

# **BROADWAY PLAN ONE WATER STRATEGY**

**May 2022**

## EXECUTIVE SUMMARY

The Broadway Plan One Water Strategy has been developed to enable growth in Broadway Plan area while mitigating risk from existing issues and building more resilience to climate change. This strategy was developed concurrent with the creation of the Broadway Plan, and considers multiple objectives:

- **Enable growth and mitigate combined sewer overflows** by undertaking strategic water and sewer upgrades.
- **Increase resilience to climate change** by constructing new stormwater outfalls that adapt to sea level rise and divert water that would otherwise cause flooding and overflows.
- **Improve quality of stormwater and achieve community and ecosystem benefits** by expanded use of green rainwater infrastructure and creating a network of park-like connector streets that manage water and increase biodiversity (referred to as a “blue green system”).
- **Reduce risk of flooding and protect valuable water resources** by expanding on-site groundwater and rainwater management requirements.

The system upgrades and other projects arising from this strategy will be delivered through a combination of development conditions, the Utilities Development Cost Levy (UDCL) program, and renewal.

Expected development conditions for rezoning and development permit applications include:

- On-site (private realm) rainwater management, per the Zoning and Development Bylaw and the Rainwater Management Bulletin.
- On-site (private realm) hydrogeological study and subsequent groundwater management plan if required, per the Zoning and Development Bylaw and the Groundwater Management Bulletin.
- Public realm green rainwater infrastructure to meet Rain City Strategy targets to capture and treat rainwater closer to where it falls, thereby increasing climate resilience and mitigating impacts to the pipe system including combined sewer overflows. Where installation by the development is not feasible, payment in lieu may be considered.
- Sewer pipe upgrades (sanitary, storm) and combined sewer separation where needed to mitigate flood risk based on existing system performance and projected development loads, and to address combined sewer overflows.

Each rezoning or development application will be assessed individually. Specific conditions of development will be dependent on the site and nature of the project.

City-led projects following from the strategy include new stormwater trunks and outfalls, as well as various public realm green rainwater infrastructure initiatives. These opportunities and servicing concepts will be further refined as part of a fully realized integrated water management plan (IWMP) following adoption of the Broadway Plan. An IWMP requires time to analyze and understand the unique characteristics of each watershed as well as the most appropriate interventions and upgrades to service growth and restore ecosystems. The concurrent work on the city-wide Healthy Waters Plan being developed by Engineering Services will also provide direction to the IWMP work.

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## INTRODUCTION

The Broadway Plan One Water Strategy outlines the upgrades and interventions required within the Broadway Plan area's water, sewer and drainage systems to mitigate risk from existing issues, service expected growth and build more resilience to climate change. This strategy was developed in coordination with the Broadway Plan, a 30-year land use plan focusing on opportunities to integrate new housing, jobs and amenities around the new Broadway Subway.

The Broadway Plan (Figure 1) is expected to create capacity for an additional 40,000 - 50,000 residents and 33,000 - 42,000 jobs by 2050. While the pressures of population growth, aging infrastructure and climate change bring challenges, they also present a tremendous opportunity to rethink how we manage water. In response, the City of Vancouver has adopted a One Water planning approach to managing water resources. This approach considers the entire urban water cycle, as well as the natural and built environments, as an integrated system. It values all forms of water including drinking water, wastewater, rainwater, surface water, and groundwater. A One Water system considers all the ways we interact with our water, to prioritize safe access to drinking water where we need it, control and reduce flooding, and collect and treat polluted stormwater runoff and wastewater to protect our health and our creeks, streams, and marine environment.

The Broadway Plan One Water Strategy identifies infrastructure upgrades and adaptation measures to service existing development and growth including strategic use of green rainwater infrastructure (GRI) (nature-based solutions) to treat polluted rainwater and control flooding, as well as tidal protection measures to provide resilience from the impacts of climate change. It also re-affirms the role of private side water measures to manage and reuse rainwater to offset potable water use and reduce run-off from development sites and public lands, and to protect groundwater. These measures will enable the provision of essential services of drinking water, stormwater and wastewater management to a growing population, while providing community and ecosystem benefits.

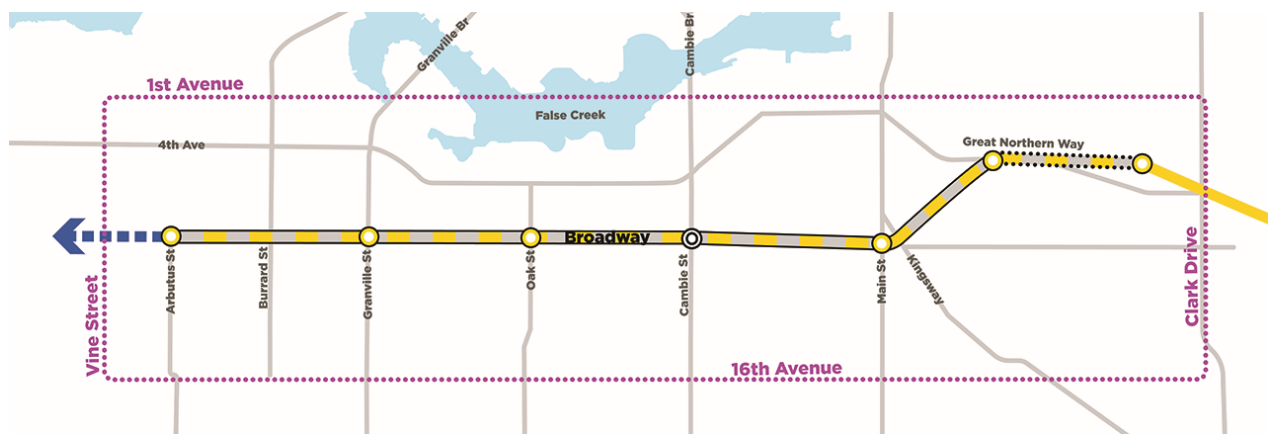


Figure 1: Broadway Plan Area with Subway Alignment

## City-wide Context

The One Water Strategy and policies are supported by city-wide strategies and policies, including:

- ***Healthy Waters Plan (directed by Council, 2020)***
  - Addresses aquatic pollution from combined sewer overflows (CSOs) and urban rainwater runoff and secures adequate sewage and drainage capacity for a growing population and climate change. This multi-phase city-wide sewer and rainwater investment plan is estimated for completion in 2024.
- ***Rain City Strategy (2019)***
  - Provides a roadmap and sets rainwater management targets to reduce pollution from urban runoff, adapt to climate change impacts, reduce the volumes of CSOs and ease the burden on infrastructure associated with increased rainwater volumes and urbanization. The Park Board also endorsed this strategy in February 2020.
- ***VanPlay (2019)***
  - Identify, acknowledge, uncover and connect freshwater features, and historic streams, to both help manage and filter stormwater and increase their visibility.
  - Establish principles and a decision-making framework to determine appropriate locations to incorporate green infrastructure, like bioswales and wetlands, in parks to create wetland habitat, improve water quality, manage stormwater and reduce need for irrigation
- ***Climate Change Adaptation Strategy (2018)***
  - Outlines priority actions for the City to take in order to prepare for the shocks and stresses of climate change. The strategy is comprised of five Core Action areas and 17 Enabling Actions. Core Action areas are as follows:
    - Climate - robust infrastructure
    - Climate - resilient buildings
    - Healthy and vigorous natural areas and green space
    - Connected and prepared communities
    - Coastal preparedness
- ***False Creek Water Quality Improvement Initiative (2018)***
  - City of Vancouver established a Waterfront Initiative for major natural waterways including the Burrard Inlet, False Creek, Lost Lagoon, the Fraser River and Trout Lake that engages First Nations, industry, senior levels of government and adjacent municipalities, and the community to support three goals:
    1. A Thriving Working Waterfront
    2. Safe, Accessible Waterfront Recreation
    3. Restoring Aquatic and Riparian Ecology and Traditional First Nation's Food Sources
  - To support a coordinated and comprehensive approach that considers the suite of actions being advanced across the City, an interdepartmental

action framework — the False Creek Water Quality Improvement Initiative (FCWQII) — has been developed. This framework organizes the key action initiatives being advanced throughout the various departments according to five priority action areas:

