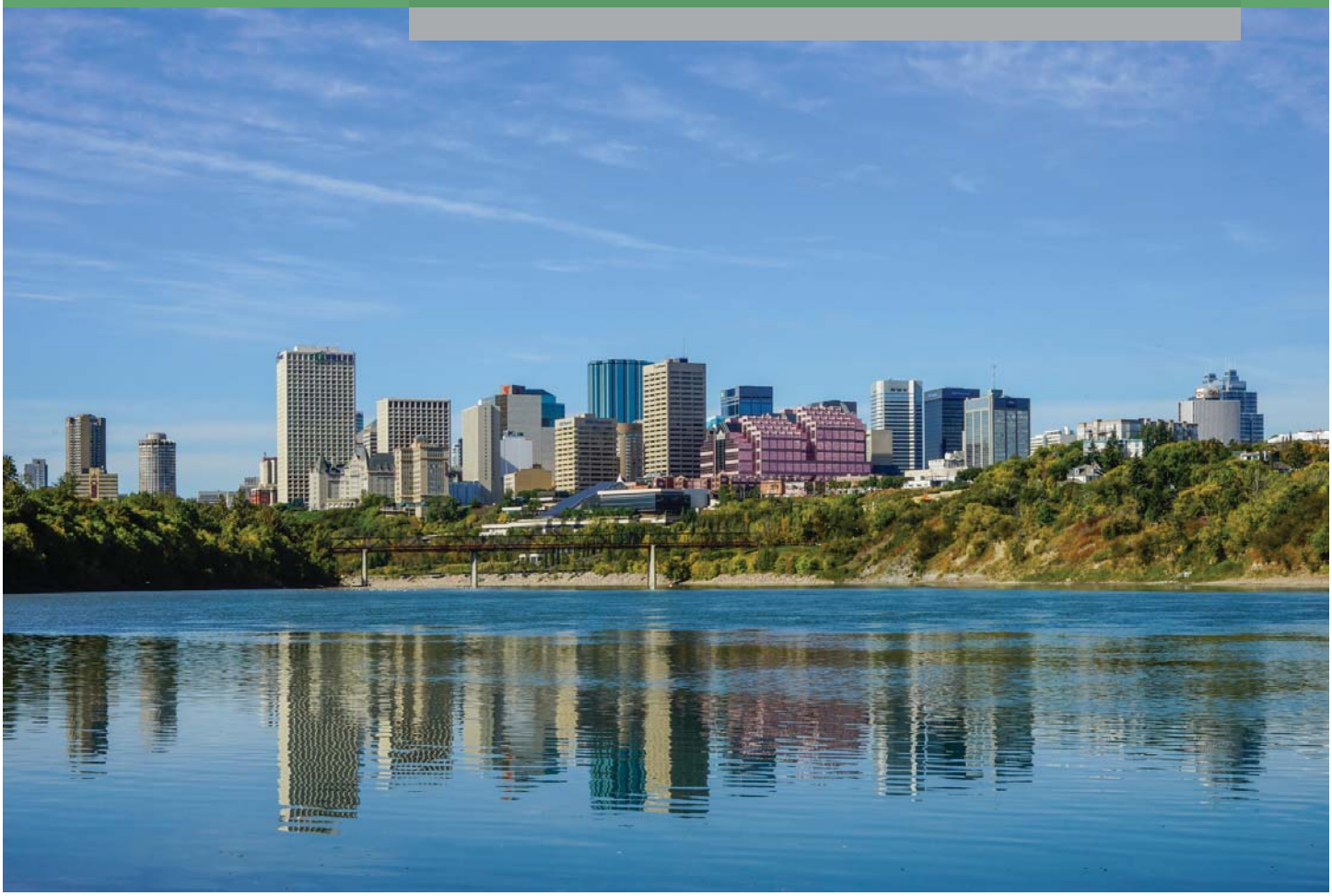
Design and Construction Standards

VOLUME 5 LANDSCAPING

June 2017 Edition



1. Design Standards Intent

The intent of the Landscaping Design and Construction Standards is to ensure that landscape developments on City lands provide well-constructed, functional, aesthetically pleasing, and sustainable public open space. Creativity and innovation are encouraged. The landscape must take into account the maintenance standards the City of Edmonton adheres to.

2. Roll Out Procedure

2.1 Developer and Other Projects

2.1.1 Design, drafting and construction requirements from the Design and Construction Standards, Volume 5: Landscaping (June 2017 edition) are applicable to all projects that are initiated into circulation as of July 1, 2017.

2.1.2 Projects initiated into circulation prior to July 1, 2017 are subject to the design and drafting requirements outlined in the Landscaping Standards that were applicable during the period the project was initiated.

2.1.3 A project is considered initiated once the "engineering drawings" (for Developer project) and "tender" (for other projects) have been accepted into first circulation.

2.1.4 Anything constructed prior to July 1, 2017 shall adhere to the applicable Standard when the construction occurred.

2.1.4.1 Trees initially planted prior to July 1, 2017 that require amendment as a result of inspection by disturbing the rootball (replacement, lift, lower or straighten) must be replanted to the current depth requirements (specifically root flare 40mm above grade).

2.1.5 Clause 4.8.2 is applicable as of July 1, 2016 for Developer and Other Projects.

2.1.6 The requirement for notification of the City for Pesticide use will come into effect January 1, 2017.

2.1.7 The City of Edmonton in consultation with the Urban Development Institute and Landscape Alberta have reviewed and updated the specification 02910 Topsoil. This specification differs significantly from the topsoil specification outlined in the 2016 Landscaping Standard. As such the City recognizes that it is not feasible to immediately implement the topsoil specification and make the specification an immediate requirement. Therefore, the 2017 topsoil specification will not be a requirement for the 2017 landscaping season. The 2017 topsoil specification may however be used voluntarily by those who would like to immediately implement the 2017 topsoil specification and are therefore included in 2017 Landscaping Standards update. Reference Appendix G 2017 Section 02910 – Topsoil Specification and Reference Document.

2.2 Approved Drawing Implementations

2.2.1 Redlines and re-lotted or re-staged projects are to adhere to the version of the Standards the project was originally approved under.

3. General Landscape Submission Requirements

3.1 Overall Intent

3.1.1 All landscape plans and specifications submitted to the City of Edmonton for approval must meet or exceed all requirements set out in the City of Edmonton's Design and Construction Standards.

3.2 Reference Documents

3.2.1 The following documents are a source of additional information:

- Trees and Shrubs for the Prairies (by Landscape Alberta, 1-800-378-3198, admin@landscape-alberta.com): latest edition, takes precedence if sizes/spreads are in conflict with other documents;
- Canadian Nursery Stock Standard Ninth Edition, Canadian Nursery Landscape Association (C.N.L.A);
- Barrier Free Design Guide (by Alberta Municipal Affairs, Safety Services);
- Community Standards Bylaw 14600;
- Edmonton Zoning Bylaw 12800;
- River Valley Bylaw 7188;
- Parkland Bylaw 2202;
- Traffic Bylaw 5590;
- City of Edmonton Corporate Tree Management Policy C456A;
- City of Edmonton, Trees and Construction;
- City of Edmonton Urban Forest Management Plan;
- City of Edmonton Low Impact Development, Best Management Practices, Design Guide;
- City of Edmonton Low Impact Development, Construction, Inspection & Maintenance Guide;
- City of Edmonton, Winter Design Guidelines: Transforming Edmonton into a Great Winter City;
- City of Edmonton, Dogs in Open Spaces Strategy: A 10-Year Strategy to Guide The Planning, Design and Management of Off Leash Areas in Edmonton;
- Environmental Impact Assessments (contact City of Edmonton, Sustainable Development);
- CSA Z614 - Children's Playspaces and Equipment;
- The City of Edmonton Playground Equipment Standard;
- Urban Parks Management Plan (UPMP);
- Utility Authority (contact respective utility company for R.O.W. landscape restrictions);

- Weed Control Act;
- Activities associated with or impacting retained natural features must conform with the recommendations provided within the following technical documents:
  - Site-specific Natural Area Management Plan (SSNAMP);
  - Natural Area Management Plan (NAMP);
  - Environmental Screening Report (ESR);
  - Environmental Impact Assessment (EIA);
  - Initial Project Reviews (IPR);
- Up By Roots, James Urban (Urban, 1992).

3.3 Definitions

3.3.1 **The Authority**: any outside agency with jurisdiction over development approval on lands not controlled by the City of Edmonton. For example, ATCO Gas or AltaLink Corporation.

3.3.2 **City**: the City of Edmonton.

3.3.3 **Parks**: Parks includes the a) Parks within City Planning, Sustainable Development, b) Open Space Planning & Design, within Infrastructure Planning and Design, Integrated Infrastructure Services, c) Urban Forestry within Parks and Roads Services, City Operations.

3.3.4 **Director/Parks**: the Directors within a) Parks within City Planning and Sustainable Development, b) Open Space Planning & Design, within Infrastructure Planning and Design, Integrated Infrastructure Services, c) Urban Forestry within Parks and Roads Services, City Operations, who are designated by the City of Edmonton to review all activities on parkland and represent the City of Edmonton as the authority to approve all landscape plans.

3.3.5 **Landscape Architectural Technologist/Parks:** the person within City Planning, Sustainable Development and Open Space Planning & Design, within Infrastructure Planning and Design, Integrated Infrastructure Services who are responsible for coordinating the inspections and issuance of Landscape Construction Completion Certificates and Final Acceptance Certificates.

3.3.6 **Consultant**: the professional hired by a Developer to represent the Developer's interests on a land development project. Note that the Landscape Architect may or may not be the prime consultant. Refer to the City of Edmonton Design and Construction Standards, Volume 1: General, Chapter 1 – Intent and Use of The Design Standards, Section 2.2.

3.3.7 **Landscape Architect**: the Landscape Architect stamping and signing the submitted drawings. Must be a full member in good standing with the Alberta Association of Landscape Architects. Upon mutual agreement with Parks, the Landscape Architect may designate an appropriate representative for field work. Refer to the City of Edmonton Design and Construction Standards, Volume 1: General, Chapter 1 – Intent and Use of The Design Standards, Section 2.5.

3.3.8 **Landscape Architect/Parks**: a Landscape Architect representing Parks within City Planning, Sustainable Development and Open Space Planning & Design, within Infrastructure Planning and Design, Integrated Infrastructure Services.

3.3.9 **Planner/Parks**: a City Parks Planner representing Parks within City Planning, Sustainable Development and Open Space Planning & Design, within Infrastructure Planning and Design, Integrated Infrastructure Services.

3.3.10 **Development Officer**: a person specifically delegated by the General Manager of Sustainable Development as having the authority to approve Development Permit applications, representing Development Services, Sustainable Development.

3.3.11 **Forestry**: Urban Forestry within Parks and Roads Services, City Operations.

3.3.12 **Project Manager/Parks**: a City project manager representing Open Space Planning & Design, within Infrastructure Planning and Design, Integrated Infrastructure Services.

3.3.13 **Concept Drawings**: a landscape drawing intended to convey design intent rather than detail. Parks utilizes a four step design drawing process, Concept Drawings, Site Development Drawings, Construction Drawings and As-Built Drawings.

3.3.14 **Site Development Drawings**: a scaled drawing outlining configuration, materials and grading intent, but lacking detailed construction information such as coordinates, dimensions and spot elevations.

3.3.15 **Construction Drawing**: a scaled drawing with sufficient information such as coordinates, construction details, and grading, and planting information to facilitate construction.

3.3.16 **As-Built Drawing**: a scaled drawing accurately surveyed and intended to record the post- construction conditions.

3.3.17 **Red Line Drawings**: drawings submitted to Parks for review and approval indicating minor revisions to the previously approved landscape plan.

3.3.18 **Developer**: the proponent initiating and funding a land development project. The Developer may be a private, public or not-for-profit entity.

3.3.19 **Master Plan**: drawings or documents outlining future developments.

3.3.20 **Natural Area**: an area of land or water that is dominated by native vegetation in naturally occurring patterns. Such areas could include grasslands, forests, wetlands, peatlands or riparian areas.

3.3.21 **Restoration**: a type of habitat restoration; the process of fully re-establishing a target level of ecosystem function and biodiversity to a degraded habitat, as defined by the reference habitat. This includes species composition and vegetation community structure.

3.3.22 **Naturalization:** a type of habitat restoration; the deliberate reintroduction of species that are native to a given area or are well adapted to the climate circumstance; activities that are intended to improve and enhance the natural environment. The biodiversity and ecosystem function of a naturalized ecosystem is lower compared to a reference habitat but higher compared to a reclaimed ecosystem.

3.3.23 **Reclamation:** a type of habitat restoration; that aims to stabilize disturbed lands to an ecologically productive use. A reclaimed ecosystem has less biodiversity and ecosystem function compared to a reference habitat, and the least compared to other types of habitat restoration.

3.3.24 **Reference Habitat:** the target ecosystem for restoration of a degraded habitat; the reference habitat may be described from historic or contemporary data sources, or may be physically represented by undisturbed, similar native habitat appropriate for the site conditions of the degraded habitat, and which may be adjacent to the project site or elsewhere in the Natural Region/Subregion. The reference habitat may include multiple sites and sources of information, where appropriate, for a particular habitat restoration project.

3.3.25 **Base Level Development**: as defined in the Urban Parks Management Plan by the Parkland Classification System. See UPMP in the references section for more details.

3.3.26 **R.O.W:** Right-of-way.

3.3.27 **Low Impact Development (LID)**: is a land development and storm water management approach that works with nature to manage storm water as close to the source as possible. LID focuses on maintaining and restoring the natural hydrological processes of a site.

3.3.28 **Enhanced Site Conditions:** are defined as conditions that promote the health of the tree including tree trenches, increased soil volume and above base level maintenance practices.

4. Submission Processes

4.1 General Submission

4.1.1 The Landscape Architect is encouraged to contact Parks for preliminary input on concept designs before preparation of construction drawings. These concept drawings are subject to a preliminary circulation to pertinent stakeholders at the discretion of Parks.

4.1.2 Site Development Drawings and Master Plans will be circulated and reviewed by Parks as required.

4.1.3 The Consultant shall submit to the City landscape plans, construction drawings, details, and specifications stamped and signed by a Landscape Architect. These plans and specifications shall, in the sole opinion of the Director/Parks, be complete, accurate and in accordance with the standards presented and referred to in the Design and Construction Standards and Reference Documents.

4.1.4 Parks will review drawings and specifications with respect for adherence to the City Design and Construction Standards, but are not responsible for any omissions or errors on, or relating to, these plans. Drawings are subject to approval by the Director/Parks.

4.1.5 The Landscape Architect must submit landscape plans with all related engineering and architectural drawings as one complete set for each project area. Engineering drawings submitted without the accompanying landscape plans will not be accepted for review by Parks.

4.1.6 Where the Landscape Architect's scope of work includes landscaping on or near high-pressure pipeline crossings or any other major utility corridors, these plans shall be submitted in accordance with the requirements of the Design and Construction Standards. Final approval of plans by the City will be subject to approval by the Utility Authority, as evidenced by signed approved drawings. One copy of the executed Crossing Agreement must be submitted to the City prior to commencement of construction of the landscape improvements.

4.1.7 Ensure drawings show all natural areas adjacent to the development and addressing how the development will impact the existing natural area. Drawings must also identify if there will be a change in the hydrology of the site.

4.2 Review Criteria

4.2.1 Parks relies on a series of approved guidelines and best practices defining appropriate design standards. During the review process, the Director/Parks shall make the final decision regarding landscape designs after consideration of the following:

- The safety and security of the general public.
- The functional relationship of the landscape design to existing and proposed utilities, land uses, flood/drainage patterns, including vehicular and pedestrian circulation networks.
- The proposals are sensitive to the location, size and scale of the space available.
- The horticultural and ecological components of the design take into consideration factors such as micro-climate, soil conditions, hydrology, slope stabilization, erosion control, successive plant growth, visual screening and control of pedestrian circulation.
- The maintenance requirements of the proposed landscape design and its suitability for the site.
- The inclusion of barrier free access.
- The protection and preservation of the natural environment, and the enhancement of biodiversity and wildlife habitat.
- Site accessibility for maintenance equipment and crews.
- Consideration shall be taken for visual interest, wind blocking and shadow casting in winter.

- The proposals address four season design and use, ensuring that any gathering spaces work well in both winter and summer seasons.

4.3 Landscape Architect's Responsibilities

4.3.1 The Landscape Architect is responsible for all design work, construction detailing, stamping and signing of landscape plans, on-site inspection, submission of required information and As-Built Drawings.

4.3.2 The following list provides an outline of the Landscape Architect's responsibilities including:

- Providing a copy of the approved construction plans at on-site meetings with Parks personnel, and for inspections.
- Submission of one copy of any Utility Crossing Agreement before construction.
- Coordination of natural stand and hazard tree assessments with Forestry prior to commencement of any proposed work or acceptance for Parks inventory, as required.
- Drawings must show all natural areas adjacent to the development and address how the development will impact the existing natural area. Drawings must also identify if there will be a change in the hydrology of the site.
- Resubmission of drawings for review by Parks, as required.
- Resubmission of revised drawings including a detailed explanation of how each of Parks concerns/comments have been addressed.
- Where revisions to previously signed and approved drawings are necessary, submission of a Red Line drawing for review and approval by Parks.
- Conducting site assessments prior to design work to determine retention or modifications to existing site features (e.g. trees).
- Undertaking site monitoring during construction and submit required documentation of materials and construction practices in accordance with the approved drawings. Note that, among others, Specifications 02910 Topsoil, 02914 Mulches, 02920 Seed and Sod, 02930 Trees, Shrubs and Groundcovers, and 02931 Naturalization have specific requirements and/or documentation for inspections.
- Staking or approval of locations of all plant material, landscape structures and site amenities with the contractor prior to installation, to ensure that there are no utility conflicts and confirm conformity to the approved landscape plans.
- Inspection and approval of the final installation of all work; structures, amenities and plant material before applying for and coordinating a CCC or FAC inspection.
- Submission of one As-Built drawing as specified in Section 5.10 As-Built Drawings. Note the As-Built should include:
  - Tree replacements that took place during the warranty period prior to FAC.

- Inspection of all work prior to the FAC inspection to ensure the deficiencies have been completed satisfactorily.

4.4 Development Permit Landscape Plan Approval Process

4.4.1 In the event the Development Officer requires a landscape plan to meet the approval of Parks, or if ground disturbance, seed, sod or plant materials are proposed for City owned lands, the process outlined below must be followed.

4.4.2 The Consultant/Developer shall submit four printed sets and an electronic version of landscape drawings, stamped and sealed by a Landscape Architect to The City of Edmonton, Development Services.

4.4.3 The Landscape Architect shall submit a cover letter to accompany the four sets of drawings which shall include the following:

- Anticipated time of construction.
- Indicated that all improvements proposed on City owned lands will be funded by the Developer.
- Construction and implementation of landscape improvements and landscape rehabilitation to be managed and completed by the Developer.
- Maintenance of all landscape improvements shall be the Developer's responsibility as specified in the Edmonton Zoning Bylaw 12800.

4.4.4 Notify Landscape Architectural Technologist/Landscape Architect/Parks in writing when work is completed and that inspections are required.

4.4.5 The Landscape Architect shall adhere to all City requirements for landscape plans, including the Design and Construction Standards.

4.4.6 The Landscape Architect is responsible for design drawing circulation to the City departments and Utility Authority as may be required for review and comment. Copies of all comments are to be provided to the Director/Parks prior to drawing revision.

4.4.7 The Landscape Architect shall submit the revised landscape plans to the appropriate City departments for signed approval.

4.4.8 The Landscape Architect shall then submit the approved City signed landscape plans complete with an electronic copy to the City of Edmonton Development Officer.

4.5 Construction Completion Certificate (CCC) Process

4.5.1 Inspections for Landscape Construction Completion Certificates (CCC) will be undertaken by Parks from June 1st - October 15th, based on snow coverage and weather dependent. Snow accumulation of greater than 5cm in the last 2 weeks of the season will result in the cancellation of the season and/or daytime temperatures below 0 degrees till the end of the season.

- Projects out of Development Inspections Unit's scope will include a Parks Operations inspector.

- Development Inspections Unit may include Parks Operations, Forestry, Ecology, or other Edmonton representatives as required to complete the inspection.

4.5.2 Inspections for Landscape Amenities and Fencing will be conducted throughout the year, based on snow coverage and weather dependent.

- Minor touch up of fencing stain is a seasonal deficiency that must be completed prior to June 30th of the following inspection season, at the inspector's discretion.

4.5.3 The Landscape Architectural Technologist/Parks shall co-ordinate CCC inspection time and date with the Landscape Architect.

4.5.4 The Landscape Architect shall submit the following documents to Eplan: A pre-inspection report, the latest City signed approved drawings and/or Red Lines (highlighted to identify the scope of inspection, matching the specified improvement within the servicing agreement, and in a single PDF document) and a maintenance schedule for landscaping improvements.

- City assets that only require a CCC will require the following documents to be submitted at the time of CCC application: the latest approved landscape drawings (PDF and AutoCAD) and a Tangible Capital Asset form.

4.5.5 During CCC re-inspection, whenever possible, the original inspector shall be used for subsequent inspections. If not available, the deficiencies identified on the original inspection report will be used to determine the scope of the re-inspection (unless there are new deficiencies identified in the re-inspection).

4.5.6 On-site inspection shall be initiated by Parks within thirty days of receipt of Parks Pre-Screen approval.

4.5.7 On the date of the site inspection, the Landscape Architectural Technologist/Parks or designate(s), will meet the Landscape Architect at the pre-arranged location.

4.5.8 The Landscape Architect will bring one set of the most recently approved landscape drawings and will record deficiencies during the inspection, as will the Landscape Architectural Technologist/Parks.

4.5.9 The Urban Forester will inspect all trees on site. All plant material must be visible.

4.5.10 The Landscape Architectural Technologist/Parks or Project Manager will supply a CCC deficiency report within two weeks of the inspection to the Landscape Architect.

- Within two weeks of receiving the deficiency report, identified site deficiencies must be corrected.
- If the identified deficiencies have not been corrected within the two week time frame the site will be rejected.

4.5.11 Bank stabilization inspection of plant material requirements must be inspected by Parks to ensure plant material is viable and as per the drawing. Bank Stabilization methods should consider bioengineering and landscape naturalization methods suitable for site context and conditions.

4.6 Inspection of Environmental Reserves

4.6.1 Environmental Reserves shall be inspected to ensure that they are left in their natural state. The inspection will review the following requirements:

- There is no stockpiling on the site;
- There is no dumping on the site;
- Weeds must be controlled as per the Weed Act;
- The site is in compliance with the site's Natural Area Management Plan; and,
- The site is left in an intended state that meets the City's satisfaction.

4.7 Inspection of Municipal Reserves

4.7.1 Municipal Reserves shall be inspected to ensure that they are left in their intended state. The inspection will review the following requirements:

- There is no stockpiling on the site;
- There is no dumping on the site;
- Weeds must be controlled as per the Weed Act;
- The site is in compliance with the site's Natural Area Management Plan; and,
- The site is left in an intended state that meets the City's satisfaction.

4.7.2 Municipal Reserve that only requires a Construction Completion Certificate (CCC) shall require an AutoCAD version of the Approved Drawing.

4.8 Warranty Period

4.8.1 The Developer shall be responsible for any defect or deficiency in the completed work for a minimum warranty period as outlined in the signed Servicing Agreement, or as identified below. Deficiencies shall be corrected at the Developer's expense.

4.8.2 All landscape improvements shall be maintained for a minimum warranty period of twelve months after issuance of CCC. The warranty period will be extended for an additional twelve months (at time of FAC inspection) when the following conditions apply:

- For sites with more than 40 trees, where 10% or more of the tree rootballs have been or are required to be disturbed (lift, lower, straighten, etc) or where 10% or more are required to be replaced within the current year.
- For sites with 40 trees or less, where 25% or more of the tree rootballs have been or are required to be disturbed (lift, lower, straighten, etc) or where 25% or more are required to be replaced within the current year.

- For sites with 25 shrubs or less, where 50% or more of the total shrubs have not established.
- For sites with more than 25 shrubs, where 25% or more of the total shrubs have not established.
- For sites where 25% or more of the turf has not established.
- At which time a new FAC application will be required.

4.8.3 If trees that are planted are selected from the trial list, reference Appendix F Tree Diversity Guidelines and Approved Species Spread and Spacing, then the following conditions apply at FAC:

- Trees must be identified as such on the submitted plans;
- In a non-roadway setting no replacements would be required on trees planted above and beyond the required numbers if the remaining landscaping allows for the vacancies as per the discretion of the City inspectors;
- 35% mortality during the maintenance period will be acceptable on the trial species;
  - Trial species are acceptable with up to 30% dieback;
- For the non-trial species the 10% mortality criteria will apply;
- The specified trial species would need to be replaced at least once during the maintenance period before initiating a species change; and,
- All boulevard trees are required to be replaced.

4.8.4 All deciduous trees specified at 80mm* caliper, or greater, to a maximum of 90mm caliper, require a minimum twenty four month warranty period. If planted in a site which has enhanced site conditions such as continuous root trench, a twelve month warranty period will be required.

- * Trees planted at 80mm caliper or above, without enhanced site conditions (tree trenching, increased soil volumes, etc.) will require a twenty four month warranty period.

4.8.5 If at the time of inspection trees are determined to be over sized (more than 20mm caliper) above specification as identified on the approved drawings, the City has the right to reject the trees or the minimum warranty period will be extended as outlined in clause 4.8.4.

4.8.6 All amenities shall be maintained for a minimum warranty period of twelve (12) months. (i.e. benches, litter/recycling receptacles, etc.) The litter receptacles must be emptied to the City of Edmonton standards until FAC.

4.8.7 All Parks fencing (i.e. metal, chain link, wood screen and rail fencing), shall be maintained as outlined in the Servicing Agreement.

4.8.8 The warranty period shall commence from the indicated inspection date, when the Construction Completion Certificate is approved by the Landscape Architectural Technologist/Landscape Architect/Parks.

4.8.9 All natural areas shall be maintained as per the Servicing Agreement.

4.9 Maintenance Agreement

4.9.1 A Maintenance Agreement between the City and the Home Owner's Association may be required by Parks for elements above base level development, including grade, level, topsoil, and seeding on-site with positive drainage on parkland, at the discretion of the Director/Parks.

4.10 Final Acceptance Certificate (FAC) Process

4.10.1 Inspections for Final Acceptance Certificates (FAC) will be undertaken by Parks from June 1st - September 30th based on snow coverage and weather dependent. Should a hard frost occur in the City of Edmonton, the inspection season will end for caliper trees to be accepted into City inventory. Hard frost is defined as "four consecutive hours of below four degrees Celsius".

4.10.2 Inspections for Landscape Amenities and Fencing will be conducted throughout the year, based on snow coverage and weather. Fencing on private property does not require a FAC.

4.10.3 Landscaping projects with an FAC anniversary date that falls after August 1st, are eligible for early inspection, on or after August 1st. The Consultant and Contractor must agree to maintain the site (should it be approved) for the remainder of the warranty period.

4.10.4 The Landscape Architect shall submit the following documents to Eplan: A pre-inspection report, the latest City signed approved drawings and/or Red Lines (highlighted to identify the scope of inspection, matching the specified improvement within the servicing agreement, and in a single PDF document) and a maintenance record.

- After FAC inspection approval the following documents must be submitted into Eplan: the latest approved landscape drawings (PDF and AutoCAD) and a Tangible Capital Asset form.
- Documents must be submitted within 30 days after the inspection approval. Failure to do so will result in FAC rejection.

4.10.5 The contractor shall provide all maintenance records for the site between CCC and FAC. This shall include standard maintenance tasks including dates when that maintenance occurred. Records shall also include pesticide application logs. Replacement tree and shrub planting must be indicated on drawings.

4.10.6 On-site inspection shall be initiated by Parks within thirty days of receipt of Parks Pre-Screen approval.

4.10.7 The Landscape Architectural Technologist/Parks shall co-ordinate FAC inspection time and date with the Landscape Architect.

4.10.8 On the date of the site inspection, the Landscape Architectural Technologist/Parks or designate, will meet the Landscape Architect at the pre-arranged location.

4.10.9 The Landscape Architect will bring one set of the most recently approved landscape drawings and will record deficiencies during the inspection, as will the Landscape Architectural Technologist/Parks.

4.10.10 The Landscape Architectural Technologist/Parks will supply to the Landscape Architect an approved FAC or a rejected FAC with a deficiency report, within two weeks of the inspection.

4.10.11 During FAC re-inspection, whenever possible, the original inspector shall be used. If not available, the original inspection report's identified deficiencies will be used to determine the scope of the re-inspection (unless there are new deficiencies identified in the re-inspection).

4.10.12 In the event that a FAC application is rejected, all original FAC forms will be returned to the Landscape Architect, and these originals must be resubmitted for all subsequent FAC applications.

4.10.13 If the trees are in the third growing season, one tree stake and all guy wires shall be removed.

4.10.14 Erosion and Sediment control measures may be removed at FAC on public Parkland, if the landscape and adjacent properties are fully established, thus eliminating the risk of erosion. Removal of the erosion and sediment control measures is at the discretion of the Landscape Architectural Technologist/Parks.

4.11 Landscape Crossing Procedures for Pipeline Corridors

4.11.1 All landscape plans identifying a high-pressure pipeline or any other utility transmission facility, regardless of its proximity to the proposed landscape improvements, must be circulated to the appropriate Authority for review.

4.11.2 The Landscape Architect shall ensure all utilities, high pressure, intermediate pressure and low pressure lines are accurately plotted on all landscape plans using the most current information available.

4.11.3 The Landscape Architect must contact the Authority to determine the landscape restrictions and/or development limitations on specific pipeline corridors. Upon identification of the restrictions and/or limitations, the Developer will enter into a Crossing Agreement with the Authority. The Landscape Architect must submit a letter to Parks outlining the Authority's site specific restrictions and/or limitations.

4.11.4 The Landscape Architect shall ensure that three complete sets of the proposed landscape plans are circulated to the proper Utility and/or Pipeline Authority.

4.11.5 Upon receipt of the above outlined letter, reference Section 4.11.3. Parks will amend the landscape requirements for the specific pipeline corridor. Landscape and development requirements may be reduced or waived at the discretion of the Director/Parks.

4.11.6 The landscape drawings shall be amended to identify those landscape improvements impacted by the Crossing Agreement. The crossing permit number shall be identified on the plans. Hydrovac soil removal is required to expose high pressure lines and/or hand digging of plant material shall be noted on the plan in bold text.

4.11.7 The Landscape Architect shall ensure coordination of the Crossing Agreement between the Developer and the Authority as required.

4.11.8 The Developer shall ensure a copy of the signed Crossing Agreement and signed landscape plans are available on-site at all times.

4.11.9 The Landscape Architect and Consultant are responsible for ensuring that all aspects of the Crossing Agreement are followed.

4.11.10 The Developer shall not commence construction until the appropriate Authorities (e.g. Alberta One Call, Shaw, etc.) have flagged below-grade utilities and the Landscape Architect has approved the location of all landscape improvements.

4.11.11 The Developer shall not commence any ground disturbance until all the above conditions have been met.

4.12 Pesticide Notification Requirements

4.12.1 A Contractor wishing to apply a pesticide on City property or property that is in the possession of the developer and has not yet received FAC, must first submit a completed Contractor Pesticide Use Notification Form to the appropriate Service Area. This must be sent at least 48 hours (not including weekends and holidays) prior, and be acknowledged by an e-mail confirmation before conducting the treatment. If no response is received within two business days, the contractor may proceed. Please submit only one site per form. The contractor Pesticide Use Notification form may be found on the City of Edmonton website.

4.12.2 Developers shall provide signs indicating that areas have received herbicide treatments wherever there is a potential for public exposure. Reference Appendix E Pesticide Notification Signage Template.

4.12.3 A pesticide as defined in the Environmental Protection and Enhancement Act includes “a substance that is intended for use in preventing, destroying, repelling or mitigating any insect, nematode, rodent, predatory animal, parasite, bacteria, fungus, weed or other form of plant or animal life or virus.”

4.13 Environmental Considerations

4.13.1 Environmental considerations are an important part of all activities and operations within the City of Edmonton. While performing services and operations working directly for the City of Edmonton, contractors must understand their environmental responsibilities. Contractors include:

- Consultants hired by the City of Edmonton;
- Any person who is hired by the City to provide Construction, Operation, Maintenance and Service activities; and,
- Any person who is hired by the City and who operates hired equipment.

4.13.2 Prior to starting work, contractors must review and understand the contents of the Contractor's Environmental Responsibilities Package and complete and submit the Contractor's Environmental Responsibilities Acknowledgement Form. The Contractor Environmental Responsibility package along with the form as well as general information about contractor environmental responsibilities may be found on the City of Edmonton website.

5. Landscape Plan Requirements

5.1 General Landscape Plan Requirements

5.1.1 All plans shall contain a scale including a bar scale, a north arrow, a key plan and a legend. Where possible, orient north to the top of the drawing.

5.1.2 All plans shall contain notes, as required, to clarify all work and responsibilities, such as utility staking, setback requirements, etc.

5.1.3 All plans shall contain notes detailing all relevant planting setback requirements.

5.1.4 All plans shall illustrate all existing and proposed above and below grade utility alignments and fixtures, such as utility pedestals, fixtures, art installations, monuments, statues, street lights, walkway lights, signage, amenities, catch basins, manholes, high, intermediate and low pressure lines, overhead power lines, pylons, sewers, etc.

5.1.5 All plans shall contain notes outlining precautionary requirements such as the necessity for hand digging or notification of Utility Authorities before construction.

5.1.6 All required details are to be referenced within the drawing set.

5.2 Landscape Layout Plan

5.2.1 The Landscape Layout plan shall be drawn to a recommended scale of 1:500 or larger (such as 1:250) and include the following:

- Subdivision name and file number;
- Approved neighbourhood name and stage;
- North arrow, date, scale and bar scale;
- Pipeline Crossing Agreement numbers;
- Breakdown of area measurements (i.e. school site, pipeline R.O.W., community league site);
- Proposed property lines and easements;
- Azimuths, iron bars, corner stakes and datum points;
- Designated use of adjacent land parcels and development stages. Identify stages as existing or proposed;
- Street, walkway and public utility lot names or numbers;
- All streets, roads and walkway alignments;
- All existing plant material locations;
- Ditches, swales and berm locations;
- Constructed wetlands and wet ponds locations or alignments; and,
- Outline of any proposed facilities/structures with access locations shown, within the landscaped area, where Parks will be maintaining.

5.2.2 The layout plan must respect driveways and service connections to individual lots.

5.2.3 The layout plan shall include all proposed site developments, including, but not limited to: parking, curbs, retaining walls, noise attenuation fences, screen and uniform fences, site furnishings and site amenities (e.g. road islands, entry features, gazebos, sculptures, bridges, playgrounds, signage and planters).

5.2.4 The layout plan shall include all grading and drainage information as follows:

- Proposed contours at a maximum of 1.0m contour intervals and/or spot elevations;
- River valley and ravine areas identifying flood line information;
- Surface and below grade storm discharge locations into the North Saskatchewan River Valley and Ravine System; and,
- Existing grade information, as required, for quantity take-offs or design evaluation.

5.2.5 The Layout Plan shall include existing vegetation located on proposed City-owned lands, including those within the North Saskatchewan River Valley, Ravine System and Natural Areas, and are to include the following:

- Trees and shrubs to be protected as per the City of Edmonton Corporate Tree Management Policy C456A.
- Detailed tree protection plan and/or drawing(s) for all remaining trees. Site lay down area(s) and construction access(es) must be identified on all of the plan(s).
- For relatively small areas where trees are evaluated individually by Forestry, identify hazard trees for removal.
- For relatively small areas, identification of tree species and appropriate size information including caliper, height/spread - for the above removals and relocations.
- For larger areas where trees are evaluated by Forestry, delineating areas of trees to be removed.
- For larger areas, a general description of the proposed material to be removed including species, size and condition of the stand.
- Trees to be relocated.

5.2.6 The layout plan shall include layout, area (m^2), and materials for all surface treatments including, but not limited to:

- Mulched planting beds;
- Perennial areas;
- Naturalized areas;
- Seeded and sodded areas;
- Total area of mown and non-mown turf areas;
- Hard surface areas; and,

- Playgrounds.

5.2.7 The layout plan shall show the limits of the project area and, if required, shall specify the exact portion of the landscape work to be covered by each landscape plan. Match lines shall be used to match individual sheets identifying a larger project area.

5.3 Storm Water Management Facility Drawing Requirements

5.3.1 In addition to the requirements outlined in Section 13, all landscape drawings identifying a Storm Water Management Facility (SWMF) must include, at a minimum, the following:

- Normal water line;
- 1:5 year flood line;
- 1:25 year flood line;
- 1:100 year flood line;
- High water line;
- Individual planting bed layouts; and,
- SWMF planting list.

5.3.2 If possible storm water management drawing should be drawn at a scale that allows trees and shrubs to be shown on the same sheet.

- The SWMF drawings will include an overall landscape plan identifying the planting calculations, surface treatments with areas, mow limits, and identify enlargements with match lines.
- Each enlargement sheet must include a key plan and a planting list (identifying the individual sheet planting only).
- Ensure the drawings are laid out and ordered for ease of inspection.

5.3.3 Pre-cast concrete boat ramps are required for all Storm Water Management Facilities; see the City of Edmonton Design and Construction Standards, Volume 3: Drainage, Section 16.11 Maintenance Access Requirements, for specifics.

5.4 Landscape Staking Plan

5.4.1 A Landscape Staking Plan shall be required only in those instances where critical dimensions must be provided to successfully implement the proposed design. The requirement for a comprehensive staking plan will remain at the discretion of Parks. All dimensions should be tied to legal boundaries. All on-site staking by the Landscape Architect shall be noted on the plan.

5.5 Landscape Planting Plan

5.5.1 The Landscape Planting Plan shall be drawn to a scale of 1:500 or larger (such as 1:250).

5.5.2 The Landscape Staking Plan may be combined with the Landscape Planting Plan if the scale and scope of planting design allows the information to be clear on one drawing.

5.5.3 The Planting Plan shall identify existing trees, shrubs, shrub beds, natural areas to be preserved, and proposed relocations of existing trees.

- Where existing trees are identified and used to meet quantity requirements on planting plans, they must be included within the plant list and be subject to CCC and FAC inspection.

5.5.4 The Planting Plan shall note minimum planting quantity requirements in tabular form, based on area measurements (m^2) of individual areas, including, but not limited to, Utility R.O.W's, Walkway R.O.W's, Storm Water Management Facilities, Park Areas and Roadways.

5.5.5 The Planting Plan shall include proposed locations for trees, shrubs, perennials and ground covers, clearly labelled and cross-referenced to the plant list.

5.5.6 Tree trenches shall be identified on the planting plan, including the exact locations and all cross sections details. Construction verification will be required. The following items are acceptable methods of verification: pre-inspection, construction photos, soil sample or physical inspection (by City inspectors).

5.5.7 The Planting Plan shall include notes detailing all seed and sod mixes being specified. Seed mix notes shall include standard application rates.

5.5.8 Plant material graphic symbols shall represent mature spread of shrubs as per Trees and Shrubs for the Prairies (see Section 3.2.1 Reference Documents).

5.5.9 Tree symbols are to be drawn at mature spread, as per the recommended tree spacing, reference Appendix F Tree Diversity Guidelines and Approved Species Spread and Spacing.

5.5.10 Shrub symbols should be shown at mature size with no overlap. Tree and ground covers symbols may be overlapped at the discretion of the City.

5.5.11 All shrub and coniferous tree material symbols shall be contained within a planting bed, with a minimum 500mm width mulched area between the edge of the mature shrub/coniferous tree and the edge of the shrub bed.

5.5.12 Where possible, shrub beds should be designed with tapered or flowing edges to allow for ease of mowing with machines, leaving no uncut grass.

5.5.13 The Planting Plan shall include all typical and applicable City planting details, as well as unique planting installations, road island and median cross section planting installation details. These details and cross sections are to be shown at an appropriate scale and cross-referenced to the landscape and engineering drawings, as required.

5.5.14 The Planting Plan shall include planting plan enlargements of road islands, entry feature shrub beds or other densely planted areas which require a larger scale to accurately show the proposed planting design. These details are to be shown at an appropriate scale and cross-referenced with the landscaping, engineering and architectural drawings as required, including all above and below grade utility alignments.

5.5.15 The Planting Plan shall identify all proposed surface treatments and other applications.

5.6 Plant List Requirements

5.6.1 For ease of drawing review and on-site construction clarity, Parks requires one plant list for each sheet if more than one sheet of planting plans is required. All landscape planting plans shall include a plant list with the following information:

- Total quantities of each plant;
- Common name/variety and botanical name;
- Root treatment (e.g. balled and burlapped, tree spade, bare root or potted);
- Plant material height and/or spread at planting;
- Minimum tree branching height (for streetscape applications only);
- Minimum caliper;
- Maximum caliper/height; and,
- Remarks including special comments or unique installation criteria.

5.6.2 A note indicating that metal bar tree stakes are not allowed within 1.0m of an underground electrical trench shall be included.

5.6.3 Prior to installation, Forestry may inspect local nursery stock for acceptability at the cost of the Developer. The Landscape Architect shall co-ordinate this optional inspection with Forestry. This inspection is intended for unique situations only and would be conducted at the discretion of Forestry. This inspection would not preclude rejection of plant material on-site.

5.7 Projects of Limited Scope

5.7.1 Projects of limited scope, for example seed or sod only, would not require the full extent of base information summarized above. At the discretion of the Landscape Architect, the Landscape Layout Plan and Landscape Planting Plan may be prepared as one drawing.

5.8 Landscape Construction Details

5.8.1 Typical construction details such as furniture anchor pads, standard furniture, park lighting, screen, uniform and solid fences, sidewalks, curbs, gutters, etc. shall be shown at an appropriate scale and cross-referenced with the landscape plans and engineering drawings as required. Additional project specific details may be requested, and will be reviewed and approved by all affected departments on a project-by-project basis during the drawing circulation process.

5.9 Architectural, Structural, Mechanical and Electrical Plans

5.9.1 Detailed Architectural, Structural, Mechanical and Electrical plans are required by Parks where the proposed facilities will be maintained by Citizen Services. These submissions are to be stamped by accredited professionals as required and shall provide the following as required:

- Construction details and specifications;
- Shop drawings;
- Geotechnical analysis; and,

- Other testing, quality control procedures and analysis.

5.9.2 Consultants are to ensure the Architectural, Structural, Mechanical and Electrical drawings for facilities not to be maintained by Parks are reviewed and approved by the City Departments responsible for maintenance.

5.9.3 The Landscape Architect, at the request of other City Departments or Consultants, may be required to include these drawings in conjunction with the landscape plan submission for facilities not maintained by Citizen Services.

5.10 As-Built Drawings

5.10.1 The Landscape Architect shall submit one complete set of electronic As-Built drawings (AutoCAD File, which is spatially correct), to the Director/Parks, stamped and noted to be compliant with the City's Design and Construction Standards, prior to or included with the FAC application. A FAC will not be issued without the submission of As-Built Drawings as outlined.

5.10.2 As-Built Drawings will identify the following items:

- Changes for planting, grading, staking or construction detailing;
- Important subgrade features not shown on approved drawings and identified through construction; and,
- Major site utility conflicts identified during plant installations.

5.10.3 As-Built Drawings are to accurately reflect the outcome of construction and the most recently approved Red Lines.

5.11 Red Line Drawings

5.11.1 Refer to the City of Edmonton Design and Construction Standards, Volume 1: General, Section 7.8 Design Revisions after Approval.

6. Landscaping Standards Change Request Process

6.1 Formal Change Request Process

6.1.1 City Planning have committed to review, revise and release the Landscaping Design and Construction Standards on an annual basis.

6.1.2 All Change Requests must be submitted on the approved Change Request Form, to the City of Edmonton, City Planning. Reference Appendix C Change Request Form.

6.1.3 All Change Requests are subject to City of Edmonton, City Planning approval.

6.1.4 Approved Change Requests will be reflected in the yearly revision of the City of Edmonton Design and Construction Standards, Volume 5: Landscaping. All revisions will be identified in Appendix D Revision Log.

7. Plant Materials

7.1 General Recommendations for Trees

7.1.1 Disease and drought have negatively affected certain tree species. Forestry encourages designs utilizing a diversity of tree species hardy to the Edmonton area to reduce the spread of pests and disease, and to mitigate the potential visual impact of losing one species within a localized area.

7.1.2 Grouping trees within mulched beds is encouraged where practical to improve growth and survival. Reduced tree spacing in group plantings may be considered by Forestry. Individual tree planting remains acceptable. No individual tree shall be planted within 2.5m of a mulched bed.

7.1.3 For spacing and setbacks, refer to Section 7.4 Tree Setbacks from Utilities and Property Lines, 7.5 Tree Setbacks from Walkways and Roads, 7.6 Tree and Shrub Planting Setbacks and Spacing, 7.9 Approved Tree Species, Spread and Spacing Requirements and Appendix H Tree Diversity Guidelines and Approved Species Spread and Spacing.

7.2 Soil Volume

7.2.1 Enhanced soil volumes are required to increase critical rooting space. Soil volumes should be designed no deeper than 1 meter with increased area to achieve the minimum soil volume requirement. Based on tree size to soil volume relationships (Urban, 1992) the list below is the recommendations for the City of Edmonton.

- Large canopy trees are defined as trees that under normal conditions can support canopies of 74m2 or spread of over 5 meters and require a minimum soil volume of 17m3.
- Small canopy trees are defined as trees that under normal conditions have a spread of 5 meters and require a minimum soil volume of 11m3 and under ideal conditions require 17m3 to reach its full potential.
- Should the design of the area not allow for the minimum required soil volume, please contact Forestry for recommendations.

7.3 Naturalization

7.3.1 The City of Edmonton is moving towards a more naturalized landscape aesthetic in the following areas: major roadways, utility corridors, non-programmable or low use park spaces, shrub beds in appropriate areas (e.g. nature parks or parks near natural areas/river valley), low impact development (e.g. bioswales and rain gardens), and storm water management facilities. Naturalization is supported by the City of Edmonton as a means to provide more sustainable landscapes, to enhance biodiversity, and to provide educational opportunities.

7.3.2 Naturalization is encouraged when it provides ecosystem function (e.g. water filtration and retention, slope stability, wildlife habitat or corridors), where there are no conflicts with other uses, where aesthetically appropriate and maintenance concerns are addressed.

7.3.3 Naturalization may be required where natural tree stands or natural open areas are removed or impacted during construction or other activities.

7.3.4 Naturalized areas must be set back 30m from playgrounds.

7.3.5 Existing natural and restored areas affected by the proposed improvements, which cannot be protected during construction, must be restored with native plant materials having regard for the surrounding environment, new drainage patterns, soil conditions and ecological rehabilitation. Generally, but not limited to, restoration would apply to river valley and ravine lands, major utility and road R.O.W's.

7.3.6 The Landscape Architect shall design an appropriate mix of native trees, shrubs, ground covers and wild flower seed mixes to rehabilitate affected areas. See the current Naturalization Master Plan. The Landscape drawings shall identify all plant communities to be established and all other information necessary to implement the proposed landscape improvements. Site characteristics including slope, soil and orientation, and their appropriateness to the site, shall be taken into account when specifying species and size of plant material.

7.3.7 The Landscape Architect shall specify all tree, shrub and ground cover sizes. To promote biodiversity and a healthy growing environment, it is recommended that 10% of all plant material, where possible and appropriate, be of larger sizes. Larger material (trees or larger shrubs) shall be at least 40mm caliper size (deciduous), 2.5m height (coniferous) and 5 gallon pot size (shrubs).

- Individually planted trees above 40mm caliper or 2.5m height and 5 gallon shrubs will require a mulched ring.

7.3.8 The Landscape Architect shall design any required subsurface drainage, surface drainage and erosion control measures in the restoration area and, if required, coordinate this with other consultants to implement geotechnical, structural and bioengineering principles.

7.3.9 Forestry stock, seedlings, deciduous tree whips and propagated/rooted cuttings are acceptable for use from an approved source.

7.3.10 All plant materials are to be nursery grown stock, with the exception of native spaded plugs and plant material.

7.3.11 Collected plant materials may be used with prior approval. Landscape drawings shall identify areas to be planted with collected material and also indicate the site from where source material has originated.

7.3.12 The guide for acceptable levels of naturalization planting (plugs, whips and bare root specimens) survival at FAC shall be 80%, with a minimum density of one plant per square meter. If the density is met, all dead plant material will be removed at FAC.

7.3.13 All natural sites (Natural Areas and Naturalized areas) must be cleaned and checked for hazards such as old barbed wire fences, abandoned structures, basements and any other objects that may be hazardous to citizens.

7.3.14 If the landscape drawings include naturalized grass, these areas will be vigorous, healthy, and naturalized by FAC inspection. Mowing may be completed only to establish plant health and must maintain a minimum height of 100-150 mm during establishment. During grass seed establishment do not cut more than 1/3 of blade height or below 100 mm (whichever is taller) at any one mowing.

7.3.15 Grass slopes greater than 3:1 will be naturalized and not mowed regularly. Newly constructed slopes should be seeded with a naturalized or native seed mix. Reference Specification 2920 Seed and Sod, 2.1.3. Native and Naturalization Seed Mixes.

7.4 Designated Roadway Tree Planting Corridors

7.4.1 Collector and arterial roadways must incorporate a utility-free planting corridor within boulevards and medians to accommodate planting requirements with appropriate setbacks. If trees are on the plan and cannot be planted due to utility or access conflicts, these trees should be planted where possible within the same stage of development.

7.5 Tree Setbacks from Utilities and Property Lines

7.5.1 Where possible, trees shall be setback a minimum distance, measured from the center of the tree trunk, from above and below grade utilities and property lines as follows:

Tree Setbacks from Utilities and Property Lines	
Distance from Light Standards/ Power Hardware	3.5m
Distance from Fire Hydrants	3.5m
Distance from Stop Signs	3.5m
Distance from Yield Signs	3.5m
Distance from Transit Zones	3.5m*
Distance from Other Signs	2.0m
Distance from Private Property on Walkway R.O.W.	1.0m
Distance from Private Property on Open Parkland	3.0m
Distance from Private Property on Boulevards	1.0m
Distance from Shallow Underground Utilities	1.0m
Distance from Gas or Oil R.O.W.	Contact Utility
Distance from Deep Underground Utilities	1.5m
Distance from Sanitary and Storm Sewers	1.8m
Distance to Sanitary and Storm Sewers and Manholes	2.0m
Distance from Water Mains	2.5m
*Ensure trees do not create sightline obstructions for vehicles approaching transit zones.	
Note: Distances from overhead power utilities shall be as per the requirements established by the Utility Authority.	

7.6 Tree Setbacks from Walkways and Roads

7.6.1 Where possible, trees shall be setback a minimum distance, measured from center of the tree trunk, to walkway and roads as follows:

Local Residential	
Face of Curb	1.25m
Face of Curb (Boulevard Without Sidewalk)	2.0m
Collector Residential or Local Industrial (Roadway Width less than 14.5m)	
20m R.O.W.	
Face of Curb	1.25m
R.O.W. greater than 20m	
Face of Curb	1.65m
14.5m Industrial or Local Collector	
Face of Curb	1.65m
Arterial Roadway	
Face of Curb	2.0m*
Hardsurface	
Edge of Commercial or Industrial Accesses	1.5m
Edge of Residential Driveways	1.0m
Edge of Sidewalk	1.0m
* Distances less than indicated above, are at the discretion of the Director/Parks in consultation with Transportation.	
Note: Setback distances apply to both Boulevards and Medians.	

7.6.2 There shall be no mulched beds within 2.5m of curb on boulevards along arterial and collector roadways.

7.7 Tree and Shrub Planting Setbacks and Spacing

7.7.1 Where possible, it is suggested that landscape improvements and plant materials have increased setbacks from underground utilities.

7.7.2 There shall be no excavations undertaken within 1.0m of any underground utility cables unless:

- The excavation is done under the control of the operator of the utility system.
- The excavation method is acceptable.

7.7.3 In the event that the mechanical tree digging equipment cannot maintain a minimum clearance of 1.0m from shallow utilities during installation, the pertinent Utility Authority must be contacted for approval and/or safety procedures (e.g. hand digging). Any additional costs incurred will be at the Developer's expense. Drawings are to note that the approval for plantings have been received from the Utility Authority, and identify the plant materials/areas affected. It should be noted that deep utilities require a minimum offset as referenced in Section 7.5 Tree Setbacks from Utilities and Property Lines.

7.7.4 Planting distances from low, intermediate and high-pressure pipelines are to be observed as dictated by the Pipeline Authority.

7.7.5 Setback distances apply to all tree and tree form shrub species. Species with suckering root systems or large hanging canopies may require increased setbacks (i.e. Poplars and Willows). Refer to Section 7.5 for appropriate setback distances.

7.7.6 Setbacks for coniferous trees are to be no less than the distances indicated above, but will be reviewed and approved on a case by case basis in regard to concerns over potential mature size. Coniferous trees must maintain clearance from fence lines at maturity.

7.7.7 Planting Populus spp. on parkland adjacent to private property is generally not recommended. However:

- Should Northwest Poplar, Balsam Poplar and Cottonwood be referenced, the minimum setback distances from private property lines shall be 15m due to root encroachment concerns.
- Should Northwest Popular, Balsam Popular and Cottonwood be referenced, the minimum setback distances from hard surfaces shall be 10m, unless special construction details are used.
- All other Populus spp., including columnar varieties, shall have a minimum setback of 10m from private property lines and 5.0m from hard surface areas where sub surface compaction has occurred.
- Some allowances may be made at the discretion of Forestry if there is special construction mitigation in place, such as a root barrier.

7.7.8 Shrub setbacks from shrub bed edges shall reflect mature diameter with the entire shrub contained in the bed. Mature spread cannot encroach on the sidewalk or onto fences. There must be 500mm from the edge of the bed or fence or sidewalk from the mature spread of the shrub.

7.7.9 Planting bed locations should accommodate the use of large turf maintenance equipment. Provide a minimum 2.5m clearance between the edge of a bed and obstructions such as fencing, furniture, buildings, individual trees etc. Where possible, shrub beds should be designed with tapered or flowing edges (no 90 degree corners) to allow for ease of mowing, and eliminate the need for hand trimming.

7.7.10 Where there is turf between planting beds and adjacent fences the minimum distance shall be 2.5m.

7.7.11 On drawings, shrub symbols should be shown at mature size with no overlap. However ground covers symbols may be overlapped at the discretion of the City. The intent is to achieve a balance between aesthetic impact, shrub health and maintenance concerns.

7.7.12 There shall be a minimum 3.0m planting setback of shrub beds from play space envelopes (playground equipment and splash parks). The design preference is naturalized planting.

7.7.13 On School playground sites, there shall be no shrub beds within 30m of the playground envelope. The design preference is naturalized planting.

7.8 Tree and Shrub Minimum Sizes

7.8.1 Unless noted otherwise or approved by the Director/ Parks, all planting shall be a minimum of 50mm caliper for deciduous trees and 2.0m height for Coniferous trees. A tree mix of deciduous and coniferous is generally encouraged where practical.

7.8.2 If proposed trees are less than the minimum caliper, additional plant material may be required, at the discretion of the City.

7.8.3 80mm caliper and larger trees will be accepted in boulevards if tree root trenching is proposed, and if there are no conflicts with utilities. A one year warranty period from CCC to FAC will apply in this case. Milestone inspections for tree root trenching will be required during trenching excavation. The consultant is to request an inspection with Forestry five business days prior to tree root trenching. If tree root trenching in boulevards is not proposed for trees 80mm caliper and larger, then a two year warranty period from CCC to FAC will apply. The City reserves the right to evaluate this standard on a case-by-case basis.

7.8.4 Coniferous trees up to the height of 3.6m will be permitted with an appropriate root ball specified in the current edition of The City of Edmonton Design and Construction Standards. All proposed trees planted with a tree spade will need to follow the current Specification 02930 Trees, Shrubs and Ground Covers, ball sizes for coniferous trees item 3.4.5, and will be treated as a transplant.

7.8.5 Minimum shrub spacing shall be based on spread at maturity. With the exception of naturalization areas, shrub size at planting shall be a minimum of 300mm height for deciduous shrubs and a spread of 450mm for coniferous shrubs. Reference Specification 02930 Trees, Shrubs and Ground Covers.

7.9 Required Planting Quantities for Open Spaces

7.9.1 The following tree quantities are outlined in the Urban Parks Management Plan (UPMP) as the minimum requirements for base level development. The total area of parkland, minus retained tree stand areas, shall be used to calculate planting requirements. Credit for individual retained specimen trees may be considered by the Director/Parks.

- River Valley and Ravine Parks (where planting is required): 70 trees/ha.
- District Activity Parks: 45 trees/ha.
- Pocket Parks: 70 trees/ha.
- Urban Village Parks: 65 trees/ha.
- School and Park Sites: 55 trees/ha.
- Greenways: 200 trees/ha (Note: this has been reduced from 240 trees/ha as specified in UPMP) assuming 10m width and 2 trees/10 lineal meters; (UPMP specifies 8-10m spacing).
- 70 trees/ha is required for other parkland not identified above.

7.9.2 Seven shrubs can be substituted for one tree, to a maximum of 10% of the total number of required trees for each site, at the discretion of Parks.

7.9.3 The Director/Parks retains the right to request variances from the required quantities as listed above.

7.9.4 Where naturalization planting is use, plant material may be substituted as per the following:

Full Size Tree	Potted Tree	Potted Tree	Shrubs	Trees or Shrubs - Whips & Plugs
(1) 60mm Cal.	(2) 40mm Cal.	(5) 20mm Cal.	(7) 5 Gallon Pot	(25) minimum 100mm Pot

- A maximum of 10% of the required 60mm caliper trees on a site may be substituted for smaller material.
- Emergent material does not qualify into the shrub or tree equivalency.
- Shrub size requirement can be substituted at a rate of 5 shrub plugs for 1 full size shrub.
- Example: One 60mm caliper full size tree can be substituted with either two, 40mm caliper potted trees, or five 20mm caliper potted trees or twenty five 100mm pots (tree or shrubs, whips and plugs).

7.10 Approved Tree Species, Spread and Spacing Requirements

7.10.1 Forestry and Parks have developed a list of acceptable tree species with recommended spacing and spread, reference Appendix F Tree Diversity Guidelines and Approved Species Spread and Spacing. Spacing may be changed at the discretion of Forestry, or by acceptance of drawings via the tender process. Agreed upon minor adjustments may be made on site. In all situations, minimum utility off-set distances must be adhered to, unless otherwise approved.

7.10.2 Trees identified in Appendix F Tree Diversity Guidelines and Approved Species Spread and Spacing, must be suitable for the location and microclimate, and will be reviewed for by Forestry during the drawing review process. It is recommended that discussions are held with Forestry in advance of drawing submission for plantings that might be different from normal applications and/or to determine if current urban conditions may preclude certain tree species on the list. The Landscape Architect may propose alternative tree species not listed.

7.10.3 When grouping Coniferous trees, place trees in mulched beds with appropriate spacing as per the recommended tree spacing.

7.10.4 Tree spacing and species selections should consider site specific CPTED principles and sightline concerns.

7.11 Planting Perennials

7.11.1 Perennials in planting beds will be reviewed on an individual basis and accepted at the discretion of the Director/Parks.

7.11.2 Only low maintenance, non-invasive and hardy perennials will be accepted.

7.12 Planting Annuals

7.12.1 Annual plantings shall not be approved in planting beds to be maintained by the City.

7.12.2 Annuals may be approved in planting beds by the Director/Parks on a temporary basis, when maintained by the Developer or other groups. Annuals must be removed prior to FAC approval, with the area rehabilitated as indicated and approved on the landscape drawings.

7.13 Tree Protection Zone

7.13.1 Where sod will not be placed until completion of all construction activities, protection of boulevard trees is required. Reference Detail LA101 Tree Protection Zone. The Landscape CCC may be granted without sod being installed, on local road boulevards.

7.13.2 All tree protection zones are to be removed by the Developer, after issuance of the FAC by Parks, unless otherwise directed.

7.14 Weed Control

7.14.1 Noxious weeds must be controlled in accordance with the Provincial Weed Control Act. Prohibited noxious weeds must be eradicated in accordance with the Provincial Weed Control Act (see Reference section).

7.14.2 Aquatic invasive species shall be controlled as per the Fisheries (Alberta) Act.

7.14.3 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 City, and all costs shall be borne by the Developer/Contractor.

7.14.4 Natural areas and naturalized areas must be in compliance with the Weed Act and associated Natural Area Management Plan (NAMP), prior to issuance of FAC.

8. Site Specific Features

8.1 Boulders

8.1.1 The use of boulders is encouraged to provide interest to the landscape. Boulders are to be located in shrub beds or other non-mowed areas to minimize maintenance activities such as grass trimming.

8.1.2 Boulders are to be immovable by hand and located in visible areas to minimize public safety hazards.

8.1.3 Refer to Construction Specification 04420 Feature Boulders and Collected Stone.

8.2 Site Furniture and Setbacks

8.2.1 Furniture such as benches, picnic tables and litter receptacles may be provided on parkland if appropriately located and approved by the Director/Parks.

8.2.2 Contact information on litter receptacles shall be placed and made visible on developer/contractor maintained sites.

8.2.3 Vandal-proof hardware (tamper resistant and locking) is required on all site furniture, with a minimum of one per receptacle, two per bench and two per picnic table. Refer to Construction Specification 02870 Site Furnishings for technical requirements.

8.2.4 Minimum required setback distances for site furniture, measured from the outer face of the amenity, are as follows:

- Benches - 1.0m minimum from back of walkway.
- Litter Receptacles – 600mm minimum from walkway and minimum 3.0m from benches.
- Picnic Tables - 1.0m minimum from back of walkway.

8.2.5 All amenities must be place on a concrete pad.

- The concrete pad should extend 150mm beyond the outside edges of the site furniture to accommodate mowing.

8.3 Fencing General Requirements

8.3.1 All fencing heights on residential properties shall conform to the Edmonton Zoning Bylaw 12800, Section 49, Fences, Walls and Gates in Residential Zones.

8.3.2 All Wood Screen Fencing shall conform to City of Edmonton Details LA400-LA406.

8.3.3 All Wood Screen Fence step down shall conform to the Edmonton Zoning Bylaw 12800, Section 49. Also reference City of Edmonton Detail LA406.

8.3.4 All Wood Screen Fencing shall have a gap not exceeding 50mm between finished grade and the bottom of the lower stringer. Reference City of Edmonton Detail LA405.

8.3.5 All Sound Attenuation Fencing shall conform to the City of Edmonton Design and Construction Standards, Volume 2: Roadways, Detail 5205.

8.3.6 All Chain Link Fencing shall conform to City of Edmonton Details LA407-LA409A.

8.3.7 Other styles of fencing may be proposed subject to approval by Parks.

8.3.8 Any disturbance to landscaping as a result of fencing construction shall be remediated to the satisfaction of City Operations Parks and Roads Services.

8.4 Fencing Adjacent to Open Space

8.4.1 School, park sites and other park site are to be separated from private development by permanent fencing. Fences including the concrete pile must be constructed wholly within private property. Fencing is to be a minimum 1.2m height and suitable for restraining pets.

8.4.2 Fencing adjacent to parkland with formalized sports fields or future sports fields shall be a minimum 1.8m height and protect against stray balls. Since sports fields on a site may be realigned in the future, any private properties adjacent to a site with potential future sports fields shall be separated using 1.8m height fencing. Contact a Planner/Parks or Landscape Architect/Parks pertaining to the site program.

8.4.3 Should the developer choose to provide above base level park site development (i.e. Urban Village Parks, School Park Sites and District Parks), improvements will fall under the Developer Funded Parks Initiative requirements and Temporary Wood Rail Fencing requirements may be reduced and/or eliminated at the discretion of the Director/Parks. Upon completion of school and park sites, grade, topsoil and seed, the Developer is to install a Temporary Wood Rail Fence. Reference City of Edmonton Detail LA401. All undeveloped park sites are to be left undisturbed. The City of Edmonton will take ownership of the Temporary Wood Rail Fence when a FAC is issued for the landscaping on the subject site. The Developer is required to restore the site back to its original condition, should any disturbance occur.

8.5 Site Drainage and Runoff Reduction

8.5.1 Due to the prevailing trend toward warmer, drier conditions and large storm events, Parks encourages implementation of designs which facilitate increased infiltration and percolation to enhance on-site turf, tree and shrub growth, prior to entering mechanical drainage systems. We encourage the use of Low Impact Design principles, however, mechanical drainage may still be required.

9. Specific Developments

9.1 School and Park Sites

9.1.1 Refer to the Urban Parks Management Plan (UPMP) for definitions of park types and base level development requirements. The following selected standards address specific design issues that commonly arise on sites containing schools, playgrounds and/or community league installations.

9.1.2 Program requirements for new school and park sites vary from site to site, depending on school type, park size and the requirement for a Community League envelope. Designers are advised to contact a Planner/Parks or Landscape Architect/Parks to determine the program for a specific site before proceeding with design. This includes space requirements for School Sites, Community League Sites, Sports Fields and passive areas.

9.1.3 All school and/or park sites are to be fully serviced along the entire roadway frontage including three phase power as per Subdivision Authority approval. Pocket parks of 0.5 ha or smaller may require three phase power and will be dealt with on an individual basis.

9.1.4 School and/or park sites may have other specific design considerations and requirements including, but not limited to, the following:

- A school bus drop-off zone with adequate roadway frontage to accommodate bus parking.

- Avoid access points to the schools, playgrounds, and Community Leagues through/across vehicular movement areas.
- Locate playgrounds centrally between Community League sites and schools are desirable. Where ever possible, playgrounds should also have visual connection to any publically accessible heated areas/structures but not be in their shadow in winter.
- Major activity nodes such as rinks, tennis courts, parking lots and playgrounds should be located as far from adjacent private property as possible.
- Community League sites are typically provided with parking space for approximately 30 vehicles.
- Connecting walkways through school and park sites are recommended to encourage neighbourhood walkability.
- Drainage from general park areas is to be directed around school sites, as these sites are considered to be separate properties.
- Drainage from general park areas is to be directed away from critical areas such as buildings on community league sites.
- Drainage is to be directed away from playgrounds to reduce the potential for flooding.

9.2 Sports Fields

9.2.1 Sports fields require a minimum 6.0m safety setback beyond the field of play. The setback area must be turf with no vertical objects, and without hard or granular surfacing. For ball diamonds, this also extends to a line 6.0m beyond and parallel to an extension of the backstop, down the first and third base lines, and behind the backstops. Larger setbacks to property lines are generally desired, dependent on field orientation and level of play. Contact a Landscape Architect/Parks for more information.

9.2.2 Contact a Landscape Architect/Parks for sizes, slopes and other sports field design requirements.

9.2.3 Sports fields may be crowned or slanted in one direction with a recommended slope of 1%. Sheet drainage is generally preferable to swales to avoid concentration of drainage and the potential for wet areas, as well as encumbrance of the site. Slopes greater than 1% from end to end are not recommended on soccer fields but may be considered cross-wise.

9.2.4 All sportsfields must be inspected during sub base installation and prior to topsoil installation by Director Parks Operations or Designate.

9.2.5 Topsoil sample results must be submitted and approved by Director, Parks Operations or Designate for approval and adherence to soil standards prior to installation.

9.2.6 Proposed turf grass mixes must be submitted to the Director, Parks Operations or Designate for approval prior to seeding sports fields. Seed lot tags must be submitted to Parks Operations post seeding in order to verify seed source and type.

9.2.7 Project Manager and or Consultant must supply maintenance and establishment records to the Director, Parks Operations or Designate on internally built sports fields or to Director, Parks Planning or designate on developer built sports fields. These records must outline: Mowing, Irrigation, Weed Management, Fertilization; (type and rate), Aeration, Overseed and Topdressing including the date each task occurred, provided over grow-in period (CCC to FAC).

9.3 Playgrounds

9.3.1 All new or upgraded playgrounds must meet the current CSA Z614 Children's Playspaces and Equipment, and The City of Edmonton Playground Equipment Standard. The Landscape Architect must consult with Parks Operations, Playspaces prior to proceeding with design work.

9.3.2 Designs for play spaces that are innovative and provide a diversity of play and learning experiences are encouraged.

- All manufacturer documentation and reference materials must be submitted for drawing review. This includes equipment for play grounds, splash pads, skate parks and fitness pods. Refer to the City of Edmonton Playground Equipment Standard.

9.3.3 A drainage sump is not permitted unless there is no acceptable drainage alternative, which shall be subject to approval. The Project Manager and /or Consultant must submit drainage alternatives to the Director, Parks and Roads Operations or Designate on internally built Playspaces or to the Director, in Sustainable Development or designate on developer built Playspaces for approval. Drainage shall be connected to the City of Edmonton Drainage infrastructure, such as a manhole or catch basin.

9.4 Greenways

9.4.1 Areas accepted as Greenways are to have a minimum 10m width unencumbered with utilities or easements to accommodate pathways, site furniture and associated planting. Variances to this requirement will be considered on a site-specific basis.

9.5 Natural Areas

9.5.1 Areas designated as Natural Areas must adhere to the site-specific Natural Area Management Plan (NAMP) or, if one is not available, use the City-Wide Natural Area Management Plan.

10. Road Right-of-Ways

10.1 General Landscape Requirements

10.1.1 All landscaping in road R.O.W's shall conform to setbacks as described in Section 7.5 Tree Setbacks from Walkways and Roads.

10.1.2 All trees shall be planted as per the City of Edmonton Design and Construction Standards, Volume 2: Roadways.

10.1.3 Alternative tree and shrub species for roadway planting will be considered and are subject to approval by the Director/Parks.

10.2 Local and Collector Boulevards

10.2.1 No planting beds, shrubs or groundcovers shall be installed on local or collector roads, with the exception of traffic calming islands.

10.2.2 Shrubs and trees may be planted on traffic calming islands with approval by Transportation Services and the Director/Parks. Where possible, use a minimum of one tree per island to indicate plant material in bed. Shrubs must be low growing, with a maximum 750mm height.

10.2.3 Shrubs and trees may be planted along the fence at neighbourhood entrances with approval by Transportation Services and the Director/Parks. The mature shrubs spread must be 500mm back from the fence and not be a suckering species.

10.2.4 Boulevards separated by walks must be graded and topsoiled with a minimum depth of 100mm, and sodded between the back of curb and the walk by the Developer to the satisfaction of the Director/Parks.

10.2.5 There are no tree planting requirements on local boulevards, although the addition of trees is encouraged.

10.3 Collector Roadways

10.3.1 Tree planting is required on collector roads, and shall be the minimum requirement of one tree per 10 linear meters on both sides of the collector roadway. Trees shall be spaced as appropriate to the species and as recommended by Forestry, Spacing and must respect minimum offset distances to existing utilities within the R.O.W. Reference Appendix F Tree Diversity Guidelines and Approved Species Spread.

10.4 Arterial Roadways

10.4.1 The design intention of arterial planting is to provide shade and block low sun, with the exception of commercial and school areas. The standard does not dictate that there must be rows of trees and shrubs, only an equivalent amount of plant material. Designs unique to each arterial roadway are encouraged. The City of Edmonton is moving towards a more naturalized aesthetic along many roadways. Naturalization designs for arterial roadways should be used in appropriate locations, using the appropriate grass, shrub and tree species. Reference Section 7.3 Naturalization.

10.4.2 Arterial R.O.W must be graded, topsoiled, seeded or sodded, and landscaped to the satisfaction of the Director/Parks.

10.4.3 There shall be a row of boulevard trees at a minimum requirement of one tree per 10 linear meters on both sides of the arterial roadway. Trees shall be spaced as appropriate to the species and as recommended by Forestry. Reference Appendix F Tree Diversity Guidelines and Approved Species Spread and Spacing.

10.4.4 There will be a row of shrubs at 1.2m spacing in a shrub bed behind the walkway on each side of the arterial. Perennials, ground covers, and tree plantings may be substituted at an equivalent rate, or plant quantities may be adjusted to meet the mature spread requirements of the proposed plant material as determined by the Director of Parks.

10.4.5 Where possible, new utility locations shall be adjusted accordingly to accommodate landscaping, as per Section 7.4 Designated Roadway Tree Planting Corridors, as long as new utility location clearances conform to the requirements outlined in the City of Edmonton Design and Construction Standards. For existing utilities, the minimum offset distances specified in the City of Edmonton Design and Construction Standards shall be maintained.

10.4.6 On 4.5m or greater width arterial medians, there shall be a row of trees at a minimum requirement of one tree per 10 linear meters of arterial median. Trees shall be spaced as appropriate to the species as recommended by Forestry, reference Appendix F Tree Diversity Guidelines and Approved Species Spread and Spacing. Planting in narrower medians will be considered on an individual basis by Transportation Services and Parks. Trees must be contained within a continuous mulched bed.

10.4.7 Within commercial and school zones, the requirement for shrubs along an arterial roadway is waived, but where opportunities exist, shrub planting in these areas is encouraged.

10.4.8 Planting requirements for tree and shrubs on arterial sections adjacent to natural areas will be reviewed on an individual basis, and a reduction of the planting quantities may be considered.

10.4.9 Intersections and areas presenting safety sight line conflicts are exempted from the above requirements. Intersections will be evaluated by Transportation Services to ensure that safety sight lines requirements are met.

10.4.10 On existing arterial roadways, the arterial roadway standards shall only be applied when the arterial boulevard includes a sidewalk and is graded to its final grade. Trees are to be planted at their ultimate location and grade. Allowance shall be made for conflicts with existing utilities.

10.4.11 When roadway construction is implemented in stages, the landscape requirement applies only for the side of the roadway that is being developed to its permanent configuration.

10.4.12 Naturalization designs for arterial R.O.W. should be used in appropriate locations. Reference Section 7.3 Naturalization.

10.4.13 When only one side of the arterial is being developed, future trees and shrub beds shall be shadowed in on the landscape drawings on the side of the arterial not being developed, to accommodate future budgeting.

10.5 Industrial Areas

10.5.1 Arterial roads in industrial areas require landscaping as per arterial requirements above. The shrub requirement will be evaluated on a case-by-case basis by the Director/Parks dependent on the existence of frontage landscaping by adjacent owners. It is anticipated that most industrial area arterials will require shrub planting. Naturalization is encouraged in industrial areas. Reference Section 7.3 Naturalization.

10.5.2 Arterial and collector roads in industrial areas require a row of trees on each side, spaced as per Forestry recommendations.

10.5.3 Local industrial roads require five trees per side, extending back from an intersection with a collector or an arterial. Adjust utilities as required.

10.6 Major Entrance Routes to the City and Downtown

10.6.1 Where appropriate, boulevards and medians shall be designed to include continuous planting beds with trees, shrubs and groundcovers.

10.7 Major Commercial Corridors

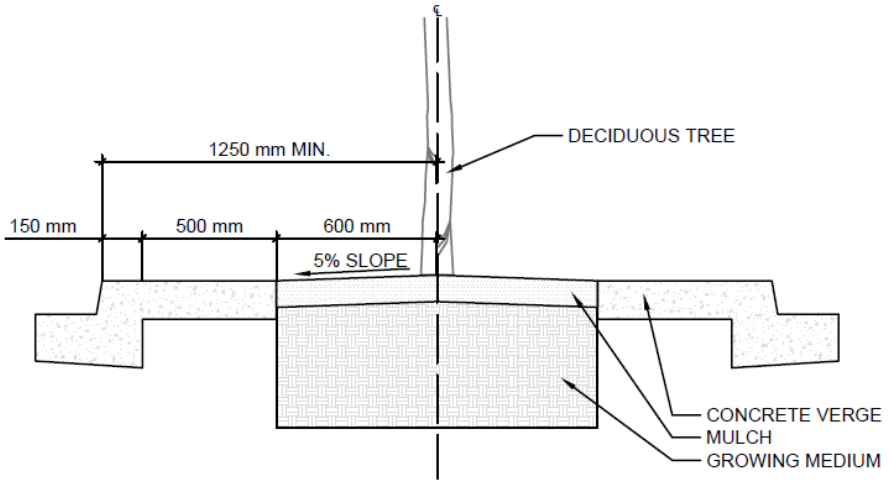
10.7.1 Where appropriate, boulevards and medians shall be designed to include continuous planting beds with trees, shrubs and groundcovers.

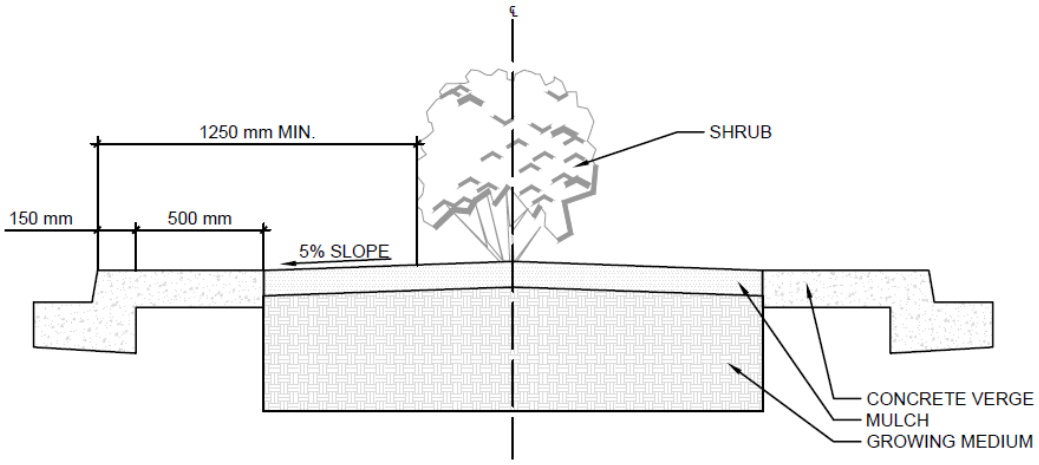
10.8 Road Islands, Median, and Entry Features

10.8.1 All road islands, medians and entry feature designs are encouraged to be low maintenance. Where appropriate, designs shall include trees, shrubs, groundcovers, mulch, sod and boulders to the satisfaction of the Director/Parks.

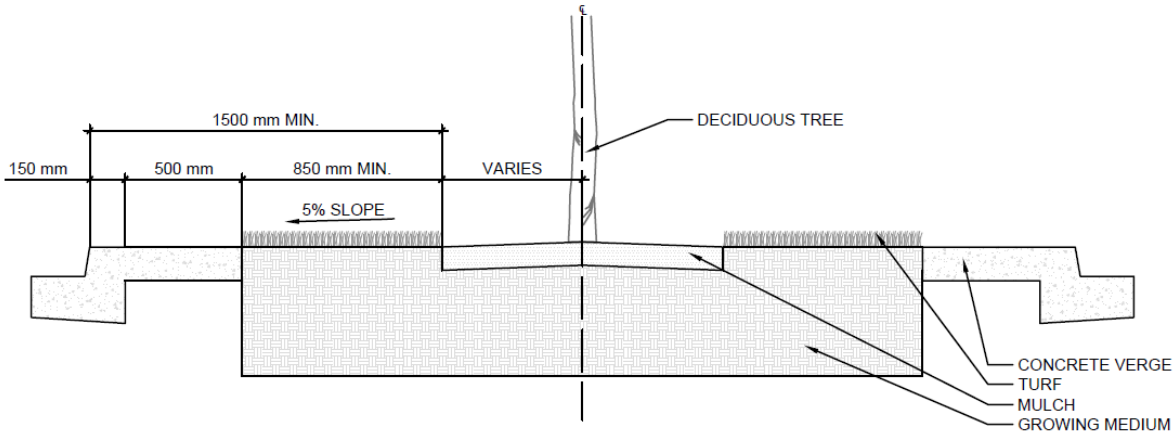
- Road islands and medians required a 500mm concrete verge on either side of the road island/medians.
- Shrubs and Perennials must be low growing with a maximum mature height of 750mm.
- Trees planted in center medians are to be in continuous mulched beds.

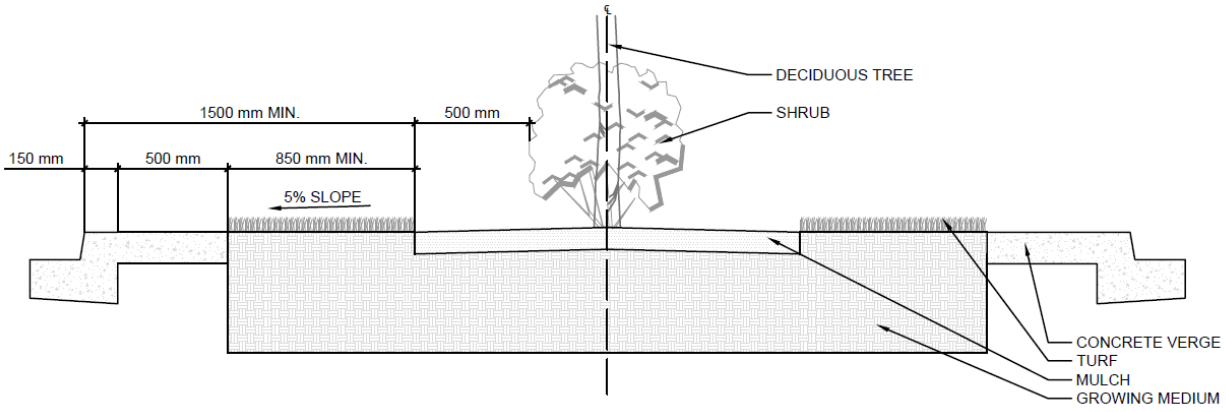
10.8.2 A minimum 1.25m setback measure from the face of curb, is required on both sides of the median and mature plant material shall not extend into the setback (to accommodate snow storage and spring sediment removal).





