TOPSOIL BYLAWS TOOLKIT

2012

An Appendix to the Green Bylaws Toolkit

Okanagan Basin WATER BOARD

www.obwb.ca

the partnership for water sustainability in bc

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This Toolkit is an evolution of two topsoil primers developed by the Green Infrastructure Partnership in collaboration with municipalities showing leadership in the use of topsoil for rainwater capture, City of Courtenay, City of Surrey, and District of North Vancouver:

Topsoil: Just How Do You Obtain a Performing Topsoil Layer to Advance Rainwater Management & Water Conservation Goals: A Law and Policy Primer for Municipal Staff and Designers (http://www.waterbucket.ca/gi/sites/wbcgi/documents/media/288.pdf) and *Topsoil: Just How Do You Obtain a Performing Topsoil Layer, to Advance Rainwater Management & Water Conservation Goals: A Technical Primer for Municipal Staff and Designers* (http://www.waterbucket.ca/gi/sites/wbcgi/documents/media/289.pdf). Leads on the original primers were Susan Rutherford, West Coast Environmental Law, and Rèmi Dubè, City of Surrey.

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INTRODUCTION

Toolkit Purpose

This Topsoil Bylaws Toolkit is an appendix to the Green Bylaws Toolkit and complements Stewardship Bylaws: A Guide for Local Government and the Groundwater Bylaws Toolkit. It includes bylaw language that local governments in B.C. are using to improve topsoil and thus integrated rainwater management. The bylaw provisions and text in this Toolkit are provided for information purposes only. They do not constitute legal advice. Please consult qualified legal counsel to draft your bylaws. Changes in legislation, the common law and site or local government specific conditions require special consideration to ensure that bylaws are legal.

Green Bylaws Toolkit
www.greenbylaws.ca

Stewardship Bylaws
www.stewardshipcentre.bc.ca/cdirs/st_series/index.php/7

Groundwater Bylaws Toolkit
www.obwb.ca/groundwater_bylaws_toolkit/

The Topsoil Bylaws Toolkit was created to give local governments practical tools that support smart topsoil policies. The consideration of topsoil on a site is key to effective rainwater management and lowering the impact of development. As the changing climate becomes more variable, bringing more frequent, heavier storms and longer, hotter droughts, smart rainwater management becomes even more important. A well-designed landscape with healthy topsoil helps communities through both wet and dry times.

The Toolkit explores the following questions:

- Why is topsoil important?
- What aspects of topsoil science should be considered for management to be effective?
- What can local government do to insist on proper topsoil management?

To answer these questions, the Toolkit presents the basic principles of topsoil science and management, and outlines the jurisdiction for managing topsoil. The toolkit provides local governments with sample policy and bylaw language that can be tailored to specific areas. Many local governments in B.C. have shown leadership by requiring topsoil standards. In particular, wisdom in this document was drawn from the experiences of City of Courtenay, City of Surrey, and District of North Vancouver.

HOW TO USE THIS TOOLKIT

SECTION 1:
THE CASE FOR CARING ABOUT TOPSOIL

This section explains the importance of topsoil for rainwater management and outlines the role for local government in topsoil management.

SECTION 2:
TOPSOIL JURISDICTIONAL FRAMEWORK

This section identifies the jurisdiction of different levels of governments in topsoil management.

SECTION 3:
UNDERSTANDING TOPSOIL SCIENCE

This section explores the basics of soil science.

SECTION 4:
UNDERSTANDING TOPSOIL MANAGEMENT

This section details standards and references for topsoil management.

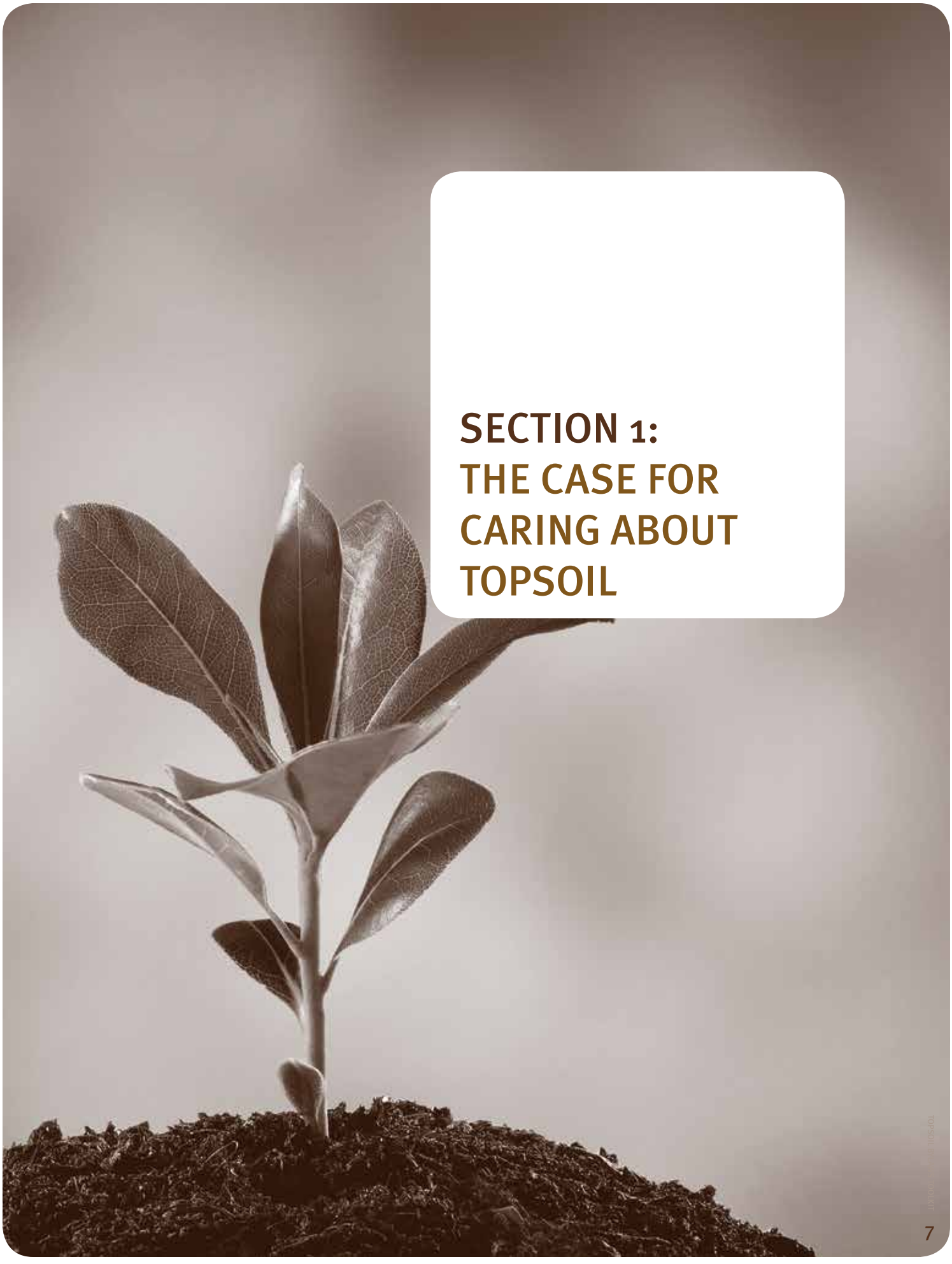
SECTION 5:
GETTING THE MOST FROM YOUR TOPSOIL

This section presents land use planning and regulatory tools available to local government.

SECTION 6:
SAMPLE TOPSOIL POLICIES AND BYLAWS

This section provides sample wording for the tools presented in the previous chapter.

Figure 1: Reader roadmap for the Topsoil Bylaws Toolkit.



SECTION 1: THE CASE FOR CARING ABOUT TOPSOIL

1.1 WHAT IS TOPSOIL?

Topsoil is the layer of soil closest to the surface—the layer exposed to air and rain. It is composed of organic matter and minerals, and it is home to beneficial microorganisms that recycle nutrients for use by plants. Spaces between the soil particles hold air and water.

The Basics of Caring for Your Soils

1. Retain native topsoil and vegetation where possible
2. Restore disturbed soil
3. Loosen compacted subsoils
4. Mulch landscape beds after planting
5. Protect soils from erosion and compaction by heavy equipment

From: www.soilsforsalmon.org

1.2 WHY IS TOPSOIL IMPORTANT?

The spaces between the soil particles let topsoil soak up water and release it slowly, like a sponge. Soils can typically store up to 50% of their volume as water before becoming saturated[1]. In high rainfall areas, like the *lower mainland of B.C.*, natural areas with healthy soils can retain as much as 90% of the rain where it falls. Rainwater captured in soils is a part of the natural water cycle, recharging aquifers, and moving through the ground rather than contributing to runoff. The water in the ground is then available to trees, lawns, and landscaping. Good topsoil supports faster plant establishment, higher plant survival rates, and can reduce the need for weed and pest control.

Two major benefits of a healthy topsoil layer:

- It reduces runoff from rain and storms by storing water on site.
- It holds water for vegetation, reducing the need for irrigation.

1.2.1 RAINWATER CAPTURE AND SOURCE CONTROL

In natural areas with undisturbed topsoil, most rainfall soaks into the soil. In developed areas, natural soil is often disturbed or replaced with buildings and pavement. Roofs and most paved surfaces are impervious, so water is not able to flow through them and get into the soil below. Instead, the water flows rapidly off these surfaces in greater volumes than off an undisturbed area. The extra volume and speed can cause flooding and erosion along flow paths and in streams and rivers, and degrading fish habitat. Excess runoff also decreases water quality. Instead of being naturally filtered through ground, the flowing surface water picks up contaminants and debris and deposits them in lakes, streams, and rivers. These problems increase as development and the amount of impervious surfaces increases. A healthy topsoil layer keeps rainwater on site during rainfall and storms. This reduces stress on stormwater infrastructure systems—curbs, gutters, trenches, and pipes—built to prevent flooding and move water offsite as quickly as possible.

[1] Soil Water Characteristic Estimates by Texture and Organic Matter for Hydrologic Solutions, K. E. Saxton and W. J. Rawls, Soil Science. Society of America Journal, Volume 70, September–October 2006 pp1569-1578.

1.2.2 REDUCED IRRIGATION AND WATER DEMANDS

Healthy topsoil of sufficient depth and quality holds amazing amounts of water. This water is available for plants and other vegetation and reduces the need to irrigate lawns and landscaping. This is particularly important during peak water use times in the summer, when water supplies are low and demand for water is high. Over the long term, reducing irrigation water demand by improving topsoil can decrease water supply costs for local governments and postpone the need to develop additional water sources. This is particularly important in areas where water for lawns and landscapes comes from a treated drinking water source, and in areas where water supplies are extremely limited and watering restrictions are common.

1.3 TOPSOIL AND CLIMATE CHANGE

Climate change will affect every region differently, but nearly every region faces increased variability in precipitation. The Okanagan has always been a water–scarce area, with variable precipitation between seasons and across years (see figure 1 on following page). Climate change scenarios from the Okanagan Water Supply and Demand model indicate that wet times could be wetter for longer, and droughts could be drier for longer. By storing water on site, healthy topsoil helps buffer against both wet times and dry times.

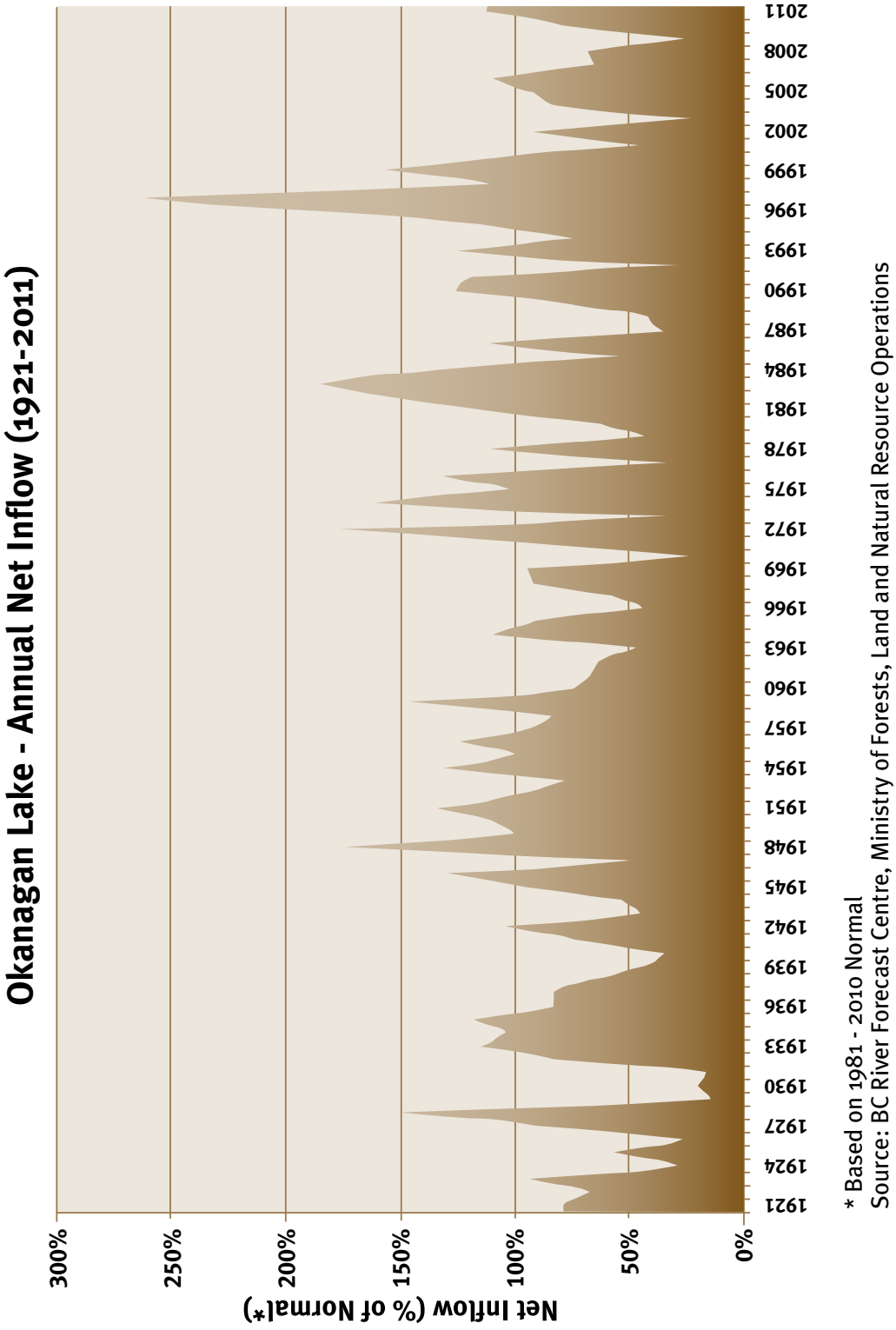


Figure 2: The natural variability of net inflow into Okanagan Lake.

