TOWN OF GEORGINA

Department of Operations & Engineering

DEVELOPMENT DESIGN CRITERIA

2013 EDITION

ACKNOWLEDGEMENTS

This project was undertaken as a result of the need to update the existing Town of Georgina Development Design Criteria. The following staff and agencies participated:

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The creation of the standard drawings, final editing and technical review of the document was carried out by the Town of Georgina Engineering Division staff members.

SECTION – RECORD OF REVISIONS

Record of Revisions

Revision	Date	Description
0	December 11, 2011	Provide draft to Town for comments.
1	June 15, 2012	Revised per Town comments.
2	October 4, 2012	Revised per Town comments (final submission)
3	November 30, 2012	Revised by Town for Web Site Posting and comments
4	March 15, 2013	Revised per GDA Consultants comments
5	May 30, 2013	Revised per Consultants Comments (Final version)
6	February 25, 2014	Revised Minimum Water Service Size
7	August 12, 2014	Revised Backflow Prevention
8	November 6, 2015	Revised Backflow Prevention, LED Luminaires, GW-2, GW-5A, GW-5B, GW-8A, GW-8B, GW-10, GW-11, GW-12, GU-6, GU-7

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SECTION – LIST OF ACRONYMS

AADT – Annual Average Daily Traffic

ANSI – American National Standards Institute

ASTM – American Society for Testing and Materials

AWWA – American Water Works Association

BC – Beginning of Curve

BM – Benchmark

BRD – Bulk Relative Density

BVC – Beginning of Vertical Curve

C of A – Certificate of Approval

CCTV – Closed Circuit Television

cm – Centimetres

CSA – Canadian Standards Association

CUP – Composite Utility Plan

DFO – Fisheries and Oceans Canada

DVD – Digital Video Disc

EC – End of Curve

ECA – Environmental Compliance Approval

ESA – Electrical Safety Authority

Etc. – etcetera

EVC – End of Vertical Curve

FITS – Functional Internal Traffic Study

FSR – Functional Servicing Report

gpm – Gallons per Minute

ICI – Industrial Commercial Institutional

IESNA – Illuminating Engineering Society of North America

ISO – International Organization for Standardization

KPa – Kilopascal

L/c/d – Litres per Capita per Day

L/m – Litres per Minute

L/s/ha – Litres per Second per Hectare

LED – Light Emitting Diode

LLF – Light Loss Factor

LSPP – Lake Simcoe Protection Plan

SECTION – LIST OF ACRONYMS

LSRCA – Lake Simcoe Region Conservation Authority

m – Metres

m^3/ha/d – Cubic Metres per Hectare per Day

mm – millimeters

MNR – Ministry of Natural Resources

MOE –Ministry of the Environment

MPa – Megapascal

MTO – Ministry of Transportation

NAAPI – North American Association of Pipeline Inspectors

NEMA – National Electrical Manufacturers Association

NFPA – National Fire Protection Association

OALA – Ontario Association of Landscape Architects

OBC – Ontario Building Code

OLS – Ontario Land Surveyor

OPSD – Ontario Provincial Standard Drawings

OPSS – Ontario Provincial Standard Specifications

OTM – Ontario Traffic Manual

PI – Point of Intersection

ppu – People per Unit

Psi – Pounds per Square Inch

PVC – Polyvinyl Chloride

PVC-DR – Polyvinyl Chloride Dimension Ratio

RMY – Regional Municipality of York

ROW – Right of Way

SDR – Standard Dimension Ratio

sq m – Square Metres

SWM – Stormwater Management

TIS – Traffic Impact Study

UTM – Universal Transverse Mercator

VPC – Vertical point of Curvature

VPI – Vertical Point of Intersection

VPT – Vertical Point of Tangency

GENERAL

1.0 INTRODUCTION

The material presented herein is intended as a manual in the production of all land development projects within the Town of Georgina. While specific design guidelines are provided herein, the Ontario Provincial Standards and Specifications supply the basis for much of the construction activity and shall be adhered to at all times unless directed otherwise by the Town and this design manual. For purposes of this document where Town approvals are referenced it shall mean the approval of the Director of Operations and Engineering.

Standard drawings and specifications referred to in this document are the current Town of Georgina Standard and Ontario Provincial Standard including the following:

- Ontario Provincial Standard Drawings (OPSD)
- Ontario Provincial Standard Specifications (OPSS).

In the case of any inconsistency or conflict between the provisions of the subdivision or development agreement, the engineering plans, design or specifications or any other document, the order of precedence shall be as follows:

- the subdivision/development agreement
- the engineering drawings as initialed by the Director of Operations and Engineering
- the Development Design Criteria
- the Consulting Engineer's design and specifications.

The design of all municipal services is to be based upon the specifications and standards in effect at the time of approval. It is incumbent upon the Developer's Consulting Engineer to ensure the latest specifications are being utilized. All plans are to be approved by the Town before they are used for the construction of services, however, such approval in no way relieves the Developer's Consulting Engineer from providing an adequate and safe design.

1.1 Familiarization

Prior to the commencement of the engineering design, the Developer's Consultant shall obtain copies of the Town's "Engineering Development Design Criteria" manual and Standard Drawings to familiarize themselves with the Town's requirements for Subdivision and Site Plan design. Meetings shall be held with the Town's Engineering and Planning staff to discuss areas of preliminary concern and other issues prior to commencement of the engineering design.

1.2 Accessibility Guidelines

All roads and services within the Town are to be designed with regard for those standards being developed at the Provincial level for facilitating accessibility for persons with physical challenges. The interim and/or final guidelines for the built form environment are to be followed for all development work – both in the public or the private domains. (Information regarding same can be found at http://www.accessiblemunicipalities.ca/home.asp?itemid=13949)

Consulting engineers are advised that all aspects of the construction of buildings and services associated with Site Plan submissions are being reviewed by a committee appointed by Council. The Georgina Accessibility Advisory Committee (GAAC) is circulated on all such submissions.

1.3 Pre-Consultation Meeting

The Town of Georgina requires all development proposals to undergo the Pre-Consultation process to determine all internal and external agency requirements. Further details may be obtained through the Planning Division and on the Town's website.

2.0 ENGINEERING REQUIREMENTS FOR DRAFT PLAN APPROVAL

This section applies to subdivisions, subdivisions in combination with common element condominiums, and vacant land condominiums.

A Functional Servicing Report (FSR) must be submitted to the Town for review and acceptance. This report must be presented in a readable, comprehensive and professional manner. The FSR must be signed by a Professional Engineer.

The FSR shall contain the following information as a minimum and be submitted in duplicate.

a) The Draft Plan

The Draft Plan must be in a form acceptable to the Planning Department of the Town of Georgina. A reduced size (8½x11) copy of the draft plan shall be included in the FSR.

b) Contour/Drainage Plan

This plan must be at a scale of no larger than 1:1250 giving contour lines at sufficient intervals to permit assessment of existing surface drainage patterns. This plan is to extend to the limits of the drainage area to be served by proposed sanitary and storm sewer systems, including lands beyond the boundaries of the development. For large

external areas contour plans at a larger scale may be provided. All elevations are to refer to Geodetic Datum.

c) General Plan of Services

This will be a plan based on the Draft Plan and must schematically show the proposed storm and sanitary sewer systems and their connection to existing systems. This plan is to be accompanied by preliminary engineering calculations indicating the quantity of flows at the connection to existing systems and/or at proposed outfalls. Consideration must be given to the whole catchment area to ultimately be developed. Blocks and easements for drainage systems shall also be shown. Preliminary road profiles must also be identified in the FSR.

The method of treatment and disposal of sewage shall be provided and an outline of the actual design shall be presented, including calculations and relative size of the treatment facilities.

d) Functional Internal Traffic Study

Prior to or at the time of draft plan approval, the Town will require the proponent to prepare and submit two supporting traffic studies for the Town's approval. The studies shall have regard for the requirements of the Official Plan and/or the Draft Functional Servicing Report for the Development Area Plan for the area.

The first study shall be a **Traffic Impact Study** (TIS) which consists of a broad-based external transportation and traffic study that examines the property boundary conditions and interconnections with adjacent properties (including signalization issues), assessed under existing and future conditions.

The Town's general requirement is that two road connections shall be provided for any new development with more than one hundred (100) residential units, one of which shall be a road collector and shall connect to either a major collector or arterial road. The intention is to preserve the capacity of the arterial roads and provide alternative travel routes for residents and businesses in new growth areas. In some cases, the collector roads may need to be planned and constructed before the adjacent local development is ready to proceed. The Town's general requirement is that two collector road connections to arterial roads will be required for each phase of development. The full extent of the collector road system in each phase is to be constructed. Roadway phasing and implementation is to be discussed with the Town early in the development process.

A **Functional Internal Traffic Study** (FITS) is to be prepared for review prior to approval of the plan. The internal traffic study will address to the approval of the Town, the compatibility of the roadway function and the adjacent proposed land uses.

Specifically, appropriate building forms are required adjacent to and in the vicinity of collector/collector road and collector/arterial road intersections.

This study is key to properly evaluating the proposed internal road network with regard to substantiation of proposed right-of-way widths, etc. and should be approved prior to draft plan approval. This study would also provide information on estimated AADT for road segments, warrants for all-way stops and traffic signals on internal intersections, analysis of on-street and off-street parking, descriptions of opportunities for traffic calming, etc. The study should also clarify daylight triangle dimensions for the varying hierarchy of intersections.

These two studies are subject to the Town's approval prior to acceptance of the proposed Draft Plan.

e) Drainage/Stormwater Plan

When a natural drainage channel passes through and is affected by the development, drawings must be submitted to indicate the location and typical cross-sections of the existing channel and any proposed changes. A preliminary stormwater management plan and report will be required by the Town of Georgina to address stormwater management planning and design issues outlined in this document to the satisfaction of the municipality. The proponent is to check with the LSRCA to determine the current status of master copies of these models before proceeding with storm drainage planning or design.

All proposed stormwater controls shall be in accordance with the Town and the Lake Simcoe Region Conservation Authority requirements. A preliminary assessment and approval of the design is required.

f) Water Systems

The FSR shall outline the proposed source and method of water distribution. For individual well applications, a hydrogeological report shall be provided which clearly indicates the availability of water, in compliance with Provincial guidelines and regulations.

For municipal systems, the FSR shall provide an overview of the existing water system, its capacities and characteristics, and the needs generated by the new development. Actual computer modeling of the water distribution system will be completed by the Developer's Consulting Engineer.

g) Soils Report

A preliminary soils investigation and report from an independent Soils Consultant will be required in conjunction with the FSR. This report shall provide input and comments on the existing soils, including, but not limited to, allowable bearing capacity, and the applicable discussions relating to roads, services, sewage disposal, cathodic protection requirements, etc.

h) Additional Reports

The Developer's Consulting Engineer is responsible to identify any and all approvals and reports required by Ontario Provincial regulations, as well as the policies of the Town, Region of York, and LSRCA.

Additional reports may include studies regarding acoustic/noise issues, environmental matters, archeological assessments, etc.

3.0 FUNCTIONAL DESIGN

A functional design is required prior to commencement of the Final Design. Prior to the commencement of the functional design, the Developer's Consulting Engineer shall meet with the Town's Development Engineer to discuss the Town's requirements. The functional design shall provide all details, calculations, stormwater and floodplain management digital models (i.e. input and output files) alternatives and recommendations necessary to evaluate the servicing of the proposed development.

In cases where the subdivision development under consideration forms part of a larger area set aside for future development, the functional report shall confirm that the servicing design does not limit the future development. The functional design shall be a definite requirement, when a subdivision is being phased and the engineering design is being undertaken for each phase separately.

4.0 SUBMISSION REQUIREMENTS

Engineering submission packages are to be submitted in full (complete with engineering fees) to the Town's Director of Operations and Engineering and with additional engineering plans/drawings to the appropriate parties as indicated in Section 4.1 Item (d) below. A copy of the submission correspondence (i.e. cover letters, etc.) is also to be provided to the Director of Operations and Engineering and the Director of Planning and Building.

4.1 First Submission

The initial engineering submission for subdivisions shall contain the following information:

a) Four (4) copies of the approved Draft Plan.

b) Four (4) copies of the proposed plan(s) for registration showing all block and lot numbers.

c) A declaration from the Applicant's Consulting Engineer showing that he/she has been retained to design and supervise the construction of the works of the proposed subdivision according to the Design Criteria Manual.

d) Three (3) copies of the following engineering plans:
   i) General Plan of Services
   ii) General Grading Plan
   iii) Sanitary Drainage Plan
   iv) Storm Drainage Plan
   v) Plan and Profile drawings
   vi) Composite Utility Plan including street lighting components
   vii) detail drawings (for items other than Town standard drawings)
   viii) any other drawing pertinent to the design.

e) Two (2) copies of the storm and sanitary sewer design sheets (including a digital copy and computer printouts).

f) Two (2) copies of a Stormwater Management report including digital copies of input and output stormwater management and/or floodplain management models, addressing issues of water run-off quantity and quality, and including drawings for the SWM ponds.

g) Three (3) copy of a soils report for confirmation of the pavement design, prepared by a qualified geotechnical Consulting Engineer.

4.2 Subsequent Submissions

Subsequent submissions of engineering drawings shall be made by the Civil Consultant Engineer having the composite utility plans approved, stamped, and signed by the respective utility authority. All revised drawings, studies and reports shall continue to be submitted until the Engineering Drawings and related design materials are acceptable to the Director of Operations and Engineering. Three (3) copies each of all the plans listed under First Submission are to be resubmitted. The Consultant shall provide, in writing,

an explanation of all revisions made to the plans including those made as a result of the comments provided by the Director of Operations and Engineering.

The design of Telephone, Cable T.V. and gas systems shall be completed by the respective authority. The electrical distribution design shall be approved by Hydro One.

A tree planting plan is to be provided with the engineering submissions which should ensure tree species are in accordance with the Town's requirements and also ensure there are no conflicts with above and below ground services.

Other information required for approvals from external agencies including but not limited to the Ministry of Transportation of Ontario (MTO), Ministry of Natural Resources (MNR), Ministry of Environment (MOE), and Lake Simcoe Region Conservation Authority (LSRCA), the Regional Municipality of York (RMY) shall be obtained by the consultant and copy of same shall be provided to the Director of Operations and Engineering.

5.0 INFRASTRUCTURE (MOE) APPROVAL PROCESS

The approval of new and expanded water systems are to be approved under a Drinking Water Work Permit program under the provisions of the Water Licensing process (in place of a 'C of A'). There is still a need for these systems to be engineered, however, the designing engineer will make a declaration that the systems are in compliance with Ministry guidelines and standards. The Town will keep this declaration on file.

Under the Water License program applicants shall provide the necessary information to the Town for review in accordance with the required outline. The consultant shall certify compliance with all applicable regulations and guidelines and submit a copy of Form 1 (see Appendix E).

Environmental Compliance Approval (ECA) applications are required for all servicing systems (storm and sanitary), excluding water works. ECA's are essentially a single certificate providing a consolidated source for environmental approvals for a given property (air, noise, waste, wastewater, etc.) under the applicable act or regulation.

The process includes an electronic form to be completed and submitted (colour copies and digital) along with supporting information. The information requirements are similar to past requirements under C of A's. A copy of the Introductory Guide to Applying for an Environmental Compliance Approval and a copy of the application form are available at the MOE web site - *http://www.ene.gov.on.ca/environment/en/resources/results/index.htm?txtSearchType=library&txtSearchValue=Forms, Manuals and Guidelines.*

After the engineering design and drawings are deemed approved by the Town, the consulting engineer is to provide, where appropriate, for the signature of the Director of Operations and Engineering copies of the MOE Applications for Storm Water Management (SWM) ponds, Storm Sewers and Sanitary Sewers. These will then be forwarded as follows:

The Regional Municipality of York
Transportation and Works Department
17250 Yonge Street
Newmarket, Ontario L3Y 6Z1
Attention: Commissioner of Transportation and Works

(Requires two (2) copies to be signed by the Director of Operations and Engineering complete with two (2) sets of drawings)

The Ministry of the Environment
York-Durham District Office
230 Westney Road South
5th Floor
Ajax, Ontario L1S 7J5
Attention: District Manager

(Requires one (1) copy to be signed by the Director of Operations and Engineering complete with one (1) set of the General Plan of Services and all plans and profiles)

5.1 Other Approvals

The Applicant's Consulting Engineer is required to make all submissions and representations necessary to obtain approvals from all other authorities affected (RMY k, MTO, LSRCA, Canada Post Corporation, etc.). The Town shall be kept informed of the progress of these submissions by copies of all correspondence.

5.2 Mylar Drawings

After all approvals have been received from all parties affected, the mylar drawings shall be submitted to the Director of Operations and Engineering. These mylar drawings will be signed and dated by the Town's Development Engineer and returned to the Applicant's Consulting Engineer. Three copies of the approved drawings, plus two reduced copies in 11" x 17" format and three copies in electronic format (PDF, TIFF and AutoCAD, latest version, or as specified by the Town) shall be provided to the Town prior to finalization of the Subdivision Agreement, and each electronic file shall be named in accordance with Sheet Number and Sheet Title as well as PDF of the SWM report. Any subsequent changes must be formally submitted for approval by the Town.

If the Developer fails to enter into a Subdivision Agreement with the Town within one year of the date of the approval of the drawings by the Town, the Town reserves the right to revoke any or all approvals related to the engineering drawings.

5.3 Preparation of Subdivision Agreement

The Consultant shall request, in writing, that the draft subdivision agreement be prepared. The draft of the Subdivision Agreement will be prepared by the Engineering Department. The Developer's consulting engineer shall prepare the draft schedules for the agreement where appropriate (i.e. list of drawings, cost estimate, legal descriptions for reference plans, etc.).

In order to request the preparation of the Subdivision Agreement, the following information must be submitted to the Director of Operations and Engineering:

a) A written request and applicable fee.

b) The name of the person and/or company and Mortgagees with whom the Subdivision Agreement will be executed.

c) Four (4) copies of the Legal Description based on the Reference Plan delineating the boundaries of the property to be subdivided.

d) Four (4) copies of the proposed final plan for registration (M-Plan) complete with all pertinent information as required by the registry office.

e) Four copies of the Reference Plans (R-Plans) for any easements to be granted to the Town.

f) Two digital copies of all reference plans.

g) Four copies of the approved engineering drawings and landscaping drawings.

h) A detailed cost estimate of all services to be constructed, in accordance with the "Cost Estimate Items to be Included" (see Appendix B). This estimate shall include:

   i) detailed cost of services and landscaping
   ii) cost of underground electrical distribution system and street lighting
   iii) all miscellaneous expenditures
   iv) allowances for contingencies and engineering.

   (This estimate will be used as a basis for calculation of the security to be posted for the development.)

i) Proposed timetable for construction of services and proposed staging plans.

j) Any required noise reports.

k) Any required architectural design statements.

l) Any other reports noted elsewhere or as requested by the Town prior to finalization of the Agreement.

5.4 Requirements Prior to Commencement of Construction

Prior to the commencement of construction, the Developer's Consulting Engineer shall provide the following:

a) Submit the following information to the Town (allow two weeks for approval).

- i) two (2) sets of construction specifications
- ii) the names of the proposed contractor and any sub-contractors
- iii) the contractor's list of suppliers
- iv) a copy of the signed contract/tender document
- v) the required Letter of Credit must be posted with the Town
- vi) any other information as required by the Town or as specified in the Subdivision Agreement.

b) Convene a pre-construction meeting.

c) All parties shall obtain and familiarize themselves with the Town's Municipal Inspection and Construction Guidelines.

6.0 ENGINEERING DRAWING REQUIREMENTS

All electronic (AutoCAD) drawings shall contain all infrastructure relevant to the Development. The electronic files shall conform to the Universal Transverse Mercator (UTM) coordinate system (North American Datum of 1983, Zone 17N) and be tied and geo-referenced to the horizontal and vertical control monuments within the local area. The location and pertinent information with respect to the monuments shall be indicated on the drawings as follows:

a) A title sheet is required for the drawings.

b) All drawings shall be prepared using AutoCAD (latest version, or as specified by the Town) with plans plotted on 3 mil mylar. All drawings are to be prepared in a neat and legible fashion.

c) All plans shall be prepared on standard ISO – A1 (594 mm x 841 mm) sheets.

d) All elevations shown on the drawings are to be of geodetic origin.

e) Plan and profile drawings are to be prepared so that each street can be filed separately. The street names are to be identified on the plan portion of the drawings.

f) When streets are of a length that requires more than one drawing, match lines are to be used with no overlapping of information.

g) The reference drawing numbers for all intersecting streets and match lines shall be shown on all plan and profile drawings.

h) A north arrow shall be referenced on all drawings.

i) A key plan drawn to 1:10 000 scale shall be shown on all plan and profile drawings as well as the General Plan of Services. The area covered by the drawing shall be clearly identified.

j) All engineering drawings shall be stamped and signed by a Professional Engineer (prior to each submission). The Engineer's stamp must be signed and dated, prior to the issuance of drawings for tendering and signing by the Town's Director of Operations and Engineering.

It is recommended that Appendix J be reviewed regarding the preparation and submission of "as-constructed" drawings, and related information.

6.1 General Services Plan

A drawing showing General Services shall be prepared for all developments at a maximum scale of 1:1000 in accordance with the following details:

a) The reference geodetic benchmark and the site benchmarks to be used for construction shall be identified on the Cover Sheet and all relevant plans.

b) A drawing index shall be shown on all General Services Plans to identify the Plan and Profile Drawing Number for each street or easement shown.

c) All streets shall have the approved street names indicated.

d) All existing services, utilities and abutting properties are to be shown in dashed/shaded lines. All proposed services to be constructed are to be shown in solid lines.

e) All manholes will be shown and are to be numbered in accordance with the design drawings. Sanitary manholes shall include the letter “A” after the number designation. All catchbasins are to be shown.

f) All existing and proposed storm and sanitary sewers are to be shown including size, length, grade, direction of flow, material and type of the sewer. Storm sewers 900 mm diameter and larger are to be drawn with two lines. Services must be shown for all lands to be registered. Services are to be terminated at the subdivision limits.

g) All watermains, valves, valve chambers, sampling stations and hydrants are to be shown. Watermains are to be identified only by size and material.

h) All curbs and sidewalks are to be shown, including details of connections to existing sidewalk networks.

i) All fencing is to be indicated by height and type.

j) All existing and proposed surface utility information including street lighting poles, hydro poles, hydro transformers, and cable and bell pedestals are to be shown.

k) All sites for parks, schools, churches, commercial and industrial developments must be shown.

l) If a subdivision encroaches on an existing floodplain, the approved fill and floodline restrictions must be shown, as specified by the LSRCA.

m) All existing buildings and structures on the lands including ones which are to be removed are to be shown.

n) The location of all traffic control and information signs and line painting is to be clearly shown on separate Traffic Management Plans, not on the General Services Plan.

6.2 Plan and Profile Drawings

All Plan and Profile Drawings shall be prepared at a scale of 1:500 horizontally and 1:50 vertically, in accordance with the following details:

a) A complete legend shall be provided on each drawing.

b) Plan and Profile Drawings are required for all roads, blocks and easements where services are proposed, for all outfalls and for all boundary roadways abutting the development.

c) All existing or future services, utilities and abutting properties shall be shown in dotted or shaded lines.

d) All services to be constructed are to be shown in solid lines.

e) All road allowances, lots, blocks, easements and reserves are to be identified. Lot and block frontages are to be dimensioned.

f) All curbs, gutters and sidewalks are to be shown and dimensioned on the plan portion of the drawings.

g) All sewers and culverts shall be shown and dimensioned on the plan and shall also be plotted on the profile of the drawings to true scale size. For all sewers and culverts, the type, size, slope, length, material and direction of flow shall be shown on both the plan and profile portion of all drawings. Storm sewers 900 mm diameter and larger are to be drawn with two lines in the plan portion. The hydraulic grade line for the storm sewer shall be drawn and labelled on the profile portion of the drawings.

h) All manholes shall be shown on the plan and profile portion of the drawings. The manholes shall be identified by number on the plan portion and by number, chainage, offset, size, invert elevations and applicable OPSD on the profile portion of the drawing. Sanitary manholes shall include the letter “A” after the number designation. Manholes that have safety platforms or drop connections shall be noted.

i) All non-standard manholes are to be detailed on the plan portion of the drawing at a scale of 1:50 and in relation to the north arrow.

j) All catchbasins and catchbasin connections shall be shown. All grate and invert elevations for rear lot catchbasins are to be shown. Concrete encasement shall be shown on all rear lot catchbasin leads.

k) When streets are of a length that requires more than one drawing, match lines are to be used with no overlapping of information.

l) The reference drawing numbers for all intersecting streets and match lines shall be shown on all Plan and Profile Drawings.

m) All watermains, hydrants, valves, etc., shall be described and dimensioned on the plan portion of the drawings. The watermain is to be plotted to true scale size on the profile portion of the drawing and shall be described.

n) The location of all storm, water and sanitary service connections shall be shown and dimensioned on the plan portion of the drawings.

o) The centreline of construction with 20.0 m stations shall be noted with a small cross on the plan portion of the drawings. Chainage shall generally start on the left side of the sheet and increase from left to right on all drawings. Existing and proposed centreline elevations shall be shown at 20.0 m intervals along the bottom of the profile.

p) The original and proposed ground at centreline of road shall be plotted on the profile. The proposed profile shall be fully described (length, grade, V.P.I. elevations, vertical curve data, etc.) with all elevations shown to three decimal places. Chainage for the centreline of construction as well as the chainages for V.P.I., B.V.C., and E.V.C. shall be noted on the profile portion of the drawings.

q) Details of the gutter grades for all intersections, cul-de-sacs and crescents shall be provided on the plan portion as a separate detail at a scale of 1:200.

r) Chainage for the centreline of construction, including chainages for P.I., B.C., E.C. and horizontal curve data shall be shown on the plan portion of the drawings.

s) The proposed pavement structure design and dimensions shall be noted on the plan portion of the drawings.

t) All existing utilities and services shall be shown on the plan view of the drawings. Utility locates will be required to determine the extent and location of existing utilities. It may be necessary to dig test holes to determine the actual elevations of these services to avoid conflicts with new construction. These elevations shall be shown on the profile portion of the drawings.

u) Profiles of roadways shall be produced sufficiently beyond the limits of the proposed roads to confirm the feasibility of future extensions, or connections to existing lands.

v) In addition to the above, the following details shall be shown on the plan portion of the drawings:

- the curb radii at all intersections
- the location of all luminaire poles and transformers
- any special notes.

6.3 Lot Grading Plans

a) All Lot Grading Plans shall be prepared in accordance with the criteria outlined in Appendix H of this document.

b) The information indicated in Section 44 should be shown as a minimum.

c) The plans shall be prepared at a scale of 1:500.

d) The plans must show overall lot fabric with lot and block numbers, street names, right-of-way limits, road curb and gutters, catchbasins, sidewalks, all aboveground street furniture and driveway locations. All easements shall be indicated on the plan complete with dimensions. The plans shall show existing topographic information, including existing contours and contour labels at an elevation interval of 0.50 m and shall extend 30 m beyond the limits of the project.

e) Road grades shall be shown at 20 m intervals and at all changes in grade. Directional arrows shall be provided indicating the overland flow route. 100 year storm event ponding limits shall also be shown.

f) Existing and proposed grades at the lot corners shall be indicated along with elevations at any break points and swales. Existing and proposed retaining walls, including top and bottom elevation, and existing and proposed embankments including slope label and associated elevations shall be shown.

g) Any lots requiring more than 1.2 metres of fill shall be indicated with an asterisk (*) beside the lot number to show that either engineered fill or extended footings may be required.

h) The house type and specified house grade shall be shown on all lots. Minimum basement elevations are to be shown where ground water or hydraulic gradeline impacts are a concern.

i) All locations requiring a goose neck riser/sump pump shall be clearly indicated on the grading plan.

j) Directional arrows shall be provided on all lots indicating the direction of flow and grade of flow in percent (%) along side lot lines and rear lots lines.

k) All trees to be pruned are to be clearly identified. The base elevation and size of all existing trees are also to be shown.

l) Any existing structures shall be shown with notes clearly identifying whether they are to be retained or demolished/decommissioned.

6.4 Composite Utility Plans

a) A Composite Utility Plan (or Plans) is to be prepared in accordance with the criteria outlined in Section 50 of this document.

b) The plans shall be prepared at a scale of 1:500.

c) The plans must show overall lot fabric with lot and block numbers, municipal addresses, street names, right-of-way limits, easements, road curbs and gutters, catchbasins, sidewalks, street trees, all aboveground street furniture and driveway locations.

d) Typical road cross-sections must be included on the plans.

e) Table 5 indicating Public Utility Clearance Requirements must be included on all plans (see Section 51.1).

f) The location of all utilities must be clearly shown (hydro, telecommunications, gas, cable, street lighting) along with Canada Post mailbox locations.

g) The location of all utility service locations to lots must be clearly identified along with storm, sanitary and water connections. All utility road crossings, including the number of ducts in each, and whether crossings are to be direct-buried, conduit, or concrete encased conduit, are to be shown.

h) Details shall be included indicating location and spacing requirements of services for the various lot types in the development.

i) A signature block shall be included for each utility to sign and date indicating acceptance of the layout as shown.

6.5 Other Drawings

6.5.1 Traffic Management Plans

Traffic Management Plans at a scale of 1:1000 are to be prepared indicating the location and details for all regulatory signage, traffic control and information signage and line painting.

6.5.2 Drainage Plans

Drainage plans shall be prepared at a scale of 1:1000. All drainage plans for the storm and sanitary sewer design shall be prepared in accordance with the criteria provided in this document. Manhole labels shall be presented at a legible text size appropriate for the scale.

6.5.3 Erosion and Sedimentation Control Plans and Tree Protection Plans

Prior to any site disturbance taking place plans will be required indicating the measures that will be put in place to protect any trees to be preserved and to prevent the migration of any silts from the site. The plans shall clearly indicate the order in which all activities are to take place and shall show the location and details for all tree protection fences, silt

control fences, earth or rock check dams, sediment ponds, mud mats and any other measures necessary to protect trees and control silts. Topsoil stockpile locations shall be indicated on the drawings and shall also be entirely enclosed with sediment control fence. Sediment pond sizing calculations and temporary outfall details are also to be shown.

6.5.4 Detail Drawings

The Town's Standard Drawings (See Appendices attached) shall be used whenever applicable. In the absence of a Standard Drawing the latest revision of the OPSD shall be used. Individual details shall be provided by the Developer's Consulting Engineer for all special features not covered by any of the above. All details shall be reproduced or drawn on standard size sheets and shall be included as part of the engineering drawings.

6.5.5 Landscaping Drawings

Drawings indicating the location and species of street trees and stormwater management pond landscaping shall be prepared in accordance with the requirements of the Town. The landscape drawings shall also include all utilities and above ground services and provide setbacks to same.

All final landscaping drawings shall be bound and included with the final engineering drawings in one package.

6.6 As-Constructed Drawings

The As-constructed Drawings constitute the original (design) engineering drawings which were accepted by the Town and which have been amended to incorporate the construction changes and variances in order to provide accurate information of the works as installed in the development. Submission of as-constructed drawing information shall be accompanied by revised design calculation sheets which confirm the capacity of the constructed condition of the sewers.

As-Constructed drawings are to be prepared in accordance with the requirements of Appendix J.

It is noted that the inclusion of any rear lot catchbasins and the associated connecting sewer pipe are subject to specific conditions for as-built information and certification (see the Town's inspection and construction guidelines for details), which are required in advance of issuance of building permits for the adjacent dwellings or structures. See standard drawing GST-1 for example.

6.7 Survey Control Monuments

Prior to assumption of the subdivision, the Owner's Surveyor shall establish a network of second order horizontal control monuments, as set out in "Ontario Specifications for Horizontal Control Surveys (OS 79)", as well as a network of vertical control benchmarks, as set out in "Ontario Specifications for Vertical Control Surveys (OS 79)".

The same monument may be used as both a horizontal and vertical control monument/benchmark.

The horizontal control monuments, and the vertical control benchmarks, shall be established at approved locations to the satisfaction of the Town, using the following criteria:

a) Two (2) horizontal control monuments and two (2) vertical control benchmarks for the first ten hectares (10 ha) (or less) subdivided by the plan, and one (1) additional horizontal control monument and vertical control benchmark for every additional ten hectares (10 ha) (or less) subdivided by the plan. Please note that environmental protection blocks/areas which are to be conveyed to the Town should not be part of this requirement.

b) In addition, every existing horizontal control monument and vertical control benchmark destroyed during subdivision or site plan construction must be replaced.

c) The new horizontal control monuments and vertical control benchmarks (including replacements) shall be installed by an Ontario Land Surveyor (OLS). A certificate by an OLS shall be provided stating that the horizontal control monuments and vertical control benchmarks were installed as set out by the "Ontario Specifications for Horizontal Control Surveys (OS 79)" and the "Ontario Specifications for Vertical Control Surveys (OS 79)" respectively, and confirmation from the Ministry of Natural Resources that the horizontal control monuments and vertical control benchmarks have been accepted into their Cosine Database.

d) The horizontal control monument shall be provided in accordance with the Town's standard drawing GG-1 "Benchmark (BM) monument and tablet details" and approved by the "Ontario Specifications for Horizontal Control Surveys (OS 79)".

e) A report on the new benchmark(s) is to be prepared by an OLS and provided to the Town in a format directed by the Town.

f) The location, description and pertinent information with respect to the monument shall be indicated on all engineering drawings.

7.0 SITE PLAN APPLICATIONS

The Town of Georgina requires all development proposals to undergo the Pre-Consultation process to determine all internal and external agency requirements. Further details may be obtained through the Planning Division and on the Town's website.

Drawings shall be provided as may be required for site plans, open spaces and park blocks or storm water management facilities (see "Drawing Submission Guidelines for Site Plans" in Appendix K).

Two (2) sets of building drawings shall be provided to the Engineering Division with all site plan applications. In addition to any other information shown on the building drawings, the plan shall show the installation of any water or sewer meters required and any interceptors as may be required pursuant to the Ontario Plumbing Code.

All submissions shall be in accordance with the Town's "Drawing Submission Guideline for Site Plans", which outlines the type of drawings, reports and number of copies and distribution of same as amended from time to time.

8.0 FIRE DEPARTMENT REQUIREMENTS

During construction, emergency access routes must be completed throughout the development. These routes shall be constructed to carry the weight of a fire truck, and designed in accordance with the standards of the Town's Engineering Division. The roadways or other access routes must be kept clear of construction materials at all times. The access routes must be maintained and accessible as indicated on the application for subdivision approval unless otherwise approved by the authorities having jurisdiction. The area around hydrants must be kept clear to afford access for firefighting purposes.

Fire break lots will be required at every fifth (5th) lot or as otherwise approved and specified by the Fire Chief within the executed Subdivision Agreement.

Controlled fire routes, as required by the Ontario Building Code Act, shall be shown on all Site Plans. It shall be the owner's responsibility to request the appropriate municipal by-law supporting the fire route designation and to install necessary signage or other methods of warning for enforcement purposes.

ROADS

9.0 CLASSIFICATIONS

All roadways in new developments shall be classified in accordance with the Town's current Official Plan (2010) as follows:

- Arterial Roads (Regional Roads)
- Collector Roads
- Local Roads
- Private Roads (not maintained by the Town).

The proposed classification of all streets planned in new development areas shall be confirmed with the Town prior to the commencement of the design. Roadways within urban areas are to be designed and constructed to urban cross-sections. Roadways supporting industrial, commercial and institutional land uses are also to be built to urban design standards.

10.0 SUPPORTING TRAFFIC STUDIES

Prior to or at the time of draft plan approval, the Town will require the proponent to prepare and submit supporting traffic studies, for the Town's approval. The first portion of the study consists of a broad-based external transportation and traffic study, which will examine the nearest major intersections, the property boundary conditions and interconnections with adjacent properties (including signalization issues), assessed under existing and future conditions. This Traffic Impact Study (TIS) must recommend the phasing of traffic signals and arterial road widenings to match development. The traffic study must conform to Region of York guidelines if any of the boundary roads are Region roads.

The second portion of the analysis consists of a Functional Internal Traffic Study (FITS) which balances appropriate urban design guidelines with a detailed assessment of internal transportation and traffic geometric design, on-street parking restrictions, off-street or driveway parking issues, stop sign warrants, roadway capacity and classification, lane configurations, boulevard requirements (i.e. snow storage and utility corridors), pedestrian requirements, vehicle decision making criteria and intersection vehicle sight lines.

The FITS will address, to the satisfaction of the Town, the compatibility of the roadway function and the adjacent proposed land uses. Specifically, appropriate building forms are required adjacent to and in the vicinity of collector/collector road and collector/arterial road intersections. The traffic study will also verify that sufficient on-street and off-street parking can be provided without impacting driveways, safety and road operations and

that appropriate accessibility standards have been complied with. The studies noted above are subject to the Town's approval prior to final assumption of the proposed draft plan.

11.0 GEOMETRIC DESIGN ELEMENTS

Table 1: Geometric Design Elements

Geometric Detail	Rural	Local	Minor Collector	Major Collector
Typical AADT	<1500	<1500	1500-4000	3000-6000
Design Speed (km/hr)	50	50	50	60
Road Allowance Width	20	20/18	23	26
Pavement Width (m) (edge to edge)	6.7	8.5	9.75	12.8
Minimum Grade (%)	0.5	0.5	0.5	0.5
Maximum Grade (%)	8	8	6	6
Pavement Cross-fall (%)	2	2	2	2
Minimum Horizontal Radius (m)	80	80	110	160
Minimum Visibility Curves in Sag (K Values)	12	8	12	15
Minimum Visibility Curves on Crests (K Values)	12	8	15	20
Minimum Tangent Length between Reverse Curves (m)	30	30	50	60
Intersection Angle (degrees)	80-100	80-100	85-95	85-95
Minimum Tangent Length required at stop-controlled intersections (m) from intersecting road center line.	30	30	50	60

Typical road cross sections for various road allowances are included in Appendix A. Standards for arterial roads are governed by the Region of York and the consultant must make reference to those standards.

SECTION – ROADS

11.1 Design Elements

11.1.1 Typical Road Cross Sections

The typical road cross sections shall comply with the Town's Standard- Drawings GR-1 GR-2, and GR-3 in accordance with the conditions established at the time of Draft Plan Approval.

11.1.2 Vertical Curves

All points of grade change in excess of 1.5% shall be designed with vertical curves. The minimum tangent length between changes in grade or between vertical curves shall be 9.0 m.

Combinations of vertical crests and horizontal curves are to be avoided.

11.1.3 Back-fall at Intersecting Streets

At all street intersections the normal cross-fall of the major street shall not be adversely interrupted by the crown line of the minor street. A 1% or 2% back-fall shall be provided on the minor street at all street intersections. This back-fall shall continue to the end of the curb return radii on the minor street to facilitate proper drainage of the intersection. The overland flow route of storm drainage through the intersection must be maintained.

11.1.4 Curb Return Radii at Intersections

The curb return radii at street intersections shall conform to the following dimensions:

Local to Local	10 m
Local to Minor Collector	10 m
Local to Major Collector	10 m
Minor Collector to Minor Collector	10 m
Minor Collector to Major Collector	10 m
Minor Collector to Arterial	15 m
Major Collector to Major Collector	15 m
Major Collector to Arterial	15 m

(Note – any arterial intersections shall be governed by RMY specifications)

11.1.5 Daylighting Requirements at Intersections

All Sight triangles at the intersection quadrants shall be designed in accordance with section 5.35 of the Town of Georgina Zoning By-law as amended from time to time. The Town's Zoning By-law 500 may be found at the following link:

http://www.georgina.ca/zoning-bylaws.aspx

(Note – any arterial intersections shall be governed by RMY specifications)

11.1.6 Cul-de-sacs

Cul-de-sacs should be avoided wherever possible. When deemed appropriate by the Town (and Draft Plan approved) they shall be constructed with a street line radius of 20 m and a pavement radius of 15 m, as per Town standard drawing GR-5. Minimum gutter grades of 1% shall be maintained along the flow line of the gutters around the cul-de-sac.

The maximum permissible down gradient leading into a cul-de-sac is 4%. The maximum length of a cul-de-sac shall generally be 150 m, where permitted.

11.1.7 Temporary Turning Circles

Temporary turning circles will be considered whenever a road is to be continued in the future. The street line and curb radius requirements for temporary cul-de-sacs are the same as for permanent cul-de-sacs. When temporary turning circles are required within the subdivision limits, the land within the temporary right-of-way limit must be conveyed to the Town or easements must be provided in favour of the Town. The temporary turning circle is to have complete services to the street line. Signage is to be erected at the terminus of the cul-de-sac indicating that the road will be extended in the future and a "dead end" barricade and sign shall be erected in accordance with OPSD 912.532.

11.1.8 Accessibility Guidelines

All roads and services within the Town are to be designed with regard for those standards being developed at the Provincial level for facilitating accessibility for persons with physical challenges. The interim and/or final guidelines are to be followed for all development work – both in the public or the private domains. (Information regarding same can be found at *http://www.accessiblemunicipalities.ca/home.asp?itemid=13949*

11.1.9 Transit

Designs shall have consideration for transit along collector roads, including accommodations for transit facilities, and convenient pedestrian access along local roads.

11.1.10 Roundabouts

The Town supports the implementation and use of roundabouts. The designer is encouraged to implement the roundabouts on a case by case basis in conjunction with and supported by a detailed Traffic Analysis. The Traffic Analysis shall include, but not be limited to, traffic capacity at the intersection, forecasted volumes of truck, car, pedestrian, and bicycle traffic, local parking considerations, right of way requirements, compatibility with adjacent intersections, speed of traffic and maintenance cost. Roundabouts proposed for RMY roads fall under the jurisdiction of the RMY. All other roundabouts fall under the jurisdiction of the Town.

12.0 TRAFFIC CONTROLS

The proposed location and type of all street name signs, traffic control signs, signalization and pavement markings shall be shown on the Traffic Control Plan. The plan shall be prepared by a Professional Engineer skilled in municipal traffic designs and regulations. All traffic control devices, including warning and regulatory signs, street signs, parking restrictions, etc., shall conform to the Ontario Traffic Manual (OTM) and local by-laws.

12.1 Signage

All regulatory signs must be installed at the completion of the base course asphalt and maintained by the Developer until “Final Assumption” by the Town. All signs indicating parking restrictions are to be installed prior to the occupancy of any initial dwelling or building being issued in a development.

The Developer will be responsible for installing all street signs and maintaining all signs in the subdivision until assumption of the subdivision by the Town with the exception of street name signs. Temporary street name signs are to be installed by the Developer at the completion of the base course asphalt and prior to the issuance of building permits in the subdivision. Prior to final assumption, upon completion of surface paving and boulevard grading, the Developer will install all permanent street name signs.

12.2 Street Name Signs

Location

Street name signs shall be placed at each intersection and shall identify each street at the intersection. The location of the street name signs are shown on the Traffic Control Plan and shall be installed on common posts with the stop signs or other signs wherever possible.

Type
The street name sign blades shall be extruded aluminum having a minimum thickness of 2.3 mm, a height of 150 mm and a length of 610 to 915 mm. Signs shall be mounted on 50 mm square galvanized posts 4 m in length, and buried 1.2m into the ground as per Town Standard GR-14.

The letters of each name/word shall be upper case. Lettering shall be white on a reflective green background, being engineering grade reflective sheeting (Type I, ASTM) as per Town Standard GR-13.

Refer to the Town's sign policy as provided in Appendix I.

12.2.1 Regulatory Traffic Control and Advisory Signs

Location
Traffic control and advisory signs shall be located in accordance with the OTM. All "No Parking" and "No Stopping" zones should be clearly identified with signs in accordance with the OTM, if required as part of an approved traffic study.

All roads under the jurisdiction of the Town of Georgina shall be posted with a 50 km/hr maximum speed limit (or less based on site specific conditions).

Type
All regulatory signs are to be in accordance with the OTM and constructed of high intensity reflective sheeting materials (type III or IV, ASTM).

Other than the Street Name Signs, all other regulatory/warning signs shall be mounted on galvanized steel U-flange posts (2.5 kg/m) and imbedded 1.2 m into the ground.

Signs must be erected at the completion of the base course asphalt and maintained by the Developer until "Final Assumption" by the Town. Temporary signs may be installed initially, however permanent signs are to be installed upon completion of all boulevard grading and sodding.

12.3 Notification Signs

Park notification signs are required to be erected at all frontages prior to issue of Building Permits. Park notification signs shall be in accordance with the Town's standard GG-4.

Entry feature planting can consist of any landscape related materials that will enhance the community. The following materials may be considered for use.

- stones/boulders
- shrubs
- trees
- flowers
- ornamental walls
- ground cover.

Signage and entry feature plantings shall be located and indicated on Development Plan and Working Drawings.

12.4 Pavement Markings

Pavement Markings for traffic control shall be provided and conform to the current standards of the OTM. All markings are to be completed with approved traffic paint in accordance with OPS specifications. Durable markings shall be used on any road which intersects an Arterial Road, at the intersection and back to a distance of 50 m from the Arterial Road. Approved paint in accordance with OPS specifications shall be used elsewhere.

Pavement markings shall be indicated on the plans for all stop bars, pedestrian crossings, centre and lane lines, as required or directed by the Town for all subdivision streets.

Painted stop bars are required at all stop-controlled intersections of any road with another road and located behind the sidewalk.

13.0 PAVEMENT DESIGN

The pavement design for all roads shall be as recommended by a qualified Geotechnical Consultant. The Geotechnical report shall be submitted as part of the Engineering Drawing Submission Package. The minimum pavement design for all streets in new subdivisions shall be as follows:

Local Road	Collector/Industrial Road
40 mm HL3	40 mm HL3
50 mm HL8	90 mm HL8
150 mm Granular “A” or 19 mm Crusher Run Limestone	150 mm of 19 mm Crusher Run Limestone
300 mm Granular “B” or 50 mm Crusher Run Limestone	300 mm of 50 mm Crusher Run Limestone

All depths noted are compacted depths.

A qualified Soils Consultant shall be engaged by the Developer to provide sampling and testing services during construction and to provide confirmation that all roads have been constructed in accordance with the design standards. All road pavement structures are to be determined based on a reasonable life expectancy for the proposed use (i.e. 20 years for an asphalt surface) and outlined as such in any report for such recommendations.

Testing and approval of all granular materials at the designated pits prior to placement and subsequent in-situ verification tests shall be performed by the Developer's Geotechnical Consultant.

Prior to the placement of asphalt pavement, the Consulting Engineer must submit the asphalt pavement mix designs to the Geotechnical consultant for approval. Once approved by the Geotechnical Consultant the mix design shall be submitted to the Town for record purposes.

14.0 CONCRETE CURB AND GUTTER

Concrete curb and gutter conforming to OPSD 600.040 (for single stage) or OPSD 600.070 (for two stage) shall be used on all new urban subdivision roads. Concrete strength is to be:

- minimum of 32 MPa at 28 days
- 355 kg/m^3 cement
- 7% +/- 1.5% air entrainment
- 60 mm slump.

Driveway depressions shall be formed in the curb according to the location shown on the engineering drawings and as detailed per OPSD 351.010. A mechanical curb cutting machine is not permitted to saw-cut driveway depressions, unless specifically approved by the Town.

All curb and gutter is to be protected from damage from heavy equipment and vehicles.

15.0 SIDEWALKS

The location requirements for sidewalks in new subdivisions shall be confirmed with the Town prior to commencing the detailed design. In general, sidewalks are required on both sides of all arterial and collector roadways and on one side of all local streets. Where possible, sidewalks shall be constructed on the north and east sides of the streets. All sidewalks shall be free of obstructions.

Sidewalks shall be installed at locations as shown on the Town Standards GR-1, GR-2, and GR-3. The width of sidewalks for all streets shall be 1.7 m (minimum) with a centreline turning radius of 3.2 m.

Construction shall comply with the Town's Standard Drawings GR-11 and GR-12. Concrete strength is to be a minimum of 32 MPa at 28 days with 7% +/- 1.5% air entrainment.

At street intersections the curb and the sidewalk shall be depressed to meet the roadway elevations as per Town Standard GR-12. Sidewalks must not be "dipped" at driveways. When a sidewalk is constructed adjacent to a curb and gutter, a keyway shall be provided along the back of the curb to support the sidewalk, all in accordance with OPSD 310.020. This type of construction is to be minimized wherever possible.

In cases where the sidewalk has been constructed prior to the establishment of an entrance to industrial/commercial/institutional driveway, then the existing sidewalk shall be removed and shall be replaced with a 200 mm deep sidewalk with wire mesh reinforcing.

The location of sidewalks and community mailboxes shall be coordinated with Canada Post to ensure that all community mailboxes have direct sidewalk access wherever practical.

15.1 Asphalt Walkways

Asphalt walkways are to be constructed having a 3.0 metre wide surface and shall consist of a layer of 64mm HL-3 asphalt on a compacted base as per Town Standard GR-10. Alternative hard surface, maintenance free, materials will be considered. Size of block to be determined based on a review of site conditions.

16.0 DRIVEWAYS

16.1 Minimum Driveway Design

All residential driveways are to be paved from the curb to the garage or face of dwelling.

The minimum consolidated depth requirements for the granular base and asphalt in driveways shall be confirmed by a soils consultant with the following minimum specifications:

a) Single Family Residential (see GR-8)
- Asphalt 25 mm HL3 surface course
  40 mm HL8 base course

– Granular 150 mm Granular “A” and 200 Granular “B”

b) Commercial, Light Industrial and Apartments
- Asphalt 40 mm HL3 surface course
  60 mm HL8 base course
- Granular 200 mm Granular “A”
  300 mm Granular “B”

c) Heavy Industrial Driveways
- Asphalt 40 mm HL3 surface course
  100 mm HL8 base course
- Granular 300 mm Granular “A”
  300 mm Granular “B”

16.2 Driveway Grades

The maximum permissible design grade for any driveway on private lands shall be 6% (desirable), or 8% (maximum). The minimum grade for all driveways shall be 1%. The use of negative grade driveways is not permitted in urban areas. Negative sloping driveways will only be considered in estate residential developments under special circumstances. Where negative sloping driveways are used, a positive slope of at least 2.5% must be maintained from the garage over a minimum distance of 10.0 m. Any variations from these limits must be approved by the Town.

16.3 Driveway Depressions

The minimum width of any driveway shall be 3.0 m. All residential driveway widths shall be in accordance with the Town’s current Zoning By-law. The width and location of the depressions in the curb and gutter, for single-family residential driveways, shall be as detailed on the Town of Georgina Standard GR-8. Driveway cuts shall be located at a minimum distance of 1.0 m from the extension of the side lot line, and are not to be located in daylighting triangles. Driveway width between the curb and the property line shall be in accordance with the Town’s Entrance By-law, as may be amended from time to time. The driveway width between the property line and the dwelling shall be in accordance with the Town's Zoning By-law.

A minimum 0.6 m separation at the curb shall be provided between driveways within cul-de-sacs and elbows along with corner lots and lots abutting walkways. Driveways are to be indicated on the above ground general plan. Curb depressions shall be in line with driveway on each side of the driveway.

All driveway and parking lot designs are to be detailed on the engineering drawings. Curbs are required on all driveways and parking lots. Curbs shall be constructed of

poured concrete as per OPSD 600.11. Alternative types and materials are subject to the Director of Operations and Engineering's approval.

All parking lot designs shall be examined using appropriate turning templates to determine a practical and acceptable layout. A traffic control site plan shall be submitted that will indicate all internal pavement markings, signage and fire truck turning radii. Parking spaces which cannot be ingressed or egressed with simple turning movements will not be approved.

The width of the curb cut-out for residential driveways shall be as detailed on OPSD - 303.01 and 303.02. The width of curb cut for apartment, commercial and industrial driveways shall take into account the basic width of the driveway and the radius of curvature as further outlined below. Where driveways are constructed between two adjoining properties, the curb cut-out shall not be continuous.

16.4 Driveway Alignment

The radius of curvature from the road into apartment, commercial and industrial driveways shall be designed to accommodate the anticipated vehicular traffic without causing undue interference with the traffic flow on the street. Details for apartment, commercial and industrial entrances shall be shown on the plans.

The Consultant shall utilize the appropriate turning templates as provided by the Transportation Association of Canada to ensure compatibility with municipal fire protection and sanitation collection vehicles. Turning templates are to be indicated on all key driveways on site plan submissions (i.e. Auto turn).

All apartment, commercial and industrial driveways and parking areas shall be provided with curbs or with curb and gutter constructed in accordance with details as outlined on the OPSD.

17.0 BOULEVARDS

All boulevard areas are to be graded according to the details shown on the Town's Standards GR-1, GR-2, and GR-3 and to the satisfaction of the Town. The final grade of the sod shall match the finished grade of the top of the concrete curb and sidewalk. Boulevards from the property line to the roadway will be graded to provide a minimum of 2% and a maximum of 4% gradient towards the roadway, whether a sidewalk is required or not.

All debris and construction materials shall be removed from the boulevard area upon completion of the base course asphalt and shall be maintained in a clean state until the roadway section is completed.

Clean, weed free topsoil shall be placed on all boulevard areas that are to be sodded. The minimum depth of topsoil shall be 150 mm. No. 1 Nursery Sod shall be used for all areas that are to be sodded.

All boulevard areas which have been disturbed due to utility construction, homeowner modification and/or otherwise shall be re-instated with 150 mm of topsoil and No. 1 Nursery Sod.

On all rural roads, the side slopes and the ditch bottoms are to be graded in accordance with the Town Standard GR-4 and approved drawings. Slopes and ditches are to be completed with a minimum depth of topsoil of 150 mm and No. 1 Nursery Sod which shall be staked as required.

18.0 CONSTRUCTION REQUIREMENTS

The construction of all roads in the Town of Georgina shall be in accordance with the Ontario Provincial Standard Specifications and Drawings, as amended from time to time, or as may be superseded by specifications within this guideline.

Prior to constructing any roadway or entrance onto an existing roadway, a mud mat shall be constructed as per Town Standard GSC-1. The type of material and size of mat shall be specified by the Consultant on a site specific basis. Each mud mat shall be subject to the Town's approval.

18.1 Sub-Grade

Mechanical analysis of the proposed sub-grade (i.e. proof-rolling) shall be taken along the entire roadway. California Bearing Ratio tests shall be taken for each representative soil type. All tests must be conducted by a qualified Soils Consultant. Copies of all tests and the road design proposed by the consultant will be submitted for the approval of the Town.

Where an unstable or organic soil is found to exist in the sub-base, such material will be removed to stable ground or ground approved by a qualified Soils Consultant and the void will be filled, and compacted with native material gravel or other approved material.

18.2 Road Sub-Drains

In general, 150 mm diameter perforated, filter cloth wrapped plastic corrugated sub-drains will be required to run continuously along both sides of all roads with curb and gutter. The sub-drains shall be installed in accordance with Town Standard GR-15. The Town reserves the right to require video inspection of sub-drains.

18.3 Compaction

All material within the roadway shall be compacted to the satisfaction of the Engineer. All material shall be spread upon the road in loose layers not exceeding 200 mm (8") in thickness.

Minimum allowable compaction requirements are as follows:

a) Road sub-grade and trench backfill – 98% Standard Proctor Density

b) Granular base – 100% Standard Proctor Density

c) Asphalt – 97% Bulk Relative Density (BRD).

All granular compaction shall be carried out under conditions of optimum moisture content. All other compaction requirements of the OPSS shall be followed.

18.4 Tack Coating

The asphalt surface shall be cleaned of any mud, debris or other material and a liquid asphalt emulsion shall be applied as specified immediately prior to spreading asphalt and shall be in accordance with OPSD 310.05.02 and shall be applied on all vertical structures abutting the pavement.

18.5 Paving

Top asphalt shall not be placed until approval is granted by the Town. Generally, no surface course asphalt is to be placed after October 25th of any year without the express written consent of the Town. Surface course asphalt shall not be placed in a single lift exceeding 100 mm (compacted) depth. If required, leveling/padding courses shall be placed and the depth of asphalt reduced wherever required.

The placement of surface course asphalt shall not commence in any area until all of the following conditions are met:

a) A minimum period of one (1) year (or two winter seasons) has expired from the date for the placement of the base course asphalt.

b) 85% of the dwellings have received Occupancy Permits.

c) All undeveloped lots or vacant lands are rough graded in accordance with the current and accepted lot grading plans, and stabilized.

d) All service connections for multiple family commercial, institutional or other blocks are installed.

e) All deficiencies and settlements have been repaired.

f) Favourable weather conditions are present, as defined by OPS Specifications.

No surface course asphalt is to be placed after October 25th of any year, without express written consent of the Director of Operations and Engineering.

19.0 TESTING

All testing for materials shall be completed by a geotechnical consulting engineer as certified for such work by MTO within the Province of Ontario. The Director of Operations and Engineering may require core tests and/or compaction tests to determine compliance with specifications; or to determine the actual thickness and for outlining areas of deficient thickness of roadways and sidewalks. Cores shall be taken at locations determined by the Director of Operations and Engineering. All costs for such testing shall be borne by the Developer.

STORMWATER

20.0 STORM DRAINAGE POLICIES

This section outlines the policies, design criteria and applicable parameters for the design and implementation of storm drainage facilities within the Town. These policies are to be adhered to in the design of all stormwater management facilities, including sewers, surface drainage and related environmental facilities.

The Town's policies are consistent with the Lake Simcoe Protection Plan (LSPP) which has been in effect since June 2, 2009. References to specific sections of the LSPP are included in the Town's storm drainage policies and it is highly recommended that any proponent of a development application review the LSPP in its entirety prior to submission to the Town.

20.1 Drainage Objectives

To assist in the attainment of proper drainage, the Town has set the following objectives for drainage management within its boundaries:

a) Prevent loss of life and minimize property damage and health hazards.

b) Minimize inconvenience from surface ponding and flooding.

c) Minimize adverse impacts on the local groundwater systems and base flows in receiving watercourses.

d) Minimize downstream flooding and erosion.

e) Minimize pollution discharges to watercourses.

f) Minimize soil losses and sediments to sewer systems and water bodies from construction activity.

g) Minimize impairment of aquatic life and habitat.

h) Promote orderly development in a cost-effective manner.

20.2 Drainage Objectives Specific to the Lake Simcoe Protection Plan

To be consistent with the LSPP, the following policies related to drainage and storm water management from Chapters 4 and 5 of the LSPP shall apply[1]:

a) Policy 4.8-DP: An application for a major development, as defined in the LSPP, shall be accompanied by a stormwater management plan that demonstrates:

   i) Consistency with stormwater management master plans prepared by or for the Municipality under policy 4.5, when completed.

   ii) Consistency with subwatershed evaluations prepared under policy 8.3 and water budgets prepared under policy 5.2, when completed.

   iii) An integrated treatment train approach will be used to minimize stormwater management flows and reliance on end-of-pipe controls through measures including source controls, lot-level controls and conveyance techniques, such as grass swales.

   iv) Through the evaluation of anticipated changes in the water balance between pre-development and post-development, how such changes shall be minimized.

   v) Through an evaluation of anticipated changes in phosphorous loadings between pre-development and post-development, how loadings shall be minimized. [The current goal is no net increase in phosphorous]. Guidelines for calculations can be obtained from the LSRCA.

b) Policy 4.9-DP: Stormwater management works that are established to serve new major development in the Lake Simcoe watershed shall not be permitted unless the works have been designed to satisfy the Enhanced Protection level specified in Chapter 3 of the MOE's "Stormwater Management Planning and Design Manual 2003", as amended from time to time.

   This policy does not apply if the works are intended to serve an infill development or a redevelopment within a settlement area, it is not feasible to comply with the specified design standard, and the person seeking to establish the works demonstrates that the works incorporate the most effective measures in the circumstances to control the quality and quantity of stormwater related to the development or redevelopment.

c) Policy 4.10-DP: Every owner and operator of a new stormwater management works in the Lake Simcoe watershed shall be required to inspect and maintain the works on a periodic basis.

[1] For definitions of *Major Development* or *Major Recreational Use* refer to Glossary in Lake Simcoe Protection Plan, 2009

d) Policy 4.11-DP: Every owner and operator of a new priority stormwater management works in the Lake Simcoe watershed shall be required to monitor the operation of works, including monitoring the quality of the effluent from the works, on a periodic basis.

e) Policy 5.6-DP: An application to establish a major recreational use, as defined in the LSPP, shall be accompanied by a recreation water use plan. Refer to Chapter 5 of the LSPP for complete details.

21.0 ATTAINMENT OF DRAINAGE OBJECTIVES

21.1 Planning

The valleys of existing watercourses and key natural heritage features should be maintained and preserved in their natural state with appropriate buffers as per Chapter 6 of the LSPP. More specifically, policies 6.1-DP through 6.11-DP, and 6.20-DP through 6.29-DP, and 6.32-DP through 6.40-DP provide complete details on setback buffers of natural heritage features. Where possible, crossings of intermittent or permanent streams should be kept to a minimum.

The Town discourages watercourse diversions, alterations, piping, and channelizations, except where these are needed for flood and/or erosion control. Permits for such work shall be obtained under existing legislation from the LSRCA and the MNR.

The LSRCA endeavours to restrict the construction of all buildings and structures from within prescribed limits as described in accordance with its “Fill, Construction, and Alteration to Waterways” Regulation. The proponent and its consulting team shall reference the LSRCA's Technical Guidelines for Stormwater Management Submissions (2010, or latest) through consultation with LSRCA staff or through their website at www.lsrca.on.ca/permits/ to fully understand the requirements of the regulation.

21.2 Planning, Policies and Design Criteria

The most current version of (MOE and LSRCA guidelines, policies and standards, LSPP shall apply to the design of storm drainage facilities in the Town, particularly the Stormwater Management Planning and Design Manual (latest version, per MOE).

Development proponents are also required to confirm design criteria and obtain approvals from any other relevant ministries or agencies (i.e. MTO, MNR, Department of Fisheries and Oceans (DFO), etc.).

The planning and design of stormwater management facilities shall be discussed with the Town and the LSRCA early in the planning process and shall focus on minimizing the number of pond facilities. Individual on-site SWM facilities are discouraged. Water

quality and quantity control in new development areas are to be provided in Town-owned municipal blocks. In the case of infilling proposals, on-site SWM concepts may be considered by the Town in conjunction with any potential off-site storm drainage improvements.

The planning and design of each pond shall also focus on opportunities to integrate the pond with the surrounding topography and land uses. Ponds are to be created as public amenity features and are to be safe, significantly visible and accessible to the general public. Opportunities for linkages through the use of trails to larger open space, floodplain areas or other SWM facilities are to be maximized.

The planning and design of SWM works is to have full regard for riparian rights of both upstream and downstream Landowners. Any change in flow rates, or water levels that would occur as a result of the development, SWM drainage areas and/or in-stream works to neighbouring private properties must be adequately addressed. Written permission from affected Landowners must be sought in cases where acknowledged impacts are proposed and any governing legislation must be strictly followed.

Post-development flows must be equal to the pre-development flows for site plans and subdivisions. Maximum peak flow rates must not exceed pre-development values for storms with return periods ranging from 2 to 100 years as per MOE policy. Enhanced quality control should be provided for stormwater run-off (minimum 80% TSS removal) per the MOE guidelines.

Where feasible, Low Impact Development (LID) technologies are to be incorporated into the stormwater management design. These technologies are consistent with the LSPP term “integrated treatment train approach”. See “Low Impact Development Stormwater Management Planning and Design Guide” Version 1.0 by Credit Valley Conservation Authority and Toronto and Region Conservation Authority. This document is available digitally through *www.sustainabletechnologies.ca*.

The Town will consider the use of technologies that utilize efficient design of features such as roof drain collectors, soak away pits, lot level controls, etc., wherever they are deemed appropriate and acceptable.

21.3 Levels of Service

The level of service to be provided by the storm drainage system is listed in Table 2 unless stipulated otherwise. The planning of access routes for emergency services (i.e. police, fire, ambulance) may result in higher levels of service as determined by the Town.

Table 2: Levels of Service for Major and Minor Systems

Item	Level of Service	Comments
Storm Sewers	1:5 year storm	• catchbasin density such that sewers capture and convey the 1:5 year storm, while minimizing flow on streets
Hydraulic Gradeline	1:100 year storm	• no less than 0.5 m separation between 1:100 year storm hydraulic gradeline and underside of finished basement floor elevations
Foundation Drain Collector	Greater of 1:100 year or Regional Storm	• not susceptible to backwater or surcharging
Major System	1:100 year storm	• large drainage areas may require classification as a floodplain using regulatory storm criteria (LSRCA) • overland flow cannot exceed width or flow capacity of right-of-way
Stormwater Management	1:100 year storm	• unless otherwise directed by Town
Critical Infrastructure	Regional Storm or Greater	• very special cases to be specified at the discretion of the Town

Storm sewers are to be initially sized for the 1:5 year storm. The Town of Georgina Storm Sewer Design Sheet is included in Appendix D. Subsequent hydraulic grade line (HGL) analyses and stormwater management may increase sewer sizes and/or require catchbasin inlet controls to be used.

21.4 Site Plans

The following additional items should be included for site plan submissions:

a) On site controls shall be provided using restrictor pipes and not orifice plates/inlet control devices

b) Minimum orifice control pipe shall be 75 mm

c) Ensure that ponding depth will not exceed a maximum of 250 mm in parking areas and a maximum of 500 mm at loading dock areas

d) Rooftop storage/controls

e) Inspection Manholes at property lines

f) Soak-aways for infill and un-serviced lots

21.5 Hydrology and Hydrologic Modelling

The estimation of peak design flow rates can be done using the Modified Rational Method or computer model simulation. The Rational Method should be used to design storm sewers and estimate peak flow rates from small urban areas (≤5 Ha). Computer analyses are best suited to large urban areas (>5 Ha), rural areas and designing municipal SWM facilities.

The minimum and maximum duration of design storms are 4 hours and 24 hours respectively. Hyetographs of the design storms are to be based on the City of Barrie WPCC Station #6110557 data and a 10 minute discretization). In order to account for climate change, the values of the WPCC Station were already increased by 15%.

The Town of Georgina supports the use of hydrologic programs such as SWMHYMO, OTTHYMO (V02), and PCSWMM.NET. Consultation with the Engineering Division of the Town is required in the event that the designer is proposing to use software different than the ones described above.

21.5.1 Design Storms

For the modeling of proposed developments which are greater than 5 Ha, the following storms shall be used:

Hurricane Hazel event (Regional Storm)
4-hour Chicago distribution
SCS Type II (6-hour, 12-hour, and 24-hour durations)

For quantity control estimates, the 1:2 year, 1:5 year, 1:10 year, 1:25 year, 1:50 year, 1:100 year, and the Regional Storm shall be applied.

In order to determine the critical design storms, the SCS Type II (6-hour, 12-hour, and 24-hour durations), as well as the 4-hour Chicago storm distribution for the 1:2 year through the 1:100 year return periods shall be applied.

Rainfall IDF curves for the 4 hour Chicago storm to be used are defined by the equation:

$$I = a \times (b+t)^{-c}$$

Where:

I = Rainfall intensity (mm/hr)
t = Time of Concentration (minutes)

The coefficients for a, b and c values are shown below:

Return Period	a	b	c
1:2 year	678.085	4.699	0.781
1:5 year	853.608	4.699	0.766
1:10 year	975.865	4.699	0.760
1:25 year	1146.275	4.922	0.757
1:50 year	1236.152	4.699	0.751
1:100 year	1426.408	5.273	0.759

Emergency outlets from stormwater management ponds are to be designed based on criteria noted in the section “Stormwater Management Pond Design”.

22.0 STORMWATER MANAGEMENT POND DESIGN

Stormwater management ponds are required to meet provincial stormwater management prerequisites as set out by MNR, MOE or LSRCA.

SWM pond locations, functions and design criteria shall be confirmed through consultation with the LSRCA and the Town. Where Stormwater Master Plans have been completed, the design criteria shall follow the approved Master Plan. End-of-pipe facilities are acceptable to the Town when the designs are safe, maintainable, integrated with the surrounding landscape, and aesthetically pleasing.

The Town concedes the overall design requirements to the most recent provincial direction, as is acceptable to the LSRCA. Exceptions to this are in circumstances that involve:

- matters of public safety and aesthetics
- operation and maintenance requirements
- protecting the riparian rights of private Landowners
- protection of municipal infrastructure
- conflicts with land use.

In these cases, the Town may invoke additional release rate stipulations and design requirements over and above those required by other agencies.

Stormwater Management Reports should include discussions of objectives, constraints, data from related studies, a summary of hydrologic results, costs and criteria for selection of alternatives. The report should give all figures required for the discussion of alternatives and their operation. Hydrologic modelling information, schematics, parameters, data for system identification should be given in a separate section. The section should present all data required for review. Examples of information to be made available in the section include:

a) Maps showing model sub-catchment that enclose the drainage modification project. Elevations at key points and minor drainage system routes.

b) Tables showing pre and post-development areas, devoted to each ground cover element (e.g. roof top, grass, pavement, etc.), runoff coefficients (Pre and Post), hydrologic soil groups, rainfall distribution.

c) Storage volumes and elevations associated with runoff control measures. Hydraulic computations of outlets and storage outflows relations (e.g. stage storage/stage discharge curves).

d) Main computer inputs/outputs should be made available for verification by the Lake Simcoe Region Conservation Authority, the Ministry of the Environment and the Town of Georgina and Regional Municipality of York and any other governing agency.

e) Operation, details and maintenance of runoff control facilities.

f) Sediment and erosion control measures and details.

