

City of Prince George

Integrated Stormwater Management Plan

Technical Working Paper # 3 - Policy and Regulatory Review

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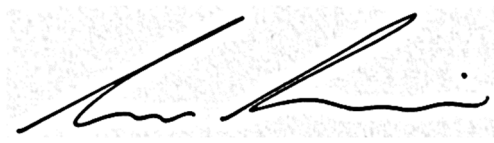
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Executive Summary

As part of the City of Prince George's (City) Integrated Stormwater Management Plan (ISMP) AECOM Canada Ltd. (AECOM) is reviewing how stormwater issues are being addressed through regulation and planning. This Technical Working Paper provides a summary of our work; namely to:

- Summarise the City's policies, regulations, and systems of enforcement with respect to stormwater;
- Compare the City's policies and regulations with those of other municipalities;
- Determine whether stormwater issues are being sufficiently addressed through the City's existing bylaws and plans (i.e. identify any gaps);
- Identify how best to address any gaps; and
- Present findings and make recommendations for the City.

Existing Stormwater Bylaws, Plans and Policies

The City has the following bylaws that impact how stormwater is managed in Prince George: Storm Sewer Bylaw; Flood Plain Regulation Bylaw; Soil Removal and Deposit Bylaw; Tree Protection Bylaw; Highways Bylaws; Sanitary Sewer Use Bylaw; Official Community Plan Bylaw; Zoning Bylaw; Subdivision and Development Servicing Bylaw; Development Procedures Bylaw; Development Cost Charge Bylaw; Building Bylaw; Bylaw Notice Enforcement Bylaw; Comprehensive Fees and Charges Bylaw; and the Municipal Ticket Information Utilization Bylaw. In addition, the City has plans, policies and guidelines in the areas of climate change, infrastructure design (i.e. Design Guidelines), asset management, salt management and sustainable financing that also affect how stormwater is managed in Prince George.

In addition to municipal regulations there are Provincial and Federal regulations and guidelines that can affect municipal stormwater management; such as: Federal Fisheries Act; Water Sustainability Act (B.C.); Riparian Areas Protection Act (B.C.); Stormwater Guidelines (DFO) and Beyond the Guidebook (B.C.); and Water Quality Guidelines (B.C. and Federal).

Identified Issues

The main issues identified with the City's policies, guidelines and bylaws involve:

- **Cost Recovery:** The need to be able to recover costs for work caused by others such as the clean-up of spills;
- **Prohibited Wastes:** Improve the definition of substances within the Storm Sewer Bylaw that are not allowed to be discharged to any component of the City's stormwater system.
- **Low Impact Development (LID)/Best Management Practices (BMP):** Lack of requirements for new development to control the quantity and quality of stormwater leaving private property;
- **Climate Change:** The need to integrate climate change adaptation into design criteria;
- **Protection of Trees and Other Natural Assets:** The need to protect trees and other natural assets such as wetlands, non-fish bearing streams and riparian set-backs;
- **Erosion and Sediment Control:** The need for improved erosion and sediment control associated with all development including the clearing of land before subdivision;
- **Culverts:** Responsibilities for replacing driveway culverts are not clearly defined;
- **Design Criteria:** The need to update and mandate existing stormwater design criteria (i.e., 2001 Draft Design Guidelines); and
- **Staffing:** The need for sufficient staffing to enforce bylaw compliance.

Conclusions and Recommendations

Based on the issues and gaps identified above we are making the following recommendations to the City of Prince George:

- Update the Storm Sewer Bylaw to improve definitions, to revise the list of prohibited discharges, to allow for in-field measurement of sediment concentration, to clearly specify the types of properties that require an oil and grit separator (including large surface parking lots and industrial properties) and associated maintenance requirements, to be consistent with the Sanitary Sewer Use Bylaw particularly with respect to unauthorized discharges (i.e. spills), to explicitly state who is responsible for maintaining, renewing and upgrading driveway culverts; and to allow for the recovery of City costs (e.g. for spill clean-up). The Bylaw Notice Enforcement Bylaw and/or the Municipal Ticket Information Utilization Bylaw would then need to be updated accordingly to include all contraventions of the Storm Sewer Bylaw
- Update the Subdivision and Development Servicing Bylaw and associated Design Guidelines to enact current best practises in stormwater management that are applicable to the climate and geography of Prince George as it pertains to: climate change; stormwater runoff rates, volumes, and quality; erosion and sediment control; and oil-grit separator design requirements for sizing and maintenance access. Technical Working Paper #2 addresses additional recommended updates such as permitting the new installation of open channels; permitted culvert materials; design standards and O&M plans with cost estimates for detention ponds and constructed wetlands; acceptance of detention ponds once appropriate and approved vegetation is established; sewer relining standards; limiting the installation of basements in high risk areas due to groundwater and flooding; maximum grades and velocities; minimum sewer depth; bike-friendly catch basin grates; and utility disconnect procedures.
- Strengthen the Tree Protection Bylaw by increasing the area covered by the bylaw and allow for the recovery of City costs associated with rectifying problems caused by infractions.
- Increase development permit areas within the OCP bylaw to include all significant flood and slope hazards, and to protect all valuable natural areas, such as riparian areas of streams that provide nutrients to downstream fisheries and wetlands that are not directly connected to fish-bearing streams.
- Develop a new Erosion and Sediment Control bylaw to increase the City's ability to require better erosion and sediment control practices by developers (particularly during land clearing before subdivision), to better monitor the quality of discharges in the field and to have more effective enforcement for non-compliance. As an interim measure, the City may strengthen existing bylaws to help increase the City's ability to require and enforce better erosion and sediment control practices.
- Obtain sufficient permitting and enforcement staffing levels and/or front-end resource prioritization on outreach and education and design submission review in order to encourage bylaw compliance.

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1. Introduction

As part of the City of Prince George's (City) Integrated Stormwater Management Plan (ISMP) AECOM Canada Ltd. (AECOM) is reviewing how stormwater issues are being addressed through regulation and planning. This Technical Working Paper provides a summary of our work; namely to:

- Summarise the City's policies, regulations, and system of enforcement with respect to stormwater;
- Compare the City's policy and regulatory framework with those of other municipalities;
- Determine whether stormwater issues are being sufficiently addressed through the City's existing bylaws and plans (i.e. identify any gaps);
- Identify how best to address any gaps; and
- Present findings and make recommendations for the City.

2. Existing Stormwater Bylaws, Plans and Policies

2.1 List of Documents

AECOM compiled and reviewed the following list of City, Provincial and Federal documents. Documents included bylaws, plans, policies, and other internal documents that relate to stormwater management.

City of Prince George Bylaws

- Storm Sewer Bylaw, No. 2656, 1974 (updated 2017);
- Flood Plain Regulation Bylaw, No. 8285, 2010;
- Soil Removal and Deposit Bylaw, No. 9030, 2019;
- Tree Protection Bylaw, No. 6343, 1995;
- Highways Bylaws, No. 8065, 2008;
- Sanitary Sewer Use Bylaw No. 9055, 2019;
- Official Community Plan Bylaw, No. 8383, 2011;
- Zoning Bylaw 7850, 2007 (updated 2020);
- Subdivision and Development Servicing Bylaw, No. 8618, 2014;
- Development Procedures Bylaw No. 7635, 2005
- Development Cost Charge Bylaw, No. 7825, 2007;
- Building Bylaw, No. 8922, 2018 (including the BC Building Code 2018);
- Bylaw Notice Enforcement Bylaw, No. 8813, 2016;
- Comprehensive Fees and Charges Bylaw, No. 7557, 2004;
- Municipal Ticket Information Utilization Bylaw No. 8919, 2017.

Other City of Prince George Documents

- Adapting to Climate Change in Prince George: An overview of adaptation priorities (2009)
- Implementing Climate Change Adaptation in Prince George, BC Volume 4: Flooding (2012)
- Climate Change Impacts on Rainfall and Freeze-Thaw Events in Prince George (2014)
- Climate Change Adaptation Strategies for the Community of Prince George (2020)
- Development Services Department - Design Guidelines (DRAFT)
- Asset Management Policy
- Salt Vulnerable Areas Action Plan (and Recommendations)
- Sustainable Finance Guidelines

Provincial and Federal Regulations

- Fisheries Act (Federal)
- Water Sustainability Act (B.C.)
- Riparian Areas Protection Act (B.C.)
- Stormwater Guidelines (DFO) and Beyond the Guidebook (B.C.)

- Water Quality Guidelines (B.C. and Federal)

2.2 Document Summary

This section describes the general intent of each document and how each document affects stormwater management in the City of Prince George.

Bylaws

Storm Sewer Bylaw

The main purpose of the City's Storm Sewer Bylaw is to regulate the extension of and connection to the storm sewer system. The City's current Storm Sewer Bylaw addresses the following topics: use of the storm sewer system, connections, illegal connections, tampering, prohibited types and levels of discharges, oil and grit separators (OGS), sampling chambers, measurement and testing, storm sewer system extensions, charges for services, inspection and penalties. The bylaw is not as comprehensive as Prince George's Sanitary Sewer Use Bylaw or Storm Bylaws from other municipalities, particularly with regard to definitions and scope. For instance, the Storm Sewer Bylaw does not define the terms "storm sewer" or "storm sewer system". Therefore, it is not clear whether the bylaw applies only to the piped storm sewer system or whether it also applies to ditches, other open channels and associated culverts within the City's storm system. Similar bylaws from other municipalities (e.g. Watercourse Bylaw from the City of Kamloops or the Drainage Bylaw from the City of Surrey) do explicitly state that they apply to sewers, ditches and other open channels.

The Parkridge Creek and West Fraser River Watershed Drainage Plan recommended adding text in the storm sewer system bylaw to prevent the connection of roof leaders or other on-lot connections to the storm system unless specific technical justification is provided and approved by the City's engineering department. Currently the City doesn't allow for the connection of single-family residential roof leaders to the system but does permit multi-family and non-residential roof leaders to connect.

Flood Plain Regulation Bylaw

A flood plain regulation bylaw designates lands as a flood plain in order to protect against loss of life and minimize property damage, injury, and trauma associated with flooding. The City's flood plain regulation bylaw designates the flood plain; setbacks from a watercourse, body of water, or dike; and flood construction levels for buildings. More specifically the flood plains and setbacks for the Nechako and Fraser Rivers are designated based on floodplain mapping completed by Northwest Hydraulics Consultants. The flood plains of other watercourses are set at 30 metres on either side of the natural watercourse boundary (and 3.0 metre vertically), and 15 metres from the top of bluffs, lakes, ponds, swamps or marshes (and 1.5 metre vertically). These setbacks, which are based on modeling or standard practices, are an important and effective means for protecting property from flooding and can also help preserve riparian habitat and wildlife corridors. These setbacks are reiterated in the OCP Bylaw.

The bylaw has a number of exemptions including parking areas, porches and accessory buildings. These exemptions could reduce the value of the setback as a riparian area and wildlife corridor. We therefore recommend that the City identify all watercourse setbacks that are particularly valuable (e.g. provides nutrients to downstream fisheries or key wildlife corridors) where exemptions should not be granted. Some of these have already been identified as part of the City's Watershed Drainage Plans. The bylaw does not address the development of roadways which can be significantly impacted by flooding and can also have a detrimental impact on riparian and wildlife corridors.