1.4 FROM STORMWATER TO INTEGRATED RAINWATER MANAGEMENT IN B.C.

Many communities are moving from the conventional stormwater management approach of draining water off a site as quickly as possible, to integrated rainwater management. Rainwater management focuses on keeping as much water as possible on site, by sinking it into the ground–improving water quality, reducing flooding and erosion, and reducing the need for new pipe infrastructure. Dealing with the rainwater at its source is called rainwater source control.

Absorbent landscapes with healthy topsoil layers are one of many keys to this integrated approach. Other source control mechanisms include bioswales, rain gardens, green roofs, infiltration trenches and soakaways, and pervious paving.

For more information moving from stormwater to integrated rainwater management, see:

From Rain to Resource 2010: Managing Stormwater in a Changing Climate
http://www.obwb.ca/fileadmin/docs/rain_to_resource/Rain_to_Resource_2010_Report.pdf

Stormwater Planning: A Guidebook for British Columbia
http://www.env.gov.bc.ca/epd/epdpa/mpp/stormwater/stormwater.html

Beyond the Guidebook 2010
http://www.waterbucket.ca/cfa/sites/wbccfa/documents/media/403.pdf

Smart Bylaws Guide
www.wcel.org/issues/urban/sbg/Part2/stormwater

Slow it. Spread it. Sink it!
An Okanagan Homeowner's Guide to Using Rain as a Resource.
http: www.okwaterwise.ca/pdf/HomeDrainageGuide_Okanagan.pdf

1.5 LOCAL GOVERNMENTS AND TOPSOIL

Local governments have regulatory jurisdiction over development on the approximately five percent of land in B.C. that is not considered Crown land. This jurisdiction includes regional, local, and community planning, controlling subdivisions and infrastructure, managing rainwater, and setting site-specific requirements for development. Regional districts and municipalities establish the baseline for how change on the landscape will occur.

Rainwater management begins at the municipal or regional district scale with policies that focus on volume reduction, infiltration for managing rainwater, and reducing demand for water. Neighbourhood or watershed-level plans contain more detailed policies about area-specific requirements, including subdivision servicing standards that may be incorporated, more broadly, into a subdivision servicing bylaw. Finally, development permit guidelines, landscape bylaws, and soil removal and deposit bylaws can set specific standards for topsoil quality, quantity, and retention.

1.6 PRINCIPLES FOR DEVELOPMENT OF TOPSOIL POLICIES

Successfully introducing topsoil polices is not necessarily a simple task. Staff commitment and energy, political will, and public support all make the process easier. Internal and external collaboration are key to gaining all of these things. The following sections share some of the lessons learned by communities that have had success with soil policies.

1.6.1 INTERNAL COLLABORATIONS

Creating or changing topsoil policies will require cooperation between many staff departments and political support.

Take an Adaptive Approach

An adaptive approach starts with a discussion document, such as a topsoil backgrounder, to elicit comments and questions from staff, followed by meetings to seek feedback and develop the policies. Staff from all affected departments should be consulted, both to assist with policy development and to provide operational support. Staff units that may be affected by topsoil policies include Engineering, Planning, Parks, Roads and Transportation, Operations and Maintenance, Construction Inspection, Building Inspection, Environmental, Front Counter, and By-law Enforcement.

Educate Staff and Council About the Benefits of Topsoil

Gaining widespread support for topsoil policies will be easier when staff and council members understand the potential benefits of topsoil and its importance in managing rainwater. Providing them the information in this Toolkit is a first step. Quantifying the potential savings that could result from integrating topsoil into regulatory processes will also be a major help.

Establish Clear Objectives and Expectations

To ensure that all staff understand how new policies might affect the operations of their unit, it is important to have open and clear communication around any new or changing responsibilities and expectations.

1.6.2 EXTERNAL COLLABORATION

Consulting with outside stakeholders is an important step in any policy change. Land development professionals bring expertise, and having widespread public understanding of the new requirements will support compliance.

Collaborate with Development Professionals

Better policies are made when all affected parties are given input. This way, potential issues can be anticipated and solved before they arise. Development professionals possess knowledge about site and market conditions that contribute to smart policy standards. Soliciting their input, and incorporating it where appropriate, will result in stronger policy.

Educate Development Professionals

Once new policy has been adopted, successful implementation relies on land development professionals and landowners. Clear objectives are important—minimum standards and preferred method for design and installation, specific regulations and policies that trigger topsoil standards, etc. To support communication, hold workshops for land professionals, produce guides and brochures, and maintain an up-to-date website on topsoil benefits and current requirements. Providing notification of any related and ongoing bylaw enforcement activities demonstrates that the local government is committed to the new policies.

Communicate with Property Owners

As with the development professionals, taking the time to inform landowners will result in better compliance with the new policies. A better informed public also supports enforcement, with eyes on the street to spot major topsoil violations. Strategies for communicating with the public include:

- Workshops, displays, and other ways to inform and educate home owners about on-site rainwater management, water conservation, and how topsoil fits that context;
- Illustrated posters that depict the benefits of enhanced topsoil;
- Engaging local environmental groups to incorporate topsoil management into educational and other communication;
- Posting contact phone numbers for inspectors.

1.7 APPROACHES TO TOPSOIL MANAGEMENT AND ENHANCEMENT

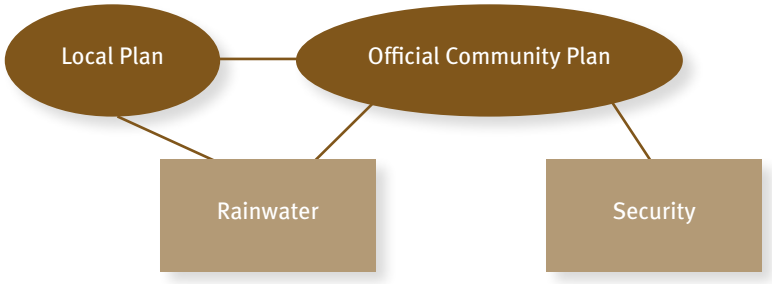
Just as no two local governments are the same, there is no one single way to incorporate topsoil standards into local regulations. The approach that a local government adopts will depend on a variety of factors, including the geographic location and size of the local government, historical patterns of land use, rate of development, administrative capacity, staff expertise, and political will.

Most local governments use a combination of one or more regulatory bylaws and the creation of development permit areas, guidelines, and policies to improve topsoil management.

The following fictitious case studies demonstrate how local governments can combine rainwater management and topsoil infrastructure tools in a variety of ways.

Local government staff agree new regulation is are most effective when incorporated into existing bylaws and permitting processes. Tweaking existing processes with additional requirements will result in greater staff commitment and less need for public outreach than will creating new processes.

1.7.1 FICTIONAL CASE STUDY: SUBURBAN DISTRICT OF HUMUSVILLE



The District of Humusville is a suburban municipality with a residential and commercial core surrounded by rural agricultural and forested land within its jurisdiction. The municipality shifted its approach to development when it contemplated the rezoning and subdivision of a prime, upland 30 ha green field site within its urban containment boundary. The trend over the past decade had been single-family homes and large-format highway commercial developments. With downtown businesses beginning to call for revitalization of the town centre, and farmers noting increased rainwater volumes on their fields, council decided to revisit the community vision stated in the official community plan (OCP): concentrating development within existing serviced areas while taking an integrated rainwater management approach to infrastructure servicing.

Town staff, elected officials, several land developers, and citizens undertook an integrated planning process for the site that would become the new neighbourhood. The resulting local area plan focuses on protecting existing ecosystem processes, including hydrology, by preserving a greenway corridor that extends along a creek across the neighbourhood. To avoid compromising habitat and other values, the plan mandates rainwater infiltration on each developed site, that to mimic pre-development levels.

While offering a variety of ways to obtain that infiltration, post construction soil quality and depth must meet the standard of a minimum organic matter content of 15% dry weight in planting beds and 8% in turf areas, with a minimum depth of 300 mm for turf and 450 mm for shrub/tree areas. The pH must be between 6.0 and 8.0 or match the original undisturbed soil. Subsoils must be scarified to 100 mm, with topsoil added to the subsoil. Planting beds must be mulched with 50 mm of organic material. Staff assessed the potential impact of the new neighbourhood on summer water demands, and with the new requirements and effective public education, predicted little net increase in demand for landscape watering.

Council also designated the entire neighbourhood as a development permit information area in the OCP, to ensure it could ask for soil quality and rainwater infiltration information. District staff recommended several bylaw amendments. Council approved changes to the municipal-wide rainwater (drainage) bylaw to require post-development site runoff to match pre-development levels, and to incorporate post-development topsoil specifications. The amendments also enable staff to incorporate standards established in the local area plan into permit conditions and to obtain security as part of development permitting.

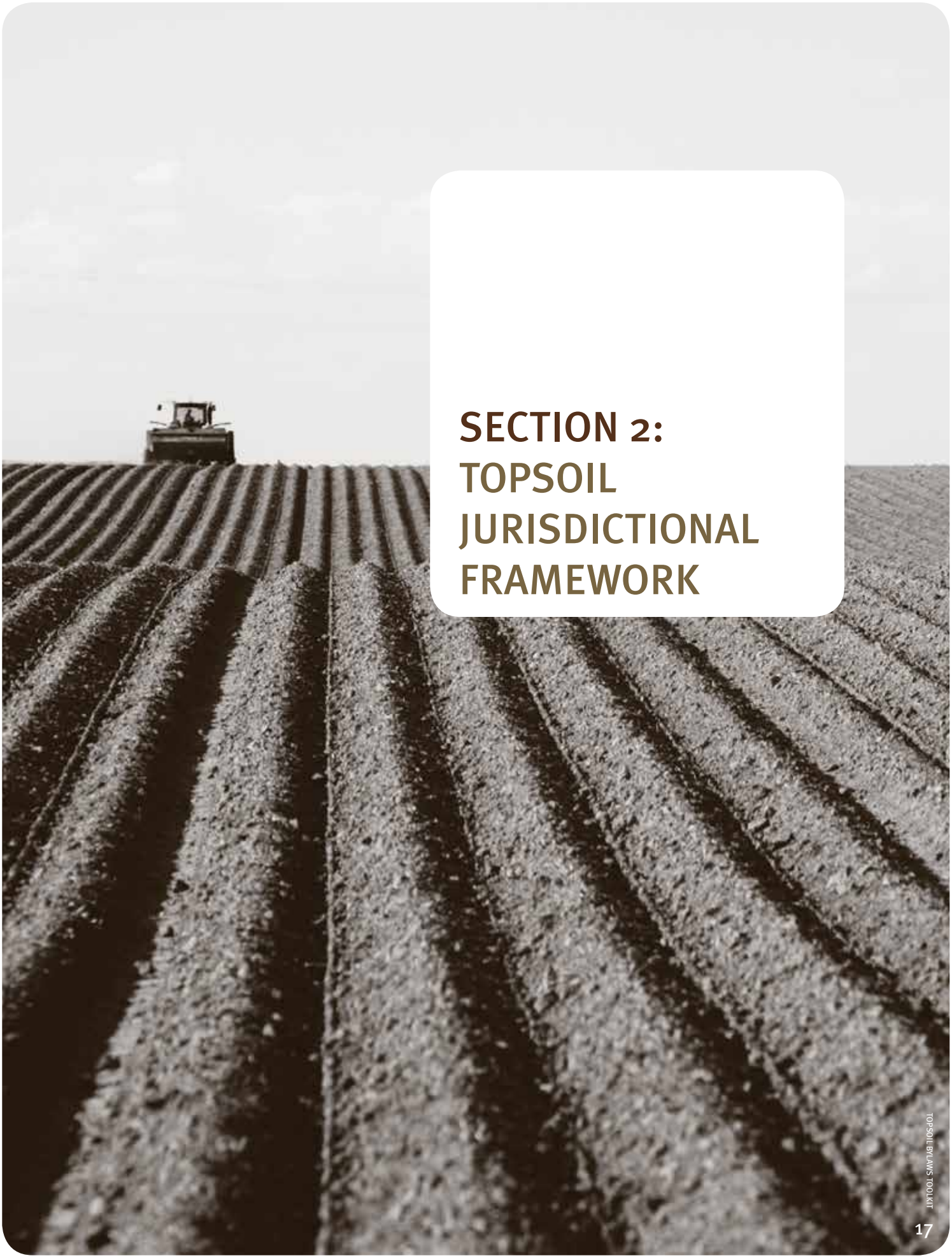
1.7.2 FICTIONAL CASE STUDY: URBAN CITY OF INFILTRATION

The City of Infiltration was largely built out in the 1980's and 1990's. It had many large commercial lots that were becoming attractive for redevelopment, and the predominantly single detached residential lots were over 10,000 sq ft, providing significant infill opportunities. When considering the redevelopment potential within its urbanized landscape, council noted the strong integrated watershed and rainwater management policies set out in the regional growth strategy.

