

CITY OF **WINDSOR**

DEVELOPMENT MANUAL



PUBLIC RIGHT-OF-WAY

PUBLIC INFRASTRUCTURE



MAY 2015

PUBLIC WORKS

I INTRODUCTION

Through its ongoing efforts to streamline the development process for clients, the Engineering and Corporate Projects Department of the Corporation of the City of Windsor (hereinafter referred to as the “City”) has prepared this update to the manual of development requirements. This manual covers all aspects of the development process, including the fees, drawings and inspection processes for all sizes of development.

The Manual is intended to assist interested parties, including developers, engineers, property owners, contractors, utilities, and government personnel with the procedures for land development within the City of Windsor. It focuses primarily on municipal requirements for the rights-of-way and for property servicing throughout all stages of the development process, from application to construction to acceptance.

As every development is unique, not all aspects of this Manual will relate to or be required of all development. Small developments, i.e. single lot rezoning, are vastly different from a subdivision or a large-scale commercial property. Appendix B will provide a quick guideline to the important sections of the Manual for various types of development.

It is noted that this manual shall not supersede the requirements of Council Resolutions, Municipal By-laws, other policies of the Municipality, City of Windsor Official Plan, and applicable provincial and federal legislation and guidelines, regulatory authorities and utility companies.

Amendments to the Manual are common and accordingly all information contained herein should be confirmed with the City. Updates shall be posted to the City of Windsor website at www.citywindsor.ca.

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1.0 GENERAL REQUIREMENTS

1.1 SERVICING/SUBDIVISION AGREEMENT

Developers will be required to enter into a Servicing/Subdivision Agreement (hereinafter referred to as “Agreement”) with the City. Developments must be designed and constructed in accordance with the requirements set out in this Development Manual plus specific requirements for individual developments.

The City Solicitor, in consultation with the City Engineer and other applicable Departments, will prepare the Agreement. No construction work shall commence in any development until both the City and the Developer have signed the Agreement, and the Developer has provided all financial securities and insurance.

1.2 CONSULTING ENGINEER

The City requires that all Developers retain a Consulting Engineer (hereinafter referred to as the “Consultant”) to be responsible for the planning, design, construction, observation, supervision and contract administration for the construction of services. The Consultant shall be registered as a Consulting Engineer with the Professional Engineers of Ontario (PEO). All reports, drawings and specifications shall be signed, sealed and dated by a Professional Engineer licensed in the Province of Ontario and employed by a Consulting Engineering firm or personally designated as a Consultant.

The Consultant shall be responsible to carry out the design of all services including the:

- a) Planning process,
- b) Preparation of design drawings,
- c) Preparation of contract documents,
- d) Assistance in obtaining municipal, provincial and federal approvals,
- e) Observation/confirmation of lay out work,

1.0
General
Requirements

- f) On-site observation, and co-ordination of inspection,
- g) Co-ordination of material testing,
- h) Preparation and maintenance of the Developer/Contractor contract construction records,
- i) Preparation of “as-built” drawings of the services constructed by the Developer.

With respect to (e) above, the Consultant shall observe, check and be responsible for verification of all survey and layout work required for the construction of the services. The Consultant will be responsible for ensuring that, where a laser beam is used for control of line and grade, that instrument checks are undertaken on a daily basis at an absolute minimum, and as required by the City’s Inspectors.

With respect to (f), (g) and (h) above, the Consultant will be responsible for the general co-ordination of the project. The Consultant will confirm to the City Engineer that the Contractor has sufficient equipment, manpower and experience to complete the works in the time allotted by an approved progress schedule. A pre-construction meeting and regularly scheduled field meetings must be held among all parties involved in the work as a means to achieve this co-ordination. As specified in Section 13.0 “Inspection and Testing” of this Manual, Inspectors employed by the City (hereinafter referred to as the “City Inspectors”) will provide detailed inspection and approval. City Inspectors are responsible for inspection and subsequent acceptance or rejection of work. *Inspection on the part of the City Inspector **must not be construed as supervision.*** The observation of the work, any deviation of the work from the designs previously approved by the City Engineer, any matters between the contractor and the Developer and any other matters except strict inspection, *are solely the responsibility of the Consultant.* The City Inspectors will not give direction to the Contractor directly but will, however, communicate whenever possible with the Consultant. The Consultant shall be required to have a representative present on site, be readily available for contract administration and to facilitate the acceptability of the work with City Inspectors. The Consultant will recommend to the City Engineer acceptance or assumption of services on completion of the contract. The City Engineer shall not accept the services until the

Director of Operations has indicated agreement with said acceptance or assumption. The Consultant shall be required to initiate remedial action if any tests carried out by the City or the Consultant (as outlined later in this Manual) proves unsatisfactory. The City Inspector does not have the authority to issue “Stop Work Orders” or “Change Orders”. The authority to issue Stop Work Orders or Change Orders lies with the Consultant. City Inspectors shall notify the Consultant in *writing* that a material or work is unsatisfactory and shall not be supported for acceptance or assumption unless corrective measures are taken.

With respect to (g) above, the Consultant shall be responsible for the co-ordination of all testing of materials prior to the installation of the services as outlined in Section 13.0 “Inspection and Testing”.

With respect to (h) above, the Consultant shall be responsible for those matters between the Contractor and the Developer such as the calculation and recording of quantities and preparation of payment certificates.

With respect to (i) above, the Consultant shall submit to the City Engineer all required as-built details, elevations, and drawings in mylar copy, digital data format, as well as details of private drain connections. For specific requirements, refer to Section 3.4 regarding “As-Built Drawings”.

The Consultant shall also be responsible for the overall co-ordination of all other services installed at the request of, and as directly by, the Developer by the appropriate utility companies (such as Bell Canada, Cogeco Cable, EnWin Utilities, Hydro One, Union Gas and Windsor Utilities Commission).

The above co-ordination shall consist of the following main functions:

- a) The Consultant shall request comments during the planning and design stage in order to ensure optimum location of the services. Standard Drawings AS-206A, B, C and D show standard utility cross-sections presently in use.
- b) The Consultant shall meet as required with representatives from the other agencies to ensure that the work is proceeding in a co-ordinated and

satisfactory manner. This includes ensuring that utility plant location requirements are met, and ensuring engineering matters such as trench compaction are provided. It is recommended that the Consultant obtain written confirmation from the utility companies as to the commencement of the installation of their individual services, in order to avoid inter-service conflicts.

1.3 ACCEPTANCE OF WORK

In accordance with the requirements of the Ontario Building Code, construction shall not proceed on any building until a building permit has been issued. In order for the issuance of a building permit, other than for model homes or conditional building permits, all of the work (as described in section 14.0) in the Agreement must have been constructed, inspected and accepted onto maintenance by the City Engineer with all required securities in place. Consideration will be given to deferring repair of those deficiencies that cannot be corrected for reasons such as weather conditions. The City Engineer shall be the sole determinant of which deficiencies can be deferred.

1.4 SPECIFICATIONS and TENDERS

All work required for the completion of construction, and not shown on the engineering drawings, shall conform to the Standard Specifications and Standard Plans applicable thereto, as prescribed or approved by the City Engineer.

In the event that the Developer shall call tenders for any of the services to be installed, such tenders shall be called on the basis of Standard Specifications and Requirements. In those cases where the City is bearing the cost of oversizing (as per Section 1.7), the Developer shall provide to the City Engineer a copy of the tender and an executed copy of the contracts with each successful Tenderer. The City Engineer shall approve the Contract prior to the work containing the oversizing being performed. Furthermore, the cost of any oversizing must be approved by City Council. The Developer may proceed at its own risk and expense with construction prior to Council approval of oversizing provided it accepts the risk of non-payment

should approval not be forthcoming. The City also reserves the right to call for public tenders any work which the City attribute to oversizing of services.

1.5 OUTSIDE APPROVALS

Developers are responsible for obtaining all required permits and approvals from other City Departments if applicable and regulatory authorities, including but not limited to the Essex Region Conservation Authority (ERCA), the Ontario Ministry of the Environment (MOE) and the Ontario Ministry of Transportation (MTO). The Developer shall not proceed with construction until copies of all approvals and permits are submitted to the City Engineer.

1.6 TAXES and INSURANCE

The Developer shall pay all arrears of taxes, including any local improvement charges levied on the property.

The Developer shall provide proof of liability insurance satisfactory in form and amount to the City Solicitor. The Developer shall indemnify the City against any and all damages, expenses, claims, suits, losses or destruction of any property, or injury to or death of any person arising directly or indirectly out of or in connection with the negligent performance or unlawful or non-performance of any obligation of the Developer. The City shall be documented as an additional party to the insurance policy with provision for cross-liability. The Developer shall also ensure that their Consultant, sub-consultants, and general contractors also carry liability insurance.

During construction of the works on land either owned by the City or to be conveyed to the City pursuant to the Agreement, and during the maintenance period, the Developer shall maintain the following requirements:

- a) A policy of Public Liability and Property Damage Insurance, in the amount of Five Million Dollars (\$5,000,000.00) and containing endorsements showing the City as an additional named insured including a cross-liability clause, and in form satisfactory to the Manager of Purchasing and Risk Management.

- b) A policy to provide Environmental Pollution Liability Insurance, in the amount of Five Million Dollars (\$5,000,000.00) exclusive of interest costs, on a claim-made basis or such other limit as the City may reasonably require and containing endorsements showing the City as an additional named insured, to cover third party bodily injury and property damage claims arising out of sudden and accidental pollution, including but not limited to unexpected and unintentional spill, discharge, emission, dispersal, leakage, migration, release or escape of pollutants. The coverage is not to be subject to the one hundred and twenty (120) hour reporting period and is not to be limited to hostile fire only, and is to be in form satisfactory to the City Solicitor.
- c) A policy to provide proof of auto liability insurance in the amount of Two Million Dollars (\$2,000,000.00) per occurrence.

The said insurance policies shall not be altered, cancelled or allowed to lapse without thirty (30) days prior written notice to the City. If the said insurance policies are cancelled or changed in any manner that would affect the City as outlined in coverage specified in the policy for any reason, thirty (30) days prior written notice by registered mail must be given by the insurer to the City.

Before any work proceeds on land owned by the City or on any lands to be conveyed to the City, the Developer further agrees to provide the City Solicitor with a certified copy of such policies.

1.7 OVERSIZING

If the City requires oversizing of services inside or outside the development or subdivision in order to accommodate future developments, the cost of such oversizing may be borne by the City based on a cost-sharing scheme and tender process to the satisfaction of the City Engineer. Oversizing may include, but is not limited to, increasing the pipe diameter, increasing the road widths and sidewalk widths, or increasing the power distribution and other services. Compliance with the following list is required in order for the approval of any oversizing:

- a) Engineering costs for oversized service shall stipulate a 15% maximum, which include inspection services, design services, as well as contract administration. Under no circumstances will more than 15% be paid for such oversizing.
- b) Ninety percent (90%) of the value of the cost-sharing work shall be paid to the Developer following completion of the work. With acceptance by the City the additional ten percent (10%) shall be paid on termination of the maintenance period. This assumes that Council has approved the City's share and included in the City's budget for that year. The Developer may also be offered the option of a development charge credit that would be given on a "per lot" basis.
- c) Computed into the cost of oversizing will be a five percent (5%) addition to the actual cost of oversizing for engineering. The normal fifteen percent (15%) for engineering will only apply for work that is shown to be required as a result of the requested oversizing (e.g. requested oversizing has resulted in a cast-in-place manhole chamber to be constructed and engineered which would not have been necessary if oversizing had not been required).
- d) Any cost sharing work for oversizing of services conducted by the developer prior to council approval shall be at the developer's entire expense and risk. The cost of constructing a haul route shall not be considered as cost sharing under oversizing. It shall be included in the total construction cost.

All payment for oversizing must be approved by City Council in each specific case.

- i) Where the City's share of the specific cost-shared work is estimated to be less than Fifty Thousand Dollars (\$50,000.00), the cost sharing shall be negotiated by the Consulting Engineer on behalf of the Developer with the City Engineer.
- ii) Where the City's share of the specific cost-shared work is estimated to be greater than Fifty Thousand Dollars (\$50,000.00) or an amount as required by the Purchasing By-law, the work shall be either;
 - A) Tendered publicly as a single work in which the lowest bidder, assuming compliance with other tendering procedure, be awarded of total tender being at the discretion of the Developer,

or

- B) Tendered publicly with the rest of the works in the development or subdivision, but shall become a separate item in the tender call with cost-sharing to be based on the lowest tender bid for that item, however, the award of total tender being at the discretion of the Developer.

1.8 DEVELOPMENT CHARGES

The Developer shall be required to pay all applicable development charges. Inquiries regarding such charges on specific lands shall be directed to the Chief Building Official. It should be noted that these charges are the Developer's share of facilities such as trunk storm and sanitary sewers, which have been or are intended be constructed to benefit lands controlled by the Developer as well as for other lands. The Developer shall refer to the Development Charges By-Law for any additional inquiries. Development Charges are payable to the Building Department prior to the issuance of permits.

1.9 SERVICING CHARGES

Servicing Charges may typically be collected prior to the issuance/release of permits. Servicing Charges relate to costs associated with the construction/use of municipal services, which may have been provided by other Developers, the City or under the provisions of the Local Improvement Act. These Charges may include oversizing of services. Servicing Charges may be offset against payments the City owes a Developer. In some cases, the City may be collecting Servicing Charges on behalf of another Developer.

1.10 PERFORMANCE SECURITIES

A performance security shall guarantee the installation of all services as follows:

- a) Prior to construction - Sewer and pavement security (50%) and the requirements of the Construction Lien Act (1990).

- b) Prior to issuance of building permits - Security for 100% of the value of the balance of the services in the Agreement not covered by security (a) above.
- c) The City will not require a performance security for the installation of utility services administered by Windsor Utilities Commission and EnWin Utilities. These services will be guaranteed by a separate agreement between the Developer and the respective Utility.
- d) Sidewalks – refer to Section 7.0 “Sidewalks”.

The performance security shall be in the form of: bonds, irrevocable standby letter of credit - which is automatically extended, certified cheque, or other security in form satisfactory to the City Solicitor. The City Engineer shall determine the amount of the security following discussion with the Consultant.

The City shall not issue building permits until the Developer has deposited a performance security as aforesaid, provided that the development may be constructed in phases. The amount of such bond or other security shall cover completion of the services by the Developer only within a particular phase.

1.11 MAINTENANCE SECURITIES

The Developer shall be responsible for all materials, equipment and services installed on land owned by the City or lands to be conveyed to the City pursuant to the Agreement except for the following:

- a) Driveway approaches (except as noted under “Driveway Securities-sect 1.13”).
- b) Rear yard drainage systems.
- c) Water, hydro and streetlighting.

The Developer shall provide a Maintenance Bond, Letter of Credit or other security in form satisfactory to the City Solicitor and in an amount equal to fifty percent (50%) of the total value of all services completed and accepted for maintenance by the City Engineer. The Maintenance Bond, Letter of Credit or other security shall remain in force for a minimum period of one (1) year following the date of acceptance of work

onto maintenance. The maintenance bond shall be released after final inspection and acceptance of all works, subject to the satisfaction of the City Engineer.

1.12 CONSTRUCTION LIEN ACT (1990)

The Developer shall comply with the Construction Lien Act, 1990, and shall deposit with the City, in order to satisfy the requirements of *Section 17(4)* of the Construction Lien Act, a security in form satisfactory to the City Solicitor and in an amount satisfactory to the City Engineer, for the estimated amount of the holdbacks (part IV of the Construction Lien Act). This said security is to be in the amount of ten percent (10%) of the value of the services and material supplied under contract or subcontract for work on the public right-of-way or lands to be public. Upon the forty-sixth (46th) day following the completion of the said work and provided that the City has received no notice of claim or lien for the supply of services or materials for the improvement of the public right-of-way or lands to be public, the City shall return the Bond, Letter of Credit or other security, hereinbefore mentioned, to the Developer.

1.13 DRIVEWAY SECURITIES

It should be noted that in many cases, the responsibility of constructing driveways rests with the homebuilder or property owners who may be the Developer.

1.14 EASEMENTS

The Developer shall grant to Bell Canada, Cogeco Cable, EnWin Utilities, Hydro One, Windsor Utilities Commission, Union Gas (Utility Providers) and the City such easements as may be required for the installation of services within the development or subdivision to the satisfaction of the City Engineer, prior to the issuance of any construction permits.

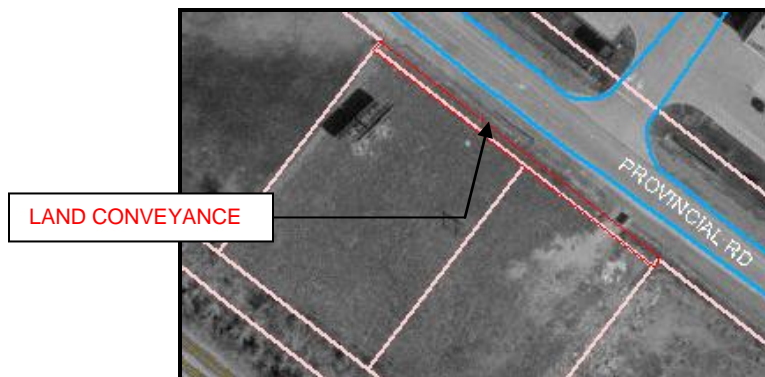
No permanent structures - sheds, swimming pools exclusive of driveways - shall be placed on the lands granted for easements. Neither the City nor the Utility Providers shall be responsible for restoration or replacement of any structure located on

easements, except for driveways. The Developer shall retain an Ontario Land Surveyor to prepare all reference plans at its entire expense.



1.15 LAND CONVEYANCE

Gratuitous conveyances of roadways, widening of existing right-of-ways, walkways, parks, storm detention ponds and sewers etc. may be required as a condition of development and shall be in compliance with the City of Windsor's *Official Plan*, *Environmental Assessment (EA)* or *Environmental Study Report (ESR)*. The Developer shall gratuitously convey to the City land sufficient to create the public right-of-way. Such conveyance may be required as a condition of severance rezoning or site plan control under the Planning Act. The Developer shall retain an Ontario Land Surveyor to prepare all reference plans at its entire expense.



1.16 LANDSCAPING and URBAN DESIGN

1.0
General
Requirements

The Developer may be required to retain a Landscape Architect to prepare an integrated landscaping design of medians, boulevards, and driveway approaches to achieve a seamless and efficient design on roads connecting to or designated as Theme Streets or on major commercial development. All information regarding landscaping and streetscaping requirements, urban design, tree planting and parkland development is provided in:

- a) The City of Windsor Landscaping Requirements for Development in Windsor, 4th Edition,
or
- b) The City of Windsor *Official Plan* (Part IV: Civic Image, Section 8 – Urban Design)

Alternatively, inquiries may be directed to the Executive Director of Parks and Facility Operations, Manager of Urban Design and Community Development, City Planner and/or Chief Building Official.



1.17 STUDIES and REPORTS

Depending on the location of the Development, the Developer, through the Consulting Engineer may be required to provide the City with special studies and reports prior to approval of a development. The studies and reports may also be a requirement from other authorities such as Essex Region Conservation Authority (ERCA). The cost of these studies shall be borne by the Developer. Some studies that may be required include the following:

- a) Archaeological Study
- b) Environmental Impact Study
- c) Environment Site Assessment
- d) Fill and Floodline Study
- e) Geotechnical Report
- f) Noise and Vibration Study
- g) Storm Water Management Study
- h) Traffic Impact Study
- i) Servicing Study

Refer to the City of Windsor Official Plan (Section 10.2 – Support Studies) for further listings of studies that may be required by Council as part of the development / subdivision.

2.0 SURVEY REQUIREMENTS

2.0
Survey
Requirements

- a) The Developer shall contribute to the City a sum equivalent to 0.1% of the total construction cost for the installation of permanent geodetic benchmarks. The City shall install benchmarks in such locations as approved by the City Engineer. The elevations shall be transferred by a Professional Engineer or an Ontario Land surveyor using Second Order precision and submitted to the City Engineer.

- b) The Developer shall provide the City with a written statement by an Ontario Land Surveyor indicating that they have found or replaced all Standard Iron Bars shown on legal survey plans, prior to acceptance onto maintenance.

- c) The Developer shall provide grade stakes at each lot (or will arrange for the Builder to do so) to ensure that the dwellings are constructed at a grade which will be compatible with the road grade and which will permit lot drainage, to the satisfaction of the Chief Building Official. The Developer shall have the approved elevations for each lot verified by the Consultant or by an Ontario Land Surveyor following completion of construction on the lot. Verification of lot and building grades are required at the following stages:
 - A) Prior to pouring of foundation
 - B) At completion of final grading
 - C) One year after finalization of Building Permit.

3.0 DRAFTING REQUIREMENTS

3.1 PRELIMINARY DRAWINGS

The Consultant shall, prior to preparing detailed engineering drawings as outlined below, submit a minimum of three (3) copies of preliminary drawings to the City Engineer. These drawings shall be to a scale of 1:750, 1:1000 or 1:1250 horizontal and shall indicate the following:

- a) General layout of storm sewers, sanitary sewers and watermains including the proposed means of connection of these services to the existing City services inside, outside or on the limit of the development. The location of all other existing and proposed underground utilities shall also be indicated on the general layout.
- b) The limits of all storm and sanitary drainage affecting the design of storm sewers for the development and the composite runoff coefficients which the Consultant proposes to use for each area or sub area.
- c) The width of the proposed pavements and the location of sidewalks. The purpose of the preliminary drawings is to facilitate agreement between the City Engineer, City Planner and the Consultant on the general design concepts for the development before the Consultant proceeds with detailed engineering drawings.

3.0
Drafting
Requirements

3.2 NEW TECHNOLOGIES, METHODS and MATERIALS

If the Consultant wishes to introduce new technologies, methods, materials or products, the Consultant shall arrange a pre-construction meeting to discuss designs that may contravene City standards.

3.3 ENGINEERING DRAWINGS

3.0
Drafting
Requirements

Following approval of the preliminary drawings by the City Engineer, the Consultant shall submit three (3) sets of engineering drawings and three (3) set of specifications to the City Engineer. The plan / profile portion of the drawings shall have a minimum scale of 1:500 horizontally and 1:50 vertical. Where necessary, a larger scale up to 1:250 will be acceptable. The digital drawings shall be geo-referenced to the Corporation's Standard of NAD 83.

The engineering drawings shall contain the following:

- a) For City projects, The City of Windsor Coat of Arms shall appear on the cover sheet. The cover sheet shall also include the project title, date, key plan and index of contents.
- b) A sheet containing the overall layout of proposed lots, roads, sewers and services at a minimum of 1:1250 scale as outlined in Section 3.1 "Preliminary Drawings".
- c) Plan and profile of existing and proposed roads, sidewalks, storm and sanitary sewers, watermain and street lighting layout. The construction layout stations shall commence (0+000) at a survey bar at the intersection of a street right-of-way. Standard drawings AS-206A, B, C and D shall be used as guidelines for the location of utility placement. Profile portion shall indicate stationing, existing and proposed grade elevation, existing and proposed sewer pipe inverts, top of manhole elevation, pipe size, length, class and slope of each sewer segment.
- d) Detail sheet indicating typical cross-section of proposed pavement, base composition, sewers and utilities with trench backfill and any manhole detail that require special design consideration.
- e) A lot grading plan for the entire development indicating existing and proposed elevations, the proposed direction of overland flow and direction of flow on adjacent lands. The lot-grading plan shall also include elevations of all abutting properties and elevations of the proposed swales. A typical individual lot drainage plan shall also be shown on the grading plan. The Consultant shall supply to the City Engineer sewer design calculations. The Consultant shall also submit the grading plan to both the Chief Building Official and the City

Engineer. The Consultant shall coordinate responses from both officials and shall be included with the final grading.

- f) Borehole data charts and location plan.
- g) A detour plan with signage requirements and signature block for the Executive Director of Operations.
- h) Drainage area plans for both storm and sanitary.

The following additional general requirements shall apply to engineering drawings:

- i) Standard 594mm x 841mm or 610mm x 915mm sheet size.
- ii) Refer all elevations to Canadian Geodetic Datum.
- iii) Sewer easement widths are to be a minimum of 6.0 metres for one sewer, 7.5 metres for two sewers in the same trench and 9.0 metres for two sewers in separate trenches.

3.0
Drafting
Requirements

The Consultant shall make all changes to the drawings as required by the City Engineer and shall submit the originals and three (3) sets of specifications for final approval. One (1) set of drawings shall be returned to the Consultant bearing the approval of the City Engineer. The City Engineer shall be given additional sets of plans and specifications upon request.

The approval of the City Engineer shall be based upon the information provided by the Consultant and the City Engineer relies upon the professional skill, judgment and the ability of the Consultant. Notwithstanding the approval of the City Engineer, compliance with Standards, design and property ownership shall be the responsibility of the Consultant.

The Consultant shall obtain confirmation from each utility agency the proposed location of their respective utility in the right-of-way. The City Engineer shall not sign or accept construction drawings until he/she has received written notice that all utilities in the right-of-way are in agreement with the locations provided in the drawings.

If the drawings are revised in any way whatsoever after they have been approved by the City Engineer, the date of the revision shall be prominently noted in the list of

revisions in the title block and the drawings submitted to the City Engineer for approval. No revision is effective unless it is noted in the list of revisions and approved by the City Engineer.

3.4 AS-BUILT DRAWINGS

3.0
Drafting
Requirements

The Consultant shall make necessary corrections to the engineering drawings as required by the City Engineer in order to completely reflect “as-built” conditions and forward two (2) sets of prints, one (1) mylar and one (1) copy in electronic format (CD ROM disk, or DVD disk) of each sheet to the City Engineer by no later than one (1) month after the commencement of the maintenance period. Each sheet shall be signed and stamped by the Consultant and indicate all “as-built” details. The location and elevation of all private drain connections shall be indicated on the “as-built” drawings. The Consultant shall be responsible for making all field measurements required to complete the as-built drawings.

The final drawings must indicate:

- a) The location of all new private drain connections.
- b) The correct locations of new manholes in both plan and profile.
- c) Invert and top of manhole elevations as constructed.
- d) Adjusted stationing values for sewer segment lengths.

Where a development has been phased, a set of as-built drawings shall be submitted at the completion of each phase. Title sheet, index pages shall be adjusted to clearly identify the location of the work. Any portion of the drawing not related to the current construction shall be indicated in a light lineweight and clearly identified "NOT IN CONTRACT".

3.5 CONNECTION CARDS

The Consultant shall supply the City Engineer with Private Drain Connection details for each lot serviced.

The format shall be in a bound book, letter or legal size with front cover describing project, Consultants' name, project name and date. Each connection sheet shall contain the following information:

- a) Project name and date
- b) A legal description (i.e. Lot and 12M-plan number or Part and 12R-Number)
- c) Assigned Municipal address
- d) A Lot grading plan
- e) A Cross-section of lot showing drainage details

Each connection sheet must have a maximum of 2 municipal addresses where multi-residential such as duplex, or fourplex are being serviced.

3.6 DELIVERY OF DIGITAL DATA

The Consultant shall submit digital data for as-built drawings under the following standard conventions:

3.6.1 FORMAT and DELIVERY

- a) All Digital Plan Submissions must be submitted in an *AutoCAD Drawing (dwg) format*, version 2000 or higher.
- b) All digital files must be submitted on a standard Compact Disk (CD), Digital Video Disk (DVD), or email. Floppy diskettes will not be accepted. The media shall be delivered at no additional cost to the Corporation.
- c) If submitted on CD, it shall be labelled identifying the legal property description, type of drawing (i.e. Draft or Final), a project name, the 12M or 12R number, the contractor's name, the date of creation or submittal and the Coordinate System used (i.e. UTM NAD 83).
- d) A digital copy of the draft plan and the final plan are required.

3.6.2 GEO-REFERENCING and DRAWING ACCURACY

3.0
Drafting
Requirements

- a) The 6-degree Universal Transverse Mercator (UTM) Coordinate System, based on the North American Datum (NAD 83), Zone 17 with a minimum of two points of geodetic control for spatial reference, shall be used in all submitted drawings. All submitted drawings must be displayed in Metric Units.
- b) The resolution of all coordinates shall be stated to 0.001 metres and shall be given as a full coordinate (i.e. do not subtract 4,000,000 from the Northing coordinate).
- c) All submitted drawings shall be stamped with the time and date and with a notation of the reference monument used and its geographic coordinates and location. The following shall be stated on the face of the plan:
 - i) Integrated Survey – UTM NAD 83 (original or CSRS – whichever one is utilized)
 - ii) Bearings shown hereon are grid bearings are NAD 83, UTM ZONE 17, derived from (state the horizontal control monuments used and their Northing and Easting to three decimal place) using GPS observations on (state date) and are referred to the Central Meridian 81 degrees West.
 - iii) Distances shown hereon are adjusted ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.999879 (state to 6 decimal places).
 - iv) Co-ordinates shown hereon are UTM, ZONE 17, NAD 83 (original or CSRS – whichever one is used) (state to three decimal places).
- d) The accuracy of geodetic control must be within acceptable survey tolerances as set out by the Surveyors Act and other relevant surveying procedures provided by the Association of Ontario Land Surveyors for integrated surveys.

3.6.3 LAYER STANDARDS and REQUIREMENTS

Separation of layers is required to properly display and extract similar features from the drawing. An AutoCAD colour table file (.ctb) for plotting purposes shall be made available upon request. Specific layering structure or additional layers may be required for a select group of drawing entities.

- a) The boundary limit of the subdivision shall be a closed polygon with no overhanging or undershooting lines and exist on its own layer, free of text or other features. End points of polylines must be “snapped” together. The name of the layer must be recognizable as to what it contains. (i.e., Boundary)
 - i) All reserve parcels (i.e., 0.30m reserves) shall be assigned to a separate layer and drawn to scale with no exaggeration applied to the line work.
 - b) Lines delineating parcels, lots and or parts within the boundary shall exist on its own layer free of text or other features. The name of the layer must be recognizable as to what it contains. (i.e. Lot lines)
 - c) Text pertaining to the numbering and or description of the individual lots shall exist on its own layer free of other features. Text shall be entered using the AutoCAD standard font, TXT.SHX. The name of the layer shall be recognizable as to what is contains. (i.e. Plaintext)
 - d) All other features, layers and text that do not pertain to the subdivision boundary or delineations of parts and lots need no change. They may exist on individual layers, named accordingly to their contents.
- The drawing and line accuracy shall be within acceptable survey tolerances as set out by the Surveyors Act and other relevant surveying procedures provided by the Association of Ontario Land Surveyors.

