed above, etc.).

Driveway culverts will also need to be sized per the same method, if the catchment area exceeds 5 hectares. Cross-culverts shall be a minimum of 600 mm in diameter, while driveway culverts shall be a minimum of 450 mm in diameter.

4.2.3 Rational Method Flow Calculation & Parameters

$$Q = 2.78CiA$$

Where: Q is the peak runoff (L/s)
C is the runoff coefficient as detailed below
I is the storm intensity in mm/hr for a given time of concentration
A is the area in hectares

Runoff Coefficient

Runoff coefficient is to be taken from the following table:

Table 4-5 Runoff Coefficients

Source	Runoff coefficient (C)
Asphalt, concrete, roof areas	0.90 – 1.00
Grassed areas, parkland	0.20 – 0.35
Gravel areas	0.50 – 0.70
Precast paving areas	0.70 – 0.80
Commercial	0.75 – 0.85
Industrial	0.65 – 0.75
Residential:	
Single family (urban)	0.40 – 0.45
Single family (rural)	Calculate weighed C based on lot size
Row housing, townhouses	0.50 – 0.70
Apartments	0.60 – 0.75
Institutional	0.40 – 0.75

Adapted from MOE Design Guidelines for Sewage Works (2008)

Lower values of the range may be used for moderate to flat slopes, while higher values are to be used for steeper slopes.

The surface type coefficients should be used when designing at the site plan level, and the development type coefficient may be used when designing at a higher level.

Time of Concentration

The time of concentration is the time required for runoff to reach a particular point in the sewer system from the most hydraulically distant point of the watershed (not necessarily the most physically distant point).

Initial time of concentration is to be calculated, or the minimum below are to be used:

- 10 minutes when designing at the site plan level
- 15 minutes for urban subdivisions
- 20 minutes for rural subdivisions

Acceptable methods to calculate time of concentration:

- Where runoff coefficient < 0.40, the Airport formula is to be used:

$$t_c = \frac{3.26(1.1 - C)L^{0.5}}{(s^{0.33})}$$

Where: t_c is the time of concentration (min)
C is the runoff coefficient
s is the average slope of the watershed (%)
L is the length of the watershed (m)

- Where runoff coefficient > 0.40, the Bransby Williams formula is to be used:

$$t_c = \frac{0.057L}{(s^{0.2}A^{0.1})}$$

Where: t_c is the time of concentration (min)
L is the length of the watershed (m)
s is the average slope of the watershed (%)
A is the area of the watershed (ha)

Rainfall Intensity

Rainfall intensity to be derived from MTO's IDF Curve Lookup tool for the project site, or from the Ottawa Sewer Design Guidelines. The MTO lookup tool may be found online at http://www.mto.gov.on.ca/IDF_Curves/terms.shtml.

The A and B parameters given in the MTO lookup tool "Coefficient summary" table are to be substituted in the formula below, where i is the rainfall intensity for a given period (in mm/hr), and t_c is the time of concentration (in hours) as calculated above:

$$i = A(t_c)^B$$

Alternatively, Ottawa rainfall intensities (1967 to 1997) may be used, and are as follows:

Table 4-6 Ottawa Rainfall Intensities

Time (min)	2 year (mm/hr)	5 year (mm/hr)	10 year (mm/hr)	25 year (mm/hr)	50 year (mm/hr)	100 year (mm/hr)
5	102.80	140.20	165.00	196.00	219.00	242.60
10	77.10	104.40	122.50	145.30	162.20	179.00
15	63.30	85.60	100.40	119.10	133.00	146.80
30	39.90	53.90	63.10	74.70	83.40	91.90
60	24.20	32.00	37.10	43.60	48.50	53.20
120	14.30	18.90	22.00	25.80	28.70	31.50
360	6.20	8.40	9.90	11.70	13.10	14.50
720	3.60	4.80	5.60	6.60	7.30	8.00
1440	2.00	2.60	3.00	3.50	3.90	4.30

Source: Ottawa Sewer Design Guidelines

Again based on Ottawa rainfall intensities and the Ottawa Sewer Design Guidelines, IDF curve equations are as follows (intensity in mm/hr):

- 100 year intensity = 1735.688 / (Time in min. + 6.014)$^{0.820}$
- 50 year intensity = 1569.580 / (Time in min + 6.014)$^{0.820}$
- 25 year intensity = 1402.884 / (Time in min + 6.018)$^{0.819}$
- 10 year intensity = 1174.184 / (Time in min + 6.014)$^{0.816}$
- 5 year intensity = 998.071 / (Time in min + 6.053)$^{0.814}$
- 2 year intensity = 732.951 / (Time in min + 6.199)$^{0.810}$

4.2.4 Modeling Flow Calculations & Parameters

When modeling is required as discussed in Section 4.2.1, it shall be performed based on the following parameters. The Engineer will be required to justify any deviation from the below.

Depth of Rainfall

Depth of rainfall for design purposes shall be established from MTO's IDF Curve Lookup tool for the project site, which may be found online at: http://www.mto.gov.on.ca/IDF_Curves/terms.shtml

Depression Storage

Depression storage represents available storage on the ground surface, before overland flow and runoff occurs. Per the City of Ottawa Sewer Guidelines, these values are to be set at 1.57 mm for impervious areas and 4.67 mm for pervious areas.

Curve Numbers

Curve numbers shall be as per Appendix "C".

Width Parameter

The width parameter is the dimension of the flow plan that is perpendicular to the direction of flow. For a typical urban area, this is equal to twice the length of the street segment where there are properties on both sides of the street. This parameter is to be calculated for each catchment area.

A value of 225 m per hectare is to be used if no detailed information exists for a catchment area.

Storm Event Distribution

For urban areas, the AES 30% Southern Ontario storm event distribution is to be used in design, with a time step not less than 10 mins. The duration of the storm is to be either:

- 12-hour duration for sizing stormwater management facilities,

- 1-hour duration to evaluate performance of major system.

For rural areas, the SCS Type II storm event distribution is to be used. The Engineer is to verify both the 12-hour and 24-hour storm event durations.

Storm distributions for both the AES 30% and SCS Type II storm events are given in the following table:

Table 4-7 Design Storm Distributions

	Time (minutes)											
Storm Event	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**
AES 30%, 1-hour, Rain distribution (%)	10	14	17	12	14	8	11	6	4	3	1	0
	Time (hours)											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
AES 30%, 12-hour Rain distribution (%)	15	25	22	14	12	8	3	1	0	0	0	0
SCS Type II, 12-hour Rain distribution (%)	2.2	2.6	3.2	4	6.1	48.2	15.7	6	4.5	2.7	2.8	2
	Time (hours)											
	2	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**
SCS Type II, 24-hour Rain distribution (%)	2.2	2.6	3.2	4	6.1	48.2	15.7	6	4.5	2.7	2.8	2

4.2.5 Minor System (Sewer) Sizing

Sizing of the minor system shall be per the general requirements of MOECC Design Guidelines for Sewage Works (2008).

As for sanitary sewers, oversized sewers may not be used to justify using flatter slopes, and flow is to be sub-critical where possible.

Pipes to be sized to achieve a full flow velocity between 0.8 m/s to 3.0 m/s using Manning formula as per:

$$Q = \frac{1{,}000}{n} A R^{2/3} s^{0.5}$$

Where: Q is the flow capacity of the sewer (L/s)
n is the Manning roughness coefficient
A is the flow cross-sectional area
R is the hydraulic radius (area of flow / wetted perimeter)
s is the slope (m/m)

Manning roughness coefficients used in design are to be as follows:

Table 4-8 Manning Roughness Coefficient - Pipes

Material	Manning Coefficient
Smooth walled PVC, Concrete, HDPE	0.013
Corrugated steel pipe, 68 x 13mm profile	0.024 (or refer to Design Chart 2.01 in MTO Drainage Management Manual for other profiles / special cases)

Adapted from MTO Drainage Management Manual Design Chart 2.01

Outlet sewers should be installed high enough to not be submerged when subjected to the 5-year storm. Partially submerged outlets may be done; however, they should be avoided where possible and will require a HGL verification.

4.2.6 Major System (Overland Flow) Sizing

The major system is again to be sized using Manning equation as given in Section 4.2.5. Manning roughness coefficients used in design are to be as follows:

Table 4-9 Manning Roughness Coefficient – Other Surfaces

Material	Manning Coefficient
Grass ditches & swales (mowed to 0.05 m, depth of flow < 0.2 m)	0.045
Grass ditches & swales (mowed to 0.05 m, depth of flow > 0.2 m)	0.035
Riprap	0.035
Concrete gutter	0.015
Asphalt	0.016

Adapted from MTO Drainage Management Manual Design Chart 2.01

Maximum ponding depths of 300 mm and 250 mm will be allowed above the gutter line for local roads and collector roads, respectively. Ponding limits and overland flow routes must also clearly be shown on drawings.

In all cases, the product of the flow depth (m) and the velocity (m/s) should be less than 0.6.

Major system shall also be stress tested using a flow 20% larger than the calculated Rational method 100-year runoff.

4.2.7 Other Design Considerations

The following other general requirements apply for the design of storm sewers:

- Location in right-of-way per City detail X1 to X6, inclusively,
- Minimum 3.0 m wide easements required for sewers not in right-of-way, or wider depending on the depth and/or diameter of the sewer,
- Sewers and laterals to be installed at minimum 2.0 m cover, or insulated per City detail SW1 if not below the Engineer’s calculated frost depth,

- Minimum 250 mm pipe diameter for main storm sewers,
- Minimum 200 mm pipe diameter for catch basin and ditch inlet lead,
- Minimum 250 mm pipe diameter for twin inlet catch basin lead,

The following requirements apply with regards to storm maintenance holes:

- Maximum maintenance hole spacing of 120 m for sewers smaller than 450 mm diameter
- Maximum maintenance hole spacing of 150 m for sewers 450m diameter or larger
- Any maintenance holes located outside of the road edge of asphalt shall be identified with a maintenance hole locator sign & post,
- Minimum drop between maintenance hole inlet/outlet inverts as follows:

Table 4-10 Minimum Drop Between Inverts at Maintenance Hole

Turn Angle Between Inlet/Outlet	**Minimum Drop Between Inverts**
0º (straight run)	Grade of sewer (0.03 m preferred)
1º - 45º	0.03 m
46º - 90º	0.06 m
Greater than 90º	Not recommended – calculate drop based on expected hydraulic losses

Source: MOE Design Guidelines for Sewage Works

4.2.8 Connection to Existing Infrastructure

All storm sewer mains are to be connected to existing storm sewers at a maintenance hole.

Where a maintenance hole exists, core drill existing structure to suit new storm sewer, and make watertight connection with hydraulic cement.

Where a maintenance does not exist, a "dog house" maintenance hole is to be installed on the existing sewer, complete with a cast-in-place base.

4.2.9 Approved Materials

The following requirements apply for storm sewer pipes and appurtenances:

- Culverts, rural sections:
  - HDPE to CSA B182.8, 320 kPa
- Main storm sewer, rural sections:
  - Same as for ditch infills, refer to Section 10.5
- Main storm sewer, urban sections:
  - PVC DR 35 to CSA B182.2,
  - Ribbed PVC to CSA B182.4 (smooth interior) - subject to City approval,
  - Reinforced concrete to CSA A257.2, minimum Class 65-D or greater as required,

    - HDPE is not allowed within right-of-way in urban sections.
- Laterals: 100 mm diameter SDR 28 to CSA B182.2, white in colour
- Insulation: rigid high-density insulation with minimum compressive strength of 275 kPa (40 psi) to ASTM C578 Type VI

The following requirements apply for storm maintenance holes:

- precast concrete to OPSS 1351 and OPSD 701.010 – 701.081 (inclusively),
- Diameter as required to suit proposed sewers
- Flat caps allowed for shallow structures only
- Adjustment units: precast concrete to OPSD 704.010, parged or sealed per OPSS 407. Minimum of 1 and maximum of 3 adjustment units per structure
- Frame: standard frame to OPSD 401.010 with adjustment units, or self-adjusting frame (C-50M-ONT/AutoStable by Bibby-Ste-Croix or equivalent),
- Cover: circular open cover to OPSD 401.010 (Type B)
- Benching not required for storm maintenance holes
- Safety platform to OPSD 404.020, 404.021, or 404.022 where depth > 5.0 m
- Ladder rungs to OPSD 405.010
- Drop structure to OPSD 1003.010 where drop between inverts exceeds 600mm

The following requirements apply for other precast structures and appurtenances:

- Catch basins:
    - precast concrete to OPSS and OPSD 705.010 or 705.020
    - 600 x 600 mm (single inlet) or 600 x 1,450 mm (twin inlet) depending on design flows,
    - Adjustment units: precast concrete to OPSD 704.010, parged or sealed per OPSS 407. Minimum of 1 and maximum of 3 adjustment units per structure,
    - Frame: as per OPSD 400.020,
    - Cover: as per OPSD 400.020,
- Ditch inlets:
    - precast concrete to OPSS and OPSD 705.030 or 705.040
    - 600 x 600 mm or 600 x 1,200 mm depending on design flows
    - Frame: 50x50x6mm angle as per OPSD 403.010
    - Grate: Type A or B to OPSD 403.010
- Inlet control devices:
    - Orifice plate, with minimum 75 mm diameter orifice or 67x67 mm square
    - Vortex type units

4.2.10 Servicing

The Owner will be responsible to install storm laterals to the right-of-way property line.

Laterals are to be temporarily capped at property line with watertight cap, and a marker post extending a minimum of 1.0 m above finished grade is to be installed at termination of laterals.

In residential developments, the purpose of storm laterals is to provide building foundation drainage only. Gravity connection is preferred wherever possible. If not, sump pumps will be required. Roof drains, downspouts and/or surface catch basins may not be connected directly to the storm lateral.

Laterals are to be installed perpendicular to the main, as shown on City detail SW2 and per OPSD 1006.010 or 1006.020.

Laterals shall have a minimum diameter of 100 mm and be installed at a minimum slope of 1% and maximum slope of 8%. A vertical riser is to be installed where maximum slope would be exceeded.

Residential laterals shall not be connected directly into maintenance holes, except in cul-de-sacs. In such case, connection should be aligned within 15 degrees of the main sewer and a 100 mm drop should be provided between inverts.

Horizontal bends on laterals greater than 22.5 degrees will not be allowed, and a maximum of two bends will be allowed per service.

Services are to connect to new storm sewer mains using pre-manufactured tees or shall connect to existing sewer mains using strap-on saddles.

For larger diameter services, connection to the sanitary sewer main shall instead be made at a maintenance hole as described in Section 4.2.8 where the service is greater than 50% of the diameter of the mainline concrete pipe, or where the lateral is 200 mm in diameter or larger.

Sump pumps and rainwater leaders may not be connected to a sanitary lateral or sewer.

Ditch pipe subdrains (such as in low-impact development projects) are to be interconnected and are to have a proper outlet.

4.3 STORMWATER MANAGEMENT

Urbanization increases impervious surface cover, such as roads, driveways and rooftops. These surfaces prevent infiltration of stormwater, which is forced to flow overland, creating significant erosion, pollution, or flooding problems.

The purpose of managing stormwater is to control the quantity of stormwater runoff to reduce erosion and flooding, and to improve the quality of runoff to waterbodies and groundwater. As such, stormwater management will be required for all projects, unless deemed not necessary by the City or CA.

4.3.1 General Requirements

A stormwater management report will need to be submitted to City, including all necessary calculations per the Stormwater Management Planning and Design Manual (2003, MOECC) and/or model results.

The City encourages low-impact development (LID) but recommends pre-consulting to establish criteria and suitability.

4.3.2 Quantitative Requirements

Unless otherwise specified, 100-year post-development peak flows shall not exceed the 5-year pre-development peak flows when discharging into urban storm sewer. In some cases, the City may impose stricter quantitative requirements based on available capacity in receiving storm sewers.

For rural areas, the 100-year post-development peak flow shall not exceed the 100-year pre-development peak flow, and the 5-year post-development peak flow shall not exceed the 5-year pre-development peak flow.

Uncontrolled areas may be allowed on a case-by-case basis, but 'overcontrolling' will be required such that the sum of peak flows leaving the site does not exceed the allowable pre-development value.

In cases where the information is not readily available, the City could require the Owner to provide an assessment of downstream capacity. Pre-consultation with the City will serve to establish this requirement.

4.3.3 Qualitative Requirements

Unless otherwise specified, a minimum of 80% total suspended solids (TSS) removal is to be provided.

All qualitative treatment facilities must be designed to meet the requirements of the Stormwater Management Planning and Design Manual (2003, MOECC), and all supporting calculations are to be provided.

4.3.4 Sizing Methods

Modified Rational Method

Smaller developments (5 ha) are to be designed with the Modified Rational Method (MRM), an example of which is given below.

Assuming an area of 0.30 ha with a weighed runoff coefficient of 0.60 and a release rate of 25 L/s, required storage for a 100 year storm is calculated as follows:

Table 4-11 Modified Rational Method (MRM) Example

Time (min)	Column #1 Intensity (mm/hr)	Column #2 Peak Flow (L/s)	Column #3 Release Rate (L/s)	Column #4 Storage Rate (L/s)	Column #5 Volume (m^3)
5	242.70	121.45	25.00	96.45	28.93
10	178.56	89.35	25.00	64.35	38.61
15	142.89	71.50	25.00	46.50	41.85
20	119.95	60.02	25.00	35.02	**42.03**
25	103.85	51.97	25.00	26.97	40.45
30	91.87	45.97	25.00	20.97	37.75
35	82.58	41.32	25.00	16.32	34.28
40	75.15	37.60	25.00	12.60	30.25

- The peak flow (column #2) is calculated from the Rational method and area properties given above,
- The storage rate (column #4) is the difference between the calculated peak flow (column #2) and the release rate (column #3),
- The storage volume is calculated from the product of the time and the storage rate (column #4), and converted to m^3,
- The required storage volume (in bold, above) corresponds to the time step with the greatest volume.

Modeling

Stormwater management facilities servicing larger or more complex developments may be designed with modeling. Refer to Section 4.2.1 for more information on approved models. Pre-consult with City to establish requirement for modeling.

4.3.5 Accepted Stormwater Management Methods

The following stormwater management methods, or combination thereof, are accepted for use in the City:

- Wetlands,
- Wet pond,
- Dry pond,
- Infiltration basin where soils permit,
- Oil & grit interceptor - Owner to propose device for City approval prior to construction,
- Catch basin inlet control devices.

The following methods are not acceptable:

- Enhanced grassed swales with check dams in roadside ditches.

4.3.6 Other Requirements

Owner is to install fencing around stormwater management facility located adjacent to institutional areas and to commercial areas requiring shopping carts (grocery stores, department stores, etc.), with the following requirements:

- Chainlink fencing with top rail, to OPSD 972.130
- Gate to be hot-dip galvanized after fabrication
- All fence posts to be set in concrete to OPSD 972.132
- Fence posts to be Schedule 40 galvanized steel pipe, diameter to OPSD 972.132
- Fence fabric to be galvanized, 1.8 m high, Type 1, Class A, medium style, double knuckled selvedge, 9 gauge
- A lockable single or double swing gate must be provided, minimum width of 4 m, to OPSD 972.102

Granular access is to be constructed for operation and maintenance of the stormwater management facility and must extend from closest public roadway to the forebay, pond and outlet. Access is to be a minimum of 3.5 m wide, and constructed of the following materials:

- 150 mm Granular "A" to OPSS.MUNI 1010, compacted to 100% SPMDD,
- 300 mm Granular "B" Type II to OPSS.MUNI 1010, compacted to 100% SPMDD,
- Non-woven geotextile fabric.

Owner is to provide operation & maintenance manual to the City, which is to include as a minimum:

- Discussion on procedures to empty the pond for maintenance purposes, including maximum allowable discharge from the pond and pump size,
- Cleaning operations,
- Re-vegetation procedures,
- Disposal of sediments,
- Logbook and/or results of any inspections that have been carried out,
- Environmental Compliance Approval,
- Other pertaining items.

Lastly, Owner is to install warning signage (fluctuating water level, no access, no skating, etc.) as appropriate for the type of facility being constructed.

4.4 WATERMAINS

4.4.1 Hydraulic Design

New watermains are to be designed to the general requirements of MOECC's Design Guidelines for Drinking-Water Systems (2008) for domestic demand.

Fire protection demand is to be per the requirements of Fire Underwriters Survey (FUS) method and may be capped at 10,000 L/min for residential developments only.

In areas where the existing watermain system is unable to meet Fire Underwriters Survey requirements, the fire protection demand will be reviewed on a case-by-case basis.

Watermains may be sized using modeling software (WaterCAD, WaterGEMS, EPANET, or similar). In some cases, simplified calculations (head loss spreadsheet) may be acceptable for smaller developments. The suitability of this method will be at the discretion of the City and will be reviewed on a case-by-case basis.

City may be able to provide model information (such as theoretical hydrant flow curves and boundary conditions) to assist Owner. In some cases however, and at the discretion of the City, the Owner may be required to conduct hydrant flow test(s) at its cost to establish available flows and pressures. All testing is to be coordinated with the City.

For domestic demands, an average flow of 350 L/person/day is to be used in calculations, and the per unit population shall be per the following table:

Table 4-12 Average Persons per Unit (Residential Uses)

Unit Type	Persons Per Unit
Residential, single family	3.4
Residential, semi-detached	2.7
Residential, duplex	2.3
Residential, townhouse (row)	2.7
Apartment, bachelor	1.4
Apartment, 1 bedroom	1.4
Apartment, 2 bedroom	2.1
Apartment, 3 bedroom	3.1
Apartment, average	1.8

Source: City of Ottawa Design Guidelines - Water Distribution

Commercial and industrial flows will vary greatly depending on the type of development and should be calculated based on the proposed use from the OBC Table 8.2.1.3.B. where possible, or from the City of Ottawa Appendix 4-A – Daily Sewage Flow for Various Establishments (see Appendix "B") if the latter is more relevant.

If the exact type of development is not known, common allowances to be used for conceptual planning are as follows:

Table 4-13 Commercial & Industrial Flow Allowances

Development Type	Average Flow
Commercial, average	28 m^3/ha per day
Industrial, light	35 m^3/ha per day
Industrial, heavy	55 m^3/ha per day

Source: City of Ottawa Design Guidelines - Water Distribution

Hazen-Williams C-factors shall be per MOECC Guidelines and as listed below:

- 150 mm diameter = 100
- 200 – 250 mm diameter = 110
- 300 – 600 mm diameter = 120
- > 600 mm diameter = 130

Domestic peaking factors to be used for design shall be per MOECC Guidelines and are listed in the following table:

Table 4-14 Domestic Demand Peaking Factors

Population	Minimum Hour Factor	Maximum Day Factor	Peak Hour Factor
30 – 149	0.10	9.50	14.30
150 – 299	0.10	4.90	7.40
300 – 449	0.20	3.60	5.40
450 – 499	0.30	3.00	4.50
500 – 1,000	0.40	2.75	4.13
1,001 – 2,000	0.45	2.50	3.75
2,001 – 3,000	0.50	2.25	3.38
> 3,000	Refer to MOECC Design Guidelines (2008)		

Adapted from Table 3-1 & Table 3-3 of MOECC Design Guidelines for Drinking-Water Systems

Lastly, the watermain system must be designed to meet the pressure requirements given in the MOECC Guidelines and summarized in the following table:

Table 4-15 Watermain Pressure Requirements

Scenario	Minimum Pressure		Maximum Pressure	
	kPa	psi	kPa	psi
Maximum Day + Fire Flow	140	20	n/a	n/a
Average Day	350	50	480	70
Maximum Day	350	50	480	70
Maximum Hour	275	40	n/a	n/a
Minimum Hour	n/a	n/a	700	100

Adapted from MOE Design Guidelines for Drinking-Water Systems (2008)

4.4.2 Other Design Considerations

The following other general requirements apply for the design of watermains:

- Location in right-of-way per City detail X1 to X6, inclusively,
- Connections to existing watermains shall be with a wet tap connection where possible,
- Minimum cover of 2.4 m,
- Any valves located outside of the road edge of asphalt shall be identified with a valve locator sign & post,

- Horizontal and vertical separation with sewers to meet requirements of MOE Procedure F-6-1 Procedures to Govern Separation of Sewers and Watermains,
- Minimum pipe diameter = 150 mm,
- Smaller mains may be allowed on a case-by-case basis,
- Valves:
  - Minimum of 2 valves at tee intersections
  - Minimum of 3 valves at cross intersections
  - Maximum 400 m spacing on straight sections
- Maximum hydrant spacing per Table below:

Table 4-16 Maximum Hydrant Spacing

Description	Maximum Hydrant Spacing
Single family unit residential with lot frontage of 15 m or greater	125 m
Single family unit residential with lot frontage less than 15 m, row housing, duplexes or semis	110 m
Institutional, commercial, industrial, apartments, and high density areas	90 m

Source: Adapted from City of Ottawa Design Guidelines - Water Distribution

4.4.3 Approved Materials

The following requirements apply for watermains, services and appurtenances:

- Watermain pipe:
  - PVC DR-18, Class 235 to AWWA C900,
  - Certified to CSA B137.3,
  - UL Listed, NSF-61 Certified, FM approved.
- Tracing Wire:
  - TWU or RWU, 10 gauge, 7 strands or more, copper, 60 ºC or higher, 600V
- Fittings:
  - Cast iron to AWWA C110 or C153, cement lined to AWWA C104,
  - Moulded PVC to AWWA C900, certified to CSA B137.2.
- Couplers:
  - Bolted sleeve-type in accordance with AWWA C219,
- Valves:
  - Resilient-seated gate valves to AWWA C509,
  - Open counter-clockwise (black nut),
  - 51 x 51 mm operating nut.
- Valve boxes:
  - 130 mm ductile iron adjustable (slide type) by Mueller or approved equivalent, with cap.
- Hydrants:

- Acceptable model: Mueller Canada Century Hydrant,
- Two 64 mm hose outlets (threaded),
- One 127 mm pumper outlet (Storz),
- Open counter-clockwise,
- Drain holes: closed,
- With fluorescent hydrant marker (Flexstake or approved equivalent),
- Green seals, rated for chloramine resistance,
- Colour: yellow body, with bonnet painted according to NFPA 291 and Table below:

Table 4-17 Hydrant Colour Codes

Class & Rated Capacity @ 20 psi	Bonnet Colour
Class AA – 1,500 USPGM	Blue
Class A – 1,000 to 1,499 USGPM	Green
Class B – 500 – 999 USGPM	Orange
Class C – Less than 500 USGPM	Red

Source: Adapted from NFPA 291

- Thrust Restraints:
  - Mechanical restraints on all horizontal bends, vertical bends, tees and caps, designed for use on AWWA C900 / C909 pipes
  - Standard of acceptance: Uni-Flange Series 1350
  - Stainless steel bolts & nuts
  - Concrete thrust blocks not allowed
- Corrosion Protection:
  - Required for all metallic appurtenances and services
  - Denso LT tape
  - Zinc anodes to OPSS.MUNI 442 and to table below:

Table 4-18 Watermain Anode Requirements

Location	Anode Type	Maximum Spacing and Quantity
< 50 mm copper service	Z-12-24	20.0 m
50 mm copper service	Z-12-24	16.0 m
100 – 300 mm metallic fittings and valves	Z-12-24	1 per fitting and valve
400 – 300 mm metallic fittings and valves	Z-24-48	1 per fitting and valve
Hydrant bases	Z-24-48	1 per hydrant
Tracer wire	Z-12-24	1 per every 1,000 m of wire

Source: Adapted from OPSS.MUNI 442

- Services, pipe:
  - Type K copper (soft) to ASTM B88, or
  - Crosslinked polyethylene (PEX) to AWWA C904, certified to CSA B137.5, or,
  - HDPE to CSA B137.1

- Services, appurtenances:
  - Watermain saddle: double bolt stainless steel (Ford Meter Box Company Model FS202 or approved equivalent),
  - Main stop: plug or ball valve in accordance with AWWA C800,
  - Curb stop: ball valve to AWWA C800,
  - Service box: slide type.

4.4.4 Servicing

The Owner will be responsible to install water services to the right-of-way property line. Marker post is to be installed at temporary termination of services and shall extend a minimum of 1.0 m above finished grade.

Services are to be installed perpendicular to the main, as shown on City detail SW2 and per OPSD 1104.010 or 1104.020.

Laterals shall have a minimum diameter of 19 mm or larger as required for longer services such as in rural areas. Engineer is to confirm sizing.

Site plan projects shall have a watermain valve on every water service, located 0.30 m inside private property.

4.5 SANITARY PUMP STATIONS & FORCEMAINS

4.5.1 General Chamber Design Guidelines

Design of sanitary pump station chambers and forcemains shall be per the general requirements of MOECC Design Guidelines for Sewage Works (2008).

More specifically, pump stations shall consist of a wet well with a minimum of two submersible pumps, each sized to operate independently.

Pump station and forcemain sizing to be based on system-head calculations and curves for three operating conditions using the Hazen-Williams coefficients as follows:

- Low sewage level in wet well, C = 120
- Median sewage level over the normal operating range in wet well, C = 130
- High sewage level in wet well, C = 140

Pump to operate satisfactorily over full range considered above.

Level control shall be using ultrasonic sensor with mechanical floats as a backup, and carbon filters will be required on all ventilation piping.

4.5.2 General Forcemain Design Guidelines

Forcemains are to be designed to achieve a minimum velocity of 0.6 m/s and maximum velocity of 3.0 m/s at the design pumping rates. Forcemains shall have a minimum diameter of 75 mm, however a diameter of 100 mm is preferred.

Forcemains shall be installed at a minimum cover of 2.4 m and shall be insulated where required cover cannot be met.

Where a forcemain discharges into a sanitary maintenance hole, the receiving maintenance hole shall be lined with a protective material to protect against H_2S.

4.5.3 Approved Materials

The following requirements apply for pumping stations and appurtenances:

- Pumps: Xylem or Sulzer, with variable frequency drives (VFD),
- Chamber to be concrete precast or cast-in-place,
- Access hatches to be aluminum with stainless steel hinges, with 90 degree hold open arm, recessed drop handle, lockable tab and shall have hydraulic lift assist,
- Access ladders to be aluminum per OPSD 406.010, and egress from wet well shall have retractable ladder (MSU Mississauga Ltd. Model #1105 c/w #3105 safety handle, or approved equivalent),
- Pump lifting system to be sliding guide and brackets, and portable lifting davits with chair hoist is to be provided,
- All braces, brackets, rods, supports, etc. are to be stainless steel,
- Chamber piping, fittings and joints are to be Schedule 10S 304L stainless steel,
- Control panel is to be a NEMA 4X enclosure mounted on a concrete pad.

The following requirements apply for pumping stations and appurtenances:

- Piping: PVC DR-25, Class 165, to AWWA C900,
- Fittings: PVC to AWWA C907,
- Tracer wire: TWU or RWU, 10 gauge, 7 strands or more, 60 C or higher, 600 V plastic coated with access point to be provided at all forcemain valves.

4.5.4 Backup Power

Natural gas, propane or diesel backup generator will be required.

4.5.5 Fencing

Provide chainlink fencing as described in Section 4.3.6.

4.5.6 Access

A granular access is to be provided for operation and maintenance purposes. Granular access shall be per the requirements listed in Section 4.3.6.

4.5.7 Other

Owner shall provide operation & maintenance manual to the City.

4.6 ROADS

4.6.1 Layout

Local roadways designed to discourage through or transient traffic, and cul-de-sacs are to be avoided where possible.

Where cul-de-sacs cannot be avoided, provide cul-de-sacs to the following requirements:

- 15.0 m for rural roads, OPSD 500.010 Type A
- 13.0 m for urban residential roads, OPSD 500.020 Type A or B
- 15.0 m for commercial & industrial roads, OPSD 500.030 Type A or B

Temporary cul-de-sacs may also be required for phasing purposes. In such cases, cul-de-sacs are to have a minimum radius of 13.0 m, similar to OPSD 500.010 Type A.

In some cases, a traffic study and off-site improvements (for example, left-turning lanes) may be required to maintain an acceptable Level of Service.

4.6.2 Cross-Sections

Refer to typical details X1 to X6, inclusively, for lane width, shoulder width, etc.

Collector roads will be required where identified in the Official Plan, Urban roads will be required in the "Urban Area" as established in the Official Plan and Zoning By-Law whereas Rural roads will be allowed in the "Rural Area" as established in the Official Plan and Zoning By-Law.