The area was faced with water supply issues and summer peak demand had increased dramatically, with uncharacteristic hotter and drier periods becoming more frequent. Council had been hearing from staff and the public about the benefits of green infrastructure and re-integrating nature into developed areas. Staff prepared a cost-benefit analysis of maintaining the traditional road and pipe infrastructure systems versus implementing new green bylaws. They realized upgrading the stormwater infrastructure, and potentially having to acquire a new water supply source, would result in an unpopular tax increase.

Through their OCP review process, council decided to use development permit areas as its primary approach to shaping development. Because of the need to address impacts of rainwater on the natural environment, council designated the entire municipality as a development permit area for the protection of the natural environment, its ecosystems, and biodiversity. In the detailed development permit guidelines in the OCP, council established a naturalized watercourse policy and required applicants to pay a security deposit. They set out erosion and sediment control, and topsoil and vegetation protection requirements. Council also created guidelines for ensuring that overall rainwater flows and water quality to the various watercourses remain at pre-development levels. The guidelines also established minimum post–construction soil quality and depth standards.

Staff recommended to council the development of a blanket green infrastructure bylaw to provide enforcement support for the development permitting process, even on single detached sites. An amalgamation of existing bylaws and new provisions, it addresses rainwater infiltration and environmental protection.



SECTION 2: TOPSOIL JURISDICTIONAL FRAMEWORK

As with many elements of the environment, each level of government has some authority over soil and topsoil.

2.1 FEDERAL GOVERNMENT

The federal government's primary role in soil regulation is the classification of soils and approval for soil imports and movement within Canada. The Canadian Soil Information Service of Agriculture and Agri-Food Canada maintains the National Soil DataBase, a national archive for information about soil and land in Canada.[1] The digital maps and files provide information about soils, landscapes, and climate across the country. The National Land and Water Information Service of Agriculture and Agri-Food Canada also has similar soil databases. [2]

Soil Landscapes of Canada, developed by Agriculture and Agri-Food Canada, shows information about agricultural soils across the country from provincial and national perspectives.

http://sis.agr.gc.ca/cansis/nsdb/slc/intro.htm

The Government of Canada regulates the import of soil into Canada, as well as movements of soil within the country, trying to prevent the introduction and spread of soil-born pests.[3] The import of soil into Canada is prohibited except when imported with a permit for scientific research, education, processing, industrial, or exhibition purposes. For transporting soil within Canada, a Movement Certification from the Canadian Food Inspection Agency may be required.

2.2 PROVINCIAL GOVERNMENT

The provincial government has jurisdiction over the Crown land base, which accounts for approximately 95% of the province of British Columbia. Some provincial statutes and planning processes that apply to Crown land allow the provincial government to regulate soils through approval processes. [4]

The province shares jurisdiction with local governments over the regulation of activities on agricultural land and on contaminated sites. It is prohibited to use agricultural land for non-farm uses, over which includes the removal of soil and placement of fill.[5] A landowner can apply to the Agricultural Land Commission for permission to undertake non-farm uses, with prescribed non-farm activities such as gravel extraction requiring the filing of a notice with the Commission. The provincial government has enabled local governments to regulate the storage and application of compost, mulches, and soil amendments on agricultural land.

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[1] See http://sis.agr.gc.ca/cansis/.

[2] See http://nlwis-snite1.agr.gc.ca/slc-ppc22/index.phtml and http://atlas.agr.gc.ca/agmaf/index_eng.html#context=soil-sol_en.xml&extent=-3376783.7007038,-320112.9712985,3904545.7007038,3489884.9712985&layers=place37M,place25M,place15M,place5M,place1M,place500K,place250K;rivers25M,rivers15M,rivers5M,rivers1M,rivers500K,lakes37M,lakes25M,lakes15M,lakes5M,lakes1M,lakes500K,Roads25M,Roads15M,Roads5M,Roads1M,Roads500K,ferry500K,bndy5-37M,bndy1M,BndyLn1-5M;SoilOrder1M

[3] See *Plant Protection* Act, S.C. 1990, C. 22 at section 43 and *The Plant Protection Regulation*, SOR/95-212

[4] See, for example, under the *Forest and Range Practices Act*, S.B.C. 2002, c.69, the Forest Planning and Practices Regulation, B.C. Reg. 14/2004 establishes an objective for soils of "...without unduly reducing the supply of timber from British Columbia's forests, to conserve the productivity and the hydrologic function of soils" at section 5.

The province has given local governments broad authority to regulate the storage and application of compost on agricultural land. The Agricultural Land Reserve Use, Subdivision and Procedure Regulation of the *Agricultural Land Commission Act* enables local governments to regulate but not prohibit (except by a bylaw under s.917 of the *Local Government Act)*:

- the storage and application of fertilizers, mulches and soil conditioners;
- the application of soil amendments collected, stored, and handled in compliance with the *Agricultural Waste Control Regulation*;
- the production, storage, and application of compost from agricultural wastes produced on the farm for farm purposes in compliance with the *Agricultural Waste Control Regulation*;
- the application of compost and biosolids produced and applied in compliance with the *Organic Matter Recycling Regulation*; and
- the production, storage, and application of Class A compost in compliance with the *Organic Matter Recycling Regulation*, if all the compost produced is used on the farm.

The provincial government regulates the identification, clean up, and use of contaminated sites.[7] An applicant seeking approvals to develop lands must provide a site profile to an approving office of a local government or a municipality if they know, or reasonably should know, that the land is or was used for industrial or commercial activities.[8] Soil removal is considered one of these land development activities. If a director at the Ministry of Environment determines that a site is contaminated, they must notify an approving officer or municipality. [9]

Finally, the provincial government delegates local land use and regulatory functions to local governments in B.C. through two primary pieces of legislation, the *Community Charter* and the *Local Government Act*. Together, these two statutes enable local governments to craft comprehensive land development regimes that address rainwater management and topsoil quality and quantity.

Washington State established topsoil best management practices that are used by local government in their stormwater codes to require rainwater detention through topsoil enhancement. See the City of Seattle's Green Stormwater Infrastructure initiative at

http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/GreenStormwaterInfrastructure/index.htm.

See also http://www.soilsforsalmon.org/

[5] *Agricultural Land Commission Act*, S.B.C. 2002, c.36 at section 20.

[6] Agricultural Land Reserve Use, Subdivision and Procedure Regulation B.C. Reg. 171/2002 at sections 4-5.

[7] *Environmental Management Act*, S.B.C. 2003, c.53 at Part 4 (sections 39-64) and Contaminated Sites Regulation, B.C. Reg. No 375/96.

[8] *Ibid* at section 40.

[9] *Ibid* at section 44.

2.3 LOCAL GOVERNMENT

Local governments are empowered with many planning and regulatory powers to address rainwater management and topsoil care. Table 1 outlines this jurisdiction for both municipalities and regional districts.

Table 1 – Municipal and Regional District Jurisdiction

Bylaw Approaches		
Regional Growth Strategies	*Local Government Act* Part 25	*Local Government Act* Part 25
Official Community Plans (including Local Area & Watershed Plans)	*Local Government Act* ss.875-879, 882, 884, 941 (OCP) *Community Charter* s.69 (drainage)	*Local Government Act* ss.875-879, 882, 884, 941 (OCP) *Local Government Act* ss.540-542 (drainage)
Development Permit Areas	*Local Government Act* ss.919.1-920	*Local Government Act* ss.919.1-920
Impact Assessment Development Approval Information Areas Development Process	*Local Government Act* ss.919-920.01 *Local Government Act* s.895	*Local Government Act* ss.919-920.01 *Local Government Act* s.895
Rainwater Management Bylaw	*Local Government Act* s.907 (impermeable surfaces) *Community Charter* s.69 (drainage)	*Local Government Act* s.907 (impermeable surfaces) *Local Government Act* ss.540-542 (drainage)
Landscaping Bylaw	*Local Government Act* s.909 *Community Charter* s.15	*Local Government Act* s.909
Parking	*Local Government Act* s.906	*Local Government Act* s.906
Soil Removal & Deposit Bylaw	*Community Charter* ss. 8(3)(m), 9(1)(e), 15 & 195	*Local Government Act* s.797.1(1)(c), s.723
Security	*Community Charter* ss.8(8)(c), 17 & 19 *Local Government Act* s.925	*Local Government Act* s.925
Subdivision Servicing Bylaw	*Local Government Act* s.938 *Land Title Act* ss.83, 86	*Local Government Act* s.938 *Land Title Act* ss. 83, 86

* Note – always update legislation to ensure the most current law.

Local government jurisdiction can be divided into four topic areas: planning, regulation, information, and enforcement. Together, these give local governments a comprehensive way of shaping the development and maintaining the health of watersheds in urban or urbanizing areas.

Planning can occur at any scale, from regional to neighbourhood, and for different landscape values, such as for integrated watershed management. Many official community plans and neighbourhood plans contain policies relating to the local government's approach to rainwater management, as well as guidelines for site-specific application of the policies through development permit areas.

A host of regulatory bylaws enable local governments to set site-specific or performance requirements through permitting. These include requirements for impermeable surfaces, drainage infrastructure, landscaping, subdivision servicing, and soil removal and deposit.

Local governments may also designate development approval information areas, within which applicants for land development must provide any requested information. This can include information about soil composition and rainwater infiltration.

Finally, taking financial security or a bond from a development application can assist local governments to enforce topsoil quality and quantity requirements. If the work is not performed to the standard required in permits, the local government can use the security to remedy the shortfall.

2.4 A NOTE ABOUT JURISDICTION FOR RAINWATER AND WATER

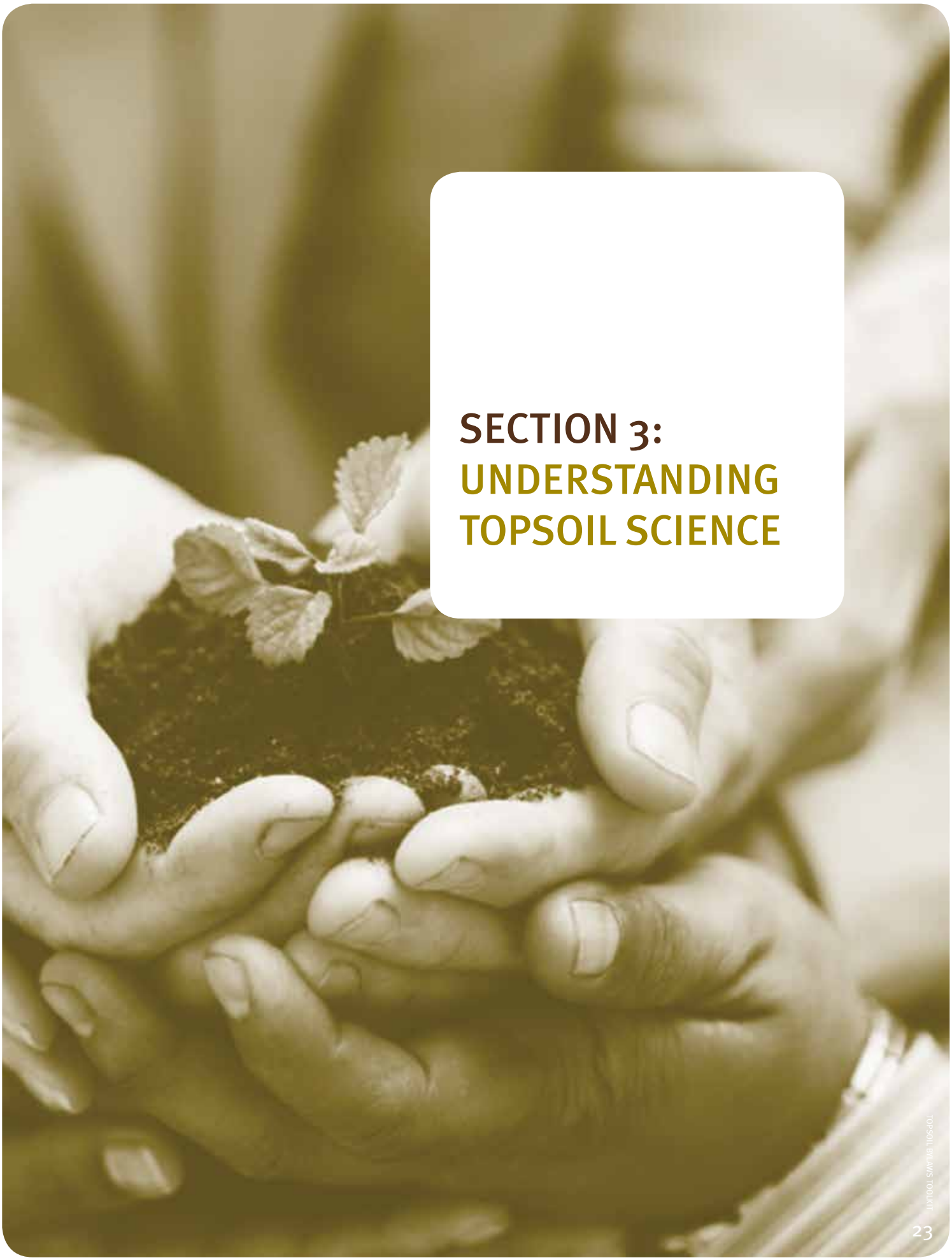
Provincial government requirements for liquid waste planning have driven some of the interest in topsoil as a rainwater management and aquifer recharge tool. In May 2011, for example, the Minister of Environment approved Metro Vancouver's Integrated Liquid Waste & Resource Management Plan developed by the Greater Vancouver Sewerage and Drainage District. The approved plan is part of the regulation of liquid waste and rainwater resources in the region and replaces other regulatory direction from the province. [10]

In addition, some organizations provide coordinated, regional, or local team approaches that facilitate the sharing of overlapping responsibilities. For example, the Okanagan Basin Water Board (OBWB) includes representation from three regional districts that share a watershed and receives technical advice from the Water Stewardship Council–a diverse group of water experts and stakeholders. The OBWB's *Okanagan Sustainable Water Strategy* describes the region's objective of reducing the demand for water and sets out the local actions necessary to meet that objective.[11] Another example is the Comox Valley Land Trust that has taken a lead role in creating a regional conservation strategy for the Comox Valley titled *Conservation with Borders*. [12] That initiative is now lead by a steering committee whose membership includes local environmental organizations.

[10] *Environmental Management Act,* S.B.C. 2003, c.53 at section 24.

[11] http://www.obwb.ca/water_strategy/

[12] http://www.cvconservationstrategy.org/



SECTION 3:
UNDERSTANDING TOPSOIL SCIENCE

This section provides a general overview of topsoil science and provides a quick reference for basic topsoil standards.

Topsoil plays a key role in the movement and retention of water in a watershed. Topsoil is the the layer of soil found at the surface that is regularly exposed to rain.

3.1 SOIL BASICS

Soils are more than just "dirt"! This section provides a brief introduction to the structure and composition of common types soil and describes their roles in supporting life and retaining water. Top soil has several key characteristics that make it important for rain water management. Understanding the physical properties of soil will lead to better soil management decisions, which improve the management of water resources and leads to healthier watersheds.

3.1.1 SOIL COMPONENTS

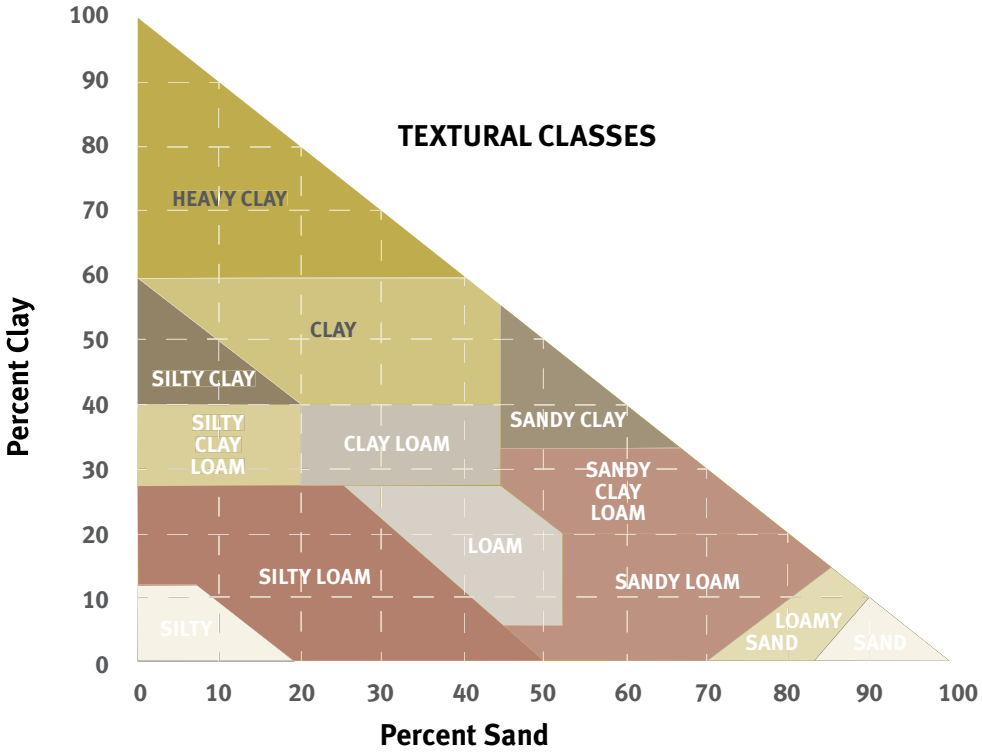
There are two major components in soil: organic particles and mineral particles. Water and air fill the spaces between the particles. Organic matter in the soil, like leaf litter or compost, is broken down until it becomes humus, its smallest and most stable form. Mineral matter includes all non-organic material—depending on the soil, it might include big particles like cobble or gravel and smaller particles of sand, silt, or clay.

The amount of sand, silt, and clay in a soil will determine how much water it can hold, as well as how easily it can be "cultivated"—stirred and moved around, as you would to prepare soil for growing plants. A soil that is mostly clay particles is considered "heavy" because it is difficult to cultivate, but it can hold the most water. Pure sand would be very "light" because it is easy to cultivate, but it will not hold much water. A soil composed of almost equal parts of sand, silt, and clay will exhibit the best combination of moisture retention and ease of cultivation or use in rainwater management and growing plants.

You can get a rough idea about what a soil is made up of by looking closely and feeling it in your hand. Sand is coarse and the particles can be seen with the naked eye, while individual silt and clay particles need a microscope to be seen. Sand feels gritty, whereas both silt and clay feel smooth to the touch. You can tell the difference between clay and silt by adding a little water to the soil in your hand and squishing it—clay becomes sticky when it gets wet, whereas as silt feels smooth.

A classification system for soils has been developed based on the proportion of each of these particles in the soil. See Figure 3.1 for a simplified illustration of how a soil's textural class is determined.

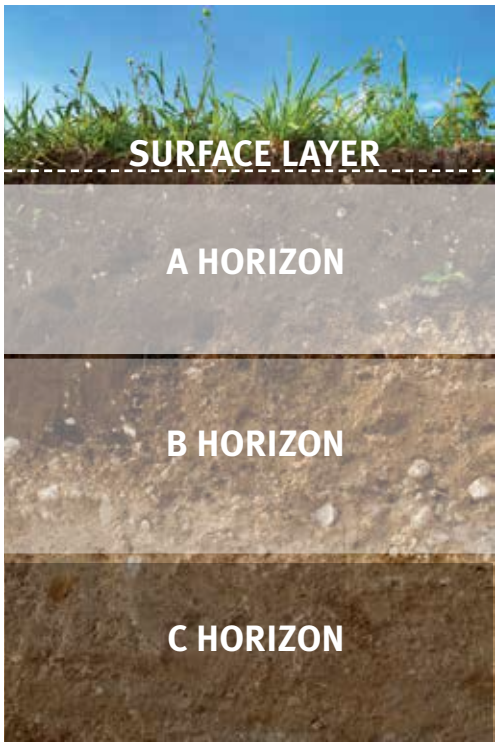
Figure 3.1 – Textural class of soil by percent sand and clay.



3.1.2 SOIL LAYERS

The Canadian Soil Classification System has been developed to describe soil in the Canadian landscape. If a deep vertical cut was made into the earth, a number of soil layers, called horizons, would be visible. These layers run parallel to the surface and, although they vary in thickness, they are usually found in the same order. Each soil layer has a specific set of physical, chemical, and biological characteristics, and the depth of certain layers can determine the suitability of a region for different uses. It should be noted that the Canadian Soil Classification System shares some, but not all, common terminology with systems used in the United States, England, and other countries.

Figure 3.2 – The Soil Horizons.



In undisturbed areas, the surface layer is composed of organic matter in varying states of decomposition. This layer is labeled as an L, F, or H HORIZON depending upon how far the material has progressed, from leaf litter to humus. In bogs, swamps, and marshes, this top layer of matter is called the SURFACE LAYER. Once broken down, humus is slowly mixed and moved into the next underlying soil layer by water and soil animals.

Just below the organic horizon is the A HORIZON, more commonly called topsoil. This is the most biologically active layer of soil and the region where most nutrients, important soil microbes, and plant roots are found. Although made up mainly of mineral matter, it is also rich in organic matter. Water moving through the organic and A horizons transports soluble minerals and nutrients through a process called leaching. Very fine particles can also be physically transported by water. Animals such as earthworms alter the soil by moving and mixing the organic and mineral constituents of the soil. When the soils are mixed, oxygen is trapped and the soil becomes aerated, allowing further chemical processes to occur.

Over long periods of time, the materials carried by downward moving water accumulate in underlying soil layers. These layers are referred to as the B HORIZON. The B HORIZON undergoes less change and disturbance than the A HORIZON, but if there is sufficient organic material in the B HORIZON, it can also be included in the definition of a top soil.

Below the B HORIZONS are the deepest and least weathered soil layers called the C HORIZON, sometimes called the parent geologic material. Although some very deep plants roots may extend into these layers, it is not considered to be biologically active and is composed almost entirely of mineral matter. Underlying bedrock is not considered part of the C HORIZON.

3.2 THE BEHAVIOUR OF WATER AND SOILS

The topsoil layers (A, and sometimes B, horizons) play the most important role in water movement and retention. In a natural setting, top soil is an important contributor to the hydrologic cycle. At the same time, movement of water is one of the main contributors to soil formation.

The interaction of water and soil is comprised of several processes; infiltration of water into the soil, movement through the soil called percolation, and water retention in the soil layers.

3.2.1 WATER INFILTRATION

Soil is naturally permeable, with spaces or pores between the particles. When water enters the pores, it is called infiltration. Water is drawn into the soil and moves through soil pores by the forces of gravity and capillary action. Gravity plays a bigger role in coarse soils with large pore spaces, such as a sandy soils. Capillary action is more important for soils with lots of silt or clay. As the pores fill with water, the rate of infiltration will decrease.

The slope of the soil surface will also affect how much water infiltrates the soil. Flat areas allow water more time to infiltrate, whereas water runs more quickly off steep slopes, allowing less time for infiltration.

3.2.2 WATER MOVEMENT THROUGH SOIL

The movement of water through soil plays a critical role in the quality and quantity of local and regional water sources. The potential of water to move through a soil is affected by the attraction of water to soil solids (adhesion), other water molecules (cohesion), as well as the force of gravity. There are several main factors that will influence how and when water is moved through a soil. If water is not moved through the soil, it stays in the pores, and is retained.

Organic content and pore space are the two key soil characteristics that determine how much water a soil can retain. The presence of humus increases water retention while providing a variety of nutrients. For every additional 1% of organic matter added to the volume of a soil sample, the water capacity of the soil increases by 1.5%.

How tightly the soil particles are pressed together will also impact the ability of water to move through soil. When soil is compacted, the pore spaces are reduced and there is less room for water to move between particles.

3.2.3 WATER RETENTION IN SOIL

Water retention is directly related to organic content and pore size, with soils consisting of finer particles retaining water more than soils made up of medium or large–sized particles. Water is more likely to be retained in a clay soil than a sandy soil—it has a higher water capacity.

When it rains, water fills the pores between the soil particles. When all the pores are filled, and the soil can't hold any more water, the soil is saturated. The volume of water being held in the soil is its saturation capacity. There is no room for air in the pores of saturated soils, and plants will begin to suffer and drown.

As the rain slows and stops, water begins to percolate into the lower layers of soil, a process called drainage. This can take a couple of hours in sandy soils, or a couple of days in clay soils. When drainage is complete and there is both water and air in the pores, the soil is ideal for plant growth and is said to be at field capacity.

Water stored in the soil is used by plant roots, or lost to the atmosphere through evaporation. As the soil dries out, water particles adhere more tightly to the soil particles and it becomes harder for plant roots to extract them. The point at which no additional evaporation can occur and plants can no longer access water is called the wilting point.

Wilting point is the moisture content of a soil at which plants wilt and is also commonly called air dry, a condition when no additional evaporation will occur and any moisture remaining in the soil is not accessible to plants.

Soils with a greater ability to retain water between field capacity and wilting point will remain moist longer and support vegetation for a longer period of time.