The Town requires integration of SWM pond grading design with the surrounding landscape. The design is to consist of varied contour grading to ensure public safety, provide improved aesthetics, support of a variety of plantings and vegetation. Safety aspects must be given special consideration. This includes identifying the use of gentle slopes in areas where passive recreation takes place, increasing density of appropriate plantings and vegetation on steeper slopes, handrails/guardrails at headwalls and placing signs which inform of the function and potential hazards of SWM ponds. The following guidelines shall be used:

SECTION – STORMWATER

Subject	Criteria
Depths	• Maximum permanent pool depth – 2.5 m. • Maximum water level fluctuation – 2.0 m (active storage area). • Minimum freeboard – 0.25 m.
Side Slopes	• Maximum permissible side sloping is 4:1. • A safety shelf with maximum 7:1 side slopes is required for at least 3.5 m (plan view), on either side of the Normal Water Level (NWL). • A minimum 3m wide strip at a maximum crossfall of 4% is to be provided around the property boundary of the SWM block for the purposes of grass cutting. • A horizontal terrace of 3.0 m required for continuous slope changes in elevation greater than 3.0 m. • Berming of wet ponds are to be designed as proper dams (clay core, toe drains, etc.).
Outlets	• A bottom draw low flow outlet structure with reverse sloped control pipe is required for the extended detention outflow. • A minimum orifice size of 75 mm diameter is permitted to avoid clogging issues. • Emergency overflow with spill capacity for the Regional Storm Event is required. In lieu of modeling the Regional Storm Event, the peak overflow can be estimated by assuming 0.1 m^3/s/ha of drainage area. Where public safety or severe property damage may be at risk arising from dam failure, the Town may ask for the emergency overflow to convey more than 0.1 m^3/s/ha. • Safety grates shall be provided on all storm sewer inlet and outlet pipes and safety railings shall be provided along the top of all headwalls 600 mm in height or greater.
Landscaping	• Suitable landscape plantings are required to discourage access to the water (swimming, skating, boating, etc.), break accidental falls, and to provide for both aesthetics and environmental enhancement, and are subject to the requirements of the Town .
Fencing	• The Town prefers not to require fencing around SWM pond blocks, but instead, allow for casual public access to facilities, subject to maintaining public safety. • Fencing shall be provided along the rear of lots backing onto SWM facilities. • Specific approval will be required from the Town for consideration of fenced facilities. • Where approval for fencing SWM ponds is given by the Town, 1.8 m high black vinyl-coated fencing, posts and hardware shall be used.
Signage	• Signage to educate and advise public of facility must be erected. As per Town Standard GG-2.

Additional Notes:

a) A sediment drying area shall be provided with a surface area equivalent to the area of the bottom of the forebay. This area shall be graded at a 2.0% to 5.0% slope with surface drainage to the facility. The drying area shall consist of a surface area having a minimum of 300 mm depth of 50 mm crusher run limestone with 150 mm of topsoil and sod.

b) A maintenance access roadway shall be constructed with asphalt from the municipal road to the inlet structure, outlet structure and to the bottom of the sediment forebays and wet cell shall be looped with a maximum grade of 10%. Turf stone shall be used in areas below the high water level. The maintenance access shall have a minimum width of 6.0 m with a 4.0 m wide asphalt surface. In areas where the maintenance access will be also used as a walkway, the access area shall have a minimum width of 8.0 m with a 4.0 m wide road surface. The turning radii shall not be less than 12.0 m. Access roads adjacent to residential lots shall have a minimum 3.0 m landscape buffer between the road and the residential property line.

c) Fencing is to be placed to separate any SWM block from any private residential land uses.

d) Warning signage is to be installed at various locations surrounding the pond area, in accordance with the Town's standards and practices.

e) Erosion protection shall be provided on the top, down slope opposite storm bank base of the emergency spillway. The side slopes at the top of the spillway shall be 3:1 maximum and shall be 10% if used as an access roadway.

f) The local ground water elevation shall be compared to the proposed permanent pool elevation within the facility as lining of the permanent pool areas may be required to ensure that permanent pool levels are maintained. Alternatively, where the groundwater elevation is above the permanent pool elevation, confirmation that there will be no detrimental effects on the groundwater levels and/or quality will be required. This shall be addressed in the soils report.

22.1 Operational and Maintenance Features

The SWM pond designs are to incorporate features that allow the Town to operate and maintain the facility efficiently. These features include:

SECTION – STORMWATER

Subject	Criteria
Access Road	• Must provide access to bottom of sediment forebay and wet cell and designed to support maintenance vehicles. Must also provide access to control structures and outfall. • Max. gradient of 10%, cross-fall of 2%. • Min. width of 3.0 m. • Min inside turning radius of 10.0 m. • Bollards or gates to discourage vehicular access to the maintenance road must be installed.
Flow Control Structures	• Must be located at any easy access point for maintenance and cleaning purposes. • Must be protected from public access. • Must blend into surrounding landscape (railings are to be avoided where possible).
Pond Drain-down	• If possible, a gravity outlet outfitted with a valve is to be provided for the drawdown of the pond (forebay and wet cell) and shall be accessible from the access road. • The valve must be directly accessible in a chamber or structure. • If a gravity outlet is not available, a perforated pipe leading to a dewatering sump is to be provided. The sump is to be located as close to the pumping outlet as possible. • A gravity outlet or dewatering sump is to be provided in the forebay for drain down into the wet cell.
Bypass Sewer	• To be installed between inlet and outlet and sized for 2-year storm. • Outfitted with a normally closed valve or gate, in an accessible location for maintenance vehicles and shall be fitted with lockable access.
Sediment Drying Area	• A Sediment Drying Area shall be incorporated into the design provided that it does not impose additional land requirement within the pond block. The Drying area should be equivalent to the area of the bottom of the forebay, be graded at 2.0% to 5.0% slope with surface drainage to the facility and shall consist of a minimum of 300mm depth of 50mm crusher run limestone.
Emergency Shut Off	• A valve is required on the extended detention outlet in order to temporarily shut off the pond outlet during emergency contaminant spill conditions and shall be fitted with lockable access.

22.2 Operations and Maintenance Manual

A SWM Facility "Operations and Maintenance Manual" is to be prepared for the Town by proponents of new SWM facilities, which is consistent with LSPP Policy 4.10-DP. The Operations and Maintenance Manual shall be a separate, bound document from the SWM report. The manual is to describe how each facility operates and the short term and long term inspection and maintenance requirements of the facilities. The manual shall also include estimated yearly maintenance costs for the facilities along with supporting calculations. Any collection system SWM components, such as oil and grit separators are to be included in the manual.

A list of typical items that should be included in the manual is as follows:

- Location
- Design Drawings
- Type of SWM Facilities
- Pond Specifics
  - How does the facility work (describe methodology of typical events)
  - Design Values for Facility (volumes, elevations, discharges, design event, over topping, etc.)
  - Detention Time/Drain Down Time
  - Reduced Scale Plan of Facility
  - Inspection (what to check, frequency)
  - Sediment (anticipated volume, frequency of removal, disposal, testing)
  - Instructions for drawdown/dewatering (valve operation details)
  - Maintenance (grass cutting, weed control, vegetation replanting, garbage removal, etc.)
  - Annual Cost Estimate for all Maintenance Activities, photographs of the forebay, wet cell, inlet and outlet structures and any other pertinent control structure
- A maintenance access roadway shall be constructed with asphalt from the municipal road to the inlet structure, outlet structure and to the bottom of the wet cell and sediment forebays and shall be looped with a maximum grade of 10%. Turf stone shall be used in areas below the high water level. The maintenance access shall have a minimum width of 6.0 m with a 4.0 m wide road surface. In areas where the maintenance access will be also used as a walkway, the access area shall have a minimum width of 8.0 m with a 4.0 m wide road surface. The turning radii shall not

be less than 12.0 m. Access roads adjacent to residential lots shall have a minimum 3.0 m landscape buffer between the road and the residential property line

- Additional items as per the MOE's latest Stormwater Management Planning and Design Manual should also be included as deemed appropriate for the particular facility.

22.3 SWM Facility Monitoring Requirements

In addition to the consultant providing certification that the SWM pond has been built in accordance with the approved design, specifications for long term monitoring shall be outlined in the criteria consistent with LSPP Policy 4.11-DP. It will be required that a statement/certificate be provided from the consultant upon assumption certifying that the SWM pond functions as per design based upon the results of the monitoring and effluent testing data, all clearly and neatly put together in a package with the Operation and Maintenance Manual for turn over to the Operations Division.

Monitoring and testing shall include inflow, outflow, water quality, sediment testing, phosphorus, etc.

Monitoring requirements shall be finalized in consultation with the Town and LSRCA on a site by site basis. Should the SWM pond not function as designed, the consultant will be required to outline the shortcomings and provide design(s) to rectify same. The developer shall implement the changes and continue the monitoring process, either in accordance with the original terms or as may be further required by the Consultant, LSRCA or the Town.

22.4 As-Constructed Drawings (SWM)

As-built drawings in the form of a topographic survey of the stormwater management facility accompanied by calculations will be required to confirm the following:

- Permanent pool volume
- Forebay volume
- Active storage volume
- Location and height of berms
- Location, invert elevations and size of pipes, inlets and orifices for the outfall structure.

The Consulting Engineer's certificate of completion shall certify that the as-constructed facility has been built and is performing in accordance with the engineering plans and design report.

SECTION – STORMWATER

The following steps shall be undertaken during construction and prior to assumption of the stormwater management facility:

a) After grading is completed, the consultant shall submit a complete topographic survey of the facility indicating that same has been constructed in accordance with the approved design and plans.

b) The survey shall be completed in a dry condition. Should remedial work be necessary to achieve specified elevations/dimensions a subsequent survey will be required to be submitted to indicate that the remedial work conforms to the specified elevations/dimensions.

The following items are also to be addressed:

a) The above noted topographic survey is required to be submitted prior to building permit release by the Town.

b) The consultant shall monitor the sediment levels on a monthly basis and provide a summary to the Town.

c) Sediments shall be removed from the forebay on an annual basis, unless the consultant demonstrates that the accumulated sediment volume is less than 25% of the forebay permanent pool volume.

d) Sediments shall be removed from the main pond when the accumulated sediment volume is greater than 25%.

e) A minimum of five (5) measurements of sediment depth along the mid-section of the length of the facility will be required.

f) Water samples shall be taken at the outfall from the stormwater management facility within 24 hours of a significant rainfall event on a yearly basis to assess the Total Suspended Solid (TSS) concentrations in mg/l.

g) Quantity performance monitoring.

h) Fluctuations in the permanent pool water elevations shall be recorded on a monthly basis.

i) The consultant shall provide monthly inspection reports to the Town along with copies of instructions to the site contractor for any remedial work.

j) At the time of assumption, the facility shall be drained and all sediments shall be removed from the forebay and main pond. A topographic survey shall be

completed after the sediment removal. This final survey shall be submitted together with the initial survey to verify that all sediments have been removed from the facility. Town staff shall be present during the drainage of the pond and sediment removal.

23.0 STORMWATER CONVEYANCE SYSTEM

23.1 General

Urban stormwater conveyance systems may include open channels and swales, storm sewers, manholes and catchbasins, foundation drainage collectors, roadways and road allowances. The design of stormwater conveyance systems shall follow "dual drainage" principles, which consist of:

- The minor drainage system which conveys runoff from the 1:5 year return period storm
- The major drainage system which conveys runoff from storms greater than the 1:5 year return period up to the 1:100 year storm.

The design of the minor drainage system shall include both the capture and conveyance of the 1:5 year storm event. The system must provide un-surcharged conditions during the minor event. The minor system design shall include capacity for connection of foundation drains or weeping tiles and the storm sewers shall be at an appropriate depth to provide connection to foundation drains.

As an alternative to connecting foundation drains or weeping tiles to the storm sewer the use of sump pumps may be considered. However, they will only be considered under certain conditions, where it is considered to be in the Town's interests.

A hydraulic gradeline analysis shall be completed and submitted for review. Sufficient inlet control devices at appropriate locations shall be determined by the Design Engineer to ensure un-surcharged conditions are maintained in the minor system during the 1:100 year storm event.

The design of the major system shall be such that runoff is conveyed within the boundaries of municipal road allowances, blocks or easements. A continuous overland flow route is to be identified on the Engineering Drainage Plans.

23.2 Major Drainage System Design

A continuous overland flow drainage route is to be identified on the engineering drawings and grading plans. No major system overland flow during a 1:100 year storm shall use private property and must be limited to rights of ways and public property. Any

inlet grating associated with the major drainage system is to include a 50% blockage factor in its design.

Runoff rates in excess of the design capacity of the minor system shall be conveyed via streets and appropriate open channels to a sufficient outlet. The combination of overland and minor systems shall be designed such that a 25 year return frequency storm does not flood private property and the depth of flow at the curb does not exceed the top of the curb both within and external to the development.

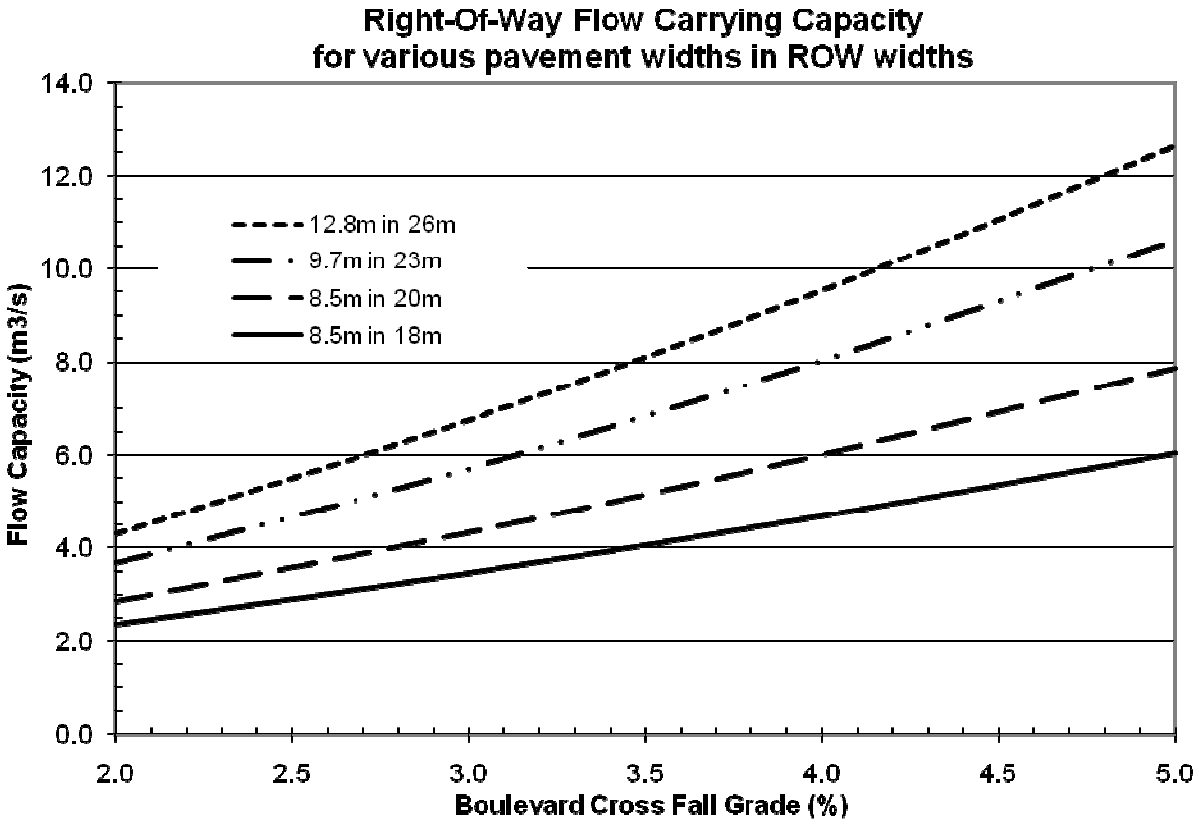
Any 1:100 year storm sewer capture situations are to be avoided where possible. In cases where no other options are available, redundancy in the system must be provided such that a localized spill point is provided before flooding of private properties occurs. If a spill point does not exist, additional high capacity inlets are required to provide redundancy.

23.2.1 Roadway Major System

Generally, road rights-of-way vary in width from 18.0 m to 23.0 m and have a gradient in the supercritical range of 0.5% to 6%. The flow carrying capacity is predominately influenced by the boulevard cross-slopes, whereby steeper boulevards provide for deeper flow. Designers should set the boulevard slopes accounting for the need to convey overland flow, but must have regard for other constraints which affect boulevard cross slopes (i.e. maximum permissible driveway grades). Boulevard slopes of 2% are to be used unless a steeper slope is required for overland flow conveyance. Overland flow must be limited to road rights-of-way, walkways and easements, free of fences and other impediments to flow.

Refer to Figure 1 which provides the maximum road allowance carrying capacity for overland flow for various pavement and road allowance widths. This table shall be used to confirm the capacity of the overland conveyance system relative to the expected design flows.

Figure 1: ROW Flow Carrying Capacity



Note –flow capacity at critical depth to within limits of ROW.

23.2.2 Swales and Open Channels

Swales and open channels can play an important role in both the major overland flow systems and the minor systems. They are to be designed to be aesthetically pleasing, safe, resistant to erosion and easy to maintain. Design velocities are to be calculated using Manning's equation and need to consider critical depth.

The following table provides acceptable values for Manning's "n":

Grass Channel (>0.5 m deep)	0.025
Grass Swale (<0.5 m deep)	0.030
Rip-Rap Channel (>1 m deep)	0.035
Rip-Rap Channel (<1 m deep)	0.040

Generally, grassed surfaces are adequate for velocities up to 1.5 m/s and more robust erosion protection is required for velocities beyond this range.

Fences, gardens, sheds and other flow impediments significantly reduce the flow carrying capacity of swales on private property. Overland flow from public property onto swales on private property is not permitted. Overland flow must be limited to road rights-of-way, walkways and easements, free of fences and other impediments to flow.

23.2.3 Foundation Drain Collector Systems

In areas where it cannot be demonstrated that the hydraulic gradeline for the 1:100 year storm will be at least 0.5 metres below the finished basement floor elevations of the dwellings, sump pumps may be permitted.

24.0 MINOR DRAINAGE SYSTEM DESIGN

Storm sewers should be sized to convey the peak design flow in accordance with Manning's equation, whereby the friction slope is assumed the same as the bed slope of the pipe.

$$Q = \frac{1000\ A\ R^{2/3} S^{1/2}}{n}, \quad V = \frac{R^{2/3} S^{1/2}}{n}$$

Where

Q = Flow (L/s)
V = Velocity (m/s)
R = Hydraulic radius (m)
S = Slope (m/m)
A = Nominal cross sectional area of the sewer (m^2)

The sizing of sewers at slopes greater than the critical slope is limited by inlet capacity and not friction slope. Table 3 lists the maximum allowable flow rate for each sewer size. The table also lists the maximum pipe slopes based on a full flow velocity of 4.0 m/s. The critical slope is based upon the pipe flowing 85% full.

The values listed in Table 3 shall be incorporated into storm sewer design sheets and carried through to Hydraulic Grade Line calculations.

24.1 Rational Method

The design of the storm sewers shall be computed on the Town's standard Storm Sewer Design Sheet. All storm sewer minor system designs shall be based on a 5 year frequency unless otherwise directed by the Town.

a) All storm sewers shall be designed according to the rational formula where:

Q = 2.778 (ACI)

Where:

Q = Run-off quantity in m^3/sec.
A = Area in hectares (ha)
C = Runoff coefficient
I = Average rainfall intensity in mm/hr.

b) The value for rainfall intensity shall be calculated in accordance with the values as provided in Section 21.5. The equation for the 5-year storm is indicated as:

$$I = 853.608/ (T+4.669)^{0.766}$$

24.1.1 Initial Time of Concentration

The initial time of concentration, to be used to determine total time of concentration, should be calculated using the following methods, subject to the run-off coefficient:

Method	**Condition**
Airport Method	C ≤ 0.4
Bramsby-Williams	C > 0.4

Airport Method

$$\mathbf{Tc = \frac{3.26\ (1.1 - C)\ L^{0.5}}{S_w^{0.33}}}$$

Where:

Tc = Time of Concentration (minutes)
C = Runoff coefficient
L = Length (m)
S = Slope (%)

Bramsby Williams Method

$$Tc = \frac{0.057L}{S_w^{0.2} A^{0.1}}$$

Where:

Tc = Time of Concentration (minutes)
L = Length (m)
S = Slope (%)
A = Area (ha)

Typical initial Tc value for urban areas is 10 minutes and should be used as the minimum value.

24.1.2 Runoff Coefficients

Values for the run-off coefficient "C" are as follows:

Commercial areas	0.90
Industrial areas	0.75
Schools, churches, institutions	0.70
Apartments, townhouses, multi res. unit blocks	0.70
Semi-Detached residential	0.65
Single Family residential	0.60
Estate residential	0.45

An appropriate run-off coefficient may also be determined from the following:
C = 0.2 (1-I) + 0.9 (I)

Where “I” is the site imperviousness ratio.

24.1.3 Roughness Coefficients

Manning’s formula shall be used in determining the subcritical capacity of all storm sewers and channel, as outlined above. The value of the roughness coefficient ‘n’ used in the Manning’s formula shall be as follows:

- All smooth walled pipes 0.013
- Concrete Box Culverts 0.015
- Corrugated Steel (culverts only) 0.024

24.1.4 Flow Velocities

- Minimum velocity = 0.8 m/sec
- Maximum velocity = 4.0 m/sec

24.1.5 Minimum Sizes

The minimum size for a storm sewer main shall be 300 mm in diameter, and as stipulated by Q Maximum in Table 3.

24.1.6 Minimum and Maximum Grades

The minimum and maximum grades for all storm sewers shall be in accordance with Table 3. The first upstream leg shall have a slope not less than 1.0% and be a length of not less than 50 m., unless the designer demonstrates that the minimum velocity of 0.8m/s is being achieved.

Table 3: Allowable Storm Sewer Capacities and Gradients

Diameter (mm)	Q Maximum (m^3/s)	Slope Minimum (%)	Slope Critical (%)	Slope Maximum (%)
300	0.12	0.5	1.34	8.4
375	0.20	0.5	1.25	6.3
450	0.32	0.5	1.17	4.9
525	0.47	0.5	1.12	4.0
600	0.66	0.5	1.07	3.4
675	0.88	0.3	1.03	2.9
750	1.1	0.3	0.99	2.5
825	1.5	0.3	0.96	2.2
900	1.8	0.3	0.93	2.0
975	2.2	0.2	0.91	1.8
1,050	2.7	0.2	0.89	1.6
1,200	3.7	0.2	0.85	1.3
1,350	5.0	0.2	0.81	1.1
1,500	6.5	0.2	0.79	0.99
1,650	8.2	0.2	0.76	0.87
1,800	10	0.2	0.74	0.77

Diameter (mm)	Q Maximum (m^3/s)	Slope Minimum (%)	Slope Critical (%)	Slope Maximum (%)
1,950	12	0.2	0.72	0.70
2,100	14	0.2	0.70	0.63
2,250	16	0.2	0.69	0.58
2,400	19	0.2	0.67	0.53
2,700	24	0.2	0.65	0.45
3,000	29	0.2	0.62	0.39

The Town may consider flatter grades for large sewers, in special circumstances, provided a minimum velocity of 0.8 m/s can be attained.

25.0 SUBMISSION REQUIREMENTS FOR SWM DESIGN REPORTS

The following is a list of documentation which should be included within SWM design reports submitted to the Town for review. These reports are submitted to support the final design of quality and/or quantity control facilities. These reports shall clearly identify how applicable recommendations from Master Servicing, Functional Servicing, Geotechnical, Environmental or Hydrogeological Reports have been incorporated into the final design of the facility.

a) Site Location Plan.

b) Existing and proposed catchment area plan which delineates internal/external drainage areas and labels areas and catchment reference numbers.

c) Engineering plans for stormwater facilities which should identify the following:

- permanent, extended detention, highest water levels on plan view and include all ponding levels for various return periods in tabular form
- section/details of major overland flow routes
- section/details of maintenance access roads
- section/details of erosion protection at inlet/outlet structure and on spillways
- fencing limits
- location of facility signage
- borehole location and existing groundwater elevation
- existing and proposed grading elevations and transition slopes
- sediment forebay details including lining and separation berm

- details of sediment drying area and/or by-pass pipe for cleaning purposes
- sump pumps and other pumping
- section/details of inlet/outlet structures.

d) Landscaping/restoration plans and details.

e) Erosion and sediment control plans and details.

f) Excerpts from comprehensive Storm Water Master Plans and Functional Servicing Studies which outline requirements for quantity/quality/erosion control and any specific facility or design requirements. The comprehensive Storm Water Master Plans to be developed by or approved by the Town shall be consistent with the requirements of the LSPP.

g) Identify any deviations from the Town Design Criteria and Standards including an explanation based on site specific conditions.

h) Pre and post development hydrologic modeling schematic to illustrate all components of each model.

i) Table summarizing pre and post development catchment parameters (i.e. catchment number, area, percent impervious, CN value, etc.).

j) Table summarizing stage, storage and discharge characteristics of the facility.

k) Table summarizing pre and post development peak flows and storage volumes based on output from hydrologic modeling or comparison to volumes and target peak flows identified in Master and Functional Servicing Studies.

l) Table to summarize and compare required permanent pool and extended detention storage requirements to volumes provided in the facility.

m) Table to compare calculated 1:100 year hydraulic grade line elevations within storm sewer system to estimated underside of basement floor slab elevations.

n) Sample or supporting calculations for the following:

- extended detention drain downtime (hours)
- major system overland flow and velocity to confirm conveyance within road allowance and/or defined flow routes
- erosion control sizing, flow velocity at inlet/outlet structures and spillways
- sediment forebay length and width in conformance with MOE manual
- major system inlet grating sizing (assuming 50% blockage).

o) Hard and digital copies of input/output files from hydrologic modeling (digital files may be provided on CD or via e-mail).

p) Identify erosion and sediment control methods to be implemented before, during, and after municipal servicing construction up to the end of servicing maintenance period, including schedule for implementation/decommissioning and maintenance requirements.

q) Any HGL above the storm sewer obverts is to be shown on the sewer profile drawings.

r) Pre and post development Phosphorous budget with goal for no net increase and describe how loadings shall be minimized consistent with the LSPP and LSRCA guidelines.

s) Pre and post development water balance if not already included under the hydrogeological study and how changes shall be minimized consistent with the LSPP and LSRCA guidelines.

26.0 STORMWATER CONVEYANCE SYSTEM DESIGN

26.1 Sewers

26.1.1 Pipe Cover

Typically a minimum cover of 2.7 m (from future road grade) is required to the top outside edge of the pipe barrel for the storm sewer. However, where specifically approved by the Town, minimum frost cover of 1.5 m may be provided on storm sewers where servicing limitations exist.

The maximum depth of sewers with direct lateral connections shall be 7.0 m (measured from finished centerline of road elevation to invert of sewer). In cases where deeper sewers are required these shall be considered trunk sewers and no direct lateral connections will be permitted. Should the installation of lateral connections be warranted, separate local sewers shall be constructed offset above the trunk sewer with sufficient space to allow maintenance of the trunk sewer should it be necessary.

26.1.2 Location

The storm sewers shall be located as shown on the Town Standards GR-1, GR-2 and GR-3. This standard location shall be generally 1.5 m south or west of the centreline of the road allowance, although deviations from this standard may be considered on a site by site basis. In the case of crescents, looped and curvilinear streets, this standard location may be varied to the extent that the storm sewer remains on the same side of

the centreline of the street (i.e. left or right) to avoid crossing the sanitary sewer trenches at the changes in direction of the street.

All storm sewers shall have a minimum horizontal separation of 2.5 m and a vertical clearance of 0.5 m (outside of barrels) from watermains in accordance with MOE regulations.

26.1.3 Termination Points

All sewers shall be terminated at the subdivision limits when external drainage areas are considered in the design, with suitable provision in the design of the terminal manholes to allow for the future extension of the sewer.

When external areas are not included in the sewer design, the sewer shall extend at least half way across the frontage and/or flankage of any lot or block in the subdivision.

26.1.4 Sewer Alignment

All storm sewers shall be laid in a straight line between manholes unless radial pipe has been permitted by the Town. In such cases, pipe shall be as outlined in Section 26.1.7.

26.1.5 Pipe Crossings

A minimum clearance of 300 mm shall be provided between the outside of the pipe barrel at the point of crossing for storm and sanitary sewers. Where the minimum clearance cannot be obtained, the crossing is to be encased in 25 MPa concrete. A minimum clearance of 0.5 m shall be provided for all sewer and watermain crossings.

A minimum horizontal clearance of 2.5 m (MOE) shall be provided from all water services to any storm sewers or catchbasins, unless the designer can demonstrate that same is not achievable, at which time, a lesser clearance may be considered as per Section 15.1.1 of the MOE.

In cases where the storm sewer crosses a recent utility trench at an elevation higher than the elevation of the utility, a support system shall be designed to prevent settlements of the storm sewer, or alternatively, the original trench will be re-excavated to the top of the utility and shall be backfilled with compacted crushed stone or concrete to adequately support the storm sewer. When the storm sewer passes under an existing utility, adequate support shall be provided for the utility during and after construction to prevent damage to that utility.

26.1.6 Changes in Pipe Size

No decrease of pipe size from a larger upstream pipe to a smaller downstream size will be allowed due to the increase in grade.

26.1.7 Radius Pipe

No radial pipe will be allowed for pipe having a diameter of less than 1,050 mm. For pipes larger than 1,050 mm, radial pipe will be considered by the Town based on the specific application being proposed. Minimum radius will be 15 times the pipe diameter.

A manhole shall be placed either at the beginning or end of the radial pipe section.

Minimum pipe radius shall be as per manufacturer's recommendation or as directed by the Town.

26.1.8 Pipe Bedding and Backfill

The class of pipe and the type of bedding shall be selected to suit loading and proposed construction conditions. Details and types of bedding and backfill are illustrated in OPSD 802.010 and 802.030. In general, type “2” bedding (Granular “A”) shall be used for storm sewers in new developments with compaction of 98% SPD. The class of pipe will be selected to suit this bedding detail. Alternate granular materials for pipe bedding may be specified, subject to the approval of the Town, based on recommendations of a Geotechnical Engineer.

The width of the trench at the top of the pipe must be carefully controlled to ensure that the maximum trench width is not exceeded unless a higher class of bedding or higher strength pipe is used.

26.1.9 Design

a) The class of pipe and type of pipe bedding will be shown on the profile for all lengths of sewers. (See General Notes and approved material lists for current specifications for pipe.)

b) All storm sewers will be located as shown on the appropriate Town standard road cross-section.

c) All storm sewers will be laid in a straight line between manholes except where radius pipe is permitted by the Town.

d) The pipe size will not decrease from a larger size up-stream to a smaller size down-stream regardless of the increase in grade.

e) Pipe bedding and class will be designed to suit loading conditions as per the current OPSD specifications. The geotechnical report shall address these items and make recommendations with regard to same. The class or strength, size and bedding will be shown on the profiles.

f) No service connections will be made to a trunk sewer.

g) Riser pipes will be constructed when the invert of a sewer exceeds 4.5 m in depth from final grade. No riser will exceed 3.0 m in length unless approved by the Town.

h) The connection to the main sewer will be made with an approved manufacturer's tee for main sewer sizes up to and including 450 mm and in accordance with current OPSS.

26.2 Manholes

26.2.1 Location

Manholes shall be constructed at the following locations:

- At changes in pipe size
- At pipe junctions
- At changes in pipe slope
- At changes in pipe alignment
- At changes of pipe material (example: PVC to concrete)
- At either the beginning or end of radial pipe sections.

The outside wall of any manhole structure located within the roadway shall not be located closer than 1.5 m to a curb or service lateral. The manholes shall be oriented in such a way that the access cover is offset towards the centerline of the road.

26.2.2 Maximum Spacing of Manholes

Pipe Size	Maximum Spacing
300 mm to 750 mm	110 m
825 mm to 1200 mm	120 m
1350 mm and over	150 m

26.2.3 Manhole Types

Manholes shall be constructed of pre-cast concrete. The standard manhole details as shown on the OPS Drawings shall be used for manholes. In cases where the standard drawings are not applicable, the manholes shall be individually designed and detailed.

A reference shall be made on all Profile Drawings to the OPSD type and size for all storm manholes. Further, a detail of the benching will be shown on the plan portion of the drawing for cases when the benching differs from OPSD 701.021

Precast manholes shall conform to ASTM Specification C478 latest revision.

26.2.4 Manhole Frame and Covers

Manhole covers shall be as per OPSD 401.010 type “A” and shall have the word “STORM” cast in the top.

All manholes located within the travelled portion of the roadway shall have the rim elevation initially set flush with the base course asphalt. A maximum of 300 mm height of modular rings shall be permitted on all manholes in new subdivisions and adhere to OPSD 704.010. No offsetting of modular rings is permitted in manholes.

Prior to the placement of the final course asphalt, the manhole frame shall be adjusted to suit the final surface asphalt elevation. Manholes and catchbasin riser rings (moduloc) shall be externally parged and inspected prior to completion of the road construction and paving. (Internal parging is not acceptable.)

26.2.5 Manhole Design

a) All manhole chamber openings shall be located on the side of the manhole parallel to the flow for straight run manholes or on the upstream side of the manhole at all junctions.

b) The manhole shall be centered on the sewer main.

c) The direction of flow in any manhole shall not be permitted at acute interior angles.

d) The number and spacing of manhole openings shall comply with OPSD 701.021.

e) The obverts on the upstream side of manholes shall not be lower than the obvert of the outlet pipe.

f) All storm sewer manholes shall be benched to the obvert of the outlet pipe on a vertical projection from the spring line of the sewer, all in accordance with the Standard Detail Drawing. Pre-benched manholes will not be permitted.

g) Where the difference in elevation between the obvert of the inlet and outlet pipes exceeds 0.6 m, a drop structure shall be placed on the inlet pipe.

h) Safety gratings shall be required in manholes when the depth of the manhole exceeds 5 m (per OPSD 404). Where practical, safety gratings shall be located 0.5 m above any drop structure inlet pipe.

i) The minimum width of benching in all manholes shall be 230 mm.

j) Frost straps are required in all manholes per OPSD 701.100.

k) When any horizontal dimension of a manhole exceeds 2.4 m, the manhole must be designed and individually detailed.

26.2.6 Drop Structures

Drop structures shall be used when invert levels of inlet and outlet sewers differ by 600 mm or more. The size of the drop pipe shall be one size smaller than the storm sewer diameter and shall have a maximum size not exceeding 300 mm in diameter (OPSD 1003.010). Wherever feasible, sewer systems should be designed to avoid the use of drop structures. Internal drop structures are not permitted. All drop structures shall be constructed in accordance with OPSD 1003.010.

26.2.7 Head Losses through Manholes

The maximum change in the direction of flow in any sewer manhole shall be no more than 90 degrees. Sewers up to 525 mm in diameter may be turned a maximum of 90 degrees. Sewers greater than 525 mm in diameter may be turned a maximum of 45 degrees. In extreme cases, deviations from the above guidelines may be permitted by the Town provided acceptable supporting hydraulic calculations are provided.

Suitable drops shall be provided across all manholes to compensate for the loss of energy due to the change in flow velocity and for the difference in the depth of flow in the sewers. Hydraulic calculations are required where the change in velocity through a manhole is 0.6 m/s or greater.

The minimum drops across manholes shall be as follows:

Change of Direction	Minimum Drop
Straight Run	0.02 m
up to 45 degrees	0.05 m
46 to 90 degrees	0.08 m

26.3 Catchbasins

26.3.1 Location and Spacing

The maximum allowable drainage path along a roadway (spacing) for a catchbasin is as follows:

Recommended Maximum Spacing		
Pavement Width	**≤ 4% grade**	**> 4% grade**
7.3 m to 8.4 m	90 m	60 m
8.5 m to 9.7 m	82 m	55 m
9.8 m to 12.1 m	73 m	50 m
12.2 m to 14.0 m	60 m	40 m

a) A double catchbasin is required where drainage is received from more than one direction, as at a low point.

b) All catchbasins at street intersections shall be located on the tangent section of the curb at a minimum distance of 0.6 m from the beginning or the end of the radial portion of the curb.

c) Catchbasins are required on the upstream side of all intersections, and upstream of any sidewalk or pedestrian crossing.

d) Catchbasins shall not be located in driveway curb depressions.

26.3.2 Catchbasin Capture

a) Calculations to estimate the catchbasin capture to the sewer system are to consider the type of grate, whether the catchbasin is in a “sag”, the catchbasin lead diameter and any inlet control device.

b) Double catchbasins are required at all sags. Capture rates are to consider the depth of flow over the grate based on the depth of flow over the downstream point of relief.

26.3.3 Catchbasin Types

a) Catchbasins must be of the precast type as shown on the OPSD 705.010 or 705.020.

b) Special catchbasins and inlet structures shall be fully designed and detailed by the Consulting Engineer (Example Fish Grate Catch Basin as per Town’s Standard GST-3).

26.3.4 Catchbasin Connections

Type	Minimum Size of Connection	Minimum Grade of Connection
Single Catchbasin	250 mm	1%
Double Catchbasin	300 mm	1%
Rear Lot Catchbasin*	250 mm	1%

* All rear lot catchbasin leads (where permitted) shall be encased in concrete from the catchbasin to the street line.

26.3.5 Catchbasin Frame and Covers

a) Frame and cover shall be as per OPSD 400.100. Envirograte may be used where grades are compatible and do not exceed 1%. Specialty grates may be allowed such as the Fish Grate Catch Basin as per Town's Standard Drawing GST-3.

b) All catchbasin frame and covers located in roadways shall be "bike proof".

c) Rear lot catchbasin (where approved) shall have frame and covers per OPSD 400.120 ("bird cage") unless otherwise requested by the Town.

d) The use of galvanized honeycomb grating in roadways will only be considered in special circumstances at the discretion of the Town. These must be bicycle safe and able to withstand traffic loads.

e) Adjustment units may be used to a maximum of 300mm and may be offset from the precast structure a maximum of 100mm.

26.4 Storm Service Connections

26.4.1 General

Storm service connections are to be provided to all lots for the purpose of connecting foundation drain collectors. All storm sewer connections for single, semi-detached and townhouse lots shall be made with single service pipes and shall conform to Ontario Provincial Specifications. All connections are to have a cast iron test fitting installed at the property line.

The sewer connection shall extend 1.5 m inside of the property line and terminate with a cap. The pipe is to be white in colour and marked with a 50 mm x 100 mm x 2.4 m stake painted white.

The use of sump pumps is discouraged, but will be considered by the Town if they are deemed to be the only viable option available. All sump pumps shall be fitted with a

gooseneck riser and a backflow preventer. (Roof leaders shall be directed overland.) The storm sewer system shall be designed such that the 1:100 year storm does not surcharge the sewers or create backwater effects that could surcharge the weeper tiles within 0.5 m of the finished basement level.

26.4.2 Location

The proposed location of the storm sewer service shall be shown on the Plan and Profile Drawings and Composite Utility Plans per Town specifications.

26.4.3 Size

Service connections for single family and semi-detached (or linked) units shall be 150 mm in diameter. Service connections for multiple residential unit blocks, commercial, institutional and industrial areas shall be sized according to the intended use and the Ontario Plumbing Code.

26.4.4 Connection to Main

The connection to the main sewer shall be made with an approved manufactured tee. Approved saddles shall be used for connecting to existing sewer mains.

Connection to manholes will be allowed only if the invert is connected no higher than the obvert of the outlet pipe in the manhole and properly benched.

No service connection of a size greater than half the diameter of the main shall be cut into the main sewer. A manhole shall be installed on the main sewer at the intersection of a service connection which has a size greater than half the diameter of the main sewer except as provided below.

The invert of the service connection is to be above the spring-line of the main sewer.

26.4.5 Depth

The depth of the service connections for single family units, semi-detached units and townhouses at the property line measured from the finished centre line road elevation shall be:

Minimum – 1.8 m
Maximum – 2.5 m (unless proposed house types require deeper service depths)

Risers shall be used when the obvert depth of the sewer main exceeds 4.50 m. The riser section shall be brought to a depth of within 3.0 m.

26.4.6 Connection to Multiple Residential Unit and Other Blocks

An inspection manhole shall be required on the private property located 1.5 m from property line to centre of the frame and cover on all connections to multiple residential unit and other blocks.

26.4.7 Connection to Commercial/Industrial Institutional Blocks

An inspection manhole shall be required on private property located 1.50 m from the property line to the centre of the frame and cover.

27.0 MATERIALS

27.1 Sewer Pipe Materials

Storm sewers shall be constructed of reinforced concrete pipe or Polyvinyl Chloride (PVC) pipe. PVC-DR pipe may only be used on Storm sewers up to and including 450 mm in diameter. (Ribbed pipe is not permitted.) Reinforced concrete shall be used for sewers over 450 mm diameter.

The type and classification shall be clearly indicated on all profile drawings on each sewer length.

Pipe to be supplied for storm sewer use shall be as indicated in Appendix G. No materials, except as noted therein shall be used without the express written consent of the Director of Operations and Engineering.

27.2 Pipe Bedding and Backfill

The class of pipe and the type of bedding shall be selected to suit loading and proposed construction conditions. Details and types of bedding and backfill are illustrated in OPSD 802.010 and 802.030. Proposed bedding and backfill material shall be outlined within the Soils Report provided for the proposed development.

Material beneath sewers is to be approved native or engineered fill, as determined by the Geotechnical Engineer, and shall compacted to 98% Standard Proctor Density, also as directed by the Geotechnical Engineer.

28.0 INLETS, OUTFALLS AND SPECIAL STRUCTURES

Inlet and outfall structures including headwalls shall be designed, detailed and stamped by a qualified Structural Professional Engineer. In each case existing topography should be shown as well as the protective works necessary to counteract erosion of the site around the structures.

Grates will be provided on all inlet and outlet structures and shall be designed and detailed when standard drawings are not appropriate. All metal parts shall be galvanized to adequately protect against rusting.

28.1 Inlets

Inlet structures must be fully designed and detailed on the engineering drawings. Inlet grates shall generally consist of galvanized inclined parallel bars or rods set in a horizontal parabolic shape as determined with input from the Town.

Precaution must be taken in the design of grating for structures to minimize the risk of entanglement or entrapment of a person. Locks shall be installed on all grates.

Gabions, rip rap or concrete shall be provided at all inlets to protect against erosion and to channel flow to the inlet structure.

28.2 Outlets

The OPSD 804.030 standard headwall shall be used for all storm sewers less than 900 mm in diameter. For sewers 900 mm in diameter and larger the headwall shall be in accordance with OPSD 804.040 or individually designed. All headwalls shall be equipped with a grating over the outlet as per OPSD 804.050.

All outlets shall blend in the direction of flow of the watercourse with the directional change being taken up in the sewer rather than the channel.

Gabions, rip rap, concrete, terrafix block or other erosion protection shall be provided at all outlets to prevent erosion of the watercourse and the area adjacent to the headwall. The extent of the erosion protection shall be indicated on the Engineering Drawings and shall be dependent upon the velocity of the flow in the storm sewer outlet, the soil conditions, the flow in the existing watercourse and site conditions.

28.3 Safety Railings

Chainlink fence shall be provided along the top of all headwalls 0.6 m in height or greater. Railings may also be required along shorter headwalls where a risk to pedestrian safety has been identified. The site specific conditions must be reviewed in determining the requirement for safety railings and must have due regard to public health and safety.

29.0 TESTING

All storm sewers and service connections installed are subject to inspection by television (CCTV) in accordance with section 29.2, all at the expense of the Owner.

Exfiltration testing will be carried out in accordance with the current OPSS and/or the MOE practices. The test used will be determined by the Director of Operations and Engineering based upon information provided by the Consulting Engineer detailing the water table elevation in relation to the sewer pipe elevation.

29.1 Deflection Test

A deflection test shall be performed on all sewers constructed using flexible (i.e. PVC, etc.) material. Said testing shall be generally in conformance with OPSS 410. The allowable pipe deflection shall be as described in OPSS 410.07.

A suitably designed device shall be pulled manually through the pipe not sooner than 30 days after completion of the installation and backfilling operations. The device shall be provided as described by OPSS 410 and shall have a minimum length in accordance with the following:

Normal Pipe Size (mm)	Length (mm)
150	100
200	150
250	200
300	250
375	300
450	350

The mandrel shall be checked with a go-no-go proving ring. The proving ring shall have a diameter equal to the computed deflected diameter +/- 1 mm. An acceptable mandrel shall not pass through the proving ring. The proving ring shall be fabricated from 6 mm minimum thick steel.

Any section of pipe that does not allow the mandrel to pass shall be considered to have failed the deflection test.

All sections of pipe that fail the deflection test shall be repaired and retested.

29.2 Closed-Circuit Television Inspection

All sewers installed shall be inspectedin accordance with OPSS 409 - Closed Circuit Television Inspection of Pipelines prior to preliminary acceptance of underground works and for preliminary acceptance of aboveground works, prior to final assumption of the subdivision. Prior to the above undertaking, all sanitary and storm sewers shall be flushed and have debris removed.

Service connections may be subject to inspection as determined necessary by the Director.

The Town will require Certification from the Consulting Engineer that he/she has reviewed the videos and have found the sewers to be acceptable and free of all defects. Any deficiencies should be clearly identified in the Consulting Engineer's letter and shall provide recommended remedial action for each noted deficiency. Confirmation that all deficiencies have been rectified must be included with the Certification. All rectified deficiencies shall be re-videoed to ensure satisfactory completion.

A permanent record, in DVD video form, shall be supplied illustrating a continuous record of the sewer installations, service connection, manholes, etc. A report identifying any unusual or substandard conditions shall also be submitted.

The CCTV inspection shall be carried out by an Operator certified by NAAPI and shall be carried out in accordance with OPSS 409.

All DVD's, reports and data provided from these inspections shall become the property of the Town.

At the discretion of the Director of Operations and Engineering, additional inspections and records may be required prior to Final Assumption.

30.0 CONSTRUCTION

Construction of all storm sewers in the Town will be in accordance with the current OPSS, the Town's Municipal Inspection and Construction Guidelines and the appropriate standard drawings.

Where connection to the storm sewer is made on an existing municipal roadway, non-shrinking backfill shall be utilized. Low strength concrete, 3 MPa, or an approved alternative shall be used. Step joints with a minimum 300mm step shall be made with existing asphalt surfaces, and all joints sealed with hot rubber sealing compound in accordance with current OPSS.

All catchbasins located within the travelled portion of a roadway shall have the frame elevation set flush with the surface of the base course asphalt. The adjusting and setting of the frames and grates shall be completed in accordance with OPSS at the time of placement of surface course asphalt.

Temporary asphalt curbing shall be placed behind all catchbasins within the travelled portion of the roadway at the stage of base course asphalt. Asphalt curbing shall be placed in accordance with OPSD 601.01 between the two adjacent expansion joints.

SANITARY SEWER SYSTEM

31.0 Hydraulic Design

31.1 Sanitary Drainage Plan

The sanitary drainage plan shall be prepared to a scale suitable to show all the tributary areas that are being used to determine the design flows. For each sub-catchment, the plan shall indicate the land use, area, and population. Where lotting is not known, population density shall be shown.

The design flow in each manhole and length of sewer shall be computed on standard sanitary design sheets. A typical Town Design Sheet is included in Appendix D. For each area entered on the design sheet, the manhole numbers, size, grade and material of the sewers and the numbers consistent with the detailed plan and profile for each section of the sanitary sewer shall be shown.

31.2 Calculation of Sewage Flows

All sewers are to be designed for maximum design flow plus an infiltration allowance.

Peak domestic sewage flows are to be calculated using the following formula:

$$\mathbf{Q(d) = \frac{PqM}{86{,}400} + IA}$$

Where,

Q(d)	=	Peak domestic sewage flows (including extraneous flows in L/s)
P	=	Design population
q	=	Average daily per capita domestic flow in L/cap/day (exclusive of extraneous flows)
M	=	Peaking factor
I	=	Unit of peak extraneous (infiltration) flows in L/ha/s
A	=	Gross tributary area in hectares

For Residential Development the **Peaking Factor** shall be calculated based on the Harmon Formula:

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

Where,

P = Population, in thousands

M_d (Maximum) = 4.0

M_d (Minimum) = 2.0

31.3 Average Daily Flows

The following average daily flows are to be used in calculating the design flows for sewer sizing:

Residential	=	365 L/c/d
Industrial (Light)	=	35 m^3/ha/d
Industrial (Heavy)	=	55m^3/ha/d
Commercial	=	28 m^3/ha/d
Institutional	=	18 m^3/ha/d

The **Peaking Factor** for the ICI flows shall be 2.0 (see appendix D, Sanitary Sewer Design Sheet)

31.4 Extraneous Flows

An infiltration allowance of 0.21 L/s/ha shall be used in determining the design flows.

31.5 Design Populations

The design population for residential developments shall be derived using the proposed Plan of Subdivision and the following persons per unit factors:

Single Detached Dwellings	= 2.9 ppu
Semi-Detached Dwellings	= 2.9 ppu
Townhouses	= 2.9 ppu
Apartments	= 2.0 ppu

In the absence of a proposed Plan of Subdivision, populations should be estimated based on drainage areas and the land uses identified in the Town's Official Plan or Master Servicing Studies.

31.5.1 Sanitary Sewer Design

31.5.2 Location

All sanitary sewers shall be located as shown on the Town Standards GR-1, GR-2, and GR-3. The standard location shall generally be 1.5 m offset from the centerline of the road allowance, although deviations from this standard may be considered on a site by site basis.

A minimum clearance of 2.5 m (MOE) shall be provided from all water services to any sanitary sewer, or sanitary service connection, unless the designer can demonstrate that same is not achievable, at which time, a lesser clearance may be considered as per Section 15.1.1 of the MOE.

31.5.3 Pipe Capacities

Manning's formula shall be used in determining the capacity of sewers.

$$Q = \frac{1000AR^{2/3}S^{1/2}}{n} \quad , \quad V = \frac{R^{2/3}S^{1/2}}{n}$$

Where,

Q(d) = sewage flows in L/s

V = velocity in metres/second

R = hydraulic radius in metres

S = pipe slope in metres/metre

A = area of the pipe in square metres.

n = Pipe Roughness Coefficient "n" shall be 0.013 for all types of sewers.

Table 4 provides the allowable sanitary sewer capacities and gradients. This table shall be used to determine the maximum and minimum slopes for sanitary sewers. Although the Manning's Formula is to be used as a basis for sewer design, the values listed in Table 4 will supersede the results of Manning's calculations, where applicable. In the case of partial pipe flow, the actual velocity is to be checked against the minimum allowable velocity at the design flow rate.

Table 4: Allowable Sanitary Sewer Capacities and Gradients

Diameter (mm)	Q Max (m^3/s)	Slope Min (%)	Slope Critical (%)	Slope Max (%)
200	0.042	0.33	1.54	8.2
250	0.074	0.50	1.43	6.1
300	0.12	0.50	1.34	4.8
375	0.20	0.50	1.25	3.5
450	0.32	0.50	1.17	2.8

31.5.4 Flow Velocities

Minimum acceptable velocity = 0.6 m/s (based on actual velocities as calculated)
Maximum acceptable velocity = 3.0 m/s

31.5.5 Minimum Size

The minimum allowable size for a sanitary sewer shall be 200 mm in diameter.

31.5.6 Minimum and Maximum Grades

The absolute minimum and maximum grades for sanitary sewers shall be in accordance with Table 4 subject to achieving minimum acceptable velocity at the design flow. The minimum grade for the first upstream leg shall not be less than 1.0% and not less than 50 m in length, unless the designer demonstrates that the minimum actual velocity of 0.6m/s is being achieved.

Slopes less than those required for 0.75 m/s velocity (when flowing full) may be permitted when increasing the slope would require deepening of extensive sections of the system, or the addition of a pumping station.

31.5.7 Minimum and Maximum Depths

The minimum depths of sewers for residential areas shall be 2.7 m as measured from the final centreline finished road elevation to the top of the sanitary sewer.

The maximum depth of sewers with direct lateral connections shall be 7.0 m (measured from finished centerline of road elevation to invert of sewer). In cases where deeper sewers are required these shall be considered trunk sewers and no direct lateral connections will be permitted. Separate local sewer shall be constructed offset above the trunk sewer with sufficient space to allow maintenance of the trunk sewer should it be necessary.

31.5.8 Curved Sewers

The use of radius pipe or deflected pipe is not permitted.

31.5.9 Termination Points

All sewers shall be terminated at the subdivision limits when external service areas are being considered in the design with suitable provision in the design of the terminal manholes to allow for future extension of the sewer.

31.5.10 Pipe Crossings

A minimum clearance of 300 mm shall be provided between the outside of the pipe barrel at the point of crossing for storm and sanitary sewers. A minimum clearance of 0.50 m shall be provided for all sewer and watermain crossings.

In the event the minimum clearances cannot be obtained, the designs must adhere to MOE policies. In addition the pipes shall be concrete encased 25 MPa minimum to ensure that the pipes are properly bedded.

31.5.11 Changes in Pipe Size

No decrease of pipe size from a larger upstream to a smaller downstream will be allowed regardless of the increase in grade.

31.5.12 Pipe Bedding

The class of pipe and the type of bedding shall be selected to suit loading and proposed construction conditions. Details and types of bedding and backfill are illustrated in OPSD 802.010 and 802.030. The width of the trench at the top of the pipe must be carefully controlled to ensure that the maximum trench width is not exceeded unless a higher class of bedding or higher strength pipe is used. The recommendations of a Geotechnical Engineer will be required in determining strength of pipe, bedding material required and construction methods to be used.

32.0 MANHOLES

32.1 Location

Manholes shall be constructed at the following locations:

- At changes in pipe size.
- At pipe junctions.
- At changes in pipe slope.
- At changes in pipe alignment.
- At changes of pipe material (example: PVC to concrete).

The outside wall of any manhole structure located within the roadway shall not be located closer than 1.5 m to a curb or services. The manholes shall be oriented in such a way that the access cover is offset towards the centerline of the road.

32.2 Maximum Spacing

The maximum spacing between manholes is as shown below:

Pipe Size (mm)	Maximum Manhole Spacing (m)
200 to 750	110
825 to 1,200	120
1,200 and over	150

32.3 Manhole Types

Manholes shall be constructed of pre-cast concrete. The Ontario Provincial Standard (OPS) manhole details shall be used for manhole design, where applicable. In all cases where the standard drawings are not applicable, the manholes shall be individually designed and detailed.

A reference shall be made on all profile drawings to indicate the type and size of all sanitary manholes.

Pre-cast manholes shall conform to ASTM Specification C478 latest revision.

32.4 Manhole Frame and Covers

Manhole covers shall be the “closed” type per OPSD 401.010 (Type “A”) and shall have the word “SANITARY” cast into the top.

All manholes constructed in the vicinity of low points or outside of the paved roadway shall have watertight covers. In addition all manholes located in cul-de-sacs shall have watertight covers. Such locations shall be clearly noted on the drawings.

All manholes located within the travelled portion of the roadway shall have the rim elevation initially set flush with the base course asphalt. A maximum of 300 mm height of modular rings shall be permitted on all manholes in new subdivisions. No offsetting of modular rings is permitted in manholes.

Prior to the placement of the final course asphalt, the manhole frame shall be adjusted to suit the final surface asphalt elevation. Manhole riser rings (moduloc) are to be used for

grade adjustments and shall be externally parged and inspected prior to completion of the road construction and paving.

32.5 Head Losses

When pipe size does not change through a manhole and the upstream flow velocity does not exceed 1.5 m/s, the following minimum invert drops across the manhole shall be made to compensate for hydraulic losses:

Alignment Change	Drop Required
Straight run	0.030 m
15 to 45 degrees	0.060 m
46 to 90 degrees	0.090 m

In order to reduce the amount of drop required (in excess of the values above), the Designer shall, restrict the change in velocity between the inlet and outlet to 0.6 m/s wherever possible.

Hydraulic calculations shall be submitted for all junction and transition manholes on sewers where there is a change in velocity of greater than 0.6 m/s. In addition, hydraulic calculations may be required for manholes where in the opinion of the Town, there is insufficient invert drop provided across any manhole.

Regardless of the invert drop across a manhole, as required by calculations, the obvert of the outlet pipe shall not be higher than the obvert of the inlet pipes at any manhole location.

32.6 Manhole Design

a) All manhole access openings shall be located on the side of the manhole parallel to the flow for straight run manholes, or on the upstream side of the manhole at all junctions.

b) The manhole shall be centered on the sanitary sewer main.

c) The maximum change in the direction of flow in any sanitary sewer manhole shall be no more than 90 degrees. A change of flow direction at acute interior angles will not be permitted.

d) All pipe connections at manholes shall be completed using Kor-N-Seal rubber gasketed assemblies, or approved equivalent.

e) All sanitary manholes shall be benched to the obvert in accordance with OPS Drawings. Benching shall have a minimum internal width of 225 mm. Pre-benched manholes will not be permitted.

f) Safety grates shall be required in all manholes in accordance with OPS Specifications. Where practical, a safety grate shall be located 0.5 m below the invert of the upper inlet pipe of drop structure.

32.7 Drop Structures

Whenever feasible, sewer systems shall be designed to avoid the use of drop structures. Drop structures shall be used when invert levels of inlet and outlet sewers differ by 0.6 m or more. Wherever feasible, sewer systems should be designed to avoid the use of drop structures. Internal drop structures are not permitted. All drop structures shall be constructed in accordance with OPSD 1003.020 or 1003.010.

33.0 SANITARY SERVICE CONNECTIONS

33.1 General

All sanitary sewer connections for single, semi-detached and townhouse lots shall be made with single services and shall conform to Ontario Provincial Specifications. All connections are to have a watertight cast iron (i.e. Crowle) test fitting installed at the property line. The sewer connection shall extend 1.5 m inside of the property line and terminate with a cap. The pipe is to be green in colour and marked with a 50 mm x 100 mm x 2.4 m stake painted green.

33.2 Location

The proposed location of the sanitary sewer service shall be shown on the Plan and Profile Drawings and Composite Utility Plans.

33.3 Size

Service connections for single family and semi-detached (or linked) units shall be 125 mm in diameter pipe, placed at grades between 2% and 8%.

Service connections for multiple residential unit blocks, commercial, institutional and industrial areas shall be sized according to the intended use.

33.4 Connection to Main

The connection to the main sewer shall be made with an approved manufactured tee. Approved saddles shall be used for connecting to existing sewer mains. Unless otherwise approved by the Town. All materials are required to be AWWA approved or as per OPSD.

Connection to manholes will NOT be allowed. Special consideration may be made for cul-de-sacs or dead ends provided that the invert is connected no higher than the obvert of the outlet pipe in the manhole and is properly benched.

No service connection of a size greater than half the diameter of the main shall be cut into the main sewer. A manhole shall be installed on the main sewer at the intersection of a service connection which has a size greater than half the diameter of the main sewer except as provided below.

A 125 mm or 150 mm service connection will be permitted to connect to a 200 mm and 250 mm main sewer provided an approved manufactured tee is installed and provided the invert of the service connection is above the spring-line of the main sewer.

33.5 Depth

The depth of the service connections for single family units, semi-detached units and townhouses at the property line measured from the finished centre line road elevation shall be:

Minimum – 2.5-0 m
Maximum – 3.0--- m (unless proposed house types require deeper service depths)

Risers shall be used when the obvert depth of the sewer main exceeds 4.50 m. The riser section shall be brought to a depth of within 3.0 m of centerline road grade.

33.6 Connection to Multiple Residential Unit and Other Blocks

An inspection manhole shall be required on the private property located 1.5 m from the property line to the centre of the frame and cover on all connections to multiple residential unit and other blocks.

33.7 Connection to Commercial/Industrial/Institutional Blocks

An inspection manhole shall be required on private property located 1.50 m from the property line to the centre of the frame and cover.

34.0 PIPE MATERIALS

34.1 Sanitary Sewers

Sanitary sewer shall be constructed of reinforced concrete pipe or Polyvinyl Chloride (PVC) pipe. PVC–DR pipe may only be used on sanitary sewers up to and including 375 mm in diameter. (Ribbed pipe is not permitted.) Reinforced concrete shall be used for sewers 450 mm diameter and larger.

The type and classification shall be clearly indicted on all profile drawings on each sewer length.

Pipe to be supplied for sanitary sewer use shall be as indicated in Appendix G. No materials, except as noted therein shall be used without the express written consent of the Director of Operations and Engineering.

34.2 Sanitary Service Connections

All sanitary service connections for residential uses shall be constructed of the Polyvinyl Chloride (PVC), SDR28, per CSA B182.1, 125 mm minimum diameter.

Pipe to be supplied for sanitary sewers shall be as indicated in Appendix G. No materials, except as noted therein shall be used without the express written consent of the Director of Operations and Engineering.

34.3 Pumping Stations

All major infrastructure items, such as sewage pumping stations, are to be designed in accordance with the latest guidelines per MOE and as may further be requested by the Director of Operations and Engineering. Further details and aids for said design and construction can be found in a checklist as included in Appendix B.

35.0 TESTING

35.1 General

Testing shall be completed on all sewers in accordance with the policies and procedures as outlined in the Sanitary Sewer System Inspection, Testing and Acceptance Guideline (October 2011 or latest). The Town shall be the sole judge of which test/tests are to be undertaken. The Developer's Consulting Engineer will be required to certify the results of any tests carried out.

WATERMAINS

36.0 JURISDICTION

The Town is responsible for the distribution of water for municipal water systems within the Town. Within the boundaries of the Town, the responsibility for the supply, treatment and storage of water for the municipal water systems rests with the RMY.

Prior to the commencement of any design for new watermains within the Town, the applicant shall obtain confirmation from the RMY that adequate water supply exists for the development proposed.

The Town is licensed under the Safe Drinking Water Act, 2002, to operate drinking water systems within the Town. Proposed alterations or additions to the current drinking water system must be applied for through the Town.

36.1 Water Charges

No person shall take water from the Town's system without direct approval from the Town. The Town policies require tracking of all water uses and losses, and to receive financial compensation for any water consumed, used or sent to waste.

36.2 Hydraulic Design

36.2.1 General

All watermains shall be sized to meet the greater of the 'maximum day plus fire flow' or the 'peak hour' demand. Watermains in subdivisions shall have a minimum of two (2) connections to the existing water network. The Town will require a computer model analysis for all or any phased portion of the proposed watermain systems. Boundary conditions for modeling purposes shall be obtained by carrying out on-site hydrant flow tests, in accordance with NFPA 291 as directed by the Town.

The requirements for fire flows shall be discussed with the Town and agreed upon prior to proceeding with the detailed design. In general, the minimum fire flow requirement shall be calculated in accordance with the latest edition of the Fire Underwriters Survey document "Water Supply for Public Fire Protection".

36.2.2 Fire Flow

The requirements for fire flows shall be confirmed with the Town and agreed upon prior to proceeding with the detailed design. In general, the minimum fire flow requirement for a particular structure or area of the municipality shall be 7,000 L/min, or, as outlined in "Water Supply for Fire Protection - A Guide to Recommended Practice" prepared by the

Fire Underwriters Survey of the Insurance Bureau of Canada or per AWWA Manual M31 - Distribution System Requirements for Fire Protection.

36.2.3 System Pressures

The maximum sustained operating pressure shall not exceed 700 kPa (100 psi). If pressure in a localized area is above this level, a pressure reducing valve shall be installed on each service downstream of the water meter within that area. Pressure reducing zone may be required at the discretion of the Director of Operations and Engineering.

Under normal conditions of maximum hour demand, the pressure shall not drop below 345 kPa (50 psi) at any point in the water system. The normal operating pressure should be approximately 345 to 480 kPa (50 to 70 psi).

Under conditions of simultaneous maximum day and fire flow demands, the pressure shall not drop below 140 kPa (20 psi) at any point in the water system.

36.2.4 Flow Design

The Hazen-Williams Formula in accordance with the current MOE design criteria shall be used for the design of water distribution systems.

The Hazen-Williams equation is as follows:

$$\mathbf{HL = \frac{C_f\, L\, Q^{1.852}}{C^{1.852}\, D^{4.87}}}$$

$$\mathbf{V = 0.84918\ (C)\ (R)^{0.63}\ (S)^{0.54}}$$

Where,

H_L = headloss due to friction (m or ft)
C_f = unit conversion factor (4.73 for Imperial, 10.7 for Metric)
L = watermain length (m or ft)
D = diameter (m or ft)
Q = watermain flow (m^3/s or cfs)
C = Hazen-Williams Factor
C = 100 for 150 mm watermain and smaller
C = 110 for 200 mm and 250 mm watermain
C = 120 for 300 mm to 600 mm watermain
R = hydraulic radius of pipe (m)
S = slope of energy grade line (m/m)

36.2.5 Domestic Demand

Domestic water demand shall be calculated on the basis of an average day consumption rate of 365 L/c/d or as directed by the Town.

Maximum Day and Peak Hour factors shall be 2.0 and 2.75 respectively, or as recommended by the Ministry of the Environment.

The following densities should be used for determining expected populations in residential developments:

Single Detached Dwellings	=	2.9
Semi-Detached Dwellings	=	2.9
Townhouses	=	2.9
Apartments	=	Planning (2.0)

36.2.6 Industrial, Commercial and Institutional (ICI) Water Demands

The following average day demands shall be used for ICI uses:

Industrial (light)	=	35,000 L/ha/d
Industrial (heavy)	=	55,000 L/ha/d
Commercial	=	28,000 L/ha/d
Institutional	=	18,000 L/ha/d

The **Peaking Factor** for all ICI shall be 2.0, and it shall further be reviewed depending on the type of industry and production schedules.

36.3 Backflow Prevention

A certified and testable backflow prevention assembly shall be installed in a chamber. Standard Drawings GW-8A, GW-8B and GW-9 have been provided as a guideline. The Consulting Engineer shall provide a site specific detailed drawing for the backflow prevention assembly incorporating the Town's requirements. The chamber shall be a minimum of 1.0m inside the property line, on private property. The location of the chamber shall be such that consideration is given to the requirement for the above ground temporary by-pass for watermain testing and commissioning prior to the final connections to the existing system. This applies to existing and future industrial, commercial, institutional and multi-residential Buildings and Structures, except Buildings of residential occupancies within the scope of Part 9 of the Building Code.

Backflow prevention assemblies and meters shall be installed in a water tight valve chamber.

SECTION – WATERMAINS

37.0 PIPES

37.1 Size

The minimum size for residential watermain is 150 mm inside diameter. Where fire protection is required on a cul-de-sac or a dead end, the watermain will be sized as per Town criteria as noted above and a minimum pressure of 50 psi. The minimum pipe size required for more than one (1) hydrant on a cul-de-sac shall be 200 mm.
All new watermains in industrial areas are to be a minimum of 300 mm in diameter.

37.2 Locations

Watermains shall be located in boulevards as shown on the Town Standards GR-1, GR-2, and GR-3. This location shall generally be on the north and east side of the street.

37.3 Depth of Cover

The minimum depth of cover shall be 1.8 m measured from top of pipe to centerline road grade (within boulevards).

37.4 Bedding and Backfill

Watermain bedding and backfill requirements shall conform to OPSD 802.010 for PVC pipe and OPSD 802.030 for rigid pipe, or as recommended by the Geotechnical Engineer and approved by the Town.

37.5 Horizontal Separation between Sewers and Watermains

Watermains and services shall be designed to have a minimum clear distance of 2.5 m from any sewer, lateral or manhole, all in accordance with MOE guidelines. This distance shall be measured from the nearest edges of the pipes or structures.

37.6 Watermain Crossing Sewers and Other Utilities

Watermains shall normally cross above sewers and service laterals with sufficient vertical separation to allow for proper bedding of the watermain (minimum 0.5 m in accordance with MOE guidelines).

When it is not possible for a watermain to pass over a sewer, the watermain passing under the sewer and shall be protected as follows:

a) A vertical separation of 0.50 m shall be provided between the outside face of the sewer and the top of the watermain.

b) The sewer must be adequately supported to prevent settling and displacement of the joints.

c) The length of watermain pipe shall be centred at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

Watermains crossing over or under other utilities must be designed with a vertical separation of 300 mm between the outside edges of the watermain and the utility.

37.7 Dead-Ends

Watermain distribution system shall be designed in grid patterns and looped to avoid dead-end sections. Dead-end watermains are to be avoided. Calculations shall be provided to demonstrate that there is adequate water usage during low flow periods to maintain adequate chlorine residual levels at all times within the watermain.