1. Partnerships and Interagency Coordination
2. Strategic Planning
3. Research and Assessment
4. Source Control
5. Ecosystem Health Improvement

- ***Greenest City Action Plan – Water Conservation Update (2017)***
  - Meets the Greenest City Action goal to reduce per capita water consumption by 33 per cent from 2006 levels; identifies accelerated residential metering, a rate review to address price of water, and the use of potable water offsets through integrated water management to address population growth, climate change, and the need for equity across potable water users
  - Provides a roadmap leading to updates to the Vancouver Building By-law, increased water efficiency measure for fixtures and appliances (2018), and rainwater harvest and reuse (2018).
- ***Financing Growth Policy (2004)***
  - Provides direction for development projects to contribute towards the infrastructure and amenity costs that result from growth.

## **LAND USE AND GROWTH**

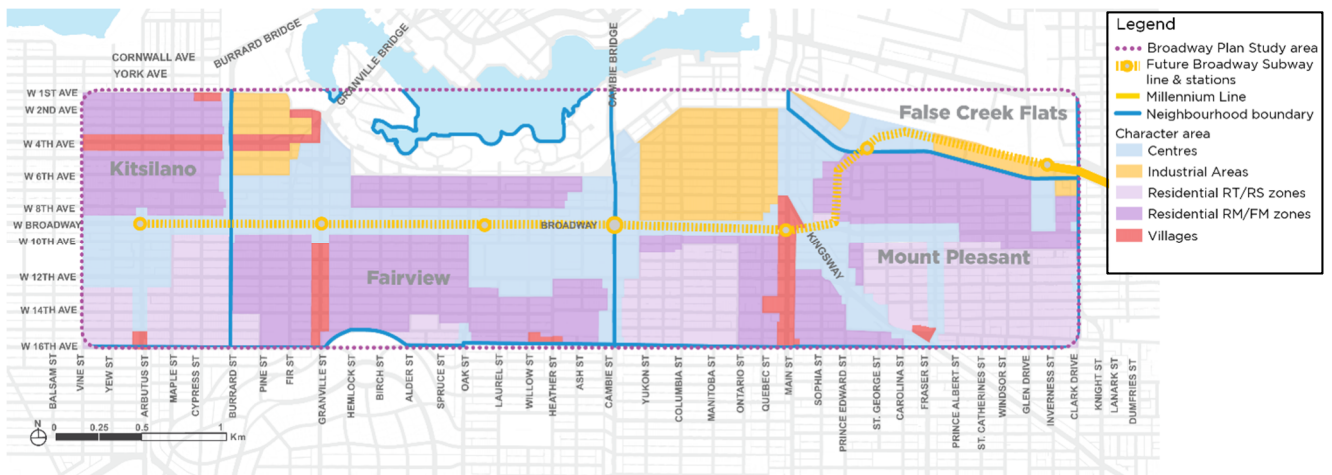
### **Existing Land Use**

The Broadway Plan area has a diverse employment and residential mix that includes established neighbourhoods. As of 2016, more than 78,000 people resided in the area, representing approximately 12 per cent of the city's population. This translates to a relatively high population density, with 91 residents per hectare in the Broadway Plan area, compared to the city average of 54 residents per hectare. A significant portion of the city's rental housing supply is located in the area: as of 2016, 59% of households in Broadway were rental households, compared to 53% city-wide.

Also notable is the amount and diversity of job space: the Broadway Plan area is the second largest job centre in the province with more than 84,400 jobs. The area is a key source of employment for residents within Vancouver and throughout the region, with more than 62,000 people commuting to Broadway for work from outside the area. Broadway is also a regionally important corridor that connects the city to the largest university (UBC) and the largest hospital (Vancouver General Hospital) in Western Canada.

### **Future Land Use and Growth**

As a result of the Broadway Plan, significant growth and development is expected. Development patterns will not be uniform across the entire area and will vary depending on new land use allowances, as well as existing land use (Figure 2).



**Figure 2: Broadway Plan Character Areas**

In general, new development in the Centres, Villages, and Industrial Areas will have limited capacity for site permeability and rainwater infiltration, similar to current conditions with little or no building setbacks. In the Residential Areas, retaining some level of site permeability for rainwater infiltration will be a priority.

Estimates of future population and job growth were prepared as part of the Broadway Plan for utility planning, reflecting a conservative high growth scenario. They include an estimate of growth for large/unique sites within the Broadway Plan area (such as institutional campuses) to permit sizing of key infrastructure (particularly sewers); however those sites will be subject to their own utility servicing studies. Refer to Broadway Plan for further information on future land use allowances and growth estimates.

## SEWER AND DRAINAGE SERVICING

### Plan Area Context

The Broadway Plan area spans five watersheds: Balaclava, Kitsilano-South Granville, Cambie-Heather, China Creek, and Terminal, as shown on Figure 3. The topography of the watersheds (Figure 4) generally consists of highly sloped upper watersheds that drain to low-lying flat land adjacent to False Creek and English Bay.

The existing sewer trunk system (City of Vancouver and Metro Vancouver) is illustrated on Figure 5. Only large diameter sewers (trunks) and other key infrastructure such as pump stations and force mains are shown, and mainly for systems that service or interact with the Broadway Plan area. Not all pipes are shown on this schematic.

As indicated on the map, City trunks servicing Broadway generally flow from south to north, and discharge either to the Metro Vancouver interceptors (very large trunks running east to west) or to the stormwater or CSO outfalls along False Creek and English Bay.

