Appendix C: Climate-related Hazard Exposure Maps

New Westminster Climate Change Adaptation and Resilience Plan

New Westminster faces several climate-related hazards, including river (freshet) flooding and extreme heat. These hazards affect different areas of the city and pose different challenges and impacts to infrastructure and the community. The following exposure maps show where these hazards occur and what they affect, establishing the physical foundation for understanding risk.

River (freshet) Flooding

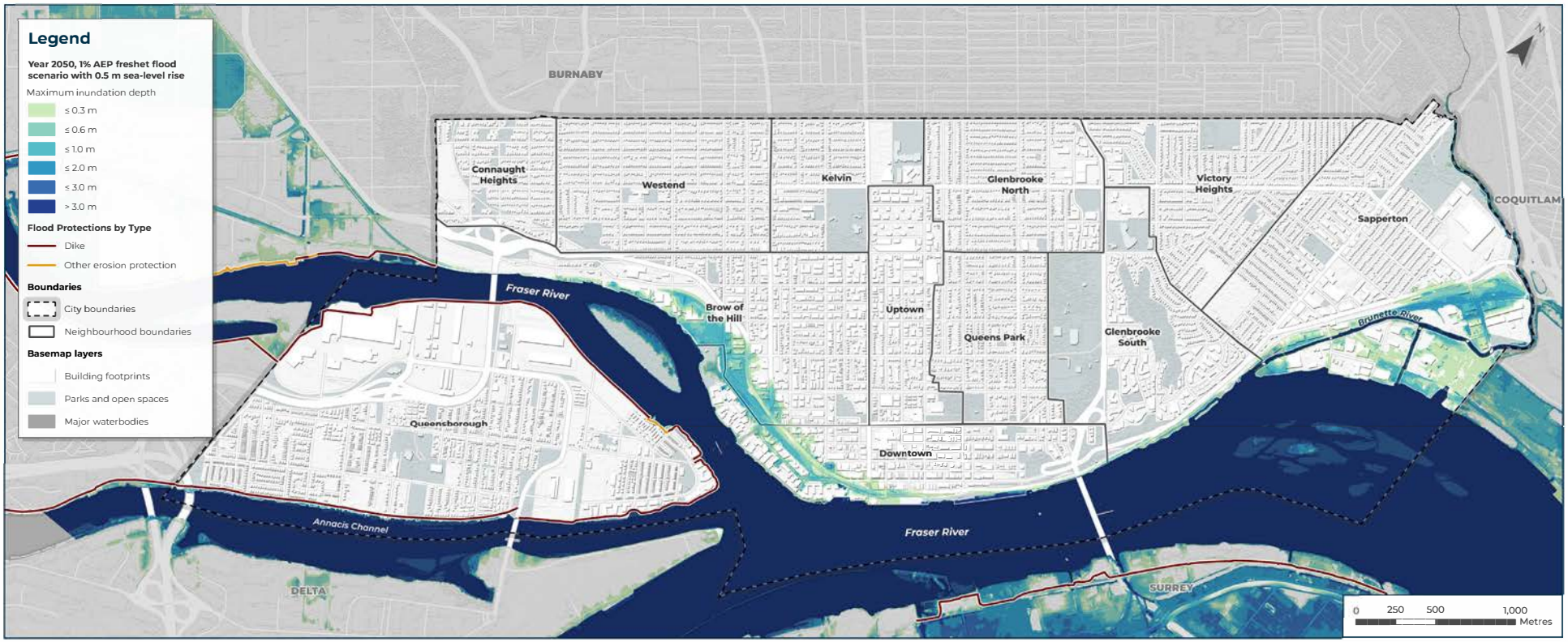
A freshet is the seasonal rise in river levels driven by snowmelt and rainfall in the watershed—the primary sources of flood risk along New Westminster's Fraser River shoreline. One river flooding scenario has been mapped for the Plan, representing a 1% annual exceedance probability (AEP), or 1-in-100-year flood event. The scenario projects mid-century conditions (c. 2050), accounting for climate change effects on ocean water levels and peak river flows based on the City's 2022 Flood Resilience Plan.

The map shows maximum flood-inundation depths across the city using a graduated colour scale, with dike infrastructure and erosion-protection measures identified.

