Town of The Blue Mountains

Engineering Standards

Effective May 29, 2023

Table of Contents

Tables

Appendices

Located on the Town Website

Appendix A: Project Signage

Appendix B: Service Record Sheets

Appendix C: Design Deviation Form

Appendix D: Standard Drawings and Cross Sections

1. GENERAL REQUIREMENTS

1.1. Introduction

This document is intended to provide direction to developers, engineers, contractors, and the general public with regard to the Town's minimum design and construction requirements for Works to be completed on municipal owned lands within the Town of The Blue Mountains. This includes reconstruction, redevelopment and new development that will become public such as road allowances, blocks, or easements.

These Standards are to be read in conjunction with the Ontario Provincial Standard Specifications (OPSS) and the Ontario Provincial Standard Drawings (OPSD). Where there are any apparent conflicts or discrepancies, the Town Engineering Standards shall take precedence.

The information provided in this document is general in nature and is not intended to relieve the Engineer or Consultant of their responsibility to provide a complete and competent engineering design in full compliance with all applicable legislation.

It is the responsibility of the professional engineer who is performing the design and contract administration of the Works to verify that the design and installation is in accordance with the latest revision of these Standards. The Engineering Standards are available on the Town's website at www.thebluemountains.ca.

The Town reserves the right to make project specific requests deemed reasonable by the Town.

Approved development with Accepted for Construction Drawings will be required to adhere to current commissioning protocols.

Development in the review process will be required to use the revised latest version of Engineering Standards.

1.2. Definitions

In this specification the following definitions shall apply:

"AODA" shall mean Accessibility for Ontarians with Disabilities Act.

"AFC" shall mean Accepted for Construction.

"AWWA" shall mean the American Water Works Association.

"CHBDC" shall mean the Canadian Highway Bridge Design Code.

"CLI-ECA" shall mean Consolidated Linear Infrastructure Environmental Compliance Approval

"Engineer" shall mean professional engineers licensed to practice in Ontario and shall be responsible for the preparation of drawings and specifications to the satisfaction of the Town.

"Contractor(s)" shall mean the firm of Contractors, the company or individual acting as the Contractor and having entered into a contract with the Developer/Owner to install the services.

"Developer(s)/Owner(s)" shall mean the person(s) causing the Works to be undertaken.

"DFO" shall mean the Department of Fisheries and Oceans, Canada.

“GSCA” shall mean the Grey Sauble Conservation Authority.

“Landscape Architect” shall mean a professional landscape architect who is a full member of the Ontario Association of Landscape Architects with a Seal and Certificate and shall be responsible for the preparation of drawings and specifications to the satisfaction of the Town.

“Major Pumping Station” shall mean a water pumping station greater than 30 L/s and a sanitary pumping station greater than 15 L/s.

"MNRF" shall mean the Ontario Ministry of Natural Resources and Forestry.

"MECP" shall mean the Ontario Ministry of the Environment, Conservation and Parks.

"MTO" shall mean the Ontario Ministry of Transportation.

“NEC” shall mean the Niagara Escarpment Commission.

"NVCA" shall mean the Nottawasaga Valley Conservation Authority.

“OBC” shall mean the Ontario Building Code.

"OPSD" shall mean the Ontario Provincial Standard Drawings.

"OPSS" shall mean the Ontario Provincial Standard Specifications.

“TAC” shall mean the Transportation Association of Canada.

“Town” shall mean The Corporation of The Town of The Blue Mountains, Director of Operations of the Town of The Blue Mountains or the Director of Planning and Development Services of the Town of The Blue Mountains or designates.

"Town Representative" shall mean any person assigned to a project by the Town to carry out work on their behalf.

[End of Section 1]

2. DEVELOPMENT DESIGN SUBMISSION PROCESS

2.1. Design Process

The design process including submission requirements for development projects can be found on the Town Website at www.thebluemountains.ca.

The submission requirements for Town initiated projects will be coordinated directly with the project engineer.

[End of Section 2]

3. DRAWINGS

3.1. Specifications for Engineering Drawings

3.1.1. Size

Drawings to be Metric Standard A1 (594 mm x 841 mm) or Imperial Equivalent Arch D (24” x 36”). Reduced drawings on Metric Standard A3 (297x420) or Imperial Equivalent (11” X 17”).

3.1.2. Materials for all Drawing Submissions including "Record Drawings”

Drawings shall be submitted on Bond (paper) with black permanent ink (no colour) along with digital copies in AutoCAD and PDF format.

3.2. General Drawing Requirements

All drafting work on the drawings to be done neatly and legibly. The following basic information and criteria shall apply in preparation of the drawings:

- All drawings are to be stamped, sealed, and dated by the professional responsible for the design.
- All plans shall include a north arrow and key plan in the upper right-hand quadrant.
- All text to be horizontal, vertical read from right side of page, or aligned to feature described (i.e. pipe).
- All text shall be presented neatly in an orderly manner and not over lapping.
- Text size for general notes and descriptions shall be 2.0 mm plotted size.
- Text size shall not be less than 1.5 mm plotted size.
- Text size for headings and titles to be appropriate for use.
- Elevations are to be geodetic and related to the Geodetic Survey of Canada datum.
- All drawings shall reference geodetic datum NAD83.
- A local benchmark note shall appear in each drawing.
- Rubber stamps shall not be used except for the Professional's seal.
- Nothing shall be affixed to the drawing with tape or adhesive.
- The drawings shall indicate the submission phase to which they apply.
- Existing information shall be shown light, shaded or background line weight.
- Proposed information shall be shown dark, bold or foreground line weight.
- In general, east-west streets shall have zero chainage at their westerly limit and north-south streets shall have their zero chainage at their southerly limits.
- Chainage on a plan-profile shall increase from left to right.

- Key Plan shall be shown in all plan and profile drawings and any other plans that encompass more than one drawing sheet, with the area covered by the drawing clearly identified.
- A legend is to be provided on each drawing or a comprehensive legend on second sheet.
- A cross reference number scheme provided for each section or detail.

3.3. Computer Aided Drawings (CAD)

All drawings shall be prepared digitally in an unlocked format compatible with the latest version of AutoCAD.

3.4. General Plans

3.4.1. Cover Sheet

The Cover Sheet shall contain:

- Name of the Project/Development.
- Name and Address of the Developer/Owner.
- Name and Address of the Consulting Engineer.
- Name and Address of the Municipality.
- Any applicable reference number (i.e. Town Contract No. or Consultant's Project No.).
- A key plan that clearly identifies the location of the proposed project.
- Submission description and date submitted to the Town.
- Drawing Index (complete set) including drawing number and title. Alternatively, the Index could be included as a page of its own included in the drawing set immediately after the cover page.

3.4.2. General Servicing Plans

General plans showing above ground services and appurtenances are to be drawn to a scale of 1:1000 (maximum). When more than one "General Servicing Plan" is required, a supplementary "General Servicing Plan" at a smaller scale shall be prepared to show the entire plan of development on one drawing.

The General Servicing Plan shall show but not be limited to:

- All road allowances, approved street names, lots, blocks, easements, daylighting, and reserves in the same manner as shown on the registered plan (or appropriate legal plan).
- A reference to the geodetic benchmark and site benchmarks (minimum of 2) being used for construction.
- Existing services, utilities and abutting properties are to be shown as light, shaded or background line weight.

- All proposed services, sidewalk, curbing etc. to be constructed shall be shown as dark, bold, or foreground line weight.
- All proposed sanitary and storm sewer shall be shown including length, size, material, grade, and direction of flow. All associated structures, maintenance holes, and catch basins (incl. rear lot and ditch inlet) complete with their identification number.
- All watermains and appurtenances (hydrants, valves etc.), with notes showing size and material.
- All curbs and sidewalks including construction details of connections to existing.
- Lot numbers per registered plan with provision to add street addresses when available.
- Future land use identified.
- Retaining walls and fencing.
- Community mailboxes.
- All proposed and existing culverts.
- All street lighting poles, pedestals and transformers/vaults.
- Existing watercourse across lands or adjacent to lands.
- Existing land use bordering lands extended far enough to clearly identify adjoining roads, buildings, driveways, utilities poles, hydrants, sewers and ditches.
- Fill and flood line restrictions as specified by the local Conservation Authority.
- Clearly identify phasing and/or staging of the works.
- Clearly identify lands to be conveyed to the Town.

3.4.3. Grading Plans

Grading plans are to be drawn to a scale of 1:500 and shall clearly provide sufficient information to fully understand the movement of stormwater.

The grading plans shall indicate, but not be limited to, the following:

- Overall lot fabric for the subject lands with lot and block numbers, easements, street names, right-of-way limits.
- Location of road curb and gutter, sidewalks, driveways, catch basins, maintenance holes, hydrants, valves, streetlights, transformers, pedestals, and all other above ground street furniture.
- Existing 0.5 m contours (clearly labelled) extended at least 15m outside the subject lands or that distance necessary to determine the existing and future drainage patterns.
- Elevations at existing trees, structures, watercourses, etc.
- Existing and proposed centerline of road elevations and right-of-way limit elevations at 20 m intervals.

- Low and high points in road allowances.
- Sidewalks and trails.
- Catch basins and ditch inlets.
- Proposed lot building envelopes per zoning by-law.
- Elevations at front and rear building envelope as per zoning by-law.
- Elevations at the corners of each lot and block.
- Elevations at side-yard highpoints or intermediate grade change points if applicable.
- Elevation at changes in slope.
- Proposed top of foundation elevation or finished floor (FF) elevation.
- Location of fire break lots.
- Identify all lots where engineered fill has been placed or will be placed.
- Elevation at 15 m intervals along the frontage and at appropriate intervals along the sides and rear of large blocks (> 1.0 ha).
- 0.5 m contours for grading within large blocks and parks (> 1.0 ha).
- Grades and direction of flow for major and minor overland flow routes including high water level for major storm events.
- Areas regulated by Conservation Authorities (if applicable).
- Swale and ditch cross-section(s) identifying width, depth, side slope easement or property limits and maximum depth of water.
- Location of existing and proposed retaining walls including top and bottom of wall elevations at appropriate intervals and cross-sections.
- Proposed grading directional arrows and grade of flow in percent (%).
- Road crossings culverts including proposed inverts and slope.
- Any other information necessary to fully describe the required grading and drainage design.

3.4.4. Storm Drainage Plans

Storm drainage plans are to be drawn to a scale of 1:1000 (a scale not exceeding 1:5000 will be accepted for large external drainage areas) and are to indicate the total area to be drained by the proposed storm sewers and drainage system.

The storm drainage plan shall indicate but not be limited to, the following:

- Existing 0.5 m contours with even numbered contours labelled.
- Drainage patterns of adjacent lands.

- Runoff coefficients and areas (ha) of tributary areas outside the development and for each section of the storm sewers within the development.
- Direction of runoff.
- Rights-of way, blocks, lots and easements.
- Street names.
- Storm maintenance holes, numbered consecutively from the outlet or Town provided numbering to match asset management system.
- Storm sewers including size, slope, and directions of flow.
- Storm sewer connections/leads.
- Any catch basins or swales, on the lots or blocks, required to collect the runoff.
- Temporary or permanent quantity and quality stormwater management facilities.
- Major and minor overland flow routes.
- Show storm discharge from site to nearest sufficient outlet or adequate outlet.
- Culverts and other drainage appurtenances.

3.4.5. Sanitary Drainage Plans

Sanitary drainage plans are to be drawn to a scale of 1:1000 and are to indicate the total area to be collected by the proposed sanitary sewers.

The sanitary drainage plan shall indicate but not be limited to, the following:

- Sanitary catchment areas (ha), number of units and population per unit for each section of the sanitary sewers within the development.
- Overall sanitary catchment area (ha) and population based on population per unit for each upstream section of the sanitary sewer entering the development.
- Rights-of-way, blocks, lots and easements.
- Street names.
- Sanitary maintenance holes including label/numbers.
- Sanitary sewers, forcemain or low pressure forcemain including size, slope, and directions of flow.
- Pump stations.
- Service laterals.

3.4.6. Water Distribution Plans

Water Distribution plans are to be drawn to a scale of 1:1000.

The water distribution plan shall indicate but not be limited to, the following:

- Rights-of-way, blocks, lots and easements.
- Street names.
- Watermain size and material.
- All watermain appurtenances including valves, hydrants, bends, automatic flushing stations, water meters, chambers, booster stations, sample points etc.
- Service lateral and curb stop valves.
- Symbol on lots requiring individual pressure reducing valves.
- Connections to existing watermain.

3.4.7. Plan and Profile Drawings

Plan and profile drawings are required for all streets, pipe outfalls, easements, and watercourses. The plan and profile drawings shall be arranged so that all streets have their own drawing(s). Where multiple drawings are required for one street, match lines must be used and there shall be no overlap or duplication of information. The plan and profile drawings are to be drawn to a horizontal scale of 1:500 and a vertical scale of 1:50. The plan and profile portions of the drawing must be in line vertically in relation to each other. Where intersecting streets or easements are shown on a plan and profile drawing, only the diameter of the pipe and direction of flow of the intersecting sewers shall be shown. The limits of construction are to be shown in both plan and profile. Where the proposed works intersect or connect to an existing street the plan and profile shall be shown for a distance at least 40m past the limit of construction to demonstrate how the proposed works transition with existing conditions.

The following information and details are to be provided on the plan view:

- Existing and proposed road allowances, curb and gutter, sidewalk, walkways, trails, and entrances/driveways.
- Existing buildings, structures, culverts, watercourses, in the vicinity of the proposed construction.
- All existing and proposed utilities and services shall be shown on the drawings. Utility locates are required to determine the exact location of existing utilities.
- Location of all street lighting, pedestals, transformers etc.
- Street names (if available otherwise to be updated on the Record Drawings).
- The proposed lot and block layout including lot numbering along with lot frontage dimensions.
- Easements and reserves.
- North arrow and key plan.
- Location and type of wall street name and traffic control signage.

- All existing and proposed watermains, service laterals and appurtenances (hydrants, valves etc.), drawn in their own unique line type and labelled with the type of pipe and diameter. Proposed pipe and appurtenances (hydrants, valves etc.) to be shown with a darker (bold) line type and existing pipe and appurtenances to be shown as a lighter or shaded (60%) line type.
- All existing and proposed storm sewer, sanitary sewer or forcemain and associated service laterals and appurtenances drawn in their own unique line type and labelled with the type of pipe and diameter. Maintenance holes and catch basins shall be shown complete with their identification number. Proposed pipe and appurtenances (maintenance holes, catch basins etc.) to be shown with a darker (bold) line type and existing pipe and appurtenances to be shown as a lighter or shaded (60%) line type.
- Grading details (edge of pavement elevations and slope) for curb radii at intersections, cul-de-sacs or anywhere minimum curb grades are proposed, to demonstrate the road drains to an appropriate outlet.
- Curb radii at all intersections, cul-de-sac's (where permitted), crescents and horizontal curves.
- Borehole locations.
- Proposed centreline of road including chainage at 20 m intervals.
- Any other relevant features or construction notes.

The following information and details are to be provided on the profile view:

- All existing and proposed watermains, appurtenances (hydrants, valves, automatic flushing devices etc.), drawn in their own unique line type and labelled with the type of pipe, material, diameter, length, grade, and class of pipe. Proposed pipe and appurtenances (hydrants, valves etc.) to be shown with a darker (bold) line type and existing pipe and appurtenances to be shown as a lighter or shaded (60%) line weight.
- All proposed watermain and forcemain shall have the minimum cover dimensioned. Where the minimum cover is not achieved it shall be noted in profile and the details and limits of the proposed remediation (i.e. insulation) shall be shown.
- All existing and proposed storm sewer, sanitary sewer or forcemain and appurtenances drawn in their own unique line type and labelled with the type of pipe, material, diameter, length, grade, and class of pipe. Maintenance holes and catch basins shall be shown complete with their identification number, top of grate elevation, maintenance hole diameter/catch basin dimensions, proposed pipe invert elevations and applicable OPSD. Maintenance holes that require drop structures or safety platforms shall be noted including reference to the appropriate OPSD or detail drawing. Proposed pipe and appurtenances (maintenance holes, catch basins etc.) to be shown with a darker (bold) line weight and existing pipe and appurtenances to be shown as a lighter or shaded (60%) line weight.

- Where the minimum cover on storm and sanitary sewer is not achieved it shall be noted in profile and the details and limits of the proposed remediation (i.e. insulation) shall be shown.
- Connection details for all connections to existing infrastructure shall be shown.
- The original ground elevation at the centreline of construction and the proposed centreline profile including all longitudinal slopes, crest and sag K values, vertical curve information, PVI, BVC, EVC stations and elevations. The proposed profile shall be described sufficiently to demonstrate compliance to the Town's Road geometric requirements.
- The centreline chainage at 20 m intervals complete with proposed centreline of road elevation and existing centreline elevation shall be noted along the bottom of the profile.
- Existing utilities and services shall be shown in profile. Utility locates are required to determine the extent and location of the existing utilities. It may be necessary daylight to safely expose the utility and determine the actual elevation and location to avoid conflicts with the proposed works.
- Where the possibility of a conflict between two services (such as sewer and watermain) exists the minimum separation requirements shall be noted.
- Relevant information from the borehole logs is to be plotted in profile. This is to include a brief description of soils, top of bedrock and groundwater elevation.

3.4.8. Pavement Marking and Signage Plan

A Pavement Marking & Signage Plan shall be prepared to show the proposed location of all pavement markings and signs to be installed. The plan shall be prepared in accordance with the Ontario Traffic Manual and/or the Highway Traffic Act Regulations for Ontario and shall form part of the engineering drawings, which must be approved by the Town.

3.4.9. Composite Utility Plan

The Composite Utility Plan (CUP) shall show all the above ground requirements of the General Servicing Plans as well as the proposed location of Bell, Hydro, Gas and Cable TV and street lighting.

All running line and road crossing locations must be established and resolved by the Consulting Engineer in conjunction with the Utility companies and in accordance with the locations shown on the typical cross-section.

3.4.10. Street Lighting Plan

The street lighting plan shall indicate but not be limited to, the following:

- All the above ground requirements of the General Servicing Plans.
- The location and type of street lighting luminaires including the height of the luminaire plus arrangement of wiring and associated appurtenances.

- The luminaire manufacturer's specification data, including lumen output and photometric data showing cut off angles.
- A photometric plan demonstrating that the illumination levels meet the required lighting levels and not exceed uniformity ratios per the Town's Engineering Standards.

3.4.11. Landscaping Plans

3.4.11.1. General

All landscape plans shall be prepared and stamped by a Landscape Architect licensed to practice by the Ontario Association of Landscape Architects. All landscape plans shall be drawn at a minimum scale of 1:500.

The landscape drawings may include the following:

- Existing Natural Features Assessment.
- Tree Survey/Vegetation Analysis.
- Tree Preservation Plan and Details.
- Streetscape and Buffer Planting Plans and Details.
- Detailed Park Development Plans and Details.
- Trails Master Plans and Details.
- Landscape Restoration Plans and Details.
- Stormwater Management Pond Planting Plan.

Construction details will be required for all landscape elements to be implemented as part of the development.

Any required landscape Restoration Plans and Stormwater Management Facility Planting Plans will require both the Town and the appropriate Conservation Authority's approval prior to implementation of the plans.

3.4.11.2. Streetscape Plan

The Streetscape Plan shall show the following:

- Existing trees and natural features to remain with protection details.
- Building envelopes, driveways, and sidewalks.
- Walkways, trails, and associated blocks/easements.
- Required fencing including privacy, acoustic and chain link.
- Proposed plantings including detailed planting list.
- Entry features.
- Day lighting triangles.

- Location of street lighting, traffic signals and signage, public utility boxes, hydrants, and other street furniture.
- Location of blocks/easements.
- Underground municipal and third-party utility servicing.

3.4.11.3. Park Development Plan

Detailed Park Development Plans are to be submitted by the Landscape Architect. A complete set of detailed design plans and working drawings are required. Park plans are to be submitted at a scale of 1:500 and shall indicate, but not be limited to, the following:

- Existing contours.
- Drainage structures and direction of overland drainage.
- Species and size of existing plant material to remain and be protected.
- Species and size of plant material to be removed.
- Layout of all proposed recreation facilities.
- Layout of parking lot and spaces (including handicapped parking).
- Layout of all trails.
- Proposed site amenities including benches, bike racks, trash receptacles, signs.
- Perimeter fencing.
- Park lighting.
- All surface treatments.
- All proposed plant materials.

3.4.11.4. Tree Preservation and Erosion and Sediment Control Plans

Tree Preservation and Erosion and Sediment Control Plans shall be prepared and approved prior to any construction to prevent the migration of any sediment from the site and to protect any trees to be preserved. 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 and sediment and erosion control measures such as silt fence, check dams, sediment ponds, inlet protection, mud mats or any other measures necessary to protect trees and control sediment. The location and details of any topsoil stockpiles shall also be indicated on the drawings.

3.5. Record Documents

3.5.1. General

Record Documents are the accumulation of all relevant information on the constructed Works and consists of Record Drawings, Quality Assurance Reports, Asset Inventory, and other documentation required by the Town to document the Works.

During construction and upon completion of the Works or as requested by the Town, the Consulting Engineer shall obtain actual conditions of the completed Works, conduct a record survey, and revise the construction drawings or prepare new drawings accordingly to represent the final state of the Works and submit the same as Record Drawings.

The Record Drawings are to be prepared to no less detail than that required for and provided on the construction drawings. These Record Drawings will show accurate construction details and locations of construction features such as sanitary sewers, storm sewers, watermains, (including all laterals, structures, and appurtenances), electrical conduit/cables, power poles, light standards, pedestals, vaults, roadway, pavement markings, sidewalks, landscaping, channels, property lines, easements and utilities.

Sketches, as-built, as-constructed, as-recorded or redline drawings are not considered Record Drawings. The Engineer is to have regard to the PEO's Guideline entitled "Preparing As-built and Record Documents". It is expected that the Engineer has provided sufficient on-site inspection during construction so that they can accurately verify in detail the actual condition of the completed works and prepare and seal the Record Drawings and associated documents.

The Record Documents shall be provided in hardcopy (bond), digitally in PDF and in an unlocked format compatible with the latest version of AutoCAD. Record Documents must be signed and sealed by the Engineer. Record Drawings with any kind of "Third Party Disclaimer" will not be accepted. The Engineer has primary responsibility for the accurate data collection used in the preparation of the Record Documents.

For drawings signed and sealed by a Landscape Architect, the Landscape Architect is to prepare a signed and sealed record of the relevant works to no less detail than that provided on the construction drawings.

In addition to the Record Drawings, the Engineer shall supply a list of all materials used during construction in a form specified by the Town for incorporation into the Town's Asset Management System and the Town DWQMS.

Lots and Blocks are to be numbered according to the Registered Plan. The municipal street address will be provided by the Town for incorporation into the Record Drawings.

3.5.2. Record Survey

The Consulting Engineer shall also undertake a record survey at the completion of the work for inclusion in the Record Drawings. The following minimum information is required:

- The survey of the sanitary and storm sewer systems(s) must include the horizontal location of all structures (maintenance holes, catch basins, oil grit separators, outlets etc.), sewer main, leads, cleanouts and laterals. Rim elevations for all structures and invert elevations for all pipes, drop pipes, orifices etc. are required.
- The survey of the water distribution system and sanitary forcemain must include the horizontal location of all structures/vaults, hydrants, valves, and curb stops etc.
- The roadway shall be surveyed at minimum 20 m stations (as well as low/ high points and curb radii) and must include the horizontal location and elevation for the centreline of

road, pavement edges, back of curb, sidewalk, and limit of the right-of-way. For rural roadways the edge of the shoulder, centreline of ditch, top of banks, and culverts will also be required. The horizontal location of any other feature or street furniture (street signs, traffic signs, mailboxes, street lighting, street trees, retaining walls, traffic signals etc.) located in the right-of-way must also be collected.

- All stormwater management facilities or drainage features shall be surveyed with enough detail to accurately determine that they will function as designed. This will include a full topographic survey of the facility or feature with sufficient information to confirm the design volumes and must include horizontal location and elevations for key features such as control structures, orifices, weirs, pipes, culverts, channels, outlets etc.

3.5.3. Asset Inventory List

The Engineer shall complete an Asset Inventory in MS Excel format that lists the make and model of all materials along with the cost of installation. The Engineer is to contact the Town to consider the requirements.

3.5.4. Quality Assurance Report

The Engineer is to prepare a Quality Assurance Report that will include:

- Quality Assurance Statement.
- Geotechnical material, compaction and related testing reports and summary of results, including a plot of the field density tests on plan and profile drawings.
- CCTV Inspection Videos and Reports.
- Daily Construction Inspection Reports.
- Photographic Record sufficient to document the installation of the works.
- Tracer Wire Conductivity Results.
- Water Quality Test Results.
- Sewer Test Results.
- Environmental Compliance Records including Erosion and Sediment Control Reports.
- Drinking Water Quality Management System material assurance statement and records.

3.5.5. Service Record Sheets

The Consulting Engineer shall provide Service Record Sheets (**Appendix B**) for each service lateral installed for new development or reconstruction. The Service Record Sheet shall clearly identify the registered plan number, lot number and municipal street address along with the service pipe material type, size, invert elevation, depth and location at property line with swing ties to property bars at the front lot corners. In reconstruction where property bars are not readily available the swing ties are to be from nearby street furniture or other permanent structures within the Town's right-of-way. The distance from the watermain or sewer main to the curb stop or sanitary view port or service termination at property line shall be provided. The distance from

the water curb stop valve to the sanitary view port and/or storm lateral termination shall also be provided. UTM coordinates shall be provided for each service termination location (Northing/Easting).

3.5.6. Fire Flow Verification

The Consulting Engineer in consultation with the Town is to undertake fire flow verification tests in critical locations to demonstrate that the available fire flow is the greater of the minimum requirements and the predicted fire flows.

3.5.7. Environmental Compliance Approvals

If Environmental Compliance Approvals for the Works were not issued in the name of the Town, the Engineer is to provide a copy of all Environmental Compliance Approvals documenting that the Works to be owned and operated by the Town have been transferred to the Town. In addition, all documentation made to show compliance with the Environmental Compliance Approval while the Works were not under the care and control of the Town are provided to the Town.

3.5.8. Watermain and Forcemain

Actual watermain and forcemain obvert elevations at maximum 40 m intervals and at all high/low points or changes in direction shall be indicated on the Record Drawings to a tolerance of 10 mm. If the difference is greater than 150 mm from design vertical alignment, affected portions of the watermain or forcemain shall be redrawn in profile. If horizontal alignment changes exceed 0.5 m the affected portions of the main shall be redrawn in plan.

In addition, the following shall be indicated on the Record Drawings:

- Profiles for all main lines.
- Swing-ties from permanent structures/property bars to all main appurtenances (valves, bends, tees etc.).
- Chainage from appurtenances (bend, tee, etc.) along main to main stops.
- Dimensions from lot corners to the service lateral at p/l including obvert elevations for service laterals.
- Tracer wire gauge.
- Main size, bedding, and materials (including DR rating and IPS/DIPS where applicable).
- Service size, bedding and all materials installed (including type and class rating where applicable).
- Thrust restraint details including type, locations, extents and materials.
- Anode details including locations, size, product information.
- Special features (casings, insulation, etc.).
- Final approved shop drawings for concrete pressure pipe (CPP) added to detail sheets.

3.5.9. Storm and Sanitary Collection System

Actual storm sewer and sanitary sewer system invert elevations shall be indicated on the Record Drawings to a tolerance of 10 mm. If the difference is greater than 150 mm from the design vertical alignment, affected portions of the sewer or overland drainage route shall be redrawn in profile. Any structure which differs from the proposed horizontal location by more than 1.0 m shall be redrawn in both plan and profile.

In addition, the following shall be indicated on the "Record" Drawings:

- Pipe/culvert size, grade, type, class/gauge, bedding.
- Chainage from MH along main to service tees.
- Dimensions from lot corners to the service lateral at p/l including elevations for service laterals.
- Surveyed invert elevations.
- Re-calculated pipe grades and design sheets.
- Measured lengths.
- Pipe strength.
- Structure type and size (with reference to applicable OPSD or detail drawing).
- Details of the frost strap installation including depth.
- Special features (casings, concrete bedding, trench cut-off walls, etc.).
- Service lateral size, grade, type, class, and bedding.
- Product information for all materials installed.

If the final grade of sewer differs by more than 5% of the design grade, the Engineer shall submit hydraulic calculations to document the constructed capacity of the system.

3.5.10. Road System

All actual roadway centreline elevations to a tolerance of 25 mm, at a maximum 20 m interval, shall be indicated on the Record Drawings. Gutter elevations shall be indicated for cul-de-sacs and intersections to show drainage into the storm system. If horizontal road alignment changes more than 0.5 m or vertical geometry changes greater than 150 mm the plan and/or profile shall be redrawn as appropriate.

In addition, the following shall be indicated on the Record Drawings:

- Entrances, lay-byes, curb depressions.
- Road signage.
- Laneway marking and stop bar locations.

3.5.11. Stormwater Management Facilities

The actual key dimensional and elevation information shall be updated to the constructed condition on the Record Drawings. The Stormwater Management Report and Operation and Maintenance Manual are to be revised to reflect the constructed condition.

3.5.12. Water and Sanitary Pumping Stations

The Operation and Maintenance Manual for water and sanitary pumping stations are to be revised and updated to completely document the equipment relevant to the pumping station and its operation and maintenance.

3.5.13. Lot Grading

Provide Record Drawings of individual lots once constructed and finished landscaping in place.

3.5.14. Erosion and Sediment Control Inspection Reports

All erosion and sediment control measures shall be inspected by the Engineer at minimum once every two weeks, after each rainfall of 25 mm or greater and in accordance with MECP requirements. Inspection reports are to be forwarded to the Town within five days of inspection and at the conclusion of the Works.

3.5.15. Utilities, Street Lighting and Traffic Signals

Record Drawings in Accordance with PEO requirements must be provided for all Utilities (Electrical, Communications, Gas etc) installed as well as information for any existing utilities encountered during construction to accurately reflect how these Utilities will affect Town infrastructure. Utilities not confirmed as installed in the proper location may not be accepted by the Town. The information required is as follows:

- All cable/main locations complete with actual offset from property line in plan view and installed/existing depth.
- Dimensions from lot corners and elevations for service laterals.
- All pole, pedestal, and transformer locations.
- All road crossings.
- Measured lengths.
- Materials used.

[End of Section 3]

4. DESIGN REQUIREMENTS

4.1. Introduction

The purpose of this section is to outline the minimum design requirements for the construction of municipal services in the Town. These requirements are general in nature and do not relieve the Engineer of the responsibility for submitting a completed project demonstrating competent engineering design in full compliance with all applicable legislation.

The requirements that follow must be adhered to wherever possible. It is acknowledged that on occasion unique and special circumstances occur and minor deviations may be considered from the requirements. It is also recognized that Town Standards lag innovation in the industry, and it is the desire of these Standards to ensure that the infrastructure constructed in the Town meets or exceeds the minimum required level of service in accordance with our asset management objectives. Furthermore, that the infrastructure constructed as a result of these Standards is durable, resilient and provides value to the residents and visitors in the Town.

The Proponent may submit a written request to the Town via a Design Standard Deviation Form (**Appendix C**) to waive or modify a portion of the design requirements on a project-by-project basis. The submission must be accompanied by documentation to substantiate the modifications. **The design modification must demonstrate that the Town is receiving better value than that specified within the Town's Engineering Standards based on life-cycle cost analysis. Lifecycle cost analysis must include capital cost, operating and maintenance cost and renewal cost. The lifecycle analysis must include an assessment of both the Town Standards and proposed deviation including a comparison of the proposed deviation vs. the Town Standards.** In the event that a deviation has a higher operation and maintenance cost in comparison with the Town Standards, the Town may require payment in lieu to address the additional costs to be incurred by the Town on a case-by-case basis.