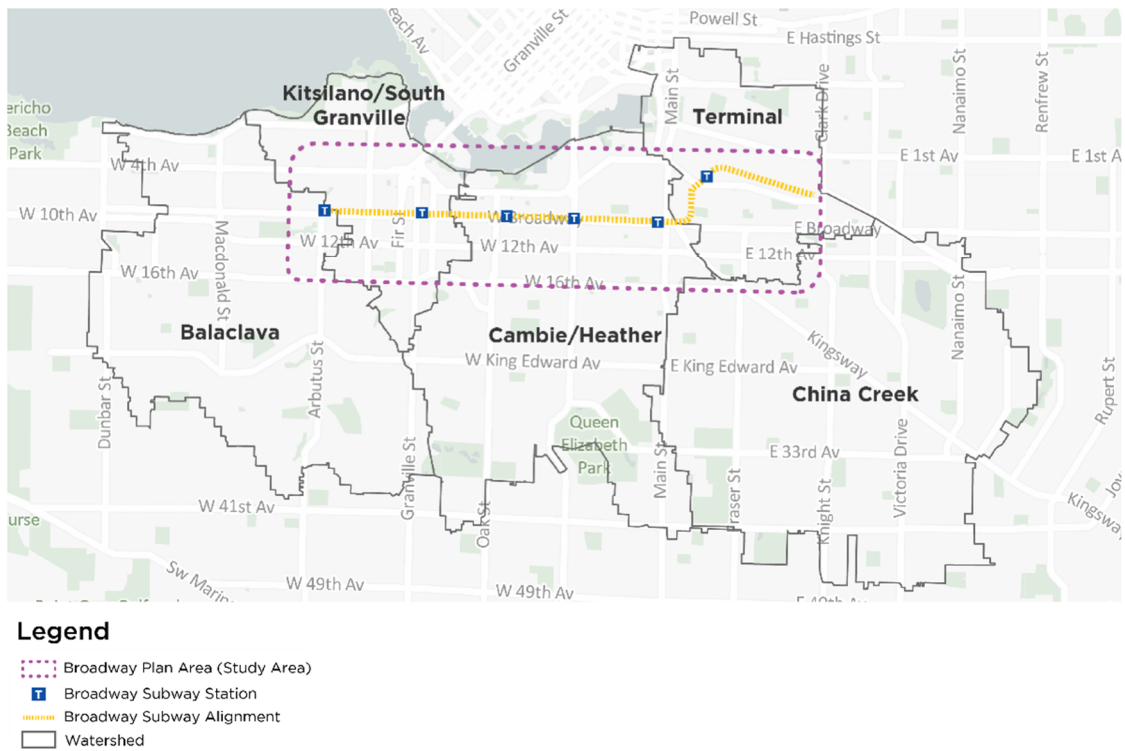


Figure 3. Broadway Watersheds

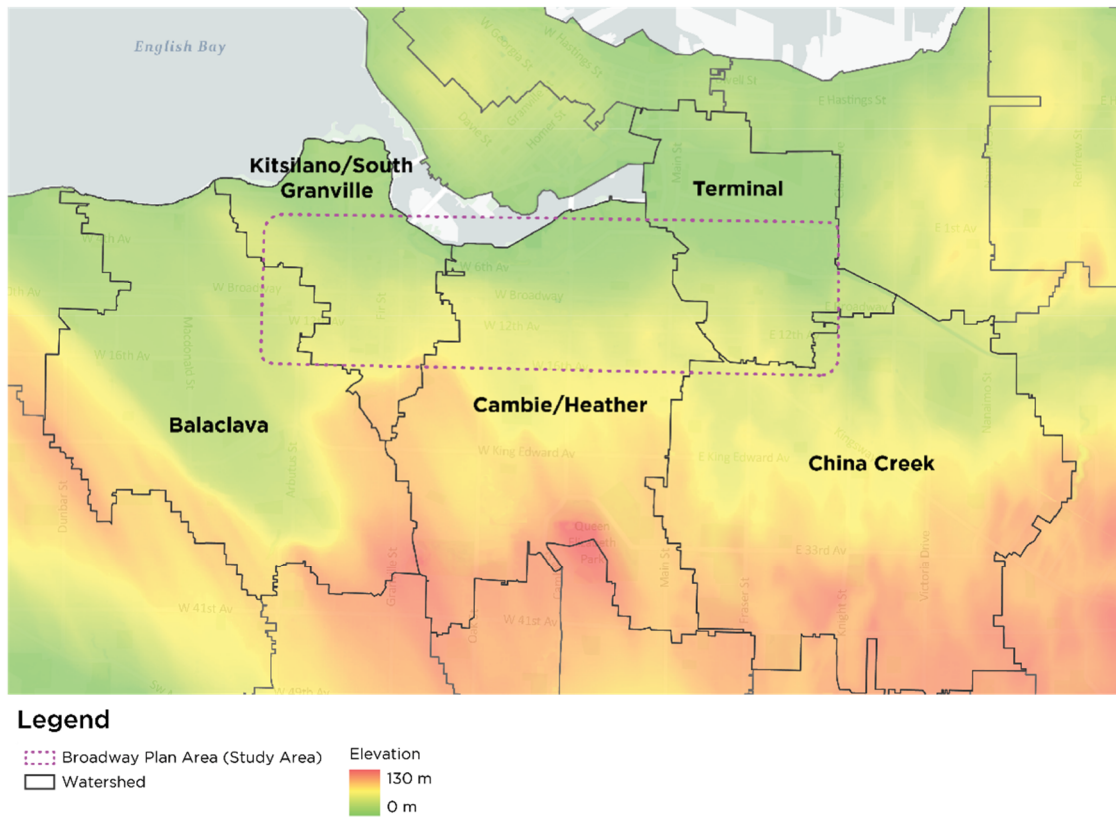


Figure 4. Topography

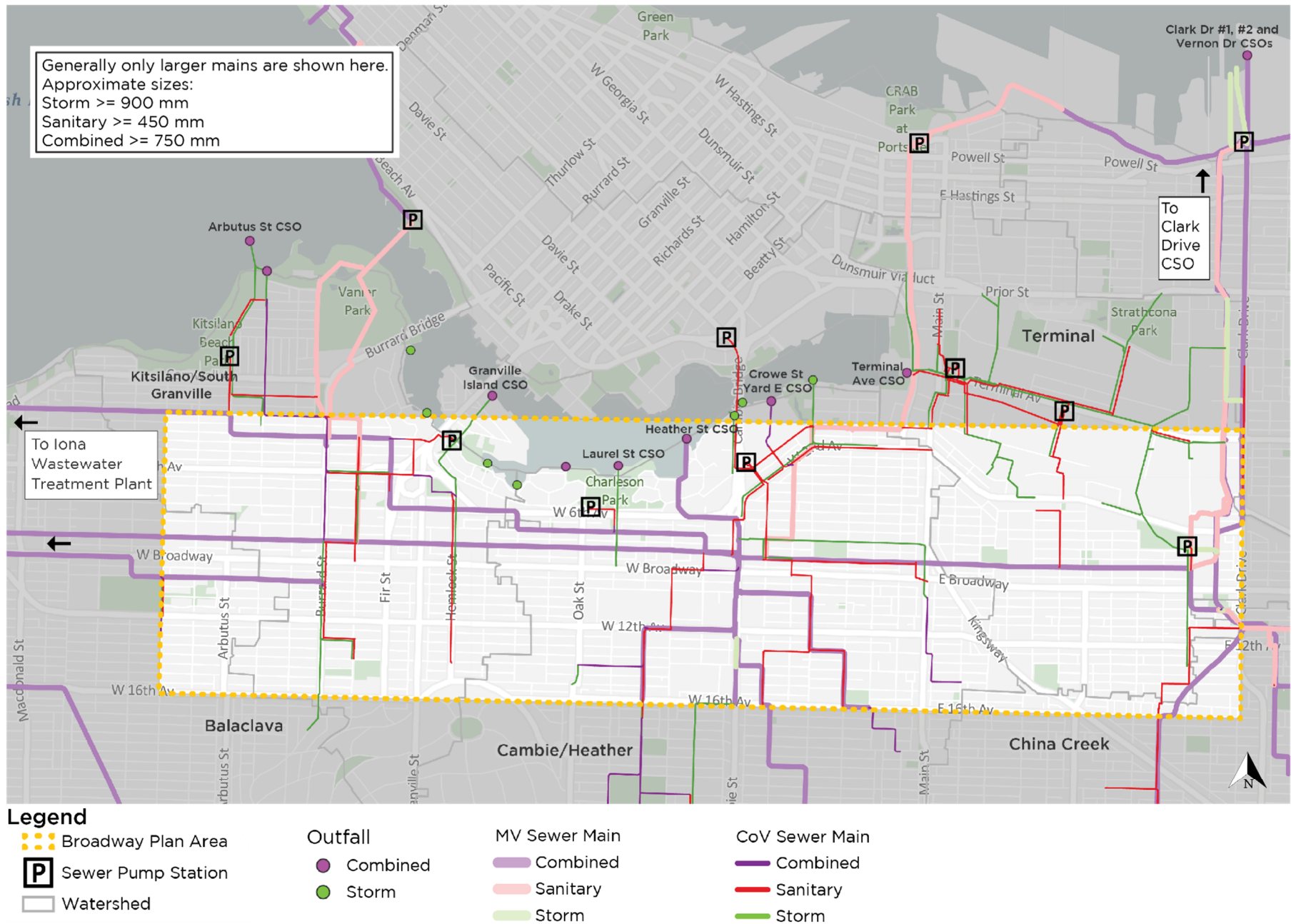


Figure 5. Existing Broadway Trunk Systems



The Metro Vancouver interceptors currently convey combined flow towards the Iona Wastewater Treatment Plant, allowing for the potential of combined sewer overflow to occur at dedicated outfalls during periods of wet weather.

