General Municipal Servicing Standard (GMSS) 2024

Sturgeon
COUNTY

Community. Innovation. Ambition.

Volume 1

General

Sturgeon
COUNTY

Community Innovation. Ambition.

1. General

Contents

1.1 Use of Standards

The GMSS has been established based on an assessment of current and future needs and to the knowledge available up to the date of their preparation. Periodically, the County will amend the General Municipal Servicing Standards (GMSS) to revise requirements to align with prevailing best practices and engineering standards. The latest version of the GMSS is available on the County's website. Proponents are expected to consult the County's website to ensure the latest version of the GMSS are being referenced.

The GMSS is considered the minimum requirements and where a deviation from such requirements may achieve a better technical, environmental, or economical solution, the Proponent shall be responsible for presenting the County with a proposal and initiating a Variance request.

For all work being undertaken in accordance with the GMSS, the Developer and their agents remain fully responsible for the design and construction of all Municipal Improvements and associated work. The Consulting Engineer must be satisfied with the applicability of the design criteria in these Standards to the specific project and apply more stringent criteria, where required or appropriate, if necessary.

The County reserves the right to the final decision regarding the interpretation of the intent of the design, the interpretation of the GMSS, and the acceptability of any Variances from the Standards proposed by the Proponent.

1.2 Definitions

Alberta Land Surveyor means a registered or licensed member, in good standing, of the Alberta Land Surveyor's Association.

Applicant means any Proponent applying to undertake infrastructure or improvement work or develop land in the County, whether as the owner or an agent for the owner of specified lands.

As-built Drawings means marked-up Construction Drawings provided by the Contractor which show true elevation and location information of all constructed features on-site, including all changes to the original Construction Drawings, indicated in red.

Authority Having Jurisdiction means an organization, department, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

Capital Project means a County-owned and initiated project that improves or maintains a County-owned asset or other Municipal Improvement within Sturgeon County.

CCC Inspection Report means the report completed by the Consulting Engineer following a formal CCC inspection or re-inspection with the County describing, at a minimum, a written account of all identified deficiencies, proposed corrective actions, applicable site photographs, temperature, and any other pertinent information noted during the inspection.

Collected Plants means any plant material dug from native stands, wood lots, orchards or neglected nurseries and which have not received proper cultural maintenance as in accordant with the Canadian Nursery Trades Association.

Construction Completion Certificate means a certificate issued by Sturgeon County confirming that the specified work is complete, that all deficiencies have been resolved to the satisfaction of the County (unless otherwise noted), and that the warranty and maintenance period for the work has commenced.

Construction Drawings means project-specific engineering drawings that are issued for construction, signed and stamped by a Licensed Engineer, and have been reviewed and approved to proceed with construction by the County. Construction Drawings may contain Construction Specifications.

Construction Specifications means the documents prepared by the Consulting Engineer in accordance with these Standards that specify the legal, administrative, and technical requirements of the Engineering Drawings. Also referred to as Specifications.

Consulting Engineer means the Licensed Engineer responsible for the preparation of design drawings, construction specifications, engineering reports, studies, and the execution and supervision of the associated design, typically on behalf of the Developer or County, to the standard of care prescribed by the Association of Professional Engineers and Geoscientists of Alberta. Also referred to as the Developer's Engineer.

Contractor means the person, firm, or corporation retained by the Developer to construct the Municipal Improvements in accordance with the accepted Construction Specifications and Construction Drawings.

County means Sturgeon County.

County Project Representative means the individual representing or engaged by the County to periodically review, supervise, inspect, and approve the work to be performed by the Developer pursuant to the Development Permit or Development Agreement.

Developer means an entity that develops private or public lands, infrastructure, or improvements within Sturgeon County. Responsibilities of the Developer stated in these standards may be delegated to an appropriate Consulting Engineer, Contractor, or other agent acting on the Developer's behalf. The ultimate responsibility and liability for work undertaken shall remain with the Developer, regardless of delegation of responsibilities or any portion thereof.

Development Agreement means the legal agreement between the Developer and Sturgeon County which specifies the financial obligations and the terms and conditions for the construction and warranty of municipal improvements necessary to service the lands approved for development.

Development Permit means a document that is issued under the County Land Use Bylaw and authorizes development. A development permit is separate and distinct from a safety codes permit.

Development Area means any portion of the Lands that are the subject of a subdivision or development permit approval, which the Developer intends to immediately develop, and for which the Developer will be obligated to design, construct and install the Infrastructure, which will be more particularly described in each agreement between the Developer and the County.

Disturbed Soil Area means any area in which soil has been changed from its natural condition by excavation or other means.

Easement means an area of land owned by a different party where there is an interest in the land registered on title that entitles its holder to a specific purpose, as defined in the easement document.

Engineering Drawings means the detailed design drawings and Construction Specifications prepared by the Consulting Engineer for submission to the County as associated with a Development Agreement or Development Permit.

FAC Inspection Report means the report completed by the Consulting Engineer following a formal FAC inspection or re-inspection with the County describing, at a minimum, a written account of all identified deficiencies, proposed corrective actions, applicable site photographs, temperature, and any other pertinent information noted during the inspection.

Final Acceptance Certificate means a certificate issued by Sturgeon County confirming that the specified work is complete and acceptable, that all noted deficiencies and maintenance work has been resolved to the satisfaction of the County, that the warranty

and maintenance period for the work has finished, and full responsibility for the municipal improvement is transferred to the County.

Franchise Utility means a utility that is provided by an independent service provider or Utility Authority who pay franchise fees to the County for access to municipal land and the exclusive right to provide distribution, through a franchise agreement. Franchise Utilities typically include gas, electrical power, telecommunications, and street lighting.

General Municipal Servicing Standards means these Standards, as amended from time to time.

Geotechnical Engineer means a Licensed Engineer with sufficient specialized experience that demonstrates knowledge in assessing soil characteristics, groundwater conditions, slope stability, providing recommendations, and other areas of geotechnical knowledge associated with the pertinent scope of work.

Good Housekeeping Letter means a formal letter provided by the County stating a specified project does not require an ESC Plan and instead requires Good Housekeeping Practices.

Good Housekeeping Practices means the on-site erosion and sediment control best management practices described in SECTION 7.9.

Green Infrastructure means a category of stormwater management systems designed to treat stormwater by imitating the natural hydrologic processes of infiltration, filtration, retention, evaporation, and/or evapotranspiration. Rain gardens, bioretention cells, and bioswales are examples of GI.

Hydraulic Network Analysis means an engineering analysis of the potable water system to ensure that the proposed development adheres to minimum design standards and criteria and clearly identifies any impact on existing users, and recommended onsite and offsite improvements.

Hydrogeologist means a Licensed Engineer with sufficient specialized experience that demonstrates knowledge in assessing soil characteristics, groundwater conditions, sub-surface flow regimes and fluctuations, hydraulic connectivity characteristics, providing recommendations, and other areas of hydrogeologic knowledge associated with the pertinent scope of work.

Landscaping means the physical enhancement of a site or modification of the natural features of a site through the placement or addition of any combination of the following:

i Soft landscaping features such as trees, shrubs, plant material, lawns, and ornamental plantings;
ii Hard landscaping features or decorative surfacing such as bricks, pavers, shale, rock, concrete, and asphalt; and
iii Architectural elements or site furniture such as fencing, walls, benches, garbage receptacles, playgrounds, etc.

Landscape Architect means the professional architect responsible for the preparation of landscape design drawings, specifications, plant material types and quantities, layout, supervision of installation of landscape and related work, certifying the material and installation is in accordance with the standards, and performing those duties with the standard of care prescribed by the Alberta Association of Landscape Architects (AALA).

Land Use Bylaw means the most recent version of the County's bylaw document which regulates and controls the use and development of land and buildings within Sturgeon County.

Licensed Engineer means a professional engineer, professional (engineering) licensee as defined by APEGA or professional technologist as defined by ASET requirements and in accordance with the *Engineering and Geoscience Professionals Act* (Government of Alberta).

Low Impact Development means a stormwater and land use management strategy that uses natural processes to protect water quality and aquatic habitat. To minimize intrusion into the existing hydrologic regime, LID avoids centralized stormwater management infrastructure and minimize impervious surfaces to the extent practicable. Pre-disturbance hydrologic processes, green infrastructure (GI), and runoff reduction are incorporated into the project design.

Municipal Improvement means both underground and surface infrastructure including, but not limited to, water and sewer systems, roadways, shallow utilities, signage, fencing, street lighting, and other improvements which shall become the property of the County to operate and maintain following the issuance of a Final Acceptance Certificate. Municipal Improvements may refer to both new development and retrofit/rehabilitation of existing municipal infrastructure.

Naturalized means an area developed as a natural looking landscape using plants that are native to the area and requiring little to no maintenance or upkeep.

Noise Impact Assessment means a study on the effects of Industrial or commercial development noise or traffic noise on residential developments adjacent or abutting a

major transportation corridor or railway and the measure(s) required to reduce noise levels to an allowable amount as determined by the County.

Open Space consist of natural and developed areas within the County and may be local, neighbourhood, or county-wide, including PULs, MR, ER, naturalized, conserved or reclaimed areas, wetlands, SWMF, buffers, trails and walkways. Open spaces should be designed to maximize universal accessibility through the implementation of Crime Prevention Through Environmental Design (CPTED) principles described in *Security and Resilience – Protective Security – Guidelines for Crime Prevention Through Environmental Design* (International Standards Organization) and FireSmart Canada guidelines.

Pipeline Company means the owners, or their designates, of the pipeline being crossed.

Planning and Development Services means the County department that represents Sturgeon County for all approvals related to planning and development matters, including review and approval of redistricting applications, subdivisions, Development Permits, and Development Agreements. Also referred to as The Subdivision Authority and Development Authority of Sturgeon County.

Proponent means a person or entity who is conducting work in accordance with the General Municipal Servicing Standards. Proponents typically include Developers, Consulting Engineers, Contractors, and land owners.

Public Utility Lot means land required to be dedicated to the County for public utilities or surface drainage requirements pursuant to the *Municipal Government Act* (Government of Alberta).

Qualified Professional means a professional, such as an engineer, architect, landscape architect, planner, surveyor, biologist or geoscientist, who is registered or licensed and in good standing with a professional organization in Alberta and possesses sufficient demonstrated experience and knowledge in the discipline area relevant to the undertaking. The County reserves the right to request submission of documentation that demonstrates the Qualified Professional possesses sufficient relevant experience.

Railway Company means the owners, or their designates, of the railway being crossed.

Record Drawings means the complete and final version of Engineering Drawings prepared by the Consulting Engineer that indicates final constructed location, elevation, and reflects all Variances from the approved Construction Drawings, including all information provided in As-built Drawings and change documents, such as change orders, addendums, GMSS Variances, RFI responses, etc. that were approved during the project. Since the

Consulting Engineer is responsible for the content of the record drawing, he or she is required to authenticate them (i.e., sign and seal).

Right-of-way means a legal plan that has been registered with the Land Titles Office that defines the boundary limits for the purpose of identifying area(s) for municipal roadway, access, and utilities.

Sturgeon County means the municipal corporation of Sturgeon County.

Tangible Capital Asset means non-financial assets having physical substance that are held for use in the production or supply of goods and services, for rental to others, for administrative purposes, or for the development, construction, maintenance, or repair of other tangible capital assets; that have useful economic lives extending beyond one accounting period; are used on a continuous basis; and are not intended for resale in the ordinary course of operations.

Traffic Impact Assessment means a study prepared by a Licensed Engineer to analyze the impact of traffic generated by a proposed new development on the existing transportation network.

Utility and Waste Management Services means the County's utility department responsible for utility management, inventory, and inspection who can be reached at 780-939-4321.

Utility Authority means the County, company, commission, or other body that owns the respective utility service.

Variance means a deviation from a requirement listed in these Standards. All Variances must be submitted to the County for review and approval. Refer to SECTION 2.10.

Variance Review Committee means the committee appointed by the Transportation and Engineering Services Department to review and decide on proposed variances to these Standards as initiated by proponents.

Warranty and Maintenance Period means the period of time commencing with the issuance of a Construction Completion Certificate and ending with the issuance of a Final Acceptance Certificate, during which time the Developer shall be responsible, at their sole expense, for all maintenance in accordance with the Development Agreement and/or Contract Documents, and remediation of any deficiencies to ensure adequate functionality of all work associated with the Construction Completion Certificate, to the satisfaction of the County.

1.3 Abbreviations

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADD	Average Day Demand
AHJ	Authority Having Jurisdiction
APEGA	Association of Professional Engineers and Geoscientists of Alberta
ASCM	Alberta Survey Control Marker
ASET	Association of Science and Engineering Technology Professionals of Alberta
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BC	Beginning of Curve
BMP	Best Management Practice
BOC	Back of Curb
CAD	Computer Aided Design
CB	Catch Basin
CBMH	Catch Basin Manhole
CCC	Construction Completion Certificate
CPESC	Certified Professional in Erosion and Sediment Control
CPSI	Canadian Playground Safety Institute
CPTED	Crime Prevention Through Environmental Design

CSA	Canadian Standards Association
CSP	Corrugated Steel Pipe
EC	End of Curve
EOW	Edge of Walk
ER	Environmental Reserve
ESC	Erosion and Sediment Control
FAC	Final Acceptance Certificate
FOC	Face of Curb
FOS	Factor of Safety
GIS	Geographic Information System
GMSS	General Municipal Servicing Standards
HDPE	High Density Polyethylene
HNA	Hydraulic Network Analysis
HWL	High Water Level
ITE	Institute of Transportation Engineers
KPH	Kilometers Per Hour
LID	Low Impact Development
LOG	Lip of Gutter
MDD	Maximum Day Demand
MR	Municipal Reserve
MTD	Maximum Theoretical Density (at optimum moisture content)
NSF	National Sanitation Foundation
NWL	Normal Water Level

P.Eng	Professional Engineer as licensed by APEGA for working in Alberta
P.L.Eng	Professional Licensee as licensed by APEGA for working in Alberta
P.Tech (Eng)	Professional Technologist as licensed by ASET for working in Alberta
PE	Polyethylene
PHD	Peak Hour Demand
PL	Property Line
PMPZ	Plant Material Protection Zone
PPM	Parts Per Million
PUL	Public Utility Lot
RAP	Reclaimed Asphalt Pavement
RFI	Request For Information
ROW	Right-of-way
SGC	Superpave Gyratory Compactor
SPD	Standard Proctor Density (at optimum moisture content)
SWMF	Stormwater Management Facility
TAC	Transportation Association of Canada
TIA	Traffic Impact Assessment
URW	Utility Right-of-way
VPD	Vehicles Per Day
VPH	Vehicles Per Hour

1.4 General Responsibilities

The Contractor shall be responsible for verifying the location of all existing underground utilities prior to excavation and is required to contact Utility Safety Partners (formerly Alberta One-Call) at 1-888-420-3464 and other private utilities not included in the Utility Safety Partners locates program. Excavations, digging, or placing of plant materials that impact or have the ability to impact existing utilities shall not commence until the affected Utility Authority has been notified and approval has been obtained in writing. The Contractor shall be responsible for notifying and coordinating with the appropriate Utility Authority.

The Contractor shall ensure the protection of the development area by installing barricades, fencing, and signage as needed for public safety or as otherwise indicated by the County. Tree protection zones shall be established in accordance with SECTION 5.8.

The Developer shall ensure all necessary permits and signed agreements have been obtained and finalized prior to construction. The Developer must inspect existing natural landscape features or those to be conserved/protected throughout development.

The Consulting Engineer shall be responsible for the coordination of all inspection documentation during the Warranty and Maintenance Period. The Consulting Engineer must ensure construction is sufficiently complete and deficiencies have been addressed prior to requesting an inspection with the County.

1.5 Conflicts

Any discrepancies identified between these standards and other standards, specifications, regulations, legislation, County bylaws and authorizations (Land Use Bylaw, Development Agreement, Development Permit, etc.), or Construction Drawings must be communicated to the County and the document of higher precedence shall govern.

In all cases and without exception, Proponents or their respective agents must exercise best engineering and construction practices and sound judgement when carrying out work.

1.6 Freedom of Information and Protection of Privacy Act

The *Freedom of Information and Protection of Privacy Act* (FOIPP) allows any person a right of access to the records in the County's control or custody, subject to limited and specific exceptions. All documents and information, including correspondence, agreements, plans, and specifications that are written, photographed, recorded or stored

in any manner by the County may be subject to the access and privacy provisions of the *FOIPP Act*.

The County will adhere to the *FOIPP Act* to protect confidential information at all times. Applicants must identify all information that they consider confidential and the basis for confidentiality, including those parts of their submission that relate to trade secrets, commercial, financial, labour relations, scientific and technical information. Only information in accordance with the *FOIPP Act* will be disclosed as per the requirements therein.

1.7 Approval by Other Agencies

The Consulting Engineer or Developer is responsible for obtaining and coordinating all approvals by other agencies, including provincial and federal regulator approvals, that are required in conjunction with municipal approvals. Signed approval documents must be provided to the County prior to the County approving Construction Drawings, wherever possible.

Obtaining the approval of other agencies in no way removes the responsibility of the Developer or Consulting Engineer to comply with these Standards or to obtain County approvals. Where these conflict with the requirements of another agency's approval, the more stringent requirement, in the opinion of the County, shall take precedence. The County must approve any Variance to these Standards in accordance with SECTION 2.10.

1.8 Data Provided by the County

Any available information provided by the County, such as existing services, utilities, legal boundaries, or topographic information shall be externally referenced in submitted CAD files with the understanding that such information is regularly updated and is subject to change without notice. Any information provided by the County is not guaranteed to be correct or accurate and the County does not assume any responsibility for incorrect or inaccurate information that it provides. All information provided by the County must be confirmed by the Proponent using an appropriate field verification method (e.g., CCTV, survey, site visit, etc.).

An Electronic Release Form is required prior to the release of any data by the County. Refer to SECTION 9.

1.9 Rights-of-way and Easements

The Developer shall be responsible, at their sole expense, for obtaining and coordinating all aspects of any right-of-way and easement required for the development of Municipal Improvements. Easement and right-of-way documents must be prepared by a registered Alberta Land Surveyor. The Developer must coordinate with the County, as needed, for the requirements, preparation, and execution of such documents.

The Developer shall provide, at their sole expense and to the satisfaction of the Utility Authority, rights-of-way, easements, or public utility lots necessary to accommodate the respective utility service, that are registered in the name of the County. Easements must be registered on each lot title prior to the sale of any lot in the development area.

Where a right-of-way or easement has been obtained for a specific use by the County, no other utility or facility is permitted within that right-of-way or easement without prior written permission from the County. For example, the Contractor cannot use a County easement to extend a drainage connection or communication duct to private property without prior written consent.

All rights-of-way and easements must be obtained prior to the approval of Construction Drawings. The County will not approve Construction Drawings until all rights-of-way and easements have been identified and obtained.

Any work required within existing County rights-of-way or easements requires written approval from the County that authorizes work to take place prior to the start of work. Such work may include, but is not limited to, municipal servicing connections, curb cuts and/or fills, driveway accesses, turning lanes, sidewalks, walkways, boulevard restorations, traffic control signals, traffic control signage, roadside ditches, and culverts.

1.9.1 Public Utility Lots and Utility Rights-of-Way

Mains constructed outside of public road rights-of-way must be placed within a Public Utility Lot (PUL) or Utility Right-of-Way (URW) registered to the County. Service roads must be provided and must be shown on the Engineering Drawings when required to ensure this infrastructure can be accessed in the future.

PULs and URWs must be a minimum of 6.0 m wide unless otherwise specified. Mains shall be located at a minimum of 1.2 m (preferably 2 m) from a property line or edge of URW, unless otherwise approved by the County.

Mains ≥ 350 mm in diameter should not be placed in URWs unless pre-approved by the County. In such instances, the width of the URW is to be increased above the 6.0m

minimum by two times the pipe diameter, rounded up to the nearest half metre. The offset is to be increased above the 1.2m minimum by one half the pipe diameter, rounded up to the nearest half metre.

Water mains located at depths greater than 3.0 m will require wider PULs or URWs as follows:

1. The PUL or URW must be increased in width by 1.0 m for every metre of depth in excess of 3.0 m, rounding up; and
2. The offset from the edge of the PUL or URW must be increased by 0.5 m for every metre of depth in excess of 3.0 m, rounding up.

Mains located in unstable soils or engineered fill require a geotechnical evaluation of the soils to recommend safe cut back slopes, spill pile setbacks, side slope allowance for v-trench excavation, pipe embedment zone width, and access of equipment in proximity to trench in accordance with the *Alberta Occupational Health and Safety Code*. Any additional rights-of-way and easements must be obtained prior to the approval of Construction Drawings based on these recommendations.

Sidewalks and multi-use paths may be constructed within County PULs. For further details on landscaping refer to SECTION 5.5.11.

1.10 Crossing and Proximity Agreements

Where a crossing or proximity agreement is required for a proposed development, the Developer shall be responsible for obtaining and coordinating all aspects of the agreement(s), as needed, at their sole expense. The Developer must prepare and submit plans to the proper authorities and obtain the necessary permissions to enter upon, cross over, construct under or over, or in close proximity to any utility, gas, oil, or power transmission lines or railways. Approvals are also required when working in proximity to any existing infrastructure such as PUL, underground servicing or roadways. All signed crossing and proximity agreements must be submitted to the County prior to the approval of Construction Drawings.

For capital projects, crossing and proximity agreements shall be secured by the Consulting Engineer on behalf of the County prior to issuing of Construction Drawings.

For any crossing or proximity agreement where the conditions of the agreement include long-term commitments or obligations beyond the Final Acceptance Certificate, the County must be notified of such conditions and provided an opportunity to review and approve the agreement.

It is the responsibility of the Consulting Engineer and Contractor to ensure that any affected Pipeline Company or Railway Company is contacted, allowed on-site, and that work is completed to the satisfaction of the Pipeline Company or Railway Company and in accordance with these Standards. Where these Standards conflict with the requirements of the Pipeline Company or Railway Company, the requirements of the Pipeline Company or Railway Company shall take precedence and the Variance reviewed by the County in accordance with SECTION 2.10.

1.11 Survey Control Markers and Legal Pins

The Developer and their Contractor shall make every effort to protect existing survey control markers. Survey markers that are destroyed, disturbed, or otherwise impacted as a result of development activity shall be replaced by the Developer at their sole expense.

The Developer shall be responsible for providing new survey control markers at a maximum spacing of 500 m with a minimum of two (2) other markers located within clear view subsequent to development.

The Developer shall be responsible for installing marker posts to identify and protect all legal survey lot corner pins within a proposed subdivision. A marker post is not required for any pin that is provided with a legal survey marker post. The marker post shall consist of a 2.5 m x 100 mm x 100 mm treated wood post imbedded to a depth of 600 mm. Pins must not be disturbed during marker post installation.

Legal pins must be placed following the installation of all utilities and prior to the issuance of the Final Acceptance Certificate. The Developer must have any missing or disturbed legal pins replaced at their sole expense. The location(s) and final established elevation of permanent survey control markers must be shown on the appropriate Record Drawings, including identification of benchmarks used to establish the marker(s).

1.12 Slope Stability Analysis

Slope stability assessment requirements are determined based on site-specific surface topography, soil characteristics, and in conjunction with the County's Land Use Bylaw. The Developer must consult the Land Use Bylaw to determine project-specific slope stability submission requirements.

There are typically two levels of slope assessment reporting accepted as part of land development applications:

- A Preliminary Slope Stability Evaluation included as part of the Geotechnical Report, where, in the opinion of the Geotechnical Engineer, the site is deemed suitable for development and further assessment is not required, to the satisfaction of the County; or
- Where a more detailed investigation is deemed necessary, or recommended within a Preliminary Slope Stability Evaluation, a Stability Report is required.

Preliminary Slope Stability Evaluations are typically completed as part of the initial Geotechnical Report. Refer to SECTION 1.20.1.3

1.13 Geotechnical Restrictive Covenants

Based on the recommendations of the Geotechnical Report, the County may require that a restrictive covenant be registered on title of the affected parcel(s) to notify future land owners of specific development restrictions associated with geotechnical conditions on the parcel.

The Developer shall be required to register the restrictive covenant on title of all affected parcels prior to endorsement of the subdivision plan. Examples of circumstances where the County may require a geotechnical restrictive covenant are listed below:

- **Development Boundary Line:** In the developed areas where the Slope Stability Report identifies a FOS of less than 1.5 within the existing property boundaries, a restrictive covenant is registered restricting development to the area meeting the FOS of 1.5 only. In addition to registering the restrictive covenant, the Developer will be required to prepare a plan of survey showing the bounds of the FOS 1.5 line and register this plan on title.
- **Deep Fills:** registered on title of all affected lots within a plan area with compacted fills in excess of 1.5 m where the anticipated requirements for fill consolidation may exceed the proposed start date of construction. In developing areas, the restrictive covenant is registered concurrent with registration of the tentative plan. The building grade plan shall also identify all lots having deep fill.
- **Other Restrictions:** Including stormwater infiltration, watering restrictions, additional setback requirements, removal of vegetation, installation of underground sprinklers, placement of fill, or other specific recommendations from the Geotechnical Report.

1.14 Materials

The Developer shall provide and install only new materials. Recycled, re-used, or otherwise re-manufactured materials are not permitted unless first approved in writing by the County.

The Developer shall provide and install only those materials as specified in these Standards, Specifications, or otherwise approved in writing by the County. Materials must be manufactured, installed, and maintained in accordance with the manufacturer's specifications.

All materials shall be tested or otherwise certified to demonstrate that the materials conform to their specifications. Material testing must be performed by an accredited testing agency at the sole cost of the Developer. Failure to submit required material test results or certifications to the County may result in delayed issuance of a Construction Completion Certificate, progress payment, or replacement of materials.

1.15 Meetings

Scheduled meetings with the County must be initiated by the Consulting Engineer at various points throughout the project, as required. Meetings may be held on-site, off-site, or remotely, depending on the purpose of the meeting and parties involved.

1.15.1 Pre-application Meeting

The Developer must initiate a pre-application meeting with the County prior to submitting an application for any multi-lot land development project. A pre-application meeting is strongly recommended for all other types of development, especially unique designs or challenging proposals, but is not required. The Developer must submit to the County all preliminary project documents at least seven (7) days prior to the scheduled pre-application meeting date. Such documents may include conceptual or preliminary design drawings, geotechnical or other studies and reports, and other supporting documents relevant to the pre-application meeting.

The primary purpose of the pre-application meeting is to provide the Developer with project-specific information on the application process, design standards, and submission requirements. The meeting provides the Developer an opportunity to receive guidance and preliminary feedback from the County to set expectations and ensure submission requirements are understood prior to the submission of an application and supporting documents.

During the meeting, issues of concern, key milestones, and general timing will be discussed. The County will highlight the regulatory documents and key planning policies that apply to the land based on the type of development being proposed. The County will also outline what supporting studies or reports may be required to be submitted with the application, as outlined in Section 2.4.3 of the Land Use Bylaw.

Engineering Drawings will not be considered ready for submission if there are identified major unresolved issues that may affect the design of the development or information is missing from the design drawings that is required for review, in accordance with these Standards.

Pre-application meeting minutes shall be recorded by the County and distributed to the Developer within seven (7) days following the meeting.

1.15.2 Pre-construction Meeting

The Developer must initiate a pre-construction start-up meeting with the County, at least two (2) weeks prior to the start of construction, for improvements contained within a development agreement. One weeks' notice is required when scheduling a date for pre-construction meetings. The Developer, Consulting Engineer(s), Contractor(s), and their agents must be present for the meeting.

The primary purpose of the pre-construction meeting is to identify any special considerations for the site, discuss and review site safety and safe working practices, establish a construction progress schedule and start date, and outline the inspection and coordination requirements for obtaining Construction Completion Certificates. The County may raise particular aspects of the *Occupational Health and Safety Act* or related issues considered to be of special importance to the project at this meeting such as traffic accommodation, working hours, housekeeping, etc.

If the meeting is held on-site and erosion and sediment controls have been installed, ESC implementation may also be discussed in accordance with SECTION 7.7.

Pre-construction meeting minutes shall be recorded by the Consulting Engineer and distributed to all attendees within three (3) days following the meeting.

1.15.3 Progress Meetings

The Contractor must initiate periodic on-site progress meetings with the County, at a minimum frequency of every two (2) weeks, for all projects. The Consulting Engineer(s), Contractor(s), and their agents must be present for the meetings.

The primary purpose of progress meetings is to document progression of work, update the construction schedule, discuss solutions for identified problems, identify new risks or review and update previously identified risks (update risk register), review and record on-going lessons learned, and ensure work is being completed in accordance with the Construction Drawings.

Progress meeting minutes shall be recorded by the Consulting Engineer or Contractor and distributed to all attendees within three (3) days following the meeting.

1.16 Coordinate System and Survey Standards

Digital data and Engineering Drawings submitted to the County must be in the NAD83 3TM coordinate system. All AutoCAD drawings and Engineering Drawings must contain a coordinate system description included in the notes.

Any survey data submitted shall be in PNEZD, comma delimited, ASCII text file format. A description key file corresponding to point codes used by the survey crew must be provided.

1.17 Computer Aided Design (CAD)

All Engineering Drawings must be prepared using computer aided design software, such as Autodesk AutoCAD (referred to as AutoCAD). The County will not accept historical submission version formats that are no longer supported by the current version of AutoCAD. Hand drafted Engineering Drawings will not be accepted.

AutoCAD files must be in accordance with the following specifications:

AutoCAD Data Specifications	
Projection	3TM
Origin	0,0,0
Datum	NAD 83
Coordinate System	Northing/Easting
Spheroid	WGS84

Submitted AutoCAD files must contain all externally referenced files (x-ref's), as required. When raster images are included in a drawing, all related files containing imagines and information (TFW, JGW, SID, etc.) must be provided.

Digital files must not be password protected.

1.18 Tangible Capital Assets

A Tangible Capital Asset Report must be included as part of the Construction Completion Certificate application package. The report must include an itemized inventory of all contributed assets (i.e., every pipe, valve, manhole, etc.), the cost of each asset, the mapped location of each asset and be in accordance with provincial reporting requirements for Tangible Capital Assets.

The Tangible Capital Asset Catalogue Form (.xlsx document) can be found in SECTION 9.

1.19 Drawing Requirements

The number and type of Engineering Drawings required may vary for each submission and is dependant on the scope of development. If a project area is too large to fit on one drawing it may be divided into multiple drawings and identified with a corresponding match line. All drawings must be at the scales indicated in Section 1.19.2. unless otherwise noted below. Every drawing set must include a cover sheet.

Engineering drawings shall show all existing information in greyscale and proposed (i.e. new) information in black. It shall be the responsibility of the Consulting Engineer to coordinate with the appropriate Utility Authority to establish the location of their existing and new services.

1.19.1 General Drawing Requirements

All submitted drawings must be Engineering Drawings completed with AutoCAD and in accordance with the following:

☑	**General Plan Requirements**
☐	Standard ANSI D (559mm x 864mm) or A1 (594mm by 841mm)
☐	Elevations are relative to geodetic datum using an ASCM control point. Reference benchmark and their elevations identified
☐	All cadastral information including easements, rights-of-way, and property lines are delineated and dimensioned
☐	No overlapping or cut-off text and labels
☐	All text is standard sizing as defined below
☐	All dimensions in SI (System International) units.
☐	North arrow

☐	Title block that includes the following: ☐ Sturgeon County logo ☐ Project name ☐ County project number (e.g., DA #, DP #) ☐ Drawing title ☐ Drawing number ☐ Legal land description ☐ Civic address ☐ Name of Consultant(s) ☐ Name of Owner ☐ Consultant(s) permit to practice stamp ☐ Engineer stamp and signature ☐ Revision table ☐ Legend ☐ Scale bar ☐ Date

General drafting and drawing preparation shall be in accordance with the following:

- Continuous chainage shall be used wherever possible
- Elevations shall be relative to the geodetic datum. Benchmark numbers, location and elevations used shall be shown on design drawings
- The plan portion of a drawing shall not extend into the profile section and vice versa
- Plan views shall be horizontal across the drawing sheet and shall be aligned vertically by centerline stationing with the profile view below
- Nothing shall be located within 75 mm of the left binding edge
- Lines shall be uniform in weight, density, and type
- Proposed and existing features shall be readily distinguishable. Typically, proposed features are black and existing features are grey
- Dimensioning is to be clearly legible and should be placed that it will not be misinterpreted. Dimensions should be given from an iron pin, lot line, chainage station, a centerline, and face of curb or other approved reference that can be readily established.

Lettering shall be black uppercase inclined text for proposed work and grey uppercase vertical text for existing infrastructure. Lettering must not be unobstructed by linework and other drawing information. Conflicts between linework, symbols, dimensioning or text shall be removed. Standard paper drawing text heights shall be as follows:

Engineering Drawing Paper Text Heights	
Notes	2mm
Road name, phase, lot numbers	3.5mm
Dimensions	2mm
Title Block Header	4.5mm
Annotations and labels	2 mm

Standard drawing scales shall be as follows:

Engineering Drawing Standard Scales	
Overall Plans	1:1000
Plan and Profile [(1)]	1:500 horizontal 1:50 vertical
Lot Grading Plan	1:500 or 1:750
Cross-sections	1:100 horizontal 1:50 vertical
Landscape Plan	1:500
Standard Details	1:100
(1): a vertical scale of 1:25 may be used where vertical exaggeration is required for clarity	

1.19.1.1 Plan and Profile

For simple drawings, the road, sewer, and utility information may be contained on the same drawing. For more complicated drawings, road drawings may be shown on one drawing while sewer and utilities are shown on another or separate surface improvements and underground utilities into individual plan and profile drawings. If plans are deemed illegible or over-crowded the County may require plans to be separated and re-submitted.

The plan portion of the drawing must be positioned at the top of the sheet and the profile portion at the bottom of the sheet. Plan views shall be horizontal across the drawing sheet and shall be aligned vertically by centerline stationing with the profile view below. The plan portion of a drawing shall not extend into the profile section and vice versa. Grid elevations must be placed on both sides of the profile.

☑	**Plans and Profiles Requirements**
☐	All cadastral information including property line(s), rights-of-way, and easement lines with sufficient dimensions to relate to adjacent properties
☐	Roadway and pipe alignments
☐	All relevant topographic information. 1 meter contours are required for slopes >10%
☐	Existing surface and overhead structures such as pavement, powerlines, curbs, sidewalks, ditches, driveways, power poles, lanes, retaining walls, trees, and shrubs (topographic survey)
☐	Existing underground structures such as mains, services, fittings, manholes, and catch basins (topographic survey / line locate)
☐	Existing shall and deep utilities and services showing offsets, elevations, size, age, material type, and as-built reference
☐	Manhole and catch basin rim and invert elevations
☐	Station chainage is to metric standards (0+000) at 20m intervals and is related geometrically to legal property lines or survey control monuments
☐	Existing ground profile and finished surface profile along the pavement centerline are included with elevations at 20m intervals
☐	Stations and elevations are located at each BVC, EVC, and VPI
☐	Vertical curve information is shown
☐	A table for each utility that identifies attributes for existing and proposed work, such as diameters, materials, types, nodes, ownership, elevations, depths, and coordinate values

1.19.1.2 Cross-sections

Grid elevations shall be shown on both sides of the cross-section. Chainage stations shall be shown at the top. Sufficient spacing shall be provided between multiple cross-sections to ensure clarity.

Where space is limited, cross-sections should be shown on a separate plan and referenced.

Road cross-sections must show rights-of-way width, existing ground elevations, proposed road design structures, pavement width, sidewalks, curbs, underground utilities, trees, permanent landscaping, street lighting and all other pertinent surface and underground structures. Where only a portion of road is being constructed, full-width design cross-sections must be provided to ensure the design suits the future development of adjacent properties and location plan for road sections.

1.19.1.3 Standard and Non-standard Drawings

Standard drawings such as roadway cross-sections, manholes, etc. that are provided in SECTION 8 of these Standards must be referenced and added to the Standard Details drawing. Such standard drawings must be provided within the Engineering Drawing package and submitted to the County to ensure this information is readily available and included as part of the Construction Drawings.

Non-standard drawings – those not described in SECTION 8– must be drafted and provided by the Consulting Engineer or designer and added to the Standard Details drawing. Non-standard drawings must be reviewed and stamped by a Licenced Engineer.

Scales shall be determined by the designer to suit the specific design detail and shall be identified on the drawing.

1.19.1.4 Construction Notes

Construction notes shall be boxed and referenced on each drawing with sufficient detail to facilitate clarity in construction. The following notes must be added to each Engineering Drawing in the submission package:

1. “All work and materials are as described in the Sturgeon County ‘General Municipal Servicing Standards’, project-specific specifications, or as otherwise authorized in writing by the County Project Representative.”; and
2. “Connection or alteration to existing County-owned utilities requires written authorization by the County Project Representative prior to any connection or alteration work taking place.”

1.19.1.5 Units

All Engineering Drawings shall be in SI units (i.e., metric) set to meters (Architectural drawings to millimeters) of the azimuth system with 0° north. Degrees shall be in decimal degrees and measured clockwise.

All elevations shown on drawings shall be metric geodetic datum. The source and location of the datum used shall be clearly noted on each drawing they appear on.

Numerical values shown on drawings shall be typically shown to two decimal places. Three decimal places may be required in areas with modest elevation changes or where additional detail is necessary.

1.19.1.6 Discipline Designator

The first letter of the Engineering Drawing number must be the discipline designator, denoting the category of subject matter content contained within the drawing. Discipline designators are as follows:

Discipline Designator Index	
Architectural	A
Geotechnical	B
Civil	C
Electrical	E
Fire Protection	F
General	G
Landscape	L
Mechanical	M
Structural	S
Telecommunications	T
Survey/Mapping	V
Contractor/Shop Drawings	Z

1.19.2 Specific Drawing Requirements

Standard Engineering Drawings	
Drawing Title	Drawing Number
Cover Sheet	C000
Index Plan	C100
Legend	C101
Land Acquisition and/or Legal Plan	C110
Topography and Land Use Plan	C120
Lot Grading Plan	C130
Entrance Features Plan	C140
Overall Major Drainage Plan / Profiles	C150
Overall Roadway and Sidewalk Plan / Profiles	C160
Overall Utilities Plan / Profiles	C200
Water Distribution Plan / Profiles	C210
Storm Sewer Plan / Profiles	C220
Sanitary Sewer Plan / Profiles	C230
Shallow Utilities Plan	C240
Traffic Control, Pavement Markings and Signage Plan	C300
Street Furniture Plan	C310
Overall Pond and Stormwater Management Plan	C320
Erosion and Sediment Control Drawing	C330
Demolition Plan	C400
Standard Details	C500
Landscape Plan	L100

1.19.2.1 Cover Sheet

☑	**Cover Sheet Requirements**

☐	Sturgeon County logo
☐	Name of development or project name
☐	Stage or phase of development
☐	Subdivision authority approval number
☐	Reason for submission (e.g., review, approval, etc.) and date
☐	Names of the Developer and Consulting Engineer(s)
☐	Key plan showing Sturgeon County and marks the location of the development

1.19.2.2 Index Plan

The Index Plan should be a copy of the legal plan indicating each portion of the development which relates to a particular plan/profile sheet. This plan shall also list each drawing included in the set of drawings. Each drawing is to be listed sequentially along with its corresponding drawing number.

☑	**Index Plan Requirements**
☐	Drawing index table listing all applicable drawings in the package (sheet list table)
☐	Plan(s) and profile(s) drawing reference and sheet numbers
☐	Small-scale location plan (i.e., 1:10,000) showing the development as it relates to the surrounding lands and its orientation
☐	Street names
☐	Stage/phase boundary

1.19.2.3 Legend

The Legend shall list and define all symbols and abbreviations used within engineering drawings contained in the submission package. Alternatively, legends may be shown on each individual drawing upon County approval.

1.19.2.4 Land Acquisition and/or Legal Plan

Where the proposed construction of capital works is within private lands and requires a right-of-way, a separate Land Acquisition Plan must be prepared for every lot affected.

The plan must show the total area of the proposed right-of-way and the total lot area through which the right-of-way will enter.

A dimension perpendicular to the adjacent lot line and any other dimensions required to clarify the extent of the proposed right-of-way must be added.

The Legal Plan must be completed to the standards of the *Land Titles and Procedures Manual* published by Alberta Land Titles Office for all digital plan submissions and surveys for registration.

☑	**Land Acquisition and/or Legal Plan Requirements**
☐	All property lines
☐	All lot/parcel and block numbers
☐	Lot dimensions
☐	All proposed and existing monuments with labels
☐	Right(s)-of-way indicated and dimensioned, including widths
☐	Easement(s) indicated and dimensioned, including widths
☐	Restrictive Covenant(s) location and impacted lots table
☐	Roadway names
☐	All adjacent property information

1.19.2.5 Topography and Land Use Plan

The Topography and Land Use Plan should be prepared to a 1:1000 scale and shall indicate the existing contours at a 0.5 m interval and the proposed land uses for each lot or parcel of land. The plan should also indicate all stands of trees and existing structures or features that will remain, be relocated, or be removed.

1.19.2.6 Lot Grading Plan

The Lot Grading Plan shall be drawn to a scale of 1:500 or 1:750 or 1:1000 depending on size of development and shall indicate the proposed building(s) finished grade elevations within the building pocket, manhole and catch basin rim elevations, and sewer service invert elevations.

All lots requiring bearing certificates for foundations on fill, disturbed or unstable soil shall be clearly identified on the lot grading plan.

☑	**Lot Grading Plan Requirements**
☐	Proposed finished lot corner elevations
☐	Proposed building(s) pocket finished grade elevations
☐	Proposed design finished grade elevation at critical points throughout the site
☐	Proposed curb alignments with type of curb labelled
☐	All easements, rights-of-way, and property lines are delineated and dimensioned
☐	Location of all existing utilities and service connections (deep and shallow)
☐	Existing and proposed manhole and catch basin rim elevations
☐	Direction of flow of surface drainage and lot drainage type, swales, grades, elevations
☐	Identify survey control stations and markers
☐	Road allowance and easement dimensions
☐	Identify lots requiring restrictive covenants and the type of restrictive covenant
☐	Location of swales labelled with lengths, slopes, elevations, and cross sections
☐	Contours of existing elevations at 0.5m intervals
☐	Direction of overland major drainage system indicated with heavy arrows, including overflow elevation at property line
☐	Surface ponding areas are delineated and depths resulting from a 1:100 year storm are identified
☐	Recommended finished grade elevation within the building pocket for each lot adjacent to a trapped low area
☐	Sanitary sewer, foundation drain, and storm service connection inverts at the property line
☐	Indicate lots requiring > 1.5 m of fill material
☐	Notes added outlining roof leader discharge and extension requirements, the requirement for foundation drains in all houses, and cross-referencing of applicable details for discharge piping
☐	Notes for Builders that draw attention to the foundation, weeping tile, building pocket locations and foundation drain design considerations and

	a cross reference to the Geotechnical Report. Reference to the requirements outlined within Sturgeon County Lot Grading policies.
☐	Typical three dimensional detail drawings of the lot grading types depicting the house, required slopes around the house, and lot grades with each lot labelled to identify the applicable detail
☐	Details of intersections with spot elevations at all critical points, including grades and elevations of curb returns
☐	Limits of construction
☐	North Arrow

1.19.2.7 Entrance Features Plan

The Entrance Features Plan must describe all proposed entrance features to be included as part of the development, including subdivision entrance signs.

☑	**Entrance Features Plan Requirements**
☐	Front view elevation(s)
☐	Cross-section(s)
☐	Critical elevation points, slopes, and lengths
☐	Flow of surface drainage
☐	Planting material with sight lines shown
☐	Street names
☐	All cadastral information including easements, rights-of-way, and property lines are delineated and dimensioned
☐	Material types
☐	Limits of construction

1.19.2.8 Overall Major Drainage Plan

The Overall Major Drainage Plan shall indicate the post-construction major system surface drainage routes and highlight any proposed features that will affect drainage, such as culvert, ditches, swales, and roadways. The plan must show all pertinent existing and design elevations, such as existing ground contours, design grades, and finished grade overall major surface drainage routing.

☑	**Overall Major Drainage Plan Requirements**
☐	Proposed finished lot corner elevations
☐	Proposed building(s) finished floor elevations
☐	Direction of overland major drainage system indicated with heavy arrows, including overflow elevation at property lines
☐	Drainage Basin boundaries, catchment areas and future development areas draining into the system.
☐	Proposed curb and/or gutter alignments with type of curb labelled
☐	All easements, rights-of-way, and property lines are delineated and dimensioned
☐	Existing and proposed manhole and catch basin rim elevations
☐	Identify survey control stations and markers
☐	Road allowance and easement dimensions
☐	Identify lots requiring ponding or other drainage related restrictive covenants or easements (i.e., drainage easement, trap low restrictive covenants, etc.)
☐	Location of swales labelled with lengths, slopes, elevations, and cross sections
☐	Contours of existing elevations at 0.5 m intervals
☐	Surface ponding areas are delineated and depths resulting from a 1:100 year storm are identified
☐	Localized low areas showing the maximum extent of ponding and maximum depth in meters (trap low areas delineated and identified)
☐	Limits of construction
☐	Calculation table outlining allowable flow rates, maximum allowable Q

1.19.2.9 Overall Roadway and Sidewalk Plan

The Overall Roadway and Sidewalk Plan shall include information on all proposed roadway, including pavement and curb, sidewalk, path, and trail works. Where only a portion of road is being constructed, full-width design cross-sections must be provided to ensure the design suits the future development of adjacent properties.

☑	**Overall Roadway and Sidewalk Plan Requirements**

☐	The alignments, widths, and types of all existing and proposed roadways, lanes, walks, trails, ditches and other topographical surface features
☐	Curb alignment and type of curb label
☐	Stations of BC and EC of road centerline and curb return horizontal curves including delta angle, tangent length, and arc length
☐	Roadway VPI elevations complete with center line length and grade between each VPI
☐	Roadway Profile with a vertical exaggeration of 10x
☐	Street names
☐	Carriageway widths from FOC to FOC
☐	Sidewalk, curb, and gutter type and width is identified
☐	Gutter elevations provided at LOG for all changes in grade, high-points, low-points, and limits of construction
☐	Boulevard widths
☐	Cross-sections (or reference) and details for all roadways including structure
☐	Direction of surface flow indicated with arrows along roadways and public utility lots
☐	Vertical curve information including length, K Values and differences in elevation
☐	Center line curve radii table included
☐	Swales labelled with lengths, slopes, elevations, and cross sections showing width and anticipated discharge details.
☐	Catch basins and manholes labelled with rim elevations
☐	All access points into the site, including temporary access connections, emergency accesses, and temporary accesses or turnarounds, if required, complete with grades and drainage flow direction
☐	Location of any SWMF and labelled with NWL and HWL elevations
☐	Bollards, safety barriers, and railings labelled
☐	Limits of construction

1.19.2.10 Overall Utilities Plan

The Overall Utilities Plan shall indicate the locations of the alignments of sanitary sewers, storm sewers, water mains, services, stormwater management facilities, shallow utilities, and all associated easements.

☑	**Overall Storm, Sanitary and Watermain Plan Requirements**
☐	Water mains and services (including size), including hydrants and valves, are labeled. Alignments must be dimensioned
☐	Sanitary mains and services(including size), including manholes, are labelled. Alignments must be dimensioned
☐	Storm mains and services, including manholes, catch basins, treatment units, outfalls, inlets, etc., are labelled. Alignments must be dimensioned
☐	Shallow utilities and duct crossings are labelled.
☐	All easements, rights-of-way, and property lines are delineated and dimensioned
☐	Sidewalks, trails, curb lines and types, curb ramps, medians, community mailboxes, and other pertinent structures outlined
☐	Road allowance and easement dimensions
☐	Station chainages for roadways and utility lot center lines
☐	Limits of construction

1.19.2.11 Water Distribution Plan

The Water Distribution Plan shall indicate the locations and alignments of water mains, services, and their associated easements. All service connection information must be included as a schedule on each plan and profile drawing.

☑	**Water Distribution Plan Requirements**
☐	Invert elevations at all VPIs
☐	Main alignments and critical elevations (including separation vertically and horizontally)
☐	Service alignments and invert elevations at building(s), property line(s) and main

☐	Each service connection is dimensioned horizontally to the nearest property lot corner and size of connection shown.
☐	Pipe material specified and labelled
☐	Hydrant locations, identification numbers, and critical elevations. Each hydrant must show the fire service radius indicating area of coverage
☐	Fitting locations and types
☐	Pipe profiles with a vertical exaggeration of 10x
☐	Each segment of pipe labelled with diameter, length, type of pipe, and depth of cover (to finished grade)
☐	Label sections of insulation or frost box, including type and dimensions, if applicable
☐	All standard structures are labeled and referenced to applicable standard details (i.e., standard details drawing)
☐	Station chainages for roadways and utility lot center lines
☐	All easements, rights-of-way, and property lines are delineated and dimensioned
☐	Road allowance and easement dimensions
☐	Limits of construction
☐	Design table on drawing that shows: ☐ Lot and block number, distance from lot line to CC, distance from FOC to CC, and water service elevation at property line ☐ A column showing the distance from the nearest manhole to the T-wye location

1.19.2.12 Storm Sewer Plan

The Storm Sewer Plan shall indicate the locations of the alignments of storm sewer mains, services, and their associated easements. All service connection information must be included as a schedule on each plan and profile drawing.

☑	**Storm Sewer Plan Requirements**
☐	Service alignments and invert elevations at building(s), property line(s) and main

☐	Each service connection is dimensioned horizontally to the nearest property lot corner
☐	Each segment of pipe labelled with slope, diameter, length, and depth of cover (to finished grade)
☐	Sections of insulation or frost box, including type and dimensions, if applicable
☐	All standard structures are labeled and referenced to applicable standard details
☐	Existing watercourses identified and labelled
☐	ditches, culverts, storm sewers, manholes, cleanouts, inlets/outlets, catch basins, and any other sewer structure identified and labelled
☐	Catch basin type, identification number, and lead labelled
☐	Check valve (backflow) and cleanouts provided downstream and labelled for each foundation drain and storm service
☐	Rim elevations at manholes and catch basins
☐	All easements, rights-of-way, and property lines are delineated and dimensioned
☐	Road allowance and easement dimensions
☐	Routing of all major surface storm flows including the 1:100 year storm
☐	Limits of construction
☐	Each ponding basin is delineated with max ponding depth identified
☐	Catchment areas are delineated
☐	Direction of pipe flow
☐	Pipe profiles with a vertical exaggeration of 10x
☐	Pipe material specified and labelled
☐	All pipes achieve self-cleaning velocity
☐	Identify all manholes requiring safety platforms
☐	Station chainages for roadways and utility lot center lines
☐	SWMF including contours, utility infrastructure (e.g., pipes, outlets, treatment units, etc.), and any proposed enhancement features (e.g., water fountain, dock for a wet pond or sports field for a dry pond), etc.
☐	SWMF has all critical design parameters labelled including NWL, HWL, overflow route, side slopes, and freeboard

☐	SWMF has access road
☐	Design table (stormwater calculation spreadsheet) on drawing that shows: ☐ Manning's 'n' ☐ Time of concentration 'Tc' ☐ Design storm parameters, including intensity, duration, and frequency ☐ Runoff coefficient ☐ Runoff coefficient x drainage area (accumulated) ☐ Depth of flow ☐ Design flow in cubic meters per second ☐ Pipe network analysis calculations including pipe capacity (m^3/s), velocity (m/s), pipe diameter (mm), pipe slope (%), pipe length (m)

1.19.2.13 Sanitary Sewer Plan

The Sanitary Sewer Plan shall indicate the locations of the alignments of sanitary sewer mains, services, and their associated easements. All service connection information must be included as a schedule on each plan and profile drawing.

☑	**Sanitary Sewer Plan Requirements**
☐	Service alignments and invert elevations at building(s), property line(s) and main
☐	Overall Sanitary Catchment plan illustrating development boundary, basin boundary(s), catchment boundary(s)
☐	Each service connection is dimensioned horizontally to the nearest property lot corner
☐	Each segment of pipe labelled with slope, diameter, length, and depth of cover (to finished grade)
☐	Sections of insulation or frost box, including type and dimensions, if applicable
☐	All standard structures are labeled and referenced to applicable standard details
☐	All easements, rights-of-way, and property lines are delineated and dimensioned

☐	Road allowance and easement dimensions
☐	Limits of construction
☐	Pipe profiles with a vertical exaggeration of 10x
☐	All pipes achieve self-cleaning velocity
☐	Identify all manholes requiring safety platforms
☐	Rim elevations at all manholes
☐	Pipe material and diameters specified and labelled
☐	Direction of pipe flow
☐	Manholes and manhole identification numbers complete with diameters and rim and base elevations
☐	Identify drop manholes (interior and exterior)
☐	Station chainages for roadways and utility lot center lines
☐	Design table (sanitary calculation spreadsheet) on drawing that shows: ☐ Manning's 'n' ☐ Per capita flow (L/capita/day) ☐ Peaking factor ☐ Allowable infiltration and inflow allowance (L/s/ha) ☐ Design population ☐ Design flow (m^3/s) ☐ Pipe network analysis calculations including pipe capacity (m^3/s), velocity (m/s), pipe diameter (mm), pipe slope (%), pipe length (m)

1.19.2.14 Shallow Utilities Plan

The Shallow Utilities Plan shall compile the location and alignment of overhead, deep (sewer and water), and shallow (power, gas, and telecommunication) utility lines including the location of all related surface and underground features such as power poles, street lights, transformers, pedestals, hydrants, valves, manholes, etc.

All franchise utility alignments must be approved by the Utility Authority prior to submission and review by the County. The Shallow Utilities Plan must only reflect approved utility alignments (i.e., not proposed, pending, etc.). Refer to SECTION 6.

☑	**Shallow Utilities Plan Requirements**
☐	All crossings identified with horizontal and vertical clearances provided
☐	Alignment information for each utility including pipe size, length and slope
☐	All associated structures including transformers, pedestals, guy wires, poles, and fixtures to be shown within a standard cross-section
☐	Size, type, and class of conduits
☐	Finished surface grades
☐	Depth of cover
☐	Topographic information including trees, watercourses, swales, and berms
☐	Proposed and existing landscape features including planting beds, walkways, trees, and shrubs
☐	All easements, rights-of-way, and property lines are delineated and dimensioned
☐	Road allowance and easement dimensions
☐	Limits of construction

1.19.2.15 Traffic Control and Signage Plan

The Traffic Control and Signage Plan shall include all new, removed, and altered advisory signage and pavement markings proposed for the development. The design must be in accordance with the TAC *Manual of Uniform Traffic Control Devices for Canada*.

For drawing clarity, show curb locations only. Do not show utilities, legal information, or addresses.

☑	**Traffic Control and Signage Plan Requirements**
☐	Pavement markings including parking stalls, bike lanes, arrows, etc.
☐	Traffic control signs and devices are identified and labelled
☐	Dimensions, lengths, and color of proposed roadway or curb markings, medians, and crosswalks
☐	Lane widths, median radii, and taper ratios
☐	Dimensioned location and type of new or relocated signs
☐	Sign inventory table including all types of new or relocated signs

☐	Street name and identification signs
☐	The location and alignment of traffic signal poles. The appropriate number and spacing of the traffic signal heads is indicated for each pole. All other traffic signal related hardware attached to the pole is identified (e.g., street signs, cameras, street lights, etc.)
☐	Conduit runs between traffic signal related features are identified and numbered by a unique identifier. Indication of where the power feed is coming from is shown. All necessary junction boxes are shown
☐	Vehicle detection zones by either video or other means are shown
☐	Traffic control signs that are not mounted on traffic signal poles are identified and labelled
☐	Pertinent schedules and tables identifying specific features are included: ☐ Traffic Control Cabinet – identifies hardware components installed within the cabinet. If a fiber optic line is connected to the cabinet, the tube and strand colors must be identified ☐ Power Disconnect Cabinet – identifies featured of the cabinet ☐ Conductor Assignment Schedule – identifies traffic signal cable going to each pole. The purpose of each conductor of a cable running to a pole must be marked accordingly ☐ Pole Schedule – identifies each pole, including the type of pole structure, shaft height, mast arm length, streetlight extension features, and components of the pole base. If streetlight extensions are installed the specifics of the luminaries must be listed ☐ Phase Sequencing Diagram – as required ☐ Conduit and Cable Schedule – identifies the number, type, and size of conduit installed to each feature of the traffic signal or pedestrian crossing. The schedule must also identify the purpose of each cable to each pole and which conduit runs the cable is installed within ☐ Conduit Diagram – a cross-sectional view of each conduit run must be shown to clarify the information provided in the Conduit and Cable Schedule ☐ Vehicle Head Schedule – provides characteristics of each signal head ☐ Pedestrian Equipment – characteristics of each pedestrian signal hardware must be identified if installed as part of the design ☐ Junction Box Schedule – identifies the size and type of junction box material

	☐ Detection Zones – identifies and provides characteristics of each detection zone

1.19.2.16 Street Furniture Plan

The Street Furniture Plan shall include all surface improvements including roads, sidewalks, walkways, catch basins, handrails, footbridges, telecommunication pedestals, Canada Post mailboxes and their pads, street lights, benches, garbage receptacles, transformers, switching cubicles and hydrants.

Anticipated driveway locations and orientation must be included if that information is available. Street identification and traffic signs should also be shown.

☑	**Street Furniture Plan Requirements**
☐	All traffic sign locations and the type of sign to be installed at that location
☐	All proposed street furniture including hydrants, light poles, power transformers, telephone and cable boxes, pedestals, mailboxes, manholes and curb stops with overall quantities(furniture schedule)
☐	All existing features and furniture indicating what is to be removed, relocated, or remain
☐	Sight line triangles as required
☐	A driveway detail depicting the offset distance from the property line
☐	All easements, rights-of-way, and property lines are delineated and dimensioned
☐	Road allowance and easement dimensions
☐	Street names and numbers
☐	Limits of construction or site boundaries

1.19.2.17 Overall Pond Plan

An Overall Pond Plan shall be submitted when a pond is proposed as part of the development. The drawing shall be drawn to a scale no greater than 1:1000.

☑	**Overall Pond Plan Requirements**
☐	Inlet and outlet details

☐	Pond data chart showing elevation, volume, depth, length of shoreline, and surface area for 1:5, 1:25, and 1:100 storm event scenarios
☐	A cross section of the pond that shows side slopes, NWL, HWL, and any proposed bank/riparian area treatments
☐	Emergency overflow route (spillway) identified
☐	A stage versus storage graph
☐	A stage versus discharge graph
☐	All easements, rights-of-way, and property lines are delineated and dimensioned
☐	A plan view showing any silt ponds/sedimentation bays, access routes to these sites, all storm pope locations and sizes entering the pond, and all proposed erosion protections
☐	Limits of construction

1.19.2.18 Erosion and Sediment Control Drawing

When multiple ESC drawings are required within the ESC Plan, each drawing must be labelled with the appropriate ESC Drawing Number corresponding to the stage of development (i.e., ESC-1, ESC-2, etc.).

Refer to SECTION 7.1 to determine if an ESC Plan is required. Refer to SECTION 7.8 for ESC Plan submission requirements.

☑	**ESC Drawing Requirements**
☐	Each ESC drawing is consecutively labelled to match construction phasing
☐	Existing topography with contours at 0.5m and design elevations are shown
☐	Where more than one drawing is required to show a single stage, match lines are visible on each drawing
☐	Limit of construction
☐	Vegetated areas are delineated. Protected areas clearly indicate protection measures or controls to be implemented
☐	Adjacent properties are labelled (e.g., residential, commercial, rivers, roadways, etc.)
☐	The height and location of retaining walls are labelled

☐	Cover type for all surfaces is labelled (e.g., asphalt, grass, gravel, etc.)
☐	Drainage divides are clearly labelled to define drainage areas and sizes
☐	Surface drainage patterns are indicated with arrows, including run-on, run-off, major flow routes, and emergency overland flow routes
☐	Existing and proposed permanent storm drain inlets, outlets, pipes, and other permanent facilities for on-site and surrounding lands are labelled
☐	All critical areas, such as environmental reserves, natural areas, and waterbodies are labelled
☐	The construction footprint appropriate to the stage of development is shown on each drawing (e.g., building footprints would not show up on stripping and grading drawings)
☐	The locations, types, dimensions, and details for all ESC BMPs and controls present at the stage of development the drawing represents are shown.
☐	Each lot is delineated and labelled
☐	The locations of stockpiles are delineated and labelled, indicating what type of stockpiles is in place and the estimated volume of the pile. For soil being hauled off-site, a separate map showing haul routes is included.
☐	A separate landscaping plan that includes details on seed, sod, and plant materials is provided, if applicable.
☐	A phasing plan showing the identified areas to be constructed in phases, if applicable, is included. (e.g., Phase 1 will be constructed in 2022, Phase 2 in 2023, etc.)
☐	Drawing is signed by an appropriate ESC Qualified Professional

1.19.2.19 Demolition Plan

The Demolition Plan depicts existing structures or features that are to be removed, modified, or relocated as a result of the proposed development. The proposed design must be shown as an overlay. The requirement for a Demolition Plan is based on the size and complexity of the project and should be utilized when clarity is necessary.

1.19.2.20 Standard Details

Refer to SECTION 1.19.2.3.

1.19.2.21 Landscape Plan

The Landscape plan shall be drawn to a scale of 1:500 and indicate all proposed landscaping including planter materials, overall quantities, entry or other special features, and surface types. Cross-sections should be shown on a separate plan and cross-referenced if drawing space is limited. The title block should specify the general location and include all applicable offsets.

☑	**Landscape Plan Requirements**
☐	Alignments of existing and proposed streets, walks, roadways and ditches
☐	Alignments of existing and proposed underground, surface, and overhead utilities
☐	Topography contours at 0.5m intervals and existing surface features such as trees and structures
☐	Selection, size, quantity, conditions and installation specifications, and locations of plant material with overall quantities (plant schedule)
☐	Existing plant material and other natural features to remain
☐	Existing plant material and vegetation to be relocated or removed
☐	Temporary site access, stockpiles, laydown areas, and parking
☐	Adjacent land use information including natural areas and trees immediately adjacent to the subdivision
☐	Type and depth of mulch for shrub beds and tree wells
☐	Trail locations, signage, and proposed drainage. Include total trail length in meters and associated furniture (signs, bollards, etc.)
☐	Identify entrance features including sight lines, planting materials, front view, cross-section(s), materials and construction details
☐	Locations of proposed site furnishings
☐	Fencing locations and construction details including anchoring, foundation, cross-section(s) and critical elevations to be shown on separate plan
☐	If irrigation is proposed, an irrigation plan must be included
☐	Areas to be seeded or sodded complete with specified seed mix. No-mow and natural areas are delineated
☐	Total measurements of seeded and sodded areas, planting beds, islands, buffers, (PUL’s, MR’s) in square meters

☐	All easements, rights-of-way, and property lines are delineated and dimensioned
☐	Road allowance and easement dimensions
☐	Street names and numbers
☐	Limits of construction or site boundaries

1.19.3 Drawing Revisions After Approval

Refer to SECTION 2.12.

1.20 Report Requirements

The preparation of each required engineering and design report shall be the responsibility of the Developer and completed at their sole expense. Each report shall contain sufficient design detail in terms of calculations, demonstrations, and diagrams to provide the County with a comprehensive understanding of the functional capabilities of the proposed design or development in conjunction with the existing lands.

All reports submitted to the County must be completed by a Qualified Professional with sufficient experience and in accordance with APEGA's relevant practice standards in the area for which the report pertains to. Final reports and supporting documentation shall be complete with the professional seal and permit stamp of the Consulting Engineer and firm responsible. All responsibilities for authorship of all report and documents must be clearly identified and the signing engineer must be recognized as a Licenced Engineer.

Final reports must contain all applicable project information including the following:

- Permit Seal and Signature
- Project Name
- Owner
- County Project Number (e.g., Development Agreement #, Development Permit #)
- Report Title
- Revision Number
- Civic Site Address and Legal Land Description
- Date

1.20.1 Geotechnical Report

The Geotechnical Report is an interpretative report that is completed by a Geotechnical Engineer and is intended to evaluate the geotechnical conditions of the site and confirm that the land may be used safely for the intended purpose without undue risk of hazards.

Geotechnical Reports submitted to the County must be authored by a Geotechnical Engineer with sufficient experience and a valid permit to practice in Alberta.

The Geotechnical Report may contain a Preliminary Slope Stability Evaluation and a Preliminary Hydrogeological Evaluation and must contain recommendations for any further studies and/or investigation that may be required at later stages of the proposed development to define lands suitable for development

The Geotechnical Report must include, at a minimum, all of the following:

- A description of the purpose, objectives and scope of the report.
- A description of the extents of the study area.
- A description of the existing terrain and/or topography.
- A description of the proposed development and extents of proposed development.
- A description of the evaluation approach methodology as determined by the Geotechnical Engineer, such as:
    - Factors considered in planning and executing the subsurface investigation program (e.g., program objectives, site constraints).
    - Test hole locations and depths, observation and sampling methods, laboratory testing, and instrumentation installations (e.g., piezometers, slope inclinometers).
    - Description of specific testing and/or other methods used to characterize the subsurface conditions (e.g., cone penetration testing, geophysical techniques, in situ testing, geotechnical/hydrogeological instrumentation, aerial photographs).
- A summary of the Geotechnical Engineer's findings and observations, which may include, but is not limited to:
    - Existing information review, such as existing available information (geological maps and reports, water well records, flood plain mapping, etc.), aerial imagery (LiDAR, aerial photographs, etc.), and previous geological or geotechnical reports related to the study area or adjacent lands.
    - Site Reconnaissance or field visits, including relevant observations related to terrain or physical descriptions, soil and rock exposures, signs of potential slope

instability, groundwater discharge, surface flow, erosion, and vegetated areas within the study area and adjacent lands.

- Subsurface investigation, including a description of the subsurface conditions and general stratigraphy encountered during the site visit and subsurface investigation (supported by test hole records), number of California Bearing Ratio (CBR) tests to be completed, relevant laboratory test results (e.g., Atterberg limits, water content, particle size distribution, corrosivity, strength and compressibility testing), estimated weeping tile flow rate, and a description of other relevant observations (e.g., frost depth, sloughing).

- A description of the interpreted geotechnical and hydrogeological site conditions and parameters based on field observations and/or testing, and laboratory testing (e.g., soil conditions, groundwater conditions after drilling: 1day, 7days, 14 days and 31 days, depth of frost penetration, seismic potential, soil erodibility for all soil types).
- Any recommendations, areas of concern, or discussions required with respect to the proposed development (e.g., site grading, foundations, frost protection, retaining walls, slab-on-grade, construction procedures, concrete type, weeping tile requirements, pavement structure and design, site drainage, testing and inspection to be carried out during construction).
- A description of any further studies, evaluation, and/or investigation that may be required at later stages of development.

1.20.1.1 Report Limitations

The County accepts reports and relies on the professional engineering judgment of the Geotechnical Engineer authoring the report. Reports accepted by the County must name "Sturgeon County" as a party and addressee of the report. The report must also make clear that the County can use and rely on the information in the report.

If a previously approved Geotechnical Report is being re-submitted to the County as part of a new application, the County must still be named as a party to and addressee of the report, with specific reference to the new land development application. In such instances, a signed letter from the Geotechnical Engineer who authored the report may be submitted along with the report indicating that the County may rely on the information for the purposes of the new land development application.

1.20.1.2 Verification of Dated Reports

For Geotechnical Reports older than two (2) years from the date of issuance, the County shall require written confirmation from the authoring Geotechnical Engineer indicating that the report adequately addresses the geotechnical requirements for the application and is therefore suitable for submission to the County.

The intent of this requirement is to provide the County with assurance that the Geotechnical Engineer agrees with the information presented within the report and confirms that it accurately addresses the geotechnical qualities of the site as it currently exists in conjunction with the proposed development activities.

If the Geotechnical Engineer does not agree with all information presented in the Geotechnical Report being submitted, or does not consider the Geotechnical Report to accurately address the geotechnical qualities of the site with respect to the proposed development activities, an amended geotechnical report or new geotechnical report will be required by the County.

1.20.1.3 Preliminary Slope Stability Evaluation

A Preliminary Slope Stability Evaluation is required where any existing or proposed bank slopes on or adjacent to the development site exceed 15% in slope, and 2.5 m in elevation, or in the opinion of the County, slope stability is considered to be a potential concern. A Preliminary Slope Stability Evaluation is typically completed as part of a Geotechnical Assessment using existing information and site reconnaissance.

The evaluation must consider any factors that may affect the stability of the slope over the life-cycle of the development or the estimated service life of the structure, whichever is greater.

As part of the evaluation, the Geotechnical Engineer must provide a plan that classifies the terrain according to the following three (3) categories:

1. lands suitable for development;
2. lands requiring further investigation to evaluate development suitability; or
3. lands that are not suitable for development.

A minimum Factor of Safety (FOS) of 1.3 for infrastructure, roads, and property; and 1.5 for buildings and houses, unless otherwise approved by the County. In instances where the FOS is less than 1.3, the slope may be modified to increase the FOS to a minimum of 1.3, subject to the recommendation of the Geotechnical Engineer and acceptance by the County.

Where the Preliminary Slope Stability Evaluation is deemed suitable for development by the Geotechnical Engineer, and to the satisfaction of the County, a subsequent Slope Stability Report is not required. In such instances, the Developer must provide a letter from the Geotechnical Engineer that verifies the proposed development will not have an adverse affect on the stability of the slope and a minimum factor of safety of 1.5 is

achieved to the satisfaction of the County. The Letter must be under seal and permit to practice stamp and submitted to the County.

If further slope stability analysis is required, a Slope Stability Report must be completed and submitted for review and acceptance. Refer to SECTION 1.20.2.

1.20.1.4 Preliminary Hydrogeological Evaluation

A preliminary hydrogeological evaluation is typically completed as part of a Geotechnical Report using existing information, site reconnaissance observations, and results collected from the geotechnical subsurface investigation.

When completing a slope stability assessment, the Geotechnical Engineer must consider groundwater conditions, as they are often one of the greatest unknowns for a development site. Generally, there are three (3) groundwater conditions that can be used in preliminary slope stability analysis using simple geology:

Full Hydrostatic Saturation	Assumes that the groundwater level is at ground surface (i.e., all of the soils are saturated) and that groundwater flows horizontally towards the slope (may be considered conservative and somewhat unrealistic, since water would be flowing out of and along the full slope face, a condition not generally observed).
Groundwater Flow Parallel to the Slope Face	Assumes full saturation, but there is discharge at the slope toe, which may be reasonable where surface water flow is observed at the slope toe.
Groundwater Level at Some Depth in the Slope	Assumes that the upper soil profile is in an unsaturated condition and the piezometric surface slopes down towards the slope toe.

Groundwater conditions can occur on different portions of the same slope, and under seasonal conditions their locations on the slope can vary. Adequate study must be carried out to understand the groundwater regime and fluctuations.

Ideally, piezometers should be installed within boreholes to measure the groundwater levels at various locations above, below, and on the slope and these should be measured at various times in the year and under worst case conditions (e.g., when precipitation is generally highest). However, it is unlikely that the groundwater levels will be measured to be the highest that may occur, and the timeframe required for on-going monitoring is likely not practical. Therefore, care needs to be taken by the Geotechnical Engineer to use

the highest groundwater level that could reasonably be expected to occur using reasonable judgement on how high the groundwater levels could become for preliminary analysis.

Consideration should also be given to influences of flooding of the slope, possible saturation of the slope due to discharge, the effects of irrigation, and the effects of adjacent stormwater management ponds. Where new development is anticipated, consideration may be required for further hydrogeological study depending on the sensitivity of the slope to changes in the groundwater levels.

At a minimum, the evaluation should identify that the groundwater levels have been established or assumed based on a rational defensible method that accounts for potential fluctuations and are modelled in an anticipated worst case condition.

If further hydrogeological analysis is required, a Hydrogeological Report must be completed and submitted for review and acceptance. Refer to SECTION 1.20.3.

1.20.2 Slope Stability Report

A Slope Stability Report is required where any existing or proposed bank slopes on or adjacent to the development site exceed 15% in slope, 2.5 m in elevation, and:

- Setback distances, buffers, or development boundary line is unable to be determined from a Preliminary Slope Stability Evaluation;
- A Preliminary Slope Stability Evaluation indicates further investigation is required to determine lands suitable for development; or
- In the opinion of the County, slope stability is considered to be a potential concern and a Slope Stability Report is required.

The intent of a Slope Stability Report is to assess whether or not a slope is considered to be stable, and if not, to establish a development boundary line beyond which structures and other facilities may be constructed. Slope Stability Reports submitted to the County must be authored by a qualified Geotechnical Engineer with a valid permit to practice in Alberta.

Slope Stability Reports require site-specific geotechnical investigation and must consider both pre-development and post-development conditions. It should outline operational rules and restrictions required for any portion of the lands within the investigation area to prevent unnecessary detrimental impacts to existing slopes and to maintain the long-term stability of lands suitable for development.

The Slope Stability Report must include, at a minimum, all of the following:

- A description of the purpose, objectives and scope of the report.
- A description of the study area, including the extent of the study area and a legal land description of the property, if applicable. The study area should be determined by the size of the parcel of land or the size of a specific site, as well as the stability and geological and geotechnical complexity of the terrain involved, and the type of development.
- A description of the proposed Development and the slope(s) under review, considering existing and post-development conditions, including any modifications that may affect the slope stability.
- A description of the evaluation approach methodology as determined by the Geotechnical Engineer, such as:
    - Factors considered in planning and executing the subsurface investigation program (e.g., program objectives, site constraints).
    - Test hole locations and depths, observation and sampling methods, laboratory testing, and instrumentation installations (e.g., piezometers, slope inclinometers).
    - Description of specific testing and/or other methods used to characterize the subsurface conditions (e.g., cone penetration testing, geophysical techniques, in situ testing, geotechnical/hydrogeological instrumentation, aerial photographs).
- A summary of the Geotechnical Engineer's findings and observations, which may include, but is not limited to:
    - Existing information review, such as existing available information (geological maps and reports, water well records, flood plain mapping, etc.), aerial imagery (LiDAR, aerial photographs, etc.), and previous geological or geotechnical reports related to the study area or adjacent lands.
    - Site Reconnaissance or field visits, including relevant observations related to terrain or physical descriptions, soil and rock exposures, signs of potential slope instability, groundwater discharge, surface flow, erosion, and vegetated areas within the study area and adjacent lands.
    - Subsurface investigation, including a description of the subsurface conditions and general stratigraphy encountered during the site visit and subsurface investigation (supported by test hole records), relevant laboratory test results (e.g., Atterberg limits, water content, particle size distribution, corrosivity, strength and compressibility testing), and a description of other relevant observations (e.g., frost depth, sloughing).

- A description of geotechnical and hydrogeological site conditions and parameters based on field observations and testing, and laboratory testing (e.g., soil/rock conditions, groundwater conditions, seismic potential).
- A description of the slope stability assessment, which may include, but is not limited to:
    - The slope stability analysis method (e.g., limit equilibrium) and analysis software (i.e., Slide, Slope/W, SV Slope, or acceptable equivalent).
    - The input parameters used in the slope stability analysis and basis for selection (e.g., in situ measurement, laboratory measurement, published information, relevant experience) including strength parameters, unit weight, and anticipated "worst case" piezometric conditions.
    - The location of stratigraphic cross-sections used for slope stability analysis shown in plan view with an explanation on the basis for the selection of those cross-sections.
    - The slope stability results considering an appropriate range of slope failure mechanisms used to determine:
        1. The minimum FOS for the slope, and associated location(s) of failure mechanism slip surface; and
        2. The location at/beyond the crest or toe of the slope for which all slip surfaces have a FOS of 1.5 and greater.
- A description of the conditions anticipated over a period of one life-cycle of development or the estimated service life of the structure that may negatively impact the stability of the slope and consequently change the development boundary line, such as:
    - Changes to slope geometry from either natural erosion processes (e.g., hydrologic, wind, temperature) or human activities.
    - Changes to groundwater and/or surface flow patterns from either natural change in precipitation trends and runoff patterns, or human activities and urban development.
    - Changes in land use and/or changes resulting from resource development.
    - Natural processes such as earthquakes, wildfires and insect infestations on treed slopes.
- A description of additional setback allowances (as identified by the Geotechnical Engineer) to be included in the development boundary line to address anticipated condition changes, future slope access, etc.
- Identification of the following on a detailed topographic plan for the proposed development area:
    - Proposed and existing property lines.

- Top of embankment or escarpment (crest of slope)
- Bottom of embankment or escarpment (toe of slope).
- Cross-section(s) selected for slope stability analysis.
- Development boundary line at both the crest and toe of slope (if applicable).
- Footprint of the proposed development including building structures.
- Location of proposed retaining walls (if applicable).

- Indicate any conditions and restrictions associated with the development boundary line including, such as:
  - Controlled overland surface water flow to prevent uncontrolled discharge of water proximate to the crest of the slope.
  - Possible restrictions regarding swimming pools and irrigations systems adjacent to the development boundary line.
  - Limitation on the installation of underground utilities and pipelines.
  - For man-made fill or cut slopes, and for portions of natural slopes for which loss of vegetation and erosion is a problem or potential problem, recommendations related to erosion control blankets and establishing a suitable, sustainable vegetation cover.
  - Where cut or fill slopes may impede or expose the existing surface water, or groundwater flow regime, drainage measures or restrictions to manage that water.
  - Erosion control measures where erosion of/near the toe of a slope is a potential problem.
  - Loading near the crest of the slope (e.g., fill placement, retaining walls, road embankments).
- Provide the appropriate following statements within the report:

  1. "*In the opinion of the Geotechnical Engineer, the proposed site is suitable for development with specific reference to the proposed development*."; and
  2. "*The stability analysis and the results shown in this report comply with all the requirements of Sturgeon County's General Municipal Servicing Standards*.";

     or

     "*In the opinion of the Geotechnical Engineer, additional geotechnical investigation and/or analysis is required and would be beneficial prior to development of the site*."

1.20.2.1 Minimum Factor of Safety

All proposed land suitable for development must have a minimum factor of safety (FOS) of 1.5 applied against slope failure. Lands with a FOS of less than 1.5 are deemed to be potentially unstable from a slope stability perspective and may be taken as Environmental Reserve at the discretion of the County and pursuant to the Municipal Government Act.

Minimum Factor of Safety Development Requirements	
Developing Area (property lines are not established)	The entire parcel proposed for development must have a minimum FOS of 1.5 (i.e., the property line must lie where the FOS is greater than or equal to 1.5) and must include additional setback provisions (e.g., erosion allowances, future construction access allowance) where appropriate.
Developed Area (property lines are established)	If a Slope Stability Report indicates that a portion of the parcel does not meet the FOS of 1.5, a restrictive covenant must be registered against the title of the property that restricts development to the area with a FOS of 1.5 or greater.
Public Lands	Pathways and other County-maintained infrastructure located on public land (e.g., lighting, benches) must meet a minimum FOS requirement of 1.5, unless otherwise approved by the County.

In instances where the FOS is less than 1.5, the slope may be modified, subject to the approval of the Approving Authority, to increase the FOS to a minimum of 1.5, thus increasing the area able to be developed.

1.20.2.2 Report Compliance and Verification

It is the responsibility of the Developer to comply with all recommendations presented in the geotechnical report(s), such as drainage routing, fill and slope configuration, setback distances, and development boundary line restrictions.

The Developer must retain the Geotechnical Engineer to review the final design to confirm that the setback limit and drainage layout are in accordance with the recommendations made in the Geotechnical Report.

During and after construction, an adequate number of geotechnical inspections shall be conducted to satisfy the Geotechnical Engineer that construction is conducted in accordance with Geotechnical Report recommendations.

The Developer must retain the Geotechnical Engineer to review the as-built slopes and drainage systems, following completion of construction. The Geotechnical Engineer shall certify, in a signed letter, compliance with the recommendations made in the Geotechnical Report. The letter must be submitted to the County prior to issuing any Construction Completion Certificate.

1.20.3 Hydrogeological Report

A Hydrogeological Report is required when groundwater is a known potential concern in an area, as identified by a Preliminary Hydrogeological Evaluation or Geotechnical Report. Hydrogeological Reports must be authored by a qualified Hydrogeologist or Geotechnical Engineer with appropriate experience in hydrogeology.

The Hydrogeological Report is intended to address, at a minimum, the following areas:

1. Current and future groundwater elevations with considerations for seasonal and long-term fluctuations that may affect the performance of foundations, drainage systems (for below-grade structures), frost heaving of surface structures, etc.;
2. Current and future groundwater elevations with considerations for seasonal and long-term fluctuations as input into the geotechnical designs for slope stability assessment and stabilization, earth embankments, and site grading, including cuts and fills; and
3. Groundwater withdrawals required for construction and during service life of development.

The Hydrogeological Report must include, at a minimum, all the following:

- A description of the purpose, objectives and scope of the report.
- A description of the study area (e.g., the extents of the study area, legal description of the property, description of the property relative to well-known geographic features).
- A description of the regional setting (e.g., topography, physiogeography, surficial geology, bedrock geology, hydrogeology, vegetation).
- A description of the proposed Development and extents of proposed development.
- A description of the interaction between the development and the groundwater system.

- A description of the approach methodology, as determined by the Geotechnical Engineer or Hydrogeologist, such as:
    - The depth and areal extent of investigation with supporting rationale, demonstrating consideration to impacts outside the proposed development area;
    - Data collection methodology such as description of field investigation, sources of data, nature of data used (published, unpublished and verbal), and geophysical survey methods; and
    - Analysis methodology (e.g., analytical or numerical models), if applicable.
- A description of the findings and observations, which may include, but are not limited to:
    - Hydro-stratigraphy (i.e., subdivision of strata into aquifers and aquitards).
    - Hydro-structural features (i.e., structures that do not have a stratigraphic control).
    - Areal extent and thicknesses of each unit.
    - Lithology and hydraulic properties for aquifer and aquitards.
    - Recharge and discharge areas, groundwater levels, flow directions, and flow rates.
    - Fluctuations in water levels pertinent to the objectives (e.g., seasonal, multiple year).
    - Groundwater quality, if applicable.
    - Groundwater users, if applicable.
    - Surface water-groundwater interactions (e.g., locations and groundwater discharge rates).
    - Any special physical or chemical features present (e.g., structural features, instability, caverns/karst, expansive clays, water chemistry and quality, hot springs, fumaroles).
    - A description of any modelling or assessment, which may include the analysis method and any software used, the input parameters and basis for selection, the location of stratigraphic cross-sections shown in plan complete with an explanation on the basis for the selection of those cross-sections, and the results.
- A description of the anticipated hydrogeologic conditions during and after development, including, but not limited to:
    - The anticipated affects the proposed development will have on local and regional groundwater regime, such as changes to groundwater levels and direction, changes in groundwater quality, and changes in discharges to surface water bodies. Groundwater impacts should be described as known or potential risks

affecting the study area and adjacent lands. Quantified measures should be used to describe the risks of the impacts.

  - Anticipated water table fluctuations under current and future conditions that could impact slope stability, or proposed/existing underground development.
  - Any uncertainty in predictions.
  - A description of potential cumulative effects based on known future development in adjacent areas.

- A statement as to whether, in the opinion of the Geotechnical Engineer or Hydrogeologist, the proposed site is suitable for development with specific reference to the proposed Development.
- Any recommendations for additional reports and/or mitigation plan(s), which in the opinion of the Geotechnical Engineer or Hydrogeologist, are required or would be beneficial prior to development of the site.
- Any recommendations for additional work or monitoring, including the frequency of reporting monitoring data, if there is significant inherent uncertainty and if consequences of the uncertainty are material.

1.20.4 Hydraulic Network Analysis

The subdivision approval level Hydraulic Network Analysis report must, at a minimum, include the simulation of all pipes 150 mm or larger in diameter and include the following:

- An introduction with a general description of the proposed development.
- A section describing the boundary conditions used for the analysis and how they were obtained.
- A section indicating the assumptions used for modelling, e.g., pipe material, Hazen William's C- factor, demand consumption rates and minimum allowable pressures.
- A section describing the results of all simulations and/or modelling.
- A figure showing the location of the development.
- A figure showing the zoning and lot count.
- A figure showing the node demand boundaries.
- Figures showing the assigned pipe and node numbers, pipe diameters and lengths, location of fire flow simulations, node elevations, and any other hydraulic elements modelled into the system, e.g., check valves, pressure or flow regulators, and booster pumps.
- The identification of nodes where peak hour pressure is less than 280 kPa (minimum peak hour pressure) and less than 350 kPa (minimum maximum day pressure for

operation of residential fire sprinklers), including multi-unit or commercial areas with on-site grading which results in peak hour pressure below 350 kPa at the node.

- The identification of nodes where maximum pressure is greater than 550 kPa (maximum allowable pressure for water services).
- Pipes less than 150 mm in diameter must be included in simulations if they are required to service areas of extreme elevation or dead ends.
- Calculations utilized to determine the sizing of water main thrust blocks, if modified thrust blocks are required as part of the design.
- Calculations utilized to determine the restraint length for water main joints if restrained joints are required as part of the design.
- An appendix containing model runs for the following conditions:
    - Peak hour;
    - Maximum day plus fire flow runs at all critical locations (i.e., high value properties, remote locations, high elevation locations); and
    - Other simulations as requested by the County.
- An appendix that includes:
    - A pipe table;
    - A junction or node table;
    - A reservoir table for each scenario; and
    - Available fire flow reports for each maximum day plus fire flow scenario.

Hydraulic Network Analysis to align with the requirements and format set out by the HNA Consultants Handbook by EPCOR.

1.20.4.1 Standards and Guidelines

The applicable standards and guidelines used in the preparation of a Hydraulic Network Analysis are listed in the following table:

Standards and Guidelines for Preparing a Hydraulic Network Analysis	
Minimum Peak Hour Pressure	280 kPa
Minimum Maximum Day + Fire Flow Pressure	140 kPa
Minimum Maximum Day Pressure (for operation of residential fire sprinklers)	350 kPa
Maximum Allowable Pressure in Distribution System	700 kPa

Maximum Allowable Pressure for Water Services	550 kPa
Average Day Demand (ADD)	320 L/c/d
Maximum Day Demand (MDD)	640 L/c/d
Peak Hour Demand (PHD)	960 L/c/d
Maximum Hazen-William's Coefficient	120
Fire Flow for Single Unit Residential	100 L/s
Fire Flow for Mid-Value Multi Unit Residential	180 L/s
Fire Flow for Apartment Residential	300 L/s
Fire flow for Light Industrial	200 L/s
Fire flow for Commercial	250 L/s
Fire flow for Heavy Industrial	250 L/s

Pressures in the above table are relative to node elevation. Node elevation must be set at the ground elevation of the highest point of service within the demand boundary for that node.

Where a proposed water servicing system requires pressure regulating devices including, but not limited to, booster pump stations, check valves, pressure reducing valves and pressure sustaining valves, then the report must include a copy of the peak hour and maximum day simulations without these devices to facilitate evaluation of the need, operational characteristics and consequences of failure.

Where a proposed water servicing system requires the installation or removal of any temporary water infrastructure, the Developer shall, at their sole expense, design, install, remove, and abandon any temporary water main and its associated appurtenances to the satisfaction of the County.

In the event that a subdivision is proposed to be staged into multiple phases, an interim staging HNA is required. This HNA will contain all items identified in SECTION 1.20.4 and depending on the nature of the phasing may require multiple maximum day plus fire flow pressure analyses and any other simulations as requested by the County.

1.20.5 Tangible Capital Asset Report

The Tangible Capital Asset Report must include an itemized inventory of all contributed assets (i.e., every pipe, valve, manhole, etc.) the cost of each asset, the mapped location of each asset and be in accordance with provincial reporting requirements for Tangible

Capital Assets. The Tangible Capital Asset Catalogue Form (.xlsx document) can be found in SECTION 9.

1.20.6 Report Revisions After Submission

Refer to SECTION 2.12.2.

Volume 2

Process and Procedures

Sturgeon
COUNTY

Community. Innovation. Ambition.

2. Process and Procedures

Contents

2.1 General

This section outlines the standard process and procedures for undertaking work within the County. The Developer and their Consulting Engineer are responsible for understanding and adhering to all requirements listed in these Standards and ensuring any variances, conflicts, or inconsistencies are promptly communicated to the County during the review process. Variances shall be reviewed and approved or rejected by the County in accordance with the variance review process in Section 2.10.

2.2 Contractual Relationships

2.2.1 County/Developer

The contractual relationship between the County and the Developer is defined within the Development Agreement and/or Development Permit, through which the Developer agrees to complete the construction of the identified Municipal Improvements to the Standards and requirements as administered by the County. Notwithstanding the specific contractual relationships described below, the Developer is ultimately responsible for the performance of all obligations, terms, and conditions specified in the Development Agreement and/or Development Permit.

2.2.2 Developer/Consulting Engineer

The Developer shall retain a Consulting Engineer to design and supervise all work to be carried out under the agreement. The Developer remains responsible for the full and proper performance of all obligations, terms, and conditions under the Development Agreement and/or the Development Permit.

The Consulting Engineer retained by and acting on behalf of the Developer shall prepare design drawings, reports, and specifications based on the particular location, ground form, site conditions, and specific information associated with the development to be constructed. The Consulting Engineer's designs and specifications must meet or exceed County Specifications, approved designs, provincial and federal regulations and legislations, or as otherwise required by County.

The Consulting Engineer's contract with the Developer must be defined such that the Consulting Engineer is obligated and responsible to provide at least the minimum level of field and design services as specified in these Standards.

Following the issuance of the CCC(s), the Consulting Engineer, acting on behalf of the Developer, shall continue to ensure the identification and repair of deficiencies until such a time that the FAC is issued for the specific Municipal Improvement and is accepted by the County.

Should the Developer not fulfill their obligations, as set out in the terms and conditions of the Development Agreement and/or Development Permit, by abandoning the project, not completing the work to the required standards, or electing not to correct the deficiencies identified by the County or the Consulting Engineer, the Consulting Engineer shall not be held responsible to complete the construction of the Municipal Improvement. In such instances, the Developer shall remain strictly responsible for all incomplete or inadequately completed obligations.

2.2.3 Developer/Contractor

The Developer shall define its contract with the Contractor based on the approved Construction Drawings and contract documents prepared by the Consulting Engineer. The Contractor is responsible for the quality of work.

Notwithstanding the above, the Developer is ultimately responsible for the performance of all obligations, term, and conditions specified in the Development Agreement and/or Development Permit.

2.2.4 Consulting Engineer/County

There is no direct contractual relationship between the Consulting Engineer and the County. However, as the Consulting Engineer is the representative of the Developer, the County has the right to request that the Developer, through the Consulting Engineer, correct any deficiencies as they are observed and identified, to the satisfaction of the County.

The Consulting Engineer shall maintain adequate records to satisfy the County that the work is being constructed and installed in a safe and approved manner that conforms with these Standards. The Consulting Engineer shall submit applications to the County for CCC and FAC approval and ensure any maintenance deficiency items are rectified expeditiously.

The County may stop the construction and installation of work as set forth in the Development Agreement and/or Development Permit. Should the Consulting Engineer not be available on site, the County may issue a stop work order directly to the Developer, with a copy of the order given to the Contractor to stop the work.

2.2.5 County/Contractor

There is no direct contractual relationship between the County and the Contractor. Any communications from the County regarding the ongoing work will be addressed directly to the Consulting Engineer, unless otherwise indicated in SECTION 2.2.4.

2.3 Prior to Excavation

The Contractor shall be responsible for verifying the location of all existing underground utilities (deep and shallow) prior to excavation and is required to contact Utility Safety Partners (formerly Alberta One-Call) at 1-888-420-3464and other private utilities not included in the Utility Safety Partners locates program. Excavation of any kind is strictly prohibited prior to verifying existing underground and surface utilities.

Excavations, digging, or placing of plant materials that impact or have the ability to impact existing utilities shall not commence until the affected Utility Authority has been notified and approval has been obtained. The Contractor shall be responsible for notifying and coordinating with the appropriate Utility Authority.

The Contractor must ensure all authorizations and/or agreements (e.g., crossing, proximity, etc.) are signed and in effect prior to work taking place. The Contractor shall be responsible, at their sole expense, for any costs resulting from damage, disruption, repair, or remediation to existing underground and surface utilities.

2.4 Working Near Buried Lines

Work taking place near buried lines shall be completed in accordance with the *Guidelines for Working Near Buried Facilities* (Edmonton Area Pipeline and Utility Operators' Committee).

Pipeline crossings of a roadway shall be completed in accordance with the *Guidelines for Underground Utility Installations Crossing Highway Right-of-Way* (Transportation Association of Canada).

2.5 Utility Main, Service, and Other Infrastructure Connections

Connections to County-owned utility infrastructure, including service connections, must be inspected by the County prior to backfill. Connections to lines under pressure using a tapping valve and sleeve (i.e., hot tap) must be completed in the presence of the County. Opening and closing of existing water valves shall only be completed by Utility and Waste Management Services personnel.

Inspection requests for utility main, service, and other infrastructure connections must be submitted to Utility and Waste Management Services a minimum of three (3) working days prior to the requested inspection date. Utility and Waste Management Services can be reached at 780-939-4321.

2.6 Operation of Valves and Hydrants

Opening and closing of existing County Owned water valves shall only be completed by the County. The Developer, Contractor, or their delegated agents shall not open or close any water valves or hydrants.

VALVES The Contractor shall coordinate valve operations with Utility and Waste Management Services. Requests shall be submitted a minimum of three (3) working days prior to the requested valve operation date. Utility and Waste Management Services can be reached at 780-939-4321.

HYDRANTS The Contractor shall receive County approval prior to operating or using a hydrant as a water source. The Contractor shall be responsible for the costs of all water used during operation. Only County hydrant meters provided by Utilities and Waste Management Services may be used. The Contractor shall complete and submit a Hydrant Meter Use Agreement a minimum of three (3) working days prior to the requested inspection date. Refer to SECTION 9 FORMS.

2.7 Inspections

Inspections exceeding the minimum requirements outlined in this section shall be at the discretion of the Consulting Engineer or the County.

2.7.1 Underground Improvements

Full-time inspection by the Consulting Engineer of ongoing work shall be provided during the installation and maintenance work of underground utilities with the exception of the following items:

1. Repairs to the top box, bottom box, rod, and casing for water service connections;
2. Repairs where exposure of contaminants to the water supply would not occur;
3. Valve rods and casing repairs for water mains;
4. Cathodic protection repairs;
5. Cleaning and flushing of both sanitary and storm sewer systems;

6. Thawing of services;
7. Manhole adjustments and repairs; and
8. Catch basin and lead repairs.

Although full-time inspection is not required during the undertaking of the specific items noted above, spot inspections shall still be completed by the Consulting Engineer, as determined reasonable to ensure sufficiently completed work. Full-time inspection is required by the Consulting Engineer during the re-installation of water servicing, water mains, sewer services, sewer mains, and associated sewer surface appurtenance repairs.

2.7.2 Surface Improvements

Full-time inspection by the Consulting Engineer is required when more than three (3) cubic meters of concrete is to be poured for sections of sidewalk, curbs, and gutters. The level of inspection required when less than three (3) cubic meters of concrete is to be poured for sidewalks, curbs, and gutters shall be determined by the Consulting Engineer and approved by the County.

Full-time inspection by the Consulting Engineer is required when more than fifteen (15) tonnes of asphalt is to be placed.

Regardless of whether or not the Consulting Engineer provides full-time inspection during surface improvement construction, the Consulting Engineer shall:

1. Contact the County Project Representative at least 48 hours prior to placing any granular fill and/or asphaltic material and concrete pours;
2. Maintain sufficient spot inspections during the placement of any granular fill materials to ensure that all granular materials placed comply with these Standards and any other associated Specifications;
3. Ensure material testing required during the placement of any granular fill – including areas beneath the sidewalks, curbs and gutters, walkways, and roadways – complies with these Standards and associated Specifications;
4. Prepare inspection and quality control reports for roads, lanes, and walkways that contain compaction certificates and asphalt pavement core logs for thickness verification;
5. Check the subgrade and road structure and coordinate soil density tests as necessary to certify adherence to these Standards and any other associated Specifications;
6. Arrange and coordinate compaction and density tests of fills and embankments during construction; and

7. Determine the amount of inspection required during replacement or maintenance of sidewalks.

2.8 Testing

It shall be the responsibility of the Consulting Engineer to ensure that testing of all materials called for in these Standards or associated Specifications is carried out by an accredited testing agency. Copies of all test results shall be forwarded to the County as soon as test results are returned. The cost of all testing shall be at the sole expense of the Developer.

Municipal Improvements shall not be permitted to operate or be operated as part of the existing municipal systems until the Municipal Improvement has been tested, inspected, and approved in writing by the County.

Tests results must be submitted to the County prior to obtaining CCC. Refer to SECTION 2.9.

2.8.1 Compaction Testing

The Consulting Engineer shall ensure that all compaction and density tests are completed in accordance with these Standards and the appropriate CSA/ASTM Standards. Lab-tested results for Proctor testing, sieve analysis for granular soil, moisture-density relationship results and soil sampling results for each subdivision are required as indicated in these Standards.

The Consulting Engineer shall ensure that the testing agency retained for compaction testing has been notified and is on site during backfilling of utility trenches, compaction of backfill for underground and surface municipal improvements, and at all other times they must be present. After the installation of all underground utilities, a report of the compaction tests completed and subsequent results shall be reviewed and verified by the Consulting Engineer and provided to the County. A similar report for surface Municipal Improvement compaction results shall also be submitted to the County.

The Consulting Engineer, prior to submission of the reports to the County, shall review the test results to ensure that all tests submitted have met the compaction requirements. Test areas not meeting the compaction requirements shall be re-compacted and re-tested at the sole expense of the Developer. All testing results must be included in the final compaction report.

Subgrade compaction test results must be verified to meet requirements prior to placing granular base course. Granular base course compaction test results must be submitted to the County prior to placing asphalt or pouring concrete.

The CCC(s) for underground utilities and surface improvements will not be issued until all the compaction results have been submitted to the County.

2.9 CCC/FAC

Upon the satisfactory completion of Municipal Improvements and after all identified deficiencies have been corrected, the Developer or their Consulting Engineer shall apply to the County for a Construction Completion Certificate (CCC). Following review and subsequent approval, a CCC shall be issued by the County to the Developer, noting acceptance of the work and the duration of the Warranty and Maintenance Period.

During this period, the developer shall be responsible, at their own expense, to remediate any defect, fault, or deficiency that occurs in the work associated with the CCC. All work must be completed in accordance with these Standards and associated Specifications.

Upon completion of the Warranty and Maintenance Period, after a final inspection by the County, and correction of all identified deficiencies, the Developer or their Consulting Engineer shall apply to the County for a Final Acceptance Certificate (FAC). Following review and remediation of all identified deficiencies, an FAC shall be issued by the County to the Developer.

2.9.1 Inspections

Once work is complete, the Consulting Engineer must request a CCC/FAC inspection prior to submitting the CCC/FAC application for the associated Municipal Improvement.

Prior to an inspection request, the Developer, Consulting Engineer and Contractor(s) must conduct their own independent pre-inspection to confirm the work has been completed in accordance with Construction Drawings and meets the requirements to conduct a formal inspection with the County, in addition to the following:

- All site areas to be inspected are readily accessible and visually unobstructed including free of debris, dirt, snow, and ice;
- Land developer shall procure an accredited Alberta Land Surveyor to install grade stakes at all corners of the/each individual lot as well as along the centerline of the/each lot. Stakes shall also be installed at the toe and heel of all slopes and swales.

Acceptable tolerances of ± 150mm on lot corners and ± 300mm within the lot will be accepted, subject to the satisfaction of Engineering Services.

- There is no construction equipment, vehicles, or materials placed or parked that may impede the inspection; and
- Supporting documents are prepared and ready to be submitted with the inspection request. Refer to SECTION 2.9.1.1.

Failure to meet these requirements may result in the delay and rescheduling of the inspection to a future date once the site has been adequately prepared for an inspection or supporting documents are provided.

CCC/FAC inspection requests must be submitted by the Consulting Engineer. The process for requesting a formal CCC/FAC inspection with the County is as follows

1. Complete the Engineering Inspection Request Form.
2. Submit signed Engineering Inspection Request Form and applicable supporting documents directly to the County Project Representative via email at least seven (7) working days prior to the earliest requested inspection date.
3. The County Project Representative will contact the Consulting Engineer if additional information is required, otherwise, a Microsoft Outlook calendar invite will be sent out to all required attendees indicating the confirmed inspection date. Working email addresses must be provided for all attendees.

For both CCC and FAC inspections there must be at least one (1) representative each for the Consulting Engineer and Contractor in attendance. While not required, it is strongly recommended a representative for the Developer be in attendance as well.

The Consulting Engineer shall be responsible for completing and submitting to the County a detailed CCC/FAC Inspection Report within three (3) business days following the inspection or re-inspection. The inspection report shall include, at a minimum, a written account of all identified deficiencies, proposed corrective actions, applicable site photographs, inspection temperature, and any other pertinent information noted during the inspection.

Inspections shall occur annually between April 1st and October 15th, with the exception of softscape landscaping, which shall occur between June 1st and September 30th. Trees must contain complete foliage capable of being visually observed for an inspection to occur – the County will not complete inspections where fall seasonal changes are occurring (e.g., leaves falling, color changes, etc.). In such cases, the inspection shall occur the following year once foliage has re-established. The Warranty and Maintenance Period

start date may be backdated to the previous year at the discretion of the County Project Representative.

All inspections are subject to adequate weather conditions, in the opinion of the County Project Representative, and must allow for proper inspection of work. Weather conditions that impede inspection capabilities or otherwise adversely impact the ability of the County Project Representative to conduct the inspection may result in the inspection to be rescheduled to a different day.

2.9.1.1 Supporting Documents

CCC inspection requests must include As-built Drawings highlighting the inspection area associated with the Municipal Improvement and delineating the phase and subdivision boundary. Construction Drawings that include all approved redline changes and represent final constructed conditions may be accepted in lieu of As-Built Drawings, at the discretion of the County Project Representative, when As-built Drawings are delayed or otherwise not immediately available.

FAC inspection requests must include a drawing that highlights the inspection area associated with the Municipal Improvement and delineating the phase and subdivision boundary.

Additional supporting documents may be required to accompany a CCC/FAC inspection request based on the scope of the inspection or as otherwise requested by the County Project Representative.

Additional supporting documents required for CCC inspections include:

Improvement Type	CCC Supporting Document(s) Required
CCC Inspection Requests – Playground and Play Structures	Inspection report from the CPSI certified inspector confirming that the installation of the equipment complies with CSA Z614-14 (Children's Play spaces and Equipment Standards) or ASTM F3101-15 (Standard Specification for Unsupervised Public Use Outdoor Fitness Equipment) and the GMSS. The report must identify any deficiencies and their corrective plan, to be complete within 30 days following the inspection. Refer to SECTION 5.5.5.
	Letter from the equipment manufacturer confirming that the structural integrity of the equipment complies with CSA Z614-14 (Children's Play spaces and Equipment Standards) or ASTM

	F3101-15 (Standard Specification for Unsupervised Public Use Outdoor Fitness Equipment). Refer to SECTION 5.5.5.
CCC Inspection Requests – Fencing	Fence tolerance letter from the fence Contractor certifying that fence improvements have been installed in accordance with an accredited legal survey and within the tolerances specified in these Standards. Refer to SECTION 5.11.3.3.

Additional supporting documents required for FAC inspections include:

Improvement Type	FAC Supporting Document(s) Required
FAC Inspection Requests – Playground and Play Structures	Inspection report from the CPSI certified inspector confirming that all previously identified deficiencies and new deficiencies identified during the inspection have been rectified.

2.9.2 Acceptance Criteria

All laboratory and field test results must be submitted to the County prior to acceptance. Test results must clearly indicate all constructed work conforms to these Standards, other Specifications, and is within the appropriate specified tolerances. Required test results typically consist of trench, bedding, and backfill compaction results, concrete material and strength results, asphalt density and thickness core results, CCTV inspection report, and water pressure, leakage, disinfection, and bacteriological results.

All work constructed shall be visually inspected for conformance prior to acceptance. In all situations the County shall have the final decision on whether completed work is acceptable. Inspection acceptance criteria for each Municipal Improvement is per the following table:

Municipal Improvement	Acceptance Criteria Section
Roadways	
Roadway Structure	3.1.20.12
Sidewalks, Curbs, and Gutters (concrete)	3.1.21.21
Streetlights [(1)]	3.1.23.3
Water Distribution System	3.2.22
Storm Water Management System	3.3.14

Sanitary Sewer System	3.4.20
Landscape and Open Space	5.11.3
(1): Acceptance criteria shall apply only for those streetlights not inspected, approved, and maintained by the Utility Authority (Fortis) as part of the County Ratepayer Plan.	

2.9.3 Deficiencies

All deficiencies identified during an inspection shall be corrected by the Developer within thirty (30) days following the inspection date. If deficiencies are not corrected within this period, the entire inspection area will be subject to a full re-inspection. Once deficiencies have been corrected, a formal re-inspection must be completed and all deficiencies corrected to the satisfaction of the County.

The Consulting Engineer shall be responsible for completing and submitting to the County a detailed CCC/FAC Inspection Report within three (3) business days following the inspection. The inspection report shall include, at a minimum, a written account of all identified deficiencies, proposed corrective actions, applicable site photographs, temperature during inspection, and any other pertinent information noted during the inspection.

2.9.4 Warranty and Maintenance Period

The Developer shall be responsible for all deficiencies, including defects and damage, that occur during the Warranty and Maintenance Period. All corrective work associated with identified deficiencies required to obtain CCC/FAC from the County shall be completed by the Developer at their sole expense. The Developer shall also be responsible for all maintenance and repair items including third-party damages, maintenance of street signs, re-grading, flushing of sewer lines, thawing and flushing of watermains, etc. during the Warranty and Maintenance Period, with the exception of snow removal and street sweeping.

The County will assume responsibility for normal snow removal and street sweeping operations once CCC for roadways has been issued. The Developer shall remain responsible for the removal of excess dirt and debris from the streets and sidewalks that have been deposited as a result of construction activities. The Developer will be required to enter into a maintenance agreement to hold the County harmless in the event of damages resulting from normal snow removal activities.

The Warranty and Maintenance Period shall commence on the date CCC is issued and shall remain in effect for the period length indicated in the below table and up until FAC is issued, unless otherwise specified in the Development Agreement. For instances with

Warranty and Maintenance Period conflicts between these Standards and the Development Agreement, the period indicated in the Development Agreement shall take precedence.

The Warranty and Maintenance Period shall end only upon issuance of the FAC. The Developer shall remain solely responsible for initiating and coordinating application of the FAC with the County and completing all outstanding deficiency work required for acceptance and issuance of the FAC. The County will not issue FAC until such a time that all identified deficiencies have been rectified and accepted to the satisfaction of the County.

During the Warranty and Maintenance Period, the Consulting Engineer shall inspect the development area and note any failures, settlements or other deficiencies in the completed work and must respond to any County resident calls and emails forwarded by the County. Should any major failures, settlements, or other deficiencies occur, the Consulting Engineer shall notify the County and arrange for the Contractor to complete the necessary repair.

Warranty and Maintenance Periods	
Municipal Improvement	Period Length [(1)]
ROADWAYS	
Roadway Structure	2 years [(2)]
Surface Course Asphalt (Final Lift)	1 year
Pavement Markings	2 years
Sidewalks, Curbs, and Gutters	2 years
Traffic Signals	2 years
Streetlights	None [(3)]
WATER DISTRIBUTION SYSTEM	2 years
STORM WATER MANAGEMENT SYSTEM	2 years
SANITARY SEWER SYSTEM	2 years
LANDSCAPE AND OPEN SPACE	2 years
Seed and Sod	2 years
Site Clearing, Stripping, Stockpiling and Grading	2 years
Plant Material (trees, shrubs, etc.)	2 years
Fencing (CCC only)	None [(4)]

Trails and Walkways	2 years
Site Furniture	2 years
Signage, entry features	2 years
Community Gardens	2 years
Playground and Outdoor Fitness Equipment	2 years
Sports Fields	2 years

(1): Commencing upon issuance date of the CCC for the associated Municipal Improvement.
(2): Excluding surface course asphalt (i.e., final lift) when two lifts of asphalt are required, in which case the Warranty and Maintenance Period for surface course asphalt shall be one year and commencing once FAC for roadway structure (excluding surface course asphalt) has been obtained.
(3): A CCC will not be issued for this improvement. Streetlights are inspected, approved, and maintained by the Utility Authority (Fortis) as part of the County Ratepayer Plan.
(4): An FAC will not be issued for this improvement. Fencing must be located on private property, owned, and maintained by the owners of the lots created upon subdivision creation. Noise Attenuation Fencing shall have a Warranty and Maintenance period of 2 years.

2.9.5 CCC Application

Upon completion of the CCC inspection and once all outstanding deficiencies are corrected to the satisfaction of the County, the Developer or their Consulting Engineer shall apply to the County for a Construction Completion Certificate (CCC). Refer to SECTION 9 FORMS.

Each CCC application must include the following general supporting documentation:

CCC Application General Supporting Documents	
As-built Drawings [(1)]	As-built Drawings highlighting the inspection area associated with the Municipal Improvement and delineating the phase and subdivision boundary
CCC Inspection Report(s)	The CCC Inspection Report indicating no deficiencies remain outstanding. If a re-inspection was required, each subsequent inspection report must be included
TCA Report	A completed Tangible Capital Assets (TCA) Report. Refer to SECTION 1.20.5

(1): Construction Drawings indicating all approved redline changes may instead be accepted, at the discretion of the County Project Representative, when As-built Drawings are delayed or otherwise immediately unavailable. In such cases, As-built Drawings **must** be submitted to the

County no later than one (1) month following issuance date of the CCC for the associated Municipal Improvement.

In addition, the CCC application must include the supporting documents specific to the associated Municipal Improvement work as described in the SECTIONS 2.9.5.1 to 2.9.5.5.

2.9.5.1 Roadways

☑	**Roadway CCC Application Supporting Documents**
☐	Asphalt test results, density test results and proof roll reports for subgrade, granular base course, and base course asphalt. Refer to SECTION 3.1.20.6
☐	Concrete test results (compressive strength, air content, etc.). Refer to SECTION 3.6.1
☐	Asphalt penalty assessment. Refer to SECTION 3.1.20.6
☐	Concrete penalty assessment. Refer to SECTION 3.6.1.2

2.9.5.2 Water Distribution System

☑	**Water CCC Application Supporting Documents**
☐	Test results (density, sieve analysis, etc.) for pipe bedding, trench backfilling, and associated underground structures. Refer to SECTION 3.2.20
☐	Hydrostatic pressure and leakage test results report. Refer to SECTION 3.2.21.1
☐	Disinfection and bacteriological test results report. Refer to SECTION 3.2.21.2
☐	Hydrant flow test(s). Refer to SECTION 3.2.21.3
☐	Concrete test results (compressive strength, air content, etc.) for all associated structures, including thrust blocks. Refer to SECTION 3.2.21.4

2.9.5.3 Storm Sewers

☑	**Storm Sewer CCC Application Supporting Documents**
☐	Test results (density, sieve analysis, etc.) for pipe bedding, trench backfilling, and associated underground structures. Refer to SECTION 3.3.12
☐	CCTV Inspection report and video. Refer to SECTION 3.3.13.1
☐	Exfiltration/Infiltration leakage test results (when required by the County). Refer to SECTION 3.3.13.2
☐	Deflection test results (when required by the County). Refer to SECTION 3.3.13.3
☐	Concrete test results (compressive strength, air content, etc.) for all associated structures. Refer to SECTION 3.3.13.4

2.9.5.4 Sanitary Sewer

☑	**Sanitary Sewer CCC Application Supporting Documents**
☐	Test results (density, sieve analysis, etc.) for pipe bedding, trench backfilling, and associated underground structures. Refer to SECTION 3.4.18
☐	CCTV Inspection report and video. Refer to SECTION 3.4.19.1
☐	Exfiltration/Infiltration leakage test results (when required by the County). Refer to SECTION 3.4.19.2
☐	Deflection test results (when required by the County). Refer to SECTION 3.4.19.3
☐	Concrete test results (compressive strength, air content, etc.) for all associated structures. Refer to SECTION 3.4.19.4
☐	**FORCE MAIN SYSTEM**: CCTV, exfiltration/infiltration, hydrostatic pressure and leakage, deflection, and any other test results associated with the force main low pressure system. Refer to SECTION 3.4.19.5

2.9.5.5 Landscape and Open Spaces

☑	**Landscape and Open Spaces CCC Application Supporting Documents**
☐	Density test results for all prepared subgrades and asphalt or concrete surface treatments, including walkways, trails, pads, paving stones, and any other structures. Refer to SECTION 5.4.2 and SECTION 5.5.2
☐	*Clean Plants Certified Nursery* documentation provided for all plant material. Refer to SECTION 5.4.1
☐	*Canada No. 1* certification documentation provided for all placed seed and sod. Refer to SECTION 5.4.5
☐	Certification documentation that installed elm trees are from a Dutch elm disease free source. Refer to SECTION 5.4.7
☐	Asphalt and/or concrete penalty assessment. Refer to SECTION 5.10

2.9.6 Record Drawings

Record Drawings must be submitted to the County prior to issuance of FAC and must be submitted before the Warranty and Maintenance Period ends. Record Drawings must only be completed and certified once all outstanding deficiencies have been completed and at a time when any future maintenance work shall not alter information contained within the Record Drawings. Refer to SECTION 2.13 for Record Drawing submission requirements.

2.9.7 FAC Application

Upon completion of the FAC inspection and once all outstanding deficiencies are corrected, to the satisfaction of the County, the Developer or their Consulting Engineer shall apply to the County for a Final Acceptance Certificate (FAC). Refer to SECTION 9 FORMS.

Each FAC application must include the following general supporting documentation:

FAC Application General Supporting Documents	
Location Drawing	A drawing highlighting the inspection area associated with the Municipal Improvement and delineating the phase and subdivision boundary

Record Drawings	Required only if Record Drawings have not been previously submitted or previously submitted drawings require a revision
FAC Inspection Report(s)	The FAC Inspection Report indicating no deficiencies remain outstanding. If a re-inspection was required, each subsequent inspection report must be included
Revised TCA Report	Required only if revision has occurred to the TCA Report submitted at CCC

In addition, the FAC application must include the supporting documents specific to the associated Municipal Improvement work as described in the SECTIONS 2.9.7.1 to 2.9.7.5.

2.9.7.1 Roadways

☑	**Roadway FAC Application Supporting Documents**
☐	Asphalt test results for surface course asphalt (i.e., final lift). Refer to SECTION 3.1.20.6
☐	Asphalt penalty assessment. Refer to SECTION 3.1.20.6

2.9.7.2 Water Distribution System

☑	**Water FAC Application Supporting Documents**
☐	N/A-

2.9.7.3 Storm Sewers

☑	**Storm Sewer FAC Application Supporting Documents**
☐	CCTV Inspection report and video. Refer to SECTION 3.3.13.1

2.9.7.4 Sanitary Sewer

☑	**Sanitary Sewer FAC Application Supporting Documents**
☐	CCTV Inspection report and video. Refer to SECTION 3.4.19.1

2.9.7.5 Landscape and Open Spaces

☑	**Landscape and Open Spaces FAC Application Supporting Documents**
☐	Contractor Monthly Maintenance Reports. Refer to SECTION 5.11.1
☐	Contractor Biocide Report. Refer to SECTION 5.11.1

2.9.8 Securities Reduction

Security shall be determined based on the cost of the Municipal Improvement and provided in accordance with the County's Development Agreement Securities Policy in the amounts stipulated in the Development Agreement.

Securities for Municipal Improvements may be reduced by 50%, upon written request from the Developer, following issuance of the CCC. Securities may further be reduced an additional 10%, upon written request from the Developer, following submission of Record Drawings. Securities shall be fully reduced following issuance of FAC.

2.10 Variance to these Standards

Where a proponent wishes to deviate from these Standards, the onus shall be upon the proponent to provide sufficient rationale for the proposed variance such that any impact to the design is identified, analyzed, and any resulting concerns are resolved, to the satisfaction of the County. If the proponent fails to provide sufficient rationale or supporting details, the proposed variance may be rejected. The County reserves the right to reject any proposed variance to these Standards for any reason.

All proposed variances must be approved by the County prior to implementation. Proposed variances must be submitted to the County using the Proposed GMSS Variance Form located in SECTION 9. All necessary supporting documentation, such as reports, technical memos, calculations, etc. must be included as part of the same submission. Submissions that lack supporting documents or sufficient detail shall not be considered complete.

The Proposed GMSS Variance Form must be submitted by the Consulting Engineer. Each submission must include a stamped and signed letter from a Licensed Engineer indicating support of the proposed variance and confirmation that the proposed variance results in no adverse effects to the engineering design.

Once a complete submission is received, the Variance Review Committee shall typically approve or reject the proposed variance within twenty (20) working days. The Variance Review Committee may request additional information from the proponent during the review period. Proposals that require additional information or are otherwise complex in nature may require more than (20) twenty working days to review. Proposed variances requiring the review of external consultants or subject matter experts outside of the County shall be completed at the cost of the Proponent proposing the variance.

2.11 Drawing Issuance

Engineering Drawings must be appropriately issued for the review stage in a project development cycle prior to submission to the County. Drawings are typically required to be issued as per the following:

Drawing Issue	Abbreviation	Stamp and Signature Required
Issued for Preliminary Review	IFPR	No
Issued for Review	IFR	No
Issued for Tender	IFT	Yes
Issued for Construction	IFC	Yes
Issued for Record Drawings	IFRD	Yes

For submissions prior to IFC, issues should be coded in alphabetical order starting with issue “A” with subsequent revisions revised by one ascending letter (e.g., B, C, D, etc.). IFC drawings shall be coded with issue “0” and subsequent revisions revised by one ascending number (e.g., 1, 2, 3, etc.).

The appropriate revision letter or number, date, and drawing issue shall be added to the title block prior to each drawing submission. To achieve consistency, the drawing issue letter must be changed for each packaged submission, even if there is no change on an Engineering Drawing. Changes or additions to technical information on a drawing after

being approved for construction must be noted in the revision column complete with a brief description in the revision box.

All drawings not issued for construction (i.e., issued for review, tender, etc.). must contain an easily visible stamp that reads “NOT FOR CONSTRUCTION”. Once approved for construction the stamp must be removed.

Drawings being issued for construction must be stamped and signed by the responsible Licenced Engineer prior to submission to the County. The County will not approve Construction Drawings lacking a seal and signature and validation of permit to practice.

County review of Engineering Drawings is to confirm their compliance with these Standards. Approval to construct does not, in any manner, imply approval of the technical aspects of the engineering design, for which the Consulting Engineer remains solely responsible for.

2.12 Changes After Approval

Once a document is submitted to the County and approved (e.g., Construction Drawings, report, technical memo, etc.) any subsequent revision to that document must again be submitted to the County for approval. The Developer shall be solely responsible for all costs associated with correcting work resulting from work completed based on an unapproved change. Changes must be documented by a revision in the issue number for Construction Drawings or on the title page for reports.

2.12.1 Construction Drawings (Red lines)

When changes to Construction Drawings are required, the revised drawing(s) must be submitted with the proposed changes shown in red (i.e., redline) and include a letter outlining a summary of the proposed changes and the reason for making the change. Any changes to Construction drawings must be approved by the County prior to construction. The Developer shall be solely responsible for all costs associated with correcting work resulting from an unapproved change.

The changes must be documented by a revision in the drawing(s) issue number (i.e., rev’d up). For example, if changes to IFC drawings with an issued number of ‘0’ are required, the submitted issue number should be revised up to 1. All changes to Construction Drawings must be clearly marked by placing a triangular flag containing the revision number adjacent to the area where the change is occurring and clouding all affected areas.

The County will review the changes within seven (7) calendar days of receiving the revised drawing(s) and accept or reject the proposed changes. If the proposed changes are approved, one copy of the revised drawing(s) will be signed and returned as issued for construction.

2.12.2 Reports

When changes to reports are required after it has been submitted to the County, the revised report must be submitted with a letter outlining a summary of the changes and the reason for making the change. The changes must be documented by a revision on the reports title page version (i.e., revised report) and include the revised submission date. Revised reports must be signed by the Qualified Professional who authored the original report.

2.13 As-built Drawings and Record Drawings

Throughout construction, As-built Drawings must be prepared and managed by the Contractor to reflect the true elevation and location of all constructed features in both the plan and profile views. All as-built features shall be surveyed by a Qualified Professional and survey points imported into the digital drawing with all deviations recorded in red. Once work is complete, the Contractor must submit As-built Drawings to the Consulting Engineer for validation and preparation of Record Drawings. As-built Drawings must be submitted to the County when requesting a CCC Inspection.

Prior to issuance of Final Acceptance Certificate (FAC), the Consulting Engineer shall prepare and deliver Record Drawings to the County. Record Drawings shall include all changes in accordance with approved change documents such as change orders, approved redline revisions, GMSS Variances, RFI responses, etc. that were executed during the project and all redline revisions that occurred during the Warranty and Maintenance Period. The Consulting Engineer must incorporate all information provided within As-built Drawings prepared by the Contractor into the Record Drawings, including as-built survey data (i.e., real elevations).

Record Drawings shall include the following information on each drawing and the cover sheet:

- Date of completion of each Municipal Improvement (typically corresponds to the date on the Construction Completion Certificate);
- Name of Contractor responsible for each improvement;
- Date on which record information was added;
- Stamped and signed by the validating Licenced Engineer; and

- A statement from the validating engineer that reads:

  "(validating engineers name) *has inspected the work laid out in* (legal land description, Construction Drawing, report, etc.) *and certifies that the work has been constructed in accordance with approved construction drawings and will function as described*".

Record drawings shall clearly show the location of all services installed. All dimensions must reflect the as-constructed conditions of the work and all reference to "proposed" work shall be removed. Proposed construction for future phases of work should not be shown on Record Drawings. A post-construction as-built survey must be completed by a Qualified Professional with survey information included on Record Drawing submissions.

Information to be added to Record Drawings includes, at a minimum, the following:

- Verification of locations and elevations of rims and inverts for all existing utilities and services encountered during construction;
- Location and elevation information of any abandoned infrastructure and the abandonment method;
- Installed pipe material and manufacturer;
- Hydrant locations and valves dimensioned relative to the property line and with a Northing/Easting coordinate;
- Distance between manholes and their calculated slopes. Sewer lengths shall be shown to the nearest centimeter and slopes calculated to one decimal place.
- Curb stop locations and elevations;
- Riser connection details shown on plan profile drawings;
- Service pipe locations and elevations, including wyes, tees and other fittings;
- A schedule for each utility plan and profile showing the following information for each service connection:
  - Lot and block number
  - Distance of service wye from downstream manhole
  - Invert elevation of each service line at the main line connection and the property line or easement
  - Length, slope, and diameter of service connection. Service connections shall be referenced to the lot corner
- The stamp and signature of the validating engineer of record; and
- All other as-built information provided by the Contractor and Surveyor.

Following the surface course asphalt layer (i.e., final lift) installation, previously submitted underground utilities Record Drawings must be revised to reflect new rim elevations.

Landscape Record Drawings shall include the as-planted location of all plant materials, species and size of trees, and size, quantity, and types of shrubs in an updated plant list on the landscape plan(s).

2.13.1 Submission Requirements

Record Drawing submissions shall include the following:

- One (1) set of signed and sealed electronic copy engineering drawings in PDF format;
- Two (2) sets of signed and sealed hard copy engineering drawings on standard A1 or ANSI D sized paper that are issued for record drawing;
- One (1) set of electronic AutoCAD and GIS files (GIS required only if AutoCAD Map 3D or AutoCAD Civil 3D software was used). Electronic files must not be password protected;
- A CSV file containing as-built survey information; and
- Any operating or maintenance manuals;

The Consulting Engineer shall be responsible for obtaining as-constructed inverts and connections for all underground services, tees, and lateral connections. The record information shall be checked for discrepancies against design information as soon as possible throughout construction and at regular intervals so that corrective action can be taken, if required.

Where major discrepancies are identified between the design and as-constructed (i.e. record) information, In the opinion of the County, the Consulting Engineer must provide a written explanation describing why the discrepancy exists and confirm the discrepancy does not adversely impact the overall engineering design or intent. Prior to issuing FAC, Record Drawings must be updated to reflect any changes that occurred during the Warranty and Maintenance Period.

The electronic AutoCAD file must include the final site as-built survey showing the locations of each improvement and infrastructure as it was constructed, including manholes, catch basins, valves, street lights, poles, transformers and pedestals, street furniture, and mailbox pads. The electronic drawing file shall be in a form that includes one overall plan or model and must include all improvements with reference to specific overalls, plan profiles etc.

Incomplete submissions will be returned to the applicant and will not be reviewed by the County. Failure to comply with submission requirements will result in the delay of County acceptance and subsequent release of securities.

2.14 Development Agreement

A Developer typically enters into a Development Agreement with the County when a development requires the construction of, or upgrades to, municipal infrastructure. The requirement to enter into a Development Agreement is set as either a condition of subdivision or development approval and must be entered into before any construction occurs.

A Development Agreement sets out the terms that the Developer and County must abide by and include the necessary Engineering Drawings for the Municipal Improvement(s), the proposed construction schedule, and the estimated construction costs associated with the Municipal Improvement(s). Both of these components must be endorsed by the Consulting Engineer.

The provision of securities forms part of the agreement and is based on the estimated construction costs. The payment of any applicable off-site levies are due when the Development Agreement is signed by all relevant parties. Refer to the County's Development Agreement Policy for the forms of securities that the County will accept and the percentage of the estimated construction costs that will apply as security.

A copy of the signed Development Agreement document is normally registered on the land title of the subject property and will only be discharged once the last FAC has been issued and the securities returned to the Developer.

2.15 Development Permit

Development Permits are authorizations approved through the Land Use Bylaw that give County permission to an applicant for development of land and/or operation of uses. Development Permits must be consistent with the Municipal Government Act including any Statutory Plan and should be consistent with any other policy or bylaw.

Regulations and procedures related to Development Permits can be found within the Land Use Bylaw. Development Permits may require a Developer to enter into a Development Agreement, or submit reports, studies, or plans to the County that conform with these Standards. A permit or approval issued under the Land Use Bylaw prevails over these standards to the extent that it complies with the permit or approval granted under the Land Use Bylaw.

2.16 Capital Projects

Capital projects are administered by the County Project Representative, as opposed to a Development Permit or Development Agreement. Engineering Drawing and report submissions must be submitted directly to the County Project Representative.

Once submitted, the Engineering Drawings shall be reviewed by the County Project Representative for approval. First review of Engineering Drawings may take up to four (4) weeks to complete, with timelines depending on the project and quality of the submission. During this time, supplemental information may be requested from the Consulting Engineer. Following first review, required changes to the Engineering Drawings shall be returned to the Consulting Engineer for revision. Note, multiple iterations of review may be necessary. Following acceptance of Engineering Drawings submission, the County shall issue For Construction (i.e., Issued For Construction) drawings to the Consulting Engineer.

During construction, the Consulting Engineer shall be responsible for maintaining communication with the County Project Representative, who shall be responsible for all construction administration required from the County, including conducting inspections and issuing Construction Completion Certificates and Final Acceptance Certificates.

Volume 3

Urban Development

Sturgeon
COUNTY

Community. Innovation. Ambition.

3. Urban Development

Contents

3.1 Roadways

3.1.1 General

The Developer and their Consulting Engineer are responsible for understanding and adhering to all requirements listed in these Standards and ensuring any variances, conflicts, or inconsistencies are promptly communicated to the County during the development review process. Variances shall be reviewed and approved or rejected by the County in accordance with the variance review process in SECTION 2.10.These Standards are intended for development densities below 20 development units per hectare. Where conflicts or inconsistencies with these Standards arise due to adoption of other planning and design documents, the Developer shall be responsible for satisfying the more stringent requirement.

These Standards are intended to represent the minimum acceptable standards and should not be considered as a substitute for detailed material and Construction Specifications to be prepared by the Consulting Engineer. The Developer and their Consulting Engineer is responsible for developing and implementing designs in accordance with good engineering practice, industry standards, specific-site condition requirements, and any requirements by other Authority's Having Jurisdiction to achieve design life and safety expectations consistent with good design and construction practices and in accordance with the design intent of the work.

3.1.2 References

The requirements presented within these Standards are guided by the reference materials listed below. For a more in-depth understanding or additional information the most recent version of these references should be consulted:

- Highway Geometric Design Guide (Alberta Transportation)
- Traffic Impact Assessment Guidelines (Alberta Transportation)
- Geometric Design Guide for Canadian Roads (Transportation Association of Canada)
- Canadian Roundabout Design Guide (Transportation Association of Canada)
- Canadian Guide to Traffic Calming (Transportation Association of Canada)
- Manual of Uniform Traffic Control Devices for Canada (Transportation Association of Canada)
- Traffic Accommodation in Work Zones Manual (Alberta Transportation)

3.1.3 Traffic Impact Assessment

A Traffic Impact Assessment (TIA) is required for all subdivision developments and must be completed in accordance with the *Traffic Impact Assessment Guideline* by Alberta Transportation. TIA's shall be required for any other development that generates more than 100 daily trips. The County reserves the right to require a TIA be completed for developments generating 100 or less daily trips. Applicant is to provide traffic projections at initial application and volumes will be included within the review and approvals to track future TIA requirements.

TIA's must be completed and signed by a Licensed Engineer with sufficient applicable experience and must identify all required transportation improvements and their implementation thresholds. The Licensed Engineer shall use the effort and complexity required to complete the appropriate TIA – either a Comprehensive Report or Memo Report – based on each project's specific details, such as scope of work, project location, and potential impacts to traffic and mobility conditions:

- **Comprehensive Report**: used for larger development with significant traffic impacts or at complex location where the recommended improvements require a detailed analysis
- **Memo Report**: used for small development with low traffic impacts at simple location where the recommended improvements can be assessed in a memo format.

For more specifics on what is required in the TIA please refer to *Alberta Transportation Traffic Impact Assessment Guidelines*. For all lot types, trip generation shall be determined using the most recent version of the Institute of *Transportation Engineers Trip Generation Manual.* An analysis justifying the proposed trip generation rate(s) must be provided. The analysis must be technically sound and reflect an appropriate range of variables and their potential range of values. Upon review, the County may provide an alternative rate to be used.

3.1.4 Traffic Accommodation Strategy

Work within a roadway ROW may require a Traffic Accommodation Strategy completed in accordance with *Traffic Accommodation in Work Zones* provided by Alberta Transportation.

The Traffic Accommodation Strategy must identify the most appropriate combination of traffic controls required to provide a safe, well organized, and efficient flow of traffic through construction zones. All factors within the component checklist in Appendix D of the *Traffic Accommodation in Work Zones* manual must be addressed.

3.1.5 Urban Geometric Design Summary

3.1.5.1 Local

		Local			
		Lane	Residential cul-de-sac	Residential	Industrial/ Commercial
Drawing Number		3.1.13	3.1.10	3.1.14 & 3.1.15	3.1.16
Traffic Volume (vpd)		<1000	<1000	<1000	<3000
Design Speed (km/hr)		30	50	60	60
Minimum Intersection Spacing (m)		45	NA	60	60
Road Width (m)		5.8	10	10	11
ROW Width (m)		6	30	21	22
Maximum Superelevation (m/m)		Reverse crown	Crowned	Crowned	Crowned
Minimum/Maximum Grade (%)		0.5/6	1/6	0.5/6	0.5/6
Minimum Vertical Curve Length (m)		NA	30	30	30
Minimum K Value	Crest Curve	NA	8	8	8
	Sag Curve	NA	7	7	7

3.1.5.2 Collector

		Collector			
		Minor Residential	Major Residential	Industrial/ Commercial	Four-Lane Divided
Drawing Number		3.1.18	3.1.19	3.1.20	3.1.22
Traffic Volume (vpd)		<5000	<10,000	<10,000	<15,000
Design Speed (km/hr)		60	60	60	80
Minimum Intersection Spacing (m)		100	100	100	200
Road Width (m)		12	12.5	13.5	2x7
ROW Width (m)		23	25	26	32
Maximum Superelevation (m/m)		Crowned	Crowned	Crowned	Crowned
Minimum/Maximum Grade (%)		0.5/5	0.5/5	0.5/5	0.5/5
Minimum Vertical Curve Length (m)		50	50	50	60
Minimum K Value	Crest Curve	8	8	8	14
	Sag Curve	7	7	7	10

3.1.5.3 Arterial

		Arterial
		Divided
Drawing Number		3.1.24
Traffic Volume (vpd)		<30,000
Design Speed (km/hr)		80
Minimum Intersection Spacing (m)		400
Road Width (m)		2x7.4
ROW Width (m)		42
Maximum Superelevation (m/m)		0.06
Minimum/Maximum Grade (%)		0.5/5
Minimum Vertical Curve Length (m)		70
Minimum K Value	Crest Curve	35
	Sag Curve	32

3.1.5.4 Sturgeon Valley South

		Local			
		35, 40, 42 DU/HA w/Separate Walk	35, 40, 42 DU/HA w/Asphalt Trail	20 DU/HA w/Separate Walk	20 DU/HA w/Asphalt Trail
Drawing Number		6.1.0	6.1.1	6.1.2	6.1.3
Traffic Volume (vpd)		<1000	<1000	<1000	<1000
Design Speed (km/hr)		60	60	60	60
Minimum Intersection Spacing (m)		60	60	60	60
Road Width (m)		10	10	10	10
ROW Width (m)		22	23	20	21
Maximum Superelevation (m/m)		Crowned	Crowned	Crowned	Crowned
Minimum/Maximum Grade (%)		0.5/6	0.5/6	0.5/6	0.5/6
Minimum Vertical Curve Length (m)		NA	30	30	30
Minimum K Value	Crest Curve	NA	8	8	8
	Sag Curve	NA	7	7	7

*Exception for shared driveways.

		Collector		
		35, 40, 42 DU/HA w/Asphalt Trail	20 DU/HA w/Asphalt Trail	Commercial/Mixed Use
Drawing Number		6.1.5	6.1.7	6.1.10
Traffic Volume (vpd)		<10,000	<5000	<10,000
Design Speed (km/hr)		60	60	60
Minimum Intersection Spacing (m)		100	100	60
Road Width (m)		12.5	12.5	12.5
ROW Width (m)		26.5	25	22.5
Maximum Superelevation (m/m)		Crowned	Crowned	Crowned
Minimum/Maximum Grade (%)		0.5/5	0.5/5	0.5/5
Minimum Vertical Curve Length (m)		50	60	50
Minimum K Value	Crest Curve	8	8	8
	Sag Curve	7	7	7

To promote active transportation maximum intersection spacing is 240m for the Integrated Neighborhood District (IND) and 130m for the Commercial Mixed Use District (CMUD).

		Arterial	
		35, 40, 42 DU/HA w/Separate Walk	35, 40, 42 DU/HA w/Asphalt Trail
Drawing Number		6.1.8	6.1.9
Traffic Volume (vpd)		<30,000	<30,000
Design Speed (km/hr)		80	80
Minimum Intersection Spacing (m)		400	400
Minimum Driveway Spacing (m)		NA	NA
Road Width (m)		2x7.4	2x7.4
ROW Width (m)		34	35
Maximum Superelevation (m/m)		0.06	0.06
Minimum/Maximum Grade (%)		0.5/5	0.5/5
Minimum Vertical Curve Length (m)		70	70
Minimum K Value	Crest Curve	35	35
	Sag Curve	32	32

3.1.6 Design Vehicles

Applicable design vehicles to be used for path simulation, turning radius, and other transportation design requirements shall be taken from the most recent version of TAC Geometric Design Guide for Canadian Roads.

3.1.7 Roadway Classification

Urban County roadways are classified into the following categories:

- **Arterial Road**: carry large volumes of traffic at medium to high speeds and attempt to provide a route where, other than at intersections, there is minimal interference to the through movement of traffic.
- **Collector Road**: collector roads are divided into two sub-classifications:
    - Major Collector: carry significant volumes of through traffic, with origin and destination points outside the general area traversed (beyond this classification), at medium speeds.
    - Minor Collector: carry relatively smaller volumes of through traffic, as compared to major collectors, at medium speeds.
- **Local Road**: the grid roads that primarily serve to provide land access. Although they may directly or indirectly connect two or more roads with a functional classification of minor collector or greater, they are not intended to service any through traffic
- **Access Road**: also known as laneways, serve to provide land access only and are not intended to service any through traffic. Access roads carry a very low volume or traffic at low to medium speeds.

3.1.8 Roadway Designation

Urban County roadways are further designated within each classification as per the following table:

Urban Roadway Classifications and Standard Details		
Classification	Designation	Standard Detail
Arterial	Divided Arterial	3.1.24
Collector	Four-Lane Divided Collector	3.1.22
	Industrial/Commercial Collector	3.1.20
	Major Residential Collector	3.1.19
	Minor Residential Collector	3.1.18
Local	Local Industrial/Commercial	3.1.16
	Local Residential – Monowalk	3.1.15
	Local Residential – Separate Walk	3.1.14
	Paved Residential Lane	3.1.13

3.1.8.1 Sturgeon Valley South Roadway Designations

Sturgeon Valley South Roadway Classifications and Standard Details		
Classification	Designation	Standard Detail
Local	35, 40, AND 42 DU/HA LOCAL ROADWAY C/W SEPARATE WALK	6.1.0
	35, 40, AND 42 DU/HA LOCAL ROADWAY C/W ASPHALT TRAIL	6.1.1
	DU/HA LOCAL ROADWAY C/W SEPARATE WALK	6.1.2
	20 DU/HA LOCAL ROADWAY C/W 3.0m ASPHALT TRAIL	6.1.3
Collector	35, 40, AND 42 DU/HA COLLECTOR ROADWAY C/W SEPARATE WALK	6.1.4
	35, 40, AND 42 DU/HA COLLECTOR ROADWAY C/W 3.0m ASPHALT TRAIL	6.1.5
	20 DU/HA COLLECTOR ROADWAY C/W SEPARATE WALK	6.1.6
	20 DU/HA COLLECTOR ROADWAY C/W 3.0m ASPHALT TRAIL	6.1.7
Arterial	35, 40, AND 42 DU/HA DIVIDED ARTERIAL ROADWAY C/W SEPARATE WALK	6.1.8
	35, 40, AND 42 DU/HA DIVIDED ARTERIAL ROADWAY C/W 3.0m ASPHALT TRAIL	6.1.9
Mixed Use	COMMERCIAL/MIXED USE	6.1.10

3.1.9 Traffic Calming

The use of traffic calming measures for new residential development is considered acceptable. Traffic calming measures shall be designed in accordance with *Canadian Guide to Neighborhood Traffic Calming* (Transportation Association of Canada).

Straight local residential roads shall have a maximum unimpeded length of 225 m. Any local residential road with an unimpeded length in excess of 225 m shall include traffic calming measures in the design. Collector roads with an unimpeded length in excess of 1,000 m should be avoided wherever possible.

3.1.10 Temporary Roads

All temporary roads, including accesses and turnarounds, shall be shown on Engineering Drawings and approved by the County. All temporary roads must be designed and suitably constructed for the required service life. The Developer is responsible for all construction, maintenance, and removal costs associated with temporary roads.

All temporary roads that will be accessed and travelled by residents or the general public must be paved with asphalt. Temporary roads to be used only for construction or emergency access traffic may be surfaced with gravel.

Traffic control shall be in accordance with the *Manual of Uniform Traffic Control Devices* (Transportation Association of Canada).

3.1.11 Intersections

Intersection refers to the junction of any two public roadways. The junction of a private driveway and a public road is considered an access as per SECTION 3.1.8.

Each intersection shall be evaluated by the Consulting Engineer and recommendations provided on the most appropriate intersection treatment. Evaluation should be based on roadway design, existing conditions, required capacity, traffic and pedestrian safety.

Roundabouts shall be considered an acceptable intersection treatment when designed in accordance with the *Canadian Roundabout Design Guide* (Transportation Association of Canada) and supported by a TIA.

The minimum centerline-to-centerline spacing of intersections is as follows:

Urban Roadway Intersection Spacing Requirements	
Road Classification	Minimum Spacing [(1)]
Divided Arterial	400 m
Four-Lane Divided Collector	200 m
Undivided Collector Roadways	100 m

Local Roadways	60 m
(1): centerline-to-centerline	

Variances to minimum spacing may be considered under special circumstances where traffic volumes or existing conditions render spacing impractical, as supported by the TIA.

Intersections shall be designed at 90 degrees wherever possible. The minimum angle of intersection for two roadways is 75 degrees.

Intersections shall provide for minimum sight distances as outlined in the most recent version of *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada).

Standard cut corners shall be used at all intersections as per the following table:

Urban Roadway Intersection Cut Corner Requirements		
Main Road	Intersecting Road	Cut Corner Required
Arterial	Arterial	15m x 15m
Arterial	Collector	DRAWING 3.1.1
Arterial	Major Collector	8m x 15m (1)
Arterial	Minor Collector	8m x 15m (1)
Major Collector	Major Collector	10m
Major Collector	Minor Collector	6m
Minor Collector	Minor Collector	6m
Minor Collector	Local	6m
Local	Local	6m
Local	Lane	None
Commercial Access	Arterial	6m
(1): In addition to the 3.7 m required for an auxiliary lane as per SECTION 3.1.5		

3.1.12 Auxiliary Lanes

The Developer shall provide an additional 3.7 m right-of-way widening to accommodate acceleration and deceleration lanes at intersections on arterial roadways. Bay and taper lengths shall be provided in accordance with the most recent version of the *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada). The Developer

must also provide additional right-of-way, as required, for any roadway specific accesses, turn lanes, or other roadway feature.

3.1.13 Lanes

Lanes shall be provided for residential lots fronting directly onto collector roadways.

Residential lanes shall have a minimum paved width of 5.8 m within a 6 m ROW as per SECTION 8 - DRAWING 3.1.13. Commercial and industrial lanes must be paved within the entire width of the ROW.

Where lane traffic is expected to be higher than usual, a wider paved surface width and ROW may be required, as determined by the TIA or County.

The minimum longitudinal grade of a lane is 0.6%. The maximum longitudinal grade is 6%. The maximum length of a lane between streets shall not exceed 200 m. A 1.5 m flared end is required at lane intersections.

3.1.14 Dead-end Roads

In residential subdivisions, all dead-end roads shall contain a cul-de-sac or turnaround that meets the minimum requirements set forth in these Standards and the applicable Transportation Association of Canada standards. When Dead-end Roads in excess of 120 m are approved, in accordance with SECTION 3.2.16 and an emergency access PUL designed in accordance with SECTION 8 - DRAWING 5.5.0.

3.1.15 Driveways and Crossing Access

A single-unit development is permitted only one driveway (private access). An additional driveway or shared driveway may be considered when submitted with justification and approved by the County. Subdivisions with more than 20 lots require a minimum of two subdivision (2) accesses.

All driveways must be identified on Engineering Drawings prior to any roadway construction. Any deviations from the number and location of the driveways indicated on the Construction Drawings must be approved by the County.

Driveway and crossing access widths shall be as per the following table:

Urban Driveway and Crossing Access Width Requirements

Type	Width [1]	Minimum Width of Drive lane
Single-unit residential	7.5 - 9.0 m	To be determined by County engineer.
Multi-unit residential	10.0 - 12.0 m	
Industrial or Agricultural	10.0 - 12.0 m	
Commercial	10.0 - 12.0 m	

(1): This dimension should be measured at property line. The driveway shall not exceed 70% of the lot frontage , with the exception of laneways, unless otherwise approved by county engineer. Refer to Sturgeon County Approach Construction Guidelines for more information.

Single-unit residential driveways located on local and collector roadways shall have a minimum of 1 m (edge to edge) between driveways, except around cul-de-sac bulbs, where smaller spacing is acceptable. For such driveways located on collector roadways, a minimum of 30 m from intersections (center to center) shall be provided. Driveways shall be placed as far from a curb return as able and under no circumstances shall a driveway be located within a curb return.

Industrial, commercial, multi-unit, and apartment driveways located on local and collector roadways shall be a minimum of 55 m from intersections (center to center).

Industrial, commercial, multi-unit, and apartment driveways located on local roadways shall have a minimum of 3 m between driveways (edge to edge) if parking will not be permitted on the road and 6 m between driveways if parking will be permitted. For such driveways located on collector roads, a minimum of 45 m between driveways (center to center) shall be provided.

All driveways shall connect to local or undivided collector roadways whenever possible. If a development is bordered by two roadways of different classifications, access should be provided from the lower classification roadway.

Driveways shall be placed directly opposite existing driveways whenever possible.

Driveways shall be located at least 1.5 m away from any surface objects, such as hydrants, power poles, trees and transformers.

Residential driveways shall not connect to any roadway with a projected traffic volume of 4,000 vehicles per day or greater. Refer to SECTION 3.1.3 for trip generation requirements.

Driveways and accesses shall be constructed up to the property line and with the same finished surface as the adjacent boulevard treatment or as otherwise indicated in standard details.

No access shall be located less than 150 m from a bridge, culvert larger than 1.5 m in diameter, or from an at-grade railway crossing.

Accesses on curves shall only be permitted with the written permission of the County once confirmation that safety issues have been evaluated and design parameters clearly minimize any safety risk to the public.

3.1.15.1 Access to Divided Roadways

Upon review and supported by a TIA, the County may consider a private driveway for high density commercial, industrial, or mixed-use developments. In this instance, the driveway shall be privately owned and all-directional. Driveways may be considered for residential access on minor collectors when supported by a TIA. No residential access shall be located on Major collectors or divided arterials.

A right-in/right-out driveway may be considered for high-density commercial sites when supported by a TIA. Minimum spacing shall be determined as part of the TIA. Right-out driveways are not permitted within the left turn bay and taper zone of a downstream intersection.

3.1.16 Alignment

3.1.16.1 Horizontal

Horizontal alignment design must adhere to and include minimum standards as outlined in the most recent version of *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada).

Minimum curve radius and maximum superelevation is based on road classification as per the following table:

Urban Roadway Horizontal Alignment Requirements		
Road Classification	Minimum Curve Radius (m)	Maximum Superelevation (m/m)
Divided Arterial	250	0.06

Major Residential Collector	130	crowned
Minor Residential Collector	90	crowned
Industrial/Commercial Collector	130	crowned
Four-Lane Divided Collector	170	crowned
Local Residential	90	crowned
Local Residential Cul-de-sac	90	crowned
Local Industrial/Commercial	90	crowned
Lane	-	reverse crown

3.1.16.2 Vertical

Vertical alignment design must adhere to and include minimum standards as outlined in the most recent version of *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada).

Minimum grade, maximum grade, and minimum curve length is based on road classification as per the following table:

Urban Roadway Vertical Alignment Requirements			
Road Classification	Minimum Grade (%)	Maximum Grade (%)	Minimum Curve Length (m)
Divided Arterial	0.5	5.0	70
Major Residential Collector	0.5	5.0	50
Minor Residential Collector	0.5	5.0	50
Industrial/Commercial Collector	0.5	5.0	50
Four-Lane Divided Collector	0.5	5.0	60
Local Residential	0.5	6.0	30
Local Residential Cul-de-sac	1.0	6.0	30
Local Industrial/Commercial	0.5	6.0	30
Lane	0.5	6.0	-

Minimum crest and sag curve values are as follows:

Urban Roadway Crest and Sag Requirements	
Road Classification	Minimum K Value (m)

	Crest Curve	Sag Curve
Major Divided Arterial	35	32
Major Residential Collector	8	7
Minor Residential Collector	8	7
Industrial/Commercial Collector	8	7
Four-Lane Divided Collector	14	10
Local Residential	8	7
Local Residential Cul-de-sac	8	7
Local Industrial/Commercial	8	7
Lane	-	-

A vertical curve must be included in the design when a roadway grade change occurs. The vertical curve must be calculated and designed as per TAC standards, where L=KA (K is the vertical curve calculation factor and A is the algebraic difference in grade in percent). Vertical curves are not required where the algebraic difference in grades is less than 1.5.

A minimum grade of 0.6% must be maintained along the gutter line for vertical curves in a sag location.

Any roadway intersecting with a collector or arterial roadway shall approach at a positive grade of between 0.6% and 2.0% or a negative grade of 0.6% to 1.0% for a minimum of 25 m from the curb return of the intersection. At all other intersections, the maximum grade is 2.0% and the minimum grade is 1.0% away from the curb return for a minimum of 25 m.

3.1.17 Cul-de-Sacs

The minimum radius for residential bulbs is 12.5 m measured from the FOC. The minimum radius for industrial/commercial bulbs is 18.0 m measured from the FOC.

Grade shall not exceed 6% in cul-de-sacs while still achieving positive drainage. In the case that storm sewers aren't utilized and cul-de-sacs cannot be graded to drain towards the intersection, a drainage easement must be provided to accommodate overland flow.

Sidewalks are required on both sides of cul-de-sacs. Cul-de-sacs shall be designed with separate walk, except for around the bulb, which shall be monolithic walk. Sidewalk transition shall occur within 1 m of the bulb.

Cul-de-sac bulb surfaces may be crossfall. All other portions of the cul-de-sac shall be crowned.

The maximum length of a cul-de-sac, measured from the street curb line to the beginning of the bulb, is 120 m unless otherwise approved by the County. When cul-de-sacs in excess of 120 m are approved, they require water main looping to be designed in accordance with SECTION 3.2.16 and an emergency access PUL designed in accordance with SECTION 8 - DRAWING 5.5.0.

Cul-de-sac hydrants shall be located at or near the intersection for all cul-de-sacs less than 75 m in length. For cul-de-sacs greater than 75 m in length, the hydrant shall be placed in accordance with Fire Underwriter Survey requirements.

3.1.17.1 Cul-de-sac Islands

The use of cul-de-sac islands shall not interfere with design vehicle turning movements and parking within the bulb. Spacing must include accommodations for proposed street furniture, landscaping, and utilities.

Cul-de-sac islands shall be designed with curb and gutter around the perimeter. Catch basins within the island are permitted as required to facilitate drainage.

3.1.18 Sidewalks

Sidewalks shall be constructed in accordance with Standard Details.

Concrete sidewalks measuring 1.8 m in width or an asphalt multi-use trail measuring 3 m in width shall be required on both sides of all urban roadways. Refer to SECTION 3.1.17. Sidewalk design shall incorporate and meet recommendations set forth in the Barrier-Free Design Guide (Government of Alberta). Tactile Walking Surface Indicators (TWSI) shall be installed on curb ramps in high pedestrian traffic areas or as otherwise recommended by a TIA or required by the County. Acceptable practices are tooled grooves for standard applications and implementation of Truncated Domes for high volumes and in locations of significant pedestrian traffic (schools, etc.).

Curb ramps shall be used at all curbed intersections and shall be constructed monolithically as per SECTION 8 - DRAWING 3.2.9. Catch basins must be installed a minimum of 500 mm away from curb ramp flared ends, measured from the widest point of flare to the edge of catch basin. Catch basin, frame, or cover cannot be installed within the ramp or flare under any circumstances.

Separate sidewalk is typically preferred over monolithic sidewalk on collector and local roads to provide storage space for snow removal and to create an intermediate boulevard for enhanced pedestrian safety.

Sidewalks shall be designed to achieve positive drainage with a minimum longitudinal grade of 0.5%. and transverse grade (crossfall) of 2%.

The name of the Contractor and year of construction shall be stamped in the surface of the curb or sidewalk using an approved marking tool at least once in each block or at 75 m intervals, whichever is less.

The letters “CC” shall be stamped into concrete on the property line side of the walk or curb at each curb stop location.

The letters “WV” for each water valve and “BO” for each blow off valve shall be imprinted into concrete on the roadway side of the sidewalk at each main water valve and blow off valve location.

Concrete sidewalks and ramps require a minimum 28-day compressive strength of 30 MPa. All sidewalks are to be adequately reinforced. Rebar may be replaced with fiber reinforcement with the approval of the County. Refer to SECTION 3.1.21.

3.1.19 Curb and Gutters

Curbs and gutters shall be constructed in accordance with Standard Drawings.

Straight face curb and gutter is required on all arterial roadways, collector roadways, roadways adjacent to public spaces, including, but not limited to, parks, walkways, and PULs.

Rolled face curb and gutter shall be used to provide access on all local residential roadways.

The minimum curb return radius for each road type, measured from the FOC, is as follows:

Curb Return Radius Requirements	
Road Type	Minimum Radius
Local Residential	6 m
Collector Residential	10 m
Commercial	15 m
Industrial	15 m

Residential curb returns shall transition to a straight face curb 1 m before the BC and 1 m after the EC at intersecting roadways.

The minimum longitudinal grade along gutters is 0.6%, except in cul-de-sac bulbs and curb returns, where the minimum grade is 1.0%. The transverse (crossfall) grade of gutters shall be a minimum 4% and a maximum 15%.

For all urban cross sections, Nilex NuDrain MD7407 or an approved equivalent wick drain shall be placed below the curb, between the subgrade and granular base course. The wick drain shall be placed parallel to the curb at the bottom of the granular base course layer and connected to the nearest catch basin or storm manhole and trimmed to expose a 6" lead. Refer to SECTION 8 - DRAWING 3.7.7.

Curbs must be backfilled with suitable clay within seven (7) days after concrete achieves full compressive strength or prior to placement of the roadway structure, whichever is earlier. Clay material shall be backfilled to within 100 mm of the top of curb to allow for the placement of topsoil material.

3.1.20 Roadway Construction

Roadway construction must be in accordance with Construction Drawings and Specifications approved by the County.

The Developer and their Contractor is responsible for quality control throughout all stages of the SGC hot-mix production and placement, including aggregates, asphalt cement, and all other materials used in the mix. The Developer shall, at their sole expense, obtain a qualified testing laboratory to undertake the quality control sampling and testing to determine and monitor the properties of the materials being produced and used for the work.

Refer to the publication TB-1 "Hot Mix Asphalt Materials, Mixture Design and Construction" as prepared by the National Center for Asphalt Technology and published by the National Asphalt Pavement Association for guidance in good practices of handling materials and SGC hot-mix production.

Prior to the start of SGC asphalt production, the Consulting Engineer must submit, in accordance with SETION 3.1.20:

1. Mix Design(s);
2. Asphalt cement certification; and
3. An SGC production quality control plan,

3.1.20.1 Asphalt Mix Design

All asphalt roadways and trails within the County shall be paved with Superpave Gyratory Compactor (SGC) asphalt concrete. In special situations, and upon approval from the County, pavement designs using Marshall mix designs may be permitted.

The Consulting Engineer must submit a mix design, completed by a qualified independent testing agency, for each specified mix type at least ten (10) days prior to the start of any asphalt production and for each subsequent change in supplier or source of material. No asphalt production shall proceed until the mix design has been approved by the County. All applicable SGC mix design characteristics must be submitted, including, but not limited to:

- Legal description of all aggregate sources;
- Source of RAP;
- Individual aggregate, RAP, and mineral filler gradations;
- Individual aggregate one and two crushed face counts;
- RAP aggregate one and two crushed face counts;
- Water absorption of the individual aggregates and the combined aggregates;
- The calculated water absorption of the combined aggregates, based on the individual aggregate results;
- Aggregate blend;
- Combined aggregate gradation;
- Bulk specific gravity of individual aggregates and mineral filler;
- The calculated bulk specific gravity of the combined aggregates, based on the individual aggregate results;
- Maximum Theoretical Density (MTD) of the RAP;
- Binder content of the RAP, determined by total mix to two significant digits;
- Bulk specific gravity of the RAP binder;
- Bailey CA-RUW and Bailey CA-LUW for each individual coarse aggregate Stockpile;
- Bailey FA-RUW and Bailey FA-LUW for each individual fine aggregate stockpile;
- Bailey CA-CUW
- Comments on the other Bailey parameters (CA Ratio, FAc Ratio, and FAf Ratio);
- A hard copy of the Bailey spreadsheet with an electronic copy of the Bailey spreadsheet to be e-mailed to the County;

- Virgin asphalt cement bulk specific gravity;
- Mixing and compaction temperature, as determined by the asphalt cement's temperature-viscosity curve, which is to be provided, or as recommended by the asphalt cement supplier;
- Two hour, short-term oven aging temperature;
- Anti-stripping agent supplier, product name, product specification sheet, and application rate;
- Number of design gyrations ($\boldsymbol{N_{design}}$) in the SGC;
- Number of maximum gyrations ($\boldsymbol{N_{maximum}}$) in the SGC:
- A minimum of five individual and separate asphalt cement contents must be used in the SGC mix design and each individual asphalt cement content must be separated by a minimum of 0.40% to a maximum of 0.60% (by dry weight of aggregate);
- Graph of the mix's Theoretical Maximum Density (MTD) versus asphalt cement content (by total mix) reported to two significant digits;
- All other graphs used in the mix design (by total mix);
- Individual mix property results are to be plotted and a second order polynomial graph drawn through the individual data points;
- Recommended initial asphalt cement content and associated mix parameters;
- Ratio of virgin asphalt cement content to total asphalt cement content;
- Asphalt cement absorption of the combined aggregates;
- Ignition oven asphalt cement content correction factor;
- Where specified in the contract, Asphalt Pavement Analyzer (APA) result; and
- Where specified in the contract, Tensile Strength Ratio (TSR) including the optional freeze-thaw cycle.

The mix design for the SGC hot-mix shall be performed by a qualified laboratory following the procedures described in 'Superpave Mix Design', as set out in the latest editions of the Asphalt Institute manual "For Asphalt Concrete and Other Hot-Mix Types" Manual Series No. 2 (MS-2), "Superpave Mix Design" Superpave Series No. 2 (SP-2), Section 1.4.2 SGC Mix Design, and to the following criteria:

SGC Hot-mix Mix Design Requirements			
Mix Type	10mm-HT	10mm-LT	20mm-B
Parameter	Requirement		
Number of Gyrations			

Gyrations N_{design}	100	75	100
Gyrations $N_{maximum}$	160	115	160
Density at $N_{maximum}$ (G_{mm})	98 Max	98 Max	98 Max
Bailey CA-CUW	60 – 105	60 – 85	60 – 85
Air Voids, % of total mix (1)	4.0 +/- 0.4%	3.0 +/- 0.4%	3.5 +/- 0.4%
VMA, %	13 Min	14 Min	12 Min
Voids Filled, %	70 – 80	73 – 85	65 – 75
Tensile Strength Ratio, % (2)	80 Min	80 Min	80 Min
Minimum Film Thickness, mm	7.5 Min	7.5 Min	6.5 Min
APA, (mm, 52°C, 8,000 cycles) (3)	5 Max	7 Max	5 Max

(1): The mix design air voids shall be selected at the mid point of the specified range or the lowest value within the range in which all the other mix design criterion are met
(2): Minimum Tensile Strength Ratio to be determined in accordance with AASHTO T283, with optional freeze-thaw, at air void content of 7.0+/- 0.5 percent
(3): When required by the Contract special provisions

The Consulting Engineer shall submit to the County written certification with the asphalt mix design that the asphalt cement used in the mix design adheres with these Standards and approved Specifications. The certification shall include, but is not limited to:

- Name of the Supplier;
- Source(s) of the asphalt cement(s);
- Type and source(s) of admixture(s);
- Proportions of materials used in the asphalt cement;
- Current laboratory test results of the asphalt cement; and
- Certification statement from the supplying agency that the asphalt cement is a straight run, non-air blown/oxidized, non-chemically modified asphalt cement and, if the asphalt cement is modified, it has been modified only with a SB-type copolymer and that it complies with the requirements of these Standards.

Prior to commencing SGC hot-mix production, the Consulting Engineer must submit a production quality control plan to the County for review and approval. The quality control plan shall include the following recommended tests and frequency for each mix type:

- Mix bulk specific gravity, average of two SGC specimens;
- Asphalt cement content, Reported to two significant digits;
- MTD of loose mix;

- Gradation of the extracted mix;
- Moisture content of the mix;
- Air voids by calculation and by MTD;
- Voids in the mineral aggregate (VMA);
- Voids filled with asphalt cement;
- Film thickness calculation;
- Sample time and location;
- Plant discharge temperature; and
- Asphalt storage temperature.

Testing shall be completed at a frequency of a minimum of two (2) tests per day per mix type in full production. Tests results must be submitted to the County upon request.

3.1.20.2 Pavement Structures

A Geotechnical Report specific to the proposed development must be submitted to the County during the development review process. The Geotechnical Report must include site-specific recommendations for pavement structure. Refer to SECTION 1.20.1. The recommendations provided shall be compared to the minimum pavement structures listed below and the more stringent design shall be required.

Superpave Gyratory Compactor (SGC) asphalt concrete material is required for all paved roadways. Notwithstanding surface treatment, a minimum cement stabilized subgrade preparation of 150 mm using 10 kg/m^2 of cement is required for every roadway, including curbs, gutters, monowalk, and crossings. Cement stabilization may be replaced through the use of an approved geosynthetic material.

The following table outlines the minimum pavement structure required for SGC asphalt roadways:

SGC Minimum Pavement Structures Required (mm)			
Road Classification	GBC Base	Asphalt First Stage (lower / upper)	Asphalt Final Stage (final lift)
Divided Arterial	350	100 B [(1)] / 80 HT [(2)]	60 HT
Major Residential Collector	250	80 B / 40 LT [(3)]	50 HT
Minor Residential Collector	250	80 LT	50 LT
Industrial/Commercial Collector	350	100 B / 80 LT	50 HT

Four-Lane Divided Collector	300	90 B / 40 LT	50 HT
Local Residential	200	80 LT	50 LT
Local Residential Cul-de-sac	200	80 LT	50 LT
Local Industrial/Commercial	250	80 B / 40 LT	50 HT
Paved Residential Lane	200	80 LT / 40 LT	- (4)

(1): B **means** 20mm-B
(2): HT means 10mm-HT
(3): LT means 10mm-LT
(4): Lanes are typically paved to full structure at First Stage and do not require a Final Stage

3.1.20.3 Subgrade

Subgrade preparation shall include scarification and cement stabilization, at a minimum, to a depth of 150mm, or as otherwise indicated on Construction Drawings, for all roadways, including curbs, gutters, monowalks, separate walks, and crossings. Cement stabilization shall utilize Type GU Portland Cement that conforms to CSA A3000 that is applied uniformly at a minimum rate of 10kg/m^2. Application rate to be confirmed at time of construction and proof roll. Areas that have been stabilized with more than 10 kg/m^2 of cement must be clearly delineated and identified on As-built Drawings and Record Drawings.

The subgrade must consist of suitable soils and must be free from organic and deleterious materials. The prepared subgrade shall be compacted to a minimum density as per the following table:

Minimum Prepared Subgrade Density	
Area of Subgrade	Minimum Density (MTD) / SPD
Roadway pavement structure, curb, gutter, monowalk, separate walk, crossings, and any other concrete structure subgrade	100% (1) (2)
Everywhere else	95% (1)

(1): The surface beneath the subgrade shall be undisturbed or compacted to a minimum density of 95%
(2): All roadway pavement structures must be cement stabilized

Lifts must not exceed 150 mm. When multiple lifts are required, each 150 mm lift of the subgrade shall be compacted to the required minimum density. Cement Stabilization sections can be worked in lifts up to 300mm in depth.

Roadway subgrade shall be prepared for the full width of the roadway, including all shoulder widths where there is no curb and gutter. Subgrade preparation shall extend to a minimum of 300 mm beyond the back of the curb or sidewalk.

Geotextiles, including geogrid and geocells, may be used for stabilization when supported by a Geotechnical Engineer recommendation. Geotextile shall be non-woven fabric with a minimum tensile strength of 1,300 N. Any substitution must be supported by documentation within the Geotechnical Report to the satisfaction of the County.

3.1.20.4 Granular Base Course

Subgrade compaction test results must be verified by the consulting engineer to meet requirements prior to placing the granular base course.

The granular base course shall be placed in unform lifts not exceeding 150 mm. The granular base shall extend 300 mm beyond the curb when required under concrete curb and gutter.

The granular base course shall be compacted to a minimum density as per the following table:

GBC Minimum Compaction Requirements	
Area of GBC	Required Density
Under roads, curb, and gutter	100%
Under commercial or alley crossings	100%
Under asphalt and concrete separate walk	100%
Under walk portion of monolithic walk	100%
As gravel walk	98%
Under curb ramps	98%

Under private crossings	98%
Under median or island strips	98%

Aggregate used in granular base course shall conform to each of the following specifications:

GBC Aggregate Gradation:

GBC Aggregate Gradation Requirements (Designation 3, Class 20)	
Size (µm) [(1)]	Percent Passing
20,000	100
16,000	84 – 95
12,500	60 – 90
10,000	50 – 84
6,300	-
5,000	37 – 62
2,500	-
2,000	26 – 50
1,250	19 – 43
630	14 – 34
400	11 – 28
315	10 – 25
160	6 – 18
80	2 – 10
(1): CAN/CGSB-8.2-M sieve sizes	

GBC Aggregate Physical Properties:

GBC Aggregate Physical Property Requirements	
Aggregate Property	Tolerance
Coarse aggregate (> 5,000 µm) with ≥ 2 fractured faces (% mass)	60% minimum
Plasticity index < 400 µm	6 maximum

Liquid Limit	25 maximum
Lightweight pieces (% mass)	2% maximum

3.1.20.5 Asphalt

Granular base course compaction test results must be verified to meet requirements prior to placing asphalt or pouring concrete.

The County shall be notified and permitted to inspect the granular base course or asphalt base course prior to paving. The Contractor shall repair identified imperfections and clean up as directed by the County. The paving surface must be true to line and grade within tolerance, firm, fry, and free of loose and deleterious materials prior to paving.

Asphalt shall be uniformly spread in one or more lifts to the depths sufficient to obtain the minimum and maximum compacted thicknesses as per the following table:

SGC / Marshall Minimum and Maximum Compacted Thickness Lift		
Mix Type	Minimum Thickness (mm)	Maximum Thickness (mm)
10mm-LT / ACR	35	75
10mm-HT / ACO	35	75
20mm-B / ACB	50 / 65	100 / 125

Prime coat must be applied while the soil cement or granular base surface is still moist to provide a bond with subsequent paving courses. Do not allow traffic on prime coat within six (6) hours of application or until the prime coat has cured. Apply tack coat to the previous lift before placing a subsequent lift, unless otherwise authorized by the County, as per the following table:

Liquid Asphalt Coats

Application	Type and Grade	Application Rate (L/m^2)	Concentration
Prime Coat	MS-1	1.5 ±0.5	100%
Tack Coat	MS-1	0.5±0.2	100%
	SS-1	0.5±0.2	50%
	MC-30 (1)	0.3 ±0.1	100%
(1): Only to be used for paving on bridge decks			

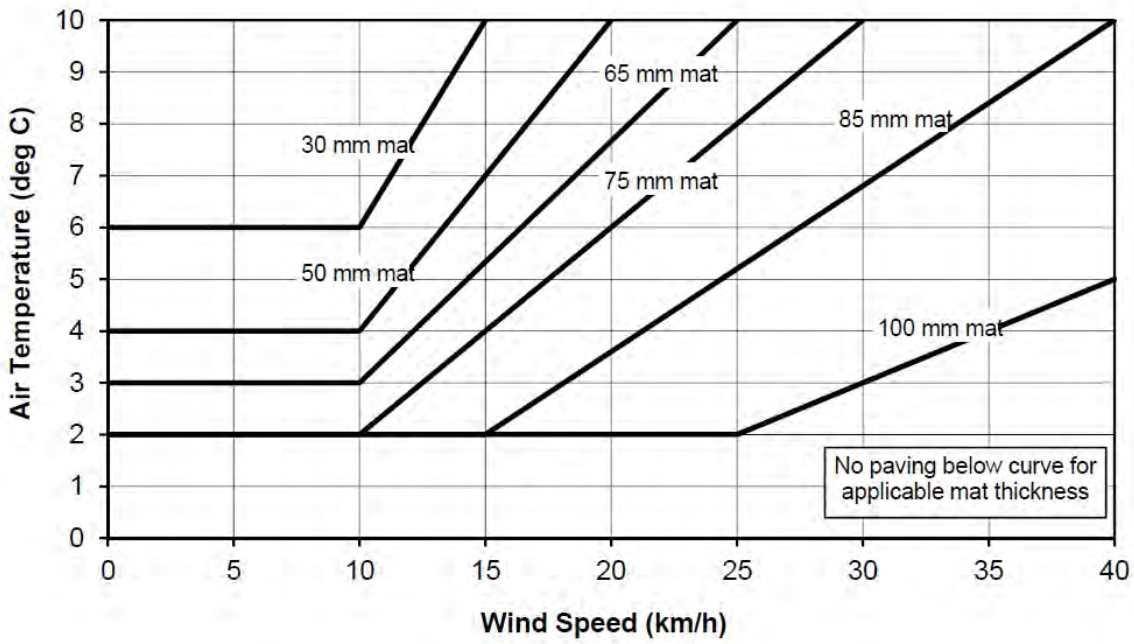
Tack coat must be applied to surfaces intended to contact with SGC hot-mix, including the sides of gutters, catch basins, manholes, and other concrete and metal fixtures. Tack coat must not be applied unless the surface is dry and free of dust and other material that could reduce the bond. Tack coat must completely cure and have formed tacked surfaces prior to placing SGC hot-mix.

Excess SGC hot-mix is to be wasted. SGC hot-mix materials that have been placed through a paver shall not be picked up and put back into the paver hopper.

The SGC hot-mix mat must be compacted with rollers in good working order and operated by competent operators. Use the number, type, and mass of rollers required to obtain the required compaction within the available compaction time and compatible with the rate of SGC hot-mix placement. Final rolling must be complete before the mat surface temperature reaches 40°C as determined with an infrared thermometer. For small areas inaccessible to rollers, use an approved vibratory plate compactor or hand tamper to thoroughly compact the SGC hot-mix.

The County shall designate those areas having 20 mm or greater depressions for levelling course application. Spread the levelling course of SGC hot-mix with a paver one lift at a time, not exceeding 60 mm compacted thickness, and compact to the required density.

Unless otherwise approved by the County, no paving is permitted when air temperature and wind speed conditions are below the applicable mat curve as per the following chart:



For new construction, or as otherwise directed by the County, all catch basins, manholes, valves, and other appurtenances and fixtures shall be brought to finished grade before final lift pacing. Temporary protection must be provided, where necessary, until completion of pavement.

When connecting new asphalt to existing asphalt (i.e., previous phase), a minimum 750 mm width shall be milled from the existing asphalt and a Nilex GlassGrid or approved equivalent installed along the joint.

SUPERPAVE GYRATORY COMPACTOR ASPHALT (SGC)

SGC asphalt is designated as per the following table:

SGC Hot-mix Asphalt Type and Use	
Mix Type	Use
20mm – B	Base course for roadways (Base)
10mm – HT	For high-traffic areas (High Traffic)
10mm – LT	For low-traffic areas (Low Traffic)

SGC asphalt shall be compacted to a minimum density as per the following table:

SGC Hot-mix Asphalt Minimum Density Requirements	
Minimum Density [(1) (2)]	Application
94%	New construction; all lifts in staged paving for all roadways and final lift, excluding lanes
93%	Lanes and asphalt trails
93%	Road Rehabilitation (mill and overlay)
(1): Percent of Maximum Theoretical Density (MTD) (2): If the average core density is below the required density, the represented area of mat may be accepted subject to a pay factor to be applied to the price of the quantity of SGC hot-mix in that mat area. Refer to SECTION 3.1.20.7.	

SGC asphalt shall conform to the following specifications:

Asphalt cement:

Shall be Performance Graded (PG) 58-28, PG 64-28, Polymer Modified PG 76-28, or Polymer Modified PG 70-28 to AASHTO M320, Table 2. For Polymer Modified PG 76-28 and PG 70-28, a straight run, non-chemically modified asphalt cement shall be modified with SB-type copolymers to reach the specified performance grade. No other modifiers are allowed unless approved in writing by the County.

If using PG asphalt cement, PG 58-28 shall be used in 10mm–LT, 10mm–HT and in 20mm-B in all new construction applications and in residential applications, while 10mm-HT, used as overlay on arterial roadways, shall utilize a PG 64-28, or as specified in the contract documents. No modification of the asphalt cement is permitted for the PG 58-28 or the PG 64-28 asphalt cement

Aggregate Gradation:

Fine aggregate (passing the 5,000 µm sieve) shall contain a minimum 75% manufactured or crushed fines. The total percentage of manufactured fines in a mix is taken as the percentage of manufactured fines in the minus 5 000 µm sieve fraction of the total combined aggregate. When the amount of manufactured fines in the RAP is unknown, it will be assumed that the amount of manufactured fines in the minus 5 000 µm sieve portion is 55% for 12.5 mm and 10 mm maximum sized RAP aggregate.

SGC Hot-mix Aggregate Gradation Requirements			
Mix Type	10mm-HT	10mm-LT	20mm-B
Sieve Size (µm)	Percent Passing by Mass (%)		
25,000	100	100	100
20,000	100	100	97 – 100
16,000	100	100	83 – 97
12,500	100	100	70 – 92
10,000	97 – 100	97 – 100	61 – 84
8,000	70 – 94	80 – 94	52 – 77
6,300	45 – 85	65 – 85	44 – 70
5,000 (1)	32 – 75	50 – 75	38 – 65
2,500	23 – 55	35 – 55	26 – 52
1,250	16 – 45	25 – 45	18 – 41
630	11 – 36	20 – 36	13 – 31
315	8 – 26	14 – 26	9 – 22
160	5 – 15	7 – 15	6 – 14
80	3 – 8	4 – 8	3 – 7
(1): Fine aggregate threshold			

Aggregate Crushed Face:

For each mix type, the minimum percentage (by mass) retained down to the 5 000 µm sieve, having at least 2 crushed faces shall be as follows, provided there is a minimum 50% crushed-face count in each individual sieve size greater than 5 000 µm:

SGC Hot-mix Aggregate Minimum Crushed Face Requirements						
Mix Type	10mm-HT		10mm-LT		20mm-B	
Minimum 2 crushed face	90%		85%		90%	
Sieve Fraction (µm)	1 face	2 faces	1 face	2 faces	1 face	2 faces
-25,000 + 12,500	-	-	-	-	90	85
-12,500 + 10,000	95	90	90	85	95	90
-10,000 + 5,000	98	95	93	90	98	95

Aggregate Physical Properties:

SGC Hot-mix Aggregate Physical Property Requirements		
Virgin Coarse Aggregate Physical Properties at Mix Design Gradation (> 5 mm)		
Property	Test Standard	Requirement
LA Abrasion, % loss, Charge C	AASHTO T96	30% Maximum
Soundness [(1)], % loss, $\boldsymbol{MgSO_4}$	AASHTO T104	16% Maximum
Detrimental Matter, %	AI [(2)] TLT 107	2% Maximum
Virgin Fine Aggregate Physical Properties at Mix Design Gradation (< 5 mm)		
Soundness [(1)], % loss, $\boldsymbol{MgSO_4}$	AASHTO T104	16% Maximum
Plasticity Index	AASTO T90	Non-plastic
(1): Five (5) cycles (2): Alberta Infrastructure		

Mineral Filler:

Mineral filler, if required, should consist of limestone dust, or approved alternate meeting the requirements of AASHTO M17 or ASTM D242. The mineral filler must be free from organic impurities and the portion passing the 80 µm sieve size shall have a Plasticity Index of zero. The mineral filler shall meet the following gradation requirements:

SGC Hot-mix Aggregate Mineral Filler Gradation Requirement	
Sieve Size (µm)	Percent Passing (by mass)
600	100
300	92 – 100
80	60 – 100

MARSHALL MIX ASPHALT (only when approved by the County)

Marshall Mix asphalt is designated as per the following table:

Marshall Mix Asphalt Type and Use	
Mix Type	Use
Asphalt Concrete Base – ACB	Base surface course for freeways, arterials,

(Designation 1, Class 25)	industrial/commercial, and collector roadways
Asphalt Concrete Overly – ACO (Designation 1, Class 12.5)	For paving freeways, arterials, industrial/commercial and collector roadways
Asphalt Concrete Residential – ACR (Designation 1, Class 12.5)	For paving alleys, local residential roadways, and walkways and trails

Marshall Mix asphalt shall be compacted to a minimum density as per the following table:

Marshall Mix Asphalt Minimum Density Requirements	
Minimum Density (1) (2)	Application
98%	New construction; all lifts in staged paving for all roads, including lanes, walkways, and trails
97%	Road Rehabilitation; overlay thickness of 40 mm or more
96%	Road Rehabilitation; overlay thickness of less than 40 mm
(1): % of Marshall Density (2): If the average core density is below the required density, the represented area of mat may be accepted subject to a pay factor to be applied to the price of the quantity of hot-mix in that mat area. Refer to SECTION 3.1.20.7.	

Marshal Mix asphalt shall be uniformly spread in one or more lifts to the depths sufficient to obtain the minimum and maximum compacted thicknesses as per the following table:

Marshall Mix Minimum and Maximum Compacted Thickness Lift		
Mix Type	Minimum Thickness (mm)	Maximum Thickness (mm)
ACR	35	75
ACO	35	75
ACB	65	125

Marshall Mix asphalt shall conform to the following specifications:

Asphalt Cement:

Shall be Performance Graded (PG) 58-28, PG 64-28, Polymer Modified PG 76-28, or Polymer Modified PG 70-28 to AASHTO M320, Table 2. For Polymer Modified PG 76-28 and PG 70-28, a straight run, non-chemically modified asphalt cement shall be modified

with SB-type copolymers to reach the specified performance grade. No other modifiers are allowed unless approved in writing by the County.

If using PG asphalt cement, PG 58-28 shall be used in all mix types for new construction applications and in residential applications, while mixes used as overlay on arterial roadways shall utilize a PG 64-28, or as specified in the contract documents. No modification of the asphalt cement is permitted for the PG 58-28 or the PG 64-28 asphalt cement

Aggregate Gradation:

Marshall Mix Aggregate Gradation Requirements		
Mix Type	ACB	ACO & ACR
Sieve Size (µm)	Percent Passing by Mass (%)	
25,000	100	-
20,000	80 – 95	-
12,500	68 – 85	100
10,000	60 – 80	75 – 90
5,000 (1)	40 – 60	50 – 70
2,500	30 – 50	35 – 50
1,250	25 – 40	25 – 40
630	20 – 30	20 – 30
315	15 – 23	14 – 23
160	9 – 15	7 – 14
80	4 – 8	4 – 8
(1): Fine aggregate threshold		

Fine aggregate (passing the 5,000 µm sieve) shall contain manufactured or crushed fines at a percentage by mass of fine aggregate as per the following table:

Marshall Mix Fine Aggregate Manufactured Fines Requirement			
Manufactured Fines (1)	ACB	ACR	ACO
Minimum	75%	75%	75%
Maximum	100%	100%	100%

(1): Pit-run shall be pre-screened to remove natural sand and subsequently crushed and screened to obtain manufactured fines

Crushed Face:

For each mix type, the minimum percentage (by mass) retained down to the 5 000 µm sieve, having at least 2 crushed faces, provided there is a minimum 50% crushed-face count in each individual sieve size greater than 5 000 µm, shall be as per the following table:

Marshall Mix Aggregate Minimum Crushed Face Requirements						
Mix Type	ACB		ACR		ACO	
Minimum two crushed faces	90%		75%		90%	
Sieve Fraction (µm)	1 face	2 faces	1 face	2 faces	1 face	2 faces
-25,000 + 20,000	90	90	-	-	-	-
-20,000 + 12,500	90	85	-	-	-	-
-12,500 + 10,000	95	90	75	70	95	90
-10,000 + 5,000	98	95	85	0	98	95

Physical Properties:

Marshall Mix Aggregate Physical Property Requirements		
Virgin Coarse Aggregate Physical Properties at Mix Design Gradation (> 5 mm)		
Property	Test Standard	Requirement
LA Abrasion, % loss, Charge C	AASHTO T96	32% Maximum
Soundness [(1)], % loss, $\boldsymbol{MgSO_4}$	AASHTO T104	16% Maximum
Detrimental Matter, %	AI [(2)] TLT 107	2% Maximum
Virgin Fine Aggregate Physical Properties at Mix Design Gradation (< 5 mm)		
Soundness [(1)], % loss, $\boldsymbol{MgSO_4}$	AASHTO T104	16% Maximum
Plasticity Index	AASTO T90	Non-plastic
(1): Five (5) cycles (2): Alberta Infrastructure		

Mineral Filler:

Mineral filler, if required, should consist of limestone dust, Portland Cement, Fly Ash, or approved alternate meeting the requirements of AASHTO M17 or ASTM D242. The mineral filler must be free from organic impurities and the portion passing the 45 µm sieve size shall have a Plasticity Index of zero. The mineral filler shall meet the following gradation requirements:

Marshall Mix Aggregate Mineral Filler Gradation Requirement	
Sieve Size (µm)	Percent Passing (by mass)
400	100
160	90
80	70
45	62

3.1.20.6 Testing

Laboratory and field testing, in addition to the tests described in this section, may be required at the discretion of the Consulting Engineer, Geotechnical Engineer, or County to determine quality and acceptance, and shall be completed at the sole expense of the Developer.

SUBGRADE

Subgrade density shall be tested at a minimum frequency of one (1) test for every 1,000 m^2 of compacted subgrade for each lift. Moisture content testing shall be completed as required for comparison with maximum dry density. Testing shall be in accordance with the following standards:

Roadway Construction Subgrade Testing Requirements	
Moisture-Density Relationship	ASTM D698; Method A
Density by Nuclear Method	ASTM D6938
Moisture Content by Nuclear Method	ASTM D6938
Standard Proctor Moisture-Density Relationship In-situ Moisture Content	ASTM D698

If a density test result is less than the required density, the test result shall be considered as failed and three (3) new tests shall be performed on the failed area. The average of the three (3) new tests shall represent the density of the area. If the resulting average is less

than the required density, the area shall be reworked to the full depth of the lift, the soil moisture altered as necessary, re-compacted to the required density, and re-tested.

PROOF ROLLING

The granular base course shall not be placed until the subgrade has been proof rolled and approved by the County or assigned representative (i.e., Consultant). Proof rolling of the granular base course may be required to be witnessed by the County prior to placing asphalt and must be confirmed with the County Project Representative prior to placement.

Proof rolling shall be performed in the presence of the County following complete compaction of the subgrade and again after compaction of the base course. Proof roll shall be performed by a dual wheel, tandem axel vehicle with a minimum gross weight of 24,800 kg with tire pressure no less than 90% of the manufacturer's recommended maximum inflation.

Proof roll shall be evaluated and accepted to the satisfaction of the County. If excessive deflection or rutting occurs, as determined by the County Project Representative, the test result shall be considered as failed and will require the area to be reworked and compacted. When remedial work is complete, a final proof roll must be performed in the presence of the County.

GRANULAR BASE COURSE

Subgrade compaction test results and granular base course compaction test results must be submitted to the County prior to placing asphalt or pouring concrete.

Granular base course material shall be tested a minimum of once per 500 tonnes, but not less than once for each day's production, to ensure that aggregate being produced and supplied meets the requirements of SECTION 3.1.20.4. Plasticity index shall be tested for every 15,000 tonnes, but not less than once for each material source.

If the aggregate fails to meet the specified gradation, the Contractor shall suspend gravel placement until proof of compliance with the specification is provided to the County Project Representative. Alternatively, the Contractor may choose to remove the suspect gravel from the jobsite and provide aggregate from a different source that meets requirements.

Granular base course testing shall be in accordance with the following standards:

Roadway Construction Granular Base Course Material Testing Requirements	
Sieve Analysis on Supplied Aggregate	ASTM C136
Moisture Content of Aggregate	ASTM C566
Crushed Faces	ATT 50
Liquid Limit, Plastic Limit, and Plasticity Index of Soils	ASTM D4318

Base course material shall be tested for density at a minimum of once for each lift (150 mm maximum) on every 1,500 m^2 of road, 1,000 m^2 of lane, and 500 m^2 of walk, monolithic walk, curb ramp, alley crossing, commercial crossing, private crossing, or median island strip. Moisture content testing shall be completed as required. Testing shall be in accordance with the following standards:

Roadway Construction Granular Base Course Testing Requirements	
Density by Nuclear Method	ASTM D6938
Moisture Content by Nuclear Method	ASTM D6938
Standard Proctor	
Moisture-Density Relationship	ASTM D698
Moisture Content of Aggregates	ASTM C566

Test Sampling shall be in accordance with ASTM D75.

If a density test result is less than the required density, the test result shall be considered as failed and three (3) new tests shall be performed on the failed area. The average of the three (3) new tests shall represent the density of the area. If the resulting average is less than the required density, the area shall be reworked to the full depth of the lift, re-compacted to the required density, and re-tested.

ASPHALT (BASE COURSE ASPHALT AND SURFACE COURSE ASPHALT)

Supplied asphalt shall be tested for Marshall stability in accordance with the following standards:

Roadway Construction Asphalt Testing Requirements	
Preparation of three specimens	ASTM D6926
Marshall Stability and Flow of Bituminous Mixtures	ASTM D6927

Unit Weight	ASTM D1188/D2726
Extraction or Ignition Asphalt Cement	ASTM D2172/D6307
Sieve Analysis of Extracted Material	ASTM C136
Air Voids	-
Voids in Mineral Aggregate	-
Bitumen Content	-
Asphalt Film Thickness	-

Asphaltic hot mix shall be sampled at the site from the mat or hopper at least once per week for every major mix. A major mix is defined as one that is produced by a supplier for a day or more. The sample shall be analyzed to determine the asphalt cement content, gradation, and mix design properties.

Asphaltic cement content testing with a nuclear A.C. gauge and density testing with a nuclear density gauge shall be completed on a daily basis. If the County is not notified by the Consulting Engineer in advance of paving, the pavement shall be considered non-compliant until verified by testing at the sole expense of the Developer.

Asphalt density shall be tested at a minimum frequency of one (1) test core for every 1000 m^2 of asphalt placed or a single day's production, whichever is less. If a core density test result is less than the required density, the core shall be discarded and three (3) new cores shall be taken within 10 m of the original core location at a minimum spacing of 2.5 m between core locations. The average density of the three (3) new cores shall represent the density of that area.

Surface thickness shall be tested at a minimum frequency of one (1) test core for every 1000 m^2 of asphalt placed for each stage of paving. Map showing test locations to be provided. If a core thickness is less than the required density, the core shall be discarded and three (3) new cores shall be taken within 10 m of the original core location at a minimum spacing of 2.5 m between core locations. The average thickness of the three (3) new cores represents the thickness of that area.

3.1.20.7 Asphalt Penalty Assessment

It is the Contractor's responsibility to ensure all new asphalt is installed as per Construction Drawings and approved Specifications. Payment reductions shall apply for those areas found to be deficient in thickness and density, unless otherwise corrected by the Contractor.

For developer projects, payment penalties shall be determined from contract unit prices and withheld from the securities collected for the paving work. For capital projects, payment penalties shall be determined from contract unit prices and deducted from the line item associated with paving.

The Consulting Engineer shall be responsible for completing and submitting the asphalt penalty assessment prior to Construction Completion Certificate acceptance. Asphalt shall meet the minimum density described in SECTION 3.1.20.5. If the average core density (MTD) is less than required, the represented area of asphalt will be assessed a penalty based on the following pay factor table:

SGC Asphalt Density Deficiency Pay Factors			
94% Required [(1)]		93% Required [(1)]	
Density	Pay Factor %	Density	Pay Factor %
94.0	100.0	93.0	100.0
93.9	99.9	92.9	98.4
93.8	99.8	92.8	96.8
93.7	99.6	92.7	95.2
93.6	99.4	92.6	93.9
93.5	99.1	92.5	92.0
93.4	98.7	92.4	90.4
93.3	98.3	92.3	88.8
93.2	97.8	92.2	87.3
93.1	97.2	92.1	85.7
93.0	96.5	92.0	84.1
92.9	95.8	91.9	82.5
92.8	95.0	91.8	80.9
92.7	94.2	91.7	79.3
92.6	93.3	91.6	77.7
92.5	92.3	Under 91.6 Reject [(2)]	

92.4	91.1
92.3	89.8
92.2	88.5
92.1	87.1
92.0	85.5
91.9	83.8
91.8	82.0
91.7	80.0
91.6	77.7
Under 91.6 Reject [2]	

(1): Percent of Maximum Theoretical Density (MTD)
(2): Grind and resurface

Marshall Mix Design Asphalt Density Deficiency Pay Factors					
98% Required [1]		97% Required [1]		96% Required [1]	
Density	Pay Factor %	Density	Pay Factor %	Density	Pay Factor %
98.0	100.0	97.0	100.0	96.0	100.0
97.9	99.9	96.9	99.9	95.9	99.7
97.8	99.8	96.8	99.7	95.8	99.3
97.7	99.6	96.7	99.4	95.7	98.9
97.6	99.4	96.6	99.1	95.6	98.4
97.5	99.1	96.5	98.7	95.5	97.8
97.4	98.7	96.4	98.2	95.4	97.1
97.3	98.3	96.3	97.7	95.3	96.4
97.2	97.8	96.2	97.1	95.2	95.6
97.1	97.2	96.1	96.3	95.1	94.6
97.0	96.5	96.0	95.5	95.0	93.4
96.9	95.8	95.9	94.6	94.9	92.2
96.8	95.0	95.8	93.6	94.8	90.7
96.7	94.2	95.7	92.5	94.7	89.1
96.6	93.3	95.6	91.3	94.6	87.3

96.5	92.3	95.5	89.9	94.5	85.1
96.4	91.1	95.4	88.4	94.4	82.6
96.3	89.8	95.3	86.7	94.3	79.5
96.2	88.5	95.2	84.8	94.2	75.5
96.1	87.1	95.1	82.7	94.1	69.7
96.0	85.5	95.0	80.3	94.0	60.0
95.9	83.8	94.9	77.6	Under 94.0 Reject	
95.8	82.0	94.8	74.3		
95.7	80.0	94.7	70.6		
95.6	77.7	94.6	66.0		
95.5	75.4	94.5	60.0		
95.4	73.0	Under 94.5 Reject (2)			
95.3	70.3				
95.2	67.2				
95.1	63.7				
95.0	60.0				
Under 95.0 Reject (2)					

(1): % of Marshall Density
(2): Grind and resurface

If the average core thickness is less than the required thickness, the area of asphalt represented by the testing core will be assessed a penalty based on the following pay factor table:

Asphalt Thickness Deficiency Pay Factors	
Thickness Deficiency (%) (1)	Pay Factor %
10.0	100.0
11.0	97.0
12.0	93.7
13.0	90.0
14.0	85.5
15.0	80.5
16.0	75.0
17.0	68.0

18.0	60.0
19.0	50.0
Under 19.0 Reject [2]	

(1): Total thickness for the lift(s)
(2): Grind and resurface

A thickness deficiency at the completion of the first stage of paving may be accepted by the County provided the deficiency is less than 20 mm and the deficiency thickness can be accounted for in the subsequent stage of paving. Asphalt pavement with excessive thickness may be accepted but no additional payment will be provided.

In the event of a Deficient Asphalt Cement Content result the following Asphalt Cement Content Appeal Mechanism will be allowed by The County and shall be paid for by the Contractor:

i. The original core location shall be confirmed by Sturgeon County, the Consulting Engineer, Developer and Contractor.

ii. The Contractor will then be allowed to re-core for determination of asphalt cement content. The re-coring (which may require multiple cores to obtain the required quantity of materials for a re-test) will be taken from the mat representing the original test within 10 meters on either side of the original test location. Only a single test is required for verification process. All core holes to be filled with hot-mix asphalt, by the contractor, to the satisfaction of Sturgeon County.

iii. The asphalt cement content test result from the re-core, along with the original test result, shall be submitted to Sturgeon County for review. The result from the asphalt cement content test from the re-core will supersede the original QA result.

iv. If the asphalt cement content of the re-core is within the penalty range the penalty will be calculated in accordance with the table below for the quantity of asphalt represented by the test. No further re-coring is allowed.

Asphalt Cement Content (%)	**PAY FACTOR (%)**
± 0.00 – 0.30	100.0
± 0.31 – 0.35	94.0
± 0.36 – 0.40	90.0

± 0.41 – 0.45	86.0
± 0.46 –0.50	78.0
± 0.51	Grind and Resurface

v. If the asphalt cement content of the re-core is in the "remove and replace" range, additional cores will be taken at equal distances on either side of the original core and tested for asphalt cement content. This process is to be repeated until locations on either side of the re-core identify asphalt within specification. The spacing is at the discretion of the contractor.

vi. Once the area of asphalt to be removed and replaced" is identified, the area inclusive of the last core used to delineate the deficient area shall be removed and replaced to the satisfaction of Sturgeon County.

3.1.20.8 Pavement Markings

All pavement markings shall be designed and installed in accordance with the latest version *Manual of Uniform Traffic Control Devices for Canada* (Transportation Association of Canada).

Standard line dimensions of pavement markings are as per the following table:

Standard Pavement Marking Requirements			
Line Type	Color	Size (mm)	Pattern
center line	Yellow	100	Continuous line; breaks at intersection
edge line	White or Yellow	100 or 200	Continuous line; white on the right and yellow on the left
lane line	White	100	3m long, 6m skip
intersection guide lines	White or yellow	100	0.5m line; 0.5m skip; color as specified on drawing
continuity lines	White	200	3m line; 3m skip
stop bars	White	300	1m separation from crosswalk; otherwise 4.5m back off FOC extension

crosswalk	White	100	2 parallel lines 4m apart
crosswalk bars	White	600	4m long
advanced yield lines	White	500 x 750	650mm center to center
arrow symbols	White	-	Arrow style and size as per TAC requirements
other symbols	White	-	Symbol style and size as per TAC requirements

Pavement marking application types are designated as per the following table:

Pavement Marking Application Type and Use		
Type	Material	Use
1A	Thermoplastic inlaid material	Hot extruded and filled into grooves in the asphalt as per manufacturers specifications
1B	Thermoplastic onlayed material	Hot extruded and applied onto asphalt surface as per manufacturers specifications
2	Spray applied hybridized polymer epoxy material	Mix and sprayed onto asphalt surface as per manufacturers specifications
3	Surface applied cold plastic material	Cold extruded and applied onto asphalt surface as per manufacturers specifications
4	Painted material	Hot applied alkyd-based traffic paint applied onto asphalt surface as per manufacturers specifications

Pavement marking application requirements are as per the following table:

Pavement Marking Application Type Requirements		
	Minimum Required Application at CCC	Minimum Required Application at FAC
Arterial Roadways		
center lines	Type 2 or Type 3	Type 1B
edge lines	Type 2 or Type 3	Type 1B
lane lines	Type 2 or Type 3	Type 1B
stop bars	Type 2 or Type 3	Type 1A
crosswalk/advance yield lines	Type 2 or Type 3	Type 1A
guidelines	Type 2 or Type 3	Type 1A
arrows and symbols	Type 2 or Type 3	Type 1A
concrete bridge decks	Type 2 or Type 3	Type 1B

asphalt bridge decks	Type 2 or Type 3	Type 1A
Collector Roadways		
center lines	Type 4	Type 2 or Type 3
lane lines	Type 4	Type 2 or Type 3
stop bar	Type 2 or Type 3	Type 2 or Type 3
crosswalk/advance yield lines	Type 2 or Type 3	Type 2 or Type 3
arrows and symbols	Type 4	Type 2 or Type 3
Local Roadways		
All lines	Type 4	Type 2 or Type 3

WARRANTY AND MAINTENACE PERIOD

The Warranty and Maintenance Period for pavement markings (painted and plastic) shall be two (2) years. Pavement markings shall be warrantied against failure due to poor adhesion, defective materials, and improper installation. The warranty for markings shall be subject to traffic and normal summer and winter roadway maintenance procedures.

During the Warranty and Maintenance Period, and until FAC is obtained, the County shall inspect pavement markings for deficiencies each spring and fall. The Developer shall be responsible for replacing markings, at their sole expense, for all markings determined deficient or not performing satisfactorily, as determined by the County. The Developer shall also be responsible for any damage to other work resulting from defects in the pavement markings that occur during the Warranty and Maintenance Period. Refer to SECTION 2.9.4.

3.1.20.9 General Asphalt Repairs

All asphalt must be repaired prior to acceptance. Asphalt shall be repaired as per the following requirements:

- Asphalt repair sections shall be rectangular or square areas a minimum of 1.2 m wide, except for trails or alleys, where the full width of the trail or alley shall be removed and replaced. Square or rectangular sections larger than 1.2 m wide may be required for larger deficiency repairs.
- Surface repairs must be ground and pre-filled prior to a full depth overlay:
    I. Arterial and collector roads to be ground a minimum of 50 mm.
    II. Residential roads to be ground a minimum of 35 mm.
- Edges of existing asphalt shall be ground or cut vertically – feathering of patches is not permitted.

- If there is base failure evident or settlements greater than 75 mm in the asphalt structure, remove and replace the base structure as recommended by a Geotechnical Engineer and approved by the County.
- To repair an asphalt surface failure, cut out failed road structure and replace. If the cut area is less than the full lane width, grinding is required to the full width of the lane.
- Grind existing asphalt adjacent to gutter lines and joints to allow for a minimum of 35 mm of asphalt. Grinding shall extend a minimum of 1.5 m into the roadway from the lip of gutter.
- Manholes, valves, vaults, and other fixtures shall be adjusted to asphalt design finished grade (± 6 mm) prior to paving.

3.1.20.10 Recycled and Reclaimed Materials

The below applications and parameters for recycled and reclaimed materials are considered acceptable within the County when detailed and recommended for use within a supporting Geotechnical Report. Additional applications or uses may be permitted provided submission of a Geotechnical Report, completed by a Geotechnical Engineer, which describes the specific application and the quality control measures to be applied.

Recycled and Reclaimed Material Application Requirements	
Application	Use and Parameter
Reclaimed Asphalt Pavement	▪ Up to a maximum of 25% (by mass) for base surface course hot mix asphalt paving ▪ Cold mix for patching and pothole repairs ▪ Not permitted for use on final lift of hot mix asphalt paving
Recycled Concrete Aggregates	▪ Trench backfill and bulk fill, where material meets the gradation below and reinforcing steel was removed via magnetic separation or other industry accepted practice. ▪ Not permitted for pipe bedding material, or levelling course.

Recycled Concrete Aggregate Gradation Requirement	
Size (µm)	Percent Passing
80,000	100
50,000	55 – 100
16,000	32 – 85

5,000	20 – 65
315	9 – 22
160	5 – 15
80	0 – 10

3.1.20.11 Asphalt Acceptance Tolerance

Asphalt shall be replaced prior to acceptance if at any time:

1. Any deficiency is defined as a safety hazard by the County Project Representative;
2. The asset is not built in accordance with Construction Drawings or Specifications;
3. The asset does not function as intended; or
4. A deficiency is determined by the County Project Representative to be out of tolerance as set by these Standards.

Prior to acceptance, all new asphalt shall rectify deficiencies as per the following table:

Asphalt Acceptance Tolerance	
Deficiency	Tolerance
Cracking	Any section [(1)] with: ▪ Alligator/Crocodile cracking; ▪ Transverse cracking; ▪ Longitudinal cracking; or ▪ Cracking that is detrimental to the road structure or causes unacceptable riding quality shall be replaced
Rutting	Any section [(1)] containing rutting shall be replaced. There is zero tolerance for rutting on asphalt
Potholes	Any section [(1)] containing a pothole shall be replaced. There is zero tolerance for potholes on asphalt
Ponding	Ponding refers to standing water on the asphalt surface, and is a result of settlement in the subgrade structure. There is zero tolerance for ponding on asphalt Localized areas of settlement which cause ponding shall be repaired by grinding from the center of the road to the lip of the gutter.
Segregation/Raveling	Segregation may occur on the asphalt surface, or at the pavement edge. This may result from loss of binder between aggregate, poor grading and mixing of aggregate, or

	insufficient compaction. There is zero tolerance for segregation on asphalt The use of an approved slurry seal may be used provided the deficiency is clean of dirt and debris. This method is only acceptable for non-staged paving improvements and when approved by the County.
Presence of Foreign Material	Any section (1) containing foreign material (e.g., chemical contamination, clay tracking, embedded object, etc.) shall be replaced. There is zero tolerance for the presence of foreign material in asphalt
Poor Quality Tie-in	Any new section (1) of asphalt with poor quality tie-in to existing asphalt shall be replaced. There is zero tolerance for poor quality tie-in
Grade	Grade of asphalt must be repaired if: ▪ Grade varies from design grade by ± 0.2%; or ▪ Any localized settlement exceeds 6mm over 3m. Asphalt shall be repaired in accordance with SECTION 3.1.20.9
(1): section means the surface area of asphalt containing the identified deficiency that is required to be removed and replaced in accordance with SECTION 3.1.20.9.	

3.1.20.12 Roadway CCC/FAC Acceptance Criteria

The CCC for roadways shall only be issued following inspection and acceptance by the County, once all noted deficiencies have been corrected, and submission of supporting documents is complete. Supporting documents may include, but are not limited to, laboratory and field materials test results, deflection test results, site reports, and any other documentation requested by the County. Refer to SECTION 2.9. All asphalt paved roadways must be constructed to within tolerance prior to acceptance. Refer to SECTION 3.1.20.11.

The Consulting Engineer must initiate CCC/FAC inspection requests in accordance with the County's submission requirements. The FAC for roadway structure (excluding surface course asphalt) shall be issued, subject to all deficiencies being rectified, after both of the following time periods have passed:

1. Following completion of the roadway structure (excluding surface course asphalt) Warranty and Maintenance Period, typically two (2) years after the issuance of the CCC; and
2. One (1) year after the issuance of the FAC for underground improvements.

Surface course asphalt (i.e., final lift) shall only be placed after all roadway concrete deficiencies have been rectified and the FAC for roadway structure (excluding surface course asphalt) has been obtained. Upon approval from the County, surface course asphalt may be placed up to six (6) months prior to the end of the Warranty and Maintenance Period for roadway structure (excluding surface course asphalt).

The Warranty and Maintenance Period for surface course asphalt (i.e., final lift) is one (1) year. The FAC for surface course asphalt will be issued once the Warranty and Maintenance Period for surface course asphalt is issued and after all identified deficiencies have been corrected.

If a pavement structure other than what is specified in SECTION 3.1.20.2 was approved by the County, the CCC/FAC warranty periods may be extended by up to twelve (12) months.

Roadway, including structure, shall be replaced prior to acceptance if at any time:

1. Any deficiency is defined as a safety hazard by the County Project Representative;
2. The asset is not built in accordance with Construction Drawings or Specifications;
3. The asset does not function as intended; or
4. A deficiency is determined by the County Project Representative to be out of tolerance as set by these Standards.

ROADWAY STRUCTURE ACCEPTANCE CRITERIA CHECKLIST (excluding concrete)

For roadway concrete acceptance criteria, refer to SECTION 3.1.21.21. Visual inspection acceptance criteria for roadway structure (excluding concrete) shall include, at a minimum, all of the following:

☑	**Roadway Structure CCC/FAC Acceptance Criteria (excluding concrete)**
☐	ESC Measures are installed, maintained, and functioning as per approved ESC Plan or Good Housekeeping Practices
☐	All paved roads free of surface defects – cracking, rutting, potholes, segregation, imbedded foreign objects, etc.
☐	All asphalt at edges of tie-in to existing asphalt completed with sufficient quality
☐	All asphalt/concrete aprons installed (if required)
☐	No settlement observed that exceeds 6mm over a 3m distance
☐	All pavement markings installed
☐	Manhole frames/covers properly fitting

☐	All traffic controls and signage installed (if not included as part of an alternative CCC)
☐	All alley/lane wick drains installed, connected, and trimmed to 6” (if applicable) – visually confirmed
☐	Water truck available to provide test water: ☐ All debris removed from roadway and gutters ☐ All paved road crowns or crossfalls provide positive drainage ☐ No ponding observed

3.1.21 Concrete Construction

At least two (2) weeks prior to starting concrete work, or anytime a change in materials occurs, the Developer shall submit to the County the applicable manufacturer’s test data and certification by a qualified independent inspection and testing agency that the following materials will meet specified requirements:

- Portland cement and supplementary cementing material;
- Aggregate;
- Water;
- Air entraining agent;
- Admixtures;
- Concrete reinforcement;
- Curing compound; and
- Joint fillers and sealants.

Fresh concrete shall be handled, deposited, and consolidated in accordance with CSA A23.

Concrete shall be discharged from the mixer within 1.5 hours or before the drum has turned 300 times, whichever comes first, after the initial introduction of mixing water to the cement and aggregates.

Initial and final finishing of plastic concrete surfaces shall be in accordance with CSA A23 and under the direct supervision of a certified journeyman concrete finisher. Water shall not be applied to concrete to facilitate finishing under any circumstance. Concrete must be protected from rain or other sources of water at all times.

3.1.21.1 Concrete Mix Design

The Consulting Engineer must submit a concrete mix design, completed by an independent testing agency, for each specified mix type of concrete and application (e.g., pumping, hand placement, slip form placement, etc.) at least ten (10) days prior to the start of production and for each subsequent change in supplier or source of material. No concrete production shall proceed until the applicable mix designs have been approved by the County. Notwithstanding approval of the mix design by the County, it is the sole responsibility of the Contractor to ensure that all proposed concrete meets the requirements of these Standards.

If requested, the Developer shall submit to the County certification that the selected mix proportions will produce concrete of quality, yield, and strength as specified in the concrete mix and in accordance with this section and CSA A23.

Roadway concrete shall meet the following mix design:

Roadway Concrete Mix Design	
Entrained Air Content (% by volume)	5.5% - 8.0%
Maximum Slump (+/- 20mm)	60 mm (1)
Minimum Portland Cement content	335 kg/m^3
Minimum compressive strength at 28 days	30 MPa (2)
Nominal maximum sized aggregate	20 mm
Maximum water to cement ratio by mass	0.45

(1): For slipform placed concrete, limit slump as follows:
20 +/- 10mm for curb, curb and gutter, and new jersey barrier; and
30 +/- 10mm for walk, monolithic walk, and pavement
(2): Unless otherwise specified on Engineering Drawings and Specifications

Concrete mix design for new jersey barriers shall also include 0.6 kg of synthetic microfibers or approved equivalent for every cubic meter of concrete.

3.1.21.2 Cement

Unless otherwise indicated on the Construction Drawings or approved Specifications, Type GU Portland cement shall be used. Exposed retaining walls and concrete located underground where sulphates may be present require the use of Type HS cement (sulfate resistant). Portland cement shall be in accordance with CSA A3000.

3.1.21.3 Aggregate

Concrete aggregates shall be in accordance with CSA A23 with a maximum nominal size of 20 mm. No aggregate from any one supplier or source shall be used unless proof of compliance with this standard, as performed by an independent testing laboratory, has been provided to and approved by the County.

Ironstone content in coarse aggregate shall not exceed 1% by mass of the total coarse aggregate sample (retained on the 5 mm sieve and larger). Ironstone content in fine aggregate shall not exceed 1.5% by mass of the total dry, unwashed fine aggregate sample (passing the 5 mm sieve to that retained on the 2.5 mm sieve). Any concrete exceeding the specified ironstone content will be rejected and shall be removed.

3.1.21.4 Water

The water used for concrete mixing shall be in accordance with CSA A23 and remain free from oil, acid, alkali, organic matter, sediment, or other substances harmful to the mixing and curing of concrete.

A maximum 20% of water in the concrete mix may be recycled slurry water. If recycled water is used, the supplier shall provide a quality assurance report to the County.

3.1.21.5 Fly Ash

Fly ash shall be in accordance with CSA A3000, A3001-03 pozzolan type F or CI. Fly ash may replace up to 20% of the specified minimum cement content in the mix between May 16 and September 30. Fly ash is not permitted at any other time.

3.1.21.6 Air Entraining Admixtures

Air entraining admixtures shall be in accordance with ASTM C260 shall be added to all concrete to produce specified entrainment, as required. The use of de-air entraining admixtures shall not be permitted.

Retempering with air entraining admixtures shall be based on air content as per the following table:

Air Entraining Admixture Requirements	
Measured Air Content (%)	Action
5.0 – 5.4	Add water or air-entraining admixture as deemed necessary by the supplier to meet specifications
4.0 – 4.9	Add air-entraining admixtures or air-entraining admixtures and water as deemed necessary by the supplier to meet specifications
< 3.9	Retempering with water or admixtures is not permitted; load to be rejected

When retempering with air-entraining admixtures, the supplier shall be allowed one opportunity to meet the specified air content. A load of concrete shall be rejected if it is retempered with air entraining admixtures and the resulting air content exceeds the specified maximum air content.

3.1.21.7 Chemical Admixtures

The use of admixtures shall not be permitted without prior approval from the County. Any admixture that is approved shall be in accordance with ASTM C494.

3.1.21.8 Concrete Reinforcement

When requested by the County, the Developer shall provide a certified copy of the mill test report from the supplier showing the physical and chemical analysis for the proposed reinforcing steel.

The Developer shall submit to the County shop drawings showing bar bending details, lists, and quantities of reinforcement. Placing drawings shall indicate sizes, spacing, locations and quantities of reinforcement and mechanical splices, with identifying code marks to permit correct placement without reference to structural Drawings. Indicate sizes, spacing and locations of chairs, spacers, and hangers. Reinforcement Drawings shall be prepared in accordance with the *Reinforcing Steel Manual of Standard Practice* (Reinforcing Steel Institute of Canada).

Detail lap lengths and bar development lengths in accordance with CSA A23. Class B tension lap splices shall be provided unless otherwise indicated.

Unless otherwise indicated on the construction drawings, reinforcing steel shall be in accordance with CSA G30; grade 400.

Tie bars shall be in accordance with CSA G30; grade 300 for uncoated and ASTM D3963 for epoxy coated.

Cold drawn and welded wire fabric shall be in accordance with CSA G30 for uncoated and ASTM D3963 for epoxy coated.

Steel dowels shall be in accordance with CSA G30 for uncoated and ASTM D3963 for epoxy coated.

Tie wires shall be cold drawn annealed steel in accordance with CSA G30.

Galvanizing shall be in accordance with CSA G164.

Steel reinforcement shall be installed in accordance with CSA A23 and CSA W186.

3.1.21.9 Curing Compound

A white pigmented resin based impervious membrane curing compound shall be used for concrete curing and be in accordance with ASTM C309; Type2 Class B.

3.1.21.10 Surface Sealant

In accordance with AT B388; Type 1b Penetrating sealers for all traffic bearing surfaces, outdoor exposure where relative moisture content is less than or equal to 70%. Silane type sealants shall not be permitted for this application.

3.1.21.11 Expansion Joint Filler

Expansion joint filler shall be non-extruding bituminous type in accordance with ASTM D1751.

3.1.21.12 Formwork and Falsework

Formwork and falsework materials and installation shall be in accordance with CSA S269; plain, reusable, pre-coated plywood sheets or formed steel panels. The use of earth forms is not permitted.

Form Ties shall be removable or snap-off metal ties, fixed or adjustable length, and free of devices which may leave holes larger than 25 mm diameter in the concrete surface.

3.1.21.13 Joint Sealant

Joint sealant for median applications shall be hot poured and in accordance with ASTM D6690. Joint sealant for sidewalk applications shall be cold applied, elastomeric, and in accordance with ASTM C920.

3.1.21.14 Subgrade and Base

All concrete structure subgrades shall be prepared and stabilized be in accordance with SECTION 3.1.20.3.

All concrete curb, curb and gutter, sidewalk, slabs, and any other road associated concrete works shall be constructed on a granular base course unless otherwise directed by the County. The granular base course shall consist of 150 mm compacted thickness of Designation 3 Class 20 aggregate. Aggregate tolerance and compaction shall be in accordance with SECTION 3.1.20.4.

3.1.21.15 Backfilling

The Contractor shall immediately backfill behind any curb and gutter and along walk edges with suitable material immediately after removal of forms. The backfill shall extend at least 300 mm behind the curb and be compacted in lifts not exceeding 150 mm by a mechanical tamper to a minimum 95% MTD at optimum moisture content, or as otherwise indicated on Construction Drawings or approved Specifications.

Backfill shall be completed to the top of the curb or walk unless landscaping is to follow immediately, in which case it shall be left low by an amount specified by the County.

3.1.21.16 Tying Existing Concrete to New Concrete

New concrete shall be connected to existing concrete with 1000 mm lengths of 10M rebar, doweled 200 mm into the existing concrete. The number of dowels required shall be as per the following:

Minimum Number of Dowels Required When Tying into Existing Concrete	
Separate curb and gutter	Two (2) dowels in the gutter section and one (1) dowel in the curb section
Separate sidewalk	Three (3) dowels
Monolithic curbs, gutter, and	One (1) dowel in the gutter section and Three (3)

sidewalk	dowels in the sidewalk section

3.1.21.17 Finishing

Initial and final finishing of concrete surfaces shall be in accordance with CSA A23.

Broom surfaces to provide uniform texture with grooves not greater than 3 mm. Apply brush finish longitudinally along curbs and gutters and transversely on walks and slabs.

Tool all edges, including contraction and surface joints, for a width of 50 mm and rounded to a radius of 5mm.

All exposed concrete surfaces shall be checked using a 3 m straight edge and any depressions greater than 6 mm shall be considered deficient and corrected at the Contractors expense.

The name of the Contractor and year of construction shall be stamped in the surface of the curb or sidewalk using an approved marking tool at least once in each block or at 75 m intervals, whichever is less.

The letters “CC” shall be stamped into concrete on the property line side of the walk or curb at each curb stop location. The letters “WV” for each water valve and “BO” for each blow off valve shall be imprinted into concrete on the roadway side of the sidewalk at each main water valve and blow off valve location.

3.1.21.18 Weather Conditions

Unless otherwise approved by the County, the placing of concrete shall be suspended during periods of precipitation.

Where fresh concrete has been placed and there is a reasonable likelihood of precipitation, or where directed by the County, the Contractor shall ensure the concrete is protected with plastic sheeting or other approved equivalent for such a period as to avoid any contact with precipitation.

All concrete irregularity caused by precipitation, or suspected by the County to have been caused by precipitation, shall be removed and replaced by the Contractor at their sole expense.

When the ambient air temperature (measured in the shade) is 23 degrees Celsius or higher, concrete at time of placement shall not have a temperature exceeding 30 degrees Celsius.

The pouring of concrete in cold weather conditions requires prior approval from the County. Cold weather conditions means the presence of an ambient temperature, typically below 5°C, that may adversely affect the compressive strength or longevity of the concrete being poured. Refer to SECTION 3.6.1. When the ambient air temperature is lower than 5 degrees Celsius, the concrete delivered to site shall have a temperature between 15 and 30 degrees Celsius and will require heating and hoarding.

3.1.21.19 Inspection and Testing

All concrete inspections and testing shall be in accordance with SECTION 3.6.1.

3.1.21.20 Concrete Acceptance Tolerance

Roadway concrete tolerances shall be in accordance with SECTION 3.6.1.1.

3.1.21.21 Concrete CCC/FAC Acceptance Criteria

All laboratory and field test results for constructed concrete work must be submitted to the County prior to acceptance. Test results must clearly indicate all constructed work conforms to Construction Drawings and approved Specifications, meets or exceeds specified compressive strength requirements, and is within the tolerances specified in SECTION 3.6.1.1. In all situations the County shall have the final decision on whether completed work is acceptable.

Concrete shall be replaced prior to acceptance if at any time:

1. Any deficiency is defined as a safety hazard by the County Project Representative;
2. The asset is not built in accordance with Construction Drawings or Specifications;
3. The asset does not function as intended; or
4. A deficiency is determined by the County Project Representative to be out of tolerance as set by these Standards.

SIDEWALKS, CURBS, AND GUTTER ACCEPTANCE CRITERIA CHECKLIST

Concrete work, including sidewalks, curbs, curb ramps, aprons, gutters, pads, and any other roadway concrete structure related to the associated CCC shall be visually inspected for conformance prior to acceptance. For roadway acceptance criteria (excluding concrete), refer to SECTION 3.1.20.12.

Visual inspection acceptance criteria shall include, at a minimum, all of the following:

☑	**Sidewalks, Curbs, and Gutters CCC/FAC Acceptance Criteria**
☐	All sidewalks, curbs, gutters, and other roadway concrete structures indicated on approved Construction Drawings are constructed
☐	Gutters are free of debris
☐	All grades (transverse and longitudinal) provide positive drainage – water truck to provide test water.
☐	All required concrete stamps are visible (CC, WV, BO, Contractor stamp).
☐	Concrete surfaces are complete with specified finishings (i.e., broom, etc.)
☐	Tactile Walking Surface Indicators are installed on sidewalks, as required
☐	Concrete meets the following tolerances: ☐ No visible ponding on walking surfaces ☐ No lift or sag > 5mm at sidewalk panel joints ☐ No joint separation > 10mm between sidewalk panels ☐ Crossfalls are within acceptable tolerance ☐ No cracks > 1.2mm (width of a dime) wide ☐ No cracks longer than 300mm ☐ No cracks that split into two or more cracks ☐ No sidewalk panels with three or more cracks ☐ No cracks spanning two or more sidewalk panels ☐ No more than 5% spalling on each surface area section ☐ No gouges with a depth > 6mm ☐ No single section of concrete with two or more gouges ☐ No undermined concrete
☐	No sidewalk panels with surface spalling greater than 10% of the panel area (replace)
☐	No sidewalk panel with three or more cracks (replace)

☐	No longitudinal cracks spanning two or more sidewalk panels (replace)
☐	Backfill level with top of curb or sidewalk
☐	All curb wick drains installed, connected, and trimmed to 6” – visually confirmed

3.1.22 Pipeline and Utility Crossings

In existing subdivisions, the Utility Authority shall ensure a minimum 98% SPD for utility trenches for any new installations or modifications to existing lines within the road carriageway, including trails and walkways, and 95% SPD for utility trenches in all other areas.

For new subdivisions and all other areas, the Developer shall ensure a minimum 98% SPD for utility trenches within the road carriageway, including trails and walkways, and 95% SPD for utility trenches in all other areas.

Pipelines crossing a roadway shall be completed in accordance with the *Guidelines for Underground Utility Installations Crossing Highway Right-of-Way* (Transportation Association of Canada).

3.1.23 Streetlights

Streetlights are required for all multi-lot subdivisions and commercial/industrial subdivisions or business parks. The design of streetlights, including location and density, shall be designed in accordance with the most recent version *Guide for Design of Roadway Lighting* (Transportation Association of Canada) and *Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting* IES RP-8-18 (Illuminating Engineering Society of North America).

The Developer is responsible for submitting streetlight plans that show layout, pole spacing, product types, heights, and luminaire wattages. The plans must be prepared and stamped by a Qualified Professional.

The Developer shall coordinate with and receive approval from the Utility Authority (Fortis) during the design, supply, and installation of all streetlights and associated structures.

Designed illumination level shall be commensurate with roadway classification and calculated average luminance or illumination should be within -5% to +10% of the average value recommended in TAC Roadway Lighting Design Guide. Streetlights shall not interfere with other utilities, street furniture, and accesses. In general, streetlights shall

be located on the projected common property line between two lots with all cables to be installed underground. Where roadways are designated for widening within five (5) years of pole installation, the pole setback shall accommodate for the required space of the widening.

Pole types, heights, and fixtures in proposed developments shall be consistent with adjacent existing developments, wherever possible.

Products and materials, including light fixtures, shall be readily available from the inventory supplies of the Utility Authority (Fortis). Notwithstanding available product, all poles shall meet the following:

Streetlight Pole General Requirements	
Pole Type	Material/Finish
Steel	Galvanized and powder coated
Aluminum	Powder coated
Composite	Pultruded
Non-break away pole Breakaway pole	< 80 km/hr design speed ≥ 80 km/hr design speed
Colour Temperature	3000K

3.1.23.1 Costs

In residential subdivisions, the County will be responsible for energizing the streetlight system. Typically, energizing will commence when the subdivision obtains endorsement.

Once energized, the Developer shall submit an irrevocable letter of credit to the County as security for the ongoing maintenance costs of energization. The amount of security is to be based on prevailing rates at the time an in accordance with the Development Agreement. Security will be released at 60 months from the date of energizing or if the subdivision area becomes 75% percent occupied, whichever occurs first.

The Developer is responsible for paying the operating costs of the Streetlighting system until the subdivision area is 75% occupied. Costs are to be paid based on invoice from the County.

In industrial/commercial subdivisions, the County will assume streetlighting costs following the installation of streetlight infrastructure and subdivision plan registration by the Developer.

All capital costs charged by the Utility Authority are to be immediately paid by the Developer and all owner rebates offered by the Utility Authority at the time must be paid to the County.

3.1.23.2 Streetlight Acceptance Tolerance

Any streetlight damaged by extraneous means, including third-party damage and builder damage shall be removed and replaced by the Developer at their sole expense.

When streetlights are accepted by the County, as opposed to the Utility Authority (Fortis), all new streetlights shall meet the minimum tolerances as per the following table:

Streetlight Acceptance Tolerance (when accepted by the County)	
Pole Base	Replace all missing anchor bolts and rusting or bent anchor rods. Tighten loose anchor bolts. When a crack is identified on a pole base that reaches the anchor rods, the pole base shall be removed, If the crack propagates through to the anchor rod or compromises the base structure, the precast base must be replaced. Top of Streetlight bases must protrude between 100mm to 150mm above finished grade.
Luminaire Poles	Luminaire poles must be replaced when: ▪ Structurally compromised (i.e., dent in the pole that is located on the mold line of the steel) ▪ Powder coat area is damaged in excess of 700 mm^2 (~size of a toonie); or ▪ Paint chips compromise galvanization Replace any missing ground bolts and hand hole covers Replace all non-galvanized hardware with galvanized hardware Poles must be installed plumb, with a tolerance of one degree. Shims may be used to level poles, however a maximum of 2 1.5mm shims per bolt is allowed.
Luminaires	Replace any non-operational luminaire
Grade	Grade at the bottom of pole must visibly match surrounding hard structures (e.g., curb, sidewalk, etc.)

3.1.23.3 Streetlight CCC/FAC Acceptance Criteria

All deficiencies shall be repaired or replaced in accordance with these Standards or approved Specifications prior to acceptance. If uncertainty exists for any items listed, contact the County Project Representative for final decision.

Streetlights shall be replaced prior to acceptance if at any time:

1. Any deficiency is defined as a safety hazard by the County Project Representative;
2. The asset is not built in accordance with Construction Drawings or Specifications;
3. The asset does not function as intended; or
4. A deficiency is determined by the County Project Representative to be out of tolerance as set by these Standards.

STREETLIGHT ACCEPTANCE CRITERIA CHECKLIST

When streetlights are accepted by the County, as opposed to the Utility Authority (Fortis), visual inspection acceptance criteria shall include, at a minimum, all of the following:

☑	**Streetlight CCC/FAC Acceptance Criteria**
☐	All streetlights constructed in accordance with Construction Drawings
☐	No cracks running through an anchor rod in the concrete pole base
☐	Orientation of each precast pole base aligns with pole
☐	All hardware galvanized and present for each streetlight (anchor bolts, hand hole covers, etc.)
☐	No rusted hardware
☐	No structurally compromising dents in poles
☐	No powder coated area damaged in excess of 700 mm^2 (~size of a toonie)
☐	All luminaires operational
☐	Inspection and acceptance by Power Provider and owner
☐	Grade at pole base matches surrounding hard structures (sidewalk, curb, etc.) – no visibly significant grade changes

3.1.24 Traffic Control and Signage

The Developer shall be responsible for installing all traffic controls and signage which must be designed in accordance with the most recent version *Manual of Uniform Traffic Control Devices for Canada* (Transportation Association of Canada).

Logo treatments and correct usage shall be in accordance with Sturgeon County Corporate Style guide and is applicable for all sign types and applications. Sign layouts must be reviewed and approved by the County prior to production. Any changes required to unapproved signage shall be completed at the sole cost of the Developer.

Diamond grade reflective material or approved alternative shall be used for the lettering and background on all signage. Lettering shall be 3M white high intensity reflective sheeting with computer cut lettering.

Breakaway systems shall be used on all arterial and collector roads for urban developments. Breakaway systems are typically not required for rural developments. Quickfix Sign Systems or an approved equivalent shall be used for breakaway systems.

Street name signs shall be placed within 10 m of an intersection and shall be offset 1 m from the edge of the road, mounted between 3 m and 3.5 m above the finished road surface. Signs shall consist of white lettering on a blue metal plate, installed on the opposite side of the road to any regulatory signage, with the following sizing:

Street Sign Requirements		
Location	Letter Height	Blade Height
Arterial roadway	250mm	300mm
Major collector roadway	250mm	300mm
Minor collector roadway	100mm	150mm
Local roadway	100mm	150mm

100 mm address numbering signs are required on all cul-de-sacs in addition to the street name sign.

No sign shall be mounted to the same pole as a regulatory sign.

Where traffic control signage is required for future development but not yet installed, the Developer is responsible for installing all temporary street name signs. Removal of temporary signs shall be the responsibility of the Developer prior to the end of the Warranty and Maintenance Period.

All street name sign locations shall be approved by the County. Street names are provided by the County and typically included in the Development Agreement.

The Developer may be permitted to install additional decorative street name signage or support when there is adequate maintenance funding provisions in place and approval from the County has been granted.

3.1.25 Sound Abatement

At a minimum, sound abatement fencing is required on all residential lots that are adjacent to an arterial roadway, roadway with plans to be upgraded to an arterial roadway, or highway. Sound abatement fencing situated on a berm shall be required when recommended by a Noise Impact Assessment or otherwise required by the County.

For such developments, the Developer must complete a Noise Impact Assessment and submit to the County during the development approval process and prior to approval of Engineering Drawings. The study must identify present and future permissible sound levels, the noise model being utilized, and provide the measures required to adequately mitigate potential noise related issues. Post-development sound levels must be equal to or less than the Alberta Transportation guideline noise limit of 65 dBA L_{eq} (24 hour) or the noise limit set by County bylaw, whichever is smaller.

Berms shall have a maximum side slope of 4:1 and a top width of 1m. Berms with a sound abatement fence shall be centered on the property line and where there is less than 6.5 m from the toe of the berm to the lip of gutter additional land must be dedicated to the ROW, as required. Berms are to be top soiled and sodded/seeded.

3.1.26 Road Rehabilitation

Roadway rehabilitation in an existing neighborhood may not have the space available to utilize the standard road cross sections described within these Standards. In these situations, the Consulting Engineer shall provide a site-specific detailed cross section of the proposed design, suitable for the area, that identifies all variances from these Standards for review and approval by the County. Road rehabilitation sections must be of equal or greater pavement structure than the existing roadway structure. In all cases, the Consulting Engineer should continue to use these Standards as the basis of design and accommodate requirements, wherever able.

3.1.27 Community Mailboxes and Turnouts

If applicable to the subdivision, the Developer shall submit an overall subdivision plan to Canada Post Delivery Planning to establish the location, size, and specific details of community mailboxes and mailbox turnouts.

The Developer shall be responsible for understanding and adhering to all Canada Post requirements set forth in the *Delivery Planning Standards Manual for Builders and Developers* (Canada Post). Each installation of a community mailbox or turnout is site-specific and must be approved by Canada Post. The Developer shall be solely responsible for providing all information required by and to the satisfaction of Canada Post.

Once approved, finalized mailbox locations and associated appurtenances (e.g., turnouts) must be shown on all applicable Engineering Drawings and provided to the County for review.

COMMUNITY MAILBOXES

Wherever possible, community mailboxes shall be located:

- On side yard of corner lots;
- Next to a park, playground, or open space area; or
- On the side of the street entering the subdivision.

Exact location to be determined by the County and Canada Post. Easements allowing encroachment onto private property must be provided if the mailbox pad extends beyond the ROW boundaries.

Mailboxes shall not be located:

- Within 10 m of an existing or future fire hydrant or bus stop;
- Above existing or proposed utilities; or
- In a location that blocks or reduces pedestrian or vehicular sight distances.
- Restricts access to PUL’s or Emergency Access routes.

MAILBOX TURNOUTS

Mailbox turnouts shall be in accordance with SECTION 8 - DRAWING 4.1.13. Wherever possible, mailbox turnout locations shall be located:

- On local residential roads;
- To allow safe vehicle access to Canada Post and mailbox users; and
- A minimum of 45m away from intersections;

3.2 Water distribution systems

3.2.1 General

The Developer and their Consulting Engineer are responsible for understanding and adhering to all requirements listed in these Standards and ensuring any variances, conflicts, or inconsistencies are promptly communicated to the County during the development review process. Variances shall be reviewed and approved or rejected by the County in accordance with the variance review process in SECTION 2.10. Where conflicts or inconsistencies with these Standards arise due to adoption of other planning and design documents, the Developer shall be responsible for satisfying the more stringent requirement.

These Standards are intended to represent the minimum acceptable standards and should not be considered as a substitute for detailed material and Construction Specifications to be prepared by the Consulting Engineer. The Developer and their Consulting Engineer is responsible for developing and implementing designs in accordance with good engineering practice, industry standards, specific-site condition requirements, and any requirements by other Authority's Having Jurisdiction to achieve design life and safety expectations consistent with good design and construction practices and in accordance with the design intent of the work.

3.2.2 Hydraulic Network Analysis

A Hydraulic Network Analysis (HNA) shall be completed by the Consulting Engineer for all proposed water distribution system developments. A Hydraulic Network Analysis containing the appropriate level of detail must be submitted for approval by the County at the following stages in the planning process:

1. Area Structure Plan;
2. Neighbourhood Structure Plan; and
3. Subdivision Approval.

If the HNA for the Area Structure Plan and Neighbourhood Structure Plan stages are omitted or superseded, an HNA which meets the requirements of the previous two stages must be submitted at the Subdivision Approval stage.

The County must approve the HNA prior to approving the Engineering Drawings. During the review process, the County may require additional analysis information to demonstrate satisfactory performance of the water distribution system. The HNA shall include, at a minimum, an analysis of average day demand, maximum day demand, peak hour demand, and fire flow calculations. The HNA shall also demonstrate that the proposed water distribution system can meet the flow demands, minimum pressure requirements, and maximum velocities for the design conditions. Refer to SECTION 1.20.4 for HNA report requirements.

The HNA report must be supported by the results of computer modeling of the proposed distribution system. Refer to AWWA Manual M32 for more information on computer modeling of a water network. The HNA shall utilize the Hazen-Williams formula where the roughness coefficient shall be 100 for all pipes, regardless of material.

3.2.3 General Design Criteria

The water distribution system shall be designed to meet the (maximum daily consumption in addition to the fire flows) or (peak hour flows), whichever is greater.

In addition to these Standards, the water distribution system shall be designed in accordance with the standards and guidelines provided by Alberta Environment and Parks and the American Water Works Association.

To facilitate proper acceptance testing of new water mains, the water distribution system shall be designed to incorporate appurtenances, wherever necessary, to be used for acceptance testing and operational routine maintenance (i.e., blow off values).

The water distribution system must be designed such that the working pressure is at the low point and high point of the system, as determined by the HNA. The working pressure is defined as the highest pressure experienced by the system during hydraulic modelling using average day demand, maximum day demand, and peak hour demand.

3.2.4 Residential Design Population Densities

Design population densities shall conform with the densities prescribed in the applicable approved Area Structure Plan. In instances where an Area Structure Plan is not available, population densities shall be as per the following table:

Residential Design Population Densities	
Low Density (single-unit residential)	3.5 persons/dwelling
Medium Density (multi-unit residential)	3.5 persons/dwelling
High Density (apartment residential)	2.5 persons/dwelling

If an Area Structure Plan is unavailable and design population density is unknown, use a design population density of 3.5 persons/dwelling.

3.2.5 Design Consumption

3.2.5.1 Residential

Residential Design Consumption Demands	
Average Day Demand (ADD)	320 L/person/day
Maximum Day Demand (MDD)	640 L/person/day
Peak Hour demand (PHD)	960 L/person/day

3.2.5.2 Non-residential

Non-residential water demand shall be based on the anticipated needs of the development. Where water demand is unknown, consumption shall be based on the following:

Non-residential Design Consumption Demands	
Industrial Average Day Demand	20,000 L/ha/day
Commercial Average Day Demand	25,000 L/ha/day
Institutional Average Day Demand	30,000 L/ha/day
Maximum Day Demand	2.0 x ADD
Peak Hour Demand	3.0 x ADD

3.2.6 Fire Flow

The level of fire protection required to be provided by the Developer will be determined by the County and outlined in the Development Permit or Development Agreement.

Notwithstanding those requirements, the Developer must size any piped water distribution system such that the system can accommodate fire flow volumes if fire protection infrastructure is developed in the future.

Fire flow volumes shall be in accordance with the latest version *Water Supply for Public Fire Protection* (Fire Underwriters Survey). Fire protection shall be supplied by the municipal water supply, wherever possible. When fire protection is required and the municipal water supply is unavailable, private fire protection systems shall be required.

If fire protection water is required by private developments and not provided by municipal means, above or below ground storage tanks for private fire protection water supplies must be sized in accordance with the latest version of the *National Building Code: Alberta 2019 Edition* and *Water Supply for Public Fire Protection* (Fire Underwriters Survey). Tanks must be constructed of materials and installed using methods acceptable to a Licenced Engineer. The owner is responsible for maintaining all systems on their property.

Dry hydrants connected to private fire water storage supplies to be used by fire departments for firefighting purposes must be constructed and installed in accordance with the latest version of the *Alberta Building Code* and *Water Supply for Public Fire Protection* (Fire Underwriters Survey) using methods acceptable to a Licenced Engineer. The land owner is responsible for maintaining systems located on their property.

Preliminary Planning Fire Flow Requirements	
Development	Required Fire Flow
Single-Unit Residential	100 L/s
Multi-unit Residential	180 L/s
Apartment Residential	300 L/s
Light Industrial	200 L/s
Heavy Industrial	250 L/s
Commercial	250 L/s
Institutional	320 L/s

The Developer shall be responsible for completing hydrant flow tests on nearby hydrants to determine available fire flow. Refer to SECTION 3.6.10.

For developments complete with a sprinkler system, a separate analysis shall be completed to determine pipe sizes and system configurations required to provide the necessary flow in accordance with the National Fire Protection standards and the Fire

Underwriters Survey. The analysis must be submitted to the County during the Engineering Drawing approval process.

3.2.7 Operating Pressures and Velocity

Water distribution system Required Operating Pressures [1]	
Maximum Allowable Pressure in Distribution System	700 kPa [2]
Minimum Peak Hour Pressure	280 kPa
Minimum Maximum Day + Fire Flow Pressure	140 kPa
Maximum Allowable Pressure for Water Services	550 kPa
Minimum Maximum Day Pressure (for operation of residential fire sprinklers)	350 kPa
(1): At any location in the system (2): The County reserves the right to request pressure control measures for areas of water systems with identified pressure in excess of 550 kPa	

During normal system operation the maximum velocity shall not exceed 1.5 m/s. During fire flow conditions, the velocity may increase, but shall not exceed 3.0 m/s.

3.2.8 Water Mains

The minimum diameter for water mains shall be as per the following table:

Minimum Water Main Pipe Diameters	
Residential	
Single-Unit Residential	200mm
Multi-Unit Residential	250mm
Commercial	300mm
Industrial	300mm

The County reserves the right to require water main sizes beyond the above minimums in order to accommodate future development and growth planning. Mixed use districts shall conform to the most stringent minimum pipe diameter standard.

3.2.8.1 Casings

Steel water main casings are required during the following scenarios:

- Railway crossings;
- Pipeline crossings;
- Watercourse crossings; and
- Arterial roadway crossings.

For arterial roadway crossings, the casing shall span, at a minimum, the entire extent of the carriageway.

Pipe casing shall be standard steel pipe in accordance with AWWA C200 and ASTM A53; Grade A and designed for equal or greater life span than the carrier pipe. The inside diameter of the casing shall be at least 50 mm larger than the outside diameter of the carrier pipe bell and insulator runners. Plastic or polyethylene carrier pipe insulators shall be used. Refer to SECTION 8 - DRAWING 3.4.2.

3.2.8.2 Separation

Water Main Separation Requirements	
Minimum Horizontal Separation Water to Water	2.0 m
Minimum Horizontal Separation Water to Storm or Sanitary	2.5 m
Minimum Horizontal Separation Water to Manhole or Catch basin	1.5 m
Minimum Horizontal Separation Water to Shallow Utilities	2.0 m
Minimum Vertical Separation	0.5 m

Water mains shall cross above sewer lines wherever possible. The minimum vertical separation between lines, measured from obvert of the bottom pipe to the invert of the top pipe, is 500 mm. If the minimum separation cannot be achieved, protective measures, such as metal casings may be acceptable, following recommendation by a Geotechnical Engineer and approval from the County.

Where it is necessary to cross the water main below a sewer line, in addition to the minimum vertical separation, the sewer line shall be provided structural support at the crossing to prevent excessive deflection. Crossing support must be supported by a recommendation from a Geotechnical Engineer.

3.2.8.3 Isolation Sections

An isolation section is defined as any section of water main that can be isolated with one or more valves. Each isolation section must have an appurtenance installed along the main to confirm the main is properly isolated as required by the *Alberta Occupational Health and Safety Code* (Alberta Regulation 87/2009).

Water services are not sufficient devices to confirm isolation as entry into private property cannot be guaranteed. The following appurtenances can be used to confirm isolation:

- Hydrants;
- Flush points;
- Manual air vents; and
- Blow offs.

3.2.8.4 Tracer Wire

Tracer wire shall be installed on all water mains. Tracer wire shall be 14-gauge coated copper wire complete with sacrificial anodes at a minimum of every 1,000 linear meters.

At every road crossing, every facility location, and at each end of every plastic pipe section that can be isolated, the tracer wire shall be brought flush to the ground inside a rigid PVC conduit and looped inside a PVC junction box within a Type A valve box marked "WATER". Splicing of tracer wire shall be soldered only, no mechanical connections are permitted, and an electrical continuity test is to be performed prior to acceptance.

3.2.9 Depth of Cover

All points along the Water distribution system shall have a depth of cover of 2.75 meters to the top of any valves and bonnets, and 3.0 meters as measured from the top of pipe to the finished surface grade.

3.2.10 Dead Ends

The maximum length of a dead end line in a residential area is 120 m. A blow-off valve must be installed at the end of each dead-end line.

Temporary dead ends less than 200 mm in diameter shall be installed with temporary flush points. Permanent dead ends shall be plugged and tapped with a flush point.

Temporary dead-ends shall be plugged with standard plugs or caps and shall be provided with reaction or thrust blocks. Where required, caps or plugs shall be tied to fittings with clamps and tie rods.

A permanent hydrant must be provided for all temporary dead ends 200 mm to 400 mm in diameter directly adjacent to the boundary valve. If a hydrant cannot be provided, an alternative means of flushing the water main must be provided within the system design. A flush point must still be provided on the stub end at the plug to confirm depressurization.

3.2.11 Cul-De-Sacs

Cul-de-sacs 120 m or longer must have a second water feed (i.e., looped) provided to the cul-de-sac through a walk way or emergency access. Cul-de-sacs less than 120 m in length must be provided a second water feed if the number of lots within the cul-de-sac exceeds 30 lots. Refer to SECTION 3.2.16.

Cul-de-sacs less than 120 m in length should be provided a second feed provided if a walkway or emergency access is present and the walkway leads to a road where water mains are available.

3.2.12 Hydrants

Hydrants shall conform with the latest version *Water Supply for Public Fire Protection* (Fire Underwriters Survey) and be installed as per SECTION 8 - DRAWING 3.5.1 and in accordance with manufacturers specifications.

Hydrants shall be located 1.5 m from the face of curb when there is a separate walk or no sidewalk present and 0.5 m from the back of walk when a monowalk is present. Hydrants shall be a minimum of 3.0 m from street furniture and 4.0 m from trees. Hydrants shall be located at the projection of property lines or at the BC of the curb return at intersections.

In situations where there is a concern of damage from collision or other impact concerns, the County may require bollards to be installed around hydrants to provide adequate protection. When required, bollard placement must not impede hydrant operation. Refer to SECTION 8 - DRAWING 3.5.0.

The maximum spacing between fire hydrants shall be as per the following table:

Hydrant Maximum Spacing	
Single-unit residential	150 m (1)
Multi-unit residential	90 m (1)
Industrial/Commercial	90 m (1)
(1): unless otherwise recommended by the most recent version Fire Underwriter Survey	

Mixed use districts shall conform to the most stringent maximum hydrant spacing standard. Cul-de-sacs less than 75 m in length shall have the hydrant located at or near the intersection joining the cul-de-sac.

Hydrants shall be oriented with the pumper port facing the street. The hydrant valve shall be installed a minimum of 1.0 m from the hydrant body.

Hydrants shall be connected to the main with a 150 mm PVC lead controlled by an independent 150 mm gate valve located at least 1.0 m from the hydrant. If hydraulically required, hydrant leads may be upsized to 200 mm using a reducer located 4.0 m from the hydrant. Each hydrant lead shall contain an isolation valve.

If a hydrant or valve must be located in a ditch area, an access pad must be constructed to allow safe access to the appurtenance.

Hydrants shall be self-draining with a gravel drainage pit provided on each hydrant lead. Where the hydrant lead is located below the water table, the hydrant drain port shall be plugged. The County shall be notified of any hydrants with plugged drain ports prior to construction. The hydrant shall be identified with a label “NO DRAIN” and a 50 mm x 50 mm blue square attached to the hydrant body that is visible from the road. The record drawings shall clearly indicate each plugged hydrant.

Hydrants that are permanently inoperative or unusable shall be removed. Hydrants that are temporarily inoperative shall be wrapped and provided with signage that indicates as such.

Hydrants shall be a minimum 2.45 m dry barrel type hydrant, complete with a 300mm extension (total bury of 2.75m), that conforms to AWWA C502. The rock disc operating nut shall be installed 300 – 400 mm below finished grade. In addition, hydrants shall include the following supplemental requirements:

Hydrant Supplemental Requirements
▪ Compression shut-off closing with line pressure ▪ Counter-clockwise turn to open ▪ Maintain a minimum of 20 kPa residual pressure ▪ Minimum 150mm inside diameter riser barrel ▪ 300mm extension on top with breakaway flange; the bottom flange shall be set 50mm above the final surface elevation. ▪ Two (2) 63.5mm (nominal) nozzles with Alberta Mutual Aid Thread; nozzles must be able to rotate 360 degrees ▪ One (1) 114.3mm (nominal) pumper with NH Thread and Storz connection ▪ Pumper and nozzle connections are to be provided with caps, without chains or cables ▪ All external nuts and bolts to be stainless steel type 304 coated with Denso Mastic and wrapped with Denso Tape during installation ▪ Bottom connection flanged to barrel, with a single gasket, push-on type joint for ductile iron or PVC pipe, 150mm diameter only (cast iron outside diameter), complete with harnessing lugs ▪ Provide a 7.7 kg magnesium anode for cathodic protection

3.2.12.1 Hydrant Color

All hydrants shall be painted with alkyd exterior enamel conforming to CAN/CGSB-1.59. Hydrant body (external top section) shall be painted yellow to conform with AWWA C502. Hydrant dome, both nozzle caps and pumper caps, shall be painted using Benjamin Moore Industrial Maintenance Rapid Dry Gloss Alkyd Enamel or an approved equivalent as per the following table:

Hydrant Color Requirement		
Hydrant Flow Capacity		Required Dome, Pumper, and Nozzle Color
US GPM	L/s	
> 1500	> 96	Benjamin Moore Safety Blue or Approved Equal

1000 – 1500	61 – 95	Benjamin Moore Safety Green or Approved Equal
500 - 999	31 – 60	Benjamin Moore Safety Yellow or Approved Equal
< 500	< 31	Benjamin Moore Safety Red or Approved Equal

Hydrant numbers shall be painted on the back of the hydrant in black, at least 300 mm above the ground flange, preferably directly behind the pumper cap. Lettering to be 50 mm Arial.

Location of hydrant control valve shall be marked on the hydrant showing the distance of the control valve from the hydrant in meters. The control valve location number is to be marked 250 mm above the ground flange or higher with 50mm Arial lettering in direct alignment with the valve.

3.2.12.2 Hydrant Fire Flow Test

All new hydrants shall be flow tested to determine the rate of flow available and to determine hydrant paint color. Hydrants shall also be tested to determine the static hydrant pressure and leakage. Pressure tests shall be completed in the presence of the County.

Testing shall be in accordance with the *Recommended Practice for Water Flow Testing and Marking of Hydrants* (National Fire Protection Association) NFPA 291 and in accordance with SECTION 3.6.10.

Water discharged from hydrants for testing must be de-chlorinated prior to entering the environment or storm sewer system. Discharge to the sanitary sewer system is not permitted unless otherwise authorized by the County.

3.2.13 Valves

Valves shall be located at the projection of the property lines at mid-block or at the BC of the curb return at intersections. Valves shall be the same size as the main they are installed on.

Valves shall be no greater than 800 m apart on mains 450 mm and larger.

A valve shall be located on each end of a main that is passing through a PUL or easement. Valves shall be placed 500 mm from the property line.

Valves shall be located such that in the event of a shutdown:

- No more than two (2) hydrants are taken out of service;
- No more than four (4) valves are required to initiate the shutdown; and
- No more than 20 single unit residential units are affected.

For lines 150 mm to 350 mm, gate valves shall be used. For lines 400 mm and greater, butterfly valves shall be used. Gate valves shall be direct buried and butterfly valves shall be located in a vault.

3.2.14 Thrust Restraint

Joint thrust restraint shall be provided using either concrete thrust blocks or mechanical joint restraints at all fittings, including bends, tees, wyes, reducers, plugs, caps, hydrants, valves, and any other location where joints do not resist longitudinal loading. Mechanical joint restraints shall be designed and installed as per the manufacturer's specifications.

Concrete thrust blocks may be used as an alternative to, or in conjunction with, mechanical joint restraints. Thrust blocks shall be constructed of Type HS sulfate resistant concrete with a minimum 28-day compressive strength of 25 MPa. Refer to standard drawings.

When using thrust blocks, all cast iron fittings shall be wrapped in bond breaker polyethylene sheets or approved equivalent to prevent direct contact between surfaces.

Mechanical joint restraints shall conform to AWWA C111 and ASTM F1674. All nuts, bolts and restraining rods shall be Type 304 stainless steel and wrapped in Denso tape. Diameter and pressure rating must match the pipe and fitting to which the restraint is being applied and include a minimum safety factor of 2.0. Gland shall be constructed of high strength ductile iron conforming to ASTM-A536.

3.2.15 Service Connections

Each titled lot shall have its own separate water service connection complete with an individual shut-off valve (curb stop) and water meter. More than one service to a site is not permitted, unless approved by the County. In those instances, the design and construction of each service, including considerations for cross-connections and backflow prevention, shall be in accordance with the *National Plumbing Code of Canada* and approved by the County, in addition to the following:

1. Private mains that are connected to the public network at two (2) or more locations and are interconnected, creating a looped system, must have check valves installed to prevent any backflow to the public system; and

2. Lots where two (2) or more services are installed and further subdivision is not proposed must have a restrictive covenant caveat registered on title lot requiring privately owned and maintained backflow prevention devices (i.e., check valves) for each water service.

Water services shall not be permitted off of mains 450 mm in diameter or larger.

The installation of a water main service to property line for a multi-unit development shall be completed at the time of initial subdivision development. Minimum single-unit and multi-unit (non-apartment) residential service sizes are as per the following table:

Minimum Residential Water Service Size (non-apartment)	
Length of Service	Minimum Diameter
30.0 m or less	25 mm
> 30.0 m	38 mm

Some multi-unit developments may require greater service sizes than the above minimums to accommodate water demands. The Developer is responsible for ensuring proposed service size meets the demand for the development. Commercial, industrial, and apartment development services shall be sized by the Consulting Engineer according to anticipated use requirements.

For a multi-building commercial retail unit (CRU) or multi-building industrial developments, one (1) service connection complete with an individual shut-off valve (curb stop) and water meter is required for the lot. Individual water meters on the private service connection within the lot may be acceptable upon County approval.

Residential water services up to 50 mm shall be installed in a common trench with the sanitary service. Minimum horizontal separation between pipes within the common trench is as based on diameter, as per the following table:

Water Service Horizontal Separation Within Common Trench	
Pipe Diameter	Minimum Separation
50 mm or less	300 mm
> 50 mm	2.0 m

Water service shall maintain a minimum cover depth of 2.75 m, measured from the top of pipe (gooseneck) to the finished surface grade, at all locations along the line. If minimum

depth of cover cannot be achieved, insulation is to be provided as specified by a Geotechnical Engineer.

Curb stops shall be installed 300 mm from the property line on County land or ROW. Curb stops shall not be located within the driveway, sidewalk, or other hard surfaces. If this is unavoidable, the valve must be placed within a 100 mm or greater PVC sleeve and utilize a type B valve box. The minimum distance between curb stops is 600 mm.

The letters “CC” shall be stamped into each curb stop valve and must be able to be seen from visual inspection once installed.

Tapping valve and sleeve shall be used for services 100 mm and larger connecting to an existing main.

New services required to cross an existing or proposed roadway or sidewalk shall be installed using trenchless methods unless otherwise approved by the County.

The Consulting Engineer is responsible for providing detailed service information on Record Drawings for all installed service connections. Drawings must include, at a minimum, pipe diameter, elevation, lot number, and relative location to property line for each service. Refer to SECTION 2.13.

3.2.16 Looped Systems

The water distribution system for all new Industrial and commercial subdivisions shall be looped. Residential subdivisions are required to be looped, except for the following situations, where a single feed system is acceptable:

1. Residential cul-de-sacs that are 120 m or less in length, measured from the street curb line to the start of the bulb, if the number of lots within the cul-de-sac is 30 or less; or
2. Initial subdivision stages consisting of up to 50 lots where the Developer can demonstrate fire flow and water quality requirements will be achieved and has been approved by the County. This is considered an interim servicing condition and looping must still be provided within one (1) year of this interim servicing condition.

3.2.17 Abandoned Services

Services smaller than 50 mm shall have the corporation stop closed at the main and the end of the service shall be cut and crimped with a 6636 Robar Abandoned Service Sleeve or approved equivalent. All service pipes shall be removed from within the County ROW

and the Developer shall confirm the remaining pipe is not leaking, to the satisfaction of the County.

Services 50 mm and larger or services that are tee'd directly into the main shall be abandoned by one of the following methods:

1. Where it is anticipated that a new service of the same size will be installed in the near future, install a closed valve followed by a blind flange immediately off the tee.
2. Where no service is anticipated to be installed in the near future, remove the tee and install a spool piece or proper closure for the material to bridge the gap in the main.

3.2.18 Operation of Valves and Hydrants

Opening and closing of existing water valves shall only be completed by the County. The Developer, Contractor, or their delegated agents shall not, under any circumstances, open, close, or otherwise operate any water valves or hydrants, unless first approved by the County.

The Developer must obtain County approval prior to using a hydrant as a water source. If approved, the Developer shall enter into a Hydrant Meter Use Agreement and be responsible for the costs of all water used.

3.2.19 Materials and Installation

The Developer shall supply and install new materials only. Materials shall be installed within two (2) years from the production date on the certification form. Any such material which is defective in manufacture or has been damaged during or after delivery shall be replaced by the Developer at their sole expense.

Materials that are different from those described in these Standards and are intended to be used as equivalents must be approved by the County prior to installation. Refer to SECTION 2.10.

All water distribution materials, including pipe linings, fittings, valves and fixtures shall be certified to NSF Standards 14 and 61 as acceptable for drinking water system components.

3.2.19.1 Water Mains

Pipe installation shall be in accordance with the pipe manufacturer's specifications. Pipe alignment shall meet minimum tolerance as per the following table:

Water Main Pipe Installation Tolerance	
Alignment	± 100 mm
Grade	± 50 mm

Acceptable water main pipe material is as per the following table:

Acceptable Water Main Pipe Material			
Material	Size Range	Dimension Ratio	Standard
Polyvinyl Chloride (PVC)	100mm – 300mm	DR18; Class 150 (1)	AWWA C900
	350mm – 900mm	DR25; Class 1138 (1)	AWWA C900
High Density Polyethylene (HDPE)	100mm and greater	DR11 (1)	AWWA C906
Steel Pipe	Transmission line	-	AWWA C200 ASTM A53
(1): DR9 shall be required for all river and watercourse crossings.			

Water main materials shall not change between valves (i.e., midline). Material transitions must be coordinated and approved by the County.

All PVC pipes shall be supplied with cast iron outside diameter integral wall thickened bell end and continuous (jointless) elastomeric gasket. Gaskets shall be of a pressure actuated seal design. PVC pipe material shall be certified in accordance with CSA B137.

PVC fittings sized 100 – 200mm shall be injection-molded, class 150 (1035 kPa), in accordance with AWWA 907. Tees, elbows, tapped couplings, and reducers sized 100 – 200mm shall also be in accordance with CSA B137. All fittings shall be complete with continuous elastomeric gaskets of a pressure actuated seal design. PVC extruded fittings sized 250 – 400mm shall be class 150 (1035 kPa) DR18 and in accordance with AWWA C900/C905 or CSA 137.

HDPE pipe shall be DR11 HDPE 3408 Iron pipe sized, and shall be in accordance with CSA B137, ASTM F714, and ASTM D3350. HDPE pipe sized 100 – 1,500mm shall also be in accordance with AWWA C906. All joints must be thermal heat fused. Mechanical service connections are not permitted. All components must be made from corrosion resistant materials. The age of pipe shall not exceed two years at the time of installation.

Steel pipes shall be used only for transmission lines. Flanges shall be 150 lb forged ASA type. The pipe shall be lined with epoxy suitable for potable water service and in accordance with AWWA C210 and NSF/ANSI 61. The pipe shall be coated with Yellow Jacket No.1 extruded polyethylene (Shawcor) or an approved equivalent.

Fusible PVC may be used in trenchless applications upon approval by the County.

All pipes shall be thoroughly flushed and clear from debris, stones, and lubricant when complete.

Thrust restraints shall be installed as per SECTION 3.2.14.

3.2.19.2 Tapping Valve Sleeves

Tapping valve sleeves shall be stainless steel and in accordance with AWWA C223-02. All steel material shall be Type 304 stainless steel.

Water service saddles shall be stainless steel type 304, bronze or a combination. Bronze components shall conform to ASTM B62. Double band design.

Tapping valve and sleeve connections shall be completed with full operating pressure in the main and in accordance with manufacturers specifications, unless otherwise approved by the County.

Service saddles must be used where the tapping diameter is greater than 50mm or where the water main diameter is greater than 300mm. Water service saddles shall be stainless steel type 304, bronze or a combination. Bronze components shall conform to ASTM B62. Double band design.

3.2.19.3 Fittings

POLYVINYL CHLORIDE FITTINGS

PVC injection-molding fittings be in accordance with AWWA C900, C905, C907, based on the fitting size, and certified to CAN/CSA B137. Fittings shall be supplied with continuous (jointless) elastomeric gaskets. All gaskets for PVC fittings shall be of a pressure actuated seal design.

HDPE FITTINGS

HDPE fittings shall be DR 11 PE 3408 in accordance with ASTM F714 and CSA B137. Molded fittings must be in accordance with ASTM D2683 for socket-type fittings, ASTM D3261 for butt-type fittings, and ASTM F1055 for electrofusion-type fittings.

CAST AND DUCTILE IRON FITTINGS

Cast and ductile iron fittings shall conform to AWWA C110. Fittings shall have bell ends and be supplied complete with vulcanized synthetic rubber gaskets in accordance with AWWA C111. The exterior of all fittings shall be factory coated with an asphaltic coating or a fusion bonded, epoxy coating, in accordance with AWWA C213.

3.2.19.4 Valves

Valves, valve boxes, and fittings shall be installed as per standard drawings and in accordance with manufacturers specifications.

When connecting into an existing water main, the connection shall be completed using a tapping valve and sleeve without shutting down the water service, unless otherwise approved by the County.

An isolation valve must be installed near the end of a water main that will be extended for future use.

Valve boxes complete with operating extension stems and rock disc nut are required for all valves. The rock disc nut must be installed 300 – 400 mm below finished grade.

GATE VALVES

Gate valves shall be in accordance with AWWA C500 for bronze mounted solid wedge gate valves or AWWA C509 for resilient seated gate valves. Gate valves shall also meet the following supplemental requirements:

- Epoxy coated cast iron body and disc. Interior to be factory coated with epoxy coating in accordance with AWWA C550.
- All external nuts and bolts and valve stem to be type 304 stainless steel.
- Non-rising stem.
- Bell ends, single-ring gasket, and push-on joints suitable for connecting to PVC pipe.

- Provide a 50mm square operating nut that turns counterclockwise to open.
- Provide O-ring valve stem seals.

BUTTERFLY VALVES

Butterfly valves shall be an iron body, EPDM seat material, bronze disc, in accordance with AWWA C504. Butterfly valves shall also meet the following supplemental requirements:

- Wafer, short body flanged, or fully lugged in accordance with AWWA-C504.
- Epoxy-coated cast iron body and disc. Interior to be factory coated with epoxy coating in accordance with AWWA C550.
- All wetted parts to be type 304 stainless steel.
- All external nuts and bolts shall be Type 304 stainless steel.
- Corrosion reduction must be provided.
- Provide O-ring shaft seals in a removable, corrosion-resistant recess to allow seals to be replaced without removing the valve shaft.

AIR RELEASE VALVES

All air valves shall be in accordance with AWWA C512 and complete with cast iron body and stainless-steel float or plastic body with fully corrosion resistant parts. Minimum working pressure shall be 1035 kPa with a low-pressure rating of 6.9 kPa. Air release valves shall also meet the following supplemental requirements:

- Installed in a vault of the appropriate size to allow for maintenance and operation.
- Vault shall be insulated with 3” spray foam and frost plugs.
- Vault shall be watertight.
- A single valve shall be utilized for both air and vacuum release. The valve shall be a double orifice with an anti-shock orifice mechanism.
- Floats shall be made of HDPE.
- O-ring seal consisting of EDPM rubber in accordance with NSF 61.
- Valve body shall have a $\frac{1}{2}$ inch female connection with stainless steel ball valve and sittings for flushing and draining.

PRESSURE CONTROL VALVES

Pressure control valves shall be a hydraulically operated globe or angle valve. The inner valve assembly shall be top and bottom guided by means of bearing bushings and shall be the only moving part. The inner valve shall be mounted on an AISI stainless steel stem.

Valves 200 mm and smaller shall be a single diaphragm type. Valves greater than 200 mm shall be a double diaphragm type.

50 mm bypass pressure control valves shall be installed in conjunction with the main pressure control valve. This is so maintenance can be conducted with no operational changes or adverse affects to the distribution system.

VALVE BOXES

Valve boxes shall be two-section, cast iron, adjustable, sliding-type, complete with cast iron lid and in accordance with ASTM A48. Coating inside and outside shall be an asphaltic coating or fusion bonded epoxy in accordance with AWWA C213. Set screws must be galvanized.

The valve box shall include operating extension stems and rock disc nut for all valves. Extensions shall be cast iron that is suitable for use with the valve box installed. Top of the box to be appropriately marked “WATER”, “CC”, or “SEWER” for identification in the field.

The top of the valve box shall be set at final finished surface grade elevation in unpaved areas and 10 mm below finished surface grade in paved areas.

The rock disc nut shall be installed 300 – 400 mm below finished surface grade. Valve boxes shall be sufficient length to provide for vertical adjustments of 300 mm.

All valves in roadways or sidewalks shall be placed in a Norwood Foundry Type B screw type valve box or approved equivalent.

Schedule 40 PVC valve boxes for the bottom boot of Norwood Foundry Type A sliding valve boxes or approved equivalent are permitted in areas not exposed to vehicle loading and when approved by the County.

3.2.19.5 Service Connections

WATER SERVICE PIPE

Accepted water service pipe material is based on diameter as per the following table:

Acceptable Water Service Pipe Material		
Pipe Diameter	Material	Standard
50 mm or less	Type K copper	ASTM B88 AWWA C800
50 mm or less	Blue Kitec water servicing tubing (200 PSI rating)	CSA B137.1
50 mm or less	Series 200 Polyethylene tubing	AWWA C901 CSA B137.1
> 50 mm	Same as main	Same as main

Copper services must be one continuous section of pipe. If the service pipe length exceeds the length of a standard roll of copper pipe, use only double union couplings to connect two sections of copper pipe. Wherever possible, locate double unions outside of paved areas and near curb valves. Record drawings must identify the services which contain unions.

Service connections shall be installed perpendicular to the property line from the water main, wherever possible. The invert of the water service shall be at least 2.75 m below finished grade at the curb stop.

Each residential service connection shall contain a 300 mm horizontal gooseneck and corporation stop. Main connections shall be staggered radially or as otherwise required by service pipe manufacturer, but no less than 600 from a joint, fitting or valve.

Water services up to 50 mm shall be installed in a common trench with sanitary and storm services as per SECTION 8 - DRAWING 3.4.3. Water services greater than 50 mm shall be installed in a separate trench. For services 100 mm and larger, a tapping valve and sleeve shall be used for connection to an existing main.

CURB STOPS

For copper pipe, curb stops shall be copper-to-copper type conforming to AWWA C800, Mueller Oriseal H15204 or approved equivalent, and must meet NSF 61 requirements.

Stop & drain curb stops are not permitted to be installed for residential services. Stop and drain curb stops shall only to be installed on water blow-off's 50mm or less.

For PEX-AL-PEX pipe, curb valves shall conform to AWWA C800. Cambridge Brass or approved equivalent.

Curb stops must operate clockwise to the off position and installed with the arrow pointed in the direction of flow. Curb stops shall be seated on a 200mm x 180mm x 38mm seating block with a friction top surface, composed of inert recycled plastics (EMCO curb stop block) or approved equivalent. The use of treated lumber or mortar blocks is not permitted.

The letters "CC" shall be stamped into each curb stop brass cap and able to be seen from visual inspection once installed.

CURB STOP BOX

Service boxes shall be double band or strap design, two-section, epoxy-coated, with stainless steel rod, bronze cap, and manganese bronze clevis and complete with a bronze, brass, or stainless steel cotter pin for connection to curb stop.

The operating rod shall be Type 304 stainless steel with the top of operating rod placed 300 – 400 mm below finished grade.

CORPORATION STOPS

For copper pipe, corporation main stops shall be copper flare or compression type, conforming to AWWA-C800. Mueller or accepted alternate and must meet NSF 61 requirements.

For PEX-AL-PEX pipe, corporation main stops shall conform to AWWA-C800. Cambridge Brass or accepted alternate.

Corporation stops shall be installed in strict conformance with pipe manufactures instructions, but in no case less than 600 mm from valves, fittings, joints, or other main stops.

SERVICE SADDLES

Service Saddles shall be bronze or Type 304 stainless steel complete with a tapered inlet thread and in accordance with AWWA C800. Water service saddles shall be stainless steel

type 304, bronze or a combination. Bronze components shall conform to ASTM B62. Double band design.

Fasteners shall be treated to prevent binding. O-ring gaskets shall be constructed of synthetic rubber suitable for potable water use and provide pressure-tight seal on the water main.

Service saddles must be used where the tapping diameter is greater than 50 mm or where the water main diameter is greater than 300 mm.

COUPLINGS

Couplings shall be compression type in accordance with AWWA C800. Mueller, Cambridge Brass, or accepted alternate and must meet NSF 61 requirements.

WATER METERS AND METER CHAMBERS

A water meter shall be required for each water service. All water meters shall be a Neptune water meter: T-10 with pro-coder register head in accordance with AWWA C700, C701, and C710.

Water meter chambers shall be either of the following types:

1. MUELLER/Hunt THERMAL-COIL (catalogue # 250-CT-18-96-L-B-A-L-N). Insulated pad (catalogue # 790153). Flat lid with center mount lock (catalogue # 780069);

   OR

2. FORD Coil Pit Setter (catalogue # PTCBHH-388-18-96-FP-NL). H-20 rated composite flat lid (catalogue # PPSC-18-L-P-BR). Closed cell insulated disc (catalogue #CCID-18-6). Solid plastic bottom plate (catalogue # PPSBP-18-P).

Each side of the chamber shall be insulated with 50 mm polyethylene insulation complete with 1.27 mm thick, high density black polyethylene jacket. The jacket shall be factory installed using the “U.I.P.” system furnished by Urecon Ltd. or approved equal. The top shall be insulated with 100 mm factory supplied insulation.

3.2.19.6 Service Crossing Existing Structures

All service connections passing underneath an existing or proposed roadway, walkway, or other surface feature shall be completed using auguring method or an alternative approved equivalent trenchless method. In situations where trenchless method is not

feasible due to adverse soil conditions, open cut method may be permitted, following reasonable justification by the Contractor and approval by the County.

All auger pit excavations shall be backfilled with granular bedding material in lifts not exceeding 150 mm. Backfill shall be mechanically compacted to 95% SPD up to 350 mm above the pipe and 98% SPD above that. Road side slopes shall be compacted to 98% SPD.

3.2.19.7 Concrete

All concrete required for the construction of the water distribution system shall be in accordance with SECTION 3.1.21. Notwithstanding that section, all concrete shall be constructed with Type HS sulfate resistant cement and a minimum 28-day compressive strength of 25 MPa. The minimum concrete cover on all reinforcing steel is 75 mm.

3.2.19.8 Nuts and Bolts

Nuts and bolts shall be type 304 stainless steel and wrapped with Denso Petrolatum Tape in accordance with AWWA C217-09.

3.2.19.9 Cathodic Protection

All metallic elements in the water distribution system shall be provided cathodic protection. Sacrificial anodes shall be inspected by the County prior to backfilling.

CATHODIC PROTECTION FOR BURIED STEEL PIPE AND FITTINGS

All steel pipe and fittings require cathodic protection. In order to calculate the type, weight and spacing of the anodes, a soil resistivity analysis shall be conducted along the length of the pipeline. The analysis shall determine the conductivity of the soil and provide details of the appropriate cathodic protection system. A report on the soil resistivity analysis and the recommended weight and spacing of anodes must be provided to the County along with the first submission of Engineering Drawings.

All existing steel pipes being connected to must have at least two (2) 7.7kg (17lb) sacrificial magnesium anodes at the point of connection. The composition of the magnesium anodes must conform to the most recent publication of ASTM B843

CATHODIC PROTECTION FOR BURIED NON-STEEL METALLIC FITTINGS, VALVES, AND HYDRANTS

All buried non-steel metallic fittings and valves shall be cathodically protected with 7.7 kg magnesium anodes and all hydrants shall be cathodically protected with a 7.7 kg magnesium anode. The composition of the magnesium anodes must conform to the most recent publication of ASTM B843. Refer to SECTION 8 - DRAWING 3.5.5.

All exterior bolts on valves, hydrants and couplings shall be Stainless Steel type 304 or an approved equivalent.

All existing cast iron or ductile iron pipes being connected to must have at least two 7.7 kg (17lb) magnesium anode at the point of connection. The composition of the magnesium anodes must conform to the most recent publication of ASTM B843.

CATHODIC PROTECTION FOR COPPER WATER SERVICES AND WATER MAINS

All copper services 50 mm and smaller in diameter shall have a 7.7 kg magnesium anode attached to the copper service pipe and located 1.0 meter from the curb stop within the road right-of-way. The composition of the magnesium anodes must conform to the most recent publication of ASTM B843. The magnesium anode wire is to be clamped to the copper pipe with an all-brass clamp or an approved equivalent. Refer to SECTION 8 - DRAWING 3.5.6.

All copper water mains shall have a 7.7 kg magnesium anode attached to the copper pipe at 20 m spacing. The composition of the magnesium anode must conform to the most recent publication of ASTM B843. The magnesium anode wire is to be clamped to the copper pipe with an all-brass clamp or an approved equivalent.

3.2.20 Trenching, Bedding and Backfill

In accordance with SECTION 3.5.

3.2.21 Inspection and Testing

The Consulting Engineer and Contractor are responsible for inspecting and testing all new water distribution system components. Inspections and testing shall be in accordance with SECTION 3.6.

Bacteriological sampling for total coliforms must be performed by the Consulting Engineer or Contractor and the samples submitted to ProvLab North (located at the University of Alberta Hospital) for analysis. The results must be forwarded to the County through Alberta Health Services before the water main can be placed into service

3.2.21.1 Hydrostatic Pressure and Leakage Test

Prior to acceptance, the entire water distribution system shall be hydrostatic pressure and leakage tested.

3.2.21.2 Disinfection and Bacteriological Test

Prior to acceptance, the entire water distribution system shall be disinfected and bacteriologically tested.

3.2.21.3 Hydrant Flow Test

Prior to acceptance, all new hydrants shall be hydrant flow tested.

3.2.21.4 Concrete Test

The Developer shall be responsible for ensuring all required concrete testing is completed.

3.2.22 Water CCC/FAC Acceptance Criteria

All laboratory and field test results for constructed water distribution system components must be submitted to the County prior to acceptance. Test results must clearly indicate all constructed work conforms to these Standards and approved Specifications and that the inspection and testing requirements described in SECTION 3.2.21 are within the tolerances specified in SECTION 3.6. In all situations the County shall have the final decision on whether completed work is acceptable.

All appurtenances such as valves, hydrants, curb stops, meters, and meter vaults shall be visually inspected for conformance prior to acceptance. Refer to SECTION 2.9.

The water distribution system, or any portion therein, shall be replaced prior to County acceptance if at any time:

1. Any deficiency is defined as a safety hazard by the County Project Representative;
2. The asset is not built in accordance with Construction Drawings or Specifications;
3. The asset does not function as intended; or
4. A deficiency is determined by the County Project Representative to be out of tolerance as set by these Standards.

VISUAL INSPECTION ACCEPTANCE CRITERIA CHECKLIST

Visual inspection acceptance criteria shall include, at a minimum, all of the following:

☑	**Water distribution system CCC/FAC Acceptance Criteria**
☐	All components of the water distribution system are installed in accordance with Construction Drawings
☐	All appurtenances (valves, meters, curb stops, rods, etc.) are operational – manual test
☐	All appurtenances (valves, meters, curb stops, rods, etc.) are installed at specified elevations and are relatively flush with finished grades
☐	Main tracer wire installed, electrical continuity test performed and any valve boxes stamped with “WATER”
☐	The letters “CC” are stamped into each curb stop valve and can be visually inspected. Any other water valve is stamped with “WATER”.
☐	All appurtenances (valves, meters, curb stops, rods, etc.) are free from asphalt or other materials
☐	All hydrants are installed and located as per Construction Drawings: ☐ Hydrant is properly oriented (i.e., towards the street) ☐ Hydrant is painted in accordance with the GMSS ☐ Cathodic protection is installed ☐ Hydrant valves are accessible and operable ☐ All hardware is installed, tight, and in good working order ☐ Bottom of hydrant flange is 50mm above finished grade ☐ Rock nut on operating rod is 300 – 400mm below finished grade

3.3 Storm Water Management Systems

3.3.1 General

The Developer and their Consulting Engineer are responsible for understanding and adhering to all requirements listed in these Standards and ensuring any variances, conflicts, or inconsistencies are promptly communicated to the County during the development review process. Variances shall be reviewed and approved or rejected by

the County in accordance with the variance review process in SECTION 2.10. Where conflicts or inconsistencies with these Standards arise due to adoption of other planning and design documents, the Developer shall be responsible for satisfying the document that takes highest precedence.

These Standards are intended to represent the minimum acceptable standards and should not be considered as a substitute for detailed material and Construction Specifications to be prepared by the Consulting Engineer. The Developer and their Consulting Engineer is responsible for developing and implementing designs in accordance with good engineering practice, industry standards, specific-site condition requirements, and any requirements by other Authority's Having Jurisdiction to achieve design life and safety expectations consistent with good design and construction practices and in accordance with the design intent of the work.

The design of storm sewer systems shall be in accordance with the most recent version *Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems* (Alberta Environment and Parks).

Plan-profile drawings, specifications, and a design report must be prepared by a Licenced Engineer and be submitted to the County and Alberta Environment and Parks for review and approval. All necessary approvals must be granted by Alberta Environment and Parks and submitted to the County prior to construction.

3.3.2 Major and Minor Drainage Systems

The storm water management system shall be comprised of a minor and a major system complete with the following components:

1. **Minor System:** consisting typically of pipes, manholes, catch basins, swales, storage facilities, and other structures designed to convey run-off from snowmelt, 1:5 year storm events, and foundation drain collection to an adequate receiving waterbody without sustaining surface ponding or excessive surface flow.
2. **Major System:** consisting typically of roadways, surface flood paths, and watercourses designed to convey 1:100 year storm events without sustaining damage to buildings or homes. The major system accommodates flows not intercepted by or beyond the capacity of the minor system through planned surface flow routes and stormwater management facilities. Major overland flow and ponding shall be restricted to within the road ROW and shall not encroach on private developments.

The design of the major system shall consider surface flows that may enter the area from adjacent lands and any downstream effects on receiving waterbodies and adjacent

developments. When the minor system capacity is exceeded, the major system shall provide a continuous surface flow route for runoff to discharge, consisting typically of roadways and open channels.

Each drainage systems shall be designed as a separate drainage system and shall not convey effluent from sanitary sewers or potentially contaminated drainage from industrial, agricultural, or commercial developments.

3.3.3 Low Impact Development

Low impact development (LID) principles shall be considered and incorporated into the storm water management system, wherever feasible. LID design features (e.g., porous pavement, bioswales, etc.) must include a cost analysis outlining any anticipated additional construction and maintenance costs and service life impacts associated with the LID feature, as compared to a non-LID feature (e.g., asphaltic concrete pavement, swale, etc.). Considerations should promote infiltration of storm water and reduce runoff from frequent minor storms using the following principles:

- Soft landscape areas to consist of deep absorbent soils. Where adjacent to roadways, subgrade protection shall be included in the design.
- Underlaying landscaping with sandy engineered soils to promote bio-filtration.
- Consideration for rainwater harvesting for on-site irrigation on re-use.
- The use of subsurface stormwater management systems to promote groundwater recharge in appropriate soils.
- Limiting the use of grass or turf landscaped lawn areas and instead using natural vegetation that contributes to diverse habitat and resilient ecology.
- Maintain existing vegetation, where possible.
- Utilizing green roofs on buildings.

Examples of low impact developments include:

	Examples of Low Impact Development Designs
Rain Gardens	Small landscape depression features that use a soil and vegetation complex to detain and filter runoff from an upstream catchment area. As runoff filters through the soil and vegetation complex, pollutants and contaminates are removed through biodegradation, root absorption, and plant uptake. Rain gardens are more likely to be used in residential applications, such as a single-unit lot.
Bioretention	Similar to rain gardens, these facilities are larger and typically

Facilities	service a larger catchment area. Bioretention facilities are more likely found in commercial and industrial sites and multi-unit developments.
Green Roofs (Living Roofs)	The primary purpose of a green roof is to manage flow rates and discharge volumes at the source prior to discharging into the offsite drainage course. A green roof is a roof partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers, such as a root barrier, and drainage and irrigation systems.
Bioswales	These landscape elements are designed to remove silt and pollutants from surface runoff water. Bioswales are gently sloping drainage swales comprising a soil and vegetation complex that is used to infiltrate and treat runoff prior to discharging into the receiving drainage course.
Absorbent Landscapes	These landscapes consist of typical landscape features that use a thicker, less-compacted layer of top soil below to maximize the water-holding potential of the feature. Absorbent landscaping typically consists of flatter slopes that slow incoming runoff and allow it to infiltrate through the vegetation and soil complex.
Water Recycling and Reuse	This process involves retaining and storing excess runoff on-site during a rainfall event, typically by using cisterns or underground storage tanks to store and retain peak stormwater flows, and reusing the stored water at a later date for irrigation or other grey water uses.

3.3.4 Storm Water Release and Storage

The following table summarizes on-site stormwater management requirements:

<table>
<tr><th colspan="4">Storm Water Management Requirements Summary</th></tr>
<tr><th>Development Site Area</th><th>On-Site SWM Required?</th><th>On-Site Storage Required?</th><th>Release Rate</th></tr>
<tr><td>< 0.16 ha</td><td>No (1)</td><td>No (1)</td><td>-</td></tr>
<tr><td>0.16 ha – 10 ha</td><td>Yes</td><td>Yes (1:100)</td><td rowspan="2">Storm Water Discharge Maximum Release Rate Requirements Table</td></tr>
<tr><td>> 10 ha</td><td>Yes</td><td>Yes (critical storm event)</td></tr>
<tr><td colspan="4">(1): Unless there are concerns regarding the available capacity of the existing drainage system. Contact the County for confirmation prior to system design.</td></tr>
</table>

Small sites (< 0.16 hectares) are typically exempt from on-site storm water management requirements unless there are concerns regarding the available capacity of the receiving drainage system. System designers must confirm case-by-case storm water requirements with the County prior to system design.

Development sites with areas between 0.16 hectares and 10 hectares require on-site stormwater management and storage provisions to accommodate runoff from the 1:100 year design storm event, with a maximum release rate as specified in the following table:

Storm Water Discharge Maximum Release Rate Requirements	
Neighbourhood (1)	Maximum Release Rate (L/s/ha)
A, B, E, and G	2.5
C	1.7
H and I	3.0
D and J	1.0
(1): Delineation of neighborhood boundaries shall be as per the County's most recent Master Drainage Plan.	

Development sites with areas greater than 10 hectares require on-site storm water management and storage provisions to accommodate runoff from the critical storm event with a maximum release rate as specified above.

Upon approval from the County, the required on-site storage volume for a development site may be reduced to accommodate the 1:25 year design storm event in cases where an adequate major drainage system and SWMF exist. Conversely, the required on-site storage volume may be required to increase to accommodate the critical storm event at the specified maximum release rate if there are concerns regarding the existing major drainage system.

The critical storm event means the storm event which creates the greatest stress on the storm sewer system, including the maximum surcharge and system outflow, using various models and events. At a minimum, the critical storm event analysis must include modelling of the 1:100 year 4-hour Chicago distribution and 1:100 year 24-hour Huff distribution events.

Depths of flow and ponding must not exceed 350 mm at any time. For arterial roadways, the water depth at the crown of the road must not exceed 150 mm.

A defined surface overflow path using publicly owned land (e.g., roadways, PUL, etc.) and/or established drainage courses must be included in every development and

designed to convey major surface flows for cases where the capacity of the minor system or on-site storage volume will be exceeded.

The minimum orifice diameter permitted is 75 mm (100 mm preferred). Where a very small orifice (e.g., 75 – 100 mm) is required for discharge control, the design should provide for overflow caused by freezing (i.e., provide a secondary high-level orifice of larger diameter or other appropriate design feature.).

3.3.5 Roof Drainage

Roof drainage (i.e., roof leaders) from single-unit and multi-unit (non-apartment) residential developments may be discharged to the surface and onto an appropriately designed splash pad a minimum 1.5 m away from the building. Surface discharge for all other situations is not permitted unless approved by the County. Notwithstanding the above, roof drain connection to the storm system shall still be required where surface drainage is not recommended or geotechnical conditions are a concern, such as areas with slope stability concerns or potentially erodible soils.

Roof drainage for all other developments, including apartments, commercial, industrial, and other non-residential developments must discharge directly into the storm system, if available, via service connection. Roof drainage shall not be connected to the foundation drainage (i.e., weeping tile) system and must use a separate connection.

3.3.6 Water Quality

Water quality for all SWMF shall meet the *Stormwater Management Guidelines for the Province of Alberta* (Alberta Environment and Parks). The recommended BMPs provided therein shall be incorporated into the design, as required, to meet or exceed quality requirements.

OIL AND GRIT SEPARATORS

The use of ISO 14034 (ETV) certified oil and grit separators that remove, at a minimum, 85% TSS for particle sizes greater than or equal to 50 µm shall be required for all the following developments:

- Commercial or industrial sites greater than 2 ha;
- Gas stations, oil change facilities, car washes, vehicle maintenance and mechanical shops, sites with on-site fuel storage, and any other development utilizing petroleum or hydrocarbons;
- Heavy industrial and manufacturing sites; and

- Any development as required by the County.

Specified oil and grit separators must meet the following requirements:

- The unit must be readily accessible to personnel and equipment for maintenance.
- The hydraulic design of the OGS with respect to backwater conditions meets the manufacturer's specifications (some OGSs are designed to operate under free flow conditions).
- Unit must treat a minimum of 90% of the total runoff volume over the period of record before a bypass is allowed. A bypass will remove excess high stormwater volumes.
- The following minimum information must be submitted:
    - The manufacturer must submit a performance table showing average annual removal rates, total runoff volumes, treated volumes and sediment deposition volumes for all available years using Edmonton Municipal Airport rainfall data. This typically means providing supporting modeling information.
    - A minimum annual TSS removal rate of 85% for particle sizes 50 µm and greater is required for each and every year. Submit calculations and information showing how removal rates were achieved or modelled.
    - ISO 14034 (ETV) certification.
    - The unit must have a minimum of one (1) year of adequate sediment storage capacity without scouring.
- To limit the potential for scour, the hydraulic loading rate of oil/grit separators (excluding the bypass) must be restricted to a maximum rate of 27 L/s/m^2, or lower if recommended by the manufacturer. The area m^2 is defined as the horizontal cross-sectional area of the settling area of the unit.
- The Developer or owner is responsible for the cost of maintenance and annual inspections. The unit must be maintained periodically per the manufacturer's specifications and instructions, with a minimum cleaning frequency of six months unless it can be demonstrated otherwise.

The oil and grit separator shall be installed upstream of a sampling manhole, with both being located on the service lead, prior to the main connection. The sampling manhole shall be a minimum of 1,200 mm diameter and located 0.5m from the property line on public property. If the sampling manhole cannot be located on public property, it shall instead be located on private property with an appropriately sized easement registered for municipal access. In all situations, the oil and grit separator (not the sampling manhole) shall be located on private property with the property owner responsible for the ongoing operation and maintenance costs.

For all privately owned units, a plan describing the maintenance requirements of the specific unit and the proposed maintenance routine to satisfy those requirements, including, but not limited to, sediment removal frequency, inspection frequency, and routine upkeep procedures must be submitted to the County.

The oil and grit separator shall be identified and specified on Engineering Drawings prior to review by the County. The Consulting Engineer shall submit to the County for review the oil and grit manufacturer' report which shall include sizing parameters, particle removal data, and information specific to the chosen unit.

3.3.7 Erosion and Sediment Control

All projects must implement satisfactory erosion and sediment control measures during construction to prevent erosion of the site and control sediment discharge. Review and approval of an Erosion and Sediment Control Plan by the County may be required prior to work commencing. Refer to SECTION 7.

At a minimum, Good Housekeeping Practices must be implemented for all sites. Refer to SECTION 7.9.

3.3.8 Minor System

The minor system shall be designed to sufficiently convey the runoff generated by snowmelt, 1:5 year storm events, and foundation drain discharge collection. Development areas smaller than 65 hectares shall be estimated using the Rational Method. Development areas 65 hectares and larger shall be estimated using computer modelling.

3.3.8.1 Rational Method

The Rational Method shall be used in estimating flows required to be accommodated in the minor system for development areas smaller than 65 hectares using the following formula:

$$\boldsymbol{Q = \frac{CIA}{360}}$$

Where,

$$Q = Design\ flow\ \left(\frac{m^3}{s}\right)$$
$$C = Runoff\ coefficinet$$
$$I = Rainfall\ intensity\ \left(\frac{mm}{hr}\right)$$
$$A = Drainage\ area\ (ha)$$

The five (5) year rainfall intensity shall be taken from EPCOR IDF Curves.

The maximum inlet time for residential areas shall be 15 minutes. Inlet time for all other areas shall be 10 minutes or otherwise calculated for the specific area.

Minimum runoff coefficients for minor system calculations shall be used as per the following table:

Minimum Runoff Coefficients for Rational Method	
Land Use	Runoff Coefficient
Agriculture, Undeveloped Land	0.10
Park, Lawn, Playground	0.20
Single-unit Residential	0.65
Multi-Unit Residential	0.70
Apartment	0.75
Commercial	0.9
Industrial	0.9
Other	Calculate
Surface Type	Runoff Coefficient
Gravel	0.65
Asphalt, Concrete, Paved Surface	0.95

When calculating the site-specific weighted-average runoff coefficient use the following formula:

$$C = \frac{0.95(Impervious\ Area) + 0.15(Pervious\ Area)}{Total\ Area}$$

For mixed-use areas, the weight average of each applicable runoff coefficient shall be used.

3.3.8.2 Computer Modelling

Computer modelling shall be used in estimating flows required to be accommodated in the minor system for development areas 65 hectares or larger.

The Consulting Engineer shall select appropriate computer modelling software based on the project specific design requirements. The selection of an appropriate computer model shall be based on an understanding of their principles, assumptions, and limitations in relation to the system being designed.

The storm duration used for modelling simulations will depend on the type of system being designed. Short duration storms (1 - 4 hours) will generally govern the design of the storm sewer systems and the longer duration storms (24 hours) will generally govern the design of stormwater management facilities.

The 4-hour Chicago distribution hyetographs shall be used for analysis of major and minor conveyance systems by computer simulation. When stormwater storage is required, the 24-hour Huff distribution design hydrographs shall be used for storage drawdown analysis in addition to other appropriate models.

Several design storm durations should be evaluated to determine the worst-case scenario for the system being designed.

3.3.8.3 Pipe Sizing

Minimum pipe sizing for the storm water management system shall be as per the following table:

Storm Sewer System Pipe Size Requirements	
System Component	Minimum Diameter
Storm Sewer Main	300 mm
Catch Basin Lead	250 mm
F51 Catch Basin Lead	375 mm
Single-unit Residential Storm Service	150 mm
Industrial, Commercial, Apartment, Multi-unit Storm Service	Calculate (1)
(1): Industrial, commercial, apartment, and multi-unit site services shall be calculated and sized according to anticipated site requirements using Manning's Formula with a minimum roughness coefficient (n) of 0.013. Notwithstanding calculated pipe size, storm service shall not be less than 150 mm	

3.3.8.4 Flow Velocity

Storm Sewer System Flow Velocity Requirements	
Minimum Flow Velocity	0.6 m/s
Maximum Flow Velocity	3.0 m/s

All storm sewers shall be designed with mean velocities, when flowing full, of 0.90 to 1.0 m/s based on Manning's formula. Mean velocities below 0.6 m/s are not permitted.

Sewers shall not be designed to operate in super-critical flow conditions during flows less than design capacity conditions. Hydraulic structures are required under super-critical flow regimes and to make the transition from super-critical flow to sub-critical flow. Hydraulic structures are required to minimize life cycle costs and be designed to have a minimum 75 year Design Life.

3.3.8.5 Pipe Slopes

It is recommended that all storm sewers be designed with a slope of 0.40% or greater. In no situation shall storm sewers be designed with a slope of less than 0.15%. The minimum slope shall be 0.4% for the most upstream leg of any storm system (i.e., between the terminal manhole and the first manhole downstream). The minimum slopes permitted for the storm water management system shall be as per the following table:

Storm Sewer System Slope Requirements	
Pipe Size (mm)	Minimum Slope [1] (%)
100 [2]	1.00
200	0.40
250	0.28
300	0.22
375	0.15
>375	0.15

(1): Minimum grades shall be increased by 75% for all curved pipe
(2): Single-unit residential storm/foundation drain service

3.3.8.6 Pipe Alignment

All storm pipes shall be installed in accordance with the manufacturer's specifications. Mains shall be located and aligned within the road right-of-way. Curved sewers shall be considered acceptable with the following requirements:

- The curve shall run parallel to the curb or street centerline;
- The minimum grade shall be increased by 75% as compared to straight pipes; and
- Manholes shall be located, at a minimum, at the BC and EC for each curve.

3.3.8.7 Separation

A minimum horizontal separation of three (3) meters shall be maintained between sewer mains and other deep services (e.g., sewer, water). A minimum horizontal separation of two (2) meters shall be maintained between sewer mains and shallow or franchise utility services (e.g., gas, power, telecommunications, etc.).

Sewer lines shall cross below water lines wherever possible. The minimum vertical separation between lines, measured from obvert of the bottom pipe to the invert of the top pipe, is 0.5 m. If the minimum separation cannot be achieved, protective measures, such as metal casings may be acceptable, when supported by a Geotechnical Engineer's recommendation and when approved by the County. Where it is necessary to cross the water main below a sewer line, the sewer line shall be provided structural support at the crossing to prevent excessive deflection.

3.3.8.8 Depth of Cover

All points along the storm water management system shall have a minimum cover from finished grade to pipe obvert of two (2) meters for storm sewer and foundation drain sewer pipes smaller than 600 mm diameter. If this cover cannot be achieved, adequate pipe insulation to prevent freezing in accordance with insulation manufacturer's recommended installation procedures must be included and shown on the Engineering Drawings. A minimum of 1.5 m of cover to obvert is required for storm sewers equal to or larger than 600 mm in diameter.

The depth of the storm service and foundation drain service should match the sanitary service at the property line. When this is not practical, provide a minimum cover from finished grade to pipe obvert of two (2) meters for the storm service and the foundation drain service at the property line. If this cover cannot be achieved, provide adequate pipe insulation to prevent freezing in accordance with insulation manufacturer's recommended installation procedures and as shown on the drawings

Adequate depth must be provided to allow for drainage to the sewer main of the interior of sites where interior finished grades may be lower than the finished grade at the property line.

3.3.8.9 Manholes

The obvert of a pipe entering a manhole shall not be lower than the obvert of a pipe outlet in the same manhole.

Minimum invert elevation drops in manholes shall be based on change in flow direction as per the following table:

Storm Sewer System Manhole Invert Drop Requirements	
Change in Flow Direction	Minimum Invert Elevation Drop
0° deflection	10 mm
Up to 45° deflection	30 mm
45° to 90° deflection	50 mm
Greater than 90° deflection (1)	Use two (2) manholes
(1): Change in flow direction shall not exceed 90 degrees. If such a change is unavoidable, use two manholes.	

Where drops between inlets and outlets greater than 750 mm cannot be avoided, an interior or exterior drop manhole shall be required. The drop manhole structure must be specifically designed to address the hydraulic and energy dissipation requirements.

The maximum spacing between manholes shall be 120 m.

Safety platforms shall be required for all manholes greater than 6m in depth.

Manholes shall be required at all transitions in size, grade, or direction, and at the junctions of mains. Wherever possible, manholes shall be placed outside of driveways and sidewalks.

Precast manhole bases shall be installed on a base of 100mm to 300mm washed gravel.

Safety steps shall be aligned perpendicular to the main flow channel. Distance from top of rim to first step maximum 300mm, steps equally spaced at a maximum of 400mm to within 600mm of the base of manhole.

All weather access may be provided to all Manholes.

To abandon a manhole, all pipes must be plugged with non-shrink grout. Remove and dispose of the manhole to one (1) meter below ground and backfill with Fillcrete.

3.3.8.10 Catch Basins and Leads

Spacing and capacity of catch basins shall be designed such that ponding will not occur during a 1:5 year storm event. Maximum spacing of catch basins shall be 120 m. Catch basins and leads shall not be placed outside of the public ROW.

The minimum inside diameter for a catch basin barrel shall be 900 mm unless otherwise approved by the County. The minimum sump depth in the barrel shall be 600 mm.

All catch basin leads shall discharge directly into a manhole or catch basin manhole. A direct connection to the storm sewer main shall not be permitted.

The length of a catch basin lead shall not exceed 30 m. If more than 30 m is required, a catch basin manhole shall be used as an intermediary. Catch basin manholes shall be a minimum 1,200 mm with a minimum 600 mm sump.

The minimum slope for a catch basin lead shall be 1.5% with a minimum diameter of 250 mm. A catch basin lead for an F51 catch basin shall be a minimum diameter of 375 mm. Maximum length of a catch basin lead is to be 30m.

3.3.8.11 Service Connections

For minimum storm service size refer to SECTION 3.3.8.3. For minimum storm service slope refer to SECTION 3.3.8.5.

The Consulting Engineer is responsible for providing detailed Record Drawings for all installed service connections. Drawings must include, at a minimum, pipe diameter, elevation, lot number, and relative location to property line for each service. Refer to SECTION 2.13.

3.3.8.12 Foundation Drains

A Storm service to collect drainage from building weeping tile and foundation subdrains shall be provided on each lot and in accordance with any requirements indicated in the Geotechnical Report. Each single-unit or multi-unit building shall have a separate service connection provided to the property line. Foundation drains must be connected to the storm sewer system by gravity, wherever possible. Where gravity connection to the storm system is not possible, or not recommended, a sump pump is required.

Surface discharge of weeping tile (i.e., sump pump) for apartment, commercial, and industrial developments shall not be permitted unless approved by the County. A check valve and isolation valve downstream of the check valve shall be provided in the discharge pipe to preclude backflow of wastewater into the building or sump.

If considerable flows are anticipated, they must be considered when sizing the storm sewers and services in order to avoid over-capacity and surcharge issues in the system.

Foundation Drain Size and Slope Requirements

Development	Minimum Diameter	Minimum Slope (%)
Foundation Drain Sewer Main	200 mm	0.4
Single-unit Residential Foundation Drain Service	100 mm	1.0
Industrial, Commercial, Apartment, and Multi-unit Foundation Drain Service	Calculate (1)	1.0

(1): Industrial, commercial, apartment, and multi-unit foundation drain services shall be calculated and sized according to anticipated site requirements using Manning's Formula

with a minimum roughness coefficient (n) of 0.013. Notwithstanding calculated pipe size, foundation drain service shall not be less than 150 mm

The depth of foundation drain services should match that of the storm sewer service, whenever possible. When this is not practical due to the depth of the foundation drain sewer main available, a minimum cover of 2.4 meters from the proposed finished grade to the pipe obvert of the service at the property line will be accepted. If a minimum cover of 2.4 meters is not achievable, insulated pipe that prevents freezing must be provided and supported by a Geotechnical Engineer recommendation.

Cleanouts shall be provided at every junction or where a 22.5 degree or greater bend is used. The maximum spacing for cleanouts shall be 100 m. All cleanouts located along the line shall be a bi-directional tee design.

Lot grading plans must indicate the requirement of foundation drain service (i.e., weeping tile) and/or storm service (i.e., weeping tile and/or roof leader flows) for all residential developments, when required. The plan must identify the need to use a sump pump discharging to a downpipe connected to the foundation drain service, where applicable.

3.3.8.13 Swales

Swale size shall be determined based on design flow and must accommodate, at a minimum, flows for the minor (1:5) storm flows. All swales on private lands must be concrete, placed within an easement, and appropriately sized and sloped to accommodate the major (1:100) storm flows. Swales must be constructed prior to subdivision endorsement.

Grass swales shall have a minimum grade of 2% with a minimum cross sectional depth of 150 mm and a maximum 4:1 side slope. Grass swales serving lots on one side only shall be V-shaped and located rear of the upstream lot. Grass swales serving lots on both sides shall be trapezoidal shaped with a 1m wide bottom and located on the common rear property line.

Where the grade of a swale is less than 2%, a concrete swale shall be used. Concrete slopes shall have a minimum grade of 0.75%. Refer to SECTION 8 - DRAWING 3.7.8. Swales located on private property shall be registered by an easement in favour of the County. A minimum 200 mm shall be provided between the edge of the swale and the property line.

Furthermore, swales must meet all of the following requirements:

- Contain the 1:5 year storm flow within the concrete gutter and the 1:100 year storm major flow within the easement.
- Provide a catch basin upstream of a walkway to intercept the 1:5 year storm flow. Limit the depth of ponding to 150 mm with 5H:1V maximum side slope all around the catch basin cover.
- The number of lots permitted to drain to the swale shall be determined by the concrete gutter and swale capacities, and the catch basins 1:5 year storm flow inlet capacity.
- Bends greater that 45° shall be avoided, and no bend greater than 90° shall be allowed. When 45° bend is exceeded, provide a 1.0 minimum centreline radius and adequate curbing to contain the design flows within the gutter and easement.
- The grading of the boulevard and sidewalk shall be such that the major flow is not allowed to flow down the sidewalk.
- Grass swales preferably shall be sodded, or at the least, shall be topsoiled and seeded, Interim measures shall be provided to protect exposed surfaces from erosion until the grass cover is established.
- Swales that convey flows from more than two (2) lots must not be routed along the side yard of a single unit or multi-unit residential lot.
- Future swale extensions shall be identified and evaluated to ensure that anticipated constraints and capacities are addressed.
- Calculations for the swale's minor and major flow capacities shall be submitted with the engineering drawings.

3.3.8.14 Ditches

Open ditches shall not be permitted along roadways in urban developments. Ditches may be approved by the County when forming part of a sufficiently designed Low Impact Development storm water management system. For rural development ditches refer to SECTION 4.1.9.

3.3.8.15 Culverts

Culvert sizing shall be calculated through storm water drainage analysis and sized, at a minimum, to accommodate 1:25 year rain events. Minimum culvert sizes are as per the following table:

Culvert Size Requirements	
Application	Minimum Diameter
Residential Access	500 mm
Industrial Access	500 mm
Roadway Crossing	600 mm
Everywhere Else	Calculate

Culverts that are sized larger than the minimum diameter outlined in the above table may be required to accommodate site-specific flow or other development conditions. The Consulting Engineer must complete sufficient analysis to ensure appropriate culvert size is chosen. The County reserves the right to require submission of a culvert analysis and design.

The maximum length of culverts is as per the following table.

Culvert Length Requirements	
Culvert Diameter	Maximum Length (1)
Up to 600 mm	50 m
600mm to 1,200 mm	110 m
Greater than 1,200 mm	N/A
(1): Culverts with a length exceeding the maximum length shall be provided an intermediate access point (hatch)	

Culverts shall consist of new galvanized CSP with a minimum wall thickness of 1.6mm, or as otherwise required by the specific loading criteria. All culverts shall be installed in accordance with the manufacturer's specifications and complete with bevelled end sections on both the inlet and outlet ends. The invert shall be extended to the tow of the side slope and completed with a 3:1 graded end treatment. Refer to SECTION 8 - DRAWING 5.3.5.

Riprap material end treatment shall be placed around the inlet and outlet for all culverts. Riprap material shall consist of rock ranging in size from 150 mm to 350 mm, with 50% of the rock material being larger than 300 mm, or as otherwise required by site-specific flow regime calculations and ESC requirements. Refer to SECTION 8 - DRAWING 5.3.5.

All roadway culverts shall be installed to provide a minimum depth of cover of 300 mm or ½ of the culvert diameter, whichever is greater. Depth of cover shall be measured from the finished shoulder grade of the roadway to the top of the culvert. Culverts shall be

placed on a culvert bed and buried ¼ diameter below the ditch grade. Culvert bed and backfill shall be compacted to 97% SPD. The excavation must be wide enough to allow pipe assembly and to accommodate the operation of compaction equipment on both sides of the culvert. The culvert bed is constructed using select native or granular material. Select material is also placed under the haunches prior to backfilling. A clay seal cut-off is placed around the pipe at both ends of the culvert to prevent seepage along the pipe. Refer to SECTION 8 - DRAWING 5.3.5

Culverts over 1,000 mm in diameter must include gratings for public safety. Gratings shall have a maximum clear bar spacing of 150 mm and shall be suitably anchored to the structure while still allowing maintenance access. Grated culvert structures must be designed with twice the required hydraulic capacity in order to prevent plugging and shall be designed for a maximum flow velocity of 1.0 m/s through the grating.

3.3.9 Major System

The major system shall be designed to sufficiently provide continuous overland flow along surface routes to a specified storm water management system or watercourse. The major system shall be designed with the following considerations:

- Major system conveyance components must provide continuous overland flow routes to a designated storm water management system or receiving watercourse;
- Overland flow routes shall accommodate 1:100 year design flows plus existing and anticipated overflows from stormwater management facilities;
- The depth of ponding from peak flows for major system conveyances shall prevent significant hazard to the public, property damage, and erosion; and
- The maximum depth of ponding and flow along major system conveyances resulting from peak flows shall be a minimum of 500 mm below the lowest anticipated landscape grade or opening along adjacent lots and buildings;
- The maximum depths of ponding and flow must be less than 350 mm in roadways and other public rights-of-way, except for arterial roadways, where the water depth at the crown of the road shall not exceed 150 mm; and
- Major overland flow and ponding shall be restricted to within public lands and shall not encroach on to private lands.

Storm water management facilities shall be designed as part of the minor and major system and shall control the peak run-off conditions for events up to the 1:100 year storm event.

3.3.9.1 Trap Lows

Trap lows are used to control the flow of water within storm water management systems by retaining water at low points in a roadway, parking lot, or other low-point area. Trap lows shall not be implemented on arterial roadways or areas of high active transportation. All trap lows must be delineated and identified on all applicable Engineering Drawings (e.g., extents of trap low, maximum depth, etc.).

The maximum ponding area for any trap low in a non-arterial roadway or parking lot shall be 350 mm with the minimum freeboard to the nearest building opening to be 500 mm. Collector roads shall have at least one lane that is not inundated. Local roads shall not have a depth of water more than 50 mm above the crown of the road.

The Consulting Engineer shall recommend a building finished floor elevation above the trapped low ponding elevation for each lot adjacent to a trap low area. The recommended elevation shall ensure surface run-off is adequately drained from the lot, as required.

Storage of water in trapped flows may be utilized to offset peak flows where necessary to keep velocities and depths within requirements. The velocities and depths of flow in the major system shall be as per the following table:

Major System Flow and Velocity Requirements	
Depth of Flow	Maximum Velocity
800 mm	0.5 m/s
300 mm	1.0 m/s
200 mm	2.0 m/s
100 mm	3.0 m/s

3.3.9.2 Lot and Landscape Grading

Lots shall be designed to drain from back to front. Front to back drainage shall not be permitted unless otherwise approved by the County. In cases where front to back drainage is permitted, any required drainage swales located on public lands must be constructed of concrete or to a laneway or PUL.

Lots shall be graded such that building thresholds are located a minimum of 500 mm above the major system hydraulic grade line for the 1:100 year storm event. Private lots that are lower than adjacent roadways, alleys, PUL’s, or utility ROWs should be avoided, where possible.

A minimum grade of 10% for softscape surfaces and 3% for hardscape surfaces shall be required for a minimum 2 m around all buildings. Driveway grades shall be a minimum of 2% and a maximum of 6%. Lot grading plans are to be provided for all developments.

Landscape areas shall have a minimum grade of 2% and a maximum grade of 10% to property line unless otherwise approved.

All retaining walls and drainage easements shall be registered on title in the name of the County by the Developer as part of the Subdivision Plan. If a retaining wall is required between adjacent lots, a swale shall be constructed on the higher elevated side of the retaining wall.

3.3.10 Storm Water Management Facilities (SWMF)

The use of SWMF attenuates peak flow rates to receiving watercourses and downstream sewer systems by providing a temporary receiving area during major storm events. They can also improve overall water quality in the system by allowing particles to settle out of captured water during retention time. The Rational Method shall not be used to design SWMF – computer modelling is required.

All lands required for SWMF shall be contained within a PUL, PUL's shall be designed to accommodate high water level plus additional free board determined by hydraulic network analysis.

All SWMF shall be designed to the 1:100 year storm event and in accordance with the most recent version *Stormwater Management Guidelines for the Province of Alberta* (Alberta Environment and Parks). The Developer shall be responsible for obtaining all approvals from Alberta Environment and Parks and any other AHJ required for the construction of SWMF.

3.3.10.1 Geotechnical Investigation

A site-specific geotechnical investigation shall be undertaken for each SWMF. The geotechnical investigation shall determine the permeability of soils, the elevation of the groundwater table, and any potential contaminants, including salinity. Refer to SECTION 1.20.1.

3.3.10.2 Water Quality

The Consulting Engineer shall incorporate water treatment best management practices into the SWMF design, as required, in order to meet or exceed all water quality requirements not limited to just Alberta Environment and Parks.

3.3.10.3 Emergency Overflow Routes (spillway)

An emergency overflow route shall be incorporated into the design of each SWMF. The emergency overflow shall be placed at the HWL with the routing of surface flow along public land or registered easements identified and the expected frequency of use determined.

In cases where an emergency overflow is unable to be provided, the Consulting Engineer must complete an analysis of the impact of over-topping (above the HWL) the pond and the impacts to adjacent lands. The analysis should also include the surface path over-topped water will travel, the impacts to lands, and the ultimate receiving water body or discharge point. SWMF without an emergency overflow route must be approved by the County.

Lands above the design 1:100 year storm event that are subject to flooding (i.e., over-topping) require a restrictive covenant to be registered against the title of the property. The restrictive covenant shall indicate the land is subject to flooding and that the owner shall not construct any permanent structures.

3.3.10.4 Boundary Control and Use

All SWMF area and adjacent lands required to accommodate the design 1:100 year storm event, including overflow routes, shall remain as public land (PUL) under County control.

Noxious land uses upstream or adjacent to a SWMF shall not be permitted. Noxious land uses include those which cause or have the potential to cause harmful, unpleasant, or poisonous hazards through emissions such as odour, smoke, fumes, or refuse matter.

3.3.10.5 Wet Ponds

The design of wet ponds shall meet all the following minimum requirements:

Wet Pond Minimum Requirements
▪ The lowest building opening of any building adjacent to the pond shall be a minimum of 500 mm above the HWL. The lowest basement weeping tile shall be a minimum of 300mm above the HWL ▪ A minimum horizontal separation of 6m shall be maintained between any basement wall and the HWL boundary ▪ The lowest manhole invert shall be at or above the NWL ▪ The pipe obvert at the lowest manhole upstream of the pond shall be above the HWL during a 1:5 year storm event ▪ The minimum surface area at NWL shall be 2 ha ▪ The minimum depth of water at NWL shall be 2.5 m ▪ The minimum width of water surface at NWL shall be 25 m ▪ Pond side slopes shall be 3:1 from the bottom to 1 m below the NWL and 5:1 from this point to the NWL. Pond side slopes from the NWL to the HWL shall be 7:1 and 4:1 beyond the HWL. ▪ A silt trap shall be provided at the inlets of each pond ▪ Clearly demonstrate factor of safety included in calculations ▪ There shall be no areas of stagnant or poorly circulated water in the pond. Drainage plan to be submitted showing development area, catchment area, natural and planned storage. ▪ The pond shall be designed to incorporate a semi-annual turnover at average annual precipitation ▪ The shoreline treatment for riparian area between the NWL and HWL shall eliminate or reduce shoreline erosion ▪ A minimum of 1.2 m chain link fence shall be placed along the property line for all lots adjoining the pond ▪ Appropriate warning signs installed around facility ▪ All lands within HWL shall be designated as public lands ▪ Inlet and outlets to be fully submerged and at least 200mm above the lake bottom and 1.0m below NWL.

The pond bottom and sides shall consist of impervious materials when the ground water level is below the NWL. Where the ground water level is at the NWL or above, the pond bottom and sides may be pervious materials when supported by a recommendation from a Geotechnical Engineer.

Submerged inlets and outlets are preferred and shall be constructed with the top of pipe a minimum of 1 m below the NWL. Inlets and outlets that are not submerged shall be above the NWL and require fencing along shoreline for 5 m in each direction and a galvanized removeable grate permanently fixed to the structure.

All wet ponds within new developments shall be completed with a system to prevent water stagnation and algae blooms. The Consulting Engineer shall demonstrate that the proposed annual turnover rate, aerators, and fountains will be sufficient to meet this requirement. If an issue with water stagnation or algae bloom occurs during the Warranty and Maintenance Period, the Developer shall be responsible for installing additional aerators or fountains, as required for corrective action, at their sole cost.

The shoreline treatment for riparian area between the NWL and HWL shall be chosen such that shoreline erosion is eliminated and natural vegetation growth is promoted.

An overland spillway drainage route for emergency overflow shall be provided at the HWL. The route shall be identified and defined using publicly owned land (PUL) or established drainage courses and designed to carry flows when the design storage of the pond is exceeded.

The pond and perimeter area must be designed to allow for vehicle access to inlets, outlets, and any other facilities requiring maintenance.

3.3.10.6 Dry Ponds

Dry ponds are not a preferred SWMF, but may be approved, provided water quality treatment requirements are sufficiently met. In these cases, integration of dry ponds with land uses such as flood resistant recreational amenities and sports fields are encouraged.

The design of dry ponds shall meet all the following minimum requirements:

Dry Pond Minimum Requirements
▪ Storage capacity for up to the 1:100 year storm event ▪ Maximum detention time of 24 hours. Ponds shall be designed to drain completely ▪ Maximum depth of water shall be 1.5 m ▪ Maximum 4:1 ratio of effective length to effective width, measured at the HWL ▪ The bottom of the pond shall have a minimum longitudinal slope of 1% and lateral slope of 2% ▪ Maximum side slopes of 6:1 (flatter is preferred) ▪ Water release shall be controlled using an orifice or approved equivalent and shall include provisions for increasing flow rate in an emergency ▪ Provide a low-flow bypass for minor events ▪ Clearly demonstrate factor of safety included in calculations

Inlets and outlets shall have galvanized removeable grates permanently fixed to the structure.

An overland drainage route for overflow shall be provided at the HWL. The route shall be identified and defined using publicly owned land (PUL) or established drainage courses and designed to carry flows when the design storage of the pond is exceeded. Private property subject to potential flooding must be registered in an easement in favor of the County.

All potential safety issues shall be addressed through appropriate signage. Safety issues can include, but are not limited to, catch basin mowing hazard, access to pipe system by a person, etc.

3.3.10.7 Constructed Wetlands

Constructed wetlands shall be designed in accordance with the most recent version *Alberta Guide to Wetland Construction in Stormwater Management Facilities* (Alberta Environment and Parks).

The design of constructed wetlands shall meet all the following minimum requirements:

Constructed Wetland Minimum Requirements
▪ Shall be sized for storage to accommodate a 1:100 year storm event
▪ Designed for self-sustainability and to reduce maintenance efforts
▪ Surrounded by a pedestrian trail, placed at the 1:25 year water level
▪ provided vehicle access to potential maintenance areas
▪ Clearly demonstrate factor of safety included in calculations

An overland drainage route for overflow shall be provided at the HWL. The route shall be identified and defined using publicly owned land (PUL) or established drainage courses and designed to carry flows when the design storage of the pond is exceeded. Private property subject to potential flooding must be registered in an easement in favor of the County.

3.3.10.8 Inlets, Outlets, and Outfall Structures

Obverts of outfall pipes shall be above the 1:5 year flood level in the receiving waterbody. Inverts shall be above winter ice, or the pipe shall be submerged with obverts 1 m below the NWL. Structures shall be placed such that there is minimal adverse affect on surrounding property and are aesthetically blended into the landscape design.

Cut-off walls shall be provided at outlets to prevent undermining of the structure, if necessary. Drop structures or other energy dissipators shall be used to prevent erosion in the receiving waterbody, where necessary

Galvanized grates shall be provided to restrict access Grates shall be able to be opened or removed when required. Grates shall have a maximum clear bar spacing of 150 mm. The maximum flow velocity of an outflow shall be 1.0 m/s.

3.3.11 Materials and Installation

The Developer shall supply and install new materials only. Materials shall be installed within two (2) years from the production date on the certification form. Any such material which are defective in manufacture or have been damaged during or after delivery shall be replaced by the Developer at their expense.

Materials that are different from those described in these Standards and are intended to be used as equivalents must be approved by the County prior to installation. Refer to SECTION 2.10.

3.3.11.1 Pipes

Pipe installation shall be in accordance with the pipe manufacturer's specifications. Pipe alignment shall meet minimum tolerance as per the following table:

Storm Pipe Installation Tolerance	
Alignment	± 150 mm
Grade	± 20 mm

Pipes shall be jointed with appropriate gasketed fitting or coupling. Acceptable pipe material shall be as per the following table:

Acceptable Storm Pipe Material	
Material	Size Range (mm)
Polyvinyl Chloride (PVC) [(1)] solid wall; DR35	100 – 1,500
Polyvinyl Chloride (PVC) [(1)] open profile	200 – 1,500
High Density Polyethylene (HDPE)	100 – 900
Reinforced Concrete Type HS; Class III minimum	250 and greater
(1): PVC pipe for sewers shall not be blue	

Solid wall PVC pipe and fittings shall be in accordance with CSA B182, ASTM D3034, ASTM F679, and ASTM F794 with a minimum stiffness of 320 kPa. Sealing gaskets shall be in accordance with CSA B182 and ASTM F477 and able to withstand a minimum 320 kPa hydrostatic pressure. Open wall PVC pipe and fittings shall be in accordance with CSA B182 and ASTM F794 with a minimum stiffness of 320 kPa.

HDPE pipe and fittings shall be in accordance with CSA B182 with a minimum stiffness of 320 kPa.

All concrete pipes shall be manufactured using Type HS cement in accordance with CSA A3000. Reinforced concrete pipes shall be in accordance with CSA A257 and ASTM C76. All joints shall be confined “O” ring rubber gasket in accordance with ASTM C443 and CSA A257. Reinforcing bars shall be in accordance with CSA G30; Grade 400.

Pipes shall be tested by the manufacturer and marked in accordance with CSA B182. Test results shall be recorded on a certification form signed by a qualified representative of the manufacturer.

3.3.11.2 Manholes

All manholes shall be manufactured using Type HS cement in accordance with ASTM C478 and installed as per manufacturer’s specifications.

All manholes shall be a minimum 1,200 inside diameter. Oversizing manholes is acceptable to accommodate pipe diameters and increased storage.

Manhole steps shall be standard safety type consisting of hot dipped galvanized iron or aluminum in accordance with ASTM A123.

Safety steps shall be aligned on centreline perpendicular to the main flow channel. The distance from the top of the rim to the first step shall not be greater than 300 mm. Steps shall be evenly spaced at a maximum of 400 mm to within 300 mm of the manhole base (benching).

All joints shall be sealed with rubber gaskets in accordance with ASTM C443 and grouted with non-shrink grouting.

Manhole frames and covers shall be dipped cast iron conforming to Class 20 ASTM A48 and ASTM A536. Type F80 frames and covers shall be used for all streets, driveways, and other paved areas. Type F90 frames and covers with rubber gasket shall be used for manholes located in sags and low areas. Type F39 frames and covers shall be used for all other areas. Castings shall be marked with series designation, foundry identification and date of casting. All storm manhole covers shall be labelled with “Sturgeon County” and “STM”.

Tee Riser manholes shall be in accordance with CSA A257 and ASTM C76.

Pre-benched manhole bases shall be use wherever possible, complete with pre-cored connection holes and watertight joints. All connections shall be watertight using Duraseal or G-Loc joints or approved equivalent. Manhole bases shall be pre-finished, pre-benched manhole bases properly formed to suit the gravity sewer pipe. Bases shall be placed on 200 mm of granular base course that extends a minimum of 150 mm around the base.

Backfill around manholes shall be compacted to a minimum 98% SPD. Complete field density testing around manholes in accordance with SECTION 3.5.4.

3.3.11.3 Catch Basins

All Catch basin barrels shall be manufactured with Type HS cement in accordance with ASTM C139 and installed as per manufacturer’s specifications.

Catch basin steps shall be standard safety type consisting of hot dipped galvanized iron or aluminum in accordance with ASTM A123.

Catch basin frames and grates shall be dipped cast iron Class 20 in accordance with ASTM A48 and ASTM A536. Type F38 or F39 frames and grates shall be used for all round top

inlet catch basins. Type F51 grates with side inlets shall be used for straight face curbs. Type K7 double frames and grates shall be used for mountable (i.e., rolled face) curbs.

Castings shall be marked with series designation, foundry identification and date of casting. All catch basin frames shall be labelled with “Sturgeon County” and “STM”.

Backfill around catch basins shall be compacted to a minimum 98% SPD. Complete field density testing around manholes in accordance with SECTION 3.5.4.

3.3.11.4 Concrete

All concrete required for the construction of the storm water management system shall be in accordance with SECTION 3.1.21. Notwithstanding that section, all concrete shall be constructed with Type HS sulfate resistant cement and a minimum 28-day compressive strength of 25 MPa. The minimum concrete cover on all reinforcing steel is 75 mm.

3.3.11.5 Cement Mortar

Cement mortar shall consist of one (1) part Portland Cement (Type HS) in accordance with CSA A3000 and two (2) parts clean sharp sand with sufficient water added to produce a stiff paste. Additives are not permitted.

3.3.11.6 Foundation Drain Service

Inline tee or wye fittings shall be installed during sewer main construction at all service connection locations. Saddles shall be permitted only for service connections to existing mains.

Where foundation drain collection mains are required to connect with mains in excess of 4 m deep, risers shall be installed to 4m below finished surface grade.

Red painted stakes of size 38mm x 89mm shall be extended from the end of the service connection to a minimum of 0.75 m above the ground.

3.3.11.7 Service Crossing Existing Structures

All service connections passing underneath an existing or proposed roadway, walkway, or other surface feature shall be completed using auguring method or an alternative approved equivalent trenchless method. In situations where trenchless method is not feasible due to adverse soil conditions, open cut method may be permitted, following reasonable justification by the Contractor and approval by the County.

All auger pit excavations shall be backfilled with granular bedding material in lifts not exceeding 150 mm. Backfill shall be mechanically compacted to 95% SPD up to 350 mm above the pipe and 98% SPD above that. Roadside slopes shall be compacted to 98% SPD.

3.3.11.8 Connecting to Existing System

Utility and Waste Management Services must be contacted prior to connecting to any existing County utility infrastructure. Coring into existing manholes shall be completed in accordance with best practices. Existing manhole floors shall be re-channelled and benched, the junction area grouted to form a smooth joint, and all debris removed. The connection area shall be left in a manner acceptable to the County.

3.3.12 Trenching, Bedding and Backfill

In accordance with SECTION 3.5.

3.3.13 Inspection and Testing

The Consulting Engineer and Contractor are responsible for inspecting and testing all new storm water management system components. Inspections and testing shall be in accordance with SECTION 3.6.

3.3.13.1 CCTV Inspection

Prior to issuing CCC, all storm water management system components, including lateral services, shall be CCTV inspected. At the end of the Warranty and Maintenance Period and prior to issuing FAC, sewers shall again be inspected by CCTV.

3.3.13.2 Exfiltration/Infiltration Leakage Test

Where deemed necessary by the County, an exfiltration and/or infiltration test shall be completed by the Developer. This test shall not be required if CCTV is completed immediately after sewer construction and no deficiencies are observed.

3.3.13.3 Deflection Test

Where deemed necessary by the County, a deflection test shall be completed by the Developer. A deflection test shall not be required if CCTV is completed immediately after sewer construction and no deficiencies are observed.

3.3.13.4 Concrete Test

The Developer shall be responsible for ensuring all required concrete testing is completed.

3.3.14 Storm CCC/FAC Acceptance Criteria

All laboratory and field test results for new storm water management system components must be submitted to the County prior to acceptance. Test results must clearly indicate all constructed work conforms to Construction Specifications and the inspection and testing described in SECTION 3.3.13 is within the tolerances specified in SECTION 3.6. In all situations the County shall have the final decision on whether completed work is acceptable.

SWMF pond as-builts shall be completed under dry conditions and with the pond bottom visible. Inspections shall only be completed once the water level in the SWMF has been established to the NWL.

All appurtenances such as manholes, catch basins, SWMF, culverts, ditches, and rip-rap shall be visually inspected for conformance prior to acceptance. Refer to SECTION 2.9 for inspection requirements.

The storm water management system, or any portion therein, shall be replaced prior to acceptance if at any time:

1. Any deficiency is defined as a safety hazard by the County Project Representative;
2. The asset is not built in accordance with Construction Drawings or Construction Specifications;
3. The asset does not function as intended; or
4. A deficiency is determined by the County Project Representative to be out of tolerance as set by these Standards.

VISUAL INSPECTION ACCEPTANCE CRITERIA CHECKLIST

Visual inspection acceptance criteria shall include, at a minimum, all of the following:

☑	**Storm Water Management System CCC/FAC Acceptance Criteria**
☐	All components of the storm water management system are installed in accordance with Construction Drawings
☐	Rip-rap is located (culverts, outlet, etc.) and installed in accordance with Construction Specifications
☐	Oil and grit separator is installed (if applicable)
☐	ESC Measures are installed, maintained, and functioning as per approved ESC Plan or Good Housekeeping Practices (i.e. inlet protection)
☐	Manholes and catch basins: ☐ located and installed as per Construction Drawings ☐ All manhole and catch basin covers and frames labelled with “Sturgeon County” and “STM” ☐ Connecting pipes are unobstructed and clear of debris ☐ F90 type covers installed and sealed in all sags and low points ☐ Grade rings are properly aligned ☐ Grade rings are properly grouted and sealed ☐ Manhole steps are properly installed and spaced ☐ Benching is visible and unobstructed ☐ All wick drains installed, connected, and trimmed to 6” ☐ Interior/exterior drop structures installed (if applicable)
☐	SWMF (if applicable) ☐ All mulched areas topped up to a 100mm depth (excluding naturalized planting beds and areas below 1:25) ☐ Inlet, outlet, and any other installed structure is free from damage and clear of debris and/or blockages ☐ Rip-rap is located and installed in accordance with Construction Specifications ☐ Outlet control structure is installed and outlet valve is properly adjusted to control the detention time as per Specifications ☐ Pond water level is not below the NWL elevation ☐ Riparian vegetation is established and healthy

	☐ Inlet and outlet complete with removable grate (dry pond) ☐ Standing water is not present more than 24 hours after a storm (dry pond) ☐ No signs of erosion within or around the pond ☐ Emergency overflow route (spillway) installed ☐ ESC measures installed ☐ Pond signage installed ☐ Fencing installed (if applicable) ☐ No presence of weeds, algae, oily sheen, or spills within the pond
☐	Minor Pipe Systems ☐ Pipe is clear of debris and/or blockages ☐ Pipe grade is within specified tolerances with no visible signs of localized sagging or loss of grade ☐ Pipe horizontal alignment is within specified tolerances ☐ CCTV inspected and coded in accordance with NASSCO PACP Version 7.0.0 or newer (pipes less than 1,200mm nominal diameter). All defects shall be repaired. ☐ Visual inspection by person entry and coded in accordance with NASSCO PACP Version 7.0.0 or newer (pipes greater than or equal to 1,200mm nominal diameter). All defects shall be photographed, labelled and repaired. 12:00 to 6:00 and 3:00 to 9:00 diametric measurements shall be obtained at 5m intervals along the pipe segment during the inspection. ☐ Inspections (CCTV and Person Entry) and infiltration testing for flexible pipe shall be performed a minimum of 30 days after full column of final backfill has been constructed above the test section. ☐ Inspections (CCTV and Person Entry) and infiltration testing for rigid pipe shall be performed a minimum of 365 days after full column of final backfill has been constructed above the test section.

3.4 Sanitary Sewer Systems

3.4.1 General

The Developer and their Consulting Engineer are responsible for understanding and adhering to all requirements listed in these Standards and ensuring any variances, conflicts, or inconsistencies are promptly communicated to the County during the review process. Variances shall be reviewed and approved or rejected by the County in accordance with the variance review process in Section 2.10.

These requirements are intended to represent the minimum acceptable standards and should not be considered as a substitute for detailed material and Construction Specifications to be prepared by the Consulting Engineer. The Developer and their Consulting Engineer is responsible for developing and implementing designs in accordance with good engineering practice, industry standards, specific-site condition requirements, and as may be required by other Authority's Having Jurisdiction.

Where conflicts or inconsistencies with the General Municipal Servicing Standards arise due to adoption of other planning and design documents, the Developer shall be responsible for satisfying the more stringent requirement.

The Developer and their Consulting Engineer are responsible to ensure all work is designed and completed using engineering best practice to achieve design life and safety expectations consistent with good design and construction practices and in accordance with the design intent of the work.

The design of sanitary sewer systems shall be in accordance with the most recent version *Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems* (Alberta Environment and Parks).

Plan-profile drawings, specifications, and a design report must be prepared by a Licenced Engineer and be submitted to the County and Alberta Environment and Parks for review. All necessary approvals must be granted by Alberta Environment and Parks and submitted to the County prior to construction.

3.4.2 Residential Design Population

Design population densities shall conform with the densities prescribed in applicable Area Structure Plans within the County. In instances where an Area Structure Plan is not available, residential design population is based on development density as per the following table:

Low Density	3.5 persons/residence
Medium Density	3.5 persons/residence
High Density	2.5 persons/residence

If an Area Structure Plan is unavailable and design population is unknown, use a design population of 3.5 persons/residence.

The sanitary sewer system shall be designed to convey the peak dry weather flow contribution and infiltration without the use of holding tanks.

3.4.3 Average Wastewater Generation

Residential wastewater generation shall be designed for 300 L/day/person.

Specific wastewater generation shall be calculated for commercial and industrial developments since generation will vary significantly for each development. For preliminary planning purposes, commercial and industrial wastewater generation shall be designed using an average flow rate of 20,000 L/ha/day. If this preliminary planning value is to be used, the calculation shall be verified in the future and revised, as needed, when more information becomes available.

3.4.4 Peak Dry Weather Flow

3.4.4.1 Residential

Residential peak dry weather flows shall be calculated using the following formula:

$$Q_{pdw} = \frac{(G \times P \times P_f)}{86.4}$$

where,

$$Q_{pdw} = peak\ dry\ weather\ flow\ (L/s)$$
$$G = the\ per\ capita\ average\ daily\ design\ flow\ (L/day)$$
$$P = the\ design\ contributing\ population, in\ thousands$$
$$P_f = Harmon's\ peaking\ factor$$

Harmon's Peaking Factor shall be calculated using the Harmon's formula:

$$P_f = 1 + \frac{14}{(4 + \sqrt{P})}$$

where,

$$P_f = Harmon's\ peaking\ factor$$
$$P = the\ design\ contributing\ population, in\ thousands$$

If the design contributing population (P) is less than 1.0, a Harmon's peaking factor (P_f) of 4.5 shall be used.

Harmon's peaking factor (P_f) shall not be less than 3.0. If Harmon's peaking factor is calculated to be less than 3.0, use 3.0.

3.4.4.2 Non-residential

Non-residential peak dry weather flows shall be calculated using the following formula:

$$Q_{pdw} = (Q_{AVG} \times P_f)$$

where,

$$Q_{pdw} = peak\ dry\ weather\ flow\ (L/s)$$
$$Q_{AVG} = average\ flow\ rate\ (L/s)$$
$$P_f = peaking\ factor$$

The non-residential peaking factor shall be calculated using the formula:

$$P_f = 10(Q_{AVG})^{-0.45}$$

where,

$$P_f = peaking\ factor$$
$$Q_{AVE} = average\ flow\ rate\ (L/s)$$

The peaking factor shall not be less than 3.0 or greater than 25.0. If a peaking factor of less than 3.0 is calculated, use 3.0. If a peaking factor of greater than 25 is calculated, use 25.0.

3.4.5 Infiltration and Inflow Allowance

Design flows shall include an allowance of 0.28 L/s/ha to account for groundwater infiltration and system inflows.

Design flows shall include an allowance of 0.4 L/s/ha shall be added for each manhole located in a sag with some degree of water inflow control in place.

Design flows shall include an allowance of 0.6 L/s/ha in areas where storm services are connected to the sanitary sewer system, including roof leaders and foundation drains. **New systems must not have roof leaders and foundation drains or any other storm service connected to the sanitary sewer system.**

3.4.6 Required Sewer Capacity

The sanitary system shall be designed with sufficient capacity to accommodate combined peak dry weather flow and infiltration and inflow allowances.

New sewers shall be designed with full flow capacity not exceeding 80% of the pipe diameter based on a maximum utilization rate of 86% of the pipe hydraulic capacity. As such, required sewer capacity shall be determined as per the following formula:

$$\text{Required Sewer Capacity} = \frac{\text{Estimated Design Flow}}{0.86}$$

3.4.7 Flow Velocities

Sanitary sewer systems shall be designed to meet the following velocities for peak dry weather flow:

Gravity Sewer	
Minimum Velocity	0.6 m/s
Maximum Velocity	3.0 m/s
Force Main	
Minimum Velocity	0.9 m/s
Maximum Velocity	2.5 m/s

3.4.8 Pipe Design

Gravity sewer pipes shall be sized using Manning's equation:

$$Q = \frac{1}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

where,

$$Q = quantity\ of\ flow (m^3/s)$$
$$n = roughness\ cofficient$$
$$A = cross\ sectional\ area\ of\ flow (m^2)$$
$$R = hydraulic\ radius (m)$$
$$S = slope\ (m/m)$$

Manning's roughness coefficient shall be n = 0.011 for PVC and n = 0.013 for all other material.

MINIMUM PIPE DIAMETER

The minimum pipe diameter for gravity sewers shall be as per the following table:

Residential Main	200 mm
Single-Unit Service	150 mm
Multi-Unit Service	150 mm
Commercial Main	250 mm
Commercial Service	150 mm
Industrial Main	250 mm
Industrial Service	150 mm

Some developments may require larger service sizes than the above minimums to accommodate additional demands for the specific development. The Developer is responsible for ensuring proposed service size meets the demand for the development.

MINIMUM PIPE SLOPE

The minimum pipe slope for gravity sewers shall be as per the following table:

Pipe Diameter	Minimum Slope [(1)]
150 mm [(1)]	2.0%
200 mm	0.40%
250 mm	0.28%
300 mm	0.22%
375 mm and greater	0.15%
(1): Minimum slopes shall be increased by 50% for all curved pipes (2): Single-unit residential storm service	

The minimum slope on the first upstream segment of pipe shall be increased to 1%.

3.4.9 Depth of Cover

Sanitary sewers shall have a minimum depth of cover of 2.75 m. Depth of cover is measured from the top of pipe to the finished surface grade.

Sufficient depth of cover shall be provided to allow basement service connections, avoid conflicts with other underground services, prevent damage from surface loading, and to prevent freezing of installed pipes.

3.4.10 Storm Sewer Connection to Sanitary System

Roof leaders, foundation drains (weeping tile), and any similar service that conveys storm water or ground water shall not discharge to the sanitary system. Under no circumstances shall storm services connect to the sanitary system.

3.4.11 Curved Sewer Mains

Curved sewer mains shall be permitted with the following requirements:

- The curve shall run parallel to the curb or street centerline;

- Maximum joint deflection shall be as recommended by the pipe manufacturer;
- The minimum grade shall be increased by 50% as compared to straight pipes; and
- Manholes shall be located, at a minimum, at the BC and EC for each curve.

3.4.12 Minimum Separation and Crossings

Minimum horizontal and vertical separation from other deep services shall be as per the following table:

Minimum Horizontal Separation	3.0 m
Minimum Vertical Separation	0.5 m

A minimum horizontal separation of 2 m shall be maintained between sewer mains and shallow or franchise utility services (gas, power, telecommunications, etc.).

Sewer mains shall cross below water lines wherever possible. The minimum vertical separation between lines, measured from obvert of the bottom pipe to the invert of the top pipe, is 0.5 m. If the minimum separation cannot be achieved, protective measures, such as metal casings may be acceptable, following review and approval from the County.

In addition to the minimum vertical separation, where it is necessary to cross the sewer main above a water line, the sewer line shall be provided structural support at the crossing to prevent excessive deflection. Lines shall be centered such that joints are an equal distance from the crossing.

3.4.13 Manholes

Manholes shall be required at all transitions in size, grade, or direction, and at the junctions of mains.

Manholes shall not be located in sags, whenever avoidable. Otherwise, controls must be put in place to seal the manhole lid from inflow (i.e., type F90), such as surface runoff. Wherever possible, manholes shall be placed outside of driveways and sidewalks.

All manholes shall be a minimum diameter of 1,200 mm. The maximum spacing between manholes shall be 120 m.

Maximum change in flow direction shall be based on pipe diameter and shall not exceed the following:

Pipe Diameter	Maximum Change in Flow Direction
Smaller than 600mm	90°
600mm and greater	45°

Change in flow direction shall not exceed 90 degrees. If such a change is unavoidable, use two manholes.

Invert elevation drops in manholes shall be based on change in flow direction and shall meet the following minimum requirements:

Change in Flow Direction	Minimum Invert Elevation Drop
0° deflection	10 mm
Up to 90° deflection	50 mm
Greater than 90° deflection	Use two manholes

Notwithstanding the above minimum elevation drops, where pipe diameter increases across a manhole, the crown of the downstream pipe shall match the crown of the upstream. The obvert of a pipe entering a manhole shall not be lower than the obvert of a pipe outlet in the same manhole.

Where drops between inlets and outlets greater than 750 mm cannot be avoided, a drop manhole must be used. An interior drop manhole can only be used for 200 mm and 250 mm incoming sewers. External drop manholes must be used in all other situations. Refer to DRAWINGS 3.6.3 & 3.6.4. Where standard drop manhole structures are not sufficient, a specifically designed drop manhole structure shall be required to address the hydraulic and energy dissipation requirements.

Benching shall be provided in all manholes. Manhole bases shall be pre-benched whenever possible.

Perched or oversized manholes shall be required for 600mm to 1050mm diameter mains.

Safety platforms shall be required for all manholes greater than 6m in depth. A platform design shall be submitted to the Sturgeon County for acceptance and shall include structural details, fastening details and location within the manhole.

3.4.14 Service Connections

Each lot or unit shall have its own separate sanitary sewer connection, complete with a backflow prevention device.

The minimum size of sanitary services is 150mm. All services shall be sized according to site-specific anticipated needs of the development. The minimum grade of services shall be 2% with a minimum depth of cover of 2.75m at the property line.

Sanitary service connections shall be completed using an inline tee and shall not be connected using a manhole, except for where a manhole is required, such as a cul-de-sac or major development. Manhole connections are required for services larger than 200 mm.

A sanitary sampling manhole shall be provided on the service pipe for each industrial or commercial lot, unless otherwise approved by the County. The sampling manhole shall be installed at the same time the service is installed. The sampling manhole shall be a minimum of 1,200 mm diameter and located 0.5m from the property line on public property. If the sampling manhole cannot be located on public property, it shall instead be located on private property with an appropriately sized easement registered for municipal access

Multi-unit residential developments with an intensity of more than 40 residential units shall require a sampling manhole.

All service connections shall be from the front of the street or the rear lane (if applicable). Services connections from the side yard PUL or municipal reserves shall not be permitted.

Services shall be located to not conflict with driveways, accesses, or other existing or proposed structures.

Where sanitary services are required to connect with mains in excess of 4m deep, risers shall be installed to 4m below finished surface grade.

Connection manholes and services to property lines for multi-unit and apartment lots shall be completed at the time of initial subdivision development. Services to commercial and industrial lots may be completed at the time the lot is developed, provided there is no disturbance to the roadway when connecting to the main.

Hydrocarbon and grease traps shall be provided at all food processing establishments shopping centers, gas stations, car washes, hotels/motels, manufacturing facility,

equipment servicing facility, and any other facility that is expected to discharge hydrocarbons or grease in accordance with Safety Code Act.

The Consulting Engineer is responsible for providing detailed Record Drawings for all installed service connections. Drawings must include, at a minimum, pipe diameter, elevation, lot number, and relative location to property line for each service. Refer to SECTION 2.13.

3.4.15 Abandoned Services

Sanitary services shall be abandoned with a manufactured compression type plug at the main. The service pipe shall be completely removed from within the County ROW unless otherwise approved by the County. Any service pipe to remain on private property shall have a manufactured compression type plug installed at the property line.

3.4.16 Sanitary Pressure Systems

Gravity systems are required; however, alternative designs using pressurized systems will be considered if the constraints associated with a gravity system is unable to be resolved. The Engineering Consultant shall be responsible for providing sufficient justification and related documentation, to the County's satisfaction. The use of a force main pressure systems must be approved by the County.

3.4.16.1 Force mains

Hazen-Williams formula shall be used to determine pipe flow. A roughness coefficient of 120 shall be used for all mains.

The design velocity shall be a minimum of 0.9 m/s and a maximum of 2.5 m/s.

The minimum pipe diameter for force main pressure sewers shall be as per the following table:

Main	100 mm
Single-unit Residential Service	38 mm
Industrial Service	Calculate
Commercial Service	Calculate

Commercial and Industrial services shall be calculated based on demand requirements and to achieve pressure requirements. Some developments may require larger service

sizes than the above minimums to accommodate additional demands. The Developer is responsible for ensuring proposed service size meets the demand for the development.

Direct pressure connections of individual septic pumpout systems to a County force main are generally not allowed. If no other option exists for servicing septic system pumpouts, the County may review such connections on a case by case basis considering the hydraulics of the septic pumpout system compared to the overall hydraulic flow regime of the County force main and pumping system under various operating scenarios.

Service connections shall be a HDPE DR11 material in accordance with CSA B137 and installed as per the manufacturer's recommendations. Service connections shall be made using an inline tee.

The end of a sanitary sewer connection pipe shall be adequately plugged to prevent infiltration of earth, water, or other deleterious materials. Red painted stakes of size 50mm x 100mm shall be extended from the end of the service connection to a minimum of 0.75m above the ground.

Isolation valves shall be installed along the system as required to isolate sections for servicing, repair, or maintenance. An isolation valve shall be installed each intersection where branches can be isolated. Valves shall be a plug or ball valve type and equipped with a gear actuator and non-rising stem to be operable from ground level.

Flush points shall be installed at the end of every branch and, as required, at intermediary points on long stretches of pipe.

Force main outlet manholes subject to sulfide compromise shall be constructed with inert materials and have adequate protective coating.

Any force main constructed of PVC, HDPE, or other similar nonconductive material shall have tracer wire installed. Tracer wire shall be 14-gauge coated copper wire complete with sacrificial anodes every 1000 linear meters. Tracer wire shall have connection points exposed at every opportunity, including all valves and air reliefs.

Sacrificial anodes shall be installed in accordance with SECTION 3.2.13.8.

The pressure rating of the pipe shall be twice the operating pressure or 690 kPa, whichever is greater. The force main design pressure shall allow for the normal static and dynamic operating pressures including water hammer effects.

Force main grades should be designed to avoid the requirement for an air release valve wherever possible. When unavoidable, air release valves shall be installed in concrete access chambers at all relative high points. Blow-off valves shall be provided at all low points.

When the force main length exceeds 1000 metres, cleanouts shall be installed in concrete access chambers complete with isolation valves and adaptor coupling for line flushing.

When force mains discharge into a manhole, a drop structure shall be required for energy dissipation.

A hydrostatic pressure test shall be completed prior to acceptance for all new force mains in accordance with SECTION 3.6.3.

3.4.16.2 Thrust Restraint

Joint thrust restraint shall be provided using either concrete thrust blocks or mechanical joint restraints at all fittings, including bends, tees, fittings, and any other location where joints do not resist longitudinal loading. Mechanical joint restraints shall be designed and installed as per the manufacturer's specifications.

Concrete thrust blocks may be used as an alternative to, or in conjunction with, mechanical joint restraints. Thrust blocks shall be constructed of Type HS sulfate resistant concrete with a minimum 28-day compressive strength of 25 MPa.

When using thrust blocks, all cast iron fittings shall be wrapped in bond breaker polyethylene sheets or approved equivalent to prevent direct contact between surfaces.

Mechanical joint restraints shall conform to AWWA C111 and ASTM F1674. All nuts, bolts and restraining rods shall be Type 304 stainless steel and wrapped in Denso tape. Diameter and pressure rating must match the pipe and fitting to which the restraint is being applied and include a minimum safety factor of 2.0. Gland shall be constructed of high strength ductile iron conforming to ASTM-A536.

3.4.16.3 Lift Stations

All lift stations shall be designed in accordance with *Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Design* (Alberta Environment and Parks) and any other requirements from an Authority Having Jurisdiction.

For each lift station, the Consulting Engineer shall complete a report to determine the most cost-effective equipment and arrangement. The report shall include, at a minimum, all the following considerations:

- Detailed justification for the requirement of the lift station;
- Cost of facility and expected service life;
- Area serviced, including population densities and ultimate total population;
- Contributing areas, including average and peak weather flows;
- Specifications of proposed pumping units, including number, type, and capacity;
- Energy costs during the service life;
- Reliability and safety;
- Flood proofing;
- Nuisance to adjacent residents, open spaces, and other nearby developments;
- Operation and maintenance costs, including replacement costs of pumping equipment and associated items;
- System head curves, including head computations for the pumping system;
- Local availability of repair servicing, spare parts, and equipment suppliers;
- Potential for contamination to the environment;
- P&ID for lift stations and control gates, including level start and stop, motor and pump description, and all instrumentation;
- Sewage detention times in the wet well and force main for various operating conditions;
- Projected present value of operating costs including those for power, operation, and maintenance for the service life;
- Emergency backup systems;
- Proposed or completed public consultation process; and
- Any other information required by the County.

Lift stations shall be located outside of any location subject to surface ponding or inundation by surface flow and shall be accessible by road in all weather conditions

The Developer shall be responsible for all landscaping required to enhance the aesthetic appearance of the lift station facility.

All lift stations shall require a suitable building to house electrical and control equipment, including backup generator. The building shall be included as part of the overall architectural design and considered in the development's aesthetics.

Structural members shall be masonry, concrete or structural steel. Wood frame buildings are not permitted. Buildings shall comply with the Alberta Building Code.

Access to the wet well shall not be from within the building.

Windows are not permitted in lift station buildings.

CONFIGURATION

Wet well/dry well configuration is preferred. Wet well configurations (submersible pump) shall only be an acceptable alternative for facilities with pumping requirements of less than 75 kW and if the pump is located 8m or less below the ground elevation in the wet well. The Consulting Engineer shall review any proposed wet well configurations with the County prior to engineered drawing submission.

A collection manhole shall intercept flow from all incoming sewers before discharging to the pumping station. The station shall receive flow from one inlet only. Provision shall be made to shut off flow from the collection manhole if required.

PUMPING STATION

Lift stations shall be equipped with two or more pumps sized such that if one pump is out of service, the remaining pumps can pump at the design capacity flow rate. Pumps shall be identical and interchangeable for a duplex pumping station. Pumps starts shall alternate between pumps.

Pumping capacity shall be designed for peak flows with 100% redundancy.

Submersible pumps shall have a non-clog impeller design and flush valves.

Pump motors shall operate on 3-phase power wherever possible.

Wet well storage shall be provided to minimize frequency of pump starts. The maximum retention time in the wet well shall be 30 minutes.

VALVES AND PIPING

The minimum diameter for all pump suction and discharge piping shall be 100mm.

The minimum flow velocity in the lift station shall be 0.9 m/s. The maximum flow velocity in the lift station shall be 2.5 m/s.

The minimum pressure rating of piping within the station shall be determined based on calculated operating pressures but shall be a minimum of 900 kPa.

Pumps shall be connected in parallel to a common discharge header located within the station. Check valves and isolation valves shall be installed on the discharge line between each pump and the discharge header.

A force main isolation valve shall be installed on the main discharge pipe outside the wet well.

Water supply shall be provided to the facility for washing/cleaning purposes.

The design shall ensure that the connection between the potable water supply and the wastewater pumping station does not cause contamination of the potable water supply. Where a potable water supply is to be used for washing/cleaning purposes, a break tank, pressure pump and pressure tank shall be provided. In-line backflow preventers are not acceptable. The potable water shall be discharged to the break tank through an air gap at least 150 mm above the maximum flood line or the spill line of the tank.

ALARMS AND EMERGENCY BACKUP

Detailed lift station design shall include full mechanical redundancy and emergency backup systems, including overflow provisions and standby generator, for the entire functional service life.

Lift stations shall be equipped with or provided with the feature for future connection of remote sensing and telemetry equipment enabling operators to monitor the alarms.

Power shall be supplied from two independent sources. In the event of a power failure, secondary power must automatically engage through a backup generator or direct-coupled motor. Secondary power system must not be fuelled by natural gas unless a supply tank is provided on site.

Special consideration shall be made to control any possible overflow in a manner acceptable to the County.

ACCESS AND MAINTENANCE

Permanent hoist equipment and access hatches of sufficient size and capacity shall be provided for removal of station equipment.

All access points shall have locking devices.

Ladders shall be non-skid and shall comply with Occupational Health and Safety requirements.

Lift stations shall have adequate interior and exterior lighting.

The Developer is responsible for the supply of an Operating and Maintenance manual for the facility. The manual shall include a complete parts list for all mechanical and electrical components including control diagrams, schematics and manufacturer's operation, maintenance, service and repair specifications. The Developer shall submit five (5) copies to the County along with all commissioning and testing results prior to issuance of the CCC.

HEATING AND VENTILATION

Forced mechanical ventilation is required for dry wells below ground level and for wet wells containing screens or mechanical equipment requiring maintenance or inspection.

Equipment shall provide at least six air changes per hour. Provision shall be made for ventilation of the wells with portable equipment in case of system failure. Ventilation failure alarms are required. Location of ventilation and pumping stations to be situated in a location to minimize the impact to adjacent development in terms of visibility, odour and noise.

There shall be no interconnection between wet well and dry well ventilation systems.

Multiple air inlets and outlets are required for dry wells over 5m deep. Air intakes and outlets shall be designed to function year round and screen openings should be sized to avoid frost build-up or clogging.

Air shall be forced into the dry well at a point 150mm above the pump floor and into the wet well at a point 150mm above the HWL.

Automatic heating and dehumidification equipment shall be provided in all dry wells.

3.4.17 Materials and Installation

The Developer shall supply and install new materials only. Materials shall be installed within two years from the production date on the certification form. Any such material which are defective in manufacture or have been damaged during or after delivery shall be replaced by the Developer at their expense.

Materials that are different from those described in these Standards and are intended to be used as equivalents must be approved by the County prior to installation. Refer to SECTION 2.10.

3.4.17.1 Pipes and Fittings

Pipe installation shall be in accordance with the pipe manufacturer's specifications.

Pipe alignment shall meet minimum tolerance as per the following table:

Pipe Installation Tolerance	
Alignment	± 150 mm
Grade	± 20 mm

Pipes shall be jointed with appropriate gasketed fitting or coupling. Acceptable pipe material for gravity sewers shall be as per the following table:

Acceptable Pipe Material for Gravity Sanitary Systems	
Material	Size Range
Polyvinyl Chloride (PVC); DR 35 (1)	100 mm – 1,500 mm
Reinforced Concrete; Type HS Class III minimum	525 mm and greater
(1): PVC pipe for sewers shall not be blue	

Acceptable Pipe Material for Pressurized Sanitary Systems	
Material	Size Range
Polyvinyl Chloride (PVC); DR 18 (1)	100 mm – 900 mm
High Density Polyethylene (HDPE); DR 11	100 mm and greater
(1): PVC pipe for sewers shall not be blue	

Gravity sanitary system mains shall be PVC or concrete material. Single-unit residential services shall be PVC material. Non-residential services shall be PVC or concrete material.

PVC pipe and fittings shall be in accordance with CSA B182, ASTM D3034, ASTM F679, and ASTM F794 with a minimum stiffness of 320 kPa. Sealing gaskets shall be in accordance with CSA B182 and ASTM F477 and able to withstand a minimum 320 kPa hydrostatic pressure.

All concrete pipes shall be manufactured using Type HS cement in accordance with CSA A3000. Reinforced concrete pipes shall be in accordance with CSA A257 and ASTM C76. All joints shall be confined “O” ring rubber gasket in accordance with ASTM C443 and CSA A257. Reinforcing bars shall be in accordance with CSA G30; Grade 400.

HDPE pipe and fittings shall be in accordance with AWWA C906 and CSA B137. Pipes shall be joined by thermal-butt fusion, flange assemblies, or compression type fittings. Service tapping saddles shall be Robar type 2706 or approved equivalent with bronze body, 44 mm wide stainless steel straps with stainless steel nuts and bolts.

Inline tee (service connections) or wye injection molded gasketed fittings shall be in accordance with CSA B182 and fabricated fittings shall be in accordance with CSA B182 and ASTM F679

Pipes shall be tested by the manufacturer and marked in accordance with CSA B182. Test results shall be recorded on a certification form signed by a qualified representative of the manufacturer.

3.4.17.2 Sanitary Services

Each lot or multi-unit dwelling shall have a separate service connection.

Single-unit residential service pipe and fittings shall be a minimum 150mm diameter and consist of PVC material. Non-residential service pipe shall be PVC or reinforced concrete

material. Materials and installation shall be in accordance with standards described in SECTION 3.4.17.1.

For single-unit lots, sanitary services shall be installed in a common trench with the water and foundation drain service.

Inline tee or wye fittings shall be installed during sanitary main construction at all service connection locations. Saddles shall be permitted only for service connections to existing mains.

The end of a sanitary sewer connection pipe shall be adequately plugged to prevent infiltration of earth, water, or other deleterious materials. Red painted stakes of size 50mm x 100mm shall be extended from the end of the service connection to a minimum of 0.75m above the ground.

3.4.17.3 Manholes

All manholes shall be manufactured using Type HS cement and in accordance with ASTM C478, CSA A257, and installed as per manufacturer's specifications. Tee Riser manholes shall be in accordance with CSA A257 and ASTM C76.

All manholes shall be a minimum 1,200 inside diameter. Oversizing manholes is acceptable to accommodate pipe diameters.

Manhole steps shall be standard safety type consisting of hot dipped galvanized iron or aluminum in accordance with ASTM A123 and with a minimum strength of 200 MPa.

Safety steps shall be aligned on centreline perpendicular to the main flow channel. The distance from the top of the rim to the first step shall not be greater than 300 mm. Steps shall be evenly spaced at a maximum of 400 mm to within 300 mm of the manhole base.

All joints shall be sealed with rubber gaskets in accordance with ASTM C443 and grouted with non-shrink grouting. Flexible manhole connectors shall be required wherever flexible pipe connects to a concrete manhole.

Manhole frames and covers shall be dipped cast iron conforming to Class 20 ASTM A48 and ASTM A536. Type F80 frames and covers shall be used for all streets, driveways, and other paved areas. Type F90 frames and covers with rubber gasket shall be used for manholes located in sags and low areas. Type F39 covers shall be used for all other areas. Castings shall be marked with series designation, foundry identification and date of casting. All sanitary manhole covers shall be labelled with "Sturgeon County" and "SAN".

All manholes located on arterial roadways, park reserves, PUL's, school grounds, or vacant and undeveloped land shall have a type F80 or F90 frame and locking cover installed.

Pre-benched manhole bases shall be use wherever possible, complete with pre-cored connection holes and watertight joints. All connections shall be watertight using Duraseal or G-Loc joints or approved equivalent.

Backfill around manholes shall be compacted to a minimum 98% SPD. Complete field density testing around manholes in accordance with SECTION 3.5.4.

Manhole bases shall be pre-finished, pre-benched manhole bases properly formed to suit the gravity sewer pipe. Bases shall be placed directly on undisturbed ground.

Frames and covers shall be installed following manufacturer's recommendations. The elevation of the manhole lid and cover shall be set and marked to sufficiently avoid operational issues, such as grass cutting.

3.4.17.4 Concrete

All concrete required for the construction of the sanitary sewer system shall be in accordance with SECTION 3.1.21. Notwithstanding SECTION 3.1.21, all concrete shall be constructed with Type HS sulfate resistant cement and a minimum 28-day compressive strength of 25 MPa. The minimum concrete cover on all reinforcing steel is 75 mm.

3.4.17.5 Corrosion Protection for Sanitary Sewers and Manholes

Sanitary pipes and manholes with potential for H2S exposure shall be corrosion resistant by either using corrosion resistant material such as plastic or using adequate corrosion resistant coating.

3.4.17.6 Service Crossing Existing Structures

All service connections passing underneath an existing roadway, walkway, or other existing surface feature shall be completed using auguring method or an approved equivalent trenchless method. In situations where trenchless method is not feasible due to adverse soil conditions, open cut method may be permitted following review and approval by the County.

All auger pit excavations shall be backfilled with granular bedding material in lifts not exceeding 150mm. Backfill shall be mechanically compacted to 95% SPD up to 350mm above the pipe and 98% SPD above that. Roadside slopes shall be compacted to 98% SPD.

3.4.17.7 Connecting to Existing Manhole

The County shall be contacted prior to connecting to any County utilities. Coring into existing manholes shall be completed in accordance with best practices. Existing manhole floors shall be re-channelled and benched, the junction area grouted to form a smooth joint, and all debris removed. The connection area shall be left in a manner acceptable to the County.

3.4.18 Trenching, Bedding and Backfill

All trenching, bedding, and backfill shall be in accordance with SECTION 3.5.

3.4.19 Inspection and Testing

All sanitary sewer system inspections and testing shall be in accordance with SECTION 3.6.

3.4.19.1 CCTV Inspection

Prior to issuing CCC, all sanitary sewer system components, including lateral services, shall be CCTV inspected. At the end of the warranty period and prior to issuing FAC, sewers shall again be inspected by CCTV.

3.4.19.2 Exfiltration/Infiltration Leakage Test

When mainline is below the water table or where deemed necessary by the County, an exfiltration and/or infiltration test shall be completed by the Developer. This test shall not be required if CCTV is completed immediately after sewer construction and no deficiencies are observed.

3.4.19.3 Deflection Test

Where deemed necessary by the County, a deflection test shall be completed by the Developer. A deflection test shall not be required if CCTV is completed immediately after sewer construction and no deficiencies are observed.

3.4.19.4 Concrete Test

The Developer shall be responsible for ensuring all required concrete testing is completed.

3.4.19.5 Force Mains (Low Pressure Systems)

Prior to issuing CCC, all sanitary sewer system components, including lateral services, shall be CCTV inspected. At the end of the warranty period and prior to issuing FAC, sewers shall again be inspected by CCTV.

Prior to acceptance, all new force mains shall be hydrostatic pressure and leakage tested.

Where deemed necessary by the County, a deflection test shall be completed by the Developer. A deflection test shall not be required if CCTV is completed immediately after sewer construction and no deficiencies are observed.

Deflection testing shall be performed for flexible pipe less than 1,200mm nominal diameter by mandrel testing according to "Standard Practice for the Design and Construction of Flexible Thermoplastic Pipe in the City of Edmonton – APPENDIX B: Mandrel Requirements for Deflection Testing".

Deflection testing for flexible pipe shall be performed a minimum of 30 days after full column of final backfill has been constructed above the test section. Deflection testing is not required for small diameter rigid pipe unless directed by the County.

The Developer shall be responsible for ensuring all required concrete testing is completed.

3.4.20 Sanitary CCC/FAC Acceptance Criteria

All laboratory and field test results for constructed sanitary sewer systems must be submitted to the County prior to acceptance. Test results must clearly indicate all constructed work conforms to Construction Specifications and the inspection and testing described in SECTION 3.4.19 is within the tolerances specified in SECTION 3.6. In all situations the County shall have the final decision on whether completed work is acceptable.

All appurtenances such as manholes, grade rings, frames, and covers, shall be visually inspected for conformance prior to acceptance. Refer to SECTION 2.9 for inspection requirements.

The sanitary sewer system, or any portion therein, shall be replaced prior to acceptance if at any time:

1. Any deficiency is defined as a safety hazard by the County Project Representative;
2. The asset is not built in accordance with Construction Drawings or Construction Specifications;
3. The asset does not function as intended; or
4. A deficiency is determined by the County Project Representative to be out of tolerance as set by these Standards.

VISUAL INSPECTION ACCEPTANCE CRITERIA CHECKLIST

Visual inspection acceptance criteria shall include, at a minimum, all of the following:

☑	**Sanitary Sewer System CCC/FAC Acceptance Criteria**
☐	All components of the sanitary sewer system are installed in accordance with Construction Drawings
☐	ESC Measures are installed, maintained, and functioning as per approved ESC Plan or Good Housekeeping Practices
☐	Manholes: ☐ located and installed as per Construction Drawings ☐ Connecting pipes are unobstructed and clear of debris ☐ F90 type covers installed and sealed in all sags and low points ☐ Manhole covers and frames labelled with “Sturgeon County” and “SAN” ☐ Grade rings are properly aligned ☐ Grade rings are properly grouted and sealed ☐ Manhole steps are properly installed and spaced ☐ Safety platforms are installed (> 6m) ☐ Benching is visible and unobstructed ☐ Interior/exterior drop structures installed (if applicable)

3.5 Pipe Trenching, Bedding, Backfill, and Compaction

All pipe trenching, bedding, and backfill operations shall be carried out in accordance with latest *Occupational Health and Safety Act* requirements. The contractor is responsible for locating and protecting from damage all underground and surface structures. Any such damage shall be repaired by the Contractor at their sole expense.

All recommendations noted in the applicable Geotechnical Report shall be incorporated into the construction specifications and Engineering Drawings for the development. Where required, temporary protective structures, such as, bracing, shoring, and sheeting are the responsibility of the Developer and shall be designed by a Qualified Professional.

The construction area shall be stripped and cleared of all topsoil and organic materials prior to trenching.

Trenching, bedding, and backfill shall be tested in accordance with SECTION 3.5.4

3.5.1 Trenching

Unless otherwise specified, minimum and maximum trench widths, up to a point 300mm above the top of pipe, shall be as per the following table:

Pipe Trench Width		
Number of Pipes	Minimum Trench Width	Maximum Trench Width
Single pipe, 850mm diameter or less	300mm greater than pipe outside diameter	450mm greater than pipe outside diameter or 750mm total trench width, whichever is greater
Single pipe, greater than 850mm diameter	300mm greater than pipe outside diameter	600mm greater than pipe outside diameter
Multiple Pipes	300mm greater than horizontal dimension across outer edges of pipes	600mm greater than horizontal dimension across outer edges of pipes

Trench walls shall be sloped or shored in accordance with latest *Occupational Health and Safety Act* requirements.

Trench width at any point shall not be less than trench width at any depth below such point.

Where the maximum width of the trench is exceeded, the Contractor shall, at their own expense, provide special bedding, higher strength pipe, or other mitigations as directed by a Geotechnical Engineer and approved by the County.

If unsuitable soils or conditions are encountered during excavation, mitigative or corrective measures shall be recommended by a Geotechnical Engineer, implemented by the Contractor, and communicated to the County.

The contractor shall implement measures to protect open excavations against flooding and damage due to surface run-off. Water collected in a trench shall be dewatered and discharged away from the work site so as not to cause erosion of the landscape or sediment to enter the environment. Refer to SECTION 7.

All excavated material shall be piled in accordance with the Occupational Health and Safety Act and in an area that will avoid obstructions to existing infrastructure, natural watercourses, and overall drainage patterns. Excavated material piles shall include erosion and sediment controls and shall not result in sediment run-off to the environment Refer to SECTION 7.

3.5.2 Pipe Bedding

Pipe shall be laid on trench bedding using one of the following classes of pipe zone bedding and in accordance with DRAWNG 3.4.1:

Class A: Place a 100mm cradle of 25 MPa concrete under the pipe, across the entire width of the trench, and along the sides of the pipe to provide a support angle of 120°. Place and compact fine granular bedding material above the concrete to a minimum 300mm above the top of pipe. Compact to 95% of Standard Proctor Density.

Class B: Place and compact a minimum 150mm to maximum 300mm of fine granular bedding material under and around the pipe to a minimum 300 mm above the top of pipe. Compact to 95% of Standard Proctor Density.

Class C: Place and compact a minimum 150mm to a maximum 300mm of fine granular bedding material under the pipe. Compact to 95% of Standard Proctor Density. Place and compact suitable backfill material above the fine granular material to a minimum 300 mm above the top of pipe. Compact to 95% of Standard Proctor Density.

Class D: Shape the bottom of the trench to fit the pipe over a 90º support angle. Place and compact suitable backfill material around the pipe to a minimum 300 mm above the top of pipe. Compact to 95% of Standard Proctor Density.

Unless otherwise specified, **Class B** bedding shall be used for all pipe zone bedding. When the trench wall clearance (measured from edge of pipe to trench wall) is more than 300mm, compaction shall be increased to 100% SPD.

For pipes larger than 450mm utilizing a Class A, Class B, or Class C bedding, place and compact 1m long clay cut-off walls to an undisturbed bottom at intervals of 150mm across the entire trench.

In rock, excavation shall be carried down to a minimum clearance of 150mm below the pipe Sand shall be used for bedding and compacted to a minimum 95% SPD at optimum moisture content.

All bedding material shall be placed in uniform lifts not exceeding 150mm in depth.

All testing shall be in accordance with ASTM C136 and ASTM C117. Gradation limits for bedding material is as per the following tables:

Gradation Limits for Fine Granular	
Sieve Size (μm)	% Passing by Mass
12500	100-100
10,000	90-100
5,000	70 – 100
150	5 – 20
75	0 – 12

Gradation Limits for Coarse Granular	
Sieve Size (μm)	% Passing by Mass
25,000	100
20,000	95 – 100
10,000	60 – 80
5,000	40 – 60
150	5 – 15

Gradation Limits for Sewer Rock	
Sieve Size (μm)	% Passing by Mass
25,000	100
5,000	10 max
80	2 max

3.5.3 Backfill

Minimum compaction in trenches above the pipe zone and to designated subgrade or existing ground shall be as per the following:

Backfill Area	Minimum Compaction
Under an existing or proposed roadway, parking lot, walkway, access, or other structure	98% SPD
All other areas	95% SPD

Trench shall be backfilled with approved fill material from the top of the pipe zone to the designated subgrade elevation or the existing ground level, whichever is lower.

All backfill material shall be placed in uniform lifts not exceeding 150mm in depth.

Excavation, backfilling, or compacting for open cut trenches under pavement shall not proceed when the average air temperature is expected to be -10 degrees. Upon approval from the County, work may proceed if the Contractor implements a cold weather trench covering system.

Frozen ground shall be thawed by an approved ground burning method before commencing excavation. All frozen materials shall be removed from the trench prior to backfilling, including snow and ice. Backfill shall not contain frozen soil or material containing snow, ice, straw, organic, or other deleterious materials.

3.5.4 Field Density Tests

Field density testing shall be completed in accordance with *Standard Specifications for Highway Construction* (Alberta Transportation) and with the following minimum frequencies:

Location	Tests	Minimum Frequency	Procedure
N/A – Standard Proctor	Sampling, moisture-density relationship, in-situ moisture content, classification of soil	1 test per material type	ASTM D698 ASTM D75 ASTM C566
Pipe Zone Bedding and Backfill	Density by Nuclear Method, Moisture content by Nuclear Method	1 density test in the initial lift per lineal 100m of trench and 1 density test for every 500mm of depth per lineal 100m of trench.	ASTM D6938
Trench Backfill (outside of pipe zone)	Density by Nuclear Method, Moisture content by Nuclear Method	1 density test per 600mm depth per lineal 100m of trench	ASTM D6938
Manholes, Catch Basins, Valves, Chambers, and Vaults	Density by Nuclear Method, Moisture content by Nuclear Method	Take tests adjacent to each new structure from pipe zone to finished subgrade or existing ground	ASTM D6938

The Developer shall ensure that as many tests as necessary are performed to ensure that the work conforms to the requirements of these Standards, regardless of the minimum frequency specified above. Additional Standard Proctor Tests shall be performed if required to establish relationship to field densities.

If any density test results in less than the required compaction, two more tests shall be taken for the depth and length of backfill or bedding represented by the failed test. If the average of the three tests results in a density less than required, the depth and length of backfill or bedding represented by the failed tests shall be reworked; the soil moisture modified as necessary, re-compacted, and re-tested until the required compaction is met.

3.6 Inspection and Testing

All utility system components and associated works shall be subject to inspection by the County during installation. Any components that fail to pass inspection and testing, or having obstructions, breaks, or any other defects, including zero-grade or back-grade shall be repaired, re-inspected, and re-tested to the satisfaction of the County, at the Developer's sole expense.

The Developer shall maintain detailed records of all inspections and testing as evidence of compliance of the work with these Standards and shall be provided to the County upon request.

The County may at any time require the Developer to provide evidence of certification by the testing agency that the materials and performance of the work meet these Standards.

The Developer shall provide a written endorsement of the Contractor's compliance with these Standards when submitting the application for the Construction Completion Certificate.

The Developer shall retain the services of independent testing laboratories or agencies to conduct all quality control testing. The proposed testing laboratory or agency shall be subject to the acceptance of the County.

3.6.1 Concrete

The Developer shall be responsible for ensuring all concrete testing is completed. Concrete tests shall be completed in accordance with CSA A23 and with the following minimum frequencies:

Concrete Test	Minimum Frequency
Slump and Slump Flow of Concrete	One test for not less than 60 m^3 of concrete poured, but not less than one test each day concrete is poured
Air Content of Plastic Concrete; Pressure Method	
Compressive Strength of Cylindrical Concrete Specimens	

Slump tests shall be taken between the 10% and 90% points of concrete discharge and occur with every strength test. If the measured slump for any test is outside the specified limits, a check test shall be taken on another portion of the concrete discharge or a re-test completed if retempering with water is permitted by the County. If the second test fails, the County may reject that load of concrete and require the removal of the portion already poured.

Air content tests shall be taken between the 10% and 90% points of concrete discharge and occur with every strength test. If air content is measured outside of the specified limits one of the following actions shall occur:

Measured Air Content (%)	Action
Greater than 8.0	Concrete shall be accepted if the compressive strength is achieved
5.0 to 5.4	Concrete poured from the load shall be removed and the rest of the load discarded. However, the Contractor may choose, at their own risk, to pour the rest of the load, provided within 40 days after placement they submit proof that such load of concrete meets the spacing factor requirement as determined from an air-void examination (see below). Failure of the test shall result in the Contractor removing all placed concrete from that load.
4.9 and lower	Concrete poured from the load shall be removed and the rest of the load discarded

When air void examination is required, the testing shall be completed by a qualified laboratory in accordance with ASTM C457; modified point-count traverse method at 100X magnification. The sample shall be a 100 mm diameter core drilled from the hardened concrete. If the spacing factor obtained by a full traverse of the cross section of a single core is greater than 0.23 mm the concrete represented by the core shall be removed and replaced.

Where concrete has been rejected and is to be removed for not meeting the spacing factor requirement, the Contractor shall, at their own expense, prove that concrete left in place at both ends of the removal meets the specified spacing factor by air void examination as performed by a qualified laboratory.

Compressive strength tests shall be taken once for not less than 60 m^3 of each class of concrete poured, but not less than one each day concrete is poured. Concrete shall achieve a minimum compressive strength based on the percentage of entrained air as per the following table.

Air Content (%)	28-day Minimum Compressive Strength (MPa)	
	Straight face curb and gutter	All other structures
Greater than 8.0	30	30
6.0 to 8.0	42 - (2*Air Content)	30
5.5 to 5.9	26	30

The average of three consecutive strength tests shall equal or exceed the minimum specified strength and no single test shall be less than 5 MPa below the specified compressive strength. Sampling and capping of concrete test samples shall be completed

in accordance with CSA A23. Standard test cylinders shall be either 150mm x 300mm, 125mm x 250mm or 100mm x 200 mm.

Concrete poured after October 15 shall obtain a minimum compressive strength at 7 days of 27.0 MPa. High early strength concrete shall obtain a minimum compressive strength at 7 days of 30.0 MPa. All concrete shall be provided with cold weather protection in accordance with CSA A23. Cold weather protection must be adequate to maintain concrete surface temperatures to a minimum of 10 degrees Celsius for at least seven days following placement.

In the event that a concrete compressive strength test fails to meet the specified strength, the County reserves the right to require any or all of the following:

- Change to the concrete mix design proportions for the remainder of concrete work;
- Coring and testing of the concrete area represented by the failed strength tests in accordance with ASTM C42;
- Replacement of any portion of the concrete area represented by the failed strength tests in accordance with these Standards; and
- Reduced payment for the portion of the concrete area represented by the failed strength tests in accordance with SECTION 3.1.21.20.

3.6.1.1 Concrete Tolerance

Any concrete disfigured by extraneous means, including third-party damage and builder damage shall be removed and replaced (e.g., graffiti, foot prints, tire treads, etc.).

All new concrete shall meet the minimum tolerances as per the following table:

Concrete Construction Tolerance	
Ponding	Any ponding that occurs on a walking surface shall be replaced (no tolerance). In other areas, ponding exceeding 6mm over 3m shall be replaced (using a 3m straight edge).
Vertical Displacement (lift or sag at the edge of a concrete panel)	Vertical displacements of greater than 5mm shall be replaced
Elevation	Change in specified elevations shall not exceed 10 mm
Alignment	Deviations in alignment shall not exceed 25 mm. Fluctuations in alignment shall not be greater

	than 20 mm in a 30m section	
Joint Separation	Two panels of concrete with a joint separation greater than 10 mm shall be replaced	
Crossfall	Must be replaced if outside of the following tolerance:	
	Sidewalk	< 1% or > 4%
	Gutter	< 4% or > 15%
	Curb Ramp	< 4% or > 6%
	Alley or Crossing	< 4% or > 8%
Cracks	Cracks greater than 1.2 mm in width (width of a dime) shall be replaced Cracks greater than 300 mm in length shall be replaced Cracks that split into two or more cracks shall be replaced Sidewalk panels with three or more cracks shall be replaced longitudinal cracks spanning two or more sidewalk panels shall be replaced	
Spalling	Spalling occurring on more than 5% of the section (1) surface area shall be replaced. This includes sidewalk panels, curbs, and gutters.	
Gouging	A gouge with a depth of more than 6 mm shall be replaced A single section (1) of concrete with two or more gouges shall be replaced Curb and gutter sections (1) with a single gouge that represents an area of 35 mm x 35 mm or greater shall be replaced	
Undermining	All undermined concrete shall be replaced by full panel sections	
(1): Concrete sections are to be removed at contraction, expansion, or surface joints		

Concrete sections are to be removed at contraction, expansion, or surface joints in a minimum of 1.5 m length of curb and gutter sections. Where monowalk panels are deficient, the entire monowalk - including curb and gutter - must be replaced. No flag sections are permitted. If both adjacent panels need repair, the middle concrete panel must also be removed and replaced. A panel is defined as the section between two crack control joints.

Where curb and gutter deficiencies exist, the entire mono-curb, gutter, and walk shall be replaced. Curb and Gutter repairs that are less than or equal to 3 m in length may be face formed against adjacent asphalt if the asphalt edge is straight and has no chips or cracks.

New concrete that does not meet the above tolerances shall be replaced at the sole cost of the Contractor. If, in the opinion of the County, it is not practical to remove and replace the concrete, a reduced payment may instead be substituted. The reduced payment shall be 50% of the unit price for the quantities not within tolerance.

3.6.1.2 Concrete Penalty Assessment

Concrete where the compressive strength test result is less than required may be accepted by the County subject to a pay factor as per the following table. If strength deficiencies persist, the County shall require changes in the concrete mix design for the remainder of the work.

Concrete Strength Pay Factors	
Cylinder Strength (% of specified strength)	Pay Factor (% of contract price)
97.0	100.0
96.0	99.2
95.0	98.2
94.0	96.9
93.0	95.4
92.0	93.6
91.0	91.7
90.0	89.4
89.0	86.7
88.0	83.5
87.0	79.7
86.0	75.5
85.0	70.0
Under 85.0 Reject	

The Contractor may, at their own expense, core and re-test for compressive strength in accordance with CSA A23. Testing shall be completed by a qualified laboratory within seven days of a failed 28-day cylinder test or within three days of a failed 7-day cylinder

test. Three cores shall be drilled from the hardened concrete represented by the failed cylinder strength tests at locations approved by the County.

If the average strength of the three cores is equal to or less than 85% of the specified strength and no one core is less than 75% of the specified strength, the specified strength for the representative area will be considered met with the appropriate concrete strength pay factor and reduced payment applicable.

Areas of questionable thickness, in the opinion of the County, shall be cored at a rate of three cores per 500 m^2. The average thickness of the three cores shall represent the thickness of that area. If the average core thickness is less than specified, the area will be assessed a penalty pay factor as per the following table:

Concrete Thickness Pay Factors	
Thickness Deficiency (mm)	Pay Factor (% of contract price)
6.0	100.0
7.0	97.0
8.0	93.7
9.0	90.0
10.0	85.5
11.0	80.5
12.0	75.0
13.0	68.0
14.0	60.0
15.0	50.0
Over 15.0 Reject	

For concrete where the surface temperature is measured to be below 0 degrees Celsius, the concrete may be accepted by the County subject to a pay factor as per the following table:

Cold Weather Concrete Pay Factors	
Time After Placement that Concrete Temperature Drops Below 0 Celsius	Pay Factor (% of contract price)
> 96 hours	100.0
72 to 96 hours	80.0
48 to 72 hours	70.0
< 48 hours	Remove and replace

3.6.2 CCTV Inspection

Prior to issuing CCC, all system components, including lateral services, shall be subject to inspection by the County. At the end of the warranty period and prior to issuing FAC, sewers shall again be inspected by CCTV. The Developer shall be solely responsible for all costs associated with completing CCTV.

All sewers shall be inspected by CCTV after backfilling of the trench to finished grade. All CCTV inspections shall be completed by a Qualified Professional. All lines shall be thoroughly flushed of debris prior to inspection.

CCTV picture capabilities shall be of high enough quality to show the entire pipe periphery and provide measurement within the line to an accuracy of one third of a meter per kilometer. Picture quality shall be able to produce a continuous 600 line resolution picture.

The camera shall be progressed uniformly and shall not exceed a rate of progression greater than 6 m/min.

An inspection report shall be completed by a Qualified Professional which includes, at a minimum, locations of leaks, faults, open joints, breaks, collapse, deflection, obstruction, or any other defect that may affect the overall performance for each segment of pipe. The report shall also include a measure of any standing water observed in the pipes and the location of all service connections, complete with a still image of each service connection.

The digital CCTV video must be provided along with the signed inspection report.

3.6.3 Water Testing Plan

Prior to the start of water main testing, the Consulting Engineer shall prepare and submit to the County a Water Testing Plan outlining how flushing, hydrostatic pressure testing,

disinfection, bacteriological testing, dechlorination, and discharge is proposed to proceed. The Water Testing Plan must be available on-site during all testing activities.

Water testing is not permitted to proceed until the Water Testing Plan has been approved by the County. The plan shall ensure at least 72 hours notice is provided for each test requiring the County Project Representative or Utility and Waste Management Services to be present.

The Water Test Plan shall include, at a minimum, all the following:

- Sequence of valve turning;
- Sections of water line to undergo testing;
- Detailed flushing plan (SECTION 3.6.5)
- Detailed hydrostatic pressure and leakage test plan (SECTION 3.6.6)
- Detailed disinfection and bacteriological plan (SECTION 3.6.7)
- Detailed chlorination plan, including target chlorine concentrations, sampling locations, and contact time (SECTION 3.6.7.2);
- Detailed dechlorination plan, including proposed dechlorination method and chlorine neutralizing chemicals (SECTION 3.6.7.3);
- Taste and odour sampling procedure;
- Proposed testing dates and times;
- Sampling frequency and locations (SECTION 3.6.4);
- Discharge locations; and
- Any other information requested by the County.

3.6.4 General Water Sampling Requirements

For each new water main, at least one sample of each type (chlorine, bacteriological, taste & odour) must be collected:

- In 400 m intervals;
- At the end of the water main; and
- From each branch greater than one pipe length.

If trench water has entered the new main during construction or if, in the opinion of the County, excessive quantities of dirt or debris have entered the new main, samples shall be taken at intervals of 60 m or as otherwise specified by the County.

No more than 72 hours prior to putting a newly constructed water main into service, the following water quality parameters must be measured and found to be within the limits specified in the following table:

Required Water Quality Parameters for new Water Mains	
Quality Parameter	Limit
E.coli (EC)	Absent
Total Coliform	Absent
Total Chlorine Residual	1.0 – 2.4 mg/L
pH	7.3 – 8.3
Turbidity	0 – 3.0 NTU
Colour	0 – 2.0 TCU
Volatile Organic Compounds	< 0.010 mg/L[(1)]
Pipe Lubricant	Absent
Taste and Odour	Inoffensive [(2)]
UV Scan	Negative vs. Plant Water
(1): Guidelines for Canadian Drinking Water Quality, Maximum Acceptable Concentration, Health Canada (2): If the first taste and odour sample fails, all subsequent flushing will be at the cost of the Developer	

Should any of the above parameters be outside the limits, notify Utility and Waste Management Services and obtain directions for remedial action.

3.6.5 Flushing

A flushing plan must be included as part of the Water Testing Plan. The purpose of the flushing plan is to create an agreed-upon plan for the staging, direction, and flow rate of water for flushing a water main prior to commissioning. The flushing plan must ensure the following:

- All water used for flushing must come from a clean potable source and metered to be rebilled back to the developer.

- There must be only one source valve for each stage of fill
- Filling water mains must be completed at a velocity of 0.3 m/s or less
- Flushing runs must be planned to achieve one-directional flows – the water must not loop back on itself
- The preferred flushing run length is 200 m. Flushing runs must not exceed 450 m in length
- Water mains less than or equal to 300 mm in diameter shall:
    I. be flushed with a minimum flushing velocity of 1.5 m/s (to achieve scour); or
    II. be foam pigged by properly trained personnel if minimum flushing velocity cannot be met. The water main must be flushed a minimum of five times the pipe volume after foam pigging is complete
- Water mains greater than 300 mm and less than or equal to 450 mm in diameter shall:
    I. be flushed with a minimum flush velocity of 0.9 m/s (to achieve scour); or
    II. be foam pigged by properly trained personnel if minimum flushing velocity cannot be met. The water main must be flushed a minimum of five times the pipe volume after foam pigging is complete
- Water mains greater than 450 mm in diameter shall be foam pigged by properly trained personnel then flushed with a minimum flush velocity of 0.9 m/s. Water mains greater than 900 mm in diameter can be broom swept as an alternative to pigging. The sweepings must be removed from the pipe before filling.
- Water must be exchanged a minimum of five times to achieve a completed flush
- Water quality sampling reports must confirm a completed flush
- During a flush, the source water shall flow from larger pipe to smaller pipe, whenever possible
- Use the following table to determine the number of ports required to achieve the minimum velocity:

Number of Ports Required to Achieve Velocity for Flushing [1]						
Pipe Diameter (mm)	Minimum Velocity Required (m/s)	Required Flow to Achieve Minimum Velocity (L/s)	# of 50 mm taps required		# of Hydrant Nozzles Required [2]	
					2.5"	4.5"
50	1.5	2.9	1		-	-
100	1.5	11.8	1		-	-
150	1.5	26.5	1		-	-
200	1.5	47.1	2	OR	1	-
250	1.5	73.6	2		2	1
300	1.5	106.0	-		2	1
350	0.9	86.6	-		-	1
400	0.9	113.1	-		-	1
450	0.9	143.1	-		-	1

(1): City of Edmonton Design and Construction Standards – Volume 4: Table 8.1
(2): with a 280 kPa residual pressure a hydrant flowing to atmosphere will discharge 63 L/s from a 2.5" nozzle and 158 L/s from a 4.5" steamer (AWWA C651-14).

- The discharge from the flushing pipe can be quickly estimated (±3 L/s) from the following equation:

$$Q = \frac{5.5 \times 10^{-5} \times d^2 \times S_x}{\sqrt{S_y}}$$

where,

$$\mathrm{Q} = \text{discharge (L/s)}$$

$$\mathrm{d} = \text{discharge nozzle inside diameter (mm)}$$

$$\mathrm{S_x} = \text{the horizontal distance of discharge (mm)}$$

$$\mathrm{S_y} = \text{the vertical distance from the ground to the center or nozzle (mm)}$$

3.6.6 Hydrostatic Pressure and Leakage Test

The purpose of hydrostatic pressure and leakage testing a new water main is to determine if the installation is capable of withstanding ordinary operating transient pressure conditions without failure or excessive leakage at the joints and service connections. Hydrostatic testing consists of slowly charging a new section of water main to the distribution system pressure from a boundary main. The valves are then closed on the test section and a tank of water and an appropriate pump are used to pressurize the main to the specified test pressure.

The test is typically conducted for two hours during which time the pump is periodically operated to maintain the pressure at the specified level. The volume of water added to the water main from the tank is presumed to be equal to that which has leaked from the water main during the test.

Portland cement based materials such as concrete cylinder or cement-lined metallic pipes are porous and absorb water during the initial charging of the water main. Therefore, a minimum of 24 hours of soaking prior to testing is required to ensure that apparent water leakage is due to joints and service leakage, not the absorption of water by the pipe material.

The working pressure is defined as the highest pressure experienced within the system during hydraulic modelling considering Average Day Demand (ADD), Maximum Day Demand (MDD), and Peak Hour Demand (PHD).

Prior to acceptance, the entire system shall be hydrostatic pressure and leakage tested in the presence of the County. Tests shall not commence until concrete thrust blocks have cured, typically five to seven days after the last concrete pour. The Developer shall provide all required labour and materials to complete the testing. The Developer or their Contractor shall be responsible for filling the pipes, pumping to the required test pressure, and recording the pressure losses.

3.6.6.1 Required Equipment

Required Equipment for Hydrostatic Pressure and Leakage Test	
Pressure Gauge	ANSI Standard B40.1-1974 Grade A, or equivalent, Bourdon tube pressure gauge, range of 0 to 1400 kPa, with an accuracy of 1% of the full-scale reading, 7 kPa divisions, a minimum diameter of 90 mm, and a scale which can be read in an arc of 270° (Walski, 1984)**.** The pressure gauge must be calibrated and certified annually and the certification must be submitted to the County with test results.
Pump	Hand or motor-powered pump capable of meeting required test pressures including necessary plumbing accessories for preventing backflow and for enabling the flow rate to be controlled. The pump should be provided with a pressure relief valve or should have an upper pressure limit of 1400 kPa.
Water Storage Tank	Water storage tanks shall consist of non-corroding material. The volume of the tank shall not be more than 10 times the allowable leakage for the duration of the test. A depth gauge shall be attached to the inside of the tank and must be calibrated for the volume of the tank.

3.6.6.2 General Procedure

Note: failure to notify County prior to testing may result in the test being rejected and requiring new tests to be completed.

Tests shall be permitted between April 15th and October 15th. Testing outside of this period is dependant on weather and at the sole discretion of the County. The Developer shall obtain all necessary approvals from other AHJ's prior to testing.

The following procedure is intended as a general procedure that is independent of pipe material and size. Procedural modifications specific to pipe material and sizes are listed after the general procedure.

Prior to starting:

- Inform all other site personnel and/or Contractors that hydrostatic testing will be performed and ensure that no valves are being operated during the test.
- Ensure the proper installation of water services, air relief valves, flush points, and blowoffs.
- Ensure that main stops are open and curb stops are closed. Confirm any boundary valves for the project are fully closed.
- Ensure thrust blocks and other restraining devices are in place and properly cured
- Inspect all hydrants to ensure that they are properly installed and that all nipples are threaded or locked in place.

HYDROSTATIC PRESSURE AND LEAKAGE TEST GENERAL PROCEDURE

1. Identify the section of water main to be hydrostatically tested:
    I. Maximum length of distribution water main test sections shall be 450m unless otherwise directed by the County.
    II. Maximum length of transmission water main test sections will be 800 m unless otherwise directed by the County.
    III. Each test section must consist of only one type of pipe material. If there are different types of pipe materials within the section of main, each pipe material must be tested separately prior to connection with other materials, with the exception of PVC to steel spool pieces for valve assemblies. Fused PVC and jointed PVC are considered different materials for the purposes of hydrostatic testing.
2. Open all hydrant control valves in the test section and close all hydrant boot valves.
3. Open all main valves within the test section.
4. Place sufficient backfill to prevent pipe movement. Do not place permanent surfacing prior to the acceptance of hydrostatic test results.
5. Fill and flush the water main in accordance with the approved Water Test Plan (Refer to SECTION 3.6.3).
6. Expel trapped air from the test section of water main by exhausting air at high points and dead-ends using existing air relief valves or temporary main stops. Close all air relief valves and temporary main stops prior to testing.
7. Raise the water main pressure to the required test pressure using either a hand or motor-powered pump located at a location approved by Utility and Waste Management Services. The hydrant valve will be completely opened and the flow rate will be controlled by the valve at the pump.

8. Mark the gauge and the level of water in the storage barrel at the beginning of the test.
9. Maintain the test pressure within **± 20 kPa** of the specified test pressure for the duration of the test.
10. Pump the test section back to the test pressure at the end of the first 30 minutes. If the allowable leakage is exceeded, the pressure test has failed. Correct all cause(s) leading to test failure prior to starting a new test.
11. At 30 min intervals during the test, walk along the test section and check for signs of leakage or distress at all exposed appurtenances or fittings.
12. Calculate the allowable makeup water allowance based on the appropriate pipe material equations. No allowance is permitted for services, appurtenances, or in-line valves.
13. Determine if the hydrostatic test passes or fails. For all tests, provide written notification of the hydrostatic pressure and leakage test result to the County Project Representative and Utility and Waste Management Services within 24 hours of completing the test. For all tests that fail:
    I. Provide verbal notification to Utility and Waste Management Services immediately after completion of the test; and
    II. Provide written notification to the Utility and Waste Management Services within 24 hours of completing the hydrostatic pressure and leakage test identifying the required repairs and outlining the schedule for completing such repairs.

3.6.6.3 Specific Procedures

SPECIFIC TESTING PROCEDURES FOR POLYVINYL CHLORIDE (PVC) PIPE MATERIAL

Refer to AWWA C605 and AWWA M23 for information on hydrostatic pressure and leakage testing of PVC pipe material. Specific procedures for PVC pipe material includes all of the General Procedures (SECTION 3.6.5.2) and the following:

- Test pressure shall be determined as the highest of the following:
    I. No less than 125% of the working pressure, as measured at the highest point in the test section;
    II. No less than 150% of the working pressure measured at the lowest elevation of the test section; and
    III. 1034 kPa (150 psi).

The working pressure is defined as the highest pressure experienced within the system during hydraulic modelling considering Average Day Demand (ADD), Maximum Day Demand (MDD), and Peak Hour Demand (PHD).

- Test duration shall be a minimum of 2 hours.
- Valves within the test section must not be operated for the duration for the hydrostatic pressure and leakage test.
- The test pressure must not exceed the rated valve pressure (AWWA C500) when resilient-seated gate valves or butterfly valves are at the pressure boundary.
- Allowable makeup water shall be calculated from the following formula:

$$Q_m = \frac{LD\sqrt{P}}{795{,}000}$$

where,

$$\mathrm{Q_m} = \text{quantity of allowble makeup water } \left(\frac{\mathrm{L}}{\mathrm{hr}}\right)$$

$$\mathrm{L} = \text{length of pipe test section (m)}$$

$$\mathrm{D} = \text{nominal pipe diameter (mm)}$$

$$\mathrm{P} = \text{average test pressure during testing (kPa)}$$

SPECIFIC TESTING PROCEDURES FOR STEEL PIPE MATERIAL

Refer to AWWA C206 and AWWA M11 for information on hydrostatic pressure and leakage testing of steel water pipe. Specific procedures for steel pipe material includes all of the General Procedures (SECTION 3.6.5.2) as modified by the following:

- Cement mortar-lined pipes must be filled with water 24 hours prior to testing.
- Steel water pipe shall be hydrostatically tested for a duration of not less than 4 hours.
- Test pressure shall be determined as the highest of the following:
  I. No less than 125% of the working pressure, as measured at the highest point in the test section;
  II. No less than 150% of the working pressure measured at the lowest elevation of the test section; and
  III. 1034 kPa (150 psi).
- Valves within the test section must not be operated for the duration of the pressure and leakage test.
- The test pressure must not exceed the rated valve pressure (AWWA C500) when resilient-seated gate valves or butterfly valves are at the pressure boundary.

- Use of air or other gaseous mediums for pressure testing of steel water mains is not permitted in any circumstances.
- There is no allowed leakage for the testing of welded steel water mains.

SPECIFIC TESTING PROCEDURES FOR ALL OTHER PIPE MATERIAL

A dedicated engineered testing process according to relevant AWWA standards must be developed by the Consulting Engineer and included as part of the Water Testing Plan for all other pipe materials, including but not limited to:

- Ductile Iron Pipe;
- High Density Polyethylene Pipe (HDPE);
- Reinforced Concrete Pressure Pipe (Steel Cylinder Type);
- Reinforced Concrete Pressure Pipe (Non-cylinder Type);
- Pre-stressed Concrete Pressure Pipe (Steel Cylinder Type); and
- Concrete Pressure Pipe, Bar-Wrapped (Steel Cylinder Type).

The testing procedure must reference the specific AWWA standard associated with that pipe material in the Water Testing Plan.

3.6.7 Disinfection and Bacteriological

The purpose of disinfection is to destroy pathogenic microorganisms, which may occupy the water main after construction is complete. Chlorine is typically used as the disinfectant.

A performance criterion for water main disinfection has been specified using the AWWA C651 standard. This standard comprehensively describes the minimum procedures to be followed when preparing a water main for disinfection, disinfecting the water main, testing for chlorine residual, and conducting bacteriological sampling.

Disinfection consists of the following four tasks:

1. Preventing contamination of the new pipe during shipping, storage, and construction;
2. Flushing the water main to remove loose debris and dirt which may have entered the water-main during construction.
3. Chlorination of the water main to destroy pathogenic microorganisms; and
4. Bacteriological testing of the disinfected water to ensure that the microbiological water quality is adequate.

3.6.7.1 Flushing

Water mains must be flushed prior to disinfection, **except** where hypochlorite tablets have been used (the use of tablets requires explicit approval from Utility and Waste Management Services). The flushing flow rate must be sufficient to achieve a minimum velocity of 0.9 m/s or 1.5 m/s, depending on the water main diameter. Refer to SECTION 3.6.4.

3.6.7.2 Chlorination

Once flushed, the water distribution system shall be disinfected in accordance with AWWA C651; Continuous Feed Method. Only the sodium or calcium hypochlorite solution Continuous Feed Method is permitted. Tablet method (Calcium hypochlorite tablets), slug method, and spray methods are not permitted, unless otherwise approved by Utility and Waste Management Services prior to testing.

A chlorination plan describing chlorination methods, procedures, and testing details must be included as part of the Water Testing Plan. Chlorine residual tests must be performed at the beginning and end of the disinfection.

Permitted chlorination chemicals are sodium hypochlorite or calcium hypochlorite. Initial chlorination levels shall be a minimum of 25 mg/L. Chlorination levels after 24 hours of exposure shall be a minimum of 10 mg/L.

Upon acceptance of the chlorine test results, the chlorinated water must be dechlorinated and flushed from the main. The water main must not be depressurized after chlorination is complete.

The following procedure shall be followed using the continuous feed chlorination method:

1. Notify Utility and Waste Management Services in writing at least 72 hours prior to commencing test.
2. Ensure all boundary valves are closed and stoppered.
3. Identify the main stop and service connection or bleeder as indicated on the Construction Drawings within three (3) meters of the boundary valve for chemical feed. **Do not** use fire hydrants for chemical feed. The high concentration chlorine solution will damage the hydrant.
4. Under the supervision of Utility and Waste Management Services, open the discharge point and one boundary valve permitting water from the distribution system or other approved source to flow through the new water main at a constant, measured rate.

Use a pitot gauge or a container of known volume and stop watch to calculate the rate of discharge.

5. Slowly fill the water main, keeping the velocity below 0.3 m/s. Precautions must be taken to ensure that air pockets are eliminated.
6. Flush the water main according to methods described in SECTION 3.6.5 to remove particulates.
7. Inject the chlorine solution into the water main at a point no more than three meters downstream from the beginning of the water main.
8. Feed the chlorine solution at a constant rate such that the water entering the main to be disinfected will have no less than 25 mg/L (25 PPM) of free chlorine and no more than 50 mg/L (50 PPM) of free chlorine. Free chlorine concentrations shall be measured at regular time intervals to ensure appropriate concentration is achieved during filling.

   The following table provides the amount of chlorine required for each 100 m of pipe for various pipe diameters:

Chlorine Required to Produce 25 mg/L Concentration in 100 m of Water Main (1)		
Pipe Diameter (mm)	100% Chlorine (g/100 m)	1% Chlorine Solution (2) (L/100 m)
100	20	2
150	45	4.6
200	81	8.2
250	127	13
300	179	18
400	323	33

(1): City of Edmonton Design and Construction Standards – Volume 4: Table 8.2

(2): 1.5 kg $Ca(OCI)^2$ per 100 L

9. Monitor the discharge location at regular intervals for chlorine residual using an approved field test kit. Discharge water must be dechlorinated. Refer to SECTION 3.6.6.3 for dechlorination procedures.
10. Chlorine application shall not cease until the entire main is filled with chlorinated water with a chlorine residual of no less than 25 mg/L (25 PPM).
11. Operate all valves and hydrants within the test section to ensure they are disinfected.
12. Once 25 mg/L (25 PPM) residual has been achieved, stop flow and chlorine feed. Chlorinated water shall remain in the water main for no less than 24 hours.
13. After 24 hours, test to confirm chlorine residual:

I. If residual is less than 10 mg/L (10 PPM), flush and re-chlorinate.

II. If the residual is 10 mg/L (10 PPM) or more, the results are acceptable.

14. Notify Utility and Waste Management Services in writing with the chlorine residual results and time of test within four (4) hours of completing the test.
15. Flush the heavily chlorinated water from the main, fittings, valves and branches until chlorine measurements meet normal system levels. Flushed water must be dechlorinated. Refer to SECTION 3.6.7.3 for dechlorination procedures.

CHLORINE SAMPLING

Chlorine sampling must be completed by a Qualified Professional and performed with a certified chlorine test kit appropriate for the chlorine levels. Chlorine test kits must be calibrated every six months or per the manufacturer specifications, whichever is more frequent.

In addition to the general sampling requirements described in SECTION 3.6.4, the following sampling is required for chlorine testing:

High Concentration Chlorine:	Sampled at the beginning and end of the primary disinfection period at all sampling locations.
Low Concentration Chlorine:	Sampled once the water main has been flushed of the heavily chlorinated water at all sampling locations.

3.6.7.3 Dechlorination

The Developer and their Contractor is responsible for the water quality impacts of water discharged during construction activities, including dechlorination of water disposed as part of disinfection and acceptance tests.

Dechlorination must always be verified through field sampling of discharge waters.

Water discharged from the water distribution system and released to water bodies, either directly or indirectly (e.g., via the storm sewer system), must be dechlorinated at the point of discharge in accordance with the applicable legislation. Discharge to the sanitary sewer system is not permitted unless otherwise authorized by the County.

Dechlorinated water must have a maximum total chlorine concentration of 0.5 µg/L (0.0005 PPM) or less prior to release.

DECHLORINATION METHODS

Dechlorination may be performed by adding a neutralizing chemical to the chlorinated water as it is discharged. Two accepted methods for applying the neutralizing chemicals are:

1. Continuous-feed, where neutralizing chemicals are applied at the point of water discharge; or
2. Dechlorination tank, where chlorinated water is discharged to a tank then treated to dechlorinate. The tank may be mounted on a mobile trailer.

Depending on the method of dechlorination, the chemicals used may impact the dissolved oxygen concentration of receiving waters, which may be a concern for the aquatic health of receiving wetlands and/or creeks. *The Canadian Water Quality Guidelines for the Protection of Aquatic Life* (Canadian Council of Ministers of the Environment, 1999) set the lowest acceptable concentration of dissolved oxygen in cold water of 9.5 milligrams per litre to protect aquatic life in their early life stages.

CHLORINE NEUTRALIZING CHEMICALS

The type and amount of dechlorination chemical will be impacted by project or site specific issues such as water release, temperatures, strength of chlorine, volume of water release and distance from receiving waters. AWWA C655 standard shall be referenced for detailed information on standard industry practices for dechlorination.

A summary of dechlorination chemicals is provided by EPCOR and can be used as guidance for the Contractor. The summary is located in Table 8.4 of City of Edmonton Design and Construction Standards Volume 4.

The Contractor must follow all manufacturer's recommendations and safe work procedures when handling chlorine neutralizing chemicals, including Workplace Hazardous Materials Information System, Occupational Health and Safety, and Transportation of Dangerous Goods.

3.6.7.4 Bacteriological Sampling

In addition to the general sampling requirements described in SECTION 3.6.7, the following sampling is required for bacteriological sampling:

- Samples shall be collected no less than 16 hours and no more than seven (7) days after the chlorine test has passed.

- One set of samples shall be collected and delivered to the lab:
  I. At the start of the sampling period; and
  II. 16 hours after the first set of samples were collected.

  Absolutely no flushing can occur before or between collecting the two sets of samples.

Sampling for bacteriological water quality parameters shall be done in such a way that prevents contamination from bacteria in or on air, soil, water, clothing, or any parts of the human body. The following procedure will ensure reliable results are obtained in the laboratory (Standard Methods for the Examination of Water and Wastewater):

1. Obtain approved bacteriological sample bottles and the appropriate forms for potable water sampling from the Provincial Laboratory of Public Health or the local Health Unit.
2. Keep the bottles closed until immediately prior to obtaining the sample. These bottles are sterilized and contain a tablet of dechlorination reagent. Never rinse the sample bottles.
3. Do not sample from fire hydrants. Use a service connection or blowoff especially designed for sampling the new water-main. Sample taps should be one-piece brass without aerators or other types of screens.
4. Do not flush the water main prior to sampling. The bacteriological test is meant to be a representative sample of water quality after the 16 hours hold time has elapsed. Failure to adhere to this requirement will result in rejection of the sample results and requirement to re-start the testing process.
5. Prior to filling the sample bottle, complete the Provincial Laboratory of Public Health form.
6. Begin flowing water from the sample point at a very low flow rate.
7. Carefully break the seal on the sample bottle cap and unscrew. Take great care not to contaminate the cap or the neck of the bottle with fingers or dirt.
8. Avoiding splashes, cut the water stream with the sample bottle and fill it until there is a head-space of approximately 20 mm in the sample bottle (roughly to the shoulder of the sample bottle). Replace the cap securely.
9. Shake the bottle 5 times to help the dechlorination reagent to dissolve.
10. Remove the sample identification number from the Provincial Laboratory of Public Health form and attach it to the sample bottle.
11. Bacteriological samples cannot be stored:
    I. If the sample cannot be delivered to the Provincial Laboratory within one hour of sampling, use an iced cooler for storage during transport.

II. In no case, should the samples be delivered to the Provincial Laboratory more than six hours after the sample was collected.

III. **Never** leave sample bottles in the sunshine or expose them to elevated temperatures.

12. Forward bacteriological sampling results to the County Project Representative once received from the local health authority. Test results must be deemed acceptable to the local health authority. If results are unacceptable, disinfection shall be repeated.

3.6.7.5 Clarity and Odour Sampling

Contact Utility and Waste Management Services in writing a minimum of 72 hours prior to planned sampling to coordinate the clarity and odour sampling. Testing will be completed as per the following procedure:

1. Fill a clean, white, 5-gallon pail with water. Do not flush line prior to filling.
2. Utility and Waste Management Services will inspect the sample for the following parameters:
   I. Foreign debris: organic and inorganic materials or objects. The presence of lubricant must be absent.
   II. Clarity: visual inspection of sample color and clarity.
   III. Contaminants: inspect surface for film (e.g., grease, oil, etc.)
   IV. Odour: sample must not have an offensive or unpleasant odour

If a sample fails any of the above inspection parameters, the entire test shall be considered failed. In such situations, the line must be flushed and re-tested. In some cases, when determined by Utility and Waste Management Services, additional laboratory testing may be required and must be completed by the Developer at their sole expense. In all cases, Utility and Waste Management Services shall have the final decision as to whether a clarity and odour sample is acceptable.

3.6.8 Exfiltration/Infiltration Leakage Test

Where deemed necessary by the County, an exfiltration and/or infiltration test shall be completed by the Developer. These tests shall not be required if CCTV is completed immediately after sewer construction and no deficiencies are observed.

Leakage testing shall be completed by either an exfiltration test or an infiltration test, depending on ground water levels.

The water level shall be measured at the beginning and the end of the test to calculate infiltration or exfiltration.

3.6.8.1 Exfiltration Test

Shall be performed when existing ground water level is less than 1m above the top of the pipe, measured from the highest point in the line.

The test section shall be filled with water to allow air displacement in the line. Water shall stand for 24 hours. Prior to the test, water shall be added to ensure a head of 1m to 3m over the top of pipe in the upstream manhole

The duration of testing is two hours.

Exfiltration Leakage Allowance	
Pipe Material	Exfiltration Leakage Allowed
PVC	5 L/day/mm dia/km.
Concrete	20 L/day/mm dia/km

3.6.8.2 Infiltration Test

Shall be performed when existing ground water level is 1m or more above the top of the pipe, measured from the highest point on the line.

Quantity of infiltration shall be measured by means of a V-notch weir or meter placed at the low end.

Discontinue pumping operations for at least three days before test measurements are to begin.

Measure rate of flow over a minimum one hour. Flows shall be recorded for each five minute interval.

Infiltration Leakage Allowance	
Pipe Material	Infiltration Leakage Allowed
PVC	5 L/day/mm dia/km.
Concrete	20 L/day/mm dia/km

3.6.9 Deflection Test (mandrel)

Where deemed necessary by the County, a deflection test shall be completed by the Developer. A deflection test shall not be required if CCTV is completed immediately after sewer construction and no deficiencies are observed.

Deflection testing shall be completed for PVC pipes 200mm and greater using mandrel or laser profiling equipment.

Mandrel shall be a cylindrical shape, with a minimum length of cylinder 1.5 times the pipe diameter. The cylinder shall have a minimum outside diameter of not less than 95% of the inside diameter of the pipe.

Mandrel shall be pulled by hand through all sections of sewer. If the mandrel is unable to pass through the pipe, the Contractor shall measure the exact inside diameter of the pipe using a deflectometer.

Test Date After Install	Allowable Deflection
30 to 365 days	5% of Internal Diameter
After 365 days	7.5% of Internal Diameter

If the deflection exceeds the allowable deflection, the pipe section shall be replaced at the sole cost of the Developer.

3.6.10 Hydrant Flow Test

At least one hydrant flow (hydrant hydrostatic pressure test and dry-barrel drainage test) test shall be completed by the Developer for each new hydrant to confirm flows and pressures in the design calculations are being provided in the field. Flow tests shall be permitted between April 15th and October 15th. Testing outside of this period is dependant on weather and at the sole discretion of the County.

If discrepancies between the design calculations and actual field conditions are discovered, all hydrants in the development shall be tested and the Consulting Engineer shall provide the County a written design brief outlining the corrective action to be completed by the Developer.

All hydrant flow tests must be completed in the presence of the County.

3.6.10.1 General Procedure

Acceptance testing of hydrants consists of hydrostatically pressure testing the hydrant at main pressure and conducting a drainage test for dry-barrel hydrants. Consult AWWA M17 for details on hydrant installation, testing, and maintenance.

HYDROSTATIC PRESSURE TESTING OF FIRE HYDRANTS AT MAIN PRESSURE

1. Remove the highest nozzle cap and open the hydrant boot valve a few turns to allow the water to rise in the barrel to the bottom of the nozzle.
2. Replace the nozzle cap securely, but leave it loose. Continue to charge the hydrant slowly, expelling the air through the loose cap.
3. Tighten the nozzle cap when all of the air has been expelled.
4. Open the hydrant boot valve completely.
5. Check visually for leakage at the flanges, nozzles, operating stem, O-rings, and at any joints on the hydrant body. Use a listening device to detect any leaks below grade.
6. No leaks are permitted. Repair all faults and repeat the test.

DRAINAGE TEST FOR DRY-BARREL HYDRANTS

1. Following the pressure test, close the hydrant main valve.
2. Remove one nozzle cap and place the palm of one hand over the nozzle opening.
3. Drainage should be sufficiently rapid to create a noticeable suction.
4. If the hydrant fails the drainage test:
    I. Partially open the hydrant with the nozzle caps on to create a pressure that will clear the drain valve.
    II. If this fails, remove and inspect the drain valve assembly. If the drain valve is clear, the drain outlet may be plugged from outside of the hydrant and will require digging down to clear the drain outlet.
    III. Repair all faults and repeat the test.

Volume 4

Rural Development

Sturgeon
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Community Innovation. Ambition.

4. Rural Development

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These requirements are intended to represent the minimum acceptable standards. The standards should not be considered as a substitute for detailed material and construction specifications to be prepared by the Consulting Engineer. It is the Developer and the Consulting Engineer's responsibility to develop and implement designs in accordance with good engineering practice, specific site condition requirements, and as may be required by the Authority Having Jurisdiction.

Where conflicts or inconsistencies with the General Municipal Servicing Standards arise due to adoption of other planning and design documents, the Developer shall be responsible for satisfying the more stringent requirement.

The Developer and the Consulting Engineer are responsible to ensure all work is designed and completed using engineering best practice to achieve design life and safety expectations consistent with good design and construction practices.

The Developer shall be responsible for all quality control testing. Quality control shall be performed by an independent third party and certified by a Qualified Professional.

4.1 Roadways

These requirements are intended to represent the minimum acceptable standards. In the absence of a specific rural development standard, the standard provided in the urban section (3.0) shall be considered as the requirement, unless otherwise approved by the County.

Roadway design shall be in accordance with the *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada), including minimum crest and sag k-values. The design life for all roadways shall be 20 years.

Roadway classifications and design designation shall be determined during the planning stages and in consultation with the County. The Developer shall be responsible for determining the anticipated AADT (VPD) generated by the proposed development to determine the appropriate roadway characteristics and elements.

The minimum longitudinal grade of ditches and road shall be 0.5%. The maximum longitudinal grade of ditches and road shall be 5%.

A geotechnical report for the proposed project shall be submitted to the County as part of the review process. The geotechnical report must include site-specific recommendations for pavement structure(s). The recommendations provided shall be compared to the minimum pavement structures listed in this section and the more stringent design is required.

4.1.1 Roadway Classifications

Rural roadways are designated based on classification as per the following table:

Classification	Designation	Drawing Number
Rural Grid	Class I (hot mix) 40m ROW/9m	4.1.0
	Class II (hot mix) 40m ROW/8m	4.1.1
	Class III (gravel) 30m ROW/8m	4.1.2
	Haul Road (gravel) 40m ROW/10m	4.1.3
Country Residential Subdivision	30m ROW/8.5m	4.1.4
Rural Commercial and Industrial	(L): 30m ROW/9m	4.1.5

4.1.2 Traffic Impact Assessment

Developments that generate 100 or more peak hour trips shall submit a TIA. The County reserves the right to require a TIA for any project it deems necessary.

Trip generation rates used to generate a projected volume in rural areas shall be based on a minimum of twelve (12) trips per dwelling per day external to the subdivision for single-family residential lot. Assessments must be completed in accordance with the *Traffic Impact Assessment Guideline* provided by Alberta Transportation and must identify all required transportation improvements and their implementation thresholds. The County reserves the right to require a TIA for any project it deems necessary.

The Consulting Engineer shall use the effort and complexity required to complete the appropriate TIA (Comprehensive Report vs. Memo Report) based on each project's specifics, such as: scope of work, project location, and potential impacts to traffic and mobility conditions.

TIA's are to be completed and signed by a qualified professional transportation engineer with sufficient applicable experience and who is licensed by APEGA to practice in Alberta.

4.1.3 Traffic Accommodation Strategy

Work within a roadway ROW may require a Traffic Accommodation Strategy completed in accordance with *Traffic Accommodation in Work Zones* provided by Alberta Transportation.

The Traffic Accommodation Strategy must identify the most appropriate combination of traffic controls required to provide a safe, well organized, and efficient flow of traffic through construction zones. All factors within the component checklist in Appendix D of the *Traffic Accommodation in Work Zones* manual must be addressed.

4.1.4 Rural Grid Roadways

Rural grid roads are considered any non-urban, township, or range road for which the County is the road authority.

Rural grid roadways are classified based on VPD as per the following:

Classification	VPD	Max Design Speed	Surface Treatment
Class I	> 1000	100 km/hr	Hot mix asphaltic concrete
Class II	200 – 1000	90 km/hr	Hot mix asphaltic concrete
Class III	< 200	90 km/hr	Gravel (dust mitigation)
Haul Road	< 400	90 km/hr	Gravel (dust mitigation)

Roadways requiring a design speed greater than 100 km/hr shall be designed in accordance with Alberta Transportation Highway Geometric Design Guide. The *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada) shall be incorporated in all roadway designs.

4.1.4.1 Class I Roadway – Hot Mix Asphaltic Concrete

Refer to SECTION 8 - DRAWING 4.1.0.

The standard ROW width is 40m and include spacing provisions for one multi-use trail.

The roadway structure shall be as determined by the Geotechnical report, but no less than the following:

Subgrade	150mm prepared in accordance with SECTION 3.1.20.3; Compacted to 100% SPD
Granular Base Course	300mm depth of 20mm crushed aggregate in accordance with SECTION 3.1.20.4; compacted to 100% SPD
Surface Course	60mm hot-mix ACB and 50mm hot-mix ACO in accordance with SECTION 3.1.20.5; Compacted to 98% SPD Marshall Density/94% MTD

The minimum side slope shall be a 4:1. The minimum back slope shall be 3:1. All required back sloping agreements shall be obtained by the Developer prior to construction.

The depth of the ditch shall be no less than 1m below the top of the subgrade shoulder. The width of the ditch bottom shall be 3.5m unless restricted by topography, multi-use trail, or other such encumbrance which prevents full ditch bottom width.

A ditch berm shall be required when the roadway is adjacent to standing water. Water shall be displaced outside of the ROW.

Clear zone range shall be 9m – 11m from the shoulder line, in accordance with the *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada).

Power poles shall be located 1m from the property line when no trees are present. When trees are present, power poles shall be located 5m from the property line, unless more than 5m setback spacing is required by the Utility Authority. The Developer shall be responsible for coordinating with the Utility Authority to determine the required setback spacing. Power Poles shall not be placed within the clear zone.

4.1.4.2 Class II Roadway – Hot Mix Asphaltic Concrete

Refer to SECTION 8 - DRAWING 4.1.1.

The standard ROW width is 40m. A 30m ROW may be accepted when space for a 40m ROW is not available, all appropriate back sloping agreements have been obtained, and TAC clear zone requirements are met.

The roadway structure shall be as determined by the Geotechnical report, but no less than the following:

Subgrade	150mm prepared in accordance with SECTION 3.1.20.3; Compacted to 100% SPD
Granular Base Course	250mm depth of 20mm crushed aggregate in accordance with SECTION 3.1.20.4; compacted to 100% SPD
Surface Course	60mm hot-mix ACB and 40mm hot-mix ACO in accordance with SECTION 3.1.20.5; Compacted to 98% SPD Marshall Density/94% MTD

The minimum side slope shall be a 4:1. The minimum back slope shall be 3:1. All required back sloping agreements shall be obtained by the Developer prior to construction.

The depth of the ditch shall be no less than 1m below the top of the subgrade shoulder. The width of the ditch bottom shall be 2.5m unless restricted by topography or other such encumbrance which prevents full ditch bottom width.

A ditch berm shall be required when the roadway is adjacent to standing water. Water shall be displaced outside of the ROW.

Clear zone range shall be 6.75m – 8.25m from the shoulder line, in accordance with the *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada).

Power poles shall be located 1m from the property line when no trees are present. When trees are present, for a 40m ROW, power poles shall be located 5m from the property line, unless more than 5m setback spacing is required by the Utility Authority. For a 30m ROW, power poles shall be located 2m from the property line and require 3m of tree clearing on private lands, unless more than 5m setback spacing is required by the Utility Authority. Where more than 5m setback spacing is required by the Utility Authority, the Developer shall be responsible for coordinating with the Utility Authority to determine the required setback spacing. Power poles shall not be placed within the clear zone.

4.1.4.3 Class III Roadway – Gravel

Refer to SECTION 8 - DRAWING 4.1.2.

The standard ROW width is 30m.

The roadway structure shall be as determined by the Geotechnical report, but no less than the following:

Subgrade	150mm prepared in accordance with SECTION 3.1.20.3; Compacted to 100% SPD
Granular Base Course	150mm depth of 20mm crushed aggregate in accordance with SECTION 3.1.20.4; compacted to 100% SPD
Surface Course	50mm depth of 20mm crushed aggregate surface lift in accordance with SECTION 3.1.20.5 after 12 months; Compacted to 100% SPD
Dust Mitigation (1)	Calcium chloride or approved equivalent
(1): residential accesses on class III roadways shall receive 100m of dust mitigation	

The minimum cross fall shall be 3%. The minimum side slope shall be a 4:1. The minimum back slope shall be 3:1. All required back sloping agreements shall be obtained by the Developer prior to construction.

The depth of the ditch shall be no less than 1m below the top of the subgrade shoulder. The width of the ditch bottom shall be 2.5m unless restricted by topography or other such encumbrance which prevents full ditch bottom width.

A ditch berm shall be required when the roadway is adjacent to standing water. Water shall be displaced outside of the ROW.

Clear zone range shall be 6.75m – 8.25m from the shoulder line, in accordance with the *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada).

Power poles shall be located 1m from the property line when no trees are present. When trees are present, power poles shall be located 2m from the property line and require 3m of tree clearing on private lands, unless more than 5m setback spacing is required by the Utility Authority. Where more than 5m setback spacing is required by the Utility Authority, the Developer shall be responsible for coordinating with the Utility Authority to determine the required setback spacing. Power poles shall not be placed within the clear zone.

4.1.4.4 Haul Road – Gravel

Refer to SECTION 8 - DRAWING 4.1.3.

The standard ROW width is 30m.

The roadway structure shall be as determined by the Geotechnical report, but no less than the following:

Subgrade	150mm prepared in accordance with SECTION 3.1.20.3; Compacted to 100% SPD
Granular Base Course	150mm depth of 20mm crushed aggregate in accordance with SECTION 3.1.20.4; compacted to 100% SPD
Surface Course	50mm depth of 20mm crushed aggregate surface lift in accordance with SECTION 3.1.20.5 after 12 months; Compacted to 100% SPD
Dust Mitigation (1)	Calcium chloride or approved equivalent
(1): residential accesses on Haul roads shall receive 100m of dust mitigation	

The minimum cross fall shall be 3%. The minimum side slope shall be a 4:1. The minimum back slope shall be 3:1. All required back sloping agreements shall be obtained by the Developer prior to construction.

The depth of the ditch shall be no less than 1m below the top of the subgrade shoulder. The width of the ditch bottom shall be 2.5m unless restricted by topography or other such encumbrance which prevents full ditch bottom width.

A ditch berm shall be required when the roadway is adjacent to standing water. Water shall be displaced outside of the ROW.

Clear zone range shall be 6.75m – 8.25m from the shoulder line, in accordance with the *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada).

Power poles shall be located 1m from the property line when no trees are present. When trees are present, power poles shall be located 2m from the property line and require 3m of tree clearing on private lands, unless more than 5m setback spacing is required by the Utility Authority. Where more than 5m setback spacing is required by the Utility Authority, the Developer shall be responsible for coordinating with the Utility Authority to determine the required setback spacing. Power poles shall not be placed within the clear zone.

4.1.4.5 Pipeline Crossings

Unimproved or undeveloped rural grid roadways may be considered for future road widening or upgrading to a Class I, II, III, or haul road. Therefore, to minimize potential disturbance to a pipeline, a future road ROW of 40m must be examined for each road pipeline crossing.

The top of pipe shall be a minimum of 1.8m below the single lowest elevation within the ROW.

Pipe material shall be heavy wall pipe in accordance with CSA Z662. Alternative pipe material may be approved with the use of a casing.

The top of pipe elevation must be labelled on the cross section and profile and referenced from the lowest labelled ground elevation. The top of pipe must be level throughout any potential road widening zone within the ROW. All elevations shall be UTM NAD83 geodetic elevations. Assumed elevations shall not be permitted.

Roadway centerline profile information for 150m from each side of the proposed pipeline crossing must be compiled and submitted for review by the County.

Only trenchless method installation is permitted. Open cuts are not allowed.

4.1.4.6 Shallow Utility Crossings

Shallow utilities shall be located in a conduit for the full width of the crossing.

Depth of cover is dependent on the Utility Authority. The Developer shall be responsible for coordinating with the Utility Authority to determine required depth of cover.

Refer to SECTION 6.

4.1.4.7 Access

Alberta Transportation is the road authority for all major (primary and secondary) highways within the County. Access permission for these roads must be obtained from Alberta Transportation. All proposed accesses within 800 m of a major highway shall be referred to Alberta Transportation for a Roadside Development Permit or Waiver. Accesses to County roads with a posted speed limit of 50 km/hr or less must be placed directly opposite to an existing roadways or access, whenever possible, and must have a minimum of 60m centerline to centerline spacing from any existing roadway and a

minimum of 45m from any existing access, on both sides of the grid road. There must be a minimum vertical and horizontal sightline of 85m maintained in both directions of the access.

Accesses to County roads with a posted speed limit of greater than 50 km/hr must be placed directly opposite to an existing roadways or access, whenever possible, and must have a minimum of 90m centerline to centerline spacing from any existing roadway or access, on both sides of the grid road. There must be a minimum vertical and horizontal sightline of 170m maintained in both directions of the access.

Accesses onto Rural Grid Roadways will be limited to 1 per parcel to reduce the number of connections directly onto the Grid Roadways. For large parcels separate accesses may be considered to separate the house access from Agriculture Field accesses and subject to review and approval by The County.

WIDTH

The width of a residential access at property line shall be 6.0 – 8.0 m for a single lot service and 10.0 m for a dual lot service (splitting once within private lands). A minimum 10.0 m return radii is required, unless a rural water service connection is made, at which 7.5 m is acceptable.

The width of an industrial or commercial access at property line shall be 9.0 – 12.0 m wide. A minimum 15.0 m return radii for an access with anticipated truck traffic. A minimum 10.0 m return radii for an access for the sole use of passenger vehicles (i.e., staff parking, customer parking).

STRUCTURE

Class I and II: the first 6m of the access from the edge of pavement shall be hard surfaced and constructed with the same structure as the accessed grid road. The remainder of the access surface, up to the property line, shall be a minimum 100mm gravel compacted to a minimum 98% SPD.

Class III and Haul Road: The access surface, from edge of grid road to the property line, shall be a minimum 100mm gravel compacted to a minimum 98% SPD.

Embankment material shall be clay and/or granular. Side slopes must be a minimum of 4:1.

A minimum 500mm diameter galvanized CSP culvert with 1.6mm wall thickness is required to convey water across each access. Where a larger culvert may be required, the County reserves the right to require submission of a culvert analysis and design. Refer to SECTION 3.3.8.15.

GRADE

The grade shall be between (+/-) 0.6% and 2% for the first 10m of the access from the edge of the grid road.

The grade at the property line shall be a minimum of (+/-) 0.6% and a maximum of 6%.

DELINEATOR POSTS

Two delineator posts are required at all new residential accesses to grid roads. Refer to SECTION 4.1.10.4.

4.1.5 Country Residential Subdivision Roadways

Alberta Transportation is the road authority for all major (primary and secondary) highways within the County. Access permission for these roads must be obtained from Alberta Transportation. All proposed accesses within 800 m of a major highway shall be referred to Alberta Transportation for a Roadside Development Permit or Waiver.

The minimum ROW width is 30m. Cul-de-sac bulb and return radii is 30m. Refer to SECTION 8 - DRAWING 4.1.4.

4.1.5.1 Structure

The roadway structure shall be based on a 20-year design life and as determined by the Geotechnical report, but no less than the following:

Subgrade	150mm prepared in accordance with SECTION 3.1.20.3; Compacted to 100% SPD
Granular Base Course	250mm depth of 20mm crushed aggregate in accordance with SECTION 3.1.20.4; compacted to 100% SPD
Surface Course	75mm hot-mix ACR and 50mm hot-mix ACR (six months prior to FAC) in accordance with SECTION 3.1.20.5;

Compacted to 98% SPD

When adjoining an existing road, a minimum 0.75m wide by 50mm deep section shall be ground out of the existing road and a 1.5m Type 8502 glass grid or approved equivalent must be installed to tie the new and old pavement together at the joint.

The minimum side slope and back slope shall be 5:1.

The depth of the ditch shall be as per the Geotechnical report but no less than 0.75m below the top of the subgrade shoulder. The width of the ditch bottom shall be a minimum 1m.

4.1.5.2 Alignment

Country residential subdivision roadways shall be designed in accordance with the *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada) and supplemented with the following requirements based on a 60km/hr design speed:

HORIZONTAL

Minimum centerline radius of curves	90m
Minimum tangent length	30m
Intersection return radius	15m

VERTICAL

Minimum vertical crest (k value)	15
Minimum vertical sag (k value)	10
Minimum length of vertical curve	30m
Minimum tangent length	30m

GRADE

The grade shall be between (+/-) 0.6% and 2% for the first 30m of the subdivision roadway from the edge of the grid road intersection.

4.1.5.3 Utilities and Services

GAS MAIN

- Located 1.5m from property line.
- Minimum depth of cover is 1.2m, measured from finished surface grade.

WATER MAIN

- Located 4.5m from property line.
- Minimum depth of cover is 2.75m in accordance with SECTION 3.2.
- Service connections shall be perpendicular to the road ROW.
- Water main valve marker posts are required adjacent to the property line and perpendicular to the valve for each service in accordance with SECTION 3.2.8

SEWER MAIN

- Storm sewer is not supported by the County in rural service areas.
- Sanitary sewer main shall be located 4.5m from property line, opposite side of road as the water main.
- Service connections shall be perpendicular to the road ROW.
- Sanitary sewer main valve marker posts are required adjacent to the property line and perpendicular to the valve for each service in accordance with SECTION 3.4.

SHALLOW UTILITIES

- Includes, power, cable, telephone, internet, and other telecommunications.
- All lines shall be buried underground.
- Power lines shall be located 3m from the property line.
- Minimum depth of cover is 1.2m, measured from finished surface grade.
- Refer to SECTION 6.

STREETLIGHTS

- Streetlights are not supported by the County in rural service areas.
- If provided by the Developer, a Homeowners Association shall be established prior and assume maintenance or replacement costs to the satisfaction of the County. The Developer shall complete the Homeowners Association Form in Appendix A and submit to the County for review and approval prior to commencing construction.

- Streetlights shall be designed and installed in accordance with the Illumination of Isolated Rural Intersections (Transportation Association of Canada), Guide for the Design of Roadway Lighting (Transportation Association of Canada), and any other applicable TAC streetlight standards or guidelines.

4.1.5.4 Subdivision Access and Entrance

Refer to SECTION 4.1.5.7 for location and spacing requirements.

Refer to SECTION 5.5.1 for entry feature requirements.

County residential subdivisions will require ROW tapers to accommodate deceleration and acceleration lanes when:

- Gaining access from a Class I rural grid road; or
- Gaining access from a Class II, III, or Haul Road when there are 20 or more lots

County residential subdivisions gaining access from a Class II, III, or Haul Road when there are less than 20 lots are subject to the County's review as to whether ROW tapers will be required.

10m x 10m cut corners are required for subdivision entrances.

Country residential subdivisions with more than 20 lots shall require a secondary access with a minimum roadway width of 8.5m.

4.1.5.5 Subdivision Intersections and Cul-De-Sacs

Internal roadway intersections shall be spaced a minimum of 75m, measured centerline to centerline, from the grid road and a minimum of 60m from other internal roadway intersections.

6m x 6m cut corners are required at all internal roadway intersections.

Unless otherwise directed by the County, emergency access is not required for cul-de-sacs exceeding 120m in length for country residential subdivisions, as long as the primary access is at least 8.5m wide.

For new country residential subdivisions where adjacent roads are not present and upon written request by the Developer, provisions for future access with subsequent

development for subdivisions greater than 16 hectares and less than 48.2 hectares may be considered for approval by the County and Fire Chief.

4.1.5.6 Sidewalks and Trails

Sidewalks are not required for country residential subdivisions. The County shall determine the requirement for a trail on one or both sides of the roadway on a project development basis, considering future planning and open space development policies.

4.1.5.7 Lot Access

Each access shall maintain a minimum vertical and horizontal sightline distance of 85m, or as otherwise prescribed by TAC, in both directions along the subdivision road.

The initial access location shall be a minimum distance of 75m, measured centerline to centerline, from the rural grid road subdivision entrance. All subsequent access locations shall be a minimum distance of 60m, measured centerline to centerline, from any internal subdivision roadway intersection.

A single-unit development is permitted only one driveway (private access). An additional driveway or shared driveway may be considered when submitted with justification and approved by the County. Lot access locations shall be a minimum of 1.5 m from the property line. Accesses shall be placed directly opposite other accesses, wherever possible.

Corner lots must have their access located on the internal subdivision road of lesser traffic volume. All access shall be shown on engineering drawings and must be constructed in conjunction with the subdivision roadway they adjoin.

WIDTH

The width of the access at property line shall be 7.5m – 9.0m for a single lot service and 10m - 12m for a dual lot service (splitting once within private lands). A minimum 10m return radii is required, unless a rural water service connection is made, at which 7.5m is acceptable.

STRUCTURE

Lot access roadway structure shall be consistent with the subdivision roadway it adjoins, at a minimum, up to property line.

The minimum side slope shall be 4:1. The minimum back slope shall be a 3:1. Minimum ditch bottom width of 1.0m. The depth of the ditch shall be as per the Geotechnical report but no less than 0.6 m below the top of the subgrade shoulder.

A minimum 500mm diameter galvanized CSP culvert with 1.6mm wall thickness is required to convey water across each access. Where a larger culvert may be required, the County reserves the right to require submission of a culvert analysis and design. Refer to SECTION 3.3.8.15.

GRADE

The grade shall be between (+/-) 0.6% and 2% for the first 10m of the access from the edge of the grid road.

The grade at the property line shall be a minimum of (+/-) 0.6% and a maximum of 6%.

DELINEATOR POSTS

Delineator posts are recommended at all access locations. Refer to SECTION 4.1.6.3.

4.1.5.8 Sound Abatement

Developments requiring sound abatement measures require a Noise Impact Assessment to be completed by a Qualified Professional and submitted to the County. Studies will be required when development is occurring in proximity to a Class I roadway as required by The County. The study must identify present and future noise levels and provide the measures required to adequately mitigate potential noise related issues. Post-development sound levels must be equal to or less than the *Alberta Transportation* guideline noise limit of 65 dBA Leq_{24}.

Traffic volume modelling must take into consideration the future sound levels of roadways in rural service areas, which can include road widening, improvements, and increasing traffic volumes. The design AADT to be used for traffic volume modelling must be confirmed with the County prior to finalizing the Noise Impact Assessment.

Sound abatement may be integrated into the design through use of restricted development pockets that maximize the distance from the roadway, physical structures such as berms and fences, or a combination thereof.

If a restricted development pocket is implemented, it must be reflected on all engineering drawings and be registered as a caveat on each affected lot.

If a fence is implemented, it must be constructed 150mm inside the property line. Refer to SECTION 5.6.

If a berm and fence combination is implemented, additional ROW land shall be dedicated for the front slope of the berm such that the fence is located 150mm inside the residential property line. Refer to SECTION 5.6.

A noise caveat shall be registered on all lots containing sound abatement measures. The caveat must identify the sound abatement measures included on the lot, indicate such measures must be maintained by the lot owner, and state that even with such measures there may be periodic instances of excessive traffic noise.

4.1.5.9 Community Mailbox and Turnouts

Refer to SECTION 3.1.20.

For country residential subdivisions with multiple accesses, mailbox and turnouts shall be located on the roadway from which the addressing is based (i.e., primary access).

The turnout shall be located on the right-hand side of the roadway and as far away as practical from the grid road and accesses.

The size of a turnout shall be based on the number of lots it services as per the following table:

Number of Lots	Length	Width (1)	Taper
< 10	6m	3m	15m
10 - 50	12m	3m	15m
> 50	18m	3m	15m
(1): Finished surface			

A delineator post shall be installed at each entrance/exit to a turnout. Refer to SECTION 4.1.10.4. A solid white line shall be painted at the roadway shoulder.

Adjacent ditches shall have a back slope and side slope of 4:1. Ditch bottoms shall be a minimum of 1m wide. Realignment of the ditch may require back sloping and/or drainage easements to be registered against the adjacent residential lot or a widening in the ROW.

4.1.6 Rural Hamlet Roadways

Rural hamlet roadway service standards shall be determined by the minimum size of the adjacent development lot as per the following table:

Minimum Lot Size	Density Type	Service Standard
< 0.075 ha	Urban Density	Section 3.1
0.075 – 0.80 ha	Hybrid Density	Hybrid (1)
> 0.80 ha	Rural Density	Section 4.1.5
(1): hybrid roadways shall be reviewed by the County on a case-by-case basis.		

4.1.7 Rural Commercial and Industrial Development Access

Alberta Transportation is the road authority for all major (primary and secondary) highways within the County. Access permission for these roads must be obtained from Alberta Transportation. All proposed accesses within 800 m of a major highway shall be referred to Alberta Transportation for a Roadside Development Permit or Waiver.

Accesses to County roads with a posted speed limit of 50 km/hr or less must be placed directly opposite to an existing roadways or access, whenever possible, and must have a minimum of 60m centerline to centerline spacing from any existing roadway and a minimum of 45m from any existing access, on both sides of the grid road. There must be a minimum vertical and horizontal sightline of 85m maintained in both directions of the access.

Accesses to County roads with a posted speed limit of greater than 50 km/hr must be placed directly opposite to an existing roadways or access, whenever possible, and must have a minimum of 90m centerline to centerline spacing from any existing roadway or access, on both sides of the grid road. There must be a minimum vertical and horizontal sightline of 170m maintained in both directions of the access.

When adjoining an existing road, a minimum 0.75m wide by 50mm deep section shall be ground out of the existing road and a 1.5m Type 8502 glass grid or approved equivalent must be installed to tie the new and old pavement together at the joint.

Accesses to be limited to 1 per parcel. If lot size and separation from other parcels is sufficient additional accesses may be considered by The County subject to review and approval.

WIDTH

9m – 12m wide at the property line for commercial and industrial development.

A minimum 15m return radii for an access with anticipated truck traffic or heavy industrial use. A minimum 10m return radii for an access for the sole use of commercial passenger vehicles (i.e., staff parking, customer parking).

STRUCTURE

Lot access roadway structure shall be consistent with the roadway it adjoins, at a minimum, up to property line.

The minimum side slope shall be 4:1. The minimum back slope shall be a 3:1. The depth of the ditch shall be as per the Geotechnical report but no less than 0.6 m below the top of the subgrade shoulder.

A minimum 500 mm diameter galvanized CSP culvert with 1.6mm wall thickness is required to convey water across each access. Where a larger culvert may be required, the County reserves the right to require submission of a culvert analysis and design. Refer to SECTION 3.3.8.15.

GRADE

The grade shall between (+/-) 1% and 2% for the first 10 m of the access from the edge of the road being accessed.

The grade at the property line shall be a minimum of (+/-) 0.6% and a maximum of 6%.

4.1.8 Culverts

Refer to SECTION 3.3.8.15 for culvert material and installation requirements.

Culvert sizing shall be calculated through stormwater drainage analysis and sized to accommodate 1:25 year rain events. Minimum culvert sizes are as per the following table:

Application	Minimum Diameter
Residential Access	500 mm
Industrial Access	500 mm
Roadway Crossing	600 mm

Culverts sized larger than the minimum may be required to accommodate site-specific ditch flow. The Consulting Engineer shall complete analysis to ensure appropriate culvert size is chosen. Where a larger culvert may be required, the County reserves the right to require submission of a culvert analysis and design. Refer to SECTION 3.3.8.15.

Culverts shall consist of new galvanized CSP with a minimum wall thickness of 1.6mm, or as otherwise required by the specific loading criteria. All culverts shall be installed in accordance with the manufacturer's specifications and complete with bevelled end sections on both the inlet and outlet ends. The invert shall be extended to the tow of the side slope and completed with a 3:1 graded end treatment. The culvert grade shall be 1/4 diameter of the pipe below the ditch grade.

Riprap material end treatment shall be placed around the inlet and outlet for all culverts. Riprap material shall consist of rock ranging in size from 150 mm to 350 mm, with 50% of the rock material being larger than 300 mm, or as otherwise required by site-specific flow regime calculations and ESC requirements. Refer to SECTION 8 - DRAWING 5.3.5.

All roadway culverts shall be installed to provide a minimum depth of cover of 400 mm or ½ of the culvert diameter, whichever is greater. Depth of cover shall be measured from the finished shoulder grade of the roadway to the top of the culvert. Culverts shall be placed on a culvert bed and buried ¼ diameter below the ditch grade. Culvert bed and backfill shall be compacted to 97% SPD.

4.1.9 Ditches

Refer to SECTION 7.

Maximum grade of ditch to be 5% and minimum grade of ditch to be 0.5%.

All ditches must be graded to ensure:

- Positive drainage occurs at the required velocity; and
- Standing water is eliminated or minimized.

The maximum design velocity of water conveyed in ditches must be less than the scour velocity of the ditch surface treatment such that erosion of the ditch will not occur (typically < 1.2 m/s). The minimum design velocity must be adequate to maintain positive drainage and conveyance of water and silt loading.

Temporary protection must be provided during the establishment of the ditch lining when vegetation is used as a ditch lining. Permanent protection must be provided for in the ditch design when velocities and potential erosion is a concern. Seeding or sodding of ditches shall be in accordance with SECTION 5.4.5.

4.1.10 Traffic Control and Signage

Traffic control and signage shall be placed and installed in accordance with the *Manual of Uniform Traffic Control Devices* (Transportation Association of Canada). All posts shall be pressure treated wood 4x4 or 4x6.

4.1.10.1 Street Name and Address Signs

Street name and address signs must consist of high intensity reflective material for the lettering and background. Sign sheeting shall be 5052 – H38 grade aluminum, high tensile 234 MPa with 3M High Intensity Grade reflective material.

Street name signs at intersections shall consist of white lettering on a blue metal plate. Lettering size shall be 200mm.

In addition to street name signage, cul-de-sacs shall have 100mm white address numbering on a blue metal plate.

Sign blades shall be 250mm deep and mounted on end-mount brackets in accordance with the following:

Up to 900mm	BM 18 bracket
> 900 mm	BM 36 bracket

Refer to SECTION 3.1.24.

4.1.10.2 Subdivision Sign

The Developer shall supply and erect a subdivision display sign at the main entrance of each multi-lot subdivision prior to occupation by the first resident. The specific design and location of each sign shall be approved by the County prior to installation and display the subdivision name, municipal address of the main entrance, and the subdivision layout with the assigned parcel identification number for each lot, including any municipal reserve lots.

The subdivision sign shall be constructed by a commercial sign manufacturer in accordance with the following requirements:

Subdivision Sign Requirements	
Size	Map portion: 1.2m by 2.4m Address portion: 0.3m by 2.4m
Material	HDO Plywood or approved equivalent
Layout	Address portion – top Map portion – bottom Map and address portion as described below
Finish	3M white high intensity reflective sheeting with computer cut lettering.
Date Stamp	Located on face of sign showing the date of manufacture
Warranty	10-year manufacturer against surface deterioration
Posts	Pressure treated wood 4x4 or 4x6
Fastener	As per manufacturers design; to be submitted and approved by the County prior to installation
Installation	Installed as per SECTION 8 - DRAWING 4.1.14
Location	As determined on site and approved by County

The subdivision sign layout shall consist of two parts: Map portion and Address portion:

Subdivision Sign Map Portion Requirements	
Size	1.2 m (tall) x 2.4 m (wide)
Subdivision Name	Myriad Pro Bold or Calibri Bold lettering; 550 pt (7.64”) Left justified Title case (not all capital letters) Sturgeon Blue R3 G82 B152 or C99 M76 Y9 K1
Map Image	Myriad Pro Bold or Calibri Bold lettering; 80 pt (1.1”) Simple outline of subdivision lots complete with lot numbers in black lettering Main roadways delineated in 80% black complete with road names labelled in white lettering

		MR, ER, PUL, and other open space areas delineated and filled in Sturgeon Green R73 G137 B73 or C60 M0 Y80 K35 Water features delineated and filled in blue
General Map Items	Portion	Signboard base color is white "You are here" location consists of red dot with black outline "You are here" is Calibri Bold lettering; 180 pt (2.5") Border around signboard is Sturgeon Blue R3 G82 B152 or C99 M76 Y9 K1; 23 pt (0.32") thickness; 2" from edge (center of stroke) North arrow located in upper right corner placed in alignment with right edge of Sturgeon County logo

Subdivision Sign Address Portion Requirements	
Size	0.3 m (tall) x 2.4 m (wide)
Lettering	Myriad Pro Bold or Calibri Bold lettering; 600 pt (8.33") White color Center justified vertically and horizontally in section
General Address Portion Items	Sturgeon Blue R3 G82 B152 or C99 M76 Y9 K1 background Where placement does not allow for the standard size sign, the width and height shall be reduced by equal amounts to retain the proportion of the sign.

Entry features shall be in accordance with Section 5.5.1.

4.1.10.3 Rumble Strips

Class I and II grid road intersections, high-traffic locations, or other areas as directed by the County must include discontinuous rumble strips. Rumble strips shall consist of a 150mm wide bars, milled to a depth of 8mm – 12mm. rumble strips to be placed 750mm apart with spacing as per the following table:

Start Station	Stop Station	Bar Section Length	Number of Bars
Stop line	0.0m	-	-
Strip section gap (90.0m)			
90.0m	92.85m	2.85m	4
Strip section gap (42.15m)			

135.0m	138.75m	3.75m	5
Strip section gap (46.25m)			
185.0m	188.75m	3.75m	5
Strip section gap (51.25m)			
240.0m	244.65m	4.65m	6

Refer to DRAWINGS 4.1.10 & 4.1.11 for bar geometry and alignment.

4.1.10.4 Delineator/Marker Posts

Delineator posts shall be installed at the following locations:

Intersections of a County subdivision road and grid road	6 posts
Residential access to a grid road	2 posts
Roadside turnout	2 posts

Delineator posts shall be GlasForms Inc. Fiberglass Composite Markers, Dual Flex, 66" long in white, complete with orange reflective stickers applied to both sides, or approved equivalent.

Delineator posts shall be attached to a composite post anchor and shall be installed 18" into the ground, with 48" visible above grade. Refer to SECTION 8 - DRAWING 4.1.14.

4.1.11 CCC/FAC Acceptance Criteria

The warranty and maintenance period for roads shall begin on the date of CCC issuance and last for a period of two years.

The FAC for roads (excluding surface course asphalt) shall be issued, subject to all deficiencies being rectified, two years after the issuance of the CCC for roads, or one year after the issuance of the FAC for underground improvements, whichever occurs later. An additional 12-month warranty and maintenance period shall be required on the surface course asphalt.

If a pavement structure other than what is specified in this section was approved by the County, the CCC/FAC warranty periods may be extended by up to 12 months.

Refer to SECTION 2.

4.2 Water Distribution Systems

These requirements are intended to represent the minimum acceptable standards. In the absence of a specific rural development standard, the standard provided in the urban section (3.0) shall be considered as the requirement, unless otherwise approved by the County.

These standards should not be considered as a substitute for detailed material and construction specifications to be prepared by the Consulting Engineer. It is the Developer and the Consulting Engineer's responsibility to develop and implement designs in accordance with good engineering practice, specific site condition requirements, and as may be required by the Authority Having Jurisdiction.

Water distribution Systems shall be designed in accordance with the standards and guidelines provided by Alberta Environment and Parks and the American Water Works Association.

4.2.1 System Design

The following types of water supply are acceptable for rural developments:

- High Pressure Water Distribution System;
- Low Pressure Trickle Water System
- Cistern tank system; and
- Water Well System

Rural development may be required to connect to the high pressure municipal water distribution system where a connection is available. Where a high-pressure municipal water service will be provided, design of the system shall be in accordance with SECTION 3.2.

Where connection to a high-pressure water distribution system is not feasible, a development must utilize a low-pressure trickle water system. The use of a trickle water system shall only be approved on a neighbourhood-wide basis and in conjunction with the applicable Area Structure Plan.

A trickle water system analysis report, complete with plan-profile drawing and specifications, must be provided to the County for each trickle water system. The report shall be completed by a Qualified Professional and submitted to the County for review prior to construction. The report must include the design parameters and design

calculations for sizing the lines based on 1.9 L/min restricted flow at a minimum 140 kPa and maximum 700 kPa residual pressure at the property line.

Trickle water systems must provide a minimum of 3,400 liters of storage (cistern, underground tanks, etc.) for each lot and must be complete with a meter. Storage tanks shall be set back from the roadway at an appropriate elevation that will maintain positive water pressure, allowing for a significant head loss through the meter chamber.

Where connection to neither a high pressure or low pressure (i.e., trickle) water distribution system is feasible, a development may utilize a cistern tank or water well system. An adequate groundwater supply is required, which can meet the domestic water needs of each parcel during peak demand periods and over the long term. A hydrogeological analysis of the groundwater supply and quality, completed by a Qualified Professional, is required when a ground water well system is to be utilized.

In addition to the GMSS, water wells must be designed and installed in accordance with the *Water Act* (Alberta Environment and Parks), *Environmental Protection and Enhancement Act* (Alberta Environment and Parks), and any other applicable AHJ requirements. It is recommended all water wells are installed and maintained following the guidelines provided in the Working Well Program (www.alberta.ca/working-well-resources.aspx)

4.2.2 Fire Flow

Refer to SECTION 3.2.6.

Fire protection shall be supplied by the municipal water supply, wherever possible. When fire protection is required and the municipal water supply is unavailable, private fire protection systems shall be required.

If fire protection water is required by private developments and not provided by municipal means, above or below ground storage tanks for private fire protection water supplies must be sized in accordance with the latest version of the *Alberta Building Code* and *Water Supply for Public Fire Protection* (Fire Underwriters Survey). Tanks must be constructed of materials and installed using methods acceptable to a Licenced Engineer. The owner is responsible for maintaining all systems on their property.

Dry hydrants connected to private fire water storage supplies to be used by fire departments for firefighting purposes must be constructed and installed in accordance with the latest version of the *Alberta Building Code* and *Water Supply for Public Fire Protection* (Fire Underwriters Survey) using methods acceptable to a Licenced Engineer. The owner is responsible for maintaining systems on their property.

4.2.3 Water Mains

A minimum distance of separation must be maintained between water mains and all other lines as per Section 3.2.8.2.

Water mains and distribution pipes shall be installed to provide a minimum of 2.75m to the top of any valves and bonnets, and 3.0 meters, measured from the top of pipe to the finished surface grade, at all locations along the system.

Trenchless method (i.e., directional drilling, auguring, etc.) is required under all existing and proposed roads, walkways, and structures. All auger pit excavations shall be backfilled with granular bedding material in lifts not exceeding 150mm and shall be mechanically compacted to 95% SPD up to 350mm above the pipe and 98% SPD above that. Roadside slopes shall be compacted to 98% SPD. Repair of any settlement shall be completed prior to FAC being issued.

Air release facilities and blow off valves are required at ends of lines and high points within the system.

A minimum of one water sampling station, located at the end of a water main, is required for each subdivision.

Tracer wire is to be installed on all water mains and services. Tracer wire shall be 14-gauge coated copper wire complete with sacrificial anodes every 1000 linear meters. At every road crossing, valve box riser, every facility location, and at each end of every plastic pipe section, the tracer wire shall be brought flush to the ground inside a rigid PVC conduit and looped inside a PVC junction box within a Type A valve box marked "Water". Splicing of tracer wire shall be soldered only, no mechanical connections are permitted, and an electrical continuity test is to be performed prior to acceptance.

Marker posts shall be installed at the property line perpendicular to all valve and appurtenance locations.

Warning signs and painted fence posts shall be installed at the edge of the road ROW where water mains cross roadways. Refer to SECTION 8 - DRAWING 4.2.1.

4.2.4 Service Connections

Each titled lot must have a separate water service complete with a meter and vault chamber. All rural developments and homes without a basement require a meter chamber installed 1.5m inside the private property line, within the utility easement, and

must be located a minimum of 2m from the shoulder of the driveway. A utility easement must be registered on all lots.

Water meter chambers shall be either of the following types:

- MUELLER/Hunt THERMAL-COIL (catalogue # 250-CT-18-96-L-B-A-L-N). Insulated pad (catalogue # 790153). Flat lid with center mount lock (catalogue # 780069);

  OR

- FORD Coil Pit Setter (catalogue # PTCBHH-388-18-96-FP-NL). H-20 rated composite flat lid (catalogue # PPSC-18-L-P-BR). Closed cell insulated disc (catalogue #CCID-18-6). Solid plastic bottom plate (catalogue # PPSBP-18-P).

Water services shall be installed to provide a minimum of 2.75m depth of cover, measured from the top of pipe to the finished surface grade, at all locations along the service lead. The minimum water service diameter is 25mm.

Water service connections material shall be HDPE 3408; DR11, in accordance with AWWA C902.

Connections to the main shall be made using a branch saddle or tapping tee. All fittings and joints must be thermal heat fused using either heat fusion joining in accordance with ASTM D2657 or electrofusion joining in accordance with ASTM F1290 or ASTM F1055. Services shall be one piece; no mechanical connections are permitted between the main and meter chamber.

All service connections passing underneath an existing or proposed roadway, walkway, or other surface feature shall be completed using auguring method or an approved equivalent trenchless method. In situations where trenchless method is not feasible due to adverse soil conditions, open cut method may be permitted following review and approval by the County.

All auger pit excavations shall be backfilled with granular bedding material in lifts not exceeding 150mm. Backfill shall be mechanically compacted to 95% SPD up to 350mm above the pipe and 98% SPD above that. Roadside slopes shall be compacted to 98% SPD.

4.2.5 Materials and Installation

The Developer shall supply and install new materials only. Materials shall be installed within two years from the production date on the certification form. Any such material

which are defective in manufacture or have been damaged during or after delivery shall be replaced by the Developer at their expense.

Materials that are different from those described in these Standards and are intended to be used as equivalents must be approved by the County prior to installation. Refer to SECTION 2.10.

Pipe installation shall be in accordance with the pipe manufacturer's specifications. Refer to SECTION 3.2.

4.2.6 Trenching, Bedding and Backfill

All trenching, bedding, and backfill shall be in accordance with SECTION 3.5.

4.2.7 Inspection and Testing

All water distribution system inspections and testing shall be in accordance with SECTION 3.2.21.

4.3 Storm Water Management Systems

These requirements are intended to represent the minimum acceptable standards. In the absence of a specific rural development standard, the standard provided in the urban section (3.0) shall be considered as the requirement, unless otherwise approved by the County.

These standards should not be considered as a substitute for detailed material and construction specifications to be prepared by the Consulting Engineer. It is the Developer and the Consulting Engineer's responsibility to develop and implement designs in accordance with good engineering practice, specific site condition requirements, and as may be required by the Authority Having Jurisdiction.

The design of rural storm water management systems may include surface (overland) discharge of storm water and must be in accordance with the most recent version *Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems* (Alberta Environment and Parks).

4.3.1 System Design

The design of rural storm water management systems shall be completed in two design stages: preliminary design stage and detailed design stage. Each design stage shall include

an associated storm water management report, complete with geotechnical investigation by a Qualified Professional, that addresses the suitability of the site for development in support of the Area Structure Plan or Subdivision Plan review submission. The scope and level of detail required for each report must provide sufficient detail to demonstrate storm water management in relation to the proposed development of lands.

Land Development Stage	SWM Design Stage	Level of Detail
Area Structure Plan	Preliminary Design Report	SECTION 4.3.3
Subdivision Plan	Detailed Design Report	SECTON 4.3.4

For both design stages, the storm water management report must include a description of the proposed storm water management system for all affected areas, both on-site and off-site. Supporting plans shall include proposed suitable building locations and elevations, a list of standards to be incorporated in the final design, and applicable hydrological and hydrogeological calculations verifying the proposed system's design and capabilities.

Proposed storm water management systems must be designed in accordance with these standards, Alberta Environment and Parks, and any other applicable AHJ's.

The proposed system must accommodate all drainage from adjacent lands that are presently or naturally flowing through the development site. All drainage to be discharged from the development site must be controlled such that post-development runoff rates are equal to or less than pre-development runoff rates. Drainage from the development site onto lands owned by other private landowners is not permitted.

Storm water management systems shall be generally designed and constructed to achieve the following principles:

- Eliminate or mitigate property damage and flooding from major storm events;
- Control the post-development release rate to the same or less than pre-development release rates, or as otherwise required by an applicable Master Drainage Plan, whichever is more stringent;
- Mitigate erosion of soils and subsequent sedimentation of water courses, including natural water bodies and ditches, during construction; and
- Avoid disturbing natural environmental features, such as wetlands and watercourses. Limit disturbance in these areas where avoidance is not possible.

Refer to SECTION 3.3.10.

4.3.2 Other Regulatory Bodies

Storm water management systems must be in accordance with all applicable Acts, regulations, and standards set forth by AHJ's, including provincially and federally. The following list outlines regulations which may be applicable, but should not be considered a complete list:

- Environmental Protection and Enhancement Act
- Water Act
- Water (Ministerial) Regulation
- Public Lands Act
- Alberta Wetland Policy
- Alberta Guide to Wetland Construction in Stormwater Management
- Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems
- Stormwater Management Guidelines for the Province of Alberta
- Municipal Government Act
- Subdivision and Development Regulation
- Edmonton Garrison Heliport Zoning Regulations

The Developer shall be responsible for obtaining all external approvals and providing them to the County for review prior to construction. The County will not issue approval of a storm water management system until all other required approvals are submitted to the County, whenever possible.

4.3.3 Preliminary Design

The preliminary design of the storm water management system shall be completed in conjunction with the Area Structure Plan for the development area. The level of detail must be sufficient to provide a clear assessment of the proposed system which, at a minimum, includes the following:

- A plan of development that depicts existing ground contours (topographic survey), existing watercourses and surface water features complete with the extent of their individual flood plains, and the overall proposed storm water drainage and management routing. The plan shall have a scale no greater than 1:2000. The topographic survey shall have a maximum of 0.5m ground intervals.
- A plan depicting the development area and limits of natural upstream catchment basins that drain into the site and must be accommodated within the proposed on-site storm water management system.

- The results of an assessment determining impacts of the development to any off-site downstream ditches, culverts, and water courses. The assessment must identify any off-site improvements required to accommodate drainage or erosion caused as a result of the development.
- A preliminary cross section showing water levels and pipe elevations for storm water storage areas, if present. Where existing wetland are to be used for storage, the perimeter of the wetland must be delineated for the existing wetland (pre-development), post- development, and at the 1:100 year storm event water level.
- A description of the proposed storm water management system, both on-site and off-site, the standards to be incorporated in the final design, applicable hydrological and hydrogeological calculations verifying the proposed system's design and capabilities, and the estimated floodplains (within the development) of nearby watercourses.
- An erosion and sediment control plan, including the proposed BMP's and overall strategy for mitigating erosion and sediment for construction activities.

4.3.4 Detailed Design

The detailed design of the storm water management system shall be completed in conjunction with the Multi Lot Subdivision Plan for the development area. The level of detail must be sufficient to provide a clear and detailed assessment of the proposed system which, at a minimum, includes the following:

- An overall drainage plan that depicts existing ground contours (topographic survey), existing watercourses and surface water features complete with the extent of their individual flood plains, and the overall proposed storm water drainage and management routing. The plan shall have a scale no greater than 1:1500. The topographic survey shall have a maximum of 0.5m ground intervals.
- Pre-development flow rates in comparison to post-development flow rates and controlled release rates, indicating flow controls (i.e., restrictors) in place. Including sample calculations that show work. Flow data used in calculations must be shown.
- The developable area for each lot complete with design building (finished floor) elevations and lot grades wherever possible.
- Subdivision roadway and driveway layout, including culvert locations and sizes.
- Drainage arrows depicting the direction of existing and proposed drainage (major flow route).
- Boundary limits of each drainage area tributary to culverts and ditches.
- Existing wetlands to be retained and removed, including wetland that is filled or drained.
- Location and type of storm water runoff control facilities

- An erosion and sediment control plan, including the proposed BMP's, maintenance schedule, layout, and specific strategy for mitigating erosion and sediment for construction activities.

4.3.5 Erosion and Sediment Control

An erosion and sediment control plan may be required for rural developments. The scope and level of detail required for plans shall be site-specific and provide sufficient detail to demonstrate adequate erosion and sediment control measures related to the proposed development of lands are in place. Refer to SECTION 7.

4.3.6 Trenching, Bedding and Backfill

All trenching, bedding, and backfill shall be in accordance with SECTION 3.5.

4.3.7 Inspection and Testing

All storm water management system inspections and testing shall be in accordance with SECTION 3.3.13.

4.4 Sanitary Sewer Systems (Low-Pressure Systems)

These requirements are intended to represent the minimum acceptable standards. In the absence of a specific rural development standard, the standard provided in the urban section (3.0) shall be considered as the requirement, unless otherwise approved by the County.

These standards should not be considered as a substitute for detailed material and construction specifications to be prepared by the Consulting Engineer. It is the Developer and the Consulting Engineer's responsibility to develop and implement designs in accordance with good engineering practice, specific site condition requirements, and as may be required by the Authority Having Jurisdiction.

The design of rural sanitary sewer systems shall be in accordance with the most recent version *Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems* (Alberta Environment and Parks) and the *Alberta Private Sewage Systems Standard of Practice* (Safety Codes Council).

4.4.1 System Design

Rural development may be required to connect to the existing municipal sanitary sewer gravity system where a connection is available. Where such a gravity service will be provided, design of the system shall be in accordance with SECTION 3.4.

Where an existing municipal system does not exist and a gravity system is not feasible, a low-pressure sanitary sewer system is acceptable. The system must be of sufficient capacity to service the ultimate population projected for the development area.

The Developer and Consulting Engineer are responsible for ensuring that the proposed system and infrastructure is designed and constructed to achieve the manufacturers design life expectancy, using good engineering design and construction practices. All proposed disposal means must be identified and in accordance with any applicable AHJ, including Alberta Environment and Parks legislation, regulations, and guidelines.

Plan-profile drawings, specifications, and a design report must be prepared by a Licenced Engineer and be submitted to the County and Alberta Environment and Parks for review. All necessary approvals must be granted by Alberta Environment and Parks and submitted to the County prior to construction.

The design report must include recommended pump rates and heads. The report must also include pipe sizing calculations that demonstrate consideration for the topography of the services lands and population projections.

Refer to SECTION 3.4.

4.4.2 Sewer Mains

Mains shall be installed to provide a minimum of 2.75m depth of cover, measured from the top of pipe to the finished surface grade, at all locations along the system.

Trenchless installation method is required under all existing and proposed roads and structures. Compaction of any trenches or augur pits and remediation of any settlement is required within two years.

A minimum distance of 3m horizontal separation must be maintained between sewer mains and all other lines.

Pipes capable of flushing must be at the start of each collection main to facilitate removal of main line blockages and debris.

Manual air/vacuum relief valves must be added at all high points in the system for removal or hydrogen sulfide gases from anaerobic decomposition of organics.

Tracer wire is to be installed on all sewer mains and services. Tracer wire shall be 14-gauge coated copper wire complete with sacrificial anodes every 1000 linear meters. At every road crossing, valve box riser, every facility location, and at each end of every plastic pipe section, the tracer wire shall be brought flush to the ground inside a rigid PVC conduit and looped inside a PVC junction box within a Type A valve box marked "Sewer". Splicing of tracer wire shall be soldered only, no mechanical connections are permitted, and an electrical continuity test is to be performed prior to acceptance.

Marker posts shall be installed at the property line perpendicular to all valves, air releases, and flushing standpipe locations. Refer to SECTION 4.1.10.4.

Warning signs and painted fence posts shall be installed at the edge of the road ROW where water mains cross roadways. Refer to SECTION 8 - DRAWING 4.2.1.

4.4.3 Materials and Installation

The Developer shall supply and install new materials only. Materials shall be installed within two years from the production date on the certification form. Any such material which are defective in manufacture or have been damaged during or after delivery shall be replaced by the Developer at their expense.

Materials that are different from those described in these Standards and are intended to be used as equivalents must be approved by the County prior to installation. Refer to SECTION 2.10.

Pipe installation shall be in accordance with the pipe manufacturer’s specifications.

4.4.3.1 Mains

HDPE shall be PE 3408; DR11, Iron pipe sized, and shall be in accordance with CSA B137, ASTM F714, and ASTM D3350. Pipe sized 13 – 76mm shall be in accordance with AWWA C901. Pipe sized 100 – 1,575 mm shall be in accordance with AWWA C906. Shop only molded pipe fittings are permitted. All joints must be thermal heat fused. Mechanical service connections are not permitted. All components must be made from corrosion resistant materials. The age of pipe shall not exceed two years at the time of installation.

4.4.3.2 Service Connections

A separate service line, complete with a curb stop, is required for each lot. Curb stops shall be installed at the private property line, within the utility easement, and must be marked with “Sewer”.

Rural sanitary sewer service pipe shall be a minimum 40mm HPDE DR 11 in accordance with AWWA C901.

Connections to the main shall be made using a fused inline tee or saddle. All fittings and joints must be thermal heat fused using either heat fusion joining in accordance with ASTM D2657 or electrofusion joining in accordance with ASTM F1290 or ASTM F1055. Services shall be one piece; no mechanical connections are permitted between the main and the curb stop.

Curb stops shall be non-draining type and located adjacent to driveway locations. The minimum depth of cover shall be 2.75m, measured from the top of pipe to the finished surface grade, at all locations along the service.

All service connections passing underneath an existing or proposed roadway, walkway, or other surface feature shall be completed using auguring method or an approved equivalent trenchless method. In situations where trenchless method is not feasible due to adverse soil conditions, open cut method may be permitted following review and approval by the County.

All auger pit excavations shall be backfilled with granular bedding material in lifts not exceeding 150mm. Backfill shall be mechanically compacted to 95% SPD up to 350mm above the pipe and 98% SPD above that. Roadside slopes shall be compacted to 98% SPD.

4.4.3.3 Fittings

HDPE fittings shall be DR 11 PE 3408 in accordance with ASTM F714 and CSA B137. Shop molded fittings shall be used and must be in accordance with ASTM D2683 for socket-type fittings, ASTM D3261 for butt-type fittings, and ASTM F1055 for electrofusion-type fittings.

4.4.3.4 Valves

Valves 50mm and smaller shall use brass inverted key type curb stops in accordance with ASTM B62 compression type. Curb stops must have adjustable bituminous or epoxy coated cast iron service base with stem to suit 3m depth of bury. Top of cast iron box

shall be marked “Sewer”. All curb stops shall incorporate 75mm long stainless-steel sleeves for connections to HDPE pipe.

Valves 75mm and lager shall be iron body, bronze mounted gate valves with a non-rising spindle, that opens by turning in a counterclockwise direction. Metal seated wedge gate valves must be in accordance with AWWA C500 and resilient seated gate valves must be in accordance with AWWA C509.

Valve interior and exterior must be factory coated with epoxy coating in accordance with AWWA C550. Valve ends that are compatible with pipe joint type (cast iron outside diameter) must be used.

All valves shall be located in a cast iron valve box in accordance with ASTM A48; class 25, screw or sliding type. Asphaltic coating or fusion bonded epoxy shall be applied to the interior and exterior of the box in accordance with AWWA C213. Set screws shall be galvanized and the top of the box shall be marked “Sewer”.

Extension stem shall be 25mm square mild steel with 50mm operating nut and flange suitable for 3m bury. A rock disk nut is required on all valves.

Schedule 40 PVC valve boxes for the bottom boot of Norwood Foundry type A sliding type valve boxes are permitted in areas not exposed to vehicle loading.

4.4.3.5 Septic Tank and Pump

Septic tank and pump requirements are only for those which connect to a low-pressure system and do not apply to self-serviced lots, such as septic field systems.

SEPTIC TANK

Septic tanks shall be a two-compartment tank or a single-compartment tank complete with a pump vault. Tanks must be designed, sized, and constructed in accordance with the *Alberta Private Sewage Systems Standard of Practice* (Safety Codes Council) and Alberta Plumbing Codes. Tanks must be sized large enough to accommodate the following:

- Minimum storage of 5,000 liters;
- 24 hours of emergency storage capacity above the high-water alarm level, utilizing the septic tank freeboard capacity below ground and below the building drain outlet invert;

- Minimum 12 hours of retention time below the high-water alarm level to allow for proper treatment of sewage;
- Minimum 450mm pump submergence; and
- Storage of sludge and scum accumulation.

Septic tank risers shall extend a minimum 200mm above the final surface grade and be complete with watertight sealed manhole covers. Surface runoff must be diverted away from the manhole cover. No surface drainage, water, or any discharge other than sanitary waste shall be allowed to enter the tank.

Septic tanks must be a sealed watertight type of tank, such as fiberglass, single-piece precast, or include special provisions to achieve watertight. All pipe and wire conduits into the tank must be through hubs or fittings made during construction of the tank and installed in a watertight and gastight fashion.

Effluent shall enter the pump compartment or pump vault from the clear zone of the tank between the scum and sludge layers. Anti-buoyancy provisions must be adequate.

PUMP

Pumps must be submersible, removeable, and be capable of a pump run time of three minutes at a pumping rate of 1 L/s. Pumps must be a CSA approved effluent pump and capable of delivering 0.3 L/s at 70m of total dynamic head or at a pressure established by the County.

Pump discharge pipe material shall be HDPE DR 11 or stronger and include a check valve, disconnect union, and gate valve within the pump tank.

Pump screens shall be no larger than 3mm in size with a maximum surface area of 2 m^2.

Pumps must be activated by either mechanical level controllers or mercury level control switches.

A siphon-break valve must be provided for any pump that is located at a higher elevation than the elevation of the terminal end.

4.4.4 Trenching, Bedding and Backfill

All trenching, bedding, and backfill shall be in accordance with SECTION 3.5.

4.4.5 Inspection and Testing

All sanitary sewer system inspections and testing shall be in accordance with SECTION 3.4.19.

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5. Landscape and Open Space Development

Contents

5.1 General

Open space may be developed or left in a natural state in both the urban and rural areas of Sturgeon County as defined in the Open Space Plan.

Open space development requirements for amenities will be determined on an individual basis by the County, depending on the Open Space Plan for Sturgeon County, February 2016 (or revisions as adjusted), adjacent existing amenities, surrounding land use, and the capacity of the development to accommodate an amenity.

The standards listed in this section outline minimum requirements for the development and landscaping of open spaces, parks, playgrounds, trails, walkways, public utility lots, and any other open space within the County. All landscaping and open space design and construction is the sole responsibility of the Developer.

All public property containing proposed landscaping features that require any form of maintenance or upkeep exceeding the County's standard maintenance practices shall only be permitted if a Homeowners Association has been established and has formally accepted the responsibility of such upkeep in perpetuity. The Developer shall complete the landscaping maintenance form and submit to the County for review and approval prior to commencing construction.

Open spaces consist of natural and developed areas within the County and may be local, neighbourhood, or county-wide, including PULs, MR, ER, naturalized, conserved or reclaimed areas, wetlands, SWMF, buffers, trails and walkways. Open spaces should be designed to maximize universal accessibility through the implementation of Crime Prevention Through Environmental Design (CPTED) principles described in *Security and Resilience – Protective Security – Guidelines for Crime Prevention Through Environmental Design* (International Standards Organization) and FireSmart Canada guidelines.

Under no circumstances shall landscaping or other development features restrict emergency access at any time.

The Developer shall be solely responsible for testing, placing, and inspecting all landscaping and associated materials to the satisfaction and approval of the County.

Execution and maintenance work for all landscaping work shall be reviewed and completed or directly supervised by a Qualified Professional.

5.2 Landscape Plan Submission

All landscape drawings shall be stamped and signed by a Landscape Architect who is a full member of and in good standing with the Alberta Association of Landscape Architects.

Landscape drawings shall form part of the overall drawing submission package and be submitted at the same time as detailed Engineering Drawings. Engineering Drawings submitted without a landscape plan (when applicable) shall be considered as incomplete and will not be accepted. Refer to SECTION 2

The Landscape Architect shall be responsible for completing and submitting any changes to the landscape plan once approved by the County. Changes shall be submitted as per SECTION 2.1.2.

5.3 Construction Procedures

The Landscape Architect shall ensure any work, including work completed by the Contractor, is completed in accordance with the following procedures:

- Ensure that utility locates are performed prior to any construction, including Alberta First Call and other appropriate authorities;
- Review and approve all below grade utilities flagged before construction commences;
- Protect existing landscaped areas including natural areas, sod, tree and shrub planting. Refer to SECTION 5.8;
- Review and approve rough grading, topsoil depths and spreading, new seeding and sodding, new tree locations;
- Review and approve plant material prior to installation, ensuring only Certified Number 1 Seed is being utilized, where applicable;
- Coordinate review of topsoil analysis and recommend amendments as required; and
- Direct the review and inspection of all construction and installation while in progress.

The failure of construction to comply with approved plans, specifications and standards will be considered sufficient cause to stop work and/or invoke the security clauses of the Development Agreement. Construction deficiencies shall be rectified to meet the approved plans and specifications, at the Developer’s expense.

The Landscape Architect shall submit a request to the County in writing for plant material substitutions from the approved plant list. If approved, the Landscape Architect shall identify the approved changes on the Redline or Plan of Record drawing. Refer to SECTION 5.4.7.3.

The Landscape Architect shall submit to the County a request in writing for permission to use collected plant material.

Every precaution shall be taken to not damage, injure or mark existing structures or landscaping on County owned property. Should the Developer, their Consulting Engineer, or their Contractor result in any damage, it shall be corrected at the Developer's expense and to the satisfaction of the County. If remediation work is not completed by the Developer, the work will be completed by the County or their delegate at the Developer's expense.

The Developer shall ensure that lands adjacent to development areas is protected from dust, sand, and wet soil during construction.

Landscaped areas must be kept free from weeds between construction commencement and issuance of FAC. Failure to do so will result in control action by the County, and all costs shall be borne by the Developer.

5.4 Landscaping

5.4.1 General

Existing healthy native tree stands, wetlands, and other natural features shall be considered in the planning and design of the project and preserved through the use or reserve lands.

The use of collected plants is not permitted unless authorized in writing by the County.

Areas subject to accessibility requirements, such as mowing, hazard tree removal, infrastructure maintenance, etc., shall be designed with a maintenance strip to accommodate access. Maintenance strips shall be 3m wide, free from obstructions, and complete with established seed or sod.

Plant material suitability shall be determined on an individual project basis. The Landscape Architect shall use discretion when selecting concentrations of plants that can attract pollinators and other wildlife. Landscape design that promotes pollinator habitat is encouraged, where able.

All plant material shall be sourced from a *Clean Plants Certified Nursery,* certified by the Canadian Nursery Certification Institute, and in accordance with the *Canadian Nursery Stock Standard* (Canadian Nursery Landscape Association), including grade and quality, unless otherwise specified. Appropriate certification shall be provided.

Plant material shall be true to specified species and variety, structurally sound, healthy, densely foliated when in leaf, and complete with a well-developed root system. Plant material shall be free of disease, insect infestation, insect eggs, sunscald, mechanical wounds, and any other condition that would hinder or prevent growth.

Perennials shall have healthy tops, size proportionate to root requirements, typical of species and variety not less than two years old. Root bound plants are not permitted.

A minimum 30% of required plant material shall be native to the province of Alberta. Only plant material hardy to the Sturgeon County region shall be planted, unless otherwise authorized in writing by the County.

All plant materials shall have been grown in the climate of Canadian Horticultural Zone 2 or 3 for at least two (2) years. Appropriate certification shall be provided. Plant material brought in from other provinces and/or states must be accepted by the County prior to planting.

5.4.2 Subgrade

Subgrade shall consist of suitable soils which are free from organic and deleterious materials. Stones larger than 50mm shall be excluded. Subgrade shall be prepared to a minimum depth of 150mm. Compacted lifts shall not exceed 150mm.

The subgrade shall be scarified over the entire area before receiving topsoil, including the wall of tree wells. Repeat this process in areas where equipment used for hauling and spreading has compacted the subgrade.

Subgrade in landscaped and open space areas shall meet the minimum density as per the following table:

Area of Subgrade	Minimum Density (MTD)
Concrete pads or structures, turf stone, paving stone, concrete and asphalt trails	100%
Playgrounds, gravel trails, and outdoor fitness equipment areas	98%

Seeded or sodded areas, shrub beds, and sports fields	-

Field density testing shall be completed in accordance with ASTM D6938 for comparison with a maximum density determined in accordance with ASTM D698; Method A. A minimum of one field density test shall be taken for each 1000 m^2 of compacted subgrade lift.

If a tested density is below the required density, the area represented by the failed test shall be reworked to the full depth of lift, soil moisture altered as is necessary, re-compacted to the specified density, and tested again. Upon recommendation of the Geotechnical Engineer, cement stabilization may be utilized to achieve required density.

Once complete, prepared subgrade shall be protected until subsequent sub-base or base course is placed. Vehicle traffic shall not be permitted over prepared subgrade.

5.4.3 Topsoil

Topsoil shall be loose, loamy soil, free from subsoil, slag, stones over 25mm, foreign matter, plant roots, debris, vegetation, roots, weed seeds, and other deleterious matter. Weeds shall be mechanically or chemically controlled in accordance with the current versions of the *Weed Control Act* (Alberta Agriculture, Forestry and Rural Economic Development), *Fisheries Act* (Government of Canada), and any other applicable regulations.

Topsoil shall be clean of any pests and disease that may adversely affect the health of plant materials. Topsoil that is confirmed to contain clubroot shall not be imported for use in the County.

Topsoil composition shall meet the following requirements:

Topsoil Composition	
Coarse Gravel (<19 mm to 25 mm)	0 – 3% (1)
Sand (2 mm to 0.05 mm)	35 – 65%
Silt (0.05 mm to 2 µm)	15 – 50% (2)
Clay (< 2 µm)	15 – 30% (2)
Organic Matter Content	5 – 10%
Phosphorous	20 – 60 ppm

Nitrogen	10 – 20 ppm
Potassium	300 – 1000 kg/ha
pH	6.0 – 7.5
Electrical Conductivity	<2 dS/m

(1): coarse gravel stone sizes shall not exceed 25mm

(2): total clay and silt combined shall be a maximum 65%

(3): stone content shall not exceed 10% by dry weight.

Topsoil shall be conserved and stored in accordance with the *Soil Conservation Act* (Alberta Environment and Parks) and *Environmental Protection and Enhancement Act* (Alberta Environment and Parks). Every effort shall be made to preserve and re-use existing topsoil on-site.

Topsoil shall be stockpiled in locations designated by the County. Stockpiling on future MR lands is not permitted, unless written permission is received by the Director of Engineering Services.

All placed topsoil shall be sampled and tested to ensure accordance with specifications. A topsoil analysis shall be completed for each topsoil source and shall determine particle size, available nitrogen, phosphorous, electrical conductivity, soil texture, and required fertilization application rate. The County may request topsoil analysis reports at any time.

Amendments to topsoil shall be determined based on soil analysis testing and recommendations from a Qualified Professional. Peat moss shall not be a permitted topsoil amendment. All topsoil amendments shall be approved by the County. Topsoil amendments shall be screens through a 5mm screen, not shredded.

Fertilizer shall be added to all new topsoil based on land end use and at a rate as determined by the topsoil analysis. Refer to SECTION 5.4.11.

Place dry topsoil during dry weather onto of prepared, dry, unfrozen subgrade. Topsoil shall be applied to the following minimum depths, after settlement:

Area of Topsoil	Minimum Depth
Sodded areas	150 mm
Seeded areas (non-naturalized area)	150 mm
Seeded areas (naturalized area)	300 mm

Sports and turf fields	200 mm
Community garden plots and Urban Food Forests	450 mm
Planting beds	650 mm

For topsoil depths greater than 300mm, place topsoil in lifts no greater than 150mm and compact each lift with appropriately weighted landscape roller, where applicable. Placed topsoil shall be allowed to settle or be lightly compacted enough to be firm against deep footprints prior to planting, seeding, or sodding. Compaction shall not be more than necessary.

Finished surface grade shall be checked to ensure placed topsoil is within 20 mm (above or below) of the designed elevation. When tolerance is exceeded, either trim high spots and refinish surface or add additional approve topsoil to low areas. Positive drainage must be achieved in all situations.

5.4.4 Mulch

The following mulches are acceptable to the County:

5.4.4.1 Coniferous Wood Chip Mulch

Chipped coniferous wood mulch, containing bark, wood and needles, sized 50mm to 100mm. Free of wood preservatives or diseased wood.

Coniferous wood mulch can be used on trails or pathways, picnic site surfaces and only within planting beds that containing acid loving plants, including conifers.

5.4.4.2 Deciduous Wood Chip Mulch

Chipped deciduous wood mulch, chipped from maple, poplar, birch and other deciduous trees, sized 50mm to 100mm is acceptable. Free of wood preservatives or diseased wood, and is no more than 5% of the following materials: soil, sawdust, peat moss, or coniferous wood.

5.4.4.3 Prohibited Mulches

Prohibited mulches shall include sawdust and shavings, peatmoss, manure or raw compost, paper products, plastic, rubbers, gravel, and any other lumbers containing chemical adhesives or wood preservatives.

5.4.4.4 Installation

1. Ornamental Beds: 100mm depth of wood chip mulch

2. Naturalized Beds: 25mm to 50mm depth of wood chip mulch

3. All mulches to be installed during growing season. Water planting beds prior to installing mulch

The minimum application rate of mulch is 16 kg of air-dry fibre per 100 m^2.. The minimum length of individual pieces shall be between 40mm and 60mm, mat-forming, and not susceptible to spreading by wind or rain.All decorative mulch shall be specified and placed as shown on the Construction Drawings.

5.4.5 Seed and Sod

Landscape drawings must clearly identify all areas where seed and/or sod are proposed. For seeded areas, the seed mix must be listed, and a seed analysis certificate must be submitted to the County prior to seed mix application.

All seeded and sodded areas shall be adequately protected by temporary fences at the expense of the Developer until such a time turf is established and can accommodate foot traffic. It is the Developers responsibility to protect these areas until FAC is achieved and requirements listed in Section 5.11.3.1 are achieved.

Topsoil must be checked to be adequately placed to the specified depth prior to placing seed or sod. Inspection results and test locations to be provided to The County for review and records of this being completed.

5.4.5.1 Seed

All seed shall be Certified Canada No.1 varieties in accordance with the *Canadian Seeds Act,* free of disease or foreign materials, have a minimum purity of 97% and germination of 75%, and mixed by weight to the composition as per the following table:

Application	Application Rate	Seed Composition
Urban roadway landscaping and steep slopes	225 kg/ha	30% Argyle Kentucky bluegrass 30% Kentucky bluegrass 30% Creeping red fescue 10% Perennial rye grass

Rural roadway landscaping	250 kg/ha	25% Creeping fescue 25% Tall fescue 20% Northern wheatgrass 20% Tickle grass 10% Slender wheatgrass
Parks, general open space, and and rehabilitation	225 kg/ha	30% Touchdown Kentucky bluegrass 20% Banff Kentucky bluegrass 30% Creeping red fescue 20% Fiesta II perennial ryegrass
Naturalization – wet meadow (non-maintained)	250 kg/ha	10% Awned wheatgrass 10% Western wheatgrass 10% Sloughgrass 20% Tufted hair grass 15% Giant wild rye 30% Fowl bluegrass 5% Annual ryegrass
Naturalization – dry meadow (non-maintained)	250 kg/ha	20% Junegrass 20% Rough fescue 10% Green needlegrass 15% Streambank wheatgrass 20% Northern wheatgrass 10% Sheep fescue 5% Annual ryegrass
Wildflowers	Mix and application rate shall be determined by a Qualified Professional and be appropriate to the region, subject to approval by the County	

The Landscape Architect may recommend alternatives to the above seed mix and application rates which must have similar Pure Live Seed (PLS) application rates and be approved by the County prior to spreading. The use of non-native plants may be appropriate in situations where the area being revegetated is in the middle of an area already seeded with a similar species.

HYDROSEED

Slopes 3:1 and steeper shall be seeded using hydroseed.

Hydroseed shall only occur when weather conditions, soil temperatures, moisture conditions, and wind speeds are suitable.

Unless otherwise specified by the manufacturer, mix seed with water, mulch, and fertilizer in the following quantities to be applied over 4,000 m^2:

Seed mix	80 kg
Water	6,400 L
Mulch	640 kg
Fertilizer	140 kg

Hydroseed shall not be sprayed onto trees, bike paths, roads, walkways, hard surfaces, or any other surface not meant to be seeded. Overspray must be removed.

Apply hydroseed in one application.

5.4.5.2 Sod

Sod is required in all areas of intensive use, such as grass swales, boulevards, medians, and patchwork in established turf.

All sod shall be certified No. 1 cultivated turf grass sod. At time of sale, it shall have a strong, fibrous root system and shall be free from stones, burned or bare spots, disease, insect infestation, and contain less than 1% weeds and other grasses.

Sod shall be cut in accordance with recommendations of the Nursery Sod Growers Association of Alberta, at approximately 0.5 m^2 in area with a thickness of at least 25mm and delivered within 24 hours from the time of cutting. Sod shall be installed within 36 hours of being cut and all mesh shall be removed prior to installation. All sod shall be a minimum of 18 months old.

Sod shall consist of the following composition:

Sod Composition	
Kentucky bluegrass	70 – 90%
Creeping red fescue	0 – 30%
Perennial ryegrass	0 – 10%

Sod shall be placed during the growing season when weather conditions, soil temperatures, and moisture content are suitable. Do not place sod when topsoil is covered with frost, snow, or standing water.

All placed sod shall be rolled to remove irregularities and depressions. Saturate sod with water as necessary to ensure vitality. Ensure watering does not create erosion of the top-dressing or in downstream areas. Sod should be watered for a minimum of eight days after laying or until roots are well established.

Unless otherwise approved or specified by the County, sod shall be required to be installed in areas of intensive use and as per the following:

- Install sod a minimum of 5m beyond edge of playgrounds, splash parks, and hard surface sports facilities;
- Install sod a minimum of 2m from centerline on each side of swales and no less than the entire wetted perimeter of the swale cross section; and
- Install sod a minimum of 1.5m beyond the edge on each side of asphalt trails and concrete sidewalks.

Barricades and warning signs shall be installed to protect newly sodded areas from traffic until grass is well established.

Upon completion of work, all temporary protection, debris, and unused material shall be removed, and the site left clean to the satisfaction of the County.

5.4.6 Minimum Plant Material Quantities

Minimum plant material requirements are determined based on zoning and in conjunction with the County's most recent version Land Use Bylaw. The Developer shall consult the County's Land Use Bylaw to determine development-specific landscaping requirements.

The following quantities of plant material shall be required for all new developments unless otherwise prescribed in landscape design:

Area	Minimum Plant Quantities Recommened
Urban Local ROW; Country Residential Subdivision ROW	▪ One tree every 9m or one tree per residential lot [(1)], whichever is greater, for each side of the roadway

	Three trees along the boulevard flankage for corner lots in residential subdivisions
Urban Collector ROW; Rural Commercial and Industrial ROW	▪ One tree every 9m for each side of the roadway
Urban Arterial ROW	▪ The equivalent of one row of boulevard trees at 9m spacing for each side of the roadway ▪ The equivalent of one row of median trees at 9m spacing for the median of the roadway ▪ The equivalent of one row of shrubs at 1.2m spacing, placed in planting beds behind the walkway, for each side of the roadway. Smaller shrubs may require reduced spacing. Installation to be staggered where possible.
Parks; Municipal Reserves; other County Open Space	▪ Parks < 1ha: 100 trees per hectare ▪ Parks 1ha or greater: 75 trees per hectare ▪ Shrubs shall cover 1 – 5% of total site area
Schools	▪ As directed by the School Board
SWMF (dry ponds, wet ponds, constructed wetlands)	▪ 75 trees per hectare (3) ▪ Shrubs shall cover 1 – 5% of total site area
Walkway and Trails ROW	▪ Four trees every 30m (2)
Utility Corridors	▪ 75 trees per hectare (2)(4)
(1): If a tree cannot be accommodated within the area between the front property line and the curb, the developer must commit to an equivalent tree being planted in the front 5m of the lot (2): Shrubs may be substituted for trees at a rate of six shrubs to one tree, up to a maximum of 20% shrubs and 80% trees, subject to County approval. Designated tree stand areas within these areas are exempt from this requirement, however, shall not be considered	▪ 75 trees per hectare (2)(4)

towards the developments overall tree requirements. Emergent plant material does not qualify for tree substitution (3): this is the area above the NWL for wet ponds and constructed wetlands (4): when permitted by the Utility Authority.	

The total number of residential lots and corresponding trees shall be noted on the final set of Construction Drawings and Record Drawings.

When roadway construction is staged, landscaping is required only on the portion being developed.

5.4.7 Plant Material Selection

All plant types shall be perennial, low maintenance, non-invasive, and appropriately hardy to the Sturgeon County region. Annual plantings may be planted as temporary landscaping, however, all annuals must be maintained by the Developer until the end of the maintenance period, and must be removed prior to FAC approval. The annual bed must be rehabilitated to match the surrounding landscaping, as per approved drawings.

For County open space, diversity of species, aesthetics, hardiness, disease resistance, natural occurrence, rate of growth and growth habit shall be considered when selecting varieties.

Thorny plant material types shall not be placed within ornamental planting beds in high traffic areas or in areas easily accessible to the public unless strategically placed or included as part of urban ecosystem resiliency planning. Their inclusion in a landscape design is subject to approval by the County

All plant material shall have limited horizontal root growth and be non-suckering type to mitigate root encroachment. Where potential horizontal root encroachment is likely or there is a concern from the County, root barrier shall be installed. Refer to SECTION 8 - DRAWING 5.3.6.

A mixture of 60% deciduous and 40% coniferous tree species is required where planted in public lands outside of Boulevards. Tree planting shall be in groupings or mulched beds to encourage improved growth and survivability.

Deciduous trees used for edible landscapes and human consumption may be delivered to site in a container and shall be measured by the container size. Such trees shall be a minimum 10-gallon container at time of planting and meet all other requirements listed in SECTION 5.4.12.

Only Elm trees grown in Alberta from a source that is Dutch elm disease free shall be permitted. Certification shall be submitted to the County prior to CCC.

Plant material shall be selected to prevent monoculture and the spread of disease as part of urban ecosystem resiliency planning as per the following:

No. of proposed trees per stage	Maximum Percentage of same Genus	Maximum Percentage of same Species
>100	35%	50%
50 – 100	45%	50%
25 – 49	75%	75%
1 – 24	100%	75%

Green Ash (*Fraxinus pennsylvanica*) shall be seedless. Manchurian Ash (*Fraxinus mandshurica*) and Black Ash (*Fraxinus nigra*) shall not be permitted.

New plant material, including Prunus species, which is susceptible to black knot (*Apiosporina morbosa*), such as Schubert Chokecherry (*Prunus virginiana 'Schubert'*), Pin Cherry (*Prunus pensylvanica*), and Mayday (*Prunus padus*), shall not be permitted.

Poplars (*Populus*), Birch (Betula), Amur Cherry (*Prunus maackii*), Mountain Ash (*Sorbus aucuparia*), Apple (*Malus pumila*), and Crab-apple (*Malus*), are not permitted to be planted in boulevards. Fruit bearing trees are not permitted along boulevards.

5.4.7.1 Approved Tree Species

Tree spacing closer than 80% of mature tree size is not permitted unless otherwise approved by the County.

Deciduous Trees – Large

Pollinator Attractor	Botanical Name	Common Name	Acceptable Location
	Acer negundo	Manitoba Maple	Open space
	Betula papyrifera	Paper Birch	Open space (1)
	*Fraxinus americana*	White Ash	Open space
	*Salix alba*	White Willow	Open space (1)
	*Salix alba* 'Vitellina'	Golden Willow	Open space (1)
	*Salix pentandra*	Laurel-Leaf Willow	Open space (1)
	*Tilia americana*	Basswood	Open space
	*Acer* saccharinum	Silver Maple	Boulevard
	*Acer x freemanii* 'Sienna 'Sienna Glen'	Sienna Glen Maple	Boulevard
	Fraxinus pennsylvanica 'Bergeson', 'Patmore', 'Prairie Spire', and 'Summit'	Bergeson; Patmore; Prairie Spire; Summit Green Ash	Boulevard
	Fraxinus 'Northern Gem' and 'Northern Treasure'	Northern Gem; Northern Treasure Hybrid Ash	Boulevard
	Ulmus americana	American Elm	Open space (1)
	Ulmus americana 'Brandon'	Brandon Elm	Boulevard or median
	(1): Requires a wet environment		

Deciduous Trees – Medium			
Pollinator Attractor	Botanical Name	Common Name	Acceptable Location
	*Acer ginnala*	Amur Maple	Open space
	*Aesculus glabra*	Ohio Buckeye	Open space
	*Aesculus hippocastanum*	Horse Chestnut	Open space
	*Juglans cinerea*	Butternut	Open space

	*Malus* 'Spring Snow'	Spring Snow Flowering Crab	Open space
	Populus x canescens 'Tower'	Tower Poplar	Open space
	*Prunus maackii*	Amur Cherry	Open space
	*Sorbus Americana*	American Mountain Ash	Open space
	*Sorbus aucuparia*	European Mountain Ash	Open space
	*Tillia cordata*	Little Leaf Linden	Open space
	*Tillia* x *flavescens*	Dropmore Linden	Open space
	*Quercus macrocarpa*	Burr Oak	Boulevard
	Ulmus davidiana	Discovery Elm	Boulevard
	Populus tremula 'Erecta'	Swedish Aspen	Median

Deciduous Trees – Small			
Pollinator Attractor	Botanical Name	Common Name	Acceptable Location
	*Crataegus x mordensis* 'Snowbird'	Snowbird Hawthorn	Open space
	*Maackia amurensis*	Amur Maackia	Open space
	*Malus x astringens* cv.	Rosybloom Crabapple, Gladiator crabapple	Open space
	*Sorbus decora*	Showy Mountain Ash	Open space
	*Syringa retuculata*	Japanese Tree Lilac	Boulevard/Cul-de-sac island

Coniferous Trees			
Pollinator Attractor	Botanical Name	Common Name	Acceptable Location

	Picea	Englemann, Norway, White and Colorado Spruce	Open Space
	Pinus	Scot, White, Lodgpole, Ponderosa Pine	Open Space
	Larix	Siberian Larch, Tamarack	Open Space

5.4.7.2 Approved Shrub Species

Deciduous Shrubs		
Pollinator Attractor	Botanical Name	Common Name
	*Berberis*	Barberry*
	*Cornus*	Dogwood
	*Corylus cornata*	Beaked Hazelnut
	*Euonymus*	Winged and Dwarf Narrow-leaved Burningbush
	*Hippophae*	Sea Buckthorn*
	*Hydreangea*	Hydrangea
	*Loniceria*	Honeysuckle
	*Philadelphus*	Mock Orange
	*Physocarpus*	Ninebark
	*Potentilla*	Potentilla
	*Ribes*	Currant
	*Rosa*	Rose*
	*Sambucus*	Elder
	*Spirea*	Spirea

	Syringea	Lilac
	Viburnum var.	Cranberry, viburnum 'snow ball', Nannyberry
*:Thorny		

Coniferous Shrubs		
Pollinator Attractor	Botanical Name	Common Name
	Juniperus spp.	Common, Horizontal, Pfitzer, Savin Juniper
	Juniperus scopulorum	Rocky Mountain Juniper
	Picea abies var.	Compact, Gregoryana, Nest Spruce
	Picea pungens var.	Globe, Hoopsii, Koster Spruce, Columnar blue spruce.
	Pinus sylvestris var.	Sentinal, Green Compact Pine, Columnar scotch pine
	Pinus mugo var.	Mugo Pine var.

5.4.7.3 Substitutions

Approved plant material lists are intended to provide designers with guidance and should not be considered exhaustive. Substitutions for plant material other than what is listed in SECTION 5.4.7 will be considered but shall not be permitted unless first approved by the County.

5.4.8 Plant Material

5.4.8.1 Size

All deciduous trees shall have a minimum branching height of 1.6m and a minimum caliper of 63.5 (2.5") mm at time of planting. A single, dominant leader must be evident at the time of CCC.

All coniferous trees shall have a minimum tree height of 2.4m at time if planting.

Minimum shrub spacing shall be based on spread at maturity as recommended in the Alberta Yards & Gardens Manual. Minimum shrub size at planting, except for naturalized areas, shall be 300 mm height for deciduous shrubs and 450 mm spread for coniferous shrubs.

5.4.8.2 Installation

Plant material shall only be installed when the ground is frost free. Place plant material on a minimum depth of 150mm firmly tamped topsoil mix. Tree planting shall be in groupings or mulched beds to encourage improved growth and survivability. Tree trenching to be utilized in boulevards and medians. Trees may spaded in when approved by the county.

Install a 100mm depth of mulch for individual tree plantings and planting beds. Do not cover tree trunk flare with any materials. Mulch installation shall be kept 300mm away from tree trunks and the base of shrubs. The crown and bottom branches of shrubs must not be covered,

Trees that settle out of plumb for any reason shall be excavated and reset.

Shrubs shall be mass planted within planting beds with spacing in accordance with the latest edition *Canadian Nursery Stock Standard* (Canadian Nursery Landscape Association) but not less than 80% maturity size. Shrubs at mature size shall be completely contained within the planting bed.

Plants shall not be heavily pruned at time of planting. Pruning shall only be required when planting to correct defects in tree structure, including removal of injured branches, double leaders, water sprouts, suckers, and interfering branches.

All grades in planting beds shall be sloped to ensure positive drainage from building foundations before and after planting.

5.4.8.3 Soil Volume

Minimum soil volumes for new tree installation shall be provided as per the following:

Canopy Spared	Minimum soil
> 9m (large tree)	28 m^3
4m to 9m (medium tree)	21 m^3
< 4m (small tree)	14 m^3

Minimum top soil depth for plant material shall be 600mm. Depth of top soil for all plant material should not exceed 1m.

In situations when the site does not allow for minimum required soil volumes (volume and depth), the Developer is responsible for coordinating an approved alternative with the County.

5.4.8.4 Tree Stakes and Ties

Trees shall be supported with stakes and guy wires immediately after installation as per the following table:

Deciduous	
Tree Height	Required Support
< 1.6m	1 stake; 1 tie
1.6m to 3.0m	2 stakes; 2 ties
> 3.1m	3 guy wires; 3 anchors

Coniferous	
Tree Caliper	Required Support
< 30 mm	1 stake; 1 tie
30 mm to 100 mm	2 stakes; 2 ties
101 mm to 150 mm	3 guy wires; 3 anchors
> 150 mm	4 guy wires; 4 anchors

Stakes shall be T-bar studded steel stakes, 40 mm x 40mm x 5mm thick x 2m long, primed with black zinc rich paint in accordance with CGSB1-GP-1816. Stakes shall be spaced evenly around root ball, placed outside of the tree pit, and inserted 600mm into the ground.

2-ply, reinforced, black rubber hose, and galvanised #12 AWG wire shall be used for securing trees. Alternatively, a soft polypropylene material that ensures rounded edges at all times is acceptable.

Trees that require guy wire shall have the wire looped around the tree and anchored in such a way that looped wire will not interfere with tree growth. Guy wires shall be bent in such a way as to not be exposed outwardly and flagged with fluorescent orange colored tape

Tree stakes shall be removed as soon as the tree is supported and roots are established, but no later than 14 months after planting, unless the tree shows signs of root instability. All tree staking shall be removed prior to issuing FAC.

The top 300mm of tree stake shall be colored according to the year planted as per the following table:

2022	Blue	2027	Blue	2032	Blue
2023	Yellow	2028	Yellow	2033	Yellow
2024	Green	2029	Green	2034	Green
2025	Red	2030	Red	2035	Red
2026	White	2031	White	2036	White

5.4.8.5 Tree Setbacks

Trees shall be setback a minimum distance, measured from the centre of the tree trunk, as per the following:

Utility Type or Structure	Minimum Setback Distance
Arterial boulevard face of curb	3.0 m
Arterial median curb	2.0 m
Collector boulevard face of curb	2.0 m
Collector median curb	2.0 m
Local boulevard curb	1.5 m
Local median curb	1.5 m
Street light	3.5 m
Hydrant	4.0 m
Stop and Yield sign	3.5 m
Other signs	2.0 m
Shallow underground utilities	1.5 m (1)

Deep underground services	1.8 m
Manhole, catch basin, and valve	2.0 m
Above ground power structure	3.5 m
Driveway	2.0 m
Street corners and intersections	7.5 m
Sidewalks	1.0 m
Trails	1.5 m
Fence	2.5 m
Playground	4.0 m
Private property boundary	1.5 m
Emergency access route (PUL)	4.0 m
Gas, oil, or utility ROW	Contact utility
Utility Pedestal	Contact utility
(1): unless otherwise required by the Utility Authority	

The minimum setback for *Populus* type trees from private property lines and paved areas shall be 10 m due to their invasive and shallow root structure.

Plant material species with suckering root systems or large hanging canopies may require increased setback at the discretion of the County.

Planting setbacks from intermediate and high-pressure gas pipelines shall be in accordance with the appropriate utility company and with the pipeline authority crossing or ground disturbance agreements.

If a minimum utility clearance cannot be achieved, the Contractor shall, at their sole expense, contact the appropriate Utility Authority and coordinate approval and/or safe working practices (i.e. hand digging). Engineered drawings shall indicated that such approval has been granted and must identify the affected plant materials.

Under no circumstance shall placement of plant material impede or interfere with pedestrian and traffic sight lines. Sight lines shall be in accordance with *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada).

5.4.8.6 Tree Removal

All trees proposed to be removed shall be approved by the County prior to removal. Trees removed from the development area must have the root system fully removed.

All removed trees and roots shall be disposed of off-site at an acceptable location.

Removal of mature trees may include compensation or replacement requirements.

5.4.8.7 Maintenance

All plant material shall be assessed regularly for nutrient deficiencies by a Qualified Professional and fertilized as required to support plant growth and development. Fertilizers must be selected and applied in accordance with manufacturers specifications.

Plant material shall be watered at a rate of 1.2 liters per 1mm caliper per week. Plant material shall be watered a minimum of three times prior to ground freezing to mitigate dry out.

Plant material shall be inspected regularly, and any damaged, diseased, or hazardous trees, debris, or weeds shall be removed.

Trees shall be pruned, as required, in accordance with ANSI 3000 and within the requirements as per the following table:

Tree Type	Pruning Date
Shade trees	October 15 to April 15 (1)
Birch and Maple	June 15 to July 15
Fruit trees	March 15 to April 15
Evergreen	April 15 to May 15
Elm	October 1 to March 31
(1): except Birch and Maple	

The Developer shall be responsible for all landscape maintenance of vacant lots, including mowing, weed control, debris removal, general upkeep, and to ensure compliance with County Bylaw 1433/19 (Community Standards Bylaw). The Developer shall be responsible for such maintenance until the lot has been sold at which time the new landowner will become responsible.

5.4.8.8 Pest and Weed Control

Weeds must be controlled in accordance with the current versions of *Alberta Weed Control Act* (Alberta Agriculture, Forestry and Rural Economic Development), *Fisheries Act* (Government of Canada), and any applicable municipal bylaws. Pests must be controlled in accordance with the current version of *Alberta Agricultural Pests Act* (Alberta Agriculture, Forestry and Rural Economic Development).

Use of pesticides and herbicides shall be applied by a licenced applicator in accordance with the current versions of *Environmental Protection and Enhancement Act* (Alberta Environment and Parks) and the current manufacturers label. All products used must be registered under the current version of *Pest Control Products Act* (Health Canada).

The Developer shall ensure signage is posted immediately and remains in place for at least 48 hours following a pesticide or herbicide treatment. Signage must include the date of the application, the chemical name, and the Developer's contact information.

Following inspection by the County, any remaining weeds to be identified shall be mechanically or chemically removed within the time frame specified by the inspector.

5.4.9 Planting Beds

Shrubs shall be mass planted within planting beds with spacing in accordance with the latest edition *Canadian Nursery Stock Standard* (Canadian Nursery Landscape Association) but not less than 80% maturity size. Shrubs at mature size shall be completely contained within the planting bed.

Annual plants shall not be permitted within County-owned planting beds. All plant types shall be perennial, low maintenance, non-invasive, and appropriately hardy to the Sturgeon County region.

Filter fabric and edging material within plant beds is not permitted due to long term maintenance.

All planting beds require a minimum mulch depth of 100mm. Shredded wood mulch or similar loose materials shall not be used in planting beds located in a major overland flow route or where major ponding is possible.

Shrubs, measured at maturity size, shall be setback a minimum of 500mm from the edge of planting beds.

Planting bed locations and sizing must accommodate the use of large turf maintenance equipment. Planting beds shall have a minimum clearance of 2.5m between the edge of the bed and any obstruction such as fencing, site furniture, buildings, singular trees, etc. Turf between planting beds shall be a minimum distance of 2.5m to allow maintenance equipment passage.

5.4.10 Fertilizer

Fertilizer requirements shall be calculated by a Qualified Professional utilizing topsoil analysis information to ensure adequate nutrients are available for successful plant growth and development

Fertilizer shall be standard commercial granular water-soluble type complete with a guaranteed chemical analysis. Fertilizers shall be clearly labelled and furnished in unopened moisture-proof containers.

Formula ratio and application rate of starter fertilizer to be used at time of seeding, sodding, and as supplemented during the maintenance period shall be determined from the topsoil analysis results and applied as per the manufacturer's instructions.

Fertilizer shall be spread and mixed thoroughly into the top 50mm of topsoil not more than 48 hours before seeding.

Fertilizer should only be placed once the subgrade and topsoil elevations have been confirmed to be correct.

5.4.11 Public Agriculture

5.4.11.1 Edible Landscapes

The County recognizes the value of edible landscape features if placed, designed and managed appropriately. Consideration will be given to landscape designs that include edible plant material, provided the criteria within this section is met. All edible landscape designs are subject to final approval by the County.

Fruits, herbs, vegetables, and edible flowers may be planted in spaces that are easily accessible and highly visible. The Landscape Architect shall use discretion when selecting concentrations of plants that can attract nuisance wildlife.

Edible plant material that may drop fruit and berries shall be located close to high pedestrian traffic areas and hard surfaced areas that can be easily accessed by people

with limited mobility, but far away enough to minimum maintenance issues. The Landscape Architect should consult with the County on edible plant material location.

Fruit bearing vegetation that is not suitable for human consumption shall be strategically placed away from edible plants to avoid confusion and accidental consumption.

Edible plant material shall be setback from peripheral mature trees that may reduce sun exposure and located in community gardens where there is protection from winds.

Many fruit bearing plant species require a pollinizer to be able to produce fruit. If intentionally planting these species for fruit production, the presence of a suitable pollinizer must be accounted for in the landscape plans and plant material selections.

5.4.11.2 Community Gardens

A written plan accompanying the design outlining how the Community Garden will be managed and maintained over the short and long term is required.

Community gardens shall be located outside major drainage routes and ponding areas.

Community gardens shall be fenced with a 1.2m post and rail fence or approved equivalent to delineate the community garden space. Closed board or similar structures that impede public sight lines are not permitted.

Garden plots and planting beds may be raised or in-ground. In-ground plots and beds shall be defined by an edger made of concrete, wood, or alternative material approved by the County. Raised plots and beds may be constructed with wood, concrete, corrugated steel, or alternative material approved by the County. Chemically treated wood products shall not be permitted for use in raised garden beds.

Raised garden plots shall be accessible from at least three sides and be dimensioned to allow users to reach the middle of the plot. In-ground garden plots shall be accessible from at least two sides.

The depth of topsoil in garden plots shall be a minimum 450mm.

Garden plots shall have a minimum 1.2m main pathway that allows for access to the permitter of the site. Internal pathways shall be a minimum of 0.9m and be free of any obstructions. Crushed gravel, grass, or wood mulch may be used as pathway surface treatments. Topsoil or clay shall not be permitted.

Garbage cans, benches, and/or picnic tables shall be incorporated within edible landscapes and community gardens.

A source of potable water appropriate for irrigation must be installed within each community garden. A buried water service connection shall include the installation of a meter vault, complete with meter, a self-draining type curb stop, and a water tap with a threaded end to accommodate a standard $\frac{5}{8}$" diameter garden hose. Refer to SECTION 3.2.

Educational signage is required to identify fruit bearing vegetation specifying those which are acceptable for human consumption and those valuable for other uses.

A designated compost site shall be included in the site design and include educational signage outlining the materials acceptable for composting.

5.4.11.3 Urban Food Forests

Require developer to submit a design report prepared by qualified professional if proposed within the development, accompanied by a Maintenance and Pest Management Plan.

5.4.12 Boulevard Treatment

Boulevards with separate walks shall be graded, top-soiled to a minimum 150 mm depth and sodded from edge of sidewalk to back of curb or hard surface.

In areas adjacent to the back of curb on collector and arterial boulevards, where plant material is not expected to survive due to environmental, operational, or other conditions, boulevard treatment within 1 m from the back of curb shall be hard surfaced. Hard surfacing treatment may include concrete, permeable pavers, exposed aggregate concrete with tree grates, or approved equivalent.

Planting setbacks within boulevards shall be in accordance with SECTION 5.4.8.5. Letters of confirmation from Utility Authority for overhead utility restrictions shall be submitted to the County.

Streetlight design and landscaping design must be coordinated to eliminate conflicts between streetlight patterning and tree canopies.

Tree species selection shall be suitable for boulevards and avoid visual and overhead obstructions for vehicles and pedestrians.

Boulevards may be designed to include planting beds, shrubs, and perennials. Planted perennials and shrubs shall not exceed 450mm in height at maturity.

Planting and grading in boulevards shall be designed to blend in with adjacent natural or existing vegetation. The cross slope from center of island or median shall not be less than 2%.

5.4.13 Median and Island Treatment

Landscaping designs for medians and islands shall include topsoil, trees, shrubs, perennials, mulch, and where applicable, hard surfacing, to the satisfaction of the County. Turf within medians and islands will only be permitted at the discretion of the County.

Medians less than 3m in width, that are part of a high-traffic thoroughfare, or where there is a steep road gradient that winter operations will require higher use of winter salting and sanding operations shall be hard surfaced for the full width, from BOC to BOC. Hard surfacing treatment may include concrete, permeable pavers, exposed aggregate concrete with tree grates, or approved equivalent.

Tree planting shall only be permitted in medians 4m wide and greater.

Shrubs within medians shall be selected to ensure sightline requirements are achieved and maintained. Shrubs shall be planted within planting beds complete with a 500mm concrete verge is required on either side of a median or island. Refer to SECTION 8 - DRAWING 5.1.3. Shrub planting is not permitted in narrow medians.

Shrubs in the median and island shall not exceed 350mm in height at maturity.

Planting and grading in medians and islands shall be designed to blend in with adjacent natural or existing vegetation. The cross slope from center of island or median shall not be less than 2%.

5.4.14 Traffic Calming Landscaping

Plant material may be planted on traffic calming islands such that it does not impede sight lines. Shrubs must have a maturity (maximum) height of no greater than 350mm.

5.4.15 Naturalization

Naturalization shall be required when ecosystem function is required, such as water filtration, water retention and attenuation, slope stability, wildlife habitat, etc. and for

grass slopes greater than 3:1. Naturalized grass slopes shall be designed with the consideration they will be mowed once annually.

Conserved natural areas must be maintained, including tree and root protection systems, hazard tree removal, debris, waste disposal, and weed control, from the time of subdivision until landscaping FAC has been issued.

Where trees may be approved for removal, young trees and associated native material shall be relocated to other areas, wherever possible.

Naturalized planting beds within MRs and PULs are preferred. Naturalized planting beds may also be considered within ornamental landscape designs.

The use of in-situ topsoil is preferred over imported non-native soils. Areas identified for preservation or conservation which are disturbed during construction must be restored with plant material native to the area.

Naturalization areas shall be planted with a minimum of one plant per one square meter comprised of native plant material sourced from plant hardiness zone 3A, 3B, and/or 2B (Natural Resources Canada), planted with the following mix:

shrubs (minimum 450mm height/spread)	40%
whips, live cuttings, seedlings, plants, and/or bare root stock	60%

Whips may be substituted for shrubs at a rate of fifteen whips to one shrub subject to County approval.

All plant material shall be nursery grown stock except for transplanted trees and live cuttings.

The landscape design must include an appropriate mix of native trees, shrubs, perennials, and wild flowers capable of completely naturalizing disturbed areas. Site characteristics, such as slope, soil and orientation, and their appropriateness to the site shall be considered when specifying species and size of plant material. The landscape plan shall identify all plant communities and any other information necessary to implement the proposed landscape design.

Signage (refer to SECTION 8 - DRAWING 5.3.8) shall be provided in all naturalized areas to include the following information:

- Educational information specific to the functions and benefits of the naturalized area;
- A location map outlining nearby features such as trails, rest stops, amenities, etc. including a “you are here” locator;
- Delineated “no-mow” areas;
- Applicable advisory and responsible use information (properly dispose of litter, keep dogs on leash, no motorized vehicles, etc.), including PlayCleanGo (playcleango.org) invasive species advisories; and
- Any other information as requested by the County.

Signage shall be set back 1m from the trail.

5.5 Open Spaces

All open spaces shall be topsoiled, seeded or sodded, and landscaped in accordance with these Standards.

Vehicle parking requirements shall be as per the County’s *Land Use Bylaw* or as otherwise determined by the County.

Under no circumstances shall public open spaces or other landscaped areas drain onto private property. Cross-lot drainage is not permitted.

In general, the minimum grade for all grassed areas is 2%, unless otherwise specified.

5.5.1 Entry Features

Entry features designs shall be completed and stamped by a Qualified Professional and included on all applicable engineered drawings and landscape plans. Any proposed landscaping shall be designed to be no or low maintenance.

Entry features shall be free standing and located entirely on public lands within the roadway ROW. The ROW shall be extended, as required, to accommodate the footprint and structural components of the entry feature.

The placement of entry features shall not reduce sight line requirements. A minimum setback of 2.5m shall be provided between entry features and walkways.

Entry features within public property containing flags, glass, power, or water requirements are not permitted, unless maintained by a third party. No bronze, copper,

brass, or precious metals shall be used for decorative purposes. Metal components and fasteners shall be tamperproof. All wood components shall be pressure treated.

5.5.2 Walkways and Trails

Trail connections shall be provided to allow pedestrian connectivity throughout a community. Location and layout of trails shall be determined in the area structure plan, if applicable, or outline plan design phase. Shared-use paths or multi-use paths are considered walkways and trails in these Standards.

Walkways and trails may be located in Municipal Reserves, Public Utility Lots, and road rights-of-way. Walkways and trails may be located in Environmental Reserves upon approval from the County.

New trails connecting to existing trails shall match the existing trails surface and width where possible. Trails located in environmental reserves or other environmentally sensitive areas shall be designed to minimize disturbance to landform and vegetation.

Trail design, including layout, structure, location of bollards, and signage placement, shall be completed and stamped by a Qualified Professional and included on all applicable engineered drawings and landscape plans.

Trails within SWMF's shall not be situated below the 1:25 year flood event water level.

In general, longitudinal grades shall not exceed 5% and cross slopes shall be 2%. In areas with steep topography, longitudinal grades of up to 8% will be considered, subject to approval by the County. Lands adjacent to trails shall be sloped away from the trail.

Trails shall not be used for surface drainage and shall not be used for surface water retention or long-term ponding.

Trails shall be complete with signage in accordance with SECTION 8 - DRAWING 5.3.8.

Rest stops shall be provided along all trails at minimum of 500m intervals. Additional rest stops may be required in high-traffic areas, seniors housing, and schools. Rest stops shall be in accordance with SECTION 5.5.2.9 and SECTION 8 - DRAWING 5.3.3.

5.5.2.1 Asphalt Trails

All walkways and trails that are intended as primary pedestrian routes, moderate pedestrian traffic, all-seasons use, or are adjacent to roadways shall be surfaced with

asphalt. Alternative hard surfacing treatments such as concrete, paving stones, or equivalents will be considered, subject to County approval.

Asphalt trails shall be 3m wide and designed to a 30 km/hr design speed in accordance with the *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada).

Asphalt walkways and trails shall be installed in accordance with the following specifications:

Prepared Subgrade	150 mm in accordance with SECTION 3.1.20.3
Granular Base Course	300 mm depth of 3-20 crushed aggregate in accordance with SECTION 3.1.20.4
Surface	75 mm 10mm-LT in accordance with SECTION 3.1.20.5
Testing	In accordance with SECTION 3.6

5.5.2.2 Concrete Trails

Concrete trails shall be installed in accordance with the following specifications:

Prepared Subgrade	150 mm in accordance with SECTION 3.1.20.3
Granular Base Course	150 mm depth of 3-20 crushed aggregate Compacted to 100% SPD in accordance with SECTION 3.1.20.4
Surface	120mm 28 MPa concrete. Contraction joints spaced every 1.5m; Transverse brush finish
Line Painting (1)	Hot poured, thermoplastic, onlayed centerline; 100mm wide (white)
Testing	In accordance with SECTION 3.6.1
(1): when required by the County	

5.5.2.3 Gravel Trails

Secondary trails that provide ancillary loops, are less frequently travelled, or are intended to provide users with experiences that focus on contact with nature may be surfaced with

gravel. Trails located in environmentally sensitive areas (environmental reserves) must be surfaced with gravel with adjacent areas kept undisturbed.

Gravel trails shall be a minimum 2m wide and may increase up to 3.5m in special situations such as intersections, access points, or excessive downhill grades requiring additional width.

Gravel trails shall be installed in accordance with the following specifications:

Prepared Subgrade	150 mm in accordance with SECTION 3.1.20.3
Geotextile	Non-woven fabric, Nilex 4551, extended to edges
Granular Base Course	100 mm depth of 3-20 crushed aggregate
Granular Surface Course	50 mm depth of 6mm crushed aggregate
Testing	In accordance with SECTION 3.6

5.5.2.4 Paving Stones

Paving stones shall be installed in accordance with the following specifications and only located within pedestrian zones:

Prepared Subgrade	150 mm in accordance with SECTION 3.1.20.3
Granular Base Course	100 mm depth of 20mm crushed aggregate; compacted to 100% SPD in accordance with SECTION 3.1.20.4
Leveling Course	25mm depth washed concrete sand
Surface Course	Minimum 60mm wide paving stones; Maximum 3mm between stones; Sweep polymeric sand into joints between stones
Edge Restraint	Required; install as per manufacturer's specifications

5.5.2.5 Root Barrier System

Walkways and trails located within 5m of planting beds, native tree stands, or plant species which have aggressive rooting systems, such as Populus and Salix, shall include a

polypropylene root barrier system. Root barriers shall run for the entire length of the drip of the tree(s) for the entire encroachment area.

Root barrier shall consist of 40mm HDPE installed to a minimum 650mm depth below the finished surface grade. Refer to SECTION 8 - DRAWING 5.3.6. All root barriers shall be installed to manufacturers specifications.

5.5.2.6 Lighting

Lighting shall be required where primary pedestrian route trails begin and intersect in accordance with *Design of Roadway Lighting* (Transportation Association of Canada).

Refer to SECTION 5.7.1.5.

5.5.2.7 Signage

Trail signage shall be placed at all intersections, accesses, terminations, and as otherwise requested by the County. The Consulting Engineer shall use discretion when selecting the location and quantity of trail signage to prevent visual pollution or confusion.

Trail signs shall be placed perpendicularly 1m from the right edge of the trail.

Refer to SECTION 5.5.2.7.

5.5.2.8 Pedestrian Crossings

Pedestrian crossings shall be installed at road intersections in accordance with current version of *Pedestrian Crossing Control Guide* (Transportation Association of Canada).

Pedestrian bridges crossing watercourses shall be in accordance with the *Water Act* (Alberta Environment and Parks).

5.5.2.9 Rest Stops

Rest stops in urban areas shall include a minimum of two benches and one garbage can situated on a concrete or asphalt pad. Rest stops in rural service areas shall include a minimum of one bench and one garbage can situated on a concrete or asphalt pad. Site furniture installed on asphalt pads must be mounted on concrete piles. Refer to SECTION 8 - DRAWING 5.3.3.

The slope of the rest stop shall match the slope of the adjoining trail or walkway and not to exceed 2% grade.

5.5.2.10 Testing and Tolerance

All material and density test results must be submitted to the County and approved prior to placing surface treatment (asphalt, concrete, etc.). Compaction tests shall be required every 150m.

Walkways and trails shall not exceed the tolerances as per the following table:

Vertical	Difference in elevation at any given point on the trail from the Construction Drawings shall not exceed 25 mm.
Horizontal	Difference in alignment at any given point on the trail from the Construction Drawings shall not exceed 25 mm.

5.5.3 Schools

Program requirements for new schools are site-specific and will require input from other AHJs, including school boards and Alberta Infrastructure. Designers are advised to contact the County and other AHJs to determine site-specific requirements for each school prior to proceeding into detailed design.

In general, schools shall be designed in accordance with CPTED principles and meet the following:

- school bus drop-off zones shall have an adequately sized bus loop to accommodate bus drop-off and parking;
- avoid access points to the school across vehicular movement areas;
- locate school playgrounds centrally between school and adjacent pathways.;
- major activity nodes such as parking lots and playgrounds should be located as far from adjacent private property as possible;
- encourage neighbourhood walkability through connecting walkways;
- drainage from park areas should be directed away from school and other buildings;
- a minimum grade of 5% sloped away from the foundation should be achieved for at least the first 5m around the school perimeter; and
- site surface drainage should be directed away from playgrounds to reduce the potential for ponding and flooding.

5.5.4 Parks

Each park site shall be complete with a minimum 75mm water service for irrigation. Each water service shall include, at a minimum, all the following:

- Water valve located in the road ROW 1m from the park property line;
- Self-draining standpipe installed 3m inside the park property line, complete with a minimum 1.5m x 1.5m drainage pit installed below grade;
- Lockable valve box, sized to fit the application, installed as per the manufacturer's specifications; and
- Water meter and vault.

Each park site shall be complete with electrical service and separate meter for proposed lighting and/or future lighting. The County will assume responsibility for electric utility charges upon issuance of CCC. Solar powered lighting will be considered as an alternative and must be approved by the County prior to installation.

5.5.4.1 Dog Parks

The perimeter of all dog parks shall be fenced by a 1.5m high chain link fence or approved equivalent, complete with a double entry/exit dog gate. Refer to SECTION 8 - DRAWING 5.6.8.

A vehicle access gate for maintenance shall be installed on the side adjacent or closest to a trail, roadway, or parking lot. Refer to SECTION 8 - DRAWING 5.6.1.

Signage shall be provided at all entry points using the multi-purpose sign as per SECTION 8 - DRAWING 5.3.8. Information to be posted shall be the park name and address, hours of operation, and usage rules.

Site furniture to be provided, including garbage cans and benches, shall be determined in consultation with the County. Special amenities, including drinking water, dog cleaning stations, and shelter, are recommended to be provided in partnership with community groups or private partnerships and as approved by the County.

All walking path surfaces anticipated to be heavily trafficked by dogs shall be completed with engineered wood fiber unless otherwise approved by the County. Wood chip mulch is not permitted.

High canopy trees shall be planted to provide shaded areas. The number and type of trees shall be based on the size of the dog park and in consultation with the County.

5.5.5 Playgrounds and Play Structures

Children's playgrounds shall be constructed to meet manufacturer's specifications and in accordance with CSA-Z614, including providing full accessibility to persons with disabilities as per Annex H (CSA-Z614) and the County Open Space Plan. Prior to CCC inspection, the equipment manufacturer must provide a letter confirming the structural integrity of all installed equipment.

Playground equipment shall consist of metal and plastic components. Wood equipment is not permitted unless authorized by the County. Playground equipment to be installed by a Canadian Playground Safety Institute (CPSI) installer as per manufacturers specification. Construction of natural playgrounds could be considered.

The Developer shall be responsible for coordinating all necessary CPSI inspections and certifications in order to receive sign-offs. All certification documentation shall be submitted to the County prior to CCC inspection.

At a minimum, 50% of all play components in a playground shall be accessible from a path no less than 1.5m width with a maximum slope of 6%.

All manufacturer's designs and specifications shall be included on the landscape plan and submitted to the County for review. This information shall include, at a minimum, all the following: equipment location, playground extents, height of decks and protective barriers, grades, and maintenance instructions.

A sub-drainage system with a minimum 100mm PVC sub-drain pipes shall be provided for all playgrounds. Minimum slope of sub-drain pipes shall be 2.0%. Sub-drainage systems shall connect to the storm water management system. Where storm sewers are not available, sub-drainage system shall drain to surface through a sufficient outlet complete with an appropriate end-of-pipe treatment.

Playgrounds shall be sloped to drain into the drainage system and/or appropriate surface swale. Cross-lot drainage (across the property line) or drainage onto private property is not permitted.

Playgrounds shall be graded to a minimum 2% and a maximum 2.5%.

All equipment shall be designed to be placed on concrete footings. Equipment inserted into the subgrade shall not be permitted. In-ground equipment, such as talk tubes, shall be buried below the sub grade. Slides shall be light in color and face north or east.

Roof designs shall have no adjacent platforms located near equipment which may promote access or climbing onto the roof. Roofs shall not contain ornamental features, such as flags, chimneys, and banners.

Playground surfacing shall be engineered wood fibre in accordance with ASTM F1292, poured in place rubber surfacing, or approved equivalent. Wood fibre shall be installed to a minimum compacted depth of 350mm in accordance with manufacturer specification. Pea gravel, rubber crumb, and synthetic tile surfacing is not permitted.

Sand for playgrounds shall meet the following gradation requirements:

Playground Sand Gradation Requirements	
Size (µm)	Percent Passing
2,500	100
1,250	90 – 100
800	75 – 95
315	20 – 50
160	0 – 4
80	0 – 1

Signage indicating age appropriateness shall be provided outside of the protective surfacing zone and in a visible area. Signage must also indicate pets are not permitted on the equipment or in sand areas.

Playgrounds located within 30m of a roadway or parking lot shall have a minimum 1.2m tall fence installed along the side adjacent to the roadway or parking lot. Closed board or similar structures that impede public sight lines are not permitted. Breaks in the fence or a baffled opening shall be provided for entry to the park. Gates are not permitted.

A minimum 2m grass strip shall be provided between the playground retainer and any other permanent feature, including signage, planting beds, and rest stops.

Each playground shall include at least one rest stop. Refer to SECTION 5.5.2.9.

A 1.8m high temporary fence complete with signage to surround the playground shall be provided until CCC has been obtained. Signage shall include the Developer’s name and phone number.

5.5.6 Outdoor Fitness Equipment Area

Outdoor fitness equipment shall be constructed to meet manufacturer's specifications and in accordance with ASTM F3101. The site shall be designed to be fully accessible and in accordance with ASTM F1951. Prior to CCC inspection, the equipment manufacturer must provide a letter confirming the structural integrity of all installed equipment.

All manufacturer's designs and specifications shall be included on the landscape plan and submitted to the County for review. This information shall include, at a minimum, all the following: equipment location, protective surfacing zones, grades, and maintenance instructions.

Outdoor fitness area surfacing shall be engineered wood fibre in accordance with ASTM F1292, poured in place rubber surfacing, or approved equivalent. Wood fibre shall be installed to a minimum compacted depth of 350mm in accordance with manufacturer specification. Pea gravel, rubber crumb, and synthetic tile surfacing is not permitted.

All equipment shall be located a minimum of 5m away from all roadways and parking lots.

A minimum 2m grass strip shall be provided between the outdoor fitness area retainer and any other permanent feature, including signage, planting beds, and rest stops.

Signage indicating age appropriateness, usage instructions, and equipment restrictions shall be provided outside of the protective surfacing zone and in a visible area. Each piece of equipment shall be labelled with the intended user age group, usage instructions, and weight or other restrictions.

Outdoor fitness equipment areas shall be graded to a minimum grade of 1.5% and a maximum grade of 2%.

Equipment shall not be located within major overland drainage routes or ponding areas.

A sub-drainage system with a minimum 100mm PVC sub-drain pipes shall be provided for all outdoor fitness equipment areas. Minimum slope of sub-drain pipes shall be 2.0%. Sub-drainage systems shall connect to the storm sewer through a nearby catch basin or storm manhole. Where storm sewers are not available, sub-drainage system shall drain to surface through a sufficient outlet complete with end of pipe treatment.

A 1.8m high temporary fence complete with signage to surround the area shall be provided until CCC has been obtained. Signage shall include the Developer's name and phone number.

5.5.7 Sports Fields

The design and construction of sports fields shall be in accordance with municipal, provincial, and federal guidelines for the related sport. All sports fields shall be in accordance with applicable CSA standards.

Sports fields require to have a minimum 6m turfed safety setback with no vertical objects within the safety zone area.

All sports field equipment and site furniture such as goal posts, bleachers, backstops, and dugouts must be specified on Engineering Drawings.

Sports fields shall be graded to a minimum 0.5% and maximum 2% in all directions from a high point located in the middle of the field. Final surface grade shall ensure ponding is eliminated in all areas on the sports field.

All sports fields shall be completed with sod. Seed mixes shall not be permitted, due to the lengthy establishment time.

Survey reference pins shall be installed at time of sports field construction. Survey reference pins shall be 500mm length of 15mm rebar to a depth of 50mm below finished surface grade.

Proposed or existing trees at full maturity shall not overhang sports fields. Root barriers to be installed as required.

5.5.8 Right of Ways

Artificial turf or synthetic products shall not be permitted in any roadway ROW, including boulevards and medians, unless otherwise approved by the County.

Landscaping within boulevards, medians, or any other buffers within the roadway ROW shall not contribute towards municipal reserve dedication requirements.

Landscaping within ROW and easements shall be designed to be low or no maintenance landscaping.

Where minimum plant material quantities cannot be achieved within the ROW due to sizing, spacing, or other conflicts, plant material may be placed elsewhere, subject to County approval. The Developer is responsible for contacting the County to coordinate

alternative plant material locations. Alternatively, a fee may be levied based on the outstanding plant material quantity.

5.5.9 Utility Corridors

The Landscape Architect shall coordinate and obtain required authorization agreements from the affected Utility Authority for all landscape and open space development work. This includes confirming with the Utility Authority the acceptable tree species, sizes, and locations within the corridor.

The authorization agreement shall identify required setbacks for plant materials, work restrictions, safe working practices, and any other applicable conditions required by the Utility Authority for working within the corridor.

All authorization agreements shall be in place prior to construction and shall be submitted to the County prior to CCC inspection.

If the Utility Authority will not permit landscaping in the corridor, alternative planting locations shall be proposed by the Landscape Architect. Following review by the County, planting requirements may be waived, either fully or partially. The Landscape Architect shall provide the County written confirmation from the Utility Authority when landscaping in utility corridors is not approved.

Naturalized type planting is preferred over manicured type landscapes in utility corridors.

Development within the ROW of a non-odorized natural gas line is not permitted.

5.5.10 Easements

The Developer shall coordinate and obtain required authorization agreements from the affected easement holder(s) for all landscape and open space development work. This includes confirming with the easement holder the acceptable tree species, sizes, and locations within the easement.

The authorization agreement shall identify required setbacks for plant materials, work restrictions, safe working practices, and any other applicable conditions required by the easement holder for working within the easement.

All authorization agreements shall be in place prior to construction and shall be submitted to the County prior to CCC inspection.

If the easement holder will not permit landscaping in the easement, alternative planting locations shall be proposed by the Developer. Following review by the County, planting requirements may be waived, either fully or partially. The Developer shall provide the County written confirmation from the easement holder when landscaping in an easement is not approved.

5.5.11 Public Utility Lots

Existing trees within or adjacent to a PUL shall be conserved wherever possible. Additional trees shall not be added within PULs. Shrubs may be approved if a minimum of 2m distance is provided from the edge of the walkway to the mature spread of the shrub.

Longitudinal slopes along a PUL shall not exceed 6% unless permanent ESC has been implemented and approved by the County. Under no circumstances shall a PUL drain into private lands.

Each PUL shall consist of a 6 m wide ROW with a 1 m easement on each side to prevent development in close proximity to underground utilizes. PUL ROW widths shall be increased to accommodate multiple underground utilities, as required. Urban PULs shall be fenced, graded, and seeded or sodded. Plantings shall be required where space and utility setbacks allow. Rural PULs may be fenced if there is no impact to wildlife movement.

Where a PUL is required to provide emergency access, a 4 m wide asphalt surface built with an adequate structure must be provided. Bollards must be provided at both access points to the PUL that will not impede emergency vehicle access. Refer to SECTION 8 - DRAWING 5.5.0.

Where a PUL is not required to provide emergency access, it may instead be used to provide connectivity between the County's trail system and access to other amenities through subdivisions by utilizing a 3 m wide asphalt trail or a 1.8 m concrete walkway. When an asphalt trail is used, chicane bollards must be provided at both access points to the PUL. Refer to SECTION 8 - DRAWING 5.5.1.

5.5.12 Environmental Reserves

Environmental Reserves are for land that is not suitable for development and contains features such as swamps, gullies, ravines, coulees, floodplains, or land adjacent to a body of water. ERs are used to preserve natural features of land, prevent pollution, ensure public access, and prevent the development of land that is subject to flooding or unstable.

At no time shall encroachment into environmental reserves be permitted.

Recreational improvements within environmental reserves shall not contribute towards municipal reserve dedication requirements. However, it is recommended such enhancements are provided to take advantage of these areas.

Environmental reserves shall be temporarily fenced, erosion control placed and otherwise protected from the impacts of any adjacent or nearby construction activities. Any damage that may result shall be rehabilitated to the satisfaction of the County.

5.5.13 Stormwater Management Facilities

SWMFs and areas surrounding SWMFs must be graded, top-soiled, seeded or sodded, and landscaped by the Developer.

As specified in SECTION 5.4.6, a minimum of 75 trees per hectare are required. In wet ponds, this area shall be calculated above the NWL. In dry ponds, this area shall be calculated above the 1:5 year storm event water level.

Trees shall be placed in the area between the NWL and the property line. Trees located below the 1:25 year flood event water line must be flood resistant.

Landscaping must be naturalized below the 1:25 year flood event water level. Plant material shall be appropriately flood resistant to withstand anticipated flood conditions.

Shrubs located above the 1:5 year flow event water line shall be grouped together and located in planting beds. Trees are permitted and encouraged to be placed within mulched planting beds. All planting beds require a minimum mulch depth of 100mm. Mulch shall not be installed below the 1:25 year water level, except for mulched areas within individual tree wells. Rock mulch or biodegradable erosion blankets are permitted.

Major storm outlets and inlets should be landscaped with plant material and large rocks to provide visual screening.

Landscaping shall not interfere with maintenance requirements, vehicle access, or overall function of the SWMF.

Signage (refer to SECTION 8 - DRAWING 5.3.8 shall be provided in all SWMF to include the following information:

- A location map outlining nearby features such as trails, rest stops, amenities, etc. including a “you are here” locator;

- Delineated “no-mow” areas, maintained and non-maintained areas, and other maintenance information;
- No motorized vehicles. Sign shall be installed at all entrance points to the SWMF.
- Advisory information indicating activities that involve contact with water or ice are not permitted. Sign shall be installed between the HWL and 1:25 year water level;
- All other applicable advisory and responsible use information (properly dispose of litter, keep dogs on leash, etc.), including PlayCleanGo (playcleango.org) invasive species advisories; and
- Any other information as requested by the County.

Signage shall be set back 1m from the trail.

5.5.13.1 Constructed Wetlands

If conserved natural wetlands are present in the urban watershed, pollutants shall not be intentionally diverted into them for primary treatment. Natural wetland must form part of an integrated landscape approach to water quality control and shall not be expected to compensate for insufficient use of BMPs within constructed wetlands or other SWMFs.

Constructed wetlands shall be landscaped in accordance with the most recent version *Alberta Guide to Wetland Construction in Stormwater Management Facilities* (Alberta Environment and Parks). Refer to SECTION 3.3.10.7.

As specified in SECTION 5.4.6, a minimum of 75 trees per hectare are required. Trees shall be placed in the area between the NWL and the property line. Trees located below the 1:25 year flood event water line must be flood resistant.

Plant material selection shall be indicative of natural wetland areas, based on the discretion of the Landscape Architect. Landscaping shall be naturalized.

The Developer shall include design features that mitigate mosquito breeding within the system design and/or vegetation management to prevent stagnant backwaters and shading of water surfaces. Habitat for mosquito predators, such as purple martin, swallows, baitfish, dragonflies, and bats should be encouraged within the system design.

Fountains and aerators are not permitted within constructed wetlands. Lighting along adjacent trails is not permitted.

Signage (refer to SECTION 8 - DRAWING 5.3.8) shall be provided in all constructed wetlands to include the following information:

- A location map outlining nearby features such as trails, rest stops, amenities, etc. including a “you are here” locator;
- Delineated “no-mow” areas, maintained and non-maintained areas, and other maintenance information;
- No motorized vehicles. Sign shall be installed at all entrance points to the SWMF.
- Advisory information indicating activities that involve contact with water or ice are not permitted. Sign shall be installed between the HWL and 1:25 year water level;
- All other applicable advisory and responsible use information (properly dispose of litter, keep dogs on leash, etc.), including PlayCleanGo (playcleango.org) invasive species advisories; and
- Any other information as requested by the County.

Signage shall be set back 1m from the trail.

5.6 Fences

Fences shall meet the requirements determined by the County or applicable Development Agreement(s).

Fences and any associated fence components shall be located 150mm inside the property line on private property, measured from the most outside edge to the property line. Fencing must be constructed such that it is located inside the property lines of the individual lots created upon registration of the plan of subdivision for the development property.

A terminal post shall be installed 150mm inside the property line at all locations where the fence line transitions from private lands to County or other public lands. Fencing sections shall not be continuous across terminal posts at such transitions.

Fences and any associated fence components shall not be installed within a public utility lot unless first approved by the County. Prior to installing fences within any easement, the Developer shall first receive written consent from the registered easement owner.

Fences shall be provided between private and County lands as per the following table:

Fencing Requirements		
Location	Height	Material
Roadways or parking lots adjacent to parks,	1.2m (1)	Wood screen or chain link (2)

playgrounds, or sports fields		
Private property adjoins County lands; PULs	1.8m	Wood screen or chain link [2]
Along collector roadways with adjacent lots	1.8m [3]	Wood screen or as otherwise determined by a Noise Impact Assessment
Along arterial roadways and highways with adjacent lots (Sound abatement)	As determined by a Noise Impact Assessment but not less than 1.8m	Wood screen (double board) or as otherwise determined by a Noise Impact Assessment

(1): Additional height may be required for sports fields as required by sporting standards

(2): In consultation with and as approved by the County

(3): Unless otherwise determined by a Noise Impact Assessment but not less than 1.8m

Alternative styles of fence may be allowed, subject to County approval. Fencing along private properties fronting onto local roads is not required.

Maintenance equipment gates shall be required at controlled access points to the roadway system to allow entry onto County lands, as required by the County. Refer to SECTION 8 - DRAWING 5.6.2.

Back of lot gates shall not be permitted for lots backing onto natural areas, wetlands, or SWMF's unless a trail system is first adjacent to the lot. Back of lot gates for other public lands shall be considered on a site specific basis and are subject to the approval of the County.

Fences adjacent to sports fields, playgrounds, and school sites shall provide non-gated openings in the fence to accommodate pedestrian access to adjacent trails.

5.6.1 Wood Screen Fence

Wood screen fencing shall consist of 1" x 6" pressure treated wood boards. Refer to SECTION 8 - DRAWING 5.6.3.

1.8m high wood screen fencing shall be installed along all arterial and collector roadways where private lots are adjacent to the roadway.

1.8m high wood screen fencing shall be installed on lots where side yards are parallel to a collector roadway. The Fence shall be a minimum 1.8m at the back of the lot and may include step down sections after the front entrance of the home to the front of the lot.

Sound abatement fencing shall be double boarded pressure treated wood screen fencing at least 1.8m high (or higher as determined by the Noise Impact Assessment). Refer to SECTION 8 - DRAWING 5.6.4.

5.6.2 Post and Rail Fence

Post and rail fencing may be installed along roadways to restrict access into municipal lands. Refer to SECTION 8 - DRAWING 5.6.9.

Post and rail fences installed in rural areas shall be constructed with a bottom rail a minimum of 500mm from finished surface grade to allow wildlife movement.

5.6.3 Chain Link Fence

Chain link fencing may be installed where private property adjoins County lands, such as parks, playgrounds, SWMF's, and natural areas. Refer to SECTION 8 - DRAWING 5.6.0.

Chain link fencing shall be installed in accordance with CAN/CGSB-138, applicable provincial and federal guidelines, and as per the following:

Terminal Posts	Standard continuous weld; End, corner posts 89mm outside diameter galvanized pipe; Complete with all necessary bracing and fittings; Commercial grade 0.125" wall thickness
Line Posts	Standard continuous weld; 60mm outside diameter galvanized pipe; Complete with post tops without barbed wire overhang arm; Commercial Grade 0.100" wall thickness
Top Rail	42mm outside diameter galvanized pipe coupled with slip on rail sleeves for every standard length; Commercial Grade 0.100" wall thickness
Fabric	Chain link 50mm mesh x 3.5mm gauges to full height; Highest quality galvanized wire, or vinyl coated in accordance with ASTM A392 – class 1
Bottom Tension Wire	3.5mm 9-gauge galvanized steel

Braces	42mm outside diameter hot dipped galvanized steel pipe
Fittings	Consist of first grade malleable iron, pressed steel or aluminum; Tie wire to be 3.5mm 9-gauge galvanized steel or aluminum; Tension bands and bolts shall be spaced at 380mm on the terminal posts; Fabric clips shall be 3.5mm 9-gauge aluminum alloy wire; All material shall be colour codes 10.

5.7 Site Furniture

Proposed site furniture shall be designed and placed in accordance with CPTED principles and other approved planning documents.

All site furniture shall be installed as per manufacturers specifications and complete with vandal-proof hardware (tamper resistant and locking).

Furniture placed adjacent to trails shall be setback the following minimum distances:

- 0.5m between garbage can and edge of trail
- 4m between garbage can and benches or picnic table
- 1m between picnic table and edge of trail
- 1m between bench and edge of trail

All site furniture shall be bolted and secured on a concrete or asphalt pad, unless otherwise approved by the County, in which case pile mounting may be acceptable. The pad shall extend 500 mm beyond the furniture. Refer to SECTION 8 - DRAWING 5.7.0. Pads shall be located a minimum 2.5m from obstructive objects to allow for mower access.

5.7.1.1 Benches

Approved Materials		
Supplier	Model	Options
BlueImp	PK-151B	Surface mount; brown or tan color; arm rests
BlueImp	PK-151M	Surface mount; brown or tan color; arm rests

5.7.1.2 Picnic Tables

Approved Materials		
Supplier	Model	Options
BlueImp	PK-162	Surface mount; brown or tan color; accessible; memorial

5.7.1.3 Garbage Cans

In-ground receptacles are preferred (County to provide model number). Above-ground receptables shall only be considered with the establishment of a Homeowners Association.

Garbage cans shall be provided at all park entrances/exits and rest stops. Two containers shall be provided at all intensive use areas. Garbage cans shall have at least 1m clearance on one side to allow for adequate clearance to access for maintenance and bag removal.

Recycle bins shall be painted 'recycle blue' and to be complete with standard lid and internal restrictor plate. May be combined with garbage can unit.

Garbage cans and recycle bins to be complete with appropriate decals or signage prior to acceptance.

5.7.1.4 Signage

Approved Materials	
Face	Diamond grade reflective sheet aluminum
Substrate	19mm (3/4") thick High density plywood
Post	4" x 4" pressure treated wood
Fasteners	2 - 10mm OD x 60mm lag bolt per sign c/w locking nut; Phillips pan head #14x3" Type A 18-8 Stainless steel c/w ¼" flat washer 5/6" OD

Signage shall contain an anti-graffiti coating complete with 3M 1160 laminate or approved equivalent.

Back and edges of signs shall be primed with exterior primer and painted with white exterior alkyd paint.

All signage hardware shall be zinc coated. Base colour to be powder coated, textured black.

A main trail sign must be installed near the main access to a trail system. The sign shall include a diagram of the complete trail and any features along the trail system. On trail signage showing mile markers and “you are here” features must be installed to aid responders.

5.7.1.5 Lighting

Lighting shall be provided at points of importance, such as street crossings, primary pedestrian trail intersections, bridges, underpasses, and activity nodes, including outdoor sports fields.

Lighting type shall reflect light down toward ground surface and features and shall not refract light outwards.

The Developer shall complete an Illumination Analysis to determine the impacts of the developments proposed lighting on adjacent lands. The Illumination Analysis shall include a photometric analysis that identifies the location, height, and type of fixtures, including the electrical supply. The Lighting analysis must be completed by a Qualified Professional. Lighting location and specification is subject to the approval of the County.

5.7.1.6 Bollards

Bollards shall be built and installed in accordance with DRAWINGS 5.7.1 to 5.7.5.

Unless otherwise approved by the County, bollards shall be installed on all municipal lands to prevent unauthorized access vehicle access and as per the following:

- Placed on trails exiting onto roadways as a traffic control measure to reduce pedestrian and bicycle speeds;
- Placed on emergency and maintenance accesses that intersect trails or roadways;
- Placed with adequate setback onto the trail using best practices and to allow vehicles to safely enter or exit without the use of sharp turns or obstacles; and
- As otherwise directed by the County.

5.8 Tree Protection Zone

All trees within 5m of construction activities shall be protected on all sides, known as the tree protection zone. Additional consideration and care should be given to trees with significant value such as a designated heritage tree or trees with historical or memorial significance.

Protected trees shall be clearly delineated and identified as tree protection zones on the Clearing and Protection Plan or Landscape Plan. The Clearing and Protection Plan shall form part of the landscape drawing package and submitted to the County.

For trees within 3m of the construction activity, the protection zone shall consist of thick plywood, a minimum of 1.2m high. For trees within 3 – 5m of the construction activity, the protection zone may consist of orange snow fence, a minimum of 1.2m high. Protection zone extent shall be determined based on tree trunk diameter and in accordance with SECTION 8 - DRAWING 5.1.4.

Additional consideration and care shall be given to trees with significant value such as a designated heritage tree or trees with historical or memorial significance.

Only hand clearing shall be permitted within the protection zone. No excavating, grubbing, or any other disturbance is permitted within the protection zone. This includes vehicle traffic, soil compaction, storage of materials or equipment, or disposal of liquid or other substances.

The protection zone must remain in good condition and shall not be removed or altered without prior approval from the County. Prior to issuance of FAC, all plant material in the protection zone that has died or suffered as a result of construction or other activities shall be replaced at the Developers sole cost.

5.9 FireSmart

All landscape and open space development design and work shall incorporate FireSmart principles, where applicable.

Non-combustible	0 – 1.5m	Use of non-combustible material, such as gravel, brick, or concrete
Zone 1 (Fuel Removal)	1.5m – 10m	Removal of all highly flammable vegetation

Zone 2 (Fuel Reduction)	10m – 30m	Remove all dead standing and fallen trees; Prune all ladder fuels
Zone 3 (Fuel Management)	30m – 100m	Vegetation management in this area may only be necessary where interface hazard is extreme due to fuel type and/or slope. In those instances, apply fuel reduction as outlined for Zone 2.

A Wildfire Exposure Assessment may be required for all new designs in accordance with FireSmart. Home ignition zone (non-combustible, zone 1, zone 2, and zone 3) areas must be delineated and design recommendations for each area implemented into the design, wherever possible.

5.10 Asphalt and Concrete Penalty Assessment

It is the Contractor's responsibility to ensure all new asphalt and concrete is installed as per required standards and specifications. Payment reductions shall apply for those areas found to be deficient in thickness and density, unless otherwise corrected by the Contractor.

For development projects, payment penalties shall be withheld from the securities collected for the paving and concrete work. For capital projects, payment penalties shall be deducted from the line item associated with concrete or paving.

The Consulting Engineer is responsible for completing and submitting the asphalt penalty assessment and concrete penalty assessment prior to Construction Completion Certificate acceptance.

For asphalt penalty assessment refer to SECTION 3.1.20.7. For concrete penalty assessment refer to SECTION 3.6.1.2.

5.11 CCC/FAC

Refer to SECTION 2.

5.11.1 Warranty and Maintenance Period

Landscape and open spaces shall be subject to the Warranty and Maintenance Periods indicated in SECTION 2.6.4 unless otherwise indicated in the Development Agreement.

The Developer shall be solely responsible for all maintenance expenses during the Warranty and Maintenance Period. Maintenance expenses shall include all measures necessary to establish and/or maintain the landscaping and open space development including, but not limited to, picking up litter, emptying garbage cans, plant material care and upkeep, removing and managing weeds, turf mowing, tree pruning, fertilizing, watering, and snow removal.

Areas where differential settlement has occurred and does not drain properly shall be re-graded. Remove or spread additional material from site and finish with the appropriate surface treatment as per Construction Drawings.

Areas where soil has become compacted or thatch exceeds 12mm shall be core aerated.

Maintain edge of planting beds with a 100mm deep 90-degree vertical edge cut around the permitter of the bed. A minimum of depth of 100mm of mulch must be maintained. Crowns and bottom branches of shrubs must not be covered with mulch.

All plant material identified to be dead, diseased, damaged, unhealthy, improperly planted, unapproved, or otherwise requiring replacement shall be replaced within 30 days of identification. All plant material shall be replaced with plant material of the same size, species, and in accordance with Construction Drawings at the Developers sole expense.

Special considerations shall be made for plant materials that require replacement more than once in the same location. If the species selection, location and/or site conditions are deemed a likely factor in the plant materials failed establishment, it must be replaced with a different acceptable species approved by the County.

The Contractor shall maintain a monthly written log (“Contractor Monthly Maintenance Record”) of all maintenance trips completed by the Contractor. The written log shall be submitted to and reviewed by the Developer on a monthly basis. The written log shall contain, at a minimum, all the following:

- Dates of maintenance and work performed, including materials used;
- Dates of completed watering;
- Dates and types of fertilizer used; and
- Written confirmation (sign-off).

The Contractor shall maintain a written log (“Contractor Biocide Report”) of all pesticide and herbicide applications completed by a qualified Contractor. The written log shall be submitted to and reviewed by the Developer on a monthly basis. The written log shall contain, at a minimum, all the following:

- Legal land description or street location of treatment (map acceptable);
- Dates and times of application;
- Wind speed and direction, temperature, relative humidity, precipitation;
- Purpose of the application;
- Trade name of the applied product and the PCP registration number;
- Total quantity and rate of application;
- Method of application; and
- Location and distance of any application within 30 meters of an open water body.

5.11.2 Inspections

All CCC/FAC inspections must be requested by the Consulting Engineer and include the appropriate supporting documents. Refer to SECTION 2.9.1.

Softscape landscaping shall not be eligible for FAC until all surface FAC's have been issued. If the landscape and ground cover in adjacent properties has been fully established at the time of FAC, ESC measures may be removed once authorized by the County.

5.11.3 Landscape and Open Space Acceptance Criteria

Deficiencies for any landscape and open space developments exceeding 10% of the total quantity shall result in the Warranty and Maintenance Period being extended minimum six (6) months or until the next growing season.

As-built Drawings are required prior to CCC acceptance. Record Drawings are required prior to FAC being issued. No FAC approval shall be granted if there are outstanding deficiencies. Refer to SECTION 2.9.

VISUAL INSPECTION ACCEPTANCE CRITERIA CHECKLIST

Visual inspection acceptance criteria shall include, at a minimum, all of the following:

☑	**Landscape and Open Space CCC/FAC Acceptance Criteria**
☐	Seed and Sod ☐ All areas have been seeded and/or sodded as per Construction Drawings ☐ Seeded and/or sodded areas appear healthy and free of voids or other irregularities – unestablished or damaged areas must be repaired or replaced

	☐ Turf was mowed no more than 48 hours prior to inspection ☐ Seeded area has been established on a minimum of 90% of the total area to a height of at least 65 mm (mowed area) or 100 mm (non-mowed area) ☐ Seeded areas contain less than 5% weed cover ☐ Sodded area has been established on a minimum of 95% of the total area to a height of at least 65 mm ☐ Topsoil depth and inspection logs provided for review ☐ Sodded areas contain less than 2% weed cover
☐	Plant Material ☐ All plant material (trees, shrubs, etc.) has been planted in the quantities and locations as per Construction Drawings ☐ All mulched areas topped up to a 100mm depth (excluding naturalized planting beds) ☐ No weeds present in plant material or planting beds ☐ No deciduous tree with a height less than 1.6m ☐ No coniferous tree with a height less than 2.4m ☐ All trees have been properly tied, staked, and colored ☐ All cleared trees have been removed from site and properly disposed of ☐ Plant material has been recently watered ☐ More than 20% of shrubs required to be replaced – warranty ☐ More than 30% of shrubs required to be replaced – warranty
☐	Fencing ☐ All fencing has been installed as per Construction Drawings ☐ No gap between the bottom fence rail and ground ☐ Grade along fence (both sides) has been contoured to existing ground and positively drains away from fence ☐ Wood fence posts contain no cracks with: ▪ depth exceeding 50% of the depth of the post on the face ▪ length exceeding 25% of the width of the post on the face ▪ width greater than 10 mm or

	▪ visible mechanical damage ☐ All wood post cracks 5 mm – 10 mm in width have been re-stained to penetrate crack ☐ Spacing between wood boards does not exceed 12 mm
☐	Trail and Walkways ☐ All trails and/or walkways have been installed as per Construction Drawings ☐ Trails and/or walkways appear in good condition with no visible signs of deterioration or non-conformance ☐ Asphalt trails contain no cracks with: ▪ depth exceeding 3mm; or ▪ width exceeding 2mm
☐	Site furniture (benches, picnic tables, etc.) ☐ All site furniture has been installed as per Construction Drawings and Construction Specifications ☐ Site furniture appears in good condition with no visible signs of deterioration or non-conformance
☐	Signage ☐ All signage has been installed as per Construction Drawings ☐ All signage is securely fastened and installed as per Construction Specifications ☐ Signage appears in good condition with no visible signs of deterioration or non-conformance
☐	Community gardens ☐ Community garden has been installed as per Construction Drawings ☐ Potable water service installed and functioning ☐ All signage installed ☐ Community garden appears in good condition with no visible signs of deterioration or non-conformance
☐	Playgrounds and outdoor fitness equipment ☐ Playground and/or outdoor fitness equipment has been installed as per Construction Drawings ☐ All signage installed

	☐ Surface sand and/or other surfacing material is at specified depths ☐ Playground and/or outdoor fitness equipment appears in good condition with no visible signs of deterioration or non-conformance
☐	Sports fields ☐ Sports field has been installed as per Construction Drawings ☐ All signage installed ☐ Sports field appears in good condition with no visible signs of deterioration or non-conformance

5.11.3.1 Seed and Sod Acceptance Criteria

All turf areas shall be established and in a healthy satisfactory growing condition at time of inspection.

Seeded and sodded areas shall be accepted based on the following:

Seeded Area:	Areas that require mowing shall be accepted when permanent grass cover has been established on a minimum of 90% of the total area to a height of 65 mm. Turf must be mowed no more than 48 hours prior to inspection. Areas that do not require mowing shall be accepted when permanent grass cover has been established on a minimum of 90% of the total area to a height of 100 mm. Do not mow prior to inspection. In both cases, areas must have less than 5% weed cover, be visually healthy, even, and free of voids to the satisfaction of the County.
Sodded Area:	Shall be accepted when all areas have established to a minimum of 95% of the total area to a height of 65 mm. Sod must have less than 2% weed cover, be visually healthy, even, and free of voids to the satisfaction of the County. Turf must be mowed at least 48 hours prior to inspection.

Any seeded or sodded area identified as deficient by the County and required to be replaced will be subject to a new two (2) year Warranty and Maintenance Period. The

new Warranty and Maintenance Period shall apply only to materials/areas that have been replaced and will commence from the date of replacement installation.

5.11.3.2 Plant Material Acceptance Criteria

Softscape landscaping shall not be eligible for FAC until all applicable surface FAC has been issued. Contractor to provide maintenance logs at time of application for FAC.

Prior to inspection, all mulched areas shall be topped up to ensure a consistent 100mm depth. Areas excluded from this requirement are naturalized planting beds and areas below the 1:25 year water level in constructed wetlands.

All tree stakes shall be installed prior to obtaining CCC and removed prior to FAC issuance. Any tree showing signs of girdling shall be rejected and replaced.

All plant material shall be in full leaf at the time of inspection. Tree wells and planting beds shall be neat and free from weeds and debris.

Any plant material identified as deficient by the County and required to be replaced will be subject to a two (2) year Warranty and Maintenance Period. The new Warranty and Maintenance Period shall apply only to individual plant materials that have been replaced and will commence from the date of replacement installation.

Where 20% or more of trees are required to be replaced, the warranty period for the entire stage will be extended for one additional year.

Where 30% or more of shrubs are required to be replaced, the warranty period for the entire stage will be extended for one additional year.

5.11.3.3 Fence Acceptance Criteria

WOOD SCREEN FENCE

Posts shall be rejected when structural integrity is compromised or any of the following are observed:

- Identified crack depth exceeds 50% of the depth of the post on the face it occurs;
- Identified crack length exceeds 25% of the width of the post on the face it occurs;
- Identified crack width is greater than 10 mm; or

- Mechanical damage is visible or evident.

Cracks 5 to 10 mm in width shall be re-stained such that stain penetrates wood core.

Boards shall be rejected when spacing between boards shall not exceed 12 mm when dry.

Fence shall be rejected when exceeding the following tolerances:

Vertical	Difference in elevation at any given point on the fence from the Construction Drawings shall not exceed 25 mm.
Horizontal	Difference in alignment at any given point on the fence from the Construction Drawings shall not exceed 25 mm.

POST AND RAIL FENCE

Posts shall be rejected when structural integrity is compromised or any of the following are observed:

- Identified crack depth exceeds 50% of the depth of the post on the face it occurs;
- Identified crack length exceeds 25% of the width of the post on the face it occurs;
- Identified crack width is greater than 10 mm; or
- Mechanical damage is visible or evident.

Fence shall be rejected when exceeding the following tolerances:

Vertical	Difference in elevation at any given point on the fence from the Construction Drawings shall not exceed 25 mm.
Horizontal	Difference in alignment at any given point on the fence from the Construction Drawings shall not exceed 25 mm.

CHAIN LINK FENCE

Fence shall be rejected when exceeding the following tolerances:

Vertical	Difference in elevation at any given point on the fence from the Construction Drawings shall not exceed 25 mm.
Horizontal	Difference in alignment at any given point on the fence from the Construction Drawings shall not exceed 25 mm.

PAIGE WIRE FENCE

Posts shall be rejected when structural integrity is compromised or any of the following are observed:

- Identified crack depth exceeds 50% of the depth of the post on the face it occurs;
- Identified crack length exceeds 25% of the width of the post on the face it occurs;
- Identified crack width is greater than 10 mm; or
- Mechanical damage is visible or evident.

Fence shall be rejected when exceeding the following tolerances:

Vertical	Difference in elevation at any given point on the fence from the Construction Drawings shall not exceed 25 mm.
Horizontal	Difference in alignment at any given point on the fence from the Construction Drawings shall not exceed 25 mm.

STRAIGHT WIRE FENCE

Posts shall be rejected when structural integrity is compromised or any of the following are observed:

- Identified crack depth exceeds 50% of the depth of the post on the face it occurs;
- Identified crack length exceeds 25% of the width of the post on the face it occurs;
- Identified crack width is greater than 10 mm; or
- Mechanical damage is visible or evident.

Fence shall be rejected when exceeding the following tolerances:

Vertical	Difference in elevation at any given point on the fence from the Construction Drawings shall not exceed 25 mm.
Horizontal	Difference in alignment at any given point on the fence from the Construction Drawings shall not exceed 25 mm.

5.11.3.4 Trail and Walkway Acceptance Criteria

In general, trails and walkways shall be accepted provided they have been installed in accordance with Construction Drawings, all deficiencies have been rectified during the

Warranty and Maintenance Period, and trails are visually in good condition to the satisfaction of the County.

Prior to FAC, cracks in asphalt trails and walkways are required to be repaired when they exceed the following:

crack width	> 2mm
crack depth	> 3mm

5.11.3.5 Site Furniture Acceptance Criteria

In general, site furniture shall be accepted provided they have been installed in accordance with Construction Drawings and manufacturer's specifications, all deficiencies have been rectified during the Warranty and Maintenance Period, and site furniture is visually in good condition to the satisfaction of the County.

5.11.3.6 Signage

In general, signage shall be accepted provided they have been installed in accordance with Construction Drawings, manufacturer's specifications, all deficiencies have been rectified during the Warranty and Maintenance Period, and signage is visually in good condition and fastened to the satisfaction of the County.

5.11.3.7 Community Gardens

Water service acceptance as per SECTION 3.2.

In general, community gardens (excluding water service) shall be accepted provided they have been installed in accordance with Construction Drawings, manufacturer's specifications and community garden is visually in good condition to the satisfaction of the County.

5.11.3.8 Playgrounds and Outdoor Fitness Equipment Area

In general, playgrounds and outdoor fitness equipment areas shall be accepted provided they have been installed in accordance with Construction Drawings, manufacturer's specifications and are visually in good condition to the satisfaction of the County.

Prior to inspection, the Developer shall ensure playground sand or other surfacing is at the specified depths. Additional material shall be added if required.

A pre-inspection report of all playground equipment completed by a CPSI inspector shall be submitted to the County prior to CCC and FAC inspections. The CPSI inspector must be present on-site during the CCC and FAC inspections. Written approval from the CPSI inspector certifying review and acceptance is required to be submitted to the County prior to CCC and FAC being issued.

5.11.3.9 Sports Fields

Refer to acceptance criteria for seed and sod.

In general, sports fields shall be accepted provided they have been installed in accordance with Construction Drawings and manufacturer's specifications and are visually in good condition to the satisfaction of the County.

Volume 6

Shallow Utilities

Sturgeon
COUNTY

Community. Innovation. Ambition.

6. Shallow Utilities

Contents

6.1 General

The Developer shall be responsible for coordinating with the respective Utility Authority for the design and installation of franchised shallow utilities, including gas, electrical power, street lighting, and telecommunications. The Developer shall be responsible for paying all associated costs for shallow utilities, as required by the Utility Authority. All owner rebates offered by the Utility Authority at the time are to be paid to the County.

The Consulting Engineer must coordinate locations of shallow utilities with the appropriate Utility Authority and Contractor. When working in close proximity to existing utilities, the Consulting Engineer shall contact the specific Utility Authority to determine close proximity working requirements (i.e., hand digging, hydrovac, etc.) and to obtain any required approvals. Safe digging practices and working conditions in accordance with the *Alberta Occupational Health and Safety Code* must be adhered to at all times.

6.2 Utility Authority Approval

Upon approval of a tentative subdivision plan, the Consulting Engineer shall submit the subdivision plan to each applicable Utility Authority. The Consulting Engineer shall coordinate with and provide all necessary information to the Utility Authority to facilitate completion of servicing design and engineering drawings. The engineering drawings must indicate all proposed right of ways, easements, and PULs. The drawings must also show the deep underground services and applicable surface improvements. Upon return of the engineering drawings from the Utility Authority, the Consulting Engineer must review for any potential conflicts, such as collisions or misalignments, and correct them.

The Developer shall be responsible for providing, to the satisfaction of the Utility Authority, rights-of-way, easements, and public utility lots to accommodate utility servicing. Rights-of-way, easements, and public utility lots must be registered in the name of the County. Easements must be registered for each affected lot prior to the sale of any lot in the development.

The Utility Authority and the Consulting Engineer must ensure the servicing design is efficient, adheres to good engineering practice, and considers all pertinent factors, such as existing infrastructure, future development, forecasted utility expansion, and mitigating impacts to customers in the event of a localized outage. This may include primary and secondary looping systems.

Once detailed design is complete and finalized, the Utility Authority must provide final approval. Approved plans shall be included in the engineering drawings to be submitted

by the Consulting Engineer to the County for review and approval. If utilities are to be installed on County owned land or infrastructure post development, a Utility Agreement must be entered into with Sturgeon County.

6.3 Design Criteria

In all instances, the Utility Authority must be contacted for the site-specific development requirements for each franchise utility.

Depth of cover shall be as required by the Utility Authority, subject to consideration for future development, construction, and surface grading, but no less than 1m and no more than 1.4m. Depth of cover must be identified on engineering drawings for all shallow utilities.

The bottom of the power cable should be at a maximum depth of 1.5 m from final grade. The minimum cover over a power cable is 1.1 m to the top of the cable or power duct from final surface grade.

Electric Transformers require grounding loops. Loop dimensions shall be determined based on the size and capacity of the transformer. Grounding loops must be protected from other infrastructure, including fence posts, poles, pedestals, and other utilities. The footprint of the transformer and grounding loops shall be accommodated in the subdivision design. The Depth of grounding loop shall be identified on the engineering drawings.

Pocket easements, when required, shall be identified on engineering drawing, and must be incorporated into the registered subdivision.

A minimum horizontal separation of 1m shall be maintained between shallow utilities and deep utilities. A minimum horizontal separation of 1m shall be maintained between the gas utility and other shallow utilities except in a four-party common trench.

The Developer must prepare the site, including rough grading all boulevards, lanes, and easements, in accordance with the requirements of the Utility Authority. The Developer is responsible for completing all required survey work, including layout, staking, and levelling.

6.3.1 Gas

Gas services must be provided to each lot in the development. Utilities shall be run underground.

The Consulting Engineer shall coordinate the location of gas services with the Utility Authority to ensure conflicts with other utilities does not occur.

Where required, the Developer shall provide rights of way, easements, and public utility lots registered in the name of the County of sufficient size and location to satisfy the Utility Authority. The Developer shall be responsible for registering all easements. Final design alignment must be approved by the County.

A depth of 1.4m for developed roads and a depth of 2.0m for undeveloped roads will be required below the lowest part of the cross section and maintained for 10m on either side of the road allowance. Extra depth could be required by the County Utilities Department, should it be deemed necessary at the time the application is reviewed.

For low pressure pipelines; Any portion that parallels within 15.0m of the boundary of the road will be required to maintain a depth 0.5m lower than the lowest portion of the cross section of the road and drainage infrastructure. For high pressure pipelines; a minimum of 30m from right-of-way is to be maintained for all paralleling pipelines.

Where gas distribution is at the front of lots, gas service to individual lots shall be installed such that the gas meter is placed at the side or rear of the dwelling. Gas meter shall be placed on the same side as the driveway. Gas meter shall not be permitted at the front of the dwelling.

All capital contribution and other costs charged by the Utility Authority for installation of gas utilities shall be borne and paid in full by the Developer.

6.3.2 Power

Power services must be provided to each lot in the development. Utilities shall be run underground.

The Consulting Engineer shall coordinate the location of power services with the Utility Authority to ensure conflicts with other utilities do not occur. Service boxes, transformers, pedestals, and other associated furniture shall not conflict with the location of driveways or roadways and shall be located on the intersection of lot lines wherever possible. Final design alignment must be approved by the County.

Where required, the Developer shall provide rights of way, easements, and public utility lots registered in the name of the County of sufficient size and location to satisfy the Utility Authority. The Developer shall be responsible for registering all easements.

A minimum 1.4m depth of cover below the lowest point in the cross-section shall be maintained throughout all crossing areas and shall be maintained for 10 metres beyond the existing roadway right-of-way boundaries.

All capital contribution and other costs charged by the Utility Provider for installation of power utilities shall be borne and paid in full by the Developer. All utility investment rebates shall be payable to the County.

6.3.3 Telecommunications

Telecommunications include telephone, cable, and internet services. Telecommunications services must be provided to each lot in the development. Utilities shall be run underground.

The Consulting Engineer shall coordinate the location of telecommunication services with the Utility Authority to ensure conflicts with other utilities does not occur. Service boxes and other associated furniture shall not conflict with the location of driveways or roadways and shall be located on the intersection of lot lines wherever possible. Final design alignment must be approved by the County.

Where required, the Developer shall provide rights of way, easements, and public utility lots registered in the name of the County of sufficient size and location to satisfy the Utility Authority. The Developer shall be responsible for registering all easements.

A minimum 1.4m depth of cover below the lowest point in the cross-section shall be maintained throughout all crossing areas and shall be maintained for 10 metres beyond the existing roadway right-of-way boundaries.

All capital contribution and other costs charged by the Utility Provider for installation of telecommunication utilities shall be borne and paid in full by the Developer. All utility investment rebates shall be payable to the County.

6.4 Utility Approvals

Approval Requirements:

1. Engineering Drawing (To be sealed by professional engineer):
    - Plan and profile of the proposed pipe and utility crossing(s) under the road. This drawing shall include the following information:
    - Location of the crossing(s), referencing identifiable landmarks (such as road, intersection, etc.)
    - Pipe centerline, diameter, length, size, limits, thickness, and material.
    - Location of any adjacent infrastructures including but not limited to existing pipelines, culverts, and other existing underground/buried utilities services.
    - Location of the ditch line and any breaks in slope.
    - Location of drilled boreholes or test pits from geotechnical investigation if applicable.

2. Geotechnical Investigation Report (if applicable) signed and sealed by a locally registered professional Geotechnical Engineer.
3. Traffic Accommodation Plan may be required if request by the County.
4. All pipelines and utilities installed below the highest ground water level predicted will be sealed during construction.
5. The applicant shall submit settlement monitoring plan for two years after the pipeline installation.

To determine if a Geotechnical Investigation Report is necessary, refer to the following table:

	Pipe Size	**Depth of Cover to Top of Pipe**	**Adjacent Structures (if applicable)**	**Depth of Pipes Outside Road Structure**	**Excavation Location**	**Proximity to Water Body**	**Construction Method**

No Geotechnical Submission Required	Less than 300	Greater than 1.5m or three pipe diameters whichever is greater	Greater than 10m from road centerline	All pipes will be at least 1.4m	Greater than 10m from the road centerline or outside the road right of way	No	HDD
Detailed Geotechnical Study Required	300-1500mm	Greater than 1.5m or two pipe diameters whichever is greater	Within 2.5 times cover depth from road centerline	Less than 1.4m	Within 10m of the road centerline or within the road right of way	Yes	Non-HDD
	Greater than 1500	Less than 1.5m or two pipe diameters					

6.5 Utility Locations

Unless otherwise approved by the County, all shallow utilities must be installed in the locations and alignments as indicated on the cross sections in SECTION 8 - DRAWING 8.1.1.

Four-party trenching utilizing one common trench for telephone, cable, internet, gas, and power located within a 3.5m or smaller easement on the property is the accepted trench configuration if possible.

Power utilities for all new and retrofit developments must be underground. For isolated rural developments where the installation of buried power may not be practical or urban developments that would modify existing overhead powerlines, above ground power may be considered, subject to the approval of the Utility Authority and County.

On side yard flankages, shallow utilities may be installed in the boulevard space between the back of curb and the property line. The detailed design of the shallow utilities must consider street furniture requirements, other infrastructure, including mailboxes, and sidewalk spacing. No trees shall be permitted where shallow utilities are in the side yard flankage boulevard space.

6.6 Conduits and Ducts

All shallow utilities are to be contained in a conduit of appropriate size and number. Ducts must be 4” or 6” diameter – 5” is not permitted.

All shallow utilities crossing roadways are to be contained in a conduit/duct of appropriate size and number that span, at a minimum, the entire extent of the carriageway. **One spare 4” conduit, capped at both ends, must be installed at all roadway crossings.** Conduits crossing roadways shall be aligned such that the duct crosses the roadway at 90 degrees, wherever possible. All pushes for road crossings or in boulevards require interlocking rigid PVC (Schedule 40) ducts to be pulled in before installing cable. Pulling cable into native soil is not acceptable as there is no way of knowing the conditions that the cables are being pulled into.

Crossing ducts are required under lanes and walkways. Marker tape shall be installed 300mm above the highest shallow utility in the trench.

The Developer shall ensure additional spare conduits are installed in the trench in an early phase of a multi-phase subdivision to accommodate the future requirements of the next phases, including those phases which may be completed by a different Developer. Other factors that must be considered in conduit design are:

- The future expansion of an area.
- Future cable replacement due to the direct buried cables age or failure.
- The future need for a capacity upgrade to the area.
- If future loads are single or three-phase.
- Access and ability for future pulling of the cable in the spare conduit(s).
- The number of bends required in conduit design (CSA recommendation is four maximum bends without a pull box).
- The need for pull boxes.

6.7 Prior to Excavation

Prior to any excavation or digging, the Contractor must complete a utility locate to determine the presence and locations of all existing underground infrastructure. Utility locates are completed by Utility Safety Partners (formerly Alberta One-Call) and can be reached at 1-888-420-3464and other private utilities not included in the Utility Safety Partners locates program.

Excavations, digging, or placing of plant materials that impact or have the ability to impact existing utilities shall not commence until the affected Utility Authority has been notified

and approval has been obtained. The Contractor shall be responsible for notifying and coordinating with the Utility Authority.

6.8 Cables

Additional cable must be left in bases of pad mounted equipment. Before cutting cable, the Contractor must ensure 5m of additional primary and secondary is laid out in transformers, 6m of additional primary in 1-phase cubicles, and 10m of additional primary for 3-phase cubicles. Additional cable is measured from the top of the pipe bend for switching cubicles and from the top of boards for transformers. This will ensure that there is enough cable to be trimmed by others for terminations prior to energization.

Primary cable ends must be wrapped with elastomeric tape (i.e. Greenline) to prevent the migration of moisture in the cable prior to testing. Elastomeric tape must be wrapped in a spiral shape overlapping one half of each previous wrap at a time and then covered with black low voltage vinyl tape. A minimum of two layers of half lapped tape must be applied. Immediately after testing, primary cable ends must have heat shrink caps installed.

Secondary Cable ends must have heat shrink caps installed. Use of electrical tape is not acceptable for sealing cables.

Where stages of construction end, it is necessary to protect the primary or secondary from damage or tampering. Temporary transformer bases, boarding and shading, or use of soil bags are three acceptable methods of securing primary or secondary cables.

Capped cables that are boarded and sanded are to be staked with four yellow stakes marking the location and the circumference of the coiled cable. The yellow stakes must be 2” x 4” by a minimum of 1.5 m in length and 450 mm above final grade.

6.9 Installation

All landscaping must be returned to pre-disturbance conditions to the satisfaction of the County.

Power, streetlight, and telecommunication utilities shall be placed on the “road” side of the trench. Natural gas pipe will be on the “property” side of the trench. The power and telecommunication side of the trench shall be dug in such a way that the trench accepts all the telecommunication conduits on the bottom of the trench, then sand shading, then the power cable conduit. Stakes shall be installed to ensure the power, streetlight, and

telecommunication cables/conduits are a minimum of 300 mm from the natural gas pipes.

A minimum 300 mm layer of sand shall be placed over top of the power facilities. Marker warning tape shall be placed on top of the sand, and native clay backfill can then be placed in the excavation. Compaction requirements for the trench/excavation are to be in accordance with SECTION 6.9.

Telecommunication conduits, if required, must be installed at the deepest level, with a minimum of 100 mm of sand over top of the conduit.

Service boxes shall be buried a minimum of 800 mm below the rough grade and shall be backfilled with a minimum of 300 mm of sand around the box. Marker tape must be used.

All road crossings shall be extended trench line to trench line with bell end collars.

Gas tees will be installed closest to property line and must be covered with 300mm of sand.

Where other facilities such as street lighting, telecommunications, or CATV cable or conduit is placed, care must be taken so that the facilities are neatly placed and if necessary, wider trenches used to allow access to the power facilities for future repairs.

Cables in a trench must be neatly placed. Where the width of a trench allows for utilities to be neatly separated, power cables shall be pushed to the curb side of the trench.

Where cable will be placed above ducts, all ducts must be shaded with a minimum of 100 mm of sand or with trenched material if a mechanical trencher was used, so long as the material is suitable backfill material. Backhoed material will not be an acceptable material for shading ducts.

6.10 Backfill and Compaction

Conduits shall be packed with bedding sand and overlain by suitable backfill material.

All shallow utility trenches must be compacted to the following requirements:

Shallow Utility Trench Minimum Compaction (SPD)	
Trenches [(1)] within the road carriageways, trails, walkways, and other surface improvements	98%

Everywhere else	95%
(1): 0.5m beyond the edge of concrete or pavement structure	

In existing subdivisions, the Utility Authority shall ensure the above minimum compaction for utility trenches for any new installations or modifications to existing lines (i.e., retrofit, upgrade, etc.).

Impacted road structures (base and asphalt) must be restored to the same specification as their pre-disturbance structure.

When trench depth is non-compliant or excavated at an inconsistent depth, appropriate corrective measures must be implemented, such as adding bedding sand or retrenching. If line has already been laid in the trench, it must be removed prior to repairing the trench.

Backfill material containing substantial amounts of organics, peat, black loam, sod, hardened clay, stones, straw, snow, or frozen material shall not be permitted. All backfill material is subject to the approval of the County inspector.

Where clay is used as backfill material, the moisture content of the clay shall not exceed the plastic limit or more than 15%, whichever is less, when placed in the trench. Backfill shall be placed in uniform lifts not exceeding 300 mm.

Sand or non-shrink Fillcrete (~1 MPa) may be substituted for backfill where unsuitable material is encountered, subject to geotechnical verification by a Qualified Professional and approval by the County. Fillcrete is not permitted to as backfill over bare cables.

Where a trench has been backhoed, cables must be shaded with 300 mm of sand. Backhoed material is not permitted as shading material above ducts.

6.11 Record Drawings

The Developer must submit as-built drawings showing construction details of all conduits and street furniture installed prior to issuance of CCC. Refer to SECTION 2.

6.12 Warranty

The Developer shall be responsible for correcting any damage or deficiencies that results from the installation of shallow utilities during the CCC warranty and maintenance period. Such damages and deficiencies shall include, but are not limited to, utility trench settling

or insufficient compaction, damage to landscaping or other surface features, and damage to service pipes or other existing underground infrastructure.

The Utility Authority shall be responsible for correcting any damages or deficiencies caused by shallow utility installation to an existing development (i.e., retrofits, upgrades, etc.). Such damage and deficiencies shall include, but are not limited to, utility trench settling or insufficient compaction, damage to landscaping or other surface features, and damage to service pipes or other existing underground infrastructure.

Volume 7

Erosion and Sediment Control

Sturgeon
COUNTY

Community Innovation. Ambition.

7. Erosion and Sediment Control

Contents

7.1 General

These requirements are intended to represent the minimum acceptable standards. The standards should not be considered as a substitute for detailed material and construction specifications to be prepared by the Consulting Engineer. It is the Developer and the Consulting Engineer's responsibility to develop and implement designs in accordance with good engineering practice, specific site condition requirements, and as may be required by the Authority Having Jurisdiction.

Where conflicts or inconsistencies with the General Municipal Servicing Standards arise due to adoption of other planning and design documents, the Developer shall be responsible for satisfying the more stringent requirement.

The Developer and the Consulting Engineer are responsible to ensure all work is designed and completed using engineering best practice to achieve design life and safety expectations consistent with good design and construction practices.

The Developer shall be responsible for all quality control testing. Quality control shall be performed by an independent third party and certified by a Qualified Professional.

The requirement to submit an ESC plan and the level of detail necessary is based on the development size and disturbed soil area, as well as the site-specific characteristics of the development area, including topography, steepness, and proximity to waterbodies. Submission requirements are as follows:

Development Site Area	Disturbed Soil Area (1)	ESC Plan Submission (2)	Good Housekeeping Letter (3)
< 0.4 ha	< 0.4 ha	No (4)	No
0.4 ha or greater	< 0.4 ha	No (4)	Yes
0.4 ha or greater	0.4 ha or greater	Yes	No

(1): Measured as the combined surface area of disturbed soil within the developme

(2): Refer to SECTION 7.8

(3): Refer to SECTION 7.9

(4): Good Housekeeping Practices are required. Refer to SECTION 7.9

The County reserves the right to require submission of an ESC Plan for any site that is less than 0.4 ha if the County believes there is potential of an adverse effect to property, infrastructure, health, safety, or the environment.

7.2 References

The requirements presented within these standards are guided by the reference materials listed below. For a more in-depth understanding or additional information the most recent version of these references should be consulted:

- *Erosion and Sediment Control Manual* (Alberta Transportation)
- *Field Guide for Erosion and Sediment Control* (Alberta Transportation)
- *Standard Specifications – Erosion and Sediment Control* (City of Calgary)
- *Erosion and Sedimentation Control Guidelines* (City of Edmonton)

7.3 Objective

Erosion and sediment control (ESC) is *any **temporary** or **permanent** measures taken to reduce erosion, control siltation and sedimentation, and ensure that sediment-laden water does not leave a site.*

The main objective of erosion and sediment control is to mitigate sediment pollution in watercourses by implementing best management practices to prevent erosion from occurring at the source (development site) in conjunction with managing the flow of sediment-laden runoff from erosion that has occurred.

Providing rapid protective cover on all exposed soil surfaces is the single most important practice for minimizing erosion. Cover may include topsoil application used in conjunction with seeding, mulching, hydroseeding, or erosion control blankets. The ESC designer has many options to select the proper erosion control practices for their site.

In general, the following principles should be applied to erosion and sediment control:

- Prevent pollutant release (i.e., erosion) as the primary line of defense. Prevent pollutant flow (i.e., sediment) into waterbodies as the secondary line of defence.
- Erosion and sediment control measure BMPs must be site-specific and tailored to the project and construction plan. Select appropriate control measures for the control of pollutants other than sediment.
- Site drainage and soil conditions should be reviewed to determine the most significant factors for the site and planned construction.
- Runoff should be diverted away from exposed soil areas, where possible.
- Existing vegetation should be preserved as much as possible. Unneeded clearing must be avoided.
- The extent of clearing and phased construction should be limited.
- Adequate buffers should be used to protect natural areas where flows enter the drainage system.
- Minimize slope length and steepness.
- Runoff velocities should be reduced to a speed that prevents channel erosion.
- Prevent tracking of sediment off site.

7.4 Other Regulatory Bodies

ESC measures and sediment-laden runoff to waterbodies must be in accordance with all applicable Acts, regulations, and standards set forth by AHJ's, including provincially and federally. Regulatory agencies also publish codes of practice, guidelines and standards that set out requirements for undertaking specific types of activities. The Developer shall be responsible for obtaining all external approvals and providing them to the County for review prior to construction.

The following list outlines legislation which may be applicable, but should not be considered a complete list:

- Navigable Water Protection Act
- Fisheries Act
- Canadian Environmental Protection Act
- Environmental Protection and Enhancement Act
- Water Act
- Public Lands Act
- Soils Conservation Act

7.5 Responsibilities

7.5.1 Developer

The Developer shall be solely responsible for ensuring erosion and sediment control measures, as required, are included and implemented at all times during construction and post-construction periods. The Developer may assign a representative to manage such responsibilities, such as a Contractor or Consulting Engineer, however, full responsibility shall remain with the Developer.

During development, the Developer is responsible for ensuring the protection of the storm drainage system (inlet controls) until the completion of infrastructure installation and receipt of all FACs from the County. The Developer must immediately correct, at their own expense, all defects, damages, and deficiencies in the ESC measures. Such defects, damages, and deficiencies may include, but are not limited to, materials, workmanship, operation, and vandalism.

The Developer shall maintain temporary and permanent ESC measures until the full scope of work specified by the Development Agreement or Development Permit has been completed and landscaping has been established where ESC measures are no longer required and authorized to be removed by the County. The Developer must ensure all temporary ESC measures, such as silt fencing, are removed and properly disposed of prior to FAC (if required). Temporary ESC measures are not permitted to remain in place indefinitely.

7.5.2 Project Manager

The project manager serves as the Developer's representative on a specific project and may delegate the tasks of implementing and inspecting ESC on the project to a Qualified Professional.

The project manager shall be responsible for confirming whether Good Housekeeping Practices are sufficient, or an ESC Plan submission is required, and if so, that an ESC Plan has been submitted to the County and is approved.

The project manager must ensure that the information contained within the plans are being adhered to, that the ESC Plan is understood by all site stakeholders, that a copy of the plan is available onsite, and that changes to the plan are implemented on-site and approved by the County using the modification process in accordance with SECTION 7.8.5.

7.5.3 ESC Designer

The ESC designer shall be responsible for developing an ESC Plan that meets regulatory requirements, can be integrated with project scheduling, and can be clearly understood and implemented by the Contractor.

During the development of the initial site ESC Plan, the ESC designer must visit the project site to conduct a thorough site evaluation and risk assessment.

The ESC designer must emphasize that the ESC Plan is to be approved by the County prior to the start of construction and will need to be frequently reviewed. The ESC Plan must be updated as necessary to accommodate potential changes throughout the construction stage of the project.

7.5.4 Contractor

The Contractor shall be responsible for understanding and following the approved ESC Plan. The Contractor must implement the practices prescribed in the ESC Plan, including adhering to the Inspection and Maintenance Plan. Where practices do not function as intended, the Contractor must communicate observations to the Qualified Professional responsible for submitting ESC modifications.

When the Contractor has concerns or wishes to propose alternate ESC measures, they must initiate discussions with the Developer and ESC designer. The Developer is responsible for ensuring the modification process and requirements are met and that the County has approved the modification prior to implementation.

Depending on contractual agreements, the Contractor may be responsible for the removal of temporary ESC measures once the contributing area is stabilized.

7.5.5 County

The County shall be responsible for reviewing ESC Plans submitted prior to construction and clearly communicating submission requirements to the applicant.

The County shall be responsible for reviewing Good Housekeeping Letter requests prior to construction and communicating whether a Good Housekeeping Letter or ESC Plan submission is required in accordance with these standards.

The County shall be responsible for periodically conducting ESC inspections on sites to assess compliance with approved ESC Plans and any areas of non-compliance are identified and communicated to the Developer.

7.6 Site Access

The Developer, Contractor, and their delegates, must be available and willing to provide the County, at all times, free and uninterrupted access to work areas to conduct ESC inspections.

7.7 Pre-construction Meeting

A pre-construction meeting to discuss ESC implementation must be scheduled with the County for all development sites 0.4 hectares and greater. This meeting should be held after controls have been put in place but prior to the commencement of construction. The Developer, Contractor, and the Qualified Professional responsible for ESC implementation and management must be present for the meeting.

7.8 ESC Plan

ESC Plans must describe how any potential releases from the development area will not cause or contribute to an adverse effect during a construction activity. The ESC Plan must ensure:

- All land disturbing activities and associated erosion controls, sediment practices, and storm water management practices have been identified; and
- Contractors and other impacted on-site staff are aware of all control practices to be implemented prior to and during each stage of construction.

The ESC plan shall consist of three parts: report, drawings, and calculations. An ESC plan specific to the proposed development must be prepared and submitted to the County with the engineering drawings package.

The ESC plan must be completed and stamped by a Qualified Professional. The Qualified Professional must possess sufficient experience with ESC design and an applicable professional designation, such as a CPESC, P.Eng, or P.L.Eng. The County reserves the right to require submission of documentation that demonstrates the ESC experience of the Qualified Professional.

The ESC Plan must be a stand-alone document that can be located on the construction site for use by site personnel, inspectors, and regulators. As site work progresses, the ESC

Plan should be modified by a Qualified Professional, in consultation with the County, to reflect changing site conditions. ESC Plans must be easily understood by Contractors. Drawings must clearly identify where, when, and how to implement ESC measures.

The County will review the ESC plan only to determine if it meets the minimum requirements set out in these standards. It is not the responsibility of the County to ensure that the ESC Plan is appropriate for the level of work suggested by the proposed project. It is the Developers responsibility, utilizing the services of a Qualified Professional, to ensure that the plan and proposed ESC measures are appropriate for the proposed project.

The Qualified Professional must take into consideration, at a minimum, all of the following factors when preparing the ESC plan:

- **Minimization of unneeded clearing and grading:** specific areas of the development area do not require clearing or activity should be restricted. Such areas include riparian areas, wetlands, steep slopes, and environmentally sensitive areas.

- **Protection of watercourses:** watercourses are especially susceptible to sedimentation and must be protected at all times. Clearing adjacent to a watercourse (riparian area) should not be permitted and appropriate BMPs implemented to protect these areas.
- **Protection of steep slopes:** steep slopes are generally defined as 6:1 or greater. Clearing and grading of steep slopes should be avoided, where possible. When not possible, appropriate BMPs, such as uphill flow diversion, roughening of soils, or ESC matting should be implemented to prevent uphill runoff from flowing down slopes.
- **Immediate stabilization of exposed soils and drainage channels:** existing drainage channels must be identified while preparing an ESC plan as these will likely be the major surface routes that sediment-laden runoff will travel to streams, rivers, and sewer systems. The velocity in drainage channels must be controlled to an acceptable level that will not cause erosion.
- **Phasing of construction and reducing soil exposure time wherever possible:** large surface areas of grading should be avoided, where possible, as these areas are unprotected and highly prone to erosion. Phasing construction to smaller, easier managed areas reduces overall disturbance and soil exposure time. Appropriate BMPs must be implemented, such as tarping stockpiles, roughening soils, and silt fencing.

- **Perimeter control of development area:** perimeter controls, such as silt fencing or berm interceptors, should be implemented at the boundary of the construction activity site to retain or control runoff leaving the site.

- **Include BMPs that encourage sediment settling:** the use of sediment traps or basins should be implemented to reduce high concentrations of sediments that may be

discharged during larger rain events. Sediment trapping efficiency can be improved by incorporating additional features such as larger storage volumes, baffles, skimmers, and multi-cell construction practices.

- **ESC plan user implementation and responsibility:** the ESC plan, specifically responsibilities, must be understood and followed by all Proponents who are responsible for its implementation, including contractors, consultants, and developers. A copy of the ESC plan should always be kept at the development site and ESC training made available, as necessary. Kick-off meetings and weekly site meetings can be a valuable communication opportunity.
- **Monitoring and adjusting ESC plan to site conditions:** for an ESC Plan to be effective, it may require modification due to discrepancies between planned or assumed conditions and existing conditions, weather conditions, or other unforeseen situations. Continuous and consistent monitoring is imperative to understanding when and what such adjustments may be required. Assessing the development site after a rainstorm or snow melt will indicate whether implemented BMPs are effective or not.

7.8.1 Report

The report is a written description of the overall strategy for erosion and sediment control related to all construction activities for the development. It should summarize the aspects of the project that are related to ESC control and include, at a minimum, all of the following:

- A description of the proposed land disturbing activities, existing site conditions and adjacent areas (such as creeks and buildings) that may be affected by the land disturbance.
- A description of environmentally critical areas on the site that have potential for serious erosion problems, such as severe grades, highly erodible soils, and areas near wetlands or waterbodies.
- A construction schedule that includes the date stripping and grading will begin and the expected date of stabilization.
- A description of the measures and BMPs that will be used to minimize erosion and control sedimentation on the site, including when they will be installed and where they will be located.
- An inspection and maintenance plan, including frequency of inspection, re-seeding, repair and reconstruction of damaged structures, cleanout and disposal of trapped sediment, duration of maintenance program, and final removal of the measures when site work is complete.

- Shutdown plans where construction activities are delayed for an extended period. ESC shutdown plans must address ongoing maintenance and inspection issues.
- An emergency response plan that identifies available short-term resources in terms of personnel, equipment, and ESC measures, and the steps to be taken for incident reporting to regulatory authorities where discharge of sediment exceeds regulatory requirements.
- Name and signature of the person preparing the plan and their professional stamp or designation.

The report must address, in detail, specific areas of interest for the site, such as sensitive area protection or inlet protection, and the special measures that will be implemented.

Sensitive Area Protection

- Show on-site and off-site drainage basins that flow through sensitive areas.
- Delineate major features such as the Sturgeon River, the top of bank or crest of the river valley and ravines, and show the buffer or setback distances and all proposed protection measures.
- Delineate all lakes, wetlands, impoundments, intermittent or continuous streams, and show proposed protection measures.
- Indicate any slopes greater than 20% on preliminary and final contours and show proposed protection measures for each stage of grading.

Inlet Protection

- Show the storm drain system, complete with size and location of storm drains, inlets, pipes, basins, etc.
- Provide diversions, where applicable, to divert clear water around disturbed areas.
- Indicate where the stormwater discharges and what measures exist or will be installed to prevent erosion and dissipate the flow energy. Determine and indicate the discharging velocity.
- Show the location and type of all inlet sedimentation control BMPs

7.8.1.1 Existing Site Characteristics and Location

- Describe the location of the proposed development, including a legal land description of the site and a reference to adjacent properties and landmarks.
- Describe the existing land use, including general topography, vegetation, soil types (particle size, erodibility), and drainage patterns.

- Describe critical areas within the proposed development site that have the potential for serious erosion or sediment problems.
- Identify neighbouring lands such as streams, lakes, residential, commercial, or industrial areas, environmental or municipal reserves, and roads that may be affected by the land disturbance.

7.8.1.2 Proposed Development Characteristics

- Provide a general description of the proposed development with a brief description of the land disturbing activity.
- Indicate the area and the amount of grading for each phase of development.
- Describe the permanent storm water management system and the use of these facilities during the construction period.
- Provide a seed mixture table with seed type and percentages by weight.
- Provide a timing schedule that the Contractor will follow that shows when the following will be constructed:
    - Temporary construction entrances/exits;
    - Sediment control basins;
    - Stripping and topsoil stockpiling;
    - Rough grade and finished grade;
    - SWMFs;
    - Temporary and permanent ESC BMPs; and
    - Landscaping and final stabilization.

7.8.1.3 Best Management Practices

The report must identify ESC controls and BMPs to be implemented during construction and post-construction activities. At a minimum all the following must be included:

- Determine runoff quantities from within the development area and from the upstream watershed area.
- Provide a description of the methods that will be used to control erosion and sediment transport on the site. Stabilization of soils should be the primary focus.
- Identify permanent and temporary controls and BMPs for each phase of development.

- Determine the impact on the receiving water bodies if the erosion and sediment controls are breached or fail.
- Indicate schedule of regular field checks to ensure ESC measures are operational and functional (e.g., inspect silt fencing is keyed into the ground, sediment trap not full after an event, etc.).
- Show the location, height, and volume of stockpiles. Indicate erosion control measures to control sediment runoff from the stockpiles.
- Indicate the types of individual erosion control measures, including interim or short-term measures (< 45 days duration).
- Clearly indicate the measures to control sediment export off the development site.
- Describe how the site will be stabilized after construction (site grading and servicing) is completed. Refer to SECTION 7.12.

7.8.1.4 Inspection and Maintenance Plan

The report must include an inspection and maintenance plan for ESC measures and BMPs. The plan must include, at a minimum, all the following:

- frequency of inspections;
- re-seeding, repair and reconstruction of damaged structures;
- cleanout and disposal of trapped sediment;
- duration of maintenance program;
- final removal of the measures when site work is complete; and
- a sample ESC inspection and maintenance report template.

Refer to SECTION 7.11.1.5 for BMP inspection and maintenance requirements.

7.8.1.5 Winterization Plan

All ESC Plans must include a Winterization Plan for work taking place between November 15th and April 15th of each year. Implementation of Winterization Plans must be no later than November 14th of each year.

Inlet controls must be removed before November 15th and re-installed before significant spring runoff events occur, typically before April 15th.

The Developer must complete a winter shut down inspection to note any deficiencies that do not comply with the Winterization Plan. This winter shutdown inspection must be documented and available to the County upon request. Inspection and maintenance of

the site will be required throughout winter at the frequency determined in the inspection and maintenance plan regardless of whether a project site is subject to winter shutdown or if construction is ongoing.

7.8.1.6 Haul Routes

When soil or subsoil is to be transported to or from the development site, a detailed haul route map showing the location where soil is to be stored and the haul routes that are to be used must be included in the ESC Plan. If this information is unknown at the time of the application, it must be supplied as a modification prior to any soil entering or leaving the site. Refer to SECTION 7.8.1.7.

7.8.1.7 Manufacturer's Specifications

Manufacturer's specifications for each specified BMP and product must be included in the ESC Plan.

Manufacturer's specifications provide valuable information on application, C-values, P-values, performance, installation, inspection, and maintenance. When a specific ESC product is used, it must be installed, maintained, and inspected per the manufacture's specification. If there is a discrepancy between the Standards and the manufacturer's specifications, the more stringent requirement will apply.

7.8.2 Drawings

Engineering drawings must be included as part of the ESC plan. ESC drawings must identify the location, design, and timing of appropriate ESC practices throughout all stages of construction. A specific ESC drawing must be completed for each applicable stage of construction. Typical project stages that may need to be addressed include:

Typical Project ESC Drawing Stages		
ESC Drawing	Stage of Construction	Description
ESC-0	Standard Details	Includes drawing details for ESC practices and BMPs proposed for the project
ESC-1	Pre-stripping and grading	Describes how the site looks prior to development
ESC-2	Stripping and grading	Describes how the ESC goals will be met if there is a planned pause or defined step during stripping and grading

ESC-3	Post-stripping and grading	Describes how the site will be protected following stripping and grading
ESC-4	Major cuts and fills	A separate cut and fill plan is required for sites with cut and/or fill depths that are greater than 2 m
ESC-5	Pre-construction	Describes how the site will be protected prior to starting construction of underground and surface improvements. In some cases, this drawing may be the same as ESC 3
ESC-6	Post-underground	Describes how the site will be protected prior to the start of construction of above ground infrastructure and after underground utilities have been installed
ESC-7	Surface work	Describes the continued need for ESC measures while surface improvements and other developments are being erected
ESC-8	Construction end	Describes how the site will be stabilized following completion of construction
ESC-9	Landscape	Describes the final stabilization for the site and how groundcover vegetation will be quickly and successfully established.
ESC-10	Staging (1)	Describes the phase order the site will be constructed, including approximate durations for each stage. Show soil disturbance area will be limited to 65 ha at any one time.
(1): Required only for projects containing more than one stage of construction		

Not every drawing listed above may be required for each ESC Plan – this is a guideline. The number of drawings required shall be project specific and sufficient to allow adequate review by the County.

Each drawing must include a series of notes and calculations supporting the assumptions and ESC practices selected. A checklist describing the minimum requirements for an ESC drawing is located in SECTION 1.10.1.

7.8.3 Calculations

Calculations should include, where applicable, all the following:

- Calculations determining erosion potential of the site (i.e., slope gradient, slope length, and soil erodibility calculations)
- Soil loss estimates.
- Calculations to demonstrate the design sediment removal efficiency from the runoff from the site as a percentage.
- Seeding or vegetative specifications and mix.
- Design velocities and any associated permanent BMP measures (e.g., rip rap, check dam, etc.).
- Provide sediment traps for areas less than 2 hectares and sediment basins for areas of 2 hectares or greater, complete with design calculations
- Design criteria and calculations such as design particle size for sediment basins and peak discharge for channel design and outlets.
- Show any other storm water management facilities complete with operating conditions
- Provide pipe end treatments and flow control devices to prevent channel erosion

7.8.3.1 Calculation of soil loss using the Revised Universal Soils Loss Equation for Application in Canada (RUSLE-FAC) is not required unless requested to do so by the County. The County reserves the right to require RUSLE-FAC calculations for any site it deems necessary. Erosion Potential

Two important steps involved in determining what ESC measures should be implemented on a site is to calculate the erosion potential of a site and assess the risks of impacts to downstream receivers. These calculations will typically be done as part of the preparation of an ESC Plan.

Erosion potential is determined based on several factors, including slope gradient, slope length, and soil erodibility.

SLOPE GRADIENT

Slope gradients are measured perpendicular to the contours and computed as a percentage (vertical distance divided by the horizontal distance). For example, a 1H:1V slope is a 100% slope. Based on the magnitudes, the slope gradient of a site can be classified as gentle, moderate, or steep as per the following table:

Slope Gradient Classification [1]	
Slope (%)	Gradient Classification
0 – 10	Gentle
11 – 15	Moderate
> 15	Steep
(1): City of Calgary, Guidelines for Erosion and Sediment Control, 2022	

SLOPE LENGTH

The slope length is the distance from the crest to the toe and can be classified into two categories as per the following table:

Slope Length Classification [1]	
Slope Length (m)	Length Classification
< 70	Moderate
70 or greater	Long
(1): City of Edmonton, Erosion and Sediment Control Guidelines, January 2005, Section 3.4.1	

SOIL ERODIBILITY

Soil characteristics that are most likely to impact soil erodibility are particle size distribution and texture, permeability, and organic matter content. Erodibility generally decreases as the plasticity (clay content) of the soil increases. Well-graded gravel and predominantly gravel mixtures with trace amounts of silt are the least erodible.

Soil erodibility ratings are as follows:

Soil Erodibility Rating [1]	
Low	heavy clay, clay, sandy clay, loamy sand, sand and topsoil
Medium	silty clay, silty clay loam, clay loam, sandy clay loam, and sandy loam
High	silty loam, loam, and silt

(1): Alberta Transportation, Erosion and Sediment Control Manual (June 2011), Figure 4.2

EROSION POTENTIAL

An assessment of erosion potential from sheet erosion can be determined based on the soil erodibility, the slope, and length of the site. The longer and steeper the slope, the greater the erosion potential. It is noted that in storm events, concentrated flow channels can form on gentle slopes of less than 10% inclination. The slope gradient classifications can be used as a guide for evaluating erosion potential as per the following table:

Erosion Potential Classification [1]				
Slope Topography		Soil Erodibility		
Gradient	Length	Low	Medium	High
Gentle	Moderate	Low	Low	Moderate
	Long	Low	Moderate	High
Moderate	Moderate	Low	Moderate	High
	Long	Moderate	High	High
Steep	Moderate	Moderate	High	High
	Long	Moderate	High	High

(1): City of Edmonton, Erosion and Sediment Control Guidelines, January 2005, Section 3.4.1

7.8.4 Best Management Practices

The ESC plan must select and identify BMPs to be implemented during construction and post-construction activities. Appropriate temporary and/or permanent BMPs for both erosion control and sediment control must be identified, with erosion control (source control) considered the primary objective.

The County recommends the selection of BMPs from those provided by Alberta Transportation in the *Erosion and Sediment Control Manual*. All selected BMPs must include the complete installation instructions for each BMP appended to the ESC plan. Refer to SECTION 7.11.1.4.

7.8.5 Modifications

The ESC Plan must be a stand-alone document that can be located on the construction site for use by site personnel, inspectors, and regulators. As site work progresses, the ESC Plan should be modified by a Qualified Professional, in consultation with the County, to reflect changing site conditions.

All changes to the ESC plan must be communicated to the County prior to implementation. A modification request must contain, at a minimum, all of the following:

- Project name;
- County project number (e.g., Development Agreement #, Development Permit #)
- Municipal site address;
- A detailed description of the ESC measures to be modified; and
- The modified ESC Plan including clearly indicated modified drawings and details.

7.9 Good Housekeeping Practices

For development areas that are less than 0.4 ha with disturbed soil areas of less than 0.4 ha, with no characteristics that indicate greater than normal ESC concerns, an ESC plan submission or communication with the County is not required. In such instances, the Developer must still adhere to the following:

- Develop and adhere to a site-specific erosion and sediment control drawing and implement Good Housekeeping Practices to prevent off-site transport of sediment by natural or mechanical forces; and
- Obtain and designate a Qualified Professional to inspect all erosion and sediment control BMPs a minimum of every seven (7) days and after every rainfall or snowmelt event.

For development areas that are 0.4 ha or greater with disturbed soil areas of less than 0.4 ha, an ESC plan submission is not required, but a Good Housekeeping Letter must be obtained from the County. Good Housekeeping Letter requests shall be submitted to the County and must include the following:

- Project name;
- County project number (e.g., Development Agreement #, Development Permit #);
- Project owner (must include name, phone number, and email);

- Brief description of planned work, with specific focus on soil disturbance activity;
- Disclosure indicating if the site indicates any greater than normal ESC concerns;
- Development area size in hectares;
- Disturbed soil area size, including access roads and laydown areas;
- A basic map showing the extent of the site boundaries, critical areas, and soil disturbance. Show the area size (in hectares) for both the total site area as well as the soil disturbance area; and
- A statement indicating Good Housekeeping Practices, in accordance with this section, will be followed at all times during the project.

After the review process is complete, a Good Housekeeping Letter may be issued by the County, indicating Good Housekeeping Practices are sufficient. The Good Housekeeping Letter is required to be obtained prior to the start of construction.

Good Housekeeping Practices are as follows:

1. Proper placement and protection of stockpile soils and materials. Placement of materials on a public street or where wind or water could transport material off-site is not permitted. Stockpiles should be located away from watercourses, environmentally sensitive areas, drainage courses, and existing adjacent developments. Stockpiles should be stabilized against erosion immediately following stripping operations. Stabilization can include, but is not limited to, establishment of a cover crop or hydro seed matrix consisting of seed, fiber bond, and tackifier.
2. Control of mud tracked out during construction, typically through maintaining construction entrance/exit on all access locations, in conjunction with periodic street sweeping when required. All construction traffic should leave the site at a designated point or points. Gravelling or paving (where practical) of frequently used access roads will help ensure that minimal mud is tracked off-site. The access road should consist of a bed of non-erodible material (i.e., gravel) of sufficient length to ensure that a minimal amount of mud is tracked off-site onto adjacent municipal roadways. Internal haul roads and/or track packs can also be designated and maintained to help reduce off-site tracking.
3. Dust control measures must be implemented on site (i.e., stabilized gravel pad)
4. Development and stockpile area perimeter protection, such as silt fence, compost socks or fiber rolls, to protect off-site areas from stormwater runoff and sedimentation during construction.
5. Soil windrowed during utility excavations must be placed up-gradient of the trench.

6. Rip-rap shall be sized and placed accordingly to the design flow and velocity. Riprap shall be underlain by a gravel base or geotextile depending on the soil conditions and as recommended by the Qualified Professional. Riprap shall be hand or machine placed, not end-dumped.
7. Inspections are required, at a minimum, every seven days **and** after every significant precipitation event. Inspection reports must be completed in accordance with SECTION 7.11.1.5.
8. When storm sewers have been installed or are existing, measures should be undertaken to ensure sediment and debris does not get into the municipal storm sewer system. Both catch basins and manholes should be protected. This may include sealing the openings, setting up sumps or weirs inside the structure, or by providing appropriate inlet protection (filter fences, sediment traps, etc.). A temporary drainage system should be used with appropriate velocity controls and temporary storage areas for sediment control. Diligent efforts must be taken to ensure that the temporary drainage system does not flood adjacent properties.
9. Where on-site or downstream detention facilities are provided, use can be made of a quality control facility through placing temporary weirs or check dams for sediment control during construction. Temporary detention facilities are to be in-place prior to the installation of site services, underground utility installation, or the commencement of earth moving operations.
10. All catch basins that may or have the potential to receive sediment laden water from the development site shall have a sediment trap installed. The sediment trap shall be sized appropriate for the catchment area, anticipated runoff rates, sediment loading, and other potential contaminants.
11. All exposed earth slopes subject to surface runoff shall be vegetated and landscaped until stabilized. Disturbed areas must be stabilized within 30 days of construction completion (e.g., asphalt, concrete, sod, mulch tackifier and seed, etc.).
12. All accumulated sediment and debris should be removed as required. Once construction activities are complete, all related materials and temporary structures must be removed and properly disposed of.

For development areas that are 0.4 ha or greater with disturbed soil areas of 0.4 ha or greater an ESC plan submission is required. Good Housekeeping Practices alone shall not be sufficient.

The County reserves the right to require submission of an ESC Plan for any development the County believes there exists potential of an adverse effect to property, infrastructure, health, safety, or the environment.

7.10 Revised Universal Soil Loss Equation for Application in Canada

The purpose of the RUSLE-FAC calculation is to predict the long-term average annual rate of soil erosion for various land management practices in association with an area's rainfall pattern, specified soil type and topography. RUSLE-FAC only predicts the amount of soil loss that results from sheet or rill erosion on a single slope and does not account for additional soil losses that might occur from gully, wind or tillage erosion, nor does it calculate sediment yield.

The Revised Universal Soil Loss Equation for Application in Canada (RUSLE-FAC) was adapted from the Universal Soil Loss Equation (USLE) for agricultural lands and estimates long-term average annual rates of soil loss from construction sites. The RUSLE-FAC computes the average annual soil loss as follows:

$$\boldsymbol{A = R \times K \times LS \times C \times P}$$

where,

$\mathrm{A} = \text{anual soil loss}(\text{tonnes/ha/year})$
$\mathrm{R} = \text{rainfall factor}(\text{MJ/mm/ha/hr/year})$
$\mathrm{K} = \textit{soil erodibility factor}\ (\textit{tonne hour/MJ/mm})$

$\mathrm{LS} = \textit{slope length and steepness factor}$
$\mathrm{C} = \textit{cover and management factor}$
$P = \textit{support practice factor}$

Detailed information about the RUSLE-FAC calculation, its variables, and calculation examples can be found in *the Revised Universal Soil Loss Equation for Application in Canada Handbook* published by *Agriculture and Agri-Food Canada* (Government of Canada) and *Standard Specifications Erosion and Sediment Control* (City of Calgary).

RUSLE equation values should be determined from *Standard Specifications Erosion and Sediment Control* (City of Calgary) in conjunction with applicable manufacturers specifications. A manufacture's specification showing a C-value derived from ASTM testing must be provided if a proposed C-value is lower than listed in the specifications. If there is a discrepancy between the Standards and the manufacturer's specifications, the more stringent requirement will apply.

Gravel pads, inlet protection, and perimeter protection are considered support practices and do not contain a C or P-value.

The P-value may be the least accurate and most subject to error of all the factors in RUSLE-FAC. The ESC designer must provide supporting information, such as P-value references and field and laboratory data, for practices and technologies in the ESC documentation. Refer to product manufacturer's specifications for product-specific P-values.

Total combined soil loss, for all construction areas and slopes within the proposed development site, must be equal to or less than **2 tonnes/hectare/year**. Construction areas adjacent to a water body, such as a wetland or a river, may be subject to additional provincial and federal requirements. This does not mean sites are permitted to discharge up to this amount of soil; RUSLE-FAC is only used to confirm that the ESC Plan will reduce sediment losses and justify that the selected ESC measures are adequate.

Note: RUSLE-FAC applies to unfrozen soil only and it remains the ESC designer's responsibility to ensure the construction site is protected during the frequent freeze-thaw cycles likely to occur every winter. Other limitations using RUSLEFAC include:

- The component RUSLE-FAC equations have not been verified for certain hill slope-length and gradient limits
- RUSLE-FAC does not produce watershed-scale sediment yields and it is inappropriate to input average watershed values for the computation of the RUSLE factors
- RUSLE-FAC is limited to an estimation of erosion rates due to sheet and rill erosion and cannot be used to estimate erosion rates caused by gully or channel erosion
- RUSLE-FAC is based on average storm erosivity values and not individual short, high-intensity rainfalls.

7.11 Best Management Practices

Best Management Practices (BMPs) are activities, practices, devices or combinations thereof that are designed to prevent or reduce the release of sediment and other pollutants into receiving water bodies or streams or other environmentally sensitive areas. They operate by preventing the detachment of soil particles, controlling the transport, or by facilitating sedimentation at controlled locations on the site.

On all applicable sites, the Developer must implement the appropriate level of BMPs to achieve sufficient erosion and sedimentation control.

7.11.1.1 Erosion Control vs Sediment Control

Erosion control BMPs protect the soil surface and prevent soil particles from being detached by rain and wind (i.e., erosion). These tend to be the least expensive and most

effective BMPs. Erosion control treats soil as a resource with value and works to keep it in place. Erosion control BMPs are the primary line of defense in erosion and sediment control systems. The following list includes some of the common erosion control BMPs:

- Preservation of existing vegetation
- Construction sequence scheduling (phased grading)
- Slope treatments
- Hydro-seeding and hydro-mulching
- Erosion control matting
- Rip-rap

Sediment control BMPs collect sediment on-site in selected locations and minimize the sediment transfer off-site (i.e., sedimentation). Sediment controls are typically passive systems that rely on filtering or settling of soil particles out of water. Sediment controls treat soil as a waste product and work to remove it from the transport system. Sediment control BMPs are the secondary line of defense in erosion and sediment control systems. The following list includes some of the common sediment control BMPs:

- Silt fence
- Sedimentary basins, traps, and barriers
- Inlet protection measures
- Stabilized construction entrance
- Dust control
- Brush/rock filter berms

7.11.1.2 Temporary vs Permanent

Temporary and permanent measures as follows:

Temporary ESC Measures: those measures used during the construction phase that will be completely removed once permanent measures are installed and/or vegetative cover is established.

Permanent ESC Measures: measures incorporated into the overall design to address long-term, post-construction erosion and sediment control.

Examples of temporary measures include topsoiling, seeding, slope texturing, synthetic permeable barrier, mulching, RECP coverings, silt fence, rolls, wattles, and straw bale

barriers. Examples of permanent measures include offtake ditch, energy dissipator, berm interceptor, gabion, rock check, and sediment pond/basin.

Temporary measures should be installed at the start of the construction phase and additional measures will likely need to be installed throughout the construction phase. Permanent measures can be installed during or at the end of the construction phase. Depending on the site-specific conditions, temporary, permanent, or a combination of both types of measures may be required in the ESC design.

7.11.1.3 Selection

Many BMPs or ESC measures exist, and it is essential that the appropriate BMPs be selected for the application. The selection of BMPs should be based on the following:

- Site assessment and risk assessment based on downstream receiving waterbodies;
- Project design requirements;
- Construction requirements and limitations, including the construction season;
- Permanent and temporary requirements;
- Regulatory requirements; and
- Economic factors.

Many of the BMPs may serve more than one purpose and in some situations more than one BMP may be appropriate. To select an appropriate BMP, the application (i.e., construction activity) where the BMP will be used must be determined. Typical construction applications can include slopes, ditches and channels, large flat surface areas, and borrow or stockpile areas. It is crucial that selected BMPs are appropriate for the associated application.

Alberta Transportation provides guidance for the selection of BMPs in Appendix C of the *Erosion and Sediment Control Manual.* Flexibility and good judgement must be exercised when selecting BMPs that are appropriate for the site and situation.

The Contractor must ensure that the sequence of installation of BMPs will minimize erosion and control sedimentation. If the Contractor can demonstrate that substitute materials can provide the same level of protection, then alternatives may be considered.

Any selected BMP must include, at a minimum, all of the following:

- Manufacturer’s Specification Sheet;

- Design Requirements;
- Installation Requirements;
- Inspection Requirements;
- Maintenance Requirements;
- Removal Requirements; and
- C or P-value (RUSLE-FAC).

7.11.1.4 Installation

BMPs will not function properly unless they are installed properly and in accordance with specifications and the manufacturer's recommendations. Regular inspection and maintenance is required to identify and correct deficiencies as they occur.

BMPs typically include manufacturer's installation instructions that must be included in the ESC plan to be implemented on-site. BMPs missing or without clear installation instructions will not be approved.

Quality control is essential during the installation of BMPs to keep them effective and fully functional. Some examples of the need for installation quality control are:

- A well-constructed sediment basin will capture runoff, trap sediment, and provide controlled discharge, but will require emptying after prolonged sediment build-up.
- Mulch that is spread evenly will protect the entire surface area from sheet and rill erosion. Uneven spreading of mulch may not function effectively. Poor quality mulch, straw bales or seed can introduce weeds to the site.
- A properly installed silt fence will allow passage of water and trap sediment. An improperly installed silt fence does not impede water or trap sediment effectively. **Silt fences must be keyed into the ground.**

7.11.1.5 Inspection and Maintenance

Inspection and maintenance of BMP's must be addressed and detailed in the Inspection and Maintenance plan that is included in the ESC plan. Refer to SECTION 7.8. Inspections and maintenance must be completed by a Qualified Professional with sufficient experience installing, maintaining, and inspecting the specified BMPs.

Typical maintenance activities include, but are not limited to:

- Maintenance of sod includes adequate watering and replacement of dead patches.

- Proper maintenance of erosion control blankets including seeding, watering, and restoration.
- Clearing sediment traps and basins when sediments fill the basin one-third to one-half of its storage volume.
- Removing sediment from behind silt fences before the depth of sediment reaches one-third of the height of the silt fence.
- Completing all repairs Immediately.

BMPs that are not working properly must be repaired immediately to prevent erosion and sedimentation problems. A BMP may not be working for one of the following reasons:

- Incorrect design or installation.
- BMP not suited for the function or location.
- Lack of maintenance.
- Changing site conditions.
- Changing demands for BMP.
- BMP installed out of sequence with construction activities.

The Developer or their delegate must complete an inspection report of any maintenance, damages, or deficiencies of ESC measures. It is the responsibility of the Developer or their delegate to prepare the inspection report and it must be signed by a Qualified Professional.

Inspection of all ESC measures and BMPs must be completed and documented at least every seven days and after every significant precipitation event or snowmelt. A significant precipitation event is considered greater than 12mm of precipitation within any 24-hour period. Inspection must also occur following critical weather events when erosion or sediment release may occur. Shorter duration, but more intense events may also be deemed “significant.”

Deficiencies documented during inspection of erosion and sediment control measures must be corrected within 24 hours and the corrective actions documented.

Inspection reports are not required to be submitted to the County, however, the County may, on a case-by-case basis, request to review copies of inspection reports and/or other ESC documents at the site to determine their existence and quality. Upon written request, the Developer or their delegate must submit to the County for review copies of all documentation on the ESC Plan, including inspection, installation, and maintenance documentation, or any other record.

7.12 Inactive Site Stabilization

The following conditions must be met if all or part of the site is left in a state where active construction is not occurring:

1. The inspection frequency identified in the Inspection and Maintenance Plan must be maintained, unless written approval has been obtained from the County;
2. Documentation associated with the site must be maintained, but may be kept at an alternate off-site location; and
3. Stabilization using cover to reduce annual soil loss (slopes, stockpiles, exposed soil, etc.) from the site is required in the form of short-term or long-term cover as outlined in the table below:

Inactive Site Stabilization Minimum Requirements	
Days of Inactivity	Required Control(s)
14– 365 days	Short-term or long-term cover
>365 days	Long-term cover

Short-term cover: a control that has a defined life span and must be reapplied; examples include ESC blankets, mulches, and tackifiers.

Long-term cover: a control that, once installed, will continue to provide cover with limited or no reapplication; examples include vegetated cover such as sod or established seedlings.

7.13 Stockpiles

Stockpiles must be properly placed and immediately protected to prevent material erosion and sedimentation to offsite areas, including the storm drainage system. Placement of materials on a public street or where wind or water could transport material offsite is not permitted. A stockpile is deemed in place after the first placement of soil.

Short-term stockpiles in place for less than 30 days must have an appropriate **sediment** control measure or measures on the down-gradient side of the stockpile to contain sediment. A 2-metre buffer must be in place between the toe of the stockpile and the sediment or silt fence.

Long-term stockpiles in place for 30 days or longer must be stabilized with an appropriate **erosion** control measure cover. When soil is being added to or removed from a stockpile, any face that has been undisturbed for more than 30 days must be stabilized with an appropriate erosion control measure. Stockpiles in place for more than one year must be stabilized with an appropriate long-term cover in accordance with SECTION 7.13.

7.14 Trenches

Soil windrowed during utility excavations should be placed up-gradient of the trench.

7.15 Mud Tracking

Mud tracking must be controlled by means of installing, maintaining, and using stabilized construction entrances and exits at all access locations. Traffic entering and leaving the site must be minimized when soils are wet. All sediment transported onto public streets must be removed immediately.

7.16 Inlet Protection

Installation of inlet protection is not permitted on any part of the storm drainage system, public or private, without prior written approval from the County. All inlet protection installed under a catch basin grate or manhole must be equipped with an overflow system.

All inlet protection approved on the ESC Plan must be removed at Final Acceptance Certificate. Any inlet protection to remain after this point must obtain a separate written authorization from the County.

7.17 Runoff Contamination

Practices must be implemented on the development site to prevent the release of prohibited substances to the sewer system and waterbodies resulting from construction dewatering, surface washing, sand blasting, saw cutting, washing vehicles, washing out of concrete mixers and concrete trucks (including chutes and tools), and any other activities that may result in a prohibited discharge.

Water exposed to fresh concrete or saw cutting slurry must not be allowed to enter the wastewater system, storm drainage system or any watercourse. The water and slurry must be disposed of in accordance with all applicable regulations and at approved locations.

7.18 Sediment Removal

The Developer, Contractor, and other assigned delegates are responsible to immediately remove all sediment, mud, construction debris, and any other substance that may accumulate in any part of the storm drainage system, whether on private property or within public rights-of-way. They must obtain all necessary permissions, permits, authorizations and approvals to access all property and infrastructure when cleaning sediment, mud, construction debris, and any other substance discharged into the storm drainage system.

7.19 Release Reporting

The *Environmental Protection and Enhancement Act* dictates the reporting of substance releases into the environment. The Act and pertinent Regulations, such as the Release Reporting Regulation, determines when a substance release must be reported and what information must be provided, including how and where reporting is to be completed.

In general, releases must be reported as soon as a person knows or ought to have known of the release. A person "ought to have known" a release has occurred when, based on the information available, it is possible a release has occurred. That person must then confirm whether a release has actually occurred and report accordingly.

Reports of releases must be made to Alberta Environment and Parks at **1-800-222-6514**.

Where an incident, release, or contravention requires reporting to Alberta Environment, as described above, the Developer must immediately inform the County and provide a copy of the report and AEP incident number.

7.20 Land Transfer

Where the site owner transfers ownership of a piece of property, the property must first be completely stabilized using only ESC measures contained within the boundary of the property. The ESC Plan remains tied to the land and must be followed for the property, or any piece of the property, until a subsequent ESC Plan is approved by The County.

Upon purchase of a property, which has been developed under an approved ESC Plan, the new landowner must comply with the approved ESC Plan until such time that all Final Acceptance Certificates for the piece of property are obtained.

7.21 Record Keeping

The Developer is responsible for documenting and storing all pertinent records such as inspection and maintenance reports, meeting minutes, and photos. Records must be thorough, legible, and concise to demonstrate reasonable care had been taken to prevent inadvertent release. Records showing that a proper ESC plan was implemented, properly monitored and maintained become invaluable under such circumstances and cannot be overstressed.

All ESC documentation must be made available upon request and retained for a minimum of two years following final site stabilization.

Volume 8

Drawings

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8. Standard Drawings

Standard drawings are provided for the guidance of designers in the interpretation of the General Municipal Servicing Standards. Where the typical drawings and Standards conflict, the Standards shall govern.

8.1 Urban Drawings

8.1.1 Urban Roadways Drawings

Drawing Name	Drawing Number
TYPICAL URBAN SIGN INSTALLATION	3.1.0
Collector and Arterial Intersection Cut Corner Detail	3.1.1
Rapid Flashing Beacon	3.1.3
TYPICAL CUL-DE-SAC - WALKWAY ON BOTH SIDES	3.1.10
LOCAL RESIDENTIAL ROADWAY CUL-DE-SAC BULB CROSS SECTION	3.1.12
PAVED RESIDENTIAL LANE AND ROADWAY STRUCTURE	3.1.13
LOCAL RESIDENTIAL ROADWAY - 21m RIGHT-OF-WAY, 10m ROADWAY, SEPARATE WALK	3.1.14
LOCAL RESIDENTIAL ROADWAY - 21m RIGHT-OF-WAY, 10m ROADWAY, MONOWALK	3.1.15
LOCAL INDSUTRIAL/COMMERCIAL ROADWAY - 22m RIGHT-OF-WAY, 11m ROADWAY, SEPARATE WALK	3.1.16
LOCAL ROADWAY STRUCTURE	3.1.17
MINOR RESIDENTIAL COLLECTOR ROADWAY - 23m RIGHT-OF-WAY, 12m ROADWAY, SEPARATE WALK	3.1.18
MAJOR RESIDENTIAL COLLECTOR ROADWAY - 25m RIGHT-OF-WAY, 12.5m ROADWAY, SEPARATE WALK	3.1.19
INDUSTRIAL/COMMERCIAL COLLECTOR ROADWAY - 26m RIGHT-OF-WAY, 13.5m ROADWAY, SEPARATE WALK AND ASPHALT TRAIL	3.1.20
MINOR AND MAJOR COLLECTOR ROADWAY STRUCTURE	3.1.21

FOUR LANE DIVIDED COLLECTOR ROADWAY - 32m RIGHT-OF-WAY, 2x7m ROADWAY, SEPARATE WALK AND ASPHALT TRAIL	3.1.22
FOUR LANE DIVIDED COLLECTOR ROADWAY STRUCTURE	3.1.23
FOUR LANE DIVIDED ARTERIAL ROADWAY - 42m RIGHT-OF-WAY, 2x7.4m ROADWAY, ASPHALT TRAIL	3.1.24
FOUR LANE DIVIDED ARTERIAL ROADWAY STRUCTURE	3.1.25
EMERGENCY VEHICLE ACCESS PUBLIC UTILITY LOT ROADWAY STRUCTURE	3.1.26

8.1.2 Urban Concrete Curb and Sidewalk Drawings

Drawing Name	**Drawing Number**
LANE CROSSING - SEPARATE WALK	3.2.0
LANE CROSSING - MONOWALK	3.2.1
RESIDENTIAL CROSSING - SEPARATE WALK	3.2.2
RESIDENTIAL CROSSING - MONOWALK	3.2.3
COMMERCIAL CROSSING - SEPARATE WALK	3.2.4
COMMERCIAL CROSSING - MONOWALK	3.2.5
TYPICAL CONCRETE WALKWAY - 1.8m	3.2.6
Depressed Curb & Gutter for Catch Basin	3.2.7
Standard Curb Ramp	3.2.9
125mm Standard & 80mm Low Profile Mountable Curb and 250mm Gutter	3.2.10
150mm Standard Curb and 250mm Gutter & Reverse Gutter	3.2.11
200mm Standard Curb and 250mm Gutter & Reverse Gutter	3.2.12
150mm Standard Curb and 500mm Gutter	3.2.13
40mm Drop Curb and 250mm Gutter	3.2.14

Monolithic Walk with 125mm Standard Mountable Curb and Gutter	3.2.15
Monolithic Walk with 80mm Low Profile Mountable Curb and Gutter	3.2.16
Monolithic Walk with 150mm Standard Curb and Gutter	3.2.17

8.1.3 Urban Lot Grading Drawings

Drawing Name	Drawing Number
Typical Lot Grading Types	3.3.0
Typical Walk-Out Basement Lot Grading (Type 4)	3.3.1

8.1.4 Urban Deep Utilities – General Drawings

Drawing Name	Drawing Number
STANDARD TRENCH FOR CIRCULAR PIPE	3.4.0
STANDARD TRENCH BEDDING FOR CIRCULAR PIPE	3.4.1
Typical Casing Pipe with Insulator	3.4.2
Typical Single Family Lot Residential Services (Single and Dual)	3.4.3
Typical Single Family Lot Residential Service Profile	3.4.4

8.1.5 Urban Deep Utilities – Water Drawings

Drawing Name	Drawing Number
Typical Hydrant Bollard Layout	3.5.0
Typical Hydrant Connection and Valve Placement	3.5.1
TYPICAL BLOW OFF VALVE	3.5.2

TYPICAL AIR RELEASE VALVE AND VALVE CHAMBER	3.5.3
ANODE INSTALLATION USING EXOTHERMIC WELDING	3.5.4
TYPICAL ANODE INSTALLATION AT HYDRANT AND CONNECTIONS TO CAST IRON MAINS	3.5.5
Typical Anode Layout for 50mm & Smaller Copper Water Services	3.5.6
Typical Valve Box - Type A (sliding) and Type B (screw)	3.5.7
TYPICAL METHOD OF SUPPORTING VALVES AND VALVE BOXES	3.5.8
HORIZONTAL CONCRETE THRUST BLOCKS	3.5.9
VERTICAL BEND CONCRETE THRUST BLOCKS	3.5.10
STAINLESS STEEL CLAMP DETAIL FOR VERTICAL BEND THRUST BLOCKS	3.5.11
REDUCER AND TRANSITION COUPLING CONCRETE THRUST BLOCKS	3.5.12

8.1.6 Urban Deep Utilities – Sanitary Drawings

Drawing Name	**Drawing Number**
Standard 1200 Diameter Manhole for Pipes up to 600mm	3.6.0
Standard 1200 Diameter Perched Manhole for Pipes 600mm to 1050mm	3.6.1
Standard T-riser Manhole for Pipes 1200mm and Larger	3.6.2
Standard External Drop Manhole (Sanitary Only)	3.6.3
Standard Internal Drop Manhole (Sanitary Only)	3.6.4
NECK SECTION DETAIL FOR STANDARD 1200 MANHOLE	3.6.5
SAFETY STEPS FOR MANHOLES	3.6.6
BENCHING DETAIL FOR STANDARD 1200 DIAMETER MANHOLE	3.6.7

Manhole Frame and Cover - Type 80 (Floating)	3.6.9
Manhole Frame and Cover - Type 90 (Floating C/W Gasket Seal)	3.6.10
Manhole Frame and Cover - Type 39	3.6.11

8.1.7 Urban Deep Utilities – Storm Drawings

Drawing Name	Drawing Number
STANDARD 900 DIAMETER CATCH BASIN WITH TYPE K7 GRATING AND FRAME (MOUNTABLE CURB)	3.7.0
STANDARD 900 DIAMETER CATCH BASIN WITH TYPE F51 GRATING, FRAME AND SIDE INLET (STRAIGHT FACE CURB)	3.7.1
Standard 1200 Diameter Catch Basin Manhole	3.7.2
Type K7 Catch Basin Frame and Grating	3.7.3
TYPE F51 TWO PIECE CATCH BASIN MANHOLE FRAME AND GRATING	3.7.4
TYPE F38 CATCH BASIN MANHOLE FRAME AND GRATING	3.7.5
Typical Cross Section for a Storm Water Management Wet Pond	3.7.6
Wick Drain Connection to Catch Basin	3.7.7
Typical Concrete Swale Cross Section	3.7.8

8.2 Rural Drawings

8.2.1 Rural Roadways Drawings

Drawing Name	Drawing Number
CLASS I RURAL GRID ROAD - 40m RIGHT-OF-WAY, 9m ROADWAY (ASPHALT)	4.1.0
CLASS II RURAL GRID ROAD - 40m OR 30m RIGHT-OF-WAY, 7.5m ROADWAY (ASPHALT)	4.1.1

CLASS III RURAL GRID ROAD - 30m RIGHT-OF-WAY, 8.0m ROADWAY (GRAVEL)	4.1.2
HAUL ROAD - 30m RIGHT-OF-WAY, 10m ROADWAY (GRAVEL)	4.1.3
COUNTRY RESIDENTIAL SUBDIVISION ROADWAY - 30m RIGHT-OF-WAY, 8.5m ROADWAY, ASPHALT TRAIL	4.1.4
COUNTRY INDUSTRIAL ROADWAY - 30m RIGHT-OF-WAY, 9m ROADWAY	4.1.5
TYPICAL INTERSECTION TREATMENT - COUNTY RESIDENTIAL SUBDIVISION ROAD TO CLASS I GRID ROAD	4.1.6
TYPICAL INTERSECTION TREATMENT - COUNTY RESIDENTIAL SUBDIVISION ROAD TO CLASS II GRID ROAD	4.1.7
TYPICAL COUNTRY RESIDENTIAL SUBDIVISION ACCESS	4.1.8
TYPICAL COUNTRY RESIDENTIAL SUBDIVISION CUL-DE-SAC	4.1.9
RURAL GRID ROAD MILLED RUMBLE STRIP LAYOUT	4.1.10
RURAL GRID ROAD MILLED RUMBLE STRIP SECTION DETAIL	4.1.11
Typical Rural Lot Access	4.1.12
Typical Mailbox Turnout Layout	4.1.13
TYPICAL RURAL SIGN INSTALLATION	4.1.14
DELINEATOR POST (FLEXIBLE)	4.1.15

8.2.2 Rural Deep Utilities – General Drawings

Drawing Name	**Drawing Number**
TYPICAL BURIED SANITARY SEWER MAIN WARNING SIGN	4.2.0
TYPICAL BURIED WATER MAIN WARNING SIGN	4.2.1

8.3 Landscape and Open Spaces Drawings

8.3.1 Tree Planting

Drawing Name	Drawing Number
Typical Coniferous and Deciduous Tree Planting Detail	5.1.0
Typical Tree Planting on a Slope	5.1.1
Typical Tree Transplanting	5.1.2
TYPICAL MEDIAN LANDSCAPE AND TREE PLANTING	5.1.3
Tree Protection Zone	5.1.4

8.3.2 Shrub Planting

Drawing Name	Drawing Number
Typical Bare Root and Container Shrub Planting Bed	5.2.0
Typical Naturalized Shrub Planting Bed	5.2.1
Typical Bare Root and Container Shrub Planting Bed on a Slope	5.2.2
PLANTING AROUND SWITCHING CUBICLE	5.2.3

8.3.3 Walkways and Trails Drawings

Drawing Name	Drawing Number
ASPHALT TRAIL	5.3.0
Gravel Trail	5.3.1
Hiking Trail	5.3.2

TYPICAL REST STOP AREA	5.3.3
CSP CULVERT UNDER WALKWAY	5.3.4
Culvert Rip-Rap End Treatment	5.3.5
Root Barrier Layout for Trail	5.3.6
TYPICAL MULTI-PURPOSE SIGN INSTALLATION	5.3.8

8.3.4 Playgrounds Drawings

Drawing Name	**Drawing Number**
PLAYGROUND EQUIPMENT FOOTING	5.4.0
PLAYGROUND CONCRETE RETAINER	5.4.1
Playground Sub-Drain Pipe	5.4.2

8.3.5 Public Utility Lot Drawings

Drawing Name	**Drawing Number**
TYPICAL PUBLIC UTILITY LOT WITH EMERGENCY VEHICLE ACCESS	5.5.0
TYPICAL PUBLIC UTILITY LOT WITH 1.8m WALKWAY OR 3m ASPHALT TRAIL	5.5.1
Chicane Bollard Layout for Asphalt Trail PUL	5.5.2

8.3.6 Fences and Gates Drawings

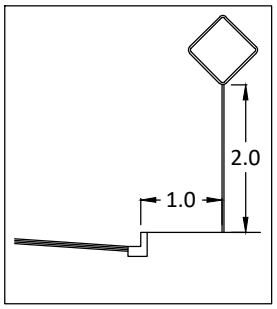
Drawing Name	Drawing Number
Chain Link Fence - 1.2m to 1.8m	5.6.0
Chain Link Fence Gate	5.6.1
Chain link Fence Maintenance Gate	5.6.2
WOOD SCREEN FENCE - 1.8m	5.6.3
Wood Screen Sound Abatement Fence - 1.8m to 3.0m	5.6.4
Wood Screen Fence Gate	5.6.5
WOOD SCREEN STEP-DOWN FENCE	5.6.6
Wood Screen Baffle Gate	5.6.7
Dog Park Double Gate	5.6.8
Post and Rail Fence	5.6.9
STRAIGHT WIRE FENCE	5.6.10
ENVIRONMENTAL RESERVE, MUNICIPAL RESERVE, AND EASEMENT MARKER POST	5.6.11

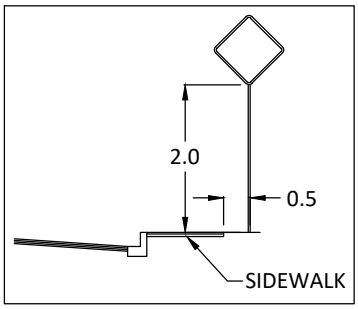
8.3.7 Site Furniture Drawings

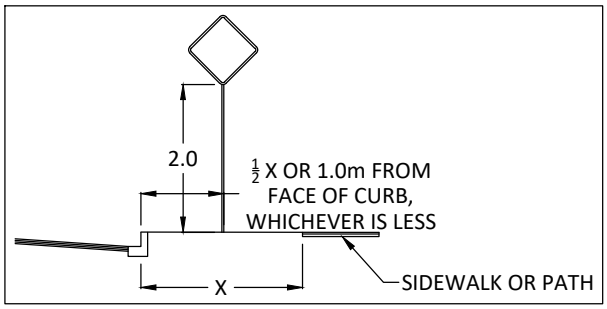
Drawing Name	Drawing Number
Furniture Mounting	5.7.0
Chicane Bollard	5.7.1
Chicane Bollard Layout	5.7.2
T-Bollard - Assembly Sheet 1 of 3	5.7.3

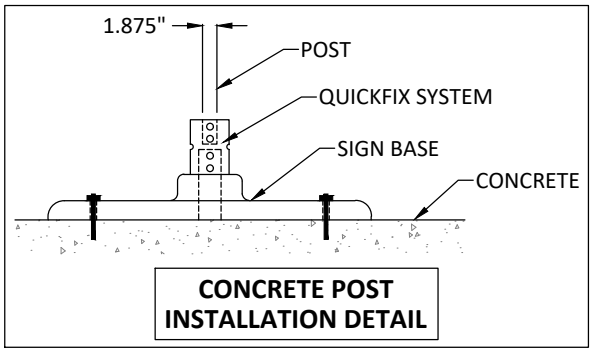
8.4.0 Sturgeon Valley South Cross Sections

Drawing Name	Drawing Number
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 35, 40, AND 42 DU/HA LOCAL ROADWAY C/W SEPARATE WALK	6.1.0
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 35, 40, AND 42 DU/HA LOCAL ROADWAY C/W ASPHALT TRAIL	6.1.1
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 20 DU/HA LOCAL ROADWAY C/W SEPARATE WALK - 3.0m SETBACK	6.1.2
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 20 DU/HA LOCAL ROADWAY C/W 3.0m ASPHALT TRAIL - 3.0m SETBACK	6.1.3
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 35, 40, AND 42 DU/HA COLLECTOR ROADWAY C/W 3.0m ASPHALT TRAIL	6.1.5
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 20 DU/HA COLLECTOR ROADWAY C/W 3.0m ASPHALT TRAIL - 3.0m SETBACK	6.1.7
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 35, 40, AND 42 DU/HA DIVIDED ARTERIAL ROADWAY C/W SEPARATE WALK	6.1.8
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 35, 40, AND 42 DU/HA DIVIDED ARTERIAL ROADWAY C/W 3.0m ASPHALT TRAIL	6.1.9
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR COMMERCIAL/MIXED USE	6.1.10
STURGEON VALLEY SOUTH ASP MID-BLOCK CURB EXTENSION	6.1.11

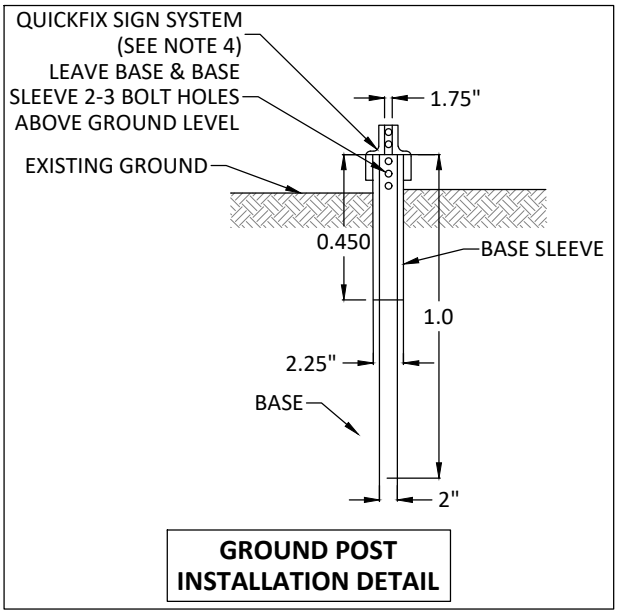




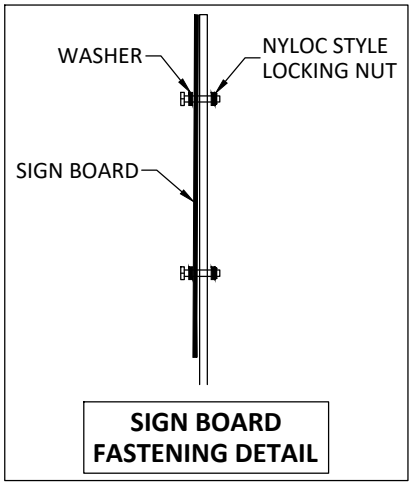




CONCRETE POST INSTALLATION DETAIL



GROUND POST INSTALLATION DETAIL



SIGN BOARD FASTENING DETAIL

ACTUAL INCH & MILLIMETRE SIZES	
1.75"	44.45mm
1.88"	47.50mm
2.00"	50.80mm
2.25"	57.15mm
2.50"	63.50mm
WALL	
0.105"	2.667mm

APPROVED POSTS AND HARDWARE:

GROUND & NEW CONCRETE MOUNT:
TELESPAR.
SQUARE FIT.
EACH SIGN INSTALLATION REQUIRES A POST, BASE, AND A BASE SLEEVE.

EXISTING CONCRETE MOUNT:
SCHEDULE 40, 47.5mm Ø PIPE.

ALUMINUM BREAK-A-WAY SYSTEMS:
QUICKFIX SIGN SYSTEM.

METAL UTILITY POLE MOUNTS:
FASTENERS ARE HANGERMATE ANCHOR OR APPROVED EQUIVALENT.
(ELCO TEXTRO CAT. #2E605)

NOTES:
1. ALL DIMENSIONS ARE IN METRES (m), UNLESS OTHERWISE NOTED.
2. ALL FASTENING HARDWARE MUST HAVE NON-CORROSIVE COATING.
3. QUICKFIX BASES ARE REQUIRED ON ARTERIAL AND MAJOR COLLECTOR ROADS ONLY.
4. QUICKFIX SIGN SYSTEM TO BE USED IN CONJUNCTION WITH BASE SLEEVE ONLY IN POSSIBILITY OF FREQUENT HITS, OTHERWISE ONLY BASE SLEEVE TO BE USED FOR GROUND POST INSTALLATION.
5. SELF TAPPING SCREWS ARE NOT PERMITTED - CONCRETE BASE ANCHOR BOLTS TO BE STAINLESS STEEL.

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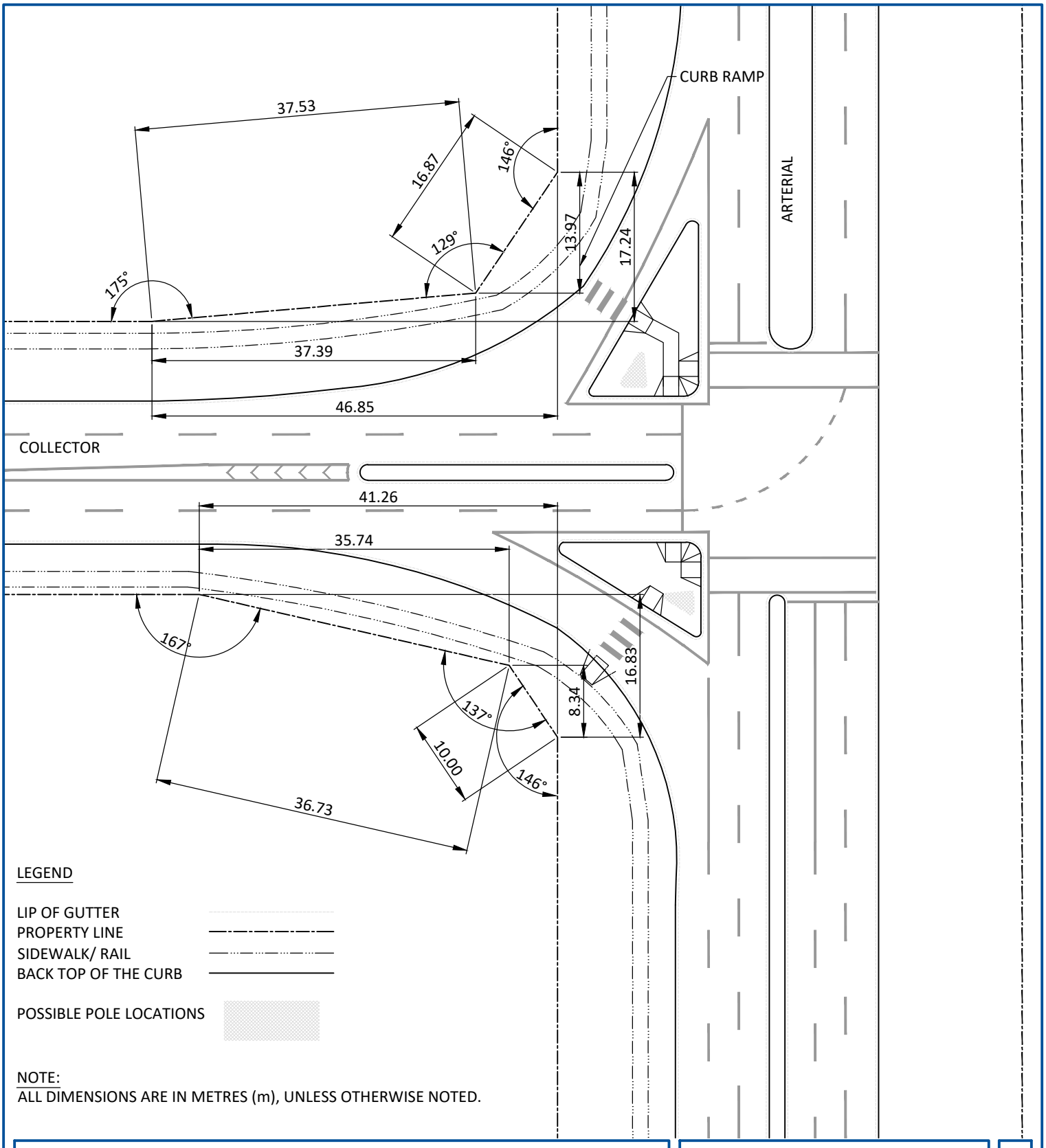
TYPICAL URBAN SIGN INSTALLATION
Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.0



LEGEND

LIP OF GUTTER
PROPERTY LINE
SIDEWALK/ RAIL
BACK TOP OF THE CURB

POSSIBLE POLE LOCATIONS

NOTE:
ALL DIMENSIONS ARE IN METRES (m), UNLESS OTHERWISE NOTED.

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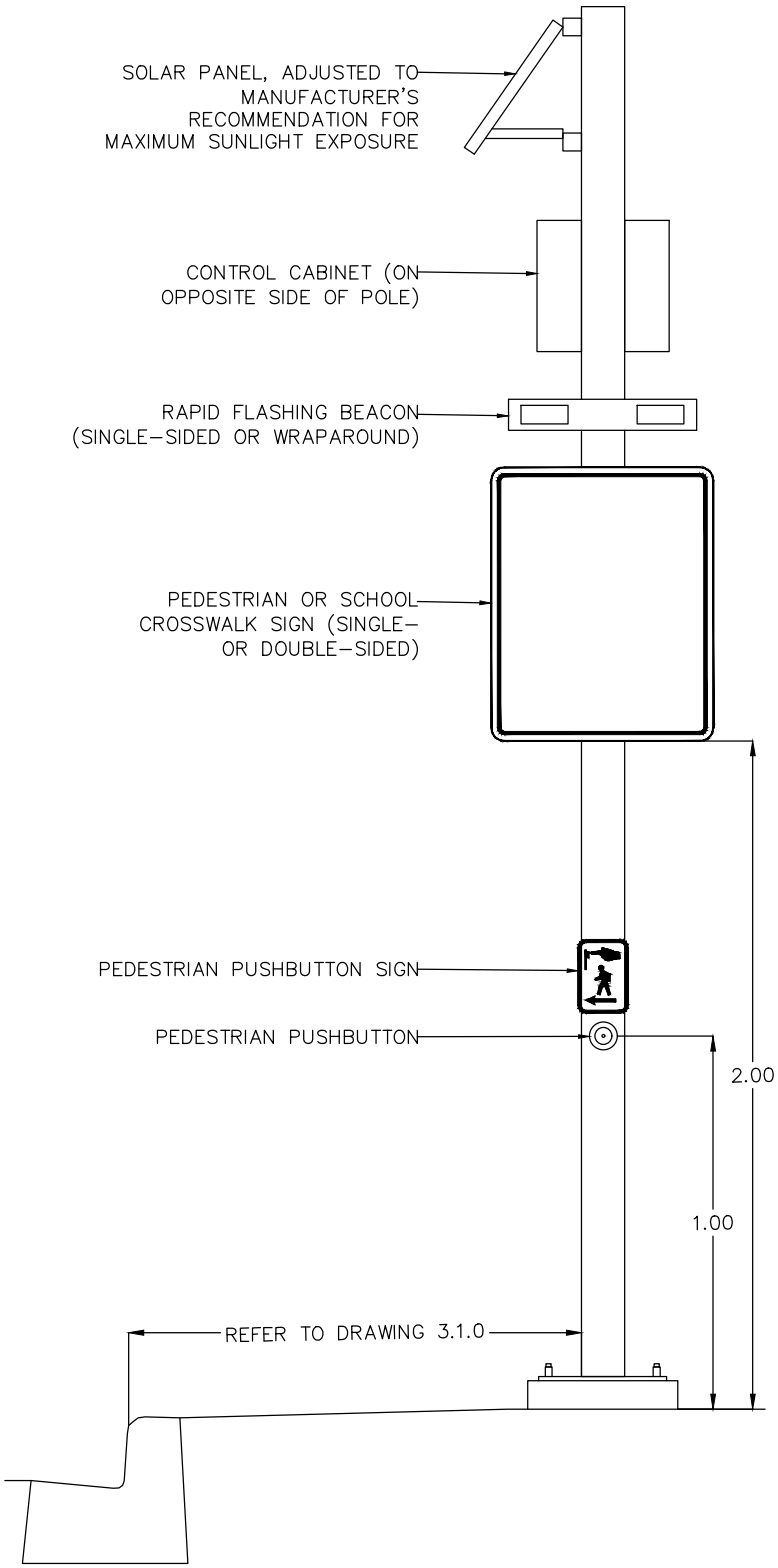
COLLECTOR AND ARTERIAL INTERSECTION CUT CORNER DETAIL

Scale: NTS

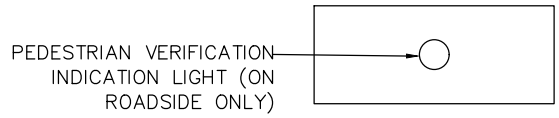
Sturgeon COUNTY

Drawing: 3.1.1



TYPICAL FRONT VIEW OF RFB

TYPICAL SIDE VIEW OF RFB



NOTES:

1. SEE DRAWING 3.1.0 FOR ADDITIONAL INSTALLATION INFORMATION.
2. ON A ONE-WAY ROAD, USE A SINGLE-SIDED RFB AND A SINGLE-SIDED CROSSWALK SIGN. ON A TWO-WAY ROAD, USE A WRAPAROUND RFB AND DOUBLE-SIDED CROSSWALK SIGNS.
3. ENSURE THAT THE CORRECT SIGNS ("L" OR "R") ARE INSTALLED SUCH THAT THE SYMBOLS POINT TOWARD ROADWAY CENTERLINE.
4. ALL DIMENSIONS IN METRES (m), UNLESS OTHERWISE STATED.

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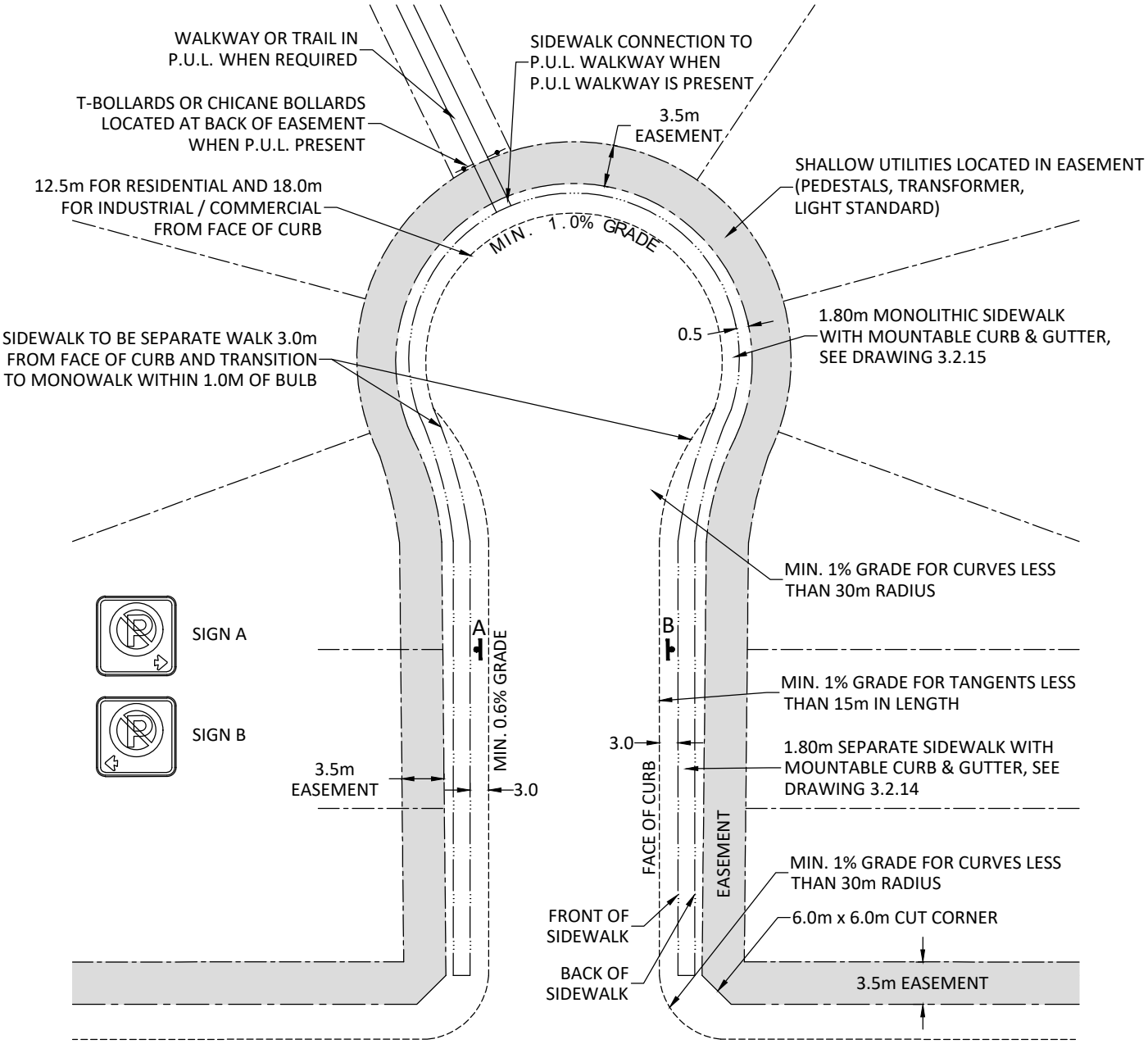
RAPID FLASHING BEACON
Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.3



NOTES:

1. ALL DIMENSIONS ARE IN METRES (m), UNLESS OTHERWISE NOTED.
2. NO PARKING PERMITTED IN BULB OR CURB RETURNS. "NO PARKING" SIGN SHALL BE LOCATED AT PROPERTY LINE PRIOR TO CURB RETURN, AND IN ACCORDANCE WITH DRIVEWAY CONFIGURATION.

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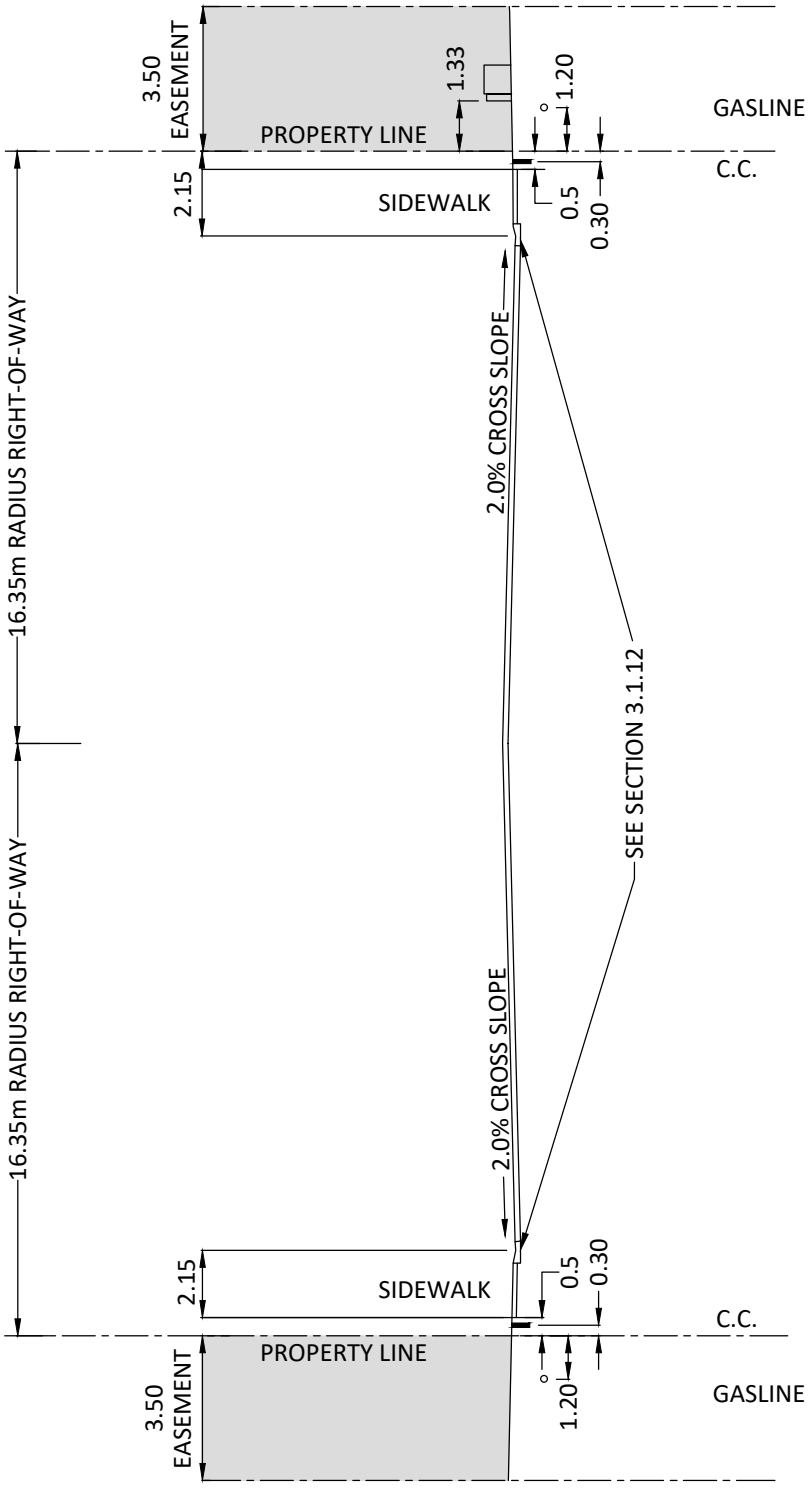
TYPICAL CUL-DE-SAC
Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.10



NOTES:

1. WHEN CUL-DE-SAC BULB CONNECTS TO A P.U.L. WITH A WALKWAY / TRAIL, ENSURE THAT A SIDEWALK EXTENDS TO THE WALKWAY / TRAIL, AND PROPERTY GAS LINES MAINTAIN PROPER CLEARANCE FROM SIDEWALK. IF THERE IS NO P.U.L., OR IF THE P.U.L. DOES NOT CONTAIN A WALKWAY / TRAIL, THE SIDEWALK SHALL TERMINATE AT / AROUND THE MID-POINT OF THE RETURN RADIUS OF THE CUL-DE-SAC BULB.
2. FOR ROAD STRUCTURE AND WICK DRAIN DETAILS SEE DRAWING 3.1.17.
3. ALL DIMENSIONS ARE IN METRES (m), UNLESS OTHERWISE NOTED.

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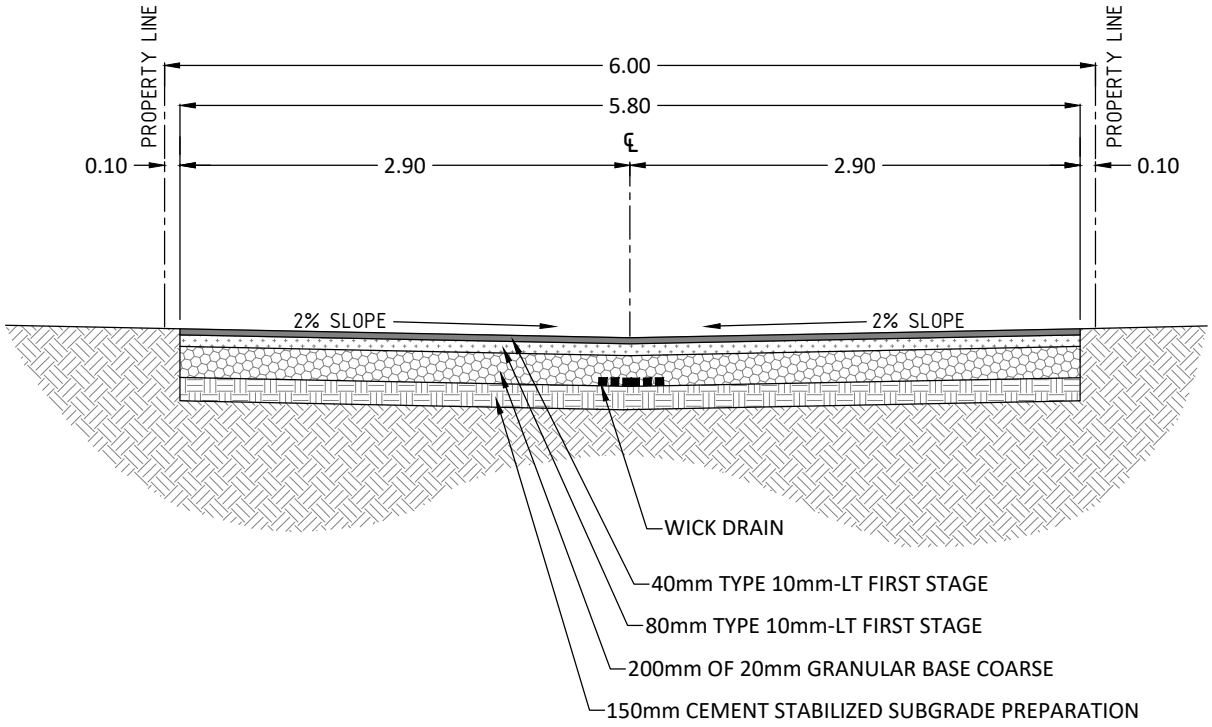
LOCAL RESIDENTIAL ROADWAY CUL-DE-SAC BULB CROSS SECTION

Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.12



NOTES:

1. ALL DIMENSIONS ARE IN METRES (m), UNLESS OTHERWISE NOTED.
2. MINIMUM LONGITUDINAL GRADE FOR ASPHALT LANES IS 0.6%.
3. WICK DRAIN SHALL BE INSTALLED IN LANE OR AT CONNECTION TO STREET WHEN STORM SEWER PRESENT.
4. WICK DRAIN ONLY TO BE INSTALLED WHEN CATCH BASIN CONNECTION POINT AVAILABLE.

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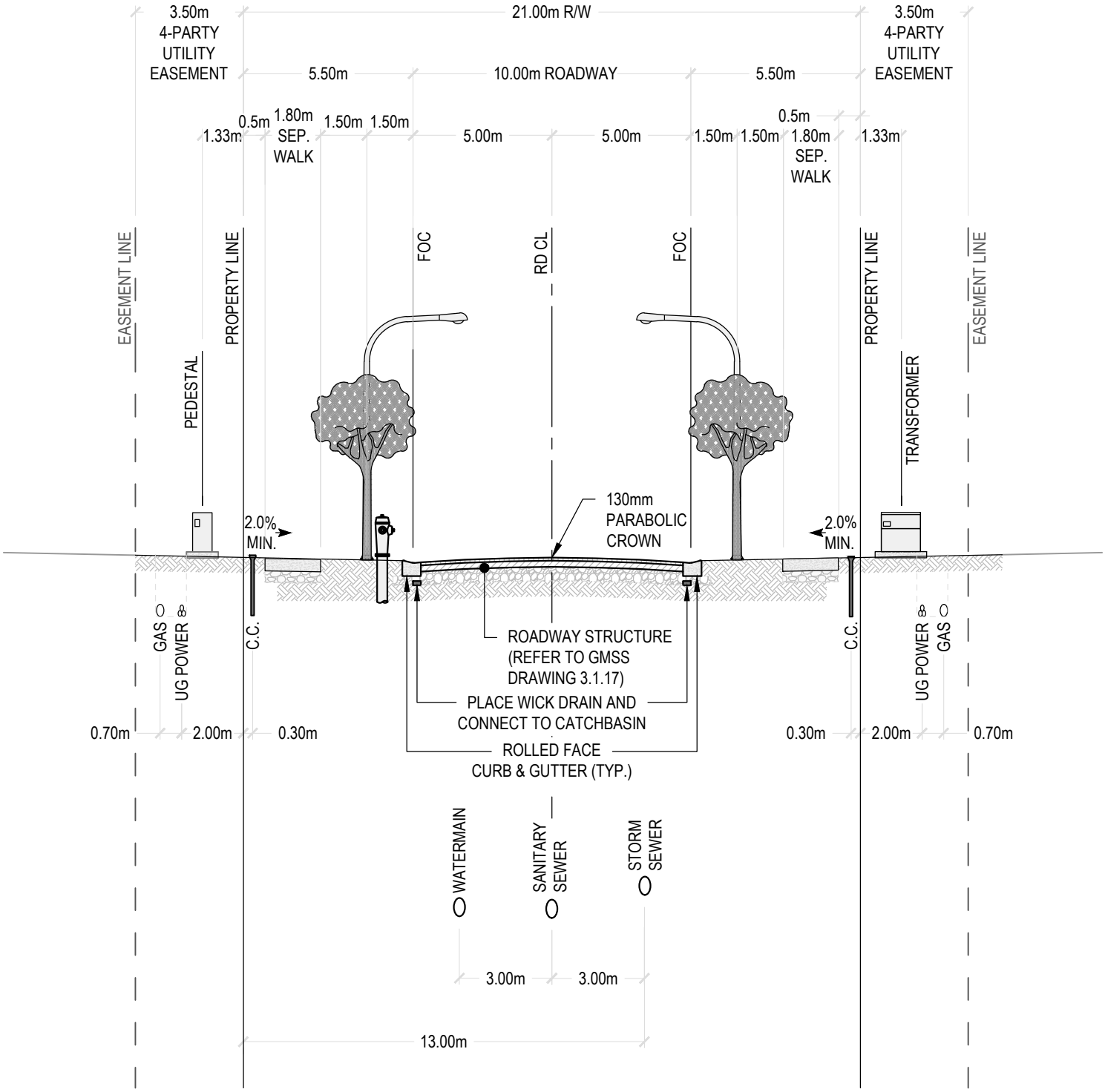
PAVED RESIDENTIAL LANE AND ROADWAY STRUCTURE

Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.13



NOTES:

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.
2. REFER TO GENERAL MUNICIPAL SERVICING STANDARDS FOR MATERIAL REQUIREMENTS.
3. SUBGRADE TO BE PREPARED AS PER GEOTECHNICAL ENGINEER'S RECOMMENDATION.
4. TRAFFIC VOLUME <1000 (vpd).
5. MINIMUM INTERSECTION SPACING TO BE 60m.
6. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%.
7. DESIGN SPEED LIMIT TO BE 60 (km/hr).
8. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.1.

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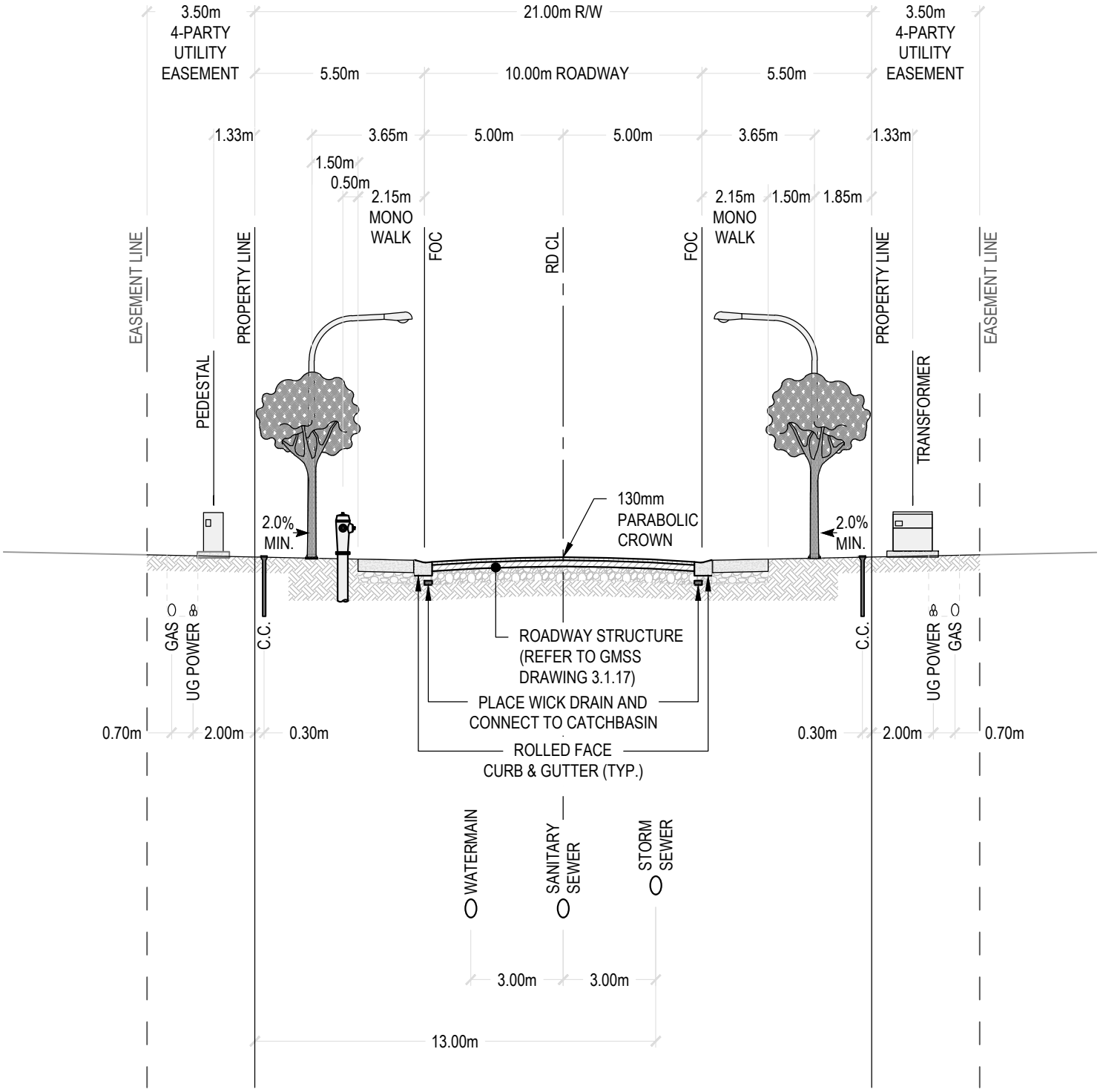
LOCAL RESIDENTIAL ROADWAY -21m RIGHT-OF-WAY, 10m ROADWAY, SEPARATE WALK

CROSS-SECTION

Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.14



NOTES:

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.
2. REFER TO GENERAL MUNICIPAL SERVICING STANDARDS FOR MATERIAL REQUIREMENTS.
3. SUBGRADE TO BE PREPARED AS PER GEOTECHNICAL ENGINEER'S RECOMMENDATION.
4. TRAFFIC VOLUME <1000 (vpd).
5. MINIMUM INTERSECTION SPACING TO BE 60m.
6. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%.
7. DESIGN SPEED LIMIT TO BE 60 (km/hr).
8. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.1.

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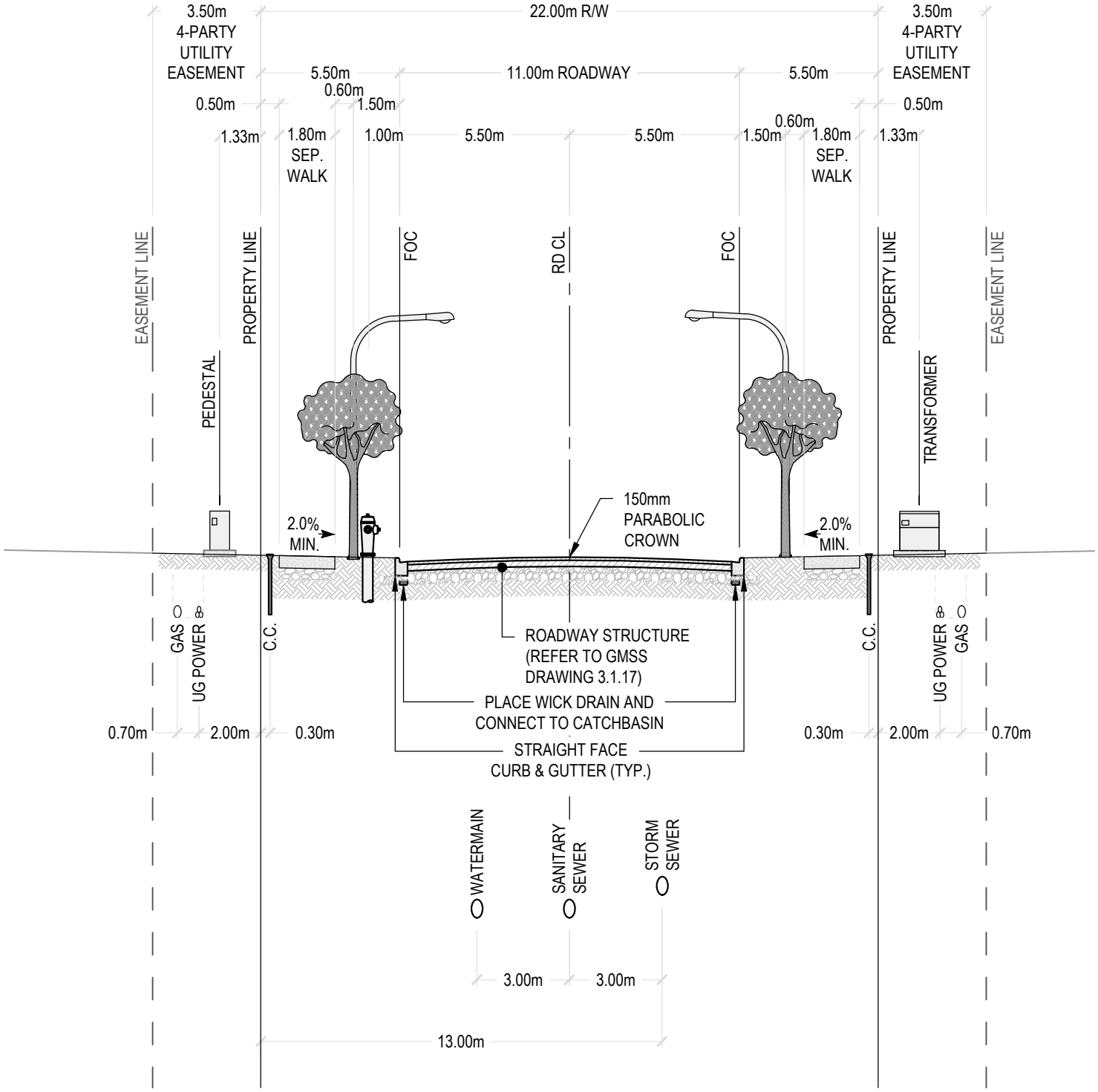
LOCAL RESIDENTIAL ROADWAY -21m RIGHT-OF-WAY, 10m ROADWAY, MONOWALK

CROSS-SECTION

Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.15



NOTES:

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.
2. REFER TO GENERAL MUNICIPAL SERVICING STANDARDS FOR MATERIAL REQUIREMENTS.
3. SUBGRADE TO BE PREPARED AS PER GEOTECHNICAL ENGINEER'S RECOMMENDATION.
4. TRAFFIC VOLUME <3000 (vpd).
5. MINIMUM INTERSECTION SPACING TO BE 60m.
6. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%.
7. DESIGN SPEED LIMIT TO BE 60 (km/hr).
8. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.1.

STURGEON COUNTY

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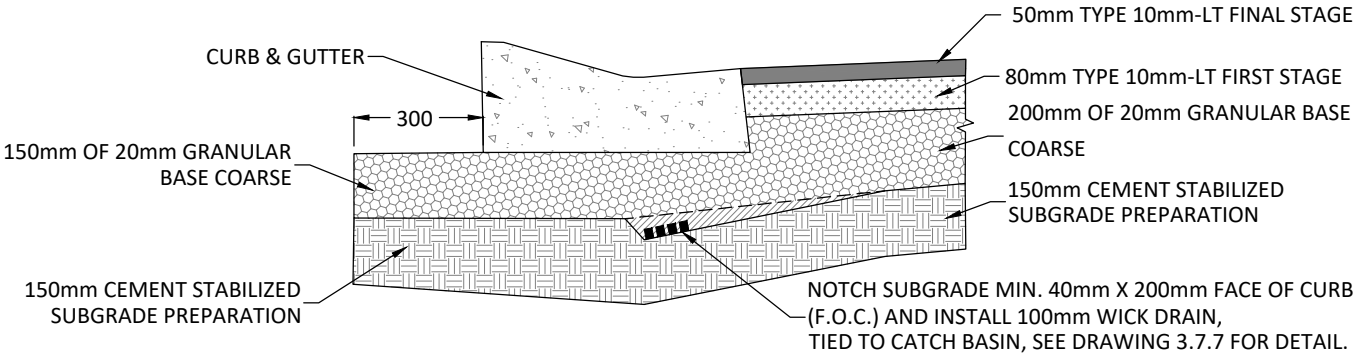
LOCAL INDUSTRIAL/COMMERCIAL ROADWAY - 22m RIGHT-OF-WAY, 11m ROADWAY, SEPARATE WALK

CROSS-SECTION

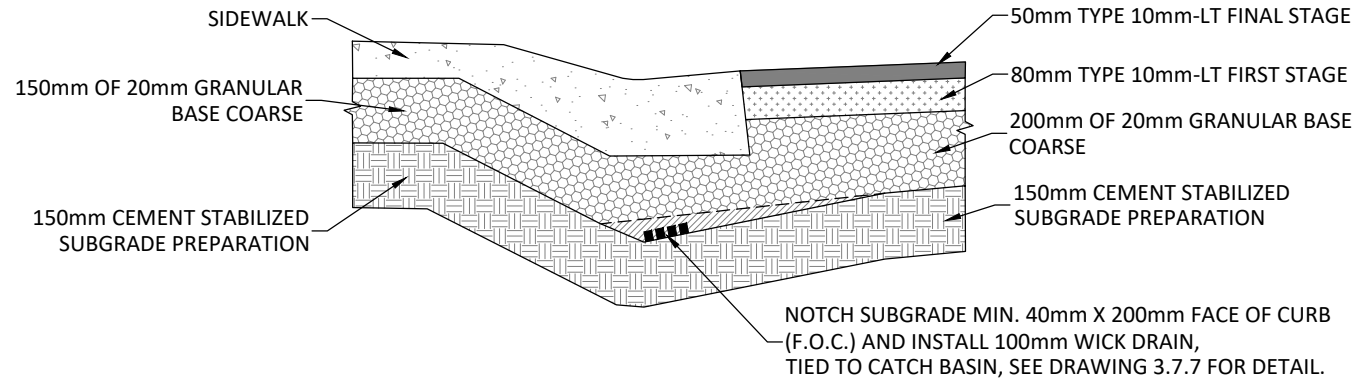
Scale: NTS

Sturgeon COUNTY

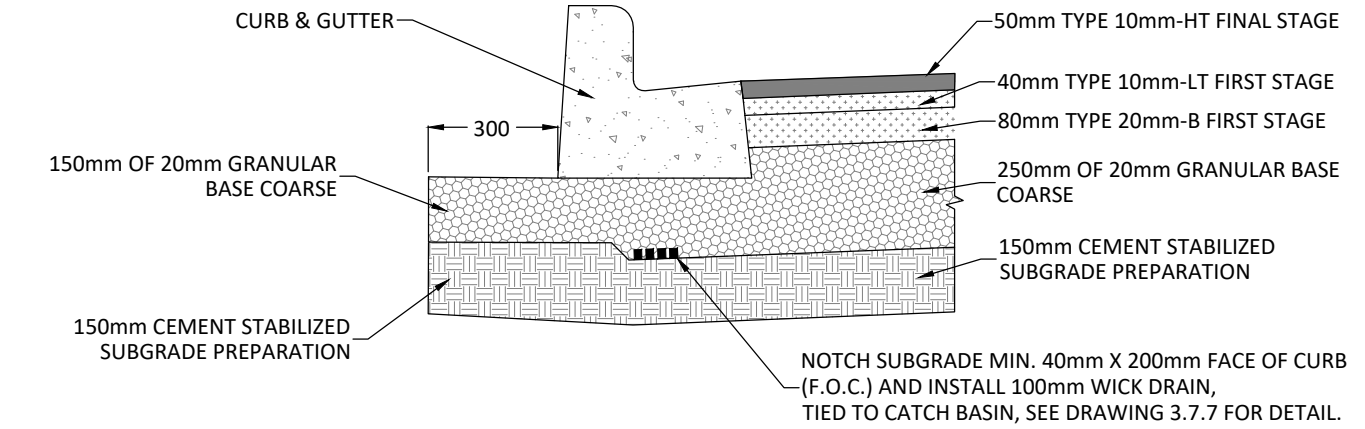
Drawing: 3.1.16



LOCAL RESIDENTIAL ROADWAY - SEPARATE SIDEWALK



LOCAL RESIDENTIAL ROADWAY - MONOLITHIC SIDEWALK



LOCAL INDUSTRIAL / BUSINESS COMMERCIAL ROADWAY

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. ENSURE GRANULAR BASE IS NOT BEING USED UNDER THE CURB AND GUTTER, INSTALL WICK DRAIN AT THE EDGE OF THE GRANULAR BASE UNDER THE ROADWAY.
3. ROAD STRUCTURE TO FOLLOW GENERAL MUNICIPAL SERVICING STANDARDS.

STURGEON COUNTY

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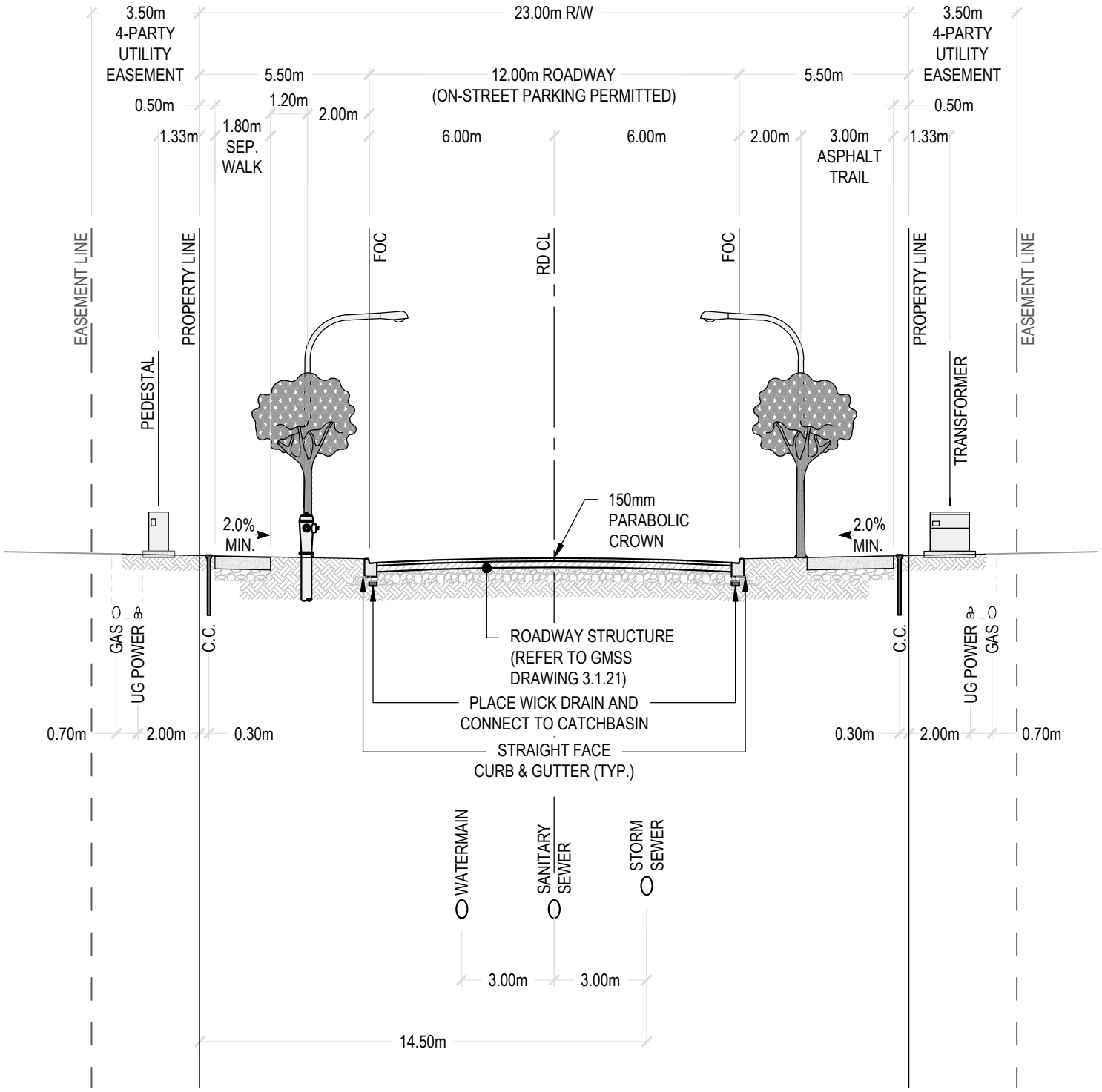
Rev. 2:
Rev. 1: JULY 13, 2022

LOCAL ROADWAY STRUCTURE
Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.17



NOTES:

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.
2. REFER TO GENERAL MUNICIPAL SERVICING STANDARDS FOR MATERIAL REQUIREMENTS.
3. SUBGRADE TO BE PREPARED AS PER GEOTECHNICAL ENGINEER'S RECOMMENDATION.
4. TRAFFIC VOLUME <5000 (vpd).
5. MINIMUM INTERSECTION SPACING TO BE 100m.
6. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%.
7. DESIGN SPEED LIMIT TO BE 70 (km/hr).
8. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.2.

STURGEON COUNTY

General Municipal Servicing Standards

REVISIONS
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Rev. :
Rev. 1: AUGUST 23, 2023

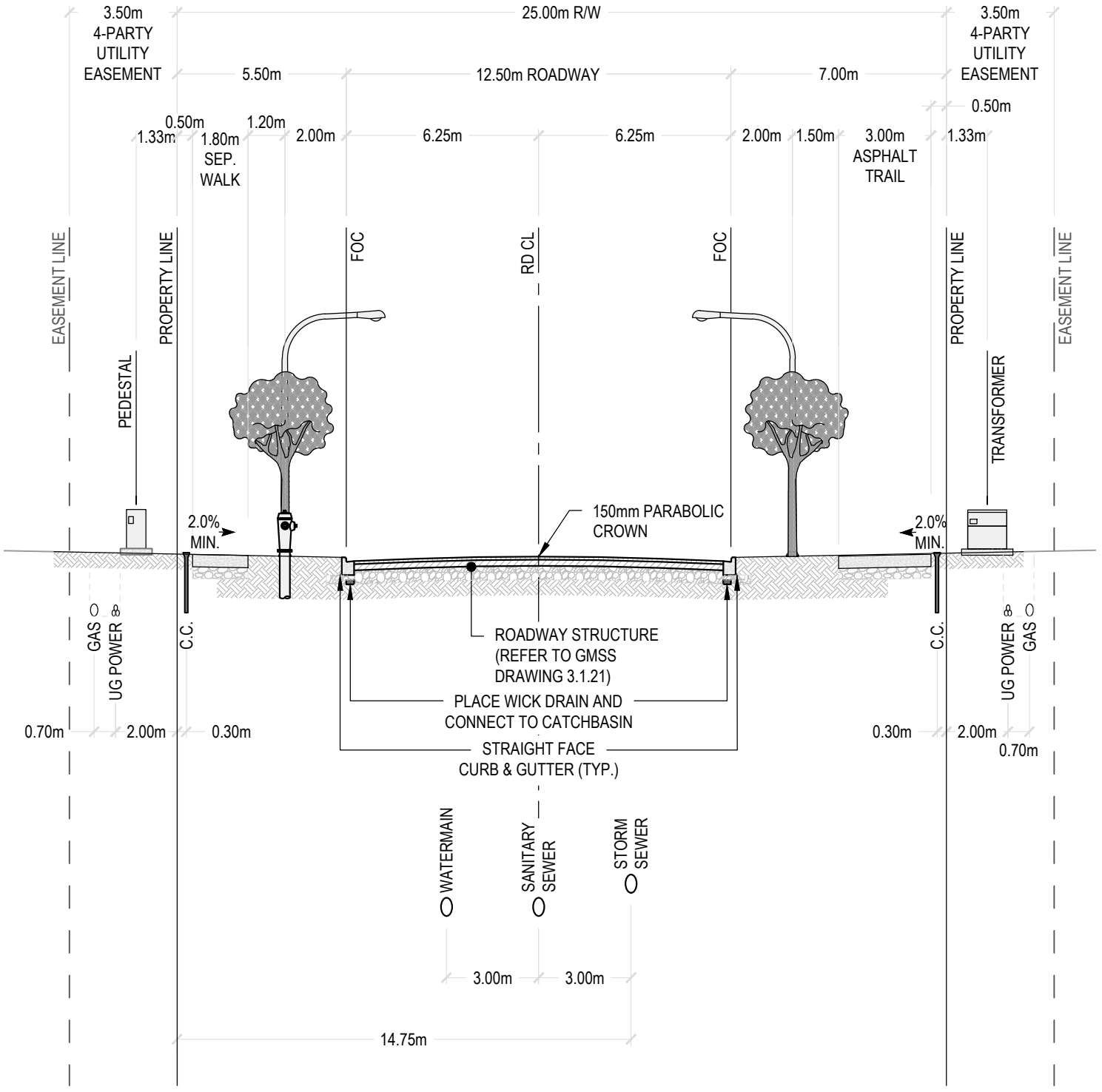
MINOR RESIDENTIAL COLLECTOR ROADWAY - 23m RIGHT-OF-WAY, 12m ROADWAY, SEPARATE WALK

CROSS-SECTION

Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.18



NOTES:

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.
2. REFER TO GENERAL MUNICIPAL SERVICING STANDARDS FOR MATERIAL REQUIREMENTS.
3. SUBGRADE TO BE PREPARED AS PER GEOTECHNICAL ENGINEER'S RECOMMENDATION.
4. TRAFFIC VOLUME <10,000 (vpd).
5. MINIMUM INTERSECTION SPACING TO BE 100m.
6. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%.
7. DESIGN SPEED LIMIT TO BE 80 (km/hr).
8. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.2.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. 1: FEBRUARY 8, 2023

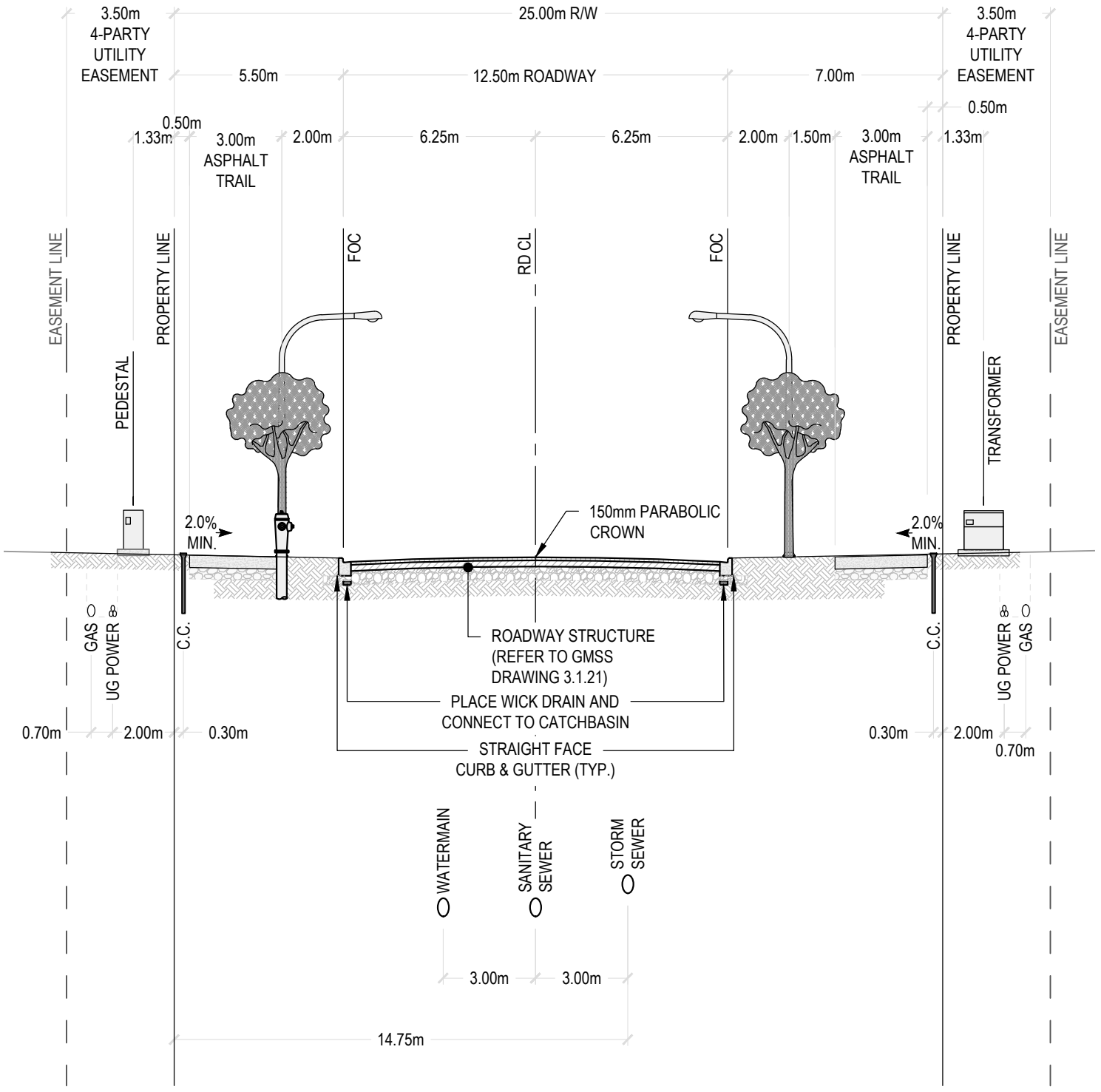
MAJOR RESIDENTIAL COLLECTOR ROADWAY - 25m RIGHT-OF-WAY, 12.5m ROADWAY, SEPARATE WALK

CROSS-SECTION

Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.19



NOTES:

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.
2. REFER TO GENERAL MUNICIPAL SERVICING STANDARDS FOR MATERIAL REQUIREMENTS.
3. SUBGRADE TO BE PREPARED AS PER GEOTECHNICAL ENGINEER'S RECOMMENDATION.
4. TRAFFIC VOLUME <10,000 (vpd).
5. MINIMUM INTERSECTION SPACING TO BE 100m.
6. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%.
7. DESIGN SPEED LIMIT TO BE 80 (km/hr).
8. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.2.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. 1: AUGUST 23, 2023

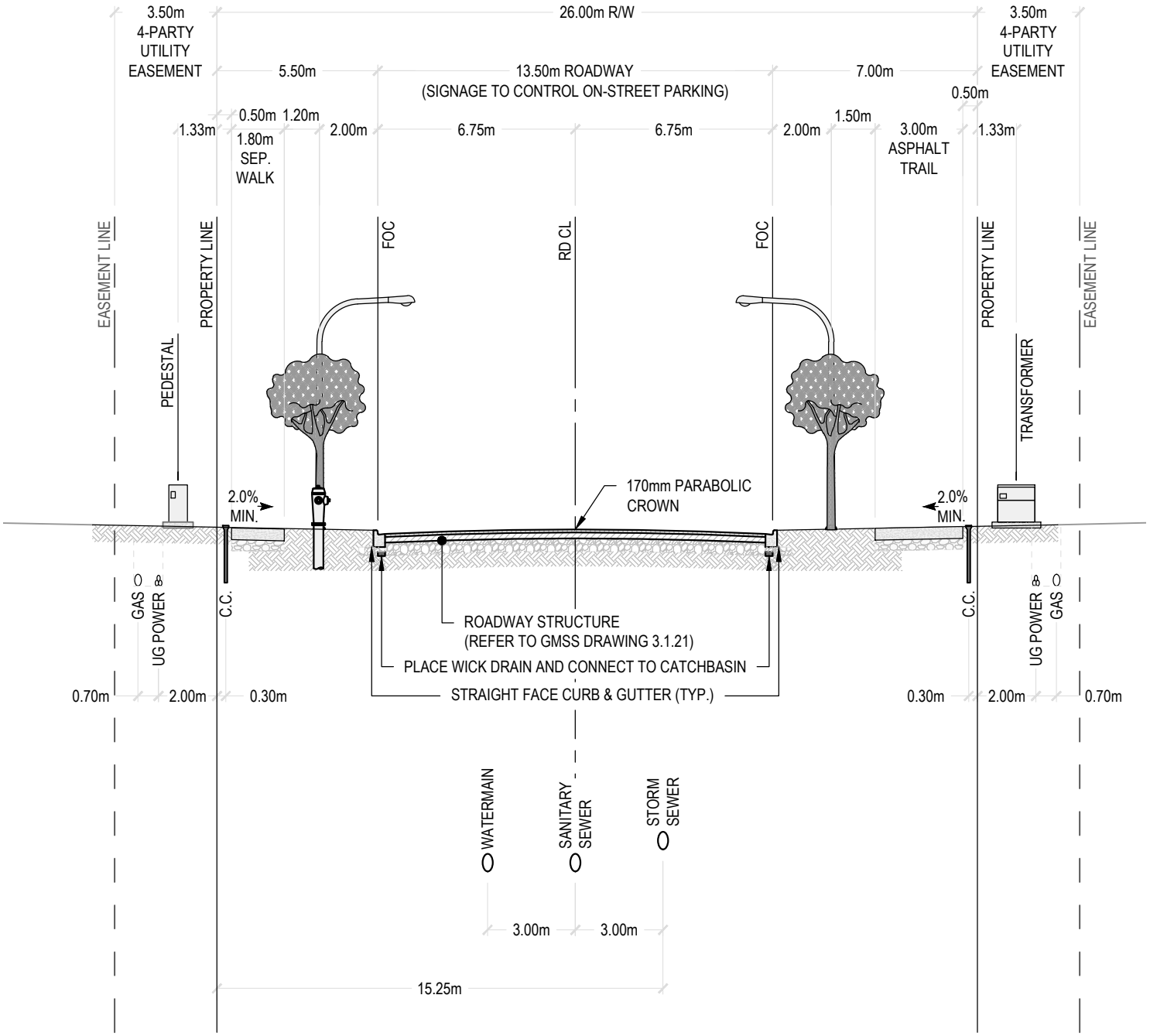
MAJOR RESIDENTIAL COLLECTOR ROADWAY - 25m RIGHT-OF-WAY, 12.5m ROADWAY, ASPHALT TRAIL

CROSS-SECTION

Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.19.B



NOTES:

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.
2. REFER TO GENERAL MUNICIPAL SERVICING STANDARDS FOR MATERIAL REQUIREMENTS.
3. SUBGRADE TO BE PREPARED AS PER GEOTECHNICAL ENGINEER'S RECOMMENDATION.
4. TRAFFIC VOLUME <10,000 (vpd).
5. MINIMUM INTERSECTION SPACING TO BE 100m.
6. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%.
7. DESIGN SPEED LIMIT TO BE 80 (km/hr).
8. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.2.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. 1: FEBRUARY 8, 2023

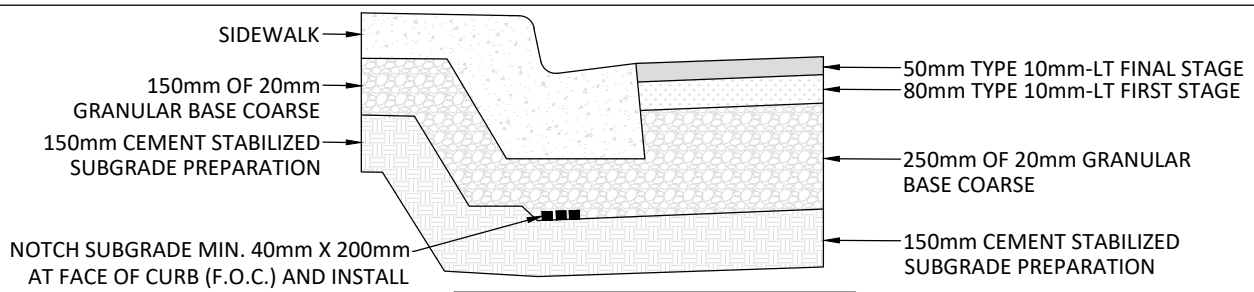
INDUSTRIAL COLLECTOR ROADWAY - 26m RIGHT-OF-WAY, 13.5m ROADWAY, SEPARATE WALK AND ASPHALT TRAIL

Cross-Section

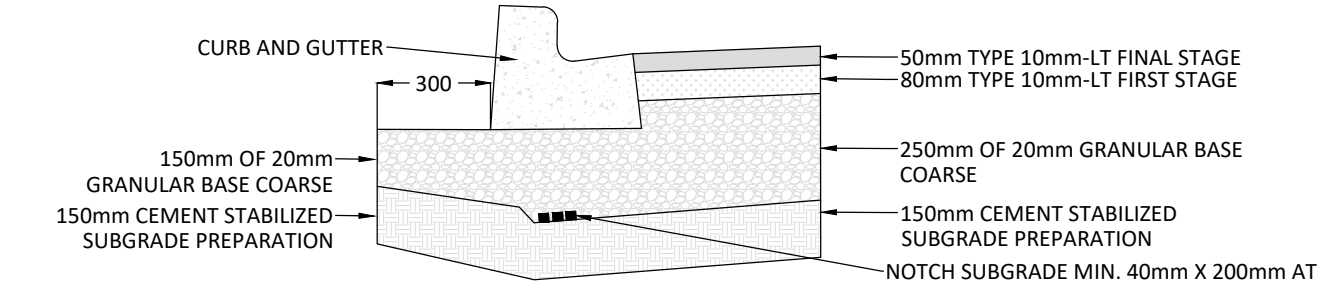
Scale: NTS

Sturgeon COUNTY

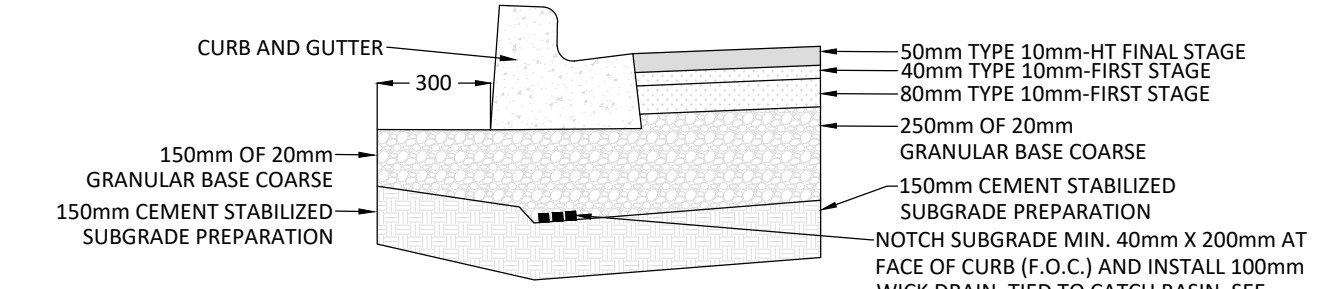
Drawing: 3.1.20



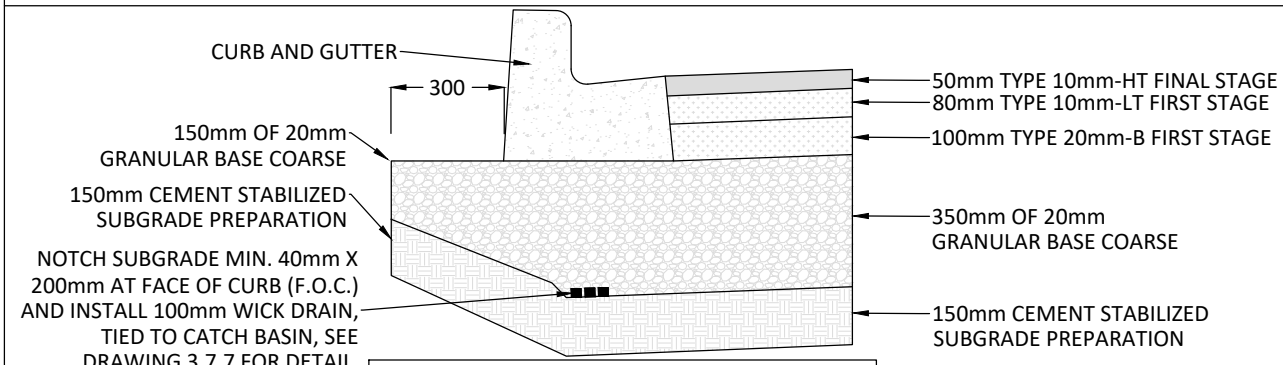
MINOR RESIDENTIAL COLLECTOR ROADWAY - MONOLITHIC SIDEWALK



MINOR RESIDENTIAL COLLECTOR ROADWAY - SEPARATE SIDEWALK



MAJOR RESIDENTIAL COLLECTOR ROADWAY



INDUSTRIAL/BUSINESS COMMERCIAL COLLECTOR ROADWAY

NOTES:

1. ENSURE POSITIVE LONGITUDINAL GRADE ALONG BASE OF WICK DRAIN AND DRAINAGE FROM BOTH SIDES.
2. IF GRANULAR BASE IS NOT BEING USED UNDER THE CURB AND GUTTER, INSTALL WICK DRAIN AT THE EDGE OF THE GRANULAR BASE UNDER THE ROADWAY.
3. ROAD STRUCTURE AS PER SECTION 3.1.
4. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

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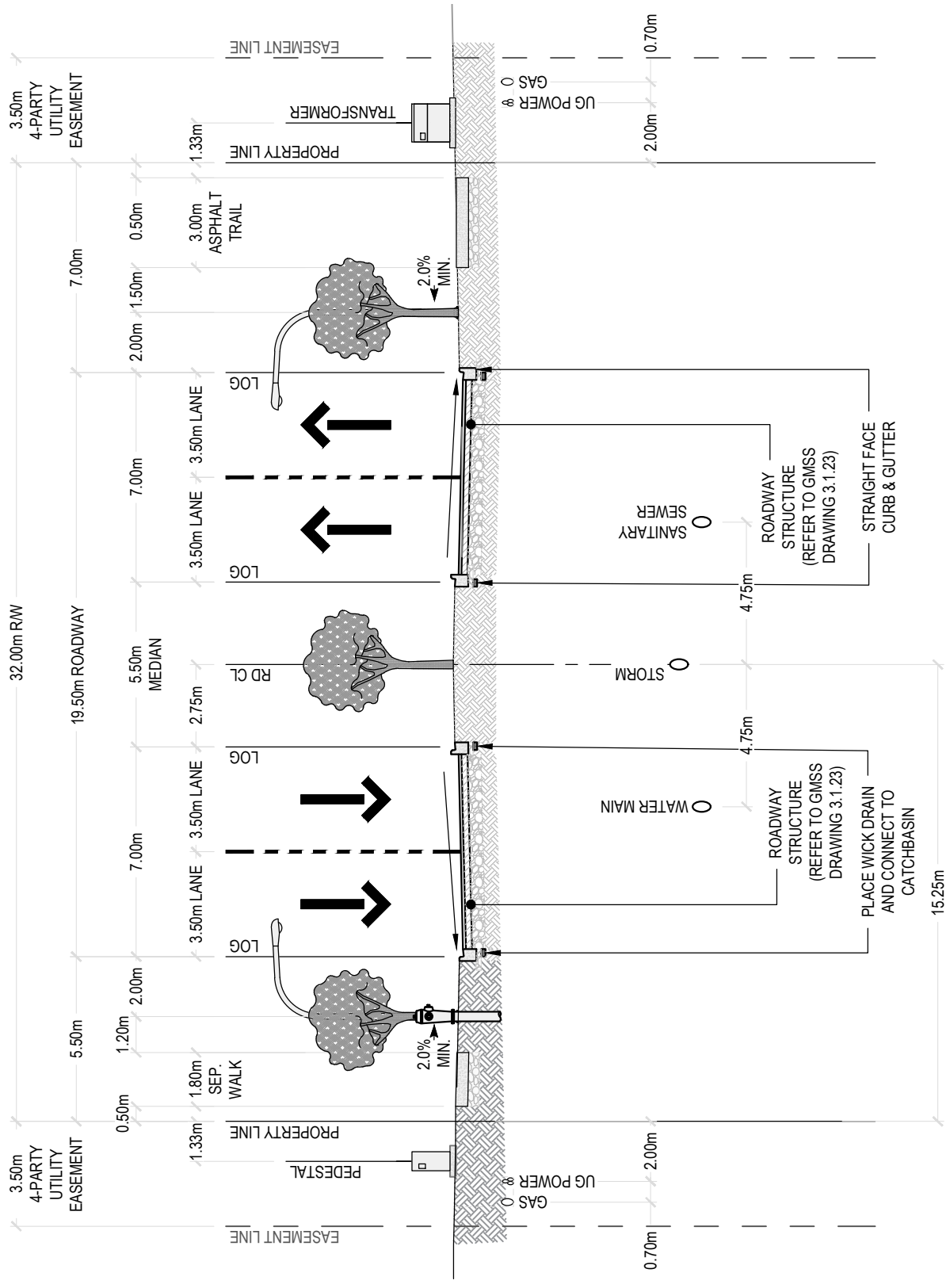
Rev. 1: JULY 19, 2022

MINOR AND MAJOR COLLECTOR ROADWAY STRUCTURE
Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.21



NOTES:

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.
2. REFER TO GENERAL MUNICIPAL SERVICING STANDARDS FOR MATERIAL REQUIREMENTS.
3. SUBGRADE TO BE PREPARED AS PER GEOTECHNICAL ENGINEER'S RECOMMENDATION.
4. TRAFFIC VOLUME <15,000 (vpd).
5. MINIMUM INTERSECTION SPACING TO BE 200m.
6. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%.
7. DESIGN SPEED LIMIT TO BE 110 (km/hr).
8. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.2.

STURGEON COUNTY

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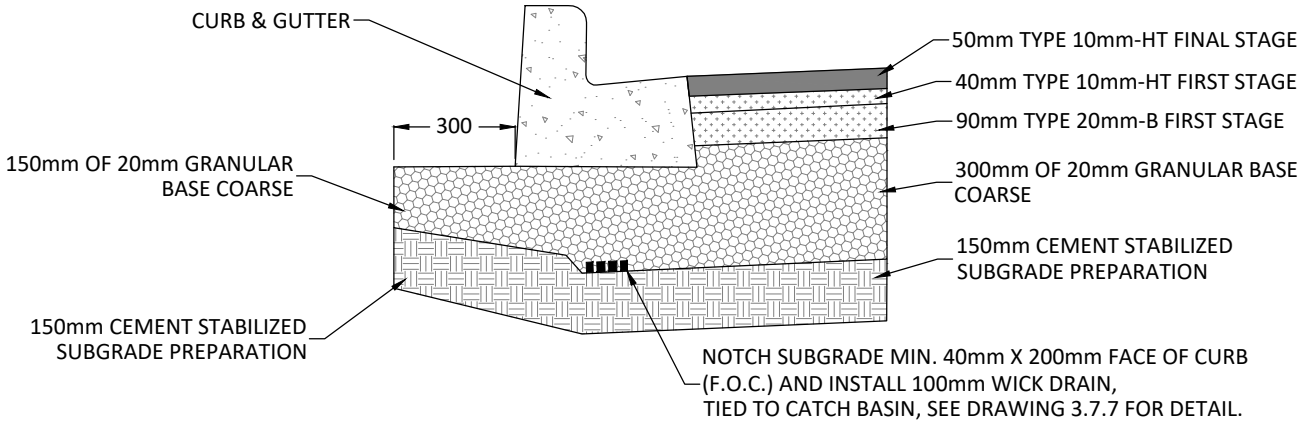
FOUR LANE DIVIDED COLLECTOR ROADWAY - 32m RIGHT-OF-WAY, 2x7m ROADWAY, SEPARATE WALK AND ASPHALT TRAIL

CROSS-SECTION

Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.22



DIVIDED COLLECTOR ROADWAY

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. ENSURE POSITIVE LONGITUDINAL GRADE ALONG BASE OF WICK DRAIN AND DRAINAGE FROM BOTH SIDES.
3. IF GRANULAR BASE IS NOT BEING USED UNDER THE CURB AND GUTTER, INSTALL WICK DRAIN AT THE EDGE OF THE GRANULAR BASE UNDER THE ROADWAY.
4. ROAD STRUCTURE AS PER SECTION 3.1.

STURGEON COUNTY

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FOUR LANE DIVIDED COLLECTOR ROADWAY STRUCTURE
Scale: NTS

Sturgeon COUNTY

Drawing: 3.1.23

STURGEON COUNTY

General Municipal Servicing Standards

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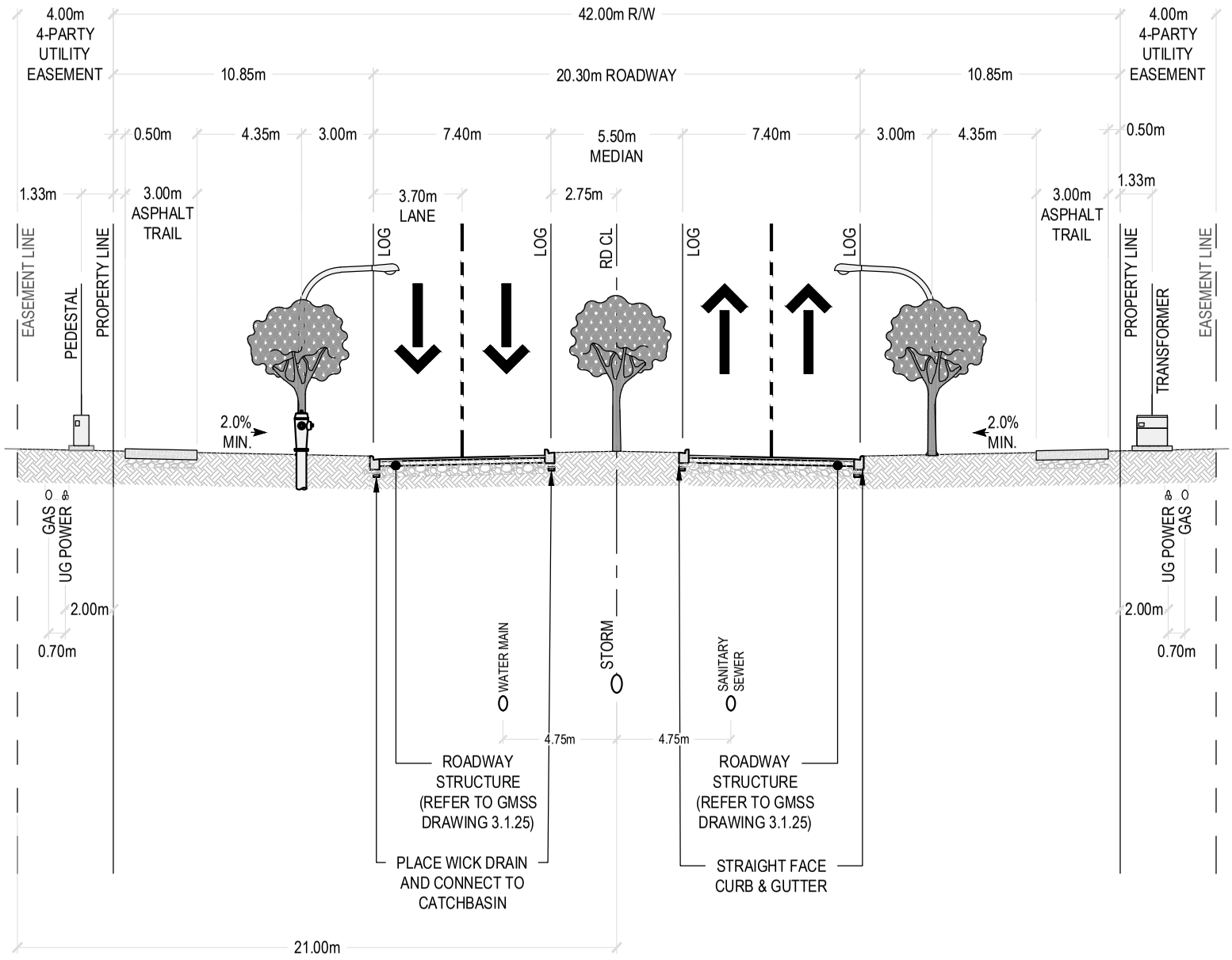
Rev. 1: NOVEMBER 10, 2022

FOUR LANE DIVIDED ARTERIAL ROADWAY - 42m RIGHT-OF-WAY, 2x7.4m ROADWAY, ASPHALT TRAIL

CROSS-SECTION

Scale: NTS

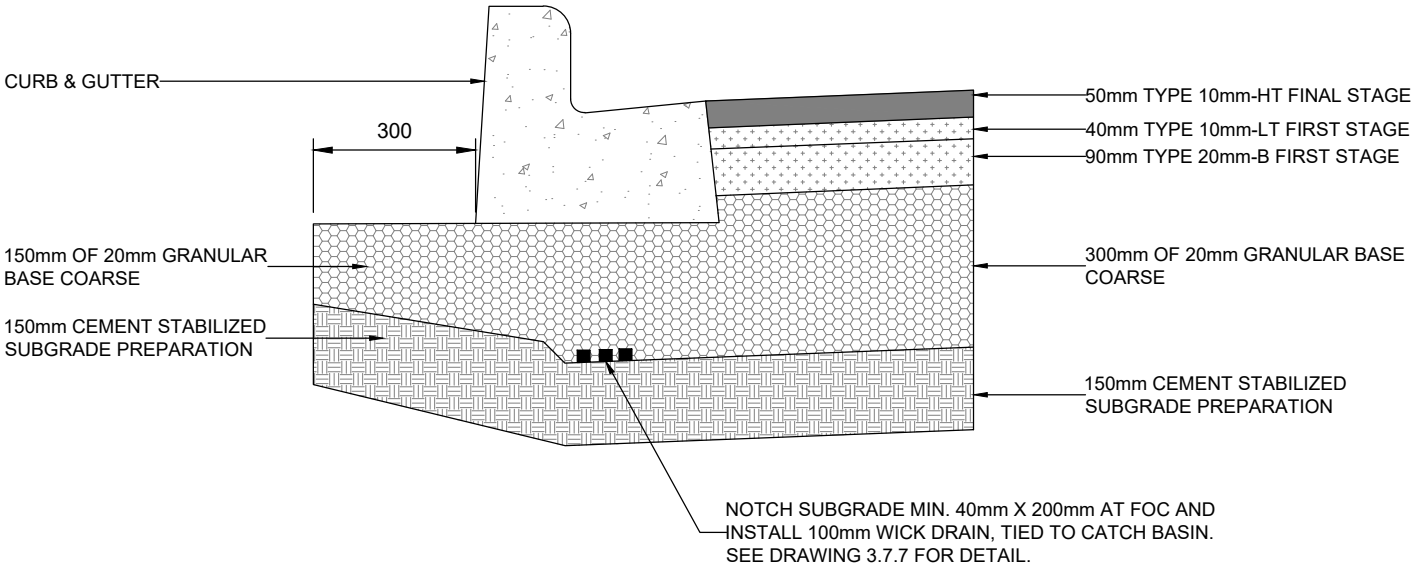


NOTES:

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.
2. REFER TO GENERAL MUNICIPAL SERVICING STANDARDS FOR MATERIAL REQUIREMENTS.
3. SUBGRADE TO BE PREPARED AS PER GEOTECHNICAL ENGINEER'S RECOMMENDATION.
4. TRAFFIC VOLUME <30,000 (vpd).
5. MINIMUM INTERSECTION SPACING TO BE 400m.
6. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%.
7. DESIGN SPEED LIMIT TO BE 110 (km/hr).
8. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.3.

Sturgeon COUNTY

Drawing: 3.1.24



DIVIDED ARTERIAL ROADWAY

NOTES:

1. ENSURE POSITIVE LONGITUDINAL GRADE ALONG BASE OF WICK DRAIN AND DRAINAGE FROM BOTH SIDES.
2. IF GRANULAR BASE IS NOT BEING USED UNDER THE CURB AND GUTTER, INSTALL WICK DRAIN AT THE EDGE OF THE GRANULAR BASE UNDER THE ROADWAY.
3. ROAD STRUCTURE AS PER SECTION 3.1.
4. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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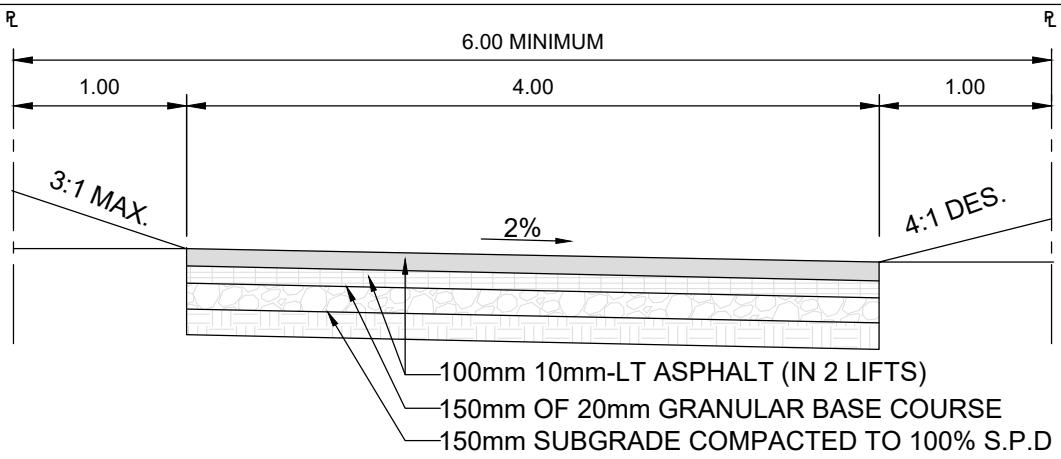
Rev. 1: JULY 20, 2022

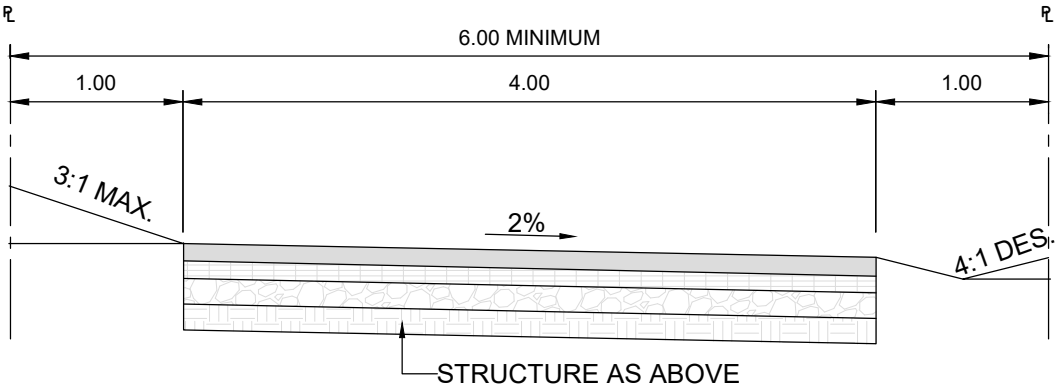
FOUR LANE DIVIDED ARTERIAL ROADWAY STRUCTURE
Scale: NTS

Sturgeon COUNTY

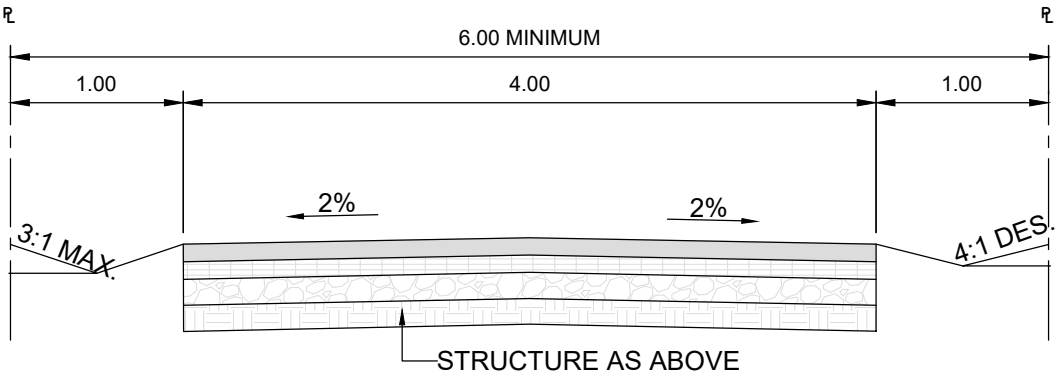
Drawing: 3.1.25



CROSSFALL WITHOUT SWALE (LONGITUDAL DRAINAGE)



CROSSFALL WITH SWALE



CROWNED WITH SWALES

NOTES:

1. ENSURE DEPTH OF FLOW CHANNEL IS SUFFICIENT, BASED ON AN APPROVED DRAINAGE PLAN.
2. ALL DIMENSIONS ARE IN METRES (m), UNLESS OTHERWISE NOTED.

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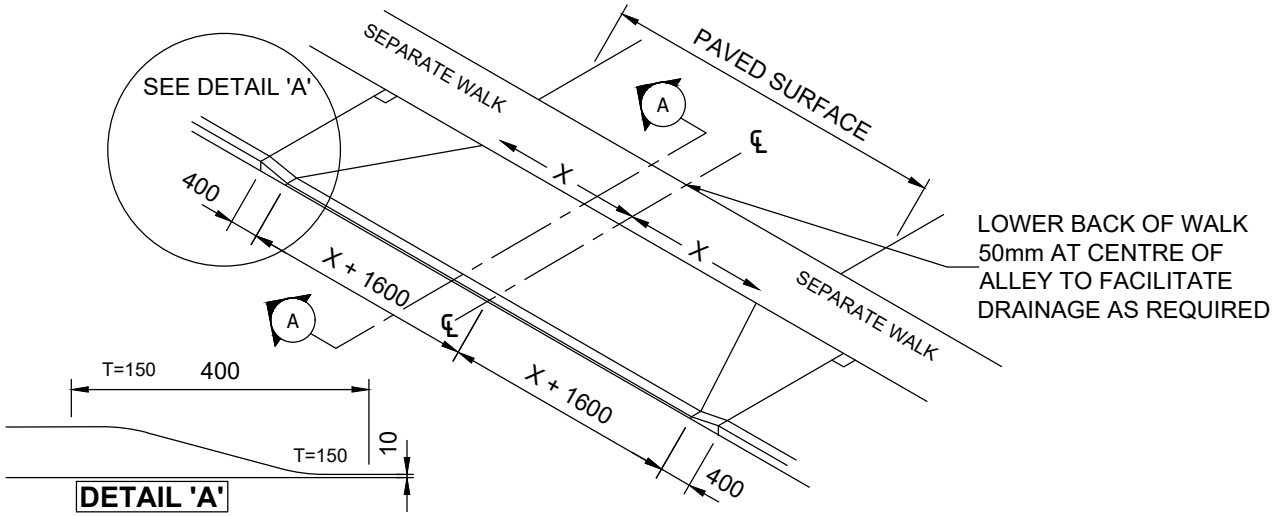
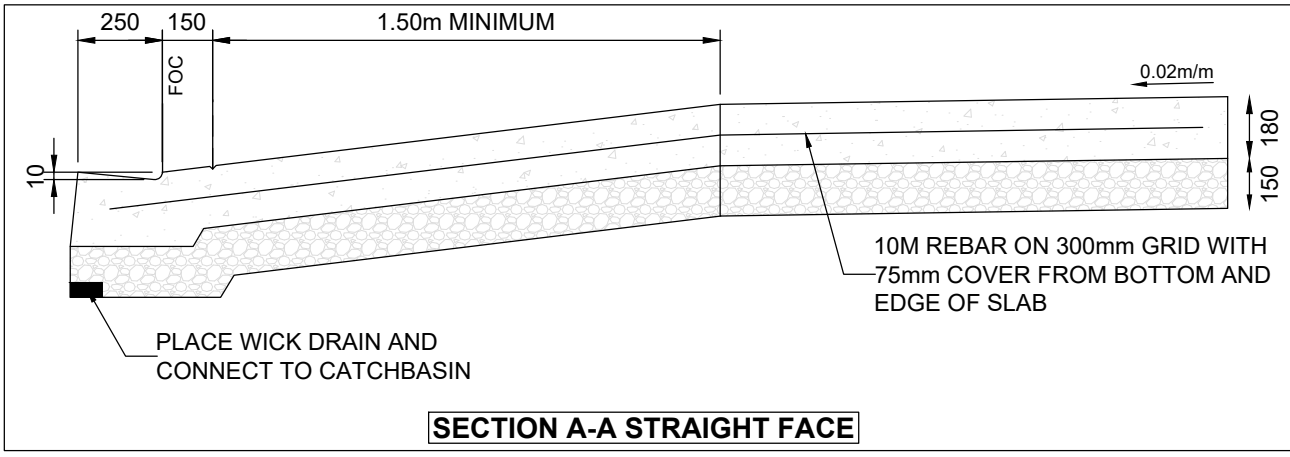
EMERGENCY VEHICLE ACCESS PUBLIC UTILITY LOT ROADWAY STRUCTURE
Scale: NTS

Sturgeon COUNTY

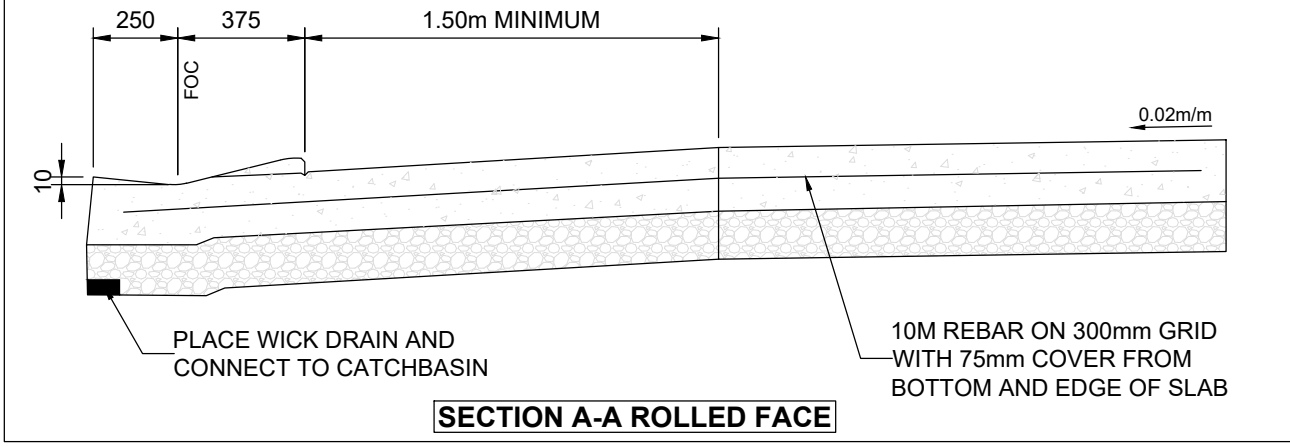
Drawing: 3.1.26



DETAIL 'A'



SECTION A-A STRAIGHT FACE



SECTION A-A ROLLED FACE

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE NOTED.
2. MAXIMUM CROSSFALL SLOPE TO BE 8.00% UNLESS OTHERWISE APPROVED BY STURGEON COUNTY
3. CROSSING MUST BE POURED MONOLITHICALLY WITH CURB AND GUTTER.

STURGEON COUNTY

General Municipal Servicing Standards

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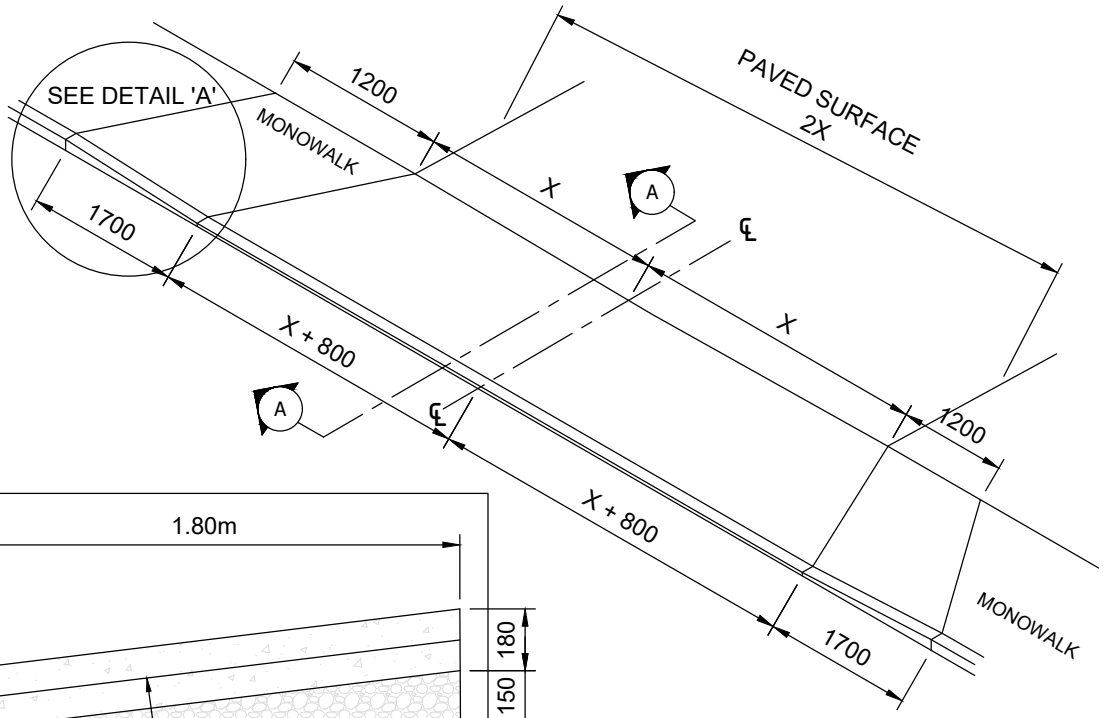
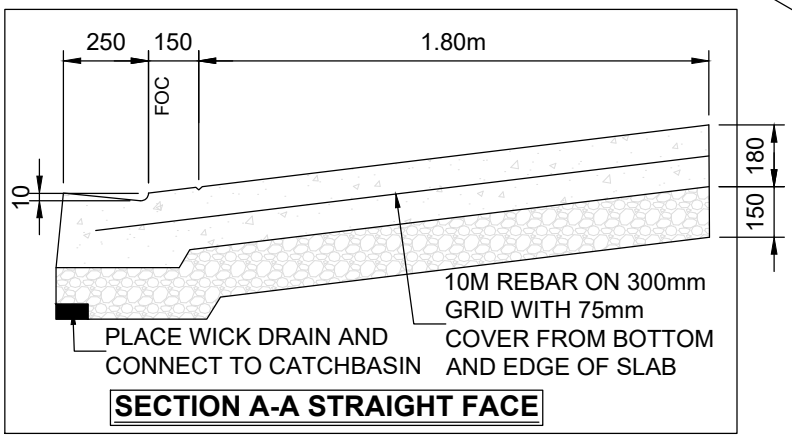
LANE CROSSING - SEPARATE WALK
Scale: NTS

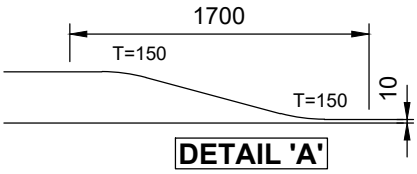
Sturgeon COUNTY

Drawing: 3.2.0

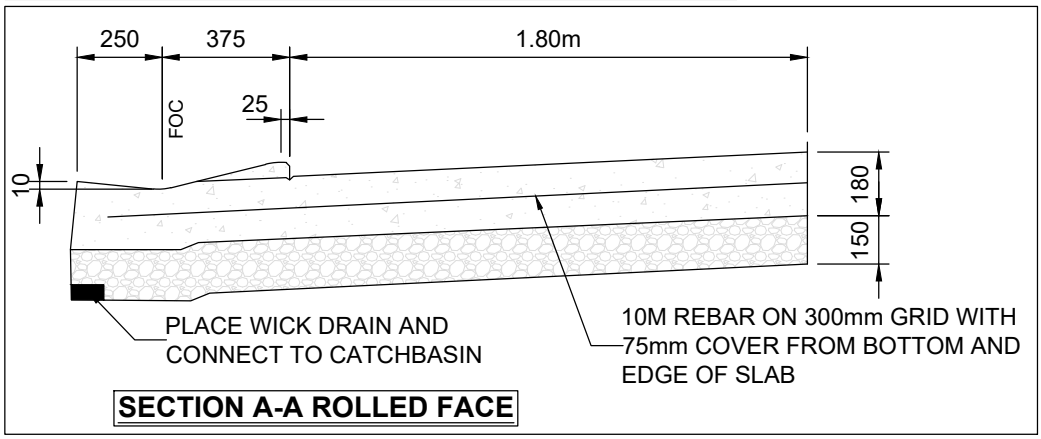




SECTION A-A STRAIGHT FACE



DETAIL 'A'



SECTION A-A ROLLED FACE

NOTES:

1. MAXIMUM CROSSFALL SLOPE TO BE 8.00% UNLESS OTHERWISE APPROVED BY STURGEON COUNTY
2. CROSSING MUST BE POURED MONOLITHICALLY WITH CURB AND GUTTER
3. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.

STURGEON COUNTY

General Municipal Servicing Standards

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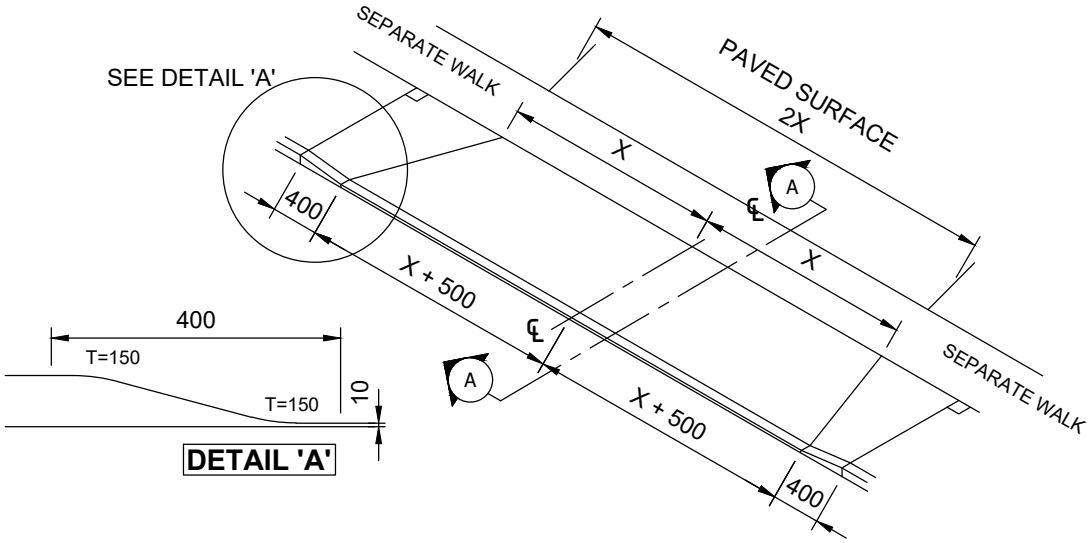
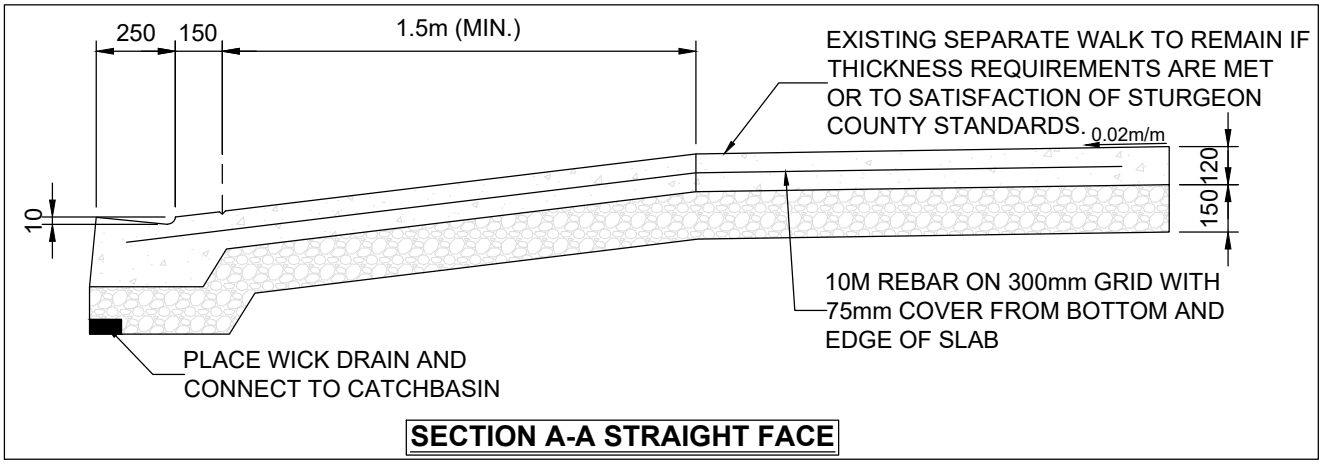
LANE CROSSING - MONOWALK
Scale: NTS

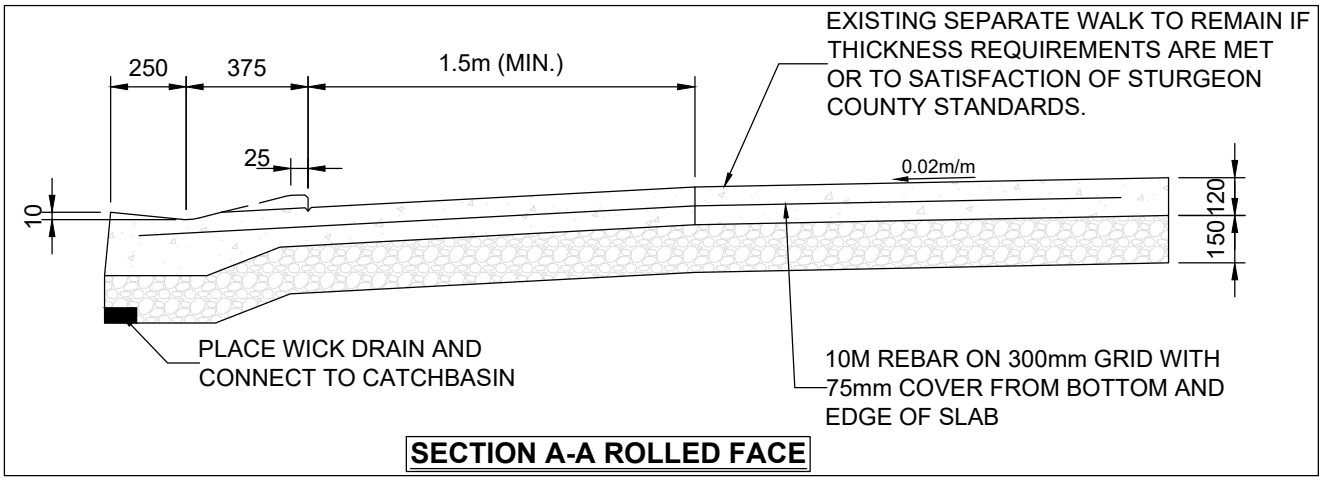
Sturgeon COUNTY

Drawing: 3.2.1





SECTION A-A STRAIGHT FACE



SECTION A-A ROLLED FACE

NOTES:

1. ALL DIMENSIONS IN MILLIMETERS, UNLESS OTHERWISE STATED.
2. MAXIMUM CROSSFALL SLOPE TO BE 8.00% UNLESS OTHERWISE APPROVED BY STURGEON COUNTY.
3. CROSSING MUST BE POURED MONOLITHICALLY WITH CURB AND GUTTER.

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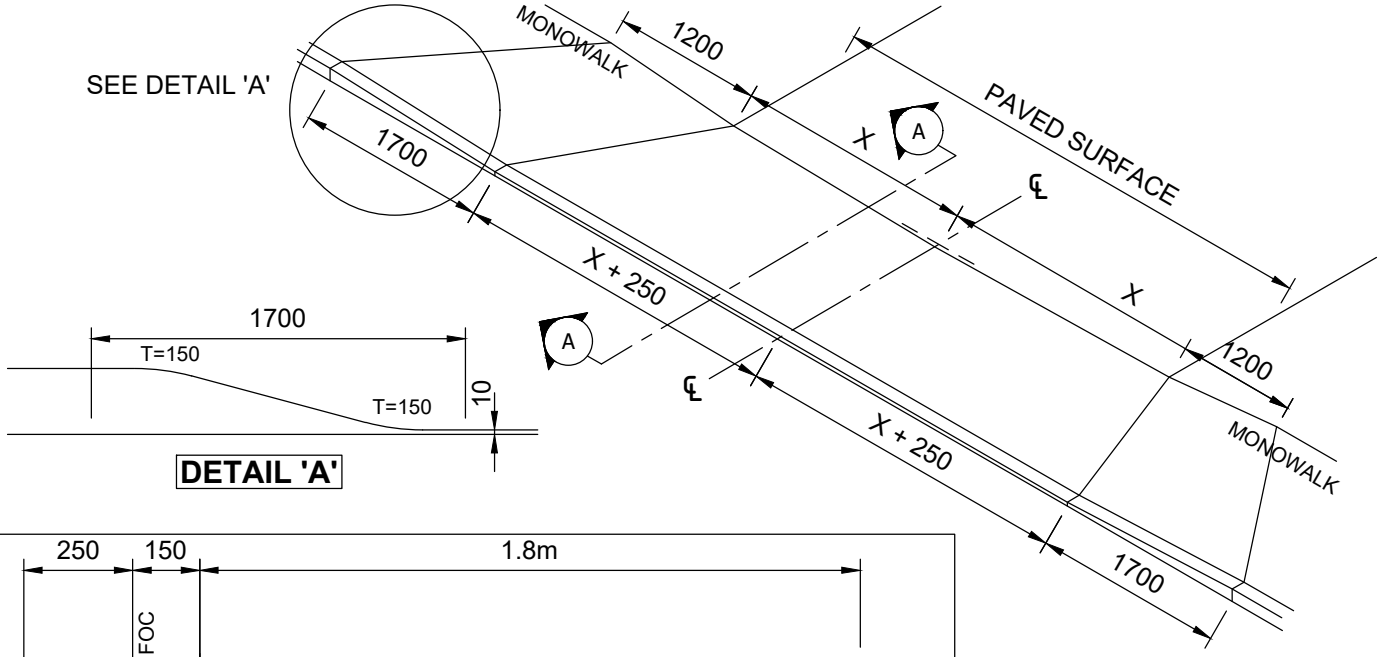
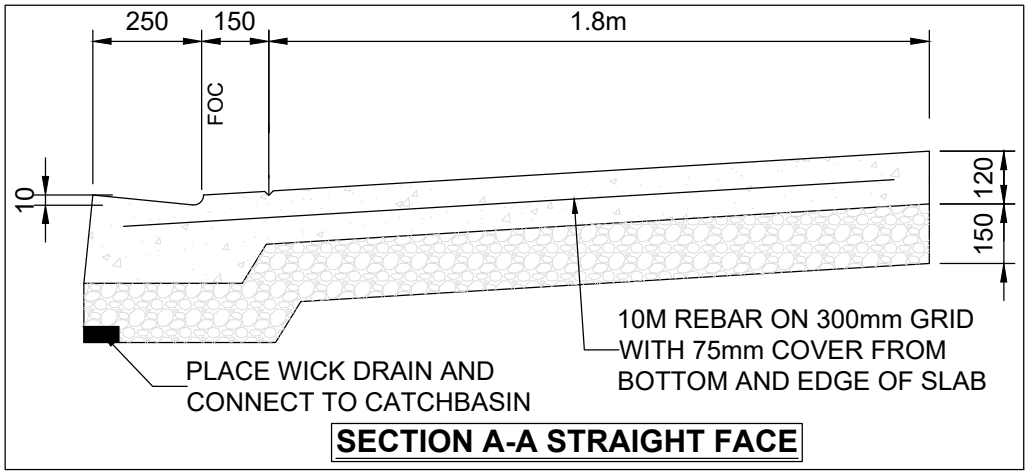
RESIDENTIAL CROSSING - SEPERATE WALK
Scale: NTS

Sturgeon COUNTY

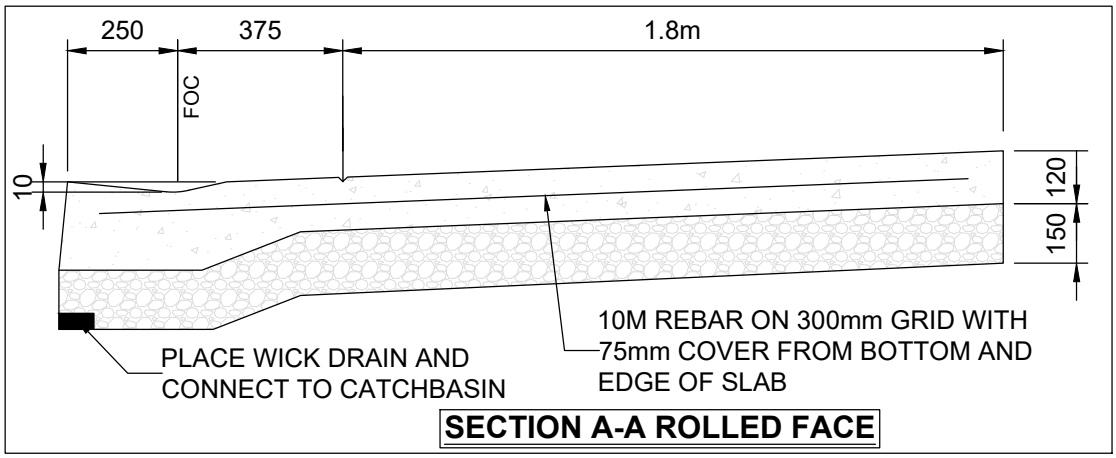
Drawing: 3.2.2



DETAIL 'A'



SECTION A-A STRAIGHT FACE



SECTION A-A ROLLED FACE

NOTES:

1. MAXIMUM CROSSFALL SLOPE TO BE 8.00% UNLESS OTHERWISE APPROVED BY STURGEON COUNTY.
2. CROSSING MUST BE POURED MONOLITHICALLY WITH CURB AND GUTTER
3. ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. :
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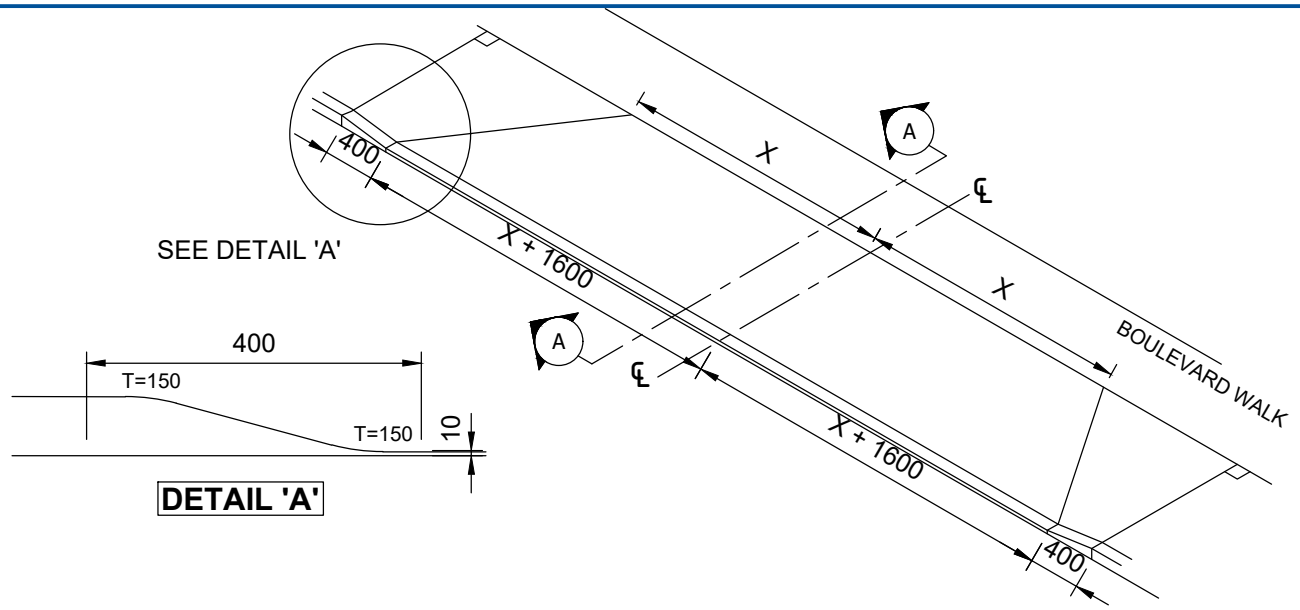
Rev. 1: FEBRUARY 22, 2023

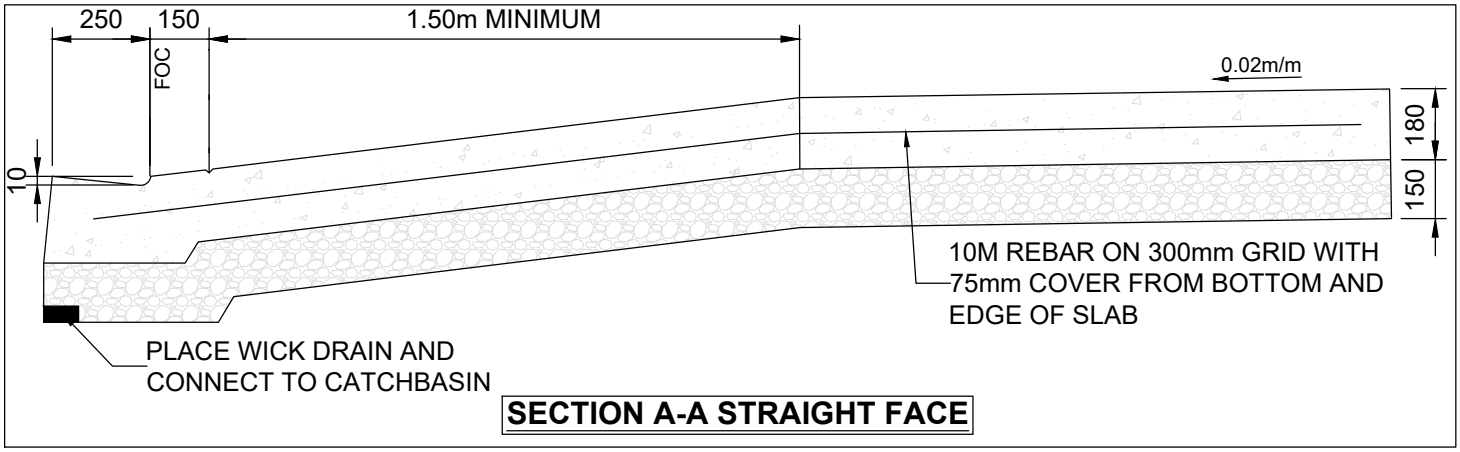
RESIDENTIAL CROSSING - MONOWALK
Scale: NTS

Sturgeon COUNTY

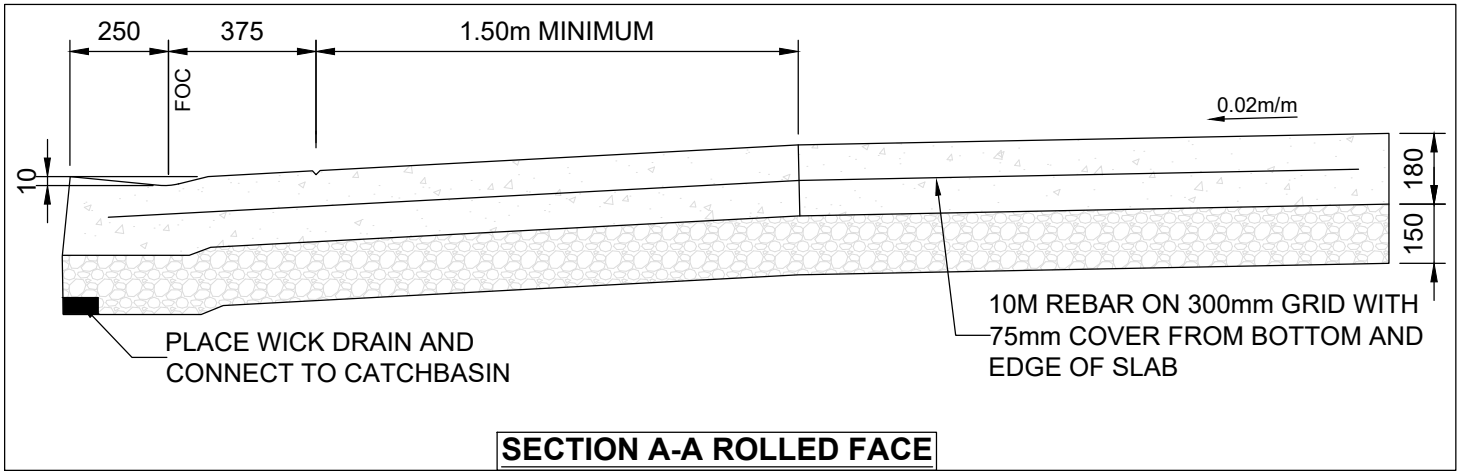
Drawing: 3.2.3



DETAIL 'A'



SECTION A-A STRAIGHT FACE



SECTION A-A ROLLED FACE

NOTE:

1. MAXIMUM CROSSFALL SLOPE TO BE 8.00% UNLESS APPROVED BY STURGEON COUNTY.
2. CROSSING MUST BE POURED MONOLITHICALLY WITH CURB AND GUTTER.
3. ALL DIMENSIONS IN MILLIMETERS UNLESS STATED.

STURGEON COUNTY

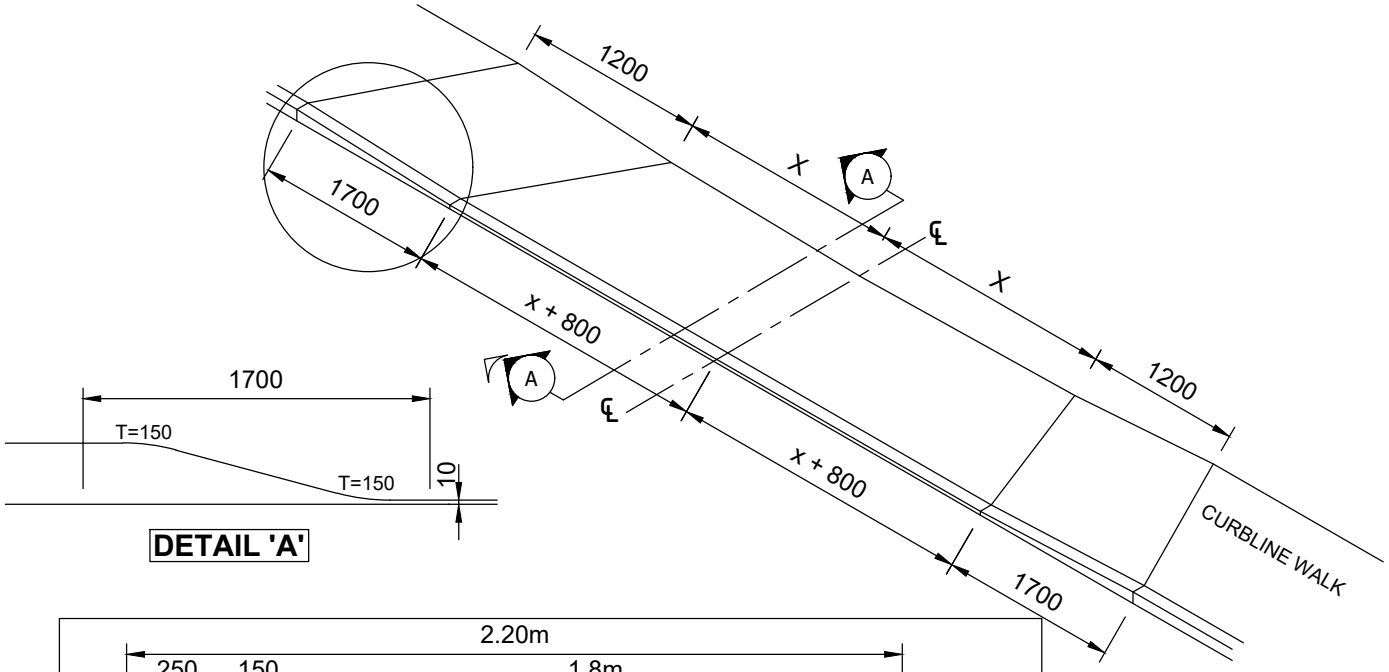
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: FEBRUARY 22, 2023

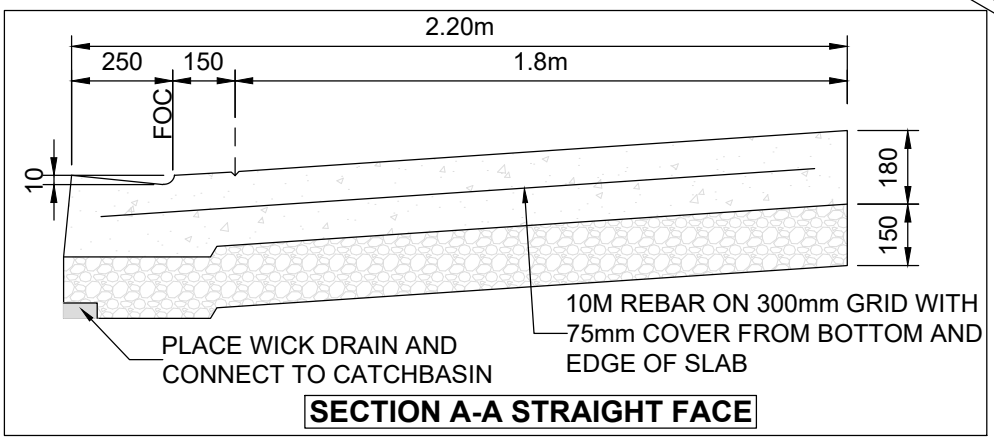
COMMERCIAL CROSSING - SEPARATE WALK
Scale: NTS

Sturgeon COUNTY

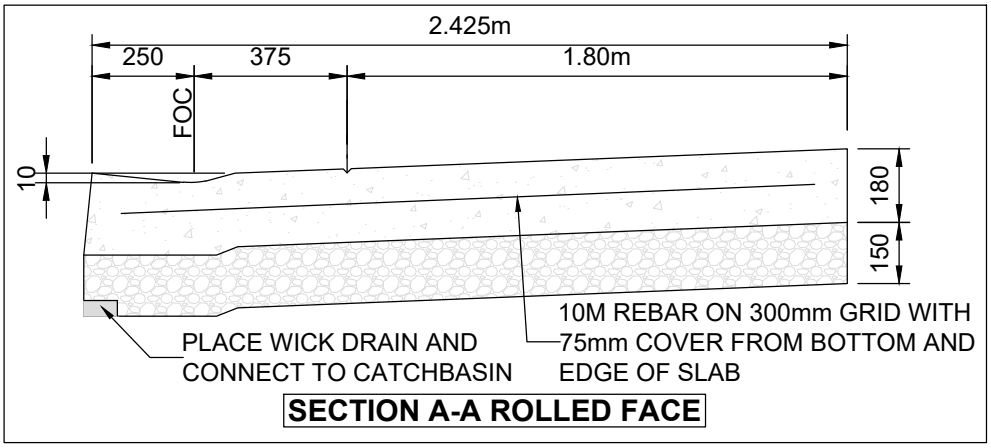
Drawing: 3.2.4



DETAIL 'A'



SECTION A-A STRAIGHT FACE



SECTION A-A ROLLED FACE

NOTE:

1. MAXIMUM CROSSFALL SLOPE TO BE 8.00% UNLESS APPROVED BY STURGEON COUNTY
2. CROSSING MUST BE POURED MONOLITHICALLY WITH CURB AND GUTTER
3. ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED.

STURGEON COUNTY

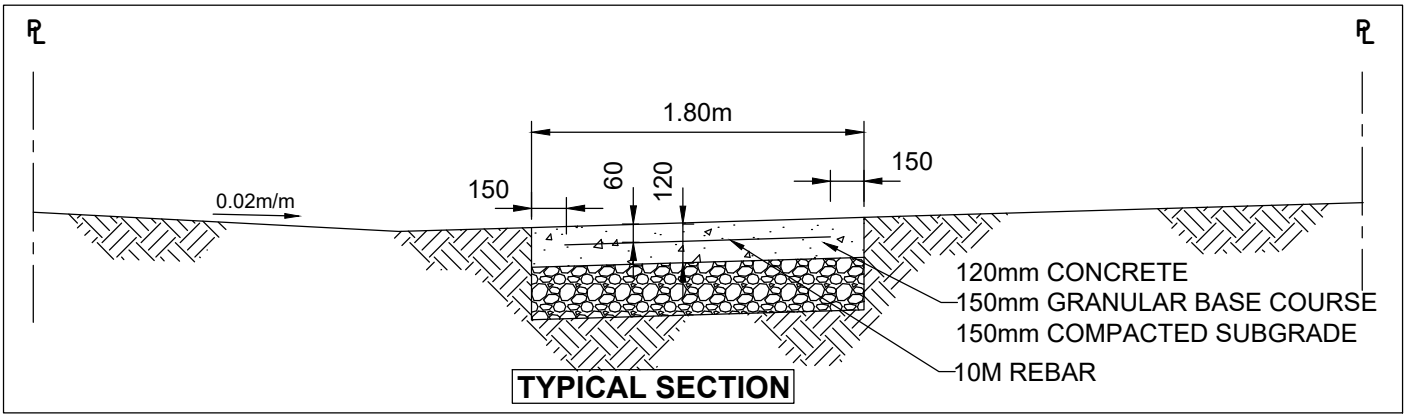
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: FEBRUARY 22, 2023

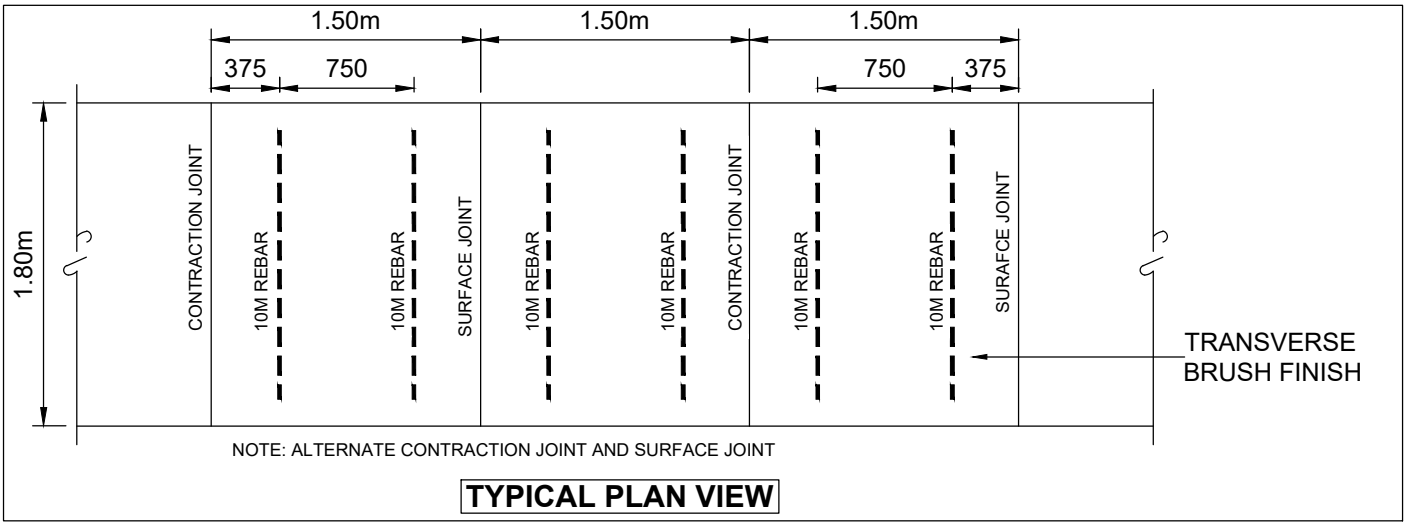
COMMERCIAL CROSSING - MONOWALK
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.5

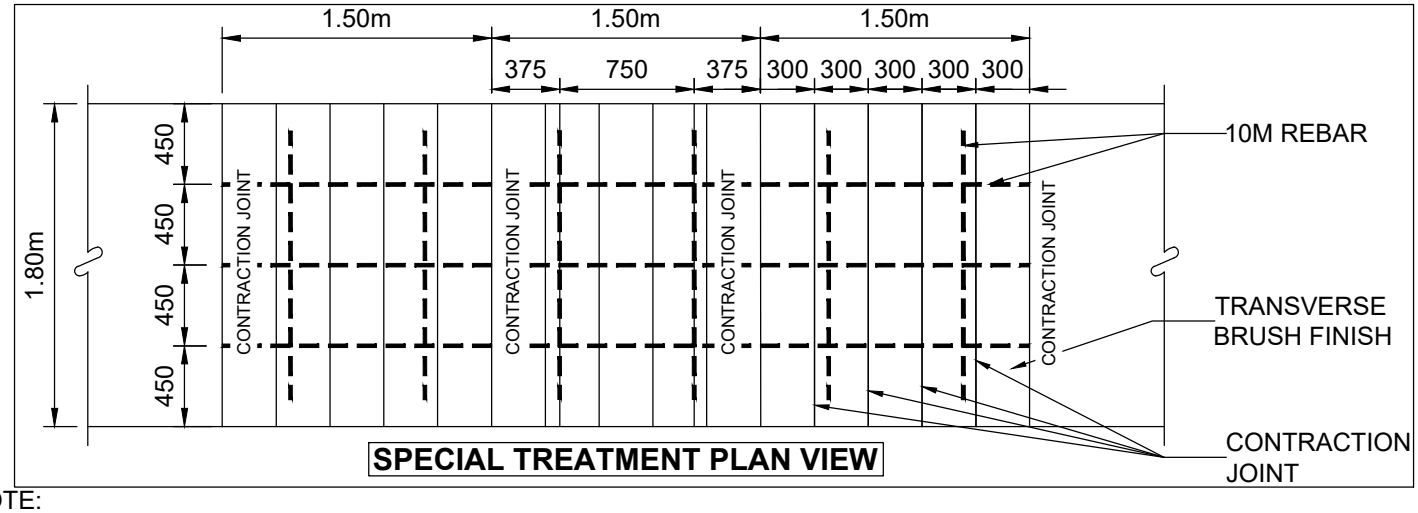


TYPICAL SECTION



NOTE: ALTERNATE CONTRACTION JOINT AND SURFACE JOINT

TYPICAL PLAN VIEW



SPECIAL TREATMENT PLAN VIEW

NOTE:

1. ALTERNATE CONTRACTION JOINT AND SURFACE JOINT FOR TYPICAL CONCRETE WALKWAY CONSTRUCTION.
2. SPECIAL TREATMENT PLAN TO BE USED AS REQUESTED BY COUNTY OF GEOTECHNICAL REPORT RECOMMENDATIONS.
3. USE ALL CONTRACTION JOINTS WITHIN SPECIAL TREATMENT AREA.
4. LONGITUDINAL REBARS MUST BE CONTINUOUS AND TIED TO THE TRANSVERSE REBARS.
5. ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED.

STURGEON COUNTY

General Municipal Servicing Standards

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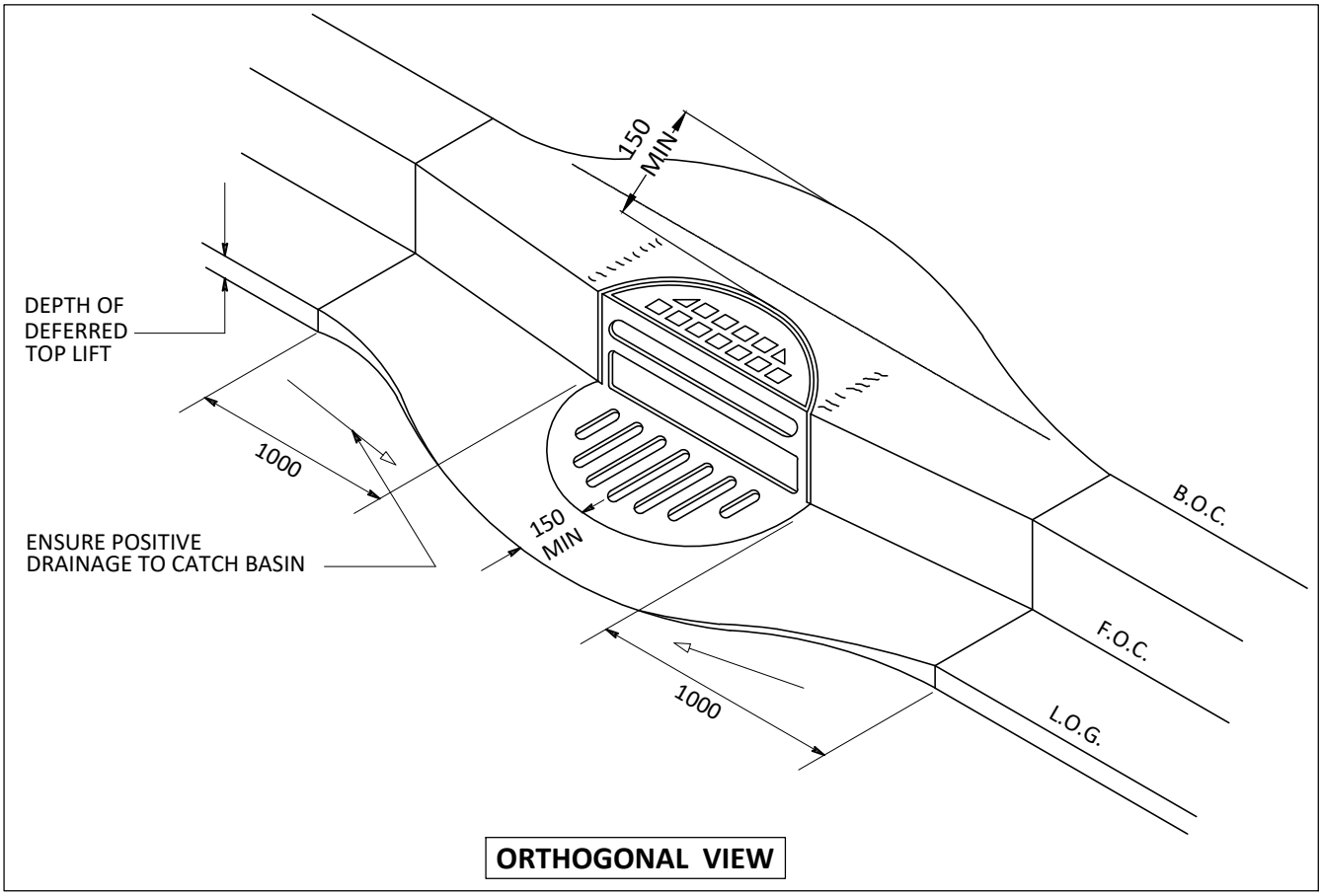
Rev. :
Rev. :
Rev. 1: FEBRUARY 25, 2023

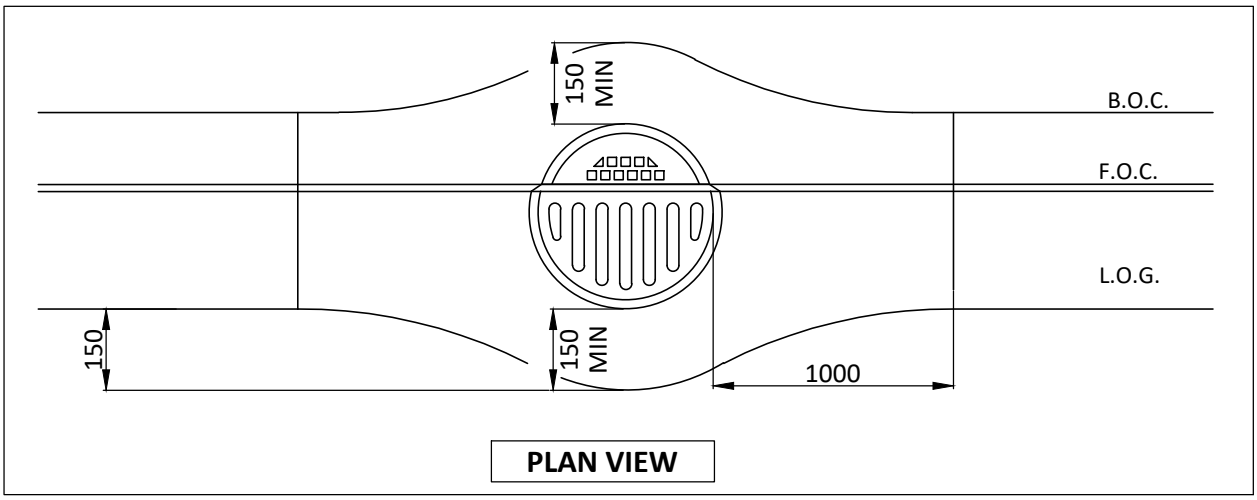
TYPICAL CONCRETE WALKWAY - 1.80m
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.6



ORTHOGONAL VIEW



PLAN VIEW

NOTES:

1. TYPICAL CURB & GUTTER TREATMENT AT CATCH BASIN WHEN ASPHALT TOP LIFT IS DEFERRED. LOCATION TO BE DETERMINED BY STURGEON COUNTY.
2. MINIMUM 0.6% SLOPE FOR 5.0m IN EACH DIRECTION ON A SAG VERTICAL CURVE.
3. IF FINAL LIFT OF ASPHALT IS 50mm OR GREATER, CURB AND GUTTER SHALL BE REMOVED AND REPLACED AT FINAL LIFT ELEVATIONS AT FAC.
4. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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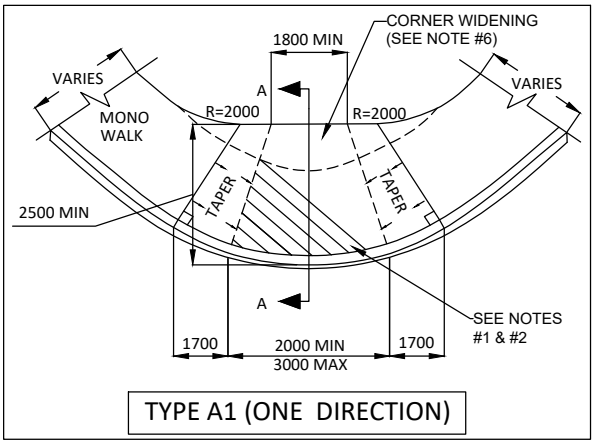
Rev. :
Rev. :
Rev. 1: AUGUST 25, 2022

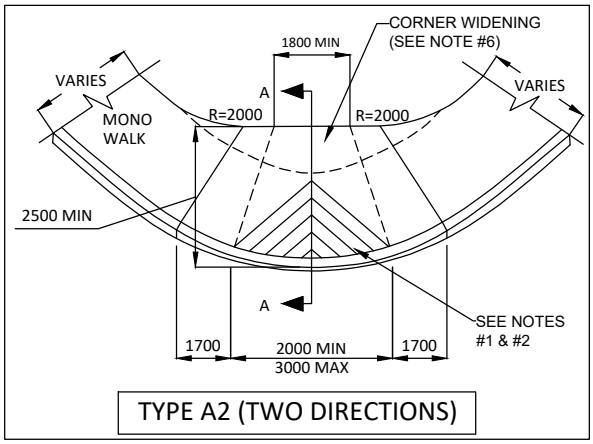
DEPRESSED CURB AND GUTTER FOR CATCH BASIN
Scale: NTS

Sturgeon COUNTY

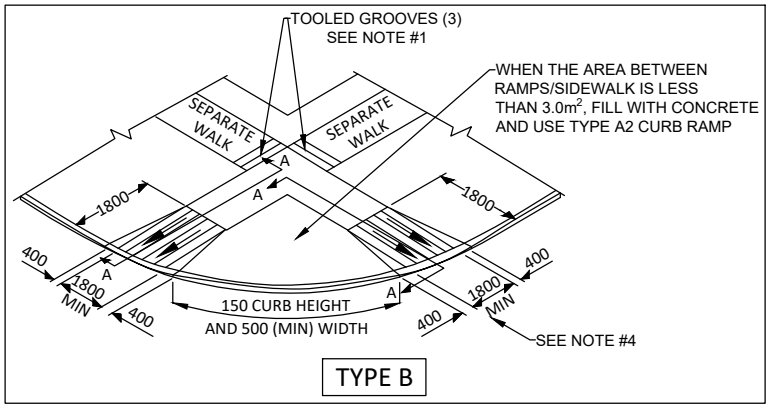
Drawing: 3.2.7



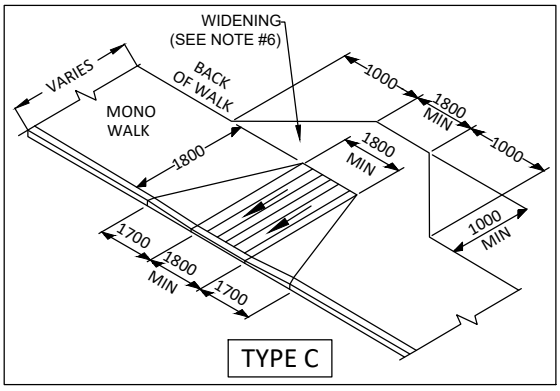
TYPE A1 (ONE DIRECTION)



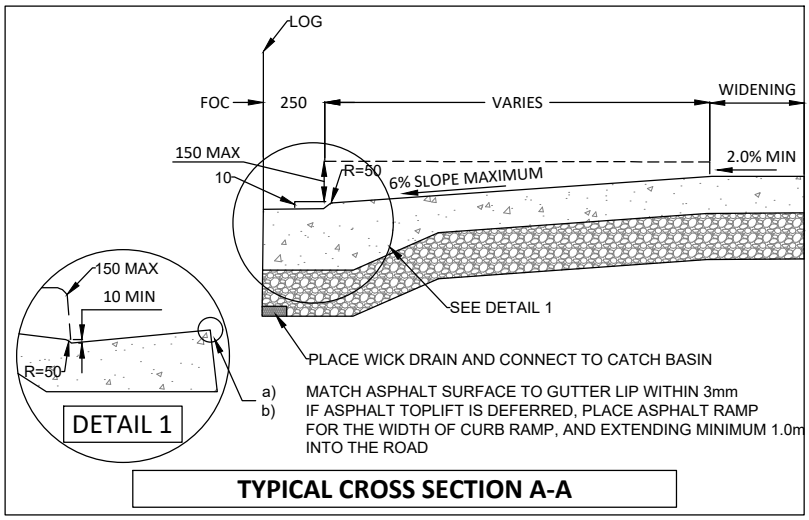
TYPE A2 (TWO DIRECTIONS)



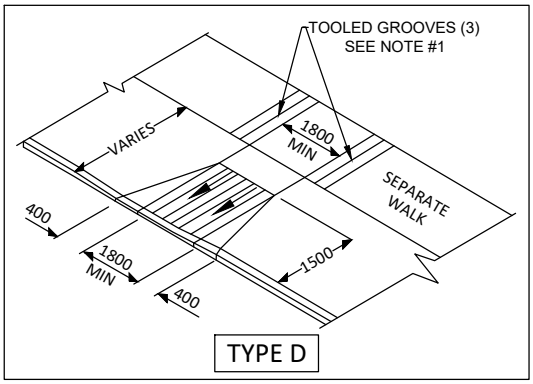
TYPE B



TYPE C



TYPICAL CROSS SECTION A-A



TYPE D

NOTES:
1. TOOLED GROOVES 5mm WIDE X 10mm DEEP, BROOM FINISH. GROOVE SPACING 150mm O.C. ADJACENT TO CURB.
2. GROOVES TO BE IN DIRECTION OF TRAVEL.
3. WHEN REQUIRED, TRANSITION FROM STRAIGHT FACE CURB TO ROLLED FACE CURB AT CURB RAMP.
4. CURBS AND RAMPS TO BE POURED MONOLITHICALLY. RAMPS TO FOLLOW SAME STRUCTURE AS ADJOINING SIDEWALK.
5. WIDTH OF RAMP MUST EQUAL WIDTH OF WALK (TYPICALLY 1.8m) EXCEPT "TYPE A."
6. PROVIDE 1.0m WIDENING (AT 2.0% X-FALL) FROM BACK OF CURB RAMP (TYPES A & C) WHERE ROAD RIGHT-OF-WAY ALLOWS.
7. IT MAY BE NECESSARY TO CONSTRUCT WIDER RAMPS IN URBAN AREAS WITH HIGH VOLUMES OF PEDESTRIAN TRAFFIC. MAXIMUM WIDTH OF RAMP IS 3m.
8. IN CASES WHERE THE WIDTH OF WALK IS NOT SUFFICIENT TO ACHIEVE MAXIMUM SLOPE, AN 6% SLOPE MAY BE ACCEPTED UPON APPROVAL FROM THE COUNTY. OTHERWISE, THE BACK OF THE WALK MUST BE LOWERED ACCORDINGLY. IN NO CASE SHALL THE MAXIMUM SLOPE EXCEED 6%.
9. ENSURE CATCH BASINS ARE A MINIMUM 500mm AWAY FROM RAMP FLARES. CATCH BASIN, FRAME, OR OVER CANNOT BE INSTALLED WITHIN THE RAMP OR FLARE UNDER ANY CIRCUMSTANCES.
10. CONCRETE STRENGTH AND SPECIFICATIONS TO BE IN ACCORDANCE WITH GENERAL MUNICIPAL SERVICING STANDARDS.

STURGEON COUNTY

General Municipal Servicing Standards

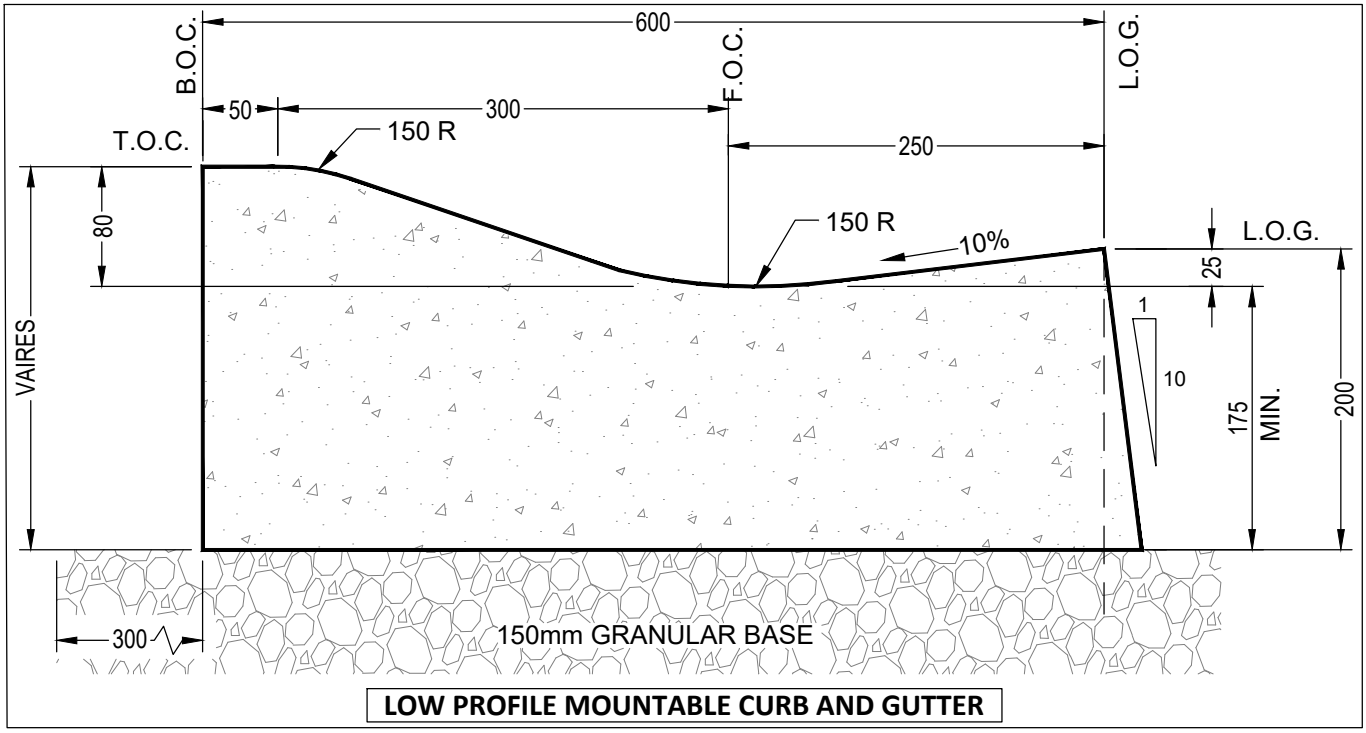
REVISIONS
Rev. :
Rev. :
Rev. 1: AUGUST 25, 2022

STANDARD CURB RAMP

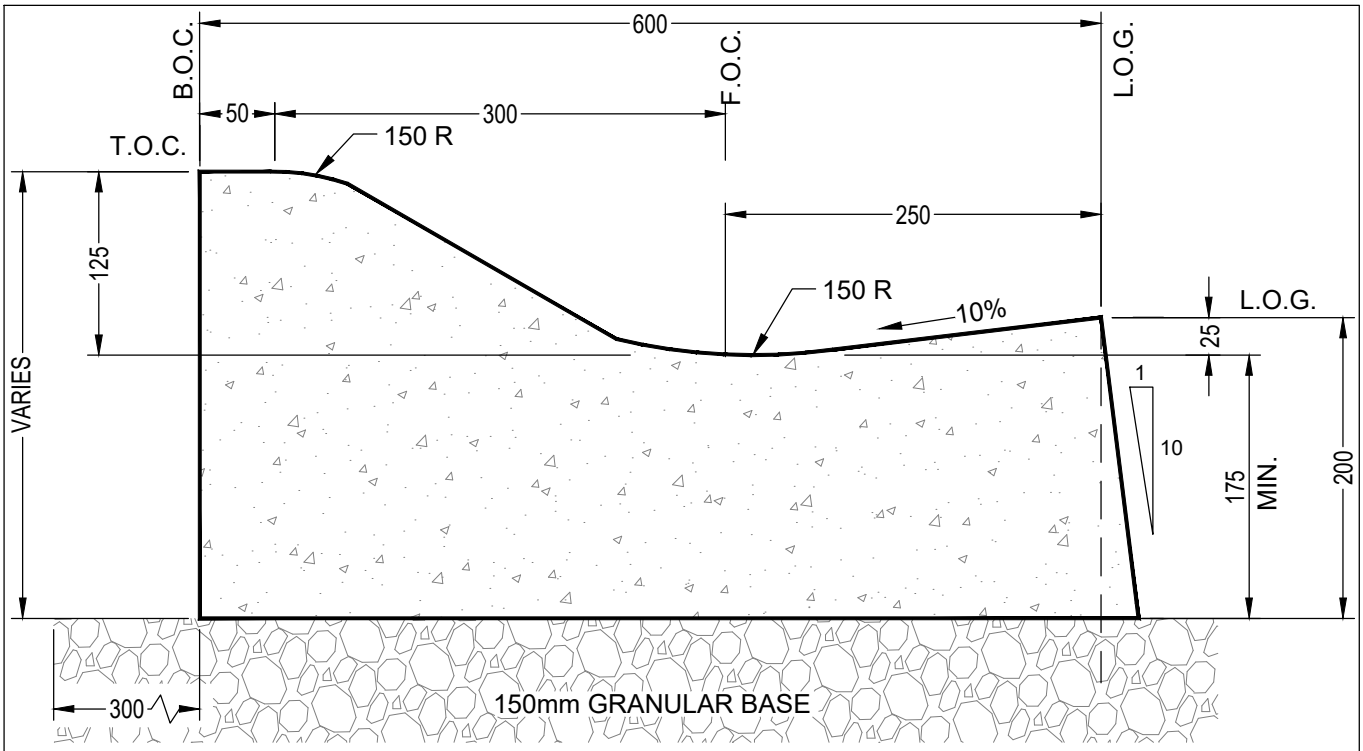
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.9



LOW PROFILE MOUNTABLE CURB AND GUTTER



STANDARD MOUNTABLE CURB AND GUTTER

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. CONCRETE STRENGTH AND SPECIFICATIONS TO BE IN ACCORDANCE WITH GENERAL MUNICIPAL SERVICING STANDARDS.

STURGEON COUNTY

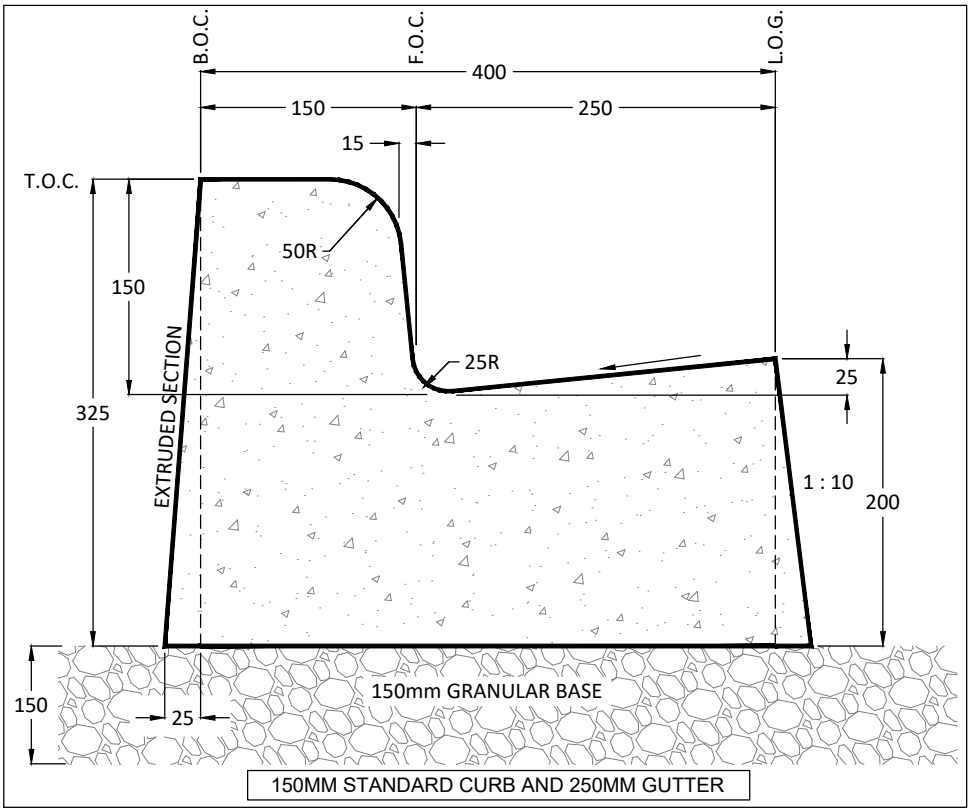
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. 2:
Rev. 1: JUNE 24, 2022

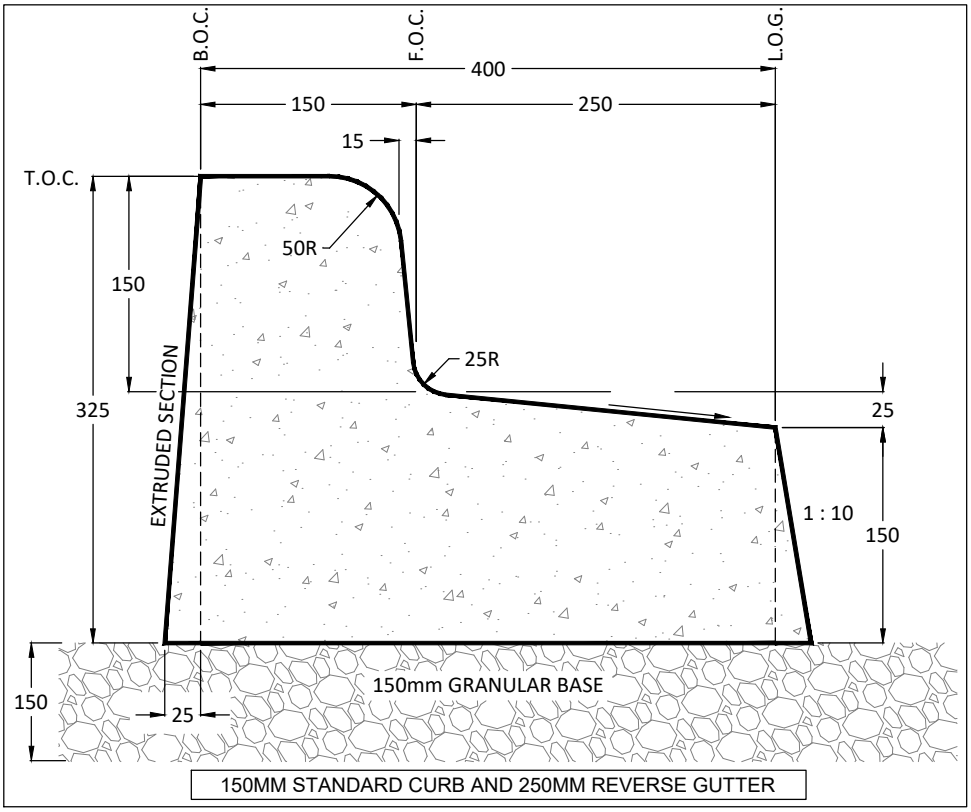
125MM STANDARD AND 80MM LOW PROFILE MOUNTABLE CURB AND 250MM GUTTER
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.10



150MM STANDARD CURB AND 250MM GUTTER



150MM STANDARD CURB AND 250MM REVERSE GUTTER

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. CONCRETE STRENGTH AND SPECIFICATIONS TO BE IN ACCORDANCE WITH GENERAL MUNICIPAL SERVICING STANDARDS.
3. REVERSE GUTTER TYPE CURB CANNOT BE USED UNLESS AUTHORIZED BY STURGEON COUNTY.

STURGEON COUNTY

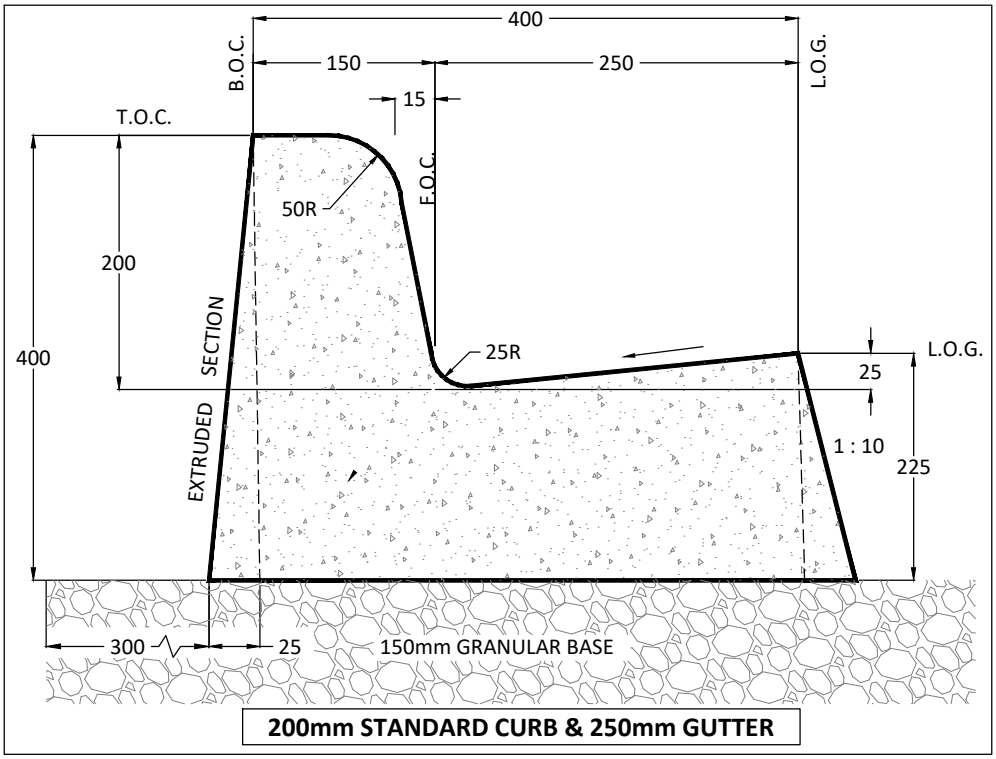
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. 2:
Rev. 1: JUNE 24, 2022

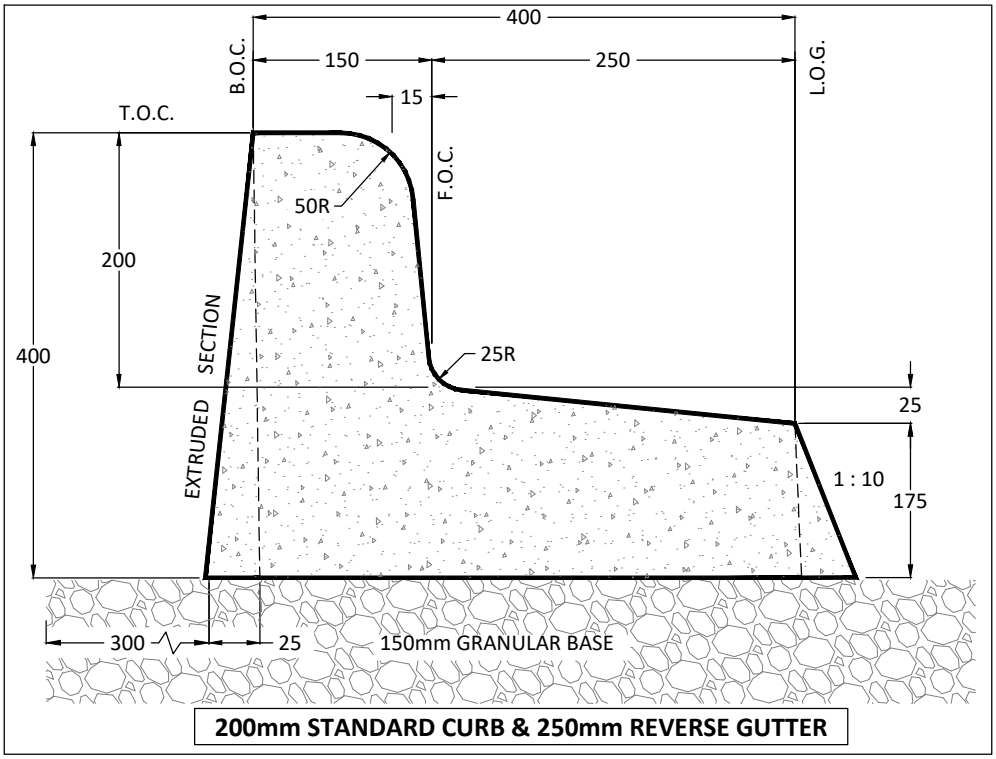
150MM STANDARD CURB AND 250MM GUTTER AND REVERSE GUTTER
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.11



200mm STANDARD CURB & 250mm GUTTER



200mm STANDARD CURB & 250mm REVERSE GUTTER

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. CONCRETE STRENGTH AND SPECIFICATIONS TO BE IN ACCORDANCE WITH GENERAL MUNICIPAL SERVICING STANDARDS.
3. REVERSE GUTTER TYPE CURB CANNOT BE USED UNLESS AUTHORIZED BY STURGEON COUNTY.

STURGEON COUNTY

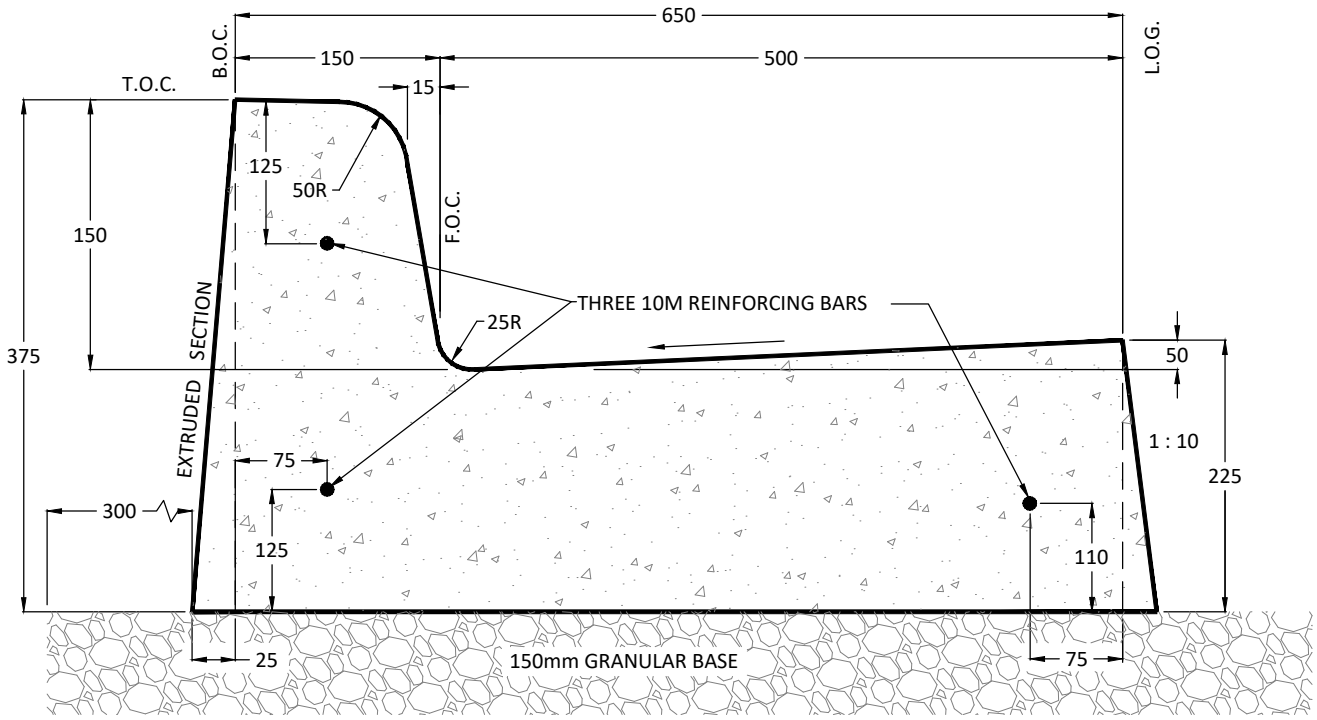
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. 2 :
Rev. 1: JULY 13, 2022

200MM STANDARD CURB AND 250MM GUTTER AND REVERSE GUTTER
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.12



150mm STANDARD CURB WITH 500mm GUTTER

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE STATED.
2. CONCRETE STRENGTH AND SPECIFICATIONS TO BE IN ACCORDANCE WITH GENERAL MUNICIPAL SERVICING STANDARDS.
3. REVERSE GUTTER TYPE CURB CANNOT BE USED UNLESS AUTHORIZED BY STURGEON COUNTY.

STURGEON COUNTY

General Municipal Servicing Standards

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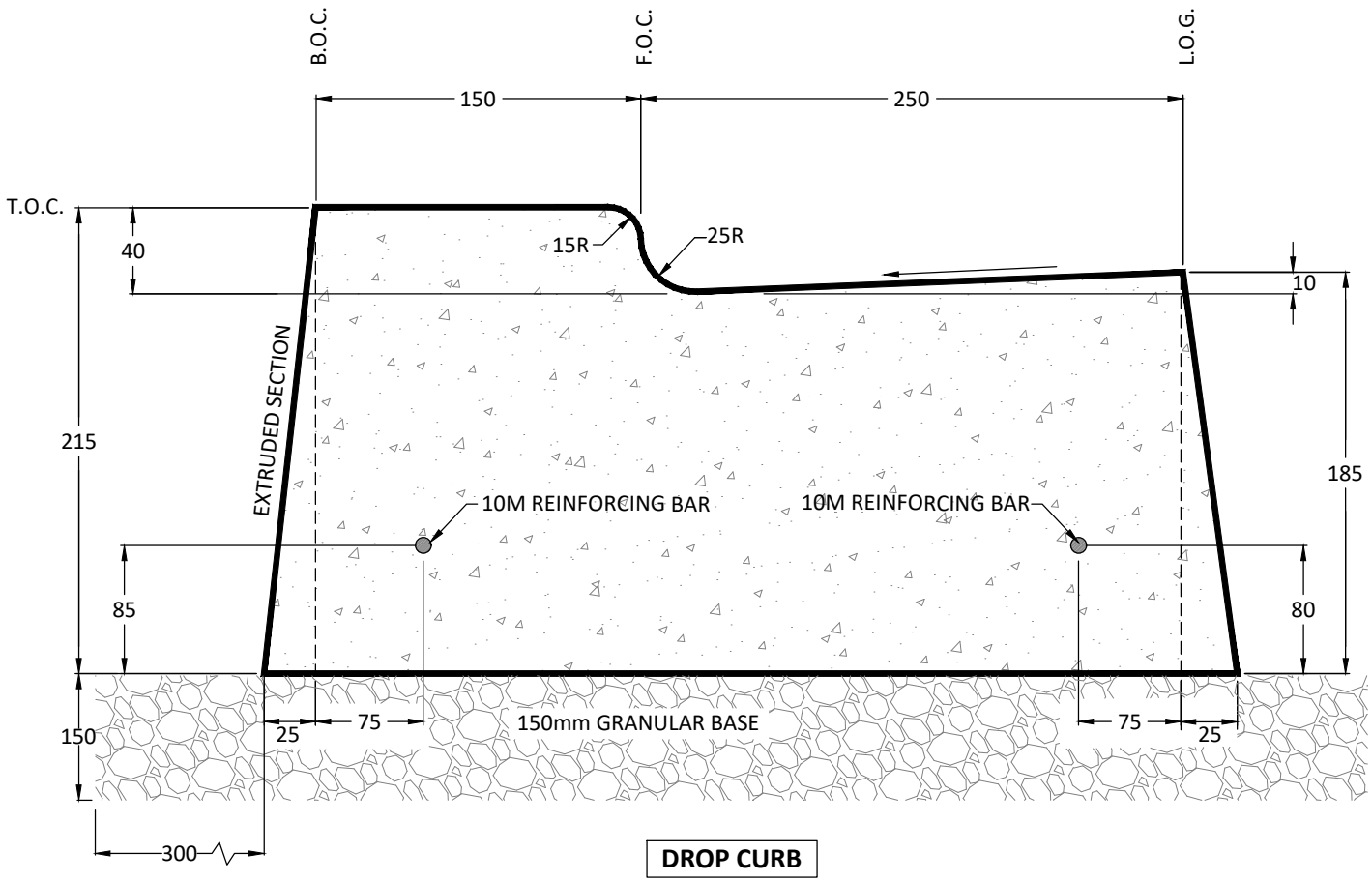
Rev. 1: JULY 13, 2022

150MM STANDARD CURB AND 500MM GUTTER
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.13



DROP CURB

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE STATED.
2. CONCRETE STRENGTH AND SPECIFICATIONS TO BE IN ACCORDANCE WITH GENERAL MUNICIPAL SERVICING STANDARDS.
3. REINFORCING BARS ARE REQUIRED AT CONSTRUCTION JOINTS AND FUTURE TIE-IN LOCATIONS.
4. REINFORCING BARS SHALL EXTEND INTO CONCRETE A MINIMUM OF 300mm.

STURGEON COUNTY

General Municipal Servicing Standards

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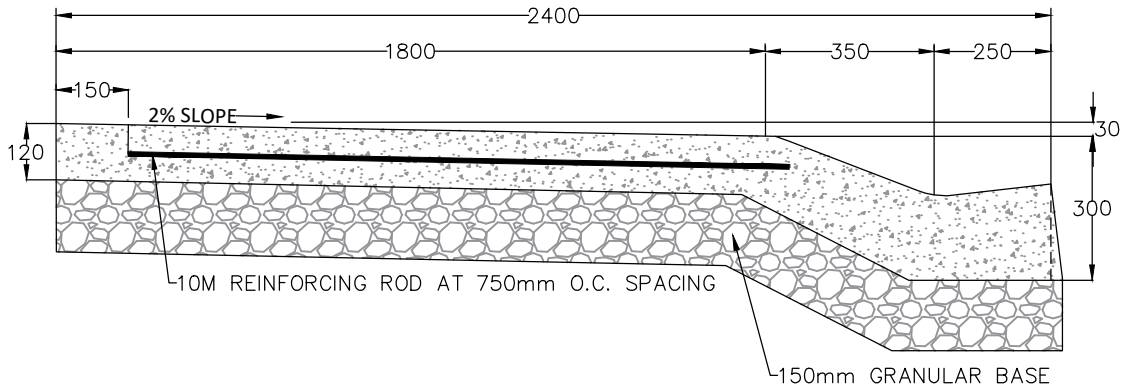
Rev. 1: JULY 13, 2022

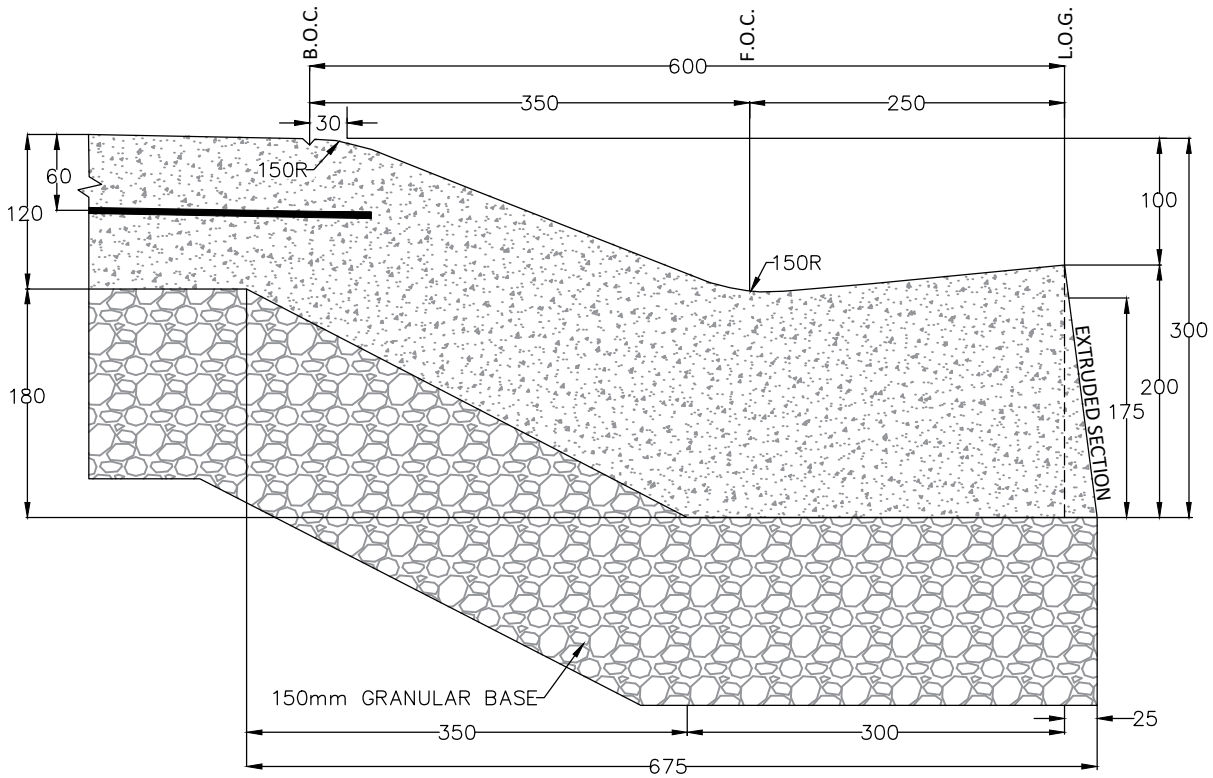
40MM DROP CURB AND 250MM GUTTER
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.14



TYPICAL SECTION



DETAIL

NOTES:

1. CONCRETE STRENGTH TO BE IN ACCORDANCE WITH STURGEON COUNTY GENERAL MUNICIPAL SERVICING STANDARDS.
2. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

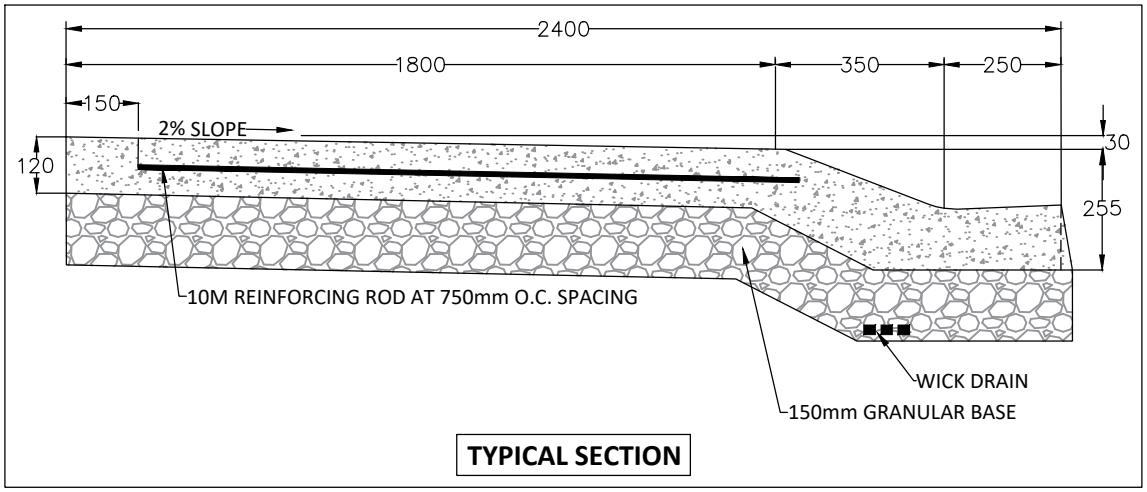
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: JULY 19, 2022

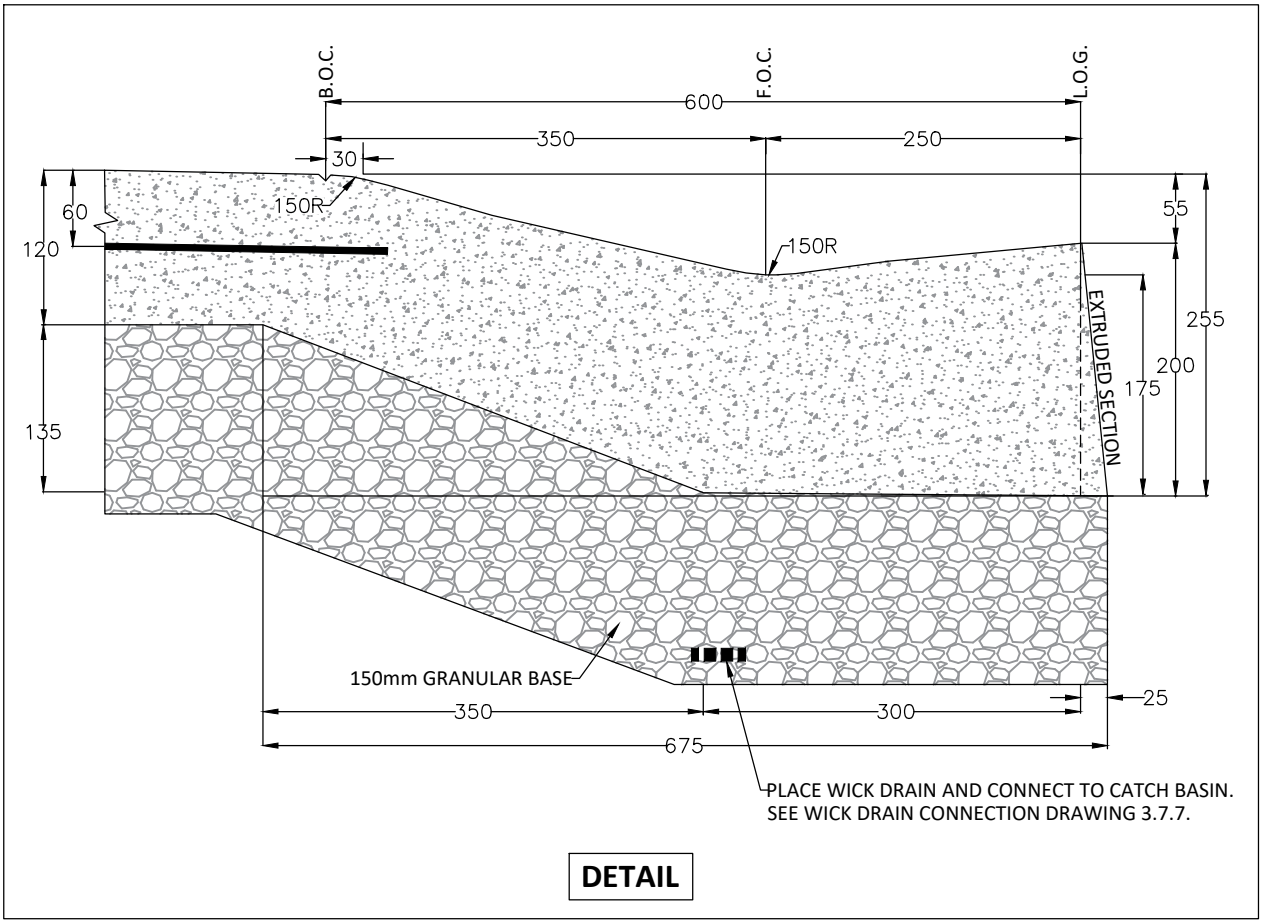
MONOLITHIC WALK WITH 125mm STANDARD MOUNTABLE CURB AND GUTTER
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.15



TYPICAL SECTION



DETAIL

NOTES:

1. CONCRETE STRENGTH TO BE IN ACCORDANCE WITH STURGEON COUNTY GENERAL MUNICIPAL SERVICING STANDARDS.
2. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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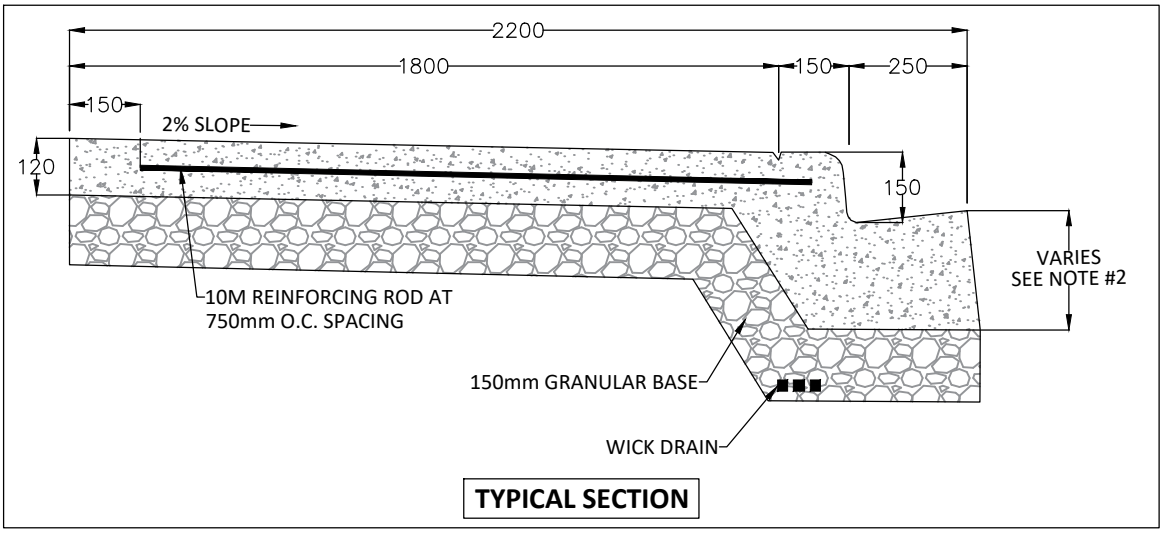
Rev. :
Rev. :
Rev. 1: AUGUST 25, 2022

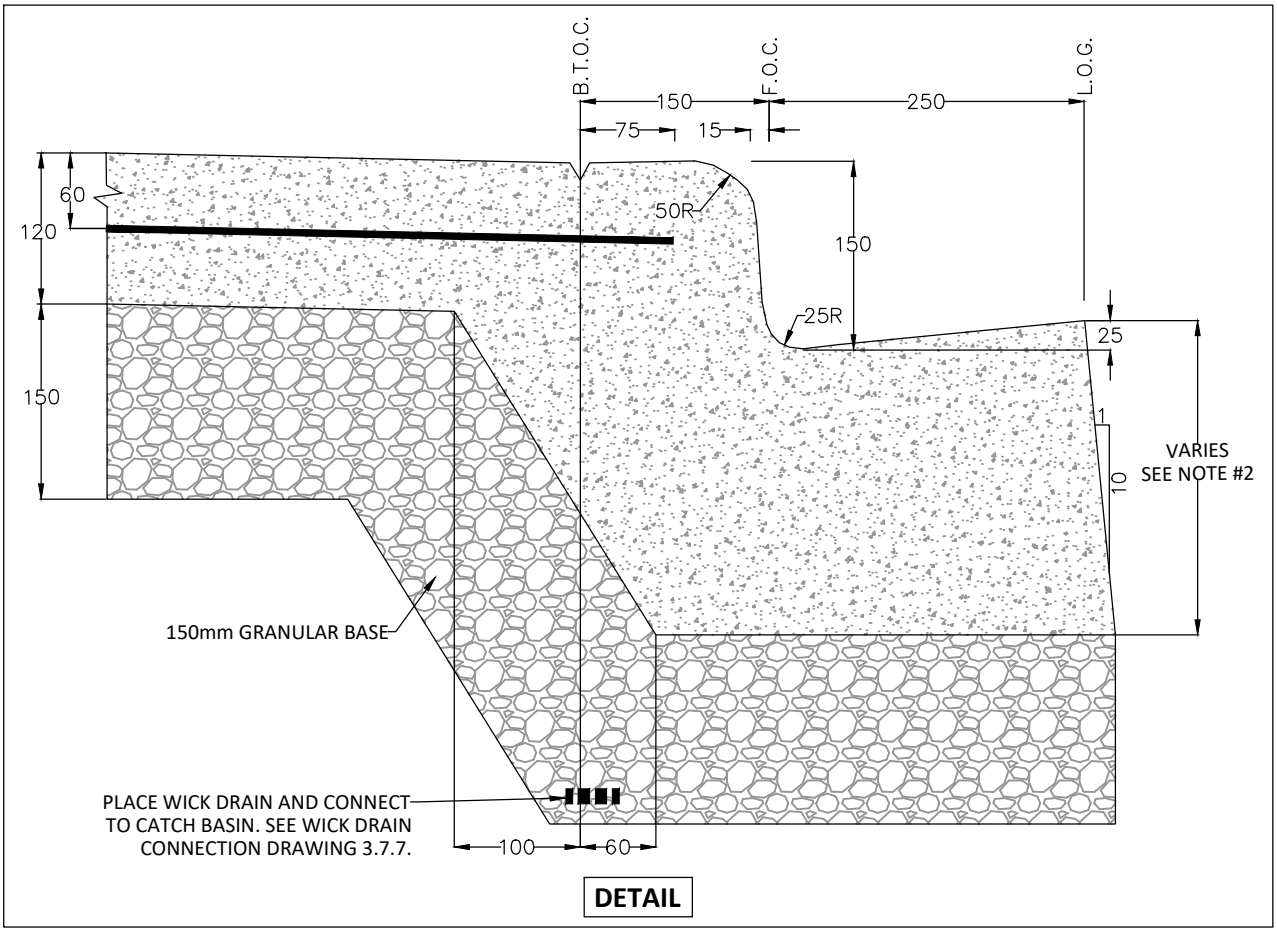
MONOLITHIC WALK WITH 80mm LOW PROFILE MOUNTABLE CURB AND GUTTER
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.16



TYPICAL SECTION



DETAIL

NOTES:

1. CONCRETE STRENGTH TO BE IN ACCORDANCE WITH STURGEON COUNTY GENERAL MUNICIPAL SERVICING STANDARDS.
2. GUTTER THICKNESS SHALL BE 200mm OR THICKNESS OF ADJOINING ASPHALT STRUCTURE, WHICHEVER IS GREATER.
3. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. :
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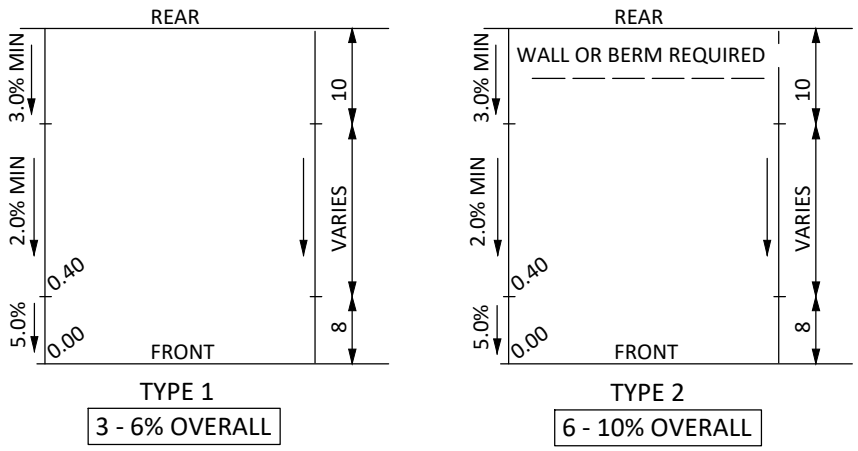
Rev. 1: JULY 26, 2022

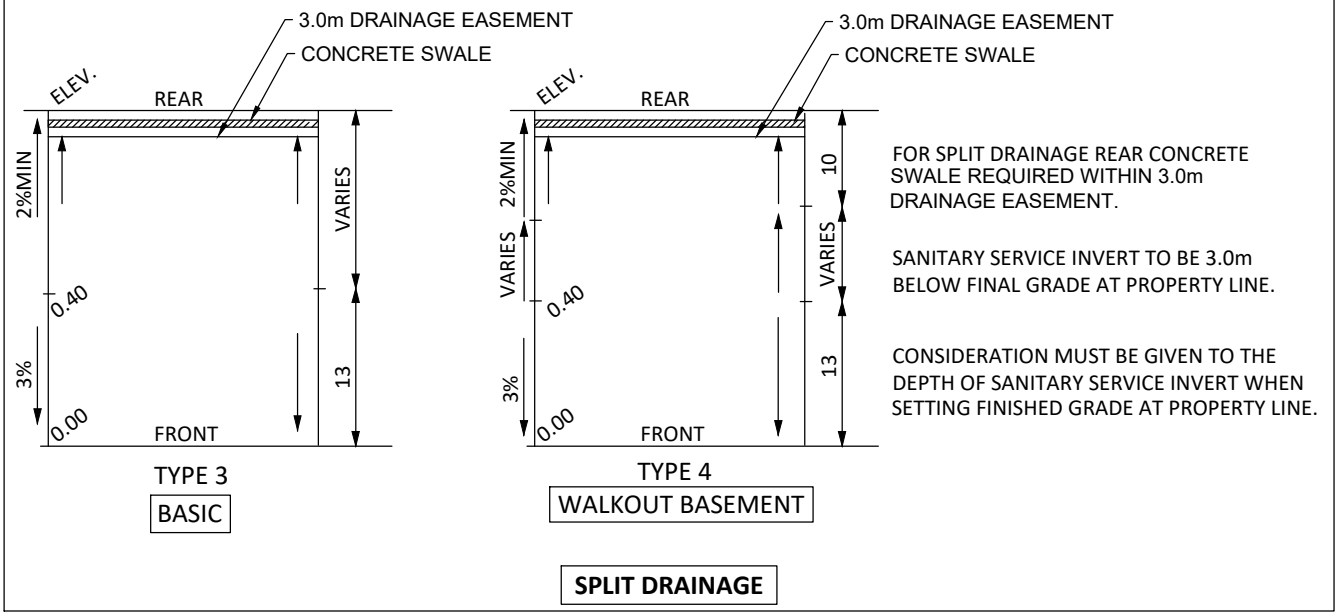
MONOLITHIC WALK WITH 150mm STANDARD CURB AND GUTTER
Scale: NTS

Sturgeon COUNTY

Drawing: 3.2.17



BACK TO FRONT DRAINAGE



SPLIT DRAINAGE

NOTES:

1. ALL RESIDENTIAL LOTS SHALL CONVEY SURFACE DRAINAGE TO PUBLIC PROPERTY OR DRAINAGE EASEMENTS WITHOUT ADVERSELY AFFECTING ADJACENT PRIVATE PROPERTY OWNERS.
2. LOT GRADING DESIGN SHALL BE PREFERENTIALLY BACK TO FRONT DRAINAGE (TYPES 1 AND 2).
3. SPLIT DRAINAGE LOT DESIGNS (TYPE 3 AND 4) REQUIRE A CONCRETE SWALE AND CONCRETE CHANNEL CAPACITY ANALYSIS BE COMPLETED BY THE DESIGN ENGINEER. THIS ANALYSIS SHALL DEMONSTRATE THE REQUIRED CAPACITY TO CONVEY THE 1:100 YEAR STORM EVEN FROM THE CONTRIBUTING AREA WITHIN THE CONCRETE CHANNEL.
4. DESIGN ELEVATIONS MUST BE SHOWN AT REAR PROPERTY LINE AND CONCRETE SWALE INVERT.
5. SUGGESTED HOUSE FLOOR ELEVATIONS ARE NOT REQUIRED ON THE OVERALL PLAN.
6. THE SURVEYOR SHALL SET THE HOUSE GRADES TO MEET BUILDING ELEVATION REQUIREMENTS.
7. FINAL ELEVATION OF FENCES MUST BE RECORDED AND FORWARDED TO THE COUNTY.

STURGEON COUNTY

General Municipal Servicing Standards

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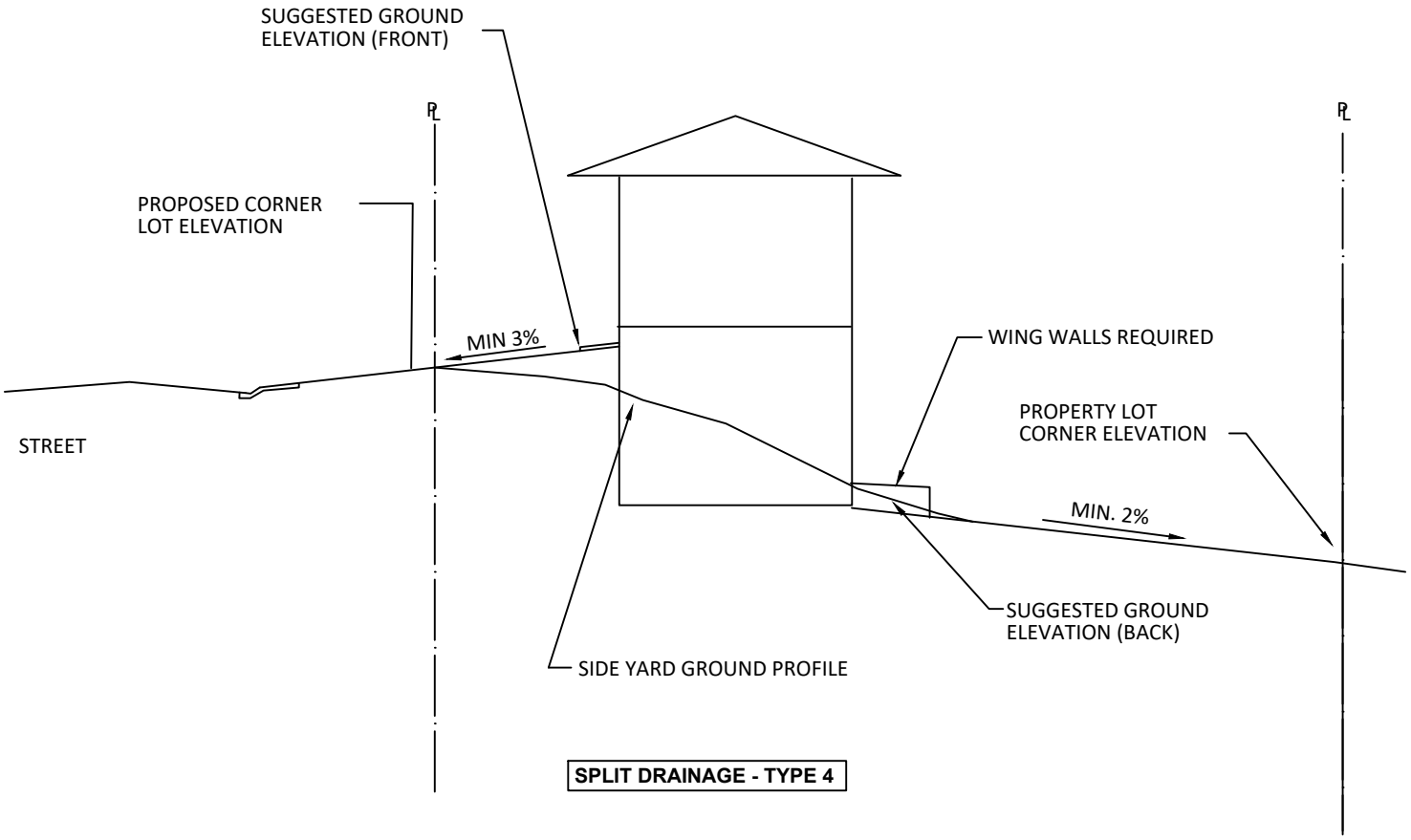
Rev. :
Rev. :
Rev. 1: AUGUST 9, 2022

TYPICAL LOT GRADING TYPES
Scale: NTS

Sturgeon COUNTY

Drawing: 3.3.0



STURGEON COUNTY

General Municipal Servicing Standards

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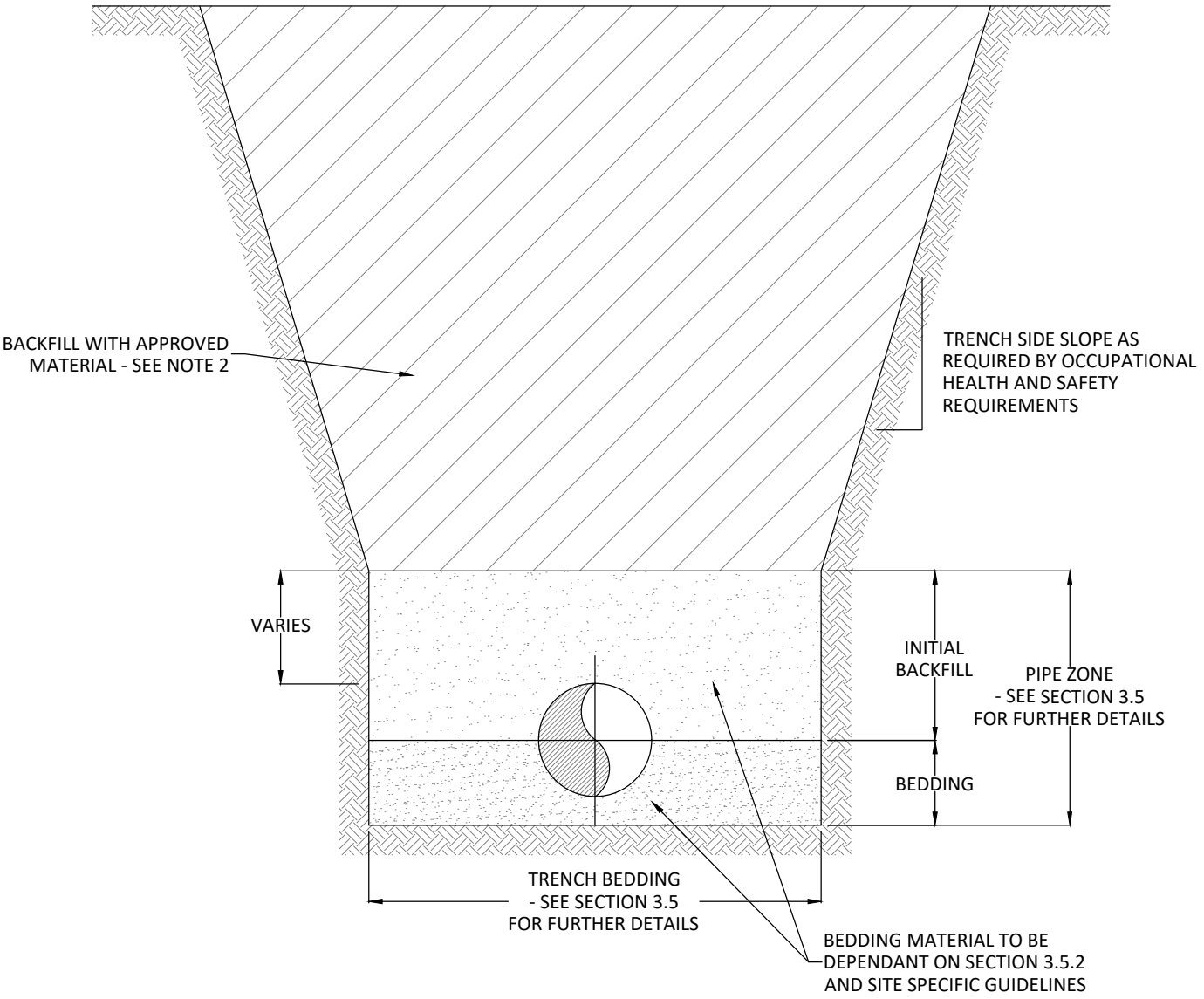
Rev. :
Rev. 2:
Rev. 1: JUNE 23, 2022

TYPICAL WALK-OUT BASEMENT LOT GRADING (TYPE 4)

Scale: NTS

Sturgeon COUNTY

Drawing: 3.3.1



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. MINIMUM COMPACTION IN TRENCHES ABOVE PIPE ZONE TO BE 98% S.P.D. UNDER PROPOSED ROADWAY, PARKING LOT, WALKWAY, ACCESS, OR OTHER STRUCTURES, 95% S.P.D. EVERYWHERE ELSE.

STURGEON COUNTY

General Municipal Servicing Standards

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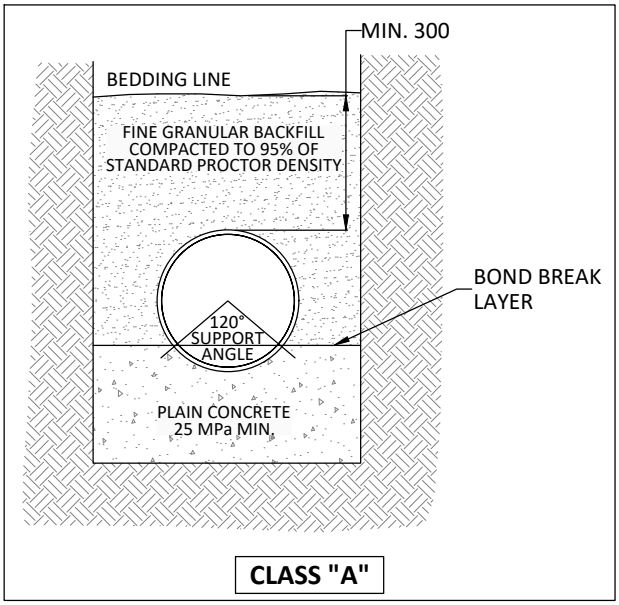
Rev. :
Rev. 2:
Rev. 1: JULY 13, 2022

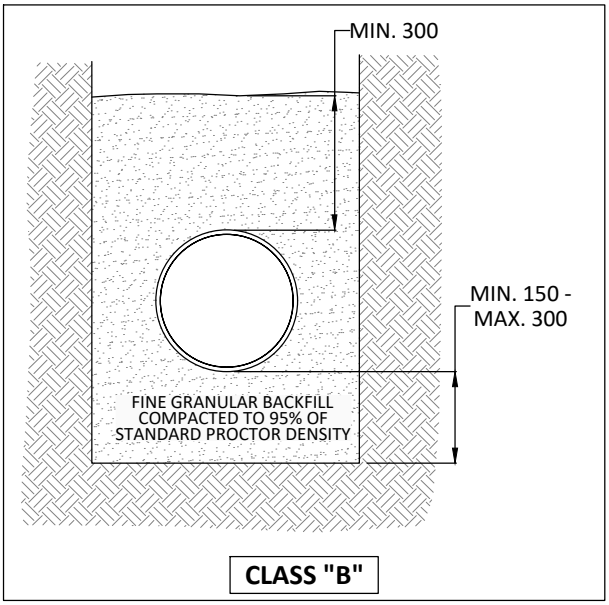
STANDARD TRENCH FOR CIRCULAR PIPE
Scale: NTS

Sturgeon COUNTY

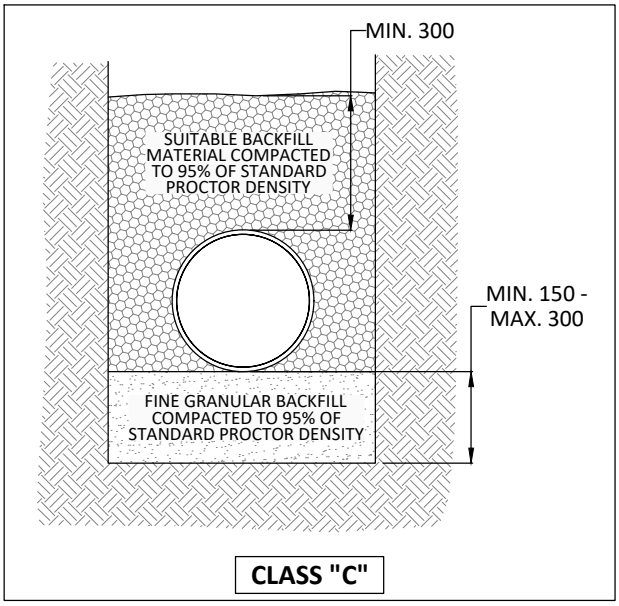
Drawing: 3.4.0



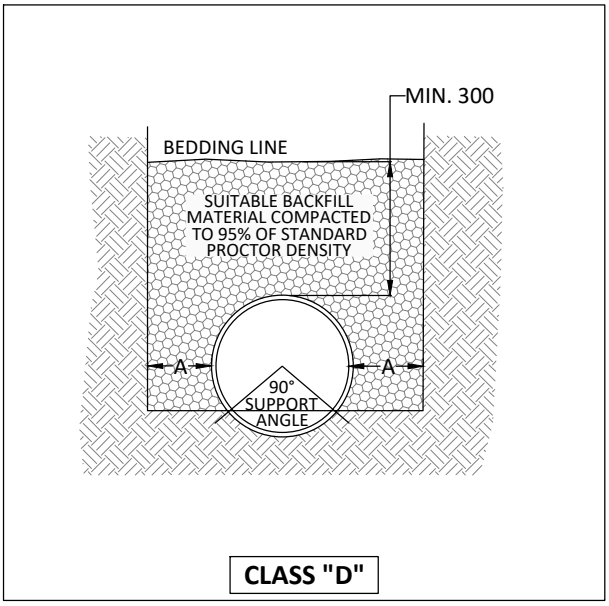
CLASS "A"



CLASS "B"



CLASS "C"



CLASS "D"

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. ALL MATERIAL TO BE PLACED AND COMPACTED IN 150 mm LAYERS.
3. WHERE INSTRUCTED OR AS SHOWN ON DRAWINGS, REPLACE FINE GRANULAR MATERIAL WITH COARSE GRANULAR MATERIAL.
4. TRENCH WALL CLEARANCE: 200 < A < 300.
5. IF A > 300 BACKFILL MUST BE COMPACTED TO 100% OF STANDARD PROCTOR DENSITY.
6. APPLICABLE ONLY TO SINGLE PIPE INSTALLATIONS IN TRENCHES EXCAVATED IN UNDISTURBED GROUND.
7. UNLESS OTHERWISE INSTRUCTED, USE CLASS "B" BEDDING WITH FINE GRANULAR MATERIAL.
8. CONCRETE STRENGTH AND SPECIFICATIONS TO BE IN ACCORDANCE WITH GENERAL MUNICIPAL SERVICING STANDARDS.

STURGEON COUNTY

General Municipal Servicing Standards

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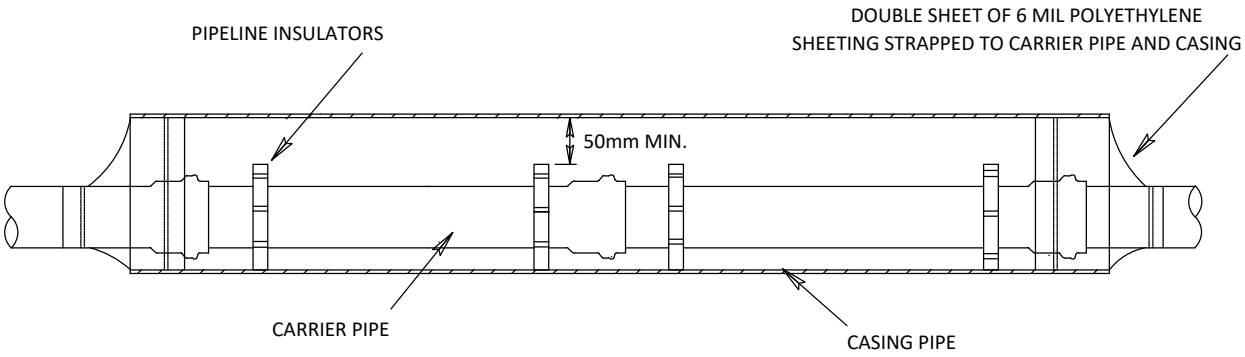
Rev. :
Rev. 2:
Rev. 1: JULY 13, 2022

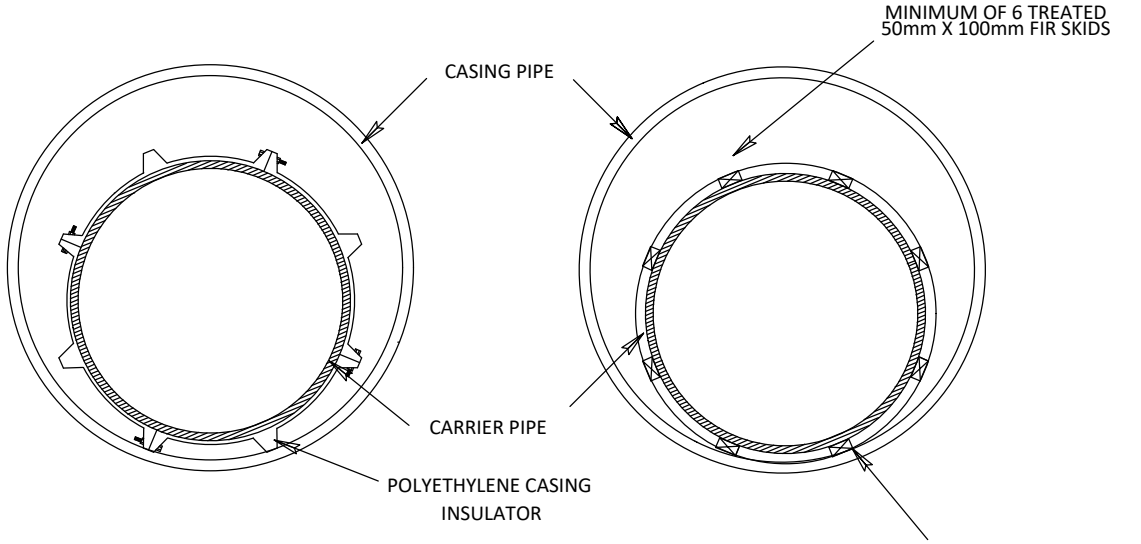
STANDARD TRENCH BEDDING FOR CIRCULAR PIPE
Scale: NTS

Sturgeon COUNTY

Drawing: 3.4.1



ELAVATION



SECTION

NOTES:
1. CASING MATERIAL AND THICKNESS TO BE AS SPECIFIED ON CONSTRUCTION DRAWINGS.
2. INSULATOR SPACING TO BE DETERMINED BY THE MATERIAL AND JOINT TYPE OF CARRIER PIPE BEING USED.
3. CASING COATING AND CATHODIC PROTECTION REQUIREMENTS TO BE AS SPECIFIED ON CONSTRUCTION DRAWINGS.
4. ALL DIMENSIONS IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. 1: JULY 7, 2022

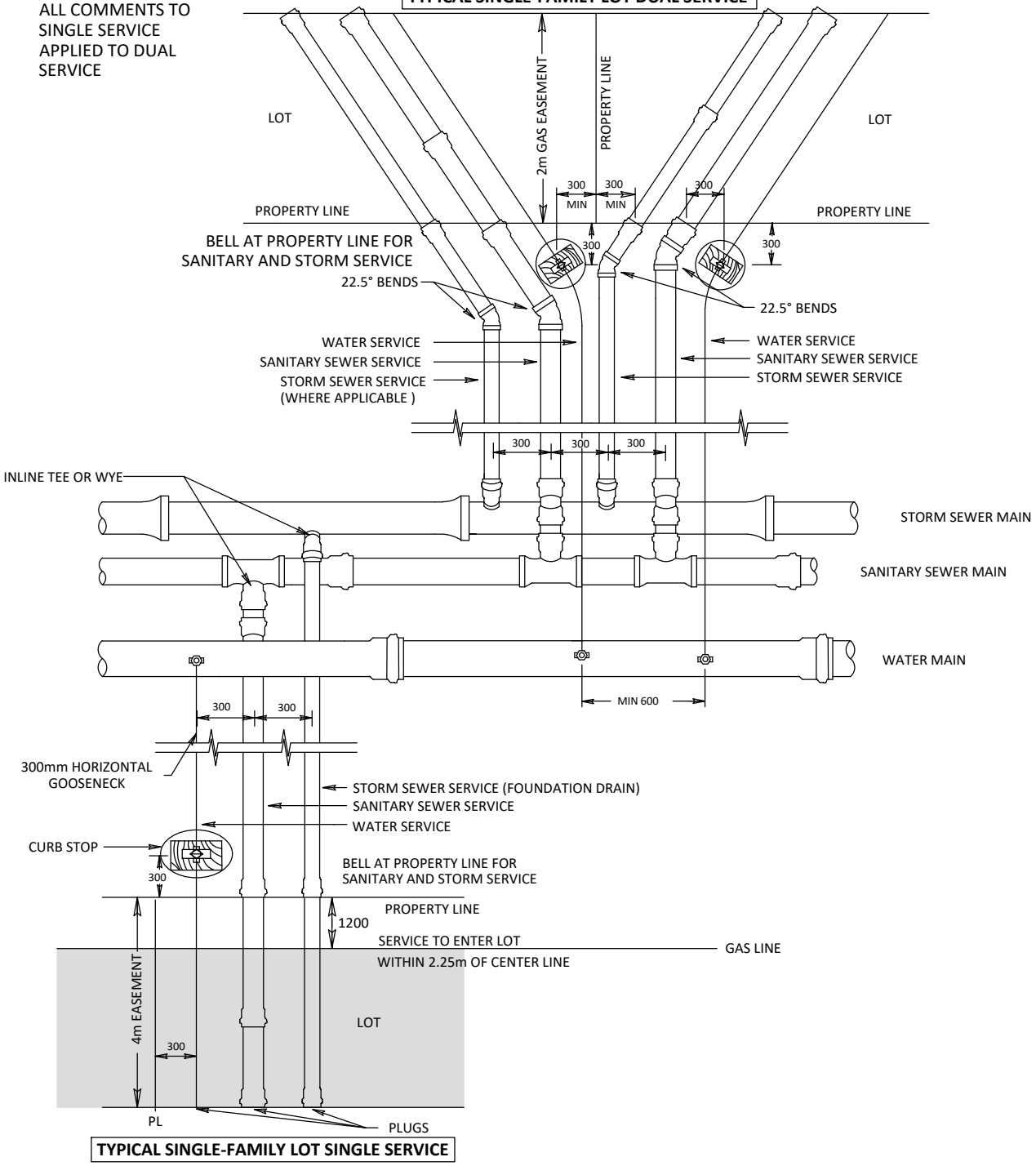
TYPICAL CASING PIPE WITH INSULATOR
Scale: NTS

Sturgeon COUNTY

Drawing: 3.4.2

ALL COMMENTS TO SINGLE SERVICE APPLIED TO DUAL SERVICE

TYPICAL SINGLE-FAMILY LOT DUAL SERVICE



TYPICAL SINGLE-FAMILY LOT SINGLE SERVICE

NOTES:

1. WATER AND SEWER SERVICES MAY BE EXTENDED TO EDGE OF 4.0m GAS EASEMENT.
2. THE COUNTY ACCEPTS NO RESPONSIBILITY FOR THE CONSTRUCTION OR MAINTENANCE OF SERVICES INSTALLED WITHIN THE EASEMENT.
3. MARK ENDS OF SERVICES AT EDGE OF GAS EASMENT WITH A 50mm X 100mm X 750mm STAKE PROTRUDING 450mm ABOVE GROUND AND PAINTED BLUE. MARK THE CURB CONTROL VALVE WITH A SIMILAR STAKE PAINTED RED.
4. THE END OF WATER SERVICE PIPING SHOULD NOT BE CRIMPED CLOSED, PERMEABLE FILTER CLOTH MAY BE USED TO PREVENT INTRUSION OF DEBRIS AND TO ALLOW TESTING FLOW OF CURBSTOP.
5. ALL DIMENSIONS IN MILLIMETRES (mm) UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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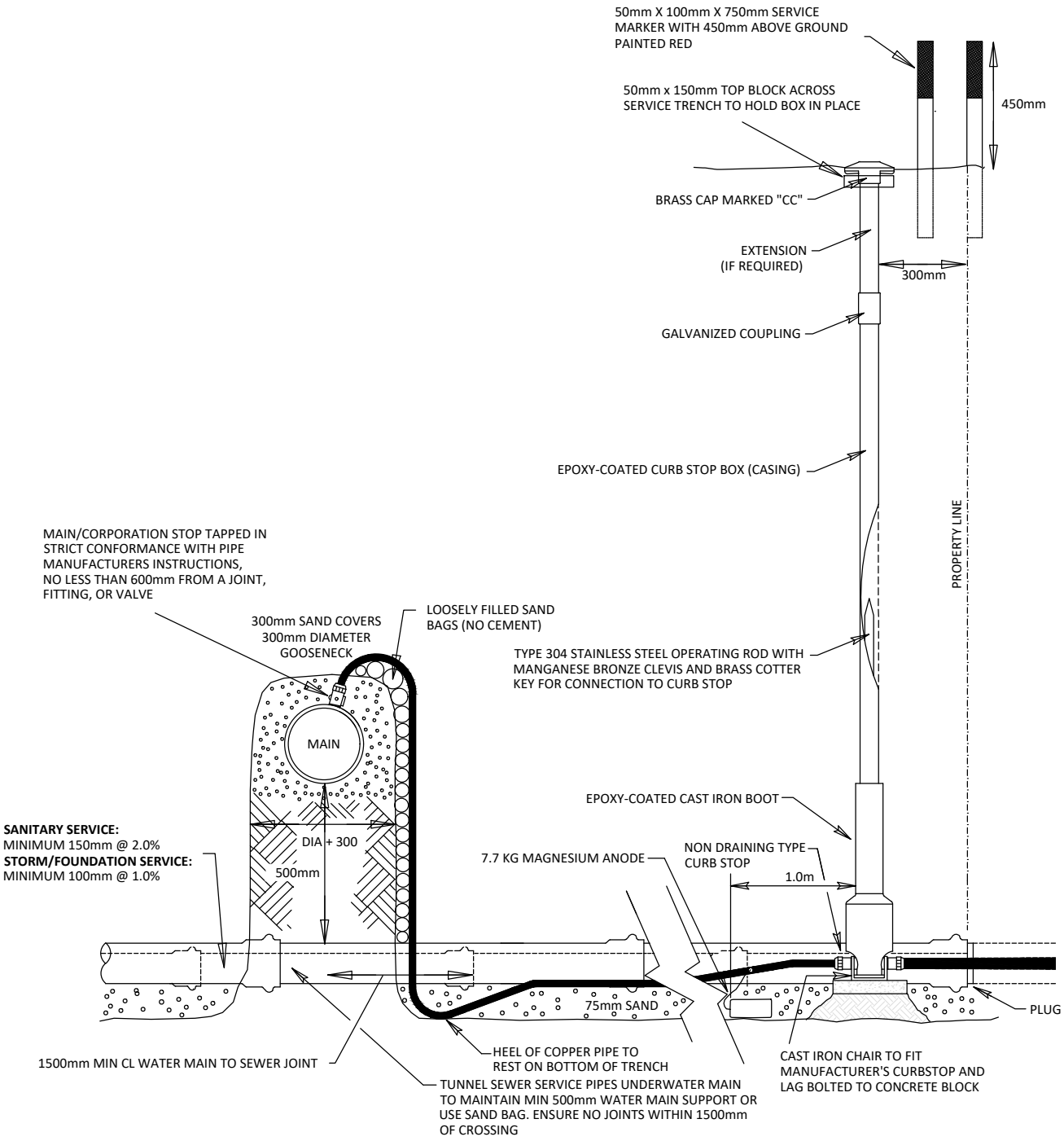
Rev. 1: JUNE 24, 2022

TYPICAL SINGLE FAMILY LOT RESIDENTIAL SERVICES (SINGLE AND DUAL)
Scale: NTS

Sturgeon COUNTY

Drawing: 3.4.3



NOTES:

1. AN ADDITIONAL GOOSENECK IS REQUIRED AT EACH SEWER CROSSING.
2. MAINSTOP TAPS SHALL BE A MINIMUM OF 600mm APART.
3. COPPER SERVICE PIPE SHALL BE ONE CONTINUOUS PIECE, SHOULD LENGTH EXCEED 30m, A DOUBLE UNION WILL BE ALLOWED. SIZE OF COPPER SERVICE MUST BE 25mm MIN. IF LENGTH OF SERVICE EXCEEDS 30m.
4. INVERT ELEV. OF WATER SERVICE PIPES AT P/L SHALL BE 2.75m BELOW ESTABLISHED FINISHED GRADE.
5. WHERE APPROVED BY STURGEON COUNTY COVER OVER WATER SERVICE LESS THAN 2.75m SERVICE IS TO BE INSULATED.
6. MAGNESIUM ANODE SHALL BE ATTACHED TO COPPER PIPE 1.0m FROM CC WITH AN ALL BRONZE (INCLUDING NUTS AND BOLTS) CLAMP OR APPROVED EQUIVALENT.
7. MAGNESIUM ANODE TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR MIN. 50mm OF NATIVE CLAY SURROUNDING ANODE.
8. CI PIPE: MAINSTOPS TAPPED AT CROWN TO 30° OF PIPE WITH 1-3 THREADS SHOWING.
9. PVC PIPE: MAINSTOPS TAPPED ARE TO BE STAGGERED FROM CROWN TO 30° OF PIPE WITH 1-3 THREADS SHOWING, TEFLON TAPE TO BE USED ON THREADS OF MAINSTOP, NOTE THAT 40mm AND 50mm TAPS REQUIRE THE USE OF A SERVICE SADDLE.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. :
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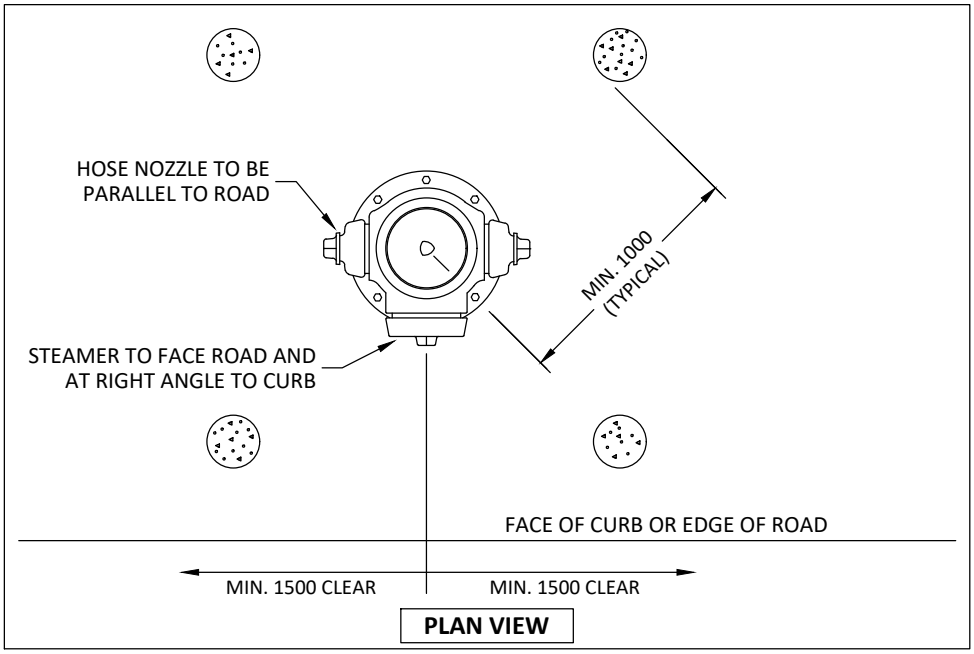
Rev. 1: JULY 27, 2022

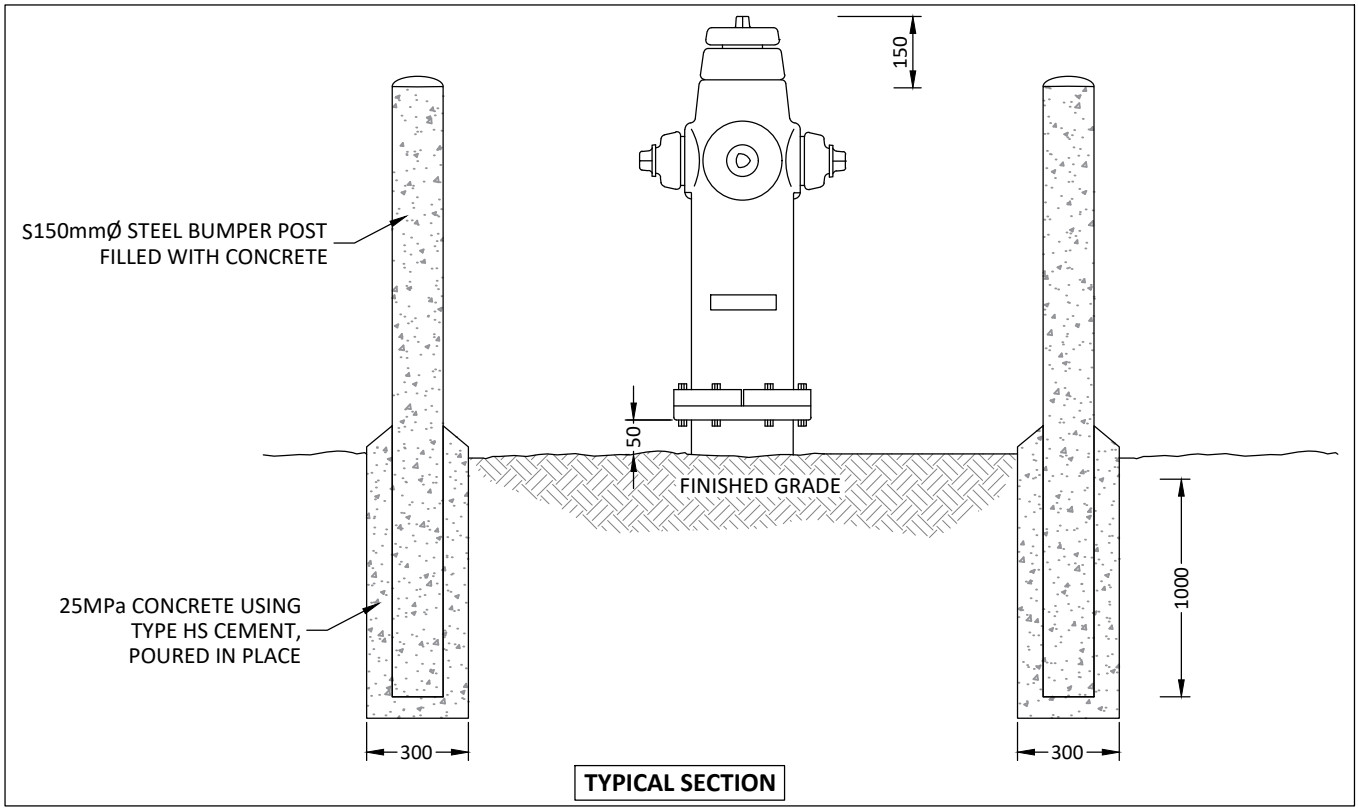
TYPICAL SINGLE FAMILY LOT RESIDENTIAL SERVICE PROFILE

Scale: NTS

Sturgeon COUNTY

Drawing: 3.4.4





NOTES:

1. TO BE INSTALLED ONLY IN SITUATIONS WHERE THERE IS A CONCERN OF DAMAGE FROM COLLISION OR OTHER IMPACT.
2. BOLLARD PLACEMENT MUST NOT IMPEDE HYDRANT OPERATION.
3. ADJUST NUMBER OF POSTS AND LOCATION ACCORDING TO SITE CONDITIONS.
4. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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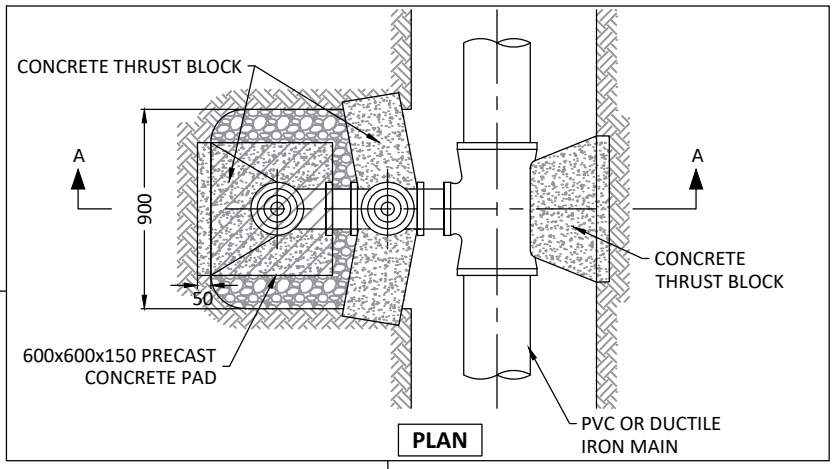
Rev. 1: JUNE 23, 2022

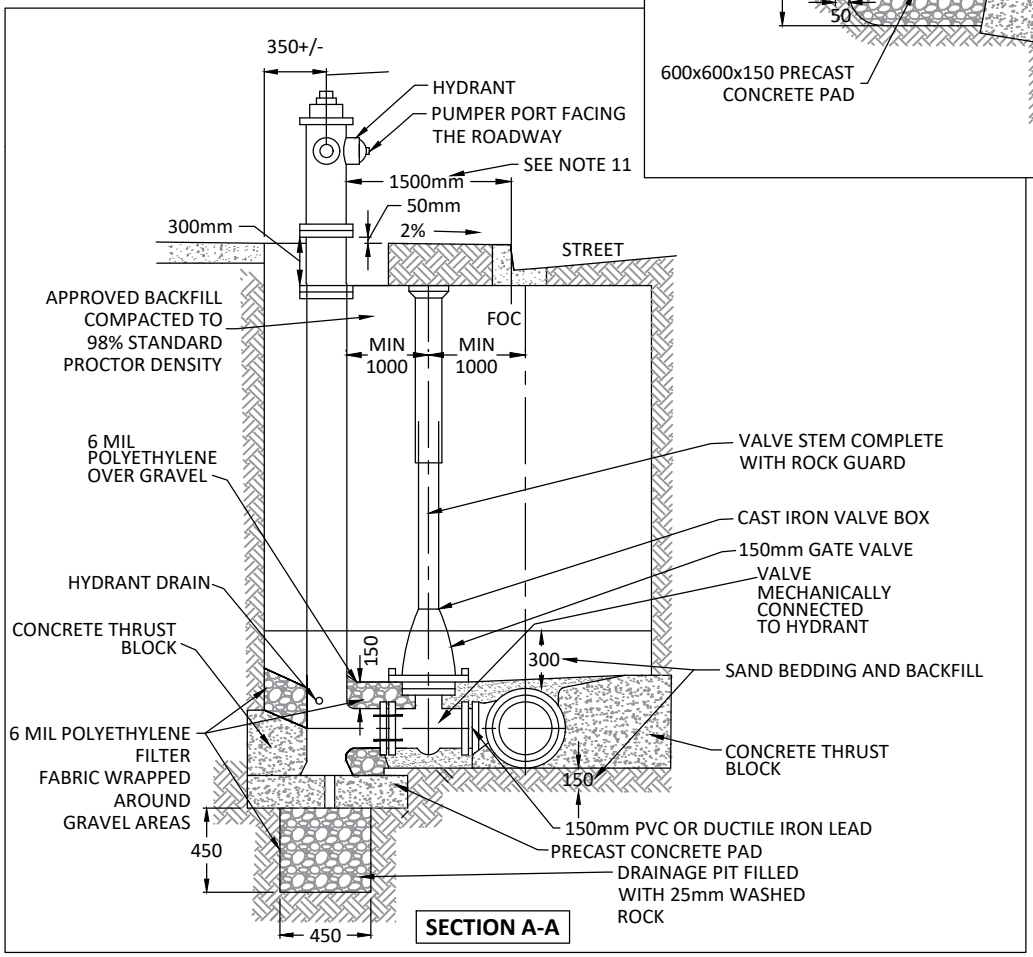
TYPICAL HYDRANT BOLLARD LAYOUT

Scale: NTS

Sturgeon COUNTY

Drawing: 3.5.0





NOTES:

1. THE HYDRANT SHALL BE PLACED ON A PRECAST 600 x 600mm x 150 REINFORCED SULFATE-RESISTANT CONCRETE PAD OR A PRECAST 600 x 600 x 300 UNREINFORCED CONCRETE PAD.
2. A PIT FOR DRAINAGE 900 WIDE x 450mm LONG x 450 DEEP SHALL BE EXCAVATED AT THE FOOT OF THE HYDRANT AND FILLED WITH 25mmØ WASHED ROCK.
3. THE SPACE AROUND THE BARREL AND 150mm ABOVE THE HYDRANT DRAIN SHALL BE FILLED WITH 25mm dia. WASHED ROCK.
4. 6MiL POLYETHYLENE SHALL BE OVER THE TOP OF AND WRAPPED AROUND THE WASHED ROCK TO PREVENT THE VOIDS FROM BEING FILLED WITH CLAY.
5. BOTTOM OF HYDRANT FLANGE TO BE 50mm ABOVE TOP OF SIDEWALK FOR MAINTENANCE SERVICE.
6. IN HIGH WATER TABLE AREAS ENSURE HYDRANT COMES WITH DRAIN PLUG AND PLUG IS INSTALLED.
7. IF DRAIN PLUG IS INSTALLED; MARK HYDRANT WITH A 50mm x 50mm BLUE SQUARE ON HYDRANT BODY, VISIBLE FROM ROAD.
8. ALL DIMENSIONS ARE IN MILLIMETERS (mm), UNLESS OTHERWISE NOTED.
9. HYDRANTS MUST BE PLACED A MINIMUM 4m FROM TREES AND 3m FROM STREET FURNITURE
10. HYDRANTS SHALL BE LOCATED 500mm FROM BACK OF WALK WHEN A MONOWALK IS PRESENT
11. INCLUDE BOLLARDS FOR PROTECTION WHEN REQUIRED. SEE DRAWING 3.5.0 FOR TYPICAL HYDRANT BOLLARD LAYOUT
12. THRUST BLOCKS SHALL BE POURED AGAINST GROUND WITH A MINIMUM SOIL BEARING PRESSURE OF 72kPa. IF BEARING PRESSURE IS INADEQUATE, SPECIAL DESIGN IS REQUIRED.
13. REFER TO DRAWINGS 3.5.9 AND 3.5.10 FOR THRUST BLOCK GEOMETRY.
14. DIAGRAM NOT MEANT TO DEPICT TRUE LOCATION OF WATER MAIN, TO BE DEPENDENT ON SPECIFIC CROSS SECTION ALIGNMENT.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. :
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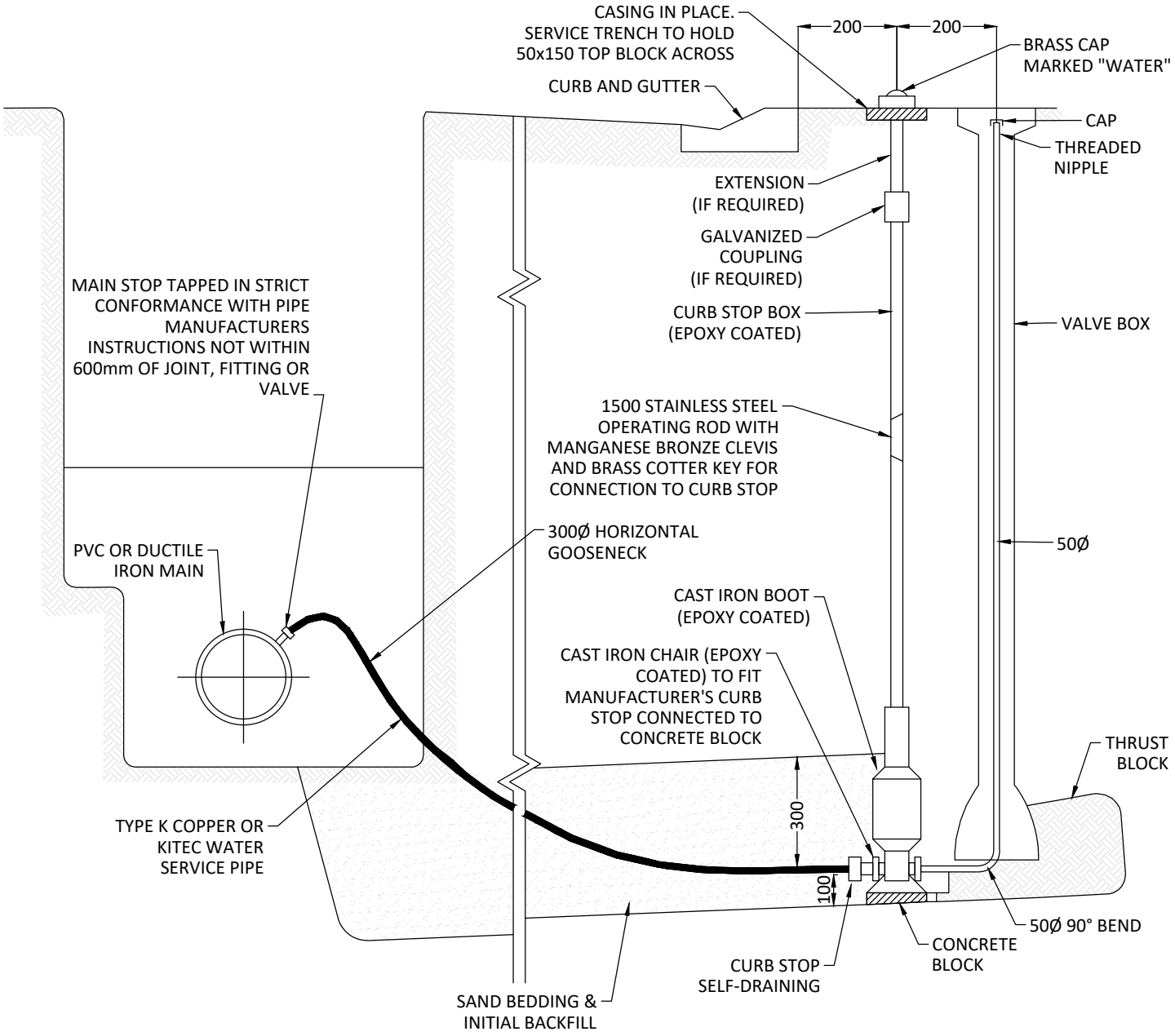
Rev. 1: NOVEMBER 17, 2022

TYPICAL HYDRANT CONNECTION AND VALVE PLACEMENT

Scale: NTS

Sturgeon COUNTY

Drawing: 3.5.1



NOTES:

1. COPPER LINE SHALL BE ONE CONTINUOUS PIECE, UNLESS LENGTH EXCEEDS 30m MIN. AND ONLY THEN WILL A DOUBLE UNION BE ALLOWED.
2. INVERT ELEVATION SHALL BE 2.75m BELOW ESTABLISHED FINISHED GRADE.
3. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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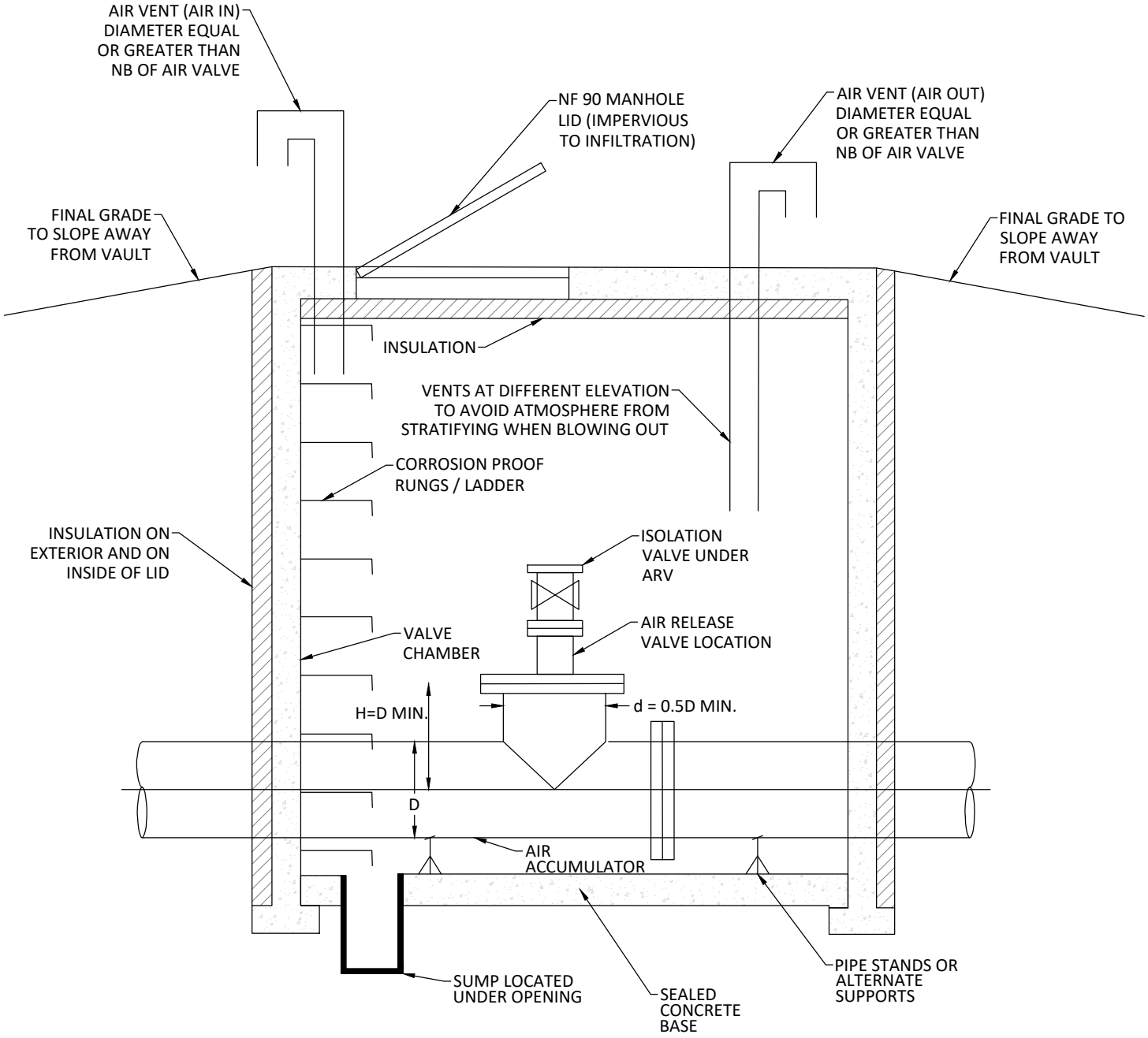
Rev. :
Rev. 1: JULY 11, 2022

TYPICAL BLOW OFF VALVE

Scale: NTS

Sturgeon COUNTY

Drawing: 3.5.2



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. ARV VAULT SHOULD BE WATER TIGHT AND IMPERVIOUS TO INFILTRATION.
3. SAFETY STEPS TO BE SPACED AT 400 MAX DISTANCE. FIRST STEP TO BE 150 MAX BELOW FRAME, LAST STEP TO BE 300 MAX ABOVE BOTTOM.

STURGEON COUNTY

General Municipal Servicing Standards

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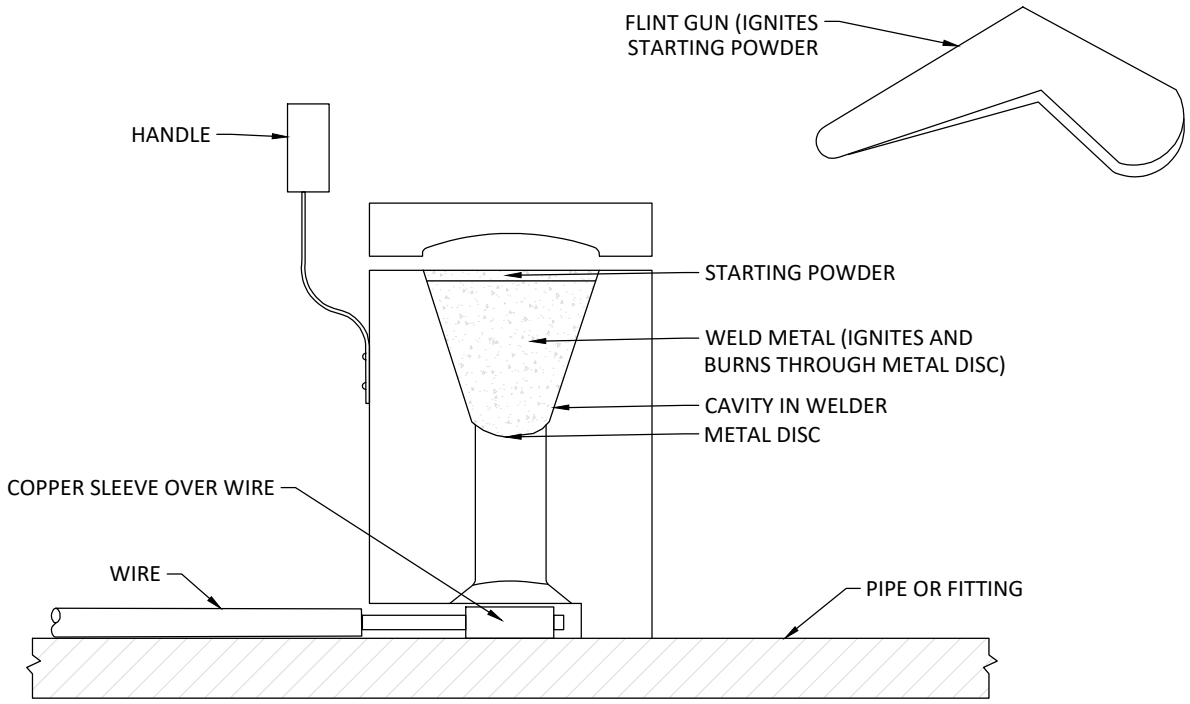
Rev. 1: JULY 11, 2022

TYPICAL AIR RELEASE VALVE AND VALVE CHAMBER

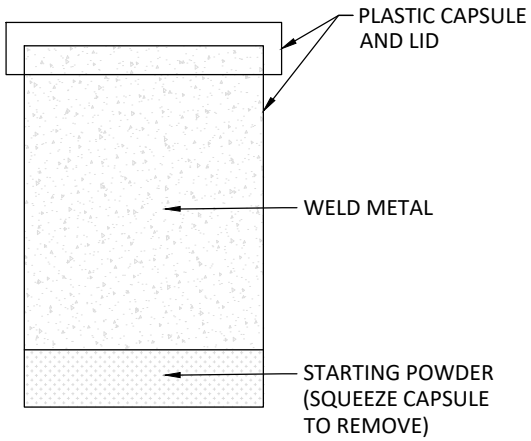
Scale: NTS

Sturgeon COUNTY

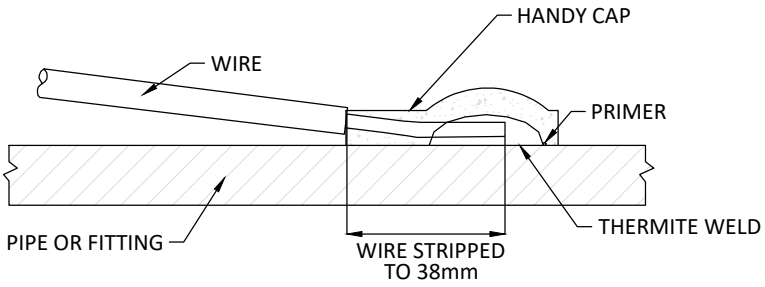
Drawing: 3.5.3



CADWELD



WELD METAL CAPSULE



FINISHED WELD

NOTES:

1. CADWELD TO BE PERFORMED AS PER MANUFACTURERS SPECIFICATIONS.

STURGEON COUNTY

General Municipal Servicing Standards

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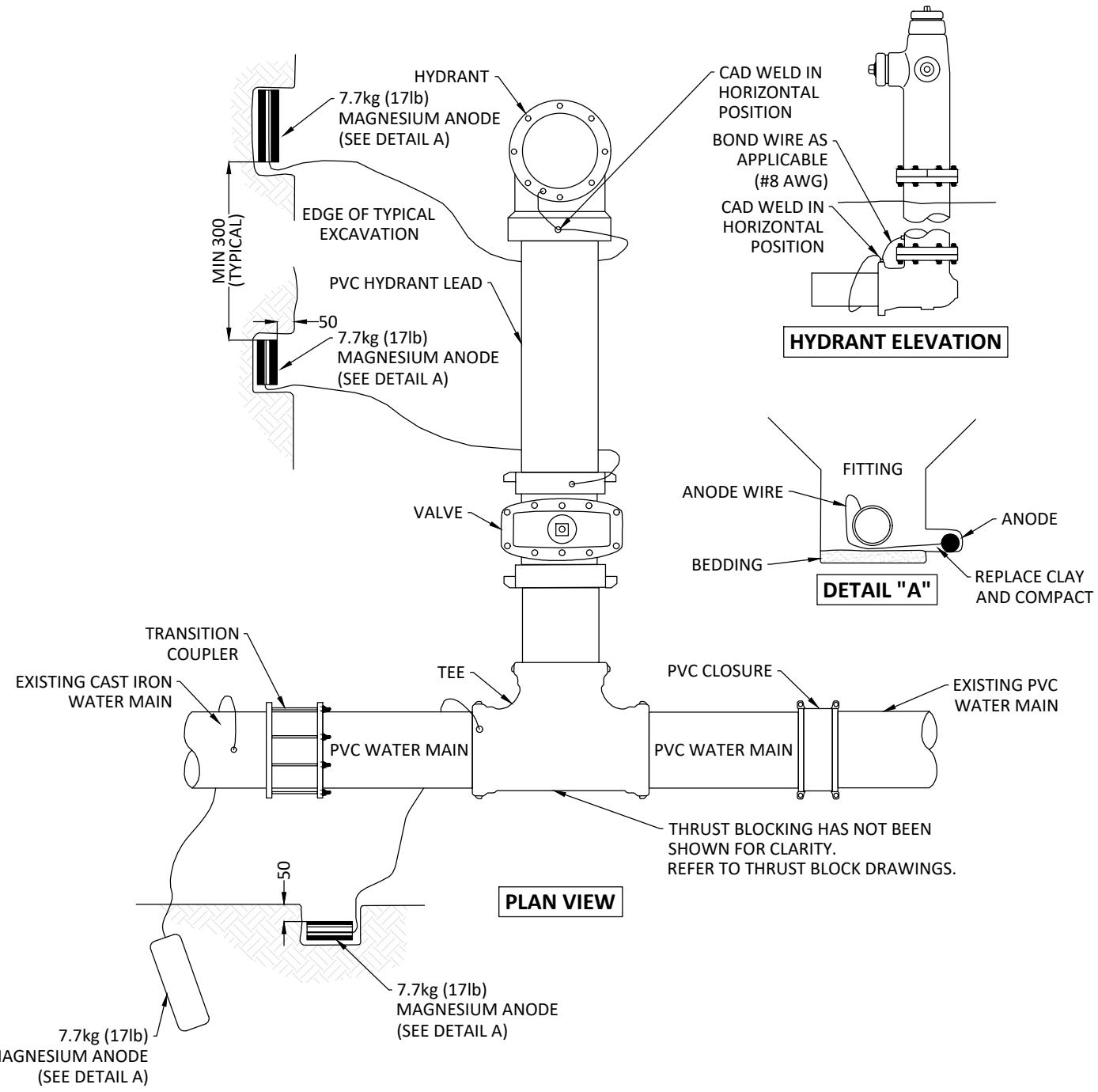
Rev. 1: JULY 11, 2022

ANODE INSTALLATION USING EXOTHERMIC WELDING
Scale: NTS

Sturgeon COUNTY

Drawing: 3.5.4



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS OTHERWISE SPECIFIED.
2. MINIMUM DISTANCE FROM ANODE TO PIPE, FITTING, VALVE OR HYDRANT IS 500mm.
3. INSTALL ANODE AT APPROXIMATE PIPE DEPTH IN NATIVE SOIL.
4. ALL ANODES ON FITTINGS AND VALVES ARE 7.7kg (17lb) MAGNESIUM ANODES.
5. ALL ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE.
6. ANODES TO BE AT LEASE 500mm CLEAR OF THRUST BLOCK.

STURGEON COUNTY

General Municipal Servicing Standards

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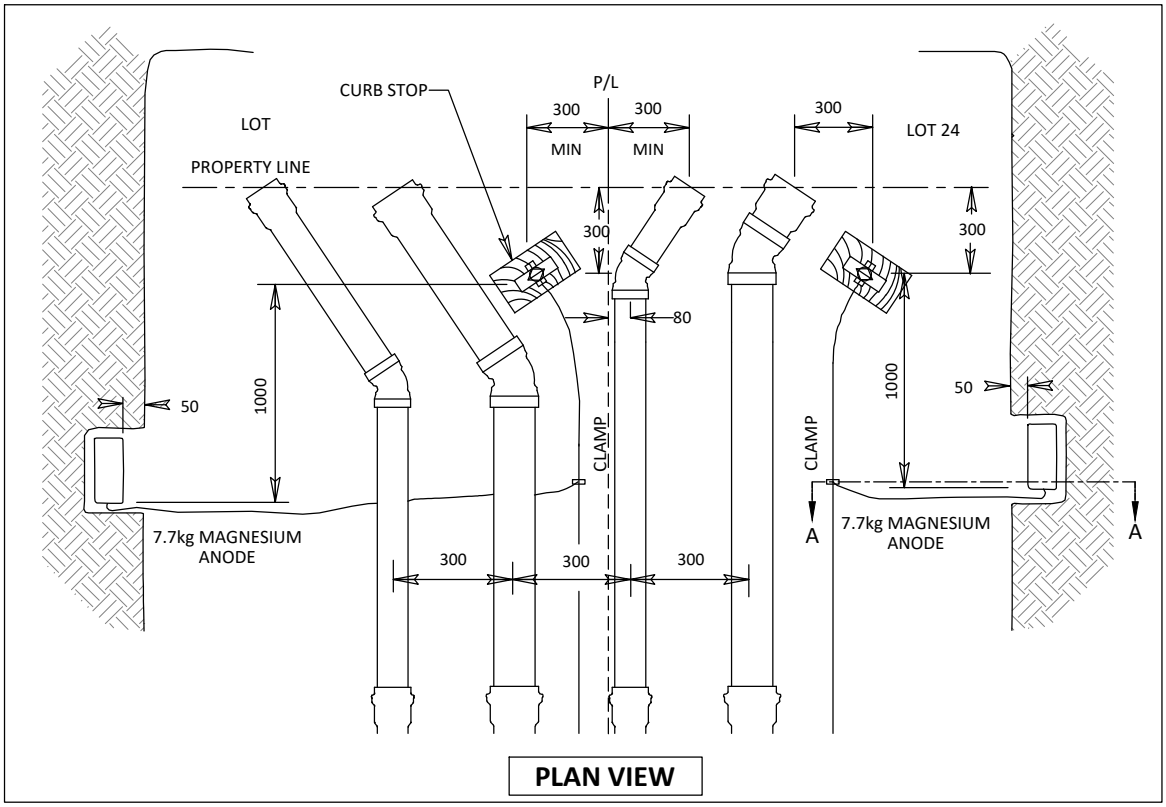
Rev. :
Rev. :
Rev. 1: SEPTEMBER 01, 2022

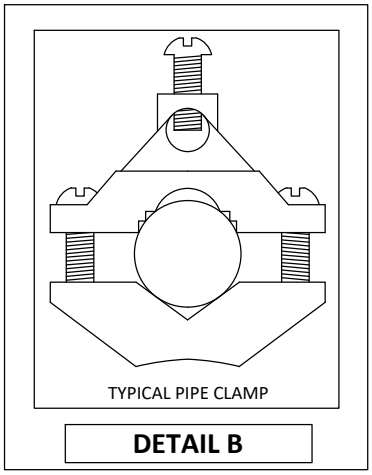
TYPICAL ANODE INSTALLATION AT HYDRANT AND CONNECTIONS TO CAST IRON MAINS
Scale: NTS

Sturgeon COUNTY

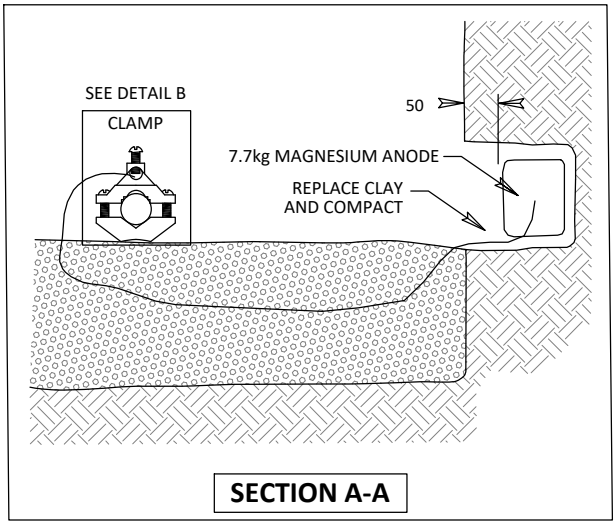
Drawing: 3.5.5



PLAN VIEW



DETAIL B



SECTION A-A

NOTES:
1. PIPE CLAMP TO BE ALL BRASS OR APPROVED EQUIVALENT.
2. ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50mm OF NATIVE CLAY COMPACTED COMPLETELY AROUND ANODES.
3. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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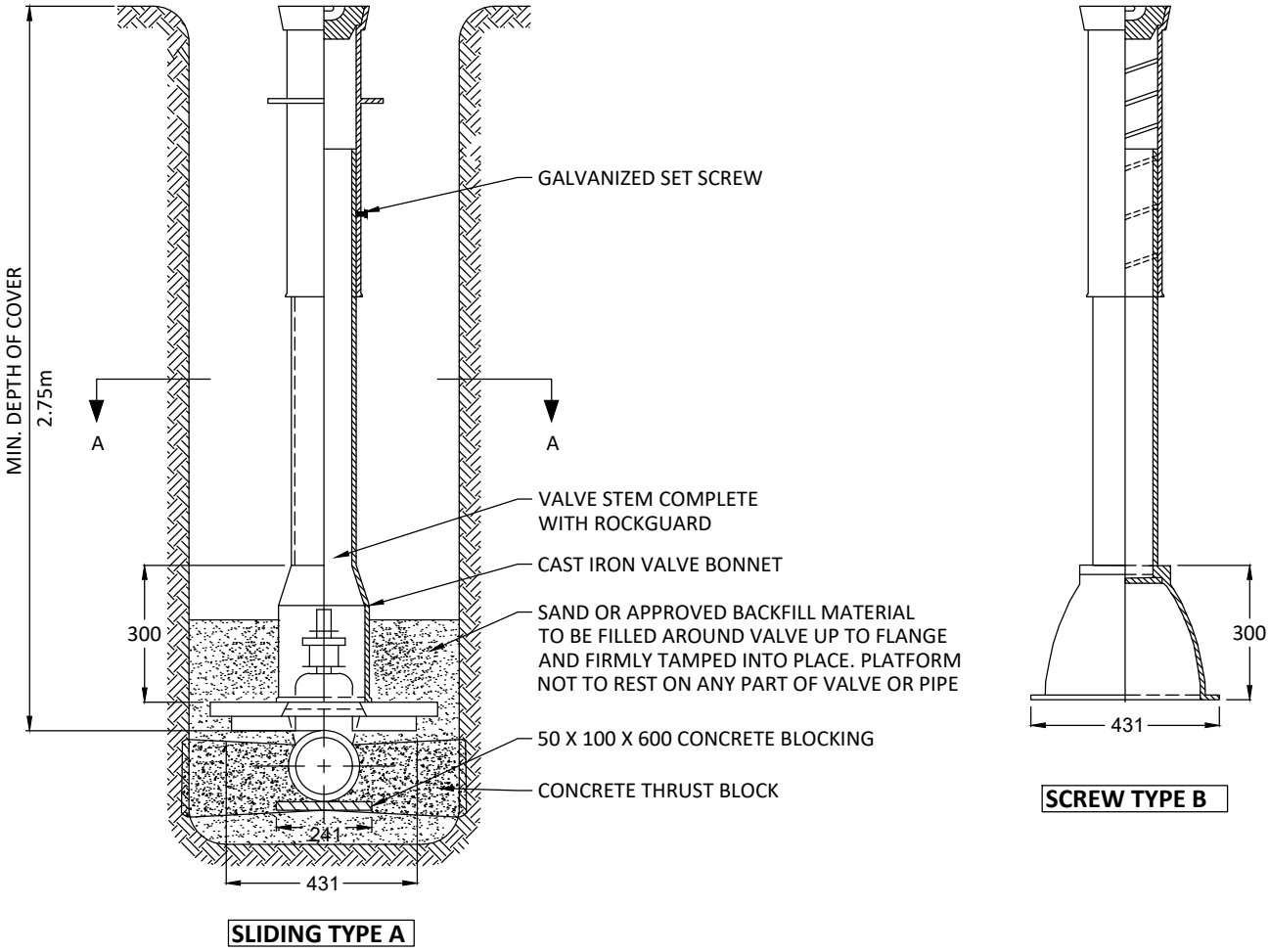
Rev. :
Rev. 2:
Rev. 1: JUNE 22, 2022

TYPICAL ANODE LAYOUT FOR 50MM AND SMALLER COPPER WATER SERVICES

Scale: NTS

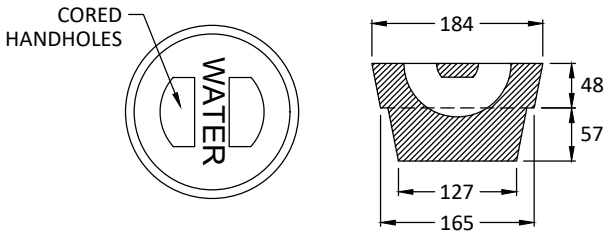
Sturgeon COUNTY

Drawing: 3.5.6

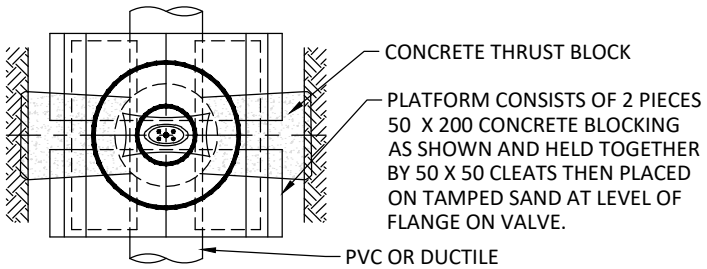


SLIDING TYPE A

SCREW TYPE B



STANDARD WATER VALVE PLUG



SECTION A-A

NOTES:

1. TYPE 'B' VALVE BOX TO BE USED ON 'HARD' SURFACES (E.G. ROADS, WALKS).
2. VALVE BOXES SHALL BE EXTERNALLY AND INTERNALLY COATED WITH ASPHALT OR EPOXY COATING.
3. PVC VALVE BOXES ARE NOT PERMITTED UNLESS FIRST APPROVED BY THE COUNTY.
4. FOR CATHODIC PROTECTION SEE SECTION 3.2.19.9.
5. ALL DIMENSIONS IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. :
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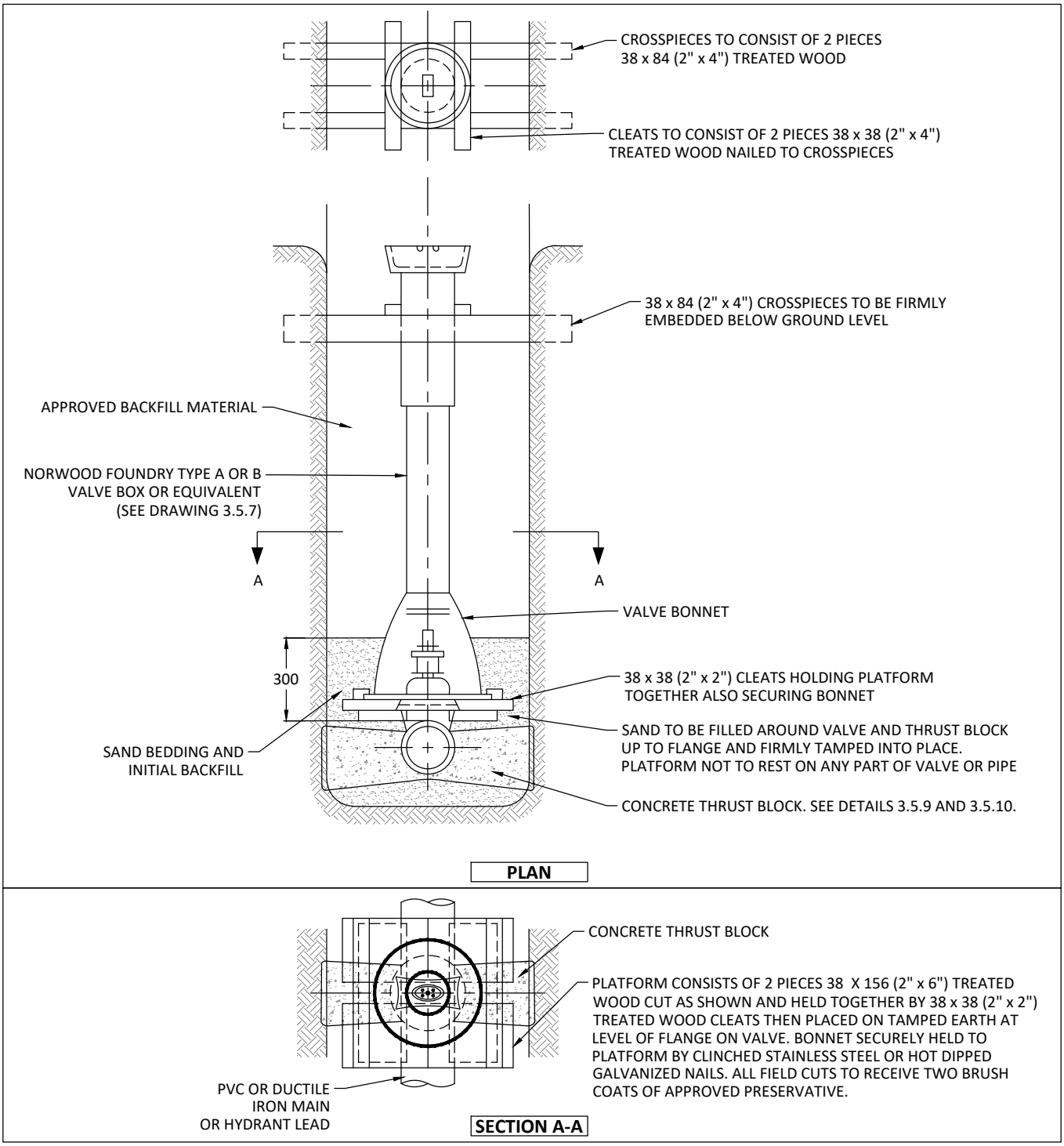
Rev. 1: JULY 19, 2022

TYPICAL VALVE BOX - TYPE A (SLIDING) AND TYPE B (SCREW)
Scale: NTS

Sturgeon COUNTY

Drawing: 3.5.7



NOTES:

1. BOTTOM SECTION AT 900 OR 150 LENGTH IS OPTIONAL ON 200, 250 AND 300 VALVES AND 1200 OR 1500 ON 150 VALVES.
2. CONCRETE THRUST BLOCKS SHALL BE POURED CLEAR OF JOINTS OR FLANGES.
3. ALL WOOD SHALL BE TREATED.
4. ALL DIMENSIONS IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. 1: SEPTEMBER 01, 2022

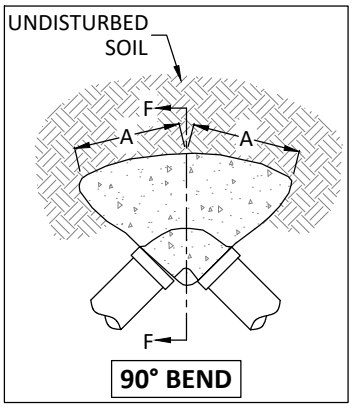
TYPICAL METHOD OF SUPPORTING VALVES AND VALVE BOXES
Scale: NTS

Sturgeon COUNTY

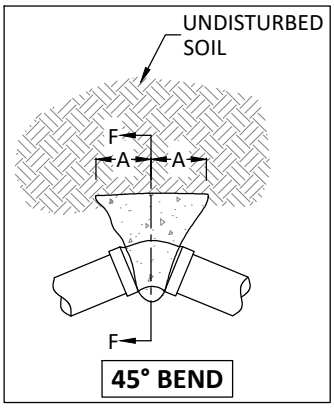
Drawing: 3.5.8

	TEE, DEAD END & VALVE						
DIA (mm)	100	150	200	250	300	350	400
A (mm)	250	375	575	800	1025	925	1025
B (mm)	125	175	200	225	250	275	450
AREA (m^2)	0.13	0.26	0.46	0.72	1.03	1.39	1.85
	11.25° BEND						
DIA (mm)	100	150	200	250	300	350	400
A (mm)	50	100	150	175	225	275	325
B (mm)	125	150	175	200	225	250	275
AREA (m^2)	0.03	0.06	0.11	0.16	0.23	0.30	0.41
	22.5° BEND						
DIA (mm)	100	150	200	250	300	350	400
A (mm)	100	175	225	325	350	425	450
B (mm)	125	150	200	225	300	325	400
AREA (m^2)	0.05	0.11	0.18	0.29	0.42	0.55	0.72
	45° BEND						
DIA (mm)	100	150	200	250	300	350	400
A (mm)	175	300	450	500	650	725	875
B (mm)	125	175	200	275	300	375	400
AREA (m^2)	0.09	0.21	0.36	0.55	0.78	1.09	1.40
	90° BEND						
DIA (mm)	100	150	200	250	300	350	400
A (mm)	325	525	800	925	1050	950	1000
B (mm)	125	175	200	275	350	525	650
AREA (m^2)	0.16	0.37	0.64	1.02	1.47	2.00	2.60

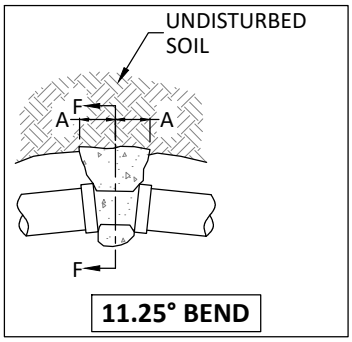
FOR DEAD END PLUG THRUST BLOCK AND VALVE THRUST BLOCK SEE WA-002-002 OR WA-002-010



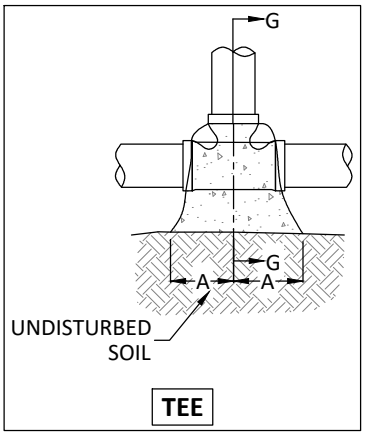
90° BEND



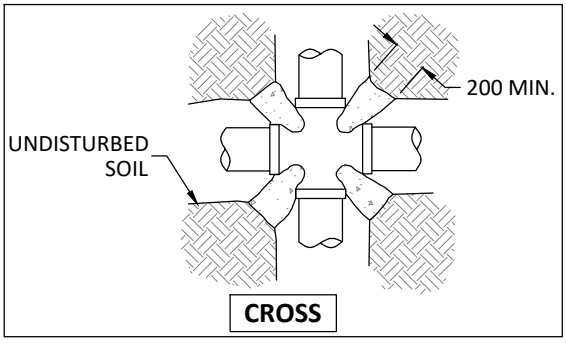
45° BEND



11.25° BEND



TEE



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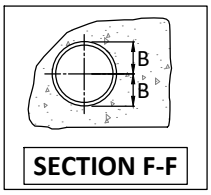
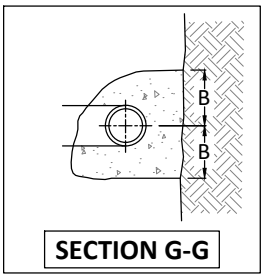


SECTION F-F



SECTION G-G

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. DESIGN BASIS:
   a. HYDRAULIC PRESSURE 1034 kPa (150 psi).
   b. SOIL BEARING CAPACITY 72 kPa (1500 lb/sq.ft).
3. TEMPORARY BLOCKING MUST BE APPROVED BY STURGEON COUNTY.
4. CONCRETE STRENGTH SHALL BE 25 MPa AT 28 DAYS.
5. CONCRETE TO BE SULPHATE RESISTANT TYPE HS ACCORDING TO THE MOST RECENT PUBLICATION OF CSA-A3000 UNLESS OTHERWISE APPROVED BY THE STURGEON COUNTY.
6. CONCRETE TO BE CLEAR OF BELLS.
7. CONCRETE TO BE PLACED UNDER ALL FITTINGS.
8. CONCRETE THRUST BLOCK REQUIRED FOR ALL FITTINGS.
9. BEARING SURFACE MUST BE ON UNDISTURBED SOIL UNLESS OTHERWISE APPROVED BY THE STURGEON COUNTY.

STURGEON COUNTY

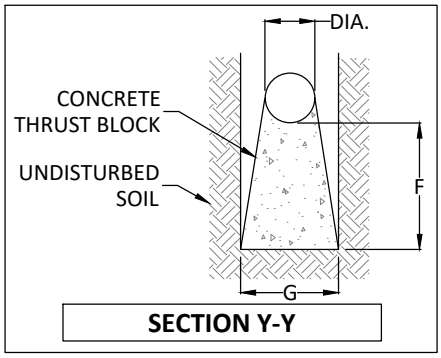
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. 2:
Rev. 1: JULY 13, 2022

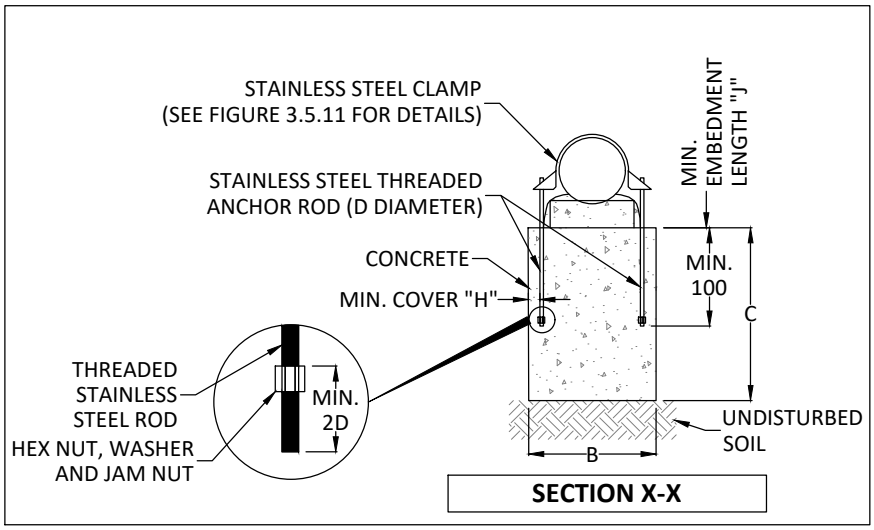
HORIZONTAL CONCRETE THRUST BLOCKS
Scale: NTS

Sturgeon COUNTY

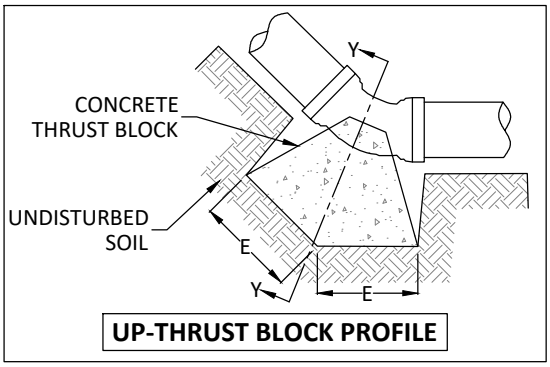
Drawing: 3.5.9



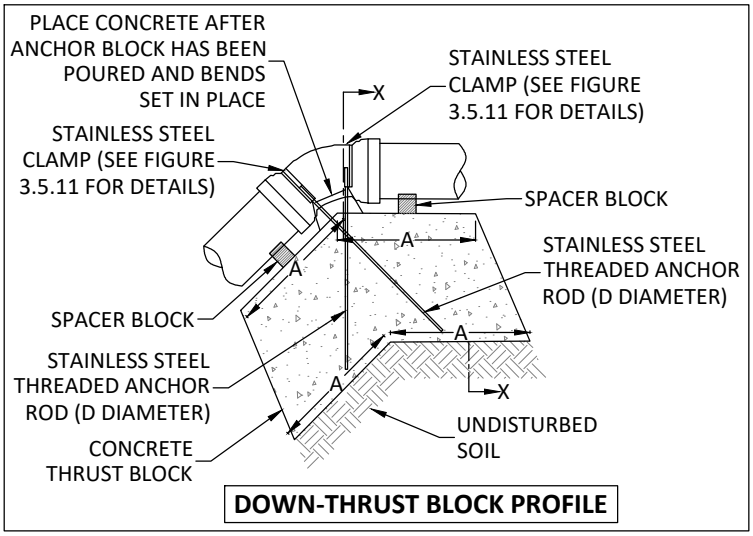
SECTION Y-Y



SECTION X-X



UP-THRUST BLOCK PROFILE



DOWN-THRUST BLOCK PROFILE

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. DESIGN BASIS:
   a. HYDRAULIC PRESSURE 1034 kPa (150 psi).
   b. SOIL BEARING CAPACITY 72 kPa (1500 lb/sq.ft).
3. TEMPORARY BLOCKING MUST BE APPROVED BY STURGEON COUNTY.
4. CONCRETE STRENGTH SHALL BE 25 MPa AT 28 DAYS.
5. CONCRETE TO BE SULPHATE RESISTANT TYPE HS ACCORDING TO THE MOST RECENT PUBLICATION OF CSA-A3000 UNLESS OTHERWISE APPROVED BY STURGEON COUNTY.
6. CONCRETE TO BE CLEAR OF BELLS AND PIPE.
7. CONCRETE TO BE PLACED UNDER ALL FITTINGS.
8. CONCRETE THRUST BLOCK REQUIRED FOR ALL FITTINGS.
9. BEARING SURFACE MUST BE ON UNDISTURBED SOIL UNLESS OTHERWISE APPROVED BY STURGEON COUNTY.
10. CONCRETE SHALL BE PLACED TO WITHIN 50mm OF THE FACE OF THE BELL.
11. POLYETHELYNE BOND BREAKER TO BE USED BETWEEN CONCRETE AND FITTINGS.
12. THIS BLOCKING IS FOR BENDS UP TO 45° ONLY.
13. ALL BOLTS SHALL BE STAINLESS STEEL GRADE ASTM A193 CLASS 1 B8. NUTS SHALL BE GRADE A194 GRADE 8.
14. ALL OTHER STEEL SHALL BE STAINLESS STEEL GRADE ASTM A276 TYPE S304.
15. STAINLESS STEEL TO BE FABRICATED BY A SHOP CERTIFIED BY THE CANADIAN WELDING BUREAU TO THE REQUIREMENTS OF CSA-W47-1, DIVISION 1 OR 2.1 ONLY. WELDING TO CONFORM TO CSA-W59.1 STANDARD REQUIREMENTS.
16. CLAMP TO REST ON BELL OF PVC FITTINGS AND ON FITTING BODY FOR CAST IRON OR DUCTILE IRON FITTINGS.
17. FOR EACH SET OF CLAMPS, THE BOLT PATTERN SHALL BE REVERSED.

MINIMUM DIMENSIONS (mm)

PIPE SIZE	A	B	C	D	E	F	G	H	J	W	T	REQUIRED VOL (m^3)
100	400	450	750	13	400	650	700	80	300	64	9.5	0.25
150	550	700	750	13	700	725	800	80	300	64	9.5	0.57
200	650	900	900	19	800	900	120	100	350	89	9.5	1.02
250	775	950	1100	19	900	1000	1250	155	350	89	9.5	1.59
300	1100	950	1100	25	1000	1175	1400	155	450	89	9.5	2.29
350	1100	1100	1300	25	1175	100	1500	155	600	102	12.7	3.12
400	1225	1250	1350	25	1350	1450	1500	155	600	114	12.7	4.07

STURGEON COUNTY

General Municipal Servicing Standards

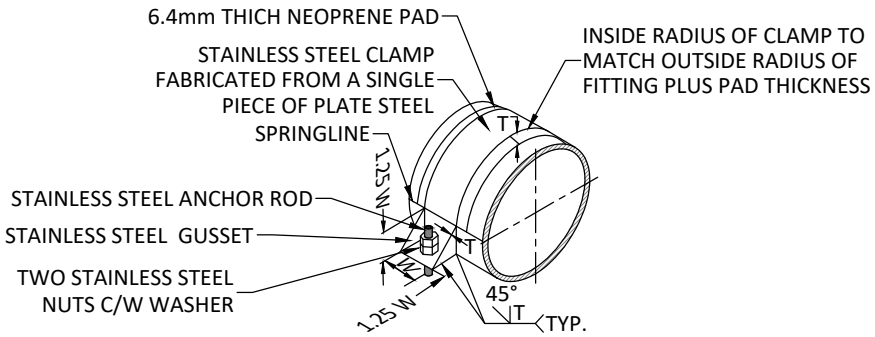
REVISIONS
Rev. :
Rev. 2:
Rev. 1: JULY 13, 2022

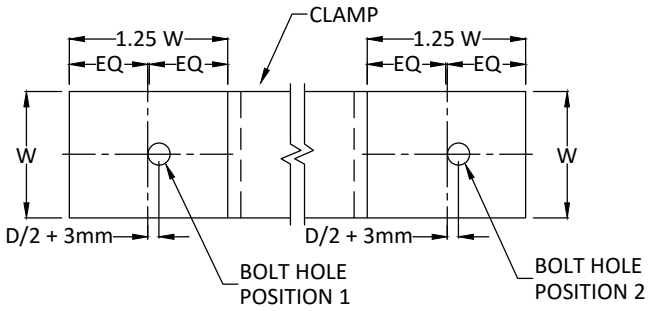
VERTICAL BEND CONCRETE THRUST BLOCKS

Scale: NTS

Sturgeon COUNTY

Drawing: 3.5.10





MINIMUM DIMENSIONS (mm)												
PIPE SIZE	A	B	C	D	E	F	G	H	J	W	T	REQUIRED VOL (m^3)
100	400	450	750	13	400	650	700	80	300	64	9.5	0.25
150	550	700	750	13	700	725	800	80	300	64	9.5	0.57
200	650	900	900	19	800	900	120	100	350	89	9.5	1.02
250	775	950	1100	19	900	1000	1250	155	350	89	9.5	1.59
300	1100	950	1100	25	1000	1175	1400	155	450	89	9.5	2.29
350	1100	1100	1300	25	1175	100	1500	155	600	102	12.7	3.12
400	1225	1250	1350	25	1350	1450	1500	155	600	114	12.7	4.07

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. DESIGN BASIS:
   a. HYDRAULIC PRESSURE 1034 kPa (150 psi).
   b. SOIL BEARING CAPACITY 72 kPa (1500 lb/sq.ft).
3. TEMPORARY BLOCKING MUST BE APPROVED BY STURGEON COUNTY.
4. CONCRETE STRENGTH SHALL BE 25 MPa AT 28 DAYS.
5. CONCRETE TO BE SULPHATE RESISTANT TYPE HS ACCORDING TO THE MOST RECENT PUBLICATION OF CSA-A3000 UNLESS OTHERWISE APPROVED BY STURGEON COUNTY.
6. CONCRETE TO BE CLEAR OF BELLS AND PIPE.
7. CONCRETE TO BE PLACED UNDER ALL FITTINGS.
8. CONCRETE THRUST BLOCK REQUIRED FOR ALL FITTINGS.
9. BEARING SURFACE MUST BE ON UNDISTURBED SOIL UNLESS OTHERWISE APPROVED BY STURGEON COUNTY.
10. CONCRETE SHALL BE PLACED TO WITHIN 50mm OF THE FACE OF THE BELL.
11. POLYETHELYNE BOND BREAKER TO BE USED BETWEEN CONCRETE AND FITTINGS.
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16. CLAMP TO REST ON BELL OF PVC FITTINGS AND ON FITTING BODY FOR CAST IRON OR DUCTILE IRON FITTINGS.
17. FOR EACH SET OF CLAMPS, THE BOLT PATTERN SHALL BE REVERSED.

STURGEON COUNTY

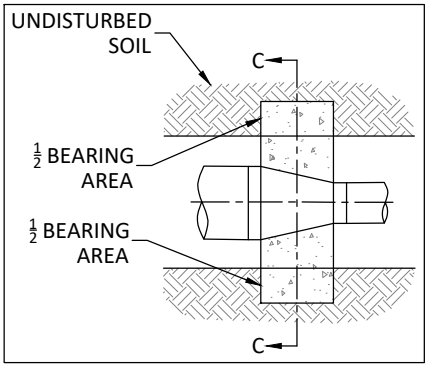
General Municipal Servicing Standards

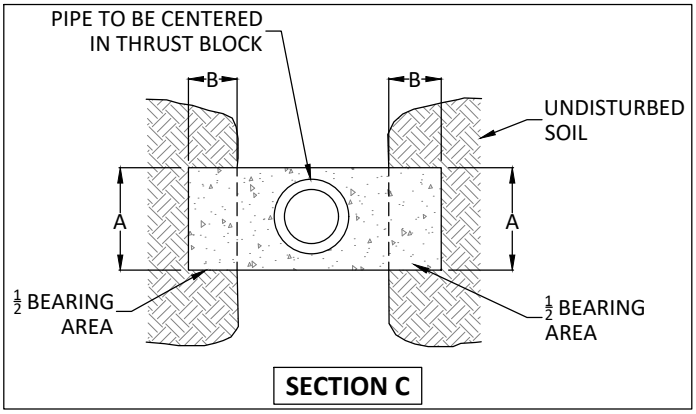
REVISIONS
Rev. :
Rev. 2:
Rev. 1: JULY 13, 2022

STAINLESS STEEL CLAMP DETAIL FOR VERTICAL BEND THRUST BLOCKS
Scale: NTS

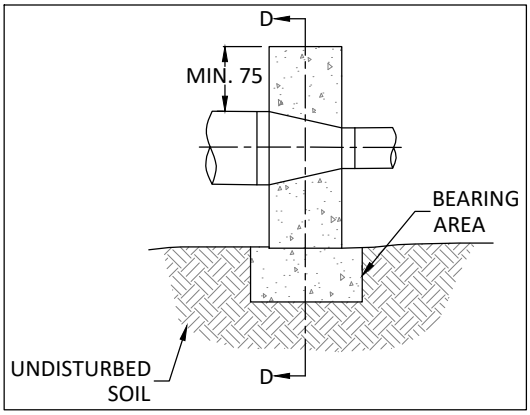
Sturgeon COUNTY

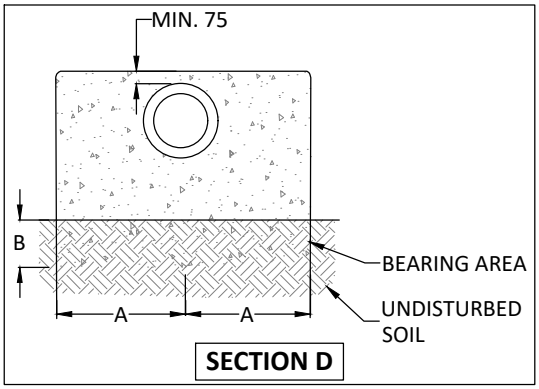
Drawing: 3.5.11





OPTION 1: KEY INTO TRENCH WALL





OPTION 2: KEY INTO TRENCH FLOOR

IPS = IRON PIPE SIZE
AC ME = ASBESTOS CEMENT MACHINED END
AC BL = ASBESTOS CEMENT BARREL
CI OD = CAST IORN OUTSIDE DIAMETER

TRANSITION COUPLINGS (CI OD TO OTHER) - REQUIRED BEARING AREA IN SQ. m										
CI OD TO:	600	500	450	400	350	300	250	200	150	100
IPS	0.65	0.49	0.41	0.35	0.28	0.09	0.09	0.09	0.09	0.09
AC ME	0.85	0.55	0.43	0.28	0.21	0.15	0.10	0.09	0.09	0.09
AC BL	0.96	0.64	0.47	0.42	0.33	0.21	0.15	0.09	0.09	0.09

REDUCERS				
SMALL PIPE DIA. (mm)	LARGE PIPE DIA. (mm)	A (mm)	B (mm)	REQUIRED BEARING AREA (m^2)
100	150	300	250	0.14
100	200	350	500	0.34
150	200	350	300	0.20
150	250	400	575	0.45
200	250	400	325	0.25
200	300	450	650	0.56
250	300	450	350	0.31
250	350	500	700	0.68
300	350	500	375	0.37
300	400	550	725	0.79
350	400	550	400	0.42

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. DESIGN BASIS:
   a. HYDRAULIC PRESSURE 1034 kPa (150 psi).
   b. SOIL BEARING CAPACITY 72 kPa (1500 lb/sq.ft).
3. TEMPORARY BLOCKING MUST BE APPROVED BY STURGEON COUNTY.
4. CONCRETE STRENGTH SHALL BE 25 MPa AT 28 DAYS.
5. CONCRETE TO BE SULPHATE RESISTANT TYPE HS ACCORDING TO THE MOST RECENT PUBLICATION OF CSA-A3000 UNLESS OTHERWISE APPROVED BY STURGEON COUNTY.
6. CONCRETE TO BE CLEAR OF BELLS AND PIPE.
7. CONCRETE TO BE PLACED UNDER ALL FITTINGS.
8. CONCRETE THRUST BLOCK REQUIRED FOR ALL FITTINGS.
9. BEARING SURFACE MUST BE ON UNDISTURBED SOIL UNLESS OTHERWISE APPROVED BY STURGEON COUNTY.
10. REQUIRED BEARING AREA CAN BE ACHIEVED BY KEYING INTO TRENCH WALL OF FLOOR.

STURGEON COUNTY

General Municipal Servicing Standards

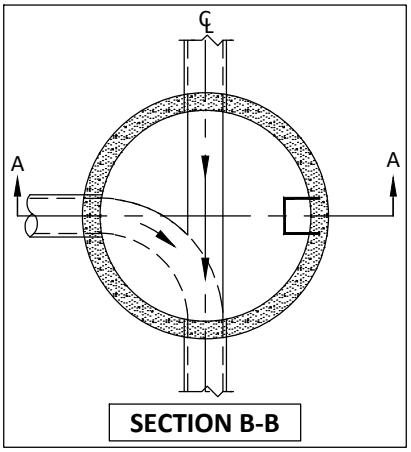
REVISIONS
Rev. :
Rev. 2:
Rev. 1: JULY 13, 2022

REDUCER AND TRANSITION COUPLING CONCRETE THRUST BLOCKS

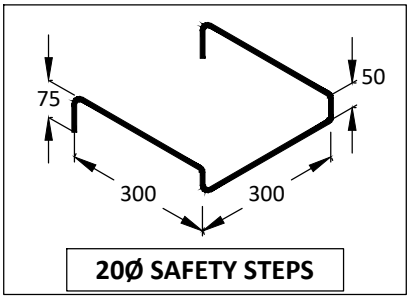
Scale: NTS

Sturgeon COUNTY

Drawing: 3.5.12



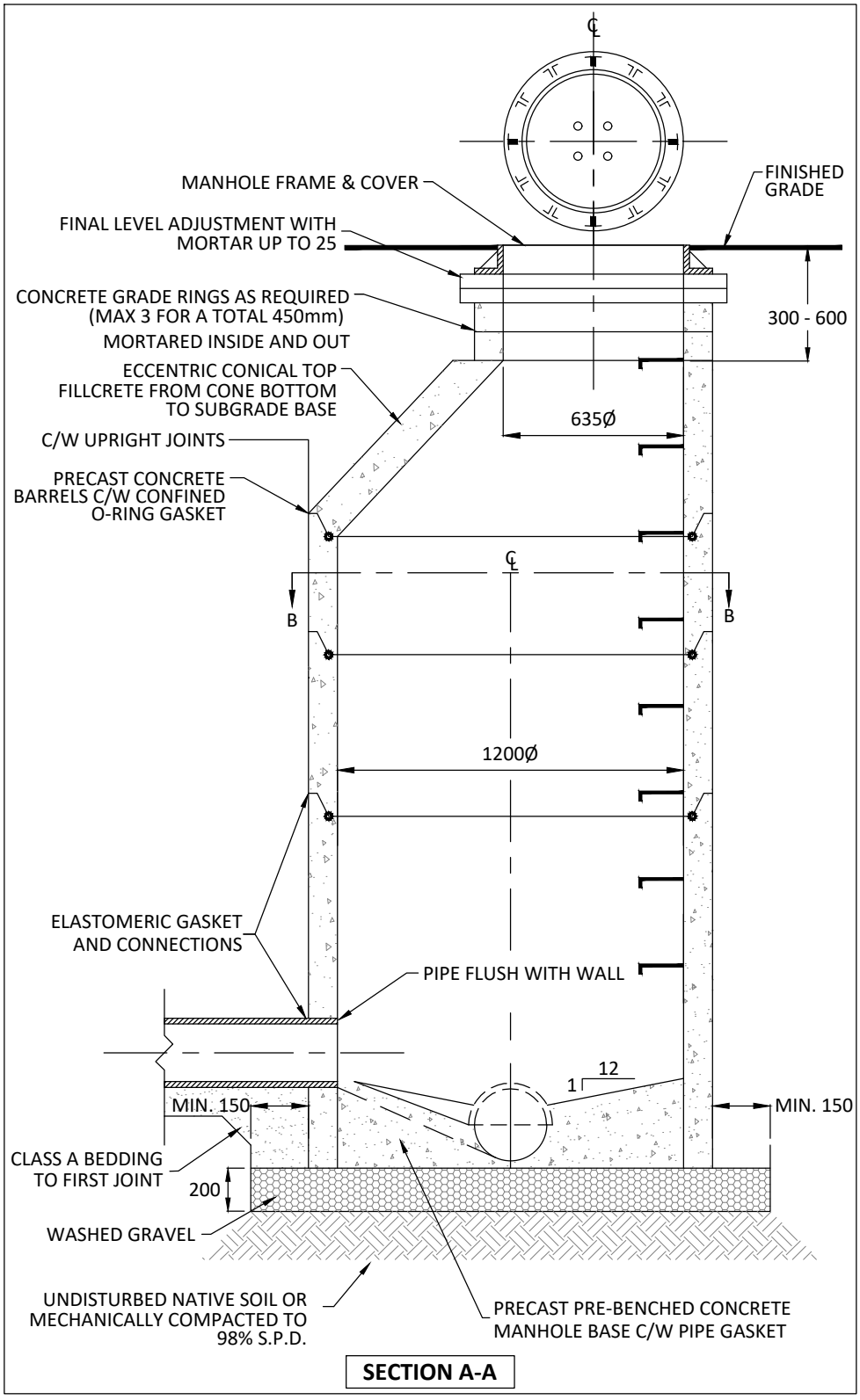
SECTION B-B



20Ø SAFETY STEPS

NOTES:

1. SAFETY STEPS TO BE SPACED AT 400 MAX. DISTANCE. FIRST STEP TO BE 300 MAX FROM THE TOP OF THE RIM. LAST STEP TO BE 300 MAX. ABOVE BENCHING.
2. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
3. COMPACT SAND BACKFILL AROUND MANHOLES TO A MINIMUM OF 98% S.P.D. IN LIFTS NOT EXCEEDING 150 MIN.
4. FLAT TOP SECTION TO BE USED FOR SHALLOW BURY MANHOLES OF UP TO 1.80m.
5. ALL JOINTS TO BE SET WITH RUBBER GASKET AND FINISHED WITH NON-SHRINK GROUT INSIDE AND OUTSIDE FOR FULL CIRCUMFERENCE.
6. THE PLACEMENT OF THE FIRST LADDER RUNG CAN VARY (BARREL SECTION OR GRADE RING INSERT) BUT MUST NOT EXCEED 600MM FROM RIM TO FIRST RUNG.
7. GRADE RINGS MUST BE SET PLUMB TO THE BARREL AND NOT BE STAGGERED.



SECTION A-A

STURGEON COUNTY

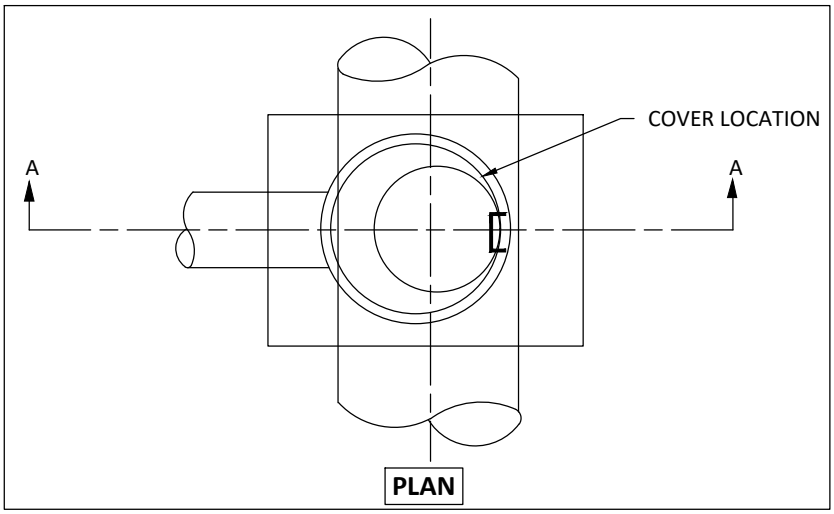
General Municipal Servicing Standards

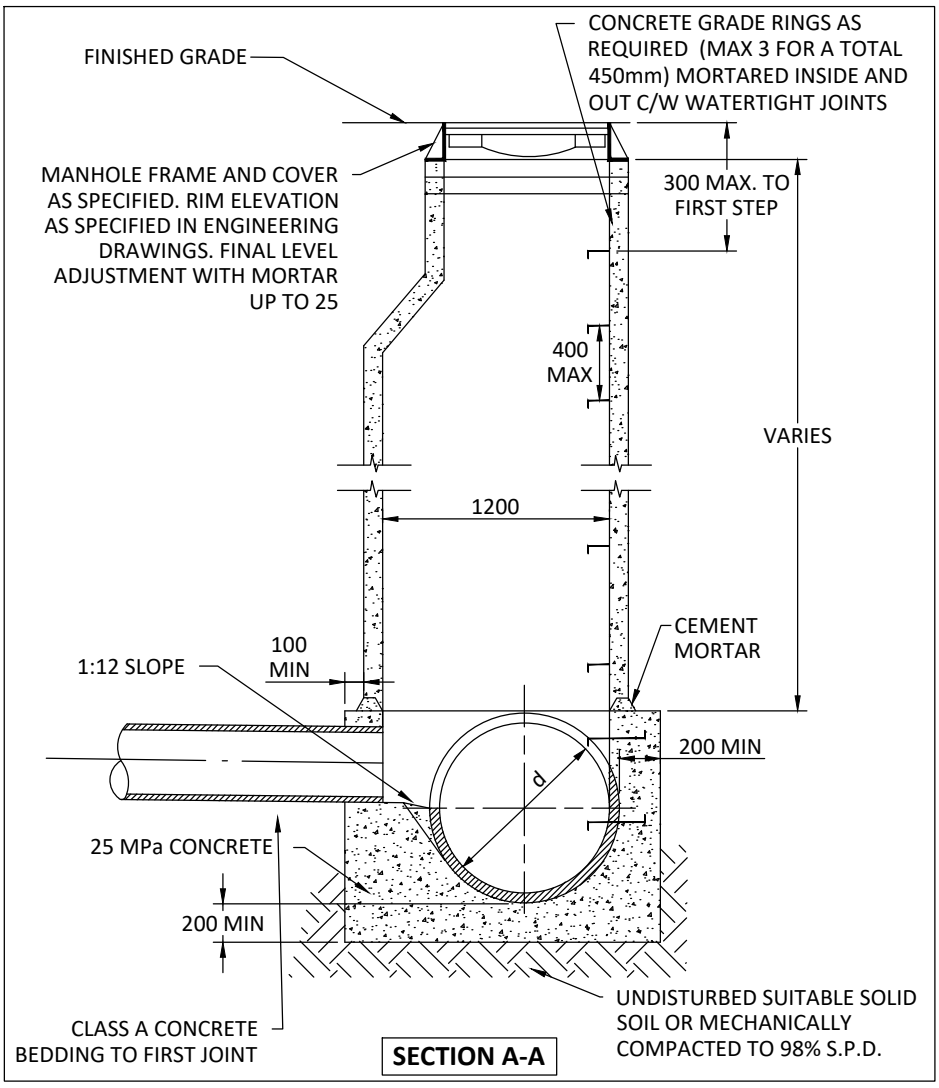
REVISIONS
Rev. :
Rev. :
Rev. 1: SEPTEMBER 01, 2022

STANDARD 1200 DIAMETER MANHOLE FOR PIPES UP TO 600MM
Scale: NTS

Sturgeon COUNTY

Drawing: 3.6.0





NOTES:

1. d = 600mmØ TO 1050mmØ
2. WHERE UNSUITABLE TRENCH CONDITIONS EXIST, CRUSHED ROCK WILL BE REQUIRED IN PLACE OF BEDDING MATERIAL BENEATH MANHOLE BASE.
3. 300 MIN FLAT TOP SECTION TO BE USED FOR SHALLOW BURY MANHOLES OF UP TO 1.80m.
4. SAFETY STEPS TO BE SPACED AT 400 MAX. DISTANCE LAST STEP TO BE 300 MAX. ABOVE BENCHING.
5. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
6. COMPACT SAND BACKFILL AROUND MANHOLES TO A MINIMUM OF 98% S.P.D. IN LIFT NOT EXCEEDING 150 MIN.
7. ALL JOINTS TO BE SET WITH RUBBER GASKET AND FINISHED WITH NON-SHRINK GROUT INSIDE AND OUTSIDE FOR FULL CIRCUMFERENCE.
8. THE PLACEMENT OF THE FIRST LADDER RUNG CAN VARY (BARREL SECTION OR GRADE RING INSERT) BUT MUST NOT EXCEED 300MM FROM RIM TO FIRST RUNG.
9. GRADE RINGS MUST BE SET PLUMB TO THE BARREL AND NOT BE STAGGERED.

STURGEON COUNTY

General Municipal Servicing Standards

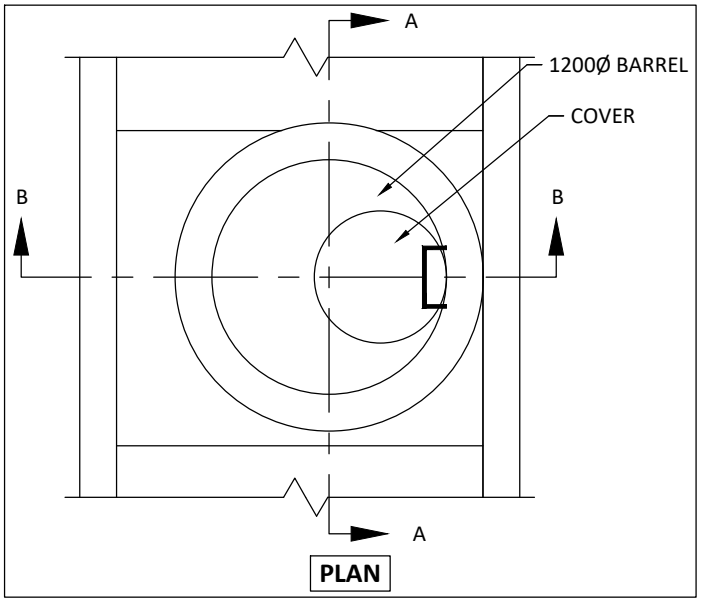
REVISIONS
Rev. :
Rev. :
Rev. 1: JULY 27, 2022

STANDARD 1200 DIAMETER PERCHED MANHOLE FOR PIPES 600mm TO 1500mm

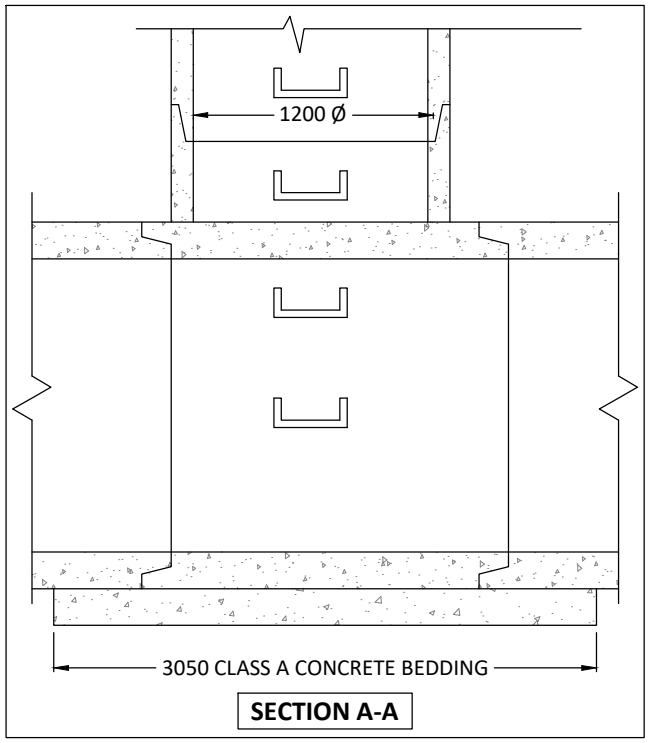
Scale: NTS

Sturgeon COUNTY

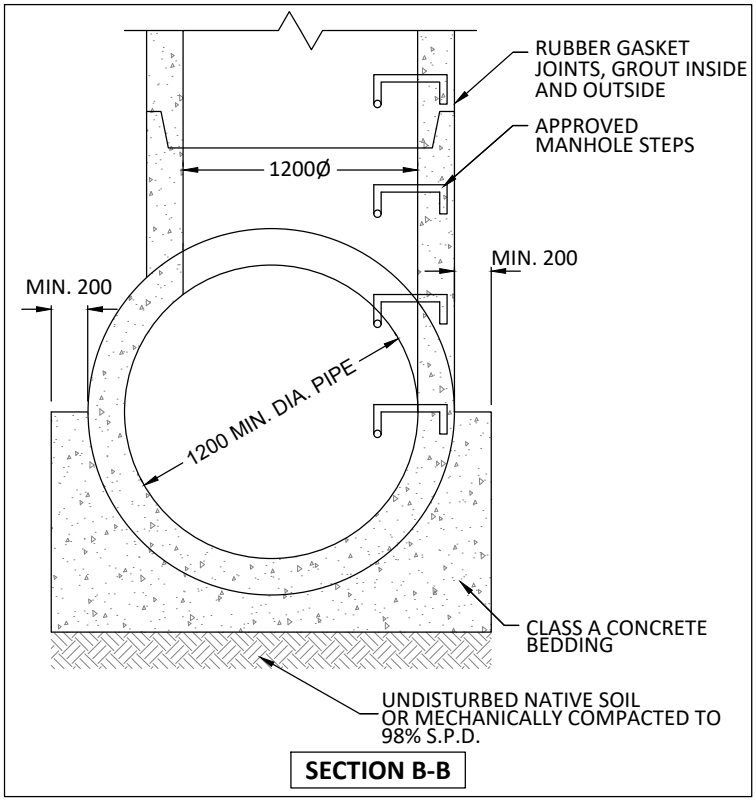
Drawing: 3.6.1



PLAN



SECTION A-A



SECTION B-B

NOTES:

1. THIS TYPE OF MANHOLE IS TO BE BUILT ONLY ON MAINS OF 1200mm DIAMETER OR LARGER AND WHERE THERE IS NO CHANGE IN DIRECTION OF FLOW, I.E. A "STRAIGHT-THROUGH" FLOW.
2. SAFETY STEPS TO BE SPACED AT 400 MAX. DISTANCE. LAST STEP TO BE 300 MAX. ABOVE BENCHING.
3. FLAT TOP SECTION TO BE USED FOR SHALLOW BURY MANHOLES OF UP TO 1.80m.
4. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
5. COMPACT SAND BACKFILL AROUND MANHOLES TO A MINIMUM OF 98% S.P.D. IN LIFTS NOT EXCEEDING 150 MIN.
6. ALL JOINTS TO BE SET WITH RUBBER GASKET AND FINISHED WITH NON-SHRINK GROUT INSIDE AND OUTSIDE FOR FULL CIRCUMFERENCE.

STURGEON COUNTY

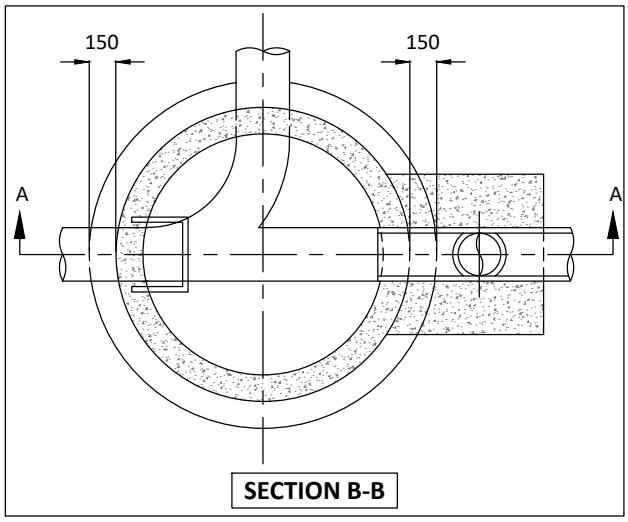
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. 2:
Rev. 1: JUNE 27, 2022

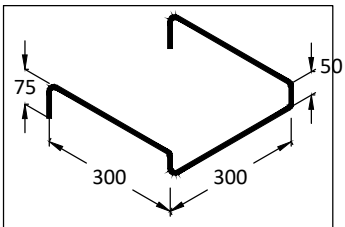
STANDARD T-RISER MANHOLE FOR PIPES 1200MM AND LARGER
Scale: NTS

Sturgeon COUNTY

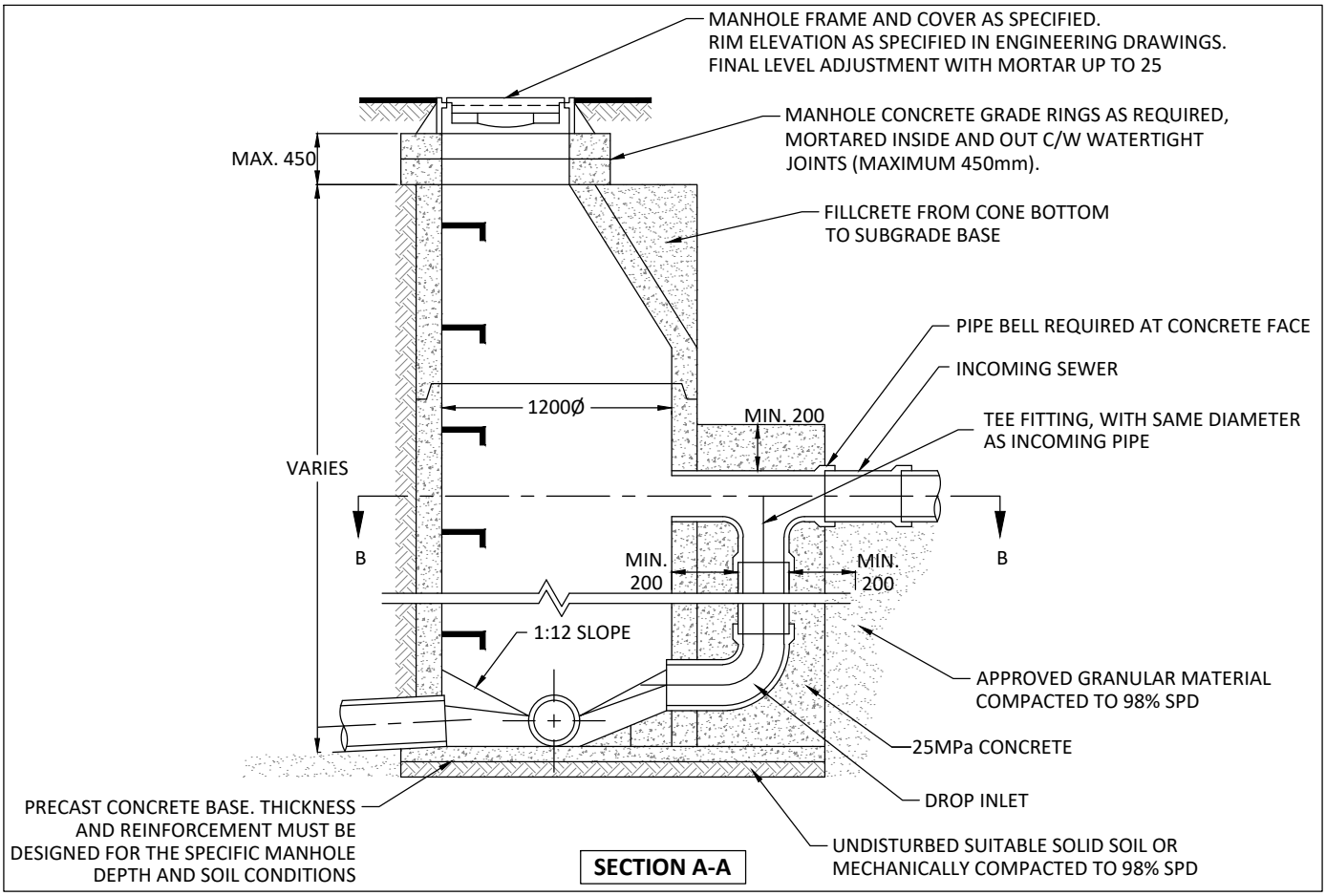
Drawing: 3.6.2



SECTION B-B



20Ø GALVANIZED IRON / ALUMINUM MANHOLE SAFETY STEPS



SECTION A-A

NOTES:

1. PRECAST CONCRETE COMPONENTS TO MEET CURRENT A.S.T.M. C478 STANDARDS.
2. CAST IN PLACE CONCRETE TO BE 25 MPa AT 28 DAYS.
3. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
4. COMPACT BACKFILL AROUND MANHOLES TO A MINIMUM OF 98% STANDARD PROCTOR DENSITY.

STURGEON COUNTY

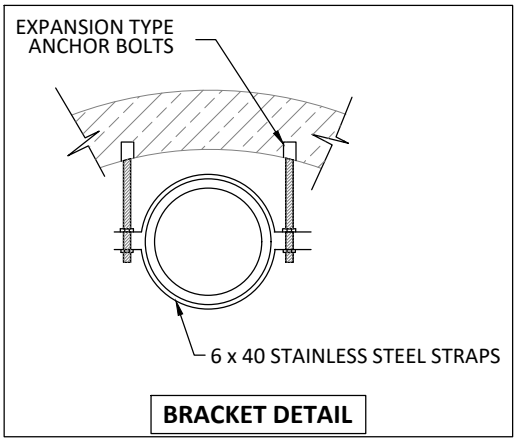
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. 2:
Rev. 1: JUNE 27, 2022

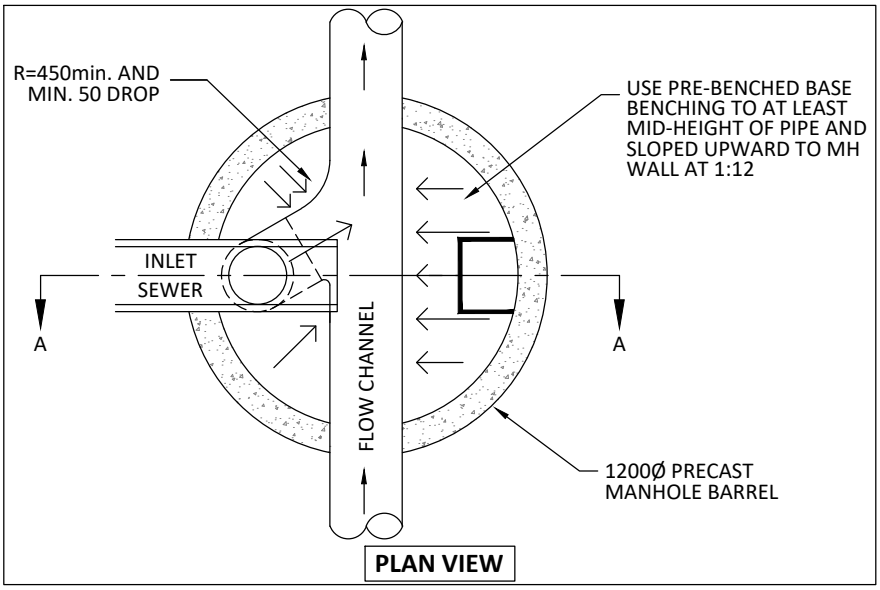
STANDARD EXTERNAL DROP MANHOLE (SANITARY ONLY)
Scale: NTS

Sturgeon COUNTY

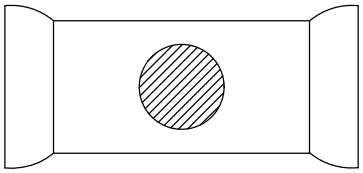
Drawing: 3.6.3



BRACKET DETAIL

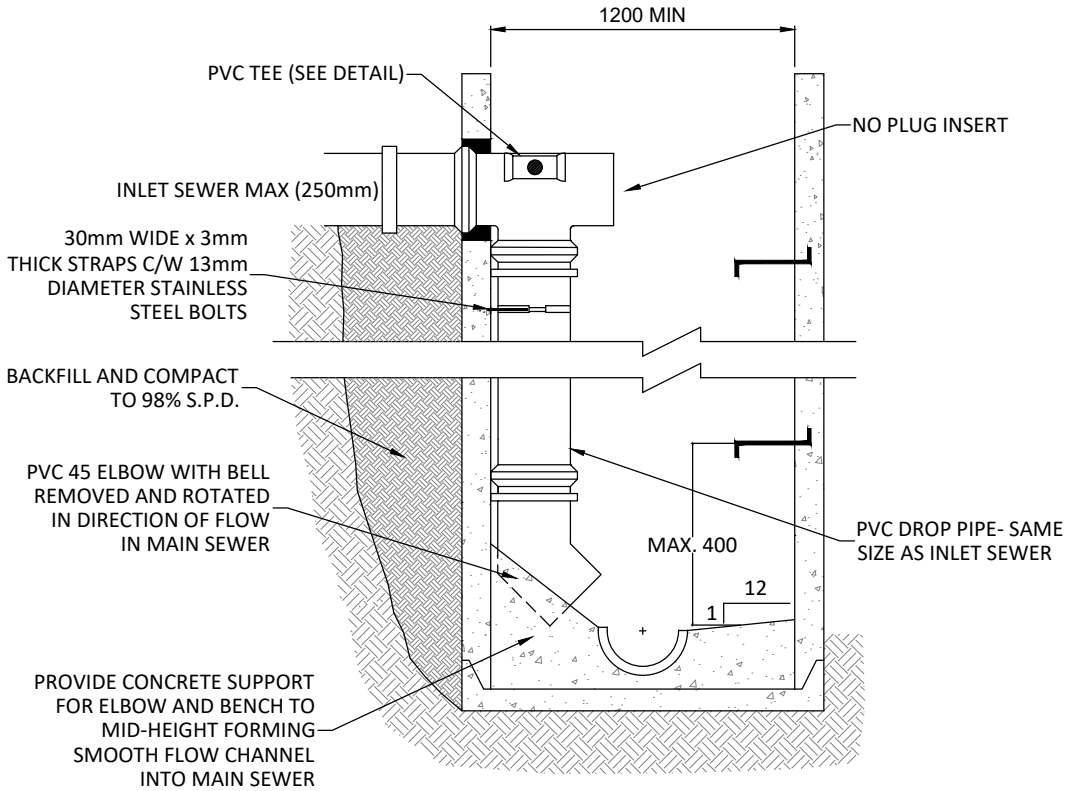


PLAN VIEW



REMOVE 150mm DIAMETER
MATERIAL FROM TOP OF TEE TO
ALLOW ACCESS FOR CLEANING

PVC TEE DETAIL



SECTION A-A

NOTES:

1. MAXIMUM INLET SEWER OF 250 DIA.
2. DROP PIPE SIZE TO EQUAL INLET SIZE.
3. TEE FITTING TO BE APPROVED PRIOR TO ORDERING.
4. CAST IN PLACE CONCRETE 25 MPa IN 28 DAYS.
5. MANHOLE BASE TO BE PRE-BENCHED.
6. USE INTERIOR DROP WHEN INCOMING PIPE INVERT IS GREATER THAN 750mm ABOVE OUTGOING PIPE CENTRELINE.
7. ONLY ONE INTERIOR DROP MAY BE USED PER MANHOLE, UNLESS A LARGER DIAMETER MANHOLE IS PROVIDED.

STURGEON COUNTY

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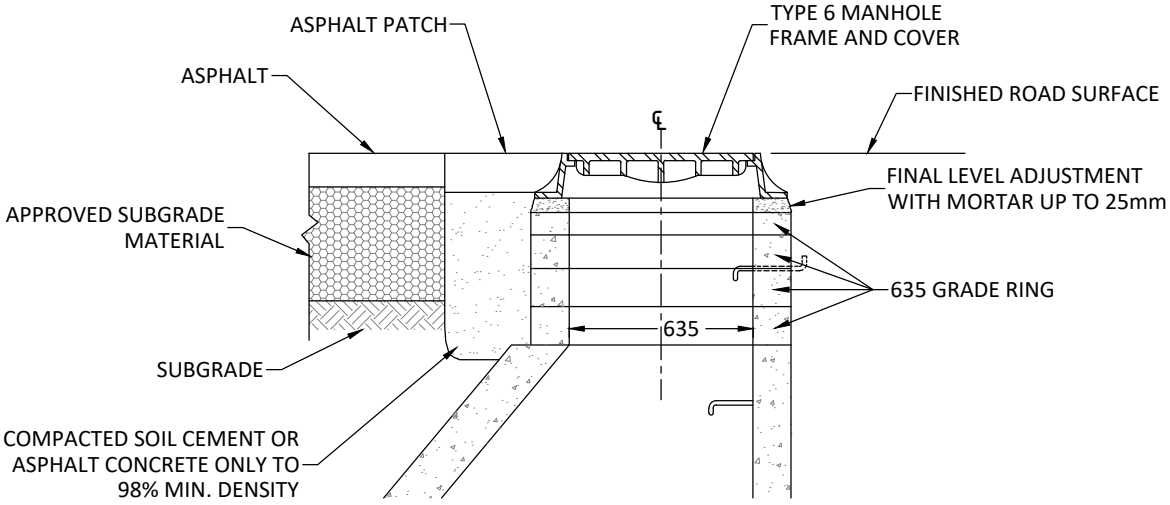
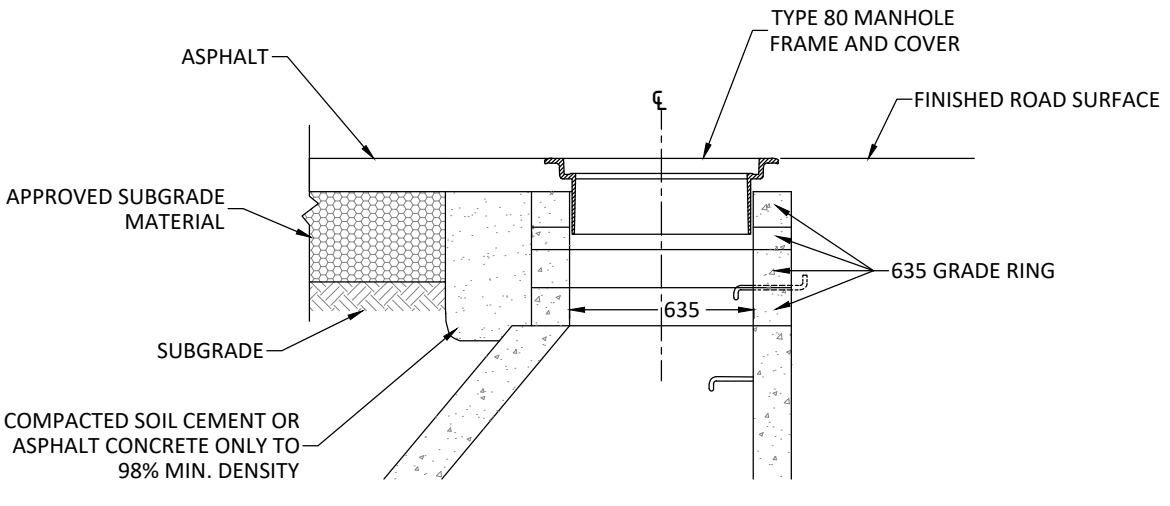
STANDARD INTERNAL DROP MANHOLE (SANITARY ONLY)
Scale: NTS

Sturgeon COUNTY

Drawing: 3.6.4



TYPE 6 MANHOLE SECTION



TYPE 80 MANHOLE SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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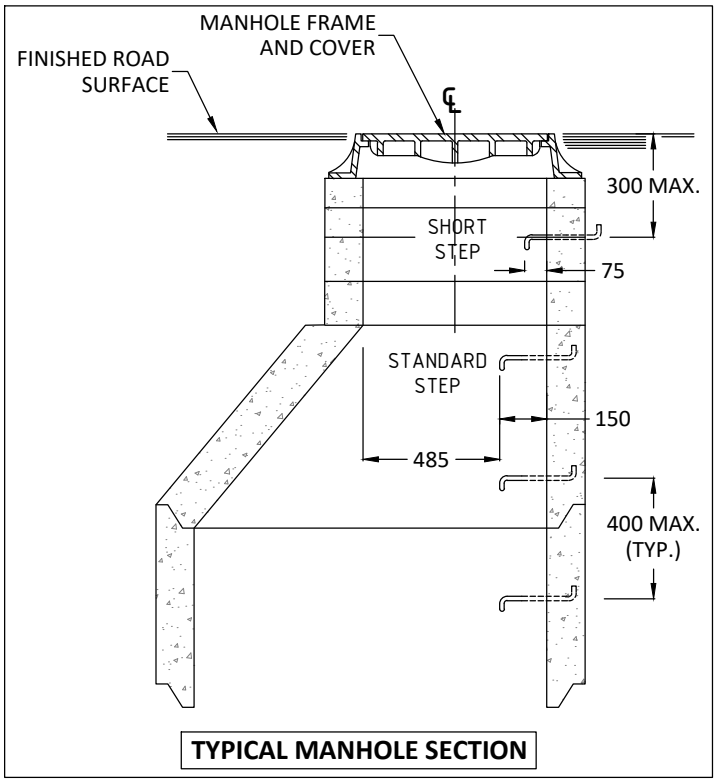
Rev. :
Rev. 2:
Rev. 1: JULY 11, 2022

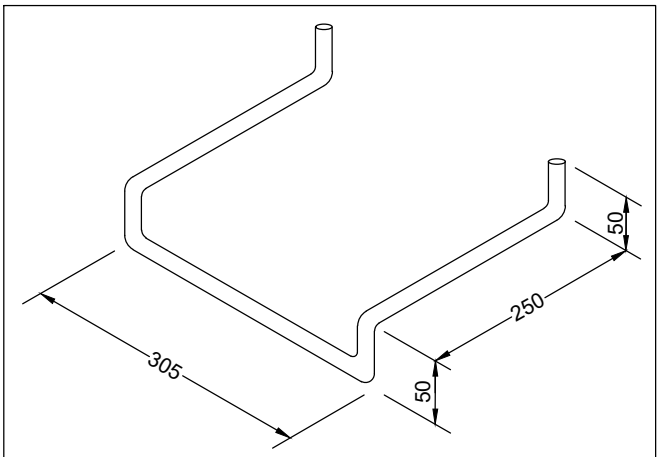
NECK SECTION DETAIL FOR STANDARD 1200 MANHOLE
Scale: NTS

Sturgeon COUNTY

Drawing: 3.6.5



TYPICAL MANHOLE SECTION



**SAFETY STEP ISOMETRIC VIEW
(CAST IN PLACE OPTION**

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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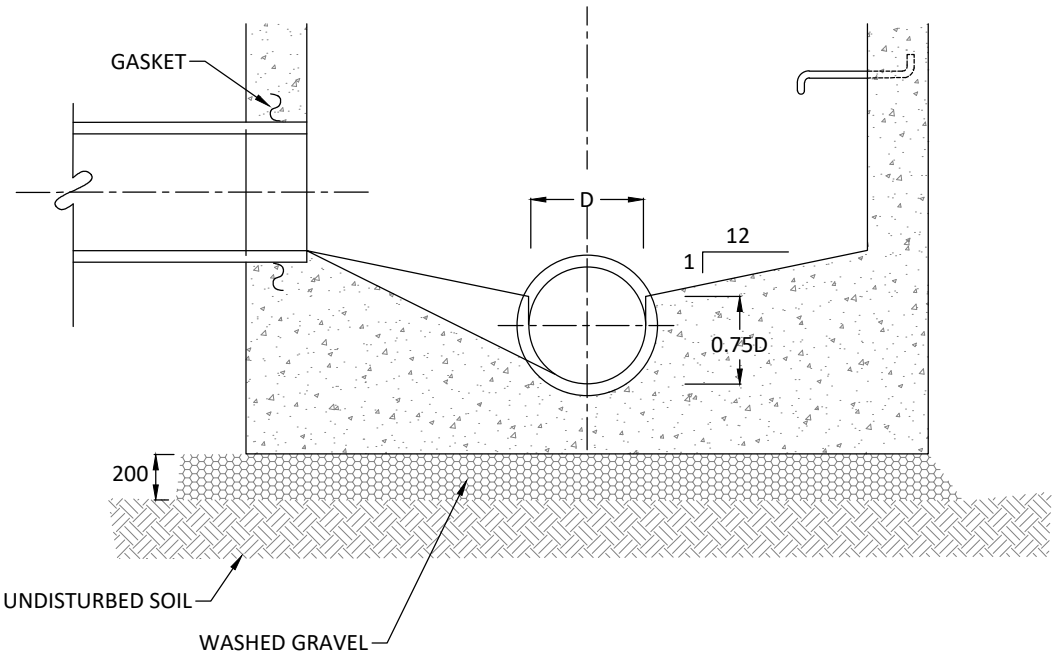
SAFETY STEPS FOR MANHOLES

Scale: NTS

Sturgeon COUNTY

Drawing: 3.6.6



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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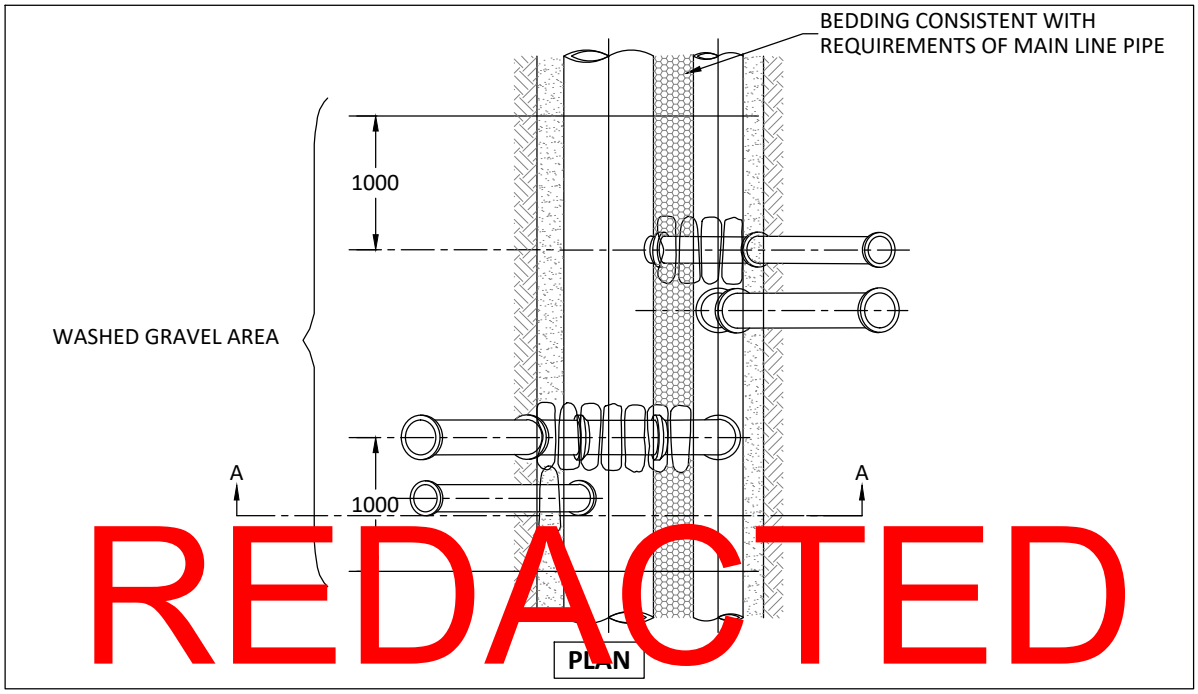
Rev. 1: JULY 18, 2022

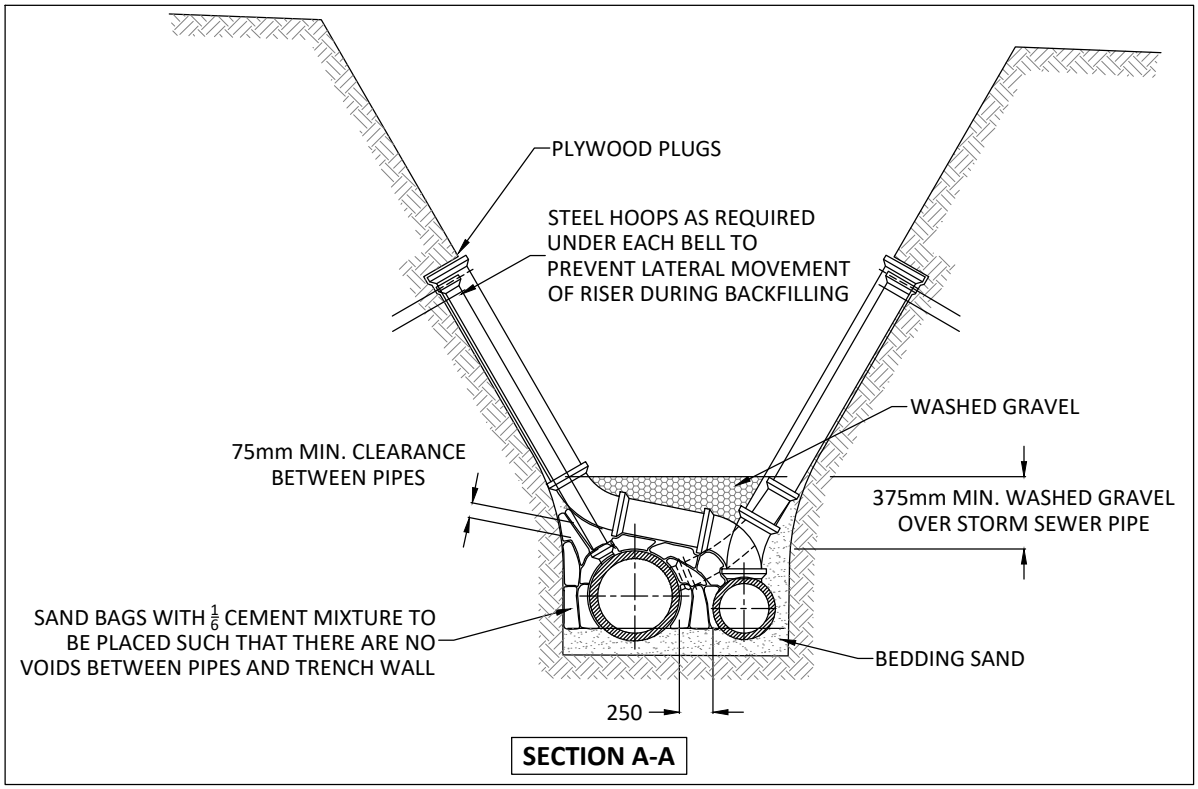
BENCHING DETAIL FOR STANDARD 1200 DIAMETER MANHOLE

Scale: NTS

Sturgeon COUNTY

Drawing: 3.6.7





NOTES:

1. THIS DETAIL APPLIES IN PRINCIPLE TO ALL RISER CONNECTIONS IN V-CUT TRENCH.
2. VERTICAL RISER INSTALLATION IS ACCEPTABLE IN NEAR VERTICAL WALL TRENCH.
3. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

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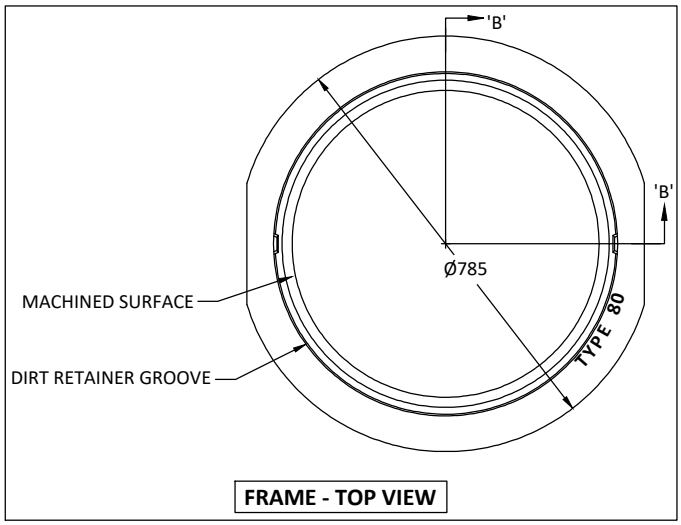
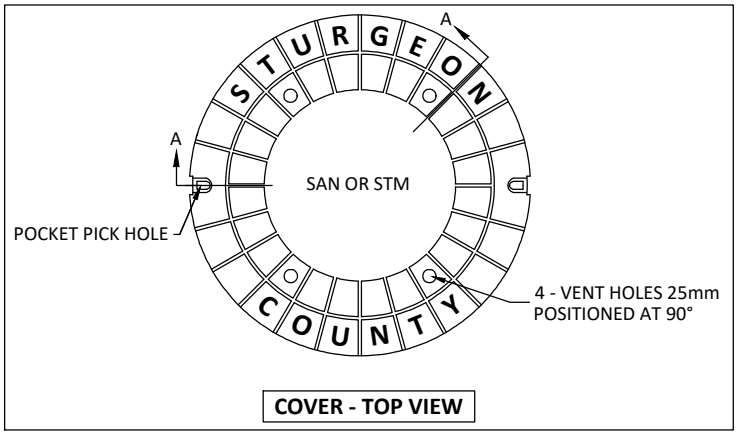
STANDARD RISER CONNECTIONS TO STORM AND SANITARY SEWERS IN COMMON TRENCH
Scale: NTS

Sturgeon COUNTY

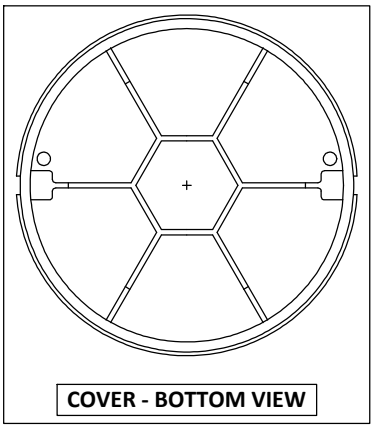
Drawing: 3.6.8



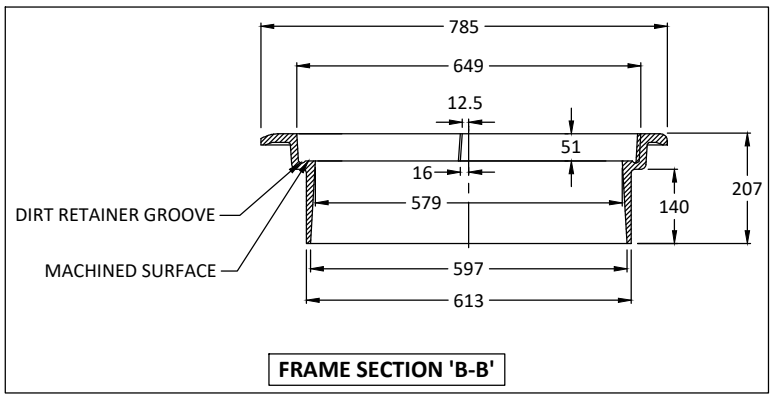
FRAME - TOP VIEW



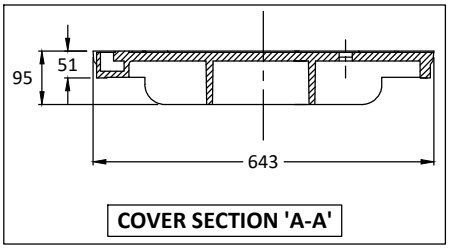
COVER - TOP VIEW



COVER - BOTTOM VIEW



FRAME SECTION 'B-B'



COVER SECTION 'A-A'

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. MATERIAL SPECIFICATIONS: FRAME AND COVER - DUCTILE MATERIAL TO CONFORM TO ASTM A536 (LATEST EDITION)GRADE 80-55-06 COVER MASS = 50 kg ±5%
   FRAME MASS - 54.4 kg ±5%
3. CASTINGS SHALL BE PRODUCED TO THE DIMENSION SHOWN AND WITHIN THE TOLERANCES NOTED IN TABLE 1 - MANUFACTURING TOLERANCES.
4. COATED CASTINGS WILL NOT BE ACCEPTED.
5. CASTINGS SHALL BE MARKED WITH THE PROPER IDENTIFICATION MARKINGS WHICH WILL INCLUDE:
   A) SERIES DESIGNATION
   B) FOUNDRY IDENTIFICATION MARKING, AND YEAR OF CASTING AND OTHER REQUIREMENTS AS PER AASHTO M306 STANDARD.
6. ALL CASTINGS WILL BE: FREE OF DEFECTS, TRUE TO PATTERN AND FREE FROM CRACKS, GAS HOLES, FLAWS AND EXCESSIVE SHRINKAGE. SURFACES OF THE CASTINGS SHALL BE FREE FROM BURNT ON SAND AND SHALL BE REASONABLY SMOOTH.
7. MATING SURFACES SHALL BE MACHINED SUCH THAT CASTINGS SHALL NOT ROCK WHEN INSTALLED. THE MANUFACTURER SHALL TRIAL FIT THE CASTINGS AGAINST A TRIAL FRAME OR COVER.

TABLE 1 - MANUFACTURING TOLERANCES:

1. NO DEVIATION SHALL BE ACCEPTABLE FOR DIMENSIONS WHICH ARE LESS THAN 50mm.
2. ALL DIMENSIONS GREATER THAN 50mm SHALL CONFORM TO ±3mm TOLERANCE.
3. ALL FILLET RADII TO BE 6mm UNLESS SHOWN OTHERWISE.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. :
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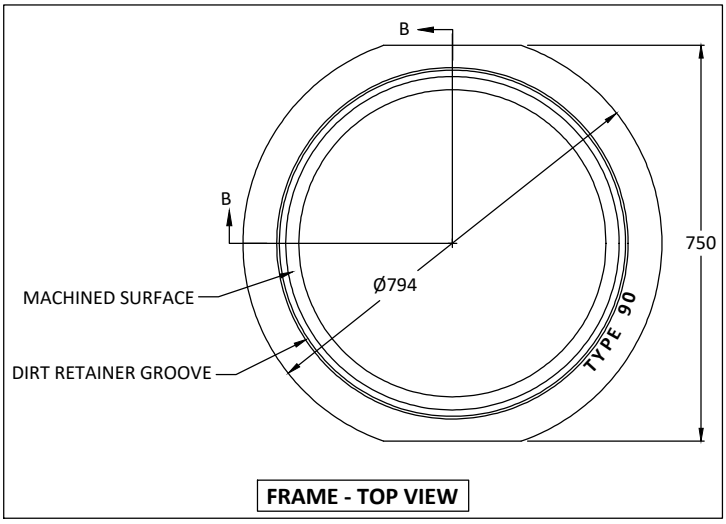
Rev. 1: JULY 18, 2022

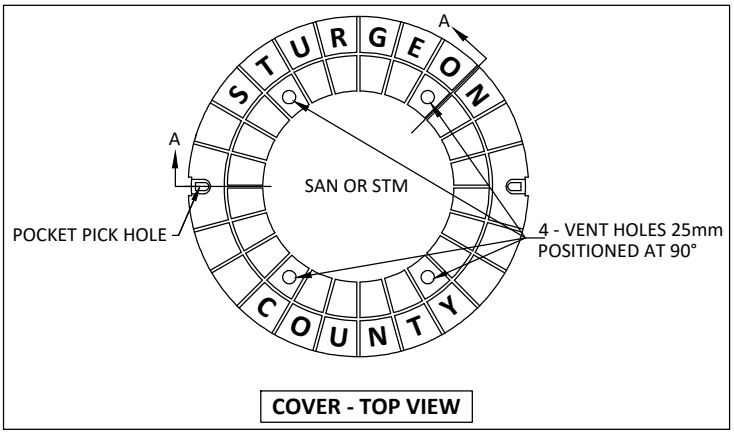
MANHOLE FRAME AND COVER - TYPE 80 (FLOATING)
Scale: NTS

Sturgeon COUNTY

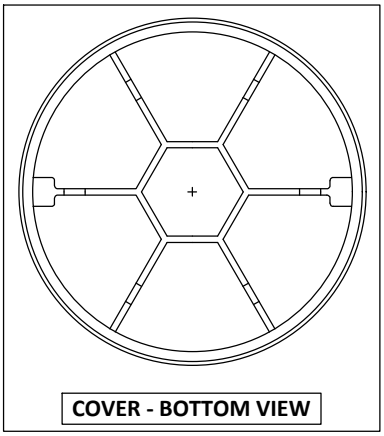
Drawing: 3.6.9



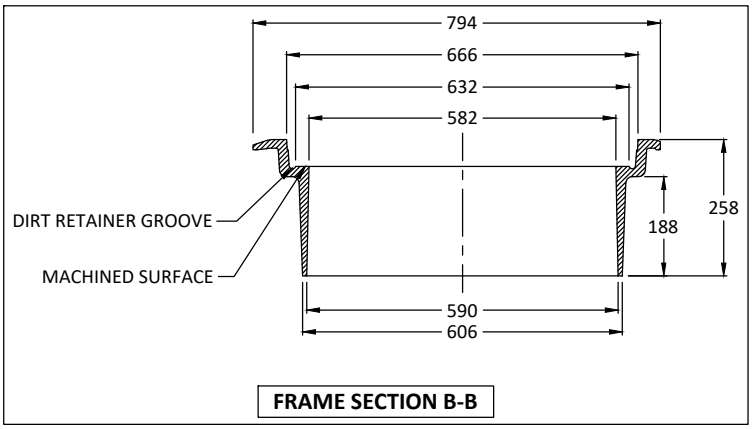
FRAME - TOP VIEW



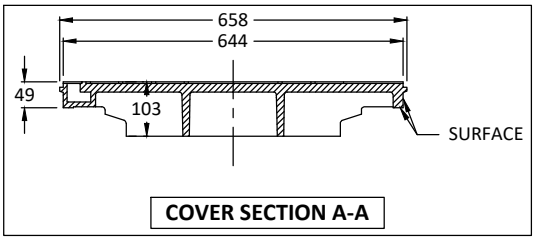
COVER - TOP VIEW



COVER - BOTTOM VIEW



FRAME SECTION B-B



COVER SECTION A-A

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. MATERIAL SPECIFICATIONS: FRAME AND COVER - DUCTILE MATERIAL TO CONFORM TO ASTM A536 (LATEST EDITION)GRADE 90-55-06 COVER MASS = 50 kg ±5%
   FRAME MASS - 54.4 kg ±5%
3. CASTINGS SHALL BE PRODUCED TO THE DIMENSION SHOWN AND WITHIN THE TOLERANCES NOTED IN TABLE 1 - MANUFACTURING TOLERANCES.
4. COATED CASTINGS WILL NOT BE ACCEPTED.
5. CASTINGS SHALL BE MARKED WITH THE PROPER IDENTIFICATION MARKINGS WHICH WILL INCLUDE:
   A) SERIES DESIGNATION
   B) FOUNDRY IDENTIFICATION MARKING, AND YEAR OF CASTING AND OTHER REQUIREMENTS AS PER AASHTO M306 STANDARD.
6. ALL CASTINGS WILL BE: FREE OF DEFECTS, TRUE TO PATTERN AND FREE FROM CRACKS, GAS HOLES, FLAWS AND EXCESSIVE SHRINKAGE. SURFACES OF THE CASTINGS SHALL BE FREE FROM BURNT ON SAND AND SHALL BE REASONABLY SMOOTH.
7. MATING SURFACES SHALL BE MACHINED SUCH THAT CASTINGS SHALL NOT ROCK WHEN INSTALLED. THE MANUFACTURER SHALL TRIAL FIT THE CASTINGS AGAINST A TRIAL FRAME OR COVER.

TABLE 1 - MANUFACTURING TOLERANCES:

1. NO DEVIATION SHALL BE ACCEPTABLE FOR DIMENSIONS WHICH ARE LESS THAN 50mm.
2. ALL DIMENSIONS GREATER THAN 50mm SHALL CONFORM TO ±3mm TOLERANCE.
3. ALL FILLET RADII TO BE 6mm UNLESS SHOWN OTHERWISE.

STURGEON COUNTY

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MANHOLE FRAME AND COVER - TYPE 90 (FLOATING C/W GASKET SEAL)
Scale: NTS

Sturgeon COUNTY

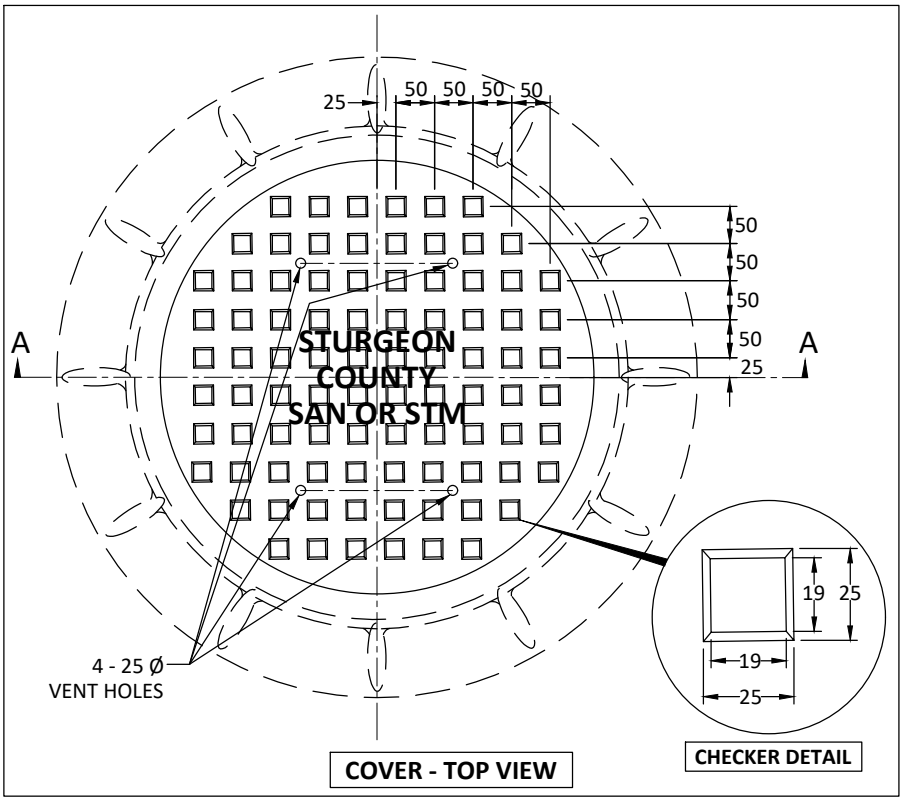
Drawing: 3.6.10

NOTES:

1. THIS DRAWING REPRESENTS DIMENSIONAL INFORMATION FOR PRODUCTS THAT HAVE BEEN PRODUCED FOR THE COUNTY HISTORICALLY, ALTERNATE DIMENSIONS AND DETAILS MAY BE PROPOSED, PROVIDING ALL ALTERNATIVE PRODUCTS AND COMPONENTS ARE FULLY INTERCHANGEABLE WITH THESES PRODUCTS; THE WEIGHTS OF ALTERNATE PRODUCTS ARE WITHIN ±5% OF THESE PRODUCTS; AND THE PRODUCTS MEET THE PROOF LOAD TEST REQUIREMENTS FOR HS-20 LOADING AS OUTLINED IN AASHTO M306 (LATEST EDITION).
2. MATERIAL SPECIFICATIONS:
   FRAME AND COVER - GREY CAST IRON TO CONFORM TO CLASS 35B ASTM A48 (LATEST EDITION).
3. CASTINGS SHALL BE PRODUCED TO THE DIMENSIONS SHOWN AND WITHIN THE TOLERANCES NOTED IN TABLE 1 - MANUFACTURING TOLERANCES.
4. COATED CASTINGS WILL NOT BE ACCEPTED.
5. CASTINGS SHALL BE MARKED WITH THE PROPER IDENTIFICATION MARKINGS WHICH WILL INCLUDE:
   A) SERIES DESIGNATION (STURGEON COUNTY STANDARD).
   B) FOUNDRY IDENTIFICATION MARKING, AND YEAR OF CASTING AND OTHER REQUIREMENTS AS PER AASHTO M306 STANDARD.
5. ALL CASTINGS WILL BE: FREE OF DEFECTS, TRUE TO PATTERN AND FREE FROM CRACKS, GAS HOLES, FLAWS AND EXCESSIVE SHRINKAGE. SURFACES OF THE CASTING SHALL BE FREE FROM BURNT ON SAND AND SHALL BE REASONABLY SMOOTH.
6. MATING SURFACES SHALL BE MACHINED SUCH THAT CASTINGS SHALL NOT ROCK WHEN INSTALLED. THE MANUFACTURER SHALL TRIAL FIT THE CASTINGS AGAINST A TRAIL FRAME OR COVER.
7. ALL DIMENSIONS IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

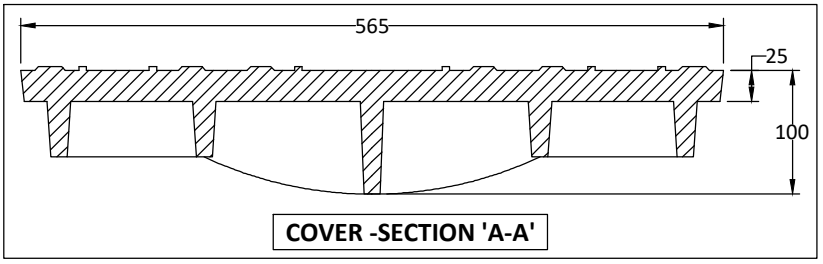
TABLE 1 - MANUFACTURING TOLERANCES

1. NO DEVIATION SHALL BE ACCEPTABLE FOR DIMENSIONS WHICH ARE LESS THAN 10mm
2. ALL DIMENSIONS GREATER THAN 10mm SHALL CONFORM TO ±3mm TOLERANCE

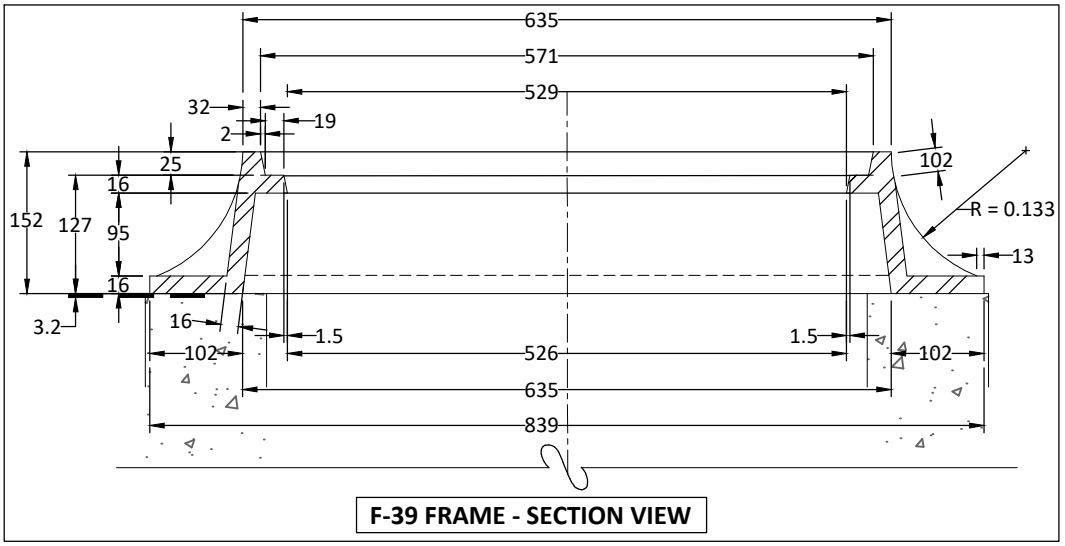


COVER - TOP VIEW

CHECKER DETAIL



COVER -SECTION 'A-A'



F-39 FRAME - SECTION VIEW

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. :
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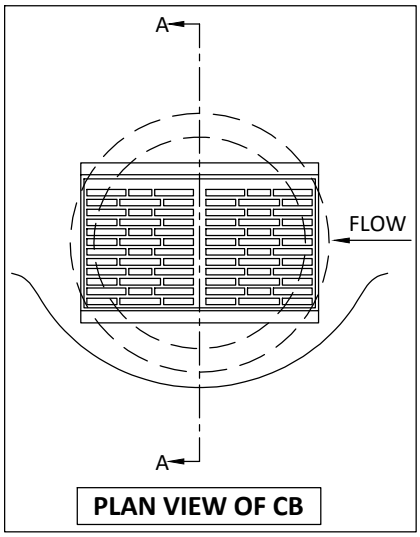
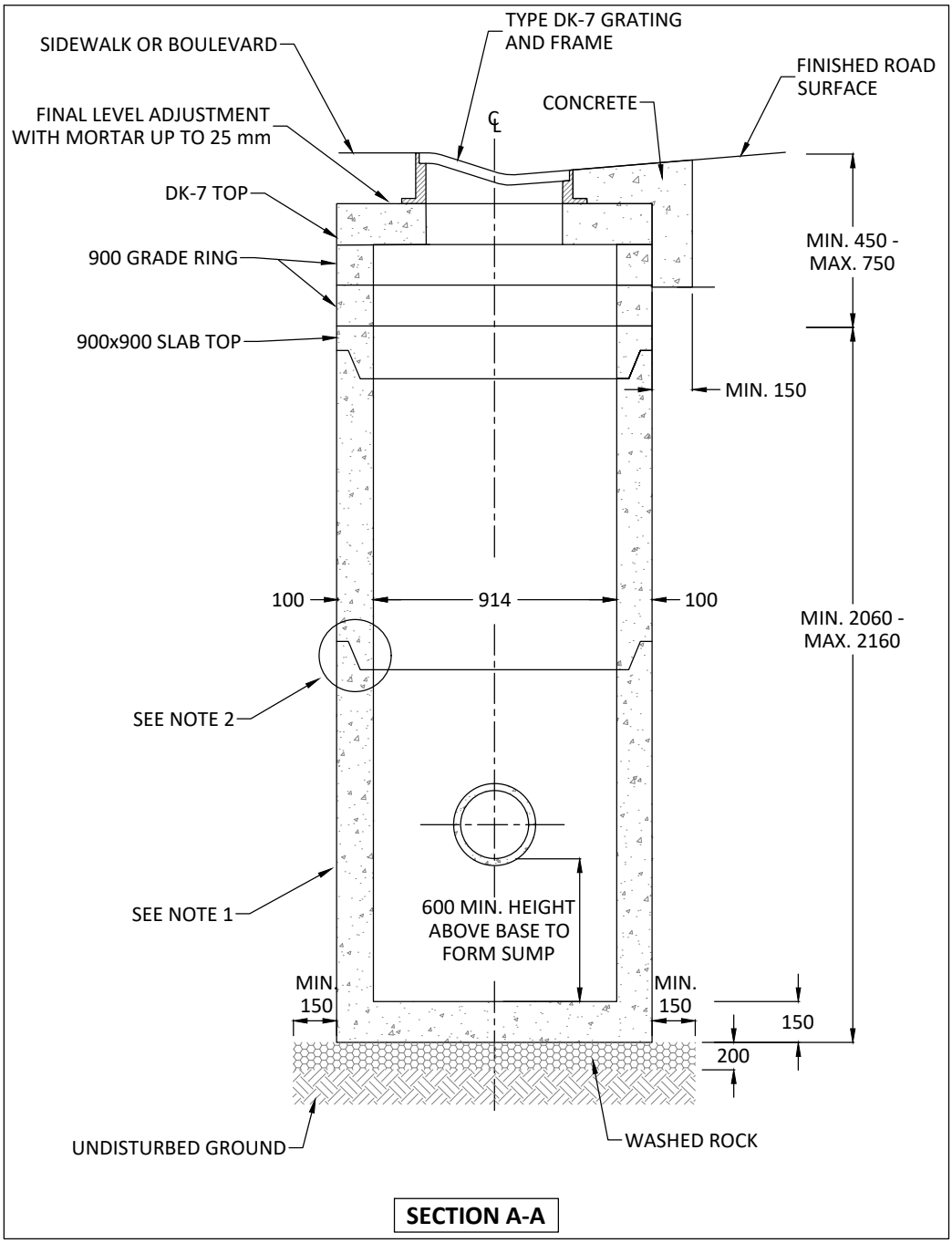
MANHOLE FRAME AND COVER - TYPE 39
Scale: NTS

Sturgeon COUNTY

Drawing: 3.6.11



PLAN VIEW OF CB



SECTION A-A

NOTES:
1. UNIT COULD BE MADE UP OF TWO ITEMS (BASE AND BARREL).
2. OPPOSITE ORIENTATION OF JOINTS IS ACCEPTABLE.
3. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

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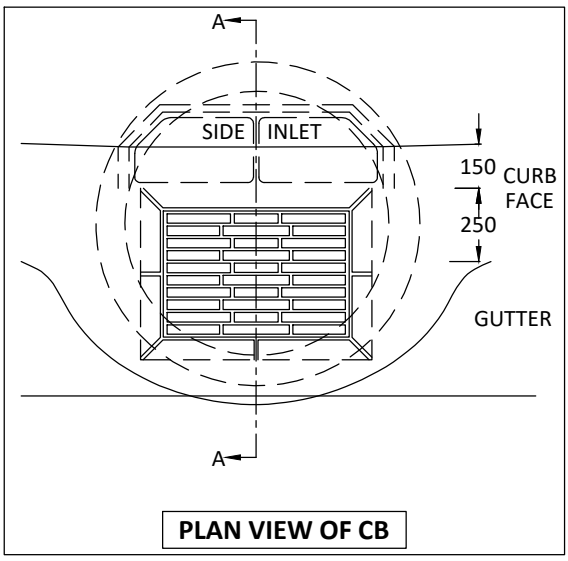
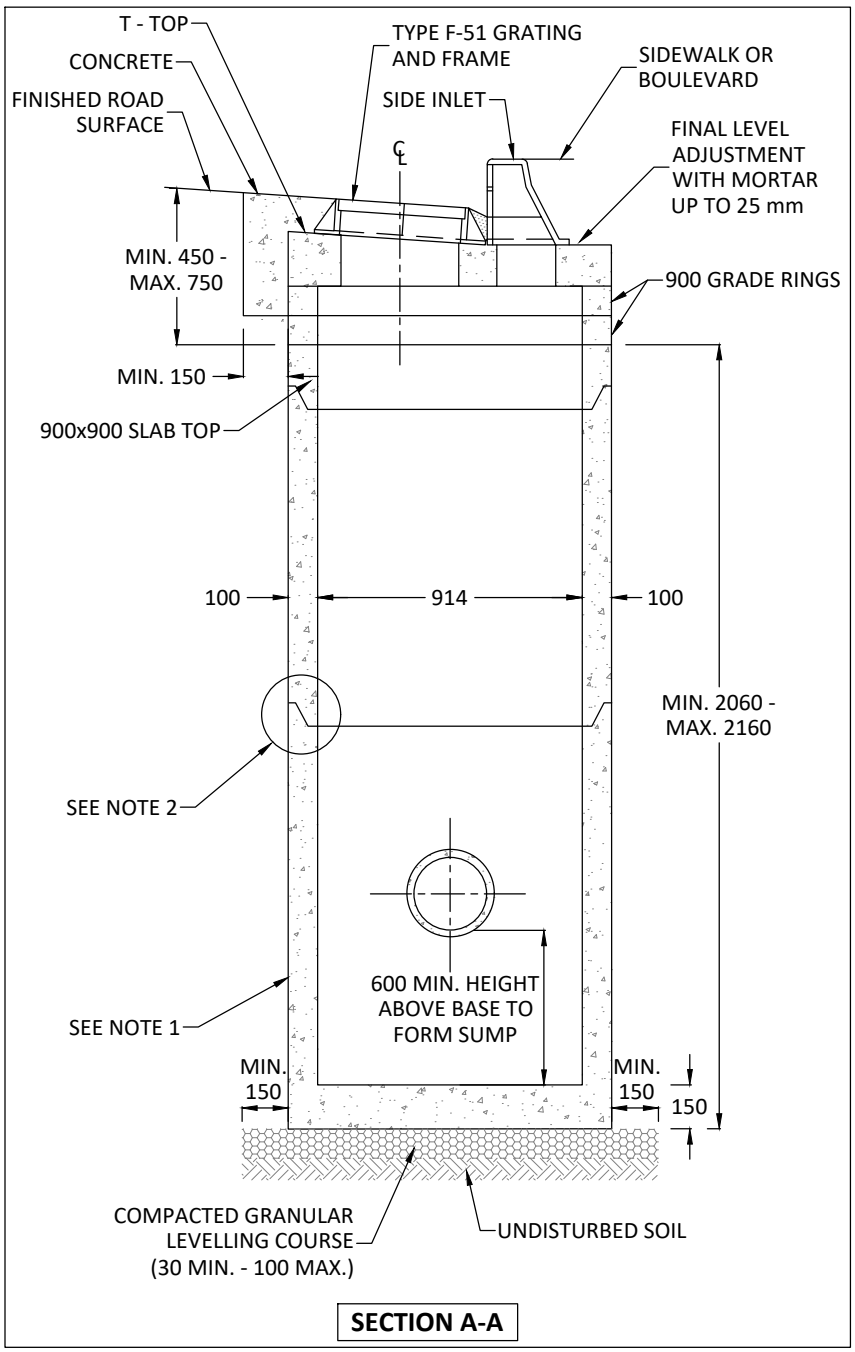
STANDARD 900 DIAMETER CATCH BASIN WITH TYPE K7 GRATING AND FRAME (MOUNTABLE CURB)
Scale: NTS

Sturgeon COUNTY

Drawing: 3.7.0



PLAN VIEW OF CB



SECTION A-A

NOTES:
1. UNIT COULD BE MADE UP OF TWO ITEMS (BASE AND BARREL).
2. OPPOSITE ORIENTATION OF JOINTS IS ACCEPTABLE.
3. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

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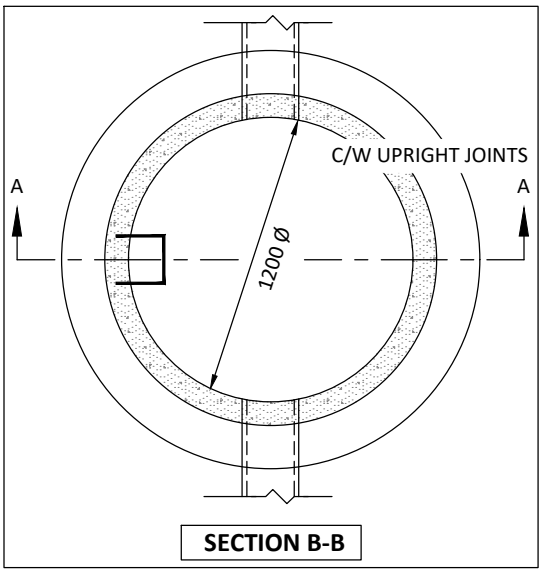
STANDARD 900 DIAMETER CATCH BASIN WITH TYPE F51 GRATING, FRAME AND SIDE INLET (STRAIGHT FACE CURB)

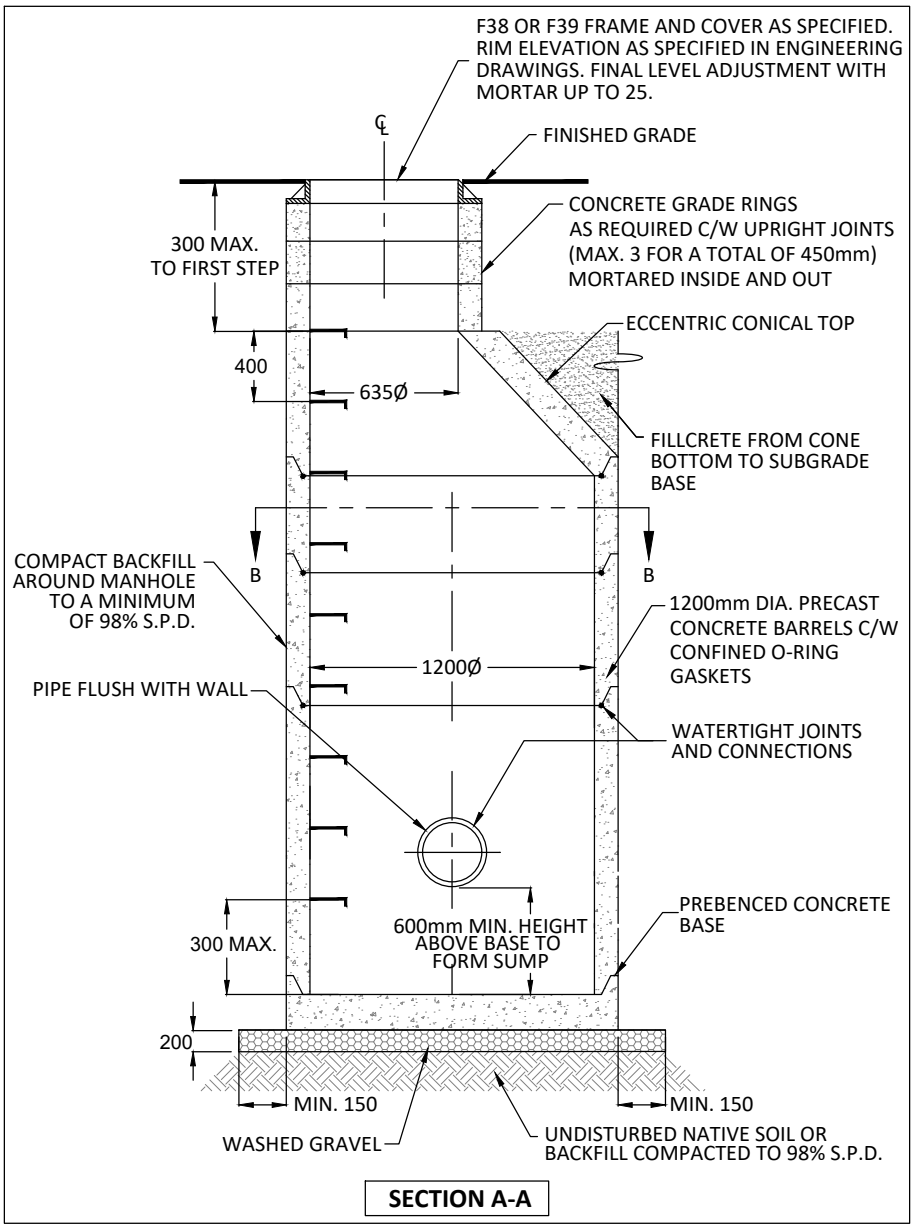
Scale: NTS

Sturgeon COUNTY

Drawing: 3.7.1



SECTION B-B



SECTION A-A

NOTES:

1. SAFETY STEPS TO BE SPACED AT 400 MAX. DISTANCE. LAST STEP TO BE 300 MX. ABOVE BENCHING.
2. PRECAST CONCRETE COMPONENTS TO MEET CURRENT A.S.T.M. C478 STANDARDS.
3. CAST IN PLACE CONCRETE TO BE 25 MPa AT 28 DAYS.
4. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
5. COMPACT BACKFILL AROUND MANHOLES TO A MINIMUM OF 98% STANDARD PROCTOR DENSITY.
6. JOINTS, GRADE RINGS AND CONES, AND BETWEEN RINGS AND FRAMES MUST BE FINISHED WITH A RAM NECK MATERIAL AND FINISHED WITH NON-SHRINK GROUT INSIDE AND OUT.
7. WICK DRAINS TO EXTEND 100mm - 150mm INTO CATCH BASIN
8. THE PLACEMENT OF THE FIRST LADDER RUNG CAN VARY (BARREL SECTION OR GRADE RING INSERT) BUT MUST NOT EXCEED 300mm FROM RIM TO FIRST RUNG.
9. GRADE RINGS MUST BE SET PLUMB TO THE BARREL AND NOT BE STAGGERED.
10. ALL DIMENSIONS IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

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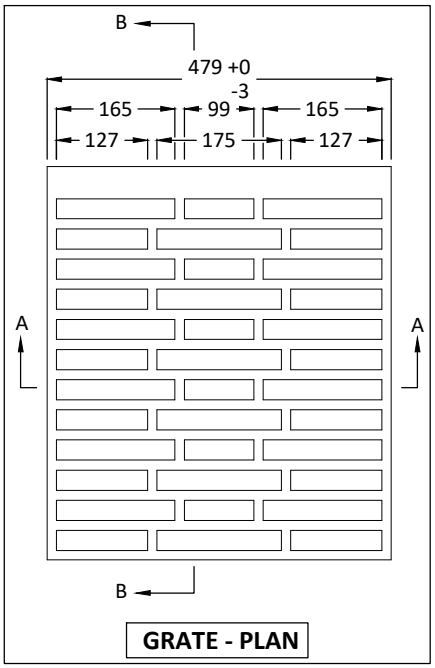
STANDARD 1200 DIAMETER CATCH BASIN MANHOLE

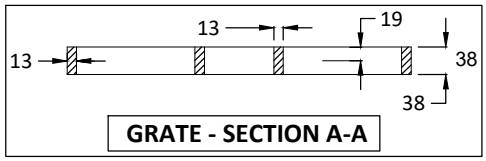
Scale: NTS

Sturgeon COUNTY

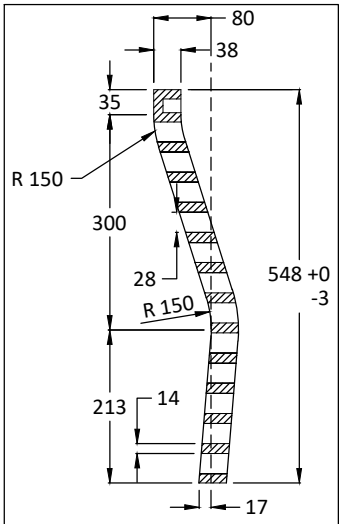
Drawing: 3.7.2



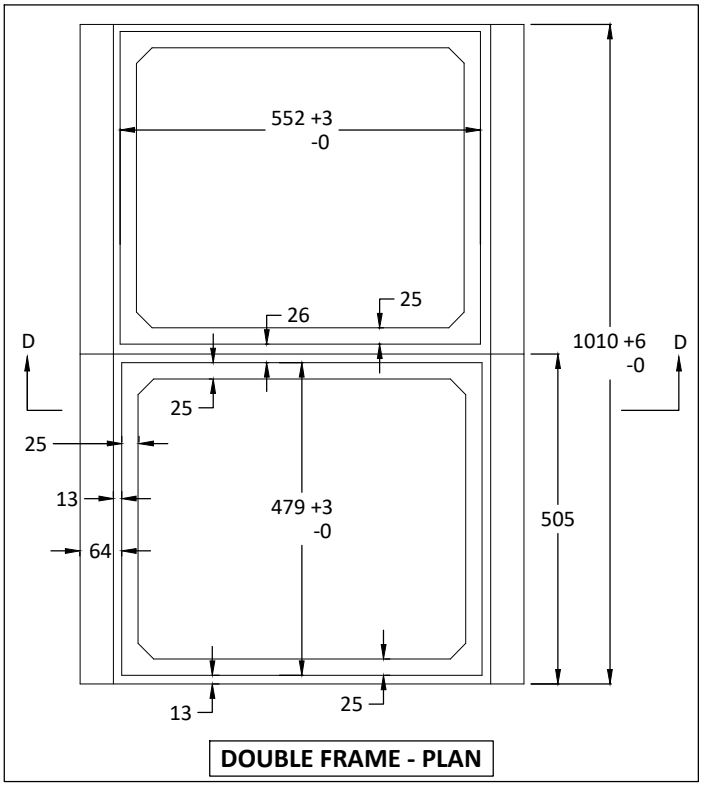
GRATE - PLAN



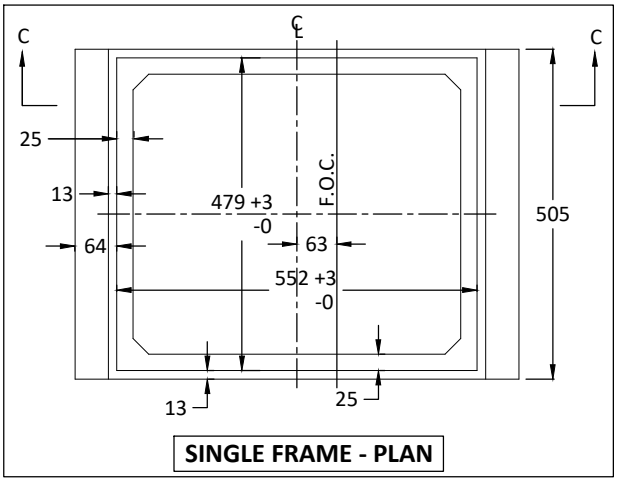
GRATE - SECTION A-A



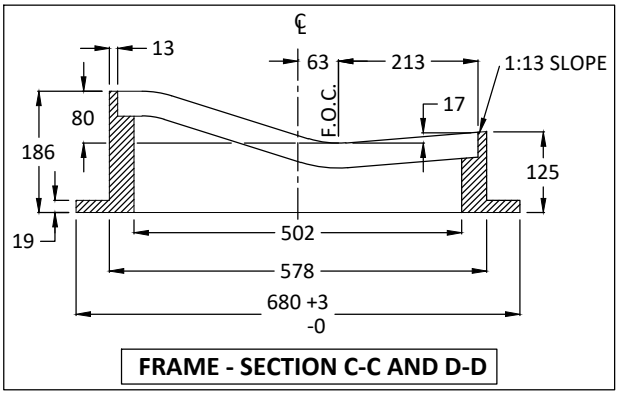
GRATE - SECTION B-B



DOUBLE FRAME - PLAN



SINGLE FRAME - PLAN



FRAME - SECTION C-C AND D-D

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. DOUBLE FRAME TO BE USED UNLESS APPROVED BY THE COUNTY.

MATERIAL SPECIFICATIONS

FRAME

* GREY CAST IRON TO CONFORM TO CLASS 25B A.S.T.M. A48 (LATEST EDTION)

GRATE

* DUCTILE IRON TO CONFORM TO A.S.T.M. A536 (LATEST EDITION) GRADE 80-55-06

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. :
Rev. 2:
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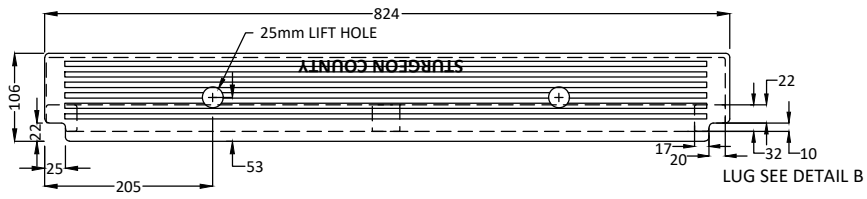
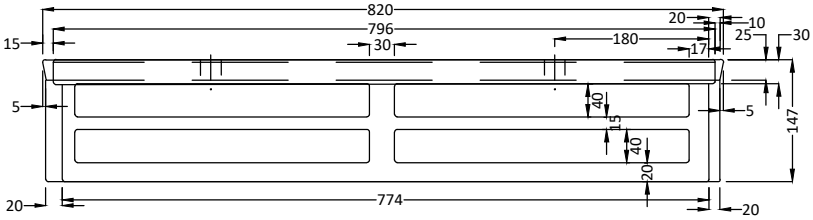
TYPE K-7 CATCH BASIN FRAME AND GRATING (MOUNTABLE CURB)
Scale: NTS

Sturgeon COUNTY

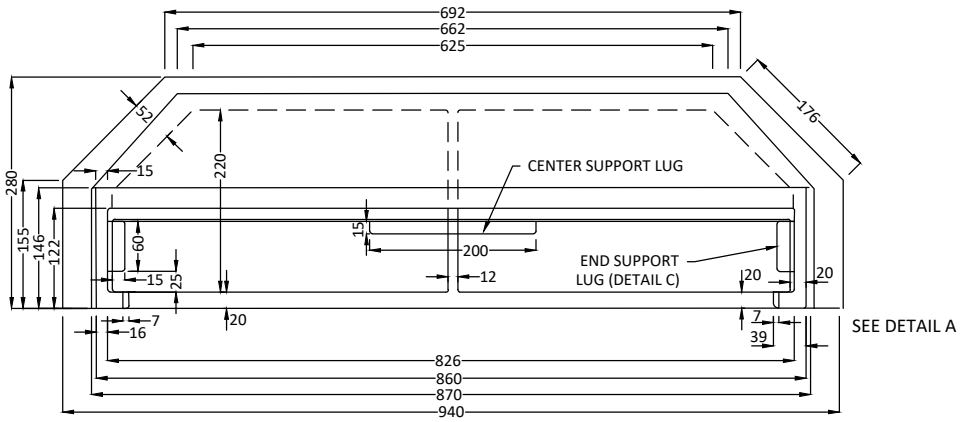
Drawing: 3.7.3



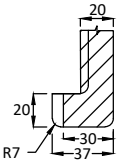
CURB COMPONENT
COVER PART A - PLAN VIEW



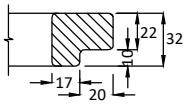
CURB COMPONENT
COVER PART A - FRONT VIEW
DUCTILE IRON (D 65 COVER STRENGTH)



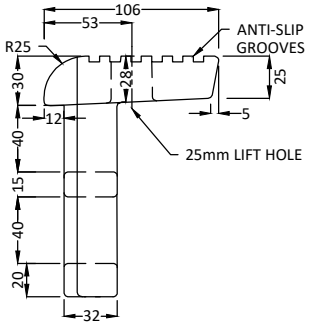
CURB COMPONENT
PART B - PLAN VIEW



DETAIL A
FRAME PART B



LUG DETAIL B
COVER PART A



COVER PART A

NOTES:

1. CASTINGS SHALL CONFORM TO ALL REQUIREMENTS OF ASTM DESIGNATION A48 CLASS 35B OR ASTM DESIGNATION A536 GRADE 65-45-12 (OR APPROVED ALTERNATE) AS SPECIFIED.
2. COATED CASTINGS WILL NOT BE ACCEPTED.
3. CASTINGS SHALL BE MARKED WITH THE PROPER IDENTIFICATION MARKINGS WHICH WILL INCLUDE:
   (A) SERIES DESIGNATION (STURGEON COUNTY STANDARD).
   (B) FOUNDRY IDENTIFICATION MARKINGS, MONTH AND YEAR OF CASTING AND OTHER REQUIREMENTS AS PER AASHTO M306 STANDARD.
4. ALL CASTINGS WILL BE FREE OF DEFECTS, BE TRUE TO PATTERN AND BE FREE FROM CRACKS, GAS HOLES, FLAWS AND EXCESSIVE SHRINKAGE. SURFACES OF THE CASTINGS SHALL BE FREE FROM BURNT ON SAND AND SHALL BE REASONABLE SMOOTH.
5. CASTINGS SHALL BE GUARANTEED NOT TO ROCK WHEN INSTALLED. CASTINGS MAY BE TRIAL FITTED AGAINST STANDARD FRAME PRIOR TO ACCEPTANCE., THE STANDARD FRAME WHICH WILL BE SUPPLIED BY THE COUNTY, WILL HAVE MACHINE BEARING EDGES.
6. THIS DRAWING REPRESENTS DIMENSIONAL INFORMATION FOR PRODUCTS THAT HAVE BEEN PRODUCED FOR THE COUNTY HISTORICALLY. ALTERNATE DIMENSIONS AND DETAILS MAY BE PROPOSED, PROVIDING ALL ALTERNATIVE PRODUCTS AND COMPONENTS ARE FULLY INTERCHANGEABLE WITH THESE PRODUCTS; ALL INLET GRATES PROVIDE THE SAME HYDRAULIC CAPACITY AS THESE PRODUCTS, BY PROVIDING THE SAME GENERAL LAYOUT AND INLET AREA; THE WEIGHTS OF ALTERNATE PRODUCTS ARE WITHIN +/- 5% OF THESE PRODUCTS; AND THE PRODUCTS MEET THE PROOF LOAD TEST REQUIREMENTS FOR HS-20 LOADING AS UTLINED IN AASHTO M306 (LATEST EDITION).
7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

STURGEON COUNTY

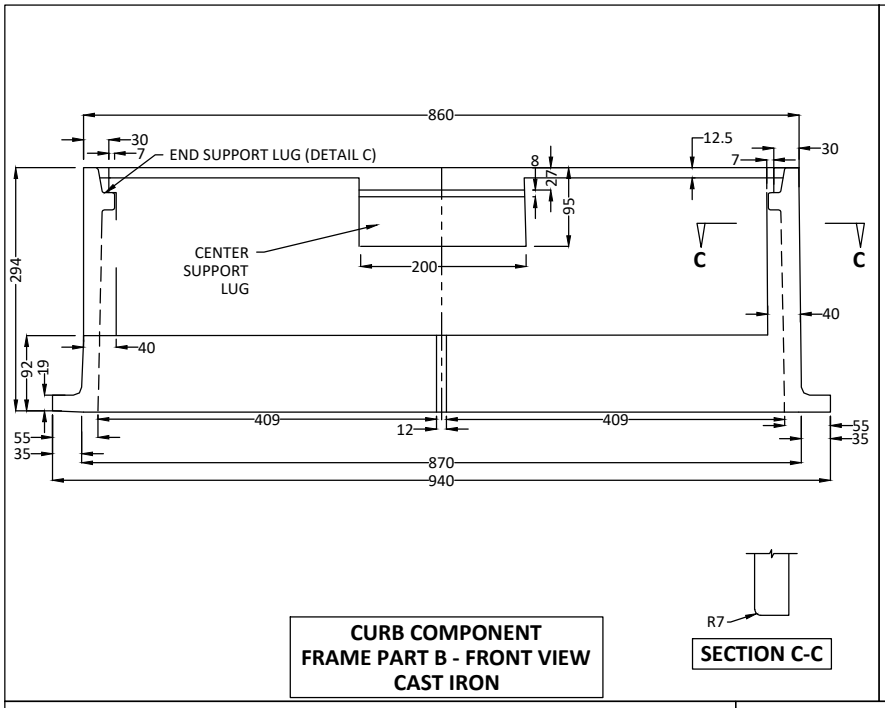
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: JULY 27, 2022

TYPE F51 TWO PIECE CATCH BASIN MANHOLE FRAME AND GRATING - A
Scale: NTS

Sturgeon COUNTY

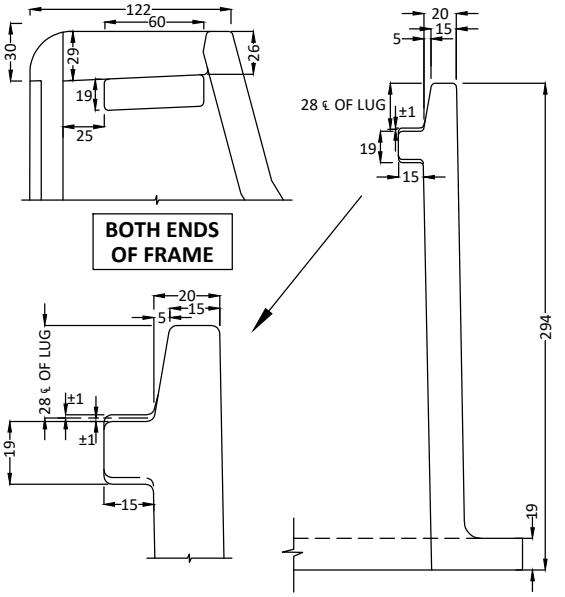
Drawing: 3.7.4



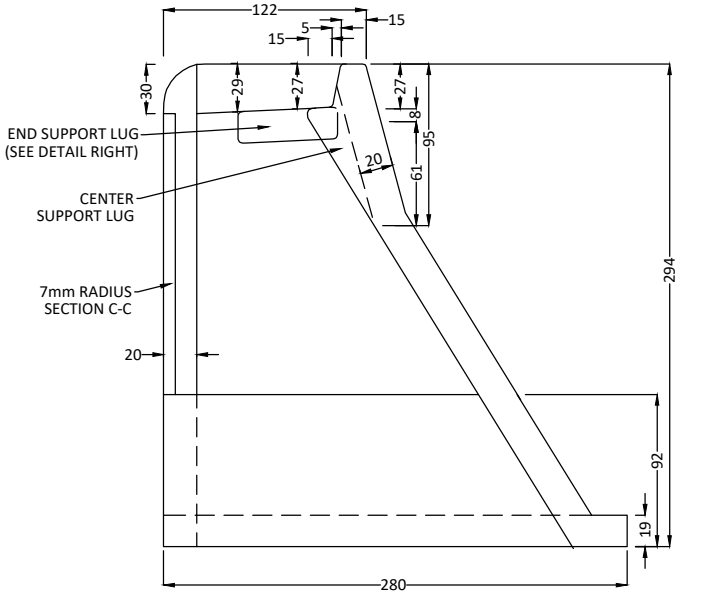
CURB COMPONENT FRAME PART B - FRONT VIEW CAST IRON

SECTION C-C

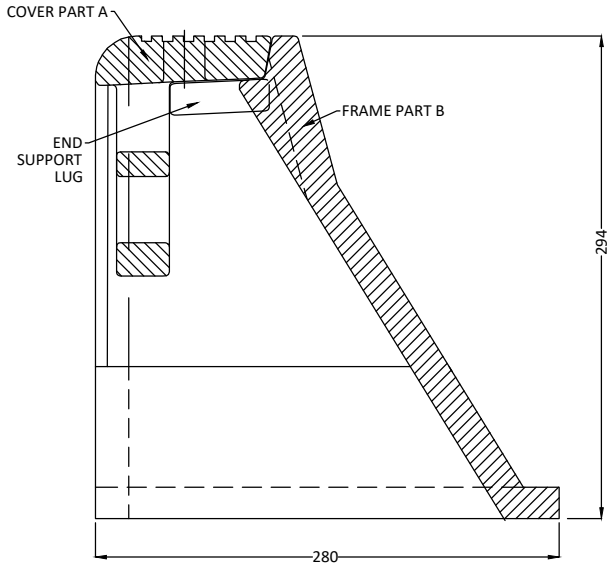
BOTH ENDS OF FRAME



DETAIL C PART B END SUPPORT LUG



FRAME PART B



SECTION A-A

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7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

STURGEON COUNTY

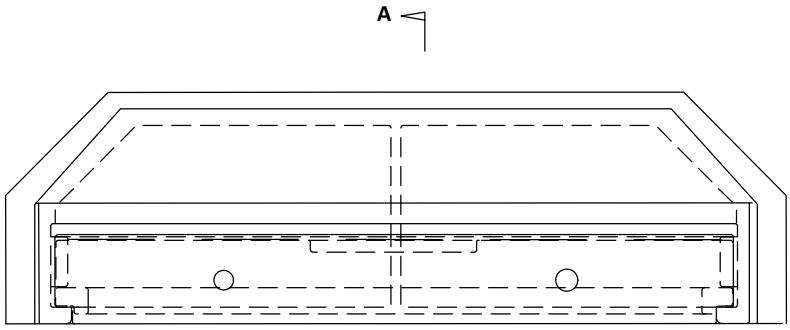
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: JULY 27, 2022

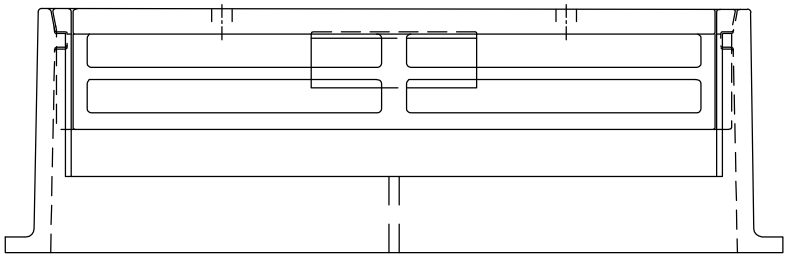
TYPE F51 TWO PIECE CATCH BASIN MANHOLE FRAME AND GRATING - B
Scale: NTS

Sturgeon COUNTY

Drawing: 3.7.4



ASSEMBLED - PLAN VIEW



ASSEMBLED - FRONT VIEW

NOTES:

1. CASTINGS SHALL CONFORM TO ALL REQUIREMENTS OF ASTM DESIGNATION A48 CLASS 35B OR ASTM DESIGNATION A536 GRADE 65-45-12 (OR APPROVED ALTERNATE) AS SPECIFIED.
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STURGEON COUNTY

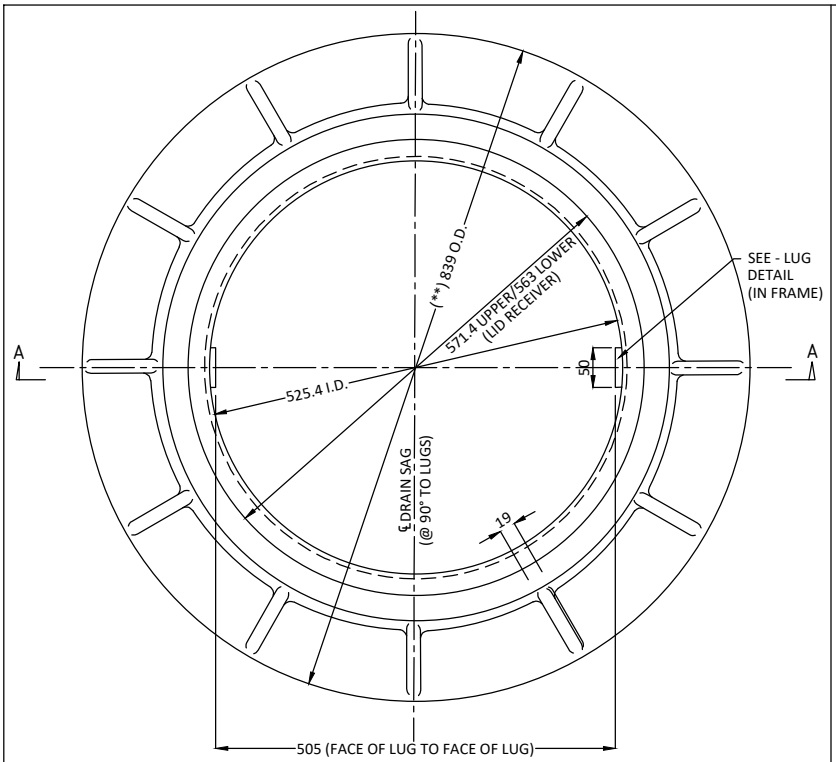
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: JULY 27, 2022

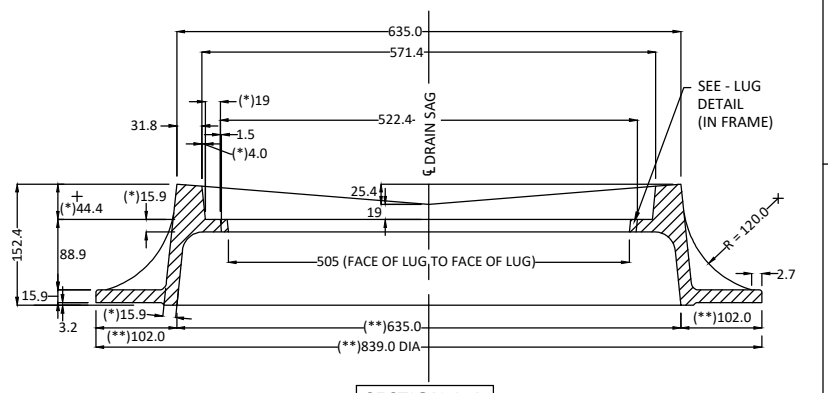
TYPE F51 TWO PIECE CATCH BASIN MANHOLE FRAME AND GRATING - C
Scale: NTS

Sturgeon COUNTY

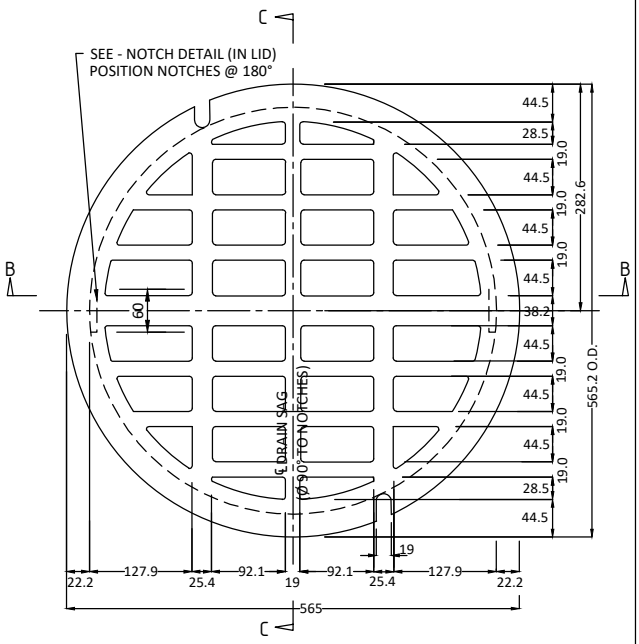
Drawing: 3.7.4



TOP VIEW



SECTION A-A



TOP VIEW

TABLE 1 - MANUFACTURING TOLERANCES

ALL DIMENSIONS SHALL CONFORM TO ±3mm TOLERANCE EXCEPT

1) DIMENSIONS MARKED (*) SHALL CONFORM TO A TOLERANCE OF 1.5mm.
2) DIMENSIONS MARKED (**) SHALL CONFORM TO A TOLERANCE OF 8mm.

NOTES:

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STURGEON COUNTY

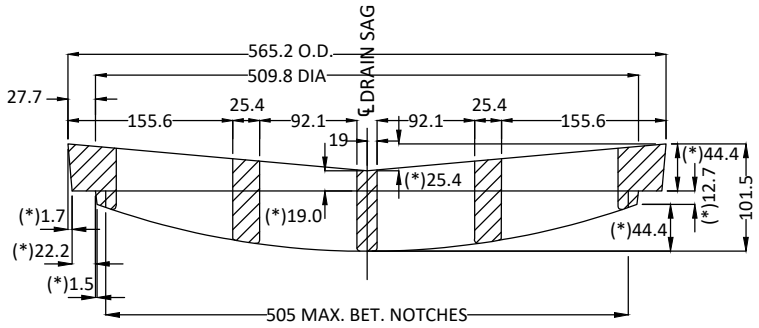
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: JULY 18, 2022

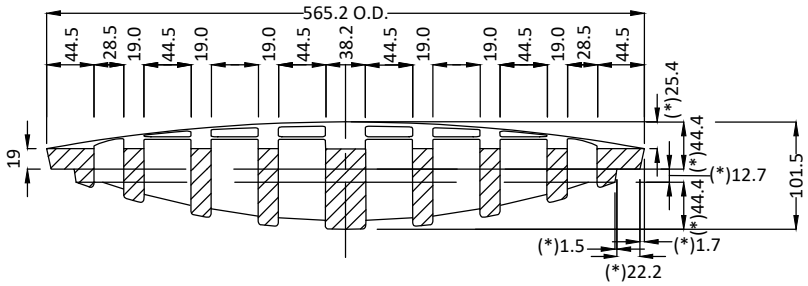
TYPE F38 CATCH BASIN MANHOLE FRAME AND GRATING - A
Scale: NTS

Sturgeon COUNTY

Drawing: 3.7.5

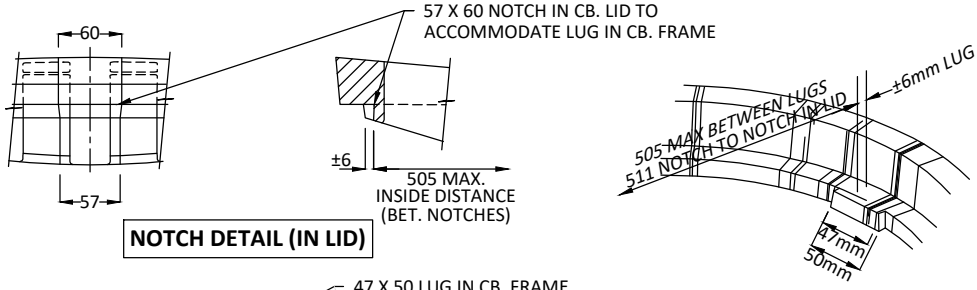


SECTION B-B

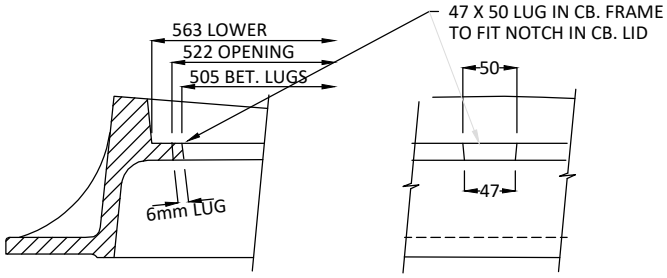


SECTION C-C

FRAME MASS = 86kg
COVER MASS = 59kg



NOTCH DETAIL (IN LID)



LUG DETAIL (IN FRAME)

NOTES:

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STURGEON COUNTY

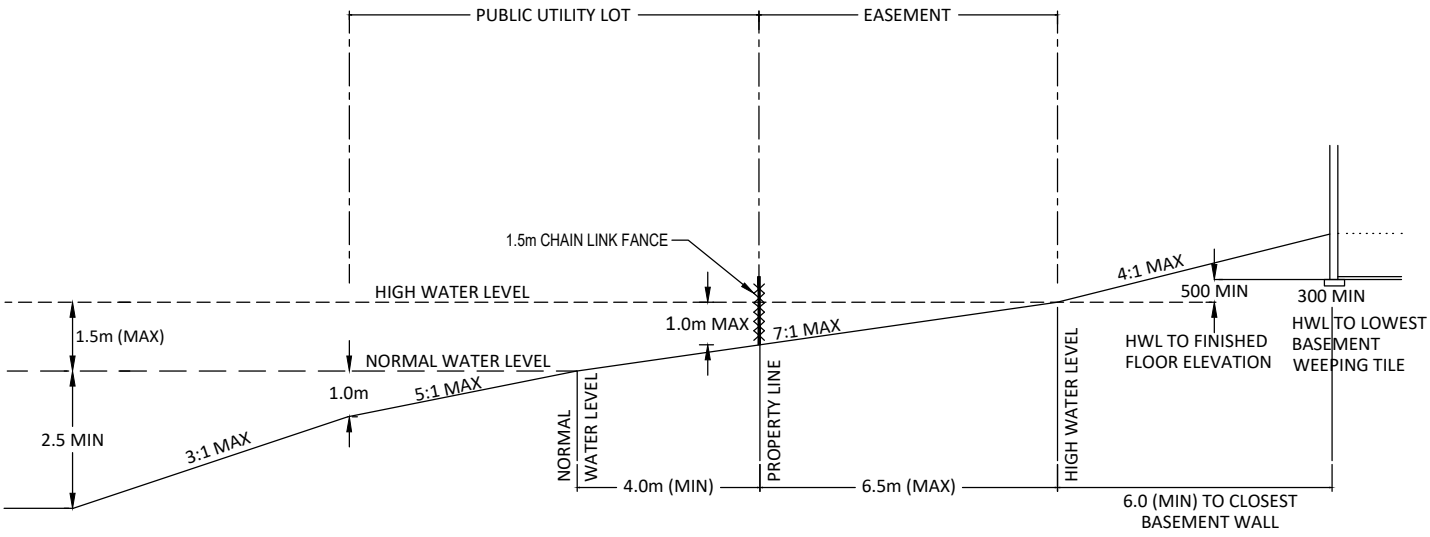
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: JULY 28, 2022

TYPE F38 CATCH BASIN MANHOLE FRAME AND GRATING - B
Scale: NTS

Sturgeon COUNTY

Drawing: 3.7.5



NOTE:
1. A 1.5m CHAINLINK FENCE MUST BE PLACED ALONG THE PROPERTY LINE FOR ALL LOTS ADJOINING THE POND.
2. PONDS MUST BE REVIEWED AND APPROVED BY ALBERTA ENVIRONMENT AND PARKS

STURGEON COUNTY

General Municipal Servicing Standards

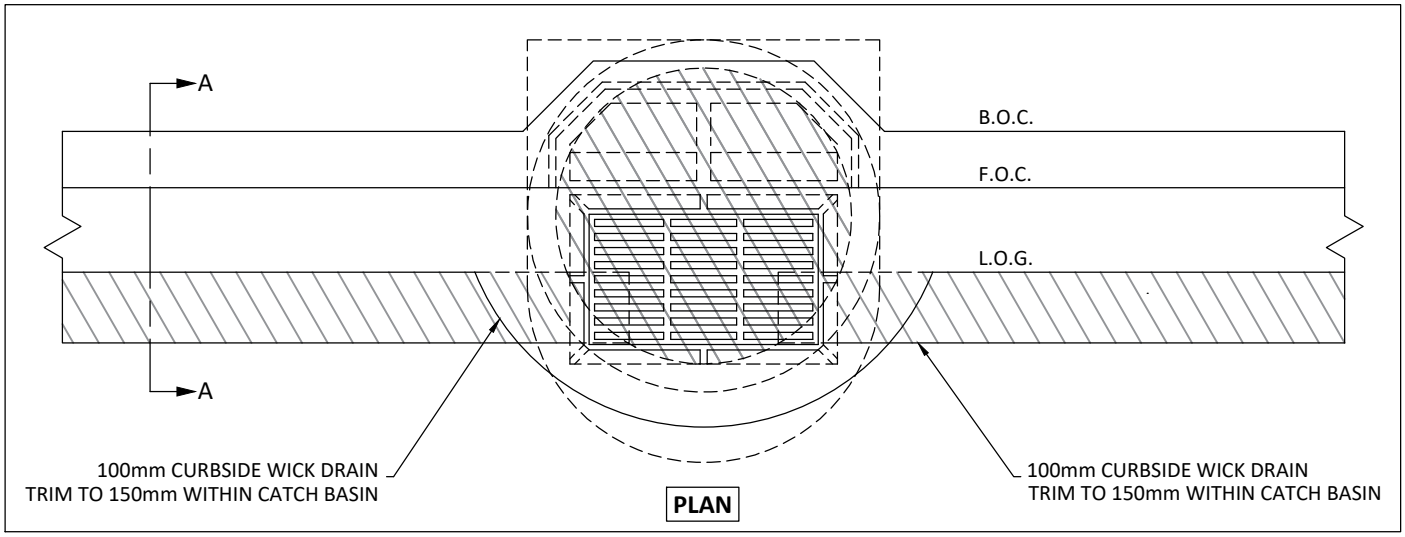
REVISIONS
Rev. :
Rev. 2:
Rev. 1: JULY 11, 2022

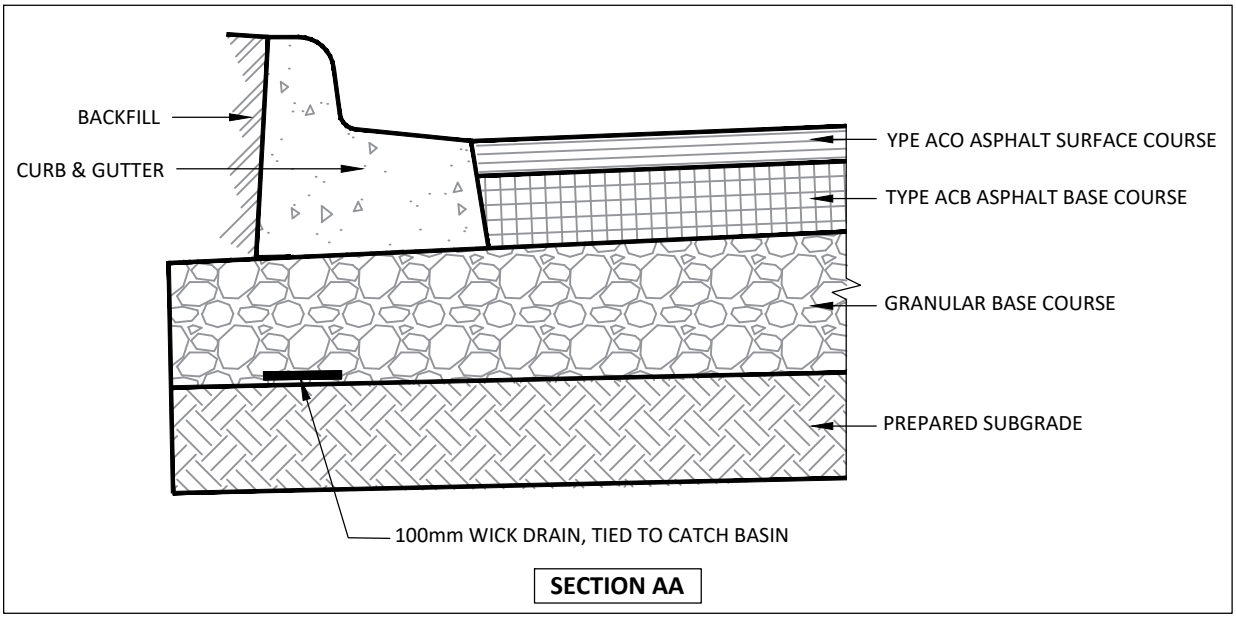
TYPICAL CROSS SECTION FOR A STORM WATER MANAGEMENT WET POND

Scale: NTS

Sturgeon COUNTY

Drawing: 3.7.6





NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

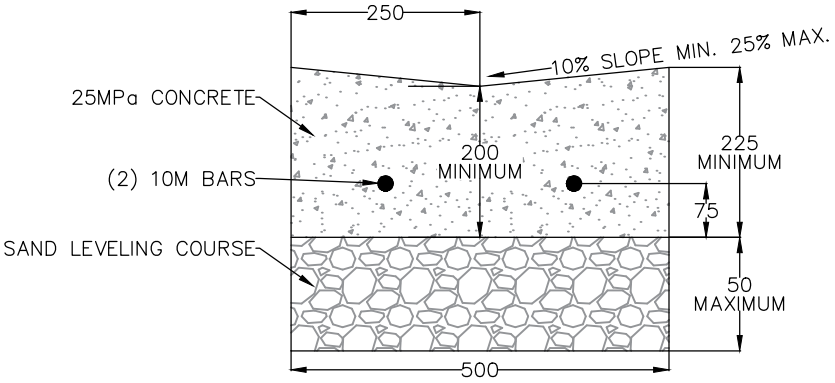
General Municipal Servicing Standards

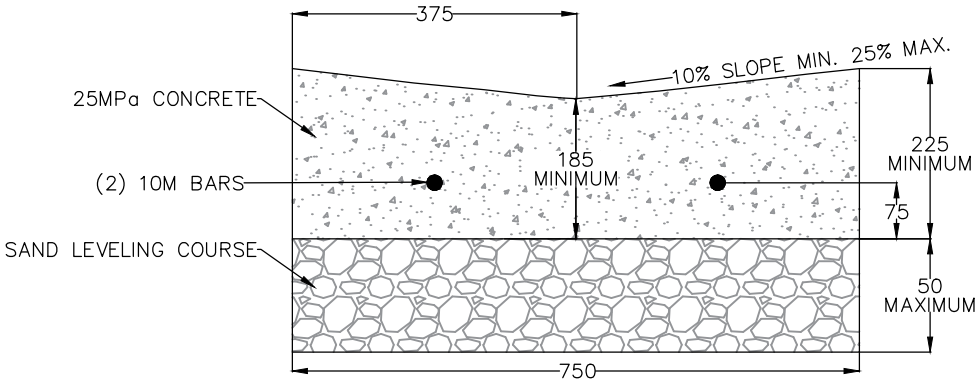
REVISIONS
Rev. :
Rev. :
Rev. 1: JULY 19, 2022

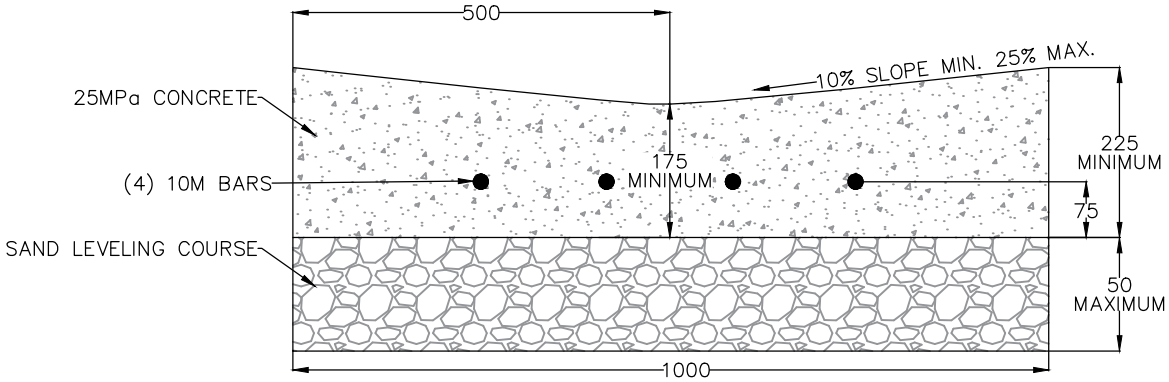
WICK DRAIN CONNECTION TO CATCH BASIN
Scale: NTS

Sturgeon COUNTY

Drawing: 3.7.7







NOTES:

1. CONSTRUCTION JOINTS SHALL BE PROVIDED EVERY 3m.
2. CONCRETE SWALE SHALL HAVE A MINIMUM LONGITUDINAL SLOPE OF 0.75%.
3. CONCRETE SWALES TO BE PLACED WITHIN APPROPRIATELY SIZED AND SLOPED GRASS SWALE AND EASEMENT.
4. REINFORCING BARS ARE REQUIRED AT CONSTRUCTION JOINTS AND FUTURE TIE-IN LOCATIONS.
5. REINFORCING BARS SHALL EXTEND INTO CONCRETE A MINIMUM OF 300mm.
6. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

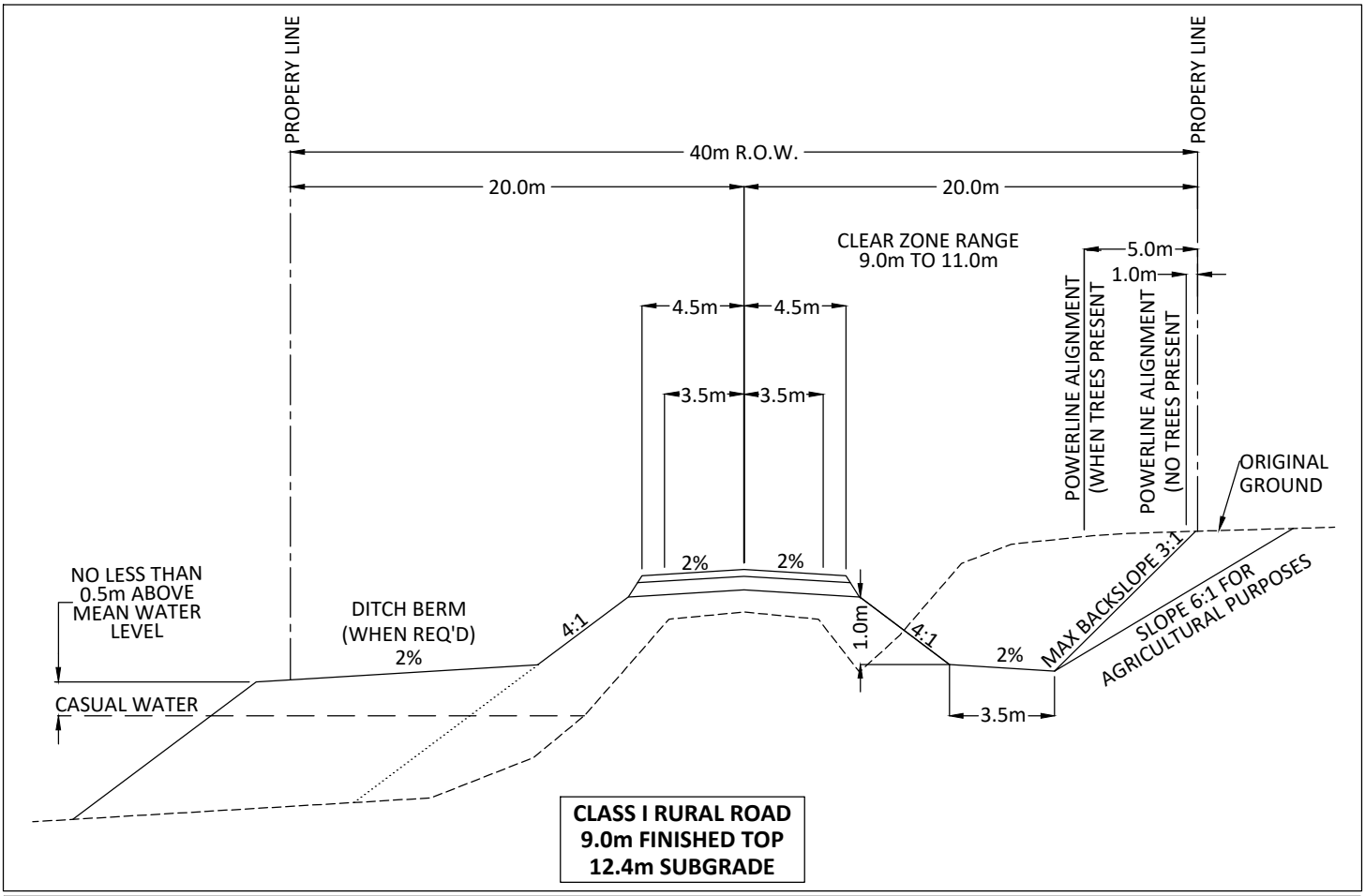
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: JULY 20, 2022

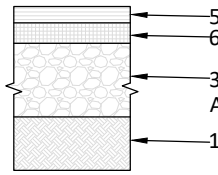
TYPICAL CONCRETE SWALE CROSS SECTION
Scale: NTS

Sturgeon COUNTY

Drawing: 3.7.8



CLASS I RURAL ROAD
9.0m FINISHED TOP
12.4m SUBGRADE



50mm TYPE ACO HOT-MIX ASPHALTIC CONCRETE SURFACE COURSE
60mm TYPE ABO HOT-MIX ASPHALTIC CONCRETE BASE COURSE
300mm GRANULAR BASE (MAY INCLUDE UP TO 50mm COLD-MIX ASPHALTIC CONCRETE
150mm SUBGRADE PREPARATION, COMPACTED TO 100% S.P.D.

MINIMUM ROAD STRUCTURE

NOTES:

1. STANDARD ALIGNMENT OF POWERPOLES IS 1.0m FROM PROPERTY LINE WHEN NO TREES ARE PRESENT. IF PRESENT, THE REQUIRED 5.0m OFFSET BETWEEN POWERLINES AND TREE CANOPY IS MET WITH A 5.0m POWERPOLE OFFSET WITHIN THE RIGHT-OF-WAY.
2. GEOTECHNICAL CONSULTANT TO CONFIRM SUITABILITY OF CROSS-SECTION STRUCTURE.
3. MINIMUM LONGITUDINAL GRADE FOR ROAD AND DITCH TO BE 0.5%.
4. POSITIVE DRAINAGE IS TO BE MAINTAINED AT ALL LOCATIONS.
5. DESIRED 4:1 BACKSLOPING (MINIMUM 3:1), WITH PROVISION FOR 6:1 FOR AGRICULTURAL PURPOSES.
6. TRAFFIC VOLUME >1000 vpd.
7. IF POSTED SPEED LIMIT ≤50 km/hr, MINIMUM INTERSECTION SPACING FROM EXISTING ROADWAY TO BE 60m AND MINIMUM INTERSECTION SPACING FROM EXISTING ACCESS TO BE 45m. IF POSTED SPEED LIMIT >50 km/hr, MINIMUM INTERSECTION SPACING FROM EXISTING ROADWAY OR ACCESS TO BE 90m.
8. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%.
9. DESIGN SPEED LIMIT TO BE 100 km/hr.
10. FOR FURTHER DESIGN INFORMATION SEE SECTION 4.1.4.1.

STURGEON COUNTY

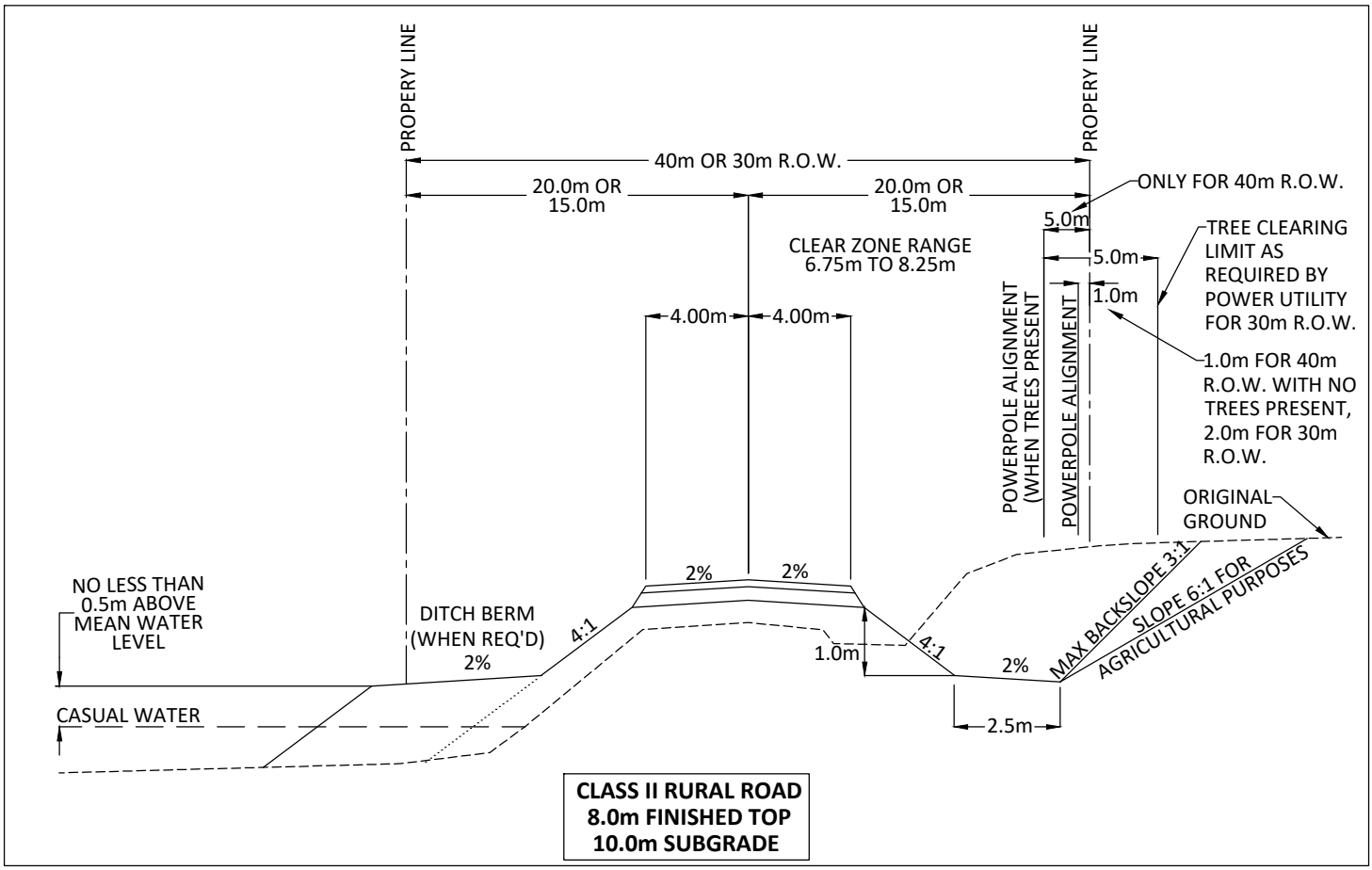
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: MARCH 15, 2023

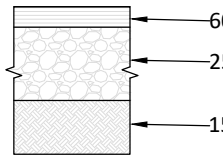
CLASS I RURAL GRID ROAD - 40m RIGHT-OF-WAY, 9m ROADWAY (ASPHALT)
Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.0



CLASS II RURAL ROAD
8.0m FINISHED TOP
10.0m SUBGRADE



MINIMUM ROAD STRUCTURE

NOTES:

1. TYPICAL 30.0m ROAD RIGHT-OF-WAY WITH BACKSLOPING AGREEMENTS OR 40.0m ROAD RIGHT-OF-WAY TO ALLEVIATE NEED FOR BACKSLOPING AGREEMENTS, POWER UTILITY COMPANY TREE CLEARING, AND TO FACILITATE FUTURE TRANSITION TO A CLASS-I ROADWAY.
2. GEOTECHNICAL CONSULTANT TO CONFIRM SUITABILITY OF CROSS-SECTION STRUCTURE.
3. MINIMUM LONGITUDINAL GRADE FOR ROAD AND DITCH TO BE 0.5%.
4. POSITIVE DRAINAGE IS TO BE MAINTAINED AT ALL LOCATIONS.
5. DESIRED 4:1 BACKSLOPING (MINIMUM 3:1), WITH PROVISION FOR 6:1 FOR AGRICULTURAL PURPOSES.
6. TRAFFIC VOLUME 200-1000 vpd.
7. IF POSTED SPEED LIMIT ≤50 km/hr, MINIMUM INTERSECTION SPACING FROM EXISTING ROADWAY TO BE 60m AND MINIMUM INTERSECTION SPACING FROM EXISTING ACCESS TO BE 45m. IF POSTED SPEED LIMIT >50 km/hr, MINIMUM INTERSECTION SPACING FROM EXISTING ROADWAY OR ACCESS TO BE 90m.
8. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%.
9. DESIGN SPEED LIMIT TO BE 90 km/hr.
10. FOR FURTHER DESIGN INFORMATION SEE SECTION 4.1.4.2.

STURGEON COUNTY

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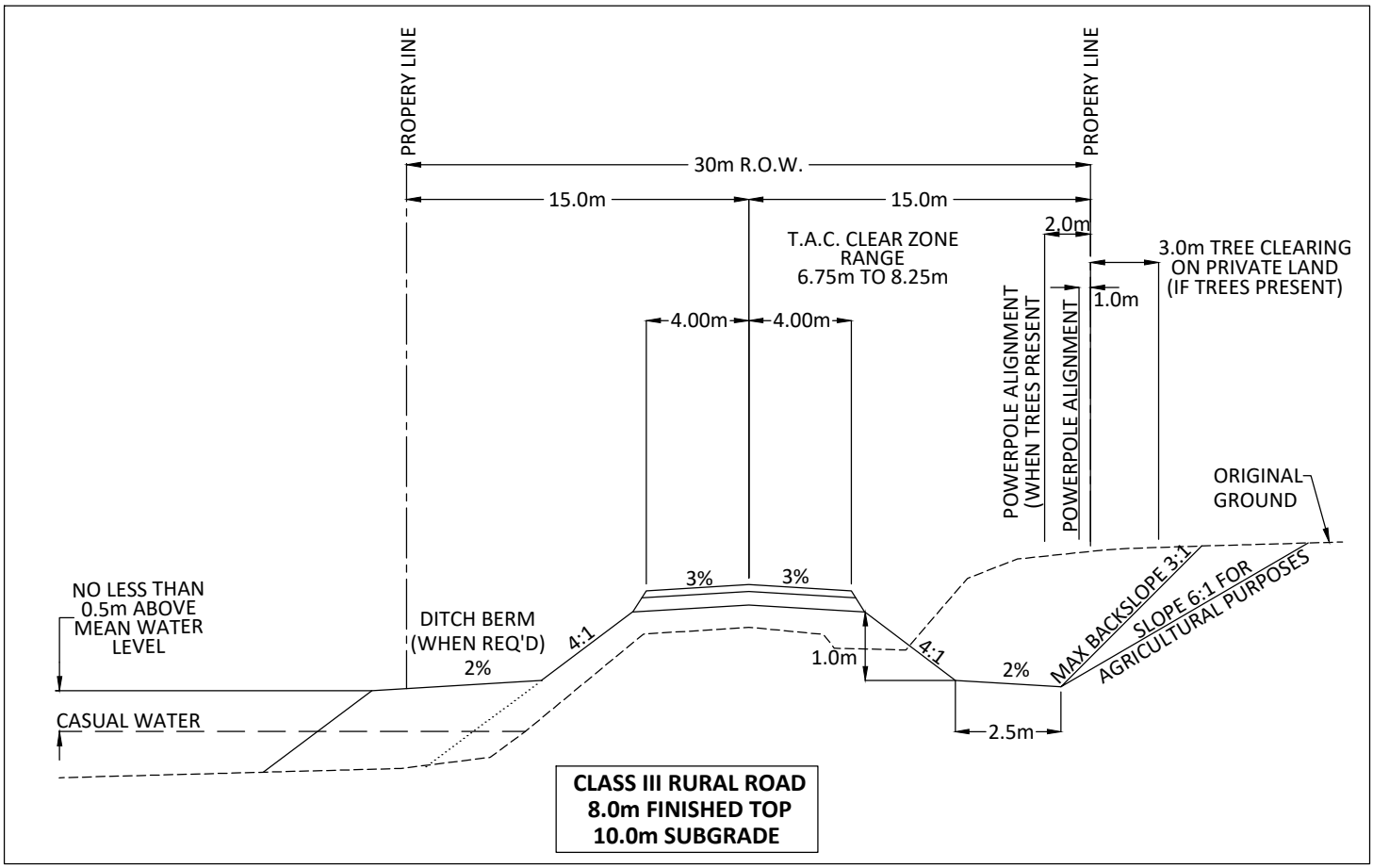
Rev. 1: MARCH 15, 2023

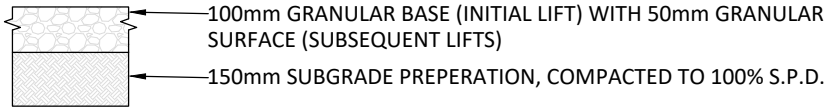
CLASS II RURAL GRID ROAD - 40m OR 30m RIGHT-OF-WAY, 8.0m ROADWAY (ASPHALT)
Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.1



CLASS III RURAL ROAD
8.0m FINISHED TOP
10.0m SUBGRADE



MINIMUM ROAD STRUCTURE

NOTES:

1. TYPICAL 30.0m ROAD RIGHT-OF-WAY WITH BACKSLOPING AGREEMENTS
2. STANDARD ALIGNMENT OF POWERPOLES IS 1.0m FROM PROPERTY LINE WHEN NO TREES ARE PRESENT. IF PRESENT, THE REQUIRED 5.0m OFFSET BETWEEN POWERLINES AND TREE CANOPY (AS REQUIRED BY THE POWER UTILITY COMPANY) IS MET WITH A 2.0m POWERPOLE OFFSET WITHIN THE RIGHT-OF-WAY AND 3.0m OF TREE CLEARING WITHIN PRIVATE PROPERTY.
3. CLASS IV RURAL GRID ROAD AS ABOVE BUT SURFACE TREATED WITH DUST ABATEMENT MATERIAL.
4. MINIMUM LONGITUDINAL GRADE FOR ROAD AND DITCH TO BE 0.5%.
5. POSITIVE DRAINAGE IS TO BE MAINTAINED AT ALL LOCATIONS.
6. DESIRED 4:1 BACKSLOPING (MINIMUM 3:1), WITH PROVISION FOR 6:1 FOR AGRICULTURAL PURPOSES.
7. TRAFFIC VOLUME <200 vpd.
8. IF POSTED SPEED LIMIT ≤50 km/hr, MINIMUM INTERSECTION SPACING FROM EXISTING ROADWAY TO BE 60m AND MINIMUM INTERSECTION SPACING FROM EXISTING ACCESS TO BE 45m. IF POSTED SPEED LIMIT >50 km/hr, MINIMUM INTERSECTION SPACING FROM EXISTING ROADWAY OR ACCESS TO BE 90m.
9. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%.
10. DESIGN SPEED LIMIT TO BE 90 km/hr.
11. FOR FURTHER DESIGN INFORMATION SEE SECTION 4.1.4.3.

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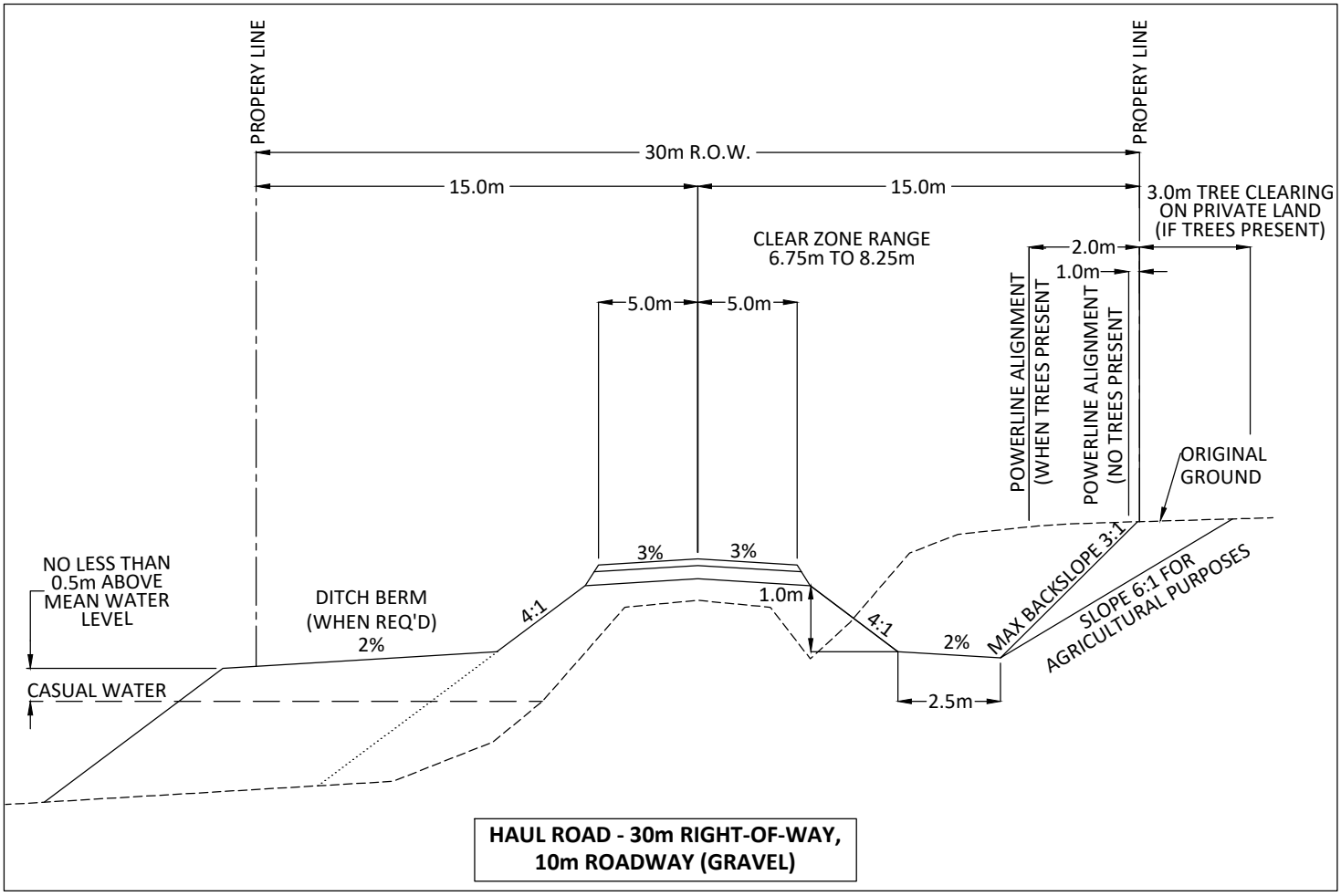
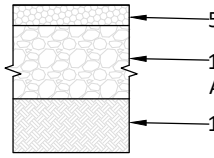
CLASS III RURAL GRID ROAD - 30m RIGHT-OF-WAY, 8.0m ROADWAY (GRAVEL)
Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.2



HAUL ROAD - 30m RIGHT-OF-WAY, 10m ROADWAY (GRAVEL)



50mm CRUSHED AGGREGATE SURFACE LIFT

150mm GRANULAR BASE (MAY INCLUDE UP TO 50mm COLD-MIX ASPHALTIC CONCRETE

150mm SUBGRADE PREPARATION, COMPACTED TO 100% S.P.D.

MINIMUM ROAD STRUCTURE

NOTES:

1. GEOTECHNICAL CONSULTANT TO CONFIRM SUITABILITY OF CROSS-SECTION STRUCTURE.
2. MINIMUM LONGITUDINAL GRADE FOR ROAD AND DITCH TO BE 0.5%.
3. POSITIVE DRAINAGE IS TO BE MAINTAINED AT ALL LOCATIONS.
4. DESIRED 4:1 BACKSLOPING (MINIMUM 3:1), WITH PROVISION FOR 6:1 FOR AGRICULTURAL PURPOSES.
5. TRAFFIC VOLUME <200 vpd.
6. IF POSTED SPEED LIMIT ≤50 km/hr, MINIMUM INTERSECTION SPACING FROM EXISTING ROADWAY TO BE 60m AND MINIMUM INTERSECTION SPACING FROM EXISTING ACCESS TO BE 45m. IF POSTED SPEED LIMIT >50 km/hr, MINIMUM INTERSECTION SPACING FROM EXISTING ROADWAY OR ACCESS TO BE 90m.
7. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%.
8. DESIGN SPEED LIMIT TO BE 90 km/hr.
9. FOR FURTHER DESIGN INFORMATION SEE SECTION 4.1.4.4.

STURGEON COUNTY

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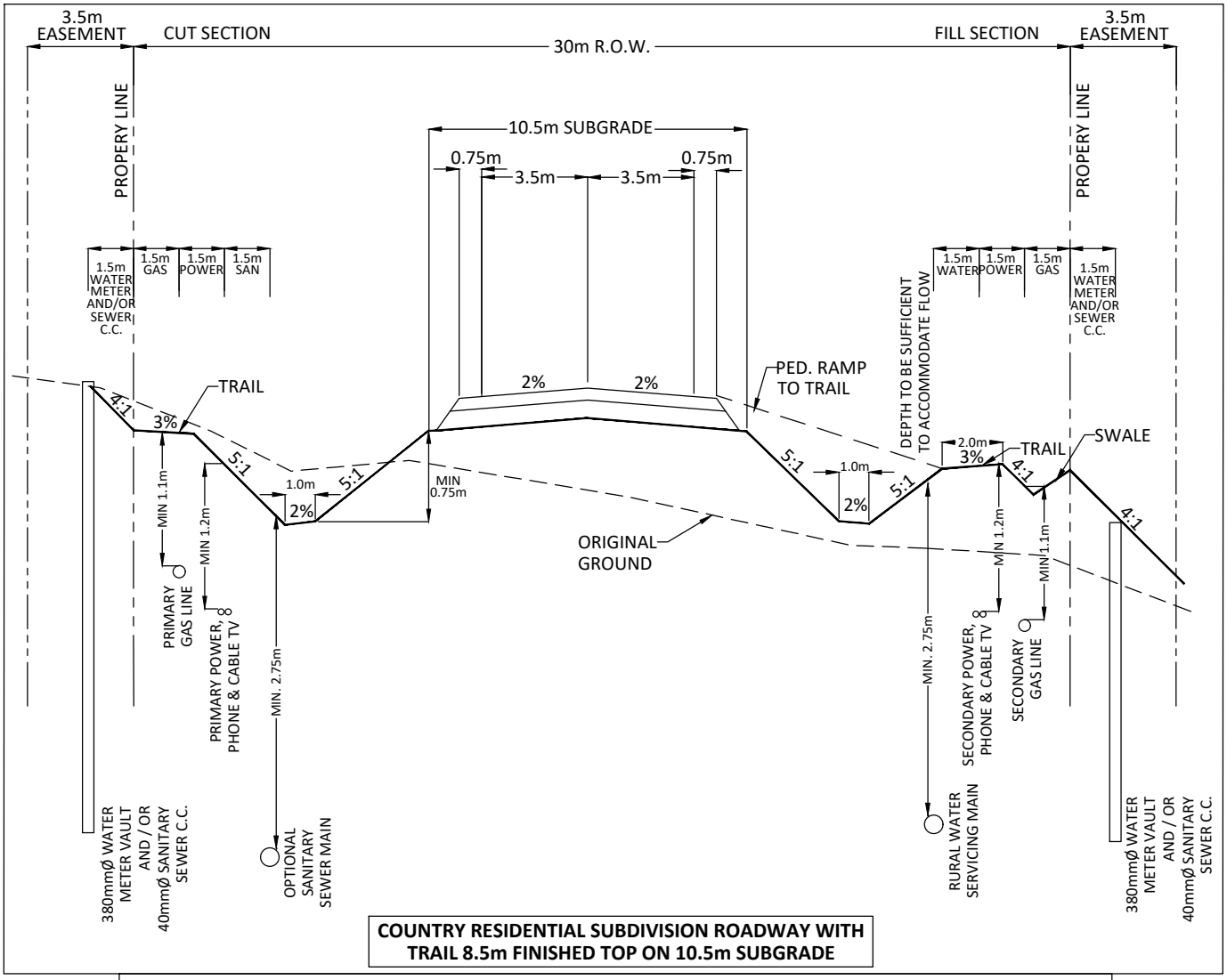
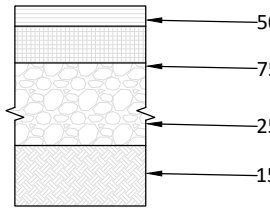
HAUL ROAD - 30m RIGHT-OF-WAY, 10m ROADWAY (GRAVEL)
Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.3



COUNTRY RESIDENTIAL SUBDIVISION ROADWAY WITH TRAIL 8.5m FINISHED TOP ON 10.5m SUBGRADE



MINIMUM ROAD STRUCTURE

NOTES:

1. PROVISION FOR 7.5m FINISHED TOP AND 9.5m SUBGRADE ON CUL-DE-SAC ROADS PER LOT NUMBER AND SECOND ACCESS REQUIREMENTS.
2. MINIMUM LONGITUDINAL GRADE FOR ROAD AND DITCH TO BE 0.5%.
3. POSITIVE DRAINAGE IS TO BE MAINTAINED AT ALL LOCATIONS.
4. DITCH DEPTH TO BE CONFIRMED BY GEOTECHNICAL REPORT.
5. MINIMUM ROAD STRUCTURE SUBJECT TO REVISION BY GEOTECHNICAL REPORT RECOMMENDATIONS.
6. ALL TRENCHES IN ROAD RIGHT-OF-WAY REQUIRE COMPACTION TO 98% STANDARD PROCTOR DENSITY, IN DITCH OR BACKSLOPE, 95% S.P.D. IS ACCEPTABLE.
7. TRAFFIC VOLUME <200 vpd.
8. MINIMUM INTERSECTION SPACING TO BE 75m FROM GRID ROADWAY AND 60M FROM INTERNAL ROADWAY.
9. MAXIMUM GRADE TO BE 2% AND MINIMUM GRADE TO BE 0.6% FOR FIRST 30m OF ROADWAY.
10. DESIGN SPEED LIMIT TO BE 60 km/hr.
11. FOR FURTHER DESIGN INFORMATION SEE SECTION 4.1.5.

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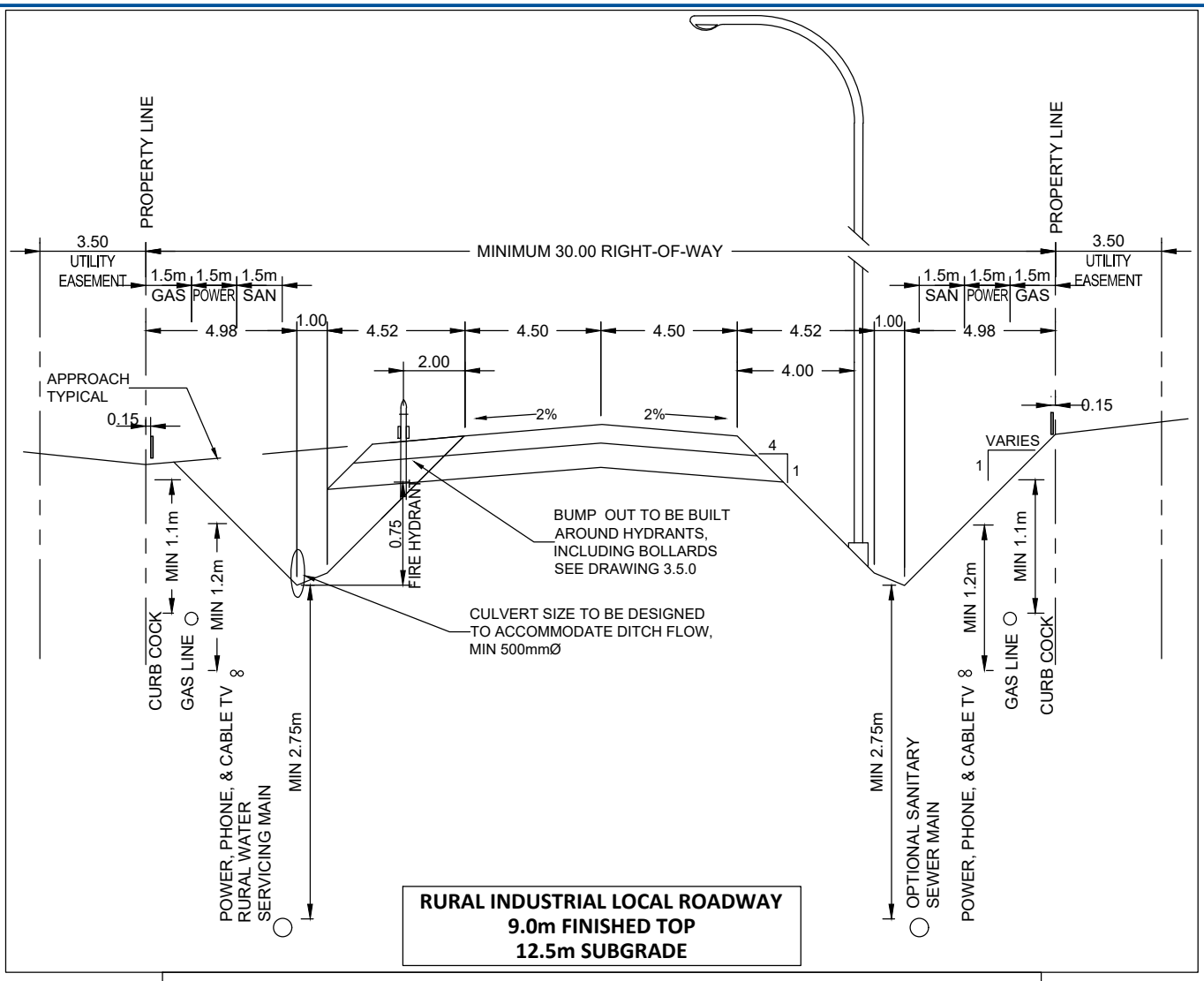
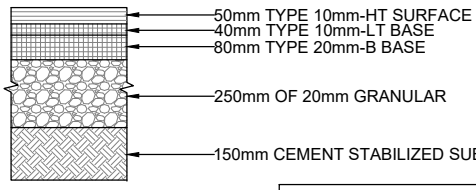
COUNTRY RESIDENTIAL SUBDIVISION ROADWAY - 30m RIGHT-OF-WAY, 8.5m ROADWAY, ASPHALT TRAIL
Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.4



RURAL INDUSTRIAL LOCAL ROADWAY
9.0m FINISHED TOP
12.5m SUBGRADE



MINIMUM ROAD STRUCTURE

NOTES:

1. MINIMUM LONGITUDINAL GRADE FOR ROAD AND DITCH TO BE 0.5%.
2. POSITIVE DRAINAGE IS TO BE MAINTAINED AT ALL LOCATION.
3. DITCH DEPTH TO BE CONFIRMED BY GEOTECHNICAL REPORT.
4. MINIMUM ROAD STRUCTURE SUBJECT TO REVISION BY GEOTECHNICAL REPORT RECOMMENDATIONS.
5. ALL TRENCHES IN ROAD OR SIDESPLOE REQUIRE COMPACTION TO 98% STANDARD PROCTOR DENSITY, IN DITCH BOTTOM OR BACKSLOPE, 95% S.P.D. IS ACCEPTABLE.
6. TRAFFIC VOLUME <200 vpd.
7. IF POSTED SPEED LIMIT ≤50 km/hr, MINIMUM INTERSECTION SPACING FROM EXISTING ROADWAY TO BE 60m AND MINIMUM INTERSECTION SPACING FROM EXISTING ACCESS TO BE 45m. IF POSTED SPEED LIMIT >50 km/hr, MINIMUM INTERSECTION SPACING FROM EXISTING ROADWAY OR ACCESS TO BE 90m.
8. GRADE TO BE BETWEEN 1% AND 2% FOR FIRST 10M OF ROADWAY.
9. DESIGN SPEED LIMIT TO BE 90 km/hr.
10. FOR FURTHER DESIGN INFORMATION SEE SECTION 4.1.7.

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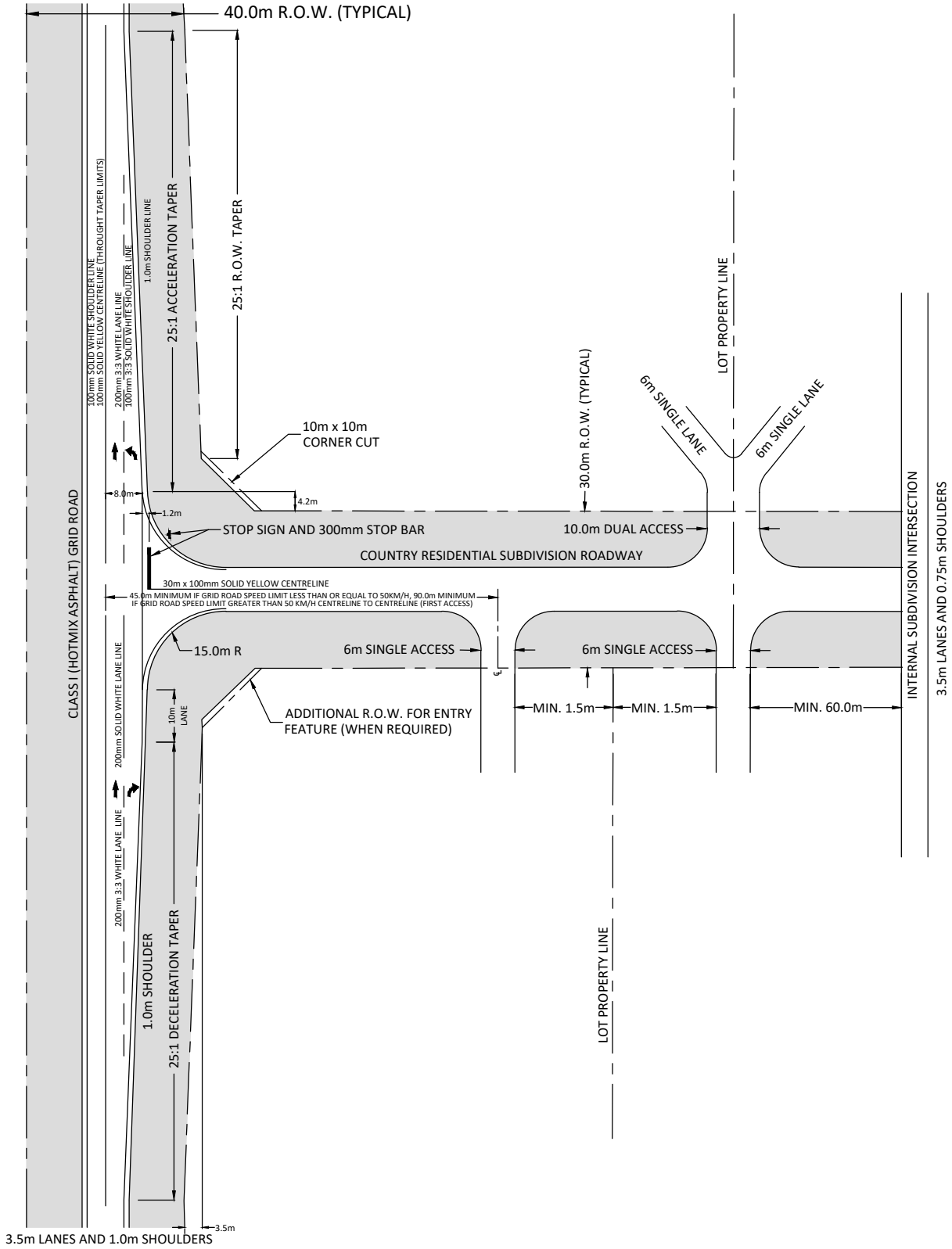
INDUSTRIAL LOCAL ROADWAY 30m RIGHT-OF-WAY, 9.0m FINISHED TOP, 12.5m SUBGRADE
Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.5



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General Municipal Servicing Standards

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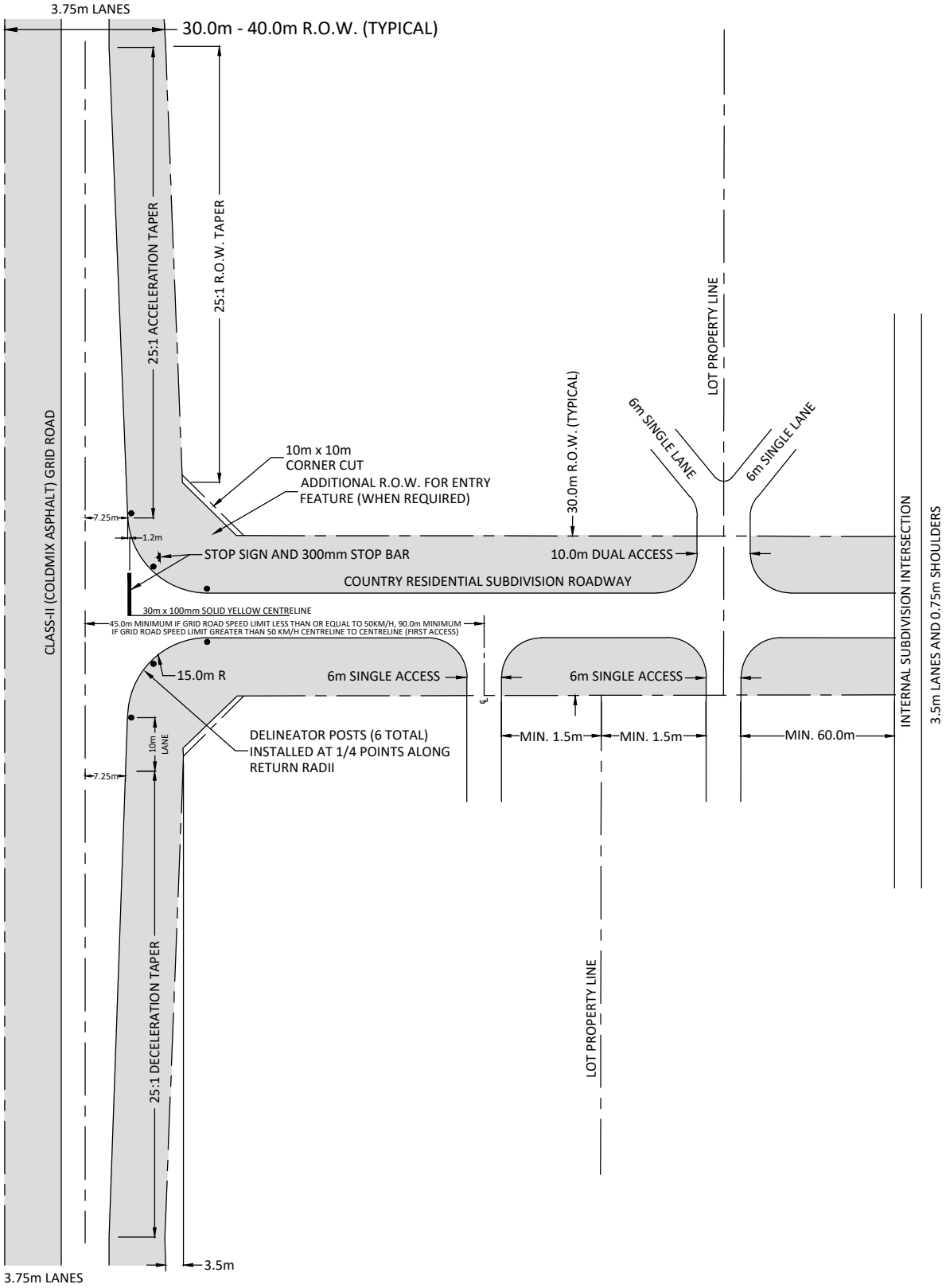
Rev. 1: AUGUST 25, 2022

TYPICAL INTERSECTION TREATMENT - COUNTY RESIDENTIAL SUBDIVISION ROAD TO CLASS I GRID ROAD

Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.6



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TYPICAL INTERSECTION TREATMENT - COUNTY RESIDENTIAL SUBDIVISION ROAD TO CLASS-II GRID ROAD

Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.7

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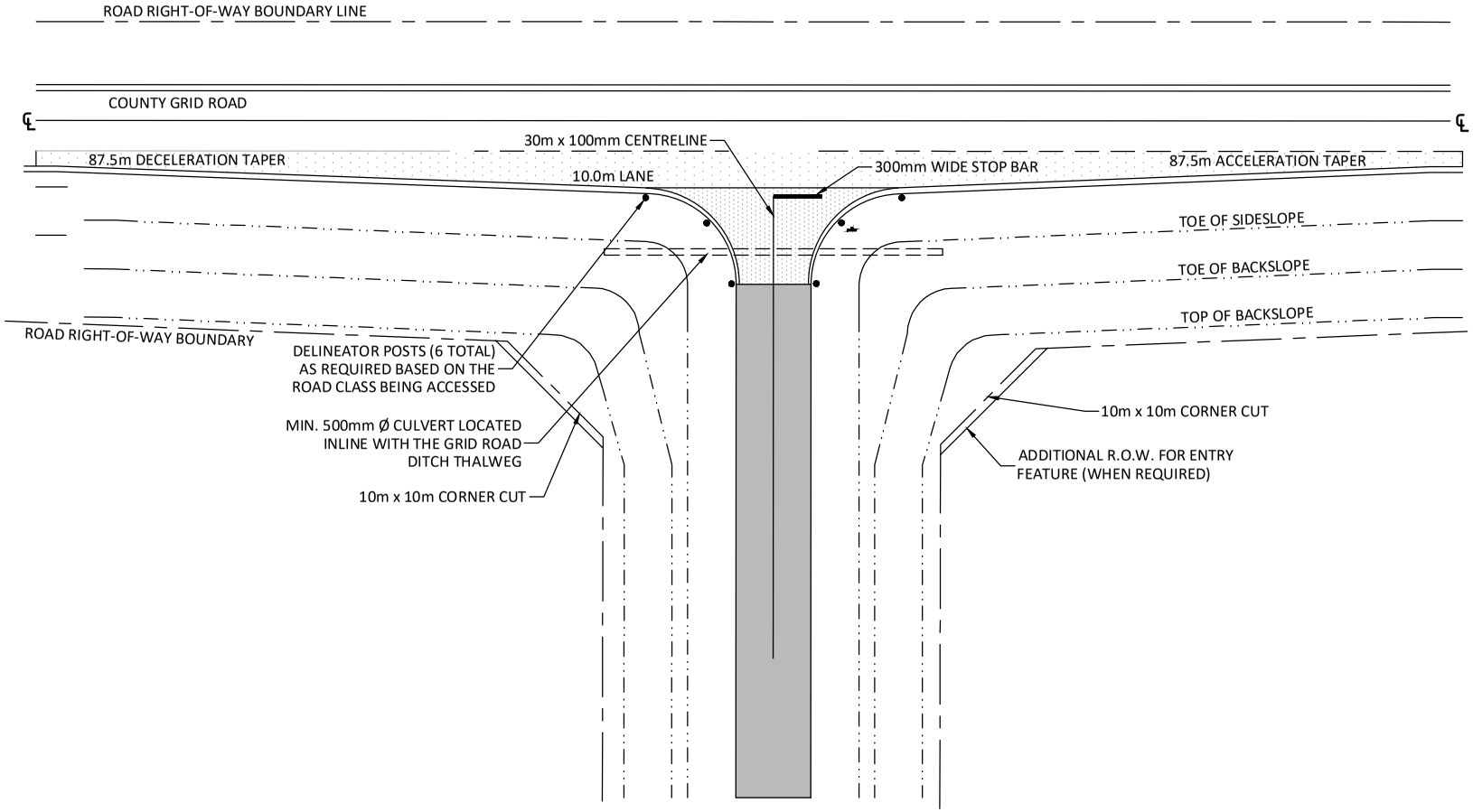
TYPICAL COUNTRY RESIDENTIAL SUBDIVISION ACCESS

Scale: NTS



BOUNDARY BETWEEN ROAD STRUCTURES

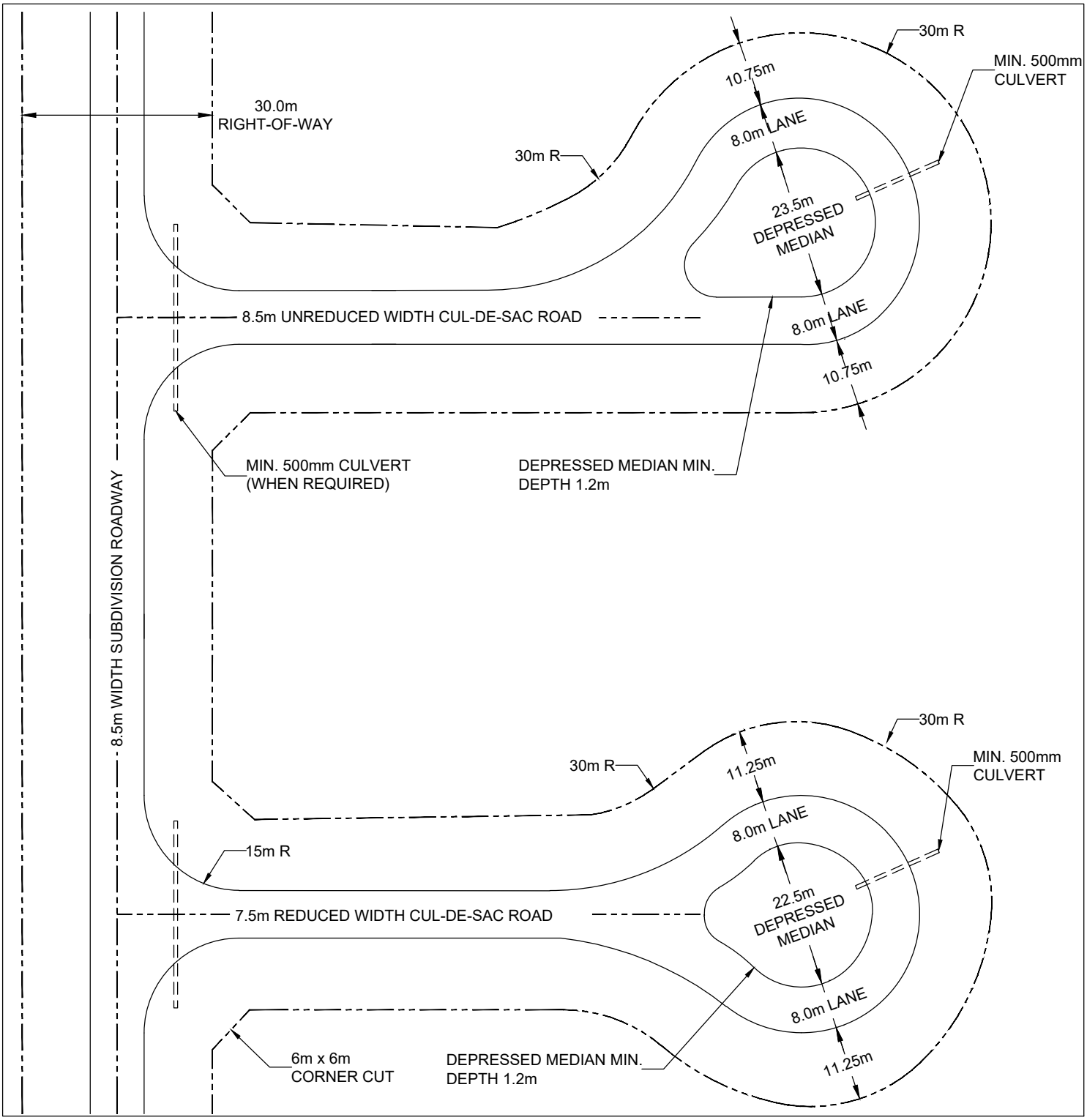
TAPER AND LANE CONSTRUCTION TO MATCH EXISTING RURAL GRID ROAD STRUCTURE

WHEN ACCESSING A CLASS I RURAL GRID ROAD, RETURN RADIUS SECTION TO MATCH CLASS I ROAD STRUCTURE
WHEN ACCESSING A CLASS II OR III RURAL GRID ROAD, RETURN RADIUS SECTION TO MATCH SUBDIVISION ROAD STRUCTURE

SUBDIVISION ROAD STRUCTURE

Sturgeon COUNTY

Drawing: 4.1.8



NOTES:

1. REFER TO SECTION 3.1 FOR CRITERIA FOR ROADWAY WITH REDUCTION (BASED ON CUL-DE-SAC LENGTH, NUMBER OF LOTS, AND EMERGENCY ACCESS REQUIREMENTS).

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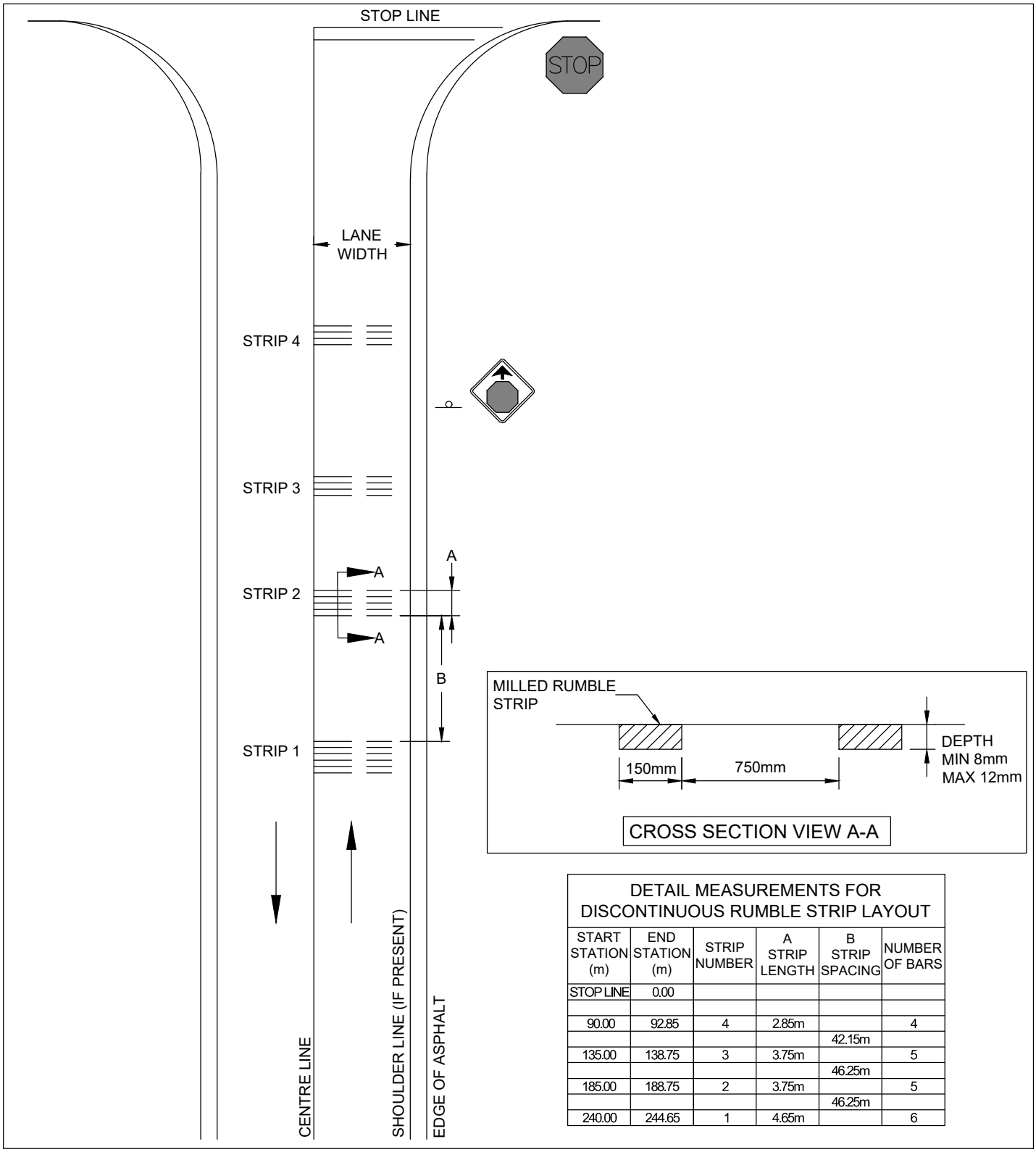
TYPICAL COUNTRY RESIDENTIAL SUBDIVISION CUL-DE-SAC
Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.9



CROSS SECTION VIEW A-A

DETAIL MEASUREMENTS FOR DISCONTINUOUS RUMBLE STRIP LAYOUT

START STATION (m)	END STATION (m)	STRIP NUMBER	A STRIP LENGTH	B STRIP SPACING	NUMBER OF BARS
STOP LINE	0.00				
90.00	92.85	4	2.85m		4
				42.15m	
135.00	138.75	3	3.75m		5
				46.25m	
185.00	188.75	2	3.75m		5
				46.25m	
240.00	244.65	1	4.65m		6

NOTES
1. SEE DWG 4.1.11 FOR STRIP DETAILS.

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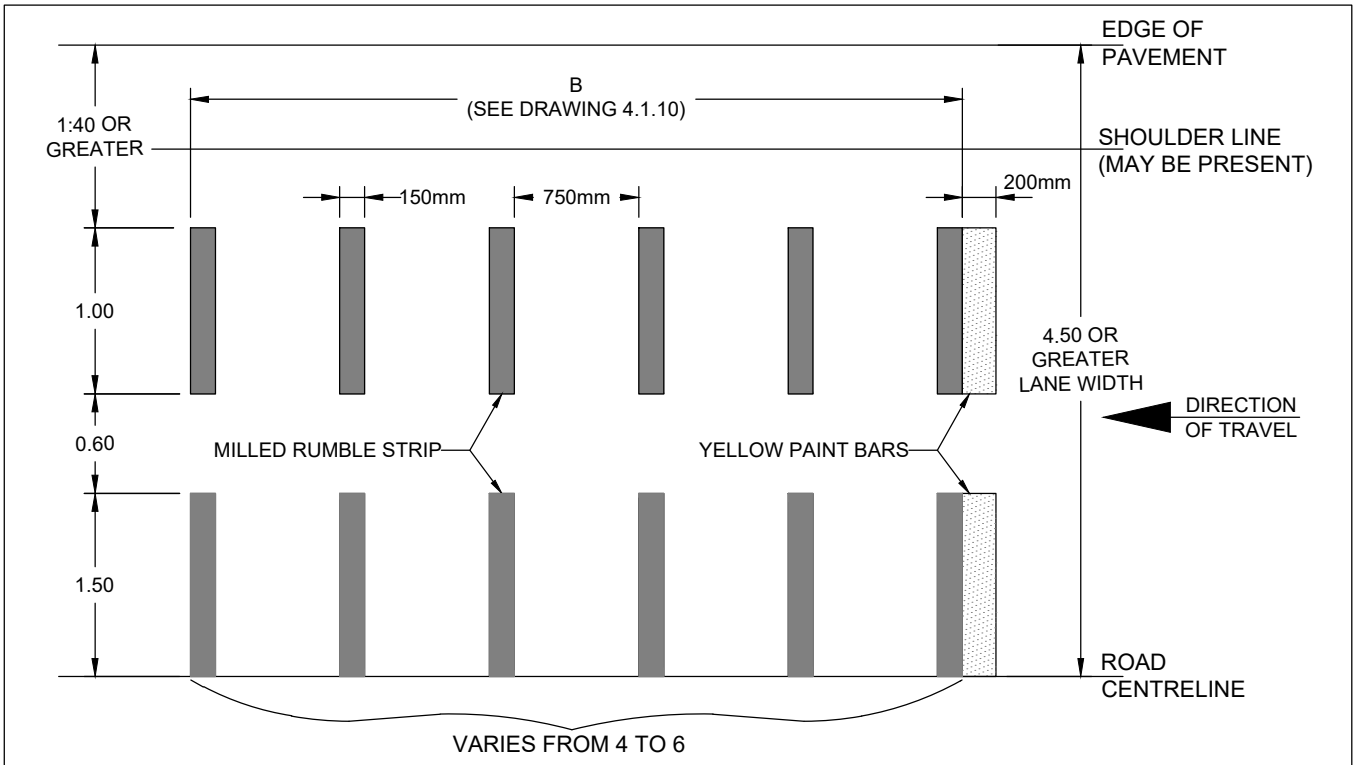
RURAL GRID ROAD MILLED RUMBLE STRIP LAYOUT

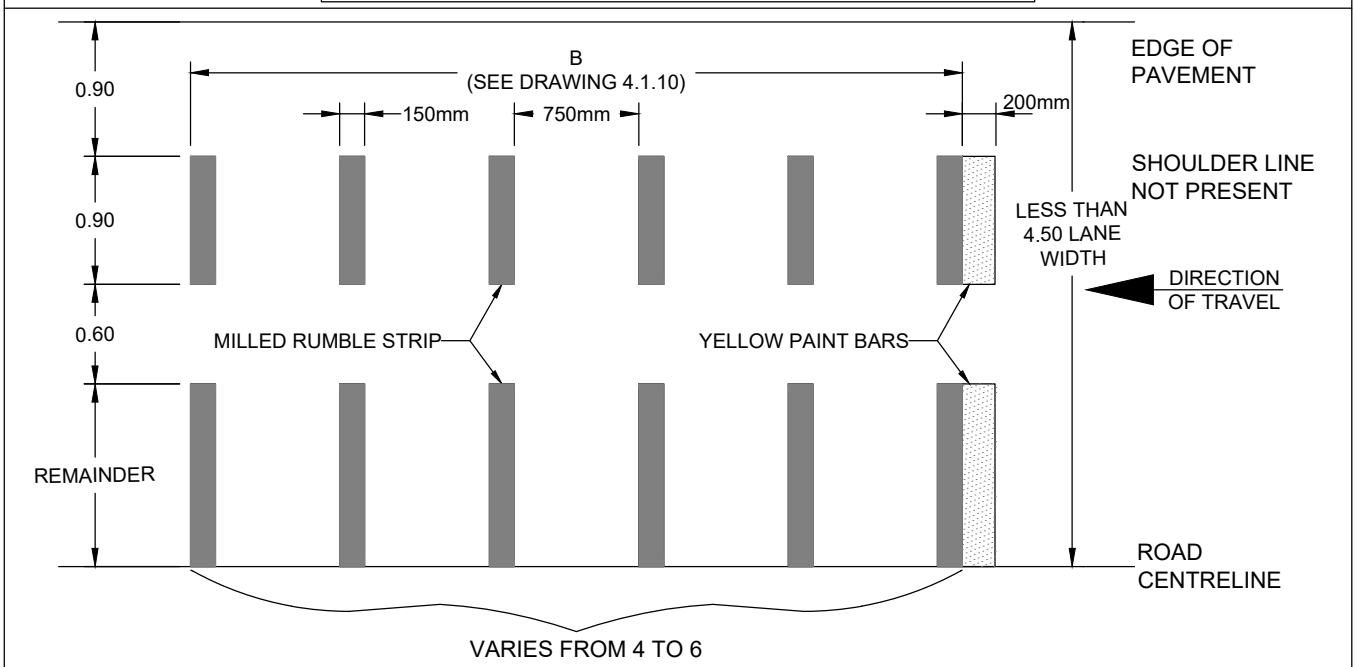
Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.10



ROADS EQUAL TO OR GREATER THAN 9.0m IN WIDTH



ROADS LESS THAN 9.0m IN WIDTH

NOTES:
1. SEE DWG 4.1.10 FOR PLACEMENT DETAILS.
2. ALL DIMENSIONS IN METRES UNLESS OTHERWISE NOTED

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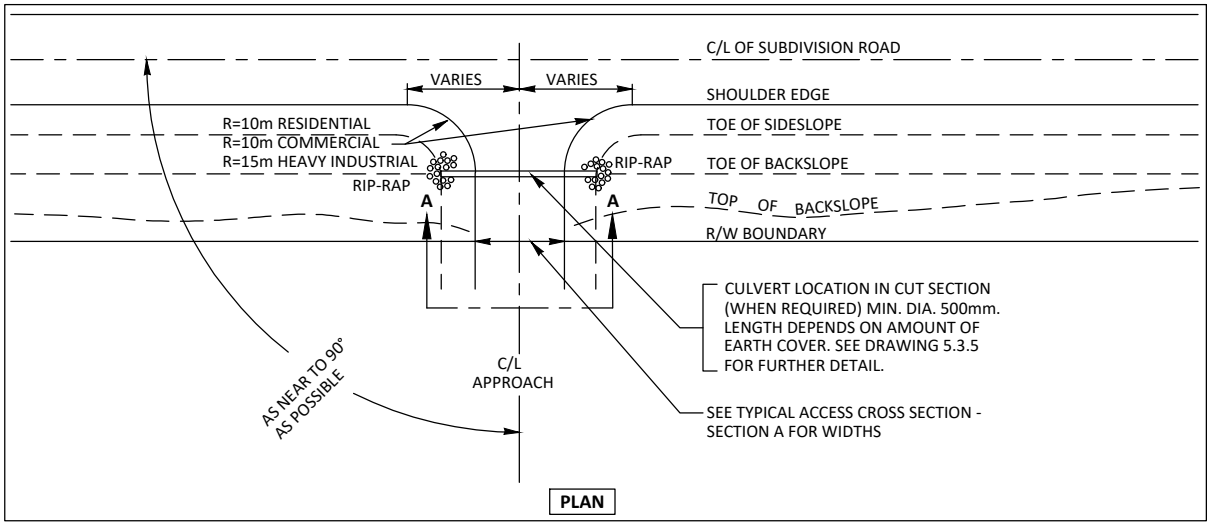
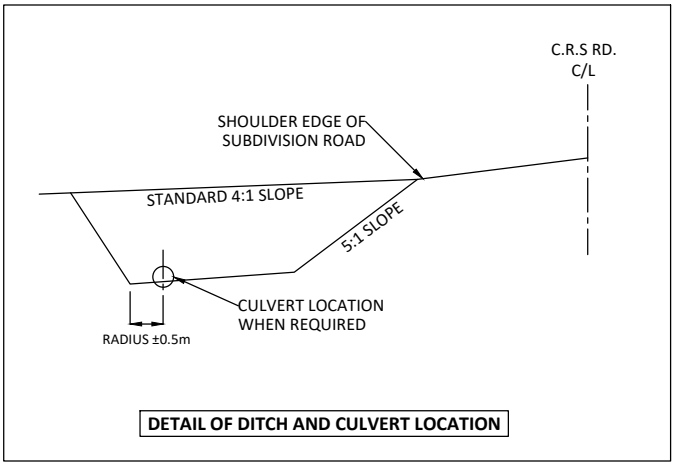
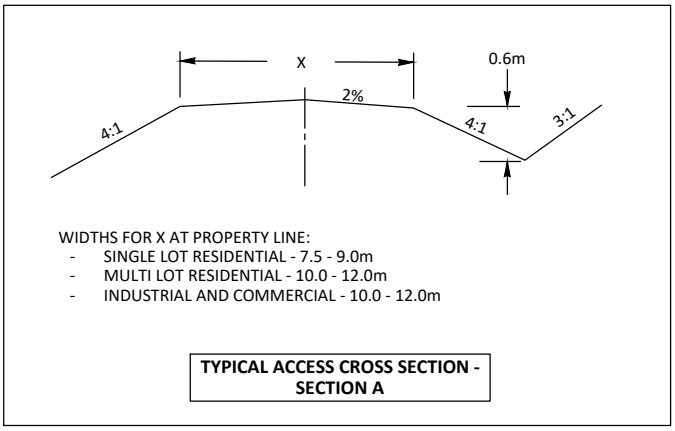
RURAL GRID ROAD MILLED RUMBLE STRIP SECTION DETAIL
Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.11







NOTE:
ALL ENTRANCES ARE TO BE FROM THE INTERNAL ROAD SYSTEM AND ARE TO PROVIDE REASONABLE ACCESS TO THE LOTS, EACH LOT IS TO HAVE A PRIVATE APPROACH.

STURGEON COUNTY

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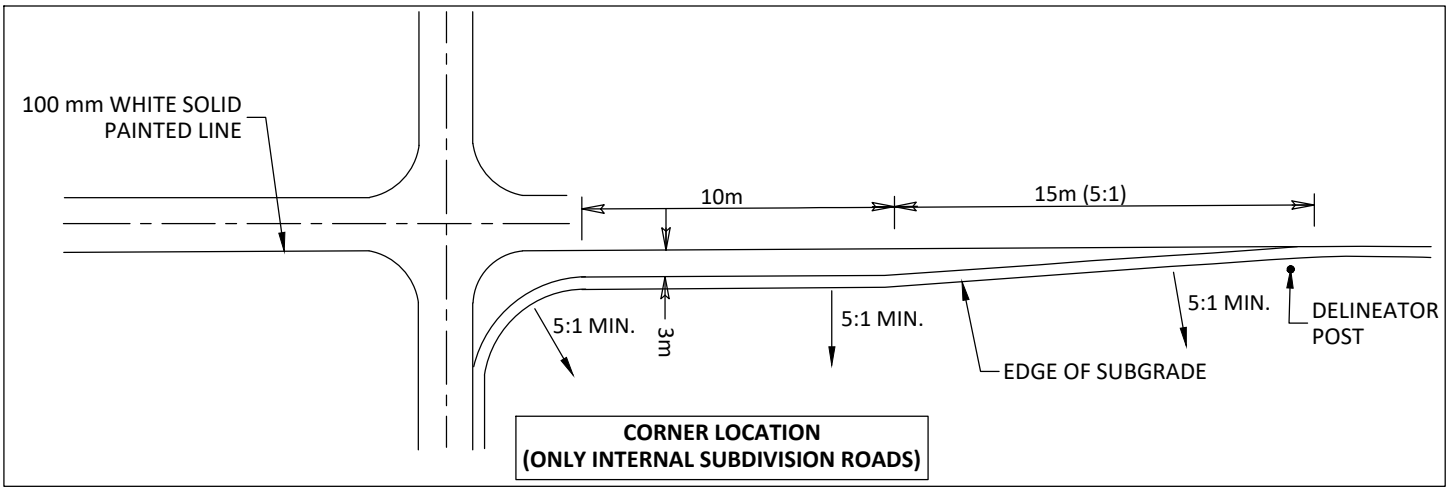
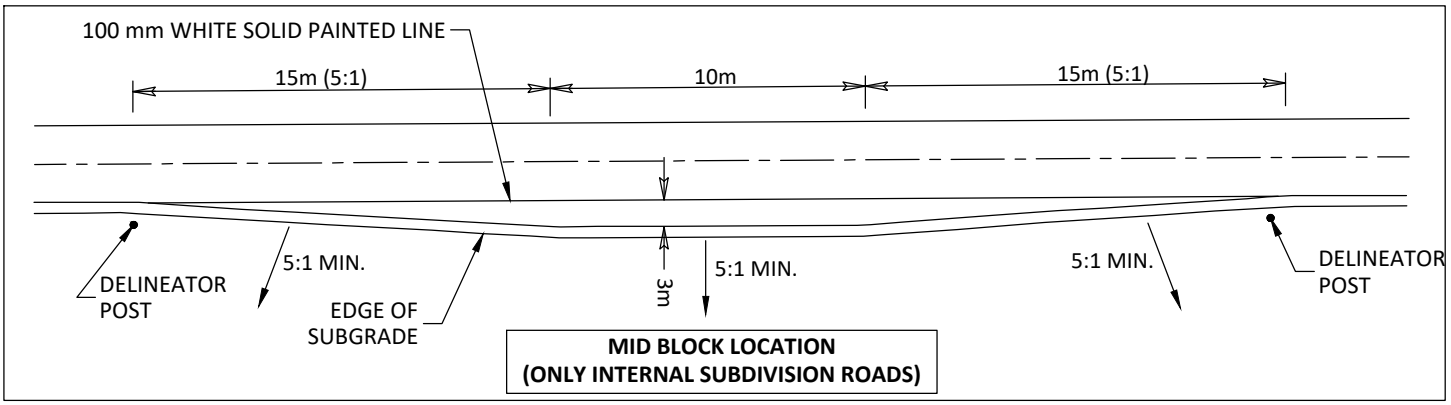
TYPICAL RURAL LOT ACCESS
Scale: NTS

Sturgeon COUNTY

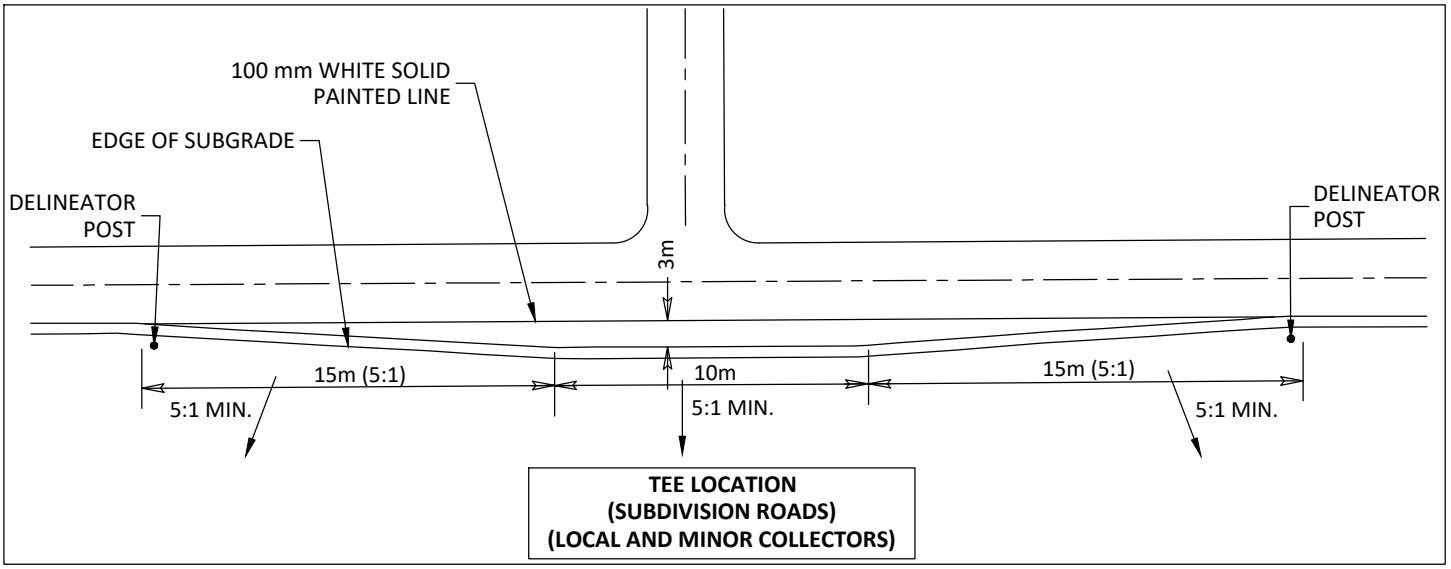
Drawing: 4.1.12



CORNER LOCATION
(ONLY INTERNAL SUBDIVISION ROADS)



MID BLOCK LOCATION
(ONLY INTERNAL SUBDIVISION ROADS)



TEE LOCATION
(SUBDIVISION ROADS)
(LOCAL AND MINOR COLLECTORS)

NOTES:

1. CANADA POST SUPERBOX LAYBYS IN COUNTRY RESIDENTIAL SUBDIVISIONS SHALL BE ON THE RIGHT WHEN ENTERING THE SUBDIVISION.
2. LENGTH OF LAYBY DETERMINED BY CANADA POST SUPERBOX REQUIREMENTS OR SIZE OF INFORMATION SIGN.
3. DESIGN AND APPROVAL BY CANADA POST REQUIRED.
4. IN COUNTRY RESIDENTIAL SUBDIVISIONS DEVELOPER IS TO GRADE DITCH AT MINIMUM 5:1. INCREASED ROW WIDTH OR DRAINAGE EASEMENT MAY BE REQUIRED TO ACCOMMODATE.

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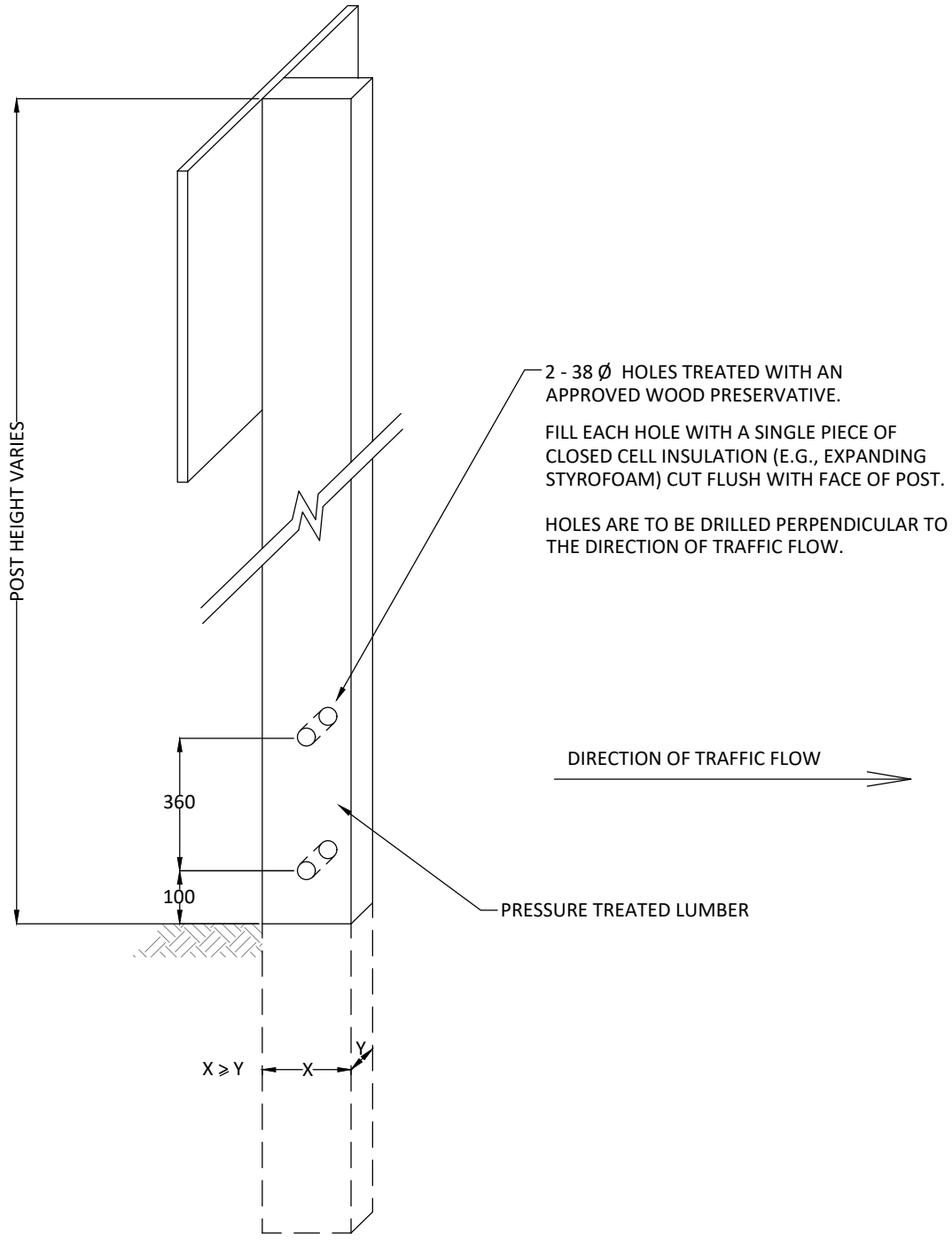
TYPICAL MAILBOX TURNOUT LAYOUT
Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.13



NOTES:

1. THE ORIENTATION OF THE POSTS FOR THE SIGN MOUNTING SHALL BE IN ACCORDANCE WITH X AND Y AS SHOWN.
2. X AND Y DIMENSIONS TO BE EITHER (4" X 4") OR (6" X 4") TYPICALLY.
3. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
4. THE BREAKAWAY FEATURE FOR WOOD POSTS WITH CROSS-SECTIONAL DIMENSIONS GREATER THAN 100mm x 100mm IS REQUIRED FOR POSTS LOCATED WITHIN THE CLEAR ZONE AND DESIRABLE FOR POSTS LOCATED OUTSIDE THE CLEAR ZONE (WITHIN HIGHWAY RIGHT-OF WAY).

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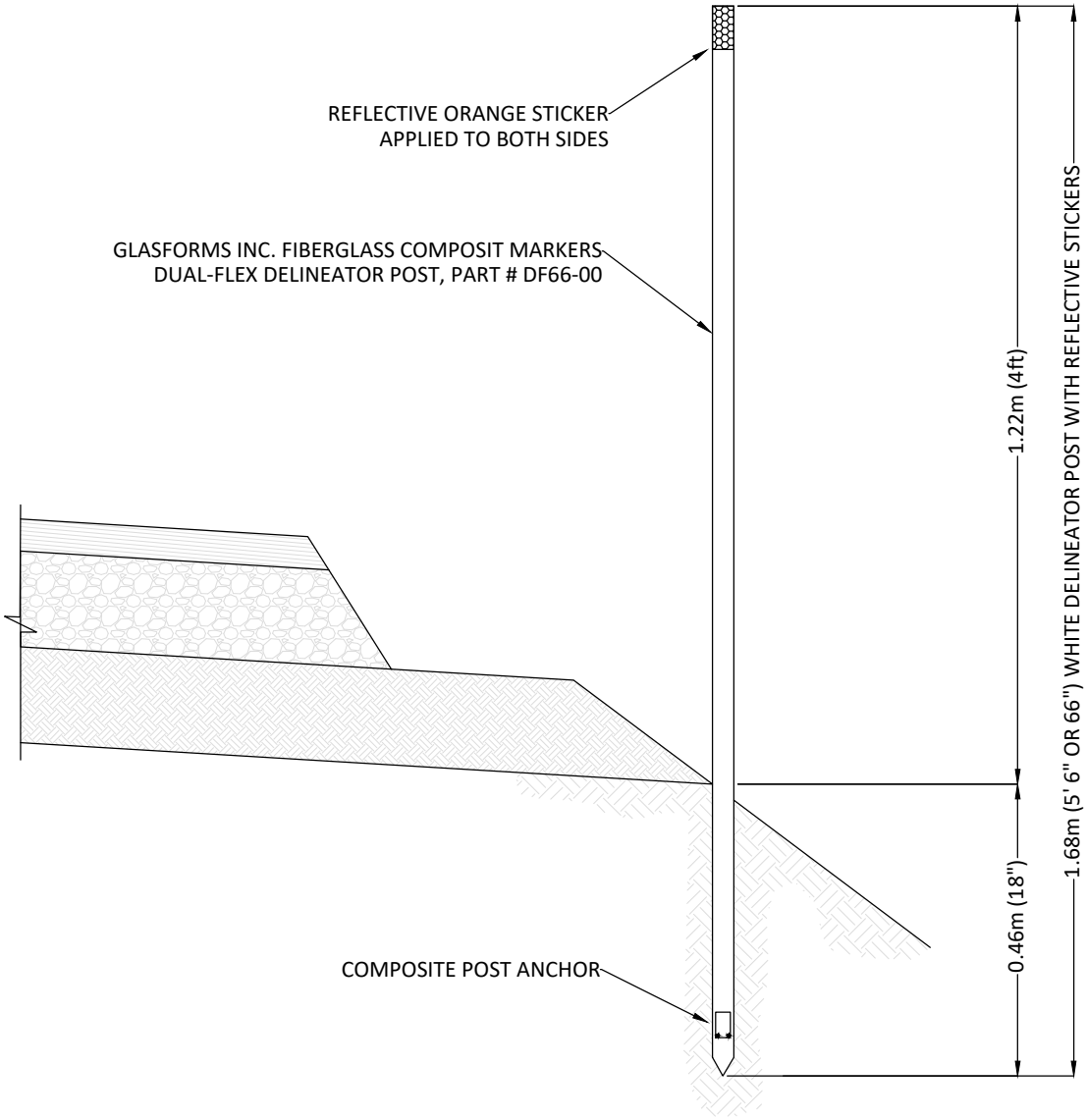
TYPICAL RURAL SIGN INSTALLATION

Scale: NTS

Sturgeon COUNTY

Drawing: 4.1.14



NOTES:

1. POSTS TO BE INSTALLED AT EDGE OF SUBGRADE PREPARATION.
2. EACH POST TO INCLUDE ON POST ANCHOR.
3. SIZE POSTS REQUIRED PER SUBDIVISION ACCESS (EXCEPT ON CLASS I GRID ROADS).
4. TWO POSTS REQUIRED PER RESIDENTIAL ACCESS.

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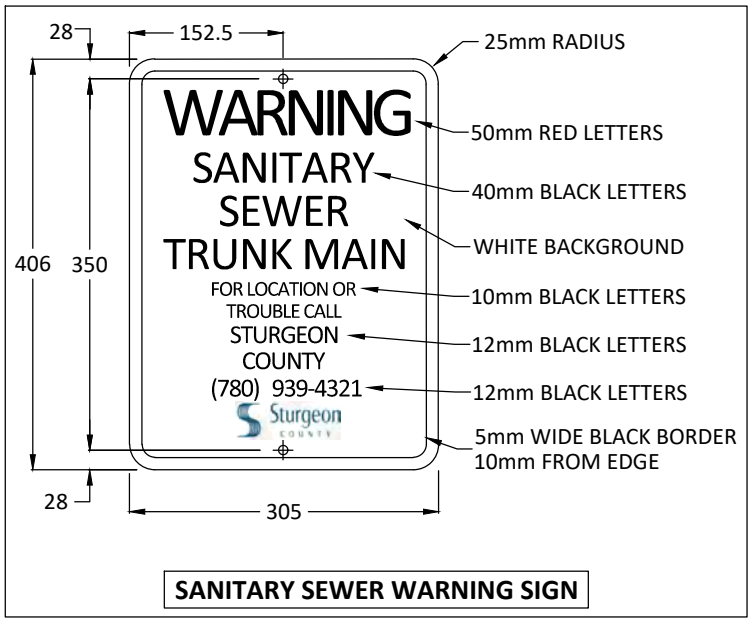
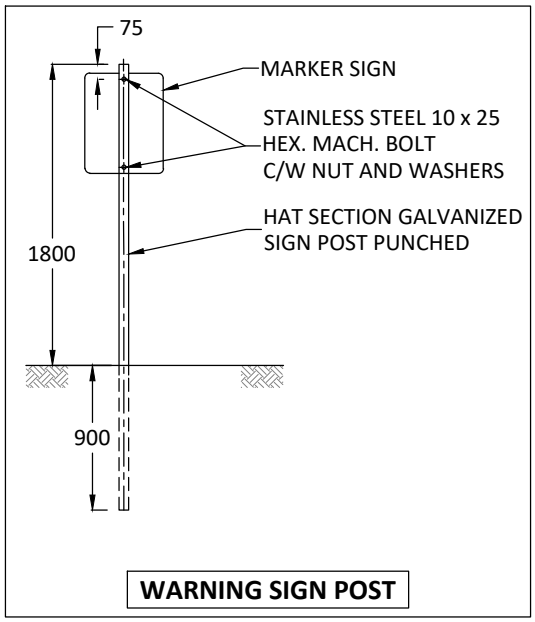
DELINEATOR POST (FLEXIBLE)
Scale: NTS

Sturgeon COUNTY

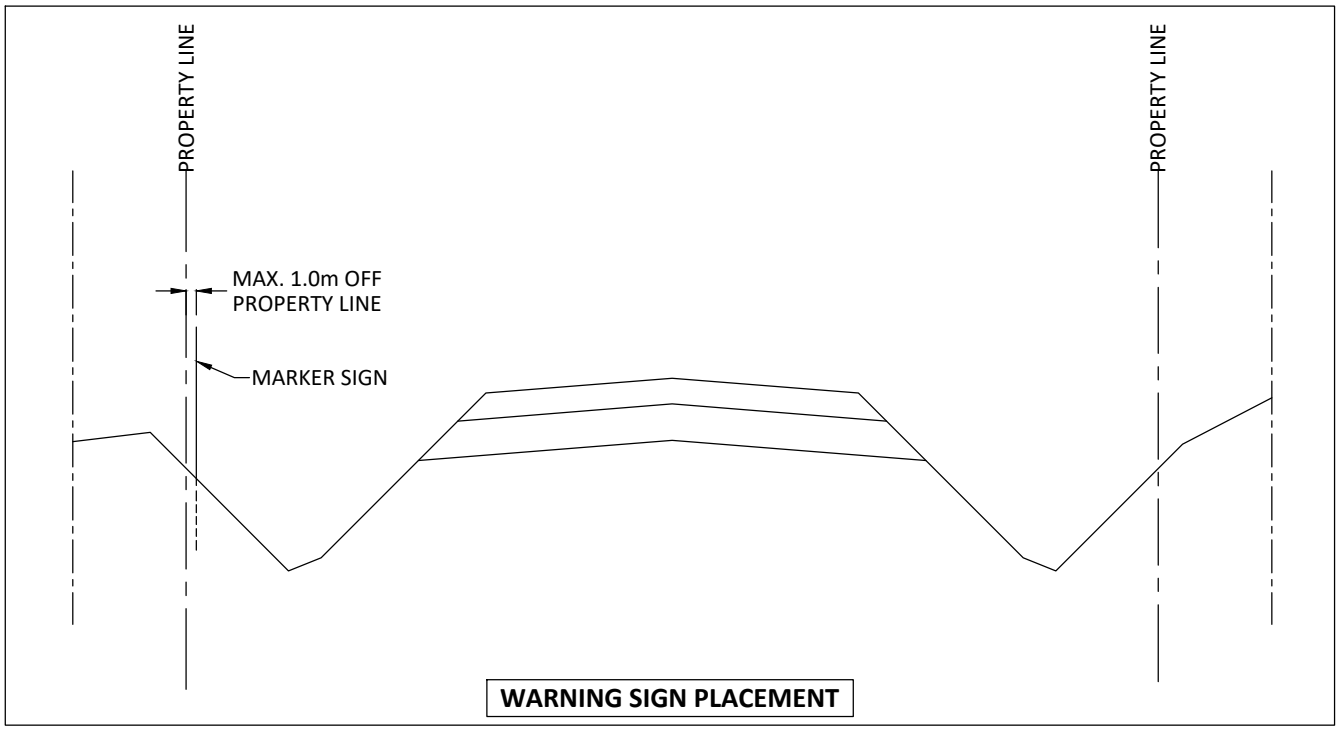
Drawing: 4.1.15



SANITARY SEWER WARNING SIGN



WARNING SIGN POST



WARNING SIGN PLACEMENT

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. SIGNS TO BE PLACED ON BOTH SIDES OF EVERY ROAD CROSSING, EVERY PROPERTY FENCE LINE, AT ALL MAJOR APPURTANCES AND AT A MINIMUM OF EVERY 1km ALONG THE ALIGNMENT.

STURGEON COUNTY

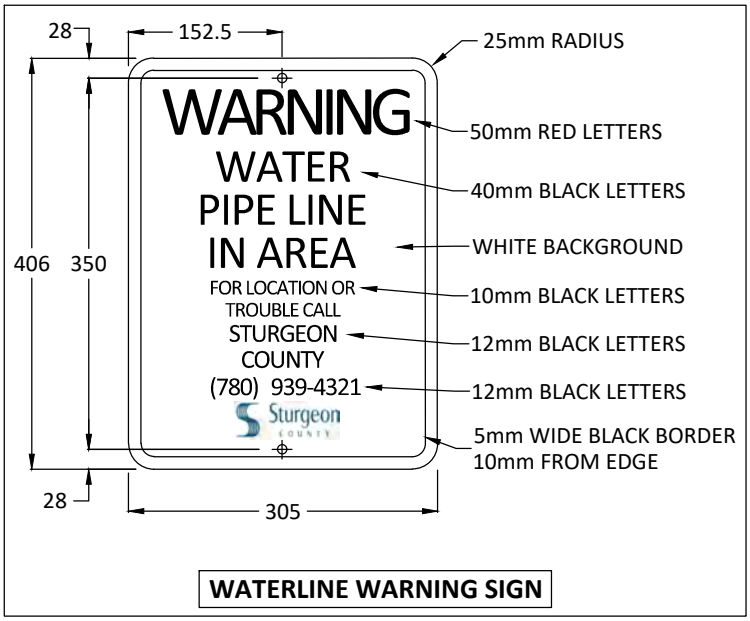
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. 2:
Rev. 1: JULY 12, 2022

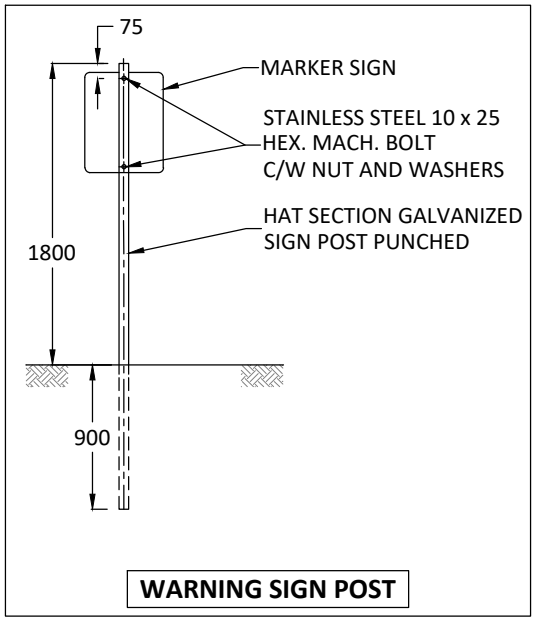
TYPICAL BURIED SANITARY SEWER MAIN WARNING SIGN
Scale: NTS

Sturgeon COUNTY

Drawing: 4.2.0



WATERLINE WARNING SIGN



WARNING SIGN POST

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. SIGNS TO BE PLACED ON BOTH SIDES OF A ROAD CROSSING, EVERY PROPERTY FENCE LINE, AT ALL VALVES AND APPURTANCES IN RURAL AREAS, AND AT A MINIMUM OF 1km ALONG THE ALIGNMENT.

STURGEON COUNTY

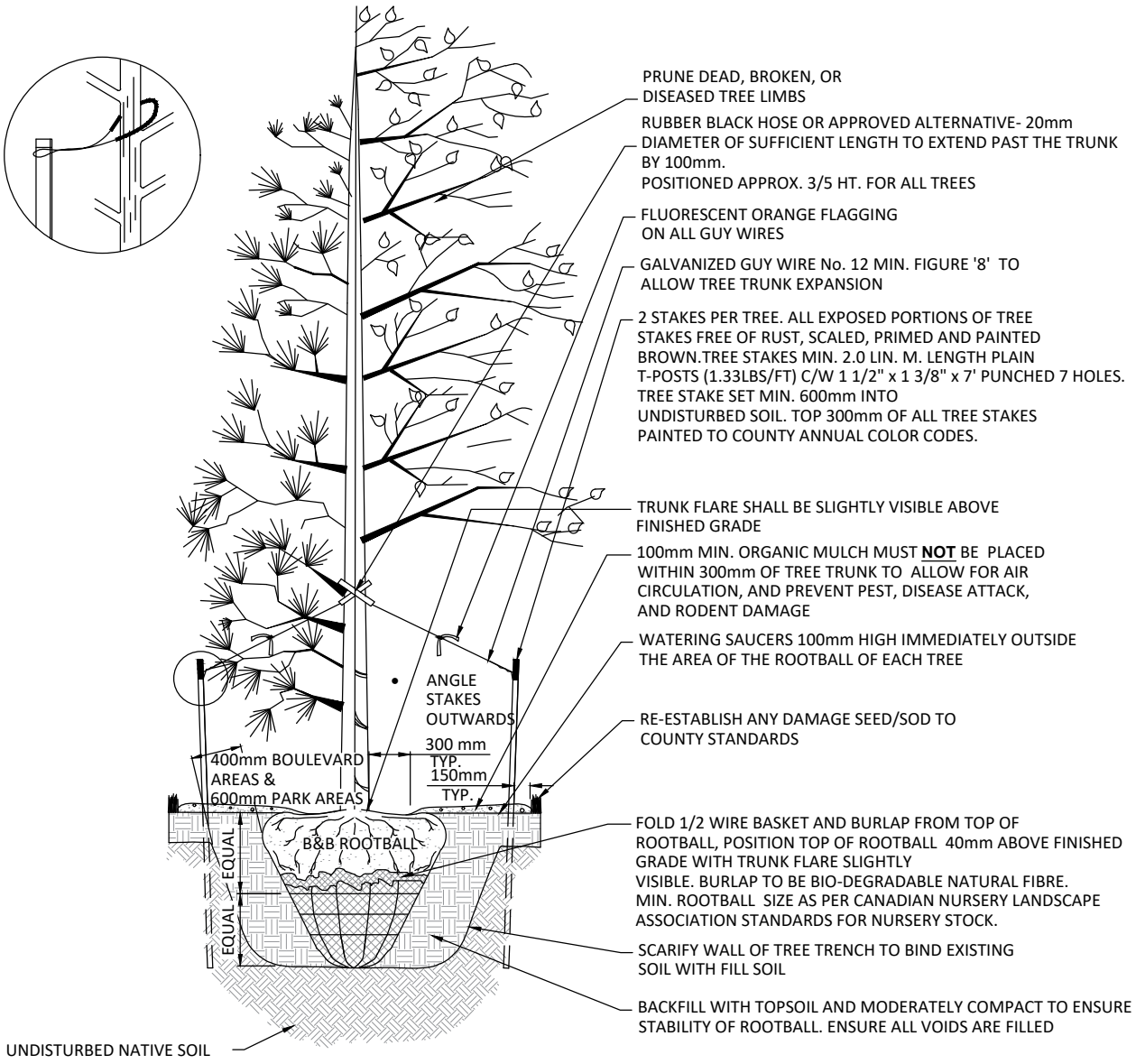
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. 2:
Rev. 1: JULY 12, 2022

TYPICAL BURIED WATER MAIN WARNING SIGN
Scale: NTS

Sturgeon COUNTY

Drawing: 4.2.1



NOTES:

1. IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS.
2. ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
3. WIDTH OF TREE TRENCH SHALL BE 25mm DEEPER THAN THE ROOTBALL, REPLACE WITH IMPORTED TOPSOIL FLAT TAMPED WITH FOOT PRESSURE TO PREVENT ROOTBALL FROM SHIFTING OR LEANING, AND A MINIMUM BETWEEN 1.8m-2.0m LONG. THE BOTTOM AND SIDES OF THE TREE TRENCH MUST BE ROUGHENED SO EXISTING AND FILLED SOIL WILL BIND TOGETHER. SOIL FILLING THE TRENCH SHALL BE AMENDED WITH COMPOST OR OTHER ORGANIC MATTER TO A MAXIMUM OF 5% BY WEIGHT. MYCORRHIZEA SHALL BE ADDED BY EITHER INCORPORATING NATIVE LEAF LITTER AND SOIL OR PURCHASED COMMERCIALLY.
4. IN AREAS OF SLOWLY DRAINING SOILS, THE ROOTBALL MAY BE SET UP TO 75mm OR 1/8 OF THE DEPTH OF THE ROOTBALL ABOVE THE ADJACENT SOIL LEVEL.
5. REMOVE ALL TAGS, LABELS, STRINGS, ETC. FROM PLANTS.

STURGEON COUNTY

General Municipal Servicing Standards

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Rev. 1: JULY 11, 2022

TYPICAL CONIFEROUS AND DECIDUOUS TREE PLANTING DETAIL

Scale: NTS

Sturgeon COUNTY

Drawing: 5.1.0

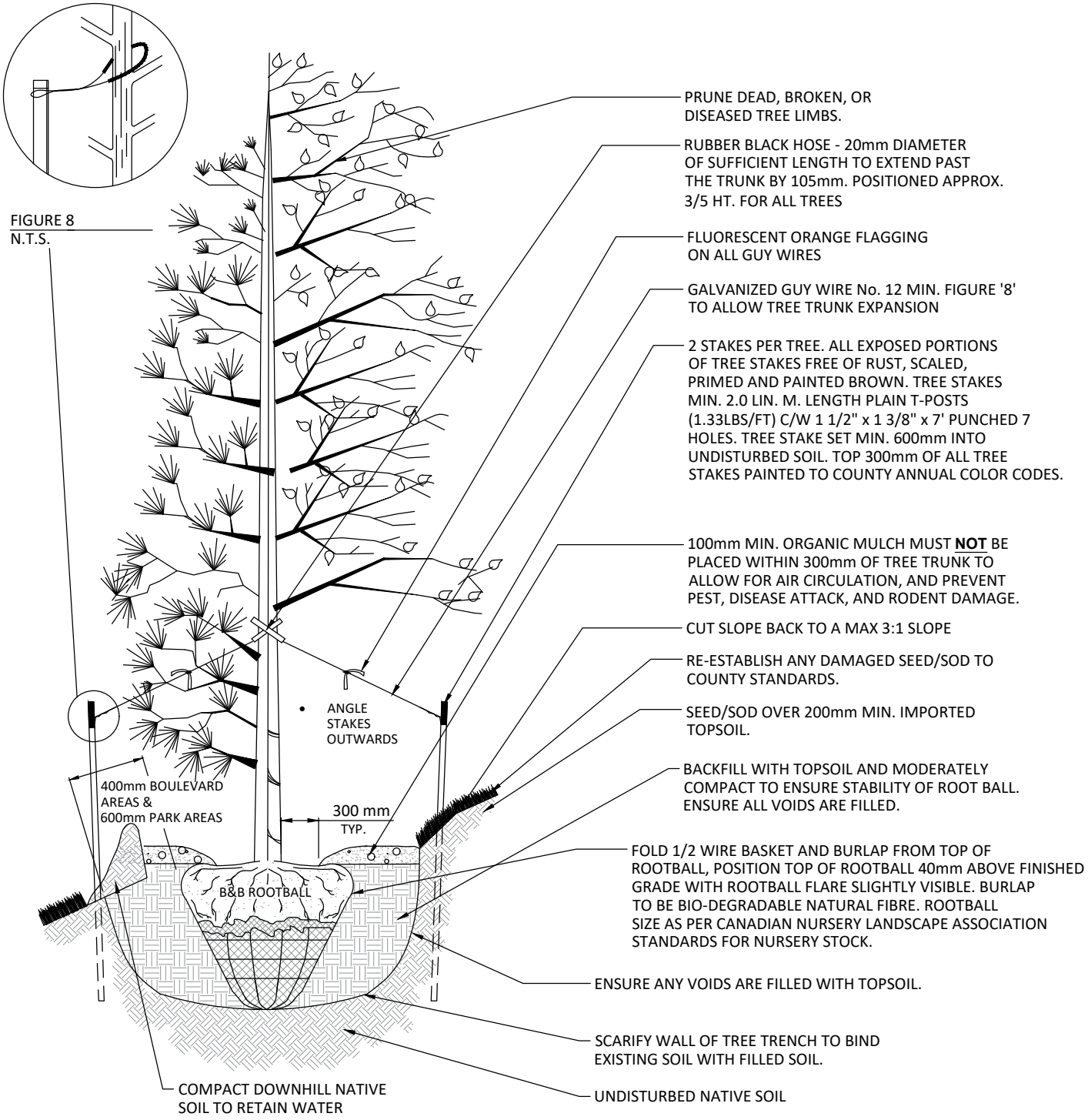


FIGURE 8
N.T.S.

NOTES:
1. IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS.
2. ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
3. IN AREAS OF SLOWLY DRAINING SOILS, THE ROOTBALL MAY BE SET UP TO 75mm OR 1/8 OF THE DEPTH OF THE ROOTBALL ABOVE THE ADJACENT SOIL LEVEL.
4. REMOVE ALL TAGS, LABELS, STRINGS, ETC. FROM PLANTS.

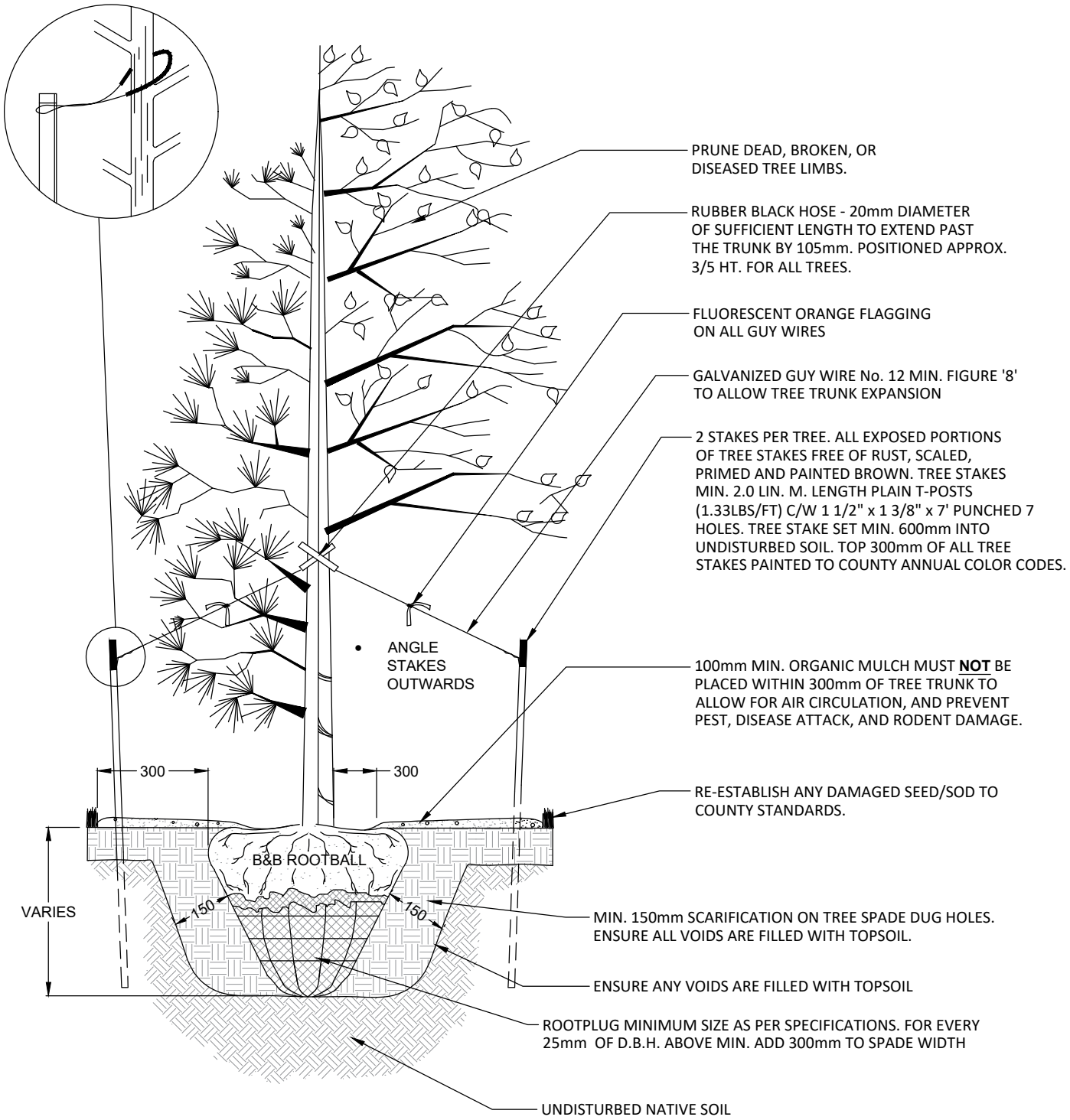
STURGEON COUNTY
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. 2:
Rev. 1: JULY 15, 2022

TYPICAL TREE PLANTING ON SLOPE
Scale: NTS

Sturgeon COUNTY

Drawing: 5.1.1



NOTES:

1. IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS.
2. ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
3. IN AREAS OF SLOWLY DRAINING SOILS, THE ROOTBALL MAY BE SET UP TO 75mm OR 1/8 OF THE DEPTH OF THE ROOTBALL ABOVE THE ADJACENT SOIL LEVEL.
4. REMOVE ALL TAGS, LABELS, STRINGS, ETC. FROM PLANTS.

STURGEON COUNTY

General Municipal Servicing Standards

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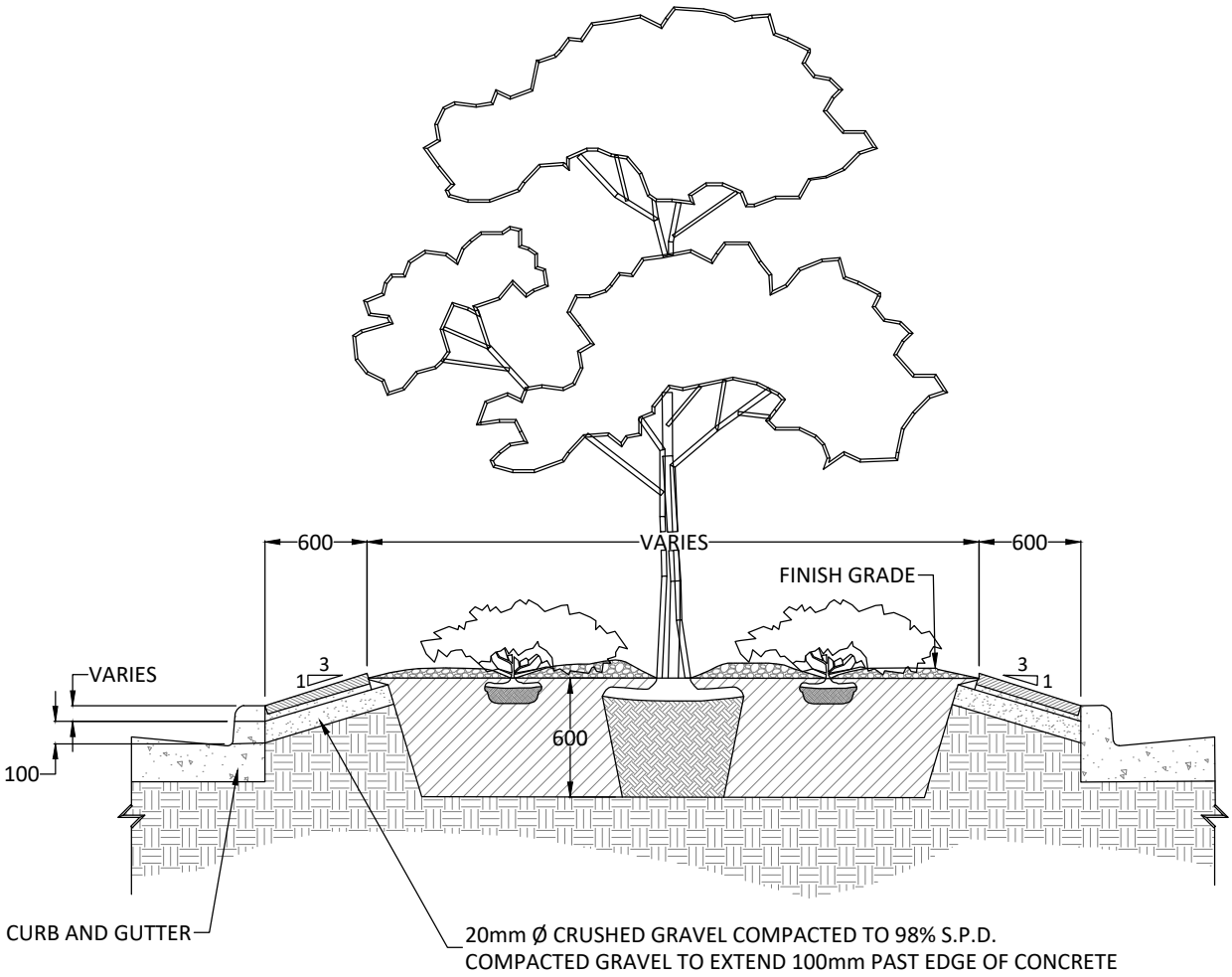
Rev. 1: JULY 20, 20222

TYPICAL TREE TRANSPLANTING

Scale: NTS

Sturgeon COUNTY

Drawing: 5.1.2



NOTES:

1. REFER TO DRAWING 5.1.0 FOR PLANTING DETAILS.
2. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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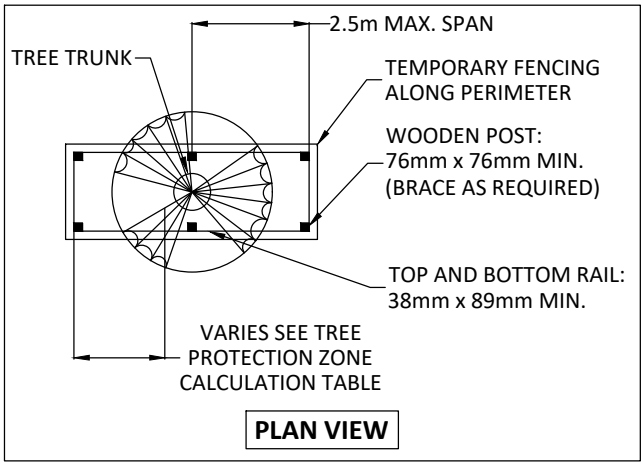
Rev. 1: JULY 20, 2022

TYPICAL MEDIAN LANDSCAPE AND TREE PLANTING

Scale: NTS

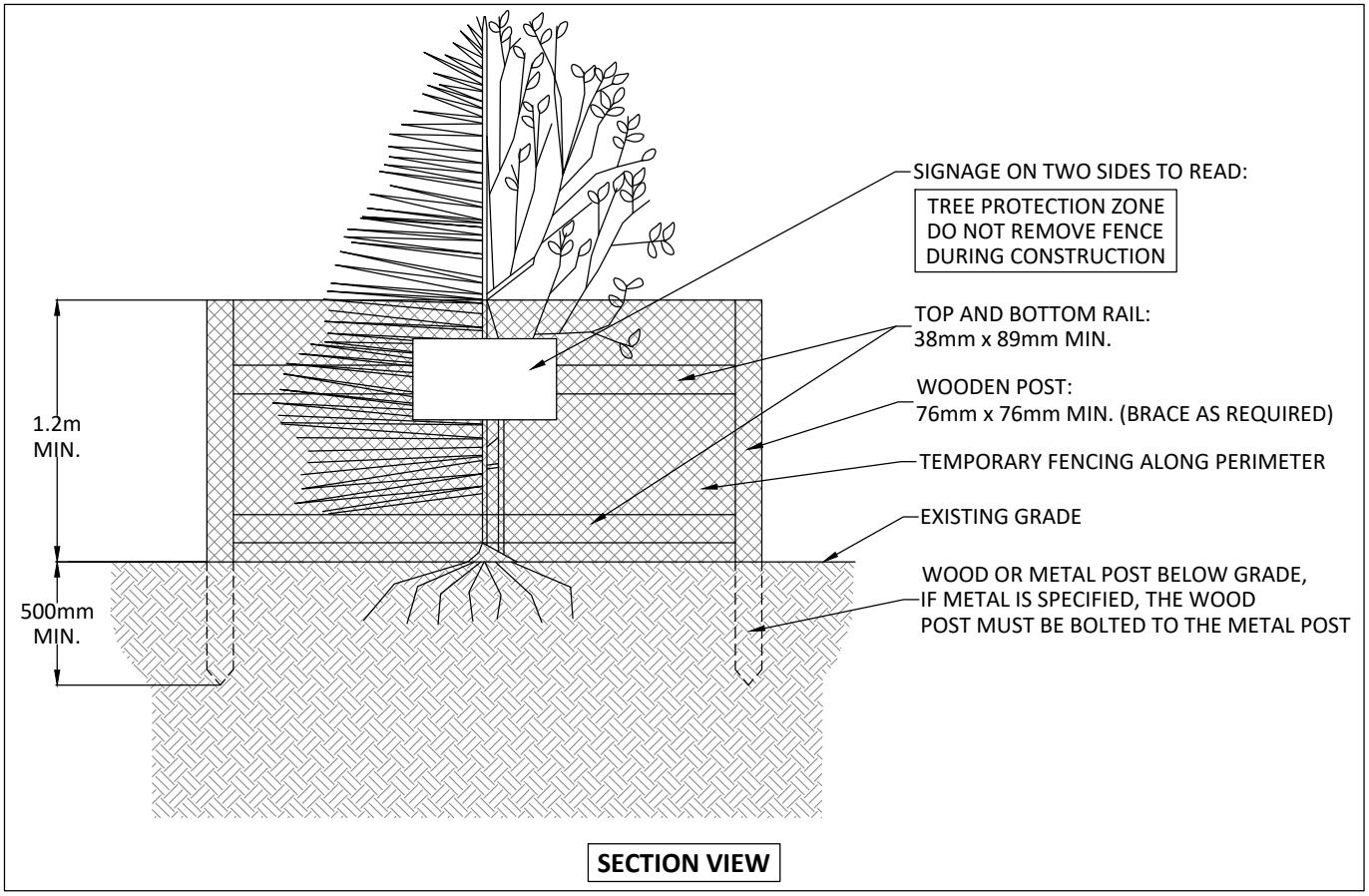
Sturgeon COUNTY

Drawing: 5.1.3



TREE PROTECTION ZONE CALCULATION TABLE

TRUNK DIAMETER (DIAMETER AT BREAST HEIGHT)	MINIMUM PROTECTION DISTANCE REQUIRED (MEASURE FROM THE OUTSIDE EDGE OF TREE TRUNK)
10 cm AND UNDER	1.2 m
11 - 30 cm	1.8 m
31 - 40 cm	2.4 m
41 - 50 cm	3.0 m
51 - 60 cm	3.6 m
61 - 70 cm	4.2 m
71 - 80 cm	4.8 m
> 80 cm	5.0 m



NOTES:

1. PROTECTION ZONES WITHIN 3m OF CONSTRUCTION ACTIVITY REQUIRE THICK PLYWOOD TO BE USED AS PERIMETER FENCE MATERIAL.
2. PROTECTION ZONES 3m TO 5m MAY USE ORANGE BARRIER FENCE (SNOW FENCE) AS PERIMETER FENCE MATERIAL.
3. NO GROUND DISTURBANCE WITHIN 1.2m OF THE TREE TRUNK (I.E., POST INSTALLATION).
4. ONLY HAND CLEARING PERMITTED WITHIN PROTECTION ZONE.

STURGEON COUNTY

General Municipal Servicing Standards

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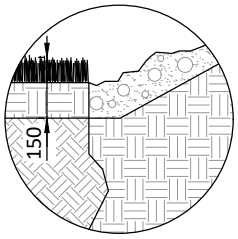
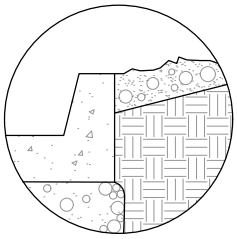
TREE PROTECTION ZONE
Scale: NTS

Sturgeon COUNTY

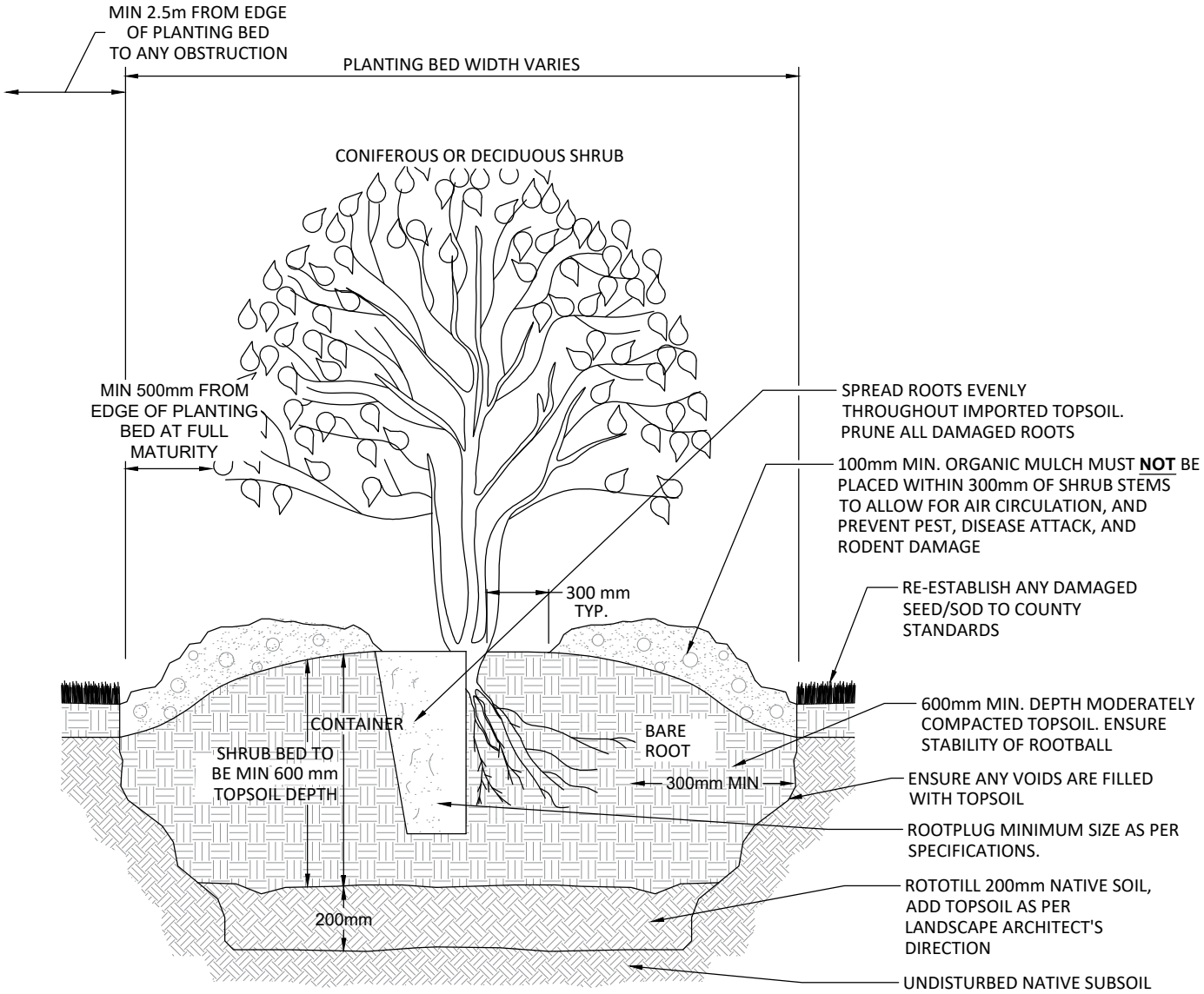
Drawing: 5.1.4



TYPICAL N.T.S.
EDGING DETAIL



CONCRETE N.T.S.
CURB DETAIL



NOTES:
1. THE USE OF PLASTIC EDGING OR PLASTIC FABRIC IS NOT PERMITTED
2. PRUNE ONLY DEAD, BROKEN OR DISEASED BRANCHES TO MAINTAIN PROPER SHRUB FORM. DECIDUOUS ONLY.
3. DO NOT ROTOTILL WITHIN 1.0m OF U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
4. DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
5. IN AREAS OF SLOWLY DRAINING SOILS, THE ROOTBALL MAY BE SET UP TO 75mm OR 1/8 OF THE DEPTH OF THE ROOTBALL ABOVE THE ADJACENT SOIL LEVEL.
6. REMOVE ALL TAGS, LABELS, STRINGS, ETC. FROM PLANTS.

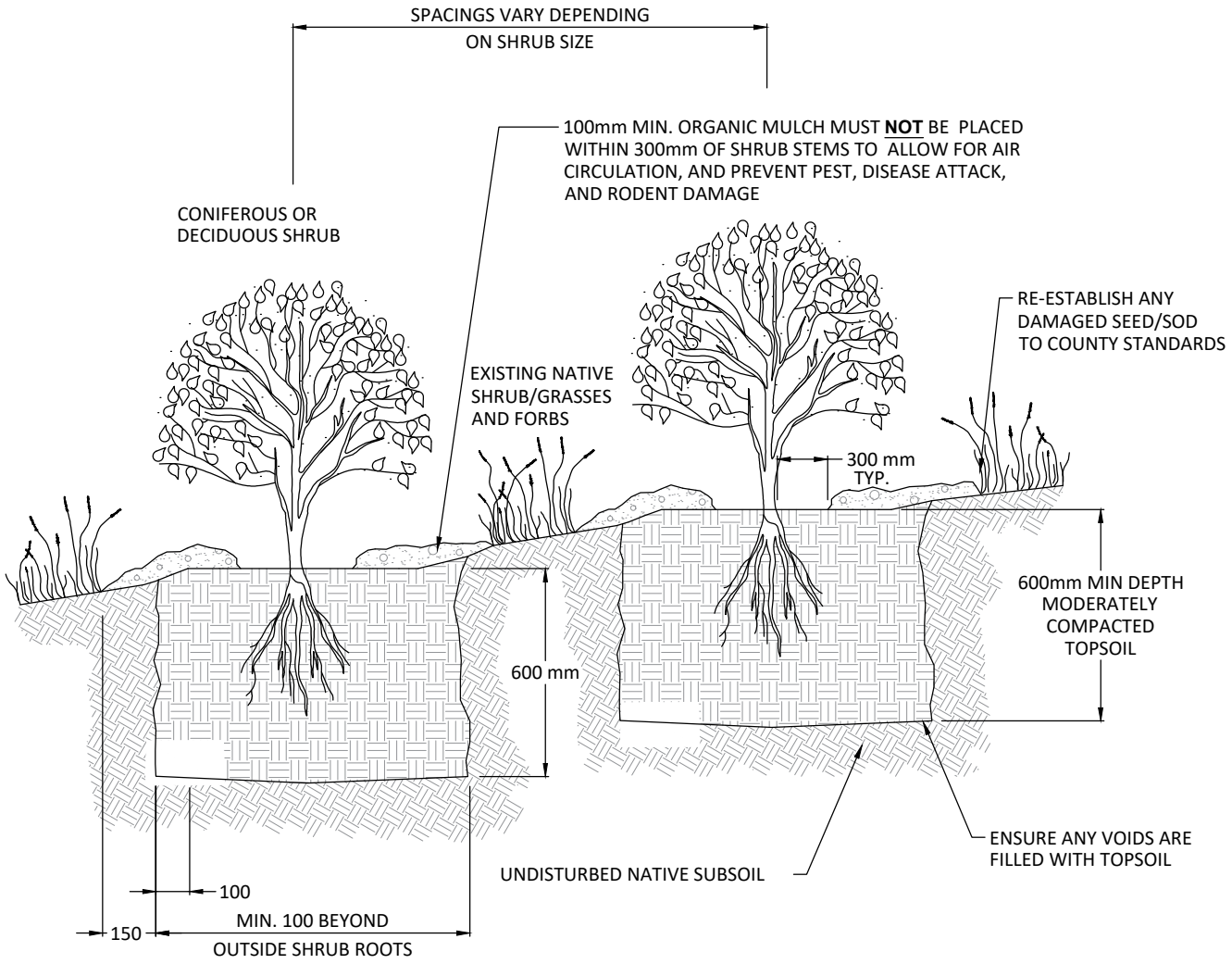
STURGEON COUNTY
General Municipal Servicing Standards

REVISIONS
Rev. :
Rev. :
Rev. 1: JULY 5, 2022

TYPICAL BARE ROOT AND CONTAINER SHRUB PLANTING BED
Scale: NTS

Sturgeon COUNTY

Drawing: 5.2.0



NOTES:
1. PRUNE DEAD, BROKEN OR DISEASED BRANCHES TO MAINTAIN PROPER SHRUB FORM. DECIDUOUS ONLY.
2. REMOVE ALL TAGS, LABELS, STRINGS, ETC. FROM PLANTS.

STURGEON COUNTY

General Municipal Servicing Standards

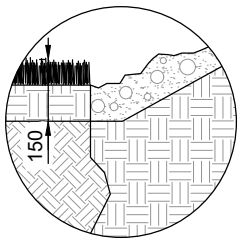
REVISIONS
Rev. :
Rev. 2:
Rev. 1: JUNE 27, 2022

TYPICAL NATURALIZED SHRUB PLANTING BED

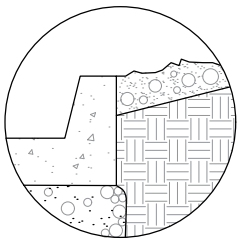
Scale: NTS

Sturgeon COUNTY

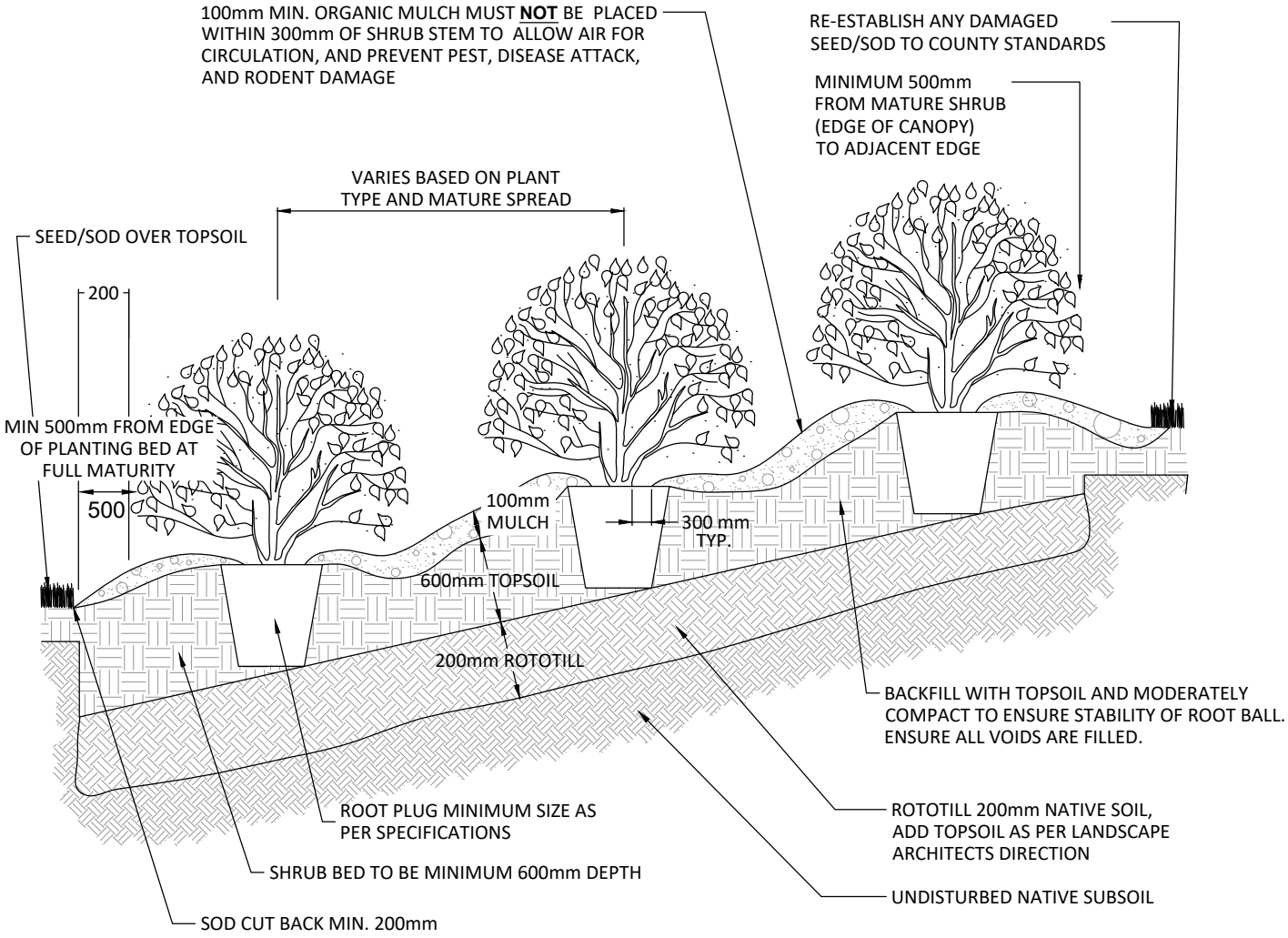
Drawing: 5.2.1



TYPICAL N.T.S.
EDGING DETAIL



CONCRETE N.T.S.
CURB DETAIL



NOTES:
1. THE USE OF PLASTIC EDGING OR PLASTIC FABRIC IS NOT PERMITTED.
2. DO NOT ROTOTILL WITHIN 1.0m OF U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
3. DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
4. REMOVE ALL TAGS, LABELS, STRINGS, ETC. FROM PLANTS.

STURGEON COUNTY
General Municipal Servicing Standards

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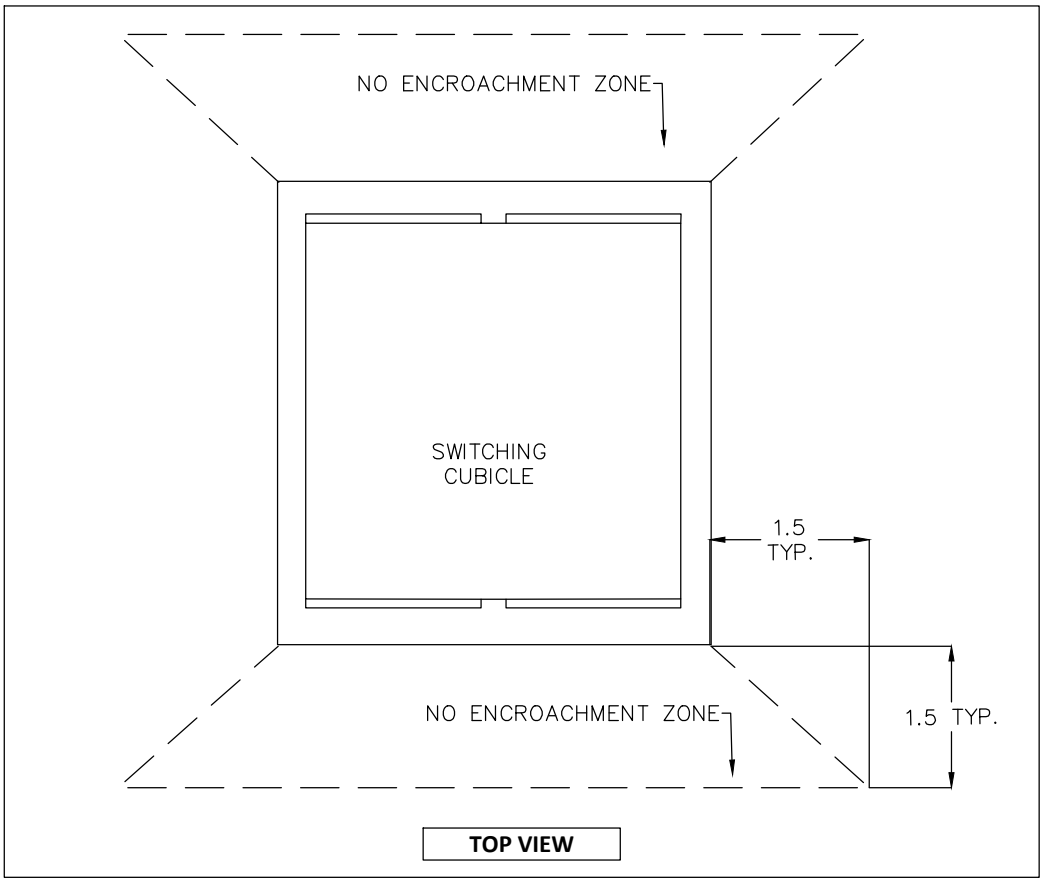
Rev. :
Rev. :
Rev. 1: AUGUST 25, 2022

TYPICAL BARE ROOT AND CONTAINER SHRUB PLANTING BED ON A SLOPE

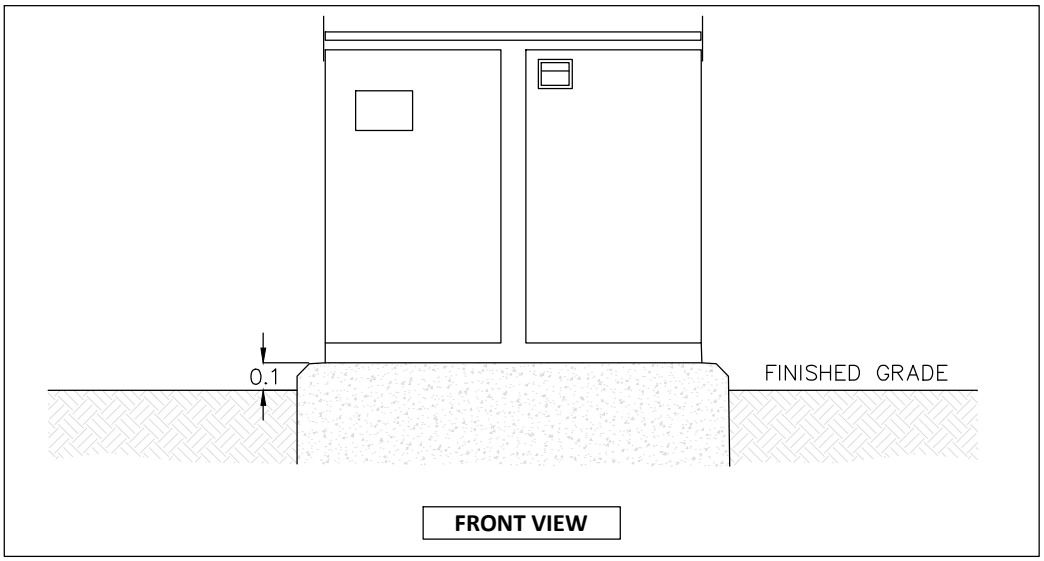
Scale: NTS

Sturgeon COUNTY

Drawing: 5.2.2



TOP VIEW



FRONT VIEW

NOTES:

1. TOP OF CONCRETE BASE TO BE A MINIMUM OF 100mm ABOVE FINAL GRADE WITHIN 3.0m OF THE BASE.
2. ALL TREES AND SHRUBS TO BE PLANTED OUTSIDE OF NO-ENCROACHMENT ZONE, INCLUDE MATURE SIZES IN ASSESSMENT.
3. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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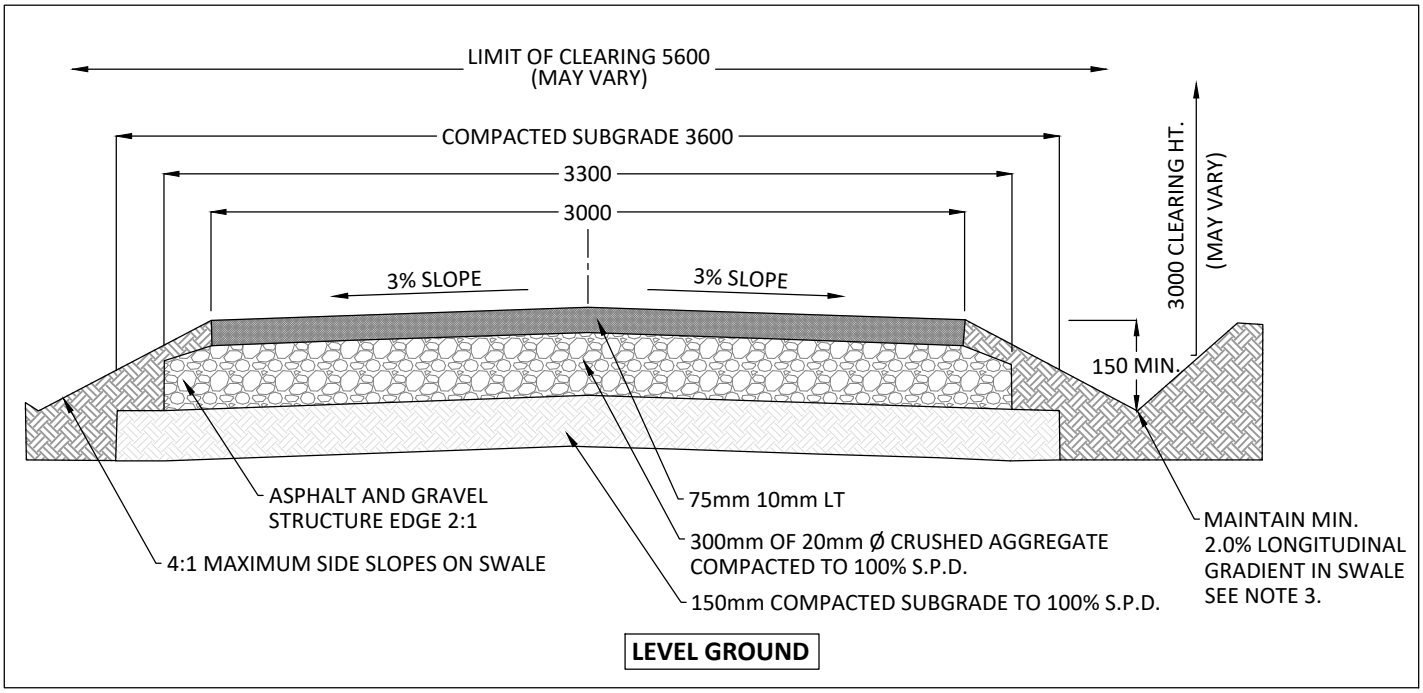
Rev. 1: JULY 21, 2022

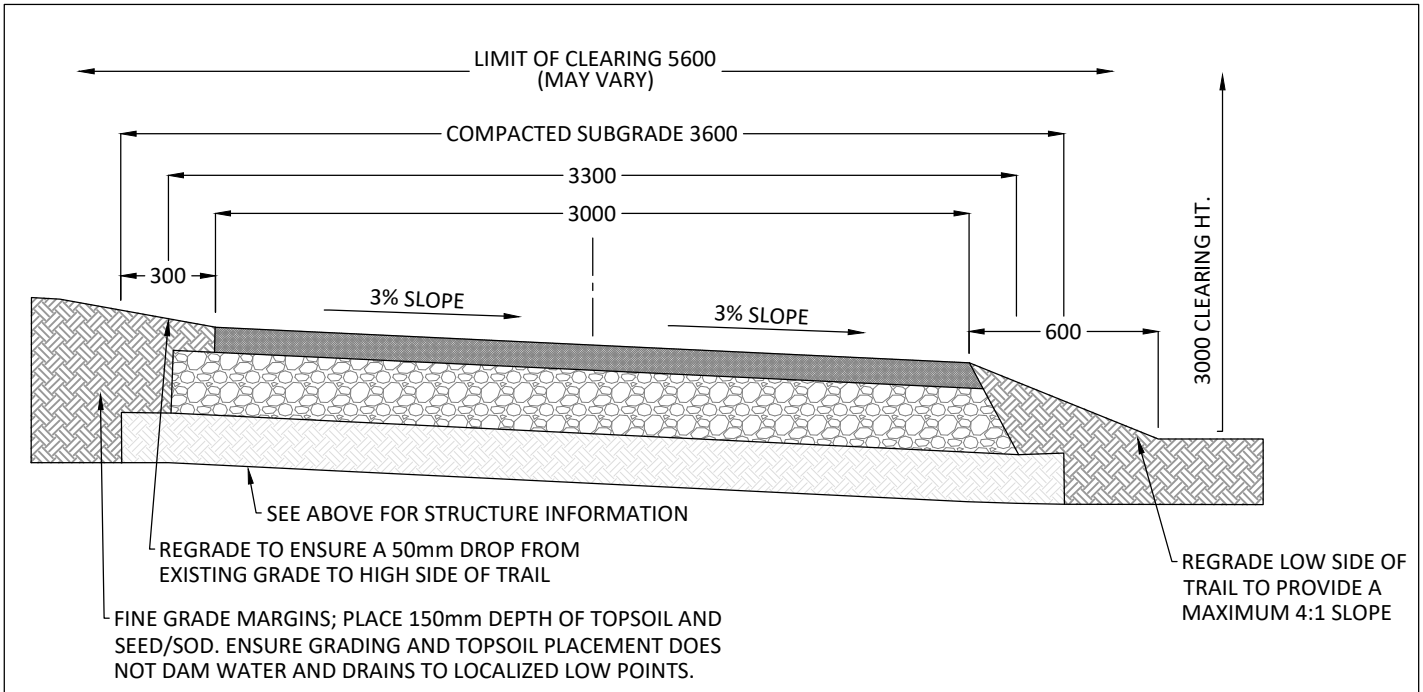
PLANTING AROUND SWITCHING CUBICLE
Scale: NTS

Sturgeon COUNTY

Drawing: 5.2.3



LEVEL GROUND



SIDESLOPE

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS (mm), UNLESS OTHERWISE NOTED.
2. ENSURE ALL JOINTS WITH EXISTING VEGETATION SMOOTH AND CONTINUOUS; WHERE NECESSARY TRIM BACK ROOTS AND CLEAR DEBRIS.
3. WHERE THE GRADE OF A SWALE IS LESS THAN 2% A CONCRETE SWALE SHALL BE USED. CONCRETE SWALE SHALL HAVE MINIMUM SLOPE OF 0.75%.

STURGEON COUNTY

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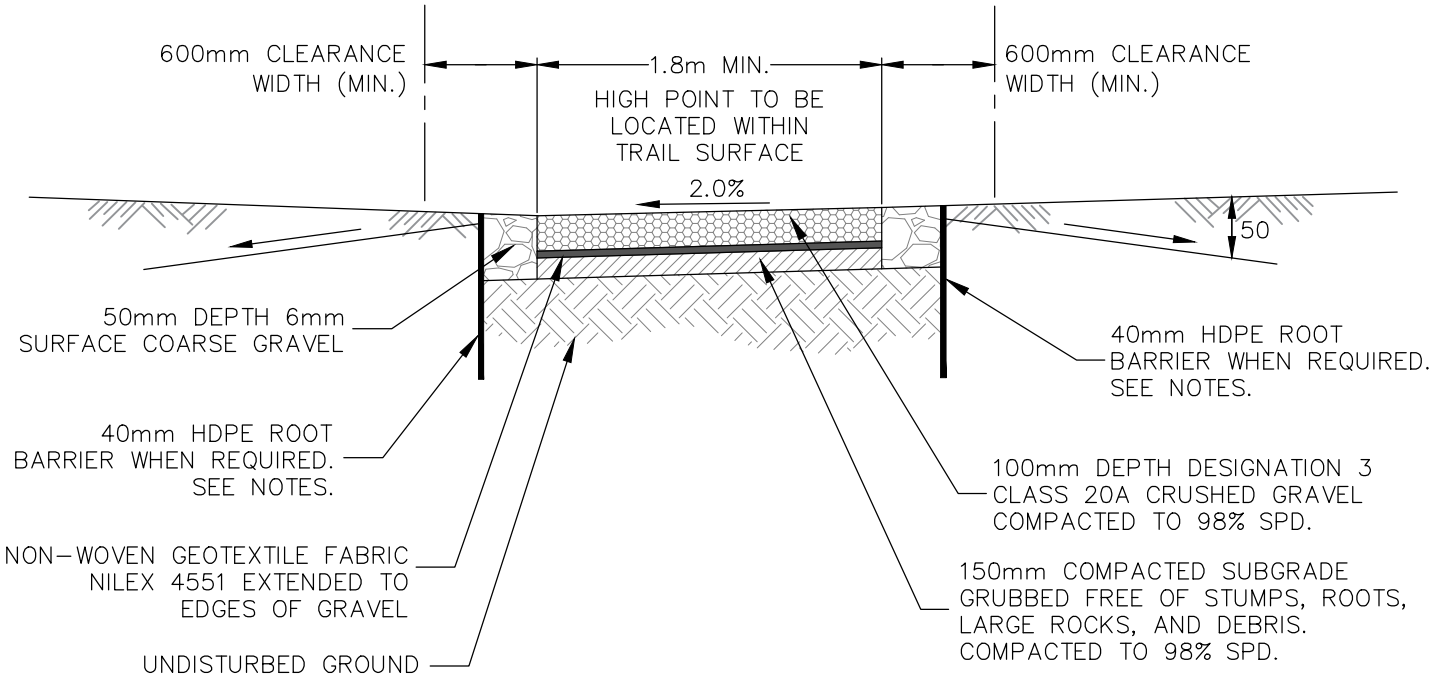
ASPHALT TRAIL
Scale: NTS

Sturgeon COUNTY

Drawing: 5.3.0



TYPICAL SECTION

NOTES:

1. GROUND MUST BE SLOPED AWAY FROM TRAIL TO PROVIDE POSITIVE DRAINGE.
2. ROOT BARRIER MUST BE INSTALLED ON WALKWAYS LOCATED WITHIN 5m OF PLANTING BEDS, NATIVE TREE STANDS, OR PLANT SPECIES WITH AGGRESSIVE ROOTING SYSTEMS. ROOT BARRIER MUST RUN FOR THE ENTIRE LENGTH OF THE DRIP OF TREES. SEE ROOT BARRIER DETAIL.

STURGEON COUNTY

General Municipal Servicing Standards

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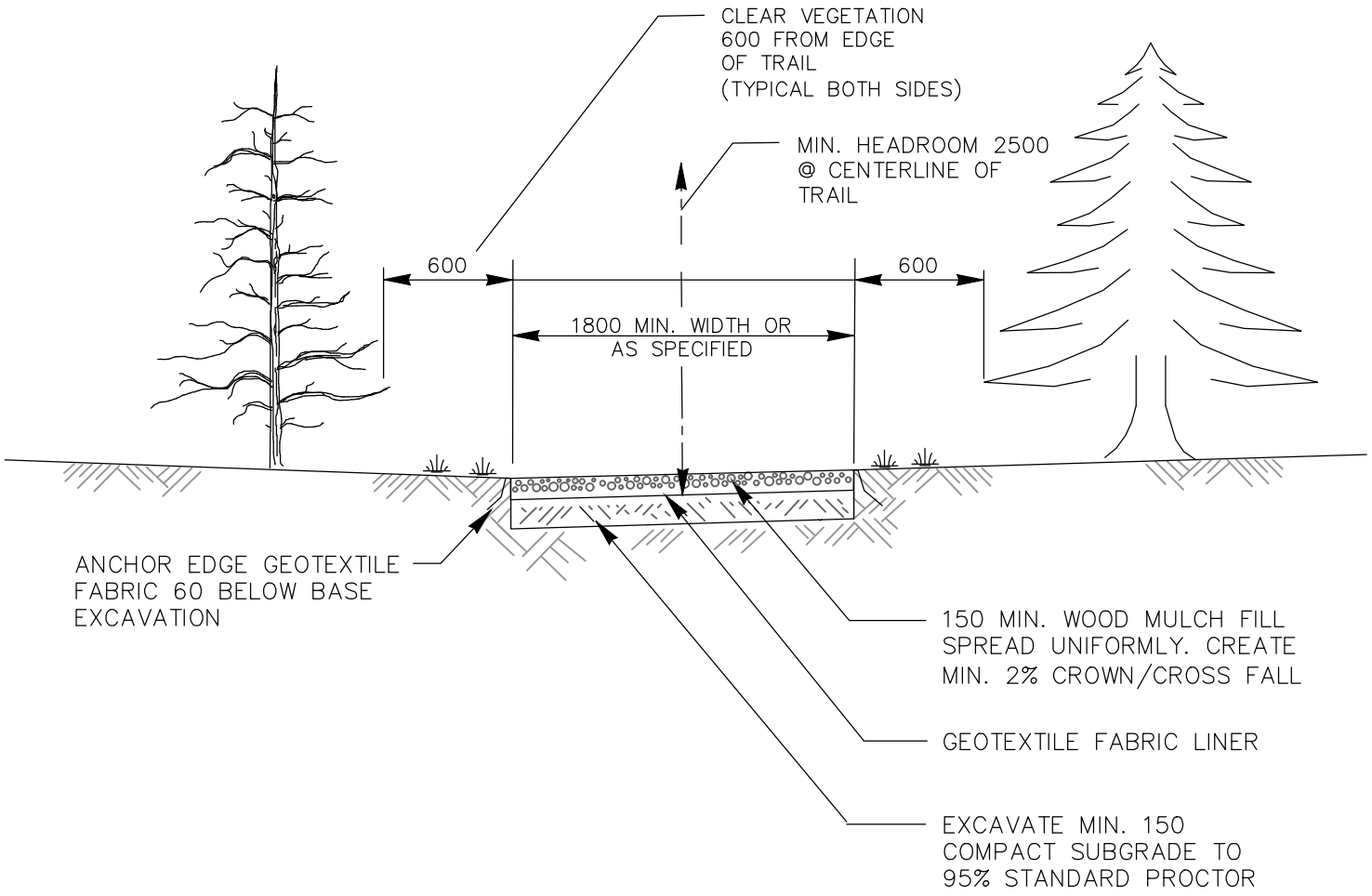
GRAVEL TRAIL
Scale: NTS

Sturgeon COUNTY

Drawing: 5.3.1



TYPICAL SECTION

NOTES:

1. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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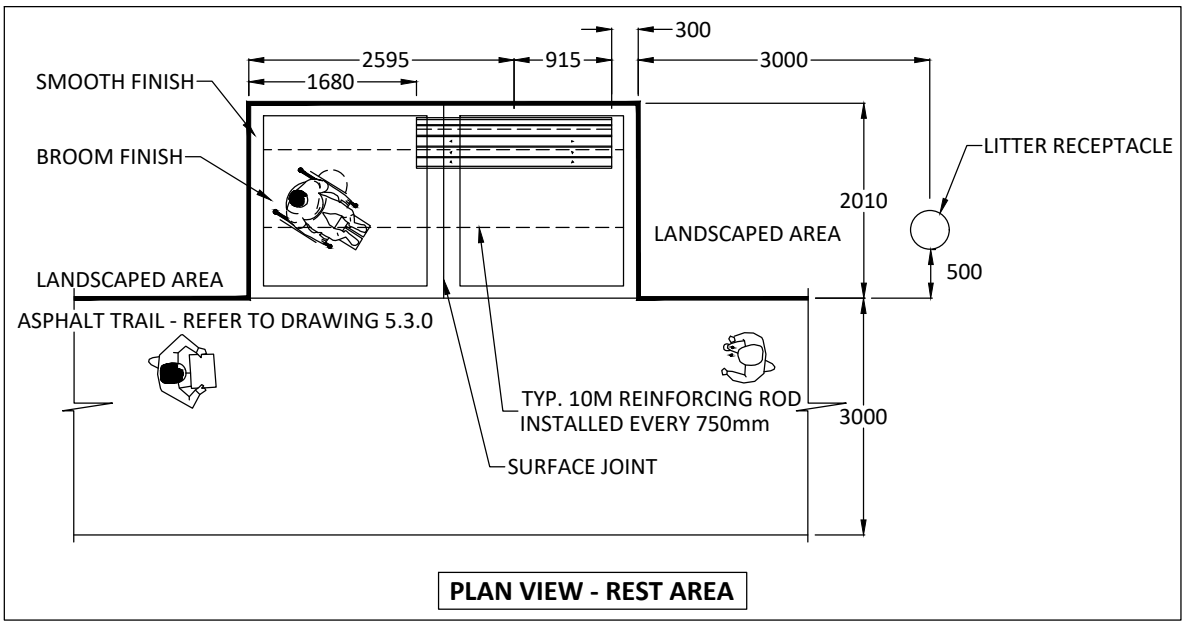
Rev. 1: JULY 21, 2022

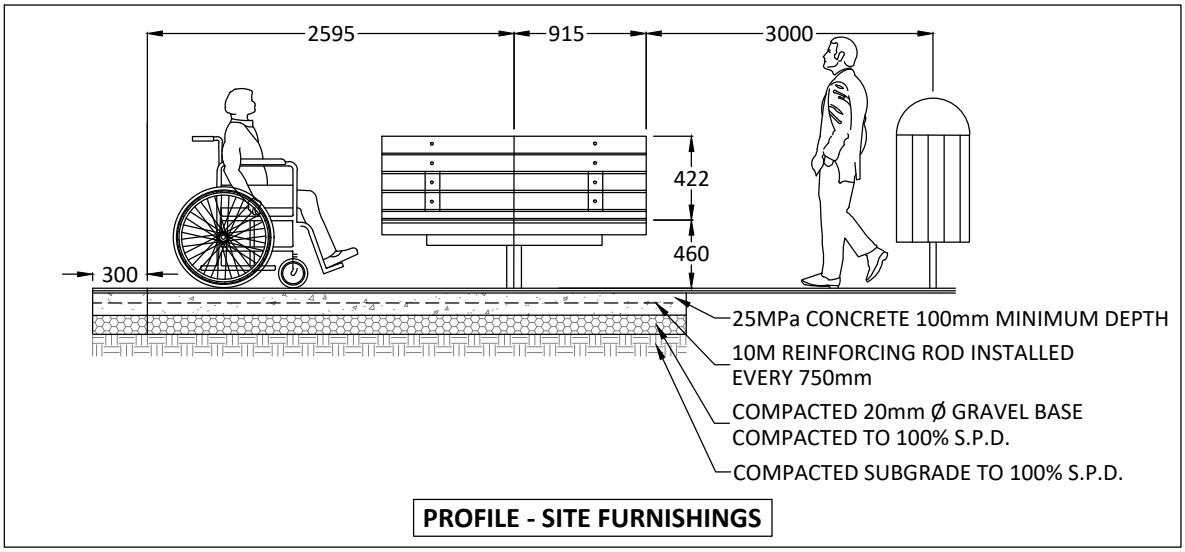
HIKING TRAIL
Scale: NTS

Sturgeon COUNTY

Drawing: 5.3.2



PLAN VIEW - REST AREA



PROFILE - SITE FURNISHINGS

NOTES:

1. REST STOPS IN URBAN AREAS SHALL INCLUDE AT LEAST TWO BENCHES AND A GARBAGE CAN, REST STOPS IN RURAL AREAS SHALL INCLUDE AT LEAST ONE BENCH AND A GARBAGE CAN.
2. REST STOPS TO BE COMPLETED WITH CONCRETE OR ASPHALT. REFERENCE DRAWING 5.3.0 FOR ASPHALT CONSTRUCTION DETAIL. BE ADVISED THAT FURNITURE INSTALLED ON ASPHALT PADS MUST BE MOUNTED ON CONCRETE PILES. REFERENCE DRAWING 5.7.0 FOR MOUNTING OPTIONS.
3. REST AREA SLOPE TO MATCH TRAIL SLOPE.
4. BENCH MAY BE TURNED 180 DEGREES TO FACE OPPOSITE SIDE OF TRAIL. A 600mm SETBACK FROM ASPHALT TRAIL IS TO BE PROVIDED.
5. SUBGRADE TO BE GRUBBED AND FREE OF STUMPS, ROOTS, ROCKS AND DEBRIS.
6. CONCRETE MINIMUM 100mm DEPTH - OR UP TO 120mm DEPTH FOR PEDESTRIAN AREAS.
7. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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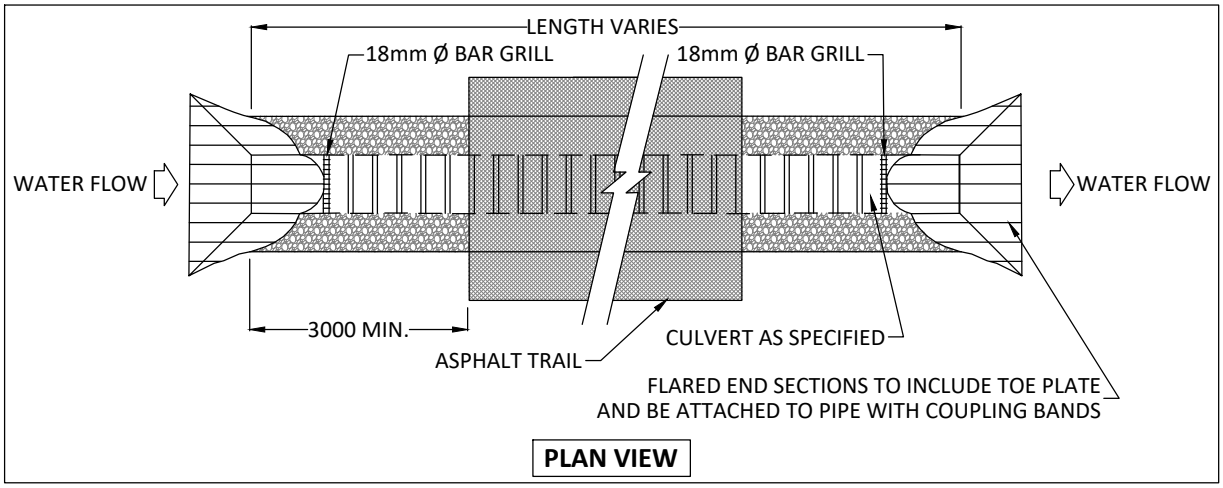
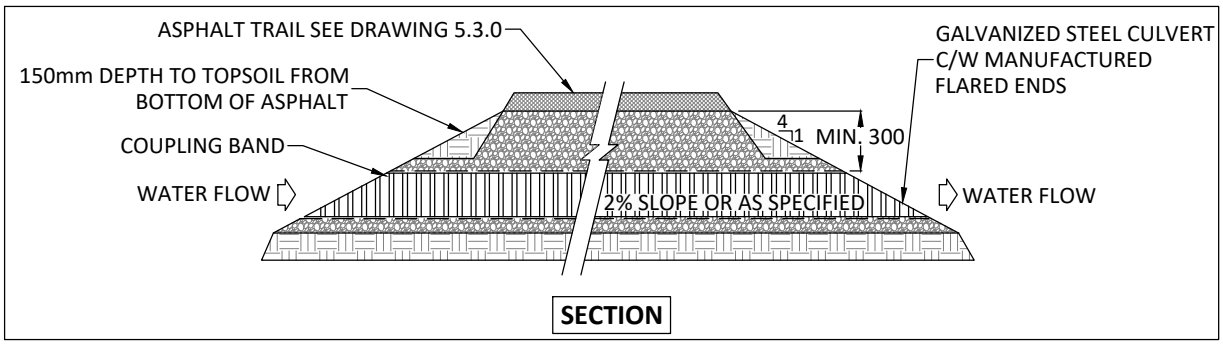
TYPICAL REST STOP AREA
Scale: NTS

Sturgeon COUNTY

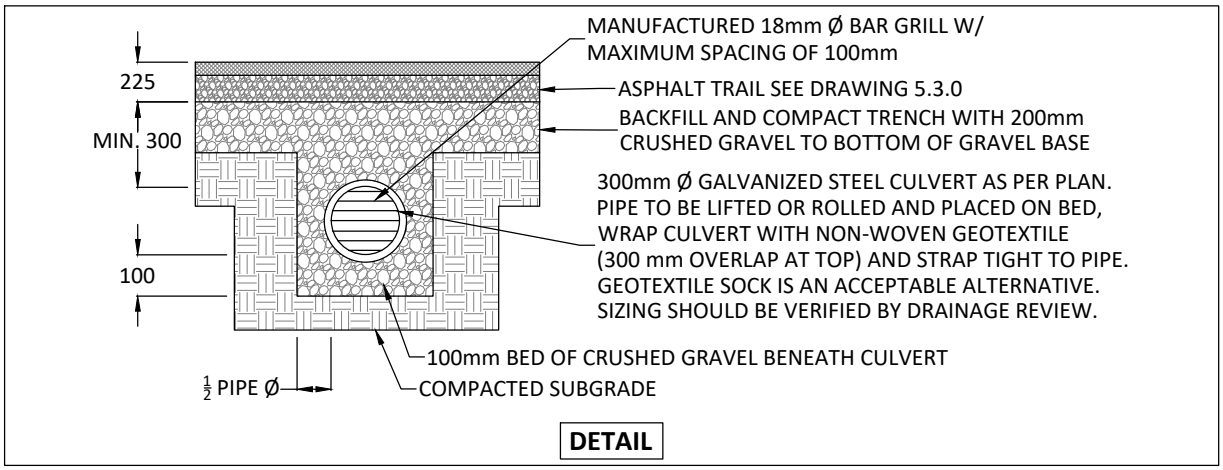
Drawing: 5.3.3



PLAN VIEW



SECTION



DETAIL

NOTES:

1. REFER TO DRAWING 5.3.5 - HAND PLACED RIPRAP FOR FURTHER DETAILS.
2. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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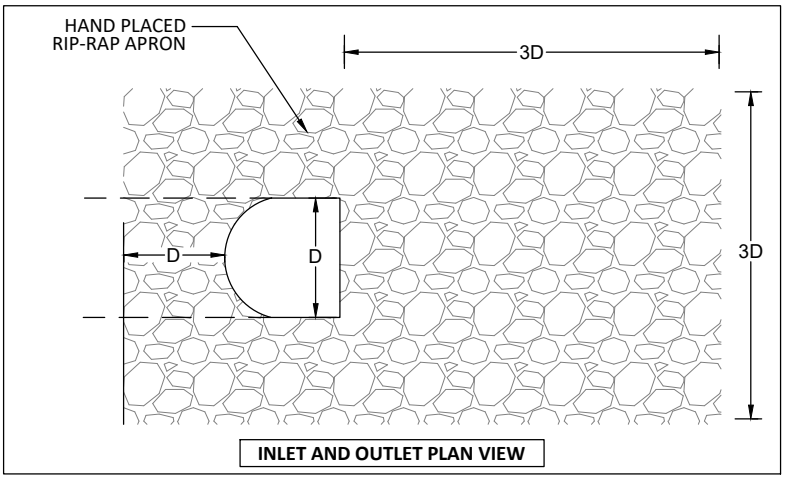
Rev. 1: JULY 27, 2022

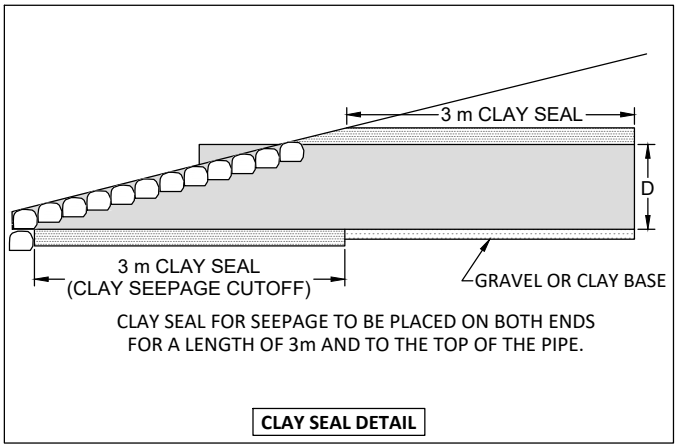
CSP CULVERT UNDER WALKWAY
Scale: NTS

Sturgeon COUNTY

Drawing: 5.3.4

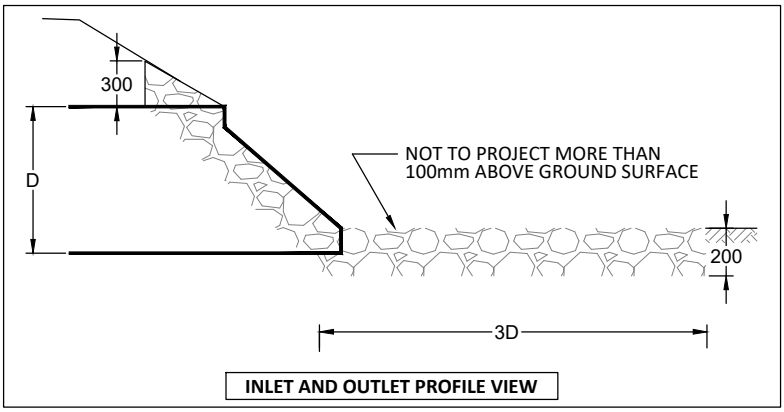


INLET AND OUTLET PLAN VIEW

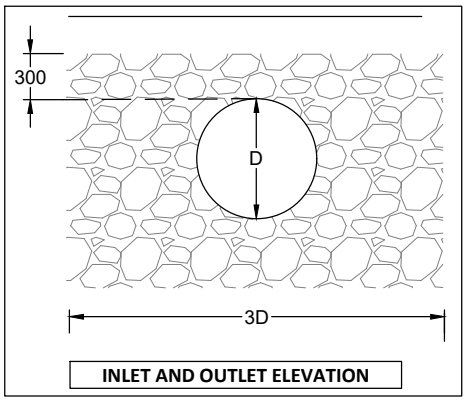


CLAY SEAL FOR SEEPAGE TO BE PLACED ON BOTH ENDS
FOR A LENGTH OF 3m AND TO THE TOP OF THE PIPE.

CLAY SEAL DETAIL



INLET AND OUTLET PROFILE VIEW



INLET AND OUTLET ELEVATION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. CULVERT TO BE BURIED 1/4 DIAMETER BELOW DITCH INVERT.
3. CULVERTS TO HAVE 3 : 1 SLOPE END TREATMENTS. REFER TO CULVERT END TREATMENT DRAWING.
4. RIP-RAP ROCK SIZE SHALL CONSIST OF MINIMUM 150mm AND MAXIMUM 350mm MATERIAL WITH A MINIMUM 50% OF ROCKS BEING LARGER THAN 300mm.
5. PLACE ROCKS INTO POSITION BY RAMING AND PACKING AGAINST EACH OTHER TO FORM A CLOSELY MOULDED AND UNIFORM LAYER AVERAGING NOT LESS THAN 125mm IN THICKNESS. PLACE ROCKS IN STAGGERED POSITION SUCH THAT ANY ROCK (EXCEPT AT THE BOTTOM LAYER) WILL REST ON TWO OR MORE OTHER ROCKS.
6. D IS DIAMETER OF THE CULVERT. 3D IS 3 TIMES THE DIAMETER OF THE PIPE AS A LINEAR DISTANCE.

STURGEON COUNTY

General Municipal Servicing Standards

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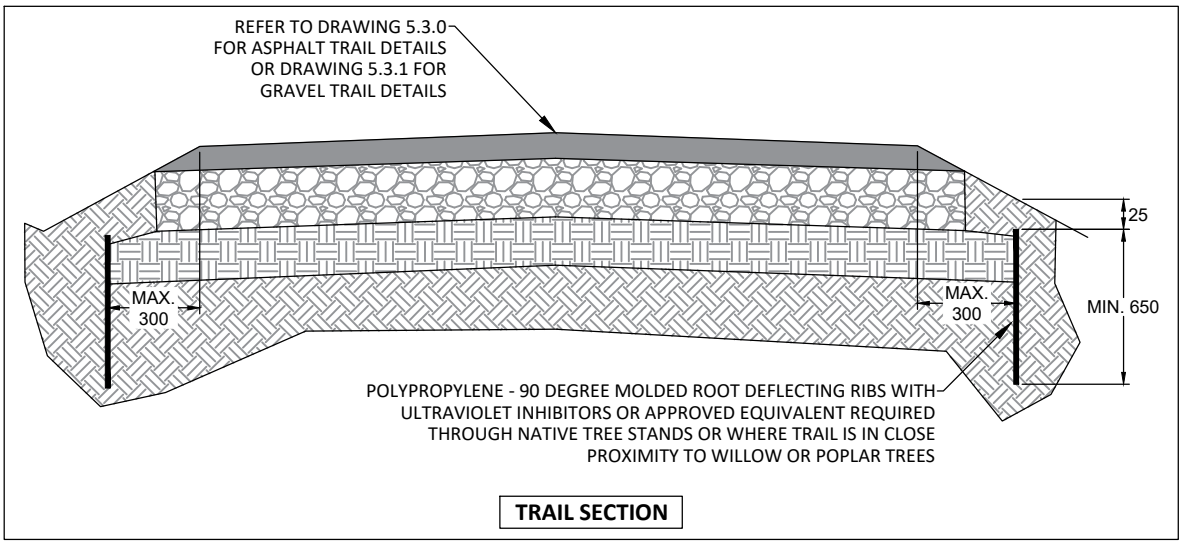
Rev. 1: NOVEMBER 17, 2022

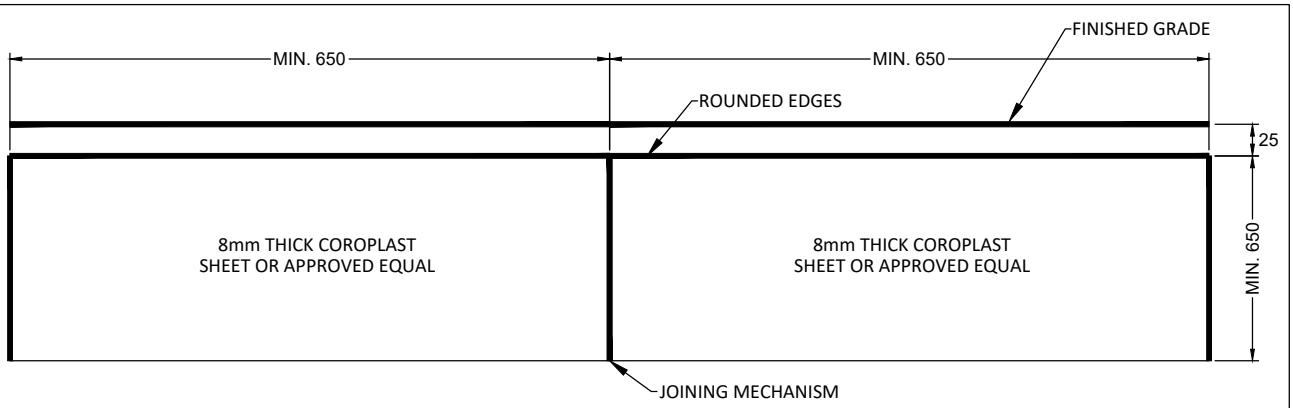
CULVERT RIP-RAP END TREATMENT
Scale: NTS

Sturgeon COUNTY

Drawing: 5.3.5



TRAIL SECTION



ELEVATION

NOTES:

1. ROOT BARRIER MAY BE INSTALLED ALONG BOTH GRAVEL OR ASPHALT TRAILS AS SITE CONDITIONS AND DESIGN DICTATE.
2. DEPTH OF ROOT BARRIER VARIES ACCORDING TO PLANT VARIETIES AND MANUFACTURER'S RECOMMENDATIONS.
3. TRENCH THE AREAS WHERE ROOT BARRIER IS TO BE INSTALLED.
4. ROOT BARRIER SHOULD BE BURIED 25mm BELOW FINAL GRADE.
5. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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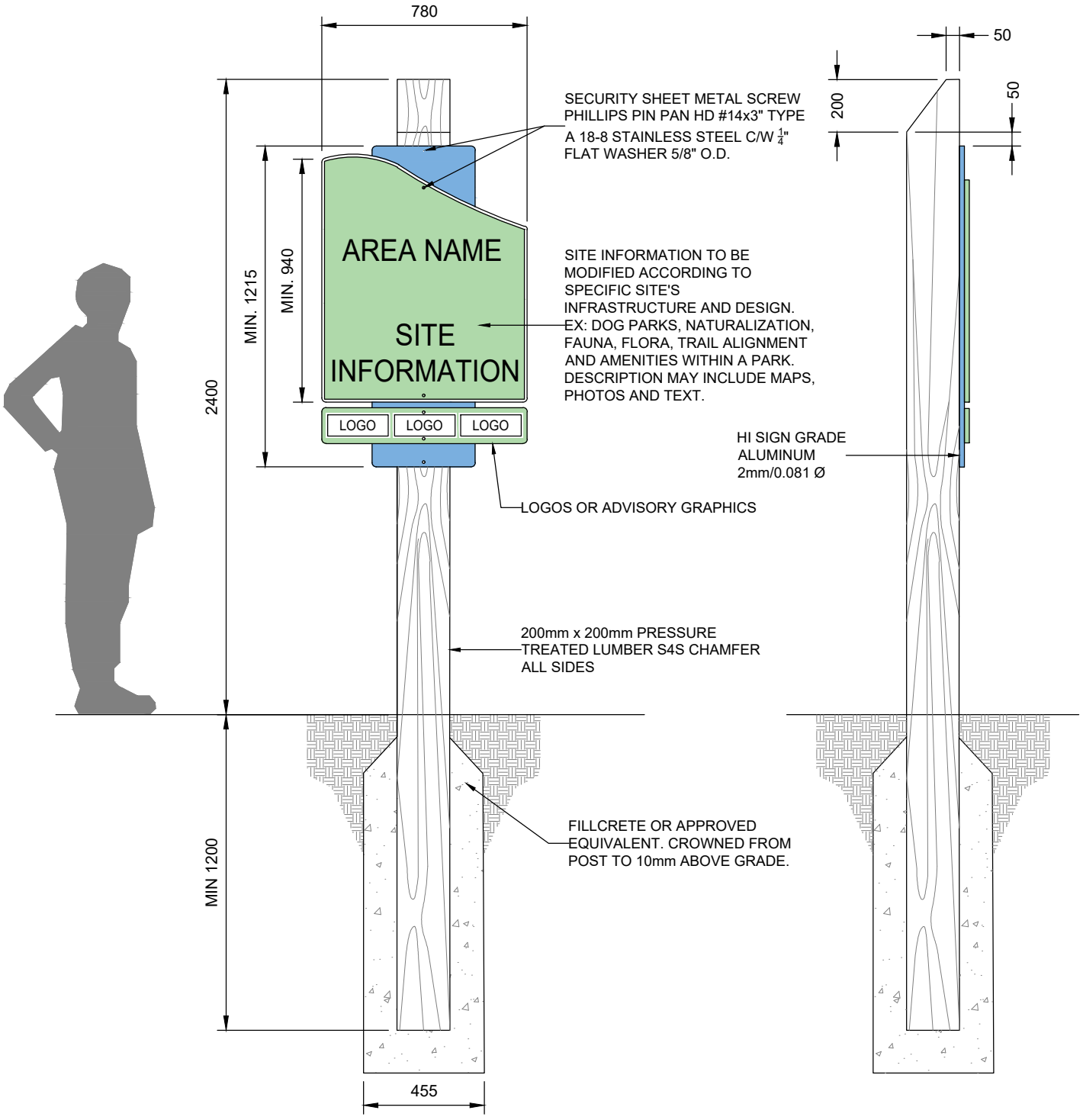
Rev. 1: JULY 14, 2022

ROOT BARRIER LAYOUT FOR TRAILS
Scale: NTS

Sturgeon COUNTY

Drawing: 5.3.6



NOTES:

1. SIGN TO BE COATED WITH ANTI-GRAFFITI 3M™ 1160 LAMINATE FINISH OR EQUIVALENT.
2. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
3. REFERENCE 5.7.0 FOR MOUNTING SIGN TO POST.
4. PLEASE CONTACT THE STURGEON COUNTY REPRESENTATIVE FOR VISUAL IDENTITY GUIDELINES AND SIGNAGE FILES WHERE AVAILABLE.