4.1.1. Differentiating Minor and Major Deviation:

Minor Deviation:

- Definition: Changes or adjustments to the Town's Engineering Standards that do not significantly impact future Town costs or liability.
- Approval Process:
    - Proponent submits a written request via the Design Deviation Authorization Form.
    - Internal stakeholders (e.g., Operations, Planning, Development Engineering, Building, By-Law, Fire, Community Services, Legal Services, Finance, and IT) review the proposed minor change.
    - Both the Director of Planning and Development Services and the Director of Operations or their delegates must authorize the minor deviation.
- Considerations: Future cost impacts, operational maintenance concerns, safety concerns and life cycle costs.

- Objective: To ensure the infrastructure still meets or exceeds the minimum required level of service, remains durable, resilient, and provides value to the Town.

Major Deviation:

- Definition: Changes or modifications to the Town's Engineering Standards that substantially increase future Town costs or liability.
- Approval Process:
    - Proponent submits a written request with documentation substantiating the modifications, including a life-cycle cost analysis.
    - The request must demonstrate that the Town is receiving better value than specified within the Town's Engineering Standards.
    - Requires Council approval.
- Considerations: Capital cost, operating and maintenance cost, renewal cost, comparison of the proposed deviation vs. Town Standards. If the deviation results in higher operation and maintenance costs, the Town may require a commuted sum for additional operating cost.
- Objective: To accommodate unique and special circumstances while ensuring the infrastructure meets the asset management objectives, provides better value and community benefits.

The Town reserves the right to modify the design requirements in writing or to provide written direction to the Engineer/Discipline Specific Professional as it may relate to project specific requirements on a case-by-case basis. This will only be applied in special circumstances and with justification as the general intent is to comply with the Standards.

All Works are to be designed, constructed, operated, and maintained in accordance with applicable Federal, Provincial, County and Town regulations and by-laws. These design requirements should be read in conjunction with the standard engineering practice as established by the MECP and MTO, together with regulations, the current drinking water license, Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) and design manuals and guidelines of the Municipal Engineers' Association. Unless superseded by the Town's Engineering Standards, specific standard drawings and specifications from the Ontario Provincial Standards Specifications and Ontario Provincial Standard Drawings shall be used as reference for individual details (OPSS, OPSD).

4.2. Supporting Studies and Reports

4.2.1. General

The following studies and reports may be required to support the design of proposed developments or existing sites undergoing significant alteration. It is the responsibility of the consulting engineer to identify the reports required for the site. The Town may request any of the reports listed below or require additional reports and/or assessments. All reports submitted

to the Town must be signed and sealed by the appropriate professional licensed to practice in the Province of Ontario as indicated in each section.

The Town Planning requirements related to development can be found on the Town website.

4.2.1.1. Background Information

All reports to include a background information section describing at minimum the property location, municipal description, legal description, current planning status as well as the proposed development scheme, topographic information, construction phasing, intent of the report, and historical land use.

Information related to the Class Environmental Assessment process must be included, if applicable.

4.2.2. Functional Servicing Report

Prior to the detailed design being undertaken the Functional Servicing Report (FSR) shall be completed for all proposed developments and existing sites being redeveloped. The report shall address the adequacy of the existing and proposed servicing of the property and include the following components:

- Introduction
    - Site Description (location, current use, property limits, adjacent uses)
    - Description of proposed development
- Site Conditions
    - Geotechnical Implications
    - Proposed Grading Impacts
- Water Supply
    - Estimated Water Demands (Domestic and Fire)
    - Water Distribution Plan (new and connection points to municipal systems)
    - Sizing of watermains and hydrant locations
    - Metering and backflow prevention
    - Compliance with MECP Guidelines
- Wastewater
    - Estimated Wastewater Production
    - Wastewater Collection Plan (service locations, percentage of flow in downstream sewer)
    - Capacity assessment of downstream sewer to accept new flows

    - Sizing of sanitary sewers, services, and maintenance hole locations
    - Low pressure sewer system design as appropriate
    - Monitoring maintenance hole location for industrial, commercial sites
    - Compliance with CLI-ECA and MECP Guidelines
- Stormwater
    - Estimated Stormwater Flows and proposed management plan
    - Proposed Quantity and Quality Management
    - Sizing of storm sewers, treatment/storage components and maintenance hole locations.
    - Compliance with CLI-ECA and MECP Guidelines
- Third Party Utilities
    - Gas, Electrical and Telecommunications location and coordination
- Transportation
    - Access/Egress Location and Description
    - Traffic impacts
    - Impact on adjacent roadways
    - Fire and Waste Management Routing
    - Postal Servicing
- Other Components
    - Streetscaping
    - Innovation or Deviations

The report will identify and ensure that the development or redevelopment site as proposed can be serviced for its intended use and that all on-site and off-site servicing requirements are identified.

The report will incorporate all relative existing information including Town standards, reports, studies, record information, in addition to site specific and staging information.

Signing Authority: This report must be signed and stamped by a Professional Engineer licensed in the Province of Ontario.

4.2.3. Geotechnical Report

A Geotechnical Report must be provided in support of the design for municipal roads, water distribution system, wastewater collection system, storm sewer system, stormwater management/drainage or any other structure (bridges, retaining walls etc.). The report will examine and confirm subsurface conditions including soil type, groundwater levels, depth to

bedrock, soil bearing capacity, slope stability, permeability, and conductivity and identify any contaminated soils.

The report must address but is not limited to the following:

- The suitability of soils as trench backfill and building foundation construction.
- Requirements for imported fill as well as construction methods for the use of both native and imported fill including compliance with the on-site and excess soil management legislation (O. Reg. 406/19).
- The adequacy of the Town standard minimum road base, sub-base, and pavement structure.
- Slope stability and sensitivity to upwelling and recharge.
- Expected seasonal high groundwater levels in relation to the proposed works including any dewatering and permit to take water requirements.
- Requirements for sewer bedding, backfill, trench dewatering, trench slopes, and pipe selection including methods to avoid water seepage or movement though the trench granular (i.e. clay collars);
- Recommendations regarding watermain bedding, backfill, thrust restraints, corrosion protection, trench slopes, trench dewatering, and pipe selection. The resistivity and corrosiveness of the soil must be determined. Where metallic watermains are to be installed, an appraisal must be done to determine the extent of corrosion protection required. This appraisal shall be performed using the 10-point soil evaluation procedure as described in AWWA C105 Appendix. If the 10-point soil evaluation establishes a need for corrosion protection, the necessary anode spacing shall be clearly shown on the construction drawings.
- Requirement for concrete collars on slopes for pipe stability, possible contamination.
- Test results and recommendations for the use and/or disposal of adversely impacted soils, such as from sodium and petroleum products, in accordance with current regulations.

The report shall be accompanied by a drawing showing the test pit/borehole locations along with the detailed test pit/borehole logs.

Signing Authority: This report must be signed and stamped by a Professional Engineer or Professional Geoscientist licensed in the Province of Ontario.

4.2.4. Hydrogeological Assessment

A Hydrogeological Assessment may be required to support the development in order to assess matters such as: groundwater infiltration and recharge; groundwater discharge and base flow, groundwater elevations and flow paths, water quality and temperature, cumulative watershed impacts, cold water fisheries supported by groundwater discharge and impacts to the Town's drinking water sources.

The Hydrogeological Study at a minimum shall include an assessment of the existing conditions, impacts and mitigation measures. The consulting engineer is encouraged to undertake a pre-consultation with the Town and Conservation Authority to properly scope the work prior to beginning any technical work. In general, the assessment shall follow the "Hydrogeological Assessment Submissions, Conservation Authorities Guidelines for Development Applications", June 2013 (as amended) and MECP requirements.

If the project area is within the limits of a previously completed sub watershed study and the specificity of the document addresses to project area adequately in the opinion of the Town, then the requirements of the site-specific hydrogeological study may be reduced provided that the signing authority has written approval to rely on the previous study's findings.

Signing Authority: This report must be signed and stamped by a Professional Engineer or Professional Geoscientist licensed in the Province of Ontario.

4.2.5. Drainage and/or Stormwater Management Report

Prior to proceeding to the detailed design, the preliminary/conceptual stormwater management plan (Functional Stormwater Management Report) must be reviewed and accepted by the Town and the Conservation Authority. Generally, either capacity to an adequate outlet shall be provided or post development flows limited to the sites pro-rata share of available capacity (flow rate that does not cause flooding). The downstream conveyance capacity shall also be reviewed. Where pre-development capacity restrictions exist downstream, these issues shall be identified and discussed with the Town to confirm how this is to be addressed in the design.

The detailed Stormwater Management Report must address all aspects of the stormwater management design. The report will provide details and supporting calculations associated with the detailed design of the minor and major drainage systems and the required source, conveyance and end of pipe controls required by the Town, the Conservation Authority and the Ministry of the Environment, Conservation and Parks. Any deviations from these criteria must be specifically identified in the report and an explanation provided. At minimum the following information shall be provided.

Signing Authority: This report must be signed and stamped by a Professional Engineer or Professional Geoscientist licensed in the Province of Ontario.

4.2.5.1. Storm Drainage Areas

An existing and proposed catchment area plan is required. It must delineate pre-development conditions including internal and external catchment areas and catchment I.D.s, and drainage patterns for the site and applicable external lands. Post development conditions must also be provided including internal and external catchment areas and catchment I.D.s, and major and minor flow routes for the site and relevant external lands.

4.2.5.2. Stormwater Management Objectives and Design Criteria

The report must identify how applicable recommendations from Master Drainage Plans or Studies, geotechnical and hydrogeological reports have been incorporated into the design.

The report must also outline the SWM design criteria being applied. This should include criteria for water quality, erosion control, water balance, quantity control and flood susceptibility and demonstrate how each requirement is being met.

4.2.5.3. Storm Drainage System Design

It must be demonstrated that the site provides safe conveyance of both the minor storm and major storms up to regulatory flows from both the subject site and any external lands, through the development to an adequate outlet, with no adverse impact to either the upstream or downstream landowners. In all cases the downstream conveyance capacity shall be reviewed and accepted by the Town prior to proceeding to detailed design for both minor (piped) and major systems (overland flow).

4.2.5.4. Stormwater Management Facility Design

Pre-development conditions must be indicated including hydrologic parameters used for modeling, and pre- development peak flow rates for the 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, and 100-yr design storms for the critical storm distribution and duration (i.e. must look at the 4-hour Chicago and 6, 12 and 24 hour SCS Type II distributions) and the Regional Storm Event for each sub catchment.

Post development conditions must be provided including hydrologic parameters used for modeling, and post development peak flow rates for the 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, and 100-yr design storms for the critical storm distribution and duration (i.e. must look at the 4 and 24 hour Chicago, and 6, 12 and 24 hour SCS Type II distributions) and the Regional Storm Event for each sub catchment as determined in consultation with the Town. Engineer/Developer may reduce the number of storm events modelled and presented on a case-by-case basis provided they provide justification that the storm used is the most conservative scenario based on type and size of development.

The water surface elevations that may impact or be impacted by the stormwater discharge from the site must be indicated to ensure the appropriate hydraulic calculations should backwater conditions exist. This shall include the hydraulic grade line that corresponds with the storm flows and not current, high, or average elevations.

If required, thermal mitigation measures must be clearly identified and described for any proposed SWM facilities.

It must be demonstrated that sufficient measures are provided to meet the required level of water quality control per the established guidelines including an evaluation of anticipated changes in phosphorus loadings from pre-development to post-development conditions and how loading will be minimized.

It must be demonstrated that sufficient measures are provided to achieve the required level of erosion control per the established guidelines.

4.2.5.5. Required Tables

The report must include the following tables in support of the design:

- Stage vs. Discharge and Storage Table – The table should include, as a minimum, all points used in the reservoir routing command.
- Existing and proposed runoff coefficients for each catchment.
- SWM Facility Operation Characteristics and Summary of Significant SWMF Features Table(s). These include type of facility, contributing drainage area, lumped catchment imperviousness ratio, permanent pool, extended detention and quantity control volumes, as well as elevations for base of pond, base of forebay, normal water level, active storage and quantity control design high water level, Regional and 100-yr design storm high water levels, and top of berm, inlet and outlet structure design details, such as: pipe size, orifice size, weir length, and invert elevation, and total draw down time required for the extended detention volume.
- Comparison of Predevelopment, Uncontrolled Post Development and Controlled Post Development Flows Table showing peak flows for the Regional and 2-yr through 100-yr design storm events at significant points of interest throughout the catchment area including downstream to where the flows are no longer significant (i.e. less than 10% of total flow).
- Comparison of pre-development, unmitigated post-development and mitigated post-development water balance volumes and infiltration volumes.

4.2.5.6. Required Figures and Drawings

The report must include the following figures and drawings in support of the design:

- Site Location Plan.
- Pre-development internal and external catchment areas and catchment I.D.'s on a topographic base showing existing land use and drainage patterns.
- Post-development internal and external catchment areas and catchment I.D.'s on a topographic base showing future land use, and major and minor flow routes.
- Siting and details for any proposed infiltration measures.
- Siting and details for any proposed thermal mitigation measures.
- Complete set of Engineering Detailed Design Drawings (including all details/cross-sections of all features (Low Impact Design components, overland flow routes, maintenance access, sediment forebay, sediment drying area, inlet /outlet structures, landscaping details, erosion, and sediment control, grading etc.), signed and sealed by a licensed Professional Engineer of Ontario in accordance with PEO guidelines.

4.2.5.7. Hydrology and Hydraulics Calculations and Modeling Details and Output

The report must include the following supporting calculations and modeling details:

- Calculations demonstrating that all storm outlets have sufficient energy dissipation and/or erosion protection based on calculated erosive velocities at each outlet.

- Storm sewer design sheets.
- Model schematics and hydrologic modelling, including input and detailed output files for the 2-yr through 100-yr return period events (i.e. must look at both 4-hour Chicago and 6, 12 and 24 hour SCS Type II distributions), 25 mm four hour Chicago quality storm, and Regulatory Storm for existing and future land uses as required shall be provided.
- Digital copies (USB) of all the modelling may be requested by the Town on a case-by-case basis for peer review purposes. Digital files must include all files necessary to run the model, (i.e. both input and storm files) as well as the detailed output files generated for the Regional and 2-yr through 100-yr design storm events. Digital files are to include both pre- and post-development scenarios.
- Relevant Storm Design Parameters Table - Identifying the design storm duration and distribution, referencing the source of the rainfall intensity duration and frequency values, and listing the intensity- duration-frequency values for the 2-yr through 100-yr return periods. Any other relevant design storm values not specified above should also be included. Tables and calculations should be provided in digital format.
- A Table comparing the pre- and post-development peak flows for different storm distributions and durations for the site and required storage volumes to determine the critical storm to be used.
- Soil Characteristics Table – Listing the areal distribution of each soil type (expressed as a %) within every subcatchment.
- Model Input Parameters Table - Summarizing key input parameters for existing and future land use for each catchment including subcatchment I.D., drainage area, CN, IA, Tp, Slope, % impervious, modelling time step, pervious and impervious roughness coefficient, etc.
- Model input parameters, i.e. CN, IA, Tc, % imperviousness, etc. calculations.
- Conveyance capacity calculations for the major system flow path.
- Stage-Storage-Discharge spreadsheet with hydraulic calculations for any proposed outlet control structures (Note: Calculation equations, coefficients, and design values for all hydraulic structures should be clearly identified).
- Incremental and cumulative volume calculations for the stormwater management facility.
- Sizing of emergency spillway (if applicable) for Regulatory flows.
- Drawdown time calculations for SWM facility (if applicable).
- Sizing of erosion control structures.
- Calculations demonstrating that any proposed infiltration measures will provide the required infiltration volumes for the site and an evaluation demonstrating how phosphorus loadings from the site will be minimized.

- Where applicable, dual drainage and hydraulic grade line calculations (if applicable tailwater elevations must be indicated for the outlet of any storm sewer and/or proposed SWM facility to demonstrate that any backwater conditions have been properly accounted for in the hydraulic design of the conveyance structures.
- Pre- and post-development watershed modelling schematics reflecting the model sub catchment I.D.s and catchment areas.
- Pre- and post-development hydrograph plots for all significant points of interest.

4.2.5.8. Independent Supporting Documents

The following independent supporting reports must be submitted with the SWM Report:

- Operation and Maintenance Manual including a monitoring program plan for stormwater management facilities in compliance with the requirements of the MECP Environmental Compliance Approval indicating how the facility will be monitored including water quality on a periodic basis. The manual is to include site specific operational instructions and a general description of individual facility components. The manual must describe how the facility performs under various storm events and the maintenance needed to ensure optimal performance over the life of the facility, including costs and recommended scheduling.
- Geotechnical Engineering Report or excerpts thereof providing borehole information for the site and proposed pond block (if applicable) and certifying geotechnical feasibility of any stormwater management facilities and identifying any liner requirements for proposed SWM facilities.
- Environmental reports (e.g., fisheries impacts, hydrogeology, fluvial geomorphology), as applicable.

4.2.6. Water Distribution Report

A Water Distribution Report shall be submitted that:

- Documents the existing condition of the water distribution system in the immediate area of the works to the extent that the existing system affects the design of the works (in consultation with the Town) and vice versa.
- Outlines design criteria of the proposed Works.
- Documents existing available water flow.
- Provides calculations to support the design of the proposed distribution works including watermain sizes, fire flows and anticipated flows and pressures for domestic and other users.
- Describes the proposed water distribution network including describing the need for any specialty flow or pressure controls (i.e. individual pressure reducing valves).
- Outlines the modifications required to the existing system to support the Works.

4.2.7. Traffic Impact Assessment

A Traffic Impact Assessment must be completed to address the potential traffic impacts that a proposed development will have on the existing road network. The exact scope of the assessment will be determined in consultation with the Town and will either be in the form of a Traffic Impact Study or a Traffic Impact Brief as indicated below.

4.2.7.1. Traffic Impact Study

Generally, a Traffic Impact Study will be required when the proposed development will generate 100 or more vehicle trips during the peak hour (peak hour of the road or peak hour of the development). A Traffic Impact Study may also be required when the proposed development will generate less than 100 vehicle trips during the peak hour when there are traffic/transportation issues or specific concerns that will have to be addressed.

The Traffic Impact Study must address the following:

- The existing road system through the study area, including the existing traffic volumes and operations at key intersections.
- The proposed development including specifics with respect to land use, phasing and volume of traffic to be generated by the site, adequacy of the site parking and site circulation.
- The distribution and the site generated traffic to the area road system, reflecting what staging or phasing may result.
- Traffic volumes on the area road system, including turning movement volumes at key intersections and at the site access point(s) for future conditions (at full build out and 5 and 10 years beyond full build out) to reflect pre and post development scenarios (i.e. with and without the subject development).
- Traffic operations under the future horizon scenarios, both pre and post development, including consideration for other area developments that may occur during the same time period and contribute traffic to the study area road system.
- The proposed site access and suitability of such in consideration of location, configuration, and available sight distances.
- The need for road system improvements associated with each future horizon scenario.

4.2.7.2. Traffic Impact Brief

For smaller scale developments where less than 100 trips during the peak hour are expected and there will be little or no impact to the external road system, a Traffic Review or Brief may be accepted.

A Traffic Brief must address the following:

- The existing road system through the development area.

- The proposed development including specifics with respect to land use, phasing and volume of traffic to be generated by the site.
- The proposed site access and suitability of such in consideration of location, configuration, and available sight distances.

The Traffic Impact Brief must provide a conclusive statement that the proposed development will not adversely affect the operations or the safety of the adjacent road system and that the development plan (including the access, parking area and internal circulatory system) is adequate to suit the site traffic or identify if there are impacts and provide appropriate recommendations.

4.2.8. Photometric Report

The Consulting Engineer shall submit a Photometric Report consisting of supporting calculations demonstrating that the Town standard illumination and uniformity ratios have been achieved along with a Lighting and Photometric Layout Drawing, drawn to a scale of 1:250 showing the location of the streetlights with the illumination and uniformity ratios.

Illumination design and pedestrian conflict classification to be addressed in the Traffic Study to ensure that the design is compliant with Crime Prevention Through Environmental Design (CPTED) Best Practices.

4.2.9. Other Reports

The Town may require additional reports such as:

- Arborist Report.
- Visual Impact Study.
- Noise and Vibration Study.
- Environmental Impact Study.
- Archaeological Report.
- Tree Inventory, Assessment and Preservation Plan.

4.3. Block and Easement Requirements

4.3.1. General

All works are to be placed within the Town's Road allowance or on Town owned lands. The Town will require dedicated blocks for all infrastructure or drainage systems that are not located in a public road allowance and will be assumed by the Town. Generally, easements will not be considered for any infrastructure that will be Town owned and maintained. Although the Town discourages the use of easements in new development there may be unusual situations arise where a dedicated block may be impractical, and the Town may consider a service easement across private lands.

4.3.2. Blocks

Dedicated blocks will be required for all municipally owned infrastructure such as sanitary sewer, storm sewer, watermain, overland flow routes, swales, ditches, drains, low impact development,

pathways etc. to allow for future access, maintenance, and renewal. Blocks must be adequately sized and maintained to allow for both the infrastructure and access for maintenance without entering onto private lands.

4.3.2.1. Block Width Requirements

No Town infrastructure shall be installed in a trench whose line of influence encroaches on the foundation of any existing or future permanent structure. The zone of influence is the notional envelope within which an external vertical load would exert stress on a pipe. The zone is typically defined as a line projected upwards at minimum 1:1 (H: V) slope from the deepest point of the excavation towards the ground surface. This zone may be increased significantly due to poor soils or steep topography and must be confirmed by a geotechnical engineer.

Underground infrastructure shall be horizontally located within a block such that all necessary safe excavation can be completed within the block without encroaching on private property.

Regardless of the minimum widths below the Town may require the block width to be increased on a case-by-case basis dependent on site specific configuration, topography, or operational requirements. Generally, grades in excess of 10% or areas with poor soil conditions will require additional width.

It is the responsibility of the engineer to ensure that the municipal services can be properly installed, maintained and replaced within the proposed minimum block limits. The Town may ask the engineer responsible for the design to demonstrate how this can be accomplished within the proposed block width.

4.3.2.2. Minimum Block Width

The minimum block width required for a single pipe (sewer or watermain) with a depth to invert of less than 2.5 m and an outside diameter of less than 500 mm shall be 6.0 m. For pipes greater than 2.5 m deep and/or 500mm diameter, the following equation shall be applied rounded up to the next metre.

$$Block\ width = 6 + 2(pipe\ depth\ (m) - 2.5) + ((pipe\ diameter(mm) - 500)/1000)$$

Table 4.3.2-1 illustrates the required utility separation and minimum block width requirements. If more than one utility is to be constructed in a block, adequate space is required to maintain and replace the utilities independently. A minimum of 2.5 m shall be added for separation between each utility to allow for access. Vertical stacking shall not be permitted.

Table 4.3.2-1 Minimum Block Width Requirements

Number of Utilities	**One**	**Two**	**Three**
Base Width	6 m	8.5 m	11 m
Depth			
3 m deep	+1.0 m		
3.5 m deep	+2.0 m		
4 m deep	+3.0 m		
>4 m deep	+1.0 m for each 0.5 m depth increase		
Pipe Diameter			
600 mm	0.1 m per pipe		
750 mm	0.25 m per pipe		
900 mm	0.40 m per pipe		
> 900 mm	Proposed diameter (m) – 0.5 m per pipe		

Example: In order to service a large development, a 3 m deep - 300mm diameter sanitary, 4m deep - 1050mm diameter storm and 1.7m deep – 200mm watermain are required to be installed in a block within the development.

Block Size Calculation:

Three Utilities:	11.5 m width (from Table 4.3.2-1)
Deepest Utility 4 m:	add 3.0m width
Utilities greater than 500mm – 1050mm storm	add 0.55 m (1050 – 500)
Total Block Width:	15.05 m

4.3.2.3. Minimum Block Width for Maintenance Access

For maintenance access for overland drainage channels and ditches receiving flow from municipal lands the minimum block width shall be calculated using the channel width from top of slope to top of slope plus 4.0 m along one side to allow access from a public right-of-way for

maintenance and a 1.0 m buffer on the opposite side. For example, a channel with a top width of 5 m will require a block a minimum of 10 m in width (5.0 m + 4.0 m +1.0 m).

4.3.3. Municipal Easements

The Town discourages the use of municipal easements in new development and will only consider them as a last resort when all other alternatives have been exhausted. Municipal easements may be considered where Town infrastructure is required outside of new development. Where easements cannot be avoided the minimum easement widths shall be calculated using the same calculation as set out in the block requirements above plus an additional 1.5 m on both sides to account for building setbacks.

4.3.4. Utility Easement

Utility Easements may be required for telecommunications, hydro, and gas. Each utility company should be consulted to determine their specific requirements.

4.4. Stormwater Drainage

4.4.1. General

The purpose of this section is to outline the minimum design requirements for the construction of municipal services related to stormwater drainage systems in the Town of The Blue Mountains. These requirements are general in nature and do not relieve the Developer of the responsibility for submitting a completed product demonstrating competent engineering design in full compliance with all applicable legislation. The design standard should be read in conjunction with the most recent version of the Drainage Master Plan.

For a deviation from the Town Standards to be considered the Proponent may submit a written request to the Town via a Design Standard Deviation Form outlined above in section 4.1. Approval will be required from both the Director of Operations and the Director of Planning.

All storm sewer work shall conform to the Ontario Provincial Standards (OPSS and OPSD), the Ministry of the Environment Conservation and Parks Stormwater Management Planning and Design Manual (latest edition), the requirements of the Town's Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) and the Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (latest edition).

The stormwater drainage system is made up of the minor and major drainage systems. The minor drainage system consists of local drainage to collect and convey frequent storm events (i.e. up to 5-year return periods). The minor system includes the storm sewer and ditch networks. The major drainage system is designed to convey less frequent storm runoff events which exceed the capacity of the minor system. The major system consists of overland flow routes along roadways, drainage swales and open channels.

Storm sewers or open ditches shall be designed and constructed in accordance with the most recent requirements and specifications of the Town of The Blue Mountains. Adequate storm drainage is required in reconstruction, redevelopment, and new development. Storm sewers shall be of sufficient size and depth to provide service for the development of lands within the

upstream watershed and/or for the drainage of any areas designated by the Town. Storm drainage shall be directed to an outlet with adequate capacity and legal outlet authority in the opinion of the Town and applicable agencies.

Channel works, bridges, culverts and all other drainage structures or works shall be designed and constructed in accordance with the most recent drawings and specifications of all applicable agencies having jurisdiction. The design and construction drawings must be approved by applicable agencies having jurisdiction including the Town, MECP, NVCA, GSCA, MTO, MNRF, DFO, etc.

4.4.1.1. Storm Sewer Design Calculations

Storm sewers shall be designed to drain all lands less than five (5) hectares based on the Rational Method. A digital hydrologic model (approved by the Town) may be used for drainage areas greater than five (5) hectares; however, a comparison of pipe sizing vs. Rational Method sizing must be provided in the stormwater design report. If, in the Town's opinion, that the pipe size variation between the Rational Method calculation and modelled pipe sizes is excessive, the Town will require additional supporting information and potentially a peer review of the model to confirm the required pipe sizing.

$Q = 0.0028\ C\ i\ A$

Q = design flow in cubic metres per second (m3/s)

A = drainage area in hectares (ha)

C = runoff coefficient

i = rainfall intensity in millimeters per hour

The rainfall intensity data provided in Table 4.4.1-1 is derived from the online Intensity-Duration-Frequency (IDF) curve lookup tool, published by the Ministry of Transportation (which is updated from time to time) with the following basis and revisions:

- The Latitude/ Longitude coordinates (44.529167, -80.412500, respectively) were selected for the Town of The Blue Mountains.
- The rainfall intensity data in the table has also been increased by 10% to account for expected rainfall increases associated with climate change. This percentage is based on a review of the literature, including the Clausius-Clapeyron relation, which demonstrates that atmospheric air can hold additional water vapor at warmer temperatures (approximately 7% per degree of temperature increase).

Table 4.4.1-1 Rainfall Intensity Data from MTO Look Up Tool with 10% Increase for Climate Change

Duration	Rainfall Intensity (mm/hr)								
	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	130.0	80.2	60.4	37.3	23.0	14.2	6.6	4.1	2.5
5-yr	173.7	106.9	80.5	49.5	30.5	18.8	8.7	5.4	3.3
10-yr	201.6	124.2	93.6	57.6	35.5	21.9	10.1	6.3	3.8
25-yr	237.4	146.3	110.2	67.9	41.8	25.7	11.9	7.4	4.5
50-yr	263.6	162.3	122.3	75.3	46.4	28.6	13.3	8.2	5.0
100-yr	289.7	178.4	134.4	82.8	51.0	31.4	14.6	9.0	5.5

4.4.1.2. Time of Concentration

The maximum inlet time for the first pipe of storm sewer system is ten (10) minutes.

4.4.1.3. External Upstream Time of Concentration

To calculate the initial time of concentration (t_c) for upstream, undeveloped lands, the Bransby Williams formula shall be used unless the project area has an upstream run-off coefficient of less than 0.4, in which case the Airport Method should be used. The most appropriate method may be provided at the discretion of the Town.

To calculate the initial time of concentration (t_c) for external lands that are scheduled for future development, the engineer responsible for the design will use reasonable assumptions in accordance with the most recent MECP guidelines and the MTO Drainage Management Manual. Future land use will be determined based on the Town's official plan. Appropriate oversizing of storm sewers internal to a development, based on any anticipated future upstream development, will be reviewed by the Town on a case-by-case basis. Any additional capital costs associated oversizing for upstream future development will be addressed through a cost sharing agreement or defined development charge project. The Drainage Act may be used, as appropriate, as a cost sharing mechanism to facilitate upstream drainage.

4.4.1.4. Run-off Coefficient

Weighted runoff coefficients, based on the proposed lot development (house size, driveway, etc.) are to be calculated based on the most recent MECP guidelines & the MTO Drainage Management Manual (MTO Design Chart 1.07). Diagrams, illustrating the lot layout, assumed values and calculations will be required by the Town to justify the weighted runoff coefficients used in the design.

Minimum run-off coefficients to be used in storm sewer design shall be as per Table 4.4.1-2.

Table 4.4.1-2 Minimum Run-off Coefficients

Land Use (Current or Zoned Future)	Runoff Coefficient (dimensionless)
Park Land	0.25
Single Family Residential	0.55
Industrial, High Density Residential	0.75
Granular Parking Areas or Roadways	0.80
Asphalt/Concrete Parking Areas or Roadways	0.95

For estimating peak flows for storms larger than the 5-year return storm, the "C" coefficients should be increased to account for the increase in run-off due to saturation of the soil, with the estimate becoming less accurate for larger storms. Coefficients for the larger storms can be derived in accordance with Table 4.4.2.3 below. This data is limited to a maximum C factor of 1.0.

Table 4.4.1-3 Runoff Coefficient Adjustment Factors

Return Period	Runoff Coefficient "C"
10 Years	$C_{10} = 1.0 * C_5$
25 years	$C_{25} = 1.1 * C_5$
50 Years	$C_{50} = 1.2 * C_5$
100 Years	$C_{100} = 1.25 * C_5$

In general, a storm sewer system shall be designed to convey not less than the 5-year return frequency storm without surcharge. Surcharged design may be considered for higher design levels.

4.4.1.5. Drainage Area

Drainage systems must be designed to accommodate all upstream drainage areas considering interim and ultimate conditions. Under all scenarios, the outlet for all storm possibilities shall be clearly defined (i.e. local, trunk and overland flow). For undeveloped upstream areas, in consultation with the Town, upstream conveyed flows may be limited to pre-development or current conditions under the assumption that any upstream development will include quantity control.

4.4.1.6. Local Storm Sewer System

A local storm sewer system shall be defined as the upper part of a drainage system draining areas less than 50 ha of land. The storm sewer shall be designed for a 5-year storm with allowance for additional potential flows.