3.0
Drafting
Requirements

4.0 STANDARD SPECIFICATIONS

Refer to the City of Windsor Standard Specifications (CWSS), the Ontario Provincial Standard Specifications (OPSS) drawings or as directed by the City Engineer for standard specifications. CWSS and OPSS will apply to, and govern, as noted herein, all construction of services in developments. The Specifications are subject to revision and the Consultant shall ensure that he/she has the most recent revisions.

4.0
Standard
Specifications

For standard specifications regarding urban design criteria, refer to the Huron Church Road Urban Design Master Plan and/or the City Centre Streetscape Standards.

5.0 STANDARD ENGINEERING DRAWINGS

The City of Windsor Standard Engineering Drawings are subject to revision and the Consultant shall ensure that he/she has the most recent revisions.

5.0
Engineering
Drawings

6.0 ROADS, BOULEVARD, DRIVEWAY APPROACHES, and EMERGENCY ACCESSES

All design and construction of roads, boulevards, and driveway approaches, shall be carried out in complete conformity with City of Windsor Standard Drawings and Specifications. The use of Supplementary Plans and Specifications prepared by the Consultant shall be permitted, but such Plans and Specifications must be approved by the City Engineer and City Planner.

6.1 DESIGN

6.1.1 PAVEMENT WIDTH REQUIREMENTS

6.0
Roads, Blvd,
DW Approach

The minimum pavement width (face-to-face) for various street classifications shall be as follows:

- | | | |
|----|--|-------------|
| a) | Cul-de-sacs and crescents with minimum lengths as shown on Standard Drawing AS-228 | 7.4 metres |
| b) | Local Roads | 8.6 metres |
| c) | Collector Roads | 10.4 metres |
| d) | Arterial Roads | 14.6 metres |

The City Engineer in consultation with the Executive Director of Operations and the City Planner shall determine the street classification. The Developer shall be required to bear the total cost of the pavements on local, minor collectors or roads that are directly attributable to the individual development. Road widths greater than the minimum and provide a community benefit shall be considered under a cost sharing or a development charge credit by the City Engineer.

6.1.2 RIGHT-OF-WAY REQUIREMENTS

The Official Plan Right-of-Way Width Requirements, as identified in Schedule F of the Official Plan or relevant Environmental Study Reports, provides a designation of all roads within the City of Windsor. Each road classification is used to describe the intended function of each thoroughfare. The following right-of-way widths shall be based on the specific road classification:

Classification	Right-of-Way Width	Roadway Access
Class I Arterial	36 metres	No direct access to properties when alternatives available
Class II Arterial	30 metres	Direct property access discouraged
Scenic Drive	20-24 metres	Direct property access permitted
Class I Collector	24 metres	Direct property access discouraged
Class II Collector	22 metres	Direct property access permitted
Local Road	15-20 metres	Direct property access permitted

6.0
Roads, Blvd,
DW Approach

Local roads with a right-of-way width of 15 metres are permitted to have a 7.4 metres wide pavement (see 6.1.1), provided the Developer conveys 2.5 metres easements on both sides of the right-of-way for the purpose of locating underground utilities.

The Developer shall gratuitously convey land for highway purposes of an appropriate width to the satisfaction of the City Engineer.

At all intersections of either a local road with a collector or an arterial road, a 4.6m x 4.6m corner cut-off shall be provided.

6.1.3 GEOMETRIC STANDARDS

The following geometric standards shall be used:

Classification	Minimum Corner Radius	Minimum Curvature
Local	7.6 metres	83 metres
Collector	9.2 metres	117 metres
Arterial	15 metres	159 metres
	• Radius to face of curb in cul-de-sacs	9.5 metres
	• Minimum boulevard width in cul-de-sacs	3.0 metres

LONGITUDINAL GRADE:

- Desirable Minimum 0.4%
- Absolute Minimum 0.3%

CROSS SLOPE OF PAVEMENTS:

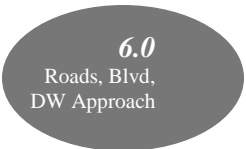
- Minimum - Concrete 2.5%
- Minimum - Asphalt 3.0%

CROSS SLOPE OF BOULEVARDS:

- Minimum 3.0%
- Maximum 8.0%

6.1.4 PAVEMENT SPECIFICATIONS

- Concrete curb and gutter shall be required on all pavements. The concrete curb and gutter shall be built to standards established by the City of Windsor Standard Engineering Drawings (AS-208 and AS-208A) or the Ontario Provincial Standard Drawings (OPSD 600.04). All underground works, including but not limited to watermains and sewers (but excluding hydro and private utilities) shall be tested and approved



(including flushing and sewer video inspection) prior to the installation of curb and gutter in the field.

- b) The design used for local street pavements shall be based on the minimum geotechnical conditions within the designated area, and must adhere to one of the following designs:
- i) 150 mm concrete pavement without reinforcement with integral curbs placed on approved uniformly compacted base.
 - ii) 190 mm of deep strength asphalt consisting of 150 mm of base asphalt and 40 mm surface asphalt on approved granular base.
 - iii) 40 mm of hot-mix asphalt of surface course asphalt plus 65 mm of base course asphalt laid on a minimum compacted thickness of 450 mm Class "A" granular base.

The Consultant shall be required to carry out soil testing and present a copy of the resultant report indicating the minimum pavement recommendations to the City Engineer. The report shall indicate that all roads shall include subdrains.

The report shall be subject to the approval of the City Engineer.

6.0
Roads, Blvd,
DW Approach

When required by the City Engineer, the Consultant shall carry out Benkelman Beam Testing, and the cost shall be borne to the Developer. The following maximum spring rebound values (mm at 21 C) will apply:

- Local Roads 2.50
- Collector Roads 1.50
- Arterial Roads 0.75

A seasonal correction factor shall be required for Benkelman Beam tests. The soil test and report shall be used by the Consultant to verify the designs referred to under above.

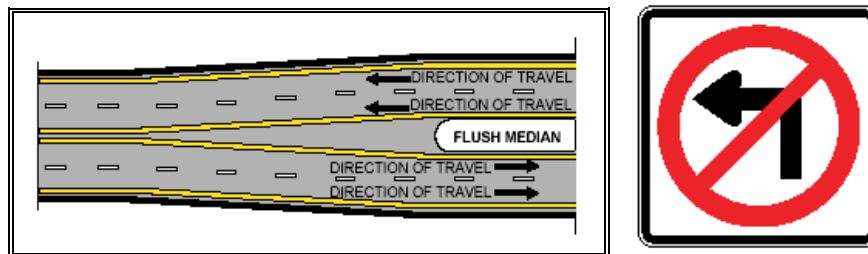
- c) At the discretion of the City Engineer, mix designs for hot-asphalt and concrete to be used in road construction shall be provided by the

Consultant to the City Engineer for approval. The latter approval must be obtained prior to commencement of road construction.

- d) Widening of pavement at road curvatures shall conform to Geometric Design Standards as published by the Roads and Transportation Association of Canada (Case 3, Table D.5.2(b)).

6.1.5 PAVEMENT MARKINGS and TRAFFIC SIGNS

Where pavement markings, delineators and object markers are used, they shall be uniform in design, position and application so that the road users can recognize and understand them immediately. All traffic signs and pavement markings (temporary, permanent) requirements shall comply with the Ontario Traffic Manual (OTM).



6.0
Roads, Blvd,
DW Approach

6.1.6 BIKE LANE

The construction of cycling networks in particular bike lanes, shall be designed to consistent and safe standards. The optimum recommended bike lane widths are as follows in order to enable cyclists to travel in a single file:

- a) WITHOUT ON-STREET PARKING
 - i) 1.5 metres (1.2 metres minimum to 1.8 metres maximum).
 - ii) Located immediately adjacent to the curb, or edge of pavement.

- b) WITH ON-STREET PARKING

- i) 4.0 metres, allowing for a 1.6 metres bike lane and a 2.4 metres wide curb side parking stall. Located immediately adjacent to the left of parked vehicles along the curb.

Refer to the Bicycle Use Master Plan (BUMP) or the Official Plan for additional design guidelines for the construction of the cycling network and supporting facilities including site-specific applications.



6.0
Roads, Blvd,
DW Approach

6.1.7 TRAFFIC CALMING

Traffic Calming requirements for new subdivisions will have an affect on the design and layout of a subdivision in an effort to maintain reasonable traffic speeds and volumes. The Traffic Calming Policy was approved by Council in 2005 and incorporates many different physical means of reducing traffic speed and volume in residential subdivisions. This policy also requires the installation of traffic calming devices in subdivisions to mitigate traffic problems from occurring.

Developers are responsible for the cost and construction of the following Traffic Calming devices when developing a neighbourhood road network:

- a) Intersections of Local Roads are to be constructed as traffic circles.
- b) Intersections of two Collector Roads are to be constructed as modern roundabouts.
- c) Long straight sections of roadway are not permitted. Therefore, one lane chicanes will be required on local roads and two lane chicanes are required on collector roads if the road segment's length is 300 metres or longer.
- d) Lane narrowing, including curb bump outs and median islands are required at all locations where a greater than usual number of pedestrians will be expected to cross. Example: Park entrances, schools, neighbourhood commercial establishments etc.
- e) Curb extensions are required at all intersections of Local and Collector Roads, unless it is determined that the device(s) would create significant impacts on Transit Service and /or Emergency Services.
- f) Median islands should be used extensively throughout all neighbourhood designs especially on Collector Roads and at key locations on Local Roads.
- g) Median islands should also be used at key locations to prevent nearby traffic from utilizing local roads as short cuts. This can be achieved by placing medians at intersections with local roads where short-cutting may be a future problem.

6.0

Roads, Blvd,
DW Approach

All of the above design elements are required to follow the Transportation Association of Canada's Traffic Calming For Residential Neighbourhoods document. The design of each respective device is subject to review by City Administration and Emergency Services.



6.1.8 DRIVEWAY APPROACH

- a) RESIDENTIAL DRIVEWAY
 - i) 115 mm concrete slab placed on a minimum compacted thickness of 50 mm of Class “A” granular base, in accordance with AS-222.
 - ii) 75 mm of hot-mix asphalt laid on a minimum compacted thickness of 225 mm of Class “A” granular base, in accordance with AS-221.

- b) COMMERCIAL DRIVEWAY
 - i) 150 mm concrete slab placed on a minimum compacted thickness of 50 mm of Class “A” granular base, in accordance with AS-204.
 - ii) 150 mm of hot-mix asphalt laid on a minimum compacted thickness of 50 mm of Class “A” granular base, in accordance with AS-203.

- c) APPROACH ACROSS CULVERT
 - i) Minimum culvert width of 4.9 metre laid on a minimum compacted thickness of 150 mm of approved backfill material, in accordance with AS-209.

6.0
Roads, Blvd,
DW Approach

6.1.9 EMERGENCY ACCESS

Emergency vehicular accesses shall be constructed where necessary as shown on Standard Drawing AS-229.

6.2 CONSTRUCTION

- a) The road base and pavement shall not be completed prior to completion and acceptance of underground services. In addition, all utility companies must complete backfilling and compaction of the sub-grade before any granular base course material is placed thereon for pavement construction purposes.
- b) The Developer may provide a temporary road to provide site access pending permanent road construction under Paragraph (i) above. The temporary road shall be removed completely before construction of the permanent road begins. The City Engineer shall consider incorporating temporary roads into the permanent roads.
- c) Approved backfill material, fully compacted, shall be provided at the rear of the curb after removal of forms.
- d) Particular care must be taken to avoid gouging or tearing of the new asphalt pavement by equipment engaged on other construction work within the development.
- e) Surface asphalt shall be placed after a minimum of one full winter following the laying of base asphalt, and following construction of 80% of proposed development.
- f) The Developer shall be required to place and grade a minimum of 100 mm approved topsoil on the boulevards and grade the latter.
- g) No natural topsoil is to be removed from designated park areas in developments.
- h) The following are the current City requirements for compaction:
 - i) All compaction testing will relate to the Standard Proctor test (and not the Modified Proctor test as previously specified by the City). Testing shall be carried out in accordance with the current A.S.T.M. Standard D-698-66T.

- ii) All road bases shall be compacted to 100% of maximum Standard Proctor dry density for granular material.
- iii) All sewer and utility trenches and their respective connections within the public right-of-way or property designated as a future right-of-way shall be compacted as follows:
 - A) Granular Material 100% of maximum Standard Proctor dry density
 - B) Native Material 95% of maximum Standard Proctor dry density
- iv) Only sewer and utility trenches that are constructed through easements or areas where no driveways or roadways are to be constructed shall be compacted as follows:
 - A) Granular Material 95% of maximum Standard Proctor dry density
 - B) Native Material 90% of maximum Standard Proctor dry density
- v) All sewer and utility trenches that would be constructed directly underneath the curb and gutter or across curb and gutter of pavements must be either augured or have their trenches compacted with granular material (100% compaction of Standard Proctor) from the pipe bedding to the road base (full depth).
- vi) Standard Drawing AS-319 (revised) shows these requirements for compaction of sewer and utility trenches.

6.0
Roads, Blvd,
DW Approach

7.0 SIDEWALKS and WALKWAYS

7.1 SIDEWALKS

The requirement for sidewalks on all roadways is indicated in the City of Windsor's *Official Plan* (particularly in new developments), and endorsed by Council Resolutions 435/2004, and 436/2004. Sidewalk locations within the public right-of-way shall be in accordance with approved cross-sections or as determined by the City Engineer. Sidewalk and walkway design must conform to the City of Windsor Accessibility Standards. Alternatively, inquiries may be directed to the Corporation's Diversity and Accessibility Officer.

The design and construction of sidewalks shall be undertaken at the Developer's expense in complete conformity to City of Windsor Standard Drawings and Specifications, specifically AS-401, 402, 403, and 404. The use of Supplementary Plans and Specifications prepared by the Consultant will be permitted, however each Supplementary Plan and Specification must be approved by the City Engineer.

7.1.1 DESIGN

7.0
Sidewalks &
Walkways

Concrete sidewalks shall be constructed as follows:

- a) RESIDENTIAL
 - i) SIDEWALK MINIMUM STANDARDS (In accordance with AS-401)
 - A) Width of 1.5 metres
 - B) 50 mm of compacted Granular 'A' base.
 - C) 115 mm thick Portland cement concrete sidewalk with broom finish.
 - D) 2% grade cross-slope.
 - E) Setback of 1.0 metre from back of curb.
 - F) Setback of 0.3 metres from any vertical obstruction.
 - G) Opposite side of streetlights, and
 - H) Sidewalks to extend through driveways.
 - ii) WHEEL CHAIR RAMP (in accordance with AS-402)

- A) Minimum 1.83 meters ramp length
 - B) Maximum slope of 12:1 or 8.3 %
- b) COMMERCIAL
- i) SIDEWALK MINIMUM STANDARDS (in accordance with AS-403)
 - A) 50 mm of compacted Granular 'A' base.
 - B) 115 mm thick Portland cement concrete sidewalk with broom finish.
 - C) 2% grade cross-slope.
 - D) Setback of 1.5 metres from back of curb.
 - E) Setback of 0.3 metres from any vertical obstruction.
 - F) Sidewalks to extend through driveways
 - ii) WHEEL CHAIR RAMP (in accordance with AS-404)
 - A) Minimum 1.83 meters ramp length
 - B) Maximum slope of 12:1 or 8.3 %



7.0
Sidewalks &
Walkways

7.1.2 REQUIREMENTS PRIOR TO CONSTRUCTION

The Developer shall agree to the following conditions prior to the construction of sidewalk(s):

- a) Sidewalks shall be constructed on a minimum one (1) side of local roads, or on two (2) side(s) of collector or arterial roads, constructed completely within the public right-of-way, and
- b) The Developer shall insert a *Sidewalk Notification Clause* into all Agreements of Purchase and Sale, and Leases for lots on the subject lands making persons aware that a sidewalk shall be constructed on one (1) or two (2) side(s) of all streets, that the sidewalk will be located on the Corporation's lands adjacent to their property, and that no structures or excavations are to take place beyond their property line without obtaining permission from the Corporation.
- c) The Developer shall erect subdivision signs/maps showing the road pattern, the location of community facilities, and sidewalks.
- d) The Developer shall identify the specific sidewalk construction costs in the comprehensive infrastructure security.
- e) The Developer shall agree to the provision for the retention of bond securities to ensure the repair of sidewalks damaged during house construction.

7.0
Sidewalks &
Walkways

7.2 WALKWAYS

Walkways shall have a minimum right-of-way width of 6.1 metres with a sidewalk width of 1.8 metres and fencing constructed thereon. (Refer to Standard Drawing AS-223). Depending on the length of walkway, lighting may be required. Refer to the City of Windsor Landscaping Requirements for Development in Windsor, 4th Edition. Alternatively, inquiries may be directed to the Corporation's Landscape Architect.

8.0 STORM SEWERS

All design and construction of storm sewers shall be carried out in complete conformity with the City of Windsor Standard Plans and Standard Specifications. The use of Supplementary Plans and Special Specifications prepared by the Consultant shall be permitted, but the City Engineer must approve each such Plan and Specification.

8.1 DESIGN

8.1.1 PIPE REQUIREMENTS

- a) The storm sewer shall be located in the right-of-way as shown on Standard Utility Cross-Section, Drawing AS-206A, B, C and D.
- b) The minimum pipe diameter shall be as follows:
 - i) Mains - 300 mm
 - ii) Double catchbasin connections - 250 mm
 - iii) Single catchbasin connections - 200 mmThe pipe bedding shall be as directed by the City Engineer.
- c) The minimum cover placed over pipes shall be 1.0 metre.
- d) Manholes shall be provided (in accordance with AS-314A-E):
 - i) At the junction of mains.
 - ii) At changes in size of mains.
 - iii) At changes in grade of mains.
 - iv) At changes in alignment of mains except on a curvilinear alignment.
 - v) At changes in product material and where conductivity is necessary.
- e) The maximum manhole spacing shall be as follows:
 - i) 120 metres for pipes up to 675 mm in diameter.

- ii) 150 metres for pipes 750 mm to 1,350 mm inclusive in diameter.
- iii) Special study to determine the optimum manhole spacing will be required for pipes 1,500 mm and over in diameter, as approved by the City Engineer.

8.1.2 CONNECTIONS

- a) Minimum 150 mm in size.
- b) Wye-connection permitted for new lots.
- c) Risers / cleanouts to be placed at property line marked with a “2x4” wood stud painted green.
- d) Storm sewer private drain connections shall be installed to each dwelling unit. The pipe shall be a single 150 mm pipe separately connected to the storm sewer. However, a wye connection servicing two lots will be permitted if connections are laid out in accordance with the City of Windsor Standard Drawing AS-318. The depth of connection at the lot line shall be a minimum of 1.2 metres and a maximum of 2.1 metres below finished grade. If special circumstances require that a shallower or deeper connection be approved, the Developer or his Consultant shall obtain such approval from the City Engineer and a special note on connection depth shall be marked with a plank extending from the obvert of pipe to 1 metre above grade, painted green to distinguish a storm connection. The depth of connection is to be reflected in the construction drawing and the PDC sheets.

8.1.3 CATCHBASINS

Catchbasins shall not be more than 90 metres apart (each side of the road considered separately) or not more than 90 metres distant from any high point, provided that no further drainage other than that from the high point to the catchbasin is directed to the catchbasin. Catchbasin locations shall not conflict with existing/future driveways.

8.1.4 SEWERS

- a) Storm sewers shall be designed to accept all drainage from the tributary catchment area. The Consultant, subject to the approval of the City Engineer, shall determine the latter.
- b) Storm sewers sizes 300 mm diameter or larger may be installed on a curvilinear alignment provided that:
 - i) 1.95 metre lengths of pipe are used.
 - ii) The minimum radius of pipe is 99 metres.
 - iii) The sewer is hydraulically designed to eliminate the need for cleaning.
 - iv) The manufacturer specifies specific requirements.
- c) The Consultant shall obtain the approval of the City Engineer as to the design methodology to be used for the proposed development. If the Rational Formula is approved for use, then the units of the equation components shall be as described below:
 - Q - storm runoff flow in m³/s,
 - A - tributary area in hectares
 - C - coefficient of runoff
 - I - intensity in mm/hr
 - i) The value of the runoff coefficient, C is to be taken from the following table and shall represent ultimate conditions:

Type of Surface	Runoff Coefficient
Roofs	0.95
Road Pavements	0.90
Paved Driveways and Patios	0.90
Lawn - Sandy Soil	0.15
Lawns - Clay Soil	0.20
Parks, Totlots	0.20
Gravel Lots	0.55

8.0
Storm Sewers

The composite runoff coefficients for each area or sub-area shall be developed by the Consultant from the above table of coefficients and indicated on the Preliminary Drawings as per Section 3.1.

- ii) The rainfall intensity (“I”) for the 1 in 5-year storm, shall be taken from the Intensity Duration curve for a separate system shown on the City of Windsor Standard Drawing no. AS-105.
- iii) The inlet time shall be taken as 20 minutes (**MAXIMUM**).
- iv) The minimum velocity for full flow shall be 0.76 metres per second and the maximum shall be 3.00 metres per second.
- v) Manning’s Roughness Coefficient “n” factor (smooth walled sewer pipes only) shall be $n = 0.013$.
- vi) The following are the minimum slopes, which shall be provided in sewers:

Sewer Size	Minimum Slope %
200 mm	0.52
250 mm	0.39
300 mm	0.30
375 mm	0.23
400 mm	0.21
450 mm	0.18
525 mm	0.14
600 mm	0.12
675 mm	0.10
750 mm	0.09
825 mm	0.08
900 mm	0.07

- d) All pipe crossings shall be designed and constructed in accordance with Standard Drawing AS-312, unless otherwise approved by the City Engineer.
- e) All pipes shall conform to City Specifications.



- f) The Consultant shall prepare Ministry of the Environment (MOE) application forms and forward them to the City Engineer for signature before transmission to the Ministry.
- g) The Developer shall install outlet storm sewers to existing or proposed City trunk sewers or natural or artificial watercourses inside or outside the development. In no case will outlet be permitted to natural or artificial watercourses not having sufficient capacity for the proposed discharge. The Developer shall obtain a permit, or clearance, from the Essex Region Conservation authority (ERCA) for all outlets to natural or artificial watercourses. The Developer shall ensure that the development does not cause interference with the riparian rights of properties upstream or downstream from the development.

8.1.5 DRAINAGE

a) REAR YARD DRAINAGE

Rear yard drainage shall be provided for each individual lot and connected to the storm sewer connection servicing the lot. Grading of rear yards shall be such that all surface drainage be directed to the rear yard drainage system. Details of typical rear yard drainage systems shall be provided for the review and approval of the Chief Building Official.

b) TILE DRAINAGE

In areas designated as agriculture lands, the installation of tile drainage is a common land improvement practice among property owners. Corrugated plastic farm tiles, clay or concrete drain tile, are installed beneath the land/soil to drain excess water from the crop root zone. Tile drainage benefits crop productivity, farm efficiency and even reduces environmental impacts.

Developers are required to plug all connections and provide the City with mapping, showing the drainage areas. Refer to the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAF) publication 29, *The Drainage Guide for Ontario* for guidelines on the design and installation of tile drainage systems.

c) DITCH ENCLOSURES

Enclosures of abutting open roadside ditches is required for new developments, additions and/or alterations to existing properties. Ditch enclosures shall be in compliance with the requirements for culverts, and shall include catchbasins for roadside drainage.

8.2 CONSTRUCTION

- a) Sewer trenches under pavements shall be backfilled to the surface with compacted granular materials (unless otherwise approved by the City Engineer) as per City Standard Specifications.
- b) Natural or artificial watercourses shall not be blocked, abandoned or otherwise altered during the course of construction in the development unless approved by the City Engineer. Such alterations shall also require the permission of the Essex Region Conservation Authority (ERCA).
- c) Culverts used for ditch enclosures and/or driveway approaches over open ditches shall comply with Drawing AS-209, as well as the following requirements:
 - i) Headwalls shall be provided at each end of the culvert, in compliance with City Standard, OPSS Standards, or as approved by the City Engineer. Culverts shall be provided with cleanouts or other access for maintenance purposes, and spaced as follows:

<u>Culvert Size</u>	<u>Maximum Spacing</u>
15" to 18"	40 feet
21" to 24"	60 feet
30" and up	80 feet maximum.

- ii) Culverts within the municipal right-of-way shall be of concrete material or plastic (smooth-walled interior surface).

9.0 SANITARY SEWERS

All design and construction of sanitary sewers shall be carried out in complete conformity with City of Windsor Standard Drawings and Standard Specifications. The use of Supplementary Plans and Special Specifications prepared by the Consultant will be permitted, but each such Plan and Specification must be approved by the City Engineer.

9.1 DESIGN

- a) The Sanitary sewer shall be located in the right-of-way as shown in the Standard Utility Cross-Section Drawings AS-206A, B, C and D.
- b) The minimum pipe diameter for mains shall be a 250 mm pipe. The pipe bedding shall be as directed by the City Engineer.
- c) The design of the sanitary sewer system should be such as to provide for gravity flow from all basements in the system.
- d) The maximum manhole spacing shall be as listed herein for storm sewers.
- e) No incoming pipe shall be permitted above the benching in the main sewer unless a drop structure is installed in accordance with AS-527, to divert sewage to beneath the benching. The drop pipe shall be on the inside of the manhole based on a design approved by the City Engineer. The size of manhole shall be increased to a minimum of 1500 mm diameter where a drop structure is required.
- f) The Developer shall install sanitary sewers that will outlet to existing or proposed City trunk sewers inside or outside the development.
- g) Sanitary sewers shall be designed to provide service for the entire sewerage area. The Consultant shall determine the appropriate outlet, subject to the approval of the City Engineer.

9.0
Sanitary
Sewers

9.1.1 CONNECTIONS

Each dwelling unit shall be serviced with a single 150 mm (minimum) diameter pipe separately connected to the sanitary sewer. However, a tee-connection or a wye-connection servicing two lots will be permitted if connections are laid out in accordance with the City of Windsor Standard Drawing AS-318. Direct connections to a manhole shall not be permitted. The depth of connection at the lot line shall be a minimum of 2.4 metres and a maximum of 3 metres below finished grade. Cleanouts shall be installed at the property line at the time of the development. A 2x4 marker painted red shall be placed adjacent to the cleanout. If special circumstances require that a shallower or deeper connection be approved, the Developer or his Consultant shall obtain said approval from the City Engineer and a special note on connection depth shall be added to the engineering drawings.

9.1.2 DESIGN CRITERIA

a) The design criteria for sanitary sewers shall be as follows:

- Residential sewage flow 0.0042 Litre/second/capita
- Infiltration 0.1560 Litre/second/hectare
- Minimum velocity 0.75 metres per second
- Maximum velocity 3.00 metres per second

b) The ultimate flow shall be determined from the following formula:

$$Q \text{ (Ultimate)} = \text{Residential Sewage Flow} \times \text{Ultimate Population Served} \times \text{Ultimate Flow Factor} + \text{Infiltration}$$

c) The ultimate population to be served by a sanitary sewer shall be determined from Land Use Plans, based on the following table:

Land Use	Population Density Code
Residential	50 persons / ha
Commercial	74 persons / ha
Industrial	62 persons / ha
Institutional	22 persons / ha

- d) The ultimate flow factor shall be taken from the following table:

Population	Ultimate Flow Factor
1,000	6.00
1,500	5.75
2,000	5.55
2,500	5.35
3,000	5.20
4,000	4.92
6,000	4.50
8,000	4.15
10,000	3.90
15,000	3.40
20,000	3.20

- e) Manning's Roughness Coefficient "n" factor (smooth walled sewer pipes only) shall be $n = 0.013$.
- f) Minimum slope requirements shall be as listed herein for storm sewers.
- g) The City shall not permit curvilinear alignment of sanitary sewers unless special circumstances warrant, which require the approval of the City Engineer.
- h) All pipe crossings shall be designed and constructed in accordance with the Standard Drawing AS-312 unless otherwise approved by the City Engineer.
- i) All pipes used as sanitary sewers shall be approved by the City Engineer and shall conform to the latest City of Windsor Specifications.
- j) The requirements and procedure regarding Ministry of the Environment approval as listed for storm sewers shall also apply to sanitary sewers.
- k) Refer to Section 1.12 for easement width requirements.

9.2 CONSTRUCTION

The requirements listed herein for storm sewer trenches under pavement and boulevards shall also apply to sanitary sewer trenches.

9.0
Sanitary
Sewers

10.0 PUMPING STATION

The Developer shall provide the City Engineer with storm and sanitary pumping station design, as required, prepared by a licensed Professional Engineer in Ontario. Drawings and specifications shall meet the following minimum design criteria.

10.1 PUMPING STATION ACCESS

- a) ASPHALTIC CONCRETE PAVING
 - i) GRANULAR BASE COURSE to be 450 mm thick Granular "A" to City of Windsor Standard Specifications S-4, compacted to 100% maximum S.P.D.D.
 - ii) SURFACE ASPHALT to be 40 mm of hot mix asphalt of surface course plus 65 mm of base coarse asphalt.

The access route shall be a minimum of 4 metres in width or as specified by the City Engineer and/or Executive Director of Environmental Services. Paved access shall be provided up to the front of building and to location of diesel fuel filler pipe.