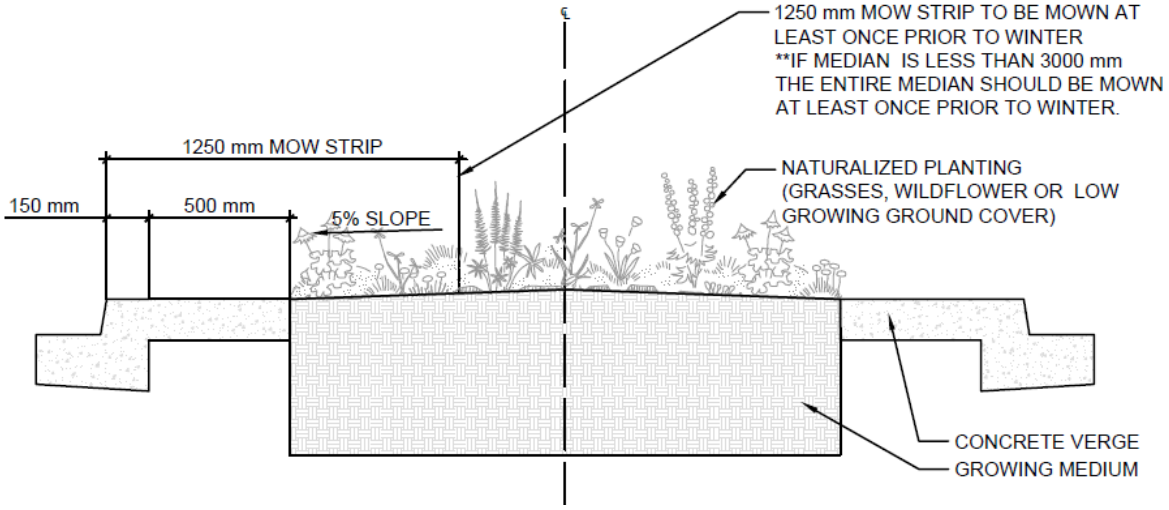
10.8.3 Should turf be specified a minimum 1.5m setback measure from the face of curb is required; the concrete verge may be included in this measurement. Mulch beds or mulch tree wells shall not extend into this setback.





10.8.4 Medians are appropriate areas for naturalization. Medians that incorporate naturalized trees and shrubs must follow required setbacks from walkways and roads as per Clause 7.5. Narrow medians can be naturalized with grasses, wildflowers and low growing ground cover as long as plant material does not fall onto the roadway. A minimum median width is not required in order for a median to be considered for naturalization. Determining which medians are appropriate for naturalization should be based on safety requirements (e.g. sight lines, mowing access), environmental conditions (suitability for plant material), and the aesthetic of the surrounding landscape (i.e. proximity to existing naturalized or natural areas).

10.8.5 Naturalized roadways and medians do not require a mowed buffer strip to be consistently maintained. A minimum of 1.25m buffer strip measure from the face of curb should be mowed at least once prior to winter in order to accommodate snow storage and spring sediment removal. Depending on the type of equipment used, mowing a buffer strip may be required up to three times during a growing season in order to accommodate for spring sediment removal. For medians less than 3.0m wide the entire median should be mowed in the fall in preparation for sediment removal the following spring.



10.8.6 The required cross slope shall not be less than 5% from center of island to curb.

10.8.7 Shrubs symbols shall be shown at mature spread with no overlap on the landscape drawing. Shrubs must maintain a minimum 500mm offset between the edge of the mature shrub and the edge of the shrub bed. Shrubs cannot extend into the above outlined setback.

10.8.8 Turf specified in road islands or medians shall be designed to allow a 1300mm driven mower to access from the end of the median and drive parallel to traffic with both wheels on the median. At no time should the mower be required to run perpendicular to traffic.

10.8.9 If aggressive groundcovers (i.e. gout weed), are proposed for use in road islands or medians, no other groundcovers or shrubs shall be planted in the same planting bed.

10.8.10 Free standing architectural features shall not be located within turf areas unless appropriate consideration is given to maintenance and mowing requirements. Examples of fee standing architectural features include: signs, sculptures, light poles or entry gates.

10.8.11 All paving stone and paving stone headers, concrete or other special hard surfaced verges or walks shall be to the satisfaction of Transportation Services.

10.8.12 Planting details of road islands and medians are to be drawn at an appropriate scale and shall illustrate a suitable rooting zone for proposed planting, indicating the soil depth, width, mulch and type.

10.8.13 Cross sections of road islands and medians shall be drawn to an appropriate scale showing:

- Above and below ground utility alignments within 3.0m of road island;
- Curb face;
- Back of curb, verge or walk;
- Tree and shrub setbacks;
- Proposed planting and spacing;
- Landscape mulches and free-standing features, (i.e. signs, gates, pedestals, sculptures and light poles); and,
- Private property lines.

10.8.14 Planting cross sections and planting installation details shall be cross-referenced with engineering and landscape plans which support the proposed design solution.

10.8.15 Above and below grade utilities should not be located under landscaped road islands or medians to avoid conflicts with landscape improvements.

11. Walkway, Emergency Rights-of- Way and Top of Bank Landscape Requirements

11.1 Walkway and Emergency Right-of-Ways

11.1.1 R.O.W. areas must be graded, topsoiled, and seeded or sodded, including planted with trees, shrubs and groundcovers to the satisfaction of the Director/Parks.

11.1.2 Groundcovers such as herbaceous perennials are not desired, although exceptions for very hardy species may be made by the Director/Parks. Invasive groundcovers such as goutweed will not be accepted.

11.1.3 There shall be a minimum of four trees per 35 linear meters of walkway R.O.W. Shrubs may be substituted at a rate of seven shrubs per tree to a maximum 10% of the total number of pathway trees required, unless otherwise approved.

11.1.4 All trees in R.O.W's with a 1.5m walkways shall be set back a minimum distance of 1.0m from center of tree trunk to the adjacent private property lines, in order to allow for root trimming at the discretion of the Director/Parks. Trees must be contained within mulched beds. All minimum utility setbacks are to be maintained. Reference Section 7.4 Tree Setbacks from Utilities and Property Lines.

11.1.5 Furniture may be provided by the Developer and placed at strategic locations within a walkway R.O.W. (i.e. entry points).

11.1.6 Bollard barrier post standards and spacing must be approved by Transportation Services, and, where shrub beds are proposed, included within the mulched bed for ease of maintenance.

11.1.7 Where possible, below grade utilities should be located under hard surfaced walkways to avoid conflicts with landscape improvements.

11.1.8 Where a walkway is designated as an emergency access route, shrubs must be included within the R.O.W. with a minimum 0.5m setback from the edge of the mature shrub to the edge of the walkway. Plant material locations must maintain an unobstructed clearance of 4.0m to provide emergency vehicular access.

11.1.9 For walkway R.O.W's, there shall be no shrubs exceeding a mature spread of 2.0m.

11.1.10 The following design issues shall be considered when reviewing proposed plant materials:

- Maintain adequate year-round sight lines through the walkway R.O.W. for pedestrian safety and security.
- Maintain a minimum 2.5m branching height for all deciduous trees in R.O.W's at maturity to allow adequate pedestrian clearance beneath tree branches.
- Utilize low maintenance hardy plant species suitable for Edmonton's climatic zone of 3a.
- Shrubs with horizontal root habits (e.g. Prickly Rose – Rosa Acicularis) shall not be allowed along private property lines.
- Encourage use of pyramidal/columnar tree forms to avoid tree branches overhanging into adjoining privately owned lands.

11.2 Top of Bank Landscape Requirements

11.2.1 All Top of Bank development must conform to The City of Edmonton Top of Bank Policy. Reference Appendix B Top of Bank Policy C542.

11.2.2 Top of Bank landscapes shall be inspected to ensure that they match existing grades. The inspection will review the following requirements:

- There is no dumping on the site;
- The site must be controlled as per the Weed Act;

- The trail should be offset a minimum of 1.5m from private property, unless the geotechnical report would necessitate encroachment of the minimum offset, and provide a mow strip of 1.0m on either side of the trail; and,
- The site is left in a state that meets the City's satisfaction.

12. Major Utility Corridors

12.1 General Landscape Requirements

12.1.1 Utility corridors may be landscaped, and are to be planted with a minimum of 75 trees per hectare. Tree plantings should be designed and massed into major groupings in mulched tree beds. Minimum deciduous tree caliper shall be 50mm. Minimum coniferous tree height shall be 2.0m. In the event that the Utility Authority will not allow landscaping in the R.O.W. the requirement for all or a portion of the landscaping will be waived.

12.1.2 The Landscape Architect is responsible for contacting the appropriate Utility Authority to determine acceptable landscaping parameters, such as tree species, sizes, locations, etc. on the utility R.O.W.

12.1.3 The Landscape Architect is responsible for circulating and obtaining approval for the Landscape Drawings from the Utility Authority, and coordinating a formal Crossing Agreement between the Developer and the Utility Authority. The Crossing Agreement is to be included with any Landscape Plans to the City for review.

12.1.4 The Landscape Architect shall provide to the Director/Parks written confirmation from the Utility Authority when landscaping in utility corridors is not permitted.

12.1.5 Shrubs shall be massed within planting beds.

12.1.6 At the discretion of the Director/Parks, the above landscape requirements may be substituted in whole or in part with a naturalization landscape design of equal value and quality.

12.1.7 Healthy existing trees within or abutting the utility corridor shall be preserved wherever possible in accordance with the City of Edmonton Corporate Tree Management Policy C456A, administered by Forestry. Retained tree or shrub areas within the corridor are exempt from planting requirements.

12.1.8 Landscape amenities (i.e. street furniture) may be provided by the Developer and placed at strategic locations within the utility corridor to the satisfaction of the Director/Parks and the Utility Authority.

12.1.9 Walks, when provided within the R.O.W. shall be to the satisfaction of Sustainable Development, Transportation Services and the Utility Authority.

12.2 Landscape Requirements for Alta Link Corridors

12.2.1 The Landscape Architect shall ensure all transmission or distribution towers, pole lines, pylons, and overhead and underground cables are accurately plotted on the landscape plans. All minimum setbacks from these facilities shall be referenced on the landscape plans to ensure no landscape improvements encroach into specified safety zones.

12.2.2 The Landscape Architect shall circulate landscape plans to Development Coordination through the standard plan circulation process.

12.2.3 The Director/Parks will review and approve landscape plans through the circulation process.

12.2.4 The Landscape Architect shall field stake all landscape improvements identified on the approved landscape drawings with the contractor prior to installation, having regard for the required safety setbacks from existing utility facilities within the R.O.W.

12.2.5 The Developer shall not commence construction until the appropriate Authorities (e.g. Alberta One Call, Shaw, etc.) have flagged below grade utilities.

12.2.6 The Developer shall not commence any ground disturbance until all of the above conditions have been satisfied.

12.3 Requirements for Developing and Landscaping High Pressure Gas Right-of-Ways

12.3.1 These requirements provide for some limited development without compromising the safety and/or integrity of high-pressure natural gas facilities.

12.3.2 These requirements apply to odorized natural gas high pressure pipeline R.O.W. above 100 psi or 740 kPa.

12.3.3 Authorization must be requested and approved by all Utilities for all development on pipeline R.O.W.

12.3.4 Development is not permitted on a R.O.W. that contains an unodorized pipeline.

12.3.5 Contouring is acceptable within the R.O.W. Subgrade fill cannot be reduced over the pipeline but it may be increased. The total subgrade fill cannot exceed 2.0m over the pipeline. This will allow access to the pipeline for repairs without having to shore or excessively back slope the excavation. Contouring must not restrict access to the R.O.W.

12.3.6 Parallel walkways must be located between the pipeline and the nearest boundary of the R.O.W. and must not encroach onto the R.O.W. by more than 3.0m, nor be constructed over the pipeline.

12.3.7 Trees shall be planted with a minimum setback of 5.0m from the pipeline and have a mature height to a maximum of 10m. The mature canopy cannot extend over the pipeline.

12.3.8 Shrubs shall be hand planted with a minimum setback of 2.0m from the pipeline, and have a maximum mature height of 2.0m.

12.3.9 The responsibility for maintaining any of the above developments on the R.O.W. shall rest with the municipality once FAC is granted, unless otherwise negotiated.

12.3.10 Appropriate signage of these developed R.O.W. may be provided and maintained by the Developer and The City.

12.3.11 Any other proposed developments and/or use for the R.O.W. are not permitted.

12.3.12 Pre-existing deviations from the standards which are otherwise non-compliant shall be allowed to continue until redevelopment occurs.

13. Constructed Wetlands, Storm Water Management Facilities

13.1 General Landscape Requirements

13.1.1 The City of Edmonton is moving towards a more naturalized landscape aesthetic in certain areas. Constructed storm water wetlands are human-made systems, designed, constructed and operated to emulate natural wetlands or many of their biological processes. Constructed wetlands should follow Drainage Design and Construction Standards.

13.1.2 Interpretive signage is encouraged within storm water management ponds and natural wetlands. Signage would identify the design intent for the area to be natural or naturalized, and provide education for public awareness on the establishment and management of the pond. Signage would also provide education on the environmental, social, and economic benefits for naturalized landscapes or natural wetlands. The City encourages developers to design custom interpretive signage for each site. Proposed signage designs are required to be reviewed and approved by Parks.

13.1.3 Developer or Contractor contact information shall be placed and made visible at developer naturalized storm water management facilities and natural constructed wetlands. City of Edmonton contact information for general questions about naturalization will also be included on the sign. A sign shall be posted by the Developer and kept in place during construction, establishment, and maintenance phases of naturalized storm water management ponds and constructed natural wetlands. Once the site receives FAC the developer/contractor will remove the sign.

13.1.4 Storm water management lakes (wet ponds) must be naturalized within the 1:5 year flood line, and naturalization is encouraged above the 1:5 year flood line when appropriate according to design and ecological function.

13.1.5 Constructed wetlands, wet ponds and areas surrounding new storm water management facilities must be graded, topsoiled, seeded or sodded, and landscaped by the Developer to the satisfaction of the Director/Parks.

13.1.6 Plant materials shall be selected to respect soil characteristics, side slopes, sun orientation, type of facility and its intended use.

13.1.7 Public lands within the facility must be planted with a minimum of 70 trees per hectare. In wet ponds this area will be calculated from above the Normal Water Level.

13.1.8 The area for quantity calculations shall be calculated from the Normal Water Level. A limited number of trees of flood tolerant species may be planted below the 1:5 year flood level, subject to approval of the Director/Parks. These trees will be credited towards the required number.

13.1.9 Shrubs shall be massed within planting beds above the 1:5 year flood level to create major focal areas in the slopes of the pond. It is recommended that trees are positioned within mulched planting beds.

13.1.10 As per Drainage Design and Construction Standard for constructed wetlands natural vegetation should be established between the normal water line and high water line. A 2.5m mowed buffer must be kept along the residential fence line.

13.1.11 For storm water management lakes (wet ponds), naturalization as a landscape management technique should be used within the 1:5 year flood line, as well as within shrub beds above the 1:5 year flood line.

13.1.12 Mulch used in shrub and tree beds around storm water management facilities should be designed and managed in a way to allow for minimal disturbance during flood events.

13.1.13 No planting beds containing wood or bark mulch shall be allowed below the 1:5 flood level.

13.1.14 Rock mulch shall not be used within Constructed Wetlands and Storm Water Management Facilities. Refer to Specification 02914 Mulches.

13.1.15 Planting beds below the 1:5 year flood level present weed control difficulties. They may also present potential erosion difficulties leading to sedimentation of the water body.

- These areas are to be weed and erosion free at CCC and FAC inspections.
- A siltation barrier is to be installed around the perimeter of the water area, and any erosion material is to be removed and relocated to its original position on a monthly basis between CCC and FAC.
- Erosion control is recommended around the perimeter of the SWMF, where adjacent lands are bare soil or undeveloped.
- Within the SWMF, shrub overlap of up to 20% mature size is recommended to encourage a stable weed-free, erosion-free environment. The use of fast growing plant species is encouraged.
- Weeds are to be removed on a monthly basis.

13.1.16 Above the 1:5 year flood level, all planting beds are to have a minimum depth of 100mm wood chip mulch, reference Specification 02914 Mulches.

13.1.17 Major storm sewer outlets and inlets should be landscaped with plant materials and boulders to provide visual screening.

13.1.18 At the discretion of the Director/Parks, the above landscape requirements may be substituted in whole or in part with a naturalization design of equal value.

13.1.19 Furniture may be provided by the Developer and placed at strategic locations within the Constructed Wetlands and SWMF's in accordance with Section 8.2 Site Furniture and Setbacks, at the discretion of the Director/Parks.

13.1.20 Special or unique features shall be designed by appropriate professionals and are subject to approval by the Director/Parks.

13.1.21 The site must be designed to permit access of maintenance vehicles from a public roadway including, but not limited to, water trucks, pruning trucks and man lifts. Reference Roadways Construction Detail 5160 Shared Use Path.

13.1.22 All SWMF's require a maintenance access; see the City of Edmonton Design and Construction Standards, Volume 3: Drainage, Section 16.11 Maintenance Access Requirements, for specifics. Parks requires inclusion of maintenance access ramps on Landscape Plans for information only.

13.2 Low Impact Development Facilities

13.2.1 Vegetation selections for LID facilities should consider two basic soil conditions: a well-drained soil that receives periodic inundation, and a slowly drained soil that is moist to wet for most of the growing seasons.

13.2.2 Select plant varieties that will thrive on the site conditions and that grow well together. Species selection should consider:

- Tolerance of seasonal salt loadings depending on facility location;
- Pollutant uptake capacity;
- Maintenance needs, including mowing and pruning;
- Reduction of water and fertilizer needs after establishment; and,
- Resistance to pests.

13.2.3 See the latest edition of the City of Edmonton Low Impact Development Best Management Practices Design Guide for recommended plant species for LID facilities in Edmonton.

13.2.4 See the latest edition of the City of Edmonton Low Impact Development Construction, Inspection, and Maintenance Guide for guidelines on construction, inspection, CCC, FAC, and maintenance of LID facilities.

Appendix A

"Windbreak, Shelter Break Evaluation for Alberta"

SECTION TWO

WINDBREAK, SHELTERBELT EVALUATION FOR ALBERTA

Trees and shrubs planted as windbreaks on the Great Plains have important economic and aesthetic effects, therefore using the cost of establishment and benefits derived and compounded through the years is not realistic. A more realistic value needs to be placed on tree plantings, so that they receive the respect they deserve. A tree with the average life of 100 years that is destroyed at 50 years of age cannot be replaced. Because age is such an important factor, there are two alternatives recommended.

For a belt up to 15 years of age, it is realistic to use the "establishment value". This seems practical because most young shelterbelts can be replaced in a reasonably short time to provide comparable protection. The younger shelterbelts should be valued by determining the establishment cost, plus the cost of annual crop loss, taxes, and other fixed costs of maintaining the land in trees.

ESTABLISHED VALUE

Established value includes costs of land preparation, planting, cultivation and other maintenance for the first five years for "all types of plantings."

A cost of $1465 + (.22 \times 1465)$ is estimated for establishing a stand of 1000 trees per hectare. A 4 per cent (.22) interest adjustment is made for five years. It includes preparation costs, planting costs, maintenance for the first five years (estimated to be establishment time). The cost is then $1.79 per tree.

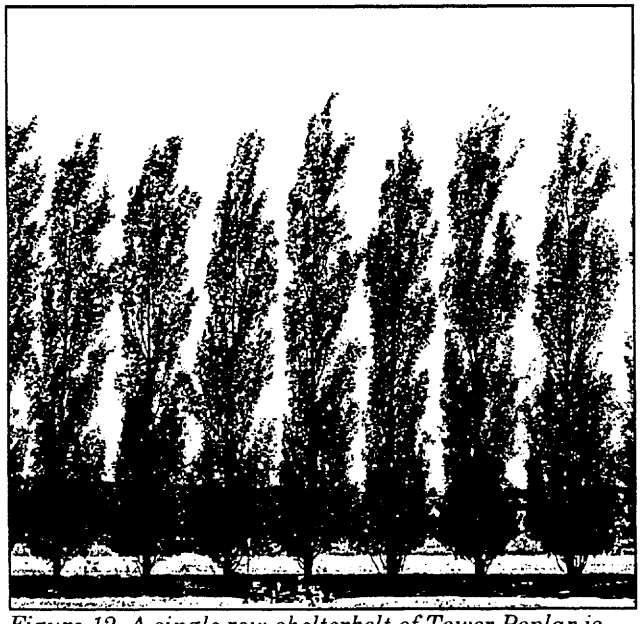


Figure 12. A single row shelterbelt of Tower Poplar is ideal for narrow areas, such as laneways or between fence and buildings.

PROTECTION VALUE

A value for the crop is estimated when protection value is to be determined. This includes present and future benefits to agricultural crops in terms of net yield increase owing to reduced wind and evaporation. Some assumption concerning average crop yield and value are needed to arrive at a monetary value for cropland protection.

To be properly evaluated, a windbreak or shelterbelt must be viewed as a continuous integrated unit. The removal of a single tree or group of trees must be judged as to its effect on the total shelter loss, not on individual tree loss. A scattered group of trees along the fence line of a grain field could be more of a hindrance and removing them may be of benefit to the landowner.

The protected acreage is arrived at by multiplying the length (metres) of the belt by the distance (metres) to which protection extends on one side of the belt. The result is divided by 10,000 (square metres per hectare) to convert to number of hectares protected. The significant protection distance is the average height of tallest trees multiplied by 15.

Example:

Dense shelterbelt 0.8 km (800 m) long and 12 m average height would protect 14.4 ha.

$$\text{i.e. } \frac{800 \text{ m} \times (12 \text{ m} \times 15)}{10{,}000} = 14.4 \text{ ha}$$

Since the average shelterbelt will grow into a different height class each five years over a 45 year life span, the calculation of protected area must be increased each five years.

Assumptions

The assumptions made to arrive at the basic field value had to be based on average situations. Alberta farmers follow a multi-crop system with various crops being planted over the years. It would be impossible to value the crop on a year-by-year basis. The average prices were based on 1989 grain values.

Example 1. 15-year-old belt with a 7.5 m average height

Age	Height (m)	Years	Protected area for each 0.1 km/ha	Year-Hectare
15	7.5 - 10.5	5	1.4	7.0
20	10.5 - 13.5	5	1.8	9.0
25	13.5 - 15.0	5	2.1	10.5
25-45	15+	20	2.6	52.0
		35		78.5

78.5-year hectares × $11.75/hectare per year. $922.38 for each 0.1 km segment appraised. (Protection Value).

Example 2. 25-year-old belt with a 14 m average height

Age	Height (m)	Years	Protected area for each 0.1 km/ha	Year-Hectare
25	13.5 - 15	5	2.1	10.5
25-45	0ver 15	20	2.6	52.0
		25		62.5

62.5 year-hectares × $11.75 per hectare = $734.38 (Protection Value)

Thus the younger windbreak has a higher protection value than the older windbreak because its protection value is increasing over a longer period of time. A 25-year-old planting can be expected to function for another 20 to 25 years at which time replacement must be made. A 45 year expected life span is average. On good moist land expected life span should be increased to 60 years.

These examples of protection value calculation are for shelterbelts of average or better density, uniformity and continuity. For windbreaks containing many gaps and openings throughout, or for rows of scattered trees the calculated value must be reduced by the number of openings or gaps, e.g., a windbreak with 50 per cent gap will be reduced in value by 50 per cent.

To arrive at the value of native or natural windbreaks, only the protection value is determined and reduced as required. Where native plants (trees/shrubs) are being removed, making homes less "private", compute the protection value and increase by a factor of three. These will be plantings on the east or south of properties where no obvious wind protection is being afforded by the plants. This is a difficult calculation as no cost/benefit is lost with the loss of privacy.

The protection value for farmstead windbreaks (around the farm house and environs) should be valued at five times that of a field shelterbelt. Research has clearly shown that trees and other plants correctly located help conserve energy by providing a cooling effect in summer and a warming effect in winter. Trees positioned to function in this manner are worth more than the same plants situated elsewhere.

Windbreaks can be effective when placed close to buildings, even though maximum wind speed reductions near ground level occur at a distance about five times the height of the tree downwind from the tree barrier. Basically, plants can be placed near buildings to control or guide wind by obstruction, deflection, and filtration.

Example 3.

A 25-year-old farmstead belt 13.5 - 15 m high would be worth $734.38 × 5 = $3671.90 for each 0.1 km segment.

The total value then is the establishment value and the protection value on a 0.1 km segment (assuming 170 trees per 0.1 km). For the 25-year-old windbreak the value is $734.38 + (170 × $1.79) = $1038.68. A farmstead belt with the same number of trees then can be valued at $734.38 × 5 = 3671.90 + 304.30 = $3976.20 for establishment and protective value.
Most important: professional judgment

Net Value Increase of Protected Area

A basic value of $11.75/year-hectare protected can be applied to grain and similar annual crops. For forage or range crops, the value is reduced to $9.40/year-hectare. The basic value × 0.94 can be used.

Basic value adjustments:

Livestock feedlot areas are valued at $47/year-hectare, and so are concentrated quarters such as dairying operations. Range livestock areas are valued at $11.75/year-hectare. The basic value × 4 can be used.

Farmstead protection value where buildings and the home are protected is assigned a $58.75/year-hectare value or × 5 the basic field value. The heating and cooling costs of farm homes and buildings can reduce the heating and cooling cost by 40 per cent with the proper use of trees for windbreaks and shelter.

In situations where more than one protection value may be used, the highest value is to be used in the calculations.

Life Expectancy of Shelterbelt Trees

In the multi-row belt, the longest lived tree is adjudged to be the lifespan that the total belt can reach.

Table 11. Life Expectancy of Trees Planted in Alberta's Shelterbelt

	Average Age	Value
Hedgeplants	50 years	1.1
Small Deciduous	65 years	1.3
Tall Deciduous		
- poplar, willow	30 years	0.75
- maple, ash	60 years	1.2
- oak	75 years	1.4
- birch	40 years	0.8
Coniferous trees	65 years	1.3

Multi-row Factor

Wind and noise reduction is related to the number of rows. The wider the belt, the greater the reduction.

Table 12. Noise Reduction Values of Row

	Value
Single row	1.0
Two rows	1.3
Three rows	1.5
Four rows	1.65
Five rows	1.8

Tree Condition Overall Value

- Above average growth, regular cultivation, maintenance, pruning, thinning, tree replacement 1.0
- Average growth, structurally sound, occasional cultivation and pruning; some thinning and removal of dead and diseased trees 0.9
- Decadent and weakened tree growth, no pruning; dead and diseased branches evident 0.8
- No pruning, thinning or removal of dead and diseased branches and trees 0.65

Design

To be effective, the windbreak must be properly designed and planted.

Table 13. Windbreak Design and Orientation

	Value
Ideal design/planting	1.0-1.2
South or east planting	0.8-1.0
Too close to or too far from buildings	0.2- 0.5

Time Adjustment

When destruction occurs and a "replacement is planted", the time difference is adjusted. The time difference is the age of the destroyed trees less the age of the replacement.

Table 14. Relative Value of Replacement Trees

Difference	Value
0 - 5 years	1.0
6 - 10	1.2
11 - 15	1.4
16 - 20	1.6
21 - 25	1.8
26 - 30	2.0
31 - 35	2.1
36 - 40	2.2
41 - 45	2.5
46 - 50	2.0
51 - 60	1.6
60 +	1.0

Example: A three-row, 15-metre high, 1.2 km long farmstead belt made up of caragana, maple and scotch pine planted in 1955. There is evidence of disease. The belt was well designed and planted on the north and east side with no major breaks or openings. The owner is a grain farmer.

Age	Height	Years	Protected area for each 0.1 km/ha*	Year - ha
35	15 m	5	2.7 (1)	(5 x 2.7) 13.5
35-45	<15 m	10	3.2 (2)	(10 x 3.2) 32.0
		15		45.5

The basic value then is 45.5 × $11.75/hectare/year or $534.63 for each 0.1 km segment. In this case, 1.2 km is being appraised; therefore, $534.63 × 12 segments equals $6,415.50.

Life expectancy	Type of belt farmstead	Rows multirows (3)	Tree condition	Design
1.3	5	1.5	0.8	1.0 ×

No replanting is being done. $6,415.50 × 1.3 × 5 × 1.5 × .8 × 1.0 = $50,040.90 * The calculations are: (1) 1200 × (15 m x 15) : 10,000 × .1 (2) 1200 × (17.5 m x 15) : 10,000 × .1

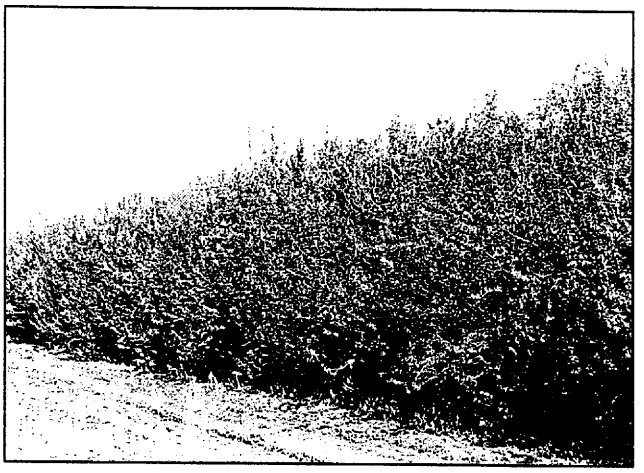


Figure 13. Shelterbelt on left with open spaces and gaps is far less effective than belt on the right.

SECTION THREE

NATURAL TREE AREAS EXCLUDING NATIVE WINDBREAKS

There has been consideration given to the evaluation of native tree cover where there is no obvious shelter given or privacy reduced. The following formula has been developed for determining the actual value of trees that have been destroyed or damaged, or are to be condemned because of land use change. All of the accrued costs are included; intrinsic or sentimental values are not considered. All values are in 1990 dollars.

Figure 14. Typical natural tree line

THE FORMULA CONSIDERATIONS

- To include planting costs, (1800 trees/hectare) based on current wage rates and adjusted for the length of time the planting will take. Also to include land preparation.
- Annual expenses and their amortization for the five year establishment period i.e 4% (.04) used in this calculation or .22 for five years.
- To provide for land replanting rehabilitation. Mainly labor to remove dead or extensively damaged trees, it should include time to burn or dispose of windrows, etc.

$$V = P + (P \times C + \frac{5(E \times C)}{R} + L)$$

V = Value of natural planting

P = Planting costs include labor, trees and other costs as well as preplanting land preparation

C = Interest factor

5 = Number of years to establishment

E = Annual expenses, to include taxes, land investment charges, cultivation and other maintenance charges

R = Annual interest rate as a decimal .04 (4%)

L = Land rehabilitation charges where needed

Using the full formula, assume one hectare of tree cover, five-year establishment time for a native site replanted to variety of plants that was disturbed by a oil company laying a pipeline. No fencing (fencing would be added cost based on current fencing rates) is to be done.

P = $180.00 for planting/hectare

C = .22 interest factor for five years (4% per annum)

E = $71.15 average yearly costs

Machine work	35.00
Weed control	15.00
Taxes	3.15
Land investment value $500.00/hectare at 4%	20.00
Total	71.15

L = No value as oil company disposed of all debris

$$V = \$180.00 + (180 \times .22) + 5\,\frac{(71.15 \times .22)}{.04}$$

$$= \$180.00 + 40 + 1957$$

$$= \$2177.00$$

To this value must be added the cost of the trees for replanting, which will vary according to the variety and source. Do not add value of plants in twice, if already included in determing "P" value, do not add again.

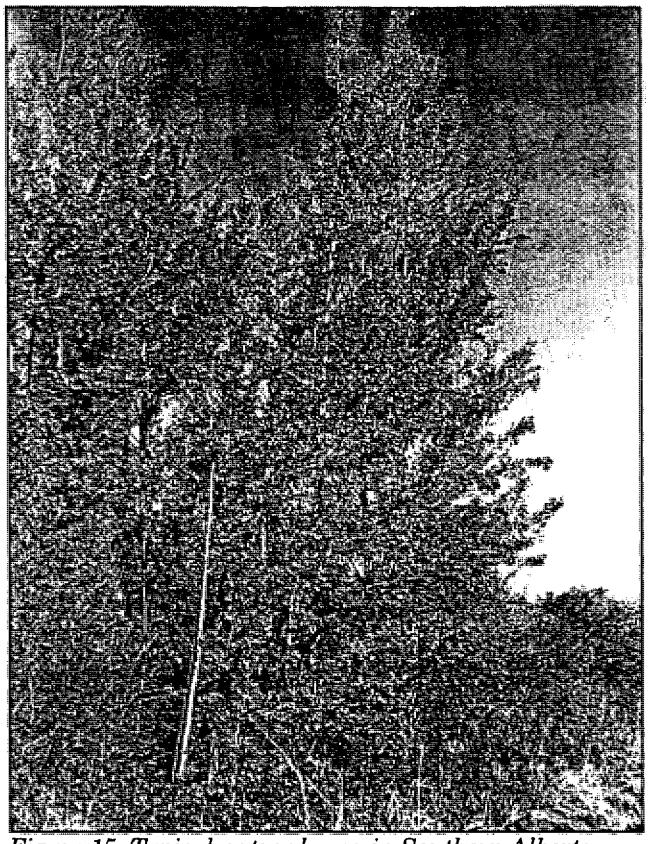


Figure 15. Typical natural area in Southern Alberta has Trembling Aspen as main species.

SECTION FOUR

Farm Woodlots – Harvestable Timber

Trees in farm woodlots that are being grown for timber purposes have a commercial value. Several methods for evaluation are in use. The one used here is based on an Australian method developed by K. J. Simpfendor in 1979. It provides the most objective initial assessment, although subjective elements may be used for later evaluations.

All trees have wood fibre, which has some potential market value. The method used here offers a good starting point for an evaluation.

Assumptions used are:

- Equivalent value of forest harvest trees to woodlot value is about $\$40.00/m^3$ (Pulpwood value is about 1/3 to 1/4 of that value).
- The simplest relationship to define tree volume is D^2 H/3 (D = diameter; H = Height, both in metres). This gives a relative index of volume for a single-stemmed tree.

A 20-year-old white spruce that is 20 cm in diameter and 25 m tall would have a potential mill value of about $13.60. This value would be realized for a tree in the peak range, in Alberta for most lumber species that is a tree between 20 and 30 years old.

The value added by annual growth to the market value of timber is comparable to a compound interest curve. One can express the relationship of plant growth to present value in 10-year increments so that a compound interest table can be used to establish the multiplying factor. Assuming that the most attractive mill tree reaches maturity at 40 years of age, the calculated basic value would be a 1 per cent increase in base value for each year over 20 years, i.e., for a 40-year-old white spruce the age factor would be 1.22, which is the compound interest at 1 per cent for 20 years.

Accepting that, the general average increase in value for farm woodlots is 11.5 times over twenty years, which is roughly 13 per cent interest compounded annually.

Here is an example:

1. Initial value, if planted, $10.00.
2. This cost to 20 years at 13 per cent gives a value of $156 plus the $10 initial value for a $166 total value. For trees that are less than 20 years old, use a compound interest table at 13 per cent for the age of the plant.
3. The tree in this example is 20 years old. In Alberta conifer trees add growth at the rate shown in Table 15.

Table 15. Conifer Growth Rate in Albera

Total growth (%)	Years
70	20-30
60	30-40
50	40-50
35	50-60
25	69-70

The 20-year-old tree increases the value of $166 by 70 per cent or $116 for the 30-year value, and $166 by 60 per cent or $100 for the 40-year value (attractive mill tree age)

The 40-year value then is $166 + $116 + $100 = $382.

This example assumes that care and maintenance is sufficient to produce a straight single-stem tree suitable for dimension lumber. If not, the value ($382) drops to 1/3 or 1/4 if the use of the plant is pulpwood only. In this example that value would be $127 or $96.

This evaluation assumes no aesthetic or shelter value, if these are to be considered the specimen value or shelterbelt value should be used.

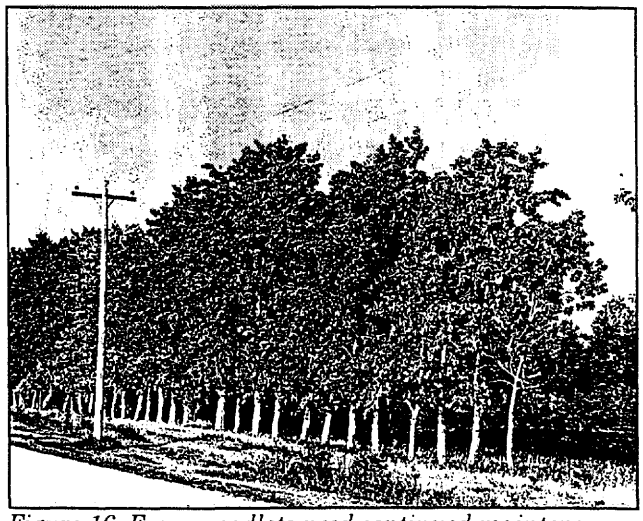


Figure 16. Farm woodlots need continued maintenance such as pruning to promote straight knot free stems.

SECTION FIVE

Municipal Tree Stands

There are certain situations when the value of tree stands cannot be effectively or efficiently calculated by any means. The stand may have numerous individual stems, the area may have no defined use such as wind protection of an identifiable subject, and/or there maybe a wide range of age condition or species within the stand.

This problem has been confronted by the City of Edmonton Parks group. Mr. K. Evans and some of his staff from the City of Edmonton have developed a formula and the methodology for evaluating these kinds of tree stands. It has been altered here by inserting the "cooling value" as determined by the shade provided by the canopy. To obtain the cooling value one needs to determine the percentage difference in shade from full sunlight to the shade provided by the stand. This measurment can be taken with a simple light meter. John Parker in *Landscaping to Reduce the Energy Used in Cooling Buildings* quantified the value of shade by measuring the reduction in electrical requirements for air conditioning on warm summer days. Parker reported that Fizzell measured the energy consumption for air conditioning and found the greatest consumption is from 11:00 a.m. to 3:00 p.m. which is the highest overheating period.

Trees and other plant material have the ability to lower free air or ambient temperatures by evaporative cooling and by absorbing and deflecting solar heat. Natural cooling occurs as water evaporates from the leaves. The cooling effect of one mature tree such as a cottonwood or elm has been calculated to equal five 10,000-BTU air conditioners. The use of electricity can be calculated using Trans-Alta's residential consumer rate for electricity @ .004¢/BTU /hr. In this case six hours of cooling (from 10:00 a.m. to 4:00 p.m.) time has been used. As the density of the crown providing shade increases, the value of the shade grows exponentially. The following table provides the factors and their definitions.

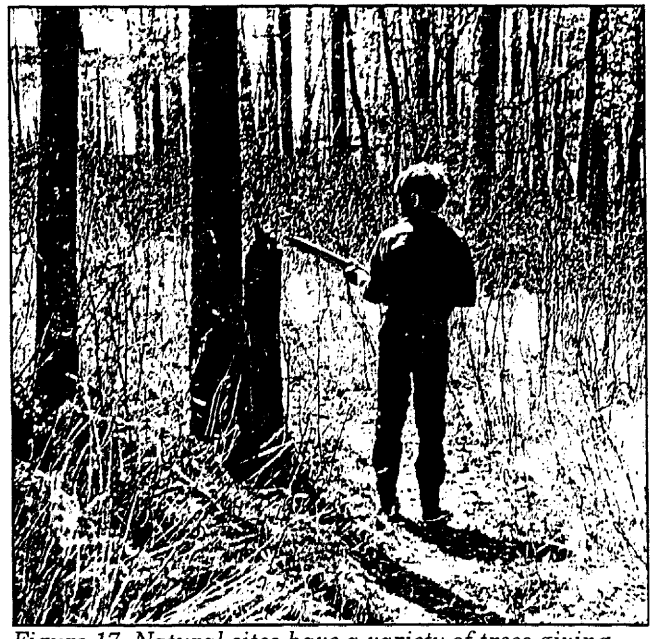


Figure 17. Natural sites have a variety of trees giving various shade densities. The shade has value to the child and the environment.

To ensure accuracy, readings should be taken on a sunny day between 10:00 a.m. to 4:00 p.m. Once competence has been gained visual determination should be accepted from competent professionals.

For simplicity of calculation the appraiser has to define and determine which range a particular stand falls into, e.g., if a stand measures 75 per cent shade and the representative count indicates a higher number of conifers the value would be 1.9.
A minimum of three readings are necessary:

- shade at fringe,
- deep shade as from species or deep within stand,
- measurements from two representatives species (if available).

Table 16. Cooling Values (CV)

Shade Difference* (%)	Value	Comments
50	1.0	Trees in an open area with less strongly defined crowns. Such as young stands or older decaying stands of poplar.
60	1.2	Shade provided by a mature evolving trembling aspen stand.
70	1.5	Typical mixed stand of poplar (aspen) and conifer.
80	1.9	Heavy shade as provided by dense conifers.

*Shade difference: determined by meter difference from bright sunny weather to shaded area.

Remaking the City of Edmonton formula, the calculation proceeds as follows:

$V = (P_{te} + P_tF_v + M_c + L_r)CV$

V = Value of existing stand

P_{te}= Total number of trees of each kind

P_t= Total planting cost of all species

$P_t = P_1 + P_2 + P_n$

$P_1 = P_c \times S_f \times C_f \times N$

P_c = unit planting cost/tree/size category, the least number of size grouping comparisons from stand to unit tree cost is preferable to reduce calculation volume, e.g., stem size categories (0 to 2.5 cm, 2.5 to 7.6 cm, 7.7 to 15.2 cm, and over (15.3 cm). This value will vary from municipality to municipality.

S_f = species factor: from appendix 1.

C_f = condition factor: from condition table, use representative selections and use an average for calculation.

$P_1 + P_2 + ...P_n$ = number of trees: use representative number again from a grid pattern, aerial photos would assist greatly, also obtain stem numbers.

N = number of trees of same species.

F_v = the interest of future value, for only those being removed. To be consistent with other examples in this book the value used here is 4 per cent over five years of establishment.

$F_v = (P_t \times C)$

C = .22

For 3 years C = .13 @ the 4 per cent rate.

M_c = maintenance to include

- watering for five years
- staking and removal of stakes
- pruning if done
- replacement value; generally 10 per cent taken of planting costs.

Elsewhere in this publication the value $71.15 per year has been used as in this example.

$$M_c = \frac{5(71.15 \times .22)}{.04} + 10\% P_t$$

L_r = land rehabilitation charge

- in most cases equals zero
- assumes a value only if replanting is on same site.

CV = cooling value from Table 16

$$V = P_t + (.22 \times P_t) + \frac{5(\$71.15 \times .22)}{.04} + .10 P_t + L_r)CV$$

E.g., a hectare of maturing aspen with the odd white spruce (less than 1%) is being removed for development. Condition is good to excellent with limited regrowth. There are two stems greater than 3 cm/10 m^2, four stems greater than 7 cm/10 m^2 and one stem greater than 15cm/10 m^2. The municipality's cost of planting: 2.6 to 7.6 m is $175.00, 7.6 cm or more is $360.00 including cost of trees. Replanting will be done at another sight to replace the removed canopy.

Aspen Stems

@ 3cm	=	200 stems
@ 7cm	=	400 stems
@15cm	=	100 stems
		700 stems

Spruce Stems

@15cm	=	70 stems (minor)
		770 stems

$P_t = P_1 + P_2 + ...P_n$

$P_1 = Pc \times S_f \times C_f \times N$

$P_t =$

$P_1 = \$175 \times .6 \times .7 \times 200 = 14,700$

$P_2 = \$360 \times .6 \times .7 \times 400 = 60,480$

$P_3 = \$360 \times .6 \times .6 \times 100 = 12,960$

$P_4 = \$360 \times .8 \times .8 \times 70 = 16,128$

$= 14,700 + 60,480 + 12,960 + 16,128$

$= 104,268$

CV = 1.2 for this example

$$V = (104,268 + (104,268 \times .22) + \frac{5(71.15 \times .22)}{.04} + (10\% \times 104,268)\,1.2$$

$= (104,268 + 22,939 + 1,957 + 10,467)\,1.2$

$= \$167,509.$

It would cost the municipality $240,200 to replace the stand with trees that would, over time, provide the same condition as the existing stand.

If this stand of aspen was valued as pulpwood its dollar value would be ($88,900 or 700 × $127) without replanting costs. Adding the value of the spruce for lumber ($382 × 70 = $26,740) the total value of the aspen and spruce becomes $115,640.

Appendix B

"Top of Bank Policy C542"

"Development Setbacks from River Valley/ Ravine Crests"

CITY POLICY

POLICY NUMBER: C542

REFERENCE:	**ADOPTED BY:**
City Council 26 February 1985	City Council 17 February 2010 **SUPERSEDES:** Top-of-the-Bank Public Roadway Policy
PREPARED BY: Planning and Development Department	**DATE:** 20 January 2010

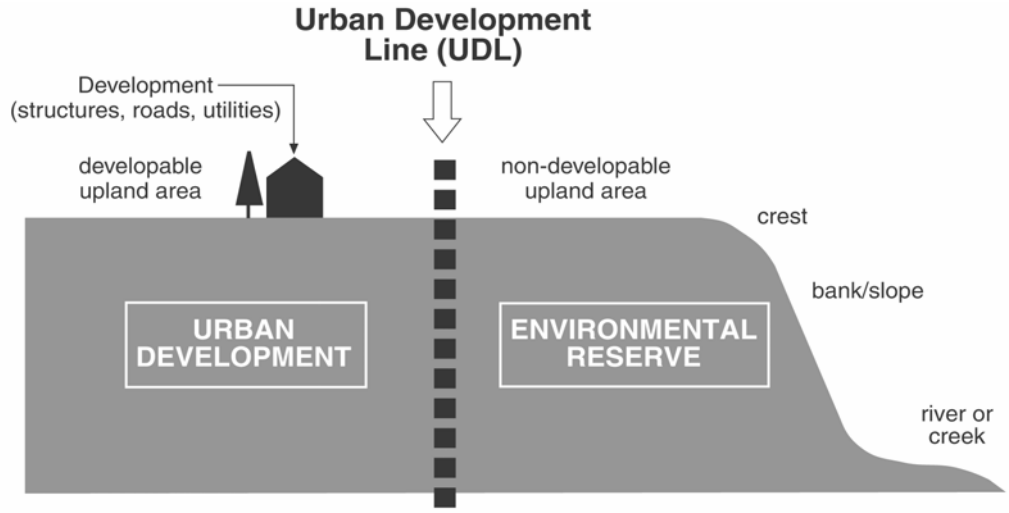
TITLE: **Development Setbacks From River Valley/Ravine Crests**

Policy Statement:

To many residents, the North Saskatchewan River Valley and Ravine System is Edmonton's finest feature. Preservation of and public access to it are key to our quality of life. The City requires that design of development in all new or redeveloping areas abutting the River Valley and Ravine System provide for the separation of development from the river valley or ravine as generally illustrated in Figure 1, and as further described in the following Policy and Procedures. This separation shall be created through establishment of a scientifically-derived Urban Development Line demarcating the boundary between developable upland area (urban development) and non-developable upland area or Environmental Reserve. Further, this separation shall be accomplished by such other legal, planning and technical measures necessary to achieve the purpose of this Policy. The only exception shall be in the Downtown and existing river valley communities where development has already occurred either on the slope or in the floodplain of the River Valley and Ravine System.

Figure 1

Urban Development and Environmental Reserve



Note: See Policy Definition 1.32 for a more precise definition of Urban Development Line.

The purpose of this policy is to:

1. Ensure that urban development is reasonably safe from environmental hazards, such as slope instability and failure, flooding or fire that may result in loss to persons and property.

2. Protect the River Valley and Ravine System from urban development that may compromise its integrity and long term stability.

3. Maximize access for local residents and the general public to a continuous circulation system along the entire length of the Upland Area Abutting the River Valley and Ravine System. Public access is provided for circulation and amenity purposes, connection to the park system within the River Valley and Ravine System, slope repair and geotechnical monitoring, fire fighting, emergency and public safety, drainage control, and for dealing with encroachment issues.

4. Ensure preservation of the River Valley and Ravine System as a significant visual and natural amenity feature, contributor to the ecological functionality of the City's natural areas system, and recreational opportunity for the citizens of Edmonton.

1. OBJECTIVES AND DEFINITIONS

The following preconditions and definitions are specific to this Policy and implement the four objectives outlined in the purpose of this policy. Definitions used are capitalized. The preconditions and definitions are then applied to "Procedures" which explain how and when the Policy will be implemented.

OBJECTIVES

Ensure that urban development is reasonably safe from environmental hazards, such as slope instability and failure, flooding or fire that may result in loss to persons and property.

1.01 A number of measures shall be undertaken to ensure the reasonable safety of urban development.

An assessment of environmental hazards shall be conducted within lands **Abutting** the **Crest.** The study area shall be established as a function of the slope height or vertical distance between the Crest and **Toe of the Slope**.

The **Estimated Long Term Line of Stability** shall be the primary scientific methodology for determining slope instability and failure. An **Urban Development Line**, which primarily delineates developable and non-developable land, shall be established on the **Upland Area**.

Fire risk shall be considered in the context of the **Wildland/Urban Interface** and evaluated under the **Wildfire Hazard Assessment System.**

For **Major Slopes** where the geotechnical assessment identifies landslide hazards or areas deemed to be of higher geotechnical risk, a **TOB Roadway** shall be the predominant form of urban development used.

1.02 The City shall register a **Restrictive Covenant** by way of a caveat on the title of properties backing onto the top of bank, describing building restrictions and other restrictions necessary to protect both urban development and the **River Valley and Ravine System**.

1.03 Reasonable compensation shall be provided to an owner required to develop a TOB Roadway. This compensation is to offset higher servicing costs and lost development opportunities associated with a TOB Roadway. The area of the TOB Roadway right of way and any residual land between the roadway and the Urban Development Line shall be deducted from the gross area at the time of subdivision to reduce the municipal reserve entitlement for the affected lands. This residual land shall be incorporated and maintained as part of the adjoining open space. Unless otherwise provided for by the City, the TOB Roadway shall adhere as closely as possible to the Urban Development Line.

Protect the River Valley and Ravine System from urban development that may compromise its integrity and long term stability.

1.04 The previously mentioned assessment of environmental hazards and the determination of a development boundary shall describe lands that are not developable for urban development on the Upland Area.

1.05 The River Valley and Ravine System shall be protected through the City's taking of **Environmental Reserve** at the time of subdivision. TOB Restrictive Covenants shall enshrine additional development restrictions to protect top of bank lands and the valley slopes based on the technical recommendations provided in the geotechnical assessment report. A TOB Roadway and protected greenspace with fronting-on top of bank development shall provide a further measure of protection in comparison to backing-on development.

Maximize access for local residents and the general public to a continuous circulation system along the entire length of the Upland Area Abutting the River Valley and Ravine System. Public access is provided for circulation and amenity purposes, connection to the park system within the River Valley and Ravine System, slope repair and geotechnical monitoring, fire fighting, emergency and public safety, drainage control, and for dealing with encroachment issues.

1.06 A number of measures shall be undertaken to maximize public access for local residents, the general public, and civic purposes. Planning for public access begin at the area structure plan level to ensure strong neighbourhood connectivity. Much of the technical assessment will be done at the neighbourhood planning level. Public access is maximized when it is based on barrier-free design, highly visible, safe, readily accessible, connected, uninterrupted, open to multi-use, and ensures vehicle parking and roadway access (where necessary). **Wayfinding** and **Crime Prevention Through Environmental Design (CPTED)** principles improve the quality of public access.

Public access shall be provided along the entire TOB for circulation, amenity, and civic purposes. Public access will be accommodated through a combination of TOB Roadway and **TOB Walkway.** The walkway will be situated on lands preferably designated as Environmental Reserve and will be provided along the entire length of the Upland Area, subject to the technical specifications identified in the geotechnical assessment report.

1.07 Public access to a TOB Walkway from a public roadway shall accommodate **Public and Emergency Access** in order to encourage public access for circulation and amenity purposes, and to provide appropriate access for fighting wildland fires.

1.08 The area abutting a minimum of 30% of the Urban Development Line shall be comprised of either a TOB roadway or land used for municipal purposes fronting on a top of bank roadway (e.g. park) in new plan areas to ensure the objectives of this policy are achieved and to address the following factors:

CITY POLICY

(a) Major Slopes where geotechnical assessment identifies areas deemed to be of higher geotechnical risk;
(b) Public access that ensures curbside parking spaces for public parks and access into the River Valley and Ravine System;
(c) A combination of continuous, uninterrupted public access (i.e. Roadway and Walkway) along the entire TOB interface;
(d) Civic needs including (but not limited to) geotechnical monitoring and repair, drainage management, fire fighting, and public emergency access;
(e) Public access for circulation and amenity purposes to outlying areas within the city;
(f) Visual Connection with the River Valley and Ravine System, Wayfinding and Crime Prevention Through Environmental Design (CPTED) within a neighbourhood;
(g) Public access to Vistas and Views along the TOB; and
(h) Ecological separation (i.e. buffer) from urban development and private encroachment.

Additional TOB Roadway may be required to achieve the aforementioned factors based on final technical and planning assessments and recommendations. In particular, additional TOB Roadway or alternatively, additional setbacks shall be incorporated in those areas, identified by Administration, with significant Vistas or Views to facilitate the provision of public promenade amenities and access.

Findings and recommendations from both technical studies and assessments will be used to inform TOB Roadway design at the neighbourhood level.

The TOB roadway requirement shall be measured as a percentage of the entire length of the Urban Development Line. The TOB Roadway shall be generally coterminous with the urban Development Line and shall be measured as set out in Schedule A. Where additional land is taken beyond the Urban Development Line for municipal purposes fronting on a top of bank roadway (e.g. park), the calculation shall include the length of the Urban Development Line used for that purpose and shall be measured as set out in Schedule B.

Ensure preservation of the River Valley and Ravine System as a significant visual and natural amenity feature, contributor to the ecological functionality of the City's natural areas system, and recreational opportunity for the citizens of Edmonton.

1.09 Coordination of relevant City policies and plans such as the Natural Area Systems Policy C531, Urban Parks Management Plan, Ribbon of Green, the North Saskatchewan River Valley Area Redevelopment Plan, and A Plan of Action for the Capital Region River Valley Park with top of bank development shall begin at the area structure plan level to ensure strong planning integration below and above the top of bank. Much of the technical assessment will be done at the neighbourhood planning level.

CITY POLICY

1.10 A number of measures shall be undertaken to enhance the visual appreciation and experience associated with the River Valley and Ravine System. Identification of **Vistas and Views** along with a strong **Visual Connection** (e.g. **View Corridor**) to the River Valley and Ravine System shall begin at the area structure plan level to ensure a high quality of public access. Much of the technical assessments will be done at the neighbourhood planning level.

1.11 **Ecological Network** function, design, and mechanisms for acquiring lands within the Upland Area for conservation shall be identified through Ecological Design Report in the preparation of future statutory and non-statutory land use plans.

1.12 This policy and the North Saskatchewan River Valley Area Redevelopment Plan work together to ensure that appropriate boundaries on the slopes and top of bank or Upland Area are identified to preserve the River Valley and Ravine System.

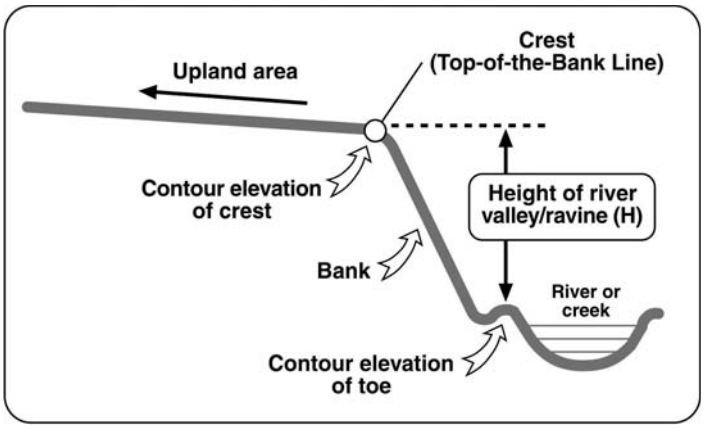
1.13 The City will work with property owners and developers of lands adjacent to and/or wholly or partially within the North Saskatchewan River Valley and Ravine System to acquire lands necessary to achieve relevant municipal planning objectives. Where possible, the City will encourage and promote the donation of all or a portion of these lands through innovative measures such as, but not necessarily limited to, income tax receipts (i.e. split receipting) for eco-gifts, environmental reserve easements, transfer of development rights, eco-trusts and non-credit municipal reserve dedication.

DEFINITIONS

1.14 **Abutting** means the top of bank area within a distance deemed close enough to the river valley or ravine crest to require an environmental hazards assessment. This is determined by the horizontal distance along the upland area equal to eight times the slope height, taken as the difference between the geodetic elevation of the crest and toe of the slope. See Figure 2.

Figure 2.

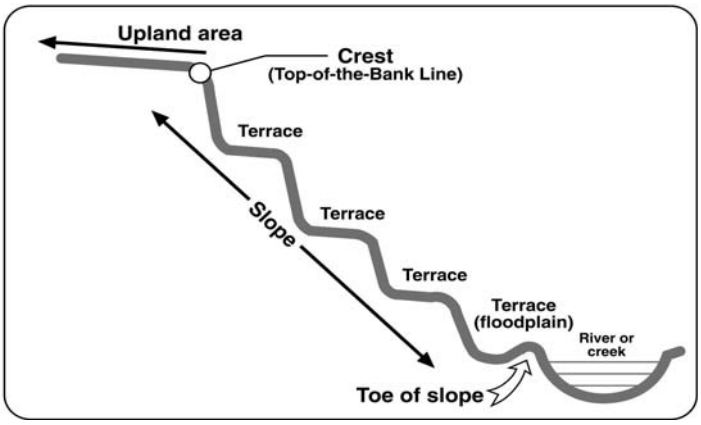
Abutting



1.15 **Crest** means the dividing line between the slope and its Upland Area. The Crest is also referred to as the top-of-the-bank (TOB) line. Where the river valley or ravine contains several terraces, the Crest is the valley break, slope edge or distinct topographic change between the Upland Area and the River Valley and Ravine System. The Crest is used to determine the area of study for the environmental hazards assessment, as well as to determine the minimum Public Upland Area Setback. See Figure 3.

Figure 3.

Crest



1.16 **Crime Prevention Through Environmental Design (CPTED)** means the design and effective use of the built environment to reduce fear and incidence of crime while improving overall quality of life.

1.17 **Ecological Network** means a coherent system of natural and/or semi-natural landscape elements that is configured and managed with the objective of maintaining or restoring ecological functions as a means to conserve biodiversity. Edmonton's Ecological Network structure includes:

(a) Regional Biodiversity Corridor – The North Saskatchewan River Valley is the most critical component for wildlife movement and ecological processes in Edmonton;
(b) Biodiversity Core Areas – Natural areas large enough to support entire populations of different species and may also serve as an important linkage;
(c) Linkages – Non-linear stepping-stones and linear ecological corridors provide structural and or functional connections between biodiversity core areas and the regional biodiversity corridor. These may take the form of either natural linkages (i.e. sites dominated by naturally occurring patterns of native vegetation such as natural areas, naturalized parks or stormwater facilities) or semi-natural linkages (e.g. sites with more manicured green space such as active recreation parks, cemeteries, schoolyards, non-naturalized stormwater facilities or public rights of ways); and
(d) Matrix – Background ecosystems or land uses within which habitat patches (core areas and linkages) lie on a landscape (e.g. sites found within agricultural, residential, commercial and or industrial lands that contribute to the overall habitat and or level of connectivity within the Ecological Network.

1.18 **Environmental Reserve** means land (as per Section 664(1) of the *Municipal Government Act*) that consists of:

(a) Swamp, gully, ravine, coulee or natural drainage course;
(b) Land that is subject to flooding or is, in the opinion of the subdivision authority, unstable; or
(c) A strip of land, not less than six metres in width, abutting the bed and shore of any lake, river, stream, or other body of water for the purpose of:
    (i) Preventing pollution, or
    (ii) Providing public access to and beside the bed and shore.

Section 671(1) of the MGA states that Environmental Reserve must be left in its natural state or be used as a public park. Under Section 676 of the MGA, a council may, by bylaw, after giving notice in accordance with Section 606 and holding a public hearing in accordance with Section 230, use an Environmental Reserve for a purpose not specified in Section 671(1). Notwithstanding Section 671, roads, public utilities, and oil and gas pipelines or transmission lines may be placed on reserve land.

Environmental Reserve, as illustrated in Figures 1, 4, 5, 6, 7 and 8 is further explained by this Policy and demarcated generally by the Urban Development Line, to include:

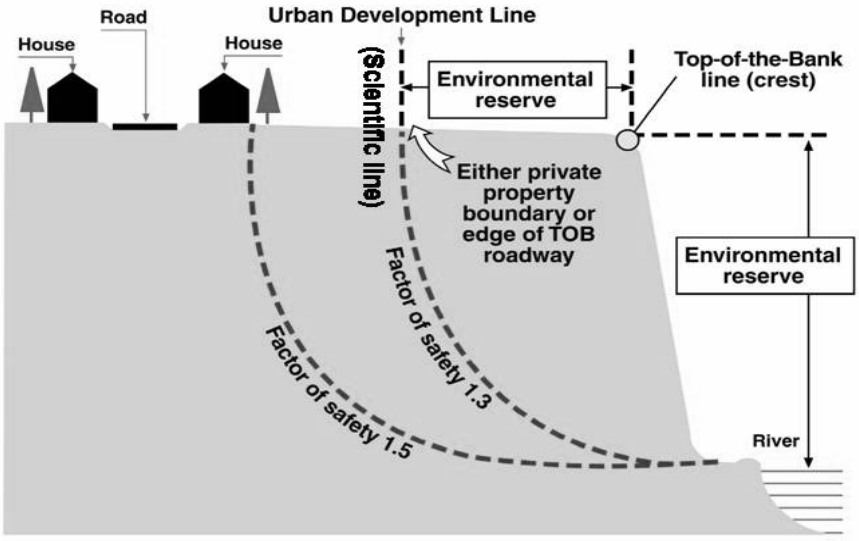
(a) The upland area that is unstable and non-developable due to slope instability or other physical conditions as identified in the geotechnical assessment report and characterized by the Estimated Long Term Line of Stability;
(b) The Upland Area that is non-developable due to other environmental hazards such as flooding and subsidence or ground collapse due to mines, excavations or sinkholes;
(c) Any other land contemplated as Environmental Reserve under the Municipal Government Act, whichever is the greater.

1.19 **Estimated Long Term Line of Stability** means the line demarcating the transition between 'stable' and 'unstable' Upland Areas relative to the Abutting river valley or ravine slopes. This line is an estimate of the Upland Area not expected to undergo movement (i.e., slumping, settling, creeping or sloughing) for a period of time and is determined by a combination of the minimum estimated long term factor of safety and future instability factors.

The Estimated Long Term Line of Stability is determined using slope stability analysis and engineering assessment adopting a minimum long term factor of safety. The development setback associated with the adopted minimum long term factor of safety is intended to provide a margin of safety for the development of roads, infrastructure, and buildings in proportion to the potential for loss to property and loss of life. See Figure 4.

Figure 4.

Estimated Long Term Line of Stability/Urban Development Line



Note: See Policy Definition 1.32 for a more precise definition of Urban Development Line.

CITY POLICY

The analysis and assessment of the Estimated Long Term Line of Stability also allows for future instability factors. Future instability factors include such considerations as: the estimated toe erosion over a period of 150 years; the anticipated increase in groundwater levels in a developed urban drainage basin; any anticipated or planned removal of vegetation; any planned placement of fill, re-grading, or related changes in surface water regime; and any instability associated with other physical conditions, such as mines excavations and sinkholes, where applicable. All relevant future instability factors are to be considered over a period of at least one life cycle of development or the estimated life expectancy of the structure.

In 'fronting on' TOB development situations, where there is a TOB Roadway, a minimum estimated long term factor of safety of 1.3, incorporating future instability factors, is used to establish the boundary of the road right-of-way abutting the non-developable Upland Area. This boundary will be deemed to be the Urban Development Line where it is greater than the setback required for other environmental hazards or the minimum Public Upland Area Setback.

In 'backing on' TOB development situations, where there is no TOB Roadway, a minimum estimated long term factor of safety of 1.3, incorporating future instability factors, is used to establish the rear property line for development. This boundary is deemed to be the Urban Development Line where it is greater than the setback required for other environmental hazards or the minimum Public Upland Area Setback. A minimum estimated long term factor of safety of 1.5, incorporating future instability factors, is used to establish the rear foundation of any primary dwelling or structure.

Based on engineering assessment consistent with the current local state of practice in geotechnical engineering, the recommended setback lines for development and structures shall be determined by the Geotechnical Engineer, and shall be in accordance with the concept of an Estimated Long Term Line of Stability. The recommended development setback lines shall also be suitably documented as part of the geotechnical report submitted for review by the City. The role of the Geotechnical Engineer through their judgment and experience in understanding the site-specific issues and geological setting, and in recognizing the complexities of geotechnical behaviour and the inherent limitations in models and theories, is of considerable importance. The management of geotechnical risk is distributed amongst the many aspects of the overall investigation, analyses and engineering assessment.

1.20 **Major Slope** means a slope with inclination greater than 15 degrees and height greater than 10 metres. For non-uniform slope geometries, a Major Slope shall also be indicated by the presence of any intermediate portion of the slope, with inclination greater than 15 degrees and height greater than 10 metres, between two areas of different slope angle.

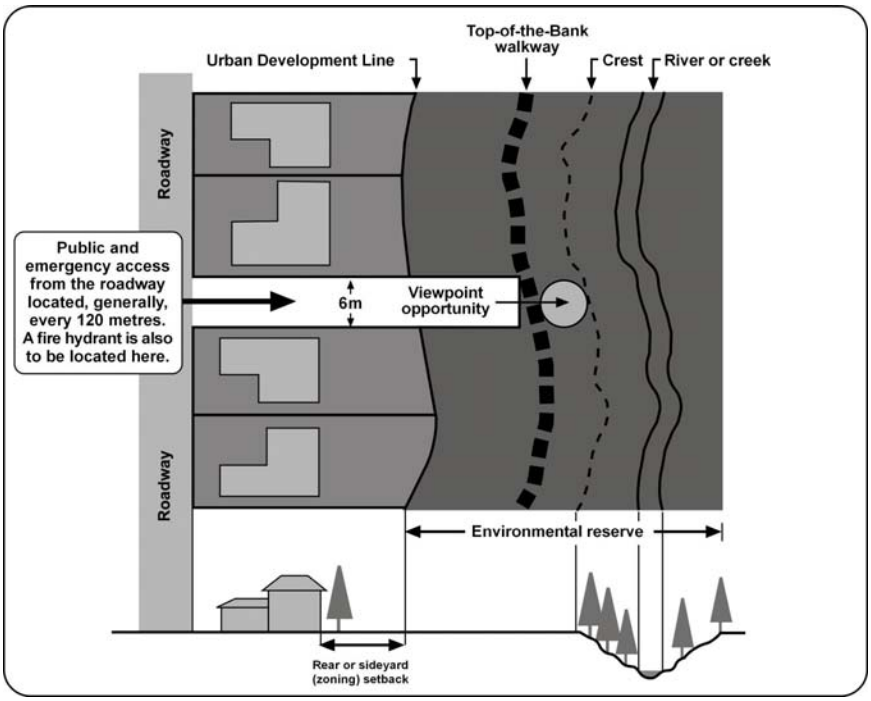
1.21 **Minor Slope** means a slope with inclination less than 15 degrees and height less than 10 metres.

1.22 **Moderate Slopes** means slopes with inclination greater than 15 degrees but having height less than 10 metres.

1.23 **Natural Areas** means an area of land or water dominated by native vegetation and relatively undisturbed by human activity. Such areas could include grasslands, forests, wetlands, peatlands or riparian areas. Areas such as groomed parks, sports fields and schoolyards are not natural areas.

1.24 **Public and Emergency Access** means public access from a roadway to a TOB walkway for both public circulation and emergency access. This access is designed to allow a higher level of pedestrian and vehicular access limited to emergency vehicles, a hard surfaced multi-use trail within a connected right-of-way that accommodates a fire hydrant. The spacing of this access is, generally, at regular intervals of 120 metres. See Figure 5.

Figure 5.
Public and Emergency Access with Backing On TOB Development



Note: See Policy Definition 1.32 for a more precise definition of Urban Development Line.

1.25 **Public Upland Area Setback** means the minimum upland area that is setback from the crest in order to provide for public access, circulation, and civic purposes including geotechnical monitoring and repair, fire fighting, emergency and public safety, drainage control, and dealing with private encroachment issues. A TOB Roadway shall not be located within the setback area. The minimum public upland area setback shall be a minimum 10 metres to 15 metres.

1.26 **Restrictive Covenant** means a legal instrument entered into by the property owner and the City which contains terms and restrictions on the use of the property which the property owner must abide by and may include the following:

(a) That the City of Edmonton is not liable for any damages resulting from bank instability, failure or any other environmental hazards;
(b) Restrictions pertaining to the required setbacks for development and structures, site grading and fill placement, surface drainage, slope protection and the maintaining of existing vegetation;
(c) Restrictions that prohibit the construction or installation of swimming pools, ornamental ponds or similar water retention structures, as well as permanent sprinkler or irrigation systems, and other restrictions pertaining to water management and special drainage systems, and;
(d) A restriction based on the recommended guidelines for Priority Zone 1, from "FireSmart: Protecting your Community from Wildfire."

The Restrictive Covenant will apply to property on or abutting to the Upland Area. The Restrictive Covenant is applied as a subdivision condition.

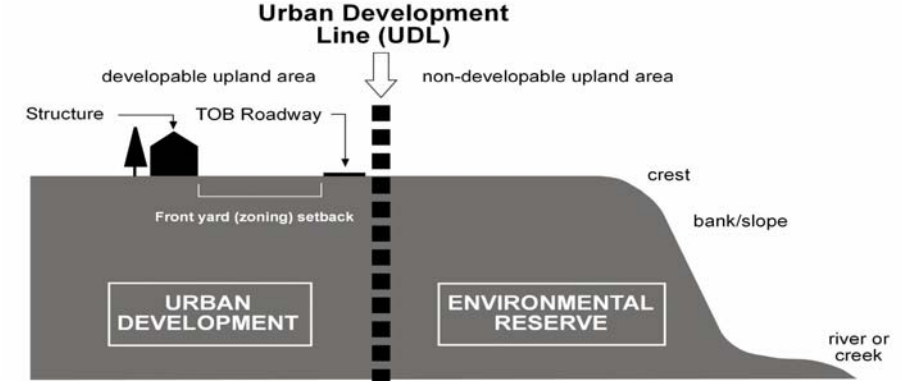
1.27 **River Valley and Ravine System** means the existing or former North Saskatchewan River and its tributary creeks, including the slope or bank up to the Crest.

1.28 **Toe of the Slope** means the lowest point of the river valley or ravine in cross section. The Toe of the Slope shall be used in the determination of the area of study for the environmental hazards assessment. See Figure 2.

1.29 **Top-of-the-Bank (TOB) Roadway** typically means a public vehicular roadway situated on the developable Upland Area adjacent and generally parallel to the Urban Development Line or the Public Upland Area Setback, whichever is the greater. In addition, a TOB Roadway may be further setback from the Urban Development Line on the developable Upland Area to accommodate public development such as stormwater lakes or parks. See Figure 6.

Figure 6.

Fronting On Top-of-the-Bank (FOTOB) Development Situation



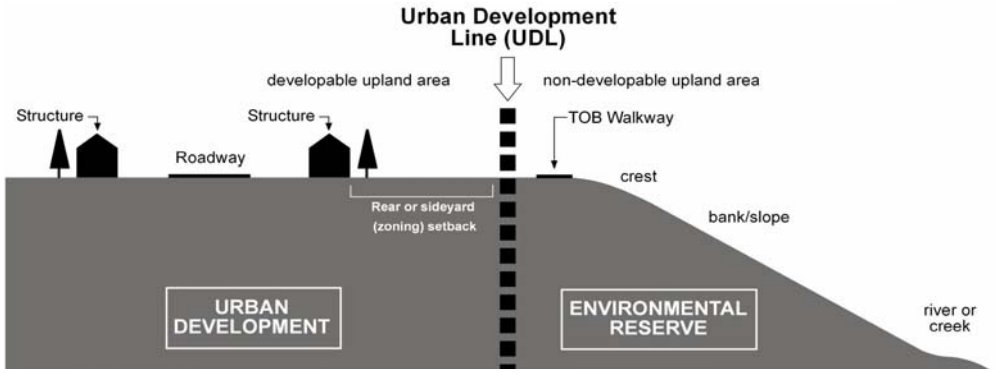
Note: See Policy Definition 1.32 for a more precise definition of Urban Development Line.

CITY POLICY

1.30 **Top-of-the-Bank (TOB) Walkway** means a public walkway situated within the Upland Area, on the river valley/ravine side of the Urban Development Line, and aligned approximately, parallel to the adjacent Crest. This walkway will be situated on lands preferably designated as Environmental Reserve where technically feasible and provided along the entire length of the Upland Area. See Figure 7.

Figure 7.

Backing on Top-of-the-Bank (BOTOB) Development Situation



Note: See Policy Definition 1.32 for a more precise definition of Urban Development Line.

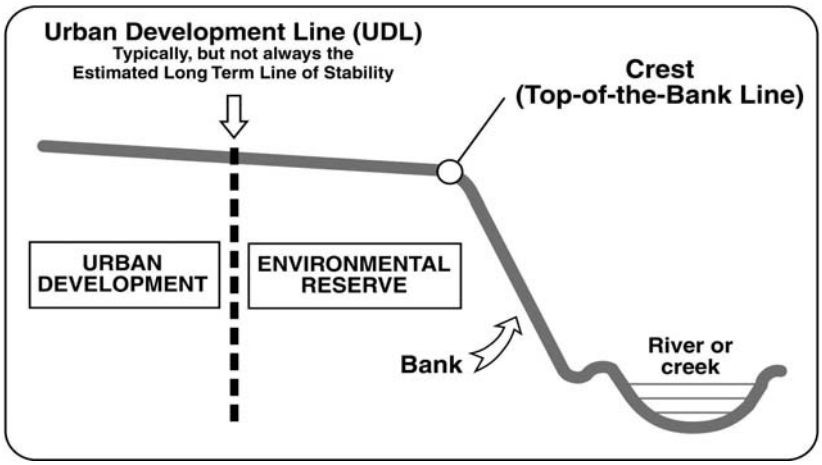
1.31 **Upland Area** means the generally flat land located above the valley break, escarpment or Crest of the river valley or ravine. See Figures 2 and 3.

1.32 **Urban Development Line** generally means the line demarcating the transition between lands suitable for urban development and non-developable land such as Environmental Reserve on the Upland Areas Abutting the River Valley and Ravine System. In calculating the Urban Development Line for new urban development requiring subdivision, this Line will generally take the greater of the environmental hazard risk due to slope instability and failure as determined by the Estimated Long Term Line of Stability, subsurface conditions such as mines, excavations or sinkholes, or flooding or any other lands contemplated as Environmental Reserve under the Municipal Government Act.

The Urban Development Line shall generally be used to measure setbacks for structures as well as the TOB Roadway requirement in new plan areas or as otherwise specified in this policy. Where the minimum Public Upland Area Setback is greater than the Urban Development Line, the Urban Development Line will be adjusted to reflect the greater setback. A TOB roadway shall not be located in this Public Upland Area Setback. See Figures 1, 4, 5, 6, 7 and 8.

Figure 8.

Urban Development Line (UDL)

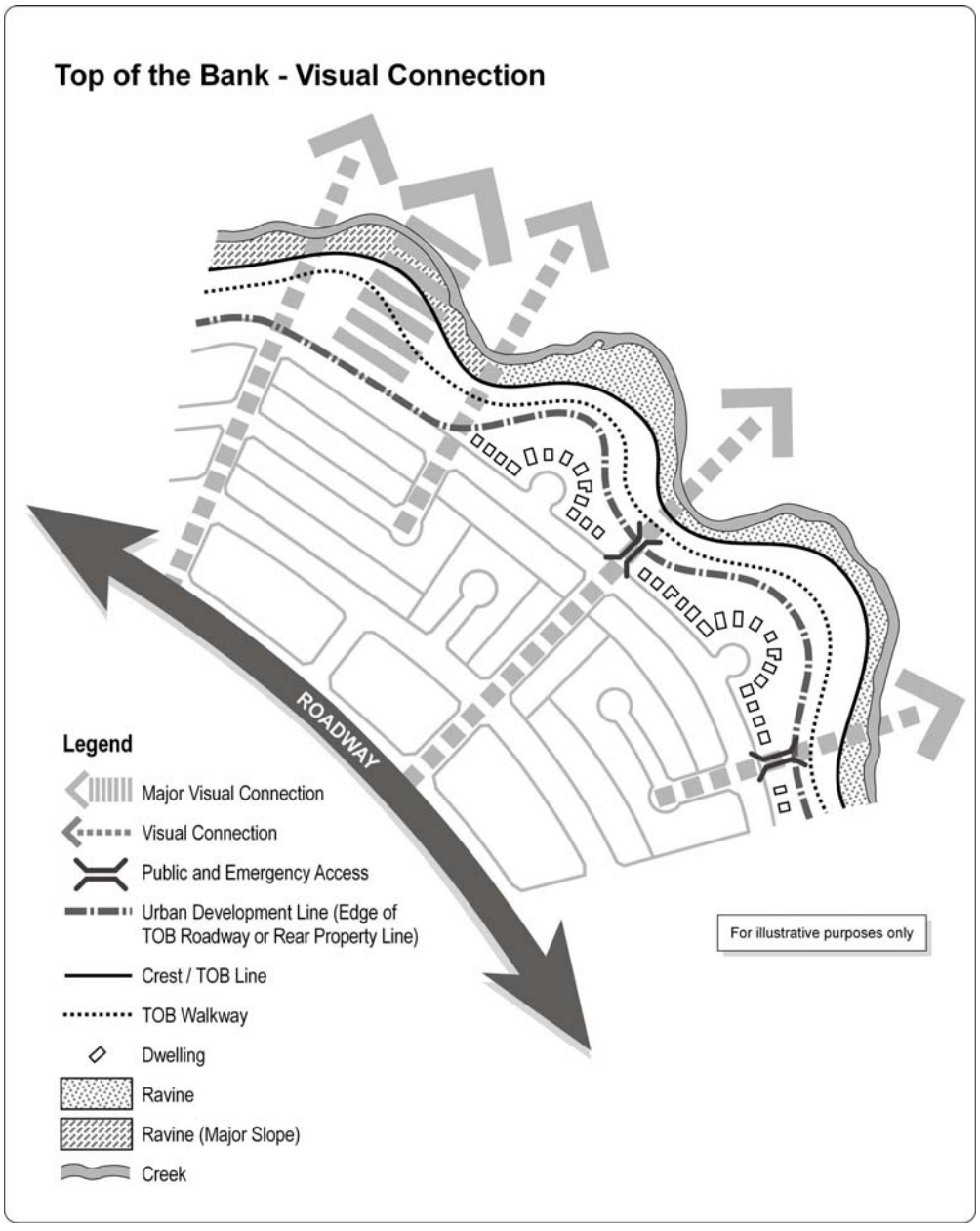


1.33 **View Corridor** means the line of sight identified as to height, width, and distance of an observer looking toward an object of significance to the community. For the purpose of this policy, the principal View Corridor will be environmental where the River Valley and Ravine System contains unique natural features to Edmonton that should be preserved for education and passive recreation.

1.34 **Visual Connection** means the cumulative visual experience and relationship between the Upland Area and River Valley and Ravine System perceived by an observer. See Figure 9.

Figure 9.

Visual Connection

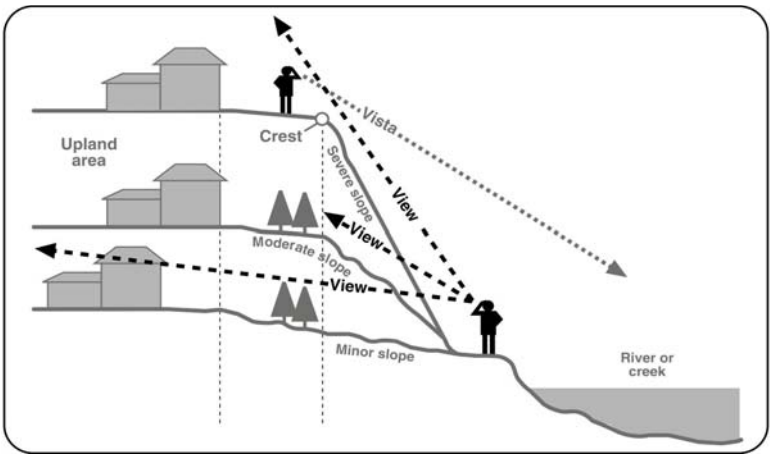


CITY POLICY

1.35 **Vistas and Views** means the visual appreciation of the River Valley and Ravine System taken from the Upland Area (vista) and below the Crest within the river valley or ravine (view), by an individual. See Figure 10.

Figure 10.

Vistas and Views



1.36 **Wayfinding** means the process of using spatial and environmental information to navigate oneself within the built or natural environment.

1.37 **Wildland / Urban Interface** means areas where homes and businesses are built among trees and other combustible vegetation. The largest and most significant wildland/urban interface in Edmonton is the Upland Area adjacent to the North Saskatchewan River Valley and Ravine System. Fires can move from forest, bush, or grassland areas into the community or from the community into adjacent wildlands.

1.38 **Wildfire Hazard Assessment System** means a structured and practical approach for assessing the hazard posed by wildfires to interface homes, facilities, or communities. This approach is outlined in the document, “FireSmart: Protecting Your Community from Wildfire”.