Where lots are located on a cul-de-sac, mains shall be looped through an easement or dedicated block to an adjacent watermain wherever possible. If an easement is to be implemented, it shall be of a minimum width of 4 m, unless the designer can demonstrate that only a 3 m easement is achievable, in which case, the main shall be installed having the benefit of an encasing.

In extreme situations, as determined by the Town, where it is determined that dead-end watermains are unavoidable, a 50 mm blow-off for flushing purposes shall be installed at the end of the watermain. All dead-end watermains temporary, or otherwise, shall be equipped with a 50 mm blow-off, a valve, and a hydrant at the end, all in accordance with Town standard drawing GW-1.

At the Town's discretion, metered automatic flushers may be required to be supplied by the Developer, with all costs being borne by the Developer.

37.8 Location Identification (Tracing)

The installation of blue caution tape is required approximately 300 mm above the pipe to delineate the location of the watermain. A tracer wire shall be provided along the top of all watermains to permit field tracing of the watermain. The wire is to be secured to the top of the watermain at every fitting and valve and at intervals not to exceed 3.0 m.

All watermains shall be installed with a #12 TWU stranded copper tracer wire on top of the watermain. The tracer wire shall be wrapped around each joint of the watermain and brought to the surface at each hydrant and connected to the bottom of the flange bolt. A continuous length of wire must be used. If the wire must be joined, the appropriate wire connectors shall be used and wrapped with self-amalgamating tape to prevent corrosion

(see Appendix G for approved materials). If no hydrants are available then some means of connecting to wire must be established.

To ensure there is no damage to the tracer wire during or after construction, the Consulting Engineer shall do a continuity test on the wire during testing procedures. Should the Consulting Engineer find a problem with continuity or installation of the tracer wire, the Contractor/Developer shall be responsible for the repair and subsequent testing at no cost to the Town.

Tracer wire shall be connected to valves in chambers and the tracer wire is to be carefully extended along the bottom of the chamber, up the backside of the steps along the chamber wall and securely fastened to the top rung with fiberglass tape or other acceptable connector. The tracer wire is also to be connected to the bottom flange of all hydrants.

Confirmation of the continuity of the tracer wire installation is to be provided in writing by the - Consulting Engineer as part of the commissioning of the watermain system.

37.9 Joint Restraint

Mechanical joint restraints are to be installed on bell and spigot joints for all watermains constructed in fill material and at all tees, horizontal bends, vertical bends, hydrants, end of mains and valves. The length of pipe to be restrained shall be per the manufacturer's recommendations or as calculated by the Consulting Engineer. The use of concrete thrust blocks is generally discouraged and they will only be permitted where deemed absolutely necessary by the Town. All mechanical restraint systems shall be installed with cathodic protection as outlined in Section 41.0. See Appendix G for approved materials.

37.10 Concrete Encasement

Concrete encasement of PVC watermain will not be permitted.

38.0 VALVE REQUIREMENTS

38.1 Number, Location and Spacing

Three valves are required at 'tee intersections and four valves are required at 'cross' intersections with the valves being placed at a point where the projection of the street line intersects the watermain. Valve boxes and chambers are to be located in the boulevards and out of the pavement areas. Under no circumstances will valve boxes or chambers be permitted in driveways or sidewalks. In addition chamber lids are not to be installed in sidewalks.

Valve spacing along a watermain shall not exceed 300 m, or for every 20 lots, whichever is less. Valves shall have a non-rising stem and a 50 mm square operating nut, opening counter-clockwise. The valves shall have mechanical joint fittings.

The Town may, at its discretion, require additional valves to be installed beyond the requirements noted above to ensure adequate isolation during construction, to allow for future development connections or to provide adequate isolation of watermains.

38.2 Size

For watermains 500 mm diameter and smaller gate valves shall be used. All valves larger than 500 mm shall be butterfly valves. For watermains greater than 600 mm diameter, valves shall be one size smaller than the watermain.

38.3 Valve Chambers

Valves greater than 300 mm diameter are to be located in chambers and shall have flanged ends. A flange to plain end spacer and a victaulic coupling shall be installed inside the chamber to permit removal of the valve, if necessary. All valve chambers shall be cored and a valve box shall be installed over the centre of the valve operating nut.

All valves shall require the operating nut to have a valve stem extension to be brought into the valve box. All valving in chambers is to be treated with the “Denso” system of paste and tape to mitigate corrosion, or an approved alternative. Reference Section 41.0 - Corrosion Protection.

All chambers are to have the tracer wire extend from the valve along the bottom of the chamber up the backside of the steps along the chamber wall and securely fastened to the top rung with fibreglass tape.

Wherever possible, valve chambers shall be provided with a storm drain connection to the storm sewer. The diameter of the drain pipe shall be 150 mm. Where it is not possible to provide a direct connection to the storm sewer 300 mm X 300 mm X 300 mm sumps shall be provided in the base of the chamber located directly below the chamber access hole.

38.4 Special Valves

Drain valves and air release valves may be required based on specific site conditions. These requirements will be determined during the design review process.

Drain valves shall be located at the low points of all watermains 300 mm in diameter and greater, or as otherwise required by the Town. These valves shall be constructed in a separate chamber in accordance with the Town's requirements.

Air relief valves shall be installed at all significant high points of the water distribution system. Air relief valves shall be double-acting type, combination air release valve. A 60 mm ball valve is to be installed prior to ARV. Air relief valves shall be housed within a chamber in accordance with the Town's requirements and Town Standard GW-5. The chambers are to be equipped with "candy cane" vents to prevent movement of gases.

39.0 FIRE HYDRANTS

39.1 Spacing

Fire hydrants shall be provided at 150 m maximum spacing in residential areas and 75 m maximum spacing in industrial/commercial/high density areas.

39.2 Type

All fire hydrants are to be equipped with one (1) 100 mm (4") diameter "Storz" nozzle with fitting facing the street. The side ports shall be 65 mm diameter. All hydrants shall be equipped with a non-rising stem and shall open in a counter-clockwise direction. All hydrants shall be fitted with anti-tampering devices of a type required by the Town during construction, to be removed at assumption and handed over to the Town.

All hydrants shall be installed in accordance with OPS specifications, have plugged drainage holes in the main valve seat and be installed with mechanically restrained joints (without thrust blocks). The hydrant base is to be installed in open-graded granular material enclosed with a geotextile fabric to ensure free draining of the boot.

The hydrant is to be set at such a height that the distance from the finished ground around the hydrant to the bottom of the flange is between 50 mm and 150 mm and the side ports and nozzle are a maximum of 875 mm.

All hydrants shall be painted with rust proof paint prior to final assumption in accordance with Town specifications (see Appendix F).

a) All public hydrant bodies or "barrels" are to be red.

b) Storz nozzle cap to be black.

c) Top, bonnet and side ports shall be painted in accordance with NFPA requirements to indicate capacity:

- Light Blue - for Class AA (≥ 5,680 L/min, or 1500 gpm)
- Green - for Class A (3785 - 5675 L/min, or 1000 - 1499 gpm)
- Orange - for Class B (1900 - 3789 L/min, or 500 – 999 gpm)
- Red - for Class C (< 1900 L/min, or 500 gpm).

(Colours are to be determined by the Town, based on flow data supplied by the Consulting Engineer.)

e) All hydrant bodies on private property are to be painted yellow.

39.3 Branch Valves and Boxes

All hydrants shall be controlled by a 150 mm diameter secondary valve. The secondary valve shall be located 1.0 m from the face of the hydrant.

39.4 Location of Hydrants

Hydrants shall be located on the projection of a lot line and offset from the street line in accordance with the Town Standards GR-1, GR-2, and GR-3.

Hydrants shall be 1.2 m minimum distance from the edge of any driveway or house service location. Other aboveground utilities such as light standards, transformers or street signs shall not be located any closer than 3.0 m to a hydrant.

39.5 Hydrant Flow Testing

Hydrant flow testing shall be completed on all hydrants in accordance with NFPA 291 at the completion of watermain testing and commissioning of each phase including all previous phases. Hydrant flow testing shall also be completed on all hydrants in the entire development prior to final assumption of the last phase of the development.

40.0 SERVICE CONNECTIONS

40.1 General

A single water line shall be installed to service each residential property. Services for other uses are to be adequately sized and identified on the engineering drawings. Services shall be installed according to OPSD 1104.010 and 1104.020.

40.2 Material

All water service connections smaller than 50 mm in diameter shall be constructed of Type ‘K’ Copper meeting the requirements of ASRM B88. No joints or fittings will be permitted on the copper service.

All water service connections 100 mm in diameter and larger shall be constructed of PVC piping. Tracer wire shall be installed on PVC services.

40.3 Minimum Size

The minimum size of service connection to be provided for a single family residence shall be 25 mm in diameter.

40.4 Location

Single services shall be provided for all single and semi-detached lots and on- street townhouse units. The location shall be shown on all Plan and Profile Drawings and the Composite Utility Plans and shall be in accordance with GG-7.

The minimum cover over water services shall be 1.8 m. Consideration shall be given to the proximity of the storm sewer in relation to the water service where services cross perpendicular to the storm sewer. Water services may be required to be installed underneath the storm sewer to prevent freezing.

A minimum clearance of 2.5 m (MOE) shall be provided from all water services to any storm, or sanitary sewers, or catchbasins, unless the designer can demonstrate that same is not achievable, at which time, a lesser clearance may be considered as per Section 15.1.1 of the MOE.

40.5 Markers

All new water service connections shall be marked with 50 mm X 100 mm X 2.4 m stakes painted blue.

40.6 Connections to Supply Main

The maximum size of connection that can be tapped into a 150 mm diameter watermain is 50 mm in diameter. A stainless steel saddle shall be used in all cases.

Water service connections larger than 50 mm in diameter shall be made by installing a tee on the supply main.

40.7 Curb Stops

The valve on all water service connections shall be located at the street limit and a minimum distance of 0.3 m away from the outer edge of any driveway or sidewalk. Curb stops are to be brass (lead free) non-draining ball valves.

41.0 CORROSION PROTECTION

For any installation of water pipe systems, an investigation of the soils conditions shall be undertaken to determine the corrodibility of the native soils and to provide recommendations with regard to corrosion protection.

As a minimum, 175 gram zinc caps or washers, or approved equivalent, shall be installed on each bolt of any mechanical connection. Additionally a 5.4 kg (12 lb.) packaged zinc anode shall be installed on each hydrant and all valves. An anode is to be attached to each curb stop. All specification are to be per OPSS 702.

"Denso" tape or approved equivalent shall be installed in accordance with the manufacturer's and the Town's specifications on all metallic valves and fittings in a chamber or direct bury. (Also see OPSS 1109.)

42.0 MATERIALS

42.1 Watermain Material

Acceptable material for watermain pipe up to and including 300 mm in diameter are as follows:

Polyvinyl Chloride Pipe (PVC) manufactured in accordance with the latest edition of AWWA C900, minimum class 150 shall be used.

Fittings shall be cast iron or ductile iron, cement lined and manufactured to AWWA C110. All fittings shall be supplied with mechanical joint ends.

See Appendix G for additional details regarding approved materials.

42.2 Water Meters

Each dwelling serviced by water shall have a wireless water meter installed, in accordance with the requirements of the Town and Town Standard GW-7.

All domestic water services and fire lines shall be metered.

42.3 Sampling Stations

Each subdivision, or phase thereof, is required to have sampling stations installed on a separate water service, being 19 mm (minimum) at the discretion of the Town, quantities and locations to be determined.

42.4 Automatic Flushing Device

Where so directed by the Town, an automatic flusher is to be installed in those locations as determined necessary to ensure sufficient flow of water in the distribution system (see Town's Standard GW-3). These devices are generally required in each phase of a development where there are "dead-ends" or in areas of low flow (i.e. as a result of an insufficient number of dwellings). All water is to be metered with all costs borne by the developer until assumption.

43.0 TESTING

43.1 Leakage Test

The Owner shall cause to be carried out a hydrostatic leakage test on all watermains and hydrants. The watermain test will be conducted as outlined in the Town's Watermain Testing and Commissioning Procedure -W/WW 11, OPSS 701, AWWA Standard C651-99 and MOE guidelines. The more stringent requirements shall govern.

All testing procedures for watermain are detailed in Appendix E.

43.2 Tracer Wire

The Owner shall also ensure that the tracer wire is tested to ensure proper function. (See Section 37.8.)

LOT GRADING

44.0 GENERAL

The lot grading of all lots and blocks in new subdivisions must be carefully monitored by the Consulting Engineer in order to provide sites that are suitable for the erection of buildings and to provide satisfactory drainage from all lands within the development.

A site alteration permit is required for any site alteration work including for new dwellings, additions to dwellings, septic system installations, in-ground swimming pools, and any alteration of grades to a property.

In addition to any requirements or guidelines provided herein, certain grading works require the issuance of a permit under the Town's Site Alteration By-law. Said works require an agreement approved by the Town or Council depending on the proposed volume of fill. The Developer/Proponent is required to review the current by-law and ensure any requirements therein are being followed as may pertain to the subject lands. See additional notes and information in Appendix H.

44.1 General Grading Plans

All general lot grading plans for new development in the Town shall be prepared in accordance with the criteria contained in this section and shall contain the following information and detail:

a) scale 1:500
b) north arrow & key plan
c) all existing and proposed lot numbers, blocks and municipal numbers (as assigned by Planning staff)
d) all proposed rear lot catchbasins, leads, top elevations and inverts
e) location of service connections and street hardware
f) existing contours at maximum 0.5 m intervals
g) existing and proposed elevations at lot corners
h) specified house grades (including rear grade for walk-outs, etc.)
i) elevations along swales, at grade change points, at top and bottom of retaining walls
j) proposed road grades, lengths and elevations on all streets with symbols at grade changes indicating direction of slope
k) proposed elevations along the boundary of all blocks abutting single family and semi-detached lots in the subdivision
l) direction of the surface run-off by means of arrows
m) all proposed easements and their respective dimensions required for registration
n) all lots requiring Engineered Fill are to be so indicated.

45.0 LOT GRADING DESIGN

a) Generally, the lots shall be graded to maximize usable land area, minimize tree disturbance and direct flows away from the house structure.

b) All boulevards are to be graded with a constant slope from the curb to the street limit. (Minimum slope to be 2% and the maximum slope to be 5%.)

c) All lot surfaces shall be constructed to a minimum grade of 2% and a maximum grade of 5% to the front or rear lot lines; and a maximum average slope of 8% from side of building to side lot line.

d) The maximum slope on all embankments and terraces shall be 3:1 for slopes up to 1 m high; slopes shall be 4:1 if greater than 1 m.

e) The minimum driveway grade shall be 2% and the maximum desirable grade shall be 6%, with 8% maximum allowable.

f) The maximum flow allowable to any side yard swale shall be that from two lots plus that from two adjacent lots.

g) The maximum number of rear lots contributing to a rear yard swale shall be that of six rear yards, or 450 sq.m.

h) The maximum length of a rear yard swale between outlets shall be 90 m. Maximum depth of rear yard swales shall be 450 mm. Rear yard swales shall have a minimum slope of 1%.

i) All drainage swales shall be located on the common lot line between adjacent lots. Minimum depth of any swale to be 150 mm. The maximum slope between houses in any direction shall be 4:1.

j) Minimum longitudinal slope of any swale shall be 1%. Maximum side slope on any swale shall be 4:1. A 3:1 slope will be permitted when it is demonstrated that a 4:1 slope cannot be achieved.

k) In all areas where the flow from more than three lots would otherwise be directed over a sidewalk, a catchbasin shall be provided to capture the runoff before reaching the sidewalk.

l) Rear yard catchbasins, where permitted by Town, are to be located entirely on one lot and shall be located 1.0 m from the lot line.

m) The grade immediately adjacent to houses shall be a minimum of 150 mm above the invert of adjacent swales.

n) Eaves troughs are to be directed toward the front of the house (not back yard). In cases of back to front drainage, downspouts may be located at the rear of the dwelling provided that the discharge is directed to the front of the dwelling via swale. In the case of a Townhouse Block, or a lot equipped with a rear yard catch basin, or as directed by the LSRCA based on water budget requirements, eaves troughs may discharge to the rear of the property. All downspouts are to be directed down to a pre-fabricated concrete 'splash pad'.

o) Where it is determined that the above criteria cannot be met due to specific roof configurations, discharge of a portion of the roof runoff to the rear yards will be considered on a lot by lot basis.

46.0 INDIVIDUAL LOT GRADING PLANS

Prior to an application for a building permit, individual lot grading plans for the lot shall be prepared and submitted for approval. Individual plot plans for each lot, designed in accordance with the overall lot grading plan, on a 8 1/2" x 14" legal sized sheet, shall be submitted to the Director of Operations and Engineering for review prior to the issuance of a building permit.

The plot plans shall be stamped and signed by the designing engineer, the control architect, the Developer's Consulting Engineer. The Town's blank review stamp shall be incorporated into the plot plan for use at the time of review. These plans shall be submitted at a scale of 1:250. See example Town Standard GL-1.

The grading plan shall contain the following information and details:

a) lot description including Registered Plan/lot number and address
b) scale of 1:250 is required for plot plans individually plotted on 8½ x 14" sheet, or otherwise approved by the Town
c) all lot dimensions and setbacks
d) proposed ground elevation adjacent to the buildings (i.e. Specified House Grade), at the house corners and at ground elevation for all exterior stairs (these elevations shall be a minimum 0.15 m below the brick line)
e) proposed elevations on the swales where the grade changes and elevations adjacent to the building corners
f) finished first floor elevation, top of foundation wall, basement slab grade, underside of footing and finished porch or decks
g) finished garage floor elevation
h) proposed elevations at lot corners
i) driveway location, width, elevation at property line and at garage, and percentage of slope of driveway
j) locations of house entrances, and number of risers (steps) required

k) grass surfaces shall have a minimum of 2%, maximum of 5%
l) the maximum slope on all embankments and terraces shall be 3:1 for slopes up to 1 m high; slopes shall be 4:1 if greater than 1 m
m) grading around houses and buildings shall direct the water away from the structure
n) locations of sidewalks (if applicable), storm, sanitary and water services (including inverts of sewer pipes) at property line (sanitary invert to be minimum 300 mm below the storm sewer service invert)
o) aboveground electrical equipment and hydrants to ensure clearance from driveway (typical clearance to be 1.5 m minimum)
p) any trees to be preserved
q) culverts shall be indicated on the plans showing material, length, diameter, gauge, invert elevations and specific end wall treatment (if applicable)
r) any porches, decks, terracing or retaining walls
s) top and bottom elevations of all terracing or retaining walls, plus the type of structure, cross-section drawings and manufacturers specifications
t) all plot plans shall include the following notes: “All roof run-off shall be directed to the front of each lot.”

Retaining walls are not desirable and should be minimized, however, they may be used to maintain a maximum lot slope where necessary. Building Permits are required for the construction of retaining walls that fall into the category of designated structures within the scope of the Ontario Building Code. All proposed retaining walls shall be accompanied by a detailed drawing stamped by the designing engineer.

In all cases the plot plans should reflect the elevations of the general grading plan. Any substantive changes to the general grading plans will require prior approval from the Town.

47.0 CONSTRUCTION

All lots are to be excavated or filled such that the final elevations conform to the approved grading plans. All lots are to be completed with 150 mm of topsoil and nursery sod. Materials shall be in accordance with OPSS 802. Sodding shall be in accordance with OPSS 803.

All lots are to be inspected by the Consulting Engineer and certified prior to the placement of sod, and a Preliminary Lot Grading Certificate (Pre-Sod) letter shall be sent to the Engineering Division.

Within one year of occupancy of 85% of the dwellings within the plan of subdivision, or phase thereof, any lots which have not be constructed upon shall be graded in

compliance with the general grading plan and seeded or sodded to ensure stabilization of the site.

48.0 CERTIFICATION

The following information is required by the Engineering Division prior to consideration of release of the lot grading security:

a) Clearance of water box installation by the water/wastewater division.

b) As-Built survey/grading plan showing compliance with the approved grading plan, prepared by a Consulting Engineer or Ontario Land Surveyor (OLS).

c) A Final Lot Grading Certificate shall be provided from the Consulting Engineer to the Town.

d) Letter from an Ontario Land Surveyor (OLS) confirming the placement of all survey control monuments (generally found on the as-built survey).

e) Where applicable, provide Rear Lot Catchbasin Certification and as-built drawings regarding the location and elevation of any rear lot catchbasin, including the location of the connecting sewer. Modification of rear lot catchbasins previously certified at the time of preliminary acceptance of underground works will not be permitted.

Once all required documentation is received by the Engineering Division, the Consulting Engineer will arrange for a final grading inspection to be carried out with the Consulting Engineer and the engineering staff to address any outstanding grading and sodding deficiencies.

Upon the completion of a successful final grading inspection, the request for the release/reduction of security deposit will be forwarded to the Engineering Division, in accordance with any requirements contained in the Subdivision Agreement.

Additional information regarding inspections and clearance for final grading inspection and approval is contained in Appendix H.

49.0 MUNICIPAL NUMBERING

All lots shown on the general grading plans are to indicate the intended municipal house number for the site. These numbers are to be obtained from the Planning and Building Department. This address information is to be shown on all individual grading plans as well.

SECTION – LOT GRADING

The house numbers are to be permanently affixed to the new dwelling in a prominent location and visible from the street prior to final approval of the lot grading. Builder's lot and house number placards shall be removed prior to installation of permanent house numbers.

UTILITIES & STREET LIGHTING

50.0 GENERAL

A Composite Utility Plan (C.U.P.) is to be submitted to the Town in order to ensure that conflicts between utilities, municipal services and driveways are avoided. The plan will indicate the location of all underground and all above ground services and utilities. The Developer's Consulting Engineer is expected to execute the coordination of all utilities and municipal services.

The hierarchy of municipal servicing and utilities shall generally apply when determining installation locations. These are, in descending order, municipal sewers and watermains including appurtenances, hydro, gas, telephone, cable, and other.

All utility surface features are to be installed, wherever possible, at projections of property lines. The Town requires that the use of aboveground utility furniture be minimized in all new developments.

Composite utility plans shall be submitted with each engineering package. The engineering package will be reviewed only as a complete submission.

50.1 Location of Utilities

All primary hydro, telephone, gas and cable T.V. lines shall be placed underground in locations as shown on the Town Standards GR-1, GR-2, and GR-3. Design of these utilities shall conform to the regulations of the respective authority and use of adopted OPSD standard drawings is acceptable.

51.0 COMPOSITE UTILITY DRAWINGS

All utilities are to be shown on the CUP and are to be submitted for the review and approval of the Town showing utilities including street lighting poles, lighting power centers, transformers, switching cubicles. This drawing shall be prepared at a scale of 1:500, unless otherwise approved and also show locations of all municipal services including sewers, watermains, laterals, manholes, catchbasins, sidewalks and driveways in addition to utilities including street lighting poles, Canada Post mailbox locations, and locations of all street trees. It is the Consulting Engineer's responsibility to ensure there are no conflicts resulting from the design of the various utilities and the municipal roads and services.

All details of any entranceway features and structures within the proposed right-of-way are to be indicated on the Composite Utility Drawing, as circulated to the various utilities.

The drawings shall also indicate the presence of any pumping stations or other such facilities that may necessitate particular service requirements.

The CUP is to be approved by all individual utility agencies identified on the drawing and Canada Post, prior to approval of all drawings and prior to construction. Any revisions to the approved CUPs will require approval of each agency. This shall be done by noting the revision in the title block of the drawing and having the title block of the drawing initialled by a representative of each agency.

51.1 Utility Drawing Preparation

a) The CUP is to show municipal addresses, as well as lot numbers.

b) Drawings shall specify type of pole, conduit, fixture, lamp wattage, size of conductor being used.

c) Provide details of pole and fixture(s) wiring.

d) Specify locations of transformers, means of disconnects, power and control centers.

e) Lighting pole installation are to clearly show locations with respect to property line and offset.

f) The typical cross-section shall be shown or referenced on the Utility Drawing.

g) A maximum of two (2) items of street furniture will be permitted on any lot.

h) Utility clearances are shown in Table 5 which represents the minimum clear separation distance for public utilities.

In addition to the aforementioned information, each CUP shall have a signature block provided for approval of each of the utilities as shown below:

ACCEPTED BY	NAME	DATE
Hydro One		
Enbridge Gas		
Bell Canada		
Rogers		
Canada Post		
Town of Georgina		

Standard Notes on Utility Drawings are as follows:

a) 1.0 metre separation is to be maintained between edge of driveway and all street furniture.

b) All gas services to be installed at the opposite side of the lot from hydro service.

c) Underground hydro to have 1.0 metre horizontal clearance at hydrant locations. Underground hydro shall clear manholes and catchbasins by minimum of 1.0 m; otherwise concrete encasement is required.

d) Hydro primary and cables to be concrete encased over split duct at watermain and hydrant connection crossings. All road crossing by Hydro primary and secondary cables shall be concrete encased and reinforced as per Town Standard GU-2.

e) Gas mains shall clear underground structures by 300 mm minimum.

f) The offices of Bell, Hydro, Gas, Cable T.V. and the Town must be contacted for precise locates before any digging can commence in the boulevard areas.

Table 5: Public Utility Clearance Requirements

Condition/Utility		Gas Line	Hydro	Bell, CATV	Water/Sewer Lines
1	Minimum Vertical Distance	0.3 m	0.3 m	0.3 m	1.2 m
2	Minimum Horizontal Distance	0.9 m	0.9 m	0.3 m	1.2 m
3	Minimum Distance Below Ditch Inverts	0.6 m	0.9 m	0.3 m	1.7 m
4	Minimum Distance from Structure/Chambers	0.3 m	0.3 m	0.3 m	0.6 m
5	Minimum Distance from Hydrants	0.3 m	1.0 m	0.3 m	0.6 m

51.2 Community Mailbox Requirements

Community mailboxes and/or site individual community mail boxes shall be placed in locations reviewed by the Town and Canada Post.

Prior consideration from the Town will be required for any mailboxes proposed without a direct sidewalk connection. In general, individual community mail boxes shall be located near the rear lot line of flankage lots on concrete pads. The location of community mail

boxes shall in no way restrict site lines at intersecting roads. Community mailboxes shall have direct sidewalk access wherever practical.

The approval of Canada Post Corporation with respect to location of community mail centres and/or site individual community mail boxes will be required prior to the approval of the Engineering Drawings by the Town.

51.3 Street Lighting Design

The street lighting system shall be designed by a qualified Electrical Consultant, signed and stamped by a Professional Engineer in accordance with the ANSI/IESNA RP-8-00 – Illuminating Engineering Society of North America's American National Standard Practice for Roadway Lighting (latest version). All street lighting systems for roadways shall meet the requirements of the Town and Hydro One.

The objective in designing street lighting is to provide a uniform distribution of lighting at a level that is adequate for the intended use of the roadway. Roadway lighting shall be designed using the values found in the IESNA Roadway Lighting RP-8-00 Table 2 and Table 3 and abbreviated in the following Table A and Table B respectively:

Table A: Illuminance Method – Recommended Values

Road Classification (IESNA R2 & R3)	Illuminance Values		
	Average Maintained Illuminance Values (Lux)	Illuminance Uniformity Ratio (Average to Minimum)	Uniformity Ratio (Maximum to Minimum)
Local Residential (Low Pedestrian Conflict)	4.0	6 to 1	N/A
Collector Residential (Low Pedestrian Conflict)	6.0	4 to 1	N/A

Table B: Luminance Method – Recommended Values

Road Classification (IESNA R2 & R3)	**Luminance Values**			
	Average Maintained Luminance Values (cd/m^2)	Luminance Uniformity Ratio (Average to Minimum)	Uniformity Ratio (Maximum to Minimum)	Veiling Luminance Ratio (Maximum to Average)
Local Residential (Low Pedestrian Conflict)	0.3	6 to 1	10 to 1	0.4
Collector Residential (Low Pedestrian Conflict)	0.4	4 to 1	8 to 1	0.4

A photometric layout will be required and must include the following information:

a) Lighting levels are not permitted to encroach onto adjacent properties.

b) Specification sheets on luminaires to be installed.

c) Average Maintained, Average to Minimum, and Maximum to Minimum calculations taken between at least four (4) lighting poles on the roadway portion of the photometric calculations are to be provided. Photometric layout LLF (Light Loss Factor) used when calculating lighting levels is to be indicated.

d) The street lighting design submission package is to be submitted to the Town and shall include a cost estimate for the proposed street lighting installation works (including wiring, poles, pedestals, etc.) and a summary of the illumination and uniformity values resulting from the design in accordance with parameters indicated in the above table (i.e. average, maximum to minimum, etc.).

e) The Consulting Engineer shall be responsible for the review/approval of any required shop drawings submitted by the Contractor/supplier for verification or compliance to the lighting design and Town specifications.

f) Design shall specify type of pole, conduit, fixture, lamp wattage, size of conductor being used. Provide details of pole and fixture(s) wiring.

g) Lighting drawings and photometric including statistical data shall be designed/ reviewed/ approved by professional engineer.

h) The Electrical Consultant shall specify on drawings location of transformers, means of disconnects, power and control centers and other related infrastructure.

i) Pole spacing shall be supported by detailed photometric. Maximum spacing not exceeding 45 m.

51.3 Street Light Poles

Poles in residential areas are to be 9.1 m (30 ft), Class A, spun reinforced concrete, hexagonal, direct bury, black polished finish, complete with cast zinc hand hole and cover (per Stress/Crete E-300-APH-G-S10-S/F130 (or equivalent). Poles are to be supplied with appropriate attachments for the specified light fixture. See Town Standard GU-6.

Standard poles for industrial areas are to be 9.1 m (30 ft), Class B, spun reinforced concrete (round) direct bury, complete with cast zinc hand hole and cover (per Stress/Crete E-300-BPR-G-M00 S/F 120 or equivalent). Poles are to be supplied with

1.8 m polished aluminum elliptical arm bracket (per Powerlite RE6MA). See Town Standard GU-7.

In areas where approved by the Town, utility (i.e. “Trafalgar”) poles may be utilized which incorporate the facilities for various utilities within the street light pole, subject to prior approval by Town.

All concrete poles to have a minimum of two coats of transparent sealer (i.e. “cap seal”) applied from the base of the pole to approximately 3 m above the top of the hand hole box.

51.4 Street Lighting Luminaires

Residential street lighting luminaires shall be Cooper LED RDG Ridgeview photometric distribution type II with spill control and 4000K colour temperature or approved equal. Fixtures shall be complete with individual photocell control and shall be black to match pole and bracket in accordance with manufacturer’s requirements and specifications. The mounting height of the fixtures shall be 7.6 m above the finished grade (subject to final design).

Luminaires for industrial streets are to be Philips RoadStar Series.

51.5 Street Light Pedestals

Standard street lighting pedestals are to be metal enclosures per Pedestal Solutions, No. SLS1 (240 V), or approved equivalent, being dark green in colour, short 690mm (27”) and mounted on a precast concrete base (per Utilicon UP1420, or equivalent).

The Town does not approve the use of in-pole circuit breakers.

51.6 Design of Lighting System

The following details should be considered during the design of the electrical lighting system by the Developer’s Consulting Engineer and will contribute to improvement of the quality of street lighting:

a) Grounding requirements shall be coordinated with Hydro One and/or with the Electrical Safety Authority.

b) Every third pole shall be equipped with grounding plate and interconnection to the grounding conductor.

c) Proposed pole spacing shall be supported by detailed photometric information and the maximum pole spacing shall be clarified.

d) A maximum of 6 fixtures is allowed per single circuit. Voltage drop shall not exceed maximum stated in Ontario Electrical Safety Code.

e) Deviation of lamp wattage and fixture light distribution pattern can be considered depending on site specifics.

f) All underground cables are to be installed in 53 mm rigid PVC ducts. All road crossings are to be provided in reinforced concrete encased conduits. Minimal conduit burial depth as per Ontario Electrical Safety Code.

g) When establishing the spacing of street lighting within a residential subdivision, consideration must be given for the placement of a street light adjacent to the location of community mail boxes.

h) In determining the position of a light standard, the designer shall take into consideration the location of driveways, living room windows and other aspects of a particular site. The objective is to provide a sense of security and to minimize spill and other disturbances to residential properties.

i) Light poles are generally to be placed in an alternating (not single-sided) pattern along the roadway. Intersections are to be fully illuminated. Considerations shall be given such that mailboxes shall be adequately illuminated.

j) OPSS standard hand holes (typical size, state requirements of stainless steel hardware) shall be provided to road crossings and to conduit runs in excess of 75 m.

k) All wiring is to be placed in a common trench as per GU-1 and at the locations as indicated on the Town Standard GR-1, GR-2, and GR-3.

l) The street lighting design submission shall include a cost estimate for the proposed street lighting installation works (including wiring, poles, pedestals, etc.).

51.7 Site Plans

Exterior lighting systems for all site plan developments shall be designed in accordance with all applicable codes and regulations by a professional engineer having qualifications in this field. The lighting system shall be designed by a qualified Electrical Consultant, signed and stamped by a Professional Engineer in accordance with the ANSI/IESNA RP-8-00 - Illuminating Engineering Society of North America's American National Standard Practice for Roadway Lighting (latest version). No light shall be permitted to extend beyond the limits of the site boundary.

51.8 Installation Details

Please refer to Town Standards GU-3, GU-4, and GU-5 in conjunction with these specifications.

Wiring:

All wiring must conform to the Ontario Electrical Code. Each pedestal to be energized at 240 volts split neutral. Main breaker 60A, full size neutral, up to 4 individual circuits, 120 volt, 40 amp single pole breakers. Each 120 volt, 40 amp breaker feeds a circuit in each direction to a typically of 6 streetlights. Maximum of 6 lights at one circuit.

Where it is deemed practical, the streetlight system shall incorporate a loop design. The end of each circuit is to be capped off in the streetlight hand hole to provide an alternate feed from another circuit. The alternate feed shall be taped and insulated (capped) so as not to pose a hazard.

The streetlight cable between the transformer and pedestal is as follows:

- #6/3-ACWU90 Copper conductor (with integral ground), in conduit
- the white conductor used as a neutral
- the black conductor used as a 120 volt feed
- the red conductor used as a 120 volt feed
- the bare conductor used as a ground, terminated at the bonding connector inside the pedestal and bonded back to the neutral source at the transformer.

The streetlight cable between the pedestal and the streetlight is as follows:

- 2-1C#6AWG-NMWU or 2-1C#AWG-NMWU Copper conductor (with integral ground), in conduit
- the white conductor used as a neutral
- the black conductor used as a 120 volt feed
- the bare conductor used as a ground, terminated at the bonding connector inside the pole immediately adjacent to the connection on hand hole and bonded back to the bonding connector at the pedestal
- all cables to be installed in rigid PVC conduit.

The streetlight wire between the hand hole and the fixture is as follows:

- 2-#12AWG NMWU Copper conductor, plus ground
- the fixture is to be protected by a 10 amp in-line fuse in the streetlight pole hand hole.

Reference Numbering:

All pedestals are to be numbered to match the numbers on the plans. All circuit breakers are to be identified in the pedestals. On the inside of the pole hand hole plate on the **streetlight** it should list the supply pedestal number and the circuit breaker for that pole. Number shall be done as shown on GU-5.

52.0 SUBMISSIONS

Design and layout drawings are to be submitted by an Electrical Consultant, signed and stamped by a Professional Engineer, and are to be included in the submission of engineering drawings. Please note that the pedestals and the streetlights must be numbered on the drawings. The pedestal number on the plan must match the pedestal number in the field. The manufacturer's shop drawings for all materials to be supplied are to be provided.

53.0 STREETLIGHT ENERGIZATION PROCEDURE:

The Town adheres to the following procedure with regard to the commissioning of streetlights:

1. The Electrical Consulting Engineer is required to inspect all equipment and works associated with streetlight construction including but not limited to underground wiring, streetlight pole and installation, fixture and installation, fuses and connections.

2. Once the streetlight construction is complete, the Electrical Engineer is required to provide a Letter of Certification stating that the consultant has reviewed and inspected the streetlight equipment and installation and certifies that same has been supplied and constructed in general accordance with the design and drawings.

3. The ESA Certificate of Inspection shall be attached to the above noted Certification.

4. The "As-Built" drawings shall also be attached to the above noted Certification. Three (3) copies of the "As-Built" drawings are required to be provided.

5. Once items 2 to 4 above have been received by the Town (within thirty (30) days prior to the first occupancy) in one complete package:

    a. The Town will request Hydro One to make the necessary connections at the transformer to feed the pedestals. It is the subdivider's responsibility to ensure the Town is made aware in writing of the date of the first occupancy.

b. The Town will send its Electrical Contractor to inspect the streetlights.

6. Subsequent to energization of the pedestals and upon completion of any deficiencies, the Town will send its electrical contractor to turn the breaker on at the pedestal and secure the pedestal for the Town to prevent inadvertent operation of the breakers. It is the subdivider's/consultant's responsibility to ensure that the pedestal and all streetlights are maintained safe and secure in an operational condition until assumption.

7. Prior to the final assumption of the development, the Consulting Engineer shall coordinate the re-lamping (replacement of all and each one of the lamp bulbs of the street lights), and the cost of such operation shall be borne by the developer.

LANDSCAPING

54.0 GENERAL

Plans for street trees and stormwater pond plantings are to be prepared by a certified professional Landscape Architect who is a full member of the OALA (Ontario Association of Landscape Architects) and all plans shall bear a signed stamp of the OALA member. At the discretion of the Town, landscape plans shall be peer reviewed with all costs being borne by the developer.

The Landscape Plan shall include the following information:

- adjacent lands and roads marked with spot elevations to show the slope of land based upon the engineer's grading plan and architectural site plan
- walkways, parking areas, exterior lighting, street furniture, hydrants, boulevard trees, transformers, curbs, signage, etc.
- location of all proposed plant material, planting beds and sodded areas
- location of existing vegetation to be retained or removed
- location and type of protection measures for the existing vegetation retained
- location of all existing natural features such as top of bank and watercourses
- a plant list including full botanical name, common name, quantity, caliper, height, and spread
- location, height and material of all fences, screen walls, retaining walls
- location of stormwater management features
- any other landscape element that contributes to site development.

All landscaping and installation to be provided by the Developer in accordance with the principles as described in the Official Plan and as otherwise detailed herein. All plants, materials and structures to be placed on municipal lands shall be completed in a manner that is deemed to be "low maintenance".

The Developer will be required to plant trees on all streets and blocks in accordance with the specifications established by the Town and as shown on the approved landscaping drawings.

In preparing a landscape plan, landscape design considerations must achieve the fundamental objective to provide an aesthetically pleasing view of the subject development from the street. Parking lots have a significant impact on both the aesthetic qualities and functional elements of a development. As such, landscape plans must attempt to break up the monotony of paved surfaces, define internal driveways for traffic movement versus parking, and screen headlights from abutting areas.

The use of specialty paving within pedestrian areas is encouraged to define crossing points, arrival and entrance areas, and amenity spaces. Such paving shall complement the architectural style and façade treatments of proposed buildings.

Large projects shall also provide for pedestrian connections within the site itself, as well as from external locations. Walkways and sidewalks must take into account car overhangs, trees, signage, bike racks, benches, lighting, etc.

Landscape plans must take into account adjacent lands. Buffer requirements will be determined by the Town and may include any combination of the following: landscape strip width, plantings, fencing, and berming. In addition to the aesthetic qualities that soft landscaping presents, fencing and/or berming may be required to serve as a noise reduction and/or privacy enhancing element.

55.0 STREET TREES

At least one tree shall be planted along all streets in front of each lot or at a minimum of 12 m spacing, including adjacent to blocks and parklands. On corner lots, trees will also be required along the flankage.

Trees are to be planted so as not to interfere with other street functions or services when the tree matures. Trees shall be planted as indicated on the typical road sections and within the following minimum setback distances from the item listed:

Fire Hydrants and Valves	3.0 m
Hydro Vault	3.0 m
Light Poles	3.0 m
Utility Pedestals	1.0 m
Buried Pipes, Lines	1.0 m
Driveways	1.5 m
Stop Signs	10.0 m

Columnar trees shall be planted at stop sign locations and streetlights.

55.1 Tree and Shrub Species

Plants shall be selected from species that are native to the Town of Georgina area and commonly used in commercial/residential development planting programs. The permissible tree species are as indicated in Appendix L.

Within a commercial/residential development, all street trees are to be of a hardwood variety and the species and percentage of types to be used are to be approved by the Town prior to commencement of the planting program. A minimum of three different tree

species are to be planted on each street in alternating patterns. On shorter streets this number may be reduced as appropriate.

55.2 Plant Material Specifications

All plant material to conform to the Canadian Nursery Trades Association Specifications and Standards. Plant material shall be No. 1 Nursery Stock that has been grown under controlled conditions in accordance with the standards and practices of the Canadian Nursery Trade Association.

All sod is to conform to the Canadian Nursery Sod Growers Specifications.

Minimum acceptable sizes for planting materials are:

Deciduous Trees

- 60 mm caliper, measured 300 mm above ground level
- 2.25 to 4.0 m minimum height
- deciduous trees planted in a row should be centered 5 to 7 m for small flowering trees, and 7 to 12 m apart for shade trees.

Coniferous Trees

- coniferous trees shall not be used within the Town's boulevard, however, they may be used within blocks to be conveyed to the Town i.e. parks, storm water management ponds, etc.
- 1.8 m height
- coniferous trees should be spaced 4 to 8 m apart depending on effect.

Shrubs

- shrubs shall not be planted within the Town's boulevard, however, they may be used in blocks to be conveyed to the Town i.e. parks, storm water management ponds, etc.
- 60 cm
- shrub spacing depends on variety, however, shrubs should be grouped in large beds and shall be mulched to a minimum depth of 70 mm.

All mulch shall be shredded bark with a minimum depth of 50 mm.

The above standards are minimum requirements. Trees and/or shrubs may be required to be planted at closer intervals, with higher calipers and in greater quantities if a specific purpose is identified by the Town.

55.3 Planting Details

Trees are to be planted in tree pits and shall be planted in a mixture of 1/3 peat moss and 2/3 genuine topsoil, properly filled to eliminate air pockets. All trees are to be placed during the Spring or Fall dormant season in unfrozen soil.

Trees shall be protected in accordance with Town Standard GSC-3, by steel “T” posts placed on both sides of the tree, parallel to the street line. A No. 9 gauge wire protected by vinyl tubing shall be used to support the tree to the posts. (Said posts are to be removed after two years and prior to Final Assumption of the development.)

All trees to be placed in proximity to services are to be excavated by hand. The final location of all trees is to be mutually determined with the Developer's Landscape Consultant and the Town, prior to placement.

All trees that die or fail to thrive prior to Final Assumption shall be replaced by the Developer and a further two year warranty shall be provided to the Town by the supplier.

56.0 FENCING

All Town and RMY lands are to be fenced at the interface with residential lots and other land uses, unless otherwise directed. All wood fences are to be constructed with good quality cedar.

Fencing of park and stormwater blocks shall be chain link in accordance with the Town’s Standard GG-5.

Additional fence locations required or where deemed necessary by the Town shall be in accordance with the Urban Design and Architectural Guidelines, as determined during the Engineering submission review.

All fences shall be constructed entirely on private property and be of a height as determined by the Town. The Developer’s Consulting Engineer shall coordinate the design and indication of the fence type and location(s) required in the preparation of detailed engineering or landscape plans.

57.0 LANDSCAPE REQUIREMENTS FOR SITE PLAN

The following is partially taken from the "Procedures and Requirements for Landscape Approval by Municipalities in Ontario" as prepared jointly by the Ontario Association of Landscape Architects and Landscape Ontario Horticultural Trades Association.

SECTION – LANDSCAPING

All plans are to be prepared by a Landscape Architect bearing a signed stamp of a full member of the OALA (Ontario Association of Landscape Architects), and shall submitted in accordance with the required number of engineering drawings for peer review.

Site Plan Drawings shall contain the following information:

a) Property boundaries; showing dimensions, azimuths, iron bars, or corner stakes and datum points.

b) Existing site features; trees, rocks, watercourse, utilities, etc.

c) Existing grades; including those on adjoining properties and streets.

d) Proposed grades in the form of spot elevations and/or contours indicating percentage of slopes at critical areas and drainage patterns should conform to the grading requirements.

e) Key elevations of all site features (i.e. top or bottom of retaining walls, etc.).

f) First floor elevations of all buildings on site.

g) Building location, showing setting-out and setback dimensions.

h) Building dimensions, including heights and grade elevations at all corners.

i) The location and elevation of soil boreholes, pits, elevations and benchmarks, co-ordinated with topographical surveys and with reference to the required soils report.

j) Existing and proposed roads, driveways and parking areas, with dimensions and materials identified.

k) Existing and proposed curbs, sidewalks and walkways with dimensions and material identified.

l) Retaining walls, stairs, fences and screens; all cross-referenced to details.

m) Patios and recreational facilities; cross-referenced to details.

n) All culverts, swales and catchbasins showing runs, slopes and connections.

o) Locations of exterior lighting fixtures and standards.

p) Existing vegetation with instructions for removal, preservation or treatment.

q) Proposed locations of trees, shrubs and ground cover; clearly labelled and cross-referenced to a plant schedule.

Plant schedule should list botanical name, common name, calliper or height, spread root condition and quantities. All description and nomenclature must conform to the latest edition of the "Guide Specification for Nursery Stock".

NOTE: Guide Specification for Nursery Stock is available from Landscape Canada, Canadian Nursery Trades Association or Landscape Ontario Horticultural Trades Association (L.O.), 1293 Matheson Boulevard East, Mississauga, Ontario, L4W 1R1.

r) Details and/or specifications for the following items are to be included to further clarify drawings:

- planting details – coniferous, deciduous trees and shrubs (staking, guying, installation, pruning, etc.)
- landscape structures – benches, fences, walkways, retaining walls, planters, edgers, stairs, ramps, playground structures, etc.
- surface materials – paving, sodding, etc.

s) Limit of contract for site and landscape work to be done.

t) Locations and details of wells, pumping stations, septic system, garbage storage/pick-up areas, etc., where required.

u) Sub-surface drainage methods, in particular for tree pits and planting areas in impermeable soil.

v) Location and details of handicap amenities - parking, curb cuts, ramps and railings.

w) Generally, site development drawings should be completed to working drawings standards showing all information necessary for the proper execution of construction work and for reviewing purposes.

x) Main building entrances are to be identified by a landscape area.

y) Pedestrian pathways are to be a minimum of 1.7 metres. The width of a walkway abutting parking spaces is 1.7 metres minimum. Pedestrian walkways are to be of a hard surface material other than asphalt. Pedestrian walkways to building entrances are to be provided for parking areas and municipal sidewalks.

APPENDIX A

Standard Drawings

Town of Georgina
Development Design Criteria and Standards

2013

Table of Contents
Town Standard Drawings

ROADS

STORMWATER

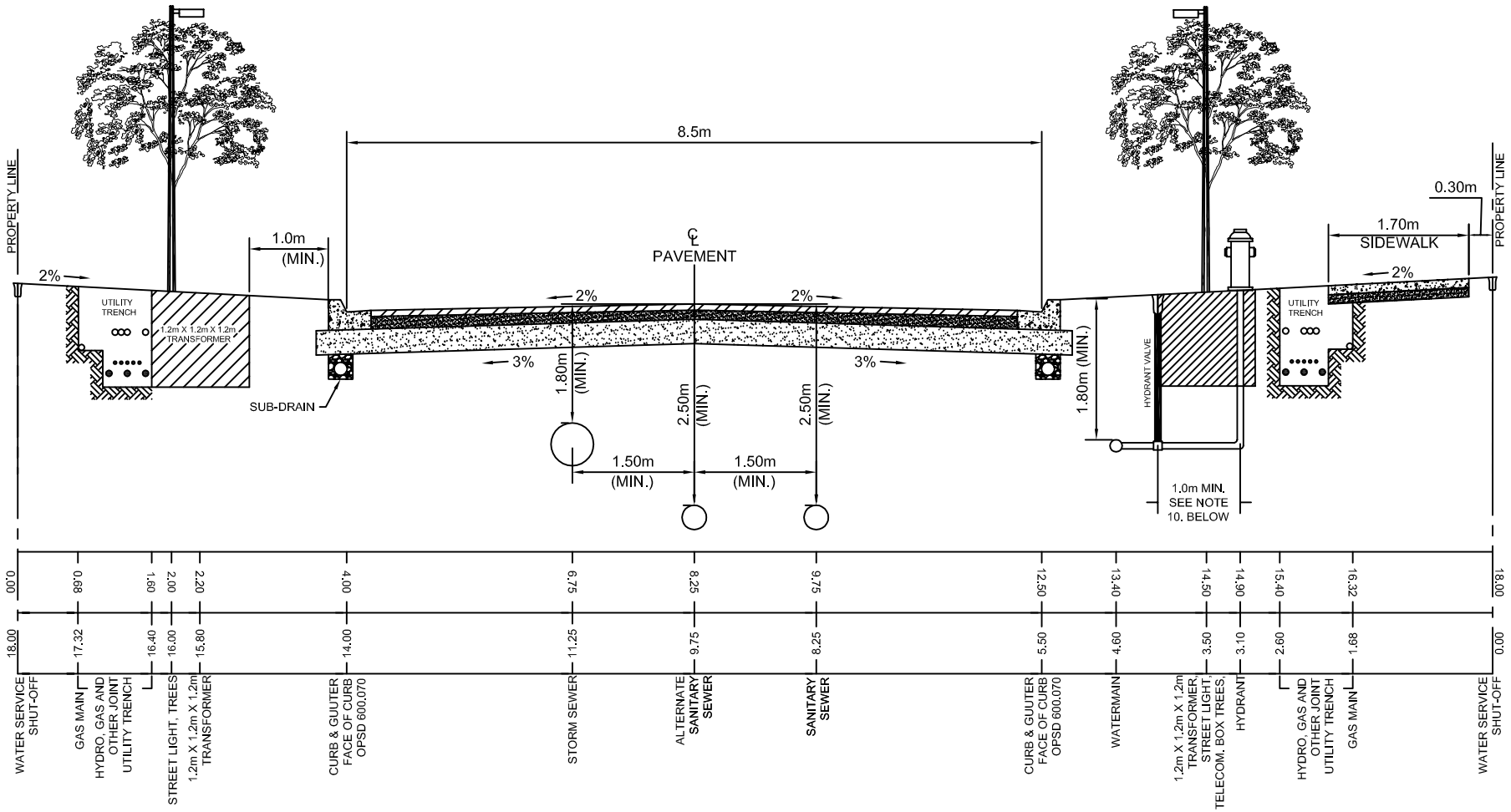
WATERMAINS

LOT GRADING

UTILITIES

SEDIMENT CONTROL

MISCELLANEOUS



NOTES:

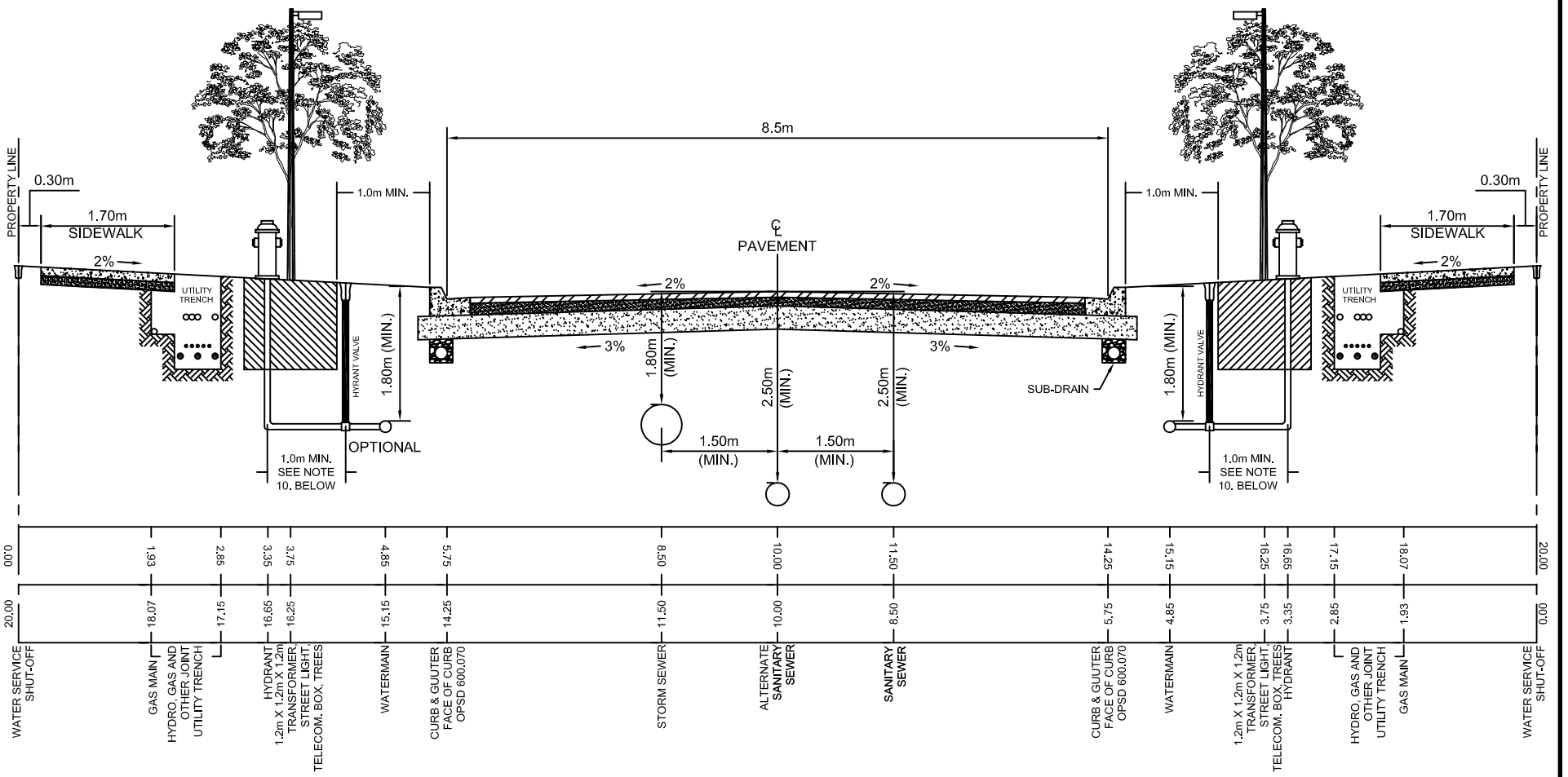
1. BASE AND PAVEMENT CONSTRUCTED TO MUNICIPAL SPECIFICATIONS SUBJECT TO SOIL ENGINEER REPORT AND DEPARTMENTAL APPROVAL.
3. a) SIDEWALKS NOT REQUIRED ON CUL-DE-SACS LESS THAN 152 METERS.
   b) SIDEWALKS ARE REQUIRED ON ONE SIDE ONLY ON LOCAL ROADS.
   c) SIDEWALKS ARE REQUIRED ON BOTH SIDES OF THE STREET ON COLLECTOR AND ARTERIAL ROADS.
4. a) CONCRETE SIDEWALKS (OPSD 303.03) FOR STANDARD LOCATION ONLY.
   b) ASPHALT SIDEWALKS TO BE USED FOR TEMPORARY SERVICE ONLY.
   c) INTERLOCKING PAVING STONE SIDEWALKS TO BE USED FOR NON-STANDARD LOCATIONS OR WHERE COVERING UNDERGROUND UTILITIES.
5. SUBDRAINS WITHIN THE ROAD BASE WILL BE REQUIRED.
6. CHANGES TO THIS STANDARD DRAWING REQUIRES APPROVAL BY THE TOWN OF GEORGINA, ENGINEERING DIVISION.
7. WATERMAIN SHALL GENERALLY BE LOCATED ON THE NORTH AND EAST SIDES.
8. WATERMAIN AND WATER SERVICES SHALL HAVE A MINIMUM DEPTH OF 1.8m AND SHALL HAVE A MINIMUM OUTSIDE BARREL VERTICAL SEPARATION OF 0.5m AND HORIZONTAL SEPARATION OF 2.5m.
9. UTILITY ROAD CROSSINGS SHALL HAVE A MINIMUM OF 1.0 METER OF COVER. FOR UTILITY TRENCH DETAILS PLEASE SEE STANDARD DRAWING NUMBER GU-1.
10. ANCHOR TEE MAY BE USED WHERE APPLICABLE IF LOCATED WITHIN THE SODDED PORTION OF THE BOULEVARD OTHERWISE NOT ACCEPTABLE WITHIN PAVED OR GRAVEL SURFACES.

No.	REVISIONS	DATE	APP'D
3	WATERMAIN LOCATION	JAN '15	MEB
2	TRANSFORMER SETBACK	OCT '14	MEB
1	PAVEMENT WIDTH	JAN '14	MEB

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

18.0 METRE R.O.W. STREET CROSS-SECTION

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-1
CHKD. BY: M.E.B.	METRIC



NOTES:

1. BASE AND PAVEMENT CONSTRUCTED TO MUNICIPAL SPECIFICATIONS SUBJECT TO SOIL ENGINEER REPORT AND DEPARTMENTAL APPROVAL.
3. a) SIDEWALKS NOT REQUIRED ON CUL-DE-SACS LESS THAN 152 METERS.
   b) SIDEWALKS ARE REQUIRED ON ONE SIDE ONLY ON LOCAL ROADS.
   c) SIDEWALKS ARE REQUIRED ON BOTH SIDES OF THE STREET ON COLLECTOR AND ARTERIAL ROADS.
4. a) CONCRETE SIDEWALKS (OPSD 303.03) FOR STANDARD LOCATION ONLY.
   b) ASPHALT SIDEWALKS TO BE USED FOR TEMPORARY SERVICE ONLY.
   c) INTERLOCKING PAVING STONE SIDEWALKS TO BE USED FOR NON-STANDARD LOCATIONS OR WHERE COVERING UNDERGROUND UTILITIES.
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6. CHANGES TO THIS STANDARD DRAWING REQUIRES APPROVAL BY THE TOWN OF GEORGINA, ENGINEERING DIVISION.
7. WATERMAIN SHALL GENERALLY BE LOCATED ON THE NORTH AND EAST SIDES.
8. WATERMAIN AND WATER SERVICES SHALL HAVE A MINIMUM DEPTH OF 1.8m AND SHALL HAVE A MINIMUM OUTSIDE BARREL VERTICAL SEPARATION OF 0.5m AND HORIZONTAL SEPARATION OF 2.5m.
9. UTILITY ROAD CROSSINGS SHALL HAVE A MINIMUM OF 1.0 METER OF COVER. FOR UTILITY TRENCH DETAILS PLEASE SEE STANDARD DRAWING NUMBER GU-1.
10. ANCHOR TEE MAY BE USED WHERE APPLICABLE IF LOCATED WITHIN THE SODDED PORTION OF THE BOULEVARD OTHERWISE NOT ACCEPTABLE WITHIN PAVED OR GRAVEL SURFACES.

No.	REVISIONS	DATE	APP'D
2	WATERMAIN LOCATION	JAN '15	MEB
1	PAVEMENT WIDTH	JAN '14	MEB

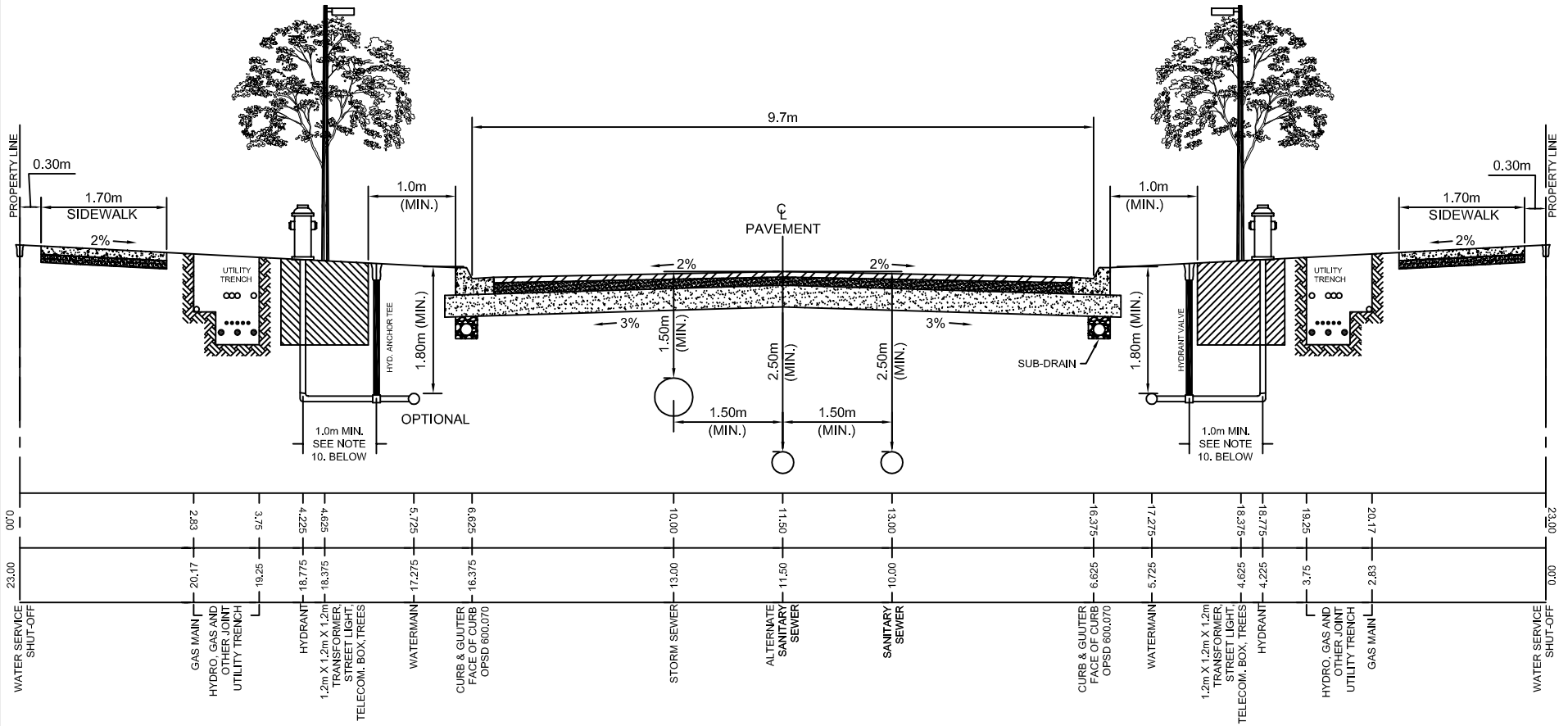
THE CORPORATION OF THE

TOWN OF GEORGINA

REGIONAL MUNICIPALITY OF YORK

20.0 METRE R.O.W. STREET CROSS-SECTION

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-2
CHKD. BY: M.E.B.	METRIC



NOTES:

1. BASE AND PAVEMENT CONSTRUCTED TO MUNICIPAL SPECIFICATIONS SUBJECT TO SOIL ENGINEER REPORT AND DEPARTMENTAL APPROVAL.
3. a) SIDEWALKS NOT REQUIRED ON CUL-DE-SACS LESS THAN 152 METERS.
   b) SIDEWALKS ARE REQUIRED ON ONE SIDE ONLY ON LOCAL ROADS.
   c) SIDEWALKS ARE REQUIRED ON BOTH SIDES OF THE STREET ON COLLECTOR AND ARTERIAL ROADS.
4. a) CONCRETE SIDEWALKS (OPSD 303.03) FOR STANDARD LOCATION ONLY.
   b) ASPHALT SIDEWALKS TO BE USED FOR TEMPORARY SERVICE ONLY.
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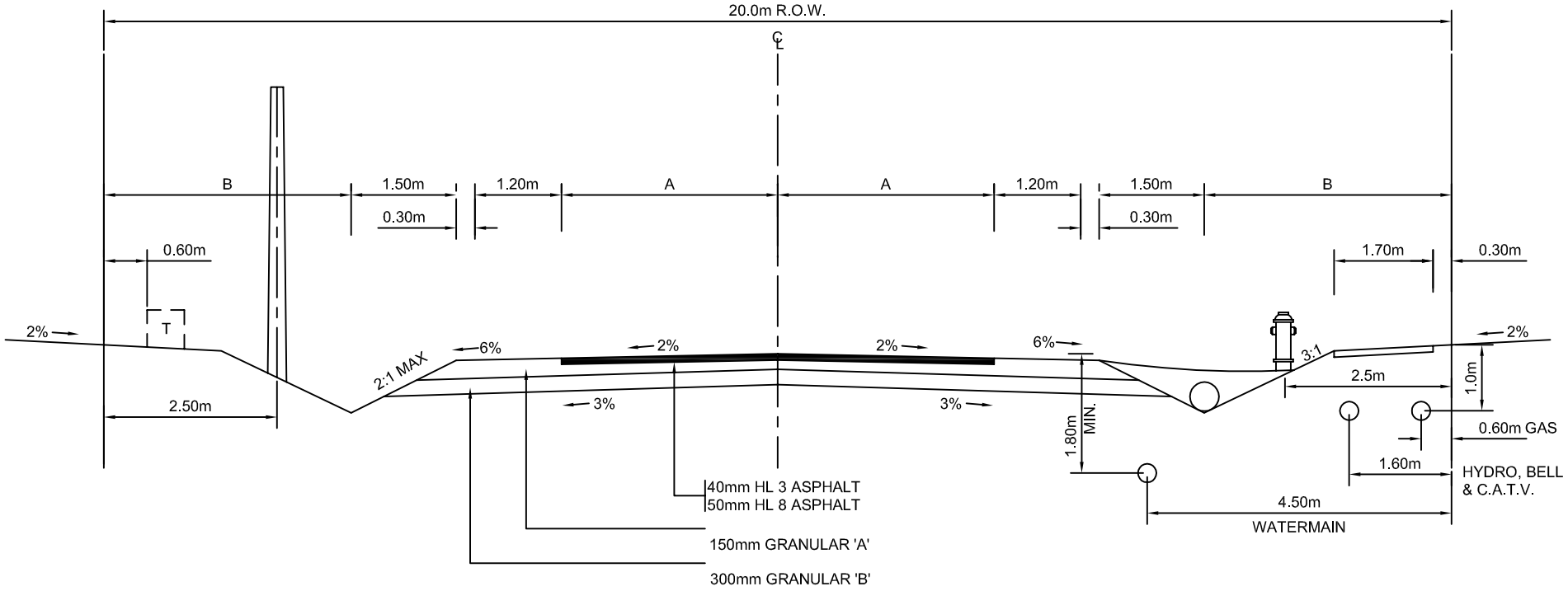
7. WATERMAIN SHALL GENERALLY BE LOCATED ON THE NORTH AND EAST SIDES.
8. WATERMAIN AND WATER SERVICES SHALL HAVE A MINIMUM DEPTH OF 1.8m AND SHALL HAVE A MINIMUM OUTSIDE BARREL VERTICAL SEPARATION OF 0.5m AND HORIZONTAL SEPARATION OF 2.5m.
9. UTILITY ROAD CROSSINGS SHALL HAVE A MINIMUM OF 1.0 METER OF COVER. FOR UTILITY TRENCH DETAILS PLEASE SEE STANDARD DRAWING NUMBER GU-1.
10. ANCHOR TEE MAY BE USED WHERE APPLICABLE IF LOCATED WITHIN THE SODDED PORTION OF THE BOULEVARD OTHERWISE NOT ACCEPTABLE WITHIN PAVED OR GRAVEL SURFACES.

No.	REVISIONS	DATE	APP'D
3	WATERMAIN LOCATION	JAN '15	MEB
2	TRANSFORMER SETBACK	OCT '14	MEB
1	PAVEMENT WIDTH	JAN '14	MEB

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

23.0 METRE R.O.W. STREET CROSS-SECTION

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-3
CHKD. BY: M.E.B.	METRIC



NOTES:
1. MAXIMUM DEPTH OF DITCH, FROM CROWN TO INVERT IS 0.75m, DEPTH BELOW SUB-GRADE 100mm.
2. DITCHES TO HAVE A MINIMUM OF 150mm TOPSOIL AND SOD.
3. ALL TRANFORMERS AND HYDRANTS TO HAVE CULVERT ACCESS. MINIMUM 3.0m LONG, 400mm DIA., 1.6mm THICK C.M.P.
4. MINIMUM CULVERT COVERAGE OF 0.3m.