10.0
Pumping
Stations



10.2 SITE / BUILDING DESIGN

The design criteria for the site/building are as follows:

- a) All pumping stations shall be vandal-proof and architecturally compatible with the neighbourhood in which they are located.
- b) Building construction shall be brick and/or architectural block.
- c) The site of the station shall be graded, sodded and landscaped to ensure proper surface drainage. It shall be compatible with the surrounding neighbourhood.
- d) The site shall be accessible from a municipal street and sufficient clearance shall be provided from neighbouring properties to allow easy access to the building and/or from all sides with a vehicle used for inspection and maintenance.
- e) Access must be provided for a standby electrical generating system where required. Access shall also be provided for the storage or removal of snow.
- f) The site shall have paved access on all sides of well and a turn-around area suitable for a 1-ton truck

10.3 PUMP DESIGN

The design criteria for the pump are as follows:

- a) Pumping stations shall be designed in accordance with the most recent Ministry of Environment (MOE) Standard Specification No. 3 for Submersible Sewage Pumps; Issue No. 2 dated March 1984 except when the sewage wet well is classified as a hazardous location to Class 1, Group D, and Division 1.
- b) Pumps shall comply with enclosed System Curves at end of Division 15, Mechanical, of Appendix F.
- c) The ordering, schedule delivery, off-load, and storage on site shall be in accordance with manufacturer's instructions, and protective of equipment whenever possible.
- d) Coordinate with manufacturer and City for equipment delivery, anchors and supports, paint requirements, factory tests, spare parts, instruction manuals, etc.
- e) Six copies of performance curves and shop drawings of equipment shall be submitted to the City Engineer for review.
- f) Four copies of mechanical and electrical instruction manuals, including parts lists, erection drawings, installation details, lubrication requirements, maintenance and operation of the equipment shall be submitted to the City Engineer.
- g) The total number of pumps in the station, exclusive of the standby pump, must be capable of providing firm capacity at the maximum rated flow to the station.
- h) If the pump station is to have several pumps installed over a period as the development proceeds, the station must have firm capacity at all times during the said period.
- i) A generator shall provide standby power unless the City Engineer approves an alternative means of standby power. The standby power shall be adequate for the rated capacity of the station plus all auxiliary equipment. The standby power system shall include an automatic transfer switch. If a station incorporates a portable generator set, a manual transfer switch is acceptable.

- j) An additional pump shall be provided to handle dry weather flow and to pump out the wet well for inspection purposes, should regular pumps in the station not be able to handle either or both of the latter duties.
- k) All pumps shall have automatic controls of a type approved by the City Engineer. The total electrical system shall be of a design approved by the City Engineer. All wiring shall be colour coded.
- l) The wet well shall be vented and completely sealed off from the working floor containing the controls so that no corrosive gases can deteriorate the electrical and/or electronic systems. Dehumidifying equipment shall be provided in the working floor area.
- m) Mufflers and architectural control of the buildings shall provide maximum control of noise. The noise level shall not exceed 75 decibels, and meet the following conditions:
 - When measured at a point not exceeding 1.8 metres from the building, or
 - At any audible frequency.
 - Must comply with MOE requirements.
- n) An internal crane of sufficient capacity or an external crane with hatches in the roof of the station shall be installed to facilitate dismantling and repair of equipment.
- o) Provision shall be made for remote monitoring of the necessary operating parameters of the station. The number of parameters shall depend on the equipment in the station.
- p) All necessary indicating and recording equipment shall be subject to the approval of the City Engineer. An ultrasonic (milltronics) water level indicating controller for the wet well shall be included in the instrumentation.
- q) The Consultant shall specify the manufacturer the type and quality of material of the pump. They shall also specify the method of design that will meet or exceed City standards prior to approval of the station design.
- r) The Executive Director of Environmental Services shall have the authority to reject any material or equipment specified by the Consultant, which does not conform to the existing equipment in order to alleviate the necessity of building up a new stock of replacement parts.

- s) Any material used during construction shall be new and meet C.S.A., CUL or ESA approval.
- t) The detailed designs for individual stations (i.e. single line 600 V diagrams lighting, heating and cooling and automatic circuitry) shall be submitted to the City Engineer for review and approval prior to tender calls.
- u) Only instrumentation from manufacturers who will supply detailed shop drawings and manuals shall be accepted. Assurance shall be required in writing from major suppliers that they shall supply detailed electrical and instrumentation schematics prior to approval of equipment to be supplied for installation and final completion of specification.

11.0 WATER AND HYDRO

11.0
Water and
Hydro

All inquiries regarding water services shall be directed to the Windsor Utilities Commission (WUC). All inquiries regarding hydro services shall be directed to EnWin Utilities. The Developer shall enter into a separate servicing agreement with both WUC and EnWin Utilities.

The above utilities shall be located as shown on the attached Standard Roadway Cross-section AS-206A, B, C, and D.

12.0 STREETLIGHTING

All design and installation for streetlights shall be to the satisfaction of the City Engineer and/or the Executive Director of Operations.

12.0
Streetlighting

13.0 INSPECTION and TESTING

13.1 CITY INSPECTOR

The role of the City Inspector is to protect the interests of the City of Windsor. The City Inspector shall oversee the quality of construction by the developer prior to the assumption of services by the City. City Inspectors are provided to ensure that all work is carried out in accordance with the City of Windsor Standards and requirements.

13.2 INSPECTION

13.0
Inspection and
Testing

All roads, boulevards, sidewalks, walkways, emergency accesses, sanitary and storm sewers and pump stations installed by the Contractor, shall be inspected and recommended for approval by City Inspectors. The duties and responsibilities of the City Inspector has been set out in the General Requirements (Section 1.0) of this Manual. No charge shall be made by the City for inspection provided that the Consultant / Contractor shall:

- a) Give the City Engineer 48 hours notice of commencement of work.
- b) Proceed expeditiously to the completion of all work undertaken.
- c) Submit to the City Engineer a schedule to be followed in construction of services required herein.
- d) Co-operate fully with the City Inspector by making all parts of the work accessible.
- e) Organize the work operation so as to permit inspections to be carried out during regular working hours as far as possible.

The City shall co-operate with the Contractor in arranging to have the City Inspector available to carry out, without delay, such inspections as may be necessary upon receipt of reasonable notice. The City may recommend that the Consultant issue “Stop work Orders” to the Contractor and/or if, “Charge Orders”, are required, to

ensure conformity to City Specifications (Refer to Section 1.2 “Consulting Engineer”).

13.3 TESTING

The City shall carry out the following tests (at no cost to the Developer) except as outlined below.

- a) Sieve analysis of all granular materials to verify conformity with specifications.
- b) Still or CCTV photography of interior of sewers to detect cracking, pipe failure or other defects in accordance to the City’s policies and requirements.
- c) Slump and air content tests of all concrete used.
- d) Compaction testing on all materials used for road bases and for backfill to sewers, laterals and appurtenant structures.



13.3.1 CLOSED CIRCUIT TELEVISION (CCTV)

Prior to performing a Closed Circuit Television Inspection (CCTV), the Contractor shall ensure that the sewers are clean, all applicable testing including infiltration / exfiltration and the passing of the test gauge has been successfully completed, and that all manholes are accessible. Sufficient water shall be introduced to the lines so that any ponding will be evident. The City shall complete all CCTV inspection within three working days, weather permitting. All costs associated with the initial CCTV Inspection shall be the responsibility of the City. The cost of subsequent CCTV Inspections due to dirt, defects, lack of water or inaccessibility shall be borne to the Contractor / Developer.

13.4 REQUIREMENTS

The Developer shall not be required to pay for normal testing as outlined above. However, if the quality of the materials used or the work provided is such that additional or repeated testing is required, the City reserves the right to invoice the Developer for the actual cost of such extra testing.

13.0
Inspection and
Testing

- a) The Developer, through its Consultant, shall arrange for the following tests to be carried out at their expense:
 - i) Compressive and/or flexural strength tests on all concrete placed.
 - ii) Structural testing of sewer pipe (if required by the City Engineer).
 - iii) Determination of laboratory Proctor values for granular and non-granular materials from new and/or untested sources.
 - iv) Physical tests of materials from new and/or untested sources.
 - v) Exfiltration and infiltration tests of sewer pipe (if required by the City Engineer), or
 - vi) Air testing of installed sewer pipe.
 - vii) Extraction, gradation and compaction tests on hot mix asphalt to verify conformity with specifications and mix design.
 - viii) Benkelman beam tests on roads under construction to verify that design rebound values shall not exceed maximum values identified in Section 6.1.4 when pavement construction has been completed, if required by the City Engineer.

The acceptance of the roads, boulevards, sidewalks, walkways, emergency accesses, sanitary and storm sewers and pumping station installed by the Developer, shall be subject to satisfactory results from all of the above tests. Furthermore, the Consultant shall submit all mix designs from suppliers of all concrete and asphalt products. The Consultant shall be responsible to ensure that the appropriate test certificates accompany all materials supplied to the site. Any new product, which has not met with prior approval, shall not be incorporated into the works. It shall be the responsibility of the Consultant to provide all background information on these new products and make recommendations to the Corporation of their acceptability. If the Contractor wishes to introduce a new product, material or method, this shall be channelled through the Consultant, to the City Engineer for approval.

The City reserves the right to perform any further testing in order to confirm the results and the cost shall be borne to the Developer.

- b) The Developer shall be responsible for inspection of their works and ensuring that their equipment is installed in the allotted locations. They shall also be responsible for ensuring that trenches are backfilled with granular materials. Should the work provided require additional testing by the City, the City reserves the right to invoice the Developer concerned for the actual cost of such testing.

13.0
Inspection and
Testing

14.0 ACCEPTANCE and ISSUANCE OF BUILDING PERMITS

14.1 RELEASE OF BUILDING PERMITS and ACCEPTANCE ONTO MAINTENANCE

Prior to the issuance of a Building Permit by the Chief building Official and prior to the City Engineer accepting the works onto maintenance, the following must be satisfied:

- a) All underground work must be completed, tested and approved by the City Engineer.
- b) All surface work, with the exception of surface asphalt and sidewalks, must be completed.
- c) All signs erected as required by the Executive Director of Operations. If early opening of roads is required, the Contractor shall provide "ROAD CLOSED" signs until "STOP" signs are in place.
- d) The only deficiencies which can be carried over are those which cannot be corrected because of weather conditions.
- e) A security for only those outstanding deficiencies, which are allowed, shall be received.
- f) A security for the maintenance period shall be received.
- g) Building Permits can be issued on a complete phase of development as long as the above criteria are met, and all issues identified in the Agreement (i.e. parkland dedication, fees, zoning) are fulfilled or satisfied.
- h) Issuance of model home permit or conditional permit.

14.0
Acceptance &
Issuance

14.2 ACCEPTANCE ONTO MAINTENANCE - PROCEDURE

The procedures for the Corporation to accept onto maintenance, roads, boulevards, sidewalks, emergency accesses, storm and sanitary sewers and pump stations installed by the Developer, are as follows:

- a. The Consultant will advise the City Engineer that installation of the services in the development is complete.
- b. City Inspectors shall inspect all installed services. This inspection shall be carried out in the company of the Consultant.
- c. The results of all previous interim inspections and tests shall be reviewed to verify that previously noted deficiencies have been rectified. City Inspectors shall be present to witness all testing and to recommend if additional testing is required.
- d. Following the inspection referred to above, a deficiency list shall be prepared by the Consultant, agreed to by the City Inspector and forwarded to the City Engineer.
- e. As soon as the deficiency list has been discharged, the Consultant shall arrange for a final inspection with City Inspector. If the entire deficiency list has been discharged, then the City Inspector shall recommend to the City Engineer that the services be accepted onto maintenance, The Developer shall ensure that a current maintenance bond is posted with the City.
- f. The City Engineer, at his discretion, may accept the work in phases.
- g. If an inspection of sewers by the City is deemed to be required, then Closed Circuit Television (CCTV) inspection of the sewers shall be completed and any deficiencies uncovered shall be repaired before all of the services are accepted onto maintenance.
- h. The City reserves the right to take necessary action and charge the Developer for any damage caused due to sewer back up.
- i. The Developer is responsible for on-going maintenance until final assumption of services by the City. The Developer's maintenance responsibilities include:
 - i) Catchbasin maintenance
 - ii) Street cleaning
 - iii) Sewer system maintenance
 - iv) Hydro poles (all utilities) and street light poles

14.0
Acceptance &
Issuance

14.3 FINAL ASSUMPTION

The services installed shall be further inspected prior to the expiry of the maintenance period. If any further deficiencies exist, the Developer shall be required to carry out the necessary remedial work. As soon as this work is completed, the City shall assume the services, subject to the following requirements:

- a) The Developer shall discharge all of its obligations as set out in the Servicing Agreement with the City.
- b) The Developer shall furnish the City Engineer with a statutory declaration to the effect that the Developer has paid all accounts in connection with the installation and maintenance of such works and that there are no outstanding claims relating thereto.
- c) The Developer shall provide all “as-built” drawings as specified in Section 3.4 “Drafting Requirements”.
- d) The Developer shall comply with the Survey Requirements listed in this Manual.
- e) The Developer shall obtain the approval of EnWin Utilities for all services for which they are responsible.
- f) The Developer shall obtain the approval of the Chief Building Official for rear yard drainage systems.
- g) The Developer shall ensure that all sewers, catchbasins are clean. If required, flushing of the sewers shall be at the Developer’s expense.
- h) The City shall bear the cost of CCTV testing.

14.0
Acceptance &
Issuance

15.0 STORMWATER MANAGEMENT

15.1 GENERAL REQUIREMENTS

Much of the development in the City of Windsor takes place in areas where there is limited capacity for storm drainage. As a result, much of the development has had to restrict the outflow of stormwater from the sites to the pre-development flow. In addition, the Essex Region Conservation Authority (ERCA) frequently comments on stormwater discharge and floodplain development and their requirements must be satisfied. To assist Developers and their Consultants in dealing with storm detention, the following points shall be complied with:

- a) The Developer's Consultant shall familiarize himself with all storm drainage reports prepared by the City and its Consultants dealing with storm drainage in the area of a proposed development.
- b) The Developer's Consultant shall liaise with ERCA early in the planning stages to ensure that the authority's requirements are well known to the Developer and can be met as part of the proposed development.
- c) The Consultant shall prepare a Servicing Report dealing with the storm drainage issue in detail.
- d) All storm sewers shall be designed in accordance with the parameters outlined in this Manual and MOE guidelines.
- e) Stormwater management facilities are designed to accommodate the difference between the pre-development flow and the post-development flow.
- f) Stormwater management ponds are usually sized to accommodate the difference between the 1:5 year pre-development and post-development flow. Storm detention calculations shall be based on a 1:5-year storm, with the exception of other specific areas, as identified by the City Engineer, which will be calculated based on the 1:2 year storm frequency.

15.0
Stormwater
Management

- g) Storm detention calculations may be submitted for parcels less than 0.40 ha (1 acre) in area; however, stormwater management reports are required for sites greater than 0.40 ha in area.
- h) ERCA normally requires that the development retain the difference between the 1:100 year pre-development flow. A good portion of this storage is normally accommodated in a stormwater management facility; however, the balance can usually be accommodated within the travelled portion of the roads within a development.
- i) ERCA has set standards for developments that are located in floodplain and adjacent areas. The Consultant shall be aware of these requirements by ERCA and incorporate them into the design of services and structures.
- j) All storm water management facilities shall follow the requirements of any Master Plans prepared for the City affecting the lands within the development.
- k) For subdivisions or large sites, stormwater management reports and plans shall incorporate Best Management Practices to control sediment movement on-site.
- l) Any permanent stormwater management facilities shall be approved by City Council and included in an amending servicing agreement.

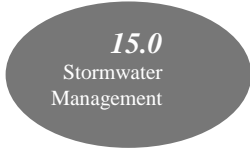
15.0
Stormwater
Management

15.2 DETERMINATION OF APPLICABILITY OF STORM WATER MANAGEMENT MEASURES

The General Requirements are applicable to the majority of developments; however some minor developments might not be required to submit storm detention calculations. Before a development may be considered minor, the Developer shall obtain approval from the City Engineer. The City is entitled to ask the Developer to submit a stormwater management plan and/or storm detention calculations regardless of the size of development.

- a) A development may qualify as minor if it meets the following criteria:

- i) The development is a single, duplex or semi-detached residential property,
 - ii) Commercial properties where the total lot area is less than 0.4 ha,
 - iii) Commercial properties where the impervious area is less than 75% of the total area.
- b) For minor developments, the following restriction measures may be required:
- i) Disconnection of downspout or roof leader.
 - ii) Use of an existing storm sewer connection if available.
 - iii) A new storm sewer connection with a diameter of 150 mm.
 - iv) Preservation of existing land coverage.
 - v) Compliance of requirements i) and ii) of section 15.1 General Requirements.
- c) All remaining properties that do not meet previous criteria shall be required to follow the requirements outlined in section 15.1 General Requirements. Properties include but are not limited to:
- i) Commercial properties with a lot area greater than 0.4 ha or an impervious lot coverage of more than 75%,
 - ii) All industrial properties,
 - iii) All institutional properties,
 - iv) All high-density residential (including triplex properties, apartments and condominiums,
 - v) All subdivision development.



15.3 SUBMISSION REQUIREMENTS FOR STORM DETENTION CALCULATIONS

Submittal of storm detention calculations, signed and stamped by the Consultant are required to be submitted, for approval by the City Engineer, prior to the issuance of permits. As part of the storm detention calculations the following must be submitted:

- a) Site Servicing and Lot Grading Drawings with the following clearly labelled:

- i) Drainage/catchment areas (size, elevations, etc.),
 - ii) Ponding areas and depths (roof top and parking areas),
 - iii) Elevations/Inverts (pipes, catchbasins, manholes, detention areas, etc.),
 - iv) Pipe (diameter, slopes, leads, cleanouts, connections),
 - v) Orifice location,
 - vi) Catchbasins and manholes conditions, existing or new.
- b) Pre-development and post-development calculation with:
- i) Pre-development storm runoff flow (Q),
 - ii) Post-development storm runoff flow (Q),
 - iii) Runoff Coefficient (C) values.
 - iv) Runoff Coefficients – existing and new, indicate C_{avg} .
- c) Design Criteria Chart indicating:
- i) Time,
 - ii) Intensity,
 - iii) Peak storm runoff flow (Q),
 - iv) Volume,
 - v) Release volume,
 - vi) Storage,
 - vii) Time of concentrations (T_c) values use 100% of drainage area in calculations for times less than twenty minutes.
- d) Intensity Values indicating:
- i) Which IDF values used,
 - ii) The formula used,
 - iii) The breakdown of calculations.
- e) Storage volume calculations and drawings detailing:
- i) Peak storage (Consultant is to provide storage drawing),
 - ii) Ponding area on drawings indicating the volume of water being stored at each storage area,
 - iii) Use 5 -year and 100- year storage calculations unless otherwise specified,
 - iv) Provide individual calculations for each storage item used (i.e. pipes, catchbasins, manholes, etc.).
- f) Orifice Calculations with:

- i) The formula used in the calculations.
- ii) Specific details.
- iii) The minimum orifice size shall be 76mm x 76mm (3"x3")
or 100mm dia. (4" dia.)

15.4 STORMWATER QUALITY

Stormwater within the City eventually makes its way to the sensitive watersheds of Little River, Turkey Creek, River Canard and Detroit River. At the discretion of the City Engineer, any proposed development may be required to perform a stormwater quality study. To conform to the Environmental Master Plan's action to reduce water pollution, the study shall include measures to minimize the effects of urban runoff on the environment. Environmental regulations and initiatives are subject to revision and it is the responsibility of the Consultant to be aware of the revisions and to comply with them.

The primary concern of the stormwater quality study is the reduction of suspended solids. The removal efficiency of the suspended solids shall be addressed in the stormwater quality study. The second concern of the stormwater quality study is the following:

- a) Phosphorus and other nutrients.
- b) Oil and grease.
- c) Salt contamination.
- d) Bacteria.
- e) Pesticides and herbicides.
- f) Metals.
- g) Temperature control.

Any other pollutants not listed above may be included depending on the sensitivity of the local environment and new regulations or initiatives.

15.0
Stormwater
Management

15.5 STORMWATER MANAGEMENT IN SUBDIVISIONS

The Developer's Consultant shall design the stormwater management facility (hereinafter referred to as "SWMF") for the proposed development to the design criteria stated by the City Engineer and ERCA, and approved by MOE.

The Consultant shall be aware of the MOE "Stormwater Management Planning and Design Manual", dated March 2003 or the most recent document for stormwater by the MOE.

Regardless, if the Consultant is recommending a dry pond or wet pond/wetland for a SWMF, the SWMF is to be located in an area satisfactory to the City Engineer and the Executive Director of Parks and Facility Operations. Similarly, the land required for the SWMF is to be calculated separate from the parkland dedication.

The SWMF shall be easily maintainable, safe for the public, and not prone to flash floods. The pond shall be integrated into the park setting and is to be natural in its design and maintenance. Vegetation is considered as an important functional component in the design of SWMF.

- a) The Consultant shall submit the following prior to approval:
 - i) The SWMF layout in plan and profile, satisfactory to the City Engineer and MOE;
 - ii) Design calculations including numerical modeling, satisfactory to the City Engineer, ERCA and MOE. It is noted that storage within the outlet pipe from the SWMF is not permitted;
 - iii) Schedule of the SWMF water level, satisfactory to the City Engineer, Executive Director of Environmental Services, and MOE.

- iv) Biological/landscaping design, satisfactory to the City Engineer, Executive Director of Environmental Services, and Executive Director of Parks and Facility Operations.
 - v) Hydraulic grade lines are to be indicated on the plan and profile drawings.
 - vi) If there is to be a pumping station, the requirements in Section 10 of the manual are to be satisfied.
 - vii) An access road for maintenance and emergency vehicles is to be indicated on the drawings.
 - viii) Contact the local airport.
- b) After construction of the SWMF, the following requirements are to be satisfied:
- i) Survey of the constructed SWMF to confirm that the elevation and active storage volume relationship meets the design requirements.
 - ii) Life saving devices are to be installed at the Developer's cost.
 - iii) Information signs about the SWMF are to be posted at the Developer's cost.
 - iv) Submit as-builts.
 - v) Copies of manuals and keys for all equipment (i.e. pump manuals).

16.0 REZONING and SITE PLAN CONTROL

The Engineering & Corporate Projects Department comment on all rezoning and site plan control applications. Requirements generally deal with such criteria as the availability of servicing, development charges, street widening, right-of-way requirements and permits. These requirements are to ensure that the proposed development constructs facilities such as trunk sewers and that any additional municipal facilities, which the development will cause to be constructed, are paid for by the Developer and not by the general public.

Engineering & Corporate Projects Department provides a standard checklist as a guide to ensure that all requirements are covered during the review of a rezoning or site plan control application (refer to Appendix C).

Upon approval of the application, the applicant enters into a development or site plan control agreement with the City. The Agreement consists of three (3) individual sections prevailing in the following order:

- a) Basic Provisions
- b) Special Provisions
- c) General Provisions

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16.1 STANDARD REQUIREMENTS

The Engineering & Corporate Projects Department has developed a list of standard responses to ensure uniformity in dealing with rezoning and site plan control applications. Certainly not all of these responses are included in any given rezoning or site plan control application. Refer to Appendix B for a listing of the standard requirements used in preparing responses to rezoning and site plan control applications. In individual cases, however, specific comments other than the standard may also be included.

16.2 REZONING APPLICATIONS

The Engineering & Corporate Projects Department comments on the servicing requirements for any property, which is the subject of a rezoning application. If servicing is deficient, recommendations will be made with respect to the installation of sufficient services. In addition, servicing costs outstanding as a condition of rezoning are noted along with permit requirements.

The Transportation Planning Division of the Operations Department is responsible for commenting on transportation requirements for re-zoning applications. Specifically this department may comment upon:

- a) Pedestrian access.
- b) Bicycle access.
- c) Vehicular access.
- d) Parking.
- e) Protection of the road network.

The Transportation Planning Division may require a completion of Transportation Impact Studies and Statements on sites where the proposed use may have a negative effect on the adjacent transportation network. It is recommended that the Developer consult with the Transportation Planning Division prior to the rezoning to ensure that the Developer is aware of all issues pertaining to Operations Department requirements.

The Transportation Planning Division may also notify the Developer through the re-zoning process of requirements for the site plan stage of the development, which may include:

- a) Land conveyances

- b) Required improvements identified in the Traffic Impact Study, Environmental Study Report or by this Division such as turn lanes, signal infrastructure and pedestrian infrastructure.

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- c) Access prohibitions to various streets to and from the development due to safety issues and to protect the integrity of the road network's ability to handle traffic.

These items will not necessarily affect the rezoning of a site; but are brought forward to make the Planning Advisory Committee and the Developer aware of the issues, in anticipation of a site plan application.

16.3 SITE PLAN CONTROL

Engineering & Corporate Projects Department comments with respect to site plan control applications are often similar to a rezoning application; however, the Planning Act does give the Municipality authority to require such things as road widening conveyances and utility easements as conditions of site plan control approval.

As with the rezoning process, we are also looking at the adequacy of services and the permits required and site plan control applications throughout the year. The Public Works requirements generally deal with such criteria as the availability of servicing, servicing costs, street widening and permits. These requirements are to ensure that the proposed development constructs its share of facilities such as trunk sewers and that any additional Municipal facilities, which the development will cause to be constructed, are paid for by the Developer and not by the general public.

The City may, at the discretion of the City Engineer, accept a cash contribution from the Developer/Applicant in lieu of services. Such services may include the construction of municipal services such as sidewalks, curb and gutters, streetlights, et cetera, required but are not feasible due to circumstances on-site. Such contributions shall be based on established unit costs provided by the municipality and/or unit price obtained through a public tender of subject works.

The Transportation Planning Division reviews all site plan applications. Depending on the size and scope of the site a Transportation Impact Study may be required prior to the Transportation Planning Division commenting on the application.

This Department comments on each site plan with respect to the following:

- a) Access location, number and safety of each access using Transportation Association of Canada Standards for access design.
- b) Location of driveway in relation to other driveways opposite and adjacent to the site.
- c) Throat length of each driveway access, to ensure that on site traffic does not spill onto the adjacent roadway. [Using Transportation Association of Canada Standards].
- d) Required number of entry / exit lanes.
- e) Ability to encourage non motorized vehicle use (i.e.: bicycles and pedestrians).
- f) On-site traffic issues, blind corners, manoeuvring issues, points of conflict between aisle ways.
- g) Location of the bicycle parking area.
- h) Location of all pedestrian linkages and crossing points with vehicular traffic.
- i) Location of all Traffic Calming measures and their relevance in terms of improving pedestrian safety.
- j) Overall site design issues including linkages with adjacent properties requiring reciprocal access agreements, overall traffic movement on site and overall conformity with Official Plan Transportation guidelines.

Generally, the Transportation Planning Division requires that site plan designs conform to sound planning and engineering principles, do not introduce unsafe conditions on-site or on the public right of way, and encourage alternative transportation uses such as public transit and non-motorized vehicles.

17.0 COMMITTEE of ADJUSTMENT

Through the review of Development Applications, particularly Committee of Adjustment Applications, the Engineering & Corporate Projects Department review such applications for compliance with the following criteria:

- a) To ensure municipal services are available to the subject land, and to verify existing services can accommodate the proposed development. In the event services are not available, the applicant shall enter into a Servicing Agreement to provide municipal services in accordance with Council Resolutions 233/98, and Council Resolution 329/98.
- b) Development Applications shall be required to complete stormwater drainage studies to ensure the subject property does not adversely affect abutting and/or adjoining properties. Stormwater studies may include stormwater detention requirements, and/or downspout disconnection as conditions of approval.
- c) Engineering & Corporate Projects shall ensure that access is available to the subject lands from a municipal roadway, and that appropriate permits are obtained for driveways to parking areas and loading areas located entirely on private property.
- d) Engineering & Corporate Projects Department shall require land conveyances for road-widening purposes based on the requirements of the *Official Plan* or an Environmental Study Report that affects the subject lands. Conveyances may also be required for corner cut-offs, utility easements, drain enclosures, and other municipal needs.
- e) Encroachments onto the municipal right-of-way are not generally permitted. Any such encroachment may be required to be removed, or the applicant may be required to enter into an Encroachment Agreement for such encroachments as structures, parking, fences, sewers, signs, etc., which may encroach onto the right-of-way.

- f) Reciprocal parking arrangements or access agreements between adjoining properties may be required, in order to minimize the number of driveway approaches to the municipal right-of-way, and to facilitate traffic movements between abutting properties.
- g) Where combined sewers service the subject property, backwater valves may be required in order to mitigate possible damage from surcharging of those sewers. In addition, separate connections to the right-of-way may be required to facilitate separation when separate sewer systems are constructed.
- h) Commercial and industrial properties are required to provide a sampling manhole or sampling station at the property line on any sanitary connection to the municipal sewer system, to facilitate testing of effluents by the City of Windsor's staff.
- i) Where a subject property utilizes an existing alley for access to the subject site, the applicant may be required to contribute to the future maintenance of the subject alley, or alternatively, upgrade the subject alley pavement to City of Windsor Standards, in order to facilitate its anticipated use. The choice of upgrading or contribution is entirely at the discretion of the City Engineer.

17.0
Committee of
Adjustment

BIBLIOGRAPHY

1. City of Windsor. *Development Manual Department of Public Works - Draft Revision 8*. 1989.
2. City of Windsor. *Standard Requirements – Development Engineering*. November 2005.
3. City of Windsor. *Servicing General Provisions*. May 2005.
4. City of Windsor. *Standard Specifications – Book 2 Engineering Drawings*. January 2006.
5. City of Windsor. *Tender Documents General Conditions Book 3*. April 1998.
6. City of Windsor Environmental Services. *Pumping Station General Requirements*. October 2006.
7. City of Windsor. *Access Management Policy Discussion Paper*. August 2006.
8. Province of Ontario. *Ontario Traffic Manual*. March 2000
9. City of Windsor. *Standard Drawings – Department of Public Works*. July 1995.
10. City of Windsor. *The City of Windsor Official Plan*. October 1999.
11. City of Windsor. *Purchasing and Risk Management By-Law*. 2004.
12. City of Windsor. *Construction Lien Act 1990*.
13. City of Windsor. *Landscaping Requirements for Development in Windsor – 4th edition*. 1996
14. Marshall Macklin Monaghan Limited, ESG International, Stantec Consulting, Paradigm Transportation Solutions Limited. *“City of Windsor Bicycle Use Master Plan (BUMP)”*. April 2001. http://www.cyclewindsor.ca/bump_site/newsletter/finalrpt/finindex.html
15. City of Windsor Transportation Planning Division. *“City of Windsor Traffic Calming for Residential Areas.”* September 2005.
<http://www.citywindsor.ca/DisplayAttach.asp?AttachID=3316>
16. City of Windsor Transportation Planning Division. *“City of Windsor Traffic Calming for Residential Areas Policy Paper.”* September 2005.
<http://www.citywindsor.ca/DisplayAttach.asp?AttachID=3315>
17. Transportation Association of Canada. *“Canadian Guide to Neighbourhood Traffic Calming”*, December 1998

APPENDIX A

I GLOSSARY

Appendix A

Advertising - the publication of projects (Tenders, Proposals and expressions of interest) in appropriate newspaper, journals or electronic bulletin boards.

