BRANTFORD

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CITY OF BRANTFORD TRAIL SAFETY AUDIT

Draft Report

SEPTEMBER 2022

TRAIL SAFETY AUDIT
DRAFT REPORT
CITY OF BRANTFORD

PROJECT NO.: 221-05994-00.
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WSP
582 LANCASTER ST WEST
KITCHENER, ON
N2K 1M3

T: +1 519 743 8777
WSP.COM

CONTRIBUTORS

CLIENT

Manager of Traffic Services	David Ferguson
Transportation Planning Project Coordinator	Kathryn Broadbelt
Manager of Communications & Community Engagement	Heather Carvalho
Director of Communications & Community Engagement	Maria Visocchi
Director of Parks and Facilities Services	Rick Cox

WSP

Project Manager	Amanda Gebhardt
Project Landscape Architect	Ben Vander Veen
Community Engagement Planner	Justin Jones
Transportation Planner	Kyle Dow
Transportation Planner	Riccardo Caimano

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1 INTRODUCTION AND PURPOSE

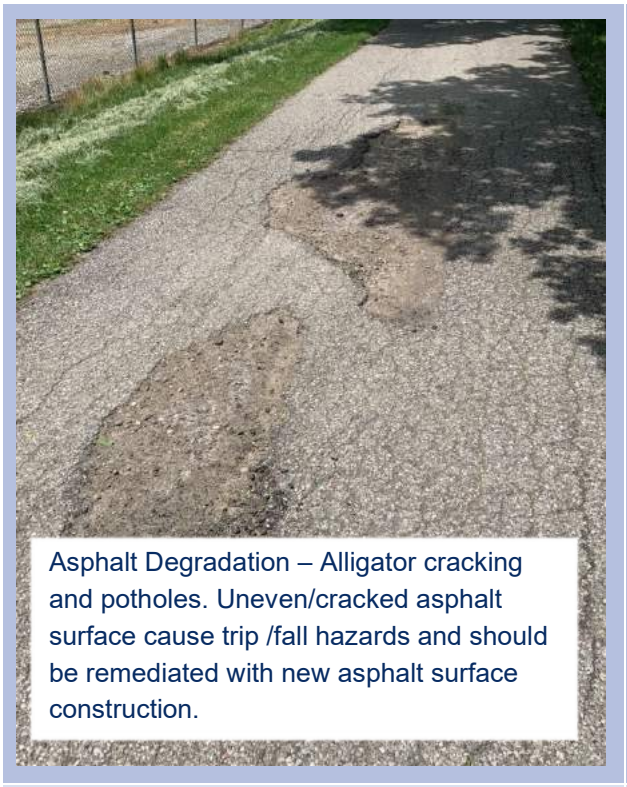
1.1 BACKGROUND

The City of Brantford is completing a safety audit of the City's trail system. The project focuses on multi-use paths and off-road trails within the City (Solid red Shared Use Trail per **Figure 1 2019 City of Brantford Trails Map**). Roughly 15km of multi-use paths and 40km of off-road trails have been included in the audit. Additionally, one foot path through Royal Oak Park was for identified for review. The trail system includes a section of the Trans Canada Trail, and connects Brantford to the communities of Port Dover, Hamilton and Paris.

Figure 1 City of Brantford Trails Map

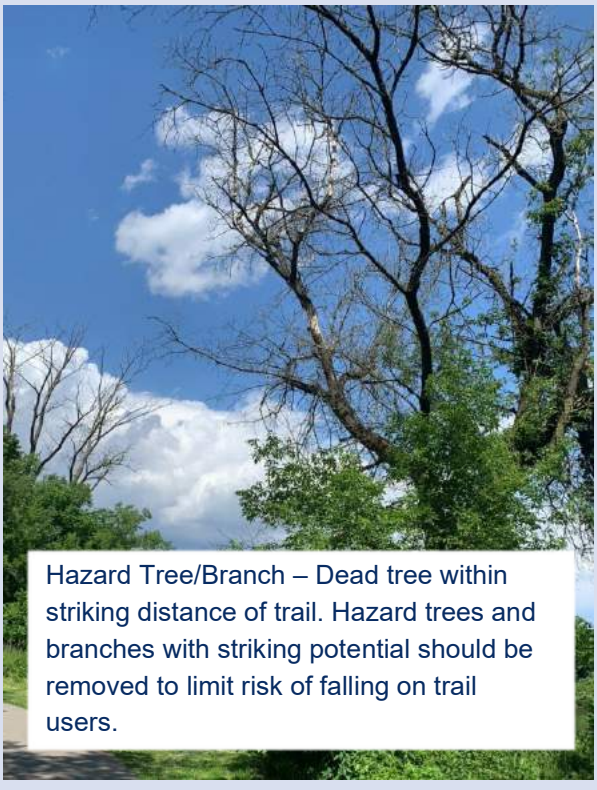
The need for the safety audit arose from City councillors raising concerns over user safety on the trail system due to increased use and various design/degradation issues. Types of use and user diversity is also increasing. Accidents and near misses are noted to be on the rise. Areas of safety concern include natural narrowing of the width of unpaved trails, loose trail surfaces, asphalt degradation, user conflict zones, unsafe crossings, erosion, blind corners, vegetation encroachment, hazard trees/branches and poor drainage. One section of trail in D'Aubigny Park is closed due to poor conditions.

Table 1 Sample Safety Issues

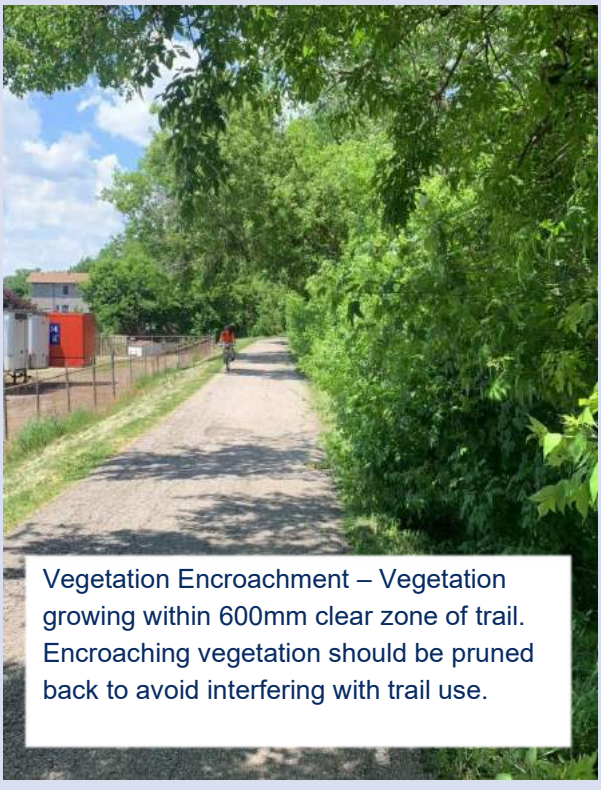


Asphalt Degradation – Alligator cracking and potholes. Uneven/cracked asphalt surface cause trip /fall hazards and should be remediated with new asphalt surface construction.

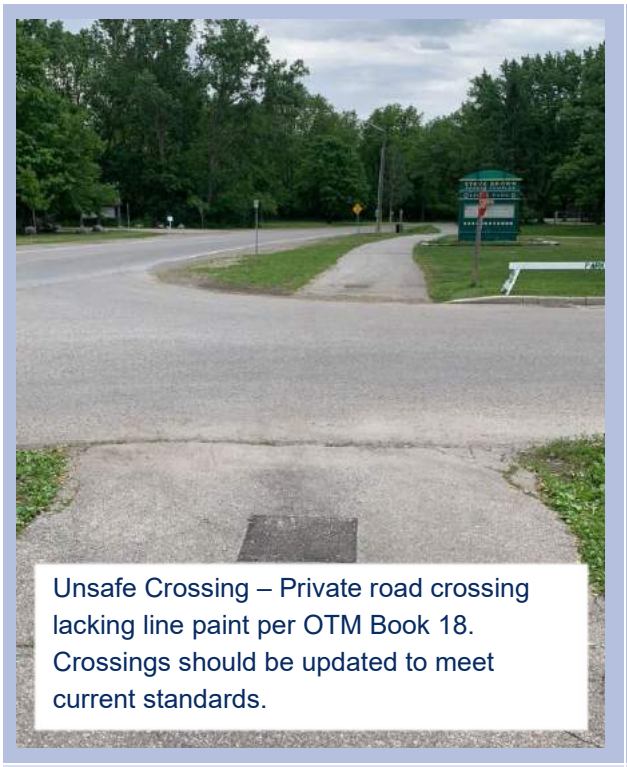
Loose Surface – ¾" Gravel loose on surface. Loose gravel causes bike tires to skid and should be compacted and topped with limestone screening of a smaller diameter.



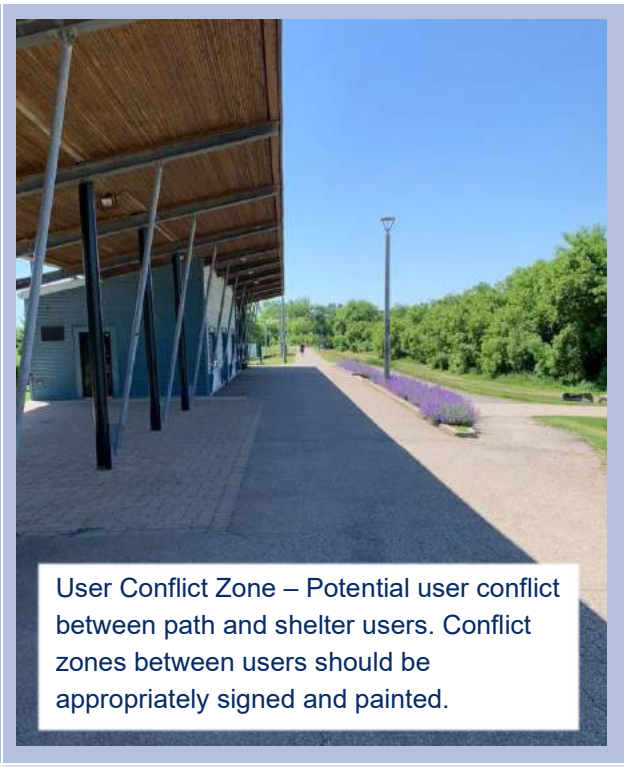
Hazard Tree/Branch – Dead tree within striking distance of trail. Hazard trees and branches with striking potential should be removed to limit risk of falling on trail users.



Vegetation Encroachment – Vegetation growing within 600mm clear zone of trail. Encroaching vegetation should be pruned back to avoid interfering with trail use.

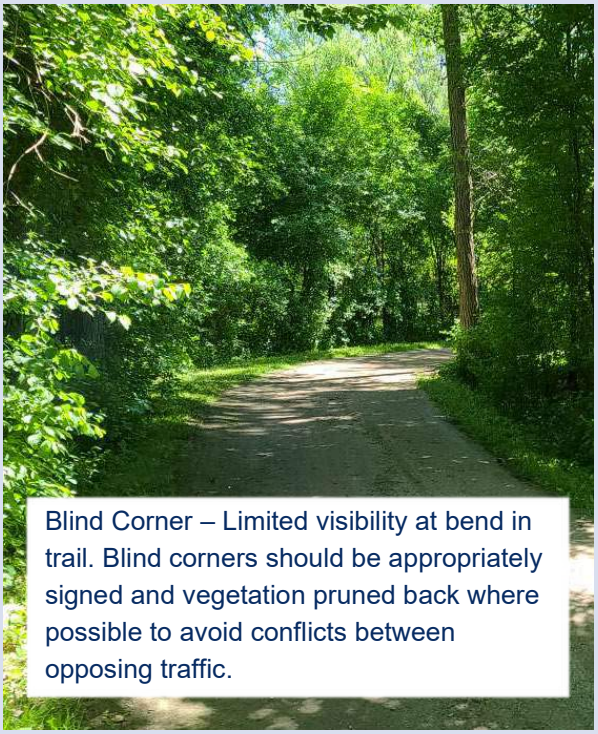


Unsafe Crossing – Private road crossing lacking line paint per OTM Book 18. Crossings should be updated to meet current standards.

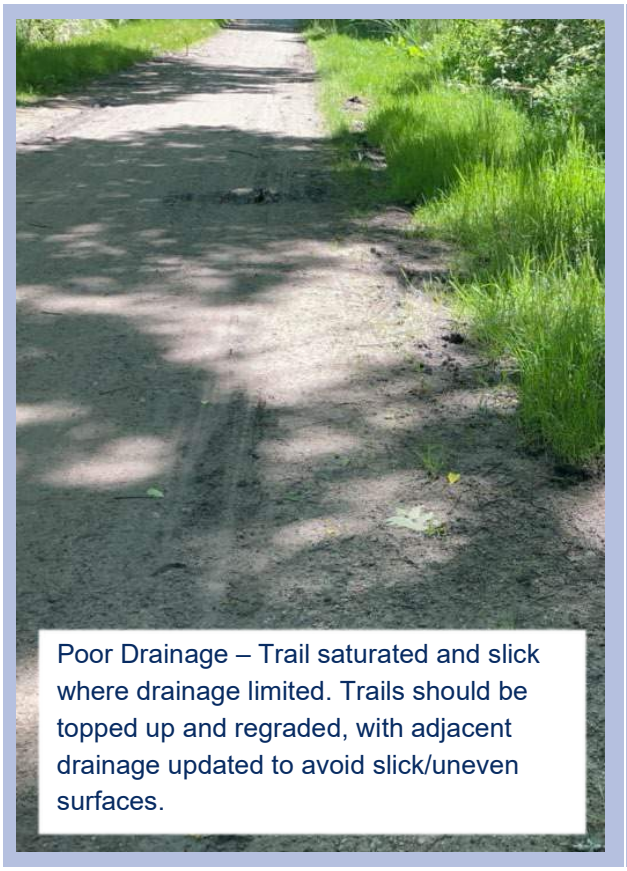


User Conflict Zone – Potential user conflict between path and shelter users. Conflict zones between users should be appropriately signed and painted.

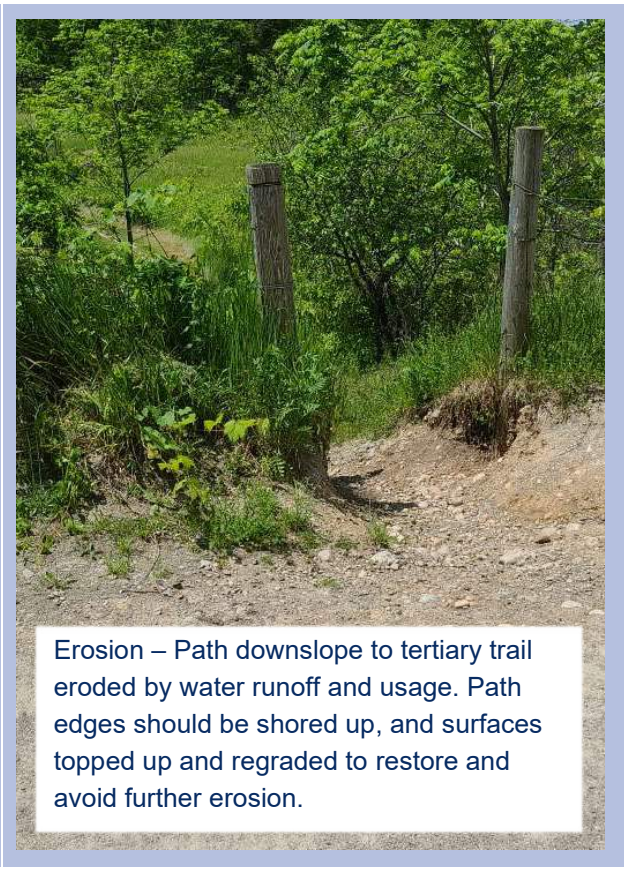
Narrow Width – Unpaved trail below minimum standard width. Narrow trails should be widened to standard to avoid user conflicts.



Blind Corner – Limited visibility at bend in trail. Blind corners should be appropriately signed and vegetation pruned back where possible to avoid conflicts between opposing traffic.



Poor Drainage – Trail saturated and slick where drainage limited. Trails should be topped up and regraded, with adjacent drainage updated to avoid slick/uneven surfaces.



Erosion – Path downslope to tertiary trail eroded by water runoff and usage. Path edges should be shored up, and surfaces topped up and regraded to restore and avoid further erosion.

The audit has identified safety concerns, as well as other items of concern for trail users. The audit includes a review of wayfinding signage, a lens for Crime Prevention Through Environmental Design (CPTED) and a review of Accessibility for Ontarians with Disabilities Act (AODA) compliance. Amenity upgrades have also been identified by City staff and the design team. Wayfinding and regulatory signage are integral to the success of a trail system. Gaps in signage have been identified where wayfinding is insufficient, warnings are required, or AODA factors have been identified. Opportunities for location of bike racks and seating have been identified where shortcomings exist. The trail facilities have also been cross referenced against typical pavement marking treatments for cycling facilities in Ontario as per industry standard manuals.

Table 2 City of Brantford Trail Classifications is taken from the City of Brantford Design Guidelines: Design and Construction Manual Parks and Off-road Trails. It details relevant trail classifications and their design parameters. Trails reviewed as part of the audit were limited to Shared Use Trails as noted in the first two rows (Note: Winter maintenance occurs on some Shared Use Off-road Trails).

Trail Type	Surfacing	Width	Capacity	Type of Use/Accessibility	Location	Slope	Residential Buffer	Winter Maintenance
Shared Use Trail, within Road Right of Way	Asphalt, Concrete	3m	High	Walking, Jogging, Cycling, Roller Blading, Stroller, Wheelchair	Parallel to road right of way, The Trans Canada Trail, Urban Areas	Optimum 5%, Maximum 8%, Short Distance 8%, Cross Slope 2%	5-10m	Yes
Shared Use Trail, Off Road	Asphalt, Concrete, Limestone Screenings	3m	High	Walking, Jogging, Cycling, Roller Blading, Stroller, Wheelchair	The Trans Canada Trail, Urban Areas	Optimum 5%, Maximum 8%, Short Distance 8%, Cross Slope 2%	5-10m	No
Park Path	Asphalt, Concrete, Limestone Screenings	2m	Low to Moderate	Walking, Jogging, Stroller, Wheelchair	Urban Area	Optimum 5%, Maximum 8%, Cross Slope 2%	5-10m	Along school access routes
Nature Path	Wood Chips, Native Material	1.5m-2m	Low	Walking, Hiking	Natural Area, Storm Water Management Ponds,	Optimum 5%, Maximum 25%, Cross Slope 2%	5-10m	No

Table 2 City of Brantford Trail Classifications

In addition to the safety audit, consultation with City Councillors and City staff occurred. Special interest stakeholders were interviewed, and the City of Brantford Engagement HQ site was leveraged to gather public comment on the location of trail safety issues and amenity upgrade opportunities.

This report includes a public education program related to safe usage of the trail network, including recommendations for signage, educational programs, trail ambassadors and other best practices from around Ontario.

Also included are remediation plans and repair recommendations for locations requiring safety improvements, as well as cost estimates. These include engineering review for stabilization requirements, design options for improving trail safety and an overall cost benefit analysis for converting granular trails to asphalt versus keeping the current trail surface treatment.

1.2 OBJECTIVES

The study objectives, as determined through consultation with City councillors, City staff and stakeholders, as well as inspection of the trail system are as follows:

- Identify specific areas of concern brought forth by trail users through consultation with City councillors, stakeholders and the public.
- Audit the trail system to identify specific areas of the trail that could lead to user injury due to:
    - breakdown of existing infrastructure;
    - trails design not meeting current standards; and,
    - external hazards in direct proximity to the trail.
- Assess the trail system to determine potential AODA and amenity upgrades.
- Identify and propose solutions to the safety issues found using standard details, schematic designs and OTM Book 18 Standards.
- Propose amenity and AODA upgrades based on perceived opportunities and gaps.
- Identify phasing for remediation works based on the Capital Cost budget breakdown provided by City Staff.
- Provide a cost/benefit analysis for converting granular trails to asphalt vs leaving as-is.
- Provide recommendations for a public education program related to safe usage of the trail network.

1.3 AUDIT METHODS

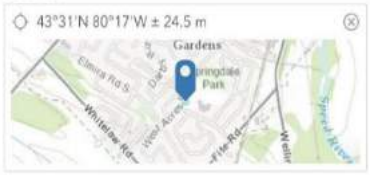
The WSP trails team performed a full cycling tour of Shared Use Paths (per 2019 Trails Map). The team investigated safety issues and opportunities for amenity improvements. Wayfinding was analyzed, as were AODA-related shortcomings and CPTED concerns. Cycling tours were performed between June 3rd and June 14th, 2022. Findings were cross referenced against City of Brantford Roads and Transportation Design and Construction Manual, City of Brantford Accessibility Plan (2020-2025), City of Brantford Wayfinding and Directional Signage Standards and City of Brantford Trail Standard Drawings. Ontario Traffic Manual (OTM) Book 18 – Cycling Facilities (2021) and the City of Toronto Multi-Use Trail Design Guidelines (2015), were also utilized as reference for best practices in trail design during the audit.

The WSP trail auditors utilized ArcGIS Survey123 to collect data. Survey123 is an online GIS form-centric application for creating, sharing and analysing surveys. Data was collected on mobile phones using Survey123. A survey was designed based on the anticipated safety issues and amenity opportunities (See **Table 3 Survey 123 Format**). A georeferenced waypoint relating to survey data and a photo was submitted for each location of interest. Survey data was then uploaded to ArcGIS online for analysis by the trails team and synthesis into the Audit Reference Maps **(Appendix A)**.

Analysis of intersections was also performed. Intersections were reviewed as they related to crossing of Shared Use Paths. Photos and notes were taken and cross-refenced with OTM Book 18 (2021) standards in order to make recommendations for upgrade or further study of intersection crossings. This analysis took place June 14th, 2022.

Where areas of specific concern were identified, WSP staff proposed remediation recommendations via schematic designs created in the field. Where schematic designs were created, further study and detailed design may also be recommended.

Table 3 Survey 123 Format



Trail Facility Type
- Asphalt
- Granular
- Dirt

Safety Issue
Please choose one issue
- Asphalt Degradation
- Erosion
- Loose Surface
- Narrow Width
- Ponding/Saturation
- User Conflict Zone
- Blind Corner
- Vegetation Encroachment
- Hazard Tree/Branch
- CPTED (e.g. potential for criminal behaviour)
- Slope Stability
- Excessive Longitudinal Slopes
- None
- Other

Safety Issue - Other

Amenities Recommended
Please choose one or more recommendation
- Wayfinding Signs (general extent or specific location)
- Seating (general for extent of trail)
- Shelter
- Bike Rack
- Linepaint
- None
- Other

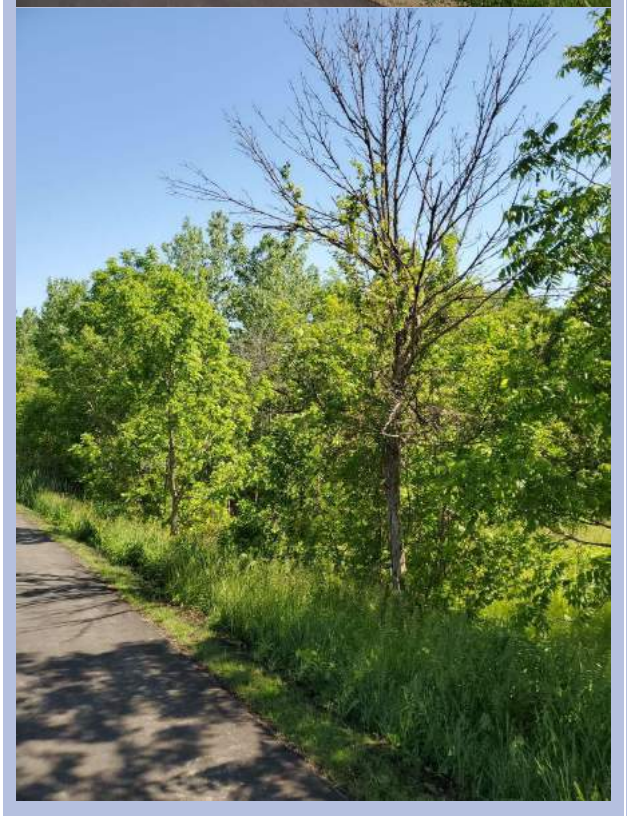
Amenities Recommended - Other

Expand on Issues and Proposed Solutions

1.4 HIGHLIGHTS

The following are highlights of issues from the trail audit. Highlights are broken down by trail section and illustrate trends noted throughout.

