City of Maple Ridge

COUNCIL WORKSHOP AGENDA

May 24, 2022

9:00 a.m.

Virtual Online Meeting including Council Chambers

The purpose of the Council Workshop is to review and discuss policies and other items of interest to Council. Although resolutions may be passed at this meeting, the intent is to make a consensus decision to send an item to Council for debate and vote or refer the item back to staff for more information or clarification.

The meeting is live streamed and recorded by the City of Maple Ridge.

1. APPROVAL OF THE AGENDA

2. ADOPTION OF MINUTES

2.1 Minutes - April 26, 2022 and May 10, 2022

3. PRESENTATIONS AT THE REQUEST OF COUNCIL

4. UNFINISHED AND NEW BUSINESS

4.1 Connected Community Strategy

Staff report dated May 24, 2022, recommending that staff review and develop an implementation plan to address the recommendations proposed in the Connected Community Strategy - Findings & Recommendations report.

Presentation by Eric Rothschild, Rothschild & Co. and Rob McCann, Clearcable Networks.

4.2 Single-Use Item Reduction Bylaw

Staff report dated May 24, 2022, recommending that staff prepare a Single-Use Item Reduction Bylaw consistent with the regionally harmonized approach for consideration.

5. CORRESPONDENCE

6. BRIEFING ON OTHER ITEMS OF INTEREST/QUESTIONS FROM COUNCIL

7. MATTERS DEEMED EXPEDIENT

8. NOTICE OF CLOSED COUNCIL MEETING

9. ADJOURNMENT

APPROVED BY: Patrick Hlavac-Winsor

DATE: May 20, 2022

PREPARED BY: Corinn Howes

DATE: May 19, 2022

CHECKED BY: _____

DATE: _____

City of Maple Ridge

COUNCIL WORKSHOP MINUTES

April 26, 2022

The Minutes of the City Council Meeting held on April 26, 2022 at 9:00 a.m. held virtually and hosted in the Council Chambers of the City Hall, 11995 Haney Place, Maple Ridge, British Columbia for the purpose of transacting regular City business.

PRESENT	*Appointed Staff*
Elected Officials	S. Hartman, Chief Administrative Officer
Mayor M. Morden	C. Carter, General Manager Planning & Development Services
Councillor J. Dueck	
Councillor C. Meadus	C. Crabtree, General Manager Corporate Services
Councillor G. Robson	S. Labonne, General Manager Parks, Recreation & Culture
Councillor R. Svendsen	
Councillor A. Yousef	D. Pollock, General Manager Engineering Services
	P. Hlavac-Winsor, Acting Corporate Officer, General Counsel and Executive Director, Legislative Services
ABSENT	
Councillor K. Duncan	A. Nurvo, Deputy Corporate Officer
	Other Staff as Required
	T. Cotroneo, Manager of Community Engagement
	K. Gowan, Planner
	M. McMullen, Manager of Development & Environmental Services
	R. Ollenberger, Manager of Infrastructure Development
	D. Pope, Director, Recreation & Community Engagement
	F. Smith, Director of Engineering
	T. Thompson, Director of Finance
	L. Zosiak, Manager of Community Planning

These Minutes are posted on the City Web Site at www.mapleridge.ca

Note: Due to COVID Councillors Robson, Svendsen and Yousef participated virtually.

1. *APPROVAL OF THE AGENDA*

R/2022-WS-016
It was moved and seconded

That the agenda of the April 26, 2022 Council Workshop Meeting be approved as circulated.

CARRIED

2. *ADOPTION OF MINUTES*

2.1 Minutes of the March 29, 2022 Council Workshop Meeting

R/2022-WS-017
It was moved and seconded

That the minutes of the Council Workshop Meeting of March 29, 2022 be adopted as circulated.

CARRIED

3. *PRESENTATIONS AT THE REQUEST OF COUNCIL* - Nil

Note: Councillor Svendsen joined the meeting at 9:10 a.m.

4. *UNFINISHED AND NEW BUSINESS*

4.1 Parks, Recreation and Culture Engagement Program

Stephen Slawuta of RC Strategies on Engagement Program reviewed the project phases, timelines for completion and opportunities for public input, invited Council feedback and answered questions from Council.

Note: Councillor Meadus left the meeting at 9:55 a.m. and rejoined at 9:56 a.m.

Note: Councillor Robson joined the meeting at 9:58 a.m.

4.2 Market Update and Secondary Suites Regulatory Options

Staff report dated April 26, 2022, providing a housing and rental market update along with accessory dwelling unit regulatory options. Staff presented the recommendations and answered questions from Council. Council reviewed each of the below recommendations individually and provided feedback to staff on the recommendations and priorities.

Note: Councillor Yousef left the meeting at 10:53 a.m. and retuned at 10:57 a.m.

Council discussed the various recommendations from the Staff report:

Secondary Suite Recommendations:	Support	Opposed	Outcome
1.That staff prepare amendments to the Zoning Bylaw to remove the maximum and minimum gross floor area requirement for secondary suites;	Dueck, Meadus, Mayor, Svendsen, Yousef (would support no minimum but wants maximum)	Robson	General support

2.That staff develop 'Alternate Compliance Methods for Alterations to Existing Buildings to Add a Secondary Suite' in the BC Building Code; **(discussion between members – will require more details and have not seen building recommendations)**	Meadus, Robson, Dueck, Yousef, Svendsen, Mayor		General support
3.~~That staff prepare amendments to the Zoning Bylaw to permit secondary suites in all single detached residential zones~~ – **Amended by Dueck:** **That staff bring back options looking at potentially allowing secondary suites in R2 and R3 and bring a report back to Council**	Dueck (should have conversation with neighbors), Meadus, Mayor, Yousef (wants to look at area plans not all single detached residential zones and based on size of property), Robson (has issue with saying it is for all neighborhoods – needs to be selective – did not oppose Dueck's amended language),	Svendsen	General support on amended wording
4.That staff prepare options for amendments to the Zoning Bylaw to permit secondary suites in ground-orientated duplexes and townhouses **(discussion between members and staff - work best with walkout basement units and reach out to other municipalities – staff would put it on the bottom of the priority list)**	Meadus, Mayor, Dueck (duplex ok – townhouse depends on size depends on neighborhood and size of townhouse), Svendsen (change requirements for apron and parking requirements for units, may be most suited in complete communities)	Yousef, Robson	General Support
5.That staff prepare amendments to the Zoning Bylaw permit lock-off suites in apartments and stacked townhouses	Meadus	Yousef, Dueck, Svendsen, Robson (if it was accompanied by owner occupier), Mayor	General opposition
Detached Garden Suite Recommendations:	**Support**	**Opposed**	**Outcome**
6.That staff prepare amendments to the Zoning Bylaw to permit secondary suites and detached garden suites on the same lot in the Agricultural Land Reserve **(discussion between members and staff - – look to do what the ALC allows)**	Dueck (in order to support agricultural use of property), Mayor, Svendsen (it is being allowed by ALC), Yousef (if consistent with ALR), Robson did not oppose	Meadus (does not see this going much to farm use)	General support

7.That staff prepare amendments to the Zoning Bylaw to allow flexible siting of a detached garden suite on a lot	Mayor, Yousef, Dueck, Meadus	Svendsen, Robson	General support
8.That staff prepare amendments to the Zoning Bylaw to remove the minimum size requirement for detached garden suites	Yousef, Dueck, Meadus, Mayor	Svendsen, Robson	General support
9.That staff prepare amendments to the Zoning Bylaw to permit larger detached garden suites in specific residential zones **(discussion between members and staff – staff would envision this on larger properties)**	Dueck, Meadus, Mayor (with clear efforts to avoid subdivision), Yousef (with a maximum up to 140m2)	Robson, Svendsen	General support
10.That staff prepare amendments to the Zoning Bylaw to permit secondary suites and detached garden suites on the same lot in all residential zones	Meadus, Dueck, Mayor, Svendsen	Robson, Yousef (lot size and area plan should be considered)	General support
11.That staff develop a program, for council consideration, that would create "pre-approved" building plan templates for detached garden suites	Svendsen, Meadus, Dueck, Mayor	Robson, Yousef	General support

R/2022-WS-018
It was moved and seconded

That the current bylaw enforcement related to the issue of unregistered secondary suites be held in abeyance during the review of the bylaw unless there is an obvious nuisance situation that staff are to enforce.

CARRIED

Note: The meeting recessed at 12:19 p.m. and reconvened at 12:33 p.m., with all members of Council present except Councillors Svendsen and Duncan.

4.3 2022 Property Tax Rates Bylaw and 2022-2026 Financial Plan Amending Bylaw

T. Thompson, Director of Finance provided a detailed presentation on the 2022 Property Tax Rates Bylaw and 2022-2026 Financial Plan Amending Bylaw, presented a new alternative 4, and compared alternatives 3 and 4. Staff responded to questions from Council. Council unanimously provided direction to bring Alternative 4 forward to the Regular Council meeting of May 3, 2022 for consideration.

Note: Councillor Dueck left the meeting at 1:08 p.m. and returned at 1:09 p.m.

5. *CORRESPONDENCE* – Nil

6. ***BRIEFING ON OTHER ITEMS OF INTEREST/QUESTIONS FROM COUNCIL*** - Nil

7. ***MATTERS DEEMED EXPEDIENT*** – Nil

8. ***NOTICE OF CLOSED COUNCIL MEETING*** - Nil

9. ***ADJOURNMENT*** – 1:15 p.m.

_____
M. Morden, Mayor

Certified Correct

_____
P. Hlavac-Winsor, Acting Corporate Officer

City of Maple Ridge

COUNCIL WORKSHOP MINUTES

May 10, 2022

The Minutes of the City Council Meeting held on May 10, 2022 at 9:02 a.m. held virtually and hosted in the Council Chambers of the City Hall, 11995 Haney Place, Maple Ridge, British Columbia for the purpose of transacting regular City business.

PRESENT	*Appointed Staff*
Elected Officials	S. Hartman, Chief Administrative Officer
Mayor M. Morden	C. Crabtree, General Manager Corporate Services
Councillor J. Dueck	S. Labonne, General Manager Parks, Recreation & Culture
Councillor C. Meadus	D. Pollock, General Manager Engineering Services
Councillor G. Robson	P. Hlavac-Winsor, General Counsel and Executive Director,
Councillor R. Svendsen	Legislative Services, Acting Corporate Officer
Councillor A. Yousef	A. Nurvo, Deputy Corporate Officer
ABSENT	*Other Staff as Required*
Councillor K. Duncan	C. Goddard, Director of Planning
	T. Thompson, Director of Finance
	F. Smith, Director of Engineering
	L. Zosiak, Manager of Community Planning
	M. McMullen, Manager of Development and Environmental Services
	A. Bowden, Planner 2
	H. Singh, Computer Support Specialist

These Minutes are posted on the City Web Site at www.mapleridge.ca

Note: Councillor Robson participated virtually.

1. *APPROVAL OF THE AGENDA*

R/2022-WS-019
It was moved and seconded

That the agenda of the May 10, 2022 Council Workshop Meeting be approved as circulated.

CARRIED

2. *ADOPTION OF MINUTES*

2.1 **Minutes of the April 26, 2022 Council Workshop Meeting**

There was discussion regarding the draft Minutes, and Council directed that the Minutes of the Council Workshop meeting of April 26, 2022 be further reviewed by staff and be brought back for Council review at the next Council Workshop meeting.

3. *PRESENTATIONS AT THE REQUEST OF COUNCIL* – Nil

4. *UNFINISHED AND NEW BUSINESS*

4.1 Draft Regional Growth Strategy Metro 2050 – Request for Acceptance

Staff report dated May 10, 2022 providing an update on how Council's comments regarding the draft *Metro 2050* Regional Growth Strategy were reflected in the revised version and a recommendation that Council authorize the Corporate Officer to provide a letter to Metro Vancouver accepting the proposed *Metro 2050* Regional Growth Strategy by the July 4, 2022 deadline.

A. Bowden, Planner 2, presented the recommendations and staff answered questions from Council.

R/2022-WS-020
It was moved and seconded

That the Corporate Officer be authorized to provide a letter to Metro Vancouver accepting the proposed *Metro 2050* Regional Growth Strategy by the July 4, 2022 deadline, that the letter be revised to include comments and concerns raised by Council and staff, and that the draft letter be reviewed at a Council meeting prior to sending.

CARRIED
Councillor Robson opposed

4.2 Update of Community Amenity Contribution Policy 6.31

Staff report dated May 10, 2022 summarizing feedback and providing proposed amendments to Council Policy 6.31 for consideration of Council endorsement, including rate adjustments over the following two years and modifications to the amenities eligible for funding through the Community Amenity Contribution Fund.

A. Grochowich, Planner 2, presented the recommendations and staff answered questions from Council.

Note: Councillor Svendsen joined the meeting remotely at 9:50 a.m.

Note: Councillor Dueck left the meeting at 10:23 a.m. and rejoined at 10:26 a.m.

Note: Councillor Yousef left the meeting at 10:40 a.m.

R/2022-WS-021
It was moved and seconded

That the proposed amendments to Policy 6.31 - Community Amenity Contribution Program, as attached to the staff report titled "Update of Community Amenity Contribution Policy 6.31" dated May 10, 2022, be endorsed; and

That feedback be obtained regarding Section 2.3 of the staff report titled "Update of Community Amenity Contribution Policy 6.31" dated May 10, 2022, and reflecting Council comment, from the Urban Development Institute and other industry representatives, and provided to Council in a future staff report.

CARRIED
Councillor Yousef was absent for the vote

Note: Councillor Yousef rejoined the meeting at 10:44 a.m.

Note: Councillor Robson left the meeting at 10:44 a.m. and rejoined at 10:45 a.m.

5. *CORRESPONDENCE*

5.1 Electoral Boundaries Commission of British Columbia

Correspondence received May 2, 2022 from the Hon. Ron McKinnon, Member of Parliament for Coquitlam-Port Coquitlam, regarding concerns for the proposed new electoral boundaries presented by the Electoral Boundaries Commission for British Columbia.

R/2022-WS-022
It was moved and seconded

That Maple Ridge provide a letter of opposition to the Hon. Ron McKinnon, Member of Parliament for Coquitlam-Port Coquitlam, regarding the proposed new electoral boundaries presented by the Electoral Boundaries Commission for British Columbia.

CARRIED

6. *BRIEFING ON OTHER ITEMS OF INTEREST/QUESTIONS FROM COUNCIL* - Nil

7. *MATTERS DEEMED EXPEDIENT* - Nil

8. *NOTICE OF CLOSED COUNCIL MEETING*

R/2022-WS-023
It was moved and seconded

That the meeting be closed to the public pursuant to Sections 90 (1) and 90 (2) of the Community Charter as the subject matter being considered relates to the following:

Section 90(1)(e)	the acquisition, disposition or expropriation of the land or improvements, if the council considers that disclosure could reasonably be expected to harm the interests of the municipality;
Section 90(1)(g)	litigation or potential litigation affecting the municipality;

Any other matter that may be brought before the Council that meets the requirements for a meeting closed to the public pursuant to Sections 90 (1) and 90 (2) of the Community Charter or Freedom of Information and Protection of Privacy Act.

CARRIED

9. *ADJOURNMENT* - 10:53 a.m.

M. Morden, Mayor

Certified Correct

P. Hlavac-Winsor, Acting Corporate Officer

MAPLE RIDGE
British Columbia
mapleridge.ca

City of Maple Ridge

TO:	His Worship Mayor Michael Morden and Members of Council	**MEETING DATE:**	May 24, 2022
		FILE NO:	
FROM:	Chief Administrative Officer	**MEETING:**	Workshop

SUBJECT: Connected Community Strategy – Findings & Recommendations

EXECUTIVE SUMMARY:

A Connected Community is established on the foundational technological interconnections of citizens, businesses, institutions, applications, and the greater Internet through robust and well-connected broadband networks. It exceeds the simple connections themselves and extends into the efforts, actions, and strategies the community uses to create the environment and preconditions for broad deployment of the networks, technologies, and applications that fulfill the vision of creating a connected community. Developing a connected community will ensure businesses and residents throughout Maple Ridge will have equal opportunities to participate in the economy.

Connectivity provides a life-changing opportunity to connect more people and businesses with the services and support they need to succeed and compete in a global economy by providing better access to jobs, education, training, health care, and more.

The City of Maple Ridge awarded a contract to Clearcable and Rothschild & Co. through a competitive process to complete a comprehensive review of our environment, document their findings, and outline key recommendations to establish a Connected Community Strategy.

As part of their engagement with the City, they reviewed the scope, completed an assessment of the environment, verified our assets, engaged with stakeholders (citizens, carriers, staff), made recommendations on alignment with existing and pending City strategies, considered the potential for regional coordination and cooperation, created and documented design options available to us, developed operational approaches, conducted a cost analysis and developed a final report with recommendations.

Through their analysis, the consultants have acknowledged that the City of Maple Ridge is currently well serviced in terms of broadband Internet access on fixed networks with service options of at least 50 Mbps download/10 Mbps upload with an unlimited data option. The City also benefits from its previous investments in municipal broadband infrastructure.

Market conditions have afforded Maple Ridge great connectivity options and a competitive and engaged set of incumbent service providers who have and continue to invest heavily in the City. In fact, Innovation, Science and Economic Development Canada (ISED) estimates that only 61 homes in Maple Ridge are underserved which is a tremendous accomplishment for any Canadian city and this fact supports the City's commitment to home-based businesses.

A Connected Community, however, extends beyond the simple deployment and operation of broadband and into how the City encourages, promotes, and leverages technology and connectivity to benefit residents and businesses.

RECOMMENDATION:

That Council receive the Clearcable and Rothschild & Co Connected Community Strategy - Findings & Recommendations report dated May 2, 2022 for information; and

That staff review and develop an implementation plan to address the recommendations proposed in the Clearcable and Rothschild & Co Connected Community Strategy - Findings & Recommendations report dated May 2, 2022.

DISCUSSION:

a) **Background Context:**

The purpose of the Request for Proposal was to engage a consultant(s) to conduct a broadband feasibility and needs assessment study, engage stakeholders, and ultimately deliver findings and recommendations City staff can use to develop a comprehensive Connected Community Strategy that supports current growth and long-term community broadband needs.

Deliverables of the Connected Community Strategy should include:

1. Commitment to ensure secure, reliable, and affordable high speed (Gigabit) internet services are available to residents as well as municipal, commercial, industrial, non-profit, and institutional sites throughout Maple Ridge.
2. Economic development opportunities are more readily available based on access to quality, innovative, and affordable communications services in the City and alignment with the City's Economic Development Strategy.
3. Improved broadband delivery and system maintenance where required.
4. Insurance that the existing Fibre/Conduit Network footprint aligns with the Official Community Plan for the future.
5. A plan to lower operating costs for connected City facilities (e.g., costs of phone lines, internet connections, alarm systems, etc.)
6. Development of a plan for use of Internet of Things ("IoT") sensors to contribute to an intelligent and connected City.
7. Plans to address specific gaps in telecommunications if any.
8. Recommendations that outline connectivity requirements to support field workers.

To develop the recommendations the consultants used the Innovation, Science and Economic Development (ISED) service coverage maps, the City's housing density mapping, and the City's key site data to assess potential options. Six of the nine incumbent service providers were interviewed as well as City staff, external agencies, and nearby communities. Local businesses were surveyed regarding current and future broadband requirements as well as the quality of currently available services. City staff and other stakeholders (e.g., DMRBIA, Chamber of Commerce, and First Nations) provided input regarding current processes and policies.

This scoping exercise also included a comprehensive analysis of the City's geography, buildings, and key sites, an assessment of our current network routes and technologies and a review of our existing data. Verification of our municipal assets, current incumbent providers, and partners was also completed. Included in this analysis was a review of several reference documents, including but not limited to, the City of Maple Ridge Strategic Plan 2019-2022, Economic Development Strategy, November 2021, Maple Ridge Town Centre Concept Plan, Lougheed Transit Corridor Study, and the Sustainability Action Plan.

The recommendations are to be used to help establish connectivity goals and targets, outline the necessary actions and stakeholder roles to realize better internet connectivity as well as add to the City's operational effectiveness and economic competitiveness.

Some of the key recommendations from the report are:

1. Consider connecting key facilities using a combination of leveraging existing build & lease options.
2. Hire a full-time Telecommunications Coordinator to develop and implement the Strategy, build relationships and serve as the City's point of contact to support the development of a Connected Community Strategy and become the 'face' of broadband for the City.
3. Expedite process and access by updating and standardizing key City policies, use of zoning and bylaw tools, and development of a standard municipal access agreement to create consistency and efficiency.
4. Manage aesthetics and safety through the establishment of design criteria to support Wi-Fi and small cell deployment

b) **Desired Outcome:**

The Strategy will establish connectivity goals and targets and outline the necessary actions and stakeholder roles to achieve better internet connectivity and at the same time work toward improving the City's operational effectiveness, economic competitiveness, social inclusivity, and sustainability. This could mean finding new ways for residents and businesses to improve navigating Maple Ridge, accessing City services, or even engaging with their neighbours and local businesses.

c) **Strategic Alignment:**

The Connected Community Strategy will align with and support the Council's Strategic Plan as well as the Economic Development Strategy that was adopted by Council last year.

Broadband networks form the basis for innovation, sustainability, collaboration, and improved living standards and are as important to the economic growth of our City as reliable electricity, clean water, and well-maintained roads so it is imperative that these are in alignment.

The expansion and improvement of connectivity in our community support each of Council's strategic priorities of Community Safety, Intergovernmental Relations, Growth, Community Pride & Spirit, and Natural Environment.

The Information Technology (IT) Department in conjunction with the Connected Communities Strategy consultants have connected with key stakeholders in the organization from Economic Development, Engineering, Planning, Parks & Facilities, Fire, Corporate Services, Information Technology, Property Management, Corporate Planning and Consultation, and Police Services to identify their critical needs. Clearcable and Rothschild & Co have also conducted an evaluation of our assets, key interests of the community, and required City services.

d) **Citizen/Customer Implications:**

The goal of the Connected Community Strategy is that residents, the business community, and its institutions will have high-quality, affordable high-speed broadband service and coverage. Through strategic investments, partnerships, and potential revenue generation opportunities, the implications on property taxation will be minimized.

e) **Interdepartmental Implications:**

To create an immediate or effective return on investment opportunities pertaining to our Fibre Network we need to align our programs and projects to create an optimized Connected Community Strategy. This means we need to consider our existing fibre network assets (fibre and conduit) and how these can support attaining the goals of other strategic priorities within the City by updating our Conduit Placement Policy.

Developing the Connected Community Strategy requires collaboration between all departments. Some of the benefits will be the enhancement of remote learning, connected parks, intersections, waterworks, and street-level intelligence. It will provide an opportunity for the City to have clear direction in place about its desire to ensure that connectivity is available at newly identified employment lands.

f) **Business Plan/Financial Implications:**
Support from multiple departments will be required during the annual business planning process and through the years to ensure the Connected Community Strategy is kept in alignment with the City's Strategic Plan and Economic Development Strategy (e.g., consideration of fibre when planning the development of new infrastructure and amenities.).

g) **Policy Implications:**
As we move forward on the key findings and recommendations of the report, some policies and bylaws have been identified to be reviewed, updated and adopted. For example, a standard Municipal Access Agreement, the Telecommunications Antenna Structure Siting Policy, and the conduit installation philosophy, among others.

h) **Alternatives:**
Since several recommendations have been provided in the attached consultant's report, staff suggest that any additional conduit built based on our current strategy is discontinued until the recommendations are reviewed, an implementation plan is created, and a comprehensive Connected Community Strategy is adopted.

CONCLUSION:
As per their contract with the City, Clearcable and Rothschild & Co completed a comprehensive review of our environment, documented their findings, and outlined multiple key recommendations in a detailed report, which the City will use to establish a sustainable comprehensive Connected Community Strategy that will increase our social and economic opportunities.

Prepared by: **Karen Stewart**
Chief Information Officer, Information Technology

Reviewed by: **Trevor Thompson, BBA, CPA, CGA**
Chief Financial Officer & Director of Finance

Approved by: **Christina Crabtree**
General Manager Corporate Services

Concurrence: **Scott Hartman**
Chief Administrative Officer

Attachments:
(A) Clearcable and Rothschild & Co Connected Community Strategy Findings & Recommendations Report (dated May 2, 2022)

clearcable™

rothschild&co.

Connected Community Strategy

Findings & Recommendations

City of Maple Ridge

Prepared by: Clearcable & Rothschild & Co

May 2, 2022

Version 3.5

(Final Release)

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1. Executive Summary

1.1 Context

The City of Maple Ridge is a long-time member of the Intelligent Community Forum ("ICF"), a global network that connects hundreds of cities and regions on five continents. Members collaborate on economic development and the exchange of expertise and information that drives progress. ICF studies how Intelligent Communities use information and communications technology to build inclusive prosperity, solve social problems and enrich their quality of life in our connected century.

In recognition of its ongoing efforts and actions to improve the quality of life for its residents, Maple Ridge has been selected, for the second consecutive year, as a 2022 Smart21 Community. ICF annually selects 21 finalists with the potential to become one of the Forum's Top7 and eventually Intelligent Community of the Year. Being chosen as one of the year's Smart21 is considered a significant honour. It brings Maple Ridge greater recognition as an Intelligent Community positioned to prosper in the broadband economy. Past Smart21 finalists have included the cities of Vancouver, Surrey, and New Westminster.

The commissioning of this report to assist the City of Maple Ridge in developing a Connected Community Strategy can be seen as another step taken by Maple Ridge in its ongoing efforts to leverage technology and make informed decisions that provide residents of Maple Ridge with the highest quality of life.

A Connected Community is established on the foundational technological interconnections of citizens, businesses, institutions, applications, and the greater Internet through robust and well-connected broadband networks but it exceeds the simple connections themselves and extends into the efforts, actions, and strategies the community uses to create the environment and preconditions for broad deployment of the networks, technologies, and applications that fulfill the vision.

1.2 Findings

The City of Maple Ridge is currently well serviced in terms of broadband Internet access on fixed networks with service options of at least 50 Mbps download/10 Mbps upload with an unlimited data option. The City is also benefits from its previous investments in municipal broadband infrastructure. Market conditions have afforded Maple Ridge great connectivity options and a competitive and engaged set of incumbent service providers who have and continue to invest heavily in the City. In fact, Innovation, Science and Economic Development Canada estimates that a mere 61 homes in Maple Ridge are underserved which is a tremendous accomplishment for any Canadian city and this fact supports the City's commitment to home based businesses. A Connected Community, however, extends beyond the simple deployment

and operation of broadband and into how the City encourages, promotes, and leverages technology and connectivity to benefit residents and businesses.

1.3 Recommendations

Given the excellent reported connectivity in Maple Ridge, attention should be focused on creating the right conditions for continued private sector investment and augmenting where necessary to connect City facilities. We recommend the implementation of a formal Connected Community Strategy based on the approaches in this report to support and facilitate the ongoing investment in, and enhancement of, connectivity options for the City's purposes and for businesses and residents. We recommend against creating a universal Municipal Broadband Utility specifically because of the existing connectivity and competitive market, but do support the notion of expanding on the existing investments in a selective and targeted manner.

To ensure the City is meeting its Connected Community aspirations, we recommend the City implement a full time Telecommunications Coordinator to serve as the single point of contact responsible for supporting the ongoing telecommunications needs of the City, the implementation of telecommunications infrastructure, and the facilitation of existing service providers. This role would endeavour to create the necessary conditions for the private sector to continue to invest and develop broadband in the City while also assessing where extensions to the City infrastructure make sense. The Telecommunications Coordinator would build relationships with stakeholders to uncover opportunities and find solutions, effectively the face of Maple Ridge's Connected Community Strategy and representing the City's commitment to continuing to build a connected community.

The Telecommunications Coordinator should also engage the relevant City departments and facilitate the refinement of several City policies including a standardized Municipal Access Agreement, the Antenna Structure Siting Policy, the current Conduit Installation Policy, and the Lougheed Transit Corridor Development Guidelines. We recommend against continued conduit placement without a specific target and against establishing a dig once policy, but we do encourage the City to consider the use of zoning and bylaw tools to advance broadband at the development and construction phases of expansion.

Further, a truly connected community needs more than just fixed broadband – it requires reliable broadband everywhere. To achieve ubiquitous broadband, a truly connected community requires both an extensive fibre network and extensive wireless coverage typically using WiFi and cellular technology. The deployment of WiFi and small, low-powered cellular access nodes (Small Cells) to address the range and density requirements of modern connectivity necessitates the proliferation of attachments to poles, buildings, and other infrastructure. The City of Maple Ridge should work together with service providers to address the environmental and aesthetic concerns and facilitate safe and ubiquitous deployment.

Lastly, to support these initiatives, we recommend that City of Maple Ridge consider a small Connected Community Levy. The benefits of the levy should be defined in the Connected Community Strategy and well communicated to residents. The small amount collected could help offset costs associated with implementing the strategy and the staffing necessary to ensure success.

1.4 Summary of Recommendations

The key recommendations of this report are summarized below.

Key Recommendations
Distill these recommendations into an Official Connected Community Strategy
Implement a full-time Telecommunication Coordinator
Update Key City Policies
Consider Zoning and Bylaw Tools
Establish Design Criteria to Support WiFi and Small Cell Deployment
Consider a Connected Community Levy

Figure 1 – Summary of Recommendations

1.5 Prioritized Actions

To support implementation of a strategy, we propose the following prioritized action plan.

Short Term
Create and fill the Telecommunications Coordinator position
Establish a standardized Municipal Access Agreement
Update policies for Antenna Siting and Conduit Installation
Convene discovery discussions with incumbent service providers
Medium Term
Distill these recommendations into the Connected Community Strategy and adopt it officially
Decide on Municipal Broadband Network expansion (for City purposes)
Issue RFI for service providers interested in collaborating with the City
Long Term
Codify telecommunications infrastructure and requirements for new developments in Zoning and
Consider adopting a Telecommunications Levy

Figure 2 – Prioritized Action Plan

2. Scope

2.1 Overview and Purpose

Clearcable, in partnership with Rothschild & Co, was engaged by the City of Maple Ridge to produce a broadband feasibility and needs assessment study to assist in the development of a Connected Community Strategy. The purpose of this study was to provide expert advice regarding options and opportunities that could integrate the City's current fibre strategy into a more comprehensive Connected Community Strategy.

The report was expected to outline recommended actions focused on improving broadband connectivity. The study was further expected to establish connectivity goals and targets, outline recommended actions and stakeholder roles to achieve better internet connectivity and generally support the City's strategic plan, operational effectiveness, and economic competitiveness.

2.1.1 Engagement

The scope of this engagement was to develop a high-level plan suitable for all key stakeholders to understand the overall technology, design, requirements, costs, and recommendations to make decisions as to the most appropriate strategy for bringing reliable, affordable broadband service to the community.

The output of this engagement was expected to:

i) Identify the types, needs, and current experience of broadband subscribers in Maple Ridge;
ii) Identify existing City of Maple Ridge assets and competitive advantages regarding connectivity to maximize the value of its assets;
iii) Identify the current private sector service provider landscape, service availability, and perceived connectivity gaps;
iv) Ensure alignment with other City plans and strategies and those under development, in particular the recently completed Economic Development Strategy;
v) Facilitate a cross-departmental initiative; facilitate workflow between departments that enhances the City's investment in broadband infrastructure;
vi) Assess opportunities for direct investment in broadband infrastructure to support subsidized access through a municipally owned utility;
vii) Assess opportunities for direct investment to incent or de-risk private sector providers and stimulate additional private sector investment;
viii) Assess technological impacts as input to modernize the strategy based on current and future trends in technology, connectivity, and innovation (e.g., assessment of the potential of Low Earth Orbit ("LEO") satellite connectivity and other emerging technologies);
ix) Recommend municipal policies to support additional broadband deployment;
x) Recommend technology and possible approaches to enable expansion of broadband availability in Maple Ridge;
xi) Recommend short, medium, and long-term actions.

2.2 Defining Connected Community

The term Connected Community can have broad meaning from a social, economic, and well-being perspective, but this engagement specifically focusses on the foundational technological interconnections of citizens, businesses, institutions, applications, and the greater Internet through robust and well-connected broadband networks. Broadband networks are as "vital to economic growth as reliable electricity, clean water, and good roads."[1] They form the basis for innovation, sustainability, collaboration, and improved living standards.

While a Connected Community is not a primary element in the City of Maple Ridge Strategic Plan[2], the expansion and improvement of connectivity supports all facets of Community Safety, Intergovernmental Relations, Growth, Community Pride & Spirit, and Natural Environment found in the plan.

A Connected Community extends beyond the simple deployment and operation of broadband infrastructure and into the efforts, actions, and strategies the community uses to create the environment and preconditions for broad deployment of the networks, technologies, and applications that fulfill the vision.

2.2.1 Cost Estimate Limitations

The viable technology options for servicing the identified network routes and services areas are presented as design concepts with budgetary numbers for assessing the options and potential business case. Sufficient care is taken to assess the viability and high-level design requirements of the various options as to produce reasonable budget estimates. However, before any project outlined herein were to be undertaken, a detailed engineering review would need to be conducted to confirm budget estimates. The budgets provided do not include remediation of any deficiencies in the existing conduit network.

2.3 Defining Broadband

This analysis adopts the CRTC established Universal Service Objective ("USO") for broadband Internet access services on fixed networks of 50 Mbps download/10 Mbps upload with an unlimited data option. It specifically focuses on the delivery of fixed broadband (as opposed to mobile) services to the residents of Maple Ridge. This report identifies technologies that can meet or can exceed the CRTC's USO of 50/10Mbps.

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[1] Intelligent Community Forum Canada, "Broadband: The Essential Utility", 2017, https://d3n8a8pro7vhmx.cloudfront.net/icf/pages/391/attachments/original/1482476784/Broadband_Utility_ICF_Canada_Position_Paper_FINAL.pdf?1482476784

[2] City of Maple Ridge, "Strategic Plan 2019-2022", https://www.mapleridge.ca/DocumentCenter/View/22066/2019-Strategic-Plan-with-Matrix-031919

2.4 Background Data Sources

Publicly available background data sources provided context on overall geography and scope of existing services. Primary sources of background data include the City of Maple Ridge Open Data portal, the City's comprehensive GIS mapping, the Canadian Internet Registration Authority (CIRA) Performance Data, and Canadian Radio-television and Telecommunications Commission's (CRTC) Telecommunication Service Provider Registration List, and Innovation, Science, and Economic Development's (ISED) National Broadband Data.

2.4.1 CIRA Performance Data

The Canadian Internet Registry Authority (CIRA) Performance Data suggests that not all areas of Maple Ridge enjoy connectivity that meets the CRTC Universal Service Objective of 50/10Mbps. White markers indicate ~25Mbps download of service, various shades of red indicate less than 25Mbps (with dark red the slowest), and various shades of blue indicate greater than 25Mbps (with darkest blue being above 50Mbps). However, CIRA's data is contradicted by the more detailed ISED and CRTC data which indicate Maple Ridge residents enjoy virtually ubiquitous access to 50/10Mbps service.

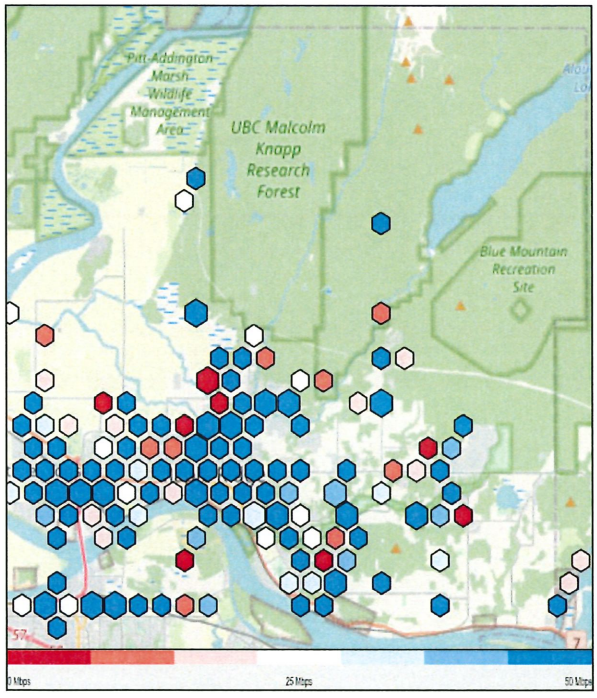

Figure 3 – Sample CIRA Performance Data[3]

[3] http://performance.cira.ca February 14, 2022

2.4.2 National Broadband Data

The ISED and CRTC National Broadband Data includes Pseudo-Household level and 250m road segment level assessments of the percentage of homes within an area that receive defined thresholds of service. The map in Figure 4 includes the 250m road segment level and the previous hexagon model. This map combines the previous 2017 National Broadband Internet Service Availability dataset (which was based on large hexagons of service) with the 2021 National Broadband Data v7.2[4] which is based on small 250m road segments derived from annual CRTC reporting obligations. The map's red lines indicate roads are currently defined as underserved having less than 50/10Mbps service and the brown hexagons signify households in 2017 that had 50/10Mbps service.

The National Broadband Data, which is the only officially accepted data to be eligible for government funding, indicates that there are only 61 households and 33km of roads across City of Maple Ridge that are considered underserved. These 61 households and 33km of roads would be the only homes or areas of Maple Ridge eligible for funding subsidies from most government funding programs including ISED and the CRTC.

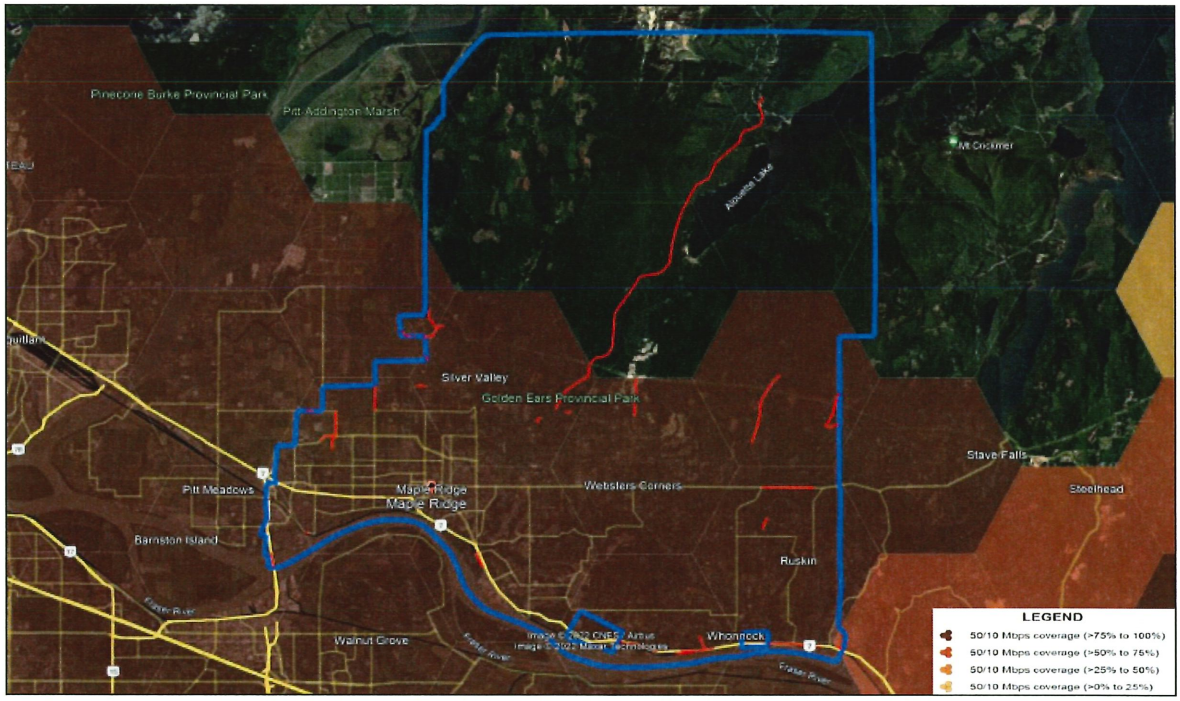

Figure 4 – CRTC National Broadband Data

[4] https://open.canada.ca/data/en/dataset/00a331db-121b-445d-b119-35dbbe3eedd9

2.4.3 City of Maple Ridge Mapping

The official maps published by City of Maple Ridge were used to establish the boundaries of the City, consider any potential service areas, and assess the current state of broadband availability.

Building Density

Building density was important to understand the distribution of households throughout the City, the number of homes per km, and the typical setbacks of buildings from the roadways.

Key Data

The City of Maple Ridge GIS data was also used to identify schools, fire halls, City conduits, communications towers, Telus and Shaw routes, street light poles, and the Downtown Business Improvement Area. This was supplemented by the ISED underserved data and Zayo Group metropolitan fibre map.

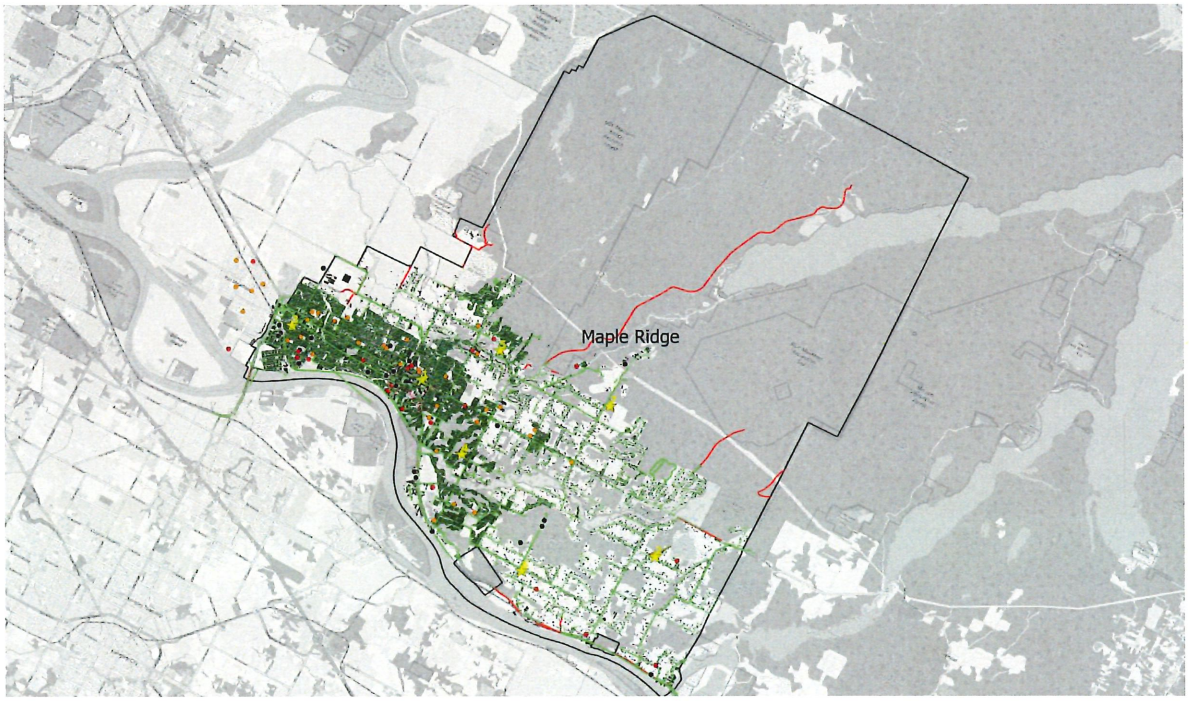

Figure 5 – Maple Ridge Map with Density

2.4.4 Service Provider Identification

The ISED National Broadband Data, the CRTC Registration List, and provider on-line marketing were used to identify providers currently serving Maple Ridge. For each service provider, public-facing information was used to determine available network coverage and pricing.

Market conditions have afforded Maple Ridge great connectivity options and a rich set of competitive and engaged service providers. The list of facilities-based broadband providers currently servicing the City include:

- Galaxy Broadband
- Rogers Communications
- Shaw Communications
- Telus Corporation
- Xplornet Communications, and
- Zayo Group

Third-party Internet Access is offered by smaller providers leveraging the facilities-based infrastructure. These smaller providers include:

- Distributel
- TekSavvy
- VMedia

While best efforts were made to identify every service provider currently operating in the City, the market is constantly changing and there may be additional small providers or recent startup operations which were not identified. Their presence or emergence would not considerably or materially influence the outcome of this report or recommendations.

2.5 Stakeholder Engagement

The ISED service coverage maps, the City's housing density mapping, and the City's key site data were used to assess potential options. Key service providers were contacted as well as City officials, external agencies, and nearby communities. Local businesses were surveyed regarding current and future broadband requirements as well as the quality of currently available services. City officials provided input regarding current processes and policies.

A complete list of those consulted is included as Appendix C. The questions included in the survey of businesses is included as Appendix D.

3. Current Landscape

3.1 Demographics

The City of Maple Ridge is one of the fastest growing cities in Metro Vancouver.

According to Statistics Canada[5], the 2021 population was 90,990 with a total number of 34,254 private dwellings. Between 2016 and 2021, the Metro Vancouver municipality with the highest rate of growth was Langley District at 13.1%, followed by Langley City at 11.9%, New Westminster at 11.2%, and Maple Ridge in fourth at 10.6%.

In 2016 the median age in Maple Ridge was 41.4[6] and 67.98% of the population were in the working age group between 15 to 64 years old. The majority of businesses in Maple Ridge have between 1-4 employees and the Economic Development Strategy identifies that "Twenty percent of the Maple Ridge of workforce is independent ...self-employed or work from home" making home-based businesses a key demographic. The breadth of coverage and investment of the current service providers supports continued growth of home-based businesses.

3.1.1 Employment Income

In 2015 the median household income in Maple Ridge was $86,178 which was above the Vancouver median household income of $65,327 and the BC median household income of $69,995 the according to Statistics Canada[7].

3.2 Local Broadband Deployment

3.2.1 Availability of Broadband

With several terrestrial facilities-based service providers in Maple Ridge (Shaw & Telus being the dominant facilities-based providers), as well as several re-sellers, reliable, and affordable broadband that meets the Universal Standard Objective of 50/10Mbps is almost universally available in Maple Ridge.

Maple Ridge is not defined by ISED or the CRTC as underserved. ISED and CRTC mapping data reveals that only 61 homes and 33km of roads are considered underserved meaning that 50/10Mbps service is not yet available in very few places. Only projects to extend USO to these 61 undeserved homes and 33km of roads would qualify for current government subsidies.

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[5] Statistics Canada. 2022. (table). Census Profile. 2021 Census. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. Released February 9, 2022.
https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E

[6] Statistics Canada. 2016.
https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=5915075&Geo2=CD&Code2=5915&SearchText=maple%20ridge&SearchType=Begins&SearchPR=01&B1=All&TABID=1&type=0

[7] Ibid

3.2.2 Affordability of Broadband

In preparing this Report the pricing of providers currently serving Maple Ridge was reviewed to confirm that prices in Maple Ridge are in line with the cost of similar services in Vancouver, New Westminster, and other Canadian urban markets.

3.2.3 Maple Ridge Conduit/Fibre/Network Assets

Currently the City of Maple Ridge operates its own broadband network as an autonomous system with an autonomous system number assignment from the American Registry of Internet Numbers (ARIN) of AS54877 and a direct allocation of a Classless Internet Domain Routing (CIDR) block of IP addresses 198.147.168.0/23. The network is multihomed to both Telus and Shaw locally and employs standard Border Gateway Protocol (BGP) to maintain redundant, diverse, and reliable Internet routing.

The City maintains a fibre/conduit network that includes almost 10km of fibre, a fibre connection between City Hall and an Access Chamber at 224 Street and Lougheed Highway, and 33.4km of existing in-ground conduit and 3.8km of pending conduit installations.

In addition to the fibre/conduit network, the City has a WiFi6 network to provide free connectivity to residents and visitors known as "Freetown". There is currently no comprehensive coverage map of the WiFi6 network but the majority of municipal buildings have connections to either the Internet or the municipal fibre/conduit network. All core municipal buildings including community centres, and Memorial Peace Park including a section of 224 are equipped with Aruba WiFi6 access points and the City's "Freetown" SSID is broadcast in all sites. In locations that are not connected to the municipal broadband network, "Freetown" clients are mapped with firewall rules directly to the local Internet which may be Telus or Shaw as available.

The City has other assets including several towers (some of which are leased to third parties) and a recently available Co-location Chamber located in Firehall #4 that hosts the City's 260+ servers, 500+ applications and online services, 1.5+ petabytes of data, and multitude of firewalls, switches, and routing services with additional available space.

These assets could be leveraged into the base infrastructure to support Maple Ridge's Connected Community Strategy.

The City has connected many municipal facilities to the fibre network which has improved the quality of connectivity while, at the same time, lowered costs. All of the municipal facilities with high bandwidth demands are already connected. The remaining sites have few staff or low bandwidth demands. The currently connected assets include:

- 9 of 29 City facilities.
- 3 of 37 major intersections.

- 0 of 45 pumping station/reservoir sites are currently connected via fibre although some have wireless or leased connections.

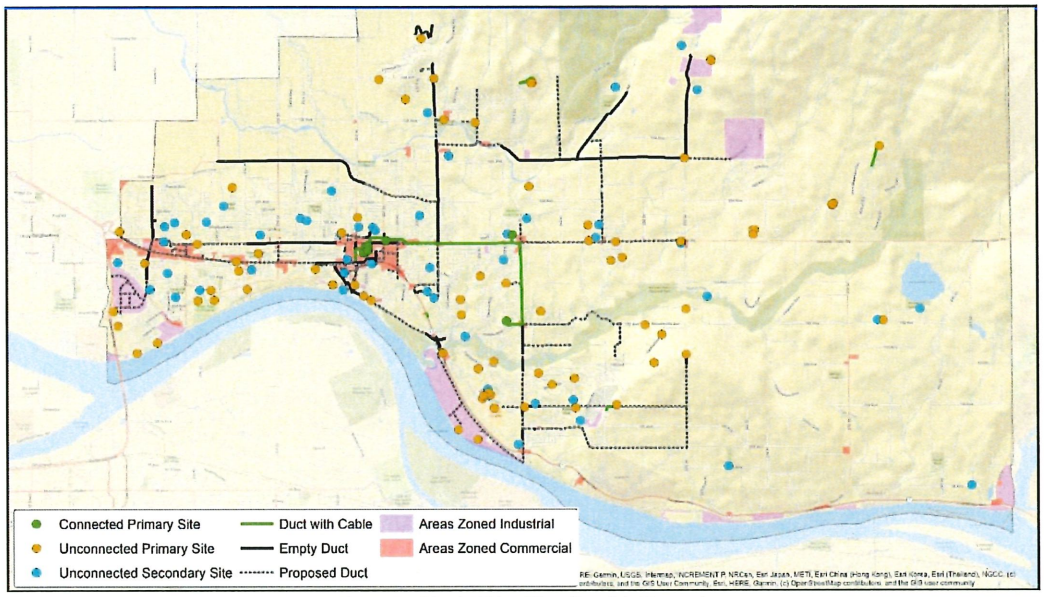

Figure 6 – Maple Ridge Fibre/Conduit Network

The City would like to leverage its existing Fibre Strategy and develop it into a more robust Connected Community Strategy. It would like to complete its fibre/conduit network to most, if not all, City facilities. It is expected that a fibre connection will be made to the 225 St\Bypass Pump Station when it's upgraded and the City can also connect the following facilities if needed, with small builds and service connections:

- Maple Ridge Lawn Bowling Club
- The ACT
- Telosky Stadium

The City's current network plan describes a final conduit configuration of roughly 80.8km and, at the end of 2023, plans to have completed a total cumulative linear distance of 31.4km with a total of existing and pending conduit at 37.24km.

3.3 Service Providers

Internet Service Providers use a variety of technologies to deliver or distribute broadband across the City of Maple Ridge.

- Digital Subscriber Line (DSL)
- Fibre-to-the-Premises (FTTP), Wireless Home Internet (WHI), Fibre to the Node (FTTN) (NOTE: FTTP is also known as Fibre-to-the-Home or FTTH)

- Hybrid Fibre-Coaxial (HFC) cable modem service
- LTE & Line-of-Sight Wireless (LOS) - including small cell

For reference, these technologies are outlined in Appendix A.

3.3.1 Galaxy Broadband

Galaxy is a national provider that targets rural and remote locations where fibre or cell coverage is not available. Galaxy uses a combination of encrypted multiple satellite, Wireless P2P and LTE networks. Going forward, to reach more remote areas, Galaxy indicates that it plans to use OneWeb LEO satellite service for backbone.

3.3.2 Rogers Communications

Rogers is a national service provider with a diversified portfolio of telecommunications offerings including mobile, Internet, television, telephone and a broad set of business related services. Rogers has invested over $30 billion over the past 35 years and bills itself as Canada's most trusted and reliable wireless network. In 2020, the company was awarded the best wireless network in Canada for the second year in a row by umlaut[8], the global leader in mobile network testing and benchmarking. A PwC study commissioned by the company indicates that in 2019 Rogers investments and operations resulted in a total economic footprint in British Columbia of $1.7 billion of output including over 5,500 full-time jobs generated and supported[9]. In 2020, Rogers announced that it will bring 350 new jobs to BC by 2021 through its customer solution centre in Kelowna. In October 2020, Rogers introduced wireless home internet service, also known as fixed wireless access (FWA). Rogers recently began to offer what it describes as "Business Internet" using its LTE wireless network to Maple Ridge businesses.

Also in 2020, Rogers began the deployment of a 5G network in major urban centres and has since expanded to over 1500 communities including Maple Ridge. The current 5G deployment covers almost 100% of Maple Ridge.

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[8] https://www.umlaut.com/stories/two-in-a-row-rogers-again-achieves-best-in-test-in-the-umlaut-mobile-benchmark-canada
[9] https://about.rogers.com/news-ideas/rogers-ranked-top-for-wireless-network-quality-by-j-d-power/

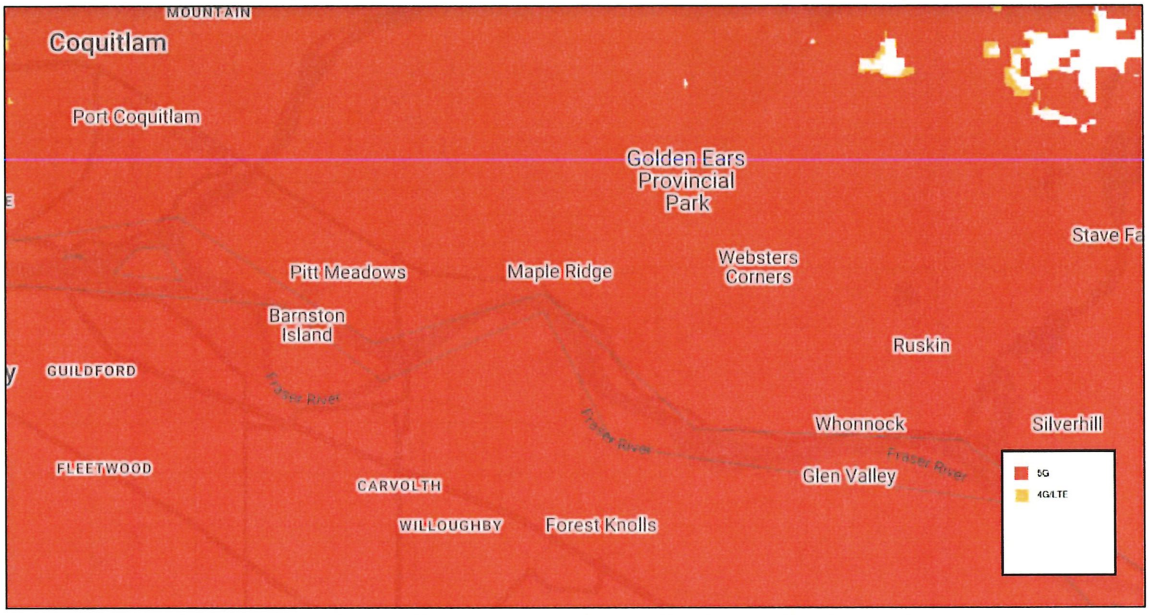

Figure 7 – Rogers 5G Network in Maple Ridge[10]

Rogers maintains a "Connected for Success" program in Ontario, New Brunswick, and Newfoundland and Labrador to offer low-cost, high-speed Internet access to subsidized tenants, seniors, families with children and to individuals receiving disability and income support.