Agreement - a formal written legal agreement or contract for the supply of goods, services, equipment or construction.

Base - a layer of material of specified type and thickness placed immediately below the pavement, driving surface, finished grade, curb and gutter or sidewalk.

Bicycle Lane - a dedicated portion of the road surface for exclusive bicycle use. They are designated by pavement markings that separate the portion of the road used by motor vehicles from that portion used by bicycles.

Bike Trail - a bikeway that is physically separated from motorized vehicular traffic by an open space and/or barrier, and is either within the highway right-of-way or within an independent right-of-way.

City of Windsor Official Plan - a policy document adopted by City Council under the provisions of the Ontario Planning Act. It reflects matters of provincial interest and describes the future direction of the City of Windsor and how land is to be used.

City or Corporation - the Corporation of the City of Windsor.

Contract - any formal or deliberate written agreement for the purchase of goods, services, equipment or construction.

Contractor - a person, firm, or company that submits a tender for works, which tender subsequently is accepted.

Culvert - concrete, plastic or steel tubes/pipes that are placed under roads and driveway approaches to allow the free flow of channelled water through the obstruction.

Development - the construction; erection or placing of a building or structure, or additional/alteration to a building or structure that has the effect of increasing the size or usability, and includes such related activities as site grading and the placing or dumping of fill.

Ditch - a small artificial drainage channel having a definite bed and banks.

Drainage Work - a drainage system constructed of tile, pipe, or tubing of any material beneath the surface of agricultural land, including integral inlets and outlets, for the purpose of improving the productivity of the land.

Encroachment - an intrusion upon the public right-of-way for private benefit. An object, structure that is placed, erected or built on the public right-of-way with or

without receiving permission to do so from the City of Windsor. The municipality may authorize the use of portions of the public highway for an encroachment by granting a license agreement.

Extra Work - work not provided for in the Contract as awarded but considered by the Engineer essential to the satisfactory completion of the Contract within its intended scope.

Haul Road - any public road excluding the road under contract, which forms part of a material haul route.

Inlet Time - the time taken for stormwater to reach the inlet of a storm sewer system.

Irrevocable Letter of Credit - an unalterable letter on the City's standard form containing a request that the party to whom it is addressed pay the bearer or a person named therein money as a result of failure to perform or fulfill all the covenants, undertakings, terms, conditions and agreements contained in a contract.

Land Conveyance - the transfer of ownership to the City of a parcel of land, either gratuitously or purchased for the purpose of obtaining necessary right-of-way. Gratuitous conveyance of land for right-of-way, roadway, road widening and walkways are in compliance with The City of Windsor's Official Plan.

Median Island - a physical barrier along the centre of a road designed to separate the opposing lanes of traffic. Can also be used to reduce lane width thus slowing traffic down, used frequently to prevent undesirable left turns and to protect residential streets from cut through traffic

Performance Bond - a bond issued by a surety company executed in connection with a contract and which secures the performance and fulfilment of the undertakings, covenants, terms, conditions and agreements contained in the contracts.

Rezoning - the process of changing the permitted use of land allowed by the zoning district to accommodate the Developer's intended use. When the Zoning By-law does not permit a proposed use, it is necessary to make an application for an amendment to the Zoning by-law.

Right-of-Way - City owned land or property used for public transportation purposes. A general term denoting land, property, or interest therein, usually in a linear orientation, acquired for or devoted to public transportation purposes.

Riparian - living or located on the bank of a natural watercourse (i.e. a river or stream) or other bodies of water.

Sidewalk - a portion of a highway or street designed for preferential or exclusive use by pedestrians.

Site Plan Control - the process of regulating development by use of the City of Windsor Official Plan, Zoning By-law, SPC By-law 1-2004 and other

applicable policies. It is a planning tool used to regulate development in accordance with the provisions of the Planning Act.

Special Provisions - special directions containing requirements peculiar to the Work.

Standard Specification - a standard practice required and stipulated by the owner for performance of the work. May include the quality of the materials as specified and stipulated by the owner for performance of the work.

Tender - an offer received from a supplier of goods and services in response to an advertisement requesting sealed tenders.

Tenderer - a person, firm, or company, which submits a tender for works, which tender subsequently accepted.

Theme Street - refers to designated roads within Windsor that are intended to be designed to:

- a) Promote a diverse mixture of commercial, residential and other appropriate land uses along the road;
- b) Encourage pedestrian activity and movement along the streetscape;
- c) Provide and/or enhance the unique character of the surrounding neighbourhood.

Tile - a pipe, tile or tubing of any material used in the installation of a drainage work.

Traffic Calming - the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized street users.

Traffic Calming Device - any vertical, horizontal or visual change to the public right of way built with an intention to reduce vehicle speed or volume and to improve the safety of other non-motorized modes of transportation.

Traffic Circle - a channelled intersection in which traffic moves counter clockwise around a centre island of sufficient size to induce weaving movements in place of direct crossings. It is sometimes referred to as a rotary or roundabout.

Work - the total construction and related service required by the Contract Documents

Works - the work described in tender documents for either or both supply, installation and construction.

5 Year Storm Flood - a flood having a return period of 5 years on average, or having a 20% chance of occurring or being exceeded in any given year.

100 Year Storm Flood - a flood having a return period of 100 years on average, or having a 1% chance of occurring or being exceeded in any given year.

Appendix A

II ABBREVIATIONS

Appendix
A

BUMP	Bicycle Use Master Plan
CBO	Chief Building Official
CCTV	Closed Circuit Television
CE	City Engineer
CWSS	City of Windsor Standard Specifications
EA	Environmental Assessment
ESR	Environmental Study Report
ERCA	Essex Region Conservation Authority
MOE	Ontario Ministry of the Environment
MTO	Ministry of Transportation of Ontario
NAD	North American Datum
OBC	Ontario Building Code
OLS	Ontario Land Surveyor
OTM	Ontario Traffic Manual
OP	Official Plan
OPSD	Ontario Provincial Standard Drawings
OPSS	Ontario Provincial Standard Specifications
PEO	Professional Engineers of Ontario
SWM	Storm Water Management
UTM	Universal Transverse Mercator
WUC	Windsor Utilities Commission

APPENDIX B

I STANDARD ENGINEERING DRAWINGS

Appendix B

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II STANDARD REQUIREMENTS

1. Alley Acquisition – The applicant(s) shall agree prior to issuance of a Building Permit, to acquire any portion of the closed alley abutting the property that is not currently owned by the applicant.
2. Alley Closing – Prior to the issuance of a Building Permit, the applicant(s) shall apply to the Street and Alley Closing Committee to close the existing alley adjacent to the subject property.
3. Alley Contribution – The owner(s) agrees, prior to the issuance of a Building Permit, to contribute the sum of [to be specified] payable to the City of Windsor and deposited in the General Fund intended for the upkeep of alleys within the City of Windsor.
4. Alley Paving – The applicant(s) shall agree to drain and pave at his entire expense, the alley abutting the subject lands. The minimum acceptable cross-section will be 230 mm Granular “A” and 75 mm surface course asphalt in accordance with Standard City of Windsor Specifications, Selected Granular Base Course (S4) and Hot Mix, Hot Laid Asphaltic Concrete (S-10). The geometrics of the pavement shall comply with Standard Drawing AS-201. All work shall be to the satisfaction of the City Engineer.
5. Backwater Valve – The applicant(s) shall agree to install backwater valve or similar apparatus on any connection to municipal combined sewer, as precaution and to mitigate possible damage from surcharge of the sewer.
6. Bell Canada – The applicant(s) shall agree to arrange with Bell Canada for the installation of underground services to the subject lands and for the provision of easements with respect to such installation in accordance with the terms, conditions, standards and specifications of Bell Canada.
7. Benchmarks – The applicant(s) shall agree to install permanent benchmarks in accordance with Standard City of Windsor Drawing AS-104 and supplied by the Public Works. These shall be located as specified by the City Engineer. The vertical elevation shall be established by an Ontario Land

- Surveyor to second order accuracy as defined by the current Ontario Specifications and Ontario Guidelines for Vertical Control Surveys.
8. Boulevards – All unpaved portions of street allowances shall be graded and the applicant(s) shall supply and place any topsoil removed there from during construction operations.
 9. Building Permits – The applicant(s) shall agree that the Chief Building Official shall not be required to issue a Building Permit for any lot or block within the proposed development until the following requirements have been met:
 - i) The applicant(s) shall have constructed curbs and base asphalt on the final pavement structure fronting the said lot or block.
 - ii) The relative development charges shall have been paid to the Corporation in accordance with the terms of the agreement.
 - iii) The applicant(s) shall have deposited with the Corporation a performance security in the amount of the uncompleted works contained in this agreement.
 - iv) An individual lot-grading plan shall have been submitted to the Chief Building Official.
 10. Completion of Work – All works required hereunder shall be completed on or before twenty-seven (27) months from date of Council Resolution, provided, however, the said completion date may be extended with the approval of the City Engineer. Each one-year extension granted by the said City Engineer will be conditional upon the re-calculation of all outstanding moneys in the agreement owed to the Corporation by the Owner and likewise owed to the Owner by the Corporation. Re-calculation will constitute the addition of a simple interest charge based on the average annual rate of debentures issued by the Corporation in the one-year period to the terminal date being so extended for a one-year period.
 11. Construction Lien Act, R.S.O. 1990 – The Owner will comply with the 1990 Construction Lien Act and shall have deposited with the Corporation a security for a holdback in a form satisfactory to the City Solicitor. Said security to be in an amount of 10% of the value of the services and materials supplied under contract or subcontractor for works on the public right-of-way or lands to be public right-of-way.

12. Consulting Engineer – The applicant(s) shall agree to retain a Consulting Engineer for the design and construction of municipal services required in this development.
13. Contractor – All work relative to this agreement shall be carried out by a Contractor, competent in the type of construction, as specified. The contractor shall be subject to the approval of the City Engineer.
14. Corner Cut-Off – The owner(s) agrees to gratuitously convey a 4.6 m x 4.6 m corner cut-off at the intersection of local with collector roadways.
15. Cul-de-Sac Reconstruction – The applicant(s) shall agree to remove, at their expense, the temporary cul-de-sac and barricade, and replace with concrete curbs and gutter, including boulevard, existing driveways, and road restoration. All work to be to the satisfaction of the Corporation's City Engineer.
16. Curbs and Gutters – The applicant(s) further agrees, at the discretion of the City Engineer, to:
 - a) Construct at their own expense and according to City of Windsor Standard Specifications, a concrete curb and gutter along the entire [specify street name] frontage of the subject lands. All work to be to the satisfaction of the Corporation's City Engineer;
 - or
 - b) Pay to the Corporation, prior to the issuance of a Building Permit, the sum of \$ _____ being the Owner's contribution towards the future construction of concrete curb and gutter on the frontage of the subject lands.
17. Damage to Pavements and Sidewalks – The applicant(s) shall agree to restore, at his expense, all landscaped areas within the public rights-of-ways, any pavements and sidewalks that are damaged during construction, and to close any existing driveway approaches which will be redundant following development of the subject lands.
18. Development Agreement – The applicant(s) shall agree to enter into a Development Agreement with the Corporation of the City of Windsor with the General Provisions of Council Resolutions 233/98 and any other specific requirements.
19. Development Charges – Prior to the issuance of a Building Permit, the

- applicant(s) shall agree to pay a development charge under the City's Development Charges By-law.
20. Ditch Enclosure – The applicant(s) shall agree to enclose the roadside ditch on [*street name*] abutting the subject property in a manner satisfactory to the City Engineer.
 21. Dirt and Debris on Corporation Streets – The applicant(s) further agrees to keep the public highways adjacent to the subject lands free from dirt and debris caused by the construction on the subject lands. The owner further agrees that, within twenty-four hours of being notified by the Corporation to clean-up the streets adjacent to the subject lands and unassumed streets within 50 metres of the subject lands and/or take dust control measures at the owner's entire expense, failing which, the Corporation may carry out or cause to have carried out the said work at the entire expense of the owner.
 22. Driveway Approaches – The applicant(s) shall construct driveway approaches to the width and location, as shall be approved by the City Engineer. The Owner further agrees to provide straight flare driveway approaches and to terminate the raised curbs at the property line to the satisfaction of the City Engineer. Raised curbs within the subject property shall not be extended onto the public right-of-way.
 23. Drop-Off Area
 - A) The applicant(s) agrees to construct a drop-off area to the satisfaction of the Corporation's City Engineer and the Owner(s) shall have the written option of constructing the said drop-off areas as follows:
 - i) a minimum thickness of 150 mm of Portland Cement Concrete on an approved uniform sub-base; or
 - ii) a minimum of 150 mm thick, two-course asphaltic concrete on an approved uniform sub-base; or
 - iii) a minimum thickness of 300 mm of compacted Granular "A" base with a minimum 90 mm thick surface of two-course asphaltic concrete.
 - B) The Owner(s) further agrees that the said drop-off area shall be used solely for the purpose of a drop-off area, automobile parking shall be prohibited thereon, and it shall be clearly signed, marked, and maintained in a manner satisfactory to the said City Engineer.

24. Elevations, Grades and Drainage Plans – The applicant(s) shall agree that the elevations, grades and drainage plans, as approved by the City Engineer and Chief Building Official in a lot grading plan for the entire subdivision, shall be adhered to. The applicant(s) shall agree to provide an individual lot-grading plan to each purchaser of a lot in the subdivision, which shall be presented to the Chief Building Official prior to the issuance of a building permit for said lot. The applicant(s) shall agree to have the approved elevations as per the lot-grading plan for each lot verified by the Consulting Engineer or an Ontario Land Surveyors following completion of construction on the said lot.
25. Emergency Vehicular Access – The applicant(s) shall agree to construct an emergency vehicular access in accordance with Standard City of Windsor Drawing AS-229.
26. Environmental Warning Clause – That the owner(s) insert a warning clause in a purchase and sale agreement for all lots, making persons aware that any use of chemicals for lawn fertilizing, vegetable growth or such activities has a potential to wash into the storm sewer system and into surrounding lakes and could thereby affect the water quality and furthermore, residences be encouraged to use environmentally friendly methods.
27. ERCA Requirements – The owner(s) further agrees to follow all drainage and flood proofing recommendations of the Essex Region Conservation Authority (ERCA) may have with respect to the subject land, based on final approval by the City Engineer.
28. Existing Watercourses and Natural Land Drainage – The applicant(s) shall agree that no natural watercourses shall be blocked, abandoned, or otherwise altered during the course of construction of this development unless approved by the City Engineer. No natural land drainage shall be cut off without adequate provision being made for its interception, to the satisfaction of the City Engineer.
29. Haul Route – The Engineer for the Owner shall design [*street name*] so as to withstand the expected construction traffic that would occur as a result of home building in this subdivision. The roads shall be constructed to the

satisfaction of the City Engineer.

30. Internal Drainage – The applicant(s) shall agree to provide internal drainage for each building lot in the locations and according to the specifications approved by the Executive Director of Development Services
31. Intra-Parcel Public Access Lane – The Owner(s) further agrees to gratuitously convey to the Corporation, prior to the issuance of a Building Permit, a [specify width] metre wide easement located along the [front or rear] limit of the subject lands in order to facilitate an intra-parcel public access service lane.
32. Land Conveyance – Prior to the issuance of a Building Permit, the owner (s) shall agree to gratuitously convey to the Corporation, land sufficient to create [specify width] metre wide right-of-way on [specify street name]. This conveyance shall range from approximately [specify width] metres on the _____ end to [specify width] metres on the _____ end.
33. Local Improvement Works – The applicant(s) shall agree to sign petitions for and not to oppose the construction, under the provisions of the Local Improvement Act, of a (storm sewer, sanitary sewer, watermain, pavement, street lights, sidewalk), abutting the subject lands.
34. Lot Grading Plan – The applicant(s) shall agree, if required by the Chief Building Official, to submit for his approval, a lot-grading plan covering all lots prior to the issuance of a Building Permit. The applicant(s) shall also agree to have the approved elevation for each lot verified by a Consulting Engineer or an Ontario Land Surveyor following completion of construction on the said lot.
35. Model Homes – Once services are under construction, the applicant shall be allowed to construct up to 10 percent of the lots per phase of the development up to a maximum of 12 model homes, subject to the following conditions:
 - a) The Model Home is to be constructed on lots within 152.4m of an active fire hydrant.
 - b) A Class "B" road be constructed in order that fire trucks have access to each Model Home prior to the general public being permitted to tour the structures, all to the satisfaction of the Fire Chief.

- c) The developer shall relieve the Corporation of any liability resulting from fire until the access road is provided.
 - d) Final inspection by the Building Department will not be undertaken, until all municipal services have been accepted by the City Engineer.
 - e) Draft plan approval has been received from the Ministry of Municipal Affairs.
 - f) The Servicing Agreement has been registered on title.
36. Ontario Co-Ordinate System – The applicant(s) shall agree to install horizontal co-ordinates within the development to Third Order Accuracy in accordance with the latest edition of the Ontario Specifications for horizontal Control Surveys and Ontario Guidelines for Horizontal Control Surveys published by the Ontario Ministry of Natural Resources.
37. Oversizing
- i) The Owner(s) further agrees to pay to the Corporation, prior to the issuance of a Construction permit, its share of previously oversized services that were constructed to ensure that the subject lands could be serviced;
 - ii) In the event the Owner(s) is required to oversize any services, to service other vacant lands, it is agreed that any oversizing costs to be paid by the Corporation to the Owner shall be based on a cost-sharing scheme and tender process satisfactory to the City Engineer. Any cost-sharing scheme agreed to will be subject to the approval by the Corporation's City Council. Payment of any oversizing will be based on its inclusion in a Public Works Budget subject to Council's approval in a future year.
38. Parent Relief Drain Easement – Prior to the issuance of a building permit, the applicant(s) shall gratuitously grant a 6 m easement along the north boundary of the subject lands, for the maintenance and improvement of the Parent Relief Drain.
39. Pavements – The applicant(s) shall construct the pavements, including curbs and gutters, driveway approaches and the necessary drainage facilities. Pavements may be 7.4 m in width, as approved by Council Resolution 310/73. Cul-de-sacs shall have a minimum radius of 9.5m. Temporary cul-

de-sacs and barricades shall be installed at temporary dead-ended streets. The applicant(s) shall agree that one full winter shall elapse following the placing of base asphalt, prior to the laying of surface asphalt. Driveway approaches shall be constructed in such width and location as shall be approved by the City Engineer and the applicant(s) shall have the option of constructing the following:

- i) A minimum thickness of 115 mm of Portland Cement Concrete on an approved uniform sub-base, or,
 - ii) A minimum of 150 mm thick, two-course, asphaltic concrete on an approved uniform sub-base, or,
 - iii) A minimum thickness of 230 mm of compacted Granular "A" base with a minimum 75 mm thick surface of two-course asphaltic concrete.
40. Permits – The applicant(s) shall agree to obtain Permits from the Engineering & Corporate Projects Department, for sewer taps, drain taps, curb cuts, and driveway approaches as applicable.
41. Placing of Fill – The owner(s) further agrees to obtain permits from the Essex Region Conservation Authority and regulated areas throughout for any construction or placing of fill on the subject property, subject to final approval from the Chief Building Official and the City Engineer as necessary.
42. Redundant Driveway Approaches – The applicant(s) shall agree to close and remove all redundant driveway approaches by reconstructing the barrier curb and restoring the boulevard, all to the satisfaction of the City Engineer.
43. Refuse & Recycling Collection – The Owner(s) further agrees to provide on-site facilities and containers for refuse and recycling storage. Such facilities shall be screened from view in accordance with the requirements of the Corporation's Zoning By-law, if located outside of a building. In the event municipal collection is requested, the Owner, through consultation with the Environmental Services Manager, shall agree to locate and design all refuse and recycling storage facilities to the satisfaction of the Corporation's City Engineer.
44. Reserves – The applicant(s) shall agree that dead-ended rights-of-way shall terminate in a 0.3 metre reserve. The applicant(s) shall convey to the Corporation these 0.3 metre reserves, which shall be held in trust by the

Corporation until required for future road allowances or for development of adjacent lands.

45. Sampling Manhole – Prior to the issuance of a Building Permit, the applicant(s) shall agree to install a sanitary sewer-sampling manhole, if one does not already exist, at the property line of the subject lands to the satisfaction of the Corporation's City Engineer.
46. Sanitary Sewers – The applicant(s) shall agree to construct sanitary sewers with the necessary appurtenances, service connections and cleanouts from the sewer to the front property line of each building unit or block.
47. Sanitary Sewer Connection – The owner(s) will be required to obtain a permit from the Engineering & Corporate Projects Department to connect to the existing sanitary sewer connection. If an existing connection is not utilized, it shall be capped and abandoned at the mainline sewer. If a new connection is required, it shall be installed, by trenchless method under the existing pavement from the sewer main tap pit on *[specify street name]*, except when specific consent is given by the City Engineer.
48. Sanitary Sewer Easement – Prior to the issuance of a Building Permit, the applicant(s) shall gratuitously convey to the Corporation a *[specify width]* easement along *[specify street name]* for the purposes of construction and maintenance of a future sanitary sewer.
49. Sanitary Sewer Extension – The owner(s) further agrees, prior to the issuance of a building permit, to extend the sanitary sewer from *[specify location]* on *[specify street name]* to service the subject lands at his own expense or under the provisions of the *Municipal Act, 2001 – Ontario Regulation 119/03*. The owner has the following alternatives:
 - a) Local Improvement – The owner(s) shall obtain from the Corporation a Local Improvement petition for the extension of the sanitary / storm sewer. The sewer would be built in the year in which the expenditure is approved by the Corporation's City Council, if the petition is returned sufficiently signed. The owner's share will be based on charges applicable under the *Municipal Act, 2001 – Ontario Regulation 119/03* for that year.

or

- b) Owner's Expense – The owner(s) shall construct an oversized sanitary sewer on [specify street name]. Any oversizing to be paid by the Corporation shall be based on cost-sharing scheme satisfactory to the Corporation's City Engineer. Any cost-sharing scheme agreed to, would be subject to approval by City Council. Payment of any oversizing will be based on its inclusion in a Public Works' budget, subject to City Council's approval in a future year.
 - c) Securities and Insurance Policies – The applicant(s) shall submit performance and maintenance securities, and insurance policies in an amount satisfactory to the City Engineer and in form satisfactory to the City Solicitor.
50. Servicing Agreement – Prior to the issuance of a Building Permit, the applicant shall ensure that:
- a) The servicing agreement between the applicant and the Corporation for servicing of the surrounding lands, has been signed by all parties, and registered on the lands, and
 - b) The construction of the municipal services defined under the servicing agreement with the applicant, has begun, and the necessary bonds and insurance as described in the servicing agreement have been submitted and accepted by the City,
- or
- c) Await the completion of construction of the services in the right-of-way and their acceptance onto maintenance.
51. Sewer Connection Approval – the applicant(s) shall agree that a qualified person/engineer shall certify that this property/building is connected to an appropriate sewer system satisfactory to the City Engineer. Should the property not be connected to a sewer, a plan to connect will be designed to the satisfaction of the City Engineer.
52. Sewerage Charges – The applicant(s) shall note that they may be required to pay sewerage charges for the existing local municipal (storm or sanitary) sewer and/or sewer connection(s) if not paid previously for this site. These

charges will be assessed prior to the issuance of a permit from the Engineering & Corporate Projects Department.

53. Sidewalks -The Owner(s) further agrees, at the discretion of the City Engineer, to:

a) Construct at their expense and according to City of Windsor Standard Specifications, a concrete sidewalk along the entire [specify street name] frontage of the subject lands. All work to be to the satisfaction of the Corporation's City Engineer;

or

b) Pay to the Corporation, prior to the issuance of a Building Permit, the sum of \$_____ being the Owner's contribution towards the future construction of a concrete sidewalk on the [specify street name(s)] frontage of the subject lands.

c) The owner will comply with Council Resolution 436/2004, which outlines the notification to new homeowners and the schedule in which sidewalks will need to be constructed.

54. Site Contamination – Prior to the issuance of a Building Permit, the applicant shall provide to the Chief Building Official, the following information documentation for his approval:
- 1) Documentation of present and past uses of the site and surrounding lands. Based on the review of existing records and discussions with knowledgeable persons, this historic audit should provide initial information on the types of contaminants, which may have been used upon the site and their possible location;
 - 2) Professional analysis of soils and of ground and surface waters where required. The analysis should be based on all present and previous uses of the site, and should document the presence, type(s), and concentration of contaminants;
 - 3) If the site analysis identifies the presence of contaminants in concentrations above the Ministry of Environment's established acceptable concentrations, preparation of a remedial action plan will be required, in accordance with the Ministry's "Guidelines For the Decommissioning and Cleanup of Sites in Ontario".
55. Specifications and Standards – The applicant(s) shall agree that all work to be carried out within the public right-of-way shall adhere to the latest City of Windsor specifications and standards.
56. Storm Detention – Prior to the issuance of a Building Permit, the applicant(s) shall agree to retain a Consulting Engineer for the design and preparation of drawings, satisfactory to the City Engineer and Chief Building Official, for an internal stormwater detention scheme to service the subject lands. The purposes of this scheme will be to ensure that the storm drainage being directed to the Corporation's (storm, combined sewer or ditch), from the lands in their improved state, be restricted to no greater than the present flow from the subject lands. If these drawings are approved, the applicant(s) shall agree to construct this storm detention scheme, to the satisfaction of the Chief Building Official.
57. Storm Sewer Connection – The owner(s) agrees to obtain a Permit from the Engineering & Corporate Projects Department for the connection to the storm sewer. If the existing connection is not utilized, it shall be capped and

abandoned at the sewer main, and a new sewer connection shall be tapped in a method approved by the City Engineer. The co-efficient for allowable runoff is _____. In addition, the site will require an oil/grit separator on site to control sediment into the storm sewer system. All works in the public right-of-way shall be to the satisfaction of the City Engineer.

58. Storm Sewers – The applicant(s) shall construct storm sewers and cleanouts with necessary appurtenances including catchbasins and service connections from the sewer to the front property line of each building unit or block.

59. Storm Water Quality Study

a) The Owner(s) further agrees to submit to the Corporation's City Engineer for his approval prior to the issuance of a building permit, a storm water study for the subject lands which addresses the aspect of storm water quality both in the construction condition and beyond. The Owner(s) further agrees to carry out the requirements of the storm water study/detention scheme to the satisfaction of the said City Engineer in conformance with Ministry of the Environment guidelines and policies.

b) The Owner(s) further agrees to conduct regular inspections every two weeks and after each sizeable storm event of all sediment and erosion control and other storm water quality measures recommended in the storm water study/detention scheme. The Owner(s) shall maintain an inspection log which shall be made available for review by the Corporation and the Ministry of Environment upon request, the said log shall state the name of the inspector, date of the inspection and the rectification or replacement measures which will be taken to maintain the sediment and erosion control and other storm water quality measures, inspections shall continue until the assumption of services by the Corporation or until site construction warrants cessation of the visits.

60. Street Lighting – The owner further agrees to construct and install streetlighting including all poles, wires, fixtures, and conduits in accordance with the design, location, and specifications of EnWin Utilities Limited and to the satisfaction of the City Engineer. Should the Developer request decorative poles, then extra poles and/or funds shall be provided as per C.R.

743/2000.

61. Surveys and Land Descriptions – All surveys and land plans or descriptions for the lands to be conveyed to the Corporation shall be at the expense of the applicant(s).
62. Median – The applicant(s) shall agree to waive his right to bring claim for compensation for injurious affection against the City of Windsor in connection with the construction of any median divider on in front of the subject lands.
63. Video Inspection – The applicant shall agree to conduct a video inspection, or pay the cost of similar inspection, of the existing [specify] mm diameter sanitary /storm sewer after it has been tapped to service the development, all to the satisfaction of the City Engineer.
64. Waste Disposal Sites – Any evidence of former waste disposal activity encountered during the construction of this development shall be brought to the attention of the Corporation. The Developer's Engineer shall make an assessment of any hazards the site may present. The Developer shall remove and/or eliminate the hazard at his own expense and to the satisfaction of the Corporation. No work shall be carried out in the affected area until an agreement has been reached.
65. Water and Electrical Services – The applicant(s) shall construct and install water and electrical services in accordance with the design, location, and specifications of EnWin Utilities Limited and the Windsor Utilities Commission.