The key existing and future sewer and drainage issues in the Broadway Plan area are described below.

### ***Inland and Coastal Flooding***

Low-lying lands adjacent to False Creek and English Bay are subject to both inland and coastal flooding, which will be exacerbated with sea level rise. Inland flooding is the result of topography, significant rainfall and sometimes high sea levels preventing stormwater from discharging to the ocean by gravity, whereas coastal flooding is the result of ocean water flooding the surrounding land.

Stormwater storage, dykes and drainage pump stations are engineered solutions that are often needed to mitigate negative impacts of inland and coastal flooding.

Key areas of concern are False Creek Flats, False Creek South and Southeast False Creek/Olympic Village, just bordering the Broadway Plan area. Also of concern is Kitsilano Beach/Point. The Broadway Plan area contributes stormwater flows through these low-lying areas and as such the servicing plan must work towards coastal mitigations.

Broadway Plan area is also located at the mid and downstream portions of the five watersheds, with substantial flows being conveyed through the area. As such, major flow paths and depression areas are also at risk of inland flooding.

### ***Combined Sewer Overflows and Stormwater Treatment***

The watersheds are serviced by both separate sanitary and storm sewers as well as combined sewers, which carry both stormwater and sanitary flows. Relative to some other locations in the city, there is a substantial number of separated sewers in the Broadway Plan area (approximately 67%), although there are still significant clusters of local combined pipes and many of the trunks are still combined. The regional Metro Vancouver interceptor system (which conveys flows from Burnaby and Vancouver to Iona Wastewater Treatment Plant) is also a combined system in the Broadway Plan area.

Sewer separation in the area has occurred through renewal-based programs and development, as well as through targeted separation in areas that historically contributed CSO to False Creek. Improved water quality in False Creek and the associated beaches has long been an objective in the planning and upgrading of the Vancouver sewer systems. Combined sewer overflow elimination by 2050 is also a requirement of the Integrated Liquid Waste and Resource Management Plan (2011). In recent years, council has passed motions asking staff to explore options to accelerate CSO elimination and to target continuous improvements over time. The planning in Broadway supports this objective while the city-wide Healthy Waters Plan is under development.

Stormwater discharged to the ocean also needs to be of acceptable quality to not degrade the environment, therefore treatment measures such as GRI or mechanical solutions need to be included in the planned sewer and drainage systems.

### **System Capacity**

The existing performance of the City's sanitary, storm, and combined sewer systems were analyzed as part of development of the plan. The pipe systems in the Broadway Plan area generally have available sanitary dry weather flow capacity (i.e. many pipes are less than 50% full in dry weather), which suggests that there is capacity for new development in many locations.

However, the wet weather performance is variable throughout the area, and this is key to minimizing flood risk. Generally, the combined pipes systems have poor wet weather performance, while the separated systems tend to have good wet weather performance, with some exceptions. Performance of separated systems is generally worst in areas with separated systems that still discharge to downstream combined trunks or with significant numbers of combined service connections in spite of separated sewer mains.

Nonetheless, system capacity is varied and will need to be reviewed for any development application to confirm adequate servicing capacity. It is important to provide adequate flood protection for existing and new customers as part of redevelopment, and for redevelopment to not exacerbate existing issues such as combined sewer overflows.

### **Future Servicing Needs**

Looking to the future, the available capacity of the system will decrease as development progresses and also as a result of climate change. Due to climate change, rain storms are become more intense, increasing the rate of wet weather flows to the sewer systems, and increasing the frequency and severity of basement and surface flooding. Sea level rise will also restrict the ability of the stormwater system to discharge to the ocean, as noted above.

Metro Vancouver's system capacity has not been evaluated directly as part of this plan, however the outcomes of previous Metro Vancouver planning studies have been incorporated. This includes:

- Canoe Creek Sewer Separation Study (McElhanney, 2019)
- Cambie Street Sewer Separation Study (McElhanney, 2019)
- Balaclava Sewer Separation Study (McElhanney, on-going)

The City aims to not increase flows to the Metro Vancouver system over time by balancing increasing sanitary contributions (due to development) against reducing stormwater contributions through sewer separation, new storm trunks and outfalls, and GRI.

These strategies will also help achieve CSO elimination, mitigate flooding, and address stormwater quality in the City's system. The One Water Strategy includes a combination of pipe upgrades and GRI solutions, including public realm enhancement and a reaffirmation of private realm requirements for water management in the Broadway Plan area.

These directions will be implemented through a combination of City-led improvements (funded by the Utilities Development Cost Levy (UDCL), sewer rates and senior government grants); developer-delivered improvements through conditions, and policy.



## **Development Conditions**

All rezoning and development permit applications in the Broadway Plan area will be reviewed to assess utility impacts arising from development. Developments may be subject to conditions in order to help meet the objectives of the One Water Strategy. These conditions may include the following:

- On-site (private realm) rainwater management, per the Zoning and Development Bylaw and the Rainwater Management Bulletin.
- On-site (private realm) hydrogeological study and subsequent groundwater management plan if required, per the Zoning and Development Bylaw and the Groundwater Management Bulletin.
- Public realm green rainwater infrastructure to meet Rain City Strategy targets to capture and treat rainwater closer to where it falls, thereby increasing climate resilience and mitigating impacts to the pipe system including combined sewer overflows. Where installation by the development is not feasible, payment in lieu may be considered.
- Sewer pipe upgrades (sanitary, storm) and combined sewer separation where needed to mitigate flood risk based on existing system performance and projected development loads, and to address combined sewer overflows.

Each rezoning or development application will be assessed individually. Specific conditions of development will be dependent on the site and nature of the project. Further details are provided in the sections below. Latecomer Agreements may be used where upgrades provide sanitary, water or drainage service to sites other than that being developed.

Developments are also required to pay development cost levies including the Utilities Development Cost Levy, which is put towards financing neighbourhood serving water, sewer and drainage (including green rainwater infrastructure) projects in support of development.

### ***Private Realm Water Management***

Consistent with the Council approved Rain City Strategy (2019) and the goal to embrace rainwater as a resource, on-site rainwater management requirements and harvest and reuse of rainwater are reaffirmed as important measures in the Broadway Plan, as is groundwater management as a resource protection and risk mitigation measure.

Rainwater management policies that maximize retention, infiltration, and reuse, and that leverage nature-based solutions where possible, help mitigate the overloading of an already constrained piped system and keep harmful pollutants from entering our receiving waters, while achieving community and ecosystem benefits. The harvest and reuse of rainwater also provides the benefit of offsetting drinking water demands. Groundwater management policies prevent discharge into the piped system and protect against depleting our aquifers. Groundwater can be a future water source while in some locations it may contain environmental pollutants that should not be mobilized or conveyed to receiving waters.