Figure 3.2 - Water content by soil texture

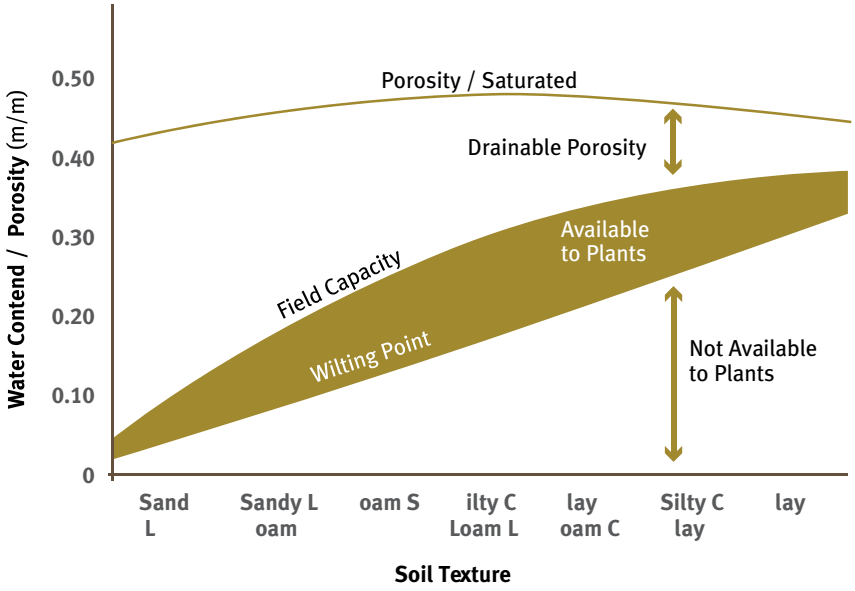
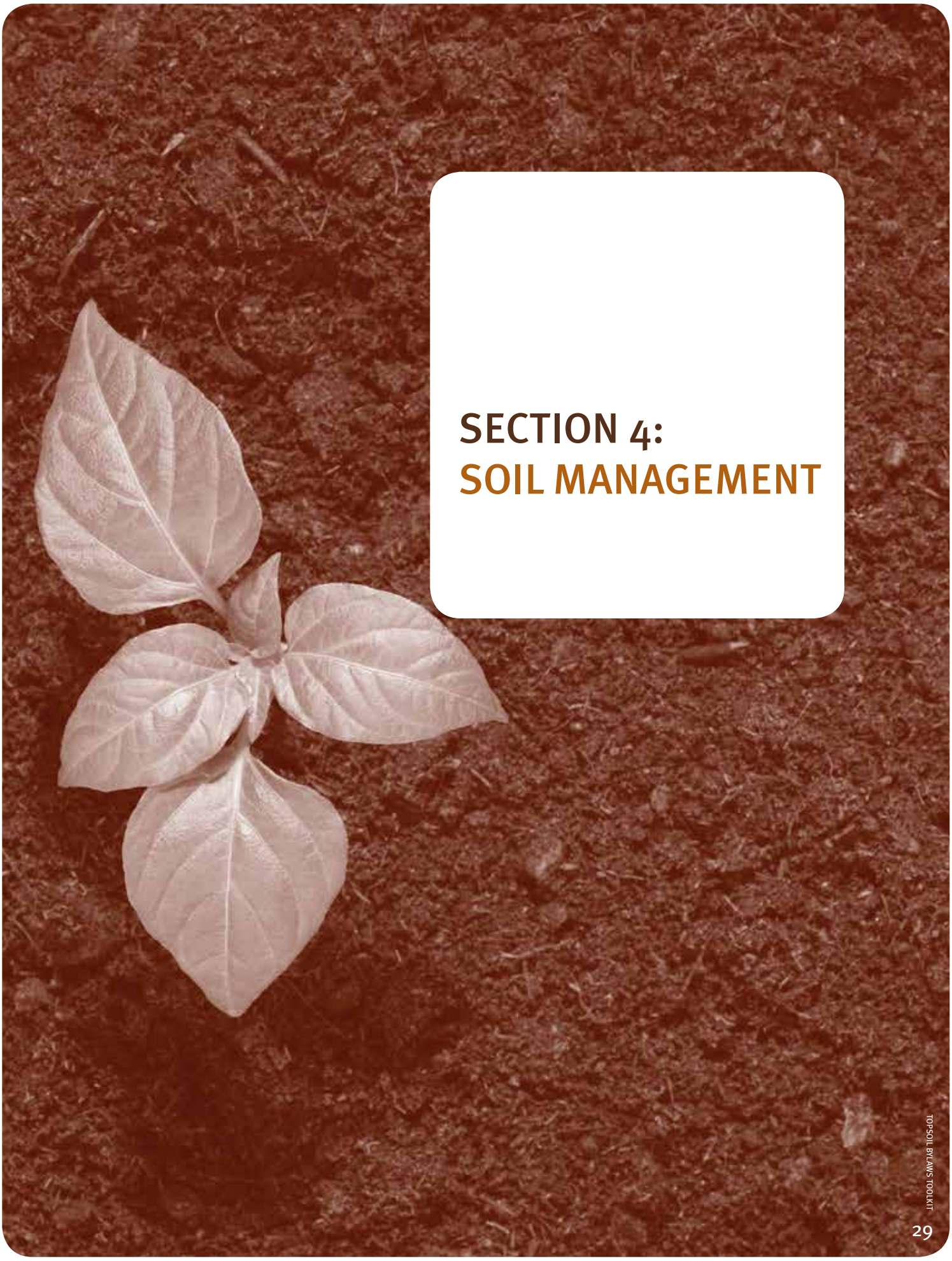


Figure 3.1 – Available water storage capacity of soils (adapted from BC Agriculture, Food and Fisheries Ministry, http://www.agf.gov.bc.ca/resmgmt/publist/600Series/619000-1.pdf)

A Guide to Available Water Storage Capacities of Soils		
	Available Water Storage Capacity	
Textural Class	(in. of water/in. of soil)	(mm water/ m of soil)
Clay	0.21	200
Clay loam	0.21	200
Silt loam	0.21	208
Loam	0.18	175
Fine sandy loam	0.14	142
Sandy loam	0.12	125
Loamy sand	0.10	100
Sand	0.08	83

Soil capacities are measured in mm of water/ m of soil. The thicker the soil layer, the greater the total water capacity. Although clay soils have the highest water storage capacity, they also have low infiltration rates and are difficult to cultivate. The best type of soil for both water infiltration and retention is one that combines soil particles in a uniform blend of sand, silt, and clay. These soils are also best at allowing plants to access available water over longer periods of time.



SECTION 4:
SOIL MANAGEMENT

Unchecked changes to native topsoil can have far-reaching impacts in a watershed. Development that increases impervious surfaces and leaves behind a poor topsoil layer will increase water runoff, which can cause erosion and flooding as the runoff collects and moves downstream. Surface runoff will carry any sediment and pollution it picks up along the way, decreasing water quality. If water runs off before it can infiltrate the soils, it cannot recharge aquifers, which are key to the local water supplies—both surface and groundwater. Reduced aquifer levels may result in a drop in river levels over the summer, causing an increase in water temperature that can stress or kill many aquatic organisms. Additionally, poor quality topsoil cannot sustain as healthy a population of soil microbes or surface vegetation, making the soil less productive than good quality top soil. Lawns and landscapes with poor topsoil will require more frequent watering, increasing water demands during the hottest months.

The overall health of an urban watershed can be improved by introducing measures to protect topsoil: setting a minimum topsoil depth and improving topsoil quality where required. This can occur proactively by implementing landscape standards during new development, or retroactively through the modification or enhancement of existing topsoil layers.

4.1 LANDSCAPE DESIGN AND TOPSOIL

Prior to breaking ground on new developments or landscape amendments, there are many important considerations that should be given to topsoil. With the help of a landscape engineer and soil professional, care should be taken to:

- Consider the amount of impervious surfaces that will be installed. Try to minimize these surfaces and use pervious surfaces wherever possible. Consider where surface runoff from impervious areas will flow to, and adjust these areas accordingly. Areas receiving runoff should have at least a 20% greater area than the impervious area where the runoff is generated.
- Design a gently (2% or less) sloping surface to improve soil water flow, or create dishes in the surface if ponding is desired. Ponding areas should retain water no longer than 48 hours and should have a maximum water depth of 15 cm (6 inches).
- Provide overflows and under drains where necessary. All ponding areas should have overflows installed to manage large rains and storms.
- Consider subsoil infiltration rates. If the rate of infiltration is less than 5.0mm/hr, sub-drains should be added to provide adequate drainage. If the rate of infiltration is greater than 75mm/hr, the maximum topsoil depth of 45 cm (18 inches) may not be required.
- Consider the conveyance of water to the pervious areas. Avoid concentrating flows to the landscaped areas unless inlets are designed to manage flow velocities, debris, and sediments. A minimum 15 cm elevation difference

between the impervious areas and landscaped areas will allow for sediment buildup and plant growth at the interface.

- To prevent erosion, ensure flow velocity of water entering the topsoil areas is less than 0.3 m/s for planters and 1.0 m/s for turf areas. Flow velocity can be reduced by reducing the area and slope of the impervious tributary

4.1.1 DETERMINE YOUR EXISTING TOPSOIL CONDITIONS

Some basic formulas can be used to determine the existing topsoil conditions at the site:

1. Determine the **net design area**, D (m^2):

   $D = A - B$,

   where:
   A = **total site area** (m^2)
   B = **area left undisturbed** (and not receiving flow from impervious areas) (m^2)

2. Determine the **receiving pervious area**, P (m^2), and the **conveying impervious area**, I (m^2):

   $D = P + I$

3. Once the areas are calculated, the **enhanced topsoil depth**, T (mm), required after site design to match the existing volume and infiltration can be calculated:

   $$T = t + t \left\{ \frac{I}{P} \right\}$$

   where:
   t = **existing topsoil depth** (mm)

These calculations will allow the developed site to have the same total volume of top soil as was present in the undeveloped site.

4.2 APPROACHES TO SOIL MANAGEMENT

When implementing best management practices (BMPs) for topsoil at a site, it is strongly recommended that a soil professional and landscape engineer are consulted during the early phases of the project. In areas of new development where native topsoil and vegetation exists, every effort should be made to preserve the existing established soil profile and prevent soil compaction. This includes working with developers to minimize the footprint of all construction activity, as well as minimizing the installation of impermeable surfaces. In areas where development is occurring near a body of water, a buffer riparian zone of undisturbed land should be left between the construction area and the water's edge.

For new developments:

1. Asses the topsoil quality on your proposed development site.
   - Topsoil should have a minimum depth of 15 cm (6 inches) and a maximum depth of 45 cm (18 inches). Topsoil over 45 cm in depth may require additional sustainability measures, such as green roofs, tree canopies, rain gardens, and infiltration galleries.
   - Soil samples should be assessed for porosity, pH, and soil organic matter (SOM). Soil pH should typically fall between 6.0 and 8.0. The SOM content should be up to 8% of the dry weight of the soil if the land is intended for turf or the surface will be actively used, and up to 15% of the dry weight of the soil if it is intended for vegetation or other ground cover. Use of high organic matter content on playing fields can present problems of stability when the moisture content is near, or above, the field capacity of the soil.

2. Identify areas in your proposed development site where the soil and overlying vegetation will not be disturbed.
   - Protect this area from compaction during development.

3. Determine if there are areas of the site where topsoil will be stripped and stockpiled.
   - Use appropriate techniques to remove and stockpile topsoil. This will ensure the soil structure is not negatively affected.
   - After development is complete, the subsoil can be scarified (tilled) to 10 cm (4 inches). This will ensure there is a transition between the two soil layers and avoids issues with water flow between the layers. The subsoil is then graded and topsoil is replaced to desired areas.
   - The replaced soil can be amended if necessary to achieve optimum depth and SOM prior to planting. In planted beds, place 2 inches of organic mulch material over the topsoil.

4. If needed, import topsoil mix with appropriate pH (6.0 to 8.0) and SOM.
   - After development is complete, scarify the subsoil to 10 cm (4 inches), grade the surface, and the imported topsoil apply.

5. Determine if any disturbed areas have been compacted, and till where required.

6. Identify methods of erosion control until vegetation is established.
   - Management of erosion will help maintain topsoil depth and quality, particularly in areas with recently disturbed topsoil. Using tools such as berms, blankets, or socks made of compost will significantly reduce soil erosion. Using compost-based erosion control has the added benefits of rapidly absorbing and filtering water and is biodegradable.

In existing developments, investigate the depth and quality of the topsoil. Determine whether soil is compacted, has a poor pH, or has a low organic content. Implement measures to improve the soil where required, including aeration, addition of organic matter, or addition of more topsoil.

4.3 QUALITY CONTROL

Quality control and follow-up are key to successful long-term soil management. Ensure that appropriate inspection and permitting procedures are in place, as described in **Section 6: Sample Topsoil Policies and Bylaws.**

Quality control measures include ensuring:

- the topsoil or compost supplier is aware of the objectives and structural requirements for the soil or compost
- installation crews are mindful of appropriate placement techniques and grading requirements
- the construction supervisor is aware of the topsoil's function, and proper quality assurance procedures are being implemented
- topsoil is handled appropriately when being removed, stockpiled, and replaced.
- topsoil is placed to appropriate depth and quality during development
- is of sufficient follow-up inspections are performed after development is completed
- all drainage is functioning once development is completed, including proper flow through all inlets and outlets connected to the development area; and,
- finances are secured to support long-term success, ensuring BMPs are followed.