Appendix B

Appendix C

APPENDIX C

**I Public Works-Engineering and Corporate Projects
CHECKLIST FOR SUBDIVISION DRAWINGS**

Subdivision Name: _____

Date Received: _____

Drawings Submitted (4 sets required)

Send to:	Yes/No/NA	Comments Returned
Field Engineering		
Operations - Crawford Yard		
Environmental Services – Central Yd		
Lot grade plan to Building Dept		
Fire Department		
Transportation Planning - McDougall		
Parks & Facility		
Contact ERCA		Ensure ERCA is aware and has an application

Appendix C

Title Page

Requirements	Yes/ No/NA	Comments
Key map		
Showing correct phase		
Title Block		
Benchmark Information		

Schematic Drainage Area Maps and Phasing Maps

Requirements	Yes/ No/NA	Comments
Storm drainage area:		
• Runoff coefficients		
• Sub-catchments area		
Sanitary drainage area:		
• Population densities		
• Property designation (res., com., indust.)		
• Sub-catchments areas		
Utility locations (If Driveways shown)		
• Hydro vaults		

• Pedestals (Bell, Cable)		
• Duct crossings		
Phasing Plan		
Municipal Manhole Numbering		
Directional Flow Arrows		

Sewer and Road Design Check

Appendix C

ITEM	Y/N/NA	Comments
CUL-DE-SAC – temporary		
- Is one needed?		
- Does one need to be removed? Driveways restored		
CULVERTS		
• Material (CSP not acceptable for road crossing)		
• Grates on ends		
• Blvd drainage		
• Cleanouts; spacings		
• Headwalls		
• D/stream and U/Stream sizes		
MANHOLE SIZES		
• Special (2.4 m for pumps) (1.5m for drops)		
• Pumps		
Access to pump station needed?		
Bentonite Plugs for pond or connections		
ROADS		
• Road classification		
• Cross section		
• Geo tech report needed?		
• Check connecting road x-sections		

• Sub drains needed		
• CB Spacing		
• Cross fall in cul de sac		
• Traffic calming needed		
• Road curvature radius checked		
• ROW widths		
• Bike lanes required		
• Check BUMPS study		

Appendix C

Lot Grading

Requirements	Yes/ No/NA	Comments
Sidewalk locations		
Community Postal Box locations		
Grades of adjoining lands		
Transition to existing lots		
Sump pump detail		
Special notes needed?		
Emergency Access		
Positive Drainage from adjoining streets (<i>show entire intersection</i>)		

Plan & Profile

Requirements	Yes/ No/NA	Comments
Municipal Manhole numbers		
Existing centre of roadway grades		
Private drain connection locations		
• Is the 'Y' crossing private property?		
• Are there any extra long / deep PDC's?		
Sewer inverts		
Pipe information: Length, Size, Material, and Slope		
Hydraulic Grade Line needed?		
Minimum sewer grades met		
Sumps in storm manholes		
Drop structure detail		

Notes to be Included

Requirements	Yes/ No/NA	Comments
Connection & Tap Details		
Cut/Fill Requirements		
Catchbasin–Temporary asphalt box out		

Detail Sheets

Requirements	Yes/ No/NA	Comments
Cross sections (including sidewalks)		
Trench details		
Typical private drain connection locations		
Filter cloth required to separate fine materials		
Detour Plan		
Road Cross section		
Pond Banks/ Outlets etc		

Appendix C

Miscellaneous

Requirements	Yes/ No/NA	Comments
Signature blocks on all sheets		
Existing and proposed elevations, a min. of 30m upstream and downstream of new outlets in ditches and drains		
Is a clay plug needed? (i.e. outletting into ditches or drains)		
Letter to designer re Responsibility		
Retaining wall required? Detail included?		

<i>Reports Needed?</i> <ul style="list-style-type: none"> - Storm water - Traffic - Archaeological - Soils - PAC & Council Resolution 		
Is Agreement Signed		
MOE Applications submitted		
Tree Survey/ salvage		

Fish Compensation (See ERCA)		
Review ESR and or Official Plan		

Review by: _____ Date: _____



THIS SHEET TO BE SUBMITTED WITH DRAWINGS FOR SIGNATURE BY CITY ENGINEER AND CHIEF BUILDING OFFICIAL

COMMENTS

**II Public Works-Engineering and Corporate Projects
CHECKLIST FOR REZONING and SITE PLAN CONTROL APPLICATION**

Application No.: _____

Application Name: _____

Address: _____

Roll No.: _____ ; _____

Appendix C

1. Update the Public Works Rezoning and SPC Tracking file:
Public works on 'Cityhallnt" (J:) → SEWER DIVISION → Shortcut to TRACKING FILES → Rezoning & SPC Tracking

2. Check EIS and AMANDA for the following information:

	✓	Comments
Bonds		
Building Dept permits		
Encroachments		
Public Works Permits		
Rezoning & Site Plan		
Sewer Cleaning Records		

3. Check EIS for following information:

	✓	Comments
Aerial map		
Assessment map		
R.P. Map		
Sewer Map		
Survey (12R, etc.)		

4. The sewers available for service are:

Type	Size	Comments
Sanitary		
Combined		
Storm		
Ditch		

5. Check for any other rezoning or site plan at or around the applicant's location.



6. Check for any Environment Class Studies or any other studies that may affect the application.

7. Check the Official Plan Transportation Section Up date for future road width requirement. Is a land conveyance required?

8. Site visit required? YES NO
If yes, date of visit _____ # of photos taken ()

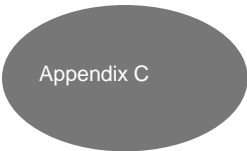
Comments:

9. Are the considerations from other departments that should be addressed?

Department	Requirements / Comments
Traffic Department Contact: Date:	
Planning Department Contact: Date:	
Parks & Recreation Department Contact: Date:	

Other Contact: Date:	
----------------------------	--

10. Date completed: _____



**III PUBLIC WORKS - TRANSPORTATION PLANNING
CHECKLIST FOR SITE PLAN CONTROL APPLICATION**

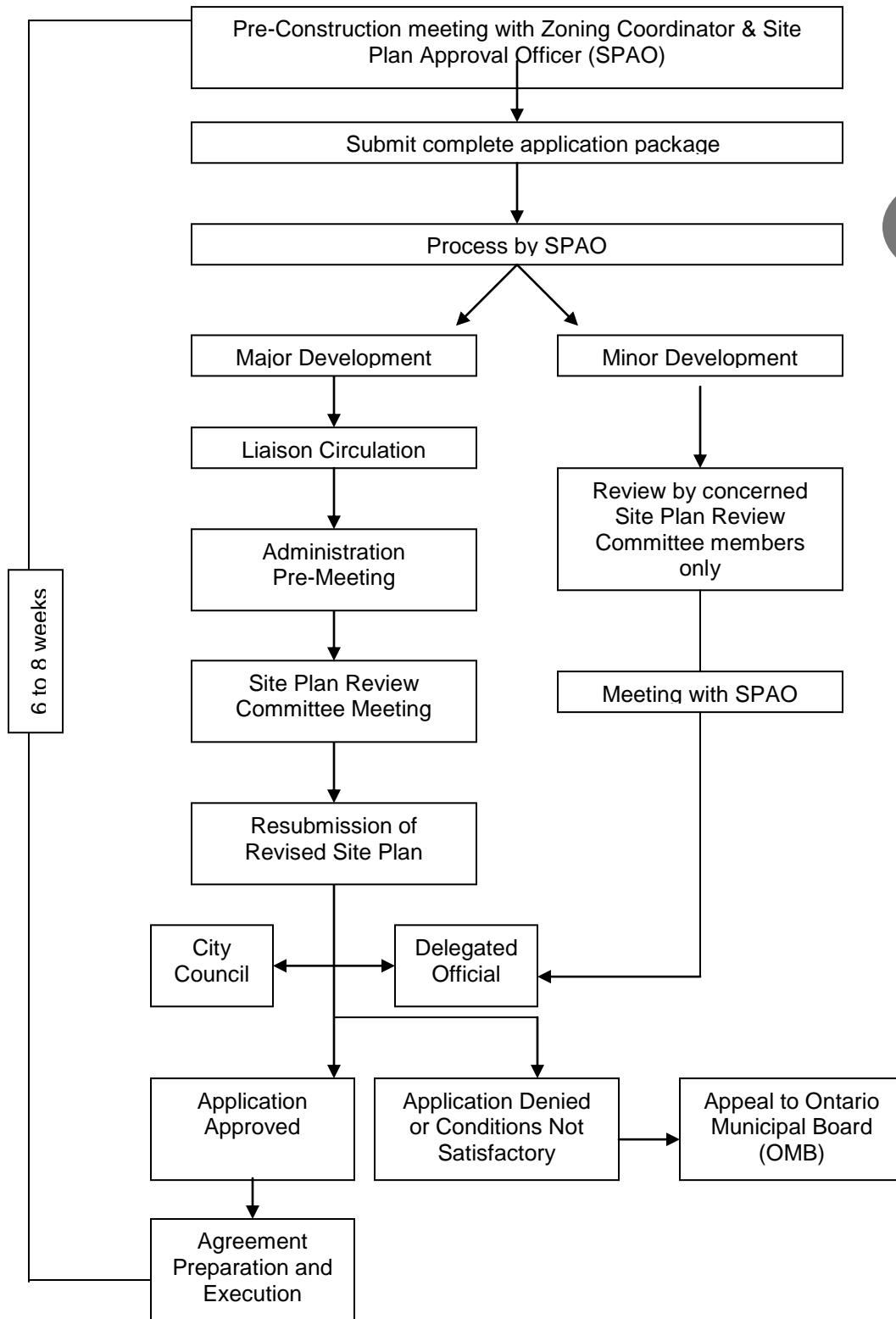
Has the Developer provided a traffic impact study? (If required)	
Do the results in the traffic impact study match this Department's calculations? (If required)	
Do trip distributions in the traffic impact study appear to be reasonable? (If required)	
Does the site plan identify each adjacent road's Official Plan classification?	
Does the site plan identify all adjacent and opposite driveway approaches?	
Does the site plan identify the required land conveyances?	
Does the site plan identify the location of Transit Windsor bus stops?	
Do the locations of driveways conform to the requirements of the Official Plan?	
Do the site plan's access driveway locations conform to the Transportation Association of Canada's Geometric Design Standards for Canadian Roads?	
Do access driveways have clear throat lengths in accordance with the principles in the Transportation Association of Canada's Geometric Design Standards for Canadian Roads?	
Do access driveways line up with the driveways opposite the development?	
Do access driveways meet the minimum spacing requirements with adjacent access driveways?	
Do the access driveways meet the public right-of-way at a right angle or near right angle?	
Do access driveways require acceleration/deceleration lanes? If so, do their lengths match the requirements in the Transportation Association of Canada's Geometric Design Standards for Canadian Roads?	
Do the access driveways have adequate sight lines?	
Do the access driveways have appropriate left turn lanes and/or storage if necessary?	
Do the locations of the access driveways present a hazard to pedestrians and/or cyclists?	
Does the Developer show linkages to and from existing/future multi-use trails in the vicinity of the site?	
Does the site plan show pedestrian walkways from the right-of-way to the front of the building in a reasonable location?	
Do the pedestrian crossings show proper treatment (i.e.: pavement markings or raised crosswalk)?	
Are bicycle parking spaces located in a reasonable location (i.e.: well lit, near entrance, not hidden from plain view)?	
Do all parking spaces allow for easy access in and out?	
Do any of the parking spaces create unreasonable conflict within a manoeuvring aisle?	
Do the manoeuvring aisles reduce conflicts? Do they work?	

Appendix C

Do the manoeuvring aisles have any blind spots or corners?	
Do manoeuvring aisle designs allow for future site expansion to adjacent?	
Does the design of the parking lot prevent people from having to walk between parked cars to access the front of the building?	
Is the location of the loading space/loading area separated from pedestrian crossing areas?	
Does the site plan show on site manoeuvring for the loading space using truck turning templates for the type of truck that will be making deliveries to the site?	
Does the site plan allow for truck manoeuvring completely within the site? (Truck manoeuvring not permitted on the public right-of-way for any reason.)	
Has the applicant submitted the required Signs and Markings Plan using sign codes from the Ontario Traffic Manual as required?	

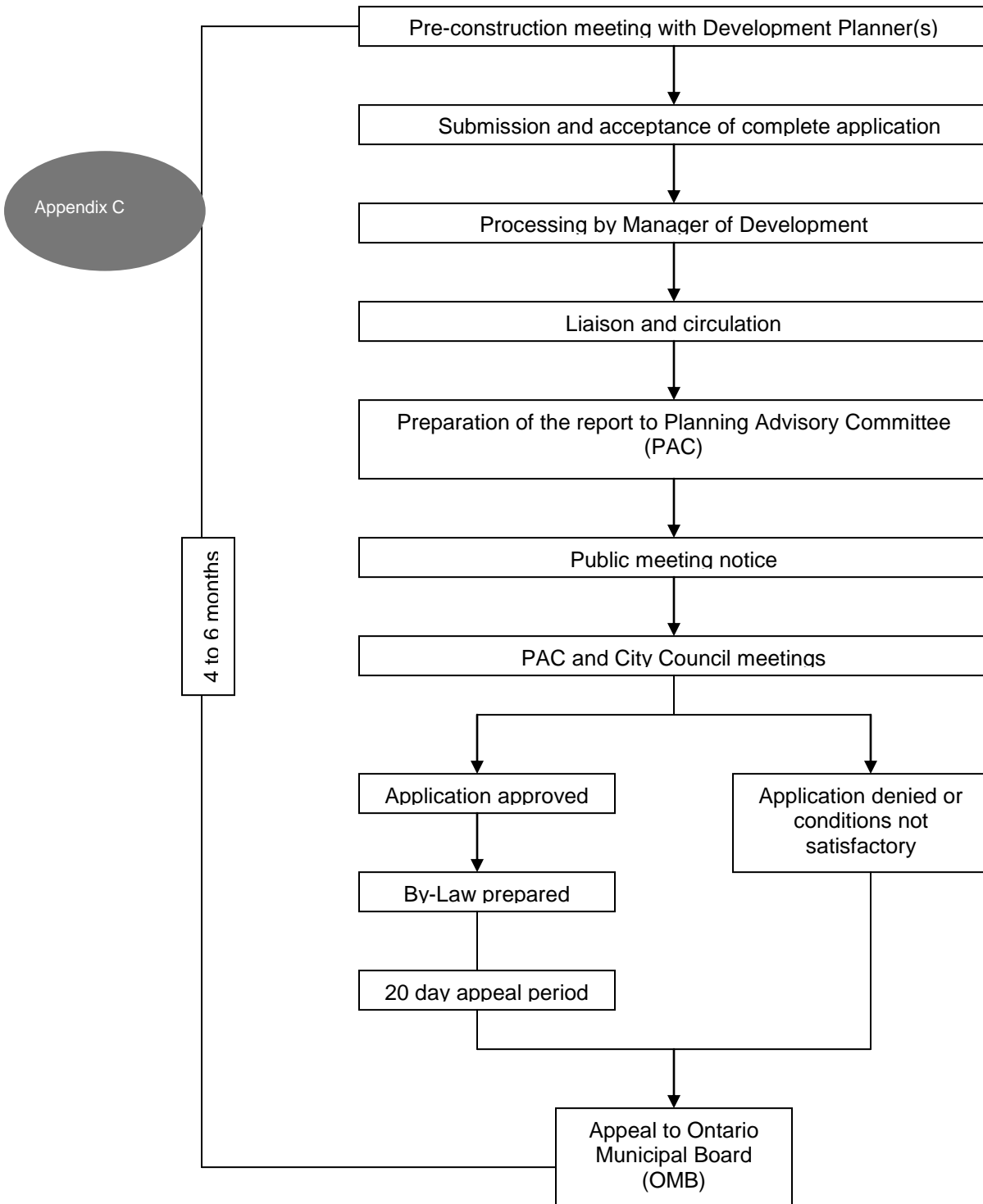
Appendix C

IV SITE PLAN CONTROL PROCESS CHART



Appendix C

V REZONING PROCESS CHART



APPENDIX D

I MODEL HOME PERMIT

A Construction Permit for a model home can be obtained for the following location(s)

As per conditions in Council Resolution 685/92.

The following is a checklist of conditions for a model home:

- | | | |
|---|--------------------------|--------------------------|
| 1. Has the bonding been accepted for the servicing? | <input type="checkbox"/> | <input type="checkbox"/> |
| | YES | NO |
| 2. Have roll numbers and addresses been assigned to lots? | <input type="checkbox"/> | <input type="checkbox"/> |
| | YES | NO |
| Roll # _____ | | |
| 3. Are the lot(s) identified above within 500 feet (153 metres) of a working fire hydrant? | <input type="checkbox"/> | <input type="checkbox"/> |
| | YES | NO |
| 4. Will a CLASS 'B' road exist to access the model home(s) prior to the public being allowed to tour the models? | <input type="checkbox"/> | <input type="checkbox"/> |
| | YES | NO |
| 5. Has the developer of the subdivision entered into an agreement with the City of Windsor regarding conditions for Model Home(s) construction? | <input type="checkbox"/> | <input type="checkbox"/> |
| | YES | NO |
| <i>If NO, the developer of the subdivision must sign the <u>attached</u> agreement outlining the conditions for construction.</i> | | |
| 6. Has the subdivision / servicing agreement been signed? | <input type="checkbox"/> | <input type="checkbox"/> |
| | YES | NO |
| 7. Has a DRAFT PLAN* been approved or a reference plan been prepared? | <input type="checkbox"/> | <input type="checkbox"/> |
| | YES | NO |
| 8. Does a Lot Grading Plan exist for the above lots? (please attach) | <input type="checkbox"/> | <input type="checkbox"/> |
| | YES | NO |
| 9. Has a Sign Permit Application been submitted to the Building and Development Department for a subdivision sign for this development which includes sidewalk locations? | <input type="checkbox"/> | <input type="checkbox"/> |
| | YES | NO |

COMMENTS: **Subdivision**
Name: _____

The undersigned understands and agrees to the following:

1. That he/she will be required to obtain Street Opening Permits from Public Works – Engineering & Corporate Projects, for sewer connection and driveway construction when the subdivision has been accepted onto maintenance;
2. That he/she is aware that use of **any** private drain connection at the property line is **prohibited**, and confirms accordingly he/she will **NOT** connect to the sewers until such time as the subdivision has been accepted onto maintenance.
3. **THAT ANY BUILDER FAILING TO COMPLY WITH THESE REQUIREMENTS WILL FORFEIT FUTURE MODEL HOME PRIVILEGES AS DETERMINED BY THE CITY ENGINEER.**

Appendix D

DEVELOPER

DATE

APPLICANT

DATE

*PUBLIC WORKS – ENGINEERING & CORPORATE
PROJECTS*

DATE

* **NOTE:** Compliance with all applicable regulations or By-laws as a result of a change to the DRAFT PLAN shall be the responsibility of the applicant.

