BCIT

BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

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STORMWATER DESIGN STRATEGY

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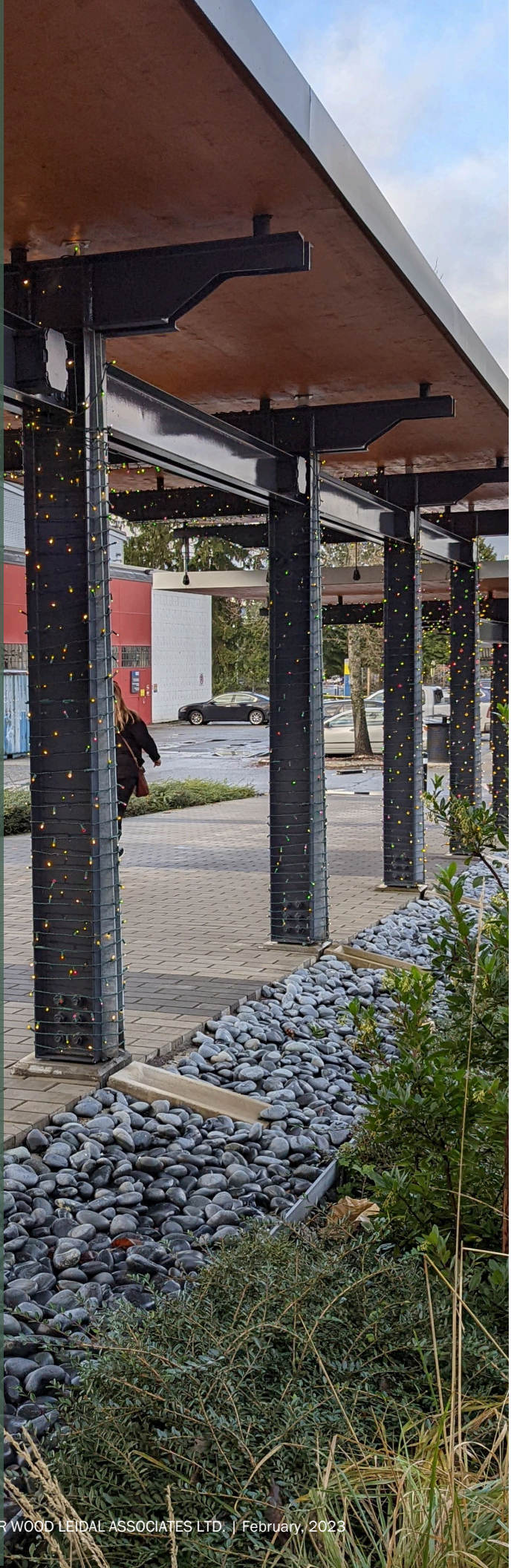
Executive Summary

The British Columbia Institute of Technology (BCIT) Stormwater Management Plan was developed to support the long range planning and development of the campus. The plan is made up of the main report and the supporting appendices: two technical memorandums, and best management practice standards. The plan was developed to support the Campus Design Standards and to provide BCIT a cohesive plan for the implementation of green infrastructure on campus.

BCIT is located in the Guichon Creek watershed, and the entirety of the campus study area is located within the City of Burnaby. The BCIT stormwater management plan was developed to support the future campus planning and development. The stormwater management plan meets rate control, volume retention, water quality, and conveyance criteria. The plan serves as a supplementary document to the Campus Design Standards, to support the long term redevelopment of the campus. Major findings and results are summarized as follows:

- An analysis of background information, existing stormwater management studies, infrastructure data, and review of drawing packages. Background review included evaluation of the existing hydraulic / hydrologic model, including updates as required. In addition, a review of the flow monitoring data collected on campus to date, including collaboration with NHC regarding locations, data uncertainties, and verification to support hydraulic model updates.
- Three rounds of engagement were completed with BCIT staff and stakeholders. The engagement was completed in the form of workshops to understand, develop, and implement stormwater management criteria and targets.
- A review of the existing campus goals, objectives, targets, and policies. Relevant regulatory requirements (municipal, provincial, federal) were summarized as they apply to stormwater management policies
- Development of stormwater management criteria for rate control, volume retention, water quality, and conveyance criteria. Campus rate control will be required to meet the City's minor storm requirements. Volume retention and water quality treatment will meet the DFO requirements. The plan supports campus sustainability, water balance goals, and strives to reduce downstream watercourse impacts.
- A climate change assessment was completed for the campus to update the existing intensity-duration-frequency (IDF) curves for future climate conditions. The median climate change projection was selected for design storms up to and including the 50-year design storm and the 95th percentile projection was selected for the 100-year design storm.
- The PCSWMM hydrologic / hydraulic model was updated to include existing green infrastructure features and updated infrastructure information. The existing conditions model was calibrated and validated based on the monitoring data for the campus. The hydrologic / hydraulic assessment was completed for four model scenarios: existing, hybrid, future (unmitigated with future land use changes and climate change projections applied), and future (with climate change projections, daylit creek cross section, green infrastructure) conditions.



