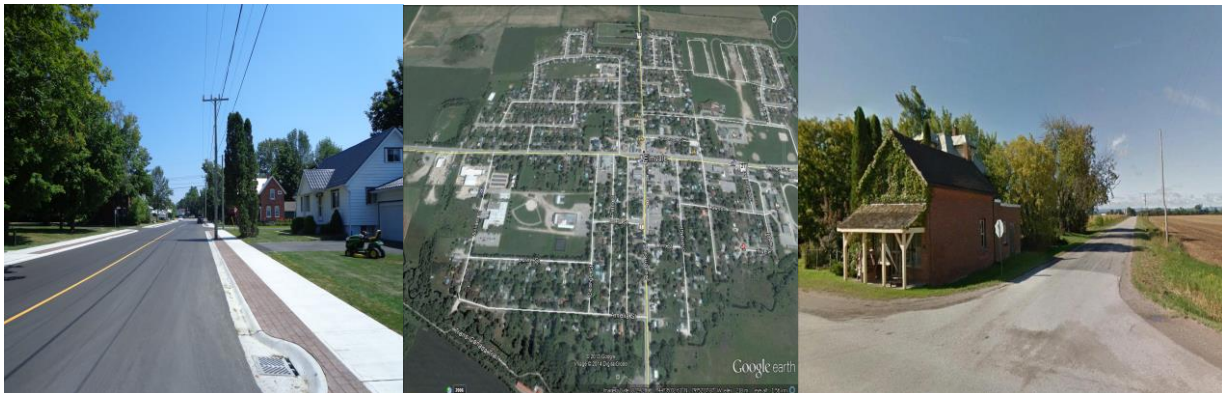




Township of Springwater

Engineering Design Standards and Specifications Manual

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SECTION 1.0: GENERAL INFORMATION

1.1 INTRODUCTION

The Township of Springwater Engineering Design Standards and Specifications Manual herein presented are intended as a guideline to provide a good engineering basis for subdivision design, to establish a uniform criteria of minimum standards, and to improve processing of subdivision plans and agreements in the Township of Springwater. Technological or economical changes which improve or maintain the quality of the design will be considered at the Township's discretion.

These standards are meant to be read in conjunction with Township of Springwater Engineering Design Standard Drawings. Changes and revisions will be made to the engineering standards and standard drawings from time to time and it is the responsibility of the Developer or Consulting Engineer to obtain and make use of the latest versions available at the time of subdivision design.

It is understood that these standards may be referred to as a schedule in a subdivision agreement and that the current revision of the standards are then considered to be part of the agreement.

1.2 ENGINEER'S ROLE

The design and all required engineering drawings and associated reports must be signed and sealed by a Professional Engineer, licensed to practice in the Province of Ontario.

1.3 DRAFTING AND ENGINEERING SUBMISSIONS FOR PLANS OF SUBDIVISION

1.3.1 Submissions

1.3.1.1 Engineering Drawings

The engineering drawing set shall contain, as a minimum, the following drawings plus any others that may be necessary to address Conditions of Draft Plan Approval.

1. Cover Sheet including key plan
2. Legal and Reference Plan of Subdivision.
3. General Servicing Plan showing all structures, services and utilities
4. General Grading Plan.
5. General Phasing Plan.
6. Sediment and Erosion Control Plan.
7. Storm Drainage Area Plan.
8. Sanitary Sewer Drainage Area Plan.
9. Stormwater Management Pond Detail Plan.
10. Park Development Plan
11. Street Profile

12. Concept Vegetation Plan.
13. Tree Preservation Plan.
14. Street Light Illumination Drawing and Electrical Design
15. Composite Utility Drawing
16. Detail drawings including standard and special details

NOTE: All drawings are to be provided with a Title Block, revision summary, benchmark, scale, legend, north arrow, "Accepted for Construction" signing blocks for Township and Township Engineer and Block for the stamp of the design engineer.

All drawings to be standard A-1 size sheets (594mm x 841mm).

All plans to include a Key Plan in top right corner.

1.3.1.2 "As-Constructed Drawings"

Upon completion of the installation of underground services, the Township shall require "as-constructed drawings" for the Certificate of Substantial Completion as well as a digital copy of the plans in PDF and Auto Cad formats.

Before the start of the maintenance periods for the Certificate of Final Completion, two full sets of "as-constructed" engineering drawings are to be forwarded to the Township Engineer for review and comments. Revisions must have been made to the drawings to reflect any changes to the line and/or grade of the roadways and services, and to incorporate all the grading modifications resulting from final lot grading. All manholes, catchbasins, valves, hydrants, curb stops and service connections shall be properly tied into fixed reference points.

If any revisions are required, one set of red lined drawings will be returned to the Developer's Engineer.

When all revisions and/or corrections have been made a complete set of "as-constructed" hard copies shall be submitted to the Township Engineers as well as digital PDF and AutoCAD drawings.

The "as-constructed" drawings shall include the following information:

1.3.1.2.1 Road System

1. Elevation of centreline of roadway every 20 metres.
2. Revised horizontal and vertical curve information.
3. Any additional information that has been required for construction after approval of engineering drawings.

4. Revised bench marks located in a permanent location throughout the new development at sufficient intervals such as on fire hydrants and/or other permanent structures.

1.3.1.2.2 Storm System

1. Invert elevations of all storm sewers.
2. Invert elevations of all storm manholes.
3. Revised percentages of all storm sewers along with “as-constructed” distances between manholes, and revised storm sewer design sheets.
4. Location measurements to all storm sewer connections to each individual lot. These should have swing ties from property corners or other fixed structures such as fire hydrants and manholes.
5. As-constructed elevations of road cross culvert inverts.
6. Any additional information that has been required for construction after approval of engineering drawings.

1.3.1.2.3 Sanitary System

1. Invert elevations of all sanitary sewers.
2. Revised percentages of all sanitary sewers along with “as-constructed” distances between manholes and revised design sheets.
3. Any additional information that has been required for construction after approval of the engineering drawing.

1.3.1.2.4 Water System

1. Elevations of top of watermain every 30 metres.
2. Location measurements to all water service boxes for each individual lot. These should have swing ties from property corners, buildings or other fixed structures such as fire hydrants and manholes.
3. Location by measurement of tees, bends, valves and dead ends.
4. Any additional information that has been required for construction after approval of the engineering drawing.

1.3.1.2.5 Lot Grading

1. Any major revisions to the approved lots
2. Invert elevations of all swales.
3. Invert elevations of all culverts.
4. Invert elevations of all ditches at 20 metre intervals.

1.3.2 DRAFTING REQUIREMENTS

1.3.2.1 Quality

All original drawings and prints shall be neat and legible and shall be corrected for “as-built” in the same manner. All information shall be reproducible by a white-printing or photocopy machine.

1.3.2.2 Drawing Sheet Sizes

Drawings shall be of a consistent size of 594mm by 841mm (metric size A1).

1.3.2.3 Scales

Standard metric scales to be used are 1:100, 1:200, 1:250, 1:500, 1:1000 and their factors of 10. Scales shall be as follows and shown on the drawings: the key plan shall be shown on the cover sheet at a scale of 1:5000;

- the General Service Plan and the Sanitary and Storm Sewer Plans shall be 1:1000;
- the Lot Grading Plan and the Park Development Plan shall be 1:500 or 1:250 if required;
- Plan and Profile Drawings shall be 1:500 (Horizontal) and 1:50 (Vertical).

1.3.2.4 Basic Information

The following standards shall apply in preparation of the drawings:

- All plans shall include a north arrow in the upper right hand quadrant. All east-west streets shall generally be drawn with the north arrow pointing to the top, all north-south streets with the north arrow generally pointing to the right, and all cul-de-sacs or other roads where this does not apply shall be drawn with the stations numbered from left to right.
- All elevation data shall be referred to geodetic datum and at least one bench mark shall be shown on each plan indicating a proposed elevation.
- In general, east-west streets shall have zero chainage at their westerly limits and north-south streets shall have zero chainage at their southerly limits. Chainages on a plan-profile shall increase from left to right.
- All existing utilities, structures and other features such as trees and hedges shall be shown and identified using a broken line.
- The beginnings and ends of curves must be shown on plan and profile with the radius of curvature shown on the plan. Chainages of points of curvature shall be calculated from the final plan. The chainage elevations and names of intersecting streets shall be shown in plan and profile.
- Street names shall be kept clear of the road allowance.

- The drawings shall show any required off-street drainage and separate profiles shall be prepared for drainage easements.
- The drawings shall show clearly the proposed profiles, road widths and cross-sections, ditches, ditch gradients, curb and gutter gradients, culvert sizes gauges and gradients, existing and proposed services and limits of the proposed work. All detail for intersecting streets including grades must be shown for a minimum distance of 30 metres from the intersection of the intersecting street. All street lines and easements for drainage or services shall be shown. Larger scale detail may be required for congested bends and/or cul-de-sacs.
- The drawings shall show the lot frontage distances and dimensions of easements and land to be dedicated to the Township.
- The Township's Consulting Engineer shall be consulted as to the manner of showing information not set out in these requirements.

1.3.2.5 Sewer Details

The standard abbreviations, sewer diameter, sewer pipe material, length, grade, manholes, inlets and connections to the sewer shall be shown on appropriate General Plans. This information plus sewer bedding, type and class of sewer pipe, manhole numbers and inverts, flow direction, grate elevations and drop structures shall be shown on Plan and Profile Drawings. Chainage of manhole locations shall be shown in profile. Service locations to be shown on plan drawing.

1.3.2.6 Watermain Details

The standard abbreviations, watermain diameter, length, type and class of pipe, and the valves, services, hydrants, bends and connections to the watermain shall be shown on appropriate General Plans and on Plan and Profile Drawings.

1.3.2.7 Road Details

Horizontal control data (beginning and end of curve, radius, length, etc.) shall be shown on appropriate General Plans and on Plan and Profile drawings.

Vertical control data (proposed road grade, length of run and percent slope, beginning and end of vertical curves, high and low point) shall be shown on Lot Grading Plans and on Plan and Profile drawings. Existing and proposed centreline road grades shall be shown every 20 metres with stations shown measured in metres with kilometres separated by a + sign on long runs (e.g. - STA 0+000, STA 0+020, STA 0+040...STA 1+020). Stations of interest (curve stations, intersections, end stations, etc.) shall be shown calculated to the nearest millimetre (e.g. -BVC STA 0+041.169, EVC STA 0+066.169, END STA 0+069.124).

1.3.2.8 Miscellaneous Details

Other details shall be according to the Township Standard Drawings where applicable or if a Township Standard Drawing is not available in accordance with Ontario Provincial Standards. Township Standards take precedence when available. All necessary details shall be included on sheets similar to other drawings sheets, if not on relevant drawings. Township Standard Drawings may be printed on these detail sheets directly.

1.3.2.9 General Servicing Plan

A copy of the General Servicing Plan shall be submitted indicating the proposed locations of the water distribution system, the sewage collection system(s) as well as all aboveground and underground utilities. The detail locations of Hydro, Bell, Cable, Streetlights and Gas shall also be shown on a composite utility plan.

All locations must be established and resolved by the Developer's Engineer in conjunction with the utility companies and following the locations show on the typical cross-sections.

1.4 SUPPORTING STUDIES AND REPORTS

The following studies and reports may be required to support the design. It should be noted that the information provided is the minimum requirement and the studies and reports may need to include further details depending upon site specific conditions. Additional reports or studies may be required at the discretion of the Township.

1.4.1 Geotechnical Report

The Geotechnical Report shall examine and confirm subsurface conditions including soil type(s) and stratification, groundwater levels, depth to bedrock, soil bearing capacity, permeability, conductivity, and presence of any contaminants.

The report shall address the adequacy of the Township's standard minimum pavement structure and sub-drainage system or recommend a higher standard of design if conditions warrant.

The report shall assess the suitability of native soils for trench backfill and building foundation construction. It shall also address requirements for imported fill as well as construction methods for the use of both native and imported materials.

The report shall discuss the requirements for pipe bedding as well as engineered fill where necessary for building construction.

The report shall be accompanied by a scaled drawing showing test pit and/or borehole locations complete with a detailed test pit and/or borehole log.

The report shall be signed and sealed by a Professional Engineer licensed to practice in the Province of Ontario.

1.4.2 Hydrogeological Assessment

Hydrogeological studies for proposed projects must be conducted by a qualified Professional Engineer and/or Geoscientist to characterize the groundwater regime from a site specific and regional perspective in order to address issues related to (as applicable):

- Impacts to existing well water supplies within the project area;
- Soil permeability and associated properties where the design of septic systems are concerned;
- Water balance;
- Groundwater impact assessment to area aquifers from construction activities and/or discharge of waste or wastewater;
- Test wells and associated testing in accordance with MECP D-5-5 guidelines to address water taking impact sustainability;
- Impacts to nearby surface water bodies; and
- Specific technical review of well field or wellhead protection areas.
- Low Impact Development (LID)

For general road and servicing construction, the report should consider depth of services and identify likely areas where dewatering will be required, the rate of dewatering, requirements for dewatering, permits, and the strategy to achieve the required groundwater levels. If dewatering is necessary, the report should contain sufficient data on groundwater quality and temperature of the receiving watercourse.

1.4.3 Stormwater Management Report

The Stormwater Management Report is to provide details and supporting calculations associated with the design of the minor and major drainage systems as well as the required stormwater management measures to achieve the standard targets or better, established by this document as well as the Conservation Authority.

At a minimum, the following details must be included in the Report:

- Background Information;
- Stormwater Management Targets and Objectives;
- Stormwater Management Strategy including a review of applicable Low Impact Development constraints and opportunities;

- Pre-Development and Post-Development Drainage Areas;
- Storm Drainage System Design;
- Design of End of Pipe Controls;
- Erosion and Sediment Control;
- Inspection and Maintenance Requirements; and
- Calculations, Tables, Figures, Modeling, and Drawings.

1.4.4 Traffic Impact Assessment:

The Traffic Impact Assessment shall review existing and projected traffic levels under full development conditions to determine requirements for traffic control devices, intersection improvements, as well as storage length requirements for turning lanes based on peak traffic flows that have been generated. In addition to vehicular traffic, the report shall identify how cyclist and pedestrian needs are satisfied, including those with barrier free requirements.

The traffic study shall consider existing traffic and a 5, 10 and 20 year design horizon for comparison. The report shall include a description of the assumptions and data used in developing trip generation, directional split and origin/destination assignments.

The area of influence of a development should include major intersections, which may not be directly adjacent to the development.

The report shall include a summary of sight lines and a comparison of existing and proposed road geometry with the MTO Geometric Design Guidelines for Ontario Roadways. For the reconstruction of existing roadways, the report should include a "Roadside Safety Review" identifying any deficiencies in road geometry, sight lines, clear zones, and roadside protection needs.

The traffic study should provide a summary of existing and proposed pavement structure and cross-sections.

The traffic study should include considerations for municipal by-laws as well as the requirements of other road authorities such as the County of Simcoe and the MTO, where applicable.

1.4.5 Noise and Vibration Study:

The Noise and Vibration Study shall review all potential noise and vibration sources and evaluate the requirements to achieve compliance with MECP guidelines and the Township's Noise By-Law, as well as this document.

For attenuation of noise, the report should identify any mitigating measures to ensure that the sound level in the outdoor living area does not exceed 55 dBA. The receiver

for the outdoor living area shall be assumed to be placed at a distance of 3m from the rear wall of the house, at the midpoint of the rear yard width, and on the basis that the rear house wall will be set at the minimum lot line setbacks in accordance with the Township's zoning by-law.

Where noise fences are proposed, the report should detail the locations and height required to attain acceptable noise levels.

For railway traffic, the report should also identify foundation requirements to attenuate vibration.

The report should consider the construction activities typically expected and provide guidance on development of a pre-construction survey of adjacent buildings and structures.

A post construction survey or report may be required by the Township to confirm that acceptable noise levels have been achieved.

1.4.6 Environmental Impact Study:

The Environmental Impact Study shall be prepared by a qualified professional and will assess any potential impact of the proposed project upon the natural environment including, but not limited to, wetlands, woodlots, and natural habitats for threatened and/or endangered species. The report shall also characterize the impact and make recommendations for mitigation, if necessary. Additional details and requirements can be found in the Township's Official Plan.

1.4.7 Environmental Site Assessment (ESA):

For any lands that are to be dedicated to or purchased by the Township, an Environmental Site Assessment may need to be completed.

If required, a Phase I ESA shall be undertaken by a "qualified person" as defined in O. Reg. 153/04 (or the latest revision thereof) and a report shall be completed in accordance with the requirements set out in the same regulation as well as the guidelines published by the Canadian Standards Association (CSA).

The report shall include, but not be limited to:

- Confirmation of Insurance coverage;
- Certification that the person undertaking the assessment and completing the report is a "qualified person";
- The "qualified person's" opinion as to whether a Phase II ESA is warranted based on the findings of the Phase I ESA;

- If the “qualified person’s” opinion is that a Phase II ESA is not required, the report shall expressly include a statement that “in his/her opinion and based on the findings of the Phase I ESA, a Phase II ESA is not necessary”; and
- Confirmation that the report may be relied upon by the Township in making the decision to accept ownership of the property.

1.4.8 Archaeological Report:

The Archaeological Report shall assess any significant historical features on the site and recommend a mitigation plan if necessary. The study shall follow the Ontario Ministry of Culture guidelines for determining the archaeological potential of the area impacted by construction. As a minimum, the report shall follow the requirements of a Phase 1 Archaeological survey and proceed with Phase 2 and 3, if necessary.

The Archaeological Report shall also consider “Built Heritage” and provide an inventory of any historically or culturally significant structures within the affected area. The Springwater Historical Society shall be contacted during the preparation of the report and the report shall include any comments they may have on the affected area.

1.5 BARRIER FREE CONSIDERATIONS

All design projects including new or replacement sidewalks, paths, trails, parks etc. throughout the Township of Springwater must comply with the Accessibility for Ontarians with Disabilities Act and must incorporate ways to remove barriers for the public.

1.6 REVISION INFORMATION

The Township of Springwater recognizes that revisions and updates to this document will be required from time to time.

It is the responsibility of the designer to obtain and make use of the latest version of this document available at the time of design.

SECTION 2.0: ROADWAYS

2.1 GENERAL

OPSS and OPSD shall apply together with these Township Standards. Where there are any apparent conflicts or discrepancies, the Township Engineering Standards and Standard Drawings shall take precedence.

- All roads to be constructed in the Township of Springwater shall be designed to urban standards complete with a sanitary sewer system, water distribution system, storm sewer system, curb and gutter, concrete sidewalk and an asphalt surfaced road structure, unless specific approval from the Township is received prior to the development receiving draft plan approval.
- Right of ways shall be a minimum of 20 m wide for local streets, 26 m for minor and major collectors, and 30 m for arterial roadways. A 23 m Right of Way conforming to STD R12 and STD R13 will be permitted, at the Township's discretion, for minor collector roads specifically for developments within the Midhurst Secondary Plan.
- Where a development adjoins or incorporates an existing County Road or Township arterial roadway as per the Township's Official Plan, the Developer shall deed to the County or the Township the required widening's.
- Daylight at intersections of Township roads and County or Provincial Roads shall be in accordance with Table No. 3
- The edge of the roadway pavement surface shall have a minimum radius at intersections as per Table No. 3
- The minimum grade on any roadway shall be 0.5 percent and the maximum grade shall be as per Table No. 2.
- Finished roadways shall have a crossfall of 2 percent conforming to OPSS geometric design standards.
- 150mm diameter perforated road subdrains complete with filter sock are required as part of the road structure design.
- On all fill sections requiring guide rails, the shoulder widths shall be 0.6m wider than the specified widths above.
- Where a development road terminates adjacent to a future development phase or stage, a temporary hammerhead turn around will be required conforming to STD-R8
- The road design for industrial and/or commercial developments shall take into account the type of traffic anticipated on the development. Granular base thicknesses, asphalt

type and thickness, shoulder width, cul-de-sac radii shall be designed specifically for the development utilizing these standards as minimum requirements.

- Where new roads are to connect to existing roads, the design shall extend along the existing road for a sufficient length to provide a satisfactory transition.
- All roads are to be extended to the limit of the subdivision boundary and shall terminate at a cul-de-sac conforming to STD-R7 when not connecting to an existing road. As a temporary condition, a Hammer Head type termination will be required.
- Roads shall be classified as arterial, collector or residential in accordance with the Township Official Plan.
- Provisions shall be included in the road design for communal (super) mailboxes. The Developer will be responsible for providing parking areas, structural concrete foundations, electrical supply, etc., all as required by the Township and Canada Post for communal mailboxes in locations designated by the Township and Canada Post.

2.2 PAVEMENT DESIGN

The minimum pavement structure for the various road classifications is provided in the table below:

TABLE 1
Minimum Pavement Structure

ROAD CLASS	SURFACE ASPHALT	BINDER ASPHALT	BASE COURSE	SUB-BASE COURSE
Local	40 mm HL3	50 mm HL4	150 mm Granular 'A'	300 mm Granular 'B'
Minor Collector	40 mm HL3	50 mm HL4	150 mm Granular 'A'	300 mm Granular 'B'
Major Collector	50 mm HL3	90 mm HL4	150 mm Granular 'A'	450 mm Granular 'B'
Arterial	50 mm HL3	90 mm HL4	150 mm Granular 'A'	450 mm Granular 'B'
Industrial	50 mm HL3	50 mm HL4	150 mm Granular 'A'	300 mm or thicker depending on Geotechnical Recommendation

The use of Superpave may be permitted for any road class; however, a recommendation must be made by the geotechnical consultant and must be approved by the Township.

The pavement structures identified above are a minimum and the actual pavement structure may need to increase as a result of the following:

- Local conditions such as soil type or water table;
- Anticipated traffic loading;
- To ensure that there will be no half load restrictions on major collector, arterial, or industrial roadways; and
- Any other requirements identified in the geotechnical report.

All asphalt materials and work shall conform with OPSS 1150.

2.3 GEOMETRIC ELEMENTS

The following geometric standards shall be applied:

TABLE 2
Geometric Standards for Road Design

ROAD CLASS (CROSS-SECTION)	ROW WIDTH (m)	DESIGN SPEED (km/h)	PAVEMENT WIDTH (m)	MIN. /MAX. GRADE (%)	MIN. HORIZONTAL C/L CURVATURE (m)	VERTICAL CURVATURE MIN. 'K' VALUE		MIN. TANGENT BETWEEN HORIZONTAL CURVES (m)
						Crest (m)	Sag (m)	
Arterial (Urban)	30	100	14.0	0.5/5.0	340	50	20	120
Collector (Major – Urban)	26	90	14.0	0.5/6.0	190	25	12	80
Collector (Minor – Urban)	26	70	12.0	0.5/6.0	190	15	8	80
Industrial (Urban)	26	60	10.0m	0.5/6.0	40 (See Note 1)	15	6	50
Industrial (Rural)	26	60	7.5	0.5/6.0	40 (See Note 1)	8	6	50
Collector (Minor-Urban)	23	60	11	0.5/6.0	45	12	9	50
Local (Urban)	20	60	8.5	0.5/7.0	20	8	6	50
Local (Rural)	20	60	6.5	0.5/5.0	30	8	6	50

Notes:

1. Shall provide pavement widening on horizontal curves as per Geometric Design Standards for Ontario Highways.
2. On rural roads, the cross-section will change to urban where centreline grades are equal to or greater than 5%.
3. “Sawtoothing” of a roadway is not preferable and will require approval by the Township on a case by case basis.
4. K values less than those listed above may be considered for stop approaches.

2.4 OTHER DESIGN ELEMENTS

2.4.1 Vertical Curves

For local streets, all changes in grade of 2% or more shall be accommodated through the use of a vertical curve.

For all other road classifications, a change in grade of 1% or more shall be accommodated through the use of a vertical curve.

2.4.2 Crossfall

Finished roadways shall have a minimum crossfall of two percent (2%). Super-elevated road platforms shall be considered subject to site specific conditions.

2.4.3 Curb Radii and Daylighting Requirements

The curb return radii, measured from edge of pavement, and daylighting requirements at intersections shall be in accordance with the table below:

TABLE 3
Minimum Curb Radii and Daylighting Requirements

ROAD CLASS	INTERSECTING ROAD CLASS	MIN. CURB RADII (m)	DAYLIGHTING (m)
Local	Local	9	3
	Collector (Minor & Major)	9	5
	Arterial	9	10
Collector (Minor & Major)	Local	9	5
	Collector (Minor & Major)	12	10
	Arterial	15	10
Arterial	Local	9	10
	Collector (Minor & Major)	15	10
	Arterial	* (See Below)	15
Industrial	Any Other Class	18	15

* A compound curve shall be provided in accordance with M.T.O. Geometric Design Standards for Ontario Highways to accommodate a Wb-15 vehicle.

2.4.4 Cul-de-Sacs

Cul-de-sacs are to be provided at all dead ends, where there is no proposed connection to an existing street.

The minimum radii of the cul-de-sac as measured from the edge of pavement shall be 13m. The minimum road allowance diameter of the cul-de-sac is to be 20 m.

2.4.5 Community Mailboxes

Provisions shall be included in the design for community mailboxes. While the final locations are subject to approval by the Township and Canada Post, the designer 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 should be avoided. Further, mailboxes are to be located a minimum of 30 m from any intersection, preferably on a lot line and giving consideration to other aboveground features such as streetlights, fire hydrants, transformers, etc. Community mailboxes must have direct sidewalk access, where ever possible and are to face the sidewalk (if present).

2.4.6 Transitions

Where a new street is to connect to an existing street, whether the design includes an extension of the existing street or connects at an intersection, the design shall extend along all existing streets for a sufficient length to provide a satisfactory transition. In the case of an intersection, the distance must be equal to the greater of the required stopping sight distance or the turning lane development lengths, if applicable, for all legs of the intersection.

2.4.7 Road Base Construction and Sub-Drains

The sub-grade shall be excavated or filled to the required grade for the required width of road surface plus shoulders or curbs plus 0.6 metre or the additional width necessary for the required depth of granular road base. Where earth fill is required, it shall be placed in lifts not exceeding 150mm in depth and each lift shall be thoroughly consolidated to the required density and approved by a qualified geotechnical consultant.

All vegetation, boulders over 150mm in diameter, topsoil and organic or frost-heave susceptible materials shall be removed from the road-base to a depth of 1.0m below finished grade and replaced with suitable granular fill material. In swamp or other areas where the depth of unsuitable material exceeds 1.0m below finished grade, the soils report shall make specific recommendations for consideration by the Township Engineer.

All unsuitable excavated material shall be removed entirely clear of the road allowance. The deposition of any fill type material within the Township is to be in compliance with the Township's cut and fill by-law requirements.

The sub-grade shall be shaped to conform to the required longitudinal grade and cross-section and shall have a cross-fall of 3 percent from the centreline of roadway to each side. If considered necessary by the Geotechnical Consultant, the sub-grade shall be compacted with suitable mechanical compaction equipment as

required to produce a solid base for the road gravel. All structurally weak sub-grade soils shall be excavated and backfilled with granular base material or in accordance with the recommendations of a Geotechnical Consultant and approved by the Township's engineer. The granular base shall be laid on dry, smooth, properly graded sub-grade and shall be spread for the required width of surface plus shoulders and tapered at the edges to meet the edge of sub-grade. Granular road base shall consist of a 300mm thick minimum bottom course of consolidated granular "B" and a 150mm thick minimum top course granular "A" conforming in all respects to OPSS. These are the minimum depths of granulars required and the actual depths shall conform to the requirements of the Geotechnical Soils Report and approved by the Township Engineer.

The granular materials shall be spread in layers of 150mm maximum compacted depths, or at lesser depths if recommended by the Soil Report, and each layer shall be thoroughly compacted.

Recycled concrete will not be permitted as granular road base.

No granular base or surface material shall be placed until the grade on which it is to be laid has been subjected to a proof role and approved by the Geotechnical Consultant and Township Engineer.

During and between construction seasons, the granular base shall be maintained suitable for vehicular and pedestrian traffic including dust control to the satisfaction of the Township Engineer.

Following the placement of base course asphalt, the Developer shall be responsible for weekly power washing and sweeping the road surface until such time as the boulevards are stabilized to the satisfaction of the Township.

Sub-drains shall be provided for all road designs on both sides of the road base and shall consist of 150mm diameter (minimum) perforated, corrugated polyethylene piping with a geotextile filter fabric. Sub-drains shall be bedded in a 300mm x300mm trench below and at each edge of the sub-grade and shall conform to O.P.S.S. Sub-drains are to be connected to catchbasins. When a sub-drain is extended to drain above grade, it shall be provided with a 3m section corrugated pipe end section and rodent grate.

2.4.8 Curb and Gutter

For all new developments concrete curb and gutter is to conform to STD R10 (two-stage).

Concrete curb and gutter shall be in accordance with OPSS 353, with the exception that all concrete shall be supplied in accordance with the "Performance Specification

Alternative” of OPSS.MUNI 1350 and shall meet the requirements of CSA A23.1, Exposure Class C-2, with a minimum compressive strength of 32 MPa at 28 days.

The transition from curb ramp to full curb shall be carried out over a length of 0.6 metres and the dropped curb shall extend 0.3 metres beyond the width of the sidewalk. If the resulting full curb between two sections of dropped curb for a sidewalk will result in a full curb section less than 1 metre in length, the dropped curb shall be continuous and the sidewalk panel widened to be continuous along the curb line.

Prior to the placement of the top stage curb, the base curb is to be completely cleaned and reviewed by the Township Engineer. Any found defects are to be corrected to the satisfaction of the Township. The developer shall make every effort to protect the curb and gutter during the maintenance period. Prior to the placement of top asphalt, the curb and gutter is again to be reviewed by the Township Engineer. Any curb and gutter found to be cracked, chipped, or deficient in any way is to be removed and replaced all at the developer’s expense.

Curb and sidewalk shall be extended across commercial and industrial entrances unless the entrance is signalized or is aligned with a municipal street on the opposite side of the street.

Curb radii at street intersections shall be provided as follows:

2.4.9 Sidewalks

A 1.5m metre wide concrete sidewalk shall be placed in locations approved by the Township. In general sidewalk will be required on one side only for local roads and on both sides for collector and arterial roads. All sidewalks shall be constructed on a properly constructed foundation of a minimum of 150mm of Granular “A”. The sidewalk shall be 150mm thick except at commercial and industrial entrances where it is to be 180mm thick. All concrete materials and work shall conform to OPSS 351. Concrete shall be 32 Mpa, Class C2 in accordance with CSA A23.1-04.

Tactile walking surface plates shall be inserted in the sidewalk at street intersections in accordance the requirements of the Accessibility for Ontarians with Disabilities Act (AODA). Tactile walking surface plates are to be subject to Township approval.

Concrete sidewalk and sidewalk joints are to be installed as per OPSD 310.010.

Prior to the issuance of the Certificate of Final Completion and Final Acceptance the sidewalk is to be reviewed by the Township Engineer. Any sidewalk found to be cracked, chipped, heaved, defaced or deficient in any way, is to be removed and replaced all at the developer’s expense.

2.4.10 Grading within Right-of-Way

The boulevard area from the curb to the property line shall be graded to provide positive drainage toward the roadway at a minimum 2% grade.

For roads having a rural design section the area between the edge of the road shoulder and the street line shall be graded and the ditches cut with slopes of 3m horizontal to 1m vertical from the edge of the shoulder to the bottom of the ditch and from the bottom of the ditch to the original ground. In fills over 1.5m measured vertically from the edge of shoulder to the toe of slope, the fill slope shall not be steeper than 2:1. The ditch shall be located at the toe of the fill slope. On fills higher than 3.0 metres, measured vertically from the edge of boulevard to the toe of slope, steel beam guide rails shall be installed conforming to the Ontario Provincial Standard Drawings and Ministry of Transportation protection warrants.

All side slopes, ditches and boulevards to the street line shall be provided with a minimum 100mm of topsoil and nursery sod. Hydro seeding of ditches and boulevards will be accepted for the issuance of the Certificate of Substantial Completion within estates residential developments. Prior to the issuance of the Certificate of Final Completion, the ditches and boulevards must have an established growth of sod subject to the satisfaction of the Township.

2.4.11 Road Crossing and Entrance Culverts

The minimum sizes for driveway entrance culverts and road crossing culverts are 400 mm.

The capacity of the culvert must be sufficient to ensure a conveyance of 1:5 year for driveway culverts and 1:25 year for road crossing culverts. Where the conveyance capacity of the minimum size culvert is not sufficient, a larger diameter culvert is to be sized using the cross-sectional end area calculated by the rational design method. Road crossing culverts are to be sized in accordance with MTO drainage Design Standards, WC-1 Design (Bridges and Culverts) Detail drawings and calculations shall be submitted for approval by the Township.

The minimum length of culvert shall be that which is required to extend from centre of ditch to centre of ditch with matching slopes not exceeding 3:1.

The minimum depth of cover for all culverts is 300 mm unless otherwise indicated by the Township.

Culverts shall be constructed with granular bedding and backfill in accordance with OPSD 802.014 or 802.034.

2.5 Driveway and Entrance Design

2.5.1 Grades

The maximum grade for driveways and entrances shall be 7% except in site specific cases that receive written approval from the Township. This maximum grade is not recommended and should be employed only in exceptional cases where conditions prohibit the use of lesser grades. The minimum grade permitted is 2%. Maximum grade change shall be 4% at curb or sidewalk and 1% per 2.0 metres average.

2.5.2 Location

All access driveways shall be located a minimum of 1.5 metres from light poles, hydro transformers, catchbasins, hydrants, watermain valves, Bell manholes, Bell and Cable TV junction boxes, side lot lines and other driveways. Water service valve boxes may be installed a minimum of 1.0m from the edge of the driveway. Where frontage limitations interfere with standard locations, site specific solutions shall be detailed with the Plan and Profile and Lot Grading Plans. On corner lots the edge of driveway is to be a minimum of 4.5 metres from the daylight triangle bar. On roadway curves, the extensions of the property line to curb line are to be at least 1m offset from edge of driveway. (To Be Determined)

2.5.3 Width

The width of a typical residential driveway shall be the lesser of half the width of the lot to a maximum driveway width of 9 metres. For lots less than 9m the maximum driveway width shall be 3.5m.

A secondary driveway entrance will only be permitted for estates residential lots with frontages exceeding 30 metres with the provision that the total driveway width of both driveways does not exceed 30% of the total lot frontage.

Deviations from the standard driveway widths may be considered subject to the following site considerations:

- width of road and grade
- end slope on entrance
- depth of ditch
- turning radius
- sight lines visibility
- proximity to existing entrances
- total road frontage
- volume and types of traffic
- divided access lanes
- number of lanes of traffic

2.5.4 Radius

For non-residential entrances, the minimum curb radius is 9.0 m, but may be greater to accommodate truck traffic. The end of the curb radius at street line should not extend beyond property line.

2.5.5 Granular Base and Asphalt

For residential driveways, between the back of curb and property line, the driveway entrance shall have a minimum of 150mm of Granular 'A' and 50mm HL3 surface asphalt or other hard surface as approved by the Township.

For non-residential entrances, the minimum pavement structure shall be 300mm of Granular 'B', 150mm of Granular 'A', 50 mm HL4, and 40mm HL3. This minimum pavement structure shall also apply for the entire fire route.

A more stringent pavement structure may be required and must be confirmed by the Geotechnical Engineer.

2.6 Walkways

The following identifies general requirements for typical walkways. It is recommended that discussion with the Township be carried out in the planning stages to determine walkway requirements. All walkways are to be provided with 1.5 meter high chain link fence unless they are adjacent to a school or storm water management facility. All pedestrian walkways are to be provided with signs indicating, "No Winter Maintenance" and "No Motorized Vehicles".

2.6.1 Pedestrian Walkway (No Landscaping)

Where the walkway block serves only pedestrians, the walkway block is to be 3 metres wide with chain link fence on either side. The walkway shall be asphalt for the full 3 metre width. In general, the sidewalk standards will be applied to the asphalt. Pedestrian entrance gates may require a removable bollard at the Township's discretion.

2.6.2 Pedestrian/Lawn Maintenance Pathway (No Landscaping)

If the pathway is to be used as an entrance to an Open Space Block or Park Area and it will be used by lawn maintenance equipment, then a 4 metre wide block shall be provided. An asphalt walkway 4 metres in width will be provided with chain link fence along each side. At the Township's discretion, a pedestrian entrance gate with removable bollard may be required at street line. The distance between the gate posts will be 4 metres.

2.6.3 Walkway/Utility Corridor

Where the walkway block includes trunk services for watermain, sanitary or storm sewer services, the block shall be a minimum of 6 metres wide. It will include a 3 metre wide asphalt walkway and a 1.5 metre wide landscaped strip along both sides. At the Township's discretion, a pedestrian entrance gate with removable bollard may be required at street line. The gate posts will be 4 metres apart. Additional wooden bollards may be required beyond the limits of the walkway to prevent motorized vehicles from accessing the walkway.

The spacing, depth and size of the trunk services shall also be considered and, if necessary, the walkway block is to be widened. The horizontal separation of services is to meet the recommendations of the MECP and the centreline of the service must not be closer than 1.5 metres from the limit of the walkway block.

2.7 Fencing

The requirements for fencing shall be determined during the drawing review process and consider safety and privacy requirements. In general, a 1.5m high standard galvanized chain link fence will be constructed with a top and bottom rail and 38mm wire mesh consisting of 3.6mm steel. Galvanized chain link fence shall be placed at locations along all walkways, open spaces, parks, and steep slopes, adjacent to commercial properties and as required by the Township. In some instances a 1.8 metre high wood privacy fence may be required between the new and existing development or between residential and commercial properties or between commercial and institutional properties.

Where required, the location and extent of acoustical fence shall be defined in the noise and vibration study prepared for the development. Various types of acoustical fence will be considered during the review process.

Where an Open Space Block is adjacent to a municipal road allowance, a fence will not be required unless necessary as part of a Park Plan or to provide a barrier from steep grades.

Fencing of storm water management facilities will be at the Township's discretion. In general, storm water management facilities are to be designed with maximum slopes of 5:1 in order to avoid fencing requirements.

2.8 Signs and Pavement Markings

2.8.1 Street Name Signs

The Developer will be responsible for coordinating the supply of the street name signs with the Township. All costs associated with the supply and installation of the signs will be borne by the developer. Street name signs of an approved design in green colour shall be erected on approved metal posts (U-Channel galvanized), complete with break-away flange, 3.6m long and embedded 1.2m in the ground. Street name signs are not to be mounted on stop sign posts and are to be installed on the opposite side of the road as the stop signs.

2.8.2 Traffic Signs

Signs of the standard type conforming to the Ontario Traffic Manual Book 2 shall be mounted on 3.6 m (1.2 m lower channel and 2.4 m upper channel), double-slide, and “U-Channel” galvanized steel posts, embedded 0.9 m in the ground. The signs shall be located as required by the Township after a By-law is passed for their installation.

2.8.3 Pavement Markings

Upon completion of the final asphalt and upon notification by the Township, pavement markings shall be painted conforming with the Standards of the Ontario Traffic Manual, Book 11 (Pavement, Hazard and Delineation Markings) at all intersections, school crossings, walkways and railway crossings to clearly indicate the proper traffic zones, lanes and stop lines.

Lane markings are to be organic solvent based or water borne traffic paint complete with glass beads. All lane marking applications to new asphalt require two applications of paint. The second application shall not be applied until the first is tack free. Pavement markings are to conform with OPSS 532 and OPSS 1712.

Traffic lane symbols, stop bars and pedestrian crosswalks are to be durable pavement markings or field reacted polymeric pavement markings in accordance with OPSS 532, OPSS 1713 AND OPSS 1714.

All pavement marking removal required to prepare the area for final pavement marking shall be done by abrasion.

Local streets do not require centreline pavement marking, but stop bars are required with a minimum of 15 metres centreline marking.

2.8.4 Seasonal Active Transportation Lanes

The requirements for Seasonal Active Transportation Lanes are to be discussed at the planning stage and within the Traffic Impact Study.

At a minimum, on any street where the average daily traffic volumes in one direction of travel exceeds 5000 vehicles, Seasonal Active Transportation Lanes must be provided. This can be accomplished by providing an exclusive 1.5 m wide Seasonal Active Transportation Lane on both sides of the street or by providing a minimum 3 metre multi-use trail on one side of the street.

For major collector or arterial streets with average daily traffic volumes less than 5000 vehicles in one direction, the Township may still require the provision of a Seasonal Active Transportation lane in accordance with their overall Transportation Master Plan.

Dedicated Seasonal Active Transportation Lanes are not required on local streets.

The design for the Seasonal Active Transportation Lanes shall be in accordance with the Transportation Association of Canada (TAC) Urban Supplement to the Geometric Design Guide for Canadian Roads and the Bikeway Traffic Control Guidelines of Canada.

The designer shall confirm with the Township if there will be any requirements for the provision of Seasonal Active Transportation Lanes prior to the commencement of the engineering design.

SECTION 3.0: UTILITIES, STREETLIGHTING, AND TRAFFIC SIGNALS

3.1 GENERAL

All street lights lamps to be light emitting diode (LED)

The location of all utilities including communications, cable, gas, streetlight and hydro must be installed in a common utility trench, in accordance with the locations as detailed on the typical cross section.

Compaction of backfill for utility trenches shall be 95% Standard Proctor within boulevards and 100% for driveways and road crossings.

3.2 STREETLIGHTING

Street lights shall be installed throughout the subdivision and may be required on roadways bordering the development if deemed necessary by the Township. A qualified engineering consultant shall prepare the street light design and provide a photometric plan for the proposed layout.

Street light poles will be either Standard Street Lighting (Cobra Head) for urban residential developments or Decorative Street Lighting for estate residential developments. All street light design must conform to the requirements of the Illumination Engineering Society of North America Design Guidelines.