Applicable City details are as follows:

- Rural, retrofit (capital projects): per City detail X1
- Rural, subdivision: per City detail X2
- Urban, local: per City detail X3 (18.0 m right-of-way) or X4 (20.0 m right-of-way)
- Urban, collector: per City detail X5
- Urban, collector, at entrance to subdivision: per City detail X6
- General notes: per City detail X7

4.6.3 Geometric Design

Geometric design of new roadways shall be per the general requirements of TAC Geometric Design Guide for Canadian Roads (1999). Asphalt widening (similar to cul-de-sac) is permitted on small radius horizontal curves.

Parameters in the table below are to be used for design, and higher crest/sag coefficients should be used whenever possible. Note that the values in bold below were modified from TAC guidelines.

Table 4-19 Roadway Geometric Design Parameters

Road class	Design Speed (km/h)	Right-of-Way Width (m)	Asphalt Width (m)	Min. / Max. Slopes (%)	Min. Horizontal Radius (m)		Vertical Curves		
					Normal crown (e=-0.03)	Reverse crown (e=0.03)	Min. Coefficient		Min. Length (m)
							Crest	Sag	
Rural, retrofit & subdivision	50	20	6.7	0.5 / 7.0	110	82	7	12	50
Urban, local	50	18 or 20	8.5	0.5 / 7.0	**10**	**n/a**	7	6	50
Urban, collector	60	26	11.0	0.5 / 7.0	189	135	13	9	50
Urban, collector, entrance	60	30	5.5 m x2	0.5 / 7.0	189	135	13	9	50

Source: Adapted from TAC Geometric Design Guide for Canadian Roads

With regards to the parameters above:

- Horizontal radii are based on maximum lateral friction factor for low speed urban design (TAC Table 2.1.2.2) and Formula 2.1.2 (rounded up),
- Crest coefficients are based on stopping sight distance (TAC Table 2.1.3.2),
- Sag coefficient for rural roads is based on headlight control (TAC Table 2.1.3.4),
- Sag coefficients for urban roads are based on stopping sight distance (TAC Table 2.1.3.4),
- Vertical curve required where algebraic difference in slopes is greater than 2% (for example, where a +1.3% slope meets a -1.0% slope),

4.6.4 Intersections

Tee intersections are preferred, with roadways intersecting at right angles. Intersection spacing shall be at least 60 m.

Crown of the major street is to be maintained through the intersection for all tee intersections. At cross intersections of two roadways of equal classification (for example, within subdivision), the intersection may be graded per TAC Figure 2.3.2.5 or 2.3.2.6, or one roadway may be designated as the major road.

Profile of minor road to be adjusted as per OPSD 300.010 (fill) or OPSD 300.020 (cut) in urban and rural cross-sections to avoid abrupt slope change at "edge of asphalt" of major road.

A minimum corner radius of 9.0 m will be required at internal intersections, whereas a minimum corner radius of 12.0 m will be required at an intersection with a County Road and/or a collector road.

A detailed intersection grading plan will be required to ensure adequate drainage.

4.6.5 Materials

A geotechnical investigation will be required to establish the required thickness of materials, compaction effort and other site-specific requirements. In all cases however, the minimum thickness of materials shall be as given in the table below:

Table 4-20 Roadway Materials & Minimum Thicknesses

Road class	HL-3 Asphalt	HL-8 Asphalt	Granular "A"	Granular "B" Type II	Geotextile	Subgrade
Rural, retrofit & subdivision	40 mm to 92% MRD	40 mm to 92% MRD	150mm to 100% SPMDD	400mm to 100% SPMDD	Non-woven geotextile fabric	Undisturbed native soil or structural fill (as required) to 100% SPMDD, depth as required. Remove bedrock if located within roadway cross-section.
Cul-de-sac, urban	40 mm to 92% MRD	40 mm to 92% MRD		400mm to 100% SPMDD		
Urban, local	40 mm to 92% MRD	40 mm to 92% MRD		400mm to 100% SPMDD		
Urban, collector	40 mm to 92% MRD	80 mm to 92% MRD (2 lifts)		450mm to 100% SPMDD		
Urban, collector (entrance)	40 mm to 92% MRD	80mm to 92% MRD (2 lifts)		450mm to 100% SPMDD		

Granular "A" and Granular "B" Type II material shall meet the requirements of OPSS.MUNI 1010, while HL-3 and HL-8 asphalt shall meet the requirements of OPSS 1150.

Alternative materials may be acceptable; pre-consult with City to review.

4.6.6 Curbs, Rural Cross-Sections

Mountable curb with narrow gutter as per OPSD 600.100 will be required wherever road profile slope is steeper than 7%. Curb outlets as per OPSD 604.010 must also be installed at low point(s), complete with riprap pad as per OPSD 810.010 Type B (with geotextile).

4.6.7 Curbs, Urban Cross-Sections

Concrete mountable curb with narrow gutter as per OPSD 600.100 will be required throughout, or concrete barrier curbs as per OPSD 600.110 depending on the cross-section. Refer to City details X3 to X6, inclusively.

A minimum 0.5% slope must be provided along all curbs, however a 1% slope is preferred.

4.6.8 Driveways

Refer to Construction of Private Entrances By-Law and Zoning By-Law for detailed requirements. A summary of those requirements may be found below.

If on a local road, the distance between the intersections of a street line measured along the street line intersected by such driveway shall be 6 m.

Driveways for all uses are to be located as far as possible from intersections and per the following requirements:

- At least 1.0 m towards the interior of side yard lot line,
- Driveways for corner lots shall be located along on the interior side yard lot line,
- Driveways may not be within 30 m of any entrance on the side of the road or/and from any intersection or/and from a public entrance if on a local collector,
- Driveways may not be within 30 m of upon or across a day lighting triangle, acceleration, deceleration or passing lane, or structure,
- Sight distance shall equal or exceed the requirements given in the Construction of Private Entrances By-Law,
- Obtain entrance permit where a culvert is required, pay security deposit and applicable fees.

Generally, a maximum of one driveway per lot will be allowed for residential uses, to a minimum width of 3.0 m. Maximum width shall be as follows:

- For lot frontage less than 12 m, the lesser of 6.0 m or 55% of the lot frontage,
- For lot frontage greater than 12 m and less than 18 m, lesser of 7.0 m or 50% of the lot frontage,
- For lot frontage greater than 18 m, 9 m.

Construction of urban residential and commercial driveways shall be generally per OPSD 351.010 and 350.010, respectively. With regards to commercial driveways, a maximum of two accesses per lot will be allowed, to a minimum width of 3.6 m for one-way access, and minimum width of 6.0 m for two-way access.

Rural driveways shall be per OPSD 301.010 and OPSD 301.020, and per City detail E1-(FR or EN) and E2-(FR or EN). Culvert headwalls (concrete or masonry) are not permitted; however, grass or gabion stone is allowed.

Lastly, driveways for agricultural uses and for non-residential uses shall meet the following requirements:

- Maximum width of 12.0 m,
- Minimum 30.0 m distance between 2 driveways on one lot,
- If on a local road, the distance between the intersections of a street line measured along the street line intersected by such driveway shall be 8 m,

- Agricultural entrance is only permitted for a property where agricultural activity takes place over an area of five or more hectares or as deemed appropriate by the Director.

4.6.9 Road Cuts

It is preferred that underground infrastructure crossings be done with trenchless technologies where possible and/or practical. Where this is not possible or practical, road cuts may be done as required to complete the Works.

Road cuts and related reinstatement shall be as per City detail R3. Refer to By-Law 2002-29 for additional information, and to Section 5.7 for construction requirements pertaining to road cuts.

4.6.10 Connection to Existing Asphalt

Connections to existing asphalt shall be done similarly to City detail R3.

At all connections to existing asphalt, sawcut existing asphalt (full depth) to a minimum width of 300 mm from the gravel edge to produce a clean, straight edge. Mill existing top lift of asphalt minimum 300 mm wide to create step connection. Install tack coat where new asphalt meets existing asphalt (for both horizontal and vertical surfaces).

Asphalt is to be sawcut shortly before reinstatement Works are undertaken. If the edge is damaged or broken, the edge of asphalt is to be re-sawcut prior to final connection being made.

If the existing depth of asphalt is found to be equal to or less than 50 mm, a butt joint may instead be done. Tack coat will be required on the vertical surface.

4.7 SIDEWALKS & PATHWAYS

4.7.1 Sidewalks

As per the City Official Plan, sidewalk will be required on one side along a minor collector and on both sides along a major collector.

Where green space is desired between the curb and sidewalk, a minimum 2.5 m wide green space shall separate the curb from the closest edge of sidewalk.

Concrete sidewalks shall be constructed similar to OPSD 310.010 or 310.020, and to the following requirements:

- Minimum 1.8 m wide,
- Maximum 4% cross-slope, 2% preferred,
- 125 mm thickness,
    - Thickness increased to 150 mm at residential driveways,
    - Thickness increased to 150 mm adjacent to curbs,
    - Thickness increased to 200 mm at commercial/industrial driveways,

- Install 152x152-MW18.7xMW18.7 welded wire mesh at driveways, at other entrances, and at curb side radius,
- Sidewalk ramps at unsignalized intersections as per OPSD 310.033,
- Sidewalk ramps at signalized intersections per OPSD 310.030 (separate crosswalks) or OPSD 310.031 (intersecting crosswalks),
- Tactile walking surface indicator plates at all ramps per OPSD 310.039,

Note that monolithic curb and sidewalk is also allowed.

In all cases, it is preferred that utilities not be installed in sidewalks. Where this is not possible, utilities are to be isolated from the concrete as per OPSD 310.040.

4.7.2 Bike Paths

As per the City Official Plan, bicycle path will be required along minor collector. Line painting shall be as per OTM Book 18 – Cycling Facilities.

4.7.3 Raised Crosswalks

Raised crosswalks as per City detail R9 may be required to interconnect pedestrian facilities. Pre-consult with City to establish requirement.

4.7.4 Asphalt Walkways

Asphalt walkways may be required to provide pedestrian access from and to parks, schools, commercial areas, etc. As always, pre-consultation with City will serve to establish requirement.

At a minimum, the following compacted thicknesses and materials shall be used for drivable walkways:

- 50 mm HL-3 asphalt to OPSS 1150, compacted to minimum 92% of MRD,
- 150 mm Granular "A" to OPSS.MUNI 1010, compacted to 100% SPMDD,
- 300 mm Granular "B" Type II to OPSS.MUNI 1010, compacted to 100% SPMDD for drivable walkways only (emergency access or similar),
- Geotextile if deemed required by geotechnical investigation or due to conditions during construction,
- Select subgrade material or structural fill (depth as required).

Likewise, the following compacted thicknesses and materials shall be used for non-drivable walkways:

- 50 mm HL-3 asphalt to OPSS 1150, compacted to minimum 92% of MRD,
- 200 mm Granular "A" to OPSS.MUNI 1010, compacted to 100% SPMDD,
- Geotextile if deemed required by geotechnical investigation or due to conditions during construction,
- Select subgrade material or structural fill (depth as required).

Additionally, fencing will be required along both sides of walkway where it abuts a residential property. Fencing shall be similar to the requirements of Section 4.3.6, however with height of 1.5 m.

Fencing is to be installed 100 mm inside private property, and breakaway bollards are to be provided to prevent unauthorized vehicular access as required by the City.

4.7.5 Bus Pads

Bus pads may be required. Pre-consult with City to establish requirement.

4.8 ROAD SAFETY

4.8.1 Clear Zone & Guiderails

Provide clear zone per the requirements of the MTO Roadside Safety Manual (1993). Generally, clear zone shall be 3.0 m wide for rural cross-section and design speed less than 60 km/h, and with extended clear zone width for non-recoverable slopes. Clear zone for urban cross-sections with design speeds less than 60 km/h shall be 0.5 m wide.

Hazards (ends of cross-culverts, deep ditches and/or steep side slopes, etc.) located within the clear zone must be protected by a guiderail per OPSD 912.130. Guiderail length to be calculated per the Roadside Safety Manual (Figure 3.4.2 for approach length "La" and Figure 3.4.3 for approach length "Là").

End treatments are to be provided at both ends of guiderail, per OPSD 922.530 or equivalent, as approved by City.

4.8.2 Traffic Signs

Owner shall pay for and install all required street signs (stop, dead end / no exit, speed limits, warning signs, etc.) and street name signs. Signs shall comply with the Manual on Uniform Traffic Control Devices (MUTCD), and reflectivity for all signs to be Type IV High Intensity Prismatic (3M™ Sheeting Series 3930 or equivalent).

Regulatory signs are to be as per OTM Book 5 – Regulatory Signs, warning signs are to be as per OTM Book 6 – Warning Signs, and temporary signage is to be as per OTM Book 7 – Temporary Conditions.

Sign posts are to be Telespar square perforated post, 1-3/4" x 1-3/4", 14 gauge.

4.8.3 Street Name Signs

Street name signs are to be extruded aluminum signs per City detail R1.1 & R1.2 and installed in locations shown on City detail R2.

Provide shop drawings to City for review prior to fabrication.

4.8.4 Line Painting

Line painting shall be as per the general requirements of OTM Book 11 – Markings and Delineation. Paint shall be water-borne to OPSS 1716, with glass beads to OPSS 1750.

Generally, the following requirements apply:

- 300 mm wide white stop bars to be painted at all stop signs,
- 100 mm wide white yellow centerline tails at all stop signs (minimum 15 m long),
- White directional arrows as required,
- In rural cross-sections, 100 mm white solid line along paved shoulders,
- Progressive stop line painting, as deemed required by the City, per City detail R5 (80 km/h road) or City detail R6 (50 km/h road),

Provide line painting drawing for City review prior to completing the work.

4.8.5 Intersection Widening (Bulb-Out)

Intersection widening (bulb-outs) may need to be done on a case-by-case basis. Pre-consult with City to establish requirement.

4.9 GRADING

A detailed grading design will be required for new development and for infill development and may not interfere with the general drainage scheme of the lands in the surrounding area and must ensure the proper drainage of all lands in the area, including those lands being built upon.

4.9.1 Typical Lot Grading

Typical lot grading shall be split drainage or walk-out basement. Back to front drainage is possible but will only be allowed when both side yards are wider than 1.2 m, and where split drainage is not possible. Refer to City detail G1 and G2 for additional information.

In all cases, there must be a minimum of 0.15 m of uninterrupted fall away from all locations on the house envelope within the property limits, and existing elevations must be matched along all exterior property lines.

If this is not possible, off-site grading modifications may be done, but Owner will be responsible to review/coordinate with the adjacent property owner and obtain written permission. Provide copy of written permission to City for approval of the proposed Works.

4.9.2 Design Slopes & Terracing

The following requirements apply with regards to allowable slopes:

- Driveway slope to be 2.0% to 7.0%,
- Front yard and back yard slope to be 2.0% to 7.0%,
- Amenity area (minimum 6 m behind dwelling) slope to be 2.0% to 5.0%.

In grassed areas, 3H:1V (33%) terracing is to be done where maximum slopes would otherwise be exceeded. Retaining walls per Section 4.9.4 may instead be done.

Where a 2H:1V slope is necessary and a retaining wall not desirable, erosion and stabilization measures will need to be implemented and approved by the City prior to implementation.

4.9.3 Swales

Swales will be required for drainage and are to be constructed as per City detail G3.

Rear-yard swales are to be located entirely on the new lot/property, at 0.5 m from rear property line, and must be designed to convey the 100-year storm. Rear-yard swales may not be obstructed with sheds, landscaping features, fences, or other construction.

Side yard swales will be required between dwellings and are to be centered on the lot line.

Perforated subdrains per City detail G3 will be required at a slope less than 1.5%. When a subdrain is used, swales may have a minimum slope of 0.5%.

Generally, 2.4 m wide easements will be required along swales with subdrains, but only when the subdrain is equal to or larger than 200 mm in diameter.

4.9.4 Retaining Walls

Refer to City detail G4 for general requirements pertaining to retaining walls.

Retaining walls will not be permitted on City right-of-way and on easements and are to be installed on the higher property.

Shop drawings stamped by a structural Engineer will need to be provided to City for approval when retaining walls of any height are part of a site plan or subdivision project.

Height of the wall will be measured from the lowest finished ground elevation to the finished ground elevation 1.5 m behind the face of the highest block. Successive (stepped) walls of 1.0 m or less in height will be considered as a single wall when spacing is less than 1.5 m between the two walls, or when the grading is greater than 5% between two walls.

A subdrain is to be provided behind wall, complete with outlet and rodent grate, and a swale is to be provided along the top of the wall with a proper outlet.

All retaining walls exceeding 1.0 m in height must be protected by guards on all open sides and must be designed and stamped by a structural Engineer. Retaining walls exceeding 1.0 m in height are to be constructed of concrete (cast-in-place or precast) or armor stone.

4.9.5 General Grading

Owner is responsible for rough lot grading, and general grading is one requirement of building permit issuance.

All surface drainage to be directed to the roads or ditches as applicable. If the rear part of any lot or block is low, Owner shall fill it to enable the surface drainage to flow to the road or ditch or shall construct such temporary facilities to convey drainage to an outlet. Owner also must establish ground elevation foundation wall consistent with lot grading plan.

In urban areas, it is recommended that the Owner proceed with general grading of the lots to balance fill generated from the excavation of basements.

4.9.6 Final Lot Grading

Owner is responsible for final lot grading and is to submit a detailed grading plan stamped by an Engineer or Surveyor for City review, which shall include the proposed footprint and location of the dwelling. This detailed grading plan shall meet the general intent of the subdivision lot grading plan, and shall meet the requirements of Sections 4.9.1 to 4.9.3, inclusively.

A lot grading deposit will be taken as part of building permit process. Upon completion of final lot grading, the Owner is to retain the services of an independent professional engineer or Ontario Land Surveyor (OLS) to verify that all final elevations at lot corners, building elevations at any and all slopes on the lands, all elevations of swales, retaining walls, etc. have been adhered to.

Independent engineer or Surveyor is to prepare an "as-constructed" grading plan and submit to the City in 2 hard copies and 1 electronic copy (PDF and/or CAD).

Engineer or surveyor must be accredited under Professional Engineers Ontario (PEO) or Association of Ontario Land Surveyors (AOLS), respectively, and must have valid liability insurance.

Final lot grades must be within a reasonable difference of proposed grade, subject to the discretion of the City. Deposit will be reimbursed upon receipt and approval of the "as-constructed" grading plan and if the above conditions are met.

4.10 STREET LIGHTING

Owner is to provide roadway lighting based on requirements of the City's Roadway Lighting Policy.

As requested, Owner will be responsible to provide locates for underground street lighting conduits until Final Acceptance is achieved.

Disconnect for street lights shall be in the first pole, not in a hand hole.

4.10.1 Design

Lighting calculations will need to be carried out per requirements of the Roadway Lighting Policy. Different requirements apply depending on the classification of the roadway and whether the area is considered an "Urban Area" or a "Rural Area" as established in the Official Plan and Zoning By-Law.

Note that "Special Areas" have also been established and shall receive decorative style lighting. Such areas are:

- Laurier Street (from St-Jean to 1540 Laurier),
- Morris Village,
- Clarence Crossing,
- Urban Subdivisions,
- Urban Private Roads (subject to site plan).

4.10.2 Approved Materials

All luminaires to be LED. Refer to Roadway Lighting Policy for additional details with regards to approved poles, pole heights, luminaires, lumen output, banner arms, etc.

4.11 UTILITIES

Owner will be responsible for design & coordination of all utilities as discussed below, and will be required for all deposits, fees, etc.

Where possible, utilities are to be installed underground in a joint utility trench within the right-of-way. In all cases, the Owner is to prepare a Composite Utility Plan per the requirements of Section 2.3.

4.11.1 Hydro, Communications, Natural Gas

Owner is to provide hydro servicing, Bell, cable (where available), natural gas (where available), and spare ducts as required for future use. See City details X1 to X6, inclusively, for additional information.

Unless otherwise noted, natural gas to be installed in ditch fore slope (in rural cross-section) or behind curb (in urban cross-sections).

4.11.2 Canada Post

Owner will also be responsible to coordinate with Canada Post for the location of supermailbox(es) as required, and the proposed location shall also be acceptable to the City.

Owner will be responsible to install concrete sidewalks at supermailbox(es) as per City detail R8 or similar in urban areas, as well as adequate lighting.

Lastly, Owner will be required to inform prospective purchasers of supermailbox(es) locations through a clause in agreement of purchase and sale.

PART 5 CONSTRUCTION REQUIREMENTS

5.1 MEETINGS & COORDINATION

A pre-construction meeting to be held prior to start of construction. This meeting is to be attended by the Owner, the Owner's Engineer, the City, and the Contractor.

Owner/Contractor will be responsible to coordinate with the City and all affected residents in case of road closures, road cuts, watermain shutdowns, etc. as required to complete proposed Works. Owner/Contractor will also be responsible to coordinate with other authorities (utilities, County, etc.) as required.

Other meetings are to be held as required as construction progresses.

5.2 PRE-CONSTRUCTION SURVEYS

Owner shall arrange and pay for a photo and/or video pre-construction survey where Works are proposed in proximity of existing dwellings or structures, or elsewhere as deemed required by the City.

A pre-construction survey complete with vibration monitoring will also be required prior to blasting of bedrock, and any blasting is to be done in accordance with OPSS 120 and OPSS 206.

5.3 HEALTH & SAFETY

Contractor to follow all relevant health and safety laws and guidelines. Prior to beginning work, the Contractor must obtain locates and notify the Ontario Ministry of Labour (Notice of Project and Notice of trench work, if applicable).

Traffic control on public roadways shall be per the Ontario Health and Safety Act and OTM Book 7. Traffic control plan is to be forwarded to City for review prior to beginning work. Note that complete road closures will typically not be allowed on public roadways. A minimum of one 3.5m wide lane must be kept open at all times.

5.4 APPLICABLE CITY BY-LAWS

Contractor must also follow all applicable City By-Laws during construction of Works, including, but not limited to, the following:

- Burning of land clearing material will not be allowed per the City's Open Air Fire By-Law,
- Owner / Contractor may not operate a fire hydrant and may not operate water valves, may not obstruct a fire hydrant, and may not use hydrants for water needed during construction,
- Construction Waste may be brought to the City landfill at 2335 Lalonde Road on days upon which it is open to the public and upon payment of prescribed fees,

- Construction prohibited between 10:00 PM to 7:00 AM (Monday to Friday) and from 8:00 PM to 8:00 AM (Saturday & Sunday and statutory holidays) in residential areas, or 10:00 PM to 6:30 AM (all days) in rural areas, per Noise By-Law,
- Contractor may not obstruct or damage streets and sidewalks with vehicles or waste, per the Use and Care of Streets By-Law (2003-25). Contractor/Owner will be responsible for damages and is to sweep streets as required,
- Contractor must follow half loads.

The latest City By-Laws and policies may be found on the City's website at: http://clarence-rockland.com/index.php/en/city-hall/municipal-by-laws

5.5 INSURANCE & WSIB

The Owner will be required to obtain an insurance policy with an insurance company satisfactory to the City to ensure for the joint benefit of the Owner and the City against any liability that may arise out of the construction or installation or maintenance of any work to be performed.

Insurance policy is to extend until Final Acceptance of the Works, and shall name the City as additional name insured.

More specifically, the insurance policy shall include the following:

- The Owner shall defend, indemnify and save harmless The Corporation of the City of Clarence-Rockland, their elected officials, officers, employees and agents from and against any and all claims of any nature, actions, causes of action, losses, expenses, fines, 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, their directors, officers, employees, agents, contractors and subcontractors, or any of them, in connection with or in any way related to the delivery or performance of this Contract. This indemnity shall be in addition to and not in lieu of any insurance to be provided by the Owner in accordance with this Contract, and shall survive this Contract.
- The Owner agrees to defend, indemnify and save harmless The Corporation of the City of Clarence-Rockland from and against any and all claims of any nature, actions, causes of action, losses, expenses, fines, costs (including legal costs), interest or damages of every nature and kind whatsoever arising out of or related to the Owner's 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 Contract, and shall survive this Contract.

- Commercial General Liability Insurance issued on an occurrence basis for an amount of not less than $5,000,000 per occurrence / $10,000,000 annual aggregate for any negligent acts or omissions relating to the obligations under this Agreement. Such insurance shall include, but is not limited to bodily injury and property damage including loss of use; personal injury; contractual liability; premises, property & operations; non-owned automobile; broad form property damage; broad form completed operations; owners & contractors protective; occurrence property damage; products; employees and volunteers as Additional Insured(s); contingent employer's liability; tenant's legal liability; cross liability and severability of interest clause.
- Coverage shall not exclude shoring, blasting, excavating, underpinning, demolition, pile driving, caisson work and work below ground surface including tunneling and grading if applicable,
- Such insurance shall add the Corporation of the City of Clarence Rockland as Additional Insured including a waiver of subrogation. This insurance shall be non-contributing with and apply as primary and not as excess of any insurance available to the City.

Automobile Liability Insurance

- Automobile liability insurance coverage shall be obtained with respect to owned or leased vehicles used directly or indirectly in the performance of the services 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.

Professional Liability Insurance

- Professional liability (errors and omissions) insurance coverage shall be obtained to a limit of not less than $2,000,000. If such insurance is written on a claim made basis, the coverage shall be maintained for a period of two years subsequent to conclusion of services provided under this Agreement.

Environmental Impairment Liability

- Environmental Impairment Liability with a limit of not less than $2,000,000. Per Incident /Annual Aggregate is to be obtained. Coverage shall include Gradual and Sudden & Accidental incidents and include Third Party Bodily Injury and Property Damage including on-site and off-site clean-up. If such insurance is issued on a claims made basis, such insurance shall be maintained for a period of two years subsequent to conclusion of services provided under this Agreement.
- Such insurance shall also include Corporation of the City of Clarence Rockland as additional Insured subject to a waiver of subrogation in favour of the municipality. This insurance shall be non-contributing with and apply as primary and not as excess of any insurance available to the City.
- Any and all deductibles shall be the sole responsibility of the Owner and the City of Clarence-Rockland shall bear no cost towards such deductibles.

- The Owner is responsible to keep their property / equipment insured for physical damage – the City shall bear no cost towards any damage to such equipment.

Workplace Safety & Insurance Board (WSIB)

- The Owner shall provide evidence of WSIB or equivalent coverage.
- Prior to commencing work, the Owner shall provide the City with a certificate of insurance evidencing the above noted coverage. Such certificate shall provide the City with 30 days' notice of cancellation, lapse of coverage or material change in risk.

5.6 TEMPORARY FACILITIES

The Owner shall provide temporary sanitary facilities for use of construction personnel and inspection personnel.

Where required, Owner shall construct and maintain temporary access roads to the City's satisfaction and shall provide adequate parking facilities on its own property.

When working on existing sewers, provide temporary bypass pumping / flow diversion as required to complete the work.

5.7 ROAD CUTS

Permit will need to be obtained from City, and Works must not begin before the City has given approval to proceed. A security deposit and application fee will also need to be paid.

The City requires a minimum 24-hour notice prior to starting Works, and Works must be done within 30 days of the date of issue of the permit. Road cut may not remain open for more than 24 hours unless the Works are actively in progress. Traffic control will be required to the requirements of Section 5.3.

Imported backfill shall be used if native material is not deemed suitable, and reinstatement of granular and asphalt shall match existing thicknesses, but not be less than 40 mm of HL-3 or HL-4 asphalt and 150 mm of Granular "A". Note that reinstatement thicknesses may be increased for County or provincial roads.

The Owner will be responsible to have compaction testing done on backfill and granular material, and the asphalt reinstatement must be completed within 10 days following backfill.

A one-year warranty period will apply and will start on the date of preliminary acceptance.

5.8 INSPECTION REQUIREMENTS

Owner shall arrange and pay for inspection services during construction.

Inspection is to be performed by a qualified engineering consulting firm. Consulting firm and site staff performing inspections must have knowledge of City infrastructure and construction methods. Inspection will be required as follows:

- **Full time** inspection during construction of any underground infrastructure,
- **Periodic** inspections during construction of surface works, lot grading, etc.,
- **Full time** inspection during pouring of concrete curbs/sidewalks & placement of asphalt.

City maintains the right to inspect the Works at all time and may order all Works to be stopped if inspection personnel are not on site, or if inspection personnel are not performing their duties in a manner satisfactory to the City Engineer. City may also order all Works to be stopped if Works are not being carried out in accordance with approved plans and specifications, or in accordance with good engineering practice.

5.9 CONSTRUCTION TESTING REQUIREMENTS

With regards to watermains, the following tests and procedures will be required:

- hydrostatic watermain testing to OPSS.MUNI 441,
- Watermain disinfection, flushing and bacteriological testing to AWWA C651. Bacteriological testing is to be for e. coli, total coliform and heterotrophic plate count, and sampling will need to be witnessed by the City and OCWA,
- Watermains are to be swabbed.

Likewise for storm and sanitary sewers, the following tests and procedures will be required:

- CCTV inspection on all storm and sanitary sewers per OPSS 409 prior to first lift of asphalt,
- CCTV re-inspection on all storm and sanitary sewers per OPSS 409 prior to second lift of asphalt,
- Leakage test for sanitary sewers per OPSS 410,
- Low pressure air testing on all storm and sanitary sewers per OPSS 410,
- Deflection testing on all storm and sanitary sewers constructed of flexible pipe per OPSS 410.

Forcemains will require hydrostatic testing to OPSS 412.

Asphalt temperature will need to be verified (every load), and samples for Marshall testing will be required to the frequency noted in Section 5.10.

5.10 MATERIALS TESTING REQUIREMENTS

Owner shall arrange and pay for material testing & geotechnical reviews during construction. City may also have additional testing done at its discretion, at the cost of the Owner.

Testing is to be performed by a qualified geotechnical engineering firm and to the frequencies listed in the table below.

Table 5-1 Materials Testing Requirements

Related Work	Testing	Frequency
General	Gradation & Proctor for Granular "B", Granular "A" and select subgrade material	Once per material. Re-test if material source changes, if material visibly changes or if test results are older than 1 year
Sewers, watermain	Compaction for granular trench bedding, surround and cover.	Random inspections, 2 to 3 times per week
Sewers, watermain	Compaction for trench backfill (select subgrade material)	Random inspections, 2 to 3 times per week
Roadway	Subgrade visual inspection	Entire subgrade, prior to placing Granular "B"
Roadway	Compaction for Granular "B"	Every 25 m, prior to placing Granular "A"
Roadway	Compaction for Granular "A"	Every 25 m, prior to placing asphalt
Roadway	Compaction for asphalt	Every 25 m, each lift
Roadway	Full Marshall asphalt testing	1 test per day, per type of asphalt, per 500 tonnes of asphalt placed
Curbs, sidewalks	Compaction for Granular "A"	Every 25 m, prior to pouring concrete
Curbs, sidewalks	Concrete air & slump	Every day or every 20 m^3, whichever occurs first
Curbs, sidewalks	Concrete strength (cylinders)	Every day or every 20 m^3, whichever occurs first

Source: Adapted from various OPSS

5.11 CONCRETE PLACING & CURING

All concrete placing curing shall be as per the general requirements of OPSS 351 and OPSS.MUNI 904.

Surfaces are to be free of standing water/snow, and no concrete shall be placed until all curing material have been delivered to site. In cold weather, no concrete shall be placed until protection material have been delivered to site.

Formwork or granular base temperature shall not exceed 30° C and must be at a minimum of 5 °C for at least 12 hours prior to pouring. Placing and protection of concrete in cold weather shall be according to OPSS.MUNI 904.

Concrete shall be cured using a membrane-curing compound applied according to OPSS.MUNI 904 at application rate of 0.2 L/m^2, and shall have a broomed finish.

Concrete to be protected against vehicular traffic for a minimum of three (3) days.

5.12 ASPHALT PLACING

Hot mix asphalt is to be placed as per the general requirements of OPSS 310.

Surfaces are to be free of standing water/snow, and paving shall not be carried out if the roadbed is frozen. Binder course shall not be placed unless the air temperature at the surface of the road is minimum of 2 ºC and rising, whereas the surface course shall not be placed unless the air temperature at the surface of the road is minimum of 7 ºC and rising.

Asphalt to be at a minimum temperature of 120 ºC immediately after spreading and prior to initial rolling.

Compact asphalt to a minimum of 92% MRD using appropriate roller combinations for production rate (see Table 5 of OPSS 310).