4.4.1.7. Trunk Storm Sewer System

A trunk sewer system shall be defined as part of a drainage system that drains an area of 50 ha of land or greater. Trunk storm sewer systems shall be designed to accommodate a 25-year storm at minimum and to a greater design storm if deemed necessary by the Town. This shall be assessed on a site-by-site basis based on flooding and/or erosive damage potential. Open ditches are preferred for trunk conveyances.

4.4.1.8. Pipe Capacities

Manning's formula shall be used in determining the capacity of all storm sewers. The capacity of the sewer shall be determined on the basis of the pipe flowing full.

The value of the roughness coefficient 'n' used in the Manning's formula shall be as indicated in Table 4.4.1-4.

Table 4.4.1-4 Manning Roughness for Pipe Materials

Type of Pipe	Roughness Coefficient
Concrete Pipe	0.013
Concrete Box Culverts	0.013
PVC Pipe	0.013
HDPE Smooth Ribbed Wall Pipe	0.013
Corrugated Metal/HDPE Pipe	0.024

4.4.1.9. Flow Velocities (Flowing Full)

For circular pipes the minimum acceptable velocity is 0.6 m/s and the maximum acceptable velocity is 6.0 m/s. Design flows shall not permit supercritical flow within the pipe in any location.

4.4.1.10. Minimum Size

The minimum size for storm sewer shall be 300 mm.

4.4.1.11. Minimum Grades

The minimum pipe grade shall be as per Table 4.4.1-5 below.

Table 4.4.1-5 Minimum Pipe Grade and Slope

Pipe Size (ID)	Minimum Acceptable Slope
300mm	0.5%
375mm	0.3%
450mm	0.25%
Greater than 450mm	0.2%

4.4.1.12. Depth of Storm Sewers

The depth of storm sewers shall be sufficient to allow for the drainage of adjacent properties having internal stormwater management systems outletting to the mainline system and/or necessary to provide residential storm connections.

The minimum cover over the obvert shall be no less than 1.5 m from the centreline of the roadway, and where sewer is not within a road allowance, the minimum cover to the top of the outside barrel shall be no less than 1.3 m. Where these criteria cannot be achieved, the Town may consider shallower insulated sewers on an individual basis. The Engineer shall provide a design solution with consideration for additional loading due to frost.

4.4.1.13. Location

The storm sewer is generally located in the centre of the north/east lane and shall be located as shown on the Town's Standard Road Cross-section drawings. In the case of crescents or looped streets the storm sewer location can be varied to avoid crossing interference with the sanitary sewer. No maintenance hole frame and cover shall be placed in the vehicle wheel path or curb line.

At changes in alignment, the maximum design tolerance from the Town's typical location is 1.5 m before a maintenance hole is required to correct the alignment. The engineer however must ensure that all regulatory tolerances are still achieved.

Clearances at sewer and watermain crossings shall be in accordance with MECP guidelines. Sanitary and water services shall be installed below the storm sewer unless proper justification is provided otherwise.

4.4.1.14. Curvilinear/ Radial Sewers

Storm sewers shall be laid in a straight line between maintenance holes unless radius pipe has been designed. Manufactured radial pipe is permitted for all storm sewers sized 975 mm in diameter or larger. A maintenance hole shall be located at the beginning and the end of the radial pipe section. Tracer wire shall be placed and confirmed on all curvilinear sewers. Tracer wire shall be installed to facilitate access from the surface every 200 m maximum for locating purposes.

The minimum centerline radius allowable shall be in accordance with the minimum radii table as provided by the manufacturers.

4.4.1.15. Elliptical Sewers

Elliptical sewers may be utilized for clearance and/or cover purposes.

4.4.1.16. Change in Pipe Size

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

4.4.1.17. Bedding and Class of Pipe

The class of pipe and the type of bedding shall be designed to accommodate external dead and live loading (i.e. traffic, soil, ground water changes, frost actions, soil settlement, etc.) imposed

on it in accordance with the criteria and methodology as outlined in the current version of the MECP Design Guidelines or as otherwise recommended in the geotechnical report.

Rigid pipe bedding shall be in accordance with OPSS 401. Bedding and backfilling to be in accordance with OPSD 802.030, 802.031, 802.032, 802.033 or 802.034 as applicable.

Flexible pipe bedding shall be in accordance with OPSS 401. Bedding and backfilling to be in accordance with OPSD 802.010, 802.013, or 802.014 as applicable.

The class, type of pipe and pipe bedding shall be indicated on the construction drawings for each section of sewer.

4.4.1.18. Storm Sewer and Culvert Material

Refer to **Town Website** for a list of approved storm sewer and culvert materials and specifications.

4.4.1.19. Safety/Rodent Grates

Manufactured safety/rodent grates are required on applicable open inlets and outlets in accordance with OPS.

4.4.1.20. Storm Sewer Service Connections

A storm service connection is a connection from the municipal sewer main to the property line. Storm service connections shall be provided to each property fronting a municipal storm sewer main (i.e. Urban 20m R.O.W. Cross-section with Parking or Urban 20m R.O.W. Cross-section without Parking) only where development density does not allow for discharge to side yard swales for overland flow. If servicing is permitted, each property is permitted only one service connection. Wye (Double) connections are not permitted. Connections for commercial, industrial, institutional, or multiple use will be considered on an individual basis.

Sump pump discharges to a storm service connection shall be pumped over the top of the foundation wall and outlet into the storm service connection with a 25 mm minimum air gap provided at the building. There shall be no direct connection between the building sump pump outlet pipe and the storm service. Where storm sewer connections are not available, the sump pump system shall discharge to a concrete splash pad on the ground surface with the water directed to side yard swales. Care shall be taken in the design of sump pump discharges to avoid water flowing over sidewalks and causing potential icing issues. Refer to **Town Standard Drawing 4.4.1 in Appendix D.**

Residential Storm sewer connections, when permitted, shall be 125 mm in diameter. The connection shall be terminated at property line 1.0 m to the right of the sanitary connection (when facing the lot) with a gasketed cap/plug and a 38 mmx 89 mm marker extending a minimum of 600 mm above grade and painted white.

Services shall have a minimum 1.2 m cover and shall be installed with a minimum grade of 1%.

All storm service connections to the mainline shall be prefabricated tees or factory-made fittings.

4.4.2. Maintenance Holes

4.4.2.1. Maintenance Hole Location

Concrete maintenance holes shall be provided at the beginning and end of each sewer line, at changes in pipe size and/or material, at changes in grade and/or alignment, at connections (150mm diameter or greater) or junction points and at all street intersections.

A boundary maintenance hole is required between a private and public system in a location that will provide ready access to the Town (either in Town R.O.W. or Block).

Where the storm sewer services commercial, industrial or institutional blocks, a control maintenance hole shall be provided. The control maintenance hole shall be installed on private property as close to the property line as possible. A municipal easement (minimum 3.0m x 3.0m) shall be provided to the Town for maintenance and inspection. The maintenance hole shall be located for ease of access by the Town. An access road may be required.

4.4.2.2. Maximum Spacing

The maximum spacing between maintenance holes shall be as shown in Table 4.4.2-1 below:

Table 4.4.2-1 Maintenance Hole Spacing Requirements

Pipe Size	Max. Maintenance Hole Spacing
300 mm	95 m
375 mm to 750 mm	100 m
825 mm to 1200 mm	125 m
1200 mm and Greater	150 m

4.4.2.3. Storm Maintenance Hole Design

Maintenance holes shall be constructed of precast concrete. The Ontario Provincial Standard 700 Series Drawings shall be used for maintenance hole design. The Engineer is to analyze each maintenance hole applying the applicable OPSD related to soil conditions, ground water, loading, and other pertinent aspects to determine structural suitability. In the cases where the OPSD's are not adequate, the maintenance hole(s) shall be individually designed and detailed. Reference shall be made on the plan and profile drawings to the applicable OPSD or detail.

Tee maintenance holes will not be permitted.

All maintenance hole chamber openings shall be located such that the steps (ladder rungs) are over the raised portions of the benched bottoms. In no case shall a step be placed in front of any portion of the inlet or outlet sewers. Maintenance hole steps are to be in accordance with OPSD 405.010.

The obvert of the outlet pipe(s) shall not be higher than the obvert of the inlet pipe(s). Changes in direction of flow through a maintenance hole greater than 90° will not be permitted.

In pipe sizes of 900 mm or greater, a change in direction of flow through a maintenance hole shall not be greater than 45°.

External drop structures shall be provided when the difference in invert elevation is greater than 600 mm. All maintenance hole drop structures are to be in accordance with OPSD 1003.010. The use of internal drop structures is not permitted. In larger pipes where OPSD does not apply the drop structure shall be designed by the consulting engineer. Detailed drawings complete with supporting calculations shall be provided.

Safety platforms shall be provided in all maintenance holes exceeding a depth of 5m. The maximum spacing between safety platforms is not to exceed 4.5 m. Safety platforms are to be in accordance with OPSD 404.020.

All storm maintenance holes shall be benched in accordance with OPSD 701.021. In the cases where OPSD 701.021 does not apply, a detailed drawing will be required on the applicable plan and profile drawing.

All structures are to be installed with frost straps in accordance with OPSD 701.100. Frost straps shall be continuous and extend a minimum of 4 m below grade.

All connections of flexible sewer pipe to any structure shall be watertight. Connections to all structures including existing structures will require a cored pipe opening. Flexible pipe shall be connected using approved watertight mechanical connectors (either cast in place or flexible "boot style" pipe to MH connectors). Rigid pipe shall be grouted in place. Pipe support at all structures to be in accordance with OPSD 708.020.

4.4.2.4. Head Loss

Appropriate drops shall be afforded across all maintenance holes to compensate for the loss of energy inherent to changes in flow velocity and changes in flow depths in sewers.

Changes in velocity between the inlet and outlet pipes shall be no greater than 0.6m/s.

Hydraulic calculations may be requested for outlet sewers 900 mm in diameter and larger and in unique situations for smaller outlet sewer sizes.

Regardless of the drop across a maintenance hole required by design calculations, the obvert of the outlet pipe shall not be higher than the obvert of the inlet pipe(s) at any maintenance hole location.

The minimum drops across maintenance holes shall be as shown in Table 4.4.2.2 below:

Table 4.4.2-2 Minimum Drops Across Maintenance Holes

Change in Horizontal Direction	Minimum Drop
0º (no change)	30 mm
1º to 45º	50 mm
46º to 90º	80 mm

4.4.2.5. Frame and Cover

Storm maintenance hole frame and covers are to be in accordance with OPSD 401.010 type 'A' closed cover. Storm maintenance hole frame and grates are to be in accordance with OPSD 401.020.

All maintenance holes located within the travelled portion of the roadway shall have the rim elevation set flush with the surface of the base course asphalt where surface asphalt will not be placed within one month. Cast iron riser rings in accordance with the Town's approved materials list may be used to raise maintenance hole covers to surface asphalt elevation.

No maintenance hole frame and grate/cover shall be placed in the vehicle wheel path.

Storm maintenance hole frames and grates are to be raised using pre-cast concrete, high density polyethylene, or rubber maintenance hole adjustment units prior to the placement of the top course of asphalt. The setting of the frame and grate shall be in accordance with OPSD 704.010 OPSD 704.011 or OPSD 704.013 as applicable. A minimum of one and a maximum of three adjustment units shall be installed. The maximum height of adjustment units shall be 300 mm. Any adjustment is excess of the 300 mm will require a precast concrete maintenance hole riser section.

The maximum allowable offset from vertical (corbelling) in maintenance hole adjustment units is 50 mm per unit to a maximum of 150 mm total.

Temporary asphalt curbs (minimum 3m in length) in accordance with OPSD 601.010 shall be constructed behind all catch basin grates with the installation of base course asphalt.

4.4.3. Catch Basins

Catch basins shall be selected, located, and spaced to ensure adequate inlet capacity is provided. If additional inlet capacity is necessary, spacing is to be decreased or special inlet structures provided as approved by the Town. The maximum area serviced by a single catch basin shall be 750 m^2 of paved area or a prorated amount based on actual imperviousness of the drainage area.

4.4.3.1. Catch Basin Location and Spacing

Catch basins and catch basin maintenance holes shall be provided as per the Town's typical cross-section, on both sides of the street, located upstream of pedestrian crossings and upstream of sidewalk crossings at intersections. All catch basins at intersections shall be located on the tangent section of the curb, a minimum of 1.0 m distance from the beginning or end of the curb radius on the upstream side of any sidewalk crossing. Catch basins shall not be located in entrance or sidewalk curb depressions.

Double catch basins shall be provided where flows are being received from more than one direction such as low points, sags or as determined by the Engineer.

The maximum catch basin spacing is summarized in Table 4.4.3-1 below:

Table 4.4.3-1 Maximum Catch Basin Spacing

Asphalt Width	Road Grade	Max. Spacing
> 11 m	< 4.5%	75m
> 11 m	> 4.5%	60m
< 11 m	< 4.5%	90m
< 11 m	> 4.5%	75m

Double catch basins will not be used to increase the minimum catch basin spacing.

4.4.3.2. Catch Basin Design

All catch basins including single and double, shall be specified in accordance with OPSD 705.010 or 705.020. Catch basin maintenance holes shall be limited to reconstructions only and shall be specified in accordance with the appropriate OPS 700 series drawings. All catch basins shall be pre-cast concrete. In circumstances where the OPSD's are not adequate, the structure(s) shall be individually designed and detailed.

The maximum catch basin height measured from the top of grate to pipe invert shall not exceed 2.4 m.

All street line catch basins shall have a 600 mm sump per OPSD 705.010.

Where rear yard catch basins are permitted, they shall be benched to limit sedimentation and maintenance. The immediate downstream maintenance hole shall be provided with a 600 mm sump to allow for sedimentation of particulate sourced from the rear yard catch basin.

4.4.3.3. Frame and Grates

The frame and grates for catch basins shall be in accordance with OPSD. For catch basins located within the roadway, pedestrian pathways, or parkland OPSD 400.020 shall be specified. Either a "Galvanized Steel Honeycomb" grate as per OPSD 403.010 or "Birdcage" style grates as per OPSD 400.120 shall be used in rear yard catch basins or as indicated by the Town. Inlet capacity calculations shall be provided allowing for 50% inlet blockage for all inlets in a sag area.

All catch basins located within the travelled portion of the roadway shall have the rim elevation set flush with the surface of the base course of asphalt. The catch basin frames and grates are to be raised using pre-cast concrete, high density polyethylene or rubber maintenance hole adjustment units prior to the placement of the surface course of asphalt. The setting of the frame and grate shall be constructed in accordance with OPSD 704.010, OPSD 704.011 or OPSD 704.013 as applicable. A minimum of one and a maximum of three adjustment units shall be installed. The maximum height of adjustment units shall be 300 mm. Any adjustment is excess of the 300 mm will require a precast concrete riser section.

If grates/catch basins are located within the main walking area, such as the curb ramp, they are to be installed such that the long dimension of the opening is perpendicular to the primary travel direction to avoid mobility devices and canes from getting caught.

The maximum allowable offset from vertical (corbeling) in maintenance hole adjustment units is 50 mm per unit to a maximum of 150 mm.

Temporary asphalt curbs (minimum 3 m) in accordance with OPSD 601.010 shall be constructed behind all catch basin grates with the installation of base course asphalt.

4.4.3.4. Ditch Inlet Structures

All ditch inlet structures shall be designed to allow inlet capacity of the design contributing runoff when 50% blocked by debris. The design calculations shall be provided to the Town in the design submission. Where the catch basin receives open channel flow that may be subject to debris, the Town may require a custom grate and a larger lead size.

All ditch inlets catch basins shall be in accordance with OPSD. Where OPSD does not apply inlet structures shall be designed and detailed on the engineering drawings.

Overland flow path shall be clearly identified for these structures to ensure that ice or blocked conditions do not cause flooding onto private property.

4.4.3.5. Side Inlet Catch Basins

The use of side inlet catch basins is discouraged and should only be installed when there is no practical alternative and when approved by the Town.

4.4.3.6. Rear Lot Catch Basins

Rear lot catch basins shall be avoided and shall only be installed when there is no practical alternative and when approved by the Town. If rear lot catch basins must be specified, the catch basins and leads shall be privately owned and the responsibility for maintenance shall rest with the private party.

When rear lot catch basins are necessary, the engineer must have regard for the depth of flooding if the catch basin were to become blocked. Inlet calculations are to be provided and are to assume 50% blockage of inlet in sag locations. The grading design must include an adequate overland flow route to minimize flooding and the associated impacts.

The Town Standard **Custom Birdcage Pyramid Grate (see Town Standard Drawing 4.4.2 in Appendix D)** shall be specified in areas where high flows and heavy debris are encountered and as required by the Town.

The rear lot catch basin and lead shall be a minimum size of 375 mm to facilitate operation in the absence of maintenance and offset minimum 1 m from the property line and be installed entirely on one lot.

Where a rear lot catch basin receives drainage from more than one lot a private easement in favour of the upstream property owner(s) will be required.

4.4.3.7. Catch Basin Leads

The minimum catch basin lead size shall be 300 mm (for all types except rear lot catch basins).

Catch basin leads located in close proximity to a maintenance hole shall have the lead connected to the maintenance hole and benched accordingly.

Blind connections directly to the main sewer are permitted for catch basins located within the paved roadway provided the main line storm sewer is at least 450mm diameter.. They are also permitted where the catch basin is within the paved roadway and the catch basin lead diameter doesn't exceed one-half of the main line sewer diameter. Blind catch basin service connections to the mainline shall utilize prefabricated tees or factory-made fittings.

The maximum length of a catch basin lead is 90 m. Long catch basin connections (in excess of 20 m) shall be connected to a maintenance hole. A maintenance hole is required at the connection of any rear yard catch basin to the main line regardless of the lead size.

Catch basins are not to be used in series.

4.4.4. Roof Leaders

Roof leaders shall not be directly connected to the Town sewer systems. Leaders shall discharge to splash pads in landscaped areas draining to side yard swales and directed to the rear of the lot where possible. Roof leader outlets shall not be closer than 5 m from the front property line. Roof leader for residential lots shall conform to **Town Standard Drawing 4.4.1A (Urban) or 4.4.1B (Rural)** in **Appendix D**.

For ICI applications, roof leaders from flat roofs must include design calculations for any storage and shall discharge to the surface unless pre-approved by the Town on a case-by-case basis provided flow control is provided at the source.

4.4.5. Foundation Drains

Foundation drains shall not be connected directly to the Town sewer systems under any circumstances. A sump pump system may discharge to a 100 mm dia. residential storm sewer service connection with an air gap as per **Town Standard Drawing 4.4.1A (Urban) in Appendix D**. Where storm sewer connections are not available, the sump pump system shall discharge to a splash pad in a landscaped area with the water draining to side yard swales and directed to the rear of the lot where possible as per **Town Standard Drawing 4.4.1B (Rural) in Appendix D**. Foundation Drains that outlet to a landscaped area shall not be closer than 5 m from the front property line. Foundation drains discharge water that becomes a nuisance (e.g. flows or ices on public sidewalks or roads) shall be corrected.

The geotechnical report shall consider the ground water table elevation and recommend minimum basement elevations that are above seasonal groundwater elevations where practical. Lot grading shall be designed to minimize foundations that will have seasonal continuous or continuous sump pump operation due to high groundwater levels.

4.4.6. Roadside Ditches

4.4.6.1. Roadside Ditch Design

Roadside ditches (and entrance culverts) shall be sized to convey at least the 5-year storm. All road cross-sections shall be constructed to contain the Regulatory storm events without flooding the adjacent properties, and lands outside of the road allowance.

All roadside ditches shall transport runoff to a safe outlet, such as a stormwater management facility or natural watercourse, approved by the Town.

Ditch inverts shall be located a minimum of 0.15 m and maximum of 0.50 m below the roadway subgrade elevation.

The minimum allowable ditch grade shall be 1%. The maximum ditch grade shall be 6%. In exceptional cases ditches with grades greater than 6% may be allowed by the Town but these shall be suitably protected against erosion.

The ditch side slope on the roadside of the ditch shall not be steeper than 3:1 as indicated on the typical rural cross-sections. The ditch side slope on the private property side shall be no steeper than 2:1 (3:1 recommended). In deep ditch installations or in areas where flatter side slopes are required the width of the right-of-way must be increased. In reconstruction conditions, where expanding the right-of-way width is not possible, steeper side slopes on the private side may be considered. In all cases safety implications of the ditch side slope shall be addressed in accordance with applicable standards. All ditches shall be designed and installed to the requirements of TAC Geometric Design Guide for Canadian Roads and the corresponding MTO Design Supplement and applicable OPSS and OPSDs.

The minimum ditch restoration shall be 150 mm of topsoil and staked sod on the side slopes and bottom of the ditch in all built up areas, areas fronting residential properties, or as specified by the Town.

Seed and mulch in accordance with OPSS.MUNI.804 shall be utilized where sod is not required. The default seed mix for most roadside applications shall be the Standard Roadside Mix from TABLE 1. Site specific seed mixes will be considered to suit existing conditions.

4.4.6.2. Maintenance Access

The design of off-road allowance ditches and drainage routes is to take into consideration ongoing operation and maintenance. At minimum, an access road 4 m wide at the top of slope is to be provided along one side to allow access from the public road allowance utilizing a tandem dump truck. The width may be increased, or a hammerhead turnaround required on a case-by-case basis dependent on site specific configuration, topography, or operational requirements. In all cases access routes are to be designed to enable all expected equipment. Where a Hammerhead turn around is required truck turning templates shall be provided demonstrating access/egress of the required equipment. Block requirements shall be in accordance with section 4.3 of this Standard.

4.4.6.3. Public Safety

Ditches through blocks or easements shall be constructed with side slopes not steeper than 4:1. In rare instances where 4:1 side slope cannot be achieved due to existing constraints (such as in reconstruction or redevelopment) a standard 1.8m high chain link fence will be required.

4.4.7. Culverts

4.4.7.1. Road Crossing Culverts

Road crossing culverts designed to convey major system flows shall be designed in accordance with section 4.4.13. Road crossing culverts shall be designed to convey flows for the minimum 5-year storm or as indicated in Table 4.4.11.1 The minimum size for road crossing culverts shall be

600 mm. Where it is necessary to construct culverts larger than the minimum size, the cross-sectional end area shall be calculated by an approved method.

Appropriate end treatment for erosion control shall be provided to the satisfaction of the Town on all road crossing culverts sufficient to withstand expected flows and site conditions. Culverts shall be installed in accordance with OPSS 421, and culvert end treatment shall be in accordance with the appropriate OPSD.

4.4.7.2. Entrance and Inline Ditch Culverts

Entrance and other inline ditch culverts shall be capable of passing the 5-year storm and shall be minimum 500 mm diameter and a maximum length of 9 m (6m driveway with 1.5m each side for end treatment) without providing access (or as set by zoning by-law). Culverts greater than 9m shall include a catch basin maintenance hole or maintenance hole to provide access in the midpoint of the culvert. For culverts greater than 19.2 m in length, the Town may require the culvert to be installed as a storm sewer with an inlet and outlet structure to facilitate access and maintenance.

Where it is necessary to construct culverts larger than the minimum size, the cross-sectional end area shall be calculated by an approved method.

The low point in the entrance surface must be at or between the culvert and property line to prevent ponding on the roadway. Site specific conditions may otherwise be permitted by the Town provided that grading can be achieved to shed water into the ditch rather than causing ponding on the travelled surface of the road.

Appropriate end treatment for erosion protection shall be provided on all driveway culverts sufficient to withstand expected flows and site conditions in accordance with OPS. The recommended maximum driveway side slope from the culvert invert to the driveways edge is 3:1. The slope may be increased to 2:1 maximum where suitable culvert end treatment/side slope support is provided. A culvert headwall may also be used when required. Where driveway side slope support or culvert headwall are used, the feature shall not be higher than the entrance surface within the boulevard as to avoid impairing overland flow along the ditch line.

The design of all entrance culverts must adhere to the requirements set out in the Town Standard Drawings **“Urban Entrance Profile Guidelines” or “Rural Culvert Profile Guidelines” in Appendix D.**

A Municipal Lands Use Permit is required for new entrances being installed on roadways/properties owned and assumed by the Town or when there is a change in use.

4.4.7.3. Fire Hydrant Culverts

When a fire hydrant is installed adjacent to a ditch, a fire hydrant access culvert is required in accordance with OPSD 217.050. The culvert shall be capable of passing the 5-year storm and shall be minimum 500 mm diameter.

4.4.7.4. Culvert Frost Protection

All culverts installed within the Town’s Road Allowance shall have frost tapers/treatment installed in accordance with OPSD 803.030 or OPSD 803.031 as applicable.

The minimum depth of cover for all culverts is 300 mm (500 mm recommended).

4.4.8. Total Capture Inlets

Total capture inlets are not recommended and should be minimized including limiting contributing areas to generally pervious and small areas (less than 0.2 ha).

For most design solutions, the Town requires the use of OPS. In cases where the engineer's solution requires a special inlet structure, the engineer shall fully design and document the structure.

All total capture inlet structures shall be designed to allow entry of the design flow at 50% blocked (i.e. minimum 2.0 factor of safety).

Headwalls 600 mm in height or greater shall have safety railings provided along the top of the structure.

The design of the inlet grating must consider public safety and minimize the risk of entrapment and entanglement.

Suitable erosion protection shall be provided at all inlets to prevent erosion in the area adjacent to the structure. The erosion protection must be sufficient to withstand expected flow and velocity for the soil/site conditions.

4.4.9. Outfalls

For all storm sewer outlets less than 900 mm in diameter OPSD 804.030 shall be specified. For storm outlets greater than 900 mm OPSD 804.040 shall be specified or as designed by the consulting engineer.

The invert of all storm sewer outfalls shall be above the 2-year flood elevation of the receiving open watercourse/ channel/ waterbody.

All headwalls shall be equipped with grating in accordance with OPSD 804.050.

Headwalls and wingwalls as appropriate 600 mm in height or greater shall have safety railings provided along the top of the structure in accordance with OPS.

Suitable erosion protection shall be provided at all outfalls to prevent erosion in the area adjacent to the headwall and the receiving watercourse/ waterbody. The erosion protection must be sufficient to withstand expected flow and velocity for the soil/site conditions.

4.4.10. Overland Flow Routes

Stormwater run-off in excess of the design capacity of the minor system shall be conveyed via a defined, continuous, overland flow route to an adequate outlet, where the flows can be safely discharged to a waterbody. The combination of overland flow system and minor system shall be designed for the Regulatory storm (the greater of the 100-year return storm or regional event), to limit surface water depths and ponding to the requirements set out in Table 4.4.10.1 Minimum Design Requirements for Storm Events.

Overland flow that is parallel to the roadway shall be limited to the maximum depths indicated in Table 4.4.10-1. In any locations where watercourses cross under a roadway, the regulatory

storm shall not be permitted to pass over the roadway for new road construction unless there are egress points on both sides of the crossing to allow for the closure of the section of road and the detour of vehicular and pedestrian traffic. Flow depths shall be limited as per Table 4.4.10-1.

The major storm is to remain entirely within public lands such as a road allowance, walkways, open space, or designated blocks until it is conveyed to an adequate outlet. It must be demonstrated that the site provides safe conveyance of both the minor and the regulatory flows from both the subject site and any external lands, through the development to an adequate outlet. An adequate outlet constitutes:

- a permanently flowing watercourse, pond, or lake,
- a public right-of-way (as approved by the Town or landowner as appropriate), or
- a legal right of discharge registered on title for discharge through privately held lands.

Analysis of overland flow shall be submitted that demonstrates the above criteria have been met. Examples of this analysis include:

- a spreadsheet style overland flow analysis for small or linear watersheds,
- or in more complicated situations, a dual drainage modelling approach.

Dependent on the condition of the downstream drainage system, the Town may also require smaller developments to submit a dual drainage analysis.

Table 4.4.10-1 Minimum Design Requirements for Storm Events (Flow Parallel to Road Alignment)

Location	Storm Return Frequency (Years)		
	5	25	100/ Regional Storm
Walkways, Open Spaces and Public Lands	Minor surface flow up to 25 mm deep on walkways No erosion potential	Max depth of 0.15 m. Some erosion potential	As approved for overland flow outlets
Local Roads	Contained within roadside ditch. Max 1.0 m wide in gutter. Max 0.10 m at gutter low point	Up to road crown	0.15 m over crown

Collector and Industrial Roads	Within the Roadside Ditch or 1.0 m Wide in Gutter or 0.10 m Deep at Low Point Catch basins	Up to road crown	0.10 m above crown for flows parallel to road.
Arterial Roads	Within the roadside ditch or 1.0 m wide in gutter or 0.10 m deep at low point catch basins	One lane clear	Up to crown for flows parallel to the road
Private Property	Minor ponding in swales	No structural damage No new or additional flooding of private lands without property owner's approval Max 0.15 m depth No erosion potential	No structural damage or flooding. Max depth to 0.30m below lowest ground level adjacent to a building No new or additional flooding of private lands without property owner's approval Max flooding depth of 0.45 m. Minor erosion potential

For flow perpendicular to the roadway, the same depths shall apply; however, overtopping of the roadway shall not be permitted unless the roadways are of low use and that both sides of the crossing have detour routes that do not require the traffic to traverse the overland flow route.

4.4.11. Open Channels

Open channel design shall be completed in accordance with the design standards defined in the MTO Drainage Management Manual Chapter 5 (latest edition)

4.4.12. Overland Flow Channels

Overland flow channels shall be designed to convey the Regulatory storm peak flow without flooding adjacent private properties. Appropriate stabilization shall be provided to protect against velocity conditions experienced during the Regulatory storm and calculations shall be provided to the Town for review and approval. The maximum velocities during the 1:5 year and Regulatory storms shall be 1.5 m/s and 2.5 m/s, respectively for sod lined channels. Channels expected to experience higher flow velocities shall be stabilized using other measures approved by the Town, such as soil reinforcement or stone lining. Calculations, using the Maximum Permissible Tractive Force method (*MTO Drainage Management Manual*, Section 5), shall be provided to the Town and Conservation Authority for review.

All open channels outside of the Town right-of-way shall be located in dedicated blocks. A minimum 4.0 m wide maintenance access must be provided along one side of the channel to allow access from the public right-of-way for maintenance. For Block requirements refer to section 4.3 Block and Easement Requirements.

The Developer shall also be responsible for obtaining approval from the authorizing Conservation Authority (NVCA/ GSCA), the Ministry of Natural Resources, and the Ministry of the Environment, Conservation and Parks.

4.4.12.1. Existing Watercourses

In general, existing watercourses shall be left in their natural state as much as possible. Where erosion or bank instability is already evident in an area to be developed or redeveloped, the Town requires that the situation be stabilized by appropriate remedial and restoration measures. In situations where development related flows will cause significantly increased downstream erosion off-site, the Town will require the Developer to mitigate further damage by appropriate remedial measures.

4.4.12.2. Natural Channel Design

The criteria for natural channel design shall be determined on a site-specific basis and shall be consistent with accepted natural channel design principles such as those provided in the *Adaptive Management of Stream Corridors in Ontario* (MNR, 2002). Natural channel design principles and bio engineering should be used wherever feasible. All natural channel design shall be designed in consultation with a fluvial geomorphologist and reviewed/approved by the Conservation Authority prior to implementation.

4.4.13. Bridges and Culverts

Culverts/ bridges crossing municipal roads shall be designed to MTO standards, by applying design flood frequencies as per Table 4.4.13-1.

Table 4.4.13-1 Design Flood Frequencies for Road Classifications

Road Classification	Design Flood Frequency
Arterial	Greater of 1:100 Year or Regional Storm
Collector	1:50 Year
Urban Local	1:25 Year
Rural Local	1:10 Year
Driveway/ Entrance	1:5 Year

For culvert and bridge projects, the proponent is responsible for obtaining all necessary approvals from the governing agencies, such as the NVCA, GSCA, MNRF, DFO and/or MECP and for applying applicable design flood frequencies.