The Rainwater Management and Groundwater Management Bulletins confirm on-site pathways to compliance with the Zoning and Development By-law's "adequate drainage" clause and, while the actual requirements remain the same, it is intended for the

bulletins to be updated following adoption of the Broadway Plan in order to include the Plan area.

The Rainwater Management Bulletin requirements will extend to sites undergoing both rezoning and development permit processes in the Broadway Plan area. Rezoning applications that were previously exempted from the rainwater management requirements, including Passive House developments, will also be required to meet them at development permit. The rainwater volume capture, treatment, and release rate requirements will remain consistent with standards across the city. This move is similar to the expansion of rainwater management requirements that were introduced for the Cambie Corridor and act as a demand-side management measure to reduce the impact of stormwater on the City's drainage and combined sewer systems.

The Groundwater Management Bulletin is also intended to be updated following adoption of the Broadway Plan to include the Plan area as an "area of concern", thereby requiring a hydrogeological study from development applicants (with lower density residential buildings typically being exempted). Other areas of concern for groundwater defined in the bulletin include the designated floodplain, areas with potential soil sensitivity to water table changes, and areas with potential flowing artesian conditions. This bulletin helps the City to preserve sewer system capacity and mitigate CSOs, protect ecosystems and aquifer resources, and minimize other risks (e.g. from flooding, subsidence, etc.).

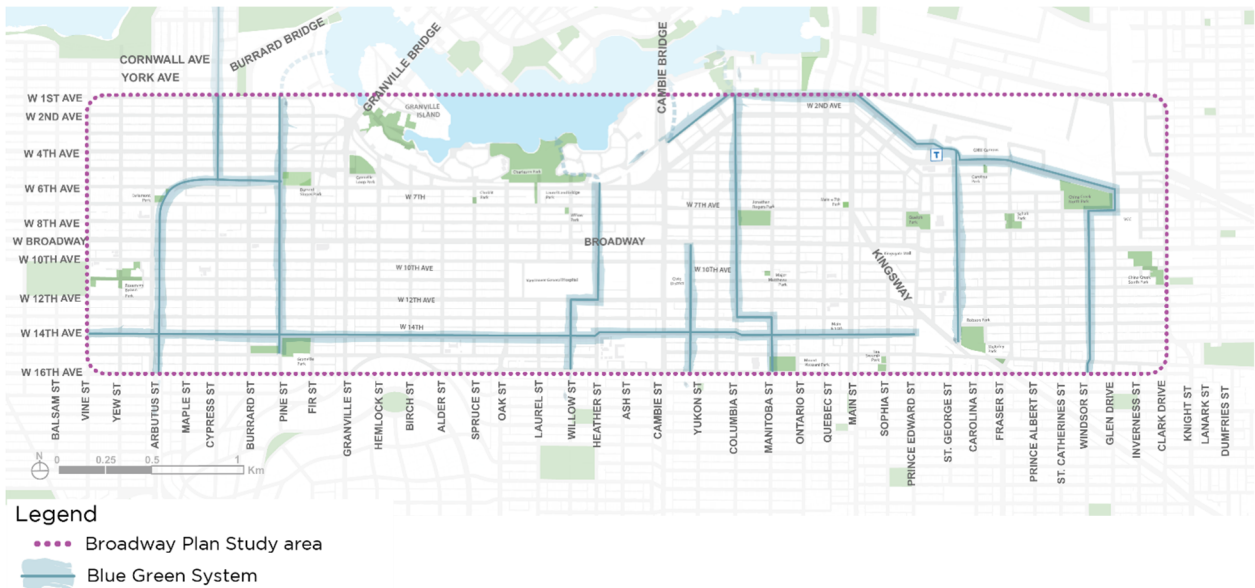
Harvest and reuse of rainwater is supported by the Vancouver Building Bylaw and encouraged by City of Vancouver for irrigation and toilet flushing, reducing reliance on drinking water and improving the city's long-term drinking water supply resilience.

### ***Public Realm Water Management***

In the public realm, GRI will be a component of street design to manage urban rainwater runoff and enhance the public realm through increased biodiversity, habitat, green space, urban tree canopy, and ultimately a reduction of urban heat island effect. The work will include a combination of linear and potentially district-scale solutions including blue green systems, with discrete and distributed GRI solutions such as bioretention corner bulges, permeable laneways and rainwater tree trenches. These solutions will help the plan area watersheds advance towards meeting the Rain City Strategy targets of capturing and treating 90% of average annual rainfall before release into the receiving waters.

The blue green system is intended to be part of a city-wide network of larger and district scale park-like corridors that manage water, contribute to biodiversity, and support active transportation. In addition to connecting parks and other destinations, some blue green system routes align with major overland stormwater flow paths and may reduce impacts of overland flow in flood prone and low-lying areas.

The blue green system is anticipated to be aligned with, or intercepting major flow paths to help mitigate surface flooding (Figure 6). Development permit and rezoning applicants are expected to work with staff to accommodate and enhance these alignments in the design of buildings, underground structures, open space, and determining setbacks. The blue green system will be delivered in a variety of ways, including City capital investments and conditions of development.



**Figure 6. Blue Green Network**

Development with frontages along designated blue green system alignments should be designed for stormwater management and to support the protection of existing trees and implementation of significant new plantings through setbacks to underground parking structures and above grade massing, and be designed to activate and acknowledge the network through ground level design and active uses.

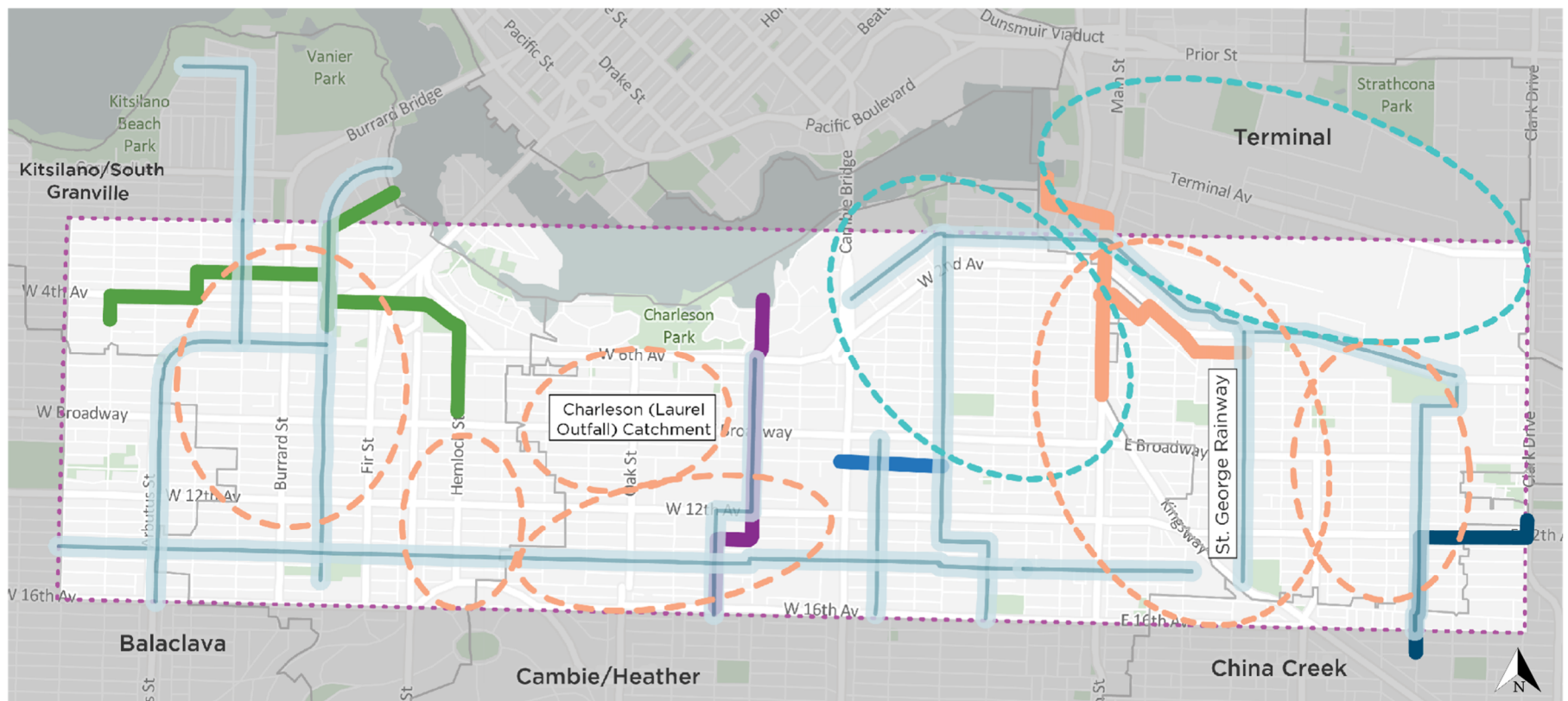
The distributed GRI and the blue green system will be designed, at a minimum, to meet the Rain City Strategy water quality target of 48 mm rainfall managed locally in 24 hours. Context specific designs may be required to improve pipe system performance and in some locations offset local pipe upgrades, and consider major overland flows.