STURGEON COUNTY

General Municipal Servicing Standards

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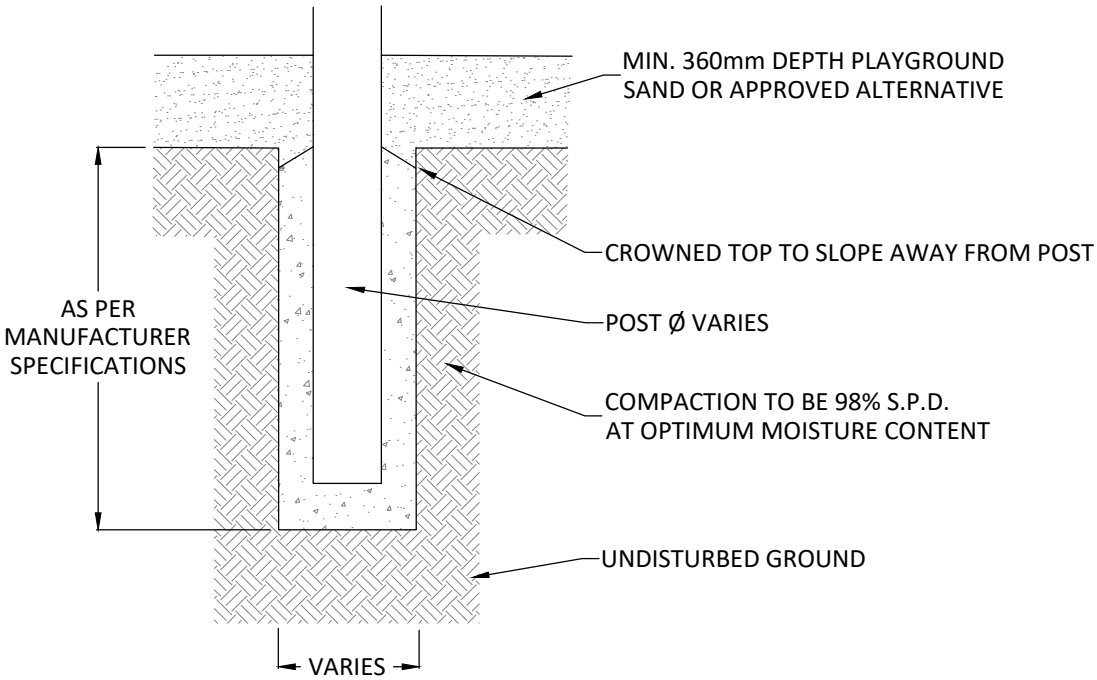
MULTI PURPOSE SIGN
Scale: NTS

Sturgeon COUNTY

Drawing: 5.3.8



NOTES:

1. FOOTING DIMENSIONS AND MATERIAL TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS DESIGN AND TO BE PROVIDED ON THE APPROVED CONSTRUCTION DRAWINGS FOR REFERENCE.
2. FOOTING TO BE DESIGNED TAKING INTO ACCOUNT LOCAL FROST LINE DEPTH.
3. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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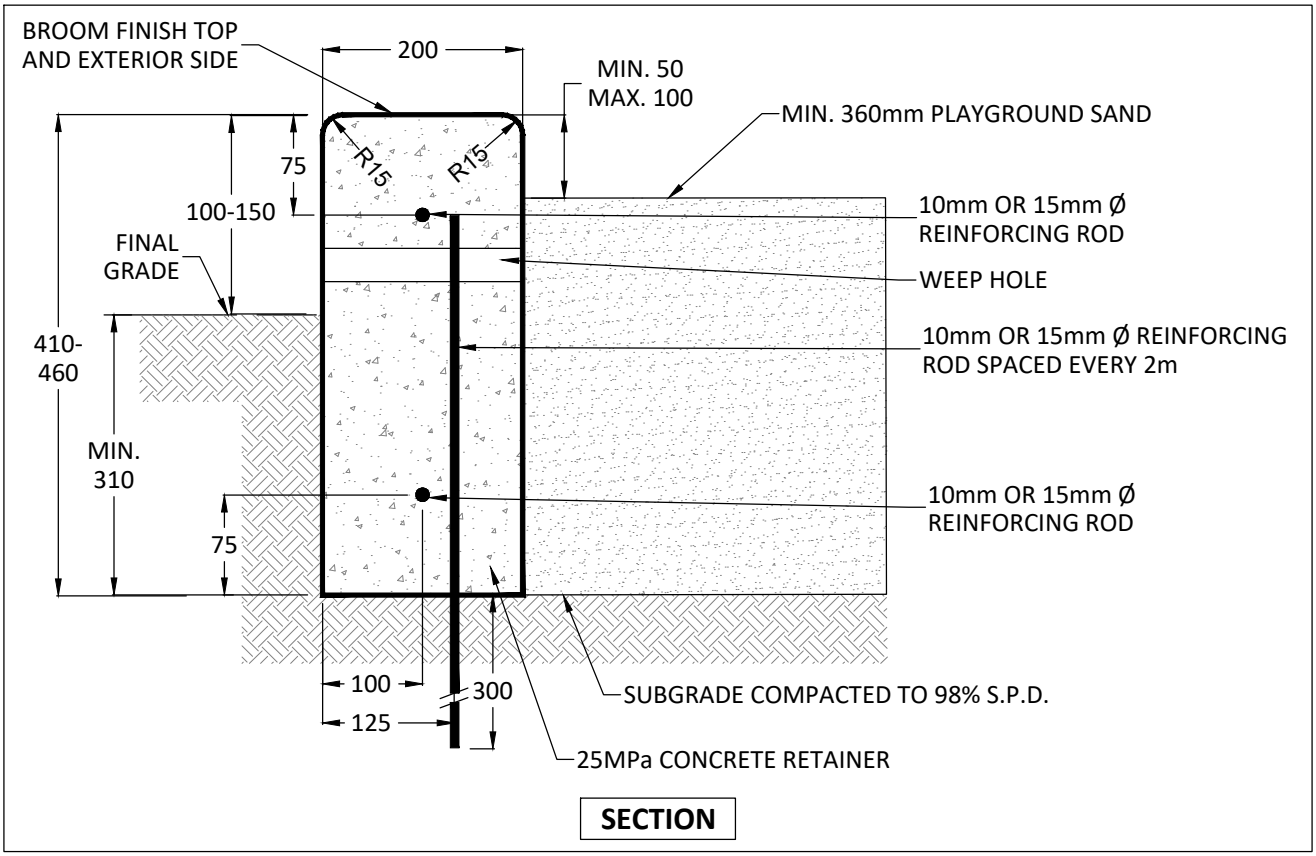
Rev. 2:
Rev. 1: JULY 11, 2022

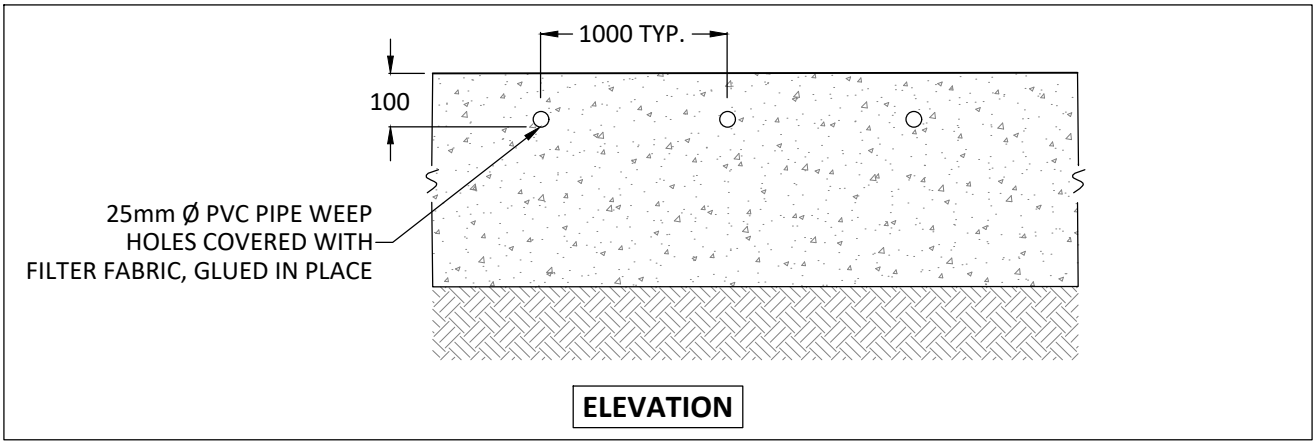
PLAYGROUND EQUIPMENT FOOTING
Scale: NTS

Sturgeon COUNTY

Drawing: 5.4.0



SECTION



ELEVATION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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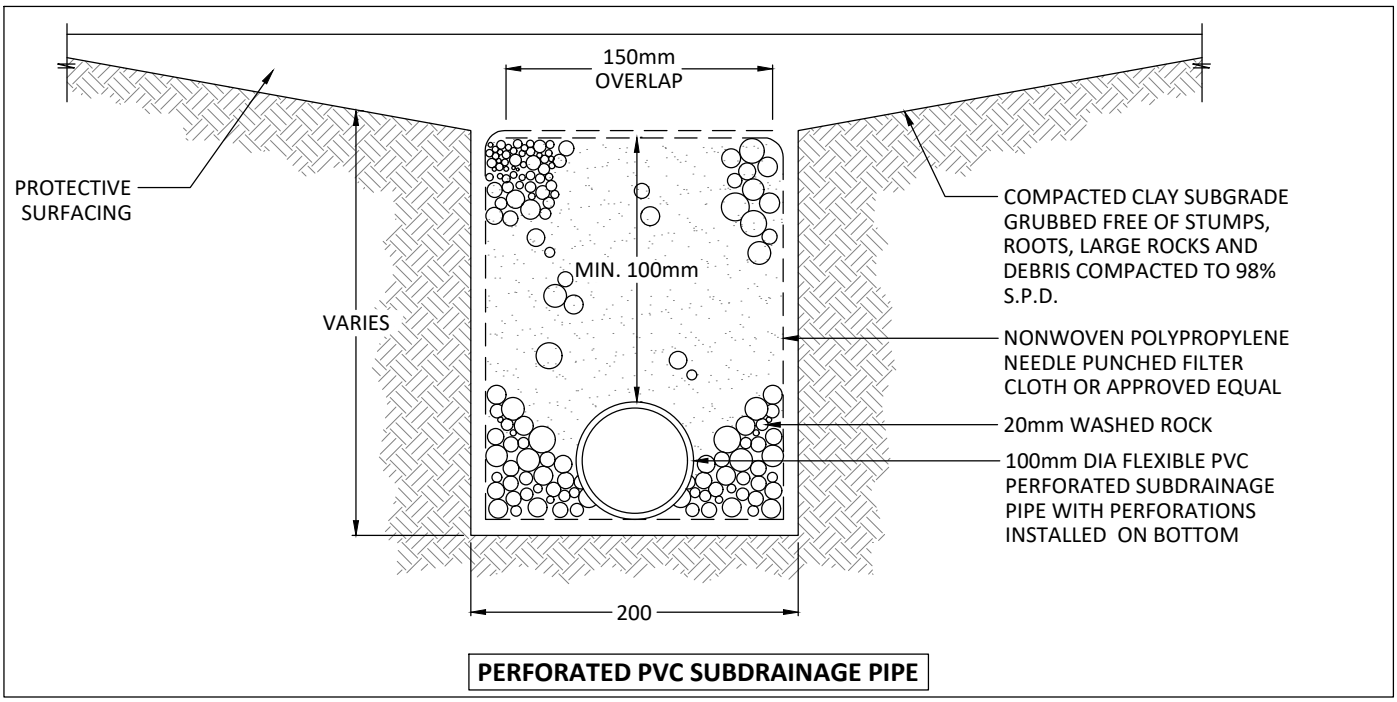
Rev. 1: AUGUST 9, 2022

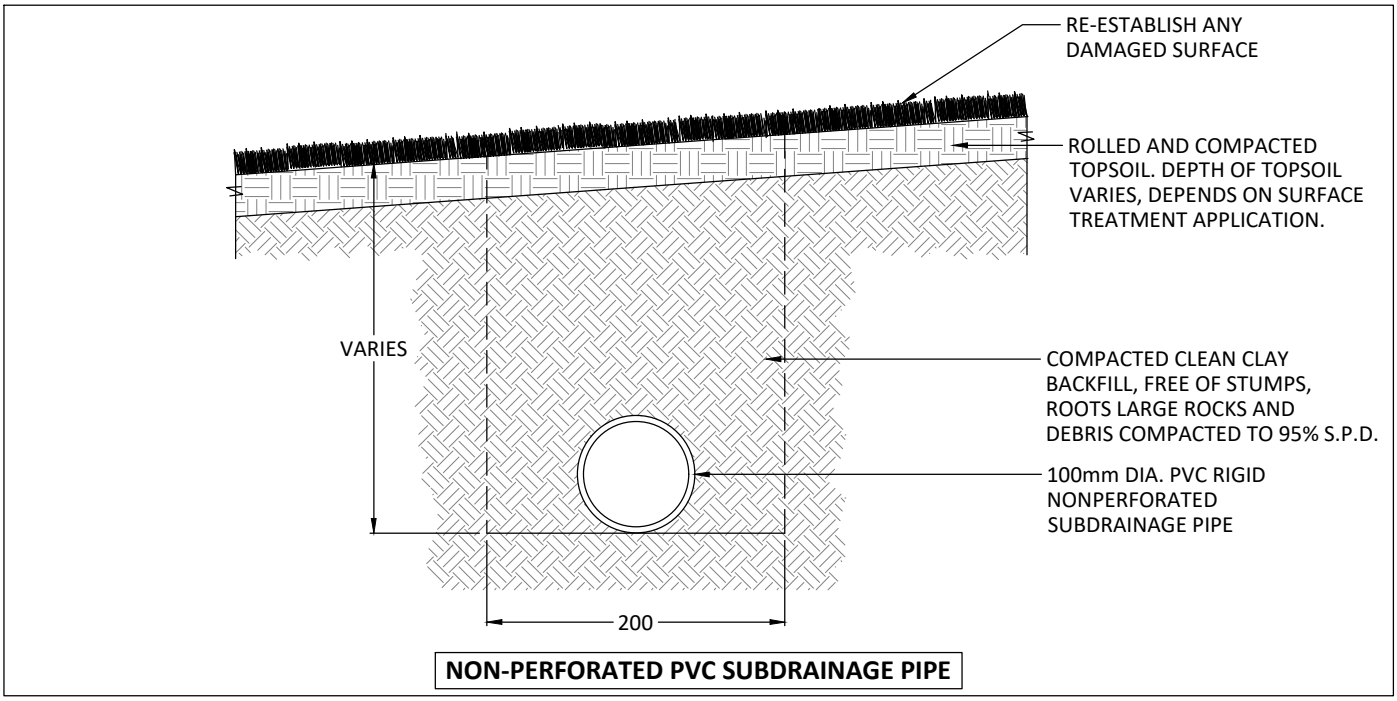
PLAYGROUND CONCRETE RETAINER
Scale: NTS

Sturgeon COUNTY

Drawing: 5.4.1



PERFORATED PVC SUBDRAINAGE PIPE



NON-PERFORATED PVC SUBDRAINAGE PIPE

NOTES:

1. MIN. 2.0% SLOPE ON ALL SUBDRAINAGE PIPE.
2. ALL DIMENSIONS IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
3. DRAINAGE MUST BE CONNECTED TO MUNICIPAL INFRASTRUCTURE, SUCH AS MANHOLE OR CATCH BASIN, WHERE ABLE.

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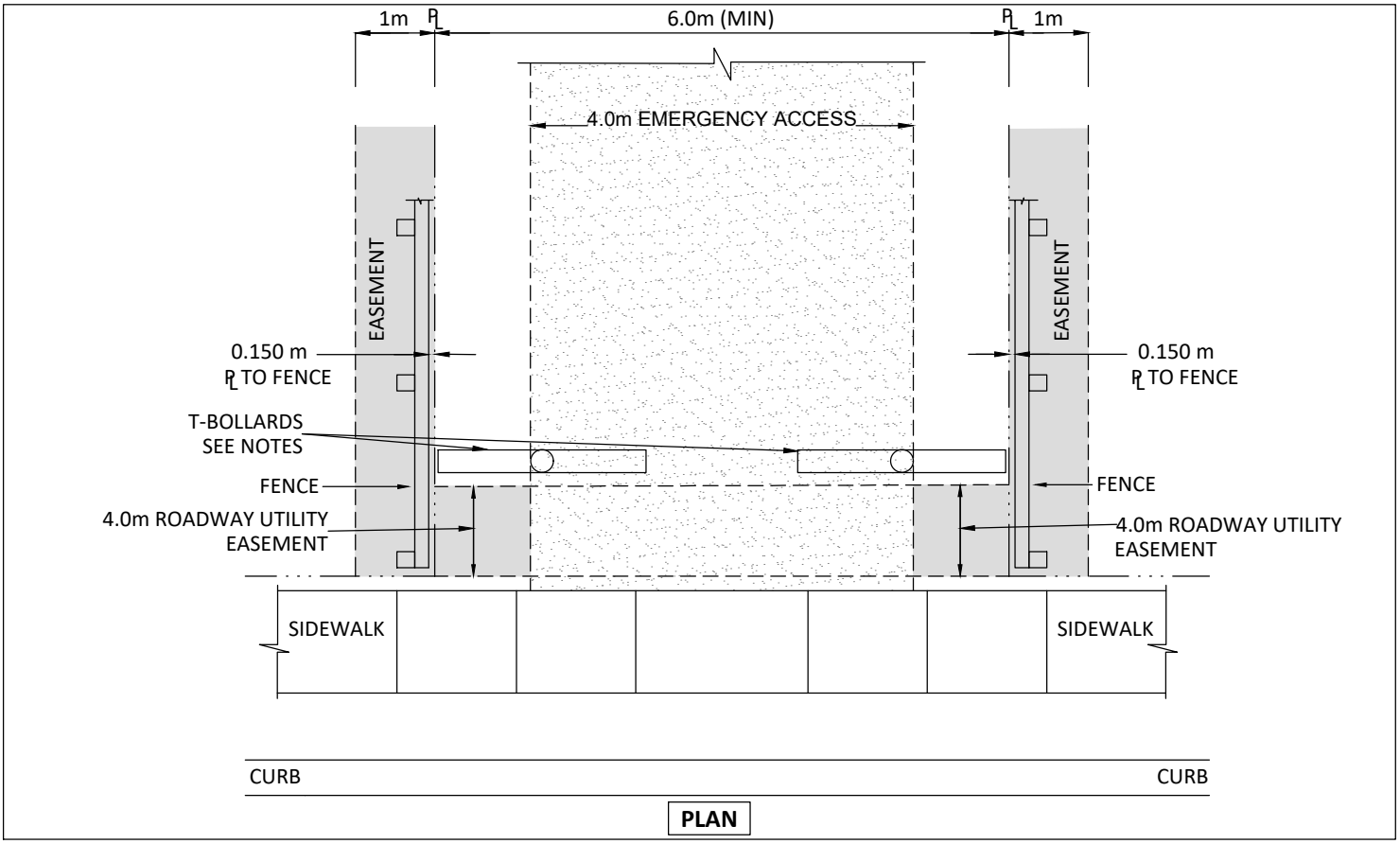
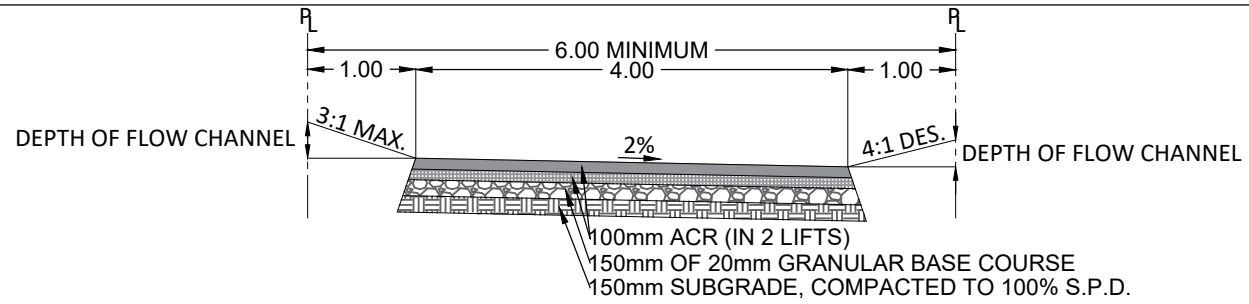
PLAYGROUND SUB-DRAIN PIPE
Scale: NTS

Sturgeon COUNTY

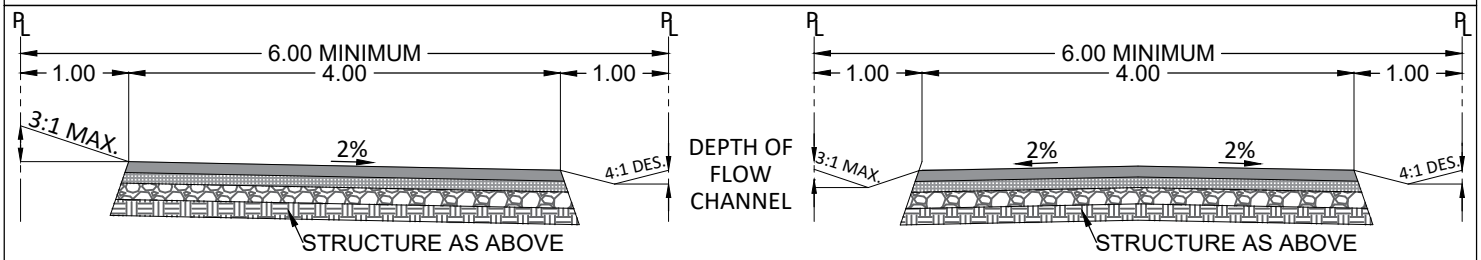
Drawing: 5.4.2



PLAN



CROSSFALL WITHOUT SWALE (LONGITUDINAL DRAINAGE)



CROSSFALL WITH SWALE

CROWNED WITH SWALES

NOTES:

1. TWO T-BOLLARDS MUST BE INSTALLED AT EACH P.U.L. ACCESS. REFER TO DRAWINGS 5.7.3, 5.7.4, AND 5.7.5.

STURGEON COUNTY

General Municipal Servicing Standards

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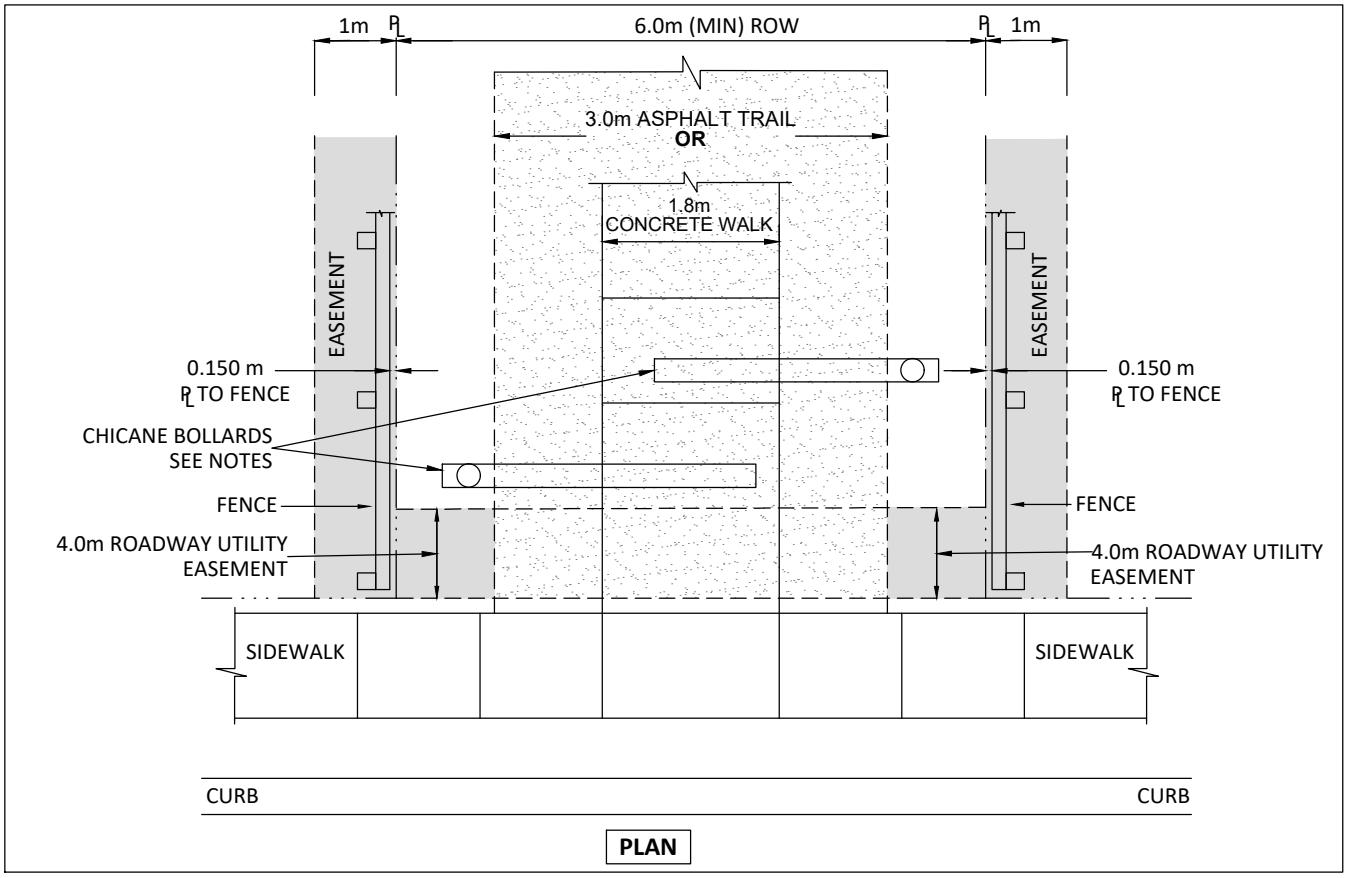
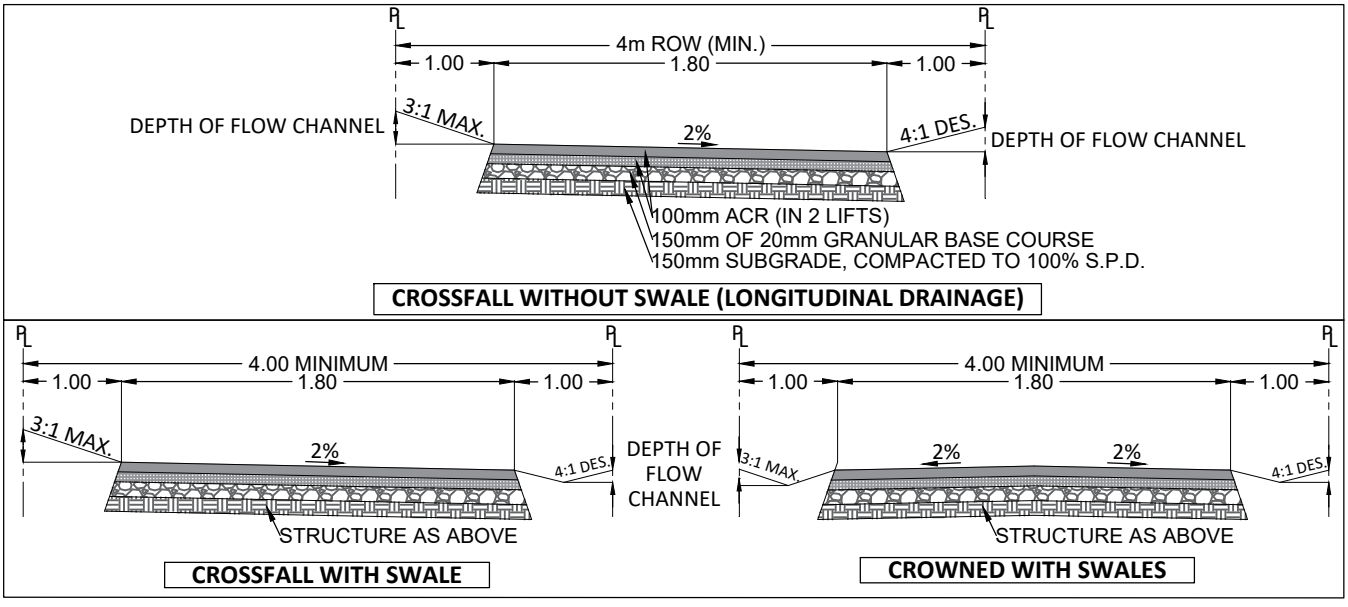
TYPICAL PUBLIC UTILITY LOT WITH EMERGENCY VEHICLE ACCESS
Scale: NTS

Sturgeon COUNTY

Drawing: 5.5.0



PLAN



CROSSFALL WITHOUT SWALE (LONGITUDINAL DRAINAGE)

CROSSFALL WITH SWALE

CROWNED WITH SWALES

NOTES:

1. TWO CHICANE BOLLARDS MUST BE INSTALLED AT EACH P.U.L. ACCESS WHEN AN ASPHALT TRAIL IS PROVIDED. REFER TO DRAWING 5.5.2.

STURGEON COUNTY

General Municipal Servicing Standards

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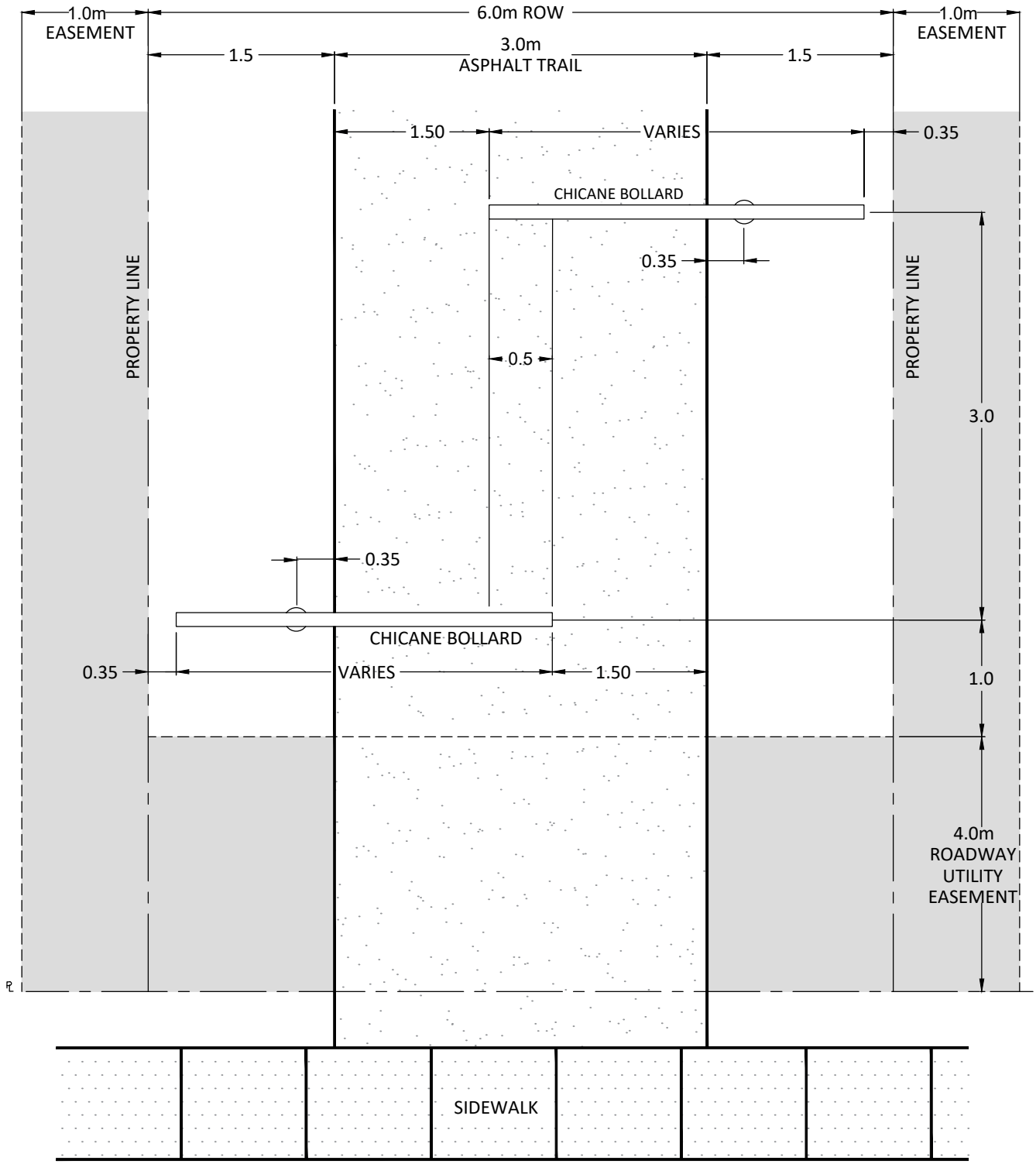
Rev. 1: JULY 22, 2022

TYPICAL PUBLIC UTILITY LOT WITH 1.8m WALKWAY OR 3m ASPHALT TRAIL
Scale: NTS

Sturgeon COUNTY

Drawing: 5.5.1



PLAN

NOTES:

1. CHICANE BOULEVARDS SHALL BE IN ACCORDANCE WITH DRAWINGS 5.7.1 AND 5.7.2.
2. T-BOLLARDS SHALL BE USED FOR EMERGENCY VEHICLE ACCESS PUBLIC UTILITY LOTS. REFER TO EMERGENCY ACCESS PUL DRAWING.

STURGEON COUNTY

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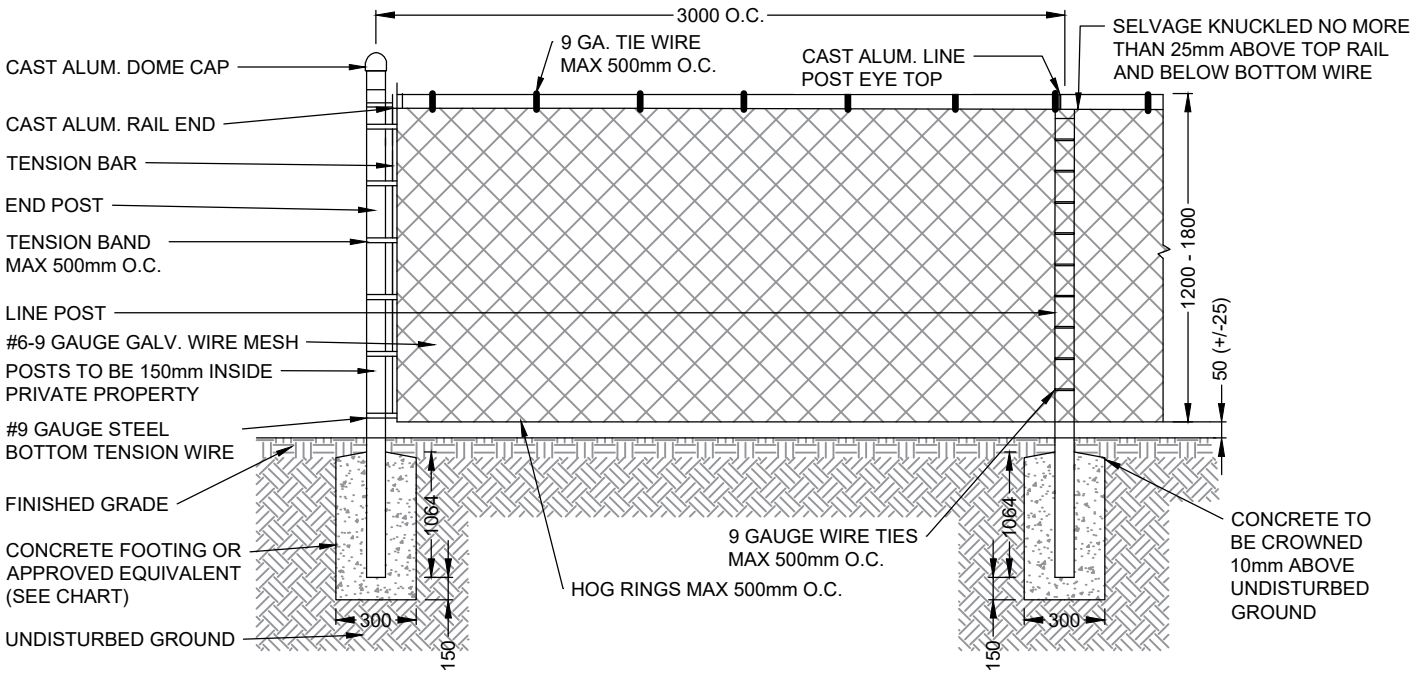
CHICANE BOLLARD LAYOUT FOR ASPHALT TRAIL PUL
Scale: NTS

Sturgeon COUNTY

Drawing: 5.5.2



CONCRETE FOOTING CHART			
FENCE HEIGHT		CONCRETE DEPTH	HOLE DIA.
1.2m, 1.5m & 1.8m	LINE POSTS	800mm	200mm
	GATE AND CORNER POSTS	900mm	300mm

NOTES:

1. CHAIN LINK FENCE TO CONFORM TO SPECIFICATIONS WITHIN SECTION 5.6.3.
2. FENCES AND FENCE COMPONENTS, INCLUDING DECORATIVE COLUMNS TO BE INSTALLED A MINIMUM 150mm INSIDE PRIVATE PROPERTY, MEASURED FROM THE MOST OUTSIDE EDGE OF FENCE TO THE PROPERTY LINE. FOOTINGS ADJACENT TO ANY UNDERGROUND UTILITY MUST BE SET BACK TO PROVIDE A MINIMUM 1.0m HORIZONTAL SEPARATION. DECORATIVE COLUMNS MUST BE INSTALLED OUTSIDE OF UTILITY EASEMENTS. ALL FENCING INSTALLED WITHIN AN EASEMENT WILL BE AT THE DISCRETION OF STURGEON COUNTY AND TO THE SATISFACTION OF THE EASEMENT OWNER.
3. WIRE MESH TO BE #6 GAUGE BEFORE COATING ALONG SPORTS FIELDS. OTHER SITES/APPLICATIONS USE #9 GAUGE BEFORE COATING IS ACCEPTABLE.
4. CONCRETE FOOTING DEPTHS LISTED ARE THE MINIMUM DEPTH TO REACH UNDISTURBED SOILS OR ENGINEERED FILL. WHERE LOOSE IMPORTED MATERIAL ARE PRESENT, CONCRETE DEPTH TO BE AMENDED.
5. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

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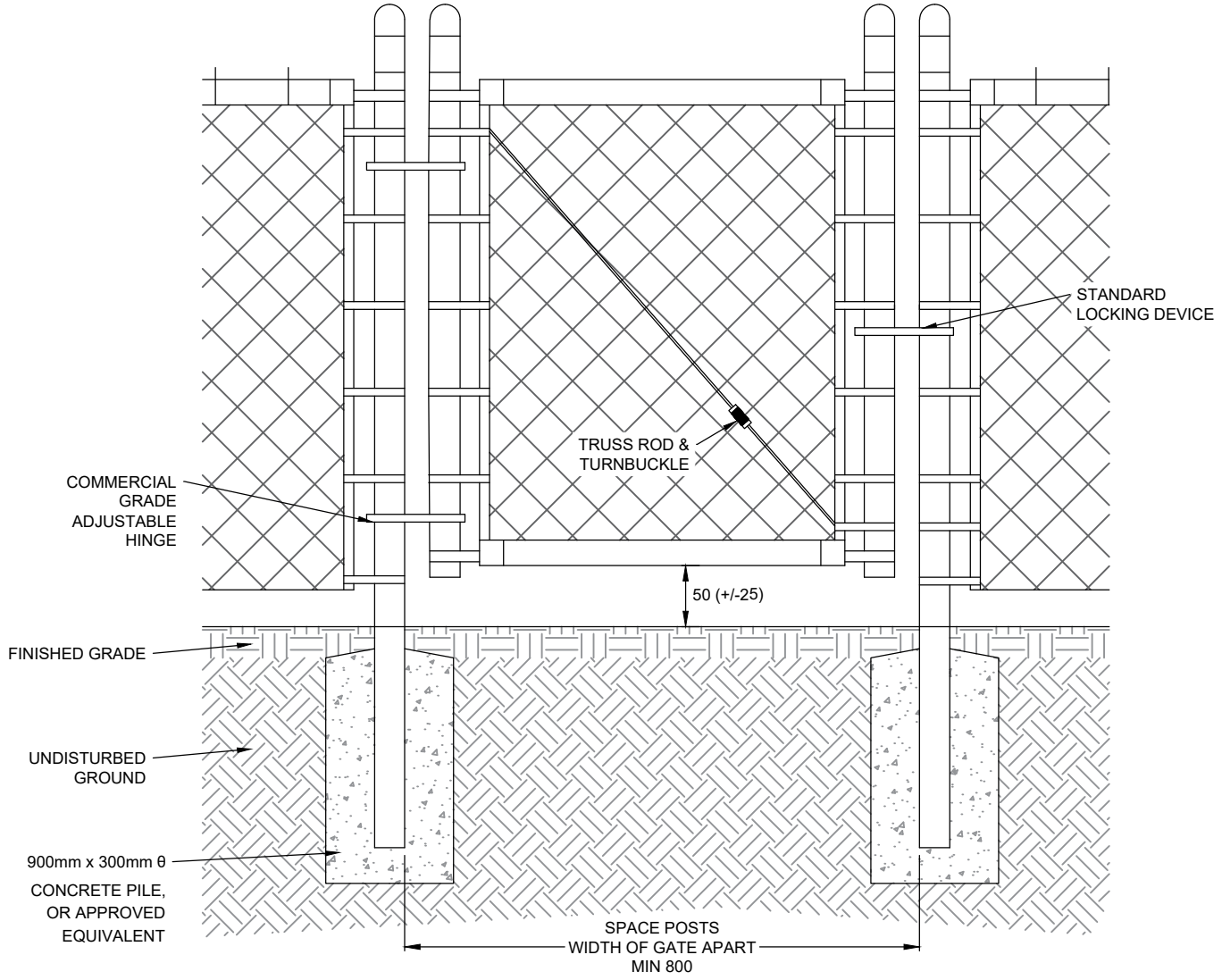
CHAIN LINK FENCE 1.2m TO 1.8m
Scale: NTS

Sturgeon COUNTY

Drawing: 5.6.0



INSTALL LINE, CORNER AND TERMINAL POSTS PLUMB, SET IN CONCRETE FOOTINGS AS FOLLOWS:

FENCE HEIGHT		CONCRETE DEPTH	HOLE DIA.
1.2m, 1.5m & 1.8m	GATE AND CORNER POSTS	900mm	300mm

NOTES:

1. CHAIN LINK FENCE GATE TO CONFORM TO SPECIFICATIONS WITHIN SECTION 5.6.3.
2. SEE DRAWING 5.6.0 FOR CHAIN LINK FENCE CONSTRUCTION.
3. FENCES AND FENCE COMPONENTS, INCLUDING DECORATIVE COLUMNS TO BE INSTALLED A MINIMUM 150mm INSIDE PRIVATE PROPERTY, MEASURED FROM THE MOST OUTSIDE EDGE OF FENCE TO THE PROPERTY LINE. FOOTINGS ADJACENT TO ANY UNDERGROUND UTILITY MUST BE SET BACK TO PROVIDE A MINIMUM 1.0m HORIZONTAL SEPARATION. DECORATIVE COLUMNS MUST BE INSTALLED OUTSIDE OF UTILITY EASEMENTS. ALL FENCING INSTALLED WITHIN AN EASEMENT WILL BE AT THE DISCRETION OF STURGEON COUNTY AND TO THE SATISFACTION OF THE EASEMENT OWNER.
4. WIRE MESH TO BE #6 GAUGE BEFORE COATING ALONG SPORTS FIELDS. FOR OTHER SITES OF APPLICATIONS USE #9 GAUGE BEFORE COATING.
5. FRAME TO BE WELDED TOGETHER.
6. TRUSS ROD TO BE REMOVED IF GATE EXCEEDS 1200mm WIDTH.
7. CONCRETE FOOTING DEPTHS LISTED ARE MINIMUM DEPTH TO REACH UNDISTURBED SOILS OR ENGINEERED FILL. WHERE LOOSE IMPARTED MATERIAL ARE PRESENT, CONCRETE DEPTH TO BE AMENDED.
8. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

General Municipal Servicing Standards

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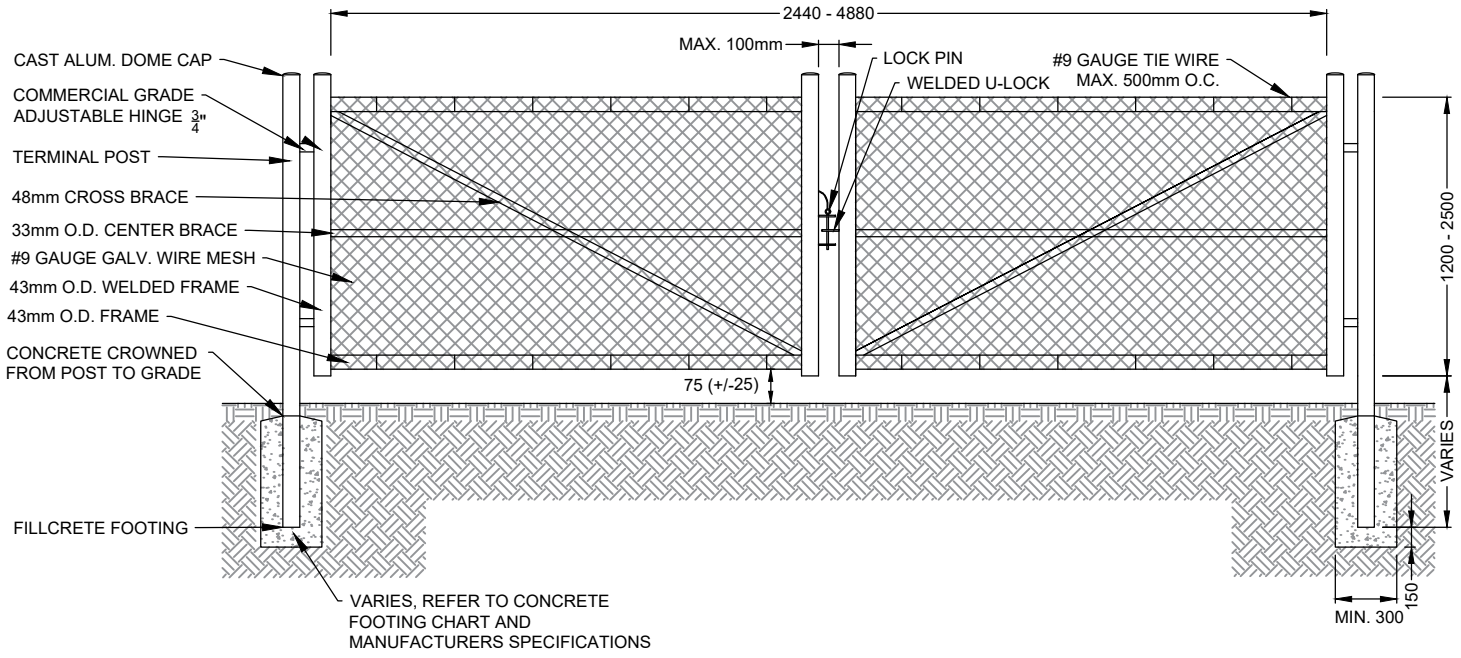
CHAIN LINK FENCE GATE

Scale: NTS

Sturgeon COUNTY

Drawing: 5.6.1



INSTALL LINE, CORNER AND TERMINAL POSTS PLUM, SET IN CONCRETE FOOTINGS AS FOLLOWS:

CONCRETE FOOTING CHART			
FENCE HEIGHT		CONCRETE DEPTH	HOLE DIAMETER AT TOP
1.2m, 1.5m & 1.8m	GATE AND CORNER POSTS	900mm	300mm

NOTES:

1. CHAIN LINK FENCE MAINTENANCE GATE TO CONFORM TO SPECIFICATIONS WITHIN SECTION 5.6.3.
2. SEE DRAWING 5.6.0FOR CHAIN LINK FENCE CONSTRUCTION.
3. FENCES AND FENCE COMPONENTS, INCLUDING DECORATIVE COLUMNS TO BE INSTALLED A MINIMUM 150mm INSIDE PRIVATE PROPERTY, MEASURED FROM THE MOST OUTSIDE EDGE OF FENCE TO THE PROPERTY LINE. FOOTINGS ADJACENT TO ANY UNDERGROUND UTILITY MUST BE SET BACK TO PROVIDE A MINIMUM 1.0m HORIZONTAL SEPARATION. DECORATIVE COLUMNS MUST BE INSTALLED OUTSIDE OF UTILITY EASEMENTS. ALL FENCING INSTALLED WITHIN AN EASEMENT WILL BE AT THE DISCRETION OF STURGEON COUNTY AND TO THE SATISFACTION OF THE EASEMENT OWNER.
4. WIRE MESH TO BE #6 GAUGE BEFORE COATING ALONG SPARTS FIELDS, FOR OTHER SITES OR APPLICATIONS USE #9 GAUGE BEFORE COATING.
5. FRAME TO BE WELDED TOGETHER.
6. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

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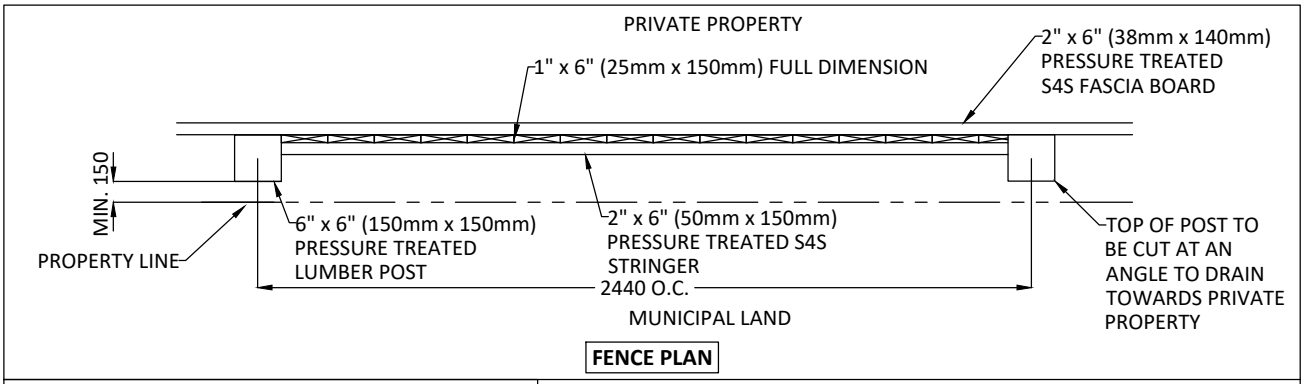
Rev. 1: AUGUST 25, 2022

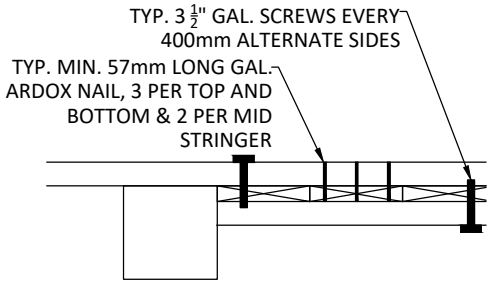
CHAIN LINK FENCE MAINTENANCE GATE
Scale: NTS

Sturgeon COUNTY

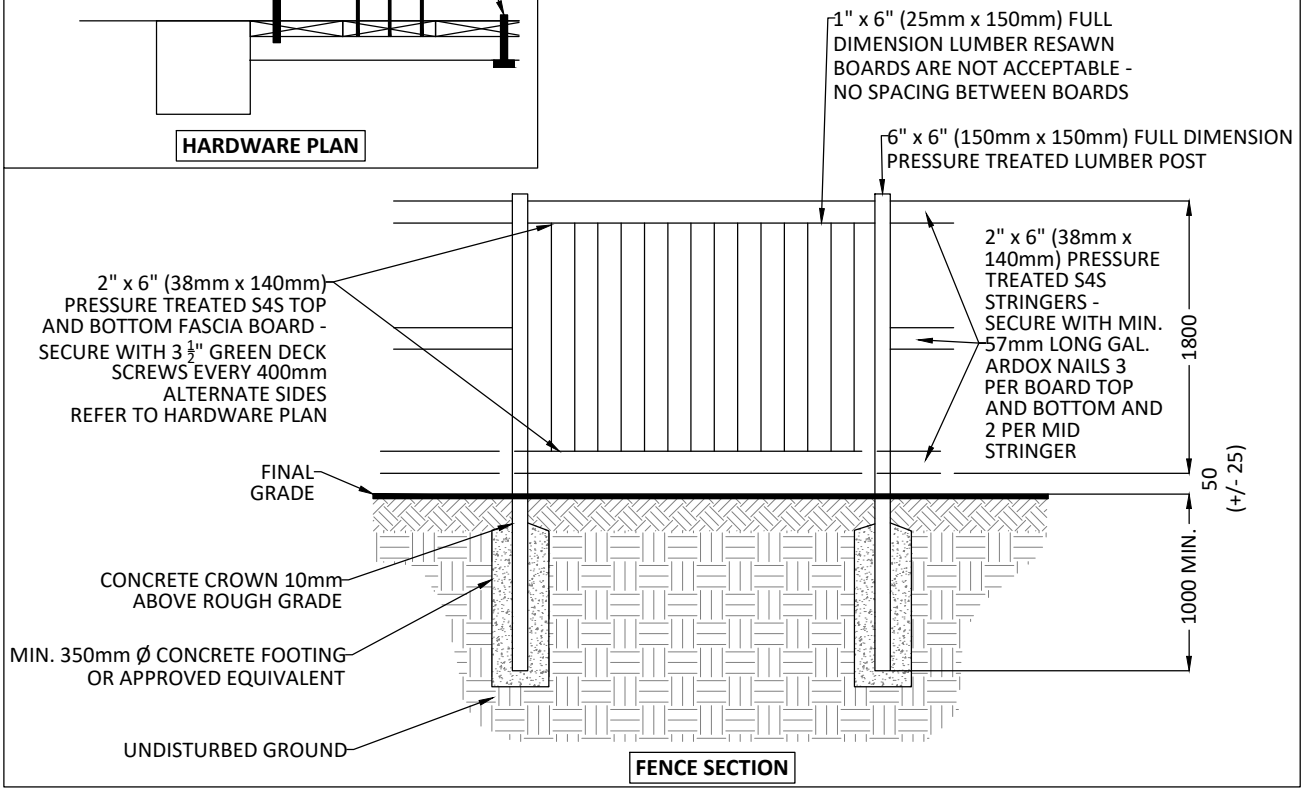
Drawing: 5.6.2



FENCE PLAN



HARDWARE PLAN



FENCE SECTION

NOTES:

1. FENCES AND FENCE COMPONENTS, INCLUDING DECORATIVE COLUMNS, TO BE INSTALLED A MINIMUM 150mm INSIDE PRIVATE PROPERTY, MEASURED FROM THE MOST OUTSIDE EDGE OF FENCE TO THE PROPERTY LINE. FOOTINGS ADJACENT TO ANY UTILITY MUST BE SET BACK TO PROVIDE A MINIMUM 1.0m HORIZONTAL SEPARATION. DECORATIVE COLUMNS MUST BE INSTALLED OUTSIDE OF UTILITY EASEMENTS. ALL OTHER FENCING INSTALLED WITHIN AN EASEMENT WILL BE AT THE DISCRETION OF STURGEON COUNTY.
2. POST HOLES TO BE EXCAVATED TO REACH A DEPTH OF UNDISTURBED SUBGRADE. MINIMUM 1000mm.
3. ALL WOOD TO BE PRESSURE-TREATED, OR CEDAR, FOR MUNICIPALLY OWNED FENCES. ONLY POST AND STRINGER TO BE PRESSURE TREATED, OR CEDAR, FOR PRIVATE FENCES.
4. STAIN SPECIFICATIONS TO BE DETERMINED BY THE LANDSCAPE ARCHITECT. PRE-STAIN TWO COATES PRIOR TO INSTALLATION. TOUCH UP AFTER CONSTRUCTION IF NEEDED.
5. ALL DIMENSIONS ARE IN MILLIMETERS (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

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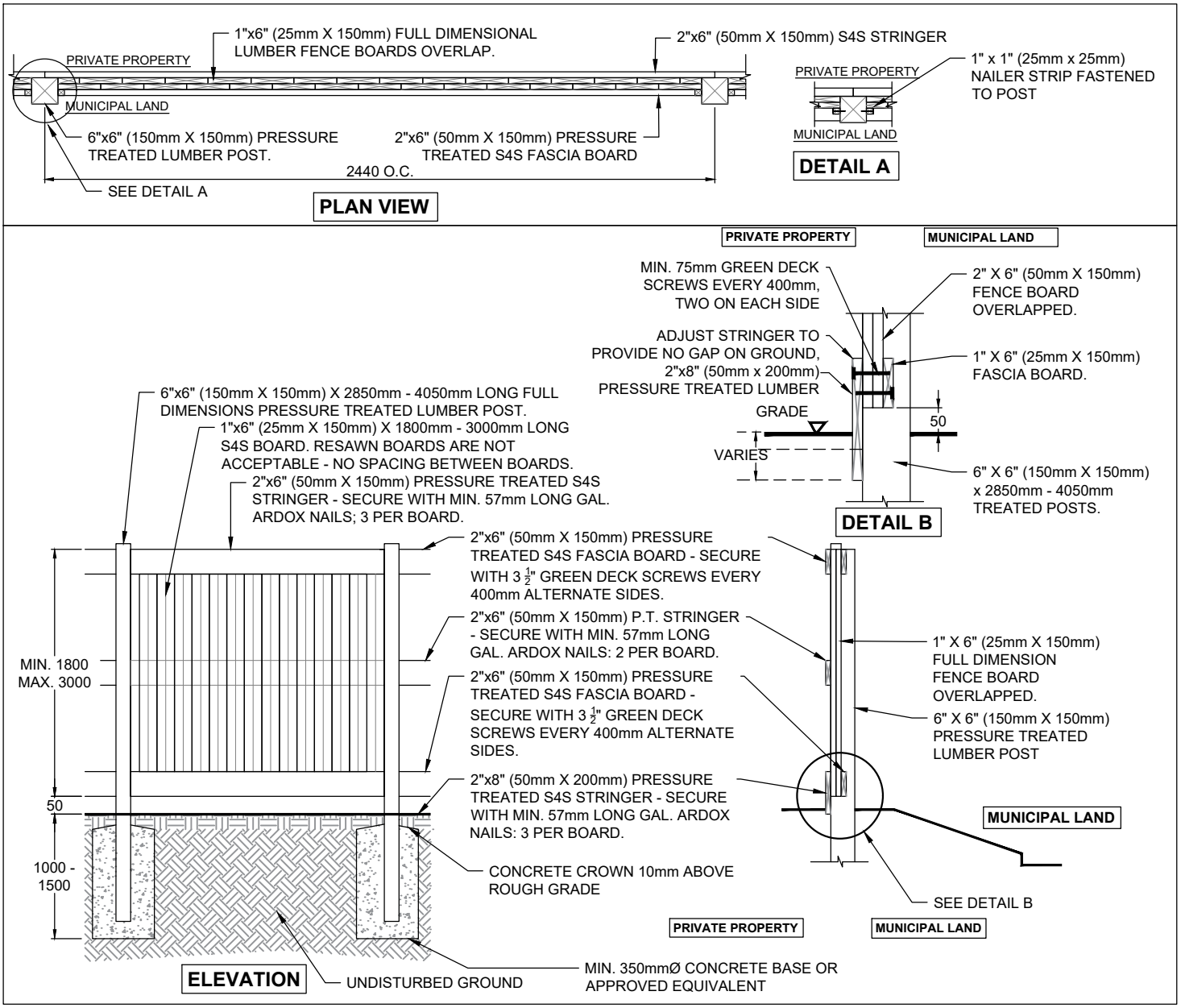
WOOD SCREEN FENCE - 1.8m
Scale: NTS

Sturgeon COUNTY

Drawing: 5.6.3



NOTES:

1. POST BASES ADJACENT TO ANY UNDERGROUND UTILITY MUST BE SET BACK TO PROVIDE A MINIMUM 1.0m HORIZONTAL SEPARATION. DECORATIVE COLUMNS MUST BE INSTALLED OUTSIDE OF UTILITY EASEMENTS. ALL OTHER FENCING INSTALLED WITHIN AN EASEMENT WILL BE AT THE DISCRETION OF STURGEON COUNTY.
2. POST HOLES TO BE EXCAVATED TO REACH A DEPTH OF UNDISTURBED SUBGRADE MINIMUM 1000mm.
3. ALL WOOD TO BE PRESSURE TREATED, OR CEDAR, FOR MUNICIPALLY OWNED FENCES. ONLY POSTS AND STRINGER TO BE PRESSURE TREATED OR CEDAR FOR PRIVATE FENCES.
4. STAIN SPECIFICATIONS TO BE DETERMINED BY THE LANDSCAPE ARCHITECT. PRE-STAIN TWO COATS PRIOR TO INSTALLATION. TOUCH UP AFTER CONSTRUCTION IF NEEDED.
5. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
6. WHERE THE NOISE ATTENUATING FENCE IS PLACED ALONG THE BACK OF A SPLIT DRAINING LOT, A SUITABLE GAP BETWEEN THE FINAL GRADE AND THE BOTTOM OF THE FENCE ON BOTH THE PRIVATE AND THE MUNICIPAL SIDE TO BE PROVIDED AS DIRECTED BY THE COUNTY.
7. TOP OF POST TO BE CUT AT AN ANGLE TO DRAIN TOWARDS PRIVATE PROPERTY.
8. 3.0m FENCES ARE REQUIRED TO HAVE 4 STRINGERS.

STURGEON COUNTY

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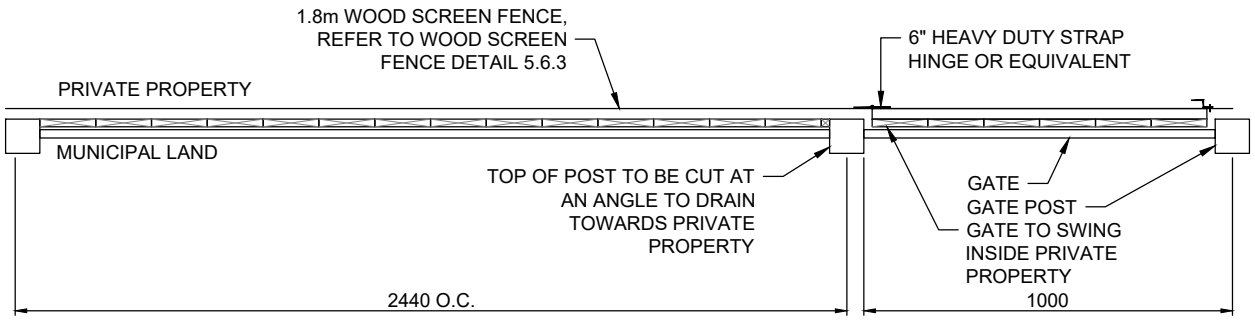
Rev. 1: JULY 28, 2022

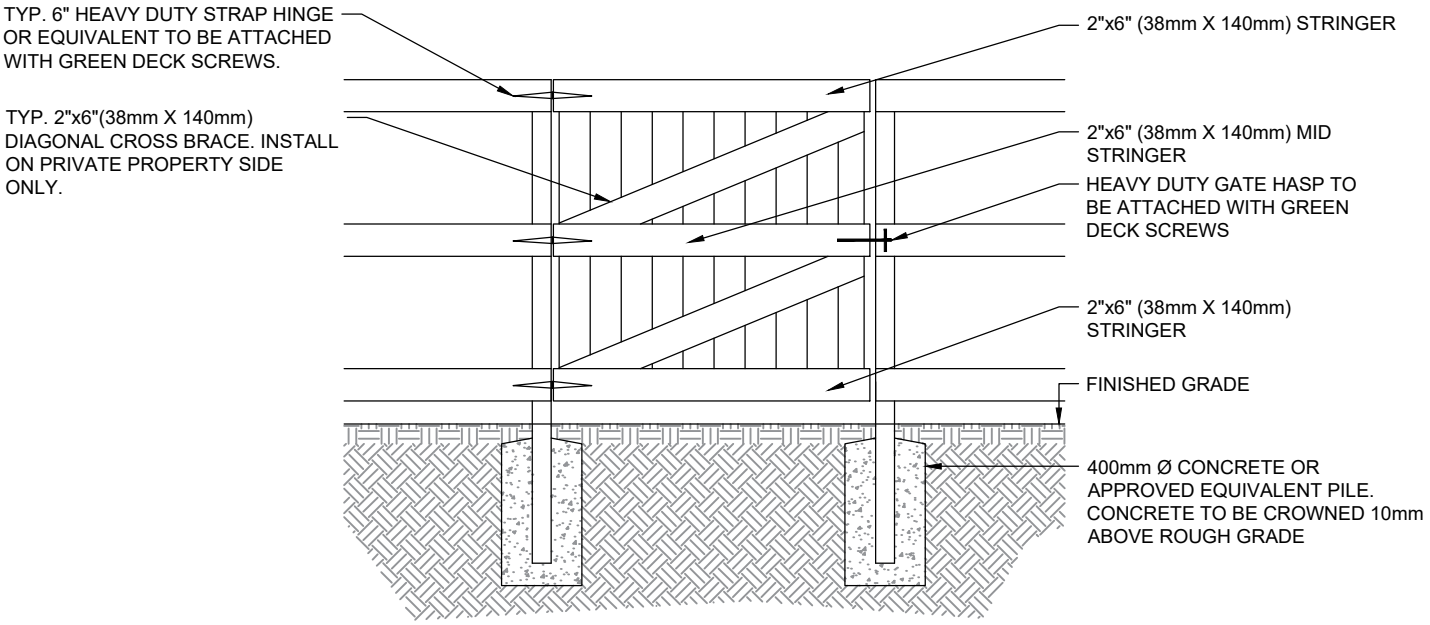
WOOD SCREEN SOUND ABATEMENT FENCE - 1.8m TO 3.0m
Scale: NTS

Sturgeon COUNTY

Drawing: 5.6.4



FENCE GATE DETAIL



FENCE GATE SECTION

NOTES:

1. POST HOLES TO BE EXCAVATED TO REACH A DEPTH OF UNDISTURBED SUBGRADE TO MINIMUM DEPTH OF 1000mm
2. ALL WOOD TO BE PRESSURED-TREATED, OR CEDAR, FOR MUNICIPALLY OWNED FENCES. ONLY POSTS AND STRINGERS TO BE PRESSURE-TREATED, OR CEDAR, FOR PRIVATE FENCES.
3. STAIN SPECIFICATIONS TO BE DETERMINED BY THE LANDSCAPE ARCHITECT. PRE-STAIN TWO COATS PRIOR TO INSTALLATION. TOUCH UP AFTER CONSTRUCTION IF NEEDED.
4. ALL DIMENSIONS ARE IN MILLIMETRES (mm). UNLESS OTHERWISE NOTED.

STURGEON COUNTY

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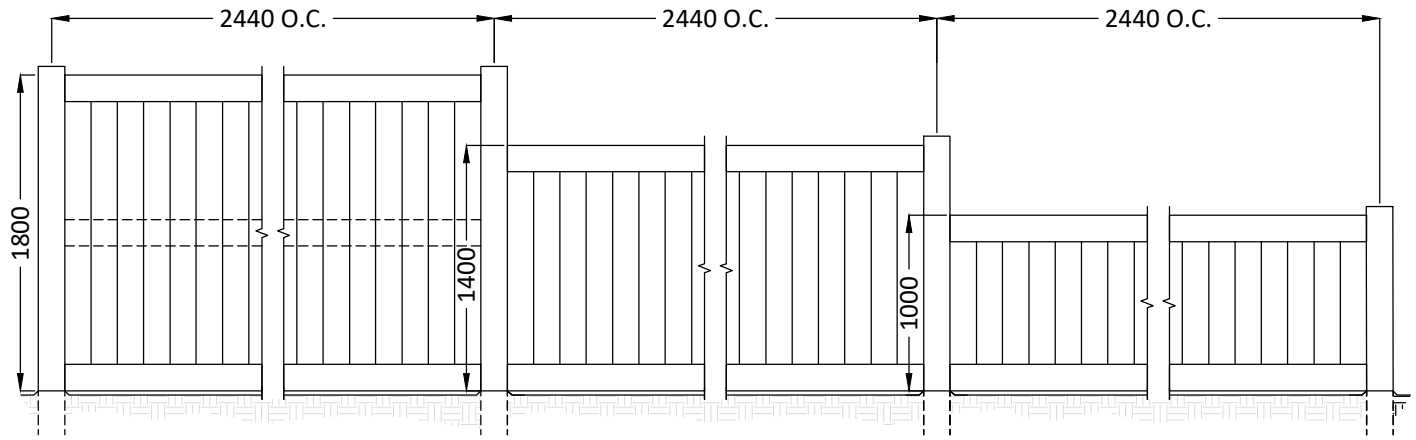
WOOD SCREEN FENCE GATE
Scale: NTS

Sturgeon COUNTY

Drawing: 5.6.5



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS (mm), UNLESS OTHERWISE NOTED.
2. INSTALL IN ACCORDANCE WITH DRAWING 5.6.3.

STURGEON COUNTY

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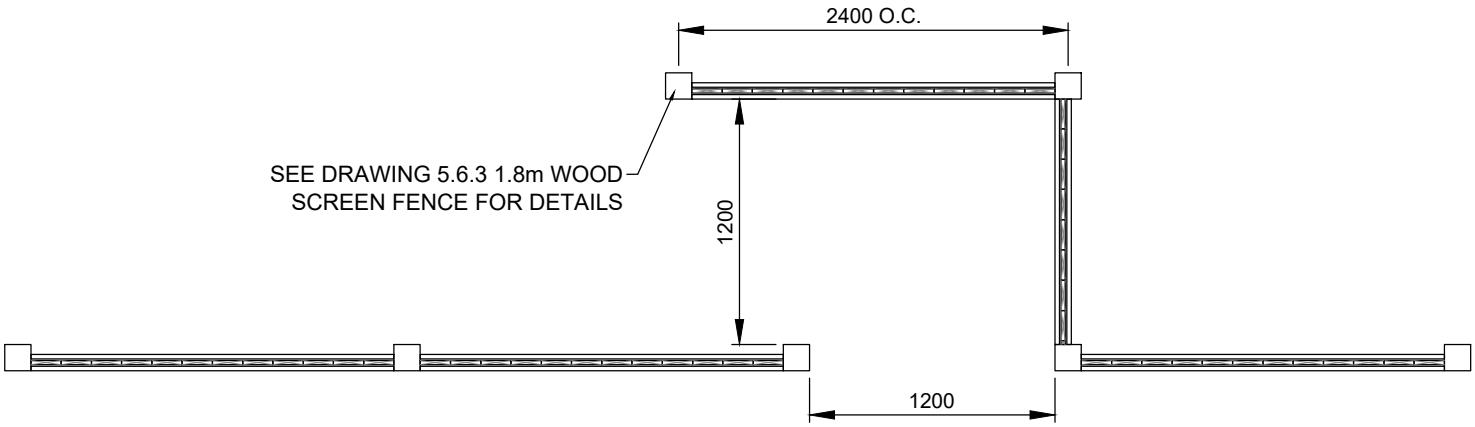
WOOD SCREEN STEP-DOWN FENCE
Scale: NTS

Sturgeon COUNTY

Drawing: 5.6.6



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm). UNLESS OTHERWISE NOTED.

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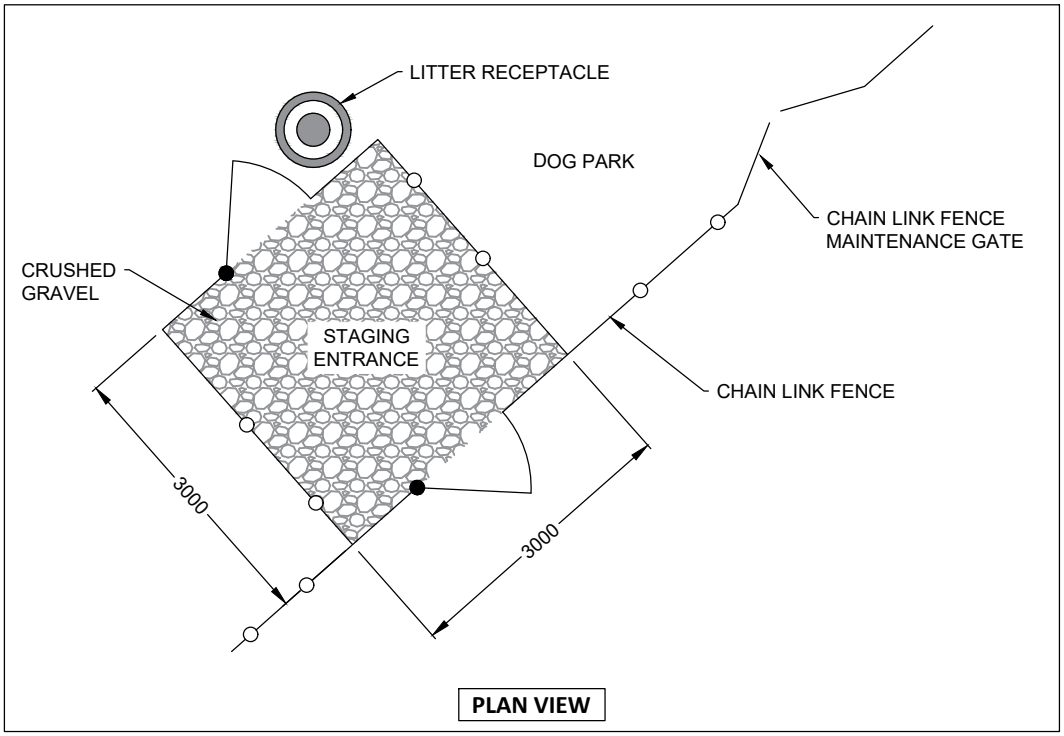
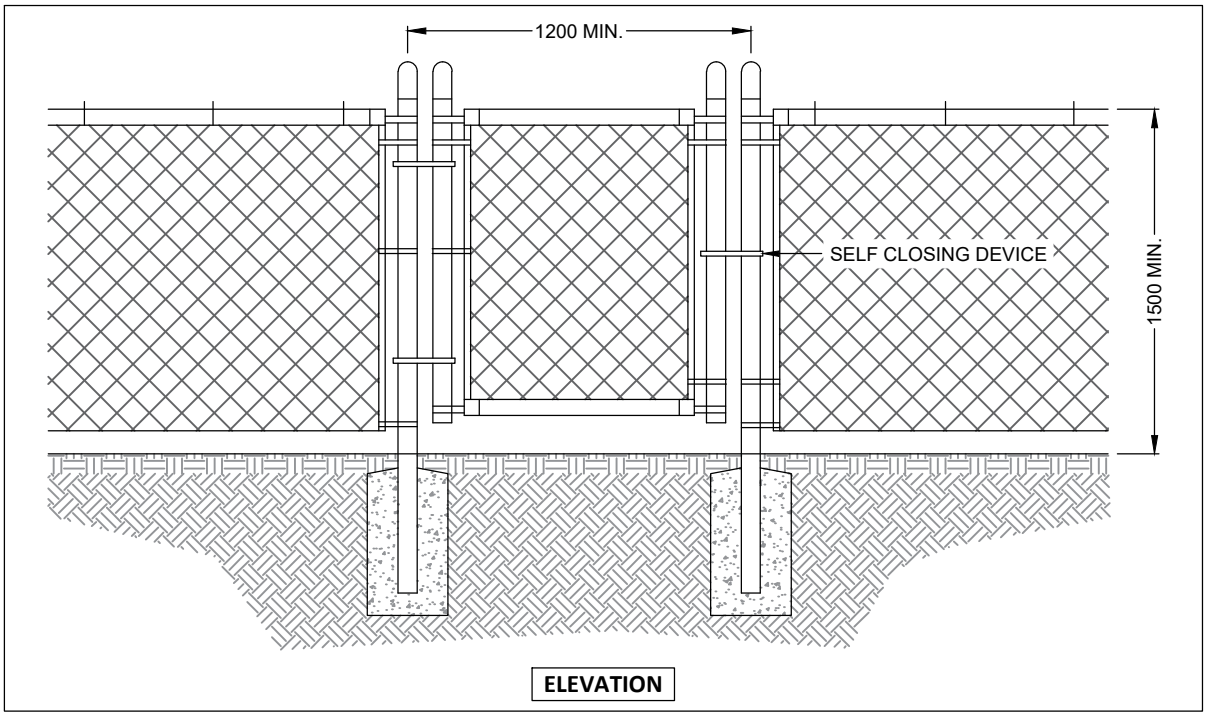
WOOD SCREEN BAFFLE GATE
Scale: NTS

Sturgeon COUNTY

Drawing: 5.6.7



PLAN VIEW



ELEVATION

NOTES:

1. STAGING AREA TO BE COMPLETED WITH A MIN. 175mm DEPTH OF CRUSHED 20mm Ø GRAVEL.
2. SEE DRAWINGS 5.6.0, 5.6.1 AND 5.6.2 FOR CHAIN LINK FENCE AND GATE CONSTRUCTION.
3. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

STURGEON COUNTY

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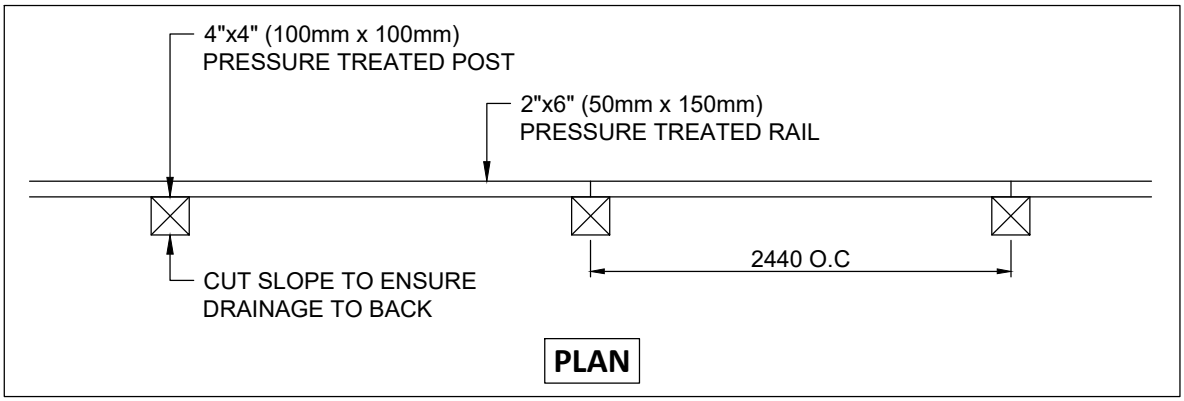
Rev. 1: JULY 22, 2022

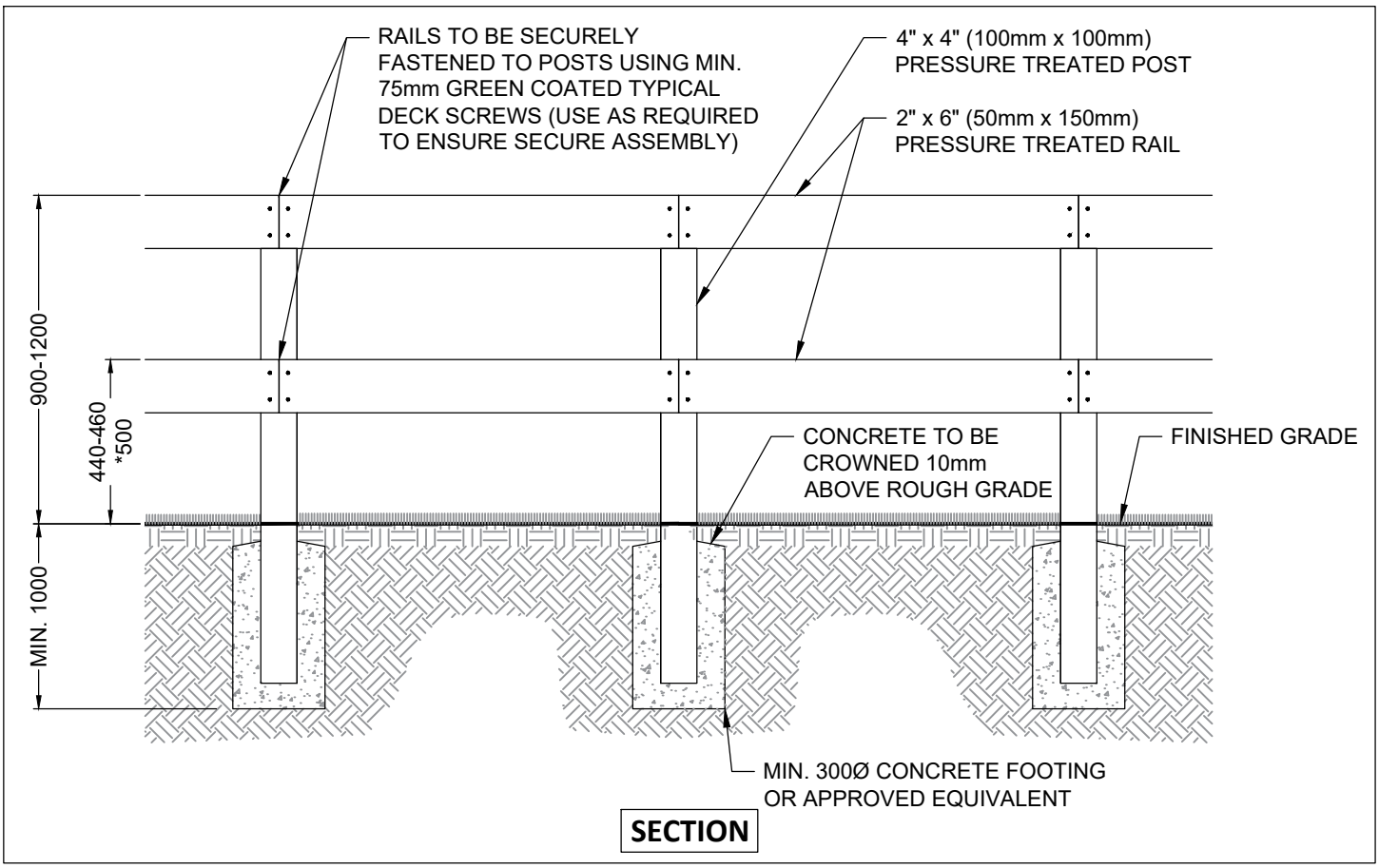
DOG PARK DOUBLE GATE
Scale: NTS

Sturgeon COUNTY

Drawing: 5.6.8



PLAN



SECTION

NOTES:

1. FENCING CONTRACTOR SHALL INVESTIGATE THE EXCAVATED SUB-SOIL MATERIAL FOR 'SOFT SPOTS' (FOR INSTANCE, FILL AREAS OF PREVIOUSLY INSTALLED TRENCHES ETC.) AND NOTIFY THE LANDSCAPE ARCHITECT IF SOFT SPOTS ARE FOUND. SOFT SPOTS SHALL BE RE-COMPACTED TO 100% S.P.D.
2. FENCES INSTALLED IN RURAL AREAS TO BE CONSTRUCTED WITH THE BOTTOM EDGE OF THE BOTTOM RAIL A MINIMUM OF 500mm FROM FINAL GRADE TO ALLOW WILDLIFE MOVEMENT.
3. ALL WOOD TO BE PRESSURE TREATED.
4. ALL WOOD CUTS TO BE COATED WITH TWO COATS OF APPROVED WOOD PRESERVATIVE.
5. POST HOLES SHOULD BE EXCAVATED TO REACH A DEPTH OF UNDISTURBED SUBGRADE MIN. 1000.
6. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
7. FENCES AND FENCE COMPONENTS, INCLUDING FOOTING AND DECORATIVE COLUMNS, ARE TO BE LOCATED 150mm INSIDE PRIVATE PROPERTY.
8. * - INDICATES DIMENSION FOR RURAL USE.

STURGEON COUNTY

General Municipal Servicing Standards

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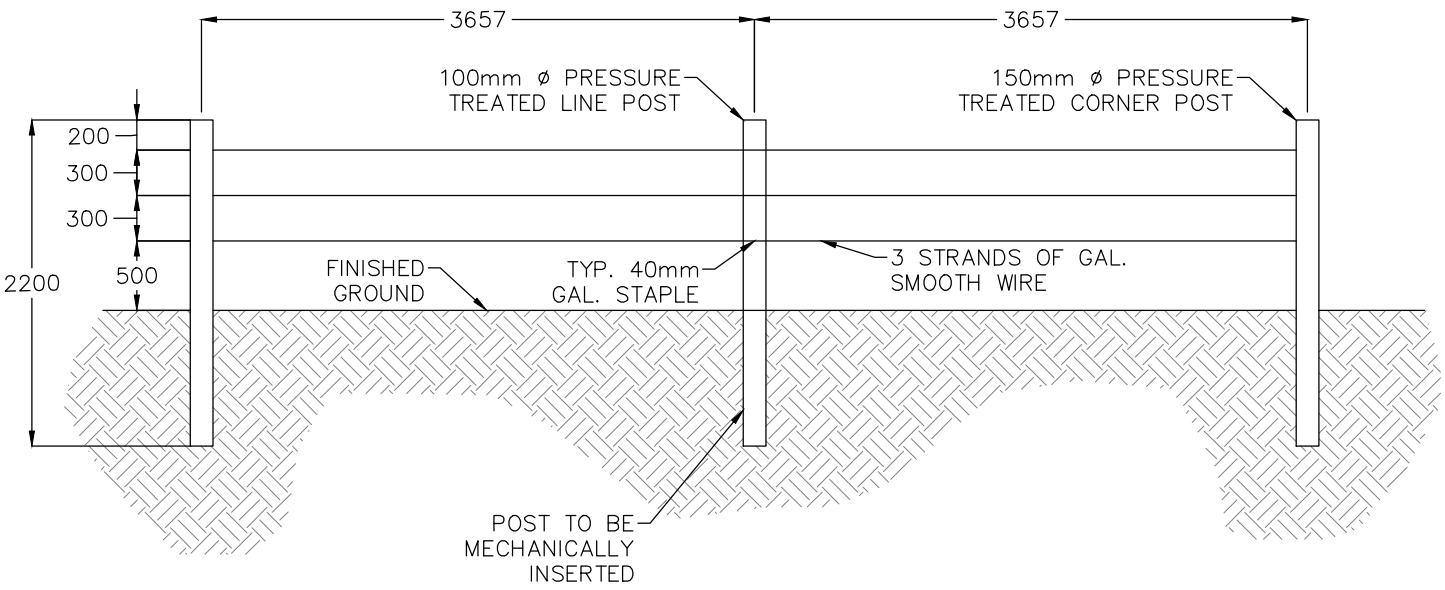
POST AND RAIL FENCE

Scale: NTS

Sturgeon COUNTY

Drawing: 5.6.9



NOTES:

1. FENCE TO BE LOCATED 150mm INSIDE PRIVATE PROPERTY.
2. ALL WOOD TO BE PRESSURE TREATED.
3. ALL WOOD CUTS TO BE COATED WITH TWO COATS OF APPROVED WOOD PRESERVATIVE.
4. ALL DIMENSIONS ARE IN MILLIMETERS (mm), UNLESS OTHERWISE NOTED.

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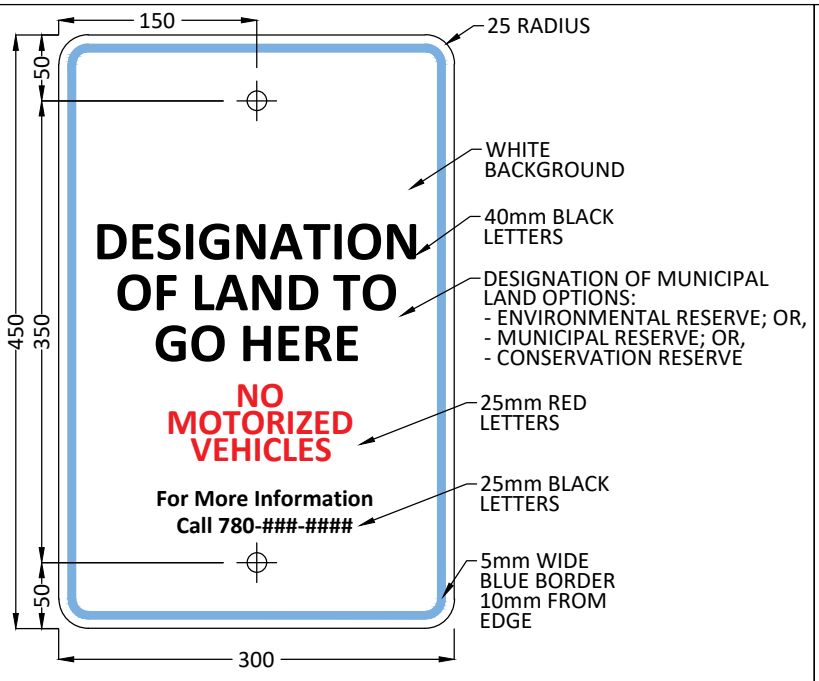
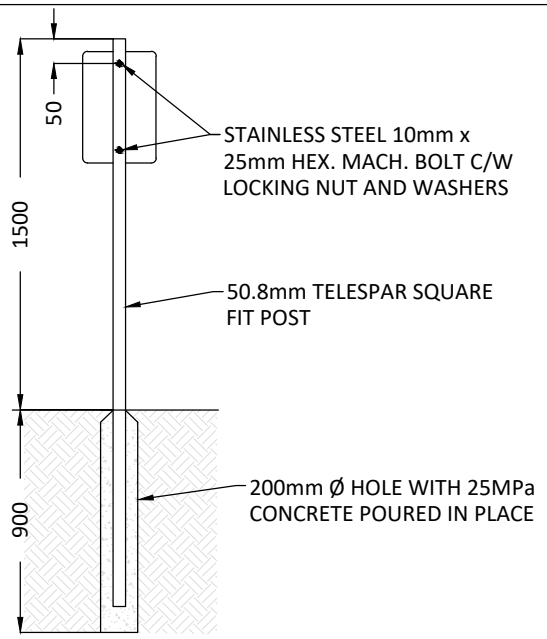
STRAIGHT WIRE FENCE
Scale: NTS

Sturgeon COUNTY

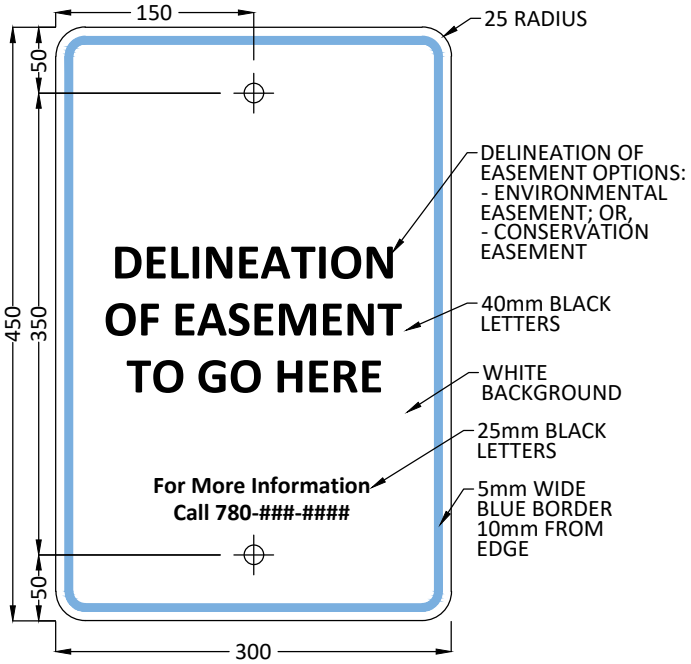
Drawing: 5.6.10



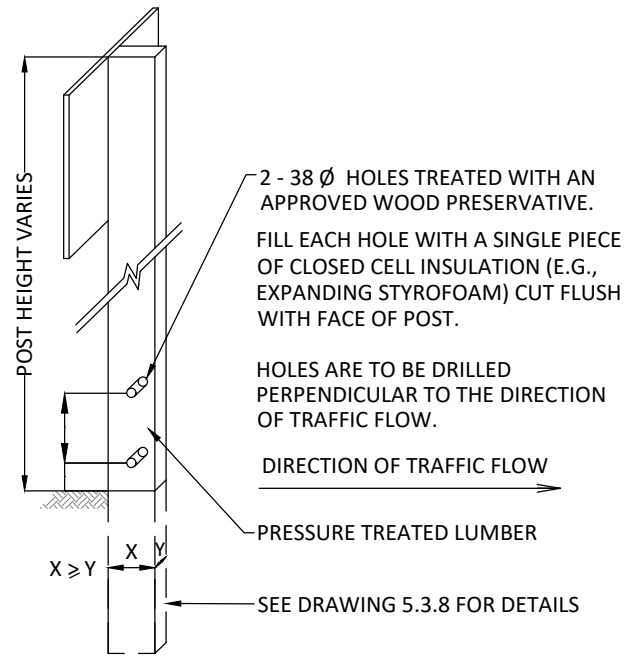
LAND DESIGNATION SIGN



GALVINIZED TELESPAR METAL POST



EASEMENT DELINEATION SIGN



PRESSURE TREATED WOODEN POST

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS (mm), UNLESS OTHERWISE NOTED.
2. SIGNS TO BE FINISHED WITH ANTI-GRAFFITI COATING C/W 3MTM 1160 LAMINATE.
3. FONT TO BE BLACK VERDANA.
4. SIGNS CONTENT TO BE CUSTOMIZED DEPENDING ON THE LAND DESIGNATION OR TYPE OF EASEMENT.
5. PLEASE CONTACT THE STURGEON COUNTY REPRESENTATIVE FOR VISUAL IDENTITY GUIDELINES AND SIGNAGE FILES WHERE AVAILABLE.

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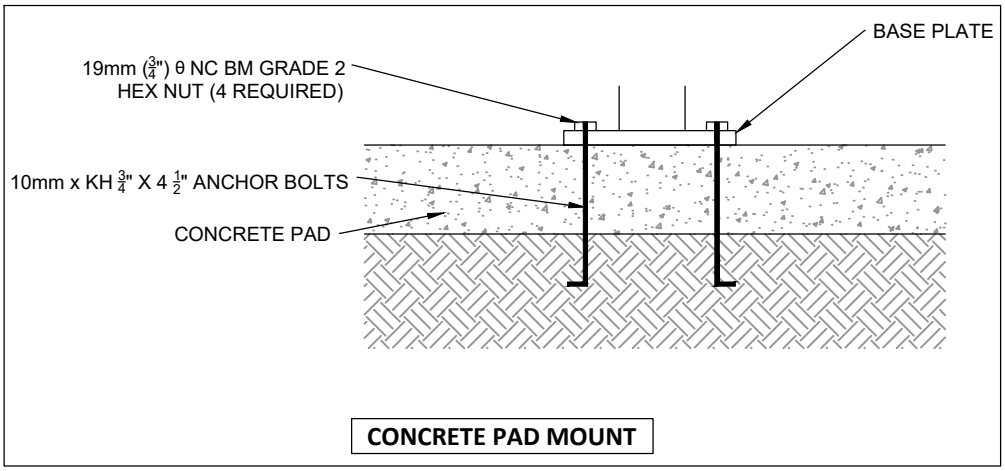
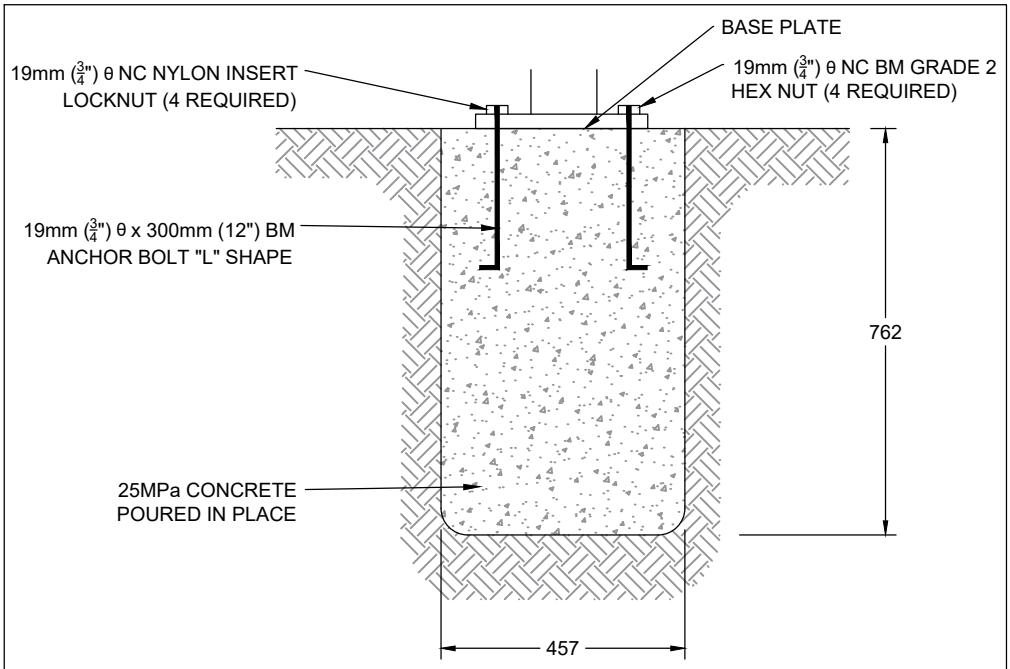
ENVIRONMENTAL RESERVE, MUNICIPAL RESERVE, AND EASEMENT MARKER POST
Scale: NTS

Sturgeon COUNTY

Drawing: 5.6.11



CONCRETE PAD MOUNT



CONCRETE PILE MOUNT (WHEN APPROVED BY THE COUNTY)

NOTES:

1. CUT EXCESS THREADED BOLTS AT NUT. BOLT MUST NOT EXCEED TWO THREADS.
2. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.

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FURNITURE MOUNTING
Scale: NTS

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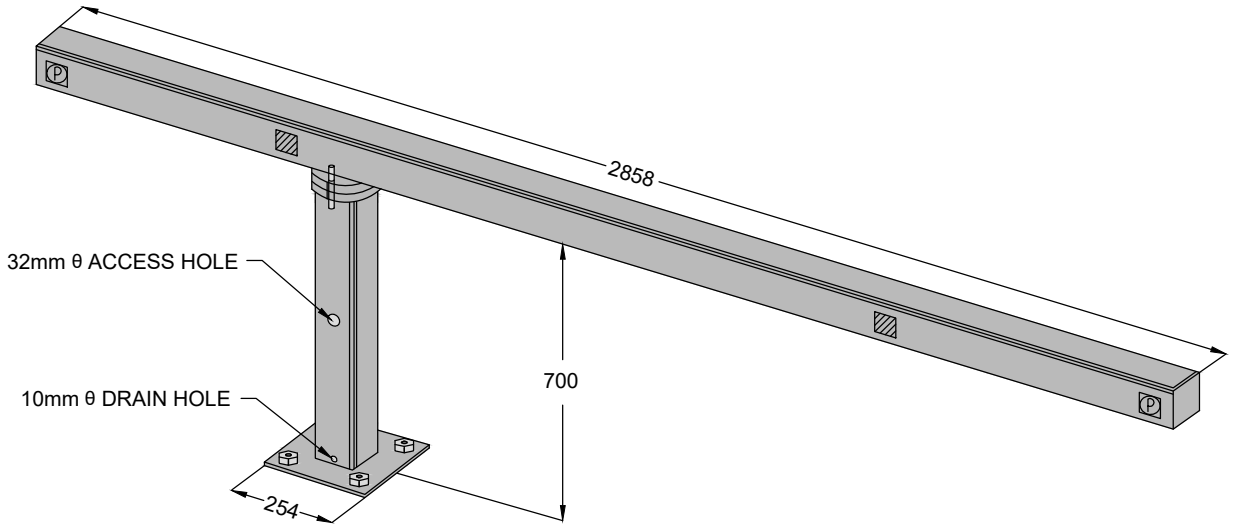
Drawing: 5.7.0



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
2. 3M™ MANUFACTURING HIGH INTENSITY WHITE REFLECTIVE TAPE (3870) 78mm x 78mm LOCATED ON BOTH SIDES. VERTICAL POSTS AND ENDS.
3. 2 - 78mm x 78mm SQUARE "NO PARKING" STICKER ON EACH SIDE OF THE BOLLARD ARM.
4. SEE DRAWING 5.7.0 FOR MOUNTING OPTIONS.
5. TO BE POWDER COATED BLACK.

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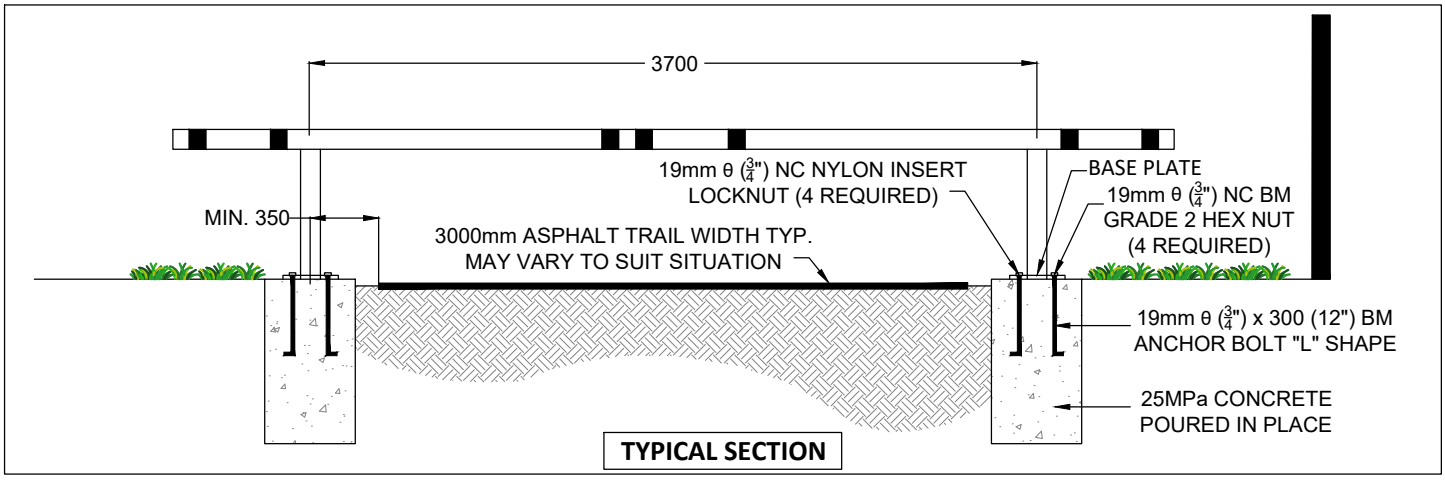
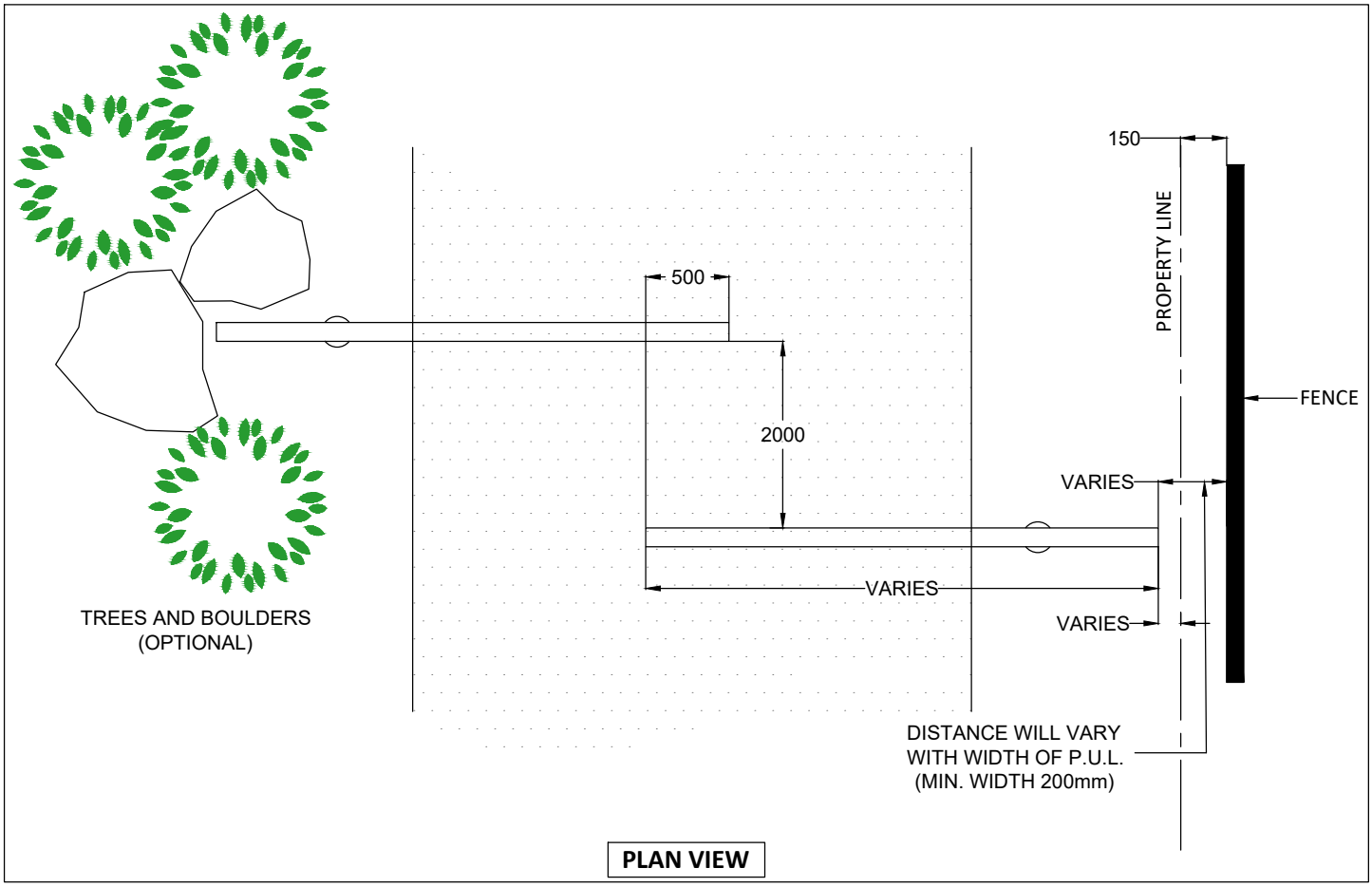
CHICANE BOLLARD
Scale: NTS

Sturgeon COUNTY

Drawing: 5.7.1



TYPICAL SECTION



PLAN VIEW

NOTES:

1. ENSURE THAT BOLLARD ARMS ARE SQUARE WITH EXISTING FENCE STRUCTURES.
2. ALL DIMENSIONS ARE IN MILLIMETRES (mm), UNLESS OTHERWISE NOTED.
3. FOOTING LOCATIONS MAY VARY BASED ON TRAIL WIDTH.
4. SHORTER BOLLARD ARM SHOULD BE COUNTER WEIGHTED FROM THE INSIDE OF THE 100mm x 100mm STEEL TUBING.

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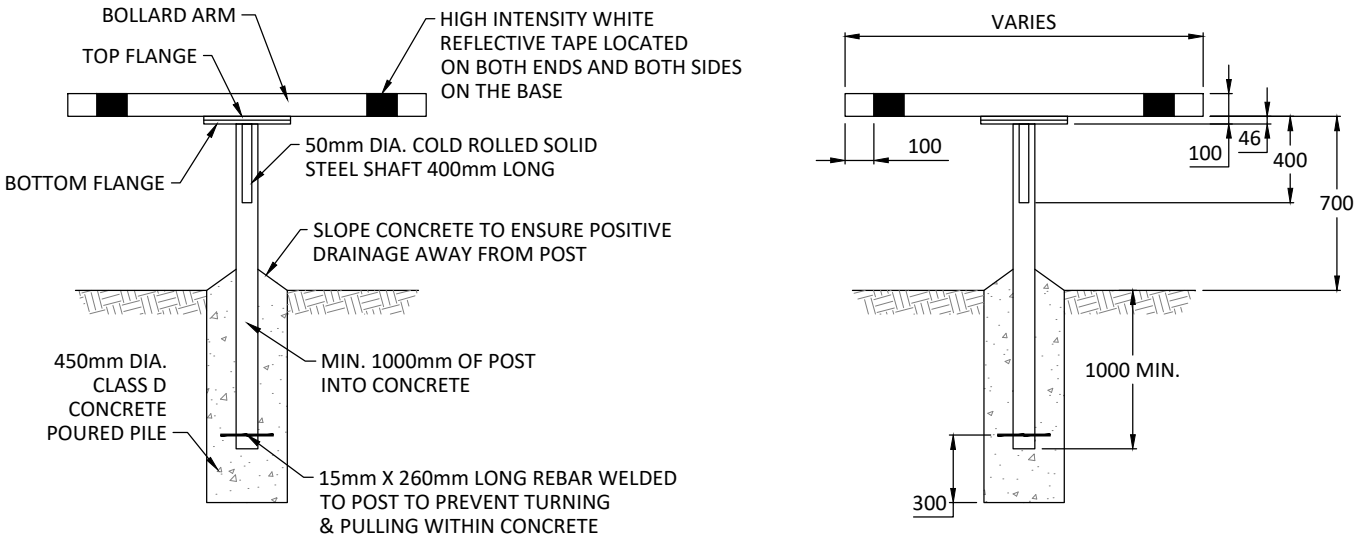
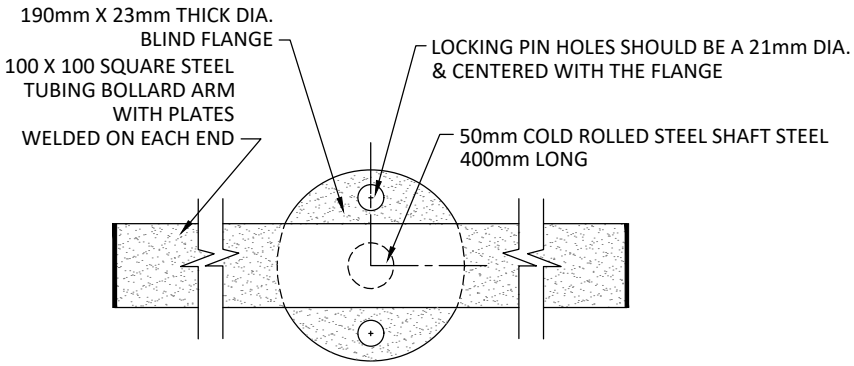
CHICANE BOLLARD LAYOUT
Scale: NTS

Sturgeon COUNTY

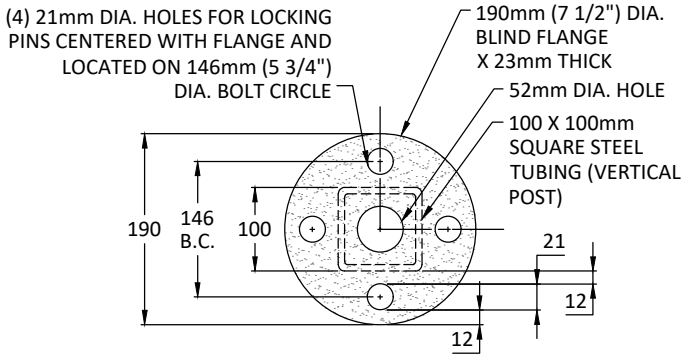
Drawing: 5.7.2



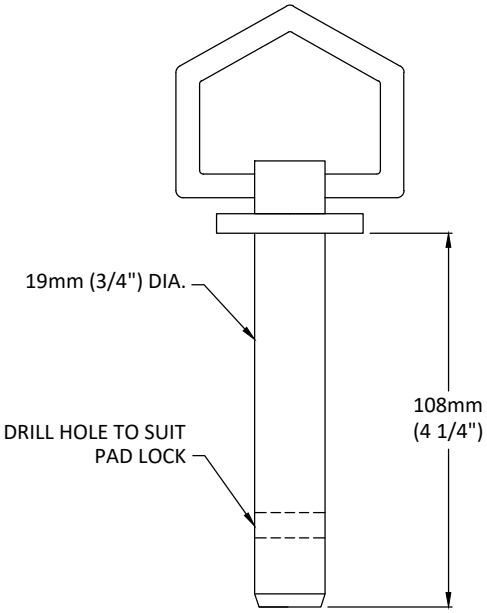
T-BOLLARD & PILING - SECTION



TOP FLANGE
(WELDED TO UNDERSIDE OF BOLLARD ARM)



BOTTOM FLANGE
(WELDED TO TOP OF VERTICAL POST)



LOCKING PIN

NOTES:
1. ALL UNITS IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. ALL METAL TO BE GALVANIZED AND BLACK POWDER COATED.
3. THE LOCKING PIN IS A PURCHASE ITEM (DYNALINE 3/4" X 4 1/4" HITCH PIN #66283). PADLOCK HOLE NEEDS TO ALIGN WITH HANDLE.
4. THE BOLLARD ARM AND VERTICAL POST TO BE FABRICATED FROM 101.6mm X 101.6mm X 4.8 SQUARE STEEL TUBING (4 X 4 X 0.188 HSS).

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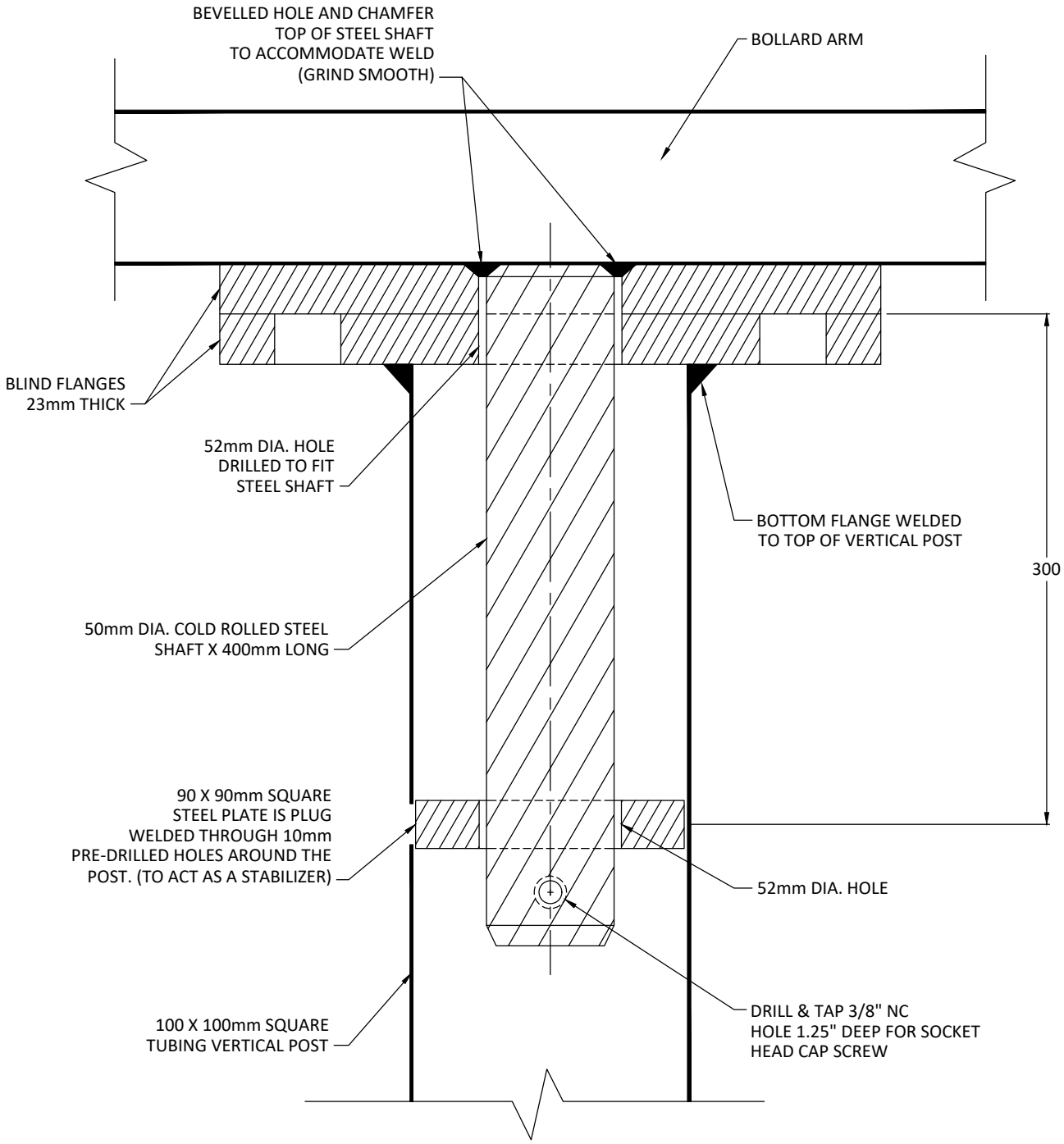
T-BOLLARDS - ASSEMBLY SHEET 1 OF 3
Scale: NTS

Sturgeon COUNTY

Drawing: 5.7.3



ASSEMBLY DETAIL

NOTES:
1. ALL UNITS IN MILLIMETERS UNLESS OTHERWISE NOTED.

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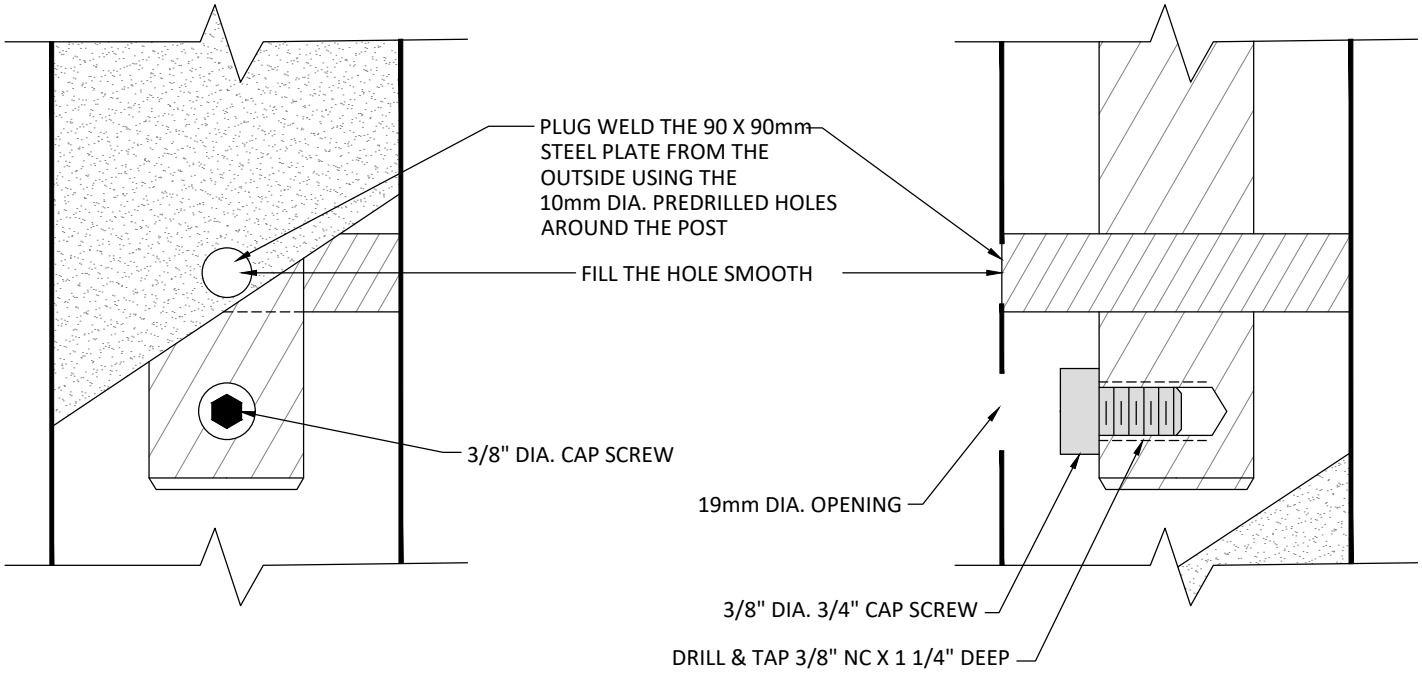
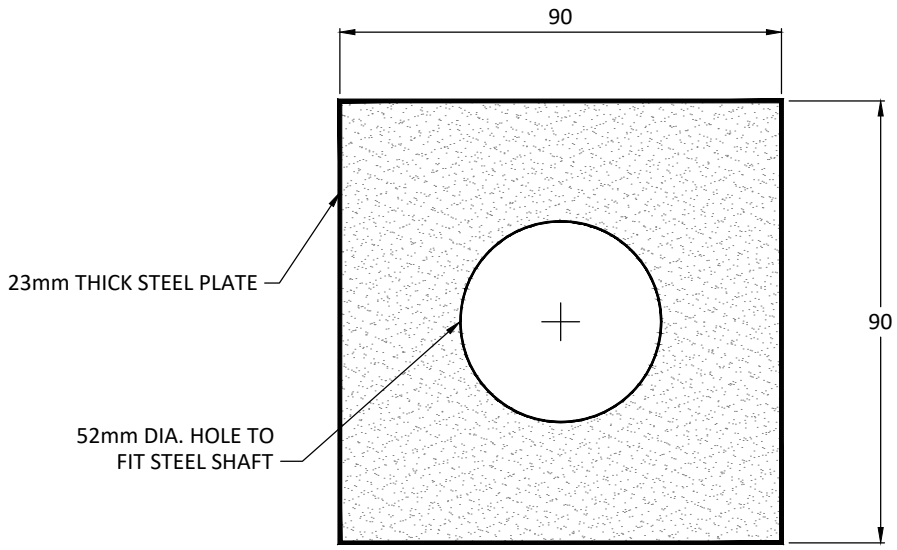
T-BOLLARDS - ASSEMBLY SHEET 2 OF 3
Scale: NTS

Sturgeon COUNTY

Drawing: 5.7.4





90 X 90mm SQUARE STEEL PLATE

NOTES:
1. ALL UNITS IN MILLIMETERS (mm) UNLESS OTHERWISE NOTED.
2. THE CAP SCREW IS INSTALLED TO PREVENT REMOVAL OF BOLLARD ARM. THEN COVER THE 19mm HOLE WITH REFLECTIVE TAPE.

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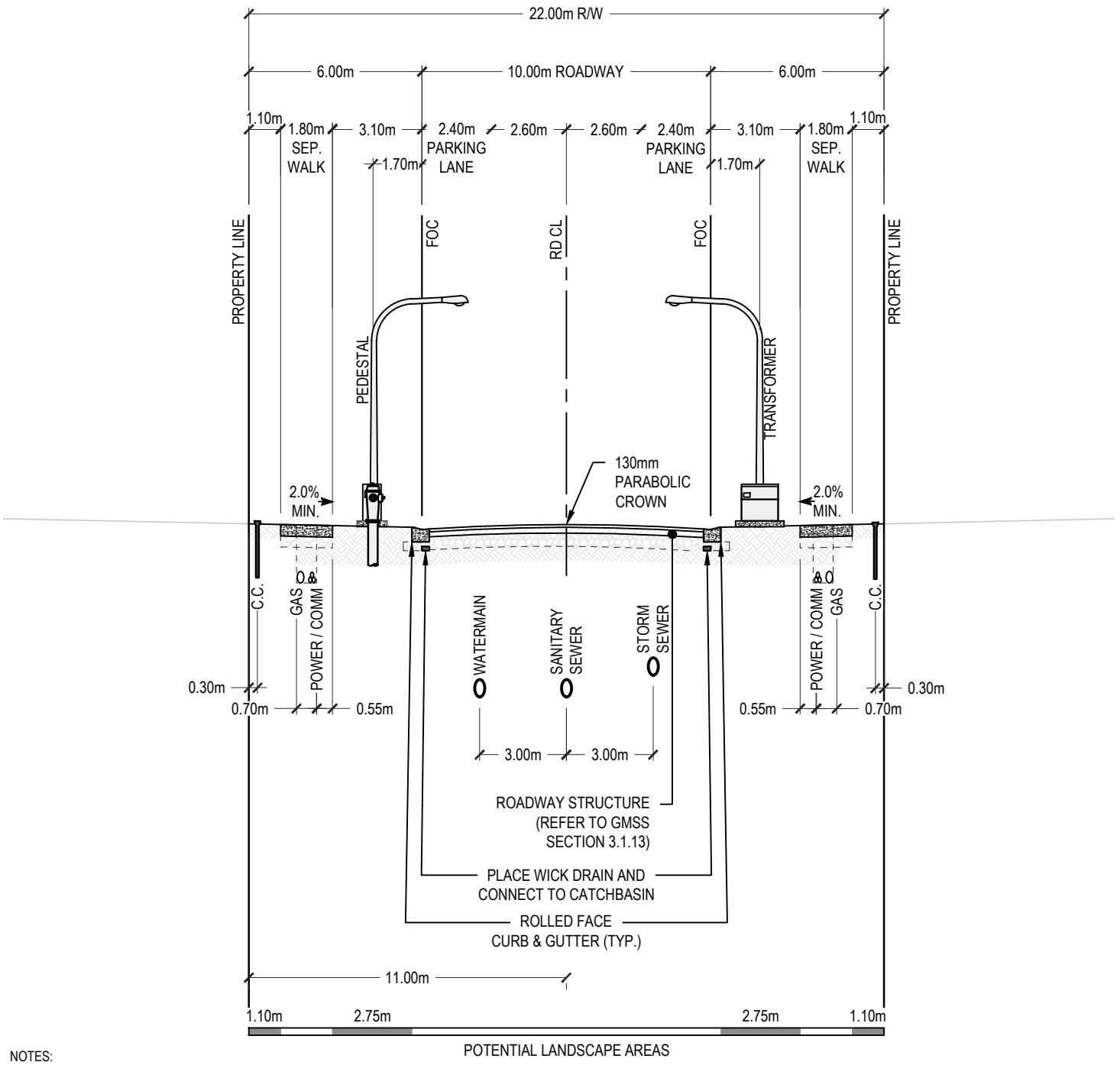
T-BOLLARDS - ASEEMBLY SHEET 3 OF 3
Scale: NTS

Sturgeon COUNTY

Drawing: 5.7.5



NOTES:

1. TRAFFIC VOLUME <1000 (vpd)
2. MINIMUM INTERSECTION SPACING TO BE 60m
3. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%
4. DESIGN SPEED LIMIT TO BE 60 (km/hr)
5. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.1.

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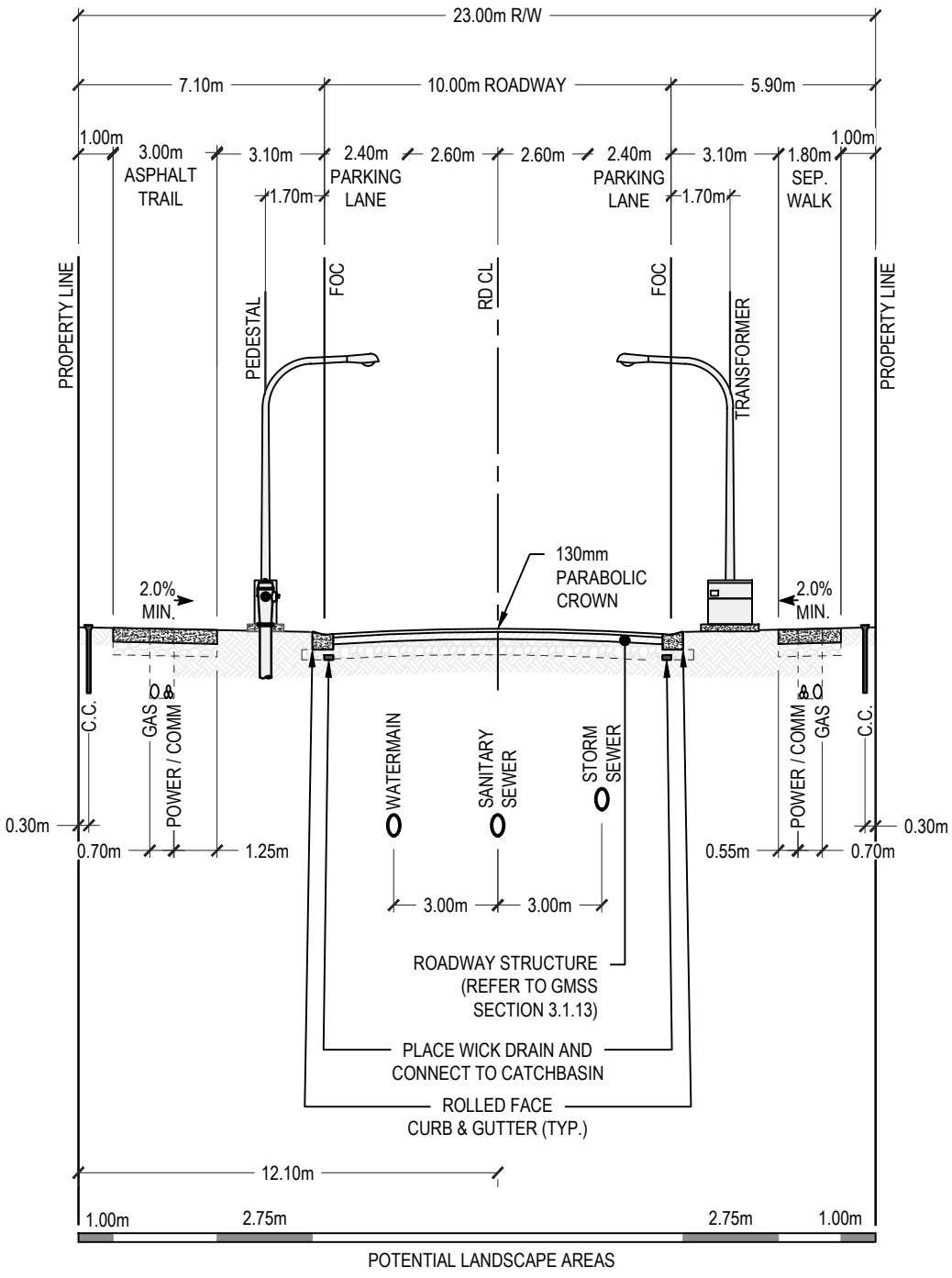
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 35, 40, AND 42 DU/HA LOCAL ROADWAY C/W SEPARATE WALK

Scale: NTS

Sturgeon COUNTY

Drawing: 6.1.0



NOTES:

1. TRAFFIC VOLUME <1000 (vpd)
2. MINIMUM INTERSECTION SPACING TO BE 60m
3. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%
4. DESIGN SPEED LIMIT TO BE 60 (km/hr)
5. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.1.

STURGEON COUNTY

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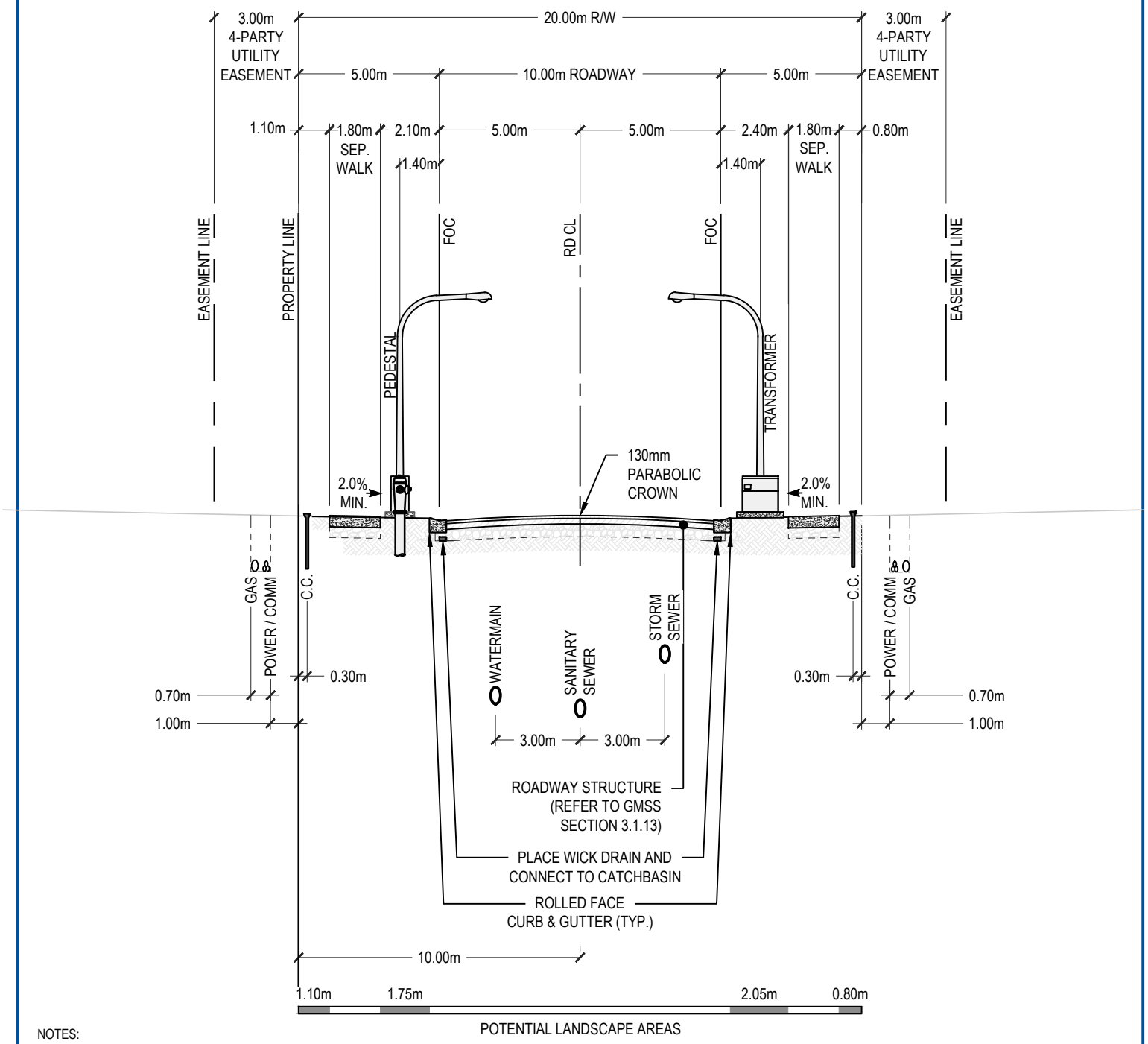
Rev. 1: SEPTEMBER 19, 2023

DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 35, 40, AND 42 DU/HA LOCAL ROADWAY C/W ASPHALT TRAIL

Scale: NTS

Sturgeon COUNTY

Drawing: 6.1.1



NOTES:

1. TRAFFIC VOLUME <1000 (vpd)
2. MINIMUM INTERSECTION SPACING TO BE 60m
3. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%
4. DESIGN SPEED LIMIT TO BE 60 (km/hr)
5. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.1.

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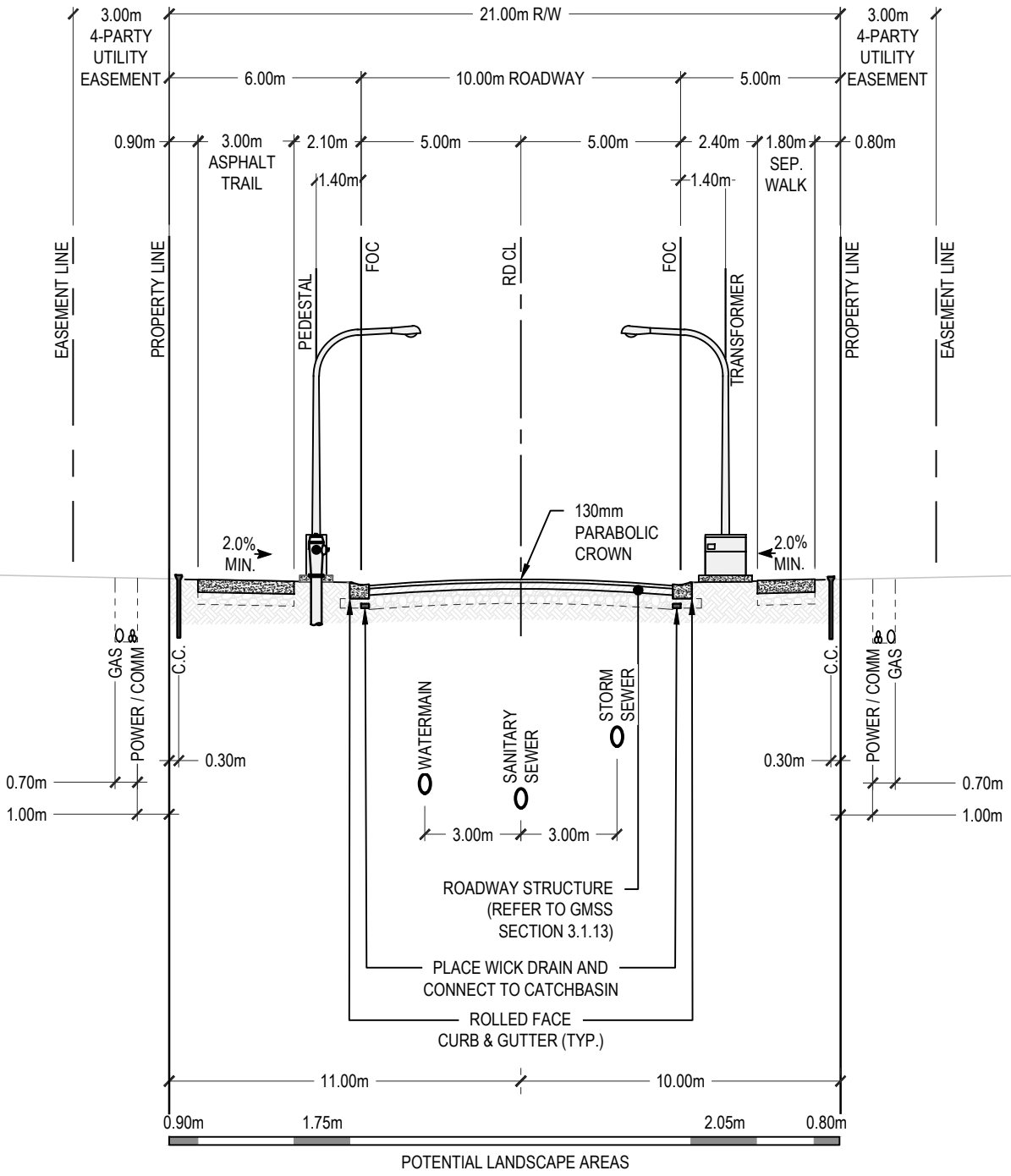
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP
FOR 20 DU/HA LOCAL ROADWAY
C/W SEPARATE WALK - 3.0m SETBACK - DRAFT MINIMUM ROW

Scale: NTS

Sturgeon COUNTY

Drawing: 6.1.2



NOTES:

1. TRAFFIC VOLUME <1000 (vpd)
2. MINIMUM INTERSECTION SPACING TO BE 60m
3. MAXIMUM GRADE TO BE 6% AND MINIMUM GRADE TO BE 0.6%
4. DESIGN SPEED LIMIT TO BE 60 (km/hr)
5. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.1.

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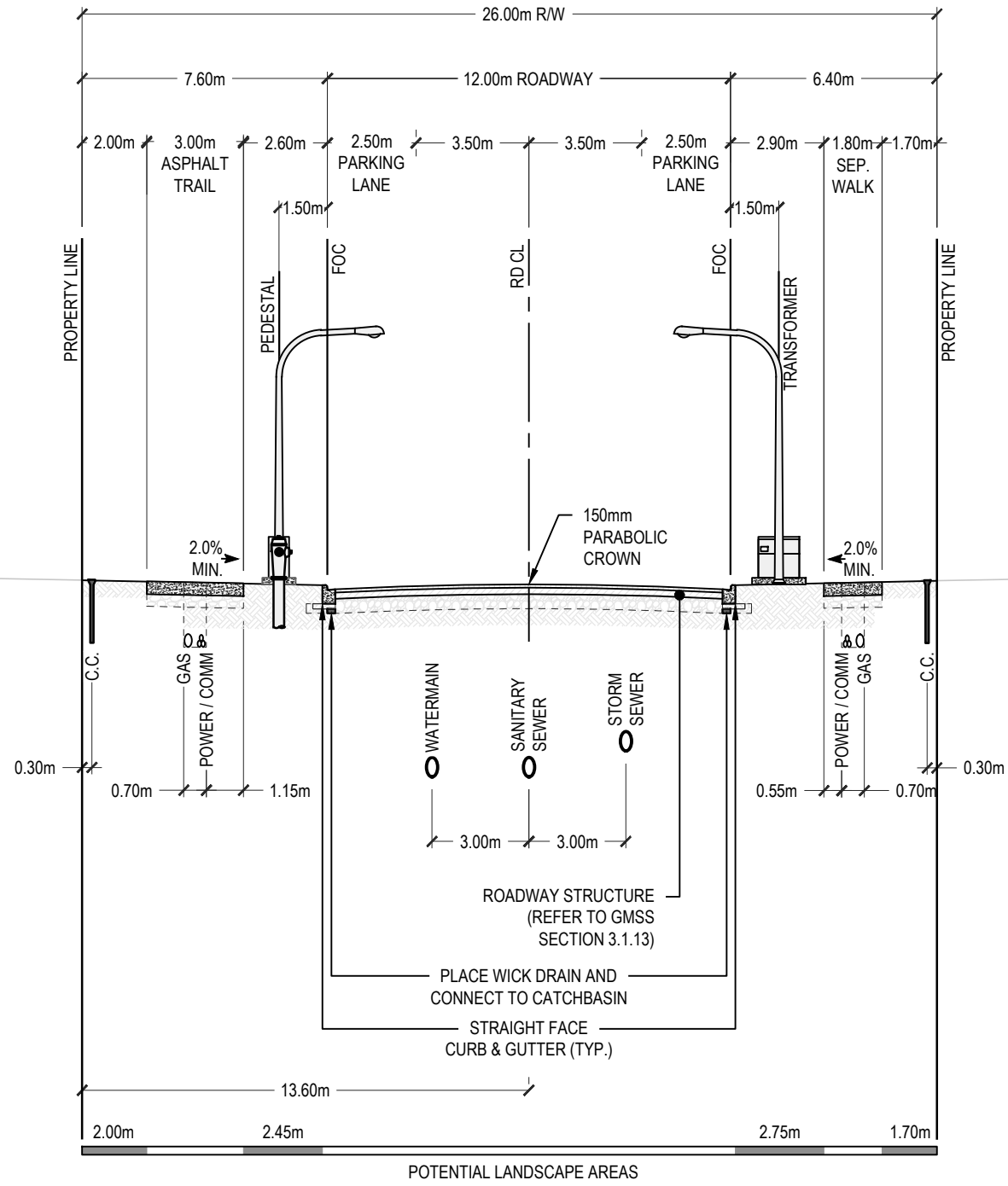
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP
FOR 20 DU/HA LOCAL ROADWAY C/W
3.0m ASPHALT TRAIL - 3.0m SETBACK - DRAFT MINIMUM ROW

Scale: NTS

Sturgeon COUNTY

Drawing: 6.1.3



NOTES:

1. TRAFFIC VOLUME <2000 (vpd)
2. MINIMUM INTERSECTION SPACING TO BE 100m
3. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%
4. DESIGN SPEED LIMIT TO BE 80 (km/hr)
5. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.2.

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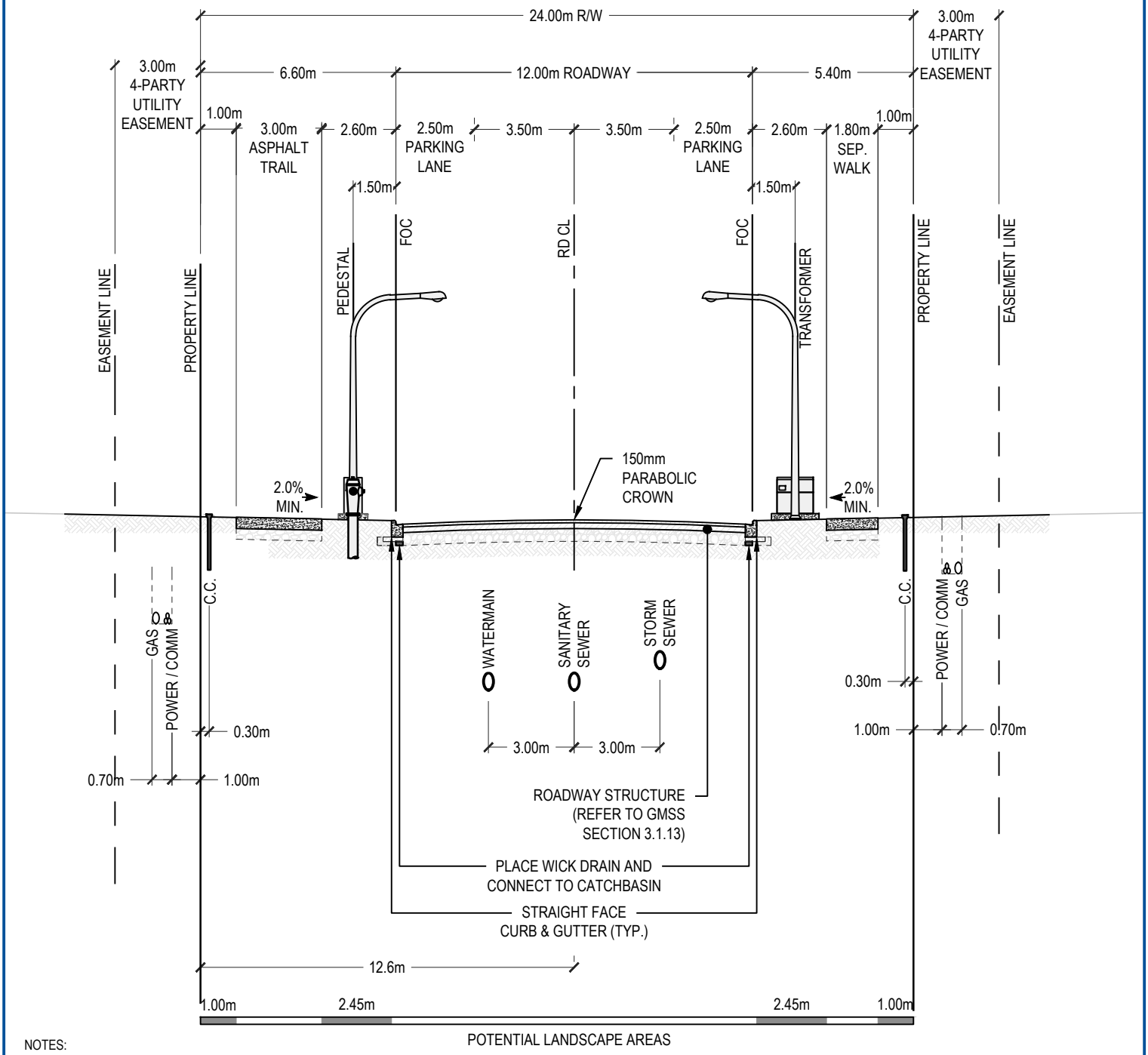
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 35, 40, AND 42 DU/HA COLLECTOR ROADWAY C/W 3.0m ASPHALT TRAIL

Scale: NTS

Sturgeon COUNTY

Drawing: 6.1.5



NOTES:

1. TRAFFIC VOLUME <10,000 (vpd)
2. MINIMUM INTERSECTION SPACING TO BE 100m
3. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%
4. DESIGN SPEED LIMIT TO BE 80 (km/hr)
5. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.2.

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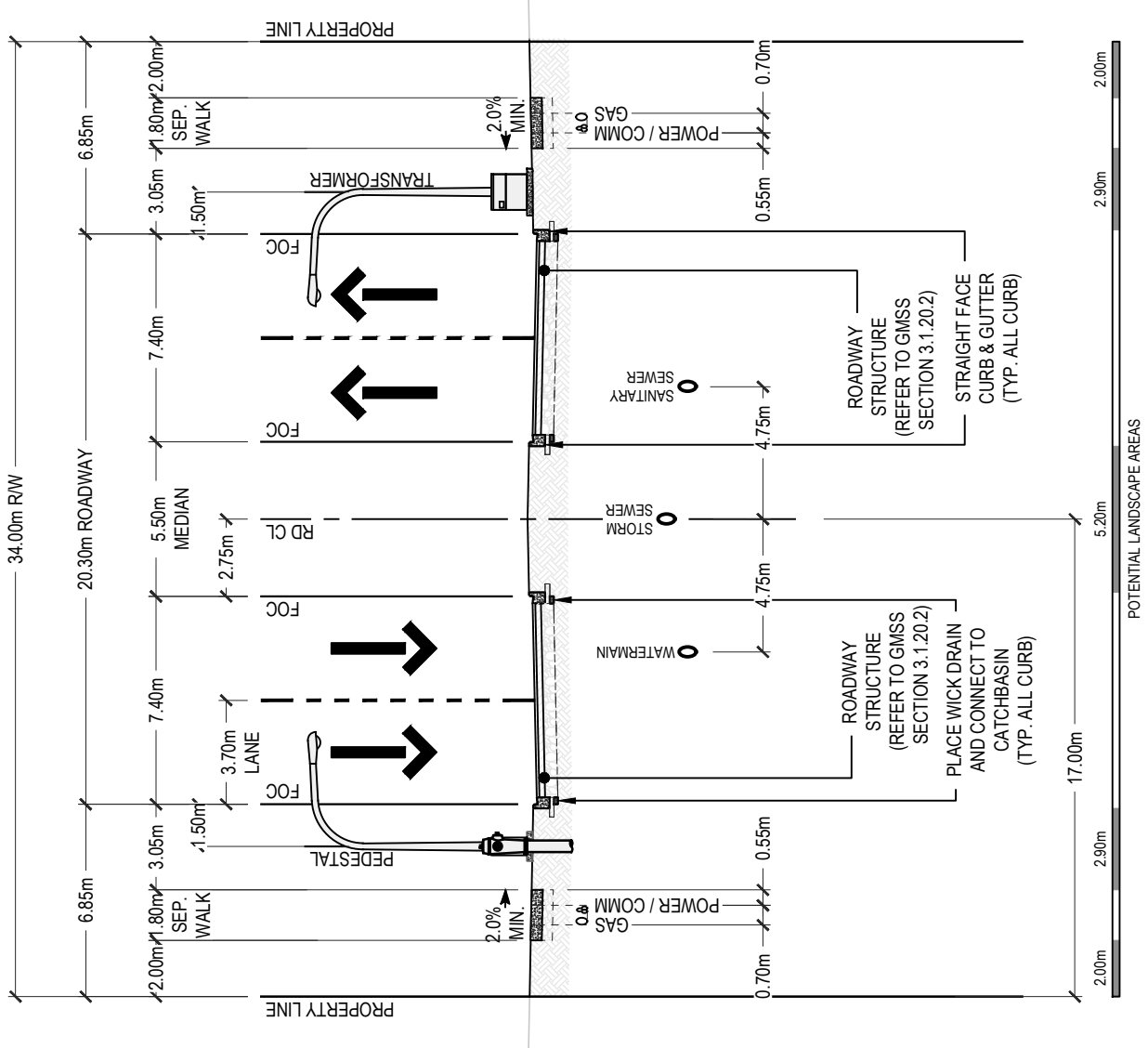
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 20 DU/HA COLLECTOR ROADWAY C/W 3.0m ASPHALT TRAIL - 3.0m SETBACK

Scale: NTS

Sturgeon COUNTY

Drawing: 6.1.7



NOTES:

1. TRAFFIC VOLUME <30,000 (vpd)
2. MINIMUM INTERSECTION SPACING TO BE 400m
3. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%
4. DESIGN SPEED LIMIT TO BE 110 (km/hr)
5. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.4.

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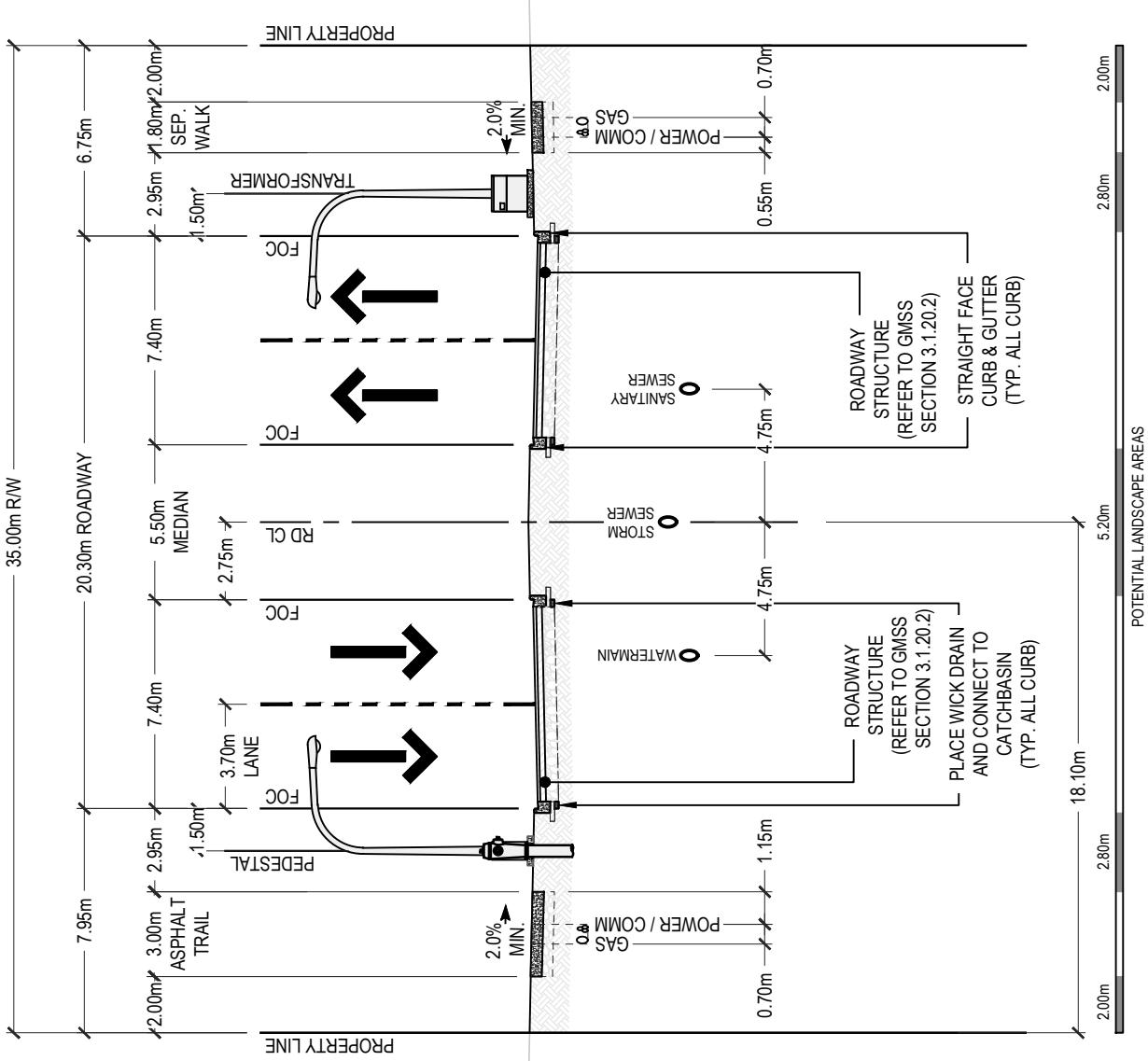
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 35, 40, AND 42 DU/HA DIVIDED ARTERIAL ROADWAY C/W SEPARATE WALK

Scale: NTS

Sturgeon COUNTY

Drawing: 6.1.8



NOTES:

1. TRAFFIC VOLUME <30,000 (vpd)
2. MINIMUM INTERSECTION SPACING TO BE 400m
3. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%
4. DESIGN SPEED LIMIT TO BE 110 (km/hr)
5. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.4.

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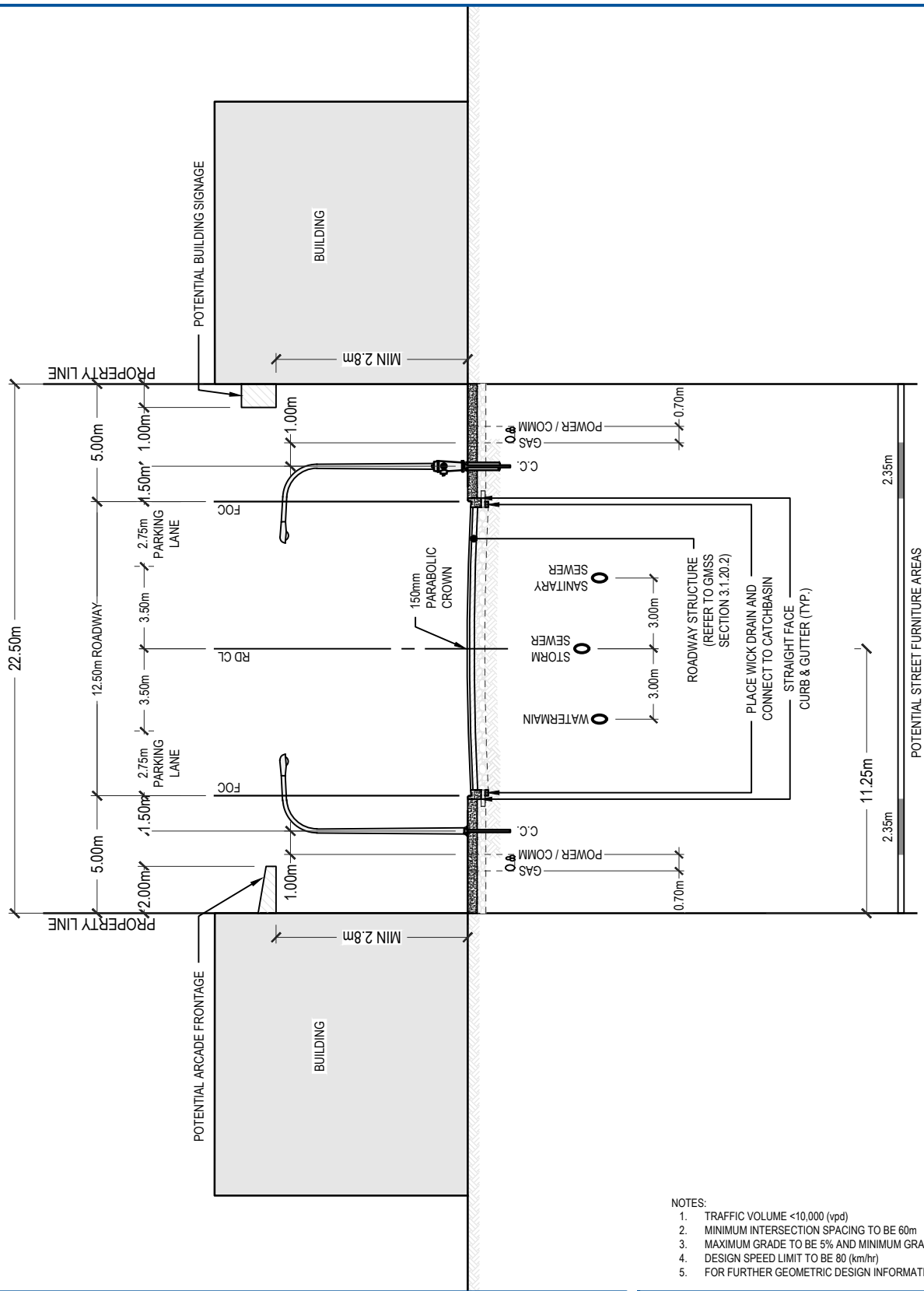
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR 35, 40, AND 42 DU/HA DIVIDED ARTERIAL ROADWAY C/W 3.0m ASPHALT TRAIL

Scale: NTS

Sturgeon COUNTY

Drawing: 6.1.9



NOTES:

1. TRAFFIC VOLUME <10,000 (vpd)
2. MINIMUM INTERSECTION SPACING TO BE 60m
3. MAXIMUM GRADE TO BE 5% AND MINIMUM GRADE TO BE 0.6%
4. DESIGN SPEED LIMIT TO BE 80 (km/hr)
5. FOR FURTHER GEOMETRIC DESIGN INFORMATION SEE SECTION 3.1.5.4.

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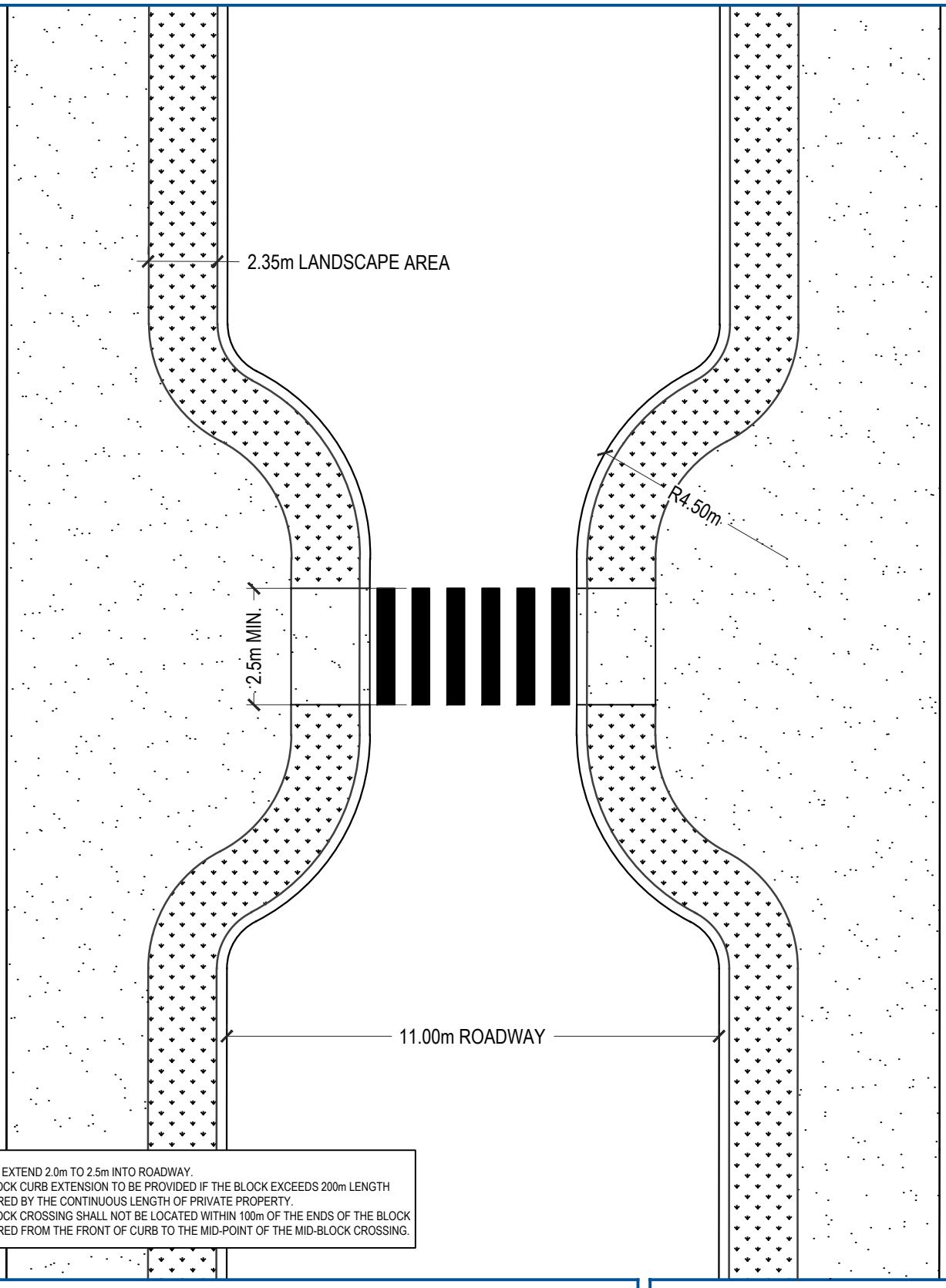
DESIGNATED AREAS OF STURGEON VALLEY SOUTH ASP FOR COMMERCIAL/MIXED USE

Scale: NTS

Sturgeon COUNTY

Drawing: 6.1.10



NOTES:
1. FOC TO EXTEND 2.0m TO 2.5m INTO ROADWAY.
2. MID-BLOCK CURB EXTENSION TO BE PROVIDED IF THE BLOCK EXCEEDS 200m LENGTH MEASURED BY THE CONTINUOUS LENGTH OF PRIVATE PROPERTY.
3. MID-BLOCK CROSSING SHALL NOT BE LOCATED WITHIN 100m OF THE ENDS OF THE BLOCK MEASURED FROM THE FRONT OF CURB TO THE MID-POINT OF THE MID-BLOCK CROSSING.

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STURGEON VALLEY SOUTH ASP
MID-BLOCK CURB EXTENSION

Scale: NTS

Sturgeon COUNTY

Drawing: 6.1.11

Volume 9

Forms

Sturgeon COUNTY

Community. Innovation. Ambition.

9. Forms

Contents

9.1 CCC_FAC Inspection Request Form

Sturgeon COUNTY

ENGINEERING INSPECTION REQUEST FORM

PROJECT INFORMATION
Provide all project information and include each representative's email address. Inspection requests will be sent to the email addresses provided.
SUBDIVISION/PROJECT:
COUNTY AUTHORIZATION:
DEVELOPER: **REPRESENTATIVE'S EMAIL:**
CONSULTING ENGINEER: **REPRESENTATIVE'S EMAIL:**
CONTRACTOR: **REPRESENTATIVE'S EMAIL:**

INSPECTION INFORMATION	
Indicate the type of inspection that is being requested and two (2) proposed inspection dates/times. If neither of the proposed dates are acceptable the County Project Representative will contact you.	
INSPECTION TYPE:	☐ CCC ☐ FAC ☐ RE-INSPECTION ☐ OTHER
IF RE-INSPECTION, HAVE ALL DEFICINCIES BEEN RECTIFIED?	YES ☐ NO ☐
COMMENTS:	
REQUESTED INSPECTION DATE AND TIME #1	
REQUESTED INSPECTION DATE AND TIME #2	

MUNICIPAL IMPROVEMENT INFORMATION

Indicate all Municipal Improvements requested to be inspected. Site-specific details related to the inspection may be included in the comments.

☐ ROADWAYS

SURFACE TYPE?

DESCRIPTION:

☐ WATER DISTRIBUTION SYSTEM

HYDRANT(S) AND/OR OTHER FIRE PROTECTION? ☐ YES ☐ NO

DESCRIPTION:

☐ STORM WATER MANAGEMENT SYSTEM

STORMWATER MANAGEMENT FACILITY?

DESCRIPTION:

☐ SANITARY SEWER SYSTEM

FORCE MAIN SYSTEM (PRESSURIZED)? ☐ YES ☐ NO

DESCRIPTION:

☐ LANDSCAPE AND OPEN SPACES

FENCING? ☐ YES ☐ NO

PLAYGROUND? ☐ YES ☐ NO

DESCRIPTION:

☐ OTHER (SPECIFY):

DESCRIPTION:

PRE-INSPECTION INFORMATION

The following items must be completed prior to requesting an inspection with the County. All supporting documents should be included and submitted with this form.

YES	NO	N/A	
☐	☐	☐	Work has been completed in accordance with Construction Drawings, General Municipal Servicing Standards, and without deficiency?
☐	☐	☐	Developer, Consulting Engineer, and Contractor completed independent pre-inspection of finished work?
☐	☐	☐	All site areas to be inspected are readily accessible and visually unobstructed, including parked construction equipment, vehicles, or placed materials?
☐	☐	☐	All required ESC measures installed and properly functioning?
☐	☐	☐	Applicable CCC/FAC Acceptance Criteria Checklist(s) reviewed?
☐	☐	☐	Applicable supporting documents attached (As-Built Drawings, etc.)?
☐	☐	☐	Water truck will be available to provide test water? (paved roads, gutters, and swales)
☐	☐	☐	Reduced size As-built Drawings delineating the project construction limits and the area of the requested inspection attached?

CONSULTING ENGINEER CERTIFICATION

I hereby confirm that the above referenced Municipal Improvement has been pre-inspected by me and found acceptable for inspection according to the General Municipal Servicing Standards. I confirm that all assets are visible and available for inspection.

_____ _____

Consulting Engineer (*name and signature*) Date

Send completed form and supporting documents by email to the engineering County Project Representative assigned to your project. Forms must be submitted at least seven (7) working days prior to the earliest requested inspection date.

9.2 Hydrant Meter Use Agreement

Sturgeon COUNTY

UTILITY & WASTE MANAGEMENT SERVICES

9613 – 100 Street, Morinville, AB, T8R 1L9
Phone: (780) 939-4321 Fax: (780) 939-2076
www.sturgeoncounty.ab.ca
utilities@sturgeoncounty.ca

HYDRANT METER USE AGREEMENT

I _____of_____

(Applicant's Name) (Company)

_____ _____

(Mailing Address)

Home Pho ne: _____Work Phone: _____ Cell Phone: _____

Subdivision/ Area hydrant meter will be used: _____

For the following purpose: _____

In renting a hydrant meter from Sturgeon County the undersigned agrees:

1. To comply with all applicable Provincial and Municipal laws or by-laws as may be in effect or may be passed in the future in relation t o hydrant use and water consumption.
2. To pay the rental fee of **$50.00** per week and the metered charge set by the "Schedule of Fees and Charges" , per cubic meter (m3).
3. To leave a **$1,000** deposit that will be used for any damage done to the hydrant meter.
4. The applicant will be responsible for the costs for damage done to the water meter exceeding **$1,000.** Replacement cost s for a lost or damaged meter is approximately **$2,500**. This requirement may be waived if the applicant is working for a developer who has provided Sturgeon County with security.
5. To operate hydrants according to AWWOA standards and in a manner that does not cause pressure problems in the distribution system. Hydrant valves should be opened and closed slowly and should not be fully opened. Any damage done to a hydrant as a result of improper use will be the responsibility of the applicant.

6. To receive training from Sturgeon County personnel on how to use the hydrant meter properly. If training cannot be done immediately, an appointment for training must be made before possession of the hydrant meter is granted. The training will include instructions and requirements for the maximum allowable draw rate from the hydrant to ensure that the Sturgeon County water system is not compromised.
7. Do not tamper with the hydrant meter and to return the meter by the expected return date (unless an extension is granted by Sturgeon County).
8. Sturgeon County reserves the right to repossess the hydrant meter equipment and cancel the meter use agreement if equipment is being abused or the hydrant meter use agreement is not being followed.

Hydrant meter I.D.:

_____ Date of

appointment for training and location:

_____

__ List of items rented from Sturgeon County in addition to the hydrant meter:

_____
_____

Initial Meter Reading (m3): _____ **Final Meter Reading (m3):**
_____

Water Consumption (m3): _____ **Total Cost for invoicing:**
_____

Rental Fee: $ _____ Deposit Fee: $_____

Expected return date: _____ Returned Date:
_____

Applicant's Signature: _____ Date: _____

Approved by: _____, UWMS Representative

Date Approved: _____

The personal information provided will be used to process the Utilities Work Order and is collected under the authority of Section 33(c) of the Freedom of Information and Protection of Privacy (FOIP) Act. If you have any questions about the collection and use of this information, please feel free to contact the Sturgeon County FOIP Coordinator at 9613 - 100 Street, Morinville, Alberta, T8R 1L9, (780) 939-8366.

9.3 Proposed GMSS Variance Form

PROPOSED GMSS VARIANCE FORM

PROPOSED VARIANCE DETAILS	
DATE:	
PROJECT NAME/SUBDIVISION:	
GMSS REFERENCE SECTION:	
PROPOSED VARIANCE: ***Provide details on what is being proposed, how it varies from the GMSS, the reason for the change, and any resulting impacts to the Municipal Improvement.***	
DOES THE PROPOSED VARIANCE CONTRAVENE ANY OTHER STURGEON COUNTY POLICY, BYLAW, OR REGULATION?	☐ YES ☐ NO
DOES THE PROPOSED VARIANCE CONTRAVENE ANY PROVINCIAL AND/OR FEDERAL ACT OR REGULATION?	☐ YES ☐ NO
ALL REQUIRED SUPPORTING DOCUMENTATION ATTACHED? ***Report, technical memo, calculations, etc.***	☐ YES ☐ NO
LETTER STAMPED AND SIGNED BY A LICENCED ENGINEER ATTACHED?	☐ YES ☐ NO

SUBMITTED BY
COMPANY:
NAME:
EMAIL ADDRESS:
PHONE NUMER:

Send completed form and supporting documents by email to the County Planning and Development Department pandd@sturgeoncounty.ca . Reviews are typically completed within twenty (20) working days following complete submission.

9.4 Tangible Capital Asset Catalogue Form

*- In Development