Standard street lighting is to consist of direct buried Class "B" pre-stressed round concrete poles with provisions for electrical ground, suitable for Powerlite 6' bracket. The street lights bracket shall be a 2.4m tapered elliptical aluminum bracket- Powerlite catalogue RE 6'. Standard Luminaires shall be "Cobra-Head" style, lamps to be light emitting diode (LED) roadway lighting with a minimum average rated life of 24,000 hours and be complete with bird stop, HPF Reactor ballast, down bottom lens and photo control cell.

Decorative street lights are to consist of a 30' direct buried octagonal spun concrete pole as manufactured by Stresscrete or King Luminaire with polished black finish and anti-graffiti coating or approved equivalent. The street light arm is to be a 1.8m, aluminum, black polished finish manufactured by King Luminaire, catalogue No.: KG01D Coach Lantern. The luminaire is to be LED manufactured by King Luminaire, or equivalent black side mount with clear, down bottom no lens, Type 3, with universal ballast and complete with photo control cell.

Street light power distribution pedestals are required and the electrical distribution system for the street lighting is to be inspected and approved by the Electrical Safety Association. Street light power pedestals are to be heavy gauge galvanized steel with powder coated paint finish and concealed ventilation as manufactured by Pedestal Solutions or approved equivalent.

The location of the street lights should generally be on the south and east side of the road, opposite the watermain. The poles shall be installed to the outside of road curves.

The maximum allowable spacing shall be 45m unless specifically approved by the Township. Poles must be installed on projections of lot lines. In urban subdivisions, all wiring is to be in underground ducts.

The wattage of lights shall be as follows:

- Arterial & Collector Roads - 150W LED at Intersections
- Residential Roads - 100W LED at Intersections
- Industrial/Commercial Roads- 250W LED at Intersections.

The following minimum standards must be attained:

TABLE 2.1.9

ILLUMINANCE CRITERIA

Roadway and Area Classification	Average Illuminance (lux)	Uniformity		Average Glare (cd/m ²)
		Avg/Min Ratio	Max/Min Ration	
Local: Urban	6	6:1	12:1	0.16
Industrial: Urban/Rural	6	6:1	12:1	0.16
Collector: Urban	10	3:1	6:1	0.18
Local: Rural	4	6:1	12:1	0.12

Notes:

1. The Illuminance Criteria is based on asphaltic pavement types R2 and R3.
2. The Illuminance Criteria for concrete roads must be in accordance with the Illuminating Engineering Society Design Guidelines and/or the Municipal Engineers Association, Municipal Works Design Manual.
3. All other Road Classifications not identified above will be considered on an individual basis in accordance with the requirements of the Town.
4. Street lights shall include:
 - replaceable button photocell, time delay 3 to 5 seconds, twist lock receptacle
 - surge protection
 - dark sky compatible cobra head flat lens
 - LED colour corrected.

3.3 Design Criteria

TABLE 4
Luminance Method for Mid-Block Sections (Non-Intersection Areas)

ROAD CLASSIFICATION	AVERAGE MAINTAINED LUMINANCE	MAXIMUM UNIFORMITY	LUMINANCE RATIOS	MAX. VEILING LUMINANCE RATIOS	PEDESTRIAN CONFLICT AREA CLASSIFICATION
	L_{avg} (cd/m ²)	L_{max} to L_{min}	L_{avg} to L_{min}	L_v to L_{avg}	
Arterial Roads	0.6	6.0 to 1	3.5 to 1	0.3 to 1	LOW
Arterial Roads	0.9	5.0 to 1	3.0 to 1	.3 to 1	MEDIUM
Collector (Minor) Roads	0.4	8.0 to 1	4.0 to 1	0.4 to 1	LOW
Collector (Major) Roads	0.6	6.0 to 1	3.5.0 to 1	0.4 to 1	MEDIUM
Local (Rural) Roads	0.3	10.0 to 1	6.0 to 1	0.4 to 1	LOW
Local Roads	0.5	10.0 to 1	6.0 to 1	0.4 to 1	MEDIUM

TABLE 5

Illuminance Method for Intersections and Walkways/Bikeways

Illuminance Design Criteria for Roadways at Intersections

ROAD AND PEDESTRIAN CONFLICT AREA CLASSIFICATION	MINIMUM AVERAGE MAINTAINED ILLUMINANCE (HORIZONTAL ONLY) (R2 & R3 Pavements) E_{avg} in lux	MAXIMUM ILLUMINANCE UNIFORMITY RATIO E_{avg} to E_{min}
Arterial Roads- Low	9	3 to 1
Arterial Roads- Medium	13	3 to 1
Collector Roads (Minor)- Low	6	4 to 1
Collector Roads (Major)- Medium	9	4 to 1
Local Roads (Rural)- Low	4	6 to 1
Local Roads (Urban/Industrial)- Medium	7	6 to 1

Illuminance Design Criteria for Walkways/Bikeways

ROAD AND PEDESTRIAN CONFLICT AREA CLASSIFICATION	MINIMUM AVERAGE MAINTAINED ILLUMINANCE (HORIZONTAL ONLY) (R2 & R3 Pavements) E_{avg} in lux	MAXIMUM ILLUMINANCE UNIFORMITY RATIO E_{avg} to E_{min}
Rural and Semi-Rural Areas	2	10 to 1
Pedestrian Areas-Low	3	6 to 1
Pedestrian Areas-Medium	5	4 to 1

Intersections shall have an illumination level equal to the sum of the recommended average illumination levels for each of the intersecting roadways. If it is not practical to achieve this level due to geometric constraints, then a minimum level of 50% higher than the recommended level for the main roadway may be acceptable, subject to the Township's approval.

Light levels shall be increased by 50% through schools areas, railway crossings and bridges. The street lights shall typically be serviced with underground wiring between poles. The luminaires shall be alternated between circuits to maintain 50% illumination upon loss of one circuit feeder.

Light fixtures shall be cut-off type to reduce light pollution and shall be dark sky compliant.

Light sources for roadways, park and walkways to be provided with long life (minimum 100,000 hours) light emitting diode (LED) type.

Other street lighting technologies such as LED may be considered for both retrofit and new development projects, subject to the Township's approval.

3.4 LED Lighting Design:

The luminaire shall be UL listed under UL 1598 for luminaires or an equivalent standard from a recognized testing laboratory. The Luminaires shall be expected to operate an average time of 11.5 hours per night at an average nighttime temperature of 20C for a

projected minimum of 100,000 hours. The individual LEDs shall be connected such that a loss or a failure of one LED will not result in the loss of the entire luminaire. A house side shield is required for house side light control. The side shield shall not hang below the bottom of the luminaire.

3.4.1 Luminaire Identification

Each luminaire shall have the manufacturer's name, trademark, model number, serial number, date of manufacture (month-year), rated voltage in watts, and lot number as identification permanently marked on the back of the module. Each street light shall be provided with an identification number as provided by the Township.

3.4.2 Compatibility

The luminaire shall be operationally compatible with currently used lighting control systems, photoelectric controls, and wireless (radio frequency, mesh network, etc.) and power line carrier lighting control systems.

3.4.3 Photoelectric Control

A photoelectric unit shall be supplied for each luminaire. The design of the photoelectric unit must include features to ensure that the device remains insect free.

IES Illumination and Luminance Design Criteria shall follow IES Illumination and Luminance Design Criteria as per ANSI/IES RP-8, 2000.

Maximum Spacing for Street Lights on Standard Road Sections:

Maximum Spacing between LED Street Lighting luminaires shall be in accordance with IES Illumination and Luminance Design Criteria.

Power supply shall be coordinated and arranged with Hydro One from the nearest feasible location.

3.4.4 Materials

All materials used for street lighting must be CSA approved.

3.4.5 Installation

The installation of the street lighting system shall be in compliance with ESA, CSA, and Hydro One's requirements, the Township's standards and specifications, as well as the manufacturer's installation instructions.

Ducts

Ducts shall be solvent welded together in trenches with minimum cover of 600mm. Ducts shall be surrounded by 80mm of brick sand and warning tape to cover width of trench.

Road crossings of existing roads are to be carried out by directional bore method with a minimum depth of cover of 750mm using thickwall PVC duct.

Where open-cut road crossings are necessary, ducts shall be installed as per OPSD 2100.06 and OPSS 603.

Cables

Cables to be continuous without splices and shall be installed after trenches are back-filled.

Installation Specifications as per OPSS 604.

Fuses

Fuses in pole handholes as per OPSD 2255.020 and OPSS 617.

Grounding

Ground rods to be installed at power service disconnect (min. 2 rods), at every 5th lighting pole, and at the last lighting pole in each circuit.

Installation Specifications as per OPSS 609.

Poles

Installation Specifications as per OPSS 615.

Brackets and Luminaires

Installation Specifications as per OPSS 617.

Power Service Disconnect

Installation Specifications as per OPSS 614.

3.5 TRAFFIC SIGNALS

3.5.1 General

Traffic signal design is to be prepared in accordance with the Ontario Traffic Manual Book 12 and the appropriate electrical design codes. All work shall be performed in accordance with the current edition of the 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.

In addition to accommodation of traffic flow, the signalized intersection design shall include pedestrian requirements and accessibility features. All signalized crossings must be designed in accordance with the TAC "Guidelines for the Understanding, Use, and Implementation of Accessible Pedestrian Signals". Accessibility features must include gentle grades for sidewalks, drop curbs and directional lines in the sidewalk to provide guidance for the visually impaired. Pedestrian crosswalk features shall include single head "walk/don't walk" heads, countdown heads, and audible pedestrian heads with tactile push button.

3.5.2 Materials and Installation

The installation shall include the following features:

- Traffic signal controllers must be pad mounted and in a location that is not visually distracting;
- A separate power pedestal is to be provided;
- The power supply is to be metered;
- The traffic signals shall include emergency vehicle pre-emption;
- Twin 100mm ducts are to be provided across the roadway approaches to the 600mm diameter electrical handwells;
- Twin 100mm ducts are to be provided from the controller cabinet to the first handwell;
- The controller cabinet shall be raised 450mm above grade with a cabinet base extension;
- Loop detectors shall be placed in the base asphalt; and
- The controller shall conform with the NEMA standard TS2 Type 2 Standard capable of handling 8 phases, solid state, micro-processor based traffic signal controller with LCD display.
- The traffic signals are to be complete with Novax 3000 audible signals and tactile push buttons.

3.6 Testing

Tests on electrical wiring and materials shall, unless otherwise specified, conform to the Canadian Electrical Code Part 1, and shall include insulation value readings and resistance to ground readings.

The following tests will be required:

- All conduits and duct systems shall be proven free of stones, dirt, water or other debris by pulling a test mandrel 1/4 inch (6.4 mm) smaller in diameter than the nominal conduit or duct size and 12 inches (300 mm) in length through each individual conduit or duct;
- All circuits shall be proven continuous and free of short circuits or ground faults;
- All circuits shall be proven free of unspecified grounds and the resistance to ground of all circuits shall be no less than fifty (50) megohms; and
- The resistance to ground for all grounded equipment shall be proven to not exceed twenty-five (25) ohms.

SECTION 4.0: STORM DRAINAGE AND STORMWATER MANAGEMENT

4.1 GENERAL

The principles and design criteria in this section are intended to augment the guidelines, policies, and standards established in the latest version of the Ministry of Transportation Drainage Management Manual (1997), the Ministry of the Environment Stormwater Management Practices Planning and Design Manual (2003), the Nottawasaga Valley Conservation Authority Development Review Guidelines (2006), the Lake Simcoe Region Conservation Authority Watershed Development Policies (2008), the Lake Simcoe Protection Act (2008), the Lake Simcoe Region Conservation Authority Technical Guidelines (2010), and the Ministry of the Environment Phosphorous Reduction Strategy (2010).

In the planning and design of stormwater management facilities, the designer is to have full regard for the riparian rights of all surrounding, upstream and downstream landowners. Consideration of the surrounding topography, land uses, and environment and integration of the facility into such elements is paramount. Opportunities for linking these facilities with trail systems should be maximized.

4.2 LOW IMPACT DEVELOPMENT

INTRODUCTION

The Township of Springwater encourages the implementation of low impact development (LID) measures as defined by the Credit Valley Conservation Authority Low Impact Design Guidelines and the Nottawasaga Valley Conservation Authority Stormwater Technical Guide (2013), and the specific needs and requirements of the Township of Springwater.

Due to the relatively small number of applications in use at the time of publishing of these standards, and the absence of a provincial standard for the design of structural LID's, the implementation of these measures can be considered a developing science. As a result, the Township will require that each construction project be assessed on a case by case basis.

DOCUMENT REVIEW AND UPDATES

The Township of Springwater recognizes that the LID approach reflects evolutionary processes in the stormwater management field that involves many different disciplines. It involves the collaborative work of planners, engineers, biologists, geo-morphologists, researchers, hydro-geologists, developers, technology and construction industries, as well as political support. It is anticipated that this document will evolve to reflect policy development, new research and technology, as well as local standard practices and guidelines. At key milestones and review of current policies, updates will be provided in the Engineering Standards list of revisions - Appendix "A". It is the responsibility of the designer to obtain and incorporate the latest version of this document available at the time of design.

DESIGN APPLICATION

The Township will require that each construction project be assessed on a case by case basis.

To assess the applicability of incorporating structural LID's as part of the stormwater management design, a comprehensive report prepared by a qualified engineer will be required for each project, which must include the following information:

- a) Describe existing site conditions, including significant environmental features as well as soil type, infiltration capacity, and depth to water table;
- b) Depending on the extent of the proposed project, prepare maps identifying the environmental features, soil conditions, and water table depth to show all aspects under consideration in the environmental design of the stormwater management system for the development;
- c) Complete single event and continuous simulation rainfall/runoff event models to establish the baseline quality and quantity of stormwater runoff originating from the development area under existing conditions as a framework for evaluating combinations of structural LID components with conventional end-of-pipe controls.

Prepare an assessment of the various combinations and sizing requirements of LID components and end-of pipe controls based on their suitability for achieving the stormwater management control targets under typical post development conditions accounting for snow accumulation and frozen ground conditions;

- d) Select a preferred alternative for achieving stormwater management control targets for consideration by the Township and the governing Conservation Authority prior to proceeding to detailed design; and
- e) Prepare a monitoring program to assess the performance of the proposed design. The assessment and recommendations can be included in the project SWM Report, or be submitted as a separate document.

The implementation of any design that utilizes Low Impact Development practices will be subject to Township and Conservation Authority Approval.

4.3 NUTRIENT MANAGEMENT STRATEGY

The Township, as an environmental leader, supports the reduction of phosphorous contributions from Greenfield development into the streams and lakes of the watershed within the Township. To achieve this goal, the Township encourages that effective measures be taken to mitigate and reduce phosphorous contributions from new developments wherever possible.

As such, the Township will require that, as part of the stormwater management design for new developments, an assessment be provided that outlines the latest advances in this regard that have been identified by agencies such as the MECP, Conservation Authorities, etc. as part of their ongoing investigations into this matter, and identifies opportunities to incorporate the most recent advances in phosphorous reduction technologies or strategies within the development proposal.

4.4 STORMWATER MANAGEMENT SYSTEM - MINOR

Generally, storm drainage shall be accommodated by a system of curb and gutters as well as storm sewers, with the exception of rural roadways or estate residential subdivisions, where an open ditch system may be permitted if minimum design criteria can be realized.

Storm sewers are to be designed to convey a minimum of the 1:5 year storm without surcharge. However, when the major storm drainage system is inadequate, the Township may consider the approval of a storm sewer system designed to carry additional flows.

4.4.1 Service Area

The system shall be designed to accommodate all on-site drainage areas as well as all external tributary areas to their maximum future development capacity in accordance with the Township's Official Plan.

4.4.2 Design Flows

The design flows used to size the storm sewer system are to be calculated using the Rational Method, as follows:

$$Q = \frac{(c)(i)(A)}{360}$$

Where:	Q	=	design flow (m ³ /s)
	c	=	runoff coefficient (dimensionless)
	i	=	average rainfall intensity (mm/hr)
	A	=	drainage area (ha)

The average rainfall intensity is to be derived from the IDF curve from the Atmospheric Environment Service Branch of Environment Canada for the Barrie WPCC station, adjusted for climate change, as follows:

The rainfall intensity shall be calculated in accordance with the following table and equation:

Parameter	Return Period					
	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
A	678.085	853.608	975.865	1146.275	1236.152	1426.408
B	4.699	4.699	4.699	4.922	4.699	5.273
C	0.781	0.766	0.760	0.757	0.751	0.759

Rainfall Intensity, I (mm/hr) = $A/(t+B)^C$, where t is time duration in minutes

Parameters based on rain gauge data for the period 1979 – 2003 for the Barrie WPCC Station #6110557

The IDF intensity value for Barrie WPCC Station were increased by 15% before calculating a, b, c values to account for climate change.

$$i = \frac{A}{(t_d + B)^C}$$

where,

i = the rainfall intensity (mm/hr)

t_d = the storm duration (minutes)

A, B, C = a function of the local intensity-duration data.

This shall apply where the upstream drainage area does not include large open space areas. Where peak flows from external areas enter a subdivision sewer system, the more critical case based on either the time of concentration including the external area or the time of concentration excluding the external area shall be used. Actual velocities of computed peak flows shall be used to estimate time of concentration.

Runoff coefficients are given by components of surface treatment and by land use. The land use values are intended as a guide only and the designer is expected to develop an appropriate coefficient using an arithmetic composite calculation as shown below:

$$C = \frac{(A_1C_1) + (A_2C_2) + \dots}{A_t}$$

Where:

- C = composite runoff coefficient (dimensionless)
- $A_{1,2,\dots}$ = area corresponding to specific land use or soils type (ha)
- $C_{1,2,\dots}$ = runoff coefficient corresponding to $A_{1,2,\dots}$ (dimensionless)
- A_t = total drainage area (ha)

Source: adapted from the Ministry of Transportation Drainage Management Manual, 1997, Equation 8.10.

The higher of the arithmetic composite runoff coefficient or the minimum required runoff coefficient by land use, provided in the following table, shall be used to compute design flows.

TABLE 6
Minimum Runoff Coefficients

<u>COMPOSITE CALCULATIONS</u>	
LAND USE DESCRIPTIONS	C
Sodded area under 7% slope	0.25
Sodded area over 7% slope	0.30
Impervious areas	0.95
Bricked areas	0.85
Gravel road and shoulders	0.60
Roof areas	0.70-0.95
Flat roof area with detention hoppers	0.10
Foundation connection (to be applied with no time of concentration)	0.075L/s/unit
<u>MINIMUM REQUIRED COEFFICIENTS</u>	
LAND USE DESCRIPTIONS	C
Single Family, Semi-Detached, Duplex, Triplex, Quad, Small Lot Single (9m), Small Lot Semi (7.5m), Street Townshiphousing (6, 7.5 m)	0.40
Block Town housing, Stack Town housing, Apartments	0.55
Neighbourhood Commercial, Institutional	0.70
Commercial Centre, Industrial	0.75
Park, Recreation Area, Cemetery with any roof leaders or pavement to sodded areas	0.25
Unimproved Open Space under 7% slope	0.25
Unimproved Open Space over 7% slope	0.30

Source: adapted from the Ministry of Transportation Drainage Management Manual, 1997, Design Chart 1.07.

For runoff coefficients not listed above, refer to the MTO Design Chart 1.07.

For estimating flows from storms larger than the 5-year event, the runoff coefficients should be increased to account for the increase in runoff due to saturation of the soil, with the estimate becoming less accurate for larger storms. Coefficients for the larger storms can be derived as follows:

$$\begin{aligned}C_{10} &= 0.8 C_5 + 0.2 \\C_{25} &= 0.7 C_5 + 0.3 \\C_{50} &= 0.6 C_5 + 0.4 \\C_{100} &= 0.5 C_5 + 0.5\end{aligned}$$

4.4.3 Pipe Capacity

Manning's Formula is to be used in calculating the full flow capacity of the storm sewer.

The roughness coefficients to be used in the calculation are as follows:

Concrete pipe, $n = 0.013$

PVC and Smooth walled PE pipe, $n = 0.013$

Corrugated pipe (for culvert use only), $n = 0.024$

4.4.4 Velocities

The minimum velocity in the pipe under full flow conditions is 0.8 m/s for the 5-year return storm.

The maximum velocity in the pipe under full flow conditions is 5.0 m/s for the 5-year return storm.

4.4.5 Minimum and Maximum Pipe Slopes

The minimum pipe slope shall be that which is required to meet the minimum velocity, but shall not be less than 0.3%.

The maximum pipe slope shall be that which is required to meet the maximum velocity.

4.4.6 Minimum Pipe Sizes

The minimum pipe size is 300 mm.

4.4.7 Minimum Depth of Cover

The minimum depth of cover to be provided shall be the greater of:

- 1.5 m below the centreline of road or finished ground surface elevation to the spring line of the sewer; or
- 1.2 m to the obvert of the sewer, provided that there are no conflicts with utility crossings.

4.4.8 Bedding and Backfill

All storm sewers are to be installed with bedding and pipe cover (well graded OPSS Granular 'A' or as recommended and approved by the Geotechnical Engineer and the Township) and backfill in accordance with OPSD 802.010 or 802.030 to 802.032 as applicable. Compaction is to be a minimum of 95% SPD or as indicated in the approved Geotechnical Report.

In soft or wet conditions, additional Geotechnical Investigation may be necessary to determine the appropriate bedding and backfill measures.

4.4.9 Pipe Clearances

Minimum clearances shall be provided in accordance with MECP guidelines.

4.4.10 Sewer Layout

Storm sewers shall generally be located as per the typical road cross-sections.

Where storm sewers mains are located in easements, the easement width shall be a minimum of 6.0m. Shallow rear yard catchbasin leads may at the Township's discretion be permitted with a minimum of 3.0m easements.

4.4.11 Maintenance Holes

Maintenance holes shall be as per OPSD 701 and shall be placed at the beginning and end of each sewer line, at changes in pipe size and/or material, and at abrupt changes in grade and/or alignment. Curved (radius pipe) or properly deflected sewer lines may be permitted but written approval from the Township is required.

Blind connections to the storm sewer must be avoided where possible.

All mainline storm manholes and catchbasin manholes do not require benching.

The maximum spacing between maintenance holes shall generally be according to the following:

- 300 to 900 mm diameter 110 metres
- Greater than 900 mm diameter 150 metres

A sufficient drop shall be provided across each maintenance hole to offset any hydraulic losses. The minimum drops across a maintenance hole shall be as follows:

Change in Direction	Minimum Drop
Straight run (0°)	0.03 m
1 - 45°	0.05 m
> 45°	0.08 m

The maximum change in direction permitted in a maintenance hole is 90°.

Drop structures shall be provided when the difference in the inlet and outlet inverts is equal to or greater than 0.9 m that cannot be eliminated by changing sewer grades. Internal drop structures are not permitted.

Benching of storm sewer maintenance structures to be at the discretion of the Township.

Safety platforms shall be installed in accordance with OPSD 404.020 for all maintenance hole depths of 5.0 m or greater.

Obverts of inlet pipes shall not be lower than obverts of outlet pipes.

Where maintenance holes are located in areas to be flooded by the major storm design and surcharged sewer design is not used, maintenance hole covers shall be of the sealed variety. Where maintenance holes are located where the surcharged sewer design hydraulic grade line is higher than the rim elevation, maintenance hole covers shall be of the bolted variety. In all other areas, standard maintenance hole covers shall be used.

Except for special cases, the downstream pipe diameter shall always be greater than or equal to the upstream pipe diameter.

4.4.12 Catchbasins

Catchbasins shall be located upstream of pedestrian crossings and not within 1.0 m of any curb depressions. Preferably, catchbasins will be installed on projections of lot lines. Double catchbasins shall be located where flows are being received from more than one direction, such as at low points.

The maximum allowable spacing shall be in accordance with the following:

Pavement Width (m)	Maximum Spacing (m)	
	Slope \leq 4.5%	Slope $>$ 4.5%
8.5	90	60
14.0	60	40

Catchbasin capacities shall be determined in conjunction with the overall stormwater management system. On roadways, catchbasins shall have a minimum capacity to pass the runoff from the 5-year return frequency storm. Where the pipe system is required to convey flows in excess of the 5-year return frequency storm, sufficient catchbasin capacity shall be provided to permit the design flows to enter the sewer system. Inlet control devices may be used where the hydraulic grade line needs to be strictly controlled to prevent surcharging of the sewer line and to allow storm sewer house connections.

Where catchbasins are used as inlet controls, spacing shall be determined by design and must be approved by the Township.

Leads shall be minimum 250 mm at 0.7% grade for single catchbasins and 300 mm at 0.7% grade for double catchbasins.

Leads shall connect to maintenance holes where possible and shall have a minimum depth of cover of 1.2 m to the obvert.

4.4.13 Foundation Drainage System

A foundation drainage system is to be provided for each residential lot. The designer has three options to choose from:

1. A sump pump discharging to an underground storm sewer service connection-STD-S2. Sump pump discharge laterals are to be white 100mm diameter, PVC DR35, complete with Crowle type fitting with a minimum depth of 1.5 metres and a minimum grade of 1%. A 25mm air gap is to be provided at the building such that there is no connection between the building sump pump outlet and the sump pump discharge lateral.
2. A sump pump or gravity connection to a third pipe (foundation drain) collection system that is separate from the storm sewer system, which discharges to a sufficient outlet, as per Section 4.5.3 or another approved location such as a valley or hillside.
3. A sump pump discharging to a splash pad at the surface.

4.4.14 Storm Service Connections

Single connections for residential lots shall be constructed in accordance with STD-S1 for each type of residential lot. Connections for commercial, institutional or multiple uses will be considered on an individual basis.

The minimum depth of cover is 1.5 m and the minimum slope is 2.0%. Utility duct trench depths must be considered in setting the depth of service connections.

Where a sump pump discharges to a storm service connection, a 25mm air gap shall be provided at the building such that there is no direct connection between the building sump pump outlet and the storm service.

Where it can be shown to the satisfaction of the Township that groundwater conditions at footing level are unlikely to require more than 2 sump basins and pumps for an entire Townhouse block, storm service connections to the internal units in a Townhouse block may be eliminated. However, storm service connections must be installed to the end units.

Single residential storm connections shall be 100mm diameter with a 100mm x 100mm test fitting plugged and braced at the property line.

Double “Y” residential storm connections shall have a 150mm x 100mm x 100mm boot jack fitting with a 100mm diameter test fitting to each individual connection plugged and braced at the property line.

For new developments, the service shall be extended 2.0 m beyond property line, complete with a temporary, plug, brace, and marker.

Roof leaders shall not be connected to the storm sewer system. Roof leaders are to be discharged to the ground surface onto splash blocks, and flows shall be directed away from the building in such a way as to prevent ponding or seepage into the foundation weeping system. Notwithstanding, the use of inground infiltration pits may be considered subject to supporting geotechnical and engineering considerations.

Where flat roofs are used, as in commercial or industrial sites, detention roof hoppers requiring smaller or fewer roof leaders may be used as part of the stormwater management design. No connections are to be installed directly to storm sewers.

4.4.15 Testing

The following testing requirements apply to all new storm sewers. Any sections of sewer or service connections which fail to meet the requirements shall be repaired or replaced at the direction of the Township.

4.4.15.1 Deflection Testing

All newly installed PVC and Polyethylene storm sewers shall be subjected to deflection testing in accordance with OPSS 410.

Deflection testing is not required for concrete storm sewers.

4.4.15.2 CCTV Inspection

A CCTV Inspection of the storm sewer shall be completed prior to substantial completion and final assumption. CCTV inspection is to be completed in accordance with OPSS 409, including flushing and cleaning.

4.4.15.3 Visual Inspection

All maintenance holes shall be visually inspected by the Township for deficiencies prior to substantial completion and prior to final completion.

4.5 STORMWATER MANAGEMENT SYSTEM – MAJOR

Runoff rates in excess of the design capacity of the minor system shall be conveyed via roadways, swales, walkways, drainage easements, and in special circumstances the storm sewer system, to a sufficient outlet. The combination of the overland flow system and the minor system shall be designed for a minimum 25-year return frequency storm, to prevent flooding of private property with maximum level of road flooding and surface detention as defined in the table below.

It shall also be demonstrated that overland flow conditions resulting from the 100-year return frequency storm will not cause unacceptable flooding damage to private property with a maximum level of road flooding and surface detention as outlined in the table below.

In new subdivisions the limit of overland flow route floodlines shall not extend onto private property unless protected by a drainage easement. Development of the site must not increase flood levels upstream or downstream of the development.

For all classes of road, the product of depth of flow at the gutter (m) times the flow velocity (m/sec) shall not exceed $0.65\text{m}^2/\text{sec}$.

Street grading must provide a continuous gradient to direct street flows to a safe outlet at low points. Outlets can be walkways or open sections of roadways leading to parks, open spaces or river valleys.

TABLE 7
Maximum Allowable Flow Depths

LOCATION	STORM RETURN FREQUENCY (YEARS)		
	5	25	100
Walkways	minor surface	as required	as required
Open Spaces	flow up to 25mm on walkways	for overland flow outlets	for overland flow outlets
Collector and Industrial Roads	1.0m wide in gutter or 0.10m deep at low point catchbasins	up to crown	0.10m above crown
Local Roads	Not applicable	as required	0.3m above crown
Arterial Roads	1.0m wide in gutter or 0.10m deep at low point catchbasins	1 lane clear	up to crown
Private Property	minor ponding in swales	no structural damage, ponding in yard areas below building openings - no basement flooding	no structural damage from overland flow
Public Property	minor ponding in swales or ditches	no structural damage, ponding in flat areas, no erosion	no structural damage, ponding in flat areas, some erosion

Pre-development peak flows shall be computed by an approved hydrologic model. Watershed definition and pre-development flows must be approved by the Township.

Preliminary estimates of post-development flow rates may be computed using the Rational Method.

For all systems and for the design of surcharged sewers and detention facilities, the latest version of the computer model OTTHYMO is recommended. Other hydrograph methods may be considered if it is demonstrated that the results are comparable to those from OTTHYMO. Post-development design flows may be determined using the Rational Method

only where the design area is less than 40 hectares and runoff control facilities are not considered. The Modified Rational method may be used to model runoff control facilities provided the tributary area to the facility is 2 ha or less.

4.5.1 Open Ditches

In rural areas, industrial areas, or estate residential subdivisions, open ditches may be permitted by the Township. Ditches shall be constructed a maximum of 0.5m and a minimum of 0.15m below the sub-grade of the roadway. Where this cannot be achieved, a sub-drain may be provided under the invert of the ditch and day-lighted once the minimum depth can be attained.

The minimum ditch grade shall be 0.5% and the maximum 5%. In exceptional cases and where ditches are on easements off the Road Allowance, ditches with grades greater than 6% may be allowed by the Township; but these shall be suitably protected against erosion to the satisfaction of the Township. Where ditch grades exceed 5%, the Township may require that an urban cross-section be applied for that road segment.

The minimum ditch protection on all ditches shall be 100mm of topsoil and staked sod on the side slopes and bottom of the ditch regardless of the ditch gradient.

4.5.2 Open Channels

Open channels are to be designed as follows:

- For the Regional Storm where the upstream watershed area exceeds 1 square kilometre;
- For a minimum 25 year return frequency storm with protection from erosion damage for larger storms if required by the Township;
- To maintain the natural storage characteristics of the watercourse;
- To maintain a natural appearance as far as possible; and
- To meet specific requirements of the Conservation Authority in each case.

4.5.3 Sufficient Outlet

All developments must demonstrate that the stormwater generated onsite is directed to a sufficient outlet.

A sufficient outlet typically constitutes a lake or permanently flowing watercourse. Sufficient outlet may also include public right-of-way provided that written permission is obtained from the Township. In the case where the discharge is directed over private land, the developer must obtain a legal right of discharge registered on title. Copies of all written documentation such as a legal right of discharge registered on title and/or written permissions from the Township must accompany the design submission.

The designer shall provide calculations for the conveyance capacity of the downstream conveyance routes to demonstrate that upstream, downstream and adjacent landowners do not incur significant adverse impacts, including increased runoff volumes, and that the flow is conveyed in a safe manner.

4.6 STORMWATER MANAGEMENT FACILITIES

All stormwater management facilities are to be designed to ensure that post-development peak flows do not exceed pre-development levels for storm events up to and including the 1:100 year event. All new stormwater management facilities are required to provide an Enhanced level of water quality protection.

The Township supports the design of stormwater management facilities using hydrologic computer programs including VISUAL OTTHYMO, PCSWMM and SWMHYMO.

All stormwater management facilities are to be designed in accordance with the preferred criteria listed in the Ministry of the Environment "Stormwater Management Planning and Design Manual". The information provided below is intended to supplement the aforementioned manual.

4.6.1 Maintenance Access

Maintenance access is required to the inlet and outlet structures, forebays, sediment drying areas, and emergency spillways. Where possible, the maintenance access is to be looped to provide two access points to all key features. When this is not possible, dead end access may be provided with a hammerhead turning area of 4m by 17m with a 12m centreline turning radius. The maintenance access must descend to the forebay bottom. Access paths shall not be less than 4m wide and shall be set a minimum of 0.3m above the maximum pond water level.

At locations where overland inlet flow routes or the emergency spillway cross the maintenance access, reinforcing measures shall be incorporated to strengthen the access route.

Refer to Section 8.0 for minimum pavement structure.

4.6.2 Emergency Spillway

All stormwater management facilities shall be provided with an emergency spillway designed to convey the greater of the 1:100 year or Regional storm event without failure. The spillway is to be designed with suitable erosion protection given the velocities associated with the uncontrolled flow.

4.6.3 Side Slopes

Stormwater management facilities shall be designed with a minimum side slope of 5:1 above and below the safety shelf.

A safety shelf shall be provided with a slope of 7:1 extending 3m horizontally above and below the normal water level.

4.6.4 Sediment Forebay Bottom

The sediment forebay bottom is to be lined with a hard surface material (with consideration of “green” materials) to assist in the maintenance operations of the facility. A Geotechnical Engineer must certify that the forebay bottom design has sufficient bearing capacity to support maintenance equipment assuming the forebay has been drained.

4.6.5 Sediment Drying Areas

Sediment drying areas are to be incorporated into the design of the stormwater management facility such that water from the sediment drains back into the sediment forebay with a slope of 2% to 4%. The sediment drying area shall be designed to accommodate 30% of the forebay volume with a maximum sediment stockpile depth of 1m and maximum side slopes of 4:1.

Sediment drying areas should be located in areas that avoid high publicity, are accessible from the maintenance access road, and are above the 5 year water level.

4.6.6 Signage

Township Standard warning signs shall be provided in clearly visible locations, as approved by the Township.

4.6.7 Landscaping

In cases where there are residential lot(s) adjacent to a stormwater management facility, a minimum 6 meter wide landscaping buffer with a maximum slope of 5:1 will be required between the maintenance access route and the residential lot(s) to provide separation between the stormwater management facility and private property. This buffer can be included within the stormwater management block.

Refer to Section 8.0 for additional guidelines related to planting and landscaping for stormwater management facilities.

4.6.8 Operations and Maintenance Manual

A detailed operations and maintenance manual will be required as part of the design of each facility, including inspection checklists, maintenance descriptions and projected frequency, as well as recommendations for facility cleanup.

The certification of a storm water management facility by the developer's engineer will be a requirement of the Certificate of Final Assumption.

4.7 WATER QUALITY 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 should be used in conjunction with additional quality control measures to provide a treatment train approach.

Supporting calculations and anticipated maintenance requirements shall be provided to the Township along with certification of the design by a Professional Engineer.

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

4.8 EROSION AND SEDIMENT CONTROL

This section presents the minimum criteria for the design of some commonly used erosion and sediment controls. For additional information and/or information on control options that have not been included in this section, please also refer to the latest revision of the Ministry of Environment and Climate Protection (MECP) *Stormwater Management Planning and Design Manual*, the Nottawasaga Valley Conservation Authority *Development Review Guidelines*, the Lake Simcoe Region Conservation Authority *Watershed Development Policies*, and the Greater Golden Horseshoe Area Conservation Authorities *Erosion and Sediment Control Guidelines for Urban Construction*.

Every control measure and all control plans must meet or exceed the specifications set out in this document and must be designed to achieve adequate performance at all times.

The controls should be designed using a phased approach whenever feasible to minimize the exposed area of the site at any given time. There must also be a contingency plan for repair, replacement and upgrading of control measures as required to achieve adequate performance at all times.

4.8.1 Runoff Control

The development of the control plan shall examine concentrated runoff from adjacent areas that will pass through the site and shall provide for the diversion of the runoff around disturbed areas. If this is not possible, the runoff shall be directed into armoured channels flanked by silt fencing with appropriate low point protection and shall outlet into a treatment facility prior to discharge.

For sites where sediment control ponds are not being proposed, sediment control fences and cut off swales/channels or equivalent control measures shall be placed along all down gradient boundaries of the site.

For sites adjacent to existing residential areas, a cut-off swale/channel shall be placed around the entire perimeter of the site to prevent drainage onto private lands. A 3 m wide buffer strip and/or sediment control fence shall be provided along the perimeter of the down gradient boundaries of the site.

4.8.2 Temporary Sediment Control Ponds

Temporary sediment control ponds are required for any project that has a construction area greater than 5 hectares.

The location of the pond(s) shall be that required to intercept runoff from the entire disturbed area unless other controls are implemented, in conjunction with the pond, to ensure that adequate performance is achieved for the entire area.

In general, the pond shall consist of:

- a) A permanent pool to contain accumulated sediment and post-storm waters;
- b) A water quality treatment volume that allows for settlement of suspended sediment from storms; and
- c) A forebay to quiet incoming flow if the construction project is anticipated to take place over more than one year.

The required active storage volume shall be designed with a minimum of 125 m³/hectare of contributing area.

The required permanent pool volume shall be designed with a minimum of 125 m³/hectare of contributing area.

The draw down time shall be a minimum of 24 hours, or as required by the governing Conservation Authority.

The outlet works shall consist of a perforated riser system, with a minimum orifice diameter of 75 mm.

The forebay shall be designed with a minimum depth of 1 m, a maximum volume of 20% of the permanent pool, have a stable bottom to allow mechanical clean out, and incorporate sediment depth indicators.

The overall pond shall be designed with a minimum depth of 1.0 m, a maximum depth of 2.5 m, maximum side slopes of 5:1, and an emergency spillway sized to safely convey the 1:100 year storm event from the contributing area.

4.8.3 Silt Fences

Silt fence is to be installed on the perimeter and on the up-gradient side of sensitive areas, streams and rivers, and at the base of slopes. It should not be used in areas of high flows.

When silt fence is proposed, it shall be:

- a) aligned with site contours;
- b) A minimum above grade height of 900 mm with a minimum of 300 mm of the fabric toed into the ground.
- c) Constructed of suitable woven UV stabilized fabric (with a weave density of 270 R or greater) fastened with wire fasteners to 150 mm page wire fencing or acceptable equivalent.
- d) Supported by steel T bar fence posts with a separation distance of no more than 2.5 m.
- e) Accompanied by a vegetative buffer strip on the down gradient side.

4.8.4 Vegetative Buffer Strips

Vegetative Buffer Strips shall be provided between the site alteration area and every down gradient protected area. They shall be protected from up gradient erosion by silt fences and shall consist of established vegetation that is growing, whenever possible, on undisturbed soil. They are to be a minimum of 3 m wide between the perimeter of the property and a disturbed area and a minimum of 15 m wide between surface water and a disturbed area. Additional width may be required if the adjacent surface water is classified as a source for cold water fisheries.

4.8.5 Non Vegetative Buffer Strips

Non Vegetative Buffer Strips shall be installed where there is not a minimum undisturbed area of established vegetation down gradient of the site alteration area.

They shall be a minimum of 2 m wide between the perimeter of the property and a disturbed area and a minimum of 15 m wide between surface water and a disturbed area.

A second silt fence must be installed no closer than 1 m to the primary silt fence and there must be space provided for access to clean out trapped sediment and complete any repairs to the fence.

4.8.6 Channel Low Point Protection (Stone Silt Traps)

Channel Low Point Protection Devices shall be constructed in channels and ditches that will contain concentrated flows to reduce the velocity; thereby reducing erosion of the sides and invert. They shall be designed as follows:

- a) so that the crest of the downstream device is at the same elevation as the downstream base of the device further upstream;
- b) with 100 mm to 150 mm diameter rip rap, wrapped in geotextile fabric, from the invert of the channel or ditch to a maximum of 250 mm below the top of the channel or ditch;
- c) with a downstream slope not to exceed 1 vertical in 4 horizontal and an upstream slope not to exceed 1 vertical in 1.5 horizontal;
- d) With a 2.5 metre long excavated sediment trap approximately 600 mm in depth at the upstream face.

4.8.7 Construction Access Mats

Construction Access Mats shall be installed at all exits from the site, and shall be designed and maintained to remove most of the sediment accumulated on vehicle tires. They shall be designed as follows:

- a) with 300 mm of 100 mm to 200 mm quarry stone placed on a geotextile fabric suitable for allowing ex-filtration of water and preventing the quarry stone from becoming contaminated with the substrate soil.
- b) To be a minimum of 8 m in width and extend a minimum of 30 m onto the site.
- c) To be flanked by silt fences and vegetative buffers from the property line to the start of any on-site roadways.

4.8.8 Topsoil and Spoil Pile Management

Topsoil and spoil piles shall be designed such that they are not in low areas of a site where water may accumulate and they must be surrounded by one or more silt fences.

Any piles containing more than 100 m³ of material shall be a minimum of 15 metres from a roadway or channel.

If topsoil or spoil piles are to be left in place for more than 45 days, they shall be stabilized by mulching, vegetative cover, tarps or other equivalent means.

Stock piles of any materials are to have a maximum slope of 2:1.

4.8.9 Drain Inlet and Catchbasin Protection

Protection of all potentially affected storm drain inlets and catchbasins shall be accounted for in the design.

Filter cloth protection may be used over the catchbasin inlet where ponding of water will not occur and where traffic will not affect the filter cloth. In all other cases, catchbasin inserts shall be used constructed of filter cloth with a metal support structure.

4.8.10 Site Dewatering

Effluent from site dewatering operations must not discharge directly into receiving bodies of water or streams.

Water pumped from the site shall be treated by control devices such as a sediment control pond, grit chambers, sand filters, upflow chambers, swirl concentrators or other appropriate controls, and must not contain particles more than 40 microns in size, or more than 100 mg/L of suspended solids.

SECTION 5.0: SANITARY SEWER SYSTEM

5.1 GENERAL

In any project where sanitary sewers are required, the sewer system is to be designed to carry domestic, commercial, and industrial sewage for the area under consideration. Flow is to be by gravity and pumping will only be considered where other alternatives are not possible and only with written approval from the Township.

If a pumping station concept is approved by the Township, it shall be designed in accordance with the current MECP guidelines and to the satisfaction of the Township.

5.2 CONFIRMATION OF AVAILABLE CAPACITY

Prior to the commencement of any design, the developer and/or designer must contact the Township and confirm that there is adequate capacity to accommodate the proposed project.

5.3 SERVICE AREA

The system shall be designed to accommodate all on site drainage areas as well as all external areas to their maximum future development capacity in accordance with the Township's Official Plan.

5.4 DESIGN FLOWS

All sewers shall be sized for peak design flows, including an allowance for infiltration based on the following:

Residential:

Average Flow = 450 L/cap/d

Infiltration = 20,000 L/ha/d

Commercial, Industrial, and Institutional:

Equivalent domestic flows for land uses other than residential shall be calculated on an area basis and approved by the Township.

In all cases, peak design flows shall be determined by applying a peaking factor to the average daily flows, based on the Harmon Formula, as follows:

$$M = 1 + \frac{14}{4+p^{0.5}}$$

where M = Harmon Peaking Factor
p = Population (in thousands)

The design population shall be derived using a density of 3.0 persons per unit for detached, semi-detached, and Townhouse dwellings.

In the absence of detailed information, populations should be estimated on drainage areas and proposed land uses identified in the Township's Official Plan or Master Servicing Studies.

5.5 PIPE CAPACITY

The pipe capacity under full flow conditions is to be calculated using Manning's formula and a roughness coefficient of $n = 0.013$.

5.6 VELOCITIES

The minimum velocity in the pipe under full flow conditions is 0.74 m/s.

The maximum velocity in the pipe under full flow conditions is 3.0 m/s.

5.7 PIPE SLOPES

The minimum pipe slope shall not be less than 0.5% or that which is required to meet the minimum velocity.

The first upstream leg of sanitary sewer shall have a slope of not less than 1.0%.

The maximum pipe slope shall be that which is required to not exceed the maximum velocity.

5.8 MINIMUM PIPE SIZE

The minimum pipe size is 200 mm.

5.9 DEPTH OF COVER

A minimum depth of cover of 2.8 metres below the centreline road elevation shall be provided or sufficient depth for basement floor drains and frost cover, as approved by the Township. Where sewers are located within an easement, a minimum frost cover of 1.5 metres may be used, provided that such sewers cross below watermains.

Where sufficient cover does not exist, the Township may consider shallower insulated sewers on an individual basis.

The maximum height of fill is not to exceed OPSD unless pipe strength design calculations are provided for approval by the Township.

5.10 BEDDING AND BACKFILL

All sanitary sewers are to be installed with bedding and pipe cover (well graded OPSS Granular 'A' or as recommended and approved by the Geotechnical Engineer and the Township) and backfill in accordance with OPSD 802.010 or 802.030 to 802.032, as applicable. Compaction is to be a minimum of 95% SPD or as indicated in the approved Geotechnical Report.

In soft or wet conditions, additional Geotechnical investigation may be necessary to determine the appropriate bedding and backfill measures.

5.11 PIPE CLEARANCES

Minimum horizontal and vertical clearances shall be provided in accordance with MECP guidelines.

5.12 SEWER LAYOUT

Sanitary sewers shall generally be located along the centre of the right-of-way.

Where sanitary sewers are located in easements, the easement width shall be a minimum of 6.0 m.

5.13 MAINTENANCE HOLES

Maintenance holes shall be as per OPSD 701 and are to be placed at the beginning and end of each sewer line, at changes in pipe size and/or material, and at abrupt changes in grade and/or alignment.

All maintenance holes shall be pre-benched up to or above springline, to the satisfaction of the Township.

The maximum spacing between maintenance holes shall be 110 metres for all pipe sizes.

A sufficient drop shall be provided across each maintenance hole to offset any hydraulic losses. The minimum drops across a maintenance hole shall be as follows:

Change in Direction	Minimum Drop
Straight run (0°)	0.03 m
1 - 45°	0.05 m
> 45°	0.08 m

The maximum change in direction permitted in a maintenance hole is 90°.

Drop structures shall be provided when the difference in the inlet and outlet inverts is equal to or greater than 0.9 m that cannot be eliminated by changing sewer grades. Internal drop structures are not permitted.

Safety platforms shall be installed in accordance with OPSD 404.020 for all maintenance hole depths of 5.0 m or greater.

Obverts of inlet pipes shall not be lower than obverts of outlet pipes.

Where maintenance holes are located in areas to be flooded by the major storm design, maintenance hole covers shall be of the sealed variety and properly vented. In all other areas, standard maintenance hole covers shall be used.

Except for special cases, the downstream pipe diameter shall always be greater than or equal to the upstream pipe diameter.

A maintenance hole will be required on the private property side for sanitary services to commercial, industrial, and institutional properties.

Foundation drains shall not be connected to the sanitary sewer.

5.14 SANITARY SERVICE CONNECTIONS

Single connections for residential and industrial use shall be located in accordance with STD R6 for each type of residential lot.

Single residential sanitary connections shall be 125mm diameter, with a 125mm x 100mm test fitting at property line. For new developments, the service shall be extended 2.0 m beyond property line, with an additional test fitting, plug, brace, and marker. Refer to Standard Drawings.

Connections for commercial, industrial and institutional will be considered on an individual basis, but will generally be 150mm diameter with a maintenance hole just beyond property line.

The minimum slope for all service connections shall be 2.0%.

Tees shall be installed at a 45° angle to the main, where possible, such that the invert of the tee is at the springline of the main.

Service connections shall be located at a minimum depth of cover of 2.6 metres or sufficient depth for basement floor drains and frost cover. Service connections should cross under watermains.

All floor drains are to be connected to the sanitary service connection. Foundation drains and roof water leaders are not to be connected to the sanitary system.

5.15 TESTING

The following testing requirements apply to all new sanitary sewers. Any sections of sewer or service connections which fail to meet the requirements shall be repaired or replaced at the direction of the Township.

5.15.1 Deflection Testing

All newly installed PVC sanitary sewers shall be subjected to deflection testing in accordance with OPSS 410.

5.15.2 Low Air Pressure Testing

All newly installed sanitary sewers shall be subjected to low air pressure testing in accordance with OPSS 410.

5.15.3 CCTV Inspection

All newly installed sanitary sewers shall be subjected to a CCTV Inspection. The sewer and sewer service laterals are again to be subjected to a CCTV inspection prior to final assumption.

5.15.4 Visual Inspection

All maintenance holes shall be visually inspected by the Township for deficiencies.

SECTION 6.0: WATER SUPPLY AND DISTRIBUTION SYSTEM

6.1 GENERAL

The water distribution system is to be designed as a network system to meet the water demand for each area or development under consideration. Long dead end mains and single supply systems are to be avoided. In order to ensure reliability, a looped system must be provided to the satisfaction of the Township.

6.2 CONFIRMATION OF AVAILABLE CAPACITY

Prior to the commencement of any design, the developer and/or designer must contact the Township and confirm that there is adequate system capacity to accommodate the proposed project.

6.3 SERVICE AREA

The system shall be designed to service all areas within the development to their maximum future capacity in accordance with the Township's Official Plan. Allowance shall be made for connection to appropriate watermains in adjacent developments or areas. The exact location for these connections shall be approved by the Township.

6.4 DESIGN FLOWS

Watermains shall be designed to meet the greater of the maximum day demand plus fire flows or peak hour flow.

Fire flows are to be determined based on the most recent publication of the Fire Underwriters Survey of the Insurance Bureau of Canada or AWWA Manual M31 – Distribution System Requirements for Fire Protection.

The minimum fire flow is to be 38 litres per second in a residential area and 75 litres per second in an industrial area.

The average daily demand is to be taken as 450 litres/capita/day.

The estimated populations and areas shall be in accordance with the Official Plan.

The maximum daily demand factor shall be determined from the current MECP design guidelines; however, a minimum of 1.8 is to be used.

Peak flows, for land uses other than residential, shall be determined on an individual basis and approved by the Township.

Pressure reducing valves will be required where water pressures exceed 552 kPa.

6.5 WATERMAIN SIZING

The Hazen-Williams formula shall be used for computing friction losses and subsequently sizing the watermains.

For new mains, the Hazen-Williams factors, “C”, shall be as follows:

- C = 100 for 150mm diameter
- C = 110 for 200mm & 250 mm diameter
- C = 120 for 300 mm diameter and greater

The minimum size of watermain shall be 150mm diameter in residential developments and 200mm diameter in industrial developments.

A hydraulic network analysis of the water distribution system shall be carried out by the Township based upon the information received from the designer.

6.6 WATERMAIN PRESSURE

The minimum pressure during the peak hourly demand shall be 275 kPa.

The maximum pressure under static load or during the minimum hourly demand shall be 550 kPa.

The minimum pressure when the system is tested under fire flow conditions in conjunction with the design maximum daily demand shall be 140 kPa.

Where water pressure exceeds 620 kPa, a pressure reducing valve will be required.

6.7 OVERSIZING

Oversizing of watermains will be provided as required to provide for adjacent areas where service is expected to be extended, and to provide fire flow requirements including oversizing of hydrants, openings and leads as required.

6.8 WATERMAIN LAYOUT

Watermains shall generally be located as per the typical road cross-section.

When watermains are located in easements, the easement width shall be 6.0m minimum.

6.9 MINIMUM DEPTH OF COVER

A minimum depth of cover of the 1.7 metres below finished ground surface.

The maximum height of fill is not to exceed OPSD unless pipe strength design calculations are provided for approval by the Township.

6.10 PIPE CLEARANCE

Minimum clearances between other types of services (i.e. sanitary) shall be provided in accordance with MECP guidelines.

6.11 BEDDING AND BACKFILL

All watermain and appurtenances are to be installed with bedding (sand or other as recommended and approved by the Geotechnical Engineer and the Township) and backfill in accordance with OPSD 802.010 or 802.030 to 802.032, as applicable. Compaction shall be to a minimum of 95% SPD or as indicated in the approved Geotechnical Report.

In soft or wet conditions, additional Geotechnical investigation may be necessary to determine the appropriate bedding and backfill measures.

6.12 RESTRAINING

All joints are to be mechanically restrained in fill areas, as per the manufacturer's recommendations.

6.13 DEFLECTION OF WATERMAIN

If it is necessary to deflect a watermain to avoid a conflict with other infrastructure, the designer will be required to provide detailed drawings and calculations for approval by the Township.

The maximum permissible vertical bend shall be in accordance with the manufacturer's specification.

6.14 SUPPORTING OF WATERMAIN

Where crossing an existing watermain, if more than 0.9 m of the watermain will be exposed, the designer will be required to provide detailed drawings showing how the watermain will be supported during construction for approval by the Township.

6.15 FIRE HYDRANTS

Hydrants shall be installed in accordance with STD W1, complete with thrust blocks and mechanical restrainers.

Hydrants shall be located as per the typical road cross-section and generally on projections of lot lines, at the end of all cul-de-sacs, and at dead ends. On rural cross-sections, hydrant access complete with culvert is to be provided.

The maximum spacing for hydrants shall be a 150 m radius for low density residential areas and 90 m radius for high density residential areas, industrial, commercial and institutional land uses or as required by the Township.

Hydrant flanges shall be set such that the final elevation is between 100 mm and 150 mm above finished grade.

In areas where the water table is known to be high, the Township may request that the drain holes of the hydrant be internally plugged.

All hydrants are to be fixed with hydrant markers.

Hydrants are to be flow tested, by an organization approved by the Township, to determine performance while maintaining a minimum residual system pressure of 138 kPa, in accordance with NFPA Standard 291. All hydrants shall be painted yellow with the top and nozzle caps to be provided with two (2) reflective hose connection markers based on the results of the flow testing as follows:

CLASS	CAPACITY	COLOUR
Class AA	> 5680 L/min	Light Blue
Class A	3785 L/min to 5675 L/min	Green
Class B	1900 L/min to 3780 L/min	Orange
Class C	< 1900 L/min	Red

Hydrant numbers will be stencilled on the top of all hydrants by the Township.

Refer to Appendix B for a list of approved materials and specifications.

6.16 VALVES

The size of main line valves shall be equivalent to the size of the watermain.

Valves shall be located as required to meet spacing and intersection requirements, or as required by the Township.

Generally, four valves shall be placed at cross-intersections and three valves at tee intersections, such that sections can be isolated without jeopardizing flow to other sections.

Valves shall be spaced such that no more than 40 dwelling units are isolated at one time. In addition, the maximum permissible spacing between valves shall be 150 metres for distribution watermains and 400 metres for trunk supply watermains.

All valves 450 mm diameter or greater shall be installed in a concrete valve chamber.

Air release valves shall be provided at high points of all trunk watermains and, where possible, installed together with valves in valve chambers. Further, where possible, fire hydrants shall be located at all highpoints to minimize the requirements for air release valves.

Drain valves shall be provided at low points of all trunk watermains and, where possible, installed together with valves in valve chambers. All drain valves must have a positive outlet.

The use of pressure reducing valves must be approved by the Township and are to be installed in concrete valve chambers.

6.17 WATER SERVICES

Single 25 mm diameter water services with a curb stop at the property line are to be installed to each residential property. Water services are to be provided with tracer wire

Water services to commercial, industrial, institutional, and multiple-use shall be sized for the specific land use and approved by the Township.

A 25mm water service shall be provided to park areas with a non-freeze post hydrant as per STD- W3.

Single services for a residential lot shall be located in accordance with STD R6. The location of a water service for commercial, institutional, or industrial use will be considered on an individual basis.

Water services shall be located at a minimum depth of cover of 1.7 metres.

Water sampling stations shall be provided where directed by the Township. In general, one sampling station is required for every 300 residential lots. Additional water sampling stations may be required at the Township's discretion.

Fire connections may be required for industrial, commercial or institutional developments.

6.18 WATER METERS

A water meter is required for each water service. The water meter will be sized by the Township using the peak instantaneous flow provided by the designer.

6.19 TRACER WIRE

A tracer wire is to be provided along the top of the entire length of watermain, secured at every fitting and valve and at intervals not exceeding five metres. Tracer wire is also being provided with each individual water service.

Tracer wire is to be brought to the surface at each fire hydrant.

Tracer wire is to be continuous, with no joints. Where the ends of rolls must be connected, approved waterproof connectors are required.

A low frequency continuity test of the tracer wire is to be completed to ensure that the tracer wire has been installed without breaks.

6.20 CATHODIC PROTECTION

Sacrificial caps are to be provided on every bolt of all mechanical joints and restrainers. The bolt lengths shall be sufficient to accommodate the caps.

At their discretion, the Township may also require zinc anodes or other corrosion protection measures.

6.21 TESTING AND DISINFECTION

The following testing requirements apply to all new sections of watermain. Any sections which fail to meet the requirements shall be repaired or replaced at the direction of the Township.

A temporary bypass connection is to be installed to permit testing of the system.

6.21.1 Swabbing

All water servicing greater than 50mm diameter shall be swabbed. Swabs shall be supplied by the Contractor. A swabbing schedule indicating the installation and removal location of the swabs is to be provided to the Township Engineer. Hand swabbing is permitted for small repair sections of watermain.

Swabbing must be completed in the presence of the Township Engineer. A swabbing plan is to be submitted to the Township's operating Authority and Engineers. All swabs are to be accounted for. The developer/contractor will be responsible to locate any swabs not accounted for.

6.21.2 Hydrostatic Testing

The contractor/ developer shall supply all materials, labour and equipment necessary to complete a hydrostatic leakage test.

All hydrostatic leakage testing procedures are to be witnessed by the Township Engineer.

Pressure and leakage test shall be performed on the completed distribution system. The distribution system shall be tested in accordance with AWWA specification C-600-93 or the latest revision thereof. Test sections are not to exceed 500m in length unless approved by the Township Engineer.

6.21.3 Disinfection

The contractor/ developer shall not operate any main valves, blow-offs, by passes during the period of chlorination. All testing procedures must be completed in the presence of the Township Engineer.

All chlorinating procedures are to be completed in accordance with AWWA standard C651 -92 or the latest revision thereof. A minimum initial chlorine concentration of 50 mg/l shall be provided to the system and checked by the Township Engineer. Following a minimum 24 hours, the system is to be tested for residual chlorine prior to flushing. Prior to flushing the system, the discharged chlorinated water must be dechlorinated utilizing a neutralizing chemical. Flushing of the watermain is not to proceed until all safety precautions have been completed to the satisfaction of the Township Engineer.

6.21.4 Bacteriological Testing

Sampling of the water system is to be completed by the Township Engineers and the Township's operating authority. 25mm tails at locations acceptable to the Township Engineer, are to be installed by the developer/contractor for the purpose of sampling. The new water system shall be deemed acceptable for consumption following two (2) consecutive acceptable potability test results in accordance with AWWA C651-92. For a test result to be deemed acceptable, the bacterial analysis of the sampled water must indicate a Total Coliform count of 0 CPU's per 100ml, an E.coli count of 0 CPU's per 100ml and Background count of 0 CPU's per 100ml.

Should the results of the Bacterial Analysis of Water be deemed unacceptable, additional swabbing, chlorinating and flushing and sampling will be required.

Following the confirmation of acceptable sampling results, valves are to be checked for operation by the Township's operating authority and service connecting curb stops shall be checked for operation by the developer's engineer.

6.21.5 Continuity Testing

A continuity test of the tracer wire shall be completed utilizing low frequency testing methodology with point to point readings recorded and approved by the Township.

6.21.6 Final Connection

The final connection shall not be made until all of the above testing has been satisfactorily completed and the Township has provided written notification to proceed.

The length of pipe required to connect the new water system to the existing distribution system shall not exceed 5.5 metres and shall be disinfected prior to installation in accordance with AWWA C651.

The completion of the final connection to the existing water system may only proceed upon written direction from the Township Engineer.

6.22 MATERIALS

Refer to Appendix "B" for a list of approved materials and specifications.

SECTION 7.0: GRADING AND DRAINAGE

7.1 GENERAL GRADING

For residential lots, it is preferable to have one consistent slope of between 2% - 5% for the entire rear yard area; however, where this is not possible, lots are to be provided with a rear yard amenity area in which a slope of between 2 – 5% is provided for a minimum of 5 m or 75% of the average rear yard length, whichever is greater. Slopes from the end of the rear yard amenity area to the rear lot line shall not exceed 4:1. All exceptions must receive written approval from the Township.

All other areas shall have a minimum slope of 2% and a maximum slope of 3:1, to a maximum vertical difference of 1.0 m. Where the vertical difference is greater than 1.0 m, a retaining wall system shall be implemented.

Any lot with a 10% average grade may require a split level dwelling and cross sections may be required.

7.2 SWALES

All swales are to be designed with a minimum slope of 2%, a maximum slope of 5%, and a maximum side slope of 3:1.

All swales shall have a minimum depth of 0.15 m. The maximum depth for side yard and rear yard swales shall be 0.3 m and 0.4 m respectively.

The maximum contributing area to a side yard swale shall be 500 m². For rear yard swales, the maximum contributing area shall be 1000 m² and the maximum length shall be 60 m. The flows from the contributing areas should be calculated and the capacity of the swale confirmed to ensure adequate conveyance.

7.3 REAR YARD CATCHBASINS

Rear yard catchbasins will only be considered where necessary and where all structures are protected from flooding if the inlet is blocked or surcharged by a major storm event.

Where the rear yard catchbasin lead extends between houses, the rear yard catchbasin shall be placed on a minimum 3 metre wide easement split 1.5m and 1.5m on the adjacent lots. The catchbasin lateral shall be placed such that the center is 0.5 metres off of the common lot line. The catchbasin shall be placed such that the center is 1.5 m offset from the rear lot line. The maximum contributing area to the inlet shall be 2500m².

Storm sewers located in side yard easements shall be offset from property line as required to avoid damage to storm pipe during the installation of lot line fencing.

Where the rear yard catchbasin lead extends across the rear yard of a corner lot, the rear yard catchbasin shall be placed on a minimum 3 metre wide easement with the catchbasin

placed such that the center is 1.5 m offset from the rear lot line. The maximum contributing area to the inlet shall be 2500 m².

All rear yard catchbasin leads are to be concrete and a minimum of 300 mm in diameter.

7.4 DRIVEWAYS

The minimum slope on any driveway shall be 2%. For residential lots, this minimum shall be measured from the garage to the property line as well as on the driveway apron, which is the area within the municipal road allowance. The preferred maximum slope for any driveway is 5%; however, an absolute maximum of 7% may be permitted where necessary.

7.5 PARKS AND OPEN SPACE

In parks or other open space areas, slopes of 1.5% – 2 % shall be applied to provide a usable area for recreation purposes. Grading designs employing steeper slopes must be approved by the Township on a case by case basis.

SECTION 8.0: PARKS AND LANDSCAPING

8.1 TREE PRESERVATION

This section provides policies, general standards and guidelines for the protection of existing trees during construction and for the planting of new trees. The section outlines tree inventory, preservation and protection requirements to ensure existing vegetation is retained where possible, and measures to ensure damage to existing vegetation is minimized.

8.1.1 Tree Inventory Requirements

For the entire property to be developed, the Proponent shall submit a tree inventory drawing for all trees on the subject property as well as for any trees on adjacent property whose critical root zones extend onto the property to be developed.

Where there is more than one tree to be removed, the trees must be numbered. These numbers must correspond to an arborist report and the Tree Protection plan as outlined below.

A report prepared by an arborist or landscape architect which details specific and accurate information about trees that may be impacted by the development initiative, and identifies the nature of the work to be undertaken and appropriate protection measures. Information on the report may include location, species, size, condition, structural integrity, disease, infestations and vigour. This report helps Township Staff to determine the legitimacy of tree removal requests by summarizing the actions necessary, and results in the efficient processing of inspection requests and applications. Arborists undertaking reports must be certified with the International Society of Arboriculture (I.S.A.).

As required to control the proliferation of the Emerald Ash Borer, ash trees will not be permitted as nursery tree plantings.

A Tree Protection Plan shall be submitted, designating trees to be preserved and trees to be removed on the subject and adjacent property. Replacement trees for those removed should also be indicated and clearly summarized in a tabular chart directly on the Plan.

8.1.2 Tree Protection Measures and Techniques

Tree protection fencing shall be erected at the critical root zone or beyond, prior to commencement of any clearing, grading or other construction activity.

Tree protection shall not be removed until completion of all construction activity.

The minimum required distances for determining a Tree Protection Zone (TPZ) is as per the following Table. Some trees depending on health, the uniqueness of the species, soil type and competition from other trees may require larger TPZ at the discretion of the Township.

TABLE 8
Tree Protection Distances

TRUNK DIAMETER (DBH)* (cm)	MINIMUM PROTECTION DISTANCES REQUIRED (m)**
<10	1.8
11-40	2.4
41-50	3.0
51-60	3.6
61-70	4.2
71-80	4.8
81-90	5.4
91-100	6.0

* *Diameter at breast height (DBH) measurement of tree trunk taken at 1.4 metres above the ground.*

** *Tree Protection Zone distances are to be measured from the outside edge of the tree base.*

8.1.3 Tree Protection Barriers and Signage

Tree protection barriers, erected for trees and tree groupings situated on the Township road allowance, parkland, and open spaces must be maintained. Tree protection barriers are to be constructed of steel t-bar posts (50 mm x 100 mm x 1.8 m) spaced 3 m, and spray painted with fluorescent orange paint. Livestock fencing and filter fabric is to be attached to the posts.

All supports and bracing used to secure the barrier should be located outside the Tree Protection Zone (TPZ) to minimize damage to roots.

Where protection barrier is on slopes greater than 4%, provide a ditch on the elevated side of the fence, lined with filter fabric and backfill to prevent erosion.

Tree protection signage must be mounted on all sides of a Tree Protection Barrier. The sign should be a minimum of 40cm x 60cm and made of white gator board or equivalent material.

Obtain approval of sign layout from the Township of Springwater before proceeding. The sign should include the Township of Springwater logo, and the following text:

TREE PROTECTION ZONE

No grade change, storage of materials or equipment is permitted within this zone. Tree protection barrier must not be removed without the written authorization of Township of Springwater.

8.2 LANDSCAPE REQUIREMENTS

This section provides guidelines, policies of procedure and practice that are to be adopted by the proponent. Specific guidelines are included for plant materials, including nursery grown trees, topsoil, shrubs, groundcovers, sod and seed mixtures.

8.2.1 Species and Size of Plant Materials

Suitable trees, varieties, and cultivars to be planted in Springwater are to be approved by the Township.

Caliper size shall be determined in accordance with the Canadian Standards for Nursery Stock and measured at 150 mm above grade for trees 40 - 100 mm caliper and at 300 mm above grade for trees larger than 100 mm caliper.

The minimum size for trees and shrubs shall be as follows:

Deciduous trees	50mm caliper
Coniferous trees	1.5m height (min.)
Deciduous shrubs	60cm in height
Evergreen shrubs (non-columnar)	60cm in spread
Columnar evergreen shrubs	100-120cm in height

8.2.2 Diversity

The Township does not support the planting of monocultures (the predominance of one tree species). This section supports our commitment to maintain tree health and bio-diversity, and recognizes the importance of a proactive integrated pest management approach to street tree planting.

As such, individual species should not occur in like rows in excess of 8 trees. The Township encourages a randomized approach to sequencing of tree species. This allows flexibility in terms of soil types and adjacent urban design.

8.2.3 Topsoil & Seed Requirements

8.2.3.1 Topsoil

The stockpiled topsoil shall be spread over the sub-grade to a minimum depth of 200mm. It shall be free of stones and roots over 25mm in diameter and other extraneous matter. All topsoil may be subjected to a physical and chemical analysis by a qualified laboratory to determine its suitability for the intended purpose. Topsoil quality is to conform to the following guidelines:

Soluble Salts (dS/m)	pH	Sand (%)	Silt (%)	Clay (%)	Texture class*	Organic Matter (%)	% Coarse fragments >2mm in diameter	Sodium Adsorption Ratio (SAR)
<4	5.0 to 8.2	<70	<70	<30	SCL, SL, CL, SiCL	>1	2.1 to 5.0	3 to 7 (SiL, SiCL, CL) 3 to 10 (SCL, SL, L)

**L=loam; SiL = Silt Loam; SCL = sandy clay loam; CL = clay loam; SiCL = silty clay loam; LS = loamy sand; SC = sandy clay; SiC = silty clay; S = sand; Si = silt; C = clay*

Where the developer is required to supply additional topsoil to meet minimum requirements, it shall be fertile, friable natural light organic loam and also conform to the above quality guidelines and shall be approved by the Township before placement.

The developer must supply all necessary fertilizers to eliminate any chemical deficiencies as indicated by a soil analysis conducted by the developer.

Such an analysis shall be completed by a recognized laboratory specializing in soil analysis and all associated cost shall be at the expense of the developer.

8.2.3.2 Native Topsoil

Use native topsoil, stripped and stockpiled, provided it meets specified requirements.

If native topsoil is inadequate in quantity, quality or both, use imported topsoil meeting specified requirements for balance of topsoil required.

8.2.3.3 Topsoil Stockpiles

Control and eliminate perennial grass and noxious weeds including their root systems until stockpile topsoil is required for landscape use. Stockpile topsoil shall be reasonably free of all weed growth before placement on site.

Perform weed control, when necessary, in accordance with relevant government chemical pesticide application legislation

Screen stockpiled topsoil, as necessary. Use a screener having a wire mesh screen size opening of minimum 25mm and maximum 50mm to remove stones, soil lumps, foreign material, debris, undesirable plants and roots.

Topsoil Stockpiles are not to be located in open space or park areas.

8.2.3.4 Preparation of Subgrade

Loosen subgrade by scarifying or tilling using discs, harrows or other suitable equipment to a depth 75-100mm immediately before placing any topsoil. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted topsoil.

8.2.3.5 Preparation of Final Grade

Rake, chain drag and lightly roll top soiled areas, remove all ridges and fill all depressions. On larger areas, use hydraulic power box rake or similar mechanical equipment to: remove soil lumps, rocks and debris; fill and level low areas; and correct other grades deficiencies in preparation of seed or sod bed.

8.2.4 Plant Material Considerations

8.2.4.1 Stock

High quality nursery stock is a prerequisite to ensuring the survival of trees. As such, all trees shall conform to the Canadian Standards for Nursery Stock and be of standards quality, true to name and type, and a first class representative of their species or variety.

Balled and burlap wrapped 50-mm caliper stock is the Township of Springwater's minimum requirement standard. Planting details can be found in Appendix B.

Whips (bare-root stocks measuring 1-1.5m in height) may be planted in low-profile, rural areas, and stormwater management facilities and seedlings or whips may be used for naturalization or restoration areas.

8.2.4.2 Form Vigour of Trees

All trees shall be true to type, structurally sound with no evidence of dead branches, sun scald, frost cracks, abraded or broken bark, and be free of insect or disease infestation.

All trees shall have a full, well-developed crown with one distinctive vertical leader, and a root system typical of the species. All parts shall be moist and show active green cambium when cut.

All trees must meet these specifications at the time of planting and final inspection by the Township's designate. Trees that are rejected will be replaced at the Proponent's expense.

8.2.4.3 Planting Holes, Drainage and Root Pruning – Balled and Burlapped Trees

All tree plantings shall be done in accordance with the standards as shown in the planting details as found in Appendix B.

Planting in linear trenches (min. 1.2 width) along street boulevards is strongly encouraged.

Where planting in trenches is not feasible, the planting hole must be at 400cm greater than the diameter of the rootball; the depth of the hole will be the same as the depth of the ball.

8.2.4.4 Backfilling

Backfill is to be placed in layers approximately 15cm in depth, and firmly tamped in place in such a manner that the tree retains its vertical position without support. Particular care is to be taken to ensure that no air pockets remain under or around roots and that damage does not occur to the root system. The fill shall be thoroughly watered immediately after planting.

At grade, a ridge of soil located at the edge of planting hole shall be formed to a height of 10cm, to act as a catch basin for any subsequent watering and to retain mulch.

Balled and burlapped trees shall have the burlap cut and rolled back from the ball and buried under least 10cm of soil. All wire, rope, burlap and twine from around the top 1/3 of the root ball shall be cut and removed.

All excess fill removed from the planting holes, which does not meet planting specifications, shall be removed by the Proponent, along with all branches, roots

from pruning, leftover wire and plastic shields from staking. Any damage done to this surrounding site shall be repaired by to the Proponent at their own cost.

8.2.4.5 Bed Preparation

Within 48 hours of planting, a circular (or other such suitable shape as may fit the site) area around the root ball shall be cultivated to improve future root growth.

The area shall extend to a minimum of 1m from the trunk of the tree in all directions; all sod shall be removed from the area, and the soil shall be broken up and cultivated to a depth of at least 15cm within the 1m radius.

8.2.4.6 Pruning

The crown of the tree shall be pruned from the bottom up at the time of planting to remove all dead and damaged branches. Branches with included bark should be pruned from the tree.

The terminal or leader is not to be pruned unless broken. All cuts shall be collar cut as per ISA standards.

On all cuts over 2cm in diameter and bruises or scars on the bark, the injured cambium shall be cut back to living tissue and removed. Wounds shall be smoothed and shaped so as not to retain water. Large wounds produced by any means other than branch pruning may render the tree unacceptable, requiring replacement.

8.2.4.7 Staking

Where staking is required, B&B trees shall be supported by two (2) steel t-bars (50 mm x 100 mm x 2.4m in length) driven outside the ball in line with the direction of the prevailing wind. The stake must be driven at least 90cm below grade line, leaving at least 5cm between the top of the stakes and the first branch. Stake replacement shall be such that no main roots are severed by the stake being driven into the ground.

Within storm water facilities, staking is not required. However, should any trees move in either direction 10% or more from the vertical plane, the Proponent is responsible for straightening and staking the trees within one week of notification from the Township.

The Proponent will be responsible for the removal of stakes prior to final inspection.

8.2.4.8 Tree Ties

Ties shall be made from burlap ranging in width from 25 – 50 mm, which must completely encircle the trunk. Plastic hoses and rubber ties are not accepted.

For B&B trees where the two stakes are driven into the ground outside the root ball, the tie tension must be such that the tree is firmly, but not too tightly, supported and remaining in a vertical position.

On final inspection of the guarantee (after spring flush), the Proponent will be responsible for the removal of the ties.

8.2.4.9 Mulching

Within 48 hours of planting, a mulch comprised of wood chips or shredded bark, shall be spread over the entire planting pit and the bed preparation to a surface diameter of 2 m.

All shrub planting beds are to be mulched to the same depth of 75mm after settlement.

Mulching is to be topped up prior to final inspection.

8.2.4.10 Minimum Root Ball Diameter

The minimum acceptable root ball diameter for B&B trees shall be:

55cm for 40mm caliper trees
65cm for 50mm caliper trees
85cm for 75mm caliper trees
100cm for 100mm caliper trees
165cm for 150mm caliper trees

8.2.4.11 Watering

The Proponent shall apply water at low pressure underground. The amount of water per tree shall be 40 litres or until excess water runs off. Watering should be applied directly after planting. The initial application of water should be included in the planting price.

After the initial application of water, the watering and maintenance plan should be followed to ensure the health of the tree.

8.2.4.12 Rodent Guards

In some locations, such as naturalized areas where grass is permitted to grow quite long, rodent guards may be required to protect the trees from girdling by rodents.

Rodent guards shall consist of plastic spiral wrap wound around the base of trunk, up to a height of 60cm. These guards must be installed after planting and inspection and then removed after two (2) years of growth.

8.2.5 Acceptance and Warranty

All plant materials shall be maintained by the Proponent, from the time of planting until acceptance by the Township.

A maintenance regime shall consist of proper cultivation, weeding, watering and pruning to establish and maintain plant material in a healthy growing condition.

The Proponent shall arrange a time to have the plant material accepted following the guarantee period. At the time of inspection, all beds and tree pits shall be freshly cultivated, weeded and in a tidy condition, with all rubbish, leaves and dead plant debris removed.

8.3 DESIGN CONSIDERATIONS

In this section the requirements relative to acceptable tree species and related landscaping components with respect to specific applications are provided.

8.3.1 Acceptable Trees

Refer to Appendix B8 for a list of Acceptable Trees. Varieties and cultivars of the species listed will be reviewed pending specific site conditions and design applications.

In selecting trees for specific applications, consider the following factors:

- Assess conflicts with power lines, sidewalks and underground utilities.
- Select of large trees where space is available to maximize planting effect.
- Encourage diversity of species to reduce susceptibility to disease.
- Utilize native species as much as possible.
- Consider long-term maintenance pruning requirements of trees.
- Select species with respect to soil microclimate requirements.
- Select species with respect to salt tolerance and specific moisture requirements.

8.3.2 Mixture and Proportion of Species

The planting of monocultures (dependence on one plant species) within the streetscape is detrimental to the maintenance of tree health, and increases a tree's overall susceptibility to pests and diseases.

Accordingly, the Township of Springwater encourages biodiversity in the streetscape by the following measures:

- The random sequencing of tree species is encouraged within a planting scheme.
- The planting of any one individual species is limited to eight (8) consecutive trees in any given planting scheme.
- To ensure diversity, the amount of one tree genus shall not exceed more than 20% of all plantings, and the amount of one tree species shall not exceed more than 10% of all plantings.
- The number of species required in a planting scheme shall be determined by the overall number of trees in the planting, as conforming to the following table.

TABLE 10
Number of Trees and Species in Planting

Number of Trees in Planting	Minimum Number of Species
1-8	1
9-15	2
16-30	3
31-40	4
41-50	5
51-100	6
101-200	10
200*	12

8.3.3 Tree Siting and Setback Requirements

A minimum of one (1) tree is required per residential lot unless determined otherwise. The tree is to be planted on the private side of the lot. The minimum spacing of trees along the lot flankage on a side street shall be 12m. When planting near utilities, the location and species of the plant material must be coordinated with mechanical and electrical site plans to ensure the non-obstruction of storm and sanitary sewers, water service, hydro, telephone, gas lines and other services. All utilities must be demarcated by the Proponent prior to any excavation.

In order to reduce conflicts with utilities, driveways, curbs, sidewalks and other trees, the following setbacks shall be incorporated:

- Large crown trees are to be planted at intervals ranging from 15 to 18 metres apart. Small crown trees are to be planted between 6 to 8 metres apart.
- In single family detached residential developments as well as multi-unit developments, a minimum of one (1) shade tree per lot is required.
- The minimum spacing for trees along a lot flankage on a side street is to be 12m.

Refer to Appendix B for minimum clearance requirements from other above grade features.

8.3.4 Park and Playground Requirements

8.3.5.1 Minimum Park Requirements for Residential Developments

Components of Parkland, and other Open Space considerations are as follows:

- Park servicing: 25mm water service, 125 mm sanitary sewer service, 250mm storm sewer service, and a hydro service are minimum requirements.
- Park grading: minimum slopes of 1.5 - 2% graded to a manner to maintain proper drainage
- Park fencing: 1.5 m high chain link fence
- Park turf: The minimum requirement for park turf may be established utilizing a seed mix conforming to the landscape architect's specifications. Once established, the turf must have a consistent sod like appearance.
- Development construction: undeveloped, disturbed blocks shall be graded, seeded, and maintained by the Proponent until construction commences thereon.

8.3.5.2 Development Adjacent to Park Property

Where development abuts a Park or Open Space, runoff from the development property shall not drain into the Park or Open Space. A rear lot catch basin may be required.

8.3.5.3 Park and Open Space Features

Required park and open space features include:

- Chain link fence (1.5m) to Township standards where Park property is adjacent to private lots. No gates into parks, open spaces, or stormwater management facilities are permitted from private property. Park frontage on streets is not fenced.

SECTION 8.0: Parks and Landscaping

- Park walkways that are to be maintained in the winter must be 3m width, asphalt surfaced. Otherwise, park walkway material is stone dust.
- Playgrounds must conform to the latest Canadian Standards Association (CSA) standards for play spaces and equipment.
- At least one (1) light standard must be provided at playgrounds for security.
- Playgrounds and walkways must conform to AODA standards in addition to CSA standards.
- A park sign indicating the name of the park is to be provided by and installed by the developer at a location approved by the Township. Specifications for the park signs are to be submitted, reviewed and approved by the Township.

8.3.5.4 Parking Supply Standards

Parking Supply Standards for Community or Township parks:

- 16 spaces per ball field, 32 spaces if fields are lit
- 16 spaces per soccer field, 32 spaces if fields are lit
- 15 for general park users
- 12 (4 per court) per group of tennis courts

Parking lots may be required for Neighbourhood Parks at the discretion of the Township.

8.3.5.5 Park Development Standards

All Parks and Open Space developed in the Township of Springwater shall comply with the following standards:

Can/CSA Standard Z614 – Children’s Playspaces and Equipment (latest edition).

Accessibility for Ontarians with Disabilities Act, (AODA) 2005, including all associated Regulations. Refer to *US Guide to ADA Guidelines for Accessible Play Areas* for clarification and requirements of “accessible” play features.

APPENDIX A: REVISION INFORMATION

LIST OF REVISIONS

The Township of Springwater recognizes that revisions and updates to this document will be required from time to time. An up to date record of all revisions to this document is provided in the table below:

REVISION NO.	DATE	DETAILS OF REVISION

Any person may request a change or revision to this document by submitting a written request using the form provided on the following page to:

Director of Public Works
Township of Springwater
2231 Nursery Road
Minesing, ON L0L 1Y2
P. 705.728.4784 ext 2034
F. 705.728.6957

**TOWNSHIP OF SPRINGWATER
ENGINEERING DESIGN STANDARDS AND SPECIFICATIONS
REVISION REQUEST FORM**

Section A: Contact Information (To be filled in by the Requesting Party)

Contact Name:	
Organization:	
Telephone:	
Fax:	
Email:	

Section B: Requested Revisions (To be filled in by the Requesting Party)

Section of Document:	
Current Description:	
Suggested Revisions:	
Reasoning:	

Please check, if applicable:

- Additional Information/Documentation Attached Red Lined Detail Drawing Attached

Signature: _____ Date: _____

Section C: Revision Review (To be filled in by the Responding Party)

The Township of Springwater has reviewed the requested revision to the Engineering Design Standards and Specifications and has decided to:

- Deny the Request Support the Request Request a Meeting to Discuss

Additional Details:

Reviewed By: _____ Date: _____

Approved By: _____ Date: _____
(Director of Public Works)

APPENDIX B: MATERIALS LIST

APPENDIX B1**STREETLIGHTING MATERIAL LIST**

Standard LED Luminaires, regardless of style, shall be complete with a bird stop and have a full cut-off distribution classification.

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
1.0 LIGHTING					
1.1	Electrical Handholes	CSA	Precast concrete type complete with cover, 460mm Dia., as per OPSD 2112.02.		
1.2	Ducts	CSA C22.2, No.211.1 CSA C22.2, No.211.2 CSA Standard B137.1, Series 75 or ENT CSA C22.2, No.227.1	In boulevard, rigid PVC DB2 duct, 53mm Dia. Below roadways, rigid PVC Thickwall duct, 53mm Dia. Flexible duct (Polypipe) to be used for protection of cables entering the wiring aperture in the concrete poles.		
1.3	Cables	CSA C22.2 No.38	Power supply cables shall be 3-#2 AWG copper RWU90 (no ground wire), with cross-linked polyethylene insulation rated 600 volt. Street light cables shall be 3- #6 AWG copper RWU90 as above with 1-#6 AWG stranded copper green ground. Riser wires from pole handhole to luminaire shall be #12 AWG stranded copper type		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>RWU90 insulation.</p> <p>Insulation colour for line conductors for 1-phase, 3-wire 240/120V system shall be "Red" and "Black" and for 1 phase, 2-wire 120V system shall be "Red". Insulation colour of all neutral conductors shall be "White".</p> <p>Cable connectors in pole handholes shall be compression connectors with insulating covers.</p>		
1.4	Fuses		Fuse holders in pole handholes shall be in-line break-away type rated 600V complete with 10 amp KTK fuse.		
1.5	Grounding	CSA C22.2 No.41	Ground rods shall be solid steel, 19mm Dia., 3.0m long, copper clad for full length.		
2.0 POLES					
2.1	Standard Roadway Lighting Poles	CSA A14-M1979	<p>Direct Buried, Class "B" spun concrete, tapered round with natural concrete smooth mold finish, complete with handhole cover plate, nameplate and ground lug.</p> <p>Arterial Roads – 12.2m (40Ft.) Collector Roads – 10.7m (35 ft.) or 12.2m Local Roads – 9.8m (32 ft.) or 10.7m</p> <p>Base mounted galvanized octagonal steel poles as per OPSD-2415.010.</p>	StressCrete Sky Cast U.S.I.	

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			Arterial Roads – 10.5m Collector Roads – 9.0m/10.5m Local Roads – 7.5m/9.0m		
2.2	Poles for Walkways/Bikeways		Base mounted contemporary pole with high tensile carbon steel shaft round (76mm) welded to top and bottom of anchor plate. Pole to be black semi-gloss powder coat finish complete with base cover assembled with stainless steel hardware. Photobutton light control recessed near top of pole.		
2.3	Poles for Commercial Sites		Poles shall be metal type square or round to suit the luminaire style and shall be base mounted. Poles shall have durable powder coat finish, colour to match the luminaire. Poles in parking areas shall be restricted to 30 ft. (9.1m) in height. Poles may be reduced in height down to 12 ft. (3.65m) level for pedestrian pathway applications. Wherever feasible, poles shall be located off the edge of pavement, behind barrier curbs (islands). Concrete bases in parking areas shall be protected by bollards or shall be raised to		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			minimum 900mm above grade and be 760mm diameter.		
3.0 BRACKETS					
3.1	Standard Roadway Lighting Brackets		Tapered elliptical aluminium brackets as per OPSD 2420.01. The length of the bracket depends on offset from pavement and pole height. Arterial Roads – 2.4m (10Ft.) preferred, 3.0m maximum Collector Roads – 1.8m (8 ft.) preferred Local Roads – 1.2m (6 ft.) preferred.		
3.2	Walkways/Bikeways Brackets		Single or double brackets with bend aluminum tubing with decorative aluminum rod, welded assembly and cast aluminum adaptor.		
4.0 LUMINAIRES					
4.1	Standard Roadway Luminaires: LED Luminaire				
4.1.1	Arterial/Industrial Roads		“Cobra Head” style, type II or III distribution pattern, medium cut-off, internally shielded with flat tempered glass lens and photocontrol receptacle.	GE Lighting Philips Lighting	Cat # ERS3-0-kXEX-5-40 Cat # RVM-

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
				LED Roadway Lighting	160w-96LED-4K-LE2 Cat # SAT-72S-525mA-T2
4.1.2	Local and Collector Roads		“Cobra Head” style, type II or III distribution pattern, medium cut-off, internally shielded with flat tempered glass lens and photocontrol receptacle .	GE Lighting LED RoadWay Lighting	Cat# SDL-03-LED-E-U-SL2-BKU Cat# ERS1-0-CXEX-5-40 Cat# SAT-48S-525mA-T2m
4.1.3	Photocontroller		Photocontroller to be twist-lock type with surge protection.	Fisher Pierce (Nightstar) Prescision (Utility Grade) AEL (D Series)	
4.2	Standard Roadway Luminaires: LED		Luminaire – Cobra Head style, type 2 or 3 distribution pattern, rugged die cast aluminum housing with surge and brown-out protection, LED drivers and electronic transfer switch. Temperature control by robust heat sink	Holophane. Cooper Lighting	“Ledgend” “OVF LED Cobrahead”

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>ensuring a minimum of 80,000 hours L70 at 40C operating ambient.</p> <p>Operating range from – 40 to + 50C with light engines meeting the dust and moisture rating of IP-66. Luminaire design to meet CSA-C22.2 number 250 for 40C, wet location and to be ROHS compliant. Maximum total harmonic distortion to conform to ANSI C82.77 : 2002.</p> <p>Solid state 120 volt 60 Hz electronic drivers with extended life to 100,000 hours minimum.</p> <p>LED colour temperature 4000 K nominal.</p> <p>5 year limited warranty on LED light engine, LED drivers and all non electrical components.</p>	Ruud Lighting	Ledway Series
4.3	Park Walkway/Bikeway Luminaires:		50W pulse start metal halide.		
4.4	Commercial Site Luminaires: Metal halide		<p>In general shall be of the “Architectural Site Lighting” style, contributing a cohesive look to the overall site lighting system.</p> <p>The architectural outdoor luminaries may be</p>		

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
			<p>shoe-box or round type with good optics and full cut-off with optional house side shielding.</p> <p>Luminaires at lower mounting heights shall have a vandal proof lens. The luminaires shall be post top arm mounted suitable for 1A to 4C configurations and also be suitable for optional wall mount applications.</p> <p>Luminaire housings shall be die-cast type with durable powder coat finish colour to match site architectural features.</p> <p>Lamp wattage for parking lot and site roadway lighting shall be in the 150 to 400 watt range, subject to application. Lamp wattage for pedestrian scale pathway and building zone lighting may be reduced to 70 watt metal halide.</p>		
5.0 POWER SUPPLY DISCONNECT					
5.1	Pole Mounted Disconnects		Pole mounted power supply disconnects shall be outdoor weatherproof type 240/120 V rated 100 amps with 60 amp 2 pole main breaker suitable for service entrance.	Square 'D' (CQO)	

MATERIAL		STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
5.2	Pedestal Mounted Disconnects		<p>Pedestal mounted power supply disconnect shall be outdoor heavy gauge galvanized steel with lockable removable front cover complete with precast concrete base.</p> <p>Colour to be equipment green with powder coat finish.</p> <p>Interior power supply disconnect shall be 240/120 V rated 100 amps with 60 amp 2 pole main breaker suitable for service entrance. Branch breakers to be 30 amps 1 pole 120V.</p>	Pedestal Solutions Inc.	

APPENDIX B2

TRAFFIC SIGNALS MATERIAL LIST

MATERIAL	STANDARDS	FEATURES
1.0 TRAFFIC SIGNAL CONTROLLER		
1.1	Street Intersections	<p>NEMA Standards Publication No. TS2-1992, TS2-Type 2 design specifications and all revisions</p> <p>8 phase, solid state, LCD display, microprocessor traffic based controller timer</p> <p>Programmable to start up in Phase 2 and 6 “Amber” and phase 4 and 8 “Red” intervals</p> <p>Capable of providing vehicle extensions of the actuated phases and capable of holding 4 different timing plans</p> <p>A “NEMA Plus” solid state 12 channel conflict monitor complete with LCD display and fault memory with RS-232 port and cable, EDI Model No. SSM-12LE.</p> <p>Include fully wired 12 position back panel set up to operate on the approximate number of vehicle and pedestrian phases</p> <p>Include wired 8 position detector rack</p> <p>Cabinet power supply to provide regulated DC power, unregulated AC power and a line frequency reference for the detector racks, load switches and auxiliary equipment.</p> <p>All time clocks to have a minimum of 12 hour power reserve complete with LCD display and fault memory, with RS-232 port and cable, EDI Model No. SSM-12LE.</p> <p>Twelve (12) solid state load switches with PDC for vehicle and pedestrian indications only, EDI Model No. 200 or approved equivalent. Indication lights showing the condition of “Green (Walk)”, “Yellow” or “Red (Don't Walk)” drive turned "ON" at the load switch shall be provided integral with the load switch.</p> <p>Provisions for future dial-in communication access (Bell Canada) and a 1200 baud FSK</p>

MATERIAL	STANDARDS	FEATURES
		<p>modem.</p> <p>Two (2) rack-mount pedestrian, 2-channel, DC Isolator cards, EDI Model 242, or approved equivalent.</p> <p>Four (4) Loop detector units (2 channel), EDI LM 222 series, or approved equivalent.</p> <p>Two (2) spare rack-mount slots wired for future emergency pre-emption cards.</p> <p>Police panel complete with a manual/auto switch, flash switch, and signal on/off switch.</p> <p>Thermostatically controlled 250W strip heater and fan which can be manually controlled.</p> <p>Four (4) Transfer Relays.</p> <p>NEMA solid state, 15A, 2-pole flasher, EDI Model #204 or approved equivalent.</p> <p>Radio interference filter.</p> <p>Two (2) internal circuit breakers for power feed:</p> <ul style="list-style-type: none"> • One 40 Amp for traffic signal system; and • One 15 Amp for cabinet accessories. <p>Duplex ground fault type convenience outlet.</p> <p>Lamp receptacle, complete with hand held lamp, bulb and switch.</p> <p>Switches inside the cabinet to simulate vehicle and pedestrian detector inputs directly to the controller.</p> <p>Switches for stop timing and flash toggle shall also be provided.</p> <p>Power surge protective device for filtering lightning and high voltage surges to ground, EDCO Model No. SHA-1210 or approved equivalent.</p> <p>Aluminium air vent cover, complete with dust filter.</p> <p>Two (2) Conflict Monitor check sheets verifying shop testing.</p> <p>Two (2) sets of equipment drawings, one (1) original bounded Manufacturer's operation manual with blank timing sheets, water-proof document bag, and two keys for the cabinet.</p>

MATERIAL		STANDARDS	FEATURES
			<p>The controller timer and cabinet shall be supplied completely wired and programmed to facilitate the mode of operation. Wiring drawings and connection instructions shall be included with the unit.</p> <p>Neoprene gasket installed between the base of a pad mounted cabinet and the concrete foundation.</p> <p>All external input wiring within the cabinet shall be Mylar tagged, labelled, grouped, and neatly tied in an organized fashion. There is not to be any loose or excessive wiring.</p> <p>Where the controller is for a pedestrian activated crosswalk the controller will be Naztec Model 980 TS-2 Type 2 Traffic Controller and shall have vehicle pre-emption and time based co-ordination capability with an EDI NEMA 6 Channel CMU with Canadian Fast Flash capability. It shall include a minimum 4 position detector rack with 2-2 channel rack detectors. There shall also be a single card rack to support the addition of an Optical Pre-emption card. The controller cabinet shall be type "G" if pole mounted and type "M" if base mounted. The assembly shall include a 8 position back panel, 8 NEMA Load Switches, 1- NEMA Flasher, Internal lighting, GFI convenience outlet, internal test switches including auto/flash, stop time and interval advance. There shall be a police door on the front door of the cabinet and shall include auto/flash, manual/auto, and a police cord for manual control.</p>
2.0 CONTROLLER CABINET			
2.1	Pad Mounted		Aluminum door in door Type M-1 pad mount cabinet with base extension
2.2	Pole Mounted		Type G

3.0 CONCRETE POLE BASES

3.1	For poles greater than 3.7 m		760 mm Dia. OPSD 2200.01 and with anchorage assemblies as per OPSD 2215.02 and 2215.03
3.2	For poles 3.7 m and less		450 mm Dia as per OPSD 2200.04 An X is to be marked atop the concrete to show location of conduit entry A 20 mm sleeve to be provided in the concrete pole base for installation of ground wire

4.0 TRAFFIC SIGNAL POLES

4.1	Octagonal Steel Poles		<p>Where a separate controller cabinet pole is required, the pole shall be 3.6 metre (Powco Steel #8312) hot dipped galvanized heavy duty octagonal, base mount pole, complete with handhole cover and top cap.</p> <p>Poles shall be 6.1 metre (Powco Steel #8620) hot dipped galvanized heavy duty octagonal, base mount poles, complete with handhole covers and top cap. The pole is to be situated such that the final mast arm position is perpendicular to the roadway and such that the hand hole is on the opposite side of the roadway.</p> <p>Combination Traffic Signal / Luminaire Pole</p> <p>Poles shall be 9.1 metre (Powco Steel #8535) hot dipped galvanized heavy duty octagonal, base mount pole, complete with handhole covers and top cap. The pole is to be situated such that the final mast arm position is perpendicular to the roadway and such that the handhole is on the opposite side of the roadway.</p> <p>On higher speed roads the use of yielding poles may need to be considered.</p>
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5.0 ELECTRICAL CHAMBERS			
			<p>Electrical chamber for the electrical systems shall be round precast concrete handwells, complete with cast iron frame and grate. The inside diameter of handwell shall be:</p> <ul style="list-style-type: none"> • 460mm ID for three (3) conduit inserts or less (OPSD 2112.02), and • • 675mm ID for four (4) conduit inserts (OPSD 2112.03). <p>Electrical chamber for vehicle loop detection connections only shall be 300mm ID round precast concrete complete with cast iron frame and grate (OPSD 2112.01).</p> <p>Each electrical chamber shall be separately grounded to a ground rod positioned 600mm from the outside of the structure. The ground wire shall be a #6 bare stranded and affixed to the frame using 70amp SLU solderless connector. System ground ties within the electrical chamber shall be made with split bolts or thermal weld "T" taps.</p>
6.0 TRAFFIC SIGNAL ARMS			
			<p>Traffic single member arms shall be tapered spun aluminium, complete with mounting hardware and mounted so that traffic signal head clearances above the roadway are 5.2 metres. Approved manufacturers of traffic single member arms are:</p> <ul style="list-style-type: none"> • Sentinel Pole and Traffic Equipment Limited - TR Series; • Powerlite - SMA Series, <p>Or approved equal.</p>
7.0 TRAFFIC SIGNAL HEADS			
			<p>Shall have polycarbonate "Special Highway" type signal heads with yellow door and housing, backboards, cowl visors, bird stops, plumbizer hanger system and steel reinforcing plates placed between the "Red" and "Amber" sections at locations indications on the Contract Drawings. Traffic signal heads shall have 300mm diameter "Red", "Amber"</p>

			<p>and “Green” sections with LED lamp indications.</p> <p>The traffic signal heads shall be installed on plumbizer signal hanger.</p> <p><u>SPECIAL TRAFFIC HEADS</u></p> <p>Shall have polycarbonate “Type 9”, “Type 9A”, “Type 10”, “Type 10A”, “Type 11” and “Type 11A” traffic signal heads with yellow door and housing, backboards, cowl visors, bird stops, plumbizer hanger system and steel reinforcing plates placed between the “Amber” and “Green” sections at locations indications on the Contract Drawings. The traffic signal head sections shall be fitted with LED lamp indications, unless otherwise noted on drawings.</p> <p>The traffic signal heads shall be installed on plumbizer signal hanger</p> <p><u>LIGHT EMITTING DIODE (LED) LAMP UNITS</u></p> <p>shall have LED lamp indications for the traffic and pedestrian signal heads. The LED lamp units shall be meet the requirements of the:</p> <ul style="list-style-type: none"> • ITE Specification for ITE Publication No. ST-017B-2001 - Equipment and Material Standards of the Institute of Transportation Engineers, and • ITE Specification for ITE Publication – Traffic Control Signal Heads – Part 2: LED Pedestrian Traffic Signal Modules (March 2004). • ITE Specification for ITE Publication – Traffic Control Signal Heads – Part 3: LED Vehicle Arrow Traffic Signal Modules (March 2004). • ITE Specification for ITE Publication – Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement (June 2005). <p>The following manufacturers of LED lamp units are approved for installation:</p> <ul style="list-style-type: none"> • Daylight – Distributed by Innovated Traffic Solutions Inc. • Leotek Electronic Corporation – Distributed by Electromega Ltd. • GELcore – Distributed by Tacel Limited.
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8.0 PEDESTRIAN HEADS AND MOUNTING BRACKETS			
			Shall have single section pedestrian heads complete with mounting hardware and LED lamp unit, installed in accordance with OPSD 2505.01 and OPSD 2524.01, providing a clearance from the bottom of signal to ground level of 2.75 metres.
9.0 PEDESTRIAN PUSH BUTTONS AND SIGNS			
			<p>Push buttons shall be “Pelco” rectangular, yellow, freeze-proof, pedestrian push button assembly for pole mounting complete with stainless steel vandal proof screws, with diaphragm, at a mounting height of 1.1m. Anti-seize compound is to be applied to the face plate and mounting screws. It shall include Ra-12 (13 x 20cm) signs at all push buttons with an arrow indicating the direction of pedestrian crossing.</p> <p>EXTRA LOW VOLTAGE (ELV) CABLES FOR PEDESTRIAN PUSHBUTTONS</p> <p>Supply be four (4) conductor #18 AWG extra low voltage cable, in shielded core from the pedestrian pushbuttons to the controller cabinet, including 3.0 metres of spare cable in each electrical chamber.</p> <p>The cable shall meet the requirements of OPSS Specification No. 2420 and shall be installed in accordance with OPSD 2528.01 and OPSD 2529.01. The cable shall be “3M Company”, Catalogue No. Canoga CC 30003 or approved equal.</p> <p>All groups of ELV pedestrian pushbutton cables in the controller cabinet, are to be tagged and labelled indicating phase number and leg of intersection.</p>
10.0 LOW VOLTAGE LUMINAIRE CABLE			
			<p>The luminaire wire shall be #12 TWU single conductor, stranded copper, low voltage cable, rated 600 volts. Low voltage wire shall meet the requirements of OPSS 604, or type RWU 90 - cross link meeting the requirements of CSA Standard C22.2, No. 38. The luminaire runner cable shall be #8 TWU-90.</p> <p>The luminaire wire shall be sized so as to satisfy voltage drop requirements of the electrical</p>

			<p>equipment and shall not exceed 5%.</p> <p>All wire apertures drilled in steel or aluminium poles / mast arms shall be deburred and painted with grey zinc rich paint. Rubber grommets will be installed after the paint is dry.</p> <p>All joints in the luminaire wire shall be made above ground in the pole handholes or junction boxes unless otherwise specified. All equipment is to be adequately grounded, using a brass ground fitting attached to the pole ground lug.</p> <p>The riser wires inside the poles and in the mast arms shall be included in this item and shall be connected to the external wiring circuit in the underground conduit by means of one single pole waterproof fuse holder "Bussman -Tron", Catalogue No. "HEB-AA" with rubber boots, or approved equal, with one 10 amp midget ferrule fuse, "Buss" type "KTK" or approved equal. A fuse holder shall be installed inside the pole handhole and shall be secured to the connector clip supplied in the pole.</p> <p>The luminaire wire shall be brought back and connected to the circuit breaker supplied and installed at the service pole.</p>
<p>11.0 GROUND WIRE</p>			
			<p>All ground wire splices inside electrical chambers and in poles shall be connected using a split bolt. Ground wire connections to ground rods shall be made with Thermit Weld connections.</p> <p>System Ground - shall be continuous #6 AWG TWH green, stranded copper ground wire through the entire main conduit system. The system ground wire is to be connected to all steel poles and maintenance hole / handwell frames (using 70amp SLU solderless connectors), junction boxes on wood poles, and the ground rods for each maintenance hole / handwell.</p> <p>Pole Grounding - shall be continuous #6 AWG TWH green, stranded copper ground wire from the ground lug in the steel pole (using 70amp SLU solderless connectors) to the ground rod located adjacent to the pole.</p> <p>Power Service Ground - A continuous #6 AWG bare, stranded copper ground wire will be</p>

			<p>installed from the service enclosure to the four (4) ground rods located 1000mm from pole, the second rod 3 metres from the first.</p> <p>A continuous #12 AWG TWH green, stranded copper ground wire shall be installed from the proposed luminaire fixture to the ground lug in the luminaire poles.</p> <p><u>GROUND RODS</u></p> <p>shall be 20mm x 3.0m copper clad ground rods where necessary to provide adequate system grounding. The ground rods driven into the ground shall be buried so that the top of the ground rods are 300mm below the finished grade.</p> <p>Grounds rods shall be driven on the exterior of electrical chambers.</p>
<p>12.0 UNDERGROUND CONDUIT</p>			
			<p>Shall be Rigid PVC conduit or High Density Polyethylene Pipe (HDPE) ducts runs. Sections of conduit are to be joined together using solvent weld cement recommended by the conduit supplier. Depth shall be as per OPSD 2103.02 and installed below any existing subdrains.</p> <p>Open Cut Installation</p> <p>Rigid conduit systems installed by open cut, direct buried and subsurface installation shall be rigid polyvinyl chloride (PVC), unplasticized conduit conforming to CSA Standard C22.2 No. 211.0-03 and CSA Standard C22.2 No. 211.2-M1984 (R2003), except where otherwise indicated.</p> <p>Directional Boring</p>

			<p>Polyethylene duct installed by directional boring method shall be High Density Polyethylene Pipe (HDPE) in accordance with:</p> <ul style="list-style-type: none"> • United Laboratories, UL 651B – Standard Specification for Continuous Length HDPE Conduit • American Society for Testing and Materials International, ASTM F2160 – Standard Specification for Solid Wall High Density Polyethylene Conduit Based on Controlled Outside Diameter; and • National Electrical Manufacturers Association, NEMA TC 7-2005 – Smooth-Wall Coilable Electrical Polyethylene Conduit <p>All road crossing trenches are to be backfilled with unshrinkable material as per OPSS 603.07 and OPSD 2103.03.</p> <p>The conduit layout shall be as follows install 2-100mm (4 inch) conduits between electrical chambers in road crossings, a 75 mm (3 inch) Rigid PVC conduit for traffic signal cabling and a 50mm (2 inch) Rigid PVC conduit for lighting cabling, when necessary from electrical chambers to traffic poles, 2-100 mm Rigid PVC conduits between the controller cabinet and closest electrical chambers. A 25mm Rigid PVC conduit shall be used for loop lead-in wires between the edge of pavement and nearest electrical chamber.</p>
13.0 LOOP DETECTORS			
			<p>Loops shall be sized and installed as shown on the Contract Drawings and as per OPSD 2520.01 and OPSD 2520.02.</p> <p>Loop wire size shall be #14 AWG stranded RWU90 type.</p> <p>Loop home-run cable from electrical chamber to the controller cabinet shall be 2 conductor, #14 AWG extra low voltage cable with shielded twisted pair conductors, a high density polyethylene insulation and ground wire. Approved cables are Belden #8719 or Detector Systems, #DSI 1602, or approved equal.</p> <p>All loop splices are to be soldered and sealed with waterproof “3M Scotchcast”, “Raycam”, “KLICKIT II” kit, or approved equivalent.</p>

			<p>All single loops are to be wound 4 times. Quadrupole loops are to be wound 2-4-2.</p> <p>Saw slots should be 50mm to 75mm deep.</p> <p>Loops connected in the series are to be wound alternately in opposite rotation.</p> <p>Pieces of 150mm plastic foam backer rod are to be tightly packed within the sawcut slot every 2 metres of the loop and lead-in sawcuts.</p> <p>Loop wire leads are to have a minimum of 5 twists per foot after leaving the loop saw slot.</p> <p>Loop sawcuts shall be fully sealed with hot applied tar or approved equivalent, and protected from traffic until completely dried.</p> <p>A loop inductance and leakage test is to be performed on the finished loop installation at the splice prior to being sealed. Loop inductance measurement shall be between 20 and 2,500 microhenries. Leakage resistance shall be equal to or greater than 100 megohms.</p>
<p>14.0 SIGNAL CABLE</p>			<p>Shall be fourteen (14) gauge colour coded, traffic signal runner and riser cables to accommodate all equipment and installation operations specified in the Contract, including 3.0 metres of spare wire within each electrical chamber.</p> <p>The traffic signal cable shall meet the requirements of OPSS 2409.</p> <p>Traffic signal cable shall be installed in the underground conduit system in accordance with the Standard Drawings OPSD 2528.01 and OPSD 2529.03 (Note B omitted), except that the conductor cable be changed to:</p> <ul style="list-style-type: none"> • All riser cables for traffic signal heads shall be seven (7) conductor, #14 AWG. • All riser cables for pedestrian heads shall be five (5) conductor, #14 AWG. • All runner cables for traffic signal heads and pedestrian heads shall be twelve (12) conductor #14 AWG, and installed in accordance with OPSD 2529.03 except that Note B be omitted. Suggest OPSD 2925.11 <p>The traffic signal heads on all legs of the intersection shall be wired separately to allow the addition of advance green or split phases without additional wiring being required.</p>

			<p>The traffic signal cable for each pedestrian phase will be brought back to the controller separately to accommodate separate “Walk” and “Don’t Walk” movements for each phase.</p> <p>Label all groups of traffic signal conductors in the controller cabinet indicating phase number, direction, and movement.</p> <p>All wire apertures drilled in steel or aluminum poles/ mast arms shall be deburred and painted with grey zinc rich paint. Rubber grommets will be installed after the paint is dry.</p>
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15.0 EQUIPMENT FOR POWER SUPPLY

			<p>The power supply disconnect facility shall be installed to service the traffic signal control device and the related intersection lighting mounted on the traffic signal poles.</p> <p>Shall be a Square-D Model #CQ018M100RB load centre complete with circuit breakers at the supply location. The load centre shall include a 120/240V, 100A, 1Ø, 3 Wire assembly with:</p> <ul style="list-style-type: none"> • 1 - Main Circuit Breaker - 2 pole - 240V - 100A common trip circuit breaker, Square D, Catalogue # QO-2100 or approved equal. • 4 - Lighting Circuit Breakers - 1 pole - 120/240 V - 30 A circuit breaker, Square D, Catalogue # QO-130 or approved equal. • 1 - Traffic Signal Circuit Breaker - 1 pole - 120/240 V - 60 A circuit breaker, Square D, Catalogue # QO-160 or approved equal. • Secondary Surge Suppressor, 650V Vac 2-pole secondary lightning arrester, Square D, Catalogue # QO2775SB or approved equal. <p>Or approved equivalent.</p> <ul style="list-style-type: none"> • There shall be sufficient length of 3-1/C #2 AWG (Black & White) copper stranded
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			RWU (-40°C) wire coiled at the weather head for the connection to the secondary supply / transformer on the service pole.
16.0 EMERGENCY PRE-EMPTION DETECTOR SYSTEM			
			Shall be two “3M Optical Pre-emption detector Model 721”, Two Channel, 2 Directions with “Discriminator Model 452” Actuator card including harness, wiring, hardware, and testing and install sufficient optical pre-emption detector cable manufactured by “3M Company (Model #138)” and connect each optical detector to the controller cabinet.
17.0 LUMINAIRES			
			<p>Luminaires shall be I.E.S. Type III-MSCO photometric curve, 250 Watt H.P.S. fixture housing, 250 Watt CWI ballast, for 120 Volt operation, complete with integral ballast, 250 Watt H.P.S. lamp, photo control receptacle, ground lug and photocell. The following luminaires are approved for installation:</p> <ul style="list-style-type: none"> • American Electric - Catalogue # 125 25 S CT DT1 R3 DG, or • General Electric – Catalogue # M-400 25 S 1 P 1 2 R MS3 U <p><u>LUMINAIRE ELLIPTICAL BRACKETS</u></p> <p>Luminaire elliptical brackets shall be aluminum tapered elliptical mast arms, complete with mounting brackets and conform to OPSS 2420. Elliptical brackets shall be mounted in accordance with OPSD 2250.01. The following aluminum tapered elliptical brackets are approved for installation:</p> <ul style="list-style-type: none"> • 3.0 m Tapered Elliptical Bracket - Powerlite RE-10MA - 3mm Wall, 60mm x 100mm OD, <p>Or approved equal.</p>

APPENDIX B3**STORM SEWER SYSTEM MATERIAL LIST**

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
1.0 SEWER MAIN				
PVC (300mm to 450mm)	CSA B182.2	<ul style="list-style-type: none"> - DR 35 - Rubber gasket in integral bell and spigot joints - Green in colour 	IPEX Royal Pipe Rehau Diamond Pipe Armtec	As per individual manufacturer
Concrete	CSA A257.2	<ul style="list-style-type: none"> - Rubber gasket type joints certified to CSA A257.3 	OCPA Plant Prequalification Member	
HDPE (300mm to 600mm)	CSA B182.6-02	<ul style="list-style-type: none"> - 320 kPa pipe stiffness - Rubber gasket in integral bell and spigot joints 	Armtec	Boss Poly-Tite
2.0 CONNECTION TEES				
PVC Sewer Main	CSA B182.2	<ul style="list-style-type: none"> - DR 28 - Injection molded or factory-fabricated gasketed tee 		
Concrete Sewer Main	CSA A257.2,3	<ul style="list-style-type: none"> - Factory-fabricated tee 		
HDPE Sewer Main	CSA B182.6-02	<ul style="list-style-type: none"> - Injection molded or factory-fabricated gasketed tee 		
3.0 SERVICE LATERALS				
PVC	CSA B182.2	<ul style="list-style-type: none"> - DR 28 - Rubber gasket in integral bell and spigot joints - White or grey in colour 	IPEX Royal Pipe Rehau Diamond Pipe	As per individual manufacturer

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
4.0 TEST FITTINGS				
PVC	CSA B182.2	- Bootjack Fitting for double connections - Straight test fitting at property line	IPEX	As per individual manufacturer
Cast Iron	CSA B70	- Bootjack Fitting for double connections - Straight test fitting at property line	Crowle	As per individual manufacturer
5.0 CATCHBASIN LEADS				
Concrete	CSA A257.2	- Rubber gasket type joints certified to CSA A257.3	OCPA Plant Prequalification Member	
PVC	CSA B182.2	- DR 35 - Rubber gasket in integral bell and spigot joints	IPEX Royal Pipe Rehau Diamond Pipe	As per individual manufacturer
HDPE	CSA B182.6-02	- 320 kPa pipe stiffness	Armtec	Boss Poly-Tite
6.0 SUB-DRAINS				
HDPE	OPSS 1840	- 210 kPa pipe stiffness - Perforated, with geo-textile sock filter	Armtec	Big "O"
7.0 MAINTENANCE HOLES				
Concrete	CSA A257.4	- Rubber gasket type joints certified to CSA A257.3 - Use pre-cast concrete grade adjustment, units with Moduloc tape between layers or Self-leveling cast iron riser rings for final adjustment - Frame & grate as per OPSD 401.010 (open cover) with date cast into the cover	OCPA Plant Pre-Qualification Member	

8.0 CATCHBASINS				
Concrete	CSA A257.4	<ul style="list-style-type: none"> - Use pre-cast concrete grade adjustment units with Moduloc tape between layers - Frame & grate as per OPSD-400.020 - Rear yard catchbasin frame & grate as per OPSD-400.120 - Lifespan rubber manhole frame and cover - Lifesaver Catch basin Adjustment units 	OCPA Plant Pre- Qualification Member IPEX	
9.0 CULVERTS				
Concrete	CSA A257.2		OCPA Plant Prequalification Member	
CSP	CSA G401	<ul style="list-style-type: none"> - Galvanized - Wall thickness as recommended by manufacturer for H2O loading. - Minimum wall thickness 2.0 mm for road crossing, 1.6 mm for entrance. 		
HDPE (up to 600 mm)	CSA B182.6-02	<ul style="list-style-type: none"> - 320 kPa pipe stiffness - Smooth Interior Wall 	Armtec	
10.0 HEADWALL AND ENDWALL TREATMENTS (Only if Approved by the Township)				
Concrete			OCPA Plant Prequalification Member	

APPENDIX B4**WASTEWATER SYSTEM MATERIAL LIST**

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
1.0 SEWER MAIN				
PVC	CSA B182.2	<ul style="list-style-type: none"> - DR35 - Rubber gasket in integral bell and spigot joints - Green in colour - "Kor-n-seal" gaskets on all pipes entering manholes 	IPEX Royal Pipe Rehau Diamond Pipe	As per individual manufacturer
2.0 CONNECTION TEES				
PVC	CSA B182.2	<ul style="list-style-type: none"> - DR28 - Injection molded or factory-fabricated gasketed tees 	IPEX Royal Pipe Rehau Diamond Pipe	As per individual manufacturer
3.0 SERVICE LATERALS				
PVC	CSA B182.2	<ul style="list-style-type: none"> - DR28 - Rubber gasket in integral bell and spigot joints - Green or black in colour 	IPEX Royal Pipe Rehau Diamond Pipe	As per individual manufacturer
4.0 TEST FITTINGS				
PVC	CSA B182.2	<ul style="list-style-type: none"> - Straight test fitting at property line 	IPEX	As per individual manufacturer
Cast Iron	CSA B70	<ul style="list-style-type: none"> - Straight test fitting at property line 	Crowle	As per individual manufacturer

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
5.0 SERVICE SADDLES				
		<ul style="list-style-type: none"> - For use as a new service connection to an existing municipal sewer only 		
6.0 MAINTENANCE HOLES				
Concrete	CSA A257.4	<ul style="list-style-type: none"> - Rubber gasket type joints certified to CSA A257.3 - “Kor-n-seal” gaskets on all pipes entering manholes - Frame & grate as per OPSD-4001.010 (Closed Cover) with the date cast into the cover - The Lifespan System Frame and Grate - Pre-cast concrete grade adjustment units with Moduloc tape between layers or Self-leveling cast iron riser rings for final adjustment 	OCPA Plant Pre-qualification Member	

APPENDIX B5**WATER DISTRIBUTION SYSTEM MATERIAL LIST**

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
1.0 WATERMAIN				
PVC Pipe	AWWA C900 (Pipe 100mm to 300mm) AWWA C905 (Pipe ≥ 350mm) CSA B137.3	- DR18, Class 150 - Rubber gasket in integral bell and spigot joints - Colour coded "Blue" - 6 m pipe length - CI OD	IPEX Royal Pipe Rehau Diamond Pipe National Pipe	As per individual manufacturer
		-		
Polyethylene	AWWA C906 CSA B137.1	- DR17, Class 100 - Thermal butt fusion joining of pipe - CI OD	KWH Pipe	As per individual manufacturer
2.0 WATER SERVICES				
Polyethylene	CSA B137.6 AWWA C901-78	- Series 160	IPEX	
3.0 WATERMAIN FITTINGS				
Ductile Iron Compact Ductile Iron	AWWA C110/A21.10 AWWA C153/A21.53 AWWA	- Minimum Pressure Class 350 - Cement Mortar Lined - Mechanical joint	Magotteax Sigma Star Bibby St. Croix Tyler Pipe	As per manufacturer

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
	C104/A21.4 AWWA C111/A21.11			
PVC	AWWA C	<ul style="list-style-type: none"> - Blue Brute fittings (100mm to 300mm) - IPEX Centurion Fittings (350mm to 600mm) - Injection molded 	IPEX	
Philmac Compression Fittings	AWWA C	<ul style="list-style-type: none"> - 12mm to 50mm 	IPEX	
4.0 WATERMAIN VALVES				
Gate Valves	AWWA C509	<ul style="list-style-type: none"> - Non-rising stem and 50mm square operating nut - Open counter clockwise - Resilient seat gate - Epoxy coating internal and external per AWWA C550 - Mechanical joints with restrainers - Bond breaker between concrete support and valve body 	Mueller (A2370-23) Clow AVK Concord Daigle	A2360 F-6100 Series 25/00 As per manufacturer Compression C2000M As per manufacturer
Pressure Reducing Valves	AWWA C530	<ul style="list-style-type: none"> - Flanged - Epoxy coating internal and external as per AWWA C116/ A21.16 	Singer OCV	106 PR-2PG As per manufacturer
Reduced Pressure Principle Back Flow Preventer	AWWA C511		Watts	#909 Series
Air Release			Apco	Model #65

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
Valve			CLA-VAL	34AR-332-3/4"
5.0 FIRE HYDRANTS				
Fire Hydrant	AWWA C502 AWWA C509-01	<ul style="list-style-type: none"> - 1.98 m barrel length - Post type dry barrel compression shutoff with ball valve closing with flow, opening counter clockwise - M.J elbow - 125mm valve ball - 2 side outlets with 2.5" CSA standard hose nozzle threads - 1 - 4" Storz pumper nozzle outlet - Breakaway flange - Self draining - PVC DR18 Hydrant laterals - Bond breaker between concrete support and fittings - Hydrant shall be painted M20 Rapid Dry Gloss Enamel (safety colours), or approved equivalent. - 4-5mm thick paint when wet - hydrant barrel shall be safety yellow - Bonnet, side outlet and pumper nozzle caps shall be light blue M20-35, green M20-41, orange M20-65 or red M20-21, based on hydrant flows. - McGard hydrant lock anti-tamper device 	Clow Canada Valve - Benjamin Moore (paint)	Premier D-67-M Century
6.0 VALVE BOXES				
		- 150mm cover	Bibby Emco/Concord	VB800 4SL-48
		- Guide Plate	Bibby Emco/Concord	VB875 GP
		- Extension 300mm	Bibby	VB700

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
			Emco/Concord	4SL-18E
		- Extension 450mm	Bibby Emco/Concord	VB705 4SL-18E
		- Extension 600mm	Bibby Emco/Concord	VB710 4SL-24E
7.0 VALVE STEM EXTENSIONS				
		- Required for additional depth over 1.7m - 52mm top operating c/w set screw	Bibby	VB950
8.0 JOINT RESTRAINT DEVICES				
MJ Retaining Gland for Ductile Iron Water Main		- Colour code black for ductile iron use	Uni-Flange Stargrip EBAA Iron	Series 1400 Series 3000 Series 1100
MJ Retaining Gland for PVC Water Main	- ASTM standard F1674-96 - ANSI/AWWA C111/A21.11 where applicable	- Ni-bell standard UNI-B-13-94	Uni-Flange Stargrip EBAA Iron	Series 1300 Series 4000 Series 2000
Split Ring Restrainers and Tie Bolts		- The split ring restraint design shall incorporate a series of non-directional machined serrations (not 'as cast') on the inside diameter to provide positive restraint, exact fit, 360 degree contact and support of the pipe wall. - if machined serrations are directional, additional safeguards must be built into casting.	Uni-Flange Stargrip EBAA Iron	Series 1390 Stargrip 1100C Series 1500

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
9.0 CATHODIC PROTECTION				
Cathodic Nuts and Sacrificial Caps		<ul style="list-style-type: none"> - 99.9% high grade Zinc - Steel core - Coated with low resistant depolarizing material: 175 grams ASTM B-418-73-type II 	<ul style="list-style-type: none"> -Protecto Caps (Maple Agencies) -Duratron 	175P190 DSN0750
10.0 METALLIC CAUTION TAPE				
		<ul style="list-style-type: none"> - Mylar marking tape c/w metallic backing - Lineguard type 2 max bury of 150mm. "Caution Water Main" colour orange. 		
11.0 TRACER WIRE				
		<ul style="list-style-type: none"> - 12 Gauge TWU solid copper, white plastic coated - For splicing, use DryConn waterproof connector 	Electrical Suppliers Canada Wire Phillips Pirelli Maple Agencies	As per manufacturer
12.0 TIE RODS (19mm)				
		<ul style="list-style-type: none"> - Stainless Steel 		As per manufacturer
13.0 SERVICE BOXES				
		<ul style="list-style-type: none"> - Steel boot only 	Mueller Emco Concord Clow	D1, D3, Size 8 A-714, A-715, A-716 Size 8

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
			Bibby/Trojan Rossland Supply	As per manufacturer As per manufacturer
14.0 SERVICE BOX RODS				
		- 36" stainless steel	Mueller Emco Concord Clow Bibby/Trojan	As per manufacturer
15.0 SERVICE SADDLES				
PVC Water Main (25mm to 50mm)		- Cast bronze service saddle - Double strap	Robar Cambridge Brass	2706 Series 812
Ductile Iron Water Main (25mm to 50mm)				
Tapping Sleeve – PVC Water Main			AFC Robar	6606
Tapping Sleeve – Ductile Iron Water Main			AFC Robar	6606

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
16.0 SPACERS				
Casing End		<ul style="list-style-type: none"> - Seal-virgin SBR and Bands - T-304 stainless steel 	Cascade PSI	As per manufacturer As per manufacturer
Casing Spacers		<ul style="list-style-type: none"> - Fusion coated steel casing insulators 	Cascade PSI	As per manufacturer As per manufacturer
17.0 MAIN STOPS				
25mm	AWWA C800		McDonald Brass Mueller Cambridge Brass Ford EMCO	4701B-T H25008 301-A4H4 25mm-FB1000-4-Q 17072 Compression
38mm	AWWA C800		McDonald Brass Mueller Cambridge Brass Ford EMCO	4701B-T H25008 301-A6H6 38mm-FB1000-6-Q 17072 Compression
52mm	AWWA C800		McDonald Brass Mueller Cambridge Brass Ford	4701B-T H25008 301-A7H7 52mm-FB1000-