Bridges and other major drainage structures shall require special designs as determined by the Town. Hydraulic calculations will be required. Bridges and culverts shall be designed so that there is no increase in the Regulatory flood conditions on the watercourses.

The frequency and magnitude of flooding or erosion shall not be increased on upstream or downstream properties.

4.5. Stormwater Management Design

4.5.1. General

The purpose of this section is to outline the minimum design requirements for the construction of stormwater management facilities in the Town of the Blue Mountains. These requirements are general in nature and do not relieve the Developer of the responsibility for submitting a completed product demonstrating competent engineering design in full compliance with all applicable legislation.

Any deviation from the minimum Town Standards shall be specifically referred to by the applicant and/or his agent with a copy of written approval of the Town attached.

Stormwater management requirements generally should reflect area wide solutions and can vary depending upon the watershed and the storm sewer shed that the site is located within. Site or area specific requirements can be obtained from the Town as part of the development pre-consultation process. In general, a stormwater management report will be required for all development applications. The stormwater management report shall consider all relevant environmental and flood protection guidelines including water quantity control, erosion control, flood susceptibility, and water quality control requirements.

The following documents should be used as a guideline where applicable:

- Stormwater Management Planning and Design Manual (MECP, 2003) or its successor.
- NVCA Stormwater Technical Guideline (Nottawasaga Valley Conservation Authority 2013) or its successor.

In addition, pre-consultation with the Grey Sauble Conservation Authority is recommended to meet their requirements for approval.

4.5.2. Stormwater Management Report

For all development applications a stormwater management report must be provided. Specific reporting requirements are provided in section 4.2 Supporting Studies and Reports.

4.5.3. Low Impact Development

The Town encourages Sustainability and Low Impact Development (LID). The Town may consider LID or Best Management Practices (BMPs) in the design and construction of stormwater management systems for new development, re-development, and municipal infrastructure projects provided that it is demonstrated that the LID does not encumber the future maintenance, operation or replacement of other Town infrastructure and third-party utilities. LID's such as underground infiltration chambers systems or infiltration trenches are not generally permitted in the right-of-way unless there are widened rights-of-way, blocks, adjacent to un-

serviced areas (parks or natural areas) or where it can be clearly illustrated that adjacent infrastructure can be replaced/repaired without adversely impacting LID operation. An analysis of sustainability cost benefit shall be prepared to illustrate the benefit of the addition of LID to the site and project long-term.

The Town will consider LID's in a linear storm block adjacent to the right-of-way where there are no Town or 3rd party infrastructure (roads, water, sewer, gas, hydro, communications etc.) or in an enlarged right-of-way provided sufficient set back/clearance is specified from all other Town and third party infrastructure (including service laterals) and it is clearly demonstrated that the existing site conditions are suitable to allow for maintenance and renewal access to utilities without impacting LID operation.

Where permitted, implementation of LIDs will be evaluated on a case-by-case basis since the selected practice will depend on geotechnical and other site-specific conditions. It must be demonstrated that soils are appropriate for the proposed LID through the submission of an acceptable geotechnical and hydrological investigation in support of the design.

4.5.4. Quantity Control

Stormwater management quantity control is required to control increases in storm runoff due to development. Post to pre-development quantity control shall be provided on all developments unless otherwise directed by the Town or applicable Conservation Authority or otherwise indicated in an approved Master Drainage Plan or Watershed Plan. Typical methods of quantity control include the temporary storage of water on flat roof tops and parking lots and end-of-pipe stormwater management facilities. Low Impact Development techniques will be reviewed on a case-by-case basis as a best-efforts basis for initial quantity reduction. Stormwater quantity controls are to be implemented in accordance with the applicable master drainage, sub-watershed plan or site-specific stormwater management plan.

4.5.5. Quality Control

Water Quality controls are to be implemented on applications in accordance with the applicable master drainage or sub-watershed plan or site-specific plan where they exist. In the absence of an established plan, the *MECP - Stormwater Management Practices, Planning and Design Manual* (MECP, 2003) or its successor document should be used. All watercourses within the Town are to be considered as requiring "Enhanced (Level 1)" water quality protection as per the above noted document.

4.5.6. End of Pipe Controls

When designing a stormwater management facility, consideration of the aesthetics of the design shall be paramount to incorporate the facility as an amenity to the surrounding neighbourhood and landscape with features such as enhanced trail systems, natural building materials and signage. The general guidelines for design shall follow the *Stormwater Management Planning and Design Manual* (MECP-2003) or its successor document.

4.5.6.1. General Requirements

The following general requirements shall apply when designing stormwater management facilities:

- Permanent pool volume will be determined based on Table 3.2 of the MECP Stormwater Planning & Design Manual.
- Erosion control storage shall be sized to accommodate the total runoff volume from the development during a 4-hr – 25 mm Chicago storm event and released over a minimum of 24 hours. Notwithstanding this, 40m^3/ha of extended detention volume shall also be provided per Section 3.3.2. of the MECP Stormwater Planning & Design Manual.
- Site fencing shall be provided in areas where necessary for safety reasons as indicated in Section 4.5.6.6.
- Warning signage shall be erected and clearly visible at all access points to applicable stormwater management facilities. Warning signage is to satisfy the requirements of By-Law 2011-32.
- Notwithstanding the noted slope and depth criteria below, in the case of headwall design, the depth of water related to adjoining side slopes may vary and fencing or pedestrian barricades is required for safety purposes.
- Areas less than 5 ha subject to the collection of contaminants or spills shall be fitted with adequate oil/grit separators. This shall include snow storage areas and large vehicle parking areas.
- A landscaping plan of the SWM Pond must be provided (see Section 4.5.6.5).
- A maintenance access shall be provided in accordance with the requirements in Section 4.5.6.7.
- A sediment drying area shall be provided adjacent to the maintenance access road and forebay and shall be appropriately sized for sediment drying. It shall have a maximum slope of 5%, draining back towards the forebay. No trees or shrubs will be planted within the drying area.
- All Stormwater Management Facilities shall be designed with a maintenance drawdown pipe complete with a methodology to allow for controlled release during maintenance.
- The invert of the spillway shall be at or above the calculated high-water level of the facility, while maintaining 0.3m of freeboard above the calculated high-water level.

4.5.6.2. Types of SWM Facilities

The type of facility selected will be in consultation with the Town and NVCA/GSCA in accordance with MECP design guidelines for treatment criteria.

4.5.6.3. Side Slopes

The maximum SWM facility side slopes shall be as outlined in the Stormwater Management Planning and Design Manual (MECP-2003). These maximums shall be met in all instances.

The geotechnical investigation report should also provide recommendations on side slopes based on native soils, the need for any clay liners if required, and possible groundwater impacts on the pond and its structures. Berms constructed as part of stormwater facilities are not preferred.

The objective of the varying side slopes is to provide public use around the facility and aesthetic benefit. The permanent pool is to be curvilinear where possible and avoid straight lines.

4.5.6.4. Inlet/ Outlet Structures & Sediment Forebay

The SWM Facility structures and sediment forebay shall be designed in accordance with the criteria outlined the Stormwater Management Planning and Design Manual (MECP-2003), and detailed calculations shall be included in the Stormwater Management Report. Specific design features shall include:

- The Engineer must demonstrate that the anticipated 10-year sediment accumulation will generate a sediment depth of one half the total depth of the sediment forebay.
- Headwall grates shall be specified for all inlet and outlet headwalls.
- Reverse-slope outlet pipes shall be used for wet pond facilities. A plunge pool shall be provided to ensure sufficient permanent pool and to mitigate thermal impacts.
- Outlet control structure calculations shall be provided in the Stormwater Management Report and must consider tailwater impacts from the receiving watercourse or storm sewer; and,
- Suitable fencing or pedestrian barricades will be provided on top of headwalls.

4.5.6.5. Landscaping

Native and non-invasive trees, shrubs, ground covers and aquatic plants are to be installed for a low maintenance landscape design which has regard for the ecology of the site and the eco-region. The designer is to adhere to the Nottawasaga Valley Conservation Authority Stormwater Management Pond Planting Guide, latest edition.

All slopes on stormwater ponds that are 5:1 slope or steeper will be landscaped in accordance with the design recommendations indicated in the MECP Stormwater Management Planning and Design Manual (latest edition)

Incorporating a wide range of slopes and ponding depths into facility design that conforms to the design criteria is strongly encouraged and desirable in order to facilitate a wide range of flora and fauna habitat conditions.

Where trees are to be planted, they must be planted at a minimum rate of one tree (40 mm caliber) per 50 m^2. The density of shrub plantings, for safety purposes, shall vary depending on the degree of slope. Shrub planting shall prevent public access on all 2:1 slope and discourage access on all 3:1 slope.

4.5.6.6. Fencing

Site fencing 1.5 m high is required to separate stormwater management facilities from private property where an alternative design solution (e.g. maximum slope criteria cannot be maintained) is not feasible. Site fencing is not required next to public lands provided maximum slope criteria is satisfied.

All stormwater management facilities are to be designed so that perimeter fencing is not required where the facility is adjacent to municipal lands, however, fencing may be required if the Town considers there to be a danger to public safety.

4.5.6.7. Maintenance Access

Maintenance access roadways from the municipal road allowance are required to allow access to all inlets, outlet structures, forebays, and sediment drying areas within the SWM facility. Maintenance access requirements are to be determined on a site-specific basis; however, the following minimum criteria shall apply:

- Access routes are to be designed to enable all expected equipment (i.e. tandem dump truck or equivalent) to access key points within the facility. Where feasible, the access shall be looped to key hydraulic features requiring regular maintenance and clean-out. If this is not practical and dead-end roads are required, then a hammerhead turnaround must be provided. The hammerhead shall be designed with a minimum width of 17 m and a minimum 16 m centreline radius. Truck turning templates are to be provided to verify access.
- The maintenance access route shall be designed for the expected equipment and shall consist of minimum 300 mm Granular 'B' base, 150 mm Granular 'A' subbase and 50 mm limestone screenings surface or increased as recommended by a Geotechnical Engineer. Sustainable alternatives such as turf stone or other green paving approach may be considered on a case-by-case basis.
- Maintenance access routes shall be a minimum of 4 m wide, with 2% crossfall and maximum 10% longitudinal gradient.
- The access route shall be located a minimum of 1.5 m from any property line or retaining wall and a shall have a minimum clearance of 3.0 m from the top of any bank.
- Where the access route is to act as an overland flow route or the emergency spillway across the maintenance access, reinforcement of the access route is required.
- The maintenance access route shall have a minimum 10 m inside turning radius and shall include a maintenance platform to the forebay.
- P-gates as per Town Standard shall be provided at the entry of the maintenance access route to deter vehicular traffic from entering the pond block.

4.5.6.8. End-of-Pipe Controls – Treatment Units

Where a stormwater management pond is not practical, consideration will be given to the use of oil/grit separators or stormwater quality treatment units. The units must be designed to provide

80% TSS removal for 90% of the annual runoff volume for the site using a fine particle size distribution. Oil/grit separators and other stormwater quality treatment units must be used in conjunction with additional quality control measures to provide a treatment train approach.

Supporting calculations verifying the designed performance, site specific details/drawings and anticipated maintenance requirements shall be provided to the Town along with certification of the design by a Professional Engineer. All end-of-pipe controls shall be accessible from the Town right-of way for maintenance. Maintenance access route may be required in accordance with section 4.5.6.7 above.

Additional documentation may be required on a case-by-case basis.

4.5.6.9. Operations and Maintenance Manual

The engineer shall provide a standalone operating and maintenance manual for the proposed Storm Water Facility(ies). The manual is to include site specific operational instructions and a general description of individual facility components. The manual must describe how the facility performs under various storm events and the maintenance needed to ensure optimal performance and compliance with the requirements of the site-specific MECP ECA over the life of the facility, including costs and recommended scheduling.

See also section 4.2.5 Supporting Studies and Reports for timing of the submission of this document.

4.5.7. Sediment & Erosion Control

Erosion control requirements for all sites shall be confirmed on a site-specific basis and reviewed with the Town prior to submission. As a general rule for development sites that are more than 5.0 ha in drainage area, erosion control measures should be implemented whereby the 25 mm – four-hour Chicago storm shall be stored and released over a minimum 24-hour period, in accordance with MECP guidelines.

A Tree Preservation and Sediment and Erosion Control Plan shall be prepared for all sites in accordance with Section 3.4.11.4 and submitted for review to the Town and NVCA/ GSCA as applicable. The plan shall consider all phases of construction from topsoil stripping and earthworks to ultimate site stabilization. All erosion and sediment controls are considered temporary applications and are to be constructed prior to any disturbance of land and shall be maintained until the site has been stabilized to a condition that is equal to, or better than, the pre-existing or design condition, whichever is more stringent.

The Tree Preservation and Sediment and Erosion Control Plan may include measures such as, but not limited to:

- Temporary sediment control ponds.
- Sediment control fences.
- Topsoil stockpile and external staging areas: locations and footprint.
- Rock check dams.
- Vegetation buffer zones and tree preservation zones.

- Locations of all trees that are to be retained.
- Stone mud mats.
- Erosion control blankets.
- Catch basin sediment traps.

All measures are to be designed in accordance with Town, MTO, NVCA and GSCA standards. During the period of de-stabilization, the measures shall be monitored, maintained and upgraded (if necessary) until site stabilization has occurred to the satisfaction of the Town and GSCA/ NVCA. The Consulting Engineer shall provide written reports to the Town and NVCA/ GSCA every two weeks that outline the status of the erosion and sediment controls. These reports shall be prepared and submitted for the duration of the project until the disturbed areas have been stabilized to the satisfaction of the Town and NVCA/ GSCA, and the measures have been removed.

4.6. Sanitary Collection System

4.6.1. General

The Engineering Standards apply to Town owned linear sanitary collection system components including smaller pumping stations up to 15 l/s inflow and do not apply to wastewater treatment or major pumping stations. Works not specified within the Standards will be specified on an individual project basis by the Town.

Future land use and population shall be based on the Town of The Blue Mountain's Official Plan. The system shall be designed to service all areas within the project to their maximum future development in accordance with the Town's Official Plan. Allowance shall be made for inflows from the appropriate adjacent contributing area. Discharges of the system are to be into appropriate sewers and are to be approved by the Town. A public system will not be permitted to discharge to a private system not included in the Town's Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) under any circumstances. The exact location for connecting to sewers in adjacent subdivisions or areas shall be as approved by the Town.

All Works are to follow the Town's Sewer Use By-Law as amended, being the Regulation of Sewer Discharge in the Town of The Blue Mountains.

For a deviation from the Town Standards to be considered the Proponent may submit a written request to the Town via a Design Standard Deviation Form outlined above in section 4.1. Approval will be required from both the Director of Operations and the Director of Planning.

The Engineer shall reference the Ministry of Environment, Conservation and Parks (MECP) Design Guidelines for Sewage Works, and Design Manual (latest edition) the requirements of the Town's Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) and the Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval (latest edition) during the design of Town owned wastewater system components.

4.6.2. Design Flows

Flows are to be designed in accordance with the MECP's Guidelines and the Town's Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) for the Design of Sanitary Sewage Works (latest edition) and the requirements below.

4.6.2.1. Residential

- The design average flow is 350 L/c/d exclusive of extraneous flows unless otherwise increased by the Town.
- The population density is 2.15 persons per household unit and is to be based on the projected populations based on information (zoning or otherwise) provided by the Town.
- The peaking factor to determine peak residential flow rate is to be found using the Harmon Formula.

4.6.2.2. Industrial

Industrial wastewater generation is to be as directed by the Town and must take into consideration:

- The specific nature of the industrial site.
- Development potential in accordance with zoning and the Town's Official Plan.
- Onsite source of wastewater in additional to municipal supply.

4.6.2.3. Commercial and Institutional

The wastewater flows from commercial and institutional sites vary greatly with the type of facilities. The Engineer is to consider the historical flows as well as proposed flows from the site. Where no records are available, the Engineer is to refer to the MECP Guidelines and the Town's Consolidated Linear Infrastructure Environmental Compliance Approval (CLI-ECA) or use flows as directed by the Town.

4.6.2.4. Miscellaneous/Extraneous Flows

A minimum infiltration allowance of 0.28 l/s/ha, or as directed by the Town, is to be made for inflow and infiltration in sanitary sewers.

The Town may direct those allowances be made for additional flows to the sanitary collection system.

4.6.3. Sanitary Sewer

4.6.3.1. Capacity Analysis

Prior to the commencement of any design the engineer must confirm that there is adequate capacity to accommodate the sanitary sewer. The Manning formula shall be used to determine the capacity of the sanitary sewer. The value of the roughness coefficient (n) used in the formula shall be no less than 0.013 for smooth walled pipes.

The available capacity of existing sewers can be found using theoretical flows up to 80% of the sewer's capacity. If the expected flow is to exceed 80% of the theoretical capacity of the sewer, a detailed analysis is required including flow monitoring, evaluation of hydraulic grade lines and field condition inspection.

4.6.3.2. Minimum Sanitary Sewer Size

The minimum allowable pipe size for mainline sanitary sewer shall be 200 mm. In no case shall the downstream pipe size be smaller in diameter than that of the upstream pipe regardless of increase in grade.

4.6.3.3. Sanitary Sewer Grade

Regardless of the flow velocities achieved, the minimum design grades for sanitary sewers shall be per Table 4.6.3-1 Sanitary Sewer Minimum Slope except the first leg of any sewer regardless of size shall be 1.00% unless where there is a reasonable expectation that the sewer will be extended within two years. If the developer requires a flatter grade, but two years is too short of a period then a letter or credit or maintenance payment shall be negotiated to address any required maintenance of the pipe in the interim period until development occurs.

Table 4.6.3-1 Sanitary Sewer Minimum Slope

Sewer Size	Minimum Slope
200 mm – 300 mm	0.50%
375 mm – 675 mm	0.40%
750 mm – 825 mm	0.30%

The maximum pipe grade is not to result in a velocity higher than that specified below.

Sewers with steep grades must be addressed in accordance with MECP requirements.

4.6.3.4. Flow Velocities

For circular pipes (flowing full) the minimum acceptable velocity is 0.75 m/s and the maximum acceptable velocity is 3.0 m/s.

The minimum velocity for sewers operating partially full shall result in self-cleansing equivalent to that produced by flow in the sewer operating full at a velocity of 0.60 m/s.

4.6.3.5. Head Losses

Head loss drops shall be provided across all maintenance holes to compensate for the loss of energy inherent to changes in flow velocity and flow depths in sewers, and additional head loss through maintenance holes.

Changes in velocity between the inlet and outlet pipes shall be no greater than 0.6 m/s. Supercritical flow velocities are not permitted.

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

The minimum drops across maintenance holes shall be per Table 4.6.3-2 below.

Table 4.6.3-2 Minimum Drop

Change in Horizontal Direction	Minimum Drop
0º (no change)	30 mm
1º to 45º	50 mm
46º to 90º	80 mm

The change in direction of the inlet(s) and outlet pipes shall always be 90º or less.

4.6.3.6. Location

The sanitary sewer shall be located in accordance with the Town's typical road cross-sections which is generally in the center of the right-of-way.

No maintenance hole frame and cover shall be placed in the vehicle wheel path or in the curb line.

Where sanitary sewers are to be installed in a location other than the Town's right-of-way, a block will be required in accordance with the Block Requirements in section 4.3 Block and Easement Requirements. The Town may require a minimum 4 m granular access road in accordance with section 4.4.7.2 above. Maintenance access roadways from the municipal road allowance may be required to allow access to maintenance holes for maintenance and repairs. Where required, access routes are to be designed to enable all maintenance equipment (i.e. vacuum truck) to safely access the structures.

4.6.3.7. Bedding and Class of Pipe

Rigid pipe bedding shall be in accordance to OPSS 401 or as increased by the geotechnical report. Bedding and backfilling to be in accordance to OPSD 802.030, 802.031, 802.032, 802.033 or 802.034 as applicable.

Flexible pipe bedding shall be in accordance with OPSS 401 or as increased by the geotechnical report. Bedding and backfilling to be in accordance with OPSD 802.010, 802.013, or 802.014 as applicable.

Pipe strength design calculations are to be completed and submitted for pipes installed deeper than six (6) metres or shallower than 2.8 m. The class, type of pipe and pipe bedding shall be indicated on the construction drawings for each section of sewer.

4.6.3.8. Depth of Cover

The sanitary sewer main shall be designed to a depth sufficient to prevent frost damage and to allow for gravity flow at a minimum grade of 2% from 0.3 m below underside of the building

footing to the main. Generally, for trunk or local sewers installed in the right-of way the minimum depth of cover should be 2.8 m. Ultimately it is the responsibility of the design engineer to ensure that the depth is sufficient for servicing. In cases where it is demonstrated that minimum cover is not feasible the Town may consider shallower sewers on an individual site-specific basis. In areas where sewer connections will never be required (such as blocks or easements) the sewer shall have a minimum frost cover of 1.9 m from the finished ground elevation to the obvert of the sewer. Where this criterion cannot be achieved, the sewer is to be insulated to avoid freezing.

4.6.3.9. Horizontal and Vertical Clearances

The minimum horizontal and vertical clearances between sewers and water system components shall be in accordance with the most recent version of the Ministry of Environment, Conservation and Parks (MECP) Guidelines and Procedures.

4.6.3.10. Limits

All sewers shall be terminated at the project limit using maintenance holes. Maintenance holes at the limit of the project shall be designed for the future extension of the sewer.

4.6.4. Sanitary Maintenance Holes

Concrete maintenance holes shall be provided at the beginning and end of each sewer line, at changes in pipe size and/or material, at changes in grade and/or alignment, at all connections equal to or greater than 150mm, pipe junction points and at all street intersections.

Where the sanitary sewer services commercial, industrial or institutional blocks a control maintenance hole shall be provided. The control maintenance hole shall be installed on private property in an accessible location as close to property line (adjacent to right-of-way) as possible in a minimum 3.0 m x 3.0 m municipal easement provided for the Town to access for maintenance and inspection.

4.6.4.1. Maximum Spacing

The maximum spacing between sanitary maintenance holes shall be as Table 4.6.4-1 below.

Table 4.6.4-1 Maximum Spacing between Maintenance Holes

Pipe Size	Max. Maintenance Hole Spacing
200 mm to 750 mm	100 m
750 mm to 1200 mm	125 m
1200mm and Greater	150 m

4.6.4.2. Sanitary Maintenance Hole Design

Maintenance holes shall be constructed of precast concrete and pre-benched. The Ontario Provincial Standard Drawings (OPSD) 700 series shall be used for maintenance hole design as applicable. The minimum maintenance hole diameter is 1200 mm. The Engineer is to analyze each maintenance hole applying the OPSD related to soil conditions, ground water, loading, and other pertinent aspects to determine structural suitability. In the cases where the OPSD's are not

adequate, the maintenance hole(s) shall be individually designed and detailed. Reference shall be made on the plan and profile drawings to the applicable OPSD or detail drawing.

All maintenance hole section joints, pipe penetrations and adjustment collars (moduloc) shall be waterproofed with a Town approved waterproofing membrane applied on the exterior. The waterproofing membrane shall be installed as per the manufacturers specifications and protected during backfilling operations.

All maintenance hole chamber openings shall be located such that the steps are over the raised portions of the benched bottoms. In no case shall a step be placed in front of any portion of the inlet or outlet sewers. Maintenance hole steps are to be in accordance with OPSD 405.010.

The obvert of the outlet pipe(s) shall not be higher than the obvert of the inlet pipe(s).

In pipe sizes of 900 mm or greater, a change in direction of flow through a maintenance hole shall not be greater than 45°.

External drop structures shall be provided when the difference in invert elevation is greater than 600 mm. All maintenance hole drop structures are to be in accordance with OPSD 1003.010. The use of internal drop structures is not permitted. In larger pipes or other unique circumstances where OPSD does not apply the drop structure shall be designed by the engineer and detailed drawings and supporting calculations provided.

Safety platforms shall be provided in all maintenance holes exceeding a depth of 5 m. The maximum spacing between safety platforms is not to exceed 4.5 m. Safety platforms are to be in accordance with OPSD 404.020.

All sanitary maintenance holes shall be benched in accordance with OPSD 701.021. The minimum width of benching shall be 230 mm. In cases where OPSD 701.021 is not applicable a detailed drawing will be required on the plan and profile drawing.

A maximum of 4 pipe openings will be permitted per maintenance hole, consisting of 3 inlet pipes and 1 outlet pipe.

All structures are to be installed with frost straps in accordance with OPSD 701.100. Frost straps shall be continuous and extend to the bottom of the maintenance hole or a minimum of 4 m below grade.

All connections of flexible sewer pipe to any structure shall be watertight. Connections to existing structures will require a cored pipe opening. Flexible pipe shall be connected using approved watertight mechanical connectors (either cast in place or flexible “boot style” pipe to MH connectors installed as per manufacturer’s recommendations). If flexible pipe with a pipe to maintenance hole connector is used, no grouting/parging shall be placed on inside of structure as to impede the operation of the flexible boot. Rigid pipe shall be grouted in place. Flexible joints are required within 300 mm of the outside of the structure. Pipe support at all structures to be in accordance with OPSD 708.020.

4.6.4.3. Sanitary Maintenance Hole Frames and Cover

Sanitary maintenance hole frame and covers are to be in accordance with OPSD 401.010 type ‘A’ closed cover.

In cases where sanitary maintenance holes are located in areas where stormwater overland flow or stormwater surface ponding is designed to take place a watertight maintenance hole cover shall be used as per OPSD 401.050. No more than two consecutive maintenance holes in series may have watertight covers without providing supplemental ventilation.

All maintenance holes located within the travelled portion of the roadway shall have the rim elevation set flush with the surface of the base course asphalt where surface asphalt will not be placed within one month. Cast iron riser rings in accordance with the Town's approved materials list may be used to raise maintenance hole covers to surface asphalt elevation.

No maintenance hole frame and cover shall be placed in the vehicle wheel path or in the curb line.

The setting of the frame and cover shall be constructed using adjustment units in accordance with OPSD 704. 010, OPSD 704.011 or OPSD 704.013. The maintenance hole frames and covers are to be raised using pre-cast concrete, high density polyethylene, or rubber maintenance hole adjustment units. A minimum of one and a maximum of three adjustment units shall be installed. The maximum height of adjustment units shall be 300 mm. Any adjustment is excess of the 300 mm will require a precast concrete maintenance hole riser section.

Where maintenance hole frames and covers are installed on existing gravel roads the maintenance hole covers shall be installed to an elevation 150 mm below the finished grade (buried). A watertight maintenance hole cover shall be used as per OPSD 401.050. This is only applicable in municipal initiated projects where servicing is being extended, road reconstruction is not required/desirable.

In all cases, adequate ventilation must be provided to the satisfaction of the Town. For buried maintenance holes, a vent shall be provided a minimum of every other maintenance hole as per **Town Standard Drawing 4.6.5** in **Appendix D**. Every structure that is buried must have signage located at an offset from the structure in the right-of-way to provide an indicator for operations staff.

The maximum allowable offset from vertical in maintenance hole adjustment units is 50 mm per unit to a maximum of 150 mm total.

4.6.5. Sanitary Service Connections

4.6.5.1. Single Unit Residential Connections

A sanitary service connection is a connection from the municipal sewer main to the property line. Service connections shall be provided to each lot fronting a municipal sewer main. Each property is permitted only one service connection. Wye (Double) connections are not permitted.

All service connections are to be in accordance with OPSD 1006.010 and the requirements below.

The minimum design grades for sanitary service connections are to be in accordance with the Ontario Provincial Standard OPSD 1006.010 (a minimum of 2% slope at all sections of the service and a maximum of 8%).

Residential services are to be 125 mm in diameter, installed perpendicular to the main where possible and terminate at the centre of the lot frontage on the property line. All residential

service connections shall terminate at property line with a 125 x 125 x 100 mm manufactured tee, complete with a 125 x 100 mm reducer, watertight plug suitably braced to withstand test pressures and a 100 mm inspection pipe to the surface as per **Town Standard Drawing 4.6.3** in **Appendix D**. A 38 mm x 89 mm wooden marker painted green shall be placed from the invert of the service to 600 mm above grade until the final connection to the private residence is completed. In landscaped or grassed areas, the inspection pipe shall be terminated flush with finished grade with a cast iron cap marked sewer. Where possible residential connections should not be installed in driveways. When permitted, the cast iron view port caps installed in hard surface driveways shall be set flush with the surface of the driveway. For gravel driveways the cast iron view port caps shall be set 150 mm below grade.

For new construction all residential connections to the main shall be made with approved manufactured tees. Residential connections to existing sanitary sewer shall be made with manufactured tees or saddles as approved by the Town. In general, factory-made tees are required where the diameter of the main sewer is 450mm or less or less than twice the diameter of the service connection. All connections shall be made at 45° to the main (i.e. 10 or 2 o'clock). Long radius bends shall be used wherever possible. The use of short bends is discouraged.

All service connections shall be installed at a depth sufficient to allow for gravity flow at a minimum grade of 2% from 0.3 m below underside of building footing to the sewer main. The maximum depth at property line shall be 3.0 m or as approved by the Town. In all cases the service connection shall cross under the watermain.

4.6.5.2. Multiple Family, Commercial, Institution and Industrial Connections

Services to multiple family residential, commercial, institutional, and industrial blocks are to be individually sized based on the expected flows and shall be a minimum diameter of 200 mm.

- All services shall have a minimum of 2% slope and a maximum of 8% to property line/servicing corridor.
- Any sewers that extend inside the private lands shall comply with Town Standards or OBC as applicable.
- Service connections to the main sewer are to be made with maintenance holes.
- Services shall terminate with a control maintenance hole at the property line in accordance with section 4.6.4 Sanitary Maintenance Holes.

4.6.6. Sewage Pumping Stations and Forcemain

In areas where a gravity sewer system is demonstrated to not be practical or feasible, a sewage pumping station and forcemain may be considered. The use of a sewage pumping station must be approved by the Town.

4.6.6.1. Pumping Station Design Criteria

The sewage pumping station shall be designed to the MECP Design Guidelines for Sewage Works, the requirements of the Town's Consolidated Linear Infrastructure Environmental Compliance

Approval (CLI-ECA) and the Town's specifications. The designing Engineer is to confirm the Town's requirements prior to undertaking the design.

The firm capacity of the sewage pumping station shall be designed such that the station can pump the peak instantaneous flow with the largest pumping unit or piece of equipment out of service.

4.6.6.2. Pumping Station Site Layout

The pumping station, parking area and access to the pumping station must be located above the 1:100-year flood limits unless approved otherwise by the Town and other regulatory agencies. The pumping station must be designed to be protected from damage and be fully operational during the 100-year storm.

Noise control and odour control shall be considered and appropriate measures and/or additional setbacks provided to ensure adjacent properties are not negatively affected.

Perimeter fencing complete with gate will be required at all pumping stations.

All pumping stations shall be enclosed in an appropriate building unless otherwise approved by the Town. Building construction shall be architecturally pleasing in relation to the surrounding community and shall be low maintenance. Permanent structures shall be masonry or concrete construction.

4.6.6.3. Minimum System Components

Any pumping station shall include the following components:

- Dual forcemains (alternating operation).
- Station by-pass capacity including adequate isolation valving throughout the facility.
- Town compliant PLC and SCADA.
- Instrumentation including pressure sensor, level, flow meter.
- Power Monitoring, Surge protection.
- Full Back-up Power (where external requires noise enclosure).

4.6.6.4. Flow Capacity

The pumping station flow capacity shall be based on the peak hourly flow rate and consider low flow conditions (such as station first coming online) as well. The design of new pumping stations shall allow for future modification or expansion to meet the requirements of the tributary area of the pumping station.