5.13 PRELIMINARY ACCEPTANCE OF WORKS

The City will issue a Certificate of Preliminary Acceptance for roads and sewers when all the following conditions are met:

- All development charges, fees, taxes, deposits, etc. have been paid,
- Easements have been registered,
- Watermain and sewers are installed, operational and tested per Section 5.9,
- Pumping station(s) are operational and tested, where applicable,
- The base lift of asphalt is installed,
- Roadway lighting is installed and operational,
- Temporary or permanent street name and traffic signs have been installed,
- Interim line painting has been completed,
- Stormwater management facility is operational and Owner has provided copy of Environmental Compliance Approval,
- General grading has been completed to the satisfaction of the City,
- CUP has been approved, and utilities have been installed and are functional.

City will inspect Works and submit a deficiency list to the Owner no later than 12 months before Final Acceptance.

The second lift of asphalt is to be placed at least 12 months after acceptance of the first lift, and no later than 60 months, or once building permits have been issued for 90% of the lots.

City will only take ownership and full responsibility of Works at Final Acceptance and as deemed by By-Law.

5.14 CONSTRUCTION PERMITS

Construction permits will be required for all proposed construction within the subdivision, as per requirements of the OBC.

The Owner will be required to provide required deposits and fees and will be responsible to coordinate City inspections.

5.14.1 Issuance of Building Permits (Lots)

Building permits will be issued by the City within any given phase of the development only when the Works have received Preliminary Acceptance as per Section 5.13.

Issuance of building permits may be stopped at any time upon failure of the Owner to fulfil the above requirements, and until such time as the requirements have been fulfilled.

At the City's discretion, one building permit may be allowed before Works have received Preliminary Acceptance and for the purpose of a model home.

5.14.2 Final Lot Acceptance Requirements

Final acceptance of a lot/building will be provided when the following requirements are met:

- Owner, within 6 months of the issue of the final building inspection, has provided documentation prepared by an Engineer or Surveyor that the final lot grading was constructed to the approved drawings,
- Driveways to be surfaced with asphalt, concrete or other hard surface between the curb (or edge of roadway asphalt) and the line of the front wall of the house/garage, within 6 months of the issue of the final building inspection,
- Owner, within 6 months of the issue of the final building inspection, shall plant at least one shade tree in the front yard and two trees on a corner lot,
- Trees planted per requirements of Subdivision Agreement,
- Water valve (curb stop) is visible and is operational.

5.15 MAINTENANCE OF WORKS

Owner will be responsible for maintenance of works until Final Acceptance, as passed under By-Law. More specifically, Owner is responsible to maintain storm sewers, sanitary sewers and watermains, including the clearing of any blockage, until Final Acceptance.

Owner is to sweep existing and new streets once a week (preferably Fridays) or as required and is to supply and place dust palliative measures of existing and new streets as required.

Owner will perform snow removal at their cost until the roads have been prepared to a satisfactory condition. The City will perform snow removal only once the roads have been prepared to a satisfactory condition. At a minimum, the Owner will be required to install gravel and grade the roads, with asphalt ramping at all iron works (maintenance holes, catch basins, valve boxes, etc.). City will complete inspection in the fall prior to performing snow removal.

Owner shall ensure that all surveyor pins and monuments are maintained in the areas where they are located in a continuous and visible manner.

Required maintenance not carried out by the Owner may be carried out by the City at the cost of the Owner.

5.16 EMERGENCY REPAIRS

City may enter property at any time and may complete emergency repairs to any Works without prior notice. Emergency repairs will be carried out by the City at the cost of the Owner.

Such costs will include a management fee of 20% of the labour and material value and a further fee of 30% for the dislocation and inconvenience caused to the City.

5.17 WARRANTY PERIOD

The warranty period ends at Final Acceptance of subdivision, when passed by By-Law. 10% of total Letter of Credit will be kept during the warranty period to cover warranty items.

Final lift of asphalt shall be guaranteed for 1 year during which time the City will inspect and submit a deficiency list to the Owner.

5.18 CLOSE-OUT DOCUMENTATION & "AS-BUILT" RECORDS

Owner's Engineer & Contractor will be responsible to assemble and submit the close-out documentation to the City, consisting of the following:

- All watermain test results (hydrostatic and bacteriological),
- All preliminary and final CCTV inspection reports & DVD's for sewers,
- All material testing & geotechnical testing results per Section 5.10,
- Service location sheet for each lot, including location of services in relation to the lot corners, and geodetic elevation of services at property line,
- A copy of all approvals (CA, MOECC, etc.),
- Approved shop drawings,
- Operation & maintenance manual for stormwater management facilities, oil & grit separators, etc. per Section 4.3.6,
- Results of water samples taken from outlet of stormwater management facility per Section 5.19,
- Operation & maintenance manual for pumping stations,
- OLS certificate,
- "as-built" drawings as discussed below, in PDF and AutoCAD format.

"As-built" drawings shall be maintained and prepared by the Owner's Engineer as construction progresses, and shall include, at a minimum:

- as-built invert elevations of all storm and sanitary sewers at all structures,
- as-built invert elevations of all culverts and ditches at maximum 25 m spacing,
- as-built watermain obvert elevations at maximum 25 m spacing,
- as-built rough lot grading elevations (red-lined),
- as-built road grade table (subgrade, granular "A", granular "B", base course of asphalt, final lift of asphalt),

- as-built retaining wall details and elevations,
- any changes made during construction (in plan view and profile view).

5.19 FINAL ACCEPTANCE OF WORKS

Final Acceptance occurs when the City assumes and takes full responsibility for the Works. Final Acceptance is achieved only when passed as a By-law by Council, before which the following requirements must be met:

- warranty period is over (1 year after placing final lift of asphalt),
- deficiencies, incomplete work and any warranty issues have been addressed,
- "as-built" documentation has been provided to the City per Section 5.18,
- All conditions set out in the ECA for the stormwater management pond have been fulfilled,
- The stormwater management pond has been fully cleaned of sediments and is operational as originally designed. Cleaning shall be done no sooner than 6 months and no later than 1 month prior to final acceptance,
- Owner shall submit 3 consecutive water samples taken from outlet of the stormwater management facility with one year apart from each other. Last sample shall be taken no sooner than 6 months and no later than 1 month prior to final acceptance. All samples must meet or exceed the design parameters of the facility,
- A final walkthrough has been completed with the City, the Owner and its Engineer,
- All other requirements of the Subdivision Agreement have been met,
- Any and all potential claims for construction liens have expired,
- Owner's Engineer has issued a letter recommending Final Acceptance of the Works and that the Works were built as per the approved engineering drawings,
- Owner has filled out an application for Final Acceptance and has submitted it to the City's Planning Department.

5.20 FINANCIAL SECURITY REDUCTION

The Owner is to provide financial security as per Section 2.9 prior to starting work and prior to the signing of the Subdivision Agreement. Financial security may be reduced as work progresses, and reduction requests must include the following:

- Completed application form with applicable fees for each request
- 2 copies of the "as-built" drawings (hard and digitial copies) when requesting reduction corresponding with preliminary acceptance,
- A table of the estimated costs demonstrating the Works that are completed to date,
- Sign-off by Owner's Engineer that the Works have been completed satisfactorily,
- A minimum of 10% shall be kept for each item until Final Acceptance of the Works, to cover maintenance and warranty commitments,

- Financial security will be entirely released only when Final Acceptance is achieved per the requirements of Section 5.19.

SITE PLANS

PART 6 GENERAL REQUIREMENTS

General requirements specifically pertaining to projects subject to site plan control are discussed in the current section of this manual. This section is meant to summarize the requirements of the Official Plan, Site Plan Control By-Law, the Zoning By-Law and other City By-Laws as may be applicable to the project and is by no means an exhaustive list.

Owners are encouraged to visit the City's website (http://clarence-rockland.com) to obtain a copy of the current Official Plan and By-Laws and will be required to pre-consult with the City early in the process.

6.1 APPLICABILITY & EXEMPTIONS

Per the Site Plan Control By-Law, the entire area located within the geographic boundaries of the City is designated as an area of site plan control as permitted in Section 41 of the *Planning Act*. More specifically, the following classes of development generally require site plan control approval:

- The construction, erection or placing on land of a residential building with 3 or more units,
- The construction, erection or placing on land of buildings or structures in a commercial zone, a community facility zone, an urban core area zone and an industrial zone,
- The construction, erection or placing on land of commercial and/or industrial buildings or structures authorized by exception within rural or agricultural zone,
- A golf course.

Again per the Site Plan Control By-Law, some classes of development are exempt from site plan control approval, such as single detached dwellings, semi-detached dwellings, etc. Refer to the Site Plan Control By-Law for the complete list.

6.2 OFF-SITE IMPROVEMENTS

The Owner may be responsible to extend sidewalks or other infrastructure (sewers, watermains, etc.) as required by the City. The City may also require other off-site improvements on a case-by-case basis such as turn lanes, traffic signals, road widenings, etc.

Work on City road allowances shall be according to the specifications and By-Laws of the City and as further detailed in this manual.

Pre-consultation with the City will serve to serve to establish which off-site improvements, if any, will be required to support the proposed project.

6.3 APPROVALS & AGREEMENTS

Signing of a Site Plan Agreement is mandatory and will need to be done prior to the issuance of a building permit.

The Site Plan Agreement will be registered on title of the property, also prior to the issuance of building permit. City must have in its possession the documents listed in Section 6.5 prior to signing a Site Plan Agreement.

Owner will be responsible to obtain, at its own cost, any and all other approvals, agreements, permits, etc. for the project from various City departments and from other senior approving authorities.

6.4 DRAWINGS

Per the requirements of the Site Plan Control By-Law, the plans submitted for review and approval must be prepared by a qualified surveyor, engineer, or architect, and they must contain the following information:

- the dimensions and area of the land and the legal description or civic address;
- location of existing and proposed easements;
- location of road boundaries, their private or public status, and dimensions;
- location, dimensions, and area of building, and relation between lot occupation area and total area of land at issue;
- site plan matrix with zoning requirements (setbacks, parking, etc.);
- distance between each building and lot boundaries;
- location, number, and dimension of parking areas and access lanes;
- location and identification of any existing or projected building(s);
- location of a stream or ditch on the land or of a substantial difference in level;
- authorization or access rights issued by the South Nation River Conservation Authority where the proposed site is located in a flood plain;
- authorization or access right issued by the United Counties where a new construction borders a county road;
- the plan, as constructed.

Additionally, the following information is to be provided for residential developments:

- occupation load calculated on the basis of the number of rooms per unit;
- percentage of green space and its location;
- number of parking spaces reserved for visitors and for persons with disabilities;
- location and details of fence, if applicable;
- traffic study, if deemed required by City.

Likewise, the following additional information is to be provided for commercial and industrial developments:

- location and dimensions of loading and unloading zones;
- traffic study, if deemed required by City.

6.5 SUBMITTALS

Again per the requirements of Site Plan Control By-Law, applications for the approval of a site plan must include the respective fees and the following documents:

- Two (2) recent copies of the location plan or reference plan,
- One (1) copy of the registration document,
- Four (4) copies (full size folded) and twenty (20) copies (11" X 17" format folded) of the preliminary version of the "general plan" depicting the proposed improvements (landscaping, parking, lighting, and other), elevations, surface water drainage, and municipal services hook-up. Where the plan contains an excess of information, provide attachments to the "general plan."
- One (1) 8½" x 11" mylar copy and three (3) copies (full size) of each final plan. These plans and copies should not be submitted before the City reviews the preliminary plans.
- One (1) PDF copy of all plans and reports, on DVD or USB drive,
- A Letter of Credit to the requirements of Section 6.9. This letter is required prior to signing the agreement,
- One (1) copy of the mortgage registration document (where applicable),
- The applicable fees required for a site plan application under the bylaw, based on a scale of fees,
- Consent of the mortgage lender,
- An electronic AutoCAD copy (final version),
- Insurance certificate.

6.6 TYPICAL PROJECT & REVIEW PROCESS

The typical flow chart attached in Appendix "A" illustrates the typical project & review process for subdivision projects. Note that this flow chart is intended as general guidelines and may vary from project to project.

6.7 CITY ENGINEERING REVIEWS AND PEER REVIEWS

The City will perform a technical review of the drawings and reports submitted and may also retain the services of a third-party consulting firm to complete a peer review.

If so, cost of consultant peer review fees will be the responsibility of the Owner. If they are paid directly by the Owner, the peer review fees will be deducted from the total engineering fees for the project. Any peer review fee overruns will be charged to the Owner. Owners are therefore encouraged to submit high-quality and thorough documents to facilitate and expedite reviews.

6.8 FINANCIAL REQUIREMENTS

The Owner will be required to pay to the City, in cash or certified cheque, all applicable administrative fees, legal fees, planning and engineering fees, development charges, road cuts and building permit fees that may be required by the City by By-Law.

It is the Owner's responsibility to verify which financial requirements are applicable to this development.

The Owner must also pay all arrears of taxes outstanding against the lands prior to the execution of the Site Plan Agreement.

Refer to the User Fees and Charges By-Law for more information.

6.9 PERFORMANCE DEPOSIT

The Owner will also be required to provide a performance deposit prior to the signing of the Site Plan Agreement with the City. The purpose of this deposit is to ensure that the City is able to complete the Works in the event that the Owner is unable to proceed with the completion, or to address deficiencies.

Performance deposit must consist of cash, certified cheque or an irrevocable Letter of Credit issued by a bank will be required prior to the signing of the Subdivision Agreement. Bonding will not be accepted. A sample Letter of Credit may be found in the Site Plan Control By-Law.

Performance deposit will be required for 50% of the estimated cost of the Works on private property. Additionally, a performance deposit will be required equal to 100% of the estimated cost of required offsite Works. The estimated cost will be based on the Engineer's estimate. Unit prices are to be reflective of current market conditions and the City reserves the right to review the estimate and unit prices.

Once construction is complete, Owner must fill out an application for a request for release at the Planning Department. Physical Services will then perform an inspection further to the request. The deposit will be released on acceptance of the Works.

A minimum period of one month is required to obtain the amount corresponding to the release. One partial release may be permitted prior to final inspection. City will retain a minimum 10% of performance deposit or $5,000 (whichever is greater).

PART 7 PLANNING REQUIREMENTS

Design requirements specifically pertaining to projects subject to site plan control are discussed in the current section of this manual. Reference is made to the current Zoning By-Laws and other City By-Laws as may be applicable to the project and is by no means an exhaustive list.

Owners are encouraged to visit the City's website to obtain a copy of the current By-Laws and will be required to pre-consult with the City early in the process.

7.1 PARKING & SITE ACCESS

7.1.1 General

Refer to Zoning By-Law Section 5.1 for general parking requirements such as applicability, location, cash-in-lieu of parking, surfacing requirements, etc.

7.1.2 Motor Vehicle Parking

Refer to the Zoning By-Law Section 5.2 for motor vehicle parking requirements (dimensions of stalls and calculations).

7.1.3 Accessible Parking Spaces

Provide accessible (barrier free) parking spaces per the Zoning By-Law Section 5.3.

Provide signage (bilingual) and line painting in accordance with the Highway Traffic Act.

7.1.4 Bicycle Parking

Provide bicycle parking spaces per requirements of Zoning By-Law Section 5.4.

7.1.5 Stacking Spaces (Drive-Through)

Provide stacking spaces for drive-through facilities on site per the requirements of Zoning By-Law Section 5.5.

7.1.6 Loading Spaces

Provide spaces for loading and unloading of goods per requirements of Zoning By-Law Section 5.6.

7.1.7 Aisle Width

Aisle widths providing access to a parking space within a parking area are to be per requirements of Zoning By-Law Section 5.7.

7.1.8 Driveway Width

Refer to Zoning By-Law Section 5.8 for driveway requirements for residential uses.

7.1.9 Landscaping

Provide landscape buffer strips to the requirements of Zoning By-Law Section 5.9.

Owners are encouraged to provide attractive landscaping

7.1.10 Barrier Free Accessibility

Site and building are to be made barrier-free to the requirements of the OBC and AODA.

7.2 BUILDING SETBACK & OTHER REQUIREMENTS

Refer to Part 6 to Part 21 (inclusively) of the Zoning By-Law for requirements with regards to building setbacks, lot coverage, frontage and other zoning requirements.

7.3 FIREFIGHTING

Provide fire route(s) to the requirements of the OBC 3.2.5.6, complete with "Fire Route" signs per the requirements of City's Fire Routes By-Law. Hydrant(s) are also to be provided on site as required to meet the travel distance requirements of the OBC.

Owner will be responsible to provide a sufficient volume of water for each of the buildings for firefighting purposes, unless otherwise stated by the City's Fire Service.

7.4 FENCING

Provide fencing as per requirements of Zoning By-Law Section 5.9 and per requirements of Fence and Privacy Screens By-Law.

7.5 SIGNS

All signs must meet the requirements of By-law 2015-160, and a permit will be required prior to their installation.

7.6 GARBAGE & RECYCLING

Waste containers are to be located as per requirements of Zoning By-Law Section 5.9.2 and must be accessible to a typical garbage truck. Owner responsible to provide a fenced enclosure as per City detail E4 and dumpster(s) for garbage and recycling container(s).

Refer to Waste Material By-Law for additional information.

PART 8 DESIGN REQUIREMENTS

Design shall generally meet the requirements of the above sections, and of the OBC.

The Owner may be required to provide, dedicate and register easements as required for water, sewer, drainage or other purposes.

8.1 SANITARY SEWERS

8.1.1 Sewer Design

Average daily flows are to be calculated from Table 8.2.1.3.B of the OBC where possible, or from the City of Ottawa Appendix 4-A – Daily Sewage Flow for Various Establishments (see Appendix "B") if the latter is more relevant.

Service shall be designed per Section 4.1.4 to accommodate the peak flow. To do so, the average daily flow is to be distributed over a reasonable time frame (for example, 7 hours for a school) and a peaking factor will need to be applied.

8.1.2 Other Design Considerations

Sanitary service is to be installed with clean-outs or maintenance holes per the general requirements of the OBC. Where required, oil & grease interceptors are to be installed per requirements of the OBC & Sewer Use By-law.

A monitoring maintenance hole shall be required just inside the property line for all non-residential and multi-residential buildings connections from a private sewer to a City sewer.

Each separate building is to be serviced by a separate building sewer; however, if there is more than one building on a particular lot, the building sewer may connect to all buildings on the lot.

Provide backwater valves to requirements of OBC (inside the building).

125 mm or 150 mm diameter laterals are to be connected to an existing sanitary sewer as per OPSD 1006.010 (rigid pipe) or OPSD 1006.020 (flexible pipe) using Kor-N-Tee saddle or approved equivalent.

Connection shall instead be made at a maintenance hole as described in Section 4.1.6 where the service is greater than 50% of the diameter of the mainline concrete pipe, or where the lateral is 200 mm in diameter or larger.

Sump pumps and rainwater leaders may not be connected to sanitary sewers or services.

8.1.3 Approved Materials

Refer to Section 4.1.7 for list of approved materials.

8.2 STORM SEWERS & CULVERTS

8.2.1 Sewer Design

Storm runoff is to be calculated with the Rational Method as per Section 4.2.3. Sewer service is to be sized per Section 4.2.5 to accommodate 5-year storm without surcharging.

Runoff shall also include the design flow from the roof drains (where applicable) as calculated by the mechanical engineer.

8.2.2 Other Design Considerations

Storm service is to be installed with clean-outs or maintenance holes per requirements of the OBC and provide backwater valves to requirements of OBC (inside the building).

Downspouts may not be directly connected to the storm sewer or storm service.

100 mm or 150 mm laterals are to be connected to an existing storm sewer as per OPSD 1006.010 or OPSD 1006.020 using Kor-N-Tee saddle or approved equivalent, whereas larger laterals are to be connected to an existing storm sewer as described in Section 4.2.8.

8.2.3 Approved Materials

Refer to Section 4.2.9 for list of approved materials.

In addition to the above, HDPE pipes and fittings to CSA B182.8 may be used for storm sewers on private property only.

8.3 STORMWATER MANAGEMENT

Urbanization increases impervious surface cover, such as roads, driveways and rooftops. These surfaces prevent infiltration of stormwater, which is forced to flow overland, creating significant erosion, pollution, or flooding problems.

The purpose of managing stormwater is to control the quantity of stormwater runoff to reduce erosion and flooding, and to improve the quality of runoff to waterbodies and groundwater. As such, on-site stormwater management will be required for all projects.

For all projects, detailed stormwater management report and calculations are to be provided, and the following requirements will apply:

- Quantitative control is to be provided per requirements of Section 4.3.2,
- Qualitative treatment to be provided per requirements of Section 4.3.3,
- Sizing of stormwater management facility for site plan projects is to be done with the Modified Rational Method (MRM) as discussed in Section 4.3.4,
- Provide fencing and access as discussed in Section 4.3.6.

8.3.1 Accepted Methods

The following stormwater management methods, or combination thereof, are accepted for use in the City:

- Wetlands,
- Wet pond,
- Dry pond,

- Infiltration basin where soils permit,
- Oil & grit interceptor,
- Surface storage (maximum depth of 300 mm in parking lots),
- Underground storage (concrete tanks, HDPE chambers, oversized pipes, etc.),
- Rooftop storage,
- Enhanced grassed swales (on private property only),
- Other forms of LID.

8.4 WATERMAINS

8.4.1 Watermain Design

Water service shall be designed per Section 4.4.1 to accommodate the peak flow. To do so, the average domestic daily flow is to be distributed over a reasonable time frame (for example, 7 hours for a school) and a peaking factor will need to be applied.

Average domestic daily flows are to be calculated from Table 8.2.1.3.B of the OBC where possible, or from the City of Ottawa Appendix 4-A – Daily Sewage Flow for Various Establishments (see Appendix "B") if the latter is more relevant.

Water service to be sized to accommodate sprinkler system, where applicable. The required fire flow is to be calculated per the Fire Underwriters Survey – Water Supply for Public Fire Protection (1999) or is to be based on the actual sprinkler demand as calculated by the mechanical engineer. For residential constructions only, fire flow may be capped at 10,000 L/min.

Watermain sizing using simplified water service sizing calculations (head loss spreadsheet) will be acceptable for unsprinklered buildings only. For sprinklered buildings, watermain sizing shall be using modeling software (WaterCAD, WaterGEMS, EPANET, or similar).

City may be able to provide model information (such as theoretical hydrant flow curves and boundary conditions). In some cases, however, and at the discretion of the City, the Owner may be required to conduct hydrant flow test(s) at its cost, to establish available flows and pressures. All testing is to be coordinated with the City.

Site plan projects shall have a watermain valve on every water service, located 0.30 m inside private property.

Connections to existing watermains shall be with a wet tap connection where possible.

8.4.2 Other Considerations

All watermains and water services shall have a minimum cover of 2.4 m.

Minimum pipe diameter shall be 150 mm where private fire hydrant(s) and/or sprinklers are required. Where private fire hydrant(s) and sprinklers are not required, minimum pipe diameter shall be 19 mm. Longer services and/or higher flows may require larger diameters. In all cases, Engineer is to confirm sizing.

8.4.3 Approved Materials

Approved materials for watermains and water services shall be as per Section 4.4.3.

8.5 GRADING & RETAINING WALLS

Grading and retaining walls shall meet the requirements of Section 4.9.1 to 4.9.4, inclusively.

8.6 SITE LIGHTING

Submit lighting calculations to the City for review. Light levels must not exceed 0.5 lux at the property line, and sharp cut-off fixtures shall be used to minimize possible lighting glare onto adjacent properties.

All lighting fixtures are to be LED.

8.7 UTILITIES

Owner will be responsible for design & coordination of all utilities (hydro, communications, natural gas) as discussed below. Owner will also be responsible for the relocation of utilities in the event of any conflict with existing utilities.

Owner will be responsible for all deposits, fees, etc. and will be required to convey any easements as may be required for utilities.

PART 9 CONSTRUCTION REQUIREMENTS

9.1 MEETINGS & COORDINATION

The City may require a pre-start Health and Safety Review meeting.

Owner/Contractor will be responsible to coordinate with City and affected residents for road closures, road cuts, watermain shutdowns, etc. as required to complete Works.

Owner/Contractor will also be responsible to coordinate with other authorities (utilities, County, etc.) as required.

9.2 PRE-CONSTRUCTION SURVEYS

Refer to Section 5.2.

9.3 HEALTH & SAFETY

Refer to Section 5.3.

9.4 APPLICABLE CITY BY-LAWS

Refer to Section 5.4.

9.5 INSURANCE

Refer to Section 5.5.

9.6 TEMPORARY FACILITIES

Refer to Section 5.6.

9.7 INSPECTION REQUIREMENTS

It is strongly recommended that the Owner retain full time professional engineering inspection personnel to supervise the construction of underground Works (servicing), and part time inspection personnel to supervise the construction of surface works (curbs, sidewalks, granulars, landscaping, etc.).

At a minimum, an Architect/Engineer will need to provide general reviews per the requirements of the OBC, and all general review reports are to be forwarded promptly to the CBO. The City shall also have the right to inspect the Works at all times.

Lastly, inspection of all Works within City allowances is mandatory and shall be per the requirements of Section 5.8.

9.8 CONSTRUCTION TESTING REQUIREMENTS

With regards to watermains, the following tests and procedures will be required:

- Hydrostatic testing to OPSS.MUNI 441,

- Watermain disinfection, flushing and bacteriological testing to AWWA C651. Bacteriological testing is to be for e. coli, total coliform and heterotrophic plate count, and sampling will need to be witnessed by the City and OCWA,
- Watermains are to be swabbed,

Likewise for storm and sanitary sewers, the following tests and procedures will be required:

- CCTV inspection on all storm and sanitary sewers per OPSS 409,
- Leakage test for sanitary sewers per OPSS 410,
- Low pressure air testing on all storm and sanitary sewers per OPSS 410,

Lastly, forcemains will require hydrostatic testing to OPSS 412.

9.9 MATERIALS TESTING REQUIREMENTS

City does not have any mandatory requirements for testing of materials on private property, however it is strongly encouraged. Refer to Section 5.10 for list of recommended tests & related frequency.

Materials testing for all Works on City allowances is mandatory and shall be per the requirements of Section 5.10.

9.10 "AS-BUILT" RECORDS

Owner shall submit to the CBO a certified building location survey prepared by a Surveyor, including foundation & elevations upon completion of the foundation to ensure interim compliance with the Zoning By-Law.

Owner shall submit to the City Engineer one set of PDF "as-built" road, grading and service drawings including the location of all Works, certified under seal by a Professional Engineer. Owner shall also provide an electronic copy of "as-built" drawings and a copy of all relevant construction & materials testing results.

9.11 PERFORMANCE DEPOSIT REDUCTION

Refer to Section 6.9 for additional information.

DITCH FILLING

PART 10 DESIGN REQUIREMENTS

10.1 GENERAL REQUIREMENTS

Main purpose of open ditches is to drain the roadway and its granular base/sub-base. In rural areas and for new subdivisions, Owners are required to design, obtain approvals & construct filled-in ditches as part of a subdivision.

For existing residential properties and for development not part of a subdivision, individual property owner will be required to submit an application to the City for the ditch filling, and to pay security deposit and application fee.

Property owner will be responsible for all costs associated with construction and shall pay deposit and application fee. Owner will be responsible for full maintenance and future replacement of the entranceway and culvert.

Ditch filling installed without proper authorization from the City will not be allowed and may be removed by the City at the cost of the abutting property owner.

10.2 DITCH FILLING BY CITY

Per the Roadside Drainage Infill Policy, the City may infill ditches at its cost in some cases, conditional to budget approval on a yearly basis, and subject to the following conditions:

- Resident must make a formal request to the Director, Infrastructure and Planning
- Open roadside drainage system must be situated in a residential area. Rural areas are not eligible.
- The Director declares that the roadside drainage is not in a maintainable condition (in his/her sole opinion), and shall exceed the following criteria:
  - Depth of 1 metre as measured from the edge of road shoulder,
  - Front and back slopes should not be steeper than 3H:1V.
- Funding must be approved by Council
- Requests shall be processed on a first-come first-served basis. If the cost of infilling requests exceeds Council's budget approval, then the request will be deferred to the following year and given a priority designation in the succeeding budget year.

10.3 DESIGN

Sizing of culvert will be determined by the City, but in some cases the Owner may be required to hire an Engineer to size culvert. Pre-consult with the City to establish requirement.

If an engineered design is required, pipe to be sized per the requirements of Section 4.2, and existing and proposed elevations must be provided for pipe inverts, and for grading of swale & driveway.

Rural driveways shall be as per City detail E1-(FR or EN) and E2-(FR or EN), and ditch filling shall be as per City detail E3.

10.4 OTHER DESIGN CONSIDERATIONS

The following other design considerations will apply for the design of ditch fillings:

- A minimum of 1 catch basin will be required, or one between each entrance,
- Additional catch basins may be required, typical spacing of 15 m,
- Surface drainage is to be directed towards swale (centered on pipe and minimum 250 mm deep) & catch basin,
- Manufactured saddles will be required for sump pump connections,
- Regrading upstream and/or downstream of ditch may be required,
- Culvert to be centered on the ditch line,
- Invert of culvert to be set +/- 150 mm below the existing ditch elevation,
- Retaining walls (headwalls) and rip-rap will not be allowed.

10.5 APPROVED MATERIALS

New pipe located within ditches shall be new perforated rigid dual wall high density polyethylene (HDPE) with smooth interior and corrugated exterior to CSA B182.8, 320 kPa strength. Perforated pipes are to be wrapped with geotextile filter sock as per OPSS 1860.

Pipe located under driveway shall be either be non-perforated HDPE similar to above or shall be new galvanized corrugated steel pipe 68 x 13 mm profile, 1.6 mm minimum thickness.

Culverts are to be a minimum of 450 mm in diameter and to the minimum length given in the Construction of Private Entrances By-Law.

Catch basin to be HDPE premanufactured fitting (cross or tee), a minimum of 300 mm in diameter and complete with a minimum 300 mm deep sump. Catch basin grate shall be either cast iron or ductile iron.

Pipe bedding, surround and cover shall consist of 19 mm clear stone (type 1) as per OPSS.MUNI 1004 covered with a non-woven geotextile to OPSS 1860.

PART 11 CONSTRUCTION & INSPECTION

No work is to be performed on right-of-way without City's approval. Prior to starting work, property owner is to submit an application to the City for the ditch filling and will need to pay security deposit and application fee. Deposit will be returned once work is complete and all deficiencies have been addressed.

Owner is to provide insurance to the requirements of Section 5.5 and is to obtain locates prior to construction.

Property owner is to contact City for inspection at the following milestones:

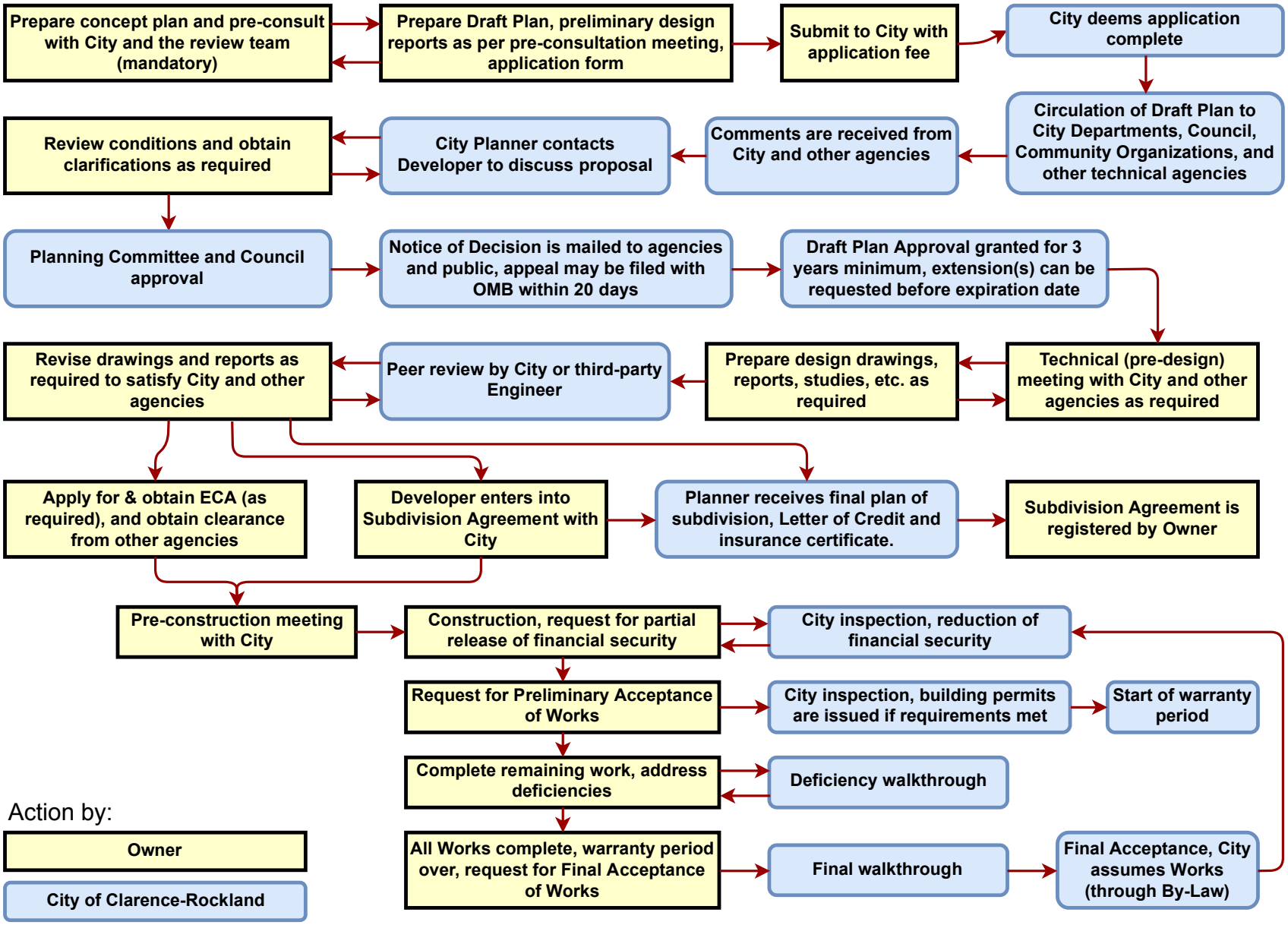
- For ditch filling, once pipe bedding, pipe, and catch basin(s) are installed, and prior to backfilling,
- For ditch filling and other driveways, once Works are complete.

Note that a minimum 24-hour notice is required for all inspections.

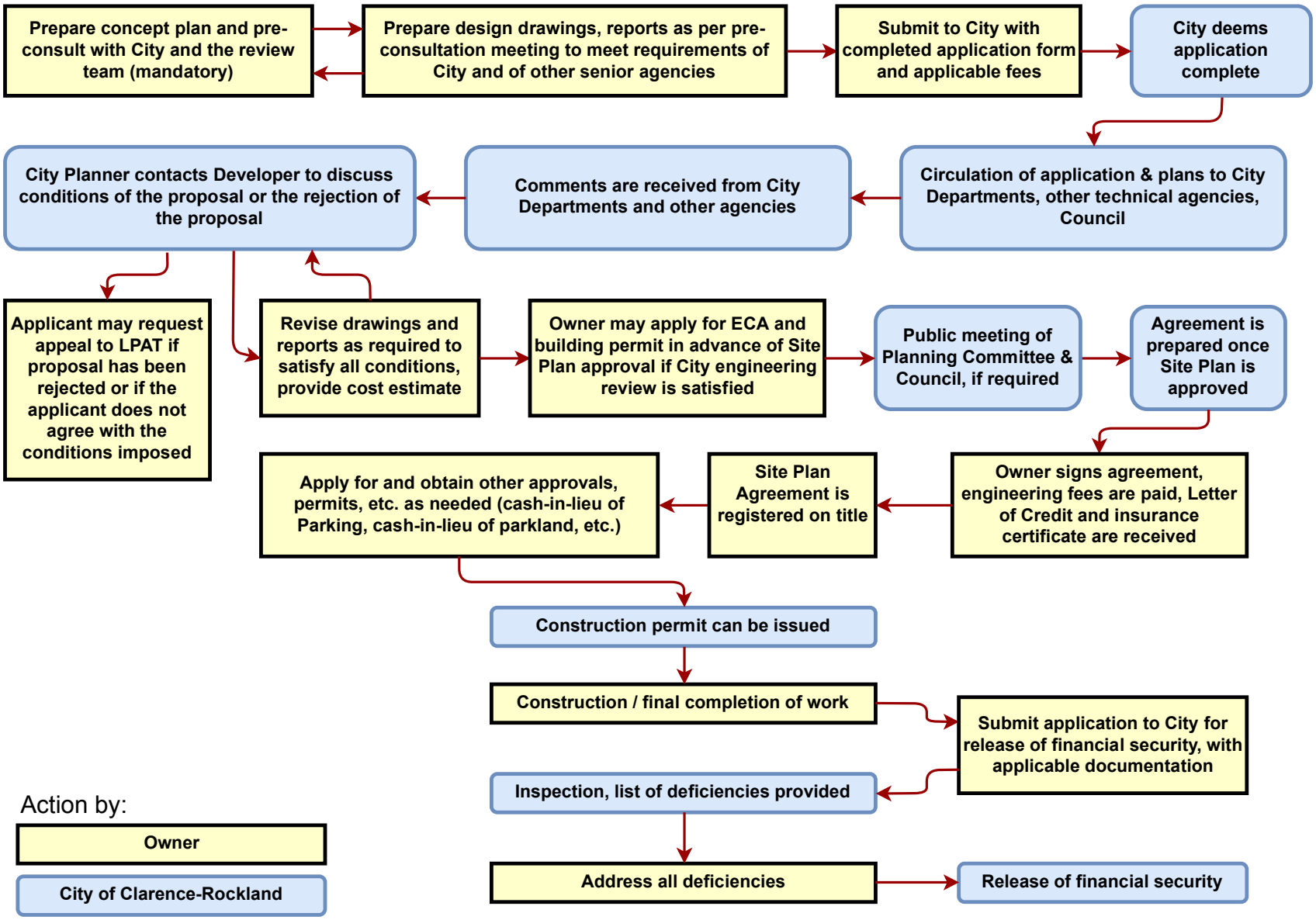
APPENDIX “A”

Project Flow Charts

SUBDIVISION PROCESS - STEP BY STEP



SITE PLAN CONTROL PROCESS - STEP BY STEP



APPENDIX "B"

City of Ottawa Appendix 4-A – Daily Sewage Flow for Various Establishments
City of Ottawa Appendix 4-B – Peaking Factor for Industrial Areas

Source: Ottawa Sewer Design Guidelines (2012)

APPENDIX 4-A DAILY SEWAGE FLOW FOR VARIOUS ESTABLISHMENTS

From The MOE Guidelines (* indicates adapted for Ottawa)

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
AIRPORTS		
- Not including food	per passenger	20
- Catering	per meal served	12
- Employees	per person	40
ASSEMBLY HALLS		
- Where no kitchen or meals provided	per person	8
- With varying facilities provided (range)	per person	8-36
BAR OR COCKTAIL LOUNGE		
- Separate establishment Minimum food service	per seat	125
- Part of a hotel or motel	per seat	70
- Customer	per customer	8
- Staff	per employee	50
BEAUTY SALON	per station	650
	per person	130
BOWLING ALLEYS		
- With no bar or restaurant	per alley	400
- With bar and/or restaurant	per alley	800
CAMPS		
- Day camps – no meals	per person	50
- Day & night camps	per person	150
- Primitive camps	per person	40
- Summer Camps with showers, Toilets, handwashing & cooking	per person	150
- as above without flush toilet	per person	75
- Construction camps – Flush toilet	per person	200
- No Flush toilet	per person	125
- Migrant workers camp – central Bathroom	per person	125
- Youth camps	per person	200
- Resort camps – limited pumping	per person	200
- Resort comps – non resident staff	per person	50
- Luxury camps	per person	400
CAMPGROUNDS, TENT AND TRAILER PARKS		
Site with water and sewer connection For recreational vehicles (e.g. trailer And motor homes)-TRL Sites		
• Sewer connected to sewage system (SS) At nearby comfort station (CS)	per site	375(475)-425(525)

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
• Sewer connected to a SS other than the one at SC		
- sewage generated at the CS	per site	275-375
- sewage to connected SS when CS is available	per site	100(200)-60(150)
- sewage to connected SS when no CS available	per site	125(425)
Sites with no sewer connections. Water supplied by a connection or From a nearby faucet		
• sewage generated at a nearby CS	per site	275-425
• sewage to vehicle tanks (TRL sites)	per site	60(150)-100(400)
• Grey water to nearby Class 2 SS	per site	15-25
For more details on designs flows and related assumptions see Section 14-2-16 and Appendix 14.2.1. Figures in brackets are for tank design.		
(CAR) WASH		
- Hand wash	per car	200
- Truck wash	per truck	400
CHURCHES		
- With kitchen facilities	per sanctuary seat	30
- No kitchen facilities	per sanctuary seat	15
- Kitchen wastes – paper service	per meal	5
- Kitchen wastes – normal service	per meal	15
COUNTRY CLUBS		
- Residents	per person	375
- Non residents – no meals	per person	100
- Showers during use	per fixture	1800
- Water closets	per fixture	550
- Wash basins	per fixture	350
- Urinals – hand flush	per fixture	350
- Showers	per person	20
- Day staff	per person	150
DANCE HALLS		
- Hall – washrooms only-per day in use	per m^2	15
- Dance hall restaurant	per seat	125
- Dance hall bar	per seat	20
- Dance hall plus restaurant plus bar	per patron	150

APPENDIX 4-A DAILY SEWAGE FLOW FOR VARIOUS ESTABLISHMENTS

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
DOG KENNELS	per closure	75
DINING HALLS – see restaurants		
DWELLINGS		
- Single family houses, apartments Condominiums, cottages, etc.	per person	350
- Each dwelling unit of -	1 bedroom	275
- Each dwelling unit of -	2 bedrooms	1100
- Each dwelling unit of -	3 bedrooms	1600
- Each dwelling unit of -	4 bedrooms	2000
- Add for each bedroom over 4	per bedroom	300
- Boarding or Rooming houses	per person	200
- Boarding or Rooming houses without meals or laundry	per person	150
- Non resident staff	per person	40
- Luxury homes – 4 bedrooms	per residence	3000
- Luxury homes – 5 bedrooms	per residence	3500
- Luxury homes – add for each bedroom over 5		500
EMPLOYEES – VARIOUS LOCATIONS		
- Factory or plant workers per day or per shift – includes showers but no industrial	per person	125
- Factory or plant workers as above but no showers	per person	75
- Various buildings and places of Employment – e.g. store employees, Office workers – depends on facilities	per person	75 *
- Medical Office buildings, dental Offices and medical clinics		
- Doctors, nurses & medical staff	per person	275
- Office staff	per person	75
- Patients	per person	25
HOTELS – See Motels		

APPENDIX 4-A DAILY SEWAGE FLOW FOR VARIOUS ESTABLISHMENTS

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
INSTITUTIONS		
- Hospitals – including laundry	per bed	1400 *
- Hospitals - excluding laundry	per bed	550
- Nursing homes & rest homes	per bed	450
- Other institutional residences	per person	400
LAUNDRY		
- Household type automatic washer Each use	per fill, wash and rinse	20
- Household type automatic washer Each use	as above plus permanent press	170
- Laundromat	per customer or per wash	170
- Laundromat per day	per machine	2000
- Auto washers in apartment bldgs	per machine	1200
MOTELS AND HOTELS		
Residential portion:		
- With full housekeeping facilities	per person	225
- With bath or toilet only (private)	per person	180
- With central bath only		150
No residential portions:		
- With dining room, add	per seat	125
- With bar or cocktail lounge, add	per seat	70
- Non resident staff, add	per person	40
MOBILE HOME PARKS		
- Mobile home – single bedroom	per unit	750
- Mobile home – 2 bedrooms	per unit	1000
- Mobile home – 3 bedrooms	per unit	1200
PARKS, BEACHES, PICNIC GROUNDS, PUBLIC SWIMMING POOLS**		
- Picnic and fairgrounds with Bathhouses showers and toilets	per person	50
- Picnic and fairgrounds Flush toilets only	per person	20
- Swimming pools & beaches with Bathrooms, showers and toilets	per person	40

******* ***Varies with facilities provided. Based on parks and picnic grounds of about 75 people per acre***

APPENDIX 4-A DAILY SEWAGE FLOW FOR VARIOUS ESTABLISHMENTS

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
RESTAURANTS AND DINING ROOMS		
- Ordinary (not 24 hour) restaurant	per seat	125
- 24 hour restaurant	per seat	200
- 24 hour intercity freeway restaurant	per seat	375
- 24 hour intercity freeway restaurant with showers		400
- Auto dishwasher and/or waste disposer		
- ordinary restaurant	per seat	12
- 24 hour restaurant	per seat	24
- Kitchen and toilet wastes only	per seat	115
- Kitchen and toilet wastes	per patron	35 *
- Banquet rooms – each banquet	per seat	30
- Drive-in restaurants	per seat	125
- Drive-in - all paper service	per car space	60
- Drive-in - all paper service	per inside seat	60
- Taverns, bars and cocktail lounges With minimum food service	per seat	125
- Night club restaurant	per seat	175
SCHOOLS		
- Day school with cafeteria, gym And showers	per person	90
- Day school with cafeteria or Gym and showers	per person	60
- Day school without cafeteria or Gym and showers	per person	30
- Boarding schools	per resident	275
- Boarding schools non resident staff	per person	50
SERVICE STATIONS		
- Car servicing (one service bay)	per car	40
- Catch basins in garage floors for Floor cleaning	per basin	375
SHOPPING CENTRES		
- Retail stores – washrooms only	per square metre of store area	5
- Retail stores area – parking area	per parking space	6
- Retail store area – employees	per person	40
- Retail store area – toilet rooms	per toilet room	2000

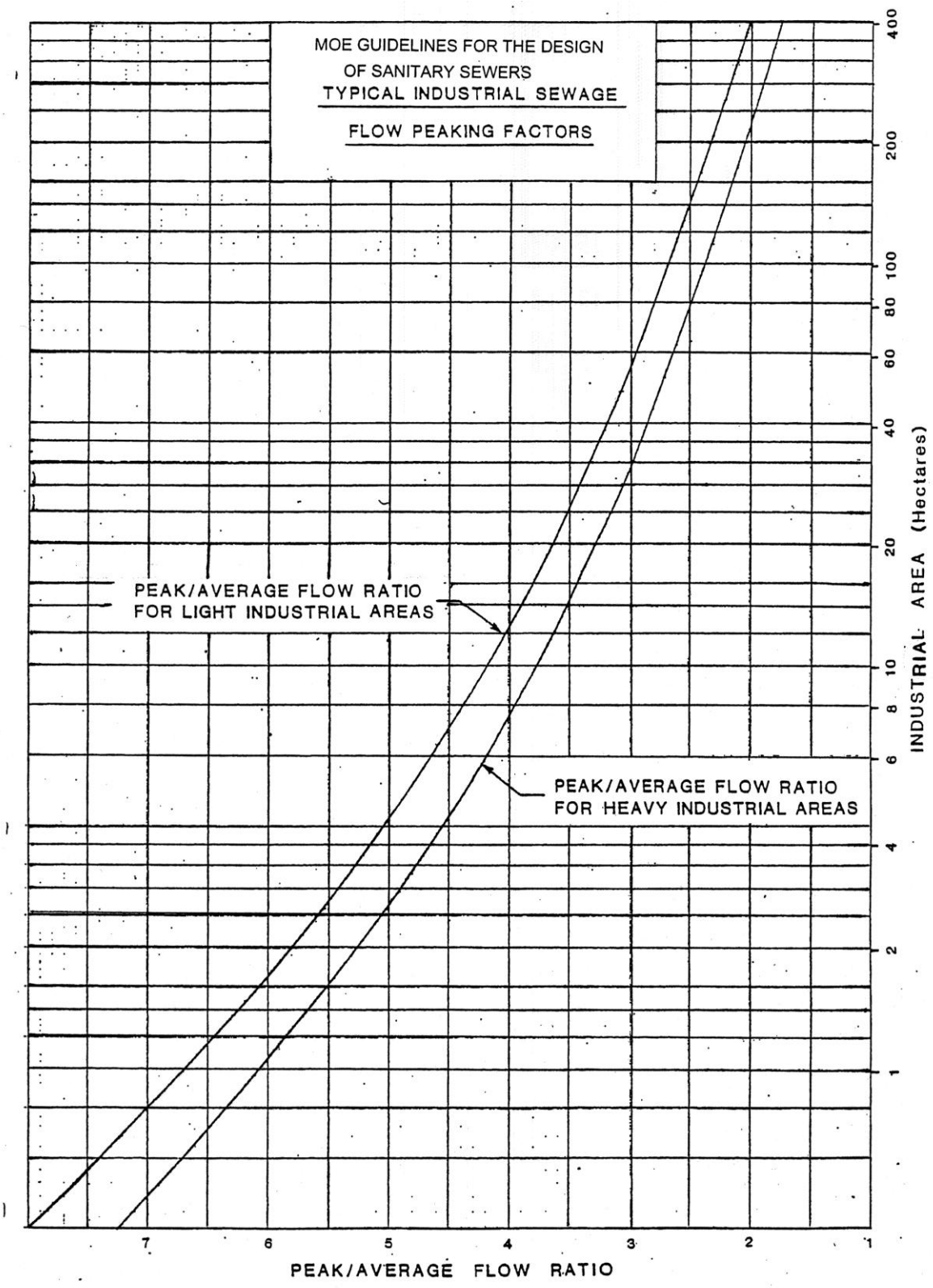
ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
THEATRES		
- Drive-in theatres – no food service	per car space	20
- Drive-in theatres with food service	per car space	40
- Auditoriums or theatres – no food	per seat	20
- Movie theatre	per seat	15

MISCELLANEOUS WATER USE ESTIMATES

FOR SEWAGE FLOW COMPUTATIONS

DETAILS	UNITS	ESTIMATED WATER SUPPLY NEEDS PER UNITS (LITRES)
1. Showers		
(a) Golf clubs	per person	40
(b) Public parks, etc.	per fixture per hour of use	575
2. Water Closets – Public parks, etc.	per fixture per hour of use	150
3. Wash basins	per fixture per day	375
4. Urinals (hand flush) Public parks, etc.	per fixture per hour Of use	375
5. Whirlpools type baths depends on make and model.		
- Types discharging after Each use	per use	130-680
- Re-circulating type	per filling (or discharge)	1300 and up

APPENDIX 4-B PEAKING FACTOR FOR INDUSTRIAL AREAS



APPENDIX "C"

Curve Numbers

Source:
MTO Drainage Management Manual (1995-1997)
Haestad Methods – Stormwater Conveyance Modeling and Design (2003)

Design Chart 1.08: Hydrologic Soil Groups

- Based on Surficial Geology Maps

Map Ref.No.	Soil Type or Texture	Hydrologic Soil Group (Tentative)
	Ground Moraine	
1a	Usually sandy till, stony, varying depth. (Most widespread type in Shield).	Usually B (shallow); may be A or AB
1b	Clayey till, varying depth.	BC-C
	End or Interlobate Moraine	
2a	Sand & stones, deep. (May be rough topography).	A
2b	Sand & stones capped by till, deep.	A-C depending on type of till.
2c	Sand & stones, deep. (Smoother topography).	A
	Kames & Eskers	
3a	Sand & stones, deep. (May be rough topography).	A
3b	Sand & stones capped by till, deep.	A-C depending on type of till.
3c	Sand & stones, deep. (Smoother topography).	A
	Lacustrine	
4a	Clay & silt, in lowlands.	BC-C
4b	Fine sand, in lowlands.	AB-B
4c	Sand, in lowlands.	AB
4d	Sand (deltas & valley trains).	A-AB
	Outwash	
5	Sand, some gravel, deep.	A
	Aeolian	
6	Very fine sand & silt, shallow. (Loess)	B
	Bedrock	
7	Bare bedrock (normally negligible areas).	Varies according to rock type.

Source: Ministry of Natural Resources - MNR

Design Chart 1.08: Hydrologic Soil Groups (Continued)

- Based on Soil Texture

Sands, Sandy Loams and Gravels	
- overlying sand, gravel or limestone bedrock, very well drained	A
- ditto, imperfectly drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium to Coarse Loams	
- overlying sand, gravel or limestone, well drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium Textured Loams	
- shallow, overlying limestone bedrock	B
- overlying medium textured subsoil	BC
Silt Loams, Some Loams	
- with good internal drainage	BC
- with slow internal drainage and good external drainage	C
Clays, Clay Loams, Silty Clay Loams	
- with good internal drainage	C
- with imperfect or poor external drainage	C
- with slow internal drainage and good external drainage	D

Source: U.S. Department of Agriculture (1972)

Design Chart 1.09: Soil/Land Use Curve Numbers

Land Use	Treatment or Practice	Hydrologic Condition[4]	Hydrologic Soil Group			
			A	B	C	D
Fallow	Straight row	---	77	86	91	94
Row crops	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	" and terraced	Poor	66	74	8	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	" and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded	Straight row	Poor	66	77	85	89
legumes[2]	" "	Good	58	72	81	85
or	Contoured	Poor	64	75	83	85
rotation	"	Good	55	69	78	83
meadow	" and terraced	Poor	63	73	80	83
	" and terraced	Good	51	67	76	80
Pasture		Poor	68	79	86	89
or range		Fair	49	69	79	84
	Contoured	Good	39	61	74	80
	"	Poor	47	67	81	88
	"	Fair	25	59	75	83
		Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		---	59	74	82	86
		---	72	82	87	89
		---	74	84	90	92

For average anticedent soil moisture condition (AMC II)
[2] Close-drilled or broadcast.

[4] The hydrologic condition of cropland is good if a good crop rotation practice is used; it is poor if one crop is grown continuously.

Source: U.S. Department of Agriculture (1972)

Design Chart 1.09: Soil Conservation Service Curve Numbers (Continued)

Land Use or Surface	Hydrologic Soil Group						
	A	AB	B	BC	C	CD	D
Fallow (special cases only)	77	82	86	89	91	93	94
Crop and other improved land	66** (62)	70** (68)	74	78	82	84	86 AMC I
Pasture & other unimproved land	58* (38)	62* (51)	65	71	76	79	81
Woodlots and forest	50* (30)	54* (44)	58	65	71	74	77
Impervious areas (paved)							98
Bare bedrock draining directly to stream by surface flow							98
Bare bedrock draining indirectly to stream as groundwater (usual case)							70
Lakes and wetlands							50

Notes

(i) All values are based on AMC II except those marked by * (AMC III) or ** (mean of AMC II and AMC III).

(ii) Values in brackets are AMC II and are to be used only for special cases.

(iii) Table is not applicable to frozen soils or to periods in which snowmelt contributes to runoff.

Table 5.5 Runoff curve numbers for urban areas (Mockus, 1969)[a]

Cover Description	Average Percent Impervious Area[b]	Curve Numbers for Hydrologic Soil Group			
Cover Type and Hydrologic Condition		**A**	**B**	**C**	**D**
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[c]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious area only)[d]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1 to 2 in. sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre (506 m^2) or less (town houses)	65	77	85	90	92
1/4 acre (1,012 m^2)	38	61	75	83	87
1/3 acre (1,349 m^2)	30	57	72	81	86
1/2 acre (2,023 m^2)	25	54	70	80	85
1 acre (4,047 m^2)	20	51	68	79	84
2 acres (8,094 m^2)	12	46	65	77	82
Developing urban areas					
Newly graded area (pervious areas only, no vegetation)[e]		77	86	91	94
Idle lands (CNs are determined using cover types similar to those in Table 5.6)					

a. Average runoff condition, and $I_a = 0.2S$.

b. The average percent impervious area shown was used to develop the composite *CN*s. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a *CN* of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.

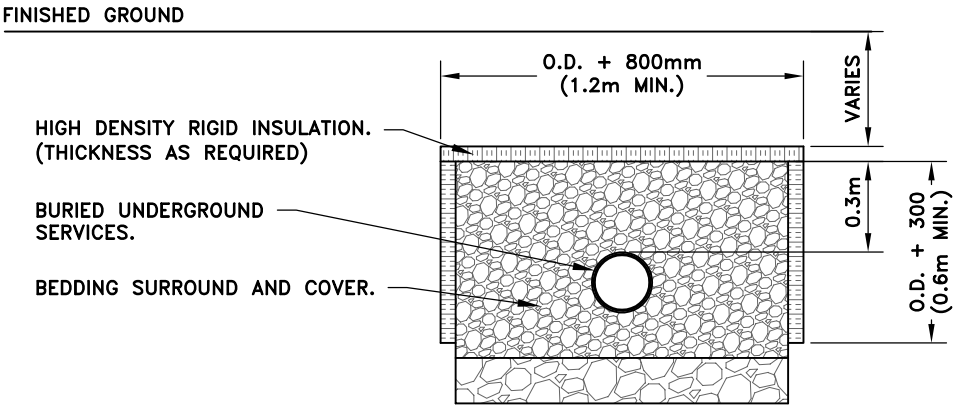
c. *CN*s shown are equivalent to those of pasture. Composite *CN*s may be computed for other combinations of open space cover type.

d. Composite *CN*s for natural desert landscaping should be computed using Figure 2.3 or 2.4 (in TR-55) based on the impervious area percentage ($CN = 98$) and the pervious area *CN*. The pervious area *CN*s are assumed equivalent to desert shrub in poor hydrologic condition.

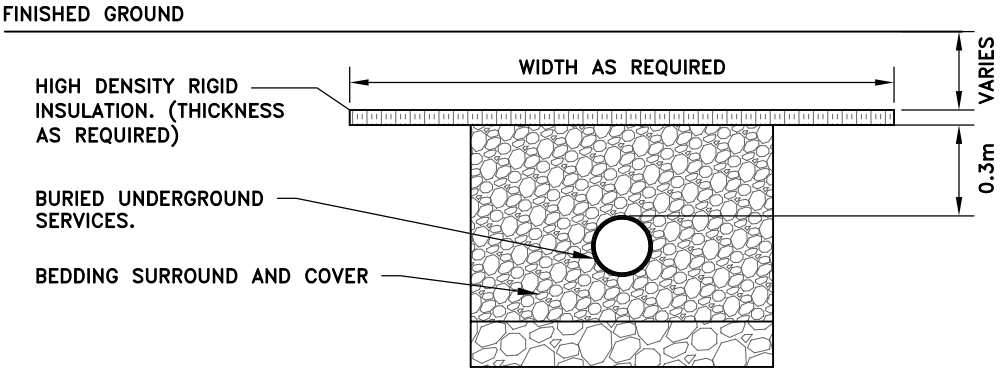
e. Composite *CN*s to use for the design of temporary measures during grading and construction should be computed using Figure 2.3 or 2.4 (in TR-55) based on the degree of development (impervious area percentage) and the *CN*s for the newly graded pervious areas.

APPENDIX “D”

City Details



TYPE 'A'



TYPE 'B'

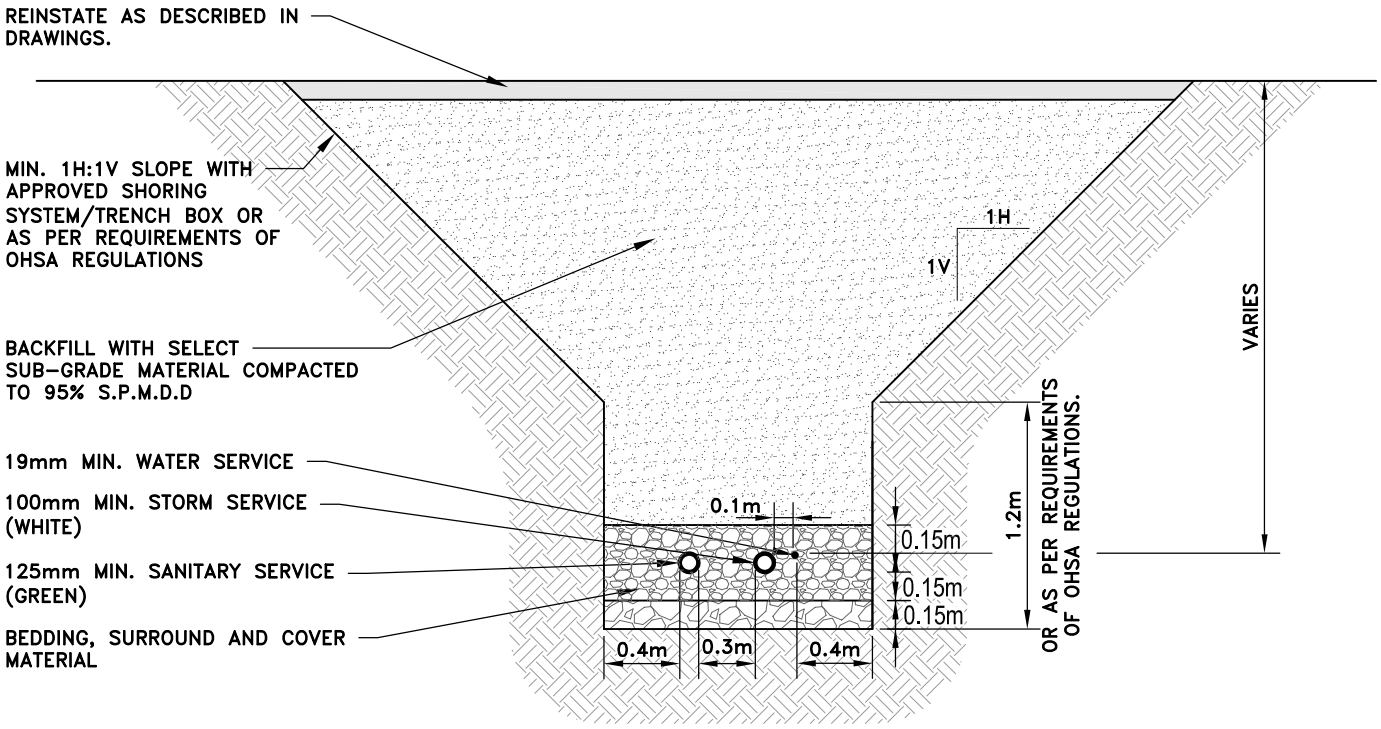
Clarence-Rockland

FROST PROTECTION DETAIL

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: SW1



Clarence-Rockland

SINGLE SERVICE TRENCH DETAIL

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: SW2

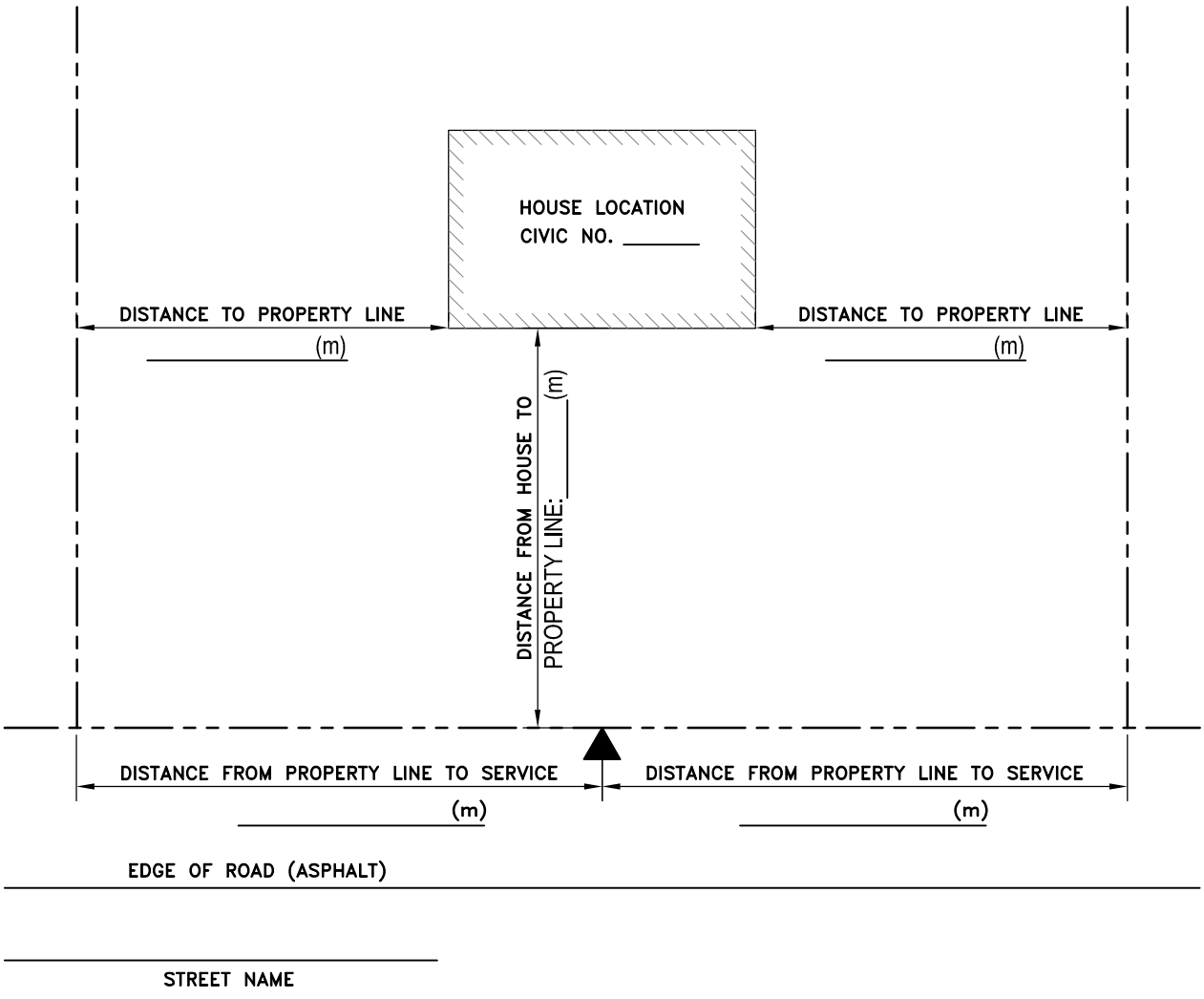
1. LOCATE NEW WATER SERVICE LOCATION (ON PROPERTY LINE) WITH A

2. LOCATE WELL WITH A ◔ OR WATERMAIN WITH — — — — —

3. LOCATE SEPTIC SYSTEM WITH A ▭ OR SANITARY SEWER WITH —·—·—·—

4. ALL MEASUREMENTS TO BE IN METERS.

5. TO DISTINGUISH BETWEEN THE SERVICES AT LOT LINE USE THE FOLLOWING COLOR CODE:
   SANITARY SEWER.....RED
   WATERMAIN.....BLUE



THIS FORM WAS PREPARED BY: _____ DATE: _____

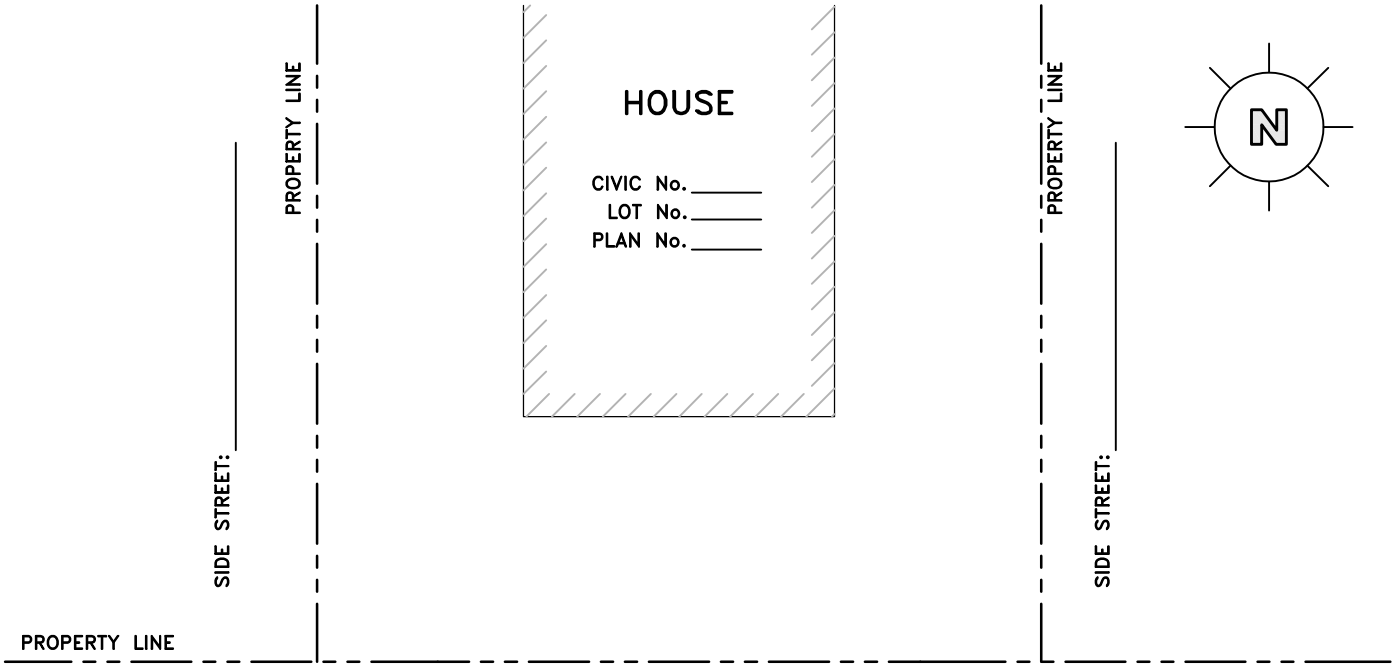
Clarence-Rockland

SERVICE LOCATION SHEET EXISTING DEVELOPMENTS

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: SW3



STREET NAME

SANITARY

MATERIAL: _____

COLOUR: _____

SIZE: _____

INVERT: _____

STORM

MATERIAL: _____

COLOUR: _____

SIZE: _____

INVERT: _____

REQUIRED CULVERT DIA.: _____
(IF APPLICABLE)

WATER

MATERIAL: _____

SIZE: _____

INVERT: _____

NOTES:

1. SHOW PLAN LOCATION OF SEWERS AND WATERMAINS. SPECIFY TYPE AND SIZE.
   USE SYMBOLS INDICATED HERE:
   STORM SEWER ——— – ———
   SANITARY SEWER ——--——--——
   WATERMAIN — — — — —

2. TO DISTINGUISH BETWEEN THE SERVICES AT LOT LINE USE THE FOLLOWING COLOR CODE:
   STORM SEWER.....GREEN
   SANITARY SEWER.....RED
   WATERMAIN.....BLUE

THIS FORM WAS PREPARED BY: _____ DATE: _____

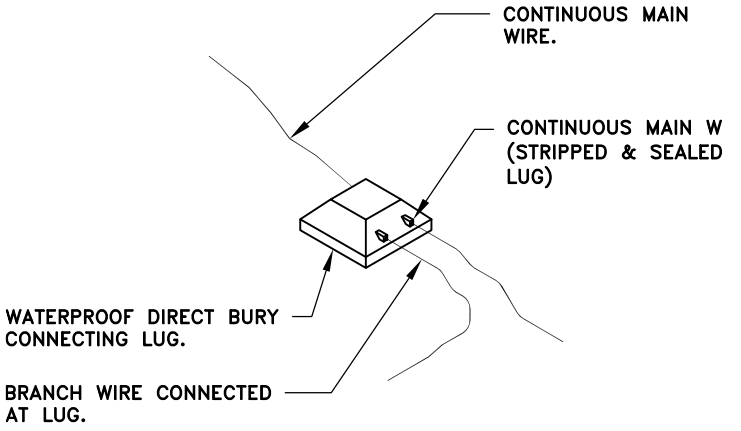
Clarence-Rockland

SERVICE LOCATION SHEET
NEW DEVELOPMENTS

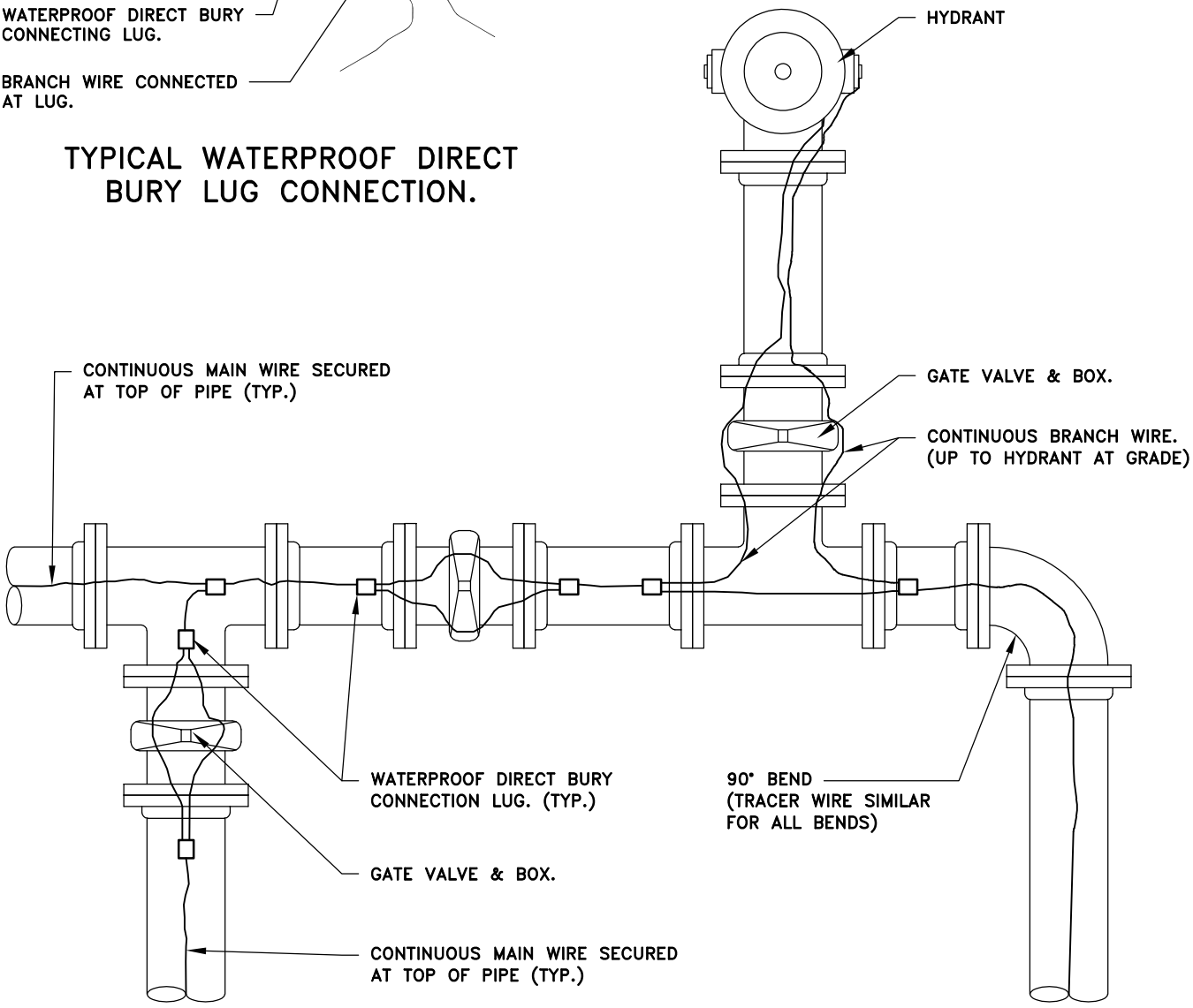
APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: SW4



TYPICAL WATERPROOF DIRECT BURY LUG CONNECTION.



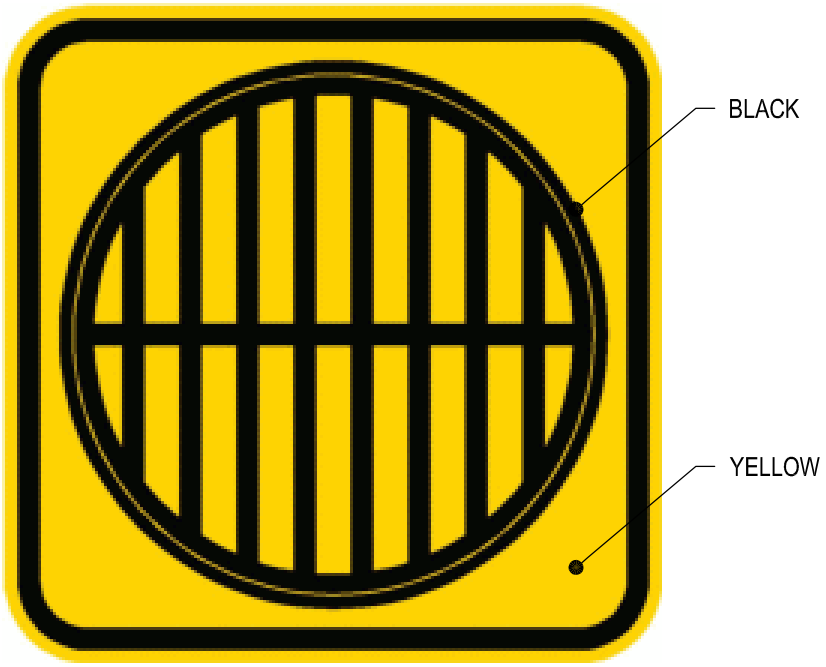
Clarence-Rockland

TRACER WIRE INSTALLATION FOR WATERMAIN VALVES, HYDRANTS AND TEES

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: SW5



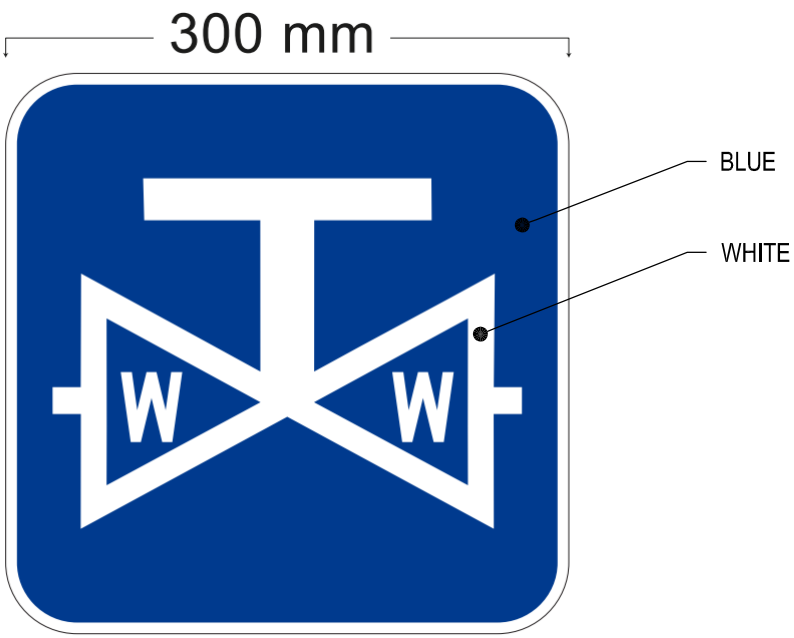
Clarence-Rockland

MANHOLE LOCATOR SIGN

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: SW6



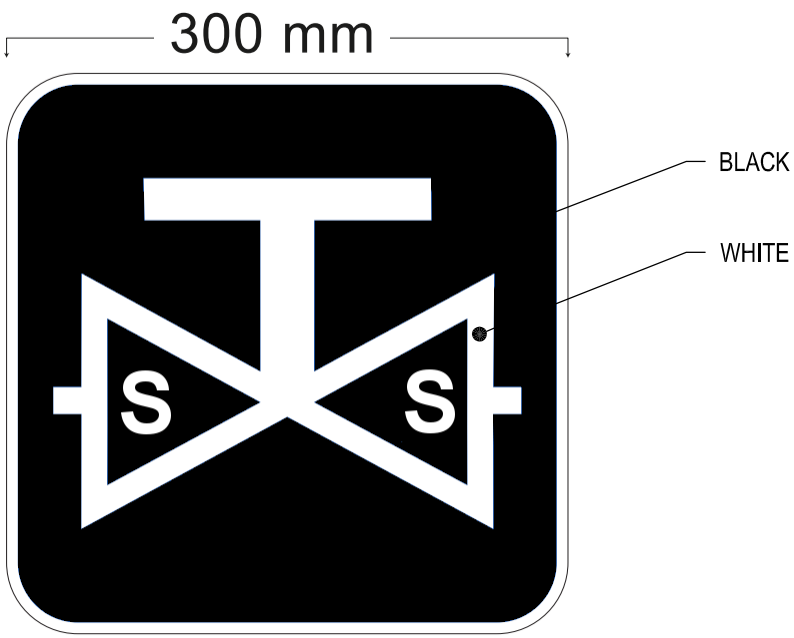
Clarence-Rockland

WATER VALVE LOCATOR SIGN

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: SW7



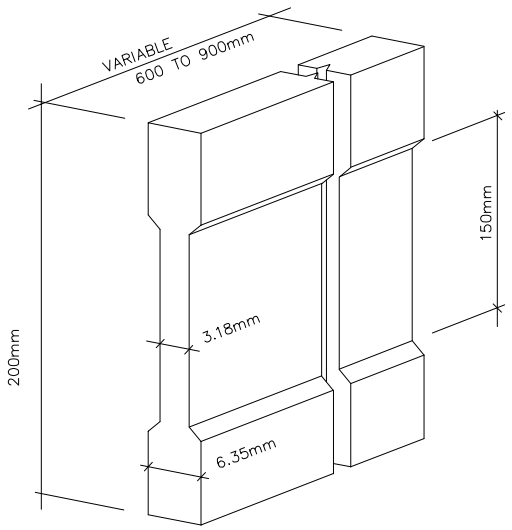
Clarence-Rockland

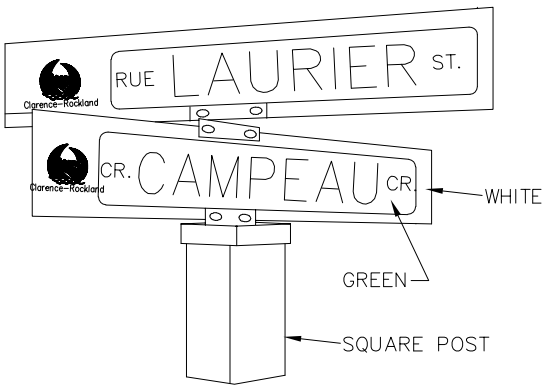
FORCEMAIN VALVE LOCATOR SIGN

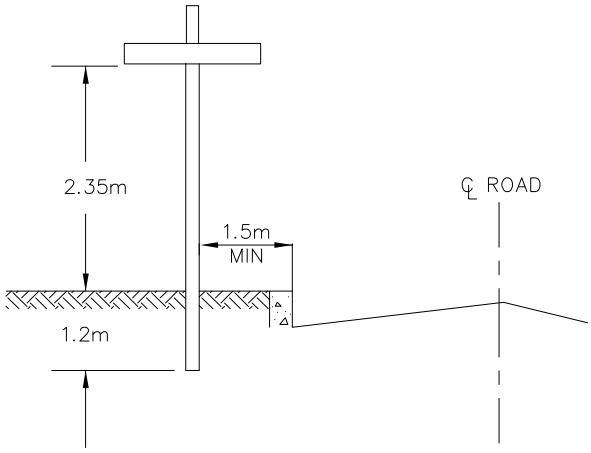
APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: SW8







NOTES:

1) TYPE IV HIGH INTENSITY PRISMATIC REFLECTIVE SHEETING (3M SHEETING SERIES 3930 OR EQUIVALENT) TO BE USED FOR THE BACKGROUND, LETTERS AND LOGO

2) COLOUR: HIGH DENSITY (DIAMOND) WHITE BACKGROUND WITH CLEAR GREEN FILM WITH CUT OUT LETTERS

3) STREET NAME LETTER SIZE SHALL BE 130mm. SUFFIX LETTER SIZE SHALL BE 75mm.

4) MAXIMUM SIGN LENGTH TO BE 900mm (36").

5) THE SIGNS SHALL BE MOUNTED ON 14 GAUGE, 10' LONG, 1–3/4" x 1–3/4" TELESPAR POSTS, WITH A POST TOP BRACKET AND INSTALLED A MINIMUM OF 1.5m FROM THE EDGE OF PAVEMENT ON THE RADIUS OF THE INTERSECTION, TO THE SATISFACTION OF OF THE CITY ENGINEER.

6) THE SIGNS SHALL BE MOUNTED AT 2.35m ABOVE ADJACENT CENTRE LINE ROADWAY ELEVATION.

7) ALL MOUNTING HARDWARE, INCLUDING POST TOP BRACKET SHALL BE MADE OF ALUMINUM.

8) FOR PRIVATE ROADS, INCLUDE CITY LOGO AND "PVT/PRIVÉE" SUFFIXES.

Clarence-Rockland

EXTRUDED ALUMINUM STREET NAME SIGNS – GENERAL

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: R1.1

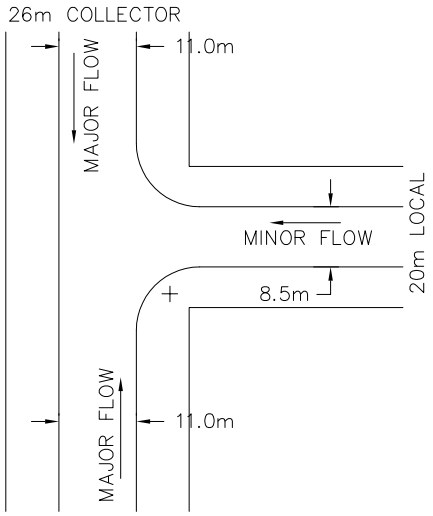
Clarence-Rockland

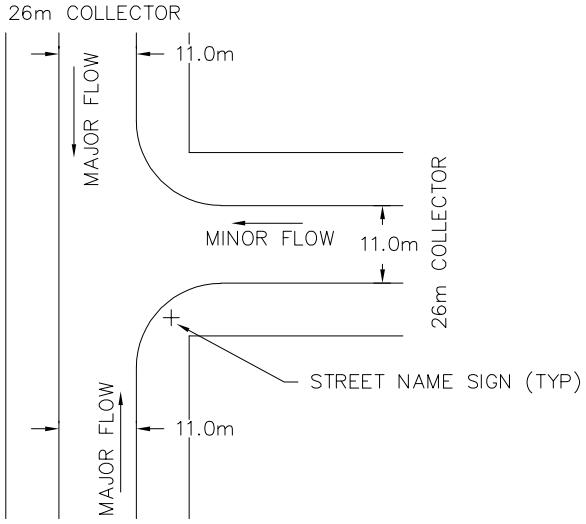
EXTRUDED ALUMINUM STREET NAME SIGNS – DIMENSIONS

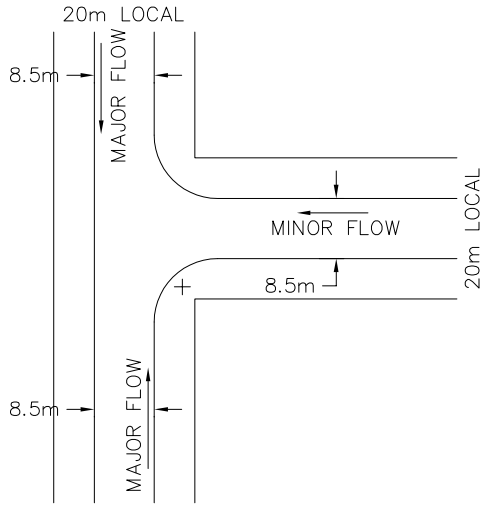
APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

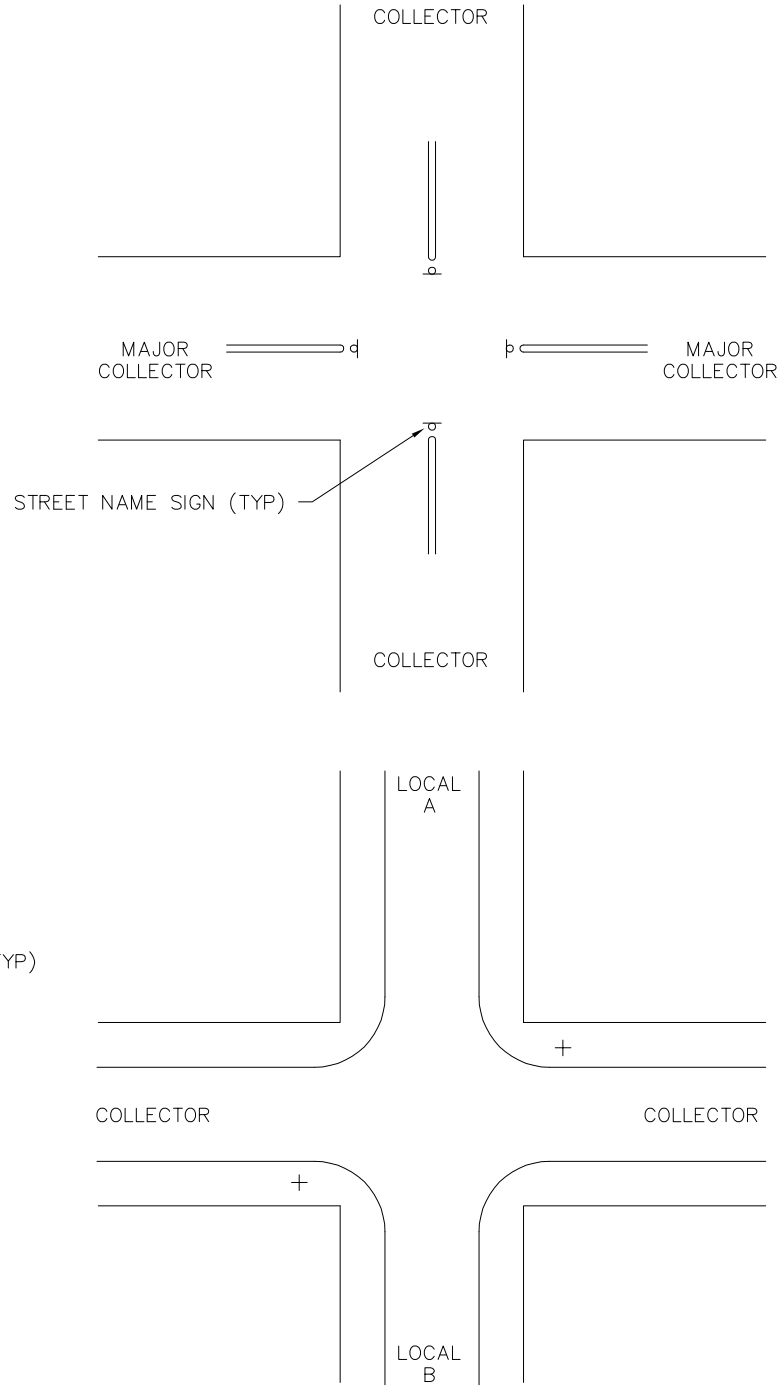
REV. DATE: MAY 2018

DWG. No.: R1.2









NOTES

1. SIGN LOCATIONS ARE FOR SIGNS AS PER CITY OF CLARENCE-ROCKLAND STANDARD R1.
2. SIGNS MAY BE STRAPPED TO STREETLIGHTS IF INSTALLED, WITH STAINLESS STEEL STRAPS.
3. FINAL LOCATIONS TO BE DETERMINED UPON DEVELOPMENT OF COMPOSITE UTILITY PLAN.

Clarence-Rockland

EXTRUDED ALUMINUM STREET NAME SIGN LOCATIONS

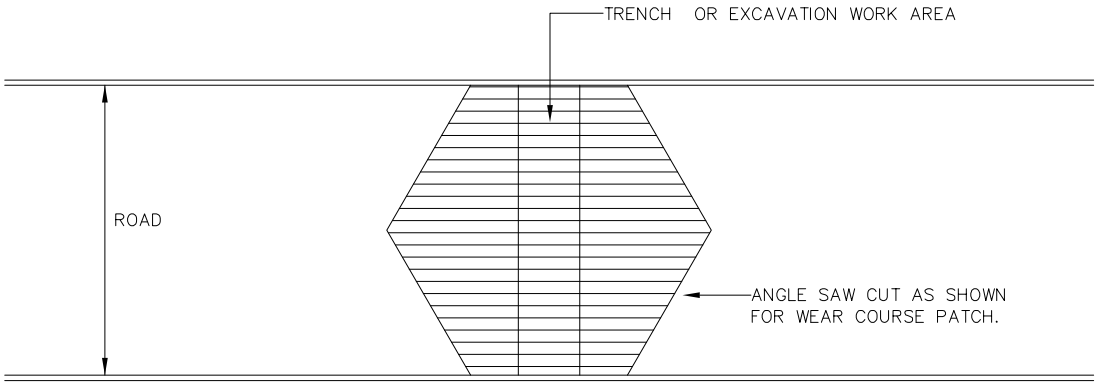
APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

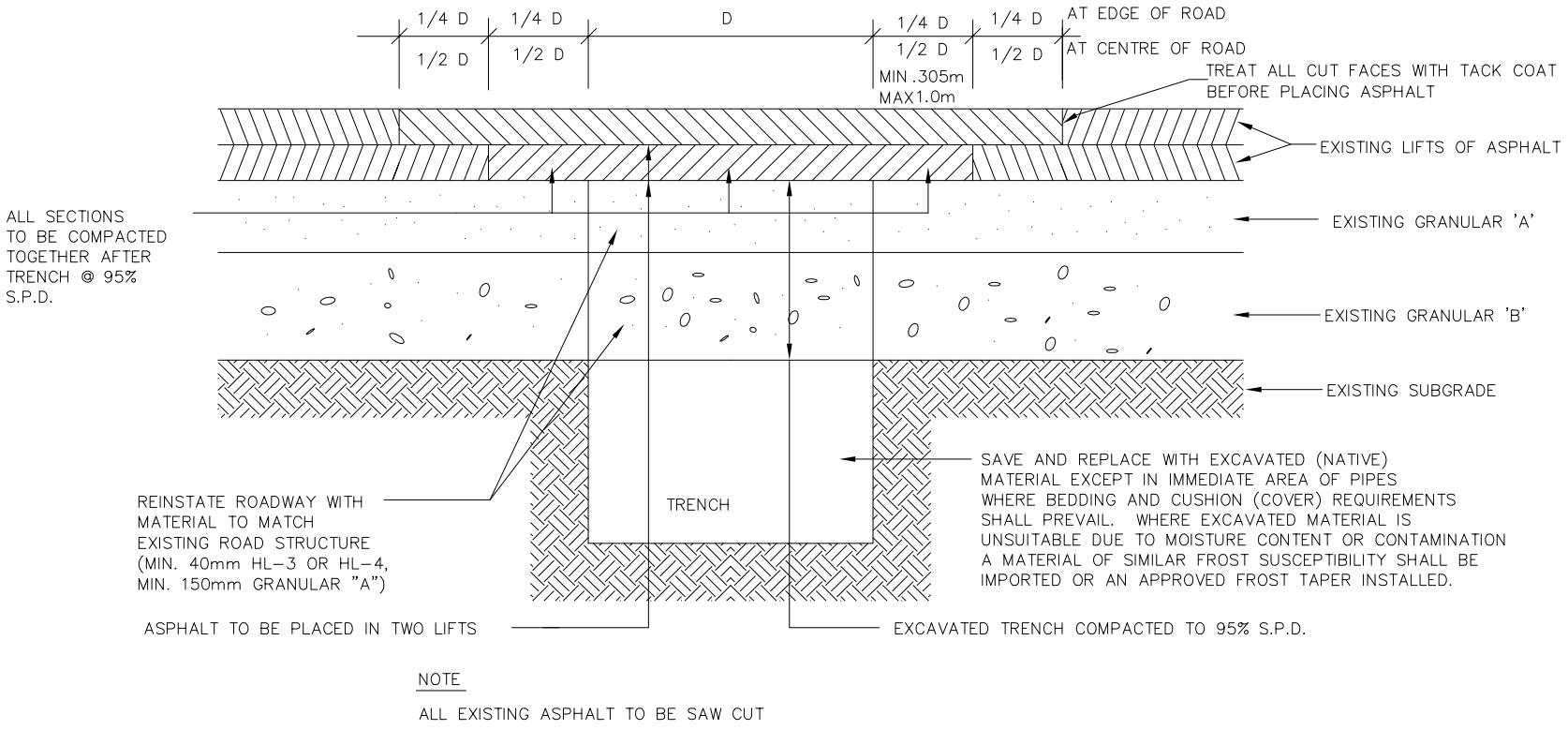
DWG. No.: R2

Clarence-Rockland

STANDARD ROAD CUT REINSTATEMENT



WEAR COURSE PATCH (PLAN VIEW)



NOTE

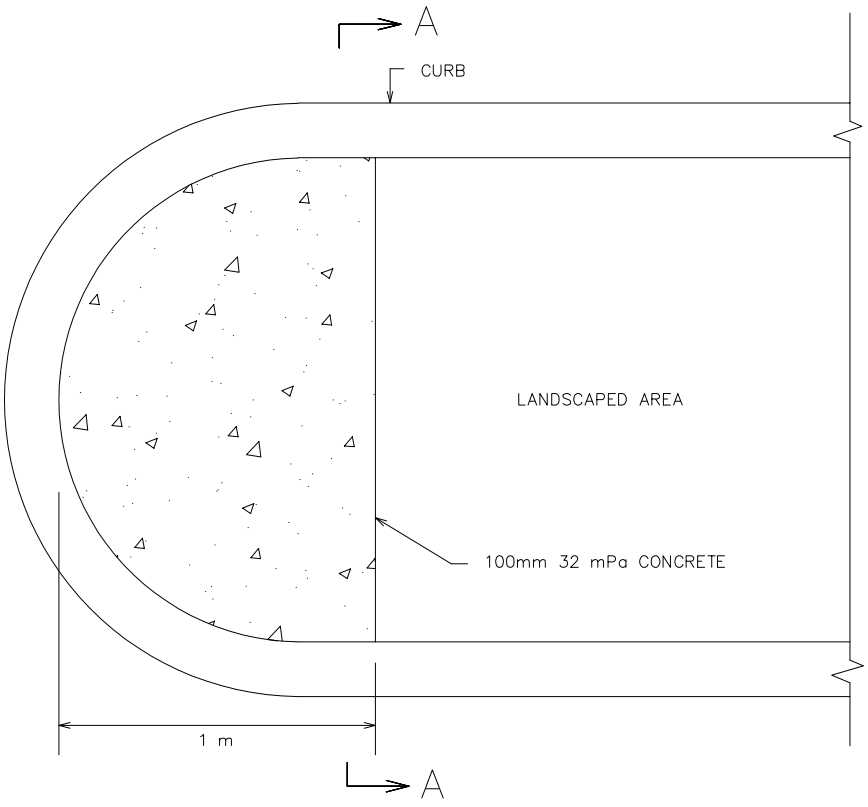
ALL EXISTING ASPHALT TO BE SAW CUT

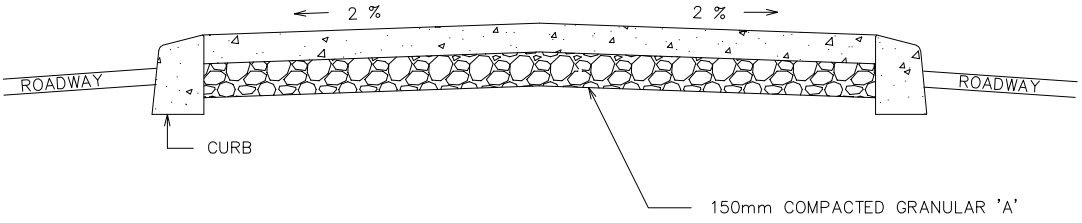
WEAR COURSE PATCH (SECTION DETAIL)

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.:
R3





SECTION A–A

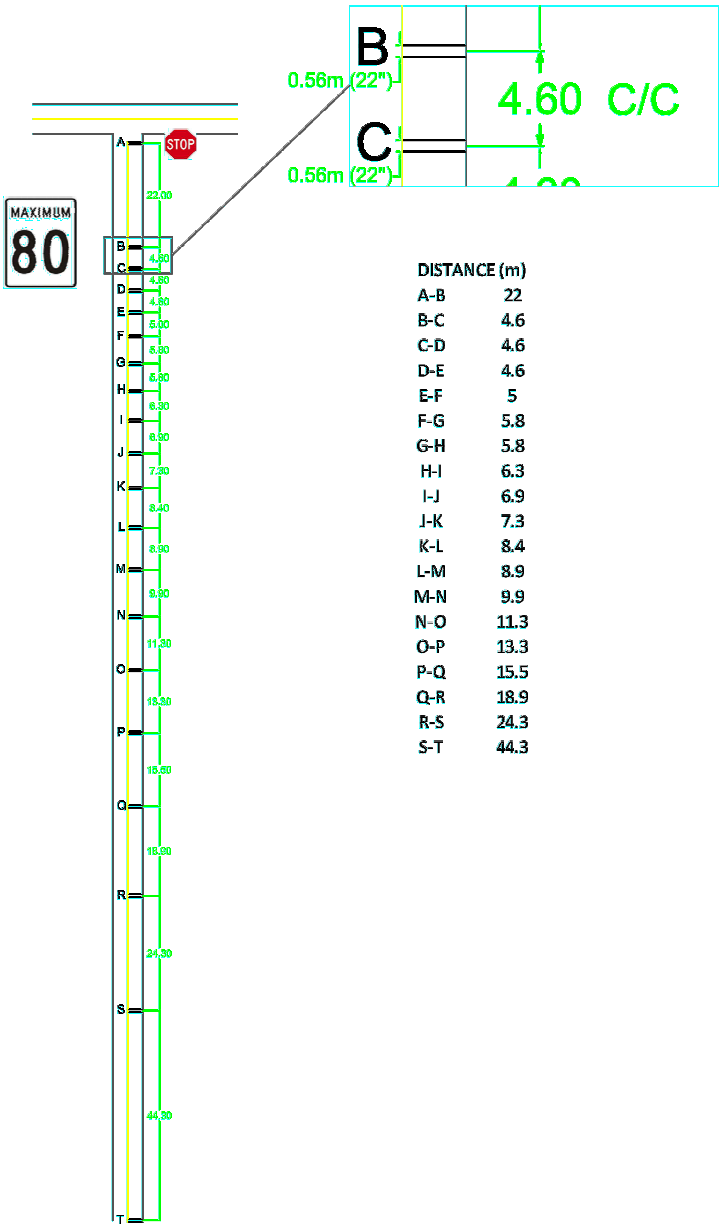
Clarence-Rockland

BULLNOSE TREATMENT

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: R4



DISTANCE (m)	
A-B	22
B-C	4.6
C-D	4.6
D-E	4.6
E-F	5
F-G	5.8
G-H	5.8
H-I	6.3
I-J	6.9
J-K	7.3
K-L	8.4
L-M	8.9
M-N	9.9
N-O	11.3
O-P	13.3
P-Q	15.5
Q-R	18.9
R-S	24.3
S-T	44.3

Note: All measurement are center to center (C/C)

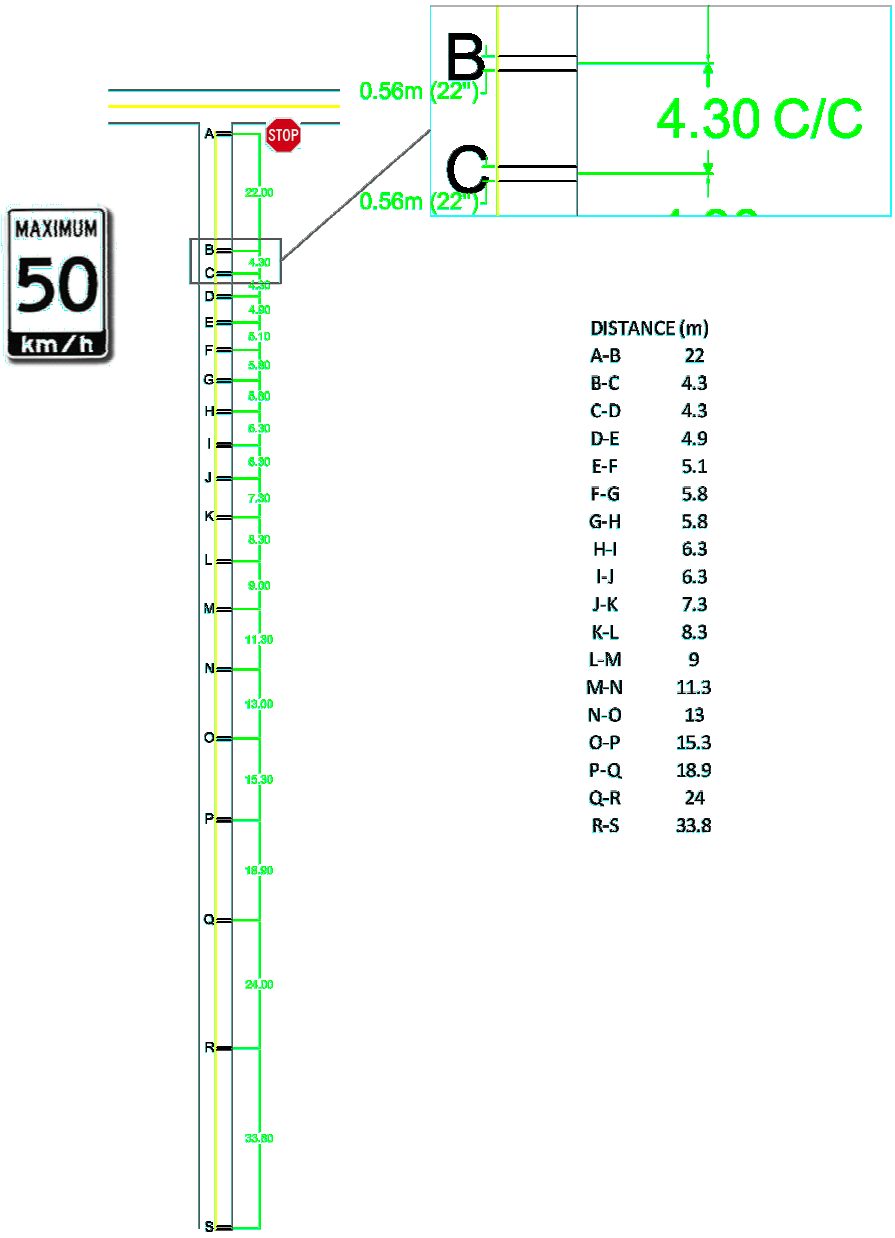
Clarence-Rockland

PROGRESSIVE STOP LINE
(80 km/h ROAD)

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: R5



DISTANCE (m)	
A-B	22
B-C	4.3
C-D	4.3
D-E	4.9
E-F	5.1
F-G	5.8
G-H	5.8
H-I	6.3
I-J	6.3
J-K	7.3
K-L	8.3
L-M	9
M-N	11.3
N-O	13
O-P	15.3
P-Q	18.9
Q-R	24
R-S	33.8

Note: All measurement are center to center (C/C)

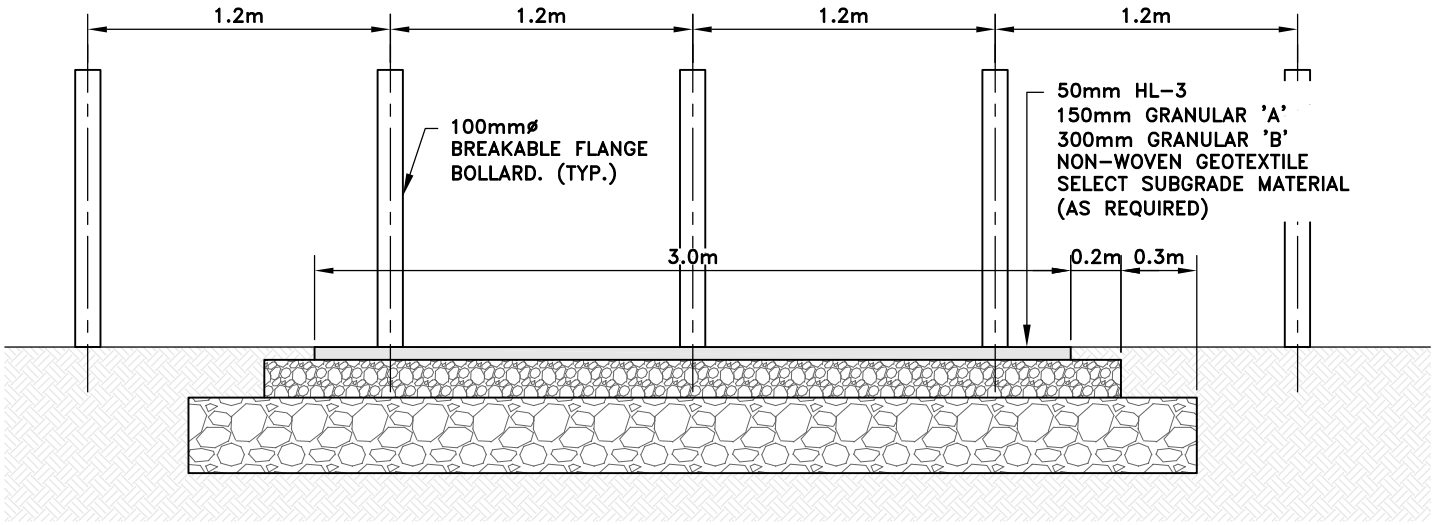
Clarence-Rockland

PROGRESSIVE STOP LINE
(50 km/h ROAD)

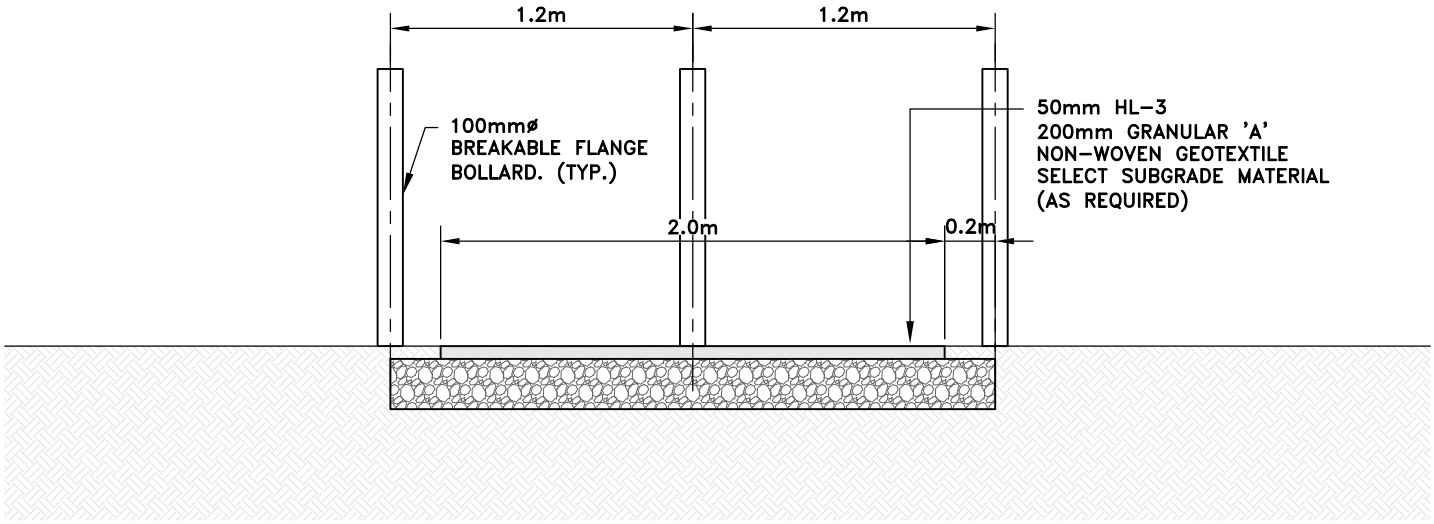
APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: R6



DRIVEABLE WALKWAYS/PATHWAYS



NON-DRIVEABLE WALKWAYS/PATHWAYS

Clarence-Rockland

TYPICAL EMERGENCY ACCESS & PATHWAY DETAIL

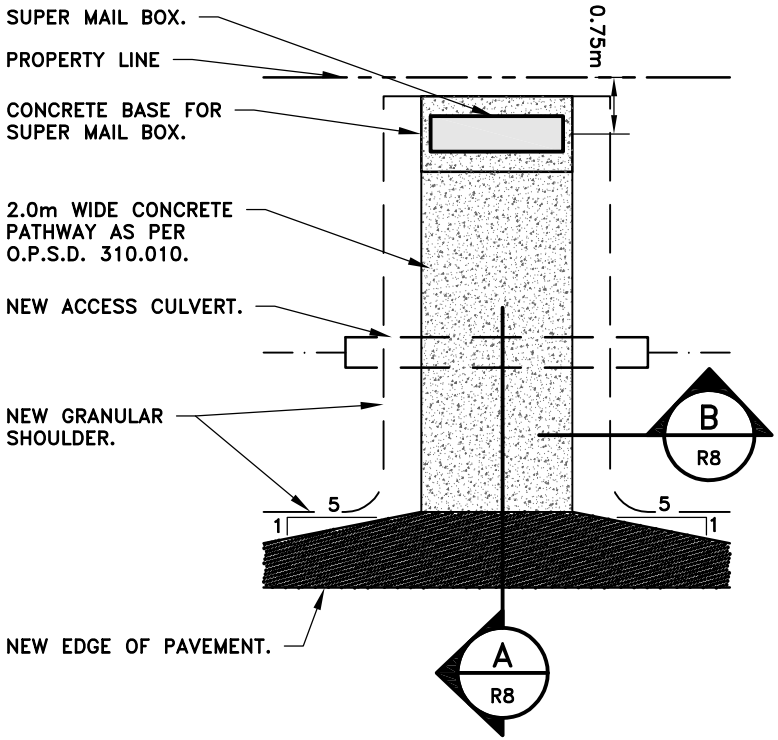
APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: R7

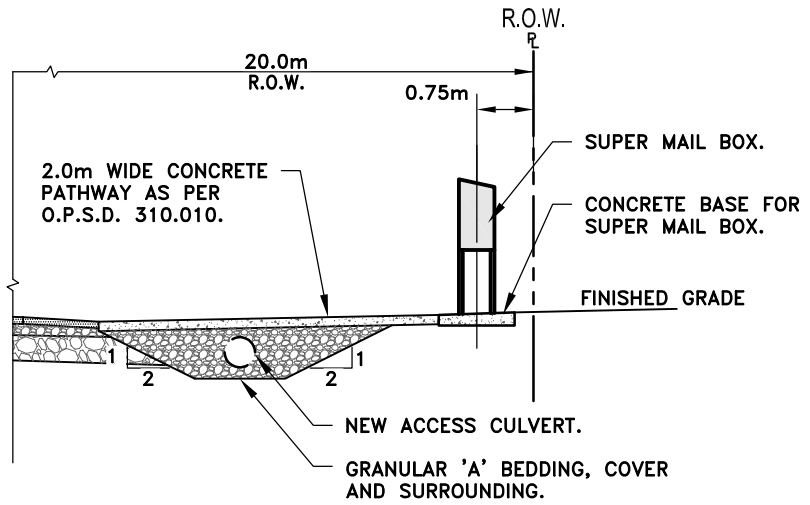
Clarence Rockland

SUPER MAIL BOX ACCESS DETAIL



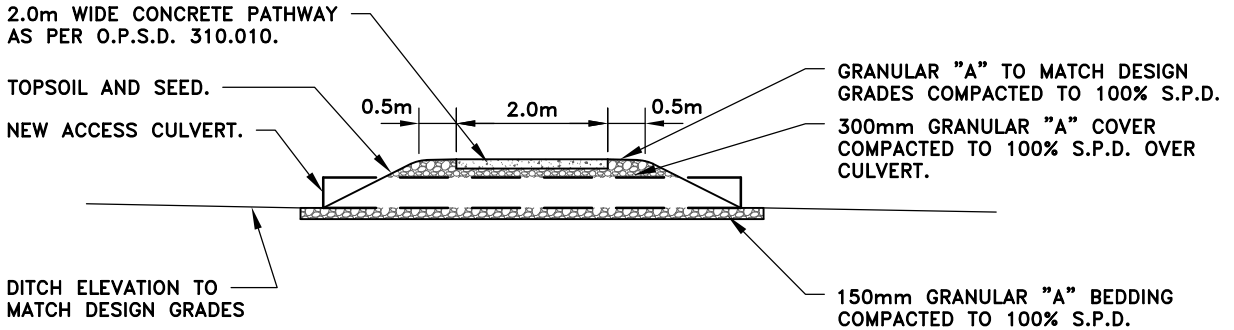
PLAN VIEW

SCALE: N.T.S.



A R8 CROSS-SECTION

SCALE: N.T.S.



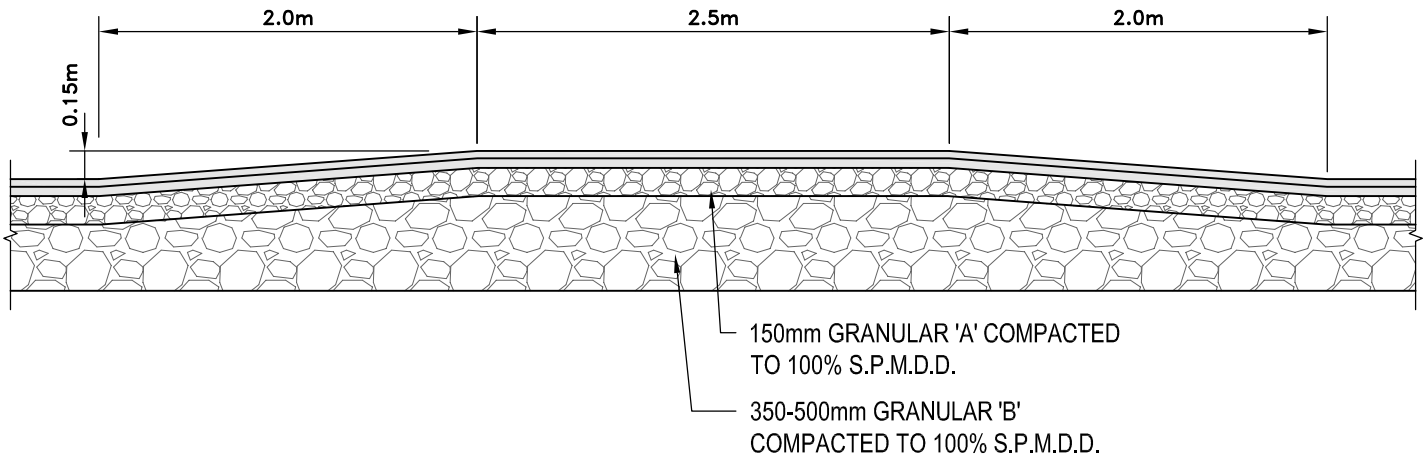
B R8 CROSS-SECTION

SCALE: N.T.S.

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: R8



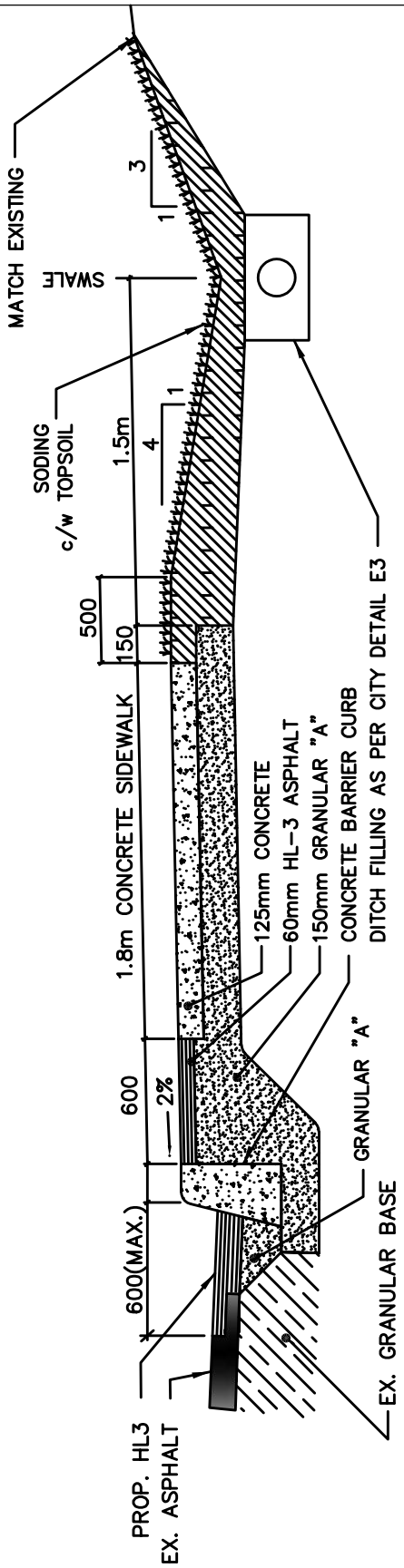
Clarence-Rockland

TYPICAL RAISED CROSSWALK

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: R9



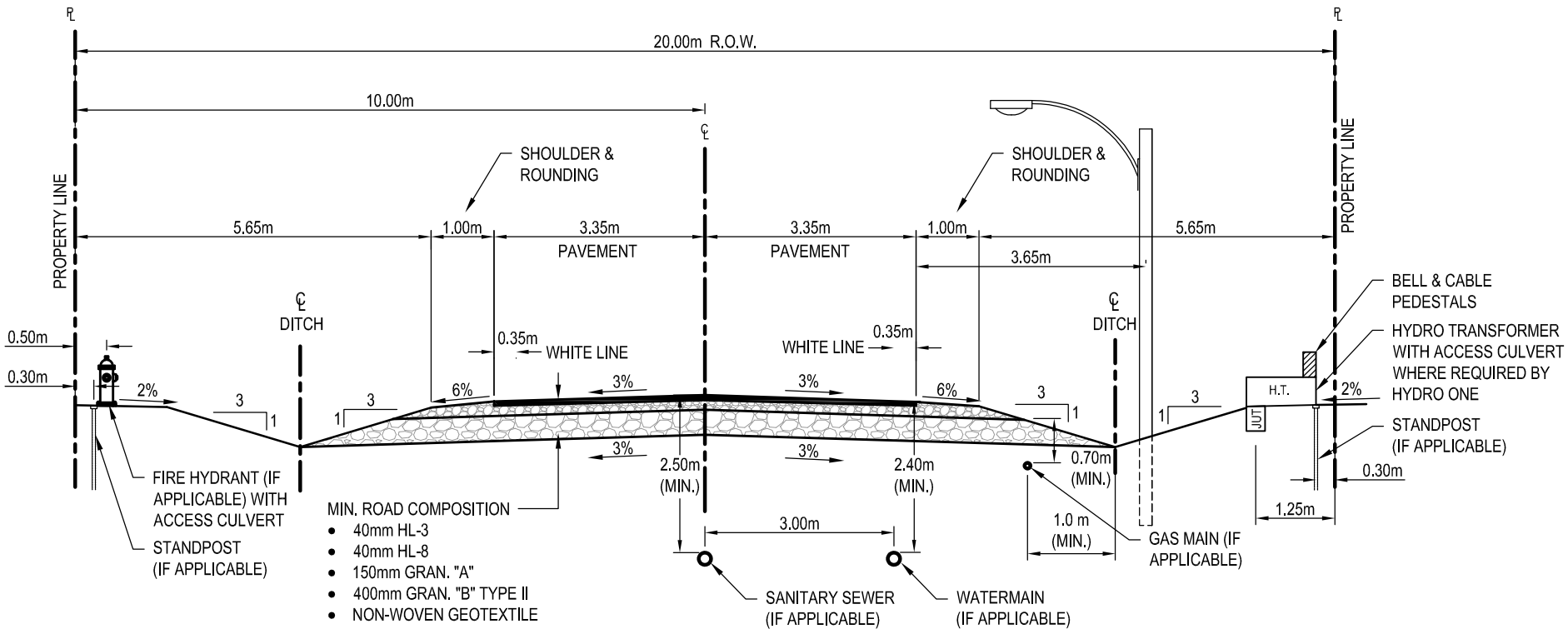
Clarence-Rockland

TYPICAL SIDEWALK WITH BOULEVARD

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: R10



City of Clarence-Rockland
1560, Laurier St, Rockland
Ontario K4K 1P7
613-446-6022

Clarence-Rockland

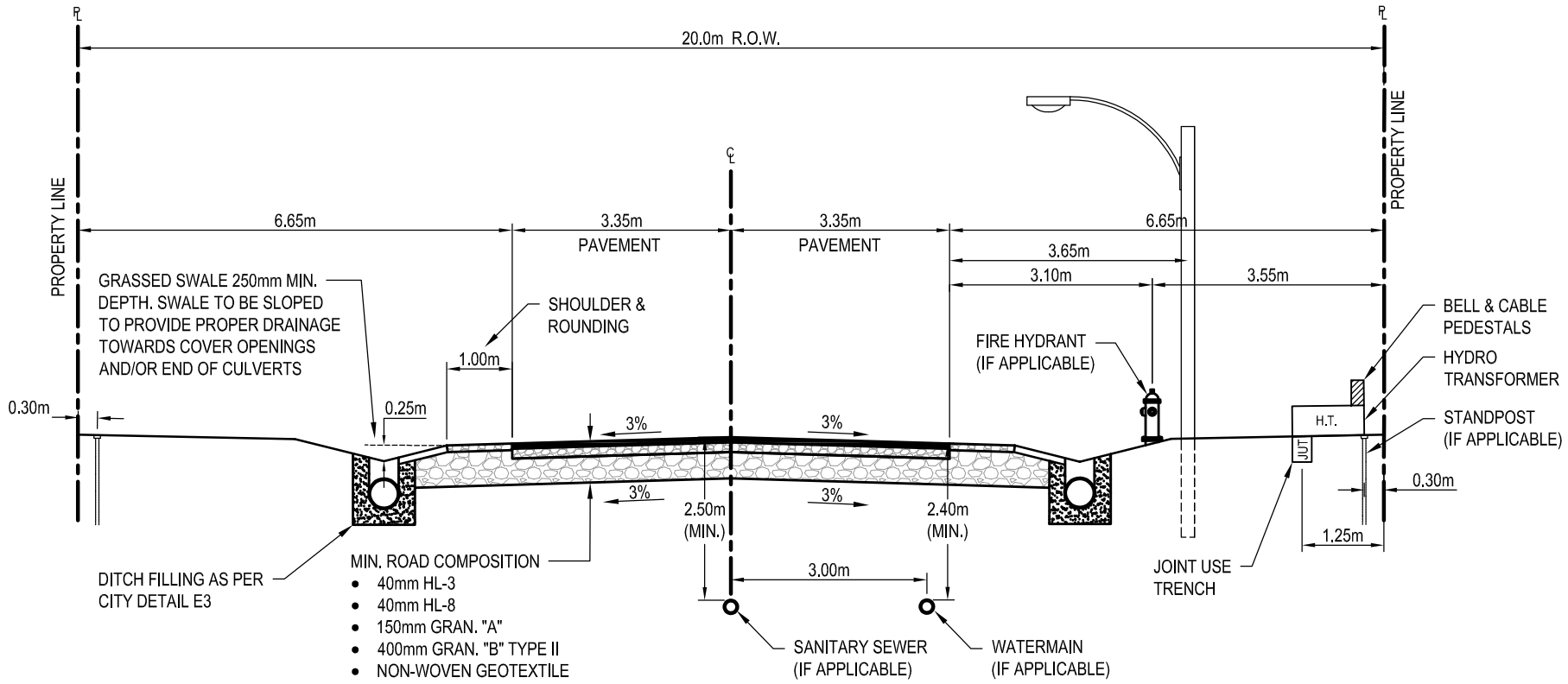
RURAL RETROFIT
20.0 METRE R.O.W

SCALE: NTS

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: X1



City of Clarence-Rockland
1560, Laurier St, Rockland
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Clarence-Rockland

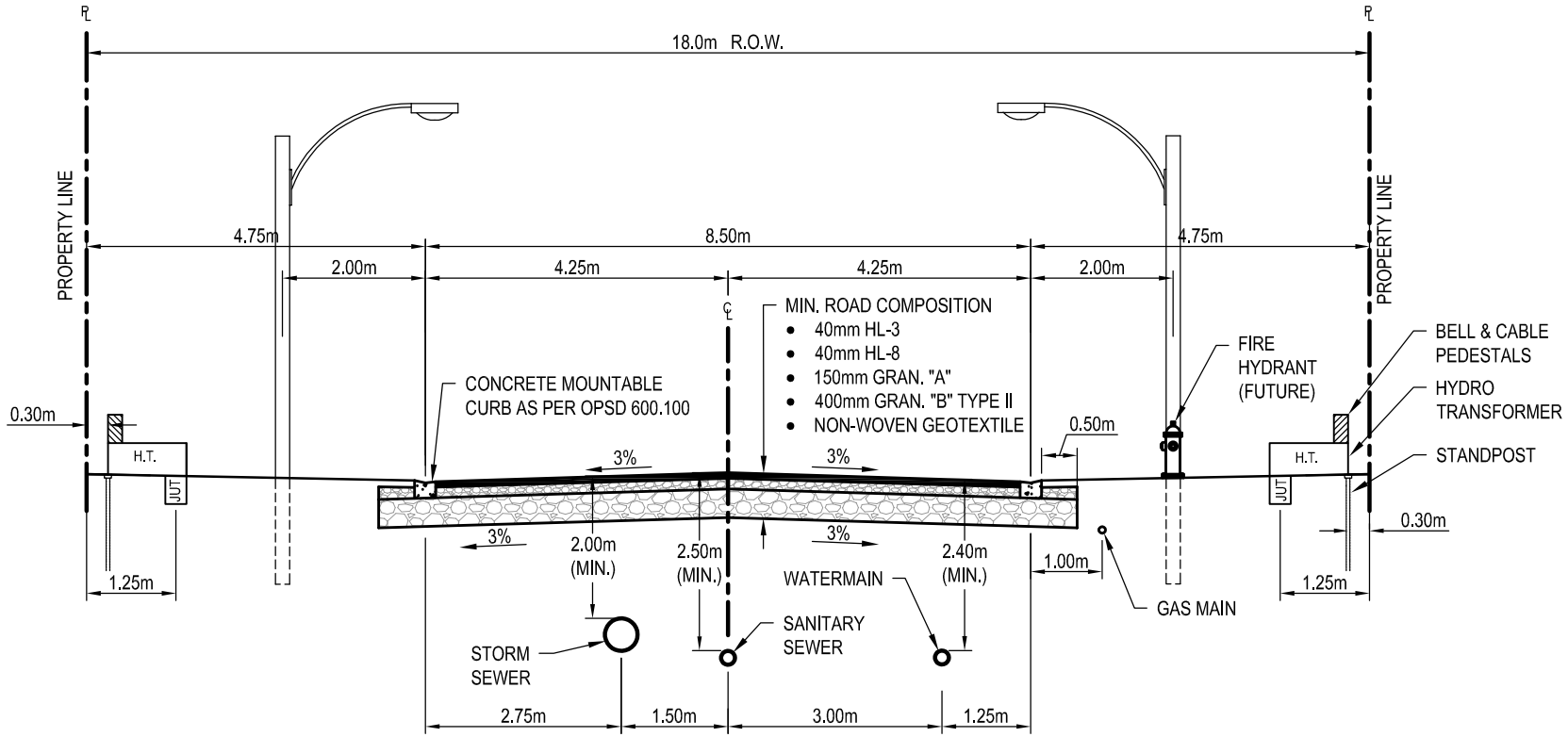
RURAL SUBDIVISION
20.0 METRE R.O.W.