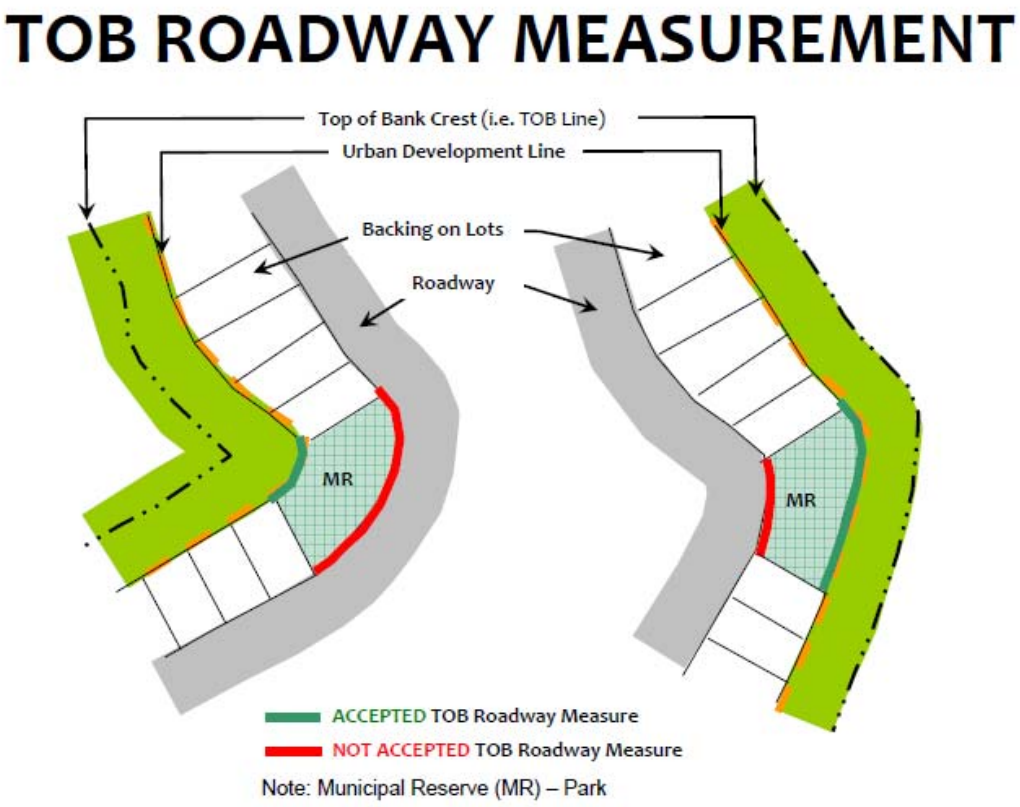
2. AREA OF APPLICATION

This Policy applies to Upland Areas Abutting the uppermost Crest of the North Saskatchewan River Valley and Ravine System. Most though not necessarily all of the river valley and ravine system in Edmonton is located found within the boundaries of the North Saskatchewan River Valley Area Redevelopment Plan (ARP, Schedule A) Bylaw 7188 and Section 811(Appendix I) of the City's Zoning Bylaw 12800. Notwithstanding the Area Redevelopment Plan or Zoning Bylaw boundaries, the boundary is a general boundary and is subject to more precise determination where such location is established through the approval of plans of subdivision or survey plans of the Crest. In such cases, the boundary will be amended to reflect the more precise boundary.

3. SCHEDULE A - Top of Bank Roadway Measurement February 2010

4. SCHEDULE B - Top of Bank Roadway Measurement

Schedule “B”



Appendix C
"Change Request Form"

CHANGE REQUEST FORM			
Requestor Information			
Company:		Requestor Name:	
Date Requested:		Requestor Title:	
Email Address:		Phone Number:	
Change Request			
Current: (include current clause number and current text)			
Proposed: (include the clause number and text amendment)			
Reason: (Justify the need for the change. Also attach any reference material)			

City of Edmonton Parkland Developer Services Use Only	
Date Received: _____ Request Number: _____	
Result: ☐ Approved ☐ Not Approved	
Reason: (for not approving or deferring)	
Date Approved: _____ Director Signature: _____	

Parks Planning – City of Edmonton
SDParksDevelopmentServices@edmonton.ca

Appendix D
"Revision Log"

2016 CLAUSE	APPROVED CHANGE IN 2017 STANDARDS
2. Roll Out Procedure 2.1 Developer and Other Projects 2.1.1 Design, drafting and construction requirements from the Design and Construction Standards, Volume 5: Landscaping (June 2016 edition) are applicable to all projects that are initiated into circulation as of July 1, 2016. 2.1.2 Projects initiated into circulation prior to July 1, 2016 are subject to the design and drafting requirements outlined in the Landscaping Standards that were applicable during the period the project was initiated. 2.1.3 A project is considered initiated once the "engineering drawings" (for developer project) and "tender" (for other projects) have been accepted into first circulation. 2.1.4 Anything constructed prior to July 1, 2016 shall adhere to the applicable Standard when the construction occurred. 2.1.4.1 Trees initially planted prior to July 1, 2016 that require amendment as a result of inspection by disturbing the rootball (replacement, lift, lower or straighten) must be replanted to the current depth requirements (specifically root flare 40mm above grade). 2.1.5 Clause 4.8.2 is applicable as of July 1, 2016 for Developer and Other Projects. 2.1.6 The requirement for notification of the City for Pesticide use will come into effect January 1, 2017.	2. Roll Out Procedure 2.1 Developer and Other Projects 2.1.1 Design, drafting and construction requirements from the Design and Construction Standards, Volume 5: Landscaping (June 2017 edition) are applicable to all projects that are initiated into circulation as of July 1, 2017. 2.1.2 Projects initiated into circulation prior to July 1, 2017 are subject to the design and drafting requirements outlined in the Landscaping Standards that were applicable during the period the project was initiated. 2.1.3 A project is considered initiated once the "engineering drawings" (for Developer project) and "tender" (for other projects) have been accepted into first circulation. 2.1.4 Anything constructed prior to July 1, 2017 shall adhere to the applicable Standard when the construction occurred. 2.1.4.1 Trees initially planted prior to July 1, 2017 that require amendment as a result of inspection by disturbing the rootball (replacement, lift, lower or straighten) must be replanted to the current depth requirements (specifically root flare 40mm above grade). 2.1.5 Clause 4.8.2 is applicable as of July 1, 2016 for Developer and Other Projects. 2.1.6 The requirement for notification of the City for Pesticide use will come into effect January 1, 2017. 2.1.7 The City of Edmonton in consultation with the Urban Development Institute and Landscape Alberta have reviewed and updated the specification 02910 Topsoil. This specification differs significantly from the topsoil specification outlined in the 2016 Landscaping Standard. As such the City recognizes that it is not feasible to immediately implement the topsoil specification and make the specification an immediate requirement. Therefore, the 2017 topsoil specification will not be a requirement for the 2017 landscaping season. The 2017 topsoil specification may however be used voluntarily by those who would like to immediately implement the 2017 topsoil specification and are therefore included in 2017 Landscaping Standards update. Consultation with the

2016 CLAUSE	APPROVED CHANGE IN 2017 STANDARDS
	Urban Development Institute and Landscape Alberta have reviewed and updated the specification 02910 Topsoil. This specification differs significantly from the topsoil specification outlined in the 2016 Landscaping Standard. As such the City recognizes that it is not feasible to immediately implement the topsoil specification and make the specification an immediate requirement. Therefore, the 2017 topsoil specification will not be a requirement for the 2017 landscaping season. The 2017 topsoil specification may however be used voluntarily by those who would like to immediately implement the 2017 topsoil specification and are therefore included in 2017 Landscaping Standards update.
	Updated Hyperlink: City of Edmonton, Dogs in Open Spaces Strategy: A 10-Year Strategy to Guide The Planning, Design and Management of Off Leash Areas in Edmonton; Canadian Nursery Stock Standard Ninth Edition, Canadian Nursery Landscape Association (C.N.L.A);
4.10.1 Inspections for Final Acceptance Certificates (FAC) will be undertaken by Parks from June 1st - September 30th based on snow coverage and weather dependent.	4.10.1 Inspections for Final Acceptance Certificates (FAC) will be undertaken by Parks from June 1st - September 30th based on snow coverage and weather dependent. Should a hard frost occur in the City of Edmonton, the inspection season will end for caliper trees to be accepted into City inventory. Hard frost is defined as “4 consecutive hours of below 4 degrees Celsius”.

2016 CLAUSE	APPROVED CHANGE IN 2017 STANDARDS
4.10.4 The Landscape Architect shall submit a standard letter, three original copies of the Sustainable Development Department FAC form including all 11"x17" reductions of the latest City signed approved landscape drawings, As-built AutoCAD drawing, As-built PDF drawing, Maintenance Log and Total Capital Assets Form, forwarding them to Development Coordination, Sustainable Development.	4.10.4 The Landscape Architect shall submit the following documents to Eplan: A pre-inspection report, the latest City signed approved drawings and/or Red Lines (highlighted to identify the scope of inspection, matching the specified improvement within the servicing agreement, and in a single PDF document) and a maintenance record. ▪ After FAC inspection approval the following documents must be submitted into Eplan: the latest approved landscape drawings (PDF and AutoCAD) and a Tangible Capital Asset form. ▪ Documents must be submitted within 30 days after the inspection approval. Failure to do so will result in FAC rejection.
4.5.1 Inspections for Landscape Construction Completion Certificates (CCC) will be undertaken by Parks from June 1st - October 15th, based on snow coverage and weather dependent.	4.5.1 Inspections for Landscape Construction Completion Certificates (CCC) will be undertaken by Parks from June 1st - October 15th, based on snow coverage and weather dependent. Snow accumulation of greater than 5cm in the last 2 weeks of the season will result in the cancellation of the season and/or daytime temperatures below 0 degrees till the end of the season.
4.10.5 The contractor shall provide all maintenance records for the site between CCC and FAC. This shall include standard maintenance tasks including dates when that maintenance occurred. Records shall also include pesticide application logs. Replacement tree and shrub planting must be indicated on drawings. These logs must be uploaded to Eplan as part of the supporting documents required for inspection to occur. This record must be provided with the inspection request.	4.10.5 The contractor shall provide all maintenance records for the site between CCC and FAC. This shall include standard maintenance tasks including dates when that maintenance occurred. Records shall also include pesticide application logs. Replacement tree and shrub planting must be indicated on drawings.

2016 CLAUSE	APPROVED CHANGE IN 2017 STANDARDS
4.10.6 Development Coordination, Sustainable Development will distribute the three original FACs to appropriate City Departments. On-site inspection shall be completed within thirty days of receipt of the above information by the Senior Development Engineer.	4.10.6 On-site inspection shall be initiated by Parks within thirty days of receipt of Parks Pre-Screen approval.
4.5.4 The Landscape Architect shall submit a standard form letter, three original copies of the standard Sustainable Development Department CCC form including all 11"x17" reductions of the latest City signed approved drawings and/or Red Lines, and forward them to Development Coordination, Sustainable Development. ▪ City assets that only require a CCC will require the following documents to be submitted at the time of CCC application: latest approved landscape drawings (PDF and AutoCAD) and a Tangible Capital Asset form.	4.5.4 The Landscape Architect shall submit the following documents to Eplan: A pre-inspection report, the latest City signed approved drawings and/or Red Lines (highlighted to identify the scope of inspection, matching the specified improvement within the servicing agreement, and in a single PDF document) and a maintenance schedule for landscaping improvements. ▪ City assets that only require a CCC will require the following documents to be submitted at the time of CCC application: the latest approved landscape drawings (PDF and AutoCAD) and a Tangible Capital Asset form.
4.5.6 Development Coordination, Sustainable Development will distribute the three original CCCs to appropriate City Departments. On-site inspection shall be completed by Parks within thirty days of receipt of the above information by the Senior Development Engineer.	4.5.6 On-site inspection shall be initiated by Parks within thirty days of receipt of Parks Pre-Screen approval.
	NEW CLAUSE 5.5.6 Tree trenches shall be identified on the planting plan, including the exact locations and all cross sections details. Construction verification will be required. The following items are acceptable methods of verification: pre-inspection, construction photos, soil sample or physical inspection (by City inspectors).

2016 CLAUSE	APPROVED CHANGE IN 2017 STANDARDS
	NEW CLAUSE 7.2.14 If the landscape drawings include naturalized grass, these areas will be vigorous, healthy, and naturalized by FAC inspection. Mowing may be completed only to establish plant health and must maintain a minimum height of 100-150 mm during establishment. During grass seed establishment do not cut more than 1/3 of blade height or below 100 mm (whichever is taller) at any one mowing. 7.2.15 Grass slopes greater than 3:1 will be naturalized and not mowed regularly. Newly constructed slopes should be seeded with a naturalized or native seed mix (Section 02920 Seed and Sod, 2.1.3. Native and Naturalization Seed Mixes).
7.2.8 The Landscape Architect shall specify all tree, shrub and ground cover sizes. To promote biodiversity and a healthy growing environment, it is recommended that 10% of all plant materials, where possible and appropriate, be of larger sizes. Larger material (trees or larger shrubs) shall be at least 40mm caliper size (deciduous), 2.5m height (coniferous) and 5 gallon pot size (shrubs).	7.2.7 The Landscape Architect shall specify all tree, shrub and ground cover sizes. To promote biodiversity and a healthy growing environment, it is recommended that 10% of all plant materials, where possible and appropriate, be of larger sizes. Larger material (trees or larger shrubs) shall be at least 40mm caliper size (deciduous), 2.5m height (coniferous) and 5 gallon pot size (shrubs). ▪ Individually planted trees above 40mm caliper or 2.5m height and 5 gallon shrubs will require a mulched ring.
	NEW CLAUSE 8.2.2 Contact information on litter receptacles shall be placed and made visible on developer/Contractor maintained sites.
	NEW CLAUSE: 8.3.8 Any disturbance to landscaping as a result of fencing construction shall be remediated to the satisfaction of City Operations Parks and Roads Services.

2016 CLAUSE	APPROVED CHANGE IN 2017 STANDARDS
	NEW CLAUSES: 9.2.4 All sportsfields must be inspected during sub base installation and prior to topsoil installation by Director Parks Operations or Designate. 9.2.5 Topsoil sample results must be submitted and approved by Director, Parks Operations or Designate for approval and adherence to soil standards prior to installation. 9.2.6 Proposed turf grass mixes must be submitted to the Director, Parks Operations or Designate for approval prior to seeding sports fields. Seed lot tags must be submitted to Parks Operations post seeding in order to verify seed source and type. 9.2.7 Project Manager and or Consultant must supply maintenance and establishment records to the Director, Parks Operations or Designate on internally built sports fields or to Director, Parks Planning or designate on developer built sports fields. These records must outline: Mowing, Irrigation, Weed Management, Fertilization; (type and rate), Aeration, Overseed and Topdressing including date each task occurred, provided over grow-in period (CCC to FAC)
	NEW CLAUSE 9.3.3 A drainage sump is not permitted unless there is no acceptable drainage alternative, which shall be subject to approval. The Project Manager and /or Consultant must submit drainage alternatives to the Director, Parks and Roads Operations or Designate on internally built Playspaces or to the Director, in Sustainable Development or designate on developer built Playspaces for approval. Drainage shall be connected to the City of Edmonton Drainage infrastructure, such as a manhole or catch basin.
	UPDATE to Section: 10.8 Road Islands, Median, and Entry Features Including revised order, revised cross sections, additional naturalization clauses and naturalization cross section.

2016 CLAUSE	APPROVED CHANGE IN 2017 STANDARDS
	NEW CLAUSE: 13.1.2 Interpretive signage is encouraged within storm water management ponds and natural wetlands. Signage would identify the design intent for the area to be natural or naturalized, and provide education for public awareness on the establishment and management of the pond. Signage would also provide education on the environmental, social, and economic benefits for naturalized landscapes or natural wetlands. The City encourages developers to design custom interpretive signage for each site. Proposed signage designs are required to be reviewed and approved by Parks. 13.1.3 Developer or Contractor contact information shall be placed and made visible at developer naturalized storm water management facilities and natural constructed wetlands. City of Edmonton contact information for general questions about naturalization will also be included on the sign. A sign shall be posted by the Developer and kept in place during construction, establishment, and maintenance phases of naturalized storm water management ponds and constructed natural wetlands. Once the site receives FAC the developer/contractor will remove the sign.
	2016 Removed Details: LA 100 Large Tree “Tree Protection Zone” LA 101 Small Tree “Tree Protection Zone” (Max. 80mm Cal.) **2017 New Details:** LA101 Tree Protection Zone LA114 Typical Tree Rootball Staking Detail **2017 Amended Details:** LA108B Typical Shrub Planting LA109 Planting Bed on a Slope LA200 Subdrainage Pipe Installation LA201 Typical Subdrainage Pipe Connections LA405 1800mm Ht. Wood Screen Fence

2016 CLAUSE	APPROVED CHANGE IN 2017 STANDARDS
	Appendix A "Definition of Major and Minor Tree Deficiencies Memorandum" has been removed. Appendix C "Corporate Tree Management Policy C456A" has been removed and added into the reference section 3.2 with a hyperlink. Appendix G "2017 Specification 02910 – Topsoil Specification & Reference Document"
2.1.4 All other fasteners and anchor bolts to be stainless steel to Type 304 (Grade 18-8). 2.1.5 Stain with "Sikkens Cetol #1" or City of Edmonton approved alternative. Shop application only. 3.1.3 All wood members will be stained with two coats of "Sikkens Cetol #1" or approved equal to manufacturer's specifications. 3.1.4 All end cuts to be dipped. 3.1.7 All assembled furniture elements will be securely anchored with stainless hardware on site as specified on the approved landscape drawings and specifications.	**2870 Site Furnishing – June 2017** 2.1.4 All other fasteners and anchor bolts to be zinc coated, galvanized or stainless steel Type 304 (Grade 18-8). 2.1.5 Coat with a water-based and UV resistant City of Edmonton approved stain and top coat. 3.1.3 All wood members shall be stained with a minimum of two coats of a water-based and UV resistant City of Edmonton approved coating. 3.1.4 All end cuts shall be treated with a water-based end sealer. 3.1.7 All assembled furniture elements shall be securely anchored with stainless, zinc or galvanized coated hardware on site, as specified on the approved landscape drawings and specifications.
3.4.1. Use a hydro seeder to seed slopes 3 horizontal to 1 vertical or steeper with Parks Naturalization Mix as in **Clause Error! Reference source not found**. In other flatter areas use Canada #1 Mix as in Clause 0. All as specified on the landscape drawings and in the scope of work.	**2920 Seed and Sod – June 2017** 2.1.3.9 Update percentage to equal 100%. 3.4.1. Use a hydro seeder to seed slopes 3 horizontal to 1 vertical or steeper with Parks Naturalization Mix as in Clause 2.1.3. In other flatter areas use Canada #1 Mix as in Clause 2.1.1. All as specified on the landscape drawings and in the scope of work.

Appendix E
"Pesticide Notification Signage Template"

Caution

This area has been treated

With	For
Date	Time
Active Ingredient	PCP Number

AVOID PROLONGED CONTACT WITH TREATED AREA

This sign will be removed 48 hours after application date

For Further Information Call:

311

Edmonton

Appendix F

"Tree Diversity Guidelines and Approved Species Spread and Spacing"

Tree Diversity Guidelines and

Approved Species Spread and Spacing

Diversity Guidelines

Species diversity must be considered during the planning and development of a neighbourhood or site. A treescape that is high in species diversity will be more tolerant of insect and disease issues and promotes a sustainable urban forest. In general, there should be no more than 25% of any one genus within the neighbourhood.

Forestry is still concerned about the high proportions of elm and ash already planted in the urban landscape. Currently, ash represents over 40% and elm represents over 35% of all roadway trees. Therefore, removal of elm and/or ash from the proposed plan may be required to increase overall diversity throughout the City.

Roadways	
Number of Required Trees within a Proposed Stage	Maximum Percentage of any one Genus
1 - 15	100%
16 - 40	75%
41 - 75	50%
75+	25%
Roadways, walkways within individual stages. Applicable to all specified trees 50mm and above.	

Parks and Open Space	
Number of Required Trees within a Proposed Stage	Maximum Percentage of any one Genus
1 - 15	75%
16 - 40	50%
41 - 75	25%
75+	20%
Applicable to all specified trees 50mm and above.	

Approved Species List – Spacing and Spread

Forestry and Parks have developed a list of acceptable tree species with recommended spacing and spread, as per the list below. Spacing may be changed at the discretion of Forestry, or by acceptance of drawings via the tender process. Agreed upon minor adjustments may be made on site. In all situations, minimum utility off-set distances must be adhered to, unless otherwise approved.

Definitions:

S **Street:** This species has been determined to perform well in roadway planting situations

St **Street Trial:** This species has the characteristics for a street tree but further observation is required

P **Park:** This species has been determined to perform well in a variety of open space situations

Pt **Parks Trial:** This species has the characteristics for an open space tree but further observation is required

Ec **Enhanced Conditions:** This species requires special consideration when determining its planting location or establishment requirements. Enhanced site conditions are defined as conditions that promote the health of the tree including tree trenches, increased soil volume and above base level maintenance practices.

La **Limited Availability:** Local suppliers have only select quantities. Use in low numbers.

Approved Tree Species – Spacing and Spread								
Deciduous Trees			**Code**					
Botanical Name	**Common Name**	**Spacing**	**S**	**St**	**P**	**Pt**	**Ec**	**La**
Alnus crispa	Green Alder	4 m			P			
Amelanchier alnifolia tree form	Saskatoon	3m			P			
Acer ginnala	Amur Maple (single stem)	4 m	S		P			
Acer negundo	Manitoba Maple	8 m	S		P			
Acer saccharinum	Silver Maple	10 m		St	P		Ec	
Acer saccharinum 'Silver Cloud'	Silver Cloud Maple	10 m		St	P		Ec	
Acer saccharum 'Bailsta'	Fall Fiesta Sugar Maple	10 m				Pt	Ec	La
Acer tataricum	Tartarian Maple	7 m	S		P			
Acer tataricum 'GarAnn'	Hot Wings Maple	6 m	S		P			
Acer tataricum 'JFS-KW2'	Rugged Charm Maple	6 m	S		P			
Acer platanoides	Norway Maple	8 m		St		Pt	Ec	
Acer x freemanii 'Jeffersred'	Autumn Blaze Maple	8 m	S		P		Ec	
Acer rubrum 'Armstrong'	Armstrong Maple	5 m		St				
Acer rubrum 'Red Rocket'	Red Rocket Maple	4 m				Pt	Ec	La
Acer rubrum 'Autumn Spire'	Autumn Spire Red Maple	5 m				Pt	Ec	La
Aesculus glabra	Ohio Buckeye	5 m	S		P			
Aesculus glabra 'Prairie Torch'	Prairie Torch Ohio Buckeye	8 m	S		P			La

Deciduous Trees			Code					
Botanical Name	**Common Name**	**Spacing**	**S**	**St**	**P**	**Pt**	**Ec**	**La**
Aesculus glabra 'Autumn Splendor'	Autumn Splendor Ohio Buckeye	8 m	S		P			La
Betula papyrifera	Paper/ White Birch	8 m		St	P		Ec	
Betula papyrifera 'Varen'	Prairie Dream Birch	6 m		St	P		Ec	La
Betula platyphyll'Jefpark'	Parkland Pillar Birch	3 m				Pt	Ec	
Betula papyrifera 'Chickadee'	Chickadee Birch	5 m				Pt	Ec	
Betula nigra	River Birch	5 m				Pt	Ec	
Betula platyphylla 'Fargo'	Dakota Pinnacle Birch	3 m				Pt	Ec	
Caragana arborescens 'Sutherland'	Sutherland Caragana	3 m	S		P			
Celtis occidentalis	Hackberry	8 m		St		Pt	Ec	
Crataegus x mordenensis 'Snowbird'	Snowbird Hawthorn	5 m	S		P			
Crataegus x mordenensis 'Toba'	Toba Hawthorn	5 m	S		P			
Elaeagnus angustifolia	Russian Olive	8 m	S		P			
Fraxinus americana	White Ash	8 m		St	P		Ec	
Fraxinus nigra 'Fallgold'	Fallgold Black Ash	6 m				Pt		
Fraxinus nigra x mandshurica 'Northern Gem'	Northern Gem Ash	6 m				Pt		
Fraxinus nigra x mandshurica 'Northern Treasure'	Northern Treasure Ash	6 m				Pt		
Fraxinus mandshurica	Manchurian Ash	6 m		St		Pt		
Fraxinus pennsylvanica 'Patmore'	Patmore Ash	8 m	S		P			
Fraxinus pennsylvanica 'Summit'	Summit Ash	8 m	S		P			La
Fraxinus pennsylvanica	Foothills Ash	8 m	S		P			
Fraxinus pennsylvanica 'Bergeson'	Bergeson Ash	8 m	S		P			La
Fraxinus pennsylvanica 'Prairie Spire'	Prairie Spire Ash	8 m	S		P			
Fraxinus pennsylvanica (seedless variety)	Green Ash	8 m	S		P			
Gleditsia triacanthos var. inermis `Dursan'	Prairie Silk Honeylocust	8 m		St	P		Ec	La
Gleditsia triacanthos var. inermis `Shademaster'	Shademaster Honeylocust	8 m		St	P		Ec	La
Gleditsia triacanthos var. inermis `Harve'	Northern Acclaim Honeylocust	8 m		St	P		Ec	La
Juglans nigra	Black Walnut	10 m			P			La
Juglans cinerea	Butternut	10 m			P			La
Maackia amurensis	Amur Maackia	8 m		St	P			
Malus x baccata 'Dolgo'	Dolgo Crabapple	5 m			P			
Malus baccata	Siberian Crabapple	5 m	S		P			
Malus x 'Spring Snow'	Spring Snow Crabapple	5 m	S		P			
Malus x adstringens 'Thunderchild'	Thunderchild Crabapple	5 m	S		P			
Malus x adstringens 'Durleo'	Gladiator Crabapple	3 m	S		P			
Malus x adstringens 'Royalty'	Royalty Crabapple	5 m			P			
Malus x baccata 'Columnaris'	Rosthern Crabapple	3 m	S		P			
Malus x adstringens 'Makamic'	Makamic Crabapple	5 m			P			
Malus x adstringens 'Kelsey'	Kelsey Crabapple	5 m			P			
Malus x 'Jeflite'	Starlite Crabapple	5 m			P			
Malus x 'DurBy'	Ambassador Crabapple	4 m			P			
Malus x 'Big River'	Big River Crabapple	5 m			P			
Malus x 'Durlawrence'	Courageous Crabapple	5 m			P			

Deciduous Trees			Code					
Botanical Name	**Common Name**	**Spacing**	**S**	**St**	**P**	**Pt**	**Ec**	**La**
Malus x prunifolia var 'Rinki Crabapple'	Rinki Crabapple	5 m	S		P			
Malus x 'Jefgreen'	Emerald Spire Crabapple	2 m	S		P			
Malus x 'Jefspire'	Purple Spire Crabapple	2 m	S		P			
Phellodendron amurense	Amur Cork Tree	10 m			P			
Populus x 'Assiniboine'	Assinboine Poplar	8 m			P			
Populus x 'ACWS151'	Sundancer Poplar	4 m			P			
Populus x 'Tristis'	Tristis Poplar	10 m			P			
Populus x 'Okanese'	Okanese Poplar	8 m			P			
Populus tremula 'Erecta'	Swedish Columnar Aspen	2 m	S		P			
Populus tremuloides	Trembling Aspen	5 m	S		P			
Populus balsamifera	Balsam Poplar	10 m			P			
Populus x jaackii 'Northwest'	Northwest Poplar	10 m	S		P			
Prunus nigra 'Princess Kay'	Flowering Plum	6 m			P			
Prunus maackii	Amur Cherry	8 m	S		P			
Prunus maackii 'Jefree'	Goldrush Amur Cherry	6 m	S					
Prunus maackii 'Jefspur'	Gold Spur Amur Cherry	3 m	S					
Prunus padus var. commutata	Mayday Tree	8 m	S		P			
Prunus pensylvanica	Pin Cherry	6 m			P			
Prunus virginiana `Schubert'	Schubert Chokecherry	8 m	S		P			
Prunus virginiana 'Spur'	Spur Schubert Chockecherry	8 m	S		P			
Pyrus fauriei 'Westwood'*	Korean Sun Ornamental Pear	6 m				Pt	Ec	La
Pyrus ussuriensis 'MorDak'*	Prairie Gem Ornamental Pear	6 m				Pt	Ec	La
Pyrus ussuriensis 'Mountain Frost'*	Mountain Frost Ornamental Pear	6 m				Pt	Ec	La
Pyrus x DurPSN303 '	Navigator Pear	5 m				Pt	Ec	La
Quercus macrocarpa	Bur Oak	8 m	S		P			
Quercus palustris	Pin Oak	8 m		St		Pt	Ec	
Quercus rubra	Red Oak	8 m		St		Pt	Ec	
Quercus ellipsoidalis	Northern Pin Oak	8 m		St		Pt	Ec	
Quercus borealis	Northern Red Oak	8 m		St		Pt	Ec	
Quercus macrocarpa 'JFS-KW14'	Cobblestone Oak	8 m		St		Pt	Ec	La
Quercus macrocarpa 'Top Gun'	Top Gun Bur Oak	5 m		St		Pt	Ec	La
Quercus x warei 'Long'	Regal Prince Oak	6 m		St		Pt	Ec	La
Salix alba 'Vitellina'	Golden Willow	10 m			P			
Salix pentandra	Laurel Leaf Willow	10 m			P			
Salix acutifolia	Sharp Leaf Willow	10 m			P			
Sorbus americana	American Mtn. Ash	6 m	S		P			
Sorbus aucuparia 'Rossica'	Russian Mountain Ash	4 m	S		P			
Sorbus aucuparia 'Fastigiata'	Pyramidal Mtn. Ash	4 m	S		P			
Sorbus aucuparia 'Skybound'	Skybound Mountain Ash	5 m	S		P			
Sorbus decora	Showy Mountain Ash	5 m	S		P			
Sorbus hybrida	Oak Leaf Mountain Ash	5 m	S		P			
Syringa reticulata 'Ivory Silk'	Ivory Silk / Japanese Tree Lilac	5 m	S		P			

Deciduous Trees			Code					
Botanical Name	**Common Name**	**Spacing**	**S**	**St**	**P**	**Pt**	**Ec**	**La**
Tilia americana	American Linden	8 m	S		P			
Tilia americana 'Duros'	True North Linden	8 m	S		P			La
Tilia americana 'Redmond'	Redmond Linden	8 m	S		P			La
Tilia cordata	Littleleaf Linden	8 m	S		P			
Tilia cordata'Greenspire'	Greenspire Littleleaf Linden	8 m	S		P			La
Tilia cordata 'Corzam'	Corinthian Linden	8 m	S		P			La
Tilia x flavescens 'Dropmore'	Dropmore Linden	8 m	S		P			
Ulmus americana	American Elm	10 m	S		P			
Ulmus americana 'Brandon'	Brandon Elm	8 m	S		P			
Ulmus americana 'Patmore'	Patmore Elm	8 m	S		P			La
Ulmus pumila	Siberian Elm	10 m	S		P			

Coniferous Trees			Code					
Botanical Name	**Common Name**	**Spacing**	**S**	**St**	**P**	**Pt**	**Ec**	**La**
Abies balsamea	Balsam Fir	4 m				Pt		La
Abies concolor	White Fir	4 m				Pt		La
Juniperus scopulorum 'Wichita Blue'	Wichita Blue Upright Juniper	4 m				Pt		La
Juniperus scopulorum 'Moonglow'	Moonglow Upright Juniper	4 m				Pt		La
Juniperus scopulorum 'Medora'	Medora Upright Juniper	4 m				Pt		La
Juniperus virginiana 'Blue Arrow'	Blue Arrow Upright Juniper	4 m				Pt		La
Juniperus virginiana 'Skyrocket'	Skyrocket Upright Juniper	4 m				Pt		La
Larix sibirica	Siberian Larch	8 m			P			
Larix laricina	Tamarack	8 m			P			
Picea abies	Norway Spruce	8 m			P			
Picea engelmannii	Engleman Spruce	8 m			P			
Picea glauca	White Spruce	8 m			P			
Picea glauca var. densata	Black Hills Spruce	8 m			P			
Picea mariana	Black Spruce	8 m			P		Ec	
Picea omorika 'Bruns'	Bruns Serbian Spruce	8 m			P		Ec	La
Picea pungens 'Fastigiata'	Columnar Colorado Spruce	3 m			P			
Picea pungens	Colorado Green Spruce	8 m			P			
Picea pungens var. glauca	Colorado Blue Spruce	8 m			P			
Pinus aristata	Bristlecone Pine	4 m				Pt		La
Pinus banksiana	Jack Pine	4 m			P			
Pinus cembra	Swiss Stone Pine	4 m			P			La
Pinus contorta var. latifolia	Lodgepole Pine	4 m			P			
Pinus flexilis	Limber Pine	4 m				Pt		
Pinus mugo subspecies uncinata	Mountain Pine	8 m				Pt		
Pinus nigra	Austrian Pine	8 m			P			La
Pinus ponderosa	Ponderosa Pine	10 m			P			
Pinus strobus	Eastern White Pine	8 m			P			La
Pinus strobus fastigiata	Columnar Eastern White Pine	4 m			P			La

Coniferous Trees			Code					
Botanical Name	**Common Name**	**Spacing**	**S**	**St**	**P**	**Pt**	**Ec**	**La**
Pinus sylvestris	Scots Pine	8 m			P			
Pseudotsuga menziesii	Douglas Fir	8 m			P			
Thuja 'Brandon'	Brandon Pyrimidal Cedar	4 m			P			
Thuja 'Skybound'	Skybound Pyrimidal Cedar	4 m			P			
Thuja 'Degroots Spire'	Degroots Spire Pyrimidal Cedar	4 m			P			

Appendix G

"2017 Section 02910 – Topsoil Specification & Reference Document"

The *2017 Section 02910 Topsoil Specifications and Reference Document* located in this Appendix are not a requirement in 2017. Please use Section 02910 Topsoil Specification (June 2016) as the required topsoil specification in 2017

City of Edmonton

Topsoil Specification Update

2017 Section 02910 – Topsoil Specification

1. GENERAL

1.1. SCOPE

This document sets out a range of measurable physical and chemical properties for acceptable topsoil applications in the installation of parks, playgrounds, school sites, standard sports field for school sites, greenways, public utility lots, premier sports fields (irrigation and with and without subdrainage), roads boulevards and medians, urban hardscape planting beds, ornamental shrub beds, urban agriculture areas, naturalization zones and low-impact development (LID).

The City of Edmonton Topsoil Specification is derived from the City of Edmonton Topsoil Specification Update: Reference Document – 2017 Edition (Reference Document). The Reference Document provides technical background and guidelines to support the City of Edmonton 2017 Section 02910 – Topsoil Specification.

The Topsoil Specification is applicable for development that occurs on City owned land.

The intent of the Topsoil Specification is to guide the use of native topsoil from the project site if it is available and suitable.

1.2. SECTION INCLUDES

Related Sections (Section 1.3)

Related References, Standards, and Legislation (Section 1.4)

Topsoil Testing Methods (Section 1.5)

Use of Tables (Section 1.6)

Required Sampling and Analysis Submittals (Section 1.7)

Quality of Work (Section 1.8)

Required Topsoil Types (Section 2.1)

On-Site Native Topsoil (Section 2.2)

Imported Topsoil (Section 2.3)

Organic Topsoil Amendments (Section 2.4)

Inorganic Topsoil Amendments (Section 2.5)

Examination (Section 3.1)

Salvaging, Stockpiling, Delivery, and Protection (Section 3.2)

Job Conditions (Section 3.3)

Subgrade Scarification (Section 3.4)

Placing Topsoil (Section 3.5)

Topsoil Amendment Application (Section 3.6)

Clean-Up (Section 3.7)

End Use Definitions (Section 3.8)

Table 1 Topsoil Types Recommended with City of Edmonton End Uses

Table 2 Topsoil Types and Associated Topsoil Properties Recommended for End Uses

1.3. RELATED SECTIONS

Design and Construction Standards Volume 2: Roadways, Section 02335 – Subgrade Preparation

Design and Construction Standards Volume 5: Landscaping, Section 02914 – Mulches

Design and Construction Standards Volume 5: Landscaping, Section 02920 – Seed and Sod

Design and Construction Standards Volume 5: Landscaping, Section 02930 – Trees, Shrubs and Ground Covers

Design and Construction Standards Volume 5: Landscaping, Section 02931 – Naturalization

1.4. RELATED REFERENCES, STANDARDS, AND LEGISLATION

1.4.1. The City of Edmonton Design and Construction Standards. https://www.edmonton.ca/city_government/urban_planning_and_design/city-design-construction-standards.aspx Document: *City of Edmonton Topsoil Specification Update: Reference Document – 2017 Edition.*

1.4.2. Canadian System of Soil Classification and associated Soil Texture Class Diagram (Soil Classification Working Group 1998) http://sis.agr.gc.ca/cansis/taxa/cssc3/index.html

1.4.3. Standard Guide for Construction of High Performance Sand-Based Rootzones for Athletic Fields (ASTM 2016) https://www.astm.org/Standards/F2396.htm

1.4.4. USGA Recommendation for a Method of Putting Green Construction (USGA 2004) https://www.usga.org/content/dam/usga/images/course-care/2004%20USGA%20Recommendations%20For%20a%20Method%20of%20Putting%20Green%20Cons.pdf

1.4.5. City of Edmonton Low Impact Development Best Management Practices (City of Edmonton 2014) https://www.edmonton.ca/city_government/environmental_stewardship/low-impact-development.aspx

1.4.6. Soil Survey of the Edmonton Sheet (83H). (Bowser et al. 1962) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag14932

1.4.7. Canadian Landscape Standard (CLSA/AAPC, CNLA 2016) http://www.csla-aapc.ca/standard

1.4.8. British Columbia Landscape Standard (BCSLA and BCLNA 2012) http://www.csla-aapc.ca/awards-atlas/british-columbia-landscape-standard

1.4.9. Soil Organic Matter (Alberta Agriculture & Food 2016) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/aesa1861

1.4.10. Alberta Tier I Soil and Groundwater Remediation Guidelines (AEP 2016) http://aep.alberta.ca/lands-forests/land-industrial/inspections-and-compliance/documents/AlbertaTier1Guidelines-Feb02-2016A.pdf

1.4.11. Soil Quality Criteria Relative to Disturbance and Reclamation (Revised) (AAFRD 1987) Plains Region http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag9469/$FILE/sq_criteria_relative_to_disturbance_reclamation.pdf

1.4.12. Alberta Soil Phosphorus Limits Project. Volume 1: Summary and Recommendations (Paterson et al. 2006) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag11864/$FILE/vol-1-summary.pdf

1.4.13. Potassium Fertilizer Application in Crop Production (AAF 2013) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex917

1.4.14. Alberta *Weed Control Act* and Regulations(Government of Alberta 2011, 2010) http://www.qp.alberta.ca/documents/Acts/W05P1.pdf and http://www.qp.alberta.ca/documents/Regs/2010_019.pdf

1.4.15. CCME Guidelines for Compost Quality (CCME 2005) http://www.ccme.ca/files/Resources/waste/compost_quality/compostgdlns_1340_e.pdf

1.4.16. Environmental Construction Operations (ECO) Plan Framework (City of Edmonton 2016) https://www.edmonton.ca/city_government/environmental_stewardship/environmental-construction-operations-plans.aspx

1.5. TOPSOIL TESTING METHODS

As cited in the 'City of Edmonton Topsoil Specification Update: Reference Document – 2017 Edition' (Reference Document, Appendix B):

1.5.1. Texture: Kroetsch and Wang (2008)

1.5.2. pH Saturated Paste: Miller and Curtin (2008)

1.5.3. Salinity (EC, SAR, Saturation Percent, Soluble Ions Ca, Mg, K, Cl, SO_4, Na): Miller and Curtin (2008); Martin et al. (1994)

1.5.4. Organic Matter Content: J.A. McKeague (1978)

1.5.5. Total Organic Carbon, Total Nitrogen via LECO: LECO Corporation (2010)

1.5.6. Total Kjeldahl Nitrogen: USEPA (1978a;1978b)

1.5.7. $CaCO_3$ Equivalent: Ziadi and Sen Tran (2008)

1.5.8. Available N, P, K: Ashworth and Mrazek (1995)

1.5.9. Total Phosphorus: USEPA (1994a, 1994b)

1.5.10. pH ($CaCl_2$): Hendershot, Lalande and Duquette (2008)

1.5.11. pH (1:2 H_2O): Goh and Mermut (2008)

1.5.12. Bulk Density: McKeague (1978)

1.5.13. Cation Exchange Capacity: McKeague (1978)

1.5.14. Saturated Hydraulic Conductivity: WSU and Puget Sound Partnership (2012)

1.6. USE OF TABLES

1.6.1. Table 1 specifies the seven topsoil types and associated topsoil depths for various end uses.

1.6.2. Table 1 provides a guide for designers and reviewers to ensure that current projects meet the City of Edmonton's Standards for topsoil type and depth. Examples:

1.6.2.1 Example 1: In a Park or Playground (End Use 1a), the topsoil type used is “Basic/Native Topsoil” (see Table 2 for associated topsoil properties). The acceptable topsoil depth range for Parks and Playgrounds is 300 mm to 500 mm.

1.6.2.2 Example 2: In a Park that contains Ornamental Shrub Beds (End Use 5), the topsoil type used is "High Organic Matter" for the ornamental shrub bed (see Table 2 for associated topsoil properties). The acceptable topsoil depth for the ornamental shrub bed is 450 mm to 500 mm. The remainder of the Park (excluding the ornamental shrub bed) is to use “Basic Native Soil” with depth of 300 mm to 500 mm.

1.6.2.3 Example 3: In a Premier Sports Field that is irrigated and contains subdrainage (End Use 2b), the topsoil type used is “Very High Sand, Low Organic Matter” (see Table 2 for associated topsoil properties). The acceptable topsoil depth range is 200 mm to 300 mm.

1.6.3. Table 2 outlines the physical and chemical properties of each topsoil type per end use.

It is the responsibility of the Qualified Professional to provide direction on how to achieve the properties set out in Table 2 based on topsoil sampling and analysis as outlined in the Reference Document (Appendix C).

1.7. REQUIRED SAMPLING AND ANALYSIS SUBMITTALS

1.7.1. Qualified Professional Definition

1.7.1.1 A professional (Agrologist, Soil Scientist) who is trained in the appropriate methods for soil survey, mapping and sampling; is competent to review and interpret analysis laboratory results and provide recommendations on

quantities, blending and application methods of soil amendment to achieve seven topsoil types in Tables 1 and 2.

1.7.2. Required Sampling and Analysis Submittals

1.7.2.1 Submit representative soil survey and topsoil samples collected by a Qualified Professional as outlined in the Reference Document for analysis of imported and native topsoil materials to an approved commercial laboratory (CSA/ASTM/CALA) (The Canadian Association for Laboratory Accreditation) that is ISO 17025 accredited.

1.7.2.2 Submit a copy of the Chain of Custody (COC) Record form to the laboratory that records all personnel responsible for handling the topsoil samples. A copy must be kept with the samples always. The City may request the COC Record at any time for review.

1.7.2.3 A copy of the analysis report shall be submitted to the Qualified Professional for their records. The City may request the analysis report at any time for review.

1.7.2.4 The analysis report will include the source and sample location(s) as outlined in the Reference Document (Appendix C).

1.7.2.5 The complete list of topsoil parameters to be analyzed are included in Table 2. The general methodology of the analyses is listed in Section 1.5 above and in detail in Appendix B of the Reference Document. Analyses will include but will not be limited to: soil texture; percentage of sand, silt and clay; total soluble salts (electrical conductivity (EC)); sodicity (sodium absorption ratio (SAR)); soil pH (saturated paste) value; saturation percentage of soil; soluble ions (Ca, Mg, K, Cl, SO_4, Na); total organic carbon and total nitrogen; total Kjeldahl nitrogen; percentage of organic matter; calcium carbonate equivalent; available nitrogen (N), phosphorus (P), potassium (K) soil nutrients: total phosphorus, as required. Additional analyses may include: soil pH (soil:water; $CaCl_2$); cation exchange capacity; and saturated hydraulic conductivity.

1.7.2.6 Recommendations by a Qualified Professional to amend the topsoil through the admixture of other organic and non-organic topsoil amendments. The goal is to bring its topsoil mixture properties within the ranges set in Table 2 will be based on the analysis report.

1.7.2.7 A Qualified Professional will clearly outline the type and quantity of topsoil amendment(s), and the application procedure to be used. The City may request a copy of the recommendations at any time for review.

1.7.2.8 Where imported topsoil type is to be used, the bidding Contractor shall test, or have the topsoil supplier test, the proposed topsoil type as per this Specification.

1.7.2.9 Failure to test and provide appropriate documentation of test results may be considered grounds for rejection of a proposed topsoil type and may result in the removal of rejected material at the Contractor's expense.

1.7.2.10 Where this Topsoil Specification is adopted as part of a landscape Contract, or where the Contract requires testing of topsoil type and its components, the Contractor shall meet all requirements of this Section, or the corresponding requirements of the Contract.

1.7.2.11 The Contractor's signature to the Contract shall signify that the Contractor has read and fully understands the requirements of the topsoil types and testing with respect to texture, nutrient value, mineral and organic content and invasive (including prohibited noxious and noxious) plant materials (roots, rhizomes, seeds) content.

1.7.2.12 The Contractor shall guarantee that the topsoil submitted for laboratory testing, as recommended by the laboratory or Qualified Professional, is a representative sample taken from the topsoil or stockpile that will be delivered to the site.

1.7.3. In-Situ Soils: Summary for Sampling and Testing to Verify Topsoil Type for End Use

Areas (native, undisturbed) to be disturbed and salvaged for topsoil must meet the physical and chemical parameters in Table 2 based on the topsoil type required for the end use (Table 1). After topsoil type(s) are placed in the designated end use areas as outlined in Table 1, the topsoil must meet the physical and chemical parameters in Table 2 based on the topsoil type (Table 1). Any topsoil salvaged shall not be contaminated (i.e., meet the Alberta Tier I Soil and Groundwater Remediation Guidelines (AEP 2016) for parameters not mentioned in Table 2).

1.7.3.1 Sampling Methodology

1.7.3.1.1 Native topsoil: Representative samples shall be taken of the proposed topsoil within the mapped soil management units (SMUs) in a stratified random sampling grid. See Soil Survey and Sampling Method (Reference Document, Appendix C). Native topsoil is defined as existing fertile, friable, dominantly coarse textured, 'A' horizon containing accumulated organic matter, and usually distinguished by a darker colouration.

1.7.3.1.2 Replaced topsoil: Representative samples shall be taken of the proposed topsoil within the differentiated end use area in a sampling grid. See Soil Survey and Sampling Methods (Reference Document, Appendix C). Replaced topsoil is defined as either native topsoil or imported topsoil (from an existing stockpile) that is used in land reclamation to meet the end uses.

1.7.3.2 Number of Samples for Verification of Acceptability: A minimum of 16 discrete topsoil samples of native topsoil per project site or SMU or 16 discrete topsoil samples of replaced topsoil are to be collected (Reference Document, Appendix C).

1.7.3.3 Parameters Tested in Laboratory: The topsoil shall be analyzed for the chemical and physical properties outlined in Table 2 and as per the

methodology outlined in the Reference Document (Appendix B, Table B1) and section 1.5 of this document.

1.7.3.4 Verification of Acceptability: The results are compared to the topsoil chemical and physical properties listed in Table 2. If the average of each parameter meets the ranges in Table 2, the topsoil is satisfactory for the end use identified in Table 1. If the topsoil does not meet the requirements in Table 2, the topsoil is unsatisfactory and will need to be amended. This amended topsoil will be re-tested to ensure the topsoil meets the requirements in Table 2.

1.7.3.5 Quality Control: A Qualified Professional shall be consulted and only accredited commercial laboratory companies (CSA/ASTM/CALA) that are ISO 17025 accredited shall be used for sample analysis.

1.7.4. Stockpile Soils: Summary for Sampling and Testing to Verify Topsoil Type for End Use

Topsoil stockpiles from previous construction activities or suspect topsoil stockpile from existing construction activities are required to be soil surveyed (physical and chemical field characterization) and sampled to verify the suitability as per the topsoil types required per end use as outlined in Tables 1 and 2.

1.7.4.1 Sampling Methodology: Representative samples shall be taken of the proposed topsoil within the stockpile at documented locations. See 'Soil Survey and Sampling Method' (Reference Document, Appendix C).

1.7.4.2 Number of Samples for Verification of Acceptability: The minimum number of topsoil samples collected are based on topsoil volume and outlined in Table C1 (also found in Reference Document, Appendix C).

Table C1 Sampling Requirements of Stockpiled Topsoil

Topsoil Volume (m^3)	Minimum Number of Sampling Locations
0-375	3
376-750	4
751-1500	5
1501-3000	6
Each additional 2000 or partial amount	One additional sample

Note: For example, if the stockpile is 15,000 m^3, there will need to be 12 discrete topsoil samples taken for analysis.

1.7.4.3 Parameters Tested in Laboratory: The topsoil shall be analyzed for the chemical and physical properties outlined in Table 2 and as per the methodology outlined in the Reference Document (Appendix B, Table B1) and section 1.5 of this document.

1.7.4.4 Verification of Acceptability: The results are compared to the topsoil chemical and physical properties listed in Table 2. If the average of each parameter meets the ranges in Table 2, the topsoil is satisfactory for the end

use identified in Table 1. If the topsoil does not meet the requirements in Table 2, the topsoil is unsatisfactory and will need to be amended. This amended topsoil will be re-tested to ensure the topsoil meets the requirements in Table 2.

1.7.4.5 Quality Control: A Qualified Professional shall be consulted and only accredited commercial laboratory companies (CSA/ASTM/CALA) that are ISO 17025 accredited shall be used.

1.7.5. Amending Topsoil to Meet Specifications

1.7.5.1 Amending Topsoil: On-site or imported topsoil to be used on a site shall be tested and modified as required by this Topsoil Specification through the amendment of approved organic and/or inorganic materials to improve its properties to meet the ranges set in Table 2.

1.7.6. Verification of Sampling and Testing

1.7.6.1 Records of sampling and laboratory testing shall be retained that verify the appropriate topsoil was used as per topsoil type and end use.

1.7.6.2 Laboratory records shall be submitted to the City of Edmonton upon request to assure that the appropriate topsoil associated with the designated topsoil type and end use was used.

1.8. QUALITY OF WORK

Quality of work is reflected in compliance with this Topsoil Specification through the testing and utilization of topsoil types with the properties in Tables 1 and 2 as set out in this Topsoil Specification.

2. PRODUCTS

2.1. REQUIRED TOPSOIL TYPES

2.1.1. Refer to Table 1 for Topsoil Types and depth by end use. Topsoil volumes to achieve optional growth conditions for trees will be per Tables 1 and 2, and City of Edmonton Typical Tree Installation Details.

2.1.2. Refer to Table 2 for the acceptable physical and chemical property ranges of each topsoil type that must be met prior to placement.

2.1.3. Topsoil will be blended with topsoil amendments as determined by a Qualified Professional based on the topsoil analysis report to achieve the physical and chemical property ranges set out in Table 2 for each topsoil type.

2.2. ON-SITE NATIVE TOPSOIL

2.2.1. Use of on-site topsoil is encouraged when it meets, or can be modified to meet, the requirements set out in Tables 1 and 2.

2.2.2. Native topsoil shall be defined as the existing fertile, friable, dominantly coarse textured, 'A' horizon containing accumulated organic matter, and usually distinguished by a darker colouration.

2.2.3. Where a Qualified Professional demonstrates that on-site topsoil is suitable for use in its present condition, or as a component of a topsoil type in Tables 1 and 2, it shall be stockpiled and protected. See section 3.2.4 for more information regarding topsoil and stockpile protection.

2.2.4. Topsoil shall be screened and free of rocks of 50 mm in diameter and over, debris and foreign objects, free of subsoil, roots and weeds, unless authorized by a Qualified Professional.

2.3. IMPORTED TOPSOIL

2.3.1. Imported topsoil shall be from an approved source.

2.3.2. If a Qualified Professional demonstrates that imported topsoil is suitable as a component of a topsoil type in Table 1 and Table 2, it shall be stockpiled and protected, if required.

2.3.3. Imported topsoil shall be screened and free of subsoil, wood debris, invasive and prohibited noxious and noxious plants and their reproductive parts, plant pathogenic organisms, organic and inorganic materials, toxins, stones over 50 mm, and debris and foreign objects.

2.4. ORGANIC TOPSOIL AMENDMENTS

Topsoil amendments shall be screened and free of subsoil, sawdust, commercial wood products, stones, lumps, plants, roots, sticks, invasive and noxious plant parts and seeds per the *Weed Control Act and Regulations*, high seed content, chemical contaminants and other organic or inorganic materials harmful to plant life.

Organic amendment components shall be determined based on testing results and on recommendations from a Qualified Professional and be thoroughly mixed with the topsoil.

2.4.1. Compost shall:

2.4.1.1 Laboratory records shall be submitted to the City of Edmonton upon request to assure that the appropriate compost associated to the designated topsoil type and end use was used.

2.4.1.2 Be commercially prepared and shall meet the CCME Guidelines for Compost Quality (2005). Compost applications shall be managed to avoid overloading soils with heavy metals.

2.4.1.3 Be substantially free from coliform, pathogens, and chemical or organic contaminants that may be detrimental to plant, animal or human health.

2.4.1.4 Meet the foreign matter and sharp foreign matter requirements (CCME 2005).

2.4.1.5 Not exceed a 40:1 total C:N ratio. Compost with a total C:N ratio of 25:1 to 30:1 is recommended.

2.4.1.6 Well rotted wood residuals when found to be a component of compost are acceptable provided the total C:N ratio for the topsoil type (mixture) shall be a maximum of 25:1 to 30:1.

2.4.1.7 Manure compost must meet the CCME (2005) guidelines before use as an amendment.

2.4.2. High-lignin Organic Material used to manufacture, or as a surface amendment for the designed topsoil mixture shall conform to the following:

2.4.2.1 Shall consist of bark or other plant materials with hard fibrous structure.

2.4.2.2 Shall have particle size of 1 mm to 15 mm, with no more than 10% under 2 mm (saw dust is not permitted).

2.4.2.3 pH shall range between 4.5 and 7.

2.4.3. Peat moss is not approved by the City as a topsoil amendment for cited end uses. It repels water (hydrophobic) and breaks down too fast, compressing and squeezing air out of the topsoil; thus, creating an unhealthy condition for plant roots.

2.4.4. Municipal sewage sludge and biosolids are not covered by this Specification.

2.5. INORGANIC TOPSOIL AMENDMENTS

Inorganic topsoil amendments include fertilizers, sand and perlite.

2.5.1. Fertilizers shall:

2.5.1.1 Be added to bring topsoil fertility within the ranges set out in Table 2, and as recommended by a Qualified Professional based on the topsoil testing results to determine the types, formations, and application rates. Substitutions or variations in fertilizers and methods shall be approval by the Qualified Professional prior to application.

2.5.1.2 Meet the requirements of municipal and provincial regulations and the Federal Fertilizers Act and Regulations.

2.5.1.3 Be in granular, pellet or pill form, dry and free flowing and have guaranteed N-P-K analysis. Liquid formations are not recommended unless prior approved by the City.

2.5.2. Sand shall be:

2.5.2.1 Clean river pump sand or a locally available equivalent that is natural and coarse and meets the analytical specification of Table 2.

2.5.2.2 Free from impurities, clay balls, chemicals or organic matter.

2.5.2.3 Laboratory records shall be submitted to the City of Edmonton upon request to assure that the appropriate sand associated to the designated topsoil type and end use was used.

2.5.3. Perlite shall be:

2.5.3.1 Siliceous mineral of volcanic origin that is chemically inert, pH neutral, light-weight, sterile and odourless.

2.5.4. Vermiculite is not a recommended amendment by the City for topsoil mixtures. Vermiculite has less strength than perlite. Rapid breakdown in the soil and clogging of drainage fabric by fine vermiculite particles have been reported.

3. EXECUTION

3.1. EXAMINATION

3.1.1. Contractor to ensure conformance with project drawings and related specifications.

3.1.2. Prior to topsoil placement, submit the as-built subgrade surveying to the City of Edmonton for verification of correct subsoil grades. Provide a proof of inspection by the appropriate qualified professional for verification purposes.

3.1.3. Contractor and Qualified Professional to ensure topsoil placement near or above utilities meet the applicable standards and specifications of those utilities.

3.1.4. Contractor to coordinate the placement of topsoil.

3.2. SALVAGING, STOCKPILING, DELIVERY, AND PROTECTION

3.2.1. Salvaging

3.2.1.1 Salvaging of native topsoil shall commence only after the area has been cleared of all scrub, plant material, invasive and noxious plants and their reproductive parts, grass, stumps, rocks 100 mm and over, and other extraneous organic and non-organic materials and containments. Refer to the Reference Document for clearing and stripping standards.

3.2.1.2 Strip native topsoil during site conditions that are not frozen, excessively wet, extremely dry or during dark or snowing conditions that limit visibility of the topsoil or otherwise in a condition detrimental to the work or topsoil integrity, or as determined by the Qualified Professional.

3.2.2. Stockpiling

3.2.2.1 A storage area shall be designated (including appropriate signage with unique identifiers) and prepared prior to delivery.

3.2.2.2 Stockpile location should be cleared of vegetation and any deleterious material, and stripped of topsoil prior to stockpiling as per the Reference Document.

3.2.2.3 Stockpile topsoil types separately at designated locations with unique identifier signage.

3.2.2.4 Stockpile in sufficient quantities to meet Project schedule and requirements.

3.2.3. Delivery

3.2.3.1 Prior to on-site delivery, a representative sample of the growing medium and current test results should be made available.

3.2.3.2 Commercial processing and mixing of topsoil components shall be done thoroughly by a mechanized screening process.

3.2.3.3 Topsoil types shall not be hand mixed.

3.2.3.4 Processed and mixed topsoil types shall be a homogeneous mixture.

3.2.3.5 Where blending on site, trucks, equipment and machinery shall be cleaned prior to use and arrival on site.

3.2.3.6 Blended soils must be sampled and tested to ensure particular topsoil type as outlined in Table 2 is met.

3.2.3.7 Efforts should be made to ensure the topsoil type is not contaminated prior to and during delivery or when stockpiled on site.

3.2.4. Protection

3.2.4.1 Prevent intermixing of topsoil types or contamination by separating differing materials with dividers or sufficient separation.

3.2.4.2 Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.2.4.3 If the stockpile is to remain for more than three months, the surface should be seeded with an approved cover crop to minimize topsoil erosion and weed infestation.

3.2.4.4 Stockpile areas will be rehabilitated to similar conditions prior to construction or per the Contract Documents.

3.2.4.5 Perform weed control, as necessary, in accordance with relevant government chemical pesticide application legislation.

3.3. JOB CONDITIONS

3.3.1. Place topsoil in dry weather on loose, friable, and graded subgrade surface.

3.3.2. Do not spread topsoil when ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work or topsoil integrity, or as determined by the Qualified Professional.

3.4. SUBGRADE SCARIFICATION

Subgrade scarification is to occur after the subgrade is finalized and inspection as per Section 02335. This step relates to preparing the subsoil for topsoil placement. Prepare subgrade for topsoil placement by the following:

3.4.1. Eliminate uneven areas and low spots.

3.4.2. Remove all debris, roots, branches, and stones more than 50 mm in size.

3.4.3. Scarify surface to depth of 150 mm where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subgrade.

3.4.4. The City shall approve the subgrade prior to placing topsoil and approve finished grade before the Contractor proceeds with the next phase of work.

3.5. PLACING TOPSOIL

3.5.1. Examine subgrade to ensure scarification has been completed. Do not place and spread topsoil until the Consultant has approved the subgrade scarification.

3.5.2. Wherever practical, topsoil shall be transferred directly to placement.

3.5.3. Do not place topsoil when either topsoil or subgrade is frozen, excessively wet, extremely dry, or in a condition inhibiting proper grading, cultivation, or compaction or otherwise in a condition detrimental to the work or topsoil integrity, as determined by the Qualified Professional.

3.5.4. Place topsoil in required areas to thickness, after settlement, as scheduled in Tables 1 and 2.

3.5.5. For topsoil depths greater than 300 mm, place topsoil at no greater than 150 mm lifts and compact with appropriate weighted landscape roller where applicable. Landscape rollers are not recommended for naturalization areas as microtopography is recommended. Mechanical compactors including plate compactors are not permitted.

3.5.6. Placed topsoil shall be allowed to settle or shall be lightly compacted such that it is firm against deep footprints prior to planting, seeding or sodding. Compaction shall not be more than necessary to meet this requirement.

3.5.7. Topsoil shall be placed and spread with appropriate low impact equipment and in a manner that does not adversely affect its structure.

3.5.8. Remove roots, weeds, rocks, and foreign material while spreading.

3.5.9. Manually spread topsoil close to existing plant life and infrastructure to prevent damage.

3.5.10. Rake the topsoil to obtain even surface and remove rocks and other foreign material greater than 50 mm in diameter.

3.5.11. A Qualified Professional is to inspect and approve placed topsoil and finish grades prior to planting, seeding and/or sodding.

3.6. TOPSOIL AMENDMENT APPLICATION

3.6.1. Topsoil amendments to be applied after topsoil placement will be done based on the recommendations of a Qualified Professional based on the topsoil analysis report to achieve the topsoil type parameters set out in Table 2 and upon approval by the City of Edmonton only. This is for mitigation only in special circumstances.

3.6.2. Fertilizers shall be added to bring topsoil types fertility within the ranges set out in Table 2. Fertilizer to be added in amounts as recommended by testing results.

Fertilizer requirements will depend on the intent of the site, topsoil type, end use and type of plan material used.

3.6.3. In consideration of environmental sensitivity, fertilization should only be done in consultation with a Qualified Professional.

3.7. CLEAN-UP

3.7.1. Clean up, immediately, any soil or debris spilled onto roads, walkways, and other finished surfaces. Keep site clean and tidy always.

3.7.2. Excess topsoil shall be either removed from site or spread on site if approved by the Qualified Professional.

3.8. END USE DEFINITIONS

3.8.1. Parks, Playgrounds, School Sites (excluding Standard Sports Fields) (1a): includes parks, school sites and playgrounds that are developed, owned, controlled, or maintained by the City and intended to be used by members of the public for recreation and general enjoyment. This may include sodded areas for passive recreation, shrub beds, trees and naturalized areas.

3.8.2. Greenways (1b): a recognizable linear open space that is a minimum of 10 m wide and connects two public spaces or a public space to non-public land. Greenways typically include a trail constructed of asphalt, crushed rock or wood chips and may also include park furniture. This space may include sod areas for passive recreation, shrub beds, trees, and naturalized areas.

3.8.3. Public Utility Lots (PUL) (1c): a zone in which a system or works is located that is used to provide for public consumption, benefit, convenience or use such as water or steam, sewage disposal, public transportation, irrigation, drainage, fuel, electric power, heat, waste management and telecommunications. Note: PULs do not include Storm Water Management Facilities (SWMF).

3.8.4. Standard Sports Fields (School Sites) (1d): sports fields on school sites that are developed, owned, controlled, or maintained by the City and intended to be used by members of the public for recreation and general enjoyment.

3.8.5. Premier Sports Fields (Irrigated, may include Subdrainage) (2a): a sport field with specific design and construction parameters that utilizes amended topsoil to address the requirements of higher level competition. The premier sports field will require higher maintenance levels to sustain healthy turf and soil foundation. Premier sports fields (2a) will include irrigation and may include subdrainage systems. Note: Specialized fields such as sand based, gravel based or artificial turf fields have specific design and construction parameters that are not covered by this Topsoil Specification.

3.8.6. Premier Sports Fields (Irrigated, Subdrainage) (2b): a sport field with specific design and construction parameters that utilizes amended topsoil to address the requirements of higher level competition. The premier sports field will require

higher maintenance levels to sustain healthy turf and soil foundation. Premier sports fields (2b) include irrigation and sub-drainage systems. Note: Specialized fields such as sand based, gravel based or artificial turf fields have specific design and construction parameters that are not covered by this Topsoil Specification.

3.8.7. Roads, Boulevards, Medians (3a, 3b, 3c): include local roadways, collector roadways and arterial roadways. This end use may include boulevards and medians with trees planted using continuous trenching (3a), trees planted without continuous trenching (3b), or on the boulevards and medians with only sod and/or shrub beds planted (3c). Continuous trenching is used to plant trees as outlined in Detail LA113 "Typical Tree Root Trench" in the latest edition of the City of Edmonton's Design and Construction Standards. When no continuous trenching is used, trees are planted using the standard planting detail LA102.

3.8.7.1 Local Roadways: Local roadways are largely residential streets that feed traffic into collector roadways.

3.8.7.2 Collector Roadways: Collect vehicles from a series of local roadways, (e.g., local residential streets) and connect to an arterial roadway. Collector roadways are wider than local roads but narrower than arterial roads. Collector roads tend to have more commercial and other non-residential uses than local roads but less than arterial roads. The City's Sustainable Development department sets Roadway standards.

3.8.7.3 Arterial Roadways: Arterial roadways are fed by vehicles from a series of collector roadways and tend to have major commercial areas adjacent to them, as well as residential areas separated by berms or noise walls.

3.8.8. Urban Hardscapes (4a, 4b): a publicly accessible environment where by greater than 90% of the surface area is covered by some form of nonliving material (pavement, masonry, concrete, gravel etc.). This may include trees in hardscape and shrub beds which use soil cells (4a) or urban hardscapes without trees (4b).

3.8.9. Ornamental Shrub Beds (5): a shrub bed with ornamental landscaping.

3.8.10. Urban Agriculture, Community Gardens (6): land developed as flower or vegetable gardens for community use. Community gardens are operated by community organizations that determine how the venture will function (e.g., plot size, plot assignment, etc.).

3.8.11. Naturalization (7): an alternate landscape management technique to conventional high maintenance landscapes. Natural processes of growth and change are less restricted and areas are allowed to return to a natural state. Naturalization projects utilize native plant materials requiring low or no maintenance along roadway boulevards of major arterials.

3.8.12. Low-Impact Development (LID) – Flow Attenuation, Water Quality Treatment (8): flow attenuation and water quality treatment are the primary functions of Low-Impact Development (LID) facilities. This includes facilities where storm water flow is slowed down and reduced and the water quality of runoff is improved. This end

use pertains to the incorporation of the specified topsoil mix into types of LID infrastructures that focus on increasing absorbency and filtration capacity of soil as a method of storm water management. Note: this definition does not include SWMFs.

Table 1 Topsoil Types Recommended with City of Edmonton End Uses

End Uses	Topsoil Type							Topsoil Depth (mm)				
	1	2	3	4	5	6	7	Sod		Shrubs/Trees		Trees
	Basic/Native Topsoil (30-60% Sand)	Standard Sports Fields (School Sites) (40-60% Sand)	High Sand, High Organic Matter (55-65% Sand)	Very High Sand, Low Organic Matter (70-90% Sand)	High Organic Matter (10-15% OM)	Very High Organic Matter (15-20% OM)	Low Impact Development (LID)	200	300	450	500	900+
(1a) Parks, Playgrounds, School Sites (excluding Standard Sports Fields)	X								X	X	X	
(1b) Greenways	X								X	X	X	
(1c) Public Utility Lots	X								X	X	X	
(1d) Standard Sports Fields (School Sites)	X*	X*							X*	X*	X*	
(2a) Premier Sports Fields (Irrigated, may include Subdrainage)			X					X	X			
(2b) Premier Sports Fields (Irrigated, Subdrainage				X				X	X			
(3a) Roads, Boulevards, Medians (Trees, Continuous Trench)	X									X	X	
(3b) Roads, Boulevards, Medians (Trees)	X									X	X	
(3c) Roads, Boulevards, Medians (No Trees)	X							X	X	X		
(4a) Urban Hardscape (Trees)**	X											X**
(4b) Urban Hardscape (No Trees)	X									X	X	
(5) Ornamental Shrub Beds					X					X	X	
(6) Urban Agriculture, Community Gardens						X				X	X	
(7) Naturalization	X									X	X	
(8) LID (Flow Attenuation/Water Quality Treatment)							X				X***	

Notes:
City of Edmonton recommends that the topsoil used in City projects relating tot the Topsoil Specification meet the Alberta Tier I Soil Guidelines for metals/elements, hydrocarbons and organic compounds. http://aep.alberta.ca/lands-forests/land-industrial/inspections-and-compliance/documents/AlbertaTier1Guidelines-Feb02-2016A.pdf
OM = Organic Matter
*Standard Sports Fields (School Sites) may be constructed at the same time as parks and playgrounds on the site. If the City does not pay to upgrade the field, then the developer is only obligated to use “basic soil” for the entire depth of the entire site. Based on the approved plan, either 300 mm, 450 mm or 500 mm of Basic/Native topsoil (Topsoil Type 1) will be placed. However, once the Standard Sports Field is identified, 100 mm of Standard Sports Fields topsoil (School Sites) (Topsoil Type 2) will be applied as topdressing over the Basic/Native topsoil depth, i.e., overtop of the area designated as a sports field at the school. For example, if the Standard Sports Field has identified the requirement for 300 mm of Basic/Native topsoil (Topsoil Type 1), then 300 mm of Basic/Native topsoil (Topsoil Type 1) will be used on the entire school site and an additional 100 mm of the Standard Sports Fields topsoil (School Sites) (Topsoil Type 2) will be added overtop of the sports field area of the school for a total depth of 400 mm, in the sports field.
If the Standard Sports Field has identified the requirement for 450 mm of Basic/Native topsoil (Topsoil Type 1), then 450 mm of Basic/Native topsoil (Topsoil Type 1) will be used on the entire school site and an additional 100 mm of the Standard Sports Fields topsoil (School Sites) (Topsoil Type 2) will be added overtop of the sports field area of the school for a total depth of 550 mm, in the sports field.
**Soil cells are recommended.
***The depth may vary from this Specification as an LID facility will be designed to manage a certain amount of water based upon the specific LID facility design parameters. For example, if the facility is limited in surface area, then deeper volumes may be required to accommodate water volume.

Limitations Regarding Offsets
The City requires that offsets from infrastructure will be mandatory as deep topsoil depths cannot be constructed immediately adjacent to above and underground infrastructure. Topsoil depths greater or equal to 150 mm topsoil depths near above and underground infrastructure require the review of a geotechnical engineer or other qualified professional to determine the appropriate offsets for the deeper topsoil from the above and underground infrastructure.

Table 2 Topsoil Types and Associated Topsoil Properties Recommended for End Uses

	Topsoil Type						
	1	2	3	4	5	6	7
	Basic/Native Topsoil **(30-60% Sand)**	**Standard Sports Fields (School Sites)** **(40-60% Sand)**	**High Sand, High Organic Matter** **(55-65% Sand)**	**Very High Sand, Low Organic Matter** **(70-90% Sand)**	**High Organic Matter** **(10-15% OM)**	**Very High Organic Matter** **(15-20% OM)**	**Low Impact Development (LID)**
END USES THAT ARE APPROPRIATE FOR SPECIFIED TOPSOIL	(1a) Parks, Playgrounds, and School Sites (excluding Standard Sports Fields) (1b) Greenways (1c) Public Utility Lots (1d) Standard Sports Fields (School Sites) (first 300 mm, 450 mm or 500 mm) (3a) Roads, Boulevards, Medians (Trees, Continuous Trench) (3b) Roads, Boulevards, Medians (Trees) (3c) Roads, Boulevards, Medians (No Trees) (4a) Urban Hardscapes (Trees) (4b) Urban Hardscapes (No Trees) (7) Naturalization	(1d) Standard Sports Fields (School Sites) (100 mm topdressing)	(2a) Premier Sports Fields (Irrigated, may include Subdrainage)	(2b) Premier Sports Fields (Irrigated, Subdrainage)	(5) Ornamental Shrub Beds	(6) Urban Agriculture, Community Gardens	(8) LID – Flow Attenuation, Water Quality Treatment
Particle Size Distribution (%) and Textural Class							
Coarse gravel (<19 mm to 40 mm) [A]	0-3%	0-3%	0-1%	0-1%	0-1%	0-1%	0-3%
All gravel (2 mm to 40 mm) [A]	0-10%	0-10%	0-5%	0-5%	0-5%	0-5%	0-5%
Very coarse sand (1 mm to 2 mm) [A]	-	-	<10% [B C]	-	-	-	-
Coarse sand (0.5 mm to 1 mm) [A]	-	-	20-50% [B C]	-	-	-	-
Medium sand (0.25 mm to 0.50 mm) [A]	-	-	20-50% [B C]	-	-	-	-
Fine sand (0.15 mm to 0.25 mm) [A]	-	-	<20% [B C]	-	-	-	-
Combined medium to very coarse sand (2 mm to 0.25 mm) [A]	-	-	>60% [B C]	-	-	-	-
Combined very coarse sand, fine gravel and gravel	<40%	<40%	<25% [B C]	<30% [B]	-	-	-
Sand (2 mm to 0.05 mm) [A]	30-60%	40-60%	55-65% [B]	70-90% [B]	50-70%	40-75%	50-85% [D]
Silt (0.05 mm to 2 µm) [A]	15-50%	15-50%	<10%	0-15%	10-25%	10-25%	10-15% [D]
Clay (<2 µm) [A]	15-30%	15-30%	<10%	0-15% [B]	0-25%	0-25%	3-10% [D]
Clay and silt combined	Maximum 60%	Maximum 60%	Maximum 20% [B C]	Maximum 15% [B]	Maximum 35%	Maximum 35%	Maximum 20% [D]
Textural Class [A]	Loam [E], Sandy loam [E], Silt loam [E], Sandy clay loam [E]	Loam [E], Sandy loam [E], Silt loam [E], Sandy clay loam [E]	Sandy loam [E]	Sand to Loamy sand [BC]	Sandy loam [E] to Loam [E]	Sandy loam [E] to Loam [E]	Loamy sand [D] to Sandy loam [D]
Organic matter content %	4-10% [F]	4-10% [F]	6-8% [B C]	2-4% [B]	10-15%	15-20%	5-10% [D]
Additional Topsoil Properties							
pH (acidity) (Saturated paste)	6.0-7.5 [A]	6.0-7.5 [A]	6.0-7.5 [A]	6.0-7.5 [A]	6.0-7.5 [A]	6.0-7.5 [A]	6.0-7.5 [D]
EC dS/m (salinity)	<2 [G]	<2 [G]	<2 [B G]	<2 [B G]	<2 [G]	<2 [G]	<2 [G]
SAR (sodicity)	<5 [G]	<5 [G]	<5 [B G]	<5 [B G]	<5 [G]	<5 [G]	<5 [G]
Total Organic Carbon (Aspen Parkland)	2.2-3.4% [F]	2.2-3.4% [F]	-	-	-	-	-
Total Nitrogen (Aspen Parkland)	0.33% [F]	0.33% [F]	-	-	-	-	-
Carbon: Nitrogen (C: N) ratio	11:1 [F]	11:1 [F]	10:1 [F]	20:1 to 30:1 [F]	10:1 to 15:1 [H]	10:1 [H]	10:1 to 20:1 [H]
Calcium Carbonate Equivalent (%)	<2 [G]	<2 [G]	<2 [G]	<2 [G]	<2 [G]	<2 [G]	<2 [G]
Saturation %	30-60 [I]	30-60 [I]	20-30 [I]	20-30 [G I]	30-60 [I]	30-60 [I]	20-30 [I]

END USES THAT ARE APPROPRIATE FOR SPECIFIED TOPSOIL	Topsoil Type						
	1	2	3	4	5	6	7
	Basic/Native Topsoil **(30-60% Sand)** (1a) Parks, Playgrounds, and School Sites (excluding Standard Sports Fields) (1b) Greenways (1c) Public Utility Lots (1d) Standard Sports Fields (School Sites) (first 300 mm, 450 mm or 500 mm) (3a) Roads, Boulevards, Medians (Trees, Continuous Trench) (3b) Roads, Boulevards, Medians (Trees) (3c) Roads, Boulevards, Medians (No Trees) (4a) Urban Hardscapes (Trees) (4b) Urban Hardscapes (No Trees) (7) Naturalization	**Standard Sports Fields (School Sites)** **(40-60% Sand)** (1d) Standard Sports Fields (School Sites) (100 mm topdressing)	**High Sand, High Organic Matter** **(55-65% Sand)** (2a) Premier Sports Fields (Irrigated, may include Subdrainage)	**Very High Sand, Low Organic Matter** **(70-90% Sand)** (2b) Premier Sports Fields (Irrigated, Subdrainage)	**High Organic Matter** **(10-15% OM)** (5) Ornamental Shrub Beds	**Very High Organic Matter** **(15-20% OM)** (6) Urban Agriculture, Community Gardens	**Low Impact Development (LID)** (8) LID – Flow Attenuation, Water Quality Treatment
Available Phosphorus	20 mg/kg to 60 mg/kg (or as per site requirements) [J K]	20 mg/kg to 60 mg/kg (or as per site requirements) [J K]	20 mg/kg to60 mg/kg (or as per site requirements) [J K]	20 mg/kg to 60 mg/kg (or as per site requirements) [J K]	20 mg/kg to 60 mg/kg (or as per site requirements) [J K]	20 mg/kg to 60 mg/kg (or as per site requirements) [J K]	-
Total Phosphorus	NA	NA	NA	NA	NA	NA	10-30 mg/kg [D]
Available Potassium	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	-
Cation Exchange Capacity	-	-	-	-	-	-	10 meq /100 g [D]
Saturated Hydraulic Conductivity	-	-	15-30 cm/hr [B C]	>25 cm/hr [B]	-	-	Minimum 25 mm/hr [D]

Notes:

City of Edmonton recommends that the topsoil used in City projects relating to the Topsoil Specification meet the Alberta Tier I Soil Guidelines for metals/elements, hydrocarbons and organic compounds. http://aep.alberta.ca/lands-forests/land-industrial/inspections-and-compliance/documents/AlbertaTier1Guidelines-Feb02-2016A.pdf

OM = Organic Matter; LID = Low Impact Development; NA = not applicable/not available

[A] Soil Classification Working Group (1998) http://sis.agr.gc.ca/cansis/taxa/cssc3/index.html

[B] ASTM (2016) https://www.astm.org/Standards/F2396.htm

[C] USGA (2004) https://www.usga.org/content/dam/usga/images/course-care/2004%20USGA%20Recommendations%20For%20a%20Method%20of%20Putting%20Green%20Cons.pdf

[D] City of Edmonton, LID BMP (2014) https://www.edmonton.ca/city_government/documents/PDF/LIDGuide.pdf

[E] Bowser et al. (1962) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag14932. There are topsoil types around Edmonton that have heavier textures such as silty clay (SiC), silty clay loam (SiCL), and clay loam (CL) but are unsuitable for the Topsoil Specification (2017).

[F] AAF (2003) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/aesa1861

[G] AEP (2016) (AB Tier I, coarse textured, agriculture) http://aep.alberta.ca/lands-forests/land-industrial/inspections-and-compliance/documents/AlbertaTier1Guidelines-Feb02-2016A.pdf

[H] Estimated based on organic matter % and texture

[I] AAFRD (1987) stahttp://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag9469/$FILE/sq_criteria_relative_to_disturbance_reclamation.pdf

[J] BCSLA and BCLNA (2012) http://www.bcsla.org/sites/default/files/PREVIEW%20Pages%20from%20Landscape_Standard_2012_Updated%20October%2015%2C%202013.pdf

[K] Paterson et al. (2006) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag11864/$FILE/vol-1-summary.pdf

[L] AAF (2013) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex917

END OF SECTION

City of Edmonton

Topsoil Specification Update

Reference Document

EXECUTIVE SUMMARY

This City of Edmonton Topsoil Specification Update: Reference Document – 2017 Edition (Reference Document) provides technical background and guidelines to support the City of Edmonton 2017 Section 02910 - Topsoil Specification (Topsoil Specification or Specification). The purpose of this document is to accompany the 2017 revision of the Topsoil Specification.

In 2017, the City of Edmonton (the City) updated the Topsoil Specification 02910. The Topsoil Specification is applicable for development that occurs on City owned land.

The City Topsoil Specification (Section 02910) contained in the *Design and Construction Standards, Volume 5, Landscaping* (Standards) (City of Edmonton 2016) sets out a range of acceptable measurable physical and chemical properties in topsoil application. The purpose of this document is to accompany the 2017 revision to the Topsoil Specification. One of the drivers of the 2017 revision is the recognition that soil serves specific purposes dependent on the end use. Therefore, the City has determined a need to update the Standards with a Topsoil Specification specific to various horticultural applications or end uses.

The City of Edmonton has valuable topsoil. The intent of the Topsoil Specification is to guide the use of native topsoil from the project site if it is available and suitable. Several topsoil types were identified based on the City's needs for the various end uses identified. The end uses vary from naturalization zones, premier sports fields, parks, playgrounds, school sites, greenways, roads/boulevards/medians, public utility lots, hardscapes, intensive plant growth zones (ornamental shrubs beds and urban agriculture, community gardens), and Low Impact Developments (LID).

Topsoil depths outlined in the Specification are considered minimums within an acceptable range but need to be relevant to the particular project in the landscape plan. The specific topsoil type will be selected with consideration of multiple end uses. Landscape plans for each project will outline the specific end uses and the appropriate topsoil type(s) and associated topsoil depth(s). It is the goal of the City to increase topsoil depths to improve success and sustainability of vegetation.

The City requires all topsoil that will be disturbed, stockpiled, and replaced/placed to be surveyed, inspected and analysed. This includes inspection and analysis of City stockpiles, imported topsoil from non-approved City sources, and replaced/placed topsoil in reclaimed areas.

The recommended chemical and physical analytical parameters of each topsoil type are outlined. The methodologies and descriptions for each of the listed topsoil parameters are also outlined.

Topsoil must be inspected and sampled using standard methods depending on whether it is being sampled in‐situ to establish baseline conditions (either native or disturbed), ex-situ from a stockpile, or in-situ after it is replaced.

Quality of work is reflected in compliance with the Topsoil Specification through the soil survey, sampling, analyses, and utilization of topsoil types with the properties set out in the Topsoil Specification. The Reference Document outlines limitations and opportunities for future revisions of the Topsoil Specification.

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1 GENERAL

1.1 Scope

This City of Edmonton Topsoil Specification Update: Reference Document – 2017 Edition (Reference Document) provides technical background and guidelines to support the City of Edmonton 2017 Section 02910 - Topsoil Specification (Topsoil Specification or Specification). The purpose of this document is to accompany the 2017 revision of the Topsoil Specification.

In 2017, the City of Edmonton (the City) updated the Topsoil Specification 02910. The Topsoil Specification is applicable for development that occurs on City owned land. The City of Edmonton has valuable topsoil. The intent of the Topsoil Specification is to guide the use the native topsoil from the project site if it is available and suitable.

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One of the drivers of the 2017 revision is the recognition that topsoil serves specific purposes dependent on the end use. Therefore, the City has determined a need to update the Standards with a Topsoil Specification specific to various horticultural applications or end uses. It is to be noted that the the topsoil volume for tree planting has changed in the 2016 Standards. Specifically, the City has made the following change (excerpt as per 2016 Standards):

> *7.1.4 Soil Volume*
> *7.1.4.1 Enhanced soil volumes are required to increase critical rooting space.*
> *Soil volumes should be designed no deeper than 1 meter with increased area to achieve the minimum soil volume requirement. Based on tree size to soil volume relationships (Urban 1992) the list below is the recommendations for the City of Edmonton.*
>
> - *Large canopy trees are defined as trees that under normal conditions can support canopies of 74 m^2 or spread of over 5 meters and require a minimum soil volume of 17 m^3.*
> - *Small canopy trees are defined as trees that under normal conditions have a spread of 5 meters and require a minimum soil volume of 11 m^3 and under ideal conditions require 17 m^3 to reach its full potential.*
> - *Should the design of the area not allow for the minimum required soil volume, please contact Forestry for recommendations.*

1.2 End Uses

The City of Edmonton has valuable topsoil. The intent of the Topsoil Specification is to use the native topsoil from the project site if it is available and suitable. Several topsoil types were identified based on the City's needs for the various end uses identified. The end uses vary from naturalization zones, premier sports fields, parks, playgrounds, school sites, greenways, roads/boulevards/medians, public

utility lots, hardscapes, intensive plant growth zones (ornamental shrubs beds and urban agriculture, community gardens), and Low Impact Developments (LID).

The end uses designated in the 2017 Topsoil Specification revision are defined below.

Parks, Playgrounds, School Sites (excluding Standard Sports Fields) (1a)

This end use includes parks, school sites and playgrounds that are developed, owned, controlled, or maintained by the City and intended to be used by members of the public for recreation and general enjoyment. This may include sodded areas for passive recreation, shrub beds, trees and naturalized areas.

Reference: *City of Edmonton, Urban Parks Management Plan 2006-2016 (March 2006).*

Greenways (1b)

Greenways are defined as a recognizable linear open space that is a minimum of 10 m wide and connects two public spaces or a public space to non-public land. Greenways typically include a trail constructed of asphalt, crushed rock or wood chips and may also include park furniture. This space may include sod areas for passive recreation, shrub beds, trees and naturalized areas.

Reference: *City of Edmonton, Urban Parks Management Plan 2006-2016 (March 2006).*

Public Utility Lots (1c)

A public utility lot (PUL) is a zone in which a system or works is located that is used to provide for public consumption, benefit, convenience or use such as water or steam, sewage disposal, public transportation, irrigation, drainage, fuel, electric power, heat, waste management and telecommunications. Note: PULs do not include Storm Water Management Facilities (SWMF).

Reference: *City of Edmonton, A General Summary of Land Use Zones. A Guide to the Edmonton Zoning Bylaw 12800.*

Standard Sports Fields (School Sites) (1d)

This end use is sports fields on school sites that are developed, owned, controlled, or maintained by the City and intended to be used by members of the public for recreation and general enjoyment.

Reference: Not applicable/ not available.

Premier Sports Fields (Irrigated, No Subdrainage) (2a)

A sport field with specific design and construction parameters that utilizes amended topsoil to address the requirements of higher level competition. The premier sports field will require higher maintenance levels to sustain healthy turf and topsoil foundation. Premier sports fields (2a) will include irrigation and may include subdrainage systems. Note: Specialized fields such as sand based, gravel based or artificial turf fields have specific design and construction parameters that are not covered by the Topsoil Specification.

Reference: Not applicable/ not available.

Premier Sports Fields (Irrigated, Subdrainage) (2b)

A sport field with specific design and construction parameters that utilizes amended topsoil to address the requirements of higher level competition. The premier sports field will require higher maintenance levels to sustain healthy turf and topsoil foundation. Premier sports fields (2b) include irrigation and include sub-drainage systems. Note: Specialized fields such as sand based, gravel based or artificial turf fields have specific design and construction parameters that are not covered by the Topsoil Specification.

Reference: Not applicable/ not available.

Roads, Boulevards, Medians (3a, 3b, 3c)

These areas include local roadways, collector roadways and arterial roadways. This end use may include boulevards and medians with trees planted using continuous trenching (3a), trees planted without continuous trenching (3b), or boulevards and medians with only sod and/or shrub beds planted (3c). Continuous trenching is used to plant trees as outlined in Detail LA113 “Typical Tree Root Trench” in the latest edition of the City of Edmonton’s Design and Construction Standards. When no continuous trenching is used, trees are planted using the standard planting detail LA102.

Local Roadways: Local roadways are largely residential streets that feed traffic into collector roadways.

Collector Roadways: Collect vehicles from a series of local roadways, (e.g., local residential streets) and connect to an arterial roadway. Collector roadways are wider than local roads but narrower than arterial roads. Collector roads tend to have more commercial and other non-residential uses than local roads but less than arterial roads. The City’s Sustainable Development department sets Roadway standards.

Arterial Roadways: Arterial roadways are fed by vehicles from a series of collector roadways and tend to have major commercial areas adjacent to them, as well as residential areas separated by berms or noise walls.

Reference: *City of Edmonton, Urban Parks Management Plan 2006-2016 (March 2006) and Design and Construction Standards, Volume 5, Landscaping (June 2016 edition).*

Urban Hardscape (4a, 4b)

A publicly accessible environment where by greater than 90% of the surface area is covered by some form of hard-surface material (pavement, masonry, concrete, gravel etc.). This may include trees in hardscape and shrub beds which use topsoil cells (4a) or urban hardscapes without trees (4b).

Reference: No applicable/ not available.

Ornamental Shrub Beds (5)

A shrub bed with ornamental landscaping.

Reference: Not applicable/ not available.

Urban Agriculture, Community Gardens (6)

Land developed as flower or vegetable gardens for community use. Community gardens are operated by community organizations that determine how the venture will function (e.g., plot size, plot assignment, etc.).

Reference: *City of Edmonton, Urban Parks Management Plan 2006-2016 (March 2006).*

Naturalization (7)

Naturalization is an alternate landscape management technique to conventional high maintenance landscapes. Natural processes of growth and change are less restricted and areas are allowed to return to a natural state. Naturalization projects utilize native plant materials requiring low or no maintenance along roadway boulevards of major arterials.

Reference: *City of Edmonton, Urban Parks Management Plan 2006-2016 (March 2006).*

Low-Impact Development (LID) – Water Flow Attenuation/ Water Quality Treatment (8)

Flow attenuation and water quality treatment are the primary functions of Low-Impact Development (LID) facilities. This includes facilities where storm water flow is slowed down and reduced, and the water quality of runoff is improved. This end use pertains to the incorporation of the specified topsoil mix into types of LID infrastructures that focus on increasing absorbency and filtration capacity of topsoil as a way of storm water management. Note: this definition does not include SWMFs.

Reference: Not applicable/ not available.

1.2.1 Recommended Topsoil Types

Table 1 outlines the topsoil type(s) (seven types in total) and depth(s) approved for each end use and will form part of the Topsoil Specification. The topsoil depths outlined in the Specification considered minimums within an acceptable range but need to be relevant to the particular project in the landscape plan. The specific topsoil type will be selected with consideration of multiple end uses. Landscape plans for each project should outline the specific end uses and the appropriate topsoil type(s) and associated topsoil depths. These landscape plans are to be approved by the City. It is the goal of the City to increase topsoil depths to improve success and sustainability of vegetation.

Table 1 provides a guide for designers and reviewers to ensure that current projects meet the City of Edmonton's Standards for topsoil type and depth. Below are some examples of how to use Table 1:

- **Example 1:** In a Park, Playground, School Site (End Use 1a), the topsoil type used is "Basic/Native Topsoil" (see Table 2 for associated topsoil properties). The acceptable topsoil depth range for Parks, Playgrounds, School Sites is 300 mm to 500 mm.

- **Example 2:** In a Park that contains Ornamental Shrub Beds (End Use 5), the topsoil type used is "High Organic Matter" for the ornamental shrub bed (see Table 2 for associated topsoil properties). The acceptable topsoil depth for the ornamental shrub bed is 450 mm to 500 mm. The remainder of the Park is to use “Basic Native Soil” with depth of 300 mm to 500 mm.
- **Example 3:** In a Premier Sports Field that is irrigated and contains subdrainage (End Use 2b), the topsoil type used is “Very High Sand, Low Organic Matter” (see Table 2 for associated topsoil properties). The acceptable topsoil depth range is 200 mm to 300 mm.

Table 1 Topsoil Types Recommended with City of Edmonton End Uses

End Uses	Topsoil Type							Topsoil Depth (mm)				
	1	2	3	4	5	6	7	Sod		Shrubs/Trees		Trees
	Basic/Native Topsoil (30-60% Sand)	Standard Sports Fields (School Sites) (40-60% Sand)	High Sand, High Organic Matter (55-65% Sand)	Very High Sand, Low Organic Matter (70-90% Sand)	High Organic Matter (10-15% OM)	Very High Organic Matter (15-20% OM)	Low Impact Development (LID)	200	300	450	500	900+
(1a) Parks, Playgrounds, School Sites (excluding Standard Sports Fields)	X								X	X	X	
(1b) Greenways	X								X	X	X	
(1c) Public Utility Lots	X								X	X	X	
(1d) Standard Sports Fields (School Sites)	X*	X*							X*	X*	X*	
(2a) Premier Sports Fields (Irrigated, may include Subdrainage)			X					X	X			
(2b) Premier Sports Fields (Irrigated, Subdrainage				X				X	X			
(3a) Roads, Boulevards, Medians (Trees, Continuous Trench)	X									X	X	
(3b) Roads, Boulevards, Medians (Trees)	X									X	X	
(3c) Roads, Boulevards, Medians (No Trees)	X							X	X	X		
(4a) Urban Hardscape (Trees)**	X											X**
(4b) Urban Hardscape (No Trees)	X									X	X	
(5) Ornamental Shrub Beds					X					X	X	
(6) Urban Agriculture, Community Gardens						X				X	X	
(7) Naturalization	X									X	X	
(8) LID (Flow Attenuation/ Water Quality Treatment)							X				X***	

Notes:
City of Edmonton recommends that the topsoil used in City projects relating to the Topsoil Specification meet the Alberta Tier I Soil Guidelines for metals/elements, hydrocarbons and organic compounds. http://aep.alberta.ca/lands-forests/land-industrial/inspections-and-compliance/documents/AlbertaTier1Guidelines-Feb02-2016A.pdf
OM = Organic Matter
*Standard Sports Fields (School Sites) may be constructed at the same time as parks and playgrounds on the site. If the City does not pay to upgrade the field, then the developer is only obligated to use "basic soil" for the entire depth of the entire site. Based on the approved plan, either 300 mm, 450 mm or 500 mm of Basic/Native topsoil (Topsoil Type 1) will be placed. However, once the Standard Sports Field is identified, 100 mm of Standard Sports Fields topsoil (School Sites) (Topsoil Type 2) will be applied as topdressing over the Basic/Native topsoil depth, i.e., overtop of the area designated as a sports field at the school. For example, if the Standard Sports Field has identified the requirement for 300 mm of Basic/Native topsoil (Topsoil Type 1), then 300 mm of Basic/Native topsoil (Topsoil Type 1) will be used on the entire school site and an additional 100 mm of the Standard Sports Fields topsoil (School Sites) (Topsoil Type 2) will be added overtop of the sports field area of the school for a total depth of 400 mm, in the sports field.
If the Standard Sports Field has identified the requirement for 450 mm of Basic/Native topsoil (Topsoil Type 1), then 450 mm of Basic/Native topsoil (Topsoil Type 1) will be used on the entire school site and an additional 100 mm of the Standard Sports Fields (topsoil (School Sites) (Topsoil Type 2) will be added overtop of the sports field area of the school for a total depth of 550 mm, in the sports field.
**Soil cells are recommended.
***The depth may vary from this Specification as an LID facility will be designed to manage a certain amount of water based upon the specific LID facility design parameters. For example, if the facility is limited in surface area, then deeper volumes may be required to accommodate water volume.

Limitations Regarding Offsets
The City requires that offsets from infrastructure will be mandatory as deep topsoil depths cannot be constructed immediately adjacent to above and underground infrastructure. Topsoil depths greater or equal to 150 mm near above and underground infrastructure require the review of a geotechnical engineer or other qualified professional to determine the appropriate offsets for the deeper topsoil from the above and underground infrastructure.

1.2.2 Limitations Regarding Offsets

In regards to offsets, the City requires that offsets from infrastructure will be mandatory as deep topsoil depths cannot be constructed immediately adjacent to above and underground infrastructure. Deeper than 150 mm topsoil depths near above and underground infrastructure require the review of a geotechnical engineer or other qualified professional to determine the appropriate offsets for the deeper topsoil from the above and underground infrastructure.

1.3 Definitions

Key definitions include:

Native topsoil is defined as existing fertile, friable, dominantly coarse textured, 'A' horizon containing accumulated organic matter, and usually distinguished by a darker colouration. Topsoil shall be screened and free of rocks of 50 mm in diameter and over, debris and foreign objects, free of subsoil, roots and weeds, unless authorized by a Qualified Professional.

Imported topsoil is defined as the topsoil type as specified by the end use and shall be shall be screened and free of subsoil, wood debris, invasive and prohibited noxious and noxious plants and their reproductive parts, plant pathogenic organisms, organic and inorganic materials, toxins, stones over 50 mm, and debris and foreign objects.

Replaced/placed topsoil is defined as either native topsoil or imported topsoil as described above and used in land reclamation to meet the end uses.

Qualified Professional is defined as a professional (e.g., Agrologist, Soil Scientist) who is trained in the appropriate methods for soil survey, mapping and sampling; is competent to review and interpret analysis laboratory results and provide recommendations on quantities, blending and application methods of soil amendment to achieve seven topsoil types in Table 2.

Other definitions applicable to this document are outlined in Appendix A (Table A1).

1.4 Report Limitations and Future Considerations

The following limitations and opportunities for future revisions of the Topsoil Specification should be considered while reviewing this document:

- Currently there is no baseline data (physical or chemical) available for existing topsoil stockpiles within the City. Obtaining baseline topsoil stockpile data may aid in further revision to the Topsoil Specification by informing achievable topsoil targets (types) more closely aligned with the topsoil currently available.
- Site slope was not considered within the Topsoil Specification, and should be addressed with geotechnical considerations.
- LID facilities are discussed for the purpose flow attenuation/water quality. Sediment should be removed prior to water entering bioretention facility through pretreatment. Refer to the

City of Edmonton LID Guides (City of Edmonton, Low Impact Development, Best Management Practices Design Guide and Low Impact Development Construction, Inspection, Maintenance Guide). Both guides are available through https://www.edmonton.ca/city_government/environmental_stewardship/low-impact-development.aspx?utm_source=virtualaddress&utm_campaign=lid.

- Mitigation measures to correct topsoil that are not acceptable (do not meet the Topsoil Specification) have not been included in this Reference Document nor the Topsoil Specification.
- Constructed wetlands have not been considered as an end use in the Topsoil Specification. Based on a previous meeting with the Topsoil Committee in 2016, it was decided to remove wetlands as an end use. Currently the City refers to the Alberta Wetland Policy (Alberta Environment and Parks 2013).
- A procedure for implementation and enforcement of the Topsoil Specification should be developed by the City. This may include reporting protocols and an approval process to be followed by both Developers and the City.
- The City should consider creating a soil management plan (SMP) and a SMP requirements checklist to ensure that design teams and contractors follow procedure.
- The City should consider the development of a Fill Management Plan (FMP) if this does not currently exist. A FMP would inform the management of low areas or brownfield sites using surplus soil as fill. It should also be noted that the Alberta Wetland Policy does not accept wetlands to be filled without authorization.
- The issue of decomposition (longevity) of amendments and topsoil has not been included in the Topsoil Specification.
- Municipal sewage sludge and biosolids are not part of the scope of this project.
- Clubroot management is not part of the scope of this project.
- Soilless media, including peat, and vermiculite are not approved by the City as an amendment for the cited end uses.
- The cost of soil analyses nor a cost benefit analysis were not part of the scope of this project.

1.5 Regional Setting

The City of Edmonton is located in the Central Parkland Natural Subregion of Alberta (NRC 2006). This area is approximately 50,000 km^2 and stretches north to south from Edmonton to the Foothills Fescue, Foothills Parkland, and Northern Fescue Natural Subregions respectively, and from the west to the east encompassing the Dry Mixedwood Natural Subregion in the west to the Alberta Saskatchewan border, respectively. The Central Parkland Subregion is characterized by undulating till plains and hummocky uplands (NRC 2006).

Monthly precipitation patterns are most similar to those of the Dry Mixedwood Natural Subregion with a marked peak in July and significant rainfalls in June and August. Surficial materials are dominantly medium to moderately fine textured, moderately calcareous till that may be a thin (less than 2 m) blanket over bedrock in some of the low-relief plains. Glaciolacustrine sediments also occur. The Soil Survey of the Edmonton Sheet (Bowser et al. 1962) also confirmed the soils and terrain information.

Undulating till plains and hummocky uplands are dominant landforms. Glaciolacustrine and glaciofluvial deposits are common in the Edmonton region. In undisturbed areas, aspen forest is dominant and grasslands are restricted to drier areas. Black Chernozems usually occur under grasslands and Dark Gray Chernozems and Luvisols usually occur under aspen forests.

The mean annual temperature for the Central Parkland Natural Subregion is 2.3°C, with a mean daily maximum temperature of 23.0°C and a mean daily minimum temperature of - 20.0°C. The frost-free period averages 102 days and the mean annual precipitation is 441.2 mm. The mean precipitation for the growing season (April to August) is 330.1 mm (NRC 2006). The mean daily temperature at the Edmonton International weather station (located 22 km south) is 2.6°C with climate normals ranging from -12.1°C (January) to 16.2°C (July) (Environment Canada 2015). The mean annual precipitation in Edmonton is 446 mm, of which 339 mm falls as rain. The average annual snowfall is 118.1 cm with heaviest snowfalls occurring during January (Environment Canada 2015). The frost-free period is approximately 110 days.

The vegetation of the Central Parkland Natural Subregion has been intensely cultivated over the last 100 years; approximately 5% of vegetative cover remains native. The region can be divided into two with regards to vegetation: the southern grassland portion and the northern aspen-dominated portion. The southern portion contains fescue prairies with aspen groves, while the northern portion contains closed aspen forests within which small grassland patches may occur. Trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), and jack pine (*Pinus banksiana*) are common tree species in this Subregion. Native plants in the Subregion include western porcupine grass (*Stipa curtiseta*), northern wheatgrass (*Agropyron dasystachyum*), Hooker's oat grass (*Helictotrichon hookeri*), and perennial herbs including prairie crocus (*Anemone patens*), prairie sagewort (*Artemisia frigida*), wild blue flax (*Linum lewisii*), northern bedstraw (*Galium boreale*) and three-flowered avens (*Geum triflorum*), bearberry (*Arctostaphylos spp.*), buckbrush (*Ceanothus cuneatus*), silverberry (*Elaeagnus commutate*), prickly rose (*Rosa acicularis*), chokecherry (*Prunus virginiana*), Saskatoon (*Amelanchier alnifolia*), beaked hazelnut (*Corylus cornuta*), hay sedge (*Carex siccata*), and creeping juniper (*Juniperus horizontalis*) (NRC 2006).

1.5.1 Naturally Occurring Soils within City Limits

The Soil Survey of Edmonton Sheet (83-H) (Bowser et al. 1962) classified the soils of the Edmonton Region surrounding the 1959 municipal boundary. The soils within the 1959 municipal boundary were not soil surveyed by Bowser et al. (1962). From review of this soil data compared to the current City municipal boundary, the dominant soils in the City region as of 2017 are Chernozemic soils developed on fine-textured lacustrine parent material along with Chernozemic soils developed on coarse-textured alluvial aeolian material. The Edmonton area consists of dominantly occurring loam, sandy

loam, silt loam, and sandy clay loam textured soils. There are significant areas of Solonetzic (salt-affected soils) developed on fine textured lacustrine parent material in the north and northeast as well as in the southeast areas of the current City limits. There is also a minor area of Gleysolic soils developed on fine-textured lacustrine parent material in the west section of the current City limits.

Note: The *City of Edmonton Topsoil Specifications Review and Recommendations* (Esak Consulting 2014) had erroneously provided AGRASID data for the City of Edmonton. It was confirmed that the AGRASID data in the file used for the report was offset 20 km to the north and should not have appeared within the City boundary.

It is the intention of the Topsoil Specification to reflect the relatively high quality of naturally occurring native topsoil in the Edmonton area.

1.6 Laboratory Analysis

The City requires all topsoil that will be disturbed, stockpiled and replaced to be surveyed, inspected and analysed. This includes inspection and testing of City stockpiles, imported topsoil from non-approved City sources, and replaced topsoil in reclaimed areas. The topsoil analysis report is to be kept by the Contractor or approval holder for audit purposes. The City approval and implementation process needs to be determined. Topsoil analysis must determine but not limited to: soil texture; percentage of sand, silt and clay; total soluble salts (electrical conductivity (EC)); sodicity (sodium absorption ratio (SAR)); soil pH (saturated paste) value; saturation percentage of soil; soluble ions (Ca, Mg, K, Cl, SO_4, Na); total organic carbon and total Nitrogen; Total Kjeldahl Nitrogen; percentage of organic matter; calcium carbonate equivalent; available N, P, K soil nutrients: total phosphorus, as required. Additional analyses may include: soil pH (soil: water, $CaCl_2$); cation exchange capacity and saturated hydraulic conductivity.

The recommended chemical and physical analytical parameters of each topsoil type are outlined in Table 2. All the parameters need to be achieved to meet suitability of topsoil type. The methodologies and descriptions for each of the listed topsoil parameters are outlined in Table B1 (Appendix B).

Only commercial laboratory companies (CSA/ASTM/CALA) that are ISO 17025 accredited shall be used. Laboratory analyses of the topsoil parameters are available at accredited commercial laboratories within Edmonton and the regular turnaround is 6 to 10 days. There is a surcharge for more expedient service. It is estimated that it will take approximately 2 weeks total to inspect, take samples and analyze the topsoil (not including preparation and reporting). The upfront cost has to be examined in comparison to future costs to replace unsuccessful and non-sustaining vegetation. With good planning, the testing requirements should not impact timelines significantly. It is to be noted that cost analyses were not considered as part of the scope of this project.

The accredited commercial laboratory companies do not provide recommendations, only analyses results. A different set of expertise (Qualified Professional) is required to provide recommendations on how to blend the topsoil with organic and/or inorganic amendments to meet the specified topsoil type for end use.

It is a best management practice to confirm the adequacy of the topsoil for each project. If the soils need to be amended to meet the specified topsoil type per end use, Tables 1 and 2 shall be followed. It is the City's understanding that amending of the native topsoil is occurring with the current Topsoil Specification. It is advantageous for larger contractors to mix and screen their own topsoil as per the topsoil type requirements than rely on suppliers.

While the current EC tolerance states that values greater than 2 mmhos/cm (2 dS/m) are unsuitable for topsoil (AEP 2016), it should be noted that there are soils within the Edmonton city limits that have naturally high EC and will have to be pre-screened (through sampling and analyses) to ensure mitigation is considered (e.g. gypsum additions may be required based on Theoretical Gypsum Requirement (TGR) analysis).

There is laboratory analysis uncertainty due to soils being a heterogeneous material. Particle size analysis allowances include ±5% value for sand and ±10% values for silt and clay, with total fine grain component (silt and clay) not exceeding 60% (Appendix B, Table B2). The LID data is referenced from the Best Management Practices (City of Edmonton LID BMP 2014). These allowances will allow for the associated uncertainty of the analytical hydrometer method. Allowances for uncertainty should also be considered for the remaining composition requirements. Table B2 (Attachment B) depicts absolute and relative uncertainty of standard laboratory analyses relating to major topsoil properties outlined in Table 1.

The ranges provided for sand, silt and clay have variances built in (refer to Table 2). For example, Topsoil Type 1 shows a range of 30-70% for sand. Table B2 (Appendix B) outlines the uncertainty of specified laboratory methods.

Table 2 Topsoil Types and Associated Topsoil Properties Recommended for End Uses

END USES THAT ARE APPROPRIATE FOR SPECIFIED TOPSOIL	Topsoil Type						
	1	2	3	4	5	6	7
	Basic/Native Topsoil **(30-60% Sand)** (1a) Parks, Playgrounds, and School Sites (excluding Standard Sports Fields) (1b) Greenways (1c) Public Utility Lots (1d) Standard Sports Fields (School Sites) (first 300 mm, 450 mm or 500 mm) (3a) Roads, Boulevards, Medians (Trees, Continuous Trench) (3b) Roads, Boulevards, Medians (Trees) (3c) Roads, Boulevards, Medians (No Trees) (4a) Urban Hardscapes (Trees) (4b) Urban Hardscapes (No Trees) (7) Naturalization	**Standard Sports Fields (School Sites)** **(40-60% Sand)** (1d) Standard Sports Fields (School Sites) (100 mm topdressing)	**High Sand, High Organic Matter** **(55-65% Sand)** (2a) Premier Sports Fields (Irrigated, may include Subdrainage)	**Very High Sand, Low Organic Matter** **(70-90% Sand)** (2b) Premier Sports Fields (Irrigated, Subdrainage)	**High Organic Matter** **(10-15% OM)** (5) Ornamental Shrub Beds	**Very High Organic Matter** **(15-20% OM)** (6) Urban Agriculture, Community Gardens	**Low Impact Development (LID)** (8) LID – Flow Attenuation, Water Quality Treatment
Particle Size Distribution (%) and Textural Class							
Coarse gravel (<19 mm to 40 mm) [A]	0-3%	0-3%	0-1%	0-1%	0-1%	0-1%	0-3%
All gravel (2 mm to 40 mm) [A]	0-10%	0-10%	0-5%	0-5%	0-5%	0-5%	0-5%
Very coarse sand (1 mm to 2 mm) [A]	-	-	<10% [B C]	-	-	-	-
Coarse sand (0.5 mm to 1 mm) [A]	-	-	20-50% [B C]	-	-	-	-
Medium sand (0.25 mm to 0.50 mm) [A]	-	-	20-50% [B C]	-	-	-	-
Fine sand (0.15 mm to 0.25 mm) [A]	-	-	<20% [B C]	-	-	-	-
Combined medium to very coarse sand (2 mm to 0.25 mm) [A]	-	-	>60% [B C]	-	-	-	-
Combined very coarse sand, fine gravel and gravel	<40%	<40%	<25% [B C]	<30% [B]	-	-	-
Sand (2 mm to 0.05 mm) [A]	30-60%	40-60%	55-65% [B]	70-90% [B]	50-70%	40-75%	50-85% [D]
Silt (0.05 mm to 2 µm) [A]	15-50%	15-50%	<10%	0-15%	10-25%	10-25%	10-15% [D]
Clay (<2 µm) [A]	15-30%	15-30%	<10%	0-15% [B]	0-25%	0-25%	3-10% [D]
Clay and silt combined	Maximum 60%	Maximum 60%	Maximum 20% [B C]	Maximum 15% [B]	Maximum 35%	Maximum 35%	Maximum 20% [D]
Textural Class [A]	Loam [E], Sandy loam [E], Silt loam [E], Sandy clay loam [E]	Loam [E], Sandy loam [E], Silt loam [E], Sandy clay loam [E]	Sandy loam [E]	Sand to Loamy sand [BC]	Sandy loam [E] to Loam [E]	Sandy loam [E] to Loam [E]	Loamy sand [D] to Sandy Loam [D]
Organic matter content %	4-10% [F]	4-10% [F]	6-8% [B C]	2-4% [B]	10-15%	15-20%	5-10% [D]
Additional Topsoil Properties							
pH (acidity) (Saturated paste)	6.0-7.5 [A]	6.0-7.5 [A]	6.0-7.5 [A]	6.0-7.5 [A]	6.0-7.5 [A]	6.0-7.5 [A]	6.0-7.5 [D]
EC dS/m (salinity)	<2 [G]	<2 [G]	<2 [B G]	<2 [B G]	<2 [G]	<2 [G]	<2 [G]
SAR (sodicity)	<5 [G]	<5 [G]	<5 [B G]	<5 [B G]	<5 [G]	<5 [G]	<5 [G]

END USES THAT ARE APPROPRIATE FOR SPECIFIED TOPSOIL	Topsoil Type						
	1	2	3	4	5	6	7
	Basic/Native Topsoil **(30-60% Sand)** (1a) Parks, Playgrounds, and School Sites (excluding Standard Sports Fields) (1b) Greenways (1c) Public Utility Lots (1d) Standard Sports Fields (School Sites) (first 300 mm, 450 mm or 500 mm) (3a) Roads, Boulevards (Trees, Continuous Trench) (3b) Roads, Boulevards (Trees) (3c) Roads, Boulevards (No Trees) (4a) Urban Hardscapes (Trees) (4b) Urban Hardscapes (No Trees) (7) Naturalization	**Standard Sports Fields (School Sites)** **(40-60% Sand)** (1d) Standard Sports Fields (School Sites) (100 mm topdressing)	**High Sand, High Organic Matter** **(55-65% Sand)** (2a) Premier Sports Fields (Irrigated, may include Subdrainage)	**Very High Sand, Low Organic Matter** **(70-90% Sand)** (2b) Premier Sports Fields (Irrigated, Subdrainage)	**High Organic Matter** **(10-15% OM)** (5) Ornamental Shrub Beds	**Very High Organic Matter** **(15-20% OM)** (6) Urban Agriculture, Community Gardens	**Low Impact Development (LID)** (8) LID – Flow Attenuation, Water Quality Treatment
Total Organic Carbon (Aspen Parkland)	2.2-3.4% [F]	2.2-3.4% [F]	-	-	-	-	-
Total Nitrogen (Aspen Parkland)	0.33% [F]	0.33% [F]	-	-	-	-	-
Carbon: Nitrogen (C: N) ratio	11:1 [F]	11:1 [F]	10:1 [F]	20:1 to 30:1 [F]	10:1 to 15:1 [H]	10:1 [H]	10:1 to 20:1 [H]
Calcium Carbonate Equivalent (%)	<2 [G]	<2 [G]	<2 [G]	<2 [G]	<2 [G]	<2 [G]	<2 [G]
Saturation %	30-60 [I]	30-60 [I]	20-30 [I]	20-30 [G I]	30-60 [I]	30-60 [I]	20-30 [I]
Available Phosphorus	20 mg/kg to 60 mg/kg (or as per site requirements) [J K]	20 mg/kg to 60 mg/kg (or as per site requirements) [J K]	20 mg/kg to60 mg/kg (or as per site requirements) [J K]	20 mg/kg to 60 mg/kg (or as per site requirements) [J K]	20 mg/kg to 60 mg/kg (or as per site requirements) [J K]	20 mg/kg to 60 mg/kg (or as per site requirements) [J K]	-
Total Phosphorus	NA	NA	NA	NA	NA	NA	10-30 mg/kg [D]
Available Potassium	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	300 kg/ha to 1000 kg/ha (or as per site requirements) [L]	-
Cation Exchange Capacity	-	-	-	-	-	-	10 mq /100 g [D]
Saturated Hydraulic Conductivity	-	-	15-30 cm/hr [B C]	>25 cm/hr [B]	-	-	Minimum 25 mm/hr [D]

Notes:

City of Edmonton recommends that the topsoil used in City projects relating to the Topsoil Specification meet the Alberta Tier I Soil Guidelines for metals/elements, hydrocarbons and organic compounds. http://aep.alberta.ca/lands-forests/land-industrial/inspections-and-compliance/documents/AlbertaTier1Guidelines-Feb02-2016A.pdf

OM = Organic Matter; LID = Low Impact Development; NA = not applicable/not available

[A] Soil Classification Working Group (1998) http://sis.agr.gc.ca/cansis/taxa/cssc3/index.html

[B] ASTM (2016) https://www.astm.org/Standards/F2396.htm

[C] USGA (2004) https://www.usga.org/content/dam/usga/images/course-care/2004%20USGA%20Recommendations%20For%20a%20Method%20of%20Putting%20Green%20Cons.pdf

[D] City of Edmonton, LID BMP (2014) https://www.edmonton.ca/city_government/documents/PDF/LIDGuide.pdf

[E] Bowser et al. (1962) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag14932. There is topsoil around Edmonton that have heavier textures such as silty clay (SiC), silty clay loam (SiCL), and clay loam (CL) but are unsuitable for the City Topsoil Specification (2017).

[F] AAF (2003) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/aesa1861

[G] AEP (2016) (AB Tier I, coarse textured, agriculture) http://aep.alberta.ca/lands-forests/land-industrial/inspections-and-compliance/documents/AlbertaTier1Guidelines-Feb02-2016A.pdf

[H] Estimated based on organic matter % and texture

[I] AAFRD (1987) (Plains Region) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag9469/$FILE/sq_criteria_relative_to_disturbance_reclamation.pdf

[J] BCSLA and BCLNA (2012) http://www.bcsla.org/sites/default/files/PREVIEW%20Pages%20from%20Landscape_Standard_2012_Updated%20October%2015%2C%202013.pdf

[K] Paterson et al. (2006) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag11864/$FILE/vol-1-summary.pdf

[L] AAF (2013) http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex917

Collection and review of the analysis of samples shall be completed by Qualified Professionals who will provide recommendations. This Qualified Professional can sign off on the work which can be reviewed during the audit process.

The soil analysis report will include the topsoil source and the recommendations for correction to meet the nutritional growing requirements of specified plant materials. Recommendations by a Qualified Professional will clearly state the type and quantity of topsoil amendments and application procedure to be used.

Topsoil (onsite or imported) to be used on a site shall be soil surveyed, sampled, tested, and modified/amended as required by the Topsoil Specification through the admixture of organic amendments and/or inorganic components (as per Sections 2.5 and 2.6, respectively) to bring its properties within the ranges in Table 2 for the intended end use of the site.

The Contractor will retain all documentation that the topsoil submitted for laboratory testing, as outlined in this Topsoil Specification, is a representative sample taken from the topsoil that will be delivered to the site. Upon request, laboratory records shall be submitted to the City of Edmonton to assure that the appropriate topsoil associated with the designated topsoil type and end use was used.

1.7 Soil Surveying and Sampling

Considering the highly variable nature of soils within a landscape, it is imperative that soils are characterized and sampled in the field to verify the physical and chemical properties outlined in Table 2 of the Topsoil Specification. Soils should be identified to Subgroup level of the Canadian System of Soil Classification (e.g., Orthic Black Chernozem), and delineated into Soil Management Units (SMUs). A SMU is an area that may include one or more soil polygons (identified by soil series) that are suitable for salvage together due to similar physical and chemical properties.

Soil survey and sampling of in-situ soils and stockpiles are important components to the pre-construction phase that will aid in identifying which soils should be salvaged and stockpiled together, as well as verifying the topsoil quality of existing stockpiles. This pre-construction planning is important to aid in understanding the soil relationships in an area prior to preparation of a development (construction) plan, in order to adequately plan for reclamation (soil salvage and replacement).

The soils are soil surveyed and sampled for two purposes: classification and replacement (reclamation). The goals are to:

- obtain a baseline terrain and soils inventory for the proposed site;
- map and describe all the soil management units and associated soil polygons in the proposed site (up to 64 ha) (Appendix C);
- assess the wind and water erosion risk to soils in the proposed site;
- sample the soils for classification and characterization; and

- verify the physical and chemical properties outlined in Table 2 of the Topsoil Specification.

Soil must be surveyed, inspected and sampled using standard methods depending on whether it is being sampled in‐situ to establish baseline (either native or disturbed), from a stockpile, or after it is replaced. A flowchart of soil survey and sampling is presented in Appendix C, Figure C1. Soil sampling shall be conducted by a Qualified Professional, who would also perform the data review upon receipt from the approved laboratory. Soil survey should follow the Survey Intensity Level (SIL) based on typical objectives and area of proposed disturbance (Soil Classification Working Group 1998; Valentine and Lidstone 1985; MSWG 1981).

The overall topsoil sampling process for native or disturbed and stockpiles is as follows:

1. The topsoil is required to be tested before use for the particular end use. The topsoil can either be in-situ or in a stockpile.
2. The results are compared to the topsoil chemical and physical properties of Table 2. If the ranges are met as outlined in Table 2 then the topsoil is satisfactory. If the topsoil does not meet the requirements in Table 2 the topsoil is unsatisfactory and will needed to be amended. This amended topsoil will be re-test to ensure the topsoil meets the requirements in Table 2. It is recommended that a Qualified Professional be consulted.
3. If the topsoil is stockpiled, the topsoil is re-tested to ensure the end use is met.

Refer to Appendix C for details on soil survey and sampling methods for topsoil (in-situ and stockpiles).

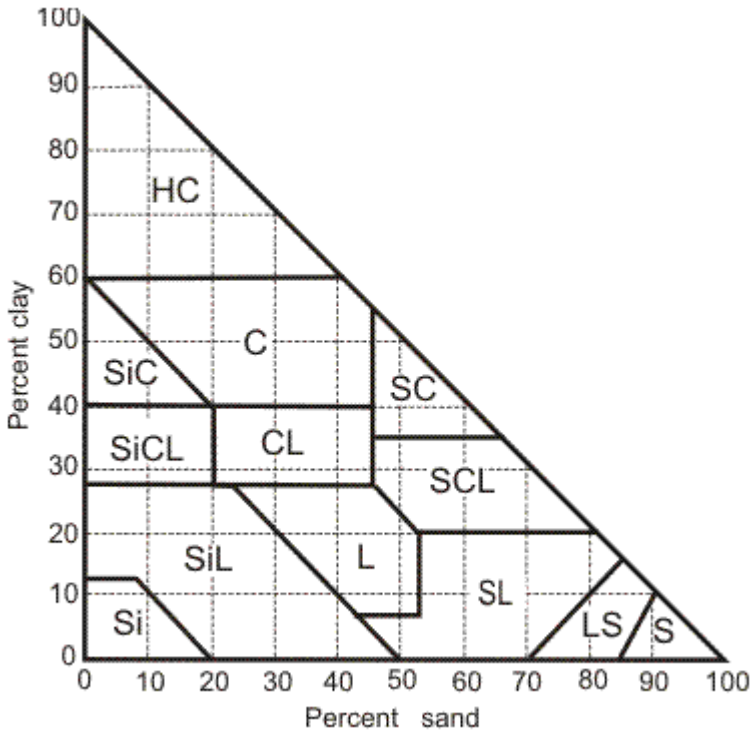
1.8 Soil Morphology and Nutrients

Soil morphology, including texture, structure, and consistency, and availability of nutrients are important components that define the topsoil types.

1.8.1 Soil Texture

Textural classes are defined in terms of the size distribution of primary particles as estimated by sieve and sedimentation analysis. The textural classes defined by the Canadian System of Soil Classification (Soil Classification Working Group 1998) are presented in the soil texture class triangle (Figure 1). The soil texture triangle depicts the percentages of clay and sand in the main textural classes of soil, while the remainder of each class is silt. Named size classes of primary particles and their dimensions are presented in Table 3.

Figure 1 Soil Texture Classes Triangle



Abbreviation	Texture Class
HC	Heavy Clay
C	Clay
SC	Sandy clay
SiC	Silty clay
SiCL	Silty clay loam
CL	Clay loam
SiL	Silt loam
L	Loam
SCL	Sandy clay loam
SL	Sandy loam
LS	Loamy sand
Si	Silt

Table 3 Dimensions of Named Size Classes of Primary Particles

Name of Soil Separate	Diameter (mm)
Very coarse sand	2.0-1.0
Coarse sand	1.0-0.5
Medium sand	0.5-0.25
Fine sand	0.25-0.10
Very fine sand	0.10-0.05
Silt	0.05-0.002
Clay	≤0.002
Fine clay	≤0.0002

Soil texture affects many different soil properties which in turn affect successful revegetation. A presentation by the Western Oregon University (no date) summarized the effects to include:

- water retention;
- leaching of nutrients;
- availability of nutrients to the plants;
- soil properties;
- maximum retention capacity;
- field capacity;
- permanent wilting point;
- cation exchange capacity;
- organic components;
- phenoics; and
- pH.

1.8.2 Soil Structure

Soil structure refers to the aggregation of primary soil particles into compound particles or aggregates called peds that are separated from adjoining aggregates by surfaces of weakness (Soil Classification Working Group 1998).

Three criteria are used to describe soil structure:

- grade describes the distinctness or ped durability (weak, moderate, strong);
- class defines the ped size (fine, medium, coarse, very coarse); and
- type describes the ped shape (granular, platy, prismatic, blocky) (Soil Classification Working Group 1998; Watson 2007).

1.8.3 Soil Consistence

Soil consistence refers to the soils resistance to deformation or rupture (soil strength), or deformation (plasticity) and its degree of internal cohesion and adhesion to other substances under three standard conditions. The standard conditions include: water content, size of specimen and application of force. The three soil moisture states relating to consistence are: dry, moist, and wet (Soil Classification Working Group 1998, Watson 2007).

Consistence of wet soil is classified in terms of stickiness (nonsticky, slightly sticky, sticky, or very sticky), and plasticity (nonplastic, slightly plastic, or very plastic). Consistence is classified for moist soil as loose, very friable, friable, firm, or very firm. For dry soil consistence is classified as loose, soft, slightly hard, hard, very hard, extremely hard or rigid.

1.8.4 Soil Nutrients

Various references have stated that at least 17 elements are known to be essential nutrients for plants. Nutrients such as carbon, nitrogen, phosphorus and sulfur are constantly recycled by soil microbes. Nutrient cycling is important for continued function of the ecosystems. The nitrogen cycle is a dynamic system that regulates the transformations and chemicals forms of nitrogen in soils and is related to plant growth and potential environmental pollution. Soil nutrients can be categorized in to macronutrients and micronutrients.

Nutrient management is about supplying plants with the appropriate amount, form, placement and timing of nutrients (whether as compost, manure, commercial fertilizer, or other nutrient sources) to optimize plant growth and minimize environmental risks. A summary of the general nutrient ranges recommended for all topsoil types is presented in Table 2. Refer to City of Edmonton (2014) LID CIM Guide regarding that no fertilizer or manure is to be used to avoid contamination with water sources.

1.8.5 Drainage and Soil Porosity

Drainage and soil porosity are key parameters in salvaging and rebuilding soil end uses. It is also imperative to understanding and preventing soil compaction. Soils consist of organic matter, various-sized soil particles referred to as soil texture (proportion of solid particles including sand, silt and clay) and pore spaces that contain air and water (McKenzie 2010).

The connectivity of soil pores coupled with the size and number of pores is very important for water infiltration, water and nutrient movement within soil and the ability of the soil to hold water (McKenzie 2010). Large, inter-connected soil pore spaces enhance several actions:

- water infiltration into soil;
- water percolation into the root zone and subsoil; and
- air exchange with the atmosphere.

Many important biological and chemical processes take place within soil pores that require both water and air. Reduced pore size and number will affect soil biological and chemical processes, such as the reduced cycling and release of plant available nutrients.

Pore space controls soil drainage characteristics. In other words, drainage problems often arise from lack of large-sized pores. In soils dominated by large pores (i.e., sandy soils), water moves rapidly. Soils that allow rapid leaching (water movement down through the soil profile) also pose environmental hazards because rain or irrigation water moving through the soil profile takes water-soluble pollutants with it. Ground water pollution is a sensitive issue on coarse-textured sandy soils. In comparison, soils dominated by small-sized pores (i.e., compacted soils and soils with greater than 20% clay content), water is slow to move or may not move at all. These latter soils easily waterlog (Colorado State University Extension 2016a).

Soil compaction changes pore space size and distribution and will increase soil strength. One way to quantify the change is by measuring soil bulk density. This procedure is done by carefully taking a soil core and measuring the diameter and length to determine the volume of the core, then oven drying the core to determine the soil dry weight.

Soil bulk density is the dry weight of soil divided by the volume of the soil. It is usually expressed in grams per cubic centimeter (g/cm^3). As the pore space is decreased within a soil, the soil bulk density is increased. McKenzie (2010) cited that in Alberta, normally, loam to clay loam soils have a bulk density of about 1.3 to 1.4 g/cm^3, and sandy loam to loamy sand soils have a bulk density of 1.4 to 1.6 g/cm^3. Naturally dense horizons in a Solonetzic soil will have bulk densities of 1.6 g/cm^3 or greater, and root growth will be hindered. Disced or cultivated surface soils will have bulk densities in the range of 1.0 to 1.2 g/cm^3.

Heavily compacted soils contain few large pores and have a reduced rate of water penetration through the compacted layer. Large soil pores are the most effective in moving water through the soil. When large pores are absent, the hydraulic conductivity of soil (rate water will move through soil) will be greatly reduced.

In addition, the exchange of gases in soil with the atmosphere slows down in compacted soils, causing an increase in the likelihood of aeration-related problems. Soil compaction increases soil strength, which means plant roots must exert greater force to penetrate the compacted layer.

Roots must have oxygen to survive and root activity shuts down in waterlogged soils. Plants growing on wet soils are typically shallow rooted. Many plants are prone to root rot in wet soils. Prolonged periods of waterlogged soil conditions lead to the decline or even death of most plants. When water does not leach through the soil profile, salts left behind by surface evaporation accumulate and create a white crust on the soil. This is frequently observed as a white deposit on low spots of pastures and fields (Colorado State University Extension 2016a). High soil salt content of soils like those present in the City Region may limit plant growth (Bresler et al 1982).

Poor drainage, as referenced by the soil classification of Solonetzic, Gleysolic and Chernozemic soils developed on dominantly glaciolacustrine fine textured materials (Bowser et al. 1962), is a common problem in many Edmonton area soils. In some areas, the surface soil allows water infiltration only to have the water stopped as it reaches a less permeable subsurface soil layer (hardpan Bnt or Bn horizon or heavy clay textured soil). See Appendix A (Definitions).

A simple test to evaluate soil drainage is to dig a hole 30 cm deep and fill it with water. If the water fails to drain in 30 minutes, the soil has a drainage problem. If the hole fails to drain in 24 hours, waterlogged soils may affect plant growth (Colorado State University of Extension 2016a). This test is only representative on soils that are moist and the structure has not been affected by cracking. The test area should be wetted prior to the test to account for water uptake into dry soils prior to conducting the test. A minimum saturated hydraulic conductivity for LID soils is 25 mm/hr (City of Edmonton 2014 LID CIM Guide).

1.8.6 Compaction

Soil compaction is a reduction in volume because of remoulding and instantaneous or temporary loading of a soil. It is distinguished from compression which is volume reduction under a sustained load and consolidation which is volume reduction when there is positive pore pressure (Thacker et al. 1994).

Compaction increases the density of the soil, which hampers infiltration of water, soil air movement, seedling emergence, root growth and ultimately reducing yield. Soil aeration is likely to become limiting to plant growth when air-filled porosity in the soil falls below 10% (Manitoba Agriculture, Food and Rural Initiatives 2008). Soil compaction can occur at the soil surface in the form of soil crusting, or it can occur in the subsoil (McKenzie 2010). Several factors can cause poor plant growth, including soil compaction. There are two types of soil compaction: natural and human-induced (McKenzie 2010, Manitoba Agriculture, Food and Rural Initiatives 2008). Human-induced soil compaction is usually caused in two ways: by excessive equipment/tillage and untimely field operations on wet soils (equipment/tillage induced), or by wheel tracking (traffic induced). Under favourable conditions, winter freezing and thawing of the soil can correct human-induced compaction problems up to a depth of 60 cm to 90 cm (Manitoba Agriculture, Food and Rural Initiatives 2008). In Alberta, naturally compacted soils that contain extremely high levels of sodium (Solonetzic) or high levels of sodium carbonates (>40%) (Calcareous), with bulk densities greater than 1.8 g/cm^3 may be prone to compaction (adapted from McKenzie 2010). Most compaction caused by wheel traffic occurs to a depth of 30 cm to 90 cm on the first pass over a field. The first pass accounts for up to 80% of the compaction that four passes would cause on the same spot (Manitoba Agriculture, Food and Rural Initiatives 2008).

Soils most susceptible to compaction:

- Moist (nearing field capacity) – Moist soils are more susceptible to compaction than saturated soils because saturated soils have their pores completely filled with water. Since water cannot be compacted and fields are usually not accessible when saturated, compaction is usually less of a problem than when soils are moist.
- Low organic matter and low residue cover – Organic matter helps soil particles resist compaction.
- Poor soil structure – Eroded soils with massive soil structure are more likely to be compacted than soils with blocky structure (Manitoba Agriculture, Food and Rural Initiatives 2008).

Soil compaction is difficult to mitigate, thus, efforts should be directed at preventing compaction. Soils generally become compacted during construction. Foot traffic on moist soils is another primary compaction force in the home landscape. The impact of falling raindrops and sprinkler irrigation also compacts the surface of fine-textured clayey soils (Colorado State University Extension 2016b).

Refer to the City of Edmonton (2014) LID CIM Guide regarding compaction during construction, which includes:

- avoiding cultivating or equipment handling of overly wet or dry soils;

- scarify and work from the perimeter of the disturbance, and/or use of tracked equipment; and
- avoiding placing topsoil over compacted fill.

Compaction can be mitigated or alleviated by the following measures:

- adding organic matter in forms of organic topsoil amendments;
- managing traffic flow;
- using mulches;
- aerating;
- avoiding excessive cultivation or equipment handling;
- avoiding cultivating or equipment handling of overly wet or dry soils; and
- avoiding placing topsoil over compacted fill.

1.9 Biological Diseases

The City is currently developing guidelines for assessing and mitigating the various biological diseases including clubroot that could affect topsoil quality. Biological diseases are not discussed in this report.

1.10 Weeds

Plant species legislated as 'Noxious' or 'Prohibited Noxious' weeds per the *Weed Control Act* (Government of Alberta 2011) and the Weed Control Regulation (Government of Alberta 2010a) are required to be controlled or destroyed. Topsoil will be monitored (pre-construction and post-construction including stockpiles) for noxious and prohibited noxious weeds and, if found, a plan for the control or removal of those plants should be created and implemented, if possible, before the weeds release seeds. Refer to the Landscape Design and Construction Standards – See clause 7.13 in the Standards.

1.11 Quality of Work

Quality of work is reflected in compliance with the Topsoil Specification through the soil surveying, sampling, testing and utilization of topsoil types with the properties and associated depth(s) per end use(s) set out in the Topsoil Specification. Thus, this version of Specification must be adhered.

2 TOPSOIL AND AMENDMENTS

The City of Edmonton has valuable topsoil. This section outlines the various topsoil types (7) which were identified based on the City needs for the various end uses (15) as outlined in Table 1. The end uses vary from naturalization zones to premier sports fields, from parks, playgrounds and school sites to greenways, from roads/boulevards/medians and public utility lots to hardscapes, from intensive plant growth (ornamental shrubs beds and urban agriculture, community gardens) to Low Impact Development (LID).

Topsoil is defined as any onsite (native) or imported topsoil, or mixture whose chemical and physical properties fall within the ranges set out by the Topsoil Specification as identified in Table 2. Topsoil should be documented as to its origin. Topsoil shall meet the requirements as set out in the Topsoil Specification.

2.1.1 Onsite (Native) Topsoil

Use of onsite topsoil is encouraged when it can be modified to meet the project specific requirements (Table 1). Onsite topsoil shall be defined as the existing fertile, friable, dominantly coarse textured, 'A' horizon containing accumulated organic matter, and usually distinguished by a darker colouration. Soils lacking in organic matter and consequently not as desired for plant growth will be recognized as the B and C horizons of the soil profile.

2.1.2 Imported Topsoil

Imported topsoil shall be brought in only when there is insufficient topsoil on site to meet the project requirements. Under these circumstances, imported topsoil shall be soil surveyed, sampled and tested and confirmed that it meets the chemical and physical properties specified in Table 2 for the proposed end use and approved by the City prior to importing. Imported topsoil is defined as topsoil type as specified by the end use and shall be screened and free of subsoil, wood debris, invasive and prohibited noxious and noxious plants and their reproductive parts, plant pathogenic organisms, organic and inorganic materials, toxins, stones over 50 mm, and debris and foreign objects.

2.2 Subsoil

2.2.1 Upper Subsoil (B Horizon)

The replacement of suitable upper subsoil is optional as the revised Topsoil Specification has considered deeper topsoil replacements to support adequate rooting growth.

2.2.2 Lower Subsoil (Genetic/Parent Material – C Horizon)

Materials are classified according to their essential properties within a general framework of their mode of formation (Soil Classification Working Group 1998). Four groups (components) of materials have been recognized to facilitate further characterization of the texture and surface expression of the materials. They are unconsolidated mineral, organic, consolidated, and ice components.

Unconsolidated mineral component (genetic/parent material) is the applicable component to this Specification and consists of clastic sediments that may or may not be stratified, but whose particles are not cemented together. They are essentially of glacial or postglacial origin but include poorly consolidated and weathered bedrock. The classes include: anthropogenic, colluvial, eolian, fluvial, lacustrine, morainal, saprolite, volcanic, marine, and undifferentiated.

2.3 Topsoil Descriptions

Topsoil approved by the City varies in type based on its application according to the proposed end uses of the site. Topsoil properties are described in this Specification for a variety of end uses within each site as outlined in Tables 1 and 2. The chemical and physical properties of this topsoil types have been adapted from various sources including: Soil Classification Working Group (1998), ASTM (2016); USGA (2004); City of Edmonton, LID BMP (2014); Bowser et al. (1962); BCSLA and BCLNA (2012); AAF (2003); AEP (2016); AAFRD (1987); Paterson et al. (2006); AAF (2013); CSLA and CNLA (2016); ASIC 2001).

All parameters need to be met within the acceptable ranges as per Table 2. If the ranges are not met, then the topsoil is not suitable and will need to be amended accordingly.

Topsoil providers will need to become familiar with the 2017 Topsoil Specification and then make products to meet the new Specification. The new Topsoil Specification roll out will be formally communicated to Landscape Alberta, UDI and the City.

2.3.1 Topsoil Type 1

Type 1 topsoil represents dominant Chernozemic soils native to the City of Edmonton and consists of loam, sandy loam, silt loam to sandy clay loam textured topsoil developed on typically fine textured lacustrine and morainal subsoils soils in the Aspen Parkland Ecoregion.

Topsoil Type 1 has a maximum combined clay and silt content of 60%. Type 1 soils have high organic matter of 4 to 10% with a total organic content range of 2.2 to 3.4%, total nitrogen of 0.33% and a C:N ratio of around 11:1 (AAF 2003). These soils also have soil pH within the normal range of 6.0 to 7.5 and are non-sodic and non-saline.

Topsoil Type 1 is compatible with the following end uses that do not require specific management:

- Parks, Playgrounds, School Sites (excluding Standard Sports Fields) (1a);
- Greenways (1b);
- Public Utility Lots (1c);
- Standard Sports Fields (School Sites) (first 300 mm, 450 mm or 500 mm) (1d);
- Roads, Boulevards, Medians (3a, 3b, 3c);
- Urban Hardscape (4a, 4b); and
- Naturalization (7).

It is important to note that the City has variable native topsoil textures due to soil formation on different landforms and parent material. There are inclusions of areas within the City of Edmonton where native topsoil is heavier textured (e.g., silty clay, clay loam and silty clay loam) and these have to be considered on a site by site basis. Therefore, Type 1 topsoil may not be representative of a specific location within the City.

2.3.2 Topsoil Type 2

Topsoil Type 2 is a sand amended topsoil mixture which is used as a 100 mm topdressing on Standard Sports Fields (School Sites) end use (1d) over the native topsoil placement (Topsoil Type 1). This Topsoil Type has 40 to 60% sand content in the mixture and are in the textural classes of loam, sandy loam, silt loam and sandy clay loam. All the other chemical and physical parameters are the same as the Topsoil Type 1 (basic/native topsoil). This higher sand topsoil type will aid in alleviating compaction and may prolong the life of the sport field.

2.3.3 Topsoil Type 3

Topsoil Type 3 is a more specialized topsoil mixture that is high in sand content and organic matter and is compatible with the specialized management of the Premier Sports Fields (Irrigated, may include subdrainage) end use (2a). The chemical and physical properties of this topsoil type have been adapted from the above stated resources with the addition of various sports field specifications. Due to the potential lack of subdrainage, this end use requires high percolating soils (maximum 20% silt and clay combined) with organic matter (6 to 8%) and C:N ratio of 10:1 to allow for adequate moisture holding capacity, plant nutrients and compaction alleviation.

2.3.4 Topsoil Type 4

Topsoil Type 4 is a more specialized topsoil mixture that has very high sand content and low organic matter which is compatible with the specialized management of the Premier Sports Fields (Irrigated, Subdrainage) end use (2b). The chemical and physical properties of this topsoil type have been adapted from the above stated resources with the addition of various sports field specifications. The subdrainage of this end use requires high percolating soils (maximum 15% silt and clay combined) with slightly lower organic matter (2 to 4%) and a C:N ratio of approximately 20:1 to 30:1 to allow for adequate moisture holding capacity, plant nutrients and compaction alleviation.

2.3.5 Topsoil Type 5

Topsoil Type 5 is a high organic matter (10 to 15%) topsoil mixture that will be used for Ornamental Shrub beds end use (5). The topsoil is slightly coarser textured than Type 1 (maximum 35% silt and clay) to allow for increased moisture capacity. The organic matter content is also higher (10-15%) than Type 1 which provide a C:N ratio of approximately 10:1 to 15:1. This will aid in nutrient availability for the plants.

2.3.6 Topsoil Type 6

Topsoil Type 6 is a very high organic matter (15-20%) topsoil mixture that will be used for Urban Agriculture/Community Garden end use (6). The organic matter content is higher and will provide a low C:N ratio (10:1). This will aid in nutrient availability and increased moisture capacity for the plants.

2.3.7 Topsoil Type 7

Topsoil Type 7 is a very specialized topsoil mixture that is used for Low Impact Development (LID) – Flow Attenuation/Water Quality Treatment end use (8). The chemical and physical properties of this topsoil type have been adapted from various sources including the above stated resources with the addition of the City of Edmonton LID Best Management Practices Design Guide, Edition 1.1 (2014), Liu (2014), WSU and Puget Sound Partnership (2012), and San Francisco Regional Water Board (2011). The higher sand content (50-85%), low silt and clay content (maximum 20%) combined with the higher organic matter (5-10%) should improve water flow and water quality in the facility.

2.4 Soilless Media/Potting Soils

Most container production uses specially prepared topsoil called soilless media or potting soils, which are comprised of various organic and inorganic growing medium amendments. Soilless media, including peat, are not approved by the City as an amendment for the cited end uses.

2.5 Organic Amendments

Topsoil amendments shall be substantially free of subsoil, sawdust, commercial wood projects, stones, lumps, plants, roots, sticks, invasive and noxious plant parts and seeds, high seed content, chemical contaminants and other organic and inorganic materials harmful to plant life. Organic components shall be within the ranges shown in Tables 1 and 2 for the specific topsoil types intended for the end uses. When requested by the City, the organic components are to be supplied in the form of a 1 kg sample for analysis and testing for the presence of invasive plant seeds, reproductive parts and roots. The organic components selection and approval will be based on testing results and on recommendation from the soil testing laboratory Soil Scientist and/or Qualified Professional.

The organic components requirement can be met by mixing topsoil with an approved type of organic matter. Note that municipal sewage sludge and biosolids are not part of the scope of this project.

2.5.1 Compost

Commercially prepared compost shall meet the CCME Guidelines for Compost Quality (2005). Compost shall be managed to avoid overloading soils with heavy metals. Category A compost has unrestricted use and can be used in any application, such as residential gardens, horticultural operations, the nursery industry, agricultural lands, and other businesses.

The compost is to be substantially free from coliform, pathogens, and chemical or organic contaminates that may be detrimental to plant, animal or human health. Compost shall meet the foreign mater and sharp foreign matter requirements (CCME 2005). Compost must not exceed a 40:1 total C:N ratio; however, it is recommended that a compost with 25:1 to 30:1 total C:N ratio is used as an amendment. Well rotted wood residuals when found to be a component of compost are acceptable provided the total carbon to total nitrogen ratio for the topsoil type (mixture) shall be a maximum of 25:1 to 30:1.

Manure compost must meet the CCME (2005) Guidelines before use as an organic amendment. Municipal sewage sludge and biosolids are not covered by this Specification.

2.5.2 High-lignin Organic Material

High-lignin organic matter consists of bark or other plant materials with hard fibrous structures. It is used to manufacture or as a surface amendment for the designed topsoil mixture and shall not make up more than 40 % of the organic content of any topsoil type. It shall contain an appropriate fertilizer application, approved by a Qualified Professional that can provide for a range of decomposition levels and deal with nutrient fluxes and other soil physical issues including air and water movement. The high-lignan organic matter shall have a particle size of 1 mm to 15 mm, with no more than 10 % under 2 mm (sawdust is not permitted). The high-lignin organic material should have appropriate subgrade drainage. It is to be approved by the Qualified Professional prior to use.

Well-rotted wood residuals when found to be a component of commercial prepared compost (CCME 2005) are acceptable provided the C:N ratio for the topsoil type is a maximum of 25:1 to 30:1 (AAFRD 2005).

2.5.1 Peat Moss

Peat moss is not approved by the City as a topsoil amendment for the cited end uses. Peat moss repels water (hydrophobic) and breaks down rapidly, compressing and squeezing air out of the soil; thus, creating an unhealthy condition for plant roots.

2.6 Topsoil Inorganic Components

2.6.1 Fertilizers

Types, formulations and rates of application of fertilizers shall be as recommended by a laboratory Soil Scientist or Qualified Professional and based on test results of the topsoil type. Fertilizers are to be added to bring topsoil fertility within the ranges set out in Table 2. Substitutions or variations in fertilizers and methods shall be approved by the consultant prior to application.

Application of fertilizer shall meet the requirements of municipal and provincial regulations and the Federal *Fertilizers Act and Fertilizer Regulations* (1985). It is recommended that fertilizers be in granular, pellet or pill form, dry and free flowing and have guaranteed N P K (nitrogen, phosphorus, potassium) analysis. Liquid formations are not recommended unless approved by the City of

Edmonton prior to use. Lime is a type of fertilizer and shall be dry, free-flowing, and ground containing not less than 85% of total combined carbonates.

2.6.2 Sand

Sand for horticultural use and tested by means of laboratory sieves, shall meet the analytical specification of Table 2. Sand shall be natural and coarse (clean river pump or a locally available equivalent), except for the removal of very fine particles and gravel, and conform to the above Specification. Sand shall be free from impurities, clay balls, chemicals, or organic mater. Reasonable care in the selection of material in a pit shall be used to produce a uniform product. There are commercial sources of sand to meet the sand fractions listed in the Topsoil Specification available within the Edmonton area.

2.6.3 Perlite

Perlite is a siliceous mineral of volcanic origin and is the most commonly used component in horticultural soilless mixes. It is generally included to improve drainage and aeration. Perlite is chemically inert, pH neutral, weed free, light-weight, sterile and odorless.

2.6.4 Vermiculite

Vermiculite has less strength than perlite. Rapid breakdown in the soil and clogging of drainage fabric by fine vermiculite particles have been reported. Vermiculite is not a recommended amendment for topsoil mixes.

3 EXECUTION

For execution of the Topsoil Specification, see Part 3 in Section 02910 – Topsoil Specification. Details as to how the execution is undertaken may be documented in a Soil Management Plan. A documented Soil Management Plan is recommended; however, presently the City of Edmonton does not require a documented Soil Management Plan to be in compliance with the Specification.

3.1 Clean-up

Clean up, immediately, any soil or debris spilled onto roads, walkways, and other finished surfaces. Keep site clean and tidy always. Excess topsoil shall be either removed from site or spread on site if approved by the Consultant.

4 CLOSING

This report is an instrument of service of Klohn Crippen Berger Ltd. The report has been prepared for the exclusive use of The City of Edmonton for the specific application to the City of Edmonton Topsoil Specification Update. The report's contents may not be relied upon by any other party without the express written permission of Klohn Crippen Berger. In this report, Klohn Crippen Berger has endeavoured to comply with generally-accepted professional practice common to the local area. Klohn Crippen Berger makes no warranty, express or implied.

We appreciate this opportunity to offer our services to the City of Edmonton. If you have any questions, please call Pamela Fines at 780.444.0706 or Lynette Esak at 780.452.4125.

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APPENDIX A

Definitions

Appendix A
Definitions

Table A1 Reference Report Definitions

Term	Definition
(ad)mixing	Also called soil displacement. Combining horizons (layers) of soil together (e.g. topsoil with subsoil, organic soil with lower subsoil); introduction of unwanted soil (e.g. off-spec sand or clay fill material) to the top of the soil profile; excavation, scalping, exposure of underlying material or burial of surface soils.
A horizon	This mineral horizon forms at or near the surface in the zone of leaching or eluviation of materials in solution or suspension, or of maximum in situ accumulation of organic matter or both. The accumulated organic matter is usually expressed morphologically by a darkening of the surface soil (Ah). Conversely, the removal of organic matter is usually expressed by a lightening of the soil color usually in the upper part of the solum (Ae). The removal of clay from the upper part of the solum (Ae) is expressed by a coarser soil texture relative to the underlying subsoil layers. The removal of iron is indicated usually by a paler or less red soil color in the upper part of the solum (Ae) relative to the lower part of the subsoil.
Amendment	An alteration of the properties of a soil, and thereby the soil itself, by the addition of substances such as lime, gypsum and sawdust to it for the purpose of making the soil more suitable for the production of plants and any such substance used for this purpose.
Available nutrient	The portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants ("available" should not be confused with "exchangeable").
B horizon (upper subsoil)	This mineral horizon is characterized by enrichment in organic matter, sesquioxides, or clay; or by the development of soil structure; or by a change of color denoting hydrolysis, reduction, or oxidation. In B horizons, accumulated organic matter (Bh) is evidenced usually by dark colors relative to the C horizon. Clay accumulation is indicated by finer soil textures and by clay cutans coating peds and lining pores (Bt). Soil structure developed in B horizons includes prismatic or columnar units with coatings or stainings and significant amounts of exchangeable sodium (Bn) and other changes of structure (Bm) from that of the parent material. Color changes include relatively uniform browning due to oxidation of iron (Bm), and mottling and gleying of structurally altered material associated with periodic reduction (Bg).
Bedrock	The solid rock that underlies soil and the regolith or that is exposed at the surface.
Bn/Bnt horizon	A subsoil horizon typically of Solonetzic soils in which the ratio of exchangeable Ca to exchangeable Na is 10 or less. It must also have the following distinctive morphological characteristics: prismatic or columnar structure, dark coatings on ped surfaces, and hard to very hard consistence when dry.
C horizon (lower subsoil)	This mineral horizon is comparatively unaffected by the pedogenic processes operating in A and B horizons, except the process of gleying (Cg), and the accumulation of calcium and magnesium carbonates (Cca) and more soluble salts (Cs, Csa). Marl, diatomaceous earth, and rock with a hardness ≤3 on Mohs' scale are considered to be C horizons.
Calcareous soil	Soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervesce visibly when treated with cold 0.1 N hydrochloric acid.
Clay	A mineral soil separate consisting of particles less than 0.002 mm in diameter; (ii) a soil textural class; (iii) (engineering) - a fine grained soil that has a high plasticity index in relation to the liquid limit.
Coarse texture	The texture exhibited by sands, loamy sands, and sandy loams but not including very fine sandy loam. A soil containing large quantities of these textural classes. A textural class that includes sand, loamy sand and sandy loam but not fine sandy loam.

Term	Definition
Compaction	Increasing the density of a material by reducing the voids between the particles by mechanical effort.
Conservation	The planning, management, and implementation of an activity with the objective of protecting the essential physical, chemical and biological characteristics of the environment against degradation
Consistence	The resistance of a soil to deformation or rupture, and its degree of cohesion and adhesion.
Disturbed land	Land on which excavation has occurred or upon which overburden has been deposited, or both.
Erosion	Wearing away of the earth's surface by water and wind causing soil loss, nutrient loss, lower productivity reduced water quality, increased sedimentation and loss of habitat.
Fertility, soil	The status of a soil with respect to the amount and availability to plants of elements necessary for plant growth.
Fertilizer	Any organic or inorganic material of natural or synthetic origin which is added to a soil to supply certain elements essential to the growth of plants.
Fertilizer requirements	The quantity of certain plant nutrient elements needed, in addition to the amount supplied by the soil, to increase plant growth to a designated optimum.
Fill	Depth to which material is to be placed (filled) to bring the surface to a predetermined grade; and the material itself.
Fine texture	Consisting of or containing large quantities of the fine fractions, particularly silt and clay. A textural class that includes clay loam, sandy clay loam, silty clay loam, sandy clay, silty clay and clay.
Hydraulic conductivity	The rate of flow of water through a given cross section of area under hydraulic gradient at the prevailing temperature.
Infiltration	Water entering the groundwater system through the land surface.
ISO 17025	The international standard, developed and published by International Organization for Standardization (ISO), specifying management and technical requirements for laboratories.
Lower subsoil	A stratum that includes one or more of the following: a) the C horizon of an upland soil; and b) the C horizon of an organic soil (e.g., Terric layer).
Micronutrient	A nutrient necessary in small, trace or minute amounts for the growth of plants.
Mulch	A natural or artificial layer of plant residue or other materials placed on the soil surface to protect seeds, to prevent blowing, to retain soil moisture, to curtail erosion and to modify soil temperature.
Native land	Land that has not been disturbed by anthropogenic activities.
Native soils	Soil that has not been disturbed by anthropogenic activities.
Nutrient	A chemical element or inorganic compound taken in by a green plant and used in organic syntheses
Off-Spec(ification) Material	Non-reclamation material that must be moved for the purposes of construction. Examples of off-spec material include: rocks, boulders, gravel, overburden above clay borrow material, frozen clay borrow material that cannot be used for construction, lower subsoil or parent material that is to be removed for levelling site for facility construction.
Organic matter	The organic fraction of the soil; includes plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by the soil population.
Parent material	The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of a soil is developed by pedogenic processes.
Particle size distribution	The amount of the various soil separates (sand, silt, clay) in a soil sample, usually expressed as weight percentages.

Term	Definition
Percolation	Downward movement of water through soils.
Permeability	The measure of the capacity for transmitting a fluid through a substance.
pH	The symbol or term refers to a scale commonly used to express the degrees of acidity or alkalinity. On this scale pH of one is the strongest acid, pH of 14 is the strongest alkali; pH of seven is the point of neutrality.
Porosity	The volume percentage of the total bulk not occupied by solid particles.
Qualified professional	A professional (Agrologist, Soil Scientist) who is trained in the appropriate methods for soil survey, mapping and sampling; is competent to review and interpret analysis laboratory results and provide recommendations on quantities, blending and application methods of soil amendment to achieve seven topsoil types in Tables 1 and 2.
Revegetation	The establishment of vegetation which replaces original ground cover following land disturbance.
Saline soil	A nonalkali soil containing soluble salts in such quantities that they interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than 4 dS/m, the exchangeable sodium percentage is less than 15, and the pH is usually less than 8.5.
Salvage	The removal of suitable soil material for reclamation purposes. It includes topsoil, upper subsoil and lower subsoil.
Sand	A soil particle between 0.05 and 2.0 mm in diameter.
Saturation percentage	The saturation percentage (SP) equals the weight of water required to saturate the pore space divided by the weight of the dry soil. Saturation percentage is useful for characterizing soil texture. Very sandy soils have SP values of less than 20 percent; sandy loam to loam soils have SP values between 20 and 35 percent; and silt loam, clay loam and clay soils have SP values from 35 to over 50 percent.
Silt	Small mineral soil grains, the particles of which range in diameter from 0.05 to 0.002 mm (or 0.02 to 0.002 mm in the international system).
Sodic soil	A soil containing sufficient sodium to interfere with the growth of most crop plants. A soil having an exchangeable sodium percentage of 15 or more.
Soil	The naturally occurring, unconsolidating mineral or organic material at least 10 cm thick that occurs at the earth's surface and is capable of supporting plant growth It is also (i) The collection of natural bodies of the earth's surface, in place, modified or even made by man of earthy materials containing living matter and supporting or capable of supporting plants out-of doors, (ii) the unconsolidated mineral matter on the surface of the earth that has been subjected to and influenced by genetic and environmental factors of: parent material, climate (including moisture and temperature effects), macro and microorganisms, and topography, all acting over a period of time and producing a product – soil – that differs from the material from which is derived in many physical, chemical biological, and morphological properties and characteristics.
Soil management	The sum total of all tillage operations, cropping practices, fertilizer, lime and other treatments conducted on or applied to a soil for the production of plants.
Soil profile	A vertical section of a soil which displays all of its horizons and its parent material.
Soil survey	A general term for the systematic examination of soils in the field and in the laboratories, their description and classification, the mapping of kinds of soil, and the interpretation of soils for many uses, including their suitabilities or limitations for growing various crops, grasses and trees, or for various engineering uses and predicting their behaviour under different management systems; for growing plants and for engineering uses.
Soilless media	Containing no soil.
Subsoil	The layer of soil directly below the topsoil layer and consists of the B horizon or the replaced subsurface layer in a reclaimed soil.

Term	Definition
Surface soil	The upper portion of arable soils commonly stirred by tillage implements or an equivalent depth (12 to 20 cm) in nonarable soils. That portion of the soil profile occurring at the surface and generally having the highest organic matter content; the A horizon.
Texture	Soil texture is the relative proportions of sand, silt, or clay in a soil.
Topsoil	Any on-site (native) or imported topsoil, or mixture whose chemical and physical properties fall within the ranges set out by the Topsoil Specification as identified in Table 2. Topsoil should be documented as to its origin. Topsoil shall meet the requirements as set out in the Topsoil Specification.
Topsoil (Imported)	Topsoil type as specified by the end use and shall be shall be screened and free of subsoil, wood debris, invasive and prohibited noxious and noxious plants and their reproductive parts, plant pathogenic organisms, organic and inorganic materials, toxins, stones over 50 mm, and debris and foreign objects.
Topsoil (Native)	Existing fertile, friable, dominantly coarse textured, 'A' horizon containing accumulated organic matter, and usually distinguished by a darker colouration. Topsoil shall be screened and free of rocks of 50 mm in diameter and over, debris and foreign objects, free of subsoil, roots and weeds, unless authorized by a Qualified Professional.
Topsoil (Reclaimed)	The uppermost layer of soil consisting of one or more of the following: all organic horizons (L, F, H and O); 'A' horizons; and/or the replaced topsoil layer in a reclaimed soil.
Upper subsoil	A stratum directly below the topsoil layer and consists of: a) B horizons b) rates as good, fair or poor as described in the Soil Quality Criteria Relative to Disturbance and Reclamation, Alberta Agriculture, 1987, as amended; and c) the replaced subsoil layer in a reclaimed soil.
Vegetative cover	The entire vegetative canopy on an area.

APPENDIX B

Laboratory Methods and Descriptions

Appendix B
Laboratory Methods and Descriptions

Table B1 Summary of Analytical Methodology

Soil Analytical Parameter	Reference	Method Description
Texture	Kroetsch and Wang (2008)	This method uses sodium metaphosphate and deionized (DI) water to help disperse the particles of a pre-weighed soil sample. The sample is mixed for 2-5 minutes using an electric mixer and then transferred to a sedimentation cylinder and allowed to equilibrate. The sample is then mixed, either by using a plunger or by inverting the sealed cylinder. Immediately after mixing, a hydrometer is placed in the sample and a density reading is taken at 40 seconds. After 6-7 hours, a second reading is taken. The temperature of the sample is recorded at the time of both of the readings, as this will be used to correct for viscosity differences of water at various temperatures. After 40 seconds all of the sand in the suspension will have settled, therefore the first hydrometer reading is a measure of the silt and clay that remains in the suspension. After 6-7 hours, all of the silt will also have settled, giving a measure of the clay that remains in suspension. The amount of silt in the sample is determined by the difference of the two readings and the amount of sand in the sample is determined based on the first reading. This assumes that the portion of sample that has settled out of the suspension up to that point represents the amount of sand in the original sample. Additionally, the percentage of gravel in a soil sample can be determined by washing the sample through a 2 mm mesh sieve and determining the percent retention by the sieve. Because these samples are top soil samples, the calcium carbonate pre-treatment and organic matter pre-treatment are not necessary to the methodology. The hydrometer method is sufficient for samples up to 20% organic matter by weight.
pH Saturated Paste	Miller and Curtin (2008)	This method quantifies the soil water content of a saturated soil. Deionized water is used to paste a pre-weighed dried and ground sample. It is then re-weighed to determine the saturation percent by quantifying the amount of water it takes to bring the sample to saturation. A saturated sample should glisten, flow slightly when the container is tipped, slide cleanly from the spatula, and easily consolidate after a trench is formed when the container is jarred. The pasted sample is allowed to stand for a minimum of one hour to allow equilibrium to occur between the soil and the water. The sample is then extracted by applying a vacuum suction. Once extracted, the pH is measured by using an ion selective electrode.

Soil Analytical Parameter	Reference	Method Description
Salinity (EC, SAR, Saturation Percent, Soluble Ions Ca, Mg, K, Cl, SO_4, Na)	Miller and Curtin (2008) Martin et al. (1994)	To prepare a saturated paste for analysis of soluble ion, deionized water is used to paste a pre-weighed dried and ground sample. This paste is extracted under partial vacuum. Saturation percentage and sodium absorption ratio (SAR) are calculated from the saturated paste extract. The determination of electrical conductivity (EC) off this extract is via manual meter. Chloride – Chloride is typically analyzed from the extract by one of the following three methods: Potentiometric titration using silver nitrate, direct potentiometric using an ion selective electrode, colorimetric analysis or by ion chromatography. Soluble cations plus sulfate - An aqueous solution is nebulized and the resulting aerosol is transported into inductively coupled argon plasma generated by radio frequency power. The high temperature (6000-10000 K) of the plasma results in almost complete dissociation of molecules, efficient atomization and ionization in the sample. Emission spectra are produced when the excited atoms and ions return to lower energy states. The spectra are dispersed by high resolution echelle polychromator and the intensities of the lines are monitored by a detector capturing the specific wavelength of light. A background correction technique is required to compensate for variable background contribution for the determination of trace elements. In optical emission spectroscopy, the power of the radiation emitted by an analyte after excitation is directly proportional to the analyte concentration.
Total Organic Carbon, Total Nitrogen via LECO	LECO Corporation (2010)	Total organic carbon (TOC) is determined by treating a weighed sample with 1:1 HCl and drying. The LECO CNS-2000 is a non- dispersive, infrared, microcomputer based instrument designed to measure the carbon, nitrogen and sulphur content in a large number of organic compounds. A weighed quantity of sample is placed in a ceramic boat and placed in an auto-loader. The ceramic boat is then pushed into a combustion chamber where the combination of the high furnace temperature and pure oxygen environment cause the sample to combust. The combustion gases move out of the combustion chamber. The gases pass through infrared (IR) cells to determine carbon content. Sample gas also passes through an aliquot loop to the catalyst heater where any NO_x gases are reduced to N_2. The N_2 carried by pure helium flows through a thermal conductivity (TC) cell to determine nitrogen content.
Total Kjeldahl Nitrogen	USEPA (1993) USEPA (1978)	Total Kjeldahl Nitrogen (TKN) is the term used to describe the sum of free ammonia and organic nitrogen compounds (N in the -3 oxidation state) which is converted to ammonium sulfate under specific digestion conditions; it does not include oxidized nitrogen (NO_3/NO_2). Nitrogen compounds of some industrial wastes such as select amines, nitrocompounds, hydrazones, oximes, semicarbazones, and some refractory tertiary amines may not be converted. In the presence of sulphuric acid, mercuric oxide, and potassium sulphate, at 360°C the amino nitrogen of many organic materials, in addition to free ammonia and ammonium hydroxide, is converted to ammonium sulphate. The digested sample is then neutralized with sodium hydroxide, which adjusts the sample matrix for the pH sensitive reactions that follow. The ammonium reacts with sodium hypochlorite to form a monochloroamine.

Soil Analytical Parameter	Reference	Method Description
		Through subsequent reactions a blue complex is formed, the colour intensity of which is proportional to concentration. The byproducts and strong acid conditions at high temperature to determine the TKN can cause significant safety issues and environmentally toxic waste. An alternative measurement for the calculation of TKN is to complete the total nitrogen analysis using the LECO combustion technique described above and to subtract out the available nitrate and nitrite as described in methodology below.
$CaCO_3$ Equivalent	Ziadi and Sen Tran (2008)	This procedure uses pH to estimate the inorganic carbon content in a soil sample due to carbonates (as calcium carbonate equivalence). Carbonates exhibit alkaline properties in an aqueous solution, and thus can be neutralized in an acid-base reaction with acetic acid as follows: $2CH_3COOH + CaCO_3 \rightarrow CO_2 + H_2O + Ca^{2+}(CH_3COO^-)_2$ A 1:1 soil: water mixture is treated with a standard buffer solution. After shaking, the pH is measured and used to calculate a lime requirement by means of a regression equation. Equations have been derived for a range of agricultural and forested soils by means of separate equilibration experiments using calcium hydroxide.
Organic Matter Content	McKeague (1978)	A sample is dried and ground and passed through a 2 mm sieve. The sample is weighed and put into a muffle furnace at 500°C to oxidize the organic matter into carbon dioxide. The sample is cooled and weighed and the difference in weight is the organic matter content.
Available Nitrogen (N), Phosphorous (P), Potassium (K)	Ashworth and Mrazek (1995)	Water soluble nitrate, available phosphate and exchangeable potassium are removed from soil samples using a modified Kelowna extraction solution. The aqueous solution containing nitrate ions is passed through a column of granular cadmium coated with copper where nitrate nitrogen is reduced to nitrite nitrogen. The nitrite ions then react with sulfanilamide under acidic conditions to form a diazo compound. This compound couples with N-1-naphthylene diamine to form a soluble purple-red azo dye with the absorbance being measured at 520 nm. The aqueous solution containing phosphate ions is injected into a carrier stream of sulfuric acid solutions to avoid matrix effects. The combined stream is mixed with acidic ammonium molybdate to form a heteropoly acid, which is reduced to molybdenum blue by adding acidic stannous chloride. The absorbance of the colored solution is measured at 880 nm. The aqueous solution containing potassium ions is mixed with lithium nitrate (an internal standard) and sprayed into an air-propane flame. The light energy emitted by the potassium (which is directly proportional to the concentration) is quantified.

Soil Analytical Parameter	Reference	Method Description
Total Phosphorus	USEPA (1994a); USEPA (1994b)	Digestion. USEPA Method 200.2, Rev. 2.8. Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements. Analysis: USEPA Method 200.7, Rev. 4.4. Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma – Atomic Emission Spectroscopy.
OPTIONAL		
pH ($CaCl_2$)	Hendershot, Lalande and Duquette (2008)	A 0.01 M $CaCl_2$ solution is added to a soil subsample at a ratio of 2 to 1. The pH is analyzed off the resulting supernatant.
pH (1:2 H_20)	Goh and Mermut (2008)	For certain applications, water is mixed with soil at one of several possible ratios and subsequent analysis is performed for pH, EC and certain soluble parameters. The ratio is generally minimized to best mimic the pH and EC of soil solution in the field.
Bulk Density	McKeague (1978)	Bulk density of a soil is the ratio of the mass (g) of an oven dry soil sample to the volume (cm^3) of that sample at a specified moisture condition. This provides a measure of soil porosity and permits the recalculation on a volume basis of data expressed on a weight basis. Samples for which the volume is not provided are analyzed using a specific amount of as received sample. This is added to a pre-weighed vessel of known volume and both the volume and weight are recorded. A separate subsample is dried to determine moisture content and used to calculate the dry bulk density.
Cation Exchange Capacity (CEC)	McKeague (1978)	Extraction: Manual on Soil Sampling and Methods of Analysis, Method 3.32, CEC and Exchangeable Cations by NH4OAc at pH 7. Analysis: Ammonium Analysis: American Public Health Association. Standard Methods for the Examination of Water and Wastewater, 21st edition, 2005. APHA, 4500-NH3 G
Saturated Hydraulic Conductivity	WSU and Puget Sound Partnership (2012)	As per the procedure in the report.

Note: References are also cited in the Topsoil Specification Reference Document – 2017 Edition.

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Table B2 Laboratory Analysis Absolute and Relative Uncertainty of Specified Methods

Method	Parameter	Unit	Absolute Uncertainty (%)	Relative Uncertainty (%)
Particle size (GS)	Sand 50 µm - 2 mm	%	3.5	0
	Clay <2µm	%	0.0	10.8
	Silt 2 µm - 50 µm	%	0.0	9.0
Saturated Paste (GS)	EC	ds/m @25°C		13.0
	pH	NA		23.0
SAR	NA	NA	NA	NA
Organic Matter by ignition	loss on ignition	%	4.0	6.7
Nutrient in general soils	Nitrogen	µg/g	0.2	14.4
	Phosphorus	µg/g	1.0	13.0
	Potassium	µg/g	7.3	11.9
	Sulfate-S	µg/g	4.0	11.8

APPENDIX C

Soil Survey and Sampling Methods

Appendix C
Soil Survey and Sampling Methods

1 BACKGROUND

1.1 Soil Variability

Soils have spatial and temporal variability and occur in a continuum within a landscape. Their physical and chemical properties are dependent on both time (i.e., age of the soil) and location (e.g., underlying parent material, landscape features, or drainage), thus creating soil patterns that vary both laterally and vertically. Wilding (1985) as referenced by Nikiforuk (2005) provides generalized statements describing the spatial variability of soil. These include:

- reliability in accurately predicting many soil properties decreases with depth;
- soil variability ties to the type of parent material from which the soils were formed;
- static soil properties are less variable than dynamic ones (i.e., organic matter, texture, mineralogy, solum depth vs. hydraulic conductivity, salt content, exchangeable cations, fertility, etc.); and
- properties that can be closely calibrated to a standard in the field are less variable than those which are qualitative (texture, colour, pH vs. structure, consistence, root abundance).

These statements were supported by MacMillian (1982) who found that morphological properties were more variable than physical properties and the nature of parent materials contributed to soil variability. It was confirmed by Pettapiece and Dell (1996) that soil characteristics can be variable within very short distances. They recommended that “average conditions” should be considered for map delineations when evaluating soil physical and chemical properties.

1.2 Soil Survey and Sampling Objective

Considering the highly variable nature of soils within a landscape, it is imperative that soils are characterized and sampled in the field in order to verify the physical and chemical properties outlined in Table 2 of the Topsoil Specifications. Soils should be identified to Subgroup level of the Canadian System of Soil Classification (ex. Orthic Black Chernozem), and delineated into Soil Management Units (SMUs). A SMU is an area that may include one or more soil polygons (identified by soil series) that are suitable for salvage together due to similar physical and chemical properties.

Soil survey and sampling of in-situ soils and stockpiles are important components to the pre-construction phase that will aid in identifying which soils should be salvaged and stockpiled together, as well as verifying the topsoil quality of existing stockpiles. This pre-construction planning is important to aid in understanding the soil relationships in an area prior to preparation of a development (construction) plan, in order to adequately plan for reclamation (soil salvage and replacement).

The procedures outlined in the following sections are meant as a guide to assist Qualified Professionals involved in soil survey and sampling related to the Topsoil Specification, and are adapted from *A soil mapping system for Canada: revised* (MSWG 1981). Reclamation technology and soils research are continually progressing. Consequently, ongoing consultation, revision and updating of this publication is expected as more data become available. This is a scientific, technical procedure for use by Qualified Professionals.

The procedures, including preparation, soil survey, and sampling, are summarized in a flowchart and presented in Figure C.1.

PREPARATION

Confirm size and location of proposed site or stockpile

↓

Review background information available for the proposed site

↓

Pre-map the proposed site into: SMUs (in-situ) or topsoil types (stockpile)

↓

Implement ground disturbance procedures, if required (Alberta One-Call)

↓

Prepare field tools and equipment

SOIL SURVEY

In-Situ

Determine the required inspection density and preselect soil inspection site locations:
Native/undisturbed : stratified random
Replaced soils: grid

↓

Adjust number and location of planned inspection sites in the field as required (complex soils/landscape, underground utilities)

↓

Conduct soil inspection at sites using appropriate equipment (Dutch hand auger and shovel)

↓

Record soil profile characteristics and landscape features. Collect GPS coordinates and photographs at each soil inspection site

↓

Adjust pre-mapped soil polygons and SMUs as necessary

Stockpile

Determine required inspection density and preselect soil inspection site locations

↓

Adjust number and location of planned inspection sites in the field as required based on complexity of soil stockpile

↓

Conduct soil inspection at sites using appropriate equipment (Dutch hand auger and shovel and/or backhoe/excavator)

↓

Record soil characteristics. Collect GPS coordinates and photographs at each soil inspection site

↓

Adjust pre-mapping of stockpile as necessary

SAMPLING

Collect the required number of samples required for:

1. Topsoil Spec, Table 2:
In-situ: min. 16 per SMU
Stockpile: min. 3 + volume

2. Soil Classification: Use professional judgment

↓

Fill in COC forms and submit samples to accredited laboratory for analyses

↓

Review laboratory data and correlate with field data and mapping

↓

Revise soil mapping, if required

↓

Retain all documentation

CONSULTANT: Klohn Crippen Berger	CLIENT: The City of Edmonton	PROJECT: Topsoil Specification Update: Reference Document Appendix C: Soil Survey and Sampling Methods
		TITLE: Soil Survey and Sampling Procedure
		Project No: A05000B27 / FIG No: C.1

2 PREPARATION

Preparation for soil survey and sampling begins with the identification of the area that requires field characterization. The Development Area (DA) includes all areas to be disturbed including construction, stockpiles, laydown, work areas, and buffer areas.

A review of historical soil surveys and aerial imagery of the DA is the next step in preparing for a soil survey. Using this information, a Qualified Professional will be able to pre-map or pre-survey the DA into SMUs according to land use and physical feature. A SMU is recommended to be no greater than 64 ha (one quarter section) to meet the City of Edmonton Topsoil Specifications soil sampling requirements. The soil survey should be planned to provide the level of information required for activities such as materials handling and soil reconstruction.

After the DA has been identified and pre-mapped by the Qualified Professional, the individual should prepare for field work by conducting the required Ground Disturbance procedures (Alberta One-Call notification) and gathering the necessary tools and equipment to conduct the soil survey and sampling.

2.1 Tools and Equipment

The following tools and equipment are recommended for soil survey and sampling:

- GPS;
- NavPhoto or similar GPS photo applications (includes legal land locations, compass and clinometer features);
- tape measure;
- survey stakes and/or flags;
- logbook, clipboard or notebook, and data sheets or digital datalogger;
- field maps;
- pen or marker with water-proof ink;
- soil sample bags from approved laboratory;
- Chain of Custody (COC) forms;
- cooler(s)/shipping containers;
- custody seals, if required for legal sampling;
- dutch hand auger;
- shovel; and
- backhoe/trackhoe, recommended for large stockpiles.

3 SOIL SURVEY

The soil survey includes areas from which soils are to be salvaged. The purpose of the soil survey and mapping is to ensure that non-suitable soils (not meeting the City's Topsoil Specifications) are delineated and identified separately for soil salvage purposes. For example, upland and wetland soils can exist within a proposed DA and should be salvaged separately. The upland area may consist of one or more soil polygons with similar soil characteristics. Other examples of soil types that may require special management include salt-affected soils, soils containing high volumes of coarse materials (gravel), or heavy clay textured soils.

3.1 In-Situ Soil Survey Methods

In-situ areas include native, undeveloped areas, previous disturbed, and replaced soil areas.

The inspection density of a soil survey is determined by the scale and purpose of the survey, and the amount of ground truthing that is required. A "soil inspection site" is a ground truth that the Qualified Professional can use to confirm or extrapolate mapping. Soil inspections of the proposed DA are determined after pre-mapping of the SMUs. The minimum inspection density for soil survey per SMU in the City of Edmonton Topsoil Specifications is to be determined by the Qualified Professional.

Soil inspections in in-situ areas that are native or undeveloped should be conducted in a stratified random pattern that is uniform across the area being inspected. Stratified random soil survey is the most common strategy used for characterizing soil. This method involves conducting random soil inspections in a field that has been stratified based on factors including topography, soil type (Soil Gubgroup), and vegetation type.

Soil inspections in in-situ areas that have replaced topsoil should be conducted in a grid. Grid sampling uses a systematic method of soil inspections to obtain fertility patterns, and assumes there is no logical reason for fertility patterns to vary within an area.

When feasible, in-situ soil inspections should be conducted using a Dutch auger and/or shovel. At a minimum, 50% of the inspection sites should be 'deep' inspections, characterized to a depth of 100 cm or until auger refusal. The remaining inspection sites may be 'shallow' inspections. These sites should be characterized to a minimum depth of 15 cm into the B horizon (upper subsoil) (approximately 35-60 cm total depth below ground surface). Soil inspection locations should be recorded using a GPS unit.

3.2 Stockpile Survey Methods

The soils in stockpiles are surveyed and sampled for classification and reclamation purposes as outlined above.

If the soils have been surveyed and classified in-situ and properly monitored during soil salvage, soil survey and sampling of stockpiles may not be required. However, if there is poor confidence of the quality of topsoil in the stockpiles, or there is incomplete or no documentation available, then a stockpile survey is required to meet the City's Topsoil Specifications. The objective is to ensure that

the topsoil physical and chemical characteristics meet the specifications outlined in Table 2. The topsoil types 2 through 7 will require amendments to the basic/native soil salvaged in the stockpile.

The size, area and type of stockpiles are to be described with the applicable characteristics outlined in Section 3.3. Generally, a clean (free of soil, weeds, pathogens, etc.) hand auger should be used to survey the soil on small soil stockpiles (<2 m high). If the stockpile is large in size and/or volume, a clean (free of soil, weeds, pathogens, etc.) backhoe or trackhoe may be used (e.g., large stockpiles). A clean backhoe/trackhoe should be used to excavate a large soil stockpile.

3.3 Soil Profile Characteristics and Landscape Features

Soil mapping involves the recognition of soil profile characteristics and landscape features. The soil profile characteristics normally observed and recorded include but are not limited to (Soil Classification Working Group 1998):

- horizon thickness and sequence;
- colour (Munsell);
- texture;
- structure;
- consistence;
- effervescence and salt crystals;
- coarse fragments, if present;
- field pH (not required for all observation sites);
- presence of mottles; and
- roots.

The site characteristics observed in completing a site description include but are not limited to (Soil Classification Working Group 1998):

- slope class (topography);
- aspect;
- landform;
- surface stoniness;
- surface and internal drainage;
- extent of erosion;
- present land use (as related to delineating SMUS or Soil Subgroups);
- vegetation cover - trees, shrubs, herbs, grasses, and mosses;;
- other parameters relevant to the site.

Not all of the above parameters need be recorded for each site inspected; however, at a minimum, they should be documented for each inspection site where a soil sample is collected. Furthermore, the parameters recorded will vary to some extent relative to the type of disturbance involved.

3.4 Map Presentation

The soil survey information shall be presented on an aerial photo mosaic base imagery, with the approximate scale (e.g., 1:2,500 to 1:10,000) depending on the size of the development.

4 SOIL SAMPLING PROCEDURE

Soil sampling typically occurs after the soil polygons or stockpiles have been field characterized and preliminary maps have been developed.

Soil sampled are collected to meet two different objectives:

- characterization of the soil polygons within the SMU for soil classification; and
- assessment of the physical and chemical properties to meet the City's Topsoil Specifications as outlined in Tables 2.

Sampling of soils is different based on type of soil disturbance:

- in-situ native soils: stratified random grid sampling;
- in-situ replaced soils: grid sampling; and
- stockpile soils: grid sampling based on volume.

4.1 In-Situ Soils (Native or Replaced)

To meet the first sampling objective (characterization of soils within a SMU), soil samples should be collected at representative soil inspection sites within each SMU.

To meet the second sampling objective (assessment of physical and chemical properties to meet Topsoil Specifications), a minimum of 16 discrete soil samples per SMU should be collected. This number has been determined as a cost-effective way to minimize sampling error when sampling heterogeneous soils within an SMU. It has been determined that this number of soil samples provides a statistical margin of error of ±25% (19 out of 20 times) within a soil polygon (Karamanos 2001). It is to be noted that Karamanos (2001) found that 1,050 soil samples would need to be analyzed to obtain a statistical margin of error of ±3% (19 out of 20 times).

There are two different sampling methods recommended for in-situ soils, based on the level of disturbance:

- For native in-situ soils, stratified random sampling is recommended. This method involves taking discrete random soil samples in a field that has been stratified based on factors including topography, soil types (Soil Subgroup), and vegetation types; and submitting the samples to the laboratory for analysis.
- After topsoil replacement, grid sampling of discrete topsoil samples within a differentiated end use area is recommended.

Soil sampling should be conducted using a Dutch auger, as per the following procedure:

1. Label appropriate bags for samples. Complete the information on the soil sample bag while in the field. Assign each sample bag an identification code (ID) consisting of letters and/or numbers that correspond to the sequence in which the samples were taken. Record the sample ID on a field map (hand drawn if necessary), as well as the pattern and locations in the field that the samples were taken. Collect the GPS locations of each sampled site. This will allow for future sampling in the same locations. Sample bags should also include location, date sampled, client, soil sample depth and analysis required.
2. Representative samples should be collected each time a different Soil SubGroup is encountered.
3. Carefully push the soil core out of the sampler and transfer the sample into a labeled sample bag. Fill the sample bag with at least 500 g of soil (this will likely require several cores from each depth range sampled). Discard any extra soil at the site inspection.
4. Mix the soil thoroughly in the sample bag, breaking up all the cores.
5. Enter all necessary information on the Chain-of-Custody (COC), field map and data sheets and check that they correspond with the soil bags they accompany.

4.2 Stockpile Soils

Representative samples shall be collected each time a different topsoil type is encountered. If the soil stockpile pile has been left to sit for more than three (3) months, dig 15 to 30 cm into the pile before taking the sample. Refer to Table C1 for the number of sampling locations per volume of topsoil, as modified from Environment Canada Tab 4. Stockpile sampling shall be done by a competent Qualified Professional.

Table C1 Sampling Requirements of Stockpiled Topsoil

Soil Volume (m^3)	Minimum Number of Sampling Locations
0-375	3
376-750	4
751-1500	5
1501-3000	6
Each additional 2000 or partial amount	One additional sample

Note: For example, if the stockpile is 15,000 m^3, there will need to be 12 discrete soil samples taken for analysis.

Soil sampling should be conducted using a Dutch auger, using the same general procedure outlined in Section 4.1.

4.3 Sample Turnaround Time

Total sample turn-around time may range from 6 to 10 days, dependent upon shipment method and turnaround request (regular, rush, emergency, legal).

4.4 Record Keeping and Documentation of Sampling

Record keeping is an integral part of the sampling procedure. If the sampling is not adequately documented, the sample results may well be meaningless. Documentation can be grouped into three areas: sample identification, sample log record, and the COC record.

4.5 Sample Identification

Each sample shall be assigned a unique number in the same sequence as the field samples were taken. The details of each sample shall be recorded in a sample log record. To avoid laboratory bias during the analysis, the only information that the laboratory shall be provided with is the sample number.

4.6 Sample Log Record

A detailed record should be kept of the sampling procedures and should contain the following:

- sampling site name;
- signature of sample collector(s);
- inspection site identification number;
- sample number;
- identification of the sample (e.g. a field sample, a control site sample, a quality control (QC) duplicate);
- sampling date and time;
- type of analysis required for the sample;
- sample collection method (composite or grab);
- sampling equipment;
- sampling conditions (e.g. weather); and
- relevant sample site observations.

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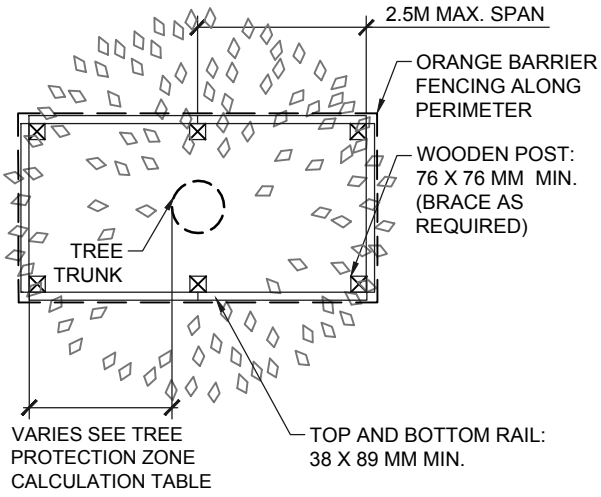
Landscape Construction Detail Reference

Drawing No.	Drawing Title	Issue Date
LA101	Tree Protection Zone	June 2017
LA102	Typical Tree Installation	June 2016
LA103	Typical Multi-Stem Installation	June 2016
LA104	Typical Tree Transplanted	June 2016
LA105	Typical Multi-Stem Transplanted	June 2016
LA106	Typical Tree Grate Planting	June 2015
LA107	Typical Tree Planting on Slope	June 2016
LA108	Typical Tree Planting Bed	June 2016
LA108A	Typical Tree and Shrub Planting Bed	June 2016
LA108B	Typical Shrub Planting	June 2017
LA109	Typical Planting Bed on a Slope	June 2017
LA110	Typical Shrub Naturalization	June 2016
LA111	Typical Tree Naturalization	June 2016
LA112	Typical Tree Rodent Protection	June 2015
LA113	Typical Tree Root Trench	June 2015
LA114	Typical Tree Rootball Staking	June 2017
LA200	Subdrainage Pipe Installation	June 2017
LA201	Typical Subdrainage Pipe Connections	June 2017
LA202	Playground Drainage Sump	June 2017
LA203	Concrete Playground Curb Adjacent Wood Mulch & Pour-In-Place	September 2013
LA204	Typical Pour-In-Place Playground Safety Surface	September 2013
LA204A	Typical Pour-In-Place Playground Safety Surface - All Rubber	September 2013
LA300	Sod Installation	September 2013
LA301	Asphalt Walkway or Plaza	June 2015
LA302	Concrete Walkway or Plaza	September 2013
LA303	Granular Walkway	September 2013
LA304	Paving Stone Walkway or Plaza	September 2013
LA305	Gravel Plank Steps	September 2013
LA306	Gravel Timber Steps	September 2013
LA400	Permanent Wood Rail Fence	June 2015
LA401	Temporary Wood Rail Fence	June 2015
LA402	915mm High Wood Guard Rail	June 2015
LA403	1400mm High Wood Guard Rail	June 2015
LA404	152 x 203mm Wood Bumper Post	September 2013
LA405	1800mm Height Wood Screen Fence	June 2017
LA405A	1800mm Wood Screen Fence Gate - Single	June 2015
LA405B	1800mm Wood Screen Fence Gate - Double	June 2015
LA406	Wood Screen Step Down	September 2013

LA407	Chain Link Fence	June 2015
LA407A	Barbed Wire for Chain Link Fence	June 2015
LA408	Chain Link Fence Single Gate	June 2015
LA408A	Barbed Wire for Chain Link Fence Single Gate	June 2015
LA409	Chain Link Fence Double Gate	June 2015
LA409A	Barbed Wire for Chain Link Fence Double Gate	June 2015
LA500	Bench - Wood and Concrete	September 2013
LA501	Picnic Table - Wood and Concrete	September 2013
LA502	Bench Installation	September 2013
LA503	Picnic Table - Installation	September 2013
LA504	Concrete Litter Container and Installation	September 2013
LA505	Community Garden Planter	June 2015
LA600	Boulder Installation	September 2013
LA601	Culvert Under Walkway	September 2013
LA602	Wood Bridge With Recycled Plastic Product Deck	September 2013

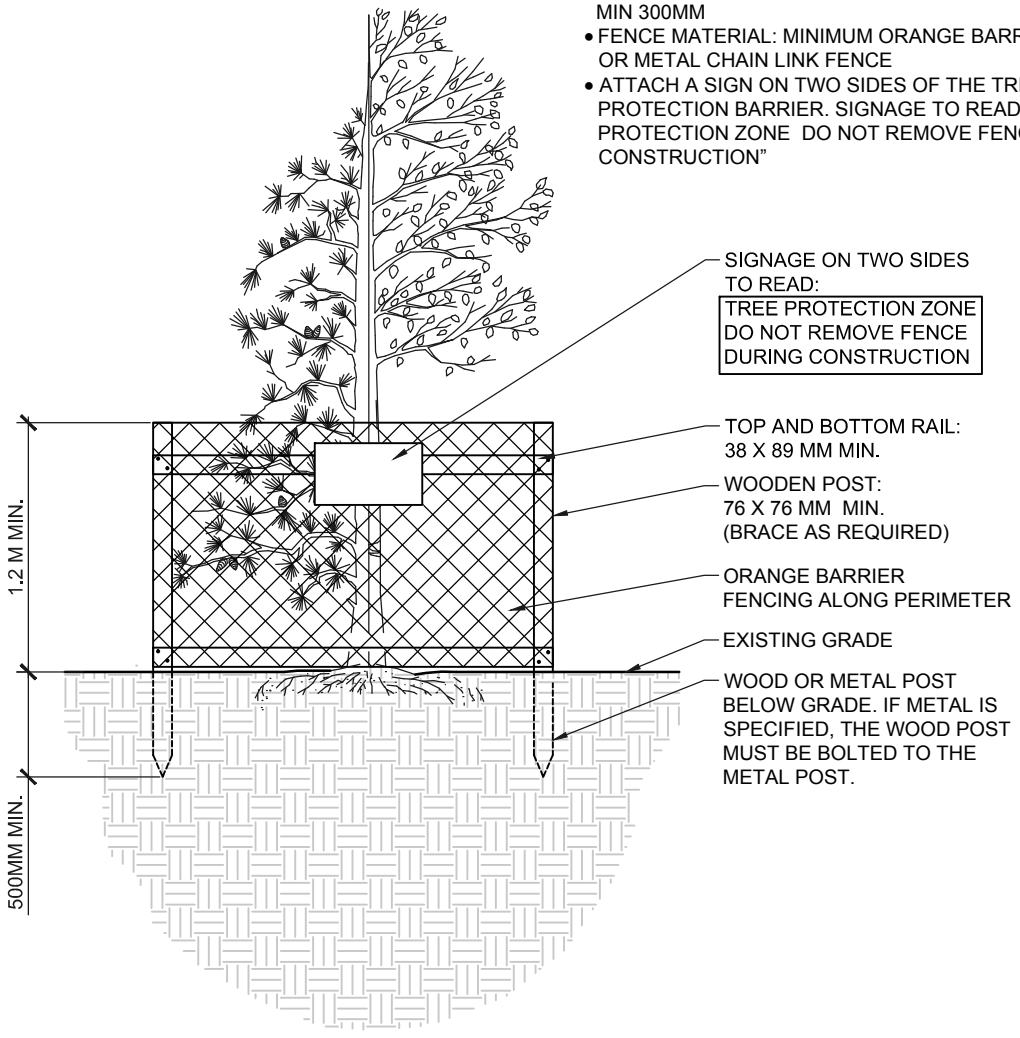


PLAN VIEW

TREE PROTECTION ZONE CALCULATION TABLE	
TRUNK DIAMETER (DBH)	MINIMUM PROTECTION DISTANCE REQUIRED (MEASURE FROM THE OUTSIDE EDGE OF TREE TRUNK)
10 CM & UNDER	1.2 METERS
11 - 30 CM	1.8 METERS
31 - 40 CM	2.4 METERS
41 - 50 CM	3.0 METERS
51 - 60 CM	3.6 METERS
61 - 70 CM	4.2 METERS
71 - 80 CM	4.8 METERS
>80 CM	5.0 METERS

NOTES:

- WOOD POST: (MIN. 76MM WIDTH) INSTALLED TO A DEPTH OF 500MM (ALBERTA FIRST CALL REQUIRED)
- TOP AND BOTTOM RAIL: (MIN. 38 X 89MM CONSTRUCTION, MAX. SPAN 2.5M), CROSS BRACING AS REQUIRED.
- HEIGHT OF THE FENCE: MIN.1.2 METERS
- NO GROUND DISTURBANCE WITHIN 1.2 METER OF THE TREE TRUNK (I.E. POST INSTALLATION)
- POSTS SET BACK FROM SIDEWALK AND CURB: MIN 300MM
- FENCE MATERIAL: MINIMUM ORANGE BARRIER FENCE OR METAL CHAIN LINK FENCE
- ATTACH A SIGN ON TWO SIDES OF THE TREE PROTECTION BARRIER. SIGNAGE TO READ “TREE PROTECTION ZONE DO NOT REMOVE FENCE DURING CONSTRUCTION”



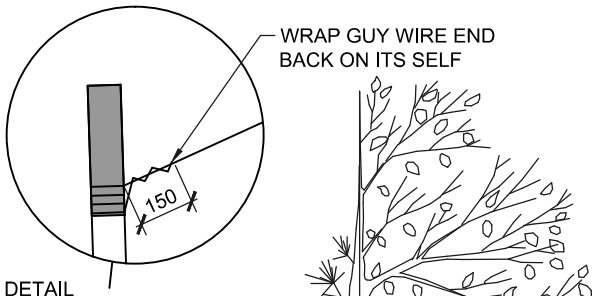
THE CITY OF Edmonton

TREE PROTECTION ZONE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2017	PARKS PLANNING			LA101
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP403a

CONIFEROUS
Less than 3.0m ht.

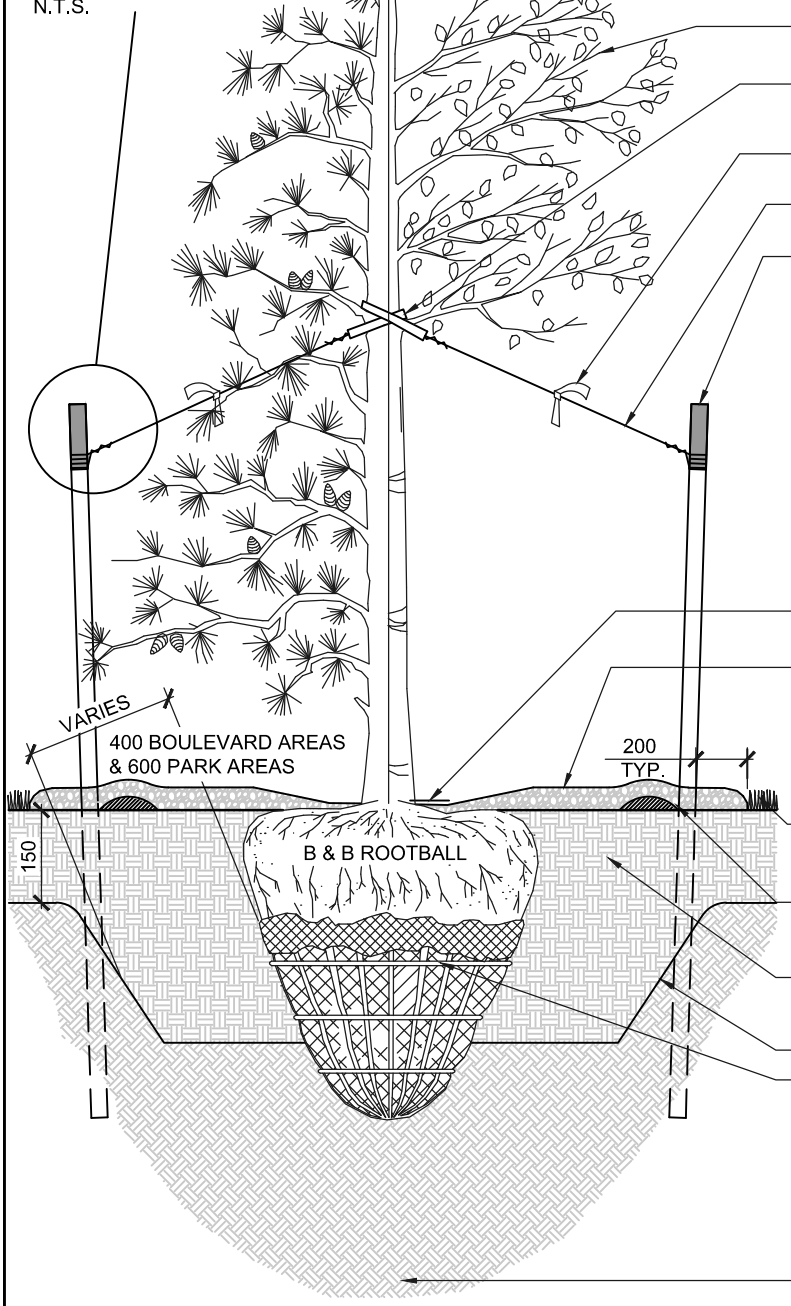
DECIDUOUS
Less than 100mm cal.



DETAIL
N.T.S.

NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS OR IF IN THE BOULEVARD THE STAKES SHOULD BE IN LINE WITH THE DIRECTION OF TRAFFIC.
- ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.



PRUNE DEAD, BROKEN, STUBS & DISEASED TREE LIMBS.

RUBBER HOSE - 12mm OR APPROVED EQUAL. POSITION AT APPROX. 3/5 HT. FOR ALL TREES.

FLUORESCENT ORANGE FLAGGING ON ALL GUY WIRES.

GALVANIZED GUY WIRE No. 12 (MIN. SIZE)

2 VERTICAL STAKES PER TREE:

- TREE STAKES MIN. 2.0m LENGTH PLAIN T-POSTS (1.33LB/FT) C/W 7 PUNCHED HOLES (1 1/2" X 1 3/8" X 7") OR TEETH / NOTCHES
- ALL EXPOSED PORTIONS OF TREE STAKES FREE OF RUST, SCALED, PRIMED, & PAINTED.
- TREE STAKES SET MIN. 600mm INTO UNDISTURBED SOIL.
- TOP 300mm OF ALL TREE STAKES TO PAINTED TO MATCH ANNUAL COLOUR CODES.
- LARGE TREES TO HAVE 3-4 STAKES.

TOP OF ROOT BALL & ROOT FLARE TO BE 40mm ABOVE FINISHED GRADE.

100mm MIN. WOOD MULCH - REFERENCE SPECIFICATION 02914 MULCHES, OVER EXPOSED ROOT BALL

- TAPER MULCH TO BASE OF TREE
- MULCH TO EXTEND 150mm BEYOND EDGE OF WELL BUMP.

RE-ESTABLISH ANY DAMAGED SEED/SOD TO CITY OF EDMONTON STANDARDS.

254mm WIDE X 51mm HIGH TOPSOIL BUMP TO HOLD IN WATER (CENTRE LINE OF BUMP ON EDGE OF WELL.)

CLASS 'B' TOPSOIL, MODERATELY COMPACTED (ENSURE STABILITY OF ROOT BALL.)

SCARIFY WALL OF TREE WELL

FOLD 1/3 (OR REMOVE) WIRE BASKET & BURLAP FROM TOP OF ROOT FLARE.

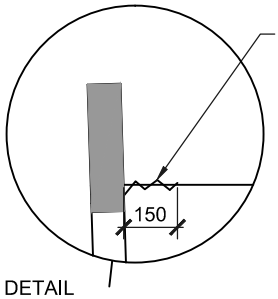
- POSITION TOP OF ROOT BALL 40mm ABOVE FINISHED GRADE
- BURLAP TO BE TREATED NATURAL FIBRE.
- ROOT BALL MIN. SIZE AS PER CNLA STANDARDS FOR NURSERY STOCK.

UNDISTURBED NATIVE SOIL

THE CITY OF Edmonton

TYPICAL TREE INSTALLATION

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2016	PARKS PLANNING	M.C.		LA102
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP400a



DETAIL
N.T.S.

NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS OR IF IN THE BOULEVARD THE STAKES SHOULD BE IN LINE WITH THE DIRECTION OF TRAFFIC.
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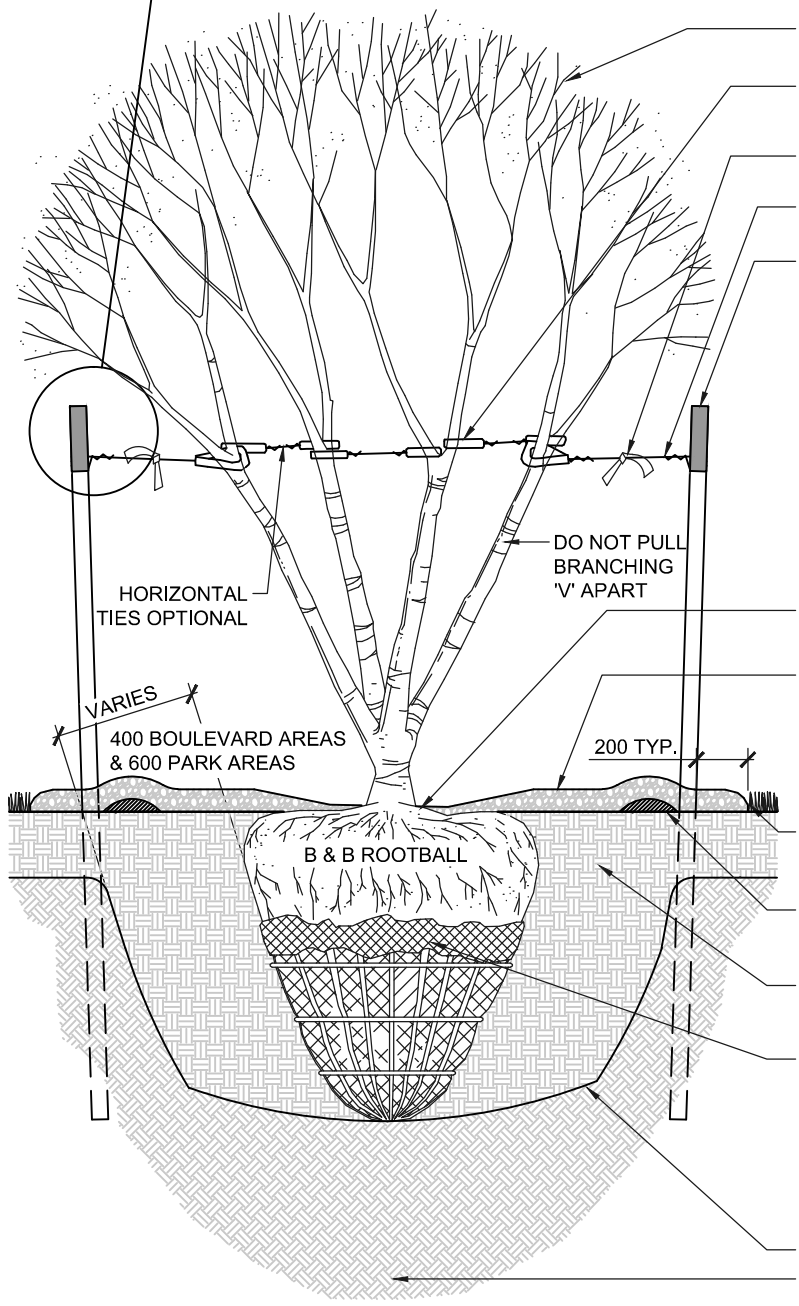
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.



PRUNE DEAD, BROKEN, STUBS & DISEASED TREE LIMBS.

RUBBER HOSE - 12mm OR APPROVED EQUAL. POSITION AT APPROX. 3/5 HT. FOR ALL TREES.

FLUORESCENT ORANGE FLAGGING ON ALL GUY WIRES.

GALVANIZED GUY WIRE No. 12 (MIN. SIZE)

2 VERTICAL STAKES PER TREE:

- TREE STAKES MIN. 2.0m LENGTH PLAIN T-POSTS (1.33LB/FT) C/W 7 PUNCHED HOLES (1 1/2" X 1 3/8" X 7") OR TEETH / NOTCHES
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- TREE STAKES SET MIN. 600mm INTO UNDISTURBED SOIL.
- TOP 300mm OF ALL TREE STAKES TO PAINTED TO MATCH ANNUAL COLOUR CODES.
- LARGE TREES TO HAVE 3-4 STAKES.

TOP OF ROOT BALL & ROOT FLARE TO BE 40mm ABOVE FINISHED GRADE.

100mm MIN. WOOD MULCH - REFERENCE SPECIFICATION 02914 MULCHES, OVER EXPOSED ROOT BALL

- TAPER MULCH TO BASE OF TREE
- MULCH TO EXTEND 150mm BEYOND EDGE OF WELL BUMP.

RE-ESTABLISH ANY DAMAGED SEED/SOD TO CITY OF EDMONTON STANDARDS.

254mm WIDE X 51mm HIGH TOPSOIL BUMP TO HOLD IN WATER (CENTRE LINE OF BUMP ON EDGE OF WELL.)

CLASS 'B' TOPSOIL, MODERATELY COMPACTED (ENSURE STABILITY OF ROOT BALL.)

FOLD 1/3 (OR REMOVE) WIRE BASKET & BURLAP FROM TOP OF ROOT BALL.

- POSITION TOP OF ROOT BALL 40mm ABOVE FINISHED GRADE
- BURLAP TO BE TREATED NATURAL FIBRE.
- ROOT BALL MIN. SIZE AS PER CNLA STANDARDS FOR NURSERY STOCK.

SCARIFY WALL OF TREE WELL

UNDISTURBED NATIVE SOIL

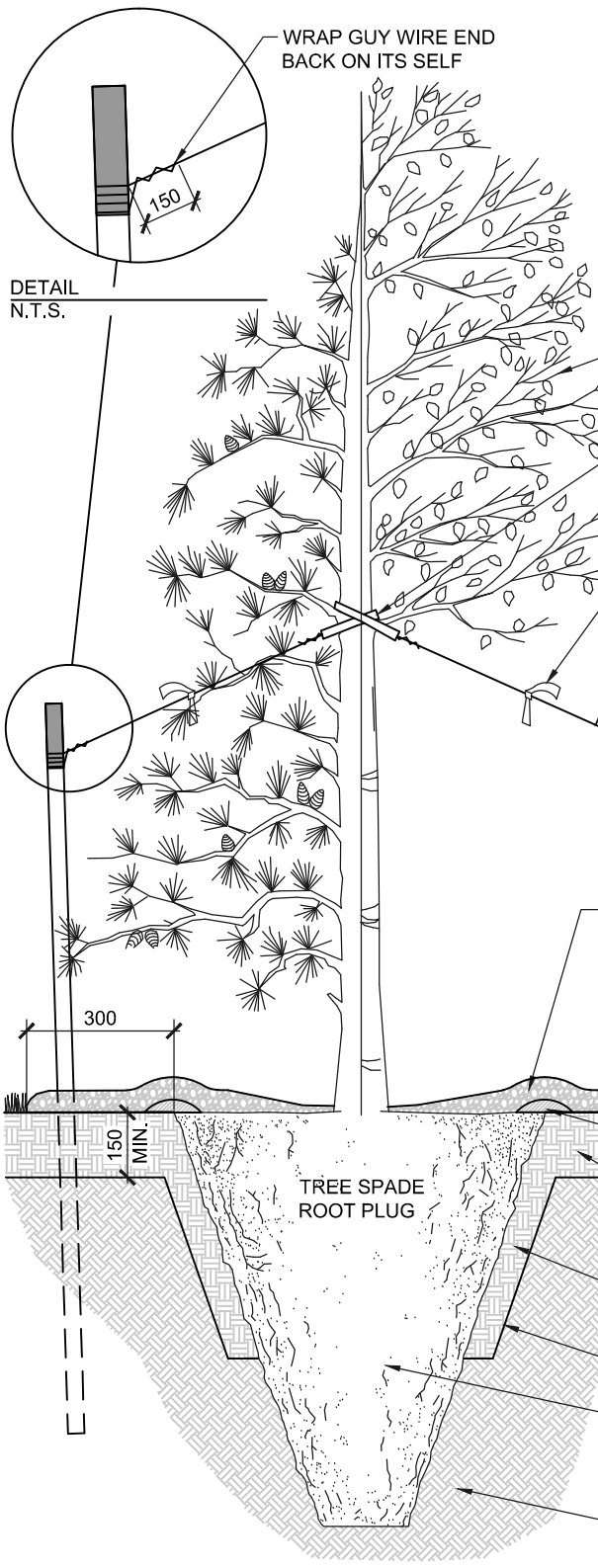
THE CITY OF Edmonton

TYPICAL MULTI-STEM INSTALLATION

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2016	PARKS PLANNING	M.C.		LA103
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP400c

CONIFEROUS
Less than 3.0m ht.

DECIDUOUS
Less than 200mm cal.



NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS OR IF IN THE BOULEVARD THE STAKES SHOULD BE IN LINE WITH THE DIRECTION OF TRAFFIC.
- ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.

PRUNE DEAD, BROKEN, STUBS & DISEASED TREE LIMBS.

RUBBER HOSE - 12mm OR APPROVED EQUAL. POSITION AT APPROX. 3/5 HT. FOR ALL TREES.

FLUORESCENT ORANGE FLAGGING ON ALL GUY WIRES.

GALVANIZED GUY WIRE No. 12 (MIN. SIZE)

2 VERTICAL STAKES PER TREE:

- TREE STAKES MIN. 2.0m LENGTH PLAIN T-POSTS (1.33LB/FT) C/W 7 PUNCHED HOLES (1 1/2" X 1 3/8" X 7") OR TEETH / NOTCHES.
- ALL EXPOSED PORTIONS OF TREE STAKES FREE OF RUST, SCALED, PRIMED, & PAINTED.
- TREE STAKES SET MIN. 600mm INTO UNDISTURBED SOIL.
- TOP 300mm OF ALL TREE STAKES TO PAINTED TO MATCH ANNUAL COLOUR CODES.
- LARGE TREES TO HAVE 3-4 STAKES.

100mm MIN. WOOD MULCH - REFERENCE SPECIFICATION 02914 MULCHES, OVER EXPOSED ROOT BALL

- TAPER MULCH TO BASE OF TREE
- MULCH TO EXTEND 150mm BEYOND EDGE OF WELL BUMP.

RE-ESTABLISH ANY DAMAGED SEED/SOD TO CITY OF EDMONTON STANDARDS.

254mm WIDE X 51mm HIGH TOPSOIL BUMP TO HOLD IN WATER (CENTRE LINE OF BUMP ON EDGE OF WELL.)

CLASS 'B' TOPSOIL, MODERATELY COMPACTED (ENSURE STABILITY OF ROOT BALL.)

ENSURE ANY VOIDS ARE FILLED WITH TOPSOIL

SCARIFY WALL OF TREE WELL

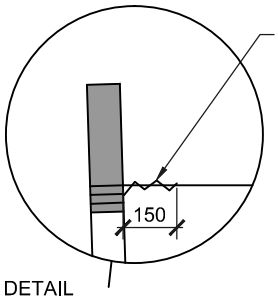
ROOT PLUG (MINIMUM SIZE AS PER SPECIFICATIONS) - FOR EVERY 25mm OF D.B.H. OVER MIN. SIZE ADD 300mm TO SPADE WIDTH

UNDISTURBED NATIVE SOIL

THE CITY OF Edmonton

TYPICAL TREE TRANSPLANTED

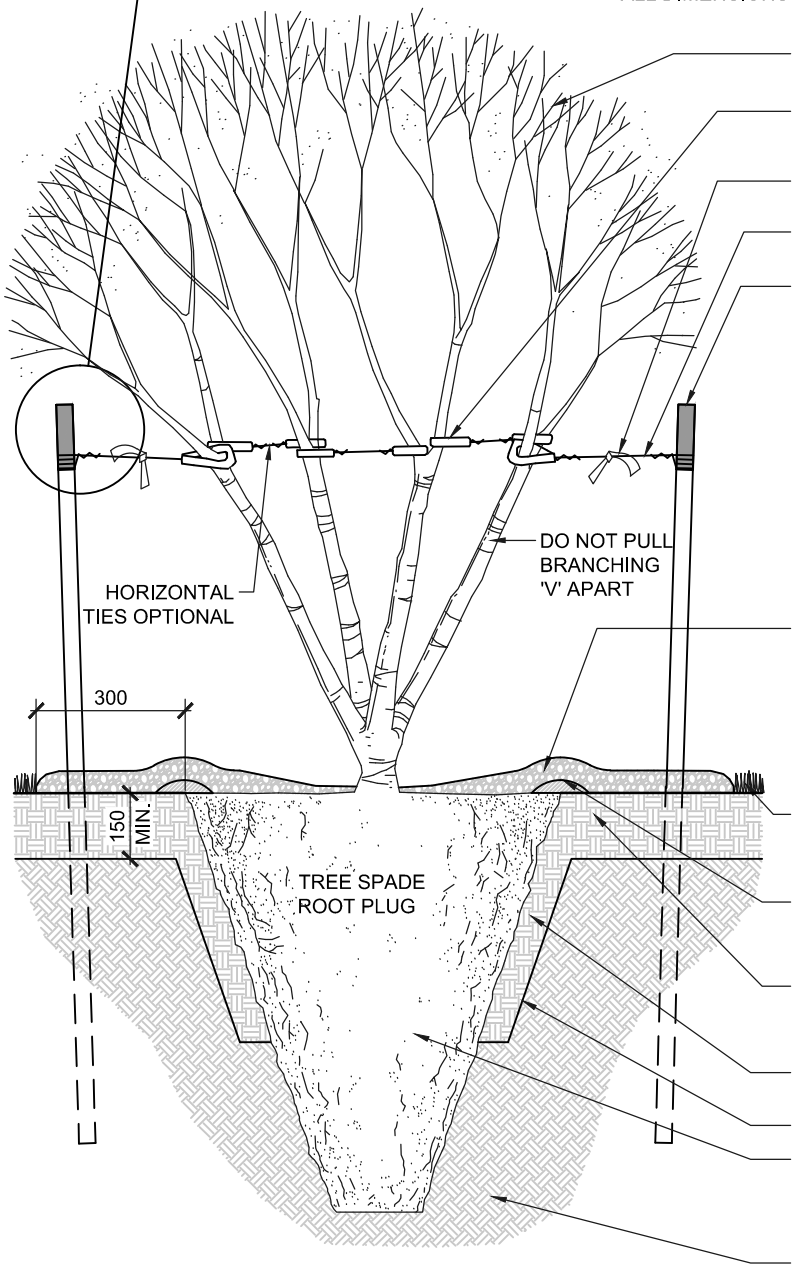
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2016	PARKS PLANNING	M.C.		LA104
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP400d



DETAIL
N.T.S.

NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS OR IF IN THE BOULEVARD THE STAKES SHOULD BE IN LINE WITH THE DIRECTION OF TRAFFIC.
- ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.



PRUNE DEAD, DAMAGED, STUBS & DISEASED TREE LIMBS.

RUBBER HOSE - 12mm OR APPROVED EQUAL. POSITION AT APPROX. 3/5 HT. FOR ALL TREES.

FLUORESCENT ORANGE FLAGGING ON ALL GUY WIRES.

GALVANIZED GUY WIRE No. 12 (MIN. SIZE)

2 VERTICAL STAKES PER TREE:

- TREE STAKES MIN. 2.0m LENGTH PLAIN T-POSTS (1.33LB/FT) C/W 7 PUNCHED HOLES (1 1/2" X 1 3/8" X 7") OR TEETH / NOTCHES.
- ALL EXPOSED PORTIONS OF TREE STAKES FREE OF RUST, SCALED, PRIMED, & PAINTED.
- TREE STAKES SET MIN. 600mm INTO UNDISTURBED SOIL.
- TOP 300mm OF ALL TREE STAKES TO PAINTED TO MATCH ANNUAL COLOUR CODES.
- LARGE TREES TO HAVE 3-4 STAKES.

100mm MIN. WOOD MULCH - REFERENCE SPECIFICATION 02914 MULCHES, OVER EXPOSED ROOT BALL

- TAPER MULCH TO BASE OF TREE
- MULCH TO EXTEND 150mm BEYOND EDGE OF WELL BUMP.

RE-ESTABLISH ANY DAMAGED SEED/SOD TO CITY OF EDMONTON STANDARDS.

254mm WIDE X 51mm HIGH TOPSOIL BUMP TO HOLD IN WATER (CENTRE LINE OF BUMP ON EDGE OF WELL.)

CLASS 'B' TOPSOIL, MODERATELY COMPACTED (ENSURE STABILITY OF ROOT BALL.)

ENSURE ANY VOIDS ARE FILLED WITH TOPSOIL

SCARIFY WALL OF TREE WELL

ROOT PLUG (MINIMUM SIZE AS PER SPECIFICATIONS) - FOR EVERY 25mm OF D.B.H. OVER MIN. SIZE ADD 300mm TO SPADE WIDTH

UNDISTURBED NATIVE SOIL

THE CITY OF Edmonton

TYPICAL MULTI-STEM TRANSPLANTED

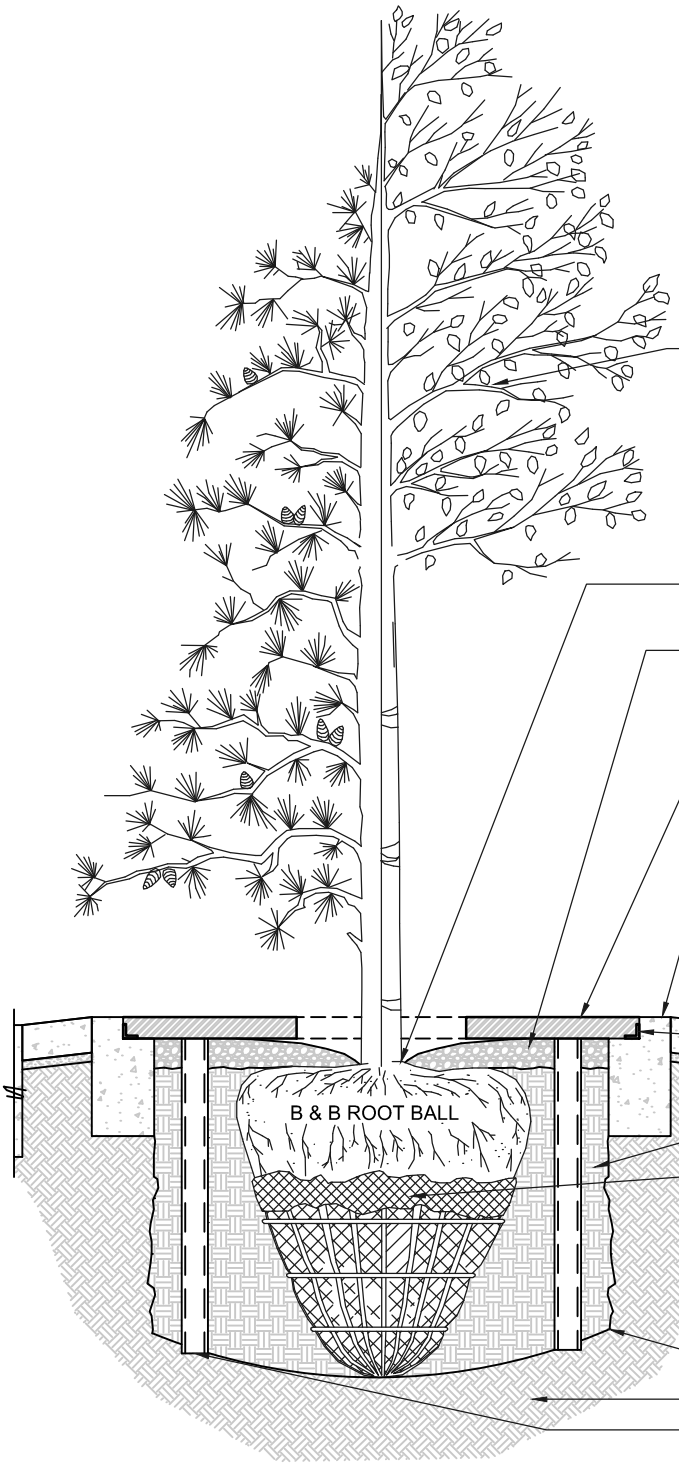
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2016	PARKS PLANNING	M.C.		LA105
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP400f

CONIFEROUS
Less than 3.0m ht.

DECIDUOUS
Less than 100mm cal.

NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).



PRUNE DEAD, BROKEN, STUBS & DISEASED TREE LIMBS.

TOP OF ROOT BALL & ROOT FLARE TO BE 40mm ABOVE FINISHED GRADE.

100mm MIN. MULCH - CONIFEROUS SHREDDED BARK OR APPROVED EQUAL OVER EXPOSED ROOT BALL
- TAPER MULCH TO BASE OF TREE

APPROVED TREE GRATE

CONCRETE TREE GRATE SURROUND

CONCRETE VERGE TO SATISFACTION OF THE CITY ENGINEER

CONCRETE CURBING

ANGLE IRON TREE GRATE FRAME

CLASS 'B' TOPSOIL MODERATELY COMPACTED TO ENSURE STABILITY OF ROOT BALL

FOLD 1/3 (OR REMOVE) WIRE BASKET & BURLAP FROM TOP OF ROOT BALL.
- POSITION TOP OF ROOT BALL 40mm ABOVE FINISHED GRADE
- BURLAP TO BE TREATED NATURAL FIBRE.
- ROOT BALL MIN. SIZE AS PER SPECIFICATIONS.

SCARIFY WALL OF TREE WELL

UNDISTURBED NATIVE SOIL

100mm PLASTIC PERFORATED PIPE
- TWO PIPES PER TREE @ 1.0m LONG
- ONE PIPE FILLED COMPLETELY WITH 19mm WASHED ROCK
- ONE PIPE HALF FILLED ONLY WITH 19mm WASHED ROCK

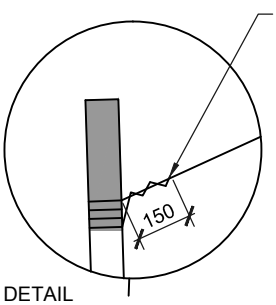
THE CITY OF Edmonton

TYPICAL TREE GRATE PLANTING

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA106
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP400h

CONIFEROUS
Less than 3.0m ht.

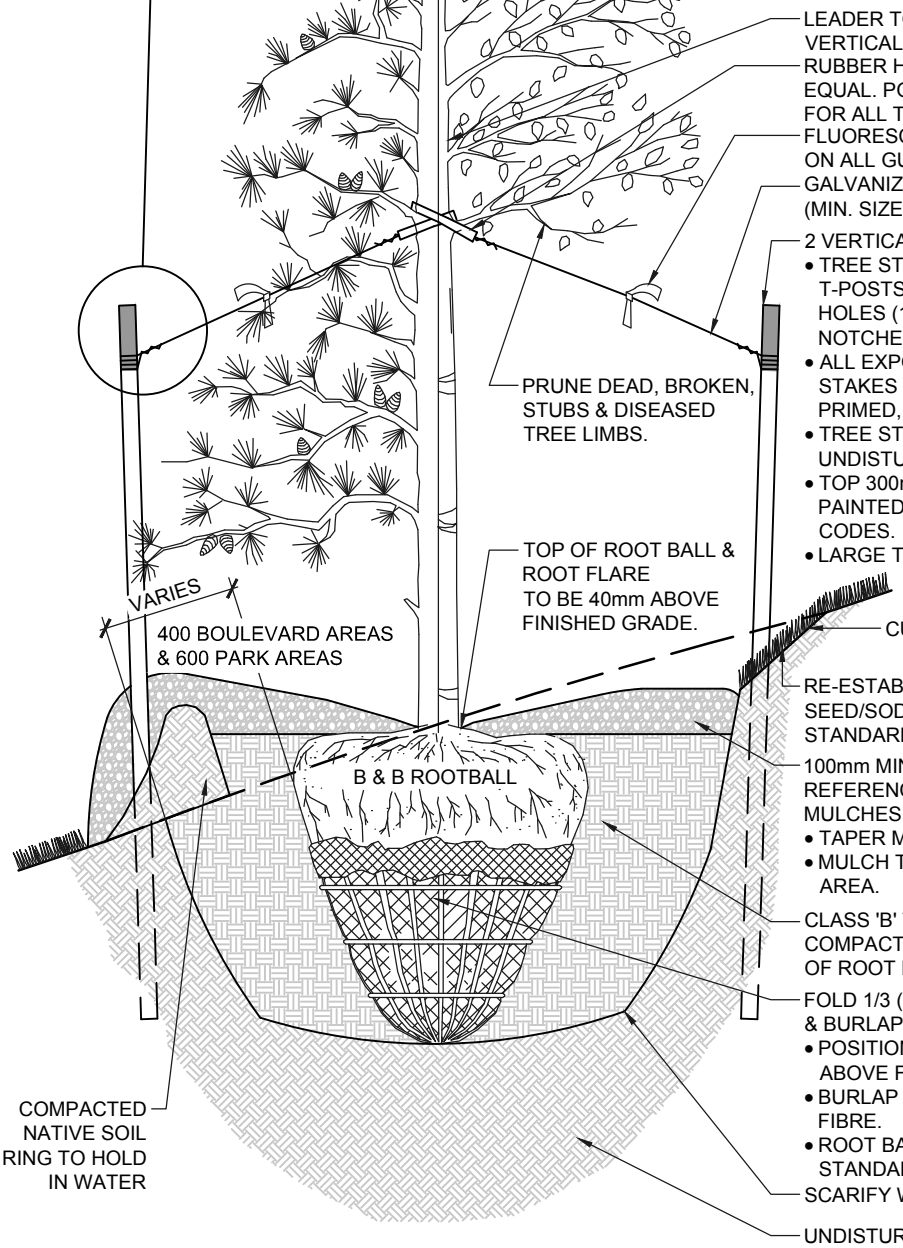
DECIDUOUS
Less than 100mm cal.



DETAIL
N.T.S.

NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS OR IF IN THE BOULEVARD THE STAKES SHOULD BE IN LINE WITH THE DIRECTION OF TRAFFIC.
- ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.



THE CITY OF Edmonton

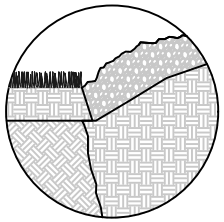
TYPICAL TREE PLANTING ON SLOPE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2016	PARKS PLANNING			LA107
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP400i

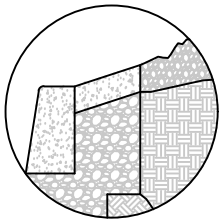
THE CITY OF Edmonton

TYPICAL TREE PLANTING BED

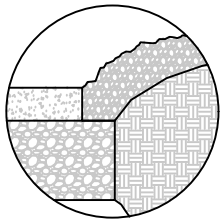
Date Approved:	JUNE 2016
Drawn By:	PARKS PLANNING
Checked By:	PARKS PLANNING
Scale:	N.T.S.
Approved:	
Revision	
Drawing No.	LA108
Old Drawing No.	-



OPTION 'A'
EDGING DETAIL
N.T.S.



OPTION 'B'
CONCRETE CURB DETAIL
N.T.S.



OPTION 'C'
CONCRETE/ASPHALT WALK DETAIL
N.T.S.

OPTIONS:
A: EDGING DETAIL
B: CONCRETE CURB DETAIL
C: CONCRETE/ASPHALT WALK DETAIL

NOTES:
- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS OR IF IN THE BOULEVARD THE STAKES SHOULD BE IN LINE WITH THE DIRECTION OF TRAFFIC.
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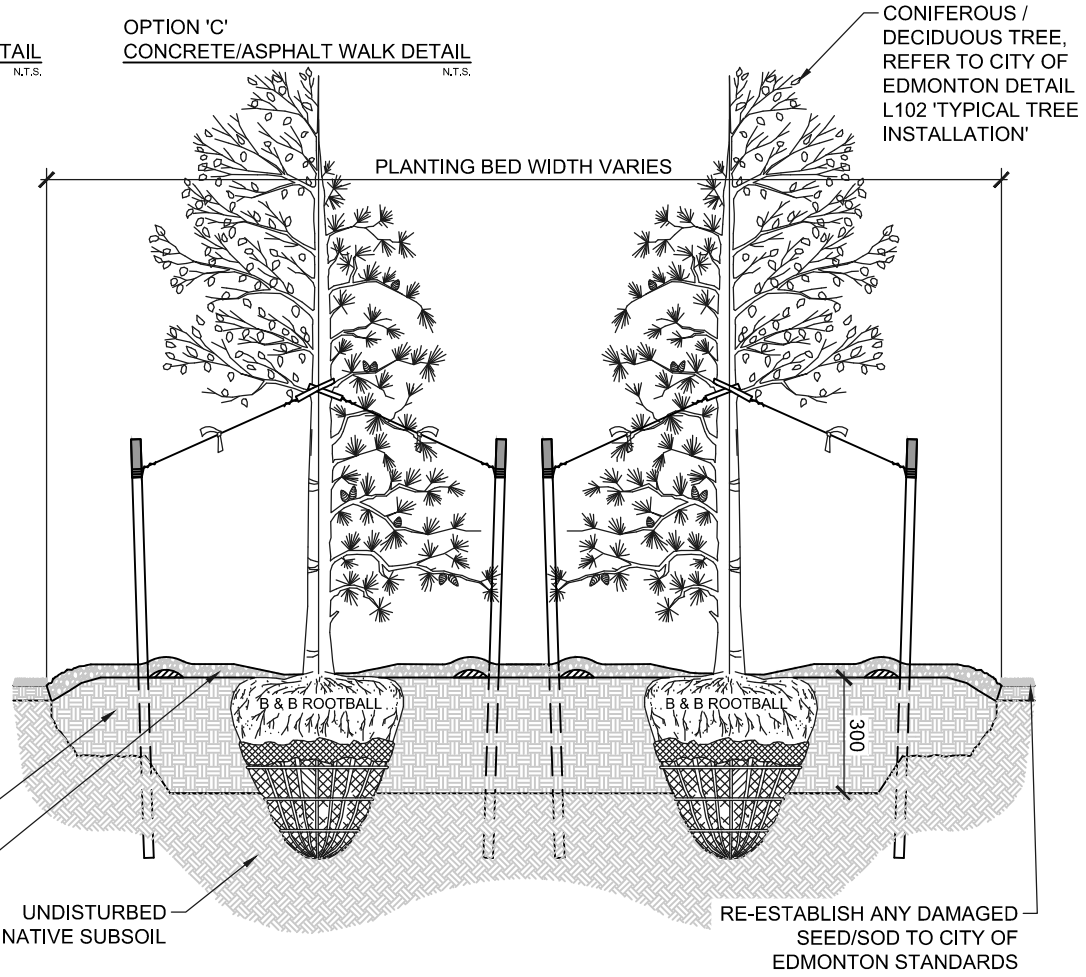
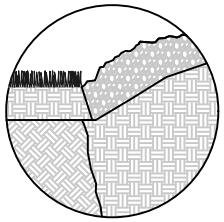
- ALL DIMENSIONS IN MILLIMETERS.



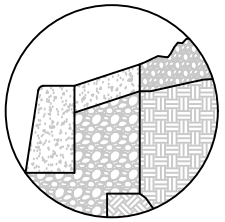
TYPICAL TREE AND SHRUB PLANTING BED

THE CITY OF Edmonton

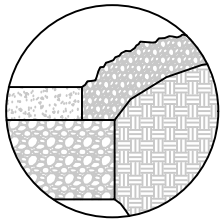
Date Approved:	JUNE 2016
Drawn By:	PARKS PLANNING
Checked By:	PARKS PLANNING
Scale:	N.T.S.
Approved:	
Revision	
Drawing No.	LA108A
Old Drawing No.	LA108



OPTION 'A'
EDGING DETAIL
N.T.S.



OPTION 'B'
CONCRETE CURB DETAIL
N.T.S.



OPTION 'C'
CONCRETE/ASPHALT WALK DETAIL
N.T.S.

OPTIONS:
A: EDGING DETAIL
B: CONCRETE CURB DETAIL
C: CONCRETE/ASPHALT WALK DETAIL

NOTES:
- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
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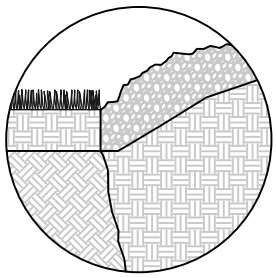
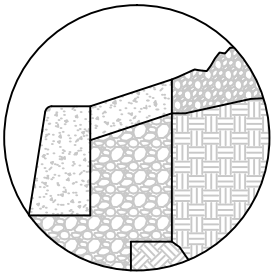
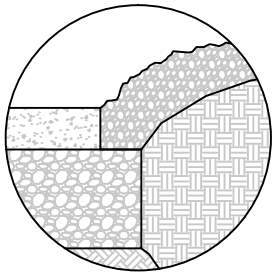
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.



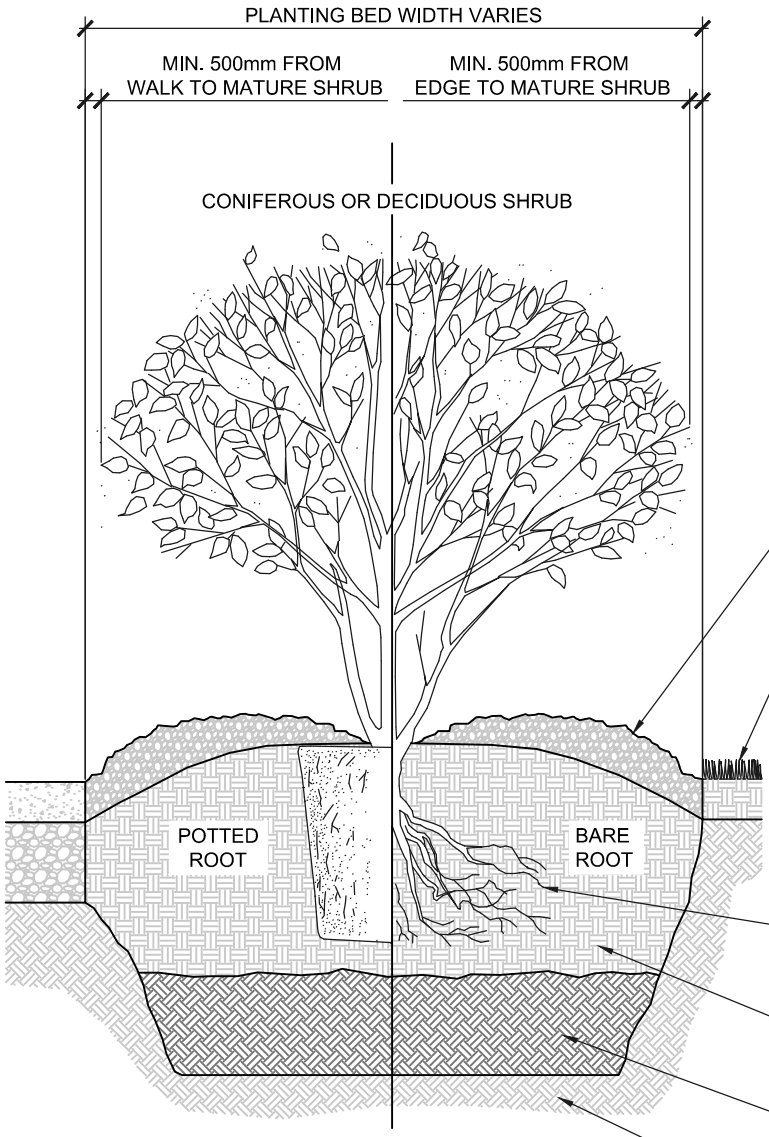
OPTION 'A'
EDGING DETAIL
N.T.S.



OPTION 'B'
CONCRETE CURB DETAIL
N.T.S.



OPTION 'C'
CONCRETE WALK DETAIL
N.T.S.



NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- PRUNE ONLY DEAD, BROKEN OR DISEASED BRANCHES TO MAINTAIN PROPER SHRUB FORM (DECIDUOUS ONLY).
- DO NOT ROTOTILL WITHIN 1.0m OF U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS.

OPTIONS:
A: EDGING DETAIL
B: CONCRETE CURB W/ VERGE DETAIL
C: CONCRETE/ASPHALT WALK DETAIL

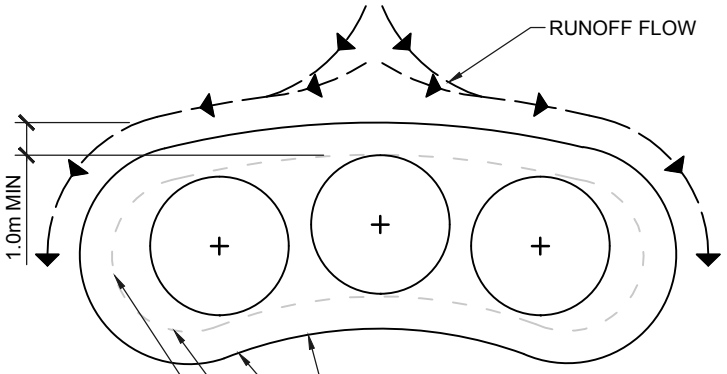
THE CITY OF Edmonton

TYPICAL SHRUB PLANTING

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2017	PARKS PLANNING	M.C. Jones		LA108B
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			LA108

NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- PRUNE ONLY DEAD, BROKEN OR DISEASED BRANCHES TO MAINTAIN PROPER SHRUB FORM (DECIDUOUS ONLY).
- DO NOT ROTOTILL WITHIN 1.0m OF U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS.



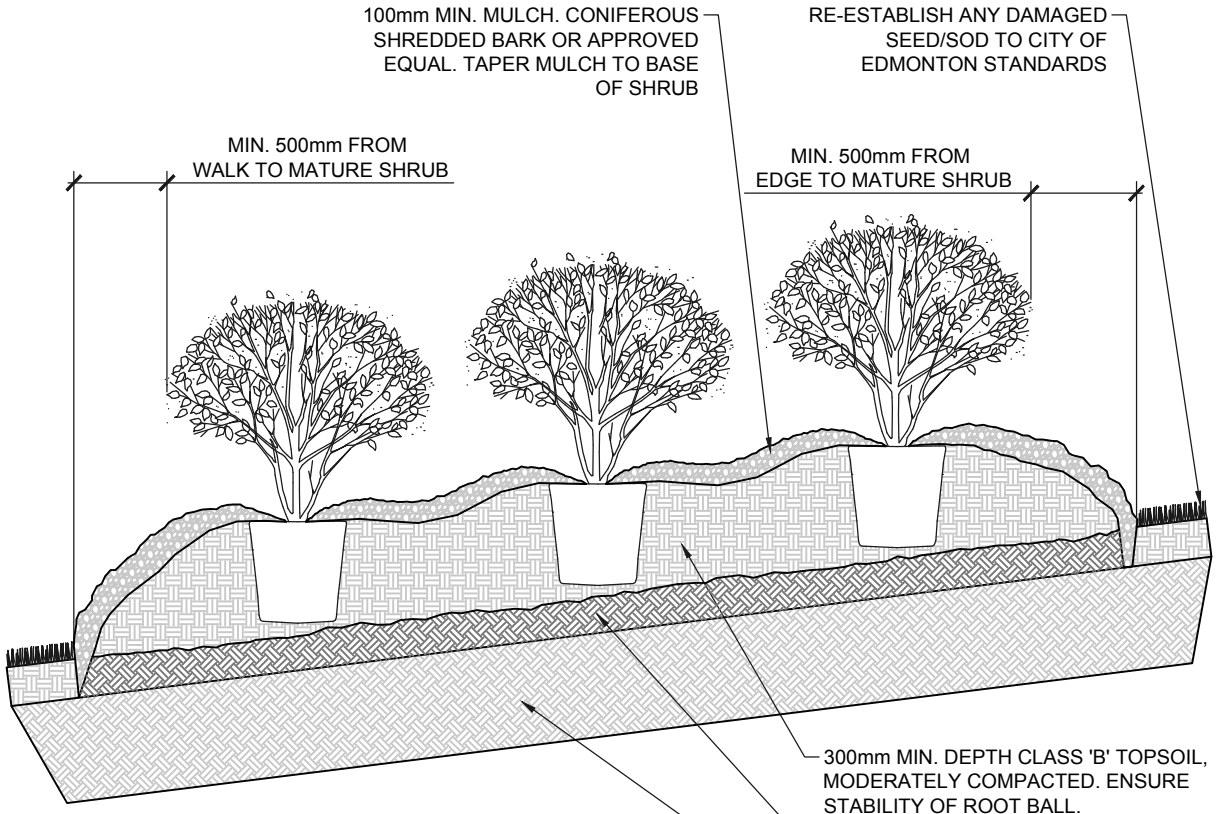
PLAN VIEW

TYPICAL SHRUB BED, SIZE AND SHAPE VARIES

SHAPE AND FORM OF PLANTING BED TO ENCOURAGE POSITIVE DRAINAGE AROUND THE PLANTING BED

TOPSOIL TO TAPER TO PLANTING BED EDGE OVER A MIN. DISTANCE OF 1.0m

CLASS 'B' TOPSOIL MODERATELY COMPACTED AND MOUNDED TO ALLOW FOR POSITIVE DRAINAGE



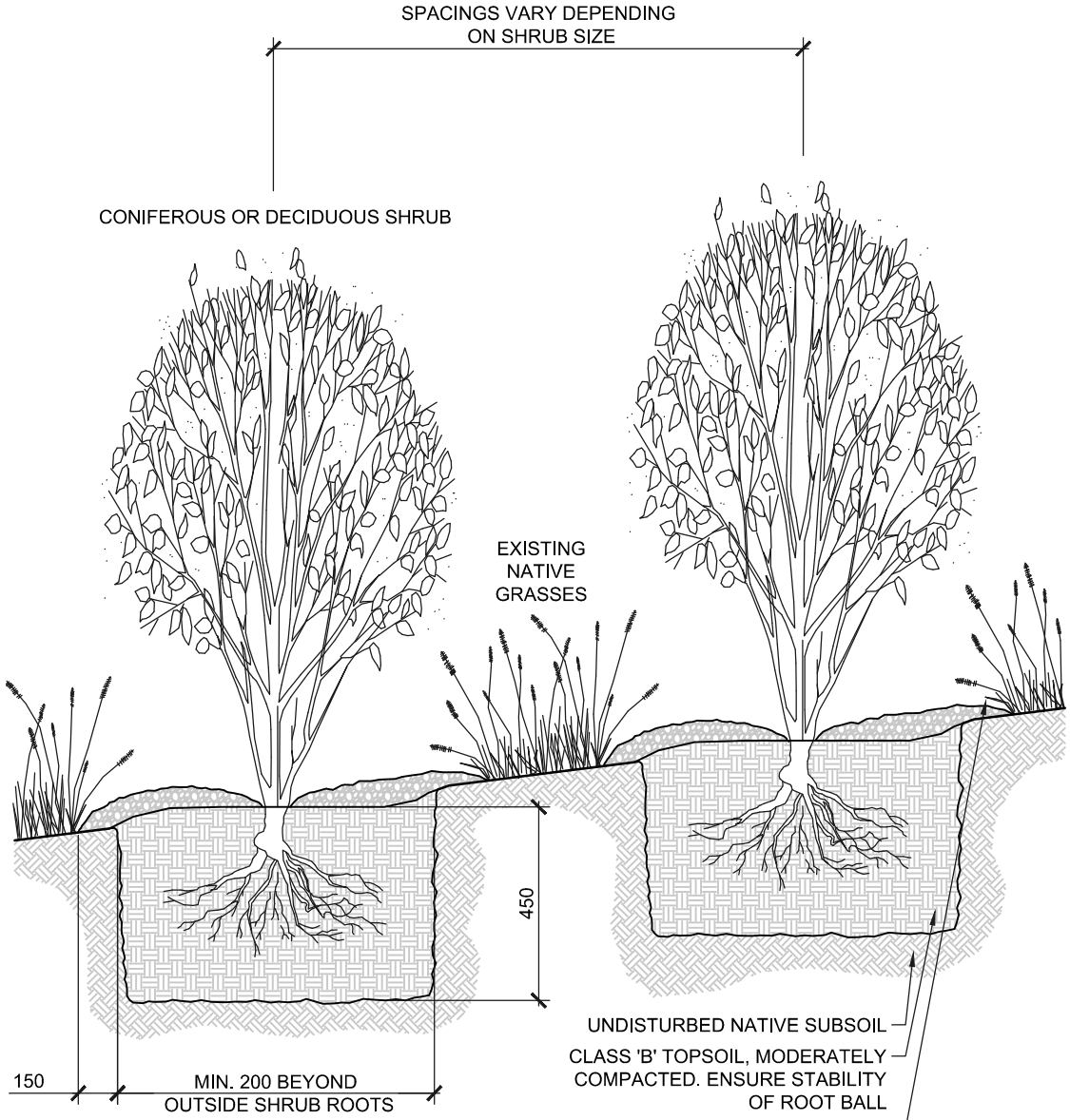
ELEVATION

TYPICAL SHRUB PLANTING BED ON A SLOPE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2017	PARKS PLANNING			LA109
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP401b

NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02931 NATURALIZATION AS WELL AS THE RELATED SECTIONS.
- PRUNE ONLY DEAD, BROKEN OR DISEASED BRANCHES TO MAINTAIN PROPER SHRUB FORM (DECIDUOUS ONLY).
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.