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
			EMCO	7-Q 17072 Compression
18.0 CURB STOPS				
25mm	AWWA C800		Mueller Cambridge Brass Ford EMCO	H-15-209 202-H4H4 B44-444 17402 Ball Compression
38mm	AWWA C800		Mueller Cambridge Brass Ford EMCO	H-15-209 202-H6H6 B44-666 17402 Ball Compression
52mm	AWWA C800		Mueller Cambridge Brass Ford EMCO	H-15-209 202-H7H7 B44-777 17402 Ball Compression
19.0 COUPLINGS				
25mm	AWWA C800		Mueller Cambridge Brass Ford McDonald Brass	H-15-403 118-H4H4 C44-44 4758T
38mm	AWWA C800		Mueller	H-15-403

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
			Cambridge Brass Ford McDonald Brass	118-H6H6 C44-66 4758T
52mm	AWWA C800		Mueller Cambridge Brass Ford McDonald Brass	H-15-403 118-H7H7 C44-77 4758T
20.0 SAMPLING STATION				
			Non-Freeze Post Hydrant	

APPENDIX B6**PARKS AND LANDSCAPING MATERIAL LIST**

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
1.0 PLAYGROUND EQUIPMENT				
1.1 Swings	CAN/CSA Standards Z614 – Children’s Playspaces and Equipment (latest edition) Accessibility for Ontarians with Disabilities Act, 2005 and Ontarians with Disabilities Act, 2001	Neighbourhood Park: 2 seats for toddlers, 4 belt seats, and 1 accessible seat for children with disabilities Community Park: 5 seats for toddlers, 6 belt seats, and 1 accessible seat for children with disabilities - All styles approved, prefer rubber over wood. - All swing posts shall be embedded in footings (anchor footing to bedrock where depth of cover is not at least 1200mm) - Top cross bar shall be min. 2440mm above finished grade - Minimum 4 seats provided in one unit or two separate units - Minimum 2 belt seats, 1 toddler seat, 1 seat for a disabled child	Certified playground suppliers	

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
		- All swing chains shall be ¼" galvanized		
1.2 Junior Creative Structure	CAN/CSA Standards Z614 – Children’s Playspaces and Equipment (latest edition) Accessibility for Ontarians with Disabilities Act, 2005 and Ontarians with Disabilities Act, 2001	<u>Neighbourhood Park:</u> 2-3 decks with min. 1 roof, transfer station & stairs, 2 plastic slides – single and dual track, climber, tunnel or bridge between decks, 3-4 activity panels, and talk tube or alternate <u>Community Park:</u> 2-3 decks with min. 1 roof, transfer station & stairs, 2 plastic slides – single and dual track, climber, tunnel or bridge between decks, 3-4 activity panels, and talk tube or alternate	Certified playground suppliers	
1.3 Senior Creative Structure	CAN/CSA Standards Z614 – Children’s Playspaces and Equipment (latest edition) Accessibility for Ontarians with Disabilities Act, 2005 and Ontarians with Disabilities Act,	<u>Neighbourhood Park:</u> 3-6 decks with min. 1 roof, transfer station with stairs, accessibility ramp, 2 plastic slides – straight and spiral both open, 3 climbers, rock wall or similar activity, 4-5 activity panels, and sliding pole <u>Community Park:</u> 5-7 decks with min. 1 roof, transfer station with stairs, accessibility ramp, 2-3 plastic slides – straight and spiral both open, 3-4 climbers, rock wall or similar activity, 5-7 activity panels, and sliding pole	Certified playground suppliers	

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
	2001			
Spring / Spinning Toy		<p><u>Neighbourhood Park:</u> 2 units varying types</p> <p><u>Community Park:</u> 3 - 4 units varying types</p> <ul style="list-style-type: none"> - Spring toy see saws - Saddlemates, dino, fire chief car - Spring rider, giant see saw, 4-way rock-a-bout - Selected spring products 	Certified playground suppliers	
Slide		<ul style="list-style-type: none"> - Attached to creative structures, no independent slides - High vandalized areas, specify stainless steel slide - All other areas specify poly slides - Open slides are required, slide tubes are not approved - Straight, wavy and spirals are acceptable 	Certified playground suppliers	
Decks		<ul style="list-style-type: none"> - Steel with plastisol coating preferred; plastic wood or Trex is acceptable - Provide minimum 1 set of stairs 	Certified playground suppliers	

MATERIAL	CERTIFICATION	SPECIFICATIONS	MANUFACTURER	CATALOGUE NO.
Climbers		<ul style="list-style-type: none"> - Chain net, cable net, and cargo net climbers shall have one piece coupling or nut and bolt couplings. Screw couplings are not acceptable - Finish: zinc bath, polyester powder coat 	Certified playground suppliers	
Activity Panels		<ul style="list-style-type: none"> - Steel bars at ends of ramps - Mix up steel bars, poly windows, activity panels - Provide 40% of activity panels on ground level for wheelchair users - Percussion musical panels permitted in low vandalized areas - (Tic tac toe, Mirror, Little Tikes 7 station panel, Poly windows, Steering wheel) 	Certified playground suppliers	
Fibre		<ul style="list-style-type: none"> - engineered wood fibres minimum 300mm (12") deep 	Certified playground suppliers	
Crushed granite sand	CSA Compliant			
Rubber			Certified playground suppliers	

APPENDIX B7
FENCING MATERIAL LIST

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
1.0 ACOUSTICAL FENCE				
1.1 Wood				
Western Red Cedar or Canada White Cedar		<ul style="list-style-type: none"> - Free of wood and bark pockets - Torn grain and surface stain eliminated - Heavy knots and sap stained pieces shall be well distributed - Skirt rail shall be pressure treated 		
1.2 Infill				
	MOE (minimum surface density requirement of 20kg/m ²)	<ul style="list-style-type: none"> - 57mm x 130mm T & G select tight knot NLGA pattern 18-200 - dressed both sides - Bevelled edges on both sides - Gaps shall not exceed 6mm - Members shall be tight and free of rattling 		
1.3 Horizontal Members				
		<ul style="list-style-type: none"> - 38mm x 140mm dressed to pattern - NLGA 204B select tight knot grade 		
1.4 Posts				
		<ul style="list-style-type: none"> - 140mm x 140mm dressed to pattern 		

MATERIAL	STANDARDS	FEATURES	MANUFACTURER	CATALOGUE No.
		- NLGA 131B*1 structural post and timber		
1.5 Stain				
		- Latex Solid Stain - Rockport grey - 2 coats on dry wood - Apply outdoors when temperature is between 5°C and 21°C for a period of 48 hours following application	- Benjamin Moore Colour Code HC-105	
1.6 Fasteners				
Ardox Nails Bolts Nuts Washers Anchors		- Hot dipped galvanized steel		
1.7 Brick Column				
		- 600mm x 600mm concrete brick column - Flashing, weephole vents and damp proof membrane - Mortar joints to be concave and smooth (mortar type N High Bond) - Provide drip groove		
Concrete Brick	CAN 3-A165.2 – M94	- 247mm x 75mm - “Tork Town” colour and pattern	Rexdale Brick, Ultra 2000	
Wall Ties	CSA A370 Level II	- Hot dipped galvanized		

2.0 CHAIN LINK FENCE				
2.1 Fabric and Wire				
Steel Wire hot dipped galvanized after weaving Steel Wire electro galvanized before weaving		<ul style="list-style-type: none"> - Minimum requirement for zinc coating – 0.5 kg/m² - 38 mm wire mesh - 3.4 mm (9 gauge) steel wire fabric 		
2.2 Post and Rails				
Galvanized Steel	ASTM Designation A 120	<ul style="list-style-type: none"> - Schedule 40 Pipe - Conforming to current specifications for black and hot dipped, zinc coated, welded and seamless pipe - Minimum requirement for zinc coating – 0.5 kg/m² 		
Frames and Braces Cast Fittings Other Fittings	ASTM Specifications (A 152)	<p>Suitable Aluminum Alloy or Steel Ductile Iron</p> <ul style="list-style-type: none"> - Minimum requirement for zinc coating – 0.5 kg/m² for frames and braces - Minimum requirement for zinc coating – 0.6 kg/m² for cast and other fittings 		
3.0 WOOD PRIVACY FENCE				
Construction grade cedar Approved pressure treated wood		<ul style="list-style-type: none"> - Zinc coated twisted steel nails #11 Gauge 		

APPENDIX B8**SEED MIX AND TREE SPECIES MATERIAL LIST****RECOMMENDED SEED MIXES**

For non irrigated parkland and open spaces:

- 45% Creeping Red Fescue
- 30% Kentucky Blue Grass
- 25% Perennial Rye Grass

For stormwater management ponds and channels, refer to the Conservation Authority planting Guidelines or use:

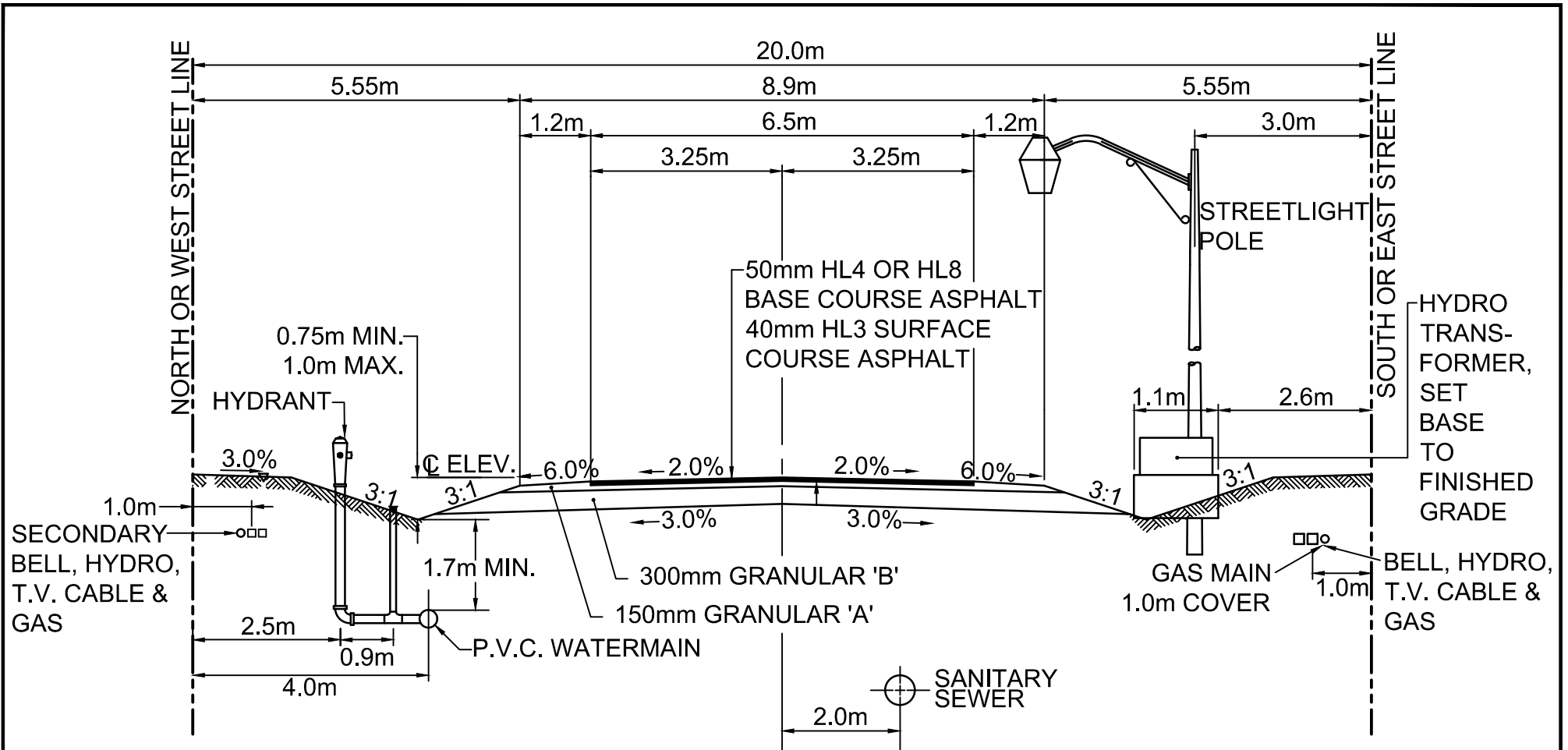
- 30% Perennial Rye Grass
- 30% Meadow Foxtail
- 25% Fowl Meadowgrass
- 15% Fox Sedge

RECOMMENDED TREES FOR SPECIFIC PLANTING APPLICATIONS

Tree Species		Planting Location		
Botanical Name	Common Name	Parks & Lawns	Paved tree pits	Beneath utilities
<i>Abies concolor</i>	White Fir	x		
<i>Acer x freemanii</i>	Freeman Maple	x		
<i>Acer ginnala</i>	Amur Maple	x	x	x
<i>Acer platanoides 'Globosum'</i>	Globe Maple			x
<i>Acer rubrum</i>	Red Maple	x		
<i>Acer sachharinum</i>	Silver Maple	x		
<i>Acer saccharum</i>	Sugar Maple	x		
<i>Acer tataricum</i>	Tartarian Maple			x
<i>Aesculus hippocastanum</i>	Horsechestnut	x		
<i>Alnus glutinosa</i>	European Alder			x
<i>Amelanchier spp.</i>	Serviceberry	x		x

<i>Catalpa bignonioides</i> 'Nanna'	Globe Catalpa			
<i>Carya cordiformis</i>	Bitternut Hickory	x		
<i>Celtis occidentalis</i>	Nothern Hackberry	x		
<i>Cornus florida</i>	Flowering Dogwood			
<i>Crataegus spp.</i>	Hawthorn	x		x
<i>Fagus sylvatica</i>	European Beech	x		
<i>Gleditsia triacanthos</i>	Honeylocust	x	x	x
<i>Juglans nigra</i>	Blackwood Walnut	x		
<i>Larix decidua</i>	European Larch	x		
<i>Malus ssp.</i>	Flowering Crabapple (non-fruited)	x		x
<i>Picea abies</i>	Norway Spruce	x		
<i>Picea glauca</i>	White Spruce	x		
<i>Picea omorika</i>	Siberian Spruce	x		
<i>Picea pungens</i>	Blue & Green Colorado Spruce	x		
<i>Pinus mugho</i>	Mugo Pine			
<i>Pinus strobus</i>	Eastern White Pine	x		
<i>Pinus sylvestris</i>	Scotch Pine	x		
<i>Prunus padus</i>	Bird Cherry			
<i>Prunus virginiana</i> 'Schubert'	Schubert Cherry			x
<i>Pseudotsuga menziesii</i>	Douglas-fir	x		
<i>Quercus alba</i>	White Oak	x		
<i>Quercus bicolor</i>	Swamp White Oak	x		
<i>Quercus coccinea</i>	Scarlet Oak	x		
<i>Quercus macrocarpa</i>	Bur Oak	x		
<i>Quercus palustris</i>	Pin Oak	x		x
<i>Quercus robur</i>	English Oak	x		
<i>Quercus rubra</i>	Northern Red Oak	x		
<i>Sophora japonica</i>	Japanese Pagodatree	x	x	
<i>Syringa reticulata</i>	Japanese Tree Lilac	x	x	x
<i>Tilia cordata</i>	Littleleaf Linden	x	x	
<i>Ulmus carpinifolia</i>	Homestead Elm	x		x

APPENDIX C: DETAIL DRAWINGS



NOTES:

- DITCHES AND BOULEVARDS TO RECEIVE 200mm TOPSOIL AND NURSERY SOD
- MINIMUM RADII
 - CUL DE SAC - 13.0m
 - RETURN - 10.0m

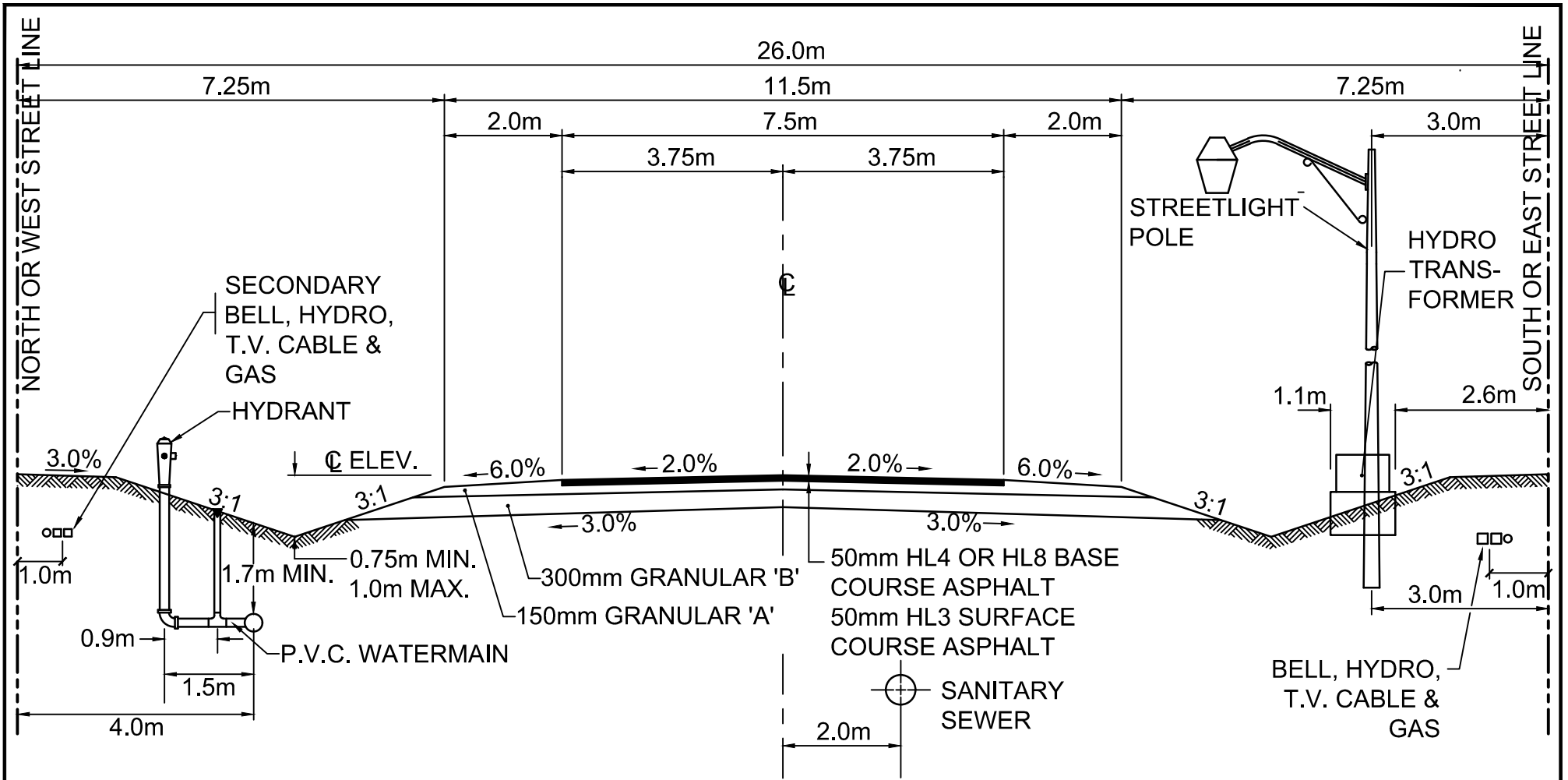
REVISIONS

No.	Date	Description
1.	FEB. 19	OFFSET OF UTILITIES, SEWER & WATERMAIN

TOWNSHIP OF SPRINGWATER

STANDARD 8.9m ROAD - 20m R.O.W.
(OPEN DITCH)
WITH SERVICE LOCATIONS

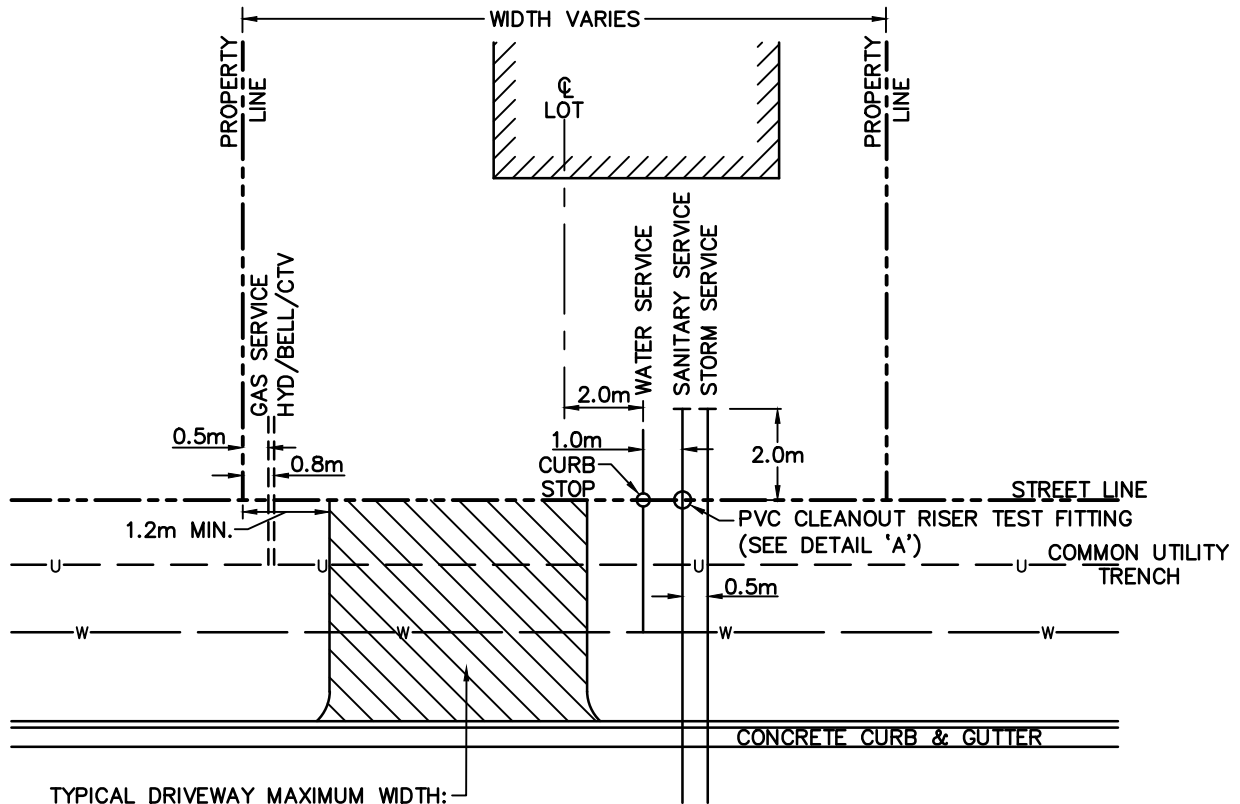
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DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		



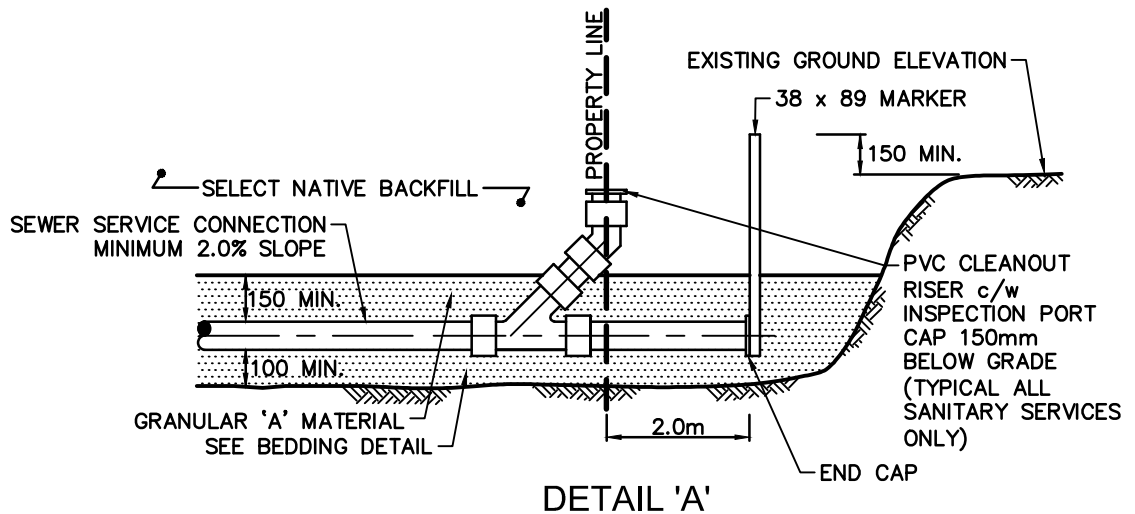
NOTES:

1. DITCHES AND BOULEVARDS TO RECEIVE 200mm TOPSOIL AND NURSERY SOD
2. MINIMUM RADII FOR EDGE OF PAVEMENT:
 - CUL DE SAC - 16.5m
 - RETURN - 12.0m

REVISIONS		
1.	FEB. 19	OFFSETS OF UTILITIES, SEWER & WATERMAIN
TOWNSHIP OF SPRINGWATER		
INDUSTRIAL 11.5m ROAD STANDARD 26m R.O.W. (OPEN DITCH) WITH SERVICE LOCATIONS		
DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-R5
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		



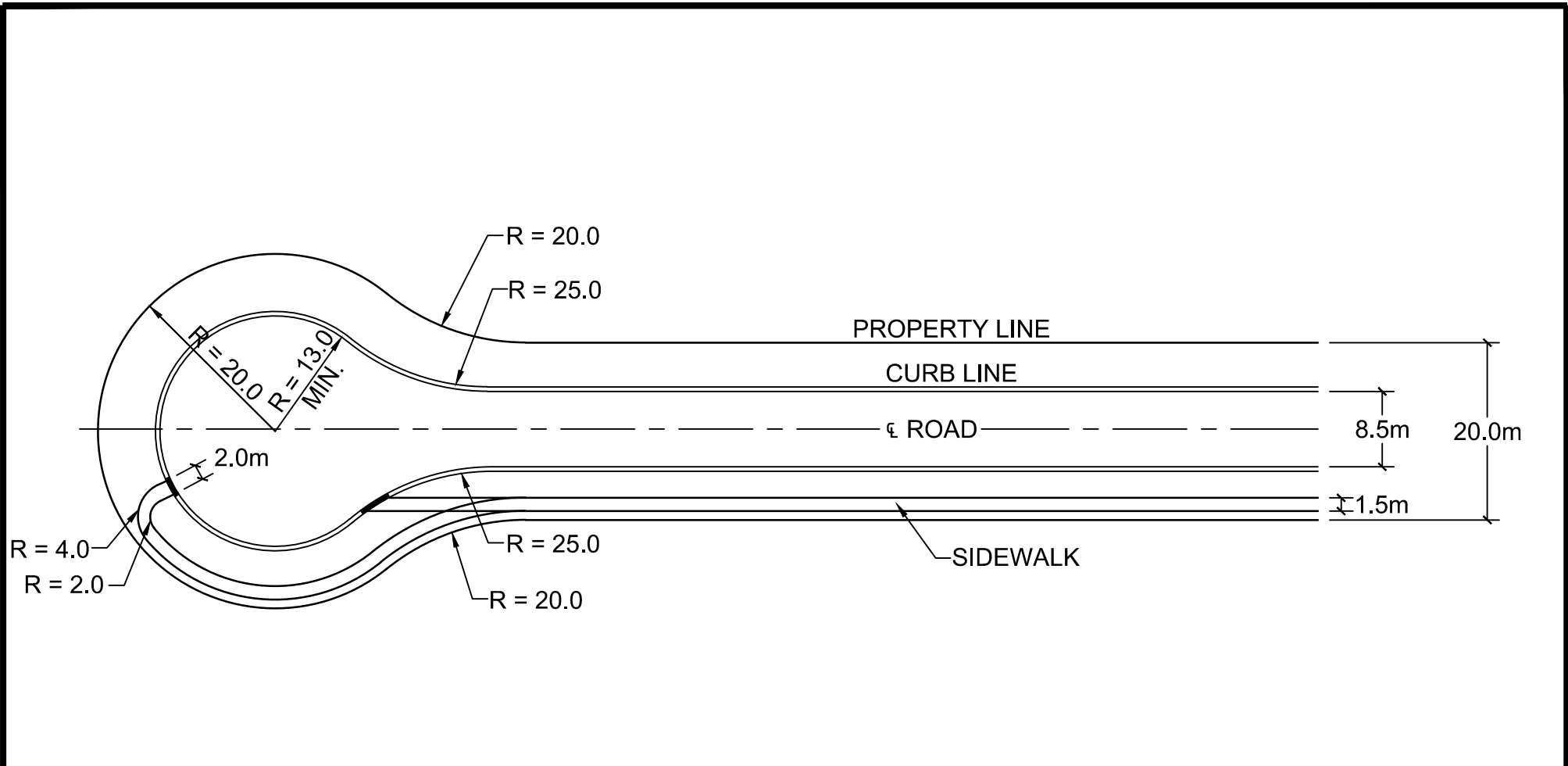
TYPICAL DRIVEWAY MAXIMUM WIDTH:
 50% OF LOT FRONTAGE TO MAXIMUM
 6m FOR FRONTAGES LESS THAN 18m,
 9m FOR FRONTAGES GREATER THAN 18m.



NOTE:

1. SANITARY, STORM & WATER SERVICE LATERALS TO BE INSTALLED & CAPPED 2.0m INTO PROPERTY AND MARKED.
2. WATER SERVICE TO BE INSTALLED AT 2.0m OFFSET FROM \O OF LOT. SANITARY SERVICE TO BE INSTALLED AT 1.0m OFFSET FROM WATER SERVICE ON NON DRIVEWAY SIDE.
3. COLOUR OF SANITARY SERVICE PIPE TO BE GREEN OR BLACK.
4. COLOUR OF STORM SERVICE PIPE TO BE WHITE OR GREY.

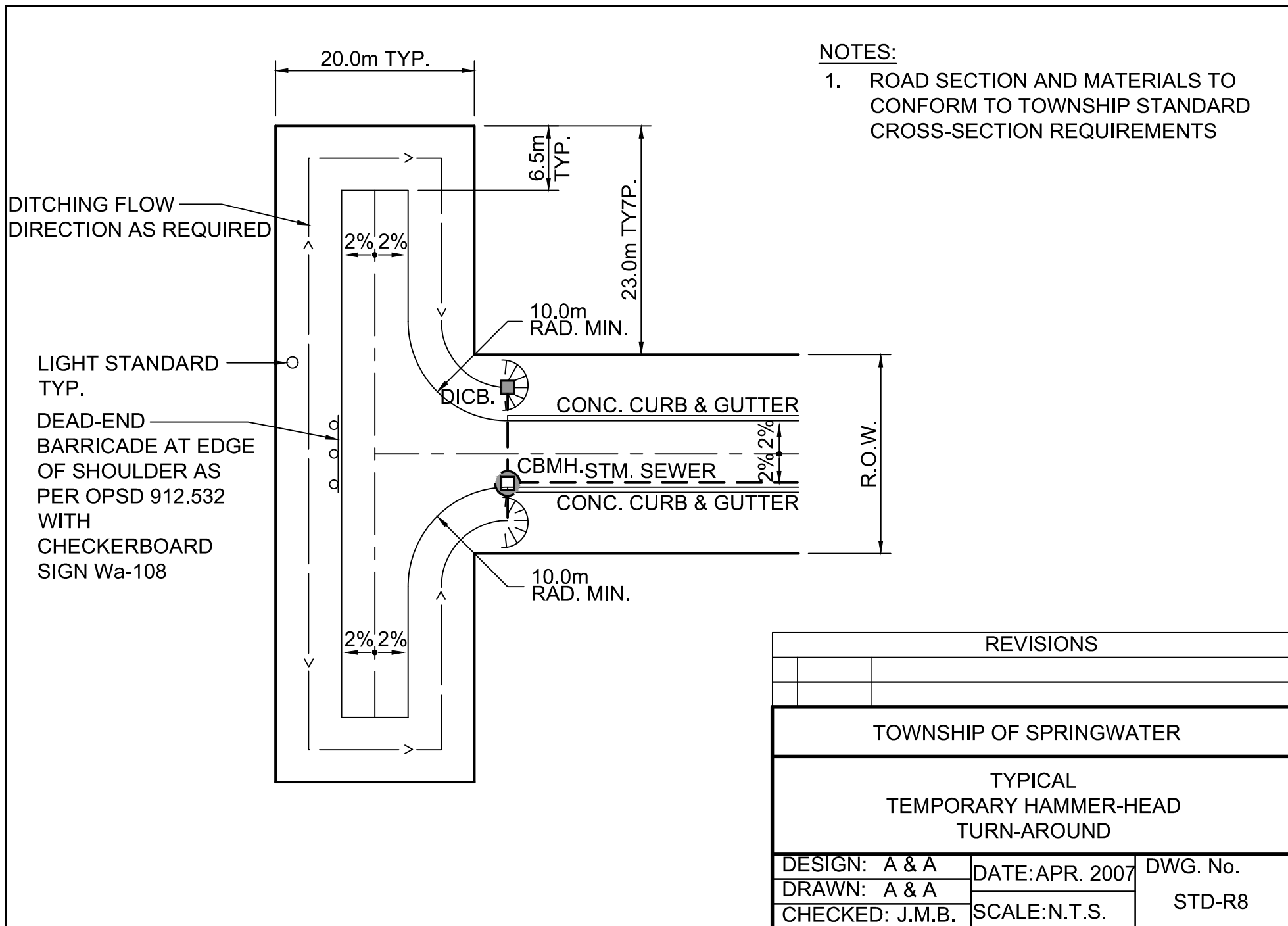
REVISIONS		
1	SEPT./18	LATERAL OFFSETS
TOWNSHIP OF SPRINGWATER		
TYPICAL DETACHED UNIT SERVICE ARRANGEMENT		
DESIGN:	A & A	DATE: APRIL 2007
DRAWN:	A & A	SCALE: N.T.S.
CHECKED:	J.M.B.	DWG. No. STD-R6



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN
2. MINIMUM GUTTER GRADE 0.75%

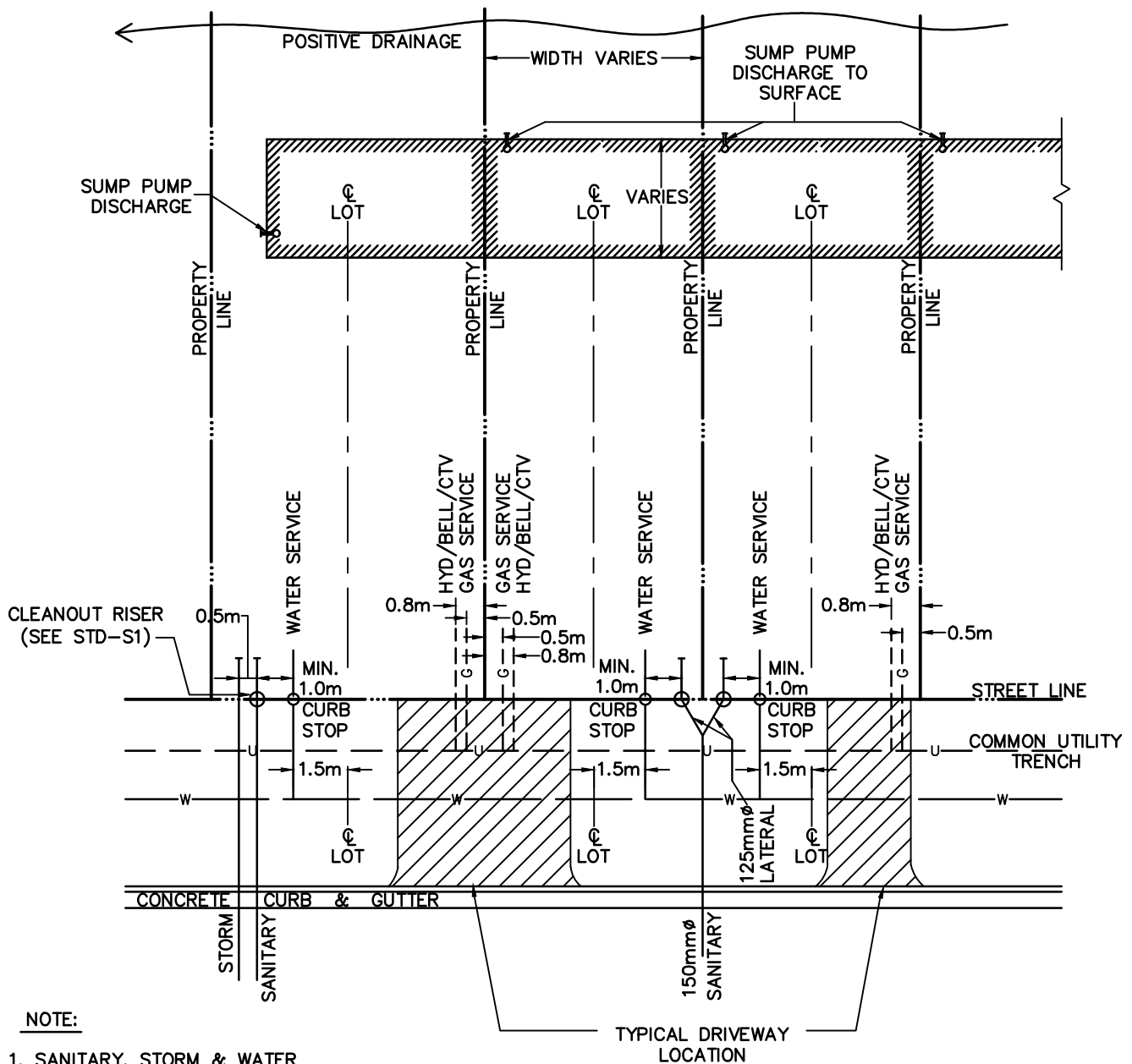
REVISIONS		
TOWNSHIP OF SPRINGWATER		
CUL-DE-SAC DETAIL		
DESIGN: A & A	DATE: FEB. 2019	DWG. No. STD-R7
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		



NOTES:

- ROAD SECTION AND MATERIALS TO CONFORM TO TOWNSHIP STANDARD CROSS-SECTION REQUIREMENTS

REVISIONS		
TOWNSHIP OF SPRINGWATER		
TYPICAL TEMPORARY HAMMER-HEAD TURN-AROUND		
DESIGN: A & A	DATE: APR. 2007	DWG. No.
DRAWN: A & A	SCALE: N.T.S.	STD-R8
CHECKED: J.M.B.		



NOTE:

1. SANITARY, STORM & WATER SERVICE LATERALS TO BE INSTALLED & CAPPED 2m BEYOND PROPERTY LINE AND MARKED AS PER STD-S1.
2. END UNITS ARE TO BE PROVIDED WITH 100mm ϕ STORM SEWER LATERAL. REFER TO STD-S2. INTERIOR UNITS ARE TO HAVE INDIVIDUAL SUMP PUMP DISCHARGES AT THE REAR OF EACH UNIT.
3. WATER SERVICE TO BE INSTALLED AT 1.5m OFFSET FROM C/L OF LOT. SANITARY SERVICE INSTALLED AT MIN. 1.0m OFFSET FROM WATER SERVICE ON NON-DRIVEWAY SIDE.
4. SEE STD-S1 FOR TYPICAL DOUBLE SEWER SERVICE CONNECTION DETAILS.
5. SEE STD-W5 FOR WATER SERVICE CONNECTION DETAILS.
6. COLOUR OF SANITARY SERVICE TO BE GREEN OR BLACK
7. COLOUR OF STORM SERVICE TO BE WHITE OR GREY

1	LATERAL OFFSETS		SEPT./18
NO.	REVISIONS	APR'D	DATE

TOWNSHIP OF SPRINGWATER

TYPICAL TOWNHOUSE UNIT SERVICE ARRANGEMENT

METRIC

ALL DIMENSIONS IN METRES UNLESS OTHERWISE NOTED

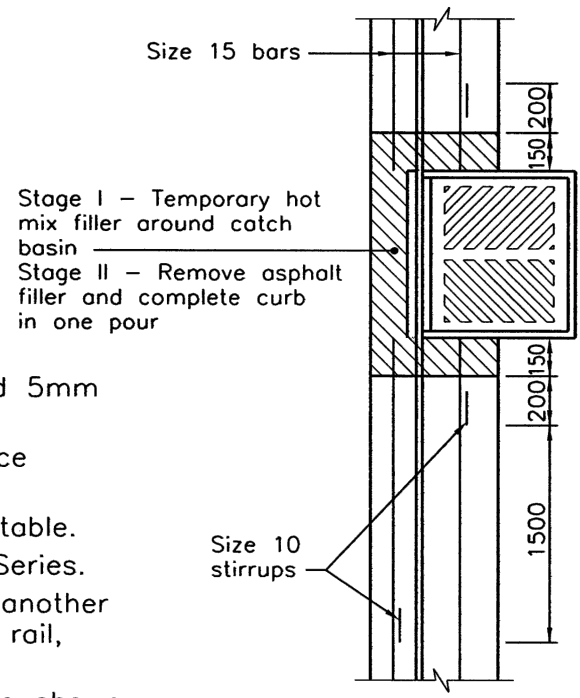
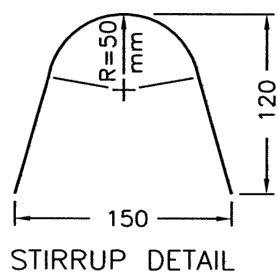
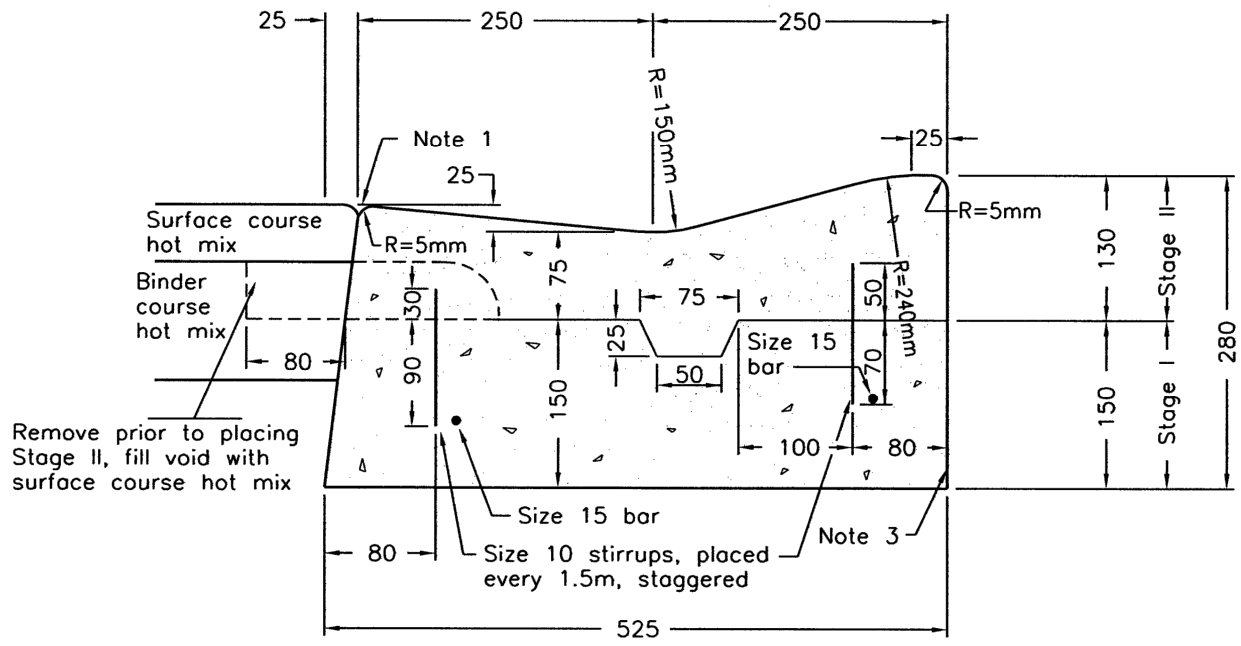
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SCALE: N.T.S.