- A campus water balance was completed for the campus, using the 6-month 24-hour design storm to evaluate volume reduction. The target for BCIT is to capture and retain the first 57 mm of rainfall. Implementation of future green infrastructure on all planned and long-range development parcels was assessed for the 6-month 24-hour design event (representative of 90% of the average annual). With green infrastructure implementation, the volume of runoff under future long-range development is reduced to 44% of the existing conditions runoff volume. The proposed mitigation represents a long-term improvement in hydrologic performance of the campus, meeting the goal of a water-balanced campus for the future.
- The existing Guichon Creek daylighting concepts were evaluated based on required capacity from the hydrologic / hydraulic assessment.
- Best management practices (BMPs) were presented and evaluated for their ability to meet the stormwater management targets, as well as for their suitability and implementation on the BCIT campus. Three tiers of BMP implementation are proposed for the campus, and the corresponding BMP standards were developed, specific to BCIT.
- The Stormwater Management Plan for the campus provides nine (9) elements to develop and implement the recommendations of the stormwater drainage study. These elements include recommended next steps and future studies to advance the stormwater management on the BCIT campus.

Recommended Stormwater Management Plan

The BCIT stormwater management plan was developed to support the future campus planning and development. The stormwater management plan meets rate control, volume retention, water quality, and conveyance criteria. Campus rate control will be required to meet the City's minor storm requirements. Volume retention and water quality treatment will meet the DFO requirements. The plan supports campus sustainability, water balance goals, and strives to reduce downstream watercourse impacts.

The key elements of the stormwater management plan are as follows:

1. **Implement recommended stormwater management criteria for rate control, volume retention, water quality, and conveyance.** Criteria to be implemented for all redevelopment and land use:

Rate Control	Control the 5-year post-development peak flow rate (including climate change) rainfall to the 5-year existing conditions peak-flow rate.
Volume Retention / Control	Capture (and retain) the first 57 mm of rainfall (72% of 2-year 24 hour rainfall, or the 6-month 24-hour storm event) that falls on the campus from both impervious and pervious surfaces.
Water Quality	Provide water quality treatment to capture and clean the first 56 mm of rainfall. Provide minimum 80% removal of TSS by mass for CA ETV particulate distribution for all vehicle loadings surfaces including roads and parking areas.

2. **Adopt climate change factors** for future infrastructure sizing and precipitation intensity. Refer to the Climate Change Technical memorandum in Appendix B for detailed considerations regarding climate change factors depending on design sizing.

3. **Provide rate control for the campus in the form of regional detention facilities.** Regional detention facilities will be sized to strategically capture runoff across campus and allow for individual redevelopment to not require detention control facilities. Implementation to occur based on the following:

Interim Conditions	Interim Conditions (i.e. prior to implementation of regional detention facilities) will require BCIT to continue to meet the requirements of the City of Burnaby to provide 5-year peak flow control for individual projects that are constructed prior the implementation of regional facilities.
Feasibility Study for Regional Facilities	Conduct feasibility study for regional facilities, including preliminary design considerations. Feasibility should include detailed sizing, modeling results, and performance. The study should provide detail on phasing requirements. The feasibility study should be prepared for the City of Burnaby review and approval prior to commencing detailed design.
Complete detailed design and construction of facilities	Complete detailed design engineering design for the regional facilities to support design and construction.

4. **Incorporate stormwater best management practices / green infrastructure on campus to meet volume control targets.** Stormwater BMPs should be sized to meet a capture target of retaining the first 56mm of rainfall from impervious and pervious surfaces.

   Provide 450mm of absorbent topsoil on landscaped or lawn areas which allow pervious areas to achieve the target without BMPs.

   Redirect all impervious runoff to green infrastructure which is sized to capture and infiltrate the volume retention target.

   Determine infiltration rate based on mapping OR test for infiltration and size green infrastructure based on subsurface infiltration rate based on the design standards.

5. **Implement water quality control for all at-grade impervious areas.** Water quality control can be provided by the following mechanisms:

   Treatment for surfaces without vehicle loading (plaza, sidewalks, etc) can be provided in adjacent pervious areas. Provide redirection of runoff from impervious surfaces to adjacent pervious areas and ensure that impervious to pervious (I/P) ratios are maintained at maximum 2:1 for these locations.

   Green infrastructure practices sized to capture and infiltrate the volume retention (57 mm) also will achieve the water quality targets. Refer to Section 8 for sizing, design guidance, specifications, and limitations.

   Provide end of pipe treatment where green infrastructure cannot be implemented. This can be provided in proprietary systems (membrane filters, oil-grit interceptors, etc.). Refer to manufacturers / suppliers for detailed sizing during design.

6. **Complete Detailed Design of Guichon Creek daylighting** as the campus develops. Ensure the major flow (100-year design storm with climate change) is conveyed via overland flow paths. Refer to Section 7.2 of report to understand the performance limitations of the proposed daylighted cross section. [Pending model results]

7. **Develop a plan for green infrastructure tracking and performance monitoring for the campus.** All green infrastructure installations should be tracked as asset management. Where opportunities present themselves, green infrastructure monitoring (including inflows and outflows) will support future implementation and Living Lab opportunities.

8. **Develop operation and maintenance programs and scaling plans** for green infrastructure and BMPs including implementation of operation and maintenance manuals for individual sites or installations. Maintenance is a critical part of operating these facilities and systems. The goal of maintenance activities is to maintain the function of the source control for the long term to promote and protect the lifespan of the system. Maintenance can range from removal of litter or debris, to dredging or hydrovac removal of sediment, to partial reconstruction of a damaged or impaired facility. Refer to the Metro Vancouver Source Control Design Guidelines (2023) design guidelines for detailed facility, operations, and maintenance considerations.

9. **Develop a storm servicing upgrade plan based on development plans.** The following will be required to support this:

   Phasing plan for planned and long range development scenarios, indicating timing, anticipated associated road works, etc.

   Storm sewer layout and upgrades to support future storm servicing.