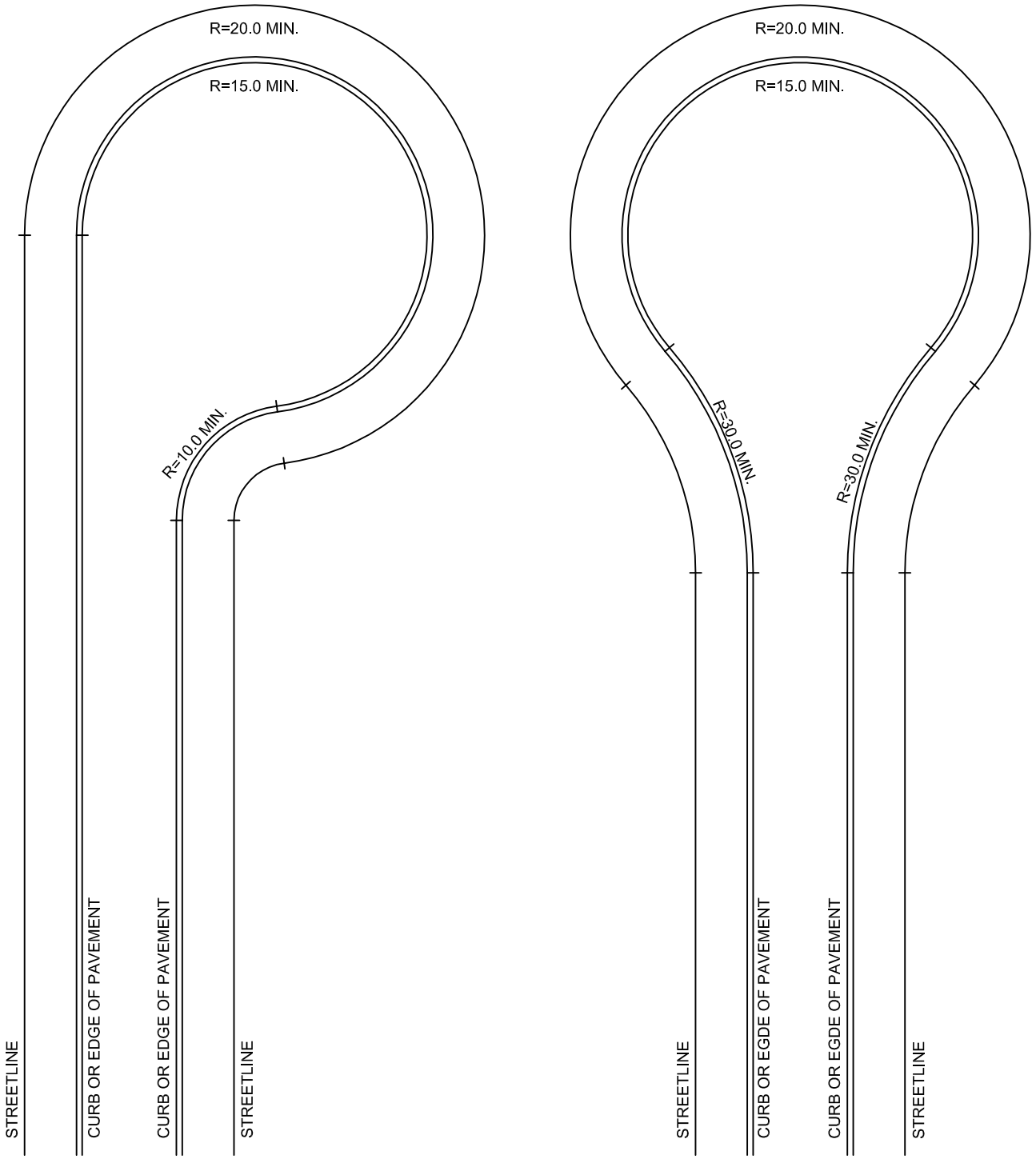
SECTION	ASPHALT (A)	BOULEVARD (B)
RESIDENTIAL	3.35m	3.65m
INDUSTRIAL	3.65m	3.35m

No.	REVISIONS	DATE	APP'D

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

TYPICAL RURAL CROSS-SECTION

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-4
CHKD. BY: M.E.B.	METRIC



NOTES:

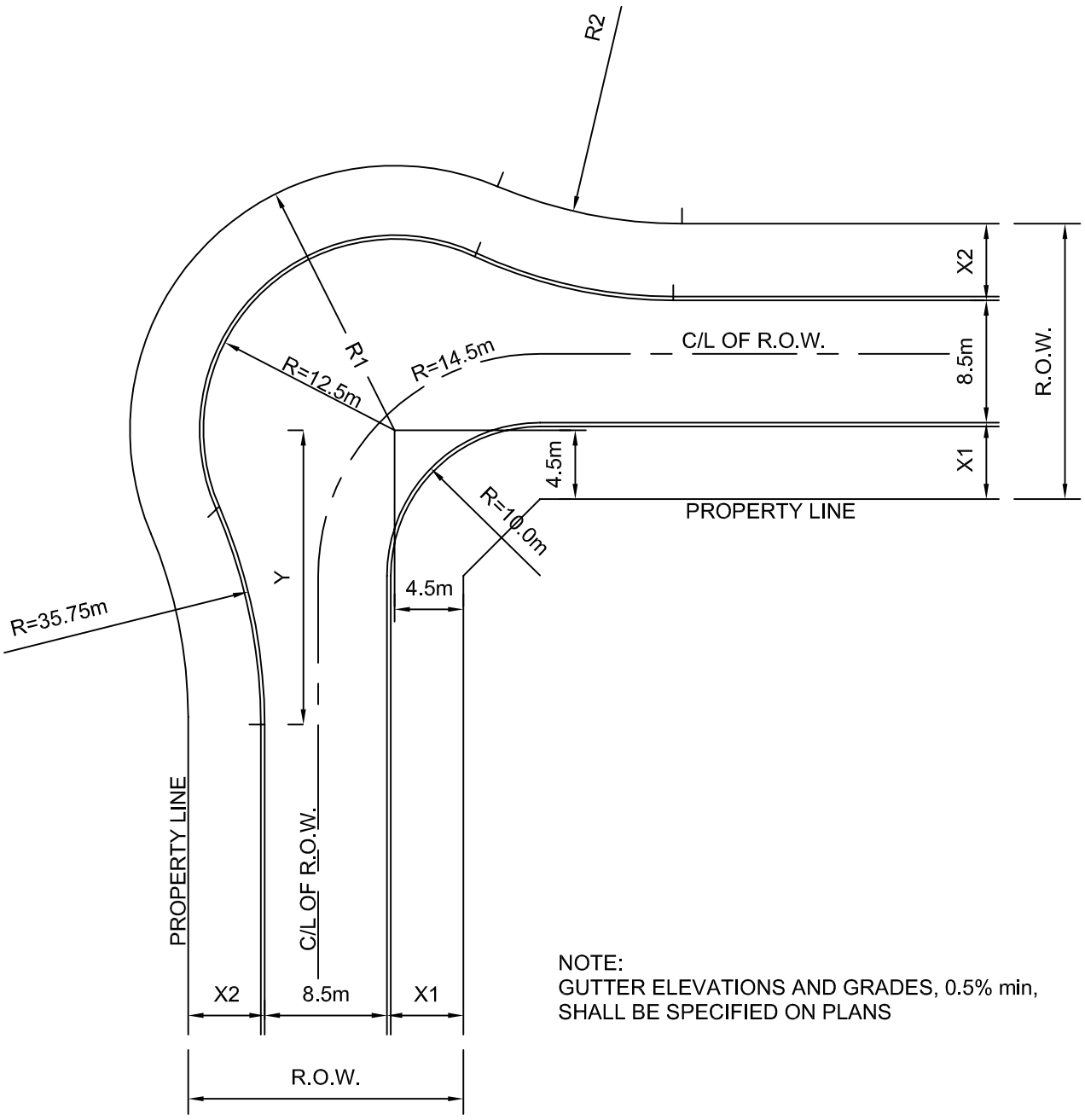
1. MINIMUM 1.0% GUTTER GRADE. (GRADES TO BE DETAILED ON PLANS).
2. BOULEVARD WIDTHS TO BE MAINTAINED AROUND BULB.
3. MINIMUM 1.0m SPACING BETWEEN DRIVEWAY CURB DEPRESSION.

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

TYPICAL CUL-DE-SAC LAYOUT

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-5
CHKD. BY: M.E.B.	METRIC

No.	REVISIONS	DATE	APP'D



NOTE:
GUTTER ELEVATIONS AND GRADES, 0.5% min,
SHALL BE SPECIFIED ON PLANS

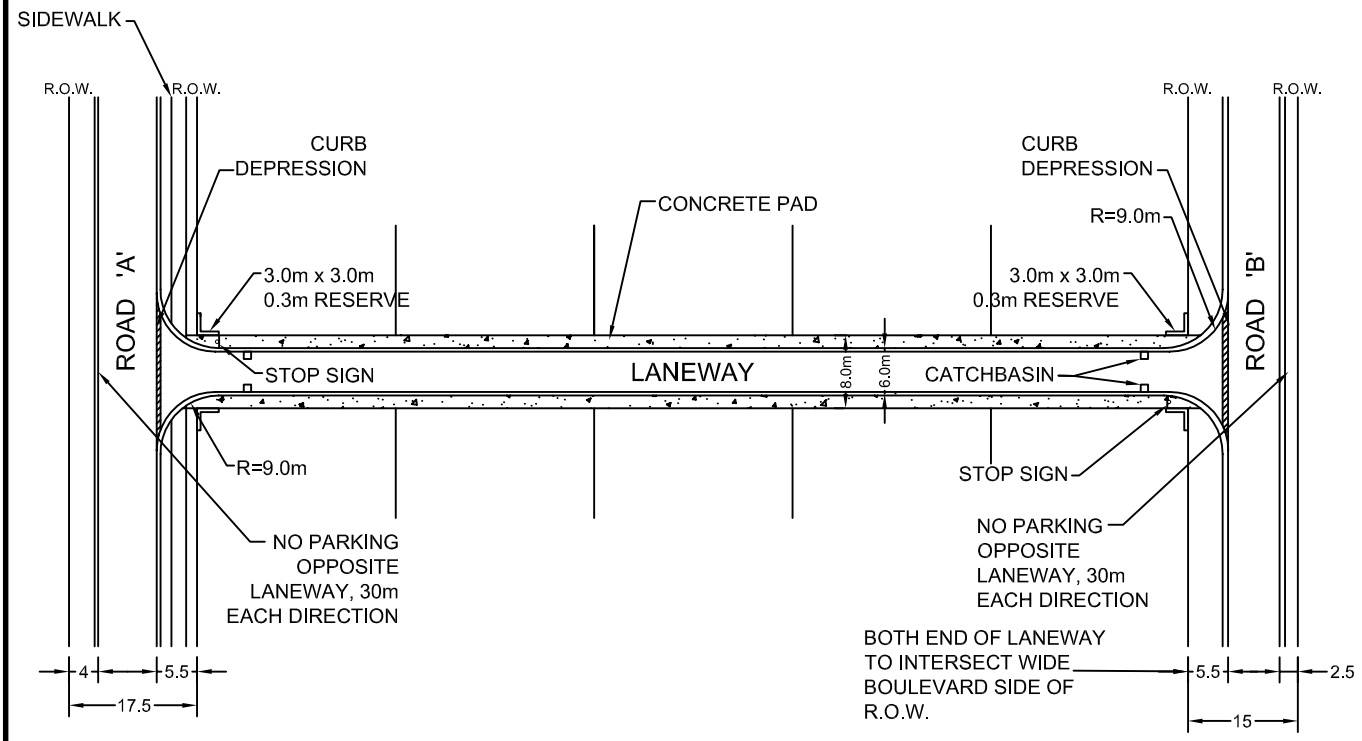
R.O.W.	X1	X2	Y	R1	R2
18m	4.0m	5.5m	20.35m	18m	30.25m
20m	5.75m	5.75m	16.06m	18.25m	30m

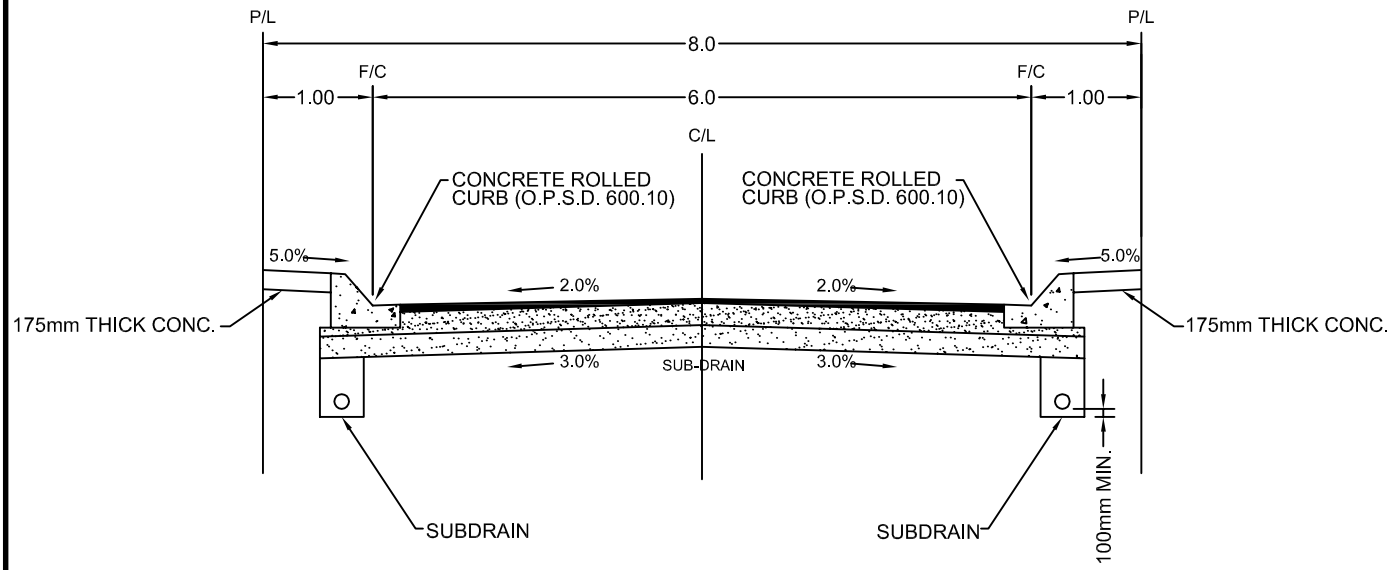
No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

TYPICAL 90° BEND DETAIL

DATE: MAY 2012	SCALE: NTS
DRAWN: N.C.F	GR-6
CHKD. BY: M.E.B.	METRIC





NOTES

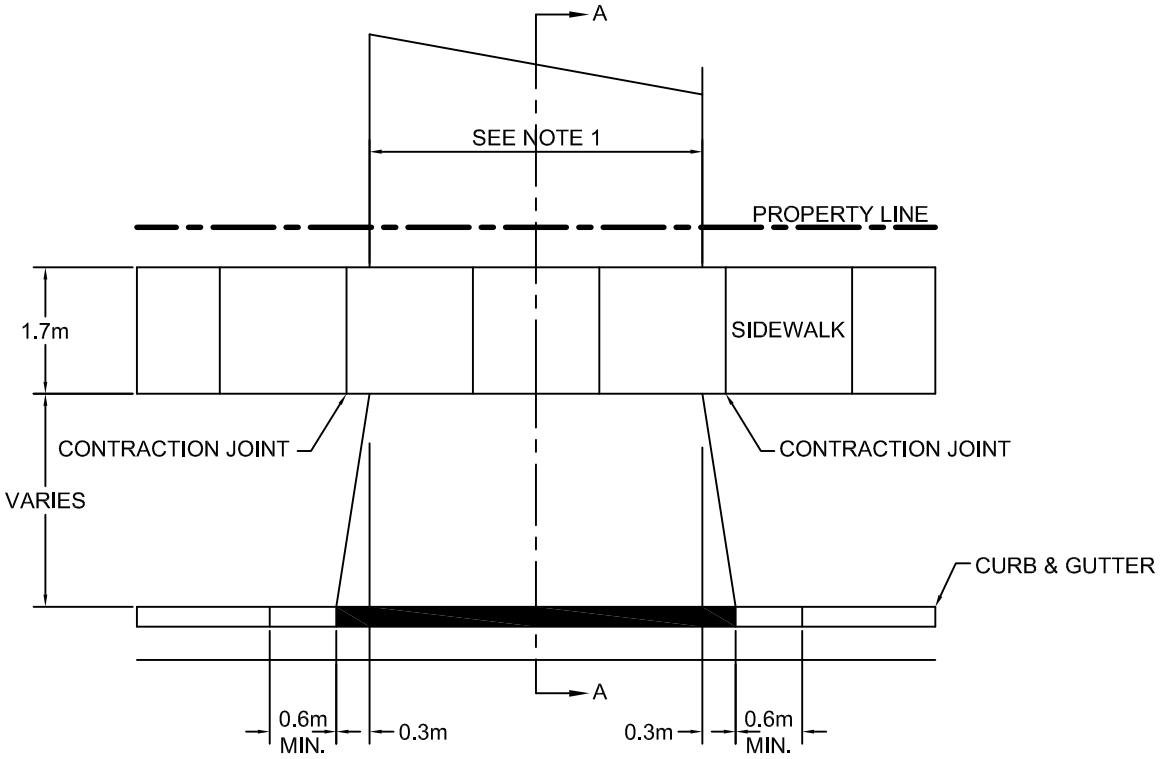
1. STOP SIGN SHALL BE INSTALLED AS PER OHTA REG. 615/616 OR AMENDMENTS THEREOF.
2. "NO PARKING FIRE ROUTE" SIGNS SHALL BE INSTALLED AT ENTRY POINTS AND LOCATED 45.0m APART THEREAFTER(WHENEVER POSSIBLE).
3. ALL SIGNS SHALL BE INSTALLED ON U-CHANNEL GALVANIZED STEEL POSTS.
4. ALL REGULATORY SIGNS MANUFACTURED USING HIGH INTENISTY SHEETING.
5. LUMINAIRES TO BE PROVIDED ON GARAGES WHERE APPLICABLE.
6. PAVEMENT DEPTH SHALL CONFORM TO MINIMUM TOWN STANDARDS AND/OR APPROVED GEOTECHNICAL REPORT.
7. DEPTH OF COVER ON ALL MUNICIPAL INFRASTRUCTURE SHALL CONFORM TO MINIMUM TOWN STANDARDS.

No.	REVISIONS	DATE	APP'D

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

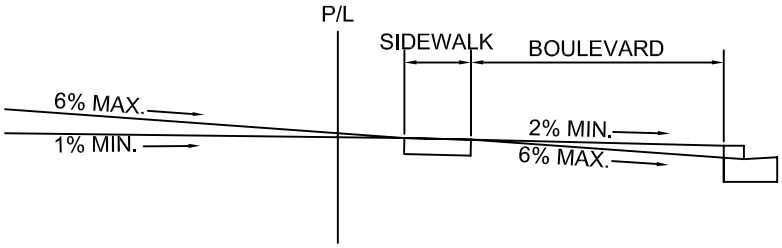
LANEWAY
8.0m R.O.W. - 6.0m LANEWAY

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-7
CHKD. BY: M.E.B.	METRIC



PLAN

ELEVATION



SECTION A-A

NOTES:

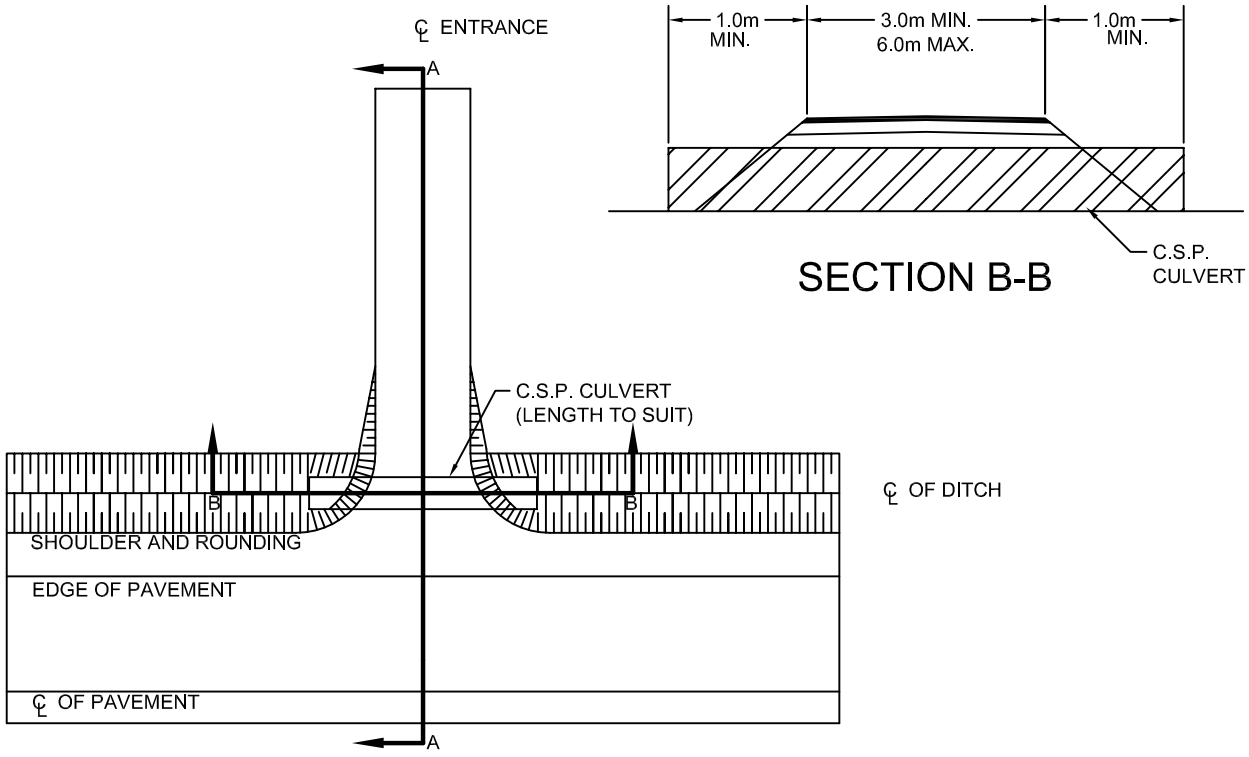
1. DRIVEWAY WIDTH SHALL BE IN ACCORDANCE WITH THE TOWN'S ZONING BY-LAW OR EXISTING DRIVEWAY IN OLDER AREAS. MAXIMUM 6m AT PROPERTY LINE OR SIDEWALK.
2. DRIVEWAY GRADES IN REDEVELOPMENT AREAS MAY BE VARIED TO SUIT EXISTING CONDITIONS.
3. DRIVEWAY SHALL BE PAVED FROM CURB TO GARAGE/ DWELLING. PAVING SHALL BE WITH 150mm GRANULAR A, 200mm OF GRANULAR B, 40mm HL8 BASE COURSE AND 25mm HL3 SURFACE COURSE (COMPACTED DEPTH).

No.	REVISIONS	DATE	APP'D

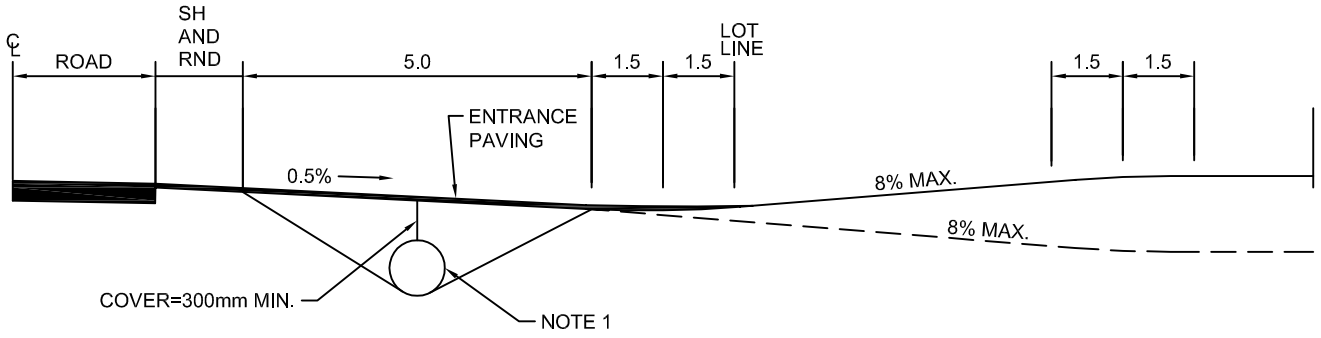
THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

URBAN RESIDENTIAL DRIVEWAY DETAIL

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-8
CHKD. BY: M.E.B.	METRIC



SECTION B-B



SECTION A-A

NOTES:

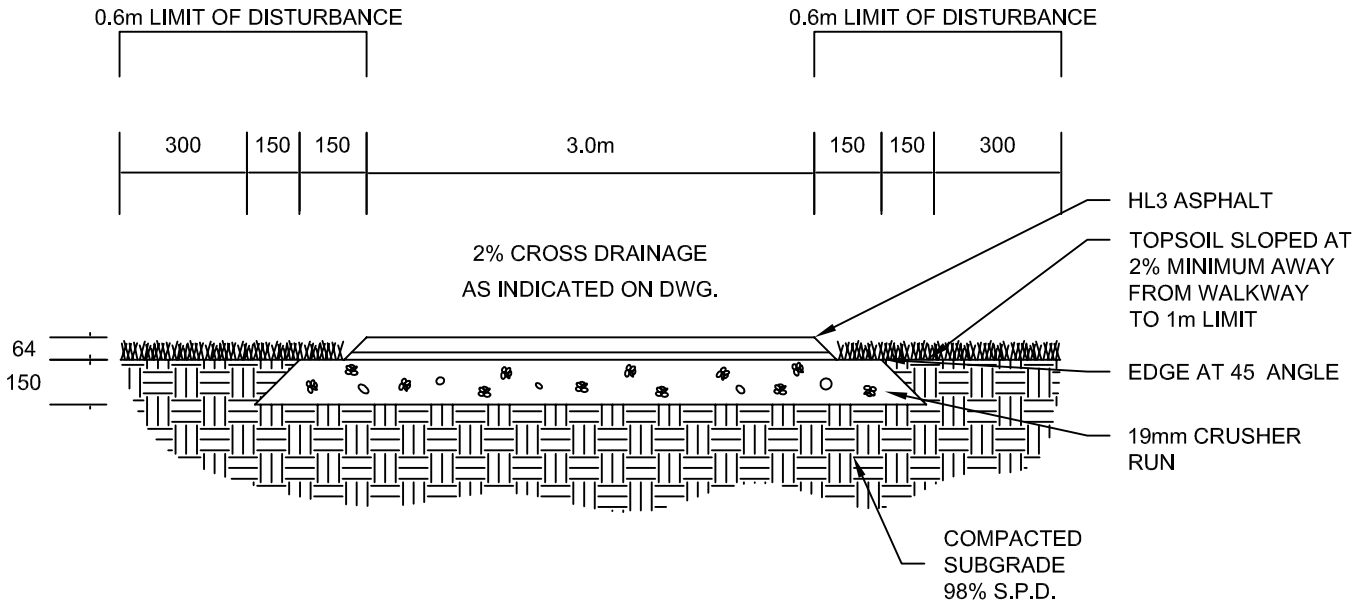
1. DRIVEWAY CULVERT SHALL BE CORRUGATED STEEL PIPE.
2. CULVERT SHALL BE 400mm MINIMUM DIAMETER AND 1.6mm MINIMUM THICKNESS.
3. DRIVEWAY SHALL BE CONSTRUCTED WITH 150mm OF 19mm CRUSHER RUN LIMESTONE.
4. ENTRANCES SHALL BE PAVED FROM THE EDGE OF THE TRAVELLED ROAD TO THE STREET LINE WITH A BASE LIFT OF 40mm OF HL8 AND A SURFACE LIFT OF 25mm HL3.

No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

RURAL ENTRANCES

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-9
CHKD. BY: M.E.B.	METRIC



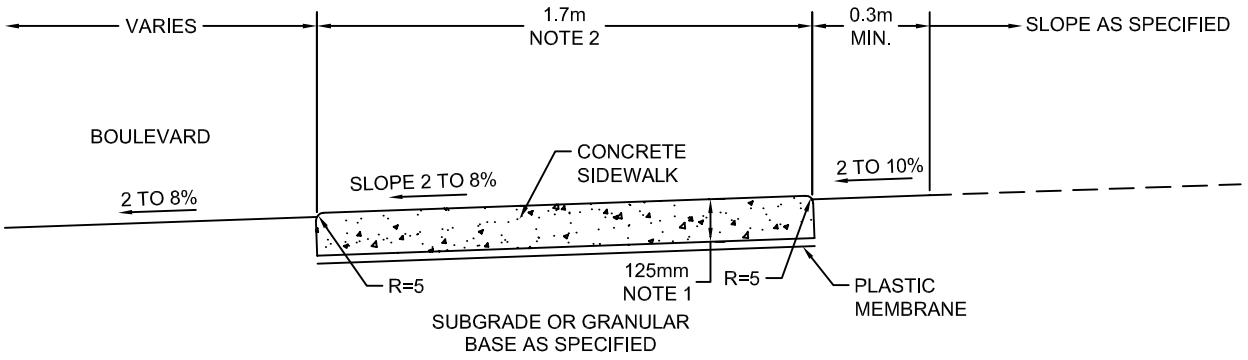
1. EXCAVATION: EXCAVATE TO 214 mm MINIMUM DEPTH OR DEEPER AS REQUIRED. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND REPLACEMENT OF ANY UNSUITABLE SUBGRADE MATERIAL SUCH AS TOPSOIL, ALL SOFT SPOTS AND/OR ORGANIC MATTER AND REPLACE WITH CLEAN SUBSOIL FILL. SUBGRADE SHALL BE CONSOLIDATED TO 95% S.P.D. REMOVE ALL EXCAVATED MATERIAL OFF SITE UNLESS OTHERWISE DIRECTED.
2. GRANULAR BASE: 150mm LAYER OF 19mm CRUSHER RUN, COMPACTED TO 100% S.P.D.
3. ASPHALT: 64mm LAYER (AFTER COMPACTION) OF HOT MIX HL3 IN ACCORDANCE WITH C.S.A. STANDARDS.
4. EDGE TREATMENT: ASPHALT EDGE SHALL BE 45° WELL TAMPED TO FORM UNIFORMLY, SMOOTH, CLEAN EDGES WITHOUT LATERAL DEVIATIONS, SOD TO FEATHER IN WITH EXISTING SOD AND GRADES AT A MAXIMUM SLOPE OF 3:1, ALL SEEDED OR SODDED AREAS MUST BE FLUSH WITH THE ASPHALT SURFACE. REPLACE ALL TOPSOIL AND SOD AS DIRECTED IN CUT AND FILL SITUATIONS.
5. DRAINAGE: SLOPE TO BE A MINIMUM OF 2% ON CROWNED OR CROSS-SLOPED PATHS AS DIRECTED ON SITE OR AS SHOWN IN DRAWINGS.
6. ALL GIVEN DIMENSIONS ARE IN MILLIMETRES.

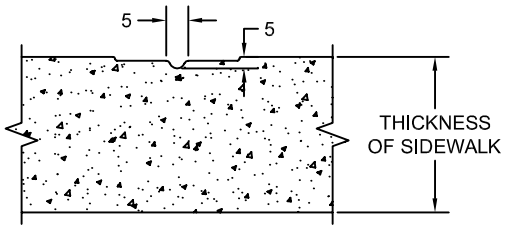
No.	REVISIONS	DATE	APP'D

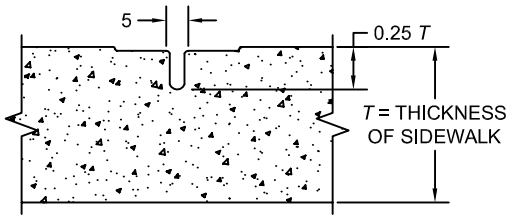
THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

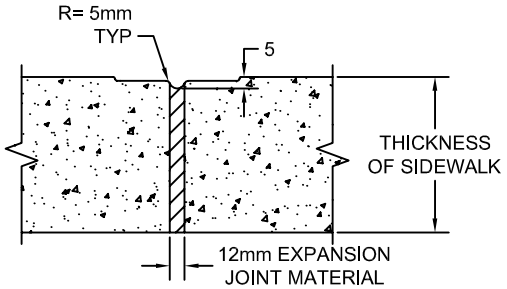
TYPICAL ASPHALT WALKWAY 3.0m WIDE

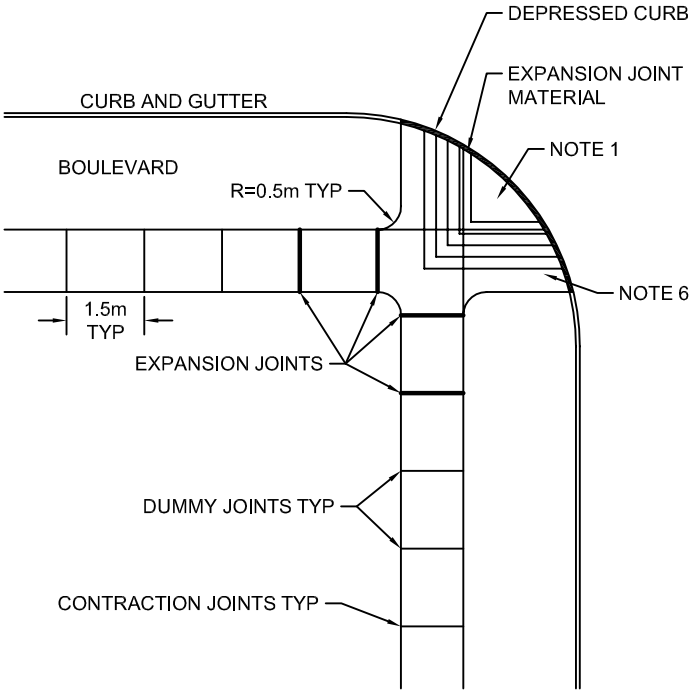
DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-10
CHKD. BY: M.E.B.	METRIC











NOTES:

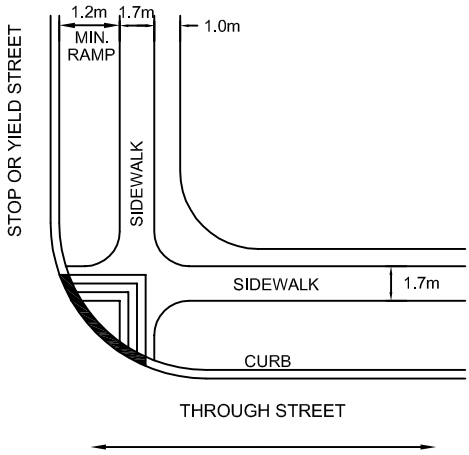
1. SIDEWALK THICKNESS AT RESIDENTIAL DRIVEWAYS AND ADJACENT TO CURB SHALL BE 125mm AND SHALL BE 200mm ATCOMMERCIAL AND INDUSTRIAL DRIVEWAYS.
2. CONCRETE SHALL BE 32 MPa.
3. PLASTIC MEMBRANE SHALL BE APPLIED TO SUBGRADE AS DIRECTED BY THE ENGINEER.
4. CONSTRUCT SIDEWALK RAMPS AS PER OPSD 310.030.
5. SEE TOWN DRAWING GR-12 FOR GROOVE DETAILS.
6. THERE SHALL BE NOT OBSTRUCTIONS IN THE CONCRETE SIDEWALK.
7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

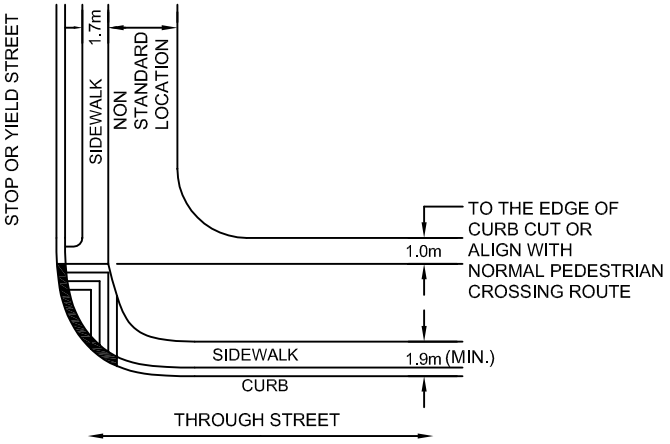
No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

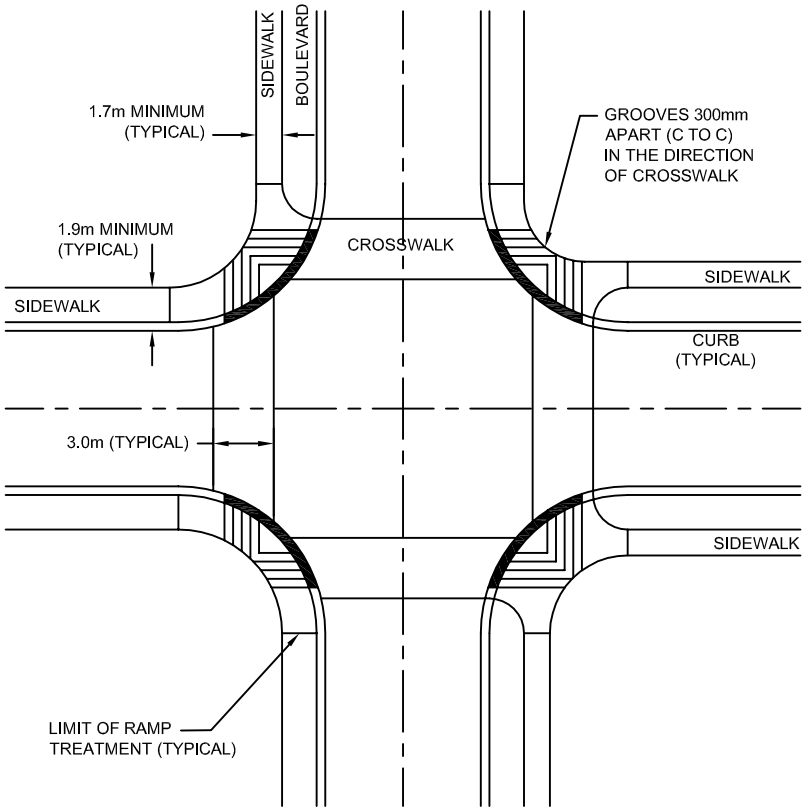
CONCRETE SIDEWALK

DATE: SEPT. 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-11
CHKD. BY: M.E.B.	METRIC





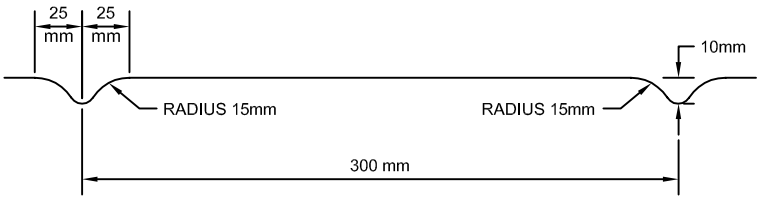
CURB CUT AND SIDEWALK RAMP AT LOCAL STREETS



NOTES:

1. RAMPS SHALL HAVE A COURSE TEXTURED BROOM FINISH.
2. SIDEWALK RAMP SHALL BE PROVIDED AT ALL INTERSECTIONS AND PEDESTRIAN CROSSINGS.
3. RAMP GRADIENT IN EXCESS OF 5% SUBJECT APPROVAL AND IN NO CASE SHALL EXCEED 6%.
4. THERE SHALL BE NO OBSTRUCTIONS WITHIN THE CONCRETE SIDEWALK.

TYPICAL LAYOUT FOR INTERSECTIONS WITH SIDEWALKS IN VARYING (NON-STANDARD) LOCATIONS



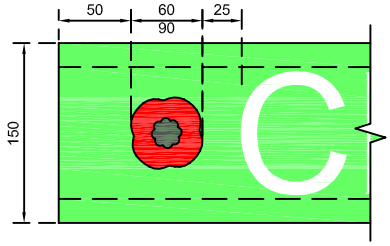
DETAIL OF GROOVES

No.	REVISIONS	DATE	APP'D

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

PEDESTRIAN RAMP GROOVE DETAILS

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-12
CHKD. BY: M.E.B.	METRIC



POPPY DESIGNATED STREET NAME BLADE DETAIL

NOTES:

1. SIGN BLADES SHALL BE 150mm WIDE EXTRUDED ALUMINUM

2. SIGNS SHALL HAVE REFLECTIVE COATING (3M ENGINEERING GRADE OR EQUIVALENT) WITH GREEN COLOURED PIGMENT FOR BACKGROUND. ALL LETTERING IN WHITE.

3. LETTERING SHALL BE HELVETICA BOLD STYLE CHARACTERS THAT ARE ALL CAPITALS AND SHALL BE APPROPRAITLY SIZED.
   100mm LETTERING FOR THE STREET NAME, E.G. CHURCH.
   50mm LETTERING FOR THE DESIGNATION, E.G. STREET (NO ABREVIATIONS).

4. WHENEVER A STREET NAME INCLUDES A DIRECTIONAL ELEMENT, THIS SHALL BE SHOWN AS A UPPER CASE SINGULAR LETTER (NORTH (N), SOUTH (S), EAST (E), WEST (W)).

No.	REVISIONS	DATE	APP'D

THE CORPORATION
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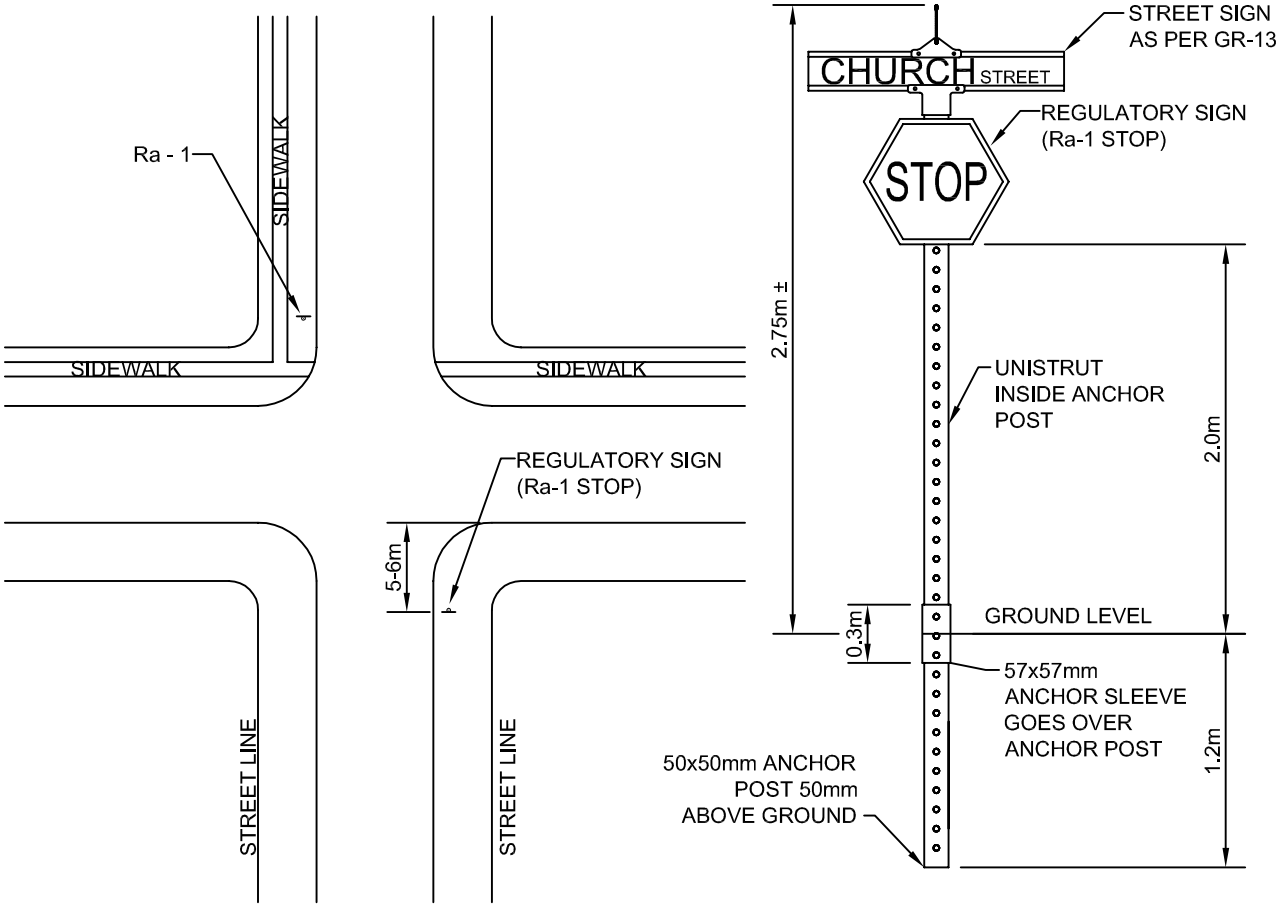
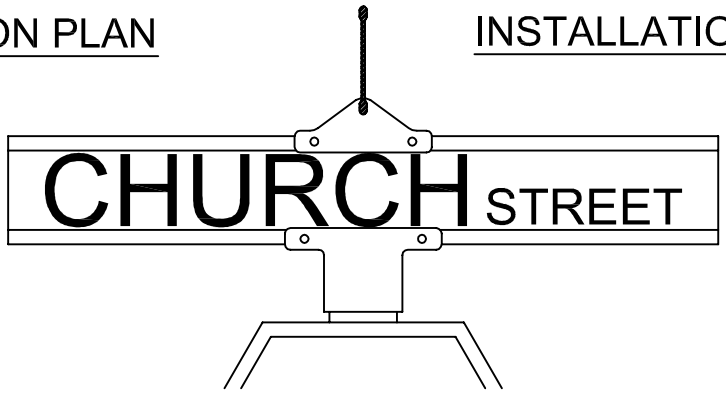
STREET NAME SIGN DETAIL

DATE: JULY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-13
CHKD. BY: M.E.B.	METRIC



LOCATION PLAN

INSTALLATION DETAIL



NOTES:

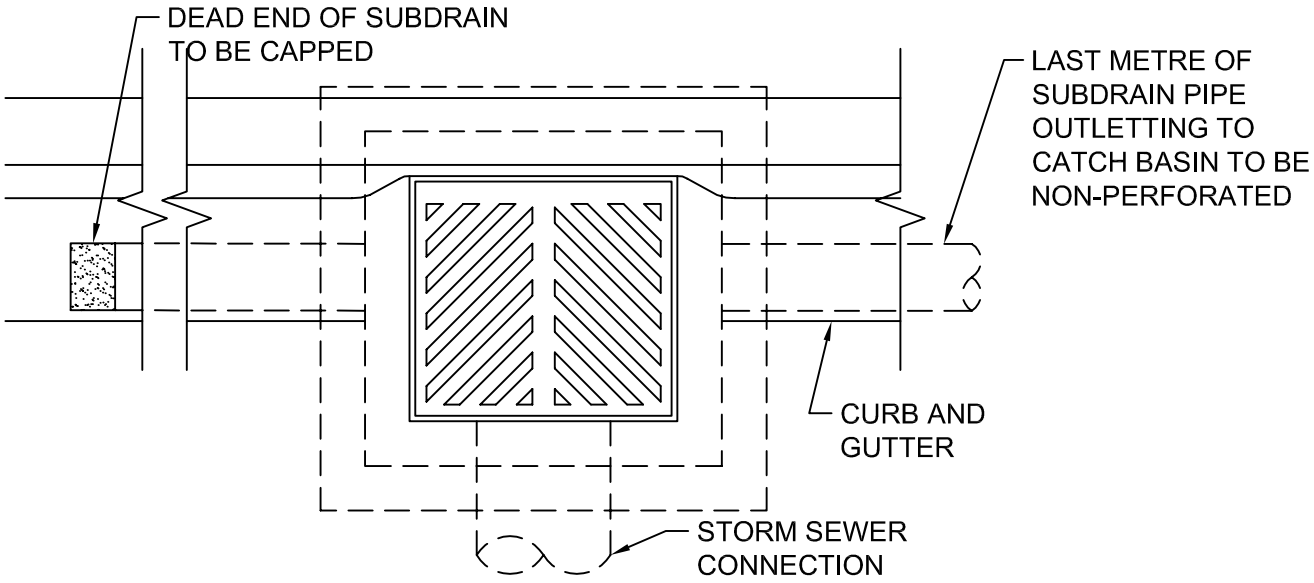
1. REGULATORY/WARNING SIGNS AS PER OHTA REG. 615/616 OR AMENDMENTS THEREOF.
2. STOP SIGN POSTS SHALL BE 50mm x 4.0m GALVANIZED STEEL COMPLETE WITH TOP.
3. STOP SIGNS SHALL BE BANDED TO THE POST WITH MINIMUM 12.7mm x 0.76mm STAINLESS STEEL BANDING AND FLARED LEG STAINLESS STEEL BRACKETS (BANDRIT MINI BRACKETS OR EQUIVALENT).
5. ALL REGULATORY AND WARNING SIGNS SHALL BE MOUNTED IN ACCORDANCE WITH THE ONTARIO TRAFFIC MANUAL.
6. ALL REGULATORY AND WARNING SIGN BLANKS SHALL BE GALVANIZED STEEL AND BE OF HIGH INTENSITY SHEETING.
7. STREET NAME SIGNS TO BE AS PER STANDARD DRAWING GR-13.

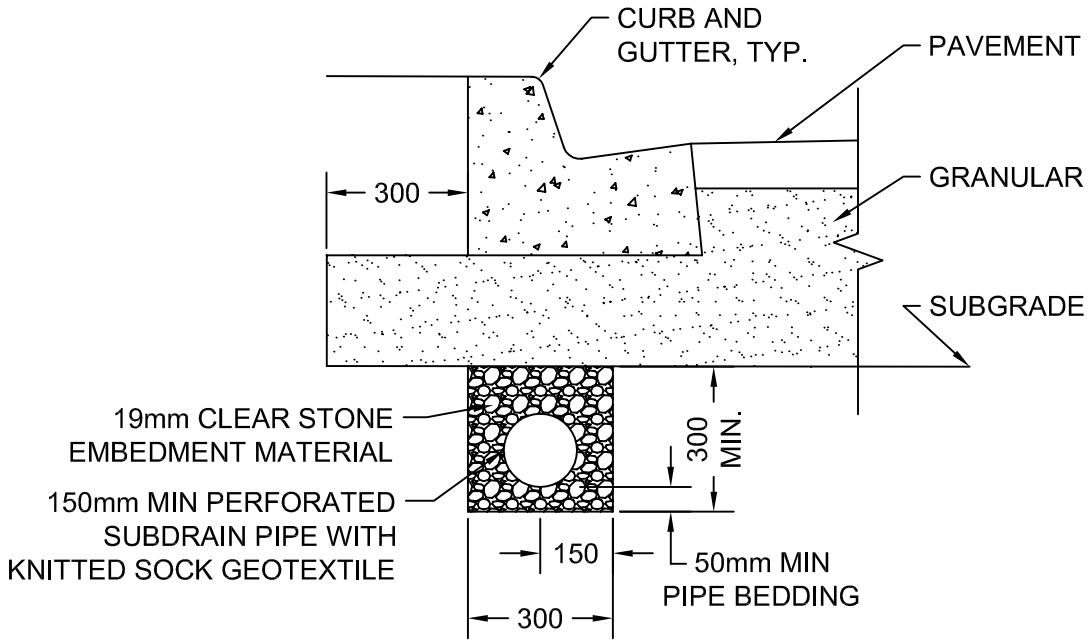
No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

STREET NAME SIGN
HEIGHT AND LOCATION

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-14
CHKD. BY: M.E.B.	METRIC





NOTES

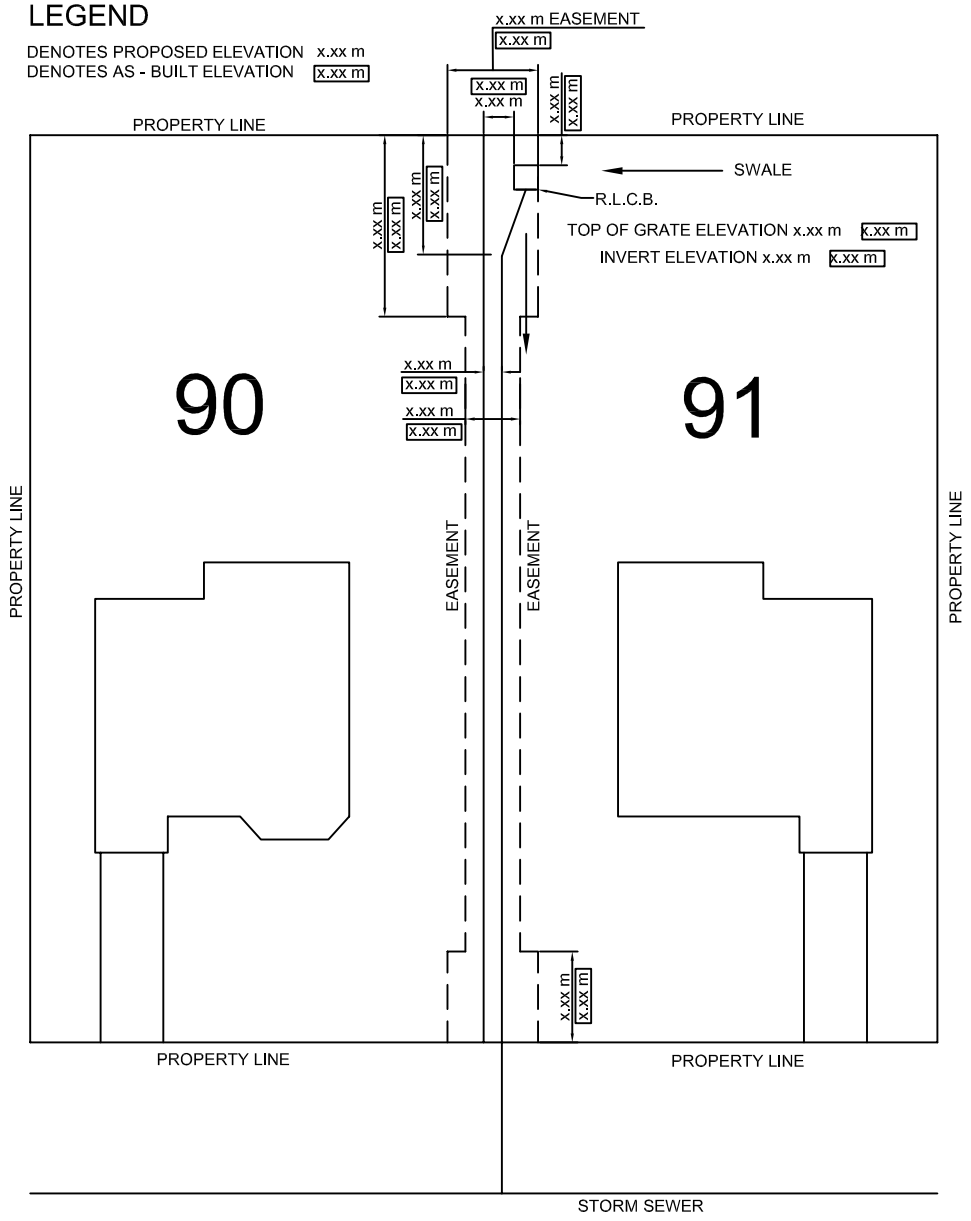
1. CORE HOLE DIAMETER TO ALLOW OUTLET PIPE INTO STRUCTURE WHERE PUNCHOUT IS NOT PROVIDED.
2. INSTALL OUTLET PIPE FLUSH WITH INSIDE FACE OF CATCH BASIN.
3. ANNULAR SPACE AROUND PIPE TO BE FILLED WITH NON-SHRINK GROUT.
4. USE COMPATIBLE MANUFACTURED FITTINGS FOR ALL CONNECTORS, COUPLINGS, AND CAPS.
5. TRENCH DIMENSIONS SHOWN TO ACCOMMODATE 100 OR 150mm DIAMETER SUBDRAIN PIPE.
6. LONGITUDINAL SUBDRAIN PIPE SHALL BE INSTALLED PARALLEL TO THE GRADE OF THE GUTTER.
7. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

SUBDRAIN DETAIL

DATE: OCT. 2012	SCALE: N.T.S.
DRAWN: N.C.F	GR-15
CHKD. BY: M.E.B.	METRIC



NOTES:

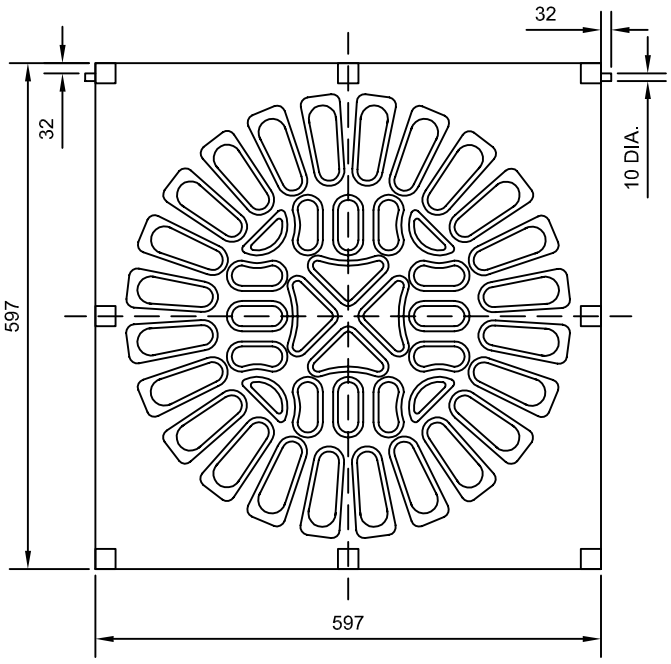
1. USE A SCALE OF 1:250
2. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
3. SURVEYOR TO RE-INSTALL THE REQUIRED S.I.B.'S TO ENSURE PROPER AS BUILT TIE-INS ARE PROVIDED.
4. AS BUILT TOP OF FRAME ELEVATION AND INVERT ELEVATIONS ARE TO BE PROVIDED.
5. AS BUILT REAR LOT CATCH BASIN DRAWING SHALL BE SIGNED AND STAMPED BY A PROFESSIONAL ENGINEER.

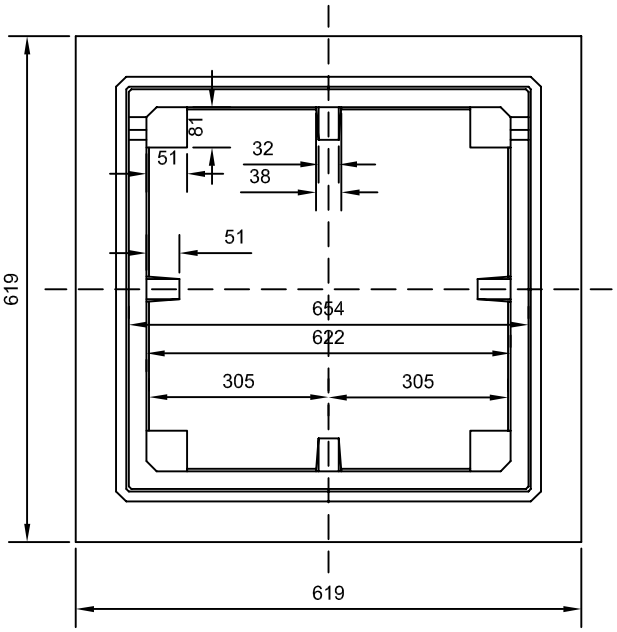
No.	REVISIONS	DATE	APP'D

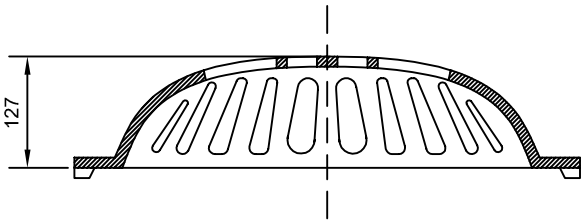
THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

AS BUILT SAMPLE DRAWING FOR REAR LOT CATCH BASINS

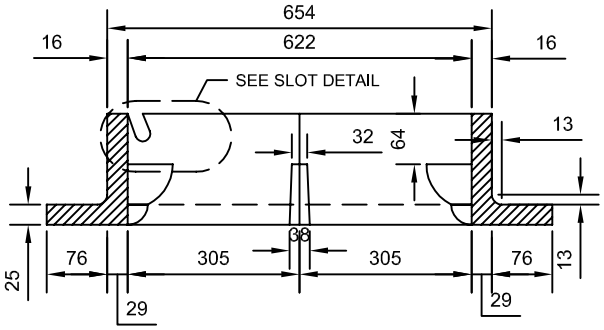
DATE: JUNE 2012	SCALE: 1 : 250
DRAWN: N.C.F	GST-1
CHKD. BY: M.E.B.	METRIC



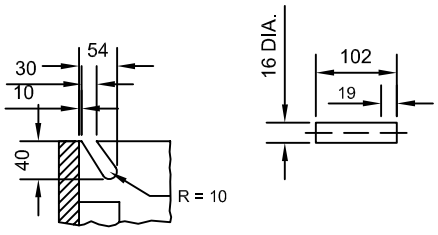




COVER DETAIL



FRAME DETAIL



SLOT DETAIL PIN DETAIL

NOTES:

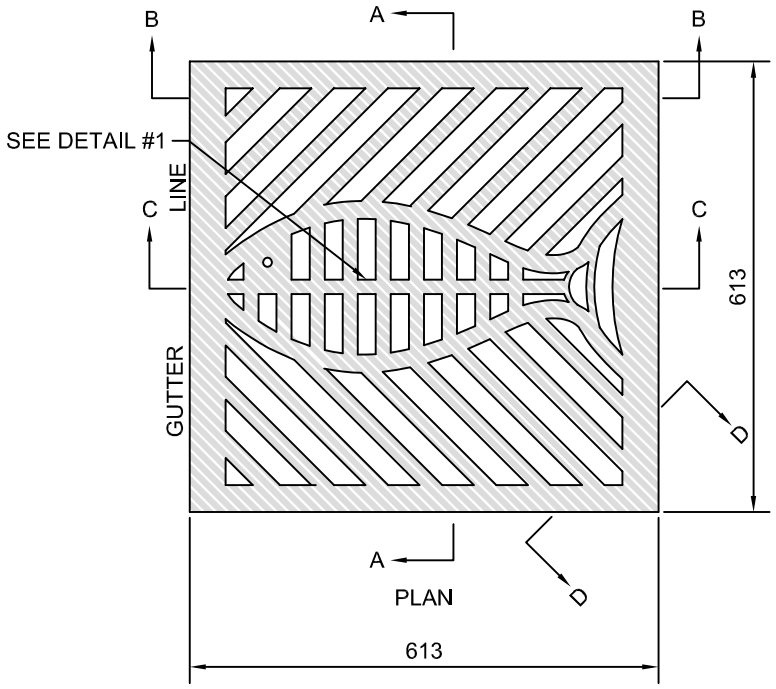
1. CATCH BASIN DESIGN FOR REAR YARD CATCH BASIN ONLY.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
3. THIS DESIGN IS ONLY TO BE USED AS APPROVED BY THE TOWN.

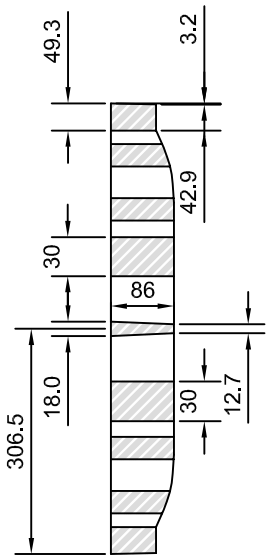
No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

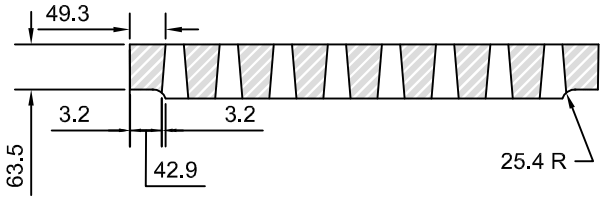
CIRCULAR C.B. FRAME & COVER
(BEEHIVE)

DATE: JUNE 2012	SCALE: N.T.S.
DRAWN: N.C.F	GST-2
CHKD. BY: M.E.B.	METRIC

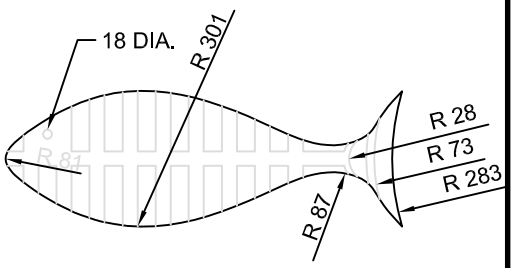




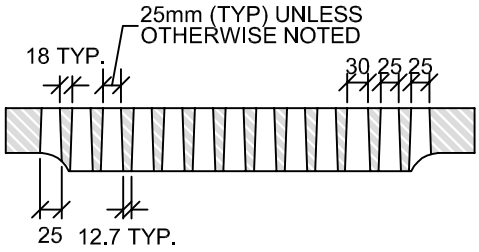
SECTION A-A



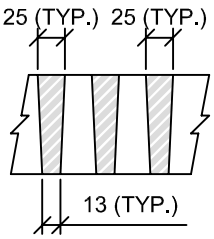
SECTION B-B



DETAIL #1



SECTION C-C



SECTION D-D

NOTE:

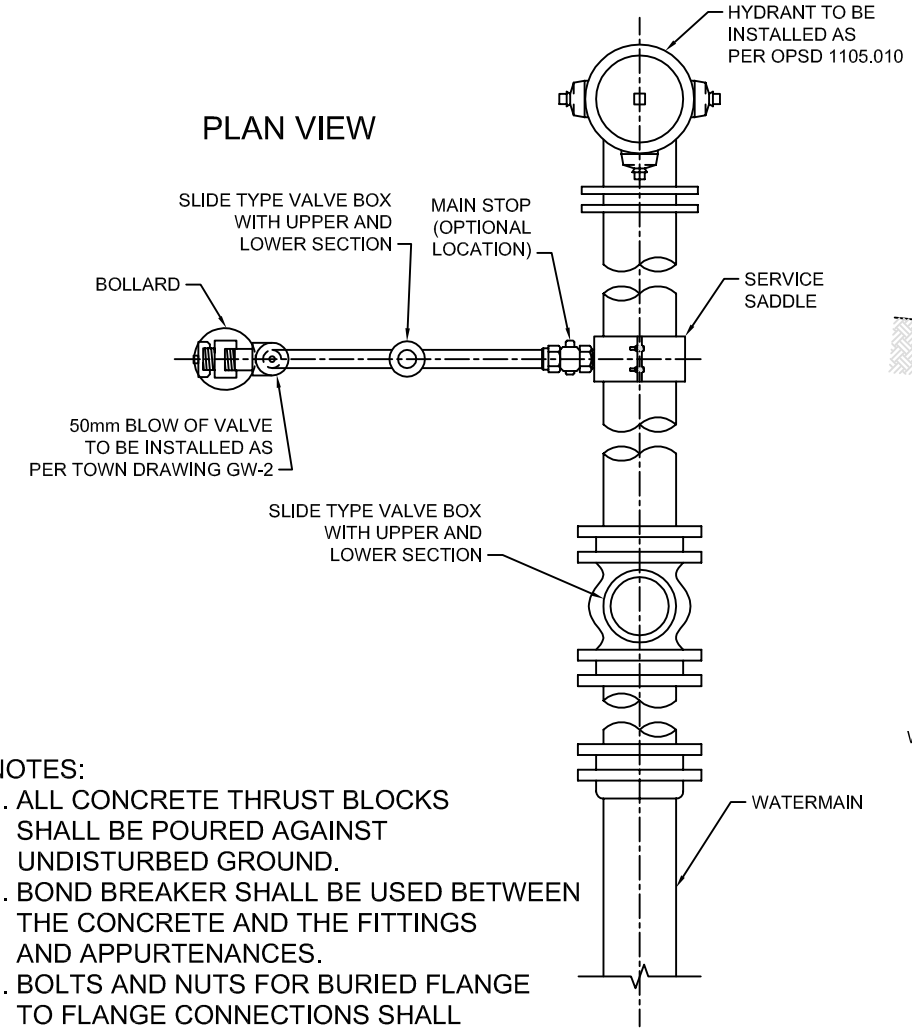
1. THIS STANDARD ONLY TO BE USED WHEN GRADING ALLOWS (LOW POINTS) AND AT THE APPROVAL OF THE TOWN.

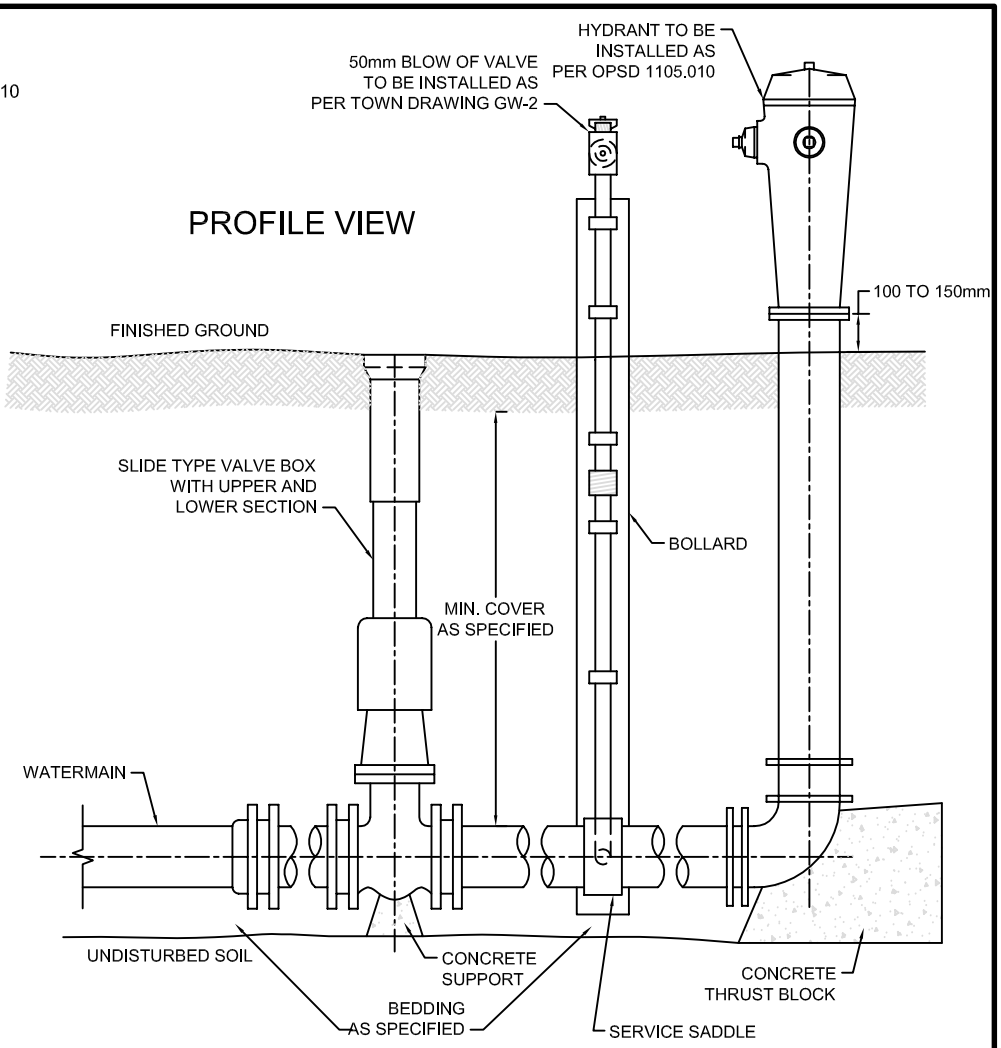
No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

FISH-STYLE CATCH BASIN

DATE: JUNE 2012	SCALE: N.T.S.
DRAWN: N.C.F	GST-3
CHKD. BY: M.E.B.	METRIC





NOTES:

1. ALL CONCRETE THRUST BLOCKS SHALL BE POURED AGAINST UNDISTURBED GROUND.
2. BOND BREAKER SHALL BE USED BETWEEN THE CONCRETE AND THE FITTINGS AND APPURTENANCES.
3. BOLTS AND NUTS FOR BURIED FLANGE TO FLANGE CONNECTIONS SHALL BE STAINLESS STEEL.
4. BLOW-OFF CONNECTIONS TO PLASTIC WATERMAINS SHALL BE MADE USING SERVICE SADDLES OR FACTORY MADE TEES.
5. BOLLARD INSTALLATION WHERE TRAFFIC PROTECTION IS REQUIRED. TO BE DETERMINED ON A SITE BY SITE BASIS.
6. HYDRANTS, VALVE BOXES, AND BLOW-OFFS SHALL HAVE A MINIMUM OF 1m SEPARATION.
7. CATHODIC PROTECTION SHALL BE PROVIDED AS PER OPSD 1109.010 AND 1109.011.

No.	REVISIONS	DATE	APP'D

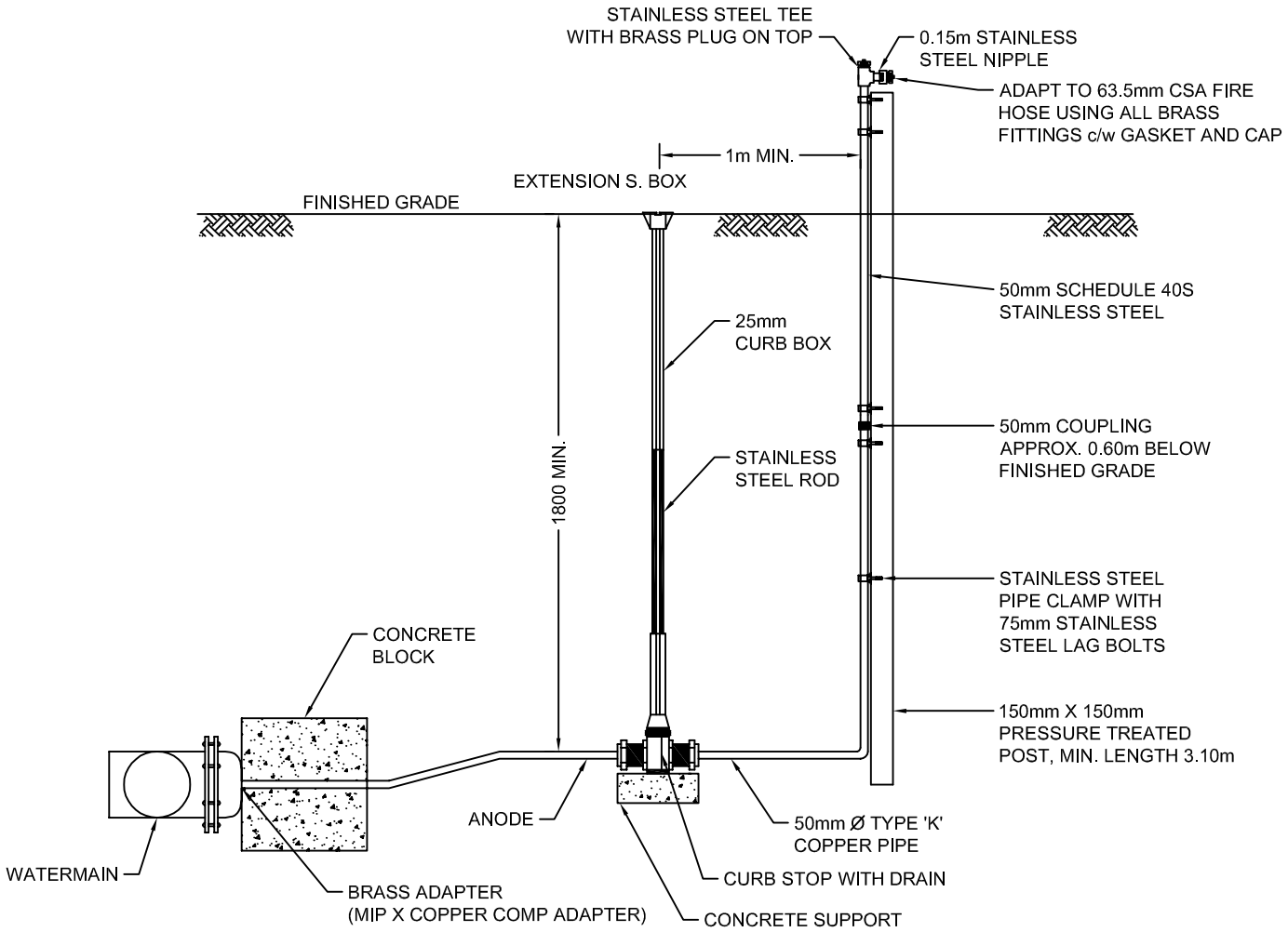
THE CORPORATION OF THE

TOWN OF GEORGINA

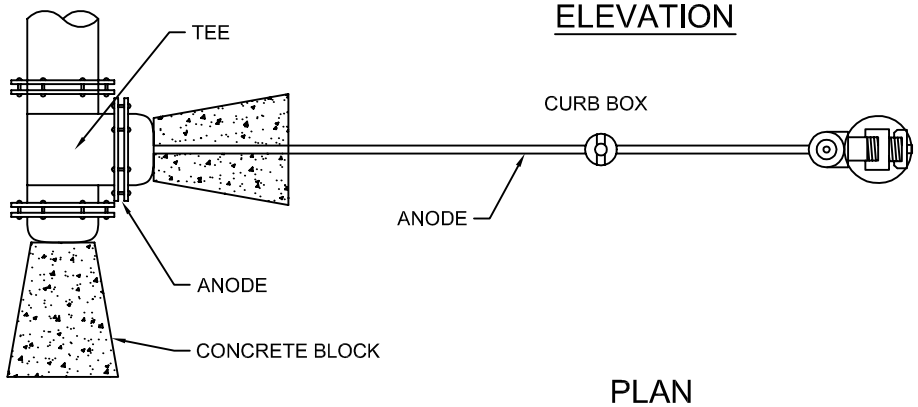
REGIONAL MUNICIPALITY OF YORK

DEAD END WATERMAIN WITH HYDRANT AND 50mm BLOW - OFF

DATE: SEPT. 2012	SCALE: N.T.S.
DRAWN: N.C.F	GW-1
CHKD. BY: M.E.B.	METRIC



ELEVATION



PLAN

NOTES:

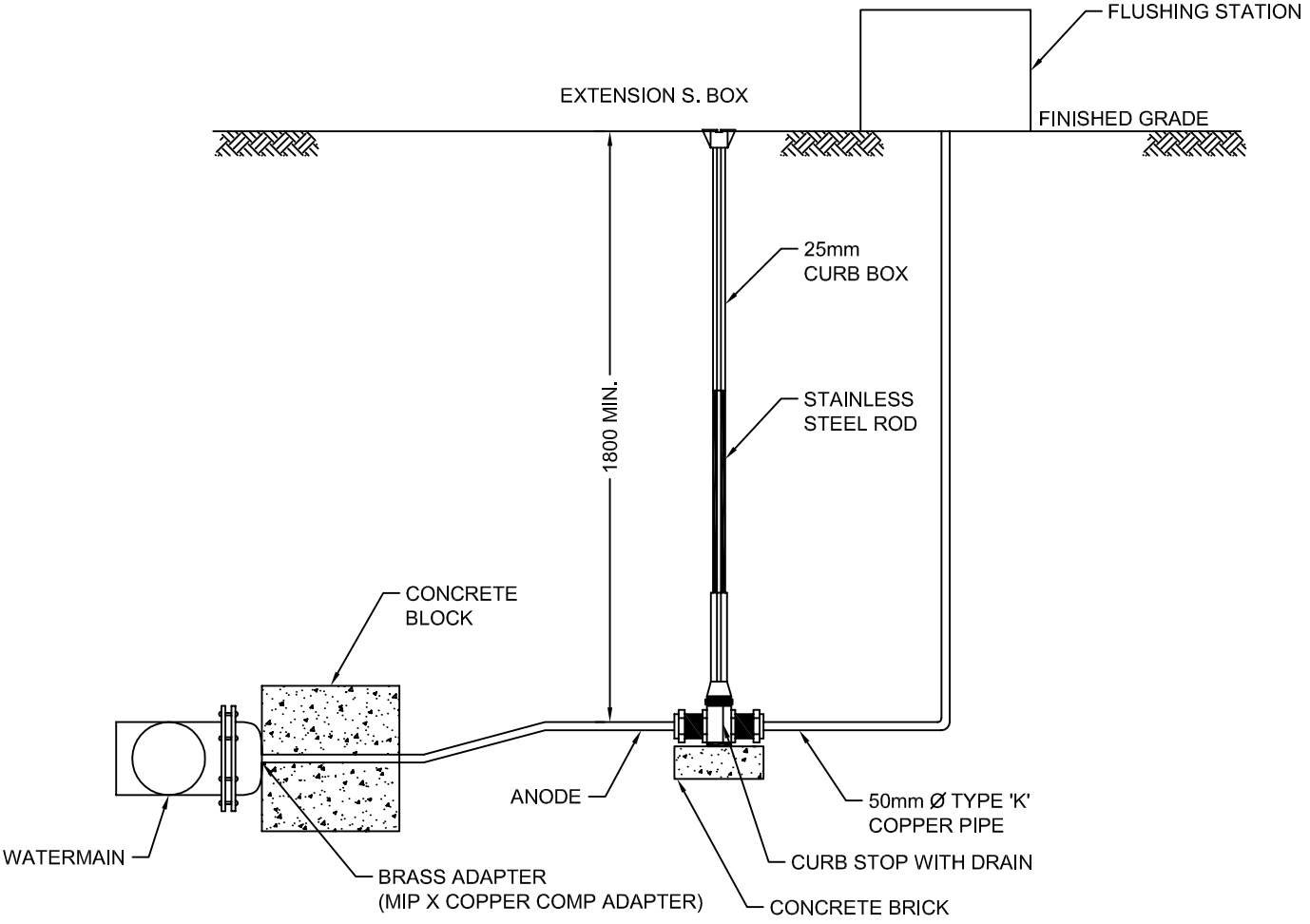
1. BLOW-OFF CONNECTIONS TO PLASTIC WATERMAINS SHALL BE MADE USING SERVICE SADDLES OR FACTORY MADE TEES.
2. BOLLARD INSTALLATION WHERE TRAFFIC PROTECTION IS REQUIRED. SHALL BE DETERMINED ON A SITE BY SITE BASIS.

No.	REVISIONS	DATE	APP'D

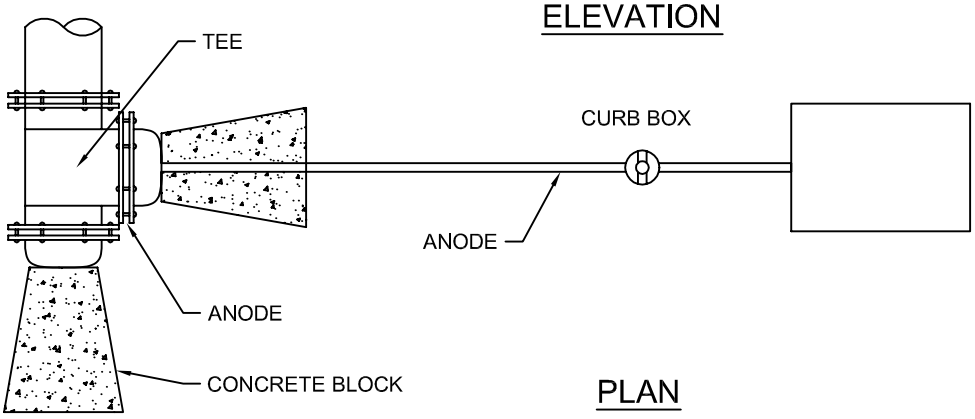
THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

50mm BLOW-OFF
DETAIL

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GW-2
CHKD. BY: M.E.B.	METRIC



ELEVATION



PLAN

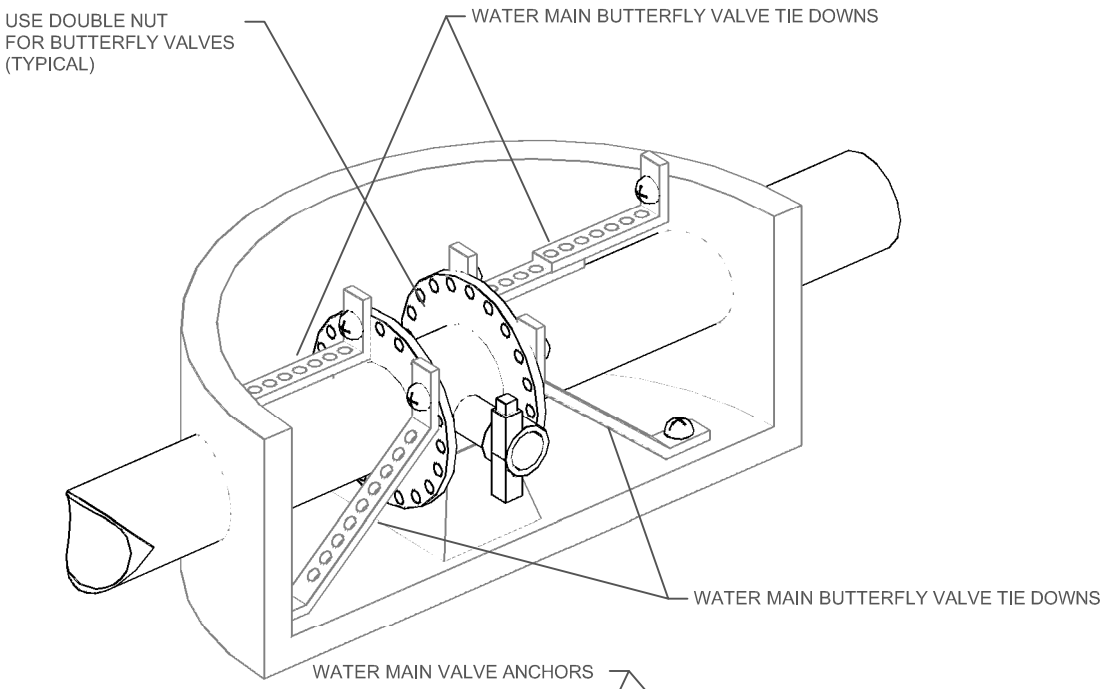
NOTES:
1. REFER TO WATERWORKS MATERIAL SPECIFICATIONS.
2. ANY JUNCTION IN SERVICE SHALL BE MADE WITH APPROVED COUPLINGS.
3. CURB STOP WITH DRAIN SHALL BE USED.
4. USE 25mm CURB STOP FOR WATERMAIN DIA. UP TO 200mm. FOR WATERMAIN GREATER THAN 200mm DIA. USE 50mm CURB STOP.

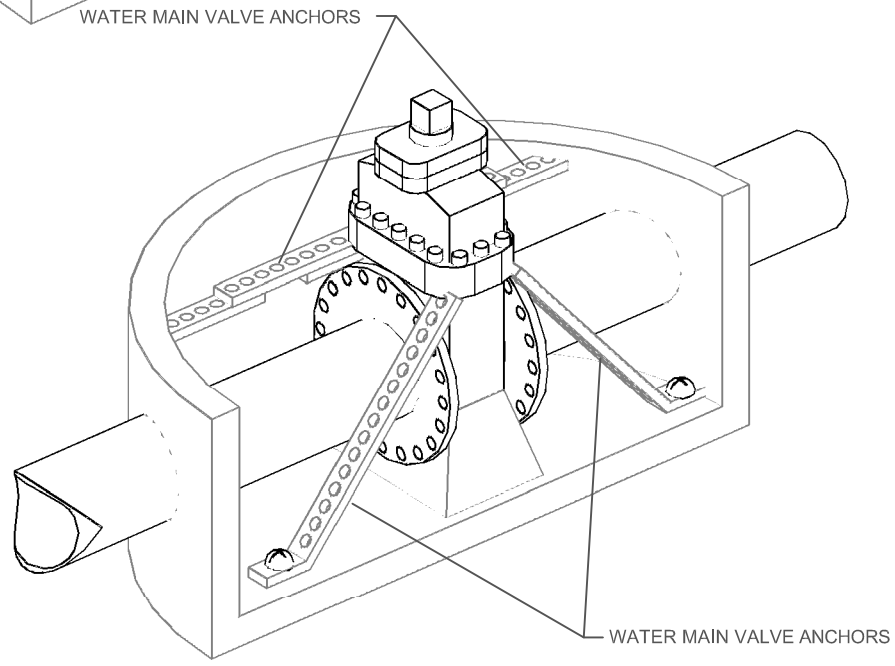
No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

FLUSHING STATION
CHAMBER STANDARD

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GW-3
CHKD. BY: M.E.B.	METRIC





NOTES

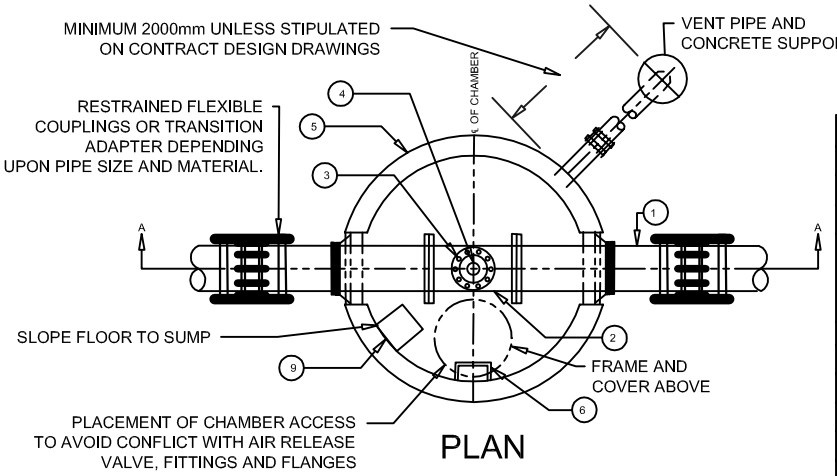
1. VALVE TIE DOWNS SHALL BE USED ON ALL M.J. CHAMBERS.
2. VALVE TIE DOWN/ANCHORS SHALL BE CADMIUM & ZINC COATED.
3. USE DOUBLE NUT FOR BUTTERFLY VALVES.
4. USE 19mm LAG AND SHIELD OR EQUIVALENT FOR ANCHORING TO CONCRETE.
5. ANCHORS AND TIE DOWNS SHALL BE PROVIDED AS INDICATED ON THIS STANDARD.

No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

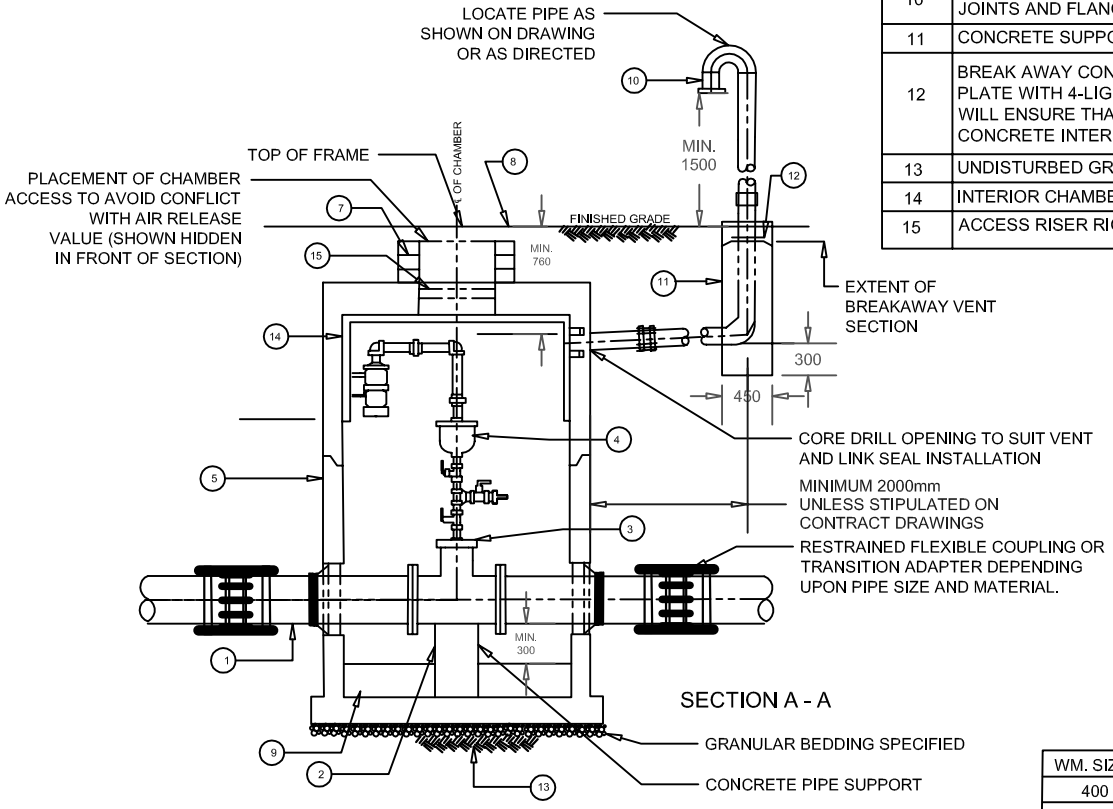
PVC WATERMAIN VALVE ANCHORS

DATE: MAY 2012	SCALE: NTS
DRAWN: N.C.F	GW-4
CHKD. BY: M.E.B.	METRIC



PLAN

ITEM	ITEM DESCIPTION
1	WATERMAIN (SEE TABLE)
2	REDUCING TEE c/w 150Ø FLANGED BRANCH OUTLET
3	BLIND FLANGE TAPPED TO SUIT AIR VALUE SIZE (SEE TABLE)
4	AIR RELEASE, VACUUM AND/OR COMBINATION VALVE AS PER DESIGN INTERIOR AND EXTERIOR OF VALVE SHALL BE FUSION BONDED EPOXY COASTED ANSI/NSF 61 APPROVED. (STD. DWG.GW-5B)
5	CIRCULAR PRECAST CHAMBER
6	CHAMBER STEPS
7	APPROVED ADJUSTMENT UNITS
8	FRAME AND COVER
9	SUMP c/w FRAME AND GRATE
10	150Ø 304 SS VENTILATION HOOK-UP WITH WELDED JOINTS AND FLANGE AND 204 SS INSECT SCREEN
11	CONCRETE SUPPORT PIER 25MPa CONCRETE
12	BREAK AWAY CONNECTION WITH WELDED FLANGE OR PLATE WITH 4-LIGHT DUTY CONCRETE ANCHORS WHICH WILL ENSURE THAT THE PIPE WILL SHEER AT THE CONCRETE INTERFACE
13	UNDISTURBED GROUND
14	INTERIOR CHAMBER INSULATION
15	ACCESS RISER RIGID INSLUATION



SECTION A - A

AIR RELEASE CHAMBER

NOTE: SEE TYPICAL AIR RELEASE VALVE STANDARD DRAWING GW-5B FOR DETAIL OF AIR RELEASE VALVE AND FITTINGS

WM. SIZE	GATE VAL.	AIR VAL.	CHAMBER SIZE
400	50 I.P.T.	50 THREADED	1800Ø
600	50 I.P.T.	50 THREADED	1800Ø

ACCEPTABLE CPP COUPLINGS FOR THIS APPLICATION
1. VICTAULIC W77 2. TANDEM RESTRAINED M11 STYLE COUPLING INSTALLATION (ENGINEERED DRAWINGS TO BE SUPPLIED) 3. LOKFAST (HANSON/MUNRO)

NOTE

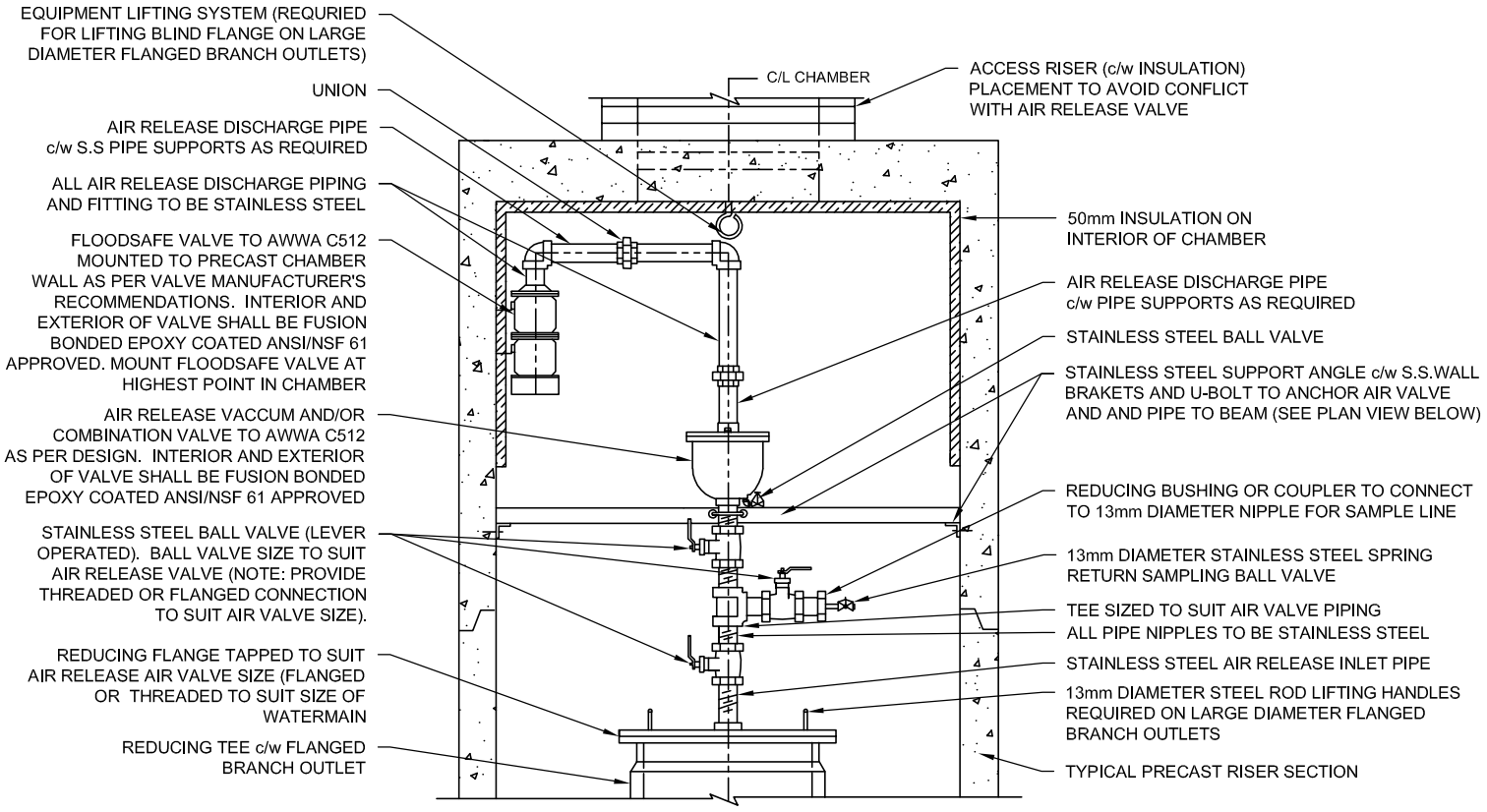
1. ALL VALVES TO BE RESILIENT SEAT TO AWWA C509, FUSION BONDED EPOXY (FBE) SHOP COAT FINISH ON INTERIOR AND EXTERIOR OF VALVE TO AWWA C550, INTERIOR CAOATING TO BE FBE ANSI/NSF 61 APPROVED.
2. INTERIOR OF ALL STEEL (NOT STAINLESS STEEL) PIPE SHALL BE LIQIUD EPOXY COATED TOAWWA C210 AND BE ANSI/SNF 61 APPROVED. ALL EXTERIOR SURFACES SHALL BE LIQUID EPOXY COATED TO AWWA C210.
3. INTERIOR OF ALL DUCTILE IRON PIPE AND FITTINGS IN CONTACT WITH POTABLE WATER SHALL BE CEMENT MORTAR LINED TO AWWA C104.
4. FOR 25mm AND 50mm AIR VALVES MUST SEE I.P.T. THREADED OUTLET WITH STAINLESS STEEL NIPPLES AS REQUIRED.
5. AIR RELEASE VALVE TO AWWA C512, FUSION BONDED EPOXY (FBE) SHOP COAT FINISH ON INTERIOR AND EXTERIOR OF VALVE TO AWWA C550, INTERIOR COATING TO BE FBE ANSI/NSF 61 APPROVED.
6. ALL NUTS, BOLTS AND WASHERS TO BE STAINLESS STEEL UNLESS OTHERWISE NOTED.
7. ALL PIPING, FITTINGS, VALVES, APPURTENANCES AND MECHANICAL RESTRAINTS TO BE c/w DENSO PASTE, DENSO MASTIC AND DENSO TAPE OR APPROVED EQUAL, APPLIED TO MANUFACTURER'S RECOMMENDATIONS.

No.	REVISIONS	DATE	APP'D.

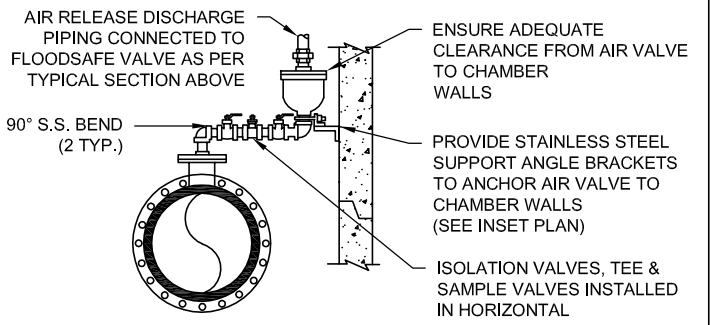
THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

AIR RELESE VALVE AND CHAMBER FOR WATERMAIN SIZE LESS THAN 750 DIAMETER

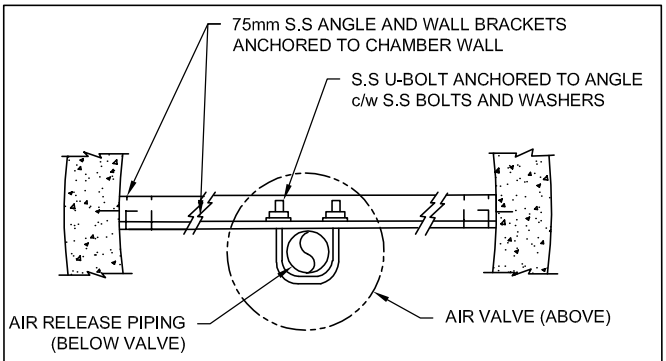
DATE: AUG. 2015	SCALE: N.T.S.
DRAWN: J.R.	GW-5A
CHKD. BY: M.E.B.	METRIC



TYPICAL SECTION
AIR RELEASE VALVE IN CHAMBER



ALTERNATE INLET PIPE ARRANGEMENT



SUPPORT BRACKET PLAN

NOTE: WHERE CLEARANCE FROM UNDERSIDE OF CHAMBER TOP SLAB IS INSUFFICIENT AN ALTERNATE AIR VALVE INLET PIPING CONFIGURATION MAY BE INSTALLED WITH TWO 90° BENDS AS SHOWN. ALTERNATE CONFIGURATION MUST BE CONNECTED TO FLOODSAFE VALVE TO AWWA C512 MOUNTED TO PRECAST CHAMBER WALL AS PER VALVE MANUFACTURER'S RECOMMENDATIONS (SIZED TO SUIT). INTERIOR AND EXTERIOR OF VALVE SHALL BE FUSION BONDED EPOXY COATED ANSI/NSF 61 APPROVED. MOUNT FLOODSAVE VALVE AT HIGHEST POINT IN CHAMBER.

NOTES:

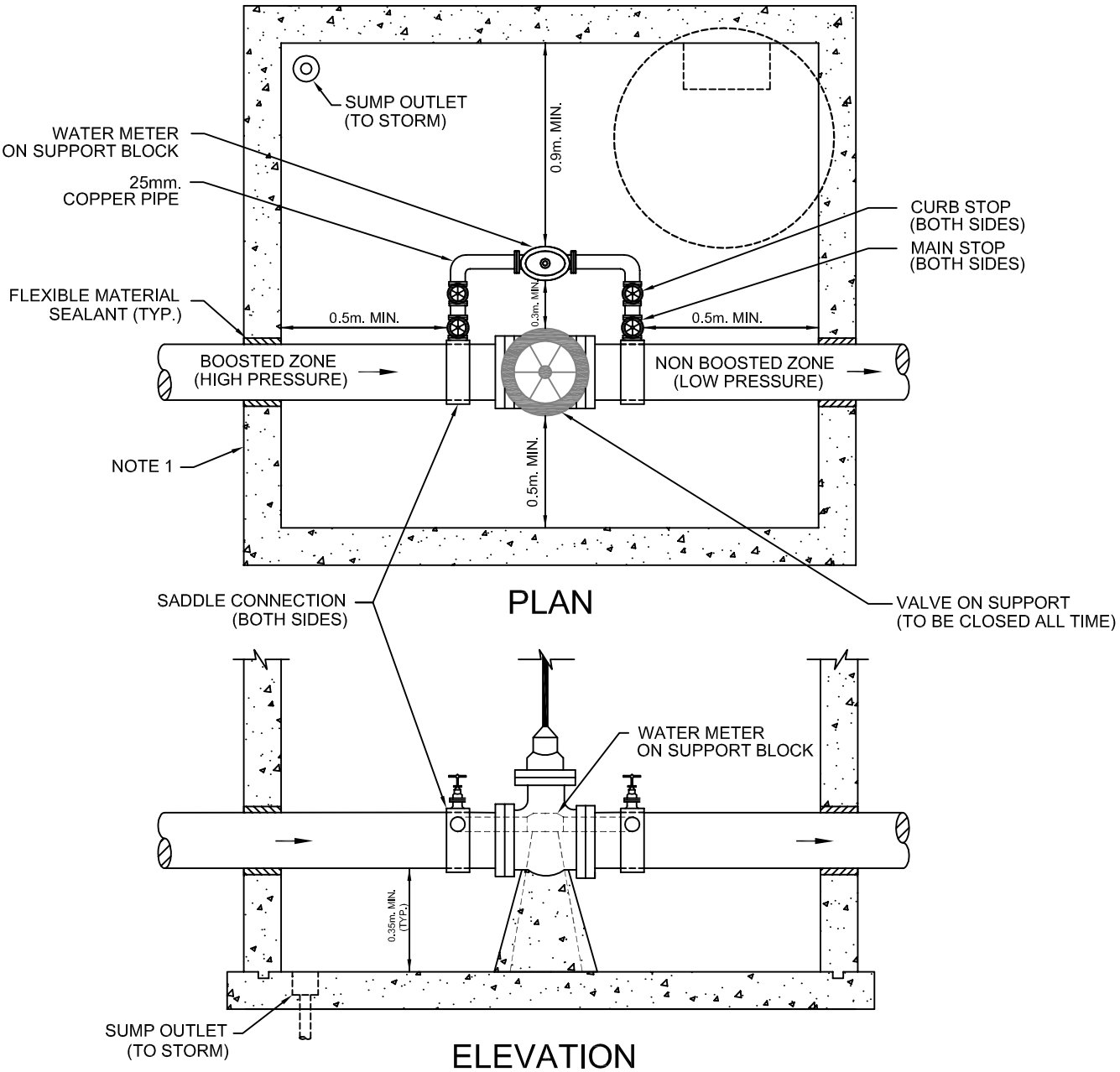
1. ALL VALVES TO BE RESILIENT SEAT TO AWWA C509, FUSION BONDED EPOXY (FBE) SHOP COAT FINISH ON INTERIOR AND EXTERIOR OF VALVE TO AWWA C550. INTERIOR COATING TO BE FBE ANSI/NSF 61 APPROVED.
2. INTERIOR OF ALL STEEL (NOT STAINLESS STEEL) PIPE SHALL BE LIQUID EPOXY COATED TO AWWA C210 AND BE ANSI/NSF 61 APPROVED. ALL EXTERIOR SURFACES SHALL BE LIQUID EPOXY COATED TO AWWA C210.
3. ALL THREADED PIPE, FITTINGS, VALVES AND APPURTENANCES MUST BE STAINLESS STEEL 304L SCHEDULE 40 TO ASTM A776. STAINLESS STEEL BALL VALVES TO BE LEVER OPERATED.
4. REFER TO STANDARD AIR RELEASE VALVE CHAMBER DRAWINGS FOR WATERMAIN DIAMETERS, CHAMBER SIZES AND DETAILS.
5. ALL PIPING, FITTINGS, VALVES, APPURTENANCES AND MECHANICAL RESTRAINTS TO BE c/w DENSO PASTE, DENSO MASTIC AND DENSO TAPE OR APPROVED EQUAL, APPLIED TO MANUFACTURER'S RECOMMENDATIONS.

No.	REVISIONS	DATE	APP'D.

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

TYPICAL AIR RELEASE VALVE DETAIL

DATE: AUG 2015	SCALE: N.T.S.
DRAWN: L.F.	GW-5B
CHKD. BY: M.E.B.	METRIC



NOTES:

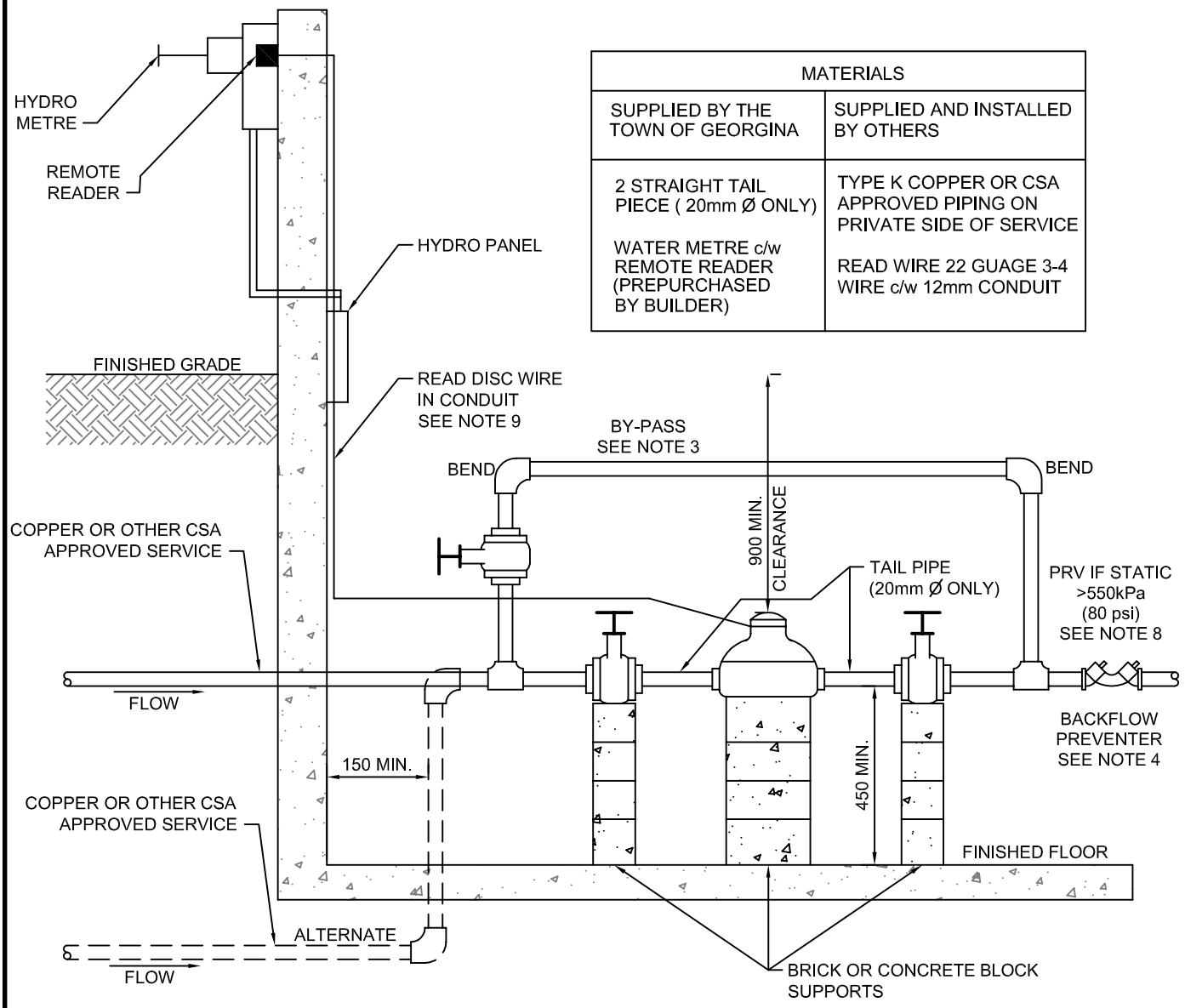
1. CIRCULAR CHAMBER MAY BE USED IF CLEARANCES ARE MAINTAINED.
2. CURB STOPS SHALL BE INSTALLED AS DIRECTED BY WATERWORKS SUPERVISOR.
3. 25mm COPPER PIPE SHALL BE USED FOR BY-PASS UNLESS OTHERWISE APPROVED.
4. UNDER NO CIRCUMSTANCES SHALL ANYONE OPERATE THE UPPER/LOWER VALVE WITHOUT THE TOWN OF GEORGINA WATERWORKS SUPERVISION.
5. MAIN VALVE SHALL BE OPERATIONAL FROM SURFACE THROUGH VALVE BOX AND CURB STOPS SHALL BE OPERATIONAL FROM SURFACE THROUGH SERVICE BOX
6. DRAIN OUTLET AND SUMP OUTLET TO NEAREST STORM SEWER (WHERE POSSIBLE).
7. METER SHALL BE INSTALLED AS DIRECTED BY WATERWORKS SUPERVISOR AND REMOTE TABULATOR WIRE BROUGHT UNDER CHAMBER ACCESS.
8. PIPE SIZE SHALL BE CONSISTANT THROUGHOUT CHAMBER.
9. FINAL CONFIGURATION SHALL BE APPROVED BY TOWN OF GEORGINA, ENGINEERING DIVISION.
10. ALL JOINTS SHALL BE RESTRAINED.

No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

PRESSURE SEPARATION VALVE
WITH WATER METER IN CHAMBER

DATE: JUNE 2012	SCALE: N.T.S.
DRAWN: N.C.F	GW-6
CHKD. BY: M.E.B.	METRIC



MATERIALS	
SUPPLIED BY THE TOWN OF GEORGINA	SUPPLIED AND INSTALLED BY OTHERS
2 STRAIGHT TAIL PIECE (20mm Ø ONLY) WATER METRE c/w REMOTE READER (PREPURCHASED BY BUILDER)	TYPE K COPPER OR CSA APPROVED PIPING ON PRIVATE SIDE OF SERVICE READ WIRE 22 GUAGE 3-4 WIRE c/w 12mm CONDUIT

NOTES:

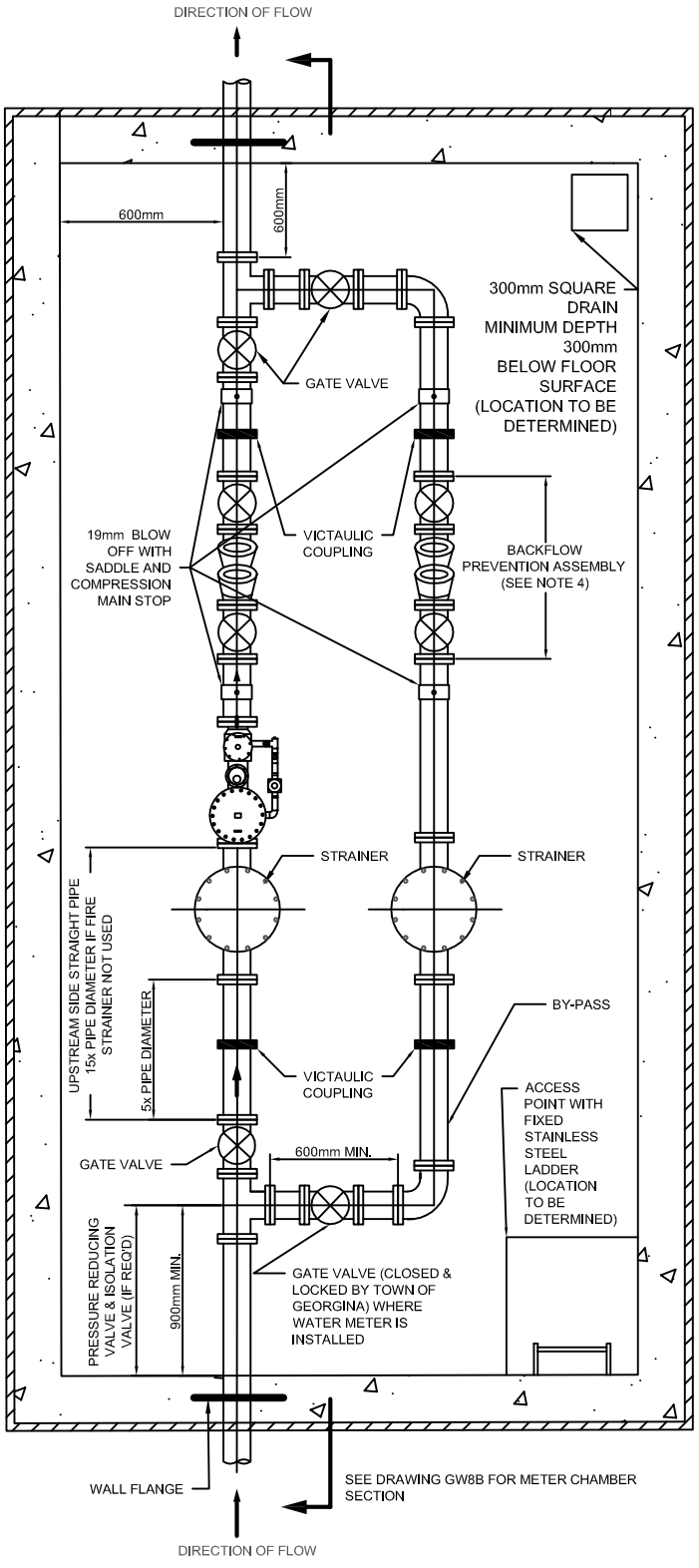
1. 100mm OR LARGER SERVICE MAY BE REDUCED BY USING A TAPPING FLANGE.
2. IF HOT WATER TANK IS WITHIN 3.0m OF METRE, THEN CHECK VALVE IS REQUIRED BETWEEN METRE AND HOT WATER TANK.
3. BY-PASS MAY BE ONE PIPE SIZE SMALLER THAN METRE SIZE AND MAY BE INSTALLED HORIZONTALLY.
4. BACKFLOW PREVENTOR SHALL BE INSTALLED DOWNSTREAM OF THE METRE AND BY-PASS.
5. INCOMING SERVICE TO BUILDING MUST BE A MINIMUM OF 20mm TYPE K COPPER OR CSA APPROVED PIPING.
6. ALL PIPE WORK DONE BY CONTRACTOR/BUILDER, INCLUDING CONNECTION TO TAIL PIECE SHALL BE IN ACCORDANCE WITH OBC.
7. METRE INSTALLATION SHALL BE BY NEPTUNE.
8. WHERE THE STATIC PRESSURE EXCEEDS 550 kPa (80 psi) A PRESSURE REDUCING VALVE SHALL BE INSTALLED AFTER THE METRE TO LIMIT THE MAXIMUM STATIC PRESSURE TO NOT MORE THAN 550kPa (80 psi).
9. BUILDER SHALL INSTALL A 12mm CONDUIT FROM THE METRE TO THE OUTSIDE OF THE BUILDING c/w READ DISC WIRE AS REQUIRED.
10. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED.

No.	REVISIONS	DATE	APP'D

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

WATER METER INSTALLATION 20mm AND LARGER

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GW-7
CHKD. BY: M.E.B.	METRIC



NOTES:

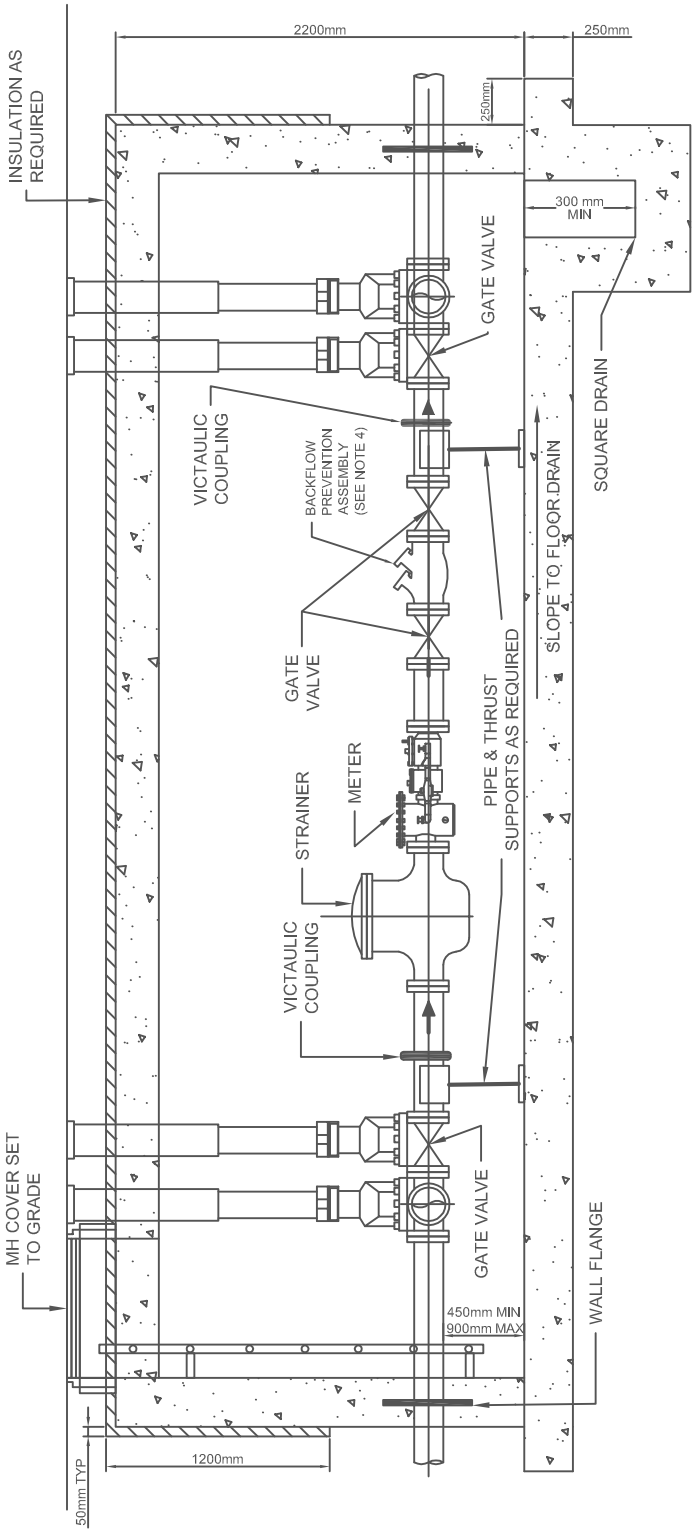
1. ALL PIPING TO BE DUCTILE IRON, CLASS 52.
2. PIPE SUPPORTS AS REQUIRED.
3. ENTIRE CHAMBER SHALL BE WATER TIGHT.
4. DOUBLE CHECK VALVE ASSEMBLY ONLY. REDUCED PRESSURE PRINCIPLE ASSEMBLY CANNOT BE INSTALLED IN UNDERGROUND CHAMBER.
5. TESTING AND CERTIFICATION OF THE BACKFLOW PREVENTION ASSEMBLY SHALL BE THE PROPERTY OWNERS RESPONSIBILITY IN ACCORDANCE WITH THE TOWN'S CROSS CONNECTION AND BACKFLOW PREVENTION BY-LAW.
6. LOCATION OF ACCESS OPENING AND SUMP TO BE DETERMINED BY CONSULTING ENGINEER AND BASED UPON SITE CONDITIONS.
7. **GRAVITY DRAIN WITH BACKWATER VALVE CONNECTED TO STORM SEWER OR SUMP PUMP ARE REQUIRED TO ENSURE THE CHAMBER CAN BE MAINTAINED IN A DRY CONDITION. (AS PER CSA B64.10-10 INSTALLATION AND SELECTION OF BACKFLOW PREVENTERS).**
8. ALL TEST COCKS ON THE DCVA DEVICE SHALL BE PLUGGED USING A MEANS THAT IS WATER TIGHT.
9. WATER CONNECTIONS ON PRIVATE SIDE OF PROPERTY LINE ARE GOVERNED BY BUILDING CODES AND ARE SUBJECT TO REQUIREMENT FROM THE BUILDING DEPARTMENT.
10. BACKFLOW PREVENTERS INSTALLED IN AREAS SUBJECT TO FREEZING SHALL BE PROTECTED IN A MANNER ACCEPTABLE TO THE AUTHORITY HAVING JURISDICTION.
11. RP BACKFLOW PREVENTERS SHALL NOT BE INSTALLED IN A CHAMBER.
12. INSTALLATION OF CHAMBERS AND BACKFLOW PREVENTERS SHALL MEET THE REQUIREMENTS OF THE ONTARIO BUILDING CODE AND CSA B64.10-10 STANDARD.
13. PIPE SUPPORT AND THRUST RESTRAINT AS REQUIRED

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

TYPICAL PLAN VIEW OF METER CHAMBER WITH BACKFLOW PREVENTION

DATE: JUNE 2014	SCALE: NTS
DRAWN: B.L.A./S.B.	GW-8A
CHKD. BY: M.E.B.	METRIC

No.	REVISIONS	DATE	APP'D



THE CORPORATION OF THE

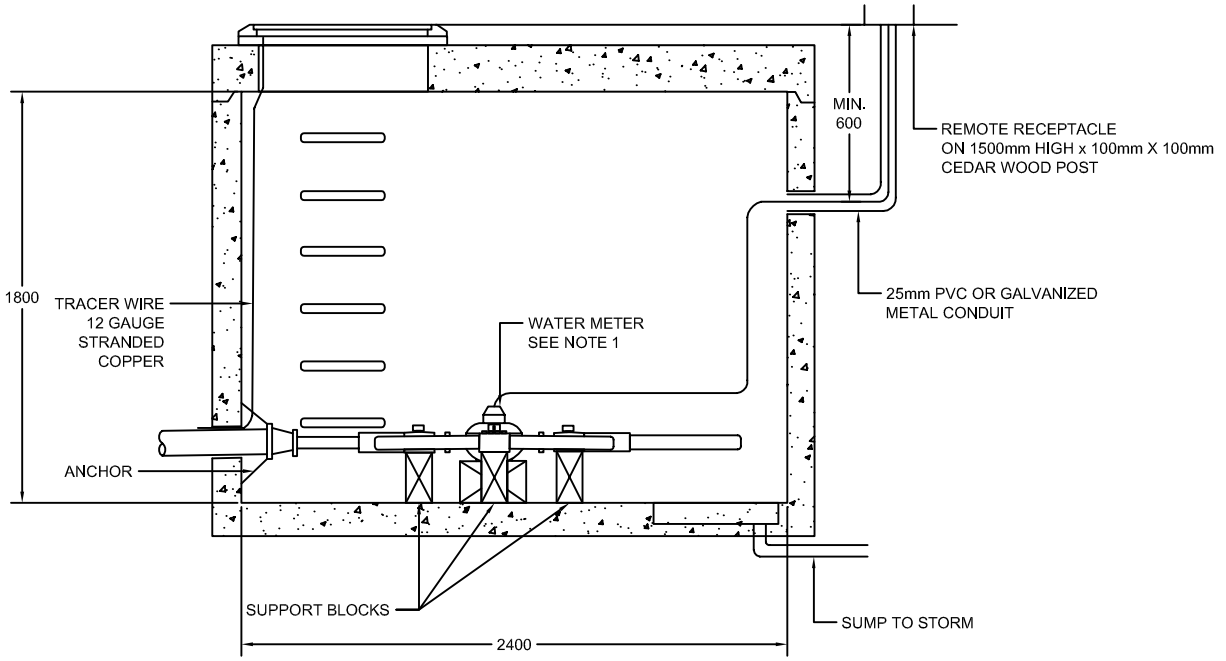
TOWN OF GEORGINA

REGIONAL MUNICIPALITY OF YORK

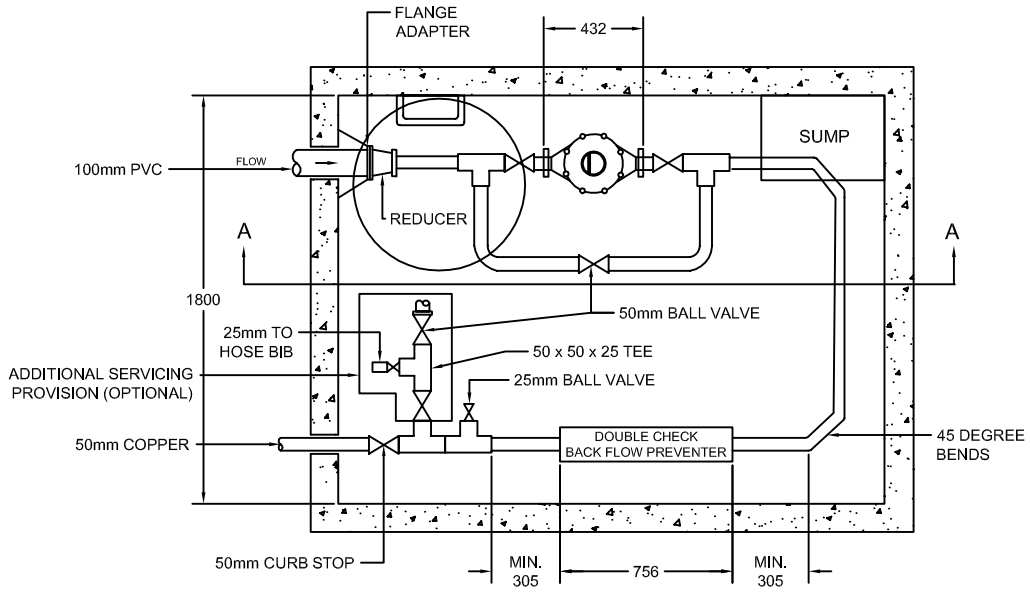
TYPICAL PROFILE VIEW OF METER CHAMBER WITH BACKFLOW PREVENTION

DATE: JUNE 25, 2014	SCALE: NTS
DRAWN: B.L.A./S.B.	GW-8B
CHKD. BY: M.E.B.	METRIC

No.	REVISIONS	DATE	APP'D



SECTION A - A



NOTES:

1. WATER METER TO BE APPROVED TYPE WITH REMOTE READ AS PER TOWN STANDARDS.
2. ALL FITTINGS 50mm AND SMALLER TO BE COMPRESSION TYPE JOINTS.
3. ALL PIPING TO BE 50mm TYPE 'K' COPPER UNLESS NOTED OTHERWISE.
4. DRAIN AND SUMP WITH GRATE TO BE PROVIDED.
5. VALVES TO BE ANCHORED WITH METAL ANCHORS.
6. ALL VALVE CHAMBER CUTOUTS TO BE FILLED WITH CONCRETE BRICKS AND MORTAR THEN PARGED INSIDE AND OUTSIDE WITH 1:3 MORTAR MIX.
7. POURED BASE SHOULD BE TROWEL FINISHED.

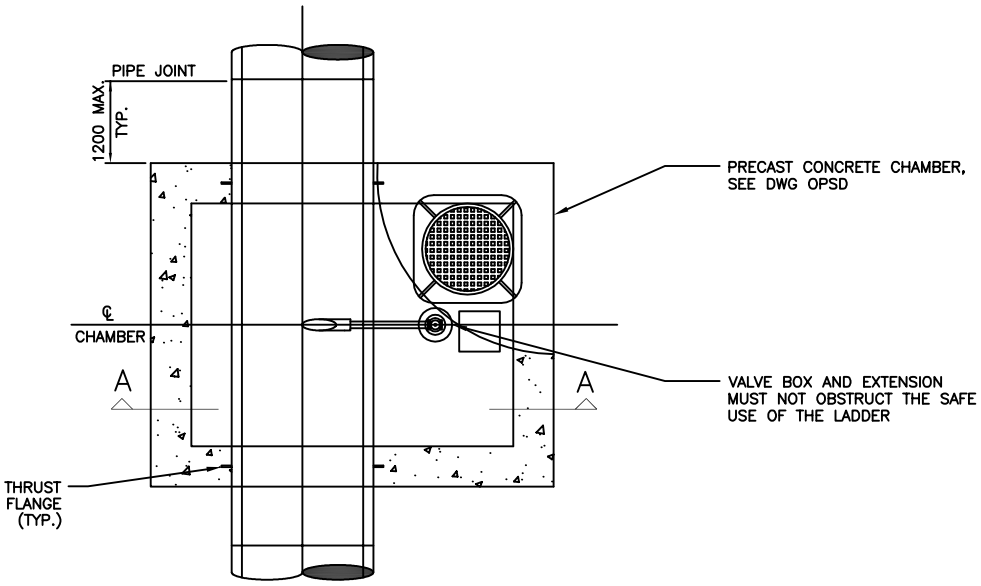
ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

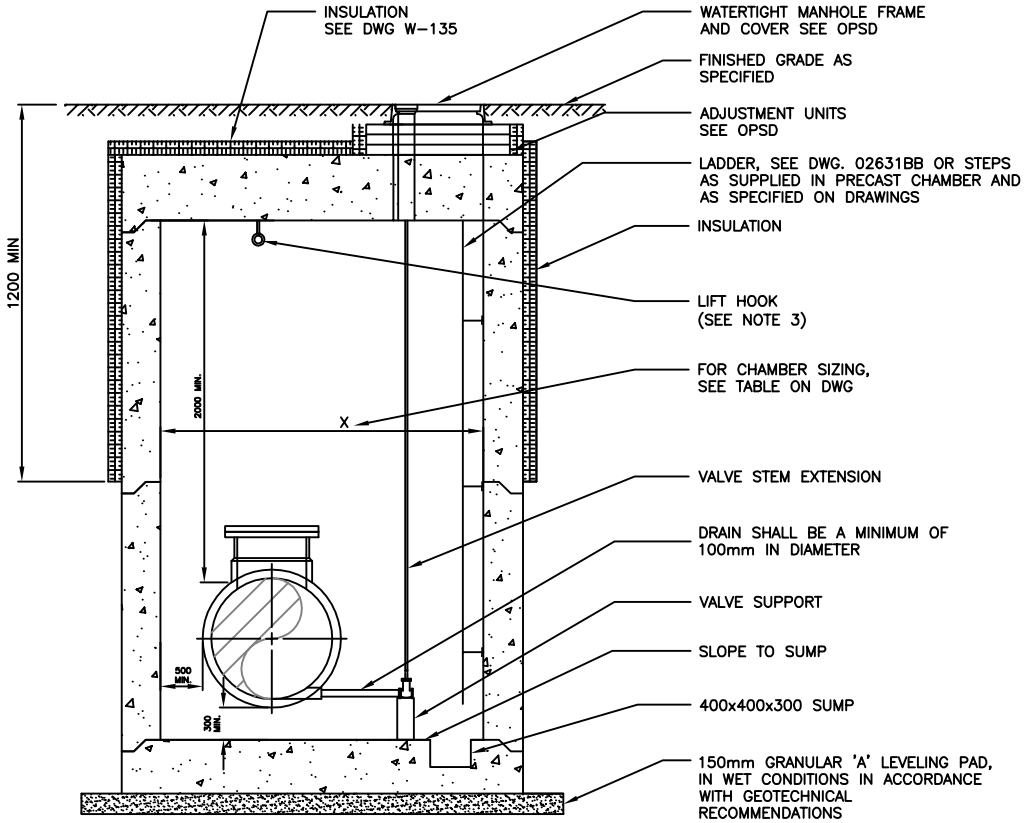
METER CHAMBER DETAILS

DATE: MAY 2013	SCALE:
DRAWN: B.L.A.	GW-9
CHKD. BY: M.E.B.	METRIC

No.	REVISIONS	DATE	APP'D



PLAN



SECTION 'A'

NOTES:

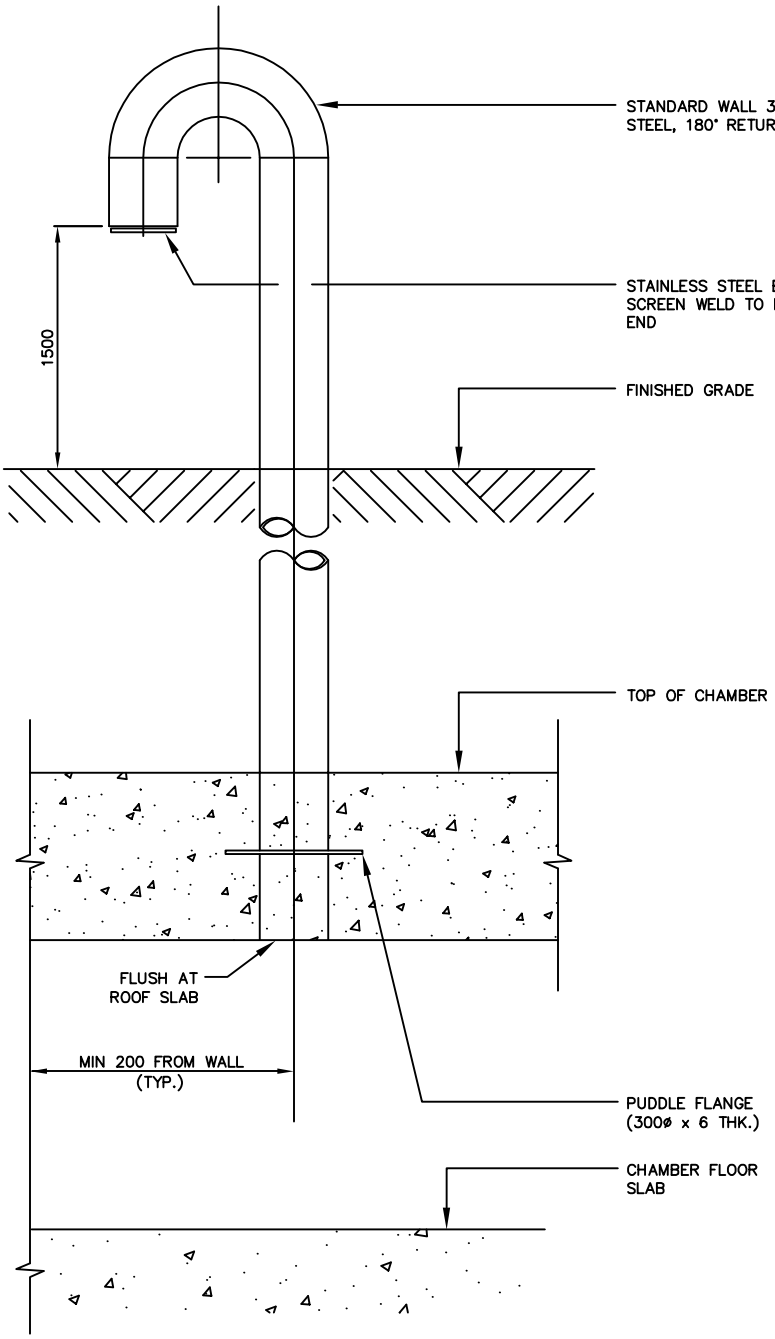
1. ACCESS AND DRAIN CHAMBER SHALL BE WATERPROOFED AND WATERTIGHT.
2. DRAIN CHAMBER AND VALVE TO BE SIZED.
3. INSTALL LIFTING HOOK ABOVE ALL VALVES.

No.	REVISIONS	DATE	APP'D

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

DRAIN VALVE

DATE: JAN 2015	SCALE: N.T.S.
DRAWN:	GW-10
CHKD. BY: M.E.B.	METRIC



ELEVATION

DIAMETER OF VENT SIZED TO SUIT AIR VALVE SIZE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS (100mm MIN. ø).

ALL VENT PIPING TO BE TYPE 304 STAINLESS STEEL.

No.	REVISIONS	DATE	APP'D

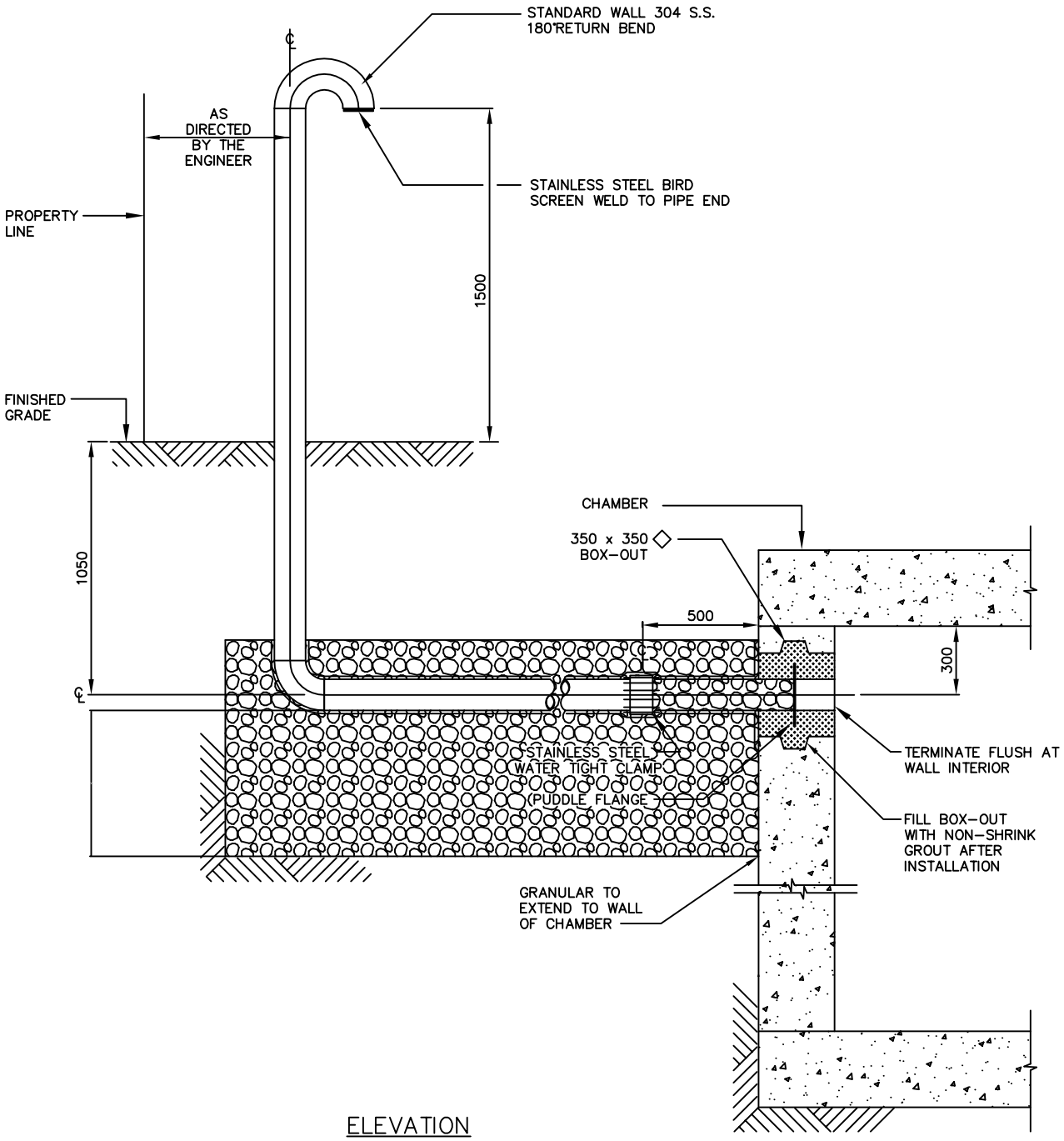
THE CORPORATION OF THE

TOWN OF GEORGINA

REGIONAL MUNICIPALITY OF YORK

CHAMBER VENTILLATION

DATE: JAN 2015	SCALE:
DRAWN:	GW-11
CHKD. BY: M.E.B.	METRIC



ELEVATION

NOTES:

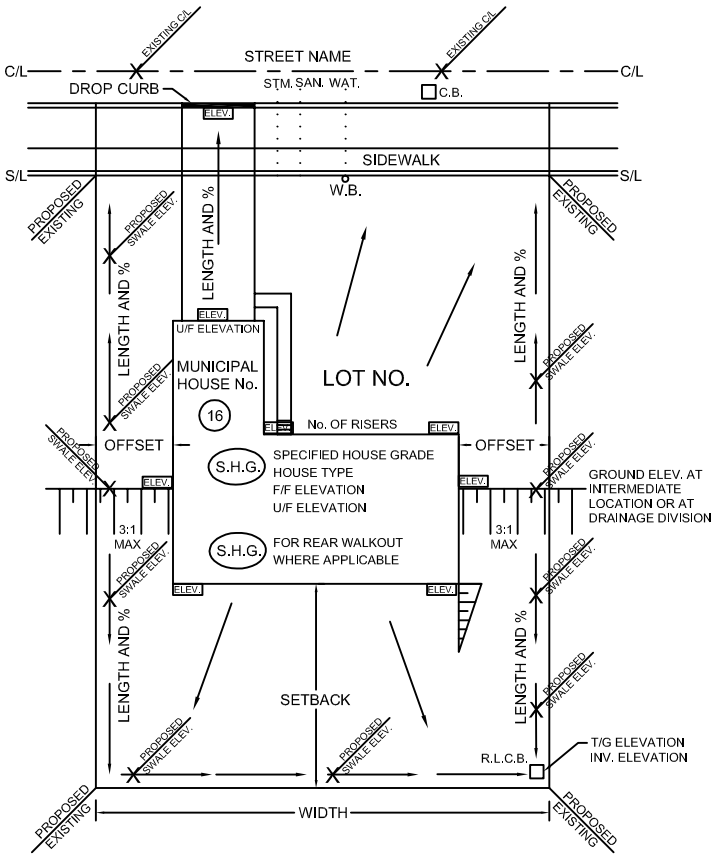
DIAMETER OF VENT SIZED TO SUIT AIR VALVE SIZE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS. (100mm MIN.ø)

No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

CHAMBER VENTILLATION (OFFSET)

DATE: JAN 2015	SCALE:
DRAWN:	GW-12
CHKD. BY: M.E.B.	METRIC



CONTROL ARCHITECT STAMP

CONSULTANT STAMP

TOWN OF GEORGINA
ENGINEERING DEPARTMENT

REVIEWED		REVISE AND RESUBMIT	
REVIEWED AS MODIFIED		SUBMISSION	

THE REVIEW IS FOR THE SOLE PURPOSE OF ASCERTAINING CONFORMANCE WITH GENERAL DESIGN CONCEPTS. RESPONSIBILITY FOR ERRORS AND OMISSIONS SHALL REST ON THE PERSONS SUBMITTING THIS DWG.

BY_____DATE_____

NOTES:

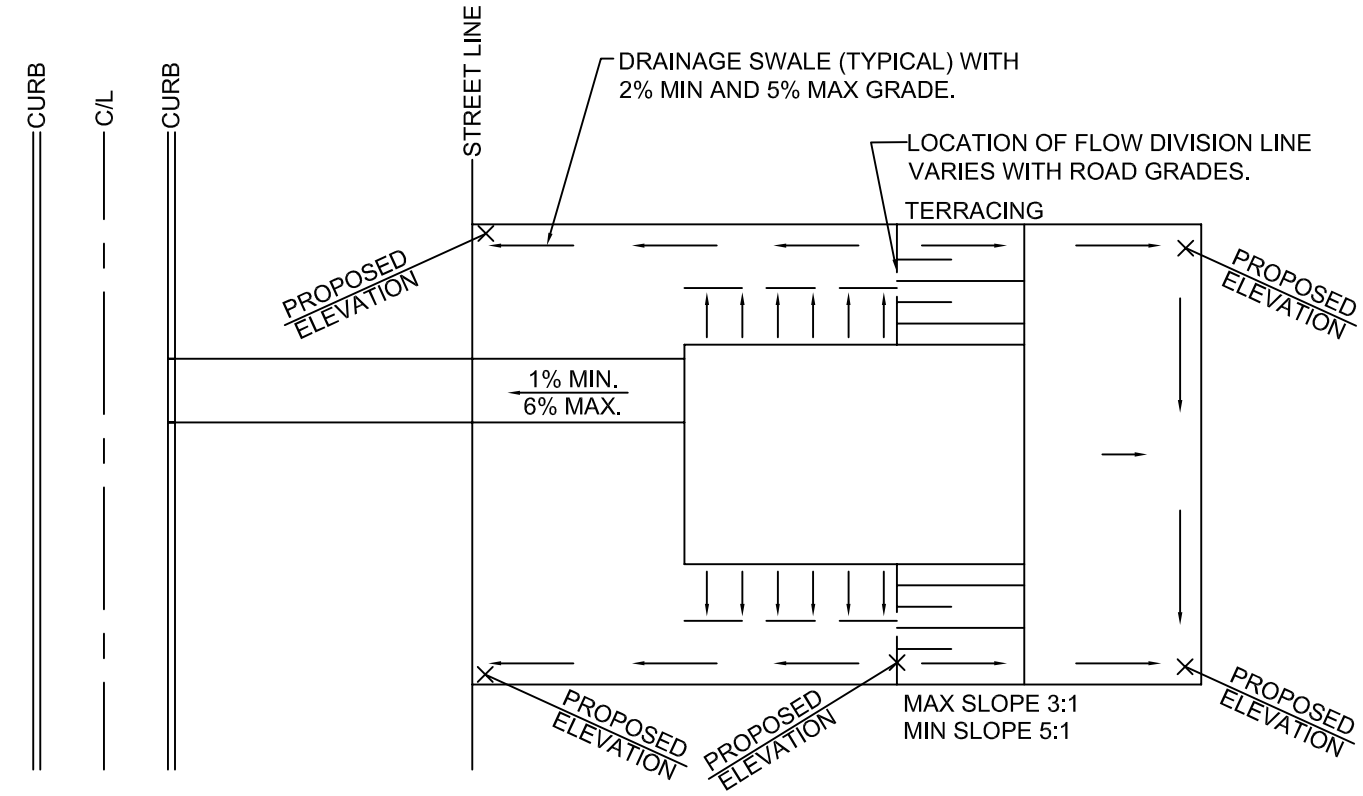
1. PLOT PLAN SHALL BE PREPARED ON A 8 1/2" X 14" SHEET.
2. PLOT PLANS SHALL BE PROVIDED WITH AN APPROPRIATE LEGEND AND NOTING.
3. PLOT PLAN SHOULD INDICATE WHETHER IT IS A WALKOUT BASEMENT, SPLIT, FRONT, OR REAR DRAINAGE.
4. PLOT PLAN SHALL BE SUBMITTED ON THE CONSULTANTS TITLE BLOCK WITH ALL PERTINENT CONSULTANT INFORMATION.

No.	REVISIONS	DATE	APP'D

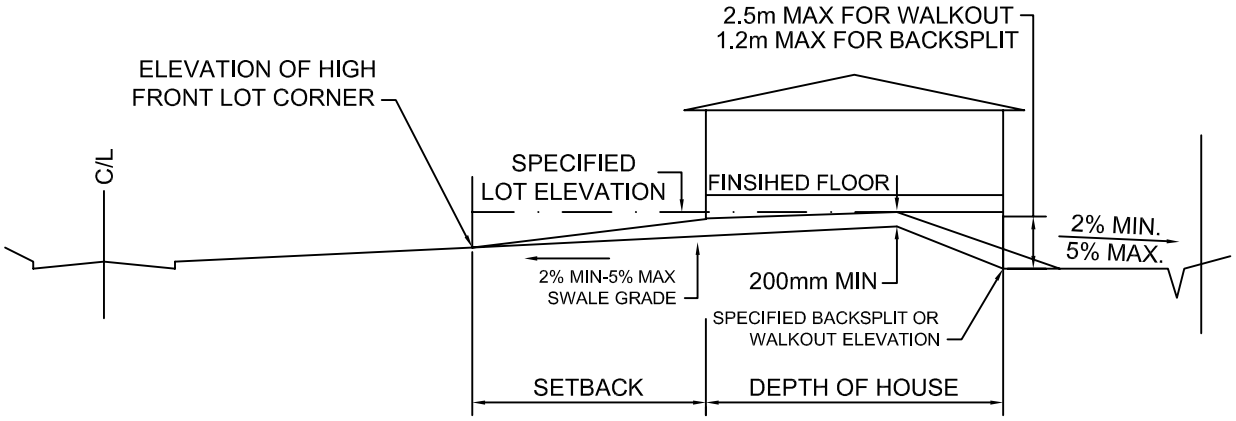
THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

SUBDIVISION GRADING DETAIL
TYPICAL PLOT PLAN

DATE: MAY 2012	SCALE: 1:250
DRAWN: N.C.F	GL-1
CHKD. BY: M.E.B.	METRIC



PLAN



ELEVATION

NOTES:

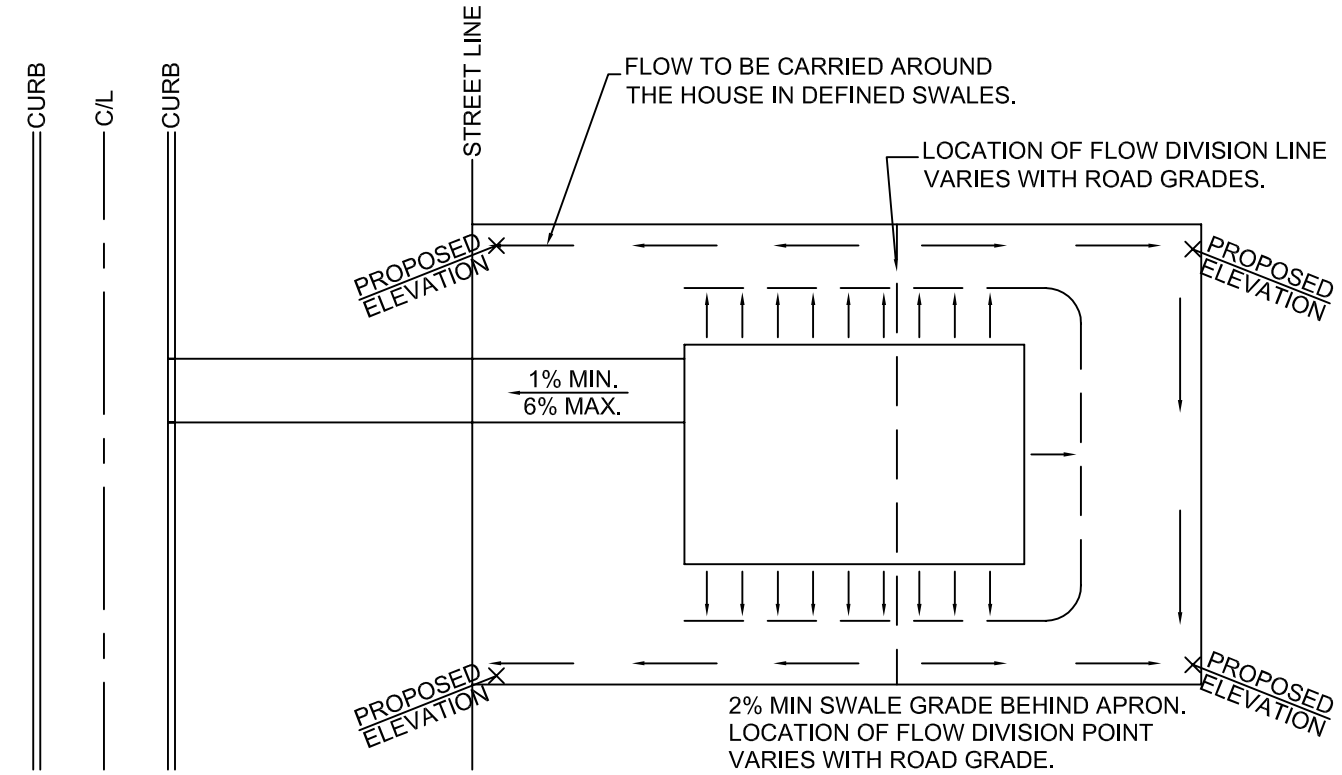
1. THE SPECIFIED LOT ELEVATION SHALL BE CALCULATED AS FOLLOWS:
   A SWALE GRADIENT OF 2% MIN TO 5% MAX FROM THE FRONT HIGH LOT CORNER AT THE STREETLINE TO THE FLOW DIVISION LINE. THE SPECIFIED LOT ELEVATION SHALL THEN BE SET A MINIMUM OF 0.15m HIGHER THAN THE ELEVATION AT THE FLOW DIVISION LINE.
2. DRIVEWAYS SHALL NOT BE USED AS AN OUTLET FOR SIDEYARD SWALES.

No.	REVISIONS	DATE	APP'D

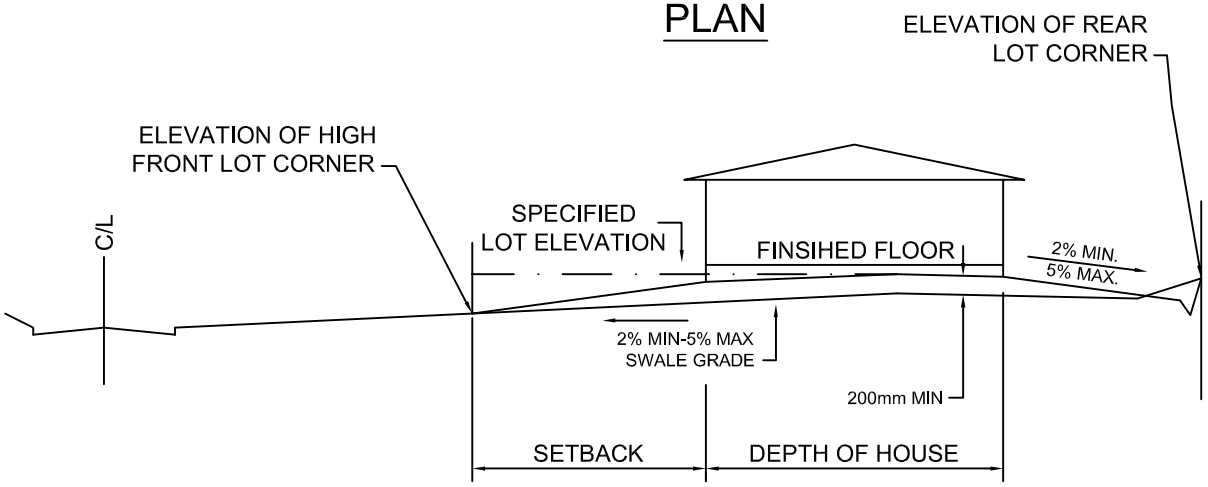
THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

SPLIT LOT DRAINAGE
FOR WALKOUT OR BACKSPLIT

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GL-2
CHKD. BY: M.E.B.	METRIC



PLAN



ELEVATION

NOTES:

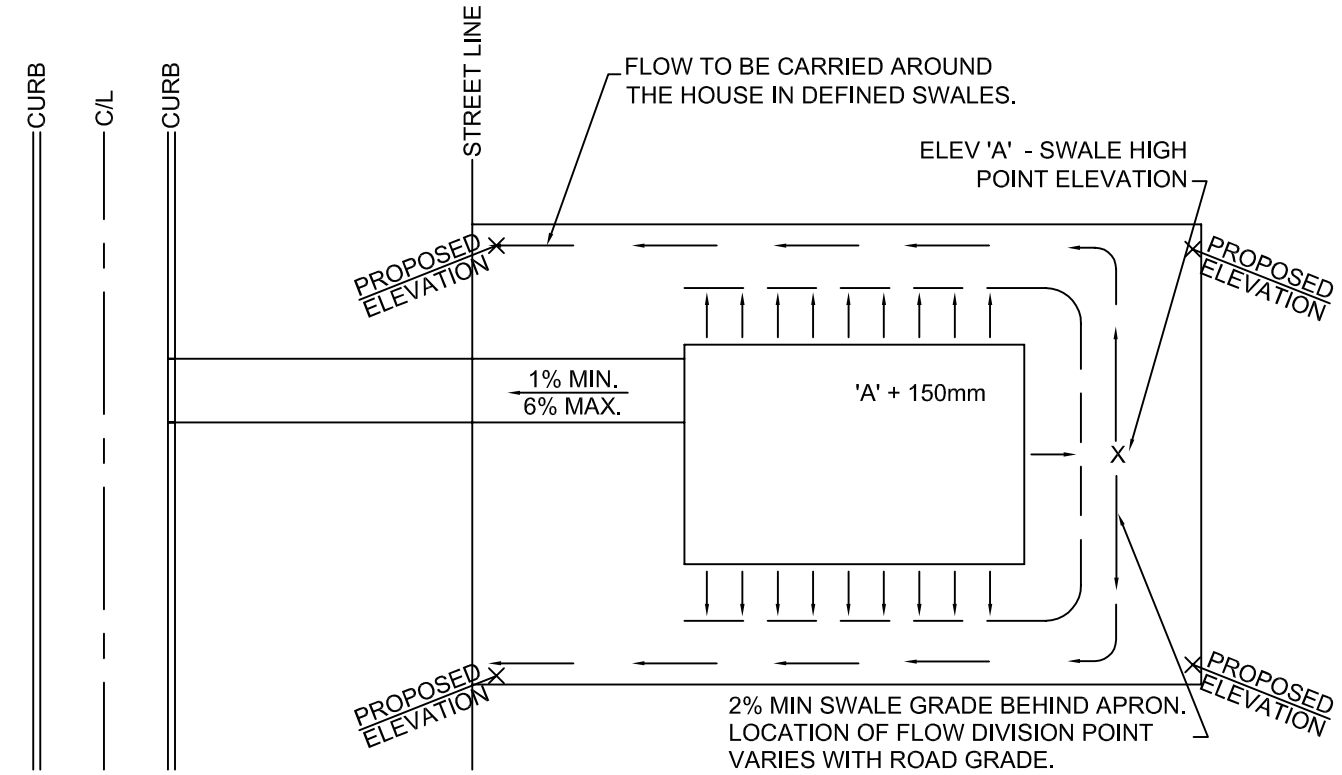
1. THE SPECIFIED LOT ELEVATION SHALL BE CALCULATED AS FOLLOWS:
   A SWALE GRADIENT OF 2% MIN TO 5% MAX FROM THE FRONT HIGH LOT CORNER AT THE STREETLINE TO THE FLOW DIVISION LINE. THE SPECIFIED LOT ELEVATION SHALL THEN BE SET A MINIMUM OF 0.15m MINIMUM OF 0.15m HIGHER THEN THE FLOW DIVISION LINE.
2. DRIVEWAYS SHALL NOT BE USED AS AN OUTLET FOR SIDEYARD SWALES.

No.	REVISIONS	DATE	APP'D

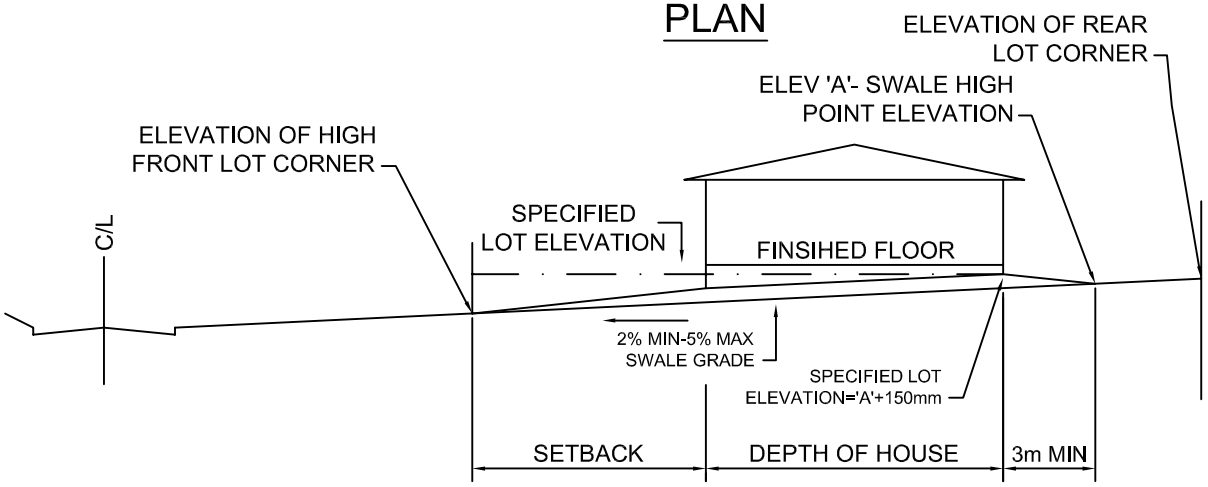
THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

SPLIT LOT DRAINAGE

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GL-3
CHKD. BY: M.E.B.	METRIC



PLAN



ELEVATION

NOTES:

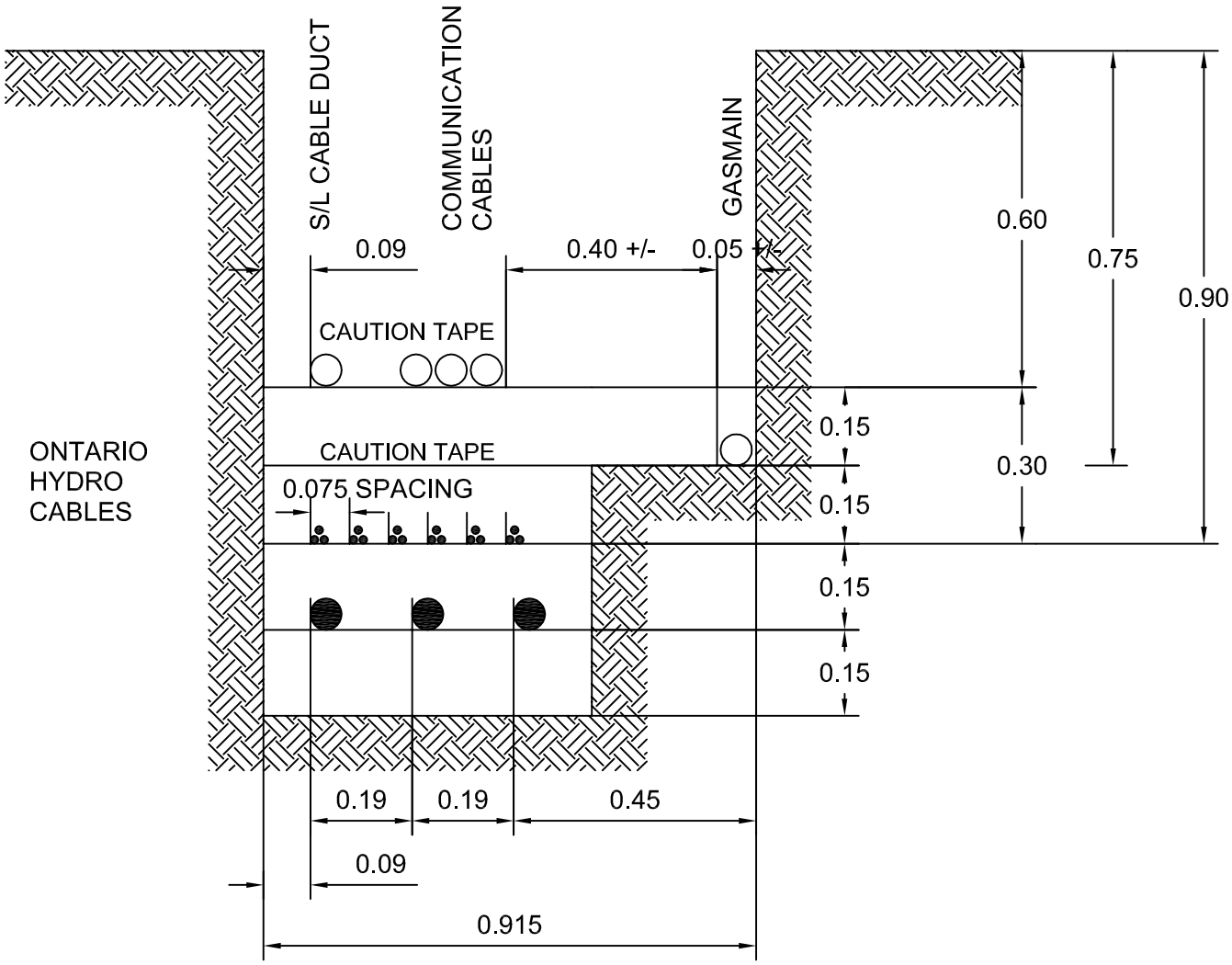
1. THE SPECIFIED LOT ELEVATION SHALL BE CALCULATED AS FOLLOWS:
   A SWALE GRADIENT OF 2% MIN TO 5% MAX FROM THE FRONT HIGH LOT CORNER AT THE STREETLINE TO THE SWALE HIGH POINT ELEVATION 'A'.
   THE SPECIFIED LOT ELEVATION SHALL THEN BE SET A MINIMUM OF 0.15m HIGHER THAN SWALE ELEVATION 'A'.
2. DRIVEWAYS SHALL NOT BE USED AS AN OUTLET FOR SIDEYARD SWALES.

No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

FRONT LOT DRAINAGE

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GL-4
CHKD. BY: M.E.B.	METRIC



NOTES:

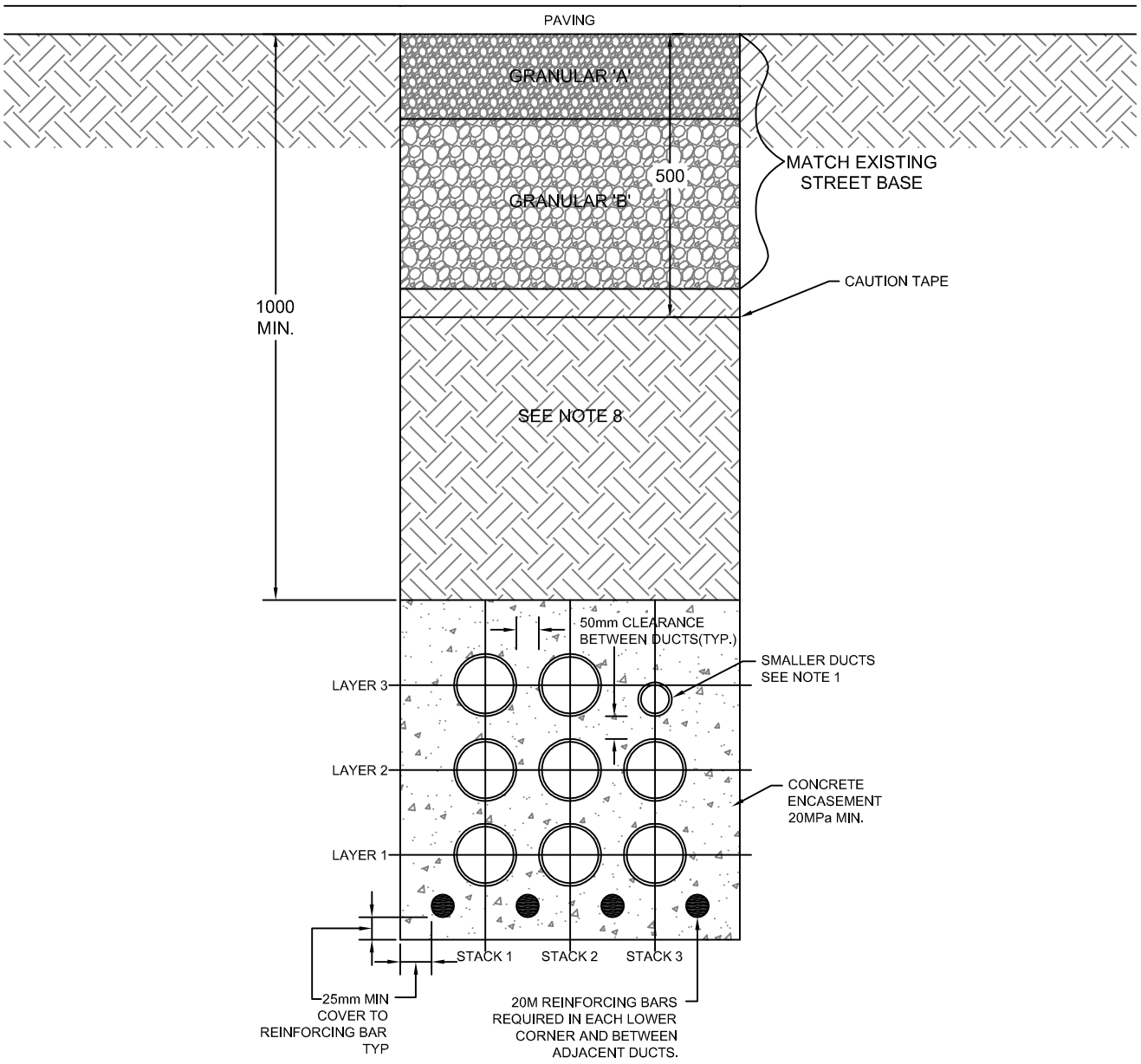
1. DIMENSIONS ARE IN METRES UNLESS OTHERWISE SPECIFIED.
2. UTILITY ROAD CROSSINGS ARE REQUIRED TO HAVE A MINIMUM OF 1.0 METRE COVER.
3. TWO LAYERS OF CAUTION TAPE ARE REQUIRED. ONE SHALL BE PLACED ABOVE THE STREETLIGHT AND COMMUNICATIONS CABLES AND ONE ABOVE THE ONTARIO HYDRO CABLES.

No.	REVISIONS	DATE	APP'D

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

UTILITY TRENCH DETAIL

DATE: JUNE 2012	SCALE: N.T.S.
DRAWN: N.C.F	GU-1
CHKD. BY: M.E.B.	METRIC



NOTES:

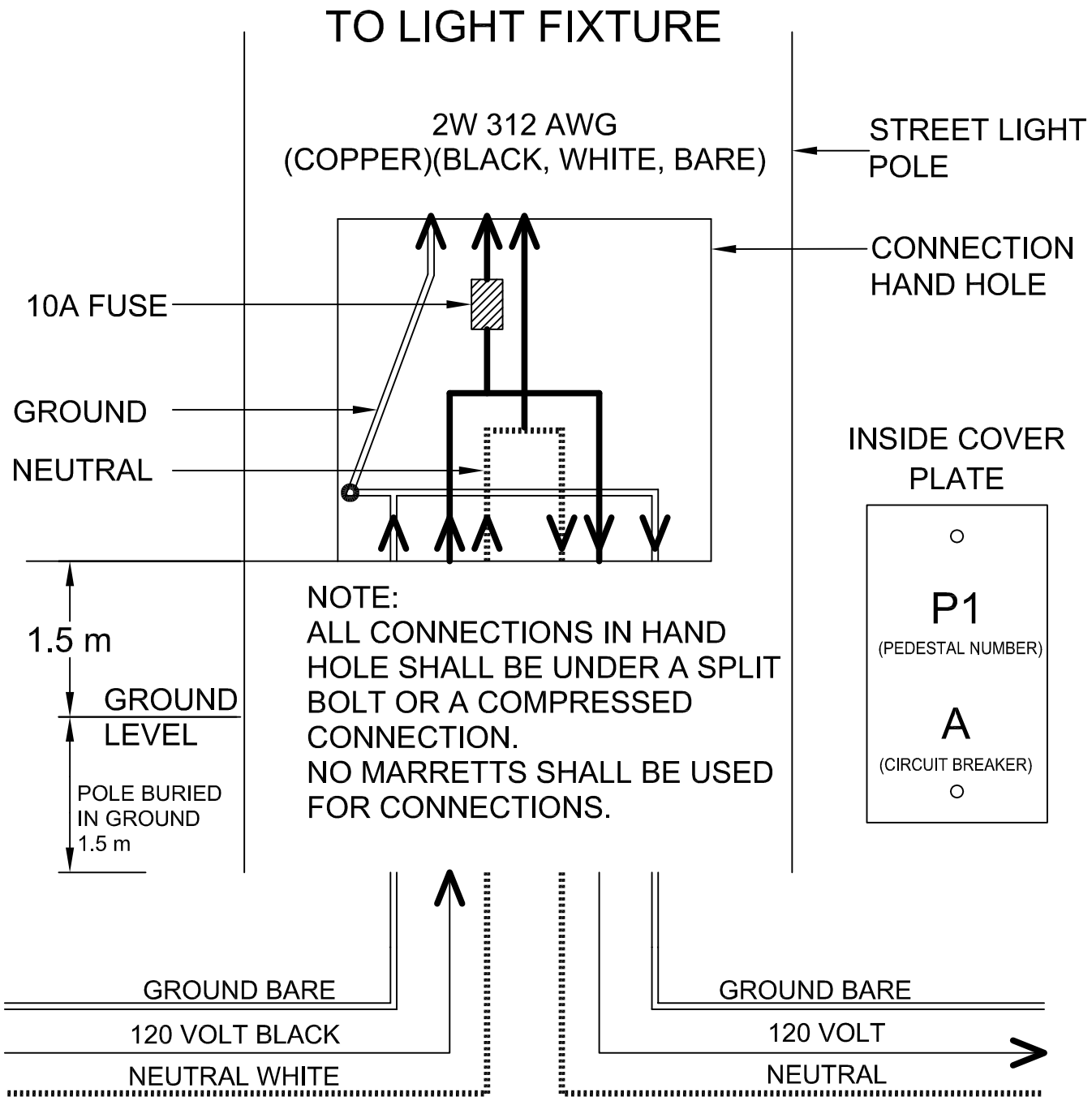
1. INSTALL SMALLER DUCTS IN UPPERMOST LAYERS.
2. THERE SHALL BE NO MORE THAN 4 LAYERS AND 4 STACKS.
3. HYDRO DUCTS TO BE 100mm TYPE II PVC UNLESS OTHERWISE NOTED.
4. BELL ENDS TO BE PLACED ON ALL OPEN DUCT ENDS.
5. UNUSED DUCTS TO BE CAPPED, COMPLETE WITH PULL ROPE.
6. PRIMARY CONDUCTORS TO BE INDIVIDUALLY DUCTED.
7. SECONDARY CONDUCTORS SHALL BE INSTALLED MAX. 2 PER DUCT.
8. TRENCH SHALL BE BACKFILLED WITH NATIVE SOIL COMPACTED TO 98% STANDARD PROCTOR DENSITY, UNLESS OTHERWISE DIRECTED BY GEOTECHNICAL CONSULTANT.
9. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

UTILITY TRENCH ROAD CROSSING

DATE: AUGUST 2012	SCALE: N.T.S.
DRAWN: N.C.F	GU-2
CHKD. BY: M.E.B.	METRIC

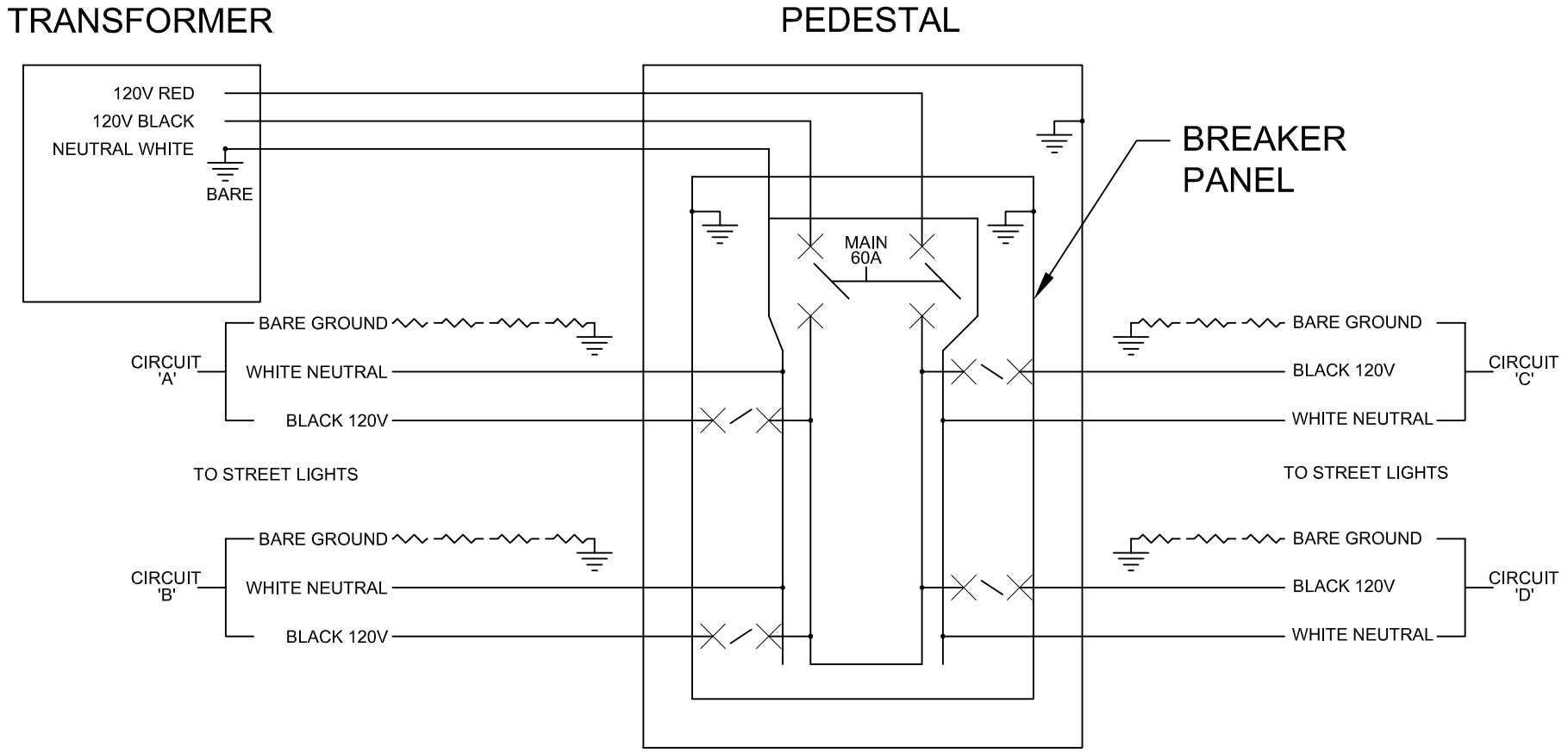


THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

TRANSFORMER
PEDESTAL CRITERIA 1

DATE: JUNE 2012	SCALE: N.T.S.
DRAWN: N.C.F	GU-3
CHKD. BY: M.E.B.	METRIC

No.	REVISIONS	DATE	APP'D



SINGLE POLE
40 AMP BREAKER

MAIN 60A

DOUBLE POLE 60 AMP
MAIN BREAKER (240V)

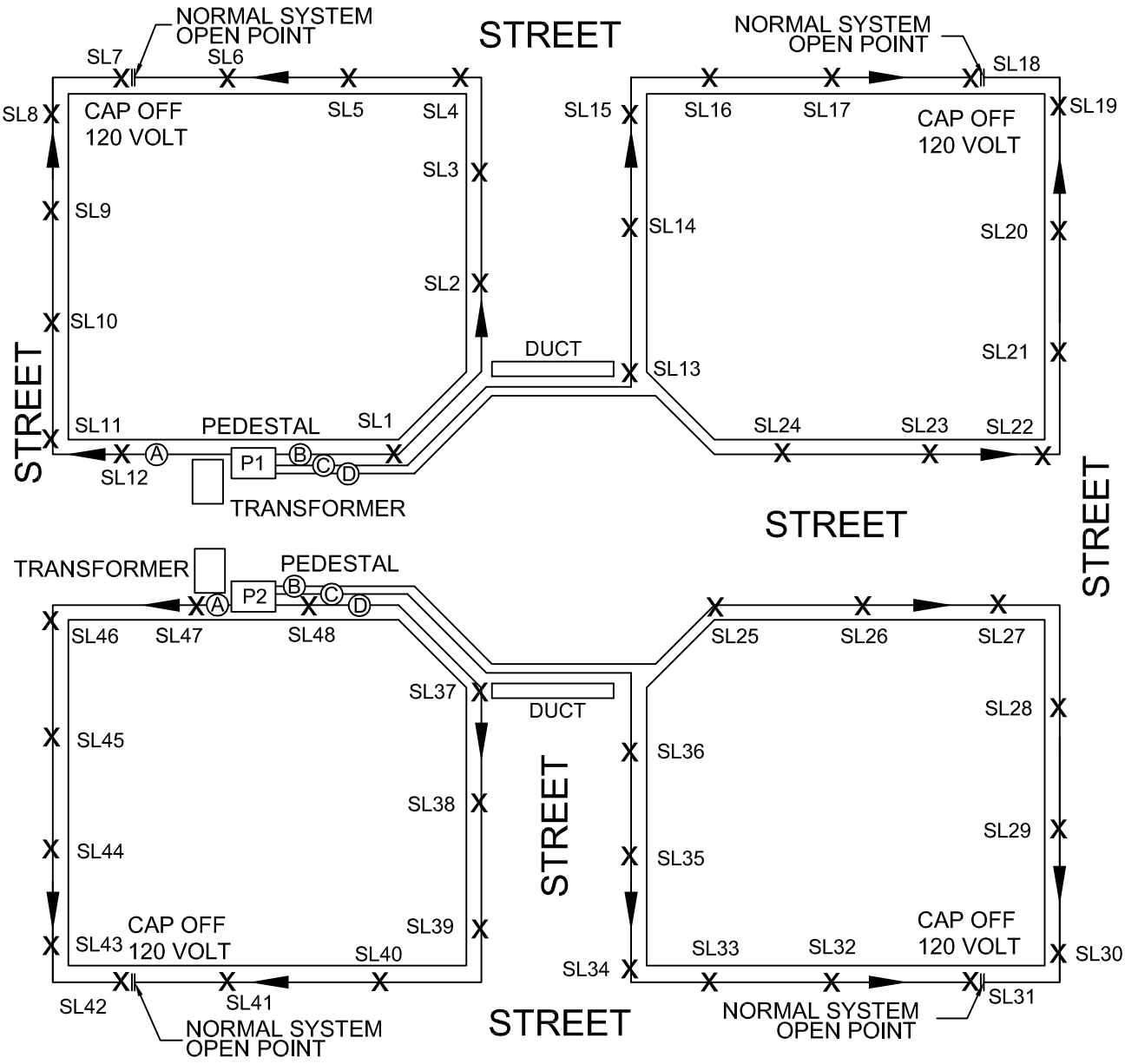
SUPPLY FROM TRANSFORMER TO PEDESTAL TO STREET LIGHTS

No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

TRANSFORMER
PEDESTAL CRITERIA 2

DATE: JUNE 2012	SCALE: N.T.S.
DRAWN: N.C.F	GU-4
CHKD. BY: M.E.B.	METRIC



NOTES:

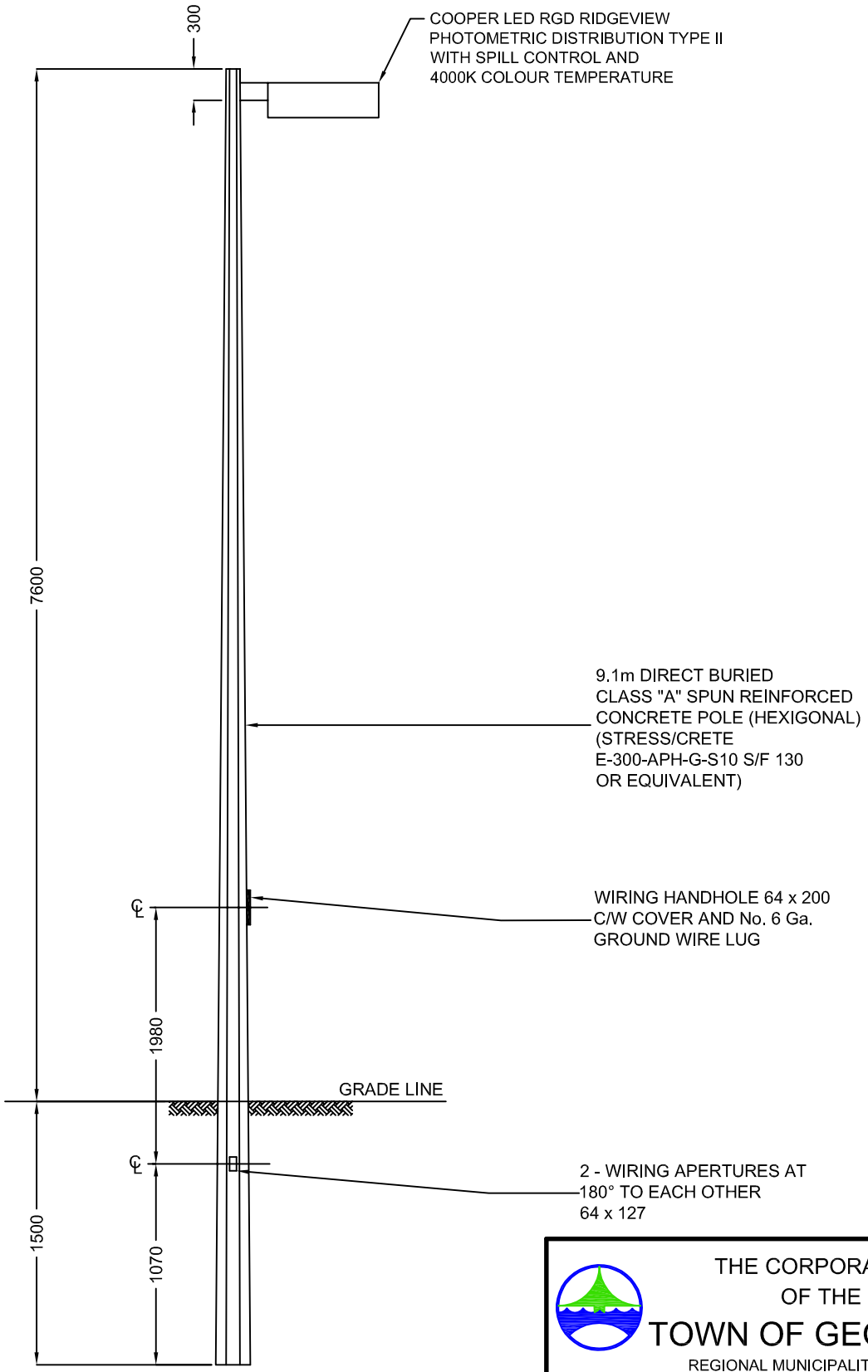
1. EACH PEDESTAL FEEDS UP TO 4 CIRCUITS OF 6 LIGHTS EACH. THE PEDESTAL BRINGS A 240 VOLT MAIN DISCONNECT AND HAVING 120 VOLT SINGLE BREAKERS.
2. AT THE END OF EACH CIRCUIT, IT WILL BE BACKED UP BY ANOTHER CIRCUIT AND CAPPED OFF IN THAT STREET LIGHT HANDHOLE (NORMAL SYSTEM OPEN POINT). THIS WILL ALLOW FOR ANOTHER FEED IN THE EVENT OF A PROBLEM OR FAULT IN THE CIRCUIT.
3. 'X' REPRESENTS STREET LIGHT.

No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

TRANSFORMER
PEDESTAL CRITERIA 3

DATE: JULY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GU-5
CHKD. BY: M.E.B.	METRIC

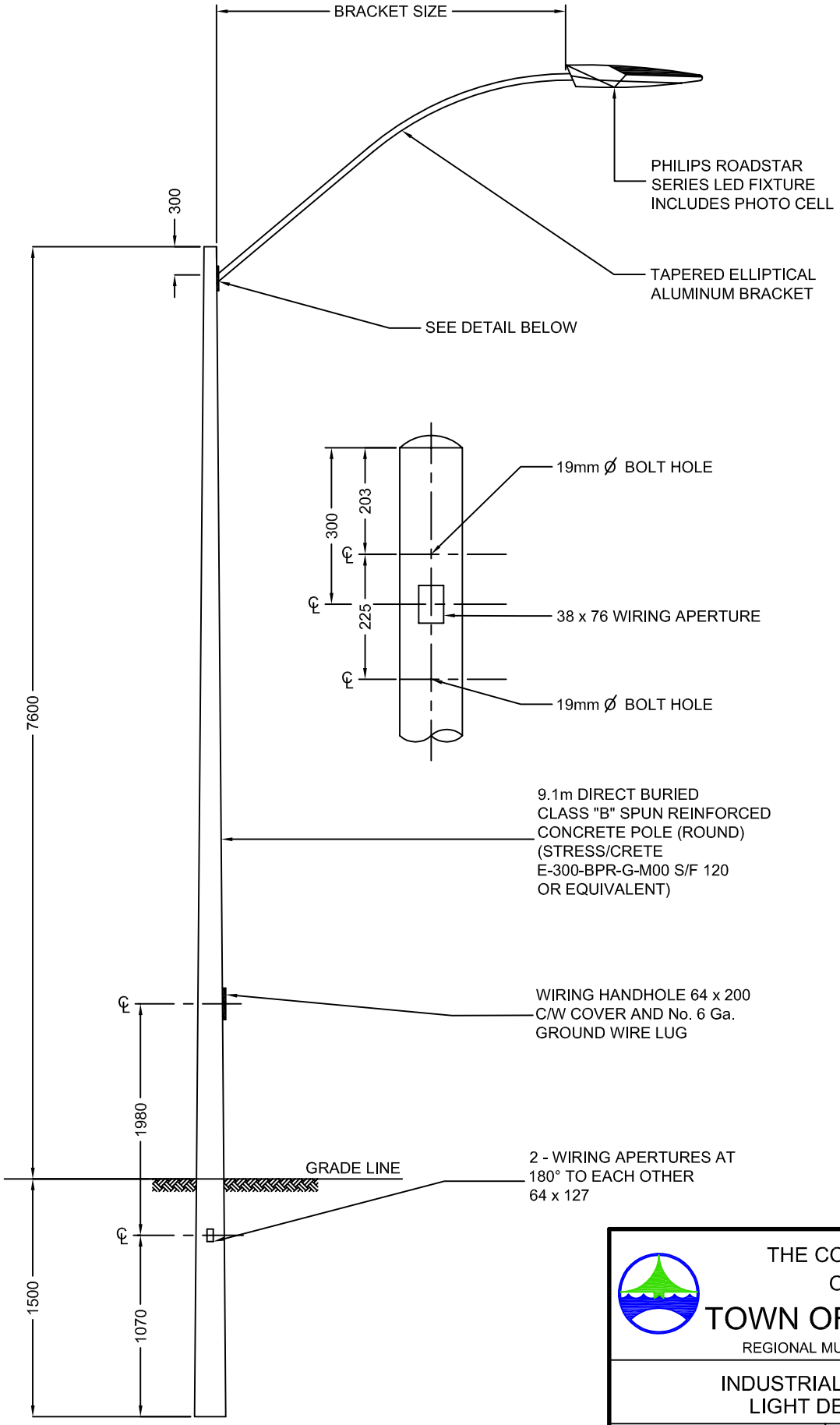


No.	REVISIONS	DATE	APP'D
1	LED LUMINAIRE	OCT '14	MEB

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

RESIDENTIAL STREET LIGHT DETAILS

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GU-6
CHKD. BY: M.E.B.	METRIC

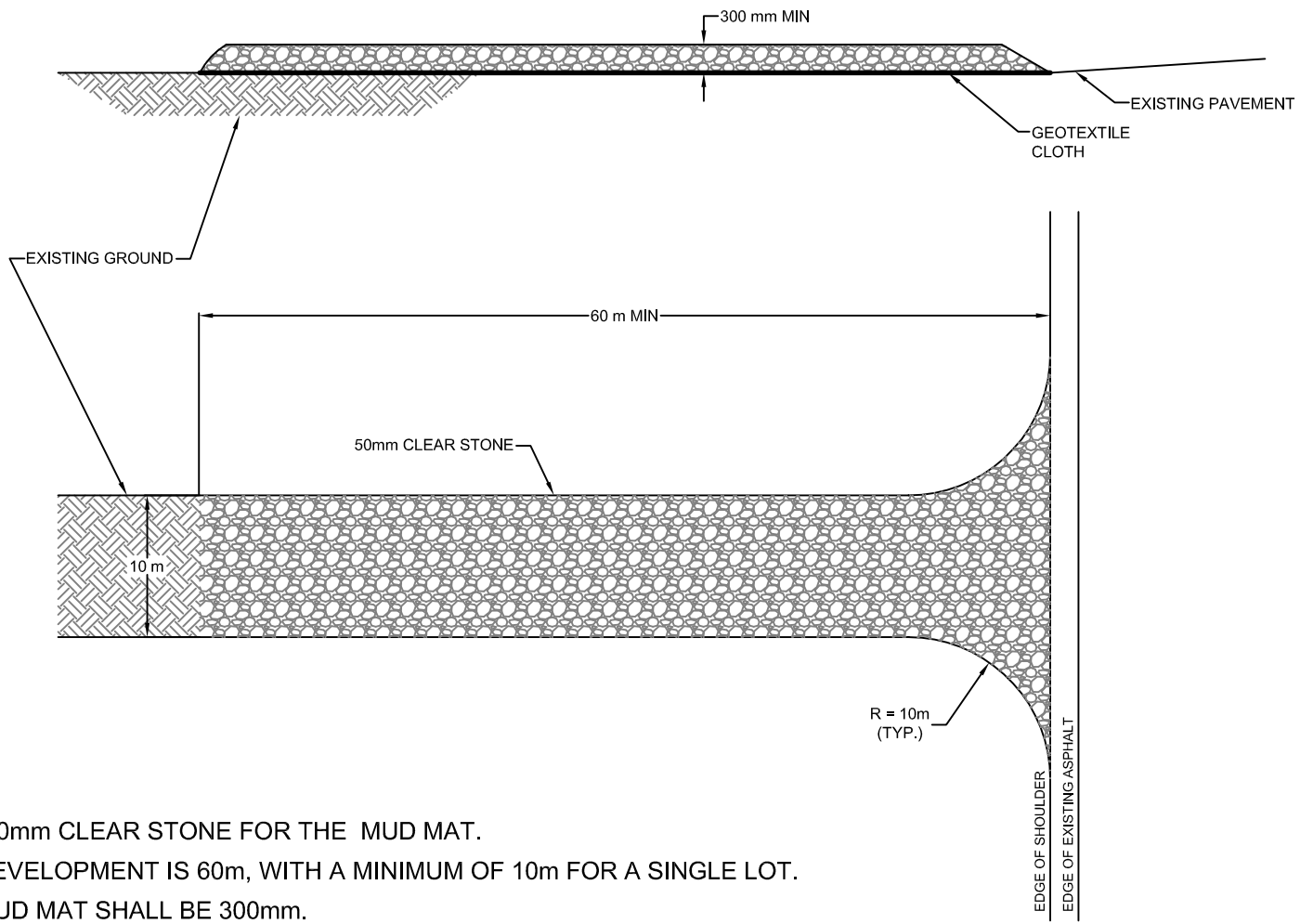


No.	REVISIONS	DATE	APP'D
1	LED FIXTURE	JAN'15	MEB

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

INDUSTRIAL STREET
LIGHT DETAILS

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GU-7
CHKD. BY: M.E.B.	METRIC



NOTES:

1. STONE USED SHOULD BE 50mm CLEAR STONE FOR THE MUD MAT.
2. MINIMUM LENGTH FOR A DEVELOPMENT IS 60m, WITH A MINIMUM OF 10m FOR A SINGLE LOT.
3. MINIMUM THICKNESS OF MUD MAT SHALL BE 300mm.
4. WIDTH SHOULD BE A MINIMUM OF 10m.
5. FILTER CLOTH SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO STONE PLACEMENT.
6. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT OF WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIRS AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT OF WAY MUST BE REMOVED IMMEDIATELY.

No.	REVISIONS	DATE	APP'D

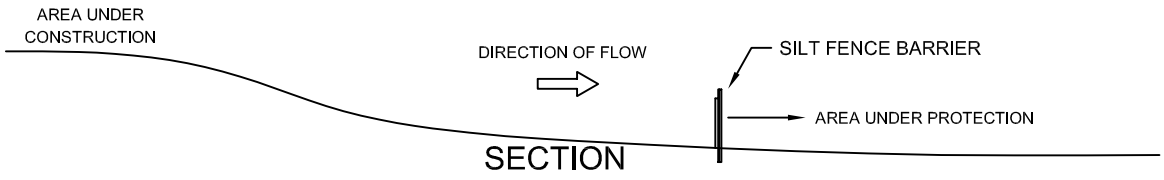
THE CORPORATION OF THE

TOWN OF GEORGINA

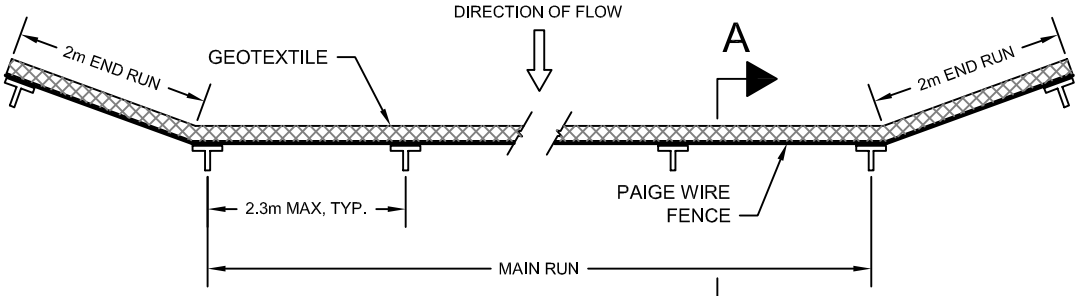
REGIONAL MUNICIPALITY OF YORK

MUD MAT DETAIL

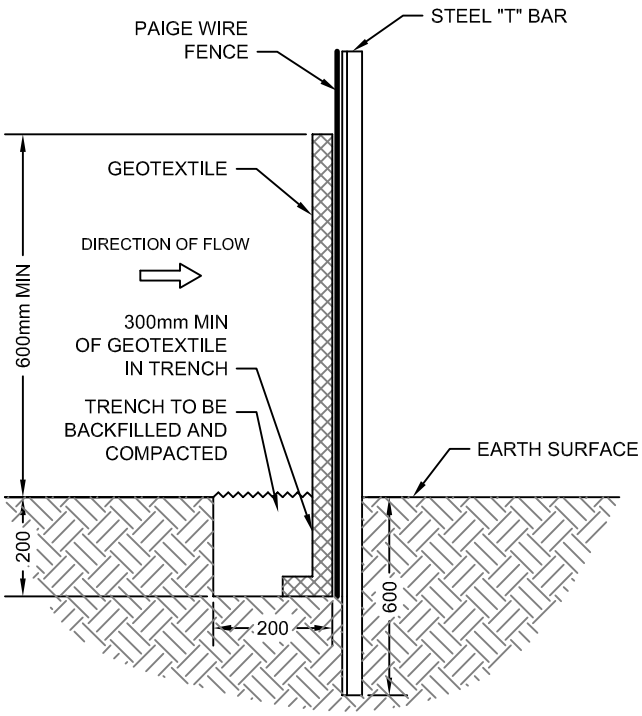
DATE: SEPT. 2012	SCALE: N.T.S.
DRAWN: N.C.F	GSC-1
CHKD. BY: M.E.B.	METRIC



SECTION



PLAN



SECTION A -A

NOTES:

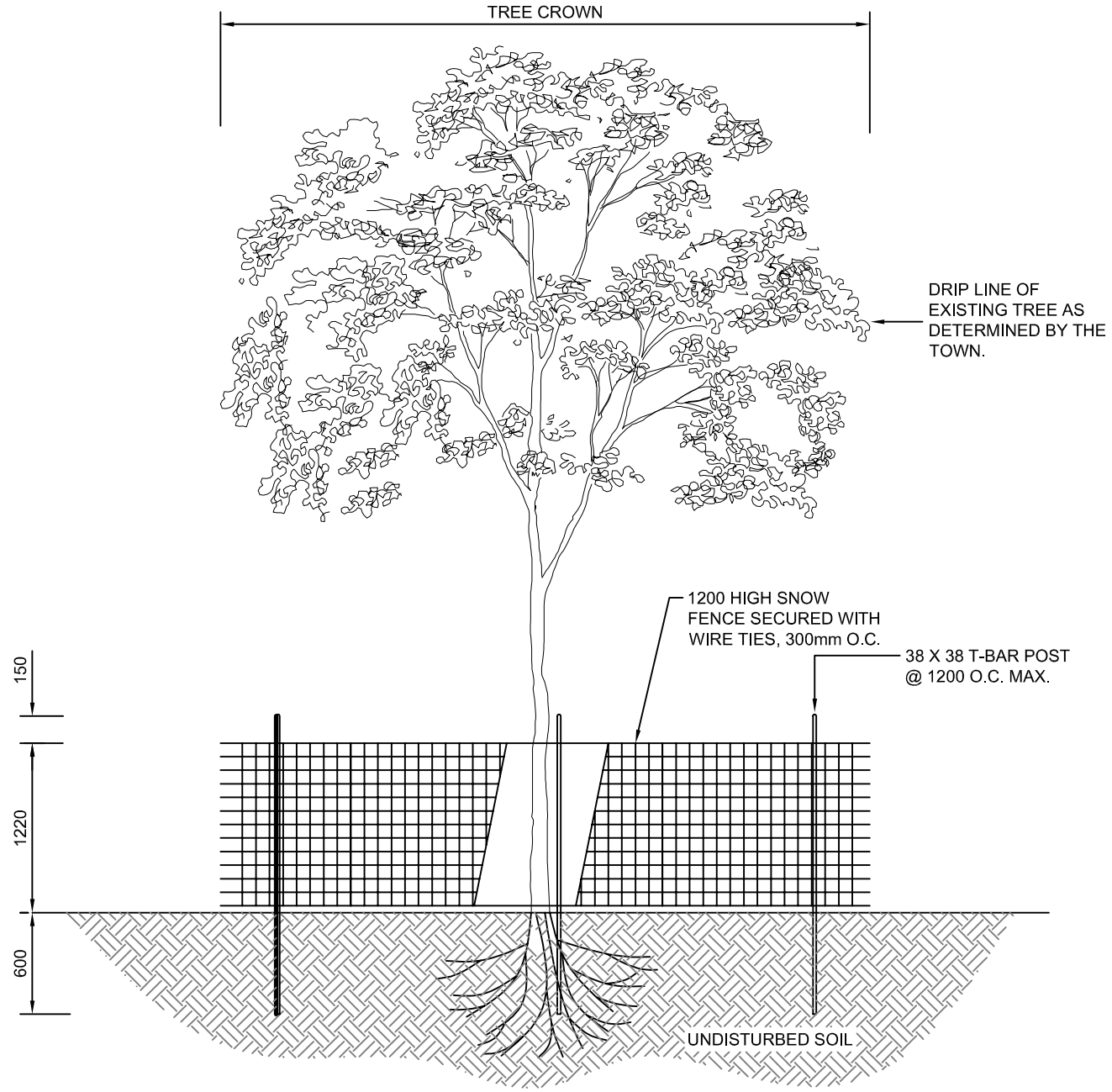
1. SILT FENCE SHOULD ALIGN WITH CONTOURS FOR SHEET OVERLAND FLOW.
2. STEEL "T" BARS SHALL BE SPACED AT A MAX OF 2.3m INTERVALS ON CENTER.
3. FROZEN GROUND CONDITIONS REQUIRE FILTER FABRIC SHALL BE BACKFILLED IN TRENCH WITH CLEAR STONE.
4. GEOTEXTILE FABRIC SHALL BE COMPRISED OF WOVEN OR NON-WOVEN U.V. STABILIZED MATERIAL. FABRIC SHALL BE BACKED BY A PAIGE WIRE FENCE AND FOLDED OVER TOP OF FENCE A MIN. OF 300mm AND WIRE FASTENED.
5. FENCE SHALL BE LOCATED ENTIRELY WITHIN PROPERTY LIMITS.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

No.	REVISIONS	DATE	APP'D

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

SILT FENCE BARRIER

DATE: SEPT. 2012	SCALE: N.T.S.
DRAWN: N.C.F	GSC-2
CHKD. BY: M.E.B.	METRIC



NOTES:

1. EXISTING TREES SHALL BE PROPERLY PROTECTED WITHIN THE DRIP LINE WITH TEMPORARY FENCING AS PER THE APPROVED LANDSCAPE PLAN UNTIL PRELIMINARY ACCEPTANCE.
2. MAINTAIN EXISTING GRADE WITHIN DRIP LINE OF ALL TREES.
3. THE AREA WITHIN THE PROTECTED FENCING SHALL REMAIN UNDISTURBED AND FREE OF DEBRIS, BUILDING MATERIALS AND EQUIPMENT.
4. PRUNE DEAD WOOD ONLY UNLESS DIRECTED OTHERWISE BY THE TOWN. DO NOT PRUNE LEADERS. ALL CUTS GREATER THAN 25mm DIAMETER SHALL BE TREATED WITH APPROVED DRESSING AT THE DISCRETION OF THE TOWN.
5. WATERING AND FERTILIZATION PROGRAM SHALL BE MAINTAINED TO THE SATISFACTION OF THE TOWN.
6. THE COST OF REPLACING DEAD AND SEVERLY DAMAGED TREES, AS DETERMINED BY THE TOWN, SHALL BE BORNE BY THE DEVELOPER AND/OR GENERAL CONTRACTOR. THE SPECIES AND SIZE(S) MUST BE APPROVED BY THE TOWN.
7. ALL MEASUREMENTS ARE IN MILLIMETRES.