Table 4 Trail Audit Highlights



Wayne Gretzky Parkway Trail from Powerline Road to Dunsdon Street (Appendix A - Audit Reference Map Figure 1a)

- Newly paved. Asphalt in very good condition
- Lacks line paint features per OTM Book 18
- Numerous hazard trees present.
- Sloped blind corner may present user conflicts.

Wayne Gretzky Parkway Trail from Dunsdon Street to Grey Street (Appendix A - Audit Reference Map Figure 1a)

- Multiple locations where Asphalt in poor condition
- Lacks line paint features per OTM Book 18
- Intersections not designed per OTM Book 18

Henry Street Trail from Wayne Gretzky Parkway to Middleton Street (Appendix A - Audit Reference Map Figure 1a)

- Multiple locations where Asphalt in poor condition
- Lacks line paint features per OTM Book 18
- Intersections not designed per OTM Book 18
- Lacks AODA features

Powerline Trail from King George Road past Francis Street (Appendix A - Audit Reference Map Figure 1a)

- Multiple locations where Asphalt in poor condition
- Lacks line paint features per OTM Book 18
- Road crossings and signs designed per OTM Book 18

SC Johnson Trail from Powerline Road to Kraemer's Way (Appendix A - Audit Reference Map Figure 1b)

- Limestone surface in overall good condition
- Some minor erosion to trail surface

SC Johnson Trail from Oak Park Rd to Hardy Rd (Appendix A - Audit Reference Map Figure 1b)

- Surface in overall good condition
- Numerous blind corners present
- Some excessive longitudinal slopes
- Lacks line paint features per OTM Book 18

SC Johnson Trail from Hardy Rd to Wilkes Dam (Appendix A - Audit Reference Map Figure 1b)

- Surface in overall good condition
- Numerous areas of erosion at the edge of limestone trail into adjacent slope
- Some CPTED concerns with understory encroaching on tertiary trail entrances.

SC Johnson Trail from Wilkes Dam to Yorkshire Street (Appendix A - Audit Reference Map Figure 1c)

- Asphalt surface in overall good condition
- Lacks line paint features per OTM Book 18

SC Johnson Trail from Yorkshire Street to Brant's Crossing (Appendix A - Audit Reference Map Figure 1c)

- Asphalt surface in poor condition
- Narrow trail, loose surfaces, excessive longitudinal slopes and blind corners
- Detailed redesign occurring as part of separate project

SC Johnson Trail from Brant's Crossing to River Rd (Appendix A - Audit Reference Map Figure 1c)

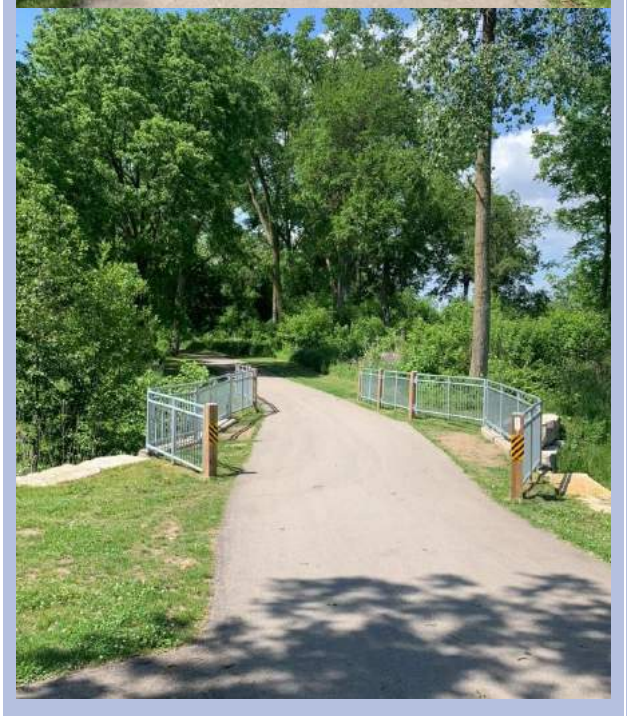
- Multiple locations where Asphalt in poor condition
- Lacks line paint features per OTM Book 18
- One steep adjacent side slope

Fordview Trail along Gilkinson St from Colborne St W to Mt Pleasant Dr (Appendix A - Audit Reference Map Figure 1c)

- Multiple locations where Asphalt in poor condition
- Lacks line paint features per OTM Book 18
- Some excessive longitudinal slopes
- Intersections not designed per OTM Book 18
- Lacks AODA features

CN Rail Trail and TH&B Trail from Hwy 7 to Veteran's Memorial Pkwy, Shellard Lane MUT, LE&N Trail from Ellis Ave to Veteran's Memorial Pkwy (Appendix A - Audit Reference Map Figure 1c)

- Limited safety issues. Trails generally in good condition.
- Asphalt sections lack line paint features per OTM Book 18



Gilkinson Trail from Mt Pleasant Dr to Gilkinson St (Gilkinson Flats) (Appendix A - Audit Reference Map Figure 1c)

- Asphalt overall in good condition
- Lacks line paint features per OTM Book 18
- Some sharp turns
- One fall risk
- Intersections not designed per OTM Book 18
- Numerous Hazard Trees

Shallow Creek Trail from East Ave to Drummond St (Appendix A - Audit Reference Map Figure 1d)

- Some portions of limestone path are narrowing
- Numerous Hazard Trees

Hamilton-Brantford Rail Trail from River Rd to Beach Rd (Appendix A - Audit Reference Map Figure 1d)

- Major portions of limestone trail have loose gravel surfaces
- Minor sections of asphalt path degrading
- Some ponding/saturation
- One cut section of asphalt path

Hamilton-Brantford Rail Trail from Beach Rd to Hwy 18 (Appendix A - Audit Reference Map Figure 1d)

- One section with major excessive longitudinal and adjacent side slope.
- Section from Colborne St W to Hwy 18 highly saturated.

Royal Oak Park Trail connecting Memorial Dr to Royal Oak Dr (Appendix A - Audit Reference Map Figure 1a)

- Roughly 200 metres of narrow inaccessible foot path through Royal Oak Park.

2 STAKEHOLDER INPUT AND ENGAGEMENT

2.1 BACKGROUND

As part of this Safety Audit, a consultation and engagement process was undertaken to understand existing challenges and opportunities from the perspective of residents, City Staff, stakeholders and City Councillors. The engagement activities were also used to confirm the existing conditions identified in the field audit and to identify overarching challenges and opportunities faced by the City's Trails. Meaningfully engaging and collaborating with stakeholders helped to create a final trail safety audit that accurately reflects the real-world conditions in Brantford, and led to proposed recommendations that are both reflective of the community's priorities and implementable.

2.2 ENGAGEMENT OBJECTIVES

This project was developed using the International Association of Public Participation (IAP2) process and practices, as illustrated in **Figure 2** below. The IAP2 Process outlines the preparation, management, and evolution of engagement tactics based on a spectrum of involvement tailored to the level of interest and the level of influence that audiences are anticipated to have through the process. There are five levels of commitment, which are known as the IAP2 Spectrum of Public Participation.

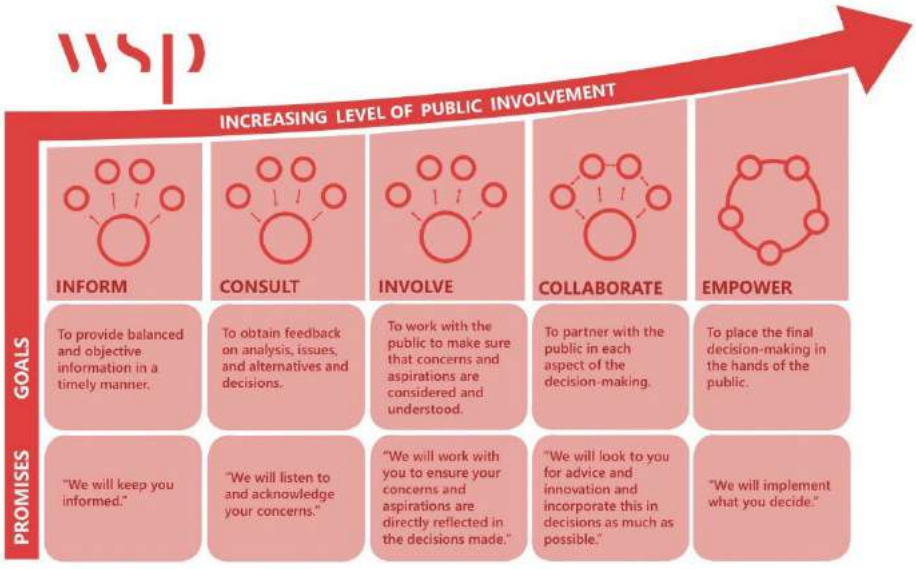


Figure 2. IAP2 Spectrum of Audience Involvement

The amount of information sharing, gathering and integration increases as you "move up" the spectrum. The intent is to recognize that not all stakeholders will have the same level of involvement in the project or need the same amount of information to inform their

involvement. The IAP2 approach emphasizes the importance of a consultation plan which is tailored to the understanding, commitment, and contribution of each of the unique groups. When developing the scope of engagement for the Brantford Trail Safety Audit engagement approach, a number of key audiences were identified and engaged using various methods. The identified audiences include:

- City of Brantford Mayor and Ward Councillors;
- City of Brantford Staff;
- Ontario Ministry of Transportation;
- Brant Waterways Foundation;
- Cycling and Trail Advocacy Groups;
- Local Businesses; and
- Members of the Public.

2.3 ENGAGEMENT APPROACH

Throughout the Summer of 2022 WSP worked with the City of Brantford to facilitate several engagement activities with the identified audiences noted above to inform the development of the Trail Safety Audit Report. These activities were completed to gain an understanding of the existing conditions and to identify the strengths, gaps, concerns, and opportunities across the City's multi-use pathway network. The following activities informed WSP's recommendations for priority areas for the City of Brantford to focus effort when seeking to enhance the safety of the trail.

2.3.1 PROBLEMS AND OPPORTUNITIES WORKSHOPS

Throughout the engagement process WSP Canada held 4 workshop sessions with Brantford's Mayor, Councillors and Staff. Additionally, members of the Ministry of Transportation, Brant Waterways Foundation, Brantford Cycling Club, and local advocates were also invited to participate in two additional workshop sessions.

The workshops were divided into two phases: During the first phase the Project Team held an open-ended discussion for stakeholders to identify trail safety concerns and issues at a high level, assessing the network holistically. The second phase involved the use of an online mapping tool to present the stakeholders with some of the results from the project team's field audit, including images and notes on existing conditions and challenges. During this session, stakeholders were invited to mark up the map and list location specific challenges they identified along the trail. They were also invited to share the tool with others in their organization and to continue to provide feedback for up to 2 weeks following their workshop session.

2.3.2 LET'S TALK BRANTFORD COMMUNITY WEBSITE

On July 7, 2022 the Project Team launched the Let's Talk Brantford Trails website. This provided a portal for community members to learn about the Trail Safety Audit project and build

ownership over it by allowing visitors to participate in a stakeholder mapping exercise and ideation board. The website was developed using the City of Brantford's existing Let's Talk Brantford Webpage.

The mapping exercise had the same existing conditions map that was used during the City Council and Stakeholder mapping exercise, however the public-facing webpage removed most of the comments to allow members of the public to start from a blank slate. Website users could also leave their high-level thoughts on trail safety concern and opportunities by using the 'ideas' tool, which allowed users to write open-ended responses. In total, 16 comments were made using the mapping tool and 4 were made using the 'ideas' tool during the month-long engagement process.

2.4 WHAT WAS SAID

The following sections summarize the inputs that were received during each respective activity of the engagement process:

2.4.1 CITY COUNCIL AND STAKEHOLDER WORKSHOPS

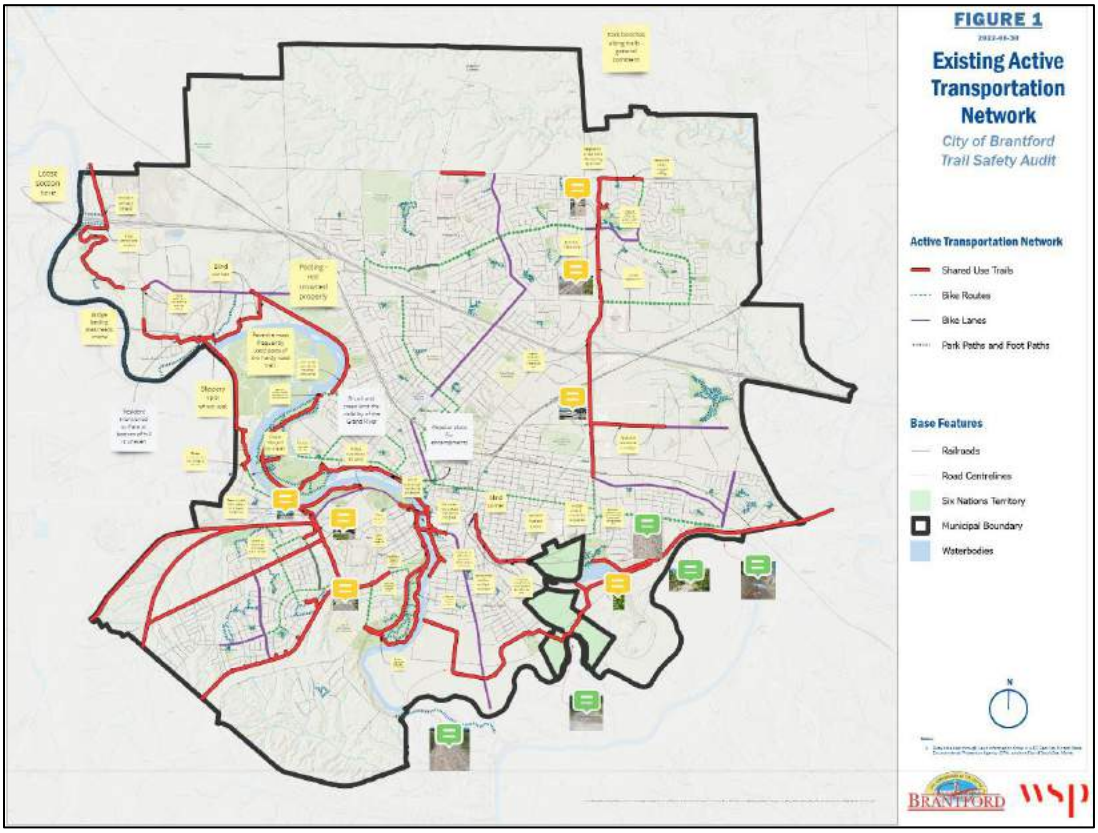


Figure 3: All comments received during the mapping exercise for the City Council and Stakeholder Workshops, and the Brant Waterways Foundation workshop. See Appendix B for enlarged imagery.

TRAIL MAINTENANCE

A number of councillors brought forward concerns about the year-round maintenance of the trail system, noting that many sections have debris from lack of pavement upkeep, loose gravel, or are susceptible to flooding and erosion. Also noted was the challenge of accessing the system in the winter and spring due to a lack of maintenance and the overall condition of the network.

PEDESTRIAN AND CYCLIST CONFLICTS

Trail etiquette and tensions between trail users was brought up frequently during all workshop sessions. Councillors and stakeholders mentioned a recent situation where a significant number of tacks were found along a portion of the trail with the apparent intent of causing damage to bicycles. They noted that this was a culmination of a growing tension between trail users, which they felt could be attributed to a lack of etiquette whether people are walking, rolling, or wheeling when using the system. Additional conflicts have been noted due to the growing prevalence of electronic bikes.

ACCESSIBILITY

Accessibility concerns were brought up during each of the workshops, with residents noting that many sections of the trail are not AODA compliant and are completely inaccessible to residents using mobility devices. Stakeholders identified that steep grades are frequently composed of soft surface materials, making them inaccessible for those using mobility devices, parents with strollers, and even cyclists. Stakeholders also identified that there is a lack of rest stops along the network.

MOTORIZED VEHICLE USE

Several community stakeholders brought up the frequent use of motorized vehicles such as ATV's and dirt bikes during the winter, early spring and late fall. They noted that these vehicles often cause damage and make the trails unsafe for others to use.

Figure 4. A steep limestone trail showing signs of erosion on the Hamilton-Brantford Rail Trail

PUBLIC SAFETY CONCERNS

Alongside the issue of tacks being placed on the trail network, stakeholders also brought forward a number of public safety concerns. This included a situation where a trail user was seen carrying a crossbow and a gun, an occurrence where a stakeholder was berated, and other accounts of feeling unsafe. Additionally, the lack of trail lighting at certain sections contributed to an unsafe feeling for stakeholders when using the network during non-daylight hours. Stakeholders also identified the growing number of unhoused individuals establishing camps along the trails as a potential contributing factor to this public safety challenge.

2.4.2 STAKEHOLDER WORKSHOPS

Conversations with the Brant Waterways Foundation and other community stakeholders were largely consistent with the discussions from the City Council and Staff meetings. Stakeholders expressed similar views with regards to pedestrian and cyclist conflicts, trail maintenance, and accessibility concerns. Stakeholder also brought forward two additional pieces of feedback that included:

WAYFINDING AND TRAIL CLASSIFICATION

Stakeholders brought forward the need for wayfinding improvements to be made all throughout the Trails in Brantford. Furthermore, stakeholders suggested introducing a trail classification system that delineates the minimum maintenance standards to clearly communicate what users can expect on different types of trails throughout the City, including maintenance and construction standards. Stakeholders suggested that introducing such a system will help users with route selection based on their comfort and skill level. Stakeholders also noted that there are several portions along the trail that are inconsistent and force users out onto roads, particularly in industrial areas in the Northwest section of the city. Refer to Northwest quadrant of the map in **Appendix A - Figure 1b** (iii) at the western end of Hardy Road for more information.

TRAIL ETIQUETTE EDUCATION

Stakeholders noted that they would like to see the formation of a regional trails council that would take responsibility for hosting trail etiquette education and promotional campaigns. Brant Waterways Foundation members and other stakeholders highlighted how trail etiquette, as well as education about safe walking and cycling skills, are lacking across Ontario and should be a priority for implementation moving forward.

2.4.3 LET'S TALK BRANTFORD COMMUNITY FEEDBACK

The Let's Talk Brantford mapping and ideas tools largely aligned with feedback from the other two engagement activities. Feedback provided on the project site included calls for more

accessibility, concerns over motorized vehicles, trail maintenance concerns, public safety concerns, and concerns about the interactions between pedestrians and cyclists. Additional input included:

TRAIL CONNECTIONS

Users identified missing connections along Dufferin Avenue to the Gordon Glaves Memorial Pathway, Mohawk Park to the pathway running adjacent to Alfred Street, and a lack of pedestrian crosswalk locations connecting the SC Johnson trail across Hardy Road. Where these recommendations were out of scope for this Audit, comments have been forwarded to City Staff for inclusion in the development of Brantford's Active Transportation Master Plan.

OVERGROWTH AND INVASIVE SPECIES

Users identified sections of the trail network that had abutting tree branches obstructing the pathway, the buildup of leaves along certain sections, and the presence of Giant Hogweed, a hazardous and invasive plant.

WASTE COLLECTION

Users noted an abundance of litter and waste along the pathway and a lack of disposal methods such as garbage cans. Users noted that garbage cans were few and far between in highly visited areas of the trail.

2.5 WHAT WAS HEARD AND WHAT WE DID

Throughout the development of this report, Community and Stakeholder Engagement has been sought to add context and local knowledge to the technical review conducted by the project team. Much of the feedback received through conversations with City Staff, political representatives, stakeholders and members of the public aligns with the findings of the audit, but some higher-level themes did emerge during these discussions that have been used to guide the recommendations contained in this report.

2.5.1 TRAIL MAINTENANCE IMPROVEMENTS AND COORDINATION

Overall, each group consulted noted that there needs to be a larger focus and more consistency provided when it comes to maintenance of the trail network. Issues including overgrown foliage, piles of leaves, loose gravel, broken pavement, flooding, erosion, and waste collection were all identified throughout the engagement process. More coordination and resources are needed to maintain the entire trail system from the pathways themselves to the spaces around them. The project team performed a thorough evaluation of the maintenance issues identified through consultation and has provided a prioritized list of capital improvements for the City to undertake.

2.5.2 USER CONFLICT REDUCTION

Participants noted several areas where blind corners, narrow pathways, or unclear signage has contributed to user conflict between trail users and vehicles. One thing to note is that each group consulted noted an increasing amount of tension between users walking and rolling with those cycling. Each committee called for education and etiquette training an enforcement. It was suggested to the City of Brantford that clear rules must be established to reduce user conflicts such as speed limit needs or enforceable signage/pavement markings.
The project team has identified additional markings, signage and capital projects that will improve clarity around trail etiquette and reduce conflict between user groups. To respond to the desire for increased education, suggestions for new ways to communicate about trail use guidelines and train the next generation of trail users has been included in this report for the City's consideration.

2.5.3 ACCESSIBILITY

Stakeholders identified accessibility enhancements along the entire network to create trails that are usable by people of all ages and abilities. Steep grades, unpaved surfaces, lack of winter maintenance, inaccessible features, and lack of rest stops were identified by each group as conditions that should be improved upon across the Brantford trail system.
Each specific location where access was limited due to physical constraints has been identified and a remediation plan has been established by the project team. The project team has provided a cost benefit analysis for converting granular trails to asphalt, permitting winter maintenance to improve year-round accessibility throughout the City.

2.5.4 PUBLIC SAFETY AND UNHOUSED ENCAMPMENTS

Stakeholders called for enhanced lighting to improve the conditions of using the trail in dark conditions. Users also called for enhanced monitoring or security at popular destinations such as Brant's Crossing. Finally, several of the Council and Stakeholder workshop attendees called for reducing the amount of bushes and tree foliage to improve sightlines along the trail to reduce the desirability of setting up an encampment along the trail network.
Where feasible, this report has included elements of CPTED principles, including lighting, brush clearing and visibility enhancements. Several of the issues raised relating to public safety – particularly those related to unhoused individuals, are beyond the scope of this project to address.

3 SAFETY AUDIT AND REMEDIATION RECOMMENDATIONS

3.1 MAPPING, FINDINGS AND RECOMMENDATIONS

The Audit Reference Maps found in **Appendix A (1a, 1b, 1c and 1d)** illustrate locations of issues and opportunities noted on Shared Use Paths throughout the City of Brantford. Amenity opportunities and safety issue reference points are colour coded and numbered on each Map. The Maps break the city into quadrants (North East, North West, South West and South East), as well as sub-quadrants (i, ii, iii, iv).

Reference numbers on the Audit Reference Maps are given detail in **Table 6 Audit Findings and Remediation Recommendations.** Detailed observations, proposed solutions, treatment descriptions, estimated cost, recommended implementation year, and cost per year can be found in this Table. These maps and figures provide the detail required to break down the location, type of work and timing of work recommended.

Remediation of standard safety issues and installation of amenity opportunities is covered in **Table 5** estimated costs. Costing is based on recent bids provided on new trail construction projects between 2019 and 2022. Costing relevance is determined by factors such as proximity of concurrent work and scale of works to be performed. For instance, a premium is added to portions of work with a small scale isolated from concurrent works.

Table 5 Estimated Unit Costing for Remediation Items (See Section 4 for drawing references)

	Item	Unit	Estimated Construction Cost
1	Supply and install regulatory / warning sign (D23)	Each	$300.00
2	Supply and install directional sign (D20 & D21)	Each	$2000.00
3	Supply and install directional bollard (D19)	Each	$1000.00
4	Supply and install bench on concrete pad (D18).	Each	$2,500.00
5	Supply and install waste receptacle (D32).	Each	$1,000.00
6	Supply and install 1400mm steel galvanized railing (BS30 or approved alternative).	Linear Metre	$500.00
7	Supply and install 300mm culvert.	Linear Metre	$250.00
8	Supply and install limestone screening top up (50mm depth) on existing limestone path (D36).	Square Metre	$5.00

9	Supply and install limestone screening top up (100mm depth) on existing limestone path (D36).	Square Metre	$9.00
10	Supply and install limestone trail and granular base. 200mm total depth (D36).	Square Metre	$17.00
11	Supply and install asphalt (50mm) and granular base (200mm) new asphalt trail (D11).	Square Metre	$35.00
12	Supply and install asphalt (70mm) and granular base (300mm) new asphalt trail within road right of way (D11).	Square Metre	$48.00
13	Remove existing asphalt surface from site.	Square Metre	$14.00
14	Remove granular base, topsoil or subsoil from site (per 100mm depth).	Square Metre	$6.00
15	Supply and install topsoil (150mm) and grass seed.	Square Metre	$10.00
16	Tactile plates install on 125mm thick concrete (includes removal of existing concrete)	Square Metre	$600.00
17	Supply and install armour stone retaining wall or Flex MSE Vegetated Wall.	Square Face Metre	$600.00
18	Trail stop bar (permanent line paint)	Linear Metre	$6.00
19	Elephant's feet crossing (L1 in permanent line paint)	Linear Metre	$20.00
20	Pedestrian, Cyclist or Arrow symbol (L3 in permanent line paint)	Each	$230.00
21	Shark's Teeth Yield Lines" (L4 in permanent line paint)	Linear Metre	$30.00
22	100mm dashed or solid trail centreline (L3 in permanent line paint).	Linear Metre	$2.00

USING THE CHART TO REFERENCE THE MAPS:

1) View the implementation year column you would like to action.
2) Find the GPS/Map ID in the column for each item to action (GPS/Map IDs are based on points taken in the field. For visual clarity, some numbers have been removed and are not present on the chart. When Shapefiles are passed to City Staff, these ID numbers will still be relevant).
3) Use the Figure # column to determine where the point exists in the quadrant and sub-quadrant in the related Map (e.g. 1a (i) can be found in the top left of Appendix A - Figure 1a).

USING THE FIGURES TO REFERENCE THE CHART:

1) Find the trail of concern on **Appendix A Maps 1a, 1b, 1c and 1d**
2) Note the GPS/Map ID found on the Map.
3) Use the trail name and GPS/Map ID column in the chart to determine the treatment and recommended timing of the works.

Section 6 Phasing Priorities summarizes the costing and phasing found in **Table 6 Audit Findings and Remediation Recommendations.** General recommendations are provided for sign, line paint and lighting recommendations that cannot be given a specific location on the Audit Reference Maps, but rather, could be implemented along the extent of the trail systems as budget allows.

Table 6 Audit Findings and Remediation Recommendations

										Recommended Implementation Year										
GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
292	1c (i)	CN Rail Trail	Granular	Steep Side Slopes	None	Provide side rails for approximately 10m	Supply and install BS30 Bikesafe (or approved alternative) 1400mm galvanized railing on slope side of trail per detail BS30.	BS30	$5,000.00											$5,000.00
297	1c (iii)	CN Rail Trail	Granular	Narrow Width	None	Replace with granular to minimum standard	Excavate and remove existing vegetation and soils as required. Supply and install limestone trail surface replacement per granular trail detail (D36).	D36	$1,000.00											$1,000.00
423	1c (i)	CN Rail Trail	Granular	None	Seating	Recommend seating spaced at 300m from Pheasant Ridge rd to Colborne St W	Supply and install benches on 125mm depth concrete pad spaced at 300m intervals per standard bench installation detail D18. (x12)	D18	$30,000.00											$30,000.00
262	1c (ii)	D'Aubigny Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
274	1c (ii)	D'Aubigny Trail	Asphalt	Asphalt Degradation	None	Repave 800m of trail and granular base from Soccer Field to Ballantyne Dr	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Remove or pulverize asphalt in place. Remove soils to widen as necessary. Supply granular A as necessary, compact and fine grade. Remediate edges with topsoil and seed	D11	$88,800.00									$88,800.00		
276	1c (ii)	D'Aubigny Trail	Asphalt	Erosion	None	Repave 150m of asphalt path. Shift path away from watercourse.	Supply and install 3.0m wide asphalt trail per new asphalt trail detail (D11). Remove existing asphalt and granular. Excavate and remove soils at new alignment. Remediate former alignment with topsoil, seed and riparian shrubs. Shift centre line alignment 3.5m away from river.	D11	$27,000.00		$27,000.00									
277	1c (ii)	D'Aubigny Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs. Provide Warning Sign	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Downgrade Warning Sigh (S7) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2. D23. S7	$900.00											$900.00
282	1c (ii)	D'Aubigny Trail	Asphalt	User Conflict Zone	None	Provide warning signs and tactile plates	Supply and install Pedestrian and Bicycle Crossing Ahead (S12 - Wc-15) per regulatory sign detail D23. Install on both approaches to the crossing on Spalding Dr. (2x). Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Provide Mixed Crossride (L7) line paint (12m). Consider intersection treatment I3.	S12. D23, L7,, I3 OPSD 310.039	$6,120.00										$6,120.00
103	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
104	1c (ii)	Fordview Trail	Asphalt	Excessive Longitudinal Slopes	None	Regrade to 5% for 20m	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Excavate and remove existing soils to meet 5% longitudinal, 2% cross slope and maximum 3:1 side slope. Remediate edges with topsoil and sod.	D11	$8,000.00							$8,000.00				
106	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 250m of trail and granular base between pedestrian bridge and Veteran's Memorial Pkwy.	Conduct geotechnical investigation of 2 boreholes to determine base and asphalt design. Supply and install 3.0m wide asphalt trail replacement per new asphalt trail detail (D11) and geotechnical recommendations. Remove or pulverize asphalt in place. Supply granular A as necessary, compact and fine grade. Remediate edges with topsoil and seed. Pricing does not include geotechnical studies.	D11	$72,000.00							$72,000.00				
107	1c (ii)	Fordview Trail	Asphalt	Vegetation Encroachment	None	Prune encroaching vegetation	Prune all vegetation within trail clearance zone (600mm) per new asphalt trail detail (D11).	D11	$500.00	$500.00										
108	1c (ii)	Fordview Trail	Asphalt	Slope Stability	None	Shore up edges with permanent erosion control for 5m.	Supply and install Flex MSE vegetated wall system (or approved alternative) to support eroding slope.	Flex MSE	$2,500.00	$2,500.00										
109	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 10m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$3,000.00	$3,000.00										
110	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 5m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$1,500.00	$1,500.00										
111	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 3m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$900.00	$900.00										
112	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 5m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$1,500.00	$1,500.00										
113	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide warning signs and line paint at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
114	1c (ii)	Fordview Trail	Asphalt	Narrow Width	None	~1.8m wide path. Replace with asphalt to minimum standard for 34m.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Excavate and remove existing soils. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed.	D11	$10,200.00							$10,200.00				
116	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 5m of trail and granular base	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$1,500.00	$1,500.00										
117	1c (ii)	Fordview Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2)	NS2, D23	$600.00											$600.00
119	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Patch pothole in short term	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$500.00	$500.00										
120	1c (ii)	Fordview Trail	Asphalt	Ponding/Saturation	None	Standard catch basin grate clogged with debris. Replace.	Replace standard flat grate with OPSD 400.120 Birdcage Grate for catch basins.	OPSD 400.120	$500.00											$500.00
121	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide warning signs and line paint at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00

Table 6 Audit Findings and Remediation Recommendations

											Recommended Implementation Year										
GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
123	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 8m of trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$2,400.00	$2,400.00										
124	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide line paint and tactile plates.	Provide stop bar. Retain stop sign in place. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to road.	OPSD 310.039	$3,650.00											$3,650.00
125	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Cars turning right out of dog park are destroying path. Shift path crossing. Repave path. Shift west side crossing 5m south. Separate as possible with armour stone. See design schematic.	Provide stop bar. Retain stop sign in place. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to road. Install barrier to cars turning right onto trail. See schematic SD-4.	Schematic SD-4	$7,500.00	$7,500.00										
126	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide tactile plates	Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to road.	OPSD 310.039	$3,600.00											$3,600.00
127	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide line paint. Commercial entrance. Elephants feet recommended.	Provide 20m of Elephant's Feet (L1) line paint (10m x2).	L1	$600.00											$600.00
128	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide tactile plates	Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to road.	OPSD 310.039	$3,600.00											$3,600.00
129	1c (ii)	Fordview Trail	Asphalt	None	Seating	Recommend seating spaced at 300m from Edge St to Colborne St W	Supply and install benches on 125mm depth concrete pad spaced at 300m intervals per standard bench installation detail D18. (x6)	D18	$15,000.00											$15,000.00
130	1c (iv)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide tactile plates	Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to road.	OPSD 310.039	$3,600.00											$3,600.00
132	1c (iv)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide line paint. Provide tactile plates.	Provide Mixed Crossride (L7) line paint (12m). Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to road.	L7, OPSD 310.039	$5,520.00											$5,520.00
133	1c (iv)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide tactile plates	Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to road.	OPSD 310.039	$3,600.00											$3,600.00
160	1c (iv)	Fordview Trail	Asphalt	Fall hazard	None	Railing wings direct traffic towards fall hazard. Extend railing wings outward to block fall hazard of retaining wall (10m).	Supply and install railings to match existing where fall from retaining wall exceeds 0.6m. Mount directly to retaining wall.	N/A	$5,000.00	$5,000.00										
162	1c (iv)	Fordview Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Do not grind stump.	OPSS Prov 201	$500.00	$500.00										
164	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide warning signs and line paint at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
165	1c (ii)	Fordview Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs. Provide Warning Sign	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Downgrade Warning Sigh (S7) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2, S7, D23	$900.00											$900.00
166	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide warning signs, line paint and tactile plates	Supply and install stop bar line paint at trail approach to parking lot. Supply and install Stop Sign (S1) per regulatory sign detail D23. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to parking lot.	S1, D23, OPSD 310.039	$2,100.00											$2,100.00
167	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide warning signs and line paint	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
168	1c (ii)	Fordview Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2)	NS2, D23	$600.00											$600.00
170	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 5m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$1,500.00	$1,500.00										
171	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 10m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$3,000.00	$3,000.00										
172	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 2m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$600.00	$600.00										
173	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 5m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$1,500.00	$1,500.00										
174	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 10m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$3,000.00	$3,000.00										
175	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 2m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$600.00	$600.00										
176	1c (ii)	Fordview Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
177	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 250m of trail and granular base between pedestrian bridges.	Conduct geotechnical investigation of 2 boreholes to determine base and asphalt design. Supply and install 3.0m wide asphalt trail replacement per new asphalt trail detail (D11) and geotechnical recommendations. Remove or pulverize asphalt in place. Supply granular A as necessary, compact and fine grade. Remediate edges with topsoil and seed. Pricing does not include geotechnical studies.	D11	$72,000.00										$72,000.00
178	1c (ii)	Fordview Trail	Asphalt	Vegetation Encroachment	None	Prune encroaching vegetation	Prune all vegetation within trail clearance zone (600mm) per new asphalt trail detail (D11).	D11	$500.00	$500.00										
179	1c (ii)	Fordview Trail	Asphalt	Uneven paver surface	None	Level pavers. Specifically along official trail route. Provide warning signs and line paint.	Level pavers. Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at entrance to plaza. Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23. Install at each approach to Shark's Teeth Yield Lines	L4, S5, D23	$5,800.00											$5,800.00
180	1c (ii)	Fordview Trail	Asphalt	CPTED	Lighting	Provide lighting within tunnel	Provide wall packs within tunnel. Further electrical and lighting design required.	N/A	$30,000.00											$30,000.00

Table 6 Audit Findings and Remediation Recommendations

GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	Recommended Implementation Year										
										2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
181	1c (ii)	Fordview Trail	Asphalt	Blind Corner	None	Provide warning sign at both ends of tunnel	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2).	NS1, D23	$600.00											$600.00
427	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave at surface transition	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$500.00	$500.00										
428	1c (ii)	Fordview Trail	Asphalt	Asphalt Degradation	None	Repave 2m of trail	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$600.00	$600.00										
134	1c (iv)	Gilkinson Trail	Asphalt	Vegetation Encroachment	None	Prune encroaching vegetation	Prune all vegetation within trail clearance zone (600mm) per new asphalt trail detail (D11).	D11	$500.00	$500.00										
135	1c (iv)	Gilkinson Trail	Asphalt	Asphalt Degradation	None	Repave 5m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right-of-way detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$1,500.00	$1,500.00										
137	1c (iv)	Gilkinson Trail	Asphalt	Vegetation Encroachment	None	Prune encroaching vegetation	Prune all vegetation within trail clearance zone (600mm) per new asphalt trail detail (D11).	D11	$500.00	$500.00										
138	1c (iv)	Gilkinson Trail	Asphalt	Asphalt Degradation	None	Rout and seal 15m of trail	Rout and seal 15m of trail per OPSS 1212 (Asphalt Joint Sealing)	OPSS 1212	$1,000.00	$1,000.00										
139	1c (iv)	Gilkinson Trail	Asphalt	Asphalt Degradation	None	Repave 10m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right-of-way detail (D12). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$3,600.00	$3,600.00										
140	1c (iv)	Gilkinson Trail	Asphalt	None	Seating	Recommend seating spaced at 300m from Mount Pleasant Rd to Edge St.	Supply and install benches on 125mm depth concrete pad spaced at 300m intervals per standard bench installation detail D18. (x2)	D18	$5,000.00											$5,000.00
141	1c (iv)	Gilkinson Trail	Asphalt	Ponding/Saturation	None	Repave and regrade 10m of trail	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right-of-way detail (D12). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$3,600.00											$3,600.00
142	1c (iv)	Gilkinson Trail	Asphalt	User Conflict Zone	None	Provide line paint. Provide tactile plates. Both sides of road,	Provide stop bar. Retain stop sign in place. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road (x2).	OPSD 310.039	$3,650.00											$3,650.00
143	1c (iv)	Gilkinson Trail	Asphalt	User Conflict Zone	None	Provide line paint at 2 entrances	Provide 40m of Elephant's Feet (L1) line paint (20m x2).	L1	$1,200.00											$1,200.00
144	1c (iv)	Gilkinson Trail	Asphalt	User Conflict Zone	Wayfinding Sign	Provide line paint. Provide directional sign.	Provide stop bar. Design and install directional sign per standard directional sign details D20 & D21.	D20. D21	$2,050.00											$2,050.00
145	1c (iv)	Gilkinson Trail	Asphalt	User Conflict Zone	Wayfinding Sign	Provide warning signs and line paint. Provide directional sign.	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at intersection with sidewalk. Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23. Install at each approach Shark's Teeth Yield Lines (x2). Design and install directional sign per standard directional sign details D20 & D21.	L4, S5, D23, D20, D21	$2,700.00											$2,700.00
146	1c (iv)	Gilkinson Trail	Asphalt	Asphalt Degradation	None	Repave 6m of trail and granular base	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$1,800.00	$1,800.00										
147	1c (iv)	Gilkinson Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard branch	Remove dead branches. Grind and remove from site.	OPSS Prov 201	$500.00	$500.00										
148	1c (iv)	Gilkinson Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs. Provide Warning Sign	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Sharp Turn Ahead Sign (S11 - WA-2L) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2, S11, D23	$900.00											$900.00
150	1c (iv)	Gilkinson Trail	Asphalt	User Conflict Zone	None	Provide warning sign at sharp corner. Sign for curve in trail that leads into river.	Supply and install Sharp Turn Ahead Sign (S11 - WA-2L) per regulatory sign detail D23. Install on approach to river (x1)	S11, D23	$300.00											$300.00
151	1c (iv)	Gilkinson Trail	Asphalt	Blind Corner	None	Prune back understory	Remove understorey on inside radius of curve. Curve radius of approximately 13m. Create unobstructed view 10m from inside edge of trail.	N/A	$2,000.00											$2,000.00
152	1c (iv)	Gilkinson Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Do not grind stump.	OPSS Prov 201	$500.00	$500.00										
154	1c (iv)	Gilkinson Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree. x3	Remove dead tree to grade. Grind and remove from site. Do not grind stump.	OPSS Prov 201	$1,500.00	$1,500.00										
156	1c (iv)	Gilkinson Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Do not grind stump.	OPSS Prov 201	$500.00	$500.00										
157	1c (iv)	Gilkinson Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Do not grind stump.	OPSS Prov 201	$500.00	$500.00										
158	1c (iv)	Gilkinson Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard branch	Remove dead branches. Grind and remove from site.	OPSS Prov 201	$500.00	$500.00										
429	1c (iv)	Gilkinson Trail	Asphalt	Asphalt Degradation	None	Repave 20m of trail between driveways	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$6,000.00	$6,000.00										
430	1c (iv)	Gilkinson Trail	Asphalt	User Conflict Zone	None	Provide cross ride. Provide tactile plates.	Provide Combined Crossride (L6) line paint (12m). Cut curbs to fit. Place Bicycle Path Crossing Side Street signs (S10) along Mt Pleasant St. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road (x2).	L6, OPSD 310.039	$6,000.00											$6,000.00
431	1c (iv)	Gilkinson Trail	Asphalt	Narrow Width	None	Replace with asphalt to minimum standard for 15m	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right-of-way detail (D11). Excavate and remove existing sidewalk and soil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$4,500.00											$4,500.00
6	1d (ii)	Ham-Brant Rail Trail	Granular	None	Wayfinding Sign	Provide directional sign	Design and install directional sign per standard directional sign details D20 & D21.	D20, D21	$2,000.00											$2,000.00
7	1d (ii)	Ham-Brant Rail Trail	Granular	Ponding/Saturation	None	Replace culvert	Replace culvert in kind. Reform surrounding swale. Apply topsoil and seed.	N/A	$2,500.00										$2,500.00	
8	1d (ii)	Ham-Brant Rail Trail	Granular	Ponding/Saturation	None	Replace culvert	Replace culvert in kind. Reform surrounding swale. Apply topsoil and seed.	N/A	$2,500.00										$2,500.00	
10	1d ii)	Ham-Brant Rail Trail	Granular	Ponding/Saturation	None	Replace culvert	Replace culvert in kind. Reform surrounding swale. Apply topsoil and seed.	N/A	$2,500.00										$2,500.00	
11	1d (ii)	Ham-Brant Rail Trail	Granular	Wayfinding sign falling	None	Remove way finding sign.	Remove and dispose of sign offsite.	N/A	$100.00										$100.00	
12	1d (ii)	Ham-Brant Rail Trail	Granular	Ponding/Saturation	None	Repave with additional surfacing and base for 700m segment between Highway 18 and the Colborne St E underpass. Inspect and cleanout CBs at Colborne St E overpass.	Supply and install additional trail base, surfacing, drain tile, topsoil and seed per schematic detail SD-2. Inspect and cleanout CBs at Colborne St E overpass.	Schematic SD-2	$103,250.00										$103,250.00	

Table 6 Audit Findings and Remediation Recommendations

GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	Recommended Implementation Year										
										2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
14	1d (ii)	Ham-Brant Rail Trail	Granular	CPTED	None	No lighting in the tunnel. Provide lighting.	Provide wall packs within tunnel. Further electrical and lighting design required.	N/A	$30,000.00											$30,000.00
17	1d (ii)	Ham-Brant Rail Trail	Granular	Excessive Longitudinal Slopes	None	Redesign/regrade trail and retaining wall. Permanent erosion control adjacent to trail.	Detailed design based on schematic detail SD-1 and SD-3. Further detailed design, geotechnical and environmental studies required. Remove redundant signs upon completion.	Schematic SD-1 & SD-3	$120,000.00					$120,000.00						
18	1d (ii)	Ham-Brant Rail Trail	Granular	Loose Surface	None	Regrade and reapply granular on 5m of trail	Regrade for minimum cross fall of 2%. Apply 50mm limestone screening surface per standard detail D36.	D36	$200.00						$200.00					
20	1d (ii)	Ham-Brant Rail Trail	Granular	Erosion	None	Regrade and reapply granular on 50m of trail	Regrade for minimum cross fall of 2%. Apply 50mm limestone screening surface per standard detail D36.	D36	$1,000.00						$1,000.00					
21	1d (ii)	Ham-Brant Rail Trail	Granular	Ponding/Saturation	None	Regrade and reapply granular on 40m of trail	Regrade for minimum cross fall of 2%. Add 100mm depth limestone screening surface per standard detail D36.	D36	$1,500.00						$1,500.00					
22	1d (ii)	Ham-Brant Rail Trail	Granular	Loose Surface	None	Reapply limestone screenings for 20m of trail	Apply 50mm limestone screening surface per standard detail D36.	D36	$500.00						$500.00					
23	1d (ii)	Ham-Brant Rail Trail	Granular	Loose Surface	None	Reapply limestone screenings for 45m from parking lot	Apply 50mm limestone screening surface per standard detail D36.	D36	$1,000.00						$1,000.00					
24	1d (ii)	Ham-Brant Rail Trail	Asphalt	None	Wayfinding Sign	Provide directional sign. There is no wayfinding signage to indicate that the Cainsville Trail continues across the cul-de-sac. Add a map/wayfinding sign to the trail entrance.	Design and install directional sign per standard directional sign details D20 & D21.	D20, D21	$2,000.00											$2,000.00
25	1d (ii)	Ham-Brant Rail Trail	Asphalt	User Conflict Zone	None	Provide warning signs at cul de sac	Supply and install "Bicycles Yield to Vehicles Sign" (S6) per regulatory sign detail D23. Install on both approaches to cul-de-sac (x2).	S6, D23	$600.00											$600.00
26	1d (ii)	Ham-Brant Rail Trail	Granular	None	Seating	Recommend seating spaced at 300m from Mohawk St to Hwy 18	Supply and install benches on 125mm depth concrete pad spaced at 300m intervals per standard bench installation detail D18. (x7)	D18	$1,750.00											$1,750.00
27	1d (i)	Ham-Brant Rail Trail	Granular	None	Wayfinding Sign	Provide directional sign to provide directions to Cainsville and Brantford-Hamilton rail trail	Design and install directional sign per standard directional sign details D20 & D21.	D20, D21	$2,000.00											$2,000.00
28	1d (i)	Ham-Brant Rail Trail	Granular	Ponding/Saturation	None	Regrade and reapply granular on 15m of trail	Regrade for minimum cross fall of 2%. Add 100mm depth limestone screening surface per standard detail D36.	D36	$600.00						$600.00					
30	1d (i)	Ham-Brant Rail Trail	Asphalt	Asphalt Degradation	None	Repave 930m of trail from Greenwich St to Mohawk St. Repave trail within 5-years.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Remove or pulverize asphalt in place. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$80,000.00											$80,000.00
31	1d (i)	Ham-Brant Rail Trail	Asphalt	Asphalt Degradation	None	Repave 30m of trail and granular base.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$11,700.00						$11,700.00					
32	1d (i)	Ham-Brant Rail Trail	Granular	Loose Surface	None	Reapply limestone screenings for 265m from Greenwich St to Hamilton - Brantford Rail Trail. Regrade at low points where ponding evident.	Compact and embed loose gravel into existing trail surface using vibratory roller. Apply 50mm limestone screening surface per standard detail D36. Regrade for minimum cross fall of 2% as necessary.	D36	$5,500.00						$5,500.00					
34	1d (iii)	Ham-Brant Rail Trail	Asphalt	Asphalt Degradation	None	Repave 7m of trail	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$1,050.00						$1,050.00					
35	1d (iii)	Ham-Brant Rail Trail	Asphalt	Asphalt Degradation	None	Repave 5m of trail and granular base.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$1,500.00						$1,500.00					
36	1d (iii)	Ham-Brant Rail Trail	Asphalt	Asphalt Degradation	None	Repave 10m of trail and granular base	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$3,000.00						$3,000.00					
37	1d (iii)	Ham-Brant Rail Trail	Asphalt	Unpaved section	None	Repave 2m of trail and granular base. Pave ASAP.	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$1,000.00	$1,000.00										
39	1d (iii)	Ham-Brant Rail Trail	Granular	Loose Surface	None	Reapply limestone screenings for 400m from Birkett Lane	Compact and embed loose gravel into existing trail surface using vibratory roller. Apply 50mm limestone screening surface per standard detail D36.	D36	$7,000.00						$7,000.00					
43	1c (iv)	Ham-Brant Rail Trail	Granular	Loose Surface	None	Reapply limestone screenings for 650m from Birkett Lane to Erie Ave	Compact and embed loose gravel into existing trail surface using vibratory roller. Apply 50mm limestone screening surface per standard detail D36.	D36	$10,625.00						$10,625.00					
44	1c (iv)	Ham-Brant Rail Trail	Granular	Ponding/Saturation	None	Regrade and reapply granular on 30m of trail	Regrade for minimum cross fall of 2%. Add 100mm depth limestone screening surface per standard detail D36.	D36	$1,000.00						$1,000.00					
45	1c (iv)	Ham-Brant Rail Trail	Granular	Loose Surface	None	Resurface 500m section south of checkpoint to Birkett Lane.	Compact and embed loose gravel into existing trail surface using vibratory roller. Apply 50mm limestone screening surface per standard detail D36.	D36	$8,250.00						$8,250.00					
447	1c (iv)	Ham-Brant Rail Trail	Granular	Narrow Width	None	Replace with granular to minimum standard around warning bollards.	Excavate and remove existing vegetation and soils as required. Supply and install limestone trail surface replacement per granular trail detail (D36).	D36	$1,000.00						$1,000.00					
448	1d (iii)	Ham-Brant Rail Trail	Granular	Narrow Width	None	Replace with granular to minimum standard around warning bollards.	Excavate and remove existing vegetation and soils as required. Supply and install limestone trail surface replacement per granular trail detail (D36).	D36	$1,000.00						$1,000.00					
449	1d (iii)	Ham-Brant Rail Trail	Granular	Narrow Width	None	Replace with granular to minimum standard around warning bollards. Fix low points around bollards.	Excavate and remove existing vegetation and soils as required. Supply and install limestone trail surface replacement per granular trail detail (D36).	D36	$1,000.00						$1,000.00					
450	1d (ii)	Ham-Brant Rail Trail	Granular	Loose Surface	None	Reapply limestone screenings for 75m along tunnel	Apply 25mm limestone screening surface per standard detail D36.	D36	$1,350.00						$1,350.00					
451	1d (i)	Ham-Brant Rail Trail	Asphalt	Vegetation Encroachment	None	Prune encroaching vegetation	Prune vegetation encroaching on the trail crossing sign for eastbound trail users.	D11	$500.00	$500.00										
452	1d (iii)	Ham-Brant Rail Trail	Asphalt	Vegetation Encroachment	None	Prune encroaching vegetation	Prune vegetation encroaching on the Pedestrian and Bicycle Crossing Ahead (Wc-15) sign on Birkett Lane southbound.	D11	$500.00	$500.00										
216	1a (iv)	Henry St Trail	Asphalt	User Conflict Zone	None	Provide crossing line paint per OTM Book 18.	Provide Mixed Crossride (L7) line paint (40m). Place Bicycle Path Crossing Side Street signs (S10) along Henry St (x2).	L7, S10, D23	$4,200.00					$4,200.00						
217	1a (iv)	Henry St Trail	Asphalt	User Conflict Zone	None	Provide crossing line paint per OTM Book 18	Provide 20m of Elephant's Feet (L1) line paint (10m x2).	L1	$600.00											$600.00
218	1a (iv)	Henry St Trail	Asphalt	Asphalt Degradation	None	Repave 10m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$3,600.00					$3,600.00						
220	1a (iv)	Henry St Trail	Asphalt	Asphalt Degradation	None	Repave 15m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$5,400.00					$5,400.00						

Table 6 Audit Findings and Remediation Recommendations

GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	Recommended Implementation Year										
										2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
221	1a (iv)	Henry St Trail	Asphalt	User Conflict Zone	None	Provide tactile plates. Provide crossing line paint per OTM Book 18.	Provide Mixed Crossride (L7) line paint (40m). Place Bicycle Path Crossing Side Street signs (S10) along Henry St (x2). Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road.	L7, S10, D23, OPSD 310.039	$7,800.00				$7,800.00							
222	1a (iv)	Henry St Trail	Asphalt	User Conflict Zone	None	Provide warning signs. Provide line paint. Provide tactile plates. Provide crossing line paint per OTM Book 18.	Provide Combined Crossride (L6) line paint (12m). Cut curbs to fit. Place Bicycle Path Crossing Side Street signs (S10) along Henry St. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road (x2).	L6, S10, OPSD 310.039	$5,220.00											$5,220.00
223	1a (iv)	Henry St Trail	Asphalt	Asphalt Degradation	None	Repave 200m of trail from Central Entrance to East Entrance to plaza. Widen to minimum standard. Shift from back of curb where feasible.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and remove subsoil as required to widen. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$45,000.00									$45,000.00		
224	1a (iv)	Henry St Trail	Asphalt	User Conflict Zone	None	Provide tactile plates. Provide crossing line paint per OTM Book 18.	Provide Mixed Crossride (L7) line paint (40m). Place Bicycle Path Crossing Side Street signs (S10) along Henry St (x2).	L7, S10, D23	$4,200.00											$4,200.00
225	1a (iv)	Henry St Trail	Asphalt	User Conflict Zone	None	Provide warning signs. Provide line paint. Provide tactile plates.	Replace crosswalk with a Combined Crossride (L6) line paint (12m). Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road.	L6, OPSD 310.039	$5,500.00											$5,500.00
441	1a (iv)	Henry St Trail	Asphalt	Asphalt Degradation	None	Repave 20m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$7,200.00				$7,200.00							
442	1a (iv)	Henry St Trail	Asphalt	User Conflict Zone	None	Provide tactile plates.	Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road.	OPSD 310.039	$3,600.00											$3,600.00
322	1c (iv)	LE&N Trail	Granular	Narrow Width	None	Replace with granular to minimum standard	Excavate and remove existing vegetation and soils as required. Supply and install limestone trail surface replacement per granular trail detail (D36).	D36	$1,000.00											$1,000.00
323	1c (iv)	LE&N Trail	Granular	Narrow Width	None	Replace with granular to minimum standard	Excavate and remove existing vegetation and soils as required. Supply and install limestone trail surface replacement per granular trail detail (D36).	D36	$1,000.00											$1,000.00
326	1c (iv)	LE&N Trail	Granular	None	Wayfinding Sign	Upgrade to current sign standard	Design and install trail marker bollard per standard detail D19.	D19	$1,000.00											$1,000.00
328	1c (iv)	LE&N Trail	Asphalt	Asphalt Degradation	None	Repave 5m of trail	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$1,500.00				$1,500.00							
329	1c (ii)	LE&N Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on both approaches to slope (x2).	NS2. D23	$600.00											$600.00
330	1c (ii)	LE&N Trail	Asphalt	Asphalt Degradation	None	Repave 10m of trail	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$3,000.00				$3,000.00							
331	1c (ii)	LE&N Trail	Asphalt	User Conflict Zone	None	Provide tactile warning plates	Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road.	OPSD 310.039	$3,600.00											$3,600.00
403	1c (i)	Oak Hill Trail	Asphalt	Asphalt Degradation	None	Recommend replacing asphalt between roads (90m). Widen to minimum standard. Provide Tactile Plates	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Excavate and remove existing soils. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road.	D11, OPSD 310.039	$18,000.00	$18,000.00										
404	1c (i)	Oak Hill Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs. Provide Warning Sign.	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Downgrade Warning Sigh (S7) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2, D23, S7	$900.00											$900.00
405	1c (i)	Oak Hill Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs. Provide Warning Sign	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Downgrade Warning Sigh (S7) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2, D23, S7	$900.00											$900.00
406	1c (i)	Oak Hill Trail	Granular	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Do not grind stump.	OPSS Prov 201	$500.00	$500.00										
407	1c (i)	Oak Hill Trail	Asphalt	Blind Corner	None	Prune back understory. Provide warning signs.	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Prune back understory.	NS1, D23	$1,600.00				$1,600.00							
408	1c (i)	Oak Hill Trail	Asphalt	Blind Corner	None	Provide warning signs	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2).	NS1, D23	$1,600.00				$1,600.00							
409	1c (i)	Oak Hill Trail	Asphalt	User Conflict Zone	None	Trail crosses Robinson road. Update crossing signs and line paint to OTM book 18.	Provide stop bar on asphalt trail. Remove line paint from road as crossing is not currently controlled.	N/A	$400.00	$400.00										
354	1a (i)	Powerline Trail	Asphalt	Asphalt Degradation	None	Repave and realign trail off of catch basin as feasible (20m). ASAP.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt and soil as necessary. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$6,000.00	$6,000.00										
370	1a (i)	Powerline Trail	Asphalt	Asphalt Degradation	None	Repave 650m of trail from King George Rd to 422 Powerline Rd within 5-10yr window.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and remove subsoil as required to widen. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$125,000.00								$125,000.00			
456	1a (i)	Royal Oak Park Trail	Dirt	Narrow Width	None	Replace with asphalt for 175m. Match 2m width of existing entrance trail off of Royal Park Dr.	Supply and install 2.0m wide asphalt trail and base replacement per new asphalt trail detail (D11). Excavate and remove existing soils as required. Clear and grub tree roots. Remove approximately 4 trees to accommodate. Ensure minimum cross slope of 2%. Remediate edges with topsoil and sod. Install swales on either side of trail between 256 and 258 Memorial Dr to transfer flow from eaves troughs.Install park/directional sign at trail and Memorial Dr. Alternative option to install asphalt trail only between 256 & 258 Memorial Dr and limestone trail on top of existing grade within woodlot to avoid tree removals and grubbing of live tree roots.	OPSS Prov 201, D11	$45,000.00		$45,000.00								
53	1c (ii)	SC Johnson Trail	Asphalt	None	Bike Rack	Provide bike rack	Supply and install Greenspoke 3 Arch Angled Bike Rack (850040) surface mounted to 125mm depth concrete pad.	MBR-400	$1,200.00											$1,200.00
54	1c (ii)	SC Johnson Trail	Asphalt	None	Seating	Recommend seating spaced at 300m from Morell St to Lafayette Ave	Supply and install benches on 125mm depth concrete pad spaced at 300m intervals per standard bench installation detail D18. (x9)	D18	$22,500.00											$22,500.00
59	1c (ii)	SC Johnson Trail	Asphalt	User Conflict Zone	Wayfinding Sign	Provide warning signs and line paint. Provide Tactile plates.	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to road.	NS1, D23, OPSD 310.039	$4,800.00											$4,800.00

Table 6 Audit Findings and Remediation Recommendations

										Recommended Implementation Year										
GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
60	1c (ii)	SC Johnson Trail	Asphalt	Blind Corner	None	Prune back understory	Remove understorey on inside radius of curve. Curve radius of approximately 13m. Create unobstructed view 10m from inside edge of trail.	N/A	$2,000.00											$2,000.00
64	1c (ii)	SC Johnson Trail	Asphalt	User Conflict Zone	None	Provide warning signs and line paint	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
65	1c (ii)	SC Johnson Trail	Asphalt	None	Seating	Recommend seating spaced at 300m from Morell St to Colborne St W	Supply and install benches on 125mm depth concrete pad spaced at 300m intervals per standard bench installation detail D18. (x5)	D18	$12,500.00											$12,500.00
66	1c (ii)	SC Johnson Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2)	NS2, D23	$600.00											$600.00
67	1c (ii)	SC Johnson Trail	Asphalt	Asphalt Degradation	None	Pothole at water valve. Raise valve.	Raise valve to finished grade.	N/A	$500.00	$500.00										
68	1c (ii)	SC Johnson Trail	Asphalt	Excessive Longitudinal Slopes	None	Safety issues to be addressed by Trail Realignment Under Lorne Bridge	No action.	N/A	$0.00											
69	1c (ii)	SC Johnson Trail	Asphalt	Narrow Width	None	Safety issues to be addressed by Trail Realignment Under Lorne Bridge	No action.	N/A	$0.00											
70	1c (ii)	SC Johnson Trail	Asphalt	Blind Corner	None	Safety issues to be addressed by Trail Realignment Under Lorne Bridge	No action.	N/A	$0.00											
71	1c (ii)	SC Johnson Trail	Asphalt	Excessive Longitudinal Slopes	None	Safety issues to be addressed by Trail Realignment Under Lorne Bridge	No action.	N/A	$0.00											
72	1c (ii)	SC Johnson Trail	Asphalt	Vegetation Encroachment	None	Safety issues to be addressed by Trail Realignment Under Lorne Bridge	No action.	N/A	$0.00											
73	1c (ii)	SC Johnson Trail	Granular	Loose Surface	None	Safety issues to be addressed by Trail Realignment Under Lorne Bridge	No action.	N/A	$0.00											
74	1c (ii)	SC Johnson Trail	Granular	User Conflict Zone	None	Safety issues to be addressed by Trail Realignment Under Lorne Bridge	No action.	N/A	$0.00											
76	1c (ii)	SC Johnson Trail	Asphalt	Asphalt Degradation	None	Repave 450m of trail from lcomm dr past Brantford skate plaza to Earl Hagg family fun park. Replace in 5 yr. window.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Remove or pulverize asphalt in place. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$50,000.00						$50,000.00					
77	1c (ii)	SC Johnson Trail	Asphalt	User Conflict Zone	None	Provide warning signs.	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at intersection with sidewalk. Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23. Install at each approach Shark's Teeth Yield Lines (x2).	L4, S5, D23	$800.00										$800.00
78	1c (ii)	SC Johnson Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at either end of conflict zone with Brant's Crossing Pavilion. Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23. Install at each approach Shark's Teeth Yield Lines (x2).	L4, S5, D23	$800.00										$800.00
79	1c (ii)	SC Johnson Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
80	1c (ii)	SC Johnson Trail	Asphalt	User Conflict Zone	None	Provide warning signs and line paint	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
81	1c (ii)	SC Johnson Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
82	1c (ii)	SC Johnson Trail	Asphalt	User Conflict Zone	Wayfinding Sign	Provide warning signs and line paint. Provide directional sign	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at intersection with sidewalk. Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23. Install at each approach Shark's Teeth Yield Lines (x1). Design and install directional sign per standard directional sign details D20 & D21.	L4, S5, D23	$2,400.00										$2,400.00
83	1c (ii)	SC Johnson Trail	Asphalt	None	Asphalt path connection	Connect asphalt path to sidewalk at desire line (37m). Add warning sign at sidewalk. Add trail intersection signs at new trail intersection.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Excavate and remove existing soils. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed. Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at intersection with sidewalk and existing trail. Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23. Install at approach to sidewalk (x1). Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to existing trail (x1).	D11, L4, S5, S2, D23	$9,000.00										$9,000.00
84	1c (ii)	SC Johnson Trail	Asphalt	Asphalt Degradation	None	Repave 5m of trail	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$750.00	$750.00										
85	1c (ii)	SC Johnson Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2)	NS2, D23	$600.00											$600.00
86	1c (ii)	SC Johnson Trail	Asphalt	Asphalt Degradation	None	Repave 130m of trail. From point to triangle park.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Remove or pulverize asphalt in place. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$15,000.00											$15,000.00
87	1c (ii)	SC Johnson Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersections.	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at each approach to triangle intersection. Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23. Install at each approach Shark's Teeth Yield Lines (x3).	L4, S5, D23	$1,200.00										$1,200.00
88	1c (ii)	SC Johnson Trail	Asphalt	Vegetation Encroachment	None	Prune encroaching vegetation	Prune all vegetation within trail clearance zone (600mm) per new asphalt trail detail (D11).	D11	$500.00	$500.00										
89	1c (ii)	SC Johnson Trail	Asphalt	Asphalt Degradation	None	Repave 250m of trail from Triangle Park to Veterans Memorial Pkwy.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Remove or pulverize asphalt in place. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$28,000.00											$28,000.00

Table 6 Audit Findings and Remediation Recommendations

GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	Recommended Implementation Year										
										2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
90	1c (ii)	SC Johnson Trail	Asphalt	Asphalt Degradation	None	Repave 5m and 8m section of highly degraded trail	Supply and install 3.0m wide asphalt trail and granular base replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed.	D11	$1,500.00	$1,500.00										
91	1c (ii)	SC Johnson Trail	Asphalt	Steep side slope	None	Provide side rails for approximately 60m	Supply and install BS30 Bikesafe (or approved alternative) 1400mm galvanized railing on slope side of trail per detail BS30.	BS30	$30,000.00											$30,000.00
92	1c (ii)	SC Johnson Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Do not grind stump.	OPSS Prov 201	$500.00	$500.00										
93	1c (ii)	SC Johnson Trail	Asphalt	User Conflict Zone	None	Provide warning signs and line paint	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	L4, S2, D23	$400.00										$400.00
94	1c (ii)	SC Johnson Trail	Granular	User Conflict Zone	None	Provide warning signs and line paint	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at intersection with sidewalk. Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23. Install at each approach Shark's Teeth Yield Lines (x1).	L4, S5, D23	$400.00											$400.00
95	1c (ii)	SC Johnson Trail	Granular	None	Seating, Waste Receptacle and Wayfinding Sign	Provide seating, garbage and wayfinding sign.	Supply and install bench on 125mm depth concrete pad at trail start per standard bench installation detail D18. (x1) Supply and install Garbage Can and Post per detail (D32). Design and install directional sign per standard directional sign details D20 & D21.	D18, D32, D20, D21	$5,500.00											$5,500.00
96	1c (ii)	SC Johnson Trail	Granular	Hazard Tree/Branch	None	Remove hazard branch	Remove dead branches. Grind and remove from site.	OPSS Prov 201	$500.00	$500.00										
97	1c (ii)	SC Johnson Trail	Asphalt	Uneven transition	None	Replace with asphalt to minimum standard for 100m.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Excavate and remove existing soils. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed.	D11	$20,000.00							$20,000.00				
98	1c (ii)	SC Johnson Trail	Asphalt	Vegetation Encroachment	None	Prune encroaching vegetation	Prune all vegetation within trail clearance zone (600mm) per new asphalt trail detail (D11).	D11	$500.00	$500.00										
101	1c (ii)	SC Johnson Trail	Asphalt	None	Wayfinding Sign	Provide directional sign. Directional sign pointing to right for asphalt trail. Warning sign for blind corner pointing in both directions.	Design and install directional sign per standard directional sign details D20 & D21. Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2).	D20, D21, D23, NS1	$2,600.00											$2,600.00
102	1c (ii)	SC Johnson Trail	Asphalt	Asphalt Degradation	None	Repave at surface transition	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$500.00	$500.00										
373	1b (iv)	SC Johnson Trail	Granular	CPTED	None	Potential hiding point. Clear understory.	Clear understory at trail intersection	OPSS Prov 201	$1,000.00											$1,000.00
374	1b (iv)	SC Johnson Trail	Granular	User Conflict Zone	None	Provide trail intersection line paint	Provide 8m of Elephant's Feet (L1) line paint (8m x2).	L1	$480.00											$480.00
375	1b (iv)	SC Johnson Trail	Granular	User Conflict Zone	None	Provide trail intersection line paint	Provide 8m of Elephant's Feet (L1) line paint (8m x2).	L1	$480.00											$480.00
377	1b (iv)	SC Johnson Trail	Granular	Erosion	None	Shore up edges with permanent erosion control	Apply topsoil and sod at erosion point	N/A	$200.00	$200.00										
378	1b (iv)	SC Johnson Trail	Granular	Erosion	None	Shore up edges with permanent erosion control	Supply and install topsoil, erosion control blanket (Terrafix C200 or approved alternative) and OSC Woodland Native Seed Mix (8275)	Terrafix C200, OSC 8275	$300.00	$300.00										
379	1b (iv)	SC Johnson Trail	Granular	Erosion	None	Shore up edges with permanent erosion control	Supply and install topsoil, erosion control blanket (Terrafix C200 or approved alternative) and OSC Woodland Native Seed Mix (8275)	Terrafix C200, OSC 8275	$300.00	$300.00										
380	1b (iv)	SC Johnson Trail	Granular	CPTED	None	Potential hiding point. Clear understory.	Clear understory at trail intersection	OPSS Prov 201	$1,000.00											$1,000.00
381	1b (iv)	SC Johnson Trail	Granular	Erosion	None	Shore up edge with permanent erosion control	Supply and install topsoil, erosion control blanket (Terrafix C200 or approved alternative) and OSC Woodland Native Seed Mix (8275)	Terrafix C200, OSC 8275	$300.00	$300.00										
382	1b (iv)	SC Johnson Trail	Granular	Erosion	None	Shore up edges with permanent erosion control	Supply and install topsoil, erosion control blanket (Terrafix C200 or approved alternative) and OSC Woodland Native Seed Mix (8275)	Terrafix C200, OSC 8275	$300.00	$300.00										
383	1b (iv)	SC Johnson Trail	Granular	CPTED	None	Potential hiding point. Clear understory.	Clear understory at trail intersection	OPSS Prov 201	$1,000.00											$1,000.00
384	1b (iv)	SC Johnson Trail	Granular	CPTED	None	Potential hiding point. Clear understory.	Clear understory at trail intersection	OPSS Prov 201	$1,000.00											$1,000.00
385	1b (iii)	SC Johnson Trail	Granular	Loose Surface	None	Repave at surface transition	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$500.00	$500.00										
386	1b (iv)	SC Johnson Trail	Granular	User Conflict Zone	None	Multiple driveways cross the trail. Upgrade crossing signs as necessary.	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at trail yield signs where asphalt paving exists.	L4	$300.00											$300.00
387	1b (iv)	SC Johnson Trail	Granular	Steep Side Slope	None	Provide side rails for approximately 15m	Supply and install BS30 Bikesafe (or approved alternative) 1400mm galvanized railing on slope side of trail per detail BS30.	BS30	$7,500.00											$7,500.00
388	1b (iv)	SC Johnson Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs. Provide Warning Sign	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Downgrade Warning Sigh (S7) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2, D23, S7	$900.00											$900.00
389	1b (iv)	SC Johnson Trail	Granular	Erosion	None	Regrade limestone path	Regrade for minimum cross fall of 2%. Apply 50mm limestone screening surface per standard detail D36.	D36	$500.00	$500.00										
390	1b (iv)	SC Johnson Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs. Provide Warning Sign	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Downgrade Warning Sigh (S7) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2, D23, S7	$900.00											$900.00
391	1b (iv)	SC Johnson Trail	Granular	Blind Corner	None	Prune back understory. Provide warning sign.	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Prune back understory.	NS1, D23	$1,600.00				$1,600.00							
392	1b (iv)	SC Johnson Trail	Granular	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$500.00	$500.00										
393	1b (iv)	SC Johnson Trail	Granular	Blind Corner	None	Prune back understory. Provide warning sign.	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Prune back understory.	NS1, D23	$1,600.00				$1,600.00							
394	1b (iv)	SC Johnson Trail	Granular	Narrow Width	None	Replace with granular to minimum standard for 15m	Supply and install 2.0m wide limestone trail surface replacement per granular trail detail (D36). Excavate and remove existing soils as required. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed.	D36	$700.00	$700.00										
395	1b (iv)	SC Johnson Trail	Granular	Hazard Tree/Branch	None	Remove hazard branch	Remove dead branches. Grind and remove from site.	OPSS Prov 201	$500.00	$500.00										

Table 6 Audit Findings and Remediation Recommendations

GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	Recommended Implementation Year										
										2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
396	1b (iv)	SC Johnson Trail	Granular	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Do not grind stump.	OPSS Prov 201	$500.00	$500.00										
397	1b (iv)	SC Johnson Trail	Granular	Blind Corner	None	Provide warning sign	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Prune back understory.	NS1, D23	$1,600.00				$1,600.00							
398	1b (iv)	SC Johnson Trail	Granular	Narrow Width	None	Replace with granular to minimum standard for 15m	Supply and install 2.0m wide limestone trail surface replacement per granular trail detail (D36). Excavate and remove existing soils as required. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed.	D36	$700.00											$700.00
399	1b (iv)	SC Johnson Trail	Asphalt	Blind Corner	None	Prune back understory. Provide warning signs.	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Prune back understory.	NS1, D23	$1,600.00				$1,600.00							
400	1b (iv)	SC Johnson Trail	Granular	Narrow Width	None	Replace with granular to minimum standard for 15m	Supply and install 2.0m wide limestone trail surface replacement per granular trail detail (D36). Excavate and remove existing soils as required. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed.	D36	$700.00											$700.00
401	1b (iv)	SC Johnson Trail	Granular	Blind Corner	None	Prune back understory. Provide warning signs.	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Prune back understory.	NS1, D23	$1,600.00				$1,600.00							
402	1b (iii)	SC Johnson Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs. Provide Warning Sign	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Downgrade Warning Sigh (S7) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2, D23, S7	$900.00											$900.00
410	1b (iii)	SC Johnson Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs. Provide Warning Sign	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Downgrade Warning Sigh (S7) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2, D23, S7	$900.00											$900.00
411	1b (iii)	SC Johnson Trail	Asphalt	Blind Corner	None	Prune back understory. Provide warning signs.	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Prune back understory.	NS1, D23	$1,600.00				$1,600.00							
412	1b (iii)	SC Johnson Trail	Asphalt	Blind Corner	None	Prune back understory. Provide warning signs.	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Prune back understory.	NS1, D23	$1,600.00				$1,600.00							
413	1b (iii)	SC Johnson Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs. Provide Warning Sign	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Downgrade Warning Sigh (S7) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2, D23, S7	$900.00											$900.00
414	1b (i)	SC Johnson Trail	Granular	Erosion	None	Resurface and regrade limestone path for 30m	Regrade for minimum cross fall of 2%. Apply 50mm limestone screening surface per standard detail D36.	D36	$1,000.00	$1,000.00										
415	1b (i)	SC Johnson Trail	Granular	User Conflict Zone	None	Provide tactile warning plates	Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Shave flush curb to 12mm height.	OPSD 310.039	$2,000.00											$2,000.00
416	1b (i)	SC Johnson Trail	Granular	None	Seating	Recommend seating spaced at 300m from Powerline Rd to Wilkes Dam	Supply and install benches on 125mm depth concrete pad spaced at 300m intervals per standard bench installation detail D18. (x18)	D18	$45,000.00											$45,000.00
417	1b (i)	SC Johnson Trail	Granular	Erosion	None	Resurface and regrade limestone path for 20m	Regrade for minimum cross fall of 2%. Apply 50mm limestone screening surface per standard detail D36.	D36	$1,000.00	$1,000.00										
418	1b (i)	SC Johnson Trail	Granular	Erosion	None	Shore up edges with permanent erosion control	Regrade for minimum cross fall of 2%. Reapply limestone screening surface per standard detail D36 to ensure main trail surface is uniform. Leave tertiary trail as is.	D36	$400.00	$400.00										
419	1b (iv)	SC Johnson Trail	Granular	None	Seating	Recommend seating spaced at 300m from Hardy Rd to 403	Supply and install benches on 125mm depth concrete pad spaced at 300m intervals per standard bench installation detail D18. (x6)	D18	$15,000.00											$15,000.00
420	1b (iii)	SC Johnson Trail	Granular	None	Wayfinding Sign	Provide directional sign	Design and install directional sign per standard directional sign details D20 & D21.	D20, D21	$2,000.00											$2,000.00
425	1c (ii)	SC Johnson Trail	Asphalt	Asphalt Degradation	None	Repave 40m of trail	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$6,000.00	$6,000.00										
426	1c (ii)	SC Johnson Trail	Asphalt	None	Wayfinding Sign	Provide directional sign	Design and install directional sign per standard directional sign details D20 & D21.	D20, D21	$2,000.00											$2,000.00
432	1b (iv)	SC Johnson Trail	Granular	Erosion	None	Shore up edges with permanent erosion control	Supply and install topsoil, erosion control blanket (Terrafix C200 or approved alternative) and OSC Woodland Native Seed Mix (8275)	Terrafix C200, OSC 8275	$300.00	$300.00										
433	1b (iv)	SC Johnson Trail	Granular	Blind Corner	None	Prune back understory. Provide warning signs.	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Prune back understory.	NS1, D23	$1,600.00				$1,600.00							
434	1b (i)	SC Johnson Trail	Granular	Blind Corner	None	Prune back understory. Provide warning sign.	Supply and install Blind Corner Sign (NS1) per regulatory sign detail D23. Install at each approach to corner (x2). Prune back understory.	NS1, D23	$1,600.00				$1,600.00							
246	1d (i)	Shallow Creek Trail	Granular	Hazard Tree/Branch	None	Remove hazard tree. 2 dead Ash	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$1,500.00	$1,500.00										
247	1d (i)	Shallow Creek Trail	Granular	Hazard Tree/Branch	None	Remove hazard tree. Several dead Ash on either side of trail	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$1,500.00	$1,500.00										
248	1d (i)	Shallow Creek Trail	Granular	User Conflict Zone	None	Provide tactile plates	Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to road. Both sides.	OPSD 310.039	$3,600.00											$3,600.00
250	1d (i)	Shallow Creek Trail	Granular	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$1,500.00	$1,500.00										
251	1d (i)	Shallow Creek Trail	Granular	None	Seating	Provide accessible concrete pads for seating along trail	Supply and install 125mm depth concrete pad around existing bench and connected to trail (D18).	D18	$400.00											$400.00
252	1d (i)	Shallow Creek Trail	Granular	Hazard Tree/Branch	None	Remove hazard tree. x2	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$1,500.00	$1,500.00										
253	1d (i)	Shallow Creek Trail	Granular	Narrow Width	None	Replace with granular to minimum standard for 45m	Supply and install 2.5m wide limestone trail surface replacement per granular trail detail (D36). Excavate and remove existing soils as required. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed.	D36	$2,000.00											$2,000.00
254	1d (i)	Shallow Creek Trail	Granular	User Conflict Zone	None	Provide tactile plates. Shift east access to align crossing (20m).	Supply and install 2.5m wide limestone trail surface replacement per granular trail detail (D36). Excavate and remove existing path and soils as required. Ensure minimum cross slope of 2%. Remediate former alignment and new edges with topsoil and seed. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approach to road. Both sides. Relocate stop sign. Restore existing curb cut. Cut new depressed curb	D36, OPSD 310.039	$7,000.00											$7,000.00

Table 6 Audit Findings and Remediation Recommendations

GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	Recommended Implementation Year										
										2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
256	1d (i)	Shallow Creek Trail	Granular	Erosion	None	Replace with granular to minimum standard width for 50m	Supply and install 2.5m wide limestone trail surface replacement per granular trail detail (D36). Excavate and remove existing soils as required. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed.	D36	$2,200.00											$2,200.00
258	1d (i)	Shallow Creek Trail	Asphalt	Asphalt Degradation	None	Fix surface transition	Top up and compact limestone screening as necessary (D36)	D36	$200.00	$200.00										
259	1d (i)	Shallow Creek Trail	Granular	Asphalt Degradation	None	Fix surface transition	Top up and compact limestone screening as necessary (D36)	D36	$200.00	$200.00										
260	1d (i)	Shallow Creek Trail	Granular	Hazard Tree/Branch	None	Remove hazard branch	Remove dead branches. Grind and remove from site.	OPSS Prov 201	$500.00	$500.00										
261	1d (i)	Shallow Creek Trail	Granular	Blind Corner	None	Provide warning sign	Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23. Install at approach to sidewalk (x1).	S5, D23	$300.00											$300.00
444	1d (i)	Shallow Creek Trail	Granular	Narrow Width	None	Replace with granular to minimum standard width for 45m	Supply and install 2.5m wide limestone trail surface replacement per granular trail detail (D36). Excavate and remove existing soils as required. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed.	D36	$3,150.00											$3,150.00
445	1d (i)	Shallow Creek Trail	Granular	None	Wayfinding Sign	Provide directional sign	Design and install directional sign per standard directional sign details D20 & D21.	D20. D21	$2,000.00											$2,000.00
446	1d (i)	Shallow Creek Trail	Granular	Narrow Width	None	Replace with granular to minimum standard for 35m	Supply and install 2.5m wide limestone trail surface replacement per granular trail detail (D36). Excavate and remove existing soils as required. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed.	D36	$2,750.00											$2,750.00
312	1c (ii)	Shellard Lane MUT	Asphalt	User Conflict Zone	None	Provide crossing line paint per OTM Book 18	Replace east crosswalk with a Combined Crossride (L6) line paint (12m) through the intersection. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Consider intersection treatment I2.	L6, I2, OPSD 310.039	$5,600.00											$5,600.00
317	1c (iii)	Shellard Lane MUT	Asphalt	User Conflict Zone	None	Provide intersection line paint	Clean up construction debris. Provide Mixed Crossride (L7) line paint (12m).	L7	$1,920.00											$1,920.00
318	1c (iii)	Shellard Lane MUT	Asphalt	User Conflict Zone	None	Relocate jersey barrier to stop parked cars from blocking trail. Crossing Line paint	Relocate jersey barriers to block parking. Provide Mixed Crossride (L7) line paint (12m).	L7	$1,920.00											$1,920.00
286	1c (i)	TH&B Rail Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection	Supply and install Yield Sign (S2) per regulatory sign detail D23 (x1). Minor trail entrance yields to main trail traffic flow.	S2. D23	$300.00											$300.00
287	1c (ii)	TH&B Rail Trail	Asphalt	Vegetation Encroachment	None	Suspected location of Giant Hogweed	Inspect area for Giant Hogweed. Treat if present.	N/A	$5,000.00											$5,000.00
288	1c (i)	TH&B Rail Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection	Supply and install Yield Sign (S2) per regulatory sign detail D23 (x1). Minor trail entrance yields to main trail traffic flow.	S2. D23	$300.00											$300.00
332	1c (ii)	VMP Trail	Asphalt	Asphalt Degradation	None	Rout and seal 30m of trail	Rout and seal 30m of trail per OPSS 1212 (Asphalt Joint Sealing)	OPSS 1212	$2,000.00				$2,000.00							
333	1c (ii)	VMP Trail	Asphalt	User Conflict Zone	None	Provide warning signs and line paint. Provide tactile plates.	Provide Combined Crossride (L6) line paint (12m) through the intersection and right turn channel. Cut curbs to fit. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Supply and install Sharp Turn Ahead Sign (S11 - WA-2L) per regulatory sign detail D23. Install on eastbound approach ahead of the right turn channel crossing. Consider intersection designs similar to I1 and I5.	L6, S11, D23, I1, I5, OPSD 310.039	$6,000.00											$6,000.00
334	1c (ii)	VMP Trail	Asphalt	Asphalt Degradation	None	Repave 50m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$18,000.00				$18,000.00							
336	1c (ii)	VMP Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at each approach to triangle intersection. Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23. Install at each approach Shark's Teeth Yield Lines (x3).	L4, S5, D23	$1,200.00											$1,200.00
337	1c (ii)	VMP Trail	Asphalt	Asphalt Degradation	None	Repave 5m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$1,800.00				$1,800.00							
339	1c (ii)	VMP Trail	Asphalt	Asphalt Degradation	None	Repave 50m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$18,000.00				$18,000.00							
340	1c (ii)	VMP Trail	Asphalt	None	Seating	Recommend seating spaced at 300m from Vet Mem Parkway To Conklin Rd	Supply and install benches on 125mm depth concrete pad spaced at 300m intervals per standard bench installation detail D18. (x6)	D18	$15,000.00											$15,000.00
341	1c (ii)	VMP Trail	Asphalt	Asphalt Degradation	None	Repave 20m of trail	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$6,000.00				$6,000.00							
342	1c (ii)	VMP Trail	Asphalt	Asphalt Degradation	None	Repave 30m of trail	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$9,000.00				$9,000.00							
422	1c (ii)	VMP Trail	Asphalt	User Conflict Zone	None	Provide crossing line paint per OTM Book 18. Provide tactile plates.	Provide Combined Crossride (L6) line paint (12m) through both legs of the intersection. Cut curbs to fit. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Supply and install Sharp Turn Ahead Sign (S11 - WA-2L) per regulatory sign detail D23. Install ahead of downhill segment on the southbound approach. Consider intersection treatment I2.	L6, S11, D23, I2, OPSD 310.039	$6,000.00											$6,000.00
424	1c (ii)	VMP Trail	Asphalt	User Conflict Zone	None	Provide crossing line paint per OTM Book 18	Replace east crosswalk with a Combined Crossride (L6) line paint (12m) through the intersection. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Consider intersection treatment I2.	L6, I2, OPSD 310.039	$5,500.00											$5,500.00
184	1a (ii)	WG Pkwy Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$500.00	$500.00										
186	1a (ii)	WG Pkwy Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$500.00	$500.00										
189	1a (ii)	WG Pkwy Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard branch	Remove dead branches. Grind and remove from site.	OPSS Prov 201	$500.00	$500.00										
190	1a (ii)	WG Pkwy Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree. 5 dead/dying Ash & others.	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$2,500.00	$2,500.00										

Table 6 Audit Findings and Remediation Recommendations

GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	Recommended Implementation Year										
										2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
192	1a (ii)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x1). Minor trail entrance yields to main trail traffic flow.	S2, D23	$400.00										$400.00
196	1a (ii)	WG Pkwy Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$500.00	$500.00										
197	1a (ii)	WG Pkwy Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs, provide warning signs and line paint	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrance to main trail and at intersection with sidewalk. Supply and install Yield Sign (S2) per regulatory sign detail D23 at trail intersection (x1). Minor trail entrance yields to main trail traffic flow. Supply and install Cyclists Yield to Pedestrians Sign (S5) per regulatory sign detail D23 at sidewalk (x1). Minor trail entrance yields to main trail traffic flow.	NS2, D23, S2, S5	$1,300.00										$1,300.00
199	1a (ii)	WG Pkwy Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard trees. Two dying Ash.	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$1,000.00	$1,000.00										
200	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 5m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$1,800.00		$1,800.00									
201	1a (ii)	WG Pkwy Trail	Asphalt	Ponding/Saturation	None	Repave 15m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$5,400.00		$5,400.00									
202	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 20m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$7,200.00		$7,200.00									
203	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 5m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$1,800.00		$1,800.00									
204	1a (ii)	WG Pkwy Trail	Asphalt	None	Accessible concrete pad	Provide accessible concrete pads for seating along trail	Supply and install 125mm depth concrete pad at bench with connection to trail per standard bench installation detail D18. (x1)	D18	$400.00											$400.00
205	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 40m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$14,400.00		$14,400.00									
206	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 60m of trail and granular base. Start point.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$21,600.00			$21,600.00								
207	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 60m of trail and granular base. End point.	End point													
208	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 12m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$4,320.00		$4,320.00									
209	1a (ii)	WG Pkwy Trail	Asphalt	Ponding/Saturation	None	Repave 20m of trail and granular base. Regrade.	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed. Regrade for minimum 2% cross slope.	D12	$7,200.00		$7,200.00									
210	1a (ii)	WG Pkwy Trail	Asphalt	None	Seating	Recommend seating spaced at 300m from Dunsdon St to Hwy 403	Supply and install benches on 125mm depth concrete pad spaced at 300m intervals per standard bench installation detail D18. (x6)	D18	$15,000.00			$15,000.00								
211	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 12m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$4,320.00			$4,320.00								
212	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 30m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$10,800.00			$10,800.00								
213	1a (ii)	WG Pkwy Trail	Asphalt	Narrow Width	None	Replace with asphalt to minimum standard for 12m	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Excavate and remove existing soils. Ensure minimum cross slope of 2%. Remediate edges with topsoil and seed.	D11	$3,600.00			$3,600.00								
214	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 12m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$4,320.00			$4,320.00								
215	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 20m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$7,200.00			$7,200.00								
226	1a (iv)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide warning signs. Provide line paint. Provide tactile plates. Provide crossing line paint per OTM Book 18.	Replace crosswalk with a Combined Crossride (L6) line paint (12m). Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Consider intersection treatment I2.	L6, I2, OPSD 310.039	$5,500.00											$5,500.00
227	1a (iv)	WG Pkwy Trail	Asphalt	Hazard Tree/Branch	None	Remove hazard tree. x2.	Remove dead tree to grade. Grind and remove from site. Grind stump and restore with topsoil and seed.	OPSS Prov 201	$750.00	$750.00										
228	1a (iv)	WG Pkwy Trail	Asphalt	Ponding/Saturation	None	Repave 20m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$7,200.00			$7,200.00								
229	1a (iv)	WG Pkwy Trail	Asphalt	Excessive Longitudinal Slopes	None	Provide accessibility signs	Supply and install Accessibility Sign (NS2) per regulatory sign detail D23. Install on all approaches to slope (x2). Supply and install Downgrade Warning Sigh (S7) per regulatory sign detail D23. Install on approach to downslope (x1)	NS2, D23, S7	$900.00											$900.00

Table 6 Audit Findings and Remediation Recommendations

GPS/ Map ID	Figure #	Trail Name	Trail Type	Safety Issue	Amenity Opportunity	Proposed Solution	Treatment Description	Report Ref #	Estimated Cost	Recommended Implementation Year										
										2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032+
230	1a (iv)	WG Pkwy Trail	Asphalt	Slope Stability	None	Repave 100m of trail and granular base from bridge	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$22,200.00				$22,200.00							
232	1a (iv)	WG Pkwy Trail	Asphalt	Ponding/Saturation	None	Repave 5m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$1,800.00				$1,800.00							
233	1a (iv)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide tactile plates. Provide warning signs. Provide crossing line paint per OTM Book 18.	Provide Combined Crossride (L6) line paint (12m). Remove the Dismount and Walk sign (Rb-70 OTM). Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Repaint the stop lines on the trail ahead of the crossing. Consider intersection treatment I2.	L6, I2, OPSD 310.039	$6,000.00												$6,000.00
234	1a (iv)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 10m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$3,600.00			$3,600.00								
235	1a (iv)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide warning signs. Provide tactile plates. Provide crossing line paint per OTM Book 18.	Provide Combined Crossride (L6) line paint (12m). Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Supply and install Stop Bar and Stop Sign (S1) per regulatory sign detail D23 at each approach (x2). Consider intersection treatment I4.	L6, I4, OPSD 310.039, S1, D23	$6,600.00												$6,600.00
236	1a (iv)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 18m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$6,500.00			$6,500.00								
237	1a (iv)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave at surface transition	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail detail (D11). Cut and remove asphalt. Top up with granular A, compact and fine grade. Remediate edges with topsoil and seed	D11	$500.00			$500.00								
238	1a (iv)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 150m of trail and granular base from bridge to on-ramp	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$33,500.00			$33,500.00								
239	1a (iv)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 25m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$9,000.00			$9,000.00								
240	1a (ii)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 11m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$4,000.00			$4,000.00								
241	1a (iv)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide crossing line paint per OTM Book 18	Provide Mixed Crossride (L7) line paint (40m). Place Bicycle Path Crossing Side Street signs (S10) along Wayne Gretzky Pkwy (x1).	L7, S10, D23	$3,900.00											$3,900.00
242	1a (iv)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 8m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$2,900.00				$2,900.00							
243	1a (iv)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Repave 8m of trail and granular base	Supply and install 3.0m wide asphalt trail surface replacement per new asphalt trail in road right of way detail (D12). Cut and remove asphalt and subsoil. Install granular A, compact and fine grade. Remediate edges with topsoil and seed	D12	$2,900.00				$2,900.00							
436	1a (iv)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide warning signs at trail intersection.	Supply and install reduced size "Shark's Teeth Yield Lines" (L4) Line Paint at tertiary trail entrances to main trail. Supply and install Yield Sign (S2) per regulatory sign detail D23. Install at approach to Shark's Teeth Yield Lines (x2). Minor trail entrance yields to main trail traffic flow. Consider intersection treatments I2 and I5.	L4, S2, D23, I2, I5	$800.00												$800.00
437	1a (iv)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide warning signs and tactile plates. Provide crossing line paint per OTM Book 18.	Supply and install Pedestrian and Bicycle Crossing Ahead (WC-15) (S12) on road per regulatory sign detail D23. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Consider intersection treatment I4. Opportunity to re-evaluate intersection design in future study.	S12. D23, I4, OPSD 310.039	$3,900.00												$3,900.00
438	1a (iv)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide warning signs and tactile plates. Provide crossing line paint per OTM Book 18.	Supply and install Pedestrian and Bicycle Crossing Ahead (WC-15) (S12) on road per regulatory sign detail D23. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Consider intersection treatment I4. Opportunity to re-evaluate intersection design in future study.	S12. D23, I4, OPSD 310.039	$3,900.00												$3,900.00
440	1a (iv)	WG Pkwy Trail	Asphalt	Asphalt Degradation	None	Shave flush curb to eliminate lip.	Shave curb flush at transition to asphalt.	N/A	$500.00				$500.00							
443	1a (iv)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide warning signs. Provide line paint. Provide tactile plates. Provide crossing line paint per OTM Book 18.	Provide Combined Crossride (L6) line paint (12m). Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Consider intersection treatment I2.	L6, I2, OPSD 310.039	$5,500.00												$5,500.00
453	1a (ii)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide tactile plates. Provide crossing line paint per OTM Book 18.	Provide Combined Crossride (L6) line paint (12m) through two legs of the intersection. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road (currently only provided at the northeast corner). Consider intersection treatment I2.	L6, I2, OPSD 310.039	$5,500.00												$5,500.00
454	1a (ii)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide tactile plates. Provide crossing line paint per OTM Book 18.	Provide Combined Crossride (L6) line paint (12m) through the intersection. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Consider intersection treatment I2. Opportunity to re-evaluate intersection design, the southbound right turn lane results in a challenging southbound crossing for pedestrians and cyclists from the northwest corner.	L6, I2, OPSD 310.039	$5,500.00												$5,500.00

Table 6 Audit Findings and Remediation Recommendations

										Recommended Implementation Year										
GPS/ Map ID	**Figure #**	**Trail Name**	**Trail Type**	**Safety Issue**	**Amenity Opportunity**	**Proposed Solution**	**Treatment Description**	**Report Ref #**	**Estimated Cost**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032+**
455	1a (iv)	WG Pkwy Trail	Asphalt	User Conflict Zone	None	Provide tactile plates. Provide crossing line paint per OTM Book 18.	Provide Combined Crossride (L6) line paint (12m) through the intersection. Supply and install tactile plates (OPSD 310.039) on 125mm concrete pad at trail approaches to road. Consider intersection treatment I2.	L6, I2, OPSD 310.039	$5,500.00											$5,500.00
							Total Estimated Cost		$1,936,645.00											
							Estimated Cost Per Phase			$116,600.00	$114,120.00	$131,140.00	$135,400.00	$120,000.00	$108,775.00	$110,200.00	$125,000.00	$133,800.00	$110,850.00	$730,760.00

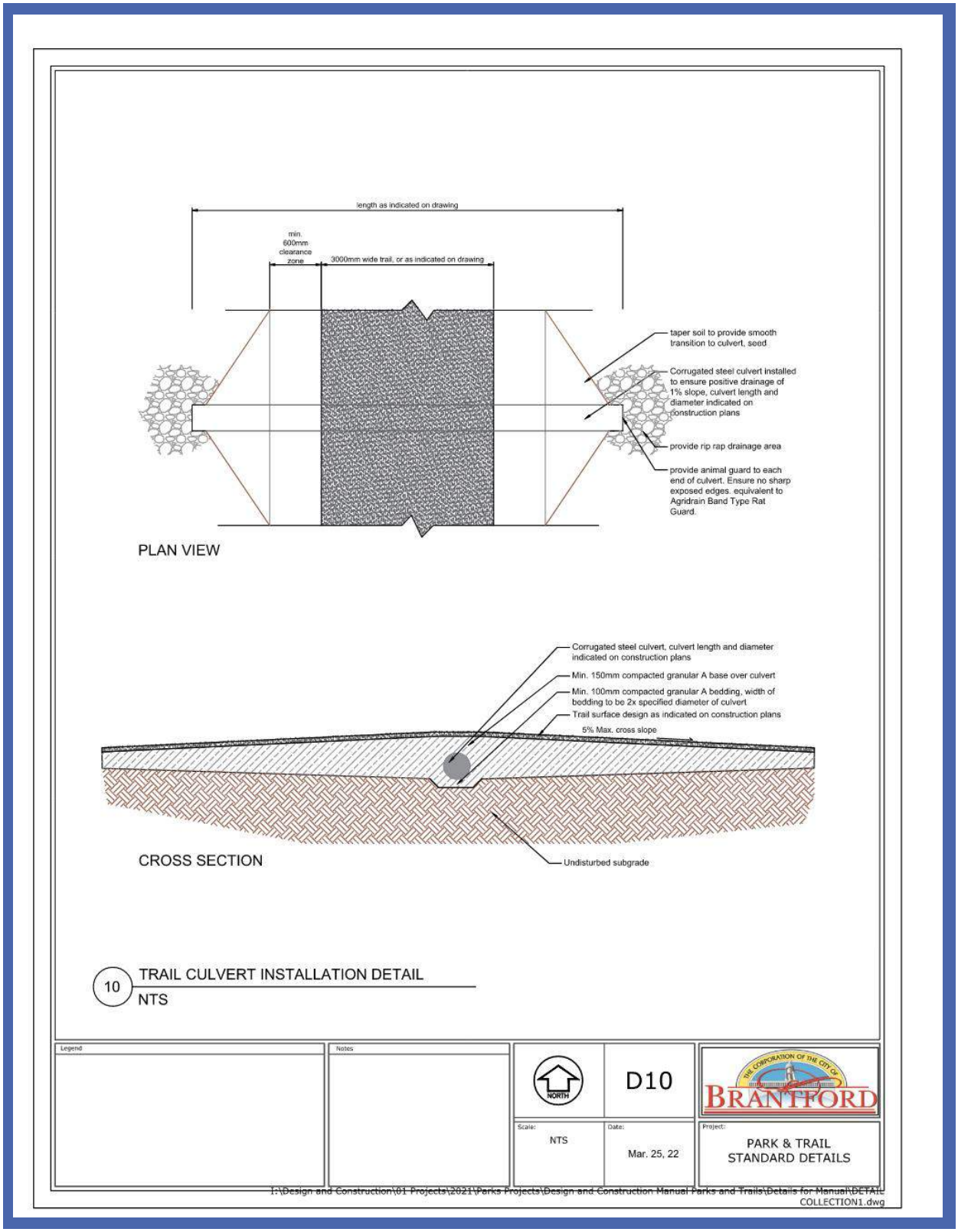
4 STANDARD DETAILS AND NON-STANDARD SCHEMATICS

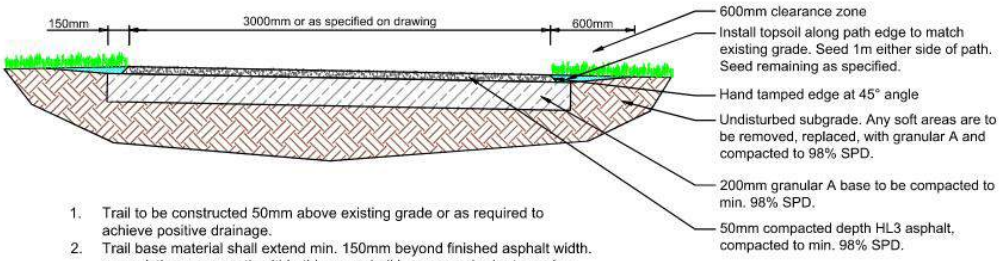
4.1 STANDARD DETAILS

Table 7 Standard Details illustrates standard detail treatments for cycling facilities and trail/park amenities in the City of Brantford as found in the City of Brantford Design Guidelines: Design and Construction Manual Parks and Off-road Trails. Where City Standards did not cover recommendations, additional details are provided. Detail numbers are referenced in **Table 6 Audit Findings and Remediation Recommendations**. Many of the safety issues noted in the Mapping can be remedied by reconstructing trails (either in part or in full) or installing elements using the standard details. Where directional and AODA signs are recommended, detailed design of custom content will be required in addition to the placement recommendations made.

Cost estimates for works are provided in **Table 6 Audit Findings and Remediation Recommendations**. Each recommendation has been assigned a number that is referenced in the **Table 6 Audit Findings and Remediation Recommendations** (e.g. GPS/Map ID number 6 calls for wayfinding detail D20 & D21 in the Report Ref # Column).

Table 7 Standard Details





1. Trail to be constructed 50mm above existing grade or as required to achieve positive drainage.
2. Trail base material shall extend min. 150mm beyond finished asphalt width. any existing overgrowth within this area shall be removed prior to paving.
3. Trail to follow existing topography. Sheet drainage across path may be necessary as per site conditions. maximum cross fall across pathway shall not exceed 2%.
4. Remove excess material off site unless otherwise directed by the city representative.
5. Minor trail edge repair will only require ± 100mm city approved topsoil, fine grade, and seed. any large disturbed areas and areas where erosion is occurring are to receive 150mm topsoil, fine grade, and seed or sod as directed by the city representative.
6. Clearance zone shall match gradient of path and shall remain free of obstruction.
7. All excess asphalt material (i.e spillage, dumps, etc.) shall be cleaned up and removed from site immediately following paving.
8. All asphalt connections to existing asphalt must be saw cut with no loose material prior to paving connection

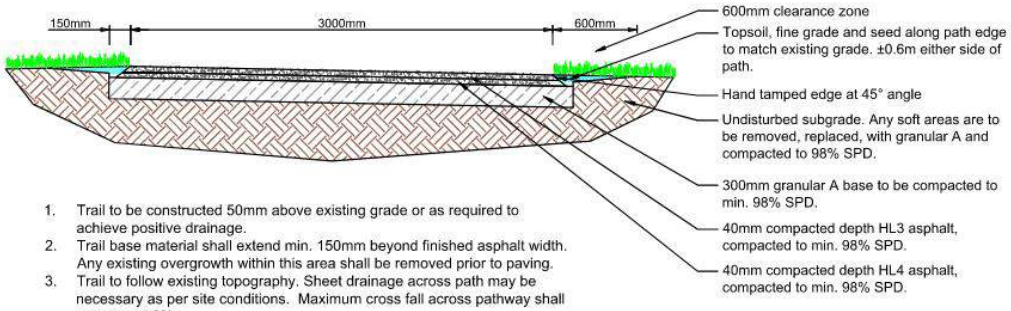
11 NEW ASPHALT TRAIL DETAIL
NTS

Legend	Notes	NORTH	D11
		Scale: NTS	Date: Mar. 25, 22

THE CORPORATION OF THE CITY OF BRANTFORD

Project: PARK & TRAIL STANDARD DETAILS

I:\Design and Construction\01 Projects\2021\Parks Projects\Design and Construction Manual Parks and Trails\Details for Manual\DETAIL COLLECTION1.dwg



1. Trail to be constructed 50mm above existing grade or as required to achieve positive drainage.
2. Trail base material shall extend min. 150mm beyond finished asphalt width. Any existing overgrowth within this area shall be removed prior to paving.
3. Trail to follow existing topography. Sheet drainage across path may be necessary as per site conditions. Maximum cross fall across pathway shall not exceed 2%.
4. Remove excess material off site unless otherwise directed by the city representative.
5. Minor trail edge repair requires ±100mm depth city approved topsoil, fine grade, and seed. Any additional disturbed areas are to receive 100mm topsoil, fine grade, and seed or sod as directed by the city representative.
6. Clearance zone shall match gradient of path and shall remain free of obstruction.
7. All excess asphalt material (i.e spillage, dumps, etc.) shall be cleaned up and removed from site immediately following paving.
8. All asphalt connections to existing asphalt must be saw cut with no loose material prior to paving connection

12 NEW ASPHALT TRAIL IN ROAD RIGHT OF WAY DETAIL
NTS

Legend

Notes

NORTH

D12

THE CORPORATION OF THE CITY OF BRANTFORD

Scale: NTS

Date: Mar. 25, 22

Project: PARK & TRAIL STANDARD DETAILS

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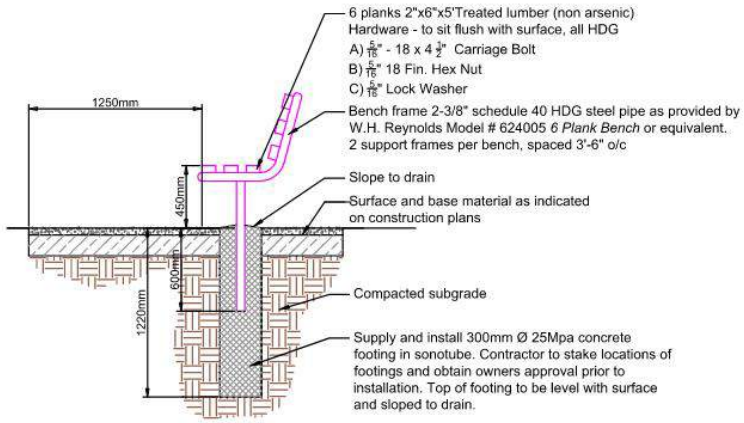

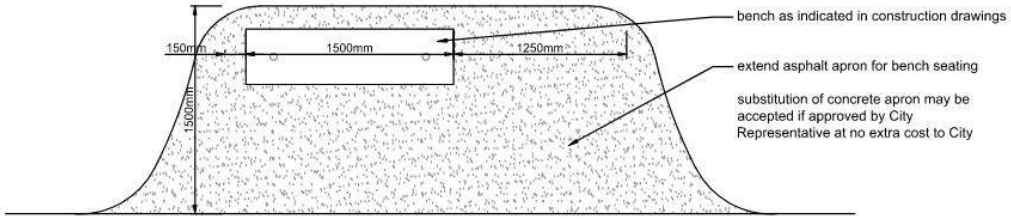

ACCESSIBLE ACCESS Existing Trail

18 BENCH INSTALLATION DETAIL
NTS

Legend

Notes

NORTH

D18

THE CORPORATION OF THE CITY OF BRANTFORD

Scale: NTS

Date: Mar. 25, 22

Project: PARK & TRAIL STANDARD DETAILS

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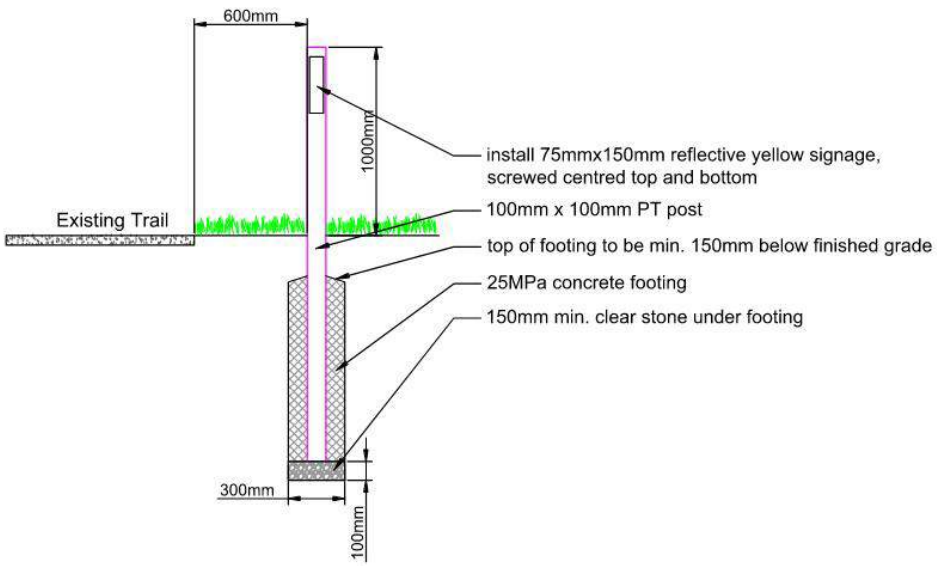

19 TRAIL MARKER BOLLARD DETAIL
NTS

Legend	Notes	NORTH	D19
		Scale: NTS	Date: Mar. 25, 22

THE CORPORATION OF THE CITY OF BRANTFORD

Project: PARK & TRAIL STANDARD DETAILS

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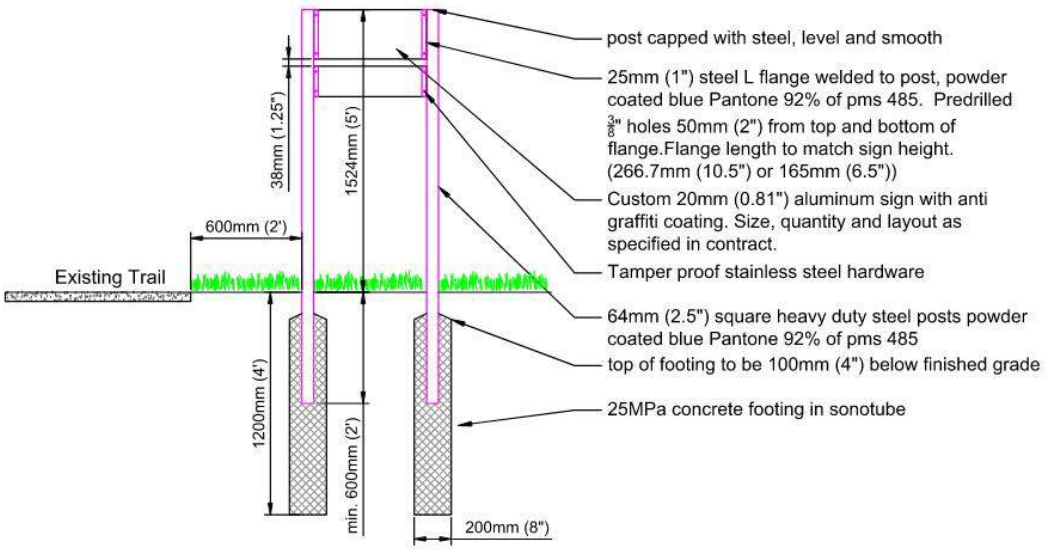

20 DIRECTIONAL SIGN INSTALLATION DETAIL
NTS

Legend	Notes		
		NORTH D20	THE CORPORATION OF THE CITY OF BRANTFORD
		Scale: NTS	Date: Mar. 25, 22
			Project: PARK & TRAIL STANDARD DETAILS

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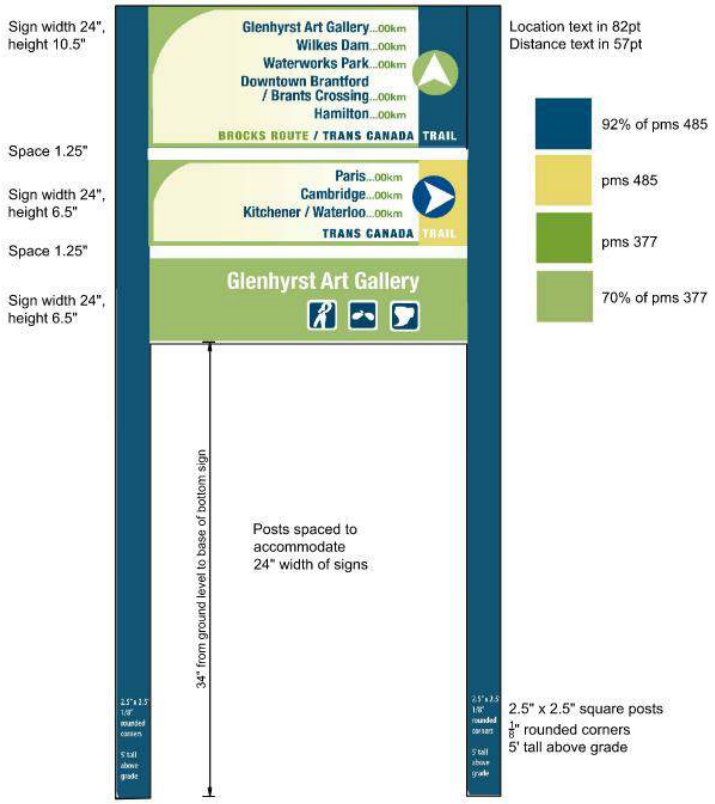

21 DIRECTIONAL SIGN DETAIL
NTS

Legend	Notes	NORTH	D21
		Scale: NTS	Date: Mar. 25, 22

THE CORPORATION OF THE CITY OF BRANTFORD

Project: PARK & TRAIL STANDARD DETAILS

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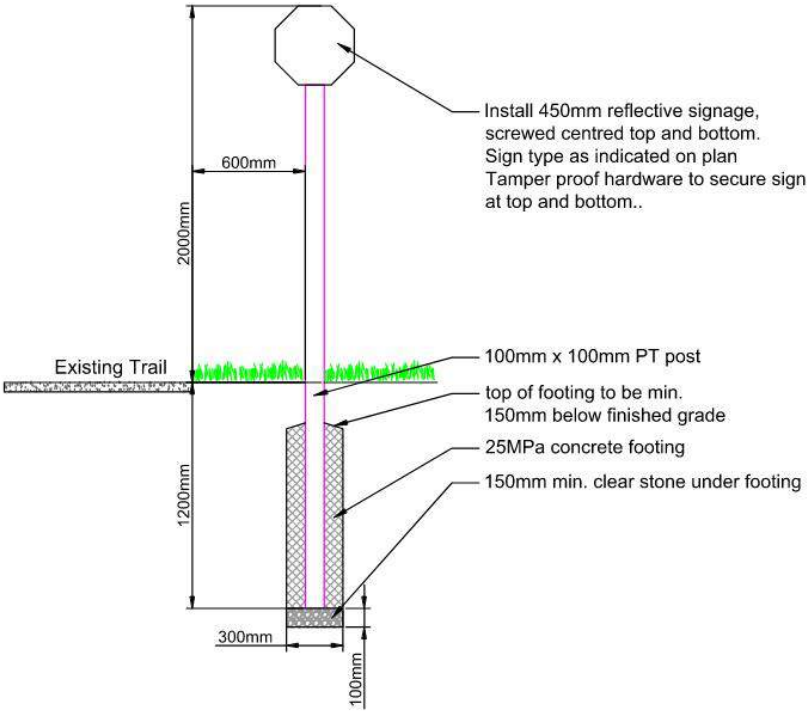

23 REGULATORY SIGN INSTALLATION DETAIL
NTS

Legend

Notes

NORTH

D23

THE CORPORATION OF THE CITY OF BRANTFORD

Scale: NTS

Date: Mar. 25, 22

Project: PARK & TRAIL STANDARD DETAILS

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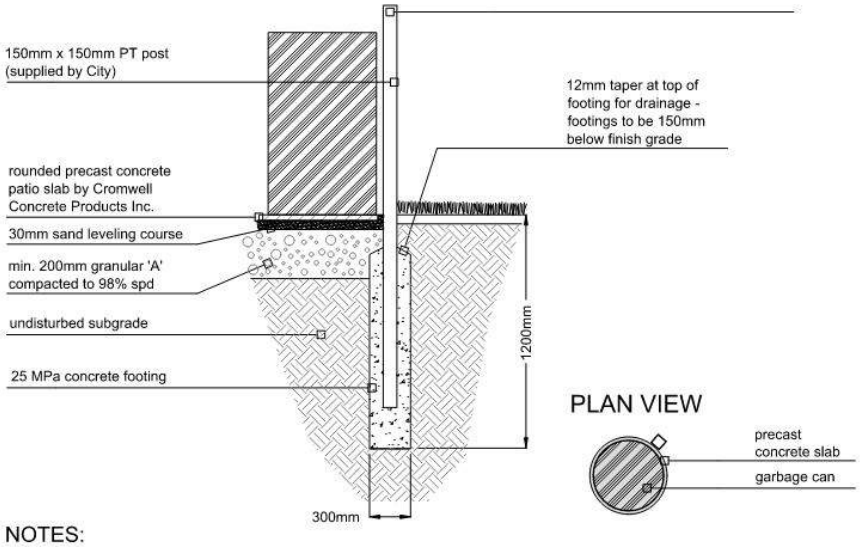

NOTES:

1. Paver types are as follows (or approved equal):

TYPE DESCRIPTION	SIZE	COLOUR
'A' Cromwell Concrete Products Inc.	36" Ø round slab	grey (to be approved by City Representative)

2. Unit pavers are 25-38mm thick. Contractor to provide samples on site to be approved by Landscape Architect and/or Owner.

32 GARBAGE CAN & POST DETAIL
NTS

Legend

Notes

NORTH

D32

THE CORPORATION OF THE CITY OF BRANTFORD

Scale: NTS

Date: Mar. 25, 22

Project: PARK & TRAIL STANDARD DETAILS

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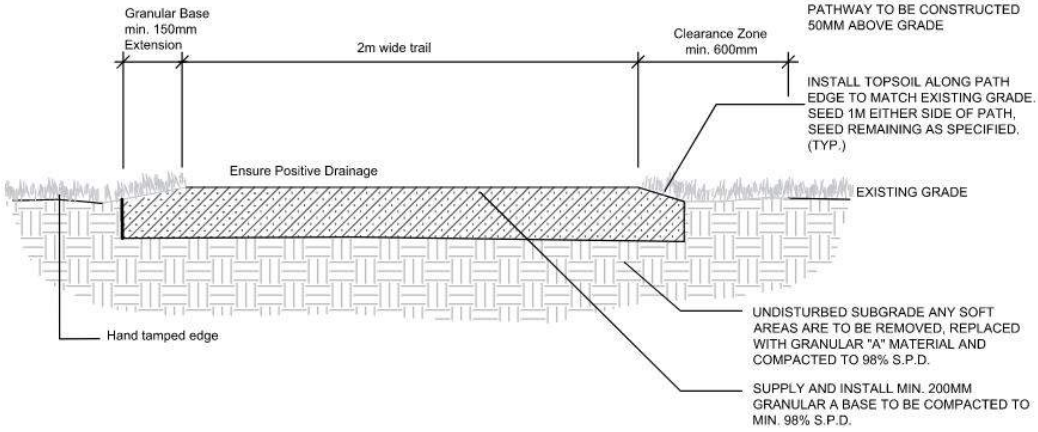

1. TRAIL TO BE CONSTRUCTED 50MM ABOVE EXISTING GRADE OR AS REQUIRED TO ACHIEVE POSITIVE DRAINAGE
2. TRAIL BASE MATERIAL SHALL EXTEND MIN. 150MM BEYOND FINISHED ASPHALT WIDTH. ANY EXISTING OVERGROWTH WITHIN THIS AREA SHALL BE REMOVED PRIOR TO PAVING.
3. TRAIL TO FOLLOW EXISTING TOPOGRAPHY. SHEET DRAINAGE ACROSS PATH MAY BE NECESSARY AS PER SITE CONDITIONS. MAXIMUM CROSS FALL ACROSS PATHWAY SHALL NOT EXCEED 2%.
4. REMOVE EXCESS MATERIAL OFF SITE UNLESS OTHERWISE DIRECTED BY THE CITY REPRESENTATIVE.
5. MINOR TRAIL EDGE REPAIR WILL ONLY REQUIRE ± 50MM CITY APPROVED TOPSOIL, FINE GRADE, AND SEED. ANY LARGE DISTURBED AREAS AND AREAS WHERE EROSION IS OCCURRING ARE TO RECEIVE 150MM TOPSOIL, FINE GRADE, AND SEED OR SOD AS DIRECTED BY THE CITY REPRESENTATIVE.
6. CLEARANCE ZONE SHALL MATCH GRADIENT OF PATH AND SHALL REMAIN FREE OF OBSTRUCTION.

36 GRANULAR TRAIL DETAIL
NTS

Legend	Notes	NORTH	D36
		Scale: NTS	Date: Mar. 25, 22
			Project: PARK & TRAIL STANDARD DETAILS

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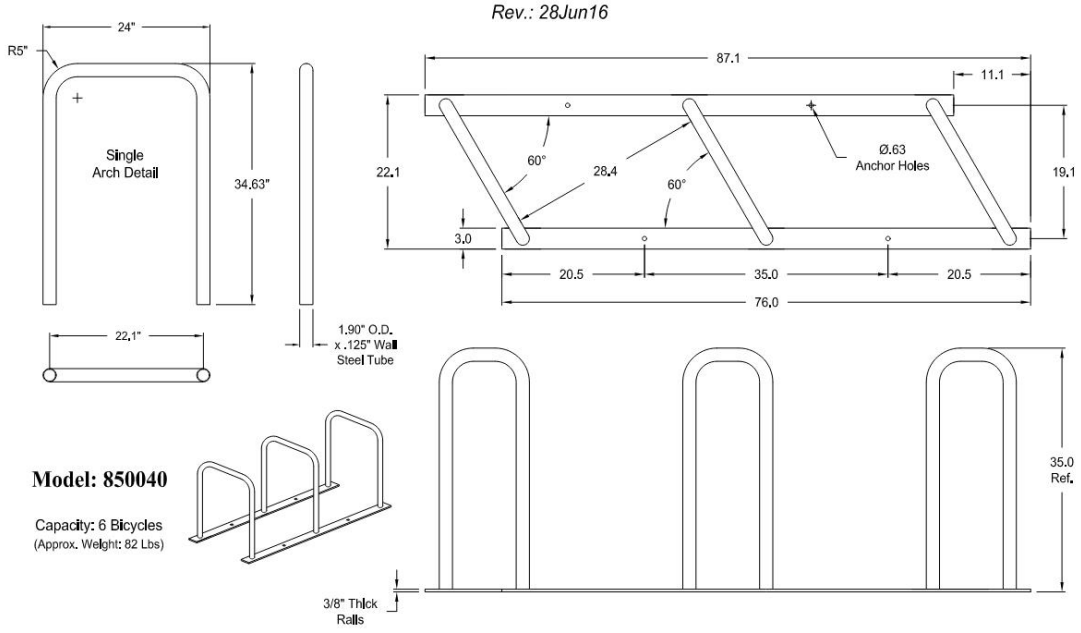
3 Arch Angled Bicycle Rack - Fully Welded, Surface Mount with Rails

- Specifications -

Rev.: 28Jun16



Model: 850040

Capacity: 6 Bicycles
(Approx. Weight: 82 Lbs)

Materials:
Tube: 1.90" O.D. x .125" Wall Steel Tube
Mounting Rails: 3/8" x 3" Steel Bar

Note: Anchoring Hardware Not Included.

Finish:
1) Polyester Powder over Zinc Rich Primer.
2) Hot Dip Galvanized.

Dimensions shown are in inches.

Greenspoke maintains a policy of continuous product improvement.
As a result, some details may change without notice.

GREENSPOKE
BIKE PARKING SOLUTIONS
1-844-888-9999
www.gogreenspoke.com

BS30 Bikesafe® Bikeway Barrier Specifications

BS30

Top Rail / Midrail & Bottom Rail

Bikeway barrier with offset top rail, midrail and bottom rail for level and rake

Key features

- Modular flexibility
- No-weld assembly
- Flat pack delivery
- Reduced corrosion
- Colour options
- Available ex-stock
- BIM & CAD Support

Applications suited to

- Cycle paths and bikeways
- Shared pedestrian paths
- Protection over culverts
- Footbridges
- Refer to applicable Aust Standards and Building Codes.

Specification Summary

Supply and install the proprietary BS30 barrier system to substrate according to Moddex specifications, or by a Moddex accredited installer.

Technical Data

Material	
Stanchions, rails & balustrades	Steel/grade C250 & 350
Clamp fittings	Malleable Cast iron
Clamp locking screws	Stainless steel (304)

Protective coating	
Stanchions, rails and balustrades	G390 Hot-dip Galvanized (min 390g/m²)
Clamp fittings	Hot-dip Galvanized with patented protective coating on threads
Optional	Powder coating and paint specs*

*The standard process for Powder Coated and Painted handrail products is as follows: black steel is used for fabrication. The steel is sand blasted and a zinc primer coating is applied. The powder coat / paint coat is then applied over the zinc primer creating a dual shield coating with a decorative finish.

Dimensions

Variable depending on building/application/code

Stanchions	
Diameter	48.3mm OD 41.9mm ID
Nominal Thickness	3.2mm - 4.0mm (loading dependent)

Rails	
Diameter	48.3mm OD 41.9mm ID
Nominal Thickness	3.2mm

Clamp fittings	
Thickness	5.0mm (approx)
Locking screws	M12 x 1.75 x 11mm - DEXX® Drive

Weight

Variable depending on building/application/code

Stanchion with clamps	7.2 to 8.0kg
Rail @ 6.0m	21.6kg
Balustrade Panel @ 2.0m	29kg

Fixings

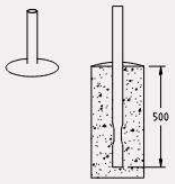
Stanchion attachment to

Concrete	M12 galvanized mechanical concrete anchor
Structural steel	M16 galvanized high tensile bolt set

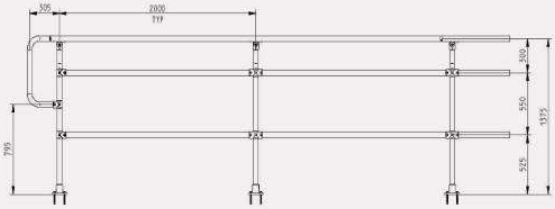
*Other Fixing options are availbie on request

Mount Dimensions

GD - Inground Mount



Technical Information



moddex.com

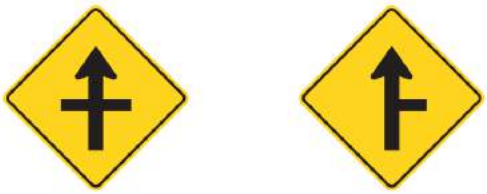
4.2 CYCLING FACILITY SIGN TREATMENTS

The following tables illustrate proposed signs for cycling facilities. **Table 8 Signage Treatments (OTM Book 18 Standards)** illustrates Ontario Standards. **Table 9 Signage Treatments (Non-Standard)** illustrates additional required signs not found in OTM Book 18. Relevant applications are provided for each treatment. Cost estimates for signs are provided in **Table 6 Audit Findings and Remediation Recommendations**. Each type has been assigned a number that is referenced in **Table 6 Audit Findings and Remediation Recommendations**. (e.g. GPS/Map ID number 25 calls for sign detail S6 in the Report Ref # Column).

Table 8 Signage Treatments (OTM Book 18 Standards)

Ref #	Treatment Type	Application
S1	 Stop Sign	At uncontrolled crossings, a stop (Ra-1 OTM) or yield (Ra-2 OTM) sign should face cycling traffic.
S2	 Yield Sign	At uncontrolled crossings, a stop (Ra-1 OTM) or yield (Ra-2 OTM) sign should face cycling traffic.
S3	 Dismount and Walk Sign	The Dismount and Walk sign (Rb-70 OTM), directs people riding bikes to dismount and walk their bikes where it may be beneficial for safety, such as through very narrow cross-sections, where a multi-use path transitions to a sidewalk, or at crossings where a designated bicycle crossing has not been provided (OTM Book 18, 2021).

S4	 Shared Pathway Sign	The Shared Pathway sign (Rb-71 OTM), may be installed along in-boulevard multi-use paths to indicate that users are expected to share the space on the path. It may be placed on the far side of intersections and other decision points (OTM Book 18, 2021).
S5	 Yield to Pedestrians Sign	The Bicycles Yield to Pedestrians (Ra-16 OTM) sign may be placed at locations where people riding bikes are required to yield to pedestrians, such as at pedestrian crossings of in-boulevard cycling facilities or at transit stops. Yield line (shark's teeth) pavement markings should be implemented in conjunction with this sign. (OTM Book 18, 2021).
S6	 Bicycles Yield to Vehicles Sign	The Bicycles Yield to Vehicles (Ra-17 OTM) sign may be placed where there is an uncontrolled crossing of a roadway from a designated bicycle facility and significant conflicts have been identified or are anticipated due to high volumes of cyclists, high volumes of vehicles, high speeds and/or high levels of driver workload. Instructs cyclists to yield right-of-way to motorists. Sample applications: points where a cycle track crosses a highway on/off ramp (OTM Book 18, 2021).
S7	 Downgrade Warning Sign	The Downgrade Warning (WA-41 TAC) sign may be placed in advance of a downgrade of 10% or is longer than 50 m. Sample application: in advance of an extended downgrade (OTM Book 18, 2021).

S8	 Slow Watch For Turning Vehicles Sign	Where turning vehicles may cross the cycling facility, a Slow Watch for Turning Vehicles (Wc-38) sign may be placed 15m in advance of the intersection. This should only be used at a controlled intersection where the cyclist has the right-of-way (OTM Book 18, 2021).
S9	 Controlled Intersection Ahead Signs	The Controlled Intersection (Wa-11A and Wa-13A) signs, may be used along in-boulevard cycling facilities to alert people riding bikes to the presence of an intersection where they have right-of-way. These signs should only be used in circumstances where the intersecting street is under stop or yield control. These signs should not be used at signalized intersections or at intersections where the cyclist is required to stop or yield (OTM Book 18, 2021).
S10	 Bicycle Path Crossing Side Street Sign	The Bicycle Path Crossing Side Street Sign (WC37L & WC37R) are placed in advance of an intersection with a setback bicycle crossing on the minor street. Warns turning motorists to watch for cyclists that could be crossing the setback bicycle crossing. Sample applications: placed in advance of a street which features the crossing of a multi-use path (OTM Book 18, 2021).
S11		A sharp turn sign (WA-2R/L) should be used to warn trail users of turns in the path could create a hazardous condition (Toronto Multi-Use Trail Design Guidelines, 2015).

S12		A Pedestrian and Bicycle Crossing Ahead (Wc-15) sign should be used to warn motorists that they are approaching a bicycle or multi-use path crossing. (OTM Book 18, 2021)

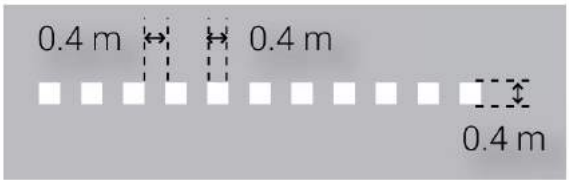
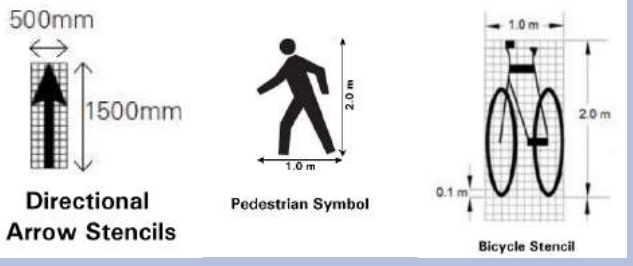
Table 9 Signage Treatments (Non-Standard)

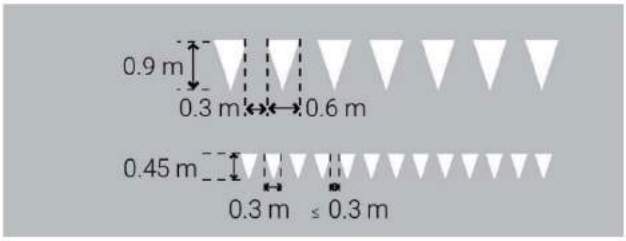
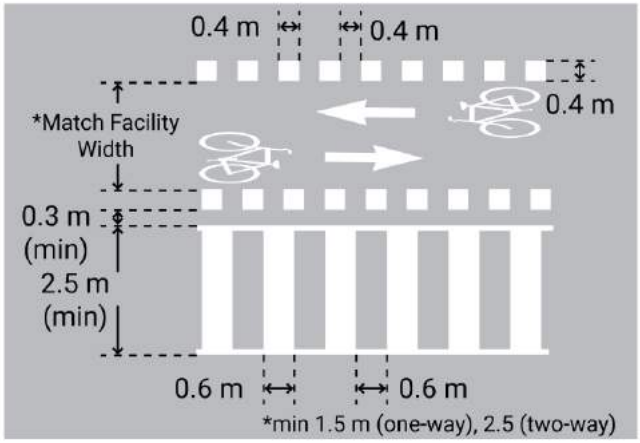
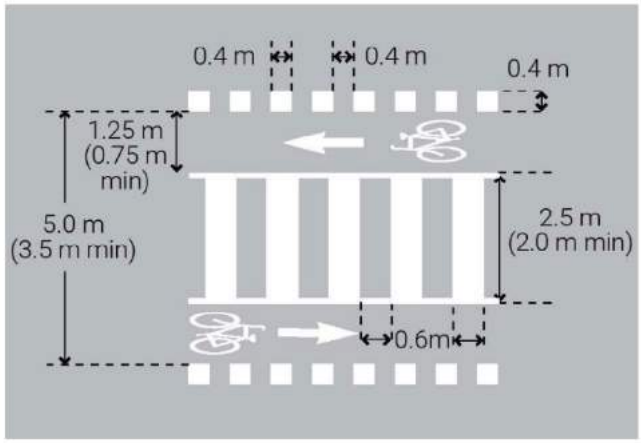
Ref #	Treatment Type	Application
NS1		Where obstacles at sharp curves in the trail impede views of oncoming users, a Blind Corner Ahead sign should face cycling traffic.
NS2		Where slopes exceed 5% maximum for exterior paths of travel, an Accessibility Sign should be placed at the base and top of slope facing oncoming traffic.

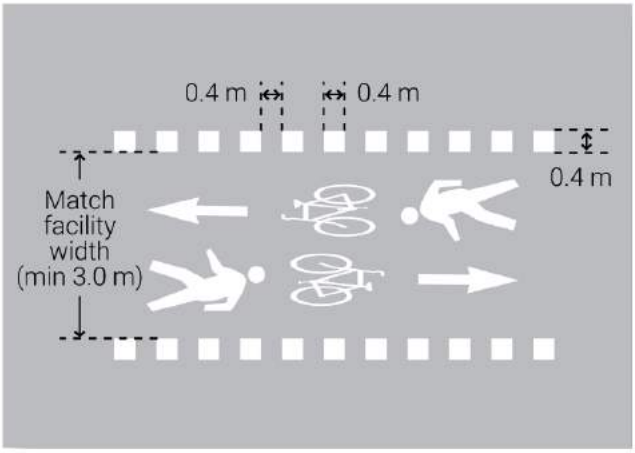
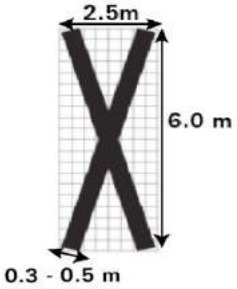
4.3 LINEPAINT TREATMENTS

The following table illustrates typical pavement marking treatments for cycling facilities in Ontario. Dimensions are provided, as are relevant applications for each treatment. Pavement markings can be applied in either water-based (non-durable) or Durable Liquid Pavement Marking (DLPM), with reapplication required every 1-2 years for water-based markings and every 3-7 years for DLPM. Cost estimates for signs are provided in the **Table 6 Audit Findings and Remediation Recommendations** (costs reflect water-based paint application). Each type has been assigned a number that is referenced in the **Table 6 Audit Findings and Remediation Recommendations**. (e.g. GPS/Map ID number 77 calls for line paint detail L4 in the Report Ref # Column).

Table 10 Linepaint Treatments (OTM Book 18 Standards)

Ref #	Treatment Type	Application
L1	 Crossride Markings ("Elephant's Feet")	Used as border lines to delineate a cyclist's path of travel within a crossride. May be applied either adjacent to or within the cycling travel path (OTM Book 18, 2021).
L2	 Broken Yellow Line	Directional dividing line for two-way cycle track or multi-use path (solid 100 mm yellow line may also be used) (OTM Book 18, 2021).
L3	 	Sample pavement markings for a multi-use path, including solid and broken directional dividing line, bicycle and pedestrian stencil plus directional arrows (OTM Book 18, 2021).

L4	 **Yield Lines "Shark's Teeth".**	Placed at a roadway approach to a cycling crossing or a cycling facility approach to a pedestrian crossing, to visually reinforce a requirement to yield. Reduced size dimensions are applied on cycling facilities, as shown (OTM Book 18, 2021).
L5	 **Separate Crossride**	Crossride which maintains the longitudinal separation of cyclist and pedestrian travel by providing separated space for each mode (OTM Book 18, 2021).
L6	 **Combined Crossride**	Typically employed where cyclists and pedestrians approach a crossing within a shared facility, such as a multi-use path. Unidirectional bicycle crossings are placed on each side of a central pedestrian crossing (OTM Book 18, 2021).

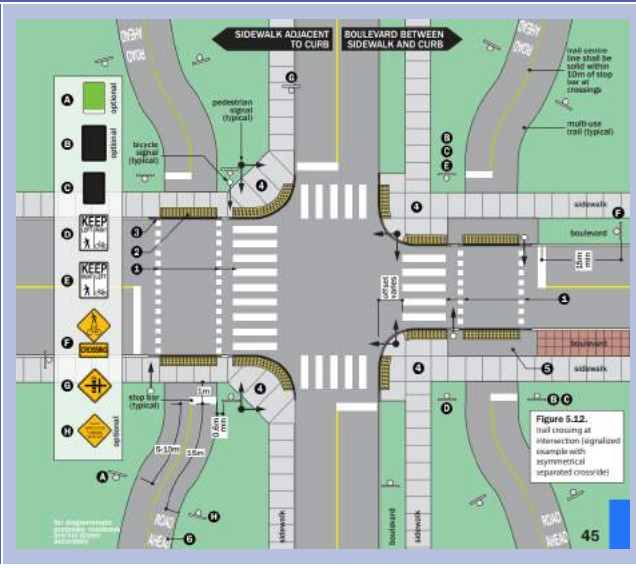
L7	 **Mixed Crossride**	Applied at intersections with low traffic volumes where cyclists and pedestrians approach within a shared facility, such as a multi-use path. Under the *Highway Traffic Act*, mixed crossrides cannot be implemented at signalized intersections (OTM Book 18, 2021).
L8	 **Railway Crossing Symbol**	Placed in advance of a railroad crossing to inform cyclists and motorists of an approaching at-grade crossing (OTM Book 18, 2021).

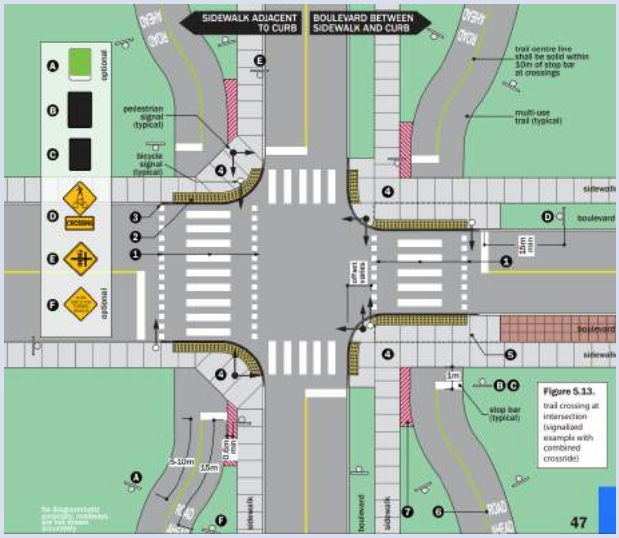
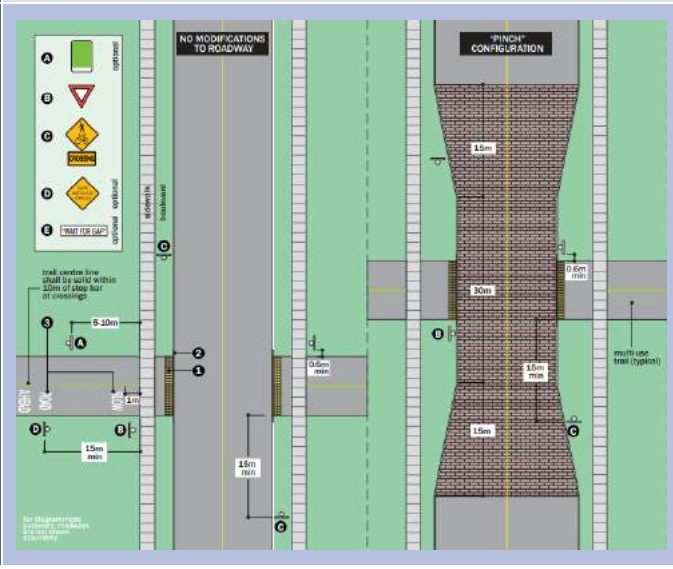
4.4 INTERSECTION DESIGN SCHEMATICS

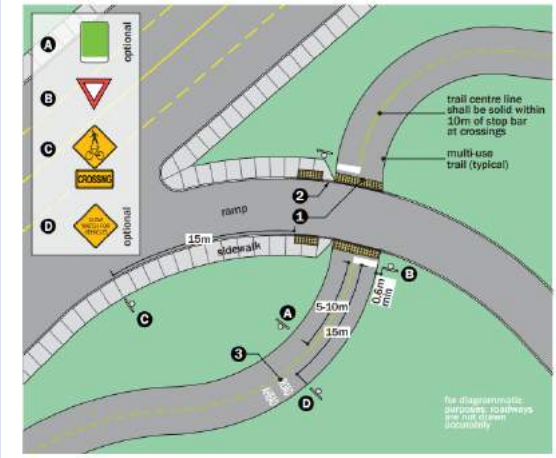
The following table illustrates sample design schematics for intersection designs with multi-use path crossings from the City of Toronto's Multi-Use Trail Design Guidelines (2015) and OTM Book 18 (2021). The schematics are intended for inspiration on the typical layout of pavement markings and signage for multi-use path crossings for future consideration. The designs are not intended to cover every scenario or serve as definitive functional designs for any of the intersections evaluated as part of the audit. Designers should apply latest intersection design best practices (for example from OTM Book 18) to the context of each intersection.

Each type has been assigned a number that is referenced in the **Table 6 Audit Findings and Remediation Recommendations**. (e.g. GPS/Map ID number 226 suggests considering intersection design similar to I2 in the Report Ref # Column).

Table 11 Intersection Design Schematics (Toronto Multi-Use Trail Design Guidelines & OTM Book 18 Standards)

Ref #	Treatment Type	Application
I1		The separated crossride treatment is applicable for signalized intersections where separate sidewalks and trails are present and there is space available in the intersection. (Toronto Multi-Use Trail Design Guideline, 2015)

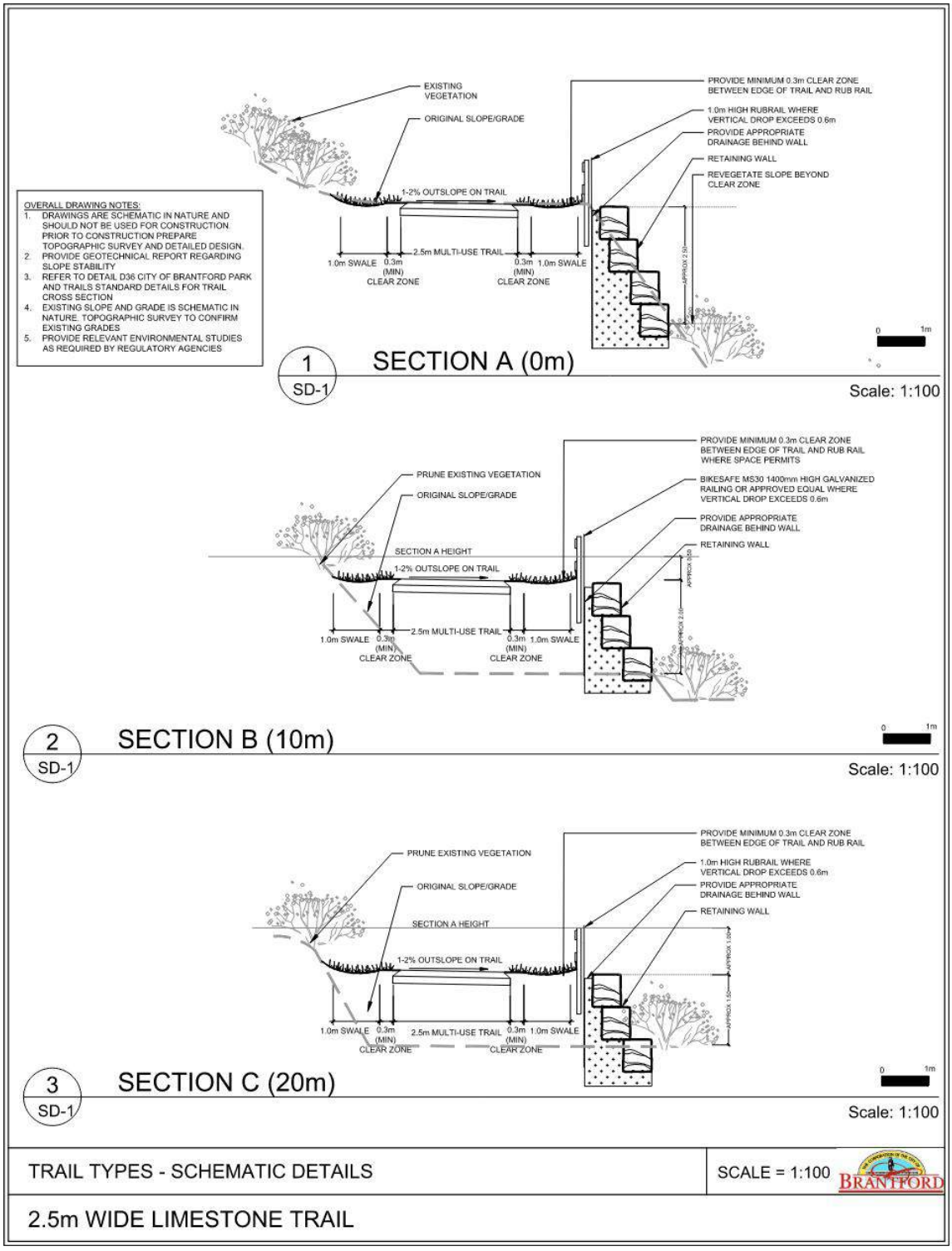
I2		The combined crossride treatment is applicable for signalized intersections where separate sidewalks and trails are present in close proximity, where the trail and sidewalk merge ahead of the intersection, or at intersections with limited space (for example at intersections with a centre median). (Toronto Multi-Use Trail Design Guideline, 2015)
I3		These mid-block crossing treatments are applicable at unsignalized intersections and show the typical placement of tactile walking surface indicators and signage. (Toronto Multi-Use Trail Design Guideline, 2015)

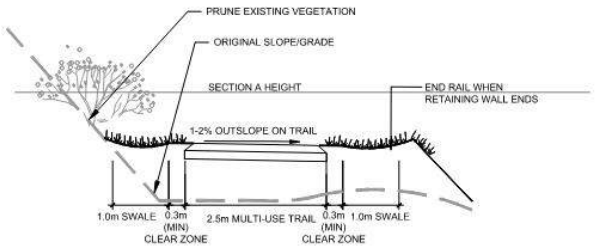
I4		On- and off-ramp treatments include advanced signage to warn motorists of the trail crossing and tactile surface indicators at each end of the trail before the crossing. (Toronto Multi-Use Trail Design Guideline, 2015)
I5		Sample crossing treatment for dedicated cycling facilities across a right-turn channel which can be adapted for multi-use trail. (OTM Book 18, 2021)

4.5 DESIGN SCHEMATICS

The following figures illustrate schematic designs treatments for safety issues where solutions were not covered by City standard details or OTM Book 18 sign and line paint treatments. Where required, the schematics call for further topographic survey and detailed design, as well as additional studies. Cost estimates for works are provided in the **Table 6 Audit Findings and Remediation Recommendations** (costs reflect construction only, and do not cover additional design and studies). Each type has been assigned a number that is referenced in the **Table 6 Audit Findings and Remediation Recommendations**. (e.g. GPS/Map ID number 12 calls for schematic detail SD-2 in the Report Ref # Column).

Table 12 Design Schematics

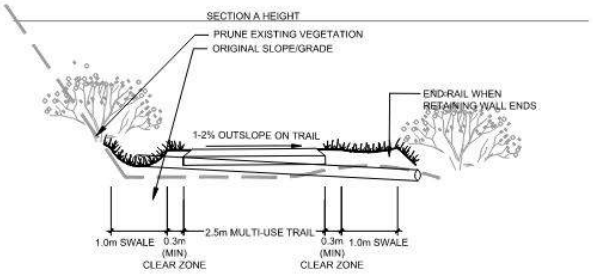




4 SD-1 SECTION D (30m)

0 1m

Scale: 1:100



5 SD-1 SECTION E (40m)

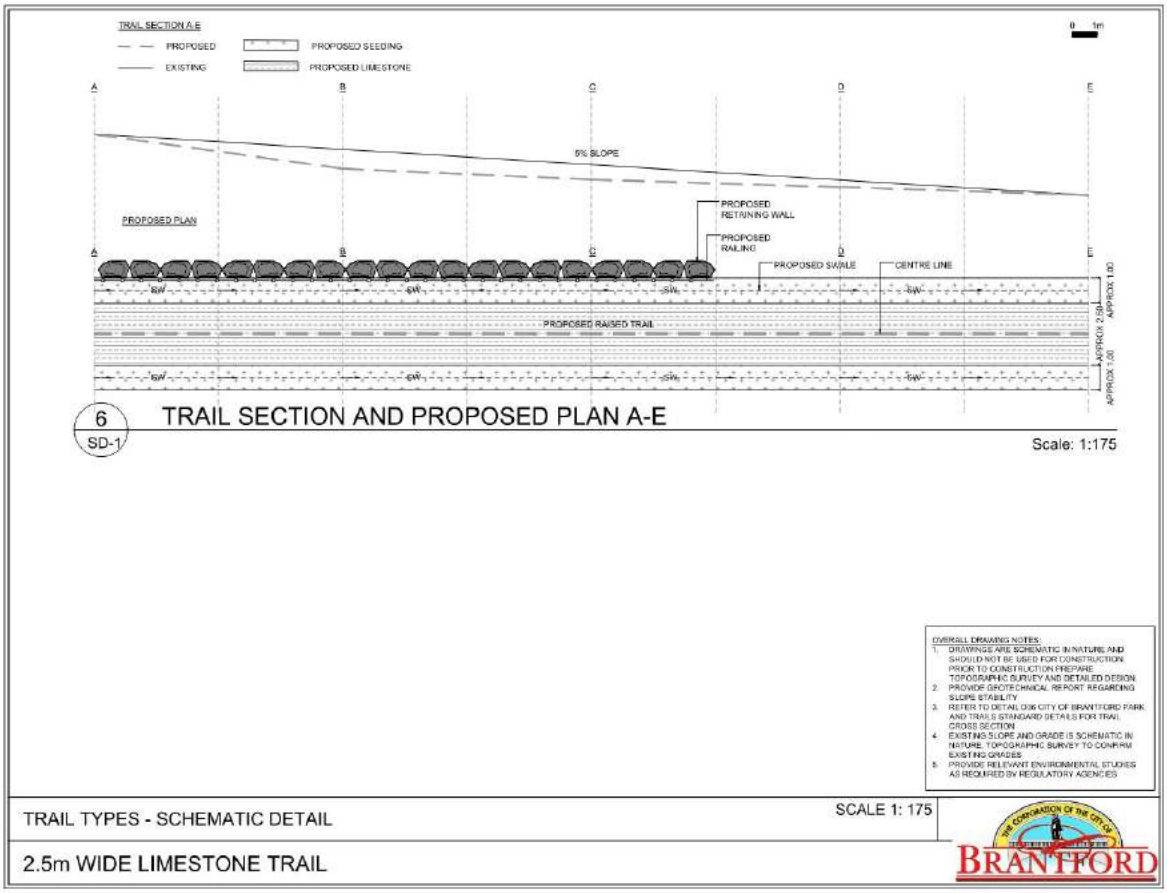
0 1m

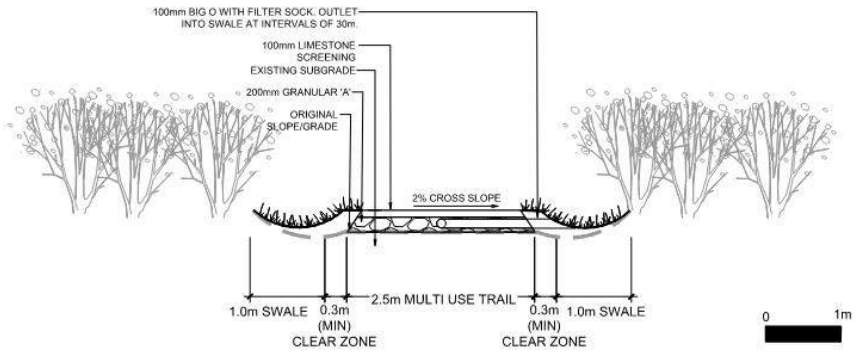
Scale: 1:100

OVERALL DRAWING NOTES:

1. DRAWINGS ARE SCHEMATIC IN NATURE AND SHOULD NOT BE USED FOR CONSTRUCTION. PRIOR TO CONSTRUCTION PREPARE TOPOGRAPHIC SURVEY AND DETAILED DESIGN.
2. PROVIDE GEOTECHNICAL REPORT REGARDING SLOPE STABILITY
3. REFER TO DETAIL D36 CITY OF BRANTFORD PARK AND TRAILS STANDARD DETAILS FOR TRAIL CROSS SECTION
4. EXISTING SLOPE AND GRADE IS SCHEMATIC IN NATURE. TOPOGRAPHIC SURVEY TO CONFIRM EXISTING GRADES
5. PROVIDE RELEVANT ENVIRONMENTAL STUDIES AS REQUIRED BY REGULATORY AGENCIES

TRAIL TYPES - SCHEMATIC DETAILS	SCALE = 1:100
2.5m WIDE LIMESTONE TRAIL	


TRAIL SECTION A-E
PROPOSED
EXISTING
PROPOSED SEEDING
PROPOSED LIMESTONE
0 1m
A
B
C
D
E
5% SLOPE
PROPOSED RETAINING WALL
PROPOSED RAILING
PROPOSED PLAN
PROPOSED SWALE
CENTRE LINE
SW
PROPOSED RAISED TRAIL
APPROX 2.5m
APPROX 1.00
6
SD-1
TRAIL SECTION AND PROPOSED PLAN A-E
Scale: 1:175
OVERALL DRAWING NOTES:
1. DRAWINGS ARE SCHEMATIC IN NATURE AND SHOULD NOT BE USED FOR CONSTRUCTION. PRIOR TO CONSTRUCTION PREPARE TOPOGRAPHIC SURVEY AND DETAILED DESIGN
2. PROVIDE GEOTECHNICAL REPORT REGARDING SLOPE STABILITY
3. REFER TO DETAIL D36 CITY OF BRANTFORD PARK AND TRAILS STANDARD DETAILS FOR TRAIL CROSS SECTION
4. EXISTING SLOPE AND GRADE IS SCHEMATIC IN NATURE. TOPOGRAPHIC SURVEY TO CONFIRM EXISTING GRADES
5. PROVIDE RELEVANT ENVIRONMENTAL STUDIES AS REQUIRED BY REGULATORY AGENCIES
TRAIL TYPES - SCHEMATIC DETAIL
SCALE 1: 175
2.5m WIDE LIMESTONE TRAIL
THE CORPORATION OF THE CITY OF
BRANTFORD



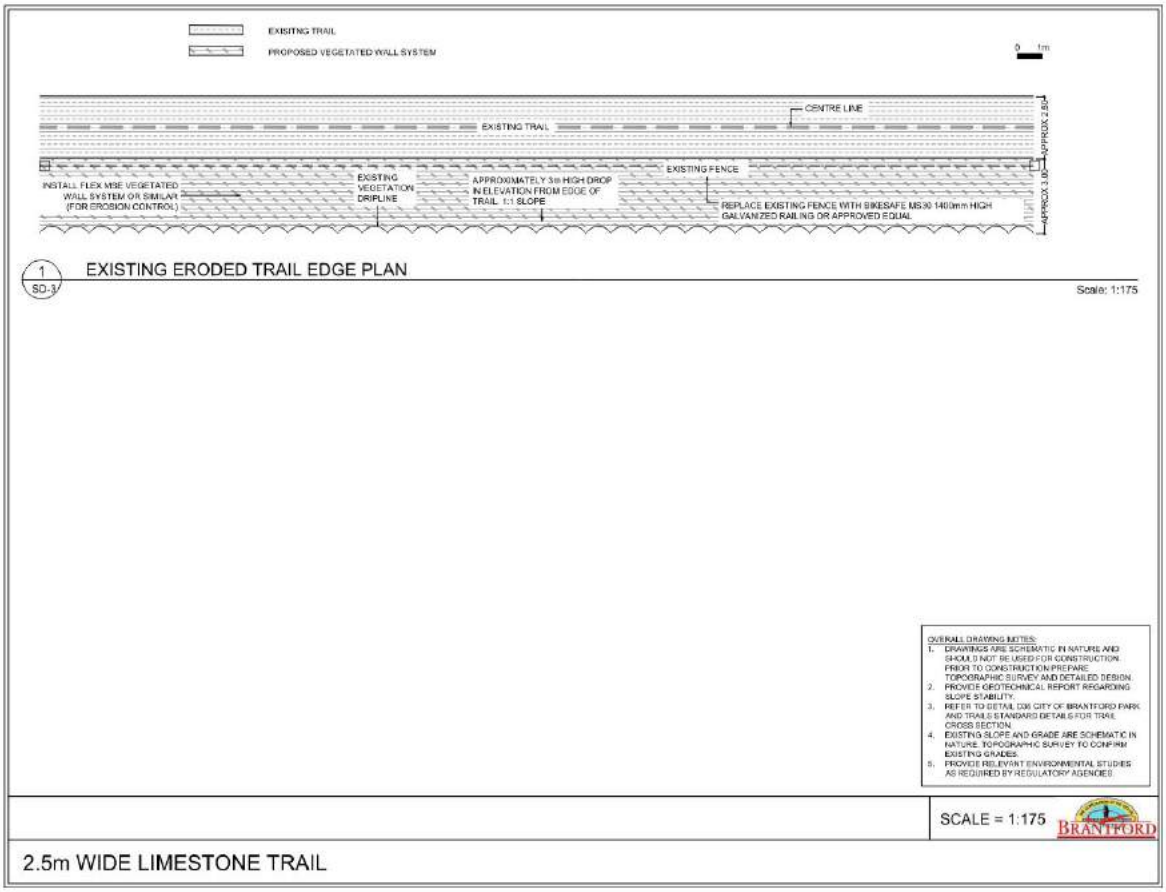
1 SD-2 RAISED TRAIL SECTION

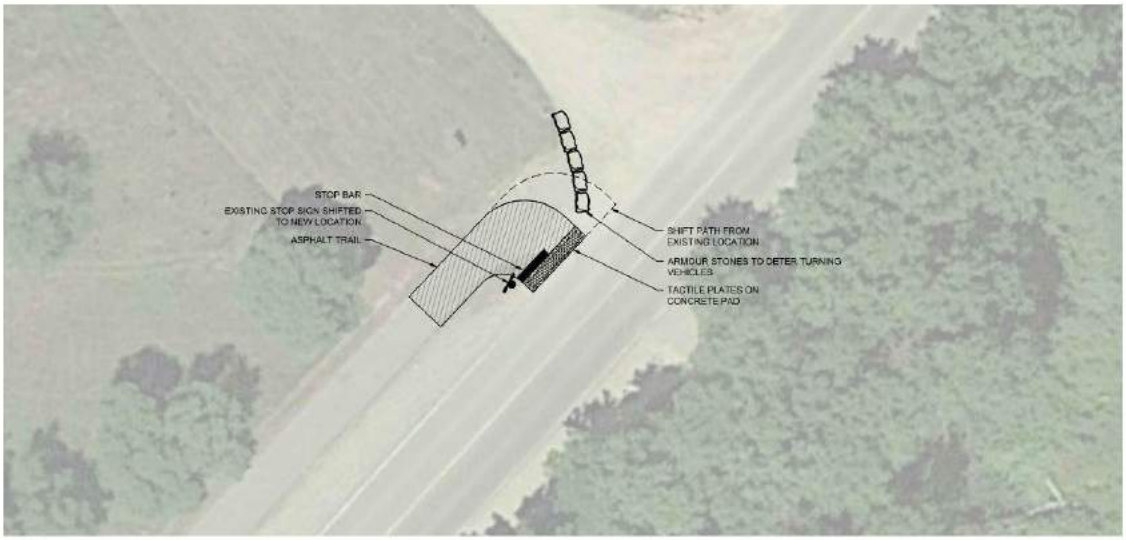
Scale: 1:75

OVERALL DRAWING NOTES:
1. DRAWINGS ARE SCHEMATIC IN NATURE AND SHOULD NOT BE USED FOR CONSTRUCTION. PRIOR TO CONSTRUCTION PREPARE TOPOGRAPHIC SURVEY AND DETAILED DESIGN.
2. PROVIDE GEOTECHNICAL REPORT REGARDING SLOPE STABILITY
3. REFER TO DETAIL D36 CITY OF BRANTFORD PARK AND TRAILS STANDARD DETAILS FOR TRAIL CROSS SECTION
4. EXISTING SLOPE AND GRADE IS SCHEMATIC IN NATURE. TOPOGRAPHIC SURVEY TO CONFIRM EXISTING GRADES
5. PROVIDE RELEVANT ENVIRONMENTAL STUDIES AS REQUIRED BY REGULATORY AGENCIES

TRAIL TYPES - SCHEMATIC DETAIL | SCALE = 1:100

2.5m WIDE LIMESTONE TRAIL


EXISTING TRAIL
PROPOSED VEGETATED WALL SYSTEM
0 1m
CENTRE LINE
EXISTING TRAIL
APPROX. 2.80
APPROX. 3.00
INSTALL FLEXMSE VEGETATED WALL SYSTEM OR SIMILAR (FOR EROSION CONTROL)
EXISTING VEGETATION DRIPLINE
APPROXIMATELY 3m HIGH DROP IN ELEVATION FROM EDGE OF TRAIL 1:1 SLOPE
EXISTING FENCE
REPLACE EXISTING FENCE WITH SIKESAFE MS30 1400mm HIGH GALVANIZED RAILING OR APPROVED EQUAL
1
SD-3
EXISTING ERODED TRAIL EDGE PLAN
Scale: 1:175
OVERALL DRAWING NOTES:
1. DRAWINGS ARE SCHEMATIC IN NATURE AND SHOULD NOT BE USED FOR CONSTRUCTION. PRIOR TO CONSTRUCTION PREPARE TOPOGRAPHIC SURVEY AND DETAILED DESIGN.
2. PROVIDE GEOTECHNICAL REPORT REGARDING SLOPE STABILITY.
3. REFER TO DETAIL D30 CITY OF BRANTFORD PARK AND TRAILS STANDARD DETAILS FOR TRAIL CROSS SECTION.
4. EXISTING SLOPE AND GRADE ARE SCHEMATIC IN NATURE. TOPOGRAPHIC SURVEY TO CONFIRM EXISTING GRADES.
5. PROVIDE RELEVANT ENVIRONMENTAL STUDIES AS REQUIRED BY REGULATORY AGENCIES.
SCALE = 1:175
BRANTFORD
2.5m WIDE LIMESTONE TRAIL



1 SD-4 NEW TRAIL CROSSING

Scale: 1:300

NOTE: DRAWINGS ARE SCHEMATIC IN NATURE AND SHOULD NOT BE USED FOR CONSTRUCTION.

SCALE = 1:300

BRANTFORD

NEW TRAIL CROSSING

5 EDUCATION PLAN

5.1 BACKGROUND

Throughout the development of this Audit Report, stakeholders, Councillors and City Staff identified conflicts that frequently occur along the Brantford Trail system between people walking, biking, and using other mobility devices. Whether due to a lack of knowledge about trail etiquette, a lack of signage and surface markings delineating space for different users, limited enforcement along the trail or simply individual behaviour not respecting shared space norms, stakeholders generally agreed that interactions between user groups could be improved through the implementation of new education and awareness campaigns along the trails. Conflicts such as collisions between cyclists and walkers, concerns over ebike speeds, and near misses were all brought up throughout the engagement process, with stakeholders noting that these conflicts have become so acrimonious that tacks have been found along a trail in the city, causing damage to bicycles and raising concern about the degree of civility being displayed on the City's trails.

Multi-use path networks provide many benefits for communities, but when trails grow in popularity, the use of a single linear space for walking, cycling, running, wheeling, walking dogs, rollerblading and more lends itself to potential conflicts between pathway users. Speed differential and a limited understanding of right-of-way and trail etiquette procedures can have detrimental effects if left unmanaged.

Several areas along the network have blind corners or a narrow cross section, features that can increase the level of conflict and risk that should be mitigated through changes to the physical elements of the trail. These improvements can be costly and can take months to implement, necessitating an education strategy as a stopgap measure to improve trail safety and wellbeing. This section explores strategies for improving cycling safety and trail use etiquette to improve safety along the multi-use pathway network in Brantford. The recommendations in this section fall into two broad categories – Passive campaigns, which aim to introduce users to trail etiquette basics and improve design features to minimize conflict and Active campaigns, which are more focused on interacting with and educating trail users in a structured, in-person environment. Passive programs that will be explored here include signage, pavement markings, trail etiquette campaigns, and best practices for including ebikes and electrified mobility devices on trails. Active programs will focus on the potential for the City of Brantford and its partners to leverage existing recreational and educational programs in the City to improve trail etiquette through new program and course offerings.

5.2 PASSIVE PROGRAMS

5.2.1 SIGNAGE

REGULATORY FRAMEWORK

Ontario Traffic Manual (OTM) Book 5 – Regulatory Signs currently does not provide standardized off-road facility signage in Ontario except for the RB-71 Shared Pathway Sign (**Figure 5**). OTM Book 5 indicates that it is up to the individual discretion of municipalities to develop pedestrian and cycling traffic signage until standardized signs are adopted in the next OTM Book 5. The Ontario Traffic Manual Book 18 – Cycling Facilities (OTM Book 18) contains an appendix of standardized signs developed by the Transportation Association of Canada (TAC) which includes cycling and pedestrian signages (**Figure 6**). However, these signs have not been formally adopted under OTM Book 5, allowing the City of Brantford to develop its own multiuse pathway signage to educate and regulate users along pathways. Signage can be used as a measure to improve safety sections of the corridor, particularly among busy sections of a trail.

Figure 5:TAC's Shared pathway sign

Figure 6: The TAC's Pathway Organization Sign (RB-72ab), Yield to Pedestrian Signs (RB-16) and Dismount and Walk Sign (RB-70).

COURTESY AND EDUCATION SIGNAGE

Courtesy and Educational signage can be used to teach trail users of rights-of-way and trail etiquette when using the facilities. **Figure 7: Trail use courtesy signs used in Collingwood, ON** demonstrates several examples of courtesy and etiquette signs that are placed throughout the trail network in Collingwood, Ontario. These signs can easily be printed and mounted onto signposts and placed throughout a trail network. The signs can provide advice to trail users and help minimize conflicts by clearly establishing rules for using multiuse paths. **Figure 8: Shared pathway and educational sign in Mississauga, ON.** demonstrates the City of Mississauga's approach to using a shared pathway and a cycling etiquette sign at a trailhead.

Figure 7: Trail use courtesy signs used in Collingwood, ON

Figure 8: Shared pathway and educational sign in Mississauga, ON.

Trail etiquette signage is an important tool to increase awareness of trail etiquette, and it is worth investing in. For most residents, the concept of trail etiquette has never been fully explored or introduced in any meaningful way – using a multi-use trail is not part of the curriculum when learning to drive, nor is it a common area of discussion among non-trail users. Especially with the significant growth in trail use in the aftermath of the COVID-19 Pandemic, there are more inexperienced users on the trails than ever before, so signage should be a top priority as a way to increase the baseline level of understanding among members of the general public. Signage can focus on key messages such as "stay to the right of the trail", "sound a warning when passing" or "keep dogs on leash", but could also feature more creative messages.

For example, many people have a negative association with a cyclist ringing their bell on the trail. In the project team's experience, people assume that a cyclist ringing their bell has the same meaning as a driver honking their horn at them – which is to say, in common parlance "get out of my way!" Ensuring that people walking understand that a cyclist ringing a bell is providing a friendly notice that they are coming up behind them so as not to surprise them can be an important, and often overlooked message to improve relations between different trail users.

The City of Brantford should feel free to get creative with signage along the trail – to install signs that invite conversation and encourage people to rethink their actions on these shared public spaces.

BY-LAW ENFORCEMENT SIGNAGE

Across Canada there has been an increase of traffic calming measures enforced along popular sections of trails. Generally, these traffic calmed zones restrict the speed of those rolling or bicycling to be from 5 – 15 km/h, with some zones asking cyclists to dismount from their bicycles entirely. The City of Calgary recently adopted a by-law that restricts rolling travel on shared pathways to not exceed 20km/h unless otherwise posted as indicated in **Figure 9.**

Figure 9: City of Calgary, AB shared pathway and speed limit signage.

The City of Vancouver has several highly frequented pedestrian areas along the Stanley Park Seawall that require cyclists to fully dismount to reduce pedestrian-bicycle conflicts. The use of a maze gate (**Figure 10**) for restricting access is sometimes used, but should not be implemented unless all other avenues have been exhausted. These features can reduce the accessibility of a trail, and also reduce access for people on non-standard bicycles, people pulling trailers, people riding cargo bikes or cyclists with disabilities who are unable to easily dismount their bike, In Vancouver, where these features have been installed, prior to the approach of each of these zones cyclists are provided with an adequate warning signage ahead of the gate and the Seawall has a speed limit of 15km/h in those areas.

Figure 10: A gateway leading to a prohibitive cycling section of the Stanley Park Seawall in Vancouver, BC.

PAVEMENT MARKINGS

Pavement markings can be used to support and enhance adherence to trail signage and improve safety on shared pathways. In many cases, pavement markings can be highly effective at alerting users of potential hazards and segregating user types when necessary.

OTM Book 18 outlines specific design criteria for using pavement markings along multi-use pathways to help advise and guide users along a path system **(Figure 11)**. First, the use of painted bicycle and pedestrian symbols near a trail entrance and placed throughout a path can alert pedestrians and bicyclists that the space is shared. Second, using directional arrows can help guide the flow of traffic in areas where directional travel is not clear. Finally, the use of solid or broken centrelines can help alert users of the presence of two-directional traffic, and the importance of staying to the right, particularly on busty sections of a Trail. Using a mix of both solid yellow lines and broken yellow lines can also advise users on places where it may or may not be safe to pass other trial users. Solid centrelines are particularly useful where reduced visibