



TOWNSHIP OF RAMARA

Engineering Design Criteria and Standard Drawings 2014

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1 General Requirements

1.1 Introduction

The Township of Ramara Engineering Design Criteria and Standard Drawings presented herein are intended as guidelines for land development to ensure uniform design throughout the Municipality. Innovative technological changes that improve or maintain the quality of the design on a life cycle cost basis may be considered at the discretion of the Township.

These standards are to be read in conjunction with the latest editions of the Ontario Provincial Standard Specifications (OPSS), the Ontario Provincial Standard Drawings (OPSD), the Township of Ramara Standard Drawings and the Township of Ramara Standard Subdivision Agreement. In the case of a discrepancy with OPSS or OPSD, the Township Standards shall prevail.

It is the applicant's responsibility to obtain and check with the Township of Ramara for new revisions. Copies are available for purchase from the Township of Ramara or can be downloaded from the web site at www.Township.Ramara.on.ca; standard drawings are available on CD in PDF format.

1.2 Definitions

In this document the following definitions shall apply:

"Clerk" shall mean Municipal Clerk of the Township.

"Consultant" shall mean a competent professional engineer or firm of engineers employed by the Developer which is skilled and experienced in municipal work and land development projects and registered with the Association of Professional Engineers of the Province of Ontario, possessing a current Certificate of Authorization to practice professional engineering as required by the Professional Engineers Act.

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

"Developer(s)/Owner(s)" shall mean the person(s) entering into the subdivision agreement with the Corporation of the Township of Ramara.

"Standard Drawings" shall mean drawings as developed and approved by the Township.

"Township" shall mean the Township of Ramara.

"Township Representative" shall mean any person assigned to a project by the Township to carry out work on their behalf. The name of the Representative shall be specified prior to the start of construction on any project.

Abbreviations:

"AWWA" shall mean the American Water Works Association.

"CSA" shall mean the Canadian Standards Association.

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

"LSRCA" shall mean the Lake Simcoe Region Conservation Authority.

"MNR" shall mean the Ontario Ministry of Natural Resources.

"MOE" shall mean the Ontario Ministry of the Environment.

"MTO" shall mean the Ontario Ministry of Transportation.

"OBC" shall mean the latest version of the Ontario Building Code including regulations.

"OHBDC" shall mean the Ontario Highway Bridge Design Code.

"OPSD" shall mean the Ontario Provincial Standard Drawings.

"OPSS" shall mean the Ontario Provincial Standard Specification.

1.3 Submissions to Government and Other Agencies

The Consultant shall be required to make all submissions and representations necessary to obtain approval from all other affected authorities (such as DFO, LSRCA, MNR, MOE, MTO, Canada Post Corporation, Transport Canada, etc.) and any other agencies for works which fall within their jurisdiction. It is the responsibility of the Consultant to ensure that all correspondence, comments and approvals are provided to the Township.

1.4 Barrier Free Considerations

All design projects throughout the Township of Severn must give due consideration to the Accessibility for Ontarians with Disabilities Act (AODA) and must incorporate ways to remove barriers for the public.

1.5 Pre-Servicing Policy for Subdivision Development

Subsequent to Draft Plan Approval and prior to execution of a Subdivision Agreement, the Township may consider agreeing to pre-servicing of a subdivision at the Owner's risk when the following conditions have been met:

- a) Written acceptance from the Township for specific works for which pre-servicing can proceed;
- b) Engineering drawings have been accepted for construction for the works under consideration;
- c) Written approval of various agencies, e.g., MOE, LSRCA, MNR, MTO, Ministry of Citizenship, Culture and Recreation, where they relate to installation of services permitted by pre-servicing;
- d) Written confirmation from utility companies that satisfactory agreement has been reached for provision of respective services;
- e) Upon approval of the pre-servicing application, the Developer must enter into a Standard Pre-servicing Agreement with the Township;
- f) No permission will be given to construct external services prior to full registration unless a Letter of Credit has been deposited with the Township, for the total cost of the services and all restoration, and approval has been granted by Township council. Connections to existing services may not be permitted until the plan is registered;
- g) All other documents considered necessary to the works under the Pre-servicing Agreement including 300 mm reserves, easements, etc., must be approved as to form and description;
- h) Cash deposits for engineering and legal fees for the Township, in amounts determined by the Township, must be paid to the Township prior to the commencement of any works;
- i) Required Insurance Certificate is to be submitted as per Pre-servicing Agreement;
- j) A cash deposit or Letter of Credit as security for possible emergency maintenance work by the Township in an amount determined by the Township. The cash deposit is to be returned at the time of registration of the subdivision;
- k) Any required zoning by-laws must be in effect;
- l) If the underground pre-servicing has been completed prior to the registration of the plan of subdivision, the Township will not require the full value of the Letter of Credit provided an appropriate reduction request has been submitted and approved;
- m) Above ground works will not be permitted to commence unless approved by the Township.

1.6 Subdivision Agreement Schedules

1.6.1 Preparation of Subdivision Agreement

The draft of the Subdivision Agreement will be prepared by the Township Solicitor and forwarded to the Township Administrator. The final Subdivision Agreement will be prepared under the direction of

the Township Administrator in consultation with various Township departments, who will obtain Council's approval for the execution of the Agreement.

The Township Administrator must be in a position to clear ALL conditions of Draft Plan Approval prior to the preparation of the Final Subdivision Agreement.

NOTE: In conjunction with preparation of the Subdivision Agreement the Developer's Consulting Engineer shall provide the Township with the appropriate number of copies of the following:

- a) Ministry of Environment Applications for approval for Township services to be constructed for the proposed subdivision;
- b) The name of the person and title and/or company and Mortgagees with whom the Subdivision Agreement will be executed. The Developer's address and telephone number shall be provided;
- c) The name, address and telephone number of the Developer's lawyer;
- d) A breakdown of the number of units proposed within the subdivision:

i.e.

- Single-family units
 - Semi-detached units
 - Townhouse units
 - Apartment units
 - one bedroom and bachelor
 - two or more bedrooms;
- e) The Reference Plan for the subdivision;
 - f) The legal description of the subdivision, based on the Reference Plan;
 - g) The proposed final plan for registration (M-Plan) complete with the street names, lot numbers, surveyor's certificate, Owner's certificate and all other pertinent information required by the registry office;
 - h) The final draft reference plans for any easements to be granted to the Township;
 - i) The engineering drawings, acceptable to the Township Engineer;
 - j) The "M" and "R" Plans reduced to legal size;
 - k) An O.L.S. certificate in tabular form identifying and certifying that all Lots and corresponding frontages, depths and areas, are in compliance with the appropriate Zoning By-law;
 - l) A detailed cost estimate of Municipal Services to be constructed for the subdivision. The cost estimate shall be signed and sealed by a Professional Engineer;
 - m) The estimated cost of Services shall be detailed to show individual items of construction. The total estimated cost of Services shall include the following:
 - i. Detailed cost of services, per Schedule of Construction Costs, following;

- ii. The actual estimated cost of streetlighting and associated underground distribution system;
- iii. Any other miscellaneous expenditures required by the Subdivision Agreement as the Developer's obligation, such as park equipment, park landscaping, development of open space, etc.;
- iv. Allowances for contingencies and engineering in the amount of 15% of the estimated cost of services.

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

- n) The Developer shall provide the Township with written confirmation from the following utility authorities that satisfactory arrangements have been made for the installation of services in the proposed subdivision:
 - Bell Canada;
 - Cable TV Company;
 - Canada Post;
 - Hydro One;
 - Union Gas;
 - Any other Authority where required.

In addition to the above, Location Approvals shall also be submitted by the appropriate utility authorities. Where requested, easements shall be provided for utilities, at no cost to the utility company or municipality.

- o) Proposed timetable for construction of services.
- p) Proposed landscaping plan where necessary or required.
- q) Proposed staging plans.

SCHEDULE OF CONSTRUCTION COSTS

SUBDIVISION:

DEVELOPER:

CONSULTING ENGINEER:

SUMMARY

A. Municipal Works

Site Preparation/Rough Grading	\$ _____
Roads to Base Course Asphalt	\$ _____
Storm Drainage Works	\$ _____
Storm Water Management Facilities	\$ _____
Culverts	\$ _____
Sanitary Sewers	\$ _____
Water Main	\$ _____
Sidewalk	\$ _____
Surface Course Asphalt	\$ _____
Street lights	\$ _____
Street Signs and Barricades	\$ _____
Streetscape, Landscaping and Boulevard Sodding	\$ _____
Fencing	\$ _____
Driveway aprons	\$ _____
Other _____	\$ _____
 Sub-Total	 \$ _____
Engineering and Contingency allowance (15%)	\$ _____
 Subtotal	 \$ _____
HST (13%)	\$ _____
 Total Municipal Works	 \$ _____

B. Engineering Department Fees/Deposits

Township Eng. Review/Supervision Fee, \$10,000 min	\$ _____
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1.6.2 Requirements Prior to Commencement of Construction

Prior to commencement of construction, the Developer's Consulting Engineer shall submit the following information to the Township Engineer for approval (Allow at least *two* weeks for review).

- a) Three sets of all construction specifications;
- b) The proposed contractor and subcontractors;
- c) The contractor's list of suppliers;
- d) One copy of the signed contract documents complete with unit prices;
- e) All other information specified in the Subdivision Agreement as a requirement prior to commencement of construction or other information required by the Township Engineer;
- f) Ministry of Natural Resources, LSRCA and/or DFO work permits for works within water bodies.

1.7 Certificate of Completion and Final Acceptance

The term "Certificate of Completion" shall be used to describe the date when the services are complete and acceptable to the Township by by-law subject to the maintenance requirements pursuant to the Subdivision Agreement. "Final Acceptance" shall be the terminology used when the Developer's maintenance requirements have been fulfilled and the Services are acceptable to the Township. "Final Acceptance" of the subdivision shall be the date on which the Council of the Township agrees by by-law that all the conditions of the Subdivision Agreement have been fulfilled, and all maintenance requirements have been completed.

The "Certificate of Completion" and "Final Acceptance" must be requested in writing by the Developer. The dates for "Certificate of Completion" and "Final Acceptance" of the Services in the development shall be established by the Township.

When the Services are completed and cleaned to the satisfaction of the Consulting Engineer, he shall advise the Township Engineer in writing that the work is completed and shall request an inspection by the Township. The Township and the Township Engineer shall carry out their inspections and shall advise the Consulting Engineer of any items of work requiring further rectifications. When all deficiencies have been corrected to the satisfaction of the Township Engineer, a report shall be forwarded to the Council ("Certificate of Completion") recommending a date for the commencement of the maintenance period. The "Certificate of Completion" may be issued with an attached list of minor deficiencies, if in the Township's opinion the deficiencies will not significantly affect the operation of the services.

Near the end of the maintenance period the services shall be re-inspected by the Consulting Engineer and all deficiencies found shall be corrected. When the Consulting Engineer is satisfied that the work is complete and acceptable, he shall so advise the Township and shall request a final inspection by the Township Engineer. When all work is completed to the satisfaction of the Township Engineer, a report

shall be forwarded to the council recommending "Final Acceptance" of the works.

Reductions in financial securities held by the Township will be considered in accordance with the provisions of the subdivision agreement. Request for reductions should be made in accordance with the following sample letter.

Sample Letter - Request For Reduction In Letter of Credit

Date:

Township of Ramara
P.O. Box 130
Brechin, ON
L0K 1B0

Attention: Township Engineer

Re: (Name of Subdivision)

Plan.

On behalf of the Owners of the above development, we submit the following request for a reduction in the amount of the letter of credit held by the Township as performance and maintenance security, for your consideration and approval.

We have attached hereto a summary listing the value of the work completed to date, based upon Schedule of Construction Costs of the Subdivision Agreement revised as noted to reflect all required alterations to the works. The current value of securities is calculated as follows:

Value of outstanding work	\$ _____
(incl. contingency)	
15% of completed work	\$ _____
Subtotal	\$ _____
15% Engineering and Contingency	\$ _____
13% HST	\$ _____
Subtotal	\$ _____
Total	\$ _____

We are also attaching a Statutory Declaration by the Owner that all outstanding accounts relative to work in this subdivision have been paid.

Yours very truly,

(Signature of Engineer), Name of Engineering Firm

1.8 Private Services

Waste Disposal Systems

Each system shall be constructed in accordance with Part 8 of the O.B.C.

Water Supply Systems

- a) Each water supply well must be drilled to the depth of the aquifer proposed for development in the supporting hydrogeologic report, prior to issuance of a building permit;
- b) The well construction shall be in accordance with the Ontario Well Regulation, R.R.O. 1990, Reg. 903, as amended from time to time;
- c) If required, the system shall be equipped prior to occupancy, with suitable water treatment equipment to provide water supplies meeting the Ontario Ministry of the Environment Drinking Water Objectives for and the Ontario Ministry of Health standards for bacteriological quality.

2 Submission Requirements

2.1 Introduction

This section outlines the required submissions to be made to the Township.

All submissions are to be coordinated by the Consultant.

Second and Final submissions are not to be made until the Township's comments regarding the first and second submission, respectively, have been received and incorporated.

Prints of drawings for all submissions shall be in accordance with Township standards and each print shall be stamped with the submission number (1, 2 or 3) and date of submission.

Engineering drawings shall be submitted to the Township. Where applicable the Consulting Engineer is advised to review the County of Simcoe and MTO design criteria for intersecting roads to determine the requirements for submission of engineering drawings to the County and MTO.

2.2 Engineering Requirements for Draft Plan Approval

A Preliminary Engineering Report must be submitted by the Developer's Consultant to the Township in accordance with the Official Plan. This report must be presented in a readable, comprehensive and professional manner. The Report must be signed and sealed by a Professional Engineer.

This Preliminary Report shall contain the following and be submitted in duplicate:

a) The Draft Plan

The Draft Plan must be in compliance with the Planning Act, as amended, and in a form acceptable to the Planning Department of the Township. Reductions of the Draft Plan (11" x 17"), to scale, must be submitted;

b) Contour Plan

This plan must be at a scale of no larger than 1:1000 giving contour lines at sufficient intervals to permit assessment of existing surface drainage patterns. Contour intervals shall not be greater than 1.5 m. This plan is to extend to the limits of the drainage area to be served by proposed sanitary and storm sewer systems, including lands beyond the boundaries of the subdivision. For large external drainage areas, separate Contour Plans at a larger scale may be provided. All elevations are to refer to Geodetic Datum;

c) General Plan of Services

This will be a plan based on the Draft Plan and must schematically show the proposed storm and sanitary sewer systems and water mains and their connection to existing systems. Direction of flow must be indicated on all sewers. This plan is to be accompanied by preliminary engineering calculations indicating the quantity of flows at the connection to existing systems and/or at proposed outfalls. Consideration must be given to the whole catchment area to ultimately be developed. Blocks and easements for storm and sanitary sewers, stormwater management facilities and water main systems shall also be shown.

Preliminary road profiles and area grading requirements must also be identified in the Preliminary Report. Blocks of land for community mail centres must be identified on the Draft Plan and the General Plan of Services.

Proposed noise attenuation barriers are to be shown;

d) Drainage Plan

When a natural drainage channel passes through and is affected by the construction of the subdivision, drawings must be submitted to indicate the location and typical cross-sections of the existing channel and of any proposed changes. In general, creek diversions will not be permitted. An erosion-sediment control plan will be required. A preliminary stormwater management plan and report will be required by the Township in accordance with the requirements outlined in this document. The Consultant must submit an outline of the erosion-sediment control plan in accordance with the requirements of these standards.

All drainage designs shall be carried out in general compliance with the MOE, Stormwater Management Planning and Design Manual – March 2003, as amended.

Any proposed modifications to an existing channel and/or floodplain will require MNR, DFO and/or LSRCA review and approval. The Consulting Engineer must consult with staff from the appropriate agency(s) and confirm their requirements, prior to proceeding with the preliminary engineering report;

e) Geotechnical Report

A preliminary Geotechnical Investigation and Report from a qualified Geotechnical Consultant will be required, with particular attention to sub-surface soil and groundwater conditions and the ability of the soils to structurally support underground services, roadways and foundations for residential, commercial, or industrial type structures. The report must determine the elevation of seasonal high groundwater and comment on minimum foundation elevations to avoid buildings constructed below groundwater;

f) Hydrogeologic Report – Rural Development

The proponents of a draft plan application proposing individual water supply wells and sewage disposal systems shall provide a detailed Hydrogeological Report prepared by a qualified Hydrogeologist, relating to the soil types and their ability to physically accommodate private sewage disposal systems, the availability of potable groundwater supplies from the proposed water supply sources, the anticipated quantitative and qualitative impacts within the development and with neighbouring water sources, and proposed mitigative measures. Preliminary on-site testing must be reviewed with the Township and must be sufficient to support the proposed residential density. Test wells shall be drilled and pump testing performed to carry out the hydrogeological investigation, in accordance with the latest MOE guideline(s). The proposed monitoring program, prior to, during and after construction shall be submitted by the hydrogeologist to the Township for review;

g) Water Mains and Sanitary Sewers

Where water mains and sanitary sewers are proposed, comprehensive servicing reports shall be prepared and submitted to the Township. Available capacity in existing water treatment and sewage treatment plants must be taken into consideration. Where public communal water systems are proposed the requirements of Section 4.4 shall apply;

h) Traffic Study

A traffic study may be required at the sole discretion of the Township.

2.3 First Engineering Submission

The initial submission of drawings to the Township shall contain the following information, comprised of the number of copies shown:

2.3.1 Engineering Submission

- 1) Letter of Retainer from the Consulting Engineer stating that they have been engaged for the design and general construction inspection of all works and coordination of sub-consultants according to the terms of the Subdivision Agreement;
- 2) Drawings and Documents:
 - a) Approved Draft Plan (1);
 - b) Proposed plan for registration showing all lot and block numbering and dimensioning (2);
 - c) Lot Grading Plan (3);
 - d) Area Rough Grading Plan (3);

- e) Erosion and Sediment Control Drawings (3);
- f) Storm Drainage Plan (3);
- g) Storm sewer design sheets, computer printouts and detail calculations for pipe strength and bedding (3);
- h) Sanitary Drainage Plans (3);
- i) Sanitary sewer design sheets and calculations (3);
- j) All plan and profile drawings (3);
- k) Park Grading Plan (3);
- l) Detail drawings other than the Township of Ramara Standard Drawings or OPSD(3);
- m) Water supply and distribution report providing calculations to support the design of the distribution works including main sizes, fire flows and anticipated flows and pressures for domestic and other users (2);
- n) Storm Water Management Report (2);
- o) Geotechnical Report (2);
- p) Traffic Impact Study (2);
- q) Illumination calculations (2);
- r) Noise attenuation report (2);
- s) Arborist Report (if required);
- t) Archaeological Assessment (if required);
- u) Preliminary "R" plans showing proposed easements (4);
- v) Streetscape or tree planting plans for boulevards (2);
- w) Supplementary hydrogeologist's reports as required by the Township (2);
- x) Cash deposits as determined by the Township to cover anticipated expenses for the review of engineering drawings and preparation of the Subdivision Agreement.

The above information will be reviewed by the Township and one set of drawings and calculations will be returned to the Consulting Engineer with the required revisions noted.

- 3) A letter from the Consultant, summarizing the contents of the submission and certifying that the design conforms with the Township Engineering Design Criteria;
- 4) A summary of lot area and frontage for each Lot/Block to be developed to confirm By-law compliance prior to registration and Building Department Administration.

2.3.2 Municipal Structures Submission

When a new roadway structure is proposed, a specific submission related to the structure is required, which includes the following information.

- 1) Two copies of the General Arrangement drawing(s), prepared in general accordance with the MTO Structural Manual, including the roadway structure plan, profile, elevation and cross sections;
- 2) Two copies of the Design Report, which includes but is not limited to the description of the works, how the detail was arrived at, different options and cost analysis/least expensive alternate;
- 3) Two copies of the Design Criteria Sheet, which includes but is not limited to the type/class of roadway, volume of traffic, geometric information and cost estimate;
- 4) Two copies of the Geotechnical Report;
- 5) Two copies of the Hydrology Report;
- 6) A letter from the Engineer responsible for the design, which certifies that:
 - The bridge type, length and width are appropriate;
 - OHBDC requirements are met;
 - Ministry standards have been followed;
 - The most economical life cycle cost solution has been selected for the site;
- 7) The structural design drawings and details included as part of the Subdivision Agreement shall be stamped and signed by the Engineer who designed the roadway structure and by the professional engineer who checked the structural design drawings.

2.3.3 Parks and Landscaping Submission

- 1) A Letter of Retainer from the Consulting Landscape Architect stating that they have been engaged for the design and complete general construction inspection of all landscape works, plus an outline of the items contained within the submission;
- 2) A covering letter from the Consulting Engineer stating that the landscape work is in conformity with the proposed grading and municipal services for the development, plus an outline of the items contained within the submission;
- 3) Two copies of the following drawings (where applicable):
 - Existing Natural Features Assessment;
 - Tree Survey/Vegetation Analysis and Tree Preservation Plan;
 - Streetscape and Buffer Planting Plans;
 - Detailed Park Development Plans;
 - Stormwater Management Pond Planting Plan.

2.4 Subsequent Submissions

Subsequent submissions shall be made, as required, until the drawings and designs are acceptable to the Township. The design of the underground electrical distribution system shall be completed by

Hydro One. This design shall be submitted to the Township and shall be approved prior to the final approval of the engineering drawings. The design of the Bell telephone system, Cable TV system and gas mains shall follow the same format as the Ontario Hydro requirements.

All utility information is to be shown on a Composite Utility Plan, prepared by the Consultant.

The following submissions shall be compiled and submitted to the Township simultaneously, comprised of the number of copies shown.

2.4.1 Engineering Submission

- 1) First Submission Drawings "red lined" by the Township from the First Submission Review;
- 2) Copies of all other applicable approval agencies comments;
- 3) Complete sets of all revised drawings, proposed M- and R- Plans (2);
- 4) Original plus one copy of Ministry of Environment application forms, signed by the Developer and the Consulting Engineer;
- 5) Copies of the Subdivision Agreement Schedules pertaining to Engineering Submission (2);
- 6) Streetlight design plans (2);
- 7) Composite Utility Plans (2);
- 8) In addition to storm sewers, sanitary sewers and water mains, MOE approval is required for proposed engineered channels, storm water detention ponds and storm water management features. The Township will not sign the MOE Application until satisfied with the engineering design. It is the Consultant's responsibility to forward the complete application to the MOE.

2.4.2 Landscaping and Parks Submissions

- 1) A covering letter from the Consulting Landscape Architect outlining the submission contents;
- 2) Two sets of revised landscape drawings as per Township comments;
- 3) One complete set of landscaping cost breakdowns.

3 Drawing Requirements

3.1 Specifications for Engineering Drawings:

Size:

- Drawings to be Metric Standard A1 (566 mm X 801 mm) or Imp. Equivalent.

Format:

- Same as Township standard sheets unless otherwise approved.

Materials for Final Submission and "as-constructed" drawings:

- Bond for Final Submission
- Black Ink (permanent)
- Digital copies on CD

Materials for Preliminary Submissions:

- Bond
- Black Ink (permanent)

3.2 General Drawing Requirements

All engineering drawings shall be prepared in metric and in a neat and legible fashion. The design information presented on these drawings shall be completed in ink.

The standard Township of Ramara title block as shown in the detail drawings shall be used on all engineering drawings. A title sheet is required for the engineering drawings.

All General Plans, Lot Grading Plans, Area Rough Grading Plans, Plan and Profile drawings and Detail Drawings shall be prepared on standard A1 sheets. Storm and Sanitary Drainage Area Plans may be completed on larger sized drawings in order that the entire drainage system being designed may be presented on one sheet.

The lot numbering and block identification on all engineering drawings shall be the same as shown on the Registered Plan for the area.

All elevations shown on the engineering drawings are to be of geodetic origin. Aerial photo interpretation methods for securing existing contours and elevations will not be accepted by the Township for base plan information on engineering drawings. A local benchmark note must appear in each drawing.

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

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

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

A north arrow and key plan shall be included on all drawings.

All engineering drawings shall be stamped by a Professional Engineer. The Engineers stamp must be signed and dated, and the drawings are to be signed by the Township Engineer prior to the issuance of drawings for tendering.

Work on the drawings to be done neatly and legibly.

Existing information shall be shown light or background line weight. Proposed information shall be shown bold or foreground line weight.

In general east-west streets shall have zero chainage at their westerly limit and north-south streets shall have their zero chainage at their southerly limits. Chainage on a plan-profile shall increase from left to right.

3.3 Computer Aided Drawings (CAD)

Digital software compatible with AutoCAD shall be used to prepare all drawings, in accordance with industry accepted standards and protocols.

3.4 General Servicing Plans

A "General Plan of Services" drawing showing aboveground services and appurtenances shall be prepared for all developments at a maximum scale of 1:1000.

When more than one "General Plan of Services" drawing is required for any development then the division of drawings shall reflect the limits of the Registered Plans as closely as possible. Where more than one plan is prepared, a supplementary "General Plan of Services" at a smaller scale shall be prepared to show the entire plan of subdivision on one drawing.

The reference Geodetic Benchmark and the Site Benchmarks to be used for construction shall be identified on the General Plan of Services.

A Key Plan at a scale of 1:10,000 shall be shown on all "General Plan of Services" drawings and the area covered by the drawing shall be clearly identified.

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

All road allowances, lots, blocks, easements and reserves are to be shown and are to be identified in the same manner as shown on the Registered Plan.

All existing services, utilities and abutting properties are to be shown in light or background weight lines.

All services to be constructed are to be shown on the "General Plan of Services" in solid lines.

Dimensioning of utilities and roadways is not required on the "General Plan of Services".

All sites for parks, schools, churches, commercial and industrial development must be shown.

If a subdivision encroaches on an existing floodplain, the approved fill line restrictions and setbacks must be shown, as specified by the MNR and/or LSRCA.

General Plans shall indicate, but not be limited to the following:

- Roadways with curblines and street names;
- Water mains and appurtenances, with notes showing sizes;
- Maintenance holes with numbers;
- Sewers with notes showing sizes, and direction of flow;
- Signage – school;
 - traffic control;
 - future land use;
- Barricades;
- Fencing indicating height and type;
- Retaining walls;
- Catchbasins;
- Community mail boxes with number of units serviced;
- Hydro vaults, streetlights, sidewalks.

3.5 Storm Drainage Plans

Watershed Area

The watershed area shall be determined from contour plans and shall include all areas that naturally drain into the system and any fringe areas not accommodated in adjacent storm drainage systems, as well as other areas which may become tributary by reason of regrading. This information shall be confirmed with the Township Engineer prior to the start of the design of the internal servicing of the site.

External Areas

A plan shall be prepared to a scale of 1:1,000 or 1:2,000 dependent upon the size of the watershed area, to show the nature of the drainage of the lands surrounding the development site and to show all external drainage areas that are contributory to the drainage system for the development. The external drainage areas shall be divided into smaller tributary areas and the area and the location to which the tributary area is considered to drain in the design shall be clearly shown. The plan shall clearly show all existing contours used to justify the limits of the external drainage areas.

In lieu of precise information on development on the whole or any part of a watershed area, the latest Zoning By-law and Official Plan issued by the Township shall be used to determine the correct values of the run-off parameters to be used for all external areas in the design and to determine the specific areas to which these values apply.

This external drainage area shall be prepared and shall be submitted to the Township Engineer at the functional report stage and prior to the commencement of the detailed storm sewer design.

Internal Areas

An internal storm drainage plan shall be prepared to a scale of 1:1,000 and shall include all streets, lots, blocks and other lands within the development. The proposed storm sewer system shall be shown on this plan with all storm structures numbered consecutively from the outlet. These maintenance holes shall be the tributary points in the design and the area contributing to each maintenance hole shall be clearly outlined on this plan. The area, in hectares, of each contributing area (to the nearest hundredth) and the run-off parameter used shall be shown in a circle located within the contributing area. In cases where areas of different run-off parameters may be tributary to the same maintenance hole, the areas and the parameters shall be separately indicated on the plan.

In determining the tributary area to each maintenance hole, the proposed grading of the lots must be considered to maintain consistency in the design.

In the case of large areas under single Ownership or blocks requiring future site plan agreements, the design shall be prepared on the basis of the whole area being contributory to one maintenance hole in the abutting storm sewer unless more than one private storm connection is necessary to serve the property, in which case the appropriate are tributary to each connection shall be clearly shown and taken into account in the storm sewer design.

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

- Existing contours;
- Drainage patterns of adjacent lands;
- Run-off coefficients and areas (ha) of tributary areas outside the development and for each section of the storm sewers within the development;
- Direction of run-off;
- Street names;
- Storm structure numbers;
- Sewer sizes, slope and directions of flow;
- Any catchbasins or swales, on the lots or blocks, required to collect the run-off;
- Temporary or permanent quantity and quality storm water management facilities;
- Major and minor overland flow routes;
- Culverts and other drainage appurtenances.

3.6 Sanitary Drainage Plans

All tributary areas used for the determination of the design flows shall be shown on a plan at the scale of 1:1,000. The plan shall indicate the land use, area and population density or number of units.

Standard sanitary sewer design sheets shall be used to compute the design flow for each leg of sewer. Each sanitary drainage area on the plan shall show an identification number along with population and area.

3.7 Grading Plans

Drawing size: (594 x 841 mm) A1

Scale: 1:500 for single-family or semi-detached urban areas, 1:200 for multi-family areas and 1:1000 for rural estate areas.

The specified lot grade shall be shown at a location 8 m from the street line. For "split" type drainage patterns, the specified rear of house grade shall be shown. The specified minimum basement floor elevation for each lot shall also be shown.

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

- All lots and blocks within the subdivision, numbered in accordance with the plan proposed for registration;
- Existing contours at maximum 0.5 m intervals within the subdivision and extended outside the subject lands far enough to determine the existing drainage pattern;
- Driveway, water service box locations and building envelopes;
- Elevations at existing trees, structures, watercourses, etc.;
- Centerline elevations of proposed and existing roads at 20 m intervals;
- Proposed elevations at front and rear building envelope;
- Proposed elevations at the corners of each lot and block and intermediate point of grade change;
- Proposed elevations at sideyard highpoints if applicable;
- Proposed 0.5 m contours for grading within large blocks and parks;
- Proposed grades for major and minor overland flow routes;
- Lot fabric of subject lands including lot, block and easement description;
- Physical structures such as fencing, retaining walls, etc.;
- an arrow indicating the direction of the surface water run-off from all lots;
- All swales, other than the normal side yard swales, along with percent grade and the invert elevation of the swale at regular intervals;
- All rear yard catchbasins including the rim elevation of the catchbasin and the invert elevation of the outlet pipe;
- All terracing required with the intermediate grades specified;
- All rear lot surfaces shall be constructed to a maximum lot grade of 12% (calculated from the difference in lot elevations between the rear wall of the house and property line - embankments included);
- The lot grading plan shall make note of the Township of Ramara Standard Drawings that are applicable to the grading of the development. The Township reserves the right to refuse any house type, which is incompatible with the lot grading design, specified for a lot;
- A 0.6 m wide strip shall be left undisturbed along the boundary of the subdivision next to adjacent properties unless grading is required to eliminate drainage problems on adjacent properties. Such grading must be stipulated on the approved Lot Grading Plan. Silt Control fencing shall be shown within the undisturbed strip along the boundary of the subdivision;
- Lot drainage is to be self-contained within the subdivision limits, where possible;
- Proposed locations for building envelopes and envelopes for private sewage disposal systems;
- All proposed easements for registration;
- Heights of proposed retaining walls, fences etc.

3.8 Plan-Profile Drawings

Plan - Profile drawings are required for all roadways, blocks and easements where services are proposed within the development, for all outfalls beyond the development to the permanent outlet, for all boundary roadways abutting the development and for other areas where utilities are being installed below grade.

Plan-profile drawings are to be drawn to a horizontal scale of 1:500 and a vertical scale of 1:50 and are to include the following:

- Complete legend;
- All existing or future services, utilities and abutting properties are to be shown in light or background weight lines;
- All services to be constructed are to be shown in solid lines;
- The profile portion of the drawing shall be a vertical projection of the plan portion whenever possible;
- All road allowances, lots, blocks, easements and reserves are to be shown and are to be identified in the same manner as on the Registered Plan;
- All curb and gutter and sidewalks shall be shown and dimensioned on the plan portion of the drawing;
- Where multiple drawings are required for one street, match lines must be used with no overlap or duplication of information;
- Where intersecting streets or easements are shown on a plan-profile, only the diameter of the pipe and direction of flow of the intersecting sewers shall be shown;
- On profile portion of drawings the type of sewer, diameter, length and grade shall be shown;
- On profile portion of drawings the water main diameter and length, shall be shown;
- Only the type, direction of flow and diameter of pipe shall be shown in the plan portion;
- All maintenance holes shall be shown on the plan and on the profile portions of the drawing and be identified by chainage and I.D. number and shall also be referred to the applicable Standard Drawing or to a special detail on the profile portion of the drawing. All invert elevations shall be shown on the profile with each having reference to the north arrow;
- All sewer maintenance holes which have safety platforms are to be noted;
- All drop connections are to be noted and referred to the Standard Drawing;
- All catchbasins and catchbasin connections shall be shown. Catchbasins are to be numbered for easy reference. All rim and invert elevations for rear lot catchbasins are to be shown;
- All water mains, hydrants, valves, etc. shall be shown, described and dimensioned on the plan portion of the drawing. In addition, the water main shall be plotted to true scale size on the profile portion of the drawing and shall be described;

- The location of all storm, water and sanitary service connections shall be shown on the plan portion of the drawing using different symbols for each service. These services need only be dimensioned when the location differs from the standard location as shown on the Township of Ramara Standard Drawings. The connections to all blocks in the development shall be fully described and dimensioned (size, length, grade, invert elevations, materials, class of pipe, bedding, etc.);
- The centreline of construction with the 20 metre stations noted by a small cross shall be shown on the plan portion of the drawing;
- The original ground at centreline and the proposed centreline road profile shall be plotted on the profile. The proposed centreline road profile shall be fully described (length, grade, P.I. elevations, vertical curve data, high point chainages, low point chainages, etc.);
- Details of the gutter grades around all 90 degree crescents, intersections and culs-de-sac shall be provided on the plan portion of the drawing as a separate detail at a scale of 1:100;
- Special notes necessary to detail construction procedures or requirements are to be shown;
- Chainage for the centreline of construction are to be shown on the profile portion of the drawing. The P.I., B.H.C., E.H.C., B.V.C. and E.V.C. chainages are to be noted;
- The basement elevation of all existing dwellings on streets where sewers are to be constructed shall be noted on the profile;
- All existing services, utilities and features are to be shown on the plan portion. Those services and utilities below grade that are critical to the new construction shall also be shown in the profile. Test holes may be required to determine actual elevation of these services and utilities;
- Profiles of roadways shall be produced sufficiently beyond the limits of the proposed roads, to confirm the feasibility of possible future extensions;
- The location of all luminaire poles shall be clearly shown on the plan portion;
- The proposed location and type of all street name and traffic control signs shall be shown on the plan portion;
- Proposed locations and types of all trees to be shown on the plan portion;
- Where possibility of conflict with other services exist, connections are to be plotted on the profile or a crossings chart included;
- The detail information from all borehole logs is to be plotted on the profile drawings and located on the plan.

3.9 Composite Utility Plan

The Composite Utility Plan shall be prepared in the same format as "General Plan of Services" and show all the same aboveground information as well as the proposed location of driveways, Bell, Hydro, Gas, Cable TV and community mailboxes. All locations must be established and resolved by the

Consulting Engineer in conjunction with the Utility companies and in accordance with the locations shown on the typical cross-section.

3.10 Detail Drawings

The Township of Ramara Standard Drawings shall be utilized whenever applicable. The use of the latest revision of the Ontario Provincial Standard Drawings may be utilized as specified in this document or when approved by the Township Engineer. These drawings shall be reproduced as part of the engineering drawings for the development and must be referred to by number on the affected plan and profile drawings. The Consulting Engineer shall be responsible to check the suitability of the details provided on these standard drawings for the application proposed. Individual details shall be provided by the Consulting Engineer for all special features not covered by the Township of Ramara Standard Drawings. These special details shall be drawn on standard sized sheets and shall be included as part of the engineering drawings. The minimum scale to be used for any special maintenance hole or sewer detail shall be 1:25.

3.11 Parkland Development Drawings

General Requirements

The Developer shall be responsible to prepare a detailed Grading Master Plan for approval by the Township, for all lands to be dedicated for park purposes. This plan shall show all existing trees and features that are in conformity with the end use of the park and that are to remain. All other trees shall be removed by the Developer subject to Township approval. Prior to preparing park development plans, the Developer shall meet with Township staff to review Township recreational needs, i.e. soccer pitches, ball diamonds, etc.

This Master Plan shall be prepared at a scale of 1:500 and form part of the approved Engineering Drawings, indicating the following, at a minimum:

- Existing contours;
- Drainage structures and direction of overland drainage;
- Species and size of existing plant material to remain and be protected;
- Species and size of plant material to be removed;
- Proposed underground services, as required;
- Layout of all proposed recreation facilities;
- Layout of parking lot and spaces (including handicapped parking);
- Layout of all trails;
- Proposed site amenities including benches, bike racks, trash receptacles, signs, washrooms;
- Perimeter fencing;

- Park lighting;
- All surface treatments;
- All proposed plant materials.

A Park Development Cost Estimate based on estimated quantities with corresponding unit prices is required along with the drawing submission.

3.12 Trails and Walkways

Drawing requirements for trails and walkways will be determined in conjunction with the Township at the time the need is identified.

3.13 Landscaping

3.13.1 General Requirements

All landscape plans shall be drawn and stamped by a Full Member of the Ontario Association of Landscape Architects. All landscape plans shall be drawn at a minimum scale of 1:500.

The landscape documents may include the following drawings:

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

Detailed Cost Estimates will be required for all approved landscape plans. This estimate will be used for security purposes. All streetscape plans shall be consistent with the Township of Ramara Engineering Design Criteria and will require Township approval before implementation of the plans.

The Streetscape Plan shall show the following:

- Existing trees and natural features to remain;
- Building envelopes, driveways and sidewalks;
- Walkways, trails and easements;
- Required fencing including privacy, acoustic and chain link;

- Proposed plantings;
- Entry features;
- Location of street lighting;
- Location of public utility boxes and easements and hydrants;
- Heights of existing and proposed retaining walls, fences etc.

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

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

Developers are required to display approved landscape plans at the sales pavilions for the homebuilders in the new subdivision.

3.13.2 Notes for Streetscape Submission Drawings

The following notes pertaining to layout requirements are to be included on all streetscape submission drawings:

NOTE 1

Depicted on this plan are the species and the approximate location of street trees. Once driveways, utilities and light standards have been installed, the exact location of street trees will be staked on site by the Landscape Architect and approved by the Township prior to planting.

NOTE 2

Minimum clearances for Street Trees (when trees are planted 1.5 m from the curb):

- *2.0 m from water hydrants;*
- *2.0 m from driveways;*
- *2.0 m from neighbourhood mailboxes;*
- *3.0 m from hydro transformers;*
- *5.0 m from streetlight poles;*
- *15.0 m minimum from street line (street intersection as measured from back of curb) and behind the daylight triangle as per the Geometric Design Standards for Ontario Highways;*
- *18.0 m from face of all warning signs.*

When the minimum distances noted above are not achievable, street trees may be planted in an alternate location, 0.5 m from the property line (0.8 m behind the sidewalk) and adjacent to any fences. In cul-de-sac locations the street tree may be planted just inside the private property line. If a tree is planted in an alternate location, the distances marked with an asterisk must still be maintained.

NOTE 3

The tree pits and planting beds for all trees and shrubs located within 1 metre of underground utilities are to be hand dug.

NOTE 4

Minimum clearance for fences from fire hydrants is 1.0 m.

NOTE 5

All plant material must conform to the Canadian Standards for Nursery Stock and must be guaranteed for a minimum period of 24 months following acceptance of the work by the Township.

3.13.3 Notes for Naturalization Submission Drawings

The following layout note is to be included on the submission drawings for all areas to be naturalized:

NOTE 1

All plantings and hard landscape features are to be staked out on site and approved by the Landscape Architect and Township prior to installation. Any deviations from the approved landscape plans require prior Township approval.

3.14 As-Constructed Drawings

3.14.1 General

The "As-Constructed" drawings constitute the original engineering drawings that have been amended to incorporate the construction changes and variances in order to provide accurate information on the works as installed in the development.

3.14.2 "As-Constructed" Field Survey

The "As-Constructed" revisions shall be based upon a final survey of all the subdivision services and the consulting Engineer's construction records. The final survey of the subdivision services shall include a field check of the following items:

- a) Location and invert elevations of all sewer maintenance holes;

- b) Distances between all sewer maintenance holes;
- c) Location of all roadway catchbasins;
- d) Location, rim and invert elevations for all rear yard and lot catchbasins;
- e) Location of all sidewalks and curbs;
- f) Top of water main elevations every 50 m;
- g) Location and ties to all valve boxes and valve chambers;
- h) Location of all hydrants;
- i) Location and ties to all special water main appurtenances (bends, tees, dead ends, etc.);
- j) Road centreline elevations every 20 m;
- k) Site benchmarks;
- l) Location of all service connections to all lots and blocks and location of connection from nearest downstream maintenance hole (i.e. 0 +023);
- m) Sewer pipe sizes;
- n) Location of all fencing constructed as part of the subdivision services.

3.14.3 Drawing Revisions

The original drawings shall be revised to incorporate all changes and variances found during the field survey and to provide the ties and additional information to readily locate all underground services.

All sewer and road grades are to be recalculated to two decimal places.

All Street line invert elevations of storm and sanitary house connections to each block shall be noted on the drawing.

All street names, lot numbering and block identification shall be checked against the Registered Plan and corrected if required.

The "As-Constructed" revision note shall be placed on all drawings in the revision block. The title sheet of the Engineering Drawings shall be clearly marked with "As-constructed".

The Contract Number, if applicable, shall be added to the drawings.

Tolerances

A maximum vertical plotting tolerance of 0.2 m on the 1:50 vertical profile portion of the drawings and a maximum horizontal plotting tolerance of 1 m on the 1:500 scale drawing shall be considered acceptable without replotting.

All sewer lengths are to be shown to the nearest 0.5 m.

The information shown on the "As-Constructed" drawings may be checked by the Township at any time up to two years after final acceptance of the subdivision and if discrepancies are found between the information shown on the drawings and the field conditions, then the drawings will be returned to the Consultant for rechecking and further revision.

The consultant shall be required to explain in writing any major difference between the design and the "As-Constructed" data and to provide verification that alteration does not adversely affect the design of the subdivision services.

Submissions

Upon completion of all construction work and the "As-Constructed" revisions, the original drawings shall be submitted to the Township for their permanent records.

The submission of the "As-constructed" drawings to the Township must be completed before "Final Acceptance" of the subdivision will be given.

The Consulting Engineer shall provide a written declaration to the Township stating that all subdivision works have been constructed in accordance with the terms of the Subdivision Agreement, approved Engineering Drawings and the Township's Design Criteria, prior to "Final Acceptance".

Drawings supplied in a digital format shall conform to the most recent requirements and AutoCAD standards of the Township.

3.14.4 Storm Sewers

All actual storm system invert elevations shall be indicated on the "as-constructed" drawings. If the difference is greater than 150 mm from the design vertical alignment, affected portions of the sewer or overland drainage route shall be redrawn in profile. Any maintenance hole which differs from the proposed horizontal location by more than 1.50 m shall be redrawn in both plan and profile.

In addition the following shall be indicated on the "as-constructed" drawings:

- Pipe/culvert size, grade, type, class;
- Chainage from MH along main to service tees.

NOTE: If as-constructed grade of sewer differs by more than 10% of the design grade, the Consultant shall submit revised hydraulic calculations.

3.14.5 Sanitary Sewers

All actual sanitary sewer invert elevations shall be indicated on the "as-constructed" drawings. If difference is greater than 150 mm from the design vertical alignment, affected portions of the sewer

shall be redrawn in profile. Any maintenance hole which differs from proposed horizontal location by more than 1.50 m shall be redrawn in both plan and profile.

In addition the following shall be indicated on the "as-constructed" drawings:

- Pipe size, grade, type, class;
- Chainage from MH along main to service tees;
- Dimensions from lot corners and elevations for service laterals.

NOTE: If as-constructed grade of sewer differs by more than 10% of the design grade, the Consultant shall submit revised hydraulic calculations.

3.14.6 Water Mains

All actual water main obvert elevations at 50 m intervals shall be indicated on the "as-constructed" drawings. If the difference is greater than 150 mm from design vertical alignment, affected portions of the water main shall be redrawn in profile. If horizontal alignment changes exceed 1.5 m the affected portions of the water main shall be redrawn in plan.

In addition the following shall be indicated on the "as-constructed" drawings:

- Pipe size, type, class;
- Swing-ties to all main appurtenances (valves, bends, tees, etc.);
- Chainage from appurtenance along main to main stops;
- Dimensions from lot corners and elevations for service laterals.

3.14.7 Roadways

All actual roadway centre line elevations, at a maximum 20 m interval, shall be indicated on the "as-constructed" drawings. Gutter elevations shall be indicated for cul-de-sacs and intersections to show drainage into storm system. If horizontal road alignment changes more than 1.5 m or vertical geometry changes greater than 150 mm the plan and/or profile shall be redrawn as appropriate.

In addition the following shall be indicated on the "as-constructed" drawings:

- Driveways, lay-bys, curb depressions;
- Road signage;
- Lane marking and stop bar locations.

4 Servicing Design Requirements

4.1 Introduction

The purpose of this section is to outline the minimum design requirements for the construction of municipal services in the Township. These requirements are intended to provide guidance to the designer and do not relieve the Owner and its Consultant of the responsibility for submitting a completed product demonstrating competent engineering design in full compliance with all applicable legislation.

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

4.2 Storm Drainage System

4.2.1 General Requirements

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

- Prevent loss of life and minimize property damage and health hazards;
- Prevent inconvenience from surface ponding and flooding;
- Prevent adverse impacts on the local groundwater systems and base flows in receiving watercourses;
- Prevent downstream flooding and erosion;
- Prevent pollution discharges to watercourses;
- Prevent soil losses and sediments to sewer systems and waterbodies from construction activity;
- Prevent impairment of aquatic life and habitat;
- Promote orderly development in a cost-effective manner.

4.2.2 Storm Water Management

The storm water management requirements generally must reflect distinct solutions and vary depending upon the watershed, and in some cases the storm sewer shed, that the site is located. Site-specific requirements can be obtained from the Township. A storm water management report will be required for all development applications.

Site specific storm water management reports shall be consistent with existing Watershed Planning Studies and Master Drainage Plans prepared in support of the Official Plan and / or Secondary Plan areas.

Where applicable storm water management designs must also be in accordance with LSRCA requirements, Lake Simcoe Protection Plan and DFO policies and all approvals must be obtained accordingly.

In general, storm water management reports shall address the following:

- a) Storm water quantity;
- b) Storm water quality;
- c) Sediment and erosion control;
- d) Baseflow maintenance.

Quantity Control

The Township implements a Major and Minor system approach to storm water conveyance and control, comprised as follows:

Minor (convenience) System - 5 yr return period - surface swales, roadside ditches, curb and gutters, catchbasins and storm sewers.

Major (overland) System -100 yr return period - streams, valleys, man-made channels, roadways, roadside ditches and ponds.

In general, quantity control measures are to be designed in accordance with the MOE Stormwater Management Planning and Design Manual – March 2003 or latest version.

In addition to introducing pond storage into a storm water management system, increased flows resulting from increased impervious areas may be mitigated by utilizing measures such as: discharging rainwater leaders onto grassed areas, providing temporary rooftop and parking lot storage, or using grassed swales rather than piped flow.

Other factors, such as snowmelt run-off with large volume and longer duration and potential adverse downstream effects due to uncoordinated timing of peak flows must be considered when designing storm water management facilities.

Underground storage tanks and 'superpipe' systems of storm water storage are discouraged as part of the municipal system due to inherent long term, high replacement and maintenance costs and will only be considered in exceptional cases.

Joint use facilities i.e. detention ponds over recreational playing fields and passive parks, will be considered on an individual basis subject to suitably designed control measures and the intended park use.

As a guideline to be used until Master Drainage Plans are prepared for each watershed, the degree of control on the quantity of run-off from a proposed development shall be as follows:

The post-development peak flow shall not be greater than the corresponding pre-development peak flow for the 1:5 year, 1:10 year, 1:25 year and 1:100 year storms. Other regulatory agencies may require other storm flows to be analyzed (i.e. 2 year and/or Regional flows).

Runoff Quantity

Rural Catchments – shall be modelled with OTTHYMO using the SCS 24 hr design storm to generate peak flow value.

Urban Catchments – shall be modelled with OTTHYMO using the Chicago 4 hr design storm.

In general, the SCS design storms should be used for determining the hydrographs for undeveloped watersheds and for checking detention storages required for quantity control. The Chicago design storms should be used for determining hydrographs in urban areas and also for checking detention storage. In many cases, the consultant will be required to run both sets of design storms to make sure that the more stringent is used for each individual element of the drainage system (pipe flow, street flow, channel flow, detention storage).

The time step for discretization of the design storm can vary according to the size of the sub-watershed, but must not exceed the estimated time of concentration. The maximum rainfall intensity should be compatible with that of real storms on record.

All parameter assumptions used in the OTTHYMO input shall be clearly identified in the storm water management report.

Quality Control

In general, water quality controls are to be designed in accordance with the MOE Stormwater Management Planning and Design Manual – March 2003, or latest version.

Prior to initiating design, the Consultant shall contact the Township Engineer for acceptability of specific measures in consideration of long term maintenance and effectiveness.

Specific pond design requirements which are particular to the Township are as follows:

Pond Requirements

The design of stormwater management ponds shall be completed with consideration of the following aesthetic and landscape design criteria:

- Stormwater management dry ponds shall be designed to limit the maximum depth of water to 1.8 m above the lowest point of the stormwater basin. An additional 0.3 m freeboard is required above the maximum flood level. The maximum depth of the extended detention zone shall not exceed 1.0 m above the lowest point of the pond;
- Maximum side slope will be 5:1 from the bottom of the dry pond to the limit of maximum extended detention, with a minimum horizontal length of 3.0 m. The minimum allowable gradient on the bottom of the basin shall be 1.0% and the maximum gradient shall be 5%;
- Stormwater management wetlands shall be designed to limit the maximum depth of water to 2.1 m above the lowest point of the stormwater basin excluding micropools. An additional 0.3 m freeboard is required above the maximum flood level. The maximum depth of the extended detention zone shall not exceed 1.0 m above the permanent pool elevation. Maximum peak flow attenuation zone shall not exceed 1.8 m above the permanent pool elevation. The permanent pool depth shall range between a minimum depth of 0.15 m to a maximum depth of 0.45 m;
- A maximum 5:1 slope below the permanent pool level shall be permitted around the entire stormwater management wetland. A maximum 5:1 slope above the permanent pool level shall be permitted around the entire stormwater management wetland. The slope shall extend from the permanent pool level, to the limit of maximum extended detention. The horizontal distance of this slope must be a minimum of 3.0 m;
- Stormwater management wet ponds shall be designed to limit the maximum depth of water to 3.3 m above the lowest point of the stormwater basin. An additional 0.3 m freeboard is required above the maximum flood level. The maximum depth of the extended detention zone shall not exceed 1.0 m above the permanent pool elevation. The permanent pool depth shall range between a minimum depth of 1.0 m to a maximum depth of 1.5 m;
- A maximum 5:1 slope below the permanent pool level shall be permitted around the entire stormwater management wet pond. The horizontal distance of this slope must be a minimum of 3.0 m. A slope commencing from this point to the lowest point of the stormwater basin shall be a maximum of 3:1. A maximum 5:1 slope above the permanent pool level shall be permitted around the entire stormwater management wet pond. The slope shall extend from the permanent pool level to the limit of maximum extended detention. The horizontal discharge of this slope shall be a minimum of 3.0 m;
- Fencing of stormwater management facilities shall be minimized. Where stormwater management facilities to be owned by the Township abut private property, fencing may be required at the discretion of the Township. At a minimum, demarcation of property boundaries is required. Fencing and/or property demarcation shall be to Township standards;
- In situations where existing natural areas are proposed to be used for stormwater management, exemptions to the depth and slope criteria may be provided to minimize disturbance to the natural feature, at the discretion of the Township;
- Designed pedestrian access areas shall not exceed a maximum slope of 12:1;

- Notwithstanding the above slope and depth criteria, in the case of headwall design, the depth of water related to adjoining side slopes may vary and fencing is required for safety purposes;
- Areas subject to the collection of contaminants or spills shall be fitted with adequate oil/grit separators;
- Maintenance access requirements are to be determined on a site-by-site basis, however, the following general criteria are recommended: Controlled maintenance access routes shall be provided to both inlet and outlet structures and forebays. A minimum 3.0 m wide surface to accommodate maintenance vehicles within a minimum 10 m turning radius (inside radius) and a flat 10 m loading areas is required. Maintenance access routes shall not exceed a maximum slope of 10:1. The design of maintenance routes and loading areas shall be to the approval of the Public Works Department;
- Sediment drying area may be required adjacent to the forebay area to facilitate dewatering of sediment prior to removal to an approved disposal location;
- Maintenance by-pass shall be provided via a maintenance hole upstream of the entry to the pond to divert all flow from the pond during maintenance and sediment removal procedures.

4.2.3 Storm Sewer Design

General

Storm sewers, designed and constructed in accordance with the most recent requirements and specifications of the Township, shall be of adequate size and depth to provide service for the development of lands within the upstream watershed and/or for the drainage of any areas designated by the Township. Storm drainage shall be directed to an outlet considered adequate in the opinion of the Township and applicable agencies.

Channel works, bridges, culverts and all other drainage structures or works shall be designed, approved and constructed in accordance with the most recent drawings and specifications of all applicable agencies having jurisdiction, such as the Township, MOE, LSRCA, MTO, MNR, DFO, etc.

4.2.3.1 Hydrology and Design Flows

Storm sewers shall be designed to drain all lands based on the Rational Method. The Rational Method calculations must be checked using a model approved by the Township Engineer where the drainage area is greater than 10 hectares. The larger of the flows is to be used in the design of the sewer system unless approved otherwise.

$Q = 0.0028 C I A$ where:

 Q = Flow in cubic metres per second

 A = Area in Hectares

 C = Run-off coefficient

 I = Intensity in mm/hr

Storm sewers shall generally be designed to accommodate 1:5 year storm flows.

Intensity of Rainfall

The intensity of rainfall is to be determined from the Intensity-Duration-Frequency values from the Atmospheric Environment Services Orillia Station.

Where $I = A \times t^B$ and I is in mm/hr, t is time of concentration in minutes; A and B are as follows:

<u>Storm Return Period</u>	<u>A</u>	<u>B</u>
2 year	22.5	-0.728
5 year	29.9	-0.725
10 year	34.8	-0.724
25 year	40.9	-0.723
50 year	45.5	-0.722
100 year	50.0	-0.722

Time of Concentration

The minimum initial time of concentration is to be 10 minutes.

Pre-Development Areas:

To calculate the initial time of concentration (t_c) for upstream, undeveloped lands, the following formulas may be used: Bransby-Williams, Airport Method etc. The most appropriate method will be determined at the discretion of the Township.

Run-off Coefficient

The following is a list of run-off coefficients typically used to design storm sewers using the Rational Method:

Parks over 4 hectares	0.20
Parks 4 hectares and under	0.25
Single-family Residential (Urban)	0.45
Single-family Residential (Suburban)	0.40
Semi-detached Residential	0.60
Townhouses, Maisonettes, Row Houses, etc.	0.70
Apartments	0.75
Schools and Churches	0.75
Industrial (rural)	0.75
Industrial (urban)	0.90
Commercial	0.90
Heavily Developed Areas	0.90
Paved Areas	0.95

The Engineer shall use run-off coefficients as deemed appropriate based on a site-by-site basis. Calculations in support composite run-off coefficients may be requested by the Township.

A minimum run-off coefficient of 0.55 is to be used for undeveloped upstream area where future residential development is expected and 0.75 where future industrial, high-density residential or commercial development is expected.

Drainage Area

Drainage systems must be designed to accommodate all upstream drainage areas considering interim and ultimate conditions.

It should be noted agricultural field tiles exist in many areas of the Township. The existence of tiles on or near land to be developed must be determined and if present the proposed drainage system must be designed to accommodate or relocate the tiles to ensure the original function is maintained.

4.2.3.2 Pipe Sizing and Specifications

Pipe Capacities

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

The value of the roughness coefficient 'n' used in the Manning's formula shall be as follows:

▪ Concrete pipe	0.013
▪ Concrete box culverts	0.013
▪ Corrugated metal 68 x 13 mm corrugations	0.024
▪ Corrugated metal 25% paved invert	0.021
▪ PVC pipe	0.013
▪ HDPE smooth wall ribbed pipe	0.013

Flow Velocities (Flowing full)

For circular pipes the minimum acceptable velocity is 0.75 m/s and the maximum acceptable velocity is 4.5 m/s.

Minimum Sizes

The minimum size for an on-street storm sewer shall be 300 mm.

Minimum Grades

Regardless of flow velocities obtained, the minimum design grades for pipe storm sewers shall be as follows:

<u>Sewer Size</u>	<u>Concrete Pipe</u>
up to 375 mm	0.40%
450 mm to 525 mm	0.30%
600 mm to 1,200 mm	0.20%
1,200 mm and over	0.15%

Depth of Storm Sewers

The depth of a deep storm sewer shall be sufficient to provide a suitable outlet for the building foundation weeping tiles. The minimum cover to the top outside pipe barrel of a deep storm sewer shall generally be 2.5 to 3.0 metres depending on the storm service connection requirements. The minimum cover to the top outside pipe barrel of a shallow storm sewer system shall not be less than 1.5 metres from the centreline of the roadway unless alternate measures are implemented as approved by the Township Engineer.

Location

The storm sewers shall be located as shown on the standard Township road cross-section drawings. This standard location shall be generally 1.5 m of the centreline of the road allowance. In the case of

crescents, looped and curvilinear streets, this standard location may be varied to the extent that the storm sewer remains on the same side of the centreline of the street (i.e., left or right) to avoid crossing the sanitary sewer trenches at the changes in direction of the street.

Pipe Crossings

A minimum clearance of 0.20 m shall be provided between the outside of all, pipe barrels at all points of crossing. In cases where the storm sewer crosses a recent utility trench at an elevation higher than the elevation of the utility, a support system shall be designed to prevent settlements of the storm sewer, or alternatively the original trench will be re-excavated to the top of the utility and shall be backfilled with non-shrinkable fill (low strength concrete) to adequately support the storm sewer. When the storm sewer passes under an existing utility, adequate support shall be provided for the utility during and after construction to prevent damage to that utility.

Radius Pipes

Radius pipe shall be allowed for storm sewers 975 mm in diameter and larger provided that a maintenance hole is located at the beginning or at the end of the radial section. The minimum centre line radius allowable shall be in accordance with the minimum radii table as provided by the manufacturers.

Limits of Construction

Sewers shall be terminated with a maintenance hole at the subdivision limits when external drainage areas are considered in the design. The design of the terminal maintenance holes must allow for the future extension of the sewer.

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

Sewer Alignment

Storm sewers shall be laid in a straight line between maintenance holes unless radius pipe has been designed. Joint burial (common trenching) with sanitary sewers will be considered when supported by the recommendations of a soils report prepared by a qualified Geotechnical Engineering Consultant.

Changes in Pipe Size

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

Pipe Material Classification and Bedding

All storm sewer mains shall generally be constructed of reinforced concrete with suitable strength class

recommended by the Consultant. Smooth wall ribbed PVC may be used for mains up to 900 mm diameter. Storm sewer leads from catchbasins shall be constructed with non-reinforced concrete pipe or PVC pipe.

The class of pipe and the type of bedding shall be selected to suit loading and proposed construction conditions. For rigid pipe, Class B" bedding (compacted Granular A bedding with granular over the sewer) in accordance with OPSD shall be used.

Embedment for flexible pipe shall be homogeneous granular in accordance with OPSD.

Alternate granular materials for pipe bedding may be specified, subject to the approval of the Township, however clear stone bedding is generally not permitted. In areas where it is difficult to control the infiltration of ground water into the sewer trenches clear stone may be considered provided it is completely wrapped in a suitable geotextile, selected and installed in accordance with the manufacturer's requirement.

The width of trench at the top of the pipe must be carefully controlled to ensure that the maximum trench width is not exceeded unless additional bedding or higher strength pipe is used. Where poor soil conditions and high ground water levels are present, the Consulting Engineer shall prepare Special Designs, for the Township's approval.

- Reinforced concrete pipe shall conform to the requirements of OPSS 1820;
- Polyvinyl chloride (PVC) Pipe Products shall conform to the requirements of OPSS 1841. The pipe must be manufactured with factory assembled spigot gasket and integral bell joints;
- Polyethylene Pipe products shall conform to the requirements of OPSS 1840.

Testing and Acceptance

All newly constructed storm sewers shall be TV inspected upon satisfactory completion of all other testing, prior to the Township Engineer's recommendation for issuance of the "Certificate of Completion".

All storm works shall be thoroughly flushed and/or cleaned of debris and all pipes shall have a CCTV inspection as per OPSS 409 as part of the final acceptance inspections.

4.2.3.3 Maintenance Hole Requirements

Maintenance holes must be precast concrete and shall be designed and constructed in accordance with the most recent OPSS and OPSD. Where the standard drawings are not applicable, the maintenance holes shall be individually designed and detailed.

Location and Spacing

Maintenance hole shall be located at each change in alignment, grade or pipe material, at all pipe junctions, at the beginning or end of all radius pipe sections and at intervals along the pipe to permit entry for maintenance to the sewer.

Maximum Spacing

The maximum spacing between maintenance hole shall be as follows:

<u>Pipe Size</u>	<u>Maximum Maintenance hole Spacing</u>
600 mm or less	120 m
675 mm and over	150 m

Maintenance Hole Design

- a) All maintenance hole chamber openings shall be located on the side of the maintenance hole parallel to the flow for straight run maintenance hole, or on the upstream side of the maintenance hole at all junctions;
- b) The direction of flow in any maintenance hole shall not be permitted at acute interior angles;
- c) Safety gratings shall be provided in all maintenance hole when the depth of the maintenance hole exceeds 5 m. The maximum spacing between safety gratings shall not exceed 5 m;
- d) The obverts on the upstream side of maintenance hole shall not be lower than the obvert of the outlet pipe;
- e) The maximum change in direction of flow in maintenance hole, for sewer sizes 900 mm diameter and over, shall be 45°;
- f) Where the difference in elevation between the obvert of the inlet and outlet pipes exceed 0.9 m, a drop structure shall be placed on the inlet pipe;
- g) All storm sewer maintenance hole shall be benched to the obvert of the outlet pipe on a vertical projection from the spring line of the sewer, all in accordance with the standard detail drawing. Pre-benched maintenance hole will not be permitted;
- h) The minimum width of benching in all maintenance hole shall be 230 mm;
- i) Maintenance hole in boulevards shall be located, wherever possible, a minimum of 1.5 m from the face of curb or other service;
- j) Minimum size of any maintenance hole stack shall be 685 mm square;
- k) Frost strapping as per OPSD 701.100 shall be installed on all maintenance hole.

Elevations for Maintenance hole Frames and Covers

All maintenance hole, located within the travelled portion of a roadway, shall have the rim elevation set flush with the surface of the base course asphalt. The concreting and setting of the frame and cover shall be completed in accordance with the details provided in the standard drawing. A maximum of 300 mm of modular rings shall be permitted on maintenance hole in new subdivisions. No concrete shall extend over the edge of the maintenance hole.

Prior to the placement of the final lift of asphalt, maintenance hole frames shall be reset to final elevations.

Head Losses and Drops

Suitable drops shall be provided across all maintenance hole to compensate for the loss in energy due to the change in flow velocity and for the difference in the depth of flow in the sewers.

In order to reduce the amount of drop required, the designer shall, wherever possible, restrict the change in velocity between the inlet and outlet pipes to 0.6 m/s.

Hydraulic calculations shall be submitted for all junction and transition maintenance hole on sewers where the outlet is 1,050 mm. or greater. In addition, hydraulic calculations may be required for maintenance hole where the outlet pipe is less than 1,050 mm dia. if, in the opinion of the Township Engineer, there is insufficient invert drop provided across any maintenance hole.

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

The minimum drops across maintenance hole shall be as follows:

<u>Change of Direction</u>	<u>Minimum Drop (mm)</u>
0	30
1° to 45°	50
46° to 90°	80

Frame and Grate

All maintenance hole covers shall be as per OPSD 401.010 with Type A closed cover.

4.2.3.4 Catchbasin Requirements

Location and Spacing

Catchbasins shall be selected, located and spaced in accordance with the conditions of design. The

design of the catchbasin location and type shall take into consideration the lot areas, the lot grades, pavement widths, road grades and intersection locations.

All catchbasins and their leads shall be of the single, double or backyard type. To ensure that the capture or inlet capacity matches that of the storm sewer, the spacing of catchbasins on streets may be varied.

If detailed analysis of the major-minor system and SWM analysis of the pipe system indicate the need for inlet controls, additional constrictions should be implemented. Since reduction in the size of the standard catchbasin covers is not desirable, an orifice plate can be located in the catchbasin.

Catchbasins shall be generally located upstream of sidewalk crossings at intersections and upstream of all pedestrian crossings. Catchbasins shall not be located in driveway curb depressions. Double catchbasins shall be required when the catchbasin intercepts flow from more than one direction.

Rear lot catchbasins and connections shall be located as outlined in the lot grading criteria. In general, the catchbasin and the catchbasin connections shall be located entirely on one lot.

Maximum spacing for catchbasins including cul-de-sac gutters shall be as follows:

- | | |
|--------------------------------|-------|
| ▪ Road grade 0.5% to 3.0% | 110 m |
| ▪ Road grade 3.1% to 4.5% | 90 m |
| ▪ Road grade greater than 4.6% | 75 m |

Catchbasins Types

Catchbasins must be pre-cast concrete.

Special catchbasins and inlet structures shall be fully designed and detailed by the Consulting Engineer.

Double catchbasins are to be installed at the low point of any road.

Catchbasin Leads

For single catchbasins, the minimum size of connection shall be 300 mm and the minimum grade shall be 1.0%.

For double catchbasins, the minimum size of connection shall be 375 mm and the minimum grade shall be 1.0%.

For rear lot catchbasins, the minimum size of the connection shall be 300 mm and the minimum grade shall be 1.0%.

In general, catchbasins located in close proximity to a maintenance hole shall have their leads connected to the maintenance hole. Long catch basin connections (in excess of 20 m.) shall be connected to a maintenance hole or, alternatively, the lead can be connected to the sewer and a 1,200 mm. maintenance hole catchbasin used in lieu of the normal 600 mm. square catchbasin.

Frame and Grate

In general, the “bike—proof” catchbasin grate shall be required for all catchbasins located in roadway or walkway areas, and the pyramidal type shall be used for rear lot and ditch located catchbasins.

The frame and cover for catchbasins in roadway or walkway areas shall be as detailed in OPSD 400.020. Catchbasins located in grassed areas shall have a Birdcage Grate per OPSD 400.120.

Catchbasins at Intersections

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

Elevations for Catchbasin Frames and Grates

All catchbasins located within the travelled portion of a roadway, shall have the frame elevation set flush with the surface of the base course asphalt. The adjusting and setting of the frames and grates shall be completed in accordance with the details provided in OPSD 704.010 upon placement of surface course asphalt.

Temporary asphalt curbing shall be placed behind all catchbasins within the travelled portion of the roadway at the stage of base course asphalt. Asphalt curbing shall be placed in accordance with OPSD 601.010 - Type “D”, between the two adjacent expansion joints as shown on the Standard Drawing.

Prior to placing surface course asphalt, temporary asphalt curbs shall be removed and replaced by concrete curb.

4.2.3.5 Rainwater Leaders, Foundation Drains and Storm Connections

Rainwater Leaders

Rainwater leaders on all single family and semi-detached residential units shall be discharged onto grassed or garden areas and away from wells or tile bed areas. Rainwater leaders shall not encroach over other adjacent private lands.

The rainwater leaders draining the rear halves of all townhouses shall be discharged onto grassed or garden areas. The rainwater leaders draining the front halves of all townhouses shall be connected to the storm sewer system and the roof area must be included in the calculated imperviousness ratio.

Pre-cast concrete splash pads shall be placed at each rainwater leader downspout.

The rainwater leaders from all commercial, industrial, institutional and high density residential buildings should be discharged onto grassed or garden areas, if possible and if acceptable to the Township.

Foundation Drains

The Township may require connection of foundation weepers by gravity to the storm sewer system where it exists, provided that the elevation of the basement floor is at least 0.60 m above the elevation of the storm sewer obvert at the building envelope. (In some cases, this may require shallow basements.) No basement may be constructed below the 1:100 year storm hydraulic gradeline at the site.

Where gravity connection of weepers to storm sewers is not possible, the Township requires that a sump pump system be installed in the building with the discharge line connected to the storm sewer at street line. A backwater preventer valve and a siphon break valve, approved by the Township must be installed in the sump pump discharge line to prevent backflow into the basement.

In every case, the underside of footing shall be set above the seasonal high ground water level as determined in the geotechnical report.

Where sump pumps are installed in residential developments with open ditches, discharge pipelines shall not be placed within the Township's ditch lines of the road allowances. Sump pump discharge pipelines shall be directed to rear or side yard drainage swales.

4.2.4 Channel, Culvert and Overland Flow

For channel, culvert, bridge and/or erosion control projects the proponent is responsible for obtaining all necessary approvals from the governing agencies, such as the LSRCA, MNR, DFO and/or MOE.

4.2.4.1 Culverts and Bridges

Culvert and Bridge Hydraulic Capacity

Only arterials and collectors should, if feasible, be permitted to cross the major system watercourses. It is also recommended that designers consider the need to design culverts and bridges on such arterials and collectors for at least the 1:100 year storm flow, if not for the Regional Storm flow. If smaller culverts or bridges are provided, the backwater effects for the 1:100 year and Regional Storm flows must be determined. Concrete box culverts shall be designed and placed for all watercourse crossings subject to the approval of the Township. Ministry of Natural Resources, DFO and/or LSRCA approval under their regulations may be required for watercourse/valley crossings.

<u>Road Classification</u>	<u>Design Flood Frequency</u>
Arterial	1:100 Year to Regional
Collector	1:50 Year
Urban Local	1:25 Year
Rural Local	1:25 Year
Temporary Detour	1:10 Year
Driveway	1:5 Year

All culverts must be of sufficient length to provide for a preferred 5:1 (minimum 3:1) slope off the driving surface to the ditch invert. All driveway culverts require entrance approval.

Bridges and other major drainage structures shall require special designs as determined by the Township. Hydraulic calculations will be required.

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

4.2.4.2 Open Channels

The proposed criteria for an open channel design shall be submitted to the Township for approval prior to the actual design being undertaken. Open channels shall be defined as major system overland flow channels, minor system outfall channels or natural channels. Major system overland flow channel designs may be required to accommodate the Regional storm or the 100-year storm for new development.

The Consulting Engineer shall also be responsible for obtaining the approval of the design from MNR, DFO, LSRCA and MOE, as required, if the open channel concept is favourably considered.

"Natural" channel design criteria will be determined on a site by site basis. The following guidelines must be considered:

<u>Open Channels</u>	<u>Minimum Velocity</u>	<u>Maximum Velocity</u>
Grass lined - Natural	0.7 m/s	1.5 m/s
Grass lined - Maintained	0.7 m/s	1.5 m/s
Gabion lined	0.7 m/s	2.5 m/s
Concrete lined	0.7 m/s	4.0 m/s

4.2.5 Watercourse Erosion and Bank Instability

Where erosion or bank instability is already evident in an area to be developed or re-developed, the Township requires that the situation be stabilized by appropriate remedial measures. Where development will potentially cause significantly increased downstream erosion, the Township also requires the Developer to mitigate further damage by appropriate remedial and preventative measures.

Where designing remedial erosion or bank stabilization works, preservation of the watercourse dynamics and natural valley aesthetics must be secondary only to achieving a sound technical solution. The proposed design shall reference the MNR Natural Channel Design Manual. A normal bank flow channel has a capacity of about the 1:2 year flood. Protection to this level will be adequate provided care is taken to prevent any damage by higher floods and provided that the channel bank is not coincident with a higher valley bank. In this latter case, it may be necessary to protect the bank to a level as high as the 1:100 year flood or even the flood resulting from the Regional Storm.

The proposed criteria for an erosion or bank stability design shall be submitted to the Township for approval prior to the actual design being undertaken.

4.2.6 Overland Flow Routes

An overland flow route continuous to the nearest major channel must be established through all areas and shall be contained within either the road right-of-way or by easements.

If the overland flow route travels across downstream property not municipally owned, the developer must obtain the necessary agreement(s) from downstream owner(s) accepting the increased quantity of runoff.

The depths of flooding permitted on streets and at intersections during the 1:100 year storm are as follows:

- No building shall be inundated at the ground line, unless the building has been flood proofed;
- For all classes of roads, the depth of water at the gutter shall not exceed 0.3 m.

Flow across road intersections shall not be permitted for minor storms (generally 1:10 year). To meet the criteria for major storm run-off, low points in roads must have adequate provision for the safe overland flow.

4.2.7 Inlet/Outlet and Special Structures

Inlet and outlet structures shall be fully designed on the engineering drawings. The details provided shall include the existing topography, proposed grading and the work necessary to protect against erosion.

Inlets

Inlet structures shall be fully designed by the Consulting Engineer when OPSD structures are not deemed suitable. Inlet grates shall generally consist of inclined parallel bars or rods set in a plane at approximately 180 degrees with the top away from the direction of flow. Gabions, riprap or concrete shall be provided at all inlets to protect against erosion and to channel the flow to the inlet structure.

Hydraulic design calculations for inlet structures must be performed in accordance with guidelines established by the Ministry of Transportation Drainage Manual.

The design of any culvert on a new or reconstructed watercourse where an inlet grating is required must provide a measure of safety and minimize the risk of entanglement or entrapment of a person.

Outlets

The OPSD headwall standards shall be used for all storm sewers up to 2,400 mm diameter. For sewers over 2,400 mm. the headwalls shall be individually designed. All headwalls shall be equipped with a grating over the outlet end of the pipe and a railing across the top of the headwall for the protection of the public.

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

Storm sewer outfalls shall not be connected to existing or proposed road crossing culverts. Storm sewer outfalls must be terminated at separate headwall structures, adjacent to the outlet side of road crossing culverts.

Gabions, Terra-fix blocks, riprap, concrete or other erosion protection shall be provided at all outlets to prevent erosion of the watercourse and the area adjacent to the headwall. The extent of the erosion protection shall be indicated on the engineering drawings and shall be dependent upon the velocity of the flow in the storm sewer outlet, the soil conditions, the flow in the existing watercourse and site conditions.

4.3 Sanitary Sewer System

4.3.1 General Requirements

Within the Township, the responsibility for the local collection and treatment of sanitary wastes in municipally operated sewage treatment plants rests within the Township.

Prior to the commencement of any design for any sanitary sewage works, the applicant shall obtain confirmation from the Township that adequate treatment plant capacity is available for the development proposed.

Sanitary sewers designed and constructed in accordance with the most recent requirements and specifications of the Township are required to carry domestic, commercial and industrial sewage from each area of the development under consideration. Flow is to be by gravity, in general. Pumped systems will be considered only where other alternatives are not possible and only with the approval of the Township

4.3.2 Sanitary Drainage System

4.3.2.1 Design Flows

The design flow, in each maintenance hole length of sewer, shall be computed on the standard sanitary sewer design sheets. For each area entered on the design sheet, the maintenance hole numbers, the size and grade of the sewers, and the number of the detailed plan and profile for each section of the sanitary sewer shall also be shown.

Calculations shall be based on the following:

Residential Sewage Flows

The following formula shall be used to calculate the sewage flow for residential areas:

$$Q_d = \frac{PqM}{86.4} + IA$$

Where;

- Q_d = Peak domestic flow plus extraneous flows, in L/s
- P = Design population, in thousands
- q = Average daily per capita flow, in L/cap/d
- M = Peaking factor
- I = Unit of peak extraneous flow, in L/s/ha
- A = Gross tributary area, in hectares

An average daily per capita flow of 450 L/c/d shall be used.

The unit of peak extraneous flow shall be 0.2 L/s/ha.

The peaking factor shall be calculated based on the Harmon formula,

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

Where;

P = population, in thousands

Maximum M – 4.0

Minimum M – 1.5

The design population shall be derived from the drainage area and expected maximum population over a design period of 20 years.

For areas where the lands are zoned for specific residential use, but detailed planning information is not available, the following population densities shall apply for calculation of sewage flows only:

<u>Type of Housing</u>	<u>Persons /Hectare</u>
Single Family Dwelling, Semi-detached & Duplex, Townhouse	40

Apartment 64

When the number and type of housing units within a proposed development are known, the calculation of population for the proposed development shall be based on the following:

<u>Type of Housing</u>	<u>Person/Unit</u>
Single Family Dwelling, Semi-detached & Duplex, Townhouse, Condominium	2.6

Apartment 2.0

Future land use and population shall be based on the approved Official Plan and Secondary Plans of the area.

When such information is not available for the land under consideration, the following land use standard shall be used;

Land Use Standard for 100 ha of Developable Land

Local open space	10.0	ha
Residential *	75.0	ha
Commercial	5.0	ha
Schools and Institutions	<u>10.0</u>	ha
Total	100.0	ha

* for residential lands use a population density of 45 persons per gross hectare.

Commercial Sewage Flows

A design flow of 75 m³/ha/day (includes allowances for infiltration and peaking effects) shall be used for the design of all local sewers.

The area shall be based on the gross lot area.

Industrial Sewage Flows

A design flow of 35 m³/ha/day for light industry and 55 m³/ha/day for heavy industry shall be used (excludes infiltration and peaking effects).

The area shall be calculated using the gross area included in the industrial block or development.

Peak flow and infiltration factors shall be applied as per the MOE Design Guidelines.

The Township through its Planning Policies encourages the establishment of only those industries which have low sewage requirements (dry industries).

Institutional Sewage Flows

A design of 112 m³/ha/day (includes allowances for infiltration and peaking effects) shall be used for the design of all local sewers.

The area shall be calculated using the gross area included in the school or institutional site.

4.3.2.2 Pipe Sizing and Specifications

Pipe Capacities

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

For all types of pipe a roughness coefficient of $n = 0.013$ shall be used.

Flow Velocities

Minimum acceptable velocity = 0.6 m/s

Maximum acceptable velocity = 3.0 m/s

The velocity change in a maintenance hole from one pipe to another shall not exceed 0.6 m/s.

Pipe Grades

The first upstream leg of sanitary sewer shall have a minimum pipe grade of 1%.

The minimum grade of sanitary sewers shall be the minimum grade required to achieve the minimum velocity of 0.6 m/s, as required by the MOE Guidelines for Sewage Works.

Minimum Sizes

The minimum size for an on street sanitary sewer shall be 200 mm.

Depth of Sanitary Sewers

The depth of the sewer shall be measured from the final centreline finished road elevation to the top of the sanitary sewer.

In all instances, the proposed sanitary sewer shall be installed at a depth sufficient to also service lands external to the site as determined by the Township.

For residential, commercial and institutional areas the minimum depth shall be 2.75 m.

For industrial areas, the minimum depth shall be 2.15 m.

Mainline sanitary sewers shall be located a minimum of 1.0 m below basement floor elevations to allow for the installation of sewer laterals.

Location

All sanitary sewers shall be located as shown on the typical Township roadway cross sections.

In general, this location is 1.5 m south or west of the centreline of the roadway. A minimum horizontal clearance of 3.0 m is required between the sanitary sewer and watermain.

Storm Sewer and Water Main Crossings

Generally, a minimum clearance of 0.20 m shall be provided at the point of crossing between the outside of the pipe barrels of storm and sanitary sewers. A minimum vertical clearance of 0.50 m shall be provided at the point of crossing between the outside of the pipe barrels of the sanitary sewers and

water mains.

The sanitary sewer connections are required to go under the storm sewer.

Limits of Construction

Sewers shall be terminated with a maintenance hole at the subdivision limits when external drainage areas are considered in the design. The design of the terminal maintenance holes must allow for the future extension of the sewer.

Sewer Alignment

Sanitary sewers shall be laid in a straight line between maintenance holes unless radius pipe has been designed. Joint burial (common trenching) with storm sewers will be considered when supported by the recommendations of a soils report prepared by a qualified Geotechnical Engineering.

Changes in Pipe Size

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

Pipe Bedding

The class of pipe and the type of bedding shall be designed to suit loading and proposed construction conditions. Details are illustrated in the OPSD standard Bedding and Backfill details. In general, Type 'B' bedding and cover (compacted Granular A bedding with granular over the sewer) shall be used for rigid pipe sewers.

Embedment for flexible pipe shall be homogeneous granular material in accordance with OPSD requirements.

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

Where poor soil conditions and high ground water levels are present, bedding shall consist of clearstone wrapped in geotextile fabric. The Consulting Engineer shall prepare special designs for the Township's approval.

Materials

For single family and semi-detached units, multiple family, and other residential blocks, the service connections shall be PVC.

All bends on sanitary service connections shall be long radius, sweep bends.

Sanitary sewers shall be constructed of reinforced concrete pipe, Polyvinyl Chloride (PVC) pipe or polyethylene.

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

Reinforced concrete pipe shall be used for sewers 600 mm diameter or larger. PVC pipe may only be used for sanitary sewers up to and including 600 mm in diameter.

- Reinforced Concrete Pipe shall be steel reinforced and conform to OPSS 1820;
- Polyvinyl Chloride Pipe (PVC) shall conform to OPSS 1841;
- Dimension ratio (DR) of PVC sewer pipe shall not exceed 35;
- Polyethylene pipe shall conform to OPSS 1840.

For sewer applications requiring pressure pipe, pipe design should reference MOE guidelines.

Testing and Acceptance

All testing shall be carried out from maintenance hole to maintenance hole including house service connections as work progresses.

An infiltration or exfiltration test as per OPSS 410 shall be completed on all sewers 1200 mm in diameter and smaller. The Township Engineer shall determine which test is to be undertaken.

Infiltration Test

An infiltration test shall be carried out where the ground water at time of testing is 600 mm or more above the crown of pipe throughout the section of sewer under test.

The infiltration shall not exceed the following calculated allowable infiltration for the section tested:

$$0.75 \quad \text{L/mm of diameter/100 metres of sewer/hour.}$$

Exfiltration Test

An exfiltration test shall be carried out where the ground water table is lower than 600 mm above the crown of pipe of highest point of highest service connection included in the test section. The static head for testing exfiltration shall be at least 600 mm above the ground water table.

The allowable leakage for the test section shall not exceed the following:

$$0.75 \quad \text{L/mm of pipe diameter/100 metres of sewer/hour.}$$

Deflection Test

A deflection test shall be performed on all sewers constructed using PVC pipe material.

Deformation gauge (Pig) test as per OPSS is required on all pipe works prior to substantial performance, but a minimum 30 days after installation.

Video Record

All pipe works shall have a CCTV inspection as per OPSS 409 complete as part of the substantial performance and final acceptance inspections.

A permanent record in video tape or DVD form shall be supplied, illustrating a continuous record of the sewer installations, service connections, maintenance hole, etc. A report identifying any unusual or sub-standard conditions shall also be submitted.

At the discretion of the Township, additional video inspections and records may be required prior to "Final Acceptance".

4.3.2.3 Maintenance Hole Requirements

Maintenance holes to be either precast concrete and shall be designed and constructed in accordance with the most recent OPSS and OPSD. Where the standard drawings are not applicable, the maintenance holes shall be individually designed and detailed.

Location and Spacing

Maintenance hole shall be located at each change in alignment, grade or pipe material, at all pipe junctions and at intervals along the pipe to permit entry for maintenance to the sewer.

Maximum spacing of maintenance holes shall be 120 m for sewers 600 mm or less in diameter and 150 m for sewers 675 mm or greater in diameter.

Maintenance Hole Details

- a) All maintenance hole chamber openings shall be located on the side of the maintenance hole parallel to the flow for straight run maintenance hole, or on the upstream side of the maintenance hole at all junctions;
- b) The maintenance hole shall be centered on the sanitary sewer main;
- c) The maximum change in the direction of flow in any sanitary sewer maintenance hole shall be 90 degrees. A change of flow direction at acute interior angles shall not be permitted;
- d) A maximum invert drop of 0.25 m within the maintenance hole will only be allowed if the design of

the sewer cannot be modified to reduce the drop or modified to accommodate a drop structure;

If the design of the sewer system is such that the difference in elevation between the maintenance hole inlet and outlet exceeds 0.9 m, then a drop structure will be required.

Whenever feasible, sewer systems should be designed to avoid the use of drop structures;

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

<u>ALIGNMENT CHANGE</u>	<u>DROP REQUIRED</u>
straight run (0 degrees) grade of sewer	
15 - 45 degrees	0.03 m
45 - 90 degrees	0.06 m

When the upstream flow velocity exceeds 1.5 m/s, the drop required through a maintenance hole shall be calculated using the standard calculation sheet, "Hydraulic Calculations for Manholes" found in the MOE Design Guidelines;

- f) For all junction and transition maintenance holes, the drop required shall be calculated using the standard calculation sheet "Hydraulic Calculations for Manholes" found in the MOE Design Guidelines;
- g) The obvert(s) on the upstream side of a maintenance hole shall in no case be lower than the obvert(s) on the downstream side of the maintenance hole;
- h) All maintenance holes shall be benched as detailed on the Standard Drawings. The use of pre-benched maintenance holes will not be permitted;
- i) When any dimension of a maintenance hole exceeds those on the Standard Drawings, the maintenance hole must be individually designed and detailed;
- j) Safety gratings shall be required in all maintenance holes greater than 5.0 m in depth. Safety gratings shall not be more than 5.0 m apart and shall be constructed in accordance with the Standard Drawings;
- k) Frost strapping as per OPSD 701.100 shall be installed on all maintenance holes.

Whenever practical, a safety grating shall be located 0.5 m above the drop structure inlet pipe.

Frame and Grate

All maintenance holes located within the travelled portion of a roadway shall have the rim elevation initially set flush with the surface of the base course asphalt. The concreting and setting of the frame and cover shall be completed in accordance with the details provided in the standard drawing. A maximum of 300 mm of modular rings shall be permitted on maintenance holes in new subdivisions. No concrete shall extend over the edge of the maintenance hole.

Prior to the placement of the final lift of asphalt, maintenance hole frames shall be reset to final elevation.

Where maintenance holes are located in areas to be flooded by the major design storm, maintenance hole covers shall be of the sealed variety and the maintenance hole is to be suitably vented.

All other maintenance hole covers shall be as per OPSD 401.010 with Type A closed cover.

4.3.2.4 Service Connections

All sanitary sewer service connections for single and semi-detached dwellings and townhouse units shall be individual services.

Location

The proposed locations for the sanitary sewer service connections shall be shown on the plan and profile drawings and shall be in accordance with the locations specified on the Standard Drawings.

Sanitary connections shall be in accordance with the following Standards:

- OPSD 1006.010 Sewer Service Connection for Rigid Pipe;
- OPSD 1006.020 Sewer Service Connection for Flexible Pipe.

Residential connections shall terminate at the center of the property line with a test fitting, 125 mm x 100 mm reducer, plug suitably braced to withstand test pressures and 89 mm x 38 mm marker placed from the invert of the connection to 600 mm above grade painted green. All service connections to be equipped with a cleanout to the surface as illustrated in the Standard Drawings.

Connection to Main

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

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

below:

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

Size

Sanitary connections are to be sized as follows:

Single family residential:

- Single 125 mm diameter (min.) PVC SDR 28 Joints; Bell and Spigot with rubber gasket.
PVC pipe to be green in colour.

Service Connection to all block developments:

An inspection maintenance hole shall be required on private property 1.50 m from property line to centre of rim.

Multiple family residential block, institutional, commercial and industrial blocks:

- Designed in accordance with Section 3.3.3.2.;
- Min. size 200 mm diameter.

Depth

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

Minimum - 2.50 m

Maximum - 3.00 m

Risers shall be used when the depth to obvert of the sewer main exceeds 4.50 m. The riser connection shall not exceed 3.0 m in depth.

Grade

The minimum and maximum grades for sanitary sewer service connections shall be as follows:

Size of Connection (mm)	Minimum Grade (%)	Maximum Grade (%)
125	2.0	8.0
150	1.0	6.0
200	0.5	6.0

Joints and Bedding

Joints and bedding for connections are to be equivalent to joints and bedding as specified for sanitary sewer pipe.

4.3.2.5 Low Pressure Sanitary Sewer System

Low pressure sanitary sewer systems shall be designed on a site-by-site basis in accordance with the MOE design guidelines.

Materials

- Low Pressure Mains – Polyethylene SDR11 (CTS);
- Low Pressure Service – Polyethylene SDR11 (CTS);
- Main Stop – Mueller H15008 or approved equal;
- Curb Stop – Mueller H15209 or approved equal;
- Service Box – Mueller A-726, Clow 80-1 or approved equal with stainless steel rod. Service box cap to read “Low Pressure Sewer”;
- Check Valve – Valmatic VM-1401.5THR or approved equal;
- Tracer Wire – 12-gauge T.W.U. standard copper, light coloured, plastic coated;
- Linkseal – Model LS-315-S-316-6 by Thunderline Modular Seal;
- Fittings (elbows, tees, etc.) – HDPE SDR11 brass fittings or approved equal, installed in accordance with manufacturers recommendations;
- Connections to the main shall be made with a brass “T” coupling or approved equal.

Depth

A minimum of 1.7 m cover shall be maintained over low pressure sanitary sewer mains and services. Appropriate depth rigid insulation shall be installed where the minimum cover cannot be achieved.

Embedment

Sewer embedment for low pressure sanitary sewer systems shall be equivalent to the embedment specified for gravity sanitary sewer pipe.

Cleanouts

Cleanouts shall be specified in accordance with Standard Drawing No. 127. Cleanouts shall be located at minimum 75 m intervals and at all distinct changes in direction.

Grinder Pump System

Private properties connecting to the low pressure sanitary sewer must install a grinder pump system that has been designed to suit the mainline system. Refer to Standard Drawing No. 128 for a typical grinder pump layout.

Thrust Restraint

Adequate restraint must be provided at all fittings and deflections in the low pressure sanitary sewer system to prevent pipe movement and subsequent joint failure.

Mechanically restrained joints or concrete thrust blocks in accordance with OPSD shall be used for all low pressure sewer. Use thrust block requirements for 100 mm dia. pipe for all sizes less than or equal to 100 mm dia. The recommended type of restraint in the design will depend on anticipated soil conditions.

Tracer Wire

Tracer wire shall be installed with the pipe and brought to the surface at all valve boxes and chambers.

Corrosion Protection

All ferrous fittings and tracer wires shall have corrosion protection provided by means of sacrificial anodes.

Sacrificial anodes shall be in the form of packaged zinc anodes and meet ASTM B-418-73-type II.

One 2.3 kg zinc anode is to be installed for every 500 m of tracer wire. The location for the anodes shall be shown on the construction drawings.

4.4 Water Supply System

4.4.1 General Requirements

Jurisdiction

Within the boundaries of the Township, the responsibility for the supply, treatment and storage of water for municipal water systems rests with the Township.

The Township is responsible for the distribution of the treated water to the individual users.

Water mains designed and constructed in accordance with the most recent requirements and specifications of the Township are required on every street within all proposed plans of subdivision. Water mains shall be of adequate size to provide service for the development of adjacent lands designated by the Township.

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

Public Communal Water Systems

Items to be reviewed for new public communal water systems shall include but are not limited to the following:

- The potential for future growth;
- Level of service to be provided (design water demand, peaking factors, fire flow requirements, etc.);
- Possible interconnection with other water systems in the future;
- Ground water systems;
- Storage requirements;
- Water quality and treatment;
- Potential impacts on neighbouring domestic water supplies;
- Access and security;
- Distribution system requirements; and
- Cost of maintenance and capital cost.

The Developer shall undertake all necessary investigations and prepare feasibility reports for implementation of new public communal water systems. Design parameters shall meet all current guidelines and regulations of the Ministry of Environment and guidelines established by the Fire Underwriters Survey.

4.4.2 Water Main Design Criteria

All water mains shall be sized to meet the greater of the maximum day plus fire flow or the maximum hour demand.

System Designs

The maximum sustained operating pressure shall not exceed 700 kPa. If pressure in a localized area is above this level, a pressure-reducing valve shall be installed on each service connection within that area.

Under normal conditions of maximum day demand, the pressure shall not drop below 275 kPa at any point in the water system.

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

Friction Factors

The following 'C' values shall be used in the Hazen-Williams equation, for the design of water distribution systems regardless of pipe materials:

<u>Pipe Diameter (mm)</u>	<u>C-Factor</u>
150	100
200 to 300	110
400 to 600	120
Over 600	130

The above C-factors represent long-term values. A C-factor of 140 shall be used to calculate maximum velocities for transient pressure estimations, or for checking pump motor sizes for runout conditions.

In evaluating existing systems for expansion, the C-factors shall be determined by actual field tests, wherever possible.

The Hazen-Williams equation shall be used to calculate the flow in water mains as follows:

$$Q = 0.84918 (C) (A) (R)^{0.63}(S)^{0.54}$$

where Q = Discharge (m³/sec.)

C = Coefficient of Roughness

A = Cross-Sectional Flow Area (m²)

R = Hydraulic Radius (m)

S = Slope of Energy Grade Line (m/m)

Domestic Demand

Domestic water demand shall be calculated on the basis of an average day consumption rate of 450 litres per capita per day.

The maximum day and peak hour factors shall be determined from the current MOE design guidelines although the following are considered minimums:

Maximum daily demand factor: 2.0
Peak hourly demand factor: 4.5

Peak flows other than domestic flows shall be determined on an individual basis.

Commercial and Institutional Water Demands

A population equivalent of 86 persons per hectare shall be used for design purposes to estimate the water consumption for large commercial areas unless more specific data is available.

When specific planning information is available, water consumption for individual commercial and institutional sites may be calculated from the following table:

<u>Use</u>	<u>Water Usage</u>
Shopping Centers	2500—5000 L/1000 m ² /day
Hospitals	900—1800 L/bed/day
Schools	70— 140L/student/day
campgrounds	225— 570L/campsite/day

When using the above unit demands, maximum day and peak rate factors shall be developed. For establishments in operation for only a portion of the day, such as schools, shopping plazas, etc., the water usage shall also be factored accordingly. For instance, with schools operating for 8 hours per day, the water usage rate will be at an average rate of say 70 L/student/day times 24 divided by 8 or 210 L/student over the 8 hour period of operation.

The water usage will drop to residential usage rates during the remainder of the day. Schools generally do not exhibit large maximum day to average day ratios and a factor of 1.5 will generally cover this variation. For estimation of peak demand rates, a fixture-unit approach shall be used.

The peak water usage rates in campgrounds varies with the type of facilities provided (showers, flush toilets, clothes washers, etc.) and the ratio of these facilities to the number of campsites. A peak rate factor of 4 shall be used. This factor shall be applied to the average expected water usage at full occupancy of the campsite.

Industrial Water Demands

The Township, through its Planning Policies encourages the establishment of only those industries, which have low water consumption requirements. A population equivalent of 86 persons per gross hectare shall be utilized for design purposes to estimate the average consumption rate for industrial areas unless more specific data is available.

Fire Flows

The requirements for fire flows shall be discussed and agreed upon with the Township Engineer prior to proceeding with detailed design.

In general, the minimum fire flow requirement for a particular structure or area of the municipality shall be as outlined by the MOE and the Fire Underwriters Survey.

4.4.3 Pipe Sizing and Specifications

4.4.3.1 Selection of Main Sizes, Pressures and Depth

For all water mains designed to carry fire flows, the following minimum sizing for water mains shall apply:

For Residential areas	150 mm diameter
For Commercial areas	200 mm diameter
For Industrial areas	300 mm diameter

to be sized according to the anticipated water demand.

In general, the following standardized water main sizes shall be used in the Township:

150 mm
200 mm
300 mm
400 mm
500 mm
600 mm

Depth of Water Mains

Curb and Gutter Roads	1.80 m minimum to obvert, measured below finished centre line road grade.
Open Ditch Roads	The cover over the water main and the service connections shall not be less than 1.80 metres.
Unimproved Roads	1.80 m minimum to obvert, measured below a future design centre line road grade.

Watercourses, Creek

Adequate frost protection shall be provided below stream bed. Generally 1.80 m minimum to obvert, measured below the watercourse invert shall be considered acceptable.

Each subsequent chapter should start on its own page, separate by a Page Break or Section Break.

4.4.3.2 Location of Water Mains

Water mains shall be located as shown on the standard Township roadway cross-section. This location shall generally be on the north or east sides of the street.

Horizontal Separation Between Water Mains and Sewers

Under normal conditions water mains shall be designed with a minimum clear horizontal separation of at least 2.5 m from any sewer or sewer maintenance hole. The distance shall be measured from the nearest edges of the pipes or structures.

Separations of Water Mains and Sewers – Special Conditions

Under unusual conditions (where a significant portion of the construction will be in rock, or where congestion with other utilities will prevent a clear horizontal separation of 2.5 m) a water main may be laid closer to a sewer, provided the elevation of the crown of the sewer is at least 0.50 m below the invert of the water main. Such separation shall consist of in-situ material or compacted native earth backfill.

In rock trenches, facilities shall be provided to permit drainage of the trench to minimize the effect of the impounding of surface water and/or leakage from sewers in the trench.

Water Main Crossing Sewers

Under normal condition water mains shall cross above sewers with sufficient vertical separation to allow for proper bedding and structural support of the water main and the sewer main.

When it is not possible for the water main to cross above the sewer main, the water main passing under a sewer shall be protected as follows:

- a) A vertical separation of at least 0.50 m shall be provided between the outside face of the sewer and the top of the water main;
- b) The sewer shall be adequately supported to prevent excessive deflection of joints and settling;
- c) The length of water main pipe under the sewer shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer. Water main pipe joints shall be located 1.5 m (minimum) from the centreline of the sewer (both sides).

4.4.3.3 Utility Crossings

Water mains crossing over or under other utilities shall be designed with a 300 mm minimum clear separation between the outside edges of the water main and the utility.

4.4.3.4 Dead-Ends

Water distribution systems shall be designed in grid patterns or looped to avoid dead-end sections.

Temporary dead-ends on water mains that are to be extended in the future shall be equipped with a fire hydrant at the end of the temporary dead-end main. The fire hydrant shall be immediately preceded by a valve to facilitate the future extension of the water main without disruption to the existing users.

4.4.3.5 Extra Mains and Extra Fittings

No roadway leading out of the subdivision shall be completed and accepted by the Township until connecting water mains are installed complete to the subdivision limits.

Extra fittings shall be installed at any point on the water mains requested by the Township to provide for future connections.

4.4.3.6 Pipe Classification and Bedding

Acceptable materials for water main pipe up to and including 300 mm diameter are as follows:

- Polyvinyl Chloride Pipe (PVC) manufactured in accordance with the latest edition of CSA B137.3. A minimum Class 150, DR 18 pipe shall be used;
- Fittings shall be of cast iron or ductile iron; cement lined and shall be manufactured to AWWA C110. All fittings shall be supplied with mechanical joint ends;
- Polyethylene pressure pipe shall be to OPSS 1842;
- Copper pipe service connections shall comply with ASTM B 88 (Type "K" soft copper).

The class of pipe and the type of bedding shall be selected to suit loading and proposed construction conditions. Pipe bedding and cover shall be homogeneous granular material in accordance with OPSD requirements for flexible pipe.

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

Where poor soil conditions and high ground water levels are present, the Consultant shall prepare special designs for the Township Engineer's approval.

4.4.3.7 Thrust Restraint

Adequate restraint must be provided at all fittings and deflections in the water distribution system to prevent pipe movement and subsequent joint failure.

Mechanically restrained joints or concrete thrust blocks in accordance with OPSD shall be used for all PVC water mains. The recommended type of restraint in the design will depend on anticipated soil conditions.

4.4.3.8 Utility Crossings

All ferrous fittings, tracer wires and copper water service connections shall have corrosion protection provided by means of sacrificial anodes.

Sacrificial anodes shall be in the form of packaged zinc anode or zinc anode caps and meet ASTM B-418-73-type II.

One 5.4 kg zinc anode or anode cap is to be installed on every valve, hydrant and fitting connected to a non-ferrous water main. If anode caps are to be used they are to be installed on all bolts.

Fittings shall include bends, tees, crosses, sleeves, reducers, plugs, caps, joint restrainers and couplings etc.

One 2.3 kg zinc anode is to be installed on each copper service connection. An insulated fitting shall be installed between the curb stop and the street line if the building being serviced is located 7.6 m or more from the property line.

4.4.3.9 Tracer Wires

A tracer wire shall be provided along the top of all Polyvinyl Chloride (PVC) water mains, hydrant leads and PE water services to permit future field tracing. These tracer wires shall be attached to the top of the water main and shall be looped inside each valve box, including hydrant valves and shall also be connected to the bottom flange of all hydrants. Tracer wires shall be No. 12 gauge stranded copper (TWH) complete with plastic coating.

One 2.3 kg zinc anode is to be installed for every 500 m of tracer wire. The location for the anodes shall be shown on the construction drawings.

4.4.3.10 Connecting Non-Ferrous Water Mains to Ferrous Water Mains

When connecting a non-ferrous water main to a ferrous water main, the ferrous water main shall be cathodically protected by a 14.5 kg magnesium anode.

4.4.3.11 Fire Hydrants

All fire protection design requirements shall be reviewed with the Township Engineer at the preliminary design stage.

Branch Valves and Boxes

All hydrants installed on water mains up to and including 300 mm in diameter shall be installed with a 150 mm diameter branch valve attached to the water main with an anchor tee.

All hydrants installed on water mains greater than 300 mm in diameter shall be controlled by a 150 mm diameter, branch valve directly secured to the supply main with flanged fittings or restraining tie-rods.

Fire hydrants shall be Canada Valve, Century No. 1 open left with 2 CSA hose ports, one 33 B pumper port and a break away type 6" MJ base. The hydrant lead shall be minimum 150 mm with resilient seated gate valve shut off "Open Left" by Clow or Mueller. The hydrants shall be self-draining and installed as per OPSD 1105.010.

Hydrant Spacing

Hydrants shall be installed on all water mains 150 mm in diameter and larger with the following maximum allowable spacing:

- 150 m in residential areas, or to provide for a maximum hose length of 75 m.
- 75 m in industrial and commercial areas.

Location of Hydrants

Hydrants shall be located on the projection of a lot line and offset from the street line in accordance with the standard cross-section.

Hydrants shall be located 1.20 m minimum distance from the edge of any driveway or house service connection.

A hydrant shall be placed at the end of every cul-de-sac and dead end street as well as at the high points in roads.

Hydrant Ports

In all areas hydrants shall be equipped with 114 mm dia. Pumper Ports and 2 - 64 mm dia. side ports.

Direction of Opening

All hydrants shall be equipped with a non-rising stem and shall open in a counter clockwise direction.

Colour of Hydrants

Hydrants are to be flow tested by an organization approved by the Township to determine post-construction performance while maintaining a minimum residual system pressure of 140 kPa in accordance with National Fire Protection Association (NFPA) 291. Hydrant bodies shall be factory painted reflectorized yellow. Hydrant ports and caps shall be painted based on the results of the flow testing in accordance with the NFPA colour-coded system as follows:

Class	Available Flow	Colour
AA	> 5,680 L/min	Light Blue
A	3,785 – 5,675 L/min	Green
B	1,900 – 3,785 L/min	Orange
C	< 1,900 L/min	Red

The capacity colours should be of reflective type paint for rapid identification at night. Paint specifications are subject to Township approval.

Hydrant Manufacturer

All hydrants shall be Darling Century Model, manufactured by Canada Valve.

Hydrant Markers

Each hydrant is to be provided with a standard marker for easy identification in the winter.

4.4.3.12 Valves

Type

Gate valves shall be used on all water mains 200 mm in diameter and smaller.

Butterfly valves shall be used on all water mains 300 mm in diameter and larger.

All valves shall be of the approved type with non-rising stem and a 50 mm square operating nut opening counter-clockwise.

All valves on water mains 200 mm in diameter and smaller shall have mechanical joint ends.

All valves 300 mm in diameter and larger shall be installed inside chambers and shall have flanged ends. A flange to plain end spacer and a Victaulic coupling shall be installed inside the chamber to permit removal of the butterfly valve if necessary.

Size

All line valves shall be the same size as the water main.

Number, Location and Spacing

Generally, three valves are required at a tee intersection and four valves are required at a cross intersection with the valves being located at a point where the street line projected intersects the water main. All valve boxes and valve chambers shall be located in boulevards and out of pavement areas wherever possible.

Line valves on distribution water mains shall be located such that a maximum of 20 houses can be shut-off from another block and isolated from the system at any time. In no case, however, shall the valve spacing along a water main exceed 300 m.

Valve Boxes and Chambers

All valves on water mains 200 mm in diameter and smaller shall have valve boxes and specified direct bury operators must be used.

All valve boxes shall be three-piece, sliding-type, size 'D'.

All valves on water mains 300 mm in diameter and larger shall be installed within concrete chambers set flush with finished grade. The top of the roof slab of valve chambers shall be at least 0.60 m below the profile of the finished pavement.

Air Relief Valves

Air relief valves shall be installed at all significant high points of the water distribution system.

Air relief valves shall be double-acting type, combination air release/vacuum valve.

Air relief valves shall be housed within a chamber as illustrated in the Standard Detail Drawings, and drained to storm sewers where possible. The chambers are to be equipped with "P" traps to prevent movement of gasses.

Drain Valves

Drain valves shall be located at the low points of all water mains 300 mm in diameter and greater. These valves shall be constructed in a separate chamber as illustrated in the standard detail drawings.

4.4.3.13 Service Connections

Individual service connections shall be installed to each unit within the development. Semi-detached lots shall be provided with two separate water service connections.

Minimum Sizing

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

For other situations requiring a specific evaluation, the following factors shall be used to determine the minimum size of service connections:

- Peak water consumption of the building to be serviced;
- Total length of service that will be required to reach the building;
- Elevation of the building with respect to the elevation of the water main;
- Available head in the water main;
- Loss of head in the service connection; and
- Required head at the point of water usage.

Material

All water service connections 50 mm in diameter and smaller shall be constructed of Type K soft copper tubing or polyethylene piping.

All water service connections larger than 50 mm in diameter shall be constructed of PVC piping, conforming with the requirements of Section 4.4.3.6.

Location

Water service connections shall be installed to the mid-point of the frontage of all single family lots as shown on the Standard Drawings.

The location of water service connections for semi-detached lots and freehold townhouses shall be as shown on the Standard Drawings to avoid locating the service under the driveways.

After construction, the end of the connection shall be marked by a suitable length of 50 mm x 100 mm lumber extending from the end of the connection to a point 0.9 m above grade. The top of this marker shall be painted blue.

Location of Curb Stop or Control Valve

The curb stop on all water service connections 50 mm in diameter and less shall be located at the street limit as shown on the Standard Drawing.

The control valve on water service connections 100 mm in diameter and larger shall be located at the supply main with the valve secured to the supply main by means of anchor tees, flanged fittings or approved restraining tie rods, as illustrated on the standard detail drawings.

Water service valve boxes shall not be located in driveways. In the event the designed driveway and water service box locations conflict as a result of the final house siting, the water service box shall be moved to a location to the satisfaction of the Township.

Connection to Supply Main

Water service connections 50 mm in diameter and smaller may be tapped into the supply main with the following restrictions:

- a) For PVC water mains, a stainless steel saddle shall be used for all connections;
- b) The maximum size of connection that can be direct tapped into a 150 mm water main is 32 mm in diameter. Larger sized service connections shall be connected by a cast iron fitting factory-tapped for the required service connection size.

Water service connections 100 mm in diameter and larger shall be made by installing a tee on the supply main.

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

Fittings

All fittings shall be mechanical joint ductile iron to meet AWWA/ANSI C153/A 21.53 specification. Also all mechanical joints shall use Romac gripper ring restraining glands for pipes up to 300 mm and Sigma one lock restraining glands for pipes larger than 300 mm.

Water service fittings shall be as follows:

- Main stop - Cambridge Brass 201-A3H3 (thread by compression) or approved equivalent;
- Curb stop - Cambridge Brass 202-H3H3 (thread by compression) or approved equivalent;
- Service Box - Clow or Mueller #7 or #8 D-I with 24" stainless steel rod, cap painted blue.

4.4.4 Meters

A water meter and remote reading unit complete with a backflow preventor purchased from the Township must be installed for each water connection. The location of the water meter must be approved by the Township prior to the issuance of a building permit. Water services for private property shall be installed on the property to be served and in no case cross a property line into, or pass through other private property. Refer to Township Standard Drawing No. 807.

4.4.5 Testing and Acceptance

Connections to existing water mains or water service connections shall not be made until the new water main has been tested, swabbed, chlorinated and flushed to the satisfaction of the Township.

Hydrostatic testing and disinfection of the entire watermain system, including service connections to the property line and hydrants, shall be performed in accordance with OPSS 701, or latest requirements, and MOE Regulations prior to acceptance of the system as substantially performed.

4.5 Roadways

4.5.1 Street Classification

All roadways in new developments shall be classified according to the traffic volume expected and to the intended use of the roadway. For predominantly residential areas three classifications shall be noted as follows: Local, Minor Collector or Major Collector. For industrial areas the streets shall be classified Local or Major Collector dependent upon length of street, traffic volume expected and expected amount of truck traffic. Arterial roadways shall be classified as divided or undivided. The proposed classification of all streets in the development shall be confirmed with the Township prior to the commencement of the design.

The following table is presented as a guide to the determination of the street classification.

<u>CRITERIA</u>	<u>LOCAL</u>	<u>COLLECTOR</u>	<u>ARTERIAL</u>
Source Provided	Land Access	Land Access	Traffic
Movement	Traffic Movement	Transit Routes	Transit Routes
Length of Trip	Short	Medium	Long
Flow	Interrupted	Interrupted	Through
Interconnections	Local	Local Collector	Collector
Arterial	Collector	Arterial	Freeway
Estimated A.A.D.T.	0—1,000	1,000—3,000	over 3,000

4.5.2 Geometric Design Requirements

Table 1: Road Classification

Design Element	Road Classification										
	Residential					Industrial				Arterial	
	Local		Collector			Local		Collector		Undivided	Divided
	Rural	Urban	Rural	Minor	Major	Rural	Urban	Rural	Urban		
ROW Width (m)	23.0	20.0	26.0	20.0	26.0	26.0	20.0	26.0	26.0	30.0	36.0
Road Width (m) (face of curb) <i>Note 1</i>	7.0*	8.5	8.0*	10.0	15.0	8.0*	10.0	8.0*	15.0	15.0	8.0 ea
Design Speed (km/h)	50	50	60	60	60	50	50	60	60	80	100
Posted Speed (km/h)	50									60	60
Stopping Sight Distance (SSD)	65	65	85	85	85	65	65	85	85	135	185
horizontal curve radius (m)	90	90	160	130	160	90	90	160	160	340	440
maximum grade (%)	8	8	8	8	8	8	8	8	8	8	8
minimum grade <i>Note 2</i>	0.5 *	0.5	0.5 *	0.5	0.5	0.5 *	0.5	0.5 *	0.5	0.5	0.5
vertical curve - minimum 'K'											
crest curve	8	8	15	15	15	8	8	15	15	35	70
sag curve - unlit	12	12	18	18	18	12	12	18	18	30	45
sag curve - illuminated	8	5	12	12	12	8	8	12	12	15	25
cross fall from centerline	2 %										
Standards at Intersections											
	Intersecting Roads										
	local	local	collector	collector	arterial						
Design Element	- local	- collector	- collector	- arterial	- arterial						
intersection angle (degrees)	70-110	70-110	70-110	80-100	80-100						
curb radius - minimum (m)	5	7.5	10	15	18						
daylight rounding - min. (m) <i>Note 3</i>	5	5	*	*	*						
max grade for through road (%)	3.5	3	3	2	2						
tangent on approach (from limit of daylighting) - min (m)	30	50	60	75	75						
NOTES:											
	1. Rural road widths are measured to edges of pavement										
	2. Rural roadways may require higher minimum centerline grades than criteria shown as dictated by permissible ditch grades and depths										
	3. daylighting requirements for all other intersection types shall be designed by the Consultant according to each particular situation										

4.5.2.1 Horizontal Curves

Horizontal alignment is to conform to the requirements as outlined in Table 1. In general, "right angle bends" will not be permitted on local streets except in the case of "Courts" or "Crescents" serving no more than 50 residential lots. Where permitted, these bends must not have a deflection angle greater than 110 degrees.

4.5.2.2 Vertical Curves

All points of grade change in excess of 1% shall be designed with vertical curves as outlined in the current Ministry of Transportation of Ontario publications. The minimum visibility curves to be used are outlined in the geometric details for each roadway classification in Table 1. The minimum tangent length of any road grade shall be 9 metres.

4.5.2.3 Backfall at Intersecting Streets

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

4.5.2.4 Curb Return Radii at Intersections

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

Pavement Width <u>Street A</u>	Pavement Width <u>Street B</u>	Curb Return <u>Radii</u>
8.5 m	8.5 m	7.5 m
8.5 m	10.0 m	7.5 m
10.0 m	10.0 m	10.0 m
15.0 m	15.0 m	15.0 m

4.5.2.5 Daylighting Requirements at Intersections

Daylighting at all intersection quadrants shall be included in the road allowances to provide for uniform boulevard widths. Such daylighting shall be included on the proposed plan for Registration (M-Plan) and on all engineering drawings.

For local roads intersecting local roads, the minimum daylighting requirement shall be a radius of 5 metres. For all other intersections, the size of the daylighting or visibility triangle is a function of the

number and width of lanes, the various design speeds on the intersecting roads and the R.O.W. widths on both roads. The Consulting Engineer shall submit detailed calculations for sizing of daylighting triangles at these intersections in accordance with the design criteria prepared by the Ministry of Transportation Ontario, Chapter E (at Grade Intersections).

4.5.3 Cul-de-Sacs

Permanent cul-de-sacs shall be constructed in accordance with the details provided in the standard drawings and shall be designed with a minimum grade of 1% from the centre of the bulb to the curb. Minimum gutter grades of 1% shall be maintained along the flow line of all gutters around the cul-de-sac. The design road grade on the cul-de-sac shall be such that the drainage is directed away from the end of the cul-de-sac and towards the beginning of the bulb area where catchbasins are to be located. All cul-de-sacs, bulbs and intersections shall be detailed at a scale larger than the road plan. The details shall show gutter, crown and other grades sufficient to determine that the road will properly drain and shall be used as a basis for layout.

4.5.4 Temporary Turning Circles

Temporary turning areas will be considered whenever a road is to be continued in the future in a phased Plan of Subdivision. Details for the requirements of temporary turning areas are provided in the Standard Drawings.

4.5.5 Driveway Entrances

Minimum Driveway Design with Curbs

The Developer is responsible for the grading, gravelling and the paving of all driveways from the curb to the streetline or to the sidewalk where sidewalks are proposed within the development.

The minimum consolidated depth requirements for the granular base and asphalt in driveways shall be as follows:

- | | |
|-------------------------------|--|
| a) Single-Family Residential: | Asphalt – 50 mm of HL3 asphalt |
| | Granular base – 150 mm of Granular 'A' |
| | Alternative – deep strength asphalt |
| | ▪ 75 mm HL8 base course |
| | ▪ 50 mm HL3 surface course |
| | (G.B.E. = 255 mm) |

- | | |
|---|--|
| b) Commercial, Light Industrial and Apartments: | Asphalt – 50 mm of HL8 base course
– 40 mm of HL3 base course
Granular base – 225 mm Granular 'B'
– 150 mm Granular 'A'
(G.B.E.= 480 mm) |
| c) Heavy Industrial Driveways: | Asphalt – 75 mm of HL8 base course
– 40 mm of HL3 base course
Granular base – 300 mm Granular 'B'
– 150 mm Granular 'A'
(G.B.E.= 580 mm) |

Equivalent depths of deep strength asphalt will be permitted as a substitute for the pavement specified in (b) and (c).

Alternate types of driveways (i.e. paving stones, concrete pads, etc.) will be subject to approval by the Township Engineer.

Driveway Approaches with Open Ditches

The Developer is responsible for the grading, gravelling and paving of all driveways from the edge of pavement of the roadway to the street line.

The minimum consolidated depth requirements for the granular base in Residential driveways shall be as follows:

- 250 mm Granular 'A'

The minimum consolidated depth requirements for the granular base in Commercial, Industrial and Apartment Driveways shall be as follows:

- 375 mm Granular 'A'

The minimum length of each residential C.S.P. driveway culvert shall be 6.0 metres and the minimum diameter shall be 400 mm. The maximum length of residential driveway culverts shall be 9.0 metres. The maintenance and repair of such culverts shall remain the responsibility of the Developer until such time as the Works have been accepted by the Township.

The construction of driveway headwalls at each end of the driveway culvert will not be permitted.

A 3.0 metre wide platform area shall be constructed in the ditches fronting each fire hydrant. The minimum culvert length shall be 6.5 metres and minimum diameter shall be 400 mm.

Driveway Grades

The maximum permissible design grade for any driveway on private lands shall be 8%. These maximum grades are not recommended and should be employed only in exceptional cases where physical conditions prohibit the use of lesser grades. The minimum driveway grade shall be 1.0%. The use of negative grade driveways is actively discouraged. Negative sloping driveways will only be considered in estate residential developments under special circumstances. Where negative sloping driveways are used, a positive slope of at least 2.5 % must be maintained from the garage over a minimum distance of 10.0 metres.

Driveway Depressions

The width and location of the depressions in the curb and gutter for single-family residential driveways shall be as detailed on the Standard Drawing with particular attention being placed on the location of the garage and the direction of traffic flow. Driveway cuts shall be located at a minimum distance of 1.0 metre from any side lot line. Driveway depressions are to be placed when concrete curb and gutter is initially poured. Double driveway depressions (6.0 metres minimum width) are to be placed for all single-family residential lots.

The width and location of the driveway depressions for apartment, commercial, and industrial driveways shall be detailed on the engineering drawings. These driveways shall be designed to accommodate the anticipated vehicular traffic without causing undue interference with the traffic flow on the street. The maximum width of any driveway depression for commercial, apartment or industrial driveways shall be 9.0 metres. All apartment, commercial and industrial driveways shall be provided with barrier curbs constructed to blend into the roadway curb and gutter.

The minimum clear distance between the edge of driveway and a utility structure or hydrant shall be 1.2 m.

4.5.6 Special Road Works

Whenever it is necessary to cut through an existing Township road, the Developer's Contractor will be responsible for properly compacting the backfill material and restoring the surface pavement to its original conditions immediately upon completion of backfilling operations.

Before making detours, permission is required from the Township of Ramara Public Works Department. Where the road is not part of the Township Road system, approval from the appropriate road authority will also be necessary. In all cases the Fire, Police Departments, School Bus Companies and Ambulance Service must be notified by the Developer or his Contractor.

All work will be done in accordance with ordinances and By-laws of the Township.

4.5.7 Pavement Design (Roadways)

In general, pavement design shall be completed by the geotechnical consultant in accordance with the most recent Township of Ramara Standards, OPSS and OPSD.

The minimum pavement design for all streets in new subdivisions shall be as detailed on the Standard Drawings. In all cases, a qualified Geotechnical Consultant shall be engaged by the Developer to sample, test and design a suitable pavement section for each particular site. Soil sampling shall be carried out in the presence of the Geotechnical Consultant at intervals not exceeding 60 metres along the centreline of the subdivision road. The composition and design thickness of the pavement section shall be determined from:

- 1) Mechanical sieve analysis of the Subgrade soil;
- 2) Frost susceptibility;
- 3) Drainage; and
- 4) Traffic volumes.

Copies of all test results and proposed road designs shall be submitted with the Engineering Drawings. In no case will a pavement design less than the minimum Township of Ramara Standard as shown on the standard drawing for the particular road classification be considered acceptable.

Prior to the placement of asphalt pavement, the Consulting Engineer must submit to the Township Engineer for approval, the asphalt pavement mix designs. The pavement design must be sufficient to provide for ultimate wheel loads over the road, prior to placement of surface course asphalt.

In all cases:

- Base course asphalt shall be O.P.S.S. HL8 with a minimum insitu A.C. content of 4.5%;
- The wearing course of asphalt shall be:
 - for Local Roads, Collector Roads and Industrial Roads - O.P.S.S. H.L3;
 - for Arterial Roads O.P.S.S. HL1;
- O.P.S.S. Granular 'A' and Granular 'B' materials shall be used for road construction in the Township.

4.5.8 Surface Course Asphalt Placement

Prior to placement of surface course asphalt, the following works must be completed:

- All sidewalk, curb and boulevard work;
- Raise maintenance hole and catchbasin frames;
- Install delineation for raised frames 40 mm above asphalt lift;
- Flush and sweep surface and evenly apply tack coat;

- Base course asphalt pad as required in accordance with OPSS;
- Final sewer video inspection;
- Place surface course asphalt in accordance with OPSS.

The following conditions must also be met:

1. A minimum period of one year has expired from the completion date for the placement of the base course asphalt;
2. 85% of the dwellings have received unconditional Occupancy Certificates;
3. All undeveloped lots are rough graded in accordance with the approved lot grading plans;
4. All service connections for multiple-family, commercial, institutional or other blocks are installed; and
5. The approval of the Township Engineer is obtained in writing.

4.5.9 Curbs and Gutters

Where constructed to an urban cross-section, new Township streets shall be constructed with mountable curb and gutter to OPSD 600.060 on local roadways and barrier curb and gutter to OPSD 600.070 on collector or higher order roadways. Prior to final acceptance all curb blemishes will be rectified by removing a minimum 1 m section of curb and replacing.

A driveway entrance is required for each lot. Curb depressions are required at each intersection as per OPSD 310.030.

A minimum of 300 mm of Granular 'B' material compacted to 95% Standard Proctor Density will be required as a base for all curb installations.

Minimum grade on curb is 0.75% desirable, 0.5% absolute minimum.

4.6 Street Name and Traffic Signs

4.6.1 Plan

The proposed location and type of all street name and traffic control signs shall be shown on Plan and Profile Drawings.

Location

Street name signs shall be placed at each intersection and shall identify each street at the intersection. The location of the street name signs are shown in the Township of Ramara Standard Drawing.

4.6.2 Street Name Signs

All street name signs will be supplied and installed by the Township with all costs charged to the Developer.

4.6.3 Traffic Control and Advisory Signs

Location

Traffic control and advisory signs shall be located as shown on the Township of Ramara Standard Drawings. In cases where the positioning of the signs is not covered by the standard drawings, the location must be in conformance with the Manual of Uniform Traffic Control Devices for Ontario or the Highway Traffic Act Regulations for Ontario.

All signs shall be mounted approximately at right angles to the direction of and facing the traffic that they are intended to serve. On curved alignments the angle of placement should be determined by the course of the approaching traffic rather than by the roadway edge at the point where the sign is located. Signs for different purposes should not be placed closer together than 30 m.

Type

All traffic control and advisory signs shall conform to the current revised standards of the Manual of Uniform Traffic Control Devices for Ontario.

Erection

All traffic control signs shall be mounted on galvanized steel punch out type or uniflange type posts, 3.65 m. in length. Channel posts shall be a minimum 14 gauge thick and a minimum width of 45 mm. The posts shall be pre-punched with a minimum of 24 holes at 50 mm centres compatible with standard bolthole arrangements for traffic control signs. Signs shall be individually erected on separate posts.

Traffic control signs must be erected by the Developer at the completion of the base course asphalt road construction and prior to the issuance of Building Permits. Signs must be maintained by the Developer until "Final Acceptance" by the Township.

Upon completion of base course asphalt, the Developer shall place signage at each point of ingress/egress to the subdivision stating the following:

"THIS ROAD UNASSUMED BY THE TOWNSHIP OF RAMARA USE AT OWN RISK"

Each sign shall be 450 mm wide by 600 mm high with black letters on yellow reflectorized background, mounted on "U" channel posts, 3.65 metres in height.

4.7 Roadway Markings

The Developer will design pavement markings for all roadways over two lanes in width or as required by the Township. The design shall be in accordance with the Manual of Uniform Traffic Control of Ontario and approved by the Township. These pavement markings will be installed on both the topcoat of asphalt and the base coat of asphalt. The Developer shall be responsible for stop bars on roadways that are up to two lanes in width. All roadway markings shall be installed in accordance with OPSS 532.

4.8 Traffic Signals

Traffic Signals are to be designed on individual site-specific bases.

4.9 Street Lighting

Streetlights are required for all roadways and most walkways in the Township "Settlement Areas," as defined in the Official Plan, and other locations as directed by the Township Engineer. Systems are the responsibility of the Developer to design and construct. Streetlight system designs, including a photometric plan for the proposed layout shall be prepared by a qualified Electrical Consultant engaged by the Developer and submitted to the Township for approval. The design shall be completed in general accordance with the illuminance method in the American National Standard Practice for Roadway Lighting ANSVIES RP-8-00 (R2005) or latest edition.

The Developer shall arrange with Hydro One for the connection of all lighting systems. The estimated cost of the total installation must be approved by the Township Engineer. The Developer shall provide easements wherever they are required.

4.9.1 Street Light Locations

Poles shall be located at a maximum spacing of 60 m within "Settlement Areas". Pole spacing in rural areas shall be determined on a site-by-site basis.

Where possible, pole locations are to be placed on the projection of side lot lines. Where super mail boxes are proposed within a plan of subdivision, street lights must be located immediately adjacent to the super mail boxes.

Adequate illumination at all intersections must be provided.

No street lights should be placed within 3.0 m of a transformer.

Staggered arrangement of luminaire poles is not acceptable.

On curving roadways, lights are to be placed on outer radii where possible.

Proposed lighting levels adjacent to Provincial and County roads are to be reviewed and approved by the appropriate road authority.

4.9.2 Light Source, Fixture and Pole

All luminaires shall comply with all applicable requirements of CSA Standard C22.2 No. 9, "General Requirements for Luminaires".

Luminaires shall be a minimum 53 Watt CREE XPS1 Type II LED light with 101 Watt LED light used at intersections. Luminaires are to produce white light and must be "dark sky" friendly.

Each light shall be controlled by a dusk to dawn photo electric cell.

Poles for 7.60 m mounting height are to be direct burial type round concrete C.S.A. Standard A 14.1 "Concrete Poles" complete with 2.40 m aluminum tapered elliptical arm, with connecting bracket for elliptical arm made by Sylvania or equivalent, 100 mm by 175 mm handhole and cover, ground lug at the handhole and two below grade wiring apertures as per Township of Ramara Standard Drawing No. 702.

4.9.3 Approval and Construction

Approval of plans for streetlighting must be obtained from the Township. Electrical Safety Authority (ESA) approval for the installed street lighting system must be obtained by the Developer. The Developer must guarantee and maintain the lighting until final acceptance of the development. The Township, upon energization of the streetlighting, will pay energy charges.

4.10 Pedestrian Ways

The Township promotes active transportation throughout the municipality. The Developer may be required to construct trail systems in accordance with the Township's Active Transportation Plan.

4.10.1 Sidewalks

The Developer may be required to design and construct sidewalks. Sidewalks shall comply with the Accessibility for Ontarians with Disabilities Act, 2005 (AODA).

The location requirements for sidewalks in new subdivisions shall be confirmed with the Township prior to commencing the detailed design. Sidewalks will only be required in new subdivisions located in urban settings (villages, hamlets). In general, sidewalks are required on both sides of all arterial and collector roadways and at least one side of all local streets. For local roadways, the locations of schools, parks, churches, commercial establishments etc., the length of street, traffic volume expected and the number of dwelling units serviced will be used as criteria in determining whether sidewalks are required on one or two sides of the street.

The sidewalk shall conform in details and dimensions to the current Standard Drawings and shall be installed at locations as shown on the typical road cross sections. The width of sidewalks for streets is 1.50 metres.

The sidewalks shall be increased in thickness at all driveway locations as shown on the Standard Drawings. In cases where the sidewalk has been constructed prior to the establishment of an entrance to other than a single-family residence then the existing sidewalk shall be removed and shall be replaced with a thickened sidewalk section with wire mesh reinforcing in accordance with the Standard Drawing.

At street intersections the curb and the sidewalk shall be depressed to meet the roadway elevation as shown on the Standard Drawings.

When a sidewalk is constructed adjacent to a curb and gutter a keyway shall be provided along the back of the curb to support the sidewalk, all in accordance with the details shown on the Standard Drawings.

The Township requires that all concrete sidewalks be constructed as indicated on the approved Engineering Drawings, prior to the release of the first conditional or unconditional Occupancy Certificate in accordance with the Township's Subdivision Agreement and in any event no later than one year after the completion of base course asphalt.

4.10.1.1 Location

Sidewalks shall be constructed as shown on the Township's Road Cross-Section Standards. Where there are no other determining factors dictating location, sidewalks shall generally be placed on north and east sides of the street. Streetlight poles, when not staggered, should be located on the same side as the sidewalk. Local roads shall have, as a minimum, a sidewalk constructed on one side of the right-of-way and Arterial/Collector Roads shall have sidewalk on both sides

4.10.1.2 Specification

Sidewalks shall be constructed according to OPSD 310.010, 310.020, 310.030, 350.010, 351.010 and OPSS 351. Concrete sidewalks shall be placed on a minimum 150 mm compacted granular A base.

4.10.2 Trailways

The Developer may be required to design and construct a trail system or pathways/linkages to existing trail systems. The trail network shall be designed and constructed in accordance with the recommendation and construction specifications stipulated within the Township's Active Transportation Plan.

Proposed trails should link together local points of interest, all open space amenities, civic institutions and connect to the regional trails network. To the extent possible the route should utilize public open spaces, unopened right-of-ways, blocks and easements away from roadways. In the event trails are located along roadways additional right-of-way width may be required by the Township.

Entrance points to the trail system should be marked with signage coordinated with the Township.

4.10.3 Trailway Bridges

Bridges to be constructed along off-road trail corridors shall be designed on a site by site basis based on the expected year round usage as approved by the Township. As a minimum, bridges intended for use by pedestrians and small recreational vehicles shall be designed in accordance with the MNR Snowmobile Bridge Design Guidelines. Designs shall be consistent with the Township Active Transportation Plan.

4.11 Fencing

Fencing shall be in accordance with the most recent requirements and specifications of the Township as shown on the standard drawings.

Fencing is required:

- Along side yard flankage and/or rear yards backing onto roadways unless noise attenuation barriers are required;
- Along public walkways In accordance with Township Standards;
- Parks, ponds and open space blocks;
- Adjacent to commercial, industrial or institutional land uses;
- As designated by the Township Engineer;
- Acoustic fencing per approved report.

The minimum requirements for residential chain link fence heights is in accordance with the following:

<u>Adjacent Land Use</u>	<u>Fence Height (m)</u>
Parklands	1.8
Hazard lands	1.2
Open channels	1.2
Cemeteries	1.2
Public Walkways	1.2 in front of dwellings 1.8 between dwellings and rear yards
Municipal Facilities (arenas Firehalls, libraries, etc.)	1.2
School Yards	1.8 subject to Board approval
Pools	1.5
Storm ponds	1.2 where required

All chain link fencing shall be galvanized.

4.12 Lot Grading

4.12.1 General Requirements

The grading of all lots and blocks in new developments must be carefully monitored by the Consulting Engineer in order to provide sites that are suitable for the erection of buildings and to provide satisfactory drainage from all lands within the development. In this regard, the design of the grading for all developments will be of primary concern to the municipality and the following criteria shall be used in the preparation of all lot grading plans for new development in the Township.

All lot drainage shall be designed to conform to the Stormwater Management Report, overall Lot Grading Plan for the subdivision and Township standards. The Developer shall be responsible for performing the grading of lots to the satisfaction of the Township.

4.12.2 Drawing Requirements – Residential

Prior to application for a building permit, individual lot grading plans for each lot shall be approved by the Developer's Consultant prior to submission to the Township Engineer. Three (3) copies of the lot grading plans shall be provided to the Township and display the following information:

- 1) Lot description including Registered Plan Number;
- 2) Dimensioned property limits and house outline location with all setbacks shown;
- 3) House type; normal, side split, back split, etc.;
- 4) Finished first floor elevation;

- 5) Finished garage floor elevation;
- 6) Finished and original grades over septic tile beds;
- 7) Finished basement floor elevation (all locations);
- 8) Elevation of underside of footings;
- 9) Top of foundation wall (all locations);
- 10) Existing and proposed lot grades for each of the corners of the lot and intermediate points of grade change;
- 11) Existing trees to be maintained;
- 12) Driveway locations, widths and proposed grades;
- 13) Finished road grades adjacent to lot;
- 14) Location of house entrances;
- 15) Location of walkways;
- 16) Arrows indicating the direction of all surface drainage and swales;
- 17) Location and elevation of swales;
- 18) Patios, decks and/or porches;
- 19) Terraces, retaining walls and tree wells;
- 20) Location of accessories (propane tanks, a/c unit, generators, hot tubs, pools etc.);
- 21) Location and dimensions of all easements;
- 22) All yard catchbasins with rim and invert elevations;
- 23) Curb cut locations;
- 24) Hydrants, street lights, Bell and cable TV pedestals, hydro transformers;
- 25) Location and type of any private sewage disposal system and reserve areas and private wells;
- 26) Location of neighbouring wells and sewage disposal systems;
- 27) Location of all road features along frontage and flankage of lots (curb lines, catchbasins, sidewalks, etc.);
- 28) Lot grading certificate by Developer's Engineer in accordance with the Subdivision Agreement requirements;
- 29) Site benchmark as shown on approved Engineering Drawings;
- 30) Proposed driveway culverts with size, type, invert and slope information;
- 31) Number of front and rear entry step risers;
- 32) Engineered fill level is to be shown where applicable;
- 33) Minimum setback from building to Average Annual High Water (AAHW) mark of all water bodies within the Lake Simcoe watershed (where applicable);
- 34) Minimum naturalized buffer from the AAHW (where applicable);
- 35) Accessory buildings.

Prior to a building's superstructure proceeding, the Developer's Engineer or OLS must certify that the final footing and foundation elevations conform to the site grading plans and the Building Code.

4.12.3 Certification

Prior to pouring building footings, in "Settlement Areas" and "Shoreline Residential Areas" as defined in the Official Plan, an Ontario Land Surveyor must install survey pins in order to accurately locate the foundation.

Prior to the release of any lot from the conditions of the Subdivision Agreement, the Developer's Consulting Engineer shall provide certification to the Township that the grading and drainage of each lot is in accordance with the approved lot grading and drainage plans.

This certification is to include that:

- The lot grading plan conforms to the storm drainage plan. Plan and certificate are to be submitted with the building permit application;
- The final footing and top of foundation are in conformance with the certified grading plan (Tolerance 100 mm);
- The final grading for each lot conforms to the individual lot grading plan.

If the final grading differs from the approved lot grading plan, the Consulting Engineer shall provide details of the variance from the approved plans and shall include his recommendations for rectification of the area if required.

A site inspection shall be arranged by the Consultant, with the Township Engineer, to review the grading of lots after completion of sodding.

4.12.4 Lot Grading Design – Residential

The specified lot grade shall be calculated in accordance with the Lot Grading Detail Sections included in the Township of Ramara Standard Drawings.

The front yards of all lots shall be graded to drain towards the street. Exceptions for shoreline development will be considered on a site by site basis.

Suitable drainage easements shall be provided where municipal drainage is impeded by development. Requirements will be reviewed by the Township on a site by site basis.

Rear to front lot grading is preferred and a maximum of three rear lots shall outlet between any two lots.

All boulevard areas shall be graded with a constant slope from the curb to the street limit (minimum slope to be 2%, maximum slope to be 5%) and all water boxes, maintenance hole covers, valve boxes, etc. shall be set flush with the finished sod surface.

Driveways shall not be used as outlets for any swales.

All rear yard drainage shall be directed away from the houses in defined swales which outlet at the curb, sidewalk or a rear yard catchbasin. Overland flow routes must be provided for all rear yard catchbasins which will protect all structures in the event of catchbasin blockage or a major storm event.

The drainage from all the lands within the subdivision limit is to be provided for internally with drainage over abutting lands being permitted only in exceptional cases at the discretion of the Township Engineer.

The grading along the limit of the subdivision shall be carefully controlled to avoid disturbance to the adjoining areas. In general, lot drainage should be directed away from top of banks or valley slopes.

The lot grading design shall provide for drainage problems on adjacent property that can be best resolved by permitting drainage through the subdivision.

All lot surfaces shall be constructed to a minimum grade of 2.0%.

All lot surfaces shall be constructed to a maximum average lot grade of 12% (calculated from the difference in lot elevations between the rear wall of the house and property line - embankments included). A minimum of 6 metres adjacent to the rear of the house shall be graded at 2% - 5% slope.

Maximum slope between all terraces and embankments shall be 3:1 when the vertical difference does not exceed 1 metre and 4:1 when the vertical differences exceed 1 metre. Between successive terraces, an intermediate level area of at least 1.50 metres in width must be provided.

The lot grading design shall provide for the temporary drainage of all blocks of land within the subdivision that are intended for future development under site plan agreements or park development plans.

The maximum flow allowable to any side yard swale shall be that from the equivalent of 3 lot or 0.5 hectares, whichever is less.

The maximum area contributing to a rear yard swale that may be discharged directly onto a road allowance shall be the equivalent of 3 rear yards or 0.50 hectares, whichever is less.

Swales providing internal drainage from each lot shall have a minimum slope of 2.0%.

Minimum depth of any swale to be 250 mm.

Maximum depth for a rear yard swale to be 750 mm.

Maximum depth for a side yard swale to be 450 mm.

Maximum side slope on any swale shall be 3:1.

All drainage swales shall be located on lot lines unless the adjacent property is not undergoing development. In such cases drainage swales shall be located entirely within the lot being developed.

Each lot shall have at least one side yard with a maximum slope of 2% for 1.5 m continuous width from front to rear yard;

The grade around houses shall be a minimum of 2% away from houses from a point 150 mm below top of foundation wall or as required by OBC.

Generally, rear yard catchbasins shall be eliminated wherever possible. When required, rear yard catchbasins and outlet pipes shall be located such that the outlet and the catchbasin are located entirely on the same lot. In general, rear yard catchbasins shall be located 2.0 metres from the lot line.

The maximum number of lots drained by a rear lot catchbasin shall be 5.

Driveway grades shall be designed and constructed at a minimum of 2% and maximum of 8% grade. Driveway locations shall not extend beyond lot line projections within the right-of-way.

4.12.5 Sodding

The subdivision shall be sodded according to the following:

- All swales, ditches, drainage easements, and slopes 10% or greater shall be sodded using 100 mm top soil and No. 1 nursery sod;
- All residential lots shall have a minimum of 100 mm top soil and seed with variety and coverage approved by the Township;
- Where the combined side yard between buildings is less than 1.5 m the surface treatment shall be 75 mm of clear stone over a vegetation suppressing geotextile.

4.12.6 Retaining Walls

Retaining walls shall be constructed according to the following:

- Where retaining walls are required they shall be constructed on the higher lot such that the wall and tie-back do not cross property lines;
- Retaining wall design and construction shall be certified by the Engineer, in accordance with OBC requirements;

- Retaining walls shall be constructed entirely on private property, not on property to be assumed by the Township;
- Retaining walls shall comply with the Township's Bylaw requirements.

4.12.7 Area Grading

4.12.7.1 General Requirements

Where earth cuts and fills in excess of 400 mm are required within the lots and blocks of the new development, area rough grading must be performed prior to road construction.

In general, blocks intended for future development, such as institutional and commercial uses, shall be graded to preliminary grades and drain appropriately, compatible with adjacent roadways and abutting properties and complete with appropriate re-stabilization and erosion and sediment control measures as described in this document.

4.12.7.2 General Requirements

Drawing size: (594 x 841 mm) A1

Scale: 1:1,000 for single-family (Rural)

1:500 for single-family (Urban)

1:200 for multi-family areas.

All lots and blocks within the subdivision are to be shown and are to be numbered in accordance with the plan proposed for registration.

Existing contours are to be shown at maximum 0.5 m intervals.

The area rough grading plan must identify all areas where the depth of fill sections and cut sections are in excess of 400 mm.

4.12.7.3 General Requirements

Prior to commencing rough grading, the Developer must implement the approved erosion and sediment control plans as outlined in this document.

The Developer and his Engineer shall control the placement of imported fill material on registered lots where private sewage disposal systems are required. Imported fill material placed on registered lots must meet or exceed the original ground's capability to support a private sewage disposal system.

Where the proposed grading plan identifies fill over registered lots, 'Engineered Fill' shall be placed and supervised by the Consulting Engineer.

All block grading shall conform to the storm water management report. The Developer shall be responsible for the grading of blocks until assumption of the subdivision.

The Developer and his Consultant shall be responsible for approval and certification of the following:

- Certification that the block grading plan conforms to the storm drainage plan. The block grading plan and certification shall be submitted with the building permit application;
- Certification of the final grading for each block conforms to the storm drainage plan and the block grading plan.

4.13 Easement and Block Requirements

4.13.1 General Requirements

The Township shall require conveyance of easements or dedication of blocks, without consideration and free and clear of all liens and encumbrances, to the minimum width requirements, or greater as determined by the Township Engineer, in the following circumstances:

Easement Dedications

Rear and side yard swales designed to convey external or municipal drainage.

Block Conveyances

Rear and side yard piped storm drainage systems, including catchbasins, french drains, maintenance holes and other appurtenances.

Storm sewers, water mains, and sanitary sewers (other than private connections).

Where underground services are required beyond the limits of a subdivision or site plan.

All overland flow routes, open channels, and defined drainage systems accommodating a major storm.

Walkways and bicycle paths.

Valleys, streams, open channels, watercourses (whether flowing or intermittent), seepage areas, wetlands, natural bodies of water and floodplain lands identified by the Township as being environmentally significant requiring protection or designated as hazard or open space lands.

Stormwater management facilities, including detention and retention ponds, water quality control facilities and infiltration facilities which are to be owned and operated by the Township.

4.13.2 Easement Width Requirements

Easements must be located on one side of the common lot line between adjacent lots. Pipes shall be centered on the easement. The easements will not be permitted to straddle common lot lines. Buildings, including footings or building extensions, will not be permitted to encroach over the limits of the Township's easements.

The minimum width of permanent easements for lot drainage swales shall be 4.0 metres. Additional easement widths may be required depending on the critical depth of swales proposed. Drainage swales to be centered over easements.

4.13.3 Block Width Requirements

Blocks of land shall be of sufficient dimension to accommodate the proposed facility, access from a public right-of-way and maintenance requirements.

The minimum width of blocks of land for open drainage channels shall be the width of top of open channel plus 7.5 m along one side of the channel for maintenance requirements.

Valley lands (crest of slope to crest of slope) may be contained within blocks of land to be conveyed to the Township, as a condition of development. Blocks of land in this case shall include 3.0 m platform widths on both sides. Blocks of land will not be considered as part of parkland dedication requirements.

Where two pipes are to be located on one block, the minimum width of the block shall be the width of block required for the larger of the two pipes plus 1/2 the width of block for the smaller pipe, rounded to the next 1.0 m increment. Additional block width may be required to ensure adequate separation between the two pipes and a minimum separation of 3.0 metres between the block limit and the nearest pipe.

4.13.3.1 Storm and Sanitary Sewer Mains

The minimum width of blocks for storm and sanitary sewers shall be in accordance with the following:

<u>Size of Pipe</u>	<u>Depth of Invert</u>	<u>Minimum Width of Block</u>
250 to 375 mm	3.0 m maximum	6.0 m
450 to 675 mm	3.0 m maximum	6.0 m
750 to 1500 mm	3.0 m maximum	6.0 m
1650 mm and up	4.0 m maximum	4.0 m plus 3 times O.D. of pipe

4.13.3.2 Storm Connections for Rear Yard Catchbasins

The minimum width of blocks for leads to rear yard catchbasins shall be 5.0 metres for pipe sizes ranging from 250 mm to 450 mm in diameter. For pipe sizes greater than 450 mm, the above criteria shall apply. The lead shall be centered on the easement.

4.13.3.3 Water Mains

The minimum width of blocks for water mains shall be in accordance with the following:

<u>Size of Pipe</u>	<u>Depth of Invert</u>	<u>Minimum Width of Block</u>
Up to 600 mm	3.7 m maximum	6.0 m
675 mm and up	3.7 m maximum	9.0 m

4.14 Erosion and Sediment Control

4.14.1 General Requirements

Prior to commencement of any work on site, the Owner is required to implement an Erosion and Sediment Control Plan (ESCP) consisting of a report and drawing(s) as required, to be approved by the Township Engineer. This is in order to effectively reduce on-site erosion and prevent off-site transport of silt, both overland and via the municipal storm sewer system, or into treed and / or environmentally sensitive areas within or external to the development. The ESCP shall include provision to minimize wind blown dust and to minimize and manage mud tracking on to adjacent roads.

All erosion and sediment controls are temporary measures constructed prior to any other site work which shall be maintained until assumption of the subdivision. Prior to assumption of the subdivision all temporary measures shall be removed and any disturbed areas stabilized.

Erosion and sediment control measures shall be designed in accordance with Provincial guidelines and the requirements herein.

4.14.2 ESCP Measures and Requirements

The ESCP must address specific requirements for each stage of construction as follows:

- Clearing and grubbing;
- Topsoil stripping and rough grading;
- Construction of services;
- Street and building construction.

Additional requirements may be necessary where creek or stream crossings for underground services, bridge or culvert construction across active streams, channel diversions and outfalls to active streams are encountered. Plans shall outline measures to reduce impact on the streams including the timing of construction activities to minimize disruption as required by LSRCA, MNR and DFO.

All disturbed ground left inactive shall be stabilized by seeding, sodding, mulching or covering or by other equivalent measure. The period of time shall not exceed 30 days unless otherwise authorized by the Township.

The phasing of individual developments must be taken into account during the design of the control measures including locations for topsoil stockpiles. A primary consideration will be to expose the least possible area of land for the shortest possible timeframe.

All installed erosion and sediment control measures shall be inspected by the Consultant once per week and after each rainfall of 1 cm or greater. Inspection reports shall be forwarded to the Township Engineer within 5 days of inspection.

Typical accepted measures to mitigate erosion during construction are as follows:

Silt Fence

Silt fencing shall be installed wherever surface runoff drains onto adjacent properties, completely around the base of topsoil stockpiles and along the perimeter of all other areas sensitive to sediment accumulation (e.g. watercourses, valleys, woodlots, areas to remain undisturbed etc.).

Silt fence shall be in accordance with Township of Ramara Standard Drawings and consistent with LSRCA requirements. Installations shall be specified as "Light Duty" or "Heavy Duty" according to the application.

Topsoil Stockpile Protection

Stockpiles shall be located so the toe of the slope is a minimum of 10 m away from a roadway, drainage channel or residential lot. The maximum sideslopes shall be 1.5 horizontal to 1.0 vertical.

Runoff shall be controlled by light duty sediment control fence or other approved measures. If remaining for more than 30 days, stockpiles shall be stabilized by vegetative cover or other means.

The maximum stockpile height shall be approved by the Township in consideration of the surrounding land uses and duration the stockpile is to be in place

Sediment Basins, Interceptor Swales

Temporary sediment basins shall be constructed on sites having a disturbed drainage area of greater than 4 hectares. Basins may also be required for smaller areas of disturbance which are sensitive in nature as required by the Township Engineer.

The basin shall be designed to settle out particles that are 0.04 mm in diameter or larger from surface water runoff and storm sewer flows and shall be sized to meet LSRCA criteria of minimum 125 m³/ha, 24hr detention and 125 m³/ha permanent pool storage volume or the ultimate pond criteria.

Ponds are to have filter fabric / clear stone wrapped perforated riser outfalls with anti-seepage collars and rip rap overflow weirs.

Rock Check Dams

To be installed in swales and ditches in accordance with OPSD 219.210 and 219.211 where runoff drains to adjacent properties.

Catchbasin Controls

Buffers are to be provided according to Township of Ramara Standard Drawings.

Catchbasins shall be cleaned when the sump is full and before sediment accumulates to within 300 mm of the outlet lead.

Stone Pad Construction Access (Mud Mat)

In order to reduce the tracking of mud onto paved streets, a pad of crushed stone shall be constructed at the site entrance and exit leading onto any existing road. The stone pad shall be a minimum of 450 mm thick, 30 m long and 5 m wide. The first 15 m from the entrance/exit shall be constructed with 50 mm clear stone. The remaining 15 m shall be constructed with 150 mm riprap.

4.14.3 Drawing and Report Requirements

Drawings

ECSP Drawings shall be comprised of, and include the following:

- Scale at 1:500 or 1:1000;
- Location of buildings, existing and proposed, within and adjacent to the property;
- All natural features within and adjacent to the property (woodlots, watercourses, valley lands etc.);
- Trees to be preserved;
- Existing contours at 0.5m intervals;

- Proposed interim and final elevations;
- Areas to be disturbed;
- Direction of overland flow;
- Staging of construction and implementation of control measures;
- Proposed erosion and sediment control measures (silt fence, check dams, sediment basins, interceptor swales, stone mud mats, etc.);
- Topsoil stockpile locations with estimated quantities, maximum height and side slopes;
- Detail drawings.

Report

A brief report shall accompany the drawings which, at a minimum, outline staging of construction and implementation of the proposed erosion and sediment control measures, a description of measures to be undertaken, silt basin calculations, features to be protected and an inspection and maintenance program.

The report shall also recommend measures to control dust such as road cleaning, watering, work restrictions on windy days, minimizing disturbed areas and other measures.

4.15 Utilities

4.15.1 General Requirements

The appropriate utility company or their approved contractor shall install the services for Bell, Hydro, Gas, and Cable TV. The Developer must bear the cost of any surcharges for underground installation made and must grant any necessary easements for their services.

Utility crossings for new roads shall be placed prior to placement of granular road base material. Utility crossings for existing roads shall have the asphalt surface saw cut and removed for a width of the trench plus a minimum of 0.5 metres out from each side of the trench walls.

Compaction of backfill for utility trenches shall be 95% Standard Proctor Dry Density.

4.15.2 Electrical Design Requirements

Electrical distribution systems shall generally be designed as buried systems. All requirements for the design of the electrical distribution and street lighting system shall be agreed upon with Hydro One.

4.15.3 Electrical Services Plan

It is the Developer's responsibility to make direct arrangements with Hydro One to design and construct the primary and secondary electrical distribution system, together with all necessary plans.

The Developer is responsible to engage a qualified electrical consultant to design the streetlight electrical distribution system and submit plans to the Township for approval by the Township Engineer. The Developer is responsible to arrange and perform the installation of the streetlight system in accordance with Hydro One requirements.

The design of parking lot illumination must be in accordance with the guidelines of the Illuminating Engineering Society of Canada.

To confirm the average maintained lighting level and the absolute minimum lighting level, a computer printout of the lighting levels throughout the parking lots may be required. The computer printout must identify lighting levels at property lines and 10 m beyond property lines in all directions in order for the Township Engineer to assess light trespass. Lighting levels at property lines shall not exceed 5.0 percent of the average maintained lighting level over the site.

Where Site Plan proposals abut County or Provincial roads, lighting level plans with supporting computer printouts shall be submitted to the respective road authorities for their approval, if required.

Resulting lighting levels must be produced for the following elevations where development is proposed adjacent to residential areas:

- at grade;
- 2.0 m above grade;
- 3.0 m above grade.

4.16 Canada Post

The Engineer must communicate directly with Canada Post for locating of their proposed facilities. All proposed locations must be shown on the Composite Utility Plan. Any temporary placement of post boxes must be placed in accordance with the approved final location.

4.17 Landscaping

4.17.1 General Streetscape Standards

The Developer is responsible to plant trees along all road allowances in and abutting the development in accordance with the specifications established pursuant to the Subdivision Agreement. Tree locations on County Roads must be confirmed with the County of Simcoe.

The developer is required to prepare a landscape design prepared by a qualified professional landscape architect to be approved by the Township on a site by site basis. In general, at least one tree shall be planted in front of each single family dwelling, semi-detached unit and townhouse block. A minimum of 2 trees shall be placed along the exterior lot line of each corner lot.

Trees shall be placed so that its mature form will not conflict with other essential services and functions.

Timing of Construction

All trees are to be placed during either the spring or fall dormant season in unfrozen soil.

Quality and Source

All trees shall be #1 quality nursery grown stock, 2.25 m to 4.0 m in height with a minimum trunk diameter of 50 mm measured at a minimum of 1.0 m above ground level. All trees shall be free from physical damage, insects, pests and diseases and must have at least three quarters of the root system intact. All trees must meet with the standards of the Canadian Nurserymen's Association.

Boulevard Tree Species

The following list includes suggested urban tolerant, low maintenance street trees approved for use within the Township. Alternatives hardy to Zone 5 or lower will be considered on a site by site basis, subject to Township review and approval.

Species	Common Name	Collector	Residential
Acer x freemanii 'Jeffersred'	Autumn Blaze Maple	●	●
Acer x freemanii 'DTR 102'	Autumn Fantasy Maple	●	●
Acer saccharum cvs.	Sugar Maple Cultivars		●
Celtis occidentalis	Hackberry		●
Gleditsia triacanthos var. inermis 'Shademaster'	Shademaster Honeylocust	●	●
Gleditsia triacanthos var. inermis 'Skycole'	Skyline Honeylocust	●	●
Pyrus calleryana 'Glen's Form'	Chanticleer Ornamental Pear		●
Quercus macrocarpa	Bur Oak		●
Quercus rubra	Red Oak	●	●
Tilia cordata cvs.	Littleleaf Linden Cultivars		●
Tilia x flavescens 'Glenleven'	Glenleven Linden		●
Ulmus cvs.	Elm Cultivars	●	●

4.17.2 General SWM Facility Standards

The Developer is required to prepare a landscape design for the SWM facility. The design should be prepared in accordance with the LSRCA Specifications, if required. The design shall be prepared by a qualified professional landscape architect.

4.18 Parkland Development

Services

The Developer shall provide a water service connection and sanitary sewer and storm sewer lateral connections to the street line for the park, if required by the Township. Metering requirements for water service connections shall be confirmed with the Township.

Where required by the Township, underground primary or secondary electrical cables shall be placed from the road allowance to designated locations within parkland.

Grading

The park shall be fine graded in accordance with the approved grading plan with particular care being taken to avoid damage to those trees or features that are to remain. All graded areas shall be covered with a minimum of 100 mm of approved topsoil and shall be seeded and fertilized in accordance with the specifications of the Township Engineer. All topsoil stripped from parklands shall remain on-site and not be removed or sold. The seed mixture proposed shall be approved by the Township prior to placement. All park blocks less than 0.4 ha. in size shall be sodded on 100 mm. of topsoil. All stones and debris shall be removed and disposed of by the Developer prior to the seeding or sodding of any park.

The Developer shall provide chain link fencing along park boundaries or walkways as required by the Township. Building materials or equipment cannot be stored on parkland and parkland shall not be used as a dumpsite. Stripped topsoil from lots or blocks other than the parkland shall not be stockpiled on parkland or other Township blocks.

Timing of Construction

All park blocks must be graded and seeded or sodded within one year of the completion of the base course asphalt road construction in the area adjacent to the park. Seeding must be carried out during the desirable months for seeding being May, August or September. Boulevard grading and sodding on road allowances adjacent to parklands shall be completed at the same time as the park seeding.

Maintenance

The Developer shall be responsible for the maintenance, fertilizing and mowing of the parklands until "Final Acceptance".

5 Geotechnical Report Requirements

In new developments, the Owner shall engage a Geotechnical Engineering Consultant to prepare a report on the existing soil conditions which is to include:

- 1) The identification, description and limits of the existing soil regimes, including the extent of topsoil and its suitability for reuse;
- 2) The suitability of native materials for trench backfill;
- 3) The conditions under which the native material may be used as trench backfill;
- 4) The procedures to be used for high moisture contents and water table levels, which may affect the proposed servicing or structural works of the concerned area and surrounding lands;
- 5) The extent of native material which is unsuitable for trench backfill and the procedure for dealing with it such that it will not affect the structural stability of the proposed municipal services;
- 6) Areas and procedures to be followed where blasting may be required with due consideration to surrounding structures and services;
- 7) The road material depths for pavement design;
- 8) Any special recommendation for bedding materials;
- 9) Potential corrosive or chemical problems that may affect services or structures (e.g. high sulphates) and the method of resolving such problems;
- 10) Recommendations in dealing with filling conditions within the road allowances, on building lands, in the construction of berms etc.;
- 11) Identification of problem areas and recommendations for mitigating procedures regarding the stability of existing slopes and the extent of unstable soils or conditions;
- 12) Any special recommendations to be followed in the design and construction of building foundations including recommended foundation elevations in relation to the groundwater elevation;
- 13) The engineering properties of the native material including frost susceptibility, natural moisture content, compaction characteristics, relative density and structural integrity;
- 14) Recommendations for achieving proper compaction;
- 15) Recommendations for dealing with deep excavation of trenches;
- 16) Recommendations for dealing with septic or well systems that may be affected by the proposed building and servicing works;
- 17) Confirmation that sufficient boreholes have been taken to establish definite requirements and recommendations for the servicing and building works. General Soils Report must identify minimum bearing capacity of the native soil (i.e. 75 kPa) preferably on a hole-by-hole basis. Boreholes located in the area of proposed underground municipal services are to be taken to a depth of at least one (1) meter below the deepest trench.

Requirements and recommendations contained within this report along with borehole logs and grain size analysis of the native soils are to be incorporated by the engineering consultant into his first submission to the Township Engineer. Any such requirements and recommendations that are not so incorporated are to be drawn to the Township's attention with specific reasons.

During construction, the Owner is to retain a geotechnical consultant to supervise the installation of bedding and the backfilling of all trenches within road allowances and easements. A trench backfill certification is required to indicate that sufficient tests have been carried out to obtain a representative report as to the compaction of the backfill and they find the backfill to be in compliance with Township specifications and requirements.

A final subgrade certification is to confirm that the final subgrade conditions are equal to or better than those anticipated in the preparation of the pavement design. If these conditions are less than what was anticipated, the Owner and the Township are to be immediately advised with a new pavement design recommendation.

Where grading operations require the placement of "engineered fill" the Geotechnical Engineer must certify that the fill located at 1.0 m below finished grade and deeper has been sufficiently compacted to assure a minimum bearing capacity of 75 kPa and a 98% Standard Proctor Density.

6 Site Plan Developments

6.1 General Requirements

Site Plan Agreement

The Developer of lands under Site Plan Control, as specified in the Township's Official Plan and Site Control By-law may be required to enter into a "Site Plan Agreement" with the Township prior to the commencement of construction of any building or service within the parcel of land. For all proposed site plan developments, the Developer shall secure site plan approval from the Township.

County of Simcoe and MTO

The County of Simcoe is responsible for all County Roads, and MTO for all Provincial Highways. Where proposed works abut county and/or provincial roads, proponents of developments under site plan control shall secure approval from the County of Simcoe and/or MTO, where necessary.

Township of Ramara Requirements

Drawings showing grading and the location, size, grade, invert elevations, material and bedding requirements for all storm, sanitary and water main service connections shall be prepared and submitted to the Township for approval. Engineering drawings shall also be prepared for all sanitary and storm sewers and water mains that are required to be constructed within road allowances or Registered easements to service the subject property. These drawings are to be prepared to the Township requirements.

The Township is also responsible for the collection of revenue for water consumption and therefore the "metering" arrangement for the subject property shall also be approved by the Township. Water meters must be purchased through the Township.

6.2 Submission Requirements

Professional Engineer

The Developer shall retain a qualified Professional Engineer to prepare all engineering drawings and to supervise the construction of all engineering services. The Consulting Engineer shall act as the Developer's representative in all matters pertaining to the design and construction of the services in the development. The requirement for a Professional Engineer to carry out design services for a site plan shall only be specific to those developments where water, sanitary and storm services, grading works, roadworks in public right-of-way and retaining walls are proposed.

Submission Sets

Three (3) Site Plan drawing sets and supporting calculations shall be submitted to the Township, for approval by the Township Engineer, comprised of the following:

- a) Site Plan;
- b) Site Grading Plan;
- c) Site Services Plan;
- d) Drainage Area Plan;
- e) Elevation Plan;
- f) Erosion and Sedimentation Control Plan;
- g) Landscaping Plan.

Depending on the complexity of the proposed development, requirements of the above drawings may be combined, or waived, at the discretion of the Township Engineer.

Additional Site Plan drawings shall be prepared when requested by the Township. Prior to receiving a building permit, all plans must be approved by the Township.

Supporting documents may be required as follows; Stormwater Management Report, Traffic Impact Assessment, Functional Servicing Report, Noise Report, Environmental Assessment Report, Natural Heritage Evaluation and Archaeological Impact Study as determined on an individual site plan basis.

6.3 Drawing and Design Requirements

6.3.1 General Requirements

All Site Plan drawings shall be prepared from one base plan prepared at a minimum scale of 1:500 and which contains the following information:

- a) A key plan at a scale of 1:10,000 showing the site location;
- b) A north arrow;
- c) Site statistics;
- d) Street names, lot and Registered Plan numbers, and property dimensions;
- e) Road widenings;
- f) Easements;
- g) Vehicular loading and parking facilities ;
- h) The outline of all buildings with the building numbers and unit numbers indicated and garage locations within the unit;

- i) Storage areas and enclosures for garbage and waste materials;
- j) Fire routes, truck delivery and other large vehicle drive paths;
- k) Walkways and ramps;
- l) Proposed roadways /driveways and all points of access;
- m) Adjacent lands;
- n) Existing land features (trees, watercourses, roads, services, etc.);
- o) The reference benchmark (geodetic) used to establish vertical control and the site benchmarks to be used for construction;
- p) Proposed garbage enclosure(s);
- q) All other accessory items (propane tank, a/c units, generators, etc.).

6.3.2 Site Servicing Plan and Design

The Site Services Plan shall show, at a minimum, the location, size and grade (as applicable) of the following services and information:

- a) All existing underground services on the streets and easements adjacent to the property;
- b) Storm and sanitary service connections to the property with grade and invert information;
- c) Water main connections to the property;
- d) The basement and finished floor elevations of all proposed buildings;
- e) Storm, sanitary and watermain services with length, grade, material and bedding requirements to be constructed within the development;
- f) Proposed sanitary and storm maintenance holes with invert and rim elevations.;
- g) Hydrants, valves and water meters within the development;
- h) Sanitary, storm and water service connections to individual units, as applicable;
- i) Roof water leaders and method of discharge;
- j) All construction notes required to describe the construction detail or requirements;
- k) The locations of prime and reserve tile-bed areas, including mantles where required;
- l) Proposed wells;
- m) Illumination standards;
- n) Proposed landscape features;
- o) Proposed garbage enclosure.

Stormwater Management

Stormwater management techniques shall be employed on all sites in accordance with requirements identified in this document.

As a guideline, the degree of control on the quantity of run-off from a proposed development shall be:

The post-development peak flow shall not be greater than the corresponding pre-development peak flow for the 1:5 year, 1:10 year, 1:25 year and 1:100 year storms. Other regulatory agencies may require other storm flows to be analyzed (i.e. 2 year and/or Regional flows).

Where on site stormwater quantity controls are required, a stormwater management report addressing the points listed below must be submitted:

- A control device (orifice) must have a diameter of no less than 75 mm in order to prevent clogging of the opening;
- Control devices shall be installed on the upstream side of the maintenance hole;
- Storm connections from the building roof and foundation drains must be made downstream of the maintenance hole and/or catchbasin inlet controls;
- Ponding limits and available storage are to be depicted on the site servicing drawings, and the maximum ponding depth in parking areas is not to exceed 250 mm;
- An overland flow route shall be clearly marked on drawings. The grading of parking lots and landscaped areas must provide a safe path for the overland flow route to the surrounding municipal right of way during storms exceeding the design storm event;
- Roof drains should be selected to give a minimum discharge of 0.042 cms/ha of roof area;
- Details and concepts are to conform to the Urban Drainage Design Guidelines, set out by the MOE;
- On-site stormwater management facilities may require an Environmental Compliance Approval from the MOE. Two completed MOE Application forms are to be submitted to the Township signed by the developer and consultant, in accordance with MOE requirements.

Site Servicing Design

- a) All sanitary and storm sewers shall be designed in accordance with the requirements of the Ontario Building Code and the Township. The provisions of the Ontario Water Resources Act, R.S.O., 1990, may apply to sanitary and storm sewer works;
- b) All storm sewers shall be located within the limits of the roadway with storm service connections being provided for the roof water leaders along the front of the building.
Weeping tile foundation drains shall be connected to the storm sewer, where available;
- c) All storm sewer connections shall be sized according to the requirements of the Ontario Plumbing Code and shall be installed on a minimum grade of 2.0%. Goss traps shall be placed in parking lot catchbasins, located adjacent to fuelling areas. The rainwater leaders draining the rear halves of all townhouses shall be discharged onto grassed or garden areas.

The rainwater leaders draining the front halves of all townhouses shall be connected to the storm

sewer system and the roof area must be included in the calculated imperviousness ratio.

Precast concrete splash pads shall be placed at each rainwater leader downspout, all in accordance with the Standard Detail Drawing.

The rainwater leaders from all commercial, industrial, institutional and high density residential buildings should be discharged onto grassed or garden areas, if possible and if acceptable to the Township. Alternatively rainwater leaders may be directed to on-site detention facilities to achieve an equivalent controlled discharge rate of 42 litres per second per hectare of roof area.

- d) Yard catchbasins shall be provided where required for drainage of landscaped areas;
- e) Catchbasin maintenance holes may be used for roadway drainage;
- f) All water mains shall be designed in accordance with the requirements of the Ontario Plumbing Code, and Township of Ramara Fire Department;

The water main design shall be submitted to the Township of Ramara Fire Department for approval of the water main layout and the hydrant locations. The provisions of the Ontario Water Resources Act may apply to the water main works;

- g) Where requested, easements for utilities shall be provided at no cost to the utility company.

6.3.3 Site Grading Plan and Design – Commercial and Industrial Use

The site grading plan shall show, as a minimum, the following information:

- a) The drainage of the site is to be self-contained;
- b) The grading of the site is to be compatible with the elevation of the surrounding lands;
- c) All grassed embankments shall have a maximum slope of 3:1;
- d) The grade of grassed or other landscaped areas shall have a maximum slope of 10% and a minimum slope of 1%;
- e) Swales on grassed areas shall have a minimum slope of 1.5% and a maximum slope such that the velocity for the flow contained does not exceed 1.25 metres per second;
- f) The maximum suggested length for any drainage swale is 75 m;
- g) The minimum depth for any drainage swale shall be 300 mm;
- h) The maximum depth for any drainage swale shall be 750 mm;
- i) The maximum side slope on any drainage swale shall be 3:1;
- j) All driveways shall have positive drainage from the streetline to the roadway;
- k) Centreline grades at 15 m intervals along all existing streets bounding the property and existing grades;
- l) A legend indicating which are existing and proposed elevations;
- m) Contours at maximum 0.5 m intervals to indicate the existing elevations of the site. These contours are to extend to a minimum distance of 15 m. beyond the property limits to indicate the

- grading and drainage patterns of the adjacent lands;
- n) Cross sections as required to clarify the proposed grading, particularly in relation to adjacent lands;
 - o) Proposed elevations on paved areas, around proposed buildings, along swales, along roadways, parking areas, driveways, catchbasin rim elevations, and any other elevations necessary to establish the grading and drainage patterns for the development. Arrows to be used to indicate direction of the surface drainage;
 - p) A typical roadway cross section to indicate the pavement and granular base design;
 - q) Roadway dimensions and curb radii;
 - r) Concrete curbs;
 - s) Embankments, retaining walls, stairs, play areas, swimming pools, etc.;
 - t) Curb depressions, with dimensions.

6.3.4 Site Grading Plan and Design – Residential Use

Site grading design and drawings prepared for infill residential developments, which are subject to Site Plan Control shall be completed in accordance with residential lot grading requirements in Section 4.12. Drainage easements (particularly for shoreline development) may also be required in accordance with Section 4.13.

All shoreline development must be completed in accordance with the Lake Simcoe Protection Act where applicable.

6.3.5 Roadway Design

Roadway Design

- a) All roadways shall be designed in accordance with the most recent engineering requirements of the Township;
- b) The minimum pavement design for all multiple—family roadways shall be:
 - Subgrade compacted to 95% proctor density;
 - 450 mm. compacted depth of Granular 'B';
 - 150 mm. compacted depth of Granular 'A' ;
 - 50 mm. compacted depth of HL8 Asphalt base course;
 - 40 mm. compacted depth of HL3 Asphalt surface course.
- c) All driveways in multiple-family projects shall be paved with asphalt or an approved alternate from the edge of the roadway to the garage. The minimum asphalt pavement design for all driveways shall be:

- Subgrade compacted to 95% proctor density;
 - 150 mm. compacted depth of Granular 'A';
 - 50 mm. compacted depth of HL3 asphalt.
- d) The minimum width of a multiple-family roadway for two way traffic with no street parking shall be 6.0 m from E/P to E/P;
- e) All roadways serving multiple-family projects shall be designed to facilitate passage of emergency and service vehicles. Curb returns having an 8.0 m. radius and inside bends having at least a 15.0 m. radius is required. On dead end streets provision shall be provided for vehicle turning;
- f) The minimum grade for any multiple-family roadway shall be 0.5% and the maximum grade shall be 6%;
- g) The minimum grade for any driveway in the multiple-family project shall be 1% and the maximum grade shall be 6.0%. This maximum grade creates an undesirable condition and should be used only when necessary due to site conditions;
- h) The location of driveway entrances on Township roads shall be such that the minimum sight distance is maintained on the Township's road in both directions. The following criteria will apply to new driveway entrances:

Posted Speed Limit	Minimum Sight Distance
<u>km/h</u>	<u>metres</u>
40	45
50	65
60	90
70	120
80	150

6.3.6 Landscaping Requirements

A Landscaping Plan shall be prepared by a qualified Landscape Architect if required by the Township. The Landscaping Plan shall show all landscaping details as required by the Site Plan Agreement. A schedule of plant species and sizes is to be identified on the landscaping plan.

All maintenance holes, catchbasins, hydrants, valves, streetlights and other servicing features that appear above grade shall also be shown on the landscaping plan.

6.4 “As-Constructed” Drawings

After all construction is complete, the design drawings shall be amended to incorporate the changes and alterations made during construction in order that the drawings as amended represent the services and conditions as constructed. Four sets of “As-Constructed” drawings must be submitted to the Township.

6.5 Certification

Upon completion of construction the Consulting Engineer shall provide written certification to the Township that all works have been constructed in accordance with the approved plans and specifications and in accordance with good engineering practices.

The wording is to be followed by the Professional Engineers stamp and signature.

6.6 Final Inspection

Upon completion of all construction the Developer shall request the Township to carry out a final inspection of the works. All deficiencies found during this final inspection shall be immediately corrected by the Developer. This final inspection is carried out for the benefit of the Township and shall in no way relieve the Developer of his obligations under the Condominium Act and the Site Plan Agreement.

7 Landscaping Implementation Procedures

Once the infrastructure of the subdivision is in place and housing is under construction, the developer must hire a landscape contractor to install the approved landscape components. The landscape architect shall inspect and certify the installation.

7.1 Streetscape Works

The developer is required to hire a contractor to install the landscape elements called for in the approved landscape plans. The Consulting Landscape Architect will inspect the work, report on progress to the Township and provide the Township with as-built drawings. An important part of the Landscape Architect's duties will be to maintain a Summary Chart documenting the history of each new tree planted in the parcel of land being developed. At the appropriate times, the Township will conduct its own inspections. All streetscape works are to be guaranteed and maintained until assumption of services or 24 months whichever is longer.

7.2 Naturalization Works

As with streetscape works, the process begins with the developer hiring a contractor to install the landscape elements called for in the approved landscape plans. The developer's landscape architect will supervise the work and report on progress to the Township. At the appropriate times, the Township will conduct its own inspections. All naturalization works are to be guaranteed and maintained until assumption of services or 24 months whichever is longer.

7.3 Maintenance Agreement for Naturalization Areas

Carrying out a maintenance program for the first two years after planting the naturalization areas will significantly reduce the mortality rate of the trees, shrubs, grasses, etc. and help to establish healthy vegetative cover.

At the time of planting, the planting details and specifications should be followed faithfully. This means, among other things, the proper transportation and handling of plant material, the use of fertile planting soil, the proper staking of trees and the proper installation of rodent protection.

Maintenance shall include:

- Apply appropriate fertilizer to promote growth;
- Prune dead or diseased tissue;
- Remove dead plant material;
- Replace dead coniferous naturalization species to maintain a minimum live-stocking standard of 90%;
- Replace dead deciduous and shrub naturalization species to maintain a minimum live-stocking standard of 90%;

- Suppress weed growth around new trees and shrubs by adding mulch and/or removing weeds by hand. Weeds shall not be cut down with a power trimmer.

An assessment of plant material is to be carried out annually by the Landscape Architect between mid-July and early September and reported to the developer, the contractor and the Municipality in the form of a Naturalization Assessment Report. Plant vigour can be determined by a visual inspection of the current year's foliage.

The initial inspection and assessment will be conducted in the summer following the planting. It will take account of the survival and condition of the plants. It will also include a summary of the maintenance operations performed. Finally, the assessment will propose any additional maintenance measures thought necessary, and recommended where, the following spring, plants need to be replaced or new plants added.

The second assessment will be conducted the following year, and will provide similar information to the first.

The third and final assessment will take place just prior to assumption. The final report will provide a complete summary of the initial plantings, as well as a record of the replacements and maintenance services carried out during the guarantee period. The report will also make note of any additional work that should be performed prior to the Township conducting their own final inspection.

8 Standard Drawings - Index

In general, OPSD's shall be used and referenced by the designer. The suitability of any particular OPSD shall be determined by the Township Engineer.

The Township Standard Drawings which form part of this document have been developed to reflect specific requirements of the Township and shall take precedence over OPSD's.

		Revision Date
100	Miscellaneous	
101	Drop Structure for Sanitary Sewer Maintenance holes	November, 2006
110	Adjustment of Catchbasins	November, 2006
120	Service Location – Single Family Residential	November, 2006
121	Service Location – Semi-detached Residential	November, 2006
122	Service Location – Freehold Townhouse Units	November, 2006
123	Service Location – Commercial, Industrial and Multi-Residential	November, 2006
124	Supports for Water Mains and Sewers Crossing New Trenches	November, 2006
125	Supports for House Connections and Catch Basin Leads	November, 2006
126	Sanitary Sewer Cleanouts	November, 2006
127	Low Pressure Sanitary Sewer – Cleanout	March, 2013
128	Low Pressure Sanitary Sewer – Grinder Pump System	March, 2013
200	Roadways	
201	Rural (Un-paved) – Local Improvement	November, 2006
202	Rural (Un-paved) – Local Residential	November, 2006
202B	Rural – Local Improvement (for assumption)	January, 2014
203	Rural (Paved) – Local Residential	November, 2006
204	Rural – Local Industrial	November, 2006
205	Rural – Residential Cul-De-Sac	November, 2006
206 A	Rural – Turnaround – Residential – 23.0 m ROW	March, 2013
206 B	Rural – Turnaround – Residential – 20.0 m ROW	March, 2013
207	Rural – Industrial Cul-De-Sac	November, 2006
208	Urban – Local Residential	November, 2006
209	Urban – Collector Residential	November, 2006
210	Urban – Major Collector – Residential and Industrial	November, 2006

211	Urban – Local Industrial	November, 2006
212	Urban – Residential Cul-De-Sac	November, 2006
213	Urban – Industrial Cul-De-Sac	November, 2006
214	Urban – Temporary Turnaround - Residential	November, 2006
215	Urban - 90 ⁰ Bulb Detail	November, 2006
216	Heritage Street Sign	November, 2006
217	Standard Street Sign	November, 2006

300 Walkways, Fencing

301	Chain Link Security Fence	November, 2006
302	Wood Privacy Fence	November, 2006
310	Concrete Sidewalk	November, 2006
311	Pedestrian Walkway – Urban	November, 2006
312	Pedestrian Walkway – Rural	November, 2006
313	Vehicle Access / Pedestrian Walkway Gate	November, 2006
320	Driveway Approach Paving for Residential Driveways	November, 2006
321	Driveway Approach Paving for Commercial, Industrial and Apts.	November, 2006

400 Lot Grading

401	Typical Legend for Lot Grading Plan	November, 2006
402	Front Lot Drainage	November, 2006
403	Rear Lot Drainage	November, 2006
404	Rear Lot Drainage for Walkout or Back Split House	November, 2006
405	Front Lot Drainage for Front Split House	November, 2006
406	Typical Shoreline Lot Grading Plan	March, 2013
407	Typical Shoreline Lot Grading Cross-sections	March, 2013

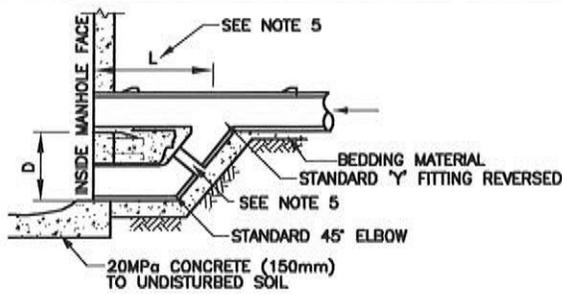
500 Drafting/Notes

501	Title Block	November, 2006
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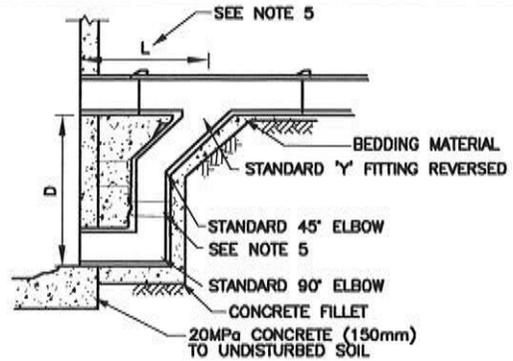
600 Silt Control

601	Heavy Duty Silt Fence Detail	November, 2006
602	Sediment Control Measure at Catchbasins and Catchbasin Maintenance holes	November, 2006

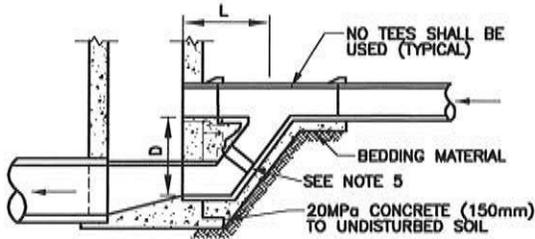
603	Construction Entrance Mat	November, 2006
700	Street Lighting, Utilities	
701	Joint Utility Trench and Road Crossing Sections	November, 2006
702	Horizontal Type Luminaire	November, 2006
800	Water Main	
801	Method of Insulating Water Main	November, 2006
802	Hydrant Barrier	November, 2006
803	Air Release Valve in Chamber	November, 2006
804	Tracer Wire Arrangement at Valve Box for P.V.C. Water Mains	November, 2006
805	Corrosion Protection for Tracer Wires on P.V.C. Water Mains	November, 2006
806	Water Service Connection – 19 mm & 25 mm dia.	March, 2013
807	Typical Water Meter Installation	March, 2013
900	Landscape	
901	Deciduous Tree Planting	March, 2013
902	Coniferous Tree Planting	March, 2013
903	Shrub Planting	March, 2013



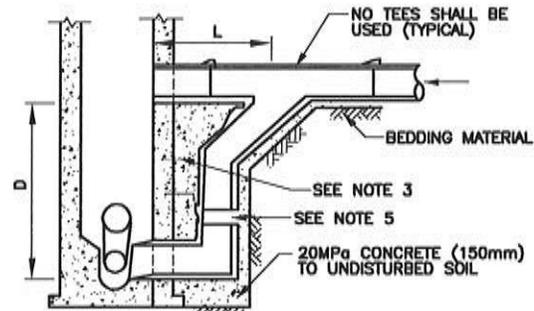
TYPE A



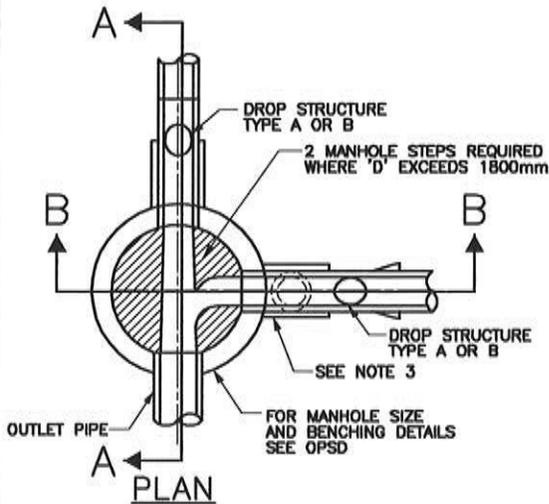
TYPE B



SECTION A-A



SECTION B-B



PLAN

DROP PIPE DIA.	TABLE OF MINIMUM DIMENSIONS AND MAXIMUM VELOCITIES				MAXIMUM VELOCITY M/S
	TYPE 'A'		TYPE 'B'		
	'D'	'L'	'D'	'L'	
200	600	750	1200	1050	1.42
250	636	801	1275	1050	1.55
300	699	900	1425	1125	1.70
375	900	1125	1875	1200	1.92
450	975	1200	2025	1275	2.16

NOTES:

1. FOR SEWER SIZES UP TO 450mm DIAMETER THE DROP PIPE SHALL BE THE SAME SIZE AS THE INLET PIPE. FOR SEWER SIZES GREATER THAN 450mm THE DROP PIPE SHALL BE ONE SIZE SMALLER THAN THE INLET PIPE.
2. OBVERT OF DROP PIPE TO BE LEVEL WITH OBVERT OF OUTLET PIPE AND BENCHED TO THE OBVERT OF THE OUTLET PIPE.
3. DROP STRUCTURE TO BE ENCASED IN A MINIMUM OF 150mm OF 20MPa CONCRETE. MANHOLE STEPS TO BE PROVIDED ON OUTSIDE FACE OF MANHOLE DROP STRUCTURE TO BE STRAPPED TO STEPS WITH STAINLESS STEEL BANDS.
4. MAXIMUM VELOCITY SHOWN IN TABLE INDICATE THE MAXIMUM FLOW VELOCITY IN INCOMING PIPE WITHOUT OVERSHOOTING.
5. ADJUSTMENT IN 'D' AND 'L' TO BE MADE THROUGH THIS SECTION OF PIPE.
6. ALL CONCRETE IN DROP STRUCTURE TO BE 20MPa AT 28 DAYS.
7. MINIMUM DIMENSIONS BASED ON USE OF STANDARD CONCRETE FITTINGS.

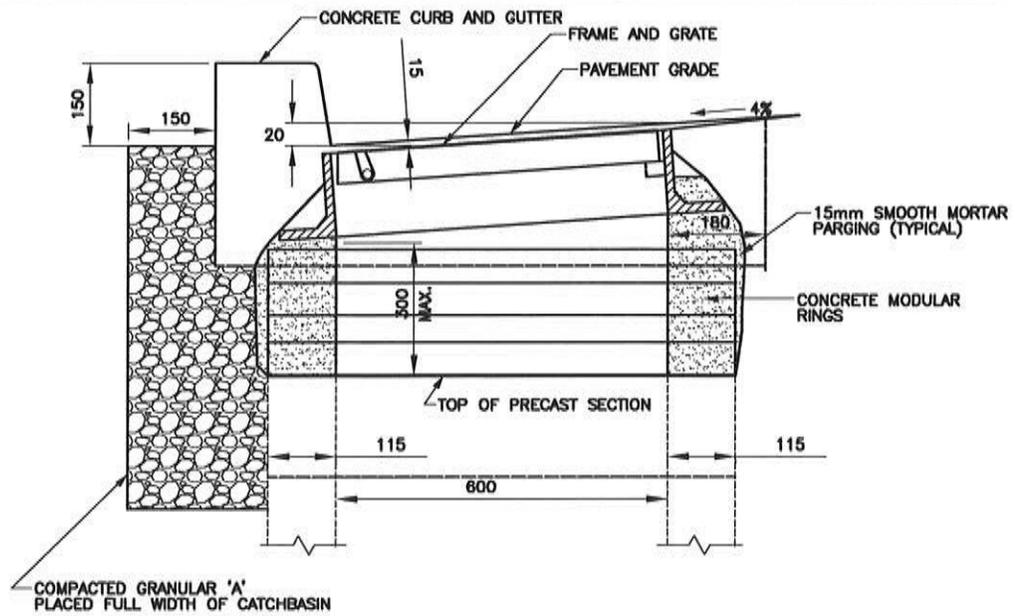
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

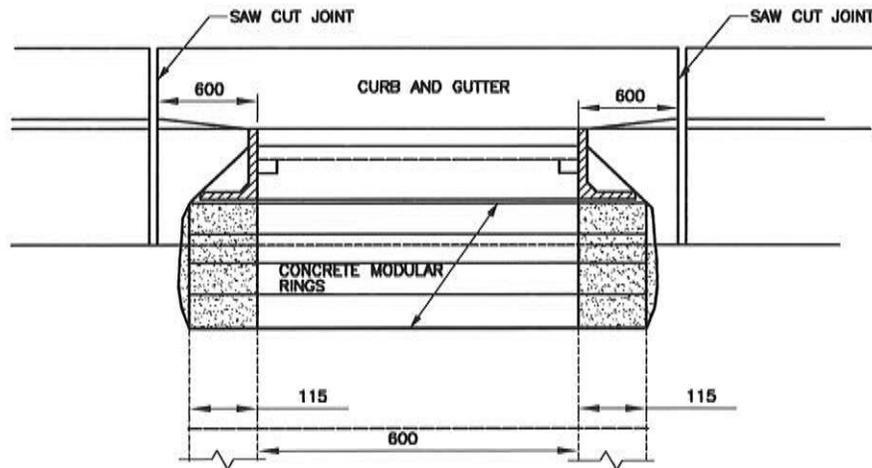
**DROP STRUCTURE FOR
SANITARY SEWER MANHOLES**

APR'D: DATE: NOV/06
DRAWN: SCALE: NTS

STD. No. 101



SIDE VIEW



FRONT VIEW

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.

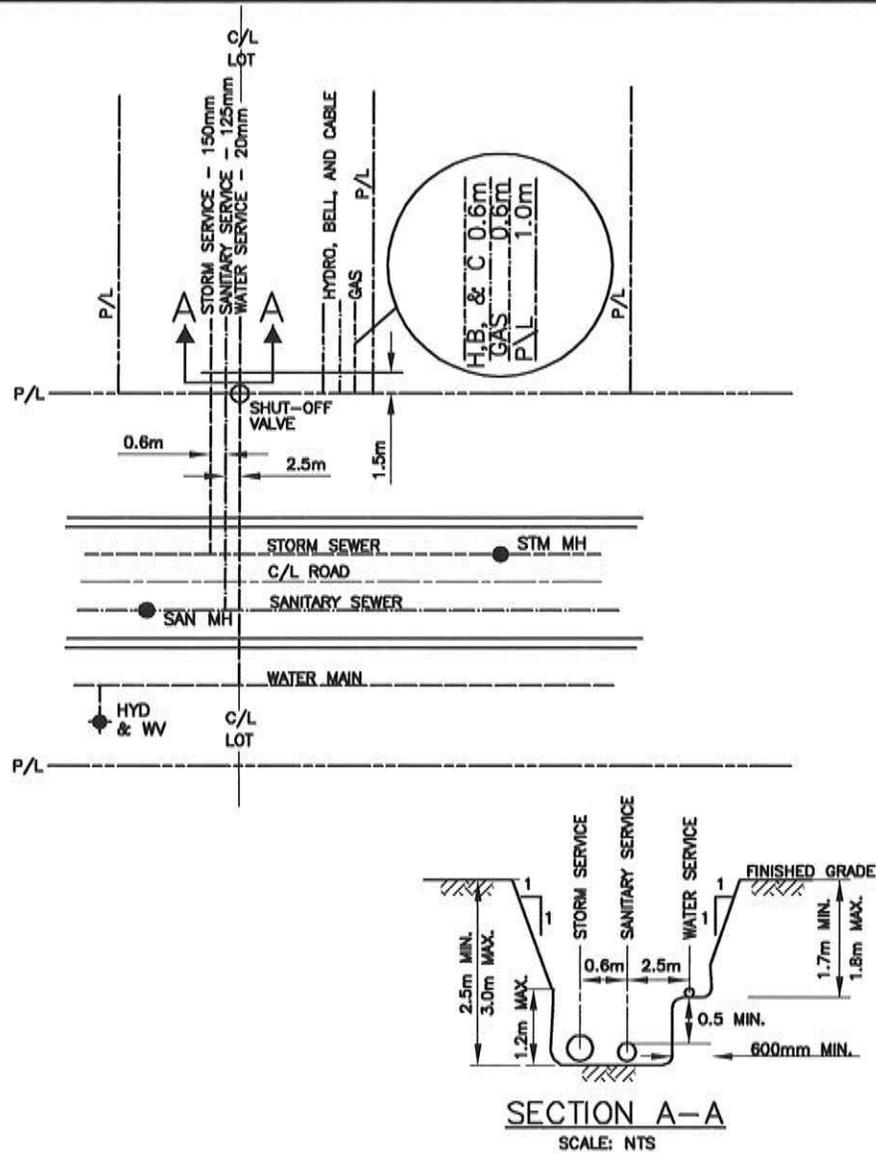
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

ADJUSTMENT OF CATCHBASINS

APR'D:	DATE: NOV/06
DRAWN:	SCALE: NTS

STD. No. 110



NOTES:

1. SERVICE TO EXTEND 1.5m INSIDE PROPERTY LINE.
2. UNDER NO CIRCUMSTANCE SHALL SERVICES CROSS ONE ANOTHER.
3. EACH HOUSE MUST BE SUPPLIED WITH A SEPARATE 150mmØ STORM SEWER SERVICE LATERAL. COMMON SERVICE CONNECTIONS WITH Y^a WILL NOT BE PERMITTED. P.V.C. PIPE TO BE OTHER THAN WHITE.
4. THE MINIMUM SIZE FOR STORM DRAIN CONNECTION SHALL BE 150mØ INSTALLED AT A MINIMUM GRADE OF 2% FROM THE STORM SEWER TO THE BUILDING ENVELOPE.
5. THE MINIMUM SIZE FOR SANITARY LATERALS SHALL BE 125mØ INSTALLED AT A MINIMUM GRADE OF 2% FROM THE SANITARY SEWER TO THE BUILDING ENVELOPE. P.V.C. PIPE TO BE WHITE.
6. ALL UNDERGROUND SERVICE CABLES TO BE PLACED MINIMUM 1.0m BELOW FINISHED GRADE AT LOTS.
7. SHUT-OFF VALVES TO BE PLACED ON PROPERTY LINE.
8. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS UNLESS OTHERWISE SPECIFIED.

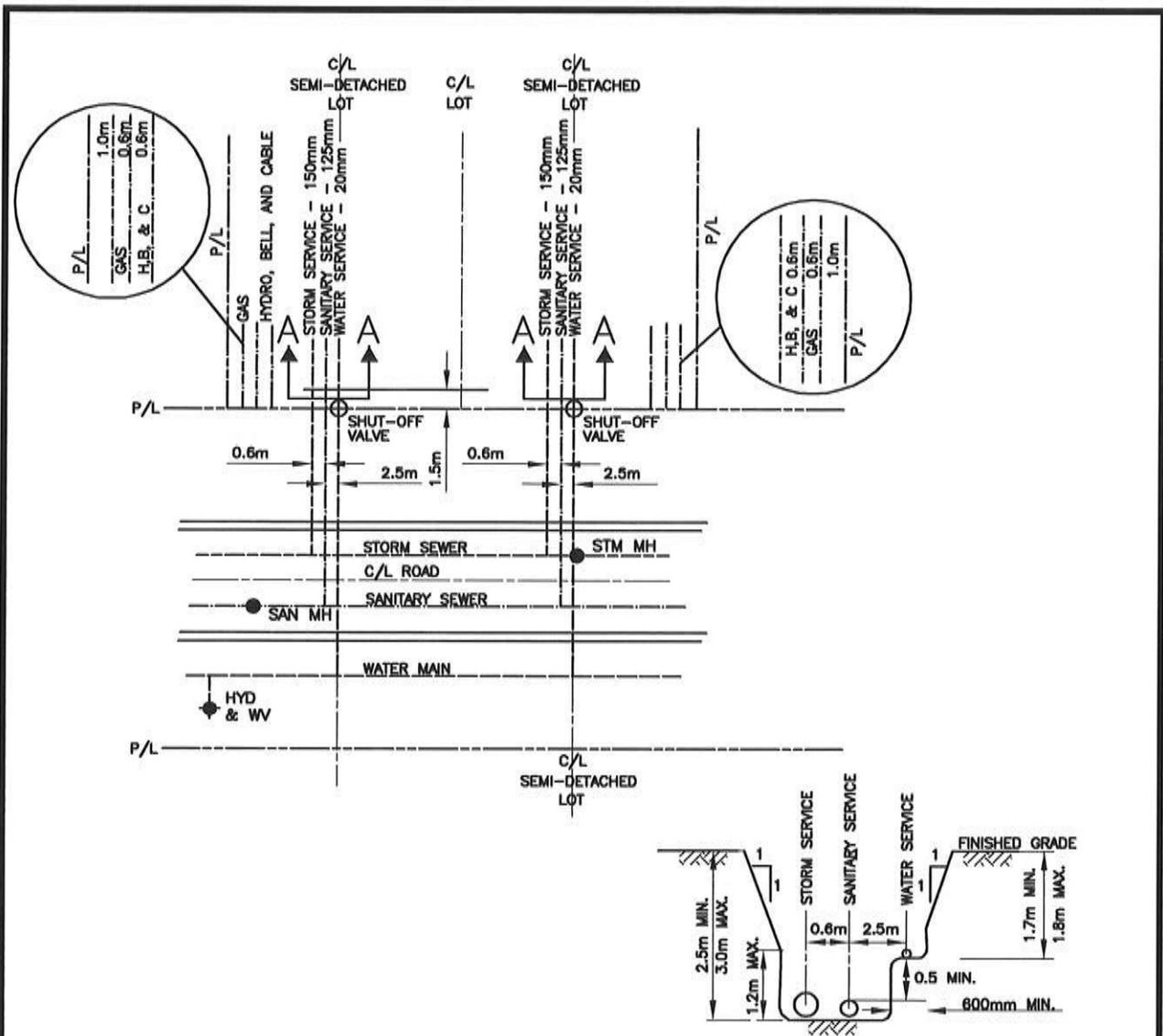
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

**SERVICE LOCATION
SINGLE FAMILY RESIDENTIAL**

APR'D: DATE: NOV/06
DRAWN: SCALE: NTS

STD. No. 120



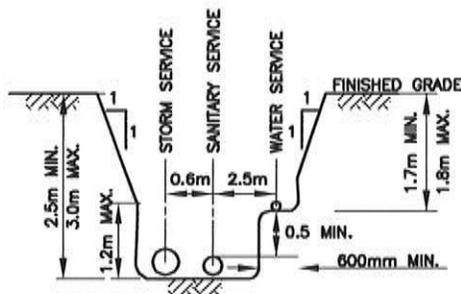
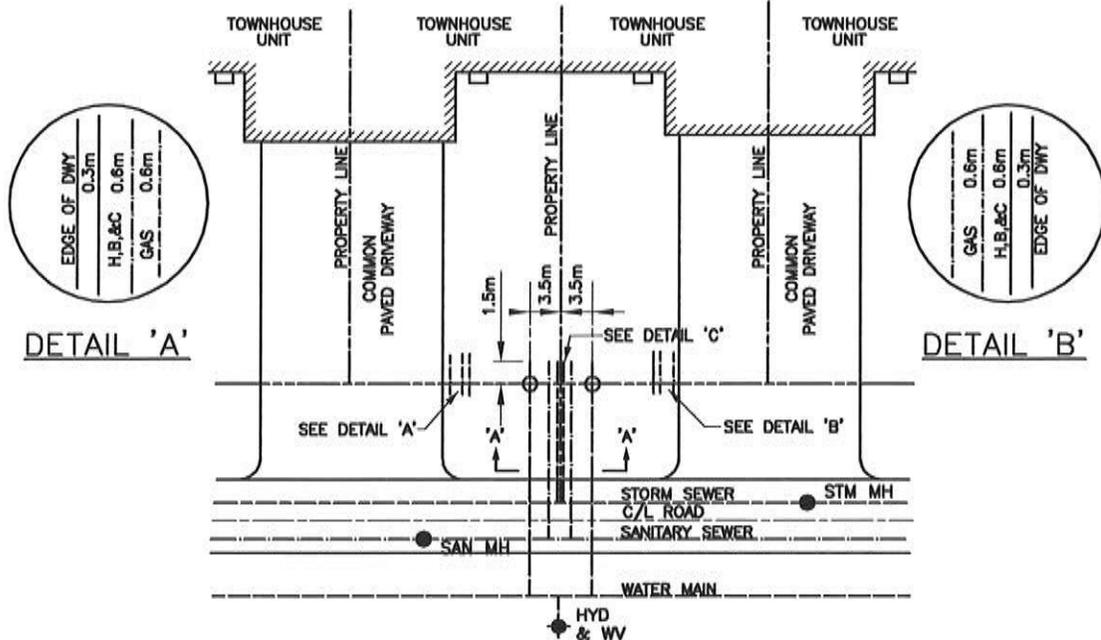
NOTES:

1. SERVICE TO EXTEND 1.5m INSIDE PROPERTY LINE.
2. UNDER NO CIRCUMSTANCE SHALL SERVICES CROSS ONE ANOTHER.
3. EACH HOUSE MUST BE SUPPLIED WITH A SEPARATE 150mmØ STORM SEWER SERVICE LATERAL. COMMON SERVICE CONNECTIONS WITH Y# WILL NOT BE PERMITTED. P.V.C. PIPE TO BE OTHER THAN WHITE.
4. THE MINIMUM SIZE FOR STORM DRAIN CONNECTION SHALL BE 150mØ INSTALLED AT A MINIMUM GRADE OF 2% FROM THE STORM SEWER TO THE BUILDING ENVELOPE.
5. THE MINIMUM SIZE FOR SANITARY LATERALS SHALL BE 125mØ INSTALLED AT A MINIMUM GRADE OF 2% FROM THE SANITARY SEWER TO THE BUILDING ENVELOPE. P.V.C. PIPE TO BE WHITE.
6. ALL UNDERGROUND SERVICE CABLES TO BE PLACED MINIMUM 1.0m BELOW FINISHED GRADE AT LOTS.
7. SHUT-OFF VALVES TO BE PLACED ON PROPERTY LINE.
8. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS UNLESS OTHERWISE SPECIFIED.

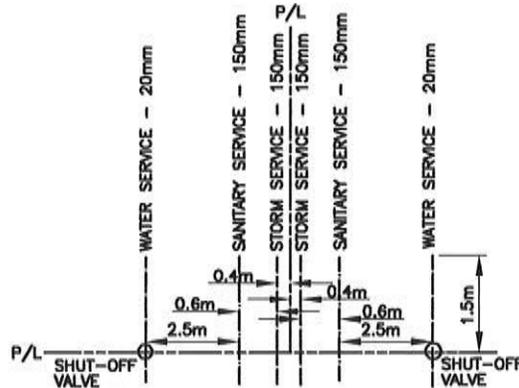
SECTION A-A
SCALE: NTS

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
SERVICE LOCATION SEMI DETACHED RESIDENTIAL	STD. No.	121



SECTION A-A
SCALE: NTS



DETAIL 'C'
SCALE: NTS

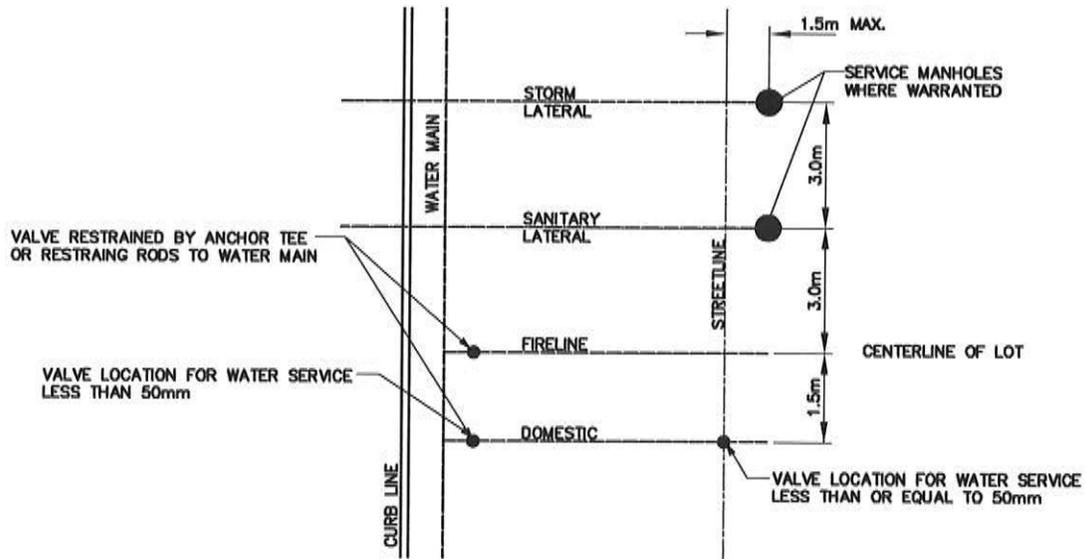
NOTES:

1. SERVICE TO EXTEND 1.5m INSIDE PROPERTY LINE.
2. UNDER NO CIRCUMSTANCE SHALL SERVICES CROSS ONE ANOTHER.
3. EACH HOUSE MUST BE SUPPLIED WITH A SEPARATE 150mmØ STORM SEWER SERVICE LATERAL. COMMON SERVICE CONNECTIONS WITH Ys WILL NOT BE PERMITTED. P.V.C. PIPE TO BE OTHER THAN WHITE.
4. THE MINIMUM SIZE FOR STORM DRAIN CONNECTION SHALL BE 150mØ INSTALLED AT A MINIMUM GRADE OF 2% FROM THE STORM SEWER TO THE BUILDING ENVELOPE.
5. THE MINIMUM SIZE FOR SANITARY LATERALS SHALL BE 125mØ INSTALLED AT A MINIMUM GRADE OF 2% FROM THE SANITARY SEWER TO THE BUILDING ENVELOPE. P.V.C. PIPE TO BE WHITE.
6. ALL UNDERGROUND SERVICE CABLES TO BE PLACED MINIMUM 1.0m BELOW FINISHED GRADE AT LOTS.
7. SHUT-OFF VALVES TO BE PLACED ON PROPERTY LINE.
8. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS UNLESS OTHERWISE SPECIFIED.

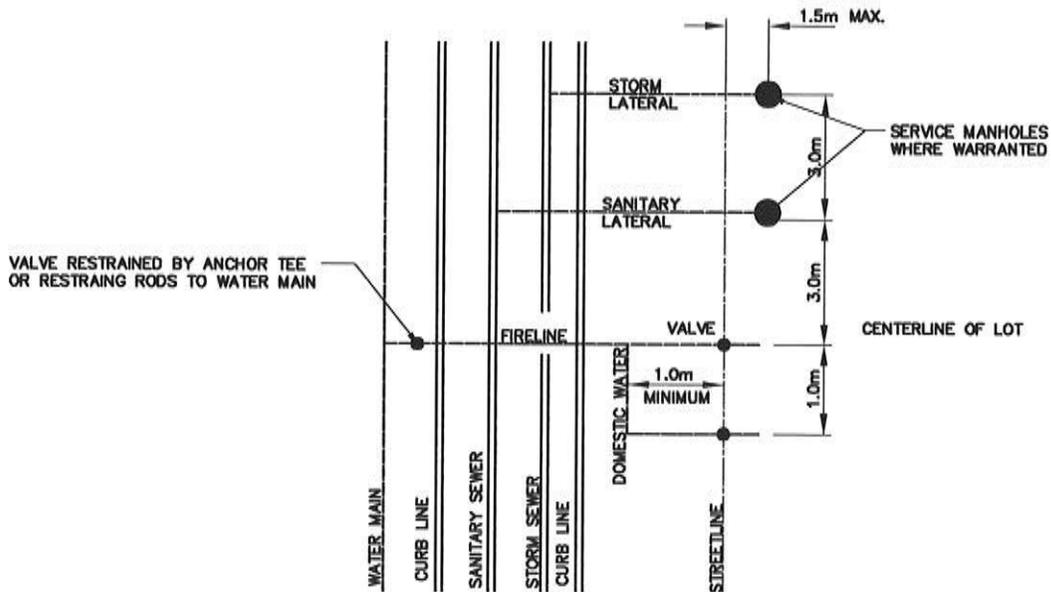
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA
SERVICE LOCATION
FREEHOLD TOWNHOUSE UNITS

APR'D:	DATE: NOV/06
DRAWN:	SCALE: NTS
STD. No.	122



SHORT SIDE CONNECTION



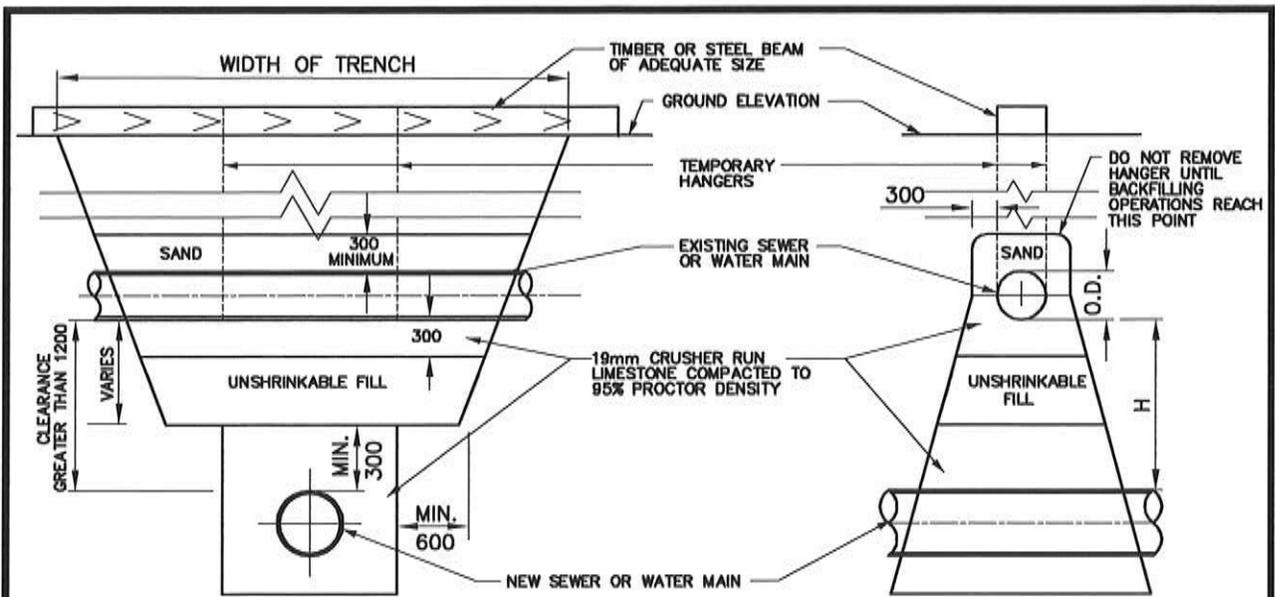
LONG SIDE CONNECTION

NOTE:

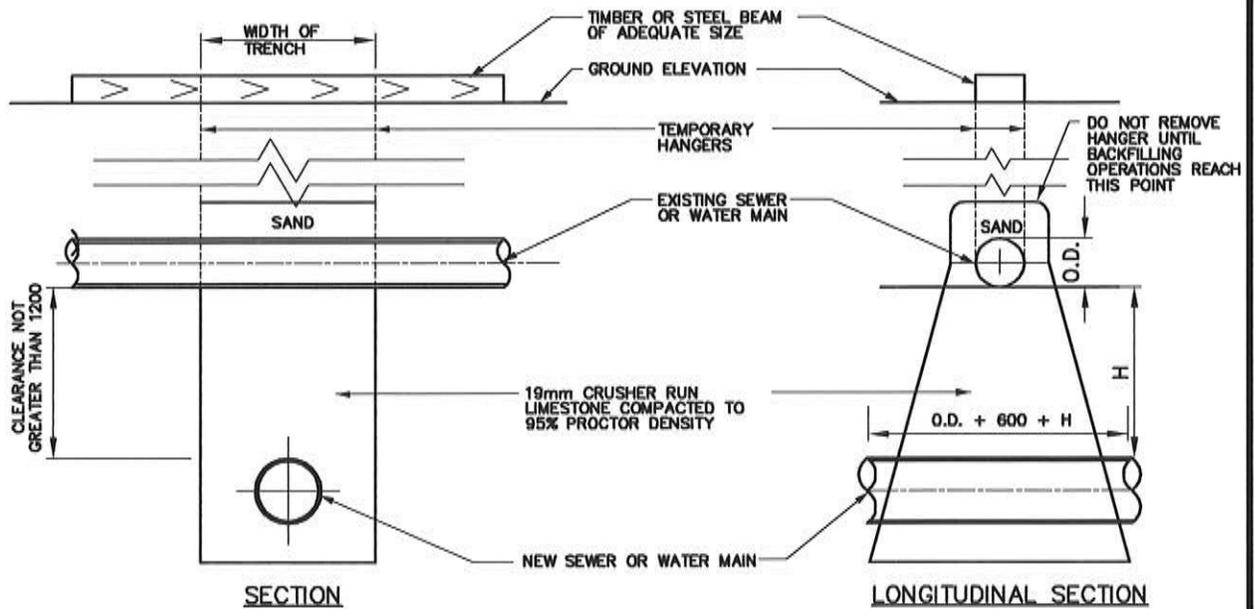
- 1. SERVICE LOCATIONS TO BE CONFIRMED WITH TOWNSHIP ENGINEER.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
SERVICE LOCATION – COMMERCIAL, INDUSTRIAL AND MULTI-RESIDENTIAL	STD. No.	123



CLEARANCE GREATER THAN 1200

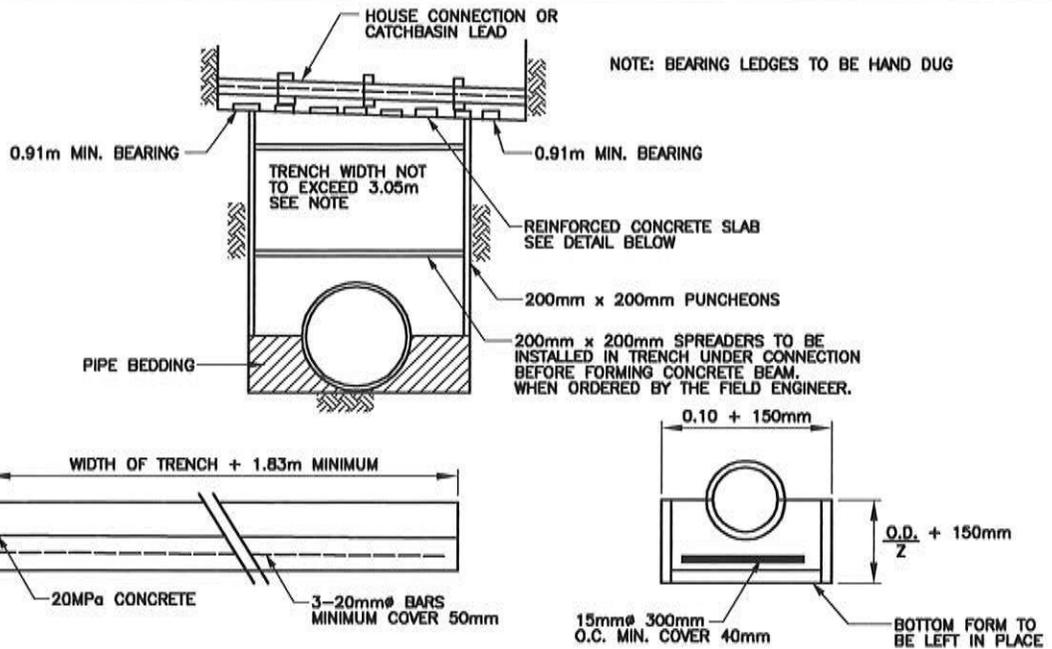


NOTES: CLEARANCE NOT GREATER THAN 1200

- 1. THIS DETAIL TO BE USED IN DRY STABLE CONDITIONS ONLY.
- 2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.

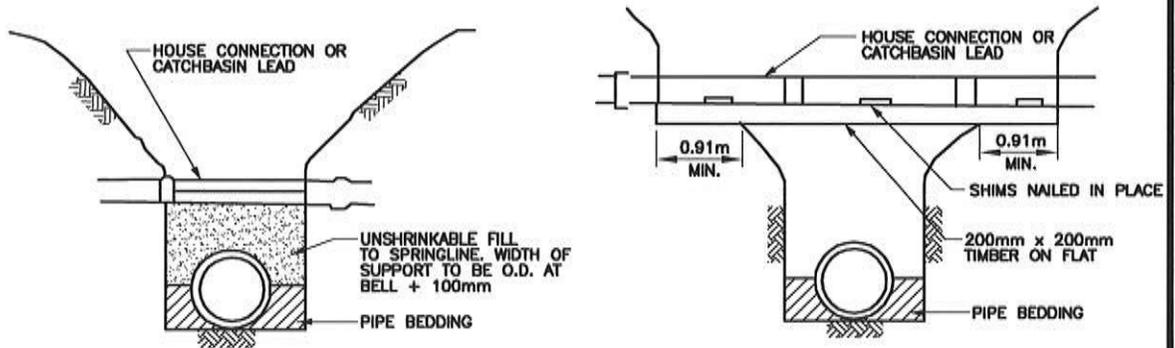
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA SUPPORTS FOR WATER MAINS AND SEWERS CROSSING NEW TRENCHES	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
STD. No.		124



REINFORCED CONCRETE SUPPORT FOR HOUSE CONNECTIONS AND CATCHBASIN LEADS WHEN WIDTH OF TRENCH EXCEEDS 1.52m BUT LESS THAN 3.05m

NOTE: WHEN WIDTH OF TRENCH EXCEEDS 3.05m METHOD OF SUPPORTING HOUSE CONNECTIONS AND CATCHBASIN LEADS WILL BE AS DIRECTED BY THE FIELD ENGINEER.



SUPPORT FOR CONNECTION CROSSING TRENCH WHEN WIDTH OF TRENCH IS LESS THAN 1.52m

NOTES:

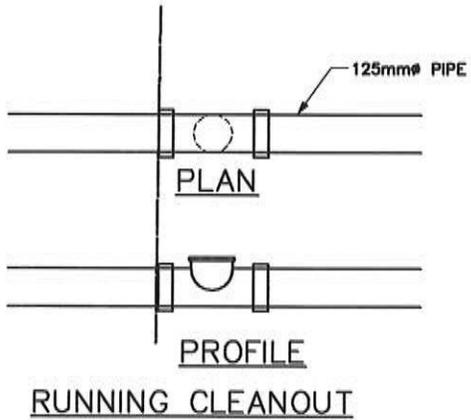
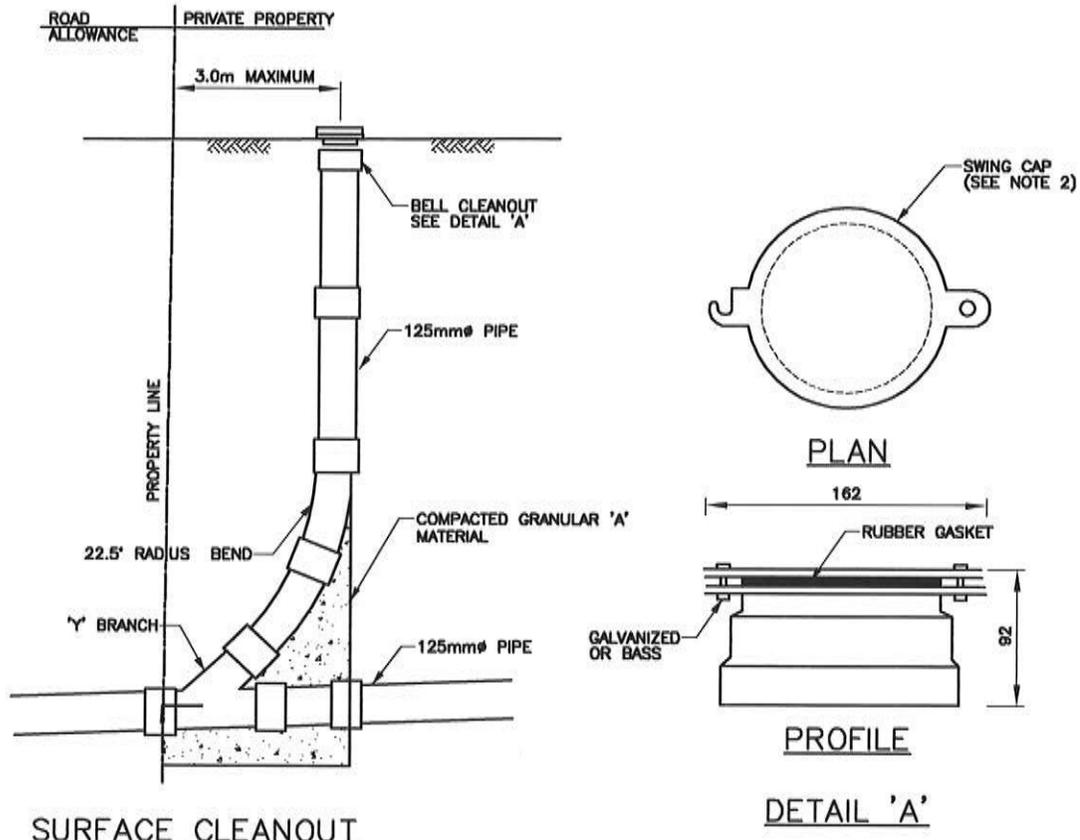
1. WHERE HOUSE CONNECTIONS OR CATCHBASIN LEADS CROSS A SEWER TRENCH, THEY WILL BE SUPPORTED ON A NEW 200mm x 200mm TIMBER WHICH HAS A MINIMUM BEARING OF 0.91m AT EACH END ON UNDISTURBED GROUND. CONNECTION MUST BE PROPERLY SHIMMED OR BEDDED ON 20MPa CONCRETE FILL TO SPRINGLINE AS PER DETAILS.
2. OPSD-1007.01 MAY BE USED WHEN APPROVED BY THE TOWNSHIP ENGINEER.
3. TO BE USED WHEN INSTALLING SEWER OR WATERMAIN ON EXISTING R.O.W.
4. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS.
5. FOR ALL CROSSING OF GAS MAINS, CONTRACTOR TO CONTACT GAS COMPANY FOR LOCATES AND INSPECTIONS.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA
SUPPORTS FOR HOUSE
CONNECTIONS AND CATCH BASIN LEADS

APR'D: _____ DATE: NOV/06
 DRAWN: _____ SCALE: NTS

STD. No. 125



NOTES:

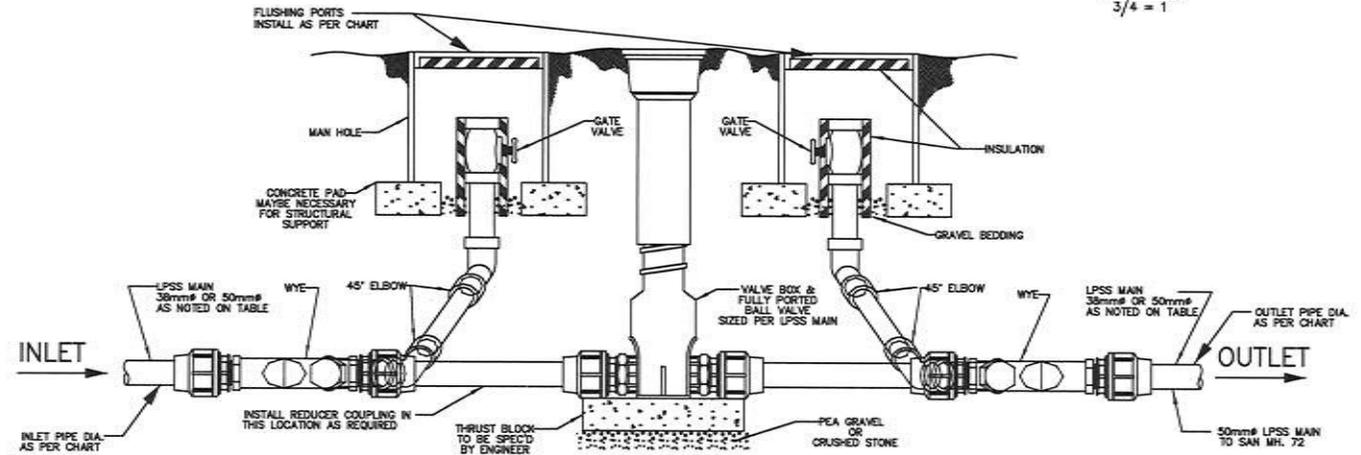
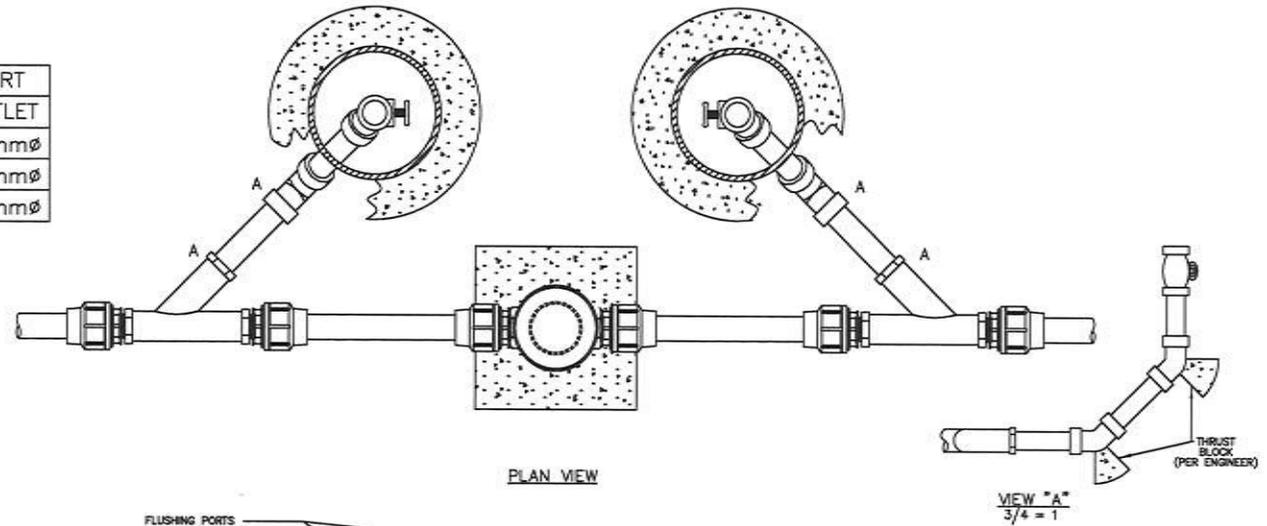
1. ALL FITTINGS TO BE APPROVED CAST IRON OR EQUIVALENT.
2. WHEN CLEANOUT IS LOCATED IN A DRIVEWAY A BRASS CAP IS REQUIRED.
3. CONCRETE CRADLE SHALL NOT BE USED FOR P.V.C. PIPE.
4. SANITARY SEWER CLEANOUTS SHALL BE PLACED WHERE LATERAL SERVICES EXCEED 30m IN LENGTH WITHIN THE PUBLIC R.O.W.
5. WHERE PARTIAL BASEMENTS ARE CONSTRUCTED FOR DEVELOPMENT PROJECTS, CLEANOUTS SHALL BE PLACED 3.0 METERS FROM THE BUILDING ENVELOPE.
6. CLEANOUTS SHALL NOT BE PLACED IN REGISTERED EASEMENTS.
7. ALL DIMENSIONS ARE IN MILLIMETERS EXCEPT WHERE NOTED.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
SANITARY SEWER CLEANOUTS	STD. No.	126

CLEAN-OUT	PIPE DIA.		FLUSHING PORT	
	INLET	OUTLET	INLET	OUTLET
C.O. #1	38mmØ	38mmØ	N/R	38mmØ
C.O. #2	38mmØ	50mmØ	38mmØ	50mmØ
C.O. #3	50mmØ	50mmØ	50mmØ	50mmØ

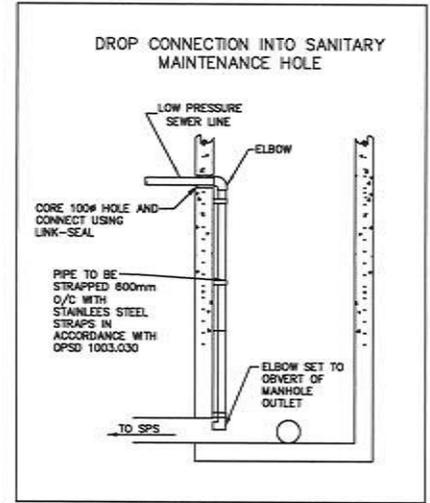
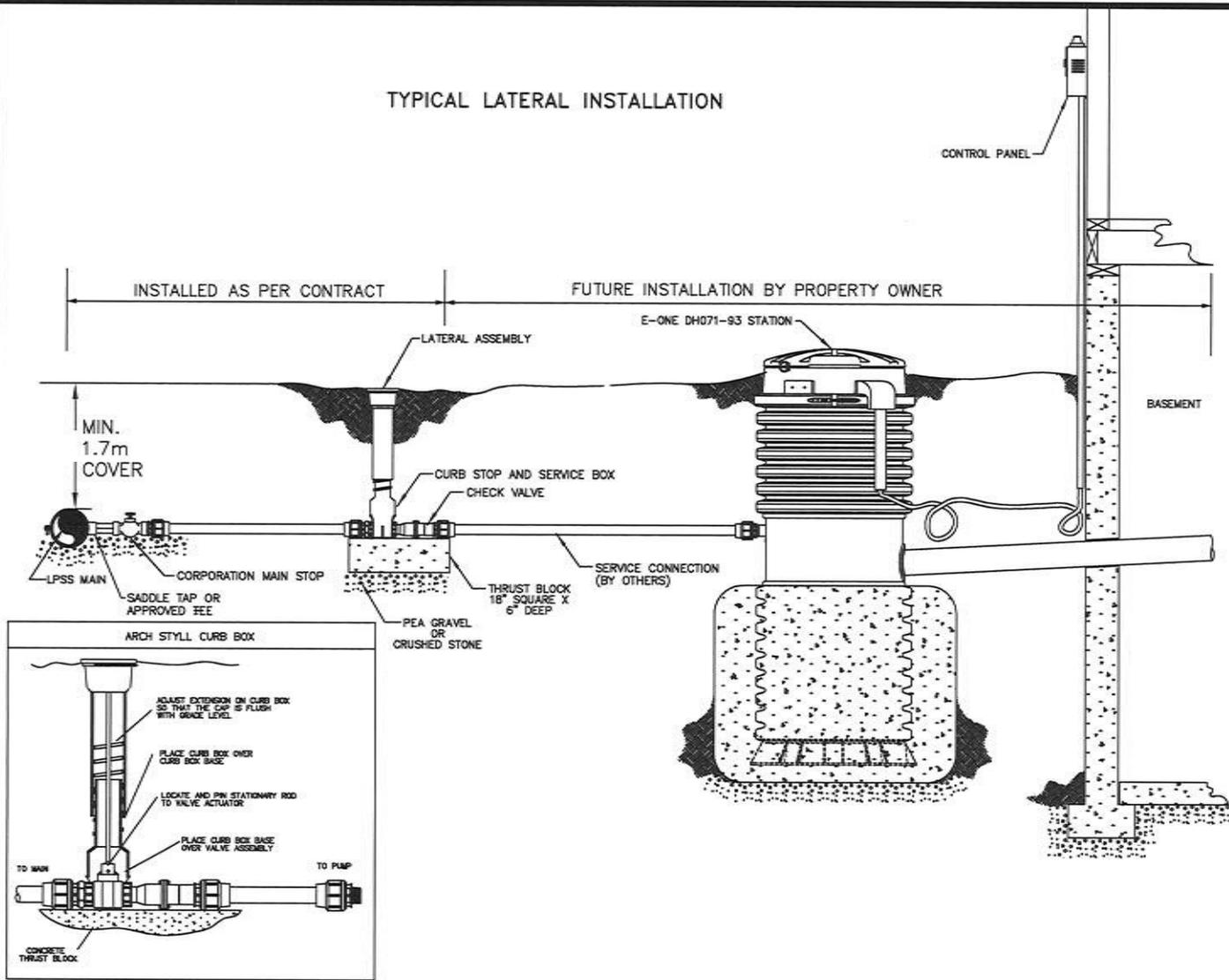
N/R = NOT REQUIRED



TYPICAL CLEANOUT/FLUSHING CONNECTION ON LPSS MAIN

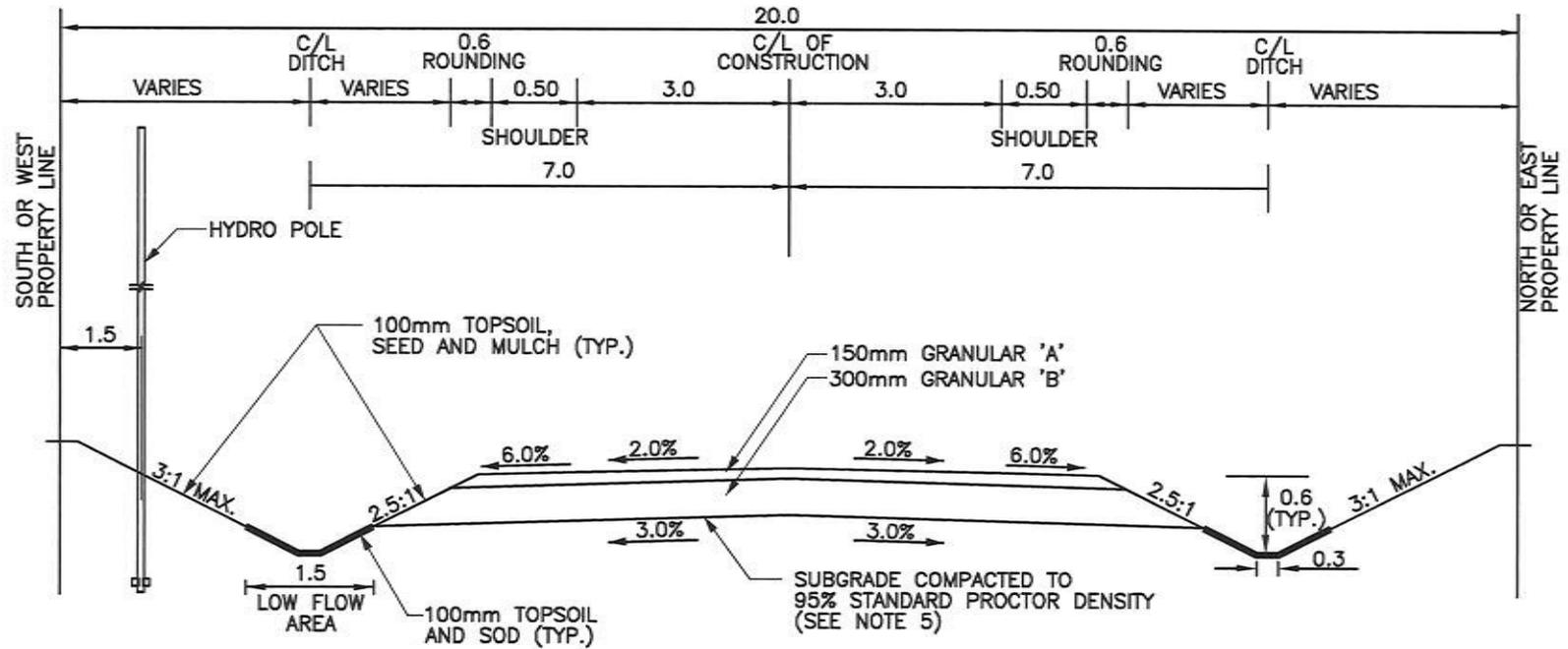
NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA	APR'D:	DATE: MAR/13
					LOW PRESSURE SANITARY SEWER - CLEANOUT	DRAWN:
					STD. No.	127

TYPICAL LATERAL INSTALLATION



NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA	APR'D:	DATE: MAR/13
					LOW PRESSURE SANITARY SEWER - GRINDER PUMP SYSTEM	DRAWN:
					STD. No.	128

"NOT FOR NEW DEVELOPMENT"

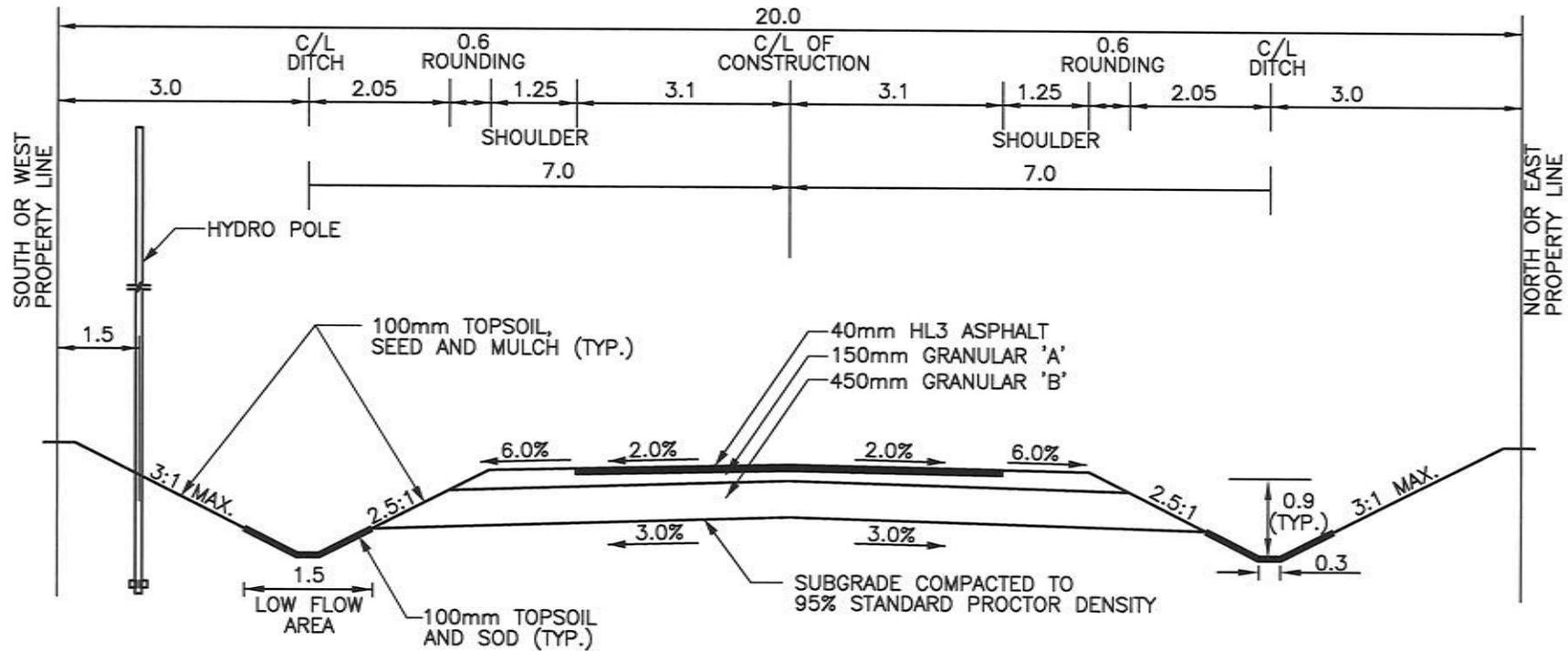


NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. ALL GRANULAR MATERIALS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.
3. NURSERY SOD TO BE PLACED IN LOW FLOW AREA OF DITCHES ONLY. SEED AND MULCH TO BE PLACED IN ALL OTHER LOCATIONS IN THE RIGHT-OF-WAY.
4. THIS ROAD SECTION IS ONLY TO BE FOR PRIVATE ROADS AND EXTENSIONS OF UNOPENED RIGHT OF WAYS WITH LESS THAN 50 VEHICLES PER DAY.
5. FILTER CLOTH ON SUBGRADE IF REQUIRED BY SUBGRADE CONDITIONS.

NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
					RURAL (UN-PAVED) – LOCAL IMPROVEMENT	DRAWN:
				6.0m RURAL ROADWAY WITH OPEN DITCHES	STD. No.	201

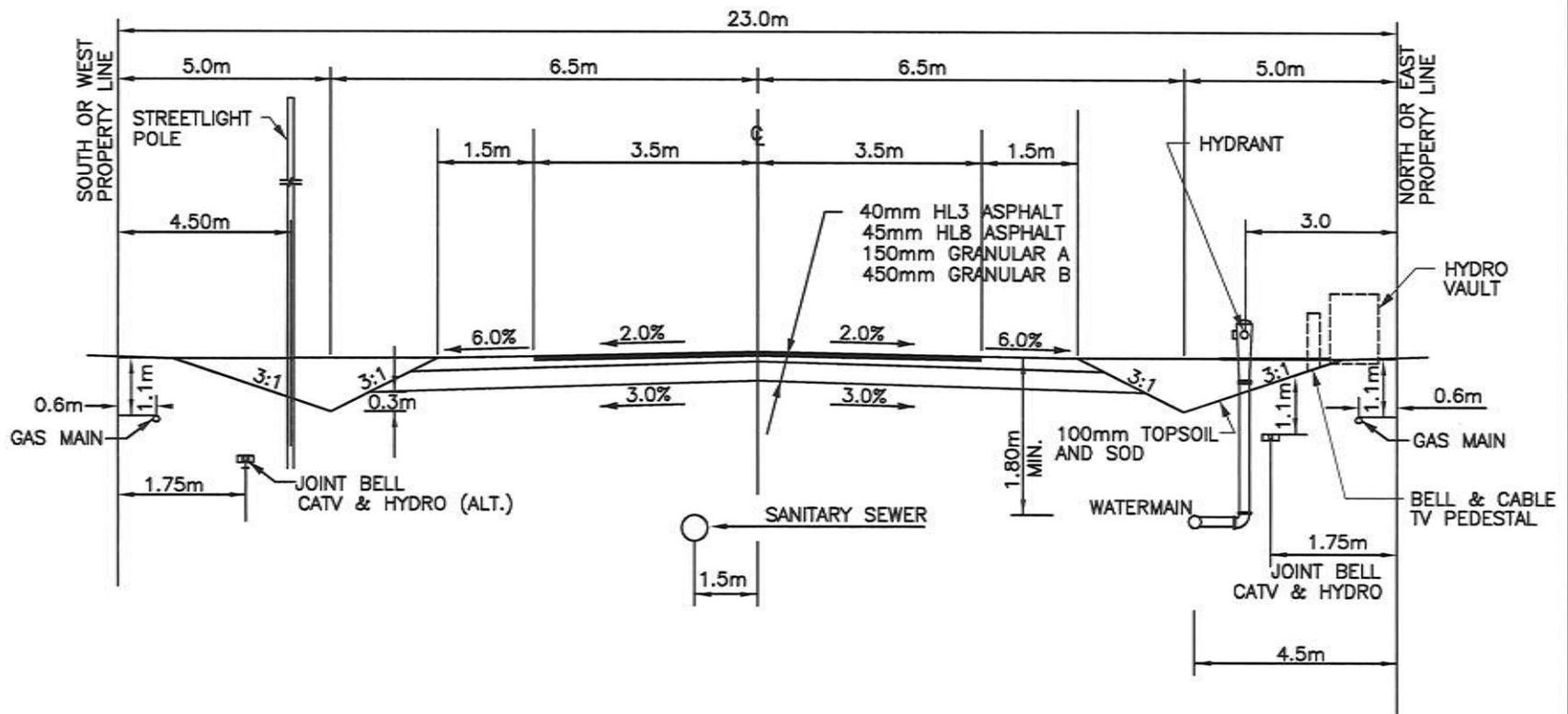
"NOT FOR NEW DEVELOPMENT"



NOTES:

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. ALL GRANULAR MATERIALS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.
3. NURSERY SOD TO BE PLACED IN LOW FLOW AREA OF DITCHES ONLY. SEED AND MULCH TO BE PLACED IN ALL OTHER LOCATIONS IN THE RIGHT-OF-WAY.
4. THIS ROAD SECTION IS ONLY TO BE USED TO UPGRADE EXISTING ROADS CONSTRUCTED AND OPENED PRIOR TO DECEMBER 31, 1965. THE PURPOSE OF THIS ROAD SECTION IS TO OUTLINE MINIMUM STANDARDS TO ENABLE ASSUMPTION BY THE TOWNSHIP.

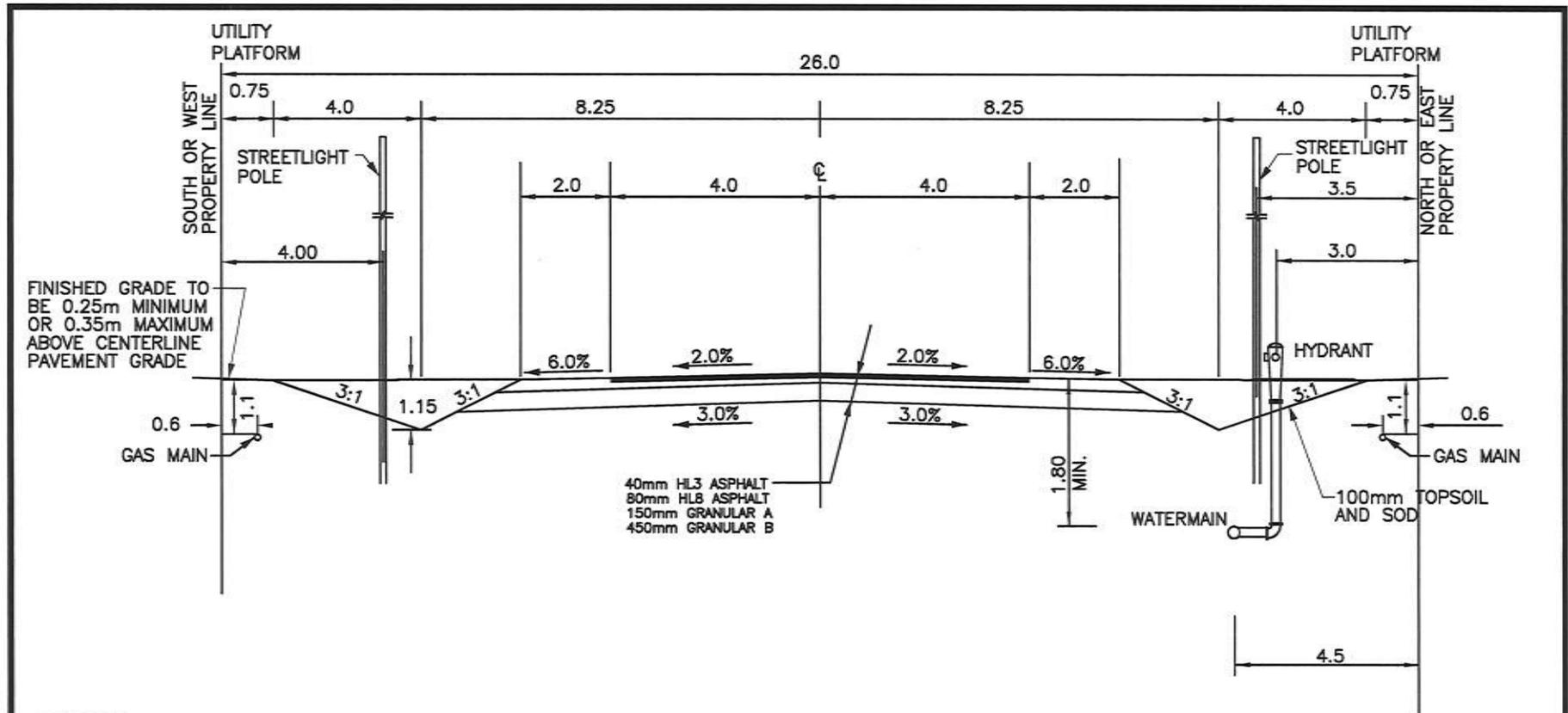
NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA		APR'D:	DATE: JAN/14
						RURAL - LOCAL IMPROVEMENT	
				6.2m RURAL ROADWAY WITH OPEN DITCHES		STD. No.	202B



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. ALL WATER CURB STOPS TO BE PLACED ON STREETLINE.
5. A 3.0m WIDE PLATFORM AREA SHALL BE CONSTRUCTED FOR EACH FIRE HYDRANT. THE MINIMUM CULVERT LENGTH SHALL BE 6.5m AND THE MINIMUM DIAMETER SHALL BE 400mm. PLATFORM AREAS SHALL BE RESTORED WITH 100mm TOPSOIL AND SOD.
6. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

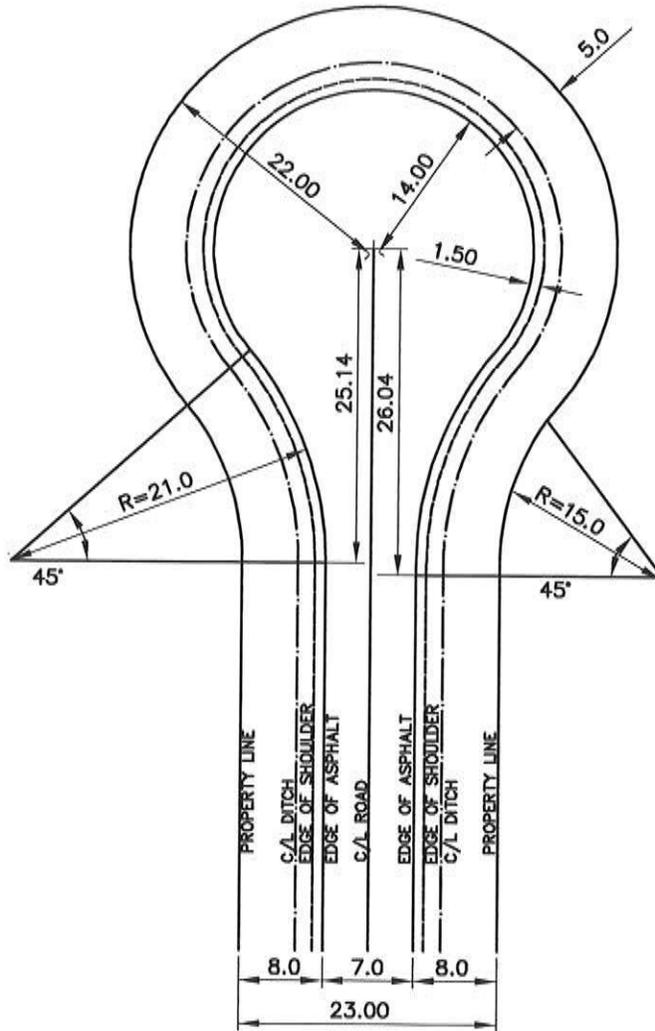
NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
					RURAL (PAVED) – LOCAL RESIDENTIAL	DRAWN:
				23.0m ROAD ALLOWANCE 7.0m ASPHALT SURFACE	STD. No. 203	



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. CURB STOPS FOR WATER SERVICES TO BE PLACED ON STREETLINE.
5. A 3.0m WIDE PLATFORM AREA SHALL BE CONSTRUCTED FOR EACH FIRE HYDRANT. THE MINIMUM CULVERT LENGTH SHALL BE 6.5m AND THE MINIMUM DIAMETER SHALL BE 400mm. PLATFORM AREAS SHALL BE RESTORED WITH 100mm TOPSOIL AND SOD.
6. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
						DRAWN:
				RURAL – LOCAL INDUSTRIAL	STD. No. 204	
				26.0m ROAD ALLOWANCE 8.0m ASPHALT SURFACE		

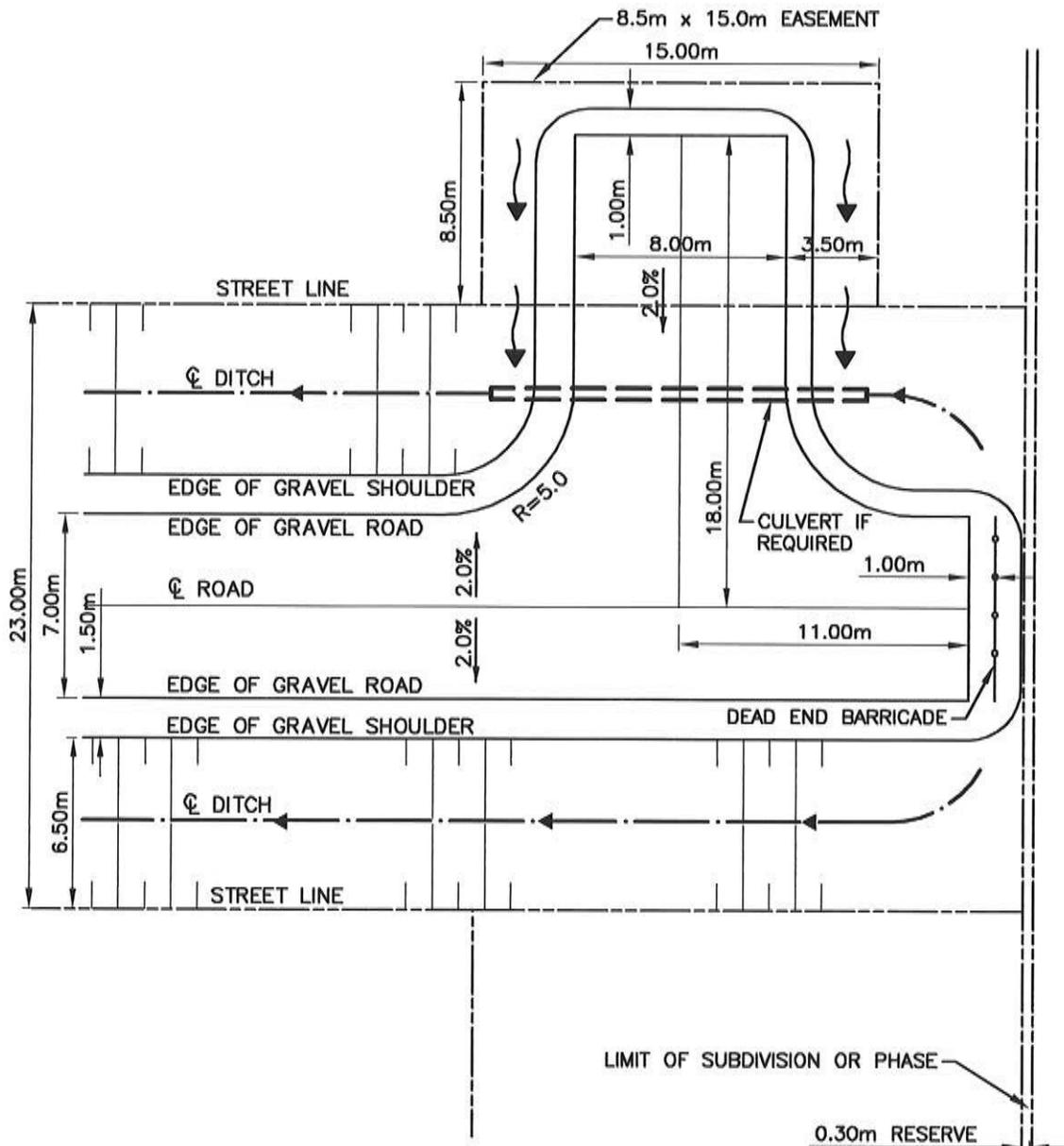


NOTES:

1. DETAIL OF GRADING OF BULB AREAS OF CUL-DE-SAC TO BE SHOWN ON PROFILE DRAWINGS.
2. CUL-DE-SAC DRAINAGE TO BE DIRECTED TOWARDS THE BEGINNING OF THE BULB.
MINIMUM DITCH GRADE TO BE 2%.
3. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA RURAL – RESIDENTIAL CUL-DE-SAC 23.0m ROAD ALLOWANCE 7.0m ASPHALT SURFACE	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
STD. No.		205



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.

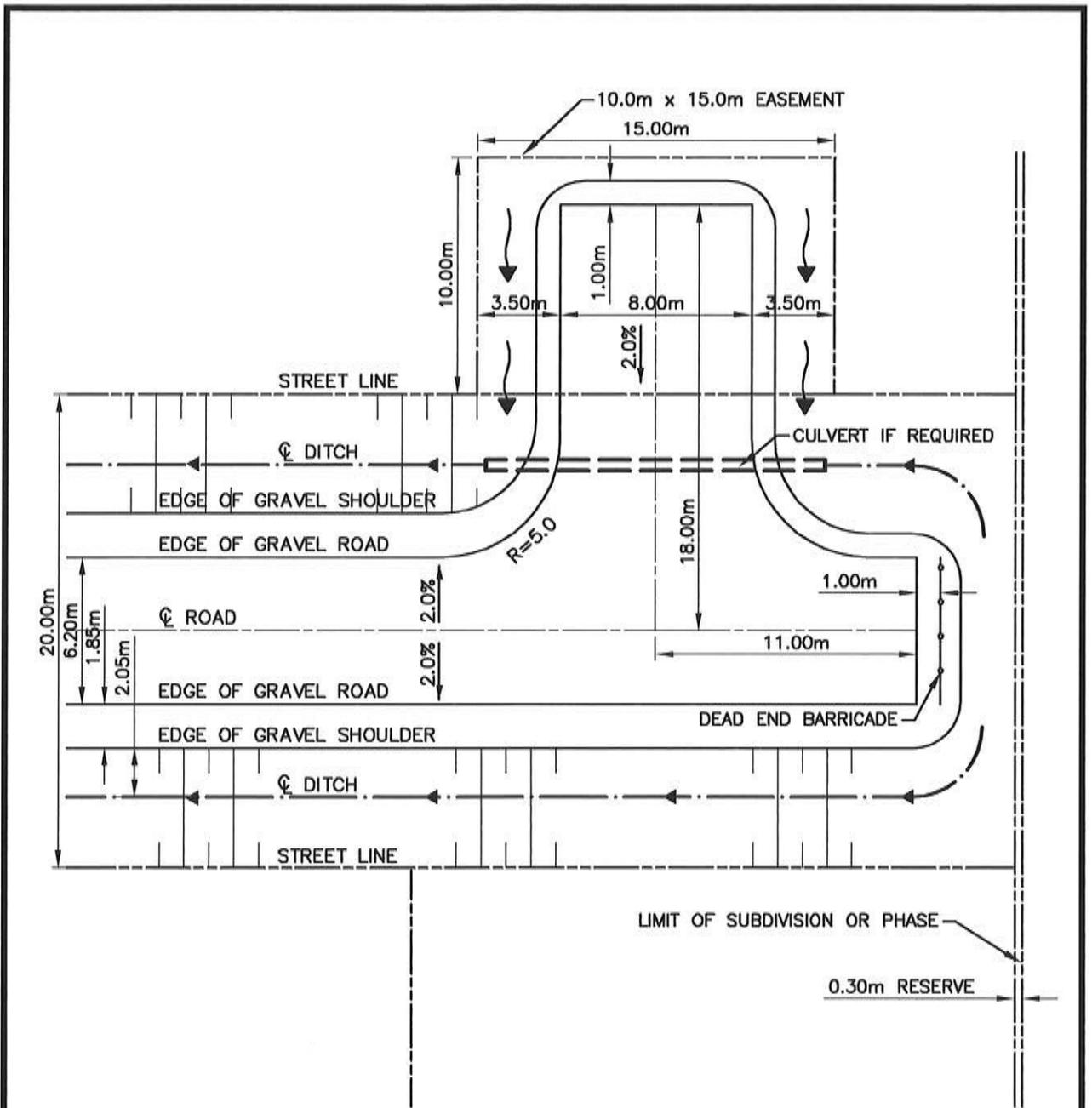
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

**RURAL – TURNAROUND RESIDENTIAL
(23.0 m ROW)**

APR'D: DATE: MAR/13
DRAWN: SCALE: NTS

STD. No. 206 A

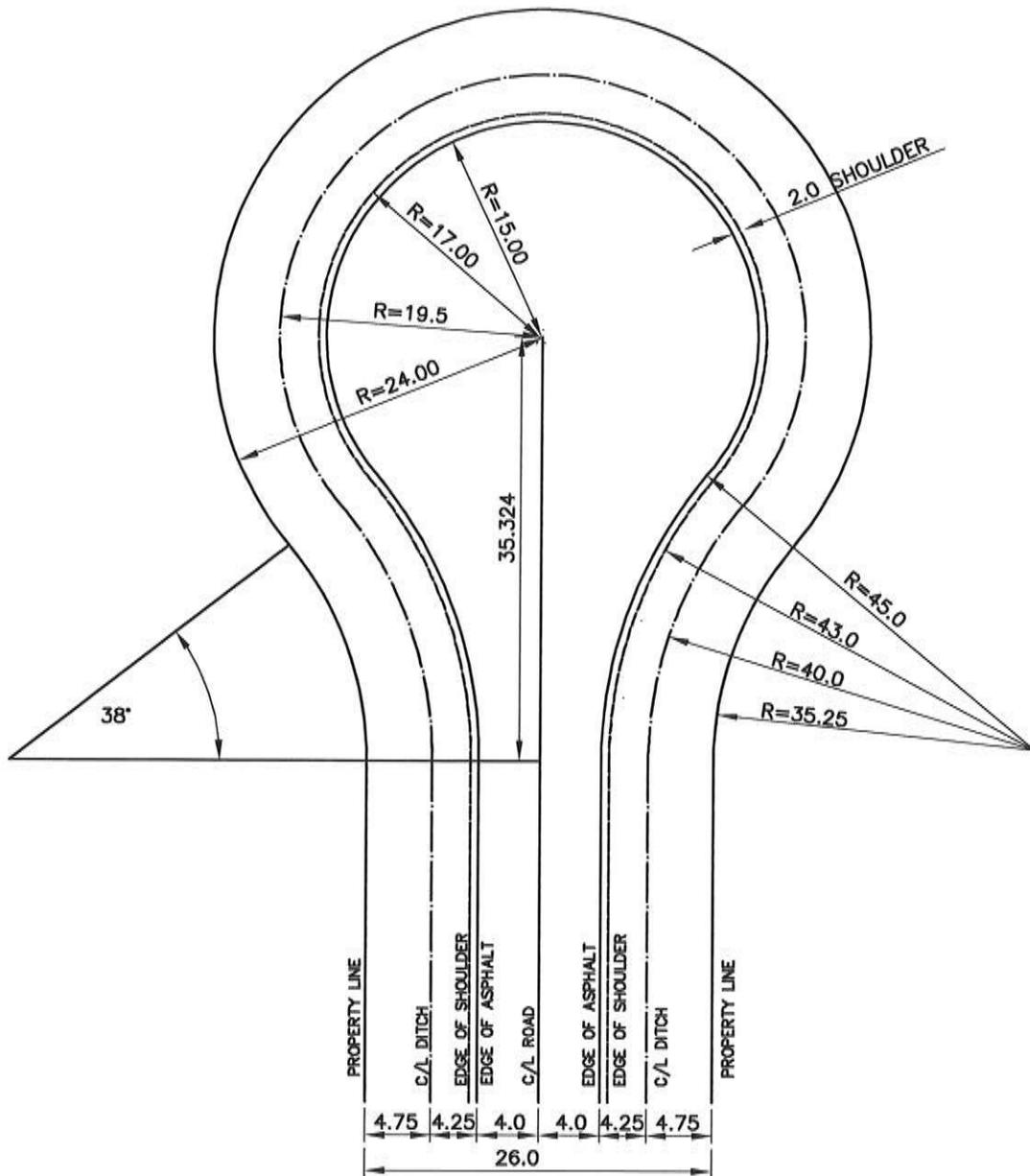


NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: MAR/13
	DRAWN:	SCALE: 1:250
RURAL – TURNAROUND RESIDENTIAL (20.0 m ROW)		STD. No. 206 B



NOTES:

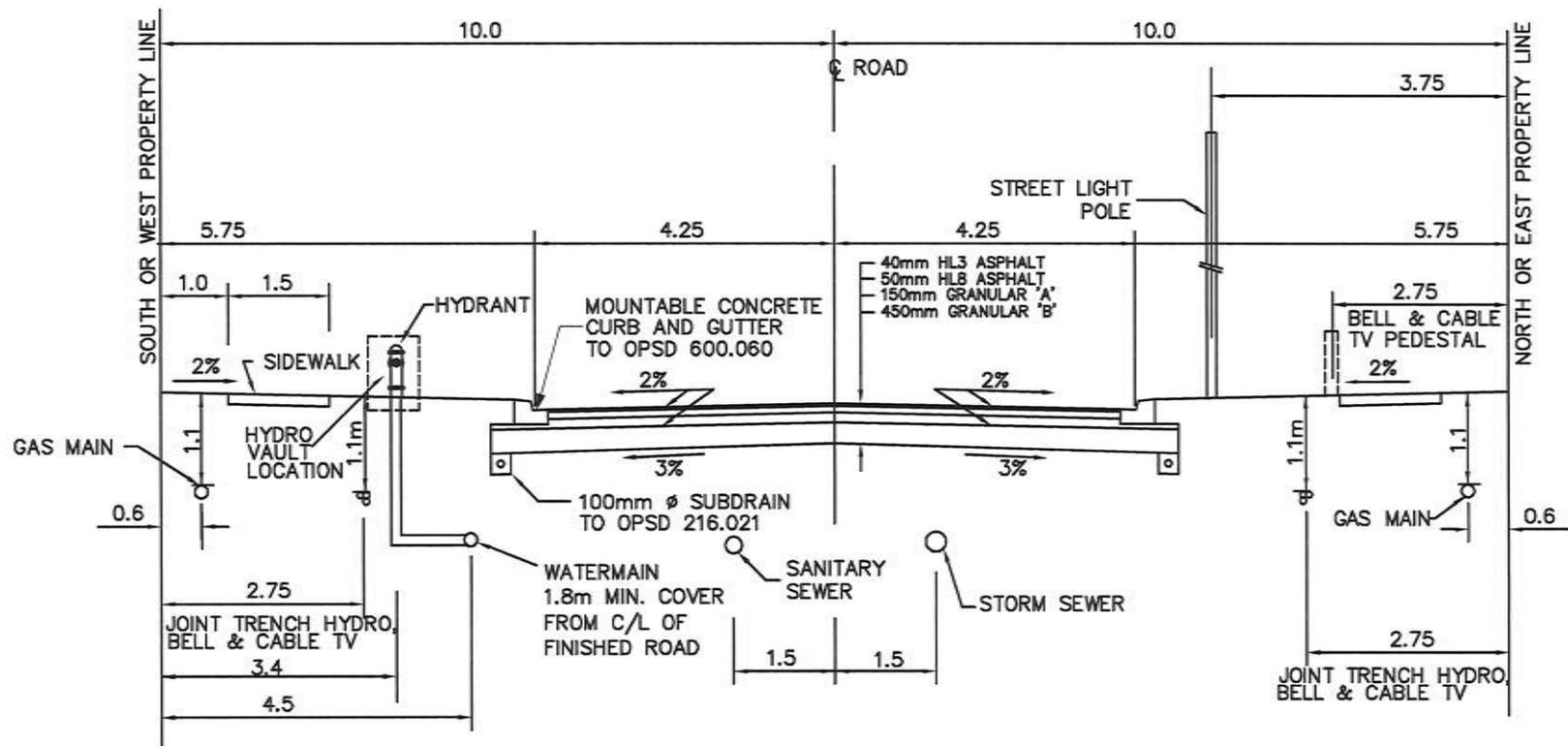
1. MINIMUM LONGITUDINAL GRADE OF DITCHLINE AROUND CUL-DE-SAC TO BE 2.0%
2. DETAIL OF GRADING OF BULB AREAS OF CUL-DE-SAC TO BE SHOWN ON PROFILE DRAWINGS.
3. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA
RURAL – INDUSTRIAL CUL-DE-SAC
 26.0m ROAD ALLOWANCE
 8.0m ASPHALT SURFACE

APR'D:	DATE: NOV/06
DRAWN:	SCALE: NTS

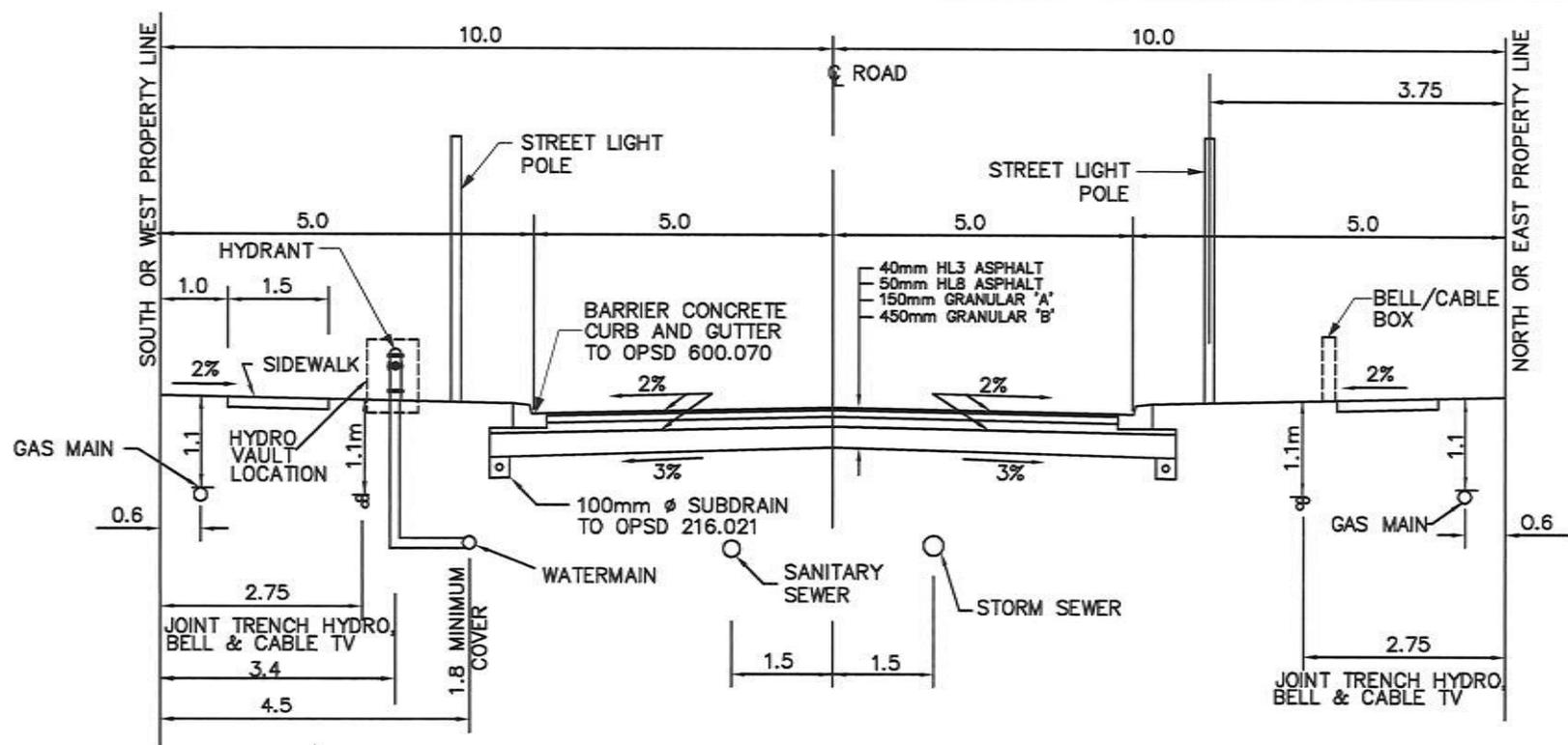
STD. No. 207



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. WHERE ONE SIDEWALK IS CONSTRUCTED IT SHALL BE ON THE NORTH AND EAST SIDE OF THE ROAD.
5. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

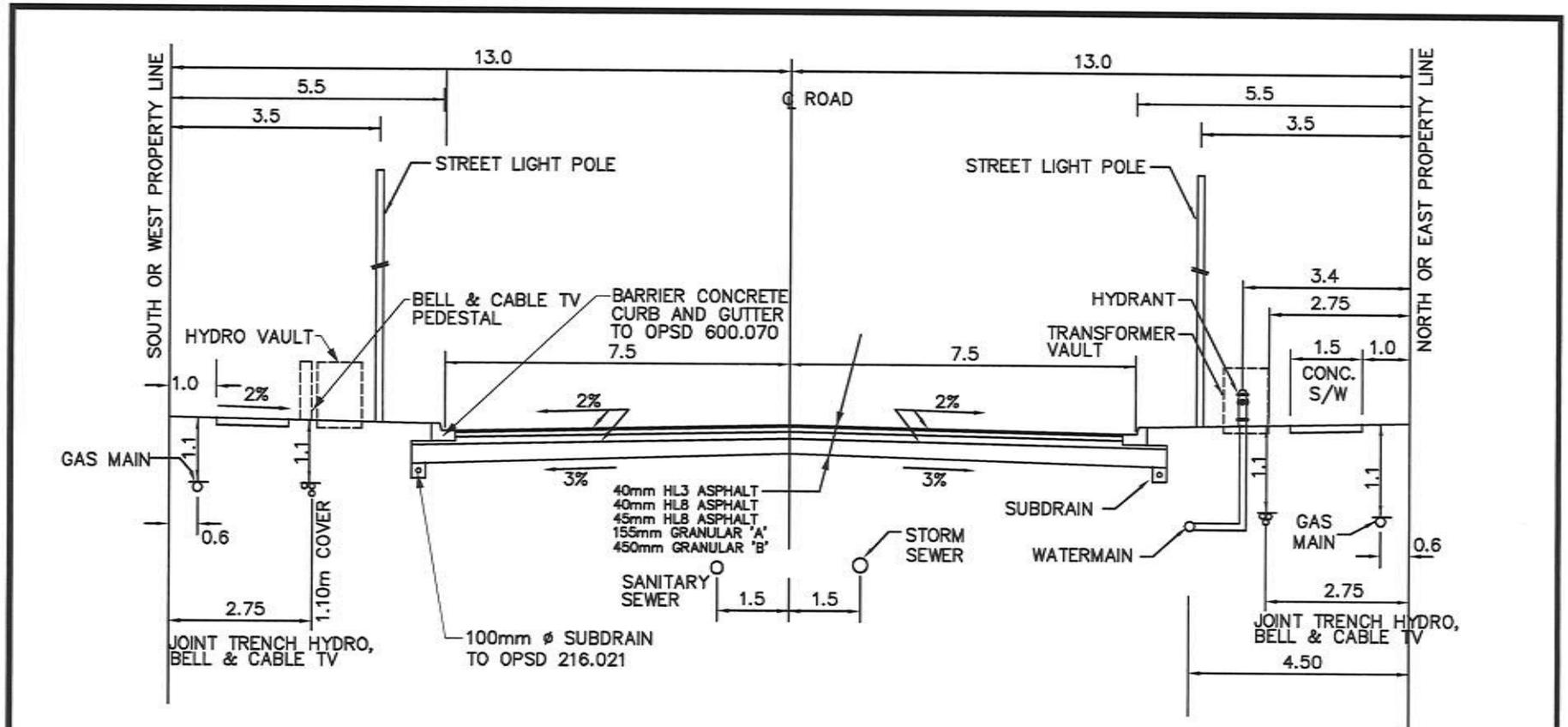
NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
					URBAN – LOCAL RESIDENTIAL	DRAWN:
				20.0m ROAD ALLOWANCE 8.5m ASPHALT SURFACE	STD. No.	208



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEViate AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. WHERE ONE SIDEWALK IS CONSTRUCTED IT SHALL BE ON THE NORTH AND EAST SIDE OF THE ROAD.
5. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

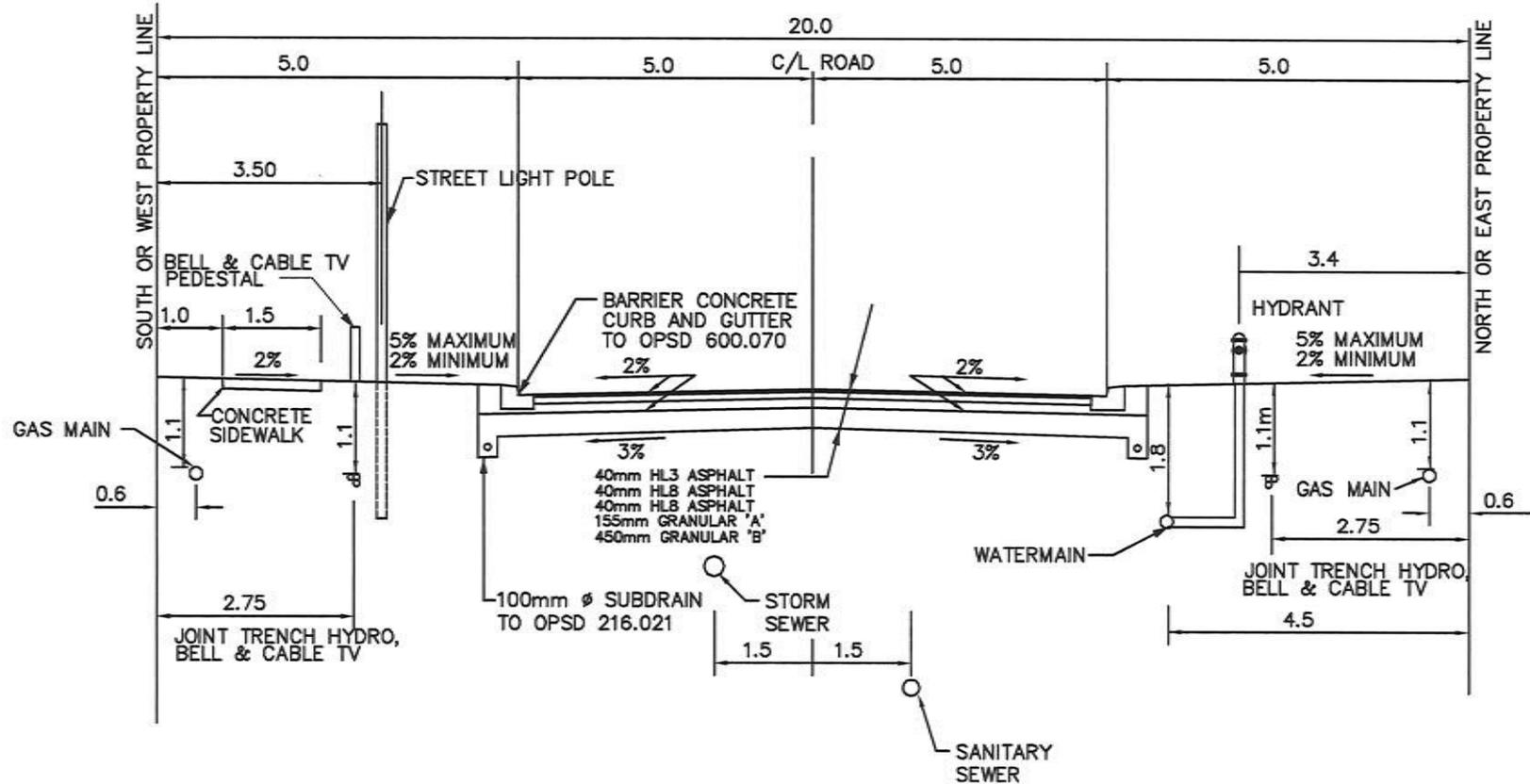
NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA		APR'D:	DATE: NOV/06
						URBAN – COLLECTOR RESIDENTIAL	
				20.0m ROAD ALLOWANCE 10.0m ASPHALT SURFACE		STD. No.	209



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. WHERE ONE SIDEWALK IS CONSTRUCTED IT SHALL BE ON THE NORTH AND EAST SIDE OF THE ROAD.
5. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

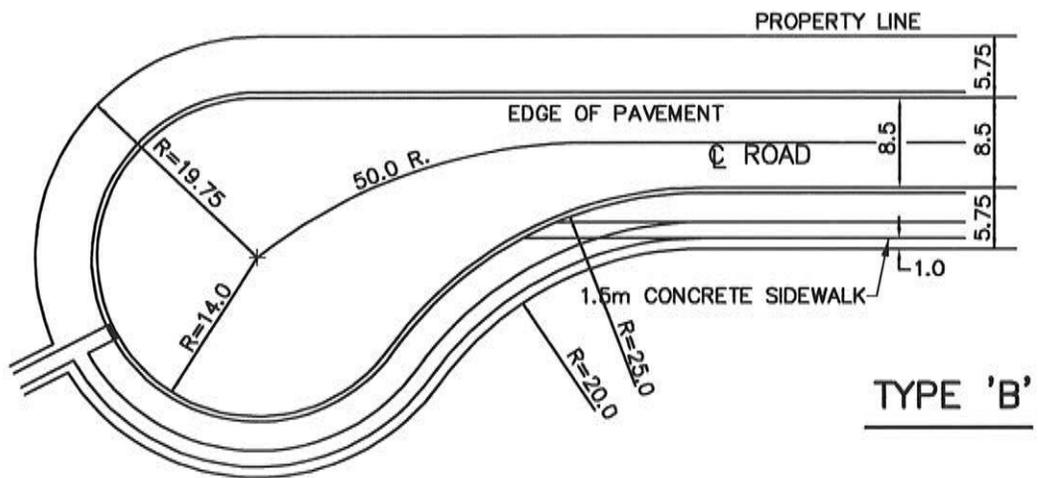
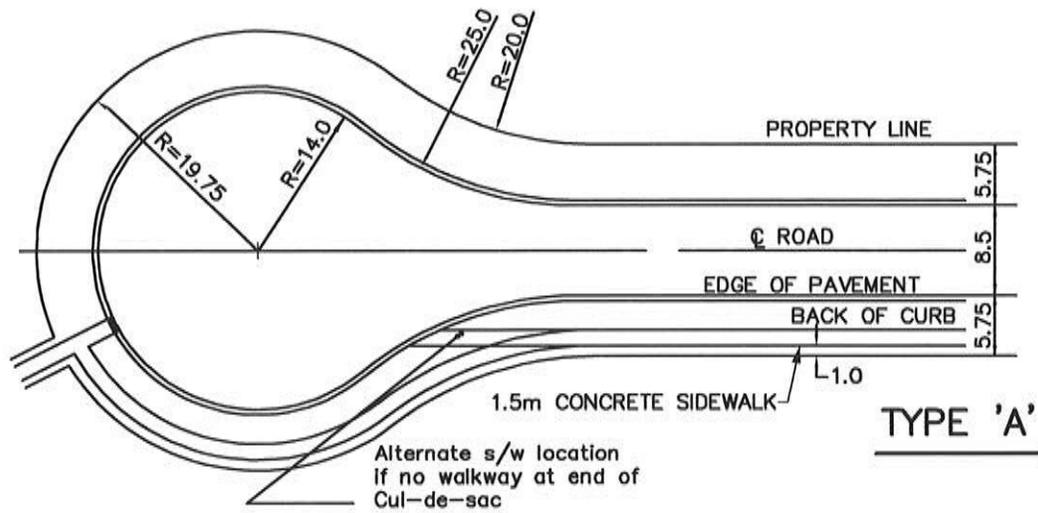
NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
					URBAN - MAJOR COLLECTOR - RESIDENTIAL AND INDUSTRIAL 26.0m ROAD ALLOWANCE 15.0m ASPHALT SURFACE	DRAWN:
					STD. No.	210



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. MINIMUM PAVEMENT AND ROAD STRUCTURE DESIGN AS PER TOWNSHIP DESIGN CRITERIA OR AS PER GEOTECHNICAL INVESTIGATION RECOMMENDATION.
3. ALL SERVICE LOCATIONS SHOWN ARE FOR GUIDELINE PURPOSES ONLY AND MAY DEVIATE AS PER THE DIRECTION OF THE TOWNSHIP WHEN STANDARD LOCATION CANNOT BE ACHIEVED.
4. WHERE ONE SIDEWALK IS CONSTRUCTED IT SHALL BE ON THE NORTH AND EAST SIDE OF THE ROAD.
5. TREES TO BE PLACED IN LOCATIONS AS PER APPROVED LANDSCAPE PLAN.

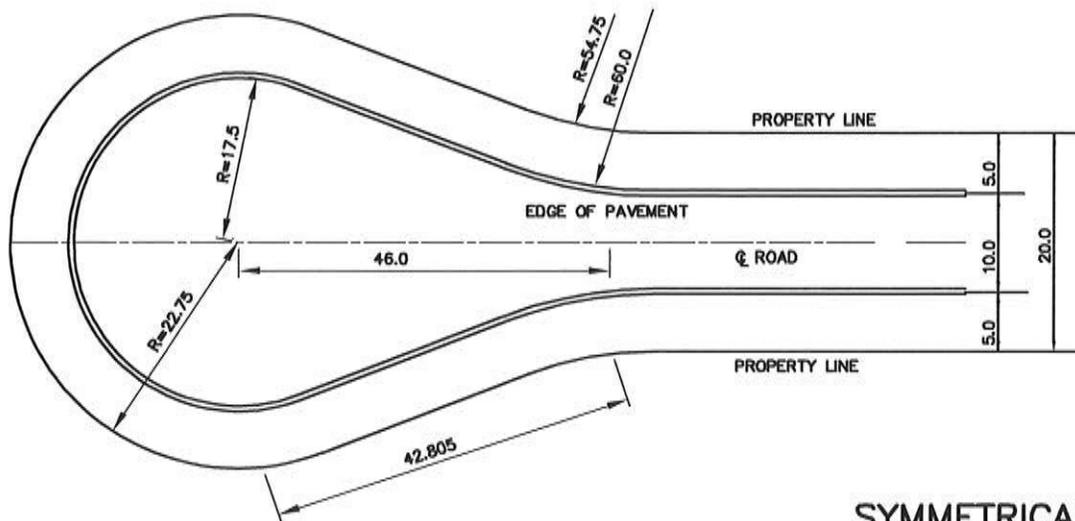
NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA		APR'D:	DATE: NOV/06
						URBAN – LOCAL INDUSTRIAL	
				20.0m ROAD ALLOWANCE 10.0m ASPHALT SURFACE		STD. No.	211



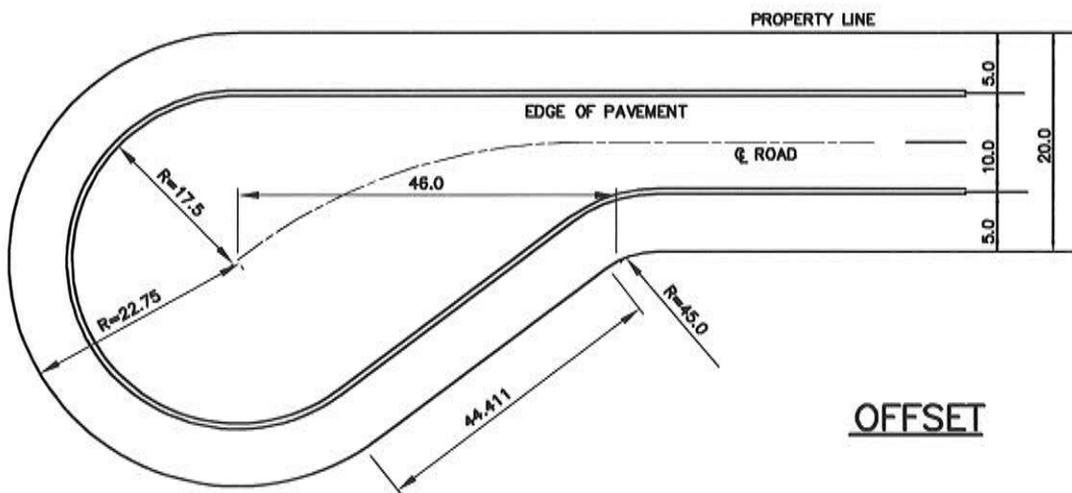
- NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
 2. MINIMUM GUTTER GRADE 0.75%.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
URBAN – RESIDENTIAL CUL-DE-SAC 20.0m ROAD ALLOWANCE 8.5m ASPHALT SURFACE	STD. No.	212



SYMMETRICAL



OFFSET

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN
2. MINIMUM GUTTER GRADE 0.75%
3. CUL-DE-SAC DRAINAGE TO BE DIRECTED TOWARDS BEGINNING OF BULB.

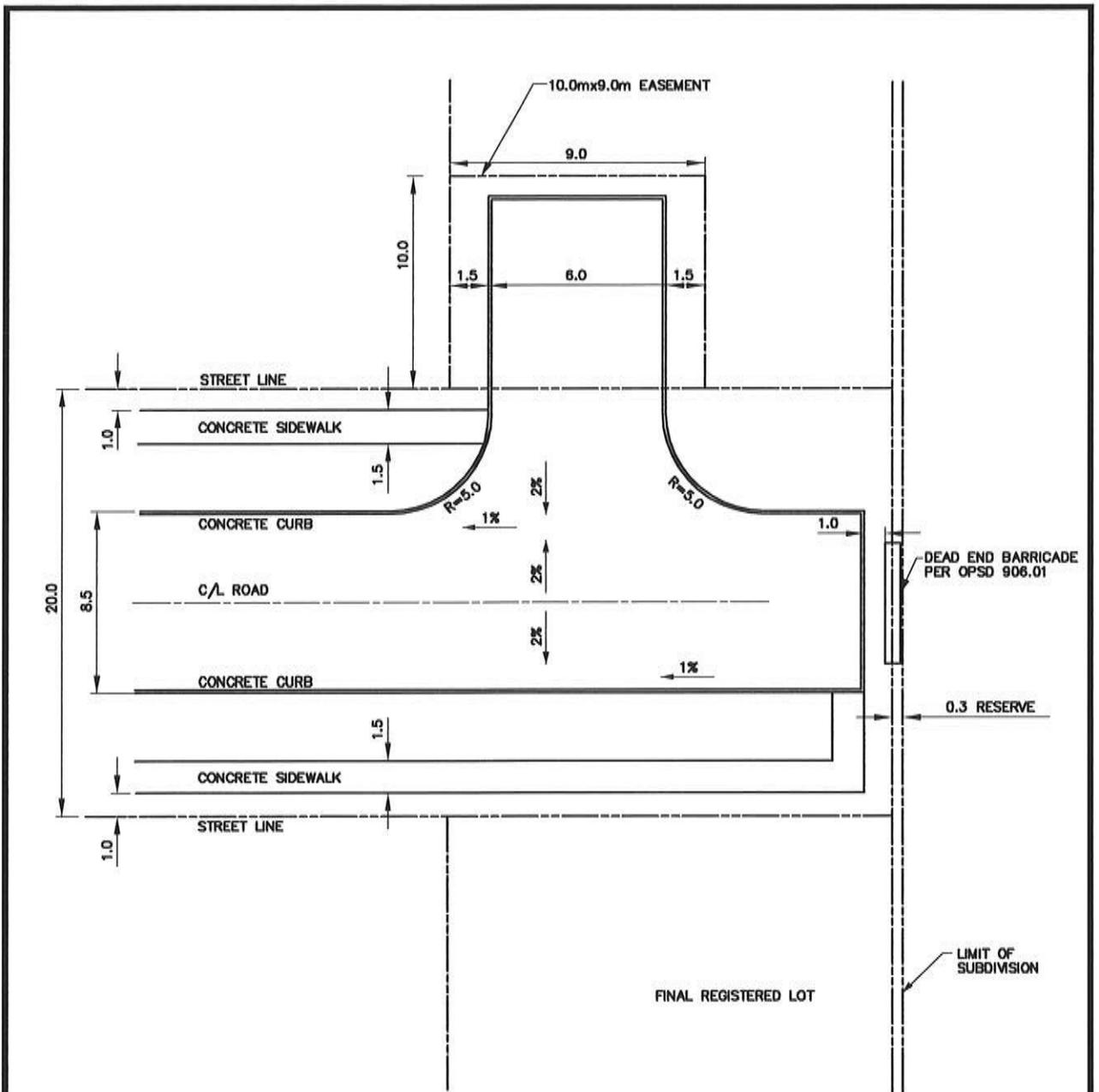
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

URBAN – INDUSTRIAL CUL-DE-SAC
 20.0m ROAD ALLOWANCE
 10.0m ASPHALT SURFACE

APR'D: DATE: NOV/06
 DRAWN: SCALE: NTS

STD. No. 213

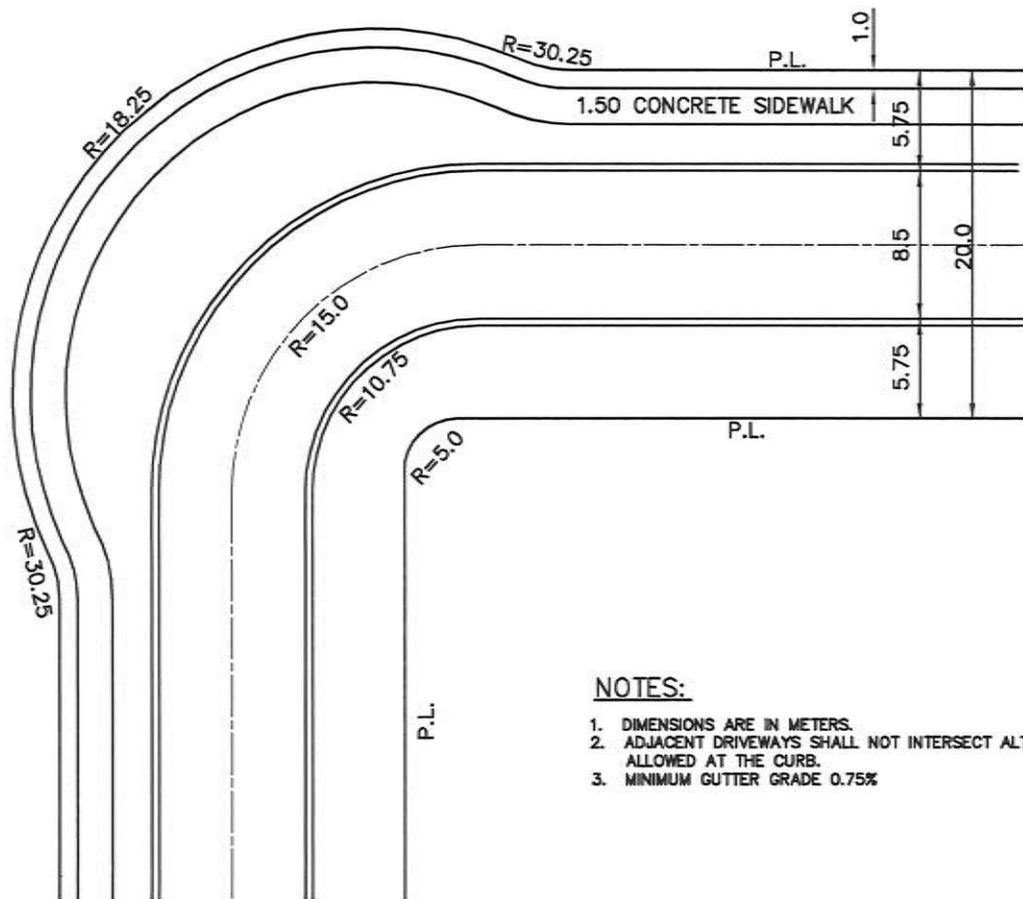


NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. GUTTER TO BE DETAILED ON ENGINEERING DRAWINGS, MINIMUM GRADE TO BE 1%.
3. THE LOCATION OF SIDEWALK TO BE DETAILED ON THE ENGINEERING DRAWINGS.
4. ALL CURB RADII ARE TO FACE OF CURBS.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
URBAN – TEMPORARY TURNAROUND–RESIDENTIAL	STD. No.	214



NOTES:

1. DIMENSIONS ARE IN METERS.
2. ADJACENT DRIVEWAYS SHALL NOT INTERSECT ALTHOUGH DOUBLE ENTRANCES MAY BE ALLOWED AT THE CURB.
3. MINIMUM GUTTER GRADE 0.75%

NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
					DRAWN:	SCALE: NTS
				90° BULB DETAIL 20.0m ROAD ALLOWANCE 8.5m ASPHALT SURFACE	STD. No.	215

ACORN:

CAST ALUMINUM THREADED
INSIDE 5/8" POWDER COATED
SEMI-GLOSS BLACK
1x3/16" STAINLESS STEEL SET
SCREW PIN MOUNTED VANDAL
PROOF SET SCREWS

FRAMES:

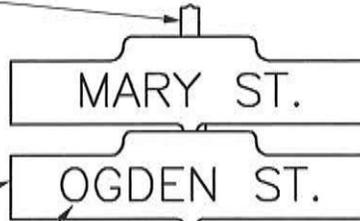
32" WIDE WITH WIDE TOP &
WIDE BOTTOM J 3/4" THICK,
SPOT C/W WELDED PLATE
SEPARATOR CLIPS. SEMI-GLOSS
BLACK POWDER COATED ON 18 ga.
SATIN COAT STEEL

STAINLESS MOUNTING SCREWS

PLATES:

0.64 ALUMINUM WITH
EMBOSSSED RIDGE FOR
STRENGTH 32" WIDE x 9-1/2"
HEIGHT. PAINTED SEMI GLOSS
ANTIQUA BLUE, MAROON & H GREEN
POWDER COATED. WHITE ENG-GRADE
REFLECTIVE TEXTING IN BOOK
ANTIQUA TYPESTYLE, SUFFIX, PREFIX

3-1/2" UC STREET NAME



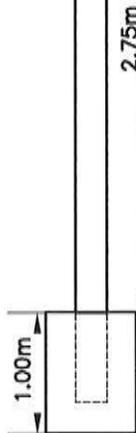
CAST IRON BASE

21-1/2"x2-7/8" I.D., 5/8" MILD STEEL
UPRIGHT THREADED 5/8" ON THE TOP
1-1/2" TO ACCEPT ACORN. STAINLESS
STEEL PIN MOUNTED, VANDAL PROOF
SET SCREWS. POWDER COATED BASE ONLY
SEMI GLOSS BLACK.

**2-7/8" OD STRUCTURAL
STEEL POST ROUND**

0.125 WALL, POWDER COATED SEMI-GLOSS
BLACK (GALVANIZED)

HOT DIP GALVANIZED SURFACE TO BE
PREPARED TO ACCEPT POWDER COATING.



NOTES

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. ALL SIGNS SUPPLIED BY PATHWAY PRODUCT INC. OR APPROVED EQUIVALENT.

SIGN LOCATION	COLOUR
ATHERLEY	BLUE
BRECHIN	BURGUNDY
LONGFORD MILLS	GREEN

NO.	REVISION	APR'D	DATE

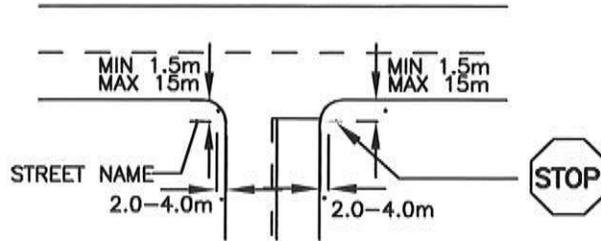
TOWNSHIP OF RAMARA

HERITAGE STREET SIGN

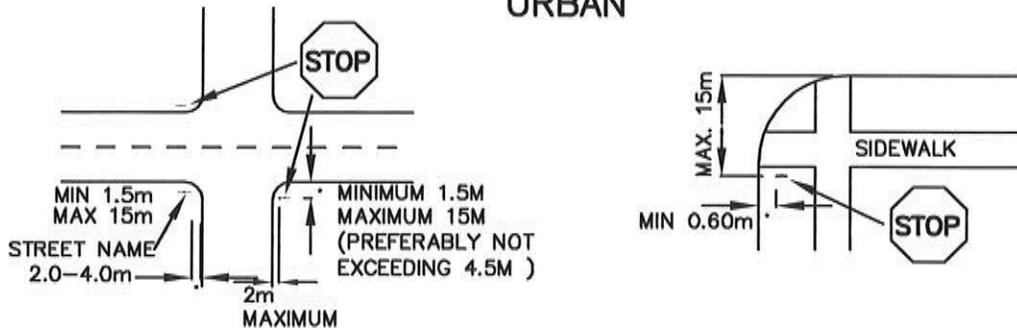
APR'D: DATE: NOV/06
DRAWN: SCALE: NTS

STD. No. 216

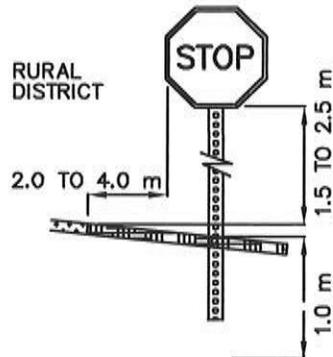
RURAL



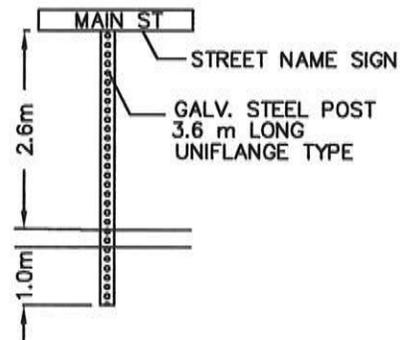
URBAN



STOP SIGN



STREET SIGN



1. ALL REGULATORY SIGNS SHALL BE ON ALUMINUM BLANKS WITH HI-INTENSITY BACKGROUND AND LEGEND IN ACCORDANCE WITH CURRENT MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND HIGHWAY TRAFFIC ACT.
2. ALL SIGNS ARE TO BE MOUNTED ON UNIFLANGE TYPE GALVANIZED STEEL POST WITH DIRECT EMBEDDED OR BREAKAWAY BASE TYPE INSTALLATIONS.
3. STREET NAME SIGNS MATERIAL TO BE 160mm HIGH EXTRUDED ALUMINUM BLADES. STREET SIGNS TO BE MOUNTED ON SEPARATE POST IN QUADRANT OTHER THAN STOP SIGN.

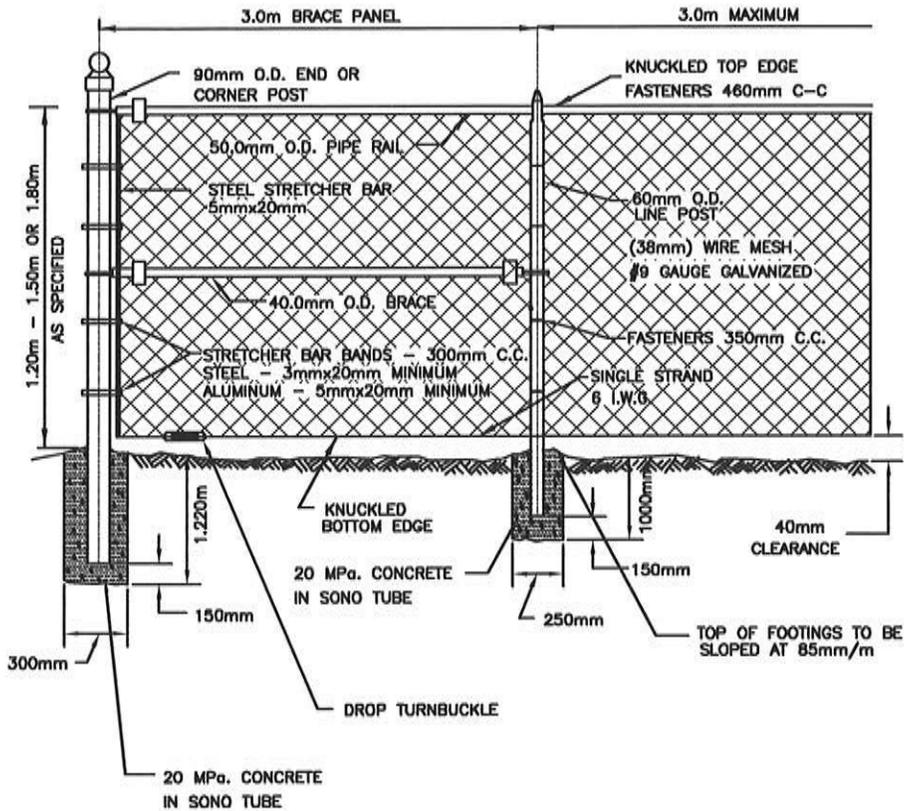
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

STANDARD STREET NAME AND REGULATORY SIGNS

APR'D:	DATE: NOV/06
DRAWN:	SCALE: NTS

STD. No. 217



NOTES:

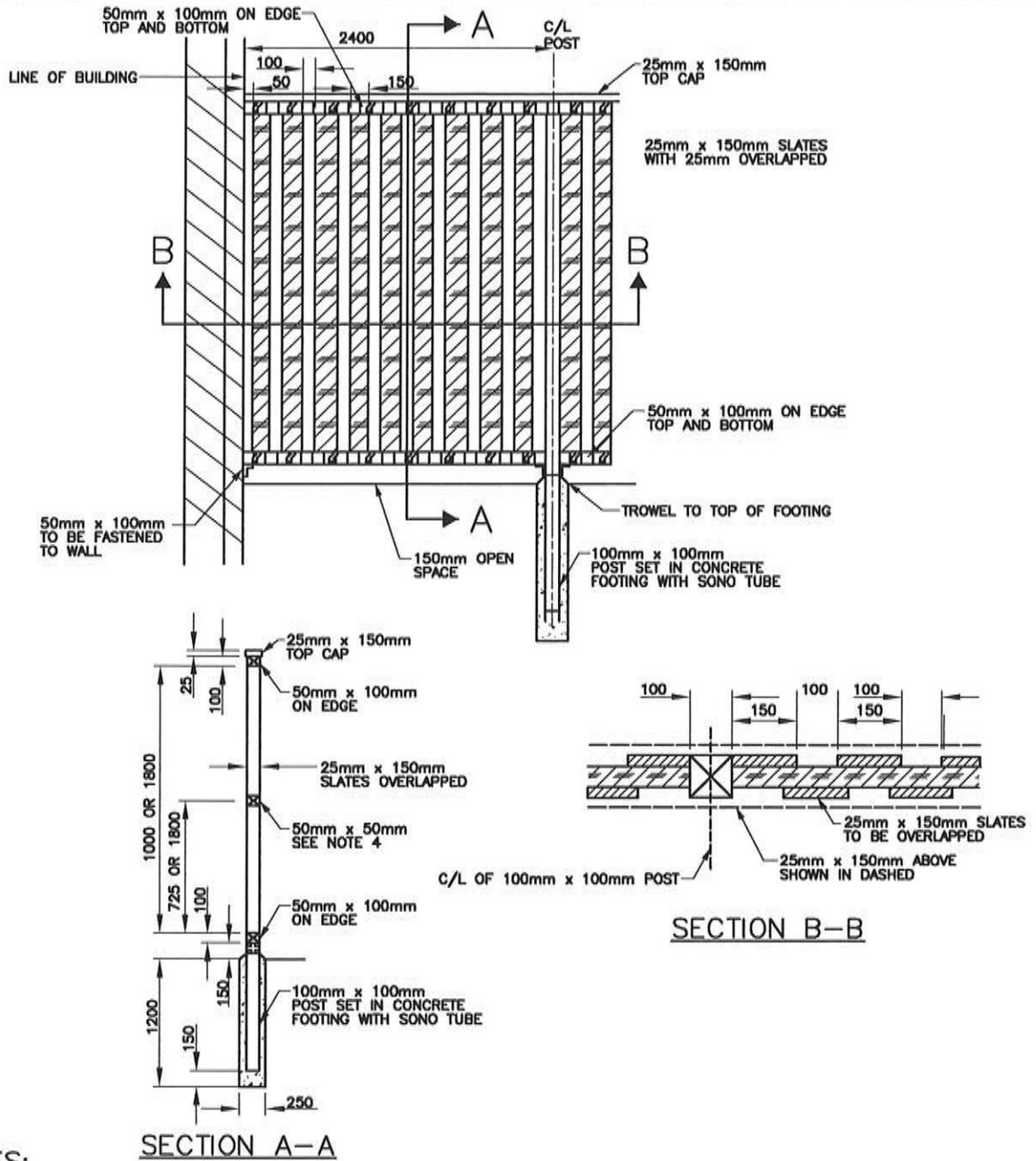
1. LENGTH OF POSTS

FENCE POST LOCATION	1.20m FENCE	1.50m FENCE	1.80m FENCE
END, CORNER OR RESTAINING	2.30m	2.60m	2.90m
LINE POST	2.05m	2.36m	2.65m

- 2. FASTENERS - 6 I.W.G. GALVANIZED STEEL OR ALUMINUM WIRE.
- 3. ALL POSTS, PIPE RAILS AND FASTENERS TO BE GALVANIZED.
- 4. BRACE RAILS TO BE ELIMINATED ON 1.20m HIGH FENCE.
- 5. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS.
- 6. FENCE FABRIC SHALL BE TYPE 1 STEEL FABRIC 3.0mm DIA. STEEL WIRE, STYLE 3 LIGHT STEEL WIRE, GALVANIZED BEFORE WEAVING.
- 7. FENCING REQUIREMENTS FOR PUBLIC WALKWAYS ARE TO BE RANGE FROM 1.2m TO 1.8m. A FENCE HEIGHT OF 1.2m IS TO BE SPECIFIED BETWEEN STREETLINE AND THE FRONT OF THE DWELLING. FENCING HEIGHTS BEYOND THE FRONT OF THE DWELLING ARE TO 1.8m.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
CHAIN LINK SECURITY FENCE	STD. No.	301



NOTES:

1. USE CONSTRUCTION GRADE CEDAR OR PRESSURE TREATED. DO NOT USE SPRUCE OR HEMLOCK.
2. USE APPROVED WOOD STAIN.
3. USE STEEL ZINC COATED TWISTED NAILS No. 11 GAUGE 64mm x 76mm.
4. FOR FENCE 1.8m OR HIGHER 50mm x 50mm MUST BE USED AS SHOWN IN SECTION A-A.
5. USE GALVANIZED FENCE BRACKETS.
6. FOR WALKWAYS, THE FENCE HEIGHT SHOULD BE 1.0m HIGH BETWEEN STREETLINE AND FRONT WALL OF DWELLINGS ON ADJACENT LOTS AND 1.8m FOR THE REMAINDER.
7. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

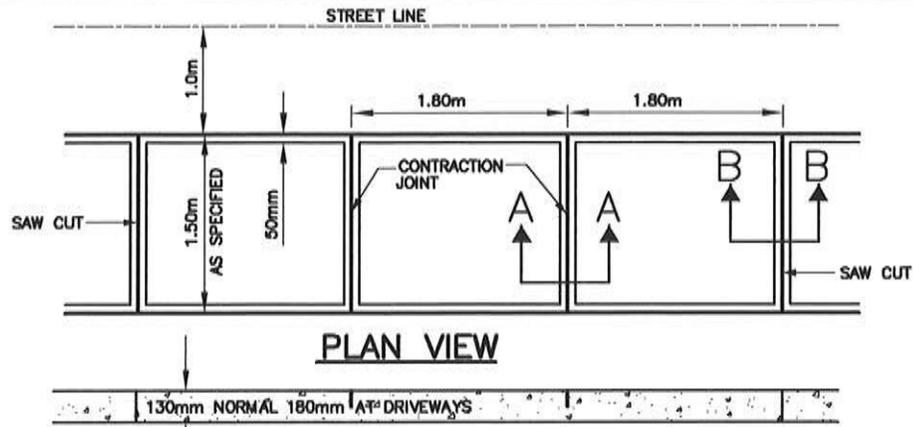
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

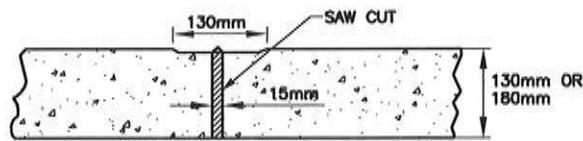
WOOD PRIVACY FENCE

APR'D: DATE: NOV/06
 DRAWN: SCALE: NTS

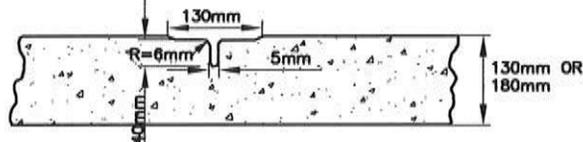
STD. No. 302



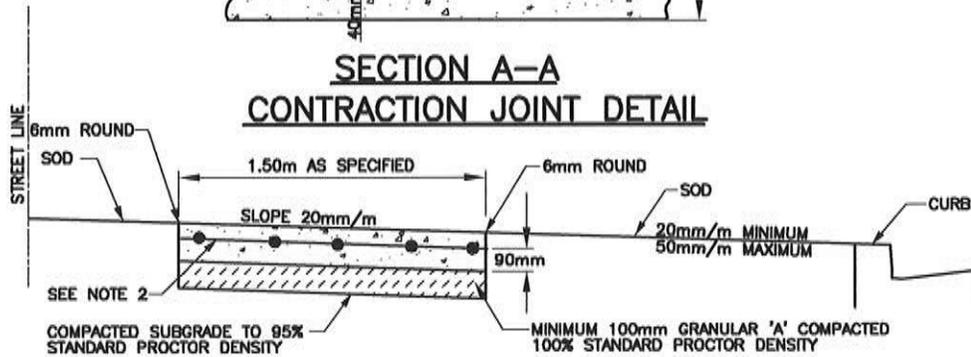
LONGITUDINAL SECTION



**SECTION B-B
SAW CUT JOINT DETAIL**



**SECTION A-A
CONTRACTION JOINT DETAIL**



BOULEVARD SECTION

NOTES:

1. CONCRETE TO BE 25 MPa, 5-7% AIR ENTRAINMENT WITH 20mm MAXIMUM AGGREGATE SIZE.
2. FOR COMMERCIAL, INDUSTRIAL AND APARTMENT DRIVEWAYS, SIDEWALK TO BE REINFORCED WITH 152mm x 152mm MW 18.7 METRIC WELDED WIRE MESH.
3. SAW CUT JOINTS ARE ALSO REQUIRED WHERE SIDEWALK ABUTS OTHER CONCRETE STRUCTURES, WALKS, CURBS, UTILITY POLES, HYDRANTS, MANHOLES AND AT CERTAIN LOCATIONS AT DISCRETION OF THE ENGINEER.
4. CONTRACTION JOINTS TO BE FORMED AFTER THE CONCRETE HAS RECEIVED ITS INITIAL SET.
5. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS UNLESS OTHERWISE SPECIFIED.

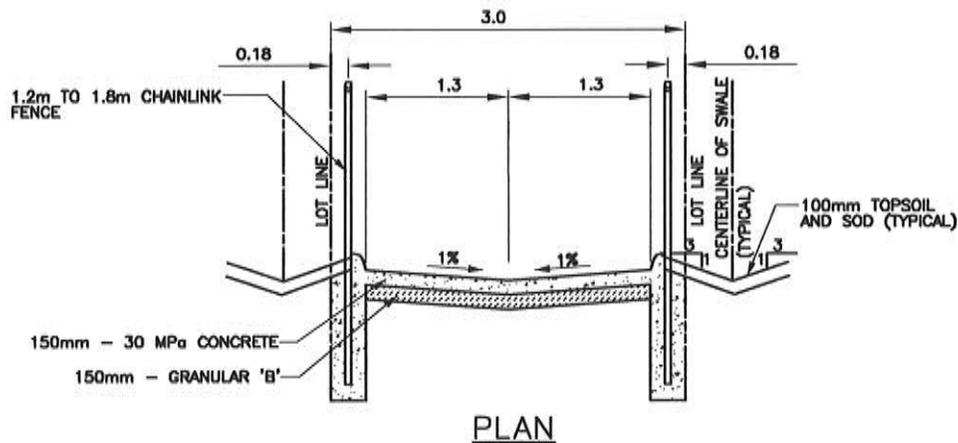
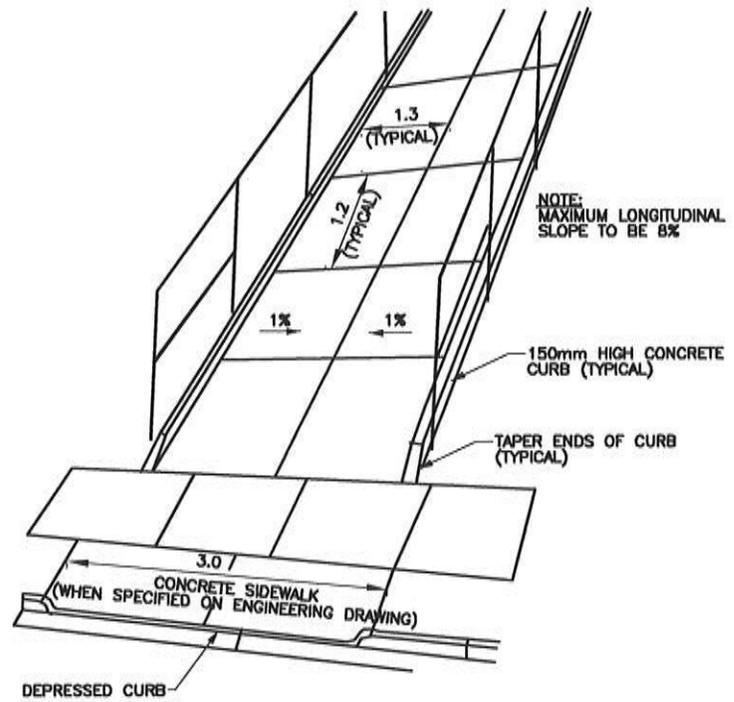
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

CONCRETE SIDEWALK

APR'D: _____ DATE: NOV/06
DRAWN: _____ SCALE: NTS

STD. No. 310



NOTES:

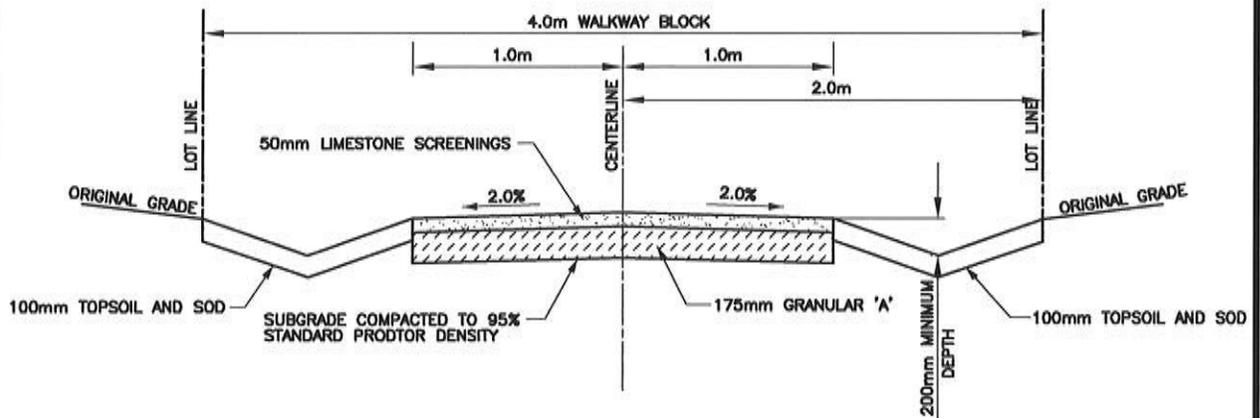
1. ALL DIMENSIONS ARE IN METERS UNLESS SHOWN OTHERWISE.
2. SECURITY LIGHTING OF WALKWAYS TO BE PROVIDED. DESIGN OF LIGHTING WILL BE SUBJECT TO APPROVAL BY THE TOWNSHIP OF RAMARA.
3. ALL CONCRETE WORK TO CONFORM TO OPSS-1350.
4. MAXIMUM SAW CUT JOINT SPACING TO BE 4.5m.
5. CONCRETE POST FOOTINGS TO BE SEPARATE FROM CURB.
6. THIS DETAIL MAY BE USED FOR OVERLAND FLOW ROUTE.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA
PEDESTRIAN WALKWAY – URBAN

APR'D: DATE: NOV/06
DRAWN: SCALE: NTS

STD. No. 311



NOTES:

1. ALL GRANULAR MATERIALS TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.
2. PROPOSED LONGITUDIAL GRADE OF WALKWAY TO BE IDENTIFIED ON ENGINEERING DRAWINGS. MINIMUM LONGITUDINAL GRADE TO BE 1.5%.

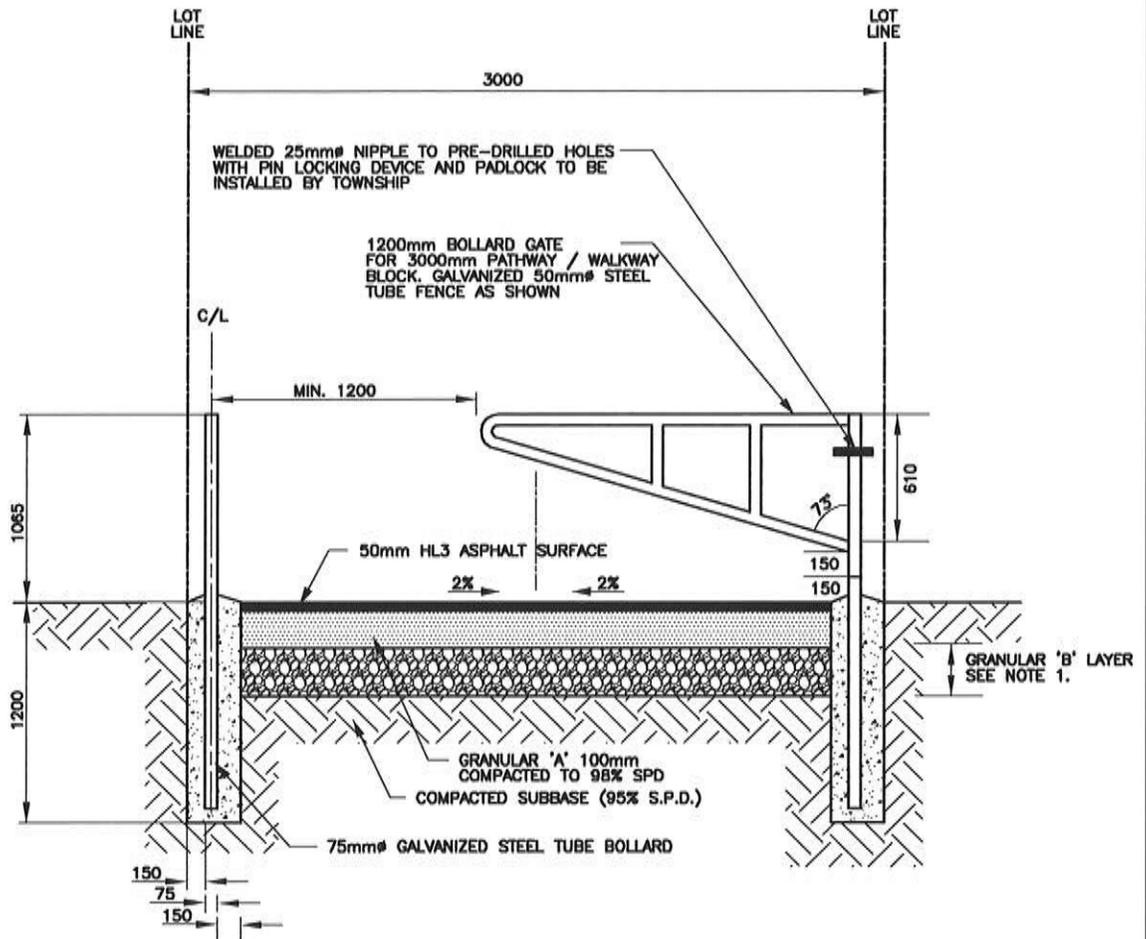
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

APR'D: DATE: NOV/06
DRAWN: SCALE: NTS

PEDESTRIAN WALKWAY – RURAL

STD. No. 312



NOTES:

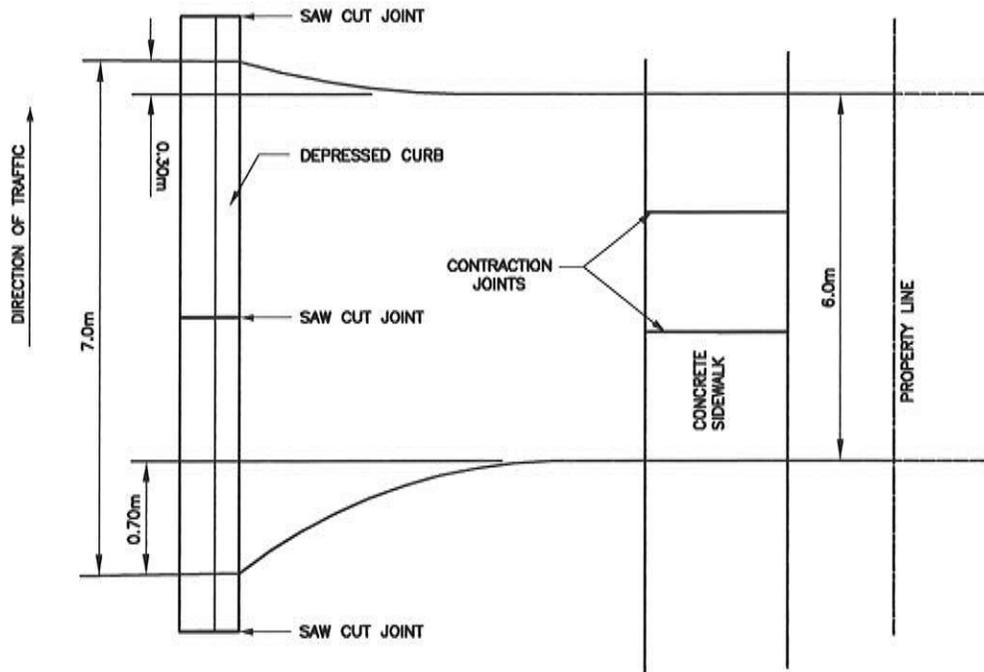
1. 200mm GRANULAR 'B' COMPACTED TO 100% S.P.D. TO BE PROVIDED ONLY WHEN MAINTENANCE OR EMERGENCY VEHICLE ACCESS.
2. 100mm GATE SLEEVE RESTS ON 75mm# GALVANIZED POST.
3. ADD SPURS (LAGS) TO BOTH GALVANIZED POLES TO PREVENT THE TUBING FROM TURNING IN THE CONCRETE FOOTING.
4. FOR 6.0m EMERGENCY ACCESS / WALKWAY TWO (2) STANDARD BOLLARD GATES ARE REQUIRED.
5. ALL SWING GATES TO BE INSTALLED ON RIGHT-HAND SIDE AT ENTRY AND AT LEAST 2500mm IN FROM SIDEWALK EDGE OR 6000mm IN FROM CURB EDGE.
6. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

NO.	REVISION	APR'D	DATE

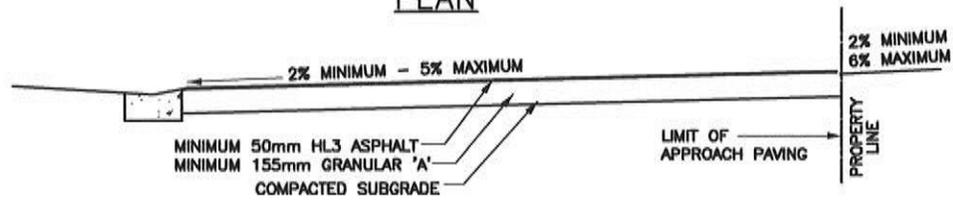
TOWNSHIP OF RAMARA
VEHICLE ACCESS / PEDESTRIAN
WALKWAY GATE

APR'D: _____ DATE: NOV/06
 DRAWN: _____ SCALE: NTS

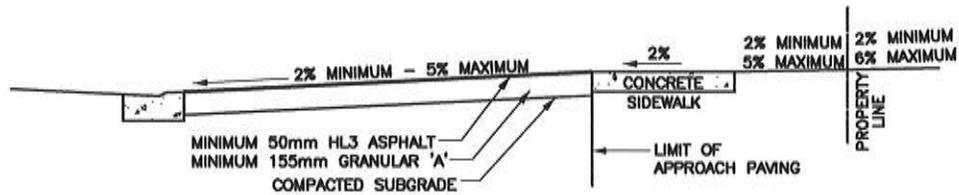
STD. No. 313



PLAN



TYPICAL SECTION
ON STREETS WITHOUT SIDEWALKS



TYPICAL SECTION
ON STREETS WITH SIDEWALKS

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS UNLESS OTHERWISE SPECIFIED.

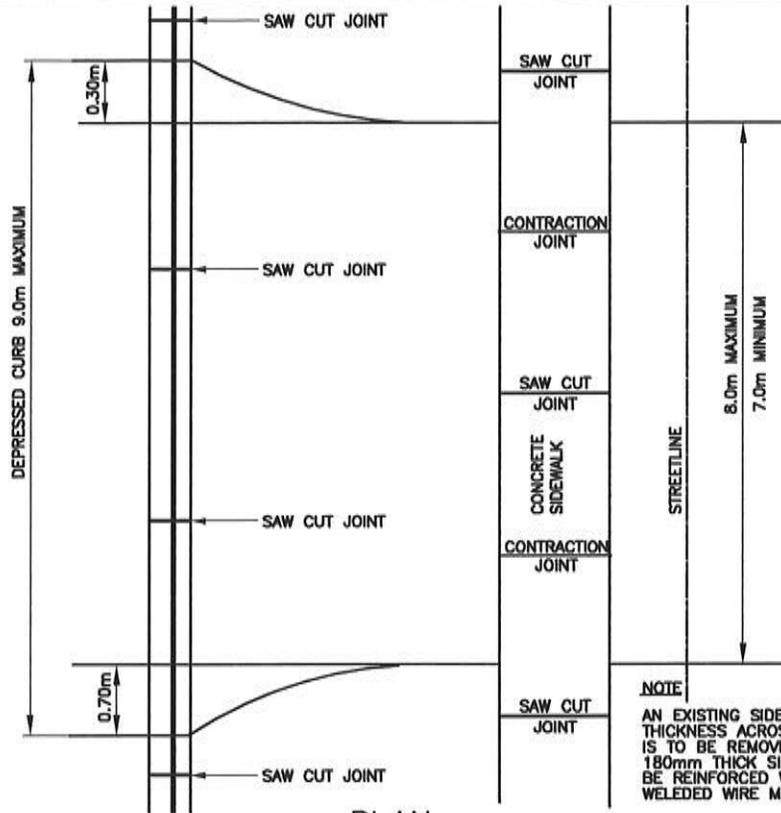
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TOWNSHIP OF RAMARA

**DRIVEWAY APPROACH PAVING
FOR RESIDENTIAL DRIVEWAYS**

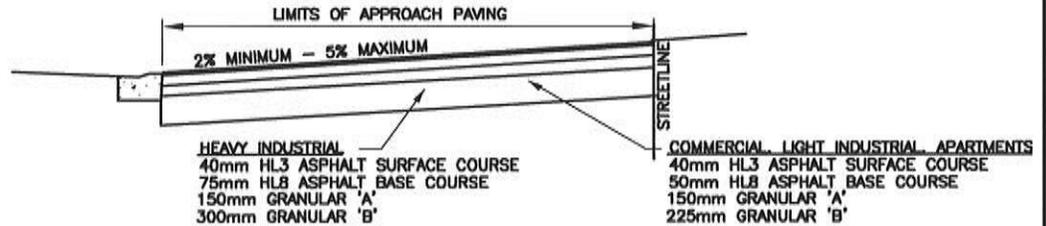
APR'D: DATE: NOV/06
DRAWN: SCALE: NTS

STD. No. 320

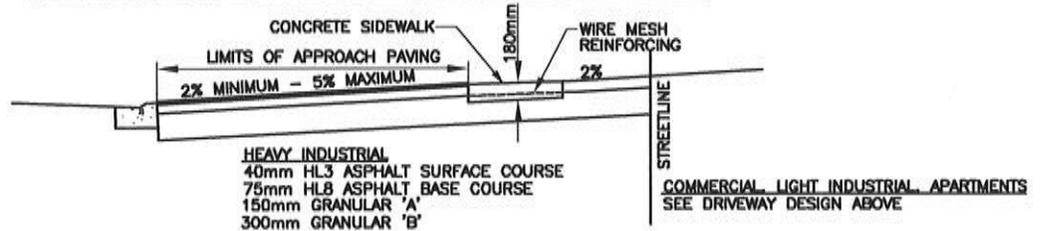


NOTE
 AN EXISTING SIDEWALK OF LESS THAN 180mm THICKNESS ACROSS THE PROPOSED DRIVEWAY IS TO BE REMOVED AND REPLACED WITH A 180mm THICK SIDEWALK. NEW SIDEWALK TO BE REINFORCED WITH 150mm x 150mm 6/6 WELEDED WIRE MESH.

PLAN



SECTION ON STREETS WITHOUT SIDEWALK



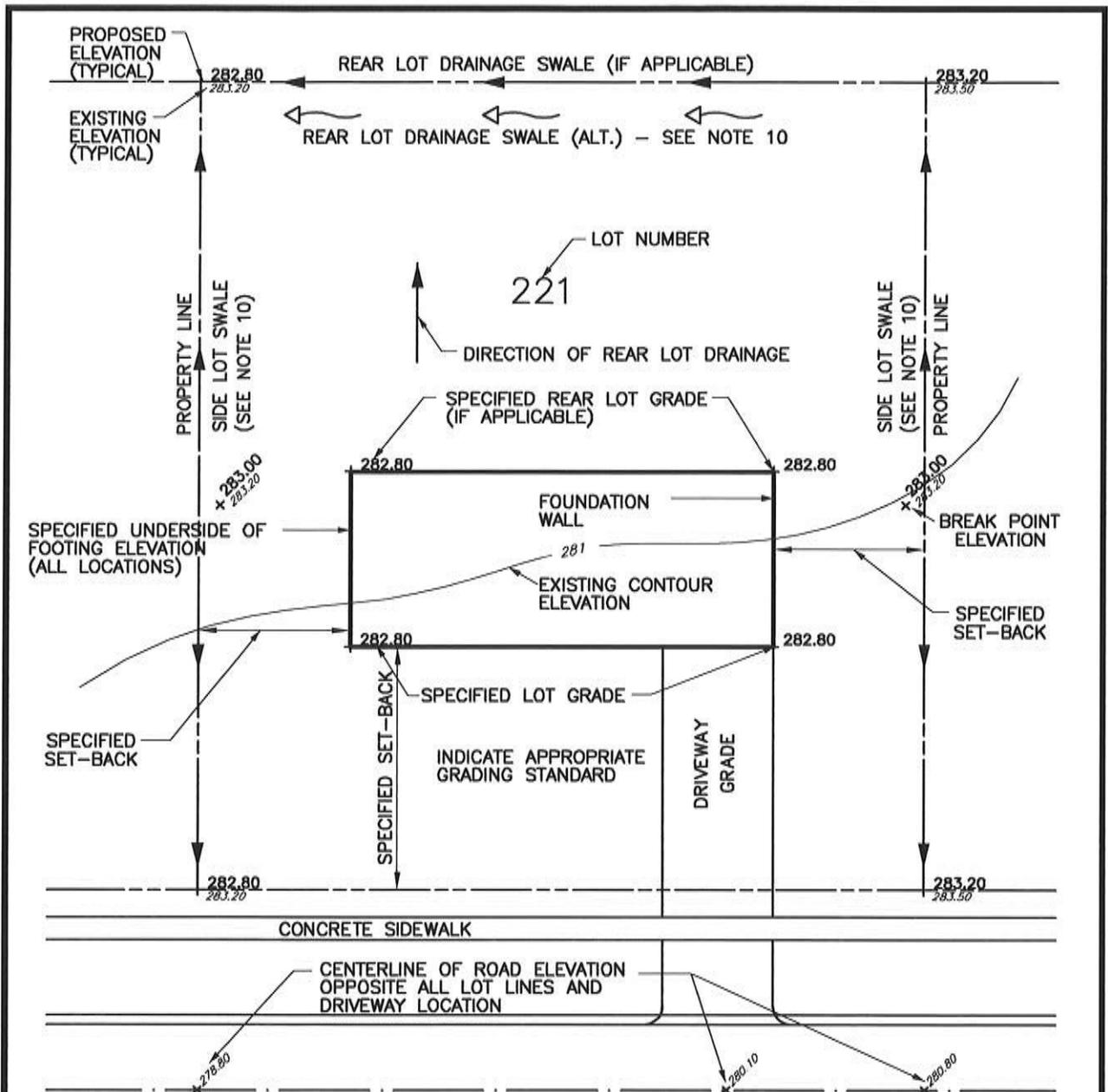
SECTION ON STREETS WITH SIDEWALK

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS OR METERS UNLESS OTHERWISE SPECIFIED.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
DRIVEWAY APPROACH PAVING COMMERCIAL, INDUSTRIAL AND APARTMENTS	STD. No.	321



NOTES:

1. ALL CATCHBASIN LOCATIONS MUST BE SHOWN ON GRADING PLAN.
2. ALL EASEMENTS MUST BE SHOWN ON GRADING PLAN.
3. PROVIDE MAIN FLOOR AND BASEMENT ELEVATIONS.
4. SPECIFY PROPOSED GRADES ON SWALES.
5. IDENTIFY PROPOSED LOCATION AND DIMENSION OF SEPTIC TILE BED AND RESERVE BED AREAS.
6. PROVIDE REGISTERED PLAN NUMBER.
7. MAXIMUM DRIVEWAY GRADE TO BE 6%.
8. SHOW SERVICE LATERAL INVERT ELEVATION AT STREET LINE AND CURB STOP LOCATION (WHEN APPLICABLE)
9. SHOW ALL UTILITY INSTALLATIONS IN BOULEVARD.
10. DRAINAGE SWALES TO BE ON PROPERTY LINE. SET SWALE ENTIRELY WITHIN LOT IF ABUTTING PROPERTY NOT UNDERGOING DEVELOPMENT.

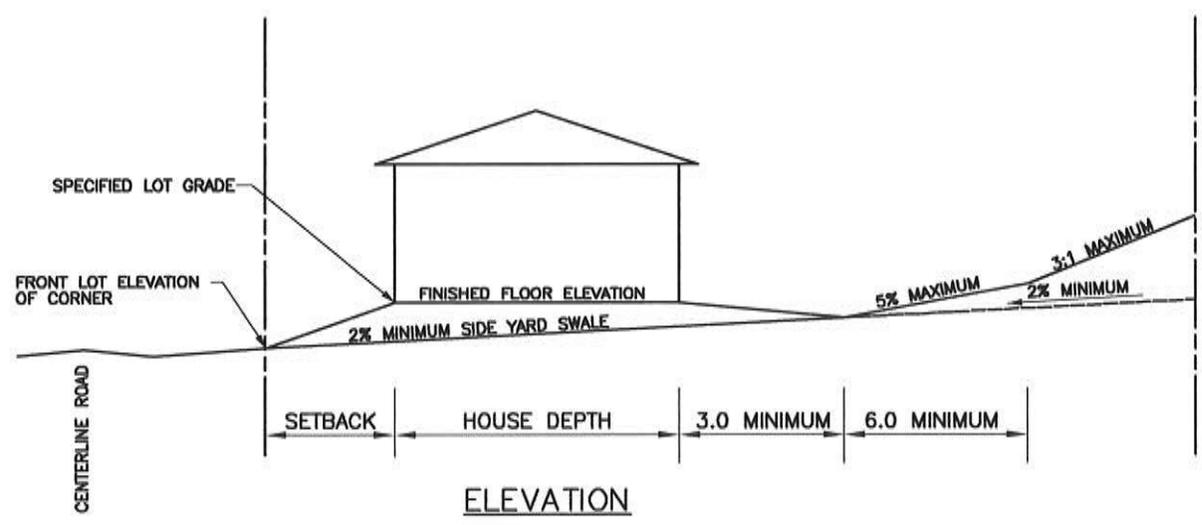
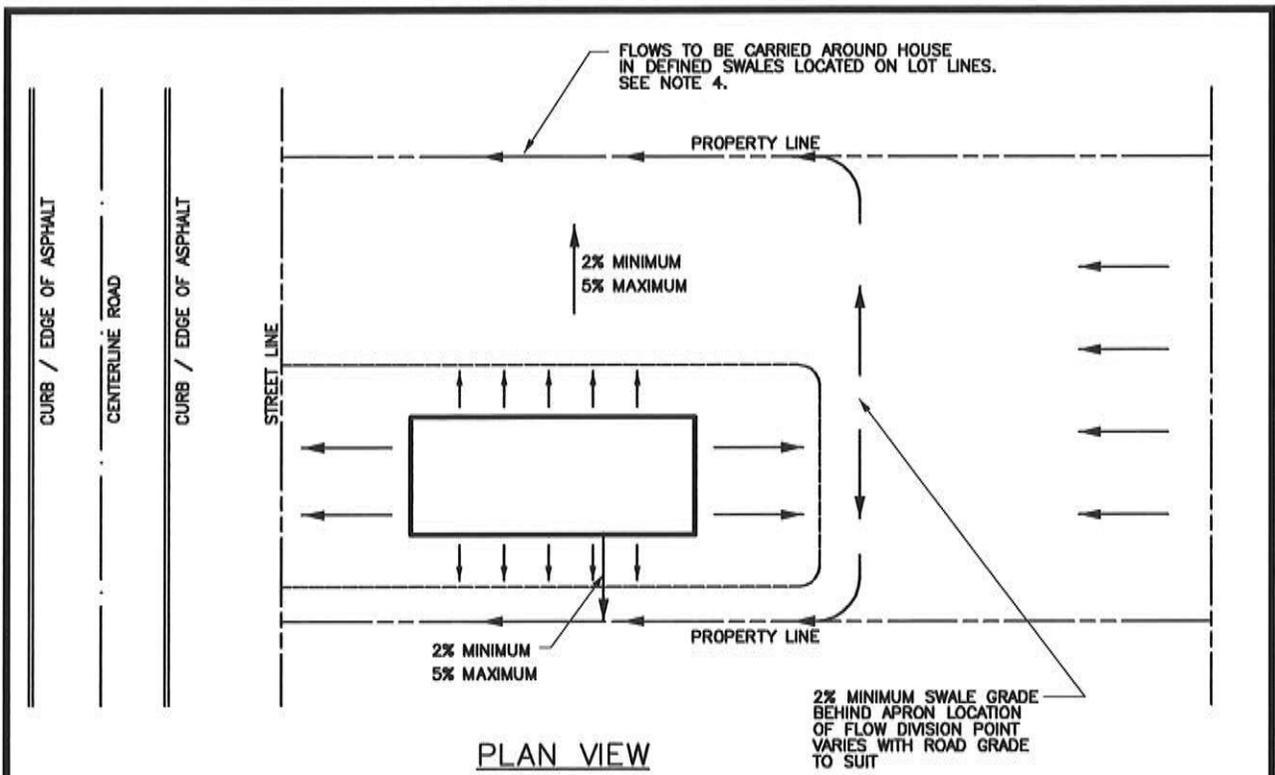
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

TYPICAL LEGEND FOR LOT GRADING PLAN

APR'D: DATE: NOV/06
 DRAWN: SCALE: NTS

STD. No. 401

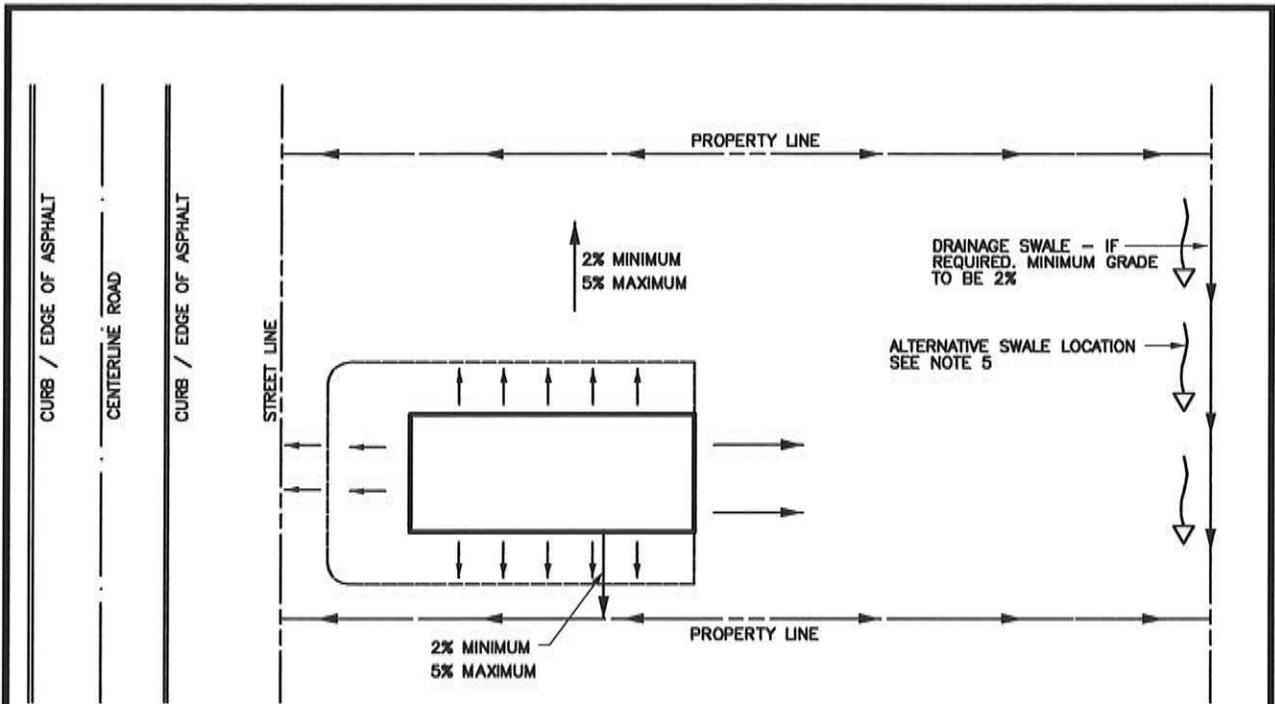


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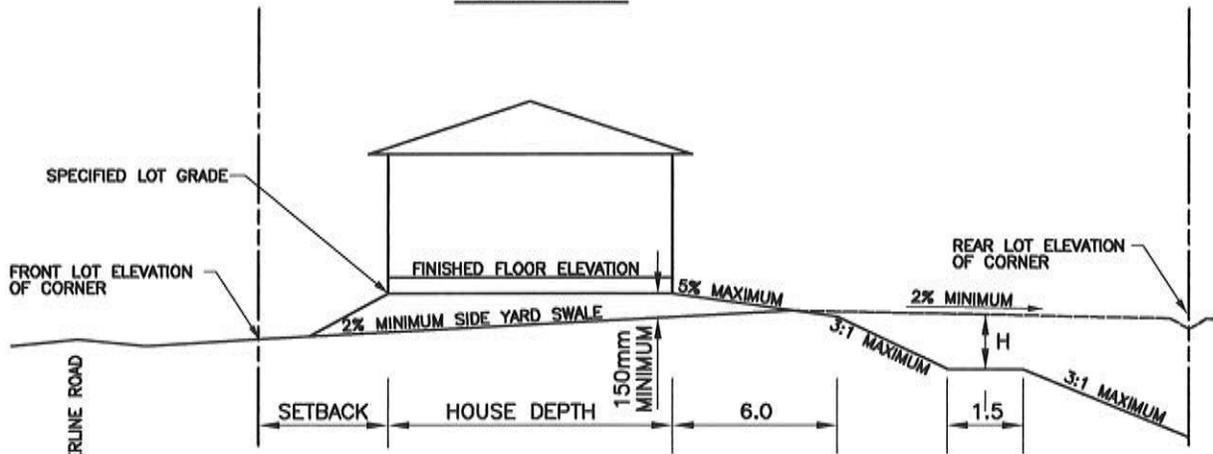
1. SPECIFIED LOT GRADE SHALL BE MINIMUM 0.30m ABOVE HIGHEST FRONT LOT CORNER.
2. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR ANY SIDEYARD SWALE.
3. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
4. DRAINAGE SWALES TO BE ON PROPERTY LINE. SET SWALE ENTIRELY WITHIN LOT IF ABUTTING PROPERTY NOT UNDERGOING DEVELOPMENT.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
FRONT LOT DRAINAGE	STD. No.	402



PLAN VIEW



NOTE: IF ATTACHED GARAGE IS CONSTRUCTED THEN REAR YARD SLOPE MAY COMMENCE AT REAR OF GARAGE.

ELEVATION

NOTES:

1. SPECIFIED LOT GRADE SHALL BE MINIMUM 0.30m ABOVE HIGHEST FRONT LOT CORNER.
2. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR ANY SIDEYARD SWALE.
3. 'H' DIMENSION TO BE 1.8m MAXIMUM, UNLESS UNDISTURBED EXISTING SLOPE. TERRACE CAN BE ELIMINATED ON SLOPES OF 4:1 OR LESS.
4. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
5. DRAINAGE SWALES TO BE ON PROPERTY LINE. SET SWALE ENTIRELY WITHIN LOT IF ABUTTING PROPERTY NOT UNDERGOING DEVELOPMENT.

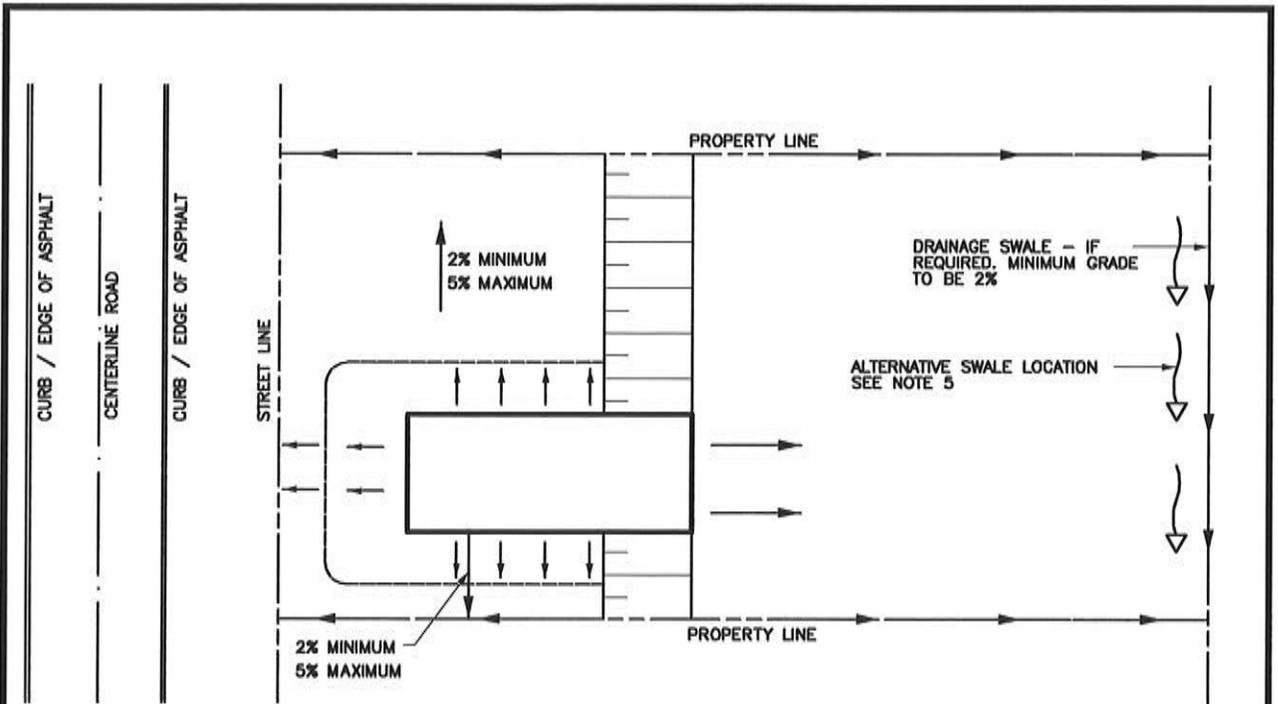
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

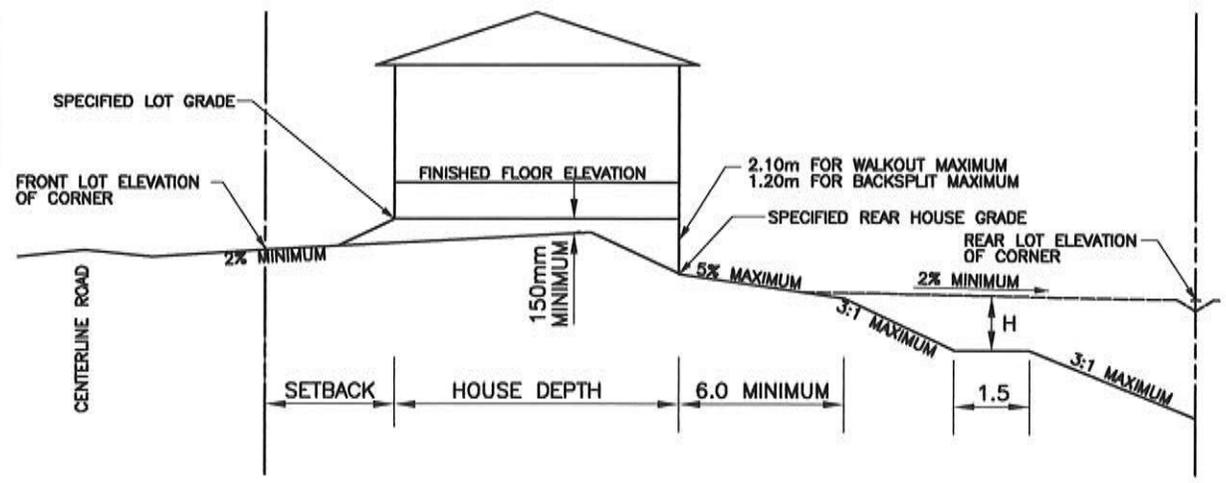
APR'D: _____ DATE: NOV/06
 DRAWN: _____ SCALE: NTS

REAR LOT DRAINAGE

STD. No. 403



PLAN VIEW



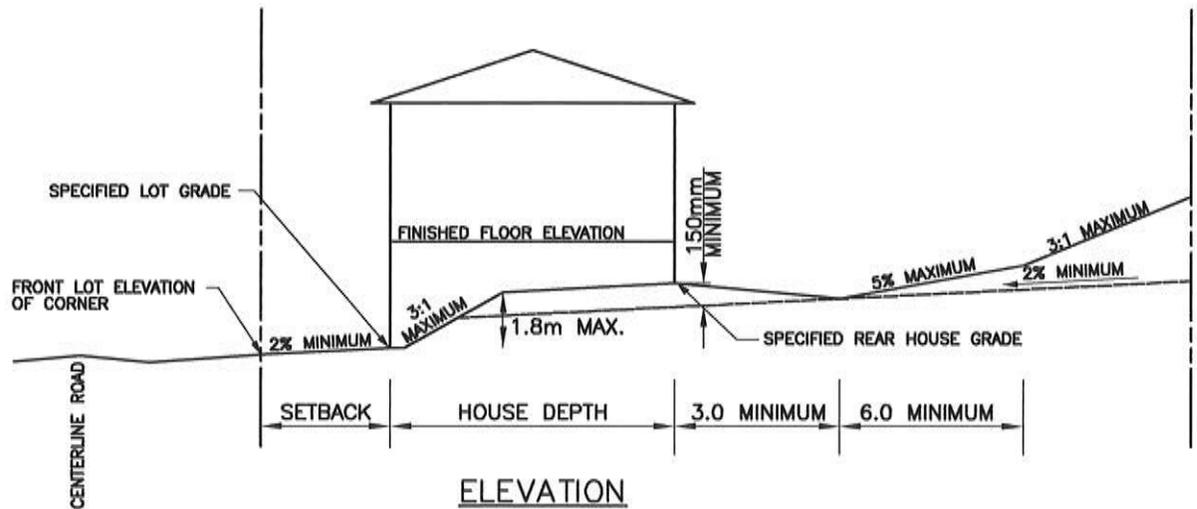
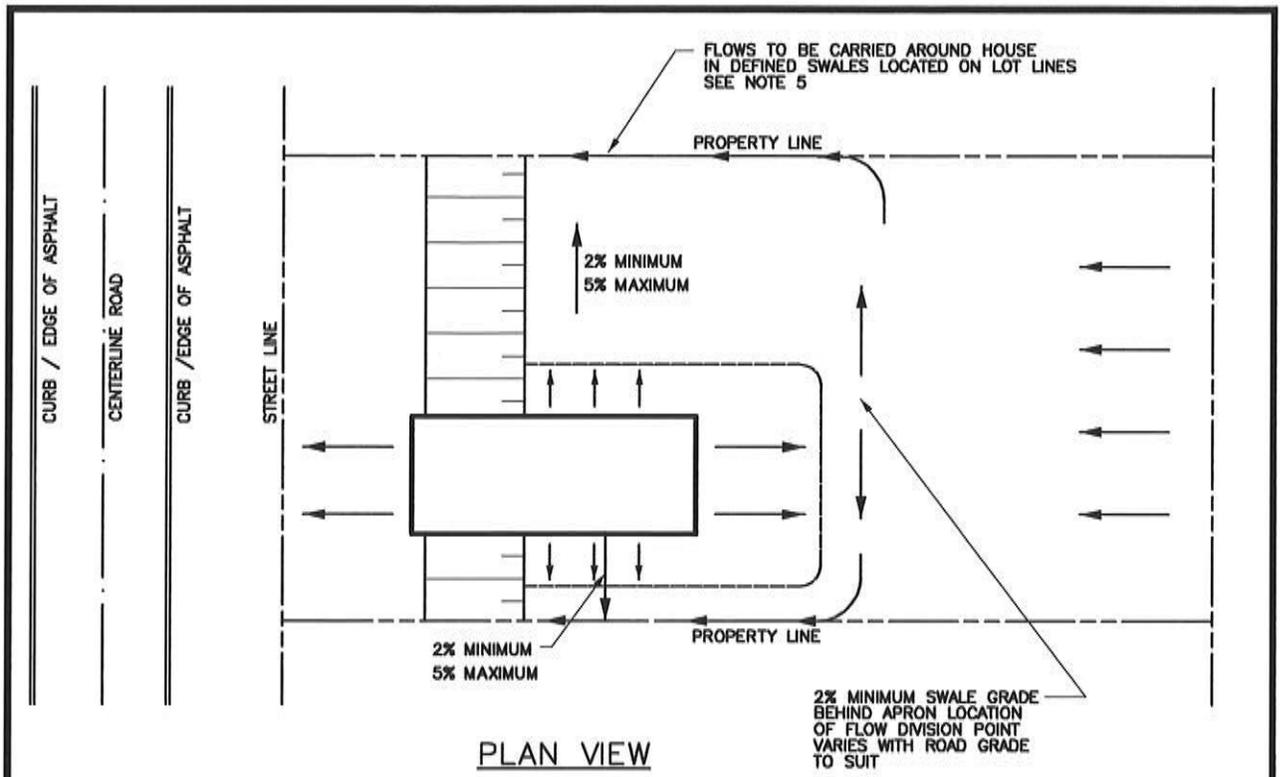
ELEVATION

NOTES:

1. SPECIFIED LOT GRADE SHALL BE MINIMUM 0.30m ABOVE HIGHEST FRONT LOT CORNER.
2. 'H' DIMENSION TO BE 1.8m MAXIMUM, UNLESS UNDISTURBED EXISTING SLOPE. TERRACE CAN BE ELIMINATED ON SLOPES OF 4:1 OR LESS.
3. REAR HOUSE GRADE MUST ALSO BE SPECIFIED ON LOT GRADING PLANS WHEN THIS HOUSE TYPE IS PROPOSED.
4. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
5. DRAINAGE SWALES TO BE ON PROPERTY LINE. SET SWALE ENTIRELY WITHIN LOT IF ABUTTING PROPERTY NOT UNDERGOING DEVELOPMENT.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
REAR LOT DRAINAGE FOR WALKOUT OR BACK SPLIT HOUSE	STD. No.	404

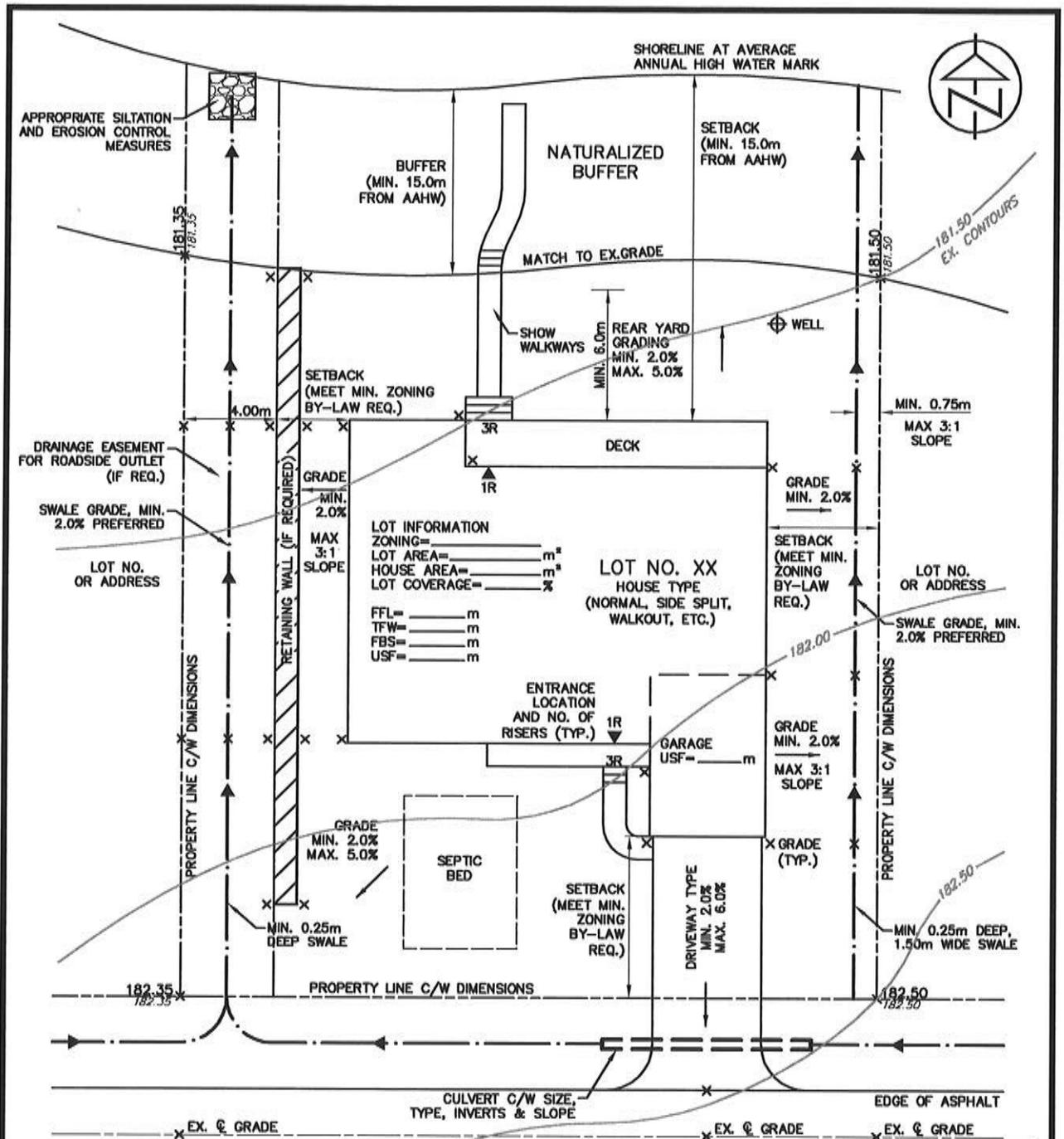


NOTES:

1. SPECIFIED LOT GRADE SHALL BE MINIMUM 0.30m ABOVE HIGHEST FRONT LOT CORNER.
2. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR ANY SIDEYARD SWALE.
3. REAR HOUSE GRADE MUST BE SPECIFIED ON LOT GRADING PLANS WHEN THIS HOUSE TYPE IS PROPOSED.
4. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
5. DRAINAGE SWALES TO BE ON PROPERTY LINE. SET SWALE ENTIRELY WITHIN LOT IF ABUTTING PROPERTY NOT UNDERGOING DEVELOPMENT.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
FRONT LOT DRAINAGE FOR FRONT SPLIT HOUSE	STD. No.	405



SEE DRAWING STD. NO. _____ FOR APPLICABLE CROSS-SECTIONS AND DETAIL NOTES.

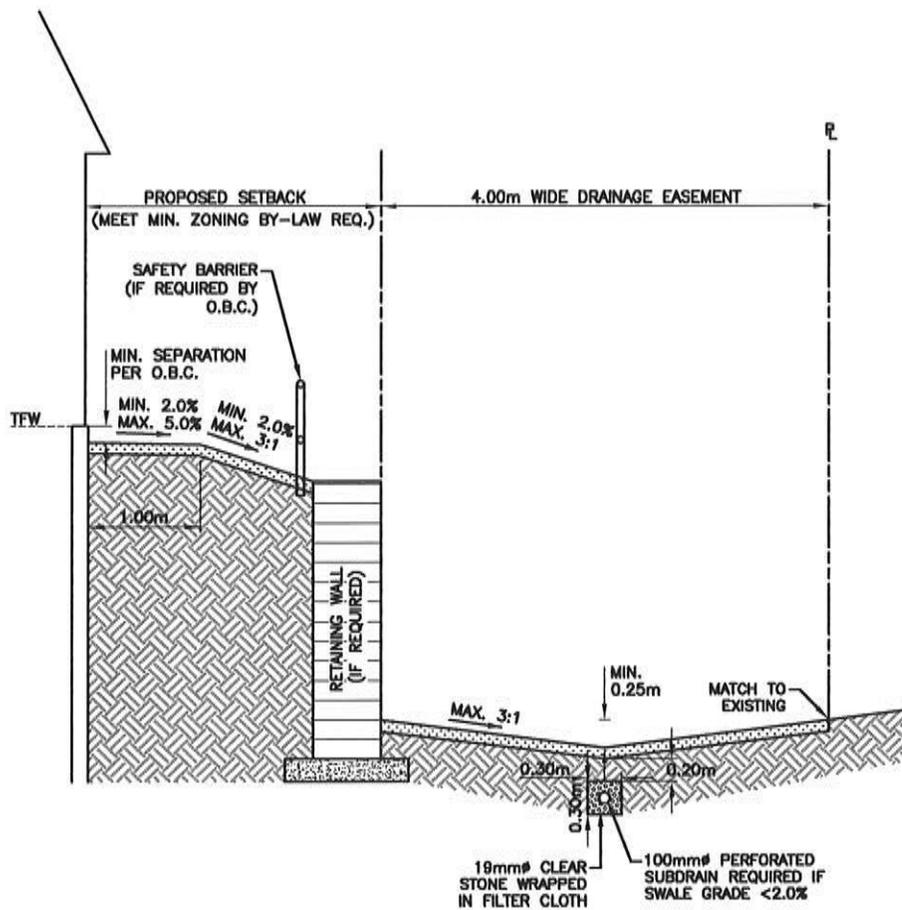
LEGEND:			
FFL	FINISHED FIRST FLOOR	———	BUILDING ENVELOPE
TFW	TOP OF FOUNDATION WALL	- - - - -	PROPERTY LINE
FBS	FINISHED BASEMENT SLAB	———	SWALE
USF	UNDERSIDE OF FOOTING	———	SEPTIC BED ENVELOPE
x 225.00	EXISTING ELEVATION	⊕	PROPOSED WELL
x 226.00	PROPOSED ELEVATION	⊗	RIP RAP PROTECTION

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

TYPICAL SHORELINE LOT GRADING PLAN

APR'D:	DATE: MAR/13
DRAWN:	SCALE: NTS
STD. No.	406



NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

**TYPICAL SHORELINE LOT GRADING
CROSS-SECTION**

APR'D: DATE: MAR/13
DRAWN: SCALE: NTS

STD. No. 407



KEY PLAN



NORTH ARROW

1. THE USER HAS TO MAINTAIN THESE RECORDS
 THROUGHOUT THE PROJECT AND MUST
 PROVIDE THEM TO THE TOWNSHIP OF RAMARA
 AT THE END OF THE PROJECT.

BENCHMARK INFORMATION

ACCEPTED FOR
 CONSTRUCTION
 Township of Ramara

per _____
 Date: _____

NO.	REVISION	DATE

BY: _____
 TITLE: _____

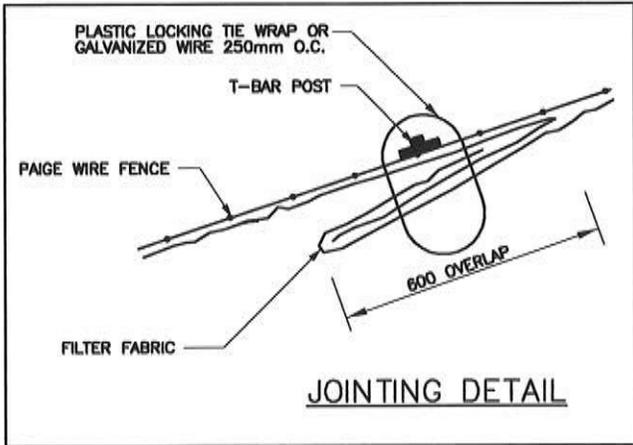
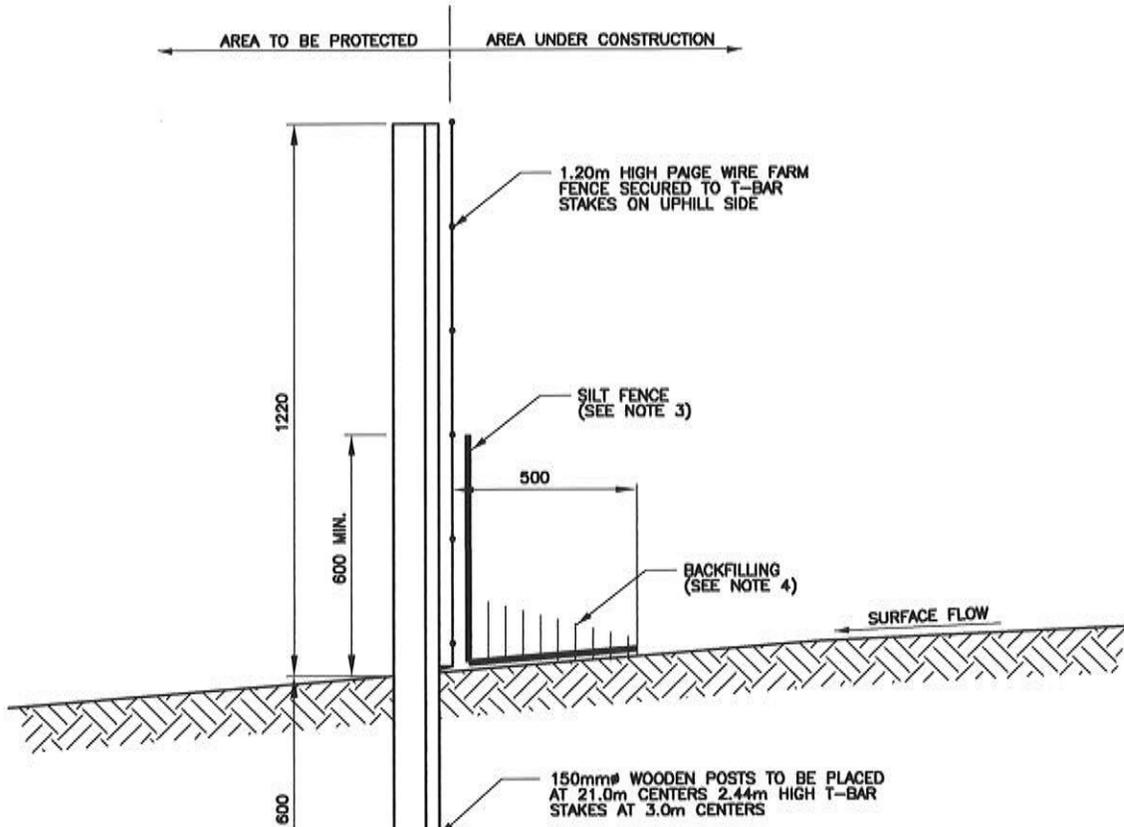
NAME OF DEVELOPMENT CORPORATION
 NAME OF DEVELOPMENT PROJECT
 TOWNSHIP OF RAMARA

DRAWING TITLE
 DRAWING TITLE

CONSULTANT INFO

SCALE	JOB NO.	DATE

NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA	APR'D:	DATE: NOV./06
					DRAWN:	SCALE: NTS
				STANDARD PLAN SHEET (HORIZONTAL TITLE BLOCK)	STD. No.	501

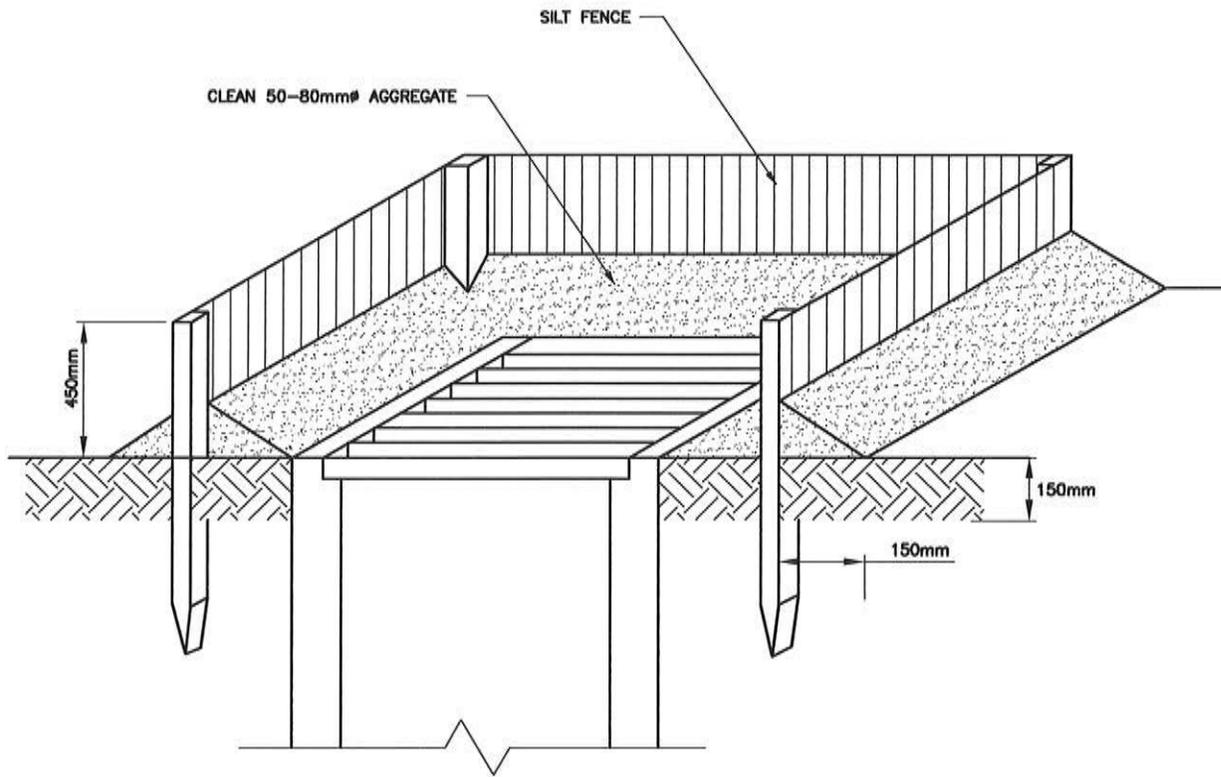


NOTES:

1. SEDIMENT ACCUMULATIONS TO BE REMOVED WHEN SEDIMENT DEPOSITS REACH ONE THIRD OF THE WAY TO THE TOP OF THE SILT FENCE.
2. FENCE TO BE INSPECTED ON A REGULAR BASIS AND MAINTAINED BY SUBDIVIDER/BUILDER IN PROPER CONDITION.
3. THE SILT FENCE SHALL BE SECURED TO THE PAIGE WIRE WITH GALVANIZED WIRE OR PLASTIC LOCKING TIE. (SEE JOINTING DETAIL)
4. FLAP ON SILT FENCE TO BE BACKFILLED OR BURIED.

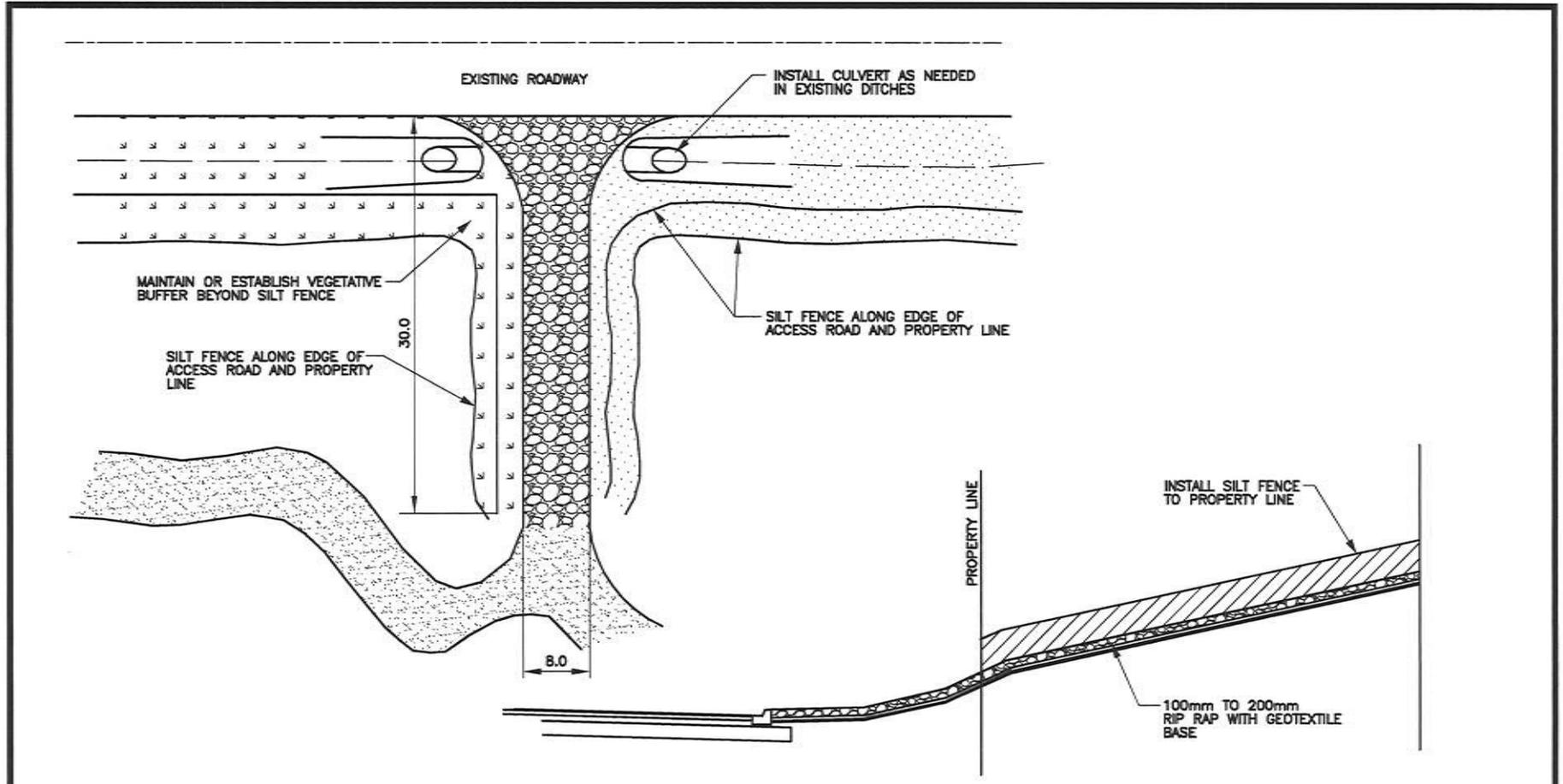
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
HEAVY DUTY SILT FENCE DETAIL	STD. No.	601



NO.	REVISION	APR'D	DATE

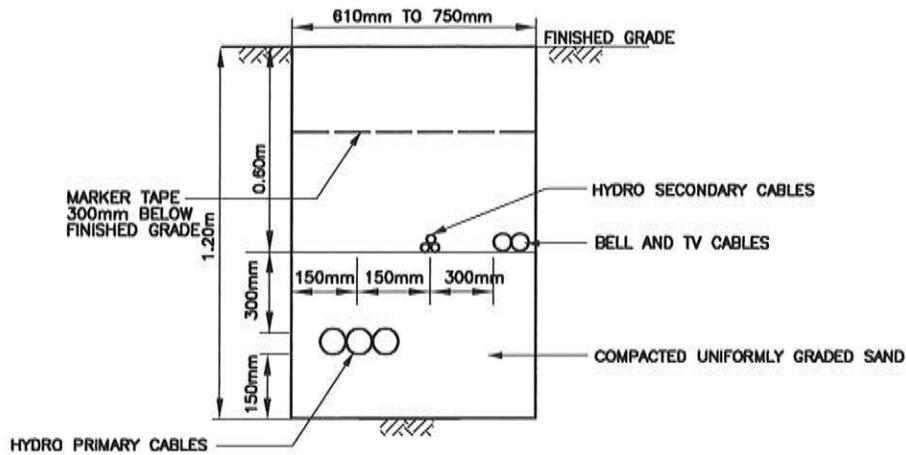
TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
SEDIMENT CONTROL MEASURE AT CATCHBASINS AND CATCHBASIN MANHOLES	STD. No.	602



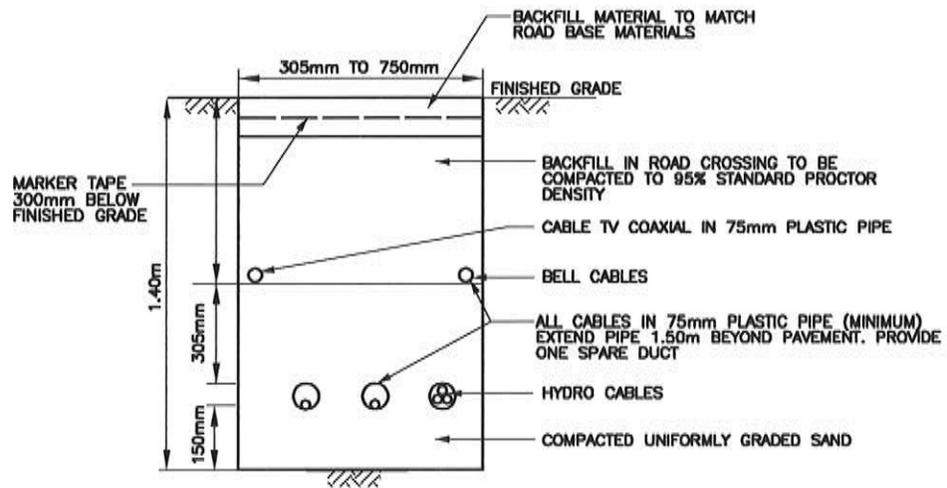
NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. PURPOSE OF CONSTRUCTION MAT IS TO MINIMIZE TRANSPORTATION OF SEDIMENT ONTO ROADWAYS.
3. CONSTRUCTION MAT IS TO BE INSTALLED AS THE FIRST STEP IN THE SITE ALTERATION PROCESS.
4. CONSTRUCTION MATS ARE REQUIRED WHERE PAVED ROADS ARE WITHIN 300m OF THE SITE.

NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
					CONSTRUCTION ENTRANCE MAT	DRAWN:
					STD. No.	603



TYPICAL JOINT USE TRENCH



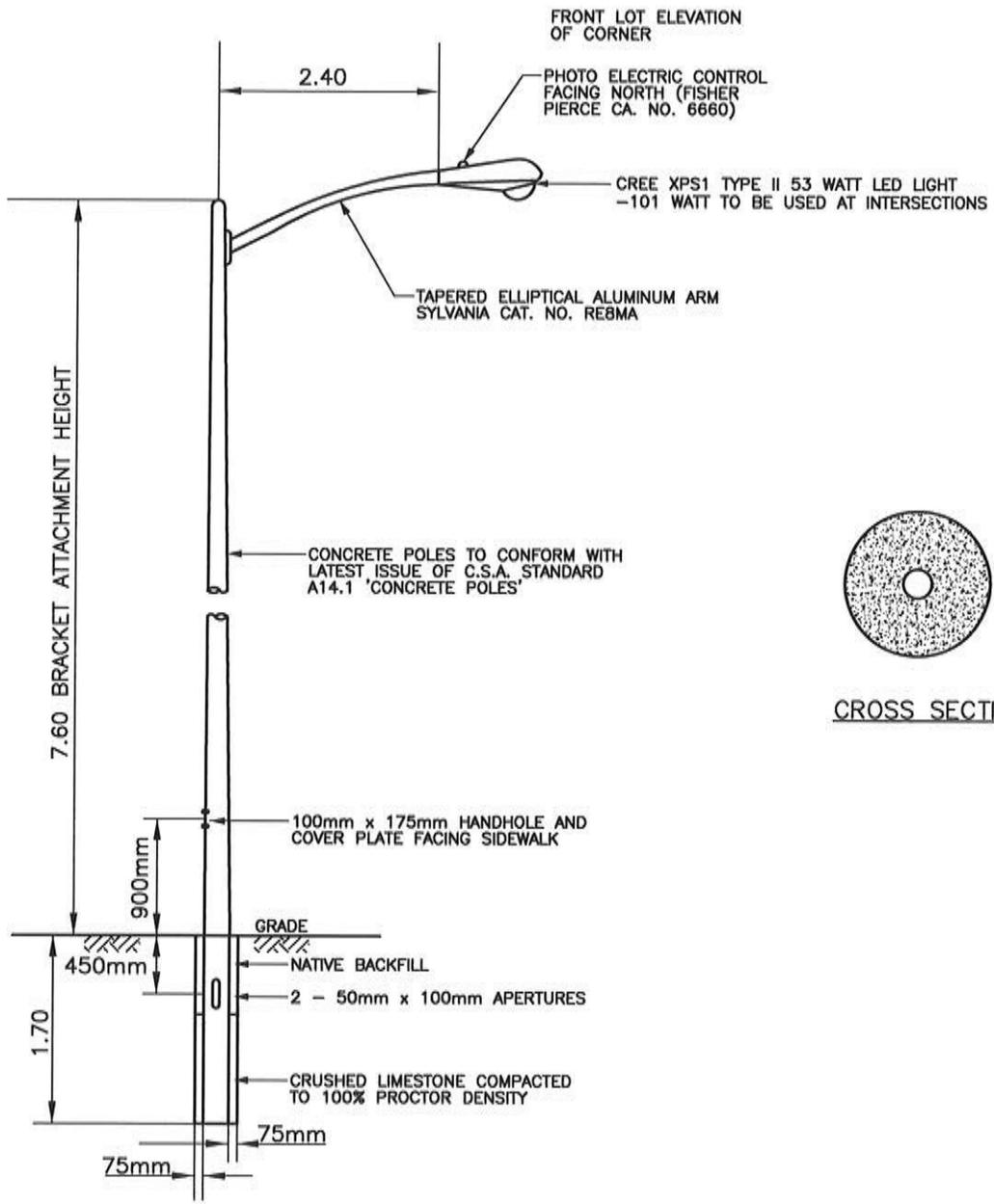
TYPICAL ROAD CROSSING

1. BACKFILL TO CONSIST OF 150mm OF CLEAN MASON SAND ABOVE CABLES/DUCTS AND CLEAN NATIVE MATERIAL.
2. WARNING TAPE TO BE PLACED PRIOR TO PLACING THE FINAL 300mm OF BACKFILL.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA
**JOINT UTILITY TRENCH
AND ROAD CROSSING SECTIONS**

APR'D:	DATE: NOV/06
DRAWN:	SCALE: NTS
STD. No.	701

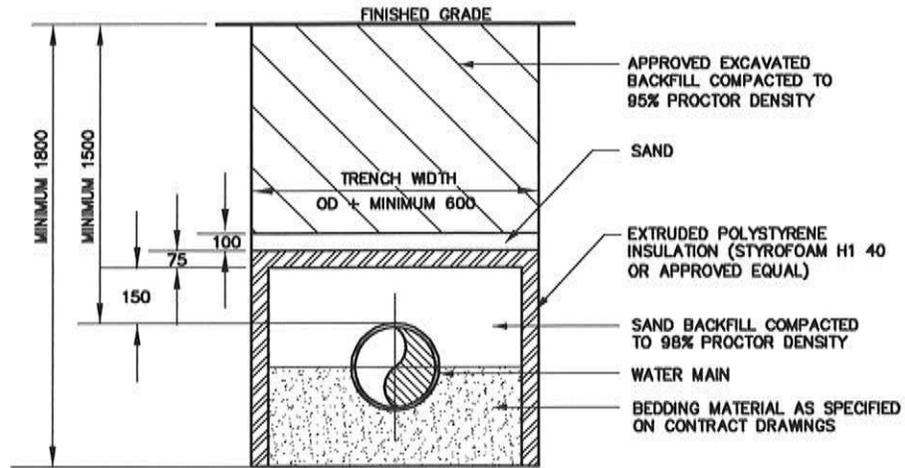


NOTES

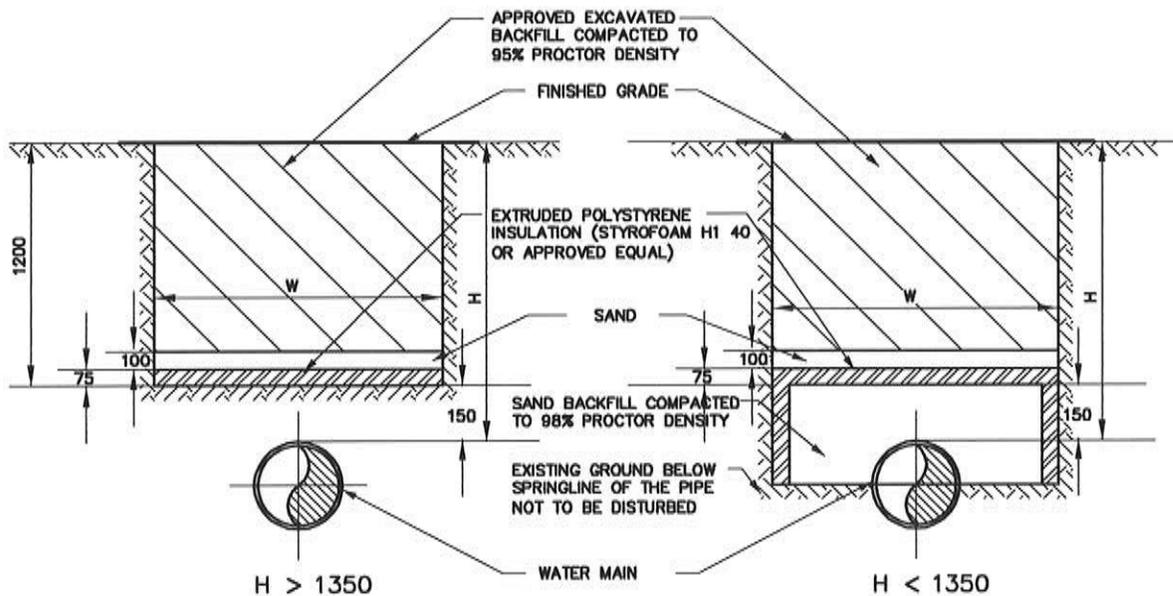
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. S/L WIRING TO LOOP UP TO HANDHOLE CONNECTION TO LUMINAIRE WIRING BY MEANS OF ESNA FUSE AND CABLE CONNECTOR.

NO.	REVISION	APR'D	DATE
1	LED LUMINAIRE	TC	JAN/14

TOWNSHIP OF RAMARA	APR'D:	DATE: NOV/06
	DRAWN:	SCALE: NTS
HORIZONTAL TYPE LUMINAIRE	STD. No.	702



INSULATION OF NEW SERVICES



INSULATION OF EXISTING SERVICES

$W = OD + 2(1500 - H)$ OR $OD + 600\text{mm}$ WHICHEVER IS GREATER
 WHERE W = INSULATION WIDTH
 OD = OUTSIDE DIAMETER OF PIPE TO BE INSULATED
 H = DEPTH OF PIPE TO BE INSULATED (MINIMUM 1200mm)

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.

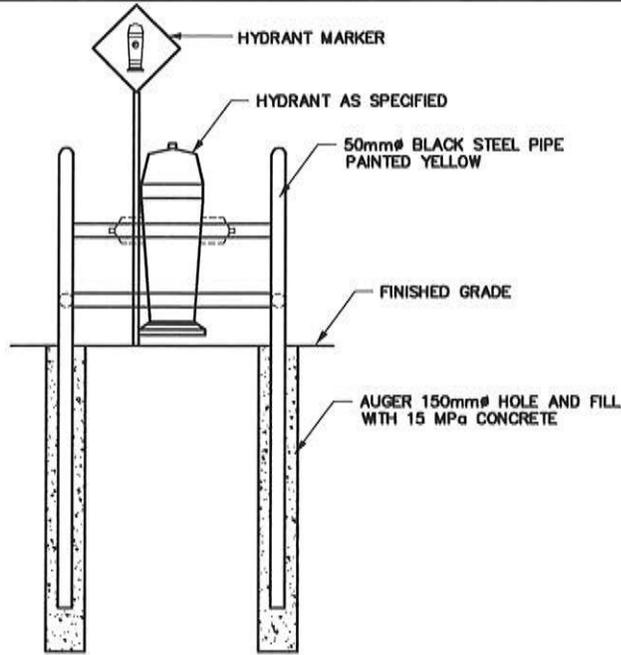
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

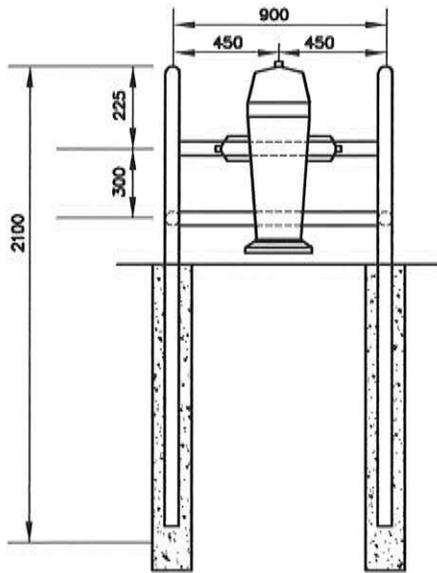
**METHOD OF INSULATING
WATER MAIN**

APR'D: _____ DATE: NOV/06
 DRAWN: _____ SCALE: NTS

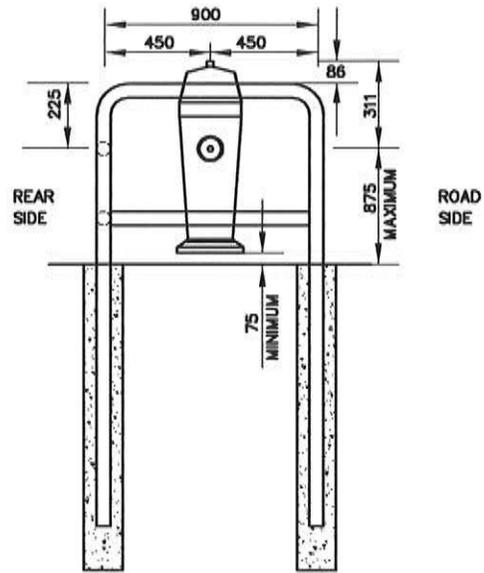
STD. No. 801



REAR VIEW



ROAD SIDE



LEFT SIDE VIEW

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.

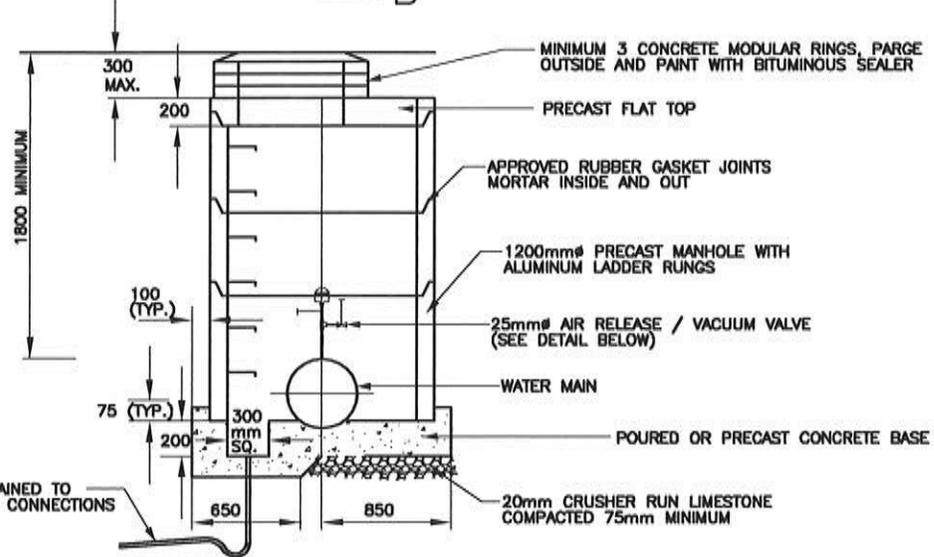
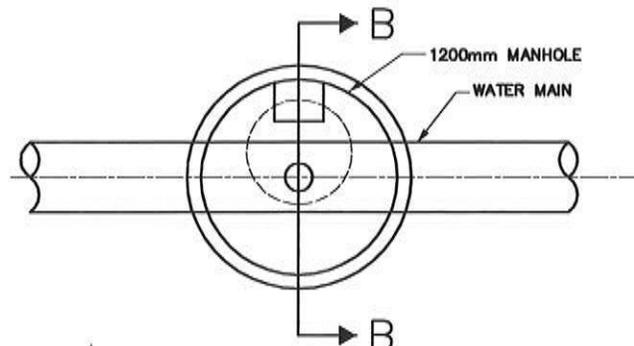
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

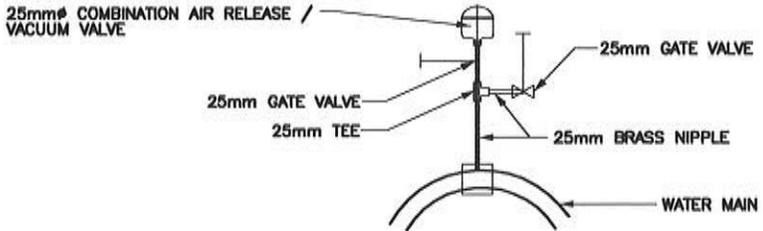
HYDRANT BARRIER

APR'D:	DATE: NOV/06
DRAWN:	SCALE: NTS

STD. No. 802



SECTION B-B



AIR RELEASE VALVE DETAIL

NOTES:

- 1. ALL FITTINGS TO BE BRASS.
- 2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
- 3. GRANULAR 'A' BACKFILL TO BE PLACED TO A MINIMUM THICKNESS OF 300mm ON ALL SIDES AND COMPACTED TO 100% STANDARD PROCTOR DENSITY.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

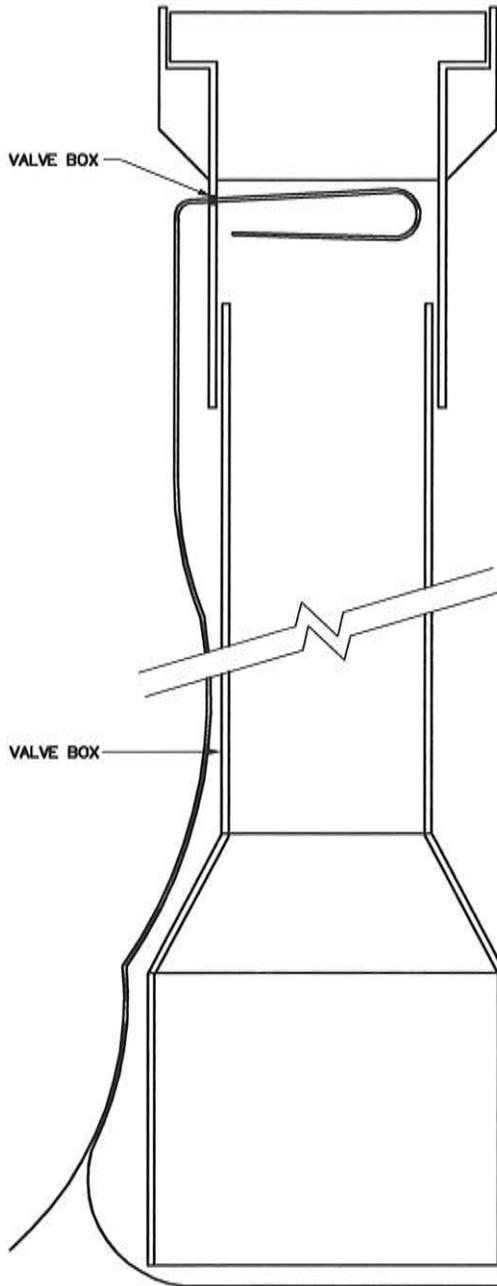
AIR RELEASE VALVE IN CHAMBER

APR'D: DATE: NOV/06
 DRAWN: SCALE: NTS

STD. No. 803

SAWCUT SLOT IN VALVE BOX

VALVE BOX



NOTES:

1. TRACER WIRE—#12 GAUGE STRANDED, C.S.A. TYPE T.W.H.
2. TRACER WIRE TO BE INSTALLED OUTSIDE LOWER VALVE BOX AND BROUGHT INTO UPPER SECTION OF VALVE BOX AND LOOPED TO BE MINIMUM 450mm IN LENGTH.
3. CONNECTORS USED FOR SPLICING TRACER WIRE SHALL BE WING NUT TYPE, WITH NYLON SHELL AND NON-CORROSIVE STEEL WIRE SPRING.

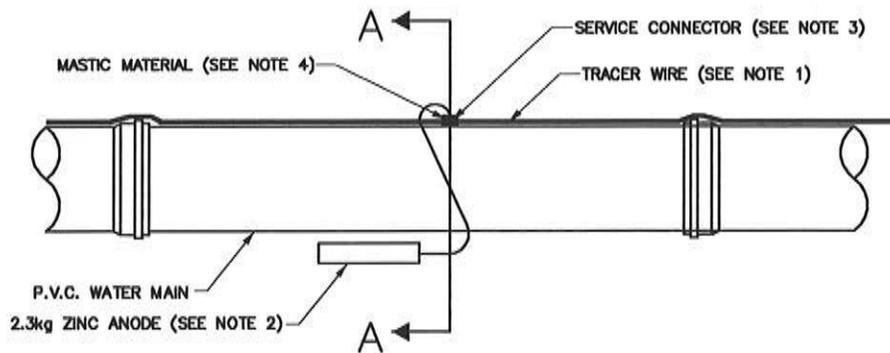
NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA

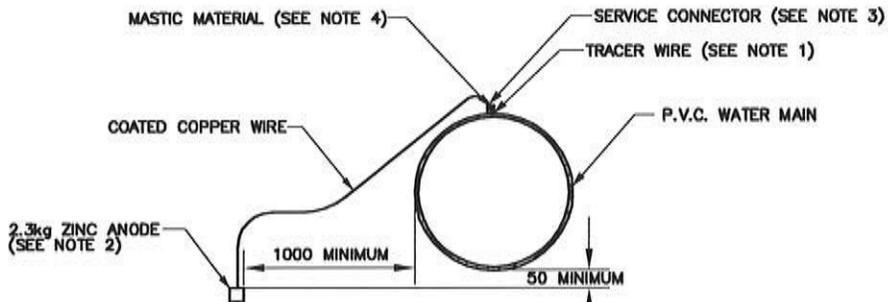
**TRACER WIRE ARRANGEMENT AT
VALVE BOX FOR P.V.C. WATER MAIN**

APR'D:	DATE: NOV/06
DRAWN:	SCALE: NTS

STD. No. 804



ELEVATION



SECTION A-A

NOTES:

1. TRACER WIRE TO BE COATED No. 12 GAUGE STRANDED C.S.A. TYPE T.W.H.
2. ONE 2.3 kg ZINC ANODE TO BE SUPPLIED AND INSTALLED IN A MANNER APPROVED BY THE TOWNSHIP ENGINEER FOR EVERY 500m OF TRACER WIRE INSTALLED.
3. SERVICE CONNECTOR TO BE A 'BURNDY SERVIT', TYPE K.S. MODEL KS20 COPPER OR APPROVED EQUAL.
4. CONNECTOR SPLICE TO BE WRAPPED WITH 'SCOTCHFILL' ELECTRICAL PUTTY OR APPROVED EQUAL.
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
6. THE LOCATION OF EACH TRACER WIRE ANODE MUST BE DETAILED ON THE CONTRACT DRAWINGS.

NO.	REVISION	APR'D	DATE

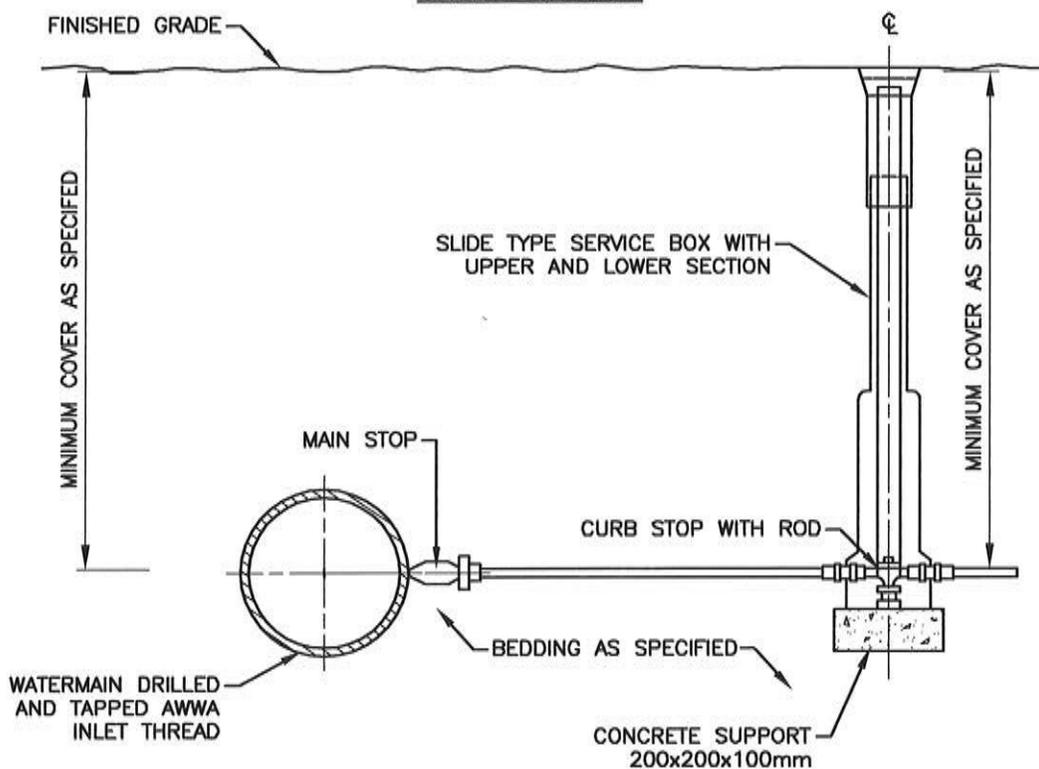
TOWNSHIP OF RAMARA

**CORROSION PROTECTION FOR TRACER WIRES
ON P.V.C. WATER MAINS**

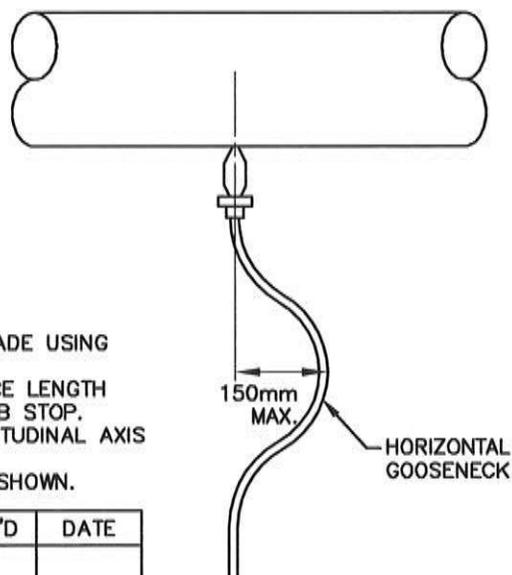
APR'D: DATE: NOV/06
DRAWN: SCALE: NTS

STD. No. 805

CROSS-SECTION



PLAN VIEW



NOTES:

1. SERVICE CONNECTIONS TO PLASTIC WATERMAINS TO BE MADE USING SERVICE SADDLES OR FACTORY MADE TEES.
2. COUPLINGS SHALL NOT BE PERMITTED UNLESS THE SERVICE LENGTH EXCEEDS 20.0 m BETWEEN THE MAIN STOP AND THE CURB STOP.
3. ALL WATER SERVICES TO BE INSTALLED 90° TO THE LONGITUDINAL AXIS OF THE WATERMAIN.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

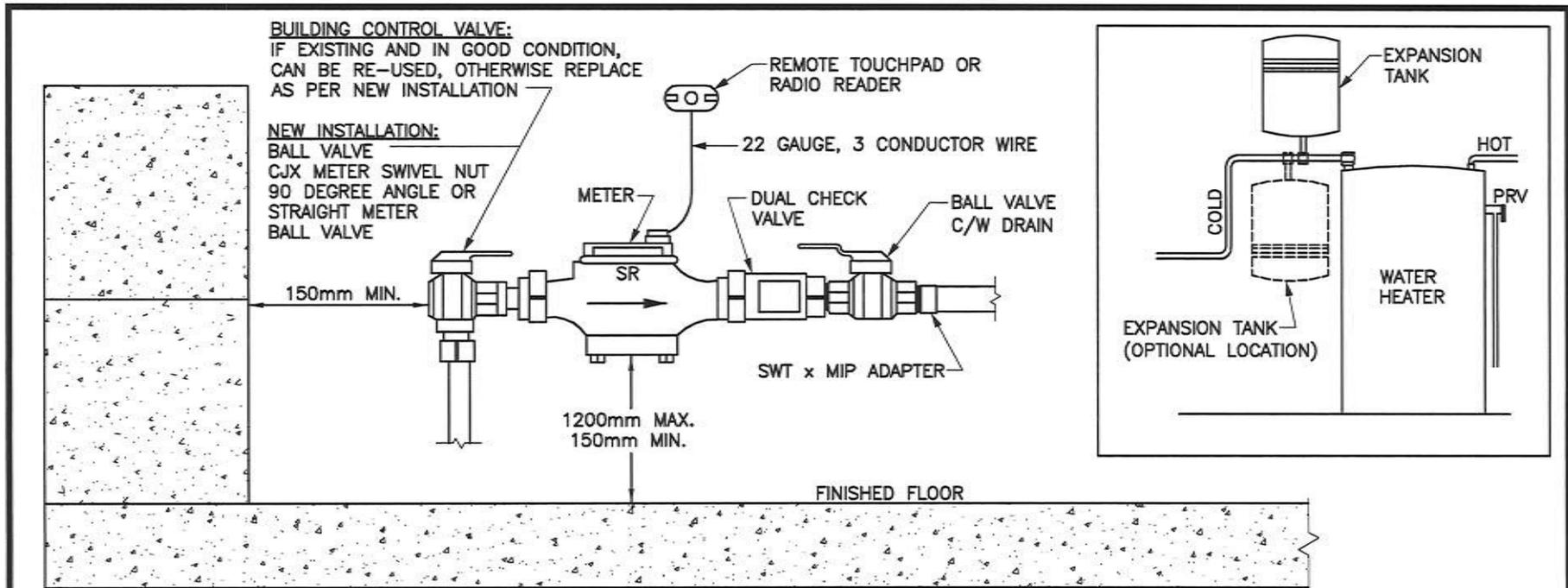
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TOWNSHIP OF RAMARA

**WATER SERVICE CONNECTION
19 AND 25 mm DIAMETER**

APR'D:	DATE: MAR/13
DRAWN:	SCALE: NTS

STD. No. 806

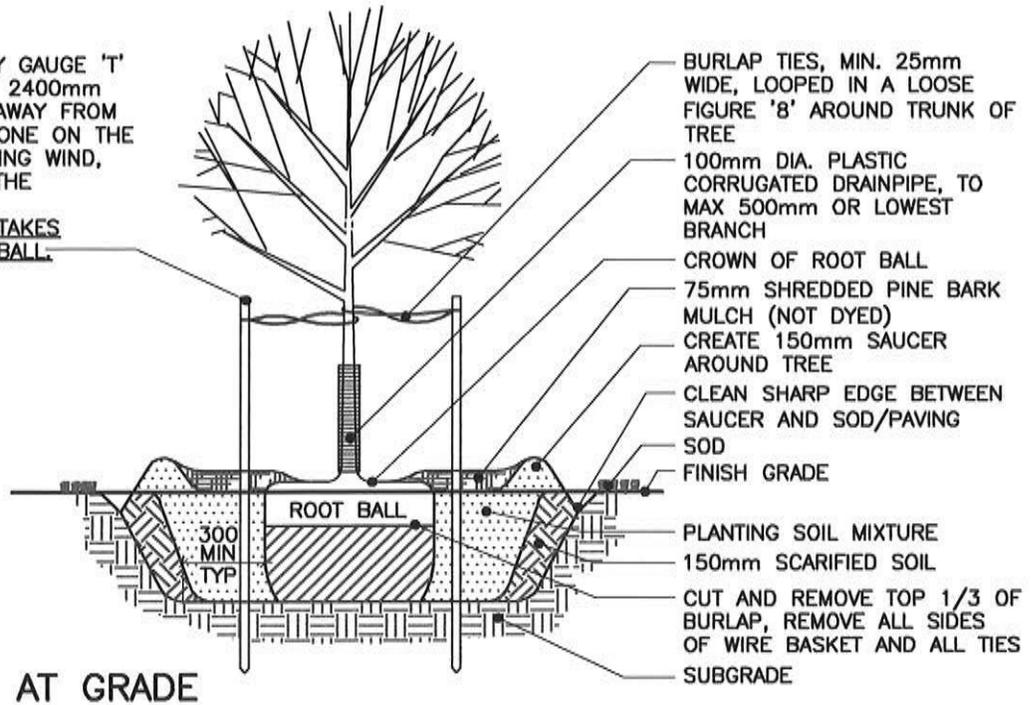


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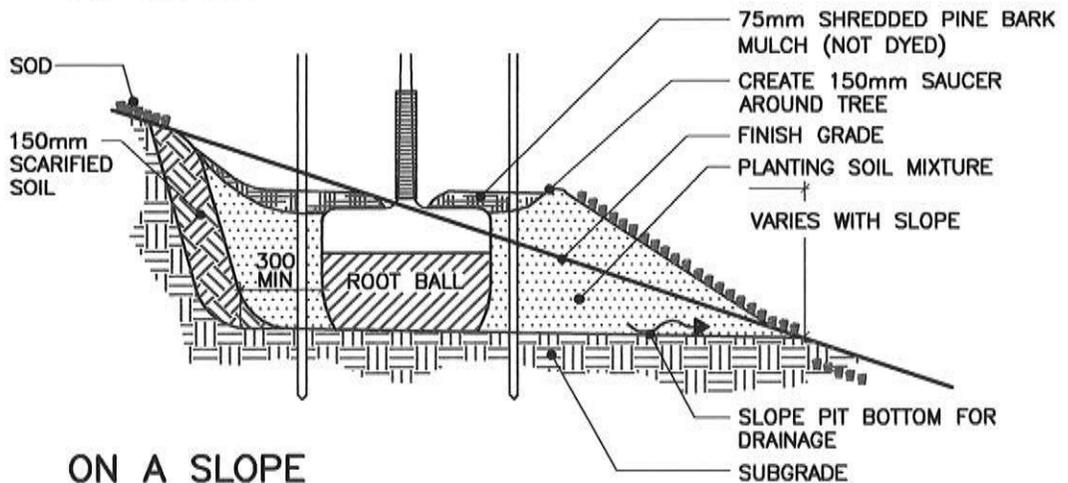
1. METER TO BE INSTALLED NOT LESS THAN 150mm FROM ANY OBJECT. AVERAGE SIZE PERSON SHOULD BE ABLE TO ACCESS METER.
2. EXPANSION TANK TO BE INSTALLED ON THE COLD WATER LINE BETWEEN THE WATER METER PACKAGE AND THE WATER HEATER. WHEN FULL, THESE TANKS WEIGH 50 POUNDS. TANK OR PIPEWORK MAY NEED SUPPORT. TANK TO BE NSF 61 CERTIFIED AND SIZED APPROPRIATELY FOR WATER HEATER SIZE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. AT A MINIMUM TANK TO BE A ST-12 BY AMTROL OR APPROVED EQUIVALENT.
3. PROVIDE SUPPORT FOR THE METER TO SUIT.
4. ENSURE PROPER DIRECTION OF FLOW FOR INSTALLATION OF DUAL CHECK VALVE. VALVE TO COMPLY WITH CSA STANDARD B64.
5. TOUCH PAD (IF INCLUDED) TO BE MOUNTED OUTSIDE BESIDE HYDRO METER, OR ON NEAREST EXTERIOR WALL TO WATER METER IF HYDRO METER IS INSIDE BUILDING. ELEVATION OF TOUCHPAD ON OUTER WALL TO BE BETWEEN 1.2m AND 1.5m ABOVE FINISHED GROUND ELEVATION.
6. NO BRANCHES OR TAPS PERMITTED UPSTREAM OF METER.
7. ISOLATION VALVES (BALL VALVE) TO COMPLY WITH AWWA C800 AND/OR PART 7 OF THE ONTARIO BUILDING CODE.

NO.	REVISION	APR'D	DATE	TOWNSHIP OF RAMARA		APR'D:	DATE: MAR/13
				TYPICAL WATER METER INSTALLATION		DRAWN:	SCALE: NTS
						STD. No.	807

TWO HEAVY-DUTY GAUGE 'T' BARS PER TREE, 2400mm LONG, LOCATED AWAY FROM ALL BRANCHES, ONE ON THE SIDE OF PREVAILING WIND, THE OTHER ON THE OPPOSITE SIDE. DO NOT DRIVE STAKES THROUGH ROOT BALL.



AT GRADE



ON A SLOPE

NOTES

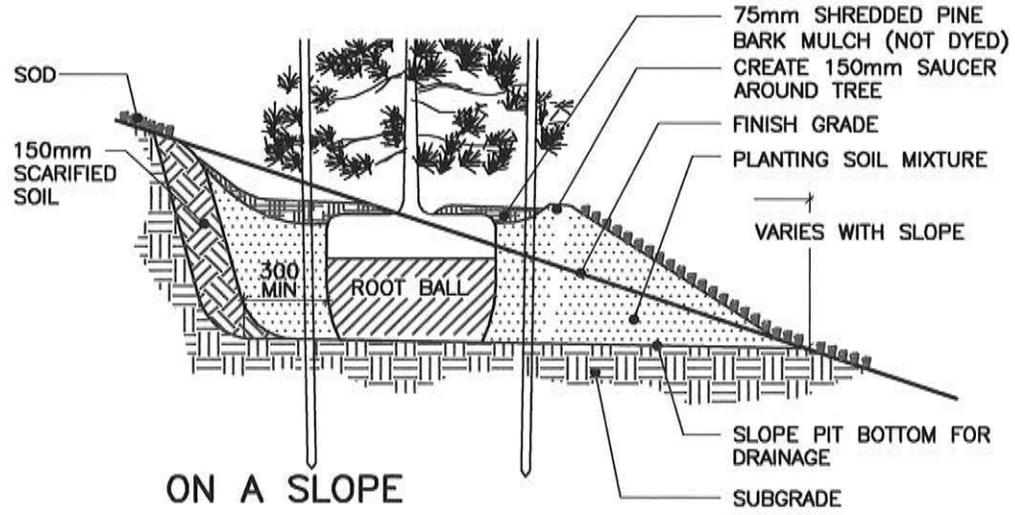
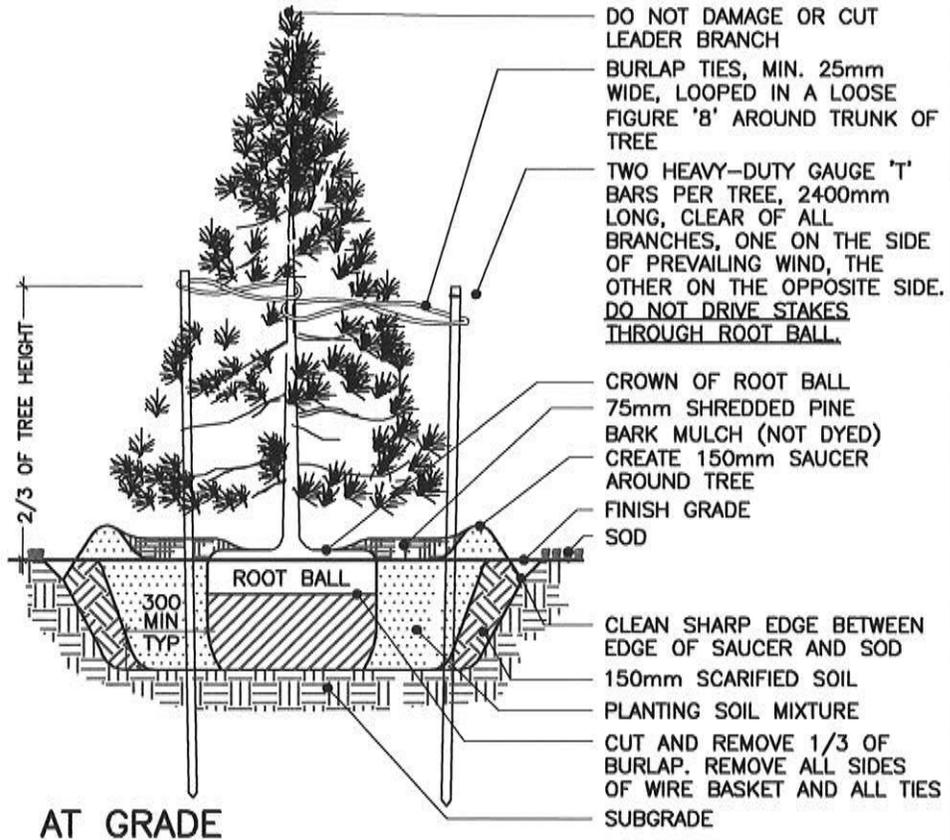
1. DO NOT ALLOW AIR POCKETS WHEN BACKFILLING.
2. POSITION CROWN OF ROOT BALL 50mm ABOVE FINISH GRADE TO ALLOW FOR SETTLING.
3. DO CORRECTIVE PRUNING TO RETAIN NATURAL FORM OF TREE AS DIRECTED BY THE LANDSCAPE ARCHITECT.
4. FOR TREES PLANTED WITHIN PLANTING OR SHRUB BEDS, DELETE SAUCER AROUND BASE OF TREE.
5. ALL DIMENSIONS ARE IN MILLIMETRES.
6. NO TREE PITS SHALL BE LEFT OPEN OVERNIGHT.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: MAR./13
	DRAWN:	SCALE: NTS
DECIDUOUS TREE PLANTING	STD. No.	901

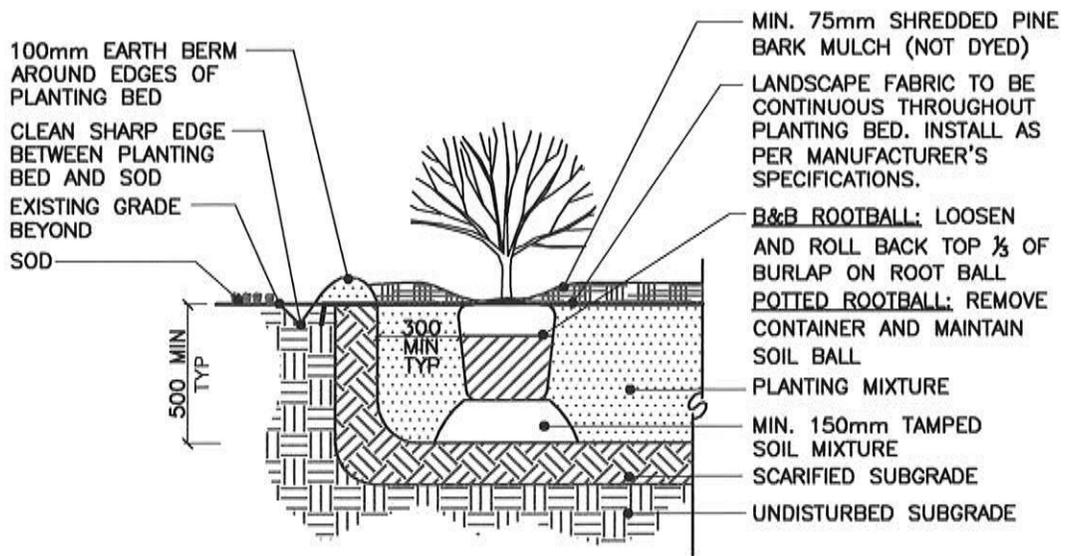
NOTES

1. DO NOT ALLOW AIR POCKETS WHEN BACKFILLING.
2. POSITION CROWN OF ROOT BALL 50mm ABOVE FINISH GRADE TO ALLOW FOR SETTLING.
3. FOR TREES PLANTED WITHIN PLANTING OR SHRUB BEDS, DELETE SAUCER AROUND BASE OF TREE.
4. ALL DIMENSIONS IN MILLIMETRES.
5. NO TREE PITS SHALL BE LEFT OPEN OVERNIGHT.

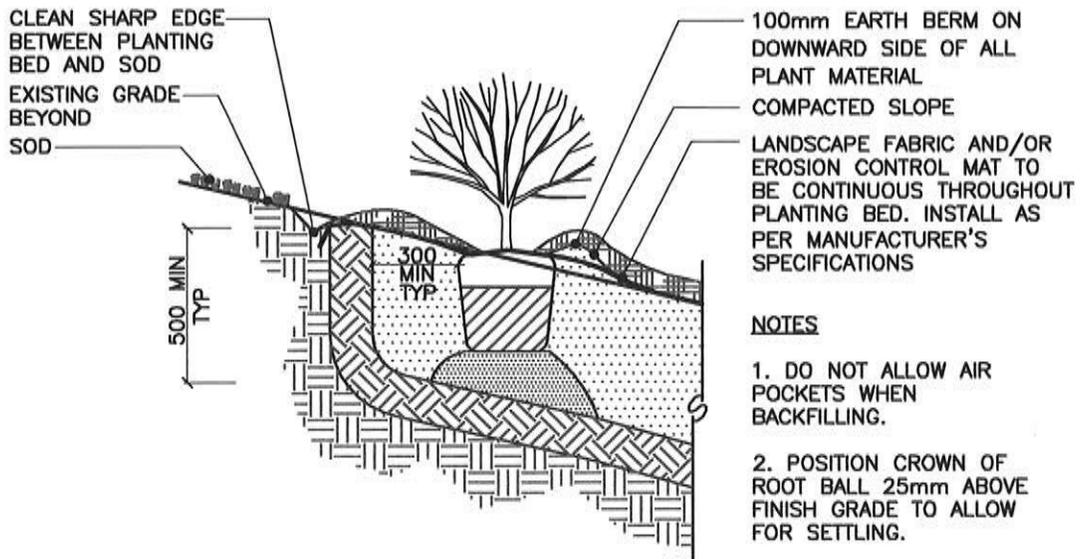


NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA		DATE: MAR./13
		SCALE: NTS
CONIFEROUS TREE PLANTING		STD. No. 902



TYPICAL SHRUB PLANTING



PLANTING ON 3:1 SLOPE DETAIL

NOTES

1. DO NOT ALLOW AIR POCKETS WHEN BACKFILLING.
2. POSITION CROWN OF ROOT BALL 25mm ABOVE FINISH GRADE TO ALLOW FOR SETTLING.
3. ALL DIMENSIONS IN MILLIMETRES.

NO.	REVISION	APR'D	DATE

TOWNSHIP OF RAMARA	APR'D:	DATE: MAR./13
	DRAWN:	SCALE: NTS
SHRUB PLANTING	STD. No.	903