Extreme Heat

Extreme heat in urban areas is significantly influenced by the urban heat island effect—the tendency of dense, built environments with high concentrations of paved surfaces to amplify and trap heat more effectively than natural or rural areas. Paved surfaces absorb heat throughout the day and re-radiate it back into the local environment slowly throughout the afternoon and evening, keeping temperatures high even after sundown. Where there are fewer trees, the natural cooling provided by tree canopy shade and evapotranspiration is largely absent.

Three complementary maps explore how extreme heat is distributed across New Westminster. The exposure map shows how surface temperatures vary across New Westminster between dense urban areas and neighbouring natural spaces and includes the locations of existing cooling facilities (cooling centres, outdoor pools, spray parks, and public misting stations). The tree canopy cover map reveals where natural cooling is present or absent at the neighbourhood scale. The impervious surface cover map identifies where heat is most likely being generated and retained.



Maximum Flood Depth: Year 2050, 1-in-100-Year Freshet Flood

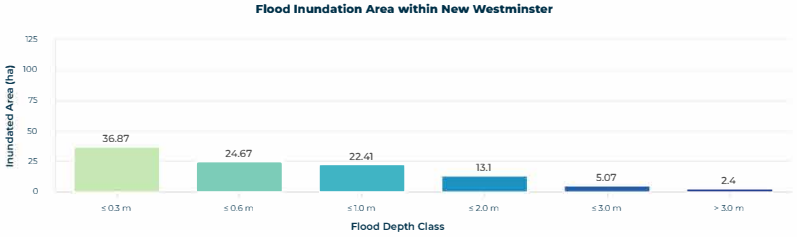
for the City of New Westminster

This map for the City of New Westminster provides a detailed view of projected flood inundation depths for a river freshet scenario with a 1% chance of occurring in any given year (i.e., a 1% annual exceedance probability (AEP), or 1-in-100-year flood). A freshet refers to the seasonal rise in river levels caused by spring snowmelt and rainfall, and represents the primary flood risk along the Fraser River.

Based on the City's 2022 Flood Resilience Plan (NHC, 2022), this scenario accounts for climate change effects on ocean water levels (0.5 m) and mid-century (c. 2050) peak river flows. Increasing inundation depths are shown in progressively darker shades of green and blue. The Queensborough dike is shown in solid red, and other erosion protection measures in solid orange. This map does not reflect projected flood-inundation depths for bridges in and between New Westminster and other Metro Vancouver municipalities.

In this scenario, maximum flood depths up to 2.0 m are anticipated along parts of the floodplain near the Brunette River in Sapperton. Low-lying areas south of Stewardson Way/Columbia Street in the Downtown and Brow of the Hill neighbourhoods are expected to experience flooding up to 2.0 m, with isolated sections potentially reaching 3.0 m.

The chart to the right provides the estimated area inundated at peak flood stage across New Westminster for each of the six flood depth classes, excluding normal waterways.