4.6.6.5. Pumps

The station shall be provided with a minimum of two pumps with each pump capable of handling the peak flow. The pumps shall be designed in accordance with MECP Guidelines

4.6.6.6. Forcemain

All forcemain shall be designed in accordance with MECP Guidelines, Ontario Provincial Standards, the requirements of the Town's Consolidated Linear Infrastructure Environmental

Compliance Approval (CLI-ECA) and the requirements in this section. For sewage forcemain in open cut OPSS.MUNI.412 shall be utilized. For sewage forcemain installed by Horizontal Directional Drilling OPSD.MUNI.450 shall be utilized.

In locations where forcemains are inaccessible either seasonally or due to natural features (i.e. river crossings), an additional redundant forcemain shall be required.

The sizing of the forcemain will be that required to meet the required flow velocities. The minimum diameter of forcemain shall be 75 mm for systems with grinder pumps upstream and 100mm for all other scenarios.

Forcemain sizing shall be coordinated with pump station design and forcemain length to minimize stagnation, maximize flushing velocity and system efficiency.

4.6.6.7. Velocity and Transient Analysis

Minimum and maximum velocities shall be in accordance with MECP Design Guidelines. A transient analysis will be required for all forcemain and must be submitted along with the design brief.

4.6.6.8. Location

The location of the sanitary forcemain shall be determined in consultation with the Town and considered on a project-by-project basis.

4.6.6.9. Depth of Cover

The minimum depth of cover shall be 1.9 m from finished grade to the top of the forcemain to minimize conflicts with other utilities. Where this criterion cannot be achieved, the forcemain may be insulated to avoid freezing as approved by the Town. The maximum allowable depth of forcemain is 2.8 m.

4.6.6.10. Connection to Gravity System

Forcemain shall discharge to the gravity sewer system at a sanitary maintenance hole. The point of connection shall be no more than 200 mm above the flow line of the receiving maintenance hole. Where the forcemain connects to the maintenance hole the connection shall include a cored opening with an approved watertight mechanical connector (flexible “boot style” pipe to MH connector). Discharge must be directed downward towards the benching.

4.6.7. Low Pressure Sanitary Sewer Systems

A low-pressure sanitary sewer system (LPSS) may be considered by the Town for sanitary sewer extensions only, where gravity sewer design and pumping stations/forcemains are not feasible from a technical or economic perspective in the opinion of the Town.

Low Pressure Sanitary Sewage Systems will not be considered for new development.

Where a low-pressure sewage system is contemplated, the Engineer is to contact the Town prior to design to gain approval for the installation and to determine what design factors the Engineer should consider. Low pressure sewage sewer must be approved by both the Director of Planning and Director of Operations.

All LPSS's shall be designed to the MECP Guidelines and the Town's Engineering Standards indicated herein.

4.6.8. Wastewater Materials

Refer to the Town website for a list of approved wastewater materials and specifications.

4.7. Water Distribution System

4.7.1. General

These Engineering Standards apply to all watermains and water services including appurtenances that are Town owned/operated and are in Town road allowance or on property which will be transferred to Town ownership. All watermains in the Town are to be designed and built to the Town Standards. They are not intended to apply to water supply, treatment, storage, or major pumping stations. Works not specified within the Standards will be specified on an individual project basis by the Town.

The proposed watermain design must consider and be able to convey all domestic water and fire flow needs for the project under consideration plus adjacent lands external to the project. The phasing of any construction or implementation must be in a manner to provide orderly and reliable water distribution systems within the development, looping of these systems shall be provided to the satisfaction of the Town.

All watermains must be designed in accordance with:

- MECP's Design Guidelines for Drinking Water Systems, latest edition.
- Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD), latest edition.
- The Town of The Blue Mountains Engineering Standards.
- By-Law 2008-02 as amended being the Regulation of Water Supply in the Town of The Blue Mountains.
- By-Law 2013-31 as amended being the By-Law to regulate Cross Connection and Backflow Prevention on plumbing systems.
- Any other applicable Legislation including legislated standards and regulations such as the Municipal Act, Ontario Water Resources Act, Safe Drinking Water Act or Environmental Protection Act.

This Standard does not apply to Private Services downstream of a backflow prevention device that are considered plumbing or other works to which the Ontario Building Code applies. For systems with more than one serviced building and a water service greater than 50mm diameter, the backflow preventer shall be installed with a water meter in a chamber at the entry point of the service to the property.

All chemicals and materials used in the alteration or operation of the drinking water system that come in to contact with water within the system shall meet all applicable standards set by both

American Water Works Association (AWWA) and the American National Standards Institute (ANSI) safety criteria standards NSF/60, NSF/61 and NSF/372.

All watermain materials shall comply with all applicable current industry standards and specifications for quality management and quality control including:

- MECP's Design Guidelines for Drinking Water Systems, latest edition.
- The Canadian Standards Association (CSA).
- American Water Works Association (AWWA).
- American Standard and Testing Materials (ASTM).
- Underwriters Laboratory (UL).
- NSF International (NSF).

4.7.2. Under the Town's Drinking Water Works Permit

Any project which proposes additions, modifications, replacements, or extensions of watermains that will become part of the Town drinking water system shall be designed and be compliant with the Town's Drinking Water Works Permit. To receive approval under the permit, the Engineer is to:

- Submit a Water Distribution Design Report to the Town prior to completing the proposed design. The Design Report shall include modelling either completed by or approved by the Town designated modeler to ensure adequate water is available for fire protection. The Report shall demonstrate that the design satisfies Provincial and Town design criteria.
- Watermain Design Checklist for Submission with Form 1 (available on the Town's Website) Verify with the Town that adequate supply capacity is available.
- Submit stamped drawings of the proposed alternations that are compliant with the most current version of the Town's Engineering Standards.
- Complete "Form 1 – Record of Watermain Authorized as a Future Alternation" (2009) which can be found at MECP's website or the Town's website and submit to the Town for acceptance by the Manager of Water and Wastewater Services. Only once the Form 1 is signed by the Town may construction commence.

4.7.3. Water System Ownership

The Town will be the owner and operator of water distribution systems installed on Town Lands i.e. public right-of-way and dedicated blocks.

The Town will not be the owner or operator of water systems/pipes located on private property such as condominium corporations, industrial, commercial, or institutional properties. A single service connection from the Municipal system will be provided to the limit of the right-of-way (front property boundary). The private water pipes beyond this property boundary are considered either private plumbing in accordance with the Ontario Building Code or a non-

municipal year-round residential drinking water system in accordance with the Safe Drinking Water Act and are not considered part of the municipal system.

Where the private water pipes are considered plumbing, they shall be constructed in accordance with Ontario Building Code requirements. Where the water pipes are determined to be designated under O. Reg. 170/03 – Drinking Water systems they shall be constructed and commissioned to Town Standards and the requirements of the MECP.

Where a private water supply or a non-municipal year-round residential drinking water system are being constructed, the municipal water distribution system shall be protected with appropriate property or premise isolation in accordance with this Standard.

4.7.4. Water System Design Documentation

A water supply and distribution report is required. The report shall provide calculations to support the design of the distribution works including sizing of the main, fire flows, and anticipated flows and pressures for domestic and other users (as provided by Town modeler as appropriate). Refer to section 4.2 Supporting Studies and Reports for Water Distribution Report requirements.

A verification report (letter report) will be required at the completion of watermain construction. Flow testing must be completed at key locations verifying the modelled results and confirming Town Standards have been met.

4.7.5. Water System Design Criteria

Table 4.7.5-1 illustrates the water system design criteria for the Town.

Table 4.7.5-1 Water System Design Criteria

	Standard Criteria	Supplemental Criteria	Minimum/Maximum Standard	Governing Regulation/Standard
Domestic Water Demand	350 Lpcd and 2.15 people per equivalent residential unit as per OP Zoning	Peaking factors to MECP Design Guidelines	Minimum 275 kPa Maximum 550 kPa (without private side pressure control)	MECP Water Design Guidelines Town-wide Water Distribution Master Plan, as amended.
Domestic Fire Flow	Fire Underwriters Survey requirements are the target; however, if not achievable to be reviewed with the Town.	Fire Underwriters Survey for multi-residential or resort/hotel accommodation.	Residual 140 kPa pressure throughout distribution system	MECP Water Design Guidelines “Water Supply for Public Fire Protection”, Fire Underwriters Survey Ontario Building Code

Industrial, Commercial and Institutional Water Demand	Site Specific based on proposed use.	MECP Design Guidelines	28 m^3/ha/d	MECP Water Design Guidelines Ontario Building Code
Industrial, Commercial and Institutional Fire Flow	FUS Standard based on use	N/A	38 L/s at any hydrant with minimum 140 kPa residual pressure (Maximum Day Demand in system)	MECP Water Design Guidelines "Water Supply for Public Fire Protection", Fire Underwriters Survey

4.7.6. Hydraulic Analysis

The Town maintains a calibrated hydraulic water model. For Town led projects, the Town may provide the model to the Engineer for their use. For Development led projects where the preliminary modelling completed by the Developer's Engineer indicates that pipe sizes greater than minimum sizes in the right-of-way, hydraulic modelling will be completed by the Town on a fee for service basis. As a minimum a peer review of the modeling will be completed where there is more than one connection to the municipal system (i.e. subdivisions).

For systems with only one connection to the municipal system, the Developer's Engineer may complete the modelling based on boundary conditions provided by the Town.

A hydraulic network analysis of the water distribution system shall be carried out on all projects unless specifically waived by the Town. Any analysis shall include allowances for demands to adjacent areas anticipated.

Pressure and flow testing shall be completed by the proponent if the design pressures are within 10% of the pressure upper and lower limits as identified by modelling with the calibrated model.

The following criteria shall be used as indicated in Table 4.7.6-1.

Table 4.7.6-1 Hydraulic Analysis Criteria

Criteria	Standard
Hazen-Williams Frictional Loss Co-efficient	As per MECP Design Guidelines Existing Mains – As per Town Model
Modelled Pipe Diameter	Actual Diameter shall be used in all situations for new design
Pipe Capacity	Maximum of either fire flow plus maximum day demand or peak hourly flow whichever is higher.
Maximum Velocity	5.0 m/s under design flow conditions.
Acceptable Pressure Range (measured at centreline of road elevation)	Average and Maximum Day: 350 – 550 kPa (50 – 80 psi) Minimum and Peak Hour: 275 – 700 kPa (40 – 100 psi) Maximum Day plus Fire Suppression: 140 – 700 kPa (20 – 100 psi)

Transient Pressure	All watermains shall be designed to withstand the maximum operating pressure plus the transient pressures to which the watermain will be subjected. As a minimum, the pipe and joint strength shall be such that it can withstand the pressure surge resulting from an instantaneous stoppage of a water column moving at 0.6 m/s. A transient pressure analysis must be completed for larger diameter greater than or equal to 400 mm in diameter and watermain 500 m in length or more without an interconnecting watermain. The Town may require a transient analysis be completed for any watermain.

4.7.6.1. Pressure Management

The Town of the Blue Mountains has significant elevation changes within the water distribution system and potential extensions. This may result in localized areas where pressures are less than or exceed Town Standards. In general, compliance with MECP Design Guideline is the objective for all system designs.

Table 4.7.6-2 delineates the conditions for pressure management in the Town. Note that all pressures are measured at the centreline of road elevation. Sites that are higher or lower than the centreline of the road will have varying pressures, and this should be dealt with on a case-by-case basis.

Table 4.7.6-2 System Pressure Management Options

Condition	Pressure Management Solution	Condition/Approving Authority
Pressure Greater than 550 kPa (80 psi) and less than 825 kPa (120 psi)	• Up to 200 properties: Private Individual Pressure Reducing Valve installed after water meter. • More than 200 properties: Municipal Monitored Pressure Reducing Valve to Town Standard.	• Notice to be provided to residents indicating need for PRV. • Municipal Monitored PRV cost to be borne by impacted residents/developer.
Pressure Greater than 825 kPa (120 psi)	• Municipal Monitored Pressure Reducing Valve.	• Municipal Monitored PRV cost to be borne by impacted residents/developer.

Condition	Pressure Management Solution	Condition/Approving Authority
Pressure Less than 275 kPa	• Unless the Town determines that the amount of development warrants the installation of a municipal pressure booster station, then development service extension is not recommended.	• Municipal booster station cost to be borne by impacted residents/developer.

If any increase of pressure is proposed on the property side of the system, backflow prevention is required in accordance with Town By-Law. Individual booster pumps require a special dispensation from the Town with an Engineer's report delineating the measures being undertaken to ensure that the booster pumping does not cause excessively low pressure in the distribution system and is located downstream of a backflow preventer in accordance with the OBC.

4.7.7. Watermain Functional Design

The watermain functional design criteria for the Town are indicated in Table 4.7.7-1.

Table 4.7.7-1 Watermain Functional Design Criteria

	Criteria	Condition
Watermain Size		
Residential	Minimum Size: 150 mm	Confirmed by Modelling
Industrial, Commercial, and Institutional	Minimum Size: 200 mm	Confirmed by Modelling
Areas without Fire Flow	Minimum size 50mm	Confirmed by Modelling
Watermain Depth	Minimum: 1.7 m below finished grade Maximum: 2.5 m below finished grade Minimum with Town approved insulation procedure: 1.2 m	Measured from finished grade to top of watermain, service or hydrant lead. Less than 1.7 m is only permissible in extenuating circumstances.
Slope	Minimum 0.5% slope with high points and low points to be located at hydrant stub locations.	No high point or low point variation in pipe grade between two hydrant locations shall be equal to or less than pipe diameter to minimize air lock potential.
Location	As indicated on Town Standard Road Cross-Section	

Dead-End Watermains	Avoid where possible. Maximum length of 150 m.	Town may require looping of watermain beyond scope of development. Town will require a hydrant and automatic flushing station at any dead end.
Separation from Sewers	To MECP Standard	
Bedding and Class of Pipe	As per OPS	
Watermain Size		
Cathodic Protection	As per OPSS.MUNI.442 and OPSD 1109.010 or OPSD 1109.011 as applicable	As supported by Geotechnical testing and recommendations. In the absence of geotechnical recommendations, OPS standards shall apply.

4.7.7.1. Joint Restraints

Mechanical joint restraints are required at all changes in pipe direction, terminations and any location where thrust pressures may occur (tees, bends, caps, valves, hydrants etc.). Water valves shall be restrained on both sides to the same standard as a dead end. Mechanical joint restraint may also be required in special circumstances such as infill areas, deep installations, under culverts, trenchless installations etc.

The use of threaded rod joint restraint is not permitted.

The length of watermain protected with mechanical joint restraint shall be calculated by the consulting engineer for the anticipated site conditions in accordance with the manufacturer's recommendations. The limits of watermain to be restrained shall be clearly shown and dimensioned on the construction drawings and updated on the Record Drawings.

4.7.7.2. Tracer Wire

Tracer wire shall be installed on all non-metallic (HDPE, PVC or CPP) watermains, hydrant laterals, and water services. The tracer wire shall be installed directly over the watermain and affixed to the watermain in two locations along each length of pipe. Tracer wire shall be 10-gauge wire with all connections as DryConn waterproof connections or equal.

Tracer wire shall be brought to the surface at hydrant valves and at water service boxes. For hydrant valves a loop of wire shall be installed along the outside of the valve box and fed through a 13 mm hole drilled 150 mm from finished grade. A 300 mm loop shall be left inside the top of the valve box. For water services a loop of wire shall be installed along the outside of the service box and wrapped around the top of the box at the surface.

Joints in the tracer wire are discouraged. Where joints are necessary (such as the end of a roll) connections shall be made with approved watertight connectors.

Continuity testing of tracer wire shall be conducted as per the Town's watermain commissioning protocol.

4.7.8. Fire Hydrants

Hydrants shall be spaced at a maximum distance of 100 m in residential areas, 90 m in commercial or industrial areas and 250 m in areas not providing fire protection such as undeveloped lands or blocks. The distance for spacing shall be measured along the centreline of the road or utility corridor.

Hydrants shall be located on the projection of side lot line and offset from the street line in accordance with the appropriate Town Standard road cross-section.

A hydrant shall be placed:

- Perpendicular to the street and the watermain.
- At street intersections.
- At the entrance and the end of every cul-de-sac and dead end street.
- At high points and low points.
- On the same side of the road as existing and future fire hydrants along the road.
- On the same side of the road as the watermain (short side).
- With a minimum of 3 m horizontal clearance from above ground obstructions (poles, streetlights, transformers, pedestals etc.). No obstructions will be permitted in front of a hydrant that will limit access from the roadway.
- With a minimum of 2.0 m horizontal clearance from the edge of any driveway.
- With a minimum 500 mm horizontal clearance from all sidewalk or pathways.
- With a minimum of 2.5m horizontal clearance from the travelled portion of the roadway (edge of pavement).

All hydrants shall:

- Be installed in accordance with OPSD 1105.010.
- Be painted chrome yellow.
- Have a 100 mm Storz connection aligned to face the street and two 65mm hose nozzles (side ports).
- Have a lead that is a maximum of 10 m long and 150 mm diameter installed without the use of bends or reducers and fully restrained from the hydrant to the main.
- Be controlled independently with a gate valve matching the lead diameter installed a minimum of 0.9 m from the centre of the valve to the centre of the hydrant. Hydrant valves will be located as shown in the typical cross sections. Where hydrant valves are located next to the watermain, they shall be installed with an anchor tee. Hydrant valves shall not be installed in the wheel path or in curb.
- Have a fire hydrant flex stake mounted on the hydrant.

Where hydrants are installed in rural cross-sections, adjacent ditches or where access is restricted, an access path shall be provided in accordance with OPSD 217.050. The access path shall consist of minimum 300 mm of Granular B and 150 mm Granular A. Where a culvert is necessary it shall be a minimum 500 mm diameter or sized as required to convey the flows. This section is to be read in conjunction with **Town Standard Drawing 4.7.4 in Appendix D**.

4.7.8.1. Private Hydrants

The owners of private fire hydrants are required to participate in the Town's "Municipal Fire Hydrant Maintenance Program" as required under By-Law 2008-02. An annual fee will be charged for this service.

All private fire hydrants shall conform to Ontario Building Code and the requirements of NFPA 24. Private hydrants must also meet the specifications of the Town of The Blue Mountains as they will be maintained by the Town.

4.7.9. Automatic Flushing Devices

In general, an automatic flushing device is to be installed at permanent dead ends and temporary dead ends in the water distribution system to maintain water quality. The Town may waive this requirement if it can be demonstrated that it is not required.

Every automatic flushing device shall be installed with dechlorination provisions, flow meter and insulated meter pit. The automatic flushing device shall be located near the end of the main and immediately before the required hydrant.

The Engineer shall consider the appropriate location to discharge the automatic flushing device. The Engineer is to ensure that the flushed water is not harmful to the natural environment. Under no circumstances is flushed water to be discharged to the sanitary collection system.

4.7.10. Valves and Valve Chambers

4.7.10.1. Isolation Valves

Isolation valves shall be the same size as the main and resilient seat gate valves with mechanical joints, open left in accordance with the Town's approved materials list.

Generally, isolation valves shall be located on the projection of side lot lines at or near intersections as required for spacing.

- Main Tee Intersection – Three valves (one on each leg).
- Main Cross Intersection – Four valves (one on each leg).

For interconnections on a block, easement or similar, the valve is to be located at the projection of the block property lines or the easement limits.

An isolation valve shall be installed between 20 homes in residential areas, between each fire hydrant such that no two adjacent fire hydrants are out of service at the same time for commercial and industrial areas.

Where watermains are terminated pending future extension, a valve, two additional lengths of restrained watermain (12 m) and temporary automatic flushing device shall be installed. The

Town may elect to the installation of a hydrant rather than an automatic flushing device at their discretion.

All valves 350 mm or larger shall be installed in a concrete valve chamber in accordance with the Valve Chamber Requirements below.

Valves shall have a maximum spacing of 100 m for distribution watermains and 300 m for trunk supply mains.

All mainline valves shall be installed with a minimum clearance of 2.0 m in all directions from above ground obstructions 0.6 m in height or greater.

Valves placed in gravel shoulders or rounding's shall be protected with an asphalt or concrete apron.

4.7.10.2. Combination Air and Vacuum Release Valves

Combination Air and Vacuum release valves shall be installed in chambers and utilized at high points in watermains where there is no servicing or fire hydrants to provide air release or as required by the Town. Refer to **Town Standard Drawing 4.7.3** in **Appendix D.**

4.7.10.3. Drain Valves

Drains shall be provided at low points of all watermains 350 mm and larger or as required by the Town.

4.7.10.4. In- line Pressure Reducing Valves

Where individual pressure reducing devices are not suitable, the creation of a new sub pressure zone utilizing an in-line pressure reducing valve (PRV) may be considered by the Town; however, new pressure zones that are not identified in Town master planning shall be avoided. This shall be considered only under exceptional circumstances as detailed in Section 4.7.6.1.

PRV's shall be installed in precast concrete chambers. The design will be prepared by the Consulting Engineer in consultation with Town and in accordance with the chamber requirements below and per **Town Standard Drawing 4.7.5A and 4.7.5B** in **Appendix D**.

Where PRV's are being utilized the following shall also be provided:

- High and low flow pressure reducing valves.
- By-pass/ isolation valving.
- SCADA connections to monitor upstream and downstream pressure and flows.
- Water meter as required by Town.
- Pressure gauge and pressure indicator transmitter on each side of PRV with additional gauges located at access hatch.

4.7.10.5. Chambers

All chambers shall comply with the general chamber requirements on **Town Standard Drawing 4.7.5C** in **Appendix D**.

4.7.11. Water Service Connections

A water service connection is a connection from the municipal watermain to the property line. Service connections shall be provided to each lot fronting the main. Only one water service connection is permitted from the Town's water system to an individual property unless approved by the Town for high risk or sensitive users (i.e. long-term care, daycare). Under no circumstances shall reverse flow be permitted from any site.

Water service connections shall be installed in accordance with OPSD 1104.010 and 1104.020 as applicable.

The engineer shall determine the required water service size based on flow requirements. The minimum residential service size shall be 25 mm. Residential services must be sized in accordance with the Ontario Building Code.

Water services longer than 30 m as measured from the property line to the connection to the building plumbing shall be installed with Town approved meter pit or enclosure at the property line.

All water services shall have minimum 1.7 m cover and be installed perpendicular to the watermain in a straight line and terminated at property line with a 38 mm x 89 mm marker installed from the invert of the service to 600 mm above grade and painted blue. Residential services shall be located 2.5 m left of the sanitary connection (when facing lot).

Service connections 50 mm and less in diameter shall have a corporation stop installed at the main complete with service saddle and terminated at property line with a curb stop valve and box with a temporary "blow off" installed and extended to a minimum of 600 mm above grade and capped until the service is extended by the property owner. The water service and curb stop box shall not be installed in a driveway or future driveway location. A minimum 1.0 m horizontal clearance from the edge of the driveway or future driveway is required. Where this is unavoidable the Town may consider installing the service in the driveway with the use of an approved access cap with adjustable valve box as per approved manufacturer's installation recommendations.

Water service connections 100 mm in diameter or larger for new construction shall be made with a manufactured tee in the supply main. Lateral connections to existing mains shall be made with a tapping sleeve and valve c/w valve box. A gate valve and valve box shall be placed at property line. Where services are not going to be connected immediately a blow off (OPSD 1104.030) or automatic flushing device may be required to maintain water quality in the system.

Service connections for industrial, commercial, institutional, or multiple dwelling use will be considered on an individual basis.

Fire connections may be required for industrial, commercial, institutional, or multiple dwelling lots.

All services, regardless of size, are to be fully restrained from the watermain to the property line valve.

4.7.12. Metering

All water services shall be metered including private irrigation & private fire lines and other exterior uses in accordance with By-law No. 2008-02 “Regulation of Water Supply in The Town of The Blue Mountains”. Meters are to be radio read in conformance to the Town’s approved materials list. All meters must be able to be to communicate with the Town’s Advanced Metering Infrastructure (AMI) network. Through consultation with the Town and Neptune Technologies Group, a propagation study may be required to assess if the new connections can be supported by the existing AMI network, or if new AMI receiver(s) (Neptune Gateways) and associated tower(s), hardware and software will be required. All water meters for single-unit dwellings are sized at 16 mm (5/8”). In cases where the Design Engineer can demonstrate the need for a larger water meter, the water meter is to be sized in accordance with AWWA M22 Sizing Water Service Lines and Meters.

The water meter arrangement installation is required to meet the AWWA M22 Sizing Water Service Lines and Meters manual. Sizing of the water meter will be such that the accuracy of the low flow measurement is optimized while ensuring that the rated supply to the property is not adversely affected.

The applicant's engineer must calculate the maximum continuous flow rate and maximum intermittent peak flow rate for water services equal to and larger than 38 mm in diameter.

For water service connections 50 mm and larger provisions shall be made in the piping system for the installation of a water meter of the same diameter as the private water pipe entering the building. Meters up to 50 mm are to be purchased directly from the Town. All water services shall have a valve installed on each side of the water meter. Meter by-passes are required on water meter installations 38 mm and larger. A lockable shut off valve is required on the bypass line. Connections between the supply main and the meter are not permitted. For water meters 75 mm (3”) and greater provide straight lengths of pipe (length equal to or greater than five times the diameter of the pipe) upstream and downstream of the water meter. Isolation shutoff valves are not permitted to be directly attached to the water meter but may be located within the straight length distance in accordance with the manufacturer’s specification. A restrained coupling must be provided on the upstream side of the water meter for flexibility in case of water meter removal. Where an electromagnetic water meter is specified a test point or port must be provided. A test tee or plug must be installed with a threaded lateral and plug on the meter piping, at a minimum distance of three pipe diameters downstream of the meter.

One bulk meter will be used per property except for multi-residential developments where multiple buildings exist on a single property. In these instances, one meter per building is preferred.

The Town will seek to require the bulk water revenue meter to be in or adjacent to the private building nearest to where the central water service enters the development. If the total distance to the nearest building exceeds 50 m, then a separate above ground heated structure large enough to contain the meter and backflow preventer will be required near the property line. Water meters located in a crawl space, under stair landing, in walls, or other inaccessible areas will not be accepted. All water meter locations are to be reviewed and approved by the Town.

The Developer/Owner shall keep the water meters accessible, clean, dry, and protected from flooding and freezing at all times.

General requirements for water meters located within buildings to which water service is being provided are:

- Meters are to be within a heated space, protected from freezing temperatures.
- Always provide a minimum of 750 mm (30”) in front of the water meter and 300 mm (12”) behind to be free of obstruction to allow for convenient maintenance and testing of the meter.
- Water meter to be installed within 1200 mm (48”) of where the service connection enters the building.
- Meters are not to be installed in a confined space.
- Minimum of 300 mm (12”) above the floor to centreline of pipe.
- Maximum of 750 mm (30”) above the floor to centreline of pipe.
- Water meters are not to be installed in a bathroom, bedroom or a garage.
- Strainers are required on compound water meters. Strainers are not required on electromagnetic meters.
- Water meters are to be horizontally level, with register casing facing upward and plumb.

**Meters up to 50 mm (2”) may be placed in approved meter pits (accessible without entering) at the discretion of the Town. Requires the use of Insulated lids, positive drainage, and must not be subject to flooding /freezing etc.

4.7.13. Cross Connections and Backflow Prevention

Where there is a risk of contamination or cross connection at a property, that may affect the

quality of the water supply, the owner of the property shall install a backflow prevention device in accordance with the Town’s Backflow Prevention & Cross Connection By-Law, the Canadian Standards Association B64.10 – Manual for the Selection and Installation of Backflow Prevention Devices and requirements set out in the Ontario Building Code. Backflow prevention devices are required to be installed on all new water service connections and sprinkler service connections supplying:

- Industrial.
- Commercial.
- Institutional.
- Multi-unit residential.

To avoid excessive pressure loss, backflow prevention devices are to be sized in conjunction with the water meter sizing and the manufacturer’s specification. Backflow prevention devices must be installed downstream of the water meter and isolated with shutoff valves. No connection of

any kind is permitted on piping between the water meter bypass outlet tee and the premise isolation backflow device. The piping will be clearly labelled 'No connection permitted'.

Backflow prevention devices may not be installed in locations subject to flooding or in confined spaces unless this is an exterior chamber specifically for isolation of a private watermain system with a sump pit and alarm system. Due to the significant volume of water a reduced pressure principal backflow device can discharge, a floor drain sized and positioned to accept the flows is required whenever this type of device is installed.

4.7.14. Non-Potable Watermain

All non-potable watermain shall have polyethylene warning tape installed 600 mm directly over the pipe. Warning tape to be minimum 75 mm wide and blue in colour with black lettering indicating “CAUTION: BURIED NON-POTABLE WATER LINE BELOW”. Under no circumstances shall non-potable watermain materials be blue in colour.

4.7.15. Water Distribution Materials

Refer to the Town website for a list of approved watermain materials and specifications.

4.8. Roads

4.8.1. General

The design and construction of all Town roads and road elements shall be in accordance with the Town’s Engineering Standards, Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads, the corresponding MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads and Ontario Provincial Standards/Drawings (OPSS/OPSD). Town Engineering Standards or whichever is more stringent shall take precedence.

All road elements (intersections, curbs, sidewalks, pathways, ramps etc.) located on Municipal lands must conform to the O. Reg. 191/11 Integrated Accessibility Standards under the Accessibility for Ontarians with Disabilities Act (AODA), 2005.

The Transportation Master Plan is now complete and should be reviewed with the Engineering Standards for design guidance and consistency.

Roads and entrance design along the Highway 26 connecting link through Thornbury (Arthur Street West, Bridge Street East, and King Street East) are Town owned and maintained however, this section shall be designed to MTO Standards.

Roads and entrance design on MTO roads (Highway 26) or County Roads shall be designed to MTO/County requirements and shall be approved by the MTO/County as applicable.

All roads shall be classified in accordance with the Towns’ Official plan. In the event the road is not specified within the Official Plan, the road shall be classified according to the traffic volumes expected (including truck traffic), the length of the road, the intended use of the road, and the environment (i.e. urban, or rural). The classification of each road shall be confirmed with the Town prior to the commencement of engineering design.

Classifications as per Table 4.8.1-1 Road Classification shall apply in accordance with definitions and designations from the Town Official Plan.

Table 4.8.1-1 Road Classification

Classification	Function
Arterial	Intended to be major transportation routes carrying moderate to high traffic volumes, providing through routes across and within the Town. County roads are typically considered arterial roads.
Collector	Intended to collect moderate traffic volumes from local roads and direct it to arterial roads, County roads or Provincial highways. May be designated Major or Minor, Residential, or Industrial.
Local	Intended to carry low traffic volumes and provide pedestrian and community connectivity. May be designated Residential or Industrial.

4.8.2. Road Allowance and Cross-sections

Generally, local roads are to be designed to the Standard "Urban - 20m R.O.W. Cross-section with Parking" and shall be constructed with an asphalt surface, curb and gutter and storm sewer system in accordance with **Town Standard Drawing 4.8.2A and 4.8.2B** in **Appendix D** unless specific approval is received from the Town. Where an urban cross-section is desirable and on street parking is not required the "Urban 20m R.O.W. with No Parking" shall be used in accordance with **Town Standard Drawing 4.8.3A and 4.8.3B** in **Appendix D**.

For land development projects, new roads designed to the "Rural Road – 23m R.O.W. Cross-section" in accordance with **Town Standard Drawing 4.8.5A and 4.8.5B** in **Appendix D** may only be considered for estate residential or industrial developments provided that:

- Lot frontages are greater than 30.48 m (100 ft).
- Traffic volumes are low.
- Speed limits are low (50km/hr or less)
- Pedestrian traffic is very low or infrequent.
- Located in areas that groundwater levels are proven to be well below proposed ditch grade.
- A rural cross-section better addresses stormwater management needs.
- The road accommodates and is safe for all users (motor vehicles, bicycles, and pedestrians).

- A rural road cross-section better suits the existing character of the rural area.