Distributed (frontage) green infrastructure shall be implemented in all areas of the Broadway Plan, with particular attention to areas highlighted on Figure 7. Where delivery of the blue green system or distributed (frontage) GRI is not possible adjacent to new development, payment in lieu options may be explored.

### ***Pipe Infrastructure Upgrades***

Sewer system capacity (sanitary, combined, storm) will be reviewed for all rezoning and development permits in the Broadway Plan area to determine if system upgrades are needed to support growth and provide an acceptable level of service to the site with respect to flooding risk.

The public realm and private realm rainwater management requirements discussed above form an integral part of the Plan's servicing strategy, and work hand-in-hand with targeted pipe system investments such as sewer separation and capacity upgrades , which will still be required in some cases depending on local conditions, as the above requirements individually may not solve all issues.



This map shows specific areas which would benefit from accelerated or intensified green rainwater infrastructure (GRI) implementation. The delineation of these areas is subject to further study. All GRI priority areas will provide water quality treatment.

Sewer system priority GRI areas address system capacity issues and mitigate CSOs.

Watershed health priority GRI areas primarily address urban heat island effect, and deficiencies in park space, green space, canopy density, and canopy cover.

Nonetheless, public realm GRI and on-site rainwater management is required and beneficial in all areas of Broadway Plan, including as part of development requirements.

Figure 7. Priority Areas for Public Realm Green Rainwater Infrastructure

GRI is not intended to fully offset pipe upgrades in all cases, and plays a different, yet critical and complementary role in managing rainwater. It has a smaller target design storm than pipes, and is intended to provide water quality and volume reduction in addition to environmental benefits. On-site RWM specifically provides water quality treatment to water that falls on the development site, and is necessary to ensure no net increase in volume contributing to CSOs for small and medium rain events. Table 1 describes the different objectives in more detail.

**Table 1. Objectives of Various Stormwater Management Measures as part of Development Conditions**

Measure	Typical Design Storm Event	Intended Benefit
On-site Rainwater Management	Small Events	<ul style="list-style-type: none"> <li>- Provides water quality treatment for runoff generated onsite</li> <li>- Targets no net increase in volume contributing to CSO</li> </ul>
	Medium Event	<ul style="list-style-type: none"> <li>- Prevent any increase in peak flow rate to the sewer system</li> <li>- Mitigates CSO at peak flow rate sensitive CSO locations</li> </ul>
Public Realm Rainwater Management - Distributed GRI	Small Events	<ul style="list-style-type: none"> <li>- Provides water quality treatment for runoff from street in front of the development</li> <li>- Reduces CSO volumes</li> </ul>
Public Realm Rainwater Management - Blue Green System	Small to Large Events	<ul style="list-style-type: none"> <li>- Provides water quality treatment for surface water</li> <li>- Reduces CSO volumes</li> <li>- Can reduce local surface flooding and sewer backup depending on design</li> <li>- Captures overland flow to mitigate flooding impacts in the downstream low-lying areas</li> </ul>
Sewer Upgrades	Medium Events	<ul style="list-style-type: none"> <li>- Provide capacity for growth</li> <li>- Reduces risk of sewer backup and flooding</li> </ul>

**Notes:**

- *Small events = 2 year event or less, 50% or greater chance every year*
- *Medium events = 5 to 10 year events, 20% or 10% chance every year (for trunks, may be up to 25 year events, or 4% chance every year)*
- *Large events = Beyond the medium size events up to the 100 year event (1% chance every year)*

Public realm rainwater management interventions (e.g. GRI) may be oversized to capture medium to large events to offset/defer storm sewer upgrades where, based on asset condition, the sewer still has remaining useful life, but this would be on a case-by-case basis. It would be the responsibility of the applicant to demonstrate that oversizing of required public realm GRI can provide adequate capacity to defer the need for a storm sewer upgrade requirement, considering all factors including back-to-back storm events, and subject to City approval.

## **Major City Initiatives**

The Broadway Plan One Water Strategy includes an initial list of sewer and drainage projects, summarized below, which are needed to achieve stated objectives. Additional or alternative projects (including optimizing the balance of grey and green infrastructure solutions) may be identified as planning work in the Broadway Plan area is refined in the future.

### ***City Trunk System Projects***

Key components of the identified trunk system projects include new stormwater trunks and outfalls, and sanitary trunk upgrades. These include improvements to City infrastructure as well as Metro Vancouver related infrastructure, as detailed in their sewer separation plans, and are identified on Figure 8.

Sanitary trunk upgrades are required to increase servicing capacity for growth, and to reduce risk of wet weather flooding or dry weather sanitary sewer overflows.

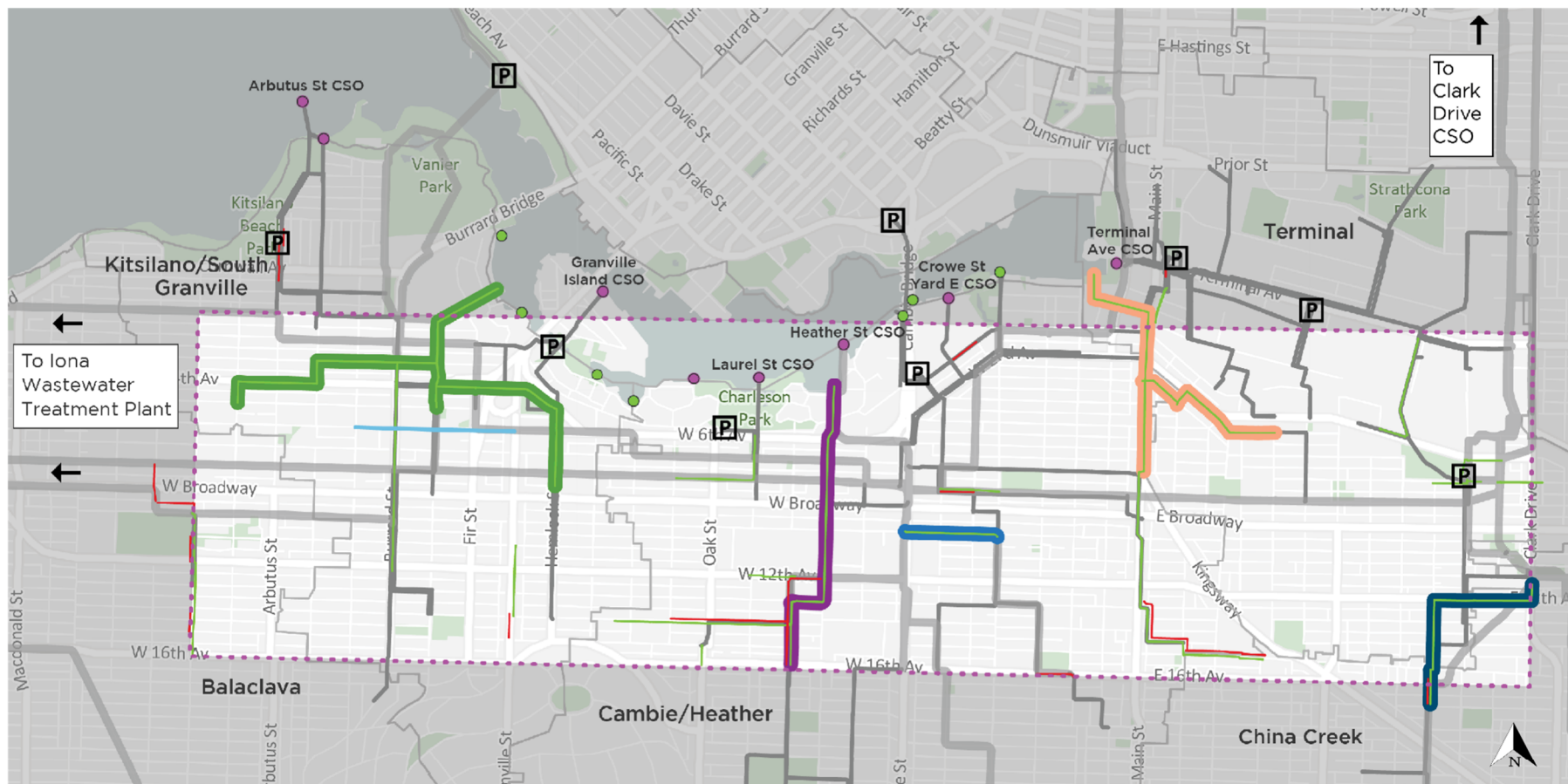
Sanitary pump station capacity upgrades may also be necessary over time. The need for and timing of these upgrades will be determined based on flow monitoring and growth patterns. In some cases, separation of upstream systems will remove contributing stormwater and open up capacity for sanitary servicing of new growth.

Stormwater trunks and outfalls are necessary to discharge separated stormwater to receiving water bodies, rather than contributing to the combined Metro Vancouver interceptor system, in order to work towards separation goals and eliminate CSOs. They are also necessary to relieve capacity constraints in the existing combined system, thereby reducing flooding risk. Notably, the Willow Stormwater Trunk (Figure 8) has immediate benefits in reducing flooding risk both in the Broadway Plan area and in the neighbouring Cambie Corridor. The proposed W 1st Avenue Stormwater Trunk and Outfall may be able to eliminate the need for upgrading of the stormwater capacity of the Metro Vancouver Broadway Branch of the Balaclava Trunk.

Drainage (stormwater) pump stations for outfalls may be needed at select locations as part of coastal flooding and sea level rise mitigation, including the outfall at the end of Terminal Avenue near Science World. In order to minimize the need for drainage pump stations, proposed sealed/pressurized storm trunks and outfalls will convey stormwater from upper elevations of the watersheds to the ocean by gravity, without being permitted to overflow to the local pipe system and ground surface in low-lying areas. Several of these systems are currently being proposed (Figure 8) including:

- East Park Stormwater Trunk and Outfall;
- W 1<sup>st</sup> Avenue Stormwater Trunk and Outfall; and
- potentially Willow Trunk (to be determined based on upcoming concept development).





## Legend

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>■ Broadway Plan Area</li> <li>□ Watershed</li> <li>Existing Infrastructure <ul style="list-style-type: none"> <li>● Combined Outfall</li> <li>● Storm Outfall</li> </ul> </li> <li>■ Sewer Pump Station</li> <li>— CoV Sewer Main</li> <li>— MV Sewer Main</li> </ul> | <ul style="list-style-type: none"> <li>Future Infrastructure <ul style="list-style-type: none"> <li>— Sanitary Upgrades</li> <li>— Storm Upgrades</li> <li>— Water Transmission Main</li> </ul> </li> <li>Future Storm Trunks <ul style="list-style-type: none"> <li>— Willow Trunk</li> <li>— W 1st Ave Trunk System and Outfall</li> <li>— East Park Trunk System and Outfall</li> <li>— MV: W 10th Ave Branch Upgrade</li> <li>— MV: Canoe Creek Trunk</li> </ul> </li> </ul> |
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Concepts are preliminary and subject to further study and design. Alternative solutions such as stormwater storage have not yet been explored. Not all necessary infrastructure is shown, including smaller diameter mains which are expressly excluded.

Figure 8. Key Infrastructure Plan

Additional strategies for coastal flood mitigation are still under development through various programs. As such, drainage pump stations or other mitigation strategies for low-lying areas have not been included in the Broadway Plan financials while the proposed pressurized storm outfalls are included.

### ***Targeted Sewer Separation***

Combined sewers, which convey both stormwater and sanitary flows, will be separated as part of the provincially-mandated CSO elimination goals. Sewer separation works will be delivered by a combination of development requirements and the City's sewer renewal and growth-triggered neighbourhood-scale programs.

Specific areas which would benefit from accelerated completion of sewer main and service connection separation to provide capacity for growth and realize earlier CSO reductions are indicated on Figure 9. These are stormwater catchments that are currently or are planned to be serviced by dedicated stormwater trunks and outfalls, rather than by the Metro Vancouver combined interceptors.

Of note, sewer separation in the Charleson catchment (Laurel Outfall) will be prioritized as it is the pre-condition to meeting the rainwater management plan objectives of the Charleson Integrated Rainwater Study (Urban Systems, 2022) and minimal construction is needed to complete the sewer separation.

### ***Public Realm Green Rainwater Infrastructure***

Public realm GRI, including the blue green system and distributed GRI were described previously as part of the Development Conditions section. These will be delivered through a combination of development requirements and City programs.

Implementation of the blue green system has already started with Phase 1 of the St. George Rainway from Broadway to East 5<sup>th</sup> Ave on St. George Street. Phase 2, from Broadway to Kingsway, may be expedited depending on funding availability. Additional distributed GRI and implementation of the blue green system are also under consideration for the Charleson catchment, as a part of a complete package to provide stormwater quality treatment in step with completion of sewer separation in that area.

Stormwater storage and/or treatment through GRI in other public spaces throughout the Broadway area will also be identified through future studies. These sites can be combined with other public realm improvements, such as public gathering spaces including green spaces for meaningful habitat and pocket parks, to provide multiple benefits in addition to flood management and stormwater quality improvements.

Catchments where public realm GRI projects are tied to planned infrastructure improvements, such as priority sewer separation and storm trunk catchments, or are expected to help with capacity issues, are identified on Figure 7 (Priority Areas for Public Realm Green Rainwater Infrastructure). These areas may have priority relative to other locations. Nonetheless, GRI is important throughout Broadway and the City to meet Rain City Strategy targets including CSO volume reductions, water quality treatment, and ecosystem health improvements. As such, no opportunity to capture and treat rainwater should be overlooked, particularly when development or public works are undertaken.