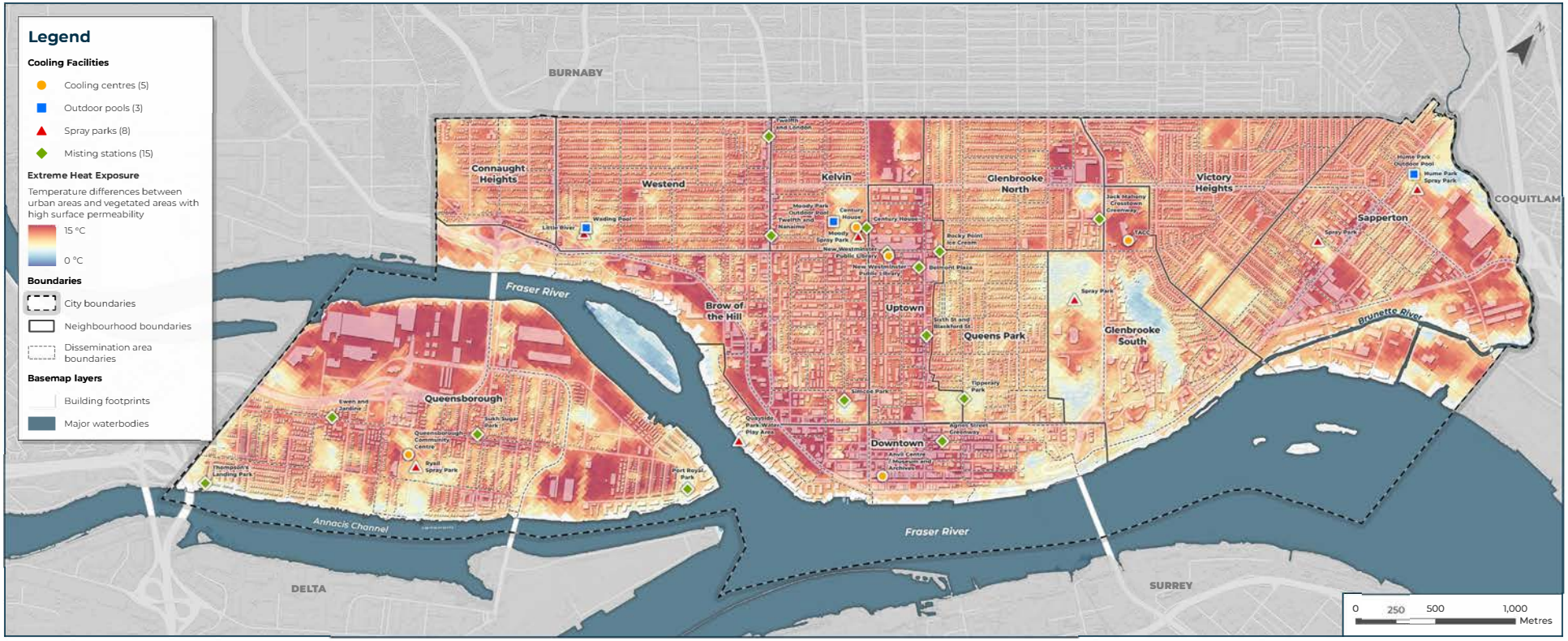
Map Series:
New Westminster Climate Change Adaptation and Resilience Plan

Source Data:
City of New Westminster flood plain management strategy update (NHC, 2022); Structural flood protections (BC Water Management, 2023); Waterbodies (Metro Vancouver, 2023); Lidar elevation data (GeoBC, 2017); Digital Road Atlas (GeoBC, 2025); all other data from the City of New Westminster.

Map Details:
Datum: NAD83
Projection: UTM Zone 10N
Scale: 1:24,000
Author: R.P. Reynolds
Date: 2026-05-04

● 2026 City of New Westminster, Pinna Sustainability, and Resilience Mapping Canada. For informational purposes only; accuracy, completeness, and reliability not guaranteed. Flood depths assume no changes are made to flood protection measures or infrastructure elevations from present day. See full legal disclaimer in associated reports.

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Extreme Heat Exposure with Cooling Facilities

for the City of New Westminster

This map uses data developed at Université Laval (2023) to explore how surface temperatures vary across New Westminster between dense urban areas and neighbouring natural spaces. Areas highlighted in darker shades of orange and red tend to be hotter, with higher concentrations of impervious surfaces and lower tree canopy cover, while those shown in lighter shades of yellow and blue indicate cooler areas.

These hotter areas can experience higher air temperatures during extreme heat events due to the urban heat island effect. As cities grow, forest cover and natural spaces tend to be lost to impervious surfaces like buildings, roads, and parking lots. Their darker surfaces and coarser materials absorb large amounts of solar heat during the day, increasing nearby surface and air temperatures as that heat is slowly released back into the environment. Tall buildings situated close to one another also limit air circulation, creating pockets of trapped heat that impede cooling. By contrast, areas near water, parks, and vegetated green spaces tend to experience lower temperatures and better air circulation, with tree canopy providing additional shade and promoting localized cooling breezes.

Certain buildings continue to accumulate or retain heat well into the night, resulting in elevated temperatures that compound daytime heat exposure. The degree of nighttime heat retention depends on building materials and orientation.

Air conditioning is not widely prevalent in residential buildings across New Westminster, leaving many residents with limited means to escape the heat during extended hot periods—a combination that can significantly increase heat-related discomfort, stress, and illness.

The City operates five official cooling centres, three outdoor pools, and multiple spray parks and misting stations where community members can seek temporary relief from extreme heat conditions. These locations are shown on the map as reference points for residents seeking heat relief. Other cool indoor spaces, such as libraries, museums, shopping centres, and similar public facilities, can also provide shelter during hot days.

Extreme heat can affect everyone; however, certain groups face an elevated risk of heat-related illness and death. Those whose work or lifestyle involves prolonged outdoor exposure, and those who are physiologically more vulnerable—including seniors, socially isolated individuals, young children, pregnant people, and individuals with certain pre-existing health conditions—are at greatest risk. The absence of air conditioning, limited mobility, and social isolation can each compound heat-related vulnerability for those most at risk within the community.

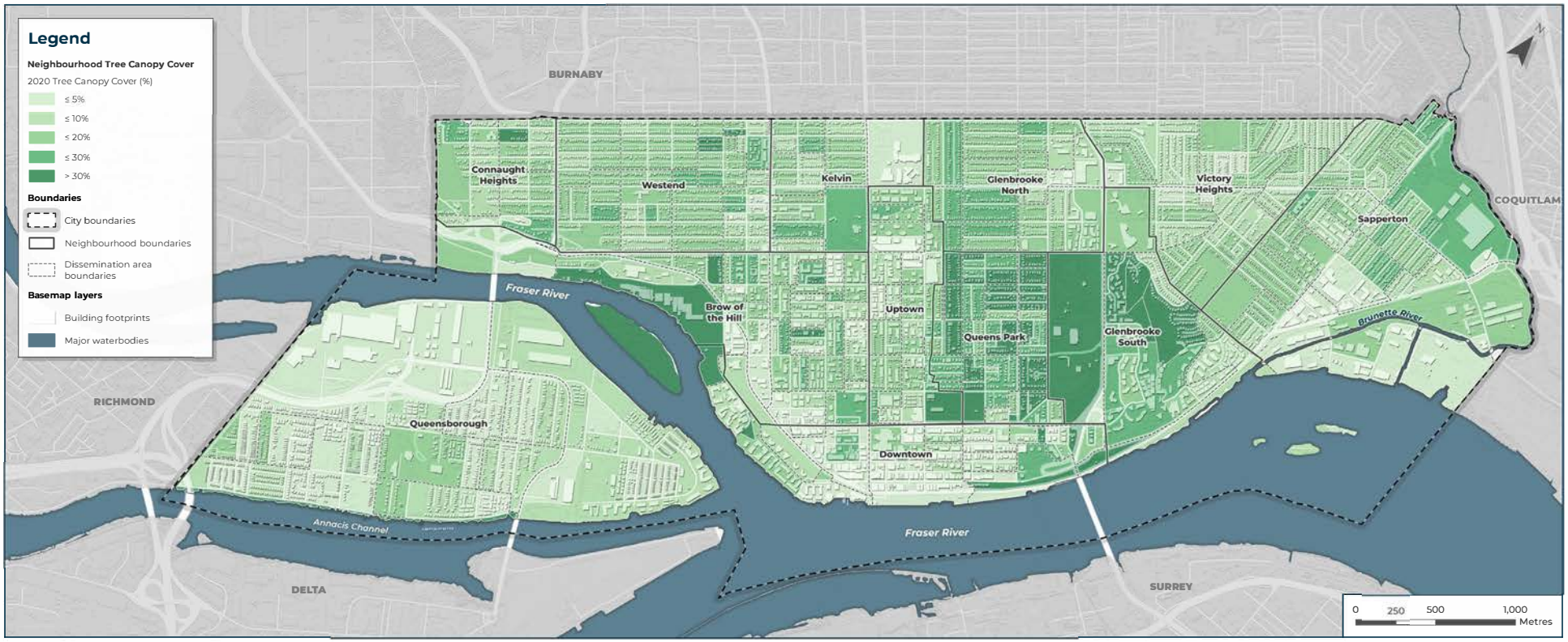
Map Series:
New Westminster Climate Change Adaptation and Resilience Plan

Source Data:
Vulnerability and exposure to extreme heat waves (Université Laval, 2023); Waterbodies (Metro Vancouver, 2023); Lidar elevation data (GeoBC, 2017); Digital Road Atlas (GeoBC, 2025); all other data from the City of New Westminster.

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Extreme Heat Exposure: Neighbourhood Tree Canopy Cover

for the City of New Westminster

This map uses data from the Regional Tree Canopy Cover and Impervious Surfaces study conducted by Metro Vancouver (2024) to assess neighbourhood tree canopy cover percentages for 2020 at the census dissemination block scale. Increasing canopy cover is depicted in darker shades of green, revealing the distribution of New Westminster's urban forest across different communities.

Trees provide a range of valuable ecosystem services, including cooling shade, carbon capture and storage, stormwater management, and support for residents' physical, mental, and social well-being. In the context of extreme heat, shading and evapotranspiration can significantly reduce local air and surface temperatures, helping mitigate the urban heat island effect and build community resilience to a hazard expected to become more frequent and intense under a changing climate. The distribution of canopy across a city also provides valuable insights into heat-related risks, vulnerabilities, and environmental equity, highlighting which areas may be most exposed and where greening efforts could yield the greatest benefit.

The greatest concentration of tree canopy cover in New Westminster is centred along Queen's Park and Glenbrook Ravine Park, spreading throughout the Queens Park and Glenbrooke South neighbourhoods, as well as portions of Brow of the Hill. These tree-rich areas have significantly larger urban forested areas than elsewhere in the city and lower concentrations of impervious surfaces, such as large roadways, parking lots, and large concrete structures. The combination of abundant shade, active evapotranspiration, and permeable ground surfaces results in measurably cooler temperatures and better air circulation.

The lowest canopy cover is found in the Queensborough and Downtown neighbourhoods. In Queensborough, the western portion of the neighbourhood is dominated by large commercial and industrial zones—warehouse-style buildings, extensive roadways, and numerous parking lots that leave little room for vegetation. Recent medium- and higher-density residential development in the Port Royal area, combined with younger trees that have not yet matured, further limits coverage in this neighbourhood.

In the Downtown neighbourhood, the dense concentration of commercial, mixed-use, and residential structures in the central core leaves minimal space for tree canopy or vegetated open space. Development and redevelopment may reduce the amount of space available for large tree planting, but also create opportunities to integrate more greenery into compact urban forms, especially in areas that have historically lacked canopy cover.

Finally, industrial facilities and rail corridors surrounding the Brunette River as it flows into the Fraser create challenging conditions with little viable space for tree planting or canopy growth. The high concentration of impervious surfaces and the demands of industrial operations have limited opportunities for greening, resulting in some of the lowest canopy coverage rates in the city.

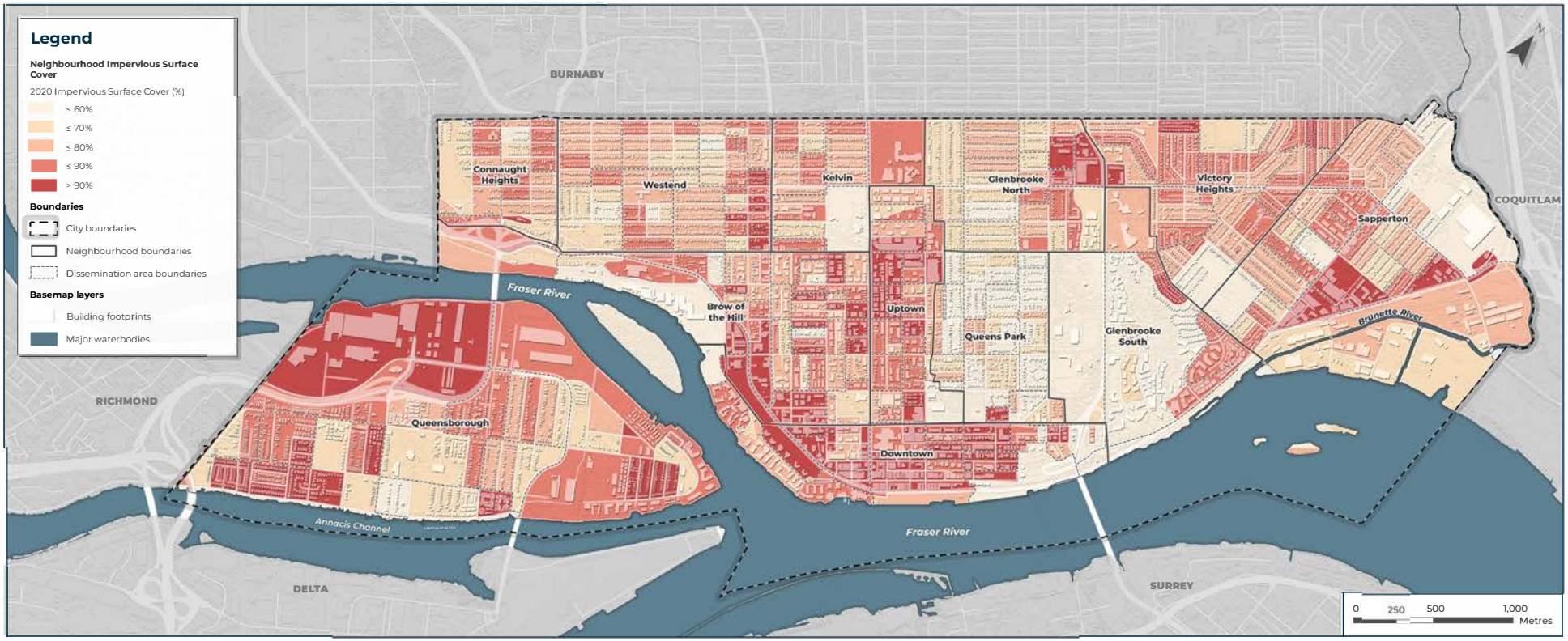
Map Series:
New Westminster Climate Change Adaptation and Resilience Plan