SCALE: NTS

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: X2



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613-446-6022

Clarence-Rockland

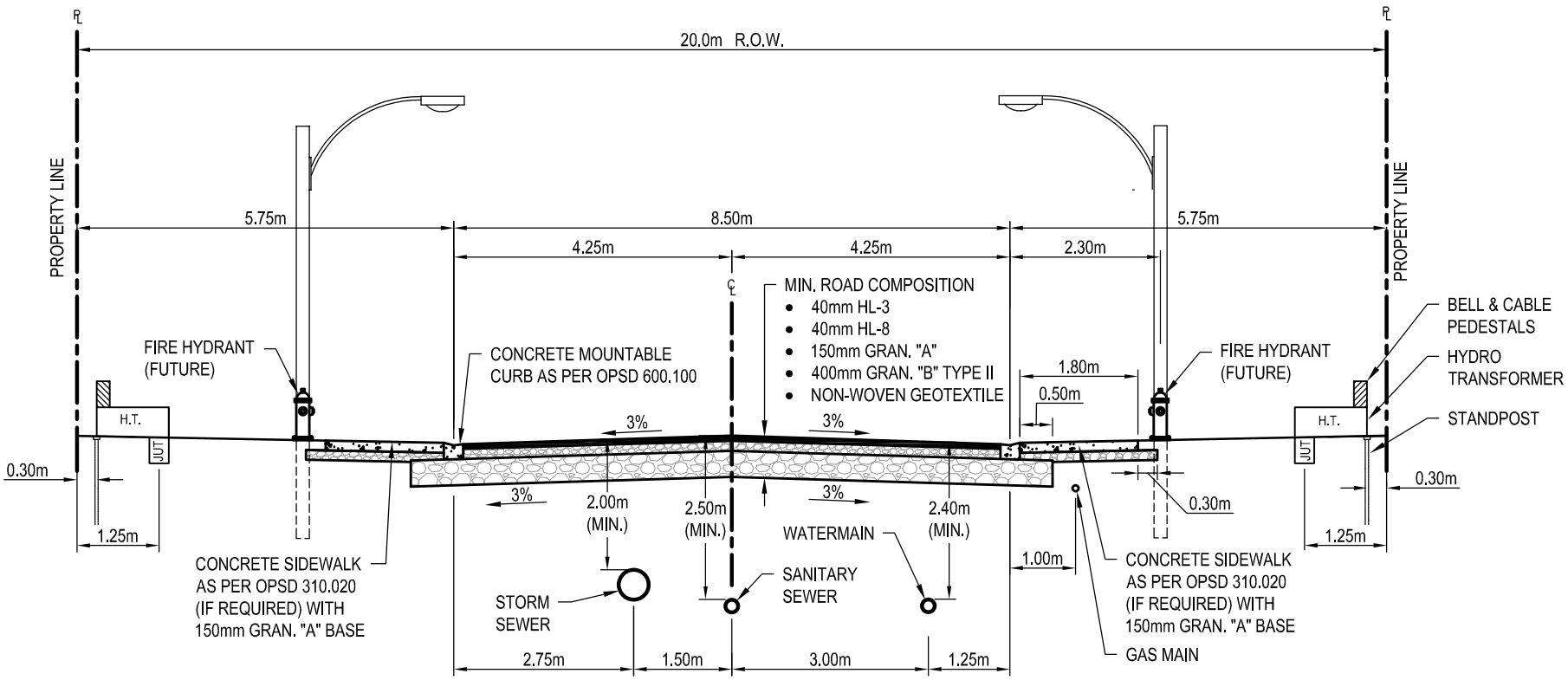
URBAN LOCAL ROAD
18.0 METRE R.O.W.

SCALE: NTS

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: X3



City of Clarence-Rockland
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Ontario K4K 1P7
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Clarence-Rockland

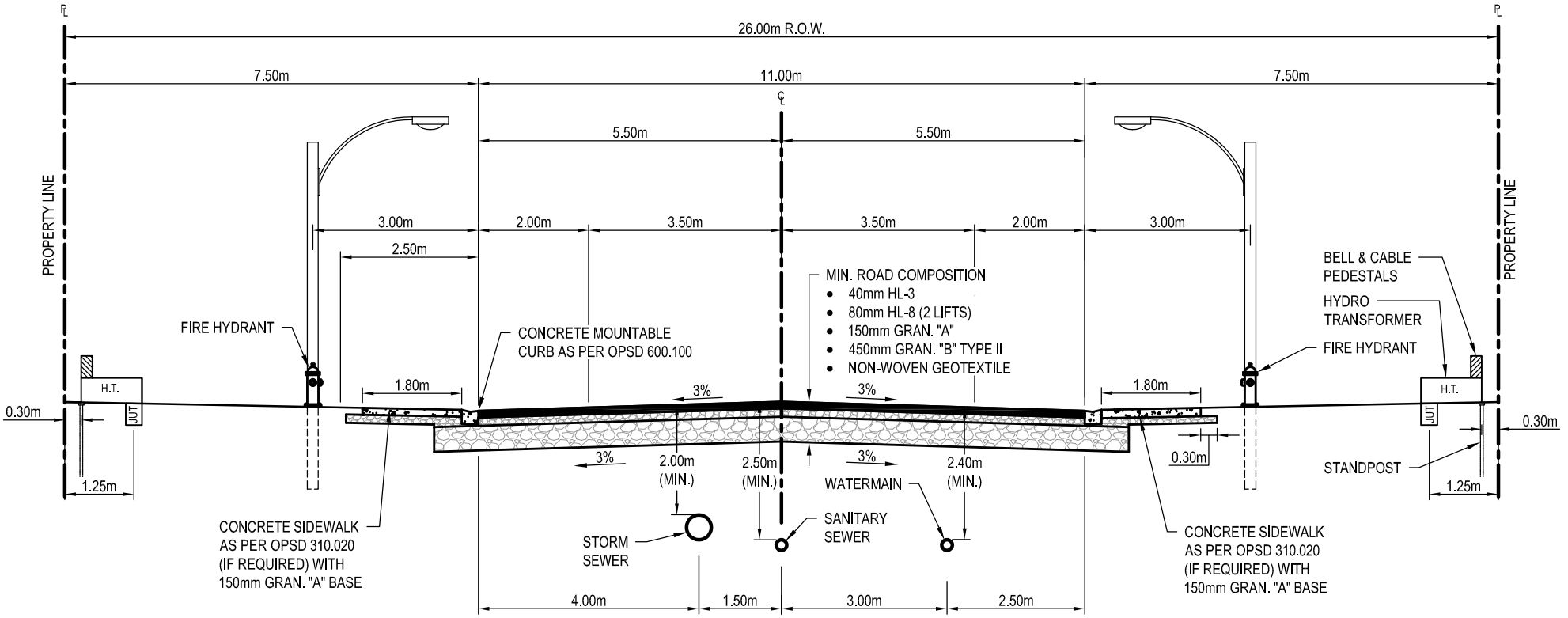
URBAN LOCAL ROAD
20.0 METRE R.O.W.

SCALE: NTS

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: X4



City of Clarence-Rockland
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Clarence-Rockland

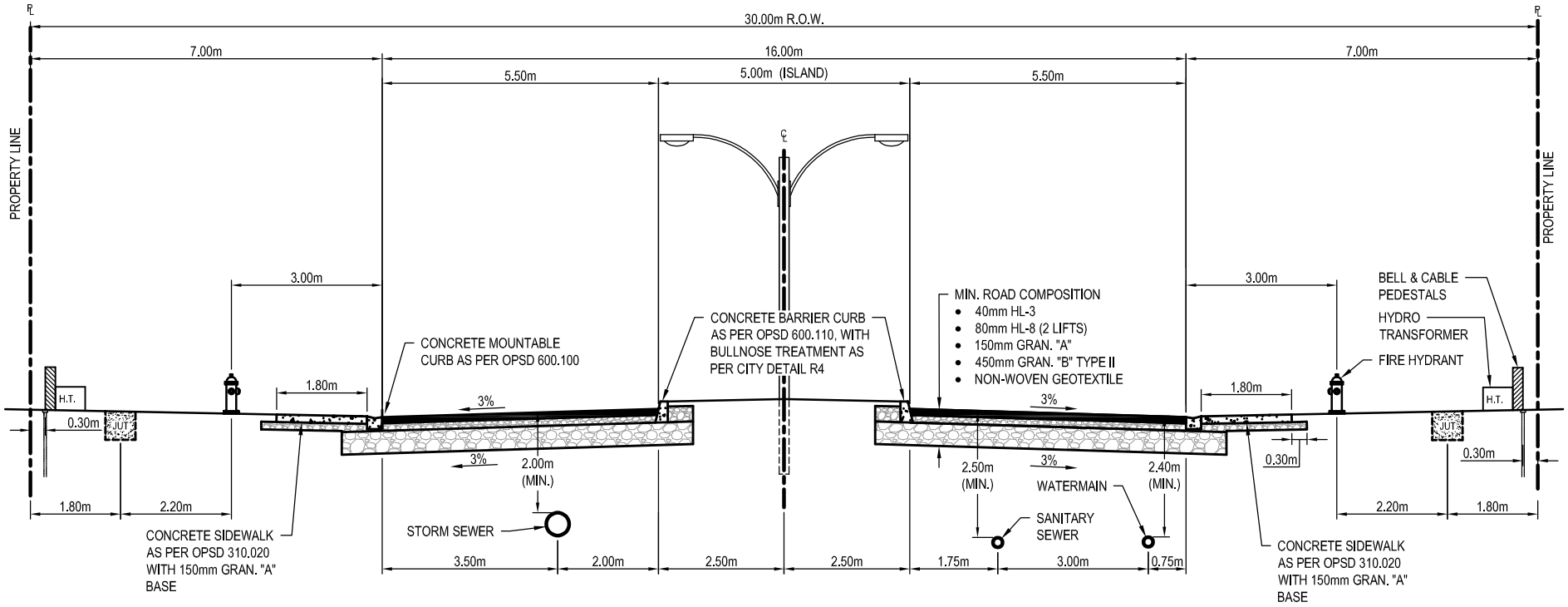
URBAN COLLECTOR
26.0 METRE R.O.W.

SCALE: NTS

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: X5



City of Clarence-Rockland
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URBAN COLLECTOR (ENTRANCE)
30.0 METRE R.O.W.

SCALE: NTS

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: X6

GENERAL NOTES

1. THE STANDARDS INDICATE MINIMUM DIMENSIONS THAT ARE TO BE INCORPORATED INTO THE DESIGN OF ANY NEW DEVELOPMENTS INVOLVING NEW AND EXISTING STREETS. ANY VARIATION TO THE DESIGN WILL REQUIRE APPROVAL OF THE CITY.

2. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH APPLICABLE CITY STANDARDS.

3. ALL COMPOSITE UTILITY PLANS MUST ADHERE TO THE CITY'S STANDARD LOCATION OF UTILITY PLANT DRAWINGS IN ORDER TO RECEIVE APPROVAL THROUGH THE SITE PLAN CONTROL AND SUBDIVISION APPROVALS PROCESS.

4. WATERMAIN AND HYDRANTS TO BE INSTALLED ON SOUTH AND EAST SIDE OF R.O.W. WHEN POSSIBLE.

5. SANITARY AND STORM SEWERS MAY BE INSTALLED OFF THE STREET CENTERLINE TO ACCOMMODATE LARGE SIZE SEWER PIPES AND STILL MAINTAIN THE CLEARANCES REQUIRED TO WATERMAINS.

6. BUILDING SEWERS AND WATER SERVICES ARE TO BE CONSTRUCTED IN ACCORDANCE WITH CITY STANDARDS.

7. SANITARY AND STORM SERVICE CONNECTIONS WILL BE TERMINATED AT THE PROPERTY LINE AND CAPPED. WATER SERVICE PIPE MATERIAL SHALL BE LAID IN ONE CONTINUOUS PIPE LENGTH (SPLICING AND JOINTING SHALL NOT BE PERMITTED) FROM INSIDE FACE OF THE BUILDING TO THE CURBSTOP AND FROM THE CURBSTOP TO THE MAIN / CORPORATION STOP.

8. 1.5 m CLEARANCE TO BE MAINTAINED AROUND WATER SERVICE POST.

9. TRANSFORMERS AND PEDESTALS SHALL BE LOCATED BETWEEN TOWNHOUSE BUILDING BLOCKS RATHER THAN ENCUMBERING AND/OR PREVENTING THE INSTALLATION OF TREES.

10. ALL PEDESTALS TO BE INSTALLED IN LINE WITH HYDRO TRANSFORMERS OR ON SIDE OF TRENCH AWAY FROM ROAD.

11. THE BASE OF A HYDRO TRANSFORMER MUST BE LOCATED A MINIMUM OF 2.0 m FROM THE EDGE OF A DRIVEWAY.

12. REQUIREMENTS FOR PROTECTIVE BOLLARDS AT TRANSFORMERS SHALL BE DETERMINED BY HYDRO ONE ON A CASE BY CASE BASIS.

13. SERVICE LATERALS MUST BE LOCATED A MINIMUM OF 3.0 m FROM THE BASE OF A HYDRO TRANSFORMER.

21. JOINT USE TRENCH TO HAVE A MINIMUM COVER AS PER GOVERNING AUTHORITY.

22. 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.

23. TRAFFIC DUCT ALTERNATIVE PLACEMENT LOCATIONS ARE:
    1) JOINT USE TRENCH LOCATION, OR
    2) SAME OFFSET AS STREETLIGHT POLES IN A SEPARATE TRENCH.

16. OPTIONAL LOCATION FOR THE TRAFFIC COMMUNICATIONS DUCT IS A TRENCH LOCATED AT THE SAME OFFSET AS THE STREETLIGHT POLES.

17. USE OF FOUR PARTY TRENCH WILL BE CONSIDERED AS AN OPTION, BUT REQUIRES THE AGREEMENT OF ALL UTILITIES PRIOR TO THE DEVELOPMENT OF THE COMPOSITE UTILITY PLAN, AND MUST BE IN CONFORMANCE WITH CITY GUIDELINES.

18. THE OWNER SHALL SUPPLY AND INSTALL DUCTS FOR UTILITY CROSSINGS AS REQUIRED.

19. ONE TREE PER LOT TYPICAL, TWO TREES ON CORNER LOT WITH ONE OF THE TREES ON THE STREET SIDE OF THE LOT. REFER TO DESIGN STANDARDS FOR ACCEPTABLE TREE TYPES. TREE PLACEMENT LOCATION WILL REQUIRE THE APPROVAL OF THE CITY. PLANT TREES NEAR PROPERTY LINE WHERE POSSIBLE.

20. RETAINING WALLS WILL NOT BE PERMITTED WITHIN R.O.W.

21. PLANT TREES NEAR PROPERTY LINE WHERE POSSIBLE.

22. CURB SHALL BE MOUNTABLE AND BARRIER UNLESS OTHERWISE AUTHORIZED BY CITY REPRESENTATIVE

23. MINIMUM ROAD COMPOSITION TO BE CONFIRMED BY GEOTECHNICAL INVESTIGATION.

City of Clarence-Rockland
1560, Laurier St, Rockland
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613-446-6022

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CROSS-SECTIONS
GENERAL NOTES

SCALE: NTS

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: X7

Clarence Rockland

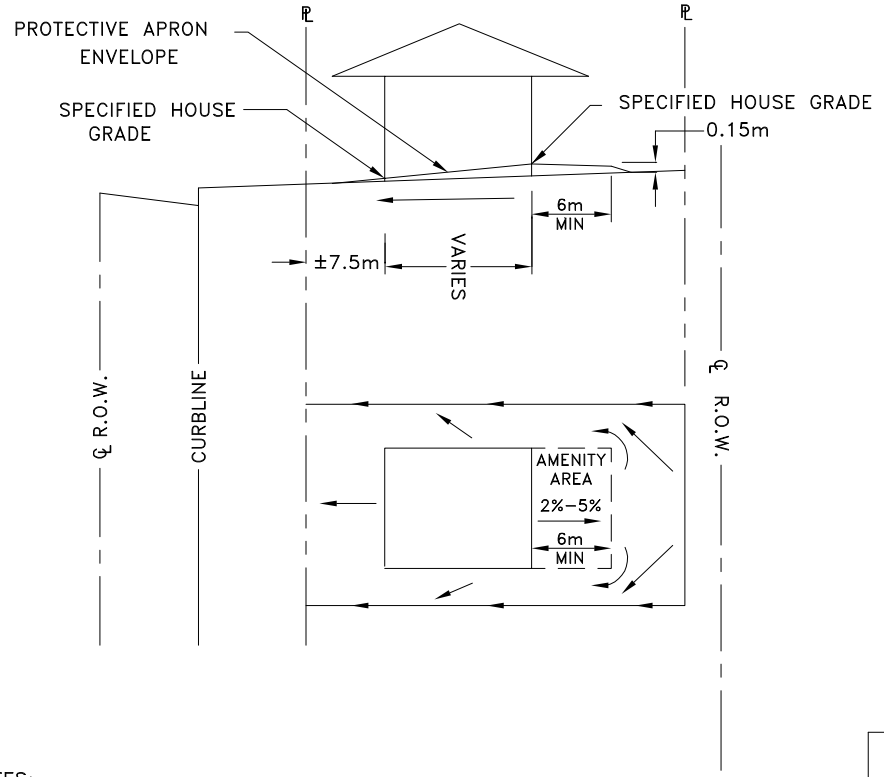
GRADING REQUIREMENTS (BACK TO FRONT & SPLIT)

APPD. BY: Yves Rousselle, C.E.T. MANAGER, ENGINEERING AND OPERATIONS

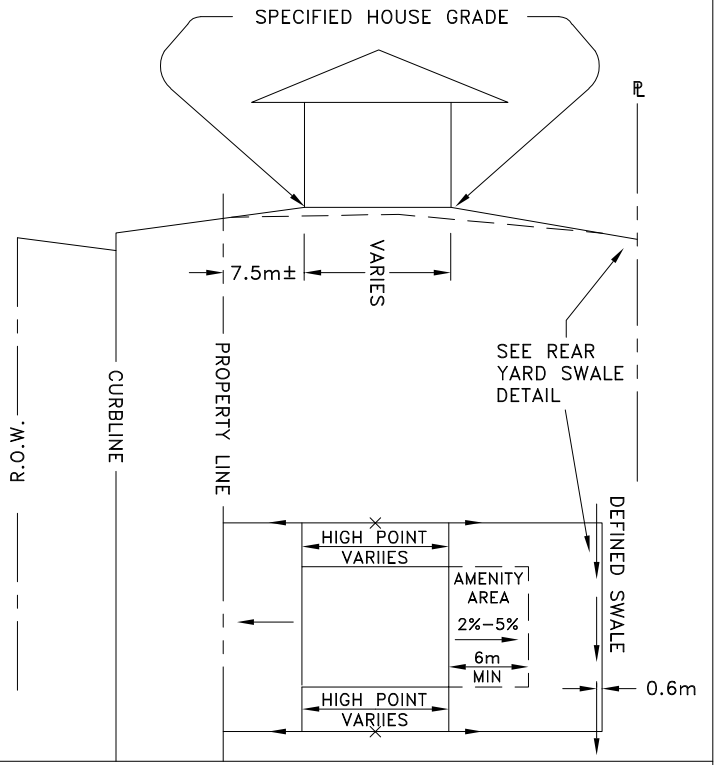
REV. DATE: MAY 2018

DWG. No.: G1

TYPICAL BACK TO FRONT DRAINAGE



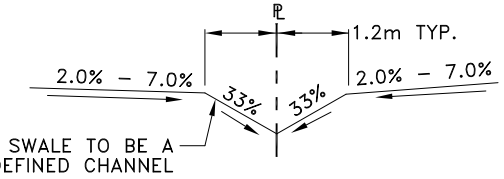
TYPICAL SPLIT DRAINAGE



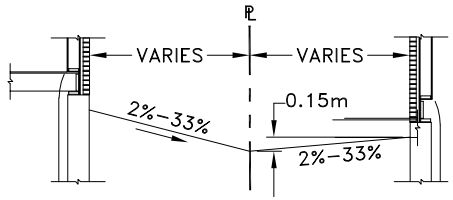
NOTES:

1) BACK TO FRONT DRAINAGE SHALL ONLY BE USED FOR SINGLE FAMILY AND SEMI–DETACHED HOMES WHEN:(a) BOTH SIDE YARDS ARE 1.2m OR MORE; AND (b) SPLIT IS NOT FEASIBLE.
2) ENSURE A MINIMUM 0.15m OF UNINTERRUPTED FALL AWAY FROM ALL LOCATIONS ON THE HOUSE ENVELOPE WITHIN THE PROPERTY LIMITS.
3) GRADING TO BE 2% TO 33%, EXCEPT IN THE AMENITY AREA AS NOTED IN ABOVE DRAWINGS.
4) DRIVEWAY SLOPE TO BE 2.0% TO 7.0%.
5) RETAINING WALL SHALL BE INSTALLED ON HIGHER PROPERTY.

MAJOR SWALE DETAIL

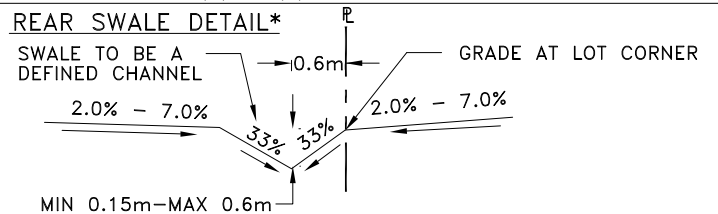


SIDE SWALE DETAIL*



RETAINING WALL CAN BE USED IN ALTERNATIVE TO 3(H) : 1(V) TERRACING OR WHERE TERRACING WILL EXCEED 3(H) : 1(V).

REAR SWALE DETAIL*

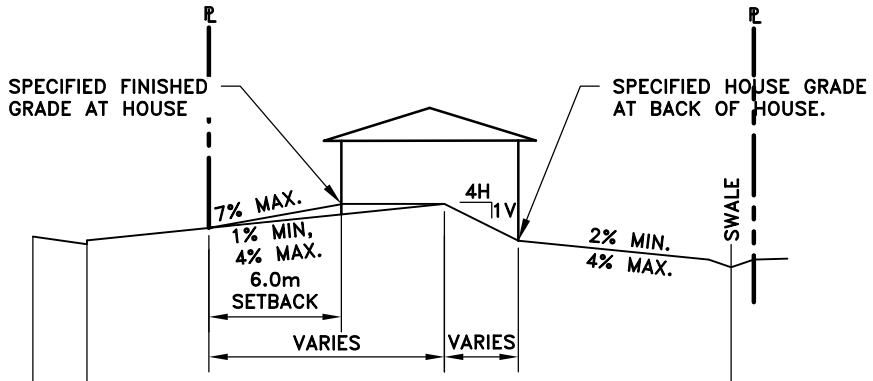


* SEE CRSD–230.02 AND CRSD–230.03 FOR SIDE SLOPE AND REAR SWALE DETAIL FOR TOWNHOUSES.

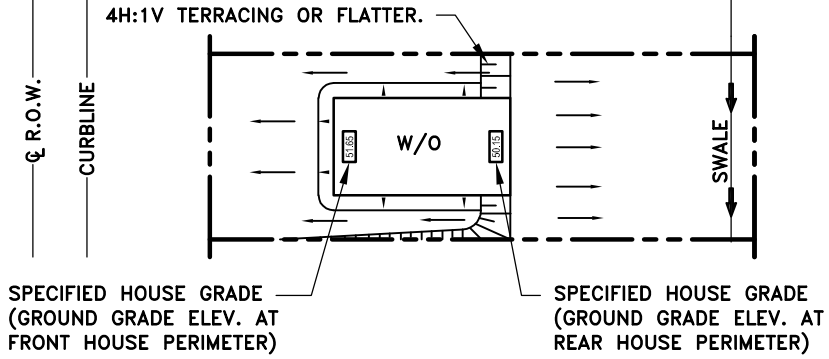
Clarence Rockland

GRADING REQUIREMENTS (WALK-OUT BASEMENT)

TYPICAL WALK-OUT BASEMENT LOT DRAINAGE

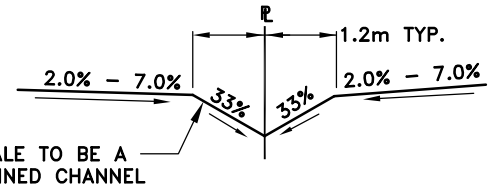


ELEVATION



PLAN

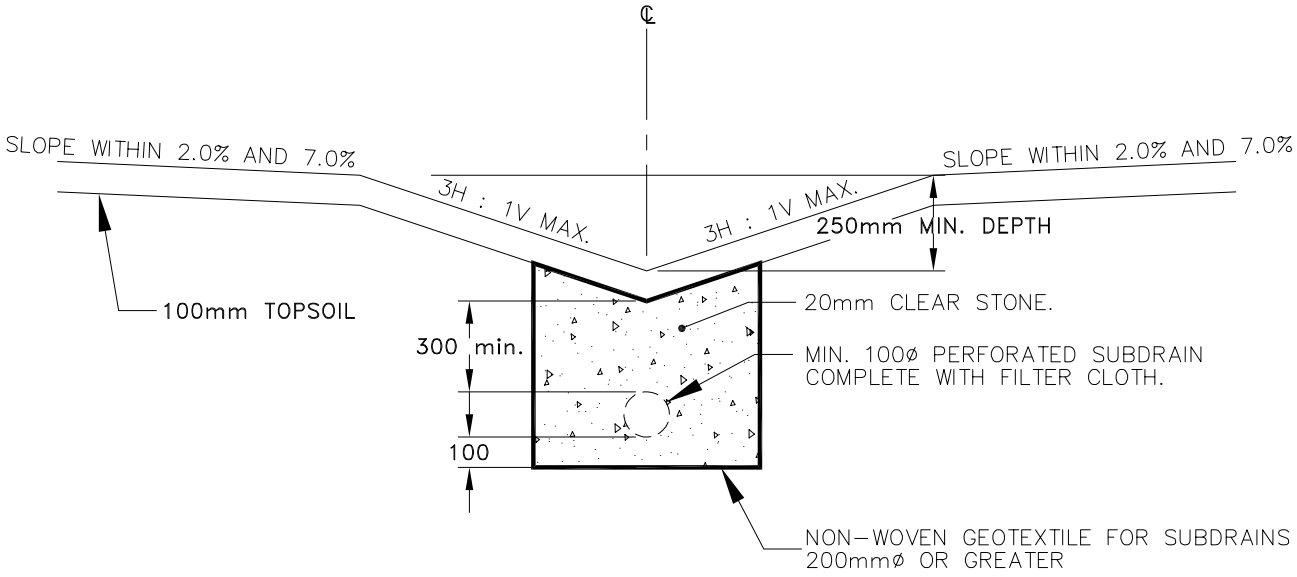
MAJOR SWALE DETAIL



APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: G2



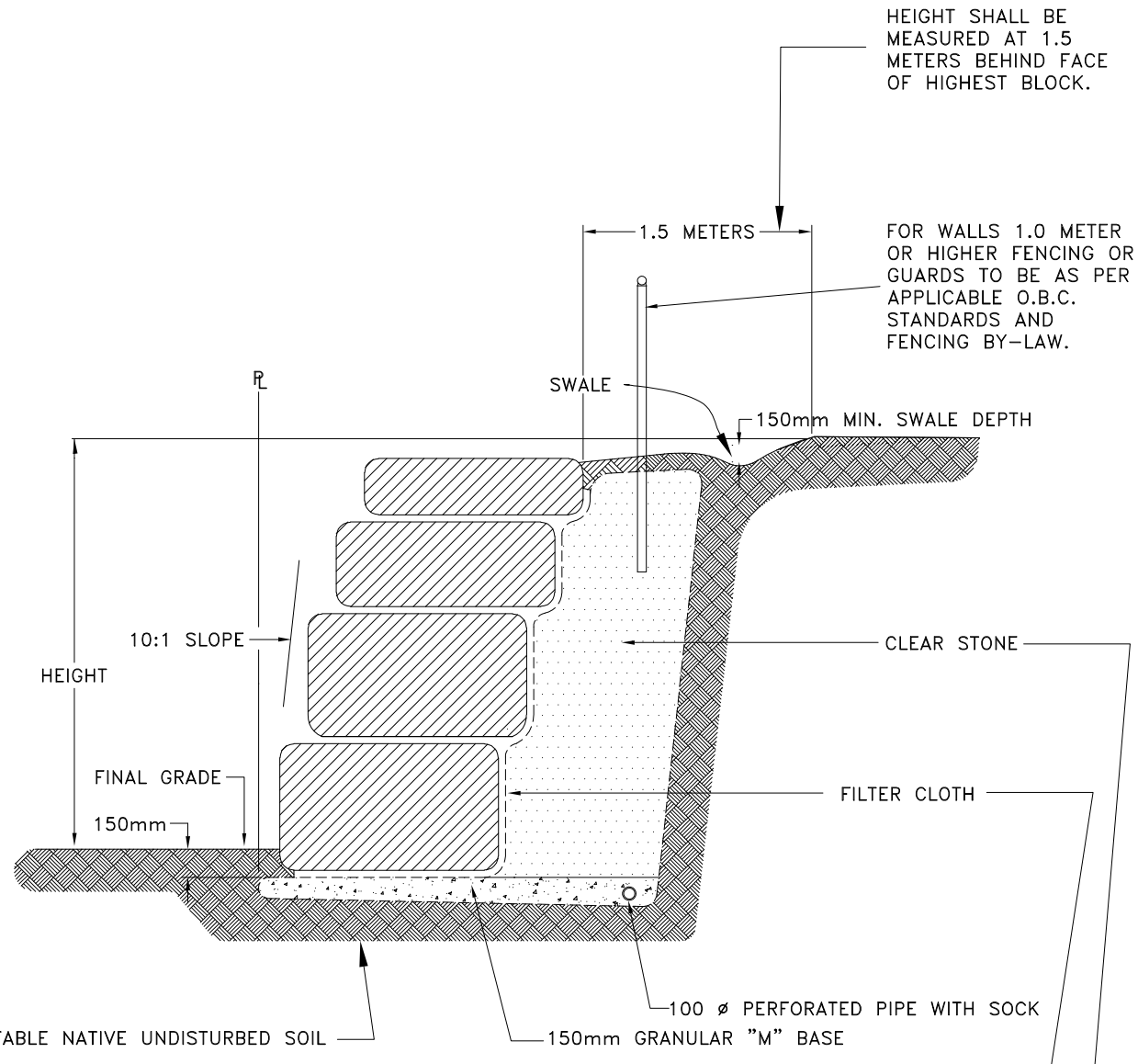
SWALE / DITCH SECTION

NOTE:

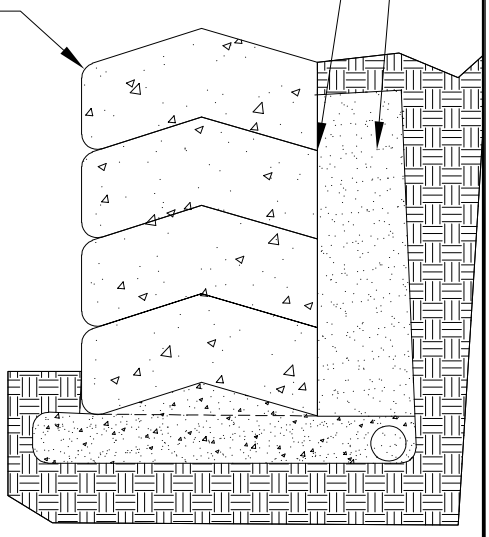
1. PERFORATED SUBDRAINS ARE REQUIRED WHERE SWALES/DITCHS ARE CONSTRUCTED AT LESS THAN 2.0% SLOPE. THE MINIMUM SWALE/DITCH SLOPE PERMITTED WITH A SUBDRAIN INSTALLED IS 1.5%
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

Clarence Rockland

TYPICAL SUBDRAIN INSTALLATION IN SWALES AND/OR DITCHES	APPD. BY: Yves Rousselle, C.E.T. MANAGER, ENGINEERING AND OPERATIONS
	REV. DATE: MAY 2018
	DWG. No.: G3



NO TIMBER WALLS SHALL BE PERMITED AT CHANGE OF ELEVATIONS BETWEEN TWO RESIDENTIAL PROPERTIES. FACE OF WALLS BETWEEN RESIDENTIAL PROPERTIES MUST BE OF DECORATIVE STRUCTURAL BLOCKS SYSTEMS OR ARMOURED STONE.



