

Tree Planting in Sensitive Marine Clay Soils - 2017 Guidelines

Background: Existing Clay Soils Policy

The City of Ottawa's Clay Soils Policy, as it is often referred to by city staff and external stakeholders, is derived from a 2005 report titled *Trees and Foundations Strategy in Areas of Sensitive Marine Clay in the City of Ottawa* (approved by Planning and Environment Committee on September 27, 2005 and by City Council on October 12, 2005).

This report was mainly focused on the provision of a risk management framework for the assessment and mitigation or possible removal of existing City trees where the trees were identified as a significant contributing factor for foundation damage. One of the six recommendations speaks to the planting of new trees on City property in Sensitive Marine Clay (SMC) soils, which can be used interchangeably with the more technical terminology of Champlain Sea Clay soils – but for the purposes of this report, the term Sensitive Marine Clay soils will be used because of historical continuity with the 2005 report noted above.

This recommendation established that when planting trees on city property where SMC soils are known to exist, the tree must be low water demand and planted at a distance equivalent to the full mature height of the tree from a building foundation or structure. This became the Council direction and policy for all new street tree planting in SMC soils, or simply, the Clay Soils Policy.

The practical result of the implementation of this policy has been many new subdivisions with only four varieties of small ornamental trees (Amur Maple, Serviceberry, Crab Apple and Japanese Lilac, which can be planted at a separation distance of 7.5 meters, their approximate mature height, from a building foundation) and some streets with no trees at all.

The Policy has since been described by some stakeholders as overly onerous, highly risk adverse, and based on inadequate scientific evidence. The results have been undesirable for residents, the Development Industry, and the City of Ottawa, who all wish to see tree-lined streets that contribute to the health and liveability of new communities and to work towards Council's strategic initiative of increasing urban forest cover.

Towards an Improved Clay Soils Policy

In March 2015, Planning Committee approved the report titled *Building Better and Smarter Suburbs: Strategic Directions and Action Plan*. Two of the Action Plan items in the report specifically dealt with obtaining better geotechnical information on clay soils and using that improved scientific basis to bring flexibility to the existing Clay Soils Policy where warranted. This builds on the early work of the draft *Street Tree Manual for Greenfield Neighbourhoods*, which demonstrated that improvements to tree planting in greenfield communities could only be accomplished by revising the Clay Soils Policy.

During the spring and summer of 2016, under the direction of the Greater Ottawa Homebuilders Association, a group of companies with expertise in geotechnical engineering, landscape architecture and forestry, including Golder, Paterson, Houle Chevrier, NAK and IFS Associates, undertook a review the City of Ottawa's existing requirements for tree planting in sensitive marine clay soils. Background information used for this review included the City of Ottawa's *Draft Street Tree Manual* (June 2015) and the United Kingdom's National House Building Council – Chapter 4.2 *Building Near Trees* (NHBC Standards 2016).

This 2016 review resulted in proposed technical revisions to the Clay Soils Policy. City staff from Forestry, Planning, Parks and Facilities Planning, and Legal have reviewed and built upon these proposed revisions to produce the *Tree Planting in Sensitive Marine Clay Soils – 2017 Guidelines*. These collaborative efforts are

based on the notion of planting trees in SMC soils in accordance with improved scientific and geotechnical information, with updated technical and procedural details outlined in this document.

The Tree Planting in Sensitive Marine Clay Soils - 2017 Guidelines were received by Planning Committee on September 26, 2017, and approved by delegated authority in October 2017. Going forward, implementation of the 2017 Guidelines is expected to increase the number and/or size and variety of street trees in new subdivisions in areas of sensitive marine clay soils.

Guidelines for Tree Planting in Sensitive Marine Clay Soils

The following Guidelines are primarily focused on small and medium size street trees. However, large trees (mature height over 14m) can still be planted in areas of SMC soils provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g. in a park or other green space).

For street trees in the road right-of-way where SMC soils have been identified, the tree to foundation setbacks may be reduced to **4.5m** for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5m-14m) provided all of the following six conditions are met:

1. The modified plasticity index of the soil between the underside of footing (USF) and a depth of 3.5m generally does not exceed 40%. This corresponds to soils with low/medium potential for soil volume change. Clay soils that exceed the 40% plasticity index are considered to have high potential for soil volume change. For these worst-case soils, the setbacks and tree planting restrictions remain unchanged from the 2005 Clay Soils Policy (tree setback must equal the mature height of the tree – i.e. 7.5m setback for small trees).
2. The USF is 2.1m or greater below the lowest finished grade. Note: this footing level must be satisfied for footings within 10m of the tree, as measured from the centre of the tree trunk, and verified by means of the Grading Plan as indicated in the Procedural Changes below.
3. A **small** size tree must be provided with a minimum of **25m³** of available soil volume, as determined by a Landscape Architect. A **medium** size tree must be provided with a minimum of **30m³** of available soil volume, as determined by a Landscape Architect. The developer will ensure the soil is generally uncompacted when backfilling in street tree planting locations.

Note: the soil volume calculation must be based on a depth of 1.5m below finished grade (e.g. 5m length x 4m width at surface x 1.5m depth = 30m³). It may include lands in the right-of-way and on private property, but must subtract the volume of shallow utility trenches (i.e. volume of shallow utility trenches cannot count towards minimum soil volume).

4. The tree species must be small to medium size, as confirmed by a Landscape Architect in the Landscape Plan.
5. The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall) to provide ductility as described in the Geotechnical Report.
6. Grading surrounding the tree must promote draining to the tree root zone (in such a manner as not to be detrimental to the tree), as noted on the subdivision Grading Plan.

Procedural Changes Required to Implement the Tree Planting in Sensitive Marine Clay Soils - 2017 Guidelines:

In areas of clay soils, the following procedures and conditions are to be followed for new plans of subdivision:

Tests

- One Atterberg Limits test and one water content test on 150 metre spacing (closer spacing where there are variations in soil composition, topography, etc.) and a grain size test for every four boreholes.
- One shrinkage test per subdivision.

Grading Plan

- The USF depth will be verified by means of the grading plan.
- The subdivision grading plan will promote draining to the tree root zone (in such a manner as not to be detrimental to the tree) and be noted in a drawing as part of the Grading Plan.

Geotechnical Reports

- Reinforcement of foundation walls will be confirmed by the Geotechnical Report. In any SMC soils, foundation walls are to be reinforced at least nominally, with a minimum of two upper and two lower 15M (rebar size) bars in the foundation wall.
- A Geotechnical Engineer will provide a separate section within the Geotechnical Report on Sensitive Marine Clay soils, which includes a signed letter and corresponding map that confirms the locations of low/medium and/or high sensitivity clay soils, as determined by the plasticity tests (referenced above under Guideline 1).
- The Geotechnical Report with signed letter and map will be provided to the Landscape Architect prior to preparation of the Landscape Plan in order to inform details of the Landscape Plan.
- The Geotechnical Report with signed letter and map will be circulated by the City Planner file lead, with the Landscape Plan, to Forestry staff and the Planning Foresters for review in conjunction with the Landscape Plan. This must be completed prior to registration of the subdivision agreement.

Landscape Plan

- A Landscape Architect will develop a Landscape Plan that is consistent with the information and recommendations provided in the Geotechnical Report to the satisfaction of the Planning, Infrastructure and Economic Development Department and Forestry Services. The Landscape Plan shall include a note indicating that it has been developed as per the Geotechnical Report (date, author), the letter (date, author), and Map (date, title).
- At the time of tree planting, in addition to providing an F1 inspection form, the Landscape Architect will provide a signed letter indicating that trees are of small or medium size and have been planted with appropriate soil volume, as noted in Guidelines #3 and #4 above.

Minimum Number of Trees per Plan of Subdivision

- In areas of low/medium plasticity SMC soils (modified plasticity index generally does not exceed 40%), the minimum number of trees that must be provided in a plan of subdivision will be one tree per lot, and two per corner lot, with the following exceptions that intend to maximize the number of medium size trees that can be planted:
 - Where abutting properties form a continuous greenspace between driveways (i.e. many townhouse and semi-detached dwellings; some detached dwellings where driveways are on opposite sides of the house) one medium size tree will be planted instead of two smaller sized trees, provided the minimum recommended soil volume can be achieved. In these cases only, for the purpose of determining the minimum number of trees in a plan of subdivision, one medium size tree that is replacing two small trees will be “counted” as two trees.
 - The medium size tree should be planted as close as possible to the middle of this continuous greenspace (in the right-of-way) to maximize available soil volume.
 - On larger lots with sufficient soil volume for a medium size tree, one medium size tree will be planted on each lot (or each side of a corner lot), even if abutting properties form a continuous greenspace between driveways.

Subdivision Conditions

The following details are intended to assist file leads with the writing of new draft plan of subdivision conditions to support the implementation of the Tree Planting in Sensitive Marine Clay Soils - 2017 Guidelines:

- City of Ottawa Forestry staff will:
 - Review the Geotechnical Report and prepare and approve any direction to homeowners regarding tree watering or surface permeability in proximity to trees.
 - Notify homeowners that trees on City property will be subject to City tree maintenance programs for pruning and other maintenance.
 - Provide file leads with the appropriate Subdivision Conditions prior to registration.
- In areas of low/medium plasticity SMC soils (modified plasticity index generally does not exceed 40%):
 - The minimum number of trees that must be provided in a plan of subdivision will be one tree per lot, and two per corner lot, except where abutting properties form a continuous greenspace between driveways. In these cases, one medium size tree will be planted instead of two small size trees, provided the minimum 30m³ of soil volume can be achieved. In these cases only, for the purpose of determining the minimum number of trees in a plan of subdivision, one medium size tree that is replacing two small trees will be “counted” as two trees.
 - The medium size tree should be planted as close as possible to the middle of this continuous greenspace (in the right-of-way) to maximize available soil volume.
 - On larger lots with sufficient soil volume for a medium size tree, one medium size tree will be planted on each lot (or each side of a corner lot), even if abutting properties form a continuous greenspace between driveways.
 - Where medium size trees cannot be planted because of high plasticity clay soils, small trees shall be planted at one tree per lot.
 - If trees need to be replaced, Forestry staff reserve the right to plant appropriate size trees at one tree per lot.