Source Data:
Regional Tree Canopy Cover and Impervious Surface Study (Metro Vancouver, 2024); Waterbodies (Metro Vancouver, 2023); Lidar elevation data (GeoBC, 2017); Digital Road Atlas (GeoBC, 2025); all other data from the City of New Westminster.

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Extreme Heat Exposure: Neighbourhood Impervious Surface Cover

for the City of New Westminster

This map uses data from the Regional Tree Canopy Cover and Impervious Surfaces study conducted by Metro Vancouver (2024) to assess neighbourhood impervious surface cover percentages for 2020 at the census dissemination block scale. Increasing impervious surface cover is depicted in darker shades of orange and red, revealing patterns of hard, non-porous surfaces across New Westminster's neighbourhoods.

Impervious surfaces, including large concrete, brick, and glass-fronted structures, as well as large roadways and paved parking lots, significantly increase local temperatures through the urban heat island effect. These hard surfaces absorb and retain heat from the sun during the day, releasing it slowly throughout the afternoon and overnight hours, sustaining elevated temperatures well into the evening. Beyond heat, impervious surfaces increase flood risk by preventing rainwater from naturally infiltrating the ground, disrupting local hydrological cycles and negatively affecting water quality and ecosystem health in nearby waterbodies through increased stormwater runoff and pollutant transport.

Measuring impervious surface cover helps us understand where exposure to extreme heat and other climate-related hazards may be higher. Exploring the distribution of these surfaces across a community provides valuable insights into heat-related risk, environmental vulnerability, and equity between neighbourhoods. While impervious surface cover is often inversely related to tree canopy cover, this relationship is not absolute, particularly in areas where greening efforts have successfully integrated vegetation into more built-up environments.

The greatest concentrations of impervious surface cover are found in five primary areas: the denser commercial and residential zones of Downtown, Uptown, and Brow of the Hill; the commercial, industrial, and higher-density residential areas of Queensborough, particularly in the western portion of the neighbourhood; eastern Sapperton, west of Brunette Avenue; the commercial corridor between Glenbrooke North and Victory Heights; and the commercial zone between the Westend and Kelvin neighbourhoods. These areas also tend to have correspondingly lower tree canopy cover and vegetated open space, increasing their exposure to both extreme heat and stormwater flooding.

The lowest impervious surface cover is found near Queen's Park and Glenbrook Ravine Park, throughout the Queens Park and Glenbrooke South neighbourhoods. Forested areas along the Brunette River also contribute to lower coverage at the north end of Sapperton, near Hume Park. The area of Brow of the Hill along the Fraser River appears to have relatively low impervious surface cover; however, this dissemination area includes the uninhabited Poplar Island, which accounts for much of the natural surface area in the zone; much of this area should be considered to have moderate to high impervious surface coverage in practice.

Map Series:
New Westminster Climate Change Adaptation and Resilience Plan

Source Data:
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