Note that development may have occurred within the designated flood plains/setbacks before the 2007 or 2010 Flood Plain Regulation Bylaws were enacted. Any existing structures within the flood plain in 2010 were exempted from the Flood Plain Regulation Bylaw, provided they don't further the contravention (i.e. expand into the flood plain).

Soil Removal and Deposit Bylaw

A soil removal and deposition bylaw regulates, prohibits, and imposes requirements in relation to the removal and deposition activities to ensure that the soil or other materials do not create a risk to public assets, the health and safety of persons and property, the natural environment, and the integrity of soil as a secure and productive resource base. The City uses a permitting system to establish the terms and conditions for soil removal and deposition on land within Prince George. As the removal and deposition of soil can create risks to natural water systems and public infrastructure through the transport and deposition of sediment and other deleterious materials, provisions in this bylaw can be used to ensure that these activities do not negatively affect the drainage system and natural receiving bodies.

Tree Protection Bylaw

A tree protection bylaw is used to prohibit or regulate the removal of trees in a city. Trees provide important stormwater management related benefits as it pertains to the natural hydrologic balance. Trees provide for interception, retention, and evapotranspiration of rainwater which reduces runoff peak flow rates and volumes as well as provide other benefits including improving air quality, sequestering CO₂, reducing the urban heat island effect, and providing habitat. The City's tree protection bylaw protects trees and sets out a permitting process for the removal of trees only within the following specific areas of the City: the AG: 'Greenbelt' (See Schedule A of Zoning Bylaw) and Riparian Protection Development Permit Areas (See OCP Schedule D-2).

A tree cutting permit may be revoked when a person has acted contrary to this Bylaw. Penalties under this bylaw include fines (between \$2,000 and \$10,000), and/or a term of imprisonment not exceeding three months.

The OCP Bylaw outlines a number of policy statements for revising and strengthening the Tree Protection Bylaw. Currently the Tree Protection Bylaw has many exemptions; such that only trees within the AG zoning are truly protected.

Highways Bylaw

A highways bylaw regulates the use of 'highways' within a City. 'Highways' are any public street, road, sidewalk, lane, bridge, boulevard, or any other public way used by or intended for use by the public. The City's Highways Bylaw addresses the following items related to stormwater: violations such as leaving debris on the highway; requirements for property owners to remove snow from sidewalks; requirements for obtaining permits to remove trees, excavate, change ground elevations, inhibit drainage, construct or maintain drainage systems along a highway; and fines and penalties for any violations (up to \$10,000 and 3 months of imprisonment). In the absence of an erosion and sediment control bylaw, the City has used the Highways Bylaw to address developments that do not have strong erosion and sediment control practices, resulting in sediment being tracked onto roadways.

Sanitary Sewer Use Bylaw

The Sanitary Sewer Use Bylaw No. 9055 was adopted in 2019 to regulate the use of the sanitary sewer system. The Sanitary Sewer Use Bylaw is considerably more comprehensive than the Storm Sewer Bylaw and could be used to help guide future updates of the Storm Sewer Bylaw. There should be consistency in regulation and language between the Storm Sewer Bylaw and the Sanitary Sewer Use Bylaw particularly with respect to unauthorized discharges (i.e. spills).

Official Community Plan Bylaw

The Official Community Plan (OCP) sets out the objectives and policies that guide decisions on planning and land use management within the City. Although the OCP does not commit or authorize the City to proceed with any projects specified in the plan and does not have an immediate effect on property rights the OCP can have consequences that may increase the regulatory burden of developing a property (e.g., designation of development permit areas). After adoption of the OCP, bylaws enacted or works undertaken by Council must be consistent with

the plan. The City's OCP has policies and objective statements that pertain to stormwater management. In general, they address the following:

- Preserving, protecting, and enhancing the quality of water resources;
- Ensuring erosion and sediment control for developments are considered;
- Continuing development of watershed drainage plans;
- Protecting aquifer recharge zones;
- Preserving sensitive ecosystems;
- Rehabilitating, restoring, and enhancing negatively impacted riparian features;
- Adapting to climate change;
- Identifying and planning for growth (e.g. storm network improvements); and
- Protecting property from flooding (e.g. flood hazard designated permit areas).

The OCP states that the City will endeavor to protect environmentally sensitive areas by one or more of the following tools:

- Development Permit Areas and guidelines
- Environment Protection bylaws (ex. Tree Protection Bylaw)
- Land dedication/acquisition
- Leavestrip areas
- Conservation covenants
- Tax exemptions

Schedules B-1, D-1 and D-2 and D-4 of the OCP Bylaw provide context for policies and development permit area guidelines, including: Agricultural Land Reserve (ALR), Parks, Significant Slopes over 20% grade, Watercourses, Bodies of Water, Groundwater Protection Development Permit Areas, Riparian Protection Development Permit Areas and Flood Hazard Development Permit Areas.

The OCP Bylaw states that the City should designate Development Permit areas and guidelines to include riparian areas and sensitive habitats identified through the Sensitive Ecosystem Inventory project. The City currently has only designated Development Permit areas for fish bearing watercourses. Developers are notified of other Sensitive Ecosystems on their properties but they are under no legal obligation to protect them and rarely do so. The upcoming development of a natural asset inventory may help develop the business case for including other waterbodies and their riparian areas (e.g. non-fish bearing streams and wetlands) within development permit areas. As expanding development permit areas to protect natural waterbodies and their riparian areas may negatively impact the interests of developers, there needs to be sufficient political will to approve proposed new areas.

The Parkridge Creek and West Fraser River Watershed Drainage Plan recommended requiring flood hazard development permits in an area upstream of Highway 16 due to the limited capacity of culverts near Gauthier Road and Highway 16. It also recommends updating the hazardous slope mapping and development permit areas based on the results of GeoNorth's detailed mapping of slope hazards.

The McMillian Creek Watershed Drainage Plan recommended limiting development in rural/undeveloped areas, including aggregate extraction.

Zoning Bylaw

The zoning bylaw establishes and provides for zoning and other development regulation in order to implement the Official Community Plan. It outlines development requirements around waterbodies. Within the zoning bylaw waterbodies are defined as fish-bearing streams or wetlands that are directly connected to fish-bearing streams. Therefore, watercourses that are not fish-bearing or wetlands that are not directly connected to fish-bearing streams would not be protected under this bylaw. The definition of waterbody and watercourse within the OCP Bylaw does not specify that it needs to be fish-bearing.

The zoning bylaw outlines riparian setback requirements which are similar to but slightly different from floodplain setbacks required by the Flood Plain Regulation Bylaw.

The zoning bylaw does not include limitations on impervious surfaces which can lead to high rates of stormwater run-off.

The OCP Bylaw states that in order to adapt to climate change, the City should begin to amend the zoning bylaw to consider future impacts.

Subdivision and Development Servicing Bylaw

A subdivision and development servicing bylaw allows a city to regulate the subdivision and development of land in order to promote the orderly and economic development of a city. The bylaw sets the requirements for the provision of works and services for development. This includes Infrastructure Specifications, similar to those found in the Master Municipal Construction Documents (MMCD). This bylaw could be used as a tool to enact current best practises in stormwater management as it pertains to stormwater runoff rates, volumes, and quality. The City of Prince George's Subdivision and Development Servicing bylaw requires the preparation of an erosion and sediment control plan but does not provide comprehensive requirements as to what shall be in the plan or that it shall be prepared by a designated professional.

A more thorough review of the Subdivision and Development Servicing Bylaw and associated Design Guidelines was conducted as part of Technical Working Paper #2.

Development Procedures Bylaw

The Development Procedures Bylaw defines procedures for the issuance of a development permit, development variance permit, or temporary use permit and under which an owner of land may apply to amend the official community plan, zoning bylaw, or a land use contract.. Schedule A of this bylaw lists development permit application information requirements. Application information requirements include the location of any waterbodies (including ditches and streams), 200-year flood plain, appropriate setbacks, underlying geology, terrain stability, proposed land clearing, site grading plan, existing and proposed drainage works, building or structure site coverage. Schedule A does not specifically require site coverage of impervious surfaces that are not a building or structure (i.e. walkway/pavers). This is important if the City wants to reduce imperviousness and wants to charge stormwater fees based on impervious area.

Development Cost Charge Bylaw

A development cost charge (DCC) bylaw allows the City to levy charges on developments for the purpose of providing funds to assist the City in paying the new capital cost burden of providing city services arising from new development. Specifically, services included in the bylaw relate to sewage, water, drainage, highways, and park land. The principal of 'development pays for development' is consistent with the City's OCP. The City is in the process of reviewing its DCC bylaw and the associated DCC rates to ensure that development is paying its fair share towards the construction of new City infrastructure that is required for servicing newly developed areas.

Building Bylaw (including the BC Building Code 2018)

The City's building bylaw regulates building construction and provides for the administration of the British Columbia Building Code. The City's Building Bylaw also notes the requirement for a building permit before excavation can begin. The Plumbing Code (Book II of the BC Building Code) directly relates to the safe conveyance of stormwater away from a building by providing minimum standards for the size and slope of underground drainage pipes. The City's Building Bylaw references the Plumbing Code to address requirements for plumbing systems, plumbing permits and fees and charges. The Plumbing Code also sets restrictions and requirements around stormwater reuse.

Bylaw Notice Enforcement Bylaw

A bylaw notice enforcement (or contravention fines) bylaw establishes a process for the issuance of bylaw notices and fines. The bylaw designates bylaw contraventions that may be dealt with by a notice and establishes the amount of the penalty, the period for paying or disputing the penalty, and the adjudications system to resolve disputes. The City's Bylaw Notice and Enforcement Bylaw outlines fines for contraventions of several bylaws including the Highways Bylaw, Storm Sewer Bylaw and Building Bylaw. The fines are up to a maximum of \$500.

For each day an infraction takes place a fine can be levied accordingly. Nominal, repeatable, fines through bylaw notices should be an effective tool for compliance with repeat offenders; however, there are many minor contraventions to the Storm Sewer Bylaw that are not listed in the Bylaw Notice Enforcement Bylaw which limit the tools available for City staff to enforce the provisions in the Storm Sewer Bylaw. The City should update either the Bylaw Notice Enforcement Bylaw or the Municipal Ticket Information Utilization Bylaw to include all contraventions of the Storm Sewer Bylaw.

Comprehensive Fees and Charges Bylaw

The comprehensive fees and charges bylaw details the fees levied for admissions, applications received, services rendered, and goods supplied by the City. Stormwater management fees include permitting fees for installation and repair of building sewers; storm sewer service applications; culvert installations, soil removal and deposit applications, snow dumping, and development applications.

Municipal Ticket Information Utilization Bylaw

This bylaw authorizes the use of the Municipal Ticketing Information System as a means of bylaw enforcement. Tickets can be issued with fines up to \$1,000. No stormwater related offences are currently listed in the City of Prince George's Municipal Ticket Information Utilization Bylaw.

Other Documents

Adapting to Climate Change in Prince George: An overview of adaptation priorities

In 2009, the City, in collaboration with the University of Northern BC, developed a document titled *Adapting to Climate Change in Prince George: An overview of adaptation priorities*. This document noted that more precipitation will likely fall as rain rather than snow and that there will be more frequent incidences of extreme weather events and flooding. The main purpose of the document was to outline the climate change adaptation priorities for the City of Prince George. The second highest priority was flooding. Other high priorities included severe weather/emergency response and medium priorities included slope stability, stormwater and utilities.

Implementing Climate Change Adaptation in Prince George, BC Volume 4: Flooding

In 2012, the City developed a document titled *Implementing Climate Change Adaptation in Prince George, Volume 4: Flooding* to evaluate and recommend flood control options. The Fraser River is vulnerable to springtime freshet flooding events, while the Nechako River is more prone to ice-jam floods. In 2007-2008 Prince George experienced flooding conditions three times; including a winter ice jam in the Nechako which pushed waters above the 200-year flood plain and caused significant damage. These events made flood mitigation an urgent priority.

Climate Change Impacts on Rainfall and Freeze-Thaw Events in Prince George (January 2014)

The study found that due to the limited available rainfall data (mostly Prince George Airport), updating of the IDF curve was not currently warranted. With more funding, the City would like to pursue additional data (through additional and improved rain gauges) to better analyse climatic trends as well as develop future looking predictive models for reviewing IDF curves that consider future climate change. The study also found that the number of freeze-thaw cycles has not recently increased but City staff have reported that the apparent severity or impact of the freeze thaw cycles seems to have increased.

Climate Change Adaptation Strategies for the Community of Prince George

In March 2020, the City in collaboration with ICLEI, finalized the document titled *Climate Change Adaptation Strategies for the City of Prince George, A Preliminary Stakeholder Informed Guiding Document*. It identified the following top climate risks related to stormwater for the City of Prince George:

- More extreme rainfall events and changing freeze thaw cycles leading to overland flooding and increased slope instability;
- Rising annual temperatures increasing invasive species;
- Hotter summers decreasing moisture content in soil and the ability to absorb storm water;
- More extreme rainfall events (including rain on snow events) causing overland flooding;
- Warmer winters and changing freeze/thaw cycles causing localized flooding and affecting infrastructure; and
- Increase in heavy rainfall events causing riverbank erosion and loss of riparian habitat.

Other specific issues mentioned in the document include:

- Extreme rainfall events causing transportation disruptions;
- Increased road salting required (and associated water quality impacts); and
- Riverine flooding, erosion and slope stability.

The document then identified objectives, goals and action items to address the risks. Identified objectives, goals and action items related to stormwater management include:

- An Erosion and Sediment Control bylaw or permitting process;
- Increased resilience of stormwater infrastructure to accommodate increased precipitation and extreme weather events;
- Green infrastructure and nature-based solutions;
- Protecting ground water and surface water resources;
- Protecting of natural assets and ecosystem services; and
- Restricting the spread of invasive species.

Design Guidelines Manual

The City's Design Guidelines were developed in 2001 to guide engineers and the development industry in the design of engineering servicing facilities and systems. The Design Guidelines have been noted as "Draft" since 2001 and are not enacted by bylaw. However, they are used to provide the minimum design criteria and standards for proposed works. Issues addressed include the widths of rights of ways, utility separation, drainage principles, storm runoff computation, minor system design, major system design, storage facility design (including ponds, constructed wetlands and channel storage), infiltration facilities, other storage options and pump stations. This document, in collaboration with the Subdivision and Development Servicing Bylaw, could be used as a tool to enact current best practises in stormwater management as it pertains to stormwater runoff rates, volumes, and quality. A more thorough review of the Subdivision and Development Servicing Bylaw and Design Guidelines was conducted as part of Technical Working Paper #2.

Asset Management Policy

The purpose of an asset management policy is to support the long-term planning, financing, operation, maintenance, upgrade, renewal, replacement and disposal of capital infrastructure assets (including the City's stormwater system) with consideration of climate change, continual improvement and stakeholders. This will be important for addressing the City's stormwater management needs, particularly as stormwater has been historically underfunded at the local, provincial and national levels. The policy includes eight policy statements that define the City's desired objectives with respect to asset management.

Salt Vulnerable Areas Action Plan

The Salt Vulnerable Areas (SVAs) action plan that has been developed for the City of Prince George (CPG) identifies management options and guidelines for road salt management within areas identified as SVAs. This includes the application of road salts as well as the transport of road salts through stormwater runoff. The study does not address private application of salts (i.e. in parking lots) but some of the findings could be used if the City wanted to address salt application on private properties.

Sustainable Finance Guidelines

The Sustainable Finance Guidelines provide the financial management framework for the City. The guidelines address many issues that are relevant to the City's stormwater management program such as the Financial Plan, property tax rates, self funded services, user fees, financial assistance, capital expenditure plan, gaming income, reserves, debt and budget management. Section 3 of the guidelines outlines the City's existing self-funded services including water, sewer, solid waste and off-street parking. The City has investigated making stormwater a self-funded service through the implementation of a stormwater rate. This is discussed further in Technical Working Paper #4: Financing.

Section 8 of the guidelines addresses the need to:

- Coordinate with the Official Community Plan and infrastructure requirements associated with growth and development;
- Align with the City's Asset Management Policy and Strategy to ensure sustainable service delivery that is fiscally, environmentally, and socially responsible; is adaptive to changing circumstances and future conditions; does not compromise the ability of future generations to meet their own needs; and addresses life cycle costs (including operating and replacement), service levels, and risk; and
- Balance the need and desire for major capital expenditures against its ability to fund them.

Provincial and Federal Regulations

Fisheries Act and Authorizations Concerning Fish and Fish Habitat Protection Regulations

Fisheries and Oceans Canada (DFO) has ultimate authority over fish habitat through the *Fisheries Act*, which is the main federal legislation protecting all fish, fish habitat, and water quality. Fish and fish habitat protection under the Act defines 'Serious Harm to Fish' as the "the harmful alteration, disruption or destruction of fish habitat" (HADD) and includes temporary effects. 'Fish Habitat' definition: 'water frequented by fish' (all fish) and the 'quantity, timing, and quality of the water flow that are necessary to sustain freshwater or estuarine ecosystems'.

Works that are likely to cause serious harm to fish and fish habitat, including riparian works require an Authorization under the Fisheries Act in order to proceed without potential prosecution under the *Fisheries Act*. The Authorizations Concerning Fish and Fish Habitat Protection Regulations specify what is required to apply for an Authorization. For works unlikely to have an impact, but are not covered by DFO's Code of Practice, a request for review needs to be submitted to DFO to confirm that an Authorization is not required. In this case, often DFO will issue a Letter of Advice describing the conditions that must be followed to avoid a HADD or serious harm to fish.

City staff have found that DFO staff are mainly concerned with projects that are within the watercourse (i.e. below the high water mark) and do not tend to get involved with projects that are only within the riparian zone, even if they may negatively impact the adjacent fish-bearing stream. As there are limited Fisheries staff (currently only two Fisheries Officers in Northern B.C.), DFO has limited capacity to review and follow-up on projects that may impact fish-bearing streams.

BC Water Sustainability Act and Water Sustainability Regulation

Section 11 of the *Water Sustainability Act* requires that anyone wishing to conduct work in or about a stream (fish bearing or not) must obtain a change approval. The Water Sustainability Regulation provides additional criteria on

the types of works that are authorized in Part 3, Section 39. The following are examples of authorized changes that only require notification for instream work if all conditions can be met:

- the installation, maintenance or removal of a culvert for crossing a stream for the purposes of a road, trail, or footpath;
- the construction or maintenance of a pipeline crossing of a stream;
- the restoration or maintenance of a stream channel by a municipality or regional district;
- the construction or maintenance of storm sewer outfalls; and
- the installation or cleaning of drainage outlets.

It should be noted that wetlands are part of the definition of a stream within the Water Sustainability Act.

Riparian Areas Protection Act and the Riparian Areas Protection Regulation

The Riparian Areas Protection Regulation (RAPR) was enacted under Section 12 of the *Riparian Areas Protection Act* in February 2016. The RAPR lists the regional districts to which the Regulation apply. Currently, the RAPR does not apply to Prince George or the geographic boundaries of the Regional District of Fraser-Fort George, but it could be added if the government sees the need for it in the context of urban development.

Stormwater Guidelines

In November 2000, DFO released the Urban Stormwater Guidelines and Best Management Practices for Protection of Fish and Fish Habitat, Draft Discussion Document. This paper provides a description of the best management practices (BMP) that are proposed, as well as implementation criteria to describe the development situations they could potentially be applied to. It provides information on the hydrological design criteria best suited for determining impacts of development, implementation of mitigation through application of best management practices, and for watershed hydrological studies.

DFO Urban Stormwater Guidelines have since evolved in 'Beyond the Guidebook':

- 2002: Stormwater Planning: A Guidebook for British Columbia
- 2007: Beyond the Guidebook: Context for Rainwater Management and Green Infrastructure in British Columbia.
- 2010: Beyond the Guidebook 2010: Implementing a New Culture for Urban Watershed Protection and Restoration in British Columbia
- 2015: Beyond the Guidebook 2015: Towards a Watershed Health Legacy in the Georgia Basin

"The purpose of the Beyond the Guidebook initiative is to help local governments and the development community establish what level of rainwater runoff volume reduction makes sense at the site, catchment and watershed scales. The objective is to protect stream health, which is broader than how much volume one can infiltrate on a particular development," (quote from Corino Salomi, DFO).

Water Quality Guidelines (BC and Federal)

BC's Approved Water Quality Guidelines (BCWQG) and the federal Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life are used to:

- Protect water values, including: aquatic life, wildlife and their habitats, drinking water sources, agriculture (livestock watering and irrigation); and recreation;
- Provide the basis for the evaluation of ambient water quality and environmental impact assessments to inform resource management decisions (e.g. wastewater discharge limits);
- Provide the basis for water quality objectives;
- And report to the public on the state of water quality and promote water stewardship.

The criteria commonly monitored related to stormwater are turbidity, total suspended solids, pH, and potential presence of hydro carbons by noting any evidence of a sheen on the water (Table 1).

Table 1: British Columbia Approved Water Quality Guidelines for the Protection of Freshwater Aquatic Life

Parameter	Guidelines
Turbidity	○ Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters ○ Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters ○ Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters ○ Change from background of 10% when background is >50 NTU at any time during high flows or in turbid waters
Total Suspended Solids	○ Change from background of 25 mg/L at any one time for a duration of 24 h in all waters during clear flows or in clear waters ○ Change from background of 5 mg/L at any one time for a duration of 30 d in all waters during clear flows or in clear waters ○ Change from background of 10 mg/L at any time when background is 25 - 100 mg/L during high flows or in turbid waters ○ Change from background of 10% when background is >100 mg/L at any time during high flows or in turbid waters
pH	○ 6.5 to 9.0: unrestricted change permitted within this range. This component of the freshwater guidelines should be used cautiously if the pH change causes the carbon dioxide concentration to decrease below a 10 µmol/L minimum or exceed a 1,360 µmol/L maximum, as these concentrations may be toxic to fish.
Oil and Grease	○ Not detectable by sight or smell

The CCME and BC Water Quality Guidelines are both just guidelines and not regulated. However, DFO will commonly use the CCME water quality criteria for aquatic life as an indicator as to whether a discharge is a deleterious substance and a contravention to the Fisheries Act.

The biggest challenge with the BC Water Quality Guidelines is that they express allowable limits as changes from background levels; which makes measurement and enforcement more difficult. In order to address this challenge, some municipalities have set hard limits within their municipal regulations. For instance, the City of Kelowna's erosion and sediment control requirements within their Design Standards Bylaw stipulates maximum concentration levels of 75 milligrams per litre (ppm) of total suspended solids (TSS) regardless of background levels.

2.3 Existing Regulatory Authority, Fines, and Enforcement

The City has the authority to regulate, prohibit, and impose requirements by bylaw. To enforce these rules, the City can engage in a range of bylaw enforcement activities (BC, 2020b) as listed below.

- Educate the public about regulatory rules;
- Conduct inspections to ensure that rules are being followed;
- Leverage voluntary compliance with the rules where possible; and,
- Seek formal consequences for bylaw contraventions where compliance is not forthcoming, or harm has been done to the community.

Provincial regulations provided by the Community Charter, Offence Act, and Local Government Bylaw Notice Enforcement Act allow the City to formally enforce bylaw contraventions. Enforcement can include direct actions, civil proceedings, bylaw notices, municipal tickets, and offence act prosecutions. The City's existing regulatory framework for bylaw enforcement is outlined in Table . General descriptions of enforcement options are provided below.

Direct Actions

In relation to certain hazardous situations or declared nuisances (e.g. the deposition of soil causing flooding of roadways and neighbouring properties), the City may order a person to rectify the situation or take action to eliminate the hazard or damage and in some cases, recover the costs from the person. When there is a license or a permit associated with a bylaw (i.e. Building Bylaw and Building Permit), the City may suspend the licence or permit when there is a contravention of the bylaw, until the person complies (BC, 2020b).

In general, the City tries to work with the developer or property owner to get them to comply. However, if the developer/property owner does not comply then the City will issue a stop-work order, where they are able to do so. The City of Prince George has issued stop-work orders to developers for violations of the building code. The City has not historically issued stop work orders for drainage related issues. As the City investigates better or new means of enforcement (e.g. for erosion and sediment control), it should consider leveraging the power of a permit, where it can issue a stop work order, to encourage compliance.

The City has used funds within security deposits to complete or rectify works that do not meet City standards. This would typically be done to rectify off-site works (i.e. within the City right-of-way) that the developer installed and don't meet City standards, and the developer is unwilling to rectify the works him/herself. The City does not use this approach to rectify on-site works due to legal concerns with entering and completing work on a private property.

Civil Proceedings

When efforts at getting voluntary compliance or using direct actions are not sufficient, a local government must decide whether the contravention of its bylaws justifies administrative or legal action to stop the activity from affecting the community or deter future instances of the behaviour or activity. The City may apply to the Supreme Court of British Columbia for an injunction or court order to enforce, prevent, or restrain a bylaw contravention (BC, 2020b).

If the City has been unable to get a developer or property owner to comply and/or rectify the situation then it has in the past applied for an injunction or court order for serious offences. This approach has not yet been used for stormwater related offences.

Municipal Tickets

Municipal ticketing can be used by the City as a form of prosecution for minor to medium contraventions of their bylaws through the municipal ticket information system. An enforcement officer can certify allegations and deliver tickets to the alleged offender without first visiting a provincial court justice to swear the information and obtain a summons. The alleged offender may then choose to admit to the offence and pay the penalty without appearing in court (BC, 2020d). The City is permitted to issue tickets through their municipal ticketing bylaw: *City of Prince George Municipal Ticket Information Utilization Bylaw No. 8919, 2017*. The bylaw identifies which offences are subject to municipal ticketing, who can issue the municipal ticket for each offence, and what penalties may be imposed for each offence. The current maximum ticketing amount permitted under Community Charter regulation is \$1,000 (BC, 2010). To dispute a ticket, the alleged offender is referred to the provincial court for hearing. Note that no stormwater related offences are currently listed in the City of Prince George's Municipal Ticket Information Utilization Bylaw.

Bylaw Notices

The City is permitted to issue bylaw notices (fines) for minor bylaw infractions under the Local Government Bylaw Notice Enforcement Act. Bylaw notices are separate from the municipal ticket information system as they are administered through an alternative adjudication system in which a City managed venue is used by a professional and non-judicial adjudicator to hear ticket disputes (BC, 2020c). The maximum amount permitted through bylaw notice is \$500 (BC, 2003). Although the City pays for the costs of the bylaw notice system, it provides a more

accessible venue for determining bylaw contraventions, reduces the demand on the court system, is less expensive to administer than the court process, and provides better balances between the penalty imposed and the costs of pursuing the bylaw contravention in court. The penalties under the bylaw notice enforcement system are strictly monetary, the burden of proof is substantially less, and the adjudicator does not have the ability to adjust the penalty amount (BC, 2020c). Several stormwater related offences are currently listed in the City's Bylaw Notice Enforcement Bylaw and therefore bylaw notices could be considered the City's most accessible and common form for enforcing stormwater related offences.

Offence Act Prosecutions

The City may enforce their bylaws by seeking prosecution under the Offence Act. The Offence Act provides a default method of enforcement if the City has not established specific enforcement schemes (such as the municipal ticket information system or bylaw notice system) or if it is deemed to be more appropriate than the established schemes. The proceedings under the Offence Act are intended for serious municipal bylaw contraventions and result in a far more formalized process. The process does not permit the alleged offender to simply pay a fine to end the proceeding as a provincial court justice must hear the case and make a decision (BC, 2020d). The maximum penalty the City may impose is \$10,000 and/or six months imprisonment. As this approach can be expensive and time consuming, the City only uses this approach for a serious offense and if all other efforts for compliance have failed.

The enforcement clauses within each of the City's bylaws reviewed as part of this Study are outlined in the following table.

Table 2: Existing Bylaw Enforcement Clauses

Bylaw	Enforcement Clauses Included in Bylaw
Storm Sewer Bylaw, No. 2656, 1974;	<u>Prohibited Discharges to Storm Sewer (Section 2.7)¹</u> All offences listed below are accompanied by a \$500 fine: - Discharge sewage containing human waste - Discharge industrial waste - Discharge liquid over 140 degrees Fahrenheit - Discharge vapor or gaseous substance - Discharge water or waste containing fats, oil, or grease - Discharge noxious or malodorous substance - Discharge sewage, waters or waste containing toxic or poisonous substance - Discharge flammable or explosive liquids, solids or gas - Discharge radioactive wastes or sewage - Discharge garbage - Discharge solids or viscous substances - Discharge waters containing more than 500 parts per million by weight of suspended solids - Discharge sludge or deposits from a septic tank <u>Disconnecting Illegal Connections (Section 2.8)</u> Any building or drain connected to a storm sewer service connection without a permit or any service connection connected to the storm sewer system discharging any substance or matter prohibited by this Bylaw may be disconnect, stopped, and closed at the owner's cost. <u>General Offences and Penalties (Section 6.0)</u> Prosecution under the Offence Act: Summary conviction not less than \$2,000 and not exceeding \$10,000, the cost of prosecution, and any other penalty or order pursuant to the Community Charter or Offence Act.

Bylaw	Enforcement Clauses Included in Bylaw
Subdivision and Development Servicing Bylaw, No. 8618, 2014;	<u>Security (Section 9.3)</u> If Owner fails to make repairs within 30 days for non-emergency Works from the date of request in writing, or, in the case of emergency situations, within two hours of receiving verbal notification of the emergency, then the City, using its own forces or a contractor hired by the City, may make the necessary repairs and recover the costs by drawing down the Security. <u>General Offences and Penalties (Section 11.0)</u> Prosecution under the Offence Act: Summary conviction not exceeding \$10,000 or to a term of imprisonment not exceeding three months.
Soil Removal and Deposit Bylaw, No. 9030, 2019;	<u>Security (Section 16)</u> If any person does not comply with the terms and conditions of a Long Term Permit, Short Term Permit, or a requirement under this Bylaw and does not within 30 days following a request for compliance remedy the non-compliance or complete the requested repair, any security shall be forfeited to remedy. If no security is held by the City, or the security is insufficient, the City may remedy the non-compliance the expense of the person and recover the costs. The security may be used at any time for the cleaning of soil or other debris from Highways, sidewalks, boulevards, or drainage facilities which may be required as a result of the Removal or Deposit Operations. <u>General Offences and Penalties (Section 19.0)</u> Prosecution under the Offence Act: Summary conviction not less than \$2,000 and not exceeding \$10,000, the cost of prosecution, and any other penalty or order pursuant to the Community Charter or Offence Act.
Tree Protection Bylaw, No. 6434, 1995;	<u>Stop Work (Section 9.0)</u> City may revoke a tree cutting permit and order immediate suspension of tree cutting authorized by this Bylaw when a person has acted contrary to this Bylaw. <u>General Offences and Penalties (Section 10.0)</u> Prosecution under the Offence Act: Summary conviction not less than \$2,000 and not exceeding \$10,000 or to a term of imprisonment not exceeding three months. <u>Replacement Trees (Section 11.0)</u> Any person cutting a tree in contravention of this Bylaw shall replace that tree with two trees if within 5 m from top of bank or one tree if more than 5 m from top of bank.
Flood Plain Regulation Bylaw, No. 8285, 2010;	<u>General Offences and Penalties (Section 8.0)</u> Prosecution under the Offence Act: Summary conviction not less than \$2,000 and not exceeding \$10,000 or to a term of imprisonment not exceeding three months, or both, and the cost of prosecution.

Bylaw	Enforcement Clauses Included in Bylaw
Highways Bylaws, No. 8065, 2008;	<u>Activities Authorized by Permit (Section 3.0)¹</u> All offences listed below are accompanied by a \$200 fine: - Dig or break up part of highway or cuts down trees or timber - Deposit earth, rocks, stones, logs or stumps or other debris to cave, fall, crumble, slide or accumulate on a highway - Damage vegetation, fence or other things erected by the City - Change level of highway or stops flow of water - Construct or maintain ditch, sewer, or drain causing damage or nuisance to portion of a highway <u>Security (Section 10.05)</u> If Permittee fails to repair damage or fulfill the obligation under the terms and conditions of the Permit, the City may apply the security to offset such damage or unfulfilled obligations. If monies are insufficient, the Permittee shall pay the balance upon invoice from the City. <u>General Offences and Penalties (Section 11.0)</u> Prosecution under the Offence Act: Summary conviction not less than \$2,000 and not exceeding \$10,000 or to a term of imprisonment not exceeding three months, or both, and in addition may be charged for any resulting damage to the Highway or users thereof.
Zoning Bylaw	<u>General Offences and Penalties (Section 3.2)</u> Prosecution under the Offence Act: Summary conviction not less than \$2,000 and not exceeding \$10,000, the cost of prosecution, and any other penalty or order pursuant to the Community Charter or Offence Act
Building Bylaw, No. 8922, 2018 (including the BC Building Code 2018);	<u>Prohibitions (Section 7.0)¹</u> - No plumbing permit (\$300) - No demolition permit (\$300) <u>Stop work (Section 6.4)</u> - The <i>building official</i> may, in consultation with the <i>authorized person</i>, order the immediate correction or suspension of any work that is being or has been done in contravention of this or any other Bylaw, the <i>Building Code</i>, the <i>Plumbing Code</i> or other enactments respecting safety by posting a <i>Stop Work Notice</i> in a conspicuous location on the property. <u>General Offences and Penalties (Section 22.0)</u> Prosecution under the Offence Act: Summary conviction not less than \$2,000 and not exceeding \$10,000, the cost of prosecution, and any other penalty or order pursuant to the Community Charter or Offence Act
Development Procedures Bylaw	Penalties under this by-law include fines between \$2,000 and \$10,000 and/or imprisonment up to 3 months

¹Bylaw section administered through the bylaw notice system under the Bylaw Notice Enforcement Bylaw, No. 8813, 2016.

2.4 Identified Issues

Through review of the City's bylaws and plans, and through discussions with City staff, regulatory and policy challenges were identified and are discussed in Table below. Primary issues for City staff relate to unavailable or unreasonable enforcement mechanisms and outdated environmental protection provisions. AECOM also identified additional issues when comparing Prince George's bylaws with those from other municipalities. Further comparison of Prince George's bylaws with those of other municipalities are provided in Section 3.2.

Table 3: Stormwater Related Regulatory and Policy Issues

Issues	Description
Cost Recovery	Bylaws do not specify mechanisms for cost recovery of work required for repairing or remediating a situation by City forces unless the City is holding a security for the specific project through a development application, soil removal or deposit permit, or a highway use permit. Therefore if a spill or discharge into the storm system (including discharges such as sediment laden water) occurs in the City

	of Prince George, it is difficult for the City to recuperate costs for clean-up or for remediation of infrastructure or natural assets from the responsible person. Additionally, some impacts may require remediation over a time period that is longer than the permitting or development cycle or that resulted from multiple parties. Fines under the Storm Sewer Bylaw are limited to \$500 and only for the listed prohibited wastes. City will only prosecute major bylaw infractions under the Offence Act (max \$10,000 fine) and this is not typically done for stormwater related issues.
Low Impact Development (LID), Best Management Practices (BMP) (also addressed in Technical Working Paper #2)	Existing bylaws do not have complete provisions for assessing and mitigating the negative effects to watercourses and the environment from development which include decreased water and sediment quality, increased runoff peak flows and volumes, decrease in stream base flows, increased sedimentation and erosion. Concerns related to previous implementations of stormwater infrastructure BMPs are that even though peak flows are reduced, more harm has resulted to downstream watercourses because of increased runoff volume stretched over a longer time period. The City would also like to be confident that any proposed LID/BMP would work well in Prince George in consideration of its climate and context (e.g. snow storage). Recommended bylaw modifications from the City's WDP include modifying the storm sewer bylaw to explicitly prevent the connection of roof leaders or other on-lot connections to the storm system unless specific technical justification is provided and approved by the City's engineering department; and limiting the area of impervious surfaces through the zoning bylaw. The draft Design Guidelines should provide requirements for controlling run-off rates, volumes and quality (see Technical Working Paper #2 for more details).
Climate Change	The Storm Sewer and Subdivision and Development Bylaws or associated Design Guidelines do not have clauses to incorporate climate change mitigation nor adaptation measures in the design of municipal infrastructure. Emerging best practice in engineering design is to incorporate climate change adaptation measures into the design of stormwater infrastructure. Annual temperatures in the region are projected to increase an average of 1.6°C to 2.5°C by 2050 and precipitation is projected to increase by 3% to 10% primarily in winter with possible decreases in the summer (Picketts, et al., 2009). The City has completed several climate change adaptation studies with a number of recommended action items. The City reviewed its IDF curves in 2014 but determined that they did not have sufficient data to develop new IDF curves and would likely need additional and improved rain gauges in order to capture all localized storms that hit various nodes or catchments within the City. The City has not developed future looking IDF curves (i.e. what rainfall events will look like over the next 50-100 years similar to what Vancouver and Edmonton have done) nor confirmed if the summer storm is still the governing event under climate change as opposed to the winter storm with snowmelt. The City has referenced the need for a review in 2022 within its Asset management Strategy & Roadmap 2019. The City's Design Guidelines comment on the need to consider partial blockages due to ice in ditches when urban areas drain to them. But the Guidelines do not present or require the assessment of a rain on snow event whose frequency may increase due climate change. Recommended modifications to the Design Guidelines and a rainfall monitoring program was addressed in Technical Working Paper #2.
Oil and Grit Interceptors	Within the Storm Sewer Bylaw property types that require oil and grit interceptors are limited or too vague. No enforcement mechanisms are in place to ensure interceptors are maintained. In addition the draft Design Guidelines should include design requirements for oil-grit separators.
Tree Protection	The reach of the Tree Protection Bylaw is limited to a relatively small area of the City which have been set aside as environmentally sensitive areas. Areas protected by permits: AG: 'Greenbelt' (See Schedule A of Zoning Bylaw) and Riparian Protection Development Permit Areas (See OCP Schedule D-2). In addition, there are exemptions within the AG and Riparian areas that further limit the applicability of the Tree Protection Bylaw.
Protection of Other Natural Assets	Wetlands and watercourse riparian areas are critical for maintaining the natural hydrological cycle and moderating peak flows, preventing erosion, providing aquatic and terrestrial habitat/corridors and supporting downstream fisheries. The existing floodplain bylaw allows the development of roadways,

	parking areas, accessory buildings and loading areas within these areas. The Zoning Bylaw only protects fish-bearing streams or wetlands that are connected by surface flow to fish-bearing streams. The zoning bylaw only requires 15 metre leave strips for riparian function in agricultural and low-density residential areas. The zoning bylaw requires 30 metre leaves strips in non-residential areas but is silent on requirements for medium to high density residential areas. In addition, the zoning bylaw allows exemptions and will reduce riparian areas if an R.P.Bio. states that a smaller leave strip is sufficient. Developers have also been known to ignore the City's riparian requirements and provincial wetland preservation requirements but the City does not have the capacity to review all possible illegal development within riparian areas/wetlands and enforce the requirements under the zoning bylaw. The City will be soon developing a natural asset inventory which should help identify and strengthen the case for protecting natural assets using development permit areas.
Land Clearing Activities	As a result of insufficient watercourse protection, ESC regulations, and tree protection requirements, developers clear land months or years prior to subdivision or building permits with no ESC measures in place. This occurs before and after the current land use application regulatory triggers. As previously mentioned, it is important that negative environmental and infrastructure impacts and resulting liability from insufficient erosion and sediment control lies with the developer and not the City.
Erosion and Sediment Control (ESC)	Existing bylaws do not have the required provisions to ensure erosion and sediment control (ESC) best practices are followed. The Storm Sewer Bylaw prohibits discharge for sediment (>500 ppm) which is significantly higher than best practice and requires laboratory testing to confirm. Federal CCME guidelines and Provincial guidelines for turbidity and total suspended solids (TSS) are based on increases above background levels but monitoring background levels is not practical in many circumstances due to staff time and costs. Therefore, it is recommended to use a specific value that is easily measured and does not exceed provincial limits (e.g. 75 mg/L during wet conditions and 25 mg/L under dry conditions). For example, the City of Kelowna does not permit discharges of TSS above 75 mg/L and samples must be submitted for lab testing of TSS if field samples have a turbidity of greater than 60 NTU (Schedule 4 of Bylaw 7900). The use of field testing for turbidity allows city staff and ESC supervisors to practically monitor the effectiveness of ESC measures. The City of Prince George's Design Guidelines require erosion and sediment control during construction but does not require oversight by a qualified professional or any specifications on monitoring, reporting and ongoing maintenance. Whereas, the City of Kelowna requires developers to retain a Qualified Professional (P.Eng, RPBio, P.Ag, ASCT, CPESC, CISEC or CESCL) responsible for inspecting and monitoring the ESC Facilities (Schedule 4 of Bylaw 7900). It is important that negative environmental and infrastructure impacts and resulting liability from insufficient erosion and sediment control lies with the developer and not the City. The City is currently looking at amending existing regulations, particularly the Subdivision Development Servicing Bylaw, to increase the City's ability to require and enforce good erosion and sediment control practices.
Staffing Levels	Effective permitting and bylaw enforcement is a time-consuming effort that requires a multi-tiered approach including outreach, education, testing, reporting, follow-up visits, ticketing, and legal proceedings. Consequently, increased staffing levels and/or front-end resource prioritization on outreach and education are required to ensure acceptable levels of bylaw compliance.
Prohibited Wastes	List of materials prohibited for discharge into the stormwater system by the Storm Sewer Bylaw does not align with current environmental standards, do not directly reference provincial or federal regulations, and do not allow for easy measurement in the field for enforcement. As a result, City staff do not have the regulatory authority to address all harmful discharges. The Storm Sewer bylaw does not specifically address ditches, ponds or watercourses, including discharges to them. The definitions within the Storm Sewer Bylaw need to be updated to include all assets within the City's stormwater system.
Driveway Culverts	Responsibilities for maintaining, repairing, replacing and upgrading driveway culverts are not specified within any legislation. Therefore it is not clear whether the City or the property owner is responsible for

	replacing existing driveway culverts when they have deteriorated or when they need to be upgraded to allow for fish passage.
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3. Benchmarking

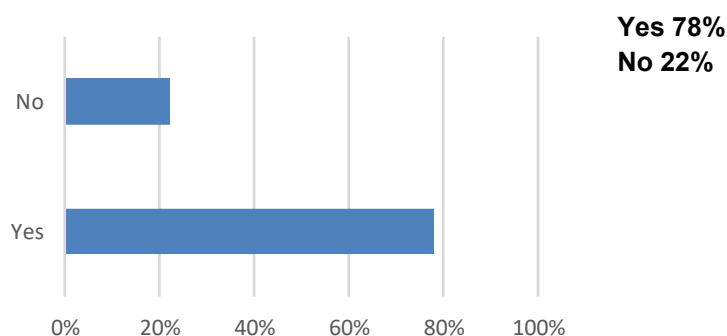
3.1 Benchmarking Survey

A survey was sent to municipalities that participate in the Stormwater module of the National Water and Wastewater Benchmarking Initiative. This is a Canadian benchmarking initiative with over 30 participating municipalities. Questions asked are listed below.

1. Are developers/property owners in your jurisdiction required to obtain a permit to clear land (i.e. clearing only, not including excavation)?
2. Do you ever have an issue with developers clearing land before receiving the necessary approvals?
3. Do you require individual developments to implement low impact development measures (also known as on-site stormwater best management practices)?
4. If you require on-site measures, how do you ensure that these on-site measures are maintained?

The results of the survey are outlined below. Nine (9) Responses were received from Kelowna, Sudbury, Whistler, Saskatoon, Calgary, Guelph, Kitchener, Squamish and North Vancouver.

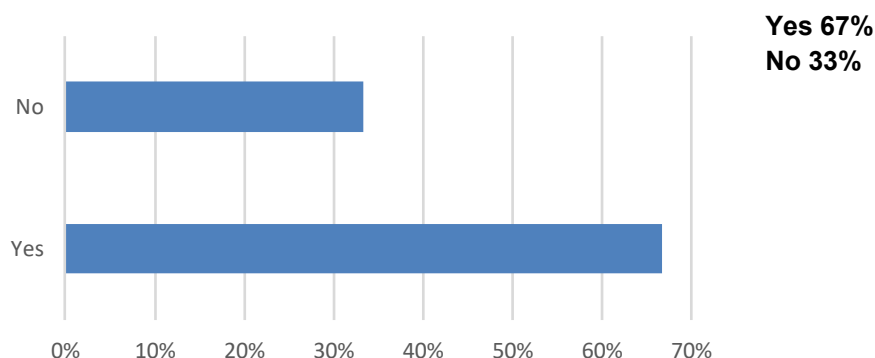
1. Are developers/property owners in your jurisdiction required to obtain a permit to clear land (i.e. clearing only, not including excavation)?



Additional comments from municipalities that require permits for land clearing are provided below.

- Kelowna: In most areas, especially sensitive ones, they have Development Permit areas that require permits prior to clearing. They are working towards a Tree Protection Bylaw on private property. They will also use ESC and stormwater management requirements in their bylaws to enforce proper clearing that does not have detrimental downstream impacts.
- Saskatoon: Their wetland policy needs to be followed for any work done in and around wetlands. The policy requires a wetland study to be completed, submitted and approved by the City prior to any work being done.
- Guelph: They have site alteration permits.
- Calgary: They require ESC and environmental permits.
- Kitchener: Has controls through their tree conservation bylaw.

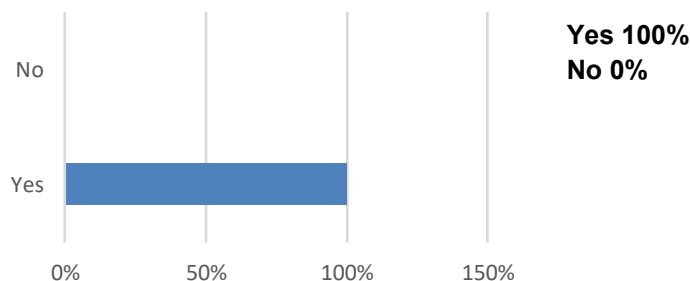
2. Do you ever have an issue with developers clearing land before receiving the necessary approvals?



If yes, have you found any successful mechanisms for encouraging compliance?

- District of West Vancouver: They can issue a stop work order for anything that isn't in conformance with their bylaws.
- Guelph: Site Alteration Bylaw.
- Kitchener: Tree Conservation Bylaw.
- Squamish: Site Alteration Bylaw and enforcement; Tree Management Bylaw; Soils Management Bylaw, and Erosion control requirements in the Subdivision Development and Control Bylaw;
- Kelowna: They follow-up on soil tracking on roads or sediment plumes in the storm system to enforce bylaw compliance.

3. Do you require individual developments to implement low impact development measures (also known as on-site stormwater best management practices)?

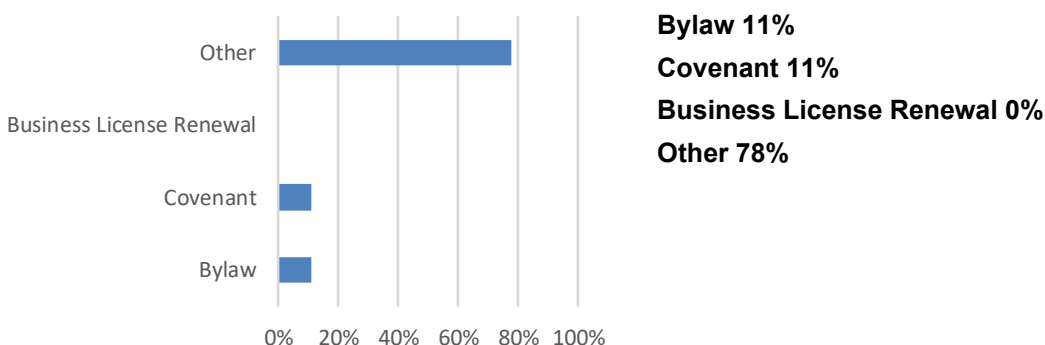


If yes, please describe any specific targets you require for runoff reduction:

- Kelowna: Requires matching post-development rate & volume to pre-development levels which generally requires extensive on-site retention and detention. 100-year stormwater quality is set to 50% of the 2-year storm.
- District of West Vancouver: No net increase in runoff from pre-development to post-development. First 31mm of run-off to be infiltrated or re-used. Maximum discharge is 31.8 L/s/Ha. They are challenged with lots of steep slopes and bedrock.
- Saskatoon: On-site stormwater management is required for every parcel other than single family or duplexes. The allowable stormwater release rates are based on design runoff coefficient for each parcel. The on-site stormwater management calculations and formulas are listed in the City of Saskatoon Design and Development Standards Manual, Section 6. The on-site stormwater management could be achieved through traditional BMP's (parking lots storage, roof tops, underground tanks etc) or LID's. The City of Saskatoon has adopted LID design guidelines that are available on the City's web site for the developers.
- Guelph: Post-development flow rates must match pre-development flow rates or meet Provincial guidelines.

- Calgary: They follow their 2014 Interim Stormwater Targets which vary by watershed (see <https://www.calgary.ca/UEP/Water/Pages/Specifications/Submission-for-approval-/Development-Approvals-Submissions.aspx>).
- Sudbury: They require post-development flows to match pre-development flows for certain watersheds that have supporting watershed studies.
- Kitchener: Requires first 12.5 mm of run-off to be infiltrated (see <https://www.kitchener.ca/en/city-services/stormwater-master-plan.aspx>).
- City of North Vancouver: Requires capturing and infiltrating the first 56 mm of run-off over 24 hours, or releasing run-off at a rate at 0.5 l/s per hectare.
- District of Squamish: Requires development to have a Stormwater Management Plan. No net increase in flow rates for the 10 year design storm. Further detention and treatment requirements may be required at the discretion of the Development Engineer.

4. If you require on-site measures, how do you ensure that these on-site measures are maintained?



The measures listed under “other” and additional comments are provided below.

- Sudbury: Site Plan Agreement but no inspection for compliance
- Kitchener: Maintenance required through Council Policy and enforced through stormwater rate credit program
- Squamish: Bylaw
- Kelowna: They have very limited assurances at the moment. They are working to incorporate it into business license renewal. We have the right to access and inspect all on-site storm infrastructure but no resources to do so.
- Saskatoon: They don't currently have anything in place but are looking to implement something, perhaps a bylaw.
- Guelph: Maintenance requirements are enforced through ECA approval requirements (through the provincial Ministry – MECP)
- Calgary: In principle, maintenance can be enforced through their Drainage Bylaw; however, enforcement is still challenging. Calgary recently started an educational program aimed at commercial and industrial property owners, informing them as to their responsibilities.
- Sudbury: Maintenance is required through a site plan agreement, but the City does not inspect for compliance yet.
- Kitchener: Council Policy, MUN-UTI-2003, https://www.ryerson.ca/content/dam/green/sponsors/7.Gollan_Ryerson.pdf
- City of North Vancouver: Current bylaw provisions are weak. They are looking to provide a fee-based incentive to encourage good maintenance. They also include provision for monitoring for bigger sites and have monitoring facilities placed on public ROW to allow easy municipal inspection.

Some of the information collected through this survey is also included in the following Section 3.2.

3.2 Other Municipalities Reviewed

Policies and bylaws from other municipalities were reviewed to develop a range of options for mitigating the key issues around stormwater management for the City. In addition to municipalities with characteristics similar to the City of Prince George, several larger municipalities with robust policy systems were reviewed to identify best practices. It is important to note that larger municipalities may have more staff dedicated to permitting and compliance than may be realistic for the City of Prince George.

The following table below outlines some of the more significant policy gaps identified and how “comparable” municipalities, as chosen by City staff, address these issues. As can be noted in the table, some of the comparable municipalities have some of the same gaps as Prince George but some of them have well developed cost recovery mechanisms, on-site stormwater control requirements, climate change criteria for development, oil-grit separator requirements, tree protection requirements and erosion and sediment control requirements.

Table 4: Regulatory Comparison of Key Stormwater Issues amongst Municipalities

	Mechanism for cost-recovery in bylaws	On-site LID/BMP requirements	Development criteria considers climate change	Well developed OGS requirements	Well developed tree protection requirements	Well developed land clearing controls	Well developed ESC requirements
Prince George	Only from limited securities	None	No	Vague and don't address maintenance	Limited area	None prior to subdivision and building permit	Can't ensure best practices are followed
Kelowna	Yes	Yes – post rate ≤ pre rate	Yes. IDF curve + 15%	Yes, installation & maintenance	Yes, within designated areas. Looking to broaden.	Somewhat	Yes – performance requirements and qualified professional for monitoring
Nanaimo	Yes	Yes	Yes. Updated IDF curves that consider climate change.	Yes	Yes	With respect to subdivisions	No – focus on education
Thunder Bay	Yes	Yes, installation & maintenance	Yes. Updated IDF curve + 15%	Yes, installation & maintenance	Only public trees.	With respect to subdivisions or soil removal	Yes, ESC plan requirements and monitoring
Sudbury	Yes	Yes – post rate ≤ pre rate	Yes	Yes	No	No	Yes
Kamloops	Not found	Yes	No	Not found	Yes	Adjacent to water courses	Requirements vague but design engineer required.
Surrey	Yes	Yes	Yes	Yes, maintenance	Yes	Yes	Yes
Other		Yes – Kitchener, Squamish and others	Yes – Edmonton, Vancouver and others		Yes – Comox, Kitchener and others	Yes – Squamish, Kitchener and others	Yes – Abbotsford and others

Further description about these “comparable” municipalities and best practices from other municipalities are provided in the following sub-sections.

Cost Recovery

Examples where municipalities have mechanisms for cost recovery include:

- City of Thunder Bay's Sewage and Stormwater Discharge By-law states that "people who violate the by-law are liable for all damages occasioned by their actions or non-actions". It also specifically mentions recovering costs resulting from spills.
- The City of Kelowna's Sanitary Sewer Storm Drain Bylaw states "Where any person contravenes any provision of this bylaw and thereby causes damage to the sewerage or drainage system, such person shall be liable to the City for all costs incurred in making repairs or taking remedial action."
- The City of Nanaimo's Storm Sewer Regulation and Charge Bylaw states "If the owner fails to correct any violation the City may, without prejudice to any other remedy it may have, enter the owner's property and correct such violation at the owner's cost."
- The City of Greater Sudbury can apply any costs to "fix" bylaw contraventions to the property's tax roll for recovery (see City Bylaw to Regulate the Removal of Topsoil).
- The City of Surrey has mechanisms for cost recovery within their bylaws (e.g. recuperating costs such as spill clean-up costs). The City's Stormwater Drainage Regulations and Charges Bylaw requires property owners to maintain on-site stormwater facilities and gives City staff the right to inspect private stormwater facilities. The Bylaw does not specifically state that the City can/will charge property owners for maintaining on-site stormwater facilities that the owner did not maintain.

On-site LID/BMP

Municipalities that require developing properties to adopt and maintain on-site Low Impact Development/ Stormwater Best Management Practices include:

- City of Thunder Bay's Engineering and Development Standards outline requirements for stormwater rate, volume and control. The standard requires on-site controls such that the post development discharge rate for all storms is not greater than the pre discharge rate. It also requires that the post-development stormwater volume for the 2-year storm is not greater than the pre-development volume. The standard also addresses stormwater quality and requires treatment for sediment removal. The standard describes overall goals, including the reduction in impervious cover and the use of BMP/LID treatment trains. City of Thunder Bay's Sewage and Stormwater Discharge By-law outlines maintenance responsibilities for private stormwater treatment facilities;
- City of Kamloops requires the capture and retention of all small storms (less than 10mm in 24 hours) on site for re-use, infiltration, evaporation, and/or transpiration. In areas where infiltration is not feasible detention in lieu of retention may be acceptable. BMPs designed to attenuate peak flows and remove TSS must be implemented on large parking areas (>1,000m²).
- City of Kelowna requires matching post development rate & volume to pre-development levels, generally requiring extensive onsite retention & detention. 100-yr storm Water Quality is set to 50% of 2-yr storm. They are working to incorporate proof of maintenance into business license renewal. They have the right to access and inspect all on-site storm infrastructure, but insufficient resources to do so.
- City of Greater Sudbury requires the implementation of on-site measures such that post development flow rates are equal to or less than pre-development flow rates for certain watersheds with supporting watershed studies. The maintenance of on-site facilities is required through site plan agreements, but the City does not inspect for compliance yet.
- City of Surrey's on-site requirements are specified in ISMPs, neighbourhood plans, and master drainage plans. Commercial and industrial properties must show proof of maintenance prior to the renewal or issuance of a business license;
- City of Kitchener requires the first 12.5 mm of run-off to be retained on-site and requires proof of maintenance for on-site stormwater measures before issuing a credit on a property's stormwater rate;
- City of Vancouver requires the first 24 mm of run-off to be retained on site and the next 24 mm to be treated before being discharged;

- District of Squamish requires developments to produce a stormwater management plan which must demonstrate no net increase in flow rates for the 10-year design storm. Further detention and treatment may be required at the discretion of the Development Engineer. Maintenance of these measures are required through a bylaw;
- City of North Vancouver requires 56 mm of rainfall to be captured/infiltrated over 24 hours, or stormwater to be released at a rate of 0.5 l/ha/s. Current maintenance requirements through a bylaw are too weak so they are looking for other tools (e.g. fee based) to encourage maintenance; and
- Sudbury requires post-development flows to equal pre-development flows for certain watersheds that have supporting watershed studies.

Municipalities which limit the amount of impervious area on-site include:

- Vancouver's zoning bylaw which limits impervious area (e.g. 60% for RS-1)

Climate Change

Municipalities that consider the future impacts of Climate Change within their development criteria include: -

- City of Thunder Bay has updated their IDF curves using recent data and better statistical analysis plus they require adding 15% flow.
- City of Kelowna's Design Standards require adding 15% to the existing IDF curves.
- The City of Nanaimo updated their IDF curve to consider climate change based on the Engineers and Geoscientists of British Columbia's guidance and current down scaled climate model projections from the Pacific Climate Impacts Consortium.
- The City of Greater Sudbury reviewed their IDF curve to consider climate change. They actually found that their current design storm which is based on a historical extreme weather event was sufficiently conservative to consider climate change.
- Edmonton (future looking IDF curves and modeling assessment)
- Vancouver (future looking IDF curves); and
- District of North Vancouver (future looking IDF curves).

Oil Grit Separators

Municipalities that have well developed requirements for the installation and maintenance of oil grit separators (OGS) include:

- City of Kamloops requires sediment control on all parking lots > 1,000 m²
- City of Kelowna requires OGS units for parking lots > 50 vehicles, all industrial properties, gas stations, vehicle service/storage sites and construction equipment service/storage sites. Proof of maintenance is tied to business license renewal.
- Thunder Bay which has a public education program and strict maintenance requirements in their Sewage and Stormwater Discharge By-law, has over 90% of the private side OGS units being inspected and/or cleaned annually. The bylaw requires OGS units for vehicle and equipment service-related properties. Sediment removal requirements as per the City's Engineering and Development Standards may also lead to the installation of OGS units.
- The City of Nanaimo requires all uncovered parking areas greater than 100 m² in size to include treatment to remove oil, total suspended solids (TSS), and other contaminants.
- City of Greater Sudbury requires OGS for all motor vehicle service stations, repair shops, vehicle wash stations etc. and requires that they be maintained and be able to produce maintenance records upon request.
- Surrey requires proof of maintenance of any on-site OGS to obtain or renew a business license.

Tree Protection

Municipalities that have well developed Tree Protection requirements include:

- The City of Kamloops' Tree Protection Bylaw;
- The City of Kelowna's Tree Protection Bylaw limits tree clearing in designated areas which includes tree cutting permit areas, along stream corridors and on steep slopes. The City of Kelowna are working on regulating better tree protection on private property;
- The City of Nanaimo's Tree Protection Bylaw
- The City of Surrey (more stringent controls and penalties than the City of Prince George including a list of priority trees);
- The City of Abbotsford (required permit with security);
- City of Chilliwack (Tree Management Land Development Bylaw);
- The City of Maple Ridge (special provisions for addressing tree removal in rural areas);
- Town of Comox (Tree Management and Protection Bylaw);
- City of Courtney (Tree Protection and Management Bylaw); and
- The City of Kitchener (Tree Conservation Bylaw and Permit with fines up to \$50,000).

Land Clearing

Municipalities that have well developed practices for controlling land clearing before subdivision include:

- District of Squamish which has a Site Alteration Bylaw (with enforcement), Tree Management Bylaw and Soils Management Bylaw; and
- City of Kitchener controls land clearing through their Tree Conservation Bylaw and associated permitting process (with fines up to \$50,000).
- City of Kelowna requires a permit for land clearing in Development Permit areas which includes most areas, especially sensitive ones. The Development Permit areas that require permits prior to clearing. Kelowna also uses their ESC and Stormwater Bylaws to enforce good land clearing practices.

Erosion and Sediment Control

Municipalities that have well developed systems for erosion and sediment control include:

- City of Kelowna (erosion and sediment control requirements within their Design Standards Bylaw). Maximum concentration levels are 75 milligrams per litre (ppm) of total suspended solids (TSS). A sample measuring > 60 nephelometric turbidity units (NTU) will be sent to the lab for analysis. A security deposit is taken and a Qualified Professional is responsible for inspecting and monitoring the ESC Facilities
- City of Thunder Bay's Engineering and Development Standards outline the requirements for an ESC plan, along with requirements for monitoring during construction. It does not require the services of a registered professional. ESC plan requirements are outlined in the Soil Removal bylaw.
- The City of Greater Sudbury prohibits discharges to sewers and watercourses > 15 mg/L TSS. An erosion and sediment control plan must be prepared and monitored by a Professional and a security must be provided.
- City of Burnaby (sediment control system permits and information pamphlets for builders)
- City of Abbotsford (erosion and sediment control bylaw)
- City of Surrey (erosion and sediment control bylaw) requires an ESC permit with a security deposit. The security deposit can be used by the City to complete the ESC facilities if the developer fails to do so. The ESC plan must be sealed by a Professional Engineer.
- City of Maple Ridge (watercourse protection bylaw), and
- Township of Langley (erosion and sediment control bylaw).

Other

Municipalities where Stormwater Infrastructure Design Criteria were referenced to rather than included within its bylaws are:

- Cities of Surrey and Maple Ridge references its criteria in its Subdivision and Development bylaw
- City of Thunder Bay references its Engineering and Development Standard within its Sewage and Stormwater Discharge By-law.

Municipalities where the list of prohibited substances for discharge into the stormwater system meet current environmental standards and only make reference to (rather than include) provincial or federal regulations include:

- City of Surrey (e.g. reference to the Environmental Management Act);
- Thunder Bay's bylaw references the Ontario Water Resource Act, the Environmental Protection Act and Fisheries Act.
- Kamloops Watercourse bylaw references Fisheries Act, Water Act and Environment and Land Use Act.
- City of Kelowna's Design Standards references the BC Ministry of Environment Recreational Water Quality Guidelines.

4. Key Findings and Recommendations

AECOM's bylaw review and discussions with staff indicated the primary concerns for stormwater management, as listed in Section 2.4. Recommendations for areas of bylaw and policy improvement are discussed in detail below.

Cost Recovery for Bylaw Infractions

In general, the City is permitted to direct a person to rectify a bylaw infraction and in some cases is able to correct the situation, if required, while recovering the costs from the person. However, the Storm Sewer Bylaw currently doesn't explicitly allow for the City to rectify the situation and recover costs. The City is permitted to 'shut off' service to a property. Shutting off a storm service may not be feasible, desirable or an effective means of enforcement.

Cost recovery is important for cleaning-up spills, removing accumulated sediment and rectifying other downstream issues due to insufficient on-site stormwater management facilities and practices. If the City were able to recover these costs, then potential responsible persons would be encouraged to implement better spill prevention and containment measures and better on-site stormwater management practices. It also allows the City to allocate more staff time to spill related activities knowing that some costs can be recovered. Implementing mechanisms for the recovery of spill related costs should not be done in such a way that deters the reporting of spills.

Recommendation #1: The City should update the Storm Sewer Bylaw and Tree Protection Bylaw with procedures for notification, rectification, spill reporting and cost recovery for bylaw infractions.

Low Impact Development/ Best Management Practices

In keeping with the policy direction of the Official Community Plan, the recommendations within the City's Watershed Drainage Plans, and increasingly common practices amongst Canadian municipalities, the City should require newly developed and re-developed areas to implement approved low impact development measures (also known as stormwater best management practices), where feasible, to maintain the natural water balance as much as possible. This will help protect downstream ravines and natural water bodies and reduce the loading on the City's engineered stormwater system.

Retention and infiltration area requirements could be made simpler for smaller lots (i.e. <1000 m²) in order to simplify the process for builders and City staff. Additional work will be required with stakeholders to ensure that proposed changes are generally acceptable to and understood by the development community.

The City could also consider setting restrictions within the Zoning Bylaw on the allowable percent imperviousness for specific land uses. Targets could be based on total impervious area or effective impervious area. In combination with setting targets for on-site stormwater management requirements and/or restricting impervious surfaces, educations and outreach programs can provide for a less legislative approach to improving stormwater management. If the City revises its policies and bylaws, educational material should be used to communicate the changes and best practices to developers and the public. These types of materials should be readily available and promoted by City staff.

A detailed review of the City's Subdivision and Development Servicing Bylaw and draft Design Guidelines was completed as part of Technical Working Paper #2 – Engineering Issues.

Recommendation #2: The City should develop performance-based requirements for on-site retention, infiltration, and release of stormwater runoff from private property in the Engineering Design Guidelines, with consideration for situations where infiltration or detention may cause undesired consequences (i.e. slope stability concerns,

increased creek erosion etc.). The Design Guidelines should be referenced within the Subdivision and Development Services Bylaw so that they are binding and enforceable.

Climate Change

Emerging best practice in engineering design is to incorporate climate change adaptation measures into the design of stormwater infrastructure.

Applying climate change into the design of the stormwater system will require having multiple operational rain gauges around the City in order to capture all localized storms. The City should also look at climate change modeling to develop future IDF curves (i.e. year 2080) to help in the design of new stormwater infrastructure that will be in operation for the next 50-100 years. The ultimate goal is to increase the resiliency of the City's stormwater system. More details are provided within the Rain Gauge Monitoring portion of Technical Working Paper #2.

Recommendation #3: The City should integrate future climate change projections into the design of the stormwater system, by updating its Design Guidelines to consider future rainfall projections.

Oil and Grit Interceptors

The current wording of Clause 2.9 Interceptors in the Storm Sewer Bylaw is vague as to which properties should have an oil and grit interceptor and does not allow the City to require an interceptor on any property that the City deems necessary. Instead, it permits the City to waive the requirement through permitted discharges. Some municipalities (i.e. Kelowna) require all Industrial properties to have an oil and grit interceptor. Kelowna also requires all parking lots for more than 50 vehicles to have an oil-grit separator (OGS), whereas Kamloops requires all parking lots with a surface area greater than 1000m² to have an OGS. Cities such as the City of Kelowna require proof of OGS maintenance (i.e. receipt from cleaning company/vac truck) when they renew their business license.

Recommendation #4: The City of Prince George should update the Storm Sewer Bylaw to clearly specify the types of properties that require an oil and grit interceptor (including large surface parking lots and industrial properties) and to include maintenance requirements. The City should also update the Design Guidelines to specify design requirements for the sizing of oil and grit separators and access for maintenance.

The bylaw and Design Guideline updates should include provisions that allow the City to require an oil and grit interceptor on any property deemed necessary; that the interceptor should be located in a readily and easily accessible location for cleaning and inspections; and that the interceptor should be maintained at the owner's expense in a continuously efficient operation at all times.

Prohibited Substances

Current language in the Storm Sewer Bylaw including the list of prohibited substances do not meet current standards for the protection of the storm sewer system, the public, and aquatic life. The City has a legal responsibility when unauthorized discharges enter its system. This is a risk that makes the City liable to contain and to some extent, remediate even if it is not the responsible party. The current bylaw includes out of date provincial and federal regulations. The City bylaws should only reference the existence of, rather than reiterate or interpret Provincial and Federal guidelines, standards and regulations. That way, as Provincial and Federal guidelines, standards or regulations change (i.e. change in allowable concentrations), the City's bylaw is still up to date. The updates should also be written to ensure that any current and future contaminants of concerns are included in the bylaw. The bylaw only addresses discharges to "storm sewers" and to the "storm sewer system" and does not explicitly include other aspects of the drainage system such as ditches and watercourses.

Currently, the City is permitted to issue bylaw notices of \$500 through the Local Government Bylaw Notice Enforcement Act for the discharge of prohibited wastes. However, there are many minor contraventions to the Storm Sewer Bylaw that are not listed in the Bylaw Notice Enforcement Bylaw which limit the tools available for City staff to enforce the provisions in the Storm Sewer Bylaw.

Recommendation #5: *The City should update the section in the Storm Sewer Bylaw on prohibited discharges to reflect current environmental standards, to allow for easy measurement in the field for enforcement, to only reference Provincial and Federal standards (rather than reiterate them) as well as to broadly include materials, concentrations and quantities of substances that may negatively impact the stormwater system, any infrastructure, health or safety of personnel, and the City's ability to meet Provincial and Federal obligations. The bylaw should explicitly address discharges to the entire drainage system (e.g. ditches and watercourses) and not just storm sewers.*

Any updates to the City's Storm Sewer Bylaw should be reviewed to ensure that all relevant contraventions are included in the Bylaw Notice Enforcement Bylaw or the Municipal Ticket Information Utilization Bylaw.

Protection of Trees and Other Natural Assets

The City's Tree Protection Bylaw requires permits for trees to be removed in the AG: Greenbelt and Riparian Protection Development Permit Areas. The Riparian Protection Development Permit Area and Zoning Bylaw do not include all creeks and wetlands, just fish-bearing watercourses and wetlands that are directly tied to fish-bearing streams. The Flood Plain Regulation Bylaw identifies setbacks from watercourses

These protections do not appear to be robust enough given the importance of the tree canopy, wetlands, non-fish bearing streams and riparian corridors throughout the City to manage stormwater runoff, maintain the natural water balance and provide other environmental, economic and social benefits.

Valuable natural assets can be defined through the City's Sensitive Ecosystem Inventory and the City's pending Natural Asset Inventory being conducted through the Municipal Natural Asset Initiative.

Recommendation #6: *The City should consider amending the Tree Protection Bylaw for better environmental protections by increasing the area covered by the bylaw.*

Recommendation #7: *The City should consider increasing its development permit areas within the OCP bylaw to include and protect additional valuable natural areas, such as riparian areas of streams that provide nutrients to downstream fisheries and wetlands that are not directly connected to fish-bearing streams. The Flood Plain Regulation Bylaw and its permissible exemptions should also be aligned, where relevant, to support the protection of the new development permit areas.*

Land Clearing Activities and Erosion and Sediment Control (ESC)

Current development activities in the City result in land being cleared well ahead of construction activities. This practice is a direct contravention of two erosion and sediment control best practices:

- Time the clearing and excavation activities so that they occur no sooner than is necessary for subsequent construction activities; and
- Remove as little of the existing vegetation as possible.

Currently, the City does not have a robust policy framework with regards to erosion and sediment control (ESC). The City only requires developers to produce erosion and sediment control plans for certain types of development. The City does not specify what the ESC plans should contain nor that they be prepared and monitored by a qualified professional. The prohibited waste list in the Storm Sewer Bylaw specifies a total suspended solids limit of 500 ppm which is much higher than best practice for ESC and does not allow for easy measurement in the field. The City does not have a cost recovery mechanism such that it can recover costs incurred due to insufficient on-site ESC practices.

The City would be able to better encourage and enforce good ESC practices, if ESC was tied to a permit with a security. The City is currently looking at strengthening existing regulations, particularly the Subdivision Development Servicing Bylaw, to help increase their ability to require and enforce effective erosion and sediment control practices.

Recommendation #8: *The City should develop a new Erosion and Sediment Control Bylaw and update the total suspended solids limit in the Storm Sewer Bylaw to better protect the natural environment and the City's infrastructure, and to allow for field testing.*

An erosion and sediment control bylaw should specify the permitting process including required securities, the ability of the City to conduct on-site inspections, issue stop work orders and recover costs, what type of information is required within an erosion and sediment control plan, that the plan be developed by a qualified professional, that the ESC system be monitored by a qualified professional, and clear ESC performance reporting requirements. . ESC plan requirements could be based on parcel size (e.g. simpler requirements for developments < 1000m²). The subdivision bylaw should refer to the new Erosion and Sediment Control Bylaw, if the City decides to develop one.

The goal of enforcement measures should be to move developers and builders towards best practices in ESC which will require a combination of clear requirements, education, and enforcement. If the City updates its ESC regulations and policies, then it may need to update its educational material and enforcement practices accordingly.

As it can take years to develop a new Bylaw, the City may want to first consider strengthening its Storm Sewer Bylaw, Subdivision and Development Servicing Bylaw and Design Guidelines to help address some of the ESC issues in the interim. Updating allowable sediment concentrations, enabling the ability for field measurements, and adding cost recovery mechanisms within the Storm Sewer Bylaw will help the City address and ultimately reduce the impact of poor ESC practices. The City could also investigate updating its development and building permit requirements to extend the need for an ESC plan to more types of development and require that ESC plans be prepared and monitored by a Qualified Professional for larger developments. Once a new ESC bylaw is in place the City will also be able to extend and better control ESC requirements to land clearing activities that occur before rezoning or the development/building permit stage.

Driveway Culverts

Driveway culverts need to be regularly inspected, periodically cleared of debris, replaced at the end of their service life and in some cases, upgraded to allow for fish passage. It is not specified in any of the City's regulations, who is responsible for maintaining and renewing driveway culverts.

Recommendation #9::*The Storm Sewer Bylaw should be updated to explicitly state who is responsible for inspecting, maintaining, repairing, replacing and upgrading driveway culverts.*

General

With respect to the nine recommendations outlined above, it is important that the City's legal council review any proposals for new or amended bylaws.

Most municipalities reviewed in the preparation of this TWP have separate bylaws to address drainage assets, tree protection and erosion and sediment control. Although, these separate bylaws need to be co-ordinated, we are not recommending that the City combine all these functions into one single bylaw.

5. References

Office of the Ombudsperson (Ombudsperson), (2016). Bylaw Enforcement: Best Practices Guide for Local Governments, Special Report No. 36 to the Legislative Assembly of British Columbia.

Picketts, I.M., Werner, A.T., Murdock, T.Q., (2009). Climate Change in Prince George: Summary of Past Trends and Future Projections. Pacific Climate Impacts Consortium, University of Victoria, Victoria BC.

Province of British Columbia (BC), (2019). British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture Summary Report. Water Protection & Sustainability Branch, Ministry of Environment &

Climate Change Strategy.

Province of British Columbia (BC), (2020b). Local Government Bylaw Enforcement. Retrieved from <https://www2.gov.bc.ca/gov/content/governments/local-governments/governance-powers/bylaws/bylaw-enforcement>

Province of British Columbia (BC), (2020c). Local Government Bylaw Notices. Retrieved from <https://www2.gov.bc.ca/gov/content/governments/local-governments/governance-powers/bylaws/bylaw-enforcement/bylaw-notices>

Province of British Columbia (BC), (2020d). Municipal Ticketing. Retrieved from <https://www2.gov.bc.ca/gov/content/governments/local-governments/governance-powers/bylaws/bylaw-enforcement/municipal-ticketing>

Province of British Columbia (BC), (2020e). Offence Act Prosecutions. Retrieved from <https://www2.gov.bc.ca/gov/content/governments/local-governments/governance-powers/bylaws/bylaw-enforcement/offence-act-prosecutions>

Province of British Columbia (BC), (2010). Community Charter Bylaw Enforcement Regulation. Retrieved from http://www.bclaws.ca/civix/document/id/complete/statreg/425_2003#:~:text=Maximum%20fine%20amount,the%20Community%20Charter%20is%20%241000.

Province of British Columbia (BC), (2003). Local Government Bylaw Notice Enforcement Act [SBC 2003] Chapter 60. Retrieved from http://www.bclaws.ca/civix/document/id/complete/statreg/03060_01#section4

Vancouver, City of (COV), (2017). Erosion and Sediment Control Large Lot Development (1,000m² or More), Bulletin 2002-003-EV. Vancouver BC.

BC MOE. 2005. A User's Guide to Working In and Around Water. Understanding the Regulation Under British Columbia's Water Act. Originally issues: May 18, 2005.

Fisheries and Oceans Canada. 2000. Urban Stormwater Guidelines and Best Management Practices for Protection of Fish and Fish Habitat, Draft Discussion Document, Revision 4.

BC MWLAP. 2002. Stormwater Planning: A Guidebook for British Columbia

Government of BC and Fisheries and Oceans Canada. 2007. Beyond the Guidebook: Context for Rainwater Management and Green Infrastructure in British Columbia. June 2007.

Government of BC, et. al. 2010. Beyond the Guidebook 2010: Implementing a New Culture for Urban Watershed Protection and Restoration in British Columbia

Government of BC, et. al. 2015. Beyond the Guidebook 2015: Towards a Watershed Health Legacy in the Georgia Basin