Rogers currently does not offer terrestrial residential services in in BC, including Maple Ridge, but is in the approval stage of a proposed deal to merge with Shaw Communications that is widely expected to take effect in June 2022.

3.3.3 Shaw Communications

Shaw is a national service provider that uses a combination of fibre, hybrid fibre-coaxial cable, and wireless to provide Internet connectivity in Maple Ridge. Shaw also offers cellular services in Maple Ridge. Shaw, along with Telus, is a dominant provider in Maple Ridge. In 2021, Shaw launched its Fibre+ 1.5 Gigabit speed tier to the majority of its western Canadian Wireline operating footprint, while also increasing the upload speed of its Fibre+ 300, 750, Gig and 1.5 Gig tiers to up to 100 Mbps. Both upgrades were enabled by the deployment of DOCSIS 3.1 cable modems. Shaw has continued to expand its cellular network including the roll out of small cell technologies in dense urban centres and popular venues. Its architecture of attaching small cells to the strand between poles has been a point of contention with BC Hydro regarding the charging for attachments. Shaw has encouraged the BC government to reach out to BC Hydro

[10] https://www.rogers.com/mobility/network-coverage-map

to discuss its broadband connectivity goals and the importance of access to support infrastructure.

Aside from terrestrial and cellular networks, Shaw has built what they purport to be Canada's most extensive WiFi network, Shaw Go WiFi. Shaw Internet customer's can access Shaw Go WiFi as an extension of their wireline network experience. There are over 110,000 public access points used by its customers in coffee shops, restaurants, gyms, malls, public transit, and other public spaces covering locations from British Columbia to Ontario including several hundred in Maple Ridge. Shaw Go WiFi effectively covers the Downtown Business Improvement Area.

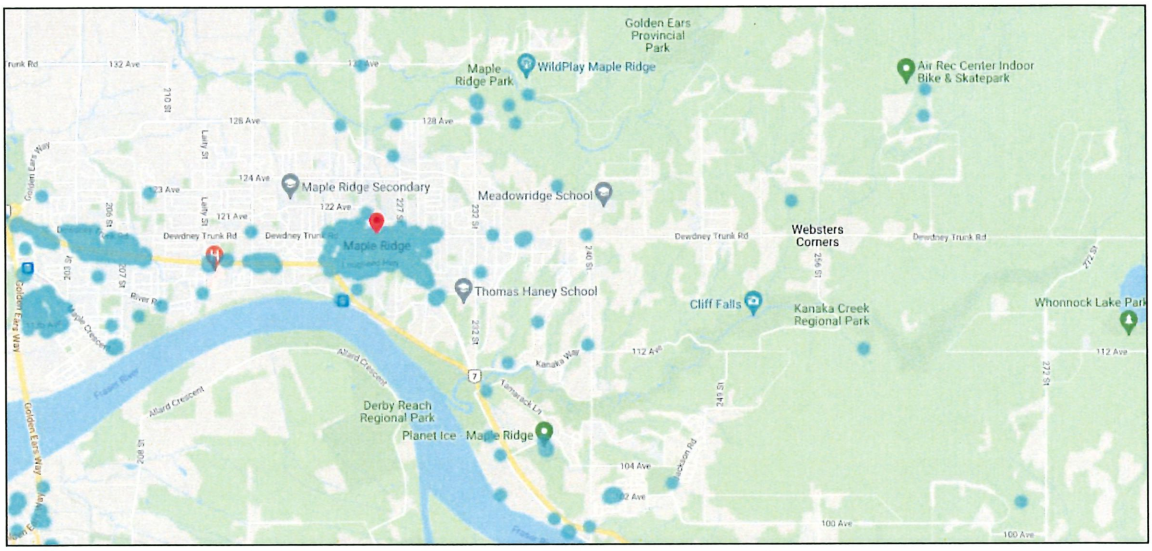

Figure 8 – Shaw Go WiFi Network in Maple Ridge[11]

Shaw is mandated by the CRTC to provide a wholesale high speed access over its traditional HFC networks at regulated rates to independent ISP resellers, who use the wholesale services to provide their own retail Internet services to consumers.

3.3.4 Telus Corporation

Telus is a nation servicer provider offering a wide range of telecommunications technology solutions, including mobile and fixed voice and data telecommunications services and products including Internet, healthcare software and technology solutions, and digitally-led customer experiences. Services include mobile, Internet, television, hosting, managed information technology and cloud-based services. Telus uses fibre exclusively to provide Internet connectivity in Maple Ridge. In June 2021, PCMag reported Telus as the fastest of major Canadian ISPs[12]. Telus has announced a 60 million dollar investment to connect homes and businesses in Maple Ridge with its PureFibre network. This investment is part of a commitment

[11] https://www.shaw.ca/internet/wifi/find-a-wifi-hotspot
[12] https://www.pcmag.com/news/the-fastest-isp-2021-canada

to invest $13 billion in infrastructure and operations across British Columbia through 2024. Work on the PureFibre network in Maple Ridge is already underway with 8,000 homes targeted for 2022 and an additional 13,000 in 2023. Telus anticipates that 75-80% of all homes in Maple Ridge will be connected to fibre by end of 2023.

Building on its PureFibre backbone, in 2020, Telus began the launch of a national 5G network including Maple Ridge, New Westminster, and Pitt Meadows. Today, Telus' 5G network covers the majority of Maple Ridge and includes an extensive small cell deployment.

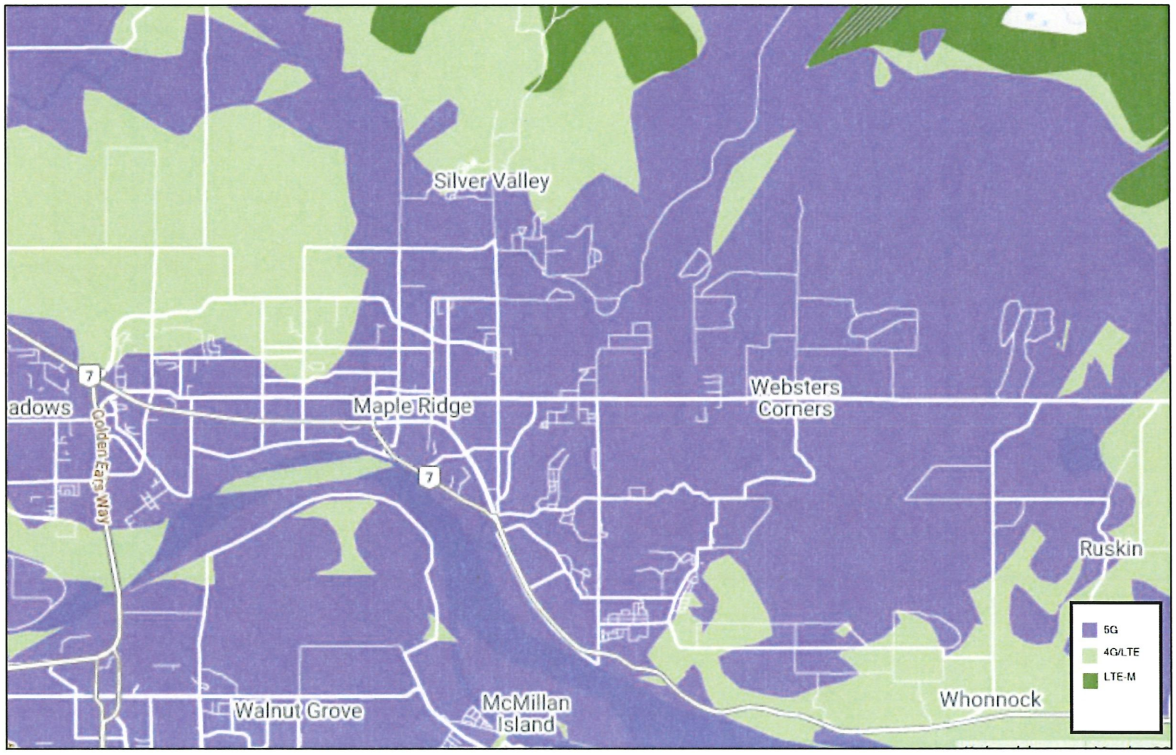

Figure 9 – Telus 5G Coverage in Maple Ridge[13]

Telus offers a "Connecting for Good" program to support marginalized individuals. They report serving 106,000 low-income family members, persons with disabilities, and youth leaving foster care all benefiting from low-cost Internet since the launch of the program in 2016. They also offer free or subsidized mobile phone rate plans and devices to all youth aging out of foster care and to low-income seniors across Canada receiving the guaranteed income supplement. In the fourth quarter of 2021, Telus launched Mobility for Good for Indigenous Women at Risk, a new program that provides free smartphones and data plans to Indigenous women who are at risk of or surviving violence, in partnership with Indigenous organizations in Alberta and BC.

[13] https://www.telus.com/en/mobility/network/coverage-map

Telus offers public WiFi at select locations such as stadiums, airports, cafes, restaurants, and shopping malls. It is a free service, offered both to TELUS customers and non-customers. Telus' free WiFi includes a concentration of access points in the Downtown Business Improvement Area but is less dense than Shaw's coverage.

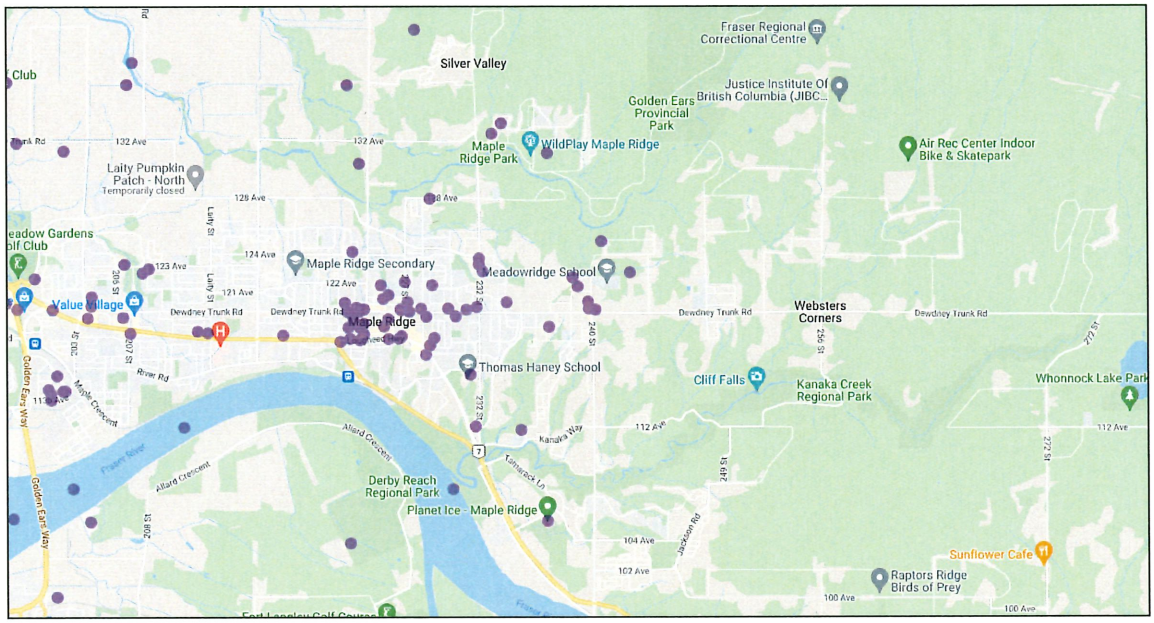

Figure 10 – Telus WiFi Coverage in Maple Ridge[14]

Telus is also mandated by the CRTC to provide a wholesale high speed access over its traditional DSL networks at regulated rates to independent ISP resellers, who use the wholesale services to provide their own retail Internet services to consumers. This does not include the fibre or 5G networks. Telus, along with Shaw, is one of the two dominant providers in Maple Ridge.

3.3.5 Xplornet Communications

Xplornet is a national service provider offering fibre, fixed wireless and satellite broadband solutions to rural customers. With no terrestrial facilities in Maple Ridge, Xplornet uses a combination of fixed wireless and GEO stationary satellite to offer services. Currently Xplornet provides 10/1Mbps broadband to residents. Speeds vary significantly depending on the level of traffic across the Xplornet system. Xplornet has commenced upgrades of its fixed-wireless access towers to include 5G technology in select rural Canadian communities across the country. It has recently been reported that Xplornet is in negotiations to acquire Freedom Mobile to allow it to compete in the national mobile market.

[14] https://www.telus.com/en/on/support/article/telus-wifi-public-hotspots

3.3.6 Zayo Group

Zayo Group Holdings Inc. is a privately held global provider of fiber-based communications solutions. In 2011 and 2016, Zayo acquired 360 Networks and Allstream respectively giving it metro fibre infrastructure in British Columbia. Zayo has approximately 33km of fibre in Maple Ridge including segments in the downtown improvement area and passing the Yennadon development area. Zayo is known for collaboration and strategic investments.

3.4 Emerging Service Providers

New technologies are emerging that will allow Internet Service Providers to deliver or distribute broadband across the City of Maple Ridge, including the more rural areas, without the requirement for terrestrial links.

3.4.1 Low-Earth Orbit Satellite – Consumer Market

Starlink

Starlink is a US-based Low Earth Orbit satellite ("LEO") global provider owned by Space Exploration (SpaceX). Starlink currently offers beta service to over 100,000 beta customers in 14 countries including a limited number of Canadians in remote areas. Starlink recently increased its pricing to $759CDN for its receiver and dish while the cost of service now begins at $140CDN per month. Starlink is perhaps the best-known LEO satellite project. Starlink currently has more than 1,800 satellites in orbit and plans to have 4,425 satellites in orbit by 2024 with its ultimate goal to launch as many as 12,000.

Starlink targets the consumer – as opposed to wholesale - market. According to SpaceX, Starlink already meets the Universal Service Objective of 50/10Mbps and tests in the US have delivered speeds of up to 100Mbps. SpaceX claims that Starlink will be able to simultaneously support as many as 2.76M users and process 276,00Gbps of traffic.

Several organizations in the US, including the Fibre Broadband Association, position that Starlink (and LEO constellations in general) will be unable to deliver consistent service that meets the CRTC and US Federal Communications Commission (FCC) service objectives at the scale and density proposed to the FCC Rural Digital Opportunity Fund (RDOF). The RDOF has a minimum speed requirement of 20/3Mbps which is significantly lower than the CRTC's Universal Service Objective of 50/10Mbps. The lobbyists' model predicts that "Starlink would face a capacity shortfall by 2028 and over 56% of Starlink's RDOF subscribers would not be fully served."[15]

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[15] NTCA, Fibre Broadband Association Equip FCC with Model to Evaluate LEO Satellite RDOF Applications, Feb 8, 2021. https://www.ntca.org/ruraliscool/newsroom/press-releases/2021/8/ntca-fibre-broadband-association-equip-fcc-model

Blue Origin-Kuiper

A competitor to Elon Musk and SpaceX will be Amazon-owner Jeff Bezos and his LEO service, Blue Origin (Amazon's official LEO corporate name is Kuiper though it is more commonly known as Blue Origin). Blue Origin plans to launch 3,236 satellites and install as many as one million earth stations to provide unimpeded reception anywhere on the planet. Amazon has committed to invest as much as $10B in Blue Origin/Kuiper. Like Starlink, Blue Origin/Kuiper will target the consumer market.

3.4.2 Low Earth Orbit Satellite – Wholesale Market

Telesat Canada

The major Canadian entry in LEO satellites is Telesat Canada. Known as Lightspeed, Telesat's LEO constellation will include 298 satellites.

The Federal government has committed $1.4B to the Telesat project. Telesat has also attracted $400M from the Quebec government and $109M from the government of Ontario. According to Telesat, Lightspeed is a $5B project.

Telesat will target the wholesale market and offer its service to Internet Service Providers as a backbone alternative to areas where fibre backbone is not available. The ISPs, in turn, will market directly to consumers.

Telesat expects to have its full constellation of almost 300 LEO satellites launched within two years with beta testing beginning in 2023

OneWeb

The original LEO satellite system, launched many years ago using quite different technology, was Iridium, now known as OneWeb. Iridium struggled for many years, was unsuccessful and went bankrupt. Its assets were purchased last year by the governments of India and the United Kingdom. It is believed the two countries to date have invested $1.4B in the new venture.

OneWeb currently has 110 satellites in orbit and plans to have a total of 648 satellites when its constellation is complete. Like Telesat, OneWeb will target the wholesale market and ISPs as opposed to the consumer market.

3.5 Infrastructure Policies

3.5.1 Municipal Access Agreements

Municipalities have an obligation to protect public infrastructure. Residents generally oppose communications pedestals, towers, road construction, or traffic disruption. Moreover, installation of communications infrastructure must maintain the integrity and serviceability of roads. Municipalities typically set the requirements on any telecommunications companies proposing to install equipment within its jurisdiction. The standard approach is to enter into a

formal Municipal Access Agreement ("MAA"). A MAA is intended to allow consistent access for providers to a city's infrastructure and minimize red tape.

While Maple Ridge currently has MAAs in place with Shaw and Telus, it does not have a standardized MAA nor is it clear who currently administers the MAA at the City. Standardizing the MAA is intended to allow ISPs to focus more on adopting recent technologies and exploring new methods for delivery and service improvement. A successful standardized MAA would focus less on monitoring and enforcement of permit conditions and more towards developing collaborative working relationships with service providers that facilitate the deployment of next-generation infrastructure critical to economic futures. Further, a successful MAA would be consistent with the CRTC-approved Model MAA[16] that is intended to serve as a guide for use by municipalities and carriers and with the recommendations of the Federation of Canadian Municipalities "Telecommunications and rights-of-way: A handbook for Municipalities"[17]. A standardized MAA would simplify deployment for service providers.

3.5.2 Antenna Structures Siting Policy

Wireless broadband requires tall towers to reach customers. Wireless often also requires the construction of a smaller tower at the customer's location to receive the broadband signal. As with most communities, the issue of towers is volatile and controversial amongst residents. Tall "broadcast" towers are especially controversial. But many residents also oppose towers erected at the customer's premises.

In Maple Ridge, the installations of telecommunications towers are governed by the Telecommunications Antenna Structures Siting Policy 5.59. The policy largely establishes the City's role as setting the local land use, consultation process, and guidelines for reviewing and evaluating antenna system siting in accordance with ISED's formal approval under the CPC-2-0-03 — Radiocommunication and Broadcasting Antenna Systems policy. The City policy sets out the preferred location and design guidelines to respect local sensitivities and preferences. The policy was recently updated and provides clear guidelines for the installation of large radio towers.

3.5.3 Small Cell Specific Policy

Wireless service providers are expanding the deployment of small, low-powered access nodes (small cells) in order to the address range and density requirements of modern mobile networks. The expansion necessitates the proliferation of attachments to poles, buildings, and other infrastructure. The Telecommunications Antenna Structures Siting Policy 5.59, in alignment with ISED's policies, currently allows for the exclusion of non-tower structures (antennas on buildings, water towers, lamp posts, etc.) from consultation but asks that

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[16] https://crtc.gc.ca/public/cisc/m-docs/MAA1311eng.docx
[17] https://data.fcm.ca/documents/resources/guide/handbook-telecommunications-row.pdf

proponents "as a courtesy" inform the City of all new Antenna System installations. As small cells become more pervasive, expansion of the policy's Development Guidelines to also cover small cells may be required.

The Small Cell Forum's (SCF) 2018 white paper *Small Cell Siting Challenges and Recommendations* notes that "the more cells that need to be rolled out, the more it will be economically non-viable to negotiate a different set of approvals, fees and processes for every site."[18] The SCF paper sets out proposed guidelines, designed to help cities adopt common streamlined approaches to Small Cell Policy. The policy should require applications to include detailed drawings and specifications of the proposed equipment, characterization of the coverage provided by the installation, powering requirements, and adherence to local aesthetic standards and environmental regulations.

Furthermore, the support and promotion of small cell technology may potentially have implications on future land use provisions as tools to promote better implementation options. Examples might include adapting zoning bylaws for requirements on medium/high density apartments or multi-level commercial to include roof-top accommodations for antennae and setting design guidelines for neighbourhoods that include mobile services accommodations.

3.5.4 Conduit Standards

The City of Maple Ridge has defined conduit standards in the form of the Design and Construction Document Version 4.5 dated May 12, 2021. The document provides methods, expectations, and guidance to parties wishing to engage in construction on the Municipal Rights of ways within the city. Conformance is generally required when obtaining a Municipal Consent (MC) document. The current document has good basic structure and covers areas of concern that a Municipality would normally require. The layout is relatively easy to read and includes appendices with drawings that try to clarify the requirements outlined in the document. The wording in some sections is outdated and some current information is missing or not addressed regarding modern construction methods. The document is otherwise a good baseline for further development of refreshed standards and guidelines.

3.6 Nearby Communities

3.6.1 New Westminster

The City of New Westminster, an early adopter of the Intelligent Community Forum methodology, in 2012 leveraged its own network assets as a key element of its intelligent

[18] https://scf.io/en/documents/195_-_Small_cell_siting_challenges_and_recommendations.php

community strategy and created BridgeNet, a municipally owned $7M fibre network.[19] BridgeNet is an open access network with capacity available for lease by third party providers.

At the time BridgeNet was conceived and began to be built, unlike the situation in Maple Ridge today, there had been minimal investment in infrastructure by providers. Moreover, New Westminster had the advantage of owning the local electric utility and the effort was largely driven and encouraged by councilor engagement. The effort got its start because the City had already built some fibre to connect its own facilities and BridgeNet was merely an extension of those assets. BridgeNet is managed by the electric utility and that ownership was critical to being able to launch and operate the network. All City departments are required to use BridgeNet for connectivity needs and the Information Technology team manages and coordinates for all departments.

Telus recently announced plans for a $53m investment to extend its fibre to more than 90% of New Westminster homes and businesses. The Telus investment is seen by New Westminster as complementary to BridgeNet and a no-cost extension of BridgeNet's fibre network. Blair Fryer, Manager of Communications and Economic Development, pointed out that at the time they began building BridgeNet, it was the right approach. But according to Fryer, it likely would not be the approach they would take today given the infrastructure that has since been built, or is now being built, by service providers.

3.6.2 Surrey

Almost a decade ago the City of Surrey adopted a Smart Surrey Strategy. A key element of the Smart Surrey Strategy was broadband. It developed the Smart Surrey Broadband Strategy to build on principles set out in its Official Community Plan, its Sustainability Charter and its Smart Surrey Strategy.[20]

The official Smart Surrey goals are:

i) Surrey should have reliable, affordable broadband service and coverage;
ii) 90 percent of homes and businesses should have access to gigabit-capable broadband by 2021;
iii) All residents should have access to broadband regardless of socio-economic status; and
iv) City utility programs should be modernized to include telecom infrastructure as a core utility.

A key element of Surrey's Broadband Strategy was to build strategic partnerships with private and public entities with the hope that this would accelerate the rollout of broadband, lessen risk and enhance affordability. Surrey rejected following the New Westminster & Coquitlam

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[19] https://www.newwestcity.ca/database/files/library/201901_IC_StrategicPlan_Final_Low.pdf#:~:text=Intelligent%20New%20West%20(INW)%3A,based%20economy%20in%20New%20Westminster.&text=Intelligent%20Mobility%3A%20Using%20technology%20and,goods%20across%20all%20transport%20modes.

[20] https://www.surrey.ca/vision-goals/smart-surrey-strategy

approaches because Surrey did not own power infrastructure and it was too large geographically to carry out equitably and cost effectively.

Instead, Surrey worked to create the conditions to incent providers and worked with incumbent providers to include them in planning and policy development. They shared objectives and drove a positive outcome from which they are now drawing benefits.

Geoff Samson, Manager of Strategic Projects, underscored the importance of their success in creating a team, educating elected officials, getting buy-in from the community, and establishing a committee to act as internal cheerleaders.

4. Analysis

4.1 Strengths

In terms of already being a well-connected community, Maple Ridge has many strengths to support its overall Connected Community Strategy. With a rich existing private sector service provider landscape and service availability, and with substantial existing City of Maple Ridge assets, the City is well positioned to support the connectivity needs of residents and businesses.

4.1.1 Availability of Broadband

According to ISED and CRTC data, broadband that meets the Universal Service Objective of 50/10Mbps is available from multiple providers virtually everywhere in Maple Ridge. As detailed previously, the National Broadband Data (which is the only officially accepted data) indicates that only 61 households and 33km of roads across City of Maple Ridge are considered underserved. These 61 households and 33km of roads would be the only homes or roads in Maple Ridge eligible for funding subsidies from most government funding programs including ISED and the CRTC. This is further evidenced by the extensive network terrestrial and cellular network investments from all three major service providers. Combining the reach of the fibre and 5G networks, there are very few places in Maple Ridge where broadband that meets the USO is not available. Maple Ridge benefits from several engaged service providers.

4.1.2 Previous Investments

Maple Ridge has had a fibre strategy in place for at least two decades. The current strategy, which was based on strategic alignment opportunities, served the City well in connecting City facilities and minimizing costs for City needs.

City Departments have worked collaboratively to identify capital works projects and past grant opportunities that met specific criteria to facilitate conduit and fibre being placed in the ground at minimal cost. As a result, Maple Ridge currently has almost 10km of fibre and 30km+ of installed conduit and has plans to significantly extend its conduit and fibre network.

The City, using its WiFi network known as "Freetown", delivers free and open WiFi to most municipal buildings and community centres adjacent to the city core. All core municipal buildings including community centres, and Memorial Peace Park are equipped with WiFi6 access points.

4.2 Weaknesses

Despite a rich service provider market and previous city investments, neither the notion of a Connected Community nor a commitment to expansion of broadband appears as a strategic direction of the City of Maple Ridge except in the most recent Economic Development Strategy. Without that notional direction at the City level, key policies, tactics, and investments necessary to promote better broadband and more ubiquitous connectivity are missing or incomplete.

4.2.1 Missing or Out-dated Policies

Telecommunications Antenna Structures Siting Policy
The current policy permits the exclusion of non-tower structures (e.g. antennas on buildings, water towers, lamp posts, etc.) from consultation. As the need for small cell deployments increases, the policy will need to be adapted and updated to include these important elements of connectivity densification.

Municipal Access Agreements
There is no standard Municipal Access Agreement and it is unclear who is responsible for the development or negotiation of such agreements. As agreements come due for renewal or renegotiation, the importance of standardization will increase.

Conduit Standards
Most areas of the policy need to have wording updated to address current industry construction methods and practices.

a) Reduce assumption that most construction for communications will be open trench.
b) Consider vault and manhole types that are not concrete technology.
c) Provide guidance on directional bore methodologies that are acceptable to the City.
d) Include tensioned steel strand with fibre lashed to it versus the self-support fibre for aerial installations.
e) No longer restrict fibre counts to an upper limit.

4.2.2 Telecommunications Coordination

Our research revealed that currently no single Maple Ridge employee or department is responsible for broadband or telecommunications. As a result, there is no coordinated approach to telecommunications and broadband development.

We believe a single point of contact for City departments as well as providers, businesses and residents is essential for future growth and to implement a Connected Community Strategy.

We recommend Maple Ridge create a full-time Telecommunications Coordinator position to be responsible for supporting the ongoing telecommunications needs of the City and the implementation of telecommunications infrastructure.

The Telecommunications Coordinator would be responsible for coordinating with internal and external stakeholders and providers to promote and expand the availability of reliable telecommunications services throughout the City. Specifically, the Telecommunications Coordinator would:

- Gather input from and provide communications to residents, businesses, local committees, and local service providers in support of an ongoing and evolving Connected Community Strategy.

- Facilitate execution of broadband and other telecommunications projects, including acting as the primary point of contact for collocation applications and processes, right-of-way agreements and utility feasibility reviews, review of suitability of proposed network routes, and assisting local service providers and new entrants with navigating City and Provincial processes and approvals.
- Track and respond to broadband-related inquiries from service providers, investors, local businesses, industry, community groups and the general public; address all concerns from residents and business owners related to broadband availability.
- Pursue and coordinate local, provincial, and federal funding opportunities that may further support the development of broadband in the City's underserved or emerging development areas.
- Work with various City departments to ensure timely and consistent feedback or approvals throughout the implementation process.
- Conduct independent research and make recommendations on opportunities that may advance the achievement of the broadband priorities, including policy recommendations.
- Prepare and deliver regular updates to senior management, Committees, and Council.

4.2.3 Previous Investments

Past build outs were largely based on leveraging opportunities with minimal cost, as opposed to focusing on high value targets. This has resulted in the City having a discontinuous network of 30+km of installed conduit. While having this proactive vision is commendable, without a comprehensive strategic focus the resulting assets may simply be stranded and never realize their full intended value. In fact, the service providers consulted were clear that using City-owned conduit was unlikely to be an advantage to them thus leaving value only to potential future City projects.

4.2.4 Lack of Strategic City Support

As stated previously, infrastructure builds to date have primarily been achieved leveraging off other capital projects to be undertaken at minimal cost rather than as part of a project with funding allocated by the City. A Connected Community is not a primary element in the City of Maple Ridge Strategic Plan and only appears in the Economic Development Strategy. Without a specific strategic direction and significant direct investment, the installation of conduit and fibre by the City is merely opportunistic.

4.3 Opportunities

4.3.1 Market Conditions

Where other cities necessarily venture into aggressive campaigns to expand broadband, it is often because the market failed to meet the residential or business requirements of the

community and its residents. In the case of Maple Ridge, the density, demographics, and market conditions have made Maple Ridge an attractive investment for all major service providers resulting in what is essentially ubiquitous coverage across the entire City. Moreover, service providers are prepared to engage with City officials to expand or resolve perceived coverage issues.

4.3.2 Available Conduit

With almost 10km of fibre and 30km+ of installed conduit, the City has extensive infrastructure to leverage and use as a base to either create a Municipal Network and expand City-owned facilities to create a Connected Community or to make its assets available to service providers who might choose to leverage the available capacity. The incumbent service providers generally saw little value in using the City conduit, especially if there were costs associated but policies and incentives could change that position. Also, alternative service providers could emerge if an advantageous leasing model was developed.

4.3.3 Available Datacentre

The City has built a data centre structure at Firehall #4 that was recently completed and currently houses City infrastructure. The datacentre could be integrated into a Municipal Network and portions could be leased to third parties to house equipment or local services. While additional business planning would be necessary, the asset is available to be integrated into the Connected Community Strategy.

4.4 Threats

4.4.1 Competing Free WiFi

Both Telus and Shaw have extensive free WiFi deployments in and around Maple Ridge that are accessible to both customers and the general public at no cost. Given the broad coverage of their terrestrial networks, it would be relatively simple and inexpensive for Telus or Shaw to extend their WiFi facilities into more Maple Ridge locations which could, in turn, threaten or undermine the viability of the City's "Freetown" WiFi service. To address this threat, the City has the opportunity to negotiate with the current providers similar to the 2018 Shaw / City of Vancouver partnership[21].

4.4.2 Dominant Incumbents

Maple Ridge is currently served by six facilities-based providers and at least three third party resellers who leverage the incumbents' networks. Telus and Shaw dominate the market with both fibre and mobile offerings. The current level of competition, coupled with the small number of underserved households and roads, means that Maple Ridge enjoys the benefits of a

[21] https://newsroom.shaw.ca/corporate/newsroom/article/materialDetail.aspx?MaterialID=6442452084

competitive market. That market would make it very difficult if not impossible for a City-owned Public Utility that services residents and businesses to be financially successful.

4.4.3 5G Competition

Both Telus and Rogers have made significant investments in 5G technology in Maple Ridge through upgrades to their large tower infrastructure and they both continue to expand small cell technology in the City. These investments bring the scale and capacity to offer gigabit type services to homes and business wirelessly. While fibre to the home may provide the most future-ready and immediately scalable option, 5G wireless services will offer ubiquity and affordability. Some experts predict that in some areas 5G services could become a replacement for expensive fibre builds. Most importantly, the proliferation of 5G small cells necessary for a modern mobility network means that the City will inevitably need to contend with the environmental and aesthetics aspects of antenna siting in more places including buildings, lighting, and other City assets.

5. Strategic Considerations

5.1 Policy Options

This section describes some of the potential municipal policy options that could influence the City's Connected Community Strategy and addresses any weaknesses of the current situation.

5.1.1 Municipal Access Agreement

A clear, concise, and standardized MAA protects public interest while facilitating ease of application and deployment for new telecommunications construction and technology. The City sets the requirements on any telecommunications companies proposing to install equipment within its jurisdiction. Complex and demanding MAAs are a deterrent to investment for service providers. The MAA should be crafted to protect both parties to the agreement. The successful MAA focuses less on monitoring and enforcement of permit conditions, and more towards developing collaborative working relationships with service providers that facilitate the deployment of next-generation infrastructure critical to economic futures.

Further, the successful MAA is consistent with the CRTC-approved Model MAA[22] that is intended to serve as a model for use by municipalities and carriers and with the recommendations of the Federation of Canadian Municipalities "Telecommunications and rights-of-way: A handbook for Municipalities"[23]. The MAA should be extended to include small cell applications particularly in regard to adherence to local aesthetic standards and environmental regulations.

5.1.2 Conduit Placement

The cost of installing conduit depends largely on the installation method, size of the conduit, type of soil, location, and depth. Simple advanced placement of conduit without coordination with future users offers no certainty that the design of the conduit placement will meet the needs of a service provider's network design. Further, without service provider input the municipality does not know where the future service providers will want to break out connections.

Retrofitting installed conduit can be complicated. Moreover, a single conduit will be unlikely to be easily serviceable for more than one provider, so the practice requires anticipating the needs of additional service providers and multiple conduits. In fact, while Shaw indicated a potential interest in using City conduit if it was cost advantageous, Telus specifically noted that it is much easier for them to use their existing rights of way and duct arrangements. In most jurisdictions we find that service providers are unlikely to want to pay for access to conduit. For all of these

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[22] https://crtc.gc.ca/public/cisc/m-docs/MAA1311eng.docx
[23] https://data.fcm.ca/documents/resources/guide/handbook-telecommunications-row.pdf

reasons, further proactive conduit placement by Maple Ridge is not expected to yield positive benefits for the City.

Use of Abandoned Water/Sewer

While it can sound attractive in congested and difficult to reach urban areas, the reuse of abandoned water mains or sewer lines can be a complicated and difficult process. Due to their most common placement under roads and their deep design depth from grade to prevent cold weather freeze up, water lines are exceptionally difficult to access. Moreover, the older the pipe, the higher the chance of compromised integrity meaning that the pipe will need to be proofed and lined with inner ducting. Ground shifting is a large component related to abandoning pipes and has a great affect on the usefulness of the pipe. Unless the use of abandoned water lines is the only viable means to make a connection, it is generally recommended to avoid such installations.

5.1.3 Dig Once Policies

In many regions municipalities have worked in recent years toward Dig Once policies to minimize road disruption from the placement of utilities. These policies can be as simple as coordinating all utilities for common placement of infrastructure during construction or can be the default placement by the municipality of conduit for future use during road reconstruction. Some jurisdictions, particularly in urban centers where real estate is limited, have had success with this approach.

The challenge with the Dig Once approach however is that it attempts to anticipate a service provider's needs but may fall short of service provider's requirements and potentially add cost to the service provider. Further, it should be recognized that service providers often operate with their own qualified installation crews to minimize cost and often have specific requirements that do not align with the requirements of other providers. Also, as noted earlier, service providers typically prefer to use their own pre-existing duct access arrangements or conduit installations for their networks.

Dig Once policies are attractive in theory, but in practice they often force service providers to use a common approved contractor which ultimately increases the costs to the service providers. For these reasons, Dig Once policies often do not yield the anticipated positive benefits for a city.

5.1.4 Service Provider Encouragement

In deciding where to expand, service providers look for communities that actively support their expansion efforts by eliminating or minimizing barriers. Encouragement by local government through clear communication, consistent policies, and streamlined approval processes can help to stimulate that investment. Minimizing complications and promoting successes are keys to unlocking private sector investments at a time when many communities are competing for telecommunications improvements.

Additional municipal investments on the part of the City are also seen as a significant sign of local support. Whether it is cash or access to municipal facilities, providers look at it as the municipalities having a direct interest in success. Naturally providers look for local subsidies to reduce their need for provincial or federal funding. However, local investment – in the form of grants or access to municipal infrastructure – amplifies the commitment of a local government and underscores the importance a municipality places on broadband expansion.

A clear road map, clear local development policies, and a small investment can all help create the right conditions and encourage service providers to continue to invest and develop in a region.

5.2 Deployment Options

5.2.1 Open Access Network

In most countries an Open Access Network means multiple service providers use the same telecommunications network infrastructure to distribute their services without each of them having to build their own infrastructure. A true Open Access Networks separates ownership of the network infrastructure from the provision of telecom services. The owner of an Open Access Network is not a service provider and does not compete with network tenants. Its business is to build and maintain the network while service providers focus on their business of providing quality services at competitive prices.

Conceptually a true Open Access Network is like a street or a highway. Cars and trucks all share the same streets and highways. We don't build one highway for Fords, another for Chryslers, and another for GM. Yet in Canada, and many other countries, the major telecom players each build their own network infrastructure and promote it as a competitive advantage. Building separate networks contributes to high costs, high prices, and lessens competition by creating a barrier to entry into the market.

An Open Access Network can come in the form of a fully-managed access network, that is one that includes the activation of the connection to the subscriber's home, or as a passive fibre network that simply makes the physical infrastructure available for other service providers.

While government funding programs like the Connecting British Columbia program[24] or the Universal Broadband Fund[25] require applicants to commit to providing open access, in practice open access has not been widely adopted in Canada.

A key reason open access has not been widely implemented, in spite it being a requirement of funding programs, is that the funding programs fail to define open access or detail any

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[24] https://www.northerndevelopment.bc.ca/funding-programs/partner-programs/connecting-british-columbia/

[25] https://www.ic.gc.ca/eic/site/139.nsf/eng/h_00006.html

obligations for providing open access. The only specific obligation is that there must be a common rate card for anyone seeking access. In our experience the lack of detailed obligations makes it difficult, and often impossible, to successfully negotiate access to network infrastructure.

Moreover, in an open access network it takes great effort to balance the cost and revenue in such a way that all parties can be successful and profitable but in a successful and competitive market, the balance is even more challenging to achieve.

5.2.2 Municipal Public Utility

In the Municipal Public Utility model, Maple Ridge could operate a broadband network directly as the City of New Westminster does with BridgeNet or contract a private sector player to construct and operate the network. The network may include fibre, tower, or hybrid fibre-tower infrastructure. In this model, the City would choose to establish its own Internet services to offer services to homes and businesses or may choose to operate the physical assets as an Open Access Network. In both cases, the City would retain ownership of the infrastructure and be responsible for raising the capital needed to build the infrastructure.

To be eligible to receive government funding to build the network, the broadband infrastructure would have to be "open" meaning other service providers would be permitted to pay to use the infrastructure to reach their customers. This could create an additional source of revenue for the Public Utility.

In the case of Maple Ridge, what would be of significantly greater concern than open access when considering the option of a Municipal Public Utility would be access to government funding. To be eligible for government funding the network would have to reach underserved areas. Given that virtually all of Maple Ridge already has 50/10Mbps service, we anticipate if Maple Ridge were to create a Municipal Public Utility network that it would not be eligible for most, if any, government funding.

Further, while the major service providers may be receptive to using municipal infrastructure, generally the cost and complications of using facilities other than their existing arrangements to access BC Hydro facilities or their own facilities exceeds the benefits.

Given that only 61 homes and 33km of roads are currently defined by ISED and the CRTC as underserved, coupled with the considerable investment already existing or announced by Shaw and Telus, creating a new Municipal Public Utility would seem both unnecessary and impractical as it would enter direct competition in an already well-served competitive market.

5.2.3 Municipal Network

With its existing investment in fibre and conduit connecting municipal facilities, the City could consider simply continuing the construction of a Municipal Network to service specifically the needs of the City and public spaces. The destinations of the municipal network could be considered on a case-by-case basis, but such a network would likely be extended to include:

- City facilities;
- Firehalls;
- Pumping Stations;
- Traffic Cabinets;
- Community Centres; and
- Selected parks.

The value of doing so would ensure the City has control over telecommunications to these facilities and offset the operational costs of leasing access from an existing provider. It is possible to take this approach given the current investments and the existing operation of the IT infrastructure serving the current connections. However, as previously noted, because of the broadband service levels already available, such a project would not be eligible for funding from current government subsidy programs.

Importantly, the Municipal Network would be targeted specifically at meeting the needs of the City as opposed to providing consumer connectivity with a minor exception of also providing City-owned capacity to extend the Freetown WiFi service. We stress that the merits and cost of creating a Municipal Network for City purposes would need to be carefully weighed against the ready availability of existing commercial services.

5.2.4 Public-Private Partnerships

A public-private partnership ("PPP") is defined as a long-term contract between a private party and a government agency for providing a public asset or service, in which the private party bears significant risk and management responsibility. PPPs often involve ongoing, long-term relationships because private sector partners are assumed to bring efficiencies and higher quality outcomes than the public sector could achieve on its own.

PPPs are based in the belief that the private and public sectors have different but complementary skills, needs and experiences that in combination can better serve the public interest than working separately. This is especially true in the case of public infrastructure projects.

The PPP model has been used for years in the construction of roads, bridges, and public transport systems. More recently it has also been used for other infrastructure projects ranging from schools to prisons and hospitals.

There is a range of approaches to a PPP that could be considered for delivering either a municipal public utility serving residents, a municipal broadband network serving city sites, or a free public WiFi network.

- A PPP could be created where a private sector partner would be chosen by the City to build, operate, and maintain specific services for the City; or
- A PPP could see a private sector partner contracted to operate and maintain City-owned infrastructure on behalf of the City; or
- A PPP could see the City create its own service provider, offer competitive services, and contract a private sector partner to operate the business.

The PPP approach would bring the expertise in broadband network deployment, operation, and maintenance that the City lacks today and may find difficult to acquire in a competitive labour market. It would also facilitate cooperation with private sector partners to optimize the cost and investments necessary to complete the City's objectives. A PPP may be an important building block as the City moves toward adopting a Connected Community Strategy.

6. Cost Considerations

There is a broad range of options, ranging from doing nothing to building a complete network to serve all of Maple Ridge, that could be considered.

For our analysis, we have modelled different approaches, each leveraging the existing Maple Ridge conduit and fibre assets, to establish the range of potential costs. Any variation of build options are expected to fall within these potential costs. The viable technology options for servicing the identified network routes and services areas are presented as design concepts with budget estimates. Sufficient care is taken to assess the viability and high-level design requirements of the various options so as to produce reasonable budget estimates. However, before any project outlined herein were to be undertaken, a detailed engineering review would need to be conducted to confirm budget estimates. The budgets provided do not include remediation of any deficiencies in the existing conduit network.

1. Build a Municipal Public Utility
   Creating a Municipal Public Utility suggests the city would extend conduit and fibre to all areas of Maple Ridge, it would create and staff a municipal ISP and it would go into direct competition with the existing providers currently serving Maple Ridge.

   Estimated capital costs: >$82M Estimated operating costs: $2M/year

2. Complete the existing City expansion plan
   Plans have already been developed by City staff to add 54.15km of conduit and fibre to the existing conduit and fibre assets. Completing this segment would reach 13 municipal sites and extend fibre to the 256 Development Lands.

   Estimated capital costs: ~$5.6M Estimated operating costs: $532k/year

3. Build an Alternative Municipal Network
   This would see the City scale back existing expansion plans to add only the conduit and fibre required to create a Municipal Network to serve the City itself. This Alternative Municipal Broadband Network would serve 37 additional key City facilities. This would require the City to build an additional 27km of conduit and fibre.

   Estimated capital costs: ~$3M Estimated operating costs: $521k/year

4. Build a Combination that includes traffic cabinets and water pumps
   This would require the City to build both the existing plan for 54.15km, the incremental 15.5km to reach the total of 37 key City facilities, and another 21.1km to reach all the target traffic cabinets and most of the water, sanitary, and drainage pumps.

   Estimated capital costs: ~$9.5M Estimated operating costs: $542k/year

In any model where the City of Maple Ridge assumes the responsibility to build and maintain telecommunications infrastructure, whether as an open access network, a public utility, a municipal network, or a partnership, it will require capital investment and ongoing operational costs.

This section considers the cost associated with each of the models listed above and the related tactical approaches. Our cost models are based on the underlying network costs detailed in Appendix B. All three models assume leveraging the City's existing investments in conduit and fibre. The completion of existing expansion plans and the creation of a Municipal Broadband Network both include at least some of the City's expansion plans that are currently in a pending status. The current and pending infrastructure is shown previously in Figure 6 and accounts for 37.24km but is also shown in the following figure for greater clarity.

We recognize that there is not fibre in all the existing conduit shown but if fibre were to be installed at the same time as other overall construction is completed, we assume that the conduit is accessible and usable such that the impact to overall costs would not be material. This can only be confirmed when a detailed engineering review is done and represents a potentially significant cost risk.

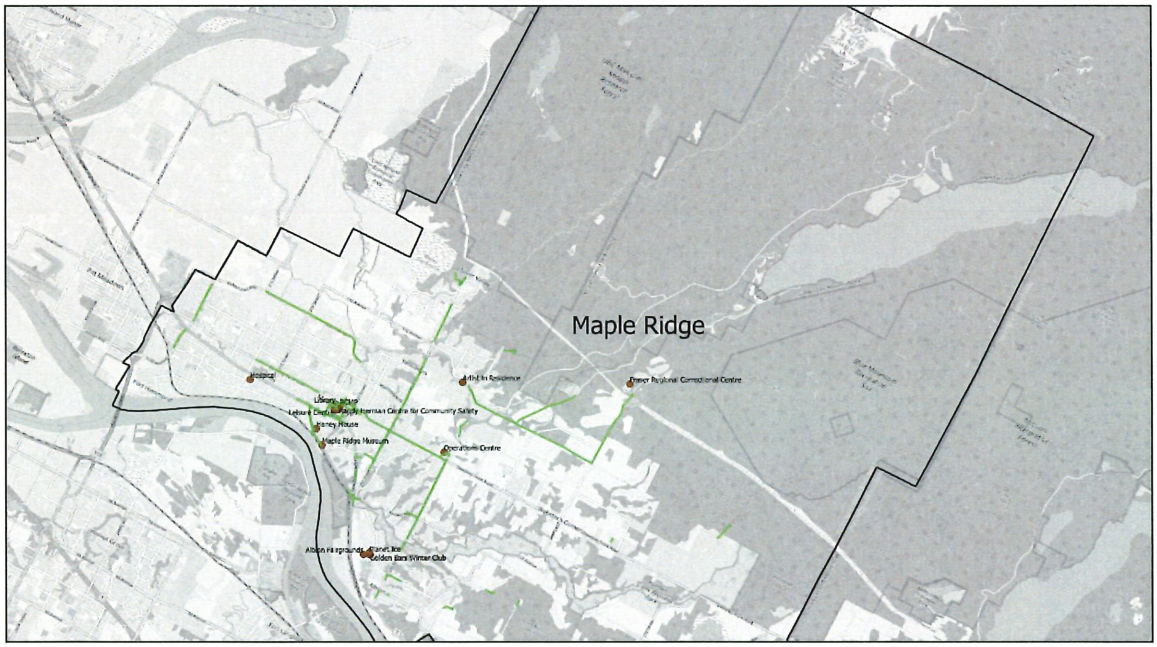

Figure 11 – Current and Pending City Conduit/Fibre

6.1 Municipal Public Utility

The City of Maple Ridge could choose to create a Municipal Public Utility to provide broadband connectivity to the entire City in direct competition with the incumbent providers.

With strong competition from six facilities-based providers and an additional three resellers, a Municipal Public Utility cannot reasonably expect to draw more than 30% penetration against the total premises passed. The City-provided building footprint map showed 39,713 buildings, many of which may be sheds or businesses while the 2021 Census data counted 34,254 private dwellings. For this analysis, we focused on the cost of reaching all 34,254 private dwellings recognizing that as a new competitor that would need to persuade customers to switch from their current providers, the City would likely only sign a maximum of roughly 10,000 subscribers.

6.1.1 Estimated Costs

Build Costs

Building a comprehensive Municipal Public Utility would require building conduit and fibre to all roads where there are existing buildings, businesses, or homes. While the City GIS shows roughly 626km of roads because of the need to support Emergency Services through the joint Emergency Operations Centre (EOC) with the City of Pitt Meadows, once filtered for the City's jurisdiction, there are only approximately 545.1km. For comparison, the ISED roads file only accounts for approximately 494.5km roads. By overlaying the City GIS data for roads with the building footprint maps we validated that the 545.1km of roads is a good estimate of the total distance of roads upon which buildings are found. The number of roads therefore requiring service are 545.1km minus the 37.24 existing and pending conduit. Thus, we consider the build requirements for 507.86km and 34,254 dwellings. Certainly, this build could be undertaken in phases or on a success basis, but to establish the upper bound we estimate on complete construction including sufficient equipment for servicing all buildings.

The capital cost to build the complete physical network is estimated at $71M and would require five fibre crews working for two years to complete.

Internet Service Provider Costs

In addition to the cost of building the physical network infrastructure, creating a Municipal Public Utility that would compete with existing providers would require the City to build, staff and manage an ISP. The capital cost of the equipment required to operate an ISP at this scale, everything from switches and routers to servers and operational support systems, and the initial marketing and branding costs are estimated at $11M.

Total Combined Capital

The total combined capital costs estimate is >$82M not including staffing or ongoing operating costs. The capital cost is summarized in the following table.

Item	Description	Cost
	Capital	
Physical FTTx Build	FTTx: Engineering, labour, materials	$71,127,171.96
PoP Sites	Physical space preparation/remediation	$50,000.00
Internet Transit	Upgrade of two carrier connections for management	$20,000.00
Access Network (XGS-PON)	XGS-PON Cabinets	$7,376,908.01
Core Network Routers	Core Routing Pair	$54,681.60
Server Switches	Server Switch Pair	$3,194.88
Standby Power	Generators, engineeirng, and UPSs	$60,750.00
Out-of-Band Access Devices	Out-of-Band Access Devices	$3,054.00
Optics	Optics	$24,000.00
OSS	Servers and OSS Software	$102,500.00
Billing System	Invoicing, payment, and inventory tracking	$100,000.00
Implementation	Install, Configure, Core Services	$125,000.00
CPE	Optical Network Terminals installed susbcribers	$2,860,000.00
Process/Support Development	Build and implement support processes	$60,000.00
Marketing	Initial Brand and Marketing Development	$135,000.00
	Total Capital	$82,102,260.45
	Provided as budgetary costs for discussion purposes.	

Figure 12 – Municipal Broadband Public Utility Capital Costs

6.1.2 Operations and Management Costs

The current complement of City personnel would need to be augmented to include a Telecommunications Coordinator, an Operations Manager, and an engineering technician, and the necessary technical support staff required to manage, provide subscriber support, and market the City-owned ISP. Furthermore, the network would require funding for ongoing maintenance and Internet connections. The high-level costs are summarized in the table below.

	Annual Operating	
Internet Transit	Ongoing transit costs to two providers	$540,000.00
Operations Management	Operations, Technical, and Customer Service Mangement	$300,000.00
Tier 1 Support	Outsourced Tier 1 Support	$600,000.00
Tier 2/3 Support	Outsourced Tier 2/3 Support	$120,000.00
Field Technician	Field operations and installations	$180,000.00
Vendor Maintenance	Annual Access/Core Hardware Maintenance	$25,000.00
Fibre/Plant Maintenance	Budget for annual maintenance and repairs	$136,275.00
Marketing	Budget for annual maintenance and repairs	$60,000.00
	Annual Operating	$1,961,275.00
	Provided as budgetary costs for discussion purposes.	

Figure 13 – Municipal Broadband Public Utility Operating Costs

6.2 Existing City Expansion Plan

The City of Maple Ridge already has a high-level plan for a proposed fibre extension covering an additional 54.16km. Such a Broadband Network is considered in this analysis only for Municipal Purposes and not for delivering services to residents or businesses. The route is shown in the following figure.

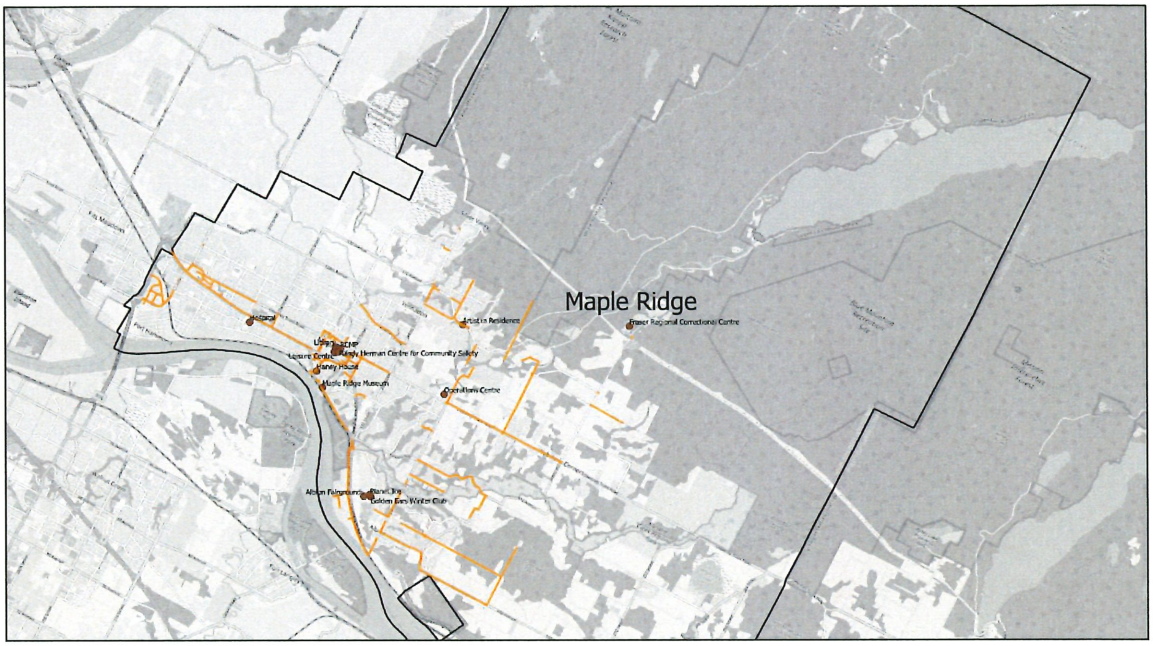

Figure 14 – City-Proposed Future Conduit/Fibre

6.2.1 Estimated Costs

Build Costs

Without considering the end locations that could be served by the proposed extension and therefore not including the related drop costs, the estimated cost to build this 54.16 km extension, using the assumptions from Appendix B, is approximately $5.6M and would take a single fibre crew roughly one year to construct.

Network Costs

Assuming this extension would be used to connect the thirteen facilities it passes (Albion Fairgrounds, Albion Park, Artist in Residence, Fraser Regional Correctional Centre, Golden Ears Winter Club, Haney House, Maple Ridge Museum, Planet Ice, Ridge Meadows Hospital, and Fire Halls #3, 5, 6, and 7) then it would require upgrading the core network and providing metropolitan Ethernet and demarcation switches. Total capital costs for the existing proposed extension are estimated at ~$5.6M and the summary is provided in the table below.

Item	Description	Cost
	Capital	
Physical Network (FTTx)	FTTx: Engineering, labour, materials	$5,356,542.46
PoP Site	Physical space preparation/remediation	$50,000.00
Core Network Routers	Core Routing Pair	$54,681.60
Distribution Switches	Switch Pair to Terminate Access Network	$22,345.93
Standby Power	Generators, engineeirng, and UPSs	$60,750.00
Out-of-Band Access Devices	Out-of-Band Access Devices	$3,054.00
Optics	Optics	$3,900.00
Implementation	Install, Configure, Core Services	$44,500.00
CPE	Demarcation Switches	$6,500.00
	Total Capital	$5,602,273.99
	Provided as budgetary costs for discussion purposes.	

Figure 15 – Existing Proposed Extension Capital Costs

Going forward, the resulting network could be further upgraded at additional cost to meet future requirements.

6.2.2 Operations and Management Costs

In terms of operating costs, given that the current network is managed within the current staff of the IT department, it is conceivable, but not recommended, the City could continue in this manner.

If the telecommunications infrastructure provided by this expansion is expected to be strategic to the City, then the current staffing would need to be augmented and should include the cost of a Telecommunications Coordinator, an operations manager, a engineering technician, and field technical support. Furthermore, the network would require funding for ongoing maintenance. Importantly, there are no customer support costs included because the network would strictly serve municipal purposes. The estimated costs are summarized in the table below.

	Annual Operating	
Operations Management	Operations, Technical, and Service Mangement	$300,000.00
Field Technician	Field operations and installations	$180,000.00
Vendor Maintenance	Annual Access/Core Hardware Maintenance	$25,000.00
Fibre/Plant Maintenance	Budget for annual maintenance and repairs	$26,750.00
	Annual Operating	$531,750.00
	Provided as budgetary costs for discussion purposes.	

Figure 16 – Existing Proposed Extension Operating Costs

Offering the connectivity of this network outside the scope of municipal purposes, such as to commercial businesses or residents, would add considerable operational support costs similar in magnitude to that discussed in the Public Utility model.

6.3 Alternative Municipal Network

The City could choose to build an Alternative Municipal Network that serves City purposes by extending the existing network to include key City facilities, Firehalls, Community Centres, and selected parks. This network could provide services for City applications and extend the Freetown WiFi network as required. An Alternative Municipal Network could be based on the existing City conduit/fibre network with an extension to allow it to connect the 37 facilities listed below.

City Facilities	Fire Halls	Community Centres	Selected Parks	
Artists in Residence	Fire Hall #2	CEED Centre	Albion Park	Jim Hadgkiss Park
Golden Ears Winter Club	Fire Hall #3	Golden Ears Winter Club	Albion Fairgrounds	Maple Ridge Park
Haney House	Fire Hall #4	Hammond Community Centre	Albion Sports Complex	Maple Ridge Golf Course
Ridge Meadows Hospital	Fire Hall #5	Maple Ridge Golf Course	Alexander Robinson Park	Maple Ridge Lawn Bowling
Maple Ridge Museum	Fire Hall #6	Ruskin Community Centre	Allco Park	Merkley Park
Planet Ice	Fire Hall #7	Thornhill Hall	Cliff Park	Port Haney Wharf Park
Randy Herman Centre		Whonnock Lake Centre	Golden Ears Field	Rotary Sports Field
RCMP			Hammond Stadium	Telosky Stadium
				Westview Secondary Rotary Sports Park

Figure 17 – Alternative Municipal Network Sites

The extension needed to reach the 37 additional municipal facilities is shown in the figure below and totals 27km.

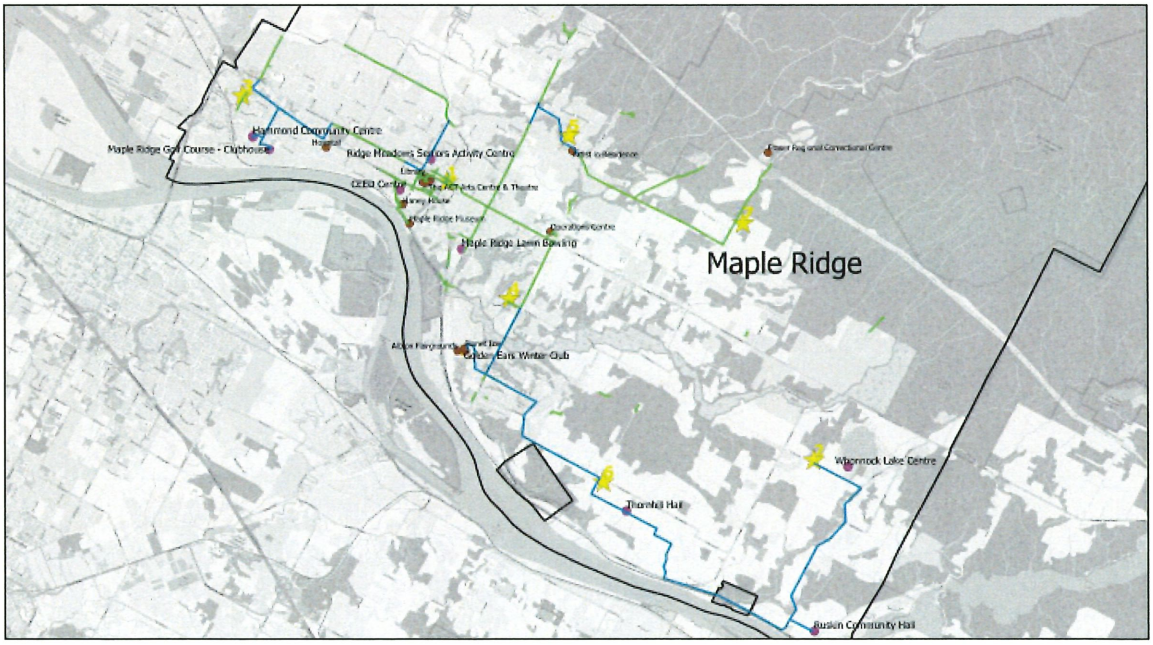

Figure 18 – Alternative Municipal Network Extension

6.3.1 Estimated Costs

Build Costs

For this purpose, we consider the build requirements for 27km and 37 municipal facilities. The expected budgetary costs to build to every building is estimated at ~$3M and could be completed in six months by one fibre crew.

Network Costs

Assuming this extension connects the 37 sites identified, then fortifying the core network and providing metropolitan Ethernet and demarcation switches would be expected to add approximately $301k in capital. Therefore, the total capital costs for the existing proposed extension are estimated at ~$3M and the summary is provided in the table below.

Item	Description	Cost
	Capital	
Physical Network (FTTx)	FTTx: Engineering, labour, materials	$2,697,147.02
PoP Site	Physical space preparation/remediation	$50,000.00
Core Network Routers	Core Routing Pair	$54,681.60
Distribution Switches	Switch Pair to Terminate Access Network	$22,345.93
Standby Power	Generators, engineeirng, and UPSs	$60,750.00
Out-of-Band Access Devices	Out-of-Band Access Devices	$3,054.00
Optics	Optics	$11,100.00
Implementation	Install, Configure, Core Services	$80,500.00
CPE	Demarcation Switches	$18,500.00
	Total Capital	$2,998,078.55
	Provided as budgetary costs for discussion purposes.	

Figure 19 – Alternative Municipal Network Capital Costs

6.3.2 Operations and Management

In terms of operating costs, given that the current network is managed within the current staff of the IT department, it is conceivable, but not recommended, the City could continue in this manner. If the telecommunications infrastructure provided by this expansion is expected to be strategic to the City, then the current staffing would need to be augmented and should include the cost of a Telecommunications Coordinator, an operations manager, an engineering technician, and a field technical support. Furthermore, the network would require funding for ongoing maintenance. The estimated costs are summarized in the table below.

	Annual Operating	
Operations Management	Operations, Technical, and Service Mangement	$300,000.00
Field Technician	Field operations and installations	$180,000.00
Vendor Maintenance	Annual Access/Core Hardware Maintenance	$25,000.00
Fibre/Plant Maintenance	Budget for annual maintenance and repairs	$16,060.00
	Annual Operating	$521,060.00
	Provided as budgetary costs for discussion purposes.	

Figure 20 – Alternative Municipal Network Operating Costs

Offering the connectivity of this network outside the scope of municipal purposes, such as to commercial businesses or residents, would add considerable operational support costs similar in magnitude to that discussed in the Public Utility model.

6.3.3 Combining Existing City Expansion with Alternative Network

Assuming the City's proposed future conduit/fibre build extension were to proceed at the estimated capital cost of ~$5.6M to install the proposed 54.1km of fibre, it would also still require an additional 15.5km of fibre to reach the proposed 37 target facilities. The additional fibre costs would be estimated at ~$1.6M. Total capital costs estimate is ~$7.2M. The resulting network is shown in the figure below.

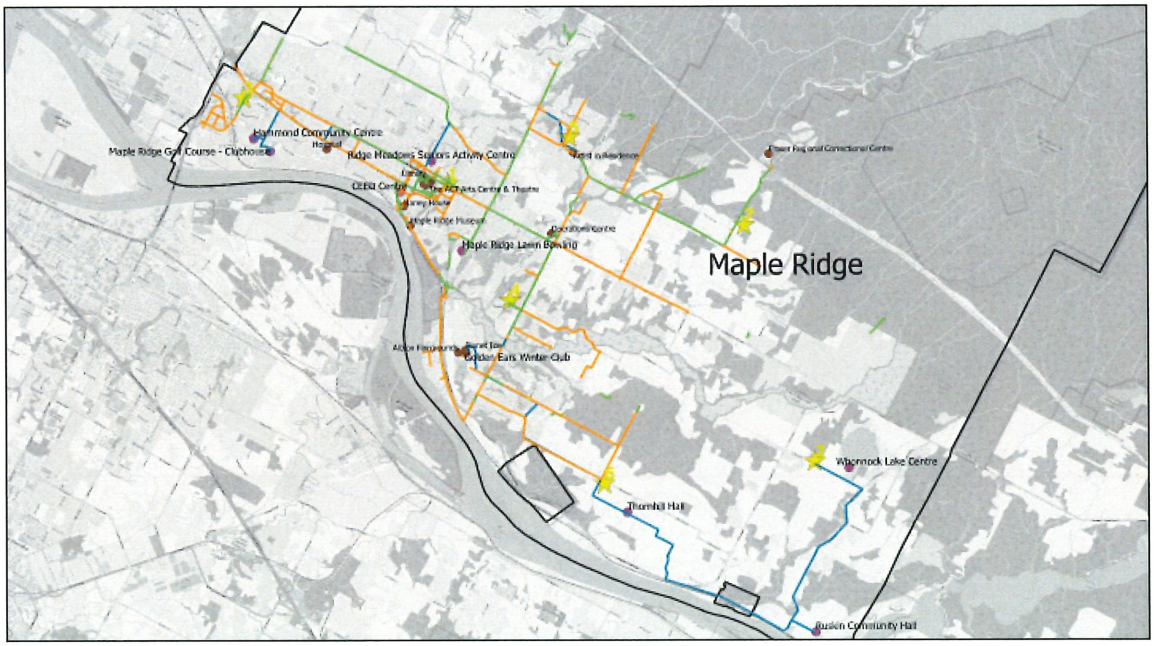

Figure 21 – Municipal Extension Leveraging Future Fibre Plan

We see no advantage to this approach and its higher capital cost of ~$7.2M over the option to create a smaller Alternative Municipal Network that would meet municipal needs at a significantly lower capital cost of ~$3M.

6.4 Traffic Cabinets and Pumps

We recognize there is City interest in connecting select traffic cabinets, water pumps, sanitary pumps, and drainage pumps thus we contemplated the fibre build necessary to make all those connections.

Assuming that all the existing and pending conduit is usable, that the existing proposed City extension is undertaken, and that Alternative Municipal Network is constructed, then we determined the requirements to be an additional 21.1 kms as follows:

- 48 Traffic Cabinets: 0.5km
- 5 Drainage Pumps: 4.2km (excluding 6 pumps)
- 38 Sanitary Pumps: 13.7km (excluding 1 pump)
- 9 Water Pumps: 2.7km (excluding 2 pumps)

Some locations are excluded simply because reaching them via terrestrial means is impractical. For these excluded sites, an LTE, 5G, fixed wireless, or LoraWan type deployment would be more appropriate and cost effective.

The resulting network is shown in the figure below.

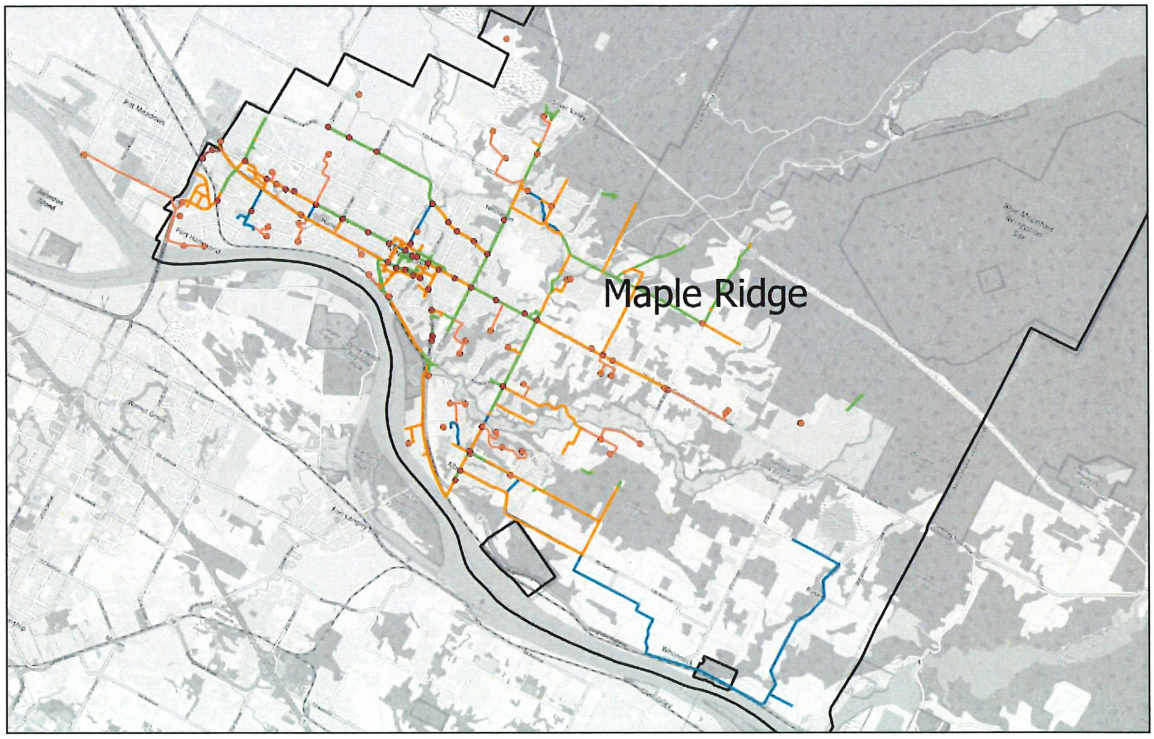

Figure 22 – Municipal Network including Traffic Cabinets and Water Pumps

6.4.1 Estimated Costs

Build Costs

For this purpose, we consider the build requirements to be an incremental 21.1km and a total of 100 sites (cabinets and pumps combined) in addition to the combined extension and alternative network costs. Assuming this extension connects the 100 sites identified then additional core network switches and demarcation media converters will be necessary. The incremental costs are shown in the table below and are approximately $2.3M.

Item	Description	Cost
	Capital	
Physical Network (FTTx)	FTTx: Engineering, labour, materials	$2,149,365.38
Distribution Switches	Switch Pair to Terminate Access Network	$45,000.00
Optics	Optics	$30,000.00
Implementation	Install, Configure, Core Services	$25,000.00
CPE	Demarcation Switches	$25,000.00
	Total Capital	$2,274,365.38
	Provided as budgetary costs for discussion purposes.	

Figure 23 – Traffic Cabinets and Water Pumps Extension Capital Costs

When added to the previous network costs, the expected overall budgetary cost is estimated at $9.5M. The annual operating costs are estimated at $542k per year and shown in the table below.

	Annual Operating	
Operations Management	Operations, Technical, and Service Mangement	$300,000.00
Field Technician	Field operations and installations	$180,000.00
Vendor Maintenance	Annual Access/Core Hardware Maintenance	$30,000.00
Fibre/Plant Maintenance	Budget for annual maintenance and repairs	$32,025.00
	Annual Operating	$542,025.00
	Provided as budgetary costs for discussion purposes.	

Figure 24 – Traffic Cabinets and Water Pumps Extension Operating Costs

As traffic cabinets and water pumps are expected to have relatively low bandwidth requirements, unless there is a need to include video surveillance, we can see no benefit to connecting them via fibre rather than some variation of wireless, especially in light of the 5G coverage from multiple service providers and the opportunity for broadscale collaboration.

7. Connected Community Strategy Framework

We provide this framework as a potential baseline for establishing a Connected Community Strategy. This is not intended to be a complete strategy, but rather identifies key elements for consideration in the ongoing development of the strategy.

7.1 Vision

The term Connected Community can have a broad meaning from a social, economic, and well-being perspective. This report focusses on the foundational technological interconnections of citizens, businesses, institutions, applications, and the greater Internet through robust and well-connected broadband networks.

Broadband networks are considered as "vital to economic growth as reliable electricity, clean water, and good roads."[26] They form the basis for innovation, sustainability, collaboration, and improved living standards.

While a Connected Community is not currently a primary element in the City of Maple Ridge Strategic Plan[27], the expansion and improvement of connectivity supports all facets of Community Safety, Intergovernmental Relations, Growth, Community Pride & Spirit, and Natural Environment found in the Plan. Despite its absence from the Strategic Plan, a Connected Community Strategy does play a central role in support the City of Maple Ridge Economic Development Strategy.

A Connected Community supports the development of a technology hub and helps expand home-based business and mixed-use commercial/residential developments/redevelopment by advocating for and supporting the provision of Gigabit fibre to all Maple Ridge premises.

The creation of a Connected Community should generate a range of benefits for Maple Ridge including, but not limited to:

- Improved efficiencies in internal communications;
- Attract new businesses to Maple Ridge;
- Facilitate e-health, e-learning, e-commerce;
- Create new opportunities with new data available to the City; and
- Have a positive environmental impact in areas like water usage management and a lowered carbon footprint.

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[26] Intelligent Community Forum Canada, "Broadband: The Essential Utility", 2017, https://d3n8a8pro7vhmx.cloudfront.net/icf/pages/391/attachments/original/1482476784/Broadband_Utility_ICF_Canada_Position_Paper_FINAL.pdf?1482476784

[27] City of Maple Ridge, "Strategic Plan 2019-2022", https://www.mapleridge.ca/DocumentCenter/View/22066/2019-Strategic-Plan-with-Matrix-031919

The City of Maple Ridge may choose to develop a Connected Community Strategy that recognizes the vision that broadband networks are considered to be as "vital to economic growth as reliable electricity, clean water, and good roads" and forms the basis for innovation, sustainability, collaboration, and improved living standards. This vision would be used to evaluate all opportunities to extend or leverage communications technology.

7.2 Goals

The City of Maple Ridge may adopt a goal to ensure the community has the ubiquitous connectivity infrastructure required to allow residents to take full advantage of broadband technology and become a fully Connected Community. The goal should include all 82,256 residents, 4,400 businesses and emerging work-from-home and home-based businesses.

Fibre-optic cable is today's preferred connection technology for network infrastructure. Most operators deploy fibre in new deployments and are in the process of upgrading to fibre in areas with older copper wire infrastructure or in areas where the competition is expected to be significant.

As part of its long-standing Fibre Strategy the City elected to install extensive fibre and conduit which generally was installed as an add-on to other capital projects to minimize costs and disruption to the community. The strategy has been to install fibre and conduit wherever possible to create a valuable City asset which could be used by the City itself or generate revenues for the City if leased to third parties.

The City also has built and operates a WiFi network, Freetown, which supplements fibre connections and provides free, out-of-home connectivity.

The City of Maple Ridge Connected Community Strategy should aim to connect all public spaces, whether directly through City resources or in partnership with telecommunications providers, whether by fibre or WiFi.

The objectives of the Connected Community Strategy should include:

1. Secure, reliable, and affordable high speed (Gigabit) internet services for residents as well as municipal, commercial, industrial, non-profit and institutional sites throughout Maple Ridge.
2. Economic development opportunities based on access to quality, innovative and affordable communications services in the City.
3. Improved broadband delivery and system maintenance.
4. Grow the existing Fibre/Conduit Network footprint in alignment with the Official Community Plan for the future.
5. Lower operating costs for connected City facilities.
6. Plan for and use Internet of Things ("IoT") sensors to contribute to an intelligent and connected City.

7. Create another potential revenue stream for the City and a tool for value creation.
8. Address specific gaps in telecommunications.
9. Reduce duplication of costs (e.g., phone lines, internet connections, alarm systems, etc.)
10. Provide better connectivity and efficiency for field workers.
11. Drive municipal differentiation (e.g., Cities of New Westminster and Surrey)

7.2.1 Links in a Connected Community

BroadbandUSA, a creation of the National Telecommunications and Information Administration within the American Department of Commerce, advises the President on telecommunications issues. BroadbandUSA is a leading proponent of broadband and the importance of connected communities. The infograph below, prepared by Broadband USA, illustrates key connectivity links within a connected community.[28] The City of Maple Ridge may choose to consider ubiquitous connectivity in all aspects of City operations.

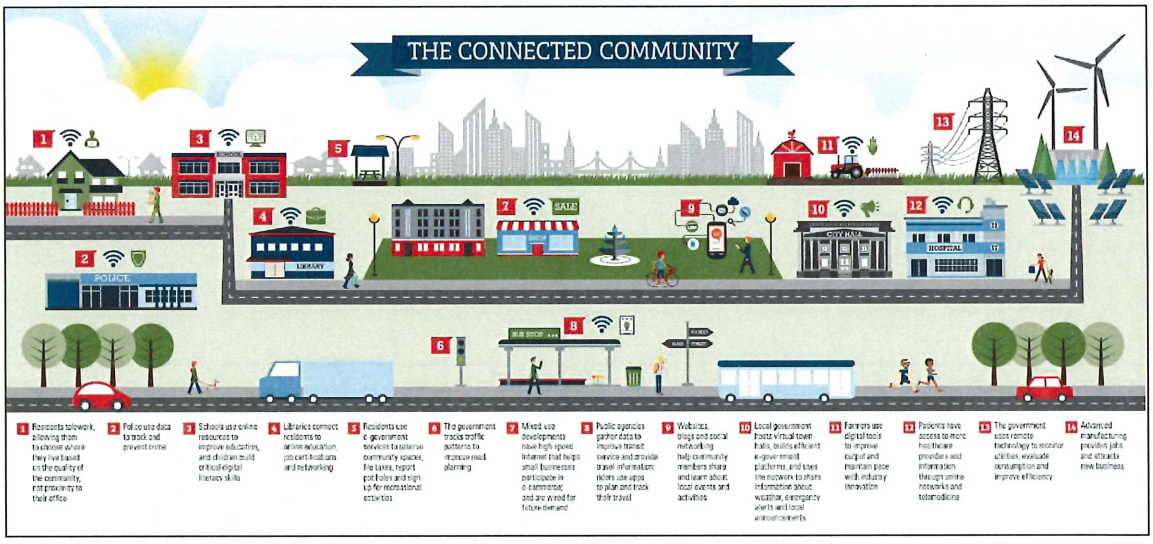

Figure 25 – BroadbandUSA "Connected Community"

7.2.2 Examples of Connected Community Benefits

When connectivity, in any technological form, is available everywhere, the City can unlock a broad range of community benefits. This section highlights some interesting examples that could be locally relevant to the City of Maple Ridge.

Remote Learning

Eduroam is a global wireless network access service for research and education. Universities participate in Eduroam to make it simple for students to log onto the university's IT systems

[28] BroadbandUSA. https://broadbandusa.ntia.doc.gov/

remotely. Communities that agree to participate in Eduroam install equipment at city facilities (for example libraries, city buildings and arenas) to create access points for students.

Eduroam uses the IEEE 802.1X WiFi protocol (WPA2-enterprise) and a system of interconnected RADIUS servers. The municipality or partner supplies all the equipment and WiFi. There are no additional costs of the municipality.

BCNet, in collaboration with CANARIE, is promoting the deployment of Eduroam in BC. They have deployments with Prince George Libraries and School District 91 and about 25 institutions in the province (e.g. UBC). Eduroam is also deployed in Surrey and Richmond. BCNet would like to extend Eduroam to Maple Ridge and thereby enhance remote learning across the City.

Connected Parks

Currently the City uses manual counters in selected parks and parking lots to monitor usage and traffic. The data is tracked on-site and must be collected manually when staff visit the location.

Currently the City must send staff to parks equipped with irrigation systems to manually adjust the schedule and duration for sprinkler activation.

If, as part of its Connected Community Strategy, the City were to purchase connectivity from an existing service provider or extend its own infrastructure to these locations it would no longer need to expedite staff to collect data or to activate irrigation systems. This would result in several benefits including cost savings, a lower carbon footprint and more efficient use of water. Further, connectivity at parks can promote the opportunity to "work from the park" in a time when society is learning to do more work from home.

Connected Intersections

Currently the City schedules traffic lights according to historic traffic flow data. The duration or sequence cannot be adjusted remotely.

If, as part of its Connected Community Strategy, the City were to purchase connectivity from an existing provider or extend its own infrastructure to selected intersections – likely along the Lougheed Highway - it could make adjustments according to real-time traffic flow. This would improve traffic flow and thereby help to reduce the City's carbon footprint.

Connected Waterworks

The City of Maple Ridge maintains eleven water pump stations, 11 drainage pump stations, and thirty-nine sanitary pump stations. Technology exists to connect the pumps for remote management and connections might include LTE, fixed wireless, LoraWan, or fibre.

If, as part of its Connected Community Strategy, the City were to purchase connectivity from an existing provider or extend its own infrastructure to the pumps they could collect real-time data to inform City operations and to provide localized controls.

Street-level Intelligence
With ubiquitous connectivity, municipalities can outfit their vehicles and fixed assets with real-time intelligence gathering technologies directly at the street-level to drive savings on existing infrastructure maintenance. Examples include traffic detection, pothole mapping, air quality reporting, garbage collection management.

7.3 Actions

If adopted as a strategic initiative, the Connected Community Strategy should permeate all functions of the City and should be considered in all decisions affecting development, policy, services, and communications.

7.3.1 Future Developments

The City of Maple Ridge should consider, during the development of new residential or commercial properties, exactly how communications infrastructure can be included and accommodated in a manner that supports but does not disrupt the aesthetic and enjoyment of residents.

7.3.2 Policy

New policy development should include assessment from the lens of future connectivity requirements and intersection of technology with the built environment.

7.3.3 Services

The City of Maple Ridge should adjust or amend how municipal services are delivered to residents to maximize the positive environmental impact of the expanded connectivity created through the adoption of a Connected Community Strategy. That is, making more information available in online and accessible formats, offering on-demand access to real-time City information, and increasing transparency through the City's online presence. To support accessibility, the Connected Community Strategy may need to promote digital literacy through free local training and access to computing resources.

7.3.4 Communications

The City should consider how residents connect with the City and stay informed of relevant municipal activities including the channels and type of connectivity resident use to make that connection.

7.4 Key Performance Indicators

To be successful, the Connected Community Strategy should include plans to collect and report on key metrics that demonstrate Maple Ridge's commitment to, and success with, expanded connectedness.

7.4.1 Connection Metrics

The City of Maple Ridge should track and report on the following metrics:

- Connected Municipal Buildings.
- Number of Public WiFi Access Points.
- Implemented use cases for e-commerce, remote learning, e-medicine
- Percentage of connected residents.
- Savings recognized by connecting facilities.

The information should be made public on the City website.

7.4.2 Resident Feedback

The City should plan to regularly conduct resident broadband surveys that solicit feedback from residents on satisfaction with home and business broadband services, broadband prices, and the availability of public WiFi access points.

8. Recommendations

Maple Ridge currently is served by six facilities-based providers with the dominant providers being Shaw and Telus. Other facilities-based providers including Galaxy, Rogers, Xplornet, and Zayo also serve Maple Ridge and broadband service is also available from at least three resellers.

According to ISED and the CRTC data, only 61 homes and 33km of roads in Maple Ridge do not currently have access to 50/10Mbps service. Research for this report confirmed that the cost of broadband to residents of Maple Ridge is comparable to prices paid in most urban markets including Vancouver, Toronto, and Montreal. In addition to facilities owned by providers, Maple Ridge itself also owns substantial broadband infrastructure including almost 10km of fibre and 30Km+ of installed conduit. We expect that existing providers will continue to invest and compete with one another in providing residential and commercial services.

The market conditions have afforded Maple Ridge great connectivity options. This section outlines our recommendations for taking the next steps toward a Connected Community.

8.1 Adopt an Official Connected Community Strategy

We recommend that the City of Maple Ridge act on the recommendations outlined in this report and move to create an official Connected Community Strategy. By making connectivity a strategic priority and establishing a clear vision, goals, and key performance indicators, the City will be better positioned to assess future opportunities to enhance accessibility to broadband.

To achieve its goal the City should work with existing providers and stakeholders, as well as consider an extension of its existing telecom assets where necessary, to create the connectivity infrastructure required to allow residents and businesses to take full advantage of broadband technologies and see Maple Ridge become a truly Connected Community.

Maple Ridge should formally establish the direction to connect key public spaces, whether directly through City resources or in partnership with telecommunications providers, to ensure ubiquitous access to broadband.

8.2 Avoid a Municipal Public Utility

The creation of a Municipal Public Utility to provide universal connectivity may have been practical, and may have made business sense, more than a decade ago before providers like Telus, Shaw and Zayo invested in infrastructure throughout Maple Ridge. At the time, a Municipal Public Utility might have given the City the opportunity to lead the market. However, in our opinion, the time and opportunity to create a Municipal Public Utility has passed.

In 2022, a city-owned Public Utility would simply create a new competitor to a well-established private sector. We anticipate that the creation of a Municipal Public Utility could result in temporary price war but in the long term would not result in substantial benefits for residents.

- Shaw, Telus, and other providers are already well entrenched and dominate the market. Both have made substantial investments in infrastructure and have announced plans to invest much more. The rates they charge are in line with rates charged in Vancouver & other large cities.
- There would be substantial risk in creating a Municipal Public Utility. Maple Ridge has no experience or staff to create and operate a Public Utility.
- The creation of a Municipal Public Utility would require an investment of millions in infrastructure.
- A Municipal Public Utility would require significant staffing to manage, operate and maintain the enterprise.
- A Municipal Public Utility would not be eligible for current government funding to subsidize building the network.
- We cannot see a new entrant being financially viable given the number of competing providers and current pricing.

We recommend against developing a Municipal Public Utility for all the reasons cited.

8.3 An Alternative Municipal Network.

We recommend Maple Ridge consider connecting key facilities and infrastructure using a combination of build and buy, leveraging its existing fibre and conduit assets where applicable, and buying services from incumbent service providers where advantageous, to develop a small and targeted expansion that creates an Alternative Municipal Network for use by the City itself.

We envision that the Alternative Municipal Network would serve as the foundation for a Connected Community with the potential for ubiquitous WiFi to supplement fibre links to city facilities, fire halls, major institutions, schools, traffic signals, pumping stations, and parks. However, we suggest that the costs of this approach should be carefully compared against competitive quotes from existing service providers to confirm that a City-built and managed Municipal Network would result in cost savings.

With almost 10Km of fibre and 30Km+ of conduit, Maple Ridge already has significant fibre & conduit assets in place that could serve as the foundation to create a Municipal Network. Creating a Municipal Network would build on the City's previous fibre strategy, but it should be recognized that achieving real efficiencies and financial benefits from such a network would require strategic alignment across City departments and a significant operating budget.

We recommend the City consider creating an Alternative Municipal Network to serve as the foundation for its Connected Community Strategy and do so in consultation with incumbent service providers who have existing connectivity and are better positioned to operate network of this scale.

This approach may require a competitive public process including a request for information to be issued to all existing or new service providers.

8.3.1 WiFi Coverage

The City currently operates Freetown to provide free WiFi connectivity, primarily in the downtown core. We note however there is also significant free WiFi coverage from the incumbent providers. We recommend only extending Freetown to where there are coverage gaps and no private sector options are available. Each identified gap should be discussed with the incumbent service providers to assess viability of a public private partnership to fill the gap.

8.3.2 Proposed Routes

The City of Maple Ridge should not build the proposed 54.1km future conduit/fibre extension currently under consideration.

We recommend that the City should only consider conduit and/or fibre extensions where there are demonstrable cost savings.

8.3.3 Contracted Segments or Operations

We recommend the City should assess whether it is to the City's advantage to contract the build and/or operation of a Municipal Network to a third party or whether it would be of greater advantage to create a department internally to manage and operate the network.

We recommend that, once the final route and facilities are decided for the Municipal Network, the City should seek competitive proposals from the incumbent providers to possibly build and/or manage the network and possibly fulfill some or all the necessary connections.

8.4 Telecommunications Coordinator

We believe a single point of contact for City departments as well as providers and residents will be essential for future expansion of facilities, to implement a Connected Community Strategy, and to assess and report on the successes.

We recommend Maple Ridge create a full-time Telecommunications Coordinator position to be responsible for supporting the ongoing telecommunications needs of the City and the implementation of telecommunications infrastructure. This role would serve as the face of the Connected Community Strategy.

The Telecommunications Coordinator would be responsible for coordinating with internal and external stakeholders and providers to promote and expand the availability of reliable telecommunications services throughout the City. The position would require a clear role and responsibilities. A detailed Job Description for a Telecommunications Coordinator position is included as Appendix F.

8.5 Update/Establish Municipal Policies

We recommend that the City should review and update its policies as to how they impact broadband and the establishing of a Connected Community Strategy.

8.5.1 Update Conduit Installation Policy

We recommend that the existing conduit installation policy should continue to serve as a guideline for future service provider or City installations, but it should be updated to reflect current construction practices.

8.5.2 Update Antenna Policy

We recommend that the City's Antenna Siting Policy should be reviewed and updated. Specific attention should be paid to the inclusion of smaller towers and the fixture of antennae to other types of structures (poles, buildings, etc.). Specific sections pertaining to Small Cell installations as outlined in this document should be included.

8.5.3 Establish Municipal Access Agreement (MAA)

We recommend that the City should develop a standard Municipal Access Agreement to expedite the processing of building applications. The MAA should be extended to include small cell applications particularly in regard to adherence to local aesthetic standards and environmental regulations. The starting point should be the FCM and CRTC model templates and details should be negotiated with the incumbent service providers using a collaborative approach.

8.5.4 Proactive Conduit Placement

For many years the City has installed conduit as part of other capital works projects. This has allowed almost 30km+ of conduit to be installed at minimal cost. However, the majority of the conduit remains empty and unused. Unless the City develops its own use for the conduit, it may well remain unused because, as detailed in this report, providers typically are reluctant to share facilities or conduit.

We recommend against further proactive conduit placement except for proposed route necessary required to create an Alternative Municipal Network that would extend service to the identified facilities of interest. This includes not proceeding with the pending proposed extension beyond the current routes.

8.5.5 Dig Once Policies

We recommend against adopting a Dig Once policy. In our experience, providers typically prefer to build, own and maintain their own facilities and promote their proprietary facilities in their marketing. In our experience Dig Once policies often add costs and delay construction.

8.5.6 Adapt Lougheed Transit Corridor Development Guidelines[29]

We recommend the inclusion of design direction provisions for telecommunications infrastructure similar to those suggested in the LTC-DPA Guidelines for street furniture, greenspaces, and public art.

8.5.7 Bylaw and Zoning

We recommend a review and update of the City's local development bylaws and zoning to include provisions for a Connected Community within the powers granted to cities under the BC Building Code[30].

Development Approval

In today's connection dependent world broadband infrastructure is far too important to the City and residents to be an afterthought added to a developer's plans. The installation of infrastructure needed to deliver and support connectivity should be a requirement for all new builds or extensive renovations of existing properties, be they commercial or residential.

The requirements and rules should be codified and a commitment to comply on the part of the builder should be required before the City approves and issues permits for projects.

In the case of a large scale residential or commercial development, the City might also consider including a requirement to provide land for the erection of a tower or the building of a shelter in which to install telecom facilities.

Building Requirements

Almost 20 years ago, as documented by the Intelligent Community Forum[31], the city of Loma Linda, California followed a similar approach to support to create a Connected Community. In consultation with residents and property developers, Loma Linda established what it called The Loma Linda Standard for all new residential and commercial construction as well as projects to remodel or renovate that affected more than 50% of a structure. The standard defined how internal cabling, the "wiring closet," the demarcation and external conduit networks were to be constructed to ensure that every resident or tenant of every building had the potential to access high-speed broadband services. Moreover, taking proactive steps to ensure all new construction has sufficient conduit access for future broadband capacity.

We recommend Maple Ridge should consider adopting its own Connected Community standard(s) and codify these measures in the permit application process.

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[29] https://mapleridge.ca/DocumentCenter/View/28821/LTC-DPA-Guidelines
[30] https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/guides/buildingactguide_sectiona1_june2015_web.pdf
[31] https://www.intelligentcommunity.org/loma_linda_california

8.6 Convene Discussions with Incumbent Service Providers

Before continuing tactical activities toward building any network infrastructure, and after establishing the Connected Community Strategy, the City of Maple Ridge should convene discussions with the incumbent service providers. The discussions should address service gaps in the new development areas, technology options for connecting City infrastructure like pumps and traffic cabinets, free WiFi for residents, and costs for connecting the key City sites.

8.7 Small Cell & Expanded WiFi

A Connected Community Strategy is built on a commitment to provide ubiquitous broadband connectivity. The preferred approach is to install fibre backbone and fibre to the premises (FTTP) wherever possible. Today 50/10Mbps is seen as the Universal Service Objective, but that will evolve as connectivity requirements evolve. Fibre ensures that network infrastructure will be scalable to allow future upgrades as connectivity requirements evolve.

As important as fibre is to a Connected Community, a truly connected community needs more than just fixed broadband connectivity – it requires reliable broadband everywhere. To achieve ubiquitous broadband, a truly connected community requires both an extensive fibre network and extensive wireless coverage typically using WiFi or cellular technology.

Currently Shaw, Telus and the City all offer WiFi service across much of Maple Ridge.

While WiFi is an important component of a Connected Community Strategy, we recommend, that the city should only expand Freetown WiFi to areas where private sector providers choose not to provide WiFi service.

In addition to WiFi, it is essential for the City of Maple Ridge embrace small cell technology. Currently providers use LTE as the standard for wireless or mobile broadband. LTE is the fourth generation of mobile technology (4G). Mobile broadband is in transition from 4G to 5G or fifth generation mobile. Small cell technology allows for much higher connection speeds than 4G. However small cell technology does not have the transmission range of 4G which means it requires more transmitters than existing 4G networks. 5G with higher throughput and smaller coverage requires small cell technology to be effective at the densities required by a modern mobile network.

In the past Maple Ridge has resisted the installation of cellular transmitters and towers. However, in our opinion, the successful implementation of a Connected Community Strategy in Maple Ridge, with ubiquitous connectivity, will require the transition to small cell technology and expanded WiFi.

We recommend Maple Ridge consult with providers to work together to find WiFi and Small Cell solutions that satisfy the needs of both sides. We are including links to policies adopted in other communities which seem to address health and aesthetic concerns Maple Ridge might have.

- https://www.smallcellforum.org/work-items/advocacy-and-policy/
- https://www.smallcellforum.org/small-cells-and-health/
- https://www.townofmilton.org/sites/g/files/vyhlif911/f/uploads/milton_small_cell_policy_4-10-2019.pdf
- https://www.city.fortbragg.com/home/showpublisheddocument/1480/637719260990500000

8.8 Connected Community Levy

Funding municipal broadband projects is always challenging. Until now Maple Ridge has minimized the cost of installing conduit and fibre by piggy-backing construction with other municipal construction projects. Given the scope, implementing its Connected Community Strategy will require direct funding by the City.

When confronted with a similar challenge the Town of Caledon in 2016 introduced a Municipal Broadband Levy of roughly $11 per household per year to support development of broadband initiatives. In this model, all households, regardless of current connectivity, contribute to the overall strategy in the interests of economic development of the entire region.

The levy began in 2016 and was expected to generate $300,000 per year. The levy will continue until the Caledon fibre build, being managed by a third party, is complete.

- https://www.caledon.ca/en/town-services/internet-levy.aspx?hdncontent=#Background
- https://www.caledon.ca/en/town-services/internet-levy.aspx?hdncontent=

We recommend Maple Ridge consider introducing a Connected Community Levy if funding is needed to help offset any costs associated with implementing its Connected Community Strategy. These could include the costs associated with staffing and deployment.

9. Appendix A – Technology Primer

9.1 Digital Subscriber Line (DSL)

Copper twisted pair and DSL are the common technology used by legacy telephone service providers like Bell. There are multiple ITU specifications for DSL, these include ADSL, VDSL, and G.Fast. The maximum Internet speeds that can be achieved with copper twisted pair and DSL decreases as the distance between the Digital Subscriber Line Access Multiplexer (DSLAM) and the DSL modem increases. The relationship between loop length and performance (speed) is a major limiting factor for DSL deployments, and it becomes a bigger challenge in rural areas where it is not practical to move the DSLAM close enough to the subscribers to achieve competitive speeds.

9.2 Hybrid-Fibre Coaxial (HFC Cable)

Hybrid Fibre Coax (HFC) networks are commonly deployed by legacy cable companies. The capabilities of these networks will depend on the bandwidth (number of RF channels) and how the channels are allocated (how much is given to each service). Unlike DSL, distance is not a significant consideration, full capabilities can be achieved at distances of up to 160 km. Typical node sizes are in the range or 100 to 400 homes passed, the service and bandwidth is shared by all the subscribers in the serving area or node. Cable companies drive node sizes smaller to reduce the amount of bandwidth sharing (reduce oversubscription) in the access network to improve speeds and customer experience. The latest deployed generation of technology allows for reliable speeds exceeding 1 Gbps downstream and 60 Mbps upstream and beyond. A cable operator with a modern HFC plant could in theory create an 8 to 10 Gbps pipe toward the subscribers (downstream) and a 300 Mbps+ upstream pipe. In common practice, the downstream pip is between 1.5 and 5 Gbps and the upstream pipe is limited to under 200 Mbps as the system must also support legacy video and other services.

Even with the current technologies, upstream speeds are a slight disadvantage for HFC cable as it cannot meet the capabilities of FTTP technologies. HFC upstream speeds will be limited in the long term to 100 to 200 Mbps compared to the option to upgrade to a Gbps or better using FTTH.

9.3 Fibre-to-the-Premises/Fibre-to-the-Home

Fibre-to-the-Premises (FTTP) is quickly becoming the main wired access network technology. Most operators are deploying FTTP in green field (new) deployments. Service providers are upgrading brown field plant in areas with very old copper plant or in areas where the competition is expected to be significant.

Fibre-to-the-Premises (FTTP) has many advantages over legacy copper and HFC network technologies. There are four main FTTP technologies being deployed today. These are Active Ethernet, Gigabit Passive Optical Network ("GPON"), Ethernet Passive Optical Network

("EPON"), and XGS Passive Optical Network ("XGS-PON"). Active Ethernet provides a direct fibre link from the central location to the customer.

GPON, EPON, and XGS-PON are shared fibre technologies where one fibre is used to deliver the service to an area, this fibre is then split to feed the pocket of subscribers. Although there is a distance limitation (about 20 to 30 km depending on the deployment and technology chosen) this is significantly higher than DSL. The distance limitation can also be stretched further by installing a remote Optical Line Terminal (OLT) closer to the subscribers.

For GPON, EPON, and XGS-PON one fibre leaves the central location, and it is split in the field between 16 and 64 times (32 being the most common deployment) to feed individual subscribers. Depending on the technology the group of homes shares either 1, 2.5, or 10 Gbps of capacity on the FTTH network. Unlike other technologies, PON be upgraded to provide up to 10 Gbps service.

9.4 Wireless

Although wireless technologies have progressed to provide some very high speeds, they cannot compete with the current capabilities of HFC Cable and FTTP. Wireless technologies do have some advantages as there is no need to provide a wire or fibre to each customer.

9.4.1 WiFi6

WiFi6, which has already been deployed in Maple Ridge with "Freetown" WiFi, is the latest generation wireless data transmission technologies offering high Internet access speeds to end users. WiFi6 is primarily targeted as a private LAN (local area network) technology for consumer use where a WiFi6 network is used to /distribute/ existing high-speed Internet access in an indoor location to consumer devices such as mobile phones, tablets, laptops and IoT (Internet of things) gadgets.

WiFi6 uses license-exempt wireless spectrum bands (2.4GHz, 5GHz, and 6GHz) so that neither consumers nor the device manufacturers need to pay any royalties for the use of the airwave resources, making it a low-cost option. However, the disadvantage is that these bands are shared with other devices (such as microwave ovens in the 2.4GHz band) so degradation of communication is possible in some cases. WiFi6 can share the new 6GHz unlicensed band; this is referred to as "WiFi 6E"

The expected main use of WiFi6 is regular Internet access such as accessing web pages, downloading games/software, streaming video, and audio-video conferencing (including conventional phone calls). WiFi6 includes the "Target Wake Time" (TWT) technology which makes it more friendly to consumer IoT (Internet of things) devices such as temperature or humidity sensors. In a residential home setting it is expected that WiFi6 will be competing with other wireless technologies optimized for low data rate and low power such as Bluetooth Low Energy (BT-LE) and Zigbee (such as in Philips Hue smart light bulbs).

In a typical residential or commercial setting a WiFi6 network can deliver 400-900 Mbit/s. One WiFi6 AP (access point) is typically needed for every level and every few rooms. In an outdoor setting, a WiFi6 AP can achieve similar speeds with distribution every 100 meters in a dense urban environment or around 300 meters in a open field setting. The theoretical upper limit of WiFi6 performance is around 9.6Gbps, but this assumes perfect conditions and future expensive hardware.

9.4.2 Fixed Wireless Point-to-Point/Multipoint RF and Microwave

These technologies "broadcast" wireless signals from a tower located at a central location via either RF or microwave to a receiver at the customer's "receiver" location (usually located on a rooftop or on a small tower). The RF or microwave spectrum can be licensed or unlicensed. These technologies have been deployed by many operators to reach rural customer that could not be practically reached by landlines.

Point to multipoint implementations use a "broadcast" tower location within the service area (typically at the central location) with multiple multipoint sectors (each feeding in a different direction). The bandwidth in each sector will be shared between all the subscribers in that sector. Due to the shared bandwidth, most of these systems are usually limited to 10 Mbps to 25 Mbps service packages but service providers are beginning to launch technology that can deliver the universal basic service of 50 Mbps by 10 Mbps.

Fixed wireless speeds are influenced by distance from a "broadcast" tower. The technology can typically reach many kilometres, depending on design, but longer distances from the tower yield lower speeds.

Systems with lower frequencies will typically have a longer reach. These systems operate in either licensed or unlicensed spectrum in the range of 700 MHz to 5 GHz.

These systems will require Line of Site (LoS) between the "broadcast" tower and each subscriber's receiver. The implementation often requires small towers at the subscriber home. A site survey is usually required for each subscriber as part of the sales cycle to verify LoS and to also check for terrestrial interference. Rogue carriers are often found operating using unlicensed spectrum in licensed spectrum areas, but unlicensed spectrum can be crowded by multiple uncoordinated providers and deliver unreliable, unacceptable download/upload speeds.

LTE/4G

Long Term Evolution/Fourth Generation (LTE/4G) wireless technology is currently being used by several large service providers. These systems are also point-to-multipoint technologies and can operate in licensed and unlicensed spectrum. Depending on the operating frequency a reach of 5 km is possible with optimum performance. These distances can be stretched to 30 km with

some performance degradation. Speeds of 100Mbps are possible with smaller cell sizes but as with any point-to-multipoint system the bandwidth is shared, and speeds may be significantly lower due to congestion. Longer distances can typically provide a 10 Mbps service.

5G

Fifth Generation or 5G is the next generation of advanced wireless systems. Globally 5G deployments have started to ramp up. The deployment of 5G is broken down into two frequency ranges. The first range (Frequency Range 1/FR1) operates below 6 GHz. The second frequency range (Frequency Range 2/FR2) operates in the mm wave band above 20 GHz. In comparison, 4G operates in the 700 MHz to 2.6 GHz range depending on the operator. In the FR1 bands 5G can provide internet speeds that are slightly better than what is possible with the older 4G technology (10 to 100 Mbps depending on distance and congestion levels), in FR2 range significantly higher speeds are theoretically possible, conceivably up to 1 Gbps.

The new 5G deployments will require smaller cell sizes than 4G required. With the older 4G technology macrocells could be as large as 30 km but the larger cells came at the expense of performance, optimal cell sizes of 5 km or less (picocells) maximized the performance. The spectrum used by 5G is operating at a higher frequency requiring much smaller cell sizes, FR1 is expected to be in the 2 km range, FR2 in the sub-100m range. In general, for all wireless technology, as the frequency increases the distance decreases. There are also expected to be significant real-world deployment challenges in the FR2 spectrum as these radio waves will also be absorbed and interfered with by trees and building construction (use of metal or brick). The smaller cell sizes will provide a capacity advantage for 5G as smaller cell sizes have fewer customers competing for bandwidth (less congestion).

It is anticipated the required range will be 500-1000m meaning FWA 5G radios will need to be densely installed and require fibre backhaul. There is debate in the industry in regard to the economics of FWA 5G vs FTTP in rural markets.

9.5 Low Earth Orbit Satellite

Traditional communications satellites, known as Geostationary Earth Orbit satellites (GEOs), are large (often the size of a school bus), on average take 5 years to design and build, are expensive to build averaging $500M and expensive to launch, again averaging $500M. GEO satellites typically orbit the earth at an average height of 36,000km. As the GEO satellite is in a stationary orbit above the equator it does not move in comparison the ground station.

Low Earth Orbit satellites (LEOs) are quite different from GEOs. LEOs are small (typically less than 100Kg), can be designed, built, and launched in months as opposed to years, and are relatively inexpensive to build and launch, typically less than $1M in total. LEOs orbit relatively close to Earth's surface at altitudes ranging from as low as 160Km above the earth to 1000Km above Earth.

The fact that LEO satellites orbit quite close to Earth means they are well suited for high-speed data transmission. It takes far less time to transmit and receive data from a LEO satellite orbiting at less than 1,000Km than from a GEO satellite orbiting at 36,000Km. In other words, LEOs are well suited for broadband transmission while GEOs are not.

LEO satellites typically work as part of a combination of multiple satellites, known as a constellation, to allow them to provide unimpeded coverage to the ground. The low orbit means the satellites are not stationary, they are in constant motion. The earthbound receive stations must switch between satellites as they move in and out of range. A constellation of LEO satellites essentially creates a 'net' around the earth, and this allows them to cover large areas by working together with one or multiple satellites within range to ensure full coverage.

As the demand per subscriber and/or the number of subscribers increases the number of satellites must also increase to maintain the same oversubscription ratio. This is not unlike HFC or wireless networks where the number of nodes or serving groups increase to meet increased subscriber demand. This is expected to be a challenge with LEO deployments if large scale adoption occurs.

Appendix B –Simple Network Cost Assumptions

This appendix outlines the underlying cost assumptions used in the project networks costs. The costs are presented as design concepts with budgetary numbers for assessing the options. Sufficient care is taken to assess the viability and high-level design requirements of the various options as to produce rational budgetary expectations but if any project outlined herein were to be undertaken, a detailed engineering exercise would need to be conducted before commencement.

In general, the core of Maple Ridge is very difficult to deal with since the pavement and sidewalks leave almost no green space to work with when doing underground directional bore. This is in contrast to the residential and rural areas where the range is from some green space to wide open. The municipal regulations on concrete sidewalk and pavement replacement will play a central role in the cost to build. In some jurisdictions the full sidewalk bay is required to be replaced. This is done for future sidewalk integrity so that undermined bays, those that have been bored, do not heave, and become a municipal liability. If pavement cuts are required, then full restoration would be expected with most jurisdictions requiring up to a metre on each side of the cut to be repaved. If day lighting, the process of fully opening the underground facilities, is required then the costs go up by an increase in the requirements for hydro-vac. Given the disparities, the cost model changes based on the area covered.

Conduit/Fibre Placement

Conduit/Fibre Distribution

The cost to install conduit and fibre distribution varies widely between providers, local geographies, and installation methods. It is not uncommon to hear ranges from $30 per metre or less in ideal conditions with low-cost methods to hundreds of dollars per metre in challenging terrain or urban settings with more complex methods. In our experience, any reliable estimate must consider the full costs of installation and must be field tested. For instance, aerial fibre might be estimated at $18-20 per metre to install, plowing in the side of the road is considered a low-cost installation method that is often estimated around $30 per meter, and buried fibre in conduit could be installed in the range of $60-$90 per metre depending on conditions. Our modelling assumes a build out will consist entirely of buried conduit installation. Buried fibre is assumed to be installed using directional boring. This analysis does not consider trenching in any of the desired areas. The core of Maple Ridge is very difficult to deal with since the pavement and sidewalks leave almost no green space to work with when doing underground directional bore leading to substantially higher costs as opposed to the less urban areas. There is significant cost risk in using existing conduit or abandoned pipelines because the condition must be assessed, and remediation may be necessary to make the conduit usable. This can only be determined during detailed engineering.

Engineering costs in our modeling are estimated at $2.75 per metre for underground. For the analysis we used a blended rate of $75/m to place conduit and $3.50/m to install fibre in the conduit. The model designs contemplate 72 and 144 count fibre in 50mm high-density polyethylene conduit/duct. We assume fibre-optic splice enclosures and vaults or ground-level-boxes at a minimum rate of 3 per kilometre and a minimum of one 8-way splitter for vault and one 4-way splitter for every four 8-ways. We carry a fibre crew splice set of $500 at every vault and the main location and assume splices for half of the total fibres (assuming even distribution of drops). Materials costs are driven from recent vendor quotes.

Official quotes from fibre contractors would be required to confirm the estimates included in this report should any project proceed but in our experience these estimates are conservative. Moreover, there may be additional costs to engineering and ancillary hardware installations.

Fibre Drops

Fibre Drops are the segments of fibre cable installed between the pole or the roadway and the subscriber's home or business. The fibre drop can be buried directly in a trench or run through a buried duct/conduit or installed above ground aerially. The way the fibre drop is installed, and the distance between the road and house, will greatly affect costs. For example, homes on large rural lots are often located at considerable distance from the roadway and, as a result, have expensive drop costs.

For our models we assume average fibre drop lengths of 30m for the target area using 2-count fibre drop cable, a consistent total cost of $500 for drop installation, $45 for drop hardware, plus the cost of the actual drop fibre based on the average length of the drop. For municipal sites we assume a 200m drop length and small-scale Cisco demarcation switches at $250 each.

Fibre Infrastructure Maintenance

When operating the physical fibre infrastructure regular maintenance of the outside (fibre, duct, strand) and inside (batteries, connections, etc.) plant is required. For budgetary purposes, we estimate annual costs of $250 per km for fibre/plant maintenance in all scenarios. On 545.1km the totally annual fibre maintenance budget is $136,275.00.