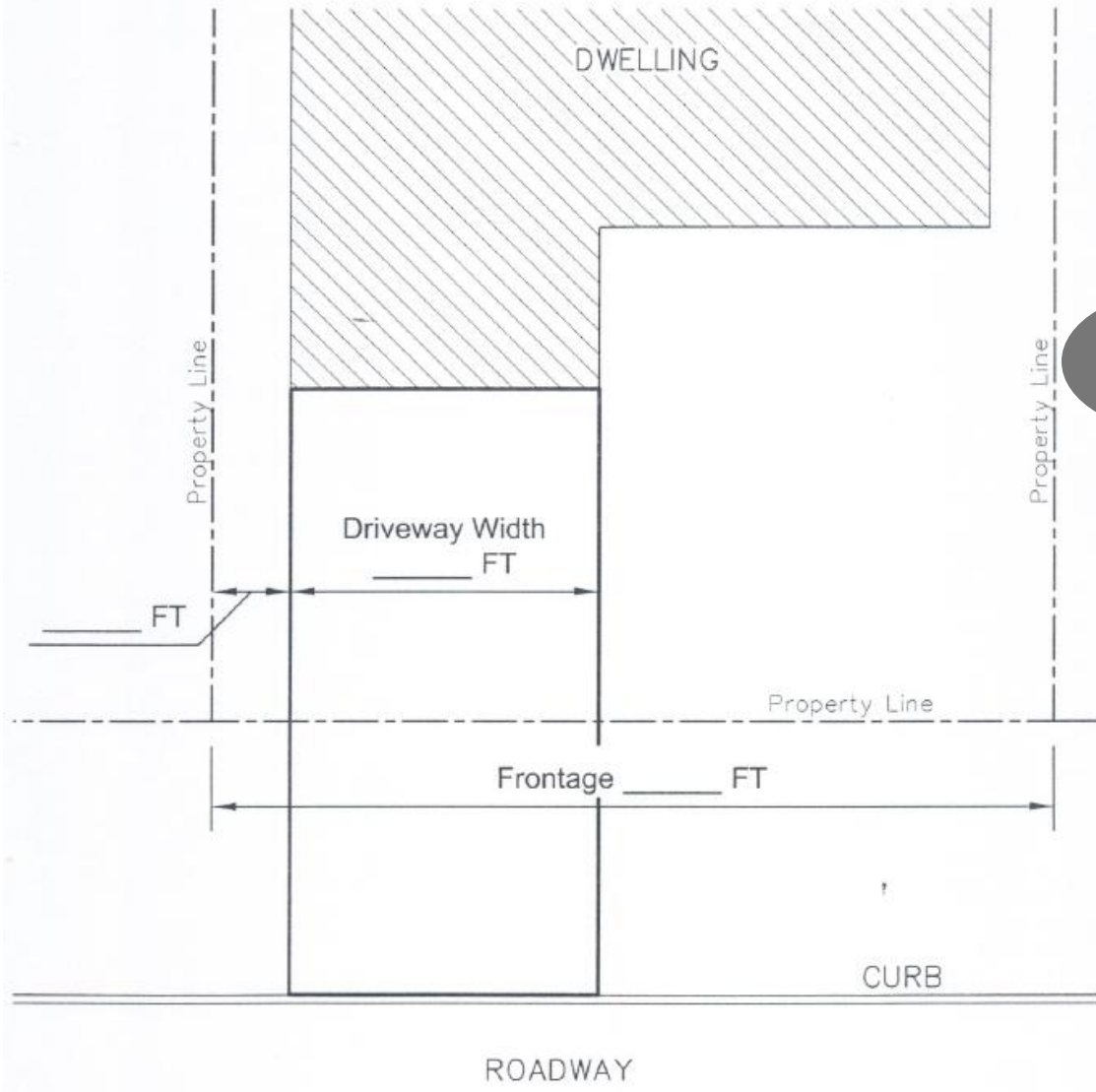
II DRIVEWAY PERMIT DRAWING

Appendix D

DRIVEWAY PERMIT DRAWING

ADDRESS: _____ APPLICANT: _____

LOT: _____ PLAN: _____



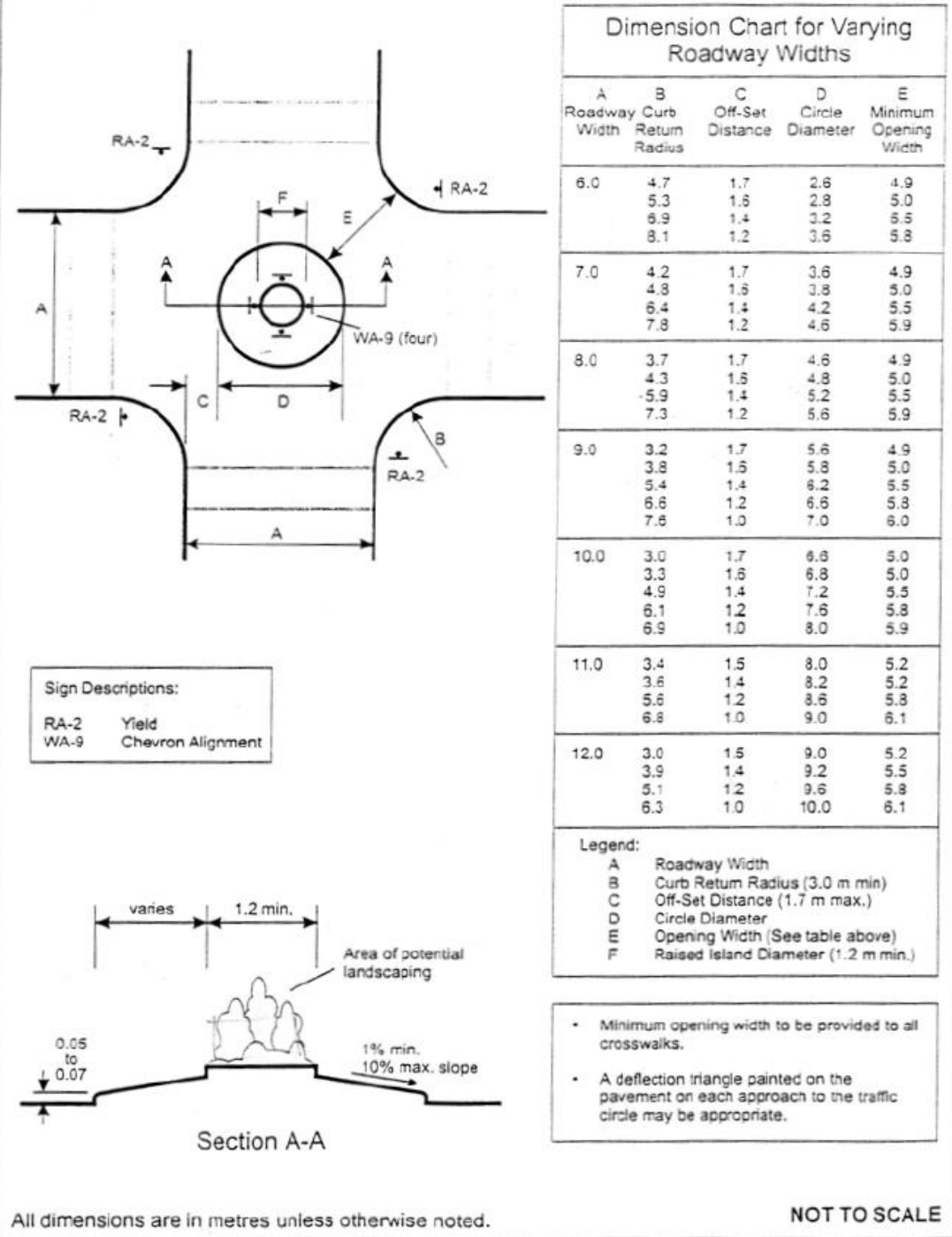
Appendix D

SIGNATURE

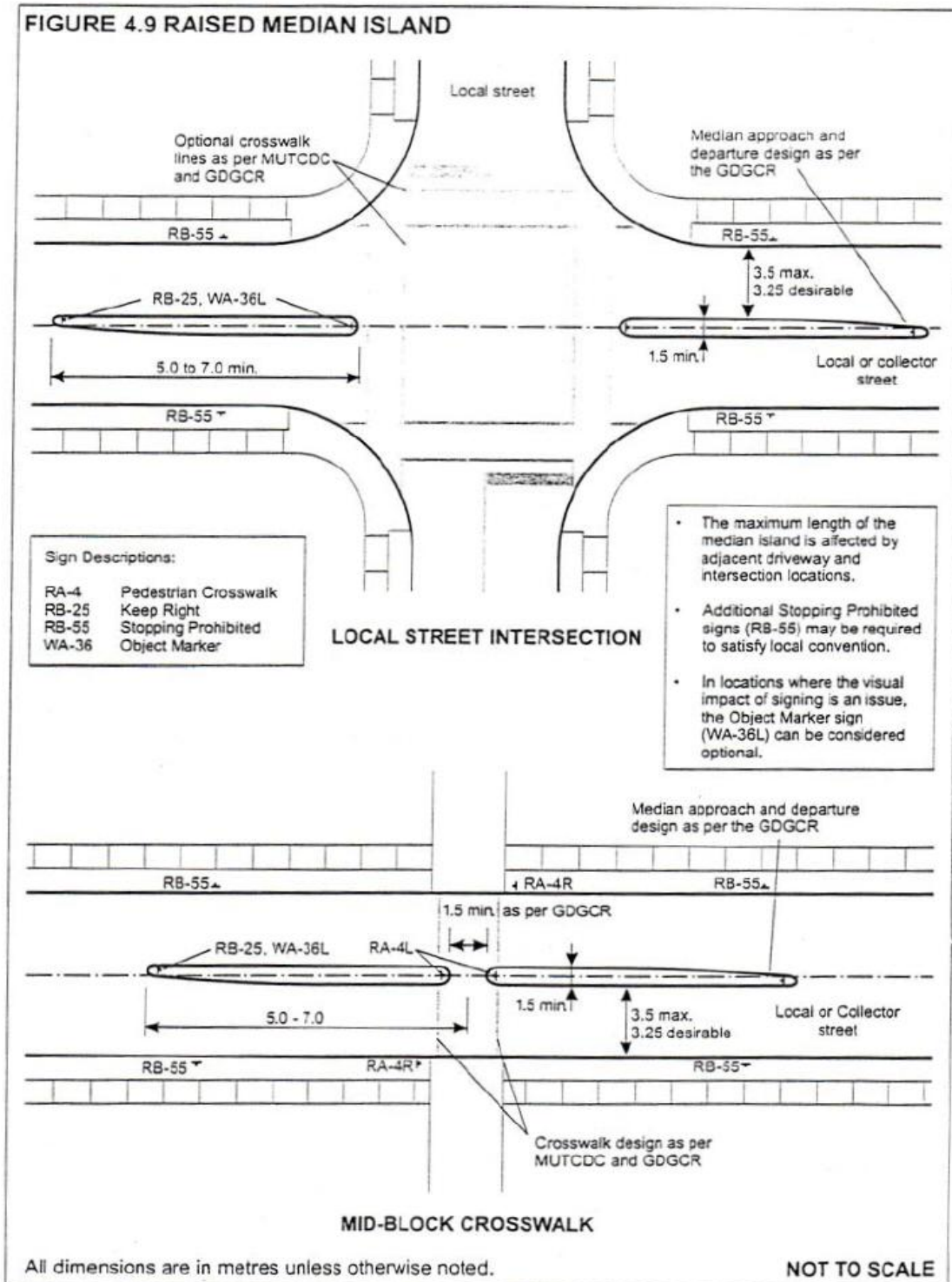
Appendix E

APPENDIX E

FIGURE 4.10 TRAFFIC CIRCLE

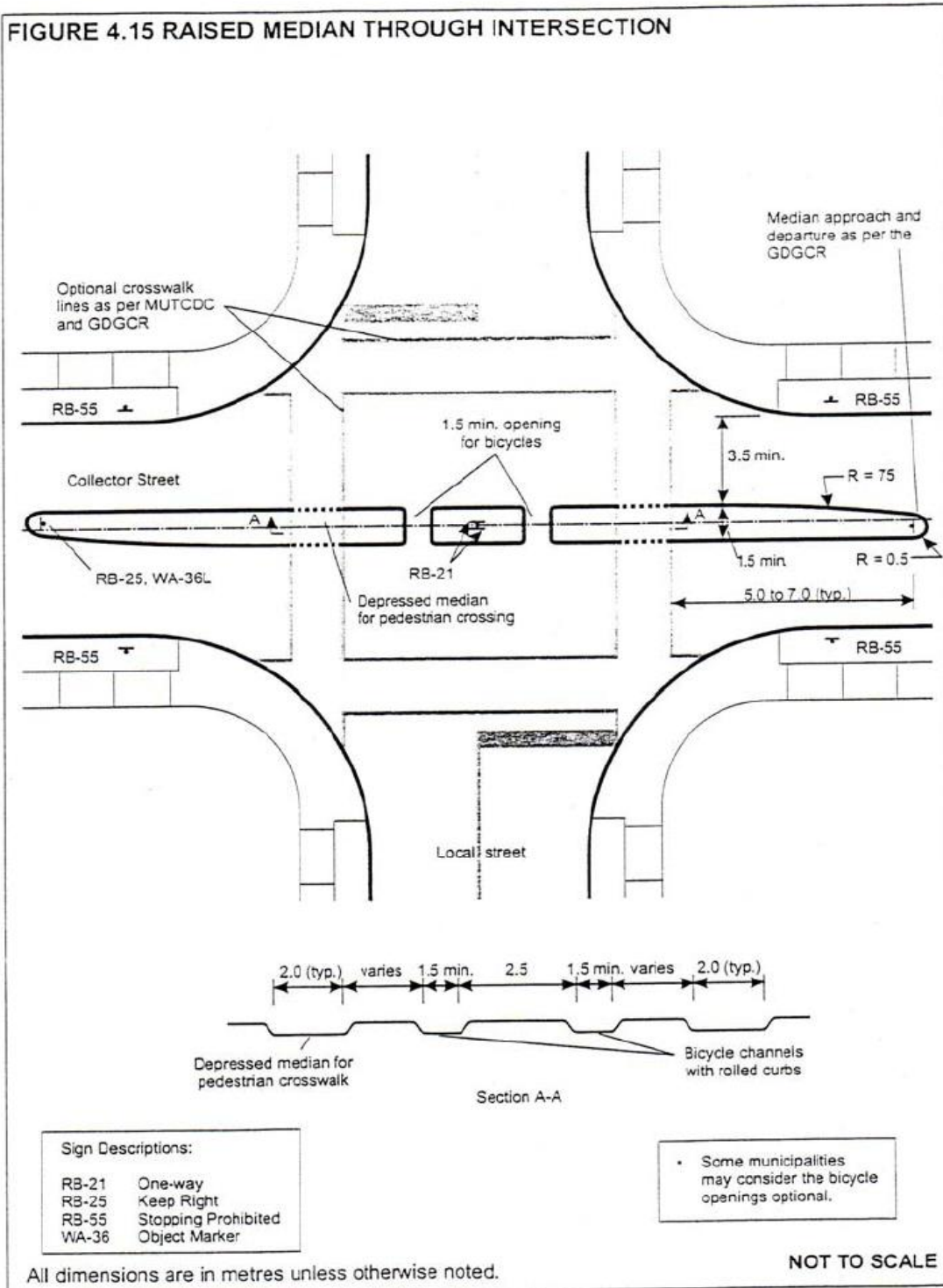


Appendix E



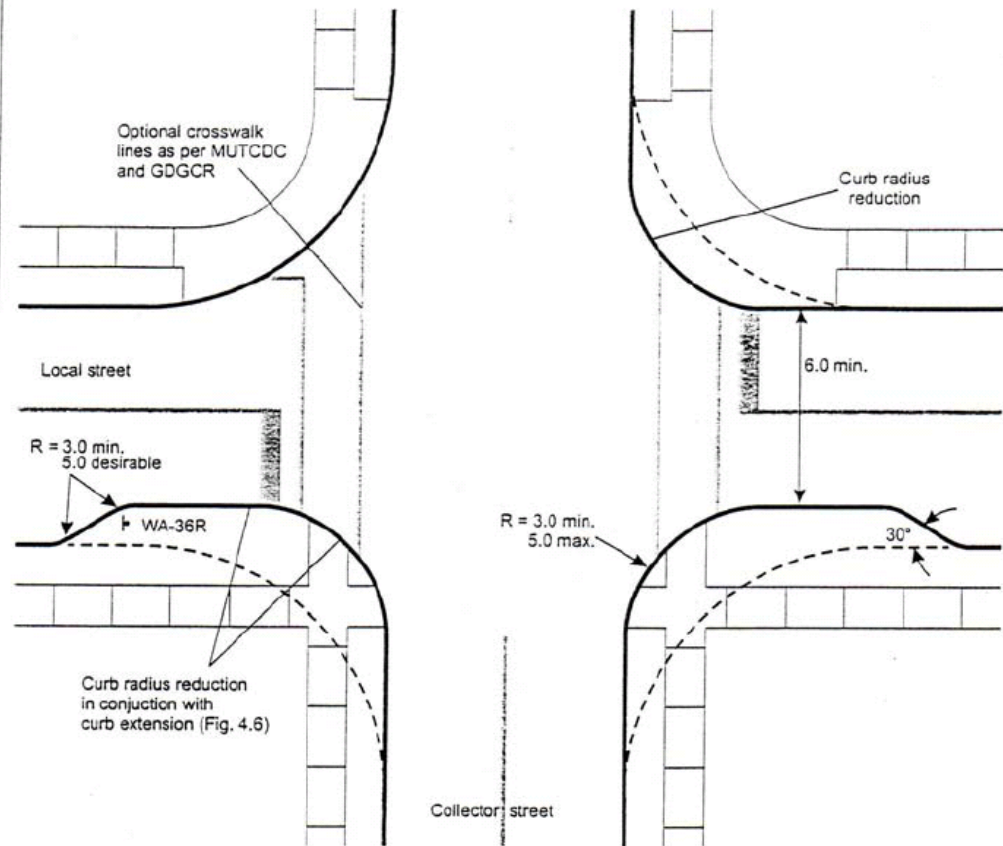
Appendix
E

FIGURE 4.15 RAISED MEDIAN THROUGH INTERSECTION



Appendix E

FIGURE 4.7 CURB RADIUS REDUCTION



Sign Descriptions:
WA-36 Object Marker

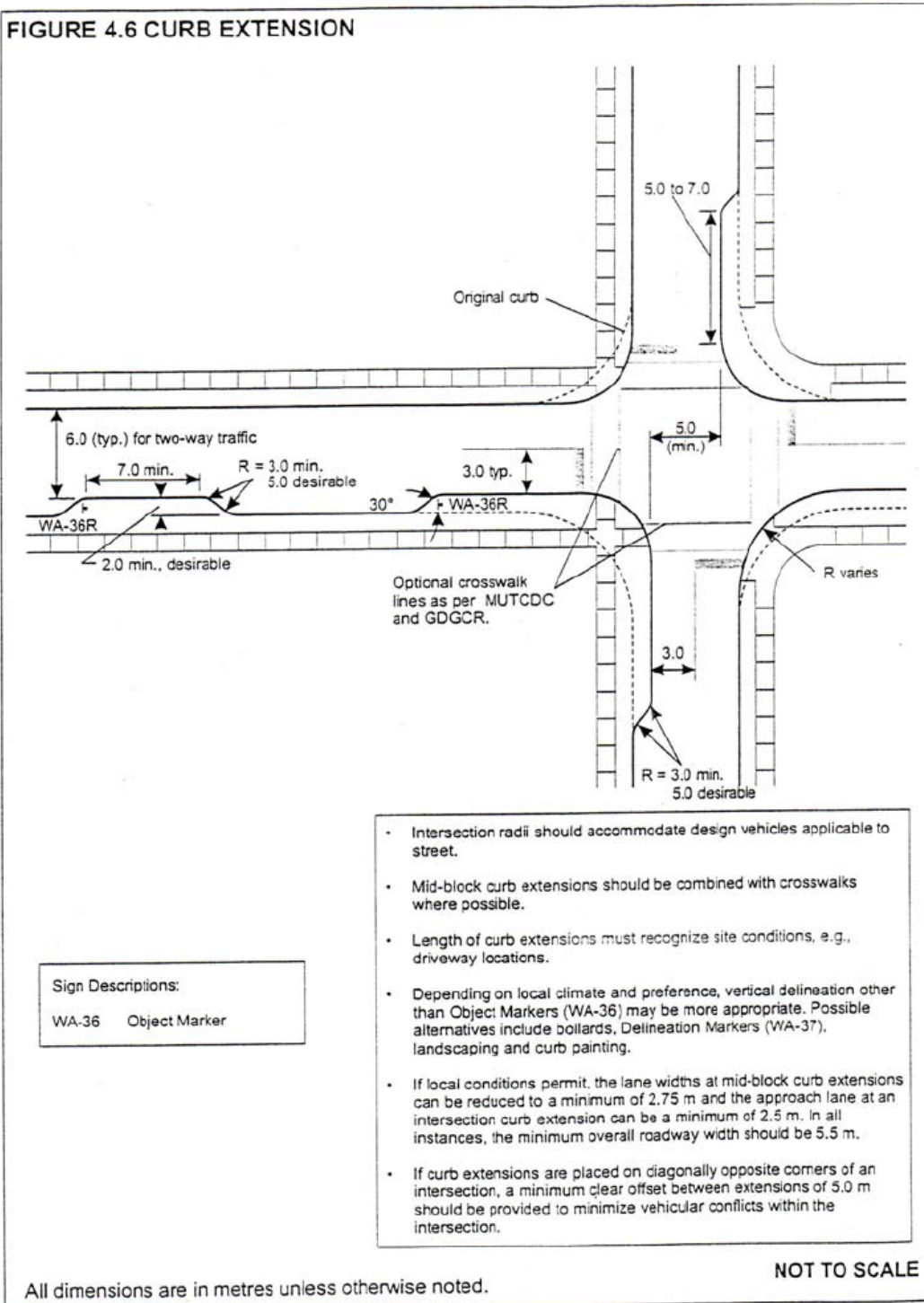
- Curb radius reductions should not be applied on primary emergency vehicle routes.
- Depending on local climate and preference, vertical delineation other than the Object Marker (WA-36) may be more appropriate. Possible alternatives include bollards, Delineation Markers (WA-37), landscaping and curb painting.

All dimensions are in metres unless otherwise noted.

NOT TO SCALE

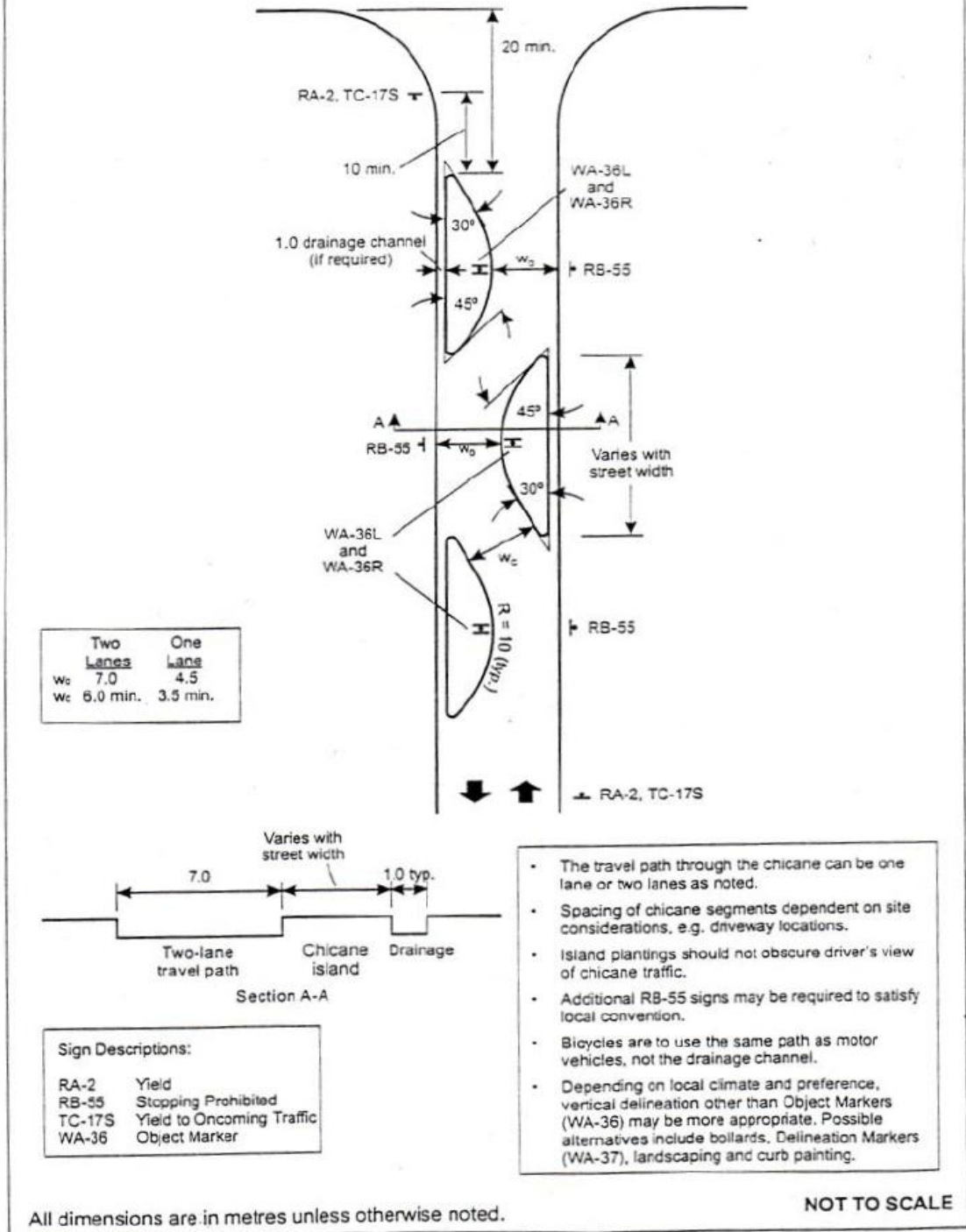
Appendix E

FIGURE 4.6 CURB EXTENSION



Appendix E

FIGURE 4.5 CHICANE



Appendix E

APPENDIX F

Appendix F

I PUMPING STATION GENERAL SPECIFICATION

SITE/BUILDING

- The wet well shall have a minimum diameter of 2400 mm.
- The well shall be sized to accommodate a maximum of 6 pump starts per hour
- Stainless steel vent pipes shall be installed in all wetwells c/w birdscreens
- Building construction shall be brick and/or architectural block.
- Site shall have paved access on all sides of well and a turn-around area suitable for a 1-ton truck
- Paved access to be provided up to front of building and to location of diesel fuel filler pipe.
- Sufficient clearance shall be provided from neighbouring properties to allow easy access to the building and/or well from all sides with a truck.

It is the consultant's responsibility to submit a complete specification to the city for review before going out to tender. The specification must include workmanship requirements. The consultant shall include the relevant sections of the specifications for construction of the new pumping station and appurtenances from the following Divisions:

Division 1 - General Requirements

Division 5 - Metals

Division 9 - Finishes

Division 11 – Equipment

Division 13 – special construction

Division 15 - Mechanical

Division 16 - Electrical, Instrumentation and Controls

Appendix F

CITY INSPECTION

City to be contacted to carry out an inspection at the following stages of construction:

- installation of well
- well in place; prior to installation of pumps
- building closed in; before installation of diesel and electrical equipment
- pump commissioning
- diesel commissioning

DIVISION 1 - GENERAL REQUIREMENTS

1.1 SHOP DRAWINGS

- 1.1.1 Provide six (6) copies to Engineer for review with the model to be supplied highlighted; Engineer to forward 2 copies to City.
- 1.1.2 The Contractor shall review and approve all shop drawings before submission to Engineer. Submissions which have not been reviewed and approved by the Contractor will be rejected and returned to the Contractor without Engineer's review.
- 1.1.3 Shop drawings shall be submitted to Engineer for review prior to the start of construction.
- 1.1.4 Submissions, revisions and resubmissions of shop drawings shall be considered as part of Contractor's work and shall be included in Contractor's construction progress schedule.

1.2 Contract Closeout

1.2.1 Take-Over Procedure

Placing into Service:

- 1.2.1.1 Assist in starting up new facilities under direction and supervision of Engineer.
- 1.2.1.2 Arrange to have sufficient labour and technical personnel on site in addition to that requested under equipment section.
- 1.2.1.3 Date of substantial completion to be considered only after satisfactory operation of all equipment and whole system.
- 1.2.1.4 Carry out all field tests of equipment prior to start-up and allow in Tender Price for all field testing costs.
- 1.2.1.5 Field testing refers to checking and operating, where possible, all equipment prior to placing station into service.
- 1.2.1.6 Payment for personnel required for placing station in service to be included in the Total Tender Price in Form of Tender.
- 1.2.1.7 Start-up will not commence until Contractor has field tested all equipment.

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1.2.2 Spare Parts

1.2.2.1 Supply all spare parts as required by specifications.

1.2.2.2 Hardware

1.2.2.2.1 Provide pump station building door; all hatches; panel doors and disconnects with ice-proof padlocks for pumping station with solid brass body 50 mm wide with 9 mm stainless steel shackle of Canadian manufacture. Contact Pollution Control for specific make and model.

1.2.2.2.2 Locks shall be grand master-keyed to owner's requirements.

1.3 Operating and Maintenance Manuals

The contents of the manual must satisfy the C. of A. requirements.

1.3.1 Upon completion and testing submit 4 sets of "Operation and Maintenance" manuals combining the Trade listed below within 2 weeks of substantial completion:

- General Trades
- Mechanical Trades
- Electrical Trades
- Instrumentation Trades

placed in a "D" Ring binder for the Engineer for review. The manual shall follow the structure outlined below:

- i) Title Page: Station Name; Project Number, date, to be placed in cover sleeve, and at front of binder.
- ii) Station Name; Project Number to be placed in back rib of binder.
- iii) Date, Owner, Consultant, General and Major Sub-Contractor information
- iv) Supplier addresses, telephone number, fax number and item(s) supplied.
- v) Table of Contents - refer to Appendix A

use numbered tab dividers for each section in the Table of Contents and coloured separator pages for each subsection.

Note: Identify all drawings and instructions by City Of Windsor Project Number, Project Title and Contract Number, etc.

1.4 As-Built Drawings

- 1.4.1 During progress of construction, keep record of all non-structural, underground and concealed work which will be transferred to set of drawings kept on site for this sole purpose.
- 1.4.2 Co-operate fully with Engineer during progress of work so that **all** measurements can be taken.
- 1.4.3 Notify Engineer in sufficient time to allow any measurements required to be taken before work is concealed or covered.
- 1.4.4 Record all revisions to electrical power and control wiring.
- 1.4.5 Within 2 weeks of substantial completion submit the following as built drawings:
 - 1 full size set of mylar drawings
 - 3 full size sets of prints
 - 2 sets of 11 x 17prints
 - all AUTOCAD files and .pdf copies of files on CD

Note: Pump station will NOT be accepted by the City until all as-built drawings and operating and maintenance manuals are submitted.

1.5 Submittals

- 1.5.1 Submit to Engineer the schedule of Pumping Station construction.
- 1.5.2 Submit shop drawings and calculations of excavation protection system to Engineer for review and record. These submissions must be certified by a licensed Professional Engineer in Ontario.
- 1.5.3 Submit to Engineer, for review before fabrication, shop drawings of all miscellaneous metal work.
- 1.5.4 Submit to Engineer, for approval prior to manufacture, shop drawings of precast concrete riser sections including dimensions, joint detail, reinforcement details, type and strength of concrete to be used.

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1.6 Pump Station Surface Finish

1.6.1 Asphaltic Concrete Paving

1.6.1.1 Subgrade 450 mm thick 0-75 mm Granular to City of Windsor S-4, compacted to 100% S.P.D.D. Refer to Special Provisions for further information.

1.6.1.2 Granular Base Course 150 mm thick Granular "A" to City of Windsor S-4, compacted to 100% S.P.D.D. Refer to Special Provisions for further information.

1.6.1.3 Granular Surface Course 150 mm thick Granular "A" to City of Windsor S-4, compacted to 100% S.P.D.D. Refer to Special Provisions for further information.

1.6.1.4 Asphalt Requirements 100 mm thick HL4 surface asphalt to City of Windsor specification.

1.6.2 Scheduling of Work

1.6.2.1 Schedule construction of roadway after installation of Pumping Station, and installation of sewers to Pumping Station site are completed.

1.7 Chain Link Fence

1.7.1 Steel wire, galvanized by hot-dip process after weaving or electro-galvanized before weaving. Galvanized fabric to have an average of 0.35 oz/ft.² of zinc over wire surface area. The galvanized wire shall be finished with a 7-10 mil thick coating of PVC thermally fused and bonded to the wire.

1.7.2 Height: 1.8 m

1.7.3 Wire Size: 11 gauge

1.7.4 Mesh Size: 25 mm

1.7.5 Knuckled at one selvage and twisted at other.

1.7.6 Colour: Green

1.7.7 Manufacturer: Secure Guard Fence, Security Fence Supply Co., Bladensburg, Maryland, Phone No. (301) 927-4080 or approved equal.

- 1.7.8 Line post: schedule 80, hot dipped galvanized steel pipe to ASTM A120, 60.3 mm (OD) outside diameter.
- 1.7.9 End, corner, strainer and gate posts: hot dipped galvanized steel pipe to ASTM A120, 88.9 mm (OD) outside diameter. For gate opening larger than 3.6 m (single gate) or 7.2 m (double gate), use 114.3 mm O.D. gate posts. 168 mm O.D. gate posts should be used for gate opening larger than 4.6 m (single gate) or 9.2 m (double gate).
- 1.7.10 Top rails and braces: hot dipped galvanized steel pipe to ASTM A120, 42.9 mm outside diameter.
- 1.7.11 Barbed Wire Arm: Cast aluminium to accommodate three strands of barbed wire at 45° overhang pointing inwards. Top strand approximately 300 mm above fabric.
- 1.7.12 Barbed wire: three strands, 4 point, 12.5 gauge, 150 mm spacing. Galvanized line wire to have 244 g of zinc per square metre of surface area.
- 1.7.13 Tension wire: single strand, galvanized steel with PVC coating to match fabric wire, 3.5 mm diameter.
- 1.7.14 Fasteners: single strand, galvanized steel wire, 3.5 mm diameter with PVC coating to match fabric.
- 1.7.15 Top Rail Sockets: Cast aluminium.
- 1.7.16 Stretcher Bar: Galvanized 5 x 19 mm minimum.
- 1.7.17 Stretcher Bar Bands: Galvanized 19 mm wide with hot dipped galvanized nuts and bolts.
- 1.7.18 Crown Post Caps: Cast aluminium.
- 1.7.19 Turn Buckles: Forged steel hot dipped galvanized.
- 1.7.20 Gate Frames: to ASTM A120, schedule 80, galvanized steel pipe, 42.9 mm O.D. pipe for outside frame, 31.8 mm O.D. pipe for interior bracing:
 - 1.7.20.1 Fabricate gates to size as indicated on Drawings. Electrically weld joints and hot-dip galvanize after welding.
 - 1.7.20.2 Fence fabric to be fastened to gate, with barbed edge on top.
 - 1.7.20.3 Gates to be furnished with galvanized malleable iron hinges, latch and latch catch with provision for padlock, which can be attached and operated from either side of installed gate. Nuts and bolts to be hot dipped galvanized.

1.7.20.4 Double gate to be furnished with chain hook to hold gates open and centre rest with drop bolt for closed position. Wheels are also required.

1.7.20.5 Barbed wire detail to be installed on all gates to match fence.

1.7.21 Post Foundation

1.7.21.1 Concrete: to Section 03300, Class "B".

1.7.21.2 Size:

1.7.21.2.1 300 mm in diameter and 1 m in depth for line posts.

1.7.21.2.2 450 mm diameter and 1.2 m in depth for terminal posts and gate posts.

1.7.21.2.3 600 mm in diameter and 1.5 m in depth for gate posts with gate opening wider than 6 m.

1.7.22 Execution

1.7.22.1 Installation of Fence (See OPSD 900.01, 900.02, 900.03 and 900.04)

1.7.22.2 Install chain link fence as per OPSD 900.01 and 900.04 requirements.

1.7.22.3 Erect fence along lines and levels as specified or directed by Engineer.

1.7.22.4 Erect fence following ground contour without stepping. Maintain clearance of 50 mm from ground level at any point along perimeter.

1.7.22.5 Drill or auger post holes to depth of one metre for line posts and 1.2 metres for terminal and gate posts.

1.7.22.6 Set post in concrete against undisturbed stiff soil. Enlarge concrete foundation to suit soft soil condition to satisfaction of Engineer.

1.7.22.7 Set concrete foundation 100 mm below finish grade.

1.7.22.8 Space line posts 3 m apart measured parallel to ground surface.

1.7.22.9 Place straining posts at equal intervals not exceeding 150 m if distance between end of corner posts is greater than 150 m.

1.7.22.10 Install additional straining posts at abrupt changes in vertical alignment or where Engineer directs.

1.7.22.11 Chain Link Fence:

1.7.22.11.1 Do not install fence fabric until concrete has cured a minimum of 5 days.

1.7.22.11.2 Install brace at end post and from gate post to nearest line post.

1.7.22.11.3 Install braces on both sides of corner and straining posts.

1.7.22.11.4 Install top rail between posts from end to end of each stretch of fence.

1.7.22.11.5 Fasten top rail to posts with waterproof caps.

1.7.22.11.6 Install bottom tension wire by stretching tightly and fastening securely to end, corner, gate and straining posts.

1.7.22.11.7 Lay out fence fabric, stretch tightly and fasten to posts with galvanized wire clips at 400 mm intervals.

1.7.22.11.8 Secure fabric to top rail and bottom tension wire with galvanized wire at 500 mm intervals.

1.7.22.12 Barbed Wire Fences:

1.7.22.12.1 Install three rows to OPSD 900.02 requirements.

1.7.23 Installation of Gates

1.7.23.1 Erect gates in locations specified or directed by Engineer to OPSD 900.03 requirements.

1.7.23.2 Secure gates with fittings to match fence, complete with latches, hinges, stops, hold openers and all necessary fittings.

DIVISION 5 - METALS

Provide suitable isolation and/or protection to protect against corrosion due to reaction of dissimilar metals.

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5.1 Manufactured Items:

5.1.1 Aluminium Manhole Steps:

5.1.1.1 Type #350 aluminium steps (drive in style, 406 mm wide, 250 mm deep) as manufactured by MSU Mississauga Ltd., Mississauga, Ontario or approved equal.

5.1.2 Aluminium Ladders:

5.1.2.1 Heavy duty aluminium ladder shall be MSU No. 1115 with No. 8191 flanges and No. 8141 flanged brackets and stainless steel mounting bolts. Max. spacing between support brackets is 1.2 m.

5.1.2.2 Safety handles shall be MSU #3104 double rail access handles as indicated on Drawings. Provide additional stainless steel wall brackets for added ladder strength and stability.

5.1.2.3 Provide No. 3152 MSU Safety Sliding Rail at locations as indicated on Drawings. Provide one MSU Safety Belt and Safety Clip #3156 and Safety Lanyard and Carabinder.

5.1.2.4 All ladders w/safety rail shall be 500 mm (20") wide.

5.1.2.5 Verify sizes as indicated on drawings.

5.1.2.6 Acceptable Manufacturer: MSU Mississauga Ltd., Vision Almet Ltd. or approved equal.

5.1.3 Aluminium Handrail and Posts:

5.1.3.1 38 diameter I.P.S. Schedule 40 aluminium pipe railing (welded construction).

5.1.3.2 Aluminium alloy, 6063-T6 or 6351-T6 with clear anodized finish.

5.1.3.3 Grind smooth all welded connections before anodizing work.

5.1.3.4 Maximum spacing between posts is 1.8 m or as indicated on Drawings.

5.1.4 Open Metal Grating:

5.1.4.1 1-3/4" x 3/16" close mesh aluminium grating with serrated bearing bars.

5.1.4.2 Band all edges with similar materials.

5.1.4.3 Fasten grating to support members with stainless steel fixing clips at 20 in. (500 mm) centres. Minimum four clips per panel.

5.1.4.4 Acceptable Manufacturers: Fisher & Ludlow Ltd., Burlington, Ontario, Borden Metal Products (Canada) Ltd.

5.1.5 Aluminium Access Hatches:

5.1.5.1 Single leaf access hatches with aluminium construction, cast in place as shown on contract drawings.

5.1.5.2 Verify sizes as indicated on drawings. (min. 750mm x 900mm)

5.1.5.3 Hatch shall feature continuous piano hinge, gas assist springs, secondary safety grating, hold-open arm with handle, provisions for padlock (non recessed). All material to be corrosion resistant.

5.1.5.4 Provide all stainless steel hardware.

5.1.5.5 Access hatch shall be built to withstand a minimum live load capacity of 150 pounds per square foot using 6 mm thick aluminium tread plate, and equipped with a snap lock and removable handle. Provide sufficient stiffeners for deflection control.

5.1.5.6 Paint all surfaces in contact with concrete with two coats of bituminous paint.

5.1.5.7 All top exposed surfaces of hatches shall come from the manufacturer with a minimum 6 mil plastic barrier that can be peeled off after being cast in place. All exposed surfaces shall present a uniform appearance.

5.1.5.8 Supplier shall be MSU Mississauga Ltd., Vision Almet, or approved equal.

5.2 Fabricated Items

Large access or equipment removal hatches must be provided with aluminium safety posts and railing, with open-bottom recessed sockets (for drainage) at each corner of hatch.

Approved anchor point for tethering to be provided complete with St. St. eye hook.

5.2.1 Aluminium Products:

5.2.1.1 Structural Shapes: to CSA S157, HA.5.6351-T6.

5.2.1.2 Sheets and Plates: to CSA S157, HA.4.6061-T6.

5.2.1.3 Pipes: to CSA S157, HA.7.6061-T6.

5.2.2 Provide all aluminium structural supports as indicated on Drawings, including bars, angles, channels, beams, and plates, etc.