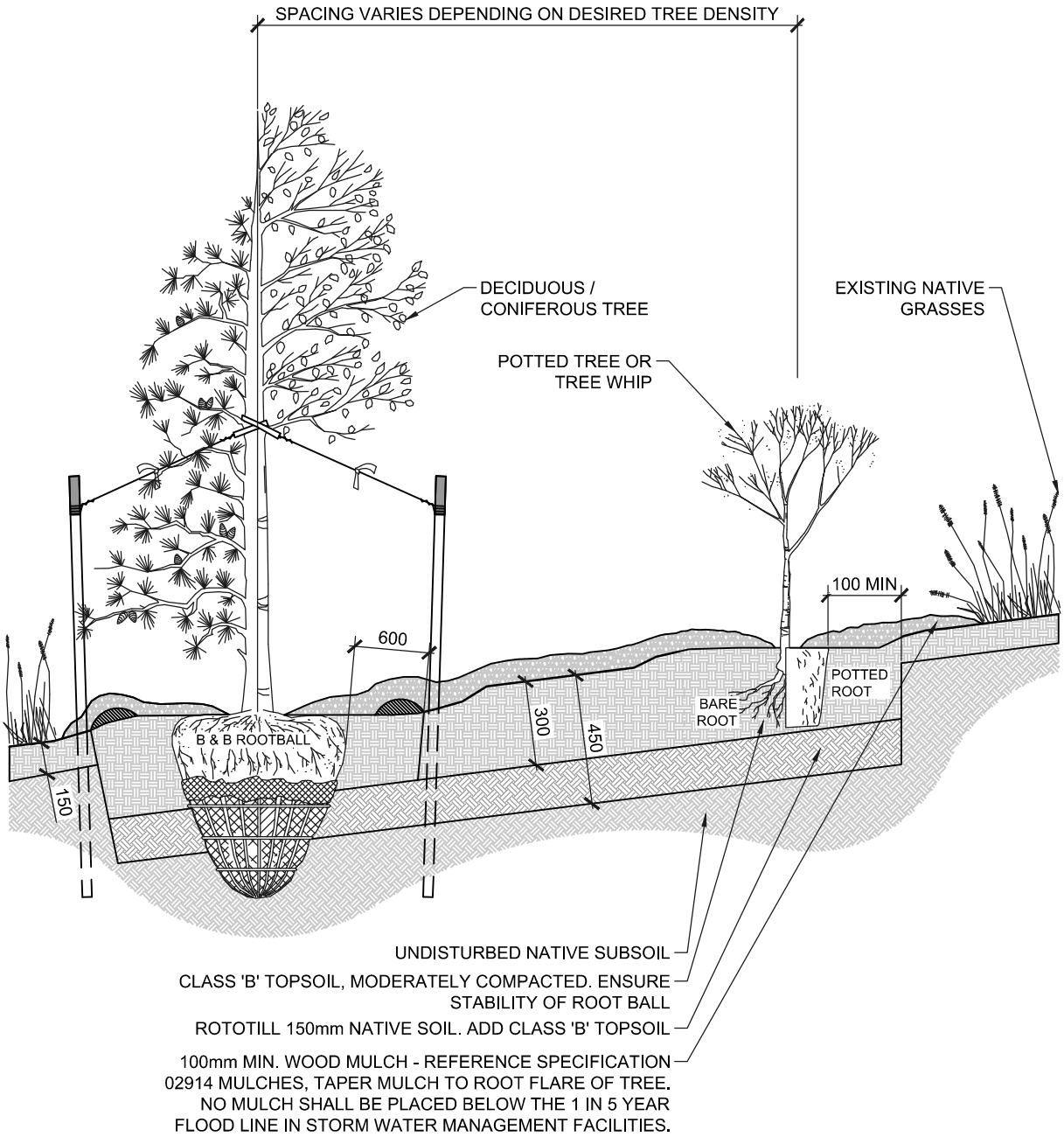
THE CITY OF Edmonton

TYPICAL SHRUB NATURALIZATION

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2016	PARKS PLANNING	M.C.		LA110
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP401c

NOTES:

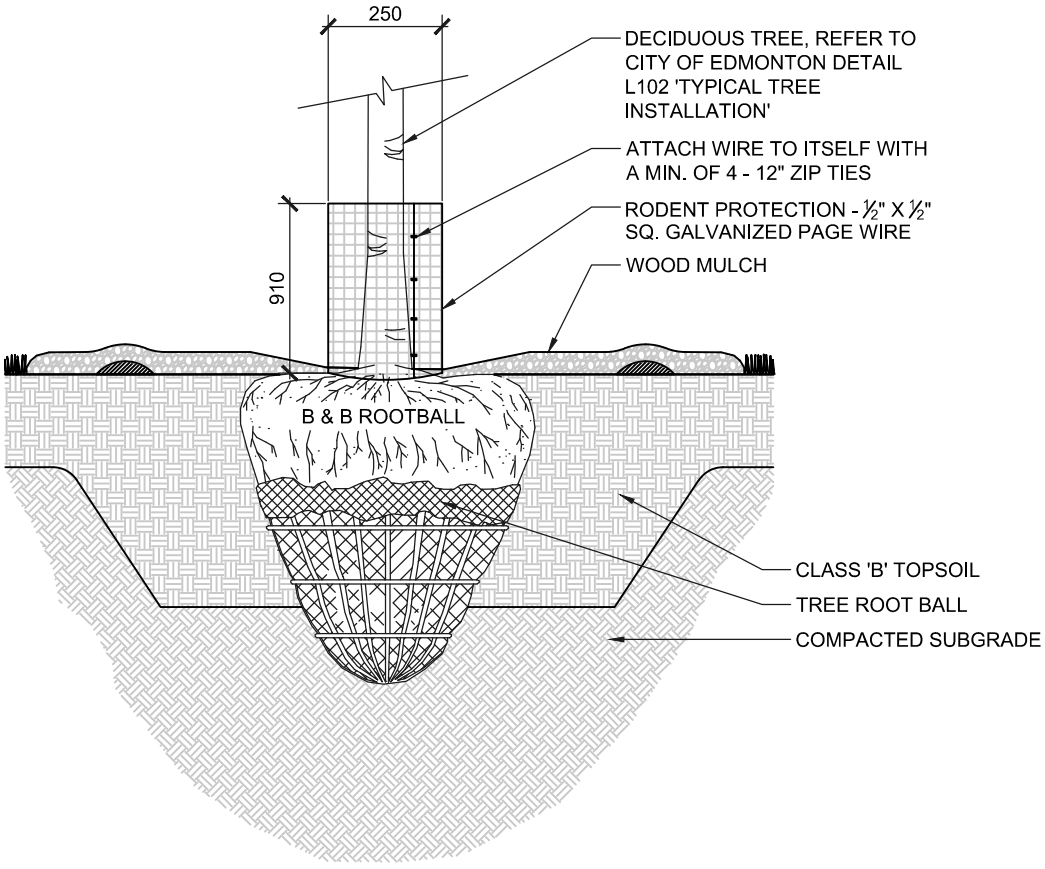
- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02931 NATURALIZATION AS WELL AS THE RELATED SECTIONS.
- PRUNE ONLY DEAD, BROKEN OR DISEASED BRANCHES TO MAINTAIN PROPER SHRUB FORM (DECIDUOUS ONLY).
- ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
- IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS OR IF IN THE BOULEVARD THE STAKES SHOULD BE IN LINE WITH THE DIRECTION OF TRAFFIC.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.



THE CITY OF Edmonton

TYPICAL TREE NATURALIZATION

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2016	PARKS PLANNING	M.C.		LA111
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			N/A



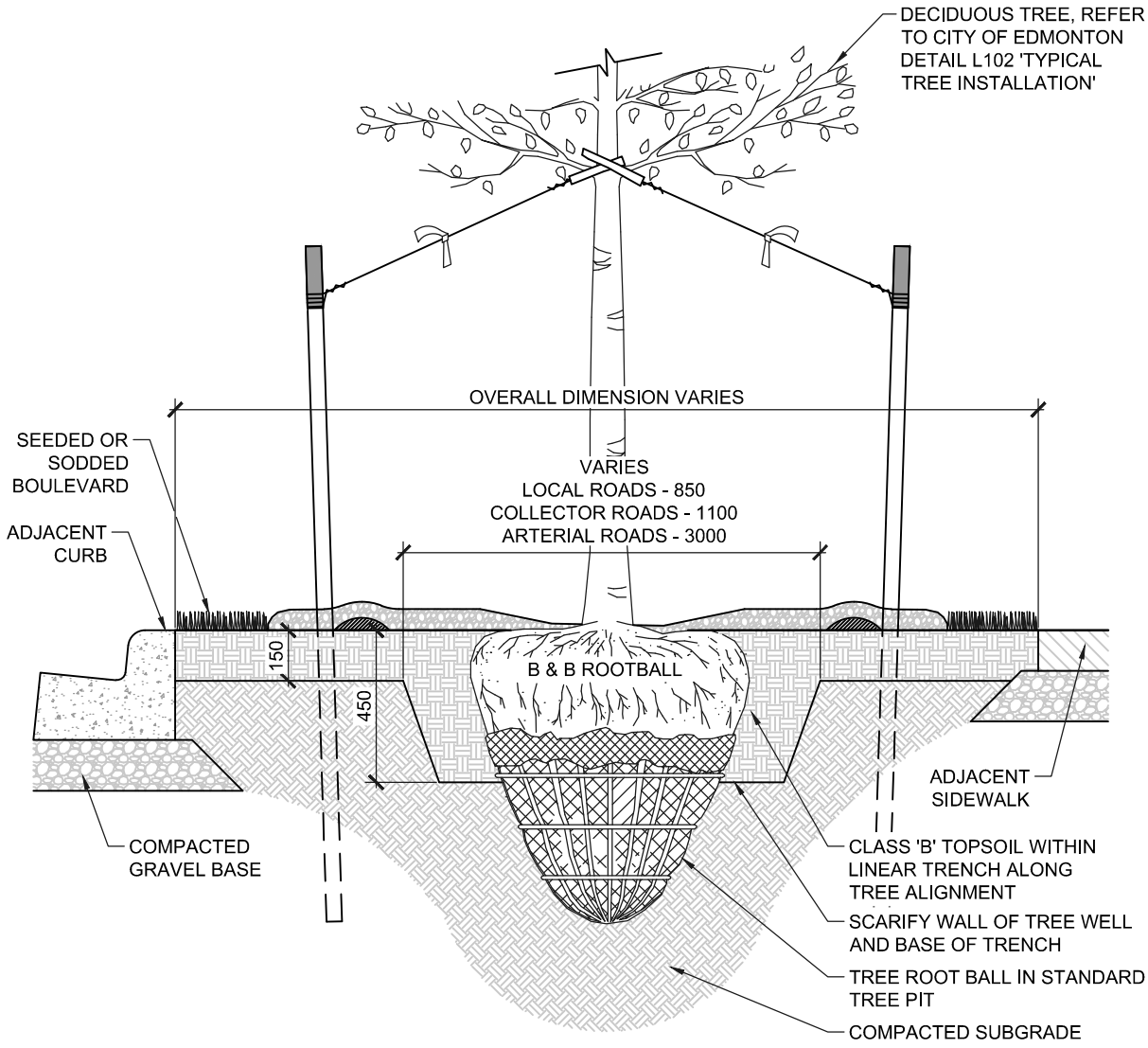
NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ENSURE RODENT PROTECTION IS INSTALLED TO TOP OF ROOT BALL BELOW ANY WOOD MULCH.
- ALL DIMENSIONS IN MILLIMETERS.
- ALL OTHER MATERIALS WILL NOT BE ACCEPTED.
- THE CITY WILL REMOVE RODENT PROTECTION FROM THE TREE AFTER FAC AT FORESTRY'S DISCRETION.

THE CITY OF Edmonton

TYPICAL TREE RODENT PROTECTION

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA112
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			N/A



NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02931 NATURALIZATION AS WELL AS THE RELATED SECTIONS.
- ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.
- IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS OR IF IN THE BOULEVARD THE STAKES SHOULD BE IN LINE WITH THE DIRECTION OF TRAFFIC.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ALL DIMENSIONS IN MILLIMETERS.

THE CITY OF Edmonton

TYPICAL TREE ROOT TRENCH

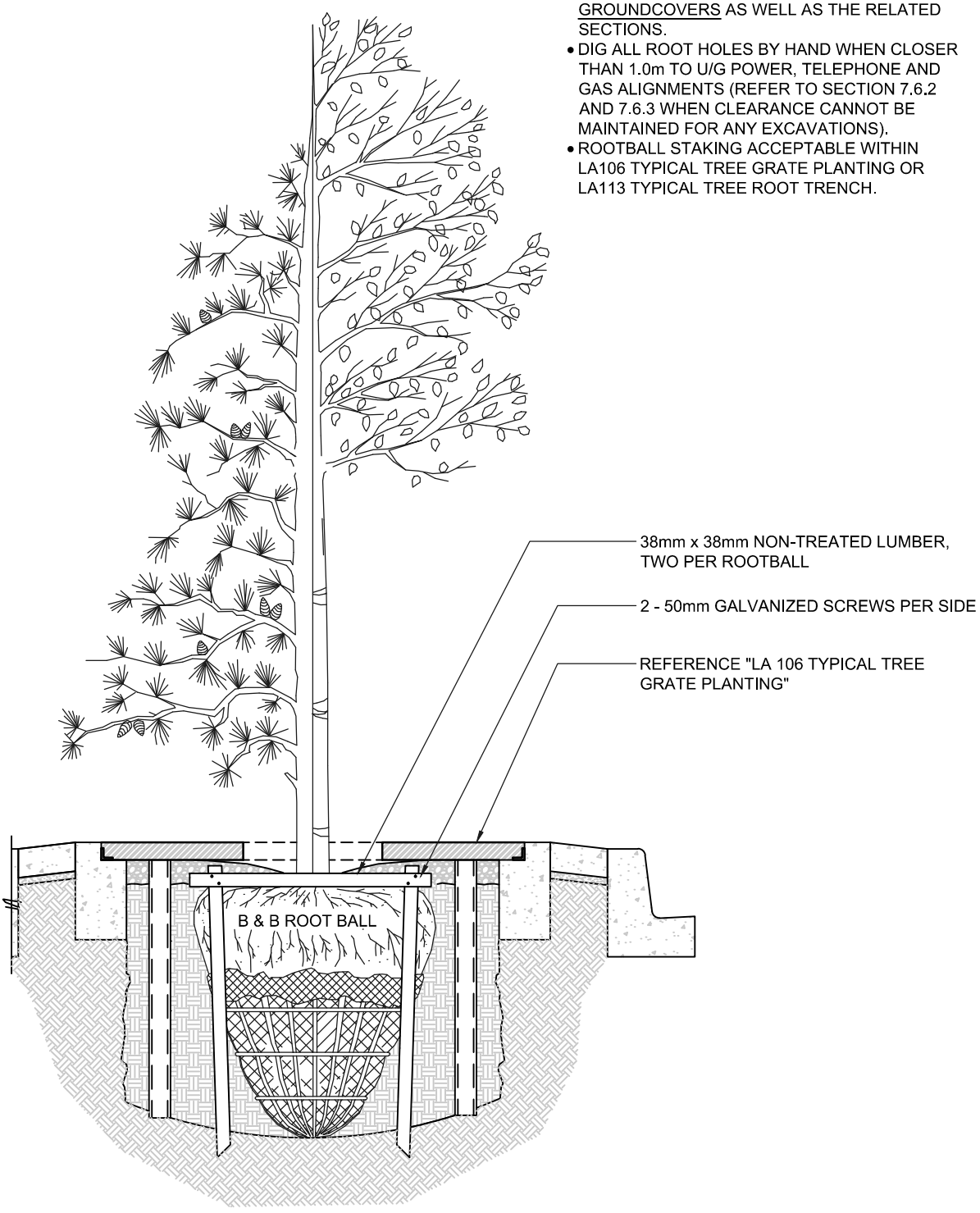
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA113
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			N/A

CONIFEROUS
Less than 3.0m ht.

DECIDUOUS
Less than 100mm cal.

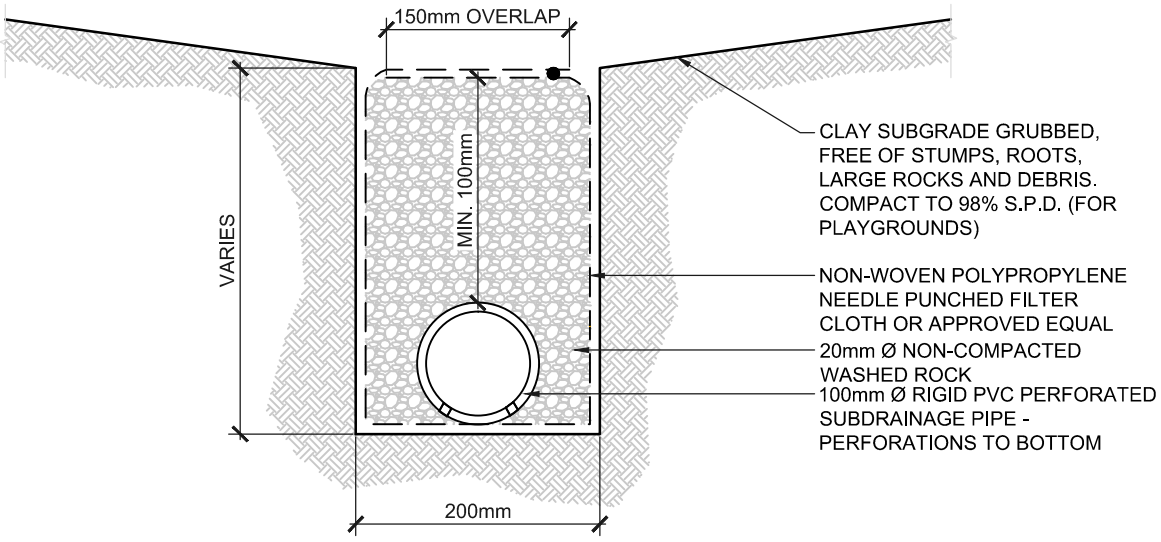
NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02930 TREES, SHRUBS AND GROUNDCOVERS AS WELL AS THE RELATED SECTIONS.
- DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).
- ROOTBALL STAKING ACCEPTABLE WITHIN LA106 TYPICAL TREE GRATE PLANTING OR LA113 TYPICAL TREE ROOT TRENCH.

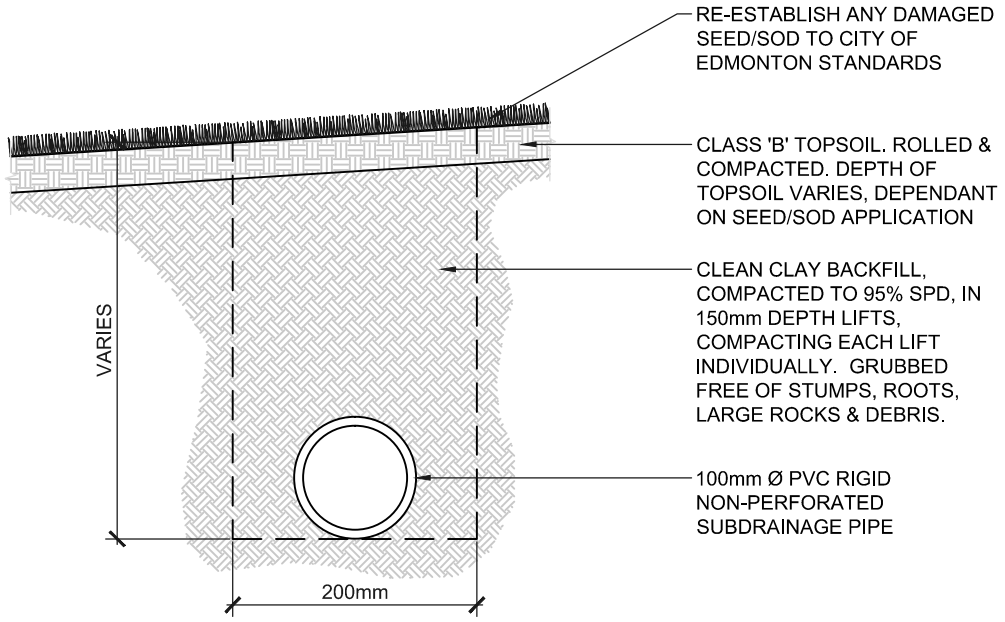


TYPICAL TREE ROOTBALL STAKING

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2017	PARKS PLANNING			LA114
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			N/A



PERFORATED SUBDRAINAGE PIPE



NON-PERFORATED SUBDRAINAGE PIPE

NOTES:

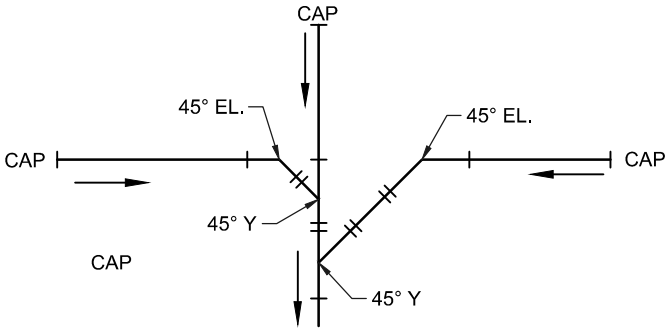
- A DRAINAGE SUMP IS NOT PERMITTED UNLESS THERE IS NO ACCEPTABLE DRAINAGE ALTERNATIVE, WHICH SHALL BE SUBJECT TO APPROVAL. DRAINAGE SHALL BE CONNECTED TO THE CITY OF EDMONTON DRAINAGE INFRASTRUCTURE, SUCH AS A MANHOLE OR CATCH BASIN LOCATED ON PRIVATE PROPERTY.
- MINIMUM 2.0% SLOPE ON ALL SUBDRAINAGE PIPE
- ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE

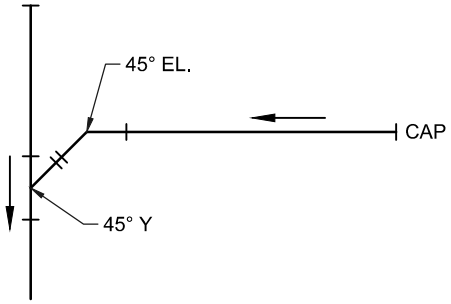
THE CITY OF Edmonton

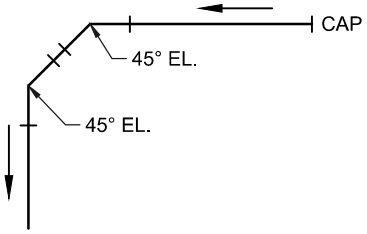
SUBDRAINAGE PIPE INSTALLATION

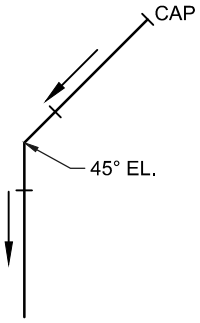
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2017	PARKS PLANNING	M.C. Jones		LA200
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP105a

ACTUAL CONNECTIONS TO BE SHOWN ON ALL CONSTRUCTION DRAWING









LEGEND:

EL. ELBOW

FLOW DIRECTION

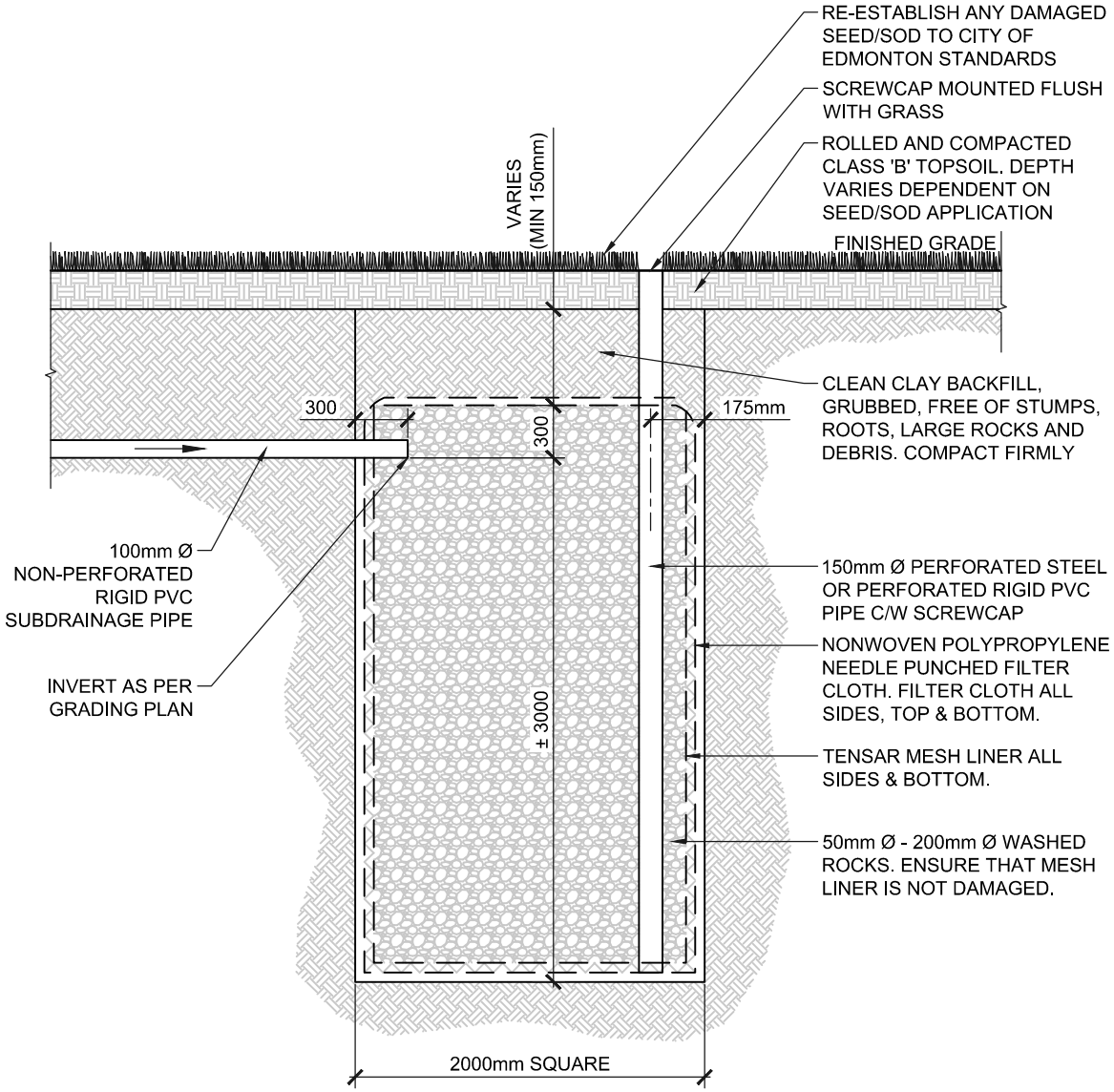
NOTES:

- MINIMUM 2.0% SLOPE ON ALL SUBDRAINAGE PIPE.

THE CITY OF Edmonton

TYPICAL SUBDRAINAGE PIPE CONNECTIONS

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2017	PARKS PLANNING			LA201
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP105



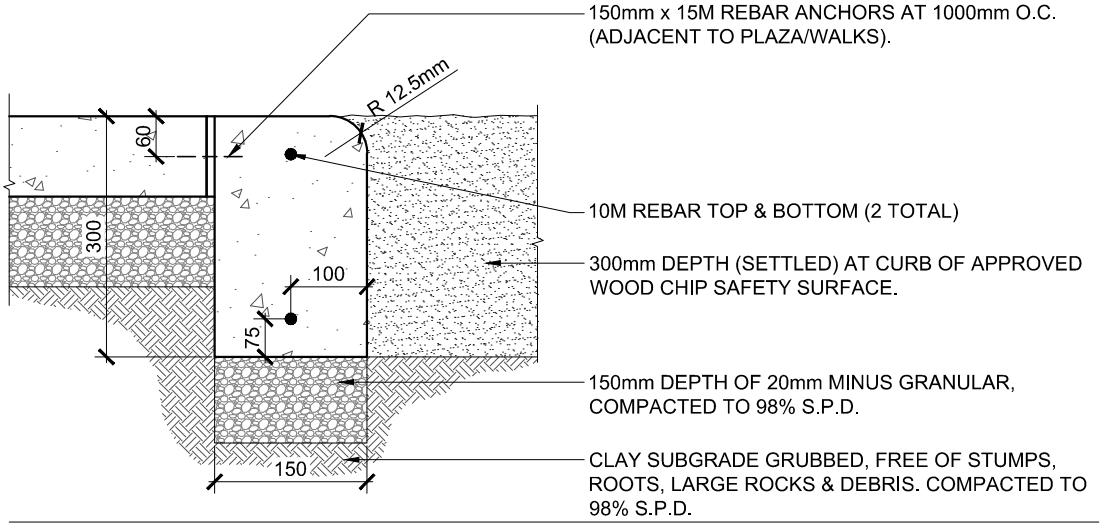
NOTES:

- A DRAINAGE SUMP IS NOT PERMITTED UNLESS THERE IS NO ACCEPTABLE DRAINAGE ALTERNATIVE, WHICH SHALL BE SUBJECT TO APPROVAL. DRAINAGE SHALL BE CONNECTED TO THE CITY OF EDMONTON DRAINAGE INFRASTRUCTURE, SUCH AS A MANHOLE OR CATCH BASIN LOCATED ON PRIVATE PROPERTY.
- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02318 TRENCH AND BACKFILL AS WELL AS RELATED SECTIONS.

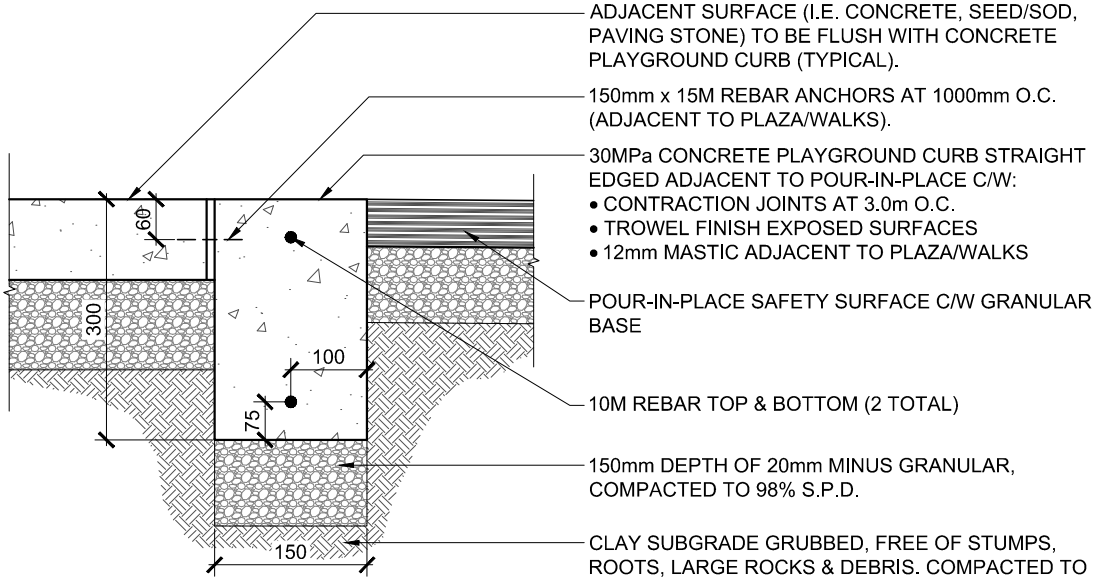
THE CITY OF Edmonton

PLAYGROUND DRAINAGE SUMP

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2017	PARKS PLANNING			LA202
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP105b



PLAYGROUND CURB ADJACENT WOOD MULCH



PLAYGROUND CURB ADJACENT POUR-IN-PLACE SURFACE

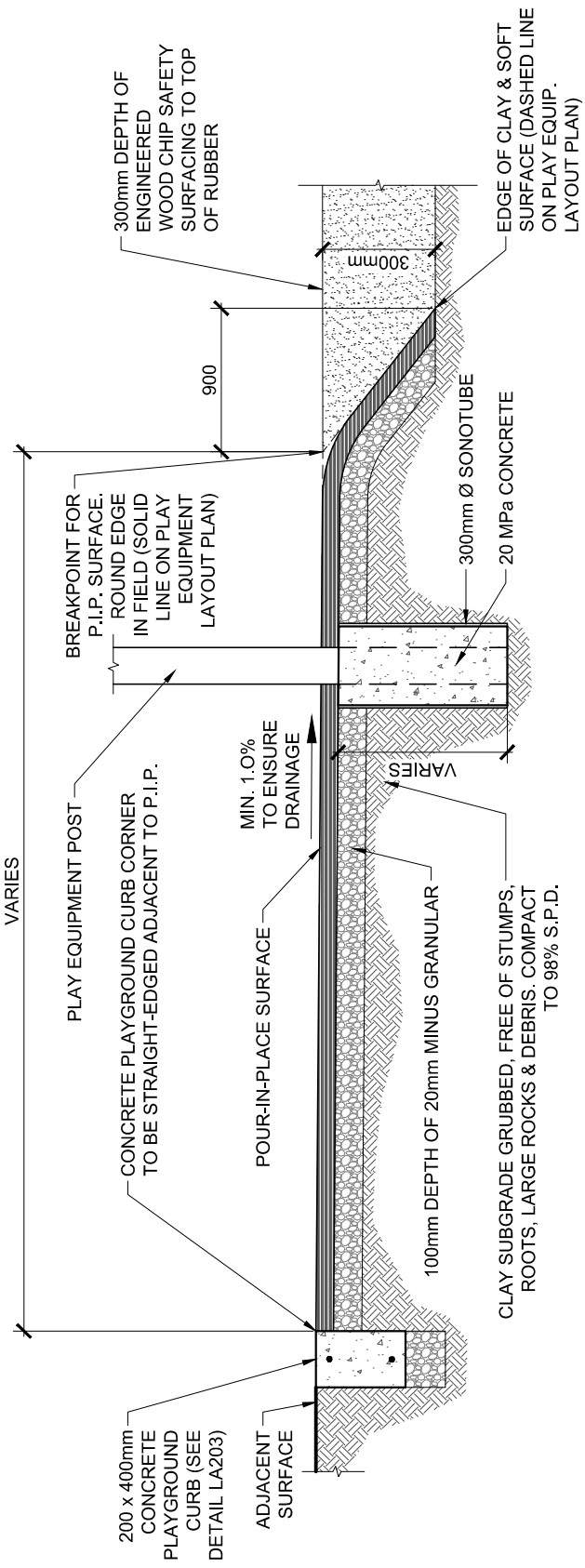
NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02770 CONCRETE CURB/GUTTER/WALK/SLABS AS WELL AS RELATED SECTIONS.
- PLAYGROUND SAFETY SURFACE THAT ARE COMBINATIONS OF WOOD MULCH AND POUR-IN-PLACE RUBBER REQUIRE A 25mm RADIUS ON CURB ADJACENT TO WOOD MULCH SURFACE AND CURB ADJACENT TO POUR-IN-PLACE RUBBER SURFACE IS TO BE SQUARE AND FLUSH.
- 20mm MINUS GRANULAR - SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, COMPACT TO 98% S.P.D.
- DEPTH OF GRANULAR LEVELING COURSE MAY BE ALTERED AT THE DISCRETION OF THE LANDSCAPE ARCHITECT ONLY.

THE CITY OF Edmonton

CONCRETE PLAYGROUND CURB ADJACENT WOOD MULCH & POUR-IN-PLACE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING	Madovic		LA203
Scale:	**Checked By:**			**Old Drawing No.**
N.T.S.	PARKS PLANNING			-

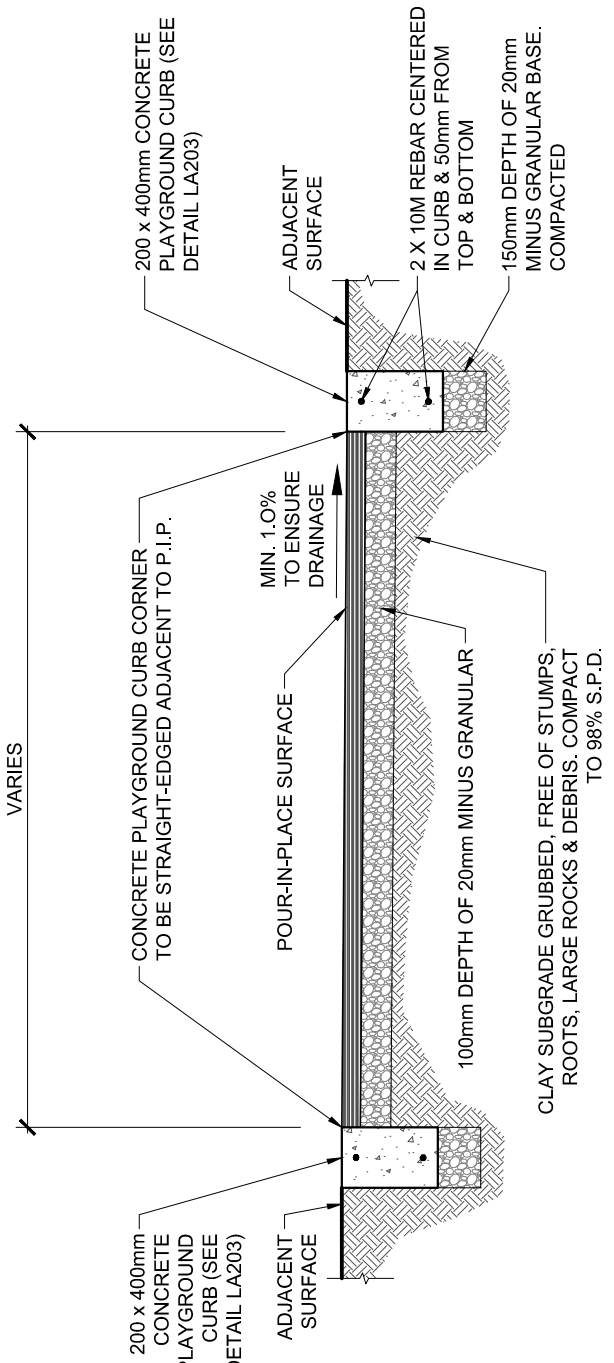


NOTES:
- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02060
  AGGREGATE AS WELL AS RELATED SECTIONS.
- 20mm MINUS GRANULAR - SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, COMPACT TO 98% S.P.D.
- HOLE DRILLING FOR PLAY EQUIPMENT POSTS BY SUPPLIER.

THE CITY OF Edmonton

TYPICAL POUR-IN-PLACE PLAYGROUND SAFETY SURFACE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING			LA204
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-

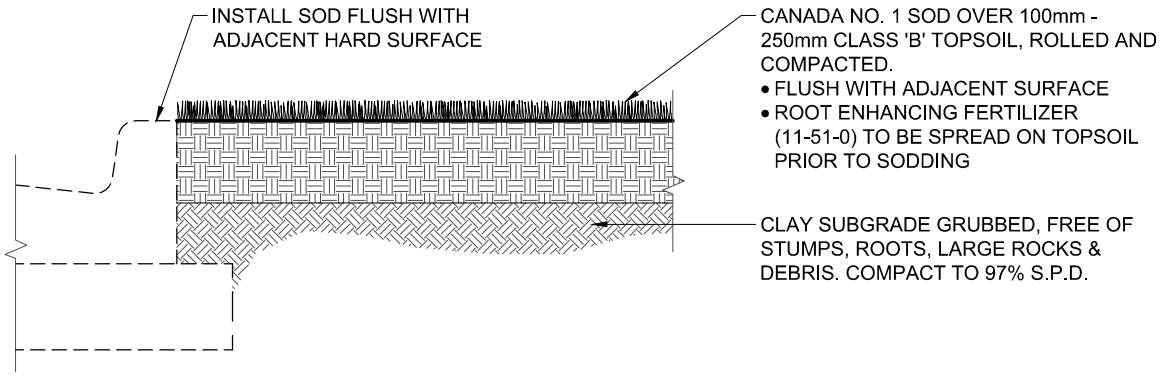


NOTES:
- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02060 AGGREGATE AS WELL AS RELATED SECTIONS.
- 20mm MINUS GRANULAR - SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, COMPACT TO 98% S.P.D.

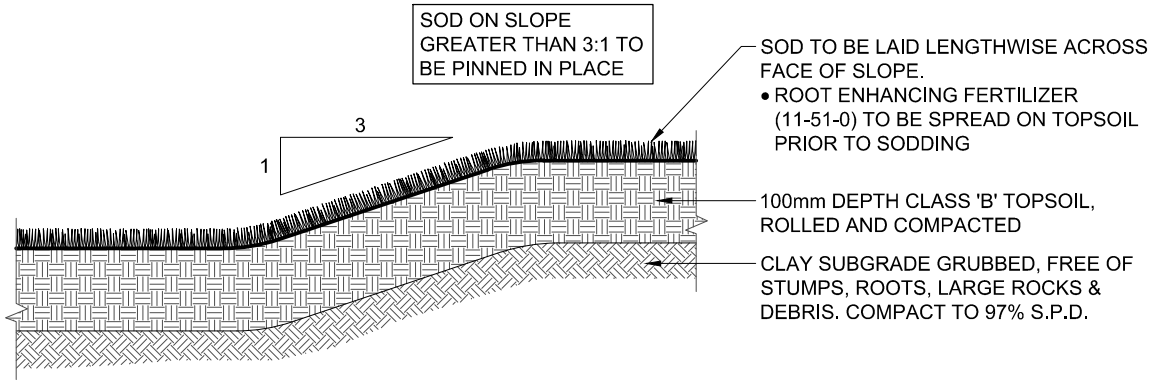
THE CITY OF Edmonton

POUR-IN-PLACE PLAYGROUND SAFETY SURFACE - ALL RUBBER

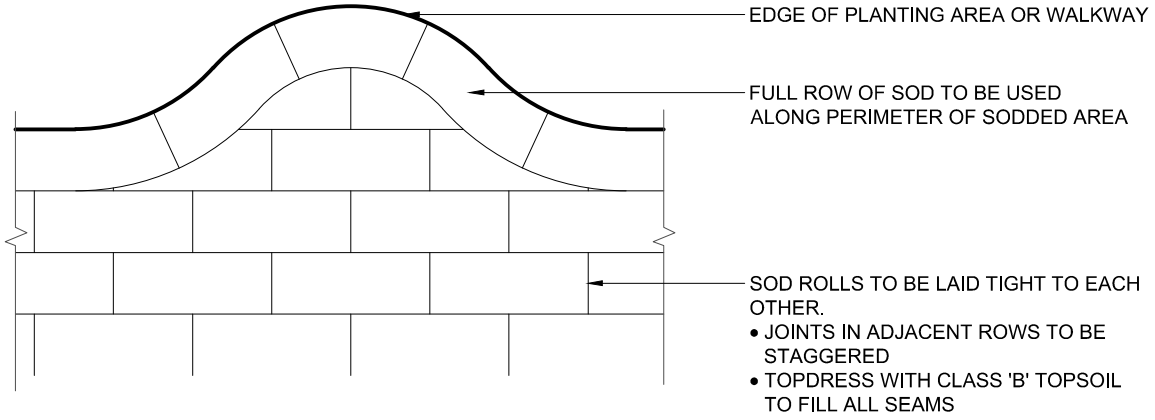
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING			LA204A
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-



CROSS SECTION



CROSS SECTION THROUGH SLOPE



PLAN VIEW

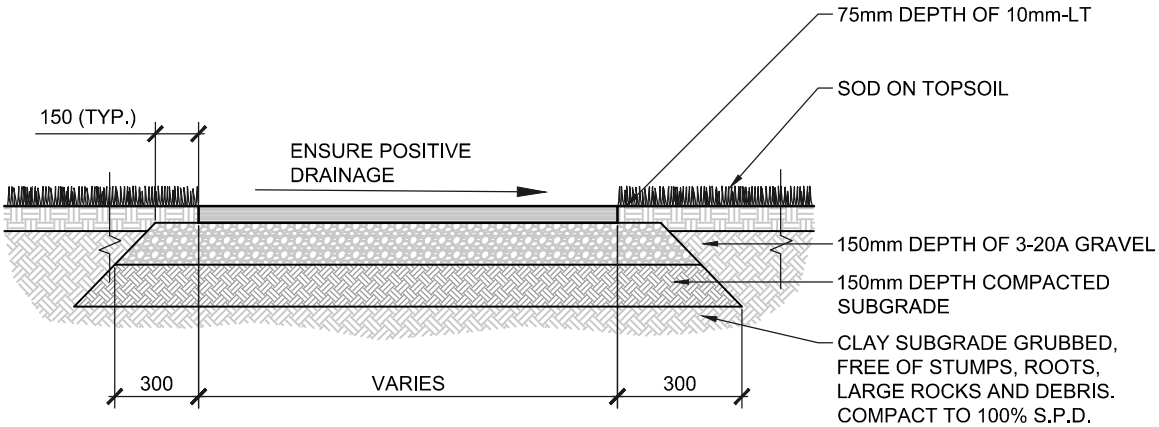
NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02920 SEED AND SOD AS WELL AS THE RELATED SECTIONS.

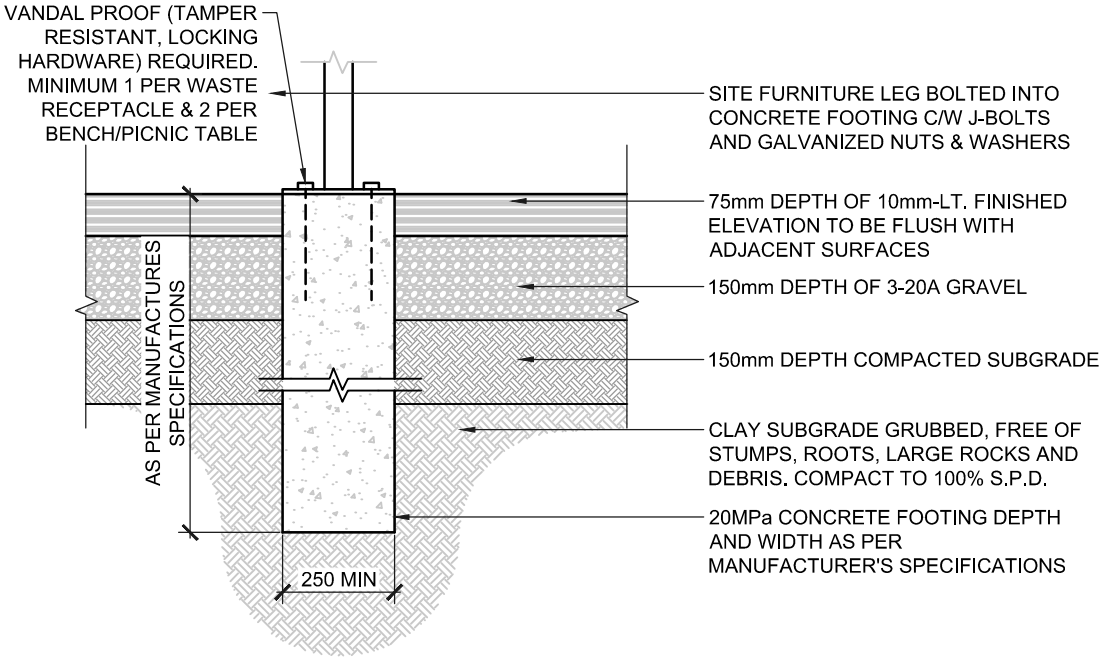
THE CITY OF Edmonton

SOD INSTALLATION

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING			LA300
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP402



ASPHALT CROSS SECTION (TYP.)



SITE FURNITURE FOOTING WITHIN ASPHALT AREA

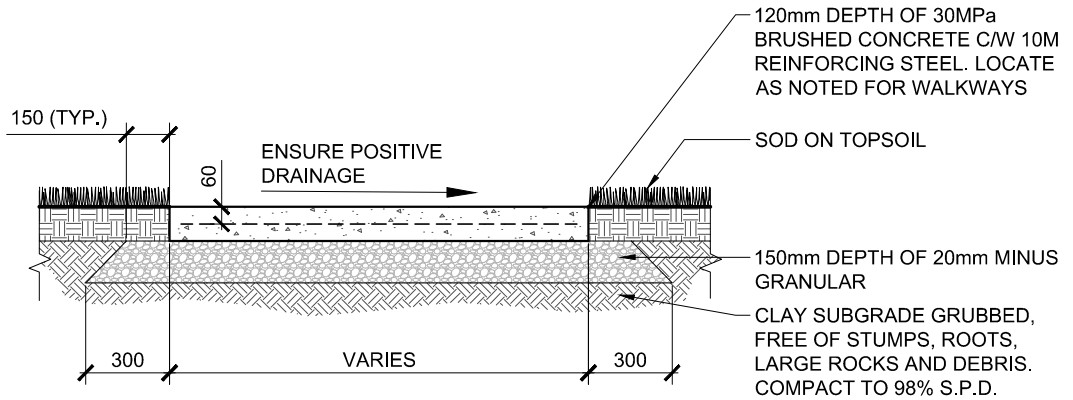
NOTES:

- DIMENSIONS OF ASPHALT WALKWAY OR PLAZA AS PER LANDSCAPE DRAWINGS.
- SET ASPHALT SURFACE FLUSH WITH ADJACENT GRADES.
- ENSURE DRAINAGE OFF ASPHALT AT ALL LOCATIONS & IN COMPLIANCE WITH THE OVERALL SITE DRAINAGE PLAN.
- 20mm MINUS GRANULAR - SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, COMPACT TO 100% S.P.D.
- ALL DIMENSIONS IN MILLIMETERS.

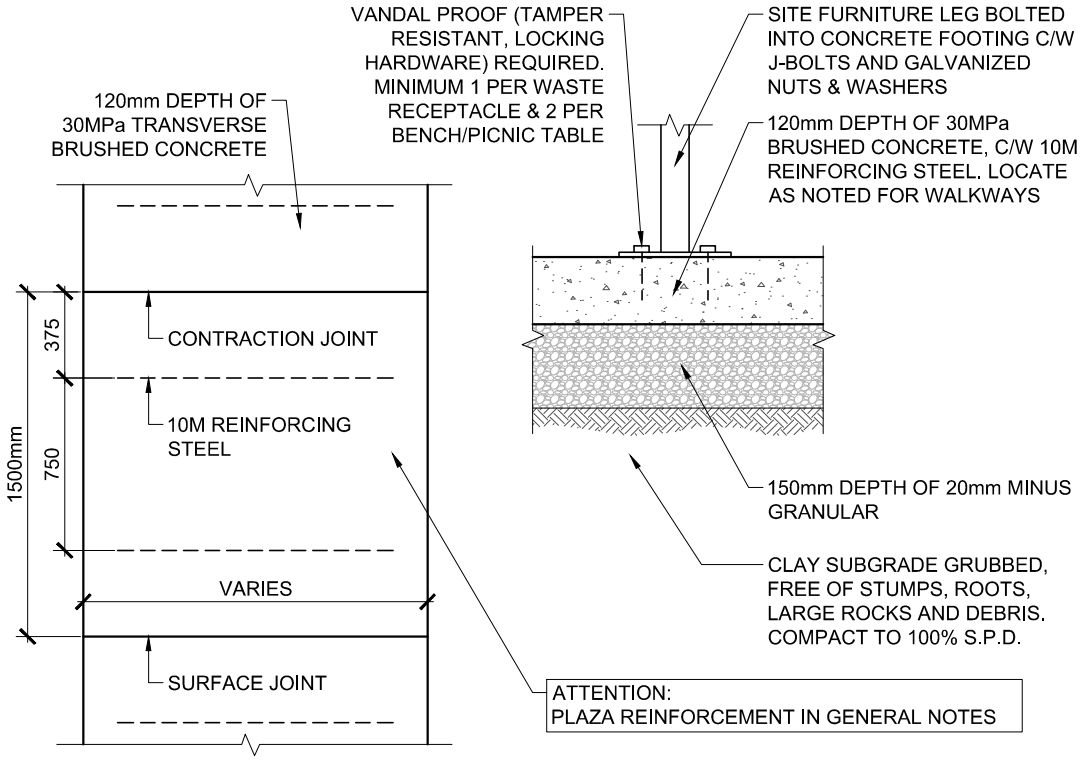
THE CITY OF Edmonton

ASPHALT WALKWAY OR PLAZA

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA301
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-



CONCRETE CROSS SECTION (TYP.)



CONCRETE WALKWAY PLAN VIEW

SITE FURNITURE WITHIN CONCRETE AREA

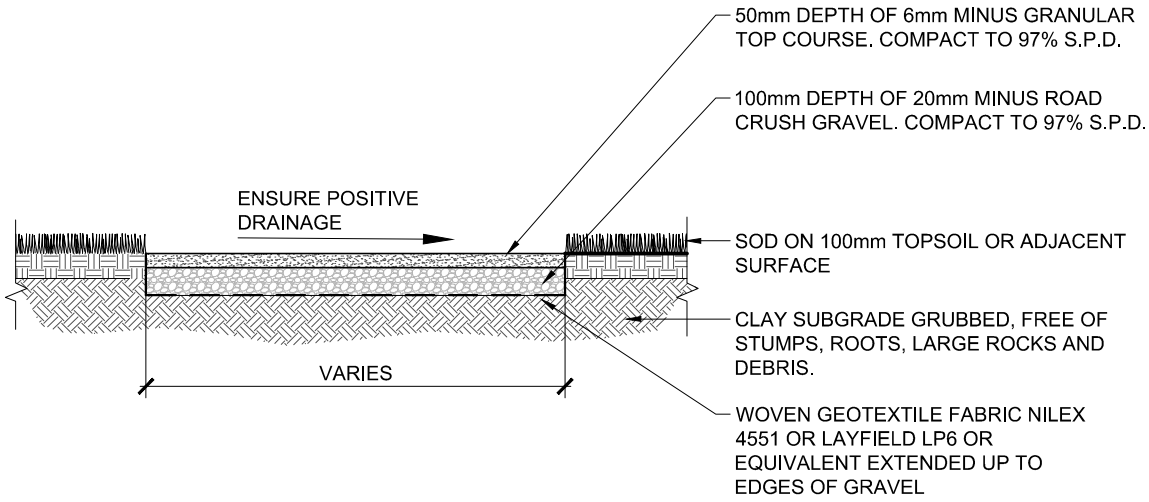
NOTES:

- DIMENSIONS/DEFINITION: A CONCRETE WALKWAY HAS A WIDTH OF 1500-2400mm AND A PLAZA IS GREATER IN WIDTH THAN 2400mm.
- FOR PLAZA AREAS INSTALL WELDED STEEL WIRE FABRIC AS PER TRANSPORTATION REQUIREMENTS. INSTALL CONTRACTION JOINTS AS PER LAYOUT DETAIL ON LANDSCAPE DRAWINGS.
- SET CONCRETE SURFACE FLUSH WITH ADJACENT GRADES.
- ENSURE DRAINAGE OFF CONCRETE AT ALL LOCATIONS & IN COMPLIANCE WITH THE OVERALL SITE DRAINAGE PLAN.
- 20mm MINUS GRANULAR - SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, COMPACT TO 100% S.P.D.

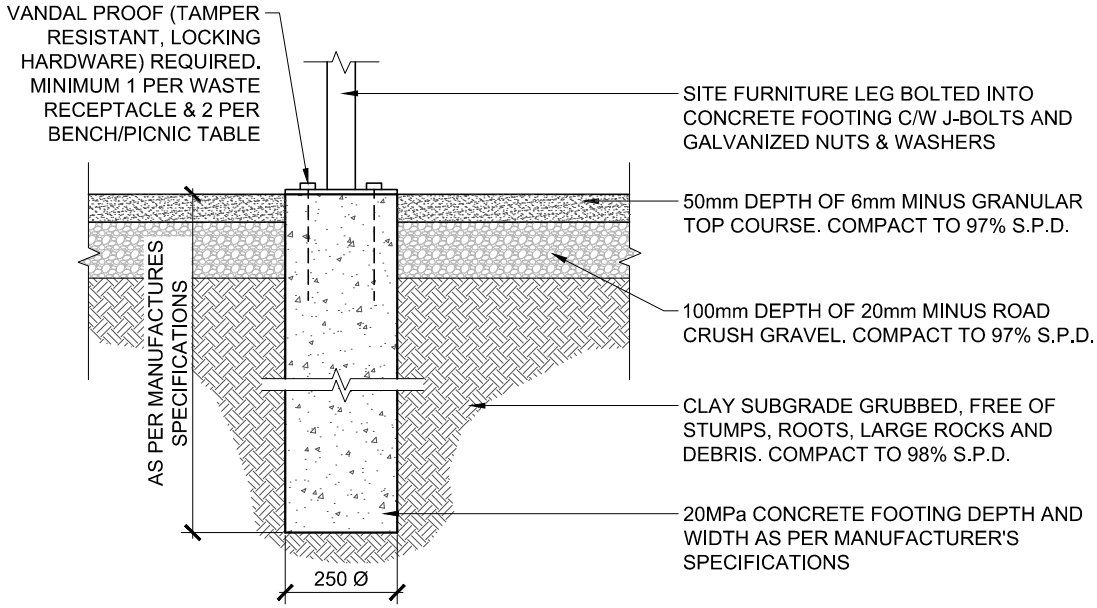
THE CITY OF Edmonton

CONCRETE WALKWAY OR PLAZA

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING	Radovic		LA302
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-



GRANULAR CROSS SECTION (TYP.)



SITE FURNITURE FOOTING WITHIN GRANULAR AREA

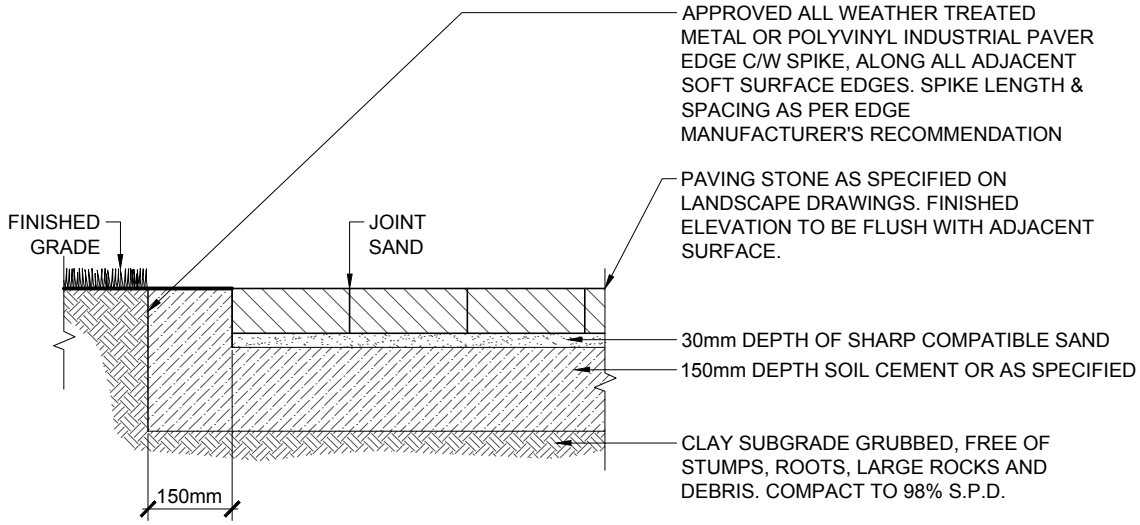
NOTES:

- DIMENSIONS OF GRANULAR WALKWAY OR PLAZA AS PER LANDSCAPE DRAWINGS.
- SET GRANULAR SURFACE FLUSH WITH ADJACENT GRADES.
- ENSURE DRAINAGE OFF GRANULAR AT ALL LOCATIONS & IN COMPLIANCE WITH THE OVERALL SITE DRAINAGE PLAN.
- 20mm MINUS GRANULAR - SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, COMPACT TO 97% S.P.D.

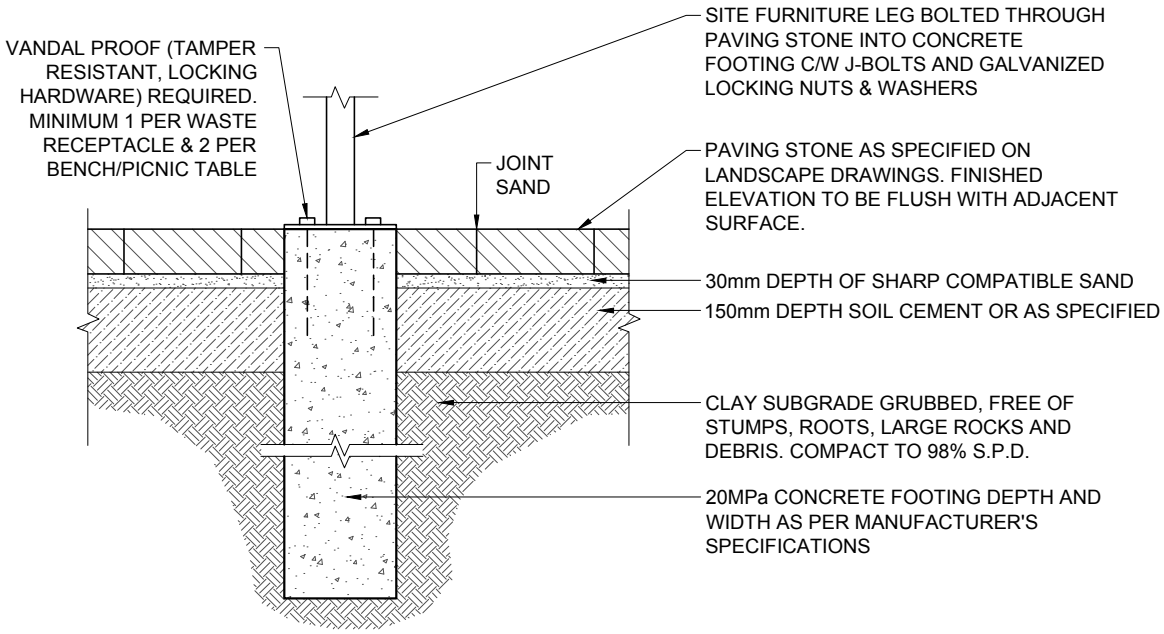
THE CITY OF Edmonton

GRANULAR WALKWAY

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING	Madovic		LA303
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-



PAVING STONE CROSS SECTION (TYP.)



SITE FURNITURE FOOTING WITHIN PAVING STONE AREA

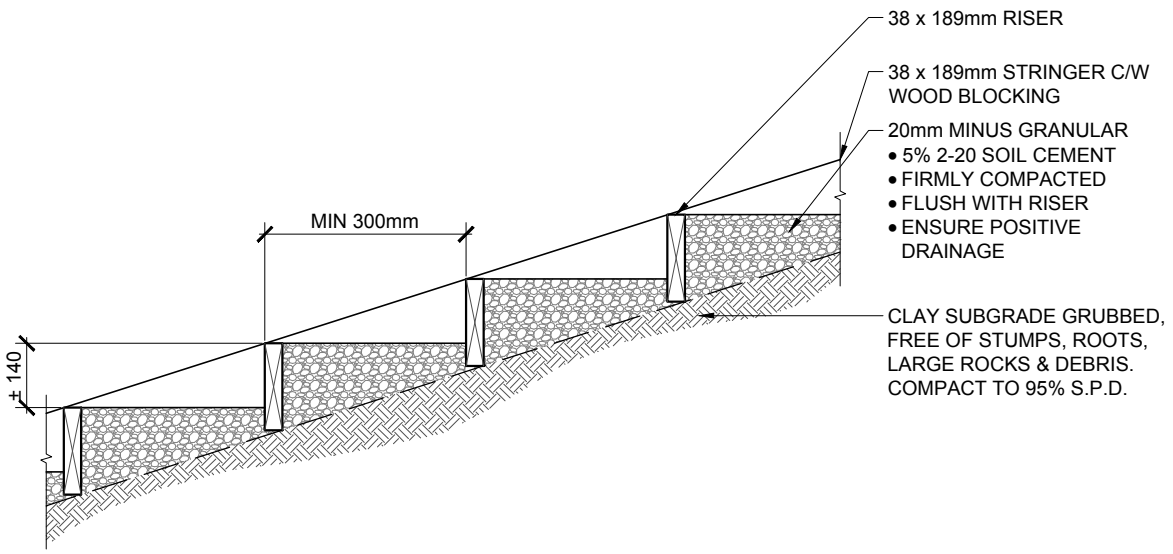
NOTES:

- DIMENSIONS OF PAVING STONE WALKWAY OR PLAZA AS PER LANDSCAPE DRAWINGS.
- SET PAVING STONE SURFACE FLUSH WITH ADJACENT GRADES.
- ENSURE DRAINAGE OFF PAVING STONE AT ALL LOCATIONS & IN COMPLIANCE WITH THE OVERALL SITE DRAINAGE PLAN.

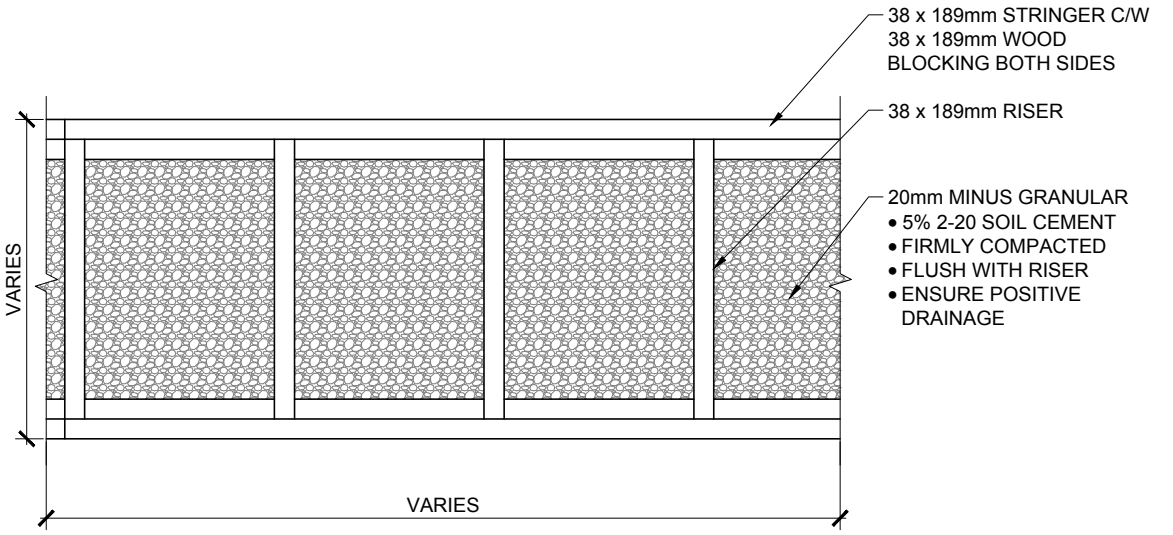
THE CITY OF Edmonton

PAVING STONE WALKWAY OR PLAZA

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING	Madovic		LA304
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-



GRAVEL PLANK STEPS CROSS SECTION



PLAN VIEW

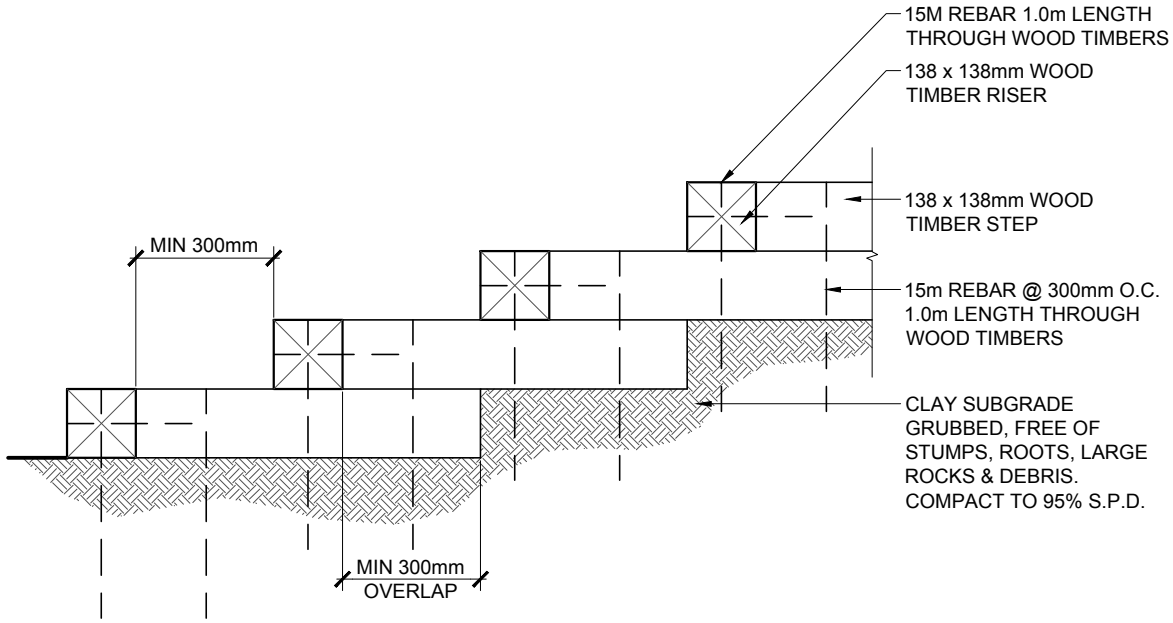
NOTES:

- ALL WOOD TO BE PRESSURE TREATED ACQ EXCEPT IN PLAYGROUND AREAS. USE CEDAR OR APPROVED ALTERNATIVE.
- DIMENSIONS OF GRAVEL PLANK STEPS AS PER LANDSCAPE DRAWINGS.
- SET GRANULAR SURFACE FLUSH WITH ADJACENT GRADES.
- ENSURE DRAINAGE OFF STEPS AT ALL LOCATIONS & IN COMPLIANCE WITH THE OVERALL SITE DRAINAGE PLAN.
- 20mm MINUS GRANULAR - SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, COMPACT TO 100% S.P.D.

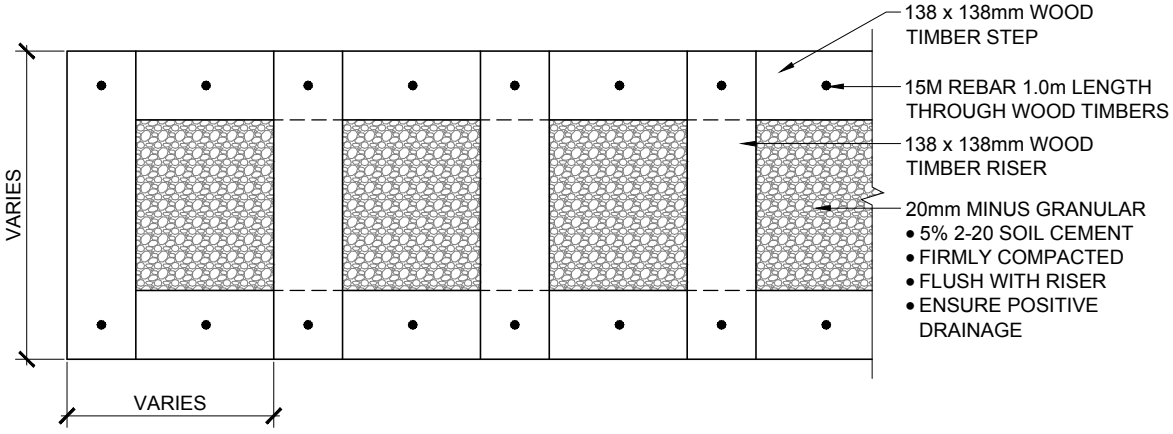
THE CITY OF Edmonton

GRAVEL PLANK STEPS

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING	Radovic		LA305
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-



GRAVEL TIMBER STEPS CROSS SECTION



PLAN VIEW

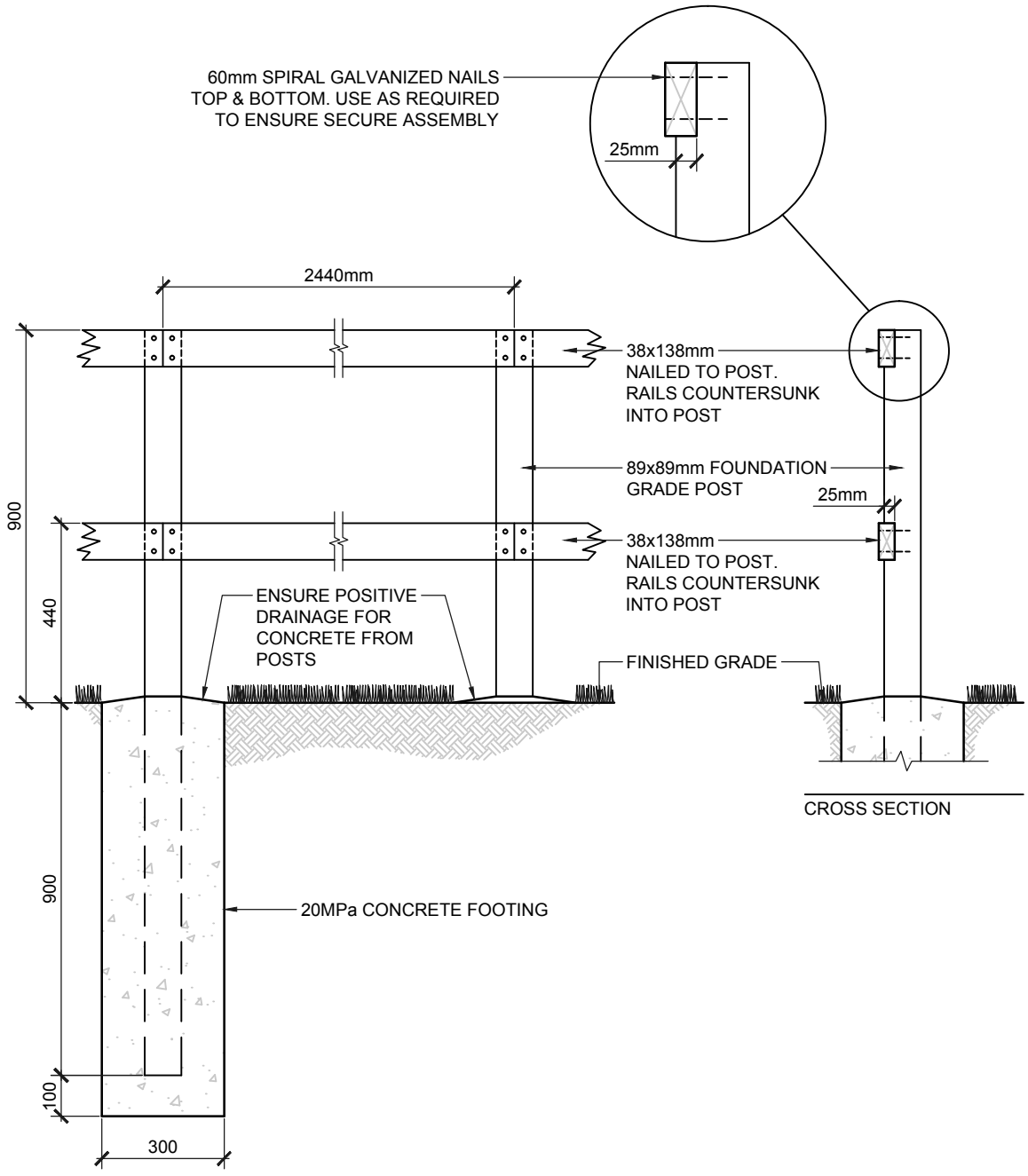
NOTES:

- ALL WOOD TO BE PRESSURE TREATED ACQ EXCEPT IN PLAYGROUND AREAS. USE CEDAR OR APPROVED ALTERNATIVE.
- DIMENSIONS OF GRAVEL TIMBER STEPS AS PER LANDSCAPE DRAWINGS.
- SET GRANULAR SURFACE FLUSH WITH ADJACENT GRADES.
- ENSURE DRAINAGE OFF STEPS AT ALL LOCATIONS & IN COMPLIANCE WITH THE OVERALL SITE DRAINAGE PLAN.
- 20mm MINUS GRANULAR - SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, COMPACT TO 100% S.P.D.

THE CITY OF Edmonton

GRAVEL TIMBER STEPS

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING	Madovic		LA306
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-



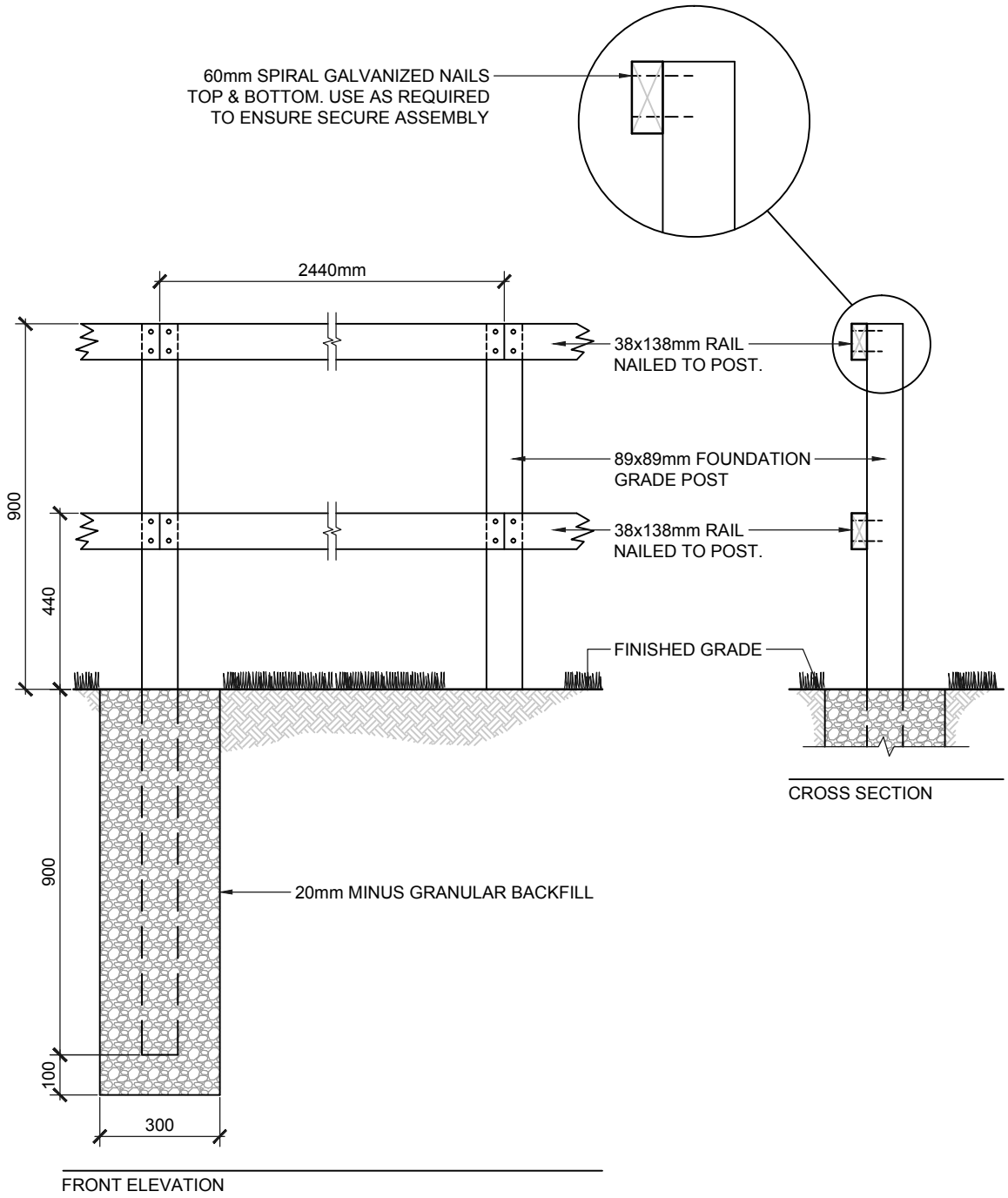
NOTES:

- ALL POSTS TO BE PRESSURE TREATED ACQ.
- ALL NAILS TO BE 60mm LENGTH SPIRAL GALVANIZED. USE AS REQUIRED TO ENSURE SECURE ASSEMBLY.
- WOOD USED MAY BE LODGEPOLE PINE, FIRE, HEMLOCK OR SPRUCE, DEPENDANT ON AVAILABILITY AT TIME OF CONSTRUCTION.
- ALL WOOD CUTS TO BE COATED WITH TWO COATS OF APPROVED WOOD PRESERVATIVE.
- ALL DIMENSIONS IN MILLIMETERS.

THE CITY OF Edmonton

PERMANENT WOOD RAIL FENCE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA400
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-



CROSS SECTION

FRONT ELEVATION

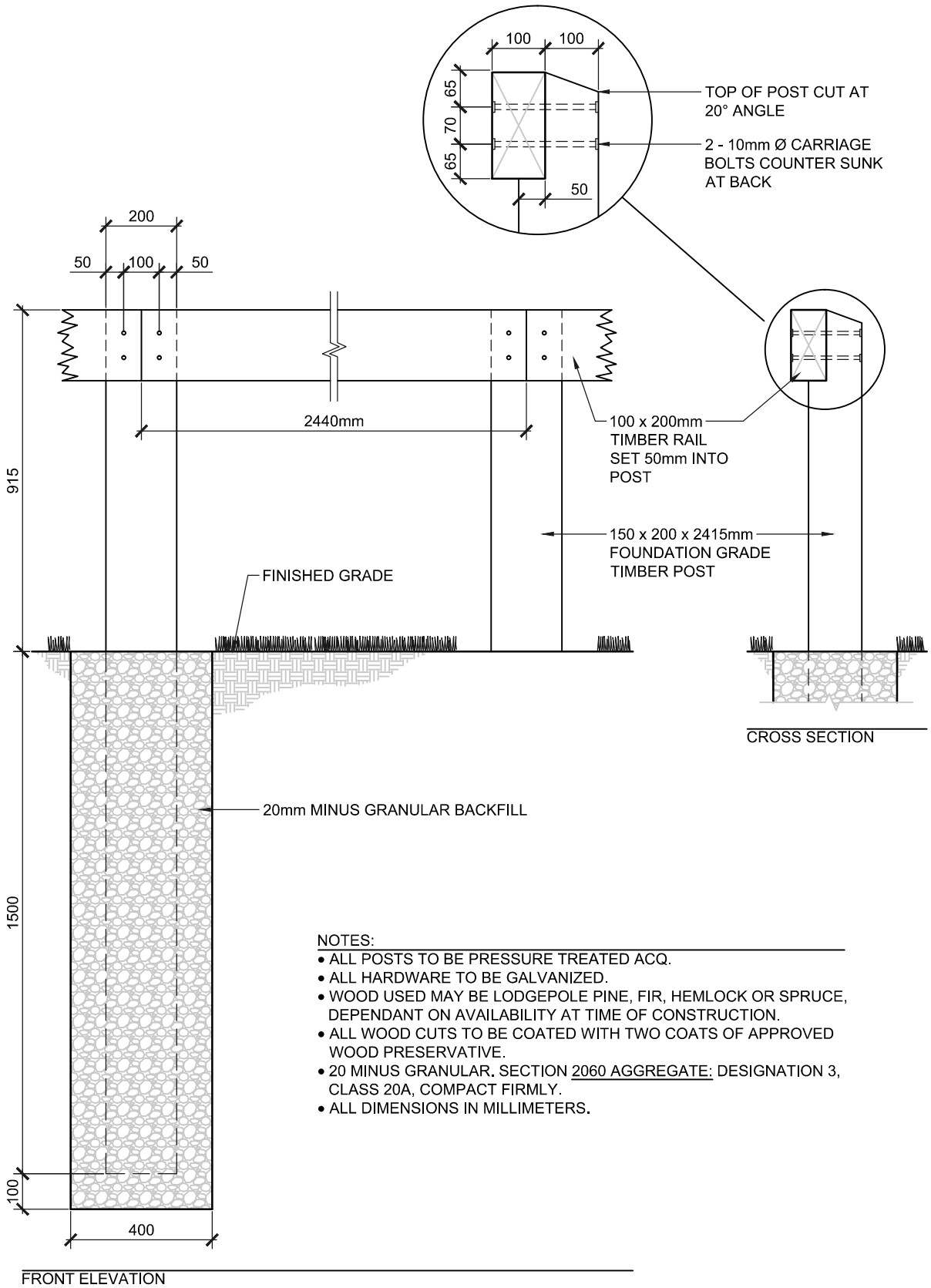
NOTES:

- ALL NAILS TO BE 60mm SPIRAL GALVANIZED. USE AS REQUIRED TO ENSURE SECURE ASSEMBLY.
- WOOD USED MAY BE LODGEPOLE PINE, FIRE, HEMLOCK OR SPRUCE, DEPENDANT ON AVAILABILITY AT TIME OF CONSTRUCTION.
- 20mm MINUS GRANULAR - SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, COMPACT FIRMLY.
- ALL DIMENSIONS IN MILLIMETERS.

THE CITY OF Edmonton

TEMPORARY WOOD RAIL FENCE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA401
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-



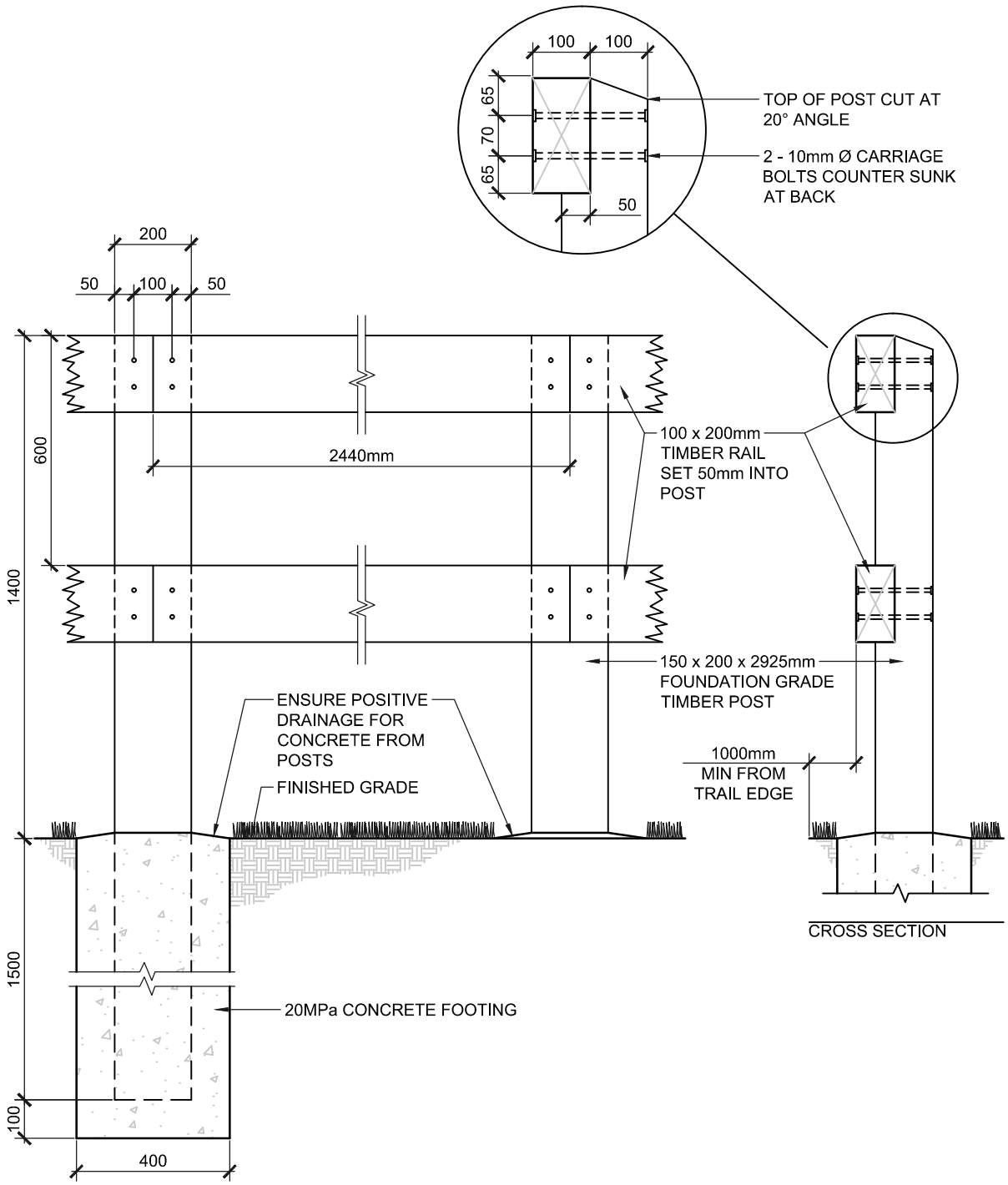
NOTES:

- ALL POSTS TO BE PRESSURE TREATED ACQ.
- ALL HARDWARE TO BE GALVANIZED.
- WOOD USED MAY BE LODGEPOLE PINE, FIR, HEMLOCK OR SPRUCE, DEPENDANT ON AVAILABILITY AT TIME OF CONSTRUCTION.
- ALL WOOD CUTS TO BE COATED WITH TWO COATS OF APPROVED WOOD PRESERVATIVE.
- 20 MINUS GRANULAR. SECTION 2060 AGGREGATE: DESIGNATION 3, CLASS 20A, COMPACT FIRMLY.
- ALL DIMENSIONS IN MILLIMETERS.

THE CITY OF Edmonton

915mm HIGH WOOD GUARD RAIL

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA402
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP300d



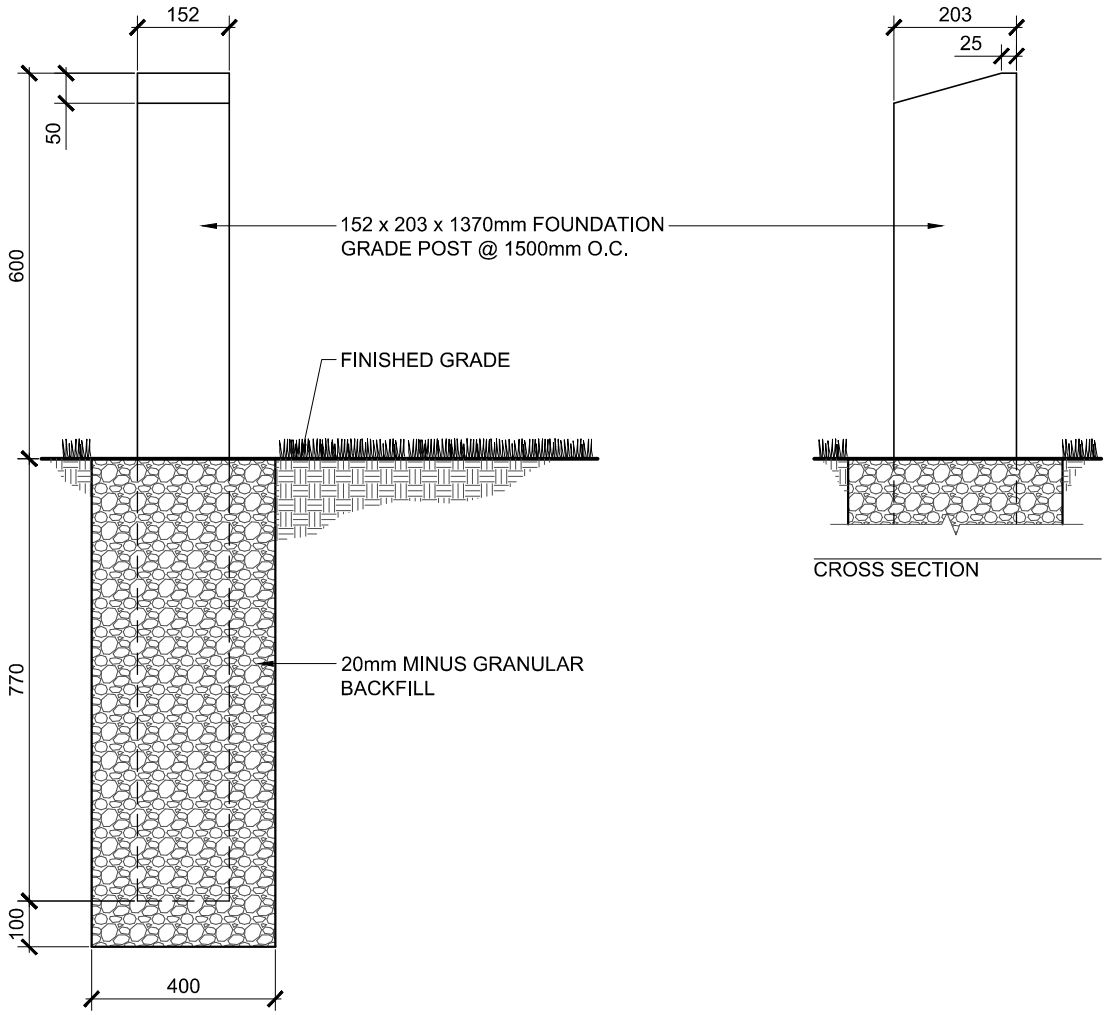
NOTES:

- ALL POSTS TO BE PRESSURE TREATED ACQ.
- ALL HARDWARE TO BE GALVANIZED.
- WOOD USED MAY BE LODGEPOLE PINE, FIR, HEMLOCK OR SPRUCE, DEPENDANT ON AVAILABILITY AT TIME OF CONSTRUCTION.
- ALL POST CUTS TO BE COATED WITH TWO COATS OF APPROVED WOOD PRESERVATIVE.
- ALL DIMENSIONS IN MILLIMETERS.

THE CITY OF Edmonton

1400mm HIGH WOOD GUARD RAIL

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA403
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP300i



NOTES:

- ALL WOOD TO BE PRESSURE TREATED ACQ.
- WOOD USED MAY BE LODGEPOLE PINE, FIR, HEMLOCK OR SPRUCE, DEPENDANT ON AVAILABILITY AT TIME OF CONSTRUCTION.
- ALL WOOD CUTS TO BE COATED WITH TWO COATS OF APPROVED WOOD PRESERVATIVE.
- 20 MINUS GRANULAR. SECTION 2060 AGGREGATE: DESIGNATION 3, CLASS 20A, COMPACT FIRMLY.

THE CITY OF Edmonton

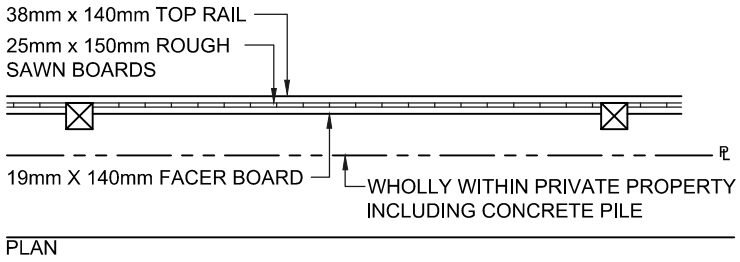
152 x 203mm WOOD BUMPER POST

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING	Radovic		LA404
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP300g

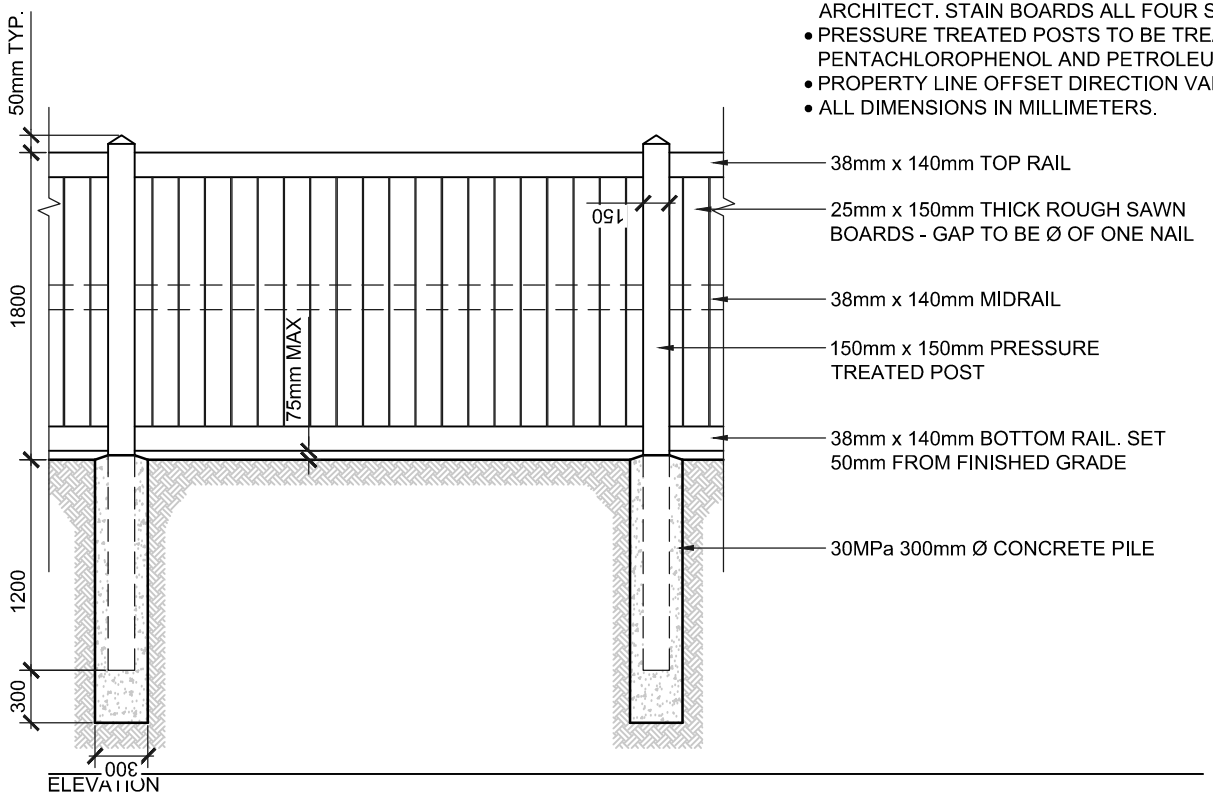
1800mm HEIGHT WOOD SCREEN FENCE

THE CITY OF Edmonton

Date Approved:	JUNE 2017
Drawn By:	PARKS PLANNING
Checked By:	PARKS PLANNING
Scale:	N.T.S.
Approved:	
Revision	
Drawing No.	LA405
Old Drawing No.	-



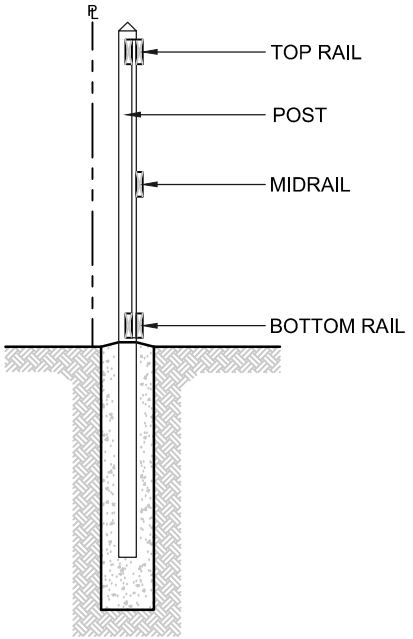
PLAN



ELEVATION

NOTES:

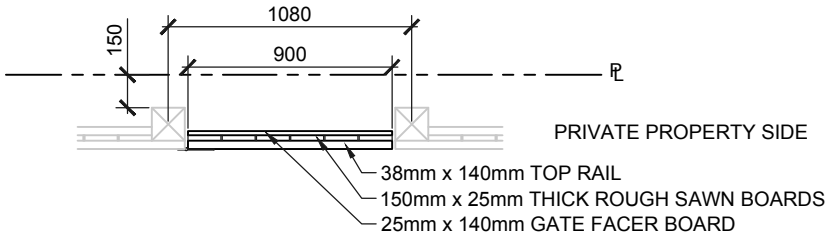
- FENCES INCLUDING THE CONCRETE PILE MUST BE CONSTRUCTED WHOLLY WITHIN PRIVATE PROPERTY.
- FENCES ON PRIVATE PROPERTY SHALL REQUIRE A MINIMUM OF PRESSURE TREATED POSTS AND BOTTOM RAILS. FENCES ON CITY PROPERTY SHALL REQUIRE ALL WOOD MEMBERS TO BE PRESSURE TREATED OR APPROVED EQUAL. ALL WOOD MEMBERS ABOVE GROUND TO BE NON-INCISED.
- ALL NAILS TO BE 60mm SPIRAL GALVANIZED. USE AS REQUIRED TO ENSURE SECURE ASSEMBLY.
- WOOD USED MAY BE LODGEPOLE PINE, FIR, HEMLOCK OR SPRUCE, DEPENDANT ON AVAILABILITY AT TIME OF CONSTRUCTION.
- ALL STAIN TO BE AS PER LANDSCAPE ARCHITECT. APPLY 2 COATS AS PER MANUFACTURERS SPECIFICATIONS. COLOUR TO BE DETERMINED BY LANDSCAPE ARCHITECT. STAIN BOARDS ALL FOUR SIDES PRIOR TO CONSTRUCTION.
- PRESSURE TREATED POSTS TO BE TREATED WITH A SOLUTION OF PENTACHLOROPHENOL AND PETROLEUM TO CSA-080.
- PROPERTY LINE OFFSET DIRECTION VARIES. REFER TO PLAN.
- ALL DIMENSIONS IN MILLIMETERS.



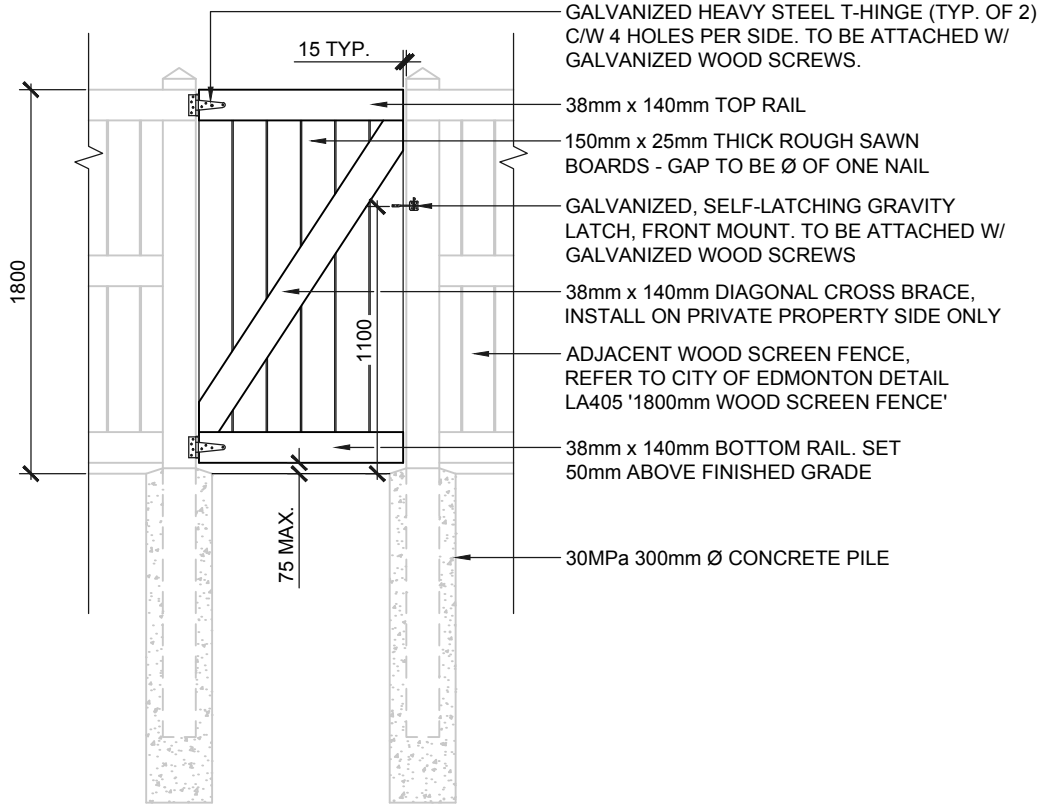
SECTION

NOTES:

- FENCES ON PRIVATE PROPERTY SHALL REQUIRE A MINIMUM OF PRESSURE TREATED POSTS AND BOTTOM RAILS. FENCES ON CITY PROPERTY SHALL REQUIRE ALL WOOD MEMBERS TO BE PRESSURE TREATED OR APPROVED EQUAL. ALL WOOD MEMBERS ABOVE GROUND TO BE NON-INCISED.
- ALL NAILS TO BE 60mm SPIRAL GALVANIZED. USE AS REQUIRED TO ENSURE SECURE ASSEMBLY. ALL HARDWARE TO BE GALVANIZED.
- WOOD USED MAY BE LODGEPOLE PINE, FIR, HEMLOCK OR SPRUCE, DEPENDANT ON AVAILABILITY AT TIME OF CONSTRUCTION.
- APPLY 2 COATS OF STAIN AS PER MANUFACTURERS SPECIFICATIONS. COLOUR TO BE DETERMINED BY LANDSCAPE ARCHITECT. STAIN BOARDS ALL FOUR SIDES PRIOR TO CONSTRUCTION.
- PROPERTY LINE OFFSET DIRECTION VARIES. REFER TO PLAN.
- ALL DIMENSIONS IN MILLIMETERS.
- GATE TO SWING INTO PRIVATE PROPERTY UNLESS OTHERWISE SPECIFIED.



PLAN



ELEVATION

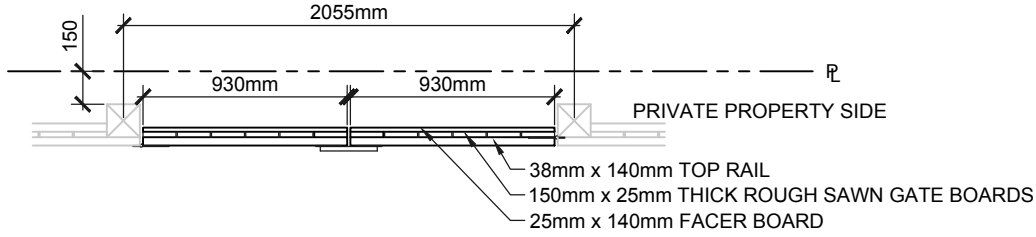
THE CITY OF Edmonton

1800mm WOOD FENCE GATE - SINGLE

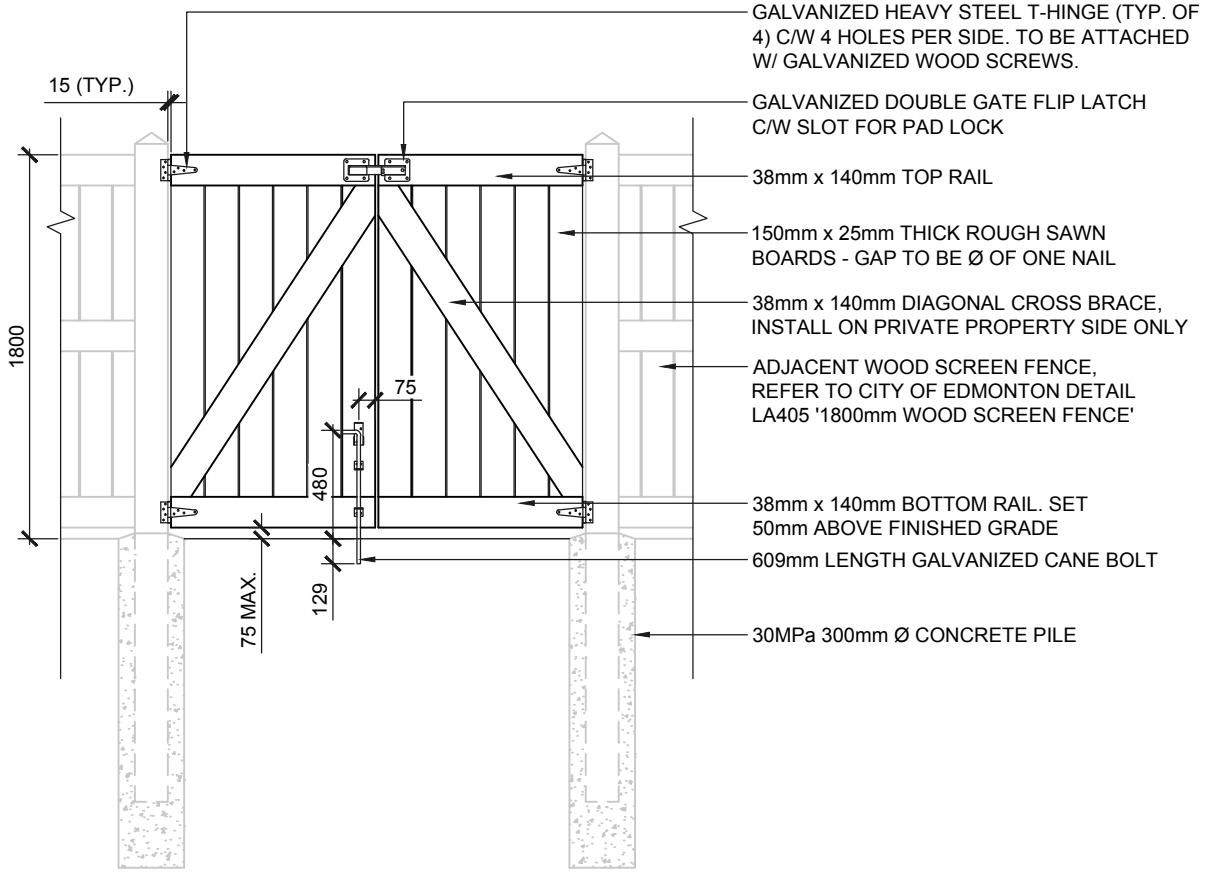
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA405A
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			N/A

NOTES:

- FENCES ON PRIVATE PROPERTY SHALL REQUIRE A MINIMUM OF PRESSURE TREATED POSTS AND BOTTOM RAILS. FENCES ON CITY PROPERTY SHALL REQUIRE ALL WOOD MEMBERS TO BE PRESSURE TREATED OR APPROVED EQUAL. ALL WOOD MEMBERS ABOVE GROUND TO BE NON-INCISED.
- ALL NAILS TO BE 60mm SPIRAL GALVANIZED. USE AS REQUIRED TO ENSURE SECURE ASSEMBLY. ALL HARDWARE TO BE GALVANIZED.
- WOOD USED MAY BE LODGEPOLE PINE, FIR, HEMLOCK OR SPRUCE, DEPENDANT ON AVAILABILITY AT TIME OF CONSTRUCTION.
- APPLY 2 COATS OF STAIN AS PER MANUFACTURERS SPECIFICATIONS. COLOUR TO BE DETERMINED BY LANDSCAPE ARCHITECT. STAIN BOARDS ALL FOUR SIDES PRIOR TO CONSTRUCTION.
- PROPERTY LINE OFFSET DIRECTION VARIES. REFER TO PLAN.
- ALL DIMENSIONS IN MILLIMETERS.
- GATE TO SWING INTO PRIVATE PROPERTY UNLESS OTHERWISE SPECIFIED.



PLAN

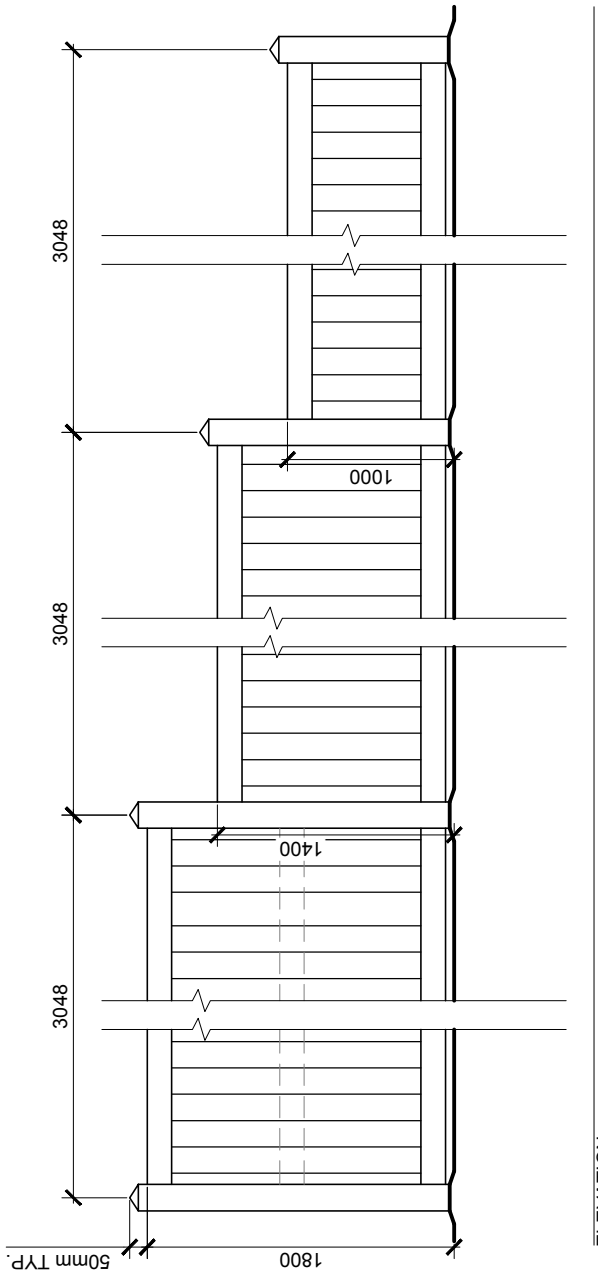


ELEVATION

THE CITY OF Edmonton

1800mm HEIGHT WOOD FENCE GATE - DOUBLE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA405B
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			N/A

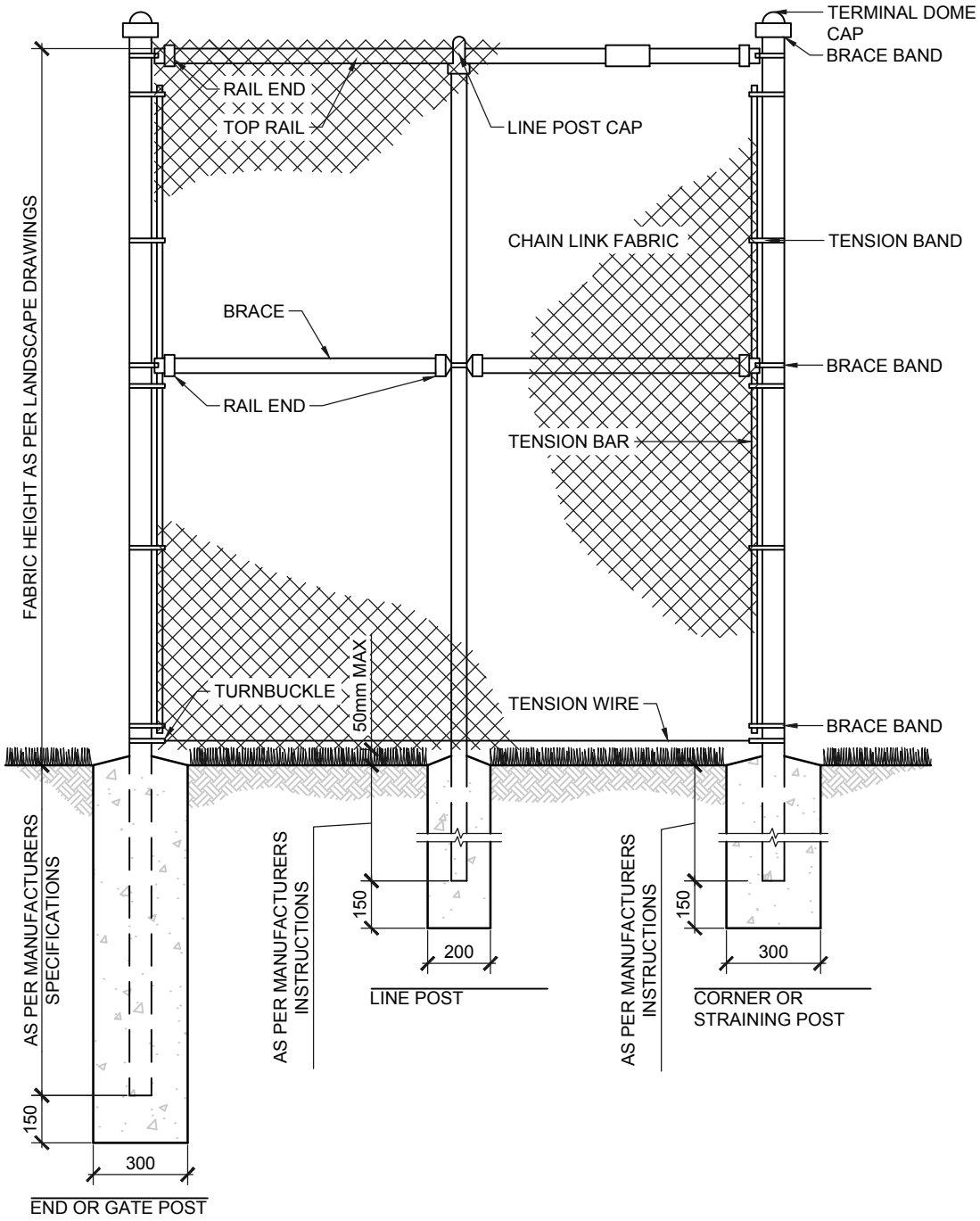


ELEVATION

NOTES:
- REFER TO CONSTRUCTION DETAIL LA405 FOR ALL METHODS AND MATERIALS REGARDING CONSTRUCTION OF WOOD SCREEN FENCING.

WOOD SCREEN FENCE STEPDOWN

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING			LA406
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-



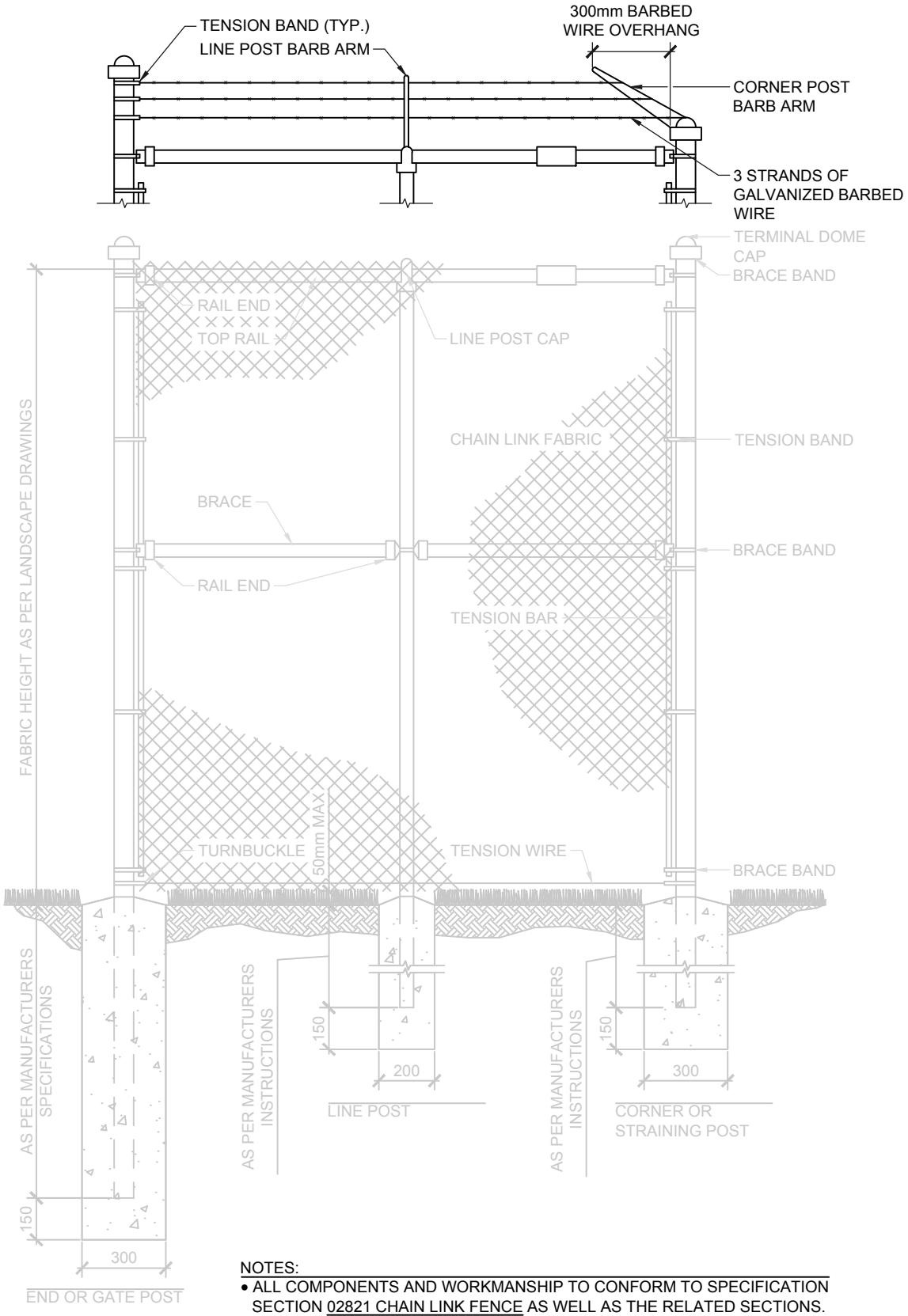
NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02821 CHAIN LINK FENCE AS WELL AS THE RELATED SECTIONS.
- ALL DIMENSIONS IN MILLIMETERS.

THE CITY OF Edmonton

CHAIN LINK FENCE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA407
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			9450



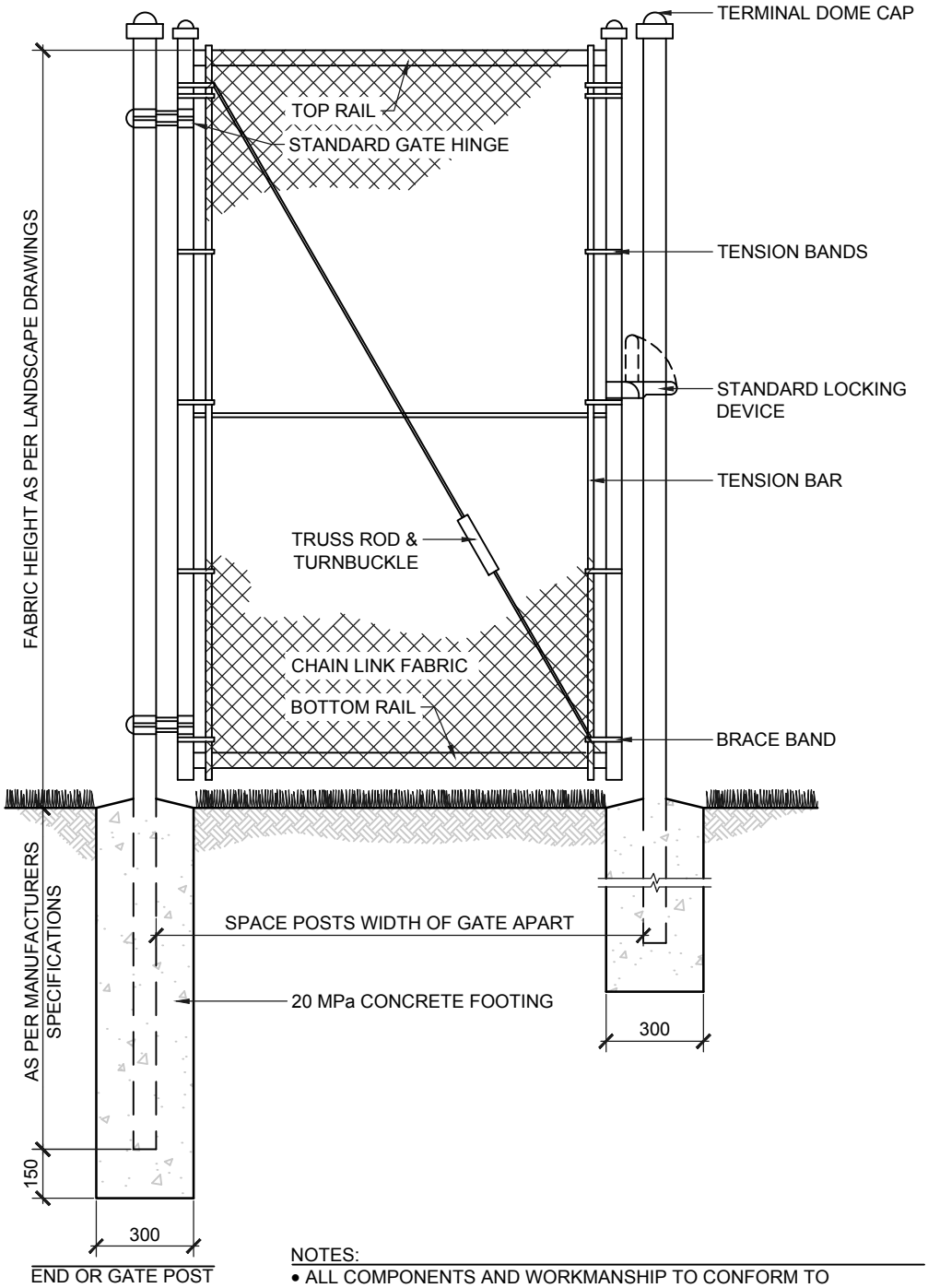
NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02821 CHAIN LINK FENCE AS WELL AS THE RELATED SECTIONS.
- ALL DIMENSIONS IN MILLIMETERS.

THE CITY OF Edmonton

BARBED WIRE FOR CHAIN LINK FENCE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA407A
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			N/A



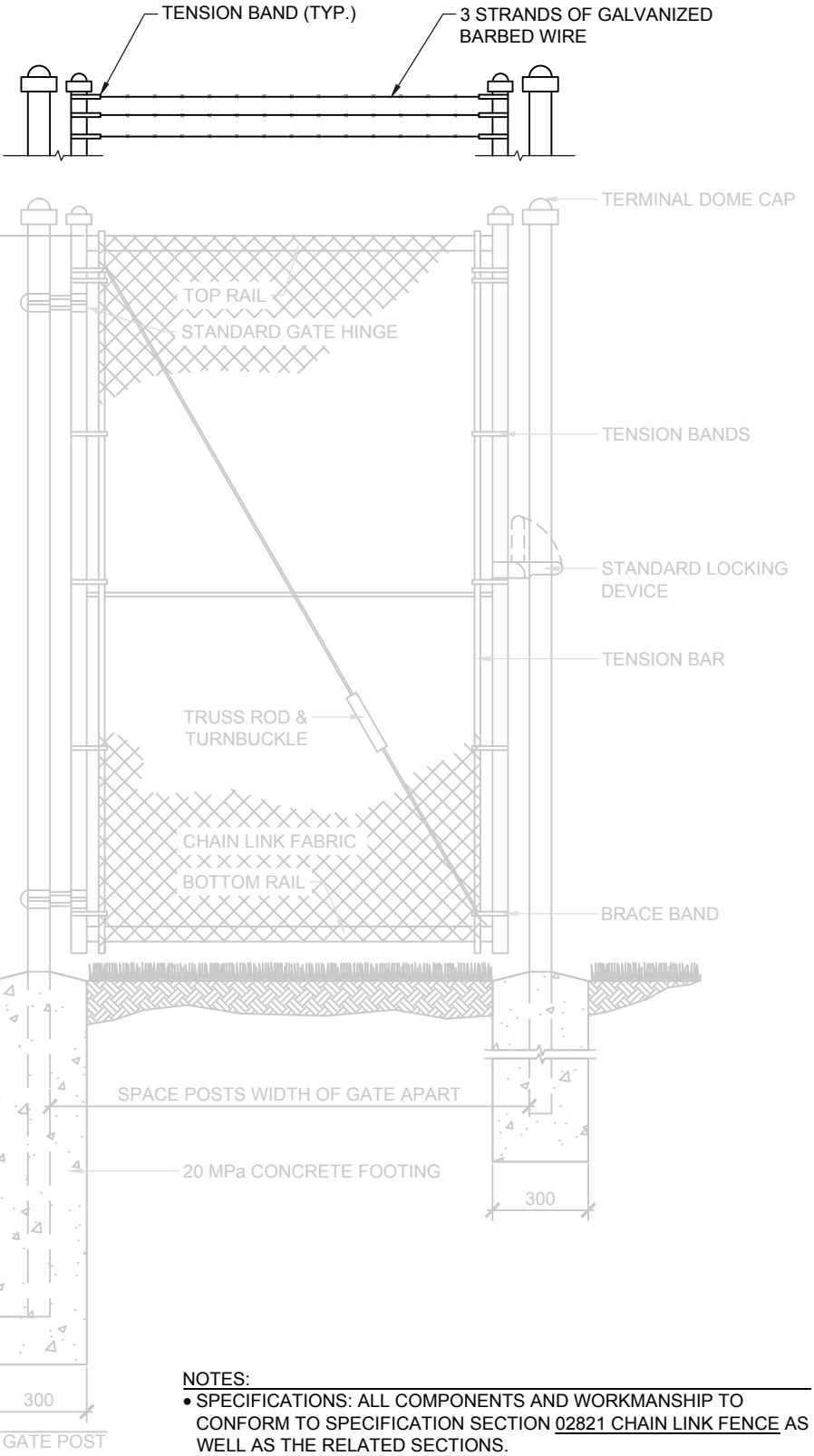
NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02821 CHAIN LINK FENCE AS WELL AS THE RELATED SECTIONS.
- ALL DIMENSIONS IN MILLIMETERS.

THE CITY OF Edmonton

CHAIN LINK FENCE SINGLE GATE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA408
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			9452



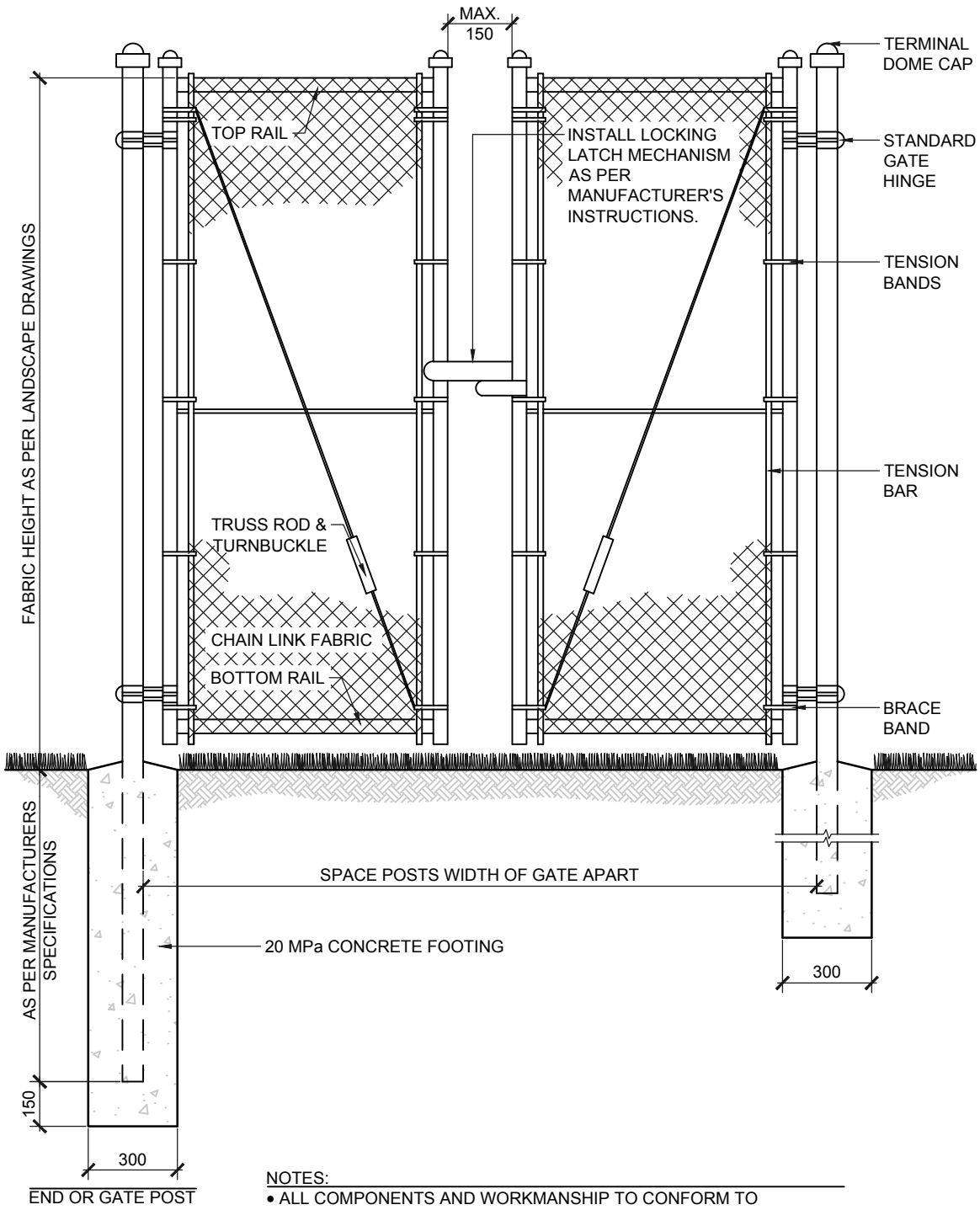
NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02821 CHAIN LINK FENCE AS WELL AS THE RELATED SECTIONS.
- ALL DIMENSIONS IN MILLIMETERS.

THE CITY OF Edmonton

BARBED WIRE FOR CHAIN LINK FENCE SINGLE GATE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA408A
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			N/A



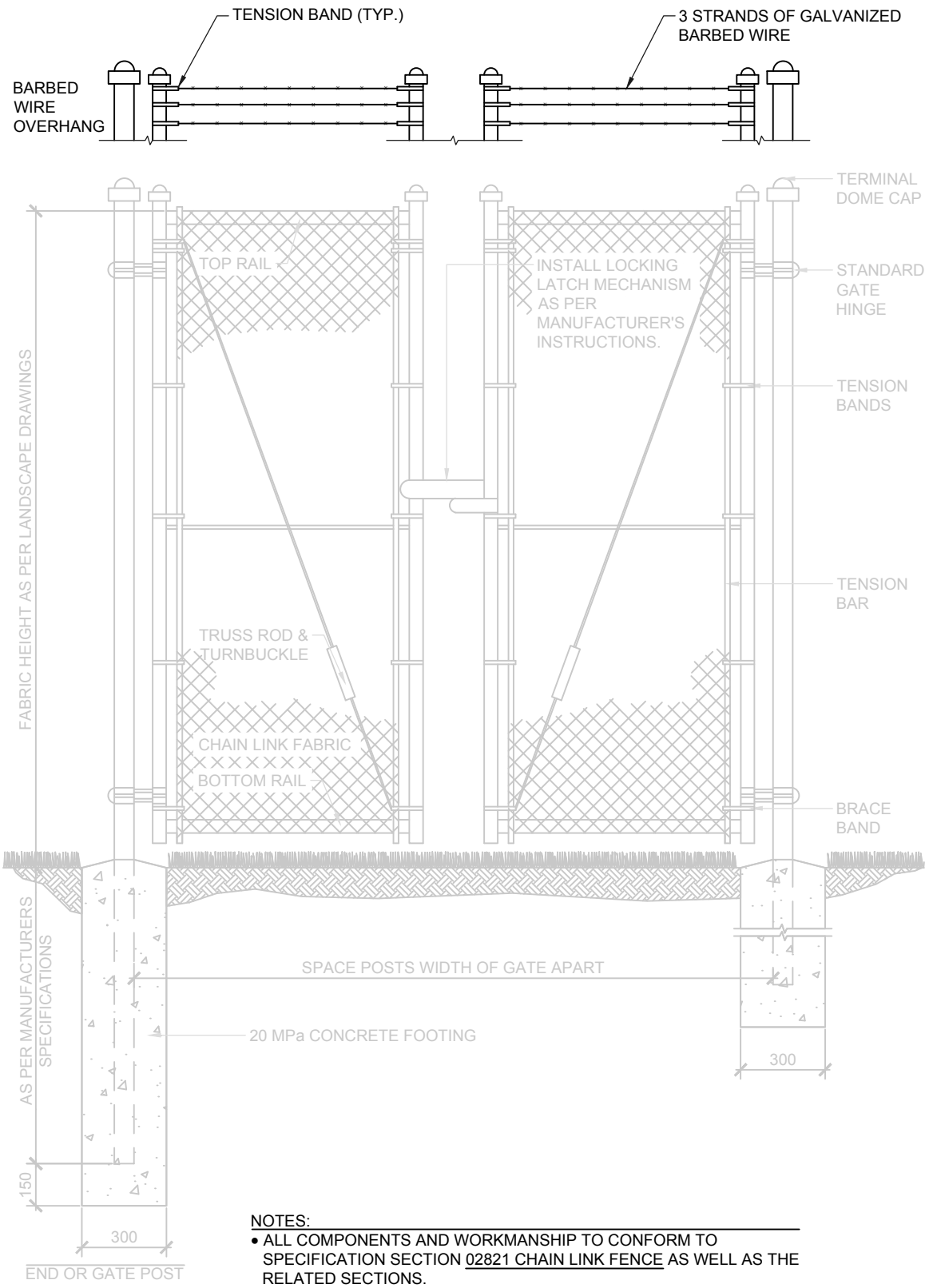
NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02821 CHAIN LINK FENCE AS WELL AS THE RELATED SECTIONS.
- ALL DIMENSIONS IN MILLIMETERS.

THE CITY OF Edmonton

CHAIN LINK FENCE DOUBLE GATE

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA409
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			9454



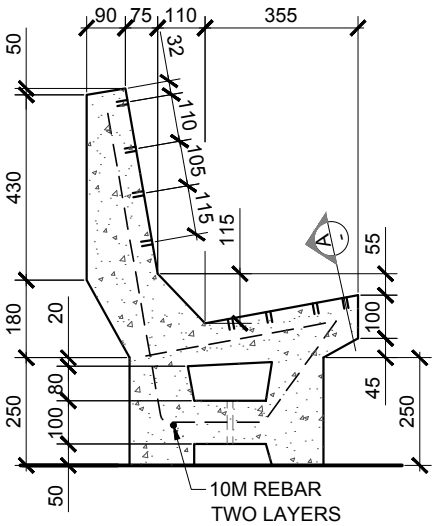
NOTES:

- ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02821 CHAIN LINK FENCE AS WELL AS THE RELATED SECTIONS.
- ALL DIMENSIONS IN MILLIMETERS.

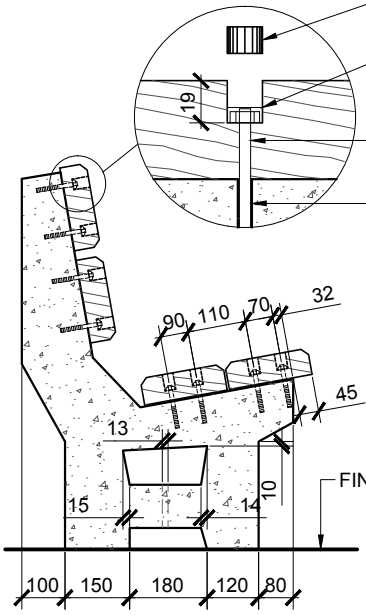
THE CITY OF Edmonton

BARBED WIRE FOR CHAIN LINK FENCE DOUBLE GATE

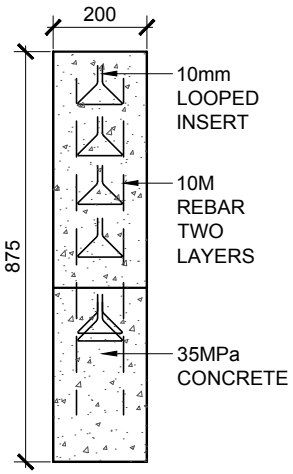
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA409A
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			N/A



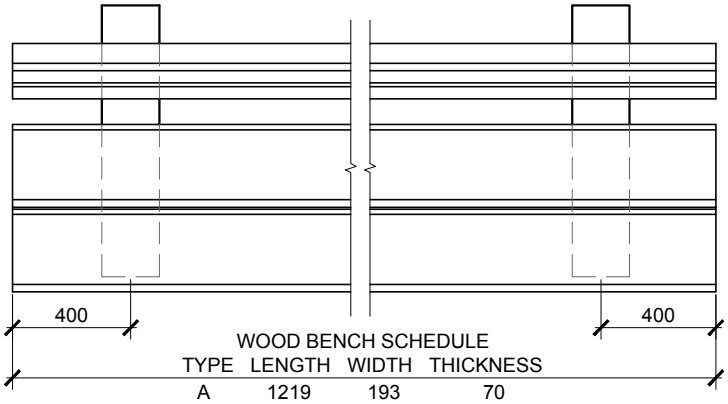
SECTION



SIDE ELEVATION



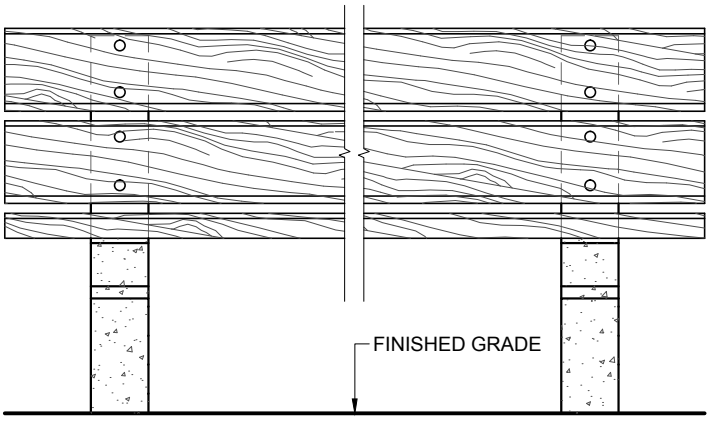
SECTION 'A'



WOOD BENCH SCHEDULE

TYPE	LENGTH	WIDTH	THICKNESS
A	1219	193	70
B	1829	193	70
C	2438	193	70
D	3048	790	70
E	3658	193	70

PLAN



FRONT ELEVATION

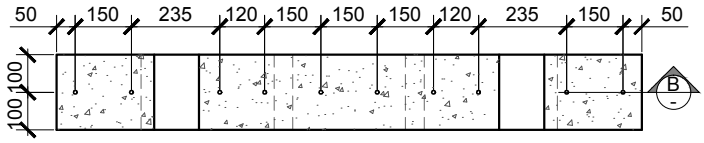
NOTES:

- WOOD TO BE SELECT, CLEAR NO. 1 DOUGLAS FIR, PINE, WESTERN CEDAR OR GLUE LAMINATED DOUGLAS FIR.
- STAIN WITH TWO COATS OF SEKINS (CETOL) CLEAR STAIN.
- PRECAST CONCRETE TO BE:
  - PEA GRAVEL (NATURAL ROUND)
  - MIN. STRENGTH 35MPa
  - AIR CONTENT 3 - 6%
  - SLUMP 100mm
  - SURFACE TO BE EXPOSED AGGREGATE (NOT SANDBLASTED)
  - SUPPLY SAMPLE FINISH FINISH 300 x 300mm SQ.
- REFER TO DETAIL LA502 FOR INSTALLATION OF BENCHES.

THE CITY OF Edmonton

BENCH - WOOD & CONCRETE

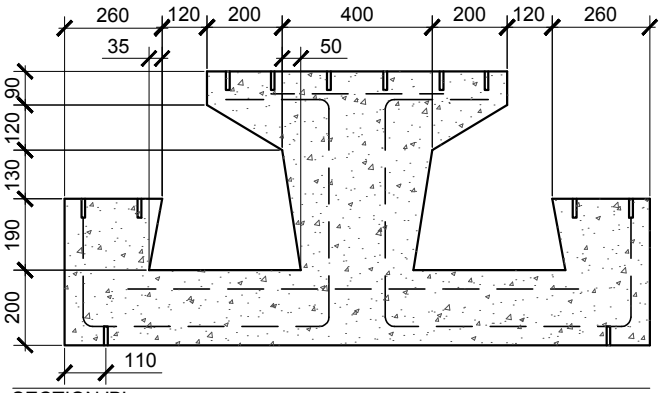
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING	Radovic		LA500
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP429



PLAN OF CONCRETE COMPONENT

NOTES:

- WOOD TO BE SELECT, CLEAR NO. 1 DOUGLAS FIR, PINE, WESTERN CEDAR OR GLUE LAMINATED DOUGLAS FIR.
- STAIN WITH TWO COATS OF SEKINS (CETOL) CLEAR STAIN.
- PRECAST CONCRETE TO BE:
  - PEA GRAVEL (NATURAL ROUND)
  - MIN. STRENGTH 35MPa
  - AIR CONTENT 3 - 6%
  - SLUMP 100mm
  - SURFACE TO BE EXPOSED AGGREGATE (NOT SANDBLASTED)
  - SUPPLY SAMPLE FINISH FINISH 300 x 300mm SQ.
- REFER TO DETAIL LA503 FOR INSTALLATION OF PICNIC TABLES.



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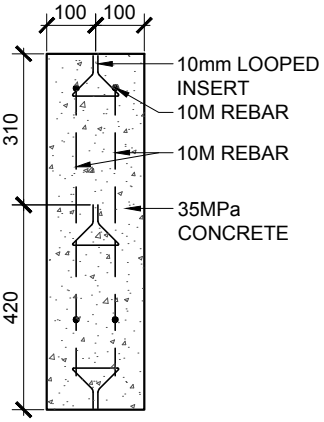
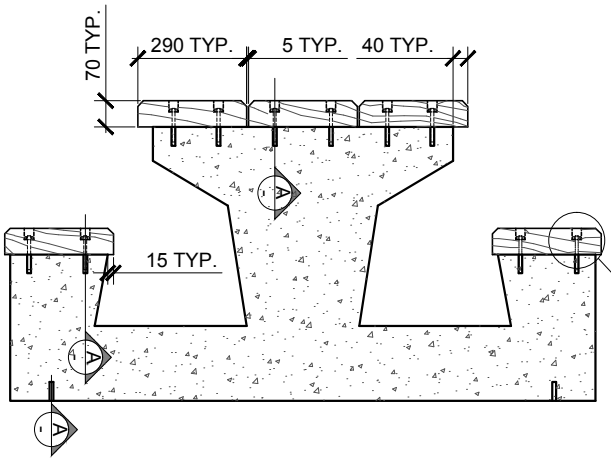
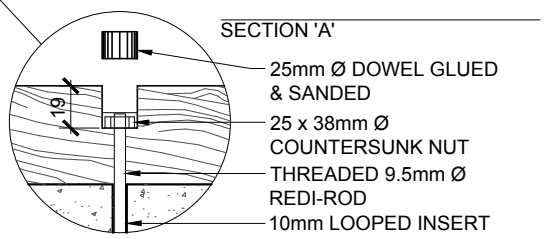
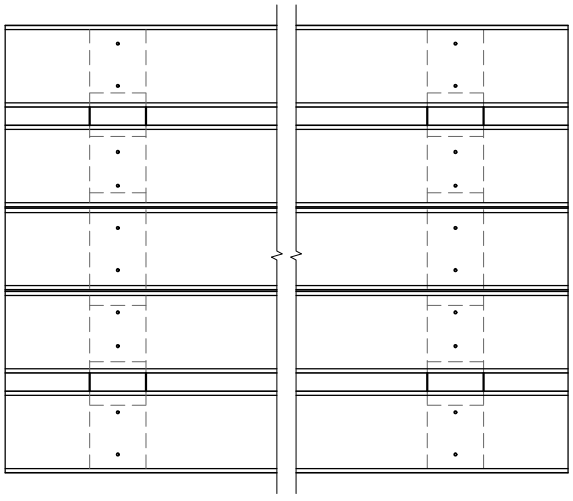


SECTION 'A'



END ELEVATION

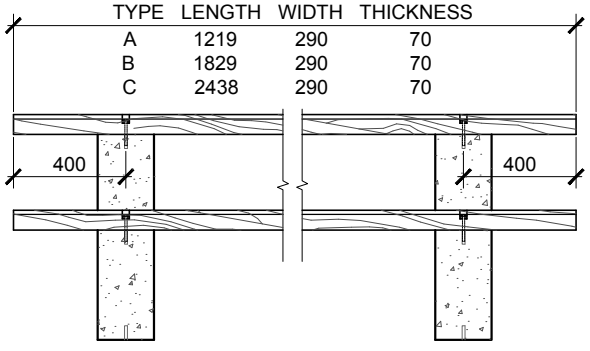




PLAN

WOOD TABLE SCHEDULE

TYPE	LENGTH	WIDTH	THICKNESS
A	1219	290	70
B	1829	290	70
C	2438	290	70



SIDE ELEVATION

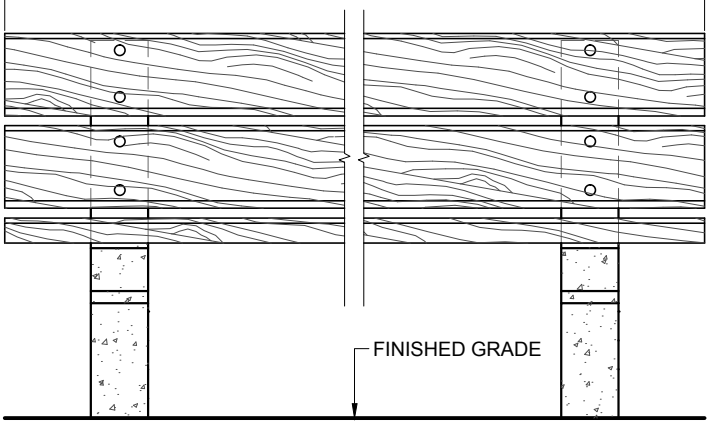
THE CITY OF Edmonton

PICNIC TABLE - WOOD & CONCRETE

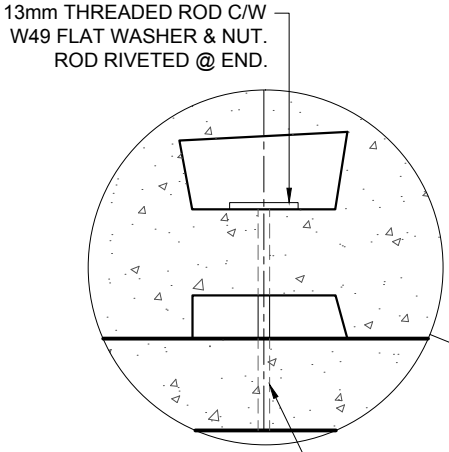
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING			LA501
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP428

WOOD BENCH SCHEDULE

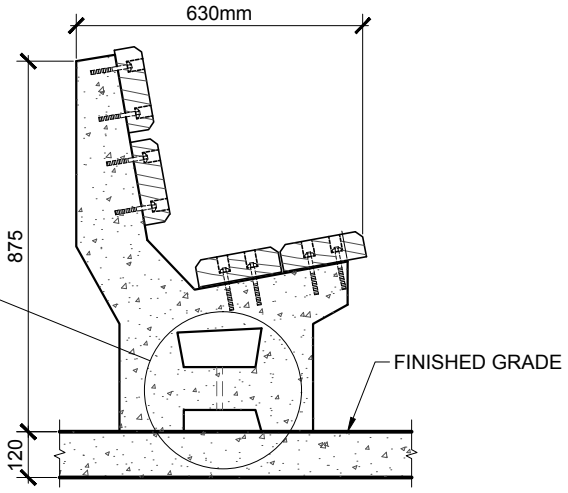
TYPE	LENGTH	WIDTH	THICKNESS
A	1219	193	70
B	1829	193	70
C	2438	193	70
D	3048	790	70
E	3658	193	70



FRONT ELEVATION



SIDE ELEVATION



SIDE ELEVATION

NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION 02870 SITE FURNISHINGS AS WELL AS THE RELATED SECTIONS.
- REFER TO CONSTRUCTION DETAIL LA500 FOR ALL METHODS AND MATERIALS REGARDING CONSTRUCTION OF BENCHES.

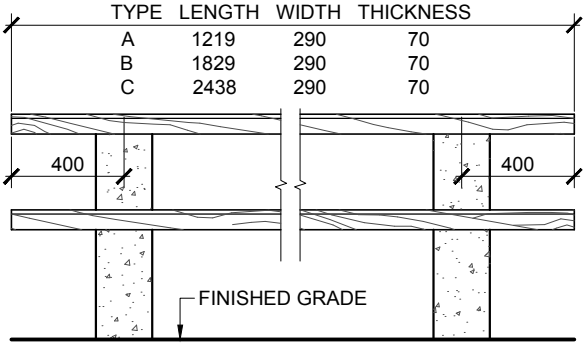
THE CITY OF Edmonton

BENCH INSTALLATION

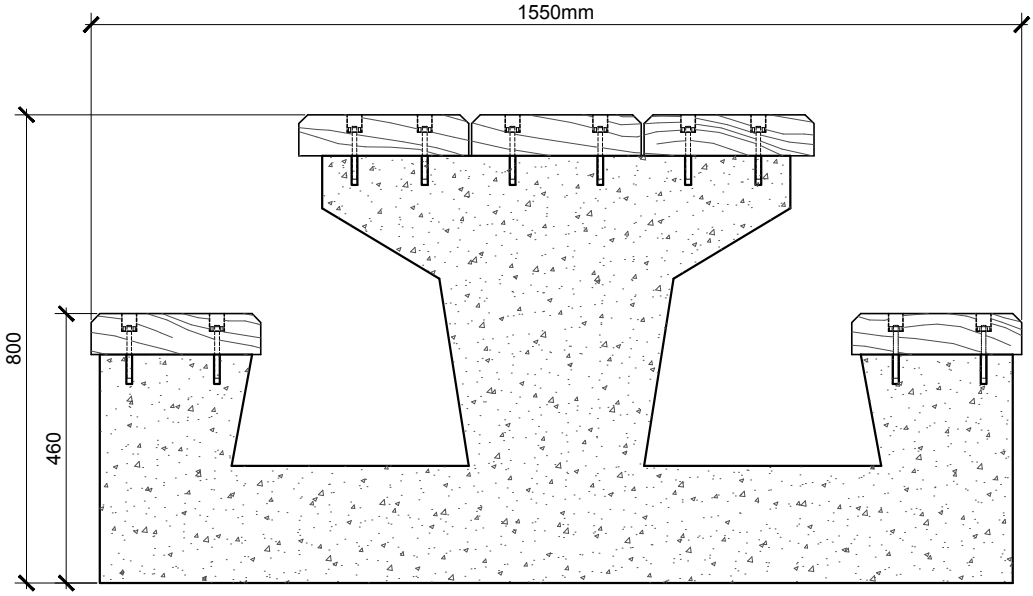
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING			LA502
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP313

WOOD TABLE SCHEDULE

TYPE	LENGTH	WIDTH	THICKNESS
A	1219	290	70
B	1829	290	70
C	2438	290	70



SIDE ELEVATION



END ELEVATION

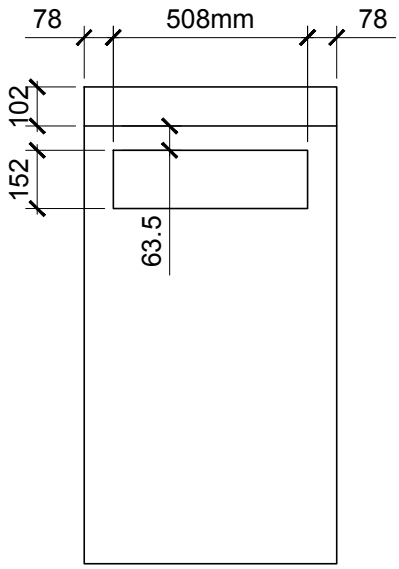
NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION 02870 SITE FURNISHINGS AS WELL AS THE RELATED SECTIONS.
- REFER TO CONSTRUCTION DETAIL LA501 FOR ALL METHODS AND MATERIALS REGARDING CONSTRUCTION OF PICNIC TABLES.
- NO ANCHOR OR FOOTINGS REQUIRED FOR INSTALLATION.

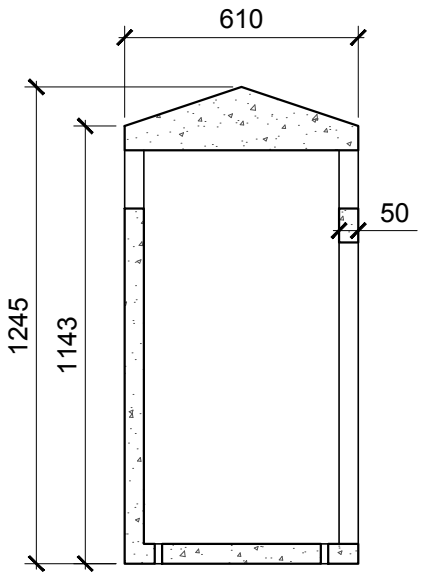
THE CITY OF Edmonton

PICNIC TABLE - INSTALLATION

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING	Madovic		LA503
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP312

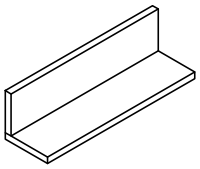


FRONT ELEVATION

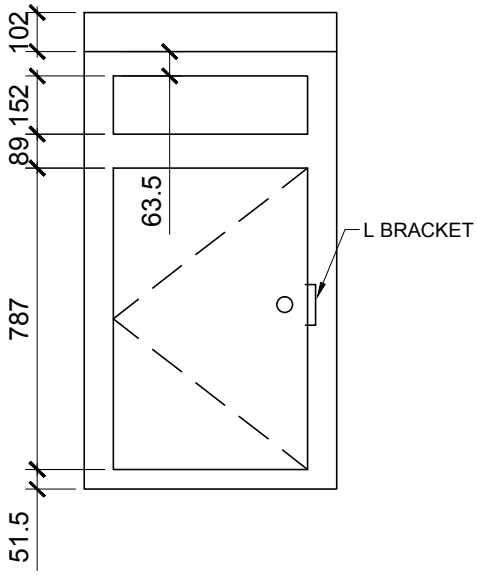


CROSS SECTION

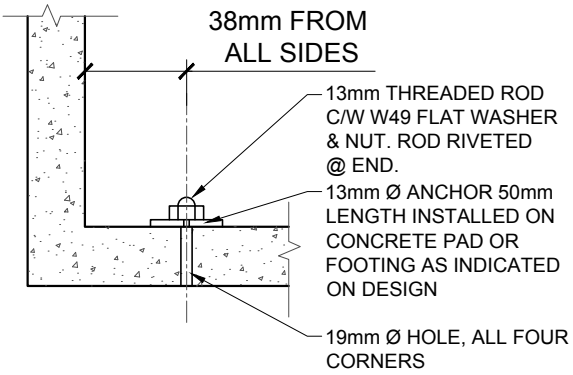
3mm THICK
25x25x100mm
LENGTH
L-BRACKET



L-BRACKET DETAIL



REAR ELEVATION



INSTALLATION DETAIL

NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02870 SITE FURNISHINGS AS WELL AS THE RELATED SECTIONS.
- FOR INSTALLATION ON ASPHALT, UNISTONE OR SHALE SURFACE USE 13mm x 1000mm LONG ROD THREADED AT ONE END AND DRIVEN THROUGH SURFACE INTO SUBGRADE.
- TYPICAL CONCRETE STRENGTH TO BE 4000 P.S.I. AT 28 DAYS.
- TYPICAL REBAR TO BE #10 EACH CORNER & #10 HORIZONTAL (2 FACES).
- 13mm NATURAL STONE AGGREGATE FINISH.
- DOOR TO HAVE 2 HINGES AND 6mm KEY LOCKS.
- CAPACITY - 25 LITRES.
- "L" BRACKET TO BE PAINTED BLACK.
- WELD "L" BRACKET ON INSIDE DOOR, CENTER TO KEY HOLE.

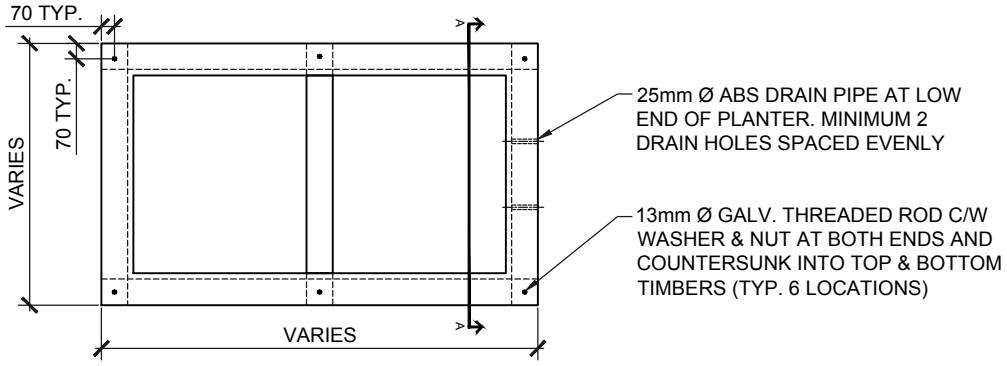
THE CITY OF Edmonton

CONCRETE LITTER CONTAINER & INSTALLATION

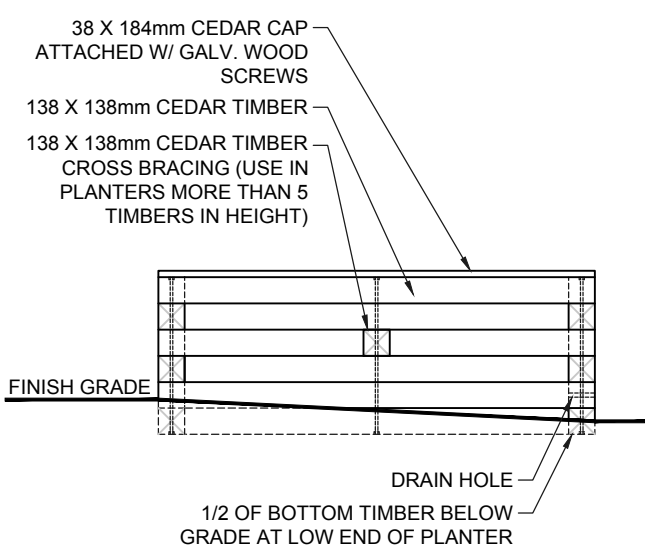
Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING			LA504
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			SP314

NOTES:

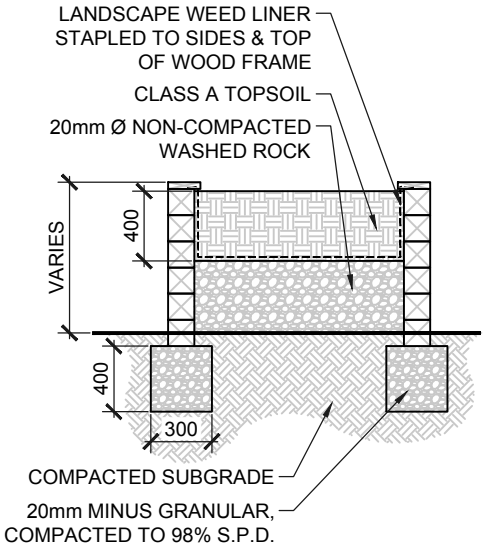
- ALL TIMBER TO BE CEDAR.
- ALL HARDWARE TO BE GALVANIZED. USE AS REQUIRED TO ENSURE SECURE ASSEMBLY.
- ALL DIMENSIONS IN MILLIMETERS.