DATE: FEB./08

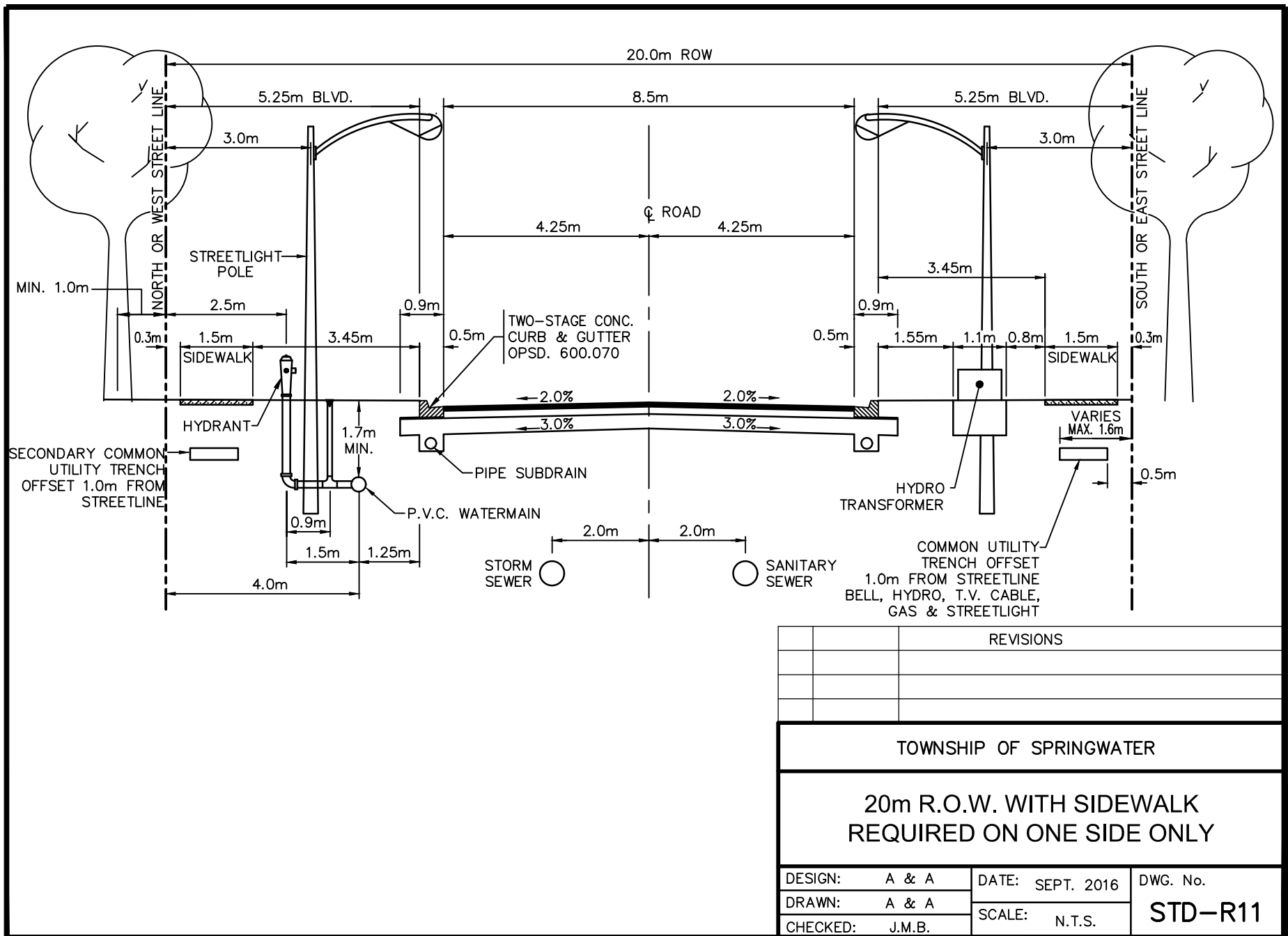
STD-R9



NOTES:

- 1 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.
- 2 Concrete to be 32 Mpa, class C-2 in accordance with CSA A23.1-04.
- 3 For slipforming procedure, a 5% batter is acceptable.
- A Outlet treatment shall conform with OPSD-610 Series.
- B The length of transition from one curb type to another shall be 3.0m, except in conjunction with guide rail, it shall conform to OPSD-900 Series.
- C All dimensions are in millimetres unless otherwise shown.

REVISIONS		
TOWNSHIP OF SPRINGWATER		
CONCRETE MOUNTABLE CURB AND STANDARD GUTTER TWO STAGE CONSTRUCTION		
DESIGN: A & A	DATE: FEB. 2008	DWG. No. STD-R10
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		

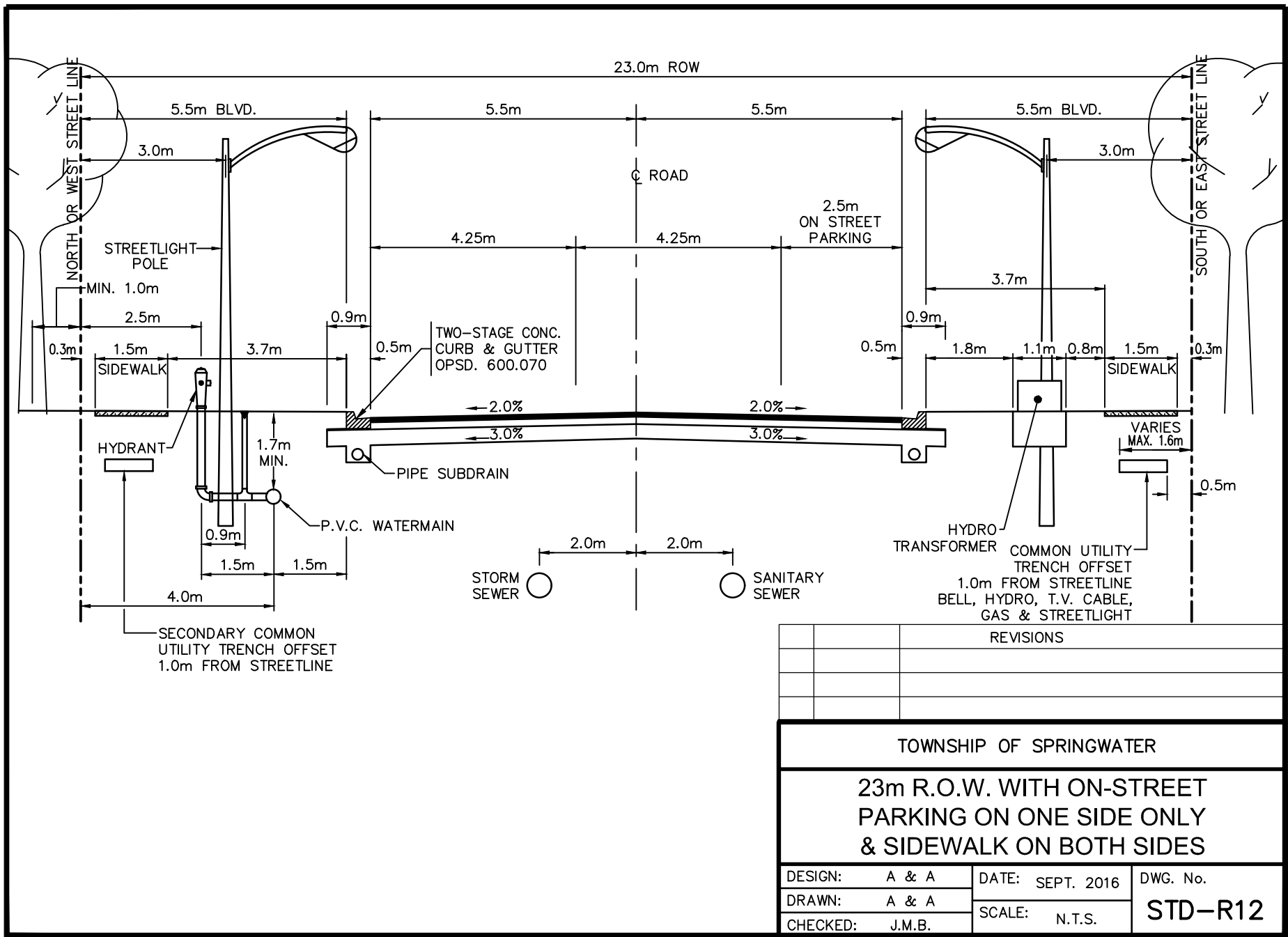


REVISIONS	

TOWNSHIP OF SPRINGWATER

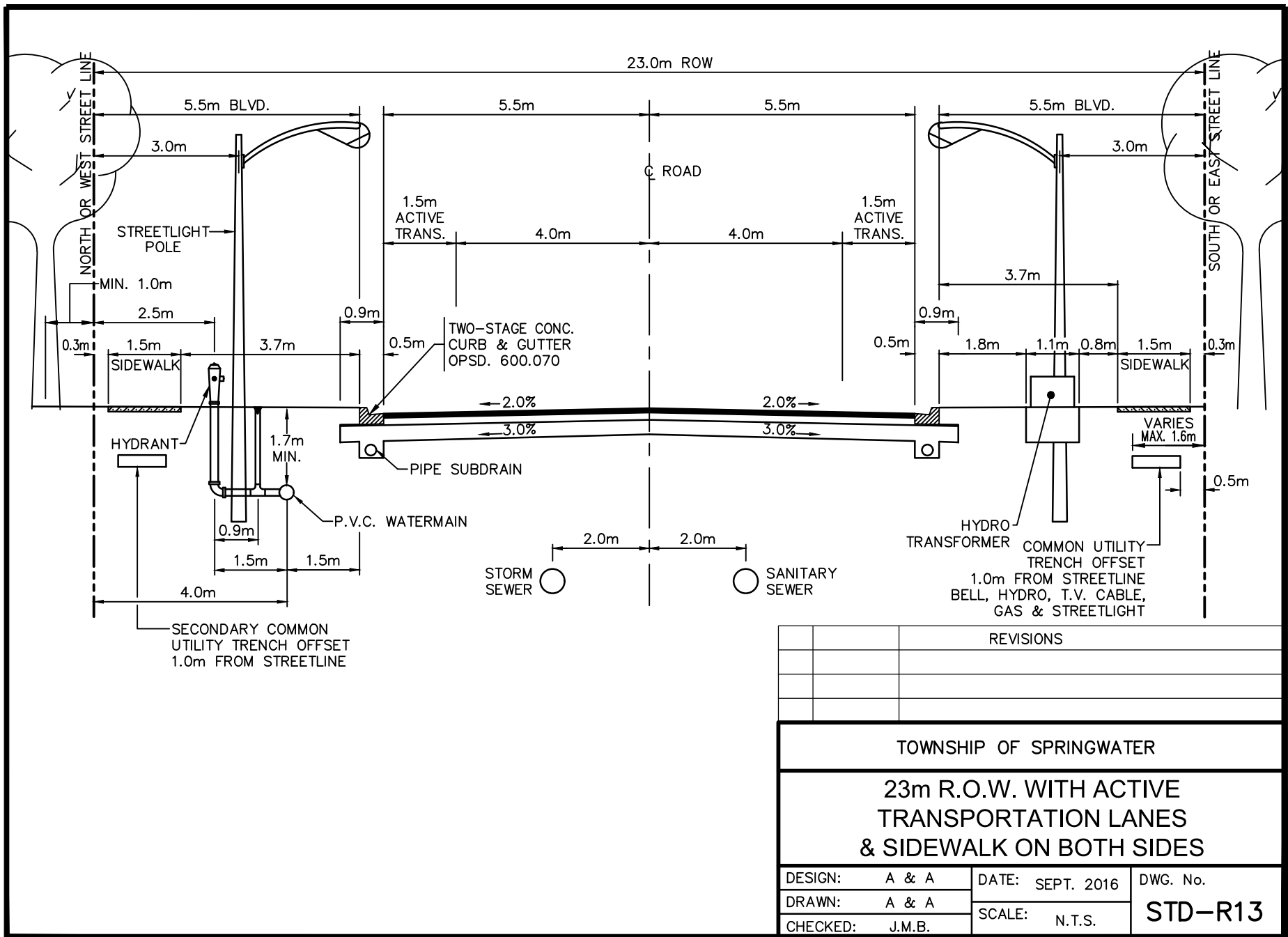
20m R.O.W. WITH SIDEWALK
REQUIRED ON ONE SIDE ONLY

DESIGN:	A & A	DATE:	SEPT. 2016	DWG. No.
DRAWN:	A & A	SCALE:	N.T.S.	STD-R11
CHECKED:	J.M.B.			



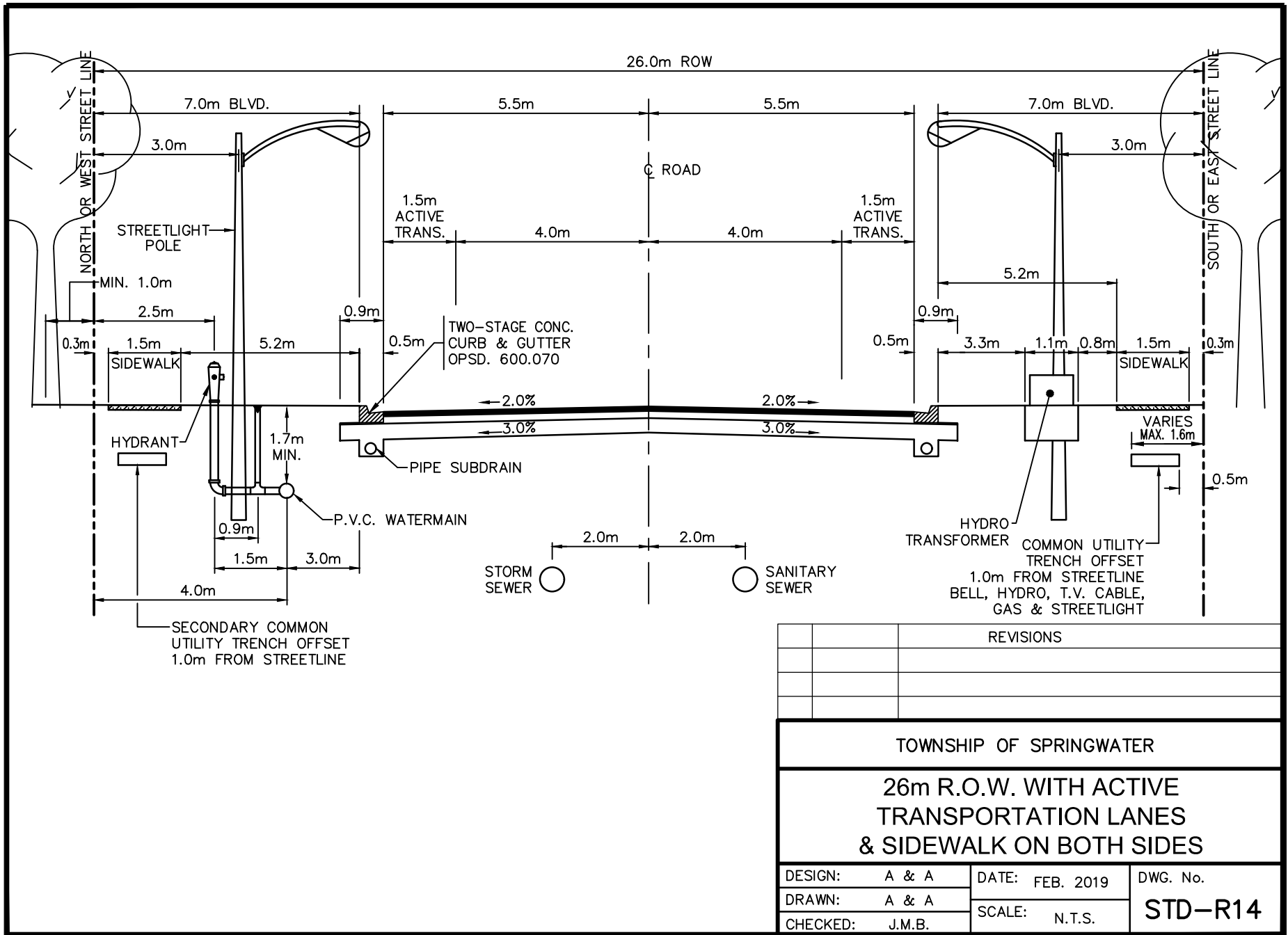
REVISIONS	

TOWNSHIP OF SPRINGWATER		
23m R.O.W. WITH ON-STREET PARKING ON ONE SIDE ONLY & SIDEWALK ON BOTH SIDES		
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DRAWN: A & A	SCALE: N.T.S.	STD-R12
CHECKED: J.M.B.		



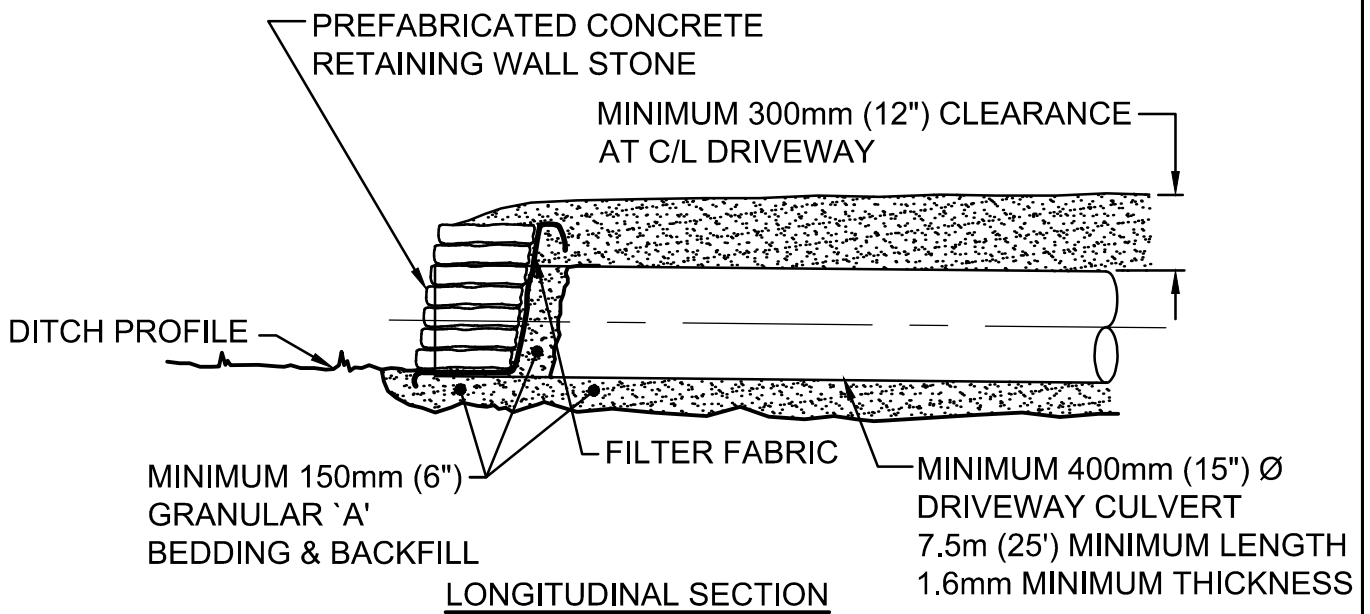
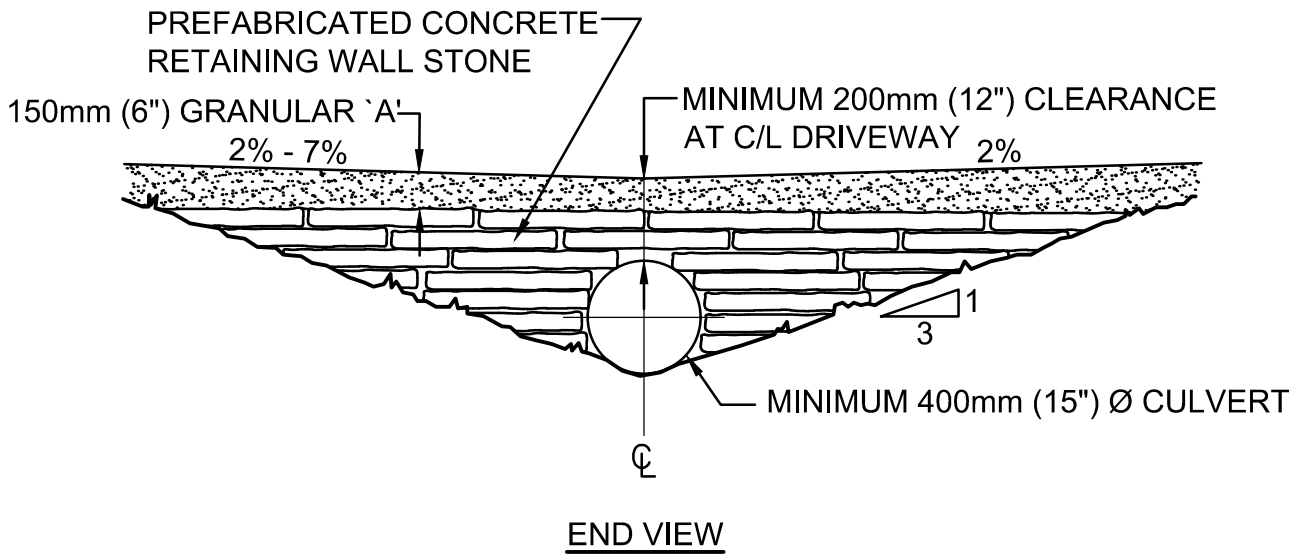
REVISIONS	

TOWNSHIP OF SPRINGWATER		
23m R.O.W. WITH ACTIVE TRANSPORTATION LANES & SIDEWALK ON BOTH SIDES		
DESIGN: A & A	DATE: SEPT. 2016	DWG. No.
DRAWN: A & A	SCALE: N.T.S.	STD-R13
CHECKED: J.M.B.		



REVISIONS	

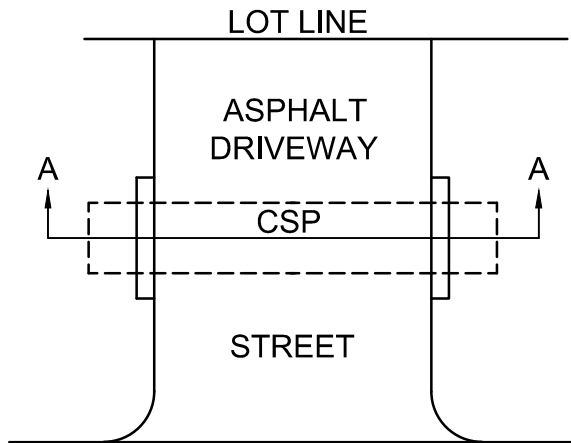
TOWNSHIP OF SPRINGWATER		
26m R.O.W. WITH ACTIVE TRANSPORTATION LANES & SIDEWALK ON BOTH SIDES		
DESIGN: A & A	DATE: FEB. 2019	DWG. No.
DRAWN: A & A	SCALE: N.T.S.	STD-R14
CHECKED: J.M.B.		



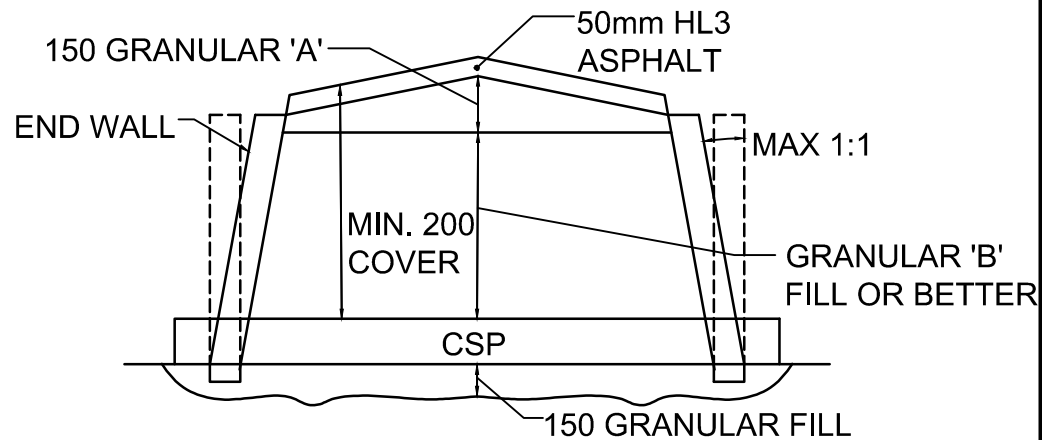
NOTE:

1. NO DRIVEWAY OR CULVERT SHALL BE LOCATED CLOSER THAN 1.5 METRES TO ANY WATER VALVE, CURB STOP, LOT LINE, TRANSFORMER OR STREET LIGHT.
2. ALL END WALLS ARE NOT TO PROJECT ABOVE THE EDGE LINE GRADE OF THE ADJACENT ROAD.

REVISIONS		
1.	FEB/19	NOTE 1 - OFFSET REQUIREMENTS
TOWNSHIP OF SPRINGWATER		
CULVERT END WALL DETAIL		
DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-D1
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		



TOP VIEW

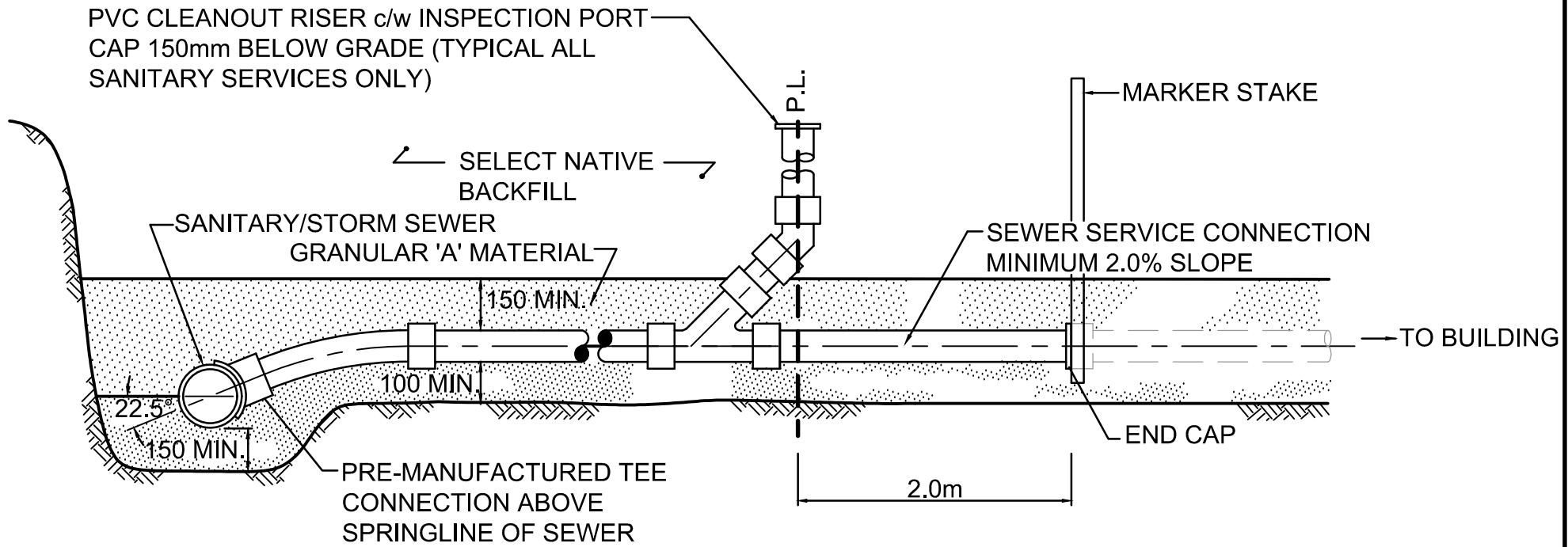


SECTION A-A

NOTES:

1. ALL CULVERTS MUST BE STANDARD CORRUGATED STEEL PIPE OR BIG 'O' BOSS 2000, 220 kPA AND HAVE:
 - a. MINIMUM DIA. OF 400mm FOR DRIVEWAYS AND 500mm FOR ROAD CROSSINGS
 - b. MINIMUM LENGTH OF 6.0m FOR DRIVEWAYS
 - c. MAXIMUM LENGTH OF 9.0m FOR DRIVEWAYS
 - d. MINIMUM THICKNESS OF 1.6mm FOR DRIVEWAYS AND 2.0mm FOR ROAD CROSSINGS
2. ALL DRIVEWAYS TO BE COMPLETED WITH A MINIMUM 150mm GRANULAR 'A' AND 50mm HL3 ASPHALT

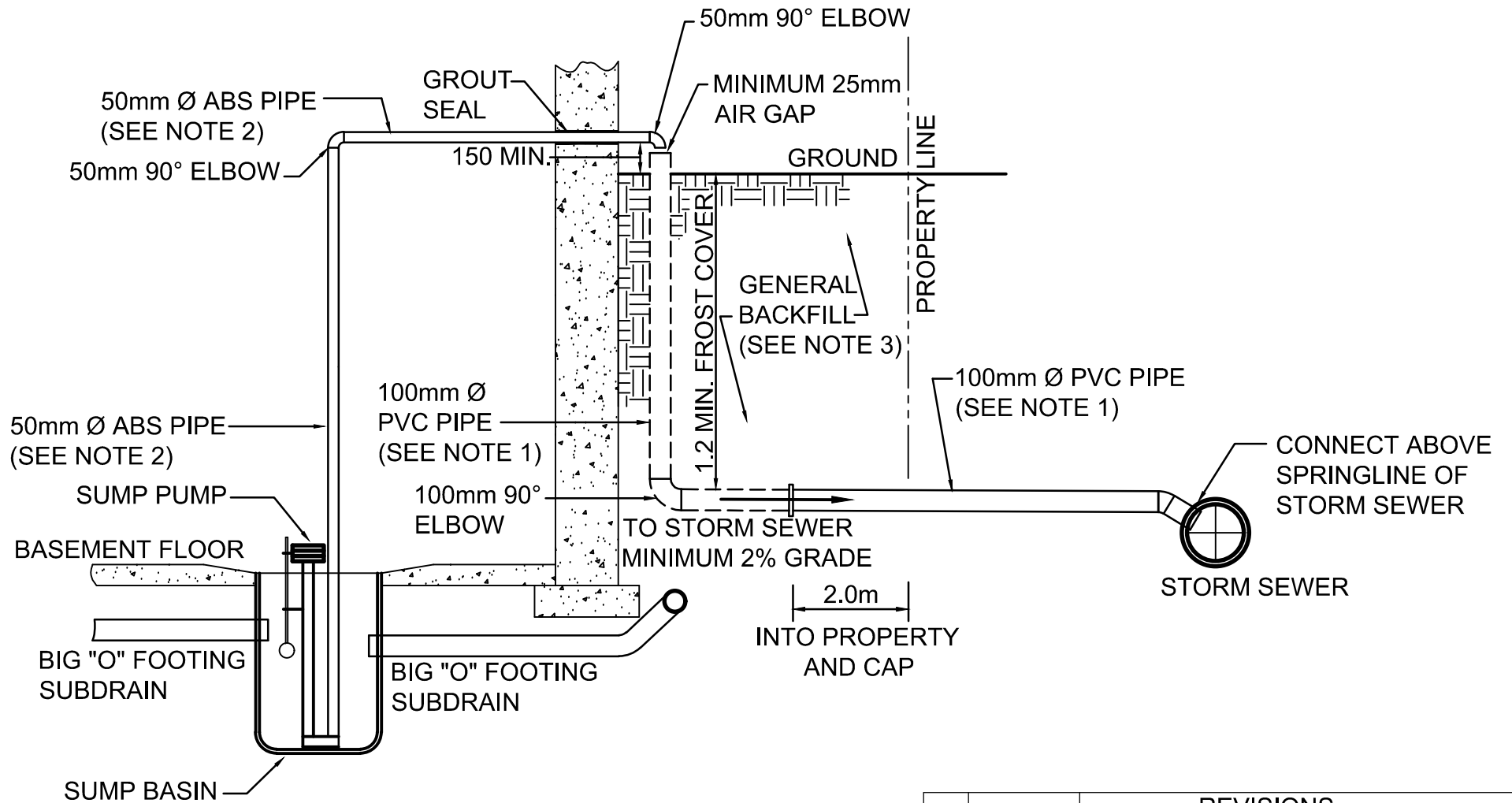
REVISIONS		
1.	FEB/19	GRANULAR 'B' BACKFILL
TOWNSHIP OF SPRINGWATER		
TYPICAL C.S.P. ENTRANCE DETAIL		
DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-D2
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		



NOTES:

1. FOR SINGLE RESIDENTIAL DWELLINGS:
 - USE 125mm DIAMETER PVC SDR28 PIPE FOR SANITARY SERVICES
 - USE 100mm DIAMETER PVC SDR28 PIPE FOR STORM SERVICES
2. MAXIMUM SANITARY SERVICE CONNECTION SIZE FOR SINGLE COMMERCIAL / INDUSTRIAL / INSTITUTIONAL BUILDING TO BE 150mm DIAMETER.
3. COLOUR OF SANITARY SERVICE PIPE TO BE GREEN OR BLACK.
4. COLOUR OF STORM SERVICE PIPE TO BE WHITE OR GREY.
5. GENERAL BACKFILL TO BE SELECT NATIVE BACKFILL MATERIAL.

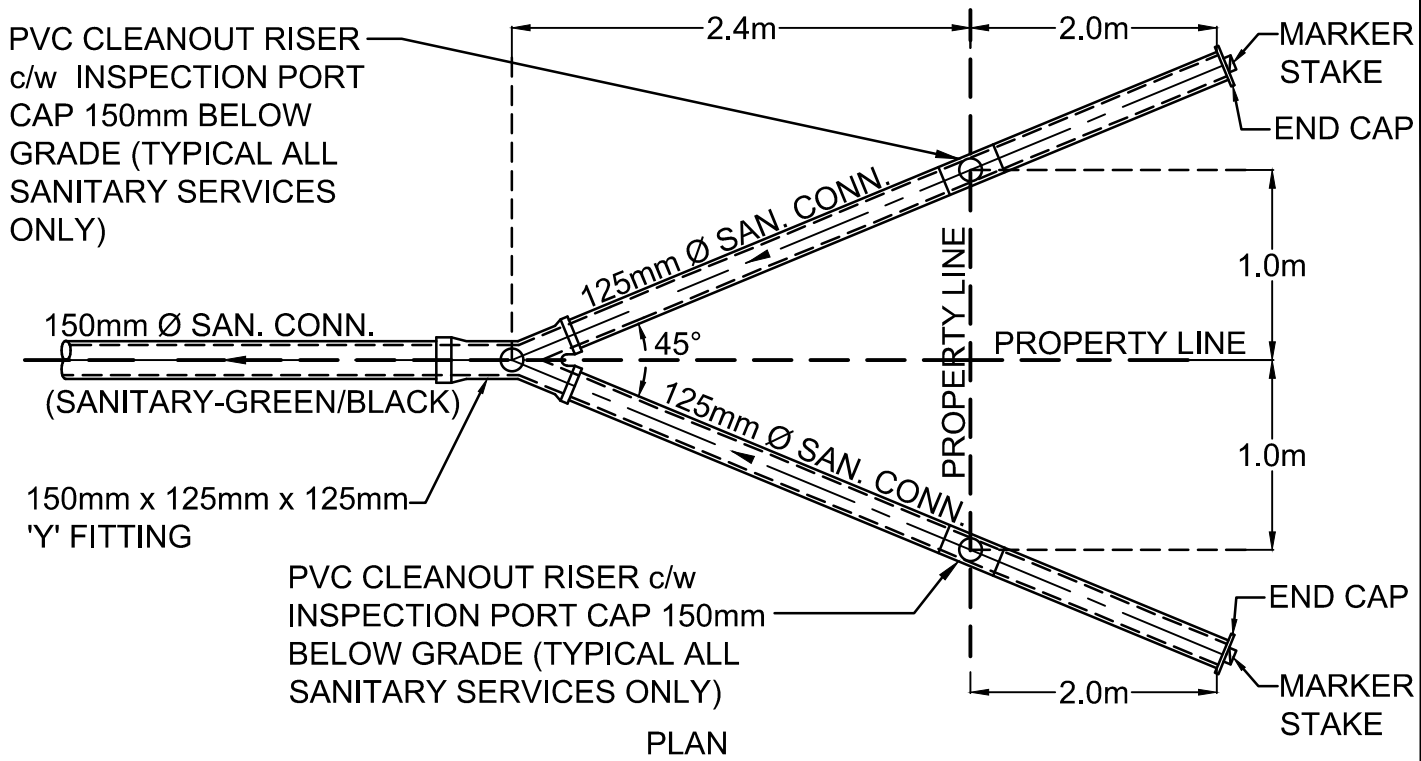
REVISIONS		
TOWNSHIP OF SPRINGWATER		
TYPICAL SEWER SERVICE LATERAL CONNECTION DETAIL		
DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-S1
DRAWN: A & A		
CHECKED: J.M.B.	SCALE: N.T.S.	



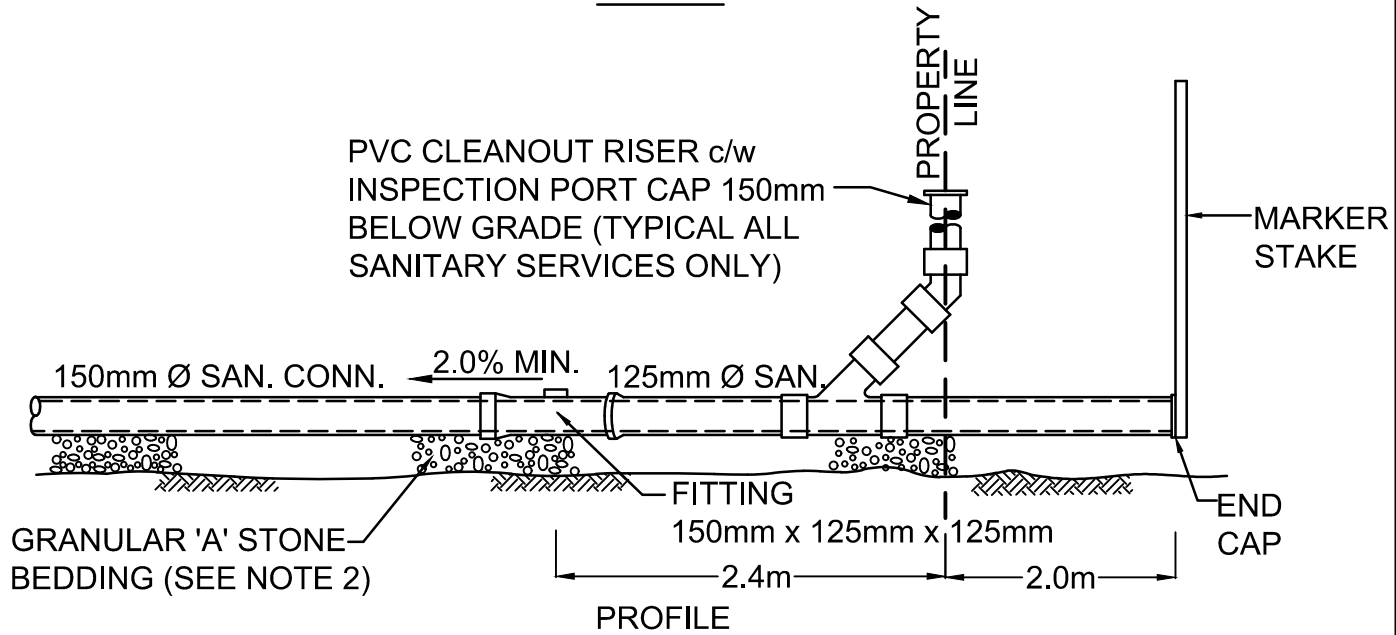
NOTES:

1. 100mm DIAMETER PVC SDR28 PIPE WHITE OR GREY IN COLOUR.
2. ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PIPE B181.1.
3. GENERAL BACKFILL TO BE SELECT NATIVE BACKFILL MATERIAL.