Access and Network Hardware

Fibre Access Network ("PON")

Providing Internet services through a Passive Optical Network ("PON") requires access network hardware. While other varieties of technology are possibilities, XGS-PON was used to develop our budget models. XGS-PON can provide up to 10 Gbps service.

In our models the XGS-PON platform typically consists of Optical Line Terminators (OLTs) at deployed in remote environment cabinets with backup power. For budget purposes, each OLT is designed for 256 individual GPON subscribers based on a 16-way split in the field over 16

GPON ports. Each port initially supports 2.5 Gbps in the downstream direction toward the subscriber and 1.25 Gbps in the upstream with 10G uplinks to the core network and an upgrade path to 10G. We budget one OLT for every 800 premises passed at a cost of $56,981.23.

We have developed our models using this approach because it assures that all subscribers can receive a consistent 150Mbps service with no oversubscription. It is common in the industry to oversubscribe the services based on the assumption that not everyone will use the network at the same time. It would be cheaper to build if the network were built using a 32-way or 64-way split, rather than the 16-way split we assume for our model, but the level of service to customers would not be assured under load, meaning when there is heavy use of the network, and future scalability would be limited.

Common XGS-PON vendors to be considered consist of Calix, Adtran, Nokia (Alcatel) and Huawei. Nokia and Huawei have large market shares globally while Calix and Adtran are strong in North America.

Point of Presence Facilities ("PoP")

A Point of Presence ("PoP") is where an access network (fibre or wireless) connects to the backbone Internet connections. It is the location where all the main network hardware for a service provider is installed. Any network serving the City will require a Primary PoP where the core infrastructure hardware will be housed. For municipal purposes we assume this site to be the existing IT facilities, but also recognize that the dormant data centre may be pressed into service for a broadband public utility. We budget $50,000 for PoP site conditioning.

Internet Transit

Any network build in the City of Maple Ridge can leverage the existing Internet connection relationships, IP addresses, and autonomous system number. Connecting additional municipal facilities is expected to add non-material incremental operating costs but building a broadband public utility would require substantial core network Internet capacity. We estimate the capacity requirements at 3Gbps of Internet transit per 1,000 subscribers. Our budget model includes the costs of $20,000 in one-time costs for interface upgrades and $1,500.00 per month per 1 Gbps of Internet Transit connection. At a target of 10,000 subscribers, the annual cost for Internet transit is projected at $540,000.00.

Core Network Hardware

The core network hardware includes the switching and routing capacity to connect the access network to the Internet. Core network routers and switches are assumed to be provisioned with redundancy by including a redundant supervisor/route engine where applicable and redundant power supplies and the core routing will be deployed in pairs.

Common core switching and routing manufacturers in the industry consist of Cisco, Juniper, and Huawei. Cisco is by far the most dominant, according to IDC Cisco had 38.8% of the combined

service provider and enterprise router revenue for 2018 globally. Huawei followed behind Cisco however most of their deployment base is in Asia and overseas. Juniper carried 14% of the market share and is widely recognized as a more cost-effective yet carrier-grade option for core and MetroEthernet networking. Both Cisco and Juniper have a considerable deployment base in North America and Cisco and Juniper certified personnel are more prominent. Each core PoP site is proposed to include a UPS, a generator, and an out-of-band management device. Budgetary estimates for the overall core network include a Core Routing Pair at $54,681.60, Server Switch Pair at $3,194.88, Generators, engineering, and UPSs at $60,750.00, Out-of-Band Access Devices at $3,054.00, and Optics at $24,000.00.

Operational Support Systems

To provide a consistent level of service, Subscriber Management and Service Monitoring will be essential. As with the network components the Operational Support System (OSS) should also be high availability with built-in redundancy. Ideally multiple physical servers are installed at the Primary PoP site with OSS functions operating in a virtualized environment.

For budgetary purposes products and services related to the service delivery and monitoring platform that consists of two redundant servers operating in a virtualization cluster. For budgetary purposes, a basic Dell PowerEdge R6515 configuration with additional budget for OSS software is used as the reference. The model budget amount is $37,500.00.

Subscriber Management System

This software subsystem is responsible for activating and supporting customers including provisioning protocols, DNS, and tracking. A typical system would operate on the budgeted hardware and carry a model budgetary cost of $65,000.00.

DNS and Tracking

The service delivery platform will need to provide Domain Name Service (DNS) resolution for the subscriber devices as well as to provide a linkage between subscriber device and assigned IP address. As subscriber devices are assigned IP addresses from the DHCP process, dynamic DNS entries (dDNS) will be generated and tracked based on the end point and subscriber details. Subsequent abuse complaints or law enforcement requests can then be dealt with promptly through an administrative query in the subscriber management web portal to determine which subscriber device initiated the network abuse. This is particularly important in Canada with the legislation changes as of January 1, 2015 and the requirement for the Notice-Notice regime.

All ISPs in Canada are required to forward copyright notice complaints on to the end user of the IP address at the time of the infringement, inform the complainant that notice has been provided and store a record of the notice for six months. If notice cannot be forwarded the complainant must be informed that notice could not be forwarded and why.

The DNS and tracking components would be part of the Subscriber Management System.

Network Management and Reporting

This subsystem is responsible for monitoring the network and providing intelligence to technical support representatives. The monitoring system will provide historical views on the overall network health and real time alerting capabilities for various services and components. The configuration of network monitoring is essential to effective network troubleshooting. This holds true both for real time monitoring as well as post-mortem analysis. Using such tools will help ensure smooth operations and provide service level assurance. Network management costs are including in the Subscriber Management System budget.

Billing System

This subsystem is responsible for rendering invoices, tracking services and hardware, and managing payments. Several service provider billing platforms exist including Great Lakes Data Systems, NISC iVue, and CSG. The model budget includes a small system billing system at $100,000.00.

Vendor Maintenance

Hardware maintenance coverage when available should be purchased for all networking equipment that comprise the core and access networks, whether existing or new. Since all core network components should provide path level redundancy both from a circuit and hardware perspective, then a minimal maintenance level can be maintained.

Based on the reference equipment included in our model, maintenance agreements are budgeted at $25,000 per year.

Customer Support

Management

Any proposed network would require an operations manager, an engineering technologist, and a customer support team to oversee operations. While it is conceivable that simple conduit/fibre extensions continue to be managed by the existing staff complement, any substantial extension should consider budget for additional staff. The model budget includes $25,000.00 per month for management roles.

Technical Support

A competitive Internet service provider would require a technical support team and guidelines. This includes support documentation for customers, operating hours for technical support, clearly defined escalation procedures and service call requirements. We have budgeted $60,000.00 for the initial build and implementation of support processes.

Technical support can be classified into three Tiers with Tier 1 being the front line taking direct phone calls and/or answering electronic communications from customers. Tier 1 provides basic assistance answering questions, providing service details, and basic troubleshooting of network

related issues. Tier 2 is escalated to for more complex issues and ultimately major network related issues are passed to Tier 3.

Tier 1 Customer Support

Tier 1 customer support fields questions from subscribers about both billing and technical issues and can be outsourced to third parties in the range of $5 per subscriber per month depending on the hours of service and call volumes.

Tier 2/3 Technical Operations Support

Tier 2/3 technical operations handles larger scale network problems and provides support to the front line. This support can be delivered in-house or also outsourced with a budget of $10,000.00 per month.

Field Services and Installations

Most field services and installation can be outsourced, and initial installation costs are captured in the customer premises equipment (CPE) installation costs. There will however be a requirement for a field services vehicle and staff training to support the ongoing operations. An additional budget of $15,000 per month is included to account for a field technician and vehicle.

Sales/Marketing and Miscellaneous

A new municipal broadband public utility will require a budget for sales and marketing efforts as well as other miscellaneous expenses such as legal, regulatory, and office expenses. The initial budget includes an initial $135,000.00 for a) development of standardized marketing services description and sale processes, and b) branding, website, marketing launch, and related legal/admin fees. Thereafter we use a model budget of $5,000.00 per month.

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Appendix C – Stakeholders Consulted

Providers

- Galaxy Broadband
- Rogers Communications
- Shaw Communications
- Telus Corporation
- Xplornet Communications
- Zayo Group

Officials

- Kimberly Armour — Referrals Manager, Katzie First Nation
- Laura Benson — Sustainability Action Plan
- Dave Cooke — Tower assets
- Christina Crabtree — GM, Corporate Services
- Darrell Denton — Property Manager
- Wendy Dupley — Director, Economic Development
- Chuck Goddard — Director of Planning
- Bruce Livingstone — Business Retention & Economic Development
- Wendy Mahat — Police Services
- Gillian Meyer — IT, Administration
- Derek Mitchell — Manager Operations, Kwatlen First Nation
- Walter Oleschak — Acting Director, Engineering
- David Pollack — GM Engineering
- Danielle Pope — Parks & Facilities
- Valoree Richmond — Director Parks & Facilities
- Sean Serediuk — IT, Manager Infrastructure & Security Services
- Forrest Smith — Director, Engineering & Asset Management
- Karen Stewart — Chief Information Officer
- Michael Van Dop — Fire Chief
- Nicole Walsh — Purchasing Agent

Resources

- Flori Chaykowski — Executive Director, Maple Ridge BIA
- Blair Fryer — Manager, Comm & Economic Development, New Westminster
- Dare Sholanke — Project Manager, BCNet
- Geoff Samson — Manager, Strategic Projects, City of Surrey

Selected Reference Documents

1. City of Maple Ridge Strategic Plan 2019-2022
2. Sustainability Action Plan
3. Lougheed Transit Corridor Study
4. Maple Ridge Town Centre Concept Plan
5. Yennadon Lands
6. Economic Development Strategy, November 2021
7. New Era Maple Ridge
8. Telecommunications Antenna Structure Siting Policy
9. Smart Surrey
10. Smart Surrey Broadband Strategy
11. City of New Westminster – Project Greenlight
12. City of Vancouver Digital Strategy, April 2013
13. Parks, Recreation and Culture Master Plan, June 2010

Appendix D - Survey Questionnaire

1. Are you the business owner: Yes____No____
2. Are you the person responsible for Internet at your business? Yes_____No_____
3. Do you have Internet at your business? Yes____ No____
   If yes, are you satisfied with quality of service? Yes____No_____

4. What type of Internet service do you have at work? Wireless___ Cable___ Fibre___
5. Who is your provider?
6. What is your monthly cost?
7. Do you have Internet service at home? Yes____ No____
   If no, why not._____

   If yes, are you satisfied with quality of service? Yes____ No____

8. What type of internet service do you have at home? Wireless____ Cable____Fibre____
9. Are you satisfied with the speed you have? Yes____ No____
10. Who is your Internet provider?
11. What is your monthly cost?
12. What are your primary uses of the Internet?
    Work_____

    Email_____

    Education_____

    Entertainment_____

    On-line shopping_____

    Gaming_____

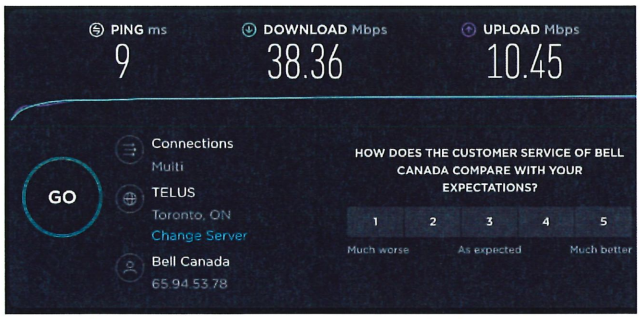
    Streaming video_____

13. Has your Internet usage changed over the past 2 years? Yes____No____
14. Do you work remotely? Yes____ No____
15. Do you use the Internet for on-line education instead of in-person learning?
Yes____ No____

16. What is most important to you?
Speed_____Reliability_____Price_____No contract_____Other_____

17. Could you confirm your actual upload and download speed? Could you please do a speedtest? A sample screenshot is below.

https://www.speedtest.net/



Enter your results: Ping ms:_____ Download Mbps:_____ Upload Mbps:_____

18. Location: Could you give us your postal code? (This will allow us to map quality of service and providers throughout Maple Ridge) _____

Appendix E – Parks That Might Benefit From Broadband

Parks Master List 2022-02-25 1

Destination Parks

Park Name	Location
Albion Fairgrounds	23588 Jim Robson Way / 23448 Jim Robson Way
Allco Park	13255 Alouette Road
Jim Hadgkiss Park & Museum	22520 116 Ave
Maple Ridge Golf Course	20818 Golf Lane
Maple Ridge Park	13180 232 St / 23280 132 Ave
Memorial Peace Park / Leisure Center	11930 224 St
Port Haney Wharf (Storey Green)	22400 River Road
Telosky Stadium / Thomas Haney Center & Skate Park	23000 116 Ave
Whonnock Lake	27871 113 Ave

Sports / Events Parks

Park Name	Location	
Albion Fairgrounds	23588 Jim Robson Way / 23448 Jim Robson Way	Events
Albion Park	24460 104 Ave / 24539 102 Ave	Sports
Albion Sports Complex	23778 104 Ave	Sports
Cliff Park	25086 116 Ave	Sports
Garibaldi Secondary School	24725 Dewdney Trunk Rd.	Sports
Golden Ears Field	23125 116 Ave	Sports
Hammond Stadium	20601 Westfield Ave / 11509 207 St	Sports
Maple Ridge Golf Course	20818 Golf Lane	Sports /Events
Maple Ridge Lawn Bowling & Tennis	11445 232 St	Sports
Memorial Peace Park / Leisure Center	11930 224 St	Events
Merkley Park / MRSS (Maple Ridge Secondary School)	22008 124th Ave / 21970 124th Ave	Sports
Port Haney Wharf (Storey Green)	22400 River Road	Events
Rotary Sports Field / SRT (Samuel Robertson technical School)	10445 245 St	Sports
Telosky Stadium / Thomas Haney Center & Skate Park	23000 116 Ave	Sports
Westview School Turf Field	20905 Wicklund Ave	Sports
Whonnock Lake	27871 113 Ave	Events

Parks with Irrigation

Park Name	Location
Albion Park	24460 104 Ave / 24539 102 Ave
Albion Sports Complex	23778 104 Ave
Alexander Robinson Park	23761 118 Ave
Cliff Park	25086 116 Ave
Hammond Stadium	20601 Westfield Ave / 11509 207 St
Memorial Peace Park / Leisure Center	11930 224 St
Merkley Park / MRSS (Maple Ridge Secondary School)	22008 124th Ave / 21970 124th Ave
Telosky Stadium / Thomas Haney Center & Skate Park	23000 116 Ave

Appendix F – Telecom Coordinator Job Description

The Telecommunications Coordinator is responsible for supporting the ongoing telecommunications needs of the City and the implementation of telecommunications infrastructure by coordinating with internal and external stakeholders and providers to promote and expand the availability of reliable telecommunications services throughout the City. Specifically, the Telecommunications Coordinator will:

- Gather input from and provide communications to residents, business, the local committees, and local service providers in support of an ongoing and evolving Connected Community Strategy.
- Facilitate execution of broadband and other telecommunications projects, including acting as the primary point of contact for collocation applications and processes, right-of-way agreements and utility feasibility reviews, review of suitability of proposed network routes, and assisting local service providers and new entrants with navigating City and Provincial processes and approvals.
- Track and respond to broadband-related inquiries from service providers, investors, local businesses, industry, community groups and the general public; address all concerns from residents and business owners related to broadband availability.
- Pursue and coordinate local, provincial, and federal funding opportunities that may further support the development of broadband in the City's underserved or emerging development areas.
- Work with various City departments to ensure timely and consistent feedback or approvals throughout the implementation process.
- Conduct independent research and make recommendations on opportunities that may advance the achievement of the broadband priorities, including policy recommendations.
- Prepare and deliver regular updates to senior management, Committees, and Council.

The successful applicant will hold the follow qualifications:

- Successful completion of university or college program in information systems, technology, or business management.
- Previous experience with a telecommunications company in a business development capacity or a system expansion planning or infrastructure project management capacity.
- Knowledge of broadband network expansion projects, real estate development, communications and business development, and urban/rural utility and infrastructure construction projects.
- Proven proficiency with various computer software applications, including Microsoft Office (Word, Excel, PowerPoint), web technologies, and desktop publishing
- Working knowledge of geographic information systems and basic mapping skills.
- Project management skills
- Excellent interpersonal, verbal and written communication and customer service skills.

The Telecommunications Coordinator must maintain a valid drivers license, have access to a vehicle for business purposes, and may be required to travel about the community.

Glossary

ADSL2: Asymmetrical Digital Subscriber Line Version 2.

ARIN: American Registry for Internet Numbers, is the Regional Internet Registry (RIR) for North America and some islands in the Caribbean.

ASN: An autonomous system number is a unique number that's available globally to identify a network connected to the Internet.

Billing System: A business support system responsible for rendering invoices, tracking services and hardware, and managing payments.

Border Gateway Protocol (BGP): A standardized exterior gateway protocol designed to exchange routing and reachability information among autonomous systems on the Internet.

Broadband: An always-on, high-speed connection to the Internet through the facilities of an ISP that provide[s] download throughput of greater than 1 Mbps (2009). In this Report, broadband is defined as 50 Mbps download, 10 Mbps upload, as per the CRTC's universal service objective (2016).

Cable: Refers to Internet Service Providers or other services provided via coaxial cable.

CIDR: Classless Inter-Domain Routing, is a way of interpreting IP addresses which allow increased flexibility when dividing ranges of IP addresses into separate networks promoting more efficient use of IP addresses.

CIRA: The he Canadian Internet Registration Authority is a member-based not-for-profit organization, best known for managing the .CA internet domain on behalf of all Canadians, developing and implementing policies that support Canada's internet community.

Core Network Hardware: Includes the switching and routing capacity to connect the access network to the Internet.

CPE: Customer premises devices are the equipment placed in a household to deliver services.

CRTC: The Canadian Radio-television and Telecommunications Commission is an independent public authority in charge of regulating and supervising Canadian broadcasting and telecommunications.

DSL Digital Subscriber Line: Copper, phone-line-based internet services.

DSLAM: Digital Subscriber Line Access Multiplexer (used in DSL deployments).

DNS: Domain Name System, stores and associates many types of information with domain names, but most importantly, it translates domain names to IP addresses.

DOCSIS: Data over Cable Service Interface Specification

Dark Fibre: Optical fibre infrastructure that is in place but is not connected to in-service transmission equipment.

EPON: Ethernet Passive Optical Network

Fibre Drop: A fibre drop is the segment of fibre cable installed between the pole or the roadway and the subscriber's home. The fibre drop can be buried directly in a trench or run through a buried duct/conduit or installed above ground aerially.

Fibre Optic Splice Closures ("FOSC"): Fibre optic splice closures are used to protect stripped fibre optic cable and fibre optic splices from the environment. Outdoor fibre optic enclosures are usually weatherproof with watertight seals.

Fibre (shorthand for "optical fibre"): The medium and technology associated with the transmission of information as light pulses guided over a filament of transparent dielectric material, usually glass or plastic.

FTTP/FTTH Fibre-to-the-Premises/Fibre-to-the-Home: Describes a fibre optic line being delivered directly to a household or business. The terms FTTP and FTTH refer to the same technology and are interchangeable.

FTTN Fibre-to-the-Node/Neighbourhood: Describes a fibre optic line being delivered to a local "central office" or another neighbourhood node.

Geographic Information System (GIS): A system for storing and manipulating geographical information on computer.

Gbps / Gigabits-per-second: a measure of internet speed. One gigabit is equal to one thousand megabits.

GPON: Gigabit Passive Optical Network

Ground-level Boxes ("GLB"): A pedestal or vault that is installed along the network route for the purposes of distributing the physical connections and holding equipment.

Internet Backhaul: The connection of individual hub or PoP sites back to a primary Internet connection.

Internet Transit: The connection of a local network to the outside Internet.

Internet Transport: The connections that carry network traffic between Internet network access points and link last mile connections to a local for Internet Transit.

ISED: Innovation, Science and Economic Development Canada, is the department of the Government of Canada with a mandate of fostering a growing, competitive, and knowledge-based Canadian economy.

ISP: An Internet Service Provider connects subscribers over an access network technology to the backbone Internet.

Lit Fibre: Optical fibre infrastructure attached to in-service transmission equipment. (See also "Dark Fibre").

LOS: Line of sight is the level of obstruction on the path between two points determining visibility from one point to another and the quality of signal reception for wireless transmissions.

LoRaWan: A long-range low power, low bit-rate wide area networking protocol designed to wirelessly connect battery operated 'things' to a network.

Low Earth Orbit Satellites ("LEOs"): LEOs orbit relatively close to Earth's surface at altitudes ranging from as low as 160Km above the earth to 1000Km above Earth.

LTE "Long Term Evolution": A standard for mobile broadband communications, part of the fourth generation of mobile telecommunications technology (4G).

Mbps: Megabits per second. A standard measure of internet speed. One megabyte is equivalent to 1,024 Kilobytes.

Multi-homed: Connecting a local network to multiple upstream Internet Transit connections.

Municipal Access Agreement ("MAA"): A MAA details the requirements on any telecommunications companies proposing to install equipment within a municipality's jurisdiction.

Network Access Point ("NAP"): An interconnection point where an Internet service provider (ISP) establishes peering arrangements to provide Internet connectivity to customers.

Open Access Network ("OAN"): A network that allows all ISPs and competitors to pay to use a common infrastructure to reach subscribers.

Operational Support System ("OSS"): Software component that enables a service provider to monitor, control, analyze, and manage services on its network.

Optical Line Terminator ("OLT"): Aggregation device used in passive optical networks services on the service provider side.

Optical Network Terminal ("ONT"): Subscriber device used in passive optical networks service on the customer end.

OSS: An operational support system is a software component that enables a service provider to monitor, control, analyze, and manage services on its network.

Passive optical network ("PON"): A PON uses fibre optic cable to deliver broadband to users. An optical fibre uses unpowered (passive) fibre optic splitters to divide the fibre bandwidth among customers. Passive optical networks are often referred to as the last mile between an ISP and its customers. A GPON refers to a PON capable of delivering gigabit service to customers.

Peering: A process by which two Internet networks connect at a NAP and exchange traffic. It allows the ISPs to directly hand off traffic between each other's customers, without having to pay a third party to carry that traffic across the Internet for them.

Point of Presence ("PoP"): A Point of presence site is the aggregation point of an access network where equipment resides and connects to the Internet backbone.

Public-private partnership ("PPP"): Defined as a long-term contract between a private party and a government agency for providing a public asset or service, in which the private party bears significant risk and management responsibility.

Subscriber Management System: This software is responsible for activating and supporting customers including provisioning protocols, DNS, and tracking

Universal Broadband Fund ("UBF"): Federal broadband funding program. Administered through department of Industry Science and Economic Development. Funds up to 75% of eligible expenses in broadband projects.

Universal Service Objective ("USO"): The CRTC's Universal Service Objective for fixed Internet access service is that all Canadians have access to speeds of at least 50 megabits per second (Mbps) download and 10 Mbps upload, with the option of an unlimited data allowance.

VDSL2: Very-High-Bit-Rate Digital Subscriber Line Version 2

MAPLE RIDGE
British Columbia
mapleridge.ca

City of Maple Ridge

TO:	His Worship Mayor Michael Morden and Members of Council	**MEETING DATE:**	May 24, 2022
		FILE NO:	11-5380-01
FROM:	Chief Administrative Officer	**MEETING:**	Workshop

SUBJECT: **Single-Use Item Reduction Bylaw**

EXECUTIVE SUMMARY:

At the April 12, 2022 Council meeting, staff were directed through a Notice of Motion to prepare a single-use and other items bylaw for consideration. This direction is consistent with the Engineering Department's 2022 workplan.

In 2018, the City of Victoria was the first Province in British Columbia to pass a Single-Use Item Reduction Bylaw; however, shortly thereafter the validity of the bylaw was challenged. Eventually, the BC Court of Appeal ruled that it should have been enacted under the municipal power to pass bylaws for the protection of the natural environment, which required approval from the (then) Minister of Environment prior to adoption. This decision is final given that the Supreme Court of Canada declined to hear the City of Victoria's appeal.

Since then, the Province has acknowledged overlap between local and provincial jurisdiction and have established Ministerial Order M309 (Attachment A) to provide municipalities a mechanism to implement Single-Use Item Reduction Bylaws. On April 22, 2022, the Province, through the Ministry of Environment and Climate Change Strategy, announced the release of its *Preventing Single-Use and Plastic Waste in British Columbia* Intentions Paper (Attachment B). This Intentions Paper is open for feedback until June 21, 2022. Once the City's approach regarding single-use items has been determined, staff will determine if feedback to the Province is required.

On December 25, 2021, the Government of Canada published *Proposed Single-Use Plastics Prohibition Regulations* (Attachment C) for consultation purposes. At this point an implementation schedule is unknown, however, it is anticipated that the federal plastic bans will compliment local bylaws and would prohibit the manufacture, import, and sale of six categories of single-use plastics (i.e. checkout bags, cutlery, foodservice ware made from or containing problematic plastics, ring carriers, stir sticks, and straws).

Following the Provincial Ministerial Order, jurisdictions within Metro Vancouver identified the importance of a regionally harmonized approach for those municipalities that want to enact bylaws in advance of province-wide regulations. Following consultation with the general public and industry stakeholders, Metro Vancouver published the *Regionally Harmonized Approach to Municipal Single-Use Item Reduction Bylaws* (Attachment D). City staff recommend implementing a bylaw consistent with this regional approach.

The purpose of this report is to obtain Council approval to prepare a Single-Use Item Reduction Bylaw consistent with the regionally harmonized approach established by Metro Vancouver with the understanding that the City will review the provincial and federal regulations when adopted to determine their impact on the City bylaw.

RECOMMENDATION:

That staff prepare a Single-Use Item Reduction Bylaw consistent with the regionally harmonized approach for consideration.

DISCUSSION:

a) Background Context:

At the April 12, 2022 Council meeting, staff were directed through a Notice of Motion to prepare a single-use and other items bylaw for consideration. This direction is consistent with the Engineering Department's 2022 workplan.

Plastics are among the most universally used materials in modern society, however, many single-use plastic items are difficult to collect and recycle, given their size and material type. Metro Vancouver's 2021 Waste Composition Audit, generated the following summary table of single-use items disposed of in the Metro Vancouver region in 2018, 2020 and 2021.

	2018		2020		2021	
SUI Item	**Items/ capita**	**Total items (millions)**	**Items/ capita**	**Total items (millions)**	**Items/ capita**	**Total items (millions)**
Retail Bags	101	256	117	318	116	321
Cups	102	262	64	174	98	271
Containers	70	179	95	259	65	180
Straws	40	102	34	92	33	91
Utensils	130	331	49	135	80	221
Totals	**443**	**1130**	**359**	**978**	**391**	**1082**

Further, in British Columbia, single-use and disposable items account for almost all of the top 12 most collected items from beach cleanups in BC.

<u>Existing Municipal Bylaws</u>

In 2018, the City of Victoria was the first Province in British Columbia to pass a Single-Use Item Reduction Bylaw. Shortly thereafter, a challenge to the validity of the Victoria bylaw was dismissed by BC Supreme Court and the Victoria bylaw came into effect on July 1, 2018. In July 2019, the BC Court of Appeal overturned the Supreme Court decision and declared the Victoria bylaw invalid on the grounds that it was an environmental measure rather than a business regulation. As such, the Court of Appeal ruled that it should have been enacted under the municipal power to pass bylaws for the protection of the natural environment, which required approval from the (then) Minister of Environment prior to adoption.

On January 23, 2020, the Supreme Court of Canada declined to hear the City of Victoria's appeal and the Court of Appeal's decision is final.

Since then, the Province has acknowledged overlap between local and provincial jurisdiction and have established Ministerial Order M309 (Attachment A) to provide municipalities a mechanism to implement Single-Use Item Reduction Bylaws. A survey of member municipalities in early April 2022 found that many members without bylaws were waiting for confirmation of the federal and provincial regulations. At the same time, several bylaws came into effect in 2022 and some members are moving forward with plans to develop bylaws that align with the regionally harmonized approach (however each is slightly different).

- City of Vancouver's bylaws were effective January 1, 2020 for foam, April 22, 2020 for straws and utensils, and January 1, 2022 for cup fees and bags;
- City of Surrey's bylaw became effective October 21, 2021;
- City of Richmond's bylaw became effective March 27, 2022;
- City of Port Moody's bylaw became effective April 22, 2022;
- City of Delta's bylaw becomes effective June 6, 2022;
- City of Coquitlam approved their Environmental Sustainability plan in January 2022 which included a priority action to "implement a single-use item bylaw that reflects the regional approach developed by Metro Vancouver"; and
- On February 28, 2022, City of Burnaby Council requested staff to draft a single-use plastics reduction bylaw for enactment prior to the end of 2022 which will follow the regionally harmonized approach.

Outside of the region:

- Tofino, Ucluelet, and Chilliwack banned plastic utensils in advance of the proposed federal ban; and
- At their April 21, 2022 meeting, the City of Victoria Committee of the Whole unanimously supported the staff's three policy recommendations:
    - utensils and packets of condiments only by request;
    - require reusable foodservice ware; and
    - $0.25 fee for any take-out cup or container.

The bylaws above are summarized into a Regional Summary Matrix included as Attachment (B).

Provincial Actions

Ministerial Order M309, established on July 26, 2021, sets out what BC municipalities are authorized to implement with respect to Single-Use Item Reduction Bylaws without requiring additional approvals from the Minister of Environment and Climate Change Strategy. While the Ministerial Order allows for increased overall harmonization, municipalities may select different approaches for some items and provide different exemptions. The order also sets out a minimum transition time of six months for a business to comply with the new regulations once a bylaw has been enacted.

Further, on October 26, 2021, the Ministry of Environment and Climate Change Strategy announced updates to the provincial regulatory framework that will allow province-wide bans. The first phase of new regulations is expected in early 2023.

On April 22, 2022, the Province, through the Ministry of Environment and Climate Change Strategy, announced the release of its *Preventing Single-Use and Plastic Waste in British Columbia* Intentions Paper (Attachment B). This Intentions Paper is open for feedback until June 21, 2022 and describes how the Province would continue to enable municipal governments to take actions on single-use and plastic waste, recognizing that a number of BC municipalities have already enacted related bylaws. In addition, the Province is seeking input on ideas for future actions to prevent single-use and plastic waste.

Federal Actions

On December 25, 2021, the Government of Canada published *Proposed Single-Use Plastics Prohibition Regulations* (Attachment C) for consultation purposes. At this point an implementation schedule is unknown, however, it is anticipated that the federal plastic bans will compliment local bylaws and would prohibit the manufacture, import, and sale of six categories of single-use plastics (i.e. checkout bags, cutlery, foodservice ware made from or containing problematic plastics, ring carriers, stir sticks, and straws).

Regional Harmonized Approach

Following the Provincial Ministerial Order, jurisdictions within Metro Vancouver identified the importance of a regionally harmonized approach for those municipalities that want to enact bylaws in advance of province-wide regulations. A regionally harmonized approach would assist in consistent customer experience and improve efficiencies for businesses operating across the region. Accordingly, at direction of the GVS&DD Board, Metro Vancouver staff developed a regionally harmonized approach through iterative engagement with member jurisdictions and industry stakeholders. Overall, the goal of single-use item reduction is to reduce single-use items overall. This means not just swapping single-use plastic items out for alternatives such as single-use paper, wood, or "compostable" plastics and moving towards more durable, reusable products.

Metro Vancouver held a webinar on October 13, 2021 for industry and other stakeholders to provide input and feedback on the harmonized approach to municipal Single-Use Item Reduction Bylaws. An online questionnaire was posted on the single-use items webpage from September 28 to October 25, 2021, asking how the respondents' organization would be affected by regional harmonization, and if there was anything Metro Vancouver should consider when developing a regionally harmonized approach.

The majority of respondents supported the idea of a regionally harmonized approach. Common themes from the feedback included:

- support for a regionally harmonized approach to Single-Use Item Reduction Bylaws;
- request for clarification on current exemptions in existing bylaws;
- concerns over requirement for businesses to report the number of bags distributed;
- concerns that the proposed regional approach is not stringent enough and needs to include more items; and
- harmonizing fees on bags.

Reporting of bags distributed would be on an as-requested basis and with reporting based on the fees collected by the businesses.

Businesses asked for sufficient lead time to comply with bylaws. Under the Ministerial Order, a mandatory six-month minimum transition period following bylaw adoption is required prior to bylaw requirements taking affect.

Following consultation with the general public and industry stakeholders, Metro Vancouver published the *Regionally Harmonized Approach to Municipal Single-Use Item Reduction Bylaws* (Attachment D). This approach is summarized in the Table 1 below.

Table 1: Summary of Regionally Harmonized Approach to Municipal Single-Use Item Reduction Bylaws

Approach	Items
Ban	Plastic bags, plastic straws (not required for medical or accessibility needs), plastic stir sticks, and foam service ware containers
Minimum fees	$0.25 for recycled bags, $2.00 for reusable bags
Only on request by customer	All utensils regardless of material, alternatives to plastic straws
Reporting	The number of recycled paper and reusable bags distributed in the past 12 months on an as-requested basis based on the fees collected.

Given that the regionally harmonized approach has recently been issued, of the Single-Use Item Reduction Bylaws which pre-date it, each vary slightly. However, going forward, the majority of municipalities considering implementing a Single-Use Item Reduction Bylaw are signaling that they will proceed forward with a bylaw consistent with the harmonized approach. Accordingly, City staff recommend implementing a bylaw consistent with the harmonized approach. A summary of the current bylaws established in the region are provided (Attachment E).

For ease of comparison, a summary table of the hierarchy of restrictions between municipal, provincial and federal governments is provided (Attachment F). Should the City move forward and implement a Single-use Item Reduction Bylaw in advance of the provincial and federal regulations, the City will review the bylaw against these new regulations when adopted.

b) Desired Outcome:

Reduce single-use items by transitioning to more durable, reusable products.

c) Strategic Alignment:

A Single-Use Item Reduction Bylaw is aligned with Council's Natural Environment Strategic Priority – be alert to opportunities to care for the natural environment, to mitigate impacts on wildlife and to utilize natural assets to grow eco-tourism opportunities.

d) Citizen/Customer Implications:

Citizen implications are noted in Table 1 above. Further, the City has initiated discussions with the BIA and intend on incorporating feedback when drafting a Single-Use Item Reduction Bylaw and include feedback in subsequent staff reports.

e) Interdepartmental Implications:

Engineering staff will work with the Planning Department Environmental staff, Economic Development, Bylaws, and Legislative Services when drafting and implementing the bylaw.

f) Policy Implications:

Creation of a Single-Use Item Reduction Bylaw consistent with the regionally harmonized approach.

g) **Alternatives:**
Defer consideration of a municipal bylaw until the provincial and federal regulations have been implemented.

CONCLUSION:

It is recommended that the City implement a Single-Use Item Reduction Bylaw consistent with the regionally harmonized approach established by Metro Vancouver. This will provide a consistent customer experience and improve efficiencies for businesses operating across the region while significantly reducing the amount of waste generated from single-use items.

Prepared by: **Forrest Smith, P.Eng.**
Director of Engineering

Approved by: **David Pollock, P.Eng.**
General Manager Engineering Services

Concurrence: **Scott Hartman**
Chief Administrative Officer

Attachments:

(A) Provincial Ministerial Order M309
(B) Clean BC - Preventing Single-Use and Plastic Waste in British Columbia Intentions Paper
(C) Canada Gazette, Part 1, volume 155, Number 52: Proposed Single-Use Plastics Prohibition Regulations
(D) Metro Vancouver - Regionally Harmonized Approach to Municipal Single-Use Item Reduction Bylaws
(E) Comparison of Regional Single-Use Item Reduction Bylaws
(F) Summary of Regional, Provincial and Federal Efforts

PROVINCE OF BRITISH COLUMBIA

REGULATION OF THE MINISTER OF ENVIRONMENT AND CLIMATE CHANGE STRATEGY

Community Charter

Ministerial Order No. M309

I, George Heyman, Minister of Environment and Climate Change Strategy, order that the Spheres of Concurrent Jurisdiction – Environment and Wildlife Regulation, B.C. Reg. 144/2004, is amended as set out in the attached Schedule.

July 26, 2021
Date

G Heyman
Minister of Environment and Climate Change Strategy

(This part is for administrative purposes only and is not part of the Order.)

Authority under which Order is made:

Act and section: *Community Charter*, S.B.C. 2003, c. 26, s. 9 (4)

Other: M71/2004

R10476196

SCHEDULE

1 The Spheres of Concurrent Jurisdiction – Environment and Wildlife Regulation, B.C. Reg. 144/2004, is amended by repealing section 1 and substituting the following:

PART 1 – INTERPRETATION

Definition

1 In this regulation, **"Act"** means the *Community Charter*.

PART 2 – PEST MANAGEMENT

Definitions for Part 2

1.1 In this Part:

"alien invasive species" means the species listed in sections 1 and 2 of the Schedule;

"dangerous wildlife" has the same meaning as in the *Wildlife Act*;

"excluded pesticide" has the same meaning as in the Integrated Pest Management Regulation, B.C. Reg. 604/2004.

2 The following Part is added:

PART 3 – PLASTIC WASTE REDUCTION

Definitions for Part 3 and interpretation

3 (1) In this Part:

"accessible straw" means a drinking straw made wholly of plastic that is not compostable or biodegradable, has a corrugated section that allows the straw to bend and maintain its position and is individually wrapped in paper;

"checkout bag" means a paper or plastic single-use supplementary bag;

"introductory period" means a period that may be set by a municipality during which there is a reduced minimum charge for the provision of a recycled paper bag or a reusable bag;

"item" means the applicable of the following:

(a) a bag;

(b) a service ware container;

(c) a utensil;

(d) a drinking straw;

"plastic" includes compostable and biodegradable plastic;

"polystyrene foam", when used in reference to an item, means an item made primarily of polystyrene foam;

"recycled paper bag" means a paper checkout bag that meets the criteria described in subsection (2);

"reusable bag" means a bag that is designed and manufactured to be used and machine-washed at least 100 times;

"service ware container" means a container that is ordinarily provided for service of prepared food or beverages and includes a cup, plate, bowl, tray, carton or lidded container;

"single-use", when used in reference to an item, means the item is provided for a single use or a short-term purpose;

"small paper bag" means a paper bag that is less than 15 cm by 20 cm when flat;

"stir stick" means an item that is designed and manufactured to stir beverages;

"supplementary", when used in reference to an item, means an item that is provided to a customer by a business to facilitate the transport of a purchase from the business, or consumption of a product, including prepared food that is purchased for take-out or delivery;

"used bag" means a checkout bag or a reusable bag that has been previously used and is being reused;

"utensil" includes a spoon, fork, knife, chopstick or stir stick.

(2) In order to be considered recycled for the purposes of this Part, a paper checkout bag must contain at least 40% recycled paper content, and have a reference printed on the outside of the bag to the applicable amount of recycled content with the word "recyclable".

Application of this Part

4 The authority to make a bylaw under section 5 to regulate, prohibit and impose requirements in relation to the protection of the natural environment does not apply to the sale of single-use items that are sold as a product, ordinarily in sets of multiple items.

Authority of municipality

5 (1) For the purposes of section 9 (4) (a) (i) of the Act, a municipality may, by bylaw, regulate, prohibit and impose requirements in relation to the protection of the natural environment under section 8 (3) (j) of the Act as set out in this section and in accordance with this Part.

(2) Subject to subsections (3), (4) and (5), a municipality may, by bylaw, do any of the following:

(a) prohibit a business from providing any of the following single-use supplementary items:

(i) checkout bags other than

(A) recycled paper bags, or

(B) used bags;

(ii) polystyrene foam service ware containers;

(iii) plastic utensils;

(iv) plastic drinking straws;

(b) if the municipality has prohibited a business from providing checkout bags under paragraph (a) (i), require that a business provide a recycled paper bag or a reusable bag to a customer only on payment of a minimum charge for each bag, as follows:

(i) subject to subparagraph (ii), a charge of at least

(A) $0.25 for each recycled paper bag, and

(B) $2 for each reusable bag;

(ii) if the municipality sets an introductory period, a charge during the introductory period of at least

(A) $0.15 for each recycled paper bag, and

(B) $1 for each reusable bag;

(c) if paragraph (a) (iii) or (iv) does not apply, require that a business provide the following, as applicable, to a customer only on request by the customer:

(i) a single-use utensil;

(ii) subject to the exemption under subsection (4), a drinking straw made of a material other than plastic;

(d) set out exemptions to the bylaw, including the exemption under subsection (4), if applicable, to the prohibitions and requirements under this subsection;

(e) require that a business report to the municipality the distribution of items governed by a bylaw made under this section.

(3) If a municipality makes a bylaw prohibiting a business from providing checkout bags other than recycled paper bags under subsection (2) (a) (i),

(a) the bylaw must provide for the payment of a minimum charge for recycled paper bags or reusable bags under subsection (2) (b), and

(b) the bylaw must include an exemption from the payment of the minimum charge for the following:

(i) used bags;

(ii) small paper bags;

(iii) in the case of prescribed pharmaceutical drugs or devices, recycled paper bags.

(4) If a municipality makes a bylaw prohibiting plastic drinking straws under subsection (2) (a) (iv), the bylaw must have an exemption so that businesses would not be prevented from providing an accessible straw on request by a person with disabilities or due to medical reasons.

(5) The authority of a municipality to make a bylaw under this section does not include the authority to permit businesses to collect, use or disclose personal information for considering a person's entitlement to an exemption in respect of the bylaw.

Exemptions to be considered and plan for implementation and enforcement

6 A municipality that intends to make a bylaw under section 5 must

(a) consider appropriate exemptions in respect of the bylaw, including exemptions for

(i) persons with disabilities,

(ii) medical reasons,

(iii) a hospital or any facility licensed as a community care facility under the *Community Care and Assisted Living Act*, and

(iv) in the case of a charge referred to in section 5 (2) (b), reasons of financial hardship,

(b) establish a plan for

(i) implementation of the bylaw, which may include setting an introductory period of not more than 12 months for the charge referred to in section 5 (2) (b) (ii), and

(ii) enforcement of the bylaw, and

(c) set a date for the bylaw to come into force that is at least 6 months after the date the bylaw is adopted by council.

Charge not a fee payable to municipality

7 An amount charged in accordance with the authority referred to in section 5 (2) (b) must not be collected by the municipality as a fee payable to the municipality.

ATTACHMENT B

PREVENTING SINGLE-USE AND PLASTIC WASTE IN BRITISH COLUMBIA
INTENTIONS PAPER

BRITISH COLUMBIA | cleanBC
our nature. our power. **our future.**

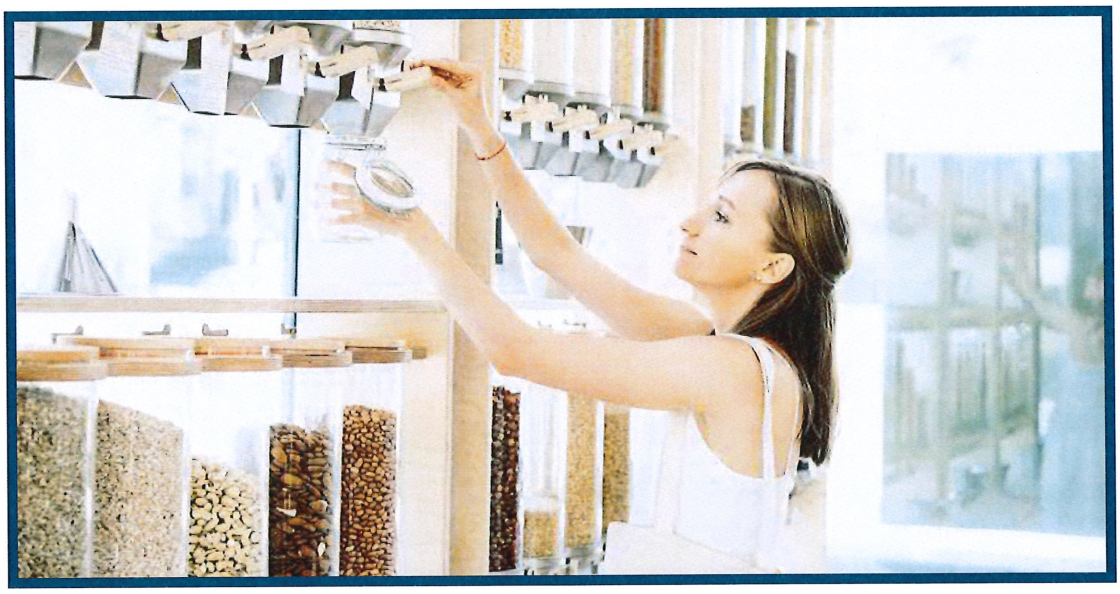
Contents

Background

British Columbians use and throw out billions of single-use items every year. Single-use items include a range of products that are designed to be used once and are typically disposed of after one or a few uses. In B.C. producers of plastic and packaging must collect and pay for a wide variety of household plastics and packaging to be recycled through a system called Extended Producer Responsibility (EPR). However, many single-use items are difficult to recycle as they are often small or are made of plastic that is hard to recycle; and because they are often used away from the home, they are hard to collect. Additionally, single-use and disposable items account for almost all the top twelve most collected items from beach cleanups in B.C.

The federal government recently announced its plan to ban six types of single-use items. Several municipalities in B.C. have also started taking action on single-use plastics. Bans are one step towards eliminating harmful plastic items, but if we are to successfully address the use of and waste from single-use items in B.C., a combination of tools and policies are needed.

The Ministry of Environment and Climate Change Strategy is proposing the development of a new waste prevention regulation to reduce the impacts of single-use and plastic waste on the environment. The proposed approach addresses the most problematic single-use items in British Columbia and puts forward actions to address the full life cycle of plastics, moving B.C. to a circular economy approach. In a circular economy, nothing is 'waste'. The circular economy retains and recovers as much value as possible from resources by reusing, repairing, refurbishing, remanufacturing, repurposing, and recycling products and materials. The proposed regulations would adopt this approach by ensuring the value of the items that do enter our economy can be retained and are not designed to become waste.



Where are we now?

2019

April

CleanBC Plastics Action Plan and public engagement on four key policy areas – bans, advancing EPR, reducing plastics in the environment, reducing plastics overall.

2020

June

Refundable deposit for beverage containers raised to 10 cents

August

$14.83M Clean Coast Clean Waters initiative launched

September

Five municipal bylaws banning single-use items approved

December

$5M CleanBC Plastics Action Fund launched

2021

February

Four more municipal bylaws banning single-use items approved

April

$5M added to the Clean Coast Clean Waters Initiative

July

Municipalities given authority under the Community Charter to regulate specific single-use items

September

Extended Producer Responsibility (EPR) Five-Year Action Plan published

October

Government of BC joins the Canada Plastics Pact

November

Environmental Management Act amended to regulate single-use products

2022

February

Milk and milk alternative containers added to deposit-refund system

April

Evaluation of Industrial, Commercial and Institutional (ICI) packaging and paper management

Proposed waste prevention regulation intentions paper and public engagement launched

2023

January

EPR programs operational for single-use items and more types of packaging

December

First phase of proposed waste prevention regulation in effect

2024

Second phase of proposed waste prevention regulation in effect

2025

EPR programs for mattresses, compressed cannisters, fire extinguishers and medical sharps operational

Identify ICI packaging and paper recycling policy

2026

EPR programs for hybrid and electric vehicle batteries and other battery types operational

KEY

Bans —

Advancing EPR —

Reducing plastics in the environment —

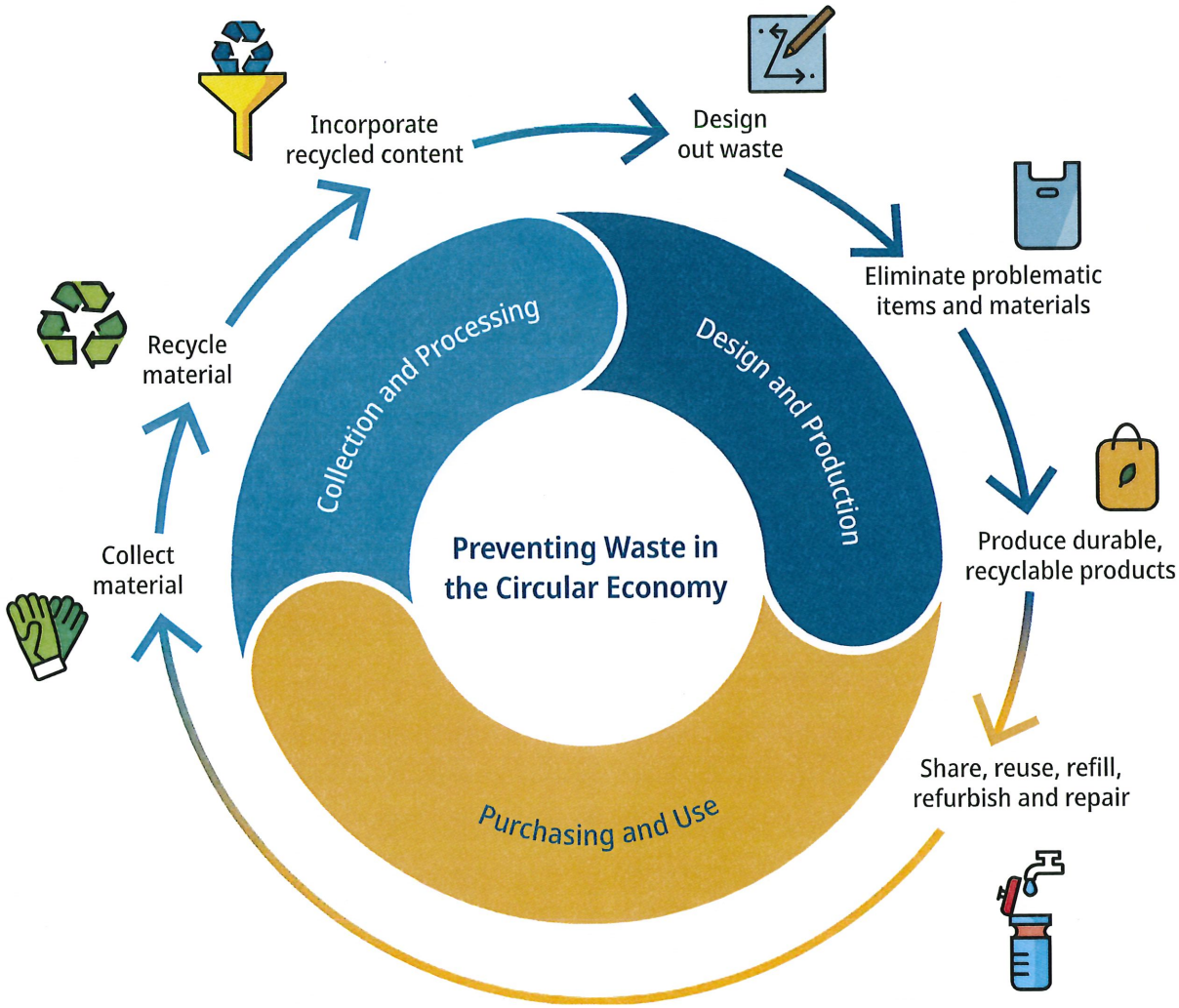
Reducing plastics overall —

Where are we heading?

We are working to move plastics into the circular economy. Much of our economy is currently based on a "take-make-waste" system - where we take resources from the environment, make products, and when we are done with them, they are thrown away as waste, often in landfills. In a circular economy, we can reduce waste by limiting the number of single-use items we use, stop using materials that are difficult to reuse or recycle, and keep what we do use working for us for longer.

By moving plastics into the circular economy, we will reduce our reliance on a constant flow of new raw materials and offer environmental benefits in both urban and remote communities by reducing litter and the volume of material going to landfill. It can also provide opportunities for small businesses and innovators, including reuse and recycling service providers, product designers, entrepreneurs thinking of new ways to provide zero waste services, and more.

We are using a combination of strategic policy, investment, and regulation to stimulate the movement of plastics into the circular economy in British Columbia.



Design and Production

It's easy to think that waste and pollution are inevitable by-products of the things we make and do. By changing how we design and make products we can minimize the creation of waste and pollution in the first place.

The **EPR 5-Year Action Plan** will expand the range of packaging and products producers are responsible for recycling and managing, in turn increasing the incentive to design better. For single-use and plastic items that are more difficult to recycle the proposed provincial **waste prevention regulation** will either ban or significantly limit their use. This builds on the change in **regulation under the Community Charter** that enabled municipal action on single-use plastics. Government is also exploring options for recycled content standards that would require designers and producers to use more recycled material to make their products.

Purchasing and Use

By sharing, leasing, reusing, refilling, refurbishing, and/or repairing items we can make materials go further and last longer. This saves raw materials and reduces waste, while creating new economic opportunities.

The proposed **waste prevention regulation** will help to increase the use of everyday reusable items (e.g., durable checkout bags, cutlery) by limiting the availability of single-use disposable items. B.C. Municipalities are also encouraging businesses in their communities to switch to reusables by introducing bylaws under the **Community Charter** that either ban or limit certain single-use items. Meanwhile, **EPR** compels producers to follow the waste prevention hierarchy. This means that producers are expected to prioritize reduction and reuse over recycling. The Province may also consider additional tools and policies that could facilitate reuse, refill, and repair in the future.

Collection and Processing

Sometimes there is a limit to how many times an item can be reused or repaired, but the materials it is made of are still valuable. These materials can be collected and used as the 'raw' materials for making new products. In many cases, these 'secondary raw materials' can be used just like traditional raw materials. Over time this will mean that less raw materials are needed, and greenhouse gas emissions from mining, processing and using virgin materials will be reduced.

The **EPR 5-Year Action Plan** will require industry to establish and fund provincewide recycling programs for a range of new packaging and products, such as more single-use items, electric vehicle batteries and mattresses; increasing the number of items that will be sent for recycling and remanufacturing. The Action Plan also demonstrates B.C.'s position as a leader in recycling by being the first in North America to commit to identifying a policy approach to improve the way packaging and paper in the industrial, commercial and institutional sector is managed.

In addition, the **Clean BC Plastics Action Fund** launched in 2020 has helped kickstart B.C.'s circular economy by enabling businesses to reduce their use of virgin plastics and make better use of post-consumer recycled plastic in manufacturing processes. The **Clean Coast Clean Waters** initiative has enabled the collection of over 500 tonnes of marine plastics and debris from our coastline, maximizing the amount of material reused and recycled.

Co-ordination with federal and municipal actions

Preventing single-use plastic pollution and waste requires effort at all levels of government. Over a dozen municipalities in B.C. have already passed bylaws banning one or more single-use items since 2020, aided by the Minister's changes to the *Spheres of Concurrent Jurisdiction – Environment and Wildlife Regulation* in 2021 to make it easier for them to move more quickly to prevent plastics from polluting their communities. We also know from previous engagement that local governments and industry want plastics to be regulated at the highest possible level of government.

In 2021, the federal government announced its intention to ban six types of single-use items, specifically plastic checkout bags, cutlery, stir sticks, drinking straws, ring carriers and foodservice ware made from or containing problematic plastics. This regulation is expected to come into effect by the end of 2022.

The proposed provincial waste prevention regulation will both provide greater consistency for citizens and businesses across B.C. and expand on the proposed federal regulation. The regulation will ensure that the use of unnecessary single-use plastics in the province not only stops but that B.C. moves plastics and their alternatives into the circular economy where reuse, repair, recycling and remanufacture are the norm.

1.0 Policy overview

The Province is moving plastics into the circular economy, where unnecessary or challenging to manage plastics are eliminated, and the plastics that are used stay in the economy and out of the environment. This shift will increase the number of times items are used, and how long they are used for before being recycled or thrown out when no longer of value. Opportunities to replace single-use with reusable items exist – from grocery bags to foodservice ware to refillable packaging. Reuse provides wide-ranging benefits, including reduced environmental impacts from waste, pollution and resource extraction, as well as potential cost savings for businesses.