5.2.3 Supply and install 316 stainless anchors as required.

5.2.4 Fabricate aluminium work using welders certified to perform aluminium welding by Canadian Welding Bureau.

5.2.5 Aluminium Platform

5.2.5.1 Fabricate to details as shown on Drawings.

5.2.5.2 All fasteners to be 316 stainless steel.

5.2.6 Aluminium Equipment Hatch

5.2.6.1 2 door, equipment hatch, cast in place as shown on contract drawings.

5.2.6.2 All aluminium construction, 6 mm thick alum tread plate w/mill finish and 150 lb/ft² min. load capacity including sufficient stiffeners for deflection control.

5.2.6.3 Includes hold open arm, snap lock w/removable key, continuous stainless steel piano hinges, secondary safety grating, lift handles, provisions for padlock (non recessed) and spring assist
All material to be corrosion resistant.

5.2.6.4 Paint all surfaces in contact w/concrete w/2 coats of bituminous paint.

5.2.6.5 Hatch framing shall be modified to accept sump pump guide rail holder to suit.

5.2.6.6 Protect exposed aluminium surfaces with peelable plastic sheets (min. 6 mils thick).

Manufacturer: MSU Mississauga Ltd., Vision Almet Ltd., or approved equal.

DIVISION 9 - FINISHES

9.1 Painting

9.1.1 Concrete Surfaces (Exterior)

9.1.1.1 Hydrozo Clear 30 M penetrating sealer.

9.1.1.2 Apply sealer to all exposed exterior surfaces of new Pump Chamber.

9.1.1.3 Apply sealer w/a flooding action at a rate of 2 m²/litre using a nap roller, brush or spray.

9.1.2 Ferrous Metals, Equipment, Piping & Valves

9.1.2.1 In accordance with Schedule B - Schedule of Surface Preparation and Painting of Metals, Equipment, Piping, Fittings and Valves.

9.1.2.2 All insulated and exposed piping, valves and equipment to be painted complete. Do not paint stainless steel piping.

9.1.2.3 All equipment, piping and valves, shall receive field touch up and two coats of finish painting to match process colour.

9.1.3 Colour Schedule

9.1.3.1 Engineer at time of construction will supply to Contractor colour schedule to cover all materials, equipment, piping, valves, fittings, etc. not prefinished. Do not interpret same to mean that schedule will be made up of standard stock colours.

9.1.3.2 Make allowance in Tender for mixing or tinting colours to match colours of schedule.

9.1.3.3 Standard stock colours of manufacturer other than specified that match colours of schedule may be used only with written approval of Engineer.

9.1.4 Workmanship

9.1.4.1 All work to be executed by skilled and experienced workmen over clean, dry surfaces according to manufacturer's directions.

9.1.4.2 Application to be by brush, roller or spray as approved by Engineer.

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- 9.1.4.3 Apply coatings in dust free atmosphere with ambient temperatures not less than 10⁰C; provide controlled ventilation during application and drying.
- 9.1.4.4 Do not undertake any exterior painting at temperatures 10⁰C or less or immediately following rain, frost, dew or on surfaces where condensation has or will form due to presence of high humidity or lack of proper ventilation.
- 9.1.4.5 Thoroughly mix material before application and apply evenly, free from sags, runs, crawls and other defects in strict accordance with manufacturer's directions for particular material and coat to be applied.
- 9.1.4.6 Allow each coat to thoroughly dry before application of next coat. Follow manufacturer's directions for dry time.
- 9.1.4.7 Apply all finishes uniformly, cut in clean, free from runs, holidays, sags, or variation of colour or sheen.
- 9.1.4.8 In case of doubt whether surface is to be painted or not, consult Engineer for final decision.

9.1.5 Reference Colour Schedule (confirm use of colours with City)

Pump Station Interior Walls	- beige
Pump Station Floor	-
Piping	
drains	- black
diesel fuel lines	- red
City Water	- blue

flow direction decals to be applied to all pipes after painting

SCHEDULE B

SCHEDULE OF SURFACE PREPARATION AND PAINTING OF METALS, EQUIPMENT, PIPING, FITTINGS AND VALVES

ITEM	SHOP SURFACES PREPARATION	SHOP COATS	FIELD SURFACE PREPARATION	FIELD PRIME COATS	FIELD FINISH
Submerged or partly submerged ferrous metals	White Metal blast cleaning SSPC-SP-5	2 coats Glidden Potable Water Epoxy or 2 coats Ameron Amercoat 90 High Perf. Epoxy 5 mils per coat or Approved Equal	Power tool clean damaged surfaces and field welds SSPC-SP-3		Touch-up and/or repaint damaged areas using same paint as per shop coats
Total Minimum Dry Film Build = 250 um (10 Mils)					
Exterior non-submerged metals (including exterior exposed structural and miscellaneous metals)	Commercial blast cleaning SSPC-SP6	1 coat Glid-Guard All Purpose Metal Primer #5229 at (2 Mils) Dry	Power tool clean damaged surfaces and field welds SSPC-SP-3	1 coat Glid-Guard All Purpose Metal Primer #5229 at 40 um (1.5 Mils) Dry	2 coats Glid-Guard Glid-Shield Urethane Gloss Enamel No. 6000 Series at 50 um (2 Mils) Dry Each Coat
Total Minimum Dry Film Build = 170 um (6.5 Mils)					
Interior non-submerged ferrous metals	Commercial blast cleaning SSPC-SP6	1 coat Glid-Guard All-purpose Primer #5229 50 um (2 Mils) Dry	Power tool clean damaged surfaces and field welds SSPC-SP-3	1 coat Glid-Guard All-Purpose Primer #5229 at 40 um (1.5 Mils) Dry	2 coats Glid-Guard Glid-Shield Urethane Gloss Enamel No. 6000 Series at 40 um (2 Mils) Dry Per Coat
Total Minimum Dry Film Build = 170 um (6.5 Mils)					

- NOTE:**
- (1) Follow coating specifications carefully as all minimum dry film build requirements must be met. If this Specification is lacking in any way, the necessary corrections must be made at the applicator's expense.
 - (2) Verification of film thickness will be by Wet Film Thickness Gauge; SSPC Method for Measurement of Dry Paint Thickness with Magnetic Gauges SSPC-PA-2-737; or combination of both.

DIVISION 15 - MECHANICAL

15.1 General

- 15.1.1 All materials shall be new, of the highest quality and subject to approval of the Engineer.
- 15.1.2 All materials shall conform to the appropriate standards
- Canadian Standards Association (CSA)
 - Occupational Health and Safety Act
 - Technical Standards and Safety Authority (TSSA)
 - American National Standards Institute (ANSI)
- 15.1.3 Comply with the latest edition of the following statutes and codes:
- The Ontario Building Code Act and regulations
 - Occupational Health and Safety Act and Regulations
 - Plumbing code
 - where applicable, all local, municipal, federal, or utilities commission rules, regulations and ordinances. Should any of these impose a higher standard than is required by the drawings and specifications, the Contractor shall execute the work in accordance with these laws, regulations, etc., rather than as specified. The Contractor shall obtain and pay for all permits and inspections, both temporary and permanent, as required and shall deliver approval certificates in triplicate to the Engineer on completion of the job.
- 15.1.4 Where hardware, materials, equipment, apparatus or other products are specified by manufacturer's brand name, type or catalogue number, such designation is to establish the standard of desired quality and style, and shall be the basis of the bid. No deviation from this standard shall be allowed without written permission from the Engineer.

15.2 Workmanship

- 15.2.1 All work in this Contract shall be performed by skilled tradesmen and workmanship shall be of the highest quality. Where the workmanship does not meet the specification, the Engineer shall have the authority to instruct the Contractor to remove such substandard work and replace it to the satisfaction of the Engineer with all associated costs being paid by the Contractor.

15.3 Process Piping and Fittings

15.3.1 Pipe Materials - General

- 15.3.1.1 Furnish and install pipes in class, size and material as shown on drawings and schedules attached to this Specification.
- 15.3.1.2 Surface preparation and painting for all ferrous metal piping, valves, and equipment (except stainless steel) to be in

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accordance with Schedule "B" of Division 9 - Finishes.

15.3.2 Ductile Iron Pipe

15.3.2.1 Manufacture: to ANSI/AWWA C151/A21.50

15.3.2.2 Pressure Class: 350 for 300 mm dia. or less
250 for 350 mm to 500 mm dia.
200 for 600 mm to 1500 mm dia.

15.3.2.3 Joints:

15.3.2.3.1 Exposed Piping - flanged to ANSI B16.1

15.3.2.3.2 Flange Adaptors - Use EBAA Series 2100 "MegaFlange" Flange Adaptors where indicated on the drawings and where approved by the Engineer.

15.3.2.3.3 Buried Piping – Push-on Bell and Spigot to ANSI/AWWA C111/A21.11

15.3.2.4 Fittings:

15.3.2.4.1 Exposed - Ductile Iron, flanged to ANSI/AWWA C110/A21.10.

15.3.2.4.2 Buried - Ductile Iron to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 or Grey Iron to ANSI/AWWA C110/A21.10.

- Interior cement lining to ANSI/AWWA C104/A21.4 and standard asphaltic coating on exteriors.

- Mechanical or Push-on Type Joints to ANSI/AWWA C111/A21.11.

15.3.2.5 Exterior Finish:

15.3.2.5.1 Buried - insulated asphaltic coating 1 mil thick.

15.3.2.5.2 Exposed - shop primed per Division 9.

15.3.2.6 Cement-lining: to ANSI/AWWA C104/A21.4.

15.3.2.7 Gaskets: 1/8" thick, full faced gaskets; red rubber with 250° F continuous service temperature rating.

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- 15.3.2.8 Nuts and Bolts: Provide all 316 stainless steel nuts, bolts and gaskets at all pipe flanges, joints and equipment connections.

15.3.3 PVC Pipe

- 15.3.3.1 General: Schedule 80 PVC pipe to be used within chamber interior unless shown otherwise on drawings.

- 15.3.3.2 Manufacture: to ASTM D-1784, D-1785 and CSA B137.3

Class: Rigid Schedule 80, Type 1, Class 1

- 15.3.3.3 Fittings:
- .1 Schedule 80 Socket type to ASTM D-2467
 - .2 Schedule 80 Threaded to D-2464 (connections to threaded equipment only)
 - .3 Schedule 80 Class 150 flanged to ANSI B2.1 where shown on drawing

- 15.3.3.4 Joints: Solvent cemented to ASTM D-2855 and/or manufacturers specifications. Use clear primer only. For threaded joints use Teflon tape. For flanged joints use Teflon gasket and 304 S.S. fasteners.

- 15.3.3.5 Provide **Union** couplings with EPDM gaskets on all equipment and speciality valves to facilitate removal and where shown on the drawings.

- 15.3.3.6 Supply: Ipex or approved equal.

15.3.4 Pump Guide Rails

- 15.3.4.1 Supply and install 50 mm diameter Schedule 80 galvanized steel pipe guide rails to pump manufacturer's recommendations.

15.3.5 Stainless Steel Pipe

- 15.3.5.1 Manufacture: to ASTM A-240, Type 304L.

- 15.3.5.2 Wall Thickness:

- .1 Liquid Filled Pipe - I.D. pipe sizes up to 18" (450 mm) diameter - 11 gauge (.125") (3.2 mm).

- 15.3.5.3 Fittings:

- prefabricated, smooth flow, long radius type for elbows, welded for tees, reducers and laterals.

- able to withstand 150 psi (1035 kPa) test pressure and reinforce if required for liquid filled service and able to withstand 25 psi test pressure for air service.
- min. wall thickness to be same as pipe.

15.3.5.4 Joints:

15.3.5.4.1 General:

Joints are to be welded except at valves, equipment and where indicated on the drawings. Major components shall be shop welded with provision for field erection using flanged connections.

Joints at valves and equipment shall be of the flanged type with a combination Vic-Flange assembly on one side and backing flange on the other to facilitate installation/removal.

15.3.5.4.1.1 Van Stones - Rolled type

15.3.5.4.1.2 Backing Flanges and Blind Flanges

- Hot dipped galvanized finish
- Drilled to ANSI B16.1, Class 125
- Material to be SA516-70 for thickness T_3 able to withstand max. 150 psi line pressures (pressure pipe only - T_1 on gravity drains).
- Blind flanges to have stainless steel liner

15.3.5.4.1.3 Victaulic Style 342 Flange Adapter

- Hot dipped galvanized finish
- Provide flange washers where recommended by manufacturer

15.3.5.4.1.4 Grooved End Adapter

- Stainless steel 316L Sch. 40 with radius groove, 100 mm long, welded to I.D. pipe.
- Refer to Standard Detail CD 250 at the end of this section.

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15.3.5.5 Gaskets - 1/8" thick, seating face only, red rubber for liquid service.

15.3.5.6 Fasteners

15.3.5.6.1 316 stainless steel nuts, bolts and washers

15.3.5.7 All piping and fittings to be pickled and passivated after fabrication, shop and field welding to achieve a consistent finish and appearance to the satisfaction of the Engineer.

15.3.6 Link Seals

15.3.6.1 Made from synthetic rubber to resist aging, ozone, sunlight, water and chemical action, with stainless steel bolts and metal parts.

15.3.6.2 Link seals as distributed by Power Plant Supply Company Ltd., Oakville, Ontario.

15.3.7 Bolted Couplings

15.3.7.1 General

15.3.7.1.1 Refer to drawings for location and size. Submit shop drawings and schedule for review.

15.3.7.1.2 Bolted type coupling with ductile iron sleeve, standard Grade 30 gaskets and ductile iron follower flanges. Bolts and nuts are to be min. 316 stainless steel. Finish to be epoxy coating suitable for potable water use.

15.3.7.1.3 Transition gaskets and couplings shall be used where required to connect different size and/or pipe materials.

15.3.7.1.4 Acceptable Manufacturers

15.3.7.1.4.1 Smith Blair Omni Coupling System or Viking Johnson equivalent.

15.3.8 Pipe Installation - General

15.3.8.1 Install all pipe in locations as shown on the Drawings. Make deviations from these locations only after written approval from the Engineer. Obtain approval from the Engineer for location of piping not specifically shown on Drawings.

- 15.3.8.2 Install all piping in neat, parallel lines with valves located in accessible position where possible.
- 15.3.8.3 Fasteners to all exterior structures or in any liquid retaining structure to be type 316 stainless steel. Anchor bolts cast-in-place or self-drilling type with 316 stainless steel shields.
- 15.3.8.4 Unless pipe joints are self restraining, restrain all joints at bends, tees, laterals, etc. to avoid movement or separation of the joint under normal working pressure or required test pressure whichever is greater. Install joint restraints as detailed on the drawings. Restraints not to interfere with joint deflection allowance for differential settlement.
- 15.3.8.5 Leave manufacturer's tags and labels showing the origin and grade of the goods until inspection is made. Thoroughly clean all piping systems upon completion of the installation.

15.3.9 Pipe Hangers and Supports

- 15.3.9.1 All piping systems to have stainless steel anchorage, sway braces, guides and supports satisfactory to the Engineer. Design all supporting equipment with the exception of springs with a minimum safety factor of 5, based on the ultimate tensile strength of the material. Base design of hangers or supports on the weight of the pipe, the weight of the medium transported, or the medium used for testing, whichever is heavier, and the weight of the insulation if used.
- 15.3.9.2 Space supports so that the sag of the pipe is within limits that will permit drainage, and avoid excessive bending stresses from concentrated loads between supports.
- 15.3.9.3 Suspend pipe to prevent an excessive stress, excessive variation in supporting force, and possible resonance with imposed vibrations while the system is in operation. Install supports for all pipelines so as not to constrain the piping to such an extent as to cause excessive transfer of load from support to piping, or from support to support. Rigid or spring type supports to be capable of taking the entire piping load imposed, including expansion or contraction.
- 15.3.9.4 Sway brace flexibly supported lines to prevent undue movement or vibration. Sway bracing shall not interfere with proper thermal movement of the piping. Install an approved sway brace that provides an instant counteracting force to control the piping.

- 15.3.9.5 Hanger rods and fastening hardware to be **stainless steel** unless noted otherwise on the drawings.
- 15.3.9.6 At hangers where lateral and axial movement is allowed, provide hanger rods with welded or forged eye nuts or suitable sockets to permit movement without bending hanger rod.
- 15.3.9.7 Hangers, pipe clamps and supports of a dissimilar metal to the pipe to have approved isolation made of red rubber to prevent galvanic corrosion.
- 15.3.9.8 Fit pipe hangers and rods with an adjusting nut or turn buckle and lock nut to allow for adjustment after erection while still under load. Screw adjustment to have a complete depth of thread.
- 15.3.9.9 Locate hangers and supports so that the piping is supported independently of valves and equipment to allow for removal of one without disturbing the other and to prevent imposing loads from one to the other.
- 15.3.9.10 Pipe supports from the floor to be of the adjustable pipe type support fabricated fully in stainless steel including saddle, adjusting rod, nuts and base plate and as noted on the drawings.
- 15.3.9.11 Make fabricated stainless steel supports from new, defect free material free from burrs, slag and cutting marks. Round all edges and corners.
- 15.3.9.12 All material for hanger rods and pipe supports to be Type 316 stainless.

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15.3.10 Pressure Tests

- 15.3.10.1 Provide all labour, materials and equipment to pressure test all piping; minimum of two hours test duration with no leakage in the presence of the Engineer; conduct test prior to application of pipe covering. Flush all pipe sediment, scale and other foreign matter prior to tests; remove all air from line during hydrostatic tests.
- 15.3.10.2 Remove all speciality fittings, equipment and similar items and internal parts of piping system which are not designed to withstand the test pressure and replace after testing.
- 15.3.10.3 Exercise care that test pressures are not accidentally applied to portions of the work that are not designed for such pressure.

- 15.3.10.4 Conduct pressure tests with cold water.
- 15.3.10.5 Where entire piping system cannot be practically tested, portions may be tested as the installation permits.
- 15.3.10.6 Test pressure shall be 150 psi.

15.4 Valves

15.4.1 Submittals

- 15.4.1.1 Submit six (6) copies of shop drawings to Engineer for review with respect to all valves and highlight the model to be supplied.

15.4.2 Ball Check Valves & Gate Valves

- 15.4.2.1 Install in-line ball check valve and gate valve on the pump discharge lines.
- 15.4.2.2 Cast Iron Body with flanged end connections to ANSI B16.1 Class 125, in sizes as shown on the drawings.
- 15.4.2.3 Provide optional epoxy coating (exterior only) and stainless steel cover bolts.
- 15.4.2.4 Flygt HDL Check Valve, Type 5087. or ValMatic SurgeBuster check valve. (Model Number 7210MIBF).

15.4.3 Tideflex Check Valve

- 15.4.3.1 Designed to be installed between pipe flanges as shown on the contract drawings.
- 15.4.3.2 Valve to be 100% elastomer construction. Flanges to conform to ANSI B16.1 Class 125 specifications. Contractor to provide galvanized backing flange as per stainless steel pipe joint specification to mate to stainless steel pipe spool shown on the drawings.
- 15.4.3.3 Sleeve to be EPDM suitable for raw sewage.
- 15.4.3.4 Supply and install to sizes and where indicated on drawings.
- 15.4.3.5 Manufacturer: Red Valve Co., Flanged In-Line Check Valve, Series 37 or EVR

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15.4.4 Supply

- 15.4.4.1 Co-ordinate with manufacturer and/or City for delivery, paint requirements, factory tests, spare parts, instruction manuals, etc.

15.4.5 Installation and Testing

- 15.4.5.1 Familiarize with equipment, installation procedures, lubrication, testing and other requirements.
- 15.4.5.2 Assemble and install valves in a neat and workman like manner and in accordance with manufacturer's instructions.
- 15.4.5.3 Provide all labour, tools, equipment and materials necessary to complete the installation and carry out field testing.
- 15.4.5.4 Furnish and install all brackets, hangers, etc. required to support valves.
- 15.4.5.5 Leave manufacturers' tags and labels showing the origin and grade of goods until inspection is made.
- 15.4.5.6 Clean and paint valves to Division 9.
- 15.4.5.7 Lubricate all equipment and supply all lubricants in accordance with manufacturers' recommendations.
- 15.4.5.8 Arrange and pay for valve supplier to have their qualified technical representatives visit the site to start up and test their product and certify in a letter to the Contractor that their valves and/or operators perform satisfactorily. The Contractor is to provide a copy of each certification letter to the Engineer.

15.5 Process Equipment

15.5.1 Submersible Sewage Pumps

15.5.1.1 Description

15.5.1.1.1 This section specifies requirements for supplying and installing submersible sewage pumps and accessories.

15.5.1.1.2 The Contractor shall provide all necessary items (i.e. stainless steel fasteners) to complete the installation of the equipment in accordance with the drawings and specifications.

15.5.2 General Requirements

- 15.5.2.1 Comply with MOE Standard Specification No. 3 for Submersible Sewage Pumps, Issue No. 2 dated March, 1984 except when the sewage wet well is classified as a hazardous location to Class 1, Group D, Division I.
- 15.5.2.2 Comply with enclosed System Curves at end of Division 15, Mechanical.
- 15.5.2.3 Order, schedule delivery, off-load, store on site in accordance with manufacturer's instructions, and protect equipment.
- 15.5.2.4 Coordinate with manufacturer and City of Windsor for equipment delivery, anchors and supports, paint requirements, factory tests, spare parts, instruction manuals, etc.
- 15.5.2.5 Submit 6 copies of performance curves and shop drawings of equipment to Engineer for review.
- 15.5.2.6 Supply 4 copies of mechanical and electrical instruction manuals, including parts lists, erection drawings, installation details, lubrication requirements, maintenance and operation of the equipment. Follow requirements outlined in Division 1.

15.5.3 Basis of Payment

- 15.5.3.1 Payments for supply and installation of sewage pumps and accessories to be included in lump sum price bid in Form of Tender for construction of pumping station.

15.5.4 Sewage Pumps

- 15.5.4.1 Submersible sewage pumps c/w flush valve (as required) and accessories to be supplied by Flygt Canada Limited or ABS.
- 15.5.4.2 Supply the required number of 600V, 3 phase, 60 Hz submersible pumps suitable for the application and in conformity with the attached system curve. Supply sufficient cable to suit pumping station plus approximately 3 m cable slack.
- 15.5.4.3 Provide portable lifting davit, ITT Flygt Model No. P/N 13-520139 (if required). Provide 2 galvanized steel wall or floor mounted sockets(as required), ITT Flygt Model No. P/N 13-520140, to be mounted at locations as shown on the drawings. All anchors and fasteners to be 316 stainless steel.

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- 15.5.4.4 Provide chain hoist, ITT Flygt Part No. 13-430006 (as required) with sufficient load chain and a stainless steel grip eye-lifting device for proper pump removal and installation.
- 15.5.4.5 Provide alarm level float switch with stainless steel sway control ring and stainless steel horizontal level regulator hanger. ITT Flygt Mode ENM-10 level regulator, sway control ring and hanger.
- 15.5.4.6 Pump lift chain to be stainless steel load rated complete with stainless steel pump fastening hardware and galvanized chain hooks. All fasteners to be 316 stainless steel.
- 15.5.4.7 Provide intermediate and upper guide bar holders in galvanized steel as shown on drawings. ITT Flygt Part No. 3042801 and 13-520227. All fasteners to be 316 stainless steel.
- 15.5.4.8 Provide leakage detector relay for each submersible pump. Shall be 24 V AC/DC operable, capable of simultaneously sensing stator over temperature and liquid in the stator housing complete with manual reset push button to reset the module once the fault has cleared, LED fault indications, dedicated dry output contact closures for leakage and temperature faults. ITT Flygt Mini-CAS II Supervision Relay or ABS equivalent.
- 15.5.4.9 Provide valves for pump discharge lines. Refer to Section 2, Valves.

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15.5.5 Installation and Testing

- 15.5.5.1 Familiarize with equipment, installation procedures, lubrication, testing and other requirements.
- 15.5.5.2 Determine the exact location of pumps, piping, guide rails, and guide rail holders in field to suit pumps and auxiliary equipment supplied.
- 15.5.5.3 Assemble and install equipment in a neat and workman like manner and in accordance with manufacturer's instructions.
- 15.5.5.4 Provide all labour, tools, equipment and materials necessary to complete the installation and carry out field testing.

- 15.5.5.5 Level and plumb equipment before fastening down. Align all connections to equipment to ensure that undesirable stresses are not transferred to or from pipes or other connections.
- 15.5.5.6 Furnish and install all brackets, hangers, etc. required to support equipment using aluminium and stainless steel materials to satisfaction of Engineer.
- 15.5.5.7 Leave manufacturers' tags and labels showing the origin and grade of goods until inspection is made.
- 15.5.5.8 Construct concrete bases under equipment where indicated on the Drawings or as required by the Engineer.
- 15.5.5.9 Provide neat openings in walls, floors and roofs for installation of all equipment and piping.
- 15.5.5.10 Clean and paint equipment to Division 9.
- 15.5.5.11 Lubricate all equipment and supply all lubricants. All lubricants to be manufactured by Shell and to be equivalent to manufacturers' recommended lubricants.
- 15.5.5.12 Arrange and pay for suppliers of **all** equipment to have their qualified technical representatives visit the site to start up and test equipment and certify, in a letter to the Contractor, that their equipment has been installed properly and operates satisfactorily. The Contractor is to provide a copy of each certification letter to the Engineer.
- 15.5.5.13 Do field test upon completion of installation under the supervision of Engineer and guidance of manufacturer's representatives.
- 15.5.5.14 Record and compile testing data.
- 15.5.5.15 Pump supplier shall provide the services of a factory-trained technical representative for the minimum of two man days, one visit at site to commission the equipment. The technical representative shall demonstrate the equipment to the satisfaction of the Engineer.

Division 16 - Electrical, Instrumentation and Controls

Appendix F

16.1 General

- 16.1.1 All materials shall be new, of the highest quality and subject to approval of the Engineer.

- 16.1.2 All materials shall conform to the appropriate standards
Canadian Standards Association (CSA)
Underwriters' Laboratories of Canada (ULC)
National Electrical Manufacturers Association (NEMA)
Occupational Health and Safety Act
Technical Standards and Safety Authority (TSSA)
American National Standards Institute (ANSI)
- 16.1.3 Where hardware, materials, equipment, apparatus or other products are specified by manufacturer's brand name, type or catalogue number, such designation is to establish the standard of desired quality and style, and shall be the basis of the bid. No deviation from this standard shall be allowed without written permission from the Engineer.

16.2 Workmanship

- 16.2.1 All electrical work in this Contract shall be performed by skilled tradesmen and workmanship shall be of the highest quality. Where the workmanship does not meet the specification, the Engineer shall have the authority to instruct the Contractor to remove such substandard work and replace it to the satisfaction of the Engineer with all associated costs being paid by the Contractor.

16.3 Codes, Permits and Inspections

- 16.3.1 The entire installation shall be made in full accordance with the latest edition of the Ontario Hydro Electrical Safety Code and subsequent bulletins, and where applicable, all local, municipal, federal, or utilities commission rules, regulations and ordinances. Should any of these impose a higher standard than is required by the drawings and specifications, the Contractor shall execute the work in accordance with these laws, regulations, etc., rather than as specified. The Contractor shall obtain and pay for all permits and inspections, both temporary and permanent, as required and shall deliver approval certificates in triplicate to the Engineer on completion of the job. Comply with ESA requirements.

16.4 Electrical Shop Drawings and Operating manuals

- 16.4.1 Submit six (6) copies of shop drawings for all electrical equipment pertaining to the submersible sewage pumping station and highlight the model to be supplied.
- 16.4.2 All electrical shop drawings shall conform to the following:
- 16.4.3 The title block for each sheet shall include an accurate description of the work covered and shall include proper identification of the location in which it is to be installed.

- 16.4.4 Standard Canadian symbols shall be used on all electrical schematic and wiring diagrams.
- 16.4.5 Electrical schematics shall be drawn in the conventional ladder-type configuration. Control levels shall be numbered on the left side and all relay and timer contacts cross-referenced to these levels. **A complete Bill of Material, listing all manufacturer's catalogue numbers shall be included on the schematic drawings and highlighted.**
- 16.4.6 All Electrical drawings (ie. Panel layouts, schematics, elementary wiring diagrams) shall be submitted as B size (11 x 17) and must be legible.
- 16.4.7 Upon completion and testing submit "Operation and Maintenance" manuals for all Electrical and Instrumentation equipment supplied to the general contractor for inclusion and submission as part of the complete documentation package as described in Division 1 – General Requirements and Division 3 – Operating Manuals.

16.5 Testing and Adjustments

- 16.5.1 The complete electrical system including all electrical control equipment connected under this contract shall be tested and adjusted so that the complete system is in perfect working order.

16.6 Grounding

- 16.6.1 All electrical equipment and systems shall be grounded as required by Ontario Hydro Electrical Safety Code.

16.7 Conduits

- 16.7.1 Unless otherwise noted, underground and wet well conduits shall be rigid PVC, Ipex or equal; conduits inside building shall be rigid aluminium. Conduits shall be sized with due regard to the number and size of conductors to be carried, and in full accordance with the Ontario Hydro Electrical Safety Code. No conduits smaller than 19 mm trade size shall be used. NOTE: EMT is not acceptable.
- 16.7.2 All PVC conduit connections shall be made using solvent cleaner and cement as per manufacturer's instructions to ensure properly welded watertight connections.
- 16.7.3 Conduits entering and within the wet well, shall be rigid PVC.
- 16.7.4 Conduits from the PVC junction box to the control enclosure shall be rigid galvanized steel and sealed as required by the Ontario Hydro Electrical Safety Code for Class 1, Division 1 hazardous locations.