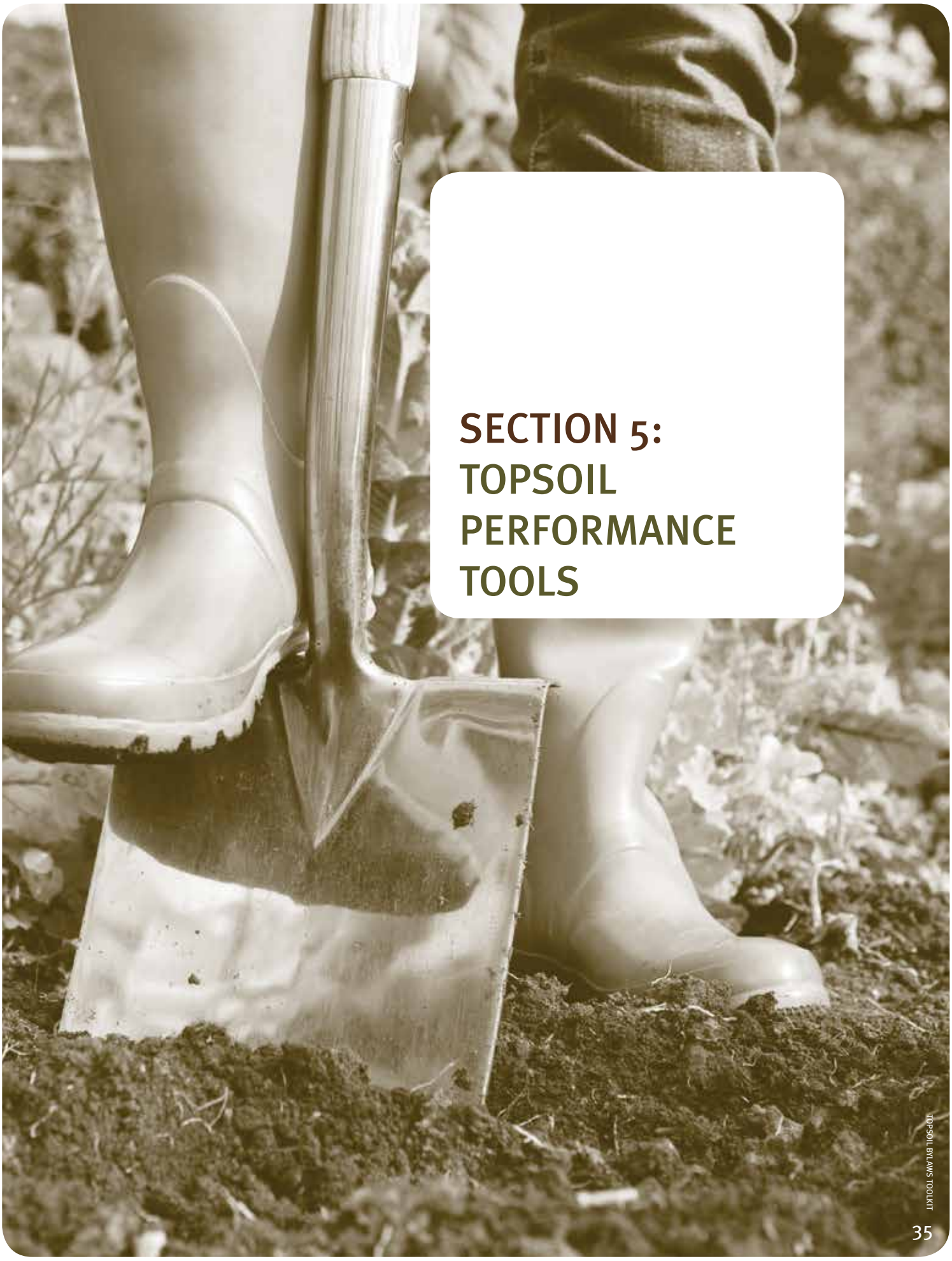
4.4 SOIL SURVEYS

A baseline soil survey will determine the types of soil that are present at a site, as well as the soil properties. Completing a soil survey will let the developer know the depth and quality of the existing topsoil layer at a planned development site. It will also inform the developer of any potential problems with soil composition or structure, which can determine how the soil should be amended before it is reused.

4.5 WORKING WITH SOIL PROFESSIONALS

Soil surveys should be done by a specialist that is trained in soil classification, usually a Professional Agrologist (P.Ag.). The professional should conduct a site visit during the planning stages, prior to the any soil disturbances or machine work. They can ensure that appropriate machines and techniques are used when development begins. Developers might also consider having a soil specialist involved throughout the construction process to provide direction in proper soil handling.

Qualified soil specialists can be contracted through many environmental consulting firms, and are listed in local directories. Professional agrologists are listed by region at the BC Institute of Agrologists (http://www.bcia.com/find_agrologist.php).



SECTION 5: TOPSOIL PERFORMANCE TOOLS

Local governments have a variety of planning and regulatory authorities they can use to craft an integrated rainwater management strategy that includes topsoil protection and enhancement. The term "bylaw," as used below, is a generic term for a regulatory authority that enables provisions dealing with a specific topic area. Local governments enact a bylaw using a variety of regulatory powers. A drainage bylaw, for example, could use drainage, runoff, and landscape powers. It is rare that a local government would have separate bylaws for each of the areas of regulatory authority listed in this chapter.

See the ***Green Bylaws Toolkit*** for more detail on how local governments can use plans, development permitting and regulatory bylaws for environmental quality purposes.

www.greenbylaws.ca

5.1 REGIONAL GROWTH STRATEGIES

A regional growth strategy (RGS) is an agreement between the regional district and member municipalities to coordinate action on regional issues. Developed with at least a 20 year timeline, its stated purpose is to promote human settlement that is socially, economically, and environmentally healthy, and to make efficient use of public facilities and services, land, and other resources.[1] A RGS should work towards the goals of reducing water pollution and protecting the quality and quantity of groundwater and surface water. [2] This includes maximizing the retention of native topsoils and protecting topsoil quality and quantity.

Jurisdiction	
Municipality	**Regional District**
Local Government Act Part 25 ss. 849-871 *(regional growth strategies)*	*Local Government Act* Part 25 ss.849-871 *(regional growth strategies)*
Strengths and Weaknesses	
Strengths	**Weaknesses**
- Increases profile of regional issues with local government and public - Transcends local government boundaries and can enable a watershed planning approach - May include: - coordination of regional action - commitment to integrated rainwater management	- No provincial standards or best practices that must be met - Based on consensus so leads to compromise in order to obtain agreement - Enforcement unclear

[1] *Local Government Act,* R.S.B.C. 1996, c.323 at section 849(1).

[2] *Ibid,* at section 849(2)(g) and (j).

Once enacted, all bylaws and services of the regional district must be consistent with the RGS.[3] Municipalities must include a regional context statement in their OCPs detailing how the OCP will be made consistent with the RGS over time.[4]

5.2 OFFICIAL COMMUNITY AND LOCAL AREA PLANS

An OCP and sub-plans such as local area plans give direction on growth and development in a community for a period of at least five years, containing significant policy directions of the local government. An OCP should work towards the same purposes as an RGS.[5] Local area plans can be adopted as part of an OCP and are more detailed area-specific plans. In both OCPs and local area plans, the benefits of topsoil depth and quality can be set out, as well as policies for maintaining native soils and integrated rainwater management.

All bylaws and local government works must be consistent with an OCP once enacted.[6] When an OCP sets out specific policies, it gives clear direction to staff, subdivision approving officers, land development professionals, and the public about where and how development should occur.

The City of Surrey's Morgan Heights Neighbourhood Concept Plan details prescriptive standards for best management practices for rainwater that are incorporated into development permitting, including requiring post-development infiltration of rainwater meet pre-development rates and prescribing minimum topsoil depth.

http://www.surrey.ca/files/Pages fromupdated1MorganHeights NCPSeptember72005.pdf

Jurisdiction	
Municipality	**Regional District**
Local Government Act ss.875-879, 882-884 *(official community plans)*	*Local Government Act* ss.875-879, 882-884 *(official community plans)*
Strengths and Weaknesses	
Strengths	**Weaknesses**
- All bylaws and works of the local government must be consistent with the OCP - Specific policies given clear direction to staff, the public and land development professionals - Policies can include integrated rainwater management and topsoil standards - Designates development permit areas management	- Policies often very general and unenforceable - Easily amended, and cumulative impacts of amendments are rarely considered - High standard for whether other bylaws consistent with the OCP

[3] *Ibid*, at section 865.

[4] *Ibid*, at section 866.

[5] *Ibid*, at section 875.

[6] *Ibid*, at section 884.

An OCP can establish comprehensive policies for integrated watershed management, rainwater detention and topsoil quality and quantity. It can also direct development of, or make reference to, watershed or rainwater design guidelines or policies that future land development must adhere to.

A key part of **water infiltration** on any site is the amount of **impermeable surface**. Many zoning bylaws limit total impermeable site coverage and are increasingly differentiating between *actual* and *effective* imperviousness. While effective impervious may be 50 percent due to 50 percent site coverage, **actual imperviousness** may be only 10 percent if the rainwater from the those areas is deliberately infiltrated into the soil. Rainwater, drainage, zoning, and subdivision bylaws that focus on effective imperviousness can achieve water infiltration goals in urbanized areas. Together with standards for topsoil quality, they can significantly increase water retention in a watershed.

See the Groundwater Bylaws Toolkit for zoning and other bylaws that address imperviousness.
http://www.obwb.ca/groundwater_bylaws_toolkit/

5.3 DEVELOPMENT PERMIT AREAS

Local governments may designate development permit areas (DPAs) to protect the natural environment, its ecosystems and biological diversity, as well as to promote water conservation. DPAs are an overlay zone that allow local governments to establish area- or ecosystem-specific guidelines that are attached to certain sites and development projects through permit conditions. They are the most effective way to shape how and where development occurs on a site. In DPAs, a landowner must obtain a development permit before subdividing or altering land, constructing, adding onto, or altering a building or other structure. Guidelines for DPAs can establish specific standards for topsoil which permit holders must adhere to, including areas where native topsoil must be retained and disturbed soils stockpiled for future use.

Jurisdiction	
Municipality	**Regional District**
Local Government Act ss.919.1-920 *(development permit areas)*	*Local Government Act* ss.919.1-920 *(development permit areas)*
Strengths and Weaknesses	
Strengths	**Weaknesses**
- Enables site-specific control of development - Guidelines can be sufficiently detailed to shape development - Able to prohibit site disturbance before development approval to ensure desired site conditions, such as topsoil, are conserved or maintained - Applies to a property regardless of ownership	- Designating DPAs is somewhat politically unpopular - Cost to landowner/developer to obtain permit - Enforcement is by court injunction only

Development permits granted for a DPA for protection of the natural environment can:

- specify areas of land that must remain free of development, except in accordance with any conditions contained in the permit;
- specify natural features or areas to be preserved, protected, restored, or enhanced;
- require construction of works to preserve, protect, restore, or enhance natural watercourses or other specified natural features of the environment; and
- specify protection measures, including planting or retaining vegetation or trees in order to conserve, protect, restore or enhance fish habitat or riparian areas, control drainage, control erosion, or protect banks. [7]

Development permits granted for a DPA that requires energy and water conservation and the reduction of greenhouse gas emissions can include requirements for:

- Landscaping, including restrictions on the type and placement of trees and other vegetation in proximity to the buildings and other structures;
- Site locations of buildings and other structures;
- Form and exterior design of buildings and other structures;
- Specific features in the development; and
- Machinery, equipment, and systems external to buildings and other structures.[8]

DPA guidelines in OCPs and zoning bylaws give the direction about how development will occur on a site. The guidelines set the additional parameters for development through which staff and council impose development permit conditions. They can be as detailed as technical standards contained in best management practices documents and can explicitly address drainage works and topsoil.

[7] *Ibid,* at section 920(7).

[8] *Ibid,* at section 920(10.1).

5.4 DEVELOPMENT APPROVAL INFORMATION AREAS

Local governments may designate areas as development approval information areas (DIAs), within which local governments may ask for additional information, or studies, from an applicant for rezoning, development permits, and temporary commercial and industrial use permits. The purpose is to allow local government to obtain information on site conditions, such as soil profiles, and the impact of a development, at the expense of the applicant.

When a local government designates a DIA, it must also enact a bylaw establishing procedures and policies on the process for requiring the information, and the type of the information that the local government may require. The information usually takes the form of a professional report and can include information about soil conditions, hydrology, and infiltration rates. Over time, this can assist local governments to compile soil data and obtain a better understanding of soil conditions throughout its jurisdiction.

Jurisdiction	
Municipality	**Regional District**
Local Government Act s.920.01 (development approval information areas)	*Local Government Act* s.920.01 *(development approval information areas)*
Strengths and Weaknesses	
Strengths	**Weaknesses**
- Provides information to assist decision makers to better understand site conditions and project impacts - Builds knowledge about site and area conditions - Can identify mitigation or management plan needs - Can help define amount of security deposit required	- Can be cost prohibitive for smaller projects - Cannot be required for subdivision applications

5.5 SUBDIVISION, RAINWATER (DRAINAGE) AND RUNOFF CONTROL BYLAWS

Except for a subdivision under the *Strata Property Act*, subdivision bylaws set the standards that works and services, such as drainage systems, must be constructed when land is divided into new parcels. Municipal drainage bylaws regulate drainage works by entities other than a municipality and regulate their design and construction, as well as require property owners to connect their buildings to the works as specified in the bylaw. The authority for regional district drainage bylaws is more limited, but does allow requirements for constructing works to protect land from erosion. Generally, subdivision servicing bylaws address community works and services on the street, drainage bylaws can address works on both the street and individual properties, and runoff bylaws apply on individual properties. These various bylaws can directly set topsoil standards.

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Jurisdiction	
Municipality	**Regional District**
Local Government Act s.938 (subdivision) *Community Charter s.69 (drainage)* *Local Government Act s.907 (runoff control)*	*Local Government Act s.938 (subdivision)* *Local Government Act* ss.540-542 *(drainage)* *Local Government Act* s.907 *(runoff control)*
Strengths and Weaknesses	
Strengths	**Weaknesses**
- Address rainwater both on the street and on individual properties - Creates green infrastructure - Addresses new development and redevelopment - Can impose best management practices developed by professional and other organizations	- Requires re-skilling of development industry in some cases - Some techniques not proven for some precipitation levels and soil types - Some sites too small to infiltrate most rainwater on site

In addition to establishing standards in a bylaw, bylaws can reference standards established in neighbourhood plans or design and policy manuals. They can also reference third party standards, such as the Master Municipal Construction Documents specifications, and vary those standards to improve topsoil depth and quality.