Where a 1.5m sidewalk is required in rural estate residential, the "Rural Road – 26m R.O.W. Cross-section" shall be used in accordance with **Town Standard Drawing 4.8.6A and 4.8.6B** in **Appendix D.**

A wider right-of-way will be required to accommodate a wider road platform for paved shoulders, deep roadside ditches, low impact development (when permitted) or pedestrian/bicycle routes etc.

The introduction of a road feature such as an entry feature island will require the road allowance to be widened by the width of the island feature. The introduction of such a feature must be designed such as to not to interfere with snow plowing operations and provide minimum 0.6m of clearance for snow plowing turning operations or a minimum throat width of 4.0 m, whichever is greater.

The road allowance (also referred to as the right-of-way) and cross-section will be established based on the road classification and in accordance with the Road Allowance & Cross-sections table 4.8.2-1. For road classifications for which there are no standard drawings, their design shall meet the minimum criteria as set out in these Engineering Standards and the appropriate cross-section will be resolved in consultation with the Town.

Table 4.8.2-1 Road Allowance & Cross-sections

Classification	**Urban**		
	Road Allowance (metres)	**Paved Width (metres)**	**Standard Drawing**
Local	20	8.5	4.8.2A
Local No Parking	20	7.5	4.8.3A
Minor Collector	26	12.0	-
Major Collector	26-30	14.0	-
Arterial	30	14.0	-
Industrial	26	10.0	-
Classification	**Rural**		
	Road Allowance (metres)	**Paved Width (metres)**	**Standard Drawing**
Local	23	10	4.8.5A
Reconstruction only	20	10	4.8.4A

Rural with sidewalk	26	10	4.8.6A
Industrial	26	10	-

[1] *Road allowance widths in some cases may need to be wider to accommodate design features, intersection improvements including extra turning lanes and traffic control devices, sight triangles, drainage culverts, low impact development, bridges and underpass construction, cuts, fills, noise walls, turning lanes, bike paths, and utilities etc. Final right-of-way requirements along roads will be determined through functional designs and subdivision approvals.*

4.8.3. Geometric Design

The geometric design of Town roads shall follow the TAC Geometric Design Guide for Canadian Roads. Key geometric design parameters are summarized in Table 4.8.3-1 Geometric Design Elements below. The Town may, dependent on circumstances, modify the geometric design standards to incorporate specific elements required to suit the project. In no instance, will safety related criteria be reduced.

Table 4.8.3-1 Geometric Design Elements

Road Classification		Speed (km/h)		Road Grade (%)		Minimum Vertical Curve K Value		Minimum Horizontal Curve (m)	Stopping Sight Distance[2] (m)
		Posted	Design	Min	Max	Crest	Sag[1]		
Local	Urban	40	50	0.5	8	7	13	100[3]	65
	Urban	50	60	0.5	8	11	18	150[3]	85
	Rural	50	60	0.5	8	11	18	150[3]	65
Industrial	Urban	50	60	0.5	6	11	18	150[3]	85
	Rural	50	60	0.5	6	11	18	150[3]	85
Minor Collector		40	60	0.5	6	11	18	150	85
Major Collector		50	60	0.5	6	11	18	150	85
Arterial		60	80	0.5	5	26	30	280	130
TAC Reference		-	-	-	-	Sec 3.3.3	Sec 3.3.3	Sec 3.2	Sec 2.5

[1] *assumes all roads except Local Residential - Rural and Industrial - Rural are illuminated*

[2] *for automobiles on a flat surface*

[3] *assumes normal 2% crown (i.e. no super elevation)*

4.8.3.1. Posted and Design Speeds

The typical posted speed is 50 km/h. The posted speed of a road shall be confirmed with the Town and may be altered with the authorization of Council in accordance with subsection 128(2) of the Highway Traffic Act, chapter H.8, R.S.O. 1990, as amended.

For Local roads, the design speed shall be minimum 10 km/h over the posted speed to ensure an appropriate factor of safety to the road design and road user.

4.8.3.2. Road Grades

All grades shall be referenced to centreline of the road.

Cul-de-sacs (where permitted) and expanded bulb corners shall be designed with the centreline profile increased to ensure that a minimum lip of gutter grade of 0.5% is maintained along the full length of the lip of gutter, to account for length increases due to curvature.

In the vicinity of sag vertical curves, the cross slope shall be adjusted as necessary to maintain a minimum lip of gutter grade of 0.5% to the low point.

4.8.3.3. Vertical Curves

All points of grade change in excess of 1% shall be designed with vertical curves. The minimum 'K' values for crest and sag curves are noted in Table 4.8.3.1 Geometric Design Elements for each road classification. The minimum length of vertical curve in metres should not be less than the 60% of the design speed in km/h.

4.8.3.4. Horizontal Curves

The minimum horizontal curve centreline radii are noted in the Geometric Design Elements table for each road classification.

In general, "right angle bends" will not be permitted except in the case of local residential roads configured as courts or crescents provided, they service no more than 50 residential units. Where permitted, these bends must have a deflection angle between 80° and 100°, a minimum inside curb radius of 15 m (measured at the edge of pavement) and must be designed with an expanded bulb as necessary to achieve minimum lot frontage width.

4.8.3.5. Stopping Site Distance

The stopping sight distances noted in Table 4.8.3.1 Geometric Design Elements are based on typical automobile vehicles on a flat surface and should be adjusted to reflect uphill or downhill grades of 3% or more as per the *TAC Geometric Design Guide for Canadian Roads*.

4.8.3.6. Crossfall

Finished roads shall have a minimum crossfall of 2%.

Super-elevation is required on Collector and Arterial roads with a design speed of 50 km/h or greater and shall conform to the requirements in the TAC Manual.

4.8.4. Special Road Designs

Road designs that are not addressed by the Town's Standards (Collector, Arterial and Industrial roads) shall be in accordance with the TAC *Geometric Design Guide for Canadian Roads*. Special designs require review and approval by the Town prior to entering the detailed design phase.

4.8.5. Fire Routes

All public and private roads shall conform to the Town's Fire Route By-law, 2001-88. Fire routes including signage locations to be clearly identified and delineated on approved for construction drawings.

4.8.6. Public Transit

Prior to the commencement of the design of the development or redevelopment the engineer shall confirm with the Town if there will be any requirements for the provision of public transit facilities.

4.8.7. Pavement Design

4.8.7.1. Minimum Design

The minimum pavement design for all roads shall be as per Table 4.8.7-1 Pavement Design – Town Roads (below) or as per geotechnical recommendation (whichever is more stringent). Major collector and arterial road designs are typically MTO, or County led, and standards should be coordinated with their requirements. The most stringent requirements shall apply.

Table 4.8.7-1 Pavement Design – Town Roads

Classification	Asphalt		Granular	
	Surface	Base	Granular A	Granular B
Local Residential and Minor Collector	50 mm HL3	50 mm HL4 or HL8	150 mm	450 mm
Major Collector, Industrial	40 mm HL3	70 mm HL4 or HL8	150 mm	450 mm

All granular and asphalt materials and work shall conform to OPSS.MUNI 310, OPSS.MUNI 314, OPSS.MUNI 501, OPSS.MUNI 1010, OPSS.MUNI 1101 and OPSS.MUNI 1150.

4.8.7.2. Geotechnical Requirements

The Town will require a geotechnical engineer to confirm the applicability of the minimum standards or provide recommendations as to increasing the depth of granular base and type and thickness of asphalt in consideration of the following:

- Physiographic setting and subgrade soil characteristics (bearing capacity, frost susceptibility, moisture content, compaction, density, structural integrity).
- Groundwater conditions.
- Projected traffic loading.

Tests of subgrade materials must be conducted by a recognized soils laboratory and be acceptable to the Town. Copies of tests, along with proposed road designs, shall be submitted to the Town for review and confirmation of standard compliance.

Undertake additional geotechnical investigation as warranted to address the specific requirements of the project such as determining the environmental quality of the soils in accordance with MECP requirements including O. Reg. 406/19;

4.8.8. Intersection Design

Key intersection standards are detailed in Table 4.8.8-1 Intersection Design. Intersections along the Highway 26 connecting link through Thornbury (Arthur Street West, Bridge Street East, and King Street East) and all arterials shall be designed to MTO Standards.

Table 4.8.8-1 Intersection Design

Intersection	Approach Angle	Minimum Curb Radius (metres)	Minimum Daylight (metres)	Maximum Intersection Grade[1] (metres)	Minimum Tangent on Approach[2] (metres)
Local to Local	80 to 100°	10	6 x 6	3.5%	45
Local to Collector	80 to 100°	10	7 x 7	3%	45
Collector to Collector	80 to 100°	10	7 x 7	3%	45
Industrial to Collector	80 to 100°	15.0	15 x 15	2%	45

[1] *refers to the grade through the intersection on the through road*

[2] *measured from centre of intersection*

4.8.8.1. Approach Angle

Roads should be designed to intersect at 90°. However, this may be reduced to 80° or increased to 100° if necessary while maintaining minimum tangent on approach.

4.8.8.2. Curb Radii

The curb radii measured along the edge of pavement shall be in accordance with Table 4.8.8-1 Intersection Design.

Intersection curb radii may need to be increased on arterial roads and/or truck routes where higher volumes of large trucks (tractor semi-trailers) are expected. The requirement for compound radii to facilitate truck movements must be confirmed.

4.8.8.3. Daylighting

A daylighting triangle is the area of a corner lot formed by measuring from the projected point of intersection between the two R.O.W. from a specific distance back along each ROW line. Daylighting triangles are required where roads intersect to ensure adequate sight distances can be maintained between approaching drivers. The minimum daylighting triangles required for traffic signal or stop control intersections shall be in accordance with The Town of The Blue Mountains Comprehensive Zoning By-Law 2018-65 as summarized in Table 4.8.8-1 Intersection Design table above.

4.8.8.4. Backfall

At all intersections, the crossfall of the major street shall not be interrupted by the crown line of the minor street. A 1% to 2% backfall shall be provided on the minor street, which shall continue to the end of the curb return radii to facilitate proper drainage of the intersection. Overland flow routing of storm drainage through the intersection must be maintained.

4.8.8.5. Centreline Offset

The maximum intersection crossroad centreline offset is 1.5 m. Any offset proposed shall be clearly shown and dimensioned on the drawings.

4.8.8.6. Spacing

Intersection spacing shall be as per Section 9.4.2 of the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads.*

For Arterial roads, the typical minimum intersection spacing is 200 m, which allows for minimum lengths of back-to-back left turn lanes at adjacent intersections. This spacing is generally only applicable in areas of intense existing development or restrictive physical controls where feasible alternatives do not exist.

For Collector roads, the typical minimum spacing is 60 m.

For Local roads, the typical minimum spacing is 60 m; 40 m is acceptable for adjacent 3-legged intersections.

The minimum intersection spacing between signalized intersections is a function of the average running speed and the signal cycle lengths. Reference is made to Table 9.4.1 in the TAC Manual for the design process for intersections.

4.8.8.7. Sight Lines

Intersections shall be designed with sufficient sight distances in accordance with the applicable design speed and for design vehicles to depart from a stopped position and make the desired maneuver through the intersection.

Intersections on curves are to be avoided. Where intersections must be placed on a curve, calculations and drawings must be submitted confirming the adequacy of intersection sight distance requirements in the TAC manual.

4.8.8.8. Roundabouts

The implementation of a roundabout will be reviewed on an individual site-specific basis. At locations where a roundabout is proposed, detailed drawings illustrating the design, lighting, pedestrian facilities, active transportation elements and other details shall be provided to the Town for review and approval. Roundabout design and guidance shall be per current applicable geometric design standards and the latest edition of Canadian Roundabout Design Guide (CRDG). Design vehicles shall be confirmed with the Town. Buses and emergency vehicles shall be accommodated without use of the central island truck apron on collector and arterial road roundabouts.

Daylighting triangles shall be determined independently for roundabouts through the design process.

4.8.8.9. Space Requirements

The space requirements for AODA compliant intersections must account for the wide variety of mobility devices used today, as per the following or the most recent AODA requirements, whichever is more stringent:

- A standard wheelchair requires 2.44 m of clear space to make a 360° turn (e.g., a circle with a 2.44 m diameter).
- The clear space required to accommodate a stationary wheelchair shall be 0.76 m by 1.22 m.
- The clear space required to accommodate a stationary scooter shall be 0.66 m by 1.37 m.

4.8.8.10. Curb Ramps

4.8.8.10.1 Design and Layout

Curb ramps ensure a continuous accessible path of travel between vehicular and pedestrian routes and are typically located at pedestrian intersections and parking areas with passenger loading zones. Curb ramps must align with the direction of travel to reduce the risk of pedestrians veering off the designated crosswalk and into vehicular traffic lanes.

All curb ramps must be compliant to the latest AODA standards and shall include:

- Suitable drainage to prevent water, snow, and ice accumulation.

- free of any grates or other obstructions/barriers that may reduce useable by those with disabilities.
- Minimum clear width of 1.5 m, exclusive of return curbs and flared sides.
- curb returns to extend across the full length of the curb ramp and have a colour contrast for identification purposes.
- Flared sides to ensure sides are clearly marked and grooved for identification purposes.
- A tactile walking surface indicator (TWSI) strip.

4.8.8.10.2 Curb Ramp Slopes

Minimum and maximum curb ramp slopes ensure that there is suitable drainage to prevent water and ice accumulation and to ensure safety of all users. OPSD 310.030 and 310.033 specify minimum and maximum slopes for concrete sidewalk ramps at signalized and un-signalized intersections respectively.

4.8.8.10.3 Tactile Walking Surface Indicators

All concrete sidewalk ramps shall include tactile walking surface indicators in accordance with OPSD 310.039.

If an intersection utilizes one common curb ramp across the intersection frontage for pedestrians to cross in either direction, the TWSI must extend across the entire frontage of the curb ramp. This will avoid pedestrians with restricted vision from being able to approach the centre of the curb ramp without encountering and recognizing the tactile surface.

4.8.9. Road Access

4.8.9.1. Road Access Points

The minimum number of access points and access arrangement will be dictated by the number of units proposed, as noted in Table 4.8.9-1 Development Access Arrangement.

Table 4.8.9-1 Development Access Arrangement

Access Arrangement	Residential Units (or Equivalent Commercial or Industrial Units)
One access point	0 – 100
One access point + separate & dedicated emergency access	101 - 600
Two or more access points	Greater than 600

4.8.9.2. Emergency Access

Where an emergency access is required and/or proposed, it shall conform to the following:

- 3.5 m wide travel lane centred within a minimum 6.0 m right-of-way provided there are no obstructions or curves.
- The travel lane shall be hard surfaced (e.g., asphalt, concrete, paving stone, turf stone or approved alternate).
- Capable of supporting firefighting equipment.
- Designed with adequate corner radii and horizontal and vertical alignments as that required for fire routes under the Ontario Building Code.
- Provided with a removable gate as per **Town Standard Drawing 4.14.2** in **Appendix D**.

4.8.10. Entrances

The entrance to a property is all the works associated with access to the property within the Town Lands from the travelled portion of the road to the property line. All entrances including any changes to existing entrances that are not constructed under a development agreement where securities have been provided to the Town to assure completion of the work to Town Standards shall require an entrance permit. The entrance permit shall allow the work proposed as described on a comprehensive site plan including all works in the boulevard across the lot frontage. All entrances shall conform to **Town Standard Entrance Profile Guidelines and Rural Culvert Profile in Appendix D.**

Without invalidating any requirements of the Town's Municipal Land Use Permit Guidelines or By-law 2014-65 a By-law to regulate installation of works on Town land, all entrances shall have the following characteristics:

- Entrances off hard surface roads shall be paved with a minimum of 65 mm compacted HL3A over a minimum of 200 mm compacted Granular A, from the travelled portion of the road to the property line. Entrances off gravel roads shall have, as a minimum, a gravel surface, and a minimum structure of 250 mm compacted Granular A to the property line. Where a culvert is installed, the pipe embedment shall be compacted Granular A and include frost tapers as per OPSD 803.030 and 803.031.
- The minimum clearance between the edge of an entrance and any street furniture (streetlight or utility pole; utility pedestal, transformer or infrastructure, fire hydrant, storm, or sanitary works, etc.) shall be 2.0 m on each side.
- The minimum setback from the projection of the side lot line (see Town's Municipal Land Use Guidelines for definition) shall be equal to the required setback for driveway and surface parking requirements of the Zoning By-law. The minimum setback is increased for entrances in rural road cross-sections where stormwater conveyance is accomplished with roadside ditches such that the entrance culvert shall have 1.0 m clearance and the entrance 2.0 m clearance from the projection of the side lot line.

Where a property has an easement in the side yard the projection of the easement line shall be used as the reference from which the minimum setbacks are required.

- The minimum width of an entrance shall be equal to the width of access ramps and driveways required by the Zoning By-law. For residential entrances, the minimum width shall be 4.0 m.
- The maximum width of an entrance shall be equal to the maximum width of driveways allowed by the Zoning By-law. The maximum width of an entrance in rural road cross-sections is restricted by the maximum culvert length of 9.0 m. Culvert end treatments shall not be used to cantilever the entrance over the end of the culvert, the ends of the culvert shall be open and accessible for maintenance free of any restrictions
- The minimum grades for entrances shall be 0.5% or sufficient to promote positive drainage. The minimum grades for entrances are subject to requirements in some cases such as curbs and sidewalks in urban road cross-sections that affect the minimum grades. Entrances shall be constructed in conformance with OPSD 301.010, 301.020, 301.050, 350.010, and 351.010.
- The maximum grades for entrances shall be in conformance with OPSD 301.010, 301.020, 301.050, 350.010, and 351.010. The maximum grade of an entrance is contingent on the type of road cross-section and design elements within cross-section. For rural entrances, a nominally flat section of the entrance next to the road is required to allow a vehicle to accelerate onto the road from a standing stop in slippery driving conditions. For urban entrances, the presence of a sidewalk or future sidewalk and its proximity to a curb will have bearing on the entrance grades.
- Entrances in rural road cross-sections shall have a low point over the culvert to drain surface water from the road and the property into the ditch. Where there is no back slope to the ditch and surface water from the road flows onto the property the entrance shall be graded away from the road and the entrance shall be lower than the travelled portion of the road. In cases where surface water from the road drains to the property it is the property owner responsibility to create drainage patterns on the property to convey this water and protect buildings from flooding.
- Entrances along the Highway 26 connecting link through Thornbury (Arthur Street West, Bridge Street East, and King Street East) shall be designed to MTO Standards.

New entrances located on roads that are hard surfaced or surface treated within the Town's service districts shall be paved from the edge of the intersecting road to the property line in consideration of the type and volume of traffic to be served and the minimum requirements of Table 4.8.10-1 Pavement Design - Entrances or as specified by a Geotechnical Engineer whichever is more conservative. Exceptions will be made for specific streets that are expected to be reconstructed as part of the Town's 5-year Capital Plan as determined by the Town.

Table 4.8.10-1 Pavement Design - Entrances

Design Element	Residential Urban	Residential Rural	Multi-Unit Residential	Commercial & Light Industrial
Surface Asphalt	65 mm HL3A	65 mm HL3A	40 mm HL3	40 mm HL3
Base Asphalt	-	-	50 mm HL4 or HL8	50 mm HL4 or HL8
Granular A	200 mm	200 mm	150 mm	150 mm
Granular B	-	-	300 mm	300 mm

All entrances are subject to the approval of the Town as per Municipal Land Use Permit Guidelines and Grey County or MTO access requirements.

4.8.11. Sidewalks

Sidewalks shall be installed to facilitate safe pedestrian movement and encourage pedestrian traffic. Sidewalks shall meet the minimum requirements of Ontario Regulation 413/12, Accessibility for Ontarians with Disabilities Act, 2005 and shall be constructed in a manner that provides maximum assistance to individuals with limited mobility and without creating hazards to individuals who are visually impaired.

4.8.11.1. Location

Sidewalks are required on both sides of all Arterial and Collector roads.

Sidewalks are required on at least one side of all Urban Local roads as shown on the typical cross sections. Sidewalks on Rural Local Roads will be at the Town's discretion.

The locations of schools, parks, churches and commercial establishments, the number of units served, sidewalk continuity, etc. shall also be considered in determining which side of the street the sidewalk should be constructed. The final location shall be resolved in consultation with the Town.

Where the development generates the need, in the opinion of the Town, sidewalks may be required on both sides of a Local Road, on existing streets external to the subdivision or on streets where reverse frontage is proposed. Sidewalks may also be required on both sides of the road for road sections leading to high pedestrian traffic generators such as schools, hospitals, community centres, parks etc.

Where sidewalk is provided it shall carry through all driveways including residential, commercial, industrial and condominium sites.

Sidewalks shall terminate at logical locations to ensure network connectivity and maintainability. Receiving sidewalks/ramps are required at all locations where pedestrians are directed to cross the roadway.

Sidewalks are not required on cul-de-sacs serving less than 10 residential units unless the sidewalk is required to connect to a walkway, emergency access, municipal trail, park and/or parkette accessed from either the road section or cul-de-sac.

4.8.11.2. Width

Sidewalks shall be minimum 1.5 m in width on all local roads and minimum 2.0 m in width on all Collector and Arterial roads as indicated on the Typical Road Cross-Section Drawings. At the discretion of the Town, wider sidewalks may be required to accommodate increased pedestrian volumes, mobility devices, etc. Generally, sidewalks will not be constructed at the back of curb. In isolated instances where sidewalks are permitted to be adjacent to the back of curb, they shall be minimum 1.8 m in width (local roads).

4.8.11.3. Grades

A maximum sidewalk grade of 5% (or the slope of the adjacent road, whichever is steeper) and a maximum crossfall of 5% will be permitted. However, the engineer must strive to limit the grade to no more than 5% and the crossfall to 2%, where possible.

4.8.11.4. Sidewalk Construction

Concrete sidewalks shall have a minimum thickness of 125 mm except where adjacent to curb (such as at intersections) or through residential driveways in which they shall be a minimum thickness of 150 mm. In new residential developments where the entrance locations are not shown on the drawings and sidewalk is required, the sidewalk shall be a minimum thickness of 150 mm.

Where sidewalk is provided, it is to carry through all driveways to private lands.

Sidewalks through industrial or commercial entrances shall have a minimum thickness of 200 mm in accordance with OPS.

Bedding under concrete sidewalks shall be minimum 150 mm Granular A, compacted to 100% of the material's SPMDD. Through entrances, the depth of Granular A shall be increased as per the Town's Municipal Land Use Permit Guidelines.

Concrete sidewalk shall be constructed in accordance with OPSS 351, OPSD 351.010, OPSD 310.020, OPSD 310.030, OPSD 310.031, OPSD 310.033, OPSD 310.039 and OPSD 310.050.

4.8.11.5. Ramp Construction

Ramps shall have a minimum thickness of 200 mm.

All new sidewalk ramps at intersections shall include cast iron tactile warning surface indicators (TWSIs). Sidewalk ramps that are reconstructed for any reason shall be retrofitted with cast iron TWSIs. TWSIs shall be in conformance with OPSD 310.039.

4.8.11.6. Rural Sidewalks

Where sidewalk is required utilizing a rural standard cross-section, the width of the right-of-way shall be increased (minimum 26m R.O.W.), or the sidewalk shall be located in a block adjacent to the right-of-way.

4.8.12. Curb and Gutter

All new urban roads shall be constructed with concrete barrier curb with standard gutter in accordance with OPSD 600.040, OPSS 353 and the appropriate Town Standard road cross-section. Curb terminations shall be in accordance with OPSD 608.010, and curb outlets shall be in accordance with OPSD 605.030.

In general, roads are to be constructed with barrier curb and gutter in accordance with OPSD 600.040 and will have a minimum 1.2 m clear zone measured from back of curb. However, the Town, at its sole discretion, may require mountable or semi-mountable curbs. Where mountable or semi-mountable curb is considered increased setbacks for street furniture (poles, pedestals, streetlights etc.) will be applied (minimum 3.0m clear zone).

Where curb and gutter are provided, it is to carry through all driveways to private lands. For multi-residential, commercial, industrial and condominium driveways, the curb shall be constructed in accordance with OPSD 350.010. For residential driveways, the curb shall be constructed in accordance with OPSD 351.010 in conjunction with the Town's Urban Entrance Profile Guidelines.

Prior to final acceptance all curb blemishes will be rectified by removing and replacing a minimum 3 m long section of curb.

4.8.12.1. Curb Depressions

Curb depressions are required at all entrances and at each intersection for pedestrian crossings. In new developments, the driveway locations and associated depressed curb locations shall be shown on the construction drawings.

4.8.12.2. Grade

In general, curb grade shall match road profile. The minimum grade on any curb shall be 0.0.5%.

4.8.13. Subdrain

Subdrain shall be installed continuously below curb on both sides of all roads where the Town's Urban Cross Sections are being applied unless soil conditions warrant otherwise. For an exception to be considered a geotechnical report will be required outlining the soil conditions and the impact the reduction or omission of subdrain will have on the road base and the life of the pavement.

All subdrain outlets in rural areas shall be fitted with a galvanized rodent grate and clearly marked in accordance with OPSD 206.050. Subdrain pipe embedment shall be at minimum granular 'A' or as specified by the geotechnical engineer.

All subdrains are to be installed in accordance with OPSS.MUNI. 405 and OPSS 421.

4.8.14. Cul-De-Sac Roads

Permanent cul-de-sacs are not endorsed by the Town. The use of cul-de-sacs in the design of new subdivisions shall be avoided whenever possible. Where they are determined to be necessary and are approved, they shall be limited to servicing a maximum of 40 lots with a total length of no more than 250 m.

4.8.14.1. Geometric Design

When cul-de-sacs are permitted by the Town, the design of bulb type cul-de-sacs on rural, local residential or local industrial roads shall reflect the following criteria (applicable to both symmetrical and offset bulbs):

- 20 m radius road allowance.
- 15 m radius measured to the edge of pavement/lip of gutter.
- 25 m curb return measured at the edge of pavement/lip of gutter.
- Maximum longitudinal road grade of +4%.
- Minimum grade of 1% measured from the centre of the bulb to the edge of pavement lip of gutter.
- Minimum gutter grades of 0.75% measured along the flow line of the gutter around the cul-de-sac bulb.

Islands will not be permitted inside bulb cul-de-sacs.

All cul-de-sacs shall be detailed to show gutter, crown, and other grades sufficient to demonstrate that the road will properly drain.

Cul-de-sacs shall be designed to provide adequate snow storage on the right side of all cul-de-sac bulbs. This requires the boulevard to be free of all above ground infrastructure/street furniture such as hydro poles, streetlights, hydrants, pedestals etc.

Cul-de-sacs shall conform to OPSD 500.010 Type A, OPSD 500.020 Type A or B or OPSD 500.030 as appropriate.

4.8.14.2. Temporary Cul-de-sacs

Temporary cul-de-sacs or turning circles will be considered whenever a road is to be continued in the future in a phased Plan of Subdivision. Temporary cul-de-sacs or turning circles are to be designed to the same standards as permanent cul-de-sacs except that concrete curb and gutter is not required. Temporary dead end barricades and roadway terminal sign may be required when warranted in accordance with OPSD 906.01.

4.8.15. P-Loop Roads

A P-Loop Road is defined as a looped road with a single connection to the municipal road network that is configured similar to the shape of a “P”.

The centreline length of a P-Loop with a single entrance from an intersecting local or collector road shall not exceed 850m. The centreline length of the primary leg of a P-loop shall not exceed

180m. The maximum length of the primary leg can be increased to 350m if there is a secondary access restricted to emergency use connecting the middle third of the primary leg with an all-season municipal road. Refer to Section 4.8.9 for road access requirements.

Centreline lengths shall be measured between centreline intersections of connecting roads.

4.8.16. Pavement Marking and Signage

The proposed pavement markings and signage are to be shown on the Pavement Marking and Signage Plans and the Composite Utilities Plan.

4.8.16.1. Pavement Marking

All pavement markings shall be designed in accordance with the requirements of Ontario Traffic Manual Book 11 and approved by the Town. Pavement markings are to include markings at all intersections, school crossings, walkways, and railway crossings to clearly indicate the proper traffic zones, lanes, stop lines and crosswalks. Centreline pavement markings are required on Collector and Arterial roads. Local roads do not require centreline pavement marking, but stop bars are required with a minimum of 15 m centreline marking at intersections.

Pavement markings will be installed on surface course asphalt and in some circumstances on binder course asphalt. All pavement marking removal required to prepare the area for final pavement marking shall be done by abrasion.

Lane markings are to be organic, solvent based, or water borne traffic paint complete with glass beads. All permanent lane markings require 2 applications of paint. The second application shall not be applied until the first is tack free. Pavement markings shall be installed in accordance with OPSS 710, OPSS 1712, OPSS 1716 and OPSS 1750.

Symbols, stop bars and pedestrian crossings shall be durable pavement markings (hot applied thermoplastic or field reacted polymeric pavement marking materials) in accordance with OPSS 710, OPSS 1713 and OPSS 1714.

4.8.16.2. Temporary Pavement Marking

Temporary pavement markings may be required on the base coat of asphalt in some circumstances at the discretion of the Town.

4.8.16.3. Street Name Signs

Street name signs shall be placed at every intersection and shall identify each street at the intersection. The preferred location of the street name signage is on the corner opposite to the stop sign.

All street name signs are to be 160 mm high extruded aluminum blades, with green high-intensity background and 90 mm pre-cut, white high-intensity upper case block highway lettering, all vacuum applied. The suffix of each road name is to be abbreviated (e.g., AVE., BLVD., RD., ST., etc.). Signs are to be mounted on 60 mm diameter round galvanized metal posts, 3.6 m long, embedded 1.2 m in the ground. Street name signs are not to be mounted on stop signposts or other signposts.

For the intersection of private roads with a Town road, the same standard as outlined above shall apply, however the signs for the private road shall be blue in colour with white lettering.

For new developments, street name signs shall be supplied and installed by the Developer at the completion of the base course asphalt road construction and prior to the issuance of Building Permits. Signs must be maintained by the Developer until "Final Acceptance" by the Town.

4.8.16.4. Traffic Control Signs

Traffic control signs are required at all intersections and shall conform to the most recent versions of the Ontario Traffic Manuals (OTM) or the Highway Traffic Act Regulations for Ontario.

All traffic control signs are to be made with high intensity type reflective sheeting in accordance with MTO, OTM, the Highway Traffic Act Regulation for Ontario and the Town, including colours. Temporary regulatory signs must also be reflective. Signs are to be aluminum, anodized both sides, according to the following requirements:

- Less than 600 mm in size - 1.6 mm utility series aluminium.
- 600 to 900 mm in size - 2.0 mm No. 655T6.
- Greater than 900 mm in size - 3.2 mm No. 655T6.

Traffic signs shall be mounted on "U" flange galvanized metal posts in accordance with OPSS 990.110. The post shall be 3.6 m long, embedded 1.2 m in the ground. All signs, with exception of "Parking" signs, shall be mounted approximately at right angles to the direction of and facing the traffic that they are intended to serve. On curved alignments the angle of placement should be determined by the course of the approaching traffic rather than by the roadway edge at the point where the sign is located. Signs shall be individually erected on separate posts, unless otherwise indicated on the Traffic Control Plan. Signs for different purposes should not be placed closer together than 30 m. Parking signs shall be mounted facing 30 to 45 degrees to the flow of traffic.

For new developments, traffic control signs shall be supplied and installed by the Developer at the completion of the base course asphalt road construction and prior to the issuance of Building Permits. Signs must be maintained by the Developer until "Final Acceptance" by the Town.

4.8.16.5. Roads Not Assumed Signs

Signs reading "Roads Not Assumed by Municipality – Use at Your Own Risk" shall be erected at each point of access/egress to new residential and industrial subdivisions. Signs shall meet following requirements:

- A minimum of 1.2 m x 1.8 m.
- A maximum height of 2.15 m above grade.
- Lettering shall be 120 mm wide by 180 mm tall, black in colour on white reflective backing.