Plastic packaging and single-use items are rapidly increasing in Canada's economy, and have been identified as a significant issue – creating harm to the environment and potential harm to human health. In B.C., over 2.5 million tonnes of waste are disposed of each year – an average of 500 kg per person[1]. Of this waste, an estimated 10-20% is plastic, including plastic packaging, food containers, beverage containers, bags, overwrap and other durable plastic items. In 2019, the Ministry of Environment and Climate Change Strategy led public engagement on the CleanBC Plastics Action Plan. Over 35,000 British Columbians responded, and 94% of participants reported being concerned about the problem of plastic waste.

The federal government is proposing to ban the manufacture and import of plastic checkout bags, straws, cutlery, stir sticks, flexible ring carriers and problematic takeout containers by 2022/23. Followed by a ban on the sale of these items a year later.

This intentions paper proposes complementary provincial actions to reduce single-use and plastic waste through a new regulation prohibiting or limiting their use. The intention of the provincial regulation is to work in co-ordination with the federal regulation, ensuring consistency between the two jurisdictions while further supporting British Columbians' desire to address plastic waste. This paper also discusses further provincial support for municipal government actions

Definitions in this paper:

Checkout bag: A paper or plastic single-use bag provided to a customer to transport purchased items.

Disposable foodservice accessories: Used as part of food or beverage service or packaging, these include all single-use straws, cutlery, stir sticks, sachets, condiment packets, napkins, cold cup lids, cup sleeves, food and beverage trays, and any other similar accessory or accompanying disposable item.

Foodservice packaging: All food packaging used for serving or transporting perishable food packaged and sold in British Columbia. This includes packaging for food that requires further preparation such as heating, cooking or boiling (e.g., meat trays, egg cartons, produce and bulk food bags, deli containers, clamshell containers, lidded containers, cartons, cups, plates and bowls).

HDPE (#2) plastic: High-density polyethylene

LDPE (#4) plastic: Low-density polyethylene

Oxo-degradable plastic: Plastic material with additives that, through oxidation, lead to the fragmentation of the plastic material into micro-fragments or to chemical decomposition.

PET (#1) plastic: (PETE) Polyethylene terephthalate

Plastic checkout bag: This includes compostable, biodegradable and conventional plastics; with handles.

PP (#5) plastic: Polypropylene

Recycling: The reclamation of materials in such a manner that they can be used to displace the primary or raw materials they were produced from.

Reusable bag: A bag that is designed and manufactured to be used and machine washed at least 100 times.

Single-use or disposable product: A product that is ordinarily disposed of after a single or short-term use, whether the product could be reused. It is recognized that some single-use items can be used more than once (e.g., checkout bags used as garbage bags). However, the item is not designed to be durable, washable or routinely used for its original purpose multiple times before disposal.

1 Municipal Solid Waste Disposal in B.C.

to regulate single-use and plastic items. These measures build upon existing work by the Province to reduce single-use and plastic waste, including expanded recycling and extended producer responsibility programs, and funding new recycling, processing and collection of plastics through the CleanBC Plastics Action Fund and the Clean Coast Clean Waters Initiative.

The proposed waste prevention regulation aims to reduce the impacts of single-use and plastic items, and the amount of single-use and plastic waste found in the environment, by:

- **Moving plastics into B.C.'s circular economy:**
  - **Phasing out unnecessary single-use and plastic items;**
  - **Promoting a shift to durable reusable options; and**
  - **Ensuring necessary single-use and plastic items are recycled or composted.**
- **Providing a consistent provincewide approach to regulating single-use and plastic items.**

2.0 What have we heard about bans, single-use and plastic items?

In 2019, the Province consulted on the CleanBC Plastics Action Plan. The resulting What We Heard Report outlined key messages about bans, as well as single-use and plastic items:

- Survey respondents strongly supported bans for single-use plastic packaging and polystyrene foam (Styrofoam) packaging.
- Top plastic items identified as items of concern were plastic straws, plastic bags, polystyrene packaging, oxo-degradable plastics, biodegradable or compostable plastics and take-out containers, single-use utensils and cutlery.
- Survey respondents supported provincial or federal bans.
- Local governments expressed the desire to ban additional items that are problematic for their specific communities.
- Concerns were identified regarding the unintended consequences of using items offered as alternatives to single-use and plastic items.
- Bans must not prevent accessibility and access to items (e.g., plastic drinking straws) that are necessary for medical, health, and disability or accessibility reasons.
- Items accepted through B.C.'s extended producer responsibility program should not be banned.
- More expensive alternatives could disproportionately impact smaller businesses.

- Businesses expressed the desire to be consulted on proposals to regulate single-use plastics.

Engagement on single-use and plastic items has also occurred at the Indigenous, federal, regional and municipal government levels, and has identified similar concerns and priorities across Canadian jurisdictions. In B.C., some municipalities have already started taking actions on single-use and plastic items through bylaws regulating their use.

3.0 Overview of the actions to prevent single-use and plastic waste

Based on the feedback from the CleanBC Plastics Action Plan engagement, as well as municipal actions within British Columbia, the Province is proposing to move forward with a waste prevention regulation under the *Environmental Management Act*.

The phased implementation of the proposed waste prevention regulation would regulate the following single-use and plastic items: checkout bags, disposable foodservice accessories, problematic plastic foodservice packaging (polystyrene foam, PVC and compostable plastics) and oxo-degradable plastics.

The Province is also proposing to continue to empower municipalities to take actions on single-use and plastic items, including beverage cups, under the Spheres of Concurrent Jurisdiction Regulation.

4.0 Highlights of the proposed waste prevention regulation

The proposed waste prevention regulation would reduce problematic single-use and plastic items using a phased approach to provide businesses time to transition. Priority items have been identified based on multiple factors, including their ability to be effectively recycled or composted throughout B.C., how long they are used for, impact on the environment, prevalence in the environment and the availability of acceptable alternatives. These provincial actions will complement the proposed federal government single-use plastic bans to prevent waste overall and reduce the use of single-use and plastic items in British Columbia.

The provincewide regulation would apply to all persons, including businesses at the point of sale or distribution of items, and would include the sale of packs of multiple items.

The timelines for the proposed regulation of the items identified below may be altered based on concerns or opportunities identified through this consultation, as well as changes to the proposed federal regulation.

Summary of the proposed waste prevention regulation

Material/Action	Regulatory Tool	Proposed Items	Alternatives Available for Use
To be phased out in 2023			
Checkout bags	Ban (plastic checkout bags); Fee (paper bags); Reusable bags	Plastic checkout bags include all plastic film, including compostable plastics. Paper bags must include a minimum of 40% recycled content. Reusable bags must be designed and manufactured to be used and machine washed at least 100 times.	Durable reusable bags; paper bags (for a fee).
Disposable foodservice accessories	By-request	All single-use straws, cutlery and stir sticks. Ketchup, soy sauce and other condiment sachets, napkins, cold cup lids, cup sleeves, food or beverage trays.	Durable reusable items, including cutlery, and refillable or bulk options for condiments.
To be phased out in 2024			
Problematic plastic foodservice packaging	Ban	Containers, bowls, plates, trays, cartons, film wrap, and cups made from polystyrene foam, PVC or compostable plastic.	Durable reusable containers; PET, PP, HDPE and LDPE plastics; aluminum; glass; and fibre-based containers.
Oxo-degradable plastic	Ban	All packaging made from oxo-degradable plastic, including oxo-degradable bin liners, dog waste bags and clothing packaging.	Other conventional plastic, non-plastic or reusable alternatives.

Regulating single-use and plastic items can take many forms. The proposed waste prevention regulation is using three main tools:

Ban – prohibition on the sale or distribution of an item, including items made from specific materials (e.g., polystyrene foam).

Fees – requiring fees (retained by retailers) on disposable items promotes the use of reusable items to ensure overall reduction in waste by encouraging customers to use their own durable reusable items.

By-request – requiring customers not be provided items that they have not asked for (e.g., straws and utensils).

4.1 Checkout bags

Goal: Prevent waste and environmental harm associated with single-use checkout bags, and promote reusable alternatives.

Material/Item	Proposed Restriction	Exemptions or out of scope	Alternatives Available for Use
Checkout bags	Ban on all plastic film checkout bags, including compostable plastics Fees for Paper: min $0.25 Reusable min $2.00	Exemptions would be included to allow bags to be reused and to provide paper or durable reusable bags at no-cost in cases of financial hardship. Does not include non-checkout bags, such as bags for prescription drugs and medical devices; bags for bakery or bulk items, including produce bags.	Bring your own durable reusable bags (free); New reusable bags for a fee; Paper bags (for a fee); reuse of other items

The proposed regulation intends to prevent waste from single-use checkout bags and encourage a move to reusable options by prohibiting single-use plastic checkout bags, as well as requiring that a fee be charged on paper and new reusable checkout bags. Customers are encouraged to bring their own bags to be reused. Retailers would be required to ask if a customer would like to purchase a paper or reusable bag, with the fees charged retained by the retailer to help offset the additional costs of these options. Many B.C. municipalities have already introduced similar bylaws regulating checkout bags in their jurisdictions.

If provided by the retailer, paper bags must contain at least 40% recycled paper content. The word "recyclable" and the amount of recycled content must be printed on the outside of the bag. These requirements promote the use of recycled material, and are consistent with actions taken by the State of California and B.C. municipalities.

What are the fees and why are they needed?

> The suggested fees are intended to cover the additional costs to retailers of purchasing paper or reusable bags compared to plastic bags. Small businesses have expressed support for the $0.25 fee. This is also consistent with the paper bag fee established by most municipalities with single-use bylaws and the recently established $0.25 paper bag fee charged at B.C. Liquor Stores. Some jurisdictions have set fees as low as $0.05; however, the total reduction in the use of paper bags at this fee level is less. This can lead to increased costs to both businesses and consumers who pay the fee instead of switching to re-usable bags.

Jurisdictions that have banned plastic bags but not charged for alternative bags have seen an unintentional increase in non-plastic bag use. In these instances, bans have resulted in consumers switching to other disposable or low-quality bags and have failed to prevent waste overall. The proposed regulation would require businesses to charge a minimum of $0.25 for each paper bag and $2.00 for each reusable bag requested by a customer. Consistent with the amended Spheres of Concurrent Jurisdiction Regulation, reusable bags must meet a minimum quality requirement of withstanding at least 100 uses and washes.

Recognizing that small businesses are likely to bear a higher burden for the cost of alternatives, retailers would retain the fees to offset the additional costs associated with paper and reusable bags. This fee model is consistent with what leading B.C. municipalities already have in place, and is widely accepted by businesses and consumers. It has also been used successfully in jurisdictions outside of B.C., such as California and New Zealand. It is recognized that fees can be a barrier to people experiencing financial hardship and it will be necessary for businesses to provide an option to avoid a fee, by either not using a bag or reusing an existing bag. Exemptions would also be included to allow the distribution of reusable bags at no cost in situations of financial hardship, and to promote reusable bag sharing or re-distribution.

4.2 By-request disposable foodservice accessories

Goal: Prevent waste and environmental harm associated with unnecessary use of disposable foodservice accessories while conserving accessibility.

Material/Item	Proposed Restriction	Exemptions or out of scope	Alternatives Available for Use
Disposable foodservice accessories	By-request for all single-use straws, cutlery, stir sticks, ketchup, soy sauce and other condiment sachets, napkins, cold cup lids, cup sleeves, food or beverage trays and any other similar accompanying disposable item used as part of food or beverage service or packaging.	Lids for warm beverages; self-service stations are permitted.	Durable reusable options preferred; single-use options available.

The proposed regulation would prohibit the automatic distribution of disposable foodservice accessories by restaurants, cafeterias and other foodservice providers. To receive a disposable foodservice accessory, customers would have to request what they need, confirm their choice when asked or select the item they want from a self-serve station. The proposed regulation would also prohibit items from being distributed in pre-packaged bundles.

In Metro Vancouver alone, it is estimated that over 400 million straws and utensils are disposed of each year. This includes plastic cutlery, straws and stirrers that are frequently found on beach clean-ups and urban litter audits in British Columbia. Research conducted by food delivery platforms already implementing by-request systems for cutlery and other foodservice accessories indicates that most of these items are not needed or wanted.

British Columbia Centre for Disease Control (BCCDC) stated there is no evidence of COVID-19 transmission risk from reusable foodservice accessories or bags, and encouraged the use of reusables to reduce waste and improve environmental health. Provincial policy on the use of reusable containers is available on the Ministry of Health website.

By-request restrictions are intended to address the unnecessary waste, without burdening businesses or consumers in situations where disposable items are still useful.

Businesses are encouraged to provide bulk or refill options for condiments, reusable options for dine-in, including reusable cutlery or cups, and to participate in emerging reuse programs for to-go items such as beverage cups and takeout containers. Customers are encouraged to bring their own durable reusable foodservice accessories, or use reusable and bulk options at home or the workplace to help reduce single-use and plastic waste.

4.3 Foodservice packaging - problematic plastics

Goal: Prevent waste from single-use plastic packaging that is not effectively recycled throughout B.C. and is prevalent in the environment.

Material/Item	Common Examples	Exemptions or out of scope	Alternatives Available for Use
Polystyrene foam foodservice packaging	Rigid containers and beverage cups, including trays, cartons, clamshells, salad and deli containers.	Coolers used to transport seafood or perishable items. Foods packaged out of province may be considered for future regulation.	Durable reusable containers; PET, PP, HDPE LDPE plastics; aluminum; glass; and fibre-based containers.
PVC foodservice packaging	Rigid containers and beverage cups, including trays, cartons, clamshells, salad, deli containers and film wrap made from PVC.	Foods packaged out of province may be considered for future regulation.	Durable reusable containers; PET, PP, HDPE, LDPE plastics; aluminum; glass; and fibre-based containers.
Compostable plastic foodservice packaging	Rigid containers and beverage cups, including trays, cartons, clamshells, salad and deli containers.	Materials that could be processed in the majority of B.C. composting facilities; may include compostable plastic bin liners.	Durable reusable containers or bags; PET, PP, HDPE, LDPE plastics; aluminum; glass; and fibre-based containers.
Oxo-degradable plastic	All packaging made from oxo-degradable plastics including bin liners, dog waste bags and clothing packaging.	None	Other conventional plastic, non-plastic or reusable alternatives.

To reduce the waste that ends up in the landfill the proposed regulation would support the phase out of plastics that are not effectively recycled or composted throughout B.C. and are known to cause harm in the environment.

Eliminating hard to recycle plastics supports improved package design that ensures items can be recycled or composted when no longer in use. Certain plastics (i.e., PET, HDPE, LDPE and PP) can be effectively recycled in B.C. and put back into food-grade packaging. Eliminating hard to recycle plastics reduces contamination of our existing recycling system (i.e., with materials that look similar but cannot effectively be recycled), and promotes the use of plastic types that are widely available and recyclable using existing infrastructure.

The proposed regulation would ban the sale and distribution of plastics that are not effectively recycled or composted in B.C., initially prohibiting the sale and distribution of expanded polystyrene foam, PVC (and PVDC) and compostable plastic foodservice packaging, and all oxo-degradable packaging.

Foodservice packaging includes all food packaging used for serving or transporting perishable food packaged and sold in British Columbia. Includes packaging for food that requires further preparation such as heating, cooking or boiling (e.g., meat trays, egg cartons, produce and bulk food bags, deli containers, clamshell containers, lidded containers, cartons, cups, plates and bowls).

Expanded polystyrene (EPS) foam (Plastic #6), also referred to by the trademark name Styrofoam, makes up a small portion of B.C.'s recycling stream and is not recycled as effectively as other plastics such as PET, PP, HDPE and LDPE. While polystyrene foam is accepted for recycling under the province's extended producer responsibility program, it is collected at select depots only. Polystyrene foam easily breaks apart, leading to collection and processing issues. Its light weight also increases the tendency for it to end up in the environment. It is regularly found in beach clean-ups, and breaks down into small pieces that harm marine and wildlife when eaten.

Polyvinylidene chloride (PVC) or polyvinylidene dichloride (PVDC) (Plastic #3) is not effectively recycled within B.C. and can disrupt the recycling of other plastics.

The proposed regulation would ban the sale and distribution of polystyrene foam and PVC foodservice packaging, including meat trays, cartons and deli containers. The proposed regulation intends to prohibit the sale and distribution of these plastic items, including the sale of multiples of these items.

Compostable plastics are not designed to be recycled alongside plastic and are not included in the list of materials that can be composted under B.C.'s Organic Matter Recycling Regulation (OMRR), which regulates B.C.'s composting facilities. Compostable plastics can rarely be effectively composted in B.C.'s existing composting facilities, and can disrupt the recycling of other plastics when they enter the recycling stream. While some compostable plastics may have beneficial uses, due to the inability of current facility operations to effectively compost the material, many end up going to landfill. There is also consumer and business confusion regarding compostable plastics, and a lack of clear labelling regarding compostable plastics and end-of-life disposal.

The proposed regulation would ban the sale and distribution of compostable plastic foodservice packaging not accepted under the OMRR. The ban would include both rigid compostable plastic containers and other flexible compostable food packaging. The proposed regulation intends to prohibit the sale and distribution of these plastic items, including the sale of multiples of these items. The regulation would exempt compostable plastic bin liners, as these products can support municipal solid waste reduction goals by encouraging diversion of organic waste from landfill.

Compostable plastics pose significant challenges to composting facilities and anaerobic digestion facilities (i.e., waste to energy facilities). Common issues, across Canada and beyond, include difficulty distinguishing compostable plastics from traditional single-use plastics, and that most compostable plastics do not adequately breakdown in B.C.'s existing facilities.

The province continues to support diversion of organic waste from landfills to reduce greenhouse gases through projects such as the Food Waste Provincial Partnership, as well as the Organics Infrastructure Program and CleanBC Organics Infrastructure and Collection Program that invest in modern composting and anerobic digestion facilities.

It is anticipated that as national standards for compostable plastics improve, more compostable products may be incorporated. Ultimately, the provincial plan emphasizes prevention of plastic waste through reusables and use of materials that can be effectively recycled throughout B.C.

Oxo-degradable plastics (including oxo-biodegradable) and plastics with oxo-degradable additives contribute to microplastic pollution, and are not suitable for long-term reuse, recycling or composting. Oxo-degradable plastics contain additives that lead to fragmentation of the plastics into microplastics that further contaminate the environment. Research indicates that they are not suitable for composting or anaerobic digestion processing, do not breakdown in landfills or if littered in marine environments, and are not suitable for recycling. In addition, there are potential toxic effects on soils from the residual additives.

Given the negative impacts of oxo-degradable plastics and the availability of conventional plastic alternatives, the proposed regulation would ban the sale and distribution of all oxo-degradable plastics.

In a health emergency, like COVID-19, public health regulations can take precedence over other regulations, including the proposed waste prevention regulation. In such cases, single-use items could be used if they were deemed necessary in an emergency.

Some single-use and plastic items can play important roles in medical situations or as personal protective equipment. The proposed and future regulations are not intended to be used to regulate necessary medical or safety items.

The Province continues to work with the health sector to identify opportunities to reduce waste and reliance on single-use plastic items, while maintaining strict hygiene and safety standards.

5.0 Future provincial actions

There are additional provincial actions that will need to be taken to continue reducing single-use and plastic waste. As the Province receives more information about problematic single-use and plastic items, this will be considered for future regulations to prevent plastic pollution and waste, including the use of bans and other appropriate regulatory tools. Other problematic plastic types have been identified through resources such as the Golden Design Rules[2], created by the Consumer Goods Forum with implementation led by the Canada Plastics Pact (of which B.C. is a partner).

Further regulation may be necessary to address these additional problematic plastics that are not effectively recycled or composted. This may include expanding the scope of the regulation for the identified plastic types (i.e., polystyrene foam) beyond food packaging. Future regulation may also occur by plastic type, including flexible plastics (i.e., non-food film wraps and other plastic bags) or to move from by-request regulations to bans on certain disposable foodservice accessories. Results of previous engagement and feedback from local governments have also indicated that single-use items, including beverage cups, are of concern and may require future regulatory actions.

In addition to bans, other opportunities have been identified for reducing single-use and plastic waste, including requiring reuse and refill options for products (e.g., home cleaning products), requiring reusables for dining in, and introducing recycled content standards for items (e.g., plastic trash bag, beverage containers, other packaging and single-use items). Bans and regulations on single-use and plastic items are one step to move plastics into the circular economy, reducing pollution and waste.

6.0 Co-ordinating actions across governments

Single-use and plastic pollution and waste are not constrained by borders; they cross jurisdictions within B.C., Canada and globally. The Province will continue to work with Indigenous governments, municipalities and the federal government to co-ordinate actions to reduce single-use and plastic waste, moving plastics into the circular economy.

2 Golden Design Rules

6.1 Engaging Indigenous governments

The UN Declaration recognizes Indigenous Peoples right to land or resources within their traditional territory (Art. 26), and rights to conservation and protection of the environment and the productive capacity of their lands/territories/resources (Art. 29). The proposed waste prevention regulation is intended to support an overall reduction in waste, including in Indigenous communities. We have heard concerns from Indigenous communities regarding the problems of single-use and plastic waste, including difficulties managing and transporting waste from remote communities. The Province will continue to engage with Indigenous governments and people to support initiatives to prevent single-use and plastic waste, recognizing the unique challenges and opportunities in each community.

6.2 Supporting municipal actions

In July 2021, the Province enabled municipalities to regulate four specific single-use items (checkout bags, straws, utensils and polystyrene foam containers). The amended Spheres of Concurrent Jurisdiction Regulation provided provincial consistency for municipalities to address the issue of single-use and plastic items in their communities, allowing them to create bylaws relevant to their unique circumstances. Enacting single-use and plastic item regulations at a municipal level has provided the opportunity for municipalities to address their local waste and challenges with plastic now, while requirements and circumstances across the province are considered for provincial regulations.

Beverage Cups Through the CleanBC Plastics Action Plan engagement, we heard that beverage cups are a high priority for waste reduction. Some local governments have already started taking actions on beverage cups. The Province will continue to support municipalities to act on single-use and plastic waste through the Spheres of Concurrent Jurisdiction Regulation. The Province will monitor the impact of municipal bylaws, including around beverage cups, to determine if bylaws are achieving the desired results and whether actions applied at a local level could be applicable on a provincial scale. Provincial actions may look different than those at the local level, given the different regulatory tools available and the provincial scope.

Going forward, the proposed regulation would stand alongside municipal bylaws that regulate the same items at the municipal level. However, municipal bylaws can be stricter than the provisions of the proposed regulation, and municipalities may further enforce and/or educate at the local level about single-use and plastic reduction. For items not covered under the proposed regulation, municipalities can continue to submit bylaws to the province for minister approval under the Spheres of Concurrent Jurisdiction Regulation (aside

from the City of Vancouver, which is acting under the *Vancouver Charter*). The Province will provide guidance regarding the approval process for individual bylaws, including ensuring municipalities have conducted consultation, and taken into consideration requirements for accessibility and other needs. Recognizing the need for provincial consistency, bylaws made in accordance with the Spheres of Concurrent Jurisdiction Regulation will require a level of uniformity with other jurisdictions within the province that are taking similar actions.

Local governments have indicated that beverage cups, as well as requiring reusables for on-site dining, are priority areas under consideration for future municipal bylaws. The Province will continue to support municipal governments to enable further actions to reduce plastic pollution and waste at the local level.

6.3 Co-ordinating with federal regulations

The federal regulation of the six plastic items (plastic checkout bags, straws, cutlery, stir sticks, flexible ring carriers and problematic plastic takeout containers), under the Canada Environmental Protection Act will prohibit the manufacture and import of the items, followed by the prohibition on the sale of the items a year later.

The proposed provincial regulation would work in co-ordination with the federal regulation to ensure consistency between the two jurisdictions. Some of the items identified through the federal regulation (checkout bags, straws, cutlery, stir-sticks, and some of the problematic plastic takeout containers) will also be regulated under the provincial regulation, providing consistency and enabling provincial actions to further support waste prevention. In the event of changes to the proposed federal regulation, including scope or timelines, the proposed provincial regulation will aim to provide consistency for those items in the federal regulation that have also been identified by the Province under the Spheres of Concurrent Jurisdiction Regulation.

7.0 When will the regulation come into effect?

The proposed regulation would coordinate with federal timing, where possible, to support businesses and consumers in the transition. Businesses will be given a minimum of six months for implementation of the proposed regulation, to use stock and prevent stranded assets.

8.0 How will government promote compliance and measure success?

Education of consumers and businesses is a key component of the proposed regulation to support and promote compliance. Education may include the creation and sharing of promotional materials for businesses, helping to inform customers about the regulation changes, as well as ensuring businesses are aware of their obligations under the regulations.

The ministry's approach to assuring compliance includes a range of tools and actions – from written advisories to administrative monetary penalties. Compliance and enforcement is informed by the Compliance Management Framework and Compliance and Enforcement Policy and Procedure, which considers the compliance history for the regulated party and the significance of the impact from the non-compliance occurrence.

The ministry is proposing shared enforcement authority by both the ministry and local governments, including regional districts and municipalities. Where appropriate, authority would be delegated to local governments to allow penalties to be administered at the provincial level and regional district or municipal level. For items also banned by the federal government, the Province would have authority for enforcement at the provincial level.

The ministry would use a variety of measures to determine and monitor effectiveness of the regulation in waste prevention for the items regulated. For example, large businesses offering paper and reusable bags for sale may be required to report on the number of these bags sold on a bi-annual basis, or as requested; delivery apps may be required to report the percentage of orders requesting foodservice accessories (e.g., single-use straws, cutlery). This would provide information to monitor the effectiveness of the regulation, and help to determine if the regulation is having the desired outcome of reducing use and waste.

In addition, the effectiveness of the regulation for reducing single-use items overall would be monitored through waste composition studies, and compliance and enforcement reports, as well as indicators of increased use and availability of reusable options.

9.0 Providing comment

The ministry welcomes comments on the proposals outlined in this document, and has provided a range of opportunities to provide feedback.

To complete the survey and/or share your comments visit **engage.gov.bc.ca/plastics**.

Alternatively, you may mail your comments to:

Ministry of Environment and Climate Change Strategy –
Waste Prevention Regulation
PO Box 9341 Stn Prov Govt
Victoria, BC V8W 9M1

All comments received through the public survey, formal submission, webinars, mail or email by 4:00pm on June 21, 2022 will be compiled for review by ministry staff before final drafting of the regulation or other policy changes.

All submissions will be treated with confidentiality by ministry staff and contractors when preparing consultation reports. Please note that comments you provide and information that identifies you as the source of those comments could be made public, either through a decision by the ministry or if a Freedom of Information request is made under the *Freedom of Information and Protection of Privacy Act*.

Thank you for your time and input!

Province of British Columbia

April 2022

Canada Gazette, Part I, Volume 155, Number 52: Single-Use Plastics Prohibition Regulations

December 25, 2021

Statutory authority

Canadian Environmental Protection Act, 1999

Sponsoring departments

Department of the Environment
Department of Health

REGULATORY IMPACT ANALYSIS STATEMENT

(*This statement is not part of the Regulations*.)

Executive summary

Issues: Current scientific evidence indicates that macroplastic pollution poses an ecological hazard, including physical harm, to some animals and their habitat. Canadians consume substantial quantities of single-use plastic manufactured items (SUPs) every year. These SUPs are designed to be discarded once their single use has been fulfilled. A share of that waste becomes plastic pollution. Action is needed to restrict or eliminate SUPs that pose a threat of harm to the environment.

Description: The proposed *Single-Use Plastics Prohibition Regulations* (the proposed Regulations) would prohibit the manufacture, import, and sale of six categories of SUPs (i.e. checkout bags, cutlery, foodservice ware made from or containing problematic plastics, ring carriers, stir sticks, and straws). Manufacture and import for the purposes of export would not be subject to the proposed prohibition. Checkout bags, cutlery, and straws have reusable substitutes so the proposed Regulations would identify performance standards to differentiate between single-use and reusable items for these three product categories. The proposed Regulations would also provide exemptions to accommodate people with disabilities. These exemptions are linked to the conditions upon which straws are sold. Therefore, the prohibitions on sale of straws would come into force one year after the proposed Regulations are registered. The prohibition on sale for all other single-use items would come into force two years after the proposed Regulations are registered. The prohibitions on manufacture and import of all six single-use items would come into force one year after registration of the proposed Regulations.

Rationale: Plastics are among the most universally used materials in modern society. Single-use consumer items are often the most commonly collected items in litter clean-ups, with plastic being the most common material recovered in both domestic and international clean-up efforts. The six categories of SUPs subject to the proposed Regulations represented an estimated 160 000 tonnes sold in 2019, or an estimated 5% of the total plastic waste generated in Canada in 2019.

The proposed Regulations would support the federal, provincial, and territorial governments' Strategy on Zero Plastic Waste. Several provincial, territorial, and municipal jurisdictions have already enacted prohibitions or standards for certain SUPs. On October 7, 2020, the Department of the Environment (the Department) published a discussion paper on the Canadian Environmental Protection Act Registry [1] outlining a proposed integrated management approach to plastic products to prevent waste and pollution. During the ensuing 60-day public comment period, the Department received

205 written submissions representing the views of 251 stakeholder groups (156 industry members; 38 provincial, territorial, or municipal governments; 3 Indigenous groups; 32 non-governmental organizations; and 22 other groups). In addition, the Department received over 24 000 emails from individual Canadians, and an online petition started by a civil society group that received over 100 000 signatures. Overall, support for the proposed Regulations has been mostly positive from environmental non-governmental organizations and local governments and negative from some industry stakeholders. Other industry stakeholders have announced or have begun transitioning away from using SUPs. Support for the proposed Regulations from provincial and territorial governments has been mixed.

The proposed Regulations are expected to result in a net decrease of approximately 1.4 million tonnes in plastic waste over a 10-year period (2023–2032), which would represent around 4% of the total estimated plastic waste generated in Canada each year. It would also result in a decrease of around 23 000 tonnes in plastic pollution over the same period, which would represent 7% of the total plastic pollution generated each year. The proposed Regulations are expected to result in $1.9 billion in present value costs over the analytical period. While these costs are significant in aggregate, they would be widely dispersed across Canadian consumers (around $5 per capita per year). The proposed Regulations would also result in $619 million in present value monetized benefits over the analytical period, stemming mainly from the avoided cost of terrestrial litter clean-up. The costs and monetized benefits of the proposed Regulations would therefore be $1.3 billion in present value net cost over the analytical period. Given the extent of ecological harm that can be inflicted to wildlife and their habitats from the plastic pollution of the six categories of SUPs, and the reduction of enjoyment of ecosystem goods and services by Canadians, the associated non-monetized benefits are expected to be significant.

Issues

The Canadian economy generates large amounts of plastic waste every year, of which a certain proportion enters the environment as plastic pollution. Current scientific evidence indicates that macroplastic pollution causes physical harm to wildlife on an individual level and has the potential to adversely affect habitat integrity. Single-use plastic manufactured items (SUPs) are significant contributors to plastic pollution, as they are designed to be discarded once their single use has been fulfilled. Preventing pollution and waste is an area of shared jurisdiction between all levels of government in Canada, and plastic pollution from certain SUPs is an issue with national and international dimensions that cannot be effectively eliminated through provincial, territorial, or local measures alone. Therefore, the Minister of the Environment (the Minister), in accordance with section 93 of the *Canadian Environmental Protection Act, 1999* (CEPA or "the Act"), is recommending that the Governor in Council propose to eliminate or restrict six categories of SUPs subject to the proposed Regulations. These categories are the following: checkout bags, cutlery, foodservice ware made from or containing problematic plastics, ring carriers, stir sticks, and straws (hereafter referred to as the "six categories of SUPs").

Background

Lifecycle of plastic manufactured items in the Canadian economy

Plastics are among the most universally used material in modern society. Plastics are low-cost and durable and are used in a wide range of applications, such as packaging, construction materials, automotive materials, electronics, textiles, and medical and personal protective equipment. Plastics can be created from a wide range of synthetic or semi-synthetic organic compounds and are formed from long-chain polymers of high molecular mass that often contain chemical additives. Different polymers can be manufactured using different compositions of petroleum products, plant-based starting material, or recycled and recovered plastics. Plastic manufactured items can be formed into a specific physical shape or design during manufacture and serve many different functions. They can include final products, as well as components of products. The scientific literature often categorizes plastic pollution by size, in an environmental context. Individual pieces of plastic that are less than or equal to 5 millimetres (mm) in size are referred to as microplastics, while those that are greater than 5 mm in size

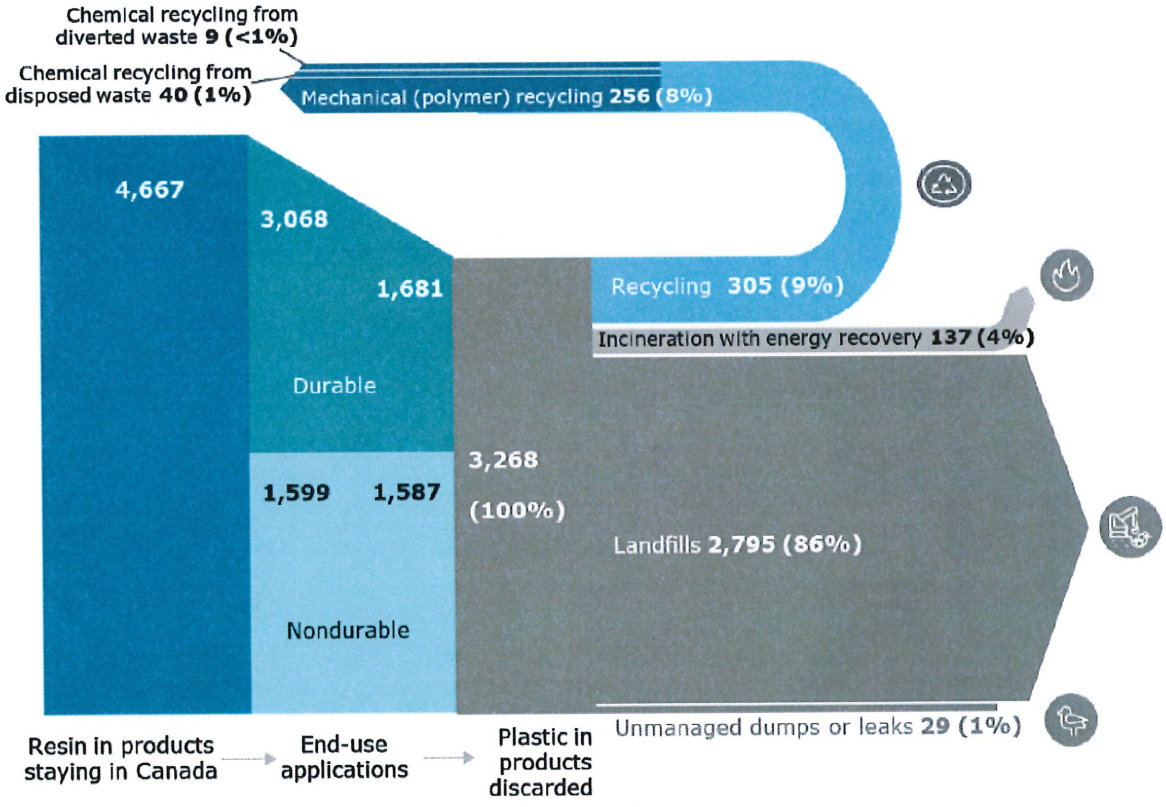
are referred to as macroplastics. Microplastics can be "primary microplastics" (intentionally produced micro-sized plastic particles), or "secondary microplastics" (micro-sized plastic particles resulting from the breakdown of larger plastic manufactured items).

The proper management of plastic manufactured items is a global issue as millions of tonnes of plastics are produced each year around the world. It is estimated that half of the plastics produced each year are for single-use items. [2] In 2020, 367 million tonnes of plastic were produced globally, a 0.3% decrease from 2019. [3] The COVID-19 pandemic has led to a decrease in production for the packaging sector, though individual consumption of plastic manufactured items may have increased (see the "Benefits and costs" section for more information on the estimated effects).

In order to better understand the quantities, uses, and end-of-life management of plastics in the Canadian economy, the Department of the Environment (the Department) commissioned the Economic Study of the Canadian Plastic Industry, Markets and Waste (the Deloitte Study), which was published in 2019. As displayed in Figure 1, the Deloitte Study found that approximately 4.7 million tonnes of plastic resins (raw materials) were introduced to the domestic market in 2016, while approximately 3.3 million tonnes of plastic manufactured items became plastic waste. The packaging sector alone accounted for 43% (approximately 1.4 million tonnes) of all plastic waste generated, as the vast majority of packaging is designed to become waste after fulfilling a single use. Of the 3.3 million tonnes of plastic waste generated nationally in 2016, 2.8 million tonnes (86%) were landfilled, 300 000 tonnes (9%) were recycled, 137 000 tonnes (4%) were incinerated with, or without, energy recovery, and 29 000 tonnes (1%) became plastic pollution, of which 2 500 tonnes were marine plastic pollution. Using those numbers, Canadians produced around 800 grams of plastic pollution per capita in 2016. If observed market trends were to continue, the Deloitte Study estimates that the 2016 figures for plastic waste and plastic pollution could increase by roughly one third by 2030.

Figure 1. Canadian plastic flow in thousands of tonnes (2016)

Figure from the Economic Study of the Canadian Plastic Industry, Markets and Waste, p. ii



▶ Figure 1. Canadian plastic flow in thousands of tonnes (2016) - Text version

Figure 1 also illustrates the Deloitte Study's finding that the current Canadian plastics economy is mostly linear, as opposed to circular. Under a linear economy, plastic manufactured items follow a unidirectional path: production from mostly virgin (as opposed to recycled) materials, usage (until no longer deemed useful), and then disposal into the waste stream, mostly for landfill. Put another way, most plastic manufactured items in a linear economy are produced from virgin resins, and their value is not recovered at the end of their useful life. Therefore, most of the plastic waste generated in Canada enters landfills and exits the economy, representing a significant potential lost economic opportunity.

By contrast, a circular economy is a model of production and consumption that recovers and restores products, components, and materials through strategies like reuse, repair, remanufacture or (as a last resort) recycling. [4] In a circular economy, plastic manufactured items would be produced by a number of different pathways, one of which includes using recycled resins. Their value would be recovered at the end of their useful life to be reintegrated into the economy. In this way, the end of the value chain for one manufactured item becomes the start of the value chain for another, thereby extending life cycles and resulting in fewer adverse environmental impacts.

There are many factors contributing to the linear nature of the plastics economy in Canada, including the following:

- **virgin and recycled plastic resins compete:** competition is difficult for the recycling industry because of inconsistent feedstock composition and a more labour-intensive cost structure compared to virgin resin production, which can take advantage of economies of scale;
- **weak end-markets for recycled plastics:** in some cases, recycled resins are a cheaper substitute for product manufacturers, for example for use in less demanding applications, but overall, the inconsistent supply of quality feedstock at a competitive price undermines the establishment of viable and lasting end-markets;
- **collection rates are low:** only 25% of plastics are collected and sent to a sorting facility in Canada according to the Deloitte Study (through curbside collection, recycling depots, or deposit-refund systems), and only around a third of collected plastics are effectively recycled because of contamination, infrastructure deficiencies, and lack of end-markets;
- **insufficient recovery options:** current near absence of high-volume recovery options, losses from existing processes, and competition from low-cost disposal substitutes, such as landfills, point to the need for investments in innovation and infrastructure, in particular to commercialize and scale up new technologies; and
- **cost of plastic pollution is shouldered by individuals and communities:** the responsibility for preventing and managing land-based sources of plastic pollution, such as urban and roadside litter, is largely shouldered by municipalities, civil society organizations, and volunteers, at a great cost.

The Deloitte Study estimated that 2 500 tonnes of the plastic waste generated in Canada in 2016 entered the oceans as plastic pollution, while the amount of plastic pollution entering Canadian freshwaters (e.g. the Great Lakes, other lakes, rivers) but never reaching the oceans is unknown. Internationally, academic studies have estimated the total amount of plastic pollution entering oceans globally at between 8 million tonnes and 13 million tonnes per year. [5] In fact, plastics constitute the most prevalent type of litter found in the oceans, estimated to make up at least 80% of total marine debris (from surface waters to deep-sea sediments), plastic bags being among the most prevalent littered items. [6]

The Deloitte Study indicates that one of the key pathways for plastic waste to become terrestrial or marine plastic pollution is people dropping litter on the ground or directly into aquatic environments. An estimated 80% of all marine plastic pollution originates on land and is transported to the ocean via wind or rivers, with the remaining 20% attributable to fishing activities, natural disasters, and other sources. [7] Once plastic pollution reaches oceans, the majority will slowly weather and fragment into microplastics, accumulate on shorelines, sink to the seabed, or float on the sea surface, but will never fully decompose.

Plastic pollution is found on the shorelines of every continent, with greater proliferation typically found near tourist destinations and densely populated areas. Large-scale marine and freshwater litter clean-ups are very costly, and therefore, limited in practice. While such clean-ups may result in temporary benefits, they do not alter the inflow of plastic pollution into marine or freshwater environments, and must therefore be frequently repeated for sustained benefits to be realized. For this reason, preventing plastic pollution from entering the environment in the first place is often seen as the only viable approach to successfully managing the issue of marine plastic pollution on a long-term basis. [7]

Science Assessment of Plastic Pollution

In October 2020, the Department of the Environment and the Department of Health published a *Science Assessment of Plastic Pollution* (the Science Assessment) on the Canada.ca (Chemical Substances) website. The intent of the Science Assessment was to summarize the current state of the science regarding the potential impacts of plastic pollution on the environment and human health, as well as to inform future decision-making on plastic pollution in Canada. The Science Assessment found that macroplastic and microplastic pollution are ubiquitous in the environment. The Science Assessment also found that many sources of release contribute to plastic pollution, and that the potential effects of microplastics on individual animals, the environment, and human health are unclear and require more research.

With respect to macroplastic pollution, the Science Assessment found evidence of adverse effects, including mortality, to some animals through

- entanglement, which can lead to suffocation, strangulation, or smothering;
- ingestion, which can block airways or intestinal systems leading to suffocation or starvation; and
- transport of invasive species into well-established ecosystems or transport of diseases that can alter the genetic diversity of an ecosystem when they use the plastic pollution as a vessel for rafting.

Overall, the Science Assessment recommended pursuing immediate action to reduce the presence of plastic pollution in the environment, in accordance with the precautionary principle as defined in section 2 of CEPA.

Government action on plastic waste and plastic pollution

The Government of Canada has committed to taking action to reduce plastic waste and plastic pollution through several avenues. In November 2018, through the Canadian Council of Ministers of the Environment, the federal, provincial, and territorial governments approved, in principle, a Canada-wide Strategy on Zero Plastic Waste (PDF) (the Strategy). The Strategy takes a circular economy approach to plastics and provides a framework for action in Canada. Federal, provincial, and territorial governments are collaborating to implement the Action Plan on Zero Plastic Waste (the Action Plan), for which Phase 1 (PDF) and Phase 2 (PDF) were approved in 2019 and 2020, respectively.

In October 2020, the Government published a discussion paper entitled *A proposed integrated management approach to plastic products to prevent waste and pollution* (the Discussion Paper). The Discussion Paper outlined a proposed integrated management approach that addresses the entire life cycle of plastics to prevent plastic waste and plastic pollution. The Government described a suite of measures to be developed under CEPA to implement the integrated management approach, which will seek to

- manage single-use plastics using a management framework;
- establish performance standards for plastic products to reduce (or eliminate) their environmental impact and stimulate demand for recycled plastics; and
- ensure end-of-life responsibility, so that companies that manufacture or import plastic products or sell items with plastic packaging are responsible for collecting and recycling them.

Responses to the Discussion Paper received from stakeholders, partners, and the public are presented in detail in the "Consultation" section.

Based on the findings of the Science Assessment and other available information, the Minister of the Environment and the Minister of Health (the ministers) were satisfied that plastic manufactured items met the ecological criterion for a toxic substance as set out in paragraph 64(a) of CEPA. In order to develop risk management measures under CEPA to address the potential ecological risks associated with certain plastic manufactured items becoming plastic pollution, the Administrator in Council made an Order adding plastic manufactured items to Schedule 1 to CEPA, which was published in the *Canada Gazette*, Part II, on May 12, 2021. The listing enables the ministers to propose risk management measures under CEPA that could target the sources of plastic pollution and change behaviour at key stages in the life cycle of plastic products, such as product design, manufacture, use, disposal, and value recovery.

Most prevalent items contributing to plastic pollution

Internationally, single-use consumer items are often the most commonly picked up items in litter clean-ups, with plastic being the most common material recovered. The top 10 items reported in the *Ocean Conservancy International Coastal Cleanup 2020 report* (in which Canada participated) were food wrappers, cigarette butts, plastic beverage bottles, plastic bottle caps, straws and stir sticks, plastic cups and plates, plastic grocery bags, plastic take-out containers, other plastic bags and plastic lids. Since 2017, the top 10 items collected each year have all been made of plastic. Similarly, data based on total items collected over time from the European Environment Agency [8] shows that the most common category of items found as marine litter on the beach are cigarette butts, plastic caps and drink lids, shopping bags, string and cord food wrappers, cotton bud sticks, drink bottles and food containers. Based on material, plastic was found to account for 87% of all materials collected over time. [9]

Domestically, a separate clean-up effort in 2019, the Great Canadian Shoreline Cleanup, [10] also found cigarette butts, food wrappers, bottle caps, plastic bags, plastic bottles and straws in their top 10 most commonly found litter items. The top 10 accounted for over 1.6 million items collected in Canada in 2019. The weight of all items collected in 2019 was almost double the weight of all items collected in 2017. Other common plastic items found in shoreline clean-up data include cutlery, ring carriers, cups, pieces of foam and plastic fragments, and personal hygiene products.

Despite the differences in the number of items recovered in each item category, some item categories are considered more environmentally problematic in terms of being more harmful to wildlife or the environment in general, based on their material, weight and shape or structure. Of common consumer items made of plastic, plastic bags have been found to pose one of the greatest impacts to marine wildlife. [11] Plastic bags are light-weight and usually have looped handles, meaning wildlife can become entangled in their handles. Plastic bags and utensils have been rated the greatest risk in terms of ingesting plastic items for seabirds, turtles and marine mammals. [11] Ring carriers can also pose a threat of entanglement as they also have a looped structure. Many of the consumer items frequently picked up in litter clean-ups are also considered to be value recovery problematic as they are made of problematic plastics that have very low recycling rates.

Government action with respect to single-use plastic manufactured items

In June 2019, the Prime Minister announced a commitment for the Government of Canada to take steps to reduce plastic waste and plastic pollution, including working with provinces and territories to introduce standards and targets that would make companies that manufacture plastic products or that sell items with plastic packaging responsible for their plastic waste. In the same announcement, the Prime Minister committed the Government of Canada to banning harmful SUPs as early as 2021, where warranted and supported by scientific evidence, and reaffirmed this commitment in the Mandate Letter to the Minister of the Environment in December 2019 and in the Speech from the Throne in September 2020.

In order to determine which SUPs are considered harmful and warrant prohibition in Canada, the Department developed a management framework for categorizing SUPs (the Framework), as presented in the Discussion Paper. The Framework categorized a wide selection of SUPs commonly collected as litter or otherwise flagged by other jurisdictions (e.g. different types of bags, different types of packaging, cigarette filters, coffee pods) as either environmentally problematic, value-recovery problematic, or both. As outlined in the Discussion Paper, in order for a SUP to be considered harmful such that a ban would be warranted and supported by science, the SUP in question must meet the environmentally problematic and value recovery problematic criteria using scientific evidence to assess environmental prevalence and value recovery challenges, with consideration for exemptions for certain essential functions. After evaluating the wide selection of SUPs in this way, the Framework identified six harmful SUPs, or categories of SUPs identified by utility, warranted for prohibition or restriction in Canada.

- **Checkout bags**. Also known as shopping bags, grocery bags, or carryout bags. These items are typically given to customers at the retail point of sale to carry purchased goods from a business. They are typically (but not exclusively) made from high- or low-density polyethylene film and may or may not have handles. SUP checkout bags have low recycling rates (estimated at less than 15%) despite being accepted in several recycling programs across Canada, and are known to hamper recycling systems by becoming caught up in sorting and processing machinery. They are some of the most common forms of plastic litter in the natural environment (e.g. 31 164 units were collected from Canadian

shorelines in 2019 through the Great Canadian Shoreline Cleanup). Checkout bags have been identified by experts as posing a threat of entanglement, ingestion and habitat disruption among marine wildlife;

- **Cutlery** (knives, forks, spoons, sporks and chopsticks). These items are typically given to customers by restaurants and other food vendors to eat quick-service or takeout food, though they can also be purchased in bulk at many retail businesses such as grocery or dollar stores. They are typically (but not exclusively) made from polypropylene or polystyrene. SUP cutlery have low recycling rates (estimated at close to 0%) and are typically not accepted in provincial or municipal recycling systems. They are common forms of plastic litter (e.g. 10 772 units were collected from Canadian shorelines in 2019 through the Great Canadian Shoreline Cleanup). Cutlery litter has been ranked as high by experts in terms of the threat posed to wildlife;
- **Foodservice ware made from or containing problematic plastics**. This category includes clamshell containers, lidded containers, cartons, cups, plates and bowls used for serving or transporting prepared food or beverages (i.e. that is ready to be consumed without any further preparation, such as cooking, boiling or heating). This category of SUPs only includes those made from extruded or expanded polystyrene foam, polyvinyl chloride, oxo-degradable plastics, or that contain the additive "carbon black." When littered in the environment, foodservice ware may be placed in a range of categories, depending on the kind of plastic used (e.g. expected to form part of the total units collected under the categories of foam [24 213 units], food wrappers/containers [74 224 units], or tiny pieces of plastic or foam [595 227 units] in the 2019 Great Canadian Shoreline Cleanup). Foodservice ware in the form of expanded polystyrene containers, takeout containers, cups and plates and plastic food lids have all been ranked as high by experts in terms of the threat posed to wildlife;
- **Ring carriers** (typically known as six-pack rings). Ring carriers are deformable bands that are placed on beverage containers (e.g. cans, bottles) to package them for transport. They can be cut to hold different multiples of containers (e.g. two-packs, eight-packs). They are typically made from low-density polyethylene. Ring carriers are not typically recycled in Canada and are not accepted by provincial or municipal recycling systems. Ring carriers are a common form of plastic litter (e.g. 1 627 units collected from Canadian shorelines in 2019 through the Great Canadian Shoreline Cleanup) and are recognized as posing a threat of entanglement for wildlife such as seabirds;
- **Stir sticks** (also known as stirrers or beverage stirrers). Stir sticks are typically made from polypropylene or polystyrene. They can be in the shape of a stick, rod, or tube, and can also have decorative elements (e.g. for cocktail stir sticks or muddlers) or have attachments to close coffee cup lids. They have very low or no recycling rates and are not typically accepted in provincial or municipal recycling systems. Stir sticks are found as litter in the environment. They are typically categorized alongside straws (e.g. stir sticks would form part of the 26 157 units collected in 2019 through the Great Canadian Shoreline Cleanup referenced below for straws). Stir sticks pose the same threats to wildlife as straws; and
- **Straws**. Straws are typically given to customers at restaurants, coffee shops and other food vendors along with purchased drinks. They are typically (but not exclusively) made from polypropylene and have varying physical dimensions. They may also be sold in packages of multiple straws at retail locations such as grocery stores and dollar stores, or may be packaged with another product (e.g. a juice box). Plastic straws are prevalent in litter data (e.g. 26 157 units of straws and stir sticks collected in Canada in 2019 through the Great Canadian Shoreline Cleanup). They have low or nil recycling rates due to their size and shape and are not typically accepted in provincial or municipal recycling systems. Straws are also ranked high by experts in terms of the threat posed to wildlife in the environment.

Several municipal and provincial jurisdictions have already implemented bans on a selection of these six categories of SUPs. For example, Newfoundland and Labrador, Nova Scotia, and Prince Edward Island each implemented bans on SUP checkout bags in 2019 or 2020, which prohibit businesses from offering SUP checkout bags. The bans permit businesses to offer paper and reusable checkout bags, but only Prince Edward Island mandates minimum fees for offering substitute checkout bags. All three of these bans also prohibit "compostable" and oxo-degradable SUP checkout bags and include various exemptions. As of August 2021, no other SUP bans have been enacted at the provincial or territorial level, though British Columbia published a framework to facilitate municipal bans, [12] and a handful of municipal governments have implemented SUP bans on a localized level. For instance, Montréal, Sherbrooke, and several smaller municipalities across Canada have implemented

bans on SUP checkout bags, and, while Vancouver has yet to implement a proposed prohibition on SUP checkout bags, a ban on SUP straws, SUP cutlery, and certain SUP foodservice ware came into effect in 2020. Yukon's May 2021 Speech from the Throne stated that they intend to ban SUPs, but no specifics were provided.

Select Canadian market characteristics

According to the Deloitte Study, Canadian plastic product manufacturing (including SUPs and durable goods) accounted for $25 billion in sales in 2017. Information from Statistics Canada indicates that, in 2017, domestic plastics manufacturers met approximately 50% of domestic demand, while imports met the remaining 50%. [13]

Distribution among the six categories of SUPs

As shown in Table 1, the six categories of SUPs accounted for just over $750 million in sales in 2019, or nearly 30 billion units sold. Per capita per day, these values translate to approximately $0.06 in sales and 2.2 units sold. Assuming that each unit sold fulfilled its single use in short order following its sale, the mass of each unit sold promptly became plastic waste. The six categories of SUPs generated approximately 160 000 tonnes of plastic waste in 2019, representing roughly 5% of the total plastic waste generated in Canada in 2019. [14]

Table 1. Estimated market characteristics [a] for the six categories of SUPs

Category of SUP [b]	Sales volume (2019, in millions of units)	Average annual growth (2015 to 2019, by volume)	Unit price (2019)	Value (2019, in millions)	Unit weight (grams)	Tonnage (2019)
SUP checkout bags	15 593	2.5%	$0.03	$410	8	124 746
SUP cutlery	4 511	2.0%	$0.04	$162	2.4	10 867
SUP foodservice ware made from or containing problematic plastics	805	3.2%	$0.09	$69	20.8	16 743
SUP ring carriers	183	1.9%	$0.03	$6	3.5	648
SUP stir sticks	2 950	3.1%	$0.01	$29	0.6	1 770
SUP straws	5 846	2.7%	$0.01	$77	0.4	2 339
Total (or weighted average)	29 888	2.5%	$0.03	$753	5.3	157 113

a Estimated market characteristics correspond to the data and methodologies described in the "Benefits and costs" section.

b The definitions constituting what is captured by each of these terms is presented in the "Description" section.

Significant progress has been made in recent years by governments and industry globally to phase out several commonly identified SUPs, especially SUP checkout bags, as exemplified by the Global Commitment 2020 Progress Report published by the Ellen MacArthur Foundation and the United Nations Environment Programme (UNEP). In Canada, some major companies have announced or have already implemented actions to reduce certain SUPs. For example, certain companies in the quick-service restaurant industry, including A&W [15] and Tim Hortons, [16] have already eliminated SUP straws and other SUPs in their Canadian establishments. In 2018, Recipe Unlimited, which operates 19 national restaurant chains such as Swiss Chalet and Harvey's, committed to eliminating all SUP straws from their restaurants. [17] In the retail space, Canadian grocery chain Sobeys eliminated SUP checkout bags from their stores as of January 2020. [18] Despite these voluntary actions from some Canadian companies to reduce plastic waste in their establishments, consumption of the six categories of SUPs nationally is still projected to grow at a positive rate for the next decade and beyond in the absence of interventions.

Substitutes to the six categories of SUPs

Substitutes to the six categories of SUPs exist, and are readily available within established markets in Canada. Many of these substitutes are single-use manufactured items that are not made from plastics (single-use non-plastic manufactured items, or SUNPs). Most SUNPs are made from paper or wood, and as such, are typically heavier and costlier than their SUP counterparts. Regardless, SUNPs have become more prevalent in the market over time, as consumer preference for a substitute to SUPs is growing as a result of increased awareness of the impacts of plastic waste and plastic pollution. In the case of SUP foodservice ware made from or containing problematic plastics and SUP ring carriers, substitutes exist that are also plastic manufactured items, but which do not pose the same environmental or value-recovery challenges. The estimated year-over-year market growth for most substitutes to the six categories of SUPs is higher than that of their SUP counterparts. As shown in Table 2, the average annual growth rate from 2015 to 2019 across a selection of readily available single-use substitutes to the six categories of SUPs was 4.7%.

Table 2. Estimated market characteristics [a] for readily available single-use substitutes to the six categories of SUPs

With respect to which category of SUP	Readily available single-use substitute material	Sales volume (2019, in millions of units)	Average annual growth (2015 to 2019, by volume)	Unit price (2019)	Value (2019, in millions)	Unit weight (grams)	Tonnage (2019)
SUP checkout bags	paper	3 709	4.8%	$0.08	$279	52.6	214 562
SUP cutlery	wood	1 091	2.8%	$0.09	$94	1.5	1 643
SUP foodservice ware made from or containing problematic plastics	paper and moulded fibre	486	2.0%	$0.15	$74	38.5	18 744
SUP foodservice ware made from or containing problematic plastics	aluminum	238	0.3%	$0.13	$32	9.5	2 262
SUP foodservice ware made from or containing problematic plastics	recyclable plastics	148	-2.7%	$0.12	$17	24	3 541
SUP ring carriers	paper and moulded fibre	127	2.7%	$0.29	$37	27.6	3 502
SUP ring carriers	recyclable plastics	53	1.6%	$0.14	$7	19.5	1 034
SUP ring carriers	plastic film [b]	-	-	$0.10	-	18	-
SUP stir sticks	wood	1 022	3.8%	$0.01	$13	1.9	1 941
SUP straws	paper	744	13.0%	$0.03	$20	0.8	595
Total (or weighted average)		**7 618**	**4.7%**	**$0.08**	**$573**	**30.0**	**247 824**

a Estimated market characteristics correspond to the data and methodologies described in the "Benefits and costs" section.

b Baseline market characteristics for plastic film with respect to use as a substitute for SUP ring carriers is unknown.

Other substitutes to the six categories of SUPs are reusable manufactured items, made from a variety of materials including durable plastics, metals, woods, glass, silicone, and fabrics. Unlike single-use items, reusable items are specifically designed to remain durable through repeated uses and machine washings. Reusable items are heavier and costlier than their SUP or SUNP counterparts, given their durability and associated quantity of raw material needed for their production. However, since a reusable item can be used multiple times, it essentially replaces a stream of single-use items over its useful lifetime.

Therefore, the cost of a reusable item will eventually "meet or beat" the total cost of the stream of single-use items it diverted over time. How long it takes to break even depends on the price of the reusable item, the price of the single-use items it diverted, and the rate of reuse.

With respect to the six categories of SUPs, the most commonly used reusable substitute is reusable checkout bags. Many Canadians have shifted their consumer behaviour over time to normalize bringing reusable checkout bags with them when frequenting a variety of retail settings, especially grocery stores, and several of these retail settings themselves sell reusable checkout bags at their checkout counters. Substituting reusable checkout bags for SUP checkout bags is more common in Canada than using substitutes for the five other categories of SUPs. For example, it is not common for consumers to bring their own reusable foodservice ware and reusable cutlery to collect and consume take-out food. Accordingly, reusable items are not seen to play a significant role in diverting the consumption of five of the six categories of SUPs in the short term, relative to the role that SUNP and other single-use substitute items play in that regard. However, education campaigns being conducted by governments and civil society groups are increasing awareness of waste and pollution caused by the consumption of single-use items. Over time, increasing the popularity of low-waste consumer behaviours may lead to more widespread preference for reusable products.

Public opinion research and considerations regarding the COVID-19 pandemic

Survey results suggest that a strong majority of Canadians are concerned about plastic pollution and that they are supportive of further action by governments. In a survey conducted by Abacus Data in 2018, 88% of respondents indicated concern about plastic pollution in oceans and waterways, including 36% who say it is one of the most important environmental issues today. [19] A major polling effort conducted by Ipsos in 2019 surveyed nearly 20 000 adults from 28 countries, showing widespread global support for action on plastics. [20] Across all surveyed countries, 71% of respondents agreed with the statement that single-use plastics should be banned as soon as possible (by country, 72% of Canadian respondents and 57% of American respondents agreed with the statement).

Amid the COVID-19 pandemic, public opinion on SUPs bans and consumption patterns towards SUPs is varied. Two surveys conducted by Dalhousie University, one pre-pandemic and another during, depict that support for a ban of all SUP food packaging fell from 72% of respondents in 2019 to 58% of respondents in 2020. [21] Nearly 52% of respondents in 2020 agreed that any new regulations regarding SUP packaging should wait until after the COVID-19 pandemic is fully resolved. The surveys also suggest that consumption habits may have been impacted, as 29% of respondents indicated that they are buying more plastic-packaged goods during the pandemic relative to before the pandemic. Conversely, over 90% of Canadians polled in a recent 2021 survey are concerned about the impact plastic pollution has on our oceans and wildlife and polling by Abacus Data in June 2020 reveals that 86% of Canadians support a ban on some SUPs which is up from 81% in 2019. In an early 2021 survey by Abacus Data commissioned by Oceana Canada, two-thirds of Canadians polled indicated support for extending the proposed prohibitions to cover more than just the six categories of SUPs identified by the Framework, such as cigarette filters, polystyrene and hot and cold drink cups. [22]

The COVID-19 pandemic has impacted the generation of plastic waste in certain fields. Plastics provide protection against the proliferation and spread of bacteria and viruses as the material itself is sanitary and easy to clean. Accordingly, equipment and instruments made of plastics, including SUPs, are often used within the medical field. In response to the COVID-19 pandemic, consumption of SUPs within the medical field (among others) has greatly increased, as workers in these settings protect themselves and others through the use of vast amounts of SUP personal protective equipment (PPE), such as masks, face shields, gloves, and gowns, the majority of which are made from petroleum-based, non-biodegradable polymers. In the face of COVID-19, single-use PPE is also attractive for use among the general public due to its sanitary nature.

The Government of Canada is working with provinces to reduce litter and waste from single-use PPE, as usage across all sectors and the general public is expected to continue to increase. The Government of Canada is also investing in Canadian research and technology innovators to develop and commercialize reusable and compostable PPE as well as options for recycling single-use varieties, when possible. While there are some environmental and value-recovery challenges associated with single-use PPE, the Framework in the Discussion Paper does not characterize single-use PPE as "harmful," given that it serves a vital function that is necessary to keep Canadians safe.

Objective

The objective of the proposed *Single-Use Plastics Prohibition Regulations* (the proposed Regulations) is to prevent plastic pollution by eliminating or restricting the manufacture, import, and sale of six categories of SUPs that pose a threat to the environment.

Description

The proposed Regulations would eliminate or restrict six categories of SUPs in Canada. The proposed Regulations would be made pursuant to section 93 of CEPA, following the addition of "plastic manufactured items" to Schedule 1 to CEPA.

Applicability

The proposed Regulations would apply to the following categories of plastic items:

- **SUP checkout bags**, which are plastic manufactured items formed in the shape of a bag that are designed to carry purchased goods from a business, typically given to a customer at the retail point of sale;
- **SUP cutlery**, which encompasses plastic manufactured items formed in the shape of a knife, fork, spoon, spork, or chopstick;
- **SUP foodservice ware made from or containing problematic plastics**, which encompasses plastic manufactured items
  - formed in the shape of a clamshell container, lidded container, box, cup, plate, or bowl,
  - designed for serving or transporting food or beverage that is ready to be consumed without any further preparation, and
  - made from or containing the following materials:
    - polystyrene foam, including expanded and extruded polystyrene,
    - polyvinyl chloride,
    - the additive "carbon black," which is an additive used as a black colour pigment for plastic manufactured items that is produced through the partial or incomplete combustion of hydrocarbons, or
    - oxo-degradable plastics, which are plastic materials that include additives which, through oxidation, lead to the fragmentation of the plastic material into micro-fragments or to chemical decomposition;
- **SUP ring carriers**, which are plastic manufactured items formed in the shape of deformable container-surrounding bands, and that are designed to be applied to beverage containers and selectively severed to produce packages of two or more beverage containers;
- **SUP stir sticks**, which are plastic manufactured items designed to stir or mix drinks, or to stop a drink from spilling out of a lid; and
- **SUP straws**, which are plastic manufactured items formed in the shape of a drinking straw, including SUP flexible straws that have a corrugated section that allows the straw to bend and maintain its position at various angles.

The prohibitions in the proposed Regulations would include performance criteria for checkout bags, cutlery, and straws. Plastic checkout bags, plastic cutlery, and plastic straws are only considered single use if they meet the criteria in Table 3. There are no similar criteria for stir sticks, ring carriers, or foodservice ware made from or containing problematic plastics, as all products meeting the definition in the proposed Regulations are expected to be single use.

Table 3. Performance criteria for determining whether a plastic product is single use

Plastic product	Criteria

Checkout bag	• will break or tear if used to carry 10 kg over 53 m 100 times; • will break or tear if washed in a washing machine in a wash cycle recommended by the manufacturer for washing cotton or linen; or • made from plastic film
Cutlery or straw	• changes shape when submerged in water maintained at a temperature of between 82 °C and 86 °C for 15 minutes

Tests to determine whether a product meets the criteria for single-use must be conducted by a laboratory accredited under ISO/IEC 17025 entitled *General requirements for the competence of testing and calibration laboratories*, by an accrediting body that is a signatory to the *International Laboratory Accreditation Cooperation Mutual Recognition Arrangement*. Alternatively, certification can be provided by a lab accredited under the Quebec *Environmental Quality Act*.

Prohibitions and exceptions

Prohibitions and exceptions for single-use plastic items except plastic straws

The proposed Regulations would prohibit the manufacture, import, and sale of the categories of SUPs described in the previous subsection (with the exception of straws, described in the subsection below). Manufacture, import, and sale for the purposes of export would not be subject to the prohibition.

Prohibitions and exceptions for plastic straws

The proposed Regulations would prohibit the manufacture, import, and sale of SUP straws, including straws packaged with other items such as drink boxes, as well as SUP flexible straws in any commercial, industrial, or institutional setting, except for the following activities:

- the manufacture and import of flexible plastic straws that are sold or offered for sale in packages of multiple straws, where a "flexible" plastic straw has a corrugated section that allows the straw to bend and maintain its position at various angles;
- the manufacture and import of any kind of plastic straw intended for export;
- the sale of flexible plastic straws to hospitals, medical facilities, long-term care facilities, and other care institutions, including the offering of SUP flexible straws to patients or residents of any of these institutions; and
- the sale of packages of 20 or more flexible plastic straws in retail stores, on the condition that the straws are not kept on public display (though businesses may advertise that straws are available for purchase) and are provided only if requested by the customer (who can be any individual).

Record keeping

Any person that manufactures or imports any of the six categories of SUPs for export must keep records providing written evidence that the SUP has been or will be exported. Records and supporting documents must be kept for at least five years after they are made.

Coming into force

The proposed Regulations would come into force one year after their registration, with the exception of prohibitions on sale for checkout bags, cutlery, foodservice ware made from problematic plastics, ring carriers, and stir sticks, which would come into force two years after registration.

Consequential amendments to other regulations under CEPA

Consequential amendments are needed to the *Regulations Designating Regulatory Provisions for Purposes of Enforcement (Canadian Environmental Protection Act, 1999)* [the Designation Regulations], which designate various provisions made pursuant to CEPA as being subject to the *fine regime under the Environmental Enforcement Act*. Specifically, any regulatory

provisions listed in the Schedule to the Designation Regulations are subject to a minimum fine and higher maximum fines, should there be a successful prosecution of an offence involving harm or risk of harm to the environment, or obstruction of authority. [23] Amendments are needed to include the proposed Regulations in the Schedule to the Designation Regulations.

Regulatory development

Consultation

On October 7, 2020, the Department published the Discussion Paper on the CEPA Registry [24] outlining its proposed integrated management approach to plastic products to prevent waste and pollution. The Discussion Paper was open to a 60-day public comment period from October 7 to December 9. During that period, the Department received written submissions representing the views of 245 stakeholder groups (151 industry members, 39 provincial, territorial, or municipal governments, 2 Indigenous groups, 32 NGOs, and 21 others). In addition, the Department received over 24 000 emails from individual Canadians and an online petition started by a civil society group that received over 100 000 signatures.

The Department also held five webinars and four online stakeholder discussion sessions between October 30 and November 27, 2020. Over 6 000 stakeholders were notified in advance of the webinars, which were also open to the public, with a total participation of 1 474 individuals. For the stakeholder discussion sessions, 100 to 150 stakeholders were invited to each session, with 35 to 50 participants attending each session. Three webinars and three stakeholder discussion sessions addressed the proposed prohibitions on certain SUPs. Topics for discussion included definitions, prohibitions, the potential need for exemptions, and the availability of substitute products. A description of each webinar and stakeholder discussion session, including topics discussed, stakeholder participation, and input received, is available in the What we heard report.

Table 4. Level of support for SUP bans by stakeholder type

Row Labels	Oppose	Partially oppose [a]	Partially support [b]	Support
Industry	30	5	10	6
Local government	0	0	2	14
Miscellaneous [c]	2	0	2	6
NGO	0	0	0	17
Provinces and territories	1	0	1	3
Total	**33**	**5**	**15**	**46**

a — Stakeholders opposed to one or more items proposed for ban or restriction, but who provided no position for remaining items

b — Stakeholders in support of one or more items proposed for ban or restriction, but who provided no position for remaining items, or, who expressed conditional support for one or more items proposed for ban or restriction

c — The Miscellaneous category includes experts from academia, science, and law; Members of Parliament; one health science institution; and one standards organization, amongst others.

Commenters included industry stakeholders, provincial, territorial, or municipal governments, Indigenous groups, NGOs, and others. Comments covered a range of topics, but generally related to one of seven themes, summarized in the subsections below. Civil society organizations and local governments agreed about the issues plastic pollution is causing for Canadians. Many of these organizations were supportive of a ban on SUPs, though many also urged the Government of Canada to pursue more ambitious measures (e.g. ban additional SUPs). Provincial and territorial governments were mostly supportive of the ban.

Non-conventional plastics

The Discussion Paper included a question about a possible exemption for non-conventional (e.g. oxo-degradable, compostable) plastics. [25] A breakdown of answers by commenter group is below.

Table 5. Level of support for an exemption for non-conventional plastics by stakeholder type

Stakeholder type	Oppose	Partial support	Support	Total
Indigenous	1	0	0	1
Industry	8	7	13	28
Local government	12	1	3	16
Miscellaneous [a]	1	0	2	3
NGO	5	3	0	8
Provinces and territories	1	1	0	2
Grand total	28	12	18	58

a The Miscellaneous category includes experts from academia, science, and law; Members of Parliament; one health science institution; and one standards organization, amongst others.

Among industry groups that responded to the question, most supported or partially supported an exemption, citing opportunities for innovation and growth, while continuing to provide options to consumers. In contrast, responses from non-industry stakeholders mostly opposed an exemption, with a minority expressing partial support or support. Commenters giving partial support were often conditional on further action being taken by the Government of Canada, such as establishing standards or consistent definitions for compostable, biodegradable, and bio-based plastics. Opposition to the exemption was mostly linked with concerns about non-conventional plastics contaminating the recycling stream or not composting in the short time frames associated with municipal compost facilities. Local governments, which are typically the operators of compost and recycling facilities, were generally opposed to exemptions on this basis, providing concerns about contamination of compost and recycling streams leading to a lower quality product.

The Department recognizes the potential advantages of using single-use items made from non-conventional plastics in place of counterpart items made from conventional plastics. Some of these benefits include reducing fossil fuel consumption when plant-based materials replace carbon-intensive plastic source materials, and increasing food waste diversion in situations where contamination of plastics may present an obstacle to recycling. The Department also recognizes these benefits are complicated by several issues related to compostable plastics. Some compostable plastics are not accepted in certain compost facilities, leading to their diversion to landfills. In addition, while compostable plastics look very similar to the conventional plastics they replace, many are not designed to be recyclable. This mixing of compostable and conventional plastics can therefore contaminate the recycling stream and reduce recycling recovery rates. Accordingly, the proposed Regulations would treat single-use items made from non-conventional plastics in the same manner as their conventional plastics counterparts. The Department is working with partners and stakeholders, including provinces and territories, to develop the knowledge base about non-conventional plastics, which will inform future actions to promote innovation, clean growth and circularity in this sector.

Accessibility concerns

Some Canadians rely heavily on SUP flexible straws in their day-to-day life, including people with disabilities and those recovering from medical procedures. Many stakeholders requested the Department consider exemptions to any proposed prohibitions on SUP flexible straws to address accessibility concerns. The Department is committed to ensuring that SUP flexible straws remain an option for Canadians who need them. The proposed Regulations would allow Canadians with

disabilities to continue to purchase SUP flexible straws for their own use, as well as to access them in hospitals and other medical settings. These accommodations seek to balance the need to ensure accessibility options in Canada while protecting the environment from plastic pollution.

Canada's international trade commitments

Some stakeholders suggested that banning SUPs may be contrary to the requirements or the spirit of Canada's international trade commitments. The Government of Canada is aware of its international trade commitments and will continue to respect them. The Department has investigated whether the proposed Regulations could run contrary to Canada's international trade commitments, and has concluded that they would not. Where required by international agreements, Canada will notify the appropriate parties, such as the World Trade Organization, about the proposed Regulations. All businesses operating in Canada or exporting to Canada would be subject to the proposed prohibitions on certain single-use plastics, removing any unfair advantages within the domestic market. However, the Department is aware of the implications of prohibitions on domestic manufacturers that are competing in the global market, where prohibitions may not be present. Therefore, manufacture of the six categories of SUPs for the purpose of export, as well as import for the purpose of re-export, will continue to be permitted under the proposed Regulations.

Unintended social, economic and environmental effects of substitute products

Some stakeholders expressed concern that wide-ranging bans imposed by government often have unintended consequences, including potential negative social, economic, and environmental effects.

Regarding potential environmental effects, some stakeholders expressed concern that some substitutes to the six categories of SUPs could result in worse environmental impacts. Generally, these concerns included increased greenhouse gas (GHG) emissions related to transportation of heavier materials (e.g. the mass of single-use paper checkout bags relative to SUP checkout bags) or greater emissions created during the manufacturing process. The Department has carefully analyzed the extent to which substitutes to the six categories of SUPs may lead to harmful environmental impacts. While the proposed Regulations would reduce plastic waste and plastic pollution, some upstream activities such as manufacturing and transportation may have some minor negative environmental impacts. Many of these potential upstream effects can be mitigated through the increased consumption of reusable products, as well as existing management measures that have been put in place by the federal government and other jurisdictions, such as putting a price on carbon pollution, various emissions and effluent regulations for pulp and paper mills and vehicle emissions standards. Greater detail on this subject is available in the "Strategic environmental assessment" section.

Regarding potential social and economic effects, stakeholders noted that some people rely on SUPs to perform crucial functions (e.g. people with disabilities who rely on SUP flexible straws) or because of their relatively low costs. The Department developed the proposed Regulations by taking into account best practices and lessons learned in other jurisdictions and thorough market research to minimize the risk of unintended consequences. In addition, the Department conducted a gender-based analysis plus (GBA+), which analyzed potential impacts of the proposed Regulations on certain demographic groups, including people with disabilities, women, and single parents. The results of this analysis have been incorporated into the regulatory design and implementation strategy (e.g. exemptions for SUP flexible straws), and the Department will work with partners and stakeholders in the implementation of the proposed Regulations to minimize the risk of unintended consequences.

Stakeholders who may have information that could further minimize the risk of environmental, social, or economic unintended consequences are encouraged to contact the Department during the 70-day public comment period.

Economic hardship due to the COVID-19 pandemic

Many stakeholders are concerned that the timing for a ban on certain SUPs is poor, as a result of ongoing economic hardship and stress caused by the COVID-19 pandemic. While SUP manufacturers and retailers are seeing an increase in sales as a result of COVID-19, these sales are expected to "reset" to approximately 2019 levels once the pandemic has passed. [26] Meanwhile, most other businesses have seen reduced revenues due to forced closures and reduced disposable incomes of consumers. At the same time, almost all businesses are facing increased costs as a result of public health measures (e.g. PPE,

hand sanitizer, Plexiglas shields). Additional hardship that may be experienced to source substitutes to the six categories of SUPs comes at a time when many businesses, especially small-to-medium enterprises, may not be able to endure further increases to their cost of business.

The Government of Canada is sensitive to the impact that the COVID-19 pandemic has had on the business community and is committed to developing environmental measures in a responsible way and in a manner that also supports economic recovery and the protection of human health. The proposed Regulations take the impacts of the pandemic and other factors, such as accessibility needs, into account. For example, a transition period for the ban of the six categories of SUPs is being proposed to allow businesses to phase out these SUPs with minimal disruption to their operations. Finally, businesses would continue to be allowed to manufacture the six categories of SUPs for the purpose of export.

Ban is not comprehensive enough

Many stakeholders identified other problematic plastics that are of concern to the environment. These stakeholders believe the ban needs to be expanded to include more items.

The Discussion Paper presents the assessment of numerous SUPs to determine if they are environmentally or value-recovery problematic. Items that were selected for the ban have readily available substitutes for consumers to use. At this time, six items were identified as candidates for a potential ban or restriction based on meeting these criteria. Many stakeholders questioned why SUP water bottles were not included in the ban. Water bottles are typically made from polyethylene terephthalate, which is a highly recyclable plastic resin, and are subject to programs such as bottle deposit schemes in many jurisdictions. As a result, they do not meet the criteria for prohibition or restriction under the Framework. Nonetheless, the Department is aware of litter data showing large numbers of SUP bottles in the environment, and will review performance data for existing measures and work with partners and stakeholders to identify areas where further action is needed. More broadly, the Department will continue to monitor the latest research and data relating to plastic pollution in our environment, and will consult with Canadians if additional items are identified to be of concern.

Creation of national standards

Stakeholders requested that the Government of Canada address inconsistencies found in product labelling and advertising when using terms like "recyclable," "compostable," and "biodegradable." Several stakeholders suggested that the creation of national standards for these terms would help consumers better understand the impacts of the products they purchase. These standards might also help Canadians dispose of plastic waste into the proper waste-management stream, thereby reducing contamination issues with recycling and composting facilities.

The creation of national standards are out of scope for the current proposal. While there is currently no regulatory framework in Canada that defines these materials and their management, bio-based plastics standards, including standards for compostable plastic products, will be addressed as part of the Canada-wide Strategy on Zero Plastic Waste.

Modern treaty obligations and Indigenous engagement and consultation

The assessment of modern treaty implications conducted on the proposed Regulations in accordance with the *Cabinet Directive on the Federal Approach to Modern Treaty Implementation* concluded that the proposal would introduce new regulatory requirements on lands covered by modern treaties. However, the proposed regulation is not expected to affect any rights protected under the *Constitution Act, 1982* nor those set out in modern treaties.

A survey conducted by the Department of the laws and regulations enacted by Indigenous governments pursuant to modern treaties found that some Indigenous laws and regulations are in place to help manage the impacts of pollution from SUPs. For example

- the Makkovik Inuit Community Government, an Inuit community constituted under the *Labrador Inuit Land Claims Agreement*, has enacted a ban on SUP checkout bags; and
- the Tsawwassen First Nation has enacted the *Good Neighbour Regulation* that prohibits the littering of plastics, Styrofoam and bags in public places.

Similar to other jurisdictions in Canada that have enacted prohibitions on SUPs or on littering, these measures would be enhanced by federal action to remove certain SUPs from the national market. By doing so, the burden on communities to develop, implement, and enforce local measures will be significantly reduced. Indigenous communities that have enacted measures to address plastic pollution will be informed of the proposed Regulations and invited to provide input.

Through consultations on the Discussion Paper, the Department received written input from two Indigenous organizations: one situated in Northern Quebec, and one situated in Atlantic Canada. These commenters expressed concern with increased levels of plastic pollution in Indigenous communities, explained some of the challenges of managing plastic waste in rural and remote areas, and encouraged the Government of Canada to work closely with communities as it develops measures.

In the spirit of early engagement, the Department held a virtual "face-to-face" meeting with interested Indigenous communities and organizations on January 8, 2021, to discuss the proposed risk management approach presented in the Discussion Paper, answer questions, and solicit feedback. Seven representatives of Indigenous organizations attended the meeting. Input received from this session included the following:

- the Government of Canada should take into consideration the needs of Indigenous communities that may rely on SUPs, such as water bottles and cutlery, during boil-water advisories;
- bans on SUP checkout bags implemented by Indigenous communities have been successful, without significant drawbacks;
- waste management policies, such as extended producer responsibility, are difficult to implement in rural and remote areas, due to the costs of transporting waste; as a result, waste is typically landfilled or burned; and
- further studies should be undertaken to understand the challenges and opportunities for Indigenous communities and businesses to reduce plastic waste and prevent plastic pollution.

In response to input from Indigenous peoples, the Department

- consulted officials at Crown-Indigenous Relations and Northern Affairs Canada, who stated that boil-water advisories should not prevent the washing of reusable cutlery; and
- will continue to seek input from Indigenous peoples on the proposed Regulations. In particular, Indigenous communities that have prohibited or restricted SUPs, or that have put in place other measures to prevent plastic pollution, will be contacted and invited to provide input.

The prepublication comment period is also an opportunity for Indigenous peoples to provide feedback on the proposed Regulations.

Instrument choice

The Prime Minister's announcement and subsequent Mandate Letter to the Minister of the Environment in 2019, followed by the 2020 Speech from the Throne, set a commitment for the Government of Canada to ban harmful SUPs, where supported and warranted by science. This commitment was reiterated in October 2020 with the publication of the Discussion paper, which described the Government of Canada's management framework for SUPs. This framework supports the above-mentioned commitment, as well as the Government of Canada's comprehensive plan to achieve zero plastic waste. It established a three-step process for

- determining the need for particular SUPs to be managed;
- determining the management objective that should be assigned to particular SUPs; and
- choosing the most appropriate instrument to achieve management objectives.

The first step in the framework characterized SUP items as either environmentally problematic, value-recovery problematic, or both, and identified considerations for possible exemptions from management actions. Criteria for categorizing SUP items are described in the table below. Considerations for exemptions from risk management actions included whether a SUP item

performs an essential function (e.g. related to accessibility, health and safety, or security) and whether a viable substitute exists that can serve the same function as the SUP item.

Table 6. Characterization of SUPs

Categories of single-use plastics	Criteria
Environmentally problematic	• the SUP is prevalent in natural or urban environments, according to citizen science, civil society data, or municipal litter audit data • the SUP is known or suspected to cause environmental harm (e.g. risk of ingestion or entanglement by wildlife)
Value-recovery problematic	• the SUP hampers recycling systems or wastewater treatment systems • the SUP has a low or very low recycling rate (i.e. lower than the average recycling rate for plastic packaging, from 0–22%) • barriers exist to increasing the recycling rate

The second step in the framework sets three management objectives based on the categorization of SUPs:

- eliminate or significantly reduce SUPs entering Canada's environment;
- reduce the environmental impact of plastic products overall; and
- conserve material resources by increasing the value recovery of plastics.

The third step of the framework was to select policy instruments informed by the Department's Instrument Choice Framework for Risk Management under CEPA. Under this framework, instruments are chosen based on several criteria, including the following:

- environmental effectiveness and achievement of the management objective;
- maximization of benefits and minimization of costs;
- distributional impacts on groups and segments of society;
- stakeholder acceptability and compatibility with other programs in Canadian jurisdictions; and
- meeting international obligations, including international protocols, agreements, and trade obligations.

Potential instruments identified under the framework include bans and restrictions on use, incentives to encourage the use of reusable products or systems, material specifications (e.g. recyclability rules or guidelines), and extended producer responsibility or other collection and recycling requirements.

The Department assessed fourteen categories of SUPs according to the criteria in the management framework described in the Discussion Paper. A total of six categories of SUPs met the criteria outlined in the first step of the framework for being both environmentally and value-recovery problematic, and therefore were identified as candidates for a ban or restrictions on their use. The other eight categories of SUPs that did not meet all the criteria are potential candidates for management using other instruments. For example, the Department identified material specifications as the most appropriate instrument for multi-material packaging. The Department will continue to consult and work with jurisdictions, stakeholders and the public to help determine how these other SUPs can be better managed to reduce plastic pollution and improve value recovery.

Under the framework, regulatory actions banning or restricting SUPs that are both environmentally and value-recovery problematic was identified as the only viable option to eliminate, or significantly reduce these SUPs entering Canada's environment. The Department identified the development of regulations under section 93 of CEPA, following the addition of

plastic manufactured items to Schedule 1 to the Act, as the preferred risk-management approach, given that CEPA is one of the Government of Canada's key pieces of legislation to prevent pollution that can cause environmental harm. The Act also provides a broad suite of tools that allow for flexibility to tailor measures to the specific issues requiring action.

Regulatory analysis

Benefits and costs

Analytical framework

In order to analyze the incremental impacts of the proposed Regulations, the Department developed an analytical framework to characterize the costs and benefits (Figure 2). Unless otherwise stated, all costs and benefits in the following subsections are presented in 2020 Canadian dollars, present value to base year 2021 using a 3% discount rate. The social discount rate of 3% is applied in the central analysis since the proposed Regulations would primarily affect private consumption of goods and services. Total monetized benefits and costs discounted at 7%, as well as non-discounted totals, are presented in the "Sensitivity analysis" subsection of the "Benefits and costs" section.

Figure 2. Cost-benefit analytical framework

Policy design and activities	Costs	Benefits
Prohibition on six categories of SUPs, resulting in • **Decreased quantity (and tonnage) of plastic waste from SUPs entering waste stream or becoming plastic pollution in the environment** • **Associated increased quantity (and tonnage) of waste from substitutes to SUPs entering waste stream and the environment**	Economic costs: • Substitution cost • Secondary-use cost • Waste management cost Environmental and social impacts: • Life cycle assessment • Potential perceived utility loss (from consumer preferences)	• Reduced risk of injury or death to wildlife and improved habitat quality • Increased enjoyment of ecological goods and services • Avoided terrestrial litter clean-up cost • Avoided marine pollution cost
Record keeping	Administrative costs	N/A
Compliance promotion	Government costs	N/A
Enforcement activities	Government costs	N/A

The policy design and activities depicted in the analytical framework correspond to those presented in the "Description" section. Before any costs or benefits can be estimated, the impact of the proposed Regulations on plastic waste and plastic pollution must first be quantified.

Quantifying the decrease in plastic waste (and associated increase in waste from substitutes)

Since single-use manufactured items are designed to become waste immediately after their single-use function has been fulfilled, the analysis assumes that "units sold" is equivalent to "waste generated." In order to quantify the change in waste associated with the proposed Regulations, the sales volumes over time for the six categories of SUPs and their main substitutes can be estimated, first in absence of the Regulations (baseline scenario), and then, given the Regulations (policy scenario). A quantification framework for this estimation is presented in Figure 3, where the area of each rectangle represents the sales volume of a given SUP and its main substitutes (note: areas are not to scale, diagram is illustrative only).

Figure 3. Quantification framework for units sold / waste generated in Canada

▶ Figure 3. Quantification framework for units sold / waste generated in Canada - Text version

The quantifications following the framework in Figure 3 are presented in the subsections below.

Baseline scenario

The Department acquired off-the-shelf market data on checkout bags, cutlery, foodservice ware, ring carriers, stir sticks and straws from international data analytics firms, and cross-referenced this data against other research (e.g. the Statistics Canada Supply and Use Tables, proprietary information from industry, publicly available literature, and manufacturer, distributor, or wholesaler websites) to create a historical database spanning from 2015 to 2019. The database includes estimates for sales volume, average price per unit (as paid by the final retailer), and the average mass per unit across the six categories of SUPs and their main substitutes. Sales volume is multiplied by average price per unit to estimate market value and by average mass per unit to estimate tonnage. These estimates for 2019 are presented in Table 1 and Table 2 in the "Background" section.

In order to construct a projected baseline scenario, the average annual growth in sales volumes over the historical period (2015 to 2019) for the six categories of SUPs and their main substitutes are first calculated and then applied from 2024 onward. The analysis assumes no sales growth for the six categories of SUPs and their main substitutes between 2019 and 2023 to account for the high level of uncertainty related to the COVID-19 pandemic and its impact on these markets. In the midst of public health measures such as stay-at-home orders, temporary business closures and teleworking, the use patterns of Canadians with respect to the six categories of SUPs have changed. For instance, greater uptake in take-out meals may contribute to higher usage of foodservice ware and cutlery, while fewer social outings in restaurants and bars may contribute to lower usage of straws and stir sticks. There is great uncertainty as to what the lasting market impacts of the COVID-19 pandemic on the six categories of SUPs may be. Equating projected sales volumes in 2023 with those observed in 2019 assumes that the markets for these goods will not shift permanently onto a different course, but rather, that they will "reset" back to their former usage rates and observed growth patterns once public health restrictions ease.

The projected baseline also takes into account Canadian jurisdictions that have implemented localized bans on any of the six categories of SUPs that have come into force after 2019 and prior to June 2021 (e.g. Prince Edward Island, Nova Scotia, Newfoundland and Labrador, Vancouver, Saint-Jean-sur-Richelieu, Sherbrooke), by adjusting the projected baseline sales volumes downward proportionate to the percentage of the population living in areas covered by these bans. This is to ensure

that the costs and benefits of measures undertaken by other jurisdictions are not attributed to the proposed Regulations. The projected baseline does not take into account any announcements from governments or industry regarding future intent to phase out usage of any of the six categories of SUPs, as these announcements are non-binding.

Policy scenario

As illustrated in Figure 3, all sales of the six categories of SUPs in the baseline scenario would be reallocated into one of three outcomes in the policy scenario: exemptions, demand reduction, or substitution. The reallocation factors into each outcome used in the analysis are presented in Table 7.

Table 7. Policy scenario reallocation factors (percentage of baseline usage)

Item category	Exemptions	Demand reduction	Substitution
SUP checkout bags	0	5	95
SUP cutlery	0	15	85
SUP foodservice ware made from or containing problematic plastics	0	0	100
SUP ring carriers	0	0	100
SUP stir sticks	0	10	90
SUP straws	10	15	75

Exemptions refer to the continued manufacture, import and sale of SUPs in certain cases as outlined in the "Description" section. The proposed Regulations would contain exemptions to retain access to SUP flexible straws for accessibility purposes. The historical database from 2015 to 2019 suggests that sales of SUP straws to "healthcare" and "households" accounted for around 6% of total sales. Given that the proposed Regulations would permit the sale of SUP flexible straws for healthcare and individual use, the analysis assumes a 10% exemption rate to account for those baseline sales as well as some contingency to account for increased sales by individuals who want a SUP straw, but would no longer receive one from a restaurant, for example. More analysis on this consideration is presented in the "Gender-based analysis plus" section.

Demand reduction refers to the expected decrease in demand for single-use substitutes that would be induced by the proposed Regulations. This may be the result of higher unit costs associated with substitutes that could drive behavioural change in retail settings (price elasticity of demand), [27] whereby certain substitutes (e.g. paper checkout bags, paper straws, wood cutlery, wood stir sticks) might become offered "on demand" as opposed to "by default."

Substitution refers to the replacement of the six categories of SUPs by their readily available substitutes. In general, for SUPs with multiple substitutes (e.g. foodservice ware made from or containing problematic plastics), reallocation into each substitute is based on relative market shares under the baseline scenario. SUP checkout bags are the only category of SUPs for which a reusable substitute (i.e. reusable plastic checkout bags) is also modelled. For all categories of SUPs except SUP checkout bags, the analysis assumes the substitution of one SUP item by one substitute item. For example, one SUP stir stick would be replaced by one single-use wood stir stick, and one SUP straw would be replaced by one single-use paper straw. For SUP checkout bags, additional factors are included to account for substitution into reusable checkout bags, as well as volume capacity differences between SUP checkout bags and their substitutes. Specifically, the analysis assumes that, on average, one single-use paper checkout bag would replace 1.2 SUP checkout bags, and one reusable checkout bag would replace 1.7 SUP checkout bags each time it is used. [28] Using the requirements for distinguishing between a plastic checkout bag that is single use versus "reusable" (as per the "Description" section), the analysis assumes that each reusable checkout bag would be used 100 times on average, thereby replacing 170 SUP checkout bags over its lifetime.

Incremental change

As outlined in the "Description" section, the prohibition on manufacture and import are anticipated to come into force in 2023, while that for sale is anticipated to come into force in 2024 (with the exception of SUP straws, for which all prohibitions are expected to come into force in 2023). The analysis assumes that 60% of substitutions for each category of

SUPs would occur in the first year of implementation and that the remaining 40% would occur in the second year of implementation. This is to account for the de-facto "sell-through" period between the prohibition on manufacture and import and the prohibition on sale. The chosen analytical period spans 10 years from the first year of implementation (2023 to 2032), and the first year of full policy stringency is the second year of implementation (2024).

The difference between the policy scenario and baseline scenario is the incremental change. As depicted in Table 8, the proposed Regulations are expected to reduce the plastic waste generated by the six categories of SUPs by 153 761 tonnes in the first year of full policy stringency (2024) and by around 1.6 million tonnes over the analytical period (2023 to 2032).

Table 8. Estimated incremental change in quantity and tonnage of plastic waste from the six categories of SUPs

Item category	Millions of units (first year of full stringency, 2024)	Millions of units (10-year analytical period, 2023–2032)	Tonnes (first year of full stringency, 2024)	Tonnes (10-year analytical period, 2023–2032)
SUP checkout bags	-14 984	-157 842	-120 668	-1 271 530
SUP cutlery	-4 583	-47 386	-11 041	-114 154
SUP foodservice ware made from or containing problematic plastics	-833	-9 305	-17 446	-199 397
SUP ring carriers	-187	-1 923	-661	-6 807
SUP stir sticks	-3 042	-32 796	-1 825	-19 678
SUP straws	-5 301	-58 314	-2 120	-23 325
Total	**-28 929**	**-307 566**	**-153 761**	**-1 634 890**

Due to inherent qualities of the substitution items, the reduction in plastic waste from the six categories of SUPs depicted in Table 8 would have an associated increase in waste from substitutes (e.g. substituting paper for plastic increases material weight). As illustrated in Table 9, the proposed Regulations are expected to increase the waste generated from substitutes by 298 054 tonnes in the first year of full policy stringency (2024) and by around 3.2 million tonnes over the analytical period (2023 to 2032), almost all of which is driven by paper substitutes. In the case of SUP checkout bags, SUP foodservice ware made from or containing problematic plastics, and SUP ring carriers, some of their substitutes would themselves be made of plastics, though they would represent inherently less risk to the environment. As shown in Table 9, substitutes made of plastics would represent an additional 21 519 tonnes of plastic waste in the first year of full policy stringency (2024), and 229 101 tonnes over the analytical period (2023 to 2032).

Table 9. Estimated incremental change in quantity and tonnage of waste from substitutes to the six categories of SUPs, by material

Substitute material	Millions of units (first year of full stringency, 2024)	Millions of units (10-year analytical period, 2023–2032)	Tonnes (first year of full stringency, 2024)	Tonnes (10-year analytical period, 2023–2032)
Paper	9 002	97 004	261 250	2 753 493
Wood	6 633	69 794	9 345	98 898
Plastics	707	7 535	21 519	229 101
Moulded fibre	161	1 933	5 139	62 403
Aluminum	84	972	801	9 238
Total	**16 587**	**177 239**	**298 054**	**3 153 132**

Combining the results in Table 8 with those from the plastics row from Table 9, the proposed Regulations would result in an expected net reduction in plastic waste of 132 242 tonnes in the first year of full policy stringency (2024), and around 1.4 million tonnes over the analytical period (2023 to 2032), as illustrated in Table 10. The net reduction in plastic waste for checkout bags alone would represent 87% of the total net reduction in plastic waste by tonnage, or 53% by unit counts.

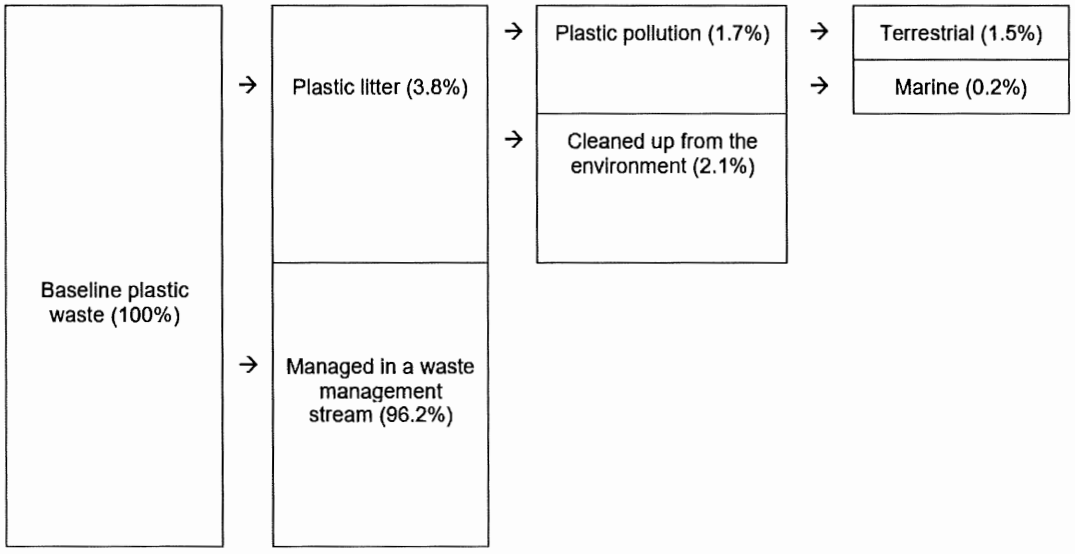
Table 10. Estimated net change in quantity and tonnage of plastic waste

Item category	Millions of units (first year of full stringency, 2024)	Millions of units (10-year analytical period, 2023–2032)	Tonnes (first year of full stringency, 2024)	Tonnes (10-year analytical period, 2023–2032)
Checkout bags	-14 932	-157 295	-114 443	-1 205 860
Cutlery	-4 583	-47 386	-11 041	-114 154
Foodservice ware made from or containing problematic plastics	-260	-3 138	-3 676	-51 405
Ring carriers	-106	-1 101	863	8 633
Stir sticks	-3 042	-32 796	-1 825	-19 678
Straws	-5 301	-58 314	-2 120	-23 325
Total	**-28 222**	**-300 031**	**-132 242**	**-1 405 789**

Quantifying the net decrease in plastic pollution (and associated increase in pollution from substitutes)

The proposed Regulations would result in a net reduction in plastic litter and plastic pollution stemming from the net reduction in plastic waste depicted in Table 10. A quantification framework relating to these estimations is presented in Figure 4, where the area of each rectangle represents a proportion of plastic waste, by tonnes (note: areas are not to scale, diagram is illustrative only, percentages relate to 2024).

Figure 4. Quantification framework for terrestrial and marine plastic pollution generated in Canada



▶ Figure 4. Quantification framework for terrestrial and marine plastic pollution generated in Canada - Text version

The quantification framework depicted in Figure 4 is populated using the following three-step methodology:

1. Estimate the littering rates (See Table 11) associated with the six categories of SUPs. Certain literature [29] has estimated the littering rates for SUP checkout bags, SUP cutlery, SUP foodservice ware, SUP stir sticks, and SUP straws. As the

Department did not identify a specific estimate of the littering rate for ring carriers in the literature, the analysis uses the estimated littering rate for the overall packaging sector (from the Deloitte Study).

2. Estimate the amount of plastic litter that is recovered through various clean-up initiatives that becomes properly disposed of in a managed waste stream and the amount of plastic litter that stays in the environment as plastic pollution. According to the Deloitte Study, the packaging sector accounted for an estimated 1.1 million tonnes of plastic waste in 2016. Of this amount, an estimated 29 600 tonnes were littered into the environment. Of this litter, an estimated 16 600 tonnes (56%) were recovered via clean-up efforts and properly disposed of, and an estimated 13 000 tonnes (44%) remained in the environment as plastic pollution. The analysis assumes that these proportions hold for the six categories of SUPs, which are a subset of the overall packaging sector, and that they would hold over the entire analytical period (i.e. paid and unpaid clean-up activities are expected to remain proportionate to the amount of baseline litter).
3. Estimate the proportion of plastic pollution in the terrestrial versus marine environment. Certain literature has estimated that 5% of all plastic litter leaks into a marine environment. [30] This approach to estimate marine plastic pollution excludes plastic pollution that enters Canadian fresh waters (including the Great Lakes, other lakes, and rivers) that never reach the oceans.

The expected reduction in plastic pollution, including marine plastic pollution, across the six categories of SUPs is presented in Table 11 for the first year of full policy stringency (2024).

Table 11. Estimated net change in tonnage of plastic litter, plastic pollution, and marine plastic pollution from the six categories of SUPs, first year of full policy stringency (2024)

Item category	Net reduction of plastic waste (tonnes)	Estimated littering rate	Avoided littered plastic (tonnes)	Reduction of plastic litter cleaned up (tonnes) [a]	Reduction in total plastic pollution (tonnes) [b]	Reduction in marine plastic pollution (tonnes) [c]
checkout bags	-114 443	4.10%	4 692	2 628	2 065	235
cutlery	-11 041	0.46%	51	28	22	3
foodservice ware made from or containing problematic plastics	-3 676	5.10%	187	105	82	9
ring carriers	863	0.89%	-9	-5	-4	-0.5
stir sticks	-1 825	0.20%	4	2	2	0.2
straws	-2 120	3.10%	66	37	29	3
Total	**-132 242**	**N/A**	**4 990**	**2 795**	**2 196**	**250**

a 56% of total avoided littered plastic

b 44% of avoided littered plastic

c 5% of avoided littered plastic

Of the expected net reduction in plastic waste of 132 242 tonnes in the first year of full policy stringency (2024), 2 196 tonnes would be prevented from becoming plastic pollution, including 1 946 tonnes in terrestrial plastic pollution and 250 tonnes in marine plastic pollution. Of the expected net reduction in plastic waste of around 1.4 million tonnes across the total analytical period (2023 to 2032), 23 432 tonnes would be prevented from becoming plastic pollution, including 20 769 tonnes in terrestrial plastic pollution and 2 663 tonnes in marine plastic pollution. The proposed Regulations would also result in 2 795 tonnes in avoided plastic litter cleaned up from the environment in 2024 and 29 823 tonnes over the total analytical period.

Overall, the expected net reduction in plastic waste and plastic pollution associated with the proposed Regulations would represent around 4% of total estimated plastic waste and 7% of total estimated plastic pollution generated in Canada in 2024. [31]

Benefits

The main benefit associated with a reduction in terrestrial and marine plastic pollution would be a reduction in the risk of injury or death to wildlife and improved natural habitat quality. Another benefit from these reductions would be an increase in enjoyment of natural scenery and outdoor public recreation spaces by individuals. These non-monetized benefits are expected to have a significant impact on the well-being of Canadians and the environment. The analysis also monetizes avoided terrestrial litter clean-up cost, as well as avoided marine plastic pollution in terms of tourism impacts, fisheries impacts, and avoided clean-up cost. Such monetization may partially capture the value that Canadians place on reduced risk to wildlife and their habitats, as well as human enjoyment of cleaner environments, given that the primary reasons that our society allocates time and resources to litter clean-up are environmental and aesthetic purposes.

Reduced risk of injury or death to wildlife and improved habitat quality

Most of the existing literature characterizes the harm from plastic pollution to wildlife and habitats in general, not specifically from SUPs, though conclusions regarding the former can be applied to the latter as SUPs are a common form of plastic pollution.

Plastic waste that enters the environment as plastic pollution does not decompose easily, and represents a persistent risk of harm to wildlife and habitats throughout its lifetime. In the marine environment, plastics degrade slower than they do on land, and light-weight plastic pollution (such as SUPs) can float on the surface of waters for a long time before sinking. The buoyancy of light-weight plastic pollution makes it easy for it to be carried by currents from smaller bodies of water to oceans, where it can collect in floating garbage patches. Marine wildlife that encounters plastic pollution on the water's surface may sustain injuries or may mistake it for food.

Entanglement is one of the most frequently reported impacts of macroplastic pollution on wildlife. [32] Certain literature estimates that over 200 species have been impacted by entanglement as of 2015, though this number is likely underestimated due to lack of reporting from some major global regions. [33] The shape of certain plastic items (e.g. plastic bags and ring carriers) poses a threat of entanglement due to having a looped structure. Plastic bags pose among the most significant threats of entanglement to marine life, along with fishing gear and balloons. [11] Entanglement can be lethal to animals, causing either suffocation or strangulation. When entanglement is not immediately lethal, it can cause severe sublethal impacts, including inhibited growth, physical injuries, reduced mobility and physiological stress in animals, which can lead to eventual mortality. [34] For example, whole or parts of plastic items lodged in various body parts of wildlife can cause severe discomfort. Lethal impacts to marine plants, sponges, and coral include smothering by larger items (e.g. plastic bags), which affects gas exchange and their photosynthetic capacities.

Another physical impact of plastic pollution on wildlife is intentional or unintentional ingestion. Intentional ingestion is when an organism mistakes plastic pollution for food, whereas unintentional ingestion is when an organism feeds on another organism that has ingested plastic pollution, thereby indirectly absorbing that pollution through the food chain. Like entanglement, ingestion can be lethal or sublethal. Lethal effects include damage to internal organs and intestinal blockages, which can ultimately lead to starvation. Sublethal impacts include altered growth or condition, nutritional changes, contamination from toxic additives, and other internal damage. [11] [35] Studies have rated SUP checkout bags and SUP cutlery as the greatest ingestion risk for seabirds, turtles, and marine mammals. [11]

In addition to bodily harm to wildlife, macroplastic pollution can have adverse effects on habitats and ecosystems. Floating plastic items in marine environments can act as rafting vessels that transport non-native organisms into established ecosystems. These organisms can be predators to native species or may outcompete them for resources, leading to losses in biodiversity. Non-native species can also expose native species to diseases, which could alter the genetic diversity within ecosystems. [36]

Macroplastic pollution can also fragment into smaller pieces, and the resulting microplastic pollution can pose a significant threat of ingestion to wildlife. While the literature in this domain is scarce, ingestion of microplastic pollution may have negative impacts on organisms' nutrition and metabolism, [37] as well as reproduction and mortality rates. [38] More literature is needed to understand the full effects of microplastic pollution on wildlife and their habitats.

The proposed Regulations are expected to reduce the risk of harm to wildlife and their habitats by reducing the amount of macroplastic pollution entering terrestrial and marine environments, thereby rendering fewer opportunities for wildlife to encounter such pollution and become adversely affected.

Increased enjoyment of ecosystem goods and services

In addition to beneficial impacts on wildlife and their habitats, the reduction in terrestrial and marine plastic pollution associated with the proposed Regulations would also increase the enjoyment of ecosystem goods and services for current and future generations. Reducing plastic pollution now is an investment in both the current and future provisions of ecosystem goods and services, in terms of the positive impacts they can provide to humans. [39] Parks, beaches, and other outdoor public spaces provide a wealth of ecosystem services, such as regulating services (e.g. regulate climate and biological processes) and cultural services (e.g. recreation and relaxation). [40] Increased accessibility and functionality to these spaces contributes to human well-being. [39] The presence of plastic pollution in these environments can hinder the functionality and aesthetic beauty of outdoor public spaces.

A reduction of plastic pollution in public spaces may have positive impacts on recreational value for residents and tourists. Studies have found that people value aesthetic beauty and cleanliness, and litter is often cited as a reason why visitors will spend less time in certain environments or will avoid certain sites if they anticipate those sites will be full of litter. [41] For example, studies have found cleanliness of beaches to be an important factor for tourists in deciding which beach to attend. [42] Studies have also found that tourists expressed a positive willingness to pay for clean water and coastlines. [43] Residents and tourists may therefore derive increased recreational value from using visually clean and sanitary public spaces. This is expected to have positive impacts on local tourism communities (through increased tourism revenues) since cleaner outdoor public areas tend to attract more tourists.

Plastic pollution can also hinder the accessibility and functionality of public spaces and prevent residents and tourists from enjoying activities in a natural setting. Specifically, the presence of litter can have direct consequences on individuals' physical and mental health. Visitors and workers can be susceptible to a range of injuries, such as cutting themselves on sharp plastics and being exposed to unsanitary items, [44] as well as to negative impacts on their emotional and mental well-being. [45] Refraining from participating in activities that ecosystems typically offer can also have health implications due to foregoing opportunities to obtain the positive impacts associated with such goods. Plastic pollution can also act as a barrier to accessing outdoor public spaces, such as boardwalks and parks.

A reduction in plastic pollution in public spaces may also provide considerable cultural or emotional gratification. Evidence shows that humans experience well-being in the knowledge that animals are present and will remain there for future generations. For example, "charismatic" marine organisms such as seabirds or turtles hold significant cultural and emotional importance to some individuals, which suggests that a reduction in marine plastic pollution that reduces the risk of harm to charismatic species may also induce improvements to human well-being. [46]

Studies have found that people's perceptions, preferences, and valuations of ecosystem goods and services differ by several variables including, but not limited to, income, culture, education, and gender. [47] These individual characteristics play a role in the degree to which the population would enjoy the benefits of the proposed Regulations. Studies have also found that peoples' relationship with ecosystem goods and services is positively correlated with their willingness to pay for them. [48] Hence, individuals will reap the benefits of improved well-being differently, depending on their relationships with ecosystem goods and services and their respective positionalities.

Avoided terrestrial litter clean-up costs

The cost of cleaning up terrestrial litter predominantly relates to the cost of collecting the individual pieces of litter that are dispersed throughout urban and rural environments (e.g. streets, parks, roadsides, shorelines). These costs are usually borne by municipalities, but can also be carried by businesses on their properties, and can represent a significant opportunity cost when accomplished through volunteering activities.

Multiple Canadian municipal litter surveys (e.g. Vancouver, Edmonton, and Toronto) and provincial highway litter surveys (e.g. Newfoundland and Labrador, New Brunswick, Nova Scotia, Prince Edward Island) provide information on plastic litter but do not disclose the costs incurred to clean up that litter. Therefore, the analysis makes use of publicly available case studies on terrestrial plastic litter clean-up costs and is structured on a per item basis. Assessing terrestrial litter clean-up costs on a tonnage basis would mischaracterize the scope of the benefit, given that plastic litter is numerous, light-weight, and scattered widely throughout the environment.

As shown in Table 11, the expected decrease in plastic litter cleaned up from the environment would be 2 795 tonnes in the first year of full policy stringency (2024), or 29 823 tonnes over the analytical period (2023 to 2032). This tonnage would be equivalent to a reduction of more than 458 million SUP units cleaned up from the environment in 2024, or 4.9 billion SUP units over the analytical period. The analysis of avoided litter clean-up costs also needs to account for the increased littering of substitutes made from materials other than plastics. The littering rates for substitutes to the six categories of SUPs are expected to be the same as the six SUPs, independent of the material type, except for reusable checkout bags, which are expected to have a littering rate of 0.5% relative to the 4.1% littering rate for SUP checkout bags. [49] Single-use substitutes made out of paper, wood, or moulded fibre are all biodegradable in the environment, and would represent around 95% of all substitutes, by weight. The littering of these substitutes is therefore not expected to result in long-term harm to the environment. However, a portion of these substitutes that are littered in the environment would still be cleaned up through paid and volunteer activities, before they had enough time to fully decompose. The proportion of these substitutes picked up during litter clean-up activities would vary depending on the category of item and the type of material. For example, a single-use paper straw decomposes in the environment much faster than a single-use paper checkout bag or a piece of single-use wood cutlery. While pollution from single-use aluminum foodservice ware would not decompose in the environment easily, these substitutes are expected to represent less than 1% of the total tonnage across all substitute materials.

The increased waste from non-plastic substitutes would result in 458 million items littered in the environment in the first year of full policy stringency (2024), or 4.9 billion items over the analytical period (2023 to 2032), of which, less than one third (106 million items in 2024 or 1.1 billion items over the analytical period) would be cleaned up from the environment before fully decomposing. The proposed Regulations would therefore result in a net reduction of 352 million littered items cleaned up from the environment in the first year of full policy stringency (2024), or 3.8 billion littered items over the analytical period (2023 to 2032).

Governments generally do not apportion litter costs based on individual pieces of litter, but rather, on the time spent cleaning up that litter. The literature provides some examples of annual per capita costs for litter collection, but these data are not helpful in determining the marginal cost of a specific source of litter (i.e. the six categories of SUPs). The majority of cost information comes primarily from roadside litter collection programs. However, there are limitations in generalizing roadside litter clean-up costs across all terrestrial litter clean-up, as roadside litter clean-up costs will vary depending on litter deposition rates and density, cost of labour, surface conditions, and cost of the necessary equipment. [50] Different studies from the United States have estimated the cost of litter clean-up at between US$0.21 and US$1.29 per littered item for paid public employees, and at between US$0.047 and US$0.18 for voluntary labour under Adopt-a-Highway litter clean-up programs. [51] Another study estimated that the cost of labour alone to collect each piece of litter that accidentally leaked into the environment from curbside recycling collection ranged from US$0.17 to US$0.79 per littered item. [52]

While the six categories of SUPs are among the most prevalent forms of plastic litter picked up during litter clean-up activities, other types of litter are also collected. Therefore, the following analysis is based on the average number of littered plastic items that can be picked up in one hour and assumes an average hourly labour rate or opportunity cost of volunteer labour of $15 per hour.

Table 12. Scenario analysis for avoided terrestrial litter clean-up (2020 dollars, discounted at 3% to base year 2021)

Number of units of SUPs picked up in one hour	Cost of collection per item	Estimated total avoided terrestrial litter clean-up cost for 346 million units (2024)	Estimated total avoided terrestrial litter clean-up cost for 3 685 million units (2023–2032)
40	$0.38	$123M	$1,167M
60	$0.25	$81M	$768M
80 (central scenario)	$0.19	$61M	$583M
100	$0.15	$48M	$461M

Under the chosen central scenario, the proposed Regulations would result in $61 million in avoided terrestrial clean-up cost in the first year of full policy stringency (2024), or $583 million across the analytical period (2023–2032). These cost savings represent $1.61 per capita [53] in avoided terrestrial litter clean-up cost in 2024, or $15.31 over the analytical period.

Avoided marine pollution costs

The proposed Regulations would result in an estimated net reduction in marine plastic pollution of 2 663 tonnes over the analytical period. While a number of studies have quantified the tonnage of plastic pollution in marine environments and provided qualitative analysis of the associated negative externalities, monetization of those impacts is still an emerging area of study, mainly due to very limited data.

The Deloitte Study estimated that 2 500 tonnes of plastic waste was permanently leaked into the Canadian marine environment as plastic pollution in 2016. Another study by Deloitte modelled the median economic cost of marine plastic pollution in terms of its impact on tourism, fisheries, and clean-up costs in Canada at US$31 million per year. [54] Combining the two figures, the cost of marine plastic pollution in Canada can be estimated at approximately Can$16,000 per tonne. This figure is expected to be a low-bound estimate, as the proprietary model only considered inhabited coastlines for clean-up, rather than the entire coastline, since that model assumed local governments would prioritize clean-up budgets around inhabited areas in comparison to remote and isolated coastal areas. The model also excluded impacts to wildlife and their habitat, and on valuation of real estate in coastal areas. The prevalence and relatively small size of the six SUPs (as compared to other plastic litter, such as fishing gear) also suggests that the $16,000 would be a low-bound estimate. Considering an estimated net reduction of 250 tonnes in marine plastic pollution in the first year of full policy stringency (2024), the proposed Regulations would result in around $3.7 million in avoided costs of marine plastic pollution (or a net reduction of 2 663 tonnes in marine plastic pollution resulting in avoided costs of around $36 million over the analytical period).

Based on available literature, the analysis assumes that there are minimal negative externalities on the marine environment associated with single-use substitutes that are not made of plastic, as most of these substitutes would decompose either prior to reaching the marine environment or relatively quickly thereafter. In comparison, the six categories of SUPs are usually lighter and more buoyant than their non-plastic substitutes, which facilitate their transport via wind or water into marine environments.

Costs

The decreased quantity (and tonnage) of plastic waste and plastic pollution from the six categories of SUPs and associated increased quantity (and tonnage) of waste and pollution from substitutes to the six categories of SUPs would elicit several costs, explored in the subsections below.

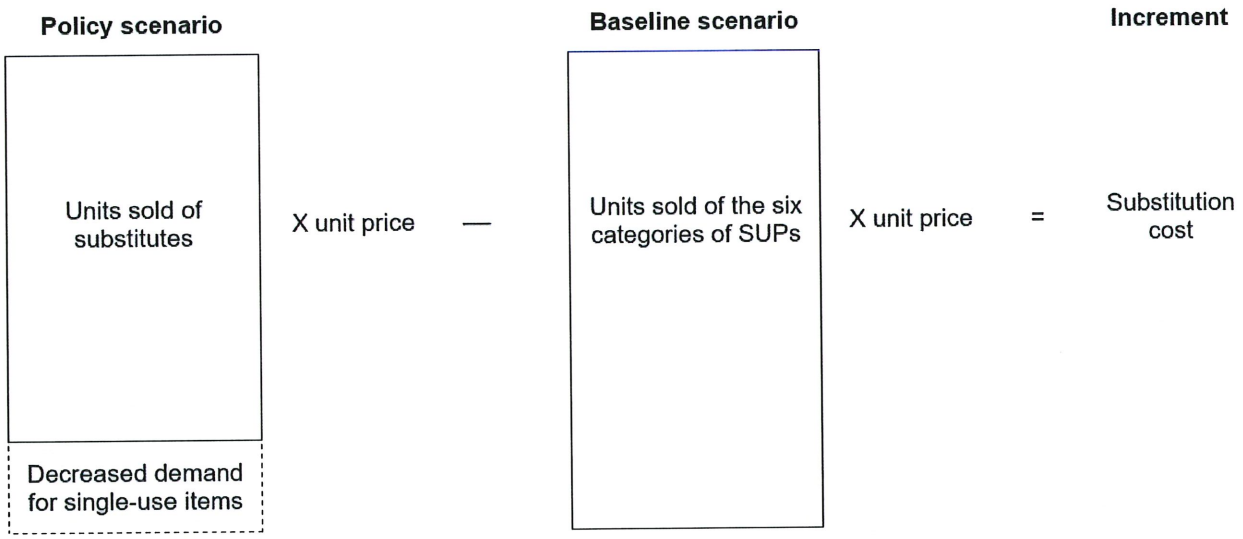
Substitution cost (for all categories of SUPs except checkout bags)

For SUP cutlery, SUP foodservice ware made from or containing problematic plastics, SUP ring carriers, SUP stir sticks, and SUP straws, the proposed Regulations would result in an estimated 308 billion fewer SUPs sold (Table 8) and 178 billion more substitutes sold (Table 9) over the analytical period (2023–2032). Market data suggests that, on average, these SUPs are sold

for lower unit prices than their readily available substitutes. Substitution costs refer to the price differentials between the SUPs that would have been sold in the absence of the proposed Regulations and the substitutes that are expected to take their place in the policy scenario, after accounting for demand reduction and the exemptions for SUP straws.

Figure 5. Substitution cost monetization framework

Note: Areas are not to scale and the diagram is illustrative only.



▶ Figure 5. Substitution cost monetization framework - Text version

While the unit price of any one single substitute is relatively small (i.e. ranging from $0.01 for a single-use wood stir stick to up to $0.34 for a single-use cardboard substitute to a ring carrier), the total substitution costs per year for the proposed Regulations are expected to be significant, given that these substitutes would replace around thirty billion SUP items annually, or around 800 SUP items per Canadian. As depicted in Table 13, the substitution costs for five of the categories of SUPs (excluding checkout bags) is estimated to be $185 million in the first year of full policy stringency (2024), or nearly $1.8 billion over the analytical period (2023–2032). Those costs represent $4.85 per capita in 2024, or $46.41 per capita over the analytical period.

Table 13. Substitution costs for five categories of SUPs (in millions, 2020 dollars, discounted at 3% to base year 2021)

Item category	First year of full policy stringency (2024)	Total analytical period (2023–2032)
SUP cutlery	73	678
SUP foodservice ware made from or containing problematic plastics	32	324
SUP ring carriers	31	285
SUP stir sticks	4	34
SUP straws	45	448
Total	**185**	**1,770**

Substitution cost and secondary-use cost for SUP checkout bags

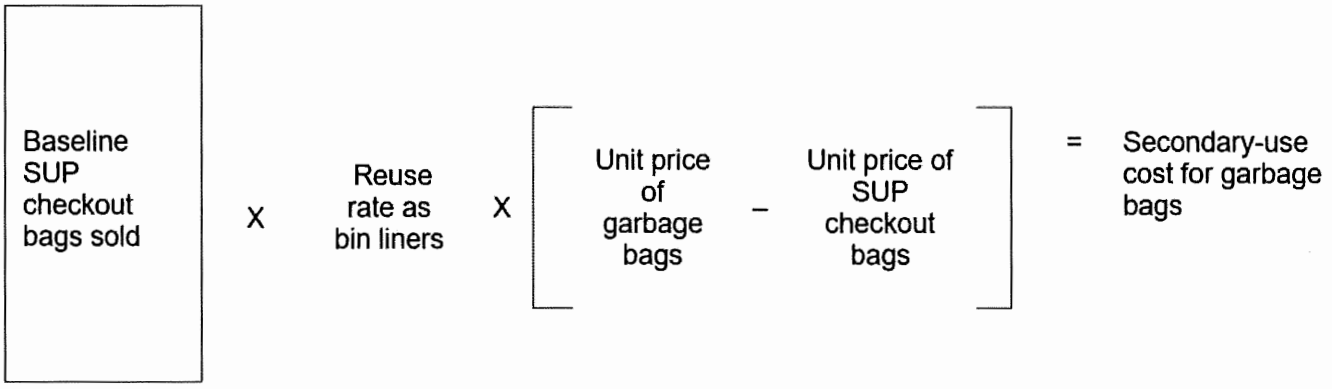
The proposed Regulations would result in an estimated 158 billion fewer units of SUP checkout bags sold over the analytical period (Table 8). In contrast to the five other categories of SUPs, the analysis for checkout bags considers substitution into reusable options alongside single-use paper substitutes. The Department of Natural Resources commissioned a report that was delivered in March 2021 to assess the potential impact of the proposed Regulations on Canadian fibre-based packaging

manufacturers (not available publicly). The report concluded that single-use paper checkout bags would only be expected to replace a minority of baseline sales for SUP checkout bags, with the majority replaced by reusable checkout bags. This finding is consistent with case studies in other countries.

Reusable checkout bags vary in material, quality, and price. The analysis only considers the unit price of relatively cheap reusable checkout bags (made of plastics) rather than other more expensive styles (e.g. made of cotton). In this way, the analysis estimates a minimum-cost way of achieving the expected substitution into reusable checkout bags. Of course, even a cheaper-end reusable checkout bag is many times more expensive than one SUP checkout bag. The average price of one reusable checkout bag can be divided by its theoretical number of uses (assumed to be 100) to obtain a low-end estimated "cost per use" (essentially, a straight-line amortization), which allows for the direct comparison of individual uses of reusable checkout bags against single-use counterparts. Using this methodology, the price per use of a reusable checkout bag is approximately 5.6 times less than the unit price of one SUP checkout bag.

Substitution cost for checkout bags cannot be considered in isolation from secondary-use cost. While SUP checkout bags are designed to become waste after their single use is fulfilled, it is common for individuals to hold on to these bags to use them in secondary applications (i.e. beyond the primary application of facilitating the transport of purchased goods from a retail setting). Some common secondary uses of SUP checkout bags are as trash bin liners, pet waste bags, to hold packed lunches, or to hold a change of clothes. Estimates in the literature of the secondary-use rate of SUP checkout bags as trash bin liners vary, but tend to fall in the range of 12% to 22%. [55] The analysis considers the cost to substitute SUP checkout bags, in their secondary application as a trash bin liners, with plastic garbage bags (Figure 6).

Figure 6. Secondary-use cost monetization framework: SUP checkout bags as trash bin liners



▶ Figure 6. Secondary-use cost monetization framework: SUP checkout bags as trash bin liners - Text version

Given that the proposed Regulations would also result in a higher quantity of single-use paper checkout bags available for secondary use, some consideration is also needed for the potentially offsetting effect of secondary usage of single-use paper checkout bags as either trash bin liners or compost bin liners. Since there is uncertainty with respect to several analytical parameters (e.g. expected proportion of baseline sales for SUP checkout bags that would be replaced by single-use paper checkout bags, reuse rates for single-use paper checkout bags, composting availability and habits), a break-even analysis is performed instead to determine the unit price consumers would need to pay for paper bags in order for all costs related to SUP checkout bags (i.e. substitution and secondary use) to break even. Scenarios for this break-even analysis are presented in Table 14.

Table 14. Break-even analysis for SUP checkout bags in first year of full policy stringency (2024), $2020 discounted at 3% to base year 2021

Substitution rate: SUP to single-use paper [a]	Substitution cost [b]	Break-even price for paper bags (low scenario) [c]	Break-even price for paper bags (high scenario) [d]
0.30	-$112M	-$0.07	$0.10

0.35	-$76M	-$0.01	$0.11
0.40 (central)	-$39M	$0.03	$0.12
0.45	-$3M	$0.06	$0.13
0.50	$34M	$0.09	$0.13

a	All remaining substitution would go into reusable checkout bags.
b	The substitution cost for checkout bags follows the same methodology presented in Figure 5. Negative substitution cost denotes cost savings.
c	The "low scenario" is derived using a unit price differential between SUP checkout bags and plastic garbage bags of $0.04, and a secondary-use rate of 12%.
d	The "high scenario" is derived using a unit price differential between SUP checkout bags and plastic garbage bags of $0.08, and a secondary-use rate of 22%.

Assuming that 40% of baseline SUP checkout bag sales would be substituted by single-use paper checkout bags (central case), paper bags would need to cost at least $0.03 to break even under a "low scenario," and $0.12 under a "high scenario." The historic unit price for single-use paper checkout bags (presented in Table 2 in the "Background" section) is $0.08. Since paper bags purchased from a store, such as composting bin liners, are typically more expensive than the single-use paper checkout bags that would accompany groceries for example, the likelihood of breaking even is expected to be reasonably high.

Waste-management costs

The proposed Regulations would prevent approximately 1.6 million tonnes of plastics from entering the waste stream over the analytical period, but would also add about 3.2 million tonnes of other materials to the waste stream from the use of substitutes, due to their increased unit weights relative to SUPs. This increase in tonnage of waste would represent additional costs for municipalities and provincial authorities, as they are usually responsible for managing collection, transportation, and landfilling of plastic waste, and would assume most of the associated costs, which would ultimately be passed on to taxpayers.

The reduction in plastic tonnage entering the waste stream from a reduction in the six categories of SUPs represents cost savings to waste management in terms of avoided costs. However, the increase in tonnage from substitutes to the six categories of SUPs represents an increase in costs to waste management. The analysis considers three waste management [56] pathways for modelling the waste management incremental costs and savings: landfilling, recycling, and composting. Figure 7 shows the pathways for the six categories of SUPs and their readily available substitutes. The rates at which waste is diverted to each pathway differ by category of SUP and material.

Figure 7. Three disposal pathways, by material

Landfill	Recycling	Composting

- Reduction in plastic for six categories of SUPs
- Single-use paper substitutes
- Single-use wood substitutes
- Single-use substitutes made of plastic
- Reusable checkout bags made of plastic
- Single-use moulded fibre substitutes
- Single-use aluminum substitutes

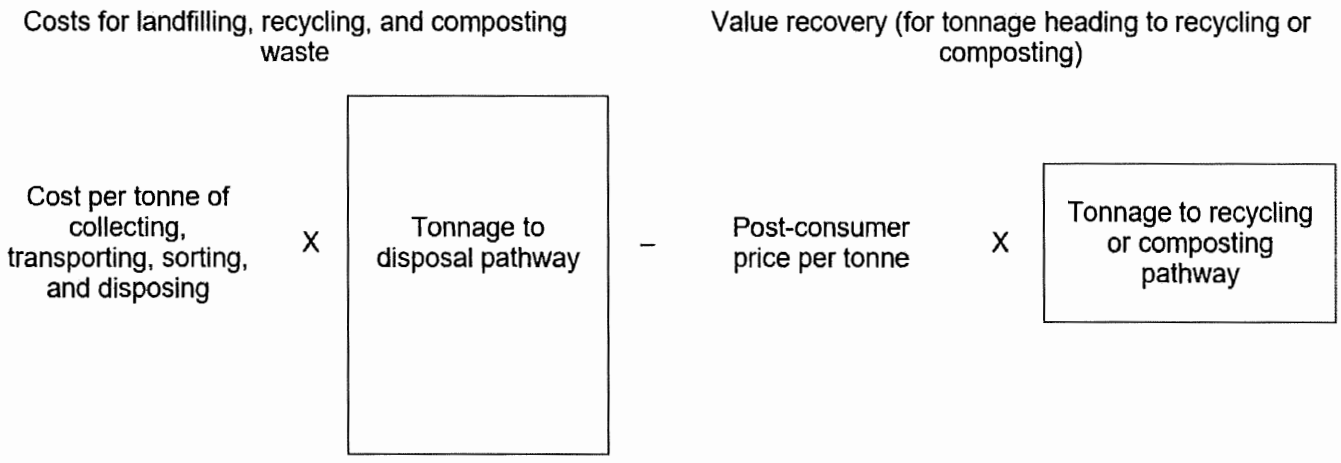
- Reduction in plastic for six categories of SUPs
- Single-use paper substitutes
- Single-use substitutes made of plastic
- Reusable checkout bags made of plastic
- Single-use aluminum substitutes

- Single-use paper substitutes
- Single-use wood substitutes
- Single-use moulded fibre substitutes

Incremental costs are calculated as the net of savings or avoided costs to waste management from a reduction in the tonnage of waste entering the waste stream from the six categories of SUPs, plus the associated increase in costs to waste management from an increase in tonnage from substitutes to the six categories of SUPs. The following aspects are considered for both SUPs and substitutes (where applicable): incremental tonnage for each material, diversion rates for each disposal pathway by category of SUPs, cost per tonne of collecting, transporting, sorting, and disposing of waste, and price of post-consumer material for materials being recycled. The cost per tonne of collecting, transporting, sorting and recycling plastic waste is based on the Deloitte Study, while the cost per tonne of collecting, transporting, sorting, and recycling or composting waste from other substitute materials is estimated from various publicly available reports, studies, and Canadian municipal websites on waste management. The analysis also considers value recovery for the recycling and composting pathways. Post-consumer price [57] per tonne of plastic (reduction in the six categories of SUPs and increase in substitute plastic), paper, and aluminum is used to estimate the value recovery for the recycling pathway, and post-consumer price per tonne of paper, moulded fibre, and wood is used to estimate value recovery for the composting pathway.

The analysis also estimates cost savings associated with a reduction in the hampering of recycling machinery by SUP checkout bags. SUP checkout bags can clog recycling machinery, causing delays in efficiency to clean out the machine. [58] The general methodology for estimating incremental costs to waste management is presented in Figure 8 (note: areas are not to scale, diagram is illustrative only). The estimation of costs per tonne of waste diverted into each of the three pathways is very similar, with the main difference being the consideration of value recovery for waste being recycled or composted. This is estimated for each of the six categories of SUPs and their readily available substitutes.

Figure 8. Waste management cost monetization framework



▶ Figure 8. Waste management cost monetization framework - Text version

The reduction in tonnage of waste from the six categories of SUPs represents a decrease in costs to the waste management stream, while the associated increase in tonnage of waste from substitutes represents an increase in costs. Despite the greater abundance of materials with value recovery, the proposed Regulations would generate net waste management costs

given that the price per tonne of post-consumer materials is much lower than the cost per tonne of collecting, transporting, sorting, and disposing of waste.

As presented in Table 15, the net waste management costs would be $18 million in the first year of full policy stringency (2024), or $163 million over the analytical period (2023 to 2032). These costs represent $0.46 per capita in 2024, or $4.29 per capita over the analytical period. The majority of the cost savings from the reduction in tonnage of waste from the six categories of SUPs is attributable to SUP checkout bags, while the majority of the increased costs from the increase in tonnage of waste from substitutes is attributable to single-use paper checkout bags.

Table 15. Waste management cost (in millions, $2020, discounted to base year 2021 at 3%)

Item category	First year of full policy stringency (2024)	Total analytical period (2023–2032)
Six categories of SUPs	-77	-734
Substitutes to the six categories of SUPs	95	897
Total incremental costs to waste management	**18**	**163**

Life cycle assessment

One recognized approach to measuring the broad impacts of any manufactured item is through a life cycle assessment (LCA). As the name suggests, LCAs provide a modelling approach that considers a manufactured item's complete life cycle, from cradle to grave, such as the upstream stage (e.g. natural resource extraction, manufacturing, transportation), the use stage (intended use by end user), and the downstream stage (e.g. disposal). Results are based on whichever environmental effects are identified for assessment, such as climate change, air quality, water quality, or biodiversity. Since these impacts go beyond the scope of the cost-benefit analysis for the proposed Regulations, a literature review of LCAs covering the six categories of SUPs and their readily available substitutes is presented in the "Strategic environmental assessment" section.

Perceived utility loss (from consumer preferences)

Substitutes to the six categories of SUPs perform an equivalent function to the SUPs they replace. For instance, a single-use paper checkout bag and a reusable checkout bag perform the same function as a SUP checkout bag: carrying purchased goods away from a retail setting. While SUPs and their substitutes are functionally equivalent, some consumers may have preferences for certain materials over others, and therefore, may not derive the same satisfaction from using SUP substitutes relative to SUPs. For example, on the negative side, certain single-use wooden cutlery may produce a subtle but detectable taste relative to SUP varieties, and certain single-use paper straws may become soggy after sitting in liquid for an extended period of time, both of which could detract from the user's experience. On the other hand, some consumers may find that certain SUP substitutes increase their user satisfaction. For example, while some consumers may be inconvenienced by bringing (and remembering to bring) their own reusable checkout bags to a retail setting, others may enjoy their greater durability and lower likelihood for breakages, relative to SUP checkout bags. It is also possible that some consumers may derive additional satisfaction from using SUP substitutes through the knowledge that their consumer choice did not contribute to the proliferation of plastic waste. For some consumers, the increased satisfaction gained from using items that are not ecologically hazardous may outweigh losses to the user experience. Whether the proposed Regulations would result in a net satisfaction loss or a net satisfaction gain depends on consumer preference, both now and how they would evolve over time, given changes in behaviour due to the proposed Regulations.

Administrative costs

The proposed Regulations would require any business that manufactures or imports any of the six SUPs for the purpose of export or re-export to keep a record (such as an invoice, contract or bill of lading) of the information and supporting documents establishing that the item has been or will be exported, as well as provide the records if requested by the Department. The Department expects that manufacturers and importers already collect the required information as part of their current business activities. The proposed Regulations should therefore not result in new administrative costs stemming from this requirement.

Businesses would be required to keep these administrative records for a period of at least five years. Should these records be requested by the Department's enforcement officers during any site visits or remotely, that retrieval would be expected to take between two and four hours of work from the business manufacturing or importing any of the six categories of SUPs for export. Associated undiscounted costs are expected to total around $2,000 per year.

Familiarization with the administrative regulatory requirements and dissemination of the information is expected to take a person 30 minutes for a total one-time cost of $35.03 per manufacturing or importing firm. [59] Familiarization with the administrative regulatory requirements and dissemination of the information, which would apply to around 250 000 businesses, is expected to take a person 15 minutes for a total one-time cost of $4.59 or $11.30 for businesses selling or offering any of the six SUPs, depending on if they are a small or a large business. [60] This undiscounted one-time cost is expected to total around $1.2 million. All administrative costs are summarized in Table 16.

Table 16. Administrative costs, by requirement

Requirement	Total one-time cost ($2020, undiscounted)	Total annual cost ($2020, undiscounted)
Familiarization with the administrative requirements	$1.2M	$0
Responding to information requests from the Department	$0	$2,000

The total discounted administrative costs to businesses over the analytical period (2023 to 2032) would be around $1.1 million (present value, $2020, discounted to base year 2021 at 3%).

Government costs

The Department would incur incremental costs related to training, compliance and promotion activities, inspections, investigations, and measures to deal with any alleged violations. Specifically, an estimated one-time cost of $57,000 would be required to train enforcement officers, with an additional cost of $32,300 per year for administration, coordination, and analysis to support enforcement activities. Ongoing enforcement costs would vary depending on the number of inspections that would be performed by the Department's enforcement officers, and would include inspections (which include operations and maintenance, and transportation), measures to deal with alleged violations (e.g. warnings, environmental protection compliance orders, and injunctions), investigations, and prosecutions. These costs are expected to gradually decrease from $1.6 million per year in the first year of full policy stringency (2024) to $0.95 million per year from 2028 onward. The Department would also incur costs for laboratory accreditation of reusable plastic checkout bags, reusable plastic straws, and reusable plastic cutlery (see the "Description" section). These costs are expected to gradually decrease from $0.74 million per year in the first year of full policy stringency (2024) to $0.30 million from 2028 onward.

The total discounted government costs in the first year of full policy stringency (2024) is estimated at $2.1 million or $13.4 million over the analytical period (2023 to 2032) [present value, $2020, discounted to base year 2021 at 3%].

Distributional analysis

Consumers

Millions of units of the six categories of SUPs are used and disposed of by Canadians on a daily basis. In 2019, each Canadian used an estimated 800 SUPs on average, or about two SUPs on a daily basis (Table 1). As SUP checkout bags, SUP cutlery, SUP foodservice ware made from or containing problematic plastics, SUP ring carriers, SUP stir sticks and SUP straws are commonly used items throughout the economy, all Canadians would be expected to be impacted by the proposed Regulations. Under the proposed Regulations, Canadians would use and dispose of comparatively more single-use (or reusable) substitutes to the SUPs overall, but in some instances, SUPs may not be replaced by another single-use product (e.g. not asking for a straw). The substitution cost associated with the proposed Regulations would be $4.85 per Canadian in the first year of full policy stringency (2024), or $46.41 per Canadian over the analytical period (2023 to 2032). As detailed in

the "Gender-based analysis plus" section, the substitution cost may be felt more acutely by Canadians with low-income and limited disposable income, as most (if not all) of the cost of implementing the ban would likely be passed on from retailers to consumers through increased prices for food, beverages, and store merchandise.

All substitution costs are expected to be passed onto consumers once the proposed Regulations come into force. The majority of SUP cutlery, SUP foodservice ware made from or containing problematic plastics, and SUP stir sticks are purchased by consumers in conjunction with food or beverage purchased in restaurants, cafés, or other facilities providing those services. Currently, the price of these items is usually embedded in the price of the overall transaction, and represents only a small fraction of it. For SUP checkout bags, substitution costs are also expected to be borne by consumers, either directly (i.e. a per-paper bag fee charged by the retailer) or indirectly (i.e. embedded in the price of goods purchased from the retailer). Consumers would also face substitution costs directly if they were to buy packages of any of the substitutes from a store, as well as any purchase of beverages that previously contained a SUP ring carrier, as these beverages would be purchased in tandem with the substitute carrier.

Businesses selling or offering any of the six categories of SUPs

The Department estimated that the proposed Regulations could impact up to 250 000 businesses selling, or offering any of the six categories of SUPs in Canada, of which, around 242 000 would be considered small businesses, as defined in the Treasury Board Secretariat's Policy on Regulatory Development (see the "Small business lens" section for further analysis).

Around 40% of these businesses are in the retail sector, and therefore, mostly impacted by the proposed Regulations through the ban on SUP checkout bags. Some of those businesses sell at least one of the six categories of SUPs directly to consumers. These businesses would be able to sell any single-use or reusable substitute instead, and therefore, should not be impacted by the proposed regulatory prohibitions. Businesses in the accommodation and foodservices sector would represent around 35% of all the businesses that potentially sell or offer any of the six categories of SUPs. Many of these businesses are expected to sell more than one of the six categories of SUPs. For example, a quick-service restaurant could be offering SUP checkout bags, SUP cutlery, SUP foodservice ware made from or containing problematic plastic, SUP stir sticks, and SUP straws. The healthcare and social assistance sector comprises around 15% of potentially affected businesses where businesses would still be able to offer flexible plastic straws to patients or residents requiring it. The remaining 10% is split between the art, entertainment, and recreation sector, the transportation sector, and the wholesale trade sector. The geographic distribution of these 250 000 businesses selling or offering any of the six SUPs is mostly in-line with Statistic Canada's population estimate by province. [61]

Businesses manufacturing any of the six categories of SUPs

Based on data acquired from a market analytics firm, the Department identified 131 unique businesses that potentially manufacture at least one of the six categories of SUPs as of March 2021. Of these businesses, seven are also importing at least one of the six categories of SUPs. Almost 80% of the facilities that manufacture these SUPs are located in Quebec and Ontario, and 15% are located in Alberta and British Columbia. Seventy-nine of these businesses are estimated to be small businesses (see the "Small business lens" section for further analysis).

The majority of the 131 unique businesses manufacture only one category (84%) or two categories (11%) of SUPs. Of the 78 businesses that manufacture SUP checkout bags, 70 produce that category of SUPs exclusively (Table 17). Of the 54 businesses that manufacture foodservice ware made from or containing problematic plastics, 37 produce that category of SUPs exclusively. The majority of businesses that manufacture SUP straws, SUP cutlery, SUP stir sticks, or SUP ring carriers produce more than one category of SUPs. While it is possible to estimate the total revenue for most of the 131 unique businesses manufacturing the SUPs that would be prohibited or restricted under the proposed Regulations, it is not possible to estimate the share of that revenue that is attributable to the manufacture and sale of the SUPs.

Table 17. The estimated 131 businesses manufacturing SUPs, by item category and business size

Item category	Straws	Checkout bags	Cutlery	Foodservice ware made from or containing problematic plastics	Stir sticks	Ring carriers	Total
Large businesses	6	26	6	25	3	0	66
Small businesses	5	52	8	29	5	3	102
Total	**11**	**78**	**14**	**54**	**8**	**3**	**168** [a]

a The total does not add up to 131 businesses, as some businesses manufacture more than one category of SUPs.

The proposed regulatory prohibitions on six categories of SUPs are not expected to result in stranded assets. Plastic item manufacturing, including single-use items, uses processes that rely on a limited series of equipment types that become more standardized upstream. For example, plastic manufacturing often relies on melt extrusion machines that can be calibrated to input multiple resin types and multiple processing parameters. According to Statistics Canada and other sources, the main cost drivers for plastic item manufacturing include the cost of goods sold rather than the equipment to produce it, and the Deloitte Study found that resin costs alone can represent roughly one quarter of total manufacturing costs.

The capital assets that are most at risk include custom-made molds and dies that cannot be reconfigured or repurposed, such as SUP cutlery moulds. Depending on their quality, size, and complexity, molds can range from thousands to tens of thousands of dollars, [62] so the assets most at risk include non-amortized plastic moulds and dies. Upstream from moulds and dies, most capital equipment can be adjusted to manufacture other products, especially products made from similar production techniques (e.g. equipment that makes SUP straws can also be used to make plastic pipes with adjustments). The capital assets least at risk include those that are designed with the flexibility to manufacture a variety of products, such as equipment designed to make several types and sizes of plastic bags.

Under the proposed Regulations, businesses that manufacture any of the six categories of SUPs would face a decrease in domestic demand for these goods. These businesses could either decide to maintain or increase their current production of the six categories of SUPs for export purposes, or they could decide to retool their production lines to manufacture other plastic items that would not be prohibited under the proposed Regulations. Data from Statistics Canada suggests that around 40% of the domestic production of plastic bags is exported, and that import of plastic bags represents around 55% of the domestic demand. Data on trade exposure was not available at the level of the five other categories of SUPs. [63]

Businesses importing any of the six categories of SUPs

Based on the Canadian Importers Database, [64] the Department estimated that 128 unique businesses imported at least one of the six categories of SUPs in 2019, of which 7 also manufacture at least one of the six categories of SUPs as described in the previous subsection. Forty-one of these businesses would be small businesses (see the "Small business lens" section for further analysis). Of the 128 businesses, 44% only import one category of SUPs, 10% import two categories, 17% import three categories, and 29% import four or more categories. The impact of the proposed Regulations on businesses importing any of the six categories of SUPs would be minimal, as these businesses could switch supply lines to import single-use (or reusable) substitutes that comply with the proposed Regulations.

Businesses manufacturing single-use substitutes to the six categories of SUPs

The Department of Natural Resources commissioned a report that was delivered in March 2021 to assess the potential impact of the proposed Regulations on Canadian fibre-based packaging manufacturers (available upon request). The report's conclusions suggest that the proposed regulatory prohibition on SUP checkout bags would have to provide a sufficient increase in sales volume of fibre-based substitutes to Canadian manufacturers in order for them to consider seizing the

market opportunity. The proposed regulatory prohibitions on foodservice ware could also create an opportunity for fibre substitutes, but this opportunity is less certain due to the smaller market and investment needed to achieve required performance characteristics with fibre substitutes.

The report showed that demand for paper bags per capita has decreased by 80% since the 1970s, as public opinion took on deforestation concerns in the 1990s, but experienced a slight increase in demand in the 2010s as public opinion turned toward the issue of plastic pollution. As shown in the "Benefits and costs" section, the proposed regulatory prohibitions could result in an increase of more than 200 000 tonnes in single-use paper bags in 2024. Regardless, the report suggests that Canada's two main producers of kraft paper (the paper used to make paper checkout bags), one located in Manitoba, the other located in British Columbia, may decide not produce more kraft paper as a result of the proposed Regulations.

As an indirect outcome of the proposed Regulations, the report suggests that new demand for kraft paper to make single-use paper checkout bags could be met by domestic production by firms in the declining market of graphic papers and firms with idled mills, which have a combined excess production capacity of 200 000 tonnes. To make the switch to producing single-use paper checkout bags, these firms would need to make a small capital expenditure. The report concluded that additional demand for single-use paper checkout bags could also be met easily by imports from the United States.

Cost-benefit statement

Number of years: 10 years (2023 to 2032)

Base year for costing: 2020

Present value base year: 2021

Discount rate: 3%

Table 18. Monetized costs, discounted (in millions of dollars)

Impacted stakeholder	Description of cost	2023	2024	2032	Total (2023–2032)	Annualized value
Canadians	Substitution (for all items except checkout bags)	$130	$185	$180	**$1,770**	**$207**
Canadians	Substitution and secondary use (for checkout bags)	Break-even	Break-even	Break-even	**Break-even**	**Break-even**
Canadians	Waste management	$11	$18	$16	**$163**	**$19**
Certain manufacturers, importers, and retailers	Administrative	$0.7	$0.4	$0.002	**$1.1**	**$0.1**
Government	Compliance and enforcement	$1.4	$2.1	$0.9	**$13.4**	**$1.6**
All stakeholders	**Total costs**	**$143**	**$205**	**$197**	**$1,948**	**$228**

Table 19. Monetized benefits, discounted (in millions of dollars)

Impacted stakeholder	Description of benefit	2023	2024	2032	Total (2023–2032)	Annualized value
Canadians	Avoided terrestrial litter clean-up cost	$42	$61	$59	**$583**	**$68**
Canadians	Avoided marine pollution cost	$2	$4	$4	**$36**	**$4**
All stakeholders	**Total benefits**	**$44**	**$65**	**$63**	**$619**	**$72**

Table 20. Summary of monetized costs and benefits (discounted)

Impacts	2023	2024	2032	Total (2023–2032)	Annualized value

Total costs (in millions of dollars)	$142	$205	$197	**$1,948**	**$228**
Total monetized benefits (in millions of dollars)	$44	$65	$63	**$619**	**$72**
Net monetized impact — net cost (in millions of dollars)	**$98**	**$140**	**$134**	**$1,329**	**$156**
Quantified reduction in plastic waste (tonnes avoided)	78 096	132 242	163 898	**1 405 789**	**140 579**
Net non-monetized impact: benefits to wildlife and humans in the form of reduction in plastic pollution (tonnes avoided)	1 293	2 196	2 744	**23 432**	**2 343**

As shown in Table 18, the proposed Regulations are expected to result in $205 million in costs in the first year of full policy stringency (2024), or $1.9 billion in costs over the analytical period (2023 to 2032). While these costs are significant in aggregate, they would be widely dispersed across Canadian consumers (around $5 per capita in 2024 or $50 per capita over the analytical period). Some consumers may feel the burden of these costs more than others, though these distributional impacts are expected to be relatively minor, especially given the exemptions for SUP flexible straws for accessibility purposes. This and other factors are explored in the "Gender-based analysis plus" section. All costs (except administrative and government costs) are assessed at the consumer level. Cost to businesses operating in the Canadian plastics industry is expected to be mitigated, as manufacture for export would be not prohibited under the proposed Regulations.

As shown in Table 19, the proposed Regulations are expected to result in $65 million in monetized benefits in the first year of full policy stringency (2024), or $619 million in monetized benefits over the analytical period (2023 to 2032), stemming mainly from the avoided cost of terrestrial litter clean-up. As shown in Table 20, the costs and monetized benefits of the proposed Regulations would total $140 million in net cost in the first year of full policy stringency (2024), or $1.3 billion in net cost over the analytical period (2023 to 2032).

While the proposed Regulations are expected to result in a total net cost with respect to monetized impacts, the most significant benefit is non-monetized; namely, the reduction in risk of harm to wildlife and their habitats from less plastic pollution. As shown in Table 20, the proposed Regulations are expected to result in 132 242 avoided tonnes of plastic waste in the first year of full policy stringency (2024), or 1.4 million tonnes over the analytical period (2023 to 2032), of which 1 293 tonnes, or 23 432 tonnes, respectively, would be avoided plastic pollution. By item count, those values translate to around 28 billion units of avoided plastic waste in the first year of full policy stringency (2024), or around 300 billion units over the analytical period (2023 to 2032), of which 360 million units, or 3.8 billion units, respectively, would represent avoided plastic pollution. Given the extent of ecological harm that the six categories of SUPs becoming plastic pollution can cause to wildlife and their habitats, and the reduction of enjoyment of ecological goods and services by Canadians, the associated non-monetized benefits are expected to be significant.

Sensitivity analysis

There are several parameters and assumptions impacting the results presented in Table 20. The most sensitive factors affecting the cost-benefit analysis results are those explored in the scenario analyses presented in Table 12 in the "Avoided terrestrial litter clean-up costs" subsection and in Table 14 in the "Substitution cost and secondary-use cost for SUP checkout bags" subsection of the "Benefits and costs" section. Tables 21 through 24 present monetized and discounted cost and benefits for a few additional scenarios.

Table 21. Sensitivity: discount rate (2023–2032)

Impacts	3% (central case)	0%	7%
Total costs (millions of dollars)	$1,948	$2,376	$1,523
Total monetized benefits (millions of dollars)	$619	$755	$484
Net monetized impact — net costs (millions of dollars)	**$1,329**	**$1,621**	**$1,039**

Net non-monetized impact: benefits to wildlife and humans in form of reduction in plastic pollution (tonnes avoided)	23 432	23 432	23 432

Table 22. Sensitivity: Reusable checkout bag life (number of uses) [2023–2032]

Impacts	100 (central case)	50	200
Total costs (millions of dollars)	$1,948	$1,967	$1,938
Total monetized benefits (millions of dollars)	$619	$615	$621
Net monetized impact — net costs (millions of dollars)	**$1,329**	**$1,352**	**$1,317**
Net non-monetized impact: benefits to wildlife and humans in form of reduction in plastic pollution (tonnes avoided)	23 432	22 247	24 024

Table 23. Sensitivity: Year-over-year real price decrease over time (compound decrease) [a] [2023–2032]

Impacts	0% (central case)	1%	2%
Total costs (millions of dollars)	$1,948	$1,727	$1,519
Total monetized benefits (millions of dollars)	$619	$619	$619
Net monetized impact — net costs (millions of dollars)	**$1,329**	**$1,108**	**$900**
Net non-monetized impact: benefits to wildlife and humans in form of reduction in plastic pollution (tonnes avoided)	23 432	23 432	23 432

a "Real price decrease over time" refers to the possibility that the unit costs for substitutes to the six categories of SUPs could decrease year over year as businesses and individuals buy higher quantities of these items, achieving economies of scale.

Table 24. Sensitivity: Average hourly labour rate or opportunity cost of volunteer labour for litter clean-up (2023–2032)

Impacts	$15 (central case)	$20	$30
Total costs (millions of dollars)	$1,948	$1,948	$1,948
Total monetized benefits (millions of dollars)	$619	$803	$1,203
Net monetized impact — net costs (millions of dollars)	**$1,329**	**$1,145**	**$745**
Net non-monetized impact: benefits to wildlife and humans in form of reduction in plastic pollution (tonnes avoided)	23 432	23 432	23 432

Small business lens

Analysis under the small business lens concluded that the proposed Regulations would impact small businesses that would be prohibited from manufacturing, importing, or selling any of the six categories of SUPs, with limited exemptions as presented in the "Description" section. The proposed Regulations would impact an estimated 242 000 businesses that sell or offer these SUPs, 79 businesses that manufacture them, and 43 businesses that import them. Additional flexibility to limit the burden on small businesses is not appropriate, as the environmental objective of the proposed Regulations could not be met unless all SUPs subject to the proposed Regulations are prohibited.

The proposed Regulations are not expected to result in any direct compliance cost to small businesses that sell or import any of the six categories of SUPs, since substitution costs would be expected to be ultimately absorbed by consumers and since importers can import any other products, including substitutes to the six categories of SUPs.

The proposed Regulations could result in compliance costs for small businesses that manufacture any of the six categories of SUPs, depending on the business decisions made as a result of the proposed Regulations. Compared to the baseline scenario, small businesses that manufacture any of the six categories of SUPs would face a decrease in demand for these products under the proposed Regulations, and may decide to maintain or increase their current production of the six categories of SUPs for export purposes, or retool their production lines to manufacture plastic items that would not be prohibited under the proposed Regulations. As these business decisions are unique to each company, the cost-benefit analysis did not estimate these potential one-time costs for small businesses. As consumers are expected to bear the substitution and secondary use costs associated with the proposed Regulations, no costs that may be carried by small businesses were ultimately monetized and attributed to them in the cost-benefit analysis.

Inputs into the calculation and relevant assumptions for administrative costs, including for small businesses, are presented in the "Administrative costs" subsection and the "Distributional analysis" subsection of the "Benefits and costs" section.

Small business lens summary

Number of small businesses impacted: 242 122

Number of years: 10 (2023 to 2032)

Base year for costing: 2020

Present value base year: 2021

Discount rate: 3%

Table 25. Costs to small businesses

Description of cost	Annualized value	Present value
Compliance cost	$0	$0
Administrative cost	$134,511	$1,047,314
Total costs	$134,511	$1,047,314
Average cost per small business	$0.56	$4.32

One-for-one rule

The one-for-one rule applies since there is an incremental increase in the administrative burden on business, and a new regulatory title is introduced. Inputs into the calculation and relevant assumptions are presented in the "Administrative costs" subsection of the "Benefits and costs" section. These costs were adjusted from 2020 dollars to 2012 dollars for the purpose of calculating the increase in the administrative burden under the one-for-one rule. Using 2012 constant dollars, with 2012 as the base year, a 10-year timeframe from the year of registration (i.e. 2022 to 2031), and a 7% discount rate, the annualized average increase in the administrative burden on businesses is estimated at $66,402 or an average of $0.27 per business, as calculated using the Treasury Board Secretariat's Regulatory Cost Calculator tool.

Regulatory cooperation and alignment

Aligning with current best practices

Plastic waste and plastic pollution is a global issue, and markets for SUPs are highly integrated globally, particularly between Canada and the United States. Recognizing these important considerations, the Department consulted extensively with government officials in other Canadian jurisdictions and international jurisdictions (United States, United Kingdom, and European Union) on their respective approaches to banning or restricting SUPs.

According to the United Nations, out of 192 countries reviewed, 127 have adopted some type of regulation to regulate plastic bags including restrictions on the manufacture, distribution, trade, free retail distribution, or taxation. Twenty-seven countries have implemented legislation prohibiting either specific single-use products (e.g. plates, cups, straws) or materials (e.g. polystyrene) or limiting production levels. About 30 countries have instituted taxes on either the manufacture of plastic

bags, on the distribution of plastic bags to consumers, on SUPs broadly through environmental tax or a combination of taxation methods. In 2019, the European Union enacted a SUPs directive, which included a list of SUPs to be banned by member states by 2021, and the United Kingdom enacted a similar measure in 2020. There are currently no policy measures in place in the United States to restrict or eliminate the use of SUPs at the federal level, but several states including the states of California, Connecticut, Delaware, Maine, New Jersey, New York, Vermont, and Oregon have already enacted prohibitions on SUP checkout bags.

The information gathered throughout these engagement activities informed the policy design and implementation approach of the proposed Regulations to minimize regulatory differences with key trading partners and provinces and territories; align with existing standards and best practices; and build upon lessons learned from other jurisdictions, so as to minimize regulatory differences to the extent practicable. As an example, the Department consulted reusable bag vendors and gathered information from officials from the State of California to inform the development of performance thresholds for SUP checkout bags that align with the certification requirements for reusable bags in California, which is considered a North American industry standard. This approach would help minimize the cumulative regulatory burden on business operating in both the United States and Canada.

Cooperating with provinces, territories, and municipalities

Preventing plastic waste and pollution are matters of shared jurisdiction between the federal, provincial, and territorial governments. Provinces and territories are key partners in addressing plastic waste and plastic pollution from SUPs. As of June 2021, several provinces and territories have measures in place that specifically address SUPs:

- Nova Scotia, Prince Edward Island, and Newfoundland and Labrador banned SUP checkout bags;
- British Columbia announced in September 2020 its intention to create a framework to allow municipalities to put in place local bans on SUPs;
- the Yukon amended its environmental protection legislation to enable regulations to prohibit or restrict SUPs, and Yukon announced in its 2021 Speech from the Throne that single-use plastics would be banned in the territory;
- the Northwest Territories put in place a bag fee program for all types of single-use checkout bags (plastic and paper); and
- Quebec, Ontario and British Columbia developed or amended extended producer responsibility policies to include SUPs.

In addition, 84 local governments in Canada have enacted bylaws to prohibit or restrict SUP checkout bags, though at least 13 of these laws are not yet in force as of August 2021. Some local governments have also enacted bylaws prohibiting or restricting other SUPs, such as SUP straws (7 local governments), expanded polystyrene SUP takeout containers (6 local governments), and SUP cutlery (2 local governments).

The proposed Regulations would have implications for many of these provincial, territorial, and municipal measures. Currently, the existing bans on SUPs function as a patchwork of rules that seek to address issues that are, in essence, national and international in scope. SUPs are typically sold into regional or national markets that are beyond the reach of provincial, territorial, or municipal bans. Only federal measures are capable of effectively preventing pollution and waste from the six categories of SUPs subject to the proposed Regulations. The proposed Regulations would also help rationalize and simplify the existing patchwork of measures that broadly align in terms of objectives (i.e. preventing waste and pollution), but also create many inconsistencies (e.g. what constitutes a reusable plastic checkout bag). The proposed Regulations would address this patchwork by creating a single set of rules that are national in scope, reducing duplicative compliance and reporting obligations from multiple jurisdictions. This will help achieve many of the same objectives as the provincial, territorial, and municipal bans, while increasing regulatory certainty for business. In addition, the Department is not expecting it to cause any conflicts with existing measures, as the proposed Regulations have been designed to align with as many existing municipal and provincial measures as possible.

For straws, however, local government bylaws prohibiting or restricting certain SUP straws could be impacted if, for example, they allow or require restaurants to provide single-use plastic straws to customers upon request.

Provinces that have included SUPs in proposed or existing extended producer responsibility policies may see a reduction in the number of SUP items recovered. However, given that the proposed Regulations would target SUP items that are both environmentally problematic and difficult to recycle, the effect on provincial extended producer responsibility policies is likely to be positive. Among other things, the removal of SUP items that are difficult to recycle from the waste stream will

- shift demand to substitutes that can more easily be recovered through strategies such as recycling and composting;
- improve the efficiency of sorting and recycling processes by removing items that hamper machinery or fall into residual waste sent to landfill; and
- improve plastic recycling rates by eliminating many SUP items that are placed on the market but not successfully collected, sorted or recycled.

Coordination efforts such as those described above will help minimize the cumulative regulatory burden on businesses associated with the proposed Regulations.

International trade

The Government of Canada is committed to respecting its commitments in relation to international trade. The Department worked closely with other federal departments and agencies, including the Department of Foreign Affairs, Trade and Development, to ensure the proposed Regulations comply with Canada's existing trade obligations, including those under the Canada-United States-Mexico Agreement (CUSMA) and those under World Trade Organization agreements. In addition, during the public consultation period held in fall 2020, industry stakeholders raised concerns regarding the potential implications of a ban on certain SUP items for companies exporting those products. To mitigate these concerns, the proposed Regulations would not prohibit the manufacturing and import of the six categories of SUPs for the purpose of export. Canadian businesses would therefore maintain their ability to market these products abroad. This approach aligns with the rules existing in the European Union.

Strategic environmental assessment

Purpose of a strategic environmental assessment

In accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*, a strategic environmental assessment (SEA) was completed for the proposed Regulations. Among other things, a SEA

- assesses the scope and nature of the potential environmental effects of a proposed policy, plan or program;
- identifies areas for mitigation or enhancement of negative or positive environmental effects;
- analyzes residual effects that may remain after mitigation; and
- proposes follow-up measures to monitor the environmental effects.

Approach taken to assess potential environmental effects

The SEA examined the potential environmental effects that could result from the restriction or elimination of the six categories of SUPs from the Canadian market. This included examining both the potential direct effects of reduced plastic waste and pollution, as well as potential effects at different points in the value chain that may be caused by increased consumption of substitutes, such as those made from substitute plastics, wood or paper.

The Department drew from a broad range of evidence sources to conduct its analysis. This followed guidance issued by UNEP on life cycle approaches to addressing SUP products pollution. UNEP's guidance states that "[life cycle assessment] provides important insights for policymakers, but these need to be supplemented with a range of additional studies and knowledge." The Department therefore drew from available LCAs for the six categories of SUPs subject to the proposed Regulations, as well as from litter data, scientific studies, the Deloitte Study, other reports on the environmental and value-recovery outcomes of the six categories of SUPs, and the Science Assessment of Plastic Pollution, among other sources. Figure 9 below shows the life cycle of SUPs and other single-use items.

Figure 9. Life cycle of SUPs and other single-use items

Life cycle stage	Description
First stage: Upstream stage	• Materials extraction • Production • Transportation to use
Second stage: Use stage	Intended use
Third stage: Downstream stage	• Transport to end-of-life • End-of-life management or littering/leakage

The approach taken in the SEA identified the six categories of SUPs subject to the proposed Regulations, as well as substitute products that could feasibly be adopted in Canada at scale, and for which sufficient data was available to conduct an analysis. The substitute products analyzed in the SEA are described in Table 26.

Table 26. Scoping of substitutes for single-use plastic products for the purpose of assessing environmental effects

SUP product	Substitutes analyzed in the SEA [a] [b]
Checkout bags	• Reusable non-woven polypropylene • Reusable woven polypropylene • Reusable recycled polyethylene terephthalate • Reusable polyester • Single-use paper • Reusable cotton
Cutlery	• Single-use wood • Reusable metal • Reusable plastic
Foodservice ware made from or containing problematic plastics	• Single-use wood pulp • Single-use paper • Single-use compostable plastic • Single-use aluminum • Single-use polypropylene • Reusable porcelain
Ring carriers	• Single-use low-density polyethylene shrink wrap • Single-use high-density polyethylene rigid snap-on lid carrier • Single-use paperboard box • Single-use fibre ring carrier

a	Not all substitutes analyzed in the SEA were modelled in the cost-benefit analysis due to availability of data.
b	There may be existing substitutes available in commerce that were not analyzed in the literature and thus not included in the SEA.

Stir sticks	• Single-use wood • Reusable metal spoon
Straws	• Single-use paper • Reusable wood • Reusable metal • Reusable glass • Reusable silicone

a	Not all substitutes analyzed in the SEA were modelled in the cost-benefit analysis due to availability of data.
b	There may be existing substitutes available in commerce that were not analyzed in the literature and thus not included in the SEA.

The Department then drew from available LCAs to scope the various categories of environmental effects that could be analyzed at three stages in a product's life cycle:

- the upstream stage (encompassing all activities before the end user);
- the use stage (encompassing all activities during a product's use by the end user); and
- the downstream stage (encompassing all activities after a product's use by the end user).

Table 27. Key life cycle assessment elements

Life cycle stage	Activities included	Environmental effects considered
Upstream stage	• Natural resource extraction • Manufacture • Transport to market	• Climate change • Air quality • Water quality • Water quantity • Terrestrial environmental quality
Use stage	• Intended use by end user	• Water quantity
Downstream stage	• Transportation and disposal • End-of-life management (e.g. landfilling, recycling, incineration, use as a waste bin liner [checkout bags only]) • Littering • Leakage from waste management systems (e.g. items blown off collection trucks)	• Climate change • Air quality • Water quality • Water quantity • Terrestrial environmental quality • Biodiversity

The Department then applied the available evidence to assess potential environmental effects, positive and negative, that could result from the elimination or restriction of each of the categories of SUPs subject to the proposed Regulations.

The assessment considered information available on potential environmental effects that would result from a reduction in the current levels of the six SUPs in commerce and a resulting increase in substitutes. This analysis was applied at each of the three stages mentioned above and was largely qualitative in nature, in particular due to inconsistencies between available

LCAs, such as the substitutes analyzed, parameters pertaining to the data used, and the environmental effects assessed. In addition, available litter data from different sources (e.g. shoreline clean-up data versus municipal litter audits) use different methodologies, categorizations, and data standards, precluding quantitative analysis. LCAs were done for different jurisdictions, mostly non-domestic. Due to these inconsistencies, as well as other variables such as humidity, weight ratios, and the use of recycled materials, it was not feasible to determine the extent or magnitude of the environmental effects.

Findings

At the upstream stage, available LCAs are the main source of evidence, though some additional evidence sources were also consulted, in particular the Deloitte Study and some meta-analyses of LCAs.

Table 28. Upstream environmental effects

Environmental effects	Summary of findings on the net environmental effects of eliminating or restricting the SUP items subject to the proposed Regulations	Conclusion
Climate change	Depending on the weight difference between the SUP and a substitute, substitutes typically have higher climate change impacts, due to the scale at which SUPs are produced, as well as natural resource inputs (e.g. logging), electricity sources (e.g. reusable bags made in other countries may depend on coal-generated electricity), and unit weight affecting GHG emissions during transportation.	Some minor negative environmental effects
Air quality	Production of substitutes, in particular non-plastic substitutes made from wood, paper, or cotton, may affect air quality, including through higher amounts of particulate matter, sulphur dioxide, and nitrogen oxides, creating a higher risk of smog and acid rain.	Some negative environmental effects
Water quality	Production of substitutes may affect water quality in both the marine and freshwater environments, including eutrophication (e.g. increased production of algae) and acidification from releases of nitrogen or phosphorus into the water in the extraction of natural resources (e.g. cotton) and the manufacturing process.	Some negative environmental effects
Water quantity	Production of substitutes typically uses or consumes more water than production of SUPs, either in the production of inputs (e.g. watering crops) or in the manufacturing process itself.	Some negative environmental effects
Terrestrial environmental quality	Substitutes may affect environmental quality on land through acidification, as well as natural resource depletion (e.g. logging).	Some negative environmental effects

At the use stage, the only environmental effect identified in LCAs related to water usage (i.e. to wash reusable products), but the Department has concluded that increases in water usage would likely be minimal. Reusable products would be expected to be washed alongside other articles. For example, a reusable woven polypropylene bag would be washed alongside clothes in a washing machine, or a reusable metal spoon would be washed alongside other dishes, cups, and glasses. This water would be used regardless of whether the proposed Regulations were in place or not.

At the downstream stage, environmental effects relate to waste (i.e. how SUPs and their substitutes are managed at end-of-life) and pollution (i.e. the extent to which SUPs and their substitutes enter the environment and pose a threat to wildlife) were evaluated. In terms of available evidence, LCAs provide some information, but analysis and findings are inconsistent, qualitative, do not apply the waste management hierarchy in assessing end-of-life outcomes, and consider the ecological impacts of litter only qualitatively. As a result, analysis at the downstream stage of this SEA relied more on other evidence sources, including litter data, scientific studies on physical harm caused by litter, data, and information on end-of-life outcomes, and the science assessment.

In terms of end-of-life outcomes at the downstream stage, each of the categories of SUPs targeted by the proposed Regulations has low or very low recycling rates (less than 15%), as well as barriers to increasing their recycling rate. They are also expected to have no potential for other forms of value recovery, such as reuse, repair, remanufacture, or refurbishment.

By contrast, substitutes have high potential for value recovery through recycling (e.g. products made from paper) or reuse (e.g. reusable bags, cutlery, and straws that meet the performance standards established in the proposed Regulations).

In terms of environmental effects, the following table summarizes potential environmental effects for each of the categories scoped for consideration at the downstream stage.

Table 29. Downstream environmental effects

Environmental effects	Summary of findings on the net environmental effects of eliminating or restricting the SUP items subject to the proposed Regulations	Conclusion
Climate change	Some substitutes such as those made from paper may produce GHGs such as methane in certain conditions (e.g. when decomposing in landfills). Substitutes with higher recycling rates (e.g. paper products) would result in lower GHG emissions due to avoided emissions from displacing virgin materials.	No significant environmental effects
Air quality	Air quality effects depend on end-of-life management methods — incineration (with or without electricity generation) of either SUPs or substitutes may affect air quality. However, given that substitutes are typically more recyclable, or have significantly longer lifespans, incineration is not expected to be a major end-point for substitutes in the downstream stage of the life cycle.	Potential environmental effects
Water quality	The science assessment shows that water quality would be impacted by plastic pollution through, among other things, the release of micro- and macroplastic particles, including from SUPs as they fragment and degrade in the natural environment. Removing SUP items as a source of plastic pollution would eliminate their impact on water quality.	Significant positive environmental effects
Water quantity	More recyclable substitutes could use water as part of the recycling process, including to wash or sort materials, but this is not expected to be significant in the context of increasing recycling activity through other instruments such as extended producer responsibility being implemented in provinces and territories.	Potential environmental effects
Terrestrial environmental quality	The science assessment shows that, among other things, plastic particles are retained in the soil for long periods of time, and that macroplastics can harm vegetation through effects such as smothering. Littered SUPs would be expected to contribute to such environmental harm more than reusable plastic substitutes, and much more than non-plastic substitutes.	Significant positive environmental effects
Biodiversity	SUPs are more prevalent in the environment than any substitute and pose a greater threat to wildlife than any substitute. All evidence sources showed that substitutes to SUPs are significantly better for wildlife in terms of the threats of harm posed by litter. Elimination or restriction of the six categories of SUPs would remove a significant threat of harm.	Significant positive environmental effects

Mitigation and enhancement

The SEA identified a range of mitigation opportunities to reduce, or eliminate the negative environmental effects identified at the upstream stage that may be caused by increased consumption of substitutes:

- **rules for reusable products:** Many LCAs conclude that a reusable substitute must be used many times before its environmental impacts equal or become less than that of SUPs. The proposed Regulations would mandate minimum performance standards for reusable plastic checkout bags, cutlery, and straws. The performance standards would ensure that reusable substitutes made of plastic could be reused enough times to minimize or negate many of the negative environmental effects identified at the upstream stage of the product lifecycle;
- **measures in place or under development:** Many of the negative effects identified in the SEA (e.g. effects on air quality, water quality, and terrestrial environmental quality) would be mitigated by existing or proposed environmental protection measures. For example, the Government of Canada announced, through its strengthened climate plan, its intention to develop new federal regulations to increase the number of landfills that collect and treat their methane. [65] This would reduce methane emissions caused by paper bags that enter landfills;
- **innovation and scaling up new technologies and business practices:** Many of the negative environmental effects identified in the upstream stage could be mitigated or negated through more circular technologies and business practices, if adopted at scale. For example, the Government of Canada's estimates on the short-term potential for the

adoption of reuse systems for foodservice ware is relatively low, meaning businesses are expected to switch to single-use substitutes to the prohibited products. The Government of Canada could work with industry and other partners to innovate and promote scalable business models for adopting reusable and refillable substitutes, which could minimize or negate any negative environmental effects. These kinds of systems are beginning to be trialled in parts of Canada, such as a system being offered by a partnership between companies Loop and Loblaws [66] that provides consumers with reusable packaging for certain grocery items; and

- **consumer education and promoting low-waste lifestyles:** While the proposed Regulations would mandate performance standards for reusable checkout bags, cutlery and straws, some studies have shown that reusable products may not be used to their fullest extent by consumers (e.g. 15 to 20 uses rather than 100 or more uses). [67] The Government of Canada will work with partners and stakeholders to educate consumers on the reuse potential of their reusable bags, cutlery and straws, as well as promote low-waste consumption behaviours more generally to encourage reuse. By increasing reuse, the environmental impacts of reusable products would be considerably reduced.

Other effects and conclusions

The SEA determined that the proposed Regulations would contribute to a number of goals outlined in the Federal Sustainable Development Strategy (FSDS), including: Greening government, Clean growth, Healthy coasts and oceans, Pristine lakes and rivers, Healthy wildlife populations, Clean drinking water, Connecting Canadians with nature, and Safe and healthy communities. There would also be a contribution to many of the United Nations Sustainable Development Goals corresponding with each of these FSDS goals.

Given the mitigation and enhancement measures, the positive effects of the proposed Regulations are likely to be significant in terms of reduced plastic waste, reduced plastic pollution, and reduced threats of harm to wildlife, and greatly exceed any negative environmental effects.

Follow-up and monitoring

The Government of Canada will continue to draw from a range of evidence sources to monitor environmental effects and follow-up on the state of knowledge with regard to the relative environmental effects of SUPs and their substitutes. This will include

- **developments in life cycle assessment:** International organizations such as UNEP, as well as academics and practitioners of LCA, have highlighted the shortcomings of LCAs in analyzing downstream environmental effects, and some are beginning to propose standardized methods for assessing effects, such as those from marine litter. The Government of Canada will continue to monitor developments in this field;
- **litter data:** The Government of Canada will continue to draw from Canadian litter data as it becomes available from a range of sources, including shoreline cleanups and litter audits or surveys conducted by different jurisdictions; and
- **science:** The Government of Canada will continue to monitor the development of scientific understandings of the impacts of plastic pollution and other forms of pollution in the natural environment. This includes supporting science through Canada's Plastics Science Agenda, which is meant to amplify the impact of Canadian plastics science by providing a framework that identifies gaps in current knowledge and the science needed to fill them, as well as policy-relevant areas of focus.

Gender-based analysis plus

A gender-based analysis plus (GBA+) was conducted for the proposed Regulations and it determined that, while the proposed Regulations would affect all Canadians to a certain extent, certain demographic groups may be disproportionately impacted. As a result, the Department determined that mitigation measures were needed in the proposed Regulations to abate these impacts.

People with physical, mental or age-related disabilities

The GBA+ analysis showed that certain people with disabilities require SUP flexible straws. SUP flexible straws may be repositioned, are lightweight, disposable and inexpensive. People with temporary, sporadic, or permanent disabilities often rely on SUP flexible straws with these characteristics to eat and drink safely. Specific groups that have identified this need via consultation processes include persons with age-related physical restrictions, arthritis, autoimmune disease, autism, cerebral palsy, dental and oral conditions, multiple sclerosis, muscular dystrophy, neurological disease, spinal cord injuries, and other illnesses and injuries, and persons who are recovering from a stroke or surgery.

Research shows that current substitutes for SUP flexible straws — including straws made from metal, silicone, glass, paper, bamboo, and pasta — do not meet accessibility needs. They cannot be repositioned and are not safe to use in cases of reduced mobility or impairment. They can pose choking hazards if the straw breaks (pasta, bamboo), may not be safe at high temperatures (metal, glass), are a food allergen risk (pasta), are not rigid enough (paper), or pose an injury risk (metal, glass). Reusable straw substitutes can also be difficult to clean and using one that has not been properly sanitized increases the risk of other health concerns, particularly for persons who are immunocompromised. A full prohibition without accommodations on SUP straws could create social barriers for people with disabilities in terms of fully participating in public life (e.g. going to restaurants). The proposed Regulations would therefore allow Canadians to purchase flexible straws in a pack of 20 or more in retail stores, which is in line with measures developed in other jurisdictions that restrict single-use plastic straws.

The prevalence of disability in Canada increases by age group, with almost half of those individuals aged 75 years and over identifying themselves as having a disability. Therefore, the intersection that exists between age and disability means that any policy affecting persons with disabilities will also have a disproportionate impact on seniors in Canada. This is especially notable given that Canada's senior population is expected to increase by 68% over the next 20 years.

Low-income households

As noted in the "Benefits and costs" section, the proposed Regulations would result in costs to Canadians. These costs could be felt more acutely by Canadians living with low income and limited disposable income, as the cost of implementing the ban for retailers would likely be passed onto consumers through increased prices for food, beverage, and merchandise. Marginalized communities in Canada are particularly likely to be living with low income due to race, gender, age, and disability status and the intersectionality between these characteristics. The proposed Regulations may also impact individuals living with low income as a result of the loss of SUP checkout bags for secondary usage. The Department's research and consultation process revealed that SUP checkout bags currently represent a cheaper substitute to garbage liners, dog waste bags and represent cost savings for people with low income. Individuals who live with low income and may not have access to a personal vehicle have also reported concerns about a ban on SUP checkout bags, as it may be more difficult to carry multiple reusable bags on public transport to get to the grocery store, versus individuals who are able to leave their bags in a car. Further, individuals experiencing homelessness may also reuse SUP checkout bags to carry their belongings, and as protective rain gear for their shoes and clothing. The COVID-19 pandemic has disproportionately impacted low-income Canadians while also increasing the number of Canadians living in poverty. As a result, the impacts highlighted above will likely be felt by more Canadians now than they would have prior to the onset of the COVID-19 pandemic.

Women and single parents

The Department's consultation process revealed that an indirect impact of the proposed Regulations could be increased time and labour required to prepare and clean up meals using reusable containers where the regulated SUPs could have previously been used and disposed of without cleaning, which may disproportionately impact women and single parents. In 2014, single-parent families in Canada accounted for 20% of families with children aged less than 16, and single mothers accounted for 80% of these parents. [68] Further, qualitative research highlights "women's retention of ultimate responsibility" for the coordination of children's lives and the smooth functioning of the household; [69] for example, women are more likely than men to be responsible for meal preparation in Canadian households. [70] SUPs have allowed Canadian lifestyles to become increasingly convenience-based and removed some burden on Canadian women and single parents when preparing

and cleaning up after meals for their households. Consequently, the proposed Regulations may cause women and single parents to clean a higher number of reusable substitutes. Impacts would be on time and labour, while disproportionate cost increases are not expected to be significant.

Mitigation measures

The GBA+ identified potential measures to mitigate negative impacts or enhance positive impacts. These include adapting prohibitions on SUP straws to allow people with disabilities to continue to purchase and use SUP flexible straws, and further educating Canadians on how they can reduce plastic waste in their daily lives and consumer choices. All of these recommendations have either been adopted (e.g. accommodations for SUP flexible straws) or are being explored further with partners and stakeholders.

Implementation, compliance and enforcement, and service standards

Implementation

The proposed Regulations would come into force as follows:

- for all SUPs, prohibition on manufacture and import for domestic consumption would come into force one year following the day on which the proposed Regulations are registered; and
- for all SUPs, except for straws, prohibition on sale would come into force two years following the day on which the proposed Regulations are registered. For SUP straws, prohibition on sale would come into force one year following the day on which the proposed Regulations are registered due to exemptions for the manufacture and import of flexible straws that are linked to conditions around where and how the straws are sold.

An intensive compliance promotion approach would be adopted by the Department within the first year after the registration of the proposed Regulations, to ensure their effective and efficient implementation. The Department would develop and distribute compliance promotion materials (e.g. a fact sheet or website material) to ensure that the regulated community is aware of the requirements within the proposed Regulations. Working relationships have been established with industry and industry associations involved in the manufacture, import and sale of products covered by the proposed Regulations. The Department would work with these organizations to ensure that the appropriate information is available to affected parties. As the regulated community becomes more familiar with the requirements of the proposed Regulations, these activities are expected to decline to a maintenance level.

Enforcement

The proposed Regulations would be made under CEPA, so enforcement officers would, when verifying compliance with the proposed Regulations, act in accordance with the Compliance and Enforcement Policy for CEPA,1999.

Verification of compliance with the proposed Regulations would include site visits, review of records, reusable product testing (if applicable), and review of written transit documents. Following an inspection or an investigation, if an enforcement officer discovers an alleged violation, the officer would choose the appropriate enforcement action based on the following factors, as outlined in the Compliance and Enforcement Policy for CEPA, 1999:

- Nature of the alleged violation: This includes consideration of the damage, the intent of the alleged violator, whether it is a repeat violation, and whether an attempt has been made to conceal information or otherwise subvert the objectives and requirements of CEPA;
- Effectiveness in achieving the desired result with the alleged violator: The desired result is compliance within the shortest possible time and with no further repetition of the violation. Factors to be considered include the violator's history of compliance with CEPA, willingness to cooperate with enforcement officers, and evidence of corrective action already taken; and
- Consistency: Enforcement officers would consider how similar situations have been handled in determining the measures to be taken to enforce CEPA.

Subject to the enforcement officer's discretion, the following responses are available to deal with alleged violations of CEPA and its regulations:

- warnings;
- directions;
- tickets;
- ministerial orders;
- environmental protection compliance orders;
- detention orders for ships;
- injunctions;
- prosecutions;
- environmental protection alternative measures; and
- court orders following convictions and civil suits by the Crown to recover costs.

More information on the Compliance and Enforcement Policy for CEPA (1999) is available on the Environment and Climate Change Canada website.

Performance measurement and evaluation

Performance measurement would evaluate how effective the proposed Regulations are at achieving their objective, which is to reduce plastic waste and prevent plastic pollution by eliminating or restricting six categories of SUP manufactured items that pose a threat to the environment and have significant barriers to end-of-life value recovery. Achieving this objective would contribute to the Government of Canada's plan to achieve zero plastic waste by 2030.

Quantitative indicators and targets, where applicable, would be defined and developed as part of the implementation strategy for the proposed Regulations. Examples of performance indicators would include the following: regulatory requirements are understood by affected stakeholders; prohibited and restricted products are not being manufactured, imported, or sold unless an exemption applies. Information gathered from various sources, such as surveys, Canada Border Services Agency import and export data, and Statistics Canada data would provide the performance information necessary to measure the indicators.

In terms of gathering data to measure the effectiveness of the proposed Regulations at keeping prohibited and restricted SUPs out of the environment, the Department is developing a plastic pollution science framework that will, over time, improve the research and monitoring of plastic pollution in the environment. In the meantime, other sources of data, such as Canadian citizen science and civil society data on the SUPs most commonly found as litter on Canadian beaches and shorelines, as well as findings from waste audits, would be used to qualitatively assess this.

Once completed, the performance information collected would be summarized and reported on the Canada.ca website. Further, the Department would continue to report on the progress, performance, and overall effectiveness of the proposed Regulations in CEPA annual reports and departmental performance reports.

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PROPOSED REGULATORY TEXT

Notice is given, pursuant to subsection 332(1) [a] of the *Canadian Environmental Protection Act, 1999* [b], that the Governor in Council, pursuant to subsection 93(1) of that Act, proposes to make the annexed *Single-Use Plastics Prohibition Regulations*.

Any person may, within 70 days after the date of publication of this notice, file with the Minister of the Environment comments with respect to the proposed Regulations or, within 60 days after the date of publication of this notice, file with that Minister a notice of objection requesting that a board of review be established under section 333 of that Act and stating the reasons for the objection. All comments and notices must cite the *Canada Gazette*, Part I, and the date of publication of this notice, and be addressed to Tracey Spack, Director, Plastic Regulatory Affairs Division, Department of the Environment, 351 Saint-Joseph Boulevard, Gatineau, Quebec K1A 0H3 (email: ec.plastiques-plastics.ec@ec.gc.ca).

A person who provides information to the Minister may submit with the information a request for confidentiality under section 313 of that Act.

Ottawa, December 9, 2021

Mirza Lončar
Acting Assistant Clerk of the Privy Council

Single-Use Plastics Prohibition Regulations

Definitions

Definitions

1 The following definitions apply in these Regulations.

single-use plastic checkout bag
means a plastic manufactured item that is formed in the shape of a bag that is designed to carry purchased goods from a business and

(a) is made from plastic film;

(b) will break or tear if it is used to carry 10 kg over a distance of 53 m 100 times; or

(c) will break or tear if it is washed in a washing machine in a wash cycle recommended by the manufacturer for washing cotton or linen. (*sac d'emplettes en plastique à usage unique*)

single-use plastic cutlery
means a plastic manufactured item that is formed in the shape of a fork, knife, spoon, spork or chopstick and that, after being immersed in water maintained at a temperature between 82°C and 86°C for 15 minutes, changes its shape. (*ustensile en plastique à usage unique*)

single-use plastic flexible straw

means a single-use plastic straw that has a corrugated section that allows the straw to bend and maintain its position at various angles. (*paille flexible en plastique à usage unique*)

single-use plastic foodservice ware
means a plastic manufactured item that

(a) is formed in the shape of a clamshell container, lidded container, box, cup, plate or bowl;

(b) is designed for serving or transporting food or beverage that is ready to be consumed without any further preparation; and

(c) is made from expanded polystyrene, extruded polystyrene, polyvinyl chloride, a plastic that contains a black pigment produced through the partial or incomplete combustion of hydrocarbons or a plastic that contains any additive that, through oxidation, leads to chemical decomposition or to the fragmentation of the plastic material into micro-fragments. (*récipient alimentaire en plastique à usage unique*)

single-use plastic ring carrier
means a plastic manufactured item that is formed in the shape of deformable container-surrounding bands and that is designed to be applied to beverage containers and selectively severed to produce packages of two or more beverage containers. (*anneaux en plastique à usage unique pour emballage de boissons*)

single-use plastic stir stick
means a plastic manufactured item that is designed to stir or mix beverages or to prevent a beverage from spilling from the lid of its container. (*bâtonnet à mélanger en plastique à usage unique*)

single-use plastic straw
means a plastic manufactured item that is formed in the shape of a drinking straw and that, after being immersed in water maintained at a temperature between 82°C and 86°C for 15 minutes, changes its shape. (*paille en plastique à usage unique*)

Non-application

Export

2 Subject to sections 6 and 7, these Regulations do not apply in respect of plastic manufactured items referred to in section 1 that are manufactured, imported or sold for the purposes of export.

Single-Use Plastic Straws

Prohibition — manufacture, import or sale

3 (1) Subject to subsections (2) to (6), a person must not manufacture, import or sell single-use plastic straws.

Exception — manufacture or import

(2) A person may manufacture or import single-use plastic flexible straws.

Exception — sale in certain settings

(3) A person may sell single-use plastic flexible straws in a non-commercial, non-industrial and non-institutional setting.

Exception — business to business sales

(4) A business may sell a package of 20 or more single-use plastic flexible straws to another business.

Exception — retail sales

(5) A retail store may sell a package of 20 or more single-use plastic flexible straws to a customer if

(a) the customer requests straws, and

(b) the package is not displayed in a manner that permits the customer to view the package before purchasing it.

Exception — sale in care institutions

(6) A hospital, medical facility, long-term care facility or other care institution may sell single-use plastic flexible straws to patients or residents.

Other Plastic Manufactured Items

Prohibition — manufacture and import

4 (1) A person must not manufacture or import single-use plastic checkout bags, single-use plastic cutlery, single-use plastic foodservice ware, single-use plastic ring carriers or single-use plastic stir sticks.

Prohibition — sale

(2) A person must not sell single-use plastic checkout bags, single-use plastic cutlery, single-use plastic foodservice ware, single-use plastic ring carriers or single-use plastic stir sticks.

Analysis

Accredited laboratory

5 (1) Any analysis performed to determine for the purposes of these Regulations the physical characteristics of single-use plastic checkout bags, single-use plastic cutlery, single-use plastic flexible straws or single-use plastic straws must be performed by a laboratory that meets the following conditions at the time of the analysis:

(a) it is accredited

(i) under the International Organization for Standardization standard ISO/IEC 17025, entitled *General requirements for the competence of testing and calibration laboratories*, by an accrediting body that is a signatory to the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement, or

(ii) under the *Environment Quality Act*, CQLR, c. Q-2; and

(b) subject to subsection (2), the scope of its accreditation includes the analysis of the physical characteristics of single-use plastic checkout bags, single-use plastic cutlery, single-use plastic flexible straws and single-use plastic straws.

Standards of good practice

(2) If no method has been recognized by a standards development organization in respect of the analysis performed to determine the physical characteristics of the plastic manufactured items referred to in subsection (1) and the scope of the laboratory's accreditation does not therefore include that analysis, the analysis must be performed in accordance with standards of good scientific practice that are generally accepted at the time that it is performed.

Record Keeping

Records — export

6 Any person that manufactures for the purpose of export or imports for the purpose of export a plastic manufactured item to which these Regulations apply must keep records containing the following information and documents for each type of plastic manufactured item that was manufactured for the purpose of export or imported for the purpose of export:

(a) in the case of a person that manufactures for the purpose of export,

(i) the common or generic name and the trade name, if any, of the item,

(ii) the quantity of the item manufactured at each manufacturing facility,

(iii) the date of manufacture of the item,

(iv) the date the item was exported and the quantity exported or, if it has not yet been exported, the date on which it is intended to be exported and the quantity intended to be exported, and

(v) the name of the entity, if any, to which the item is sold in Canada; and

(b) in the case of a person that imports for the purpose of export,

(i) the common or generic name and the trade name, if any, of the item,

(ii) the quantity imported of the item,

(iii) the date the item was imported,

(iv) the copies of the bill of lading, invoice and all documents submitted to the Canada Border Services Agency respecting the import of the item,

(v) the date the item was exported and the quantity exported or, if it has not yet been exported, the date on which it is intended to be exported and the quantity intended to be exported, and

(vi) the name of the entity, if any, to which the item is sold in Canada for subsequent export.

Retention of records

7 (1) A person that is required to keep records under section 6 must keep the records at the person's principal place of business in Canada or at any other place in Canada where they can be inspected, for at least five years after the date on which they are made. If the records are not kept at the person's principal place of business, the person must provide the Minister with the civic address of the place where they are kept.

Records moved

(2) If the records are moved, the person must notify the Minister in writing of the civic address in Canada of the new location within 30 days after the day of the move.

Related Amendment to the Regulations Designating Regulatory Provisions for Purposes of Enforcement (Canadian Environmental Protection Act, 1999)

8 The schedule to the *Regulations Designating Regulatory Provisions for Purposes of Enforcement (Canadian Environmental Protection Act, 1999)* [71] is amended by adding the following in numerical order:

Item	Column 1 Regulations	Column 2 Provisions
38	*Single-Use Plastics Prohibition Regulations*	**(a)** subsection 3(1) **(b)** subsections 4(1) and (2)

Coming into Force

First anniversary

9 (1) Subject to subsection (2), these Regulations come into force on the first anniversary of the day on which they are registered.

Second anniversary

(2) Subsection 4(2) comes into force on the second anniversary of the day on which these Regulations are registered.

Footnotes

a S.C. 2004, c. 15, s. 31

b S.C. 1999, c. 33

1 https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/plastics-proposed-integrated-management-approach.html.

2 Courtney Lindwall. (2020). Single-Use Plastics 101. NRDC. Available at https://www.nrdc.org/stories/single-use-plastics-101

3 La Presse. (2021) Les plastiques à usage unique bannis en Allemagne [single-use plastics banned in Germany]. Available at https://www.lapresse.ca/actualites/environnement/2021-07-03/les-plastiques-a-usage-unique-bannis-en-allemagne.php (in French only)

4 What is a Circular Economy? (2017). Available at https://www.ellenmacarthurfoundation.org/circular-economy/concept

5 Julien Boucher and Guillaume Billard (2019). The challenges of measuring plastic pollution. The journal of field actions special issue 19, p. 68-75. Available at https://journals.openedition.org/factsreports/5319

6 Danielle Senga Green, Bas Boots, David James Blockley, Carlos Rocha, and Richard Thompson (2015). Impacts of discarded plastic bags on marine assemblages and ecosystem functioning. Environment, Science and Technology volume 49, Issue 9. Available at https://pubs.acs.org/doi/10.1021/acs.est.5b00277

7 Jenna R. Jambeck et al. (2015). Plastic waste inputs from land into the ocean. Science 347(6223), 768-771. Available at: http://science.sciencemag.org/content/347/6223/768

8 European Environment Agency. (2015). Top marine litter items on the beach (% of total). Available at reversed%22%5D%7D">https://www.eea.europa.eu/data-and-maps/daviz/marine-litter-items-on-the-beach#tabchart_3_filters=%7B%22rowFilters%22%3A%7B%7D%3B%22columnFilters%22%3A%7B%7D%3B%22sortFilte reversed%22%5D%7D

9 European Environment Agency. (2015). Distribution of marine litter items by material. Available at https://www.eea.europa.eu/data-and-maps/daviz/distribution-of-marine-litter-items#tab-chart_1

10 Ocean Wise & WWF. Annual Data. Available at https://www.shorelinecleanup.ca/impact-visualized-data

11 Chris Wilcox et al. (2016). Using expert elicitation to estimate the impacts of plastic pollution on marine wildlife. Marine Policy, 65, 107-114. Available at https://www.sciencedirect.com/science/article/pii/S0308597X15002985

12 https://www.bclaws.gov.bc.ca/civix/document/id/mo/mo/m0309_2021/search/CIVIX_DOCUMENT_ROOT_STEM%20:(plastic)%20%20ET%20CCIVIX_DOCUMENT_ANCESTORS:734848577?1#hit1

13 Statistics Canada, Supply and use tables (2017). Not available publicly.

14 The Deloitte Study estimated the total plastic waste that was generated in Canada in 2016 and modelled a scenario for 2030 based on the continuation of baseline market factors. From these two data points, linear interpolation can be used to generate the estimated tonnage of plastic waste in each year between 2016 and 2030. The proportion of plastic waste associated with the six categories of SUPs relative to all plastic waste can be estimated by dividing the tonnage of plastic waste associated with the six categories of SUPs from Table 1 by the interpolated 2019 tonnage of total plastic waste from the Deloitte Study.

15 A&W Canada (2018). A&W Canada first restaurant chain in North America to eliminate plastic straws. Available at http://awincomefund.mediaroom.com/2018-06-08-A-W-Canada-first-restaurant-chain-in-North-America-to-eliminate-plastic-straws

16 Cision Canada (2020). Tim Hortons® to eliminate an estimated 300 million plastic straws from restaurants in Canada over the next year by transitioning to paper straws in early 2021. Available at https://www.newswire.ca/news-releases/tim-hortons-r-to-eliminate-an-estimated-300-million-plastic-straws-from-restaurants-in-canada-over-the-next-year-by-transitioning-to-paper-straws-in-early-2021-883824408.html

17 Cision Canada (2018). Recipe Unlimited plans to eliminate plastic straws from its entire restaurant network. Available at https://www.newswire.ca/news-releases/recipe-unlimited-plans-to-eliminate-plastic-straws-from-its-entire-restaurant-network-686746111.html

18 Josh Pringle (2020). Sobeys eliminating plastic bags from stores starting Friday. Available at https://ottawa.ctvnews.ca/sobeys-eliminating-plastic-bags-from-stores-starting-friday-1.4788253

19 Bruce Anderson (2021). Abacus Data: New Poll: Canadians say plastics in oceans a problem and more action needed. Available at https://abacusdata.ca/new-poll-canadians-say-plastics-in-oceans-a-problem-and-more-action-needed/

20 IPSOS (2021). A Throwaway World: The challenge of plastic packaging and waste. Available at https://www.ipsos.com/sites/default/files/ct/news/documents/2019-11/a-throwaway-world-global-advisor.pdf (PDF)

21 Robert Kitz et al. (2020). Plastic food packaging: Before and after COVID-19. Available at https://www.dal.ca/sites/agri-food/research/plastic-food-packaging--before-and-after-covid-19.html

22 Oceana (2021). Canadians want the federal government to ban more than six plastic items. Available at https://oceana.ca/en/press-releases/canadians-want-federal-government-ban-more-six-plastic-items/

23 CEPA is one of nine environmental Acts of Parliament for which the enforcement of certain regulatory provisions can become subject to this increased fine regime.

24 Government of Canada (2020). A proposed integrated management approach to plastic products: discussion paper. Available at https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/plastics-proposed-integrated-management-approach.html

25 Non-conventional plastics are typically derived from biomass and are often promoted as having lower environmental impacts than conventional plastic derived from petrochemicals. Compostable plastics are a subgroup of biodegradable plastics as all will biodegrade. Oxo-degradable plastics are not considered biodegradable plastics as they are a conventional plastic mixed with an additive to imitate biodegradation. More information is available at https://www.greendotbioplastics.com/biodegradable-vs-compostable-vs-oxo-degradable-plastics-a-straightforward-explanation/.

26 Restaurants Canada releases 2021-2025 Long Term Forecast, Restaurants Canada

27 The European Commission considered demand reduction in their 2018 impact assessment of marine litter, based on modelled price elasticities for certain categories of SUPs. The selected factors for demand reduction in Table 7 are more conservative than those modelled by the European Commission. For instance, zero demand reduction is chosen for SUP foodservice ware made from or containing problematic plastics and for SUP ring carriers, as these categories of items are expected to have low price elasticity due to their function (e.g. it is unlikely that foodservice ware would become "opt-in" due to its function of carrying take-out food, whereas the cutlery that may accompany that take-out food is more likely to become "opt-in" as it may not be needed by every consumer).

28 The Ministry of Environment and Food of Denmark estimated checkout bag size differences, by material, in their 2018 Life Cycle Assessment of grocery carrier bags (PDF). The selected factors are calculated by dividing the average volume, measured in litres, for single-use paper checkout bags and reusable plastic check-out bags by the average volume for "LDPE simple" (standard SUP) checkout bags, resulting in 1.2 and 1.7 respectively.

29 https://op.europa.eu/en/publication-detail/-/publication/a9c49259-af70-11e8-99ee-01aa75ed71a1/language-en, and https://www.recyc-quebec.gouv.qc.ca/sites/default/files/documents/acv-sacs-emplettes-rapport-complet.pdf (PDF)

30 European Commission's Assessment of Measures to Reduce Marine Litter from SUPs

31 The reduction in total plastic waste generated in Canada that is attributable to the proposed Regulations can be estimated by comparing the results of the analysis against the projections in the Deloitte Study. This study estimated that 3.3 million tonnes of plastic waste were generated in Canada in 2016 (29 000 tonnes of which were plastic pollution), which is projected to increase to 4.5 million tonnes by 2030 (40 000 tonnes of which would be plastic pollution). Calculating the straight-line growth between these two points results in estimated figures for total plastic waste and total plastic pollution in each year between 2016 and 2030. Dividing the reduction in plastic waste and plastic pollution estimated for the proposed Regulations in 2024 by the derived total figures from the Deloitte Study for 2024 results in 4% of total plastic waste and 7% of total plastic pollution generated in Canada.

32 Stefanie Werner et al. (2016). Harm caused by marine litter. Joint Research Centre [JRC] Technical Report. Available at https://mcc.jrc.ec.europa.eu/documents/201709180716.pdf (PDF)

33 Sarah Gall and Richard Thompson (2015). The impact of debris on marine life. Marine Pollution Bulletin, 92(1-2), 170-179. Available at https://www.sciencedirect.com/science/article/pii/S0025326X14008571

34 Jesse F. Senko et al. (2020). Understanding individual and population-level effects of plastic pollution on marine megafauna. Endangered Species Research, 43, 234-252. Available at https://www.int-res.com/abstracts/esr/v43/p234-252/

35 Peter S. Puskic et al. (2020). A critical review of harm associated with plastic ingestion on vertebrates. Science of The Total Environment, 743, 140666. Available at https://www.sciencedirect.com/science/article/pii/S0048969720341887

36 Stefanie Werner et al. (2016). Harm caused by Marine Litter. Joint Research Centre [JRC] Technical Report. Available at https://mcc.jrc.ec.europa.eu/documents/201709180716.pdf (PDF)

37 Marta N. Basto et al. (2019). Plastic ingestion in aquatic birds in Portugal. Marine Pollution Bulletin, 138, 19-24. Available at https://www.sciencedirect.com/science/article/pii/S0025326X18308014

38 Lisa A. Hamilton et al. (2019). Plastic & Climate: The Hidden Costs of a Plastic Planet. Available at https://www.ciel.org/plasticandclimate/

39 Nicola J. Beaumont et al. (2019). Global ecological, social and economic impacts of marine plastic. Marine Pollution Bulletin, 142, 189-195. Available at https://www.sciencedirect.com/science/article/pii/S0025326X19302061

40 Statistics Canada (2015). Lesson #2: What are ecosystem goods and services? Available at https://www150.statcan.gc.ca/n1/pub/16-507-x/2014001/ppt02/ppt02-eng.htm

41 A. Ballance et al. (2000). How much is a clean beach worth? The impact of litter on beach users in the Cape Peninsula, South Africa. South African Journal of Science, 96(5), 210-213. Available at https://www.researchgate.net/publication/279579359_How_much_is_a_clean_beach_worth_The_impact_of_litter_on_be

42 S. E. Somerville et al. (2003). Assessment of the aesthetic quality of a selection of beaches in the Firth of Forth, Scotland. Marine Pollution Bulletin, 46(9), 1184-1190. Available at https://www.sciencedirect.com/science/article/pii/S0025326X03001267?via%3Dihub

43 Frederick Blakemore and Allan Williams (2008). British Tourists' Valuation of a Turkish Beach Using Contingent Valuation and Travel Cost Methods. Journal of Coastal Research, 24(6), 1469-1480. Available at https://bioone.org/journals/journal-of-coastal-research/volume-2008/issue-246/06-0813.1/British-Tourists-Valuation-of-a-Turkish-Beach-Using-Contingent-Valuation/10.2112/06-0813.1.full

44 Isaac Rodrigues Santos et al. (2005). Influence of socio-economic characteristics of beach users on litter generation. Ocean & Coastal Management, 48(9-10), 742-752. Available at https://www.sciencedirect.com/science/article/abs/pii/S0964569105001213

45 Kayleigh J. Wyles et al. (2015). Factors That Can Undermine the Psychological Benefits of Coastal Environments: Exploring the Effect of Tidal State, Presence, and Type of Litter. Environment and Behavior, 48(9), 1095-1126. Available at https://journals.sagepub.com/doi/full/10.1177/0013916515592177

46 Nicola J. Beaumont et al. (2019). Global ecological, social and economic impacts of marine plastic. Marine Pollution, 142, 189-195. Available at https://www.sciencedirect.com/science/article/pii/S0025326X19302061

47 M. Fortnam et al. (2019). The Gendered Nature of Ecosystem Services. Ecological Economics, 159, 312-325. Available at https://www.sciencedirect.com/science/article/pii/S0921800918301836

48 Manuel A. Zambrano-Monserrate and Maria A. Ruano (2020). Estimating the damage cost of plastic waste in Galapagos Islands: A contingent valuation approach. Available at https://www.researchgate.net/publication/340312677_Estimating_the_damage_cost_of_plastic_waste_in_Galapagos_Is

49 https://www.recyc-quebec.gouv.qc.ca/sites/default/files/documents/acv-sacs-emplettes-rapport-complet.pdf (PDF)

50 Clean-up activities, including roadside litter collection, do not ignore other forms of waste, as the collection reflects the pollution profile, which includes various plastic, paper, and metal waste.

51 S.R. Stein (2005). Sweating the litter things. Resource Recycle, Volume 24, Issue 5, pp. 25-30. Not available; Container recycling Institute (2015). Estimating beverage container litter quantities and clean-up costs in Michigan. Available at www.container-recycling.org/images/stories/PDF/MichiganLitterCleanupCosts%20FINAL%20v2%204815.pdf (PDF)

52 T.P. Wagner and N. Broaddus (2016). The generation and cost of litter resulting from the curbside collection of recycling. Waste Management, Volume 50, pp. 3-9. Available at: https://www.sciencedirect.com/science/article/pii/S0956053X16300526

53 All cost and benefit figures are in present value terms (discounted to 2021). Accordingly, "per capita" values are derived by dividing the present-value figure by Statistics Canada's 2021 population estimate (Table 17-10-0009-01).

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56 Under a circular economy, there would be more reuse and/or remanufacturing for some of these disposed materials than the current linear economy where the majority of waste is sent to landfills.

57 The price of post-consumer materials was taken from the Continuous Improvement Fund's price sheet. Available at https://thecif.ca/centre-of-excellence/operations/cif-price-sheet/

58 The City of Austin, Texas, estimated costs (labour costs) of $176,000 in 2011 for removing plastic bags from machinery annually. Available at http://www.austintexas.gov/edims/document.cfm?id=147016

59 Senior management occupations

60 Sales support occupations for small businesses and middle management occupations in retail and wholesale trade and customer services for medium and large businesses

61 Statistics Canada, Table 17-10-0005-01, Population estimates on July 1st, by age and sex.

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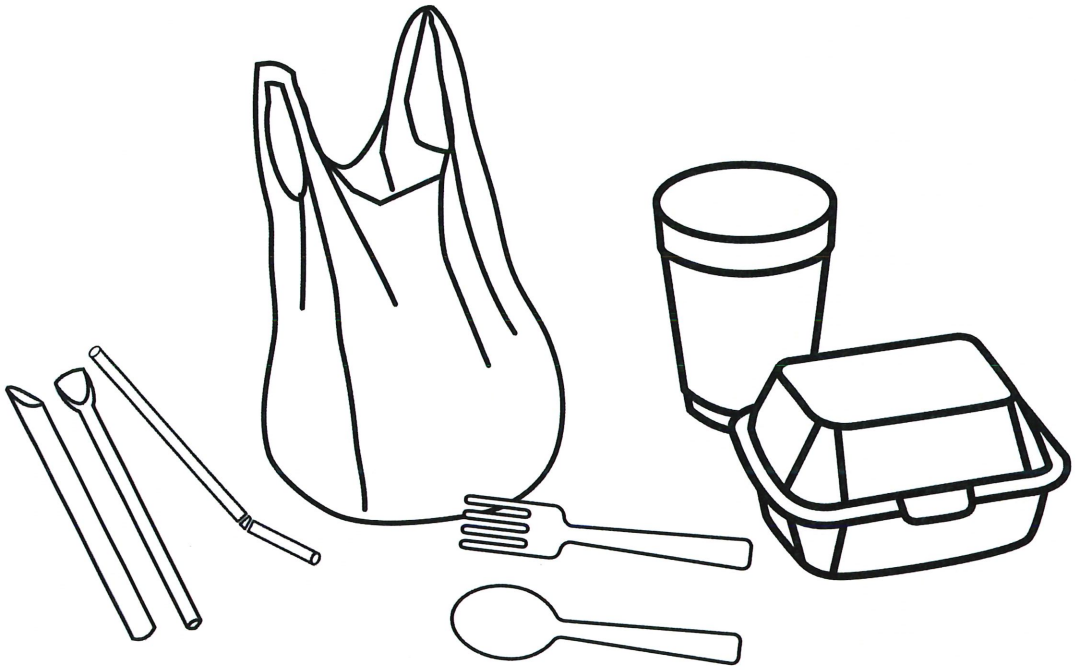
Regionally Harmonized Approach to Municipal Single-Use Item Reduction Bylaws



November 2021

Metro Vancouver Solid Waste Services

This Document is Not a Substitute for Legal Counsel

The regionally harmonized approach to municipal single-use item reduction bylaws outlined in this document does not, and is not intended to, constitute legal advice; instead, all information, content, and materials available in this document are for general informational purposes only. The regulation of single-use items is an evolving area. Information in this report may not constitute the most up-to-date legal or other information. Member jurisdictions should work with legal counsel to obtain advice with respect to the drafting and implementation of bylaws.

Introduction

A harmonized regulatory approach for single-use items across the region benefits both residents and businesses. Table 1 summarizes the regionally harmonized approach to municipal single-use item reduction bylaws. The overall goal of single-use item reduction bylaw approaches outlined in this document is to reduce single-use items overall. This means not just swapping single-use plastic items out for alternatives such as single-use paper and wood. The goal is to move up the waste hierarchy towards reusable, durable products. Therefore, where possible, approaches avoid swapping of one item for another.

Table 1 Summary of the Proposed Regionally Harmonized Approach to Municipal Single-Use Item Reduction Bylaws

Approach	**Items**
Ban	Plastic bags, plastic straws (not required for medical or accessibility needs), plastic stir sticks, and foam service ware containers
Minimum fees	$0.25 for recycled paper bags, $2.00 for reusable bags
Only on request by the customer	All utensils regardless of material, alternatives to plastic straws
Reporting	The number of recycled paper and reusable bags distributed in the past 12 months on an as-requested basis based on the fees collected

Definitions

"accessible straw" means a drinking straw made wholly of plastic that is not compostable or biodegradable, has a corrugated section that allows the straw to bend and maintain its position and is individually wrapped in paper;

"checkout bag" means a paper or plastic single-use supplementary bag;

"item" means the applicable of the following:

(a) a bag;

(b) a service ware container;

(c) a utensil;

(d) a drinking straw;

"plastic" includes compostable and biodegradable plastic;

"polystyrene foam", when used in reference to an item, means an item made primarily of polystyrene foam;

"recycled paper bag" means a paper checkout bag that contains at least 40% recycled paper content, and has a reference printed on the outside of the bag to the applicable amount of recycled content with the word "recyclable";

"reusable bag" means a bag that is designed and manufactured to be used and machine-washed at least 100 times;

"service ware container" means a container that is ordinarily provided for service of prepared food or beverages and includes a cup, plate, bowl, tray, carton or lidded container;

"single-use", when used in reference to an item, means the item is provided for a single use or a short-term purpose;

"small paper bag" means a paper bag that is less than 15 cm by 20 cm when flat;

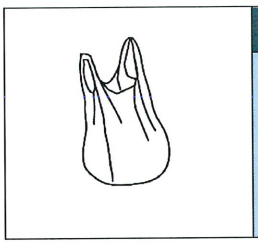
"stir stick" means an item that is designed and manufactured to stir beverages;

"supplementary", when used in reference to an item, means an item that is provided to a customer by a business to facilitate the transport of a purchase from the business, or consumption of a product, including prepared food that is purchased for take-out or delivery;

"used bag" means a checkout bag or a reusable bag that has been previously used and is being reused;

"utensil" includes a spoon, fork, knife, chopstick or stir stick.

Checkout Bags



Regionally Harmonized Approach to Reduce Single-Use Checkout Bags

- Ban on plastic checkout bags
- Prescribed fees (see Table 2) for recycled paper bags and reusable bags;
- Reporting on the number of recycled paper and reusable bags distributed in the past 12 months on an as-requested basis based on the fees collected.

Minimum Fee Levels

The minimum fees set out in Table 2 are to be kept by the businesses.

Table 2 Fees for checkout bag bylaws

	Item	Minimum Fee
Regionally harmonized minimum fee levels	Recycled Paper Bag	$0.25
	Reusable Bag	$2.00

The following bags are exempt from fees:

- used bags;
- small paper bags;
- recycled paper bags for privacy of prescription drugs and medical devices; and
- paper and reusable bags used to distribute items such as food and clothing to those in need.

Exemptions and Clarifications on Scope

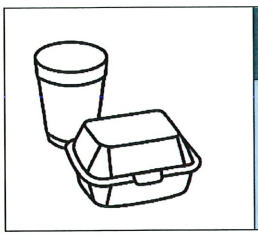
Exempt plastic checkout bags include:

- large bags used to protect linens, bedding or other similar large items.

The follow list of checkout-bag-like and plastic wrapping that are out of scope:

- package loose bulk items such as fruit, vegetables, nuts, grains, or candy;
- package loose small hardware items such as nails and bolts;
- contain or wrap frozen foods, meat, poultry, or fish, whether pre-packaged or not;
- wrap flowers or potted plants;
- protect prepared foods or bakery goods that are not pre-packaged;
- transport live fish;
- carry home belongings from a hospital or care facility;
- protect newspapers or other printed material intended to be left at the customer's residence or place of business;
- protect clothes after professional laundering or dry cleaning;
- plastic garment bags used to protect new garments during shipping; and
- reusable garment bags used to protect items such as suits and dresses.

Foam Service Ware Containers



Regionally Harmonized Approach to Reduce Single-Use Service Ware Containers

- Ban on foam service ware containers

Exemptions and Clarifications on Scope

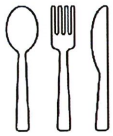
Foam service ware containers not included in the scope of food service ware containers include:

- Foam trays used for uncooked meat, poultry, seafood, or other food that requires further preparation are not part of the foam food service ware ban.
- Items packaged and sealed outside the jurisdiction of the bylaw.

Exemptions to banned foam service ware containers include:

- Hospital and care facilities under the Community Care and Assisted Living Act.
- The sale of single-use items that are sold as a product, ordinarily in sets of multiple item.

Utensils and Stir Sticks



Regionally Harmonized Approach to Reduce Single-Use Utensils and Stir Sticks

- Ban on plastic stir sticks
- Utensils (regardless of materials) available only on request by the customer.

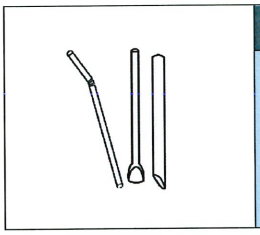
Exemptions and Clarifications on Scope

Self-serve stations are a form of only on request by the customer.

Exemptions to banned plastics stir sticks and utensils available only on request by the customer include:

- Hospital and care facilities under the Community Care and Assisted Living Act.
- The sale of single-use items that are sold as a product, ordinarily in sets of multiple item.

Drinking Straws



Regionally Harmonized Approach to Reduce Single-Use Drinking Straws

- Ban on plastic drinking straws not required for accessibility and medical needs
- Alternatives such as paper straws only provided by request

Guidance Regarding Accessibility and Medical Needs

It is important that any restrictions on plastic drinking straws consider accessibility and medical needs by:

- clarifying in all communications that the plastic drinking straw ban does not apply to accessible straws required for accessibility or medical needs;
- explaining to stakeholders why these straws are needed and encouraging businesses to stock accessible straws for those that need them; and
- including persons with disabilities and medical needs in engagement activities.

Exemptions and Clarifications on Scope

Exemptions to banned plastic drinking straws not required for accessibility or medical needs include:

- Hospital and care facilities under the Community Care and Assisted Living Act.
- The sale of single-use items that are sold as a product, ordinarily in sets of multiple items.

Single-use Item Reduction Plan - Bags

Jurisdiction	Checkout Bags	Bag Fees	Requirements above and beyond Regional Harmonized Approach
Regionally Harmonized Approach	• Ban on plastic checkout bags • Reporting on the number of recycled paper and reusable bags distributed in the past 12 months on an as-requested basis based on the fees collected.	Recycled paper Bag = $0.25 Reusable bag = $2.00	
City of Vancouver			• Ban on compostable plastic shopping bags • Ensure paper shopping bags contain at least 40% recycled content and are labeled "recyclable" and "made of 40% recycled content" • Ensure new reusable shopping bags are designed and manufactured to be capable of at least 100 uses
City of Richmond		No fee	• Permits use of plastic checkout bags only if the Plastic checkout bag has been returned to the Business for the purpose of being reused by the customer.
City of Delta			• Recycled paper bags, used bags, small paper bags and reusable checkout bags are only available upon request by the customer. • Does not apply to used bags
City of Port Moody			• Recycled paper bags, used bags, small paper bags and reusable checkout bags are only available upon request by the customer. • Does not apply to used bags

Single-use Item Reduction Plan - Bags

Jurisdiction	Checkout Bags	Bag Fees	Requirements above and beyond Regional Harmonized Approach
Regionally Harmonized Approach	• Ban on plastic checkout bags • Reporting on the number of recycled paper and reusable bags distributed in the past 12 months on an as-requested basis based on the fees collected.	Recycled paper Bag = $0.25 Reusable bag = $2.00	
City of Richmond			• Permits use of plastic checkout bags only if the Plastic checkout bag has been returned to the Business for the purpose of being reused by the customer.

Single-use Item Reduction Plan - Cups

Jurisdiction	Cups	Cup Fees	Comments
Regionally Harmonized Approach	• No regionally harmonized approach	• No regionally harmonized approach	
City of Vancouver	• Starting with the 2023 business licence renewal, report the number of single-use cups distributed in the past 12 months at each licensed location when they renew their annual business licence • The cup reporting requirement is waived for each business location participating in a reusable cup-share program. This is intended to encourage food vendors to participate in reusable cup- share programs.	• Charge a minimum fee of $0.25 for every disposable cup distributed • Display the cost of disposable cups wherever customers place orders for drinks (such as menus, menu boards, and online ordering platforms) • If receipts are given, show the fee for each disposable cup as its own line item • Tell customers the amount of the cup fee for any orders placed over the phone • Keep the fees from cups - this revenue is not remitted to the City	• The City of Vancouver is unique as they operate under the Vancouver Charter, a provincial statute. It is the Vancouver Charter which allows them to collect fees for cups. • Some local municipalities legislated through the Community Charter have also requested this ability through the Province; however the Province has yet to provide this authority.
City of Richmond	• Does not address cups	• Does not address cups	• None.
City of Delta	• Prohibits foam cups	• No fees	• None.
City of Port Moody	• Does not address cups	• Does not address cups	• None.

Single-use Item Reduction Plan - Cups

Jurisdiction	Cups	Cup Fees	Comments
Regionally Harmonized Approach	• No regionally harmonized approach	• No regionally harmonized approach	
City of Surrey	• Does not address cups	• Does not address cups	• None.

Single-use Item Reduction Plan – Foam Service Ware Containers

Jurisdiction	Foam Service Ware Containers	Fees	Requirements above and beyond Regional Harmonized Approach
Regionally Harmonized Approach	• Ban on foam service ware containers (polystyrene)	• None	
City of Vancouver	✓	✓	• Does not apply to prepared foods packaged and sealed outside of the Municipality
City of Richmond	✓	✓	• Does not apply to prepared foods packaged and sealed outside of the Municipality
City of Delta	✓	✓	• Does not apply to prepared foods packaged and sealed outside of the Municipality
City of Port Moody	✓	✓	• Does not apply to prepared foods packaged and sealed outside of the Municipality
City of Surrey	✓	✓	• Does not apply to prepared foods packaged and sealed outside of the Municipality

Single-use Item Reduction Plan – Straws

Jurisdiction	Straws	Fees	Requirements above and beyond Regional Harmonized Approach
Regionally Harmonized Approach	• Ban on plastic drinking straws not required for accessibility and medical needs • Alternatives such as paper straws only provided by request	• None	

City of Vancouver			• Allows flexible plastic straws, individually wrapped in paper, to ensure that customers who are unable to drink without a straw, or have difficulty drinking, can safely consume beverages and nutrition.
			• Ban on plastic straws include:
			  • Plastic made from fossil fuel products
			  • Plastic that is labeled or described as compostable, degradable
			  • Plastic that is labeled or described as made from plants or other biological materials (example: corn, potatoes, sugarcane)
			• During COVID-19, charitable food services may continue to distribute single-use items with food or meals, but are expected to begin working towards complying with the by-laws as soon as it is possible for them.

City of Richmond			• None.

Single-use Item Reduction Plan – Straws

Jurisdiction	Straws	Fees	Requirements above and beyond Regional Harmonized Approach
Regionally Harmonized Approach	• Ban on plastic drinking straws not required for accessibility and medical needs • Alternatives such as paper straws only provided by request	• None	
City of Delta	• Does not address straws	• Does not address straws	• None.
City of Port Moody			• None.
City of Surrey	• Does not address straws	• Does not address straws	• None.

Single-use Item Reduction Plan – Utensils and Stir Sticks

Jurisdiction	Utensils & Stir Sticks	Fees	Requirements above and beyond Regional Harmonized Approach
Regionally Harmonized Approach	• Ban on plastic stir sticks • Utensils (regardless of materials) available only on request by the customer.	• None	
City of Vancouver			• During COVID-19, charitable food services may continue to distribute single-use items with food or meals, but are expected to begin working towards complying with the by-laws as soon as it is possible for them.
City of Richmond	• Does not address utensils and stir sticks	• Does not address utensils and stir sticks	• None.
City of Delta	• Does not address utensils and stir sticks	• Does not address utensils and stir sticks	• None.
City of Port Moody	• Does not address utensils, **plastic stir sticks are banned.**	• Does not address utensils, **plastic stir sticks are banned.**	• None.
City of Surrey	• Does not address utensils and stir sticks	• Does not address utensils and stir sticks	• None.

Summary of Regional, Provincial and Federal Efforts

Material Type	Government of Canada (Proposed Regulations)	Government of BC (Proposed Regulations)	Metro Vancouver (Harmonized Approach for Member Jurisdictions)
Checkout Bags	-Ban plastic	-Ban plastic -Fees and recycled content in paper -Fees for reusables	-Ban plastic -Fees and recycled content in paper -Fees for reusables
Cups and Containers (foodservice ware)	Ban problematic plastics: -Polystyrene foam -PVC -oxo-degradable plastics	Ban problematic plastics: -Polystyrene foam -PVC -oxo-degradable plastics -compostable plastics	Ban problematic plastics: -Polystyrene foam
Plastic ring carriers	-Ban plastic		
Straws	-Ban plastic	-By-request	-Ban plastic -All others by-request
Utensils	-Ban plastic	-By-request	-By-request
Stir Sticks		-By-request	-Ban plastic -All others by-request
Disposable foodservice ware accessories		By request for: -condiment sachets -napkins -cup sleeves and other similar items	
All packaging		-Ban oxo-degradable plastics	