5.6 SOIL REMOVAL AND DEPOSIT BYLAWS

Local governments can enact soil removal and deposit bylaws to regulate soil disturbance and deposition without a permit. They can require best management practices during construction to avoid soil erosion and protect stored topsoil.

Although soil removal and deposit bylaws are often only triggered by significant soil movement, e.g. 100 cubic metres, they can be crafted to require topsoil preservation and storage during development. They can also specify quality requirements for topsoil being brought onto a site.

Jurisdiction	
Municipality	**Regional District**
Community Charter ss. 8(3)(m) & 9(1)(e) *(soil removal and deposit)*	*Local Government Act* s.723 *(soil removal and deposit)*
Strengths and Weaknesses	
Strengths	**Weaknesses**
- Enables regulation of all grading activities on a municipal-wide basis - Can require permitting for any soil disturbance through which topsoil protection and storage may be required - Permit process can specify a quality of topsoil	- Often bylaw is triggered only by significant soil disturbance

5.7 LANDSCAPE BYLAWS

A local government may require, set standards for, and regulate site landscaping. This includes the quality and quantity of topsoil for the purposes of separating uses, preserving, protecting, restoring and enhancing the natural environment, and preventing hazardous conditions. Local governments may enact landscaping bylaw provisions to replace or increase topsoil quality and quantity.

Jurisdiction	
Municipality	**Regional District**
Local Government Act s.909 *(landscaping)*	*Local Government Act* s.909 *(landscaping)*
Strengths and Weaknesses	
Strengths	**Weaknesses**
- Simple jurisdiction to impose topsoil standards - When included in a regulatory bylaw, rather than stand alone, can get good compliance	

5.8 PARKING

A local government may establish design standards for required parking spaces, including (but not limited to) standards for their size and surfacing. This can include requiring landscape features and topsoil depth and quality.

Jurisdiction	
Municipality	Regional District
Local Government Act s.906	*Local Government Act* s.906
Strengths and Weaknesses	
Strengths	Weaknesses
- Can address parking lot-specific topsoil requirements	- Limited in scope (area and type of use)

5.9 BUILDING PERMIT

As a condition of issuing a building permit, a local government may require a landowner to provide works and services that meet a standard established by subdivision servicing bylaw. A landowner may be required to provide works, such as redevelopment of a boulevard that includes topsoil, as part of a building permit for major renovations.

Jurisdiction	
Municipality	Regional District
Local Government Act s.909 *(parking)*	*Local Government Act* s.909 *(parking)*
Strengths and Weaknesses	
Strengths	Weaknesses
- Applies to both re–development and new development.	- Off-site works only

5.10 SECURITY

Local government can require applicants for certain development permits to post a security deposit or bond. The local government can then use it if a permit condition is not met, or for habitat restoration and landscaping if damage to the natural environment occurs. It provides an up-front way to encourage care to be taken in land development and increases compliance with permits.

Jurisdiction	
Municipality	**Regional District**
Community Charter ss.8(8)(c), 17 & 19 *(requirement for security)* *Local Government Act* s.925 *(requirement for security)*	*Local Government Act* s.925 *(security and defaulter's expense)*
Strengths and Weaknesses	
Strengths	**Weaknesses**
- Provides a financial incentive for carrying out the permitted work properly and with care - Acts as an enforcement mechanism for breach of development permit conditions or environmental harm	- Remediation of environmental harm or fulfilling permit conditions can be more costly than the security posted

A municipal regulatory bylaw can require the security, or the security may be a condition of a license, permit, or approval. If a permit holder does not fulfill the required permit conditions or causes harm, the municipality may complete the work and recover the costs from the owner. The municipality must use the security to remedy or fulfill the specific requirement for which it took the security.

The District of North Vancouver's *Environmental Protection and Preservation Bylaw* requires an applicant to provide security in the form of cash, certified cheque, or an unconditional irrevocable letter of credit drawn on a Canadian chartered bank in an amount equal to 30 percent of the estimated cost of the work to be performed under an aquatic or tree permit, to a maximum of $10,000, to ensure full and proper compliance with the provisions of the bylaw and conditions of the permit.

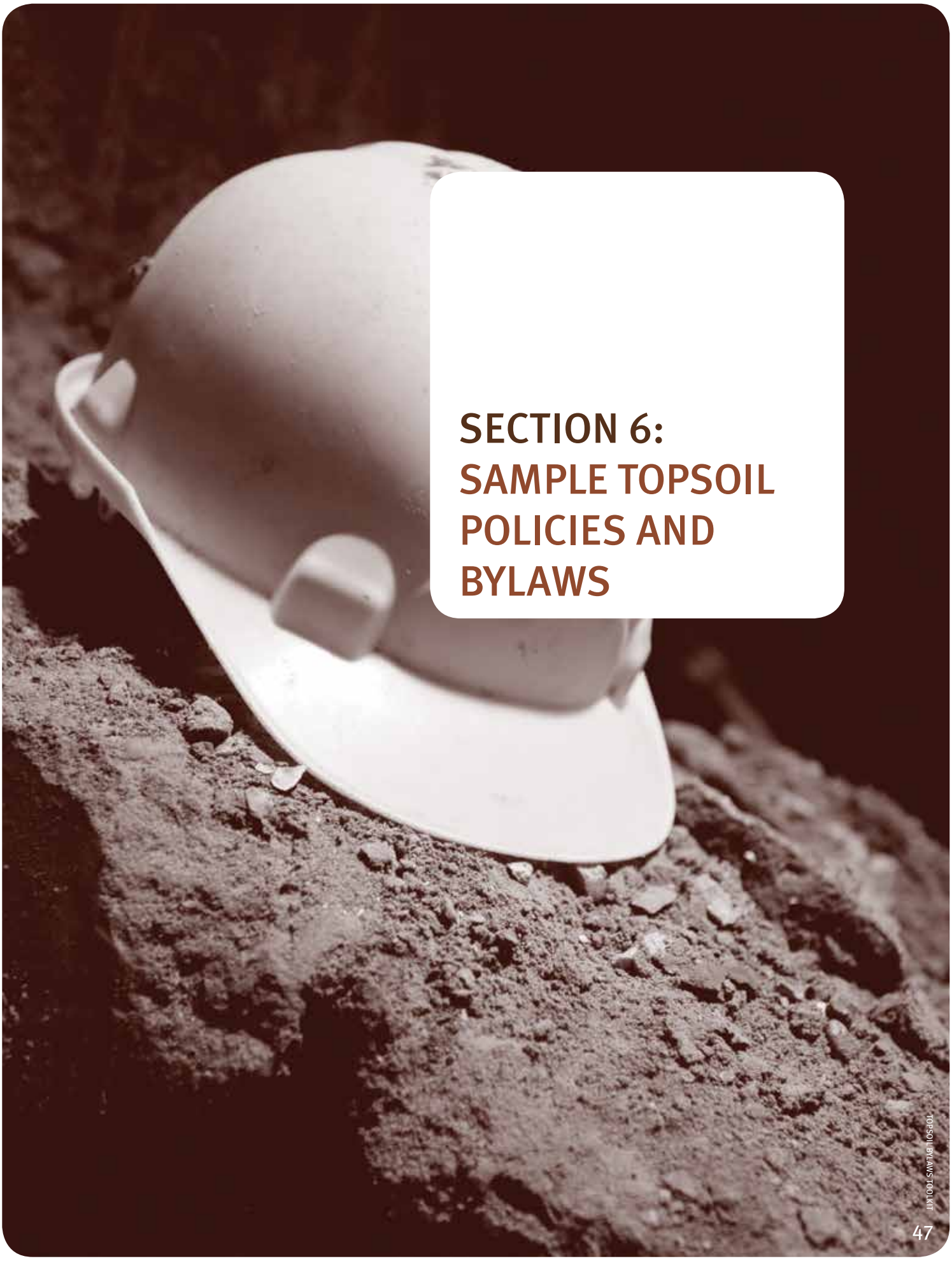
http://www.dnv.org/upload/documents/bylaws/6515.htm#_Toc117396932

The jurisdiction for regional districts to require security is more limited and also applies to the municipal authority for obtaining security under development permit areas via Division 9 of the *Local Government Act*. Local governments may require security as a condition of a development permit to pay for remediation of:

- inadequate landscaping, if post-development landscaping is a condition of a permit;
- unsafe conditions that have resulted from contravening a condition of a permit; and
- damage to the natural environment that is a consequence of contravening a permit condition.

If any of these conditions occur, a local government may complete the landscaping, correct the unsafe condition, or correct the damage to the environment and use the security to pay for the costs of the work.

Security requirements are found in regulatory bylaws, guidelines for development permit areas, or in design and policy manuals that are incorporated into bylaws for servicing subdivisions and development projects.



SECTION 6: SAMPLE TOPSOIL POLICIES AND BYLAWS

This chapter provides sample planning and bylaw language relating to rainwater management and topsoil quality and quantity. It does not set out one model bylaw approach. Local governments can select from these provisions when crafting topsoil regulations.

6.1 REGIONAL GROWTH STRATEGIES

This section on regional growth strategies is based on the regional growth strategies from the Capital Regional District, Fraser Valley Regional District, Metro Vancouver, Regional District of Central Okanagan, Regional District of Nanaimo, Squamish Lillooet Regional District, and South Okanagan-Similkameen Regional District.

The [Regional District] and member municipalities agree to:

Promote best management practices in water conservation, surface/groundwater management and ecosystem protection.

Protect and enhance the quality and quantity of the water of the region's lakes, rivers, streams, wetlands, and groundwater sources.

Establish an integrated watershed planning program that uses best management practices in rainwater management and coordinates infrastructure between local governments across political boundaries.

Develop integrated rainwater management strategies that will be incorporated into local bylaws and plans. These plans will focus on preserving pre-development hydrological conditions and infiltrating rainwater on development sites through detention infrastructure and improved topsoil quality and quantity.

Subscribe to the Water Balance Model of B.C. to provide a common platform from which local governments can integrate land–use planning with volume-based analysis of rainwater management practices.

6.2 OFFICIAL COMMUNITY AND NEIGHBOURHOOD PLANS

This section on official community and neighbourhood plan is based on the plans from the City of Courtenay and City of Surrey, and the Washington State Department of Ecology Best Management Practices for Stormwater Management.

OCP Backgrounders

Natural undisturbed soil and vegetation provide important hydrological functions, including for rainwater management and irrigation. Topsoil: infiltrates water; absorbs and filters nutrients, sediment and pollution; stores water; and provides decomposition services. These functions are compromised or lost when land development removes natural soils and vegetation and replaces it with shallow topsoil and sod of indeterminate quality. These altered landscapes themselves behave like pervious surfaces due to increased need for watering vegetation, the use of pesticides, fertilizers and other landscaping and household/industrial chemicals, and the concentration of pet wastes and pollutants.

Regulating soil quality and depth maintains rainwater function in a developed watershed, treats pollutants and sediments that result from development, and minimizes the need for some landscaping chemicals. It also retains water for longer periods of time, thus reducing the need to use treated water from the community water supply to irrigate lawns and vegetation.

Objectives

The first priority is to preserve naturally occurring soil and vegetation. The second priority is to establish a minimum soil quality and depth to provide improved onsite management of rainwater flow and water quality, as well as provide irrigation value to landscaping. The materials used to meet soil quality, including minimum percentage of organic matter, and depth requirements must be appropriate to the plant cover to be established.

Policies

Obtain information about soil profiles by requiring applicants for land development to provide information about soils.

Implement integrated rainwater management throughout [local government] focusing on rainwater detention and infiltration.

Maintain pre-development hydrology in post-development settings.

Maximize the retention of undisturbed native vegetation and soil, and protect from compaction during construction.

Where non-disturbance is not possible, stockpile the native soil and reapply to the post-development landscape.

The OCP and local area plans are based on best management practices (BMPs) in all aspects of infrastructure design and construction. Expected BMPs include at-source controls including superior topsoil depth and quality, conveyance controls, erosion and sediment control practices during construction, and ongoing maintenance of these BMPs.

The implementation of BMPs in this area will be designed in accordance with:

- Department of Fisheries and Oceans (DFO) Land Development Guidelines for the Protection of Aquatic Habitat
- Ministry of Environment (MoE) Stormwater Planning: A Guidebook for British Columbia; and Urban Runoff Quality Control Guidelines for the Province of British Columbia
- Greater Vancouver Sewerage and Drainage District Stormwater Source Controls Preliminary Design Guidelines; Best Management Practices Guide for Stormwater; and Construction Site Erosion and Sediment Control Guide
- Master Municipal Construction Document (MMCD): Green Design Guidelines Manual
- Topsoil Bylaws Toolkit

The rainwater infiltration goal of the [local government] is to infiltrate at least [25mm of rainfall within 24 hours].

BMPs include providing suitable shade trees to promote evapotranspiration, and preserving and supplementing topsoil on street rights-of-ways and on site landscaping to a depth of 450 mm to promote infiltration.

The [local government] will implement the Water Balance Model of BC to manage the natural environment and the built environment as integrated components of the same watershed.

6.3 DEVELOPMENT PERMIT AREAS FOR PROTECTION OF THE NATURAL ENVIRONMENT AND FOR WATER CONSERVATION

This section on development permit areas is based on the guidelines from the City of Courtenay, City of Seattle, the Greater Vancouver Sewerage and Drainage District Stormwater Source Control Design Guidelines, and the Washington State Department of Ecology Best Management Practices for Stormwater Management.