NOTES:

1) ALL WALLS TO BE APPROVED BY CITY'S ENGINEERING DEPT. PRIOR TO CONSTRUCTION.
2) WALLS 1.0m IN HEIGHT OR HIGHER MUST BE DESIGNED AND STAMPED BY A STRUCTURAL ENGINEER.
3) RETAINING WALL TO BE CONSTRUCTED ON HIGHER SIDE PROPERTY
4) HEIGHT OF ALL RETAINING WALLS SHALL BE MEASURED FROM BOTTOM OF WALL AND AT 1.5 METERS BEHIND WALL.
5) SUCCESSIVE WALLS OF 1.0m 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.

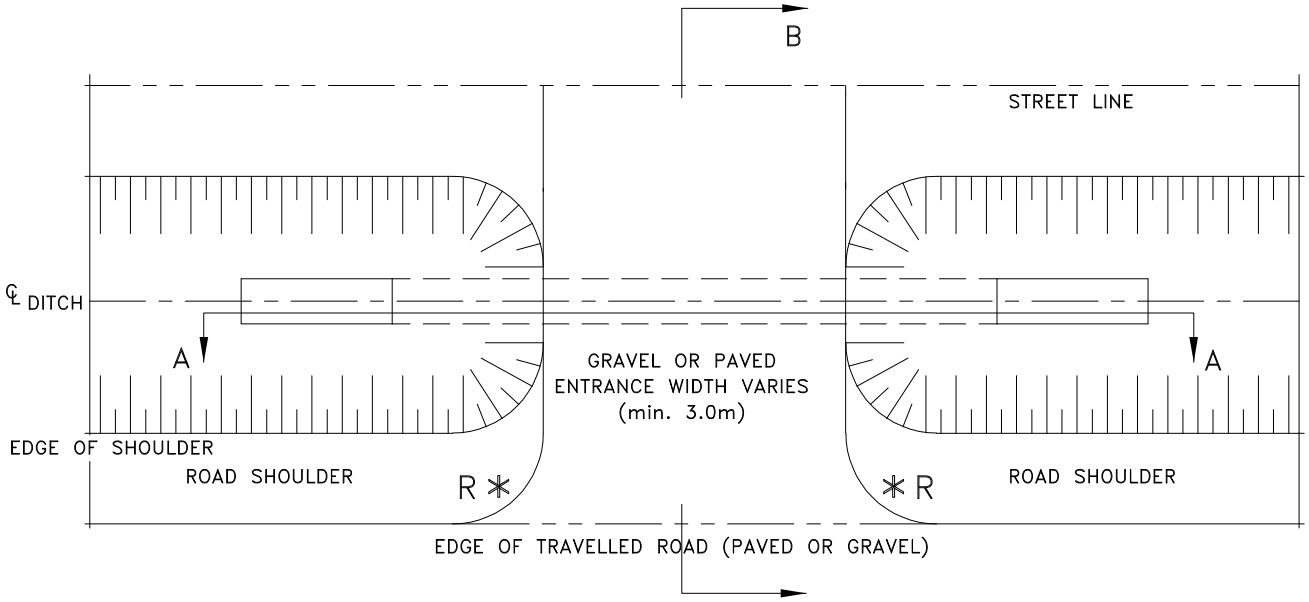
Clarence Rockland

TYPICAL ARMOUR STONE RETAINING WALL

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: G4



PLAN VIEW

NOTES:

1) SEE CITY DETAIL E2–EN FOR SECTION A–A AND SECTION B–B.

2) MINIMUM DISTANCE BETWEEN PRIVATE APPROACHES ON THE SAME PROPERTY IS 2R OR 9.0m, WICHEVER IS GREATER.

3) MINIMUM DISTANCE OF PRIVATE APPROACH FROM SIDE PROPERTY LINE IS R.

4) * RADIUS OF ENTRANCE TO CONFORM TO THE FOLLOWING TABLE:

R – FOR ENTRANCE

PROPERTY USE	RADIUS OF ENTRANCE
SINGLE FAMILY DWELLING	3.0m min./max.
DWELLING COMMERCIAL INSTITUTIONAL PUBLIC PURPOSE INDUSTRIAL	9.0m min. 10.5m max.
FARM AND FIELD ENTRANCES	4.5m min. 7.5m max.

SCHEDULE "A"

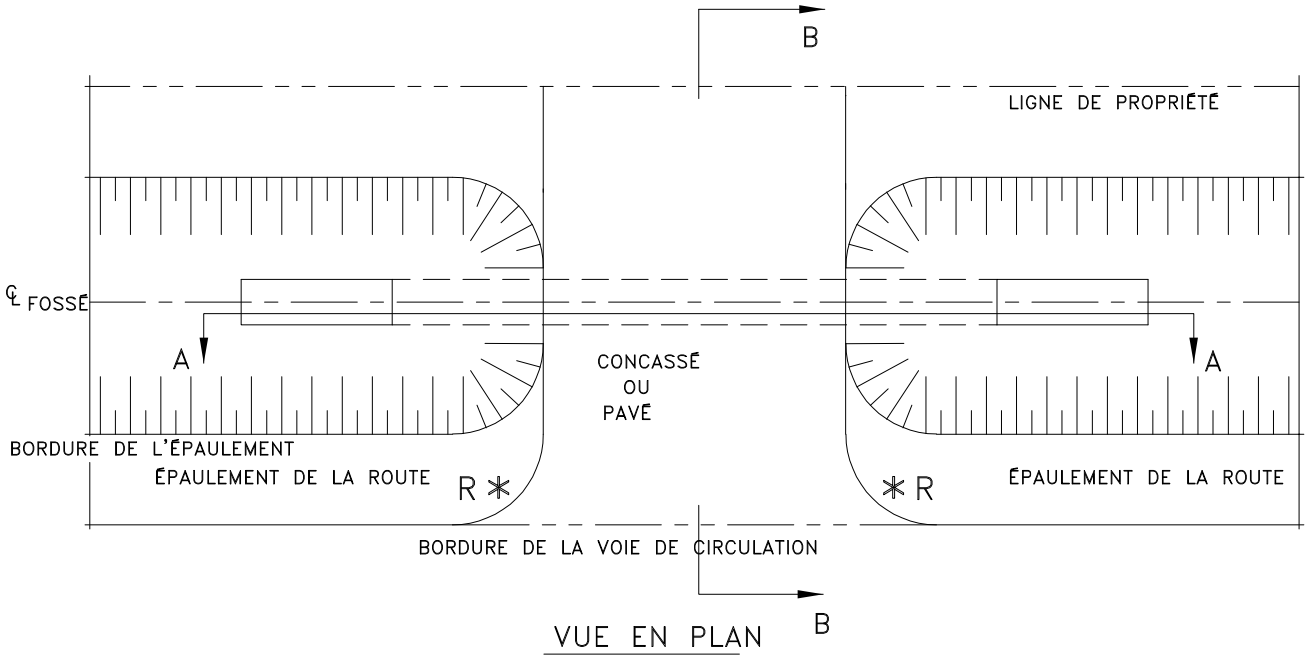
Clarence-Rockland

PLAN DETAIL FOR ENTRANCE CULVERT

APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: E1–EN



VUE EN PLAN

NOTES:

1) VOIR DÉTAIL E2–FR POUR SECTION A–A ET SECTION B–B.

2) DISTANCE MINIMUM ENTRE ENTRÉES PRIVÉES POUR UNE MÊME PROPRIÉTÉ EST DE 2R OU 9.0m, LA PLUS GRANDE DES DEUX DISTANCES SERA RESPECTÉE.

3) DISTANCE MINIMALE A RESPECTER ENTRE ENTRÉE PRIVÉE ET UNE LIGNE DE PROPRIÉTÉ EST D'AU MOINS R.

4) * RAYON DE L'ENTRÉE DEVRA ÊTRE CONFORME AU TABLEAU.

R – POUR ENTRÉE

DESTINATION	RAYON D'UNE ENTRÉE
UNIFAMILIALE	3m MIN./ MAX.
HABITATION COMMERCIALE INSTITUTIONELLE DESTINATION PUBLIQUE INDUSTRIELLE	9m MIN. 10.5m MAX.
ENTRÉES DE FERMES ET DE CHAMPS	4.5m MIN. 7.5m MAX.

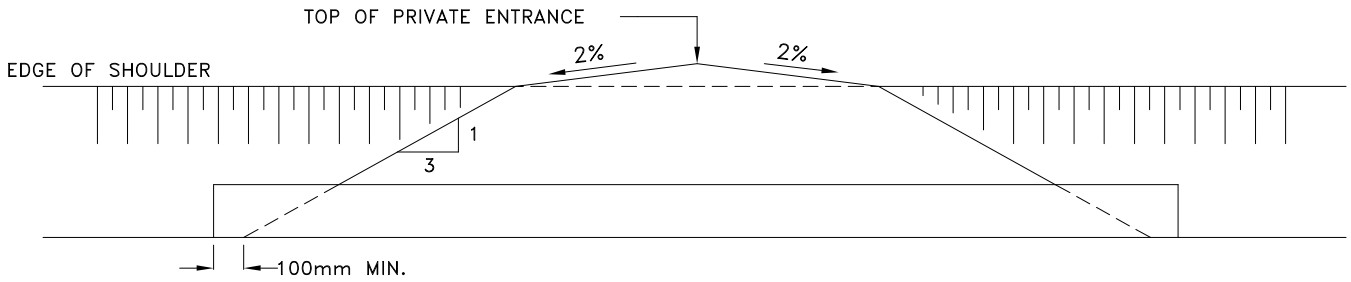
Clarence-Rockland

VUE EN PLAN POUR PONCEAU D'ENTRÉE

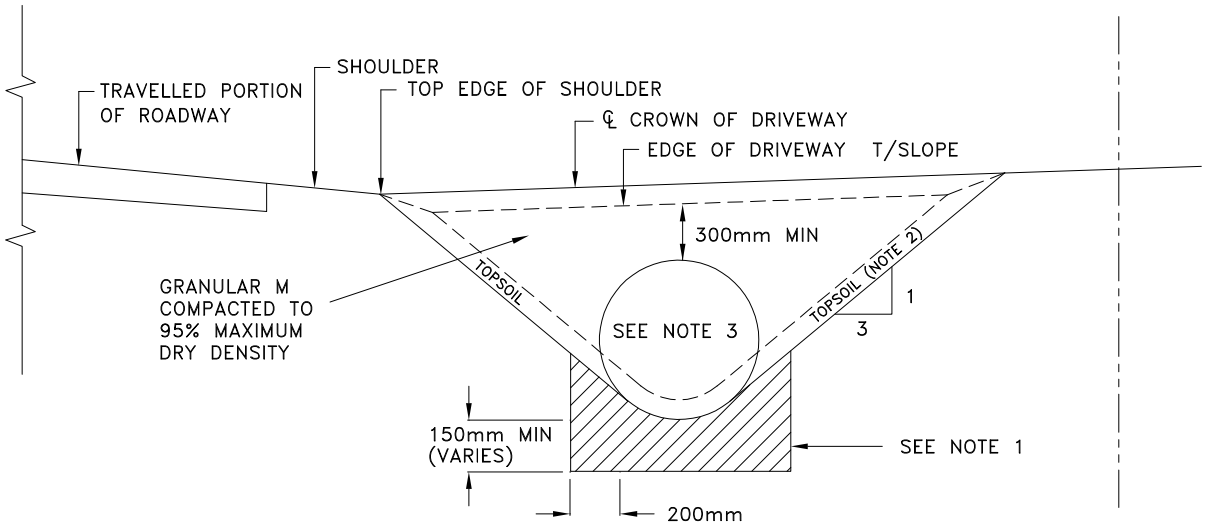
RÉV. PAR:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

DATE RÉV. MAY 2018

NO. DESSIN: E1-FR



SECTION A–A



SECTION B–B

NOTES:

1) IN HIGHLY FROST SUSCEPTIBLE MATERIAL SPECIAL BEDDING CONDITIONS WILL BE REQUIRED BY THE CITY.

2) REMOVE ALL ORGANICS FROM SIDE SLOPES AND DITCH BOTTOM PRIOR TO PLACING CULVERT AND GRANULARS.

3) CULVERT TO BE COUNTERSUNK 10% OF ITS DIAMETER BELOW FINISHED DITCH INVERT.

4) CULVERT: SMOOTHWALL HIGH DENSITY POLYETHYLENE PIPE ONLY, MINIMUM 450mmø (LARGER DIAMETERS MAY BE REQUIRED DEPENDING ON DESIGN FLOWS IN DITCH SYSTEM, AS REQUIRED BY CITY).

5) REGRADING UPSTREAM AND/OR DOWNSTREAM OF DITCH MAY BE REQUIRED BY CITY.

6) ENTRANCE CULVERTS GREATER THAN 900mmø OR DESIGNS OTHER THAN SINGLE CIRCULAR PIPES MUST BE APPROVED BY THE CITY PRIOR TO INSTALLATION.

7) HEADWALLS OR OTHER FORMS OF HARD LANDSCAPING ARE NOT ALLOWED,

8) RIP RAP TO BE INSTALLED AS PER O.P.S.D. 810.01.

9) UTILITY COMPANIES SHALL BE CONTACTED BEFORE ANY EXCAVATION IS CARRIED OUT ALONG A MUNICIPAL ROAD OR DITCH.

SCHEDULE "A"

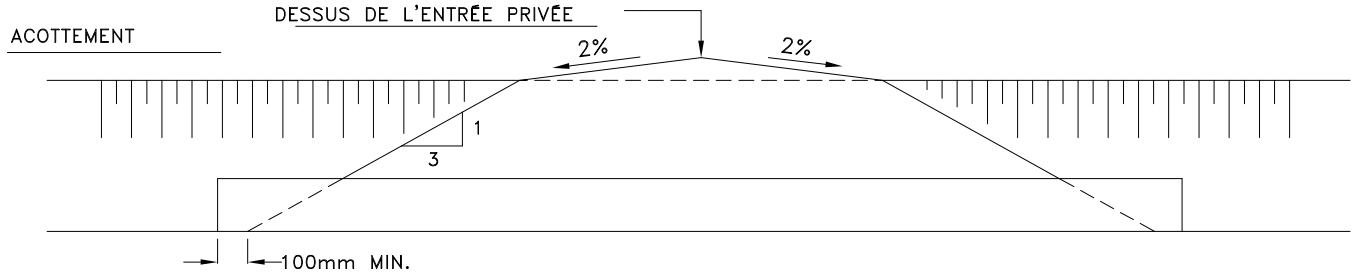
Clarence Rockland

PROFILE DETAIL FOR ENTRANCE CULVERT

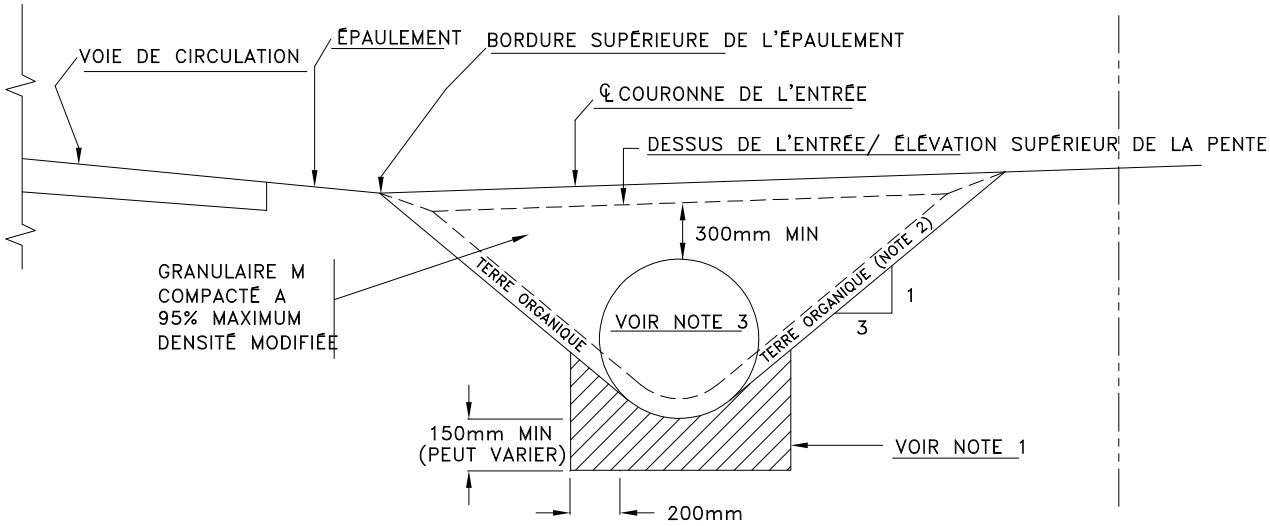
APPD. BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: E2–EN



SECTION A–A



SECTION B–B

NOTES:

1) LORSQUE L'INSTALLATION EST FAITE DANS DES SOLS GÉLIFS, UN LIT DE PIERRE SERA REQUIS PAR LA CITÉ.

2) ENLEVER TOUTES TERRES ORGANIQUES DES PENTES DE FOSSÉ AINSI QUE DU FOND AVANT L'INSTALLATION DU LIT DE PIERRE ET DU PONCEAU.

3) LE PONCEAU DEVRA ETRE ENFONCÉ A 10% DE SON DIAMÈTRE SOUS LE NIVEAU FINI DU FOSSÉ.

4) PONCEAU: UNIQUEMENT TUYAUX DE POLYÉTHYLÈNE DE HAUTE DENSITÉ AVEC MUR INTÉRIEUR LISSE DIAMÈTRE MINIMALE DE 450mm (DES DIMENSIONS PLUS GROSSES DE PONCEAU PEUVENT ÊTRES REQUISES).

5) DES TRAVAUX DE RECTIFICATION DES NIVEAUX DU FOSSÉ EN AMONT ET EN AVAL POURRAIENT S'AVÉRER ÊTRE NÉCESSAIRES PAR LA CITÉ DE CLARENCE–ROCKLAND.

6) LES PONCEAUX D'ENTRÉES D'UN DIAMÈTRE SUPÉRIEUR À 900mmø OU DANS LES CAS OÙ PLUS D'UN PONCEAU EST NÉCESSAIRE, LE TOUT DEVRA ETRE APPROUVÉ PAR LA CITÉ DE CLARENCE–ROCKLAND AVANT LEURS INSTALLATIONS.

7) LES MURETS OU TOUTES AUTRES FORMES DE TERRASSEMENTS SOLIDES NE SONT PAS PERMIS.

8) LES PENTES DE FOSSÉS DEVRONT ETRE CONSOLIDÉES SELON O.P.S.D. 810.01

9) LES UTILITÉS EN BORDURES DES ROUTES AINSI QUE DES FOSSÉS MUNICIPAUX DEVRONT ÊTRES LOCALISÉS AVANT QUE TOUS TRAVAUX D'EXCAVATION NE SOIENT ENTREPRIS.

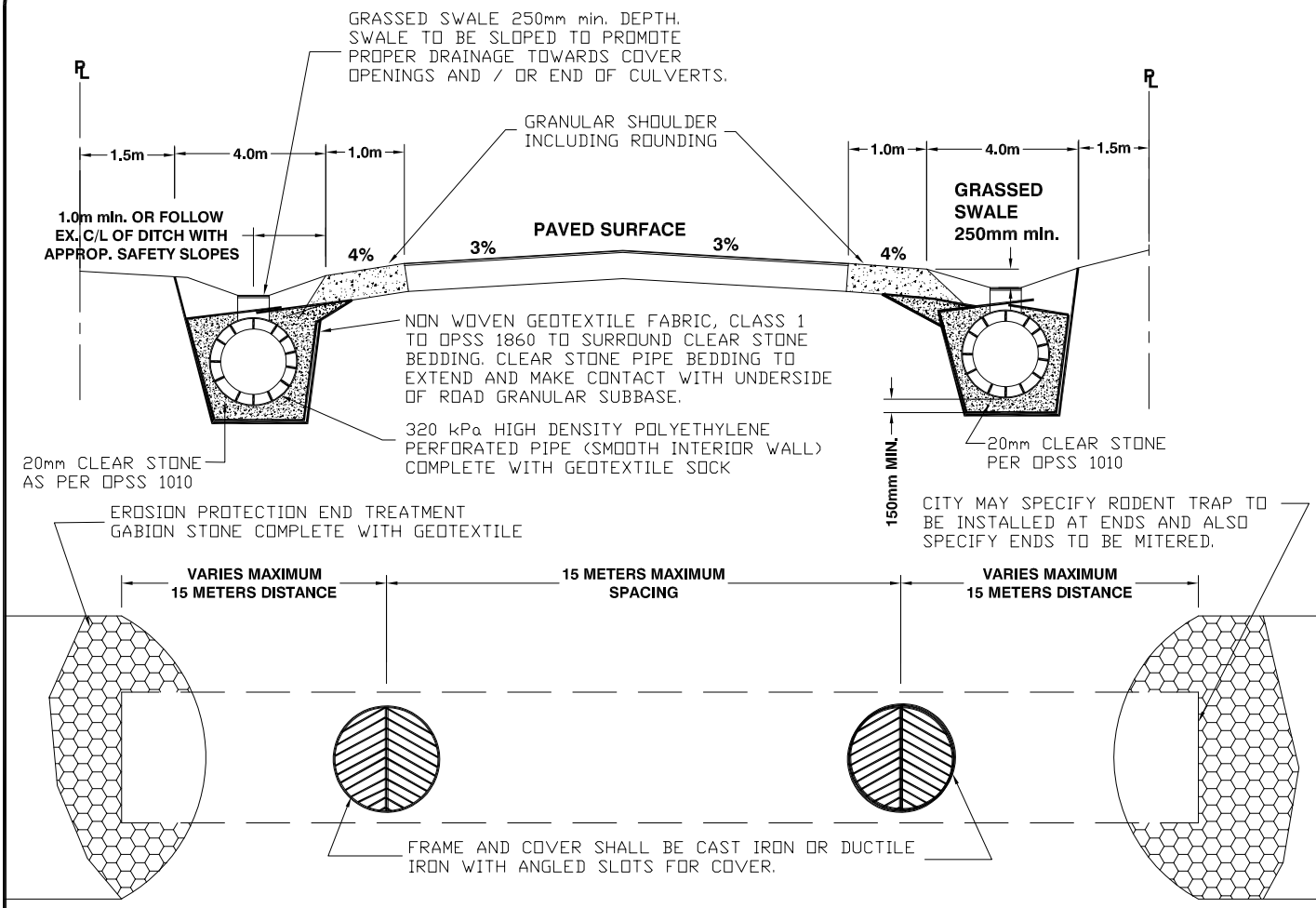
Clarence Rockland

DÉTAIL DE PROFIL POUR PONCEAU D'ENTRÉE

APR. PAR:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

DATE RÉV. MAY 2018

No. DESSIN: E2-FR



NOTES:

1) IN HIGHLY FROST SUSCEPTIBLE MATERIAL SPECIAL BEDDING CONDITIONS WILL BE REQUIRED BY THE CITY.

2) REMOVE ALL ORGANICS FROM SIDE SLOPES AND DITCH BOTTOM PRIOR TO PLACING CULVERT AND GRANULARS.

3) CULVERT TO BE COUNTERSUNK 10% OF ITS DIAMETER BELOW FINISHED DITCH INVERT.

4) CULVERT: SMOOTHWALL 320 kPa HIGH DENSITY POLYETHYLENE PIPE, MINIMUM 450mmØ (LARGER OR SMALLER DIAMETERS MAY BE REQUIRED DEPENDING ON DESIGN FLOWS IN DITCH SYSTEM, AS REQUIRED BY CITY). ALL COMPLETE DRAINAGE SYSTEMS MUST BE DESIGNED BY A REGISTERED ENGINEER FOR A 5 YEAR AND 100 YEAR STORM EVENT.

5) REGRADING UPSTREAM AND/OR DOWNSTREAM OF DITCH MAY BE REQUIRED.

6) CULVERTS LOCATED UNDERNEATH DRIVEWAY ENTRANCES SHALL BE NON-PERFORATED TYPE. PIPES AND COUPLERS MUST BE APPROVED BY THE CITY PRIOR TO INSTALLATION.

7) HEADWALLS OR OTHER FORMS OF HARD LANDSCAPING ARE NOT ALLOWED,

8) ADEQUATE RIP RAP OR EROSION PROTECTION TO BE INSTALLED AT ENDS FOR INLET AND OUTLET.

9) 15.0m MAXIMUM SPACING BETWEEN CATCHBASINS OR ONE BETWEEN EACH ENTRANCE OR ROAD.

10) TYPE AND LOCATION OF CATCHBASIN(S) TO BE SPECIFIED BY CITY.

11) NO WORK TO BE PERFORMED ON R.O.W. WITHOUT CITY'S APPROVAL.

12) UTILITY COMPANIES SHALL BE CONTACTED BEFORE ANY EXCAVATION IS CARRIED OUT ALONG A MUNICIPAL ROAD OR DITCH.

13) ALL CONNECTIONS FOR SUMP PUMP OUTLETS MUST BE EQUIPPED WITH PROPER MANUFACTURED SADDLES

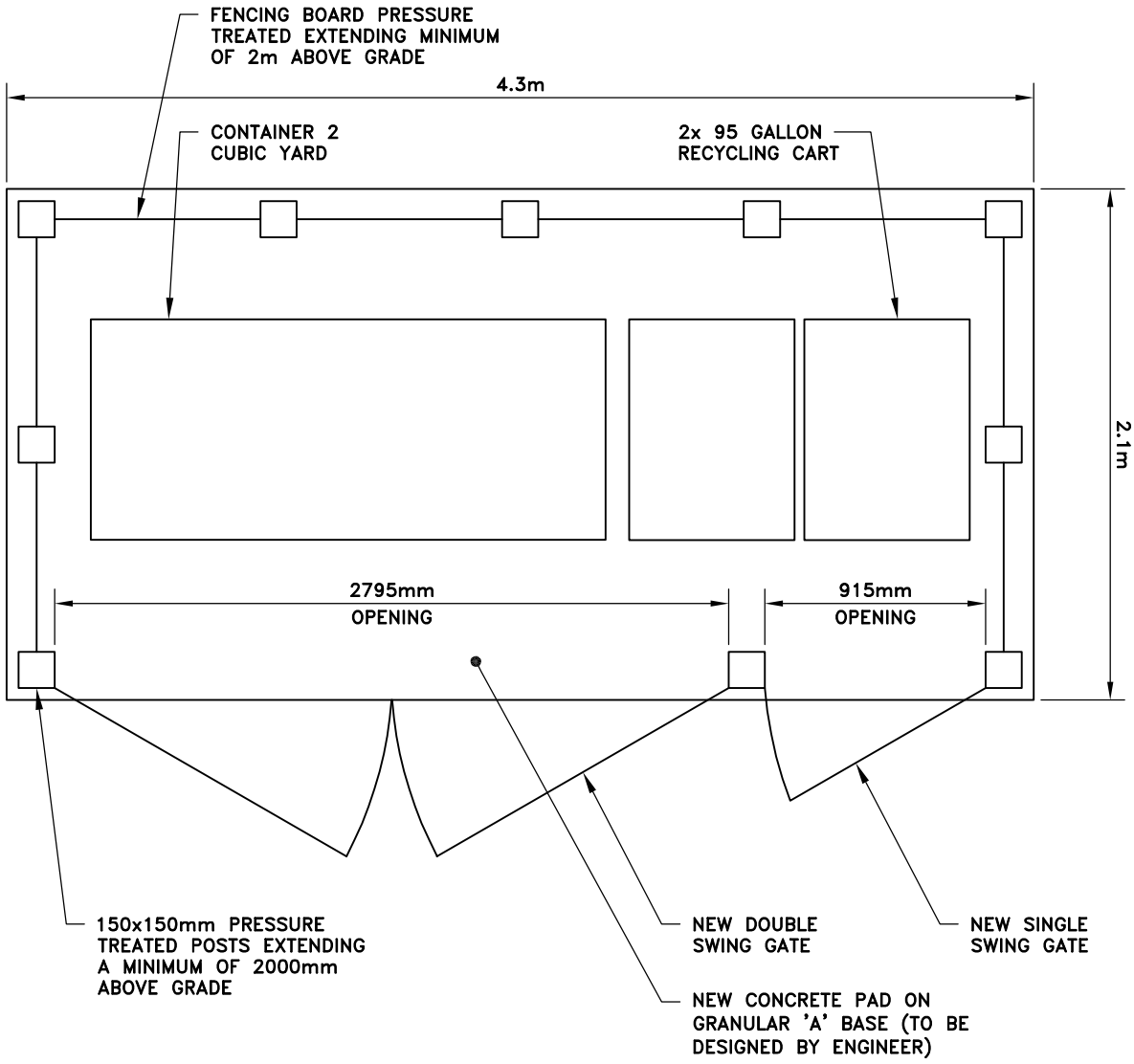
Clarence-Rockland

FRONT YARD DITCH DRAINAGE SYSTEM DETAIL

APPD BY:
Yves Rousselle, C.E.T.
MANAGER, ENGINEERING AND OPERATIONS

REV. DATE: MAY 2018

DWG. No.: **E3**



Clarence-Rockland

TYPICAL GARBAGE ENCLOSURE DETAIL

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