Signs shall be erected prior to the start of construction and shall be removed after assumption.

4.8.17. Traffic Signals

Traffic signals are to be designed on individual site-specific basis and shall conform to the most recent version of Ontario Traffic Manual Book 12, the appropriate MTO and Ontario Electrical Code, including all appending bulletins issued by the Electrical Safety Authority which are applicable to the work. All work shall be governed by Federal, Provincial and Local laws and by-laws pertaining to the work, as well as by the latest issue of CSA Standards pertinent to the work. All electrical work is subject to inspection by the Electrical Safety Authority. In the event of a conflict between regulations, the strictest regulation shall apply.

Traffic signal designs shall include the following as a minimum:

- A pad mounted traffic signal controller in a location that is not visually distracting (the controller shall conform with the NEMA Standard TS2 Type 2 Standard capable of handling eight phases, solid state, micro-processor-based traffic signal controller with LCD display.
- A separate power pedestal.
- A metered power supply.
- Accessible Pedestrian Signals.
- Emergency vehicle pre-emption.
- Loop detectors placed in the base asphalt.

Alternatives to loop detectors (e.g., radar or video) may be considered by the Town.

4.8.18. Active Transportation

The implementation of active transportation facilities (excluding sidewalk) will require the approval of the Town. Where required, active transportation facilities shall be implemented and designed in accordance with the TAC Geometric Design Guide for Canadian Roads, the corresponding MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, Ontario Traffic Manuals (specifically Books 12A, 15 and 18), and the Town's Official Plan.

4.8.19. Roadside Safety

Roadside safety barriers are protective devices installed between motor vehicle traffic and a potential hazard off the road such as a steel beam guiderail. Roadside protection shall be installed at all locations were warranted and if struck, where they will cause less damage as compared to the hazard.

All roadside protection elements shall be designed and installed per the TAC Geometric Design Guide for Canadian Roads, the corresponding MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads and applicable OPSS and OPSDs.

4.8.20. Boulevards

Boulevards are defined as the area between the property line and the back of curb or edge of pavement. The balance of the boulevard not occupied by driveways or sidewalks shall be graded and finished in accordance with the appropriate Town Standard cross-section. Boulevards shall

be constructed with positive drainage to the roadway with a minimum slope of 2% and a maximum slope of 8% (6% recommended).

Generally, boulevards shall be sodded with a minimum 150 mm of topsoil. Landscaping in the boulevard shall conform to the Town's Streetscaping Standards section 4.14 of this Standard.

4.8.21. Roadside Drainage

Road grading shall direct flows from the road allowance to an appropriate outlet in accordance with the Town's Stormwater Management System requirements as set out in section 4.3 and 4.4 of this Standard.

4.8.22. Community Mailboxes

The design of the mail delivery system shall be in accordance with Canada Post Corporation's (CPC) and Town requirements. Refer to Canada Post Corporation's "Delivery Planning Standards Manual for Builders and Developers".

The Engineer must communicate directly with Canada Post and the Town for the design requirements and site selection of the proposed facilities. The engineer must propose locations that are conducive to the pedestrian and vehicular movements anticipated in the area. As a result, placement on collector or arterial roads shall be avoided. All proposed locations must be shown on the Composite Utility Plan.

4.9. Roadway Illumination

In general, streetlights are to be provided on all new public streets, parking lots and walkways. Streetlights may be required on streets bordering new developments if deemed necessary by the Town. In reconstruction and infill areas the lighting requirements may be reduced at the discretion of the Town to match the character of the existing area while maintaining safety.

The design of roadway illumination shall be in accordance with the American National Standards Institute (ANSI)/Illuminating Engineering Society (IES) recommended practice No. 8 (ANSI/IES RP-8 latest edition), the Transportation Association of Canada (TAC) Guide for Roadway Illumination, most recent edition and the Town's Engineering Standards.

The roadway illumination system is to provide an enhanced level of visibility for motorists, cyclists, and pedestrians during low-light or nighttime conditions. The illumination must increase the contrast between objects and their backgrounds, thereby enabling motorists, cyclists, and pedestrians to correctly distinguish roadway details, unexpected obstacles, and hazards.

The roadway illumination system is to contribute in public areas to:

- Security – Effective roadway illumination systems can help deter potential criminals and aid in the prevention of vandalism. Use of Crime Prevention through Environmental Design (CPTED) principles are critical to provide the public user of the roadway with a safer environment.
- Economics – By providing a safer environment, roadway illumination can encourage people to visit commercial areas. Decorative lighting can revitalize an area and promote the development of new businesses.

- Aesthetics – Roadway illumination may draw attention to the architectural and landscape features of an area, thereby encouraging the night-time use of an area.

When designing a roadway illumination system, the engineer shall make a conscious effort to limit negative effects while still achieving the minimum required lighting levels. Meeting the required lighting levels shall not be compromised. Some of the negative impacts of improper design include:

- Light Spill onto adjacent properties
- Glare creates discomfort for the human eye.
- Sky Glow or Illumination of the night sky by lighting systems.

This Standard does not supersede, nor replace any legislation governing the design or installation of roadway illumination systems. Engineers must be fully familiar with legislation such as the current Electrical Safety Authority Requirements when carrying out the design of lighting projects within the Town of The Blue Mountains.

All roadway illumination components shall comply with all applicable current industry standards and specifications for quality management and quality control, such as the Canadian Standards Association (CSA) and the Electrical Safety Code.

4.9.1. Roadway Illumination Design Methodology

Roadway classifications, pedestrian conflict classification, and recommended roadway illumination levels outlined in the following sections are taken from ANSI/IES RP-8 Roadway Illumination ANSI Approved (Illuminating Engineering Society (IES)). It is the engineer's responsibility to apply the appropriate methodology based on the site conditions.

4.9.2. Pavement Classification

Pavement reflectivity tables are listed in ANSI/IES RP-8 and are a measure of the reflectivity characteristics of the roadway surface. The typical roadway within the Town is R2/R3. For all other road classifications refer to the corresponding values in the appropriate tables in the RP-8 Standard.

4.9.3. Pedestrian Conflict Classifications

The illumination design is based on the possibility of pedestrian / vehicle conflicts. The pedestrian conflict classification is based on the one-hour pedestrian counts of a typical street block or 200 m section and are as follows:

- High – Over 100
- Medium – 11 to 100
- Low – 10 or fewer

These volumes represent the total number of pedestrians walking on both sides of the street plus those crossing the street at non-intersection locations in a one-hour period. The pedestrian conflict values are derived from ANSI/IES RP-8.

4.9.4. Luminance Method Criteria

The design criteria for Luminance Method are provided in Table 4.9.4-1

Table 4.9.4-1 Luminance Method Recommended Values (from ANSI/IES RP-8)

Road Classification	Pedestrian Conflict Classification	Minimum Average Maintained Luminance Level L_{avg}(cd/m2)	Average Uniformity Ratio (L_{avg}/L_{min})	Maximum Uniformity Ratio (L_{max}/L_{min})	Maximum Veiling Luminance Ratio (L_{vmax}/L_{avg})
Arterial	High	1.2	3	5	0.3
	Medium	0.9	3	5	0.3
	Low	0.6	3.5	6	0.3
Collector	High	0.8	3	5	0.4
	Medium	0.6	3.5	6	0.4
	Low	0.4	4	8	0.4
Local	High	0.6	6	10	0.4
	Medium	0.5	6	10	0.4
	Low	0.3	6	10	0.4
Walkways	Low	0.9	6	10	0.4

4.9.5. Illuminance Method Criteria

The design criteria for the Illuminance Method are provided in Table 4.9.5-1.

Table 4.9.5-1 Illuminance Method Recommended Values (from ANSI/IES RP-8)

Road Classification	Pedestrian Conflict Classification	Minimum Maintained Average (lux)	Uniformity Ratio (E_{avg}/E_{min})	Veiling Luminance (L_{vmax}/L_{avg})
Arterial	High	17	3	0.3
	Medium	13	3	0.3
	Low	9	3	0.3
Collector	High	12	4	0.4
	Medium	9	4	0.4
	Low	6	4	0.4

Road Classification	Pedestrian Conflict Classification	Minimum Maintained Average (lux)	Uniformity Ratio (E_{avg}/E_{min})	Veiling Luminance (L_{vmax}/L_{avg})
Local	High	9	6	0.4
	Medium	7	6	0.4
	Low	4	6	0.4

4.9.6. Intersection Lighting Level

The design criteria for intersections Table 4.9.6-1 defines the required levels of illuminance for intersection lighting on continuous lighting roadways.

Table 4.9.6-1 Illuminance Criteria for Intersections

Road Classification	Minimum Average Maintained Illumination at Pavement by Pedestrian Conflict Classification (lux)			Maximum Illuminance Uniformity Ratio (E_{avg}/E_{min})
	High	Medium	Low	
Arterial / Arterial	34	26	18	3
Arterial / Collector	29	22	15	3
Arterial / Local	26	20	13	3
Collector / Collector	24	18	12	4
Collector / Local	21	16	10	4
Local / Local	18	14	8	6

4.9.7. Location

In general, streetlights shall be located on the projection of side lot lines and offset from the street line in accordance with the Town's Standard road cross-section and as determined by the street lighting design criteria above.

Streetlights shall be located in accordance with the following criteria:

- Streetlight poles are to be located as per the relevant Town road cross-section.
- Streetlights shall be located on the projection of side lot lines wherever possible. Off-setting of the lights up to 2 m from the side lot line is permitted.
- A minimum 3.0 m horizontal clearance is required from the face of the streetlight pole to the face of a fire hydrant, in areas where both a fire hydrant and streetlight are required, each shall be offset 1.5 m from the projection of the side lot line to achieve the 3.0 m clear separation.
- A minimum clearance of 5.0 m is required from the face of the streetlight pole to the drip edge of the future mature street tree or located so the tree canopy will not interfere with the distribution of light (to be shown on landscape plans).
- A minimum clearance of 2.0 m from the face of the streetlight pole to the edge of a residential entrance and a minimum of 3.0 m from commercial entrances. Where entrances are adjacent to each other (side by side at same property line) streetlights shall not be placed between them.

- With a minimum 1.5 m horizontal clearance from any other potential conflicts (poles, pedestals, signs, structures etc.)
- Must be controlled by a dusk until dawn photometric cell and power feed completely underground on the south/east side of the road as per cross-section.

4.9.8. Sidewalk Lighting

Area classifications and recommended sidewalk lighting levels shall be taken from ANSI/IES RP-8 Roadway Illumination ANSI Approved (Illuminating Engineering Society (IES)).

4.9.9. Dark Sky Lighting

All lighting shall be designed such that light spill is minimized in accordance with Town Dark Sky Policy. All luminaires shall be fully of shielded design and shall not emit any direct light above a horizontal plane passing through the lowest part of the light emitting luminaire.

4.9.10. Materials

All materials used for street lighting must be CSA approved. Refer to **the Town website** for a list of approved materials and specifications.

4.10. Grading

4.10.1. General

The grading and drainage design, whether it is being prepared for an individual lot, subdivision, or private development, should be completed with the following objectives:

- To provide positive drainage and maximize the use of land while minimizing maintenance requirements.
- To complement the land and suit the type of proposed structure.
- To accommodate drainage from adjacent lands and to ensure the adjacent and downstream properties are not adversely affected.
- To conform to the Stormwater Management Report (where applicable).
- To minimize the use of rear lot, catch basins and retaining walls.

Where development is phased or deferred within a particular area or block and final grading is not established initially, the engineer will be required to develop an interim grading and drainage design for that area, to the satisfaction of the Town.

4.10.2. Block Grading

All block grading shall conform to the Stormwater Management Report. Block Grading design criteria and shall comply with the requirements for Lot Grading and Right-of-way reinstatement.

The engineer shall be responsible for approval and certification of the design and final grading for each block at time of building permit application to the satisfaction of the Chief Building Official.

4.10.3. Lot Grading Criteria

The primary purpose of lot grading is to ensure that drainage is controlled such that there is no property damage or nuisance flooding upon the lot or block in question and on adjacent private or public lands.

Lot grading shall be designed in accordance with the following minimum criteria:

- Rear to front lot grading is permitted except in areas of high groundwater levels.
- A maximum of three residential lots or a maximum area serviced of 500 m² shall outlet between any two lots. Where several lots drain through a swale over private property, an easement shall be provided in accordance with Section 4.3 Block and Easement requirements for the drainage swale in favour of the serviced lots.
- Front to back drainage is not permitted. A split drainage pattern is to be used where the portion of a lot in front of a building or at least 6.0 m from the road allowance is to drain towards the street.
- The elevation at the property line is not to be less than that required in the Town's Road cross-sections, and not less than the road centreline elevation.
- Each lot is to be individually drained. Drainage to a nearby street through the rear or across adjacent land is not permitted unless the adjacent lot is part of the same development or is the historical route for the water.
- Rear lot catch basins shall be eliminated wherever possible. Where rear lot catch basins are required, they shall be privately owned and maintained.
- Where rear lot catch basins are permitted, the maximum number of lots drained by a rear lot catch basin shall be five or a maximum area serviced of 1000 m².
- Where several lots drain through a swale to a rear lot catch basin on private property, a 3 m wide easement in favour of the Town shall be provided for the drainage swale in favour of the serviced lots. This is not preferred and will be considered on a site-by-site basis if there is no other effective alternative.
- Where rear lot catch basins are used, all buildings shall be protected from flooding if the inlet is blocked or surcharged by a major storm event and overland flow should be directed away and around any proposed structures.
- In the event of blockage or surcharging of a rear yard catch basin, the maximum water level shall be 300 mm below all building's openings, or the building opening shall be specifically protected from flooding.
- Minimum underside of basement slab elevations shall be shown on all lots and blocks and shall be at least 0.5 m above the estimated seasonal high groundwater table.
- A required minimum of 75% of the rear yard area shall be graded at 2% - 5% slope.
- Driveways shall have minimum 2% and maximum 8% (6% recommended) slope. Reversed sloped entrances will not be permitted in new subdivisions and all entrances shall be

graded in accordance with the Town's Entrance requirements and the "Urban Entrance Profile Guidelines" or the "Rural Entrance Profile Guidelines" as appropriate.

- Grade around houses shall be a minimum of 2% away from houses from a point 150mm below top of foundation wall or as required by OBC.
- Finished grade tolerance is 50 mm at lot corners, grade change points, spot grades, etc.
- Finished grade tolerance is 25 mm in swales and ditches.

4.10.4. Swales

All swales shall be designed and constructed in accordance with the following criteria:

- Minimum depth of any swale to be 300 mm.
- Maximum depth of a rear yard swale or side yard swale to be 450 mm.
- Maximum ponding depth for drainage swales is 300 mm.
- Minimum slope for swales shall be 1.0%.
- Maximum side slope on any swale shall be 3:1.
- The flows for the contributing areas must be calculated and the capacity of the swale confirmed to ensure adequate conveyance. Any requested deviations from the above requirements shall require engineering explanation and supplementary measures (i.e. French drain, infiltration bed, LID) to address the risk of standing water.

4.10.5. Retaining Walls

Retaining walls are generally not accepted within new residential subdivisions. The Town may consider retaining walls once all reasonable alternatives have been investigated and eliminated. Retaining walls may be considered on private lands where the maximum grade criteria cannot be achieved along the side and rear of lot lines.

All retaining walls installed on Town property regardless of height must be designed by a Professional Engineer.

Where retaining walls are considered they shall be constructed according to the following:

- Retaining walls shall be constructed on the upper (higher) lot.
- The wall and tie-back shall not come closer to the property line than 500 mm, loading (zone of influence) should not encroach on public property.
- Retaining walls shall be constructed entirely on private property, not on Town property or property to be assumed by the Town.
- Retaining wall design and construction shall be approved by the Town and/or the Building Department and may require a building permit in accordance with Section 2 of the OBC.
- Guards for retaining walls shall be designed and constructed in accordance with the requirements for exterior guards as contained in the Ontario Building Code.

- Non-climbable fencing or equal shall be installed at the top of the wall if the wall height is in excess of 1.0 m.

4.10.6. Rough Grading

Prior to the issuance of any certificates by the Town accepting the Works, lots shall be rough graded to the following tolerances:

- Achieve positive drainage to the satisfaction of the Town.
- Lot corners, grade changes and spot elevations shall be graded to within 300 mm of proposed final grades (or as agreed to by the Town).
- Swales and ditches, except side yard swales, without finishing topsoil shall be graded to within 150 mm of the proposed final grade.

4.11. Block Grading

4.11.1. General

All block grading shall conform to the Stormwater Management Report.

The engineer shall be responsible for approval and certification of the design and final grading for each block at time of building permit application to the satisfaction of the Chief Building Official.

4.11.2. Block Grading Criteria

The criteria for block grading are as follows:

- Where catch basins are used for block drainage all buildings and structures shall be protected from stormwater if the inlet is blocked or surcharged by a major storm event.
- Where block drainage is surcharged to an existing overland flow route, the route shall be protected from erosion.
- No more than 5% of the block surface area shall drain directly onto the abutting road allowance.
- Minimum slope for swales shall be 1%.
- Maximum ponding depth for swales shall be 300 mm.

4.11.3. Ground Cover

The requirement for block ground cover is as follows:

- All blocks shall be sodded using 150 mm screened, weed free, topsoil in accordance to OPSS 802 and No. 1 nursery sod in accordance with OPSS.MUNI 803 for 5 m width around their perimeter when base course asphalt is placed on roadways, the remainder of the block shall be at minimum seeded using 150 mm topsoil in accordance to OPSS 802 and hydraulic seed and mulch in accordance with OPSS.MUNI 804 with seed of the quality and quantity appropriate for the application as approved by the Town;

- All swales and drainage easements shall be sodded using 150 mm topsoil and staked No. 1 nursery sod.
- All slopes shall be protected from erosion.

4.12. Erosion and Sediment Control

4.12.1. General

Erosion and sediment controls measures shall be designed for temporary measures during construction as well as long term protection of the natural environment. The Town requires developers, contractors, and builders to design, implement and maintain the appropriate erosion and sediment control measures to minimize sediment transport off of the site (to sewers, roads, watercourses, and waterbodies).

Erosion and sediment control measures shall be designed in accordance with all applicable requirements of the Town, MECP, MTO, MNRF and GSCA/NVCA as applicable.

The appropriate measures must be implemented in accordance with the approved Tree Preservation and Sediment and Erosion Control Plan (Section 3.4.11.4) prior to any construction and shall be maintained until any disturbed areas are stabilized and approved for removal by the Town.

The Tree Preservation (when applicable) and Sediment and Erosion Control Plan shall include the control measures required to prevent erosion and sediment migration, mud tracking onto municipal streets, windblown dust, and waterborne sediments entering the municipal sewer system.

4.12.2. Silt Fence

At minimum heavy duty silt fence barrier shall be installed on the perimeter of the site and downstream of all areas to be disturbed in accordance with OPSD 219.130. Additional measures may be required where construction is adjacent to watercourses, waterbodies, wetlands, or any other environmentally sensitive area as required by the Town, MECP, MTO, MNRF, and GSCA/NVCA.

4.12.3. Storm Inlet and Catch Basin Sediment Control

All storm inlets and catch basins shall be provided with sediment control during construction activities and shall be maintained until any disturbed areas are stabilized and approved for removal by the Town.

4.12.4. Mud Mat

In order to reduce the tracking of mud and debris onto municipal roads, a mat of crushed stone shall be constructed at all exits from the site leading onto any existing road. The stone pad shall be a minimum of 450 mm thick, 35 m long and 7 m wide. The first 5 m from the property line shall be constructed with Granular 'A'. The next 15 m shall be 50 mm clear stone and the remaining 15 m shall be constructed with 150 mm rip rap. Refer to **Town Standard Drawing 4.14.3** in **Appendix D.**

This stone pad must be maintained, and stone replaced as required given the site conditions to ensure there is no mud tracking onto the municipal roads. The Town's Engineer may direct additional measures to be taken to eliminate mud tracking up to and including vehicle washing prior to exiting the site.

4.13. Utilities

4.13.1. Location

The location of all utilities within the existing or future road allowance shall be established in conjunction with the Town and the utility companies. In general utilities shall be installed underground and, in the locations, shown on the applicable Town Standard cross-section. The design engineer is expected to coordinate the installation and/or relocation of utilities with the appropriate utility.

All above ground plant shall be installed at or near property line (i.e. behind the sidewalk) and at the projection of lot property lines. No above ground plant will be permitted in daylight triangles or within 3.0 m of the travelled portion of the road.

All Utility Works within the road allowance may be subject to vehicle loading. All works including chambers and vaults that are located in the boulevard must be designed to support the same loading as required in the travelled portion of the road.

4.13.2. Design and Installation

The design engineer is required to prepare composite utility plans in accordance with Section 3.4.9 and secure all necessary approvals. The appropriate utility company, or their approved contractor, shall design and install the services for Hydro, Gas, and Telecommunications (Telephone, cable, fibre optic etc.). The Town shall require a copy of each utility's design and it must be compliant with current standard cross-sections.

4.13.3. Utility Crossings

Utility crossings for new roads shall be placed prior to placement of the granular road base material. Utility crossings for existing roads shall have the asphalt surface saw cut and removed for a width of the trench plus a minimum of 0.5 m out from each side of the trench walls. Minimum depth of bury for utilities is 0.9 m below the lowest elevation (typically bottom of ditch), unless otherwise approved by the Town.

All utility companies are required to obtain Municipal Consent for the installation of their plant on existing roads.

4.14. Streetscape

4.14.1. General Streetscape Standards

Streetscaping shall be in conformance with Town of the Blue Mountains Streetscape and Community Design Guidelines.

4.14.2. Naturalized Areas

All disturbed natural open-space blocks and lands adjacent to conservation areas, as well as the lands surrounding stormwater management facilities, are to be re-vegetated using naturalizing plant materials. The planting design must employ native plants using a variety of trees shrubs and ground covers to re-establish the local ecosystem. If the site had been previously disturbed, landscape restoration strategies must be employed to reinstate a naturalized landscape condition.

4.14.3. Tree Preservation

A tree inventory, assessment and preservation plan and report must be completed for all developments as identified as part of the planning process. The tree assessment and preservation plan must include all boundary trees and ant trees located offsite within 6.0m of the property boundary.

The developer must preserve all trees within the limits of the development in accordance with the tree inventory, assessment, and preservation plan/report.

4.14.4. Streetscaping

Generally, the landscaping within the road allowance/boulevards is to be grass cover with a minimum of 150 mm of screened weed free topsoil in accordance with OPSS.MUNI. 802. No.1 nursery sod will be required in all built up areas, areas fronting residential properties, or as specified by the Town in accordance with OPSS.MUNI 803. Hydraulic seed and mulch may be utilized in rural applications where sod is not required and shall be in accordance with OPSS.MUNI 804. Seed mixture is to be of quantity and quality appropriate for the application as approved by the Town.

For privately owned works such as in instances where a landowner or developer wishes to install privately owned Works within the road allowance or on Town Lands, a landscape plan must be prepared for the review, comment, and approval of the Town prior to the works being undertaken. Once the Works are approved and prior to construction, the proponent must obtain a Municipal Lands Occupancy Permit if the works are not part of a pre-existing site plan or development agreement.

4.14.5. Boulevard Tree Planting

Boulevard tree planting shall conform to Town Streetscape and Community Design Guidelines and shall be designed to maximize opportunities to improve the visual and microclimatic conditions of the street environment. Planting objectives shall be achieved through coordination with other disciplines and shall consider the requirements for servicing and utility infrastructure, street lighting, traffic sightlines, and community amenities.

4.14.5.1. Location

The following general requirements for the design and layout of boulevard tree plantings shall apply:

- Boulevard trees are to be planted within the public right-of-way as shown on the appropriate cross section.
- Trees shall be planted every 10 m to 15 m along all streets where possible.
- On residential roads, a minimum of one tree per lot frontage shall be required. Where lot spacing or physical constraints restrict the ability to plant, the tree shall be planted in an alternate location approved or stipulated by the Town.
- Corner lots will require a minimum of one additional tree to be planted along the side yard to maintain continuity of the boulevard tree spacing.
- Trees are not to be planted within 3 m of the centreline of watermains and sewers.
- Trees are not located within the intersection sight triangles.
- Additional trees and plantings may be required to buffer private and public amenity areas as determined by the Town.

Where circumstances prohibit planting the required tree quotas described above, or no alternate location is deemed suitable by the Town, the Developer can provide cash-in-lieu compensation per tree below the required minimum (Typically $600/tree). Such monies will be secured in reserve for planting initiatives elsewhere in the Town or for future replacement and management of boulevard trees. The use of the cash-in-lieu payment is at the sole discretion of the Town. Alternatively, the Town may direct the developer to plant trees on public lands within the Town to correspond with the development of their property. This will be defined as part of the planning process.

To ensure that boulevard trees do not restrict access to utilities and services, create maintenance issues or impede visibility over their life span, tree layout shall conform to Table 4.14.5-1 “Minimum Street Tree Clearance”. The table shall be included on the Landscape Plans.

Table 4.14.5-1 Minimum Street Tree Clearance

Location	Clearance
Barrier Curb & Gutter (perpendicular offset from back of curb)	2.25m
Mountable or semi-mountable curb (perpendicular offset from back of curb)	3.0m
Fire Hydrants	3.0m
Driveways	2.0m
Neighborhood Mailboxes	2.0m
Hydro Transformers	3.0m

Bell or Cable Pedestals	1.2m
Streetlight Poles	5.0m
Underground Services	1.0m

It is acknowledged that at the time of the development of landscaping plans that the final location of driveways may not be known in all cases and that adjustment of streetlights, services, and utilities (above and below ground) may have occurred accommodate unforeseen conditions. Provided that adjustments fall within the approved design intent and 'Schedule of Offsets', certain flexibility in the location, number, and tree species will be permitted to allow for such circumstances.

When the minimum distances noted in the "Table of Offsets" above cannot be achieved, street trees shall be planted in an alternate location approved or stipulated, or a cash-in-lieu payment made as stipulated by the Town.

4.14.5.2. Boulevard Tree Species

It is required that a variety of tree species be selected along boulevards to add to the diversity of the streetscape and to minimize the potential for species specific mortality from pests or disease.

Boulevard tree species should be randomly sequenced within the planting scheme. To ensure diversity, the plant palette should include no more than 30% from one family, 20% from one genus, and 10% from one species (where warranted there may be some flexibility).

Plant species shall be selected by the project Landscape Architect. Plant hardiness zones vary within the Town of The Blue Mountains between zone 4b and zone 5b, generally decreasing with increasing altitude. It is recommended that for developments on the escarpment, plants should be limited to species hardy in zone 4b. Native soils in the Town of the Blue Mountains are also typically calcareous and alkaline and species selected should consider these soil conditions.

Table 4.14.5-2 Acceptable Boulevard Tree Species contains a list of suggested urban tolerant and low maintenance street trees approved for use in municipal boulevards within the in the Town of The Blue Mountains. To provide flexibility in design, alternate tree species may be proposed by the developer on a project-specific basis and will be subject to review and approval by the appropriate Town staff. For planting requirements refer to **Town Standard Drawing 4.14.1** in **Appendix D**.

Table 4.14.5-2 Acceptable Boulevard Tree Species

Species	Common Name	Arterial/ Collector	Residential
Acer x freemanii	Freeman Maple	●	●
Acer saccharum cvs. *	Sugar Maple Cultivars		●
Celtis occidentalis	Hackberry		●

Gleditsia triacanthos var. inermis	Thornless Honeylocust	●	●
Quercus macrocarpa	Bur Oak		●
Quercus rubra	Red Oak	●	●
Tilia cordata cvs. *	Littleleaf Linden Cultivars		●
Tilia x flavescens 'Glenleven'	Glenleven Linden		●
Ulmus cvs. **	Elm Cultivars	●	●
Ginkgo biloba (male cultivars)	Ginkgo	●	●
Gymnocladus dioicus (male cultivars)	Kentucky Coffee Tree	●	●
Tilia americana 'Redmond'	Redmond Linden		●
Special Circumstances (where there is insufficient room for larger trees)			
Species	**Common Name**	**Arterial/ Collector**	**Residential**
Pyrus calleryana 'Glen's Form'	Chanticleer Ornamental Pear		●
Malus sp.	Crabapple (fruitless)		●
Syringa reticulata	Ivory Silk Lilac		●
Acer x freemanii 'Armstrong'	Armstrong Maple		●
Acer ginnala 'Flame'	Flame Amur Maple		●
Acer rubrum 'Karpick'	Karpick Maple		●

** Cultivars should not be fastigiated (narrow) in form and should have superior disease resistance, drought or salt tolerance as compared to the native species.*

*** Elm cultivars should show high resistance to Dutch elm disease, have form similar to Ulmus americana, and should be hardy to the location. Ulmus pumila is not acceptable.*

4.15. Trails

The Town has an extensive network of trails and pathways. New developments may be required to provide new trails, pathways, and linkages to the existing trail systems. To the extent possible the route should utilize public open spaces, unopened rights-of-way, and blocks away from the roadways. Where trails are required along roadways an additional right-of-way width will be required. Developers are encouraged to meet with Community Services and Parks early in the design process to identify the trail requirements of the Town.

The design and construction of trails shall be in accordance with the Town's Trail Development Standards. Refer to the Town website for the most recent trail standard.

[End of Section 4]

5. CONSTRUCTION

5.1. Construction Preparation & Requirements

The purpose of this section is to outline the requirements and best practices for construction of municipal infrastructure and private works in the Town of The Blue Mountains. These requirements are to provide direction and outline expectations to the developers, engineers and constructors related to the construction of infrastructure and works but does not relieve the developer or proponent of the infrastructure and works of the responsibility for submitting a completed project demonstrating competent engineering in full compliance with all applicable legislation, Town Standards and relevant guidelines.

5.1.1. General

Site development shall require full time inspection by the developer's Engineer of Record during any construction activities associated with underground construction or construction that requires ongoing QA/QC (i.e. curb pouring, paving, etc.). Non-resident inspection is acceptable for construction stages that can be readily corrected if deficiencies are found upon inspection.

5.1.2. Health and Safety

Throughout the life of all construction projects, it is the responsibility of all personnel to adhere to the requirements outlined in the current version of the Occupational Health & Safety Act (OHSA).

The Developer or Proponent shall be responsible to ensure that their employees, constructors, and consulting engineers comply with the regulations and requirements set out in the OHSA.

Other regulations that are of concern on all construction sites include: traffic control, confined space entry, working from heights, trench safety, working in noisy environments, Workplace Hazardous Material Information System (WHIMIS)

The Constructor of any works occurring on Town Land shall have a written Traffic Control Plan and traffic control measures in place as defined in the Plan. Constructors working in new subdivisions shall be advised that the rights-of way, blocks, and roads in the new subdivision are Town Land once the subdivision is assumed and are considered open roads once occupancy is granted to any home in the subdivision.

Developer or Proponent shall ensure that staging/storage of material on open roads or sidewalks are removed, and the road/sidewalk cleaned by 4:30 pm each day Monday to Friday. No staging/storage of materials is allowed on weekends or holidays or between November 1st and April 1st which is the winter control season. At no time shall staging/storage of material restrict an open road to less than a 6.0 m wide clear route for emergency vehicle passage. Emergency vehicles have planned routes through the road network for emergency response and they rely on these routes to be clear of obstructions. Construction equipment and vehicles associated with the construction must also adhere to the same restrictions as staging and storage of material on open roads.

5.1.3. Town Inspector's Responsibilities During Construction

The Town does not provide full time inspection of construction sites. The Town reserves the right to attend construction sites where works are being constructed on Town lands, future Town lands or lands under Site Plan Control. The developer or proponent of the works shall retain responsibility for the quality of the work and all construction activities regardless of attendance by the Town.

As indicated in the development agreement it is the developer or proponent's responsibility to administer the conditions of the agreement, the construction activities as well as the design and inspection of said works.