Justification

See the *Backgrounders and Objectives* in section 6.2 as an example of justifying establishing a development permit area for protection of the natural environment or water conservation that includes topsoil guidelines.

Guidelines

Conserve as much natural forest land, existing trees, and undisturbed soil as is compatible with the project. Provide temporary fencing of these protected areas during construction to protection them from compaction.

The permit will delineate areas of the site where the soil profile is not to be disturbed.

Amend existing site topsoil or subsoil either at default "pre–approved" rates, or at custom calculated rates based on tests of the soil and amendment.

Stockpile existing topsoil during grading, and replace it prior to planting. Stockpiled topsoil must also be amended if needed to meet the organic matter or depth requirements, either at a default "pre-approved" rate or at a custom calculated rate.

Maximize the area of absorbent landscape–either existing or constructed–on the site.

Minimize impervious area through multi-storey buildings, narrower roads, minimum parking, larger landscape areas, green roof, or pervious paving.

Disconnect impervious areas from the storm sewer system, having them drain to absorbent landscape with only an overflow to the storm drainage system.

Design absorbent landscape areas as gently sloping (2%) or dished (concave) areas that temporarily store stormwater and allow it to soak in (maximum ponding time of 2 days), with overflow only occurring in large rain events.

When planting, maximize the vegetation canopy cover over the site. Cover by multi-layered evergreen trees and shrubs is ideal, but deciduous tree cover also is beneficial for stormwater management.

Use native planting species where feasible. Non-native plantings with similar attributes to native may be suitable in conditions where natives would grow too large or not meet other urban design objectives.

The following minimum specifications for topsoil or amended organic soil are required for landscaping on a property:

1. organic matter content of 15% dry weight in planting beds and 8% in turf areas;
2. depth of 300 mm for turf;
3. depth of 450 mm for shrubs/trees;
4. depth of 300 mm around and below the root ball of all trees;
5. pH from 6.0 to 8.0 or matching that of the original undisturbed soil;

6. subsoils scarified to a depth of minimum 100 mm with some topsoil being incorporated into the subsoil; and
7. planting beds mulched with a minimum of 50 mm of organic material.

Do not over-compact landscape subgrade or growing medium. Optimum compaction is firm against deep footprints (about 80% Proctor Density). Excessive compaction reduces infiltration rates. Rip or till subsoils that are excessively compacted. Aerate compacted surface soils.

Provide vegetative cover (grass, groundcovers, shrubs, trees) or organic cover (mulch, straw, wood fibre) to absorbent landscape as early as possible in the construction process, and prior to winter storms, to avoid surface crusting from raindrop impact and to maintain surface permeability.

Provide effective erosion control during construction, including erosion control on upstream sites that may flow into the absorbent landscape. Delay installation of constructed absorbent landscape until sources of potential erosion in the upstream drainage area have been permanently stabilized.

Materials and methods shall meet Master Municipal Construction Document 2000 requirements, including the Section 02921 requirements for Growing Medium, with organic matter requirements amended as follows:

- For lawn areas, minimum 8%
- For planting areas, minimum 15%

6.4 SUBDIVISION, RAINWATER (DRAINAGE) AND RUNOFF BYLAWS

This section on subdivision and rainwater (drainage) bylaws is based on bylaws from the City of Seattle, City of Surrey, District of Saanich, Greater Vancouver Sewerage and Drainage District Stormwater Source Control Design Guidelines.

Newly created parcels shall be constructed with on-site stormwater management facilities when these are prescribed through Council approved neighbourhood plans, master drainage plans, integrated stormwater management plans or as required in a servicing agreement or specific service connection.

The owner of real property where an on-site stormwater management facility has been installed must ensure that the facility is accessible and is maintained in good condition and functioning as designed at all times.

The [local government] requires that all developments provide drainage structures that will:

- reduce the rate of post development site runoff to predevelopment levels,
- improve the quality of site drainage water; and
- minimize erosion and retain sediments.

The rainwater infiltration goal of the [local government] is to infiltrate at least [25mm of rainfall within 24 hours].

If alternative BMPs are recommended, the designer must provide supporting analysis, in the form of continuous computer simulation, using "full-record" rainfall data for [local government], or alternatively, historical data as directed by [local government] staff. The model must incorporate the detailed site layout and percolation rates determined from a site geotechnical investigation. The model must account for the impacts of infiltration of the Best Management Practices as well as the impacts of the other Low Impact Development Strategies, and must demonstrate an equivalent level of infiltration.

Materials and methods shall meet Master Municipal Construction Document 2000 requirements, including the Section 02921 requirements for Growing Medium, with organic matter requirements amended as follows:

- For lawn areas, minimum 8%
- For planting areas, minimum 15%

6.5 SOIL REMOVAL AND DEPOSIT BYLAWS

For comprehensive detailed soil removal and deposit provisions see the Green Bylaws Toolkit www.greenbylaws.ca.

This section on soil removal and deposit was adapted from Kelowna Soil Deposit Bylaw, No. 8504, Mission Soil Deposit Bylaw and Soil Removal Bylaw, *Stewardship Bylaws: A Guide for Local Government*, and West Vancouver Soil Removal and Deposit Regulation.

No person shall, unless exempted by this Bylaw, remove soil or deposit soil or other materials:

a) without a permit issued pursuant to this Bylaw; or
b) contrary to a permit issued pursuant to this Bylaw.

A permit shall not be required where the soil removal or deposit:

- involves less than 5 cubic metres of soil per parcel of land per calendar year;

Unless a requirement is waived by the [local government], every application for a permit shall contain information with respect to the following matters:

- a site plan showing the legal boundaries and dimensions of the property;
- a site plan showing the location of native soil and vegetation that will be retained in their natural state;
- a replacement plan clearly identifying the proposed location where soil will be removed or deposited, including the volume of soil and volume/area where native soil from the disturbed areas will be stockpiled;
- The proposed methods of topsoil collection and storage, including protection from rainfall and erosion control;
- The proposed methods of drainage control for the site during and after the deposit operation;

All damage to adjacent [local government] or privately owned drainage facilities, roads, lanes, landscaping or other property, or natural watercourses, resulting from the removal or deposit of soil shall be repaired by the permit holder at his or her expense.

The following minimum specifications for topsoil or amended organic soil are required for landscaping on a property:

- organic matter content of 15% dry weight in planting beds and 8% in turf areas;
- depth of 300 mm for turf;
- depth of 450 mm for shrubs/trees;
- depth of 300 mm around and below the root ball of all trees;
- pH from 6.0 to 8.0 or matching that of the original undisturbed soil;
- subsoils scarified to a depth of minimum 100 mm with some topsoil being incorporated into the subsoil; and
- planting beds mulched with a minimum of 50 mm of organic material.

[Municipal] staff are authorized under the provisions of Section 16 of the *Community Charter* to enter at all reasonable times upon any property for the purpose of ascertaining whether the regulations of this bylaw are being observed.

If in the opinion of a Bylaw Enforcement Officer, immediate steps should be taken to prevent the disturbance of native soils or application of soils that do not meet the quality requirements established in this bylaw, or if a Bylaw Enforcement Officer is not satisfied that the owner has taken appropriate steps to mitigate the damage caused by the breach of any provision under this bylaw, the [municipality] may enter onto the land to take such steps in its opinion as are necessary to protect the environment.

If the [municipality] takes action pursuant to Section [number of preceding section], every owner and occupier of the parcel, shall pay to [municipality] within thirty (30) days of demand of same, all costs and expenses incurred by or on behalf of the [municipality] caused by the breach of any provision of this bylaw.

Any amount unpaid, together with interest, on the 31st day of December in any year shall be added to and form part of the property taxes payable in respect of the real property on which the [municipality] took the remedial action, or the real property that caused the environmental degradation breaching this bylaw and necessitating the remedial action, and shall be deemed to be taxes in arrears and may be so entered on the tax roll by the collector.

6.6 LANDSCAPE BYLAWS

Use native planting species where feasible.

The following minimum specifications for topsoil or amended organic soil are required for landscaping on a property:

- organic matter content of 15% dry weight in planting beds and 8% in turf areas;
- depth of 300 mm for turf;
- depth of 450 mm for shrubs/trees;
- depth of 300 mm around and below the root ball of all trees;
- pH from 6.0 to 8.0 or matching that of the original undisturbed soil;
- subsoils scarified to a depth of minimum 100 mm with some topsoil being incorporated into the subsoil; and
- planting beds mulched with a minimum of 50 mm of organic material.

[See the inspection and remedial action requirements in Section 6.6 Soil Removal and Deposit Bylaws]

6.7 SECURITY

6.7.1 DEVELOPMENT PERMIT GUIDELINES

This section on development permit guidelines was adapted from the Campbell River OCP p.9(10), and Regional District of Central Okanagan Terms of Reference, Professional Reports for Planning, and Ellison OCP Appendix A-5.

The [local government] may require the applicant to submit to the [local government] a cost estimate, prepared by a qualified professional, of the total cost of the landscaping and environmental remediation.

The applicant will provide adequate financial security, as determined by the [local government], prior to beginning the construction of any building or disturbance of a site.

The value of the financial security will be equal to the amount required to pay for:

- The cost of repairing damage caused by construction or site disturbance;
- the cost of completing the landscaping or restoring the ecosystem that has been disturbed by the development and/or construction, as determined by the [local government], in the event that the landscaping or ecosystem is damaged as a consequence of a contravention of a condition contained in the development permit.

In extenuating circumstance, the [local government] may require that adequate public liability insurance be provided, with the [local government] as an "additional named insured" in the amount of $5,000,000.00. A copy of the certificate must be presented to the [local government] upon demand.

6.7.2 REGULATORY BYLAW PROVISIONS

This section on regulatory bylaw provisions was adapted from the Coquitlam Low Impact Development Policies & Procedures Manual p.A-3 to 4 and the Subdivision and Development Servicing Bylaw, and the District of North Vancouver Environmental Protection Bylaw and Environmental Permit Application

Security deposits shall be collected where construction of low impact development works are required by this bylaw, including for:

- Bioretention areas (absorbent landscaping including topsoil depth and quality);
- Trees, shrubs, and groundcover;
- On-lot infiltration trenches;
- Vegetated swales; and
- Pervious paving.

A security deposit must be in the form of cash or an unconditional, irrevocable letter of credit issued by a financial institution acceptable to, and in a form acceptable to, the [municipal staff – development services].

Security deposits shall be calculated for individual lots, as well as for a subdivision as a whole, to the satisfaction of the [municipality].

The amount of performance security shall be 110 percent of the cost to supply material for, and to complete the works and services including engineering, inspection, testing, construction, installation, planting and taxes, and to provide record documents. This amount is to be estimated based on approved servicing design drawings.

The amount of maintenance security shall be 10 percent of the cost of the works and services, excluding street trees, plus 20 percent of the cost of landscaping.

The amount of security is to be based on estimated costs provided by the consulting engineer as agreed to by the [municipal staff – development services] with respect to the works and services excluding landscaping and by the landscape architect as agreed to by the [municipal staff – parks] with respect to landscaping.

No security deposited under the provisions of this bylaw shall be returned unless and until all of the requirements for which the security has been deposited have been completed to the satisfaction and approval of [delegated municipal staff], and of the [parks staff] with respect to landscaping.

Deposits will not be returned until a professional engineer or landscape architect has certified the works. A professional engineer must certify on-lot infiltration trenches and vegetated swales, and a landscape architect must certify absorbent landscaping, vegetated swales, and pervious paving.

The [municipality] will provide partial refunds, except for the landscaping, in accordance with the following:

a) Partial refunds will be based on the proportion of the work completed, inspected and, if required, tested in accordance with certified, detailed progress reports submitted by the consulting engineer and approved by the [municipal staff – development services].
b) Partial refunds are only permitted to a maximum of [e.g. 90 percent] of the value of the work completed.
c) Any costs incurred by the [municipality] that are recoverable from the owner, or otherwise, will be deducted from any partial refund irrespective of whether or not the recoverable amount relates to the same work as the partial refund.

Prior to the issuance of a development permit within a sensitive ecosystem, an applicant is required to provide a security in the form of cash, certified cheque, or an unconditional, irrevocable letter of credit drawn on a Canadian chartered bank in a form acceptable to the Director of [ ] in an amount equal to 30% of the estimated cost of the work to be performed under the permit to a maximum of $[10,000], to ensure full and proper compliance with provisions of this bylaw and all terms and conditions of the permit.

If the applicant does not comply with the terms and conditions of the permit or the provisions of this bylaw the [municipality] may use all or a portion of the security deposit or call for and receive the funds secured by the letter of credit and use the funds to remedy the non-compliance, or if the work under the permit is not completed before 1 month of the expiry date of the letter of credit, the [municipality] may call for and receive the funds secured by the letter of credit and retain the funds until the applicant delivers a replacement letter of credit to the [municipality] in the same form and amount; and all or part of this security may be held for up to three years.

Prior to issuance of a permit for work on land owned by the [municipality], an applicant is required to obtain and maintain, at all times during the period of validity of the permit, public liability insurance in the amount of $5,000,000, in connection with the obligations under this bylaw with deductibles and terms reasonably satisfactory to the [municipality], with the [municipality] listed as an "Additional Named Insured" and evidence of this coverage must be provided in the form of an insurance certificate, and with a provision that the insurer will notify the [municipality] in writing at least 30 days prior to cancellation of the policy, and will deliver a certified copy of such policy to the [municipality] upon demand.