No.	REVISIONS	DATE	APP'D

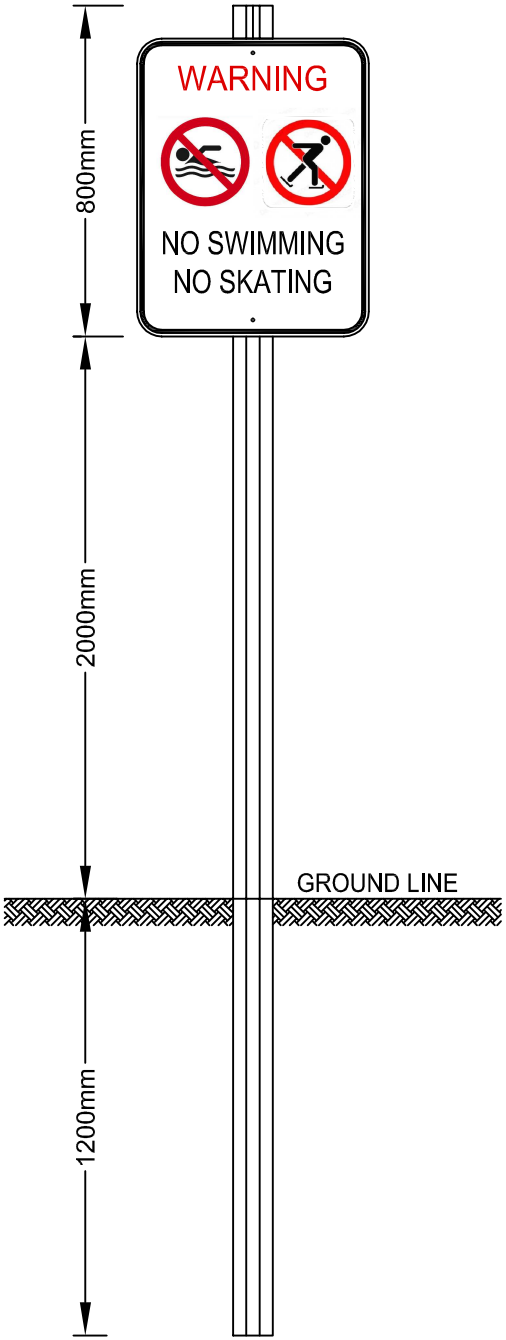
THE CORPORATION OF THE

TOWN OF GEORGINA

REGIONAL MUNICIPALITY OF YORK

TEMPORARY TREE PROTECTION

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GSC-3
CHKD. BY: M.E.B.	METRIC



NOTES:

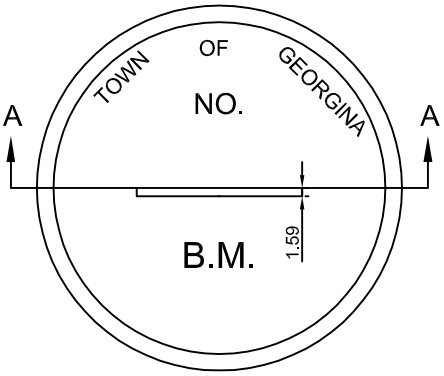
1. SIGN(S) SHALL BE PLACED AT ALL POND ENTRANCES, MAIN CELLS, FORBAYS AND OTHER LOCATIONS AS REQUESTED BY THE TOWN OF GEORGINA, ENGINEERING DIVISION.
2. SIGN(S) SHALL BE MANUFACTURED USING REFLECTIVE FINISH (ENGINEER GRADE) WITH TOP AND BOTTOM MOUNT HOLE WITH A MINIMUM OF 16-GAUGE STEEL.
3. SIGN(S) SHALL BE MOUNTED ON 4.0m U-CHANNEL GALVANIZED STEEL POST.
4. IT IS THE DEVELOPER'S RESPONSIBILITY TO MAINTAIN AND KEEP THE SIGN(S) IN GOOD CONDITION UP AND UNTIL THE SUBDIVISION/POND IS ASSUMED BY THE TOWN OF GEORGINA.
5. IT IS DEVELOPER'S RESPONSIBLITY TO OBTAIN ALL UNDERGROUND UTILITY LOCATES.

No.	REVISIONS	DATE	APP'D

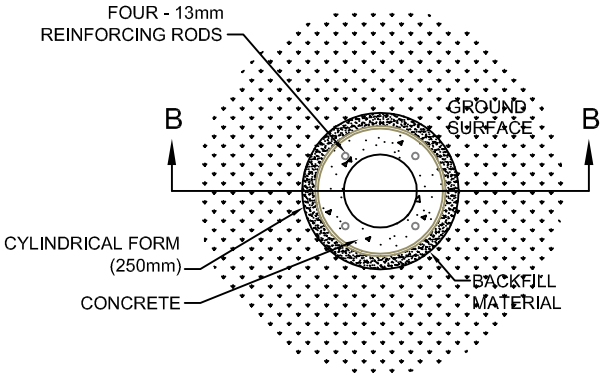
THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

STORM WATER MANAGEMENT POND WARNING SIGN

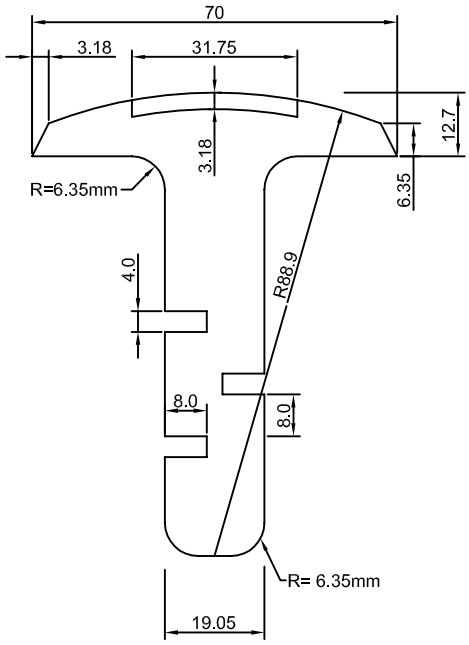
DATE: JUNE 2012	SCALE: N.T.S.
DRAWN: N.C.F	GG-2
CHKD. BY: M.E.B.	METRIC



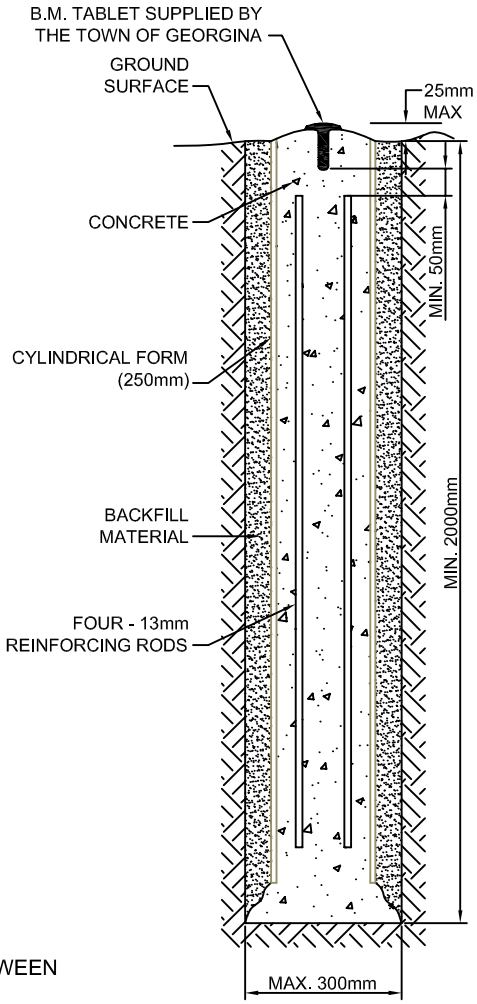
B.M. TABLET PLAN



B.M. MONUMENT PLAN



B.M. TABLET - SECTION A-A



B.M. MONUMENT - SECTION B-B

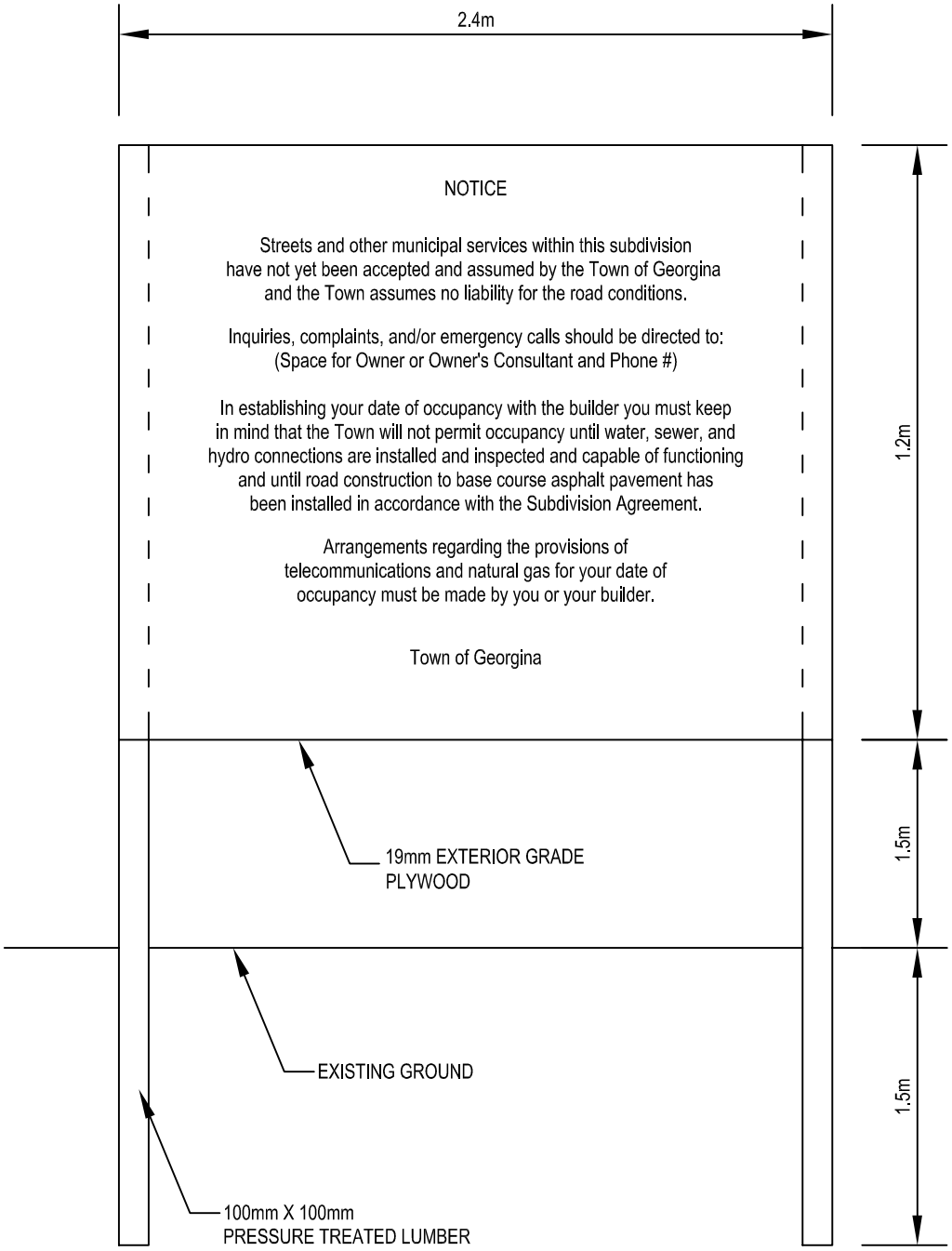
NOTES:
1. LEVELING SHALL BE OF 2ND ORDER AND SHALL BE CLOSED BETWEEN TWO EXISITING PERMENANT BENCH MARKS.
2. LEVELLING AND ADJUSTMENT SHEETS ARE TO BE SUBMITTED TO THE TOWN PRIOR TO ACCEPTANCE OF BENCH MARK. ALSO SUBMIT DRAWING SHOWING LOCATION OF BENCH MARK MONUMENT WITH TIES TO PERMENANT OBJECTS.
3. NOTIFY THE ENGINEERING DEPARTMENT FOR INSPECTION PRIOR TO POURING OF CONCRETE. CONCRETE SHALL BE OF 25 MPa.
4. BENCH MARK NUMBER MUST BE PUNCHED BY INSTALLER ON THE TABLET PRIOR TO INSTALLATION.
5. BACKFILL MATERIAL SHALL BE LIMESTONE OR FINE GRAVEL AND REQUIRED TO BE WELL TAMPED.
6. CONTACT THE TOWN ENGINEERING DEPARTMENT FOR SUBMISSION REQUIRMENTS.

No.	REVISIONS	DATE	APP'D

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

BENCHMARK (B.M.) MONUMENT AND TABLET DETAILS

DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GG-1
CHKD. BY: M.E.B.	METRIC



SIGN SPECIFICATIONS

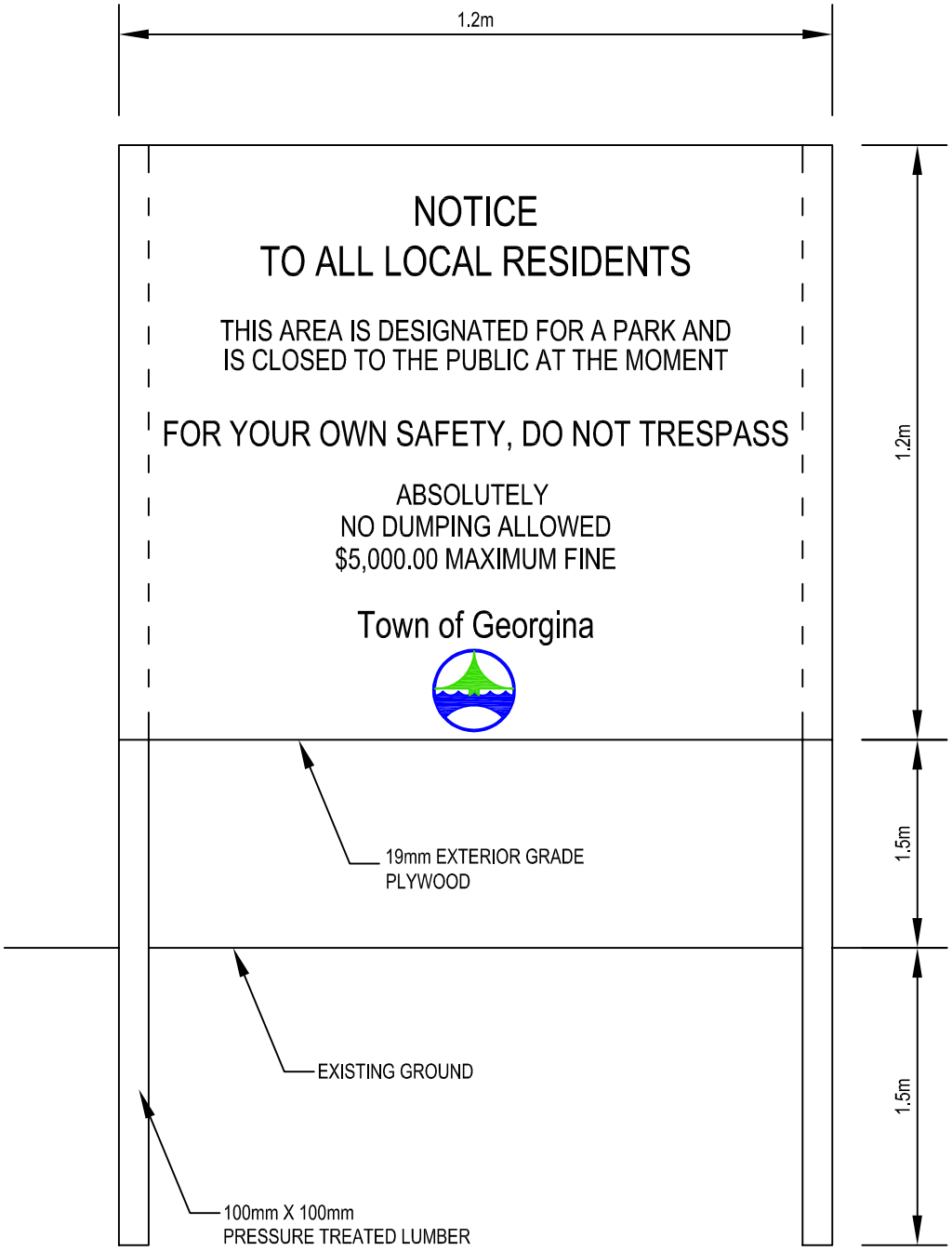
1. SIGN MATERIALS - 1.20m HIGH X 2.40m WIDE (19mm EXTERIOR GRADE PLYWOOD).
2. LETTERING - BLACK LETTERING ON WHITE BACKGROUND, HELVETICA MEDIUM (OR SIMILAR).
3. SUPPORTS - 2-100mm X 100mm PRESSURE TREATED LUMBER BURIED 1.50m INTO THE GROUND, WITH SIGN MOUNTED 2.0m CLEAR OF GROUND.
4. CROSS BRACING SHALL BE PROVIDED.

No.	REVISIONS	DATE	APP'D

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

DEVELOPMENT SIGN

DATE: MAY 2012	SCALE: NTS
DRAWN: N.C.F	GG-3
CHKD. BY: M.E.B.	METRIC



SIGN SPECIFICATIONS

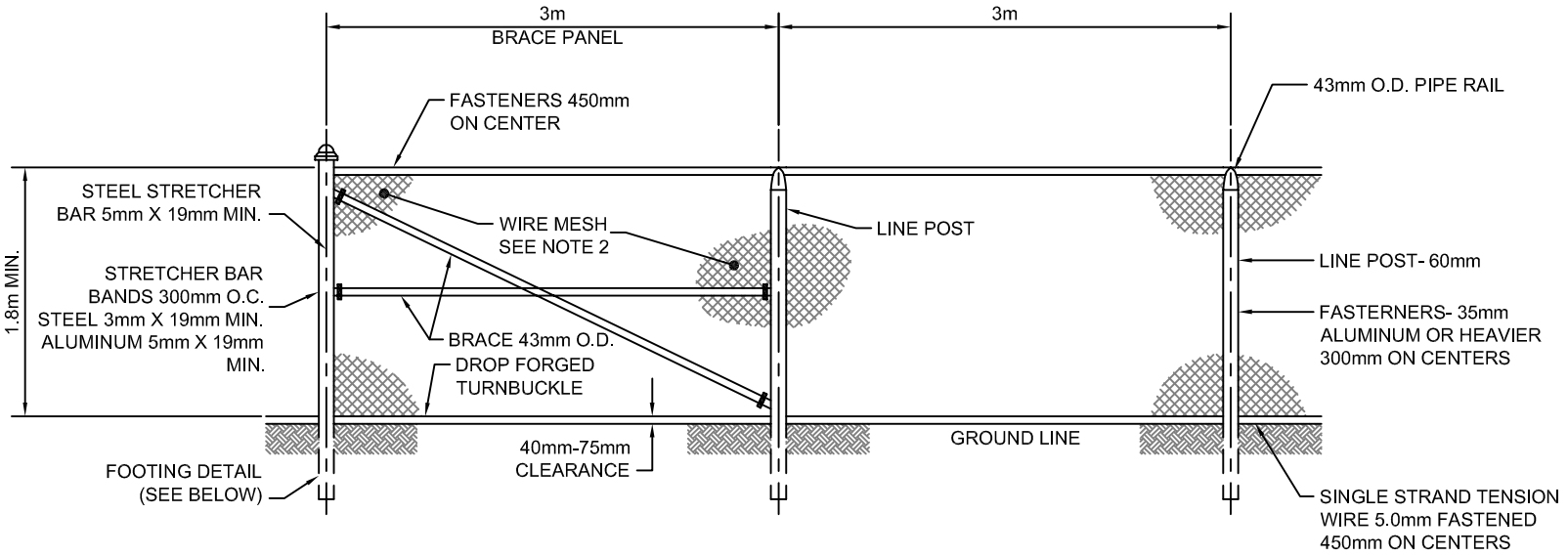
1. SIGN MATERIALS - 1.20m HIGH X 2.40m WIDE (19mm EXTERIOR GRADE PLYWOOD).
2. LETTERING - BLACK LETTERING ON WHITE BACKGROUND, HELVETICA MEDIUM (OR SIMILAR).
3. SUPPORTS - 2-100mm X 100mm PRESSURE TREATED LUMBER BURIED 1.50m INTO THE GROUND, WITH SIGN MOUNTED 1.5m CLEAR OF GROUND.
4. CROSS BRACING SHALL BE PROVIDED TO ENSURE STABILITY.

No.	REVISIONS	DATE	APP'D

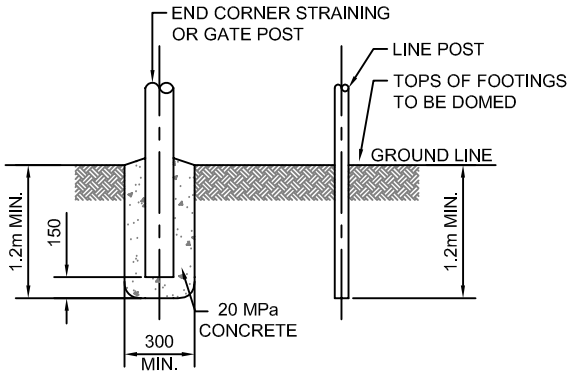
THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

PARK TO BE
CONSTRUCTION SIGN

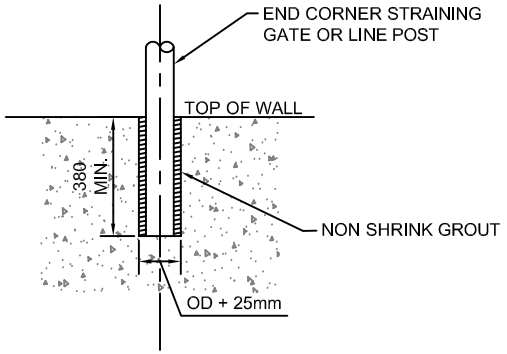
DATE: SEPT. 2012	SCALE: NTS
DRAWN: N.C.F	GG-4
CHKD. BY: M.E.B.	METRIC



FENCE DETAILS



IN EARTH OR WALKWAY



ON RETAINING WALL

NOTES:

1. CHAIN LINK FABRIC SHALL BE BLACK VINYL COATED 3.5mm O.D. WITH 3.2mm GALVANIZED STEEL CORE WOVEN INTO A 38mm MESH. TOP AND BOTTOM SALVAGE SHALL HAVE A KNUCKLED FINISH. TENSIL STRENGTH OF INDIVIDUAL PICKETS TO STAND TEST OF 550 MPa.
2. ALL POST RAILS, CONNECTOR AND FITTINGS SHALL BE GALVANIZED AND BLACK COATED.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

No.	REVISIONS	DATE	APP'D

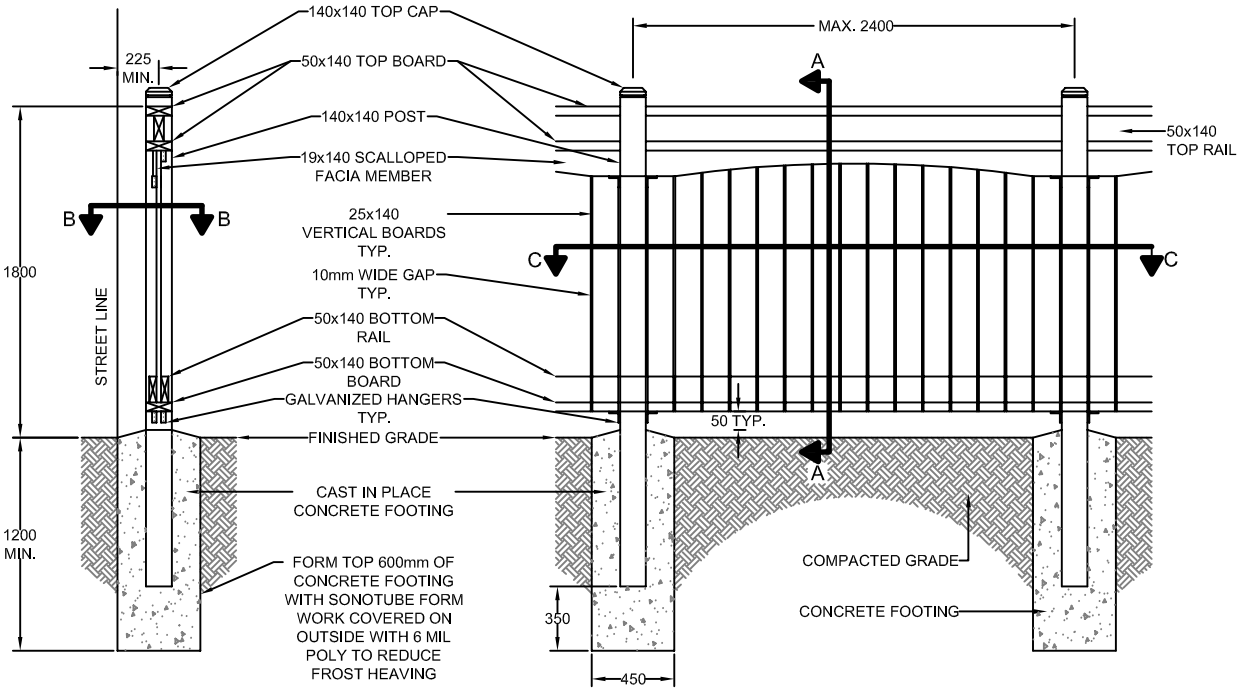
THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

CHAIN LINK FENCE

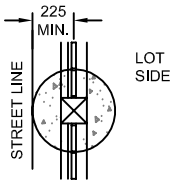
DATE: MAY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GG-5
CHKD. BY: M.E.B.	METRIC

NOTES:

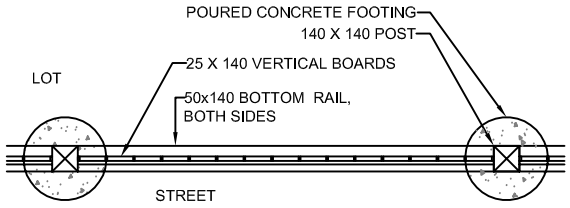
1. ALL MATERIALS, COMPONENTS AND WORKMANSHIP TO CONFORM TO BUILDING CODE AND LOCAL BY-LAWS.
2. FENCES CONSTRUCTED ON BERMS:
a) COMPACT BERMS TO A MIN. 100% STANDARD PROCTOR DENSITY.
b) CONSTRUCT BERMS WITH A 1m FLAT TOP AND SIDE SLOPES NO STEEPER THAN 3:1.
c) ERECT FENCE ALONG CENTER LINE OF BERM.
3. ALL WOOD SHALL BE WESTERN RED CEDAR AND SHALL BE FREE OF WANE AND BARK POCKETS. ALL TORN GRAIN SHALL BE ELIMINATED BY SANDING AND PLANING. MEMBERS EXHIBITING MODERATE TO HEAVY KNOTS SHALL BE WELL DISTRIBUTED THROUGHOUT THE INSTALLATION. PANEL MEMBERS SHALL BE SELECT KNOTTY (NLGA 204A). POST SHALL BE SELECT STRUCTURAL POST AND TIMBER (NLGA 131A).
4. ALL WOOD TO BEAR GRADING STAMP OF C.L.S. CERTIFIED AGENT.
5. STAIN ALL EXPOSED FENCE MATERIAL WITH TWO COATS CLEAR STAIN.
6. NAILS SHALL BE GALVANIZED ARDOX CONFORMING TO CSA STANDARD BILL.
7. DRIVE ALL NAIL HEADS BELOW SURFACE OF WOOD. USE SUFFICIENT SIZE AND QUANTITY OF NAILS TO ENSURE A STABLE, SECURE STRUCTURE.
8. STEP FENCE PANELS MAXIMUM OF 100mm AT POSTS AS REQUIRED BY GRADE CONDITIONS.
9. ALL LUMBER SIZES ARE ACTUAL RATHER THAN NOMINAL SIZES.
10. CONCRETE TO HAVE A MIN. COMPRESSIVE STRENGTH OF 25 MPa @ 28 DAYS WITH 5-7% AIR ENTRAINMENT.



CROSS-SECTION A - A



CROSS-SECTION B - B



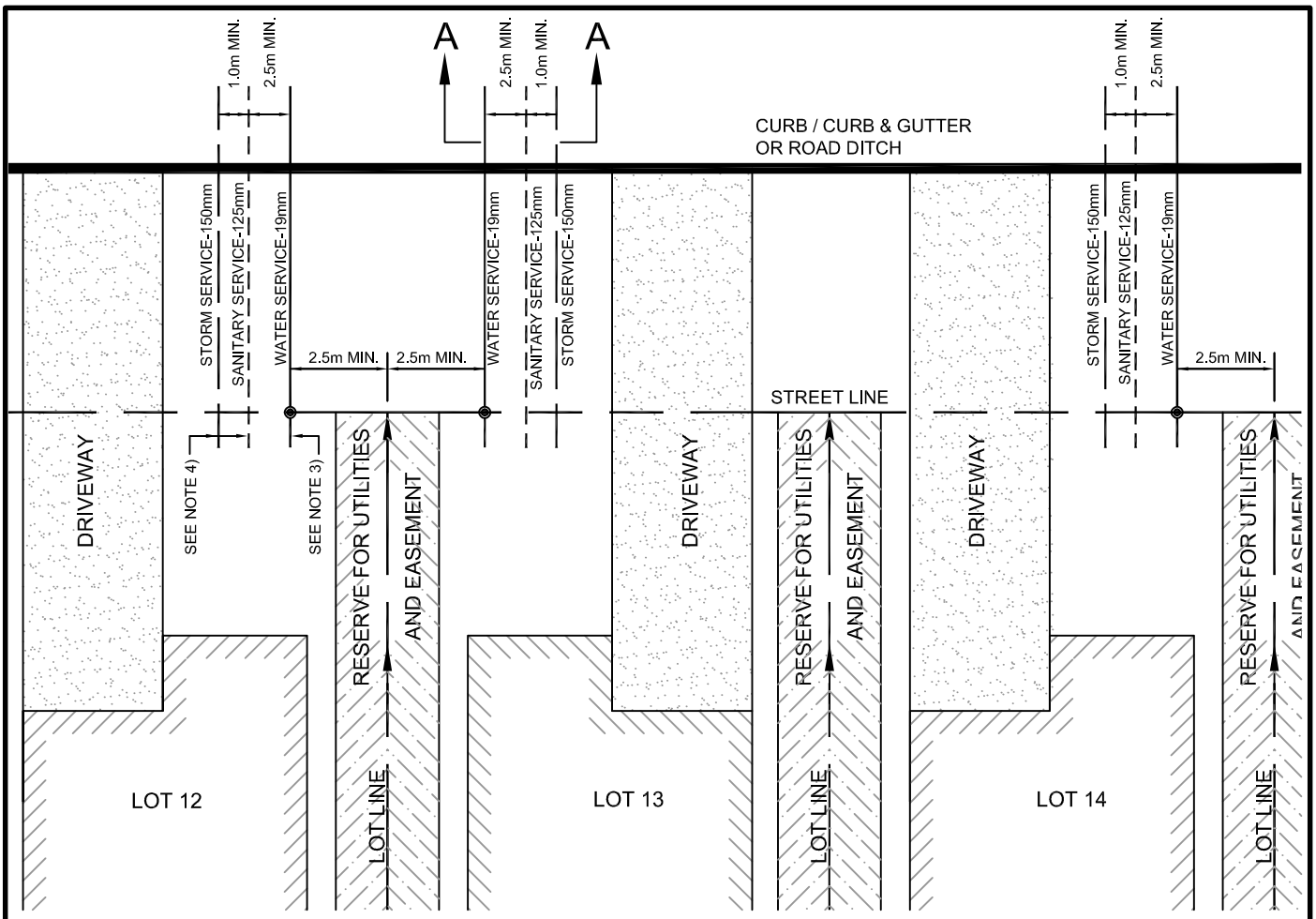
CROSS-SECTION C - C

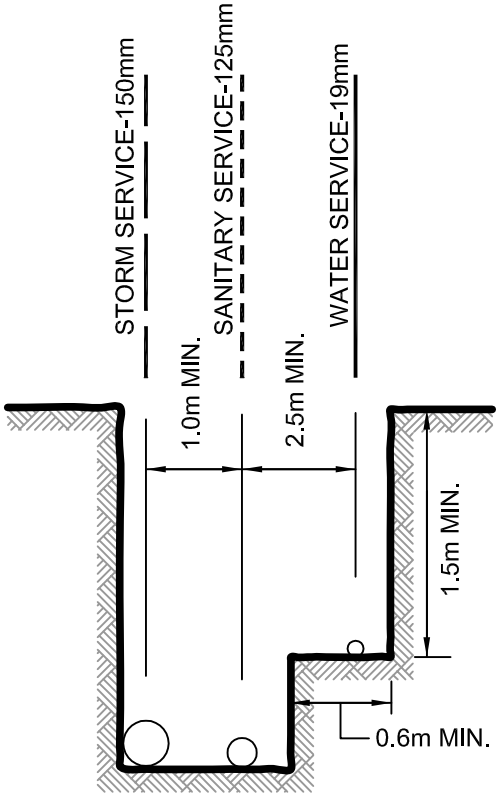
No.	REVISIONS	DATE	APP'D

THE CORPORATION OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

WOODEN PRIVACY FENCE

DATE: SEPT. 2012	SCALE: N.T.S.
DRAWN: N.C.F	GG-6
CHKD. BY: M.E.B.	METRIC





SECTION A-A

NOTES:

1. INDIVIDUAL SERVICE CONNECTIONS ARE SHALL BE INSTALLED TO EACH LOT AND TO EACH UNIT WITHIN A BLOCK.
2. WATER SERVICES WILL NOT BE PERMITTED WITHIN DRIVEWAYS.
3. THE CONTRACTOR SHALL INSTALL A SERVICE PIPE TO THE SURFACE BEYOND THE CURB STOP FOR TESTING PURPOSE ONLY. THIS PIPE MUST BE REMOVED PRIOR TO CONNECTING THE DWELLING TO THE WATER SERVICE.
4. INDIVIDUAL SANITARY AND STORM SERVICE CONNECTIONS ARE TO BE EXTENTED 1.5m (5ft) INTO PRIVATE PROPERTY WITH A CAP AT THE END OF THE PIPE. NO PLUG PERMITTED. CAST IRON TEST FITTING SHALL BE LOCATED AT THE PROPERTY LINE:
   SANITARY 125mm x 100mm
   STORM 150mm x 150mm

THE CORPORATION
OF THE
TOWN OF GEORGINA
REGIONAL MUNICIPALITY OF YORK

HOUSE SERVICE CONNECTION
LOCATION STANDARD

DATE: JULY 2012	SCALE: N.T.S.
DRAWN: N.C.F	GG-7
CHKD. BY: M.E.B.	METRIC

No.	REVISIONS	DATE	APP'D

APPENDIX B

Design Aids and Checklists

Town of Georgina
Development Design Criteria and Standards

2013

TOWN OF GEORGINA

COST ESTIMATE ITEMS TO BE INCLUDED – GENERAL ITEMS

- ❑ **Consulting engineering fees (typically 15%)**
- ❑ **Landscape architect fees (typically 15%)**
- ❑ **Surveying – provide line and grade**
- ❑ **Benchmark installation**
- ❑ **Concrete testing**
- ❑ **Asphalt testing**
- ❑ **Soils/compaction testing**
- ❑ **Mud mat**
- ❑ **Temporary entrance**
- ❑ **Silt control and maintenance of same**
- ❑ **SWM pond**
- ❑ **Temporary SWM pond should it be required during construction**
- ❑ **Clearing and grubbing**
- ❑ **Tree removal**
- ❑ **Tree protection fence**
- ❑ **Earthworks**
- ❑ **Topsoil stripping and stockpiling**
- ❑ **Sanitary, storm, watermain and appurtenances – provide breakdown**
- ❑ **Road Works – provide breakdown**
- ❑ **Flushing and cleaning of sewers**
- ❑ **Video sewers**
- ❑ **Benching**
- ❑ **Air testing and deflection testing of sanitary sewer**
- ❑ **Deflection testing of storm and FDC sewer**
- ❑ **Painting of hydrants prior to assumption**
- ❑ **Anti tampering devices on hydrants**
- ❑ **Pressure testing and chlorination for watermain**
- ❑ **Dust Control**
- ❑ **Cleaning/sweeping/flushing of roads**
- ❑ **Utility servicing**
- ❑ **Pond landscaping**
- ❑ **Streetscape**
- ❑ **Street lighting**
- ❑ **Pavement marking/Street signs**
- ❑ **Dewatering by well points**
- ❑ **Engineered Fill**
- ❑ **Trench Plugs**
- ❑ **Ground Water Monitoring**
- ❑ **Contingency (typically 5% - 10%)**

TOWN OF GEORGINA
Drawing Review Check List
Subdivisions

File No.:_____
Project:_____
Drawing No._____ Submission:_____

SANITARY SEWER DESIGN CHECK:			
	Design Flows: Residential		
	average (l/person/day): Calculation Check: (365 x person) / (24 x 60 x 60)	365	
	infiltration (l/gross ha./day) Calculation Check : (0.21 l/s x Area ha)	18,144	
	Peaking Factor: (K) = 1+{(14/[4+(p^0.5)]} or	Max. 4.0	
	Population Density: Pre-Zoned Land: (persons/ha.)		
	Detached, Semi-detached, Townhouse Mix	52	
	Apartment	99	
	Single and Semi		
	Development Proposed Land: (person/unit)		
	Single and Semi-detached	2.9	
	Town houses	2.9	
	Apartment (average)	2.0	
	Design Flows: Commercial		
	average (m^3/ha./day): includes infiltration and peaking effect	28	
	Design Flows: Light Industrial		
	average (m^3/ha./day): includes infiltration and peaking effect	35	
	Design Flows: Heavy Industrial		
	average (m^3/ha./day): includes infiltration and peaking effect	55	
	Design Flows: Schools and Institutions		
	average (m3/ha./day): includes infiltration and peaking effect	18	
	Design Area Plan - Scale	1:500	
	Pipe Capacities – design according to pipe flowing	full	
	Roughness Co-efficient n=	0.013	
	Minimum Actual Velocity	0.60 m/s	
	Maximum Velocity	3.0 m/s	
	Minimum grade of upstream leg or first leg	1.0%	
	Minimum length of first leg of pipe	50 m	
	Maximum change in velocity change from one to other pipe	0.60 m/s	
SANITARY SEWER DRAWINGS CHECK:			
	Maintenance Holes		
	Required at: Change in Alignment		
	At termination point		
	Grade changes		
	All junctions		
	Maximum spacing: For pipes 200 mm to 750 mm	110m	
	For pipes 825 mm to 1200 mm	120m	

TOWN OF GEORGINA
Drawing Review Check List
Subdivisions

File No.:_____
Project:_____
Drawing No._____ Submission:_____

	For pipes over 1200 mm				150m	
	Maximum change in direction				90°	
	Minimum drops: straight run				0.030m	
	15^0 up to 45^0				0.060m	
	Junctions from 46^0 up to 90^0				0.090m	
	Drop structure required where inlet and outlet pipe elevation exceeds				0.60m	
	Benching up to obvert and as per				OPSD 701.021	
	Benching inside MH will be minimum width of				0.225m	
	Minimum offset from curb face or other services				1.50m	
	Frost Straps				Required	
	Safety Platform Required (Located above highest pipe inlet):				= or > 5 m deep	
	Minimum clearance between outside barrel of pipe crossings or shall be encased with 25MPa concrete				0.50m	
	Horizontal clearance from outside barrel of pipe to Watermain				2.5m	
	Location from street line for Commercial, Industrial, institutional and multiple residential blocks development and as per Ont. Plumbing Code				1.5m	
	MH Covers as per (watertight cover where subject to flooding)				OPSD 401.010	
	Sanitary Pipes					
	Minimum sanitary sewer size				200mm	
	Minimum slope for first leg of pipe				1.0%	
	Minimum length of first leg of pipe				50 m	
	ALLOWABLE SANITARY SEWER CAPACITIES AND GRADIENTS					
	Diameter (mm)	Q Max (m3/s)	Slope Min (%)	Slope Critical (%)	Slope Max (%)	
	200	0.042	0.33	1.54	8.2	
	250	0.074	0.50	1.43	6.1	
	300	0.12	0.50	1.34	4.8	
	375	0.20	0.50	1.25	3.5	
	450	0.32	0.50	1.17	2.8	
	Deflection of pipe				NO	
	Minimum depth of sewer				2.7 m	
	Maximum depth of sewer				6.0 m	
	Minimum depth of service lateral at street line				2.5 m	
	Maximum depth of service lateral at street line				3.0 m	
	Pipe Material				PVC OR RCC	
	Pipe Joint – approved rubber gasket / manufacturer's detail and specs required on "Details Drawing"				YES	
	Pipe bedding as per				OPSD 802.010	

TOWN OF GEORGINA
Drawing Review Check List
Subdivisions

File No.:_____
Project:_____
Drawing No._____ Submission:_____

STORM SEWER DESIGN CHECK:			
	Design Storm	5 year	
	Modified Rational Formula	$Q_{(l/s)}$=2.78 CiA	
	Detention Facilities (detention of the difference between):Subdivisions	5 yr & 100 yr	
	Site Plans	5 yr & 100 yr	
	Runoff Coefficients: Commercial Areas	0.90	
	Industrial Areas	0.75	
	Churches, Schools, Institutions	0.70	
	Apartments and medium density	0.70	
	Townhouses	0.70	
	Semi Detached Residential	0.65	
	Single Family Residential	0.60	
	Estate Residential	0.45	
	Cultivated Fields (undeveloped lands)	0.25	
	Initial Inlet Time	10 minutes	
	Intensity Formula	I_5=853.608 x (4.699 + T) $^{-0.766}$	
	Pipe Capacity	$Q=(R^{2/3}xS^{1/2}xA)/n$	
		$V=(R^{2/3}xS^{1/2})/n$	
	Roughness Coefficient (n): Concrete Pipe	0.013	
	Corrugated Metal	0.024	
	Corrugated Metal (smooth wall)	0.021	
	Polyvinyl Chloride (PVC)	0.013	
	Velocity: Minimum	0.8 m/s	
	Maximum	4.0 m/s	
	Minimum Size of Pipe: Sewer Mains	300 mm	
	Single Catch Basin	250 mm	
	Double Catch Basin	300 mm	
	Rear Lot Catch Basin	250 mm	
	Minimum Depth to Obvert	2.7 m	
	Maximum Depth to Obvert	7.0 m	
	Special Consideration – Minimum Depth to Obvert (frost protection)	1.5 m	
	Maintenance Holes: Required at Change in:	Alignment	
		Grade	
		Junctions	
	Not Required: Where radius pipe is used in sized 1050 mm and over		
	Maintenance Hole Spacing: For 300 mm pipe to 750 mm pipe	110 m	
	825 mm pipe to 1200 mm pipe	120 m	
	For pipe sized over 1200 mm	150 m	
	Type and Size of Maintenance Holes	Specify OPSD	

TOWN OF GEORGINA
Drawing Review Check List
Subdivisions

File No.:_____
Project:_____
Drawing No._____ Submission:_____

	Maximum change in direction:	Pipes greater than 450 mm	Max 45°		
		Not permitted	Acute Angles		
	Minimum Drop Across the Maintenance Hole:	Straight Runs	0.020 m		
		15° to 45°	0.050 m		
		46° to 90°	0.080 m		
	Drop structure is required where inlet & outlet pipe elevation exceeds		0.600 m		
	Obverts will be equal at locations where		Pipe size change		
	Benching:		To obvert		
		Minimum width	0.230 m		
	Minimum offset from curb face or other services		1.50 m		
	Frost Straps		Required		
	Safety Platform Required (Located above highest pipe inlet):		= or > 5 m deep		
	Professional Engineered design and specifications are required for Maintenance Holes:		That are not OPSD		
			> 2.5 m in dia.		
	Minimum clearance between outside of pipe barrels at all crossings		0.5 m		
	CATCH BASINS:				
	Special catch basins, inlet structures, CBMH are required to be		Fully Detailed		
	Catch Basin Spacing:		**Road Grade**		
			< = 4%	**> 4%**	
	Pavement Width:	7.3 m to 8.4 m	90 m	60 m	
		8.5 m to 9.7 m	82 m	55 m	
		9.8 m to 12.1 m	73 m	50 m	
		12.2 m to 14.0 m	60 m	40 m	
	Drainage received from more than one direction requires:		Double catch basins		
	At street intersections CB's to be located upstream of:		Sidewalk or pedestrian crossing		
	Minimum pipe size and slope for:	Single catch basin	200 mm @ 1.0%		
		Double catch basin	250 mm @ 1.0%		
	Specify class of pipe and type of pipe bedding to be shown on:		Profile		
	Radius pipe permitted in sizes:		> = to 1050 mm		
	Pipe size decrease downstream		NO		
	Storm Sewer Location		See Standard Drawings		
	Pipe Bedding and Class		OPSD		
	Service Connections to a Trunk Sewer		NO		
	Risers required when sewer exceeds		4.5 m deep		
	Maximum length of riser		3.0 m		
	PIPE MATERIALS:				
	Pipe Material (200 mm to 450 mm) Ultra Rib NOT PERMITTED		Concrete or PVC		
	Pipe Material (> 450 mm)		Concrete		

TOWN OF GEORGINA
Drawing Review Check List
Subdivisions

File No.:_____
Project:_____
Drawing No._____ Submission:_____

WATERMAIN CHECK:				
	Design:		Max. fire flow & peak day demand	
			Peak hour demand	
	Residential Consumption:	Average Daily Demand	365 L/cap./day	
		Maximum Day Factor	2.0	
		Peak Hour Factor	2.75	
	Fire Flow Demand: or as per "Water Supply for Fire Protection – A Guide to Recommended Practice prepared by the Fire Underwriters Survey of the Insurance Bureau of Canada or AWWA Manual M31		7000 L/min.	
	Average Day Water Demands:			
		Industrial (light)	35,000 L/ha/day	
		Commercial	28,000 L/ha/day	
		Institutional	18,000 L/ha/day	
	Hazen Williams Formula		$V=0.85CR^{.63}S^{.54}$	
	C values:	150 mm	100	
		200 mm and 250 mm	110	
		300 mm to 600 mm	120	
		Over 600 mm	130	
	Minimum size:		150 mm	
		At dead end	See Specification	
		More then one hydrant	200 mm	
		Industrial Areas	300 mm	
	Minimum and Maximum Pressures:	Peak Hourly Demand	50 psi minimum	
		Minimum hourly demand	100 psi maximum	
		Fire flow - when tested for fire flow during peak daily demand	50 psi minimum	
	Dead End Watermains		To be avoided	
	Location:		4.5 m from PL	
			North & east side	
	Depth:		1.8 m minimum	
	Depth Under Watercourse		1.2 m min. to obv.	
	Frost protection minimum		50mm Styrofoam	
	Utility Crossing:	Over or under other utilities	0.3 m separation	
		Under or over sewers	0.5 m separation	
	Horizontal Separation from sewers to Outside of Pipe Barrels		2.5 m	
	Valve spacing:	Cross intersection	4 valves	
		Tee intersection	3 valves	
	Valve Location:		Every 20 houses	
			Max. 300 m	
	Valve and Chamber Required on Watermains		> 300 mm dia.	

TOWN OF GEORGINA
Drawing Review Check List
Subdivisions

File No.:_____
Project:_____
Drawing No._____ Submission:_____

	Hydrants: Clow (MacAvitiy) or Canada Valve (Century)	100 mm Storz	
	Spacing	150 m in res.	
		75 m in Comm.	
	Location:	3 m to streetline	
		1.2 m from D/W	
	Backflow prevention	Required	
	Air reliefs required at all high points on trunk mains	YES	
	Drains required at all low points on trunk mains	YES	
	Blow offs required at dead end watermains	YES	
	Materials	AWWA approved	
	Bedding	Per OPSD	
	Testing	Per Town WW	
SERVICE CONNECTION:			
	Individual connections to be extended into private property by	1.5 m	
	Residential services per drawing no.	M-1	
	Water Connection	20 mm type K Copper	
	Sanitary Connection: Single Family	125 mm PVC	
	Multiple Family, Commercial, etc.	OPC	
	Cast Iron Test Fitting	125 x 100 mm	
	Minimum depth at street line	2.5 m	
	Maximum depth at street line	3.0 m	
	Risers Required when invert depth of sewer exceeds	4.5 m	
	Riser length shall not exceed (use OPSD)	3.0 m	
	Maximum grade	8%	
	Minimum grade	2%	
	Manhole required at all connections to multiple family, comm., etc.	1.5 m inside PL	
	Storm Sewer Connection: Single Family	150 mm PVC	
	Multiple Family, Commercial, etc.	OPC	
	Cast Iron Test Fitting	150 x 150 mm	
	Minimum depth at street line	1.8 m	
	Maximum depth at street line	2.5 m	
	Risers Required when invert depth of sewer exceeds	4.5 m	
	Riser length shall not exceed (use OPSD)	3.0 m	
	Connect to catch basin	NO	
	Manhole required at all connections to multiple family, comm., etc.	1.5 m inside PL	

TOWN OF GEORGINA
Drawing Review Check List
Subdivisions

File No.:_____
Project:_____
Drawing No._____ Submission:_____

LOT GRADING:			
	Minimum Swale Grade	1%	
	Driveway Grade	1% to 8%	
	Maximum lot gradient	5%	
	Minimum lot gradient	2%	
	Maximum slope gradient	3:1 or 4:1 refer to specification	
	Minimum swale depth	0.15 m	
	Maximum swale depth	0.45 m	
	Maximum flow allowable in a side yard swale shall be from	2 lots + that from 2 adjacent lots	
	Maximum flow in a rear yard swale:	3 rear yards or 450 m^2	
	Maximum Length of Swale	90 m	
	Maximum area contributing to a rear yard swale	450 m^2	
	Maximum distance from rear lot line to centre of swale	1.2 m	
	Erosion Control required when swale velocity exceeds	1.5 m/s	
	Location of Catch Basin Leads: Minimum from lot line	1.0 m	
	Required easement for catch basin leads	3.0 m	
	Centerline of catch basin top to any property line - minimum	1.2 m	

Checklist for Water/Wastewater Complex Works

This section provides checklists that are meant to assist designers working on water/wastewater projects (i.e. pumping stations, etc) in ensuring that:

- information is complete and consistent throughout the design notes, documents & drawings
- sufficient information is provided for preparing specifications
- critical technical issues are addressed
- field staff is supplied with appropriate information during construction and commissioning phases

General

Have all the necessary applications for approvals been processed/provided?

- MTO
- MOE
- MNR
- Region of York,
- Conservation Authority,
- Bell, Hydro, Gas, Cable TV,
- Railways, Health Unit, FOC (DFO), HRDC (Labour Canada)

Designs, Specifications

- Have quantities been calculated?
- Is a soils report available and is it to be included in submission?
- Are "test digs" to be conducted?
- Any specific periods when certain portions of the work must be completed (work near watercourses, etc.)?
- Have arrangements and dates been made with outside utility companies for the supply of services or removal of existing plant (poles, three phase power)? This notification must be provided in the early stages of the project.
- the Contractor should have similar experience?
- Who provides layout - Contractor or Consultant?
- Maintenance Period? Final Acceptance?
- Provide copies of catalogue cuts
- Are Hydro and Bell available at site?
- Any restrictions on working times and days?
- Is the Contractor required to do any testing or provide certificates of inspection?
- Has a comprehensive list of equipment requiring shop drawings and factory tests been prepared?
- Have all property/easement acquisition issues been resolved?
- Commissioning and start-up requirements
- Is well point dewatering a possible requirement?
- What other start-up requirements may be applicable? (ie. provision of chemicals, filling of tanks, lagoons etc., disinfection of tanks/pipes)
- What supplementary equipment is to be provided? (lab sampling, lifting devices, portable pumps/compressors/generators, safety, tools, spare parts, maintenance, access equipment, etc.)

Drawings

- Have service elevations been shown? Invert elevations (sewers)? header pipe elevations?
- Have all special details been shown on the drawings?
- Have all pump capacities, equipment models, pressure switch settings, valve settings, level settings, pipe elevations, start/stop elevations been shown on the drawings?
- Are OPSD's, including modifications, shown on the drawings?
- Are actual OPSD details (not reference numbers) shown?
- Check scales on all detail drawings to be sure they match scale shown on title block.
- Have chemical injection points been shown?
- Thrust blocks - restraint requirements, calculations?
- Overflows - requirements, locations, outlet control, sizing, materials?
- Acceptable equipment model numbers?
- dimensioned distances from walls to important major pieces of equipment (pump)?
- Required clearances? (draw drawings to scale whenever possible. use schematic representation with caution ie. space limitations small piping only)
- Are both underground and overhead utilities shown on drawings?
- Is the cover above services adequate at ditch lines? Is box insulation required?
- Have all opportunities for common trenching been identified?
- Are the minimum cover requirements consistent throughout the specifications/drawings?
- If the floors in plants become wet, is millwork protected from damage?
- Should any openings be provided with screens, flap gates etc.?
- Is the intended door swing direction included on the drawings and coordinated with light switches shown on electrical drawings (ie. switch not to be located behind an open door)?
- Are all connection points and limits of piping identified?
- Have door sizes, and lifting mechanisms been reviewed to ensure all equipment can be moved to allow for original installation and future maintenance/removal?
- Are all existing underground and overhead utilities shown on the drawings (Bell, Gas, Hydro, Cable TV)?
- If buildings are being constructed, do they comply with the local by-laws and zoning setback requirements?

Design - Notes

- Do the design notes include:
  - name of designer
  - date of work
  - project number
  - page numbers
- Are summaries provided for key design information, such as:
  - design populations
  - design flows
  - capacities
  - equipment selected (capacity, power ratings, manufacturer, model number etc.)

Design - General

- Has a "common sense" review been done to ensure that all design values make sense?
- Are all units consistent?
- Have type and class of pipe been specified? Type of bedding?
- Has corrosion protection on piping and equipment been addressed?

- Have buoyancy calculations been done? (structures, pipes, etc.)
- Have hydraulic surges been considered?
- Has air relief/vacuum conditions been addressed?
- Have flood lines been considered for all facilities?
- Have critical failure modes been identified, addressed and checked?
- Is adequate space available for storage of chemicals and other maintenance materials?
- Do all exterior facilities exposed to the elements have proper provision for snow, ice and surface water. (ie. trough drains, snow removal, safety considerations etc.)
- Are there any requirements to provide air gaps or backflow preventers to avoid contamination of the potable water supply?
- Have the sequence, location of chemical addition been appropriately considered and included in contract drawings/documents?
- Have process schematics been prepared?
    - hydraulic flows/profiles
    - treatment processes (isometric drawings)
    - air/pneumatic systems
    - chemical feed
    - hot and cold water piping
- Have set points for control devices been determined?
    - pump start and stop, low level lockout, reset, high level alarm
    - pressure switch settings
    - pressure relief, sustaining valve reducing valve settings etc.
    - ramp time settings for solid state starters
- Have tank vents been appropriately located and sized?
- Where is water service coming from (individual well or municipal supply)?
- Where does sanitary sewage and storm drainage go (septic system, wet well, municipal sewer etc.)?

Design - Pumps

- The pumps are sized and selected before the layout and detail design of the pumping station layout.
- The design notes are standardized so that they can be easily checked without having to reinvent the wheel.
- All design notes are to include the following items and in this order (no exceptions):
    - the name of the designer
    - the date of the work
    - project number
    - heading for what pump is being designed.
- The description of the pumps, i.e. low lift pumps to be installed in wet well, pumping to the open top of the gravity water treatment plant.
- The design flow rate and basis for how it was established.
- The preliminary TDH estimate based on the diagram.
- The basic calculations should include:
    - the static head at start condition
    - the status head at the stop condition.
- The friction calculation on the suction side of the pump as a total of the minor losses.
- The friction calculation on the discharge side of the pump as a total of the minor losses.
- If the pump is operating under suction lift condition, the calculation of the available NPSH(a).
- The calculation of the NPSH(r) comes later after consulting the manufacturer's catalogue.

- The calculation of the system curve points for the maximum and minimum operating conditions (i.e. low and high water levels); the table should have at least the following columns Q, static, friction, total dynamic head.
- Select the correct type of pump for the application although this has probably been determined.
- Select the appropriate model number for the operating point at maximum efficiency.
- Reputable manufacturer should always be the basis for selection, select around the brand names.
- Consider the materials of construction, i.e.: stainless steel is better than plastic (no argument).
- Identify the pump manufacturer and model number, specify the Q, TDH, Hp.
- Is existing piping capable of withstanding new pressures created by new pumping equipment, tower, standpipe etc.
- Is system freeze protection required?

Design - Safety

- Explosion proof requirements, gas detection, railings, fall arrest, harnesses, retrieval devices, guards shrouds, hatches, disconnects, emergency stops, labelled capacity of lifting devices, lighting?
- Are there any particular signage/fencing/locking requirements?
- Do any surfaces require special provision to avoid slippery conditions when wet?

Coordination - Structural/Architectural

- Have all significant static/dynamic loads been identified?
  - heavy equipment
  - vibrations
  - expansion/contraction
  - equipment and other loads (tankage, piping etc.) supported from walls/ceilings/floors
  - thrust blocking
- Pad requirements?
- Containment walls/curbs/coatings?
- Ramp requirements?
- Wall/ceiling penetrations/openings: ducts, pipes, conduits, hatches, vents, doors, windows (coordinate openings with mechanical and electrical)?
- What walls are fire rated and labelled?
- Is a Building Code review required?

Coordination - Electrical

- Has mechanical equipment involving electrification been selected according to the power supply chosen by the electrical sub-consultant?
- Are conduits to be exposed or concealed? Have potential conflicts relating to conduits been considered?
- background information regarding available power supply (grid, remote, voltage, phase, operating authority, limits of existing servicing etc.)
- total connected load summary
- comprehensive equipment list
- summary of regulatory requirements/agencies
- explosion proof requirements/classifications

System Control:

- microprocessor based (PLC) vs. relay logic
- printer interface
- telemetry requirements, means of communication (avail)
- SCADA/digisponder/dialer
- data logging/output

Alarms:

- for annunciation at facility; (visual, audible, printed) beyond facility (SCADA, etc.)
- annunciation/acknowledge/reset

Displays:

- equipment status (on,off)
- analyzer/meter readings

Safety:

- explosion proof requirements, disconnects, emergency stops

Backup Power Requirements:

- powers sources; generators, batteries
- emergency lighting
- default conditions of equipment
- define scope of auxiliary power requirements

Variable Speed Pumping/Harmonics:

- potential distortion/interference - radio, controls

Regulatory Requirements:

- Labour Canada: - fire pump control (lockout, minimum run)
- ULC requirements
- Ontario Hydro - full/reduced voltage starters
- extension of power - define responsibilities financial and otherwise

- Bell Canada - extension of services
- filtering requirements
- line types (designated, Class C, voice grade)

Enclosures:

- wet environments

Breakers:

- coordination study

Other:

- cycle counters

Coordination - HVAC

- Have heat loss and ventilation calculations been done for **final** building construction and layout?
- Are there any special ventilation requirements (ie. chemical area exhausts, make up air for air compressors/blowers, wet well exhausts, diesel generator cooling, etc.)?
- Who is specifying the electrical heaters (mechanical or electrical)?
- Controls split: 100 volts and over volts AC - All controls by electrical; under 100 volts by mechanical. All humidistat thermostats, etc. by mechanical.
- If air conditioning - Is there an economizer on unit? Are A/C calcs done for final building and layout?
- Does the structural engineer and architects know about the size and locations of all HVAC elements that penetrate the strictures?

24-Nov-11

APPENDIX C

Requirements for Preliminary Acceptance and Final Assumption

Town of Georgina
Development Design Criteria and Standards

2013

PRELIMINARY ACCEPTANCE OF UNDERGROUND WORKS

Check List

THE FOLLOWING DOCUMENTATION IS REQUIRED TO BE SUBMITTED TO THE TOWN ALL TOGETHER IN ONE (1) PACKAGE BY THE ENGINEER. PARTIAL SUBMISSION WILL NOT BE ACCEPTED:

- ❑ Engineer's Certificate of Completion of Underground Works
- ❑ Electrical Engineer's Certificate of Completion
- ❑ ESA Approval Certificate
- ❑ Clearance from the Town's Electrical Contractor regarding the operation of streetlights
- ❑ Statutory Declaration
- ❑ Storm and Sanitary Sewers – flush and video inspection report and deficiencies rectified
- ❑ Oil/Grit Separator – Certificate of Installation & Maintenance Agreement
- ❑ Rear Lot Catch Basin Certification
- ❑ Written clearance from Waterworks – for fire hydrants, secondary valves and mainline valves
- ❑ Watermain Testing and Commissioning Reports
- ❑ A certificate shall be submitted by a qualified consultant identifying that all lands to be conveyed to the Town are clear of contaminants, noxious or deleterious substances
- ❑ Documentation of satisfactory completion of all required inspections below

THE FOLLOWING INSPECTIONS ARE REQUIRED TO BE COORDINATED AND DOCUMENTED BY THE DEVELOPER'S ENGINEER:

The following inspections require the presence of:

Engineer and the Town's Engineering Division

- ❑ Storm Sewer – deflection test and air test for PVC sewers
- ❑ Sanitary Sewer - testing in accordance with York Region's 'Sanitary sewer system inspection, testing and acceptance Guideline', October 2011, as amended.*
  ***All sewers shall be cleaned and flushed prior to testing
- ❑ Traffic signs – street signs, regulatory signs as required, unassumed road signs
- ❑ All SWM facilities including outfalls are complete and operational
- ❑ Valves and valve chambers, hydrants and pedestals shall be fenced
- ❑ Road structure including granular, base curb and base course asphalt

Engineer, Contractor, Town's Engineering Division and Waterworks Division

- ❑ Storm and Sanitary Sewers – visual inspection of benching, MH's, covers, CB's and RLCB's
- ❑ Testing and commissioning of sanitary pumping station (if required)
- ❑ Testing and commissioning of watermain booster station (if required)

Engineer, Contractor and Town's Waterworks Division

- ❑ Watermain – testing in accordance with Waterworks Operating Procedure W/WW11 - New Watermain Testing and Commissioning
- ❑ Final Connections and Hydrant Flow Testing

All installation and testing shall be as per Ontario Provincial Standard Specifications, Ontario Provincial Standard Drawings and approved Engineering Drawings.

THE FOLLOWING DOCUMENTATION IS REQUIRED TO BE SUBMITTED TO THE TOWN ALL TOGETHER IN ONE (1) PACKAGE BY THE ENGINEER. PARTIAL SUBMISSION WILL NOT BE ACCEPTED:

As-Built Drawings (complete sets – engineering, landscaping, design sheets):

- ❑ 1 reproducible set of mylar film drawings being a min. 3mm and double matt signed and stamped
- ❑ 4 full sets of white prints signed and stamped
- ❑ 1 compact disk (CD) of all engineering drawings and storm and sanitary design sheets which have been scanned in original scale in PDF and TIFF formats signed and stamped
- ❑ 1 compact disk (CD) of all engineering drawings in AutoCAD format
- ❑ As-built survey of Stormwater Management Pond – 2 white prints and 1 compact disk which has been scanned in original scale in PDF and TIFF formats
- ❑ A PDF digital copy of the reviewed Stormwater Management Report

Service Records

- ❑ 1 set of signed service records shall be provided on the Town of Georgina "Service Record" Form, completed all to the satisfaction of the Water/Wastewater Supervisor, complete with Assessment Roll numbers
- ❑ 1 compact disk (CD) of all signed service records, scanned in original scale in PDF format

Submissions

- ❑ Detailed list of infrastructure to be assumed, itemized and complete with quantities and values to be prepared for asset management – 1 compact disc (CD) in Microsoft Excel format (format of spreadsheet to be approved by Asset Management Coordinator), as well as, two paper copies
- ❑ Consulting Engineers Certificate of Completion
- ❑ Landscape Architects Certificate of Completion (All landscape items including but not limited to: streetscaping, pond plantings, fence location, block plantings, etc.)
- ❑ Written Clearance from Parks & Facilities Division – for parks and open spaces
- ❑ Statutory Declaration
- ❑ Written clearance from Water/Wastewater Supervisor – hydrants, secondary valves, main line valves and water service boxes
- ❑ OLS Certificate – found or replaced bars
- ❑ Benchmarks
- ❑ Storm and Sanitary Sewers – flush and video inspection report and deficiencies rectified
- ❑ Appropriate sized water meter
- ❑ Documentation of satisfactory completion of all required inspections below

THE FOLLOWING INSPECTIONS ARE REQUIRED TO BE COORDINATED AND DOCUMENTED BY THE DEVELOPER'S ENGINEER AND REQUIRE THE PRESENCE OF:

Engineer and the Town's Engineering Division

- ❑ Grading – sod (all lots to be graded and sodded)
- ❑ All Silt Fence to be Removed
- ❑ Silt Control to be Removed in Rear Lot Catch Basins
- ❑ Asphalt, Curb, and Sidewalk Inspections - cracks and settlements
- ❑ Streetlight Inspection – pole and fixture
- ❑ Utility and Transformer Boxes – secured/bolted, settlements
- ❑ Bus Stop pads
- ❑ Traffic Signs and Pavement Markings
- ❑ Access Road to be Surfaced as Required
- ❑ Other Outstanding Issues/Homeowner Complaints

Engineer, Contractor and the Town's Engineering Division and Waterworks Division

- ❑ Storm and Sanitary Sewers – visual inspection of benching, MH and CB's, covers, CB's and RLCB's – filter cloth removed. **– Please note that all as-built information (drawings and service records) are required to be provided to the Town prior to scheduling the inspections**. ***The consultant shall provide traffic protection for the duration of the inspection in accordance with Book 7.