REVISIONS		
TOWNSHIP OF SPRINGWATER		
SUMP PUMP DISCHARGE CONNECTION TO STORM SEWER		
DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-S2
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		



PLAN

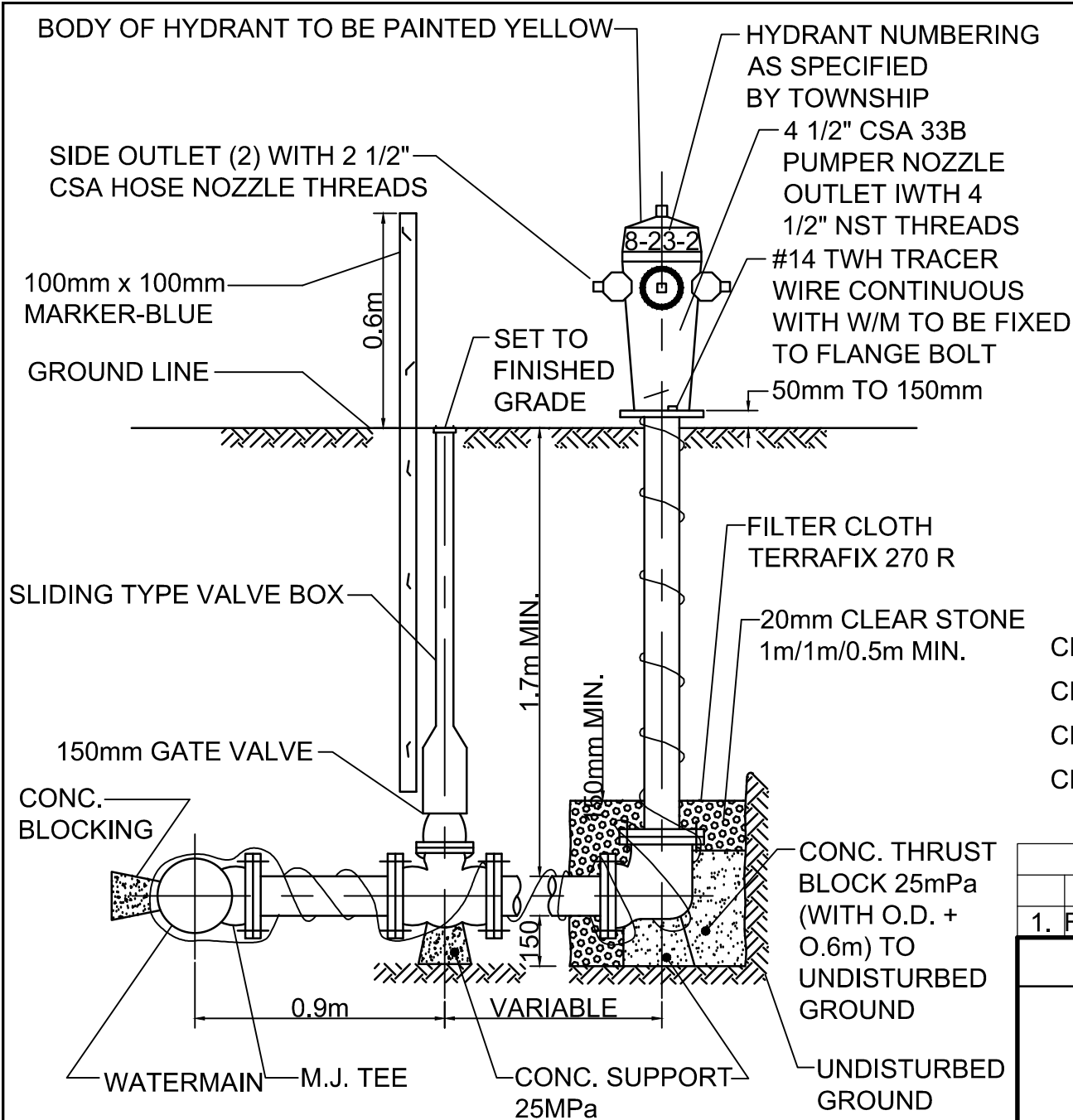


PROFILE

NOTES:

1. GENERAL BACKFILL TO BE SELECT NATIVE MATERIAL. PIPE BEDDING TO BE GRANULAR 'A'.
2. PIPE TO BE BELOW FROST LINE.
3. TYPE OF PIPE TO BE USED: PVC DR 28. COLOUR OF PIPE TO BE GREEN OR BLACK.
4. SEE STD-S1 FOR TYPICAL SEWER SERVICE CONNECTION DETAILS.

NO.	REVISIONS	APR'D	DATE
TOWNSHIP OF SPRINGWATER			
TYPICAL DOUBLE SANITARY SEWER TOWNHOUSE SERVICE CONNECTION			
DRAWN: A&A		APR'D: _____	
SCALE: N.T.S.		DATE: FEB. 2008	
			STD-S3



- NOTES:**
1. ALL HYDRANTS ARE SELF DRAINING UNLESS OTHERWISE SPECIFIED.
 2. ALL HYDRANTS TO CONFORM TO AWWA C509-01 OR AS REVISED.
 3. HYDRANT LATERALS SHALL BE PVC DR18.
 4. HYDRANT MARKER SIGNS AS DIRECTED BY THE TOWNSHIP.
 5. ALL MECHANICAL JOINTS TO BE RESTRAINED.
 6. PROVIDE BOND BREAKER BETWEEN CONCRETE AND FITTINGS.
 7. ALL HYDRANTS TO BE FLOW TESTED AND PROVIDED WITH TWO REFLECTIVE DISKS CONFORMING TO THE FOLLOWING COLOUR SCHEME:

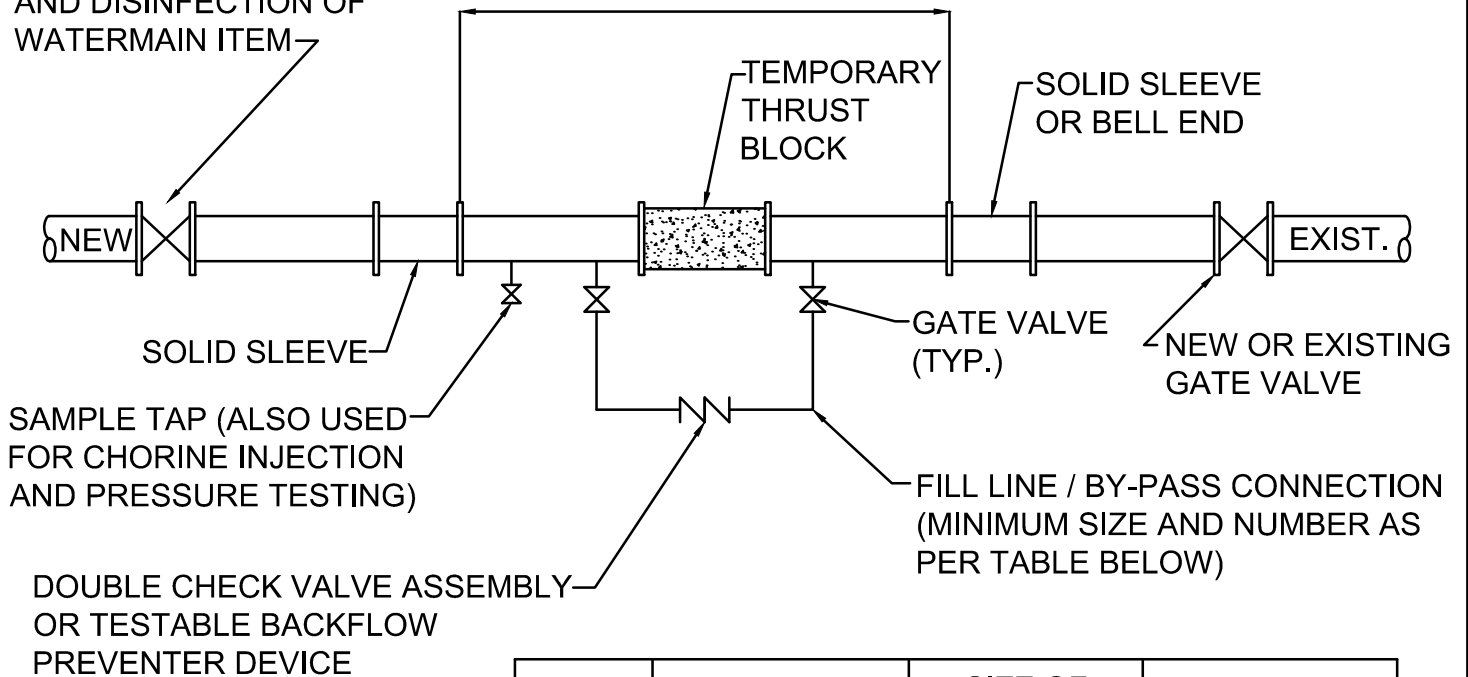
CLASS AA	LIGHT BLUE (>5680 L/min.)
CLASS A	GREEN (3785 TO 5675 L/min.)
CLASS B	ORANGE (1900 TO 3780 L/min.)
CLASS C	RED (<1900 L/min.)

TABLE A

REVISIONS		
1.	FEB. 19	ADDED REFLECTIVE MARKER DISCS
TOWNSHIP OF SPRINGWATER		
TYPICAL HYDRANT DETAIL		
DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-W1
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		

GATE VALVE TO BE LEFT IN PLACE AND INCLUDED IN TEMPORARY CONNECTION TESTING AND DISINFECTION OF WATERMAIN ITEM

REPLACEMENT SECTION AFTER COMPLETION OF TESTING, FLUSHING, AND DISINFECTION OPERATIONS

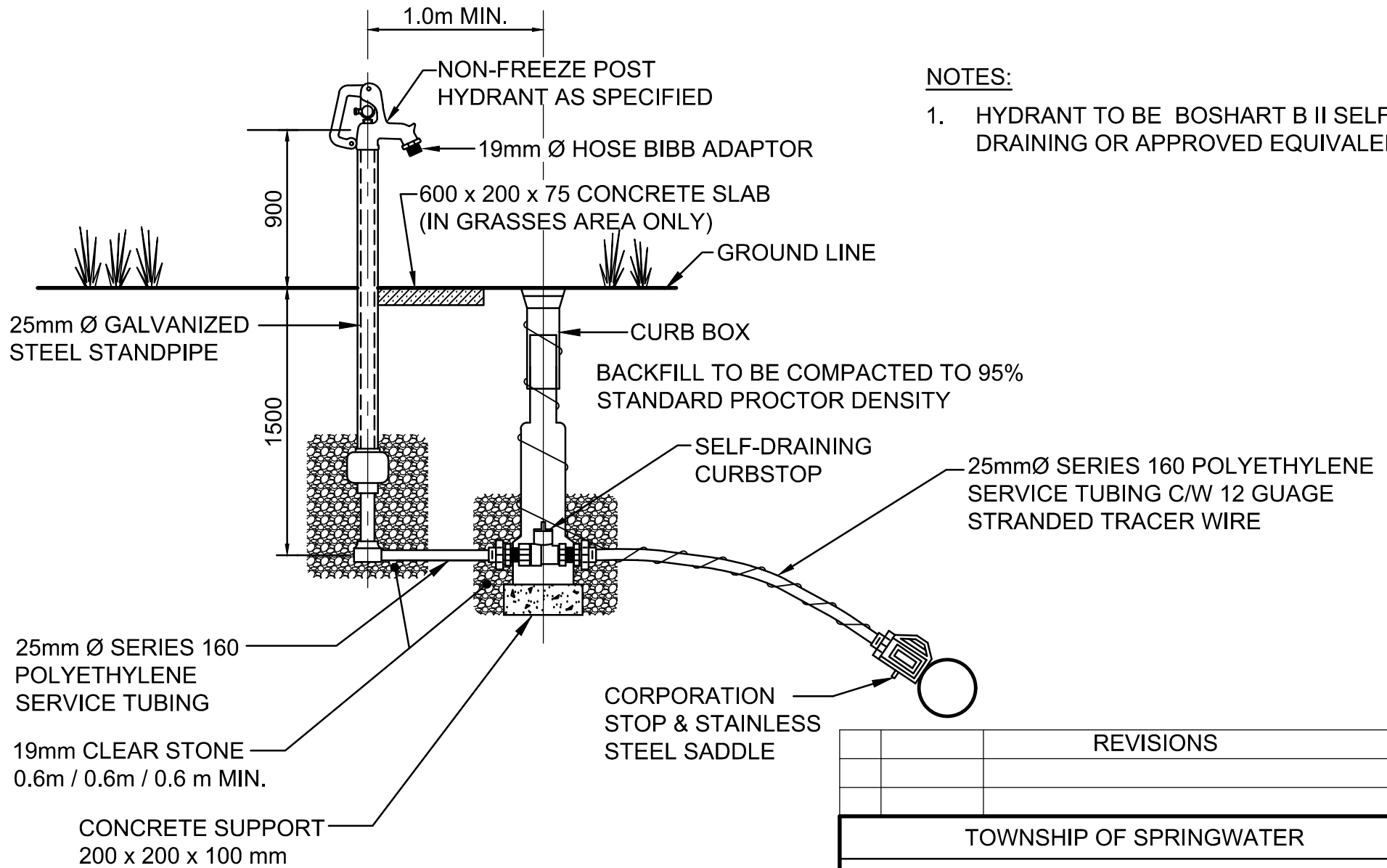


PIPE DIA.	FLOW REQUIRED TO PRODUCE 0.76m/s (APPROX.) VELOCITY IN MAIN	SIZE OF TAP (mm)			NUMBER OF OPEN 64mm (2 1/2") HYDRANT SIDE OUTLETS
		25	38	51	
mm	l/s	NUMBER OF TAPS ON PIPE			
100	6.3	1	-	-	1
150	12.6	-	1	-	1
200	25.2	-	2	1	1
250	37.9	-	3	2	1
300	56.8	-	-	2	2
400	109.9	-	-	4	2

NOTES:

1. REQUIRED FLOW AND OPENINGS TO FLUSH PIPELINES (276 kPa / 40 PSI RESIDUAL PRESSURE IN WATERMAIN)

REVISIONS		
TOWNSHIP OF SPRINGWATER		
TYPICAL TEMPORARY BY-PASS CONNECTION FOR WATERMAINS		
DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-W2
DRAWN: A & A		
CHECKED: J.M.B.	SCALE: N.T.S.	



NOTES:

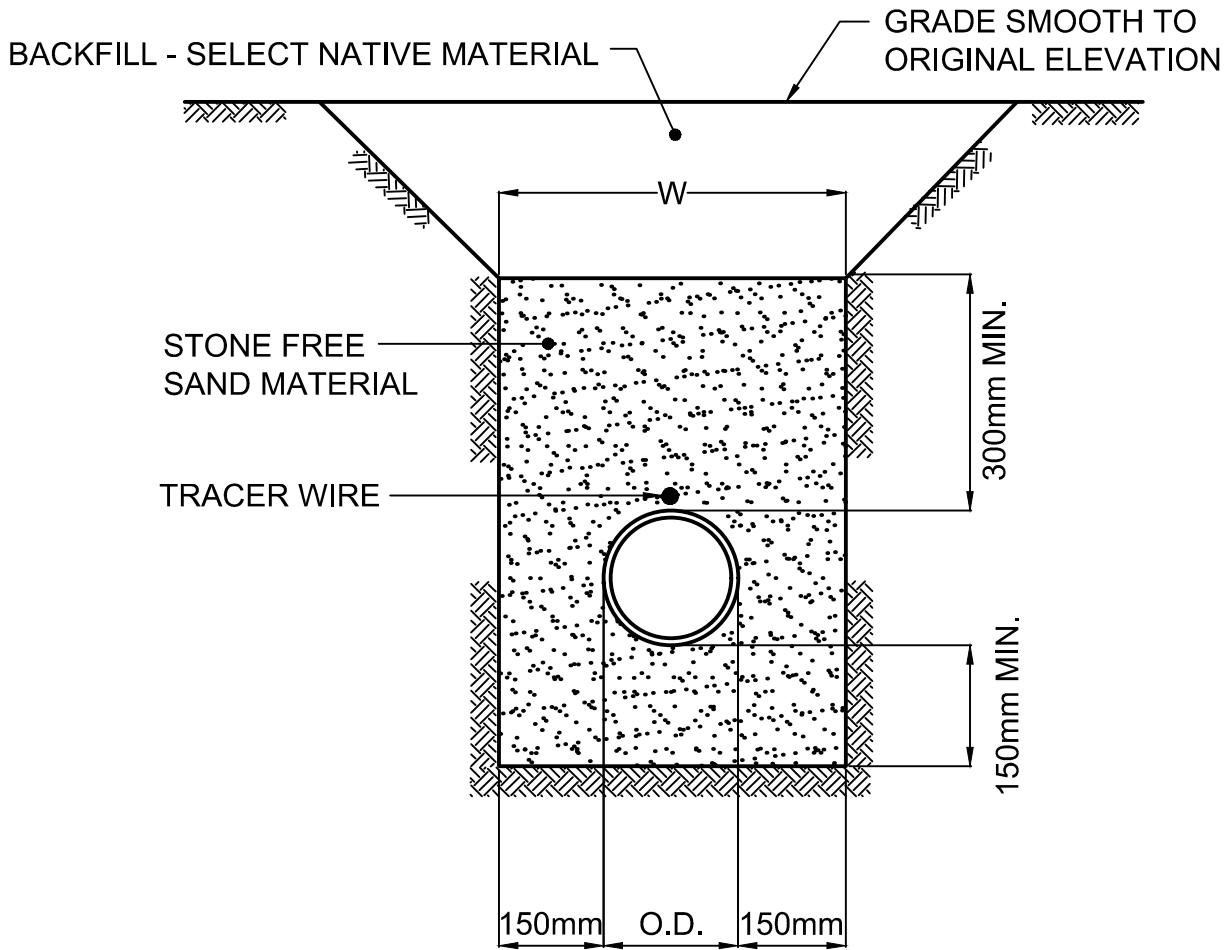
1. HYDRANT TO BE BOSHART B II SELF DRAINING OR APPROVED EQUIVALENT

REVISIONS	

TOWNSHIP OF SPRINGWATER

NON-FREEZE POST HYDRANT DETAIL
& WATER SAMPLING STATION

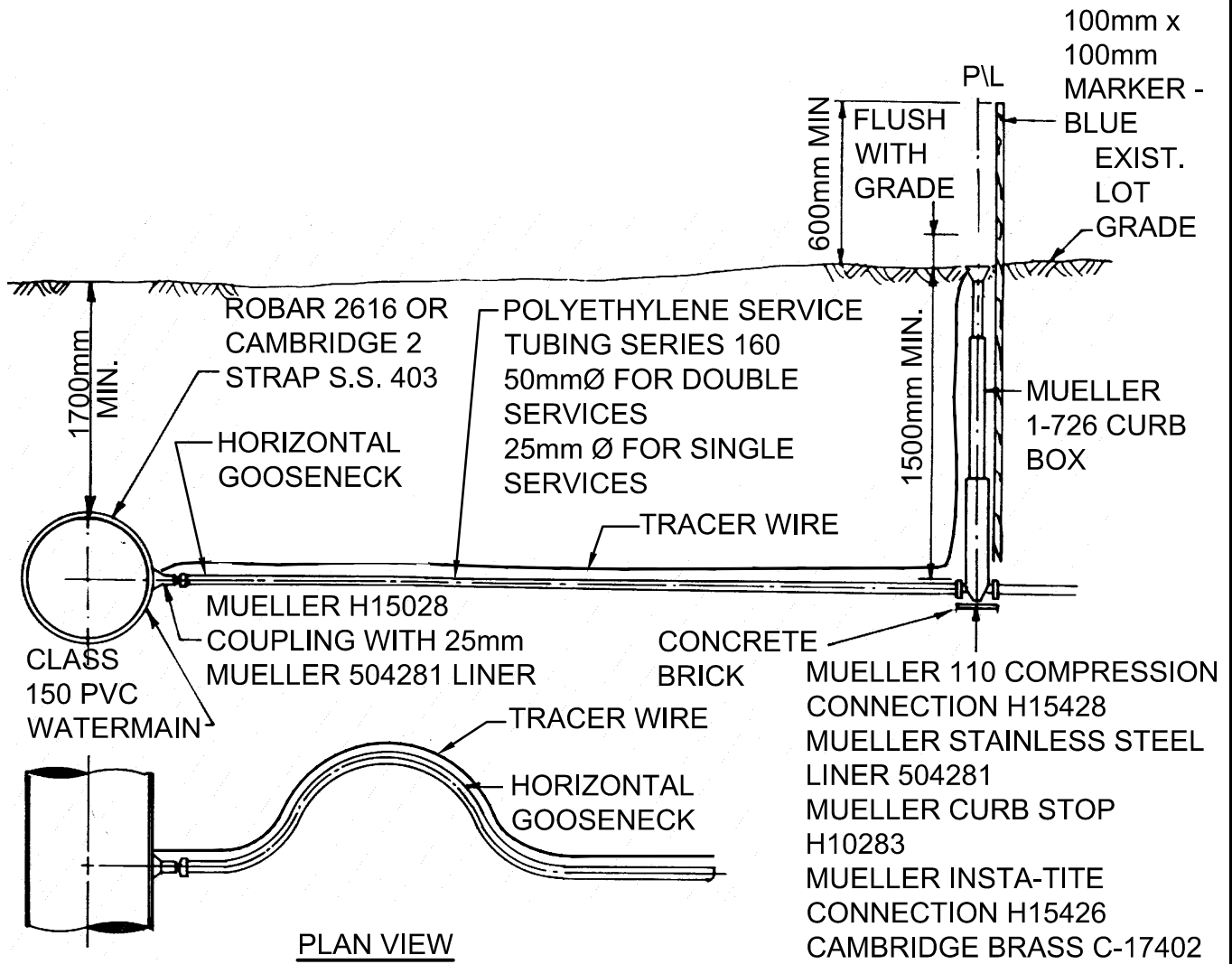
DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-W3
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		



1. COMPACTION OF BACKFILL WILL BE REQUIRED IN DRIVEWAYS AND UNDER TRAVELLED PORTIONS OF THE ROADWAY
2. BACKFILL FOR ROAD CROSSINGS WILL BE COMPACTED GRAN. "B"
3. ALL BACKFILL SHALL BE COMPACTED TO 95% SPMDD

MAXIMUM TRENCH WIDTH
 $W = \text{OUTSIDE PIPE DIAMETER PLUS } 0.6\text{m}$

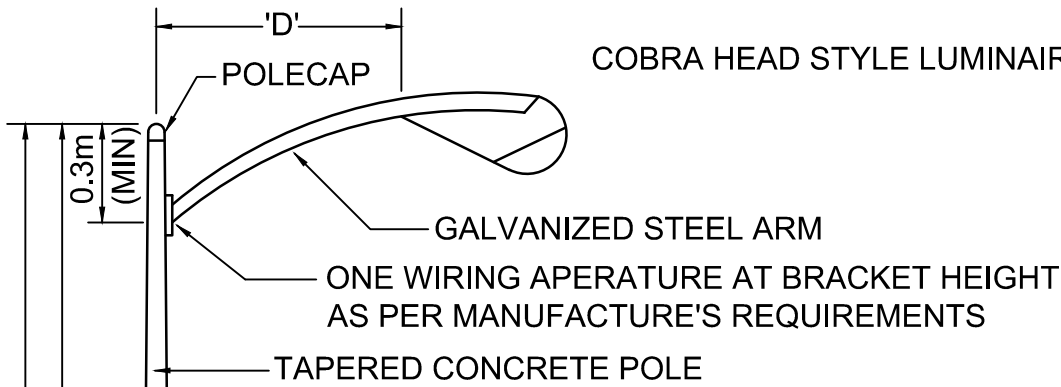
REVISIONS		
TOWNSHIP OF SPRINGWATER		
WATERMAIN BEDDING DETAIL		
DESIGN: A & A	DATE: MAR. 1999	DWG. No. STD-W4
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: JMB		



REVISIONS		
2.	FEB.'19	INCREASED DIAMETER OF SERVICES
1.	FEB.'99	CURB STOPS ON PROPERTY LINE

TOWNSHIP OF SPRINGWATER		
WATER SERVICE CONNECTION DETAIL		
DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-W5
DRAWN: A & A		
CHECKED: J.M.B.	SCALE: N.T.S.	

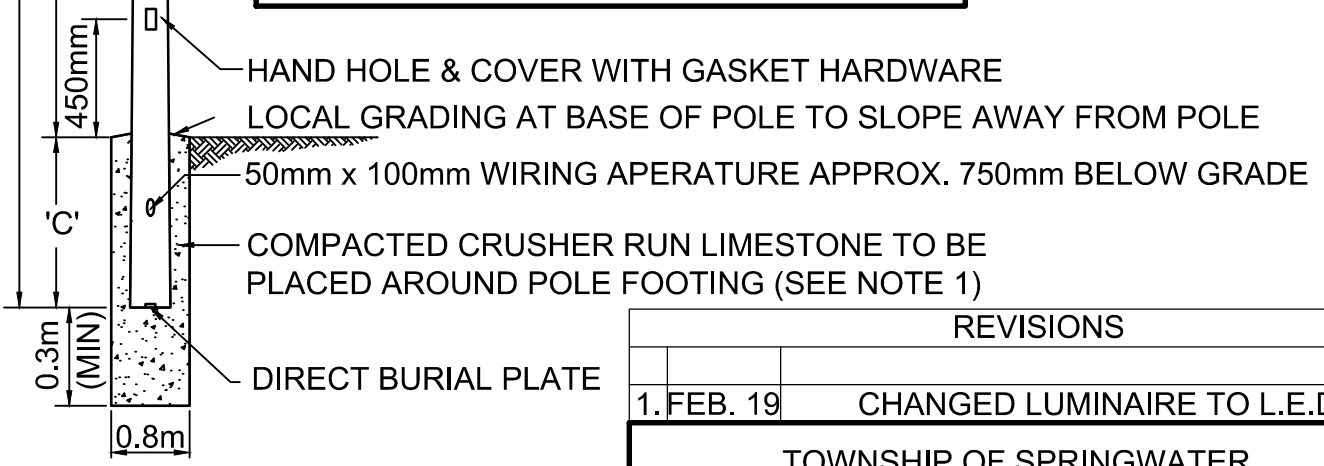
COBRA HEAD STYLE LUMINAIRE



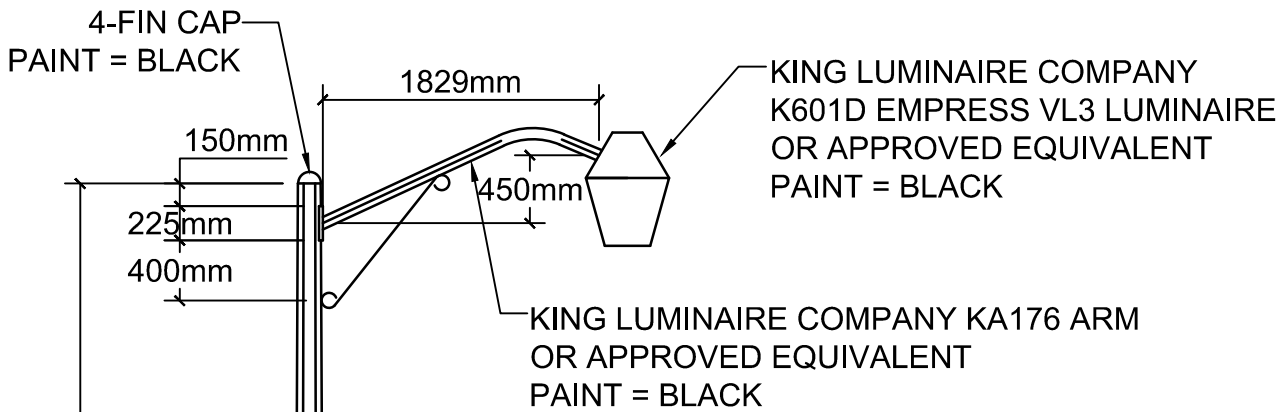
RECOMMENDED MOUNTING HEIGHTS					
	CLASS	A	B	C *	D
RESIDENTIAL	LOCAL	7.6	9.2	1.6	1.8
	ESTATE	9.0	10.7	1.7	3.0
INDUSTRIAL	SEMI-URBAN	10.3	12.2	1.9	1.2
	URBAN	7.6	9.2	1.6	1.8
COLLECTOR	14m	10.3	12.2	1.9	3.0

- NOTES:**
1. ALL STREETLIGHT DESIGNS MUST CONFORM TO THE REQUIREMENTS OF THE ILLUMINATION ENGINEERING SOCIETY GUIDELINES.
 2. LUMINAIRE TO BE L.E.D.
 3. BURIAL DEPTHS & FOOTING DESIGN TO BE AS PER MANUFACTURER'S RECOMMENDATION TO SUIT SITE SOIL CONDITIONS.
 4. ALL NATIVE FILL MATERIAL TO BE COMPACTED TO A MINIMUM 95% SPMDD.
 5. DESIGN FOR MINIMUM 150 KPH WIND GUST VELOCITY.

'B'A'



REVISIONS		
1.	FEB. 19	CHANGED LUMINAIRE TO L.E.D.
TOWNSHIP OF SPRINGWATER		
STANDARD STREET LIGHT & POLE DETAIL		
DESIGN: A & A	DATE: APR. 2007	DWG. No.
DRAWN: A & A	SCALE: N.T.S.	STD-SL1
CHECKED: J.M.B.		



NOTES:

1. ALL STREETLIGHT DESIGNS MUST CONFORM TO THE REQUIREMENTS OF THE ILLUMINATION ENGINEERING SOCIETY GUIDELINES.
2. LUMINAIRE TO BE L.E.D.
3. BURIAL DEPTHS & FOOTING DESIGN TO BE AS PER MANUFACTURER'S RECOMMENDATION TO SUIT SITE SOIL CONDITIONS.
4. ALL NATIVE FILL MATERIAL TO BE COMPACTED TO A MINIMUM 95% SPMDD.
5. DESIGN FOR MINIMUM 150 KPH WIND GUST VELOCITY.

10668mm

KING LUMINAIRE COMPANY E350-APO-G
OCTAGONAL SPUN CONCRETE POLE
OR APPROVED EQUIVALENT

NAMEPLATE

50mm x 200mm ZINC RECESSED H.H. BOX
& COVERPLATE c/w GROUND WIRE &
ROBERTSON SCREWS

LOCAL GRADING AT BASE OF
POLE TO SLOPE AWAY FROM POLE

COMPACTED CRUSHER RUN LIMESTONE
TO BE PLACED AROUND POLE FOOTING
(SEE NOTE 1)

300mm

450mm

450mm

1000mm

50mm x 100mm
WIRING
APERATURE
(BOTH SIDES)
APPROX. 450mm
BELOW GRADE

DIRECT BURIAL
PLATE

REVISIONS

1.	FEB. 19	CHANGED LUMINAIRE TO L.E.D.
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TOWNSHIP OF SPRINGWATER

ESTATE STREET LIGHT
& POLE DETAIL

DESIGN: A & A

DRAWN: A & A

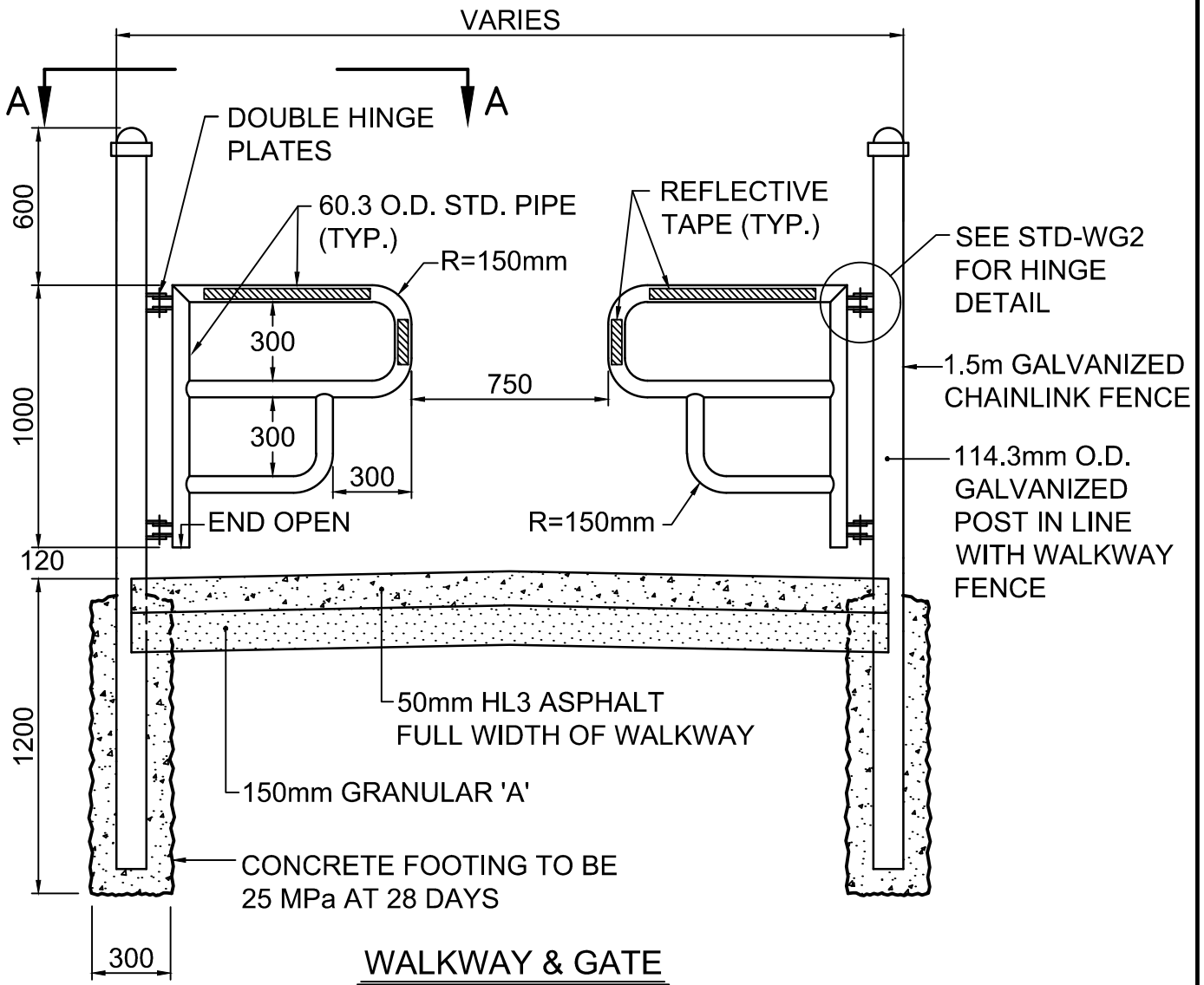
CHECKED: J.M.B.

DATE: APR. 2007

SCALE: N.T.S.

DWG. No.

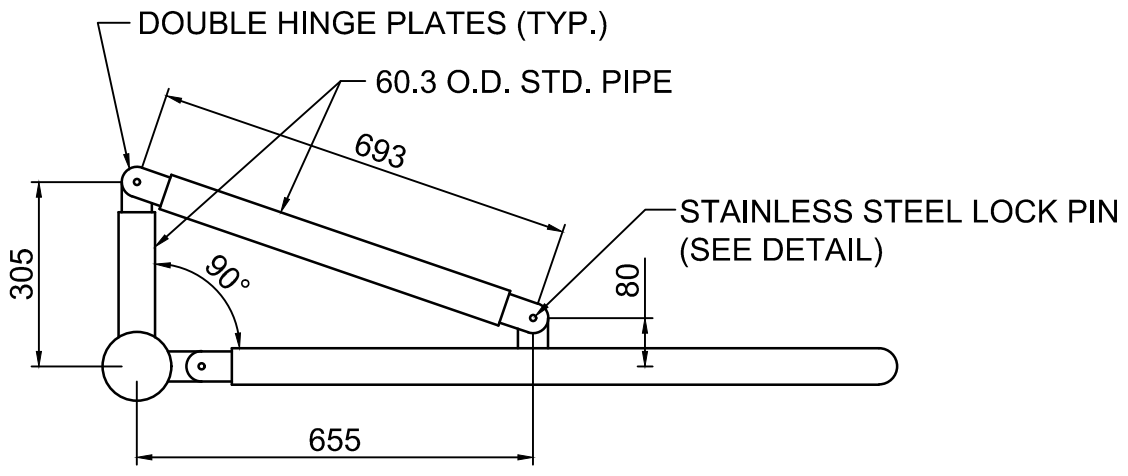
STD-SL2



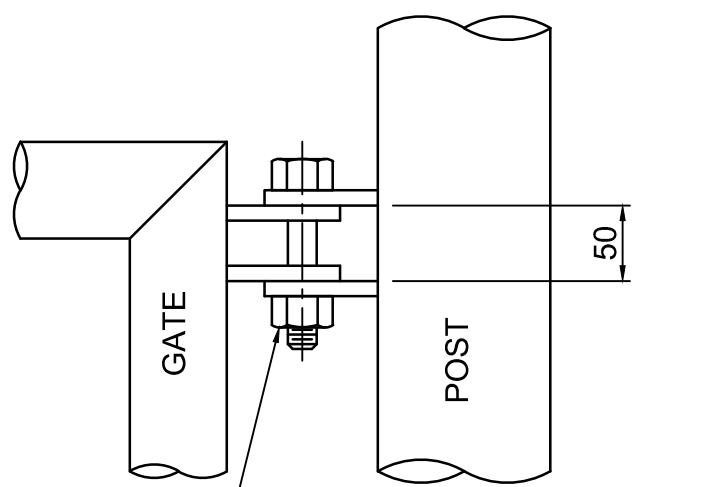
NOTES:

1. ALL JOINTS TO BE WELDED.
2. GATES AND POSTS TO BE PREMANUFACTURED AND HOT DIPPED GALVANIZED. GATES SHALL ALSO BE PAINTED SAFETY YELLOW FOLLOWING GALVANIZING AND PROPER SURFACE TREATMENT TO ENSURE ADHESION OF PAINT TO GALVANIZING
3. HINGE PINS TO BE 19mm Ø STAINLESS STEEL BOLTS WITH LOCK NUTS WELDED.

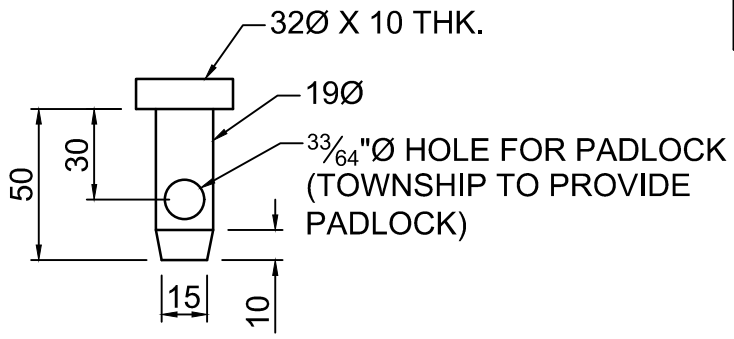
REVISIONS		
1. FEB. 19		REVISED POST HEIGHT
TOWNSHIP OF SPRINGWATER		
WALKWAY GATE DETAIL		
DESIGN: A & A	DATE: APR. 2007	DWG. No.
DRAWN: A & A	SCALE: N.T.S.	STD-WG1
CHECKED: J.M.B.		