PLAN



ELEVATION

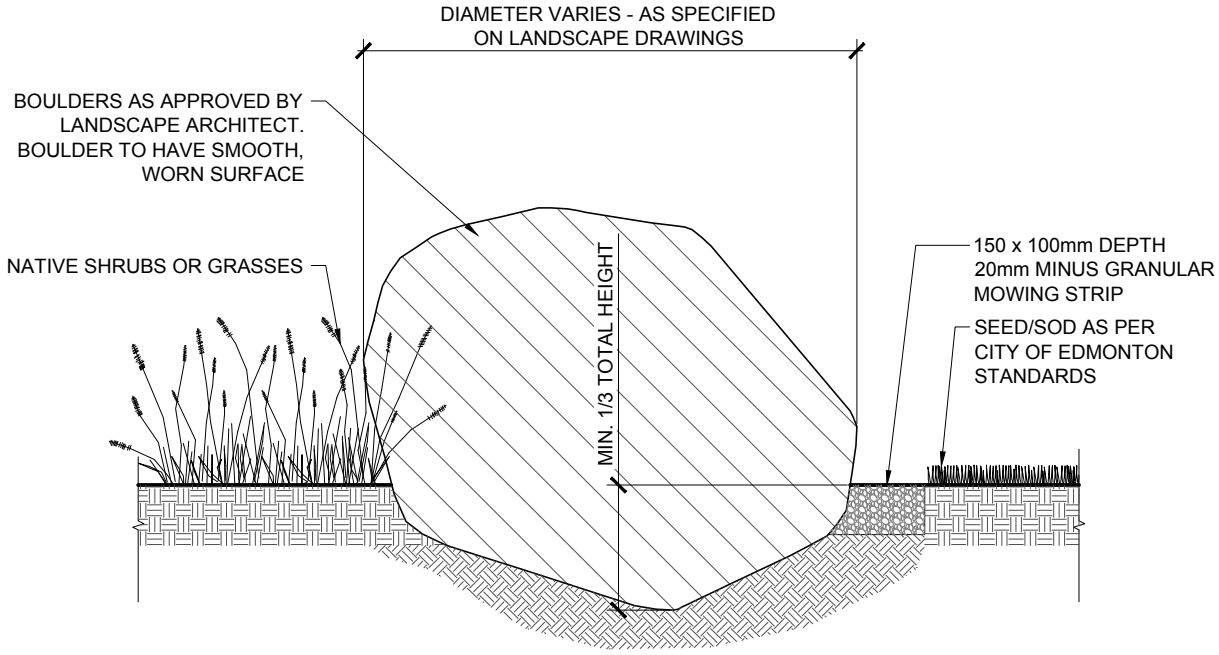


SECTION AA

THE CITY OF Edmonton

COMMUNITY GARDEN PLANTER

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
JUNE 2015	PARKS PLANNING	Frank Gasparik		LA505
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			N/A



NATURAL AREA INSTALLATION

FORMAL/MAINTAINED INSTALLATION

NOTES:

- IF BOULDERS ARE BEING PLACED IN AN AREA TO BE FINAL GRADED WITH GROWING MEDIUM, ENSURE THAT BOULDERS ARE IN PLACE PRIOR TO PLACEMENT OF GROWING MEDIUM.
- ENSURE BOULDERS ARE COMPLETELY SETTLED AND STABLE. BURY TO MINIMUM 1/3 TOTAL HEIGHT.
- 20mm MINUS GRANULAR. SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, FIRMLY COMPACTED.

THE CITY OF Edmonton

BOULDER INSTALLATION

Date Approved:	Drawn By:	Approved:	Revision	Drawing No.
SEPT 2013	PARKS PLANNING	Radovic		LA600
Scale:	Checked By:			Old Drawing No.
N.T.S.	PARKS PLANNING			-

THE CITY OF Edmonton

CULVERT UNDER WALKWAY

Date Approved: SEPT 2013

Scale: N.T.S.

Drawn By: PARKS PLANNING

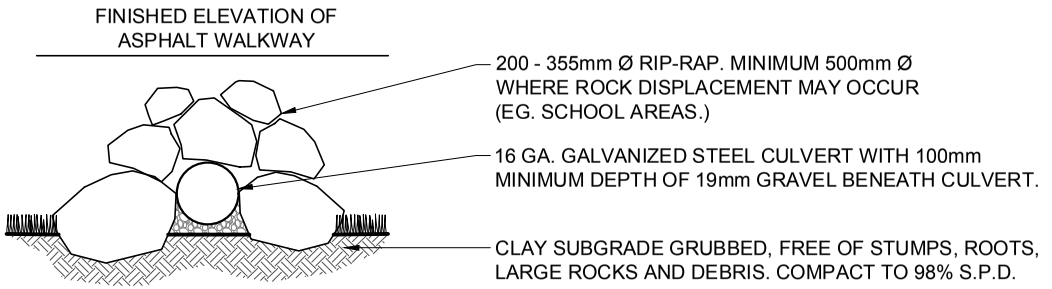
Checked By: PARKS PLANNING

Approved:

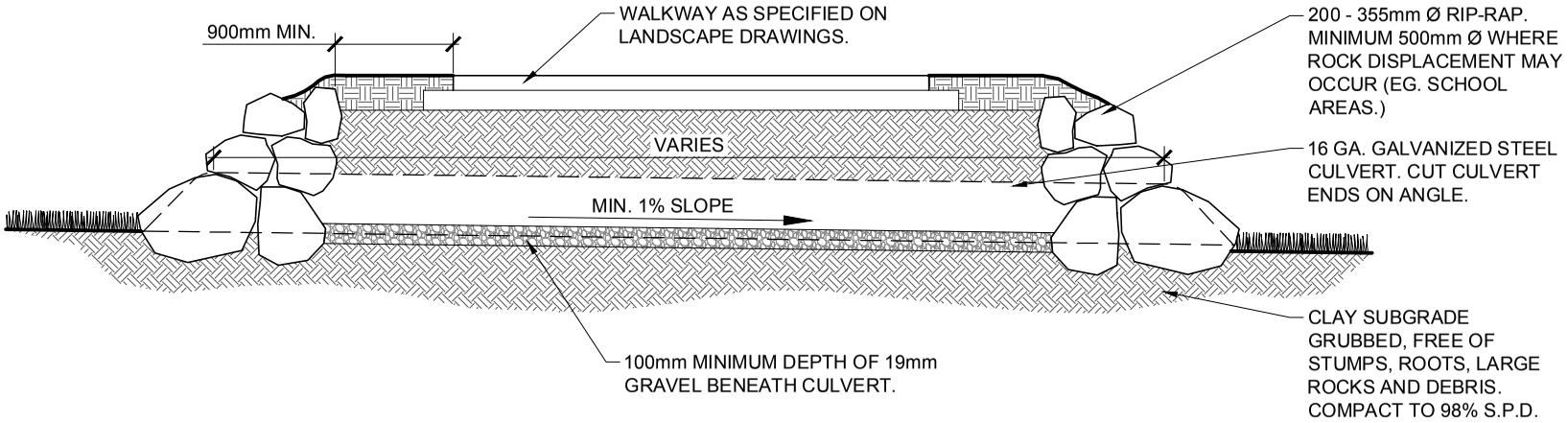
Revision

Drawing No. LA601

Old Drawing No. -



ELEVATION



CROSS SECTION

NOTES:

- SPECIFICATIONS: ALL COMPONENTS AND WORKMANSHIP CONFORM TO SPECIFICATION SECTION 02640 CORRUGATED STEEL PIPE CULVERT AS WELL AS THE RELATED SECTIONS.
- 20mm MINUS GRANULAR. SECTION 2060 AGGREGATE DESIGNATION 3, CLASS 20A, COMPACT TO 97% S.P.D.

THE CITY OF Edmonton

WOOD BRIDGE WITH RECYCLED PLASTIC PRODUCT DECK

Date Approved: SEPT 2013

Drawn By: PARKS PLANNING

Checked By: PARKS PLANNING

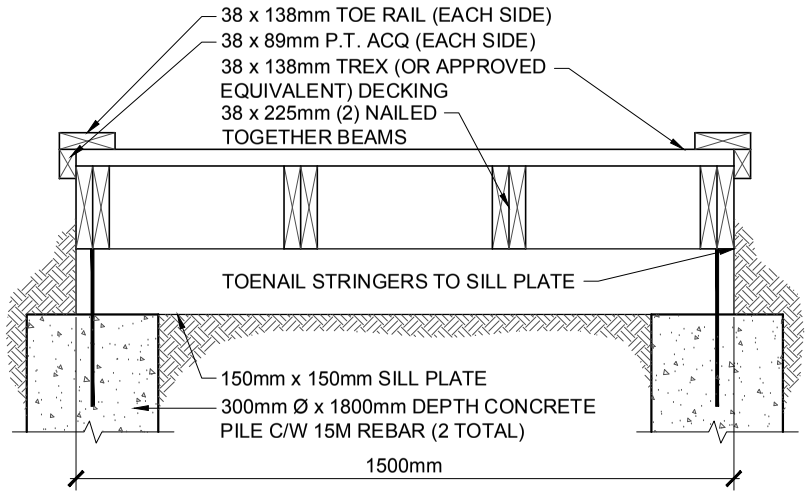
Scale: N.T.S.

Approved:

Revision

Drawing No. LA602

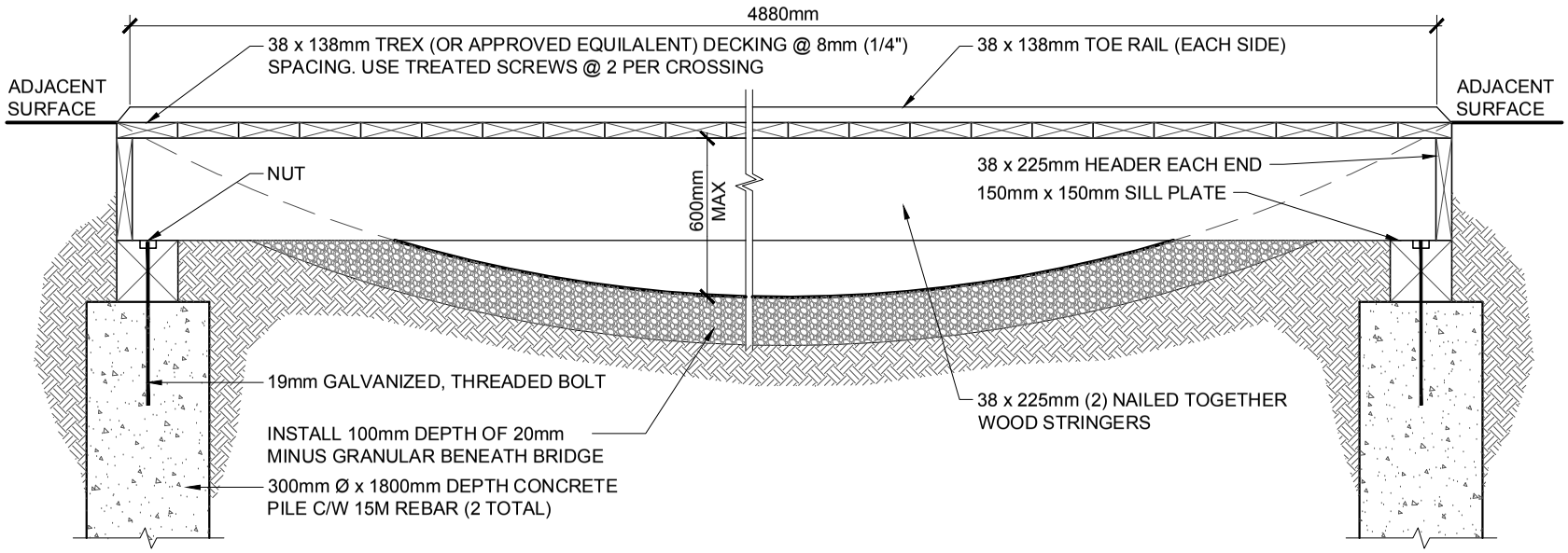
Old Drawing No. -



CROSS SECTION

NOTES:

- WOOD USED MAY BE LODGEPOLE PINE, FIR, HEMLOCK OR SPRUCE, DEPENDANT ON AVAILABILITY AT TIME OF CONSTRUCTION.
- ALL WOOD TO BE PRESSURE TREATED ACQ, EXCEPT BRIDGES IN PLAYGROUND AREAS. USE CEDAR WOOD INSTEAD OF PRESSURE TREATED ACQ.
- ALL WOOD MEMBERS ABOVE GROUND TO BE NON-INCISED.
- ALL NAILS TO BE 75mm SPIRAL GALVANIZED. USE AS REQUIRED TO ENSURE SECURE ASSEMBLY.
- ALL WOOD CUTS TO BE COATED WITH TWO COATS OF APPROVED WOOD PRESERVATIVE.
- 20 MINUS GRANULAR. SECTION 2060 AGGREGATE: DESIGNATION 3, CLASS 20A, COMPACT FIRMLY.



SIDE ELEVATION

Landscape Construction Specification Reference

Specification No.	Specification Title	Issue Date
02821	Chain Link Fence	June 2016
02870	Site Furnishings	June 2017
02910	Topsoil	June 2016
02914	Mulches	June 2016
02918	Colour Coding of T-Bar Tree Stakes	June 2016
02920	Seed and Sod	June 2017
02930	Trees, Shrubs and Ground Covers	June 2016
02931	Naturalization	June 2016
04420	Feature Boulders and Collected Stone	June 2016

1. GENERAL

1.1 SCOPE

Supply and installation of chain link fence

1.2 RELATED SECTIONS

Portland Cement Concrete Section 03055 Volume 2 Roadways

2. PRODUCTS

2.1 CHAIN LINK FABRIC: conforming to CGSB CAN2-138.1M.

2.1.1 Type I steel fabric, medium style; class A zinc-coated, grade 1 at minimum 490 g/m².

2.1.2 Nominal wire diameter: 3.5 mm (9-gauge)

2.1.3 Mesh size: 50 mm.

2.1.4 Fabric height: 1.2, 1.5, 1.8, 2.1 or 2.4 m as specified.

2.1.5 Selvage: twisted top and knuckled bottom.

2.2 FENCE FRAMEWORK: conforming to CGSB CAN2-138.2M

2.2.1 **Posts and Rails:** Hot-dip galvanized welded steel pipe, standard weight (schedule 40, ASTM A120), zinc-coated at minimum 550 g/m² and with the following minimum dimensions:

Fabric Height (m)	**1.2**	**1.5**	**1.8**	**2.1**	**2.4**
Line Post Outside Diameter (OD, mm)	48.3	48.3	60.3	60.3	60.3
Length (m)	2.0	2.3	2.6	2.9	3.2
Terminal Post (end, gate corner, straining) (OD, mm)	73.0	73.0	88.9	88.9	88.9
Length (m)	2.3	2.6	2.9	3.2	3.5
Rail and Brace (OD, mm)	-	-	42.2	42.2	42.2

2.2.2 **Bottom Tension Wire:** 5 mm diameter (6-gauge) steel wire, zinc-coated at minimum 490 g/m²

2.3 FITTINGS: CONFORMING TO ASTM F626 AS FOLLOWS

	Minimum Dimensions (mm)	Min Zinc Coating (g/m2)	Fabrication Material
Post Cap and Rail End	varies	366	Pressed Steel or Cast Iron
Top Rail Sleeve	2.0 thick x 175 long	366	Round Steel Tubing
Tie Wire and Clip	3.5 diameter (9 gauge aluminium)	122	Round Steel Tubing
Tension and Brace Bands	2.0 thick x 19.0 wide	366	Pressed Steel
Tension Bar	5.0 thick x 16.0 wide	366	Steel Strip
Turnbuckle	varies	366	Steel
Barb Arm	2.0 thick (14 - gauge)	366	Pressed Steel

2.4 BARBED WIRE OVERHANG:

May be specified in the work item, specifying fences 1.8 m in height or greater.

2.4.1 End and Gate Posts: To be 1.4 m longer than fabric height when barbed wire overhang is specified.

2.4.2 Barb Arms: Fabricated as in 2.1.3 with eyes to hold top rail; to hold 3 strands of barbed wire, top strand to be 300 mm above fabric; vertical or at 45° overhang, as specified.

2.4.3 Barbed Wire: Conforming to ASTM A121 and CGSB CAN2-138.2M, with 3 strands, 2 wires each strand; each wire 2.5 mm diameter (12.5 gauge), zinc-coated at minimum 245 g/m². Barbs to have 4 points, each 10 mm minimum length, at 150 mm maximum spacing, made from 2 mm diameter (14-gauge) steel wire with minimum 183 g/m² zinc coating.

2.5 GATES:

2.5.1 Gate Fabric: To match fence fabric Clause 2.1.1.

2.5.2 Gate Frame: As in Clause 2.2.1 with minimum 42.2 mm outside diameter; to be electrically welded at all joints and hot-dip galvanized after welding. If braces are required, use truss rod and turnbuckle adequate for gate size.

2.5.3 Gate Fittings: Malleable iron hinges, latch and latch catch, all galvanized as specified in Clause 2.1.1. Latch catch to have provision for a padlock that can be attached and operated from either side of gate. Hinges shall permit gate to open 90° or 180° as specified.

2.5.4 Double Gate: To have centre rest with drop bolt for closed position and chain hook to hold gates open, all galvanized as specified in Clause 2.1.1.

2.5.5 Gate Barbed Wire: If required, to match fence barbed wire.

2.5.6 Zinc pigmented paint: Submit paint sample to the City for approval.

2.6 CONCRETE FOR POST FOOTING::

Conforming to Section 03055 - Portland Cement Concrete, Class E with the following modified criteria:

Minimum compressive strength: 17.5 MPa at 28 days

Maximum aggregate size: 25 mm

3. EXECUTION

3.1 SITE PREPARATION

3.1.1 Necessary site clearing and grading will be done by others, or as specified in the Special Provisions.

3.1.2 The fence contractor shall do minor levelling of the ground where necessary.

3.1.3 The City will stake out fence lines and locations of end, corner and gate posts.

3.2 POST LOCATION

3.2.1 Line Posts: Set line posts not more than 3 m apart, measured parallel to ground surface.

3.2.2 Straining Posts: Where end or corner posts are more than 150 m apart over reasonably smooth grade, set straining posts at equal intervals not exceeding 150 m on a straight continuous stretch of fence. Set additional straining posts at sharp changes in grade or where directed by the City.

3.2.3 Corner Post: Set corner post where change in alignment exceeds 20°.

3.2.4 Gate Posts: Set gate posts on both sides of gate opening.

3.2.5 End Post: set end post at end of fence.

3.3 POST SETTING

3.3.1 Post Hole: Dig or drill post holes to the following minimum diameters and depths that will allow at least 150 mm of footing below bottom of post.

Fabric Height (m)	1.2	1.5	1.8	2.1	2.4
Line Post Hole Diameter (mm)	200	200	250	250	250
Depth (m)	0.9	0.9	0.9	0.9	0.9
Terminal Post Hole Diameter (mm)	300	300	360	360	360
Depth (m)	1.2	1.2	1.2	1.2	1.2

3.3.2 Concrete Footing: Place concrete in post hole and embed post to a minimum depth below ground of 0.75 m for line posts and 1.05 m for terminal posts. Extend concrete 50 mm above ground level and crown to drain away from post. Brace post in plumb position and true to alignment and elevation until the concrete has set. Let concrete footing cure for a minimum 5 days before proceeding with further work.

3.3.3 **Poor Soil:** In poor soil conditions, set post into concrete footing of such diameter and depth as will provide adequate stability to the fence, subject to acceptance by the City.

3.4 TOP RAIL

3.4.1 Support top rail at each line post with a line post cap so that a continuous brace is formed between terminal posts.

3.4.2 Join rails with sleeves to allow for expansion and contraction. Securely fasten top rail to terminal posts using rail ends and brace bands.

3.5 TERMINAL POST BRACING

3.5.1 Install brace from end and gateposts to nearest line post at mid-panel and parallel to top rail.

3.5.2 Install braces on both sides of corner and straining posts in similar manner.

3.6 BOTTOM TENSION WIRE

Install tension wire within the bottom 50 mm of fabric. Stretch wire taut and free of sag and fasten securely to end, corner, gate and straining posts with tension bands and turnbuckles

3.7 CHAIN LINK FABRIC

3.7.1 Place fabric outside of area enclosed, or as directed by the City. Bottom of fabric shall be 50 mm above finished ground level.

3.7.2 Stretch fabric to tension recommended by manufacturer and fasten to end, corner, gate and straining posts using tension bands at 300 mm spacing.

3.7.3 Secure fabric to line post, top rail and bottom tension wire with tie wire at 450 mm intervals. Give tie wires a minimum of 2 twists. Tie wires are not to protrude out, they are to be folded inwards.

3.7.4 Installed fabric shall have a smooth uniform appearance free of sag, dent and bulge.

3.7.5 Barbed twist to be placed down, when installing fence.

3.8 GATES

3.8.1 Install gates according to the drawings or as directed by the City. Reference Detail LA408 – LA409A.

3.8.2 For a double gate, cast centre rest in concrete and dome concrete above ground level to shed water.

3.8.3 Install gates true to opening and plumb in a closed position.

3.8.4 Install gate stops where indicated.

3.9 BARBED WIRE OVERHANG

3.9.1 If barbed wire is specified, install barb arms in lieu of caps on top of line, straining and corner posts. Position overhang towards area enclosed, unless directed otherwise.

3.9.2 Stretch each barbed wire strand taut and free of sag, attach firmly into slots of barb arms and secure to end and gate posts.

3.10 TOUCH UP

Clean damaged surfaces with wire brush to remove loose and cracked spelter coatings. Then apply 2 coats of approved zinc pigmented paint.

3.11 WORKMANSHIP

The installed chain link fence shall be free of any defect or imperfection that can affect its serviceability and appearance. The fence shall follow ground contours smoothly without sharp changes in grade.

3.12 CLEANUP

3.12.1 Clear the work site of excavated material, surplus material and all debris.

3.12.2 Repair damaged sod. Leave site reasonably smooth and consistent with surrounding grades.

END OF SECTION

1. GENERAL

1.1 SCOPE

1.1.1 Furniture wood, stain, preservatives, application, assembly, installation and hardware.

1.1.2 All landscape furniture elements to be fully assembled in shop prior to delivery to the site.

1.1.3 Protect furniture during transportation to site.

1.1.4 The City may elect to supply approved standard furniture from an approved supplier or custom manufacturer, all to approved shop drawings and specifications. Approved landscape drawings and specifications will outline supply details.

1.2 INSPECTION

The City will inspect all landscape furniture prior to installation. Broken, scarred, or damaged furniture elements will not be accepted.

2. PRODUCTS

2.1 MATERIALS

2.1.1 All wood furniture elements to be No. 1 wood as defined by the Alberta Forest Products Association.

2.1.2 All wood furniture elements to be sanded smooth and all edges sanded round with no sharp corners or edges.

2.1.3 Vandal Proof (tamper resistant, locking hardware) must be provided at a rate of one per Litter/ Recycling Receptacle, two per Bench and two per Picnic Table.

2.1.4 All other fasteners and anchor bolts to be zinc coated, galvanized or stainless steel Type 304 (Grade 18-8).

2.1.5 Coat with a water-based and UV resistant City of Edmonton approved stain and top coat.

3. EXECUTION

3.1 PREPARATION

3.1.1 Treat wood after members have been cut to size and all millwork completed.

3.1.2 All wood furniture elements to be sanded, cleaned and coated prior to assembly.

3.1.3 All wood members shall be stained with a minimum of two coats of a water-based and UV resistant City of Edmonton approved coating.

3.1.4 All end cuts shall be treated with a water-based end sealer.

3.1.5 Drying time between coats as per manufacturer’s specification.

3.1.6 All fastening hardware to be counter sunk, prior to staining.

3.1.7 All assembled furniture elements shall be securely anchored with stainless, zinc or galvanized coated hardware on site, as specified on the approved landscape drawings and specifications.

END OF SECTION

1. GENERAL

1.1. SCOPE:

Preparing subgrade, place topsoil and inspections

1.2. RELATED SECTIONS:

Trees, Shrubs and Ground Covers Section 02930

1.3. DEFINITIONS

Weeds: Includes but not limited to dandelions, jimsonweed, quackgrass, horsetail, morning glory, rush grass , mustard, lambsquarter, chickweed, crabgrass, Canadian thistle, tansy, ragwort, bermuda grass bindweed, bent grass, perennial sorrel, brome grass, red root, pigweed, buckweed, scentless chamomile, toadflax, foxtail and perennial sow thistle.

2. PRODUCTS

2.1. CLASS B TOPSOIL FROM CITY SOURCE

Obtain from designated City stockpile; free of weeds.

2.2. TOPSOIL MIXTURES:

The following topsoil mixes are utilized by Community Services:

2.2.1. No. 1 Mix: 1 part Class B topsoil, 1 part sand, 1 part peat moss

2.2.2. Native Soil Mix: 1 part Class B topsoil, 1 part sand, 3 parts native soil or as directed by the City.

2.2.3. Peat Moss: Peat moss shall be horticultural quality, free of any foreign material, lumps, ice, clay, soil, stumps, rocks, quack grass and noxious weeds. Peat moss shall be pulverized and shall pass through a 33 mm screen. Peat moss when tested by an accredited testing laboratory shall meet with the following limits:

Soil reaction (pH)	4.5 - 6.0
Conductivity (mm hos)	maximum 2.0
Sulphates max.	200 maximum ppm
Free of lime	Nil

Nitrogen, phosphorous and potassium will be evaluated on available nutrients.

2.2.4. Sand for horticulture use: When tested by means of laboratory sieves, the sand shall meet the following grading requirements and be uniformly graded between the limits given:

Passing	Cumulative % by Weight
2.5 mm (No. 8)	100
1.25 mm (No. 16)	90 - 100
0.8 mm (No. 20)	80 - 90
0.315 mm (No. 50)	30 - 60
0.16 mm (No. 100)	10-Feb
0.063 mm (No. 200)	1% maximum

Sand shall be natural and coarse, except for the removal of very fine particles and gravel, and conform to the above specifications. Sand shall be free from vegetation, clay balls, or other extraneous material. Reasonable care in the selection of material in a pit shall be used to produce a uniform product.

2.2.5. Lime: Dry, free-flowing, ground limestone containing not less than 85% of total combined carbonates, to the following gradation:

Sieve Size (mm)	Minimum % Passing, by Mass
800	90
160	50

2.3. TEXTURAL CLASSES FOR TOPSOIL (LOAMS)

Topsoil shall fall within an allowance of Sand ±5%, Silt ±10% and Clay ±10%, of the values stated in the table below.

Soil	Sand (%)	Silt (%)	Clay (%)	Class
1. Topsoil A	60	30	10	Sandy Loam
2. Topsoil B (Recommended)	35	35	30	Loam
3. Topsoil C	25	40	35	Clay Loam

2.4. ANALYSIS

Testing and inspection of imported topsoil from non-approved City sources:

2.4.1. The Contractor shall submit representative samples of the topsoil to be used for the intended project to a professional Agrologist for analysis and recommendations. A copy of the report shall be submitted to the City for approval.

2.4.2. The City shall provide written approval to the contractor.

2.4.3. The soil analysis report will include the topsoil source and the recommendations for correction to meet the nutritional growing requirements of specified plant materials. Recommendations will clearly state the type and quantity of soil additives and application procedure to be used. Only accredited testing companies accepted by the City of Edmonton's Quality Assurance Services will be retained.

2.4.4. Topsoil analysis to be submitted to the City prior to construction. Such analysis shall be performed on representative samples from each topsoil source and shall determine nitrogen, phosphorus, potash, soluble salt content, electrical conductivity, pH value and percentage sodium absorption ratio values of sand, clay and organic matter, conforming to the following:

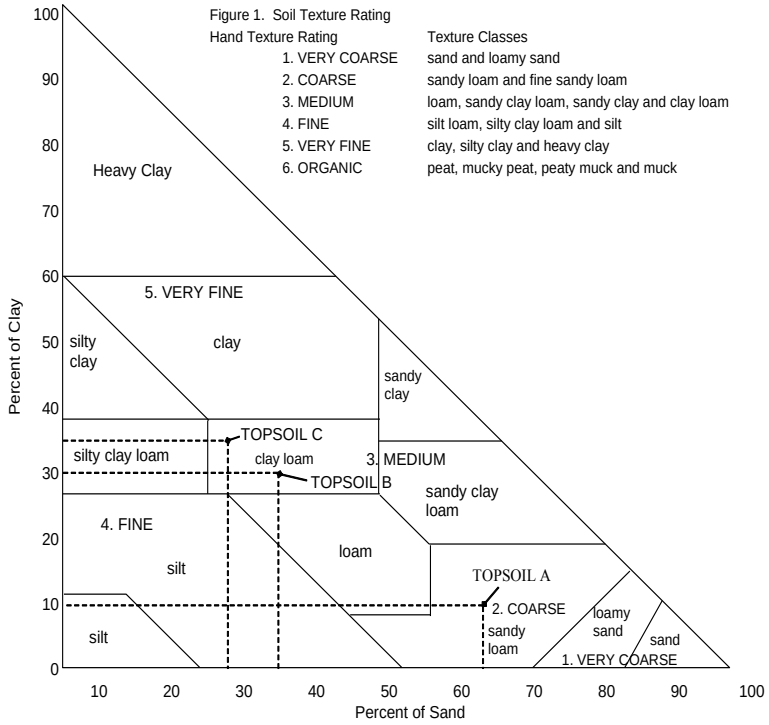
RECOMMENDED SOIL COMPOSITION:

Sand:	35% (±5%) by dry mass
Clay:	30% (±10%) by dry mass*
Silt:	35% (±10%) by dry mass*
Organic Matter:	5% - 10% by dry mass
Toxic Chemicals:	None
Electrical Conductivity:	Maximum 1.5 dS/m
pH Value (saturated paste):	6.0 to 7.5
Sodium Absorption	less than 6

Note: All soils must fall within the Clay Loam Classification

*Note: Total fine grain component (silt and clay) must not exceed 65%

2.4.5. Soil Texture



2.5. EQUIPMENT

2.5.1. Cultivators capable of scarifying, discing or harrowing.

2.5.2. Rollers of suitable size and mass and any other equipment the City may determine necessary to complete the topsoil installation.

3. EXECUTION

3.1. DELIVERY STORAGE AND HANDLING

3.1.1. If topsoil is to be stockpiled on public lands, locations must be designated by the City.

3.1.2. When loading topsoil from a designated City stockpile, do not leave a vertical face.

3.1.3. No soil stockpiling by the Contractor on future Municipal Reserve lands unless written permission is granted by the Director, Project Development, Community Services. Such permission will not be unreasonably withheld.

3.2. PLACING TOPSOIL

3.2.1. The City shall approve the subgrade prior to placing topsoil and approve finished grade before the Contractor proceeds with the next phase of work.

3.2.2. Do not place topsoil when either topsoil or subgrade is frozen, excessively wet, extremely dry, or in a condition inhibiting proper grading, cultivation, or compaction.

3.2.3. Spread topsoil uniformly on prepared subsoil to achieve a minimum compacted or settled depth of 100 mm for sodded areas and 150 mm for seeded areas unless otherwise stated.

3.2.4. Cultivate topsoil to a depth of 75mm, breaking down lumps. Remove stones larger than 50 mm, weeds, roots and other foreign matter.

3.2.5. Manually spread topsoil around trees and plants to prevent damage by grading and levelling equipment.

3.2.6. Float the area until surface is smooth. Cut smooth and flush areas adjacent to catch basin rims. Remove all lumps, rocks, roots and other debris from the finished material and from the site.

3.2.7. Fine grade to eliminate rough or low areas and to ensure positive drainage.

3.2.8. Compact topsoil with suitable rollers to the satisfaction of the City.

3.2.9. Final topsoil grades for seeded areas shall be flush to finished grade at surface structures, i.e. manholes, sidewalks and curbs.

3.2.10. For sodding, the final grade of compacted topsoil shall be 25 mm below finished grade of adjacent work such as walk, curb and manhole and 25 mm below crown of adjacent turfed area.

3.2.11. When abutting an existing turfed area, cut the existing turf so as to form a straight or non-jagged joint with the new seeded or sodded area.

3.2.12. The City shall approve topsoil preparation prior to seeding or sodding.

3.3. CLEAN-UP

Clean soil and debris resulting from work done under this section off roadway, walkway and surrounding areas at the end of each working day or as directed by the City.

END OF SECTION

1. GENERAL

1.1. SCOPE

Supplying materials, wood chip mulch, bark chip mulch, maintenance and inspections.

1.2. RELATED SECTIONS

Trees, Shrubs and Ground Covers Section 02930

1.3. PRODUCT DELIVERY, HANDLING and STORAGE

1.3.1. Supply mulch as specified on approved landscape drawings and specifications.

1.3.2. Protect mulch stockpile on site from contamination of airborne herbicides, pesticides, fertilizers and other hazardous chemicals.

1.3.3. Avoid the placement of mulches in excessively wet conditions or when the ground is frozen.

1.3.4. All organic mulches shall be generally free of diseases, moulds, fungi and insect infestations.

1.3.5. All organic mulches shall be free of inorganic materials such as metal, glass, rock and other foreign materials.

1.4. SUBSTITUTION

All mulches shall be supplied and installed as specified. Substitutions will not be allowed unless approved by the City.

1.5. INSPECTION

The City will inspect all mulches prior to installation. The Contractor must provide a mulch sample to the City for approval prior to site installations.

2. PRODUCTS

2.1. BARK WOOD MULCH

Mature bark of coniferous trees, cedar, pine, redwood, fir chipped to sizes ranging from 40 mm to 60 mm.

2.2. CONIFEROUS WOOD CHIP MULCH

Chipped trees, mulch containing bark, wood and needles. Maximum chipped sizes 50 mm to 100 mm. Free of non-organic materials, wood preservatives or diseased wood. For use on trails or pathways, picnic sites as surface cover and on planting beds containing acid loving plants such as azaleas, conifers and rhododendrons. Coniferous wood chip mulch is NOT for use in shrub beds, except as designated in this paragraph.

2.3. DECIDOUS WOOD CHIP MULCH

Chipped ash, elm, maple, poplar, birch and other deciduous trees. Mulch containing bark, wood and leaves (in summer) chipped to sizes ranging from 50 mm to 100 mm. Mulch may contain stringy twigs and seed, free of non-organic material, wood preservatives or diseased wood. Contains no more than 5% of the following materials in total: soil, sawdust, peat moss, coniferous wood and needles.

2.4. SOFTWOOD LUMBER CHIPS

Lumber, pallets and shingles chipped to a maximum size of 100 mm long x 5 mm thick & 40 mm wide. Free of all chemicals such as wood preservatives, paints, glues etc. Free of foreign materials such as nails, bolts, drywall or other refuse. No more than 5% soil and or sawdust.

2.5. PROHIBITED MULCHES

The following mulches are prohibited: rock, gravel, stone, shale, sawdust, shavings, peat moss, manures or raw composts, paper products, plastics, rubbers, aluminium foils, gelatinous sprays, plywoods and other lumbers containing chemical adhesives or wood preservatives.

3. EXECUTION

3.1. INSTALLATION

3.1.1. Include statement that 100 mm depth of deciduous wood chip mulch must be maintained to edge of planting bed.

3.1.2. All mulches to be installed during active growing season. Water plants prior to applying mulch.

3.1.3. During application all mulches shall be kept at least 50 mm to 75 mm away from tree trunks and shrubs.

3.2. PREPARATION

3.2.1. Remove all weeds and debris from area of installation.

3.2.2. A weed liner shall accompany organic mulches when designated on the Contract drawings.

3.3. SPREADING

3.3.1. Apply bark chip mulch in a 50 mm to 100 mm maximum layer in special areas as per drawings.

3.3.2. Apply coniferous wood chip mulch in acid tolerant planting beds to a minimum depth of 100 mm, except around tree trunks where chips are to be pulled back, leaving only a 25 mm depth.

3.3.3. Apply deciduous wood chip mulch to a minimum depth of 100 mm.

3.3.4. Apply softwood lumber chips in maximum layers of 50 mm to 100 mm.

3.4. CLEAN-UP

Clean roadway, walkway and surrounding turf of mulches and other debris caused by work under this Section at the end of each working day or as directed by the City.

3.5. MAINTENANCE

Spot control of weeds and seedling growth twice per year or as may be necessary. All mulched areas to be weed free during Construction Completion Certificate and Final Acceptance Certificate inspections

END OF SECTION

1. GENERAL

1.1 All "T" or "U" bar tree stakes will have the top 300 mm painted the appropriate colour code according to year planted. Colour coding of tree stakes is required for all trees to be maintained by Community Services.

YEAR	COLOUR
2012	Blue
2013	White
2014	Yellow
2015	Green
2016	Blue
2017	White
2018	Yellow
2019	Green
2020	Blue
2021	White
2022	Yellow

END OF SECTION

1. GENERAL

1.1. SCOPE

Supplying materials, seeding, sodding, fertilizing, watering, mulching, maintenance and inspection.

1.2. RELATED SECTIONS

Topsoil.	Section 02910
Trees, Shrubs and Ground Covers.	Section 02930

1.3. DEFINITIONS

Weeds: Includes but not limited to dandelions, jimsonweed, quack grass, horsetail, morning glory, rush grass, mustard, lambsquarter, chickweed, crabgrass, Canadian thistle, tansy, ragwort, bermuda grass, bindweed, bent grass, perennial sorrel, brome grass, red root, pigweed, buckweed, scentless chamomile, toadflax, foxtail and perennial sow thistle.

1.4. PRODUCT DELIVER, STORAGE AND HANDLING

1.4.1. Deliver grass seed in the original containers, tagged with identification as to the analysis of seed mixture, percentages of seed, year of seed production, net weight and date.

1.4.2. Deliver seed to site only when required.

1.4.3. Protect sod during transportation with tarpaulin to prevent sun scalding and drying out and to ensure its arrival at the site in a healthy condition.

1.4.4. Sod must be installed on the day of arrival at site. If delays in installation occur due to weather, protect sod on site from sun, keep sod moist and store in a cool place until installation. Sod that is dried out and not in a healthy growing condition will be rejected.

1.5. SUBSTITUTION

The City will review all requests by the Contractor for substitution of seed mixes.

1.6. INSPECTION

1.6.1. The City may require a seed germination test and all lawn seed must comply with Federal and Provincial seed laws. Germination test to be co-ordinated by the Contractor and the seed supplier.

1.6.2. Inspection of sod at source of supply, at the site or during the course of construction will not impair the right of the City to reject sod which has been damaged or which, in any way, does not conform to the specifications.

1.6.3. The City will inspect all seed and sod installations.

1.6.4. Remove all rejected materials from site immediately.

2. PRODUCTS

2.1. SEED MIXTURE

Certified Canada No. 1 mixture, free of disease, weed seeds or foreign matter, minimum germination of 75%, minimum purity of 97% and conforming to the mixes below or approved alternatives. All seed must be from a recognized seed firm, meeting the requirements for the Seeds act for Canada No. 1 Seed. Seed shall be certified No. 1 grade. A germination test and/or weed seed analysis may be requested and all lawn seed must comply with federal and provincial seed laws.

2.1.1. For standard roadway landscaping and steep slopes “Canada #1 Mix”:

30% Argyll Kentucky Bluegrass
30% Kentucky Bluegrass
30% Creeping Red Fescue
10% Annual Rye Grass

2.1.2. For rehabilitation of existing turf area “Parks Maintenance #1 Mix”:

30% Touchdown Kentucky Bluegrass
20% Banff Kentucky Bluegrass
30% Creeping Red Fescue
20% Fiesta II Perennial Rye Grass

2.1.3. Native and Naturalization Seed Mixes:

2.1.3.1. For non-maintained naturalized areas, or natural areas undergoing restoration, use native or naturalized seed mixes based on the ecosite or environmental conditions for the area. Examples of appropriate seed mixes to the Parkland Region are listed below. Percentages can range +/- 5%.

2.1.3.2. If mixes do not already contain a nurse crop or nitrogen fixer, adjust mixes to include 5-10% of a native nitrogen fixing species from the following choices: Purple Prairie Clover (Dalea purpureum var. purpureum), Canada Milkvetch (Astragalus canadensis), or American Vetch (Vicia Americana). Species chosen must be appropriate for site environment and intended result (e.g. slope stabilization).

2.1.3.3. Native seed mixes are used for habitat restoration (see Section 3.3.21) to fully re-establish a target level of ecosystem function and biodiversity as defined by the reference habitat. Native grass species can also be used when establishing landscapes with a natural aesthetic. Applicable for the following site types where restoration is determined to be the appropriate approach:

- Parkland natural area restoration;
- Ravine or river valley restoration;
- Disturbed sites that are surrounded by natural areas or native reference vegetation areas (Examples: Roadways, buffers, boulevards, culverts).

2.1.3.4. Native Seed Mix – Peace River Parkland

35% Awned Wheatgrass (Agropyron trachycaulum var. unilaterale);
15% Rocky Mountain Fescue (Festuca saximontana);
15% Western Wheatgrass (Agropyron smithii);
5% Junegrass (Koeleria macrantha);
5% Western Porcupine grass (Stipa spartea);
25% Slender Wheatgrass (Agropyron trachycaulum var. trachycaulum).

2.1.3.5. Native Seed Mix - Central Parkland

15% Awned Wheatgrass (Agropyron trachycaulum var. unilaterale);
15% Slender Wheatgrass (Agropyron trachycaulum var. trachycaulum);
15% Western Wheatgrass (Agropyron smithii);
5% Sloughgrass (Beckmannia syzigachne);
5% Idaho Fescue (Festuca idahoensis);
5% Alkali Bluegrass (Poa secunda ssp. juncifolia);
5% Junegrass (Koeleria macrantha);
5% Sandberg Bluegrass (Poa secunda);
20% Green Needlegrass (Stipa viridula);
10% Rocky Mountain Fescue (Festuca saximontana).

2.1.3.6. Naturalization Seed Mixes

The following seed mixes are examples of seed mixes that can be used when establishing a naturalized aesthetic in parks or open spaces, or for a particular ecological function.

Naturalization seed mixes are suitable for habitat restoration (see Section 3.3.22) as Naturalization is a type of restoration that involves the deliberate reintroduction of species that are native to a given area or are well adapted to the climate circumstance, and activities that are intended to improve and enhance the natural environment. The biodiversity and ecosystem function of a naturalized ecosystem is lower compared to a reference habitat but higher compared to a reclaimed ecosystem.

Naturalization seed mixes are also suitable for reclamation (see Section 3.3.23), which is a type of habitat restoration that aims to stabilize disturbed lands to an ecologically productive use. A reclaimed ecosystem has less biodiversity and ecosystem function compared to a reference habitat, and the least compared to other types of habitat restoration.

Specific site recommendations:

- Bioswales;
- Stormwater Management Facilities (SWMF);
- Banks and erosion control;
- Parkland.

2.1.3.7. Non-Maintained Naturalization Landscaping - Wet meadow Seed Mix

10% Awned Wheatgrass (Agropyron trachycaulum var. unilaterale);
10% Western Wheatgrass (Agropyron smithii);
10% Sloughgrass (Beckmannia syzigachne);
20% Tufted Hair Grass (Deschampsia caespitosa);
15% Giant Wild Rye (Elymus piperi syn. Cinereus);
30% Fowl Bluegrass (Poa palustris);
5% Annual Ryegrass (Lolium multiflorum).

2.1.3.8. Non-Maintained Naturalization Landscaping - Dry meadow seed mix

20% Junegrass (Koeleria macrantha);
20% Rough Fescue (Festuca campestris);
10% Green Needlegrass (Stipa viridula);
15% Streambank Wheatgrass (Agropyron riparium);
20% Northern Wheatgrass (Agropyron dasystachyum);
10% Sheeps Fescue (Festuca ovina);
5% Annual Ryegrass (Lolium multiflorum).

2.1.3.9. Non-Maintained Naturalization Landscaping - Grassland Wet Seed Mix

For use in areas that experience spring flooding followed by dry conditions as the spring and summer progress.
20% Northern Wheatgrass (Agropyron dasystachyum);
20% Slender Wheatgrass (Agropyron trachycaulum var. trachycaulum);
20% Nodding Bromegrass (Bromus anomalus);
5% Tufted Hair Grass (Deschampsia caespitosa);
5% Tickle Grass (Agrostis scabra);
10% Sloughgrass (Beckmannia syzigachne);
10% Alkali Bluegrass (Poa secunda ssp. juncifolia);
10% Annual Ryegrass (Lolium multiflorum).

2.1.3.10. Wildflower Seed Mix

Wildflower mixes should be appropriate to the region and a species list included in the planting plan (with scientific and common names).

2.1.3.11. Alternates

The Landscape Architect may recommend alternates to the above seed mixes which shall be identified within the scope of work and on plan prior to approval of drawings. Both common and scientific names should be listed on the planting plan. The use of non-regulated, non-native plants may be appropriate in situations where the area being revegetated is in the middle of an area already seeded to the same species.

2.2. SOD

Certified No. 1 cultivated turf sod; with strong fibrous root system, thick and healthy growth and delivered 24 hours from the time of cutting. Sod showing signs of deterioration due to age or lack of moisture will be rejected. Sod must be free of stones, burns, dry or bare spots, tears and delivered moist, cut in strips of uniform width and thickness and of the following mix or approved equal:

70-90% Kentucky Bluegrass

0-10% Creeping Red Fescue

0-30% Perennial Ryegrass

2.2.1. Mesh must be removed prior to installation on big roll sod on sports fields.

2.3. BINDER

2.3.1. Use Turfmaster Hydro Seal or equivalent compatible binder additive at the manufacturer's recommended rate, sufficient to mix a consistent slurry.

2.3.2. Binder shall be mixed and supplied by a recognized supplier and shall have tested rates of purity.

2.4. MULCH

2.4.1. Material shall be wood cellulose fibre containing no contaminants.

2.4.2. Fibre shall be supplied by a recognized supplier and shall have a certified weight and composition.

2.4.3. Minimum application rate is 16.0 kg of air dry fibre per 100 m2.

2.4.4. Fibre shall be measured as it is fed into the seeder.

2.5. FERTILIZER

2.5.1. Use standard commercial fertilizers, with guaranteed chemical analysis.

2.5.2. Fertilizers shall be clearly labelled and furnished in unopened moisture-proof containers.

2.5.3. Fertilizer requirements are:

Type 1 – Rate 3.5 kg/100 m2

19% Total Nitrogen

19% Available Phosphoric Acid

19% Potash

Type 2 – Rate 3.5 kg/100 m2

10% Total Nitrogen

30% Available Phosphoric Acid

10% Potash

Type 3 – Rate 3.5 kg/100 m2

12% Ammonia

51% Phosphate

0% Sulphate

2.5.4. Fertilizer shall be granular water-soluble type.

2.5.5. The City may order changes to the fertilizer feed rates above if an analysis of the topsoil shows this to be necessary.

2.6. WATER

Clean and free of any substance that may inhibit vigorous growth of grass.

2.7. EQUIPMENT

2.7.1. Cultivators: capable of scarifying, discing or harrowing.

2.7.2. Dry Seeders: of the "Brillion" type, capable of rolling and covering the seed with 3 mm to 6 mm of soil; or of the cyclone type, with flexible wire mat drag.

2.7.3. Hydro Seeders: capable of thoroughly mixing water, seed, fertilizer and pulverized wood fibre and of uniformly spraying the mix at designated rate.

2.7.4. Rollers: of suitable size and mass.

3. EXECUTION

3.1. PLANTING SEASON

3.1.1. Grass Seeding: Recommended season May 1 to September 15. On roadways, seed must be sown by July 15 to give it time to establish for the next season, before spring sweeping.

3.1.2. Sod Laying Recommended season May 1 to September 30.On roadways, sod must be laid by July 15 to give it time to establish for the next season, before spring sweeping.

3.2. PREPARATION

3.2.1. Remove weeds and debris from topsoil already in place.

3.2.2. Firm sod-bed by rolling before application.

3.2.3. Examine the site, verify the grades and check that the topsoil has been placed as specified.

3.2.4. The work shall be done in calm weather, during the normal planting season for the type of seed mixture supplied.

3.2.5. Notify the City prior to the start of seeding operations.

3.2.6. Cultivate existing topsoil and apply additional topsoil as required to obtain minimum required depths of topsoil. Additional topsoil shall be spread evenly and lightly compacted.

3.2.7. Apply fertilizer according to manufacturer's instructions or as directed by the City.

3.2.8. Apply fertilizer with spreader at designated rate and mix thoroughly into the upper portions of topsoil.

3.2.9. Float and level out the finished topsoil surface.

3.3. MECHANICAL SEEDING

3.3.1. Do not seed when prepared topsoil is covered with frost, snow or standing water. Proceed with seeding operations only during favourable weather conditions in accordance with sound horticultural practices.

3.3.2. Slopes flatter than 3 Horizontal to 1 Vertical: Apply seed by mechanical dry spread (Brillion or Cyclone type) at a rate of 24 kg/1,000 m2. Apply in two passes, each pass at a rate of 12 kg/1,000 m2 at 90 degrees to each other. Lightly roll seeded area.

3.3.3. Hand broadcast seeding is unacceptable under any conditions except for site specific repair work and pre-approved work in naturalization areas.

3.3.4. Spread type 3 fertilizer evenly at the rate specified.

3.3.5. Thoroughly harrow the site after fertilizing, on ground flatter than 3 Horizontal to 1 Vertical.

3.3.6. Sow the seed at the rate specified for the seed type, in 2 directions, 50% in one direction and remaining 50% of seed at right angles to first seeding pattern.

3.4. HYDRO SEEDING

3.4.1. Use a hydro seeder to seed slopes 3 horizontal to 1 vertical or steeper with Parks Naturalization Mix as in Clause 2.1.3**Error! Reference source not found.**. In other flatter areas use Canada #1 Mix as in Clause 2.1.1. All as specified on the landscape drawings and in the scope of work.

3.4.2. Mix seed with water, mulch and fertilizer in the following suggested quantities to cover 4,000 m2.

Grass Seed:	80 kgs	Mulch:	640 kgs
Water:	6,400 litres	Fertilizer:	140 kgs

3.4.3. Hydro seeding should not be carried out in wind velocities which cause seed mix to be blown. The City to determine if conditions are appropriate for application

3.4.4. Measure quantities of materials to be fed into the seeder, either by weight or by using another approved system.

3.4.5. Application rates:

Grass seeds 2.0 kg per 100 m2 or as specified for the seed type.

Water 106 L/100 m2.

Mulch 16 kg/100 m2 or sufficient to apply the specified amount of seed and fertilizer per 100 m2.

Use type 3 fertilizer.

3.4.6. Thoroughly mix seed, fertilizer, mulch, binder (if specified) and water in a slurry and uniformly apply in one operation of apply seed and fertilizer mixture then cover with an approved mulch.

3.5. SEED GERMINATION, DRY SEED AND HYDRO-SEED APPLICATIONS

3.5.1. If seed fails to germinate within four growing months, re-cultivate and re-seed until germination takes place.

3.5.2. Approximately six weeks after germination apply supplementary fertilizer 27-14-0, at a rate determined by topsoil analysis or such other fertilizer as may be deemed appropriate by the City.

3.6. CUTTING SOD

3.6.1. Cut sod by approved methods in accordance with the recommendations of the Canadian Standards for Nursery Stock by the Canadian Nursery Landscape Association (C.N.L.A.).

3.6.2. Handle sod carefully when loading and installing to prevent tearing or breaking.

3.7. SODDING ON SLOPES 3 HORIZONTAL TO 1 VERTICAL AND FLATTER

3.7.1. Lay sod evenly in staggered row, with edges and ends butted tightly. Blend edges of sod with existing grass or cultivated areas. Reference detail LA300.

3.7.2. Where sod butt joins surface paving, i.e. manhole, sidewalk or curb, position sod turf crown flush with finished hard surface.

3.7.3. Top dress seams as required with No. 1 mix topsoil. Water the sod and upper 100 mm of topsoil with water spray. Do not cause erosion.

3.7.4. Let sod and soil dry out sufficiently to prevent damage, then roll sod with a roller to ensure good bond between sod and soil and to smooth out humps and depressions.

3.7.5. Immediately after rolling, saturate sod and upper 100 mm of soil with fine spray. To prevent grass and soil from drying out, continue adequate watering for 8 to 10 days after laying or until roots are well established.

3.7.6. Four weeks after laying and following initial cutting apply organic supplementary fertilizer 27-14-0, at a rate determined by topsoil analysis or such other fertilizer as may be determined by the City.

3.8. SODDING ON SLOPES 3 HORIZONTAL TO 1 VERTICAL OR STEEPER

If sodding occurs on any slope steeper than 3 Horizontal to 1 Vertical, sod may be pegged, 25 per 10 m2, with short wooden pegs to prevent sod from slipping. Pegs to be pounded flush with ground.

3.9. WARRANTY

3.9.1. All grass either seeded of sodded shall have a one-year warranty period from issuance of the Construction Completion Certificate.

3.9.2. Areas showing deterioration, bare spots or thin areas shall be re-seeded or re-sodded at the Contractor’s expense.

3.10. MAINTENANCE

3.10.1. Maintenance shall include all measures necessary to establish and maintain seeded and sodded areas in an acceptable, vigorous and healthy growing condition. The maintenance will be from a period of one year from the issuance of a Construction Completion Certificate and until the issuance of the Final Acceptance Certificate. Maintenance shall include:

- Mowing at regular intervals to maintain a minimum height of 60 mm and a maximum height of 75 mm. Do not cut more than 1/3 of blade height at any one mowing. Remove heavy clippings immediately.
- Replacing areas that show root growth failure, deterioration, bare or thin spots or which have been damaged by any means.
- Removing and replacing dead sod.
- Top dressing and rolling to repair ruts or erosion.
- The City may direct the use of herbicides for weed control. They shall be applied in accordance with manufacturer's recommendations by a licensed applicator. Damage resulting from the Contractor's improper use of herbicides shall be remedied at the Contractor's own expense. The developer must keep the areas free of weeds between CCC and FAC.

3.11. FINAL INSPECTION

3.11.1. Final inspection of seeded or sodded areas will be made prior to the end of the warranty period.

3.11.2. At the time of inspection all the areas shall be alive and in a healthy satisfactory growing condition and free from weeds.

3.12. CLEAN-UP

3.12.1. Clean roadway, walkway and surrounding areas of soil, seed, clippings and other debris resulting from work done under this section at the end of each working day or as directed by the City.

END OF SECTION

1. GENERAL

1.1 SCOPE

Supplying trees, shrubs, ground covers, fertilizing, watering, mulching, staking, maintenance and inspection.

1.2 RELATED SECTIONS

Topsoil Section 02910

1.3 EXAMINATION

1.3.1 Report to the City, in writing, any conditions or defects encountered on the site during construction upon which the work of this section depends and which may adversely affect its performance.

1.3.2 Do not commence work until such conditions or defects have been investigated and corrected.

1.3.3 Commencement of work shall imply acceptance of surfaces and conditions and no claims for damages or extras resulting from such conditions or defects will be accepted thereafter, except in cases where such conditions cannot be known prior to or during the course of construction.

1.4 PRODUCT DELIVERY HANDLING AND STORAGE

1.4.1 Supply manufactured items such as fertilizer and mulch, in standard containers, clearly indicating contents, weight, component analysis and the name of the manufacturer.

1.4.2 Store manufactured materials subject to deterioration, in a weatherproof place on site and in such a manner that their effectiveness is not impaired.

1.4.3 Supply plant material as specified on the plant list outlined on the approved landscape drawings.

1.4.4 Handle plant material with reasonable care and skill to prevent injuries to trunk, branches, roots, rootballs and containers.

1.4.5 Protect plants during shipment with tarpaulin or other suitable covering and carefully tie in all branches before transporting, to prevent excessive drying from sun and wind or breakage from wind and equipment. Pad all points of contact between plant material and equipment.

1.4.6 For trees dug by tree spade the root ball shall be placed in burlap and a wire basket. Wire basket shall be laced at the top and of sufficient strength to withstand lifting the tree by the top loops of the basket at a minimum of two points.

1.4.7 Trees (in foliage) that are moved by the Basket Method or Balled and Burlapped Method; the foliage and root ball must be covered by a tarp.

1.4.8 Container stock should be handled as much as possible by the pot only, in order to reduce breakage.

1.4.9 All plants should be unloaded and checked immediately upon arrival and should be watered as required. Trees with cracked or broken root balls will not be accepted.

1.4.10 Upon arrival all plant material that cannot be planted during the current day's operations shall be heeled with topsoil or mulch and watered. All plant material should be planted within 24 hours of delivery to site.

1.4.11 Root balls, roots, trunks, branches and leaves shall be protected on site from drying, frost, construction equipment, or other damage and be kept moist until planted.

1.4.12 Replacement of all damaged stock is at the Contractor's expense.

1.4.13 Subgrade material from the digging of tree pits by a tree spade is to be removed from the site at the Contractor's expense if it cannot be utilized on site.

1.5 SUBSTITUTION

1.5.1 All substitutions shall be made through a change order to the contract.

1.5.2 All requests for substitutions shall be vetted through the Landscape Architect responsible for preparing the contract drawings. Such request shall be forwarded to the City for approval.

1.5.3 Requests for substitution of plants larger than specified may require submission of revised contract drawings by the Landscape Architect for approval by the City.

1.6 INSPECTION

Prior to the commencement of installation plant materials may be inspected and approved either at the source of local supply or on site at the discretion of the City. Previous joint approval will not impair the right of the City during the course of construction to reject plants which have been damaged or which, in any way, do not conform to the specifications. Any rejected plant materials will be noted on a site instruction form and presented to the contractor for follow-up. The consultant must request inspection with Forestry five business days prior to tree root trenching. A Forestry delegate must inspect the trenching process prior to completion of the trenching project with approved top soil.

2. PRODUCTS

2.1 PLANT MATERIAL

2.1.1 All plant materials shall meet the horticultural standards of and comply with, all sections of the latest edition of Canadian Nursery Landscape Association (C.N.L.A.) planting specifications.

2.1.2 They shall be nursery grown, under proper cultural practices as recommended by the C.N.L.A.

2.1.3 Any plants dug from native stands, wood lots, orchards, or neglected nurseries and have not received proper cultural maintenance as advocated by the C.N.L.A., shall be designated as "collected plants".

2.1.4 The use of "collected" plants will not be permitted unless previously inspected and approved in writing by the City.

2.1.5 Within reason, plants shall be generally true to type and structurally sound, well branched, healthy and vigorous and free of disease, insect infestations, insect eggs, rodent damage, sunscald, frost cracks and mechanical wounds. They shall be densely foliated when in leaf and have a healthy, well-developed root system. Pruning cuts shall show vigorous bark on all edges and all parts shall be moist and show live, green cambium tissue when cut.

2.1.6 Trees shall have straight trunks with a well-developed single (or central) leader. Minor adjustments of structural integrity may be attempted by structural pruning carried out by or directly supervised by a certified professional (ISA Certified Arborist, Landscape Industry Certified Technician, Landscape Horticulturist (Red Seal or LGAP) or equivalent designation and will be subject to re-inspection. Clump or multi-stem trees shall have three or more stems originating from a common base.

2.1.7 Shrubs shall have natural form typical of the species with a minimum of four canes.

2.1.8 Vines shall have at least four runners, each of a minimum length of 300 mm.

2.1.9 Ground covers shall have well-developed tops, size proportionate to the developed roots typical of the species.

2.1.10 Annual plants to be of vigorous growth with healthy leaf and stem tissue and without sign of wilting. All plants to be full-form without missing or broken branches and of a shape typical of the particular species.

2.1.11 Plants that have been top-worked, sheared, or colour treated are not acceptable.

2.1.12 All plant materials shall conform to the measurements specified on the plant list on the approved landscape drawings except that plants larger than specified may be used if approved by the City. If larger plants are used, the root ball shall be increased in proportion to the size of the plant as per Section 02930 – Trees, Shrubs and Ground Cover; Clause 3.4.4. Ground cover plants shall have healthy tops to a size proportionate to the above root requirements typical of the species.

2.2 CONIFEROUS TREES

2.2.1 All trees shall be suitable for immediate planting and be of normal shape and quality for the species. Trees with broken or missing leaders will not be accepted.

2.2.2 Spruce varieties shall have uniform branching which starts no higher than 300 mm from the root collar. On Pine varieties, branching shall be no higher than 600 mm from the root collar.

2.2.3 The root balls shall contain all the original soil in which the tree has grown and shall be free of all weeds and vegetation. It shall be firmly wrapped in burlap and secured to prevent any soil from spilling or drying out. Any increase or decrease in tree size shall require a corresponding adjustment to the root ball size to conform to C.N.L.A., Canadian Standards for Nursery Stock.

2.3 DECIDUOUS TREES

2.3.1 All trees are to be suitable for planting as street trees and should show signs of good trunk taper and free of branches to a point not less than 60% of tree height.

2.3.2 All bare root trees shall have a heavy fibrous root system that has been developed by proper cultural treatment, such as transplanting or root pruning and shall have a spread not less than specified.

2.3.3 The root ball shall contain all the original soil in which the tree has grown and shall be free of all weeds and vegetation. It shall be firmly wrapped in burlap and secured to prevent any soil from spilling or drying out. Any increase or decrease in tree size shall require a corresponding adjustment to the root ball size to conform to C.N.L.A., Canadian Standards for Nursery Stock.

2.3.4 Trees collected from native stands or established plantings must be so designated. Root balls shall be at least ten percent larger in diameter than Nursery grown stock.

2.3.5 All trunks shall be straight, clean and free from stubs and portions of decay, splits, or other damage.

2.4 OTHER MATERIAL

- Wire Basket
- Burlap
- Guy Wires
- Tree Anchors
- Tree Stakes
- Weed Liner
- Tree Grates and Guards

3. EXECUTION

3.1 PLANTING SEASON

Plant trees, shrubs and ground covers only during periods that is normal for such work. It is recommended that all coniferous material should be planted suggested planting in spring season only.

3.2 SITE PREPARATION

3.2.1 All rough grading, excavating work for planting beds and the preparation of subgrades, which are to receive planting soil mixture shall be as described below.

3.2.2 Dig out the tree root holes/pits, planting beds and shrub root holes and remove excess soil off site or as directed by the City.

3.3 PLANTING TOPSOILS

Soil mixes shall be as shown on standard details and as specified by Section 02910 - Topsoil; Section 2.

3.4 DIGGING OF PLANTS

3.4.1 Immediately after digging all plants, the root system shall be kept moist to prevent drying out until planted.

3.4.2 Plants specified “Bare Root” shall be dug and moved while dormant, with the major portion of the fibrous root system provided.

3.4.3 All plants specified as “Balled and Burlapped” shall be dug and moved while dormant unless directed otherwise by the City, with the major portion of the fibrous root system provided.

3.4.4 Ball sizes shall be sufficiently large to contain at least 75% of the fibrous root depth. The sizes of root balls for trees shall be as specified in the Canadian Standards for Nursery Stock from C.N.L.A. Ball sizes are a minimum and shall be adjusted according to growth habits of plants.

3.4.5 Ball sizes for coniferous trees to be:

Tree Height Range	Ball Diameter
1.8m (6') - 2.4m (8')	86 cm (34")
2.5m (8') - 3.0m (10')	100 cm (40")
3.1m (10') - 3.5m (12')	122 cm (48")

Note: All pines to have oversized minimum root ball diameter (for trees 2.5 m height) of 1150 mm (3'10").

3.4.6 Wrap root balls as per C.N.L.A., Canadian Standards for Nursery Stock.

3.4.7 All plants specified may be moved with a mechanical tree spade providing adequate roots are kept as specified and provided that no excavation shall occur within 1m of utility trench alignments.

3.4.8 Minimum utility clearances must be maintained from the edge of the excavation by the tree spade of the involved utility must be contacted for approval and/or safety procedures required, i.e. hand digging.

3.4.9 Before removing plants from containers for planting, the plants shall be well watered to reduce injury.

3.4.10 In many plants, roots have a tendency to circle the container/pot. When this is apparent, outside roots should be gently loosened and the container cut vertically with a sharp knife in one or two places and the container/pot carefully removed. When the circling roots cannot be straightened or cut without affecting the structural root system the plant will be rejected. The tree must be securely rooted at FAC.

3.5 PLANTING BED PREPARATION

3.5.1 Beds that contain shrubs and trees shall be prepared to a depth of 450 mm. Reference detail LA108A, unless otherwise stated within specifications scope of work.

3.5.2 Beds that contain only trees shall be prepared to a depth of 300 mm. Reference detail LA108, unless otherwise stated within specifications scope of work.

3.5.3 Bed edge must be cut to a vertical depth of 100mm and filled with mulch.

3.5.4 Landscape edgers and weed liners are not permitted.

3.5.5 Cut back weed liner, if provided, at each tree and shrub location with three cuts at 120 degrees from the centre of the proposed plant. Ensure weed liner is cut back sufficiently to accommodate excavation of root zone for tree or shrub. Excavate tree and shrub root holes as per standard planting details and install plant material.

3.5.6 Construct watering swales using topsoil from around the base of the plant and roll back the weed liner. The use of watering swales is not identified on the standard details but may be required by the City and shall be at the Contractor's expense.

3.5.7 Install optional landscape edgers around perimeter of planting shrub beds. Landscape edging to be a maximum 12 mm higher than existing surrounding grades. Ensure weed liner, if provided, is rolled down the interior face of the landscape edging a minimum of 100 mm

3.5.8 Install 100 mm of wood mulch as specified by landscape drawings. Finished grade of mulch to match adjacent turf grades or top of landscaping edging upon final settlement. Reference detail LA108.

3.6 TREE AND SHRUB PLANTING OUTSIDE PREPARED PLANTING BEDS

3.6.1 Staked locations of all trees and shrubs to be provided by the City prior to installation.

3.6.2 All trees shall have a minimum of 300 mm of class B topsoil surrounding the sides of the root ball. Reference details LA102 – LA113.

3.6.3 All shrubs shall have 150 mm of specified topsoil surrounding the sides of the containerized roots or exposed bare roots. Reference details LA108 – LA110.

3.6.4 If soil conditions warrant and as directed by the City, root holes dug by mechanical equipment shall be scarified to ensure that no glazed walls remain in root holes.

3.6.5 For tree root holes dug by a tree spade, provide root ball support of compacted native materials in the base of the root hole. Reference details LA104 – LA105. Soil glazing from the tree spade shovels must be scarified.

3.6.6 The depth of the planting hole should be 40mm less than the height of the root ball. Adjust hole depth (as needed) to correct the depth of the tree, the top of the root ball should be 40mm above grade.

3.6.7 Trees and shrubs shall be faced to give the best appearance or relationship to adjacent structures, walkways or park features.

3.6.8 Planting topsoil shall be firmly tamped in place in such a manner that the plant retains its vertical position. Particular care shall be taken to ensure that no air pockets remain under or around the roots. The planting topsoil shall be thoroughly watered immediately after tamping. All non-porous or non-biodegradable containers shall be completely removed. Any settling of planting topsoil shall be brought up to the intended grade after settlement and prior to issuance of the Final Acceptance Certificate.

3.6.9 When planting, topsoil is installed up to about one half of the root ball height, ties shall be cut and the top portion of the burlap on B & B plants shall be cut back carefully, not disturbing the root ball, remove excessive topsoil to expose the original root flare and remove all girdling roots.

3.6.10 Top 1/3 of wire baskets to be folded back or removed and the top 1/3 of the burlap to be cut back and removed from root ball hole. If circling roots are found in the rootball, cut the root at the beginning of the circling.

3.6.11 Damaged or broken roots of bare root stock should be cut back with a sharp knife to living parts remaining. Spread roots out gently and evenly in the root hole and complete installation of topsoil.

3.6.12 The planting topsoil shall not be placed while frozen or muddy.

3.6.13 Add 100 mm of wood chip mulch over exposed portion of tree root ball and extend mulch 150 mm beyond edge of root hole. Reference details LA102 – LA113.

3.7 CONSTRUCTION COMPLETION INSPECTION

3.7.1 Plant pits and tree and shrub beds shall be free of weeds, leaves, broken branches, and rubbish, and left in a neat and tidy condition. Soil within the drip line of the tree or soil ring (whichever is greater) shall not be cultivated.

3.7.2 All plants shall be alive and in a healthy, satisfactory growing condition.

3.8 WARRANTY

3.8.1 The Contractor is fully responsible for the general health and quality of all plant material delivered and installed.

3.8.2 All plant material shall be guaranteed for a period of one year, unless otherwise stated within the project scope of work/specifications, from the date of issuance of the Construction Completion Certificate. There is no warranty requirement on annuals, unless further noted.

3.8.3 All plant materials found dead or not in a healthy, satisfactory growing condition or which, in any other way, does not meet the requirements of the specifications, shall be replaced immediately by the Contractor at the Contractor's own expense.

3.9 MAINTENANCE

3.9.1 Maintenance shall include all measures necessary to establish and maintain all plants in an acceptable, vigorous and healthy growing condition for a period of one year from the issuance of a Construction Completion Certificate and until the issuance of the Final Acceptance Certificate.

3.9.2 Cultivated and weeding of planting beds and tree pits is the responsibility of the Contractor. The City may direct the use of herbicides for weed control; they shall be applied in accordance with manufacturer's recommendations by a licensed applicator. Damage resulting from the Contractor's use of herbicides shall be remedied at the Contractor's own expense.

3.9.3 Pruning, including the removal of dead, broken and diseased branches, immediately upon installation and in accordance with approved pruning methods.

3.9.4 The City may direct the use of chemicals and pesticides as control measures. If used they shall be applied in accordance with the manufacturer's recommendations by a licensed applicator. Damage resulting from the Contractor's use of chemicals and pesticides shall be remedied at the Contractor's own expense.

3.9.5 Maintain all accessories in good condition such as tree guy wires and tree stakes. The City will direct the repair or replacement of all such accessories when required. If the trees are in the third growing season the tree stakes and wires shall be removed.

3.9.6 Watering trees and shrubs in sufficiently to meet plant requirements.

3.9.7 **Water in tree and shrub root holes:** All planting beds shall be filled to grade with planting topsoil and watered in. The use of a water probe to ensure the removal of all air spaces in the topsoil surrounding the plant's root ball is an acceptable method of watering in. The use of a water probe will be used to water in all tree spade transplanted trees.

3.9.8 The Contractor is responsible for supplying, loading, hauling and distributing water and fertilizer for maintenance purposes.

3.9.9 Newly planted trees may require the application of a completely water-soluble high phosphorous fertilizer e.g. 10-52-10. No fertilizer should be applied during July and August. The Landscape Architect may recommend other fertilizers for trees, shrubs and ground covers as required. The Landscape Architect will provide written confirmation of the dates for water and fertilizer applications prior to the issuance of the F.A.C. by the Community Services Department.

3.9.10 Straighten all plants, which lean or sag during the warranty period. Straightening of trees is to be done in a timely manner to assist in establishment.

3.9.11 At the time of inspection for F.A.C. and at the conclusion of the warranty period, all non-mulched planting beds and tree pits shall be freshly cultivated. All planting beds shall be free of weeds, leaves and debris and shall be in a tidy condition. Mulch shall be raked.

3.10 PRUNING

3.10.1 All deciduous plants shall be pruned by or directly supervised by a certified professional (ISA Certified Arborist, Landscape Industry Certified Technician, Landscape Horticulturist (Red Seal or LGAP) or equivalent designation immediately after planting and as required during the warranty period according to the best management practices as defined by the International Society of Arboriculture in accordance with ANSI A300 Pruning Standards. The amount of pruning shall be limited to the minimum necessary to remove dead or injured branches. Pruning shall be done in such a manner as to preserve the natural character and shape of the plants. Only clean, sharp tools shall be used. All cuts shall be clean and cut to the branch collar, leaving no stubs. Cuts, bruises, scars or tears on the bark shall be traced back to living tissue and removed. The affected areas shall be shaped so as not to retain water.

Pruning outlined for these species as follows:

Birch	May 15 to June 15
Maple	June to July
Elm	October 1 to March 31

Or as approved by the Project Manager.

3.10.2 Do not cut a leader unless a lateral can be trained to take its place.

3.11 STAKING AND GUIDING

Support plants with stakes and guy wires immediately after installation.

3.12 TREE SUPPORT:

3.12.1 Trees shall be braced upright in position by guy wire and stakes in accordance with the following table:

Coniferous: Tree Height	Tree Support Method
Up to 1.5 m	1 stake with 1 tie (optional)
1.5 m - 3.0 m	2 stakes with 2 ties (optional)
3.0 m - 3.5 m	3 guy wires with 3 anchors

Deciduous: Tree Caliper	Tree Support Method
Up to 30 mm	1 stake with 1 tie
30 mm - 100 mm	2 stakes with 2 ties
100 mm - 150 mm	3 guy wires with 3 anchors
150 mm and over	4 guy wires with 4 anchors

3.12.2 Wire for trees requiring guy wiring shall be looped around the tree and anchored in such a manner that looped wire will not interfere with normal growth. Guy wires shall be placed around the trunk at a point to ensure adequate support of the tree and in such a manner that the tree trunk or branches will not be subjected to undue strain or injury. Anchors shall be equally spaced around the tree pit. Reference details LA102 – LA113.

3.12.3 Anchors required for the support of staked trees shall be painted metal "T" bars 40 mm x 40 mm x 5 mm thick and 700 mm to 750 mm long. Wires for fastening to anchors shall be pliable #12 galvanized wire. If used these shall be factory galvanized and of sufficient strength to withstand any wind pressure.

3.12.4 Anchors shall be left 150 mm above grade unless otherwise directed by the City and colour coded to Community Services specifications.

3.12.5 Stakes: "T" bar steel stakes 40 mm x 40 mm x 5 mm thick x 2.1 m length, U-bar stakes will be approved as a substitute, primed with one coat of zinc-rich paint to CGSB 1-GP-1816. Colour to be approved by the City. Top 300 mm tree stake colour coded to Community Services specifications. See Section 02918 – Colour Coding of T-bar Tree Stakes. Ties shall be placed around the trunk to provide adequate support and to prevent damage.

3.12.6 The Contractor shall be responsible for keeping guy wires taut at all times and replacing broken guy wires in accordance with the specified warranty period and to ensure that the guy wires do not damage the tree trunk during growth.

3.12.7 Guy wires shall be flagged with fluorescent orange coloured tape. All guy wires are to be folded or bent in such a fashion so as not to be exposed outwardly. New black rubber hose, two-ply, reinforced and 12 mm diameter, or approved equal, shall be used to encase wires where they circle the trunk or branches.

3.13 REPLACEMENTS

3.13.1 The cost of replacements resulting from rodent damage, theft, vandalism, carelessness, or neglect on the part of others, or any replacements caused due to circumstances beyond the control of the City shall be borne by the Contractor before the issuance of a Final Acceptance Certificate.

3.13.2 All required replacements shall be by plants of the same size and species as specified on the Plant List and shall be supplied and planted in accordance with the landscape drawings and specifications.

3.14 TRANSPLANTING EXISTING TREES

3.14.1 The City of Edmonton Tree Policy should be referenced when transplanting trees in accordance with the following specification.

3.14.2 Size of root ball: 12 times the tree caliper measured at 300 mm above grade and deep enough to enclose 75% of the existing root depth. All stock greater than 100 mm will be measured 1500 mm above ground level.

3.14.3 Basket, double burlap and drum lace, or wire basket root ball before moving, or dig and transport by tree spade.

3.14.4 Place excavated tree spade root plugs in former tree locations where possible.

3.14.5 Size of new tree root hole is to be in accordance with standard details.

3.14.6 Plant, stake and guy wire, and maintain as outlined herein.

3.14.7 Warranty period for Nursery and "collected" as follows:

- All stock 0 - 80 mm* shall be 1 year.
- All stock 90 - 150 mm shall be 3 years.
- All stock 150 - 200 mm shall be 4 years.
- No materials above 200 mm will be accepted.

* Refer to clause 4.8.3 in the Landscape Design and Construction Standards.

3.15 PROTECTION OF EXISTING TREES

The protection of existing trees shall be as per City of Edmonton Tree Policy C456A.

3.16 RESTORATION

Restore pavement, gravel stops, grassed area, planted area and structures damaged or disturbed during execution of work, in a manner satisfactory to City standards.

END OF SECTION

1. GENERAL

1.1 SCOPE

Supply of materials and construction of naturalized planting areas. Refer to Section 02920 - SEED AND SOD for the establishment of naturalized grass areas.

1.2 RELATED SECTIONS

Topsoil, Subgrade Preparation	Section 02910;
Mulches	Section 02914;
Seed and Sod	Section 02920;
Trees, Shrubs and Groundcovers	Section 02930;

1.3 PRODUCT DELIVERY, HANDLING and STORAGE

1.3.1 Refer to Section 02910 regarding supply and handling of topsoil.

1.3.2 Refer to Section 02914 regarding supply and handling of mulches.

1.3.3 Refer to Section 02920 regarding supply and handling of seed.

1.3.4 Refer to Section 02930 regarding supply and handling of plant material.

1.4 DEFINITIONS

Natural Appearing: appears non man made.

Native Material: plants and grasses native to the area. In certain cases, plants similar to or related to truly native species may be accepted.

Naturalization: the creation of a self sustaining native plant community, generally with the intent of creating a natural appearing installation while minimizing installation and on going maintenance costs.

Planting Bed Naturalization: construction of an excavated and topsoiled shrub bed reference detail LA110-LA111. A more expensive alternative suitable where larger material is specified to achieve a more immediate effect and less plant loss is desired and on barren sites where there are no existing organic soils, plants or grasses that might be retained.

Individual Plant Naturalization: excavation of individual pits for each plant. A less expensive alternative suitable for locations where there are existing soils, plant materials and/or grasses that may be retained to lessen disruption.

Plant Mats: excavated mats of native material containing plants, roots and related soil.

Live Soil: soils containing native plant material roots.

Custom Installations: dependent on site conditions and with the approval of the Director/Parks, other installation techniques may be considered.

1.5 INSPECTION AND SUBSTITUTIONS

1.5.1 The City of Edmonton reserves the right to inspect all materials prior to installation. The Contractor must provide a sample of all materials to the City of Edmonton for approval prior to site installations, if requested.

1.5.2 Product may not be substituted nor installation methods changed from approved drawings unless approved by the Director/Parks.

1.5.3 At CCC inspection plant material approved on the drawings must be present and alive and meeting specifications.

1.5.4 At FAC inspection any dead, diseased or damaged plant material must be removed or replaced. This is to be determined based on design intention or as noted on the drawing.

1.5.5 All plant material must be visible for inspections.

2. PRODUCTS

2.1 PLANT MATERIAL

Native material as detailed on the approved drawings and meeting the requirements of Section 02930 - TREES, SHRUBS AND GROUNDCOVERS.

2.2 TOPSOIL

Utilize Class 'B' topsoil as per Section 02910 – TOPSOIL, SUBGRADE PREPARATION. Amend as required through the addition of compost.

2.3 CONIFEROUS SHREDDED BARK MULCH

Coniferous shredded bark mulch as per Section 02914 - MULCHES is the preferred mulch.

2.4 DEDDUIOUS WOOD CHIP MULCH

2.4.1 Deciduous wood chip mulch as produced by the City of Edmonton from pruned or removed trees may be used after FAC for topping up the mulch, if required.

2.4.2 Mulching of naturalization areas is generally not desired after establishment.

3. EXECUTION

3.1 SHRUB BED NATURALIZATION

3.1.1 Construct a typical planting bed and install plant material as per Section 02930 - TREES, SHRUBS AND GROUNDCOVERS. For larger material install in individual pits in the planting bed reference details LA102 – LA113.

3.1.2 Space all material to ensure a full coverage.

3.2 INDIVIDUAL PLANT NATURALIZATION

3.2.1 Reference detail LA110-LA111.

3.2.2 Remove surface debris that might inhibit planting.

3.2.3 Remove grass from area to be planted by killing grasses over entire area with an approved spray or mechanically by removing grass over individual pits for each tree/shrub.

3.2.4 Construct individual pits for each plant as detailed.

3.2.5 For larger material install in individual pits reference details LA102 – LA113.

3.2.6 Space all material to ensure a full coverage.

3.3 LIVE SOIL

Gather live soil and transport to site ensuring material is kept moist. Spread live soil to a minimum 150mm depth over the existing ground. Water thoroughly.

3.4 PLANT MATS

3.4.1 Excavate a 300mm depth pit and install 150mm depth of moderately compacted Class 'B' topsoil.

3.4.2 Excavate a plant mat from the source site and transport to the site minimizing breakup of the mat and ensuring material remains moist.

3.4.3 Install the mat on the topsoil and cover all exposed edges with moderately compacted topsoil, ensuring stability of mats. Water thoroughly.

3.5 MULCHES

3.5.1 Apply mulch to 100mm settled depth. Neither a weed barrier blanket or an edger are required.

3.6 CLEAN-UP

Clean roadway, walkway and surrounding turf of mulches and other debris caused by work under this Section at the end of each working day or as directed by the City of Edmonton.

3.7 MAINTENANCE

3.7.1 Refer to Specification 02930 TREES, SHRUBS AND GROUNDCOVERS for weed free requirements at inspection points, throughout the warranty period and thereafter.

3.7.2 Spot control of weeds and seedling growth twice per year or as may be necessary. All mulched areas to be weed free at Construction Completion Certificate and Final Acceptance Certificate inspections.

3.7.3 During the period between CCC and FAC inspections, the installer is to top up mulch applications to retain minimum required depth.

3.7.4 After FAC acceptance, the City of Edmonton will be responsible for maintaining mulch applications to the specified depth and quality. Over time, as plants mature and grow together, the mulch requirement is to be phased out.

END OF SECTION

1. GENERAL

1.1. SCOPE

Supply and installation of collected stone and feature boulders.

1.2. RELATED SECTIONS

Grading	Section 02310	Volume 2 Roadways
Clearing and Grubbing	Section 02231	Volume 2 Roadways

1.3. QUALITY ASSURANCE

Make feature boulders and collected stone available at source for inspection and approval by the City. Approval at source will not impair the right of the City to inspect collected stone and boulders upon arrival on the site or during the course of construction and to reject them for non-conformance.

2. PRODUCTS

2.1. FEATURE BOULDERS

2.1.1. All feature boulders are to be of a granite composition, relatively smooth surface and outline as found in locally occurring glacial deposition material unless approved by the City. Cracked boulders are not acceptable.

2.1.2. The seating feature boulders are to be used for seating and are to be a minimum of 900 mm x 1500 mm x 1500 mm with a smooth, reasonably level top and no sharp edges on sides or top.

2.1.3. Feature boulders placed in concrete at culvert ends, within park sites, shall be of relative smooth surface and outline, with a minimum diameter of 600 mm.

2.1.4. All other feature boulders shall have a minimum 1200 mm diameter and relatively smooth surface and outline.

3. EXECUTION

3.1. PREPARATION

3.1.1. Prepare the slope to be protected by grading smooth to a maximum slope of 2:1 unless shown otherwise on the drawings.

3.1.2. Prepare a trench at the toe of slope if shown on the drawings or ordered by the City.

3.2. FEATURE BOULDERS

3.2.1. Supply and place all boulders in the locations designated by the City in accordance with the drawings.

3.2.2. Feature boulders are to be buried to 1/3 of their height, reference detail LA600.

3.2.3. Following the completion of the work specified in this section, the Contractor shall remove all surplus material and equipment from the site and leave it in a tidy condition to the satisfaction of the City.

END OF SECTION