Engineer, Contractor and the Town's Waterworks Division

- ❑ Water Service Boxes, Main Line and Secondary Valves (inspection for operation) – all services are required to be painted blue and a blue paint mark on the curb to signify the service location. **– Please note that all as-built information (drawings and service records) are required to be provided to the Town prior to scheduling the inspections**.
- ❑ Tracer wire for watermains and forcemains

Engineer, Landscape Architect and the Town's Recreation Parks and Culture - Horticulture

- ❑ Tree Inspection including streetscaping, entrance features and other landscaping on road allowances **– Please note that landcape as-built drawings are required to be provided to the Town prior to scheduling the inspections**.

FINAL ASSUMPTION

Check List

THE FOLLOWING DOCUMENTATION IS REQUIRED TO BE SUBMITTED TO THE TOWN ALL TOGETHER IN ONE (1) PACKAGE BY THE ENGINEER. PARTIAL SUBMISSION WILL NOT BE ACCEPTED.

- ❑ Engineer's Final Certificate of Completion
- ❑ Landscape Architects Final Certificate of Completion (All landscape items including but not limited to: streetscaping, pond plantings, fence location, block plantings, etc.)
- ❑ All documentation as required by the MOE Environmental Compliance Approval for SWM facility
- ❑ Statutory Declaration
- ❑ Storm and Sanitary Sewers – flush and video inspection report
- ❑ Written clearance from Water/Wastewater Supervisor – hydrants, secondary valves, main line valves and water service boxes
- ❑ Documentation of satisfactory completion of all required inspections below

THE FOLLOWING INSPECTIONS ARE REQUIRED TO BE COORDINATED AND DOCUMENTED BY THE DEVELOPER'S ENGINEER:

The following inspections require the presence of:

Engineer and the Town's Engineering Division

- ❑ Grading – sod
- ❑ Asphalt, Curb, and Sidewalk Inspections - cracks and settlements
- ❑ Streetlight Inspection – re-lamp and clean
- ❑ Utility and Transformer Boxes – secured/bolted, settlements
- ❑ Bus Stop Pads
- ❑ Traffic Signs and Pavement Markings
- ❑ Unassumed Road Sign has been removed
- ❑ All silt and sediment control has been removed
- ❑ Other Outstanding Issues/Homeowner Complaints
- ❑ Obstructions on Road Allowance (fences, armour stone, landscaping in daylight triangle)

Engineer, Contractor and the Town's Engineering Division and Waterworks Division

- ❑ Storm and Sanitary Sewers – visual inspection of benching, MH and CB's, covers, and RLCB's – filter cloth removed, settlements repaired. ***The consultant shall provide traffic protection for the duration of the inspection in accordance with Book 7.**

Engineer, Contractor and the Town's Waterworks Division

- ❑ Water Services, Main Line Valves and Hydrants (inspection for operation) – all services are required to be painted blue and a blue paint mark on the curb to signify the service location.

Engineer, Landscape Architect and the Town's Recreation Parks and Culture - Horticulture

- ❑ Tree Inspection including streetscaping, entrance features and other landscaping on road allowances – please note that a clean set of as-built landscape drawings are required to be provided to the Town prior to scheduling the inspection.

SITE PLAN SECURITY RELEASE

General List – Specific Items will be identified in the Site Plan Agreement

Check List

The following documentation is required to be submitted to the Town all together in one (1) package by the Engineer. Partial submission will <u>not</u> be accepted.

- ❑ As-Built Drawings (complete sets: Engineering, Landscape, Architectural, Electrical):
  - ❑ 1 reproducible set of mylar film drawings being a min. 3mm and double matt
  - ❑ 4 full sets of white prints
  - ❑ 1 compact disk (CD) of all drawings which have been scanned in original scale in PDF and TIFF formats
  - ❑ 1 compact disk (CD) of all drawings in AutoCAD format
  - ❑ A PDF digital copy of the reviewed Stormwater Management Report

- ❑ Service Records
  - ❑ 1 set of service records shall be provided on the Town of Georgina "Service Record" Form as approved by the Town's Water/Wastewater Supervisor
  - ❑ 1 compact disk (CD) of all service records, scanned in original scale in PDF format

- ❑ Engineer's Certificate of Completion
- ❑ Landscape Architects Certificate of Completion
- ❑ Oil/Grit Separator – Maintenance Agreement (if Oil /Grit Separator installed)
- ❑ Statutory Declaration
- ❑ Clearance from Water/Wastewater Supervisor

Clearance from the following will be required prior to release and submission:

- ❑ Planning Division
- ❑ Zoning Examiner
- ❑ Building/Plumbing Division

The following inspections are required to be coordinated by the Developer's Engineer:

The following inspections require the presence of:

Engineer and the Town's Engineering Division

- ❑ Grading – sod, all disturbed areas are sodded and all in accordance with the approved plan
- ❑ Asphalt, Curb, Sidewalk, Parking Lot Inspections - cracks and settlements, bumper curbs, ponding area for Stormwater Management
- ❑ Oil/Grit Separator (if installed)
- ❑ Traffic Signs and Pavement Markings

Engineer, Contractor and the Town's Engineering Division and Waterworks Division

- ❑ Storm and Sanitary Sewers – **LAST MANHOLE BEFORE TIE INTO TOWN SERVICES ONLY** – visual inspection of benching, MH and CB's, covers, CB's – filter cloth removed, settlements – please note that all as-built information (drawings and service records) are required to be provided to the Town prior to scheduling the inspections
  ***** PLUMBING DIVISION INSPECTS INTERNAL SERVICING*****

Engineer, Contractor and the Town's Waterworks Division

- ❑ Water Services/Main Line Valves (inspection for operation) – all services are required to be painted blue and a blue paint mark on the curb to signify the service location - please note that all as-built information (drawings and service records) are required to be provided to the Town prior to scheduling the inspections

Engineer and the Town's Engineering Division <u>OR</u> Horticulture Division

- ❑ Tree Inspection including streetscaping, entrance features and other landscaping on road allowances – please note that a clean set of as-built landscape drawings are required to be provided to the Town prior to scheduling the inspection

SITE PLAN SECURITY RELEASE

General List – Specific Items will be identified in the Site Plan Agreement

Check List

THE FOLLOWING DOCUMENTATION IS REQUIRED TO BE SUBMITTED TO THE TOWN ALL TOGETHER IN ONE (1) PACKAGE BY THE CONSULTING ENGINEER. PARTIAL SUBMISSION WILL NOT BE ACCEPTED.

As-Built Drawings (complete sets: Engineering, Landscape, Architectural, Electrical):

- ❑ 1 reproducible set of mylar film drawings being a min. 3mm and double matt
- ❑ 4 full sets of white prints
- ❑ 1 compact disk (CD) of all drawings which have been scanned in original scale in PDF and TIFF formats
- ❑ 1 compact disk (CD) of all drawings in AutoCAD format

Service Records

- ❑ 2 sets of service records shall be provided on the Town of Georgina Service Record Forms in a 3 ring binder
- ❑ 1 compact disk (CD) of all service records, scanned in original scale in PDF format

Submissions

- ❑ Consulting Engineers Certificate of Completion
- ❑ Landscape Architects Certificate of Completion
- ❑ Oil/Grit Separator – Yearly Maintenance Agreement (if Oil /Grit Separator installed)
- ❑ Statutory Declaration
- ❑ Written clearance from Water/Wastewater Supervisor
- ❑ Documentation of satisfactory completion of all required inspections below

The Civil Consulting Engineer shall obtain and provide written clearance from the following prior to security release:

- ❑ Planning Division
- ❑ Zoning Examiner
- ❑ Building/Plumbing Division

THE FOLLOWING INSPECTIONS ARE REQUIRED TO BE COORDINATED BY THE DEVELOPERS CONSULTING ENGINEER:

The following inspections require the presence of:

Consulting Engineer and the Engineering Division

- ❑ Grading – sod, all disturbed areas are sodded and all in accordance with the approved plan
- ❑ Asphalt, Curb, Sidewalk, Parking Lot Inspections - cracks and settlements, bumper curbs, ponding area for Stormwater Management
- ❑ Oil/Grit Separator (if installed)
- ❑ Traffic Signs and Pavement Markings

Consulting Engineer, Contractor, Engineering Division, Waterworks Division

- ❑ Storm and Sanitary Sewers – **LAST MANHOLE BEFORE TIE INTO TOWN SERVICES ONLY** – visual inspection of benching, MH and CB's, covers, CB's – filter cloth removed, settlements – please note that all as-built information (drawings and service records) are required to be provided to the Town prior to scheduling the inspections.
  ***** PLUMBING DIVISION INSPECTS INTERNAL SERVICING*****

Consulting Engineer, Contractor, Waterworks Division

- ❑ Water Services/Main Line Valves (inspection for operation) – all services are required to be painted blue and a blue paint mark on the curb to signify the service location - please note that all as-built information (drawings and service records) are required to be provided to the Town prior to scheduling the inspections.

Consulting Engineer, Engineering Division OR Leisure Services - Horticulture Division

- ❑ Tree Inspection including streetscaping, entrance features and other landscaping on road allowances – please note that a clean set of as-built landscape drawings are required to be provided to the Town prior to scheduling the inspection.

APPENDIX D

Storm and Sanitary Sewer Design Sheets

Town of Georgina
Development Design Criteria and Standards

2013

TOWN OF GEORGINA
STORM SEWER DESIGN SHEET

TOWN OF GEORGINA

Design Parameters (5 Year Storm)

A = drainage area (ha)	T_{init}(min)=	10
C = runoff coefficient	A=	853.608
T_c = time of concentration	B=	4.669
	C=	0.766

Design Parameters (100 Year Storm)

A = drainage area (ha)	T_{init}(min)=	10
C = runoff coefficient	A=	1426.408
T_c = time of concentration	B=	5.273
	C=	0.759

Project / Subdivision :

Consulting Engineer :

Project No.:

Design Equations

$$I = \frac{A}{(t + B)^C}$$

$$Q = 2.78 \times A \times C \times I$$

Prepared by:

Checked by:

Last Revised:

NOTE: The pipe capcity is limited to maximum values according to Table 3 of the Design Manual.

System to be Designed for: 5 Year Storm

Notes/Comments:

Location			Drainage Area Characteristics				Rainfall / Runoff			Sewer Data									Remarks
Street	From MH.	To MH.	Area (ha)	C	AC	Accum. AC	T_c (min)	I5 (mm/hr)	Q m^3/sec	Diameter (mm)	Length (m)	Slope (%)	Qmax (m3/s)	% Full	V (Full) (m/s)	V (Actual) (m/s)	Sect. Time	Accum. Time	
Sample Street	MH15	MH13	0.18	0.75	0.14	0.14	10.00	109.09	0.041	300	66.8	1.00	0.101	40.6%	1.38	1.30	0.86	10.86	

TOWN OF GEORGINA
SANITARY SEWER DESIGN SHEET

TOWN OF GEORGINA

Project / Subdivision : _____ **Prepared by:** _____

Consulting Engineer : _____ **Checked by:** _____

Project No.: _____ **Last Revised:** _____

Design Parameters

Residential Density =	2.9 cap/unit	Residential =	365	L/cap/day
Manning 'n' =	0.013	Industrial =	35	cap/ha
Extraneous Flow =	0.21 L/s/ha	Institutional =	28	cap/ha
		Commercial =	18	m^3/ha*day

Design Equations

$M(r) = 1 + \frac{14}{4 + \sqrt{P}}$ $\quad Q(i) = i \times_j A \quad Q(d) = {}_j(Q(x))$

$M(ICI) = 2.00 \quad Q(r) = \frac{P * q(r) * M}{86400}$

NOTE: The pipe capcity is limited to maximum values according to Table 4 of the Design Manual.

Notes/Comments:

Location					Individual Values						Cumulative Values									Flow Data						Sewer Data							Remarks
Street	From		To		Industrial Area	Commercial Area	Institutional Area	Residental Area	Residential Units	Residental Population	Industrial P.F.	Industrial Area	Commercial P.F	Commercial Area	Institutional P.F.	Institutional Area	Residental P.F.	Residental Area	Residental Population	Industrial Peak Flow (L/s)	Commercial Peak Flow (L/s)	Institutional Peak Flow (L/s)	Population Peak Flow (L/s)	Peak Extraneous Flow (L/s)	Total Design Flow (L/s)	Length	Pipe Size	Type of Pipe	Grade	Full Flow Capacity	Full Flow Velocity	Actual Velocity	
	MH #	Inv	MH #	Inv	(ha)	(ha)	(ha)	(ha)	#	cap.	M(ind)	A(ind)	M(com)	A(c)	M(inst)	A(ins)	M(r)	A(r)	P	Q(ind)	Q(c)	Q(ins)	Q(r)	Q(i)	Q(d)	(m)	(mm)		(%)	(L/s)	(m/s)	(m/s)	
Sample Street	2A	S	3A	N	2.50	0.60	1.00	5.00	30	87.0	2.00	2.50	2.00	0.60	2.00	1.00	4.00	5.00	87.0	0.74	0.25	0.12	1.47	1.91	4.49	50.0	200	PVC	0.50%	23.2	0.74	0.55	

APPENDIX E

Watermain Testing Procedure

Town of Georgina
Development Design Criteria and Standards

2013

SUBJECT: New Water Main Testing and Commissioning	**AUTHORITY & SEC:** Safe Drinking Water Act, 2002, S.O. 2002, c. 32 AWWA Standard C651-05 Ontario Provincial Standard Specification 701				
DEPARTMENT: Engineering and Public Works	**PAGES:** 12		**DAY**	**MONTH**	**YEAR**
			12	12	08
		REV	17	06	13
APPROVED BY: Director of Engineering and Public Works	**CONTACT POSITION FOR INFO:** Director of Engineering and Public Works				

The Corporation of the Town of Georgina is responsible for the operation, maintenance and repair of the water distribution system.

This procedure covers the cleaning, disinfection, hydrostatic testing and bacteriological sampling of all new potable watermains including above ground temporary watermains, private watermain systems and (ICI) Industrial, Commercial and Institutional development and/or redevelopment subject to the Ontario Building Code.

OBJECTIVE

To provide watermain testing and commissioning procedures in accordance with recognized methods and practices while protecting the existing water distribution system from bacteriological contamination and the natural environment from adverse effects that may be caused as a result of this testing procedure.

PURPOSE

To provide contractors, consultants and Town of Georgina staff with a standardized method for the testing and commissioning of new potable watermains.

GENERAL

The new watermain shall not be connected to the existing water distribution system prior to completion of the cleaning, disinfection, hydrostatic testing and bacteriological sampling except temporarily through an approved, certified and tested backflow device unless otherwise approved by the Department of Engineering and Public Works Water/Wastewater Division.

All locations where the new watermains are to be connected to the existing watermains they shall be stopped short of the connection point. Swabbing launch points shall be brought to the surface, capped, restrained and fitted with an appropriately sized blow off and valve.

The Contractor carrying out the cleaning, testing, disinfection, hydrostatic testing and bacteriological sampling shall submit a copy of their Watermain Disinfection Policy/Procedure to the Department of Engineering and Public Works Water/Wastewater Division for approval prior to commencing work.

All bacteriological sampling performed by the Contractor shall be carried out by persons holding valid Ministry of the Environment Water Distribution or Water Quality Analyst Certificates. Copies of same are to be submitted to the Department of Engineering and Public Works Water/Wastewater Division prior to commencing work.

The Project Consultant and the Department of Engineering and Public Works Water/Wastewater Division shall witness all cleaning, disinfection, hydrostatic testing and sampling activities performed by the Contractor. The Contractor carrying out the cleaning and disinfection shall document all activities on the Town of Georgina FORM 009 - Watermain Testing and Commissioning Report. All such records shall be submitted to Department of Engineering and Public Works Water/Wastewater Division for approval prior to making final connections to the existing water distribution system.

A proposed work schedule shall be submitted a minimum of three (3) working days prior to commencement of any testing related to this procedure by the Project Consultant to the Department of Engineering and Public Works Water/Wastewater Division for approval. The Building Department shall be notified of the same for all projects under ICI categories.

No deviations from the forgoing procedure shall be permitted unless submitted in writing by the Project Consultant to the Department of Engineering and Public Works Water/Wastewater Division for approval. Any proposed deviations shall reference recognized methods and

practices for the cleaning, disinfecting, hydrostatic testing and sampling of potable watermains.

VALVE OPERATION

All existing water distribution system valves shall only be operated by Town of Georgina Water/Wastewater Division operators unless otherwise approved by a Town of Georgina Water/Wastewater Operator. The Contractor is to contact the Department of Engineering and Public Works Water/Wastewater Division to make arrangements for this operation.

TESTING PROCEDURE

Chlorine residuals and turbitity shall be tested with an approved electronic tester such as a Hach Pocket Colorimeter or equivalent. Copies of the manufacturer's calibration certificates must be submitted to the Department of Engineering and Public Works Water/Wastewater Division prior to commencing work.

A) Sample Points Drawings

A separate drawing labeled "Sample Point Drawing" is required to be submitted for approval with the submission of engineering drawings for proposed development(s) as per the Town of Georgina development design criteria

Sample Point Drawings shall show the following information:

1) Location of existing potable water supply indicating "connect to only with an approved and certified backflow device"
2) Swab launch points
3) Sample points
4) Turbidity sample locations
5) All watermains, mainline valves, hydrants and secondary valves
6) All water services
7) De-chlorination points and discharge locations
8) Flow requirements indicating existing water distribution system static pressure at by pass location and achievable flushing velocity
9) Location and size of the by-pass

Where the scope of the work requires the watermain to be tested in phases this shall be indicated on the Sample Point drawings.

All identified locations to be used for any type of sampling or testing must reference municipal addresses as assigned by the Town and/or lot numbers as

per the registered M-plan. Where this is not practical, a clear description of the sample or testing location must be given.

NOTE - All sample and test points are to be brought to the surface complete with a valve.

B) Loading of Watermain

Prior to loading of the new watermain all mainline valves and fire hydrant secondary valves in the new system shall be checked to ensure they are in a full open position. This task shall be witnessed by the Department of Engineering and Public Works Water/Wastewater Division.

During loading of the watermain, all service connection curb stops and blow offs shall be opened expelling all air from the service line.

The new watermain shall be loaded with a by-pass via the approved potable water supply as indicated on the Sample Point Drawings. The by-pass shall be used for all water supply unless otherwise noted on the Sample Point Drawings and approved by the Department of Engineering and Public Works Water/Wastewater Division.

The minimum size of the by-pass shall be 50mm (2 inch) in diameter, or larger in order to achieve a flushing velocity of .76 m/sec (2.5 ft/sec) and fitted with an approved and certified reduced pressure principle backflow device. A copy of the inspection record for the device is to be provided upon request.

Water Main Size		**Flow Required**	
(mm)	**(inches)**	**(ltrs/sec)**	**(gpm)**
100	4	6.3	82
150	6	12.6	183
200	8	25.2	326
250	10	37.9	509
300	12	56.8	733
400	16	100.9	1304
450 and larger *			

*** Flow requirements to be noted on the Sample Point Drawings.**

All materials used for the by-pass are to be approved for potable water supply and are subject to approval by Department of Engineering and Public Works Water/Wastewater Division.

The bypass shall be disconnected during the hydrostatic testing procedure.

The by-pass shall be permanently removed once all testing is completed and accepted. For direct bury installations, the saddles and associated piping shall be

removed and repair clamps installed in their place. For chamber installations, the main stops shall be removed and the by-pass opening closed in an approved manner. This task shall be witnessed by the Department of Engineering and Public Works Water/Wastewater Division.

C) Hydrostatic Testing

All above ground temporary watermains are not required to complete this section. A visual inspection for leaks shall be completed upon loading of the temporary watermain while maintaining existing water distribution system pressure. Any leaks found shall be corrected prior to swabbing and chlorination.

The watermain hydrostatic test is to be completed in the following manner:

General Procedure

Stage 1

The watermain shall be pressurized to 1035 kPa (150 psi) and maintained there for one (1) hour during which time small pressure drops may be topped up to maintain the 1035 kPa (150 psi) testing pressure. The test section shall not exceed any of the isolated sections as indicated on the sample point drawing where the testing procedure is completed in phases as indicated on the Sample Point Drawings. If the test pressure drops significantly, the test section shall be isolated to a manageable area. At the end of the one (1) hour test period, the volume of water used to maintain the 1035 kPa (150 psi) is to be recorded on the Town of Georgina Watermain Testing and Commissioning Form by the Contractor.

Stage 2

The watermain pressure shall be reduced to 690 kPa (100 psi) and maintained there for one (1) hour with no pressure drops permitted.

When it is determined that the new watermain does not maintain the 690 kPa (100 psi) pressure test, the leak(s) shall be located and repaired and the hydrostatic test applied again beginning at Stage 1 until successful.

Polyethylene Pipe

An initial 3 to 4 hour expansion period, maintaining 1035kPa (150 psi) shall be performed. During this period makeup water may be added to maintain the test pressure. Immediately following the expansion period the test pressure of 1035kPa (150 psi) shall be maintained for a period of two (2) hours.

If the hydrostatic test is not successful, the leak(s) shall be located and repaired and the hydrostatic test applied again until it is successful.

Concrete Pressure Pipe

A 24 hour period of absorption shall be completed prior completion of the hydrostatic test. Following the absorption period the test pressure of 1035 kPa (150 psi) shall be maintained for two (2) hours.

If the hydrostatic test is not successful, the leak(s) shall be located and repaired and the hydrostatic test applied again until it is successful.

D) Swabbing

The watermain shall be loaded via the by-pass expelling all air from the watermain prior to the commencement of swabbing.

No swabs are to be inserted into the watermain during the construction process unless recorded on the Sample Point drawings and approved by the Department of Engineering and Public Works Water/Wastewater Division.

All swabs shall be new and sized a minimum of one (1) size larger in diameter than the watermain diameter and one and a half (1 ½) times longer in length of the diameter of the watermain .

All swabs inserted and removed by the Contractor are to be numbered and witnessed by the Project Consultant and the Department of Engineering and Public Works Water/Wastewater Division and recorded on the Town of Georgina **FORM 009 - Watermain Testing and Commissioning Report** by the Contractor.

All sections of the watermain shall be swabbed in such a manner that a minimum of three (3) swabs are used. All fire hydrants shall have a minimum of one (1) swab passed through them. At the discretion of the Project Consultant and/or the Department of Engineering of Public Works additional swabs may be required.

All stubs and/or dead ends of the watermain shall be provided with a temporary swab discharge point to allow for the removal of the swabs.

E) Flushing to Remove Turbidity

The watermain shall be flushed to remove any possible remaining air pockets and foreign matter from the watermain.

At the discretion of the Department of Engineering and Public Works Water/Wastewater Division flushing of the new watermain via the by-pass shall continue until such time as the turbidity levels taken using an approved Turbidimeter are less than 1 NTU.

The locations where turbidity samples are taken shall be indicated on the sample drawing. The turbidity testing shall be performed by the Contractor, witnessed by the Project Consultant and the Department of Engineering and Public Works Water/Wastewater Division and recorded on the Town of Georgina **FORM 009 - Watermain Testing and Commissioning Report** by the Contractor.

F) Disinfecting Watermain

The method of disinfection to be used is the continuous feed method unless otherwise approved by the Department of Engineering and Public Works Water/Wastewater Division.

The chlorine solution shall be applied so that the chlorine concentration is a minimum of 50 mg/l free chlorine residual throughout the new watermain system and does not exceed 100 mg/l free chlorine residual.

The chlorine solution is to be flowed through each hydrant, water service, sample point, blow-off and swabbing launch/discharge points. The high chlorine residual is to be measured by the Contractor at each location and recorded on the Town of Georgina **FORM 009 - Watermain Testing and Commissioning Report** by the Contractor.

Upon completion of the chlorination, the remaining chlorine solution within the tank is to be neutralized and disposed of in accordance with **AWWA C651 Sec.6 Appendix C.**

The chlorinated water shall be isolated in the system for a period of twenty-four (24) hours. After the required contact time, the chlorine residual shall be taken at each sample location by the Contractor and recorded Town of Georgina **FORM 009 - Watermain Testing and Commissioning Report** by the Contractor.

If the residual is above 40% of the original concentration, the chlorinated water is ready to be discharged from the system. (Example: If upon completion of chlorination process the recorded chlorine concentration level was 75ppm, the acceptable level after 24 hours of contact time would be 45ppm).

In the event that the residual is less than 40% of the original concentration of the chlorine, the system shall be discharged and neutralized, swabbed if necessary and re-chlorinated.

G) Removal and Disposal of Super-Chlorinated Water

Super-chlorinated water shall **not** be discharged from the new watermain unless neutralized with approved chemicals as per **AWWA C651 Sec.6 Appendix C.**

The super-chlorinated water shall be flushed from the new watermain via the by-pass through each hydrant, sample, blow-off and swabbing launch/discharge points until the chlorine residual matches that of the existing distribution system (bypass supply location).

The chlorine residual shall be checked at each discharge location by the Contractor, and recorded on the Town of Georgina **FORM 009 - Watermain Testing and Commissioning Report** by the Contractor.

The discharge of super-chlorinated water shall be monitored by the Contractor and witnessed by the Project Consultant and the Department of Engineering and Public Works Water/Wastewater Division. The free chlorine residual shall be tested at adequate intervals ensuring that any chlorine residual remaining will not have an adverse effect on the environment or other discharge locations. The results and times of the test results shall be recorded on the Town of Georgina **FORM 009 - Watermain Testing and Commissioning Report** by the Contractor.

The fresh supply water shall be left isolated within the new watermain system for a minimum of twenty-four (24) hours prior to bacteriological sampling.

H) Bacteriological Sampling

Two consecutive sets of bacteriological samples shall be taken and submitted to the York Durham Laboratory for analysis. The second set of samples is to be taken a minimum of 24 hours after the first set of samples.

A third set of bacteriological samples shall be taken and submitted to the York Durham Laboratory for analysis following the final connection(s) to the existing watermain.

Bacteriological sampling shall be completed by the Contractor unless otherwise approved.

All bacteriological sampling shall be witnessed by the Project Consultant and the Department of Engineering and Public Works Water/Wastewater Division.

All samples must be submitted to the York/Durham Laboratory for analysis on approved York Durham Laboratory Chain of Custody forms.

Copies of the completed York Durham Laboratory Chain of Custody forms are to be provided to the Project Consultant and the Department of Engineering and Public Works Water/Wastewater Division.

Copies of the York/Durham Laboratory samples results are to be provided to the Project Consultant and the Department of Engineering and Public Works Water/Wastewater Division.

The cost of all bacteriological sampling shall be charged back to the Development Owner unless otherwise specified.

I) Sample Results

Upon receiving two consecutive water sample results from the York Durham Laboratory that meet the requirements of the **Safe Drinking Water Act, 2002** – **Ontario Regulation 169/03** and all other testing procedures have been completed and accepted, the final connections to the existing water distribution system can be coordinated.

If sample results do not meet the requirements of the **Safe Drinking Water Act, 2002** – **Ontario Regulation 169/03** the watermain shall be re-sampled until two consecutive sets of sample results meet the requirements of the **Safe Drinking Water Act, 2002** – **Ontario Regulation 169/03** and /or retested at the direction of the Department of Engineering and Public Works Water/Wastewater Division. This may include additional swabbing, flushing, re-chlorinating, de-chlorinating and re-sampling.

J) Final Connections to Existing Mains and Acceptance

All final connections to the existing water distribution system shall be coordinated and witnessed by the Department of Engineering and Public Works Water/Wastewater Division

Upon receiving satisfactory bacteriological sample results permanent connections may be made to the existing water distribution system. Construction practices in accordance with **AWWA Standard C651-05** must be followed during installation of the final connection ensuring no contamination occurs to the new or existing water main**.**

All pipe, fittings and valve(s) required for the connection shall be hand swabbed and disinfected with chlorine meeting Town of Georgina Policy **WWW7 - Watermain Disinfection** prior to being installed, if the total length of the connection from the end of a new main to the existing main is equal to or less than 1 pipe length.

Upon completion of the final connection(s) to the existing water distribution system the new watermain shall be flushed and chlorine residuals taken and recorded on the **FORM 011 - Daily Chlorine Residual Log** by the Department of Engineering and Public Works Water/Wastewater Division.

Upon completion of the final connections, the third set of samples shall be taken. The watermain shall remain isolated by way of valves when possible upon completion of the sampling until the results of the third set have met the requirements of the **Safe Drinking Water Act, 2002** – **Ontario Regulation 169/03.**

At the discretion of the Department of Engineering and Public and Works Water/Wastewater Division additional bacteriological may be required prior to the watermain being placed in service. Upon receiving satisfactory bacteriological samples results of the same, the watermain can be turned on provided the completed **FORM 009 - Watermain Testing and Commissioning Report** has been received and approved by the Department of Engineering and Public Works Water/Wastewater Division and all other authorities having jurisdiction including but not limited to Town of Georgina Building Department approvals and water meter installations.

The cost of all bacteriological sampling shall be charged back to the Development Owner unless otherwise specified.

K) Additional Bacteriological Sampling

Where alternate methods of testing and commissioning have been approved which alter the procedures describe in Section A to Section J or at the discretion of the Department of Engineering and Public Works Water/Wastewater Division additional bacteriological samples may be required be taken at each sample location and submitted to the York/Durham Laboratory for analysis. Upon receiving acceptable sample results any final connections to the existing water distribution may be made and the water supply to the new watermain can be turned on provided the completed **FORM 009 - Watermain Testing and Commissioning Report** has been received and approved by the Department of Engineering and Public Works Water/Wastewater Division and all other authorities having jurisdiction including but not limited to Town of Georgina Building Department approvals and water meter installations.
.
The cost of all bacteriological sampling shall be charged back to the Development Owner unless otherwise specified.

L) On-going Maintenance Prior to Assumption by the Town of Georgina

Upon acceptance of the all testing and commissioning procedures by the Department of Engineering and Public Works Water/Wastewater Division and the final connections to the existing watermain have been made the Department of Engineering and Public Works Water/Wastewater Division shall ensure that the watermain system remains potable.

Ongoing water quality monitoring in accordance with the Town of Georgina **WWW4 - Water Quality Monitoring** Procedure shall be performed by the Department of Engineering and Public Works Water/Wastewater Division.

All costs associated with this practice shall be charged back to the development owner including all water costs, hydrant maintenance, bacteriological sampling and any other associated costs until final assumption of the project by the Town of Georgina.

References and Forms

Safe Drinking Water Act, 2002, S.O. 2002, c. 32

Ontario Regulation 169/03

Ontario Provincial Standard Specification 701

AWWA Standard C651-05

WWW4 - Water Quality Monitoring

WWW7 - Watermain Disinfection

FORM 009 - Watermain Testing and Commissioning Report

FORM 011 - Daily Chlorine Residual Log

APPENDIX F

Specifications For Cleaning and Painting of Fire Hydrants

Town of Georgina
Development Design Criteria and Standards

2013

SPECIAL PROVISIONS AND SPECIFICATIONS FOR CLEANING AND PAINTING OF FIRE HYDRANTS

1. SITE PREPARATION

1.1 Grass and tree branches that may touch the painted hydrants must be trimmed back and clippings disposed of off-site in an appropriate manner.

1.2 Care must be taken that paint is applied to hydrants only. Protection must be provided by use of tarpaulin, or drop clothe about the base of the hydrant; so that shrubs, trees or any other items nearby are kept free from paint. Special care must be taken to leave no spotting on sidewalks or driveways.

1.3 When painting is completed, the area about the hydrant must be left clean and undisturbed; any paint splatter, contaminated rags or trash must be removed. Freshly painted hydrants must have Wet Paint Signs attached. The signs shall be removed after a minimum 2 (two) hour dry period.

1.4 Hydrants must not be painted if they are wet due to rain or condensation. Toweling a hydrant dry before painting is not permitted. It is recommended that painting take place only on clear days with temperature ranging between 13 degrees and 35 degrees centigrade.

2. PAINT SPECIFICATIONS

2.1 Primer: One coat Benjamin Moore & Co. Ltd. M05 Rapid Dry metal Primer 4-5mm thick wet on all hydrants.

2.2 Finish coat: Two coats of Benjamin Moore & Co. Ltd. M22 Urethane Alkyd Gloss Enamel 4-5mm thick wet. The colour selection shall include L22-21 “Safety Red” and M22-82 “Safety Black”.

2.3 Solvent: Benjamin Moore & Co. Ltd. M94 shall be used to clean hydrant surfaces, and to remove any errant paint spotting.

2.4 Approved alternatives to above paints, primers and solvents.

3. PREPARATION FOR PAINTING

3.1 All hydrants must be thoroughly wire-brushed and the entire hydrant surface cleaned with M94 solvent prior to painting. Care must be taken to prevent solvent spotting on driveways, walks, or lawn surfaces.

3.2 The primer paint shall be applied immediately after M94 solvent wash.

3.3 Benjamin Moore M94 solvent must be used for the washing of the hydrant and the clean-up.

4. PAINTING PROCEDURE

4.1 One coat of Benjamin Moore M05 Rapid Dry Metal Primer must be applied by brush at a spread rate of 300 sq. ft per gallon; to give a 2mm dry coating.

4.2 Thirty minutes drying time shall be allowed, prior to applying the first finish coat of Benjamin Moore M22 Urethane Alkyd Gloss Enamel. The first coat must be applied within 3 (three) hours, otherwise the contractor must wait 30 (thirty) hours before applying over primer.

4.3 The second coat of Benjamin Moore M22 Urethane Alkyd Gloss Enamel shall be applied no sooner than 16 hours, and no later than 48 hours after the first coat.

4.4 Finish coats must be applied by brush at a spread rate of 300 sq. ft. per gallon.

4.5 Contractor shall ensure, that no paint is allowed to drip between the brass operating spindle, and bonnet cover. Hydrant port threads will be kept free of paint. Benjamin Moore M94 must be used for all clean up.

APPENDIX G

Approved Materials List

Town of Georgina
Development Design Criteria and Standards

2013

LIST OF ACCEPTABLE MATERIALS

APPROVED WATER SYSTEM MATERIALS:

Pipe:

450 mm or larger: Ductile Iron pipe, cement lined, manufactured to AWWA C151/A21.51, CL52 with cement lining to AWWA C104/A21.4.	Canada Pipe
400 mm or smaller: Polyvinylchloride pipe manufactured top AWWA C900, Class 150, DR18.	Diamond Plastics IPEX Inc. Royal Pipe

Fittings:

Ductile Iron, cement lined, conforming to AWWA C110/C111/A21.10.	Bibby Star Pipe Products Sigma Class 350

Gate Valves:

Valves 75 mm to 300 mm: Resilient seat gate valves conforming to AWWA C509.	Mueller NRS A-2360 Clow F6100 AVK Resilient Seat

Glands, Plugs, Caps:

Manufactured to CSA B131.9 and CSA B131.10

Joint Retainer Glands:

Use where required or specified for reinforcing mechanical joints.	Clow Canada EBBA Iron Romac Industries – Grip Ring Sigma – PV-Lok, One-Lok Uni-Flange – Series 400, 1300, 1350, 1360

Couplings:

Couplings for mains to be per AWWA C219. Centre sleeves and end rings to be ductile iron, be shop coated and meet AWWA C219 requirements.	Ford – FC1, FC2A Robar – 1408 Romac – 501 Rockwell – 441

Hydrants:

Conforming to AWWA C502, base to be 150 mm mechanical joint, dry barrel, c/w red body, fluorescent white caps and Storz nozzle (black)	Mueller – Century McAvity – M-67

Tapping Sleeve:

Stainless steel saddles are to be used on PVC pipe.	Ford – FAST (SS) Mueller – H-615 (SS) Robar – 6606 (SS) Romac – SST304 Smith Blair – 622, 663

Valve Boxes:

Slide type, 125 mm diameter, with 0.6 m adjustment	Bibby Mueller Domestic Foundry

Main Stops:

Plug valve type, AWWA C800-89, compression joint. (use stainless steel saddle on PVC pipes.)	Mueller – H15008 Cambridge – Series 102 Ford – F-1000-G

Curb Stops:

Ball valves only, per AWWA C800-89, compression joints.	Mueller – Oriseal, H15207, H15209 Ford – B44G Cambridge Brass – Century

Service Boxes:

D1, No.8 size, c/w stainless steel rods and pins.	Bibby Clow – D1 Mueller – A726-28

Couplings:

Couplings for services to be compression type per AWWA C800-89.	Mueller – D115403, H12940 Ford – C44G Cambridge Brass – 118

Sampling Station:

Kupferle Foundries – Eclipse No. 88 Model

Automatic Flushing Device:

Kupferle Foundries – #9800

Corrosion Protection:

Zinc Caps/Collars:

Install caps on every bolt of a fitting. Install 4 collars per water service	Protecto Caps, Sac Nuts Protecto Collars

Zinc Anodes:

Install 1 No.6 cad weld anode per watermain fitting. Attach 1 No.6 anode per service using hydro clamp.	Rustrol, Corexco Erico

Anticorrosion wraps, coatings:

Cover entire fitting per manufacturer's specifications.	Denso, Royston

Tracer Wire and Connectors:

Joint Restraint:

APPENDIX H

Grading Design and Inspection

Town of Georgina
Development Design Criteria and Standards

2013

TOWN OF GEORGINA

SUBDIVISION LOT GRADING CLEARANCE

Check List

File No. _____ Development _____

- ☐ Sod has been correctly installed and has established a healthy root base. A minimum 150mm (6") topsoil base has been provided free of rocks and debris.
- ☐ All erosion and settlements in drainage swales have been repaired.
- ☐ Settlement of ground, patio slabs, steps, driveways, around water services, around transformers, around window wells, around rear lot catch basins, etc. has been repaired.
- ☐ The water service is level with the adjacent grade and is not located in the driveway. Water service is clearly identified on site and is painted blue and marked on the curb.
- ☐ Water service operation has been verified and any required repairs completed prior to inspection.
- ☐ Driveway has been paved with two lifts of asphalt as per Development Design Criteria (final coat of asphalt shall be completed prior to final inspection.)
- ☐ Curbs are completed.
- ☐ The sod along the driveway is level with the driveway and no stone is visible.
- ☐ Swales are a minimum of 0.15m lower than the adjacent house grades.
- ☐ Water meters have been installed.
- ☐ Splash pads have been provided under all eavestrough downspouts.
- ☐ Rear lot catch basins have been adjusted and cleaned where applicable and filter cloth removed.
- ☐ House numbers are permanently installed and are clearly visible.
- ☐ The consulting Engineer's Lot Grading Certificate has been provided.
- ☐ As-built drawings have been received, reviewed and approved.
- ☐ Homeowner modifications to grading, including retaining walls, driveway interlocking, walkways, etc., or any change from the original design has been noted by the consulting engineer and submitted in writing to the Town of Georgina.

TOWN OF GEORGINA

TOWN OF GEORGINA
Engineering and Public Works Department

GRADING INSPECTIONS AND AS-BUILT DRAWING TIP SHEET FOR SUBDIVISION(S)

GENERAL REQUIREMENTS:

- As-built elevations – the as-built elevations are required to be indicated on the overall lot grading plan, in addition to the designed grades. Separate surveys will not be accepted. See As-built Elevation Requirement Section for more details.
- Final Lot Grading Certificate – the final lot grading certificate shall be submitted by the consultant for each lot concerned. This means that the consultant is responsible to conduct the inspection, record deficiencies and have them repaired prior to issuance of the certificate. See Final Lot Grading Requirement Section for more details.
- The Consulting Engineer is responsible to have the most up to date information (such as individual plot plans, over all grading plan etc...) present on the site during joint inspections.
- The Consulting Engineer is required to provide the lot grading deficiency list or any similar site meeting report including any discrepancies found during inspection for each lot in writing within five business days from the day of inspection. Same shall be stamped and signed by consulting engineer for our records.
- It is recommended that the homeowner shall be notified of the inspection findings for any possible outstanding items to minimize unnecessary inquiries.
- Individual homeowner complaints will be forwarded to the consultant for their review and action. The consultant shall submit a summary of complaints and how they have been addressed.

GRADING INSPECTION GUIDELINE:

- Sod requires healthy root base. ALL dead sod that hasn't rooted shall be replaced.
- Erosion in swales shall be repaired.
- Settlement of ground, patio slabs, steps, driveways, around water service, around transformer, around window wells, around rear lot catch basins, etc. shall be repaired.
- The water service shall be level with the adjacent grades and may not be located in driveways. All water services shall be clearly identified on site. Caps shall be painted blue and a mark on the sidewalk or curb shall be placed at the location.
- All water service operation shall be verified and any required repairs shall be completed prior to Town's inspection.
- Driveways shall be paved with two lifts of asphalt as per Development Design Criteria and the final coat of asphalt shall be completed prior to final inspection.
- Curbs shall be completed.
- The sod along the driveway shall be level with the driveway and no stone should be visible.
- Swales shall be a minimum of 0.15m lower than the adjacent house grades.
- Grading around window / window wells shall be in accordance with building code requirements (distance from grade, stone, weeping tile, etc).
- Water meters shall be installed.

- Eavestrough downspouts shall have splash pads installed.
- Grading of swales (positive flow, ponding, high/low spots, etc)
- Rear lot catch basins shall be adjusted and cleaned.
- House number shall be installed.
- Any homeowners modifications with regards to grading, such as decorative retaining walls, driveway interlocking or any change from original design needs to be submitted to the Town of Georgina by the owner, stamped and signed by the consultant including both parties name, lot number, municipal address and possible phone numbers for our records prior to inspection.

FINAL LOT GRADING CERTIFICATE:

- A Final lot grading certificate for each lot needs to be submitted to the Town's Engineering Department. Any discrepancies related to grading such as home owner modifications and other related changes shall be reflected on lot grading certificate.
- The consultant is responsible to conduct the inspection, record deficiencies and have them repaired prior to issuance of the certificate.
- Easement and rear lot catch basin information shall be included in lot grading certificate.
- The Lot Grading Certificate shall be signed and stamped by the Consulting Engineer and a standard clause shall be included stating that the builder is responsible to repair any settlement or grading discrepancies during the subdivision maintenance period.

AS BUILT DRAWINGS:

- The four corners of the lot.
- The four corners of the dwelling.
- the swale elevations directly adjacent to the four corners of the dwelling.
- Rear yard swale elevations.
- Water service box and any other utilities such as hydro pole, fire hydrant, easement, bell box etc... shall be reflected on the As-built drawing.
- High point elevations and locations with reference to approved plot plan.
- Horseshoe swale (if present) elevation and the corresponding rear dwelling elevation.
- As-built elevations shall be as per the plot plan. Additional information is required for townhouse blocks.
- Two copies of As-built drawing stamped and signed by consultant shall be submitted to our office for record purposes.
- The revision dates shall be included on each drawing submitted to our office.
- As-built elevations shall be placed in bold color and proposed elevations to be in regular fonts. The As-built drawing shall show the building envelope and shall be free from other non-related information such as existing contour, existing elevations etc...

APPENDIX I

Street Sign Policy

Town of Georgina
Development Design Criteria and Standards

2013

TOWN OF
GEORGINA

Subject: SUBDIVISION DEVELOPMENT STREET SIGNAGE	Authority & Sec: SUBDIVISION CONTROL	
Department: ENGINEERING AND PUBLIC WORKS	Page 1 of 2	Day 16 Month 08 Year 2000

PROCEDURE STATEMENT:

THE FOLLOWING SHALL APPLY TO ALL SUBDIVISION DEVELOPMENT RESPECTING STREET SIGNAGE STANDARDS:

STREET NAME SIGNS

SIZE:	3' X 6" – Double edged extruded aluminum blade
COLOUR:	Engineering standard reflective green
FONT:	Helvetica Bold (ALL CAPITALS) Name 4" , i.e., CHURCH Designation 2", i.e., STREET (no abbreviations) (see attachment for details)
POLES: (support)	Poles shall be 3" (76mm) diameter galvanized steel and shall include a flared anchor buried at the pole base. Separate posts are required for street name signs and stop signs.

STOP SIGNS

Standard shall conform with the Manual of Uniform Traffic Control Devices, as modified.

SIZE:	Ra1 (60x60cm)
COLOUR:	White refl. Legend & Border, Red Refl. Background (High Intensity)
BLANK NO.	M.T.O. B-23b
FONT:	Highway Gothic C
POLES: (support)	Poles within subdivision shall be 3" (76mm) diameter galvanized steel and shall include a flared anchor buried at the pole base Poles abutting Regional Roads shall be 4"x4" (10x 10 cm) wood posts.

Refer to attached specifications taken from M.T.O. Manual of Uniform Traffic Control Devices

../2

APPENDIX J

As-Constructed Drawing Requirements

Town of Georgina
Development Design Criteria and Standards

2013

APPENDIX J – Requirements for As-Constructed Drawings

As-Constructed Drawings

The "as-constructed" drawings represent amendments, changes and variances, to the approved engineering drawings, as a result of the works constructed/installed within the development, as accurately represented on all applicable drawings. "As-constructed" drawings shall be void of any previously existing features which have been altered or removed through construction. Drawing submissions shall be accompanied by revised drainage calculation design sheets which confirm the capacity of the constructed sewers.

"As-constructed" information pertaining to all underground services shall be provided prior to inspection and review, for approval of Preliminary Acceptance and initiation of the Maintenance Period. The "as-constructed" drawings showing all road works and servicing works shall be submitted prior to final inspections for issuance of a recommendation for Final Assumption.

The Town will then perform a spot check of elevations and locations. If major differences are found, the "As Constructed" drawings will be returned to the consultant to be corrected.

"As-Constructed" Field Survey

The "as-constructed" revisions shall be based on a final survey of all the subdivision services and the Developer's Consulting Engineer's construction records. The drawings are to be accompanied by an Infrastructure Record sheet with all requested information relative to the services constructed and presented in the Town's standard format (Microsoft Excel spreadsheet). This information shall include a list of the numbers, lengths, sizes, materials, slopes, year of construction, etc. of the infrastructure items, related to the street name and/or facility, as a minimum. The infrastructure items shall include, but not be limited to:

- storm and sanitary sewers (incl. maintenance holes, catchbasins, rear lot catchbasins, headwalls, etc., including invert and top of cover elevations, sizes, distances and pipe slopes between all manholes
- watermains (including location and ties to all valve boxes, chambers, hydrants and other watermain appurtenances)
- location of all service connections to all lots and blocks
- roads and sidewalks (including lengths, widths and centerline elevations)
- traffic signs (including type, location, year installed, etc.)
- benchmarks as otherwise required by the Town.

Drawing Revisions

General

Two (2) sets of prints shall be submitted for review prior to sending the originals. These drawings shall be sealed and signed by a Registered Professional Engineer and stamped "As Constructed".

APPENDIX J – Requirements for As-Constructed Drawings

- The original drawings shall be revised to incorporate all changes and variances found during the field survey and to provide ties and additional information to readily locate all underground services.
- All house numbers are to appear on all "as-constructed" drawings.
- All street names, lot numbering and block identification shall be checked against the Registered Plan and corrected if necessary.
- The "as-constructed" revision note shall be placed on all drawings in the revision block and dated based on the date of the surveys.
- The Developer's Consulting Engineer shall be required to explain in writing any major difference between the design and the "as-constructed" data and to provide verification that the alteration does not adversely affect the function of the subdivision services.
- Refer to the Town's current "Grading Inspections And As-Constructed Drawing Tip Sheet For Subdivision(s)", for further details
- Upon completion of all revisions to the satisfaction of the Town, the following shall be submitted:
    - two (2) complete set of as-constructed prints
    - one (1) set of mylar plans
    - one (1) Compact Disk (CD) or DVD of all engineering drawings. The as-constructed drawings shall be submitted in a form compatible with the latest release of AutoCAD and in PDF and TIFF format.
    - All CCTV inspections of all sewer lines including colour video record in CD or DVD formats and a printed report.
    - One copy of an updated, final SWM Report, including a PDF copy on CD or DVD.
    - one (1) Compact Disk (CD) or DVD of the service records on the **Town of Georgina Service Record Form,** scanned to original scale, in .TIFF format and two (2) sets of service records shall be provided on the Town of Georgina Service Record Form in a three ring binder.

Sewers

- Sewer invert elevations if different than proposed. If the difference is greater than 150 mm the affected portions of the sewer (in profile) are to be re-drawn.
- Any maintenance hole location which differs by more than 1.5 m from the proposed location is to be re-drawn both in plan and profile.
- Type of maintenance hole if different than proposed.
- Pipe size if different than proposed.
- Grade of sewer if different than proposed.
- Class of pipe if different than proposed.
- Type of bedding if different than proposed.

- If "As Constructed" grade of sewer differs by more than 10% of the design grade, hydraulic calculations will be required to be submitted by the Consultant.
- Q actual and Q design will also be required on "As Constructed" sheets.

Watermains

- Watermain elevations if different than proposed. If the difference is greater than 150 mm the affected portions of the watermain (in profile) are to be re-drawn.
- Watermain profiles are to be shown based on elevations obtained at 20 metre intervals.
- Alignment changes greater than 150mm to have offsets revised in plan. If the alignment changes exceed 1.5 m, the watermain is to be re-drawn in plan as well as indicating the revised offsets.
- Main valves are to be tied to permanent features, such as buildings, maintenance holes, catch basins, etc.
- Pipe size if different than proposed.
- Type and class of pipe if different than proposed.
- Type of bedding if different than proposed.
- Fitting changes (bends, reducers, blocking, etc.)
- Types of valves and hydrants if different than proposed.

As-Constructed Drawings for SITE PLANS

The Consultant shall submit the as-constructed plan(s) for all servicing and grading drawings as approved, as otherwise noted above with exception of the service records, together with the Certificate of Completion. The Town requires as-constructed drawings for all engineering, landscaping, and electrical services and also needs service records (as per above).

The Town shall retain all securities until such time as acceptance of the certificate and plans has occurred.

Any additional terms contained in the Site Plan agreement must be complied with.

APPENDIX K

Site Plan Guidelines and Checklists

Town of Georgina
Development Design Criteria and Standards

2013

TOWN OF GEORGINA File No.:_____
Drawing Review Check List Project:_____
Site Plans Drawing No._____Submission:_____

SANITARY SEWER DESIGN CHECK:			
	Design Flows: Commercial		
	average (m^3/ha./day): includes infiltration and peaking effect	28	
	Design Flows: Light Industrial		
	average (m^3/ha./day): includes infiltration and peaking effect	35	
	Design Flows: Heavy Industrial		
	average (m^3/ha./day): includes infiltration and peaking effect	55	
	Design Flows: Schools and Institutions		
	average (m3/ha./day): includes infiltration and peaking effect	18	
	Design Area Plan - Scale	1:500	
	Pipe Capacities – design according to pipe flowing	full	
	Roughness Co-efficient n =	0.013	
	Minimum Actual Velocity	0.60 m/s	
	Maximum Velocity	3.0 m/s	
	Minimum grade of upstream leg or first leg	1.0%	
	Minimum length of first leg of sewer	50 m	
	Maximum change in velocity change from one to other pipe	0.60 m/s	
SANITARY SEWER DRAWINGS CHECK:			
	Maintenance Holes Required at: Change in Alignment		
	At termination point		
	Grade changes		
	All junctions		
	Maximum spacing: For pipes 200 mm to 750 mm	110m	
	For pipes 825mm to 1200mm	120m	
	For pipes over 120mm	150m	
	Maximum change in direction	90^o	
	Minimum Drop Across the Maintenance Hole: Straight Runs	0.030m	
	15^o to 45^o	0.060m	
	46^o to 90^o	0.090m	
	Drop structure required where inlet and outlet pipe elevation exceeds	060m	
	Benching up to obvert and as per	OPSD 701.021	
	Benching inside MH will be minimum width of	0.225m	
	Minimum offset from curb face or other services	1.50m	
	Frost Straps	Required	
	Safety Platform Required (Located above highest pipe inlet):	= or > 5 m deep	
	Minimum clearance between outside barrel of pipe crossings or shall be encased with 25MPa concrete	0.50m	
	Horizontal clearance from outside barrel of pipe to Watermain	2.5m	
	MH Covers as per (watertight cover where subject to flooding)	OPSD 401.010	

TOWN OF GEORGINA
Drawing Review Check List
Site Plans

File No.:_____
Project:_____
Drawing No._____Submission:_____

	Sanitary Pipes		
	Minimum sanitary sewer size	200mm	
	Minimum slope for first leg of pipe	1.0%	
	Minimum length of first leg of pipe	50m	
	Deflection of pipe	NO	
	Minimum depth	2.5m	
	Pipe Material – Ribbed pipe not permitted	PVC OR RCC	
	Pipe Joint – approved rubber gasket / manufacturer's detail and specs required on "Details Drawing"	YES	
	Pipe bedding as per	OPSD 802.010	
STORM SEWER DESIGN CHECK:			
	Design Storm	5 year	
	Modified Rational Formula	$Q_{(l/s)}$=2.78 CiA	
	Detention Facilities (detention of the difference between):Subdivisions	5 yr & 100 yr	
	Site Plans	5 yr & 100 yr	
	Runoff Coefficients: Commercial Areas	0.90	
	Industrial Areas	0.75	
	Churches, Schools, Institutions	0.70	
	Apartments and medium density	0.70	
	Townhouses	0.70	
	Semi Detached Residential	0.65	
	Single Family Residential	0.60	
	Estate Residential	0.45	
	Cultivated Fields (undeveloped lands)	0.25	
	Initial Inlet Time	10 minutes	
	Intensity Formula	I_5=853.608 x (4.699 + T) $^{-0.766}$	
	Pipe Capacity	$Q=(R^{2/3}xS^{1/2}xA)/n$	
		$V=(R^{2/3}xS^{1/2})/n$	
	Roughness Coefficient (n): Concrete Pipe	0.013	
	Corrugated Metal	0.024	
	Corrugated Metal (smooth wall)	0.021	
	Polyvinyl Chloride (PVC)	0.013	
	Velocity: Minimum	0.8 m/s	
	Maximum	4.0 m/s	
	Minimum Size of Pipe: Sewer Mains	300 mm	
	Single Catch Basin	250 mm	
	Double Catch Basin	300 mm	
	Minimum Depth to Obvert	1.5 m	
	Maintenance Holes: Required at Change in:	Alignment	
		Grade	
		Junctions	
	Not Required: Where radius pipe is used in sized 1050 mm and over		

TOWN OF GEORGINA File No.:_____
Drawing Review Check List Project:_____
Site Plans Drawing No._____Submission:_____

	Maintenance Hole Spacing: For 300 mm pipe to 750 mm pipe	110 m	
	825 mm pipe to 1200 mm pipe	120 m	
	For pipe sized over 1200 mm	150 m	
	Type and Size of Maintenance Holes	Specify OPSD	
	Maximum change in direction: Pipes greater than 450 mm	45^{o}	
	Not permitted	Acute Angles	
	Minimum Drop Across the Maintenance Hole: Straight Runs	0.020 m	
	15^{o} to 45^{o}	0.050 m	
	46^{o} to 90^{o}	0.080 m	
	Drop structure is required where inlet & outlet pipe elevation exceeds	0.600 m	
	Obverts will be equal at locations where	Pipe size change	
	Benching:	To obvert	
	Minimum width	0.230 m	
	Minimum offset from curb face or other services	1.50 m	
	Frost Straps	Required	
	Safety Platform Required (Located above highest pipe inlet):	= or > 5 m deep	
	Professional Engineered design and specifications are required for Maintenance Holes:	That are not OPSD	
		> 2.5 m in dia.	
	Minimum clearance between outside of pipe barrels at all crossings	0.3 m	
	CATCH BASINS:		
	Special catch basins, inlet structures, CBMH are required to be	Fully Detailed	
	Drainage received from more than one direction requires:	Double catch basins	
	At street intersections CB's to be located upstream of:	Sidewalk or pedestrian crossing	
	Minimum pipe size and slope for: Single catch basin	200 mm @ 1.0%	
	Double catch basin	250 mm @ 1.0%	
	Leads:	Standard Strength	
	Tees:	Extra Strength	
	Specify class of pipe and type of pipe bedding to be shown on:	Profile	
	Radius pipe permitted in sizes:	> = to 1050 mm	
	Pipe size decrease downstream	NO	
	Storm Sewer Location	See Standard Drawings	
	Pipe Bedding and Class	OPSD	
	Service Connections to a Trunk Sewer	NO	
	Risers required when sewer exceeds	4.5 m deep	
	Maximum length of riser	3.0 m	
	PIPE MATERIALS:		
	Pipe Material (200 mm to 450 mm) Ultra Rib NOT PERMITTED	Concrete or PVC	

	Pipe Material (> 450 mm)	Concrete	
WATERMAIN CHECK:			
	Design:	Max. fire flow & peak day demand	
		Peak hour demand	
	Residential Consumption: Average Daily Demand	365 L/cap./day	
	Maximum Day Factor	2.0	
	Peak Hour Factor	2.75	
	Fire Flow Demand: or as per "Water Supply for Fire Protection – A Guide to Recommended Practice prepared by the Fire Underwriters Survey of the Insurance Bureau of Canada or AWWA Manual M31	7000 L/min.	
	Average Day Water Demands:		
	Industrial (light)	35,000 L/ha/day	
	Commercial	28,000 L/ha/day	
	Institutional	18,000 L/ha/day	
	Hazen Williams Formula	$V=0.85CR^{.63}S^{.54}$	
	C values: 150 mm	100	
	200 mm and 250 mm	110	
	300 mm to 600 mm	120	
	Over 600 mm	130	
	Minimum size:	150 mm	
	At dead end	See Design Criteria	
	More then one hydrant	200 mm	
	Industrial Areas	300 mm	
	Minimum and Maximum Pressures: Peak Hourly Demand	50 psi minimum	
	Minimum hourly demand	100 psi maximum	
	Fire flow - when tested for fire flow during peak daily demand	50 psi minimum	
	Dead End Watermains	To be avoided	
	Location:	4.5 m from PL	
		North & east side	
	Depth:	1.8 m minimum	
	Depth Under Watercourse	1.2 m min. to obv.	
	Frost protection minimum	50mm Styrofoam	
	Utility Crossing: Over or under other utilities	0.3 m separation	
	Over or Under sewers	0.5 m separation	
	Horizontal Separation from sewers to Outside of Pipe Barrels	2.5 m	
	Valve spacing: Cross intersection	4 valves	
	Tee intersection	3 valves	
	Valve and Chamber Required on Watermains	> 300 mm dia.	
	Hydrants: Clow (MacAvitiy) or Canada Valve (Century)	100 mm Storz	

	Spacing	150 m in res.	
		75 m in Comm.	
	Location:	3 m to streetline	
		1.2 m from D/W	
	Backflow prevention	Required	
	Air reliefs required at all high points on trunk mains	YES	
	Drains required at all low points on trunk mains	YES	
	Blow offs required at dead end watermains	YES	
	Materials	AWWA approved	
	Bedding	Per OPSD	
	Testing	Per Town WW	
SERVICE CONNECTION:			
	Individual connections to be extended into private property by	1.5 m	
	Water Connection	19 mm type K Copper	
	Sanitary Connection: Multiple Family, Commercial, etc.	OPC	
	Maximum grade	8%	
	Minimum grade	2%	
	Manhole required at all connections to multiple family, comm., etc.	1.5 m inside PL	
	Storm Sewer Connection: Multiple Family, Commercial, etc.	OPC	
	Connect to catch basin	NO	
	Manhole required at all connections to multiple family, comm., etc.	1.5 m inside PL	
LOT GRADING:			
	Minimum Swale Slope	1%	
	Driveway	1% to 8%	
	Maximum lot gradient	5%	
	Minimum lot gradient	2%	
	Maximum slope gradient	3:1	
	Minimum swale depth	0.15 m	
	Maximum swale depth	0.45 m	
	Maximum flow allowable in a side yard swale shall be from	2 lots + that from 2 adjacent lots	
	Maximum flow in a rear yard swale: Townhouse Lot	3 backyards	
	Maximum Length of Swale	90 m	
	Maximum area contributing to a rear yard swale	450 m^2	
	Erosion Control required when swale velocity exceeds	1.5 m/s	

APPENDIX L

Selected Tree Species

Town of Georgina
Development Design Criteria and Standards

2013

TOWN OF GEORGINA

Acceptable Street Tree Species List
Full Sized Trees

Common Name	Scientific Name	Time	Native	General Comments
Ohio Buckeye	*Aesculus glabra*			Prefers moist soils
Horse Chestnut	*Aesculus hippocastanum*	Sp		Good spring flower with no seeds/rare/disease susceptible
Ruby Red Horsechestnut	*Aesculus x Carnea 'Briotii'*			
Autumn Blaze Maple	*Acer Freemanii*			
Armstrong Maple	*Acer x Freemanii 'Armstrong'*			
Celebration Maple	*Acer x Freemanii 'Celebration'*			
Autumn Blaze Maple	*Acer x Freemanii 'Jeffersred'*			
Black Maple	*Acer nigrum*	Sp		Lots of seed for winter interest/rare/needs moist soil
Norway Maple	*Acer platanoides*		I	Invades native areas/surface roots conflict with turf/girdling routs/aphid problems/dense shade
	'Columnar, Olmsted, Superform'		I	Narrow form (height about twice its width)
	'Crimson King, Schwedler, Royal Red'		I	Dark red to green susceptible to reflected heat
	'Deborah, Emerald queen'		I	Excellent upright form
Sycamore Maple	*Acer pseudoplatanus*	Sp		Very pollution tolerant/rare
Red Maple	*Acer rubrum*	Sp		Green summer foliage and yellow/red fall colour/tolerates wet soil/some cultivars do not
Silver Maple	*Acer saccharinum*	Sp		Aggressive root system/increased liability with age
Sugar Maple	*Acer saccharum*			Upright form/fall colour varies/prefers good drainage
	'Green Mountain'			Upright form/fall colour is a golden yellow/prefers good drainage/forms thick leathery scorch resistant leaves
Green Mountain Maple	*Acer Saccharum 'Green Mountain'*			
Pacific Sunset Maple	*Acer trun. X Plat. 'Warrenred'*			
Turkish Hazel	*Corylus colurna*			
Ginko 'Maidenhair tree'	*Ginkgo biloba*	Sp		Good yellow fall colour/thin bark/male variety only
Honey Locust	*Gleditsis triacanthos*			Small leaves are difficult for home maintenance/provides a filtered shade/susceptible to defoliation
Shademaster Honey Locust	*Gleditia t. 'Shademaster'*			
Kentucky Coffee tree	*Gymnocladus dioicus*	Sp		Interesting winter texture/open lawn setting/large leaves/make variety only
Tulip Tree	*Liriodendron tulipifera*	Sp		Good flowers and yellow fall colour/moist well drained soil/very large tree

LEGEND: 

I	Species native to Georgina
I	Invasive species note to be within 100m of natural areas
Sp	Species which are sensitive to fall transplanting and should only be planted in the spring

Common Name	Scientific Name	Time	Native	General Comments
Saucer Magnolia	*Magnolia x soulangiana*	Sp		Good flowers low branching and spreading/scale problems
London Plane Tree	*Platanus x acerifolia*			Frost cracks on trunk/attractive peeling bark/ witche's broom is a problem
Capital Ornamental Pear	*Pyrus Calleryana 'Capital'*			
Chanticleer Ornamental Pear	*Pyrus Calleryana 'Chanticleer'*			
Ironwood	*Ostrya virginiana*	Sp		Sudden mortality problem/trunk suckers heavy wood/borer problems
Bur Oak	*Quercus macrocarpa*	Sp		Needs acidic soil/fruit maintenance difficult to transplant
White Oak	*Quercus alba*			Highly sensitive to disturbance/slow growing tree/ dead wood sometimes needs to be trimmed
Swamp White Oak	*Quercus bicolor*			Tolerant of wet soils/ difficult to transplant/ slow growing
Pin Oak	*Quercus palustris*			Difficult to transplant/ slow growing
English Oak	*Quercus robur*	Sp		Needs acid soil/ fruit maintenance/ difficult to transplant
	Quercus robur 'Fastigita''	Sp		Collumnar form, needs acid soil/ holds leaves through the winter/ difficult to transplant/ very upright in form
Red Oak	*Quercus rubra*	Sp		Needs acid soil/ fruit maintenance/ difficult to transplant/ no tap root
Littleleaf Linden	*Tilia cordata*			Showy and fragrant flowers/ green globe may be used under hydro lines. Aphid and borer problems/ suckers from base/ messy species
Glenleven Linden	*Tila cordata 'Glenleven'*			
Greenspire Linden	*Tilia cordata 'Greenspire'*			
Basswood, American Linden	*Tilia americana*			Showy and fragrant light yellow flowers/ suckers from base/ messy species
Balsam Fir	*Abies balsamea*			Little maintenance period
Silver Fir	*Abies concolor*			Little maintenance required
Eastern red/cedar	*Juniperus virginiana*			Insect problems with mites and others/ also susceptible to blights and is an alternate host for cedar apply rust
European Larch	*Larix decidua*			Larch case-bearer insect occasionally can seriously disfigure the tree form
Tamarack	*Larix laricina*			Smaller cones than *Larix decidua* resulting in less debris
Norway Spruce	*Peciea abies*			In hot dry areas mites can be a problem/ little maintenance
White Spruce	*Peciea glauca*			Fine-textured juvenile needles, promotes winter dehydration within this species of *Picea*
Colorado Blue Spruce	*Peciea pungens*			Insect and mite may be a serious problem, which can destroy the formal proportion of the tree
Austrian Pine	*Pinus nigra*			Tolerates urban settings better than most Pinus / can be susceptible to disease and insects/ little can be a problem
Red Pine	*Pinus resinosa*			Little maintenance required

Eng\roads\tree species 2008\full size

LEGEND: 

I Species native to Georgina

I Invasive species note to be within 100m of natural areas

Sp Species which are sensitive to fall transplanting and should only be planted in the spring

TOWN OF GEORGINA

Acceptable Street Tree Species List Under Hydro Wires

Common Name	Scientific Name	Time	Native	General Comments
Hedge Maple	*Acer campestre*			Compact form/ trunk suckers require extra maintenance/ yellow fall colour
Amur Maple	*Acer ginnala*			Compact form/ red and yellow fall colour/ lots of seeds/ tends to sucker/ specify single stem
Globe Maple	*Acer platanoides 'globosum'*			Dense canopy, formal globe shape
Tatarian Maple	*Acer tataricum*			Good red and yellow fall colour/ tends to sucker/ lots of seeds
Purpleblow Maple	*Acer truncatum*		I	This species of maple has similar characteristics as *Acer plantanoides*, yet this tree is smaller in size
European Alder	*Alnus glutinosa*	Sp		Showy flower and fruit/ tolerant of wet and dry soil/ common to pure stands
Shadblow or Serviceberry	*Amelanchier canadensis*	Sp		Difficult to maintain single stem/ 4 season interest/ tolerates moist soil
Globe Catalpa	*Catalpa bignonioides 'Nanna'*			Tends to be messy
Sugar Hackberry	*Celtis laevigata*	Sp		Compact form/ good in moist soils
Hackberry	*Celtis occidentalis*	Sp		Requires pruning for witches broom and general form/ good substitute for Elms/ good in container situations
Eastern Redbud	*Cercis canadensis*			Good flower/ shade/ tolerant/ weak crotches
Flowering Dogwood	*Cornus florida*			Good flower/ specimen tree/ red fall colour/ source trees locally
Turkish Hazel	*Corylus colurna*	Sp		Good form/ difficult to transplant/ winter interest
Hawthorns	*Crataegus spp.*	Sp		Thornless and disease resistant varieties only. Do not plant near stands of apples or pears
Flowering and Domestic Apple	*Malus (most)*			Good flowers/ fruit usually maintenance problems/ disease and insect problems/ tolerates most soils
Weeping Mulberry	*Morus alba 'Pendula'*		I	Adaptable to different environments, invasive, small tree
Amur Cork Tree	*Phellodendron amurense*		I	Lots of black berries
Purple Sand Cherry	*Prunus cistena*			Recommended for street tree use/ nice white flowers and purple foliage
Bird Cherry	*Prunus padus*			Highly susceptible to black knot disease/ also subject to insects/ low maintenance
Shubert cherry	*Prunus virginiana 'Shubert'*	Sp		Green spring foliage and red in summer/ black knot problems/ upright form/ bark tends to split
Cherries	*Prunus spp. 'Ornamental Cherry/ Columnar/ Sargent/ Kwanzan'*	Sp		Excellent flowers with no fruit/ single stem to be specified/ weeping cankers
Ornamental pear	*Pyrus 'Aristocrat/ Capital/ Chantieleer/ Redspire'*	Sp		Good flowers/ may have good fall colour/ lush shiny leaves/ Firelight problems
European Mountain Ash	*Sorbus aucuparia*			Small flower and orange fruit/ disease and insect problems/ weak bark/ good in clay soils
Ivory Silk Lilac	*Syringa reticulata*			Good white summer flower/ excellent small specimen
Mugo Pine	*Pinus mugo*			Insect problems (pine shoot moth, mugo pine scale)/ slow growth/ this tree is expected to stay low and compact

LEGEND:  I

I Species native to Georgina

I Invasive species note to be within 100m of natural areas

Sp Species which are sensitive to fall transplanting and should only be planted in the spring