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16.8 Wires and Cables

- 16.8.1 All wiring materials shall be approved by the Canadian Standards Association for the particular application and location in which they are to be used.
- 16.8.2 All conductors shall be copper.
- 16.8.3 Branch circuit wiring shall be stranded copper wire.
- 16.8.4 Conductor insulations shall be of a type suitable for the particular application. Conductors run underground in conduit shall be type RWU90.
- 16.8.5 Conductor colour coding shall be consistent and shall conform to the following:
- | | |
|-----------------------------------|-----------------------------------|
| 600V feeders & branch ccts | - black all phases, white neutral |
| apply phasing tape as follows: | - phase A – red |
| | - phase B – blue |
| | - phase C - black |
| AC control wiring | - red |
| Ground wires | - green |
| Telemetry wiring - 120 VAC inputs | - orange |
| (SCADA RTU) - 120 VAC outputs | - yellow |
| - 24 VDC | - light blue |
- 16.8.6 Conductor splicing and taps shall not be allowed.
- 16.8.7 Feeder cable connections shall be made with solderless or pressure-type lugs.
- 16.8.8 Wire and cable shall be suitably protected from weather and physical damage when installed.
- 16.8.9 Use teck cable for all electrical wiring within a Diesel Generator Set housing when applicable.
- 16.8.10 All wiring within the wet well shall be suitable for a Class 1, Division 1 Hazardous Location.

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16.9 Wiring Junction Boxes

Note: NO junction boxes shall be installed in the wet well.

- 16.9.1 The Contractor shall supply and install rigid PVC junction boxes, approximately 305 mm x 305 mm x 152 mm for AC circuits and 152 mm x 152 mm x 102 mm for DC circuits as manufactured by Ipex or equal.

- 16.9.2 Connections in the junction boxes shall be made with terminal blocks, equal to Allen Bradley 1492-CA1L.
- 16.9.3 All wires in the junction boxes shall be properly tagged to match the control schematic.
- 16.9.4 Provide aluminium sheet cover for mechanical protection of junction boxes and conduits as shown on the drawing.
- 16.9.5 Provide EYS fittings near the wet well between the J.B.'s and panels as shown on the drawing. Do not seal until inspected and approved.

16.10 Electrical Services

- 16.10.1 Contractor shall make all necessary arrangements with EnWin to provide a hydro service for the pumping station as indicated on the drawings and pay all fees for EnWin work.
- 16.10.2 Provide a concrete (or wood as approved) hydro riser pole and an underground feeder to the service entrance panel as shown on the Drawings.
- 16.10.3 The service shall be 600/347V, 3 phase, 4 wire, with the fourth wire used as a system ground. The system ground shall be brought into the Service Entrance Panel using an insulated conductor and grounded at the Panel.
- 16.10.4 Provide a 600 V, 3 pole, TVSS in the service panel or other locations as directed by EnWin.

All stations that require a diesel generator shall have an MCC.

The MCC shall:

- include all service entrance equipment as described below:
- include transfer switch
- include lighting panel and transformer
- include all pump control panel and SCADA equipment as noted within the Pump Control Panel description shall be mounted in a double-width MCC section without dividers
- shall be NEMA rated

Acceptable MCC manufacturers: Allen Bradley, Square D, Cutler Hammer.

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16.11 Service Entrance Equipment

- 16.11.1 Provide service entrance equipment for the Pumping Station in accordance with EnWin requirements.
- 16.11.2 Service entrance equipment shall be housed in a Service Entrance Enclosure rated NEMA 4K prior to construction, mounted above a concrete vault.
- 16.11.3 Service entrance enclosure shall be raintight construction, fabricated from stainless steel, suitably braced with rolled lip around door opening, continuously hinged gasketed door. A stainless steel automotive type handle with 3 point latching mechanism hasp and provision for padlocking. Door to be fitted with chains to limit travel to 120° and a latching bar to retain door in 90° open position. No inner door is required.

All fasteners, hinges, etc. shall be of stainless steel. Enclosure shall be of the same width as the pump control panel for back-to-back mounting on the support channels and dimensioned as shown on the drawings.
- 16.11.4 Service Entrance equipment shall be dead front NEMA rated product design and consist of the following:
 - 16.11.4.1 Service Entrance Breaker: 3 pole, 600V, interrupting capacity suitable for calculated fault currents, EEMAC 1 enclosure with neutral kit and sized as indicated on the Drawings.
 - 16.11.4.2 Meter Socket - 600V, 3 phase, 4 wire suitable for service size, 7 JAW to suit EnWin requirements.
- 16.11.5 Additional equipment supplied and installed in the service entrance panel are listed as follows:
 - 16.11.5.1 TVSS.
- 16.11.6 Provide a common drip shield over the service entrance enclosure and pump control panel as shown on the drawings.
- 16.11.7 Power services shall be grounded in accordance with requirements of the Ontario Hydro Electrical Safety Code.
- 16.11.8 All fuses to be Bussman low peak LPCC type.
- 16.11.9 Submit shop drawings for panel.

16.12 Telemetry Conduits

- 16.12.1 Supply and install a 19 mm telemetry conduit in the service trench from control panel to the respective service pole, and terminate in a service head as indicated on the drawing.
- 16.12.2 City will arrange for Bell Canada to install the required phone circuit.

16.13 Conduit Guard

- 16.13.1 Provide metal guard over conduits on riser pole, minimum height to be 3 m.
- 16.13.2 Guard any outdoor PVC conduit exposed (ie. near panels, disconnects, etc)

16.14 Pump Control Panel Construction - (Stations that do not require a diesel shall utilize a separate control panel; (for stations with a diesel, pump controls and SCADA to be installed in MCC)

- 16.14.1 **For indoor installations** - provide a NEMA 12 rated Pump Control Panel (minimum 60 x 36 x 12) mounted above a concrete vault for protection of conduits at pumping station.
- 16.14.2 **For outdoor installations** - the enclosure shall be of rain tight construction (NEMA 4X), made from stainless steel suitably braced, with rolled lip around door opening, continuously hinged inner and exterior doors.

The exterior door shall open more than 90° for full inside access and shall be fully gasketed and secured with a 3 point (minimum) latch mechanism. A stainless steel automotive type door handle complete with hasp and provision for padlocking. Door to be fitted with chains to limit travel to 120 ° and a latching bar to retain door in 90 ° open position. Provide an interior door pocket for storing "As-Constructed" drawings.

The control compartment interior door shall be of EEMAC 1 design with 90° opening. The through the door operator for the main switch and all other door mounted devices shown on the drawings shall be mounted on this door. Sufficient clearance shall be provided between the door mounted devices on the interior door and the exterior door and hardware. The main switch operating linkage shall be supported to maintain proper alignment with the door mounted handle and allow for easy closing of the door.

Mounting lugs and drip shield connections shall be provided.

Fasteners, hinges and any other hardware which make contact with the aluminium enclosure shall be stainless steel. No mild steel or cadmium plated hardware shall be allowed.

The control enclosure shall be custom manufactured in compliance with C.S.A. Industrial Control Equipment Standard C22.2 No. 14. Panel fabricator shall be CSA pre-qualified panel builder, Electro Tech, Windsor, Ontario or approved equal.

Submit shop drawings for panel.

- 16.14.3 The control compartment shall have the following control devices supplied, mounted and wired to form a complete and functional control system:

All equipment is to be dead front design.

- 16.14.3.1 Main Switch: 3 pole, 600 volt, withstand rating suitable for calculated fault currents, rotary type with suitable current rating for the station load. This switch shall have a dead front and shall be safety interlocked with the interior panel door.
- 16.14.3.2 Motor Circuit Protectors: for each pump motor, 3 pole, 600 volt, dead front, suitable for calculated fault currents, sized for pump motors, with adjustable instantaneous trips, and auxiliary contact (open when breaker tripped or open ;closed when breaker closed) Westinghouse HMCP, Square "D" Mag-Gard or approved equal.
- 16.14.3.3 Control Transformer for Pump Control Logic: 600/120 volt, 1.0 kVA minimum as manufactured by Hammond.
- 16.14.3.4 Starters: full voltage, non-reversing, three-phase, 3 pole EEMAC size 1 minimum, 120 volt coil, auxiliary contacts as required, electronic overload heaters with selectable auto or manual reset, as manufactured by Allen Bradley, Square "D" or Cutler Hammer.
- 16.14.3.5 Time Delay Relays: Off delay, 1-300 sec. delay, rated 10 amperes non-inductive, Agastat 7022AK or approved equal.
- 16.14.3.6 Well Level Controller: Milltronics Multiranger 200 Ultrasonic Programmable Level Controller suitable for panel mounting, operation on 120V, single phase 60 Hz with the following features:

- 16.14.3.6.1 Range 1.0 to 50.0 feet.
 - 16.14.3.6.2 Five form "C" output relays with contacts rated 5A, 115V AC non-inductive, with independent on-off set points.
 - 16.14.3.6.3 4-20 mA isolated analog output.
 - 16.14.3.6.4 Fail-safe operation on sensor signal or processor logic errors.
 - 16.14.3.6.5 Micro-computer based environmentally sealed electronics unit.
 - 16.14.3.6.6 Level indicator display (LCD).
 - 16.14.3.6.7 Polycarbonate membrane programming keyboard, battery operated.
 - 16.14.3.6.8 EEMAC 4 enclosure; suitable for panel mounting (as required)
 - 16.14.3.6.9 Self cleaning immersible ultrasonic transducer with a range of 1 to 50 ft. and beam angle of 6°, Milltronics Echomax Model XPS-15.
- 16.14.3.7 The motor control components housed in the control panel shall be in full compliance with the NEMA standards and have a NEMA rating identification.
- 16.14.3.8 Heater: Convection type c/w built-in thermostat, 125-watt capacity, 120 volt, Caloritech PXFT12511 c/w wire guard, or approved equal ;
- 16.14.3.9 Terminal Blocks: Tubular screw type with pressure plate, Allen Bradley 1492-CA1L, Entrelec M10/10 or approved equal. Fusible terminal blocks shall be Allen Bradley 1492-H4 Finger-Safe terminal blocks with neon blown fuse indicator or approved equal.
- 16.14.3.10 Elapsed Time Meters: 2 1/2" dial, 5 digit, hours and tenths, non-reset, 120 volt, Telemecanique Zelio count RC87610440 Electronic Hour counter, Hecon, or approved equal.
- 16.14.3.11 Pilot Lights: LED type, 120 volt, push to test, Allen Bradley Bulletin 800T complete with engraved nameplates, or approved equal.

- 16.14.3.12 Selector Switches: Positions and contacts as required, Allen Bradley Bulletin 800T complete with engraved nameplate, or approved equal.
- 16.14.3.13 Identification Markers: All control devices within the control panel shall be identified with lamicoid nameplates, white letters on black background. Nameplates shall be applied to the panel backplate adjacent to the device, not on the device. Lamacoid nameplates, black letters on white background shall be mounted above the elapsed time meter on the inner panel door and to identify the pump controls.
- 16.14.3.14 Schematic Wiring Diagram: The as-constructed wiring diagram shall be laminated and suitably secured to the rear of the interior door of the control panel .
- 16.14.3.15 Splitter Bars: 100 ampere 600 volt, 3 pole, Allen Bradley Model 1492-PD3263 or approved equal.
- 16.14.3.16 Control Relays: 120V operation, 10 amp inductive contacts, contact arrangement as required, 300V industrial type construction.
- 16.14.3.17 Intrinsically Safe Relay: 120V operation, approved for use in a Class 1, Division 1 hazardous location, complete with 2 channels each having Form C contacts Telemecanique Model NY2B31 or approved equal.
- 16.14.3.18 Leakage Detector Relays: these relays will be supplied with the pumps as accessories. Flygt MiniCas module (leak & temp) or ABS equivalent.
- 16.14.3.19 Control Transformer for leakage detector relays: 120 Volt primary/24 Volt secondary, 40VA minimum as manufactured by Hammond.
- 16.14.3.20 Terminal blocks pre-wired to panel devices to be provided for all field devices.
- 16.14.3.21 Panel devices to be pre-wired to terminals with shielded cable where required (ie. 4-20mA analog signals or other low power control signals)

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Control Wiring

- high well level alarm to be wired such that 1 or 2 pumps start and run when high level is reached and continue to run for a preset time (range 1 to 30 minutes) after the high level signal goes off.
- Leak alarm to be wired only as an alarm; no interlock with pump controls.

- Temp alarm to be wired as an alarm and pump interlock in Auto only.

16.15 SCADA RTU

16.15.1 The SCADA RTU shall be a SCADAPack system consisting of the following components:

- SCADAPack 32 Controller Part # P4-102-01-1-0 (Quantity – 1) c/w 8 analog inputs, 20 – 115VAC inputs; 15 relay outputs, 3 RS-232 ports and 1 RS 232/485 port and 1 ethernet port.
- Power Supply Module, Model 5103 (Quantity – 1)
- Bell 202 Leased Line Telephone Modem, Model 5902 (Quantity –1) or (as required for application)
- Dial Up modem , Model 5901 (Quantity 1)
- Digital I/O Module, 8 configurable I/O's, Model 5401 (Quantity – as needed)
- 12 Volt D.C. Gel/Cell Battery, Model 1206 (Quantity – 1)
- 40 VA Transformer, 120/24V AC, Model ACX24-40 (Quantity – 1)

16.15.2 The SCADA RTU components are manufactured by Control Microsystems Inc. and distributed by CB Automation Inc.

16.15.3 Provide 7.5 mm by 35 mm DIN type rails for mounting of SCADA RTU components and 16 conductor ribbon cables to interconnect modules.

16.15.4 Reserve space on the control panel backplate for mounting of Bell Canada communication equipment as indicated on the drawings, (approx. 9" x 9").

16.15.5 Fabricate a non-ferrous bracket for mounting of Gel/Cell battery onto the control panel back plate.

16.16 Control Panel Installations

16.16.1 The Contractor shall supply and install the pre-cast concrete base for the control panel as shown on the drawings. Fasteners shall be stainless steel.

16.16.2 Provide non-metallic isolation between aluminium control panel and any other dissimilar metal.

16.16.3 Provide aluminium guards for feeder, telemetry and wet well conduits as shown on the drawings.

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16.16.4 Provide drip shield over control panel and service entrance as indicated.

16.17 Level Sensing Transducers

16.17.1 Milltronics "Ultrasonic" or approved equal level transducer, Model XPS-15 c/w submergence shield and coaxial cable of adequate length to reach the junction box (25 metres minimum).

16.17.2 Supply and install a support conduit for the transducer as approved by the Engineer and the City. Provide a removable top for the conduit or pipe c/w cord grip to allow the transducer and cable to be withdrawn for inspection without disturbing the transducer cable length setting.

16.18 High Level Alarm Float Switch

16.18.1 Install float switch, cable sway rings, support hooks and wiring as shown on the drawings. Float switch and cable sway rings will be supplied with the pumps as accessories.

16.18.2 Provide an aluminium angle bracket c/w non-metallic(nylon) cord grip for setting the float switch cable length. Secure the bracket to the wall aligned with the cable sway ring.

16.19 Pump Motors

16.19.1 Provide conduit raceways for combination motor power and high temperature switch cable. Install and connect cable.

16.19.2 Provide junction boxes, conduit and wiring as required making a complete installation for the motors.

16.20 Power Monitor Relays

Power monitor relay shall be capable of monitoring a 600V, 3 phase, 4 wire distribution system for voltage irregularities, Mand-Industrial Controls Model D2652 as supplied by Western Equipment.

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16.21 Diesel

- diesels controls to be provided with the following:
 - o MEC 20 controller
 - o general alarm output
 - o Not In Auto alarm output contact
- diesel generator to be provided with main breaker with lockout device

- engine mounted gauges to include oil temp and pressure, water temp in/out.
- exhaust system to be insulated from manifold to building wall/ceiling penetration.
- Fuel filler pipe to be run to outside of building and provided with locking fuel filler cap and whistle for tank full indication.
- Battery charger shall be Interactor Model ICS.
- Automatic Transfer Switch to be ASCO or Cutler Hammer (as required for application)
- Acceptable diesel generator manufacturers Caterpillar, Kohler.

16.22 Intruder Alarm Wiring

- magnetic door switches to be installed at all doors and wired in series
- switches to be closed when door closed
- intruder alarm acknowledge push button to be standard black mushroom head.

Lighting

- all exterior light fixtures shall be full cut-off type
- all exterior lights shall be controlled by 1 photocell mounted in a suitable location (ie. Not shaded) on the south side of the building pole lamp over well area shall have ON/OFF switch for light in control panel

II ADDENDUM A

O & M Manual

Table of Contents

Section 1

- MOE Environment Approvals and Engineering Studies
- MOE C of A's
- Purchase and Warranty Information
Copy of all Warranty and Technical Service Information; including special warranties required by specification.
- Diesel Warranty

Section 2

- Consultants Commissioning Report
- Pump Commissioning Reports
Signed letters of certification that the equipment/product has been properly installed, serviced, is in proper running order and ready to operate (if applicable).
- Diesel Commissioning Report
- ESA Certificate

Section 3- Mechanical

1. Installation and Operating Manual for each piece of mechanical equipment.
2. Pump Installation, Care and Maintenance Manual
3. Pump Information and Parts List
4. Pump Curve
5. Flush Valve Installation, Care and Maintenance Manual
6. Pump Lifting System
7. HDL Check Valve
8. Keystone Ballcentric valve
9. Cable Suspension Method
10. Safe Hatch
11. Horizontal Level Regulator Hanger
12. Sway Control Ring

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Section 4 - Electrical

1. Installation and Operating Manual for each piece of electrical equipment
2. Scada and Milltronic Control Drawings
3. Milltronic Multiranger 100/200 Manual
 - Parameter sheet
4. Control Panel equipment
 - MiniCas II unit
 - ground fault relay
 - 3 phase power monitor
 - motor circuit protector
 - hour meter
 - transformer
5. Light fixtures; wall packs, pole light.
6. Unit Heaters

Section 5

1. Generator Operating and Maintenance Manuals
2. Generator Wiring Diagrams
3. Generator Shop Drawings
4. Fuel Tank Information
5. Generator Parts List
6. Diesel fuel tank and level controls
7. Louvers and Dampers

III ADDENDUM B

SCADA I/O

Standard I/O Configuration for a 1 Pump Station

(based on SCADAPack addressing)

I/O points 1 to 7 are on connector P5

I/O points 8 to 15 are on connector P6

I/O points 17 to 20 are on connector P7

<u>I/O Point</u>	<u>Channel</u>	<u>Bit</u>	<u>Description</u>	<u>Active State (115V=1)</u>
<u>1</u>	<u>0</u>	<u>0</u>	<u>Pump #1 ON</u>	<u>On=1</u>
<u>2</u>	<u>0</u>	<u>1</u>	<u>Pump #1 FAIL</u>	<u>Fail=0</u>
<u>3</u>	<u>0</u>	<u>2</u>	<u>Pump #1 AUTO</u>	<u>Auto=1</u>
<u>4</u>	<u>0</u>	<u>3</u>		
<u>5</u>	<u>0</u>	<u>4</u>		
<u>6</u>	<u>0</u>	<u>5</u>		
<u>7</u>	<u>0</u>	<u>6</u>		
<u>8</u>	<u>0</u>	<u>7</u>		
<u>9</u>	<u>1</u>	<u>0</u>	<u>POWER FAIL</u>	<u>Fail=0</u>
<u>10</u>	<u>1</u>	<u>1</u>	<u>HIGH LEVEL</u>	<u>High=1</u>
<u>11</u>	<u>1</u>	<u>2</u>	<u>LOSS OF</u>	<u>LOE=0</u>
			<u>ECHO(LOE)</u>	
<u>12</u>	<u>1</u>	<u>3</u>	<u>GROUND FAULT</u>	<u>Fault=1</u>
<u>13</u>	<u>1</u>	<u>4</u>	<u>Pump #1 HI</u>	<u>HiTemp=1</u>

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TEMP

<u>14</u>	<u>1</u>	<u>5</u>	<u>Pump #1 LEAK</u>	<u>Leak=1</u>
<u>15</u>	<u>1</u>	<u>6</u>		
<u>16</u>	<u>1</u>	<u>7</u>		

Relay Contacts on P7 connector

<u>17</u>		<u>0</u>	<u>Pump #1 START</u>	<u>Start=1</u>
<u>18</u>		<u>1</u>		
<u>19</u>		<u>2</u>		
<u>20</u>		<u>3</u>		

Standard I/O Configuration for a 2 Pump Station

(based on SCADAPack addressing)

I/O points 1 to 7 are on connector P5

I/O points 8 to 15 are on connector P6

I/O points 17 to 20 are on connector P7

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<u>I/O Point</u>	<u>Channel</u>	<u>Bit</u>	<u>Description</u>	<u>Active State</u> <u>(115V=1)</u>
<u>1</u>	<u>0</u>	<u>0</u>	<u>Pump #1 ON</u>	<u>On=1</u>
<u>2</u>	<u>0</u>	<u>1</u>	<u>Pump #1 FAIL</u>	<u>Fail=0</u>
<u>3</u>	<u>0</u>	<u>2</u>	<u>Pump #1 AUTO</u>	<u>Auto=1</u>
<u>4</u>	<u>0</u>	<u>3</u>		
<u>5</u>	<u>0</u>	<u>4</u>	<u>Pump #2 ON</u>	<u>On=1</u>

<u>6</u>	<u>0</u>	<u>5</u>	<u>Pump #2 FAIL</u>	<u>Fail=0</u>
<u>7</u>	<u>0</u>	<u>6</u>	<u>Pump #2 AUTO</u>	<u>Auto=1</u>
<u>8</u>	<u>0</u>	<u>7</u>		
<u>9</u>	<u>1</u>	<u>0</u>	<u>POWER FAIL</u>	<u>Fail=0</u>
<u>10</u>	<u>1</u>	<u>1</u>	<u>HIGH LEVEL</u>	<u>High=1</u>
<u>11</u>	<u>1</u>	<u>2</u>	<u>LOSS OF ECHO</u>	<u>LOE=0</u>
			<u>(LOE)</u>	
<u>12</u>	<u>1</u>	<u>3</u>	<u>GROUND FAULT</u>	<u>Fault=1</u>
<u>13</u>	<u>1</u>	<u>4</u>	<u>Pump #1 HI TEMP</u>	<u>Hi Temp=1</u>
<u>14</u>	<u>1</u>	<u>5</u>	<u>Pump #1 LEAK</u>	<u>Leak=1</u>
<u>15</u>	<u>1</u>	<u>6</u>	<u>Pump #2 HI TEMP</u>	<u>Hi Temp=1</u>
<u>16</u>	<u>1</u>	<u>7</u>	<u>Pump #2 LEAK</u>	<u>Leak=1</u>

Relay Contacts on P7 connector

<u>17</u>		<u>0</u>	<u>Pump #1 START</u>	<u>Start=1</u>
<u>18</u>		<u>1</u>	<u>Pump #2 START</u>	<u>Start=1</u>
<u>19</u>		<u>2</u>		
<u>20</u>		<u>3</u>		

Appendix F

Standard I/O Configuration for a 2 Pump Station with Diesel

(based on SCADAPack addressing)

I/O points 1 to 7 are on connector P5

I/O points 8 to 15 are on connector P6

I/O points 17 to 20 are on connector P7

<u>I/O Point</u>	<u>Channel</u>	<u>Bit</u>	<u>Description</u>	<u>Active State</u>
				<u>(115V=1)</u>
<u>1</u>	<u>0</u>	<u>0</u>	<u>Pump #1 ON</u>	<u>On=1</u>
<u>2</u>	<u>0</u>	<u>1</u>	<u>Pump #1 FAIL</u>	<u>Fail=0</u>
<u>3</u>	<u>0</u>	<u>2</u>	<u>Pump #1 AUTO</u>	<u>Auto=1</u>
<u>4</u>	<u>0</u>	<u>3</u>		
<u>5</u>	<u>0</u>	<u>4</u>	<u>Pump #2 ON</u>	<u>On=1</u>
<u>6</u>	<u>0</u>	<u>5</u>	<u>Pump #2 FAIL</u>	<u>Fail=0</u>
<u>7</u>	<u>0</u>	<u>6</u>	<u>Pump #2 AUTO</u>	<u>Auto=1</u>
<u>8</u>	<u>0</u>	<u>7</u>		
<u>9</u>	<u>1</u>	<u>0</u>	<u>UTILITY POWER FAIL</u>	<u>Fail=0</u>
<u>10</u>	<u>1</u>	<u>1</u>	<u>HIGH LEVEL</u>	<u>High=1</u>
<u>11</u>	<u>1</u>	<u>2</u>	<u>LOSS OF ECHO(LOE)</u>	<u>LOE=0</u>
<u>12</u>	<u>1</u>	<u>3</u>	<u>GROUND FAULT</u>	<u>Fault=1</u>
<u>13</u>	<u>1</u>	<u>4</u>	<u>Pump #1 HI TEMP</u>	<u>Hi Temp=1</u>
<u>14</u>	<u>1</u>	<u>5</u>	<u>Pump #1 LEAK</u>	<u>Leak=1</u>
<u>15</u>	<u>1</u>	<u>6</u>	<u>Pump #2 HI TEMP</u>	<u>Hi Temp=1</u>
<u>16</u>	<u>1</u>	<u>7</u>	<u>Pump #2 LEAK</u>	<u>Leak=1</u>
<u>Relay Contacts on P7 connector</u>				
<u>17</u>	<u>2</u>	<u>0</u>	<u>Pump #1 START</u>	<u>Start=1</u>
<u>18</u>	<u>2</u>	<u>1</u>	<u>Pump #2 START</u>	<u>Start=1</u>
<u>19</u>	<u>2</u>	<u>2</u>		
<u>20</u>	<u>2</u>	<u>3</u>		

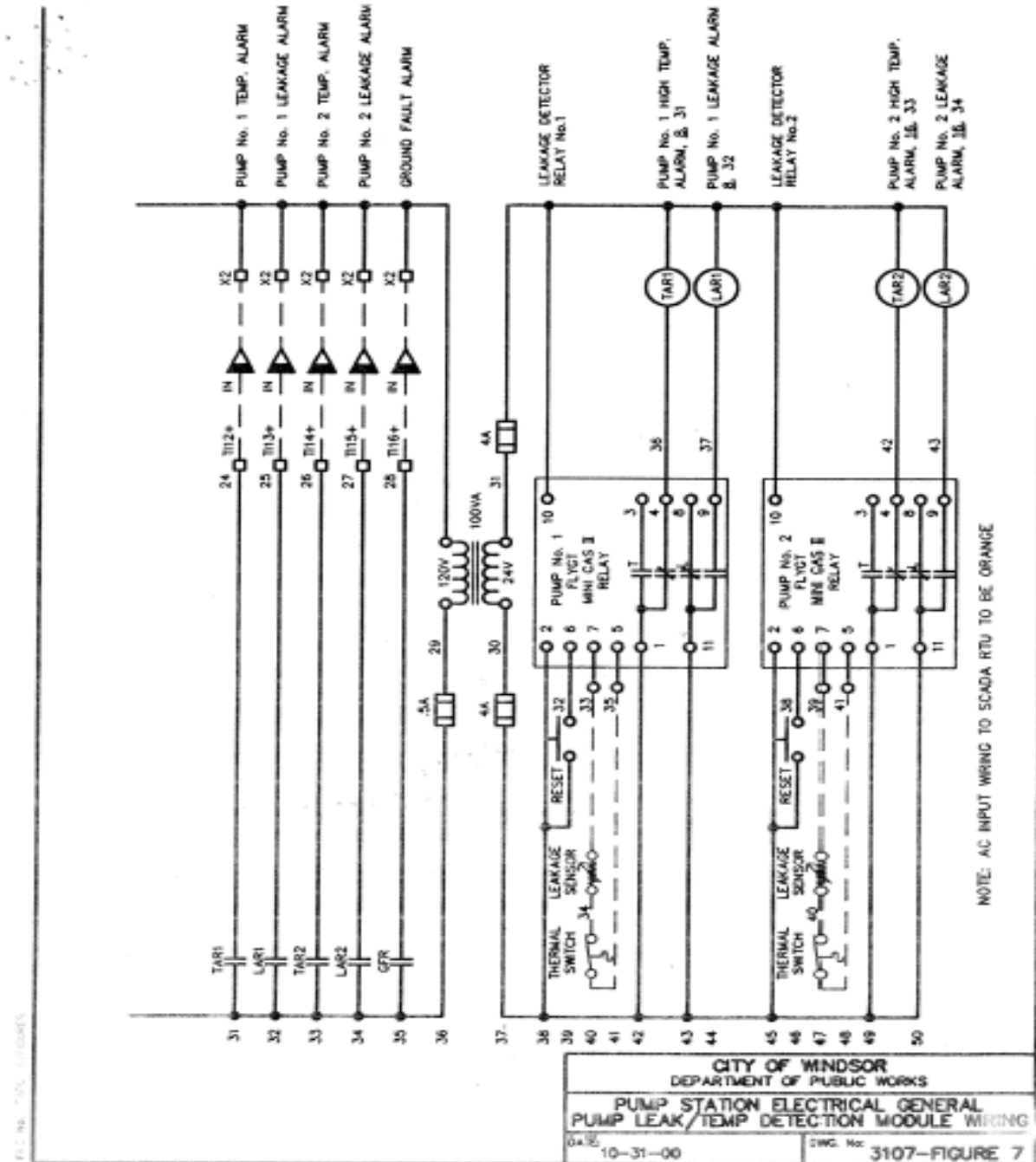
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The following I/O exist on the first external 8 point digital I/O module Model 5401

<u>25</u>	<u>3</u>	<u>0</u>	<u>Generator Power FAIL</u>	<u>Fail=0</u>
<u>26</u>	<u>3</u>	<u>1</u>	<u>Transfer Switch Emerg.</u>	<u>Emerg=1</u>
<u>27</u>	<u>3</u>	<u>2</u>	<u>Transfer Switch Normal</u>	<u>Normal=1</u>
<u>28</u>	<u>3</u>	<u>3</u>	<u>Diesel Fuel Low</u>	<u>Low=0</u>
<u>29</u>	<u>3</u>	<u>4</u>	<u>Diesel Running</u>	<u>Running=1</u>
<u>30</u>	<u>3</u>	<u>5</u>	<u>Diesel Alarm</u>	<u>Alarm=1</u>
<u>31</u>	<u>3</u>	<u>6</u>	<u>Intruder Alarm</u>	<u>Alarm=1</u>
<u>32</u>	<u>3</u>	<u>7</u>	<u>Intruder Ack</u>	<u>Ack=1</u>

IV ADDENDUM C

Pump Control Schematic.



REVISED NOVEMBER 2015

Revisions

November 2015 – Section 7.