The role of the Town inspector shall include that they:

- Liaise with the developer's engineer on matters pertaining to construction process progress.
- Provide periodic site inspections to monitor adherence to municipal Engineering Standards and construction of work to approved drawings. Attendance by the Town does not relieve the developer's responsibility to assure works are constructed in conformance with Engineering Standards and or approved drawings.
- Periodically inspect in conjunction with the engineer's full-time inspection the construction of sanitary and storm collection systems, water distribution systems, road systems, street lighting system, stormwater management facilities.
- Witness testing of all municipal infrastructure on Town Lands including mandrel testing and CCTV inspection of storm and sanitary sewers, leakage testing of storm and sanitary systems inclusive of structures, street illumination testing, traffic light system testing.
- Witness proof-roll of road sub-grade prior to placement of sub-base prior to placement of base.
- Witness final grading of base by a road grader prior to placement of base asphalt.
- Witness watermain commissioning including certification of backflow preventer if used, swabbing, pressure testing, injection of disinfecting chlorine along with flushing and sampling for bacteriological testing, receiving laboratory test results and coordination with the Town's Water department.
- Participate in joint inspections with the developer's engineer for benchmark stages in the development ahead of Town certification required by the agreement.
- Monitor compliance with the conditions of the development agreement.
- Review requests for security reduction and release.
- Review field design changes in conjunction with the manager of Development Engineering and Infrastructure Managers of the systems affected.
- Any other inspections required by the Town associated with the development.

Town related inspections include:

- Investigate any complaints pursuant to the construction process received by the Town and forward the information to the developer, the Engineer of Record and/or the proponent for corrective action.
- Periodically inspect erosion and sediment control measures (ESCM) including mud mats, temporary siltation control ponds, silt fences, straw bale, and rock flow checks, etc. to monitor proper maintenance and function of the elements is being addressed.

The Town shall report any infractions to the developer, the developer's engineer and/or the proponent for corrective action. Should the developer, the developer's engineer and/or the proponent fail to initiate corrective actions in a timely fashion the Town may decide to have corrective actions undertaken by Town forces or contract services. All related costs will be charged back to the developer or proponent as per the terms of the development agreement.

The Developer or their Engineer is responsible for notifying the Town Inspector of any milestone event as identified above for inspection/review a minimum of 48 hours in advance of any milestone.

5.1.4. Developer's Engineer, Developer or Proponent Responsibilities During Construction

The developer or proponent shall have an Engineer of Record (Licensed by PEO with a Certificate of Authorization) engaged to represent them as per the development agreement. Where the project is of a minor nature and no development agreement is in place the developer or proponent may represent themselves.

The role of the Engineer of Record shall include the following tasks as a minimum. Additional site-specific tasks may be necessary. The objective is that inspection reflects the Professional review duties of the Professional Engineer of Record for the project and ensures that quality assurance is completed for all aspects for the design for both the Town and other impacted stakeholders.

- Coordinate works within the site and ensure all documentation (drawings, certifications, permit etc.) are received by the Town.
- Review all grade sheets related to works and notify contractor if discrepancies exist between accepted for construction (AFC) drawings and grade sheets prior to construction.
- Inspection, testing and certification of all works including underground works, above ground works, excavation grading and backfill, road sub-grade, sub-base base and pavements, curbs and sidewalks, boulevard grading, topsoil ground cover landscaping.
- Coordinate sub-consultant testing to assure test undertaken are sufficient to ensure certification.
- Grading inspections and certification of all lot grading and all lot grading complaints.
- Review CCTV inspection video of all sanitary and storm sewer collection systems as a condition of Town certification of Basic Services and Final Certification, report all deficiencies and provide CCTV inspection video before and after deficiencies corrected.

Ensure all CCTV inspections are performed in conformance with the Town's requirements).

- Certification of all constructed municipal infrastructure systems.
- Review all geotechnical testing results (soil, aggregate, concrete, and asphalt) and provide recommendations as required. Provide trench backfill testing locations visually represented on a plan and profile drawing with the test number and compaction shown such that no test location is more than 60 m apart horizontally nor 600 mm vertically from another.
- Review and monitor all environmental issues including erosion control and sediment migration control (wind, water and traffic borne), noise, tree preservation, well monitoring, water quality requirement by authorities having jurisdiction etc.
- Notify the contractor of any deficiencies in the work and instructing the contractor to take appropriate corrective measures, then confirm and report to the Town the results of the corrective measures.
- Promote on-site safety.
- Ensure the site work and construction activities do not affect surrounding lands such as mud tracking, redirected runoff causing erosion, wind borne dust etc. and if present coordinate immediate remediation.
- Respond to concerns, inquiries, complaints and provide appropriate corrective measures in a timely manner.
- Identify and record all materials incorporated into the works. Identify and reject all materials that do not meet the project specifications, Town Standards or unsuitable for installation due to condition or damage. Assure all materials incorporated are suitable for the project.
- Distribution of all documents, reports, and test results to appropriate parties.
- Coordinate and attend the project pre-construction and construction progress meetings including preparation and distribution of meeting minutes.
- Coordinate all infrastructure testing with the Town Staff. Any municipal infrastructure testing conducted without Town Staff being provided adequate notice to allow them to attend at their discretion shall be considered developer assurance testing and the system tested shall be considered untested by the Town. It is the Developer's Engineer's responsibility to document notification of the Town.
- Provide certification of testing, service record sheets for each lot and revised AFC drawings to record drawing standard as a condition of Town certification of Basic Services.
- Monitor the site monthly (minimum) during municipal infrastructure construction hiatus during the construction of homes and provide a report on the municipal infrastructure condition and site activity every six months following issuance of the Town certification

of Basic Services. Monitor (every two weeks and after significant rainfall or runoff events) and report on condition of ESCM and evidence of maintenance of same

- Report on integrity of 6 m emergency access route following the occupancy certification of any homes in the subdivision (developer responsibility until assumption). Access is required for emergency services at occupancy.
- Provide full documentation called for in the development agreement for Town Certification of Basic Services and Final Certification; and,
- Provide administration of the development agreement including requests for security reductions and releases and the various conditions Basic Services and Final.
- Any other duties as required by the Town to verify or document site conditions, quality assurance and impacts (on and off-site) related to the implemented works.

The role of the Geotechnical Engineer shall include that they:

- Provide ongoing monitoring, certification and reports of all material and methods involved in earthworks, disposed material, imported fill, engineered fill, pipe embedment, trench backfill including trench backfill testing locations visually represented on a plan and profile drawing with the test number and compaction shown such that no test location is more than 60 m apart horizontally nor 600mm vertically from another, proof roll of road sub-grade before sub-base and road sub-base before base, compaction testing of sub-grade, granular and asphalt, concrete testing.
- Review and approve all asphalt and concrete mix designs.
- Ensure the type, frequency, location, and results of tests undertaken are sufficient to ensure certification.
- Communicate any insufficient or negative test results to the Engineer of Record and contractor in a timely manner to allow for retesting without delaying progress; and,
- Ensure that all results and geotechnical requirements are acceptable prior to commencing the next stage of construction.
- All testing is to be completed in accordance with the latest revision of OPSS and CSA standards/specifications.

The role of the Structural Engineer shall include that they:

- Submit structural and shop drawings and required details to the Engineer of Record and the Town, obtain approvals relevant to the structural design and schedule (or assist in scheduling) contractor works. All structural or shop drawings shall be complete and sealed by two professional engineers.
- Provide full time monitoring of all equipment, materials and methods involved in erecting or constructing any structural works.
- If required, provide full time monitoring of methods involved in demolishing structures on-site.

- Review and certify completed works including all poured in-place walls, modular retaining walls, building pads and other engineering structures.

The role of the Electrical Engineer shall include that they:

- Carry out daily inspection and supervision of all constructed Town infrastructure during the course of installation of the street lighting system and/or traffic light system and complete the daily construction log report.
- Report any deficiencies with the work and report to the contractor, Engineer of Record and the Town and re-inspect the work and report of correction.
- Provide a certification letter when the works are complete and deficiency free and submit this with the as-built drawings submission to the Engineer of Record and the Town.

5.1.5. Construction Meetings

Construction meetings will be required for works that are expected to be assumed by the Town. The developer's Engineer shall schedule, organize, facilitate, create, and distribute agenda, record, distribute and correct minutes of all construction meetings. The Town will require a minimum of two weeks notification of the Pre-Construction Meeting.

5.1.5.1. Pre-Construction Meeting

The pre-construction meeting agenda shall include as a minimum:

- Introductions.
- Contact Information.
- Construction Office and Site Records.
- Notification of Residents, Project Sign.
- Notification of Utilities and Canada Post.
- Site Access and Security.
- Scope of Work and Construction Schedule.
- Approvals/Permits/Authorization.
- Contract Documents, Accepted for Construction Drawings and Specifications.
- Notification of Ministry of Labour.
- WSIB Clearance Certificate and Form 1000.
- Insurance Certificates with Town listed as additionally insured.
- Bonds.
- Occupational Health and Safety Policy.
- Construction Inspections.
- Pre-Construction and Construction Video & Photos.

- Working Hours and Municipal Noise By-law.
- Utility Relocation Work and Locates.
- Erosion and Sediment Control Measures, Mud and Dust Control.
- Surface Water Control & Dewatering.
- Spills Contingency Plan.
- Traffic Control Plan and Road Closures.
- Layout/Benchmarks.
- Suppliers/Materials List.
- Construction Materials Testing and Mix Design Approval.
- Stockpiles/Material Storage Areas.
- On-Site Construction Progress Meetings.
- As-Constructed and Record Drawings.
- Certification of Works.

5.1.5.2. Construction Progress Meeting

In addition to Pre-Construction items carried forward the construction progress meeting agenda shall include:

- Revised Contact Information.
- Report on Construction Progress and Construction Schedule.
- Review As-Built Drawings.
- Review Daily Construction Progress reports.
- Review geotechnical test reports and record of testing locations.
- Report on Erosion and Sediment Control Measures;
- Report on surface water control and dewatering.
- Report of spills.
- Report on health and safety record.
- Report on traffic control measures and road closures.
- Report on complaints from residents.

5.1.6. Project Preparation

Prior to site preparation commencing, various legislation and permitting restrictions shall be considered for restrictions on work timing. The Engineer of Record shall report on compliance

with legislation and permitting required for site preparation in accordance with permits received and all applicable local, provincial, and federal legislation related to the works.

5.1.7. Erosion and Sediment Control Measures

Erosion and sediment control measures (ESCM) are required by the Town for any proposed site alteration. This requirement includes all sites where the land will be disturbed and prone to erosion for more than a few days inclusive of residential construction on individual lots. Prior to commencement of any work, the developer/proponent shall implement an ESCM plan to effectively reduce on-site erosion and minimize off-site transport. The off-site transport mechanisms that must be addressed/protected shall include overland storm flows, existing drainage channels, municipal sewer systems, wind driven and vehicular tracking.

The condition of the erosion and sediment control measures shall be recorded at the end of each working day, prior to the start of any construction hiatus and following any rainfall event during a construction hiatus. Deficiencies in the siltation and erosion control measures shall be addressed immediately. Daily construction inspection reports shall be compiled and be provided to the Town monthly. Rainfall event construction inspection reports shall be provided to the Town within three days following the event.

All disturbed ground left inactive for more than 90 days shall be stabilized by seeding, sodding, mulching, covering or other equivalent measures.

5.1.8. Temporary Erosion and Sediment Control Measures

The temporary erosion and sediment control measures shall be installed prior to any site work, maintained during the construction period, modified if the proposed measures prove insufficient, reestablished when damaged or ahead of a planned construction hiatus, and removed once the disturbed ground is restored and stabilized. These shall be completed in accordance with the approved for construction drawings, Section 4.12, Provincial Standards and permits.

Temporary erosion and sediment control measures shall also include on-going construction housekeeping activities including dust suppression and street sweeping. All ESC systems shall be monitored, cleaned, and maintained throughout construction and until final vegetation is achieved.

5.1.9. Tree Preservation Measures

Tree preservation measures are installed on site to protect vegetation identified for preservation throughout the construction program as indicated in the AFC drawings.

5.1.10. Communication Plan

Where servicing or construction is to occur within an open public highway, easement, or open space the Engineer of Record coordinate with the Town for the development of the communication plan for the project. Adequate information shall be provided to the Town communications group to be posted on the Town Development Webpage.

The communication plan must identify the responsibilities of the parties involved namely the contractor, engineer and the Town as follows:

- The contractor shall assume responsibility of ordering and placing all signage and pavement markings as required for traffic control and traffic notification and inform the engineer of any impacts on the schedule.
- The engineer assumes responsibility of being the point contact for the Town and the public and shall oversee the implementation of the plan.
- The Town will make information prepared to communicate with those affected available on the Town website. The Town will also make information prepared available to Town and emergency services.

5.2. Municipal Infrastructure

5.2.1. General

Design or construction alterations to the AFC drawings must be reviewed and approved by the Town prior to the changes being constructed.

The Contractor shall have a set of clean AFC drawings updated with As-Constructed data recorded on the drawings that is not older than two working days available within 24 hours of Town request during construction. The As-Constructed redline drawings shall be presented to the engineer as a condition of Substantial Performance. The Consultant shall provide a scanned copy of the As-Constructed redline drawing to the Town as a condition the Basic Services Certificate. The As-Constructed drawings are not Record Drawings and should be considered supplemental to the Consultant's requirement to provide Record Drawings.

The Consultant shall have a clean set of AFC drawings, updated with data that will aid completion of the Record Drawings results that is not older than two working days on site at all times. The drawings shall record the location of pipe bedding, cover and trench backfill compaction testing, showing both failed tests and passed tests. The location of passed test results shall be no farther apart than 60 m horizontally 600 mm vertically.

Record Drawings shall be prepared in accordance with section 3.6 Record Documents.

5.2.1.1. Erosion and Sediment Control Measures During Construction

Erosion and Sediment Control (ESC) measures shall be installed as per the approved drawings and specifications and maintained throughout construction as per section 5.1.7.

5.2.1.2. Pipe Installation

Pipe (storm, sanitary, water) installation shall not commence until siltation and erosion controls measures are in place and potential discharge route from the construction is prepared.

5.2.1.3. Pipe Bedding

Pipe bedding shall be as per OPSS and the geotechnical report requirements. If the specified trench width were to be exceeded during construction, a stronger pipe or an increase in bedding material shall be required.

In areas where it is difficult to control the infiltration of ground water into the sewer trenches, clear stone may be used provided it is wrapped in a suitable geotextile, selected, and installed in accordance with the Geotechnical engineer's requirement.

5.2.1.4. Maintenance Holes (General)

All maintenance hole installations shall include frost straps (min. 4.0 m depth) as per OPSD 701.100 (Rev November 2018). The Record Drawings shall include the details on frost straps installed during construction including the depth to which the strap is installed.

5.2.1.5. Frames and Grates (General)

All maintenance structures shall include access frames and grates. Frames shall be set flush to base asphalt elevation when surface asphalt will be delayed for more than one month. Catch basin maintenance hole and catch basin frames and grates shall be set to base course asphalt elevation and the curb for 3 m behind the structures shall be temporary asphalt per OPSD 601.010.

Refer to Section 4.6.4 for additional design details as required.

5.2.2. Stormwater Management System

5.2.2.1. General

Construction of the stormwater management system must consider ESCM as a priority because stormwater is the major mechanism for erosion and sediment transport on any construction site. The location of the stormwater management system is typically in the route of the subdivision drainage which makes ESCM critical during construction when the land is opened and following construction when the system can collect soils being transported storm events.

Construction of stormwater management facilities shall require full time inspection by the Engineer of Record during any construction activities.

5.2.2.2. SWM Facility Acceptance for Basic Services / Final Certification Requirements

Prior to acceptance of the Stormwater Management Facility acceptance for Basic Services or Final Certification the following information shall be submitted to the Town:

- SWM Facility cleaning: sediment shall be completely removed from the SWM Facility. Prior to cleaning, the developer shall conduct a topographic/bathymetric survey of the entire facility and provide the Town with the following:
    - Plan and profile drawings matching the accepted for construction drawing set and facility cross-section drawings at 20 m stations showing the design grades and existing sediment levels including sediment volume calculations.
    - Cost estimate for sediment removal, disposal and restoration of disturbed areas.
    - Sediment removal work plan addressing dewatering pumping rate and discharge location, erosion & sediment control, sediment disposal location, temporary haul route, etc.; and,
    - Necessary permit and approvals from applicable agencies.

- Prior to disposal of sediment, the developer shall sample the sediment following acceptable methods, criteria and guidelines and provide the Town with a sediment sampling report, including lad results for peer review. The report shall be signed by a qualified person.
- After sediment removal and site restoration, the developer shall conduct a topographic/bathymetric survey of the entire facility and provide the Town with Record Drawings in AutoCAD and pdf format demonstrating:
    - All accumulated sediment has been removed.
    - Plan and profile drawings matching the accepted for construction drawings set and facility cross-section drawings at 20 m stations showing the design and post cleaning grades.
    - The permanent and active pond volumes as designed are present.
    - Record elevations of inlet(s), outlet(s), weirs, forebays, berms, emergency spillway and any other hydraulic structures within the facility; and,
    - Plan & profile record drawings of the facility showing maintenance access and representative sections of the various pond sections.
- The developer shall provide the Town with Engineering Certification indicating that all components of the facility are in good repair and that they have been installed in conformance with the approved SWM report and detailed design. A comparison table shall be provided showing the design and record pond attributes (inlet/outlet pipe size and inverts, control structures, orifice size and invert, forebay berm elevation, side slopes, emergency spill way, and any other hydraulic structures in the facility) including stage/storage/outflow characteristics. Any deviation between design and record information shall be identified in the report with remediation measures proposed.
- The developer shall collect field data and develop a rating curve for the hydraulic outlet control structure(s) and submit to the Town to demonstrate that the facility is functioning as designed to the satisfaction of the Town.
- A copy of the MECP Environmental Compliance Approval.
- A copy of an acceptance letter from the Town.

The developer shall submit to the Town a completed SWM Facility General Information Form sealed by a professional engineer licensed in Ontario.

Upon receipt of the above information, the Town will perform verification checks to confirm sediment removal, facility permanent pool capacity, proper hydraulic and performance function, the condition of the facility is satisfactory and will provide subsequent feedback if deficiencies are found.

5.2.2.3. Landscaping of Stormwater Management Systems

Landscaping within a SWM facility as well as stormwater management systems shall have a two-year warranty period.

5.2.2.4. Operating and Maintenance Manuals

The facility's Operation & Maintenance Manuals shall be provided to the satisfaction of the Town as a condition of Certificate of basic Services.

5.2.2.5. Storm Sewer

Storm sewer installation shall not commence until siltation and erosion controls measures are in place and potential discharge route from the construction is prepared. The subdivision stormwater management facility or temporary stormwater facilities are constructed and prepared to receive flows from the storm sewer construction.

5.2.2.6. Frames and Grates

As per Section 4.4.3.

5.2.2.7. Ditches and Culverts

Design ditch grades shall be provided for the ditch inverts on the projection of side lot lines for all blocks and lots in the subdivision.

Design culvert sizes shall be shown on the plan and profile drawings.

5.2.2.8. Connections to Ditches and Storm Sewers

Sump pump discharge, rainwater leaders, roof drain leaders, area drains, field tile drains, etc. shall not be discharged directly to the roadside or municipal ditches. Drainage of this nature may be discharged to the surface or to a dry well on private property. Collection and concentration of stormwater or ground water with point discharging such as a sump pump outlet shall not cause a nuisance such as erosion, ponding, ice accretion etc. on public or private neighbouring lands.

5.2.3. Testing and Acceptance

The complete sewer system including service connections to the property line and maintenance holes shall be tested in accordance with the requirements of OPSS for the type of pipe installed. Leakage testing shall be conducted on the entire system including structures. Deformation gauge (Pig) test as required by OPSS is required for the type of pipe installed. All pipe works shall have a CCTV inspection as per OPSS 409 completed as part of the preliminary and final acceptance inspections. Testing of the Storm Sewer System shall be done with the participation of the Town inspector, who will coordinate with the department responsible for operating the system at assumption.

5.3. Sanitary Collection System

5.3.1. Sanitary Sewer

No flow (sanitary or otherwise shall be permitted from the new system to the existing Town owned sanitary sewer until the new sewer system is tested with the participation of the Town and a written approval, from the Town, to connect has been issued.

5.3.2. Testing and Acceptance

A commissioning plan shall be submitted to the Town for review and approval. Testing of the Sanitary Sewer System shall be coordinated with the Town Inspector with the participation of the Town department responsible for operating the system at assumption and shall strictly conform to the requirements set out in the most current revision of "The Blue Mountains Sanitary Sewer Commissioning Protocol" as found on the Town website.

The complete sewer system including service connections to the property line and maintenance holes shall be tested in accordance with OPSS and "The Blue Mountains Sanitary Sewer Commissioning Protocol". Deformation gauge (Pig) test as per OPSS is required on all pipe works prior to Town acceptance. All pipe works shall have a CCTV inspection as per OPSS 409 completed as part of the preliminary and final acceptance inspections.

5.3.3. Flow Monitoring until Assumption

Any system is connected to the municipal system via a public or boundary maintenance and constructed sanitary sewers that may be assumed by the Town will have a flowmeter and datalogger installed in the boundary maintenance hole. This unit shall monitor sanitary flow for a period of no less than twelve months after the development sanitary sewers are accepted by the Town or when a minimum of eighty percent (80%) of units are complete and occupied. The unit shall be installed, monitored and maintained by Town or Town contracted staff. The cost of this shall be borne by the Developer.

5.3.4. Sewage Pumping Station -Operation and Maintenance Manuals

Sewage pumping stations and accessory equipment shall be supplied with a minimum of three complete hardcopy sets and one electronic PDF copy of operational instructions for automatic and manual mode including program control narratives, emergency procedures, shop drawings, maintenance schedules, and such tools and spare parts as may be necessary. The engineer will ensure that this documentation will be provided along with the necessary training for operation and maintenance of the equipment prior to commissioning.

5.4. Water Distribution System

5.4.1. Watermains

The watermain shall not be connected to the existing Town owned watermain until the new main is tested and commissioned with the participation of the Water department that will operate the system and a written approval, from the Town, to connect has been issued. A Temporary Water Connection shall be used during construction and commissioning as per **Town Standard Drawing 4.7.1** in **Appendix D**.

5.4.2. Thrust Restraint

Thrust restraint shall be achieved through mechanical joint restraint. The contractor shall have the required length of joint restraint calculated for the entire water supply system prior to beginning the water system installation. The required length of joint restraint for all locations in the system shall be provided to the Town at the pre-construction meeting.

The location and details of the joint restraints installed shall be recorded on the As-Constructed and Record Drawings.

5.4.3. Cathodic Protection

Metallic watermain and appurtenances shall be protected with Cathodes.

The location and details of the cathodic protection installed shall be recorded on the As-Constructed and Record Drawings.

5.4.4. Service Connections

Service connections shall be installed in the Town right-of-way within 100 mm of the property being serviced and the valve box shall be marked with a wooden marker painted blue with the service tail attached to the marker terminating at least 600 mm above grade and capped or crimped.

5.4.5. Testing and Acceptance

The complete water system including service connections to the property line and hydrants shall be tested in accordance with "The Blue Mountains Watermain Commissioning Protocol" available on the Town's website. Testing of the Water System shall be done with the participation of the Water Department.

5.5. Roads

5.5.1. Road Works

Road work shall not commence until siltation and erosion controls measures are in place and potential discharge route from the construction is prepared.

The Record Drawings shall contain all actual elevations, grades, lengths, locations, material types, sizes of the works incorporated into the complete road system. Elevations of at 40m intervals:

- Sub-grade at centreline and the theoretical edge of asphalt.
- Top of road base at centreline and theoretical edge of asphalt.
- Top of base asphalt at centreline and theoretical edge of asphalt.

Proof rolls of the sub-grade and sub-base shall be done in coordination with the Town Inspector.

5.5.2. Entrances

Entrances are the section of a driveway that is constructed between the travelled portion of the road and the subject lot property line.

Entrance grades shall conform to the Town entrance guidelines as well as the OPSS/OPSD guidelines for entrances.

5.5.3. Top Course Asphalt

Approval to place top course asphalt is required from the Town. The following must be completed:

- All sidewalk, curb, and boulevard work.
- Raise maintenance hole and catch basin frames.
- Raise water valve box.
- Flush and sweep surface and evenly apply tack coat.
- Base course asphalt pad as required in accordance with OPSS; and,
- All testing of sewer and watermain has been accepted by the Town including Sewer video inspection and watermain continuity testing.
- Repair any identified deficiencies.
- Base asphalt has had at least one complete winter season pass to allow for settlement,
- Certification from Geotechnical Engineer and Engineer of Record.

Place top course asphalt in accordance with OPSS.

5.5.4. Curbs

Prior to final acceptance of curb and gutter, all blemishes shall be rectified by removing a minimum 1.5 m section of curb and replacing. If a section less than 3.0 m is to be replaced, two 600mm 10M rebar drilled 300mm into the existing curb on each side and grouted with epoxy grout or approved equal.

The replacement curb may be placed by curb machine or hand placed form work. Existing material on either side of the linear curb shall be removed to allow full depth curb forms placed. Following curing, when the concrete has reached 75% of its design compressive strength the area on either side of the linear curb shall be prepared. Where pavement (asphalt, unit pavers or concrete) abuts the curb, a minimum of 0.5 m width of the pavement shall be removed to allow the granular pavement base to be recompacted. Suitable compaction equipment shall be used to compact the granular pavement base before the pavement is reinstated. Under no circumstances shall a concrete curb be poured against existing pavement.

Note: Refer to Town's Website for Curb Inspection & Repair Guideline.

5.5.5. Sidewalks

Prior to final acceptance of sidewalk, all blemishes shall be rectified by removing a minimum single panel of sidewalk and replacing.

The replacement sidewalk may be placed by sidewalk machine or hand placed form work. Existing material on either side of the linear curb shall be removed to allow full depth curb forms

placed. Sidewalk depths shall be in accordance with Ontario Provincial Standards. The minimum depth of sidewalk in The Blue Mountains is 125 mm or as per OPS. Following curing, when the concrete has reached 75% of its design compressive strength the area on either side of the linear sidewalk shall be prepared. Where pavement (asphalt, unit pavers or concrete) abuts the sidewalk, a minimum of 0.5m width of the pavement shall be removed to allow the granular pavement base to be recompacted. Suitable compaction equipment shall be used to compact the granular pavement base before the pavement is reinstated. Under no circumstances shall a concrete sidewalk be poured against existing pavement. *C-2 Design Mix should be used for all sidewalk repairs.*

5.5.6. Testing and Acceptance

The complete road system including road structure, curbs, sidewalks, and boulevards shall be tested in accordance with the appropriate OPSS. Testing of the Road System shall be done with the participation of the Town department responsible for operating the system at assumption. A comprehensive geotechnical and material testing record shall be presented to the Town as a condition of basic Services and Completion.

Full acceptance will be upon completion of the warranty period including receipt of all required documentation.

5.6. Pavement Marking and Signage

5.6.1. Pavement Marking and Signage Plan

All traffic control signs shall be of new material, installed, and their reflectivity confirmed via shop drawing submission and recorded on the Record Drawings as a condition of Basic Services. For reconstruction projects signs may be removed during construction and replaced/reused as required by the Town.

5.6.2. Street Name Signs

For new developments, street name signs shall be supplied and installed by the Developer at the completion of the base course asphalt road construction and prior to the issuance of Building Permits. Signs must be maintained by the Developer until “Assumption” by the Town.

5.6.3. Traffic Control Signs

For new developments, traffic control signs shall be supplied and installed by the Developer at the completion of the base course asphalt road construction and prior to the issuance of Building Permits. Signs must be maintained by the Developer until “Assumption” by the Town.

5.6.4. Roads Not Assumed Signs

Signs reading “Roads Not Assumed by Municipality – Use at Your Own Risk” shall be erected at each point of access/egress to new residential and industrial subdivisions. Signs shall meet following requirements:

- A minimum of 1.22 m x 1.83 m.
- A maximum height of 2.15 m above grade; and,

- Lettering shall be 120 mm wide by 180 mm tall, black in colour on white reflective backing.

Signs shall be erected prior to the start of construction and shall be removed after assumption.

5.6.5. Pavement Markings

All roadway markings shall be installed on base course asphalt as a condition of Basic Services if base course asphalt will remain as the primary surface for more than three months. The permanent roadway markings shall be installed on surface course asphalt as a condition of the Town Completion Certificate.

5.7. Traffic Signals

Traffic Signals shall be commissioned as per the appropriate requirements including the MTO Ontario Traffic Manual Book 12.

5.8. Street Lighting

Prior to energizing the street lighting system, the electrical engineer shall obtain from the contractor a copy of the Electrical Safety Authority (ESA) certification and submit to the Town.

Upon energizing the street lighting system, the electrical consultant shall carry out a field verification of the illumination design in accordance with IES specification LM-50.

Upon completion of the project, the electrical engineer shall carry out a final quality verification inspection in conjunction with the Town's inspector. The project will not be deemed complete until the Town inspector is satisfied with the workmanship, has received all certification, test results and as-built drawings. The as-built drawings must also be provided to the Engineer of Record for inclusion in the Record Drawings set for the project.

5.9. Subdivision Grading

5.9.1. Lot Grading

Lot grading elevations shall be provided on the Record Drawings.

5.9.2. Block Grading

Block grading elevations shall be provided on the Record Drawings.

5.9.3. Retaining Walls

Retaining walls details shall be provided on the Record Drawings.

5.9.4. Rough Grading

Prior to the issuance of any certificates by the Town accepting the Works, blocks shall be rough graded as follows:

- Achieve positive drainage to the satisfaction of the Town.
- Lot corners, grade changes and spot elevations: 300 mm (or otherwise approved by the Town); and,
- Swales and ditches, except side yard swales, without finishing topsoil: 150 mm.

5.10. Utilities

Third party utilities installation shall require non-resident engineering supervision to be approved by the Town's Engineer to confirm that installation does not compromise any municipal infrastructure.

Compaction of backfill for utility trenches shall be 95% Standard Proctor Dry Density.

5.11. Streetscape

Streetscaping shall be inspected and approved by the Engineer of Record or their Landscape Architect and coordinated with the Town Inspector.

[end of Section 5]

6. DEVELOPMENT AGREEMENT SECURITIES & ASSUMPTION OF MUNICIPAL INFRASTRUCTURE

6.1. Development Securities

The following shall be used for the determination of Development Agreement Securities;

For Pre-Servicing Agreements; 10 % of the Estimated Cost of the works

For Subdivision Agreements

- Twenty-five percent (25%) of the cost of completed curbs, gutters and sidewalks
- Twenty-five percent (25%) of the cost of completed landscaping
- Ten percent (10%) of the cost of all other completed works
- One hundred and five percent (105%) of the cost of uncompleted works
- Six percent (6%) engineering of uncompleted works
- Grading and tree preservation security
- Any other security required case to case basis

6.2. Assumption timelines

To ensure consistent & efficient assumption of Public Infrastructure within Subdivisions, the following deadlines and procedures apply:

- Developers must provide formal notification to the Town of their intent to request the assumption of infrastructure or subdivision works no later than (May 31st).
- All required documentation, including inspections and any necessary remedial works, must be completed and submitted to the Town by September 1st (Labour Day).
- At the Town's sole discretion, the completion of minor remedial works may be extended to no later than Thanksgiving (second Monday in October), provided all other requirements are met by Labour Day.
- The Town will not assume infrastructure or subdivision works from the commencement of Winter Control on November 1st through May 1st of the following year.

[end of Section 6]

APPENDIX A

Project Signage

APPENDIX B

Service Record Sheets

APPENDIX C

Design Deviation Form

APPENDIX D

Standard Drawings and Cross Sections