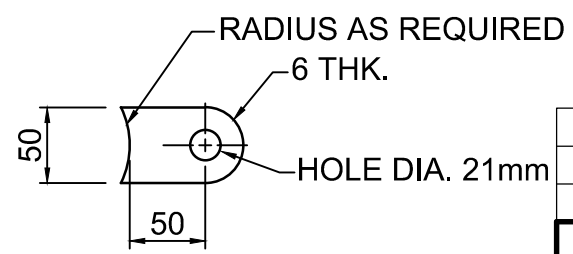
PLAN A-A



HINGE DETAIL

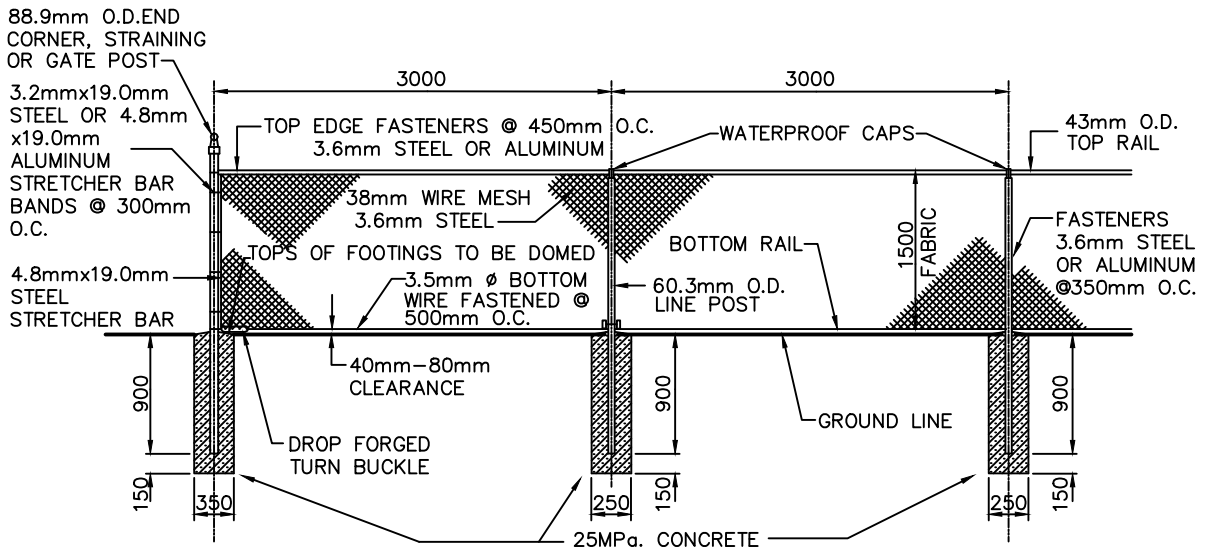


STAINLESS STEEL LOCK PIN

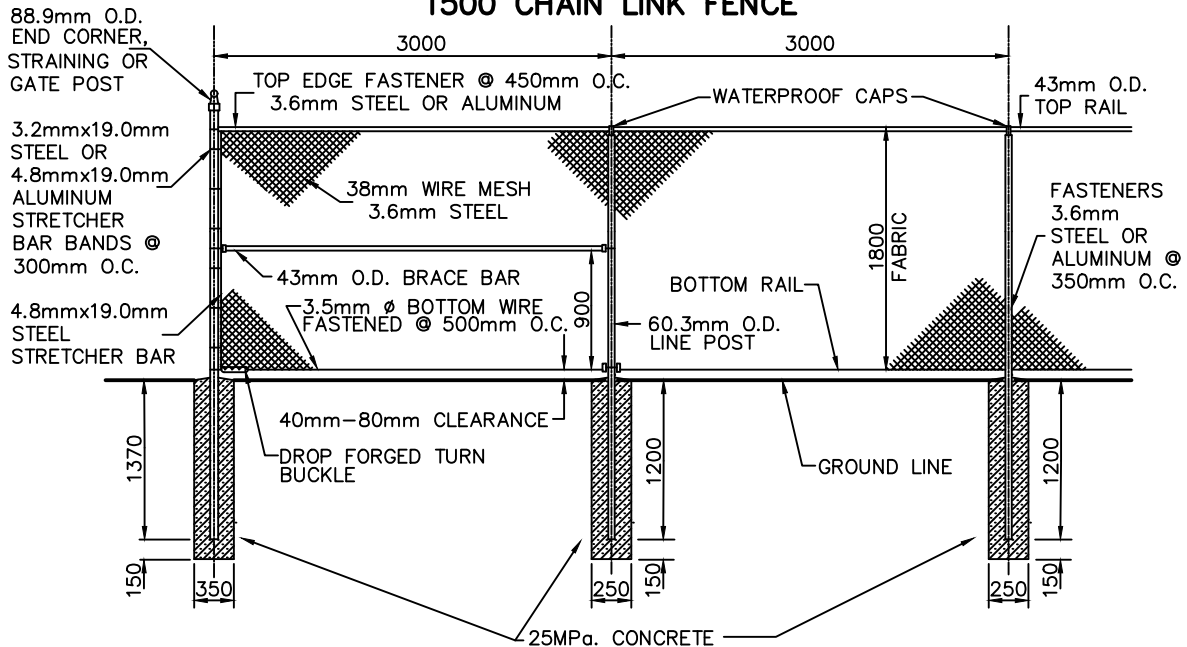


HINGE PLATE DETAIL

REVISIONS		
TOWNSHIP OF SPRINGWATER		
WALKWAY GATE HINGE DETAIL		
DESIGN: A & A	DATE: APR. 2007	DWG. No.
DRAWN: A & A	SCALE: N.T.S.	STD-WG2
CHECKED: J.M.B.		



1500 CHAIN LINK FENCE



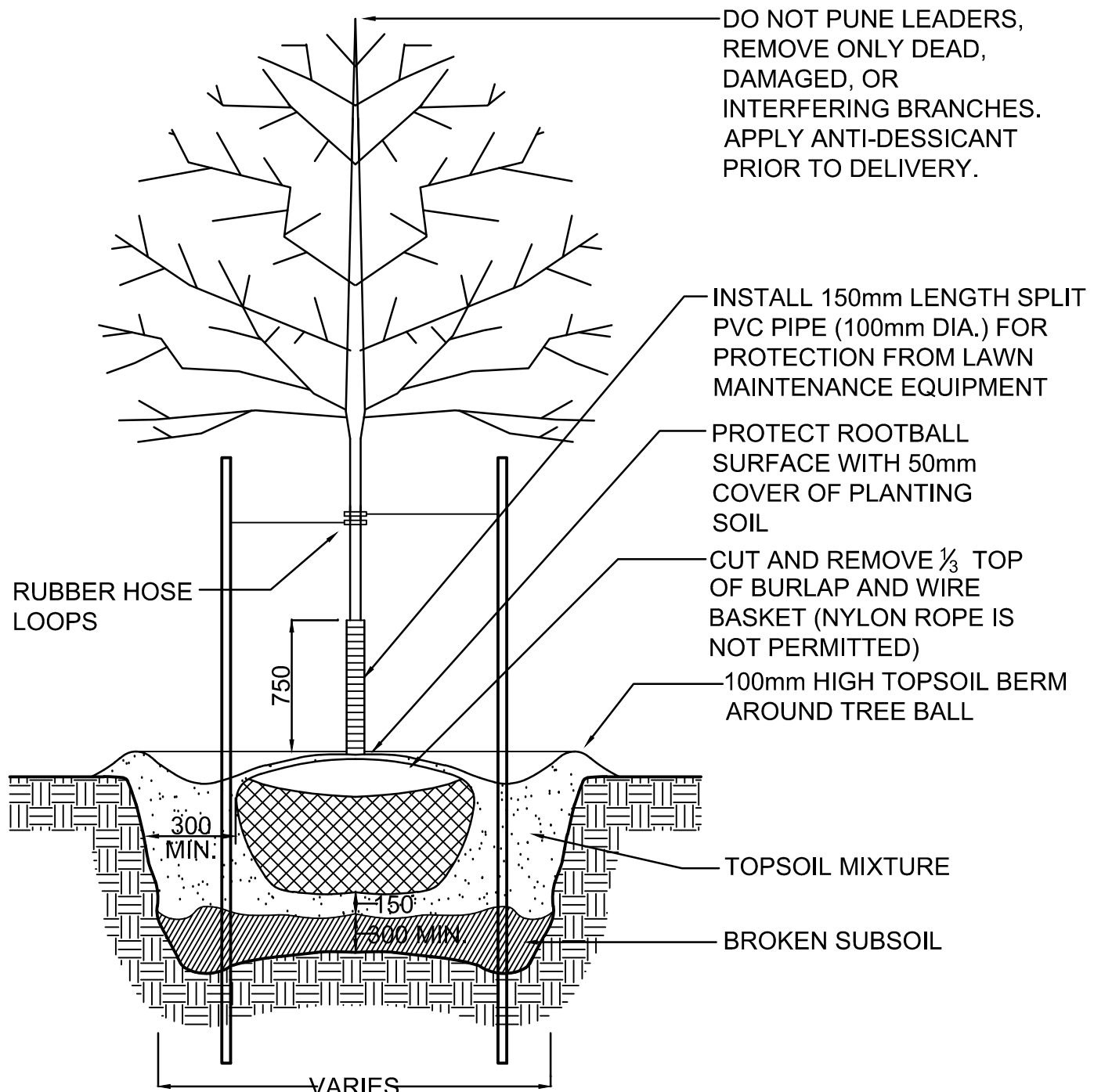
1800 CHAIN LINK FENCE

NOTES:

1. ALL FABRIC SHALL BE 3.6mm KNUCKLED AT TOP AND BOTTOM AND ONE OF THE FOLLOWING MATERIALS:
 (A) STEEL WIRE, HOT DIP GALVANIZED AFTER WEAVING
 (B) STEEL WIRE, ELECTRO GALVANIZED BEFORE WEAVING
2. ALL POSTS AND RAILS SHALL BE GALVANIZED STEEL "SCHEDULE 40 PIPE", CONFORMING TO CURRENT SPECIFICATIONS FOR BLACK & HOT DIPPED ZINC COATED (GALVANIZED) WELDED AND SEAMLESS PIPE. FOR ORDINARY USES, ASTM DESIGNATION A 120.
3. ALL REQUIRED FITTINGS AND HARDWARE SHALL BE OF A SUITABLE ALUMINUM ALLOY OR OF A STEEL DUCTILE IRON. ASTM SPECIFICATIONS (A 152)
4. MINIMUM REQUIREMENTS FOR ZINC COATING

FABRIC AND WIRE	0.5 kg/m ²
POST AND RAILS	0.5 kg/m ²
FRAMES AND BRACES	0.5 kg/m ²
CAST FITTINGS	0.6 kg/m ²
OTHER FITTINGS	0.6 kg/m ²

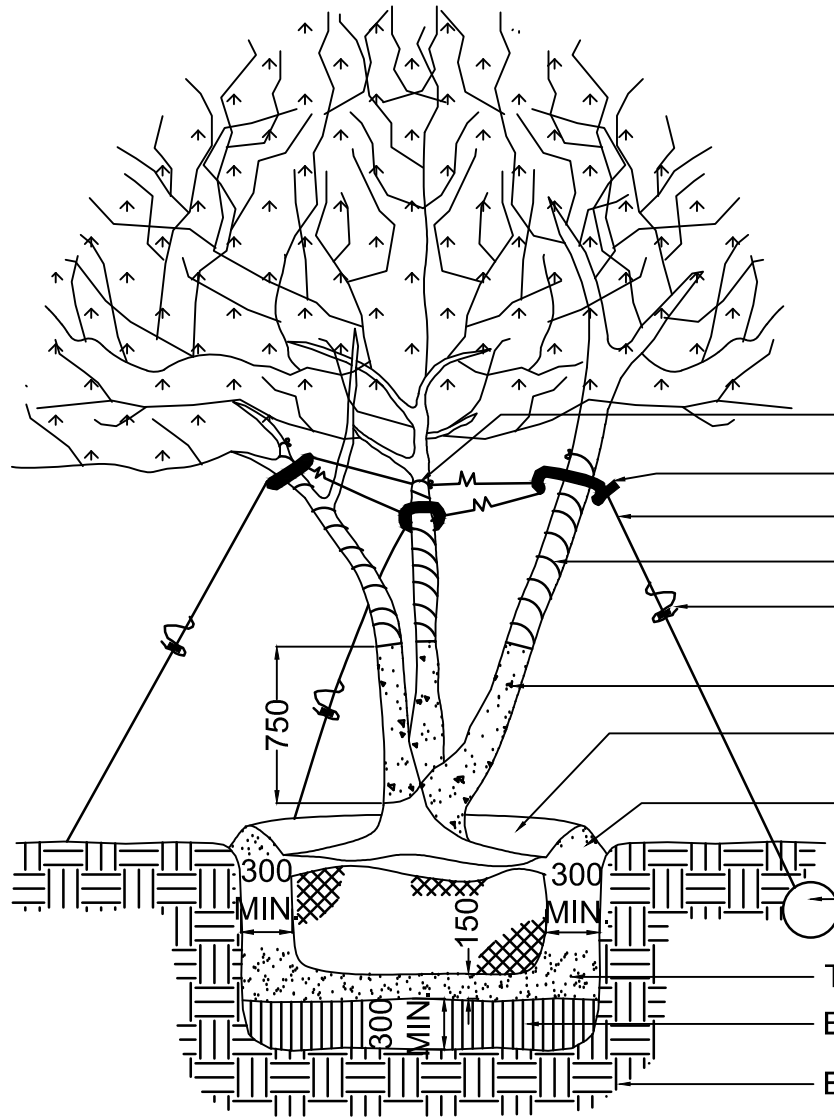
REVISIONS		
TOWNSHIP OF SPRINGWATER		
CHAIN LINK FENCE		
DESIGN: A & A	DATE: JAN. 2011	DWG. No. STD-P1
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: TRG		



NOTES:

1. EACH TREE TO BE SUPPORTED BY TWO 50mm x 50mm STAKES 2.4m LONG. EACH STAKE TO BE INSTALLED WITH THE GUY WIRE AT 1.5m ABOVE FINISHED GRADE.
2. WATER AT TIME OF PLANTING AND WHENEVER DEEMED NECESSARY TO MAINTAIN THE TREES IN HEALTHY CONDITION.
3. PLANT TREE NO HIGHER THAN 50mm ABOVE ORIGINAL GROUND GRADE TO ALLOW FOR SETTLEMENT.

REVISIONS		
TOWNSHIP OF SPRINGWATER		
PLANTING AND GUYING OF DECIDUOUS TREES		
DESIGN: A & A	DATE: JUN. 2007	DWG. No. STD-P2
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		



NOTE:

SPRAY TRUNK WITH MALATHION BEFORE WRAPPING

MINIMUM OF 3 GUY WIRES

TREE WRAPPING BURLAP OR PAPER 100mm WIDE TIED WITH TWINE

EACH HOSE LOOP CONNECTED BY GALV. WIRE

RUBBER HOSE LOOP

GALV. GUY WIRES (SEE NOTE ABOVE)

TREE WRAP (SEE NOTES ABOVE)

GALVANIZED TURNBUCKLE

PLASTIC TREE GUARD

100mm DEEP WOOD CHIP MULCHING

100mm HIGH TOPSOIL BERM AROUND TREE BALL

100mmØ DISC

ANCHOR

750mm DEEP

TOPSOIL MIXTURE

BROKEN SUBSOIL

EXISTING SUBSOIL

REVISIONS

TOWNSHIP OF SPRINGWATER

PLANTING AND GUYING OF
MULTI-STEM DECIDUOUS TREES

DESIGN: A & A

DRAWN: A & A

CHECKED: J.M.B.

DATE: JUN. 2007

SCALE: N.T.S.

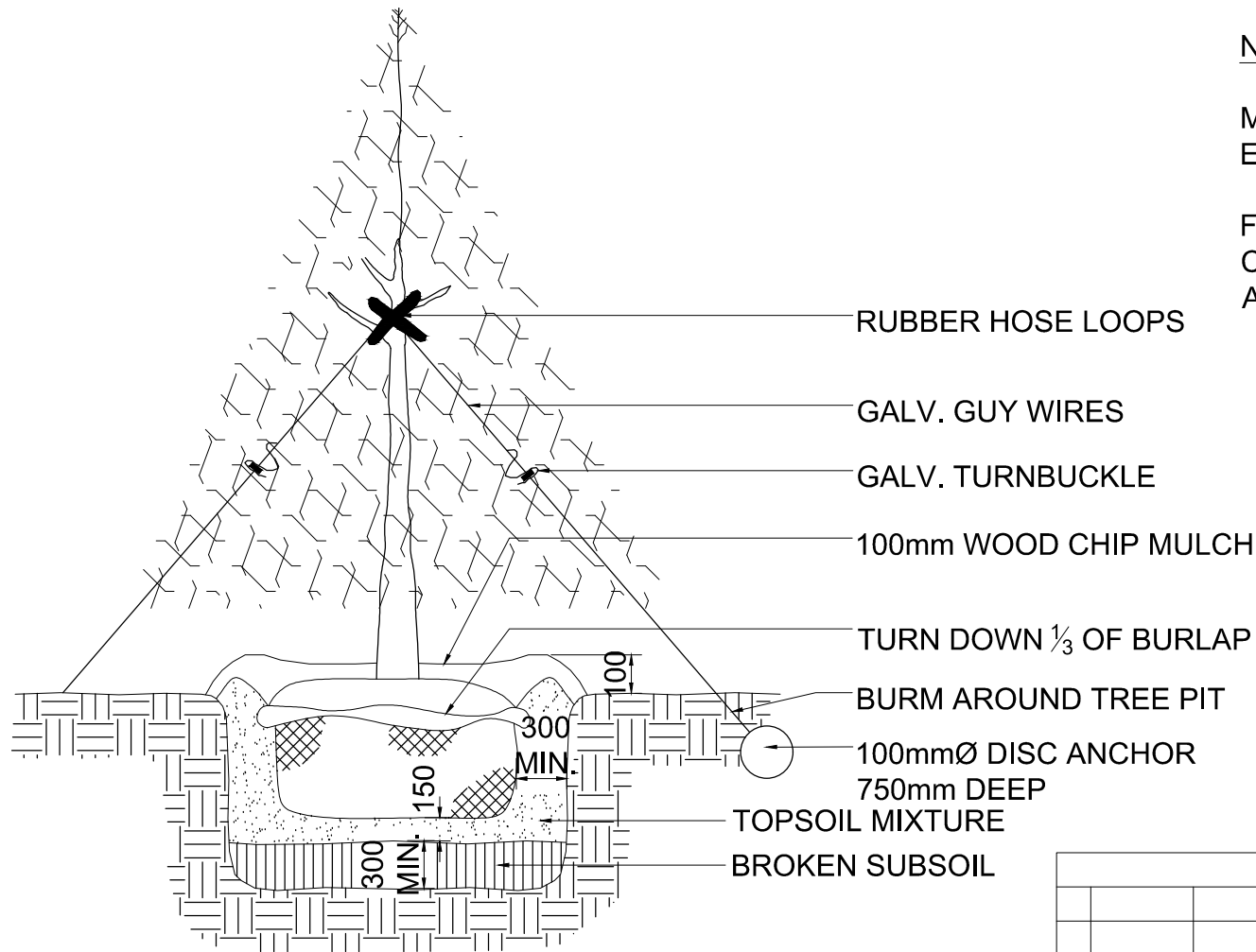
DWG. No.

STD-P3

NOTE:

MIN. OF 3 GUY WIRES,
EQUALLY DISTRIBUTED

FALL PLANTED
CONIFERS TO RECEIVE
ANTI-DESICCANT SPRAY



REVISIONS

REVISIONS		

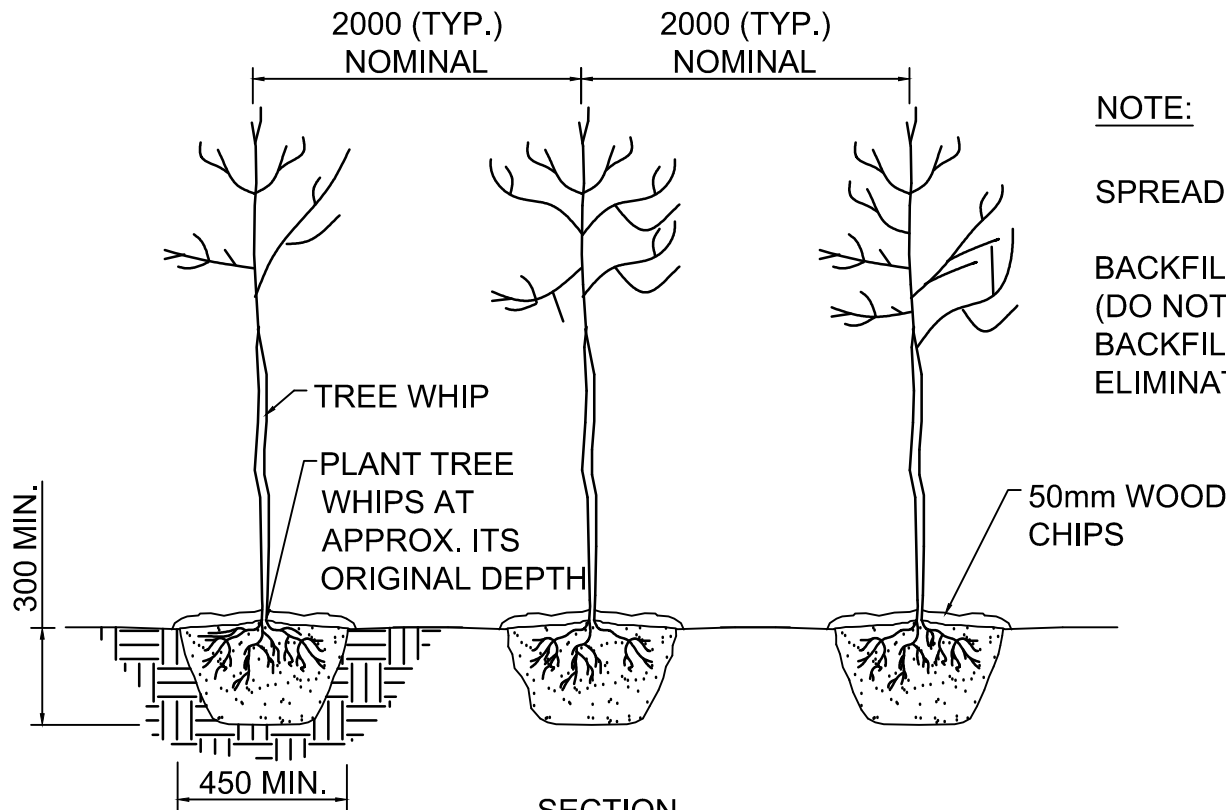
TOWNSHIP OF SPRINGWATER

PLANTING AND GUYING
OF CONIFEROUS TREES

DESIGN: A & A
DRAWN: A & A
CHECKED: J.M.B.

DATE: JUN. 2007
SCALE: N.T.S.

DWG. No.
STD-P4

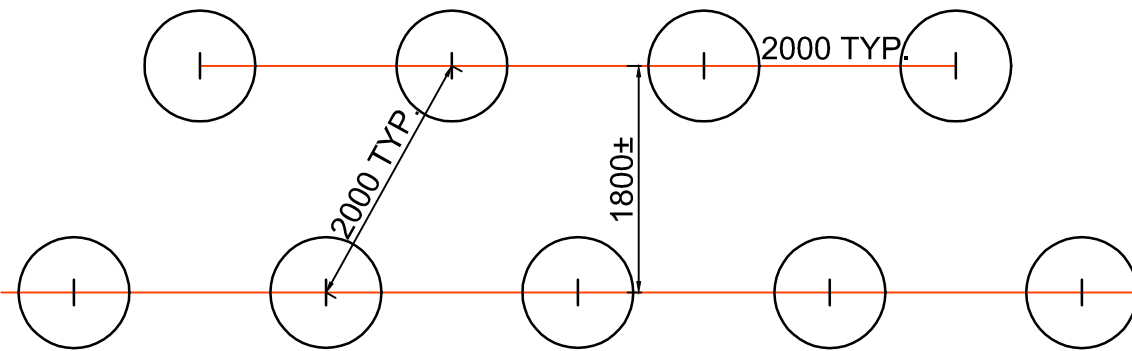


NOTE:

SPREAD ROOTS IN ALL DIRECTIONS

BACKFILL WITH TOPSOIL MIXTURE (DO NOT USE EXCAVATED MATERIAL FOR BACKFILLING) TAMP THOROUGHLY TO ELIMINATE AIR VOIDS.

SECTION

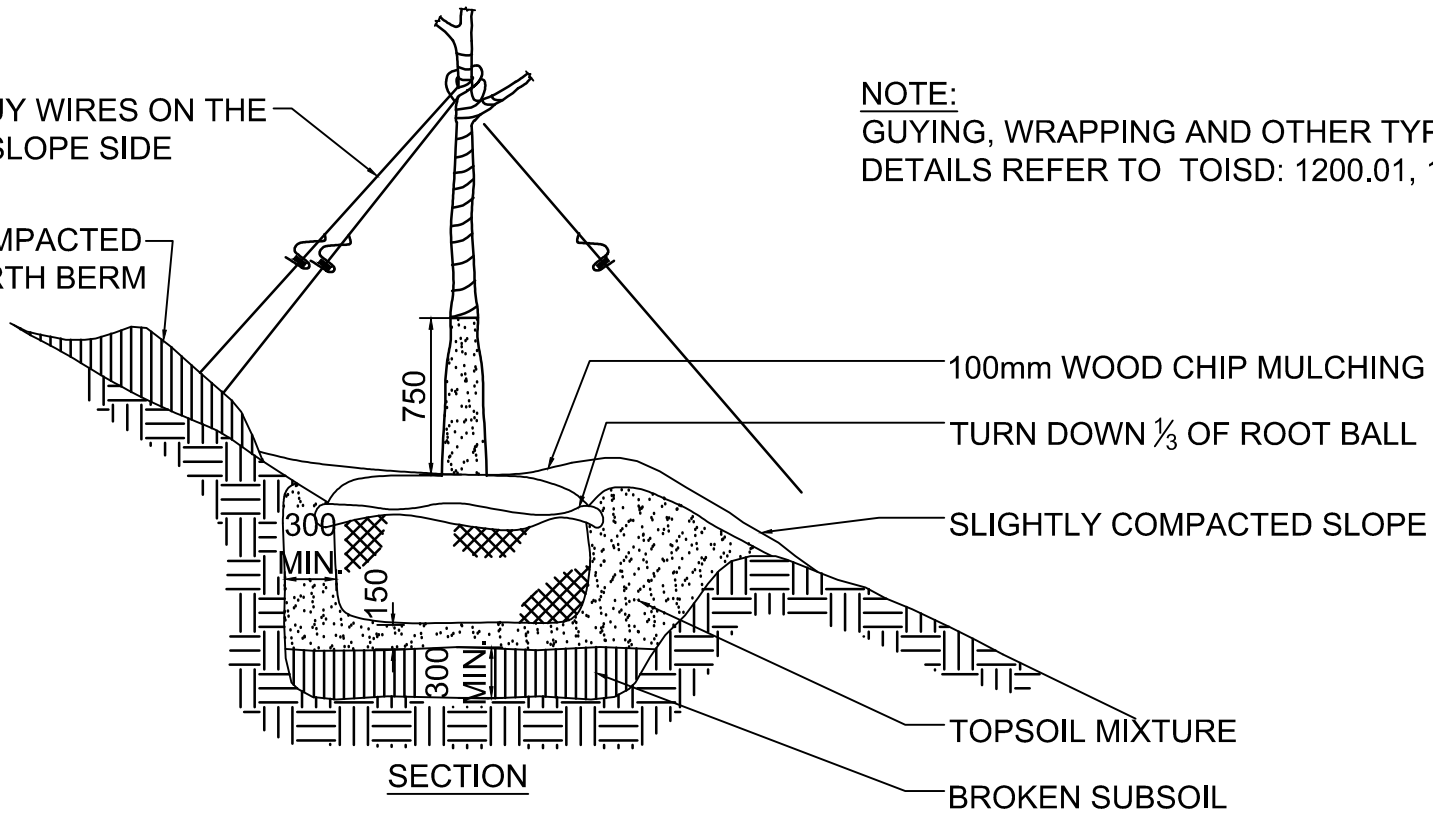


PLAN VIEW

REVISIONS		
TOWNSHIP OF SPRINGWATER		
PLANTING OF TREE WHIPS		
DESIGN: A & A	DATE: JUN. 2007	DWG. No. STD-P5
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		

2 GUY WIRES ON THE UP-SLOPE SIDE

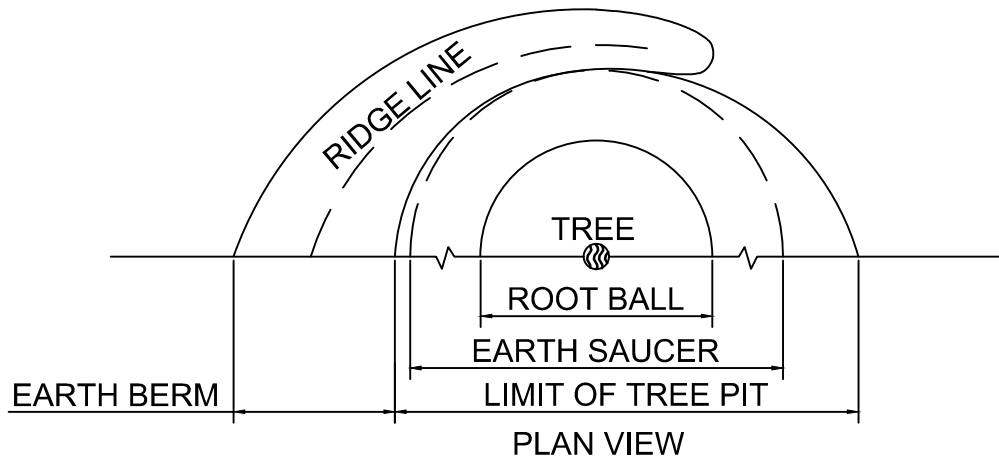
COMPACTED EARTH BERM



NOTE:
 GUYING, WRAPPING AND OTHER TYPICAL PLANTING
 DETAILS REFER TO TOISD: 1200.01, 1200.02 & 1200.03

SECTION

SLOPE →



REVISIONS

TOWNSHIP OF SPRINGWATER

PLANTING ON SLOPE

DESIGN: A & A

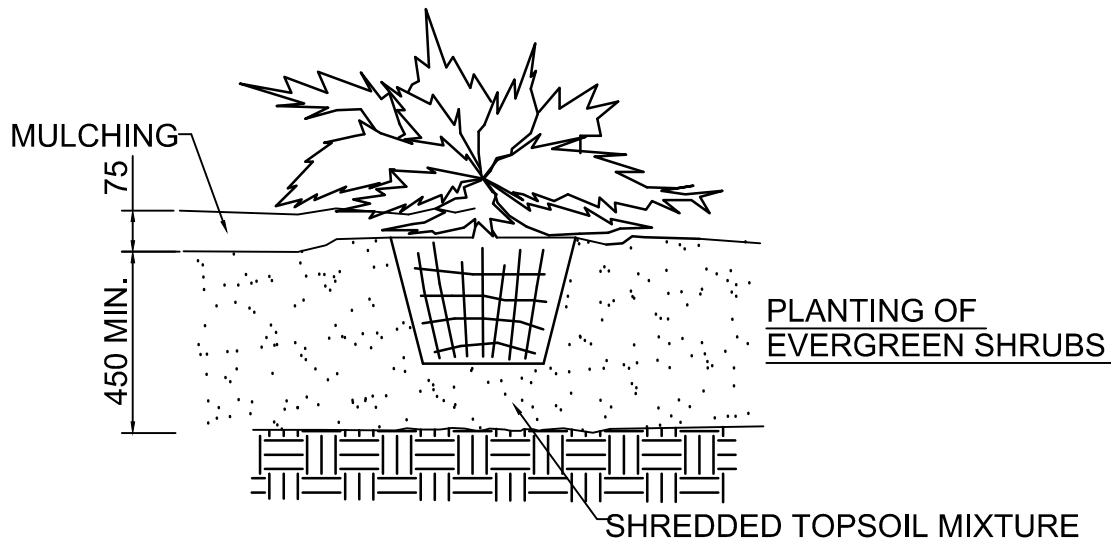
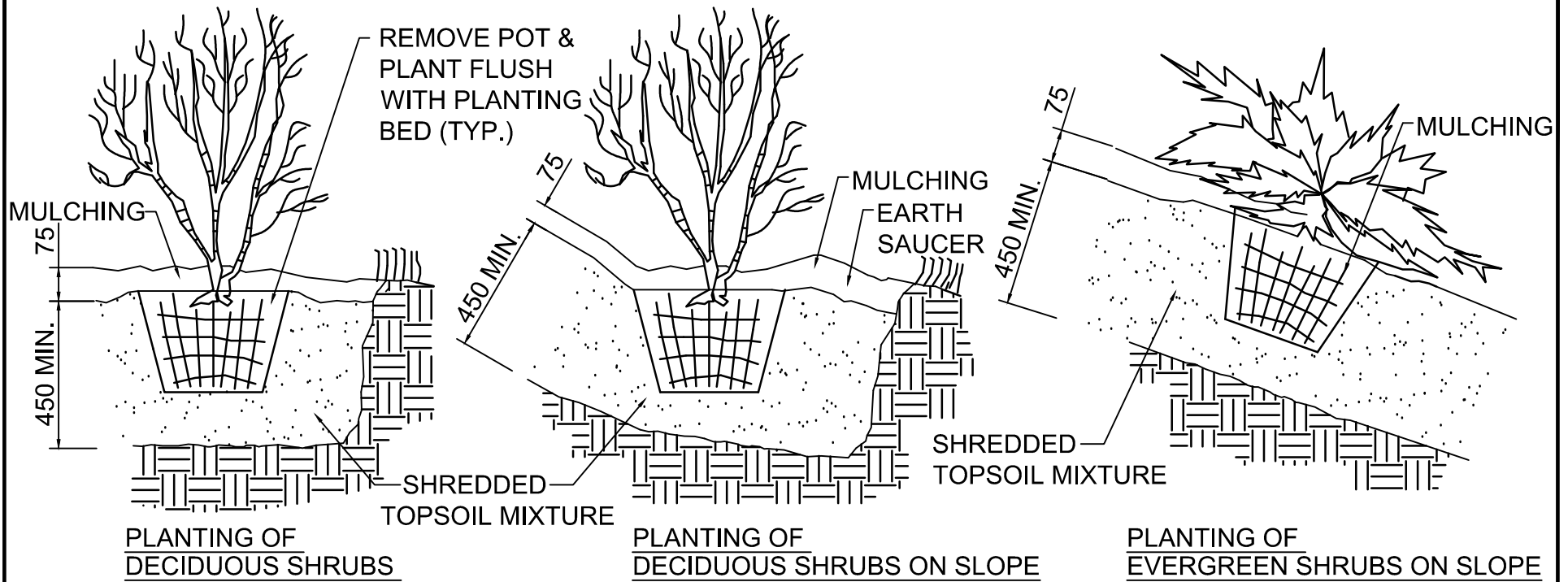
DRAWN: A & A

CHECKED: J.M.B.

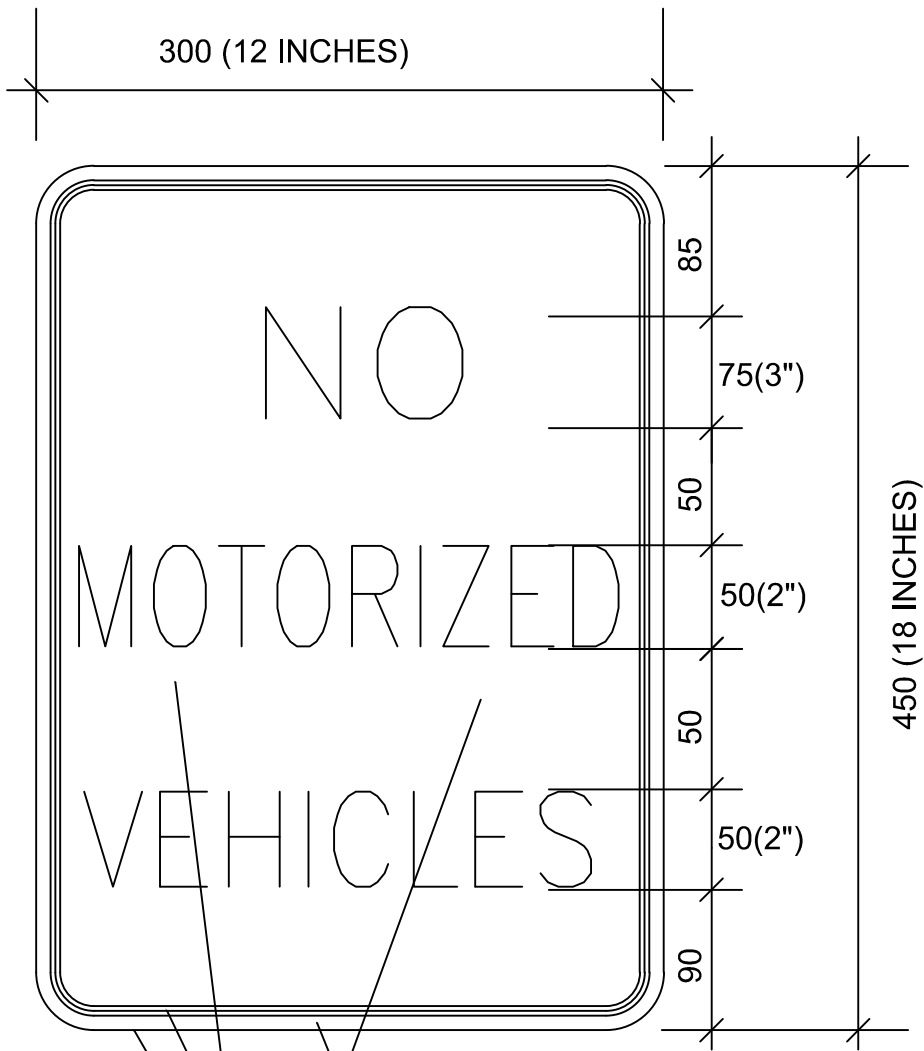
DATE: JUN. 2007

SCALE: N.T.S.

DWG. No.
 STD-P6



REVISIONS		
TOWNSHIP OF SPRINGWATER		
PLANTING OF SHRUBS (DECIDUOUS AND EVERGREEN)		
DESIGN: A & A	DATE: JUN. 2007	DWG. No. STD-P7
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		



RED REFLECTIVE BACKGROUND

WHITE LETTERS & BORDER

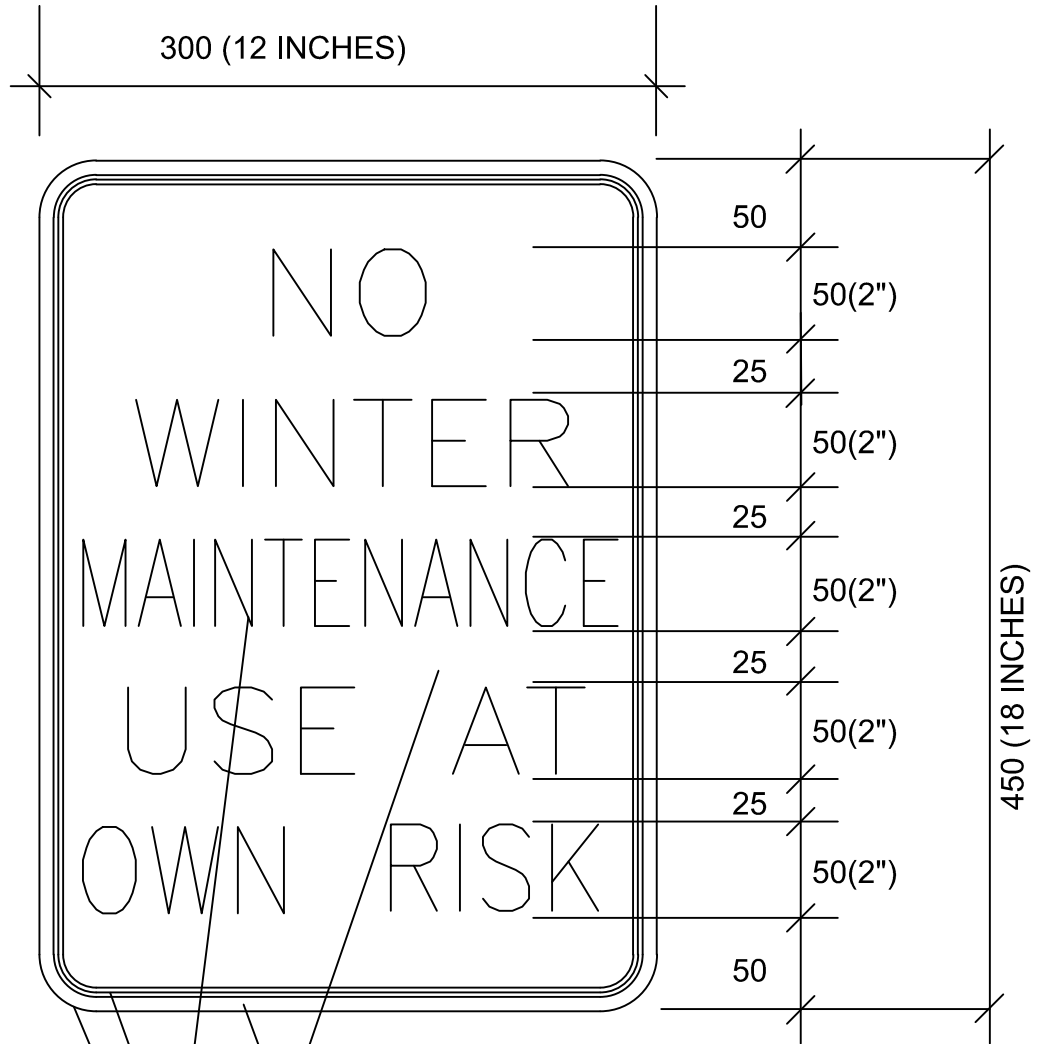
0.064 GAUGE ALUMINUM SIGN BLANK C/W HOLES
- METRO PUNCH

REVISIONS		

TOWNSHIP OF SPRINGWATER

NO MOTORIZED VEHICLES SIGN
DETAIL

DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-P9
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		



300 (12 INCHES)

450 (18 INCHES)

RED REFLECTIVE BACKGROUND

WHITE LETTERS & BORDER

0.064 GAUGE ALUMINUM SIGN BLANK C/W HOLES
- METRO PUNCH

REVISIONS		
TOWNSHIP OF SPRINGWATER		
NO WINTER MAINTENANCE SIGN DETAIL		
DESIGN: A & A	DATE: APR. 2007	DWG. No. STD-P10
DRAWN: A & A	SCALE: N.T.S.	
CHECKED: J.M.B.		