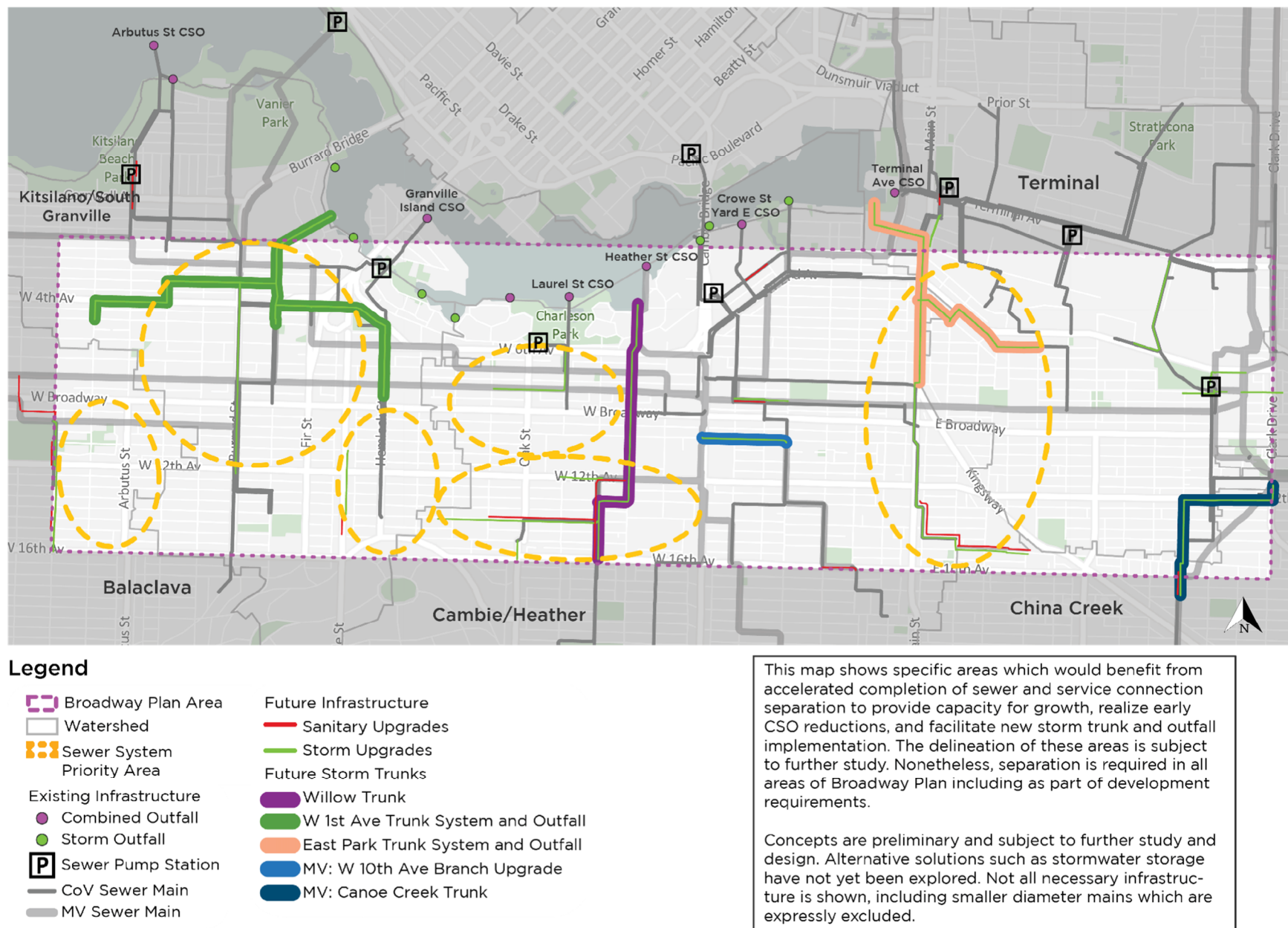


Figure 9. Priority Areas for Targeted Sewer Separation

## **WATER SERVICING**

### **Current State**

The City's potable water system servicing the Broadway Plan area is generally adequate to service the area as it exists today. The area is also partially serviced by the City's Dedicated Fire Protection System (DFPS), which is a seismically resilient saltwater system built to provide water for fire protection after an earthquake event.

Although the City water system is generally adequate to distribute potable water to the Broadway Area, the City does not produce treated drinking water. The City receives its source water from Metro Vancouver reservoirs. Climate change and rising population will put strain on Metro Vancouver reservoir capacity into the future.

### **Future Servicing Needs**

Analysis of the City's water system impacts due to the ultimate Broadway Plan build out predicts that a new transmission main (Figure 8) and distribution main upgrades will be required to increase the capacity of the distribution system to adequately provide domestic potable water and adequate fire flow for fire protection. In addition to the predicted capacity upgrades, local water main upgrades may be required to address development-specific servicing requirements.

### **Development Requirements**

City-wide water conservation initiatives to promote fit-for-use water, reduce strain on source waters, and increase equity across all potable water users will help to balance the increased water demands of densification through development. Harvest and reuse of non-potable water, although not currently a development requirement, is supported for certain sources and end uses under the Vancouver Building Bylaw to protect drinking water supply.

As noted above, local water main upgrades may be required to address development-specific servicing requirements.

### **Major City Initiatives**

Currently, a study is underway to understand the costs and benefits of expanding the use of non-potable water sources and incorporating them into the Vancouver Building By-Law.

## **FINANCIAL**

Consistent with the Financing Growth policy that requires new developments to contribute to sewer and drainage upgrades that result from growth, upgrades that are neighbourhood serving will primarily be delivered by the City and funded through the Utilities Development Cost Levy (UDCL), whereas many localized upgrades will be delivered through conditions of development. The portion of upgrading that is not tied to growth will be funded through other City programs including sewer utility fees.

Projects have been prioritized with consideration of when they will need to be implemented to service anticipated growth as it happens. The projects needed to service the first 10 years of growth have been included in the Broadway Public Benefits Strategy, and the 10-year growth projects will also be included in the current updates to the Utilities Development Cost Levy (UDCL) project list. Implementation of UDCL upgrades and other City funded upgrades will be on a prioritized basis, depending on where growth is occurring in Broadway as well as risk management and city-wide system needs.

Refer to Broadway Plan (Public Benefits Strategy chapter) for the overall funding strategy.

## CONCLUSION

The Broadway Plan One Water Strategy provides a servicing plan which enables growth in Broadway in consideration of multiple objectives: providing adequate servicing capacity, flood mitigation, CSO elimination, and ecological and public realm benefits. The system upgrades and other projects arising from this strategy will be delivered through a combination of development conditions, the UDCL program, and renewal.

Expected development conditions include:

- On-site (private realm) rainwater management, per the Zoning and Development Bylaw and the Rainwater Management Bulletin.
- On-site (private realm) hydrogeological study and subsequent groundwater management plan if required, per the Zoning and Development Bylaw and the Groundwater Management Bulletin.
- Public realm green rainwater infrastructure to meet Rain City Strategy targets to capture and treat rainwater closer to where it falls, thereby increasing climate resilience and mitigating impacts to the pipe system including combined sewer overflows. Where installation by the development is not feasible, payment in lieu may be considered.
- Sewer pipe upgrades (sanitary, storm) and combined sewer separation where needed to mitigate flood risk based on existing system performance and projected development loads, and to address combined sewer overflows.

City-led projects include new stormwater trunks and outfalls, as well as various public realm green rainwater infrastructure initiatives such as the blue green system.

**This strategy will be refined through further planning studies and is subject to change, to best respond to growth pressures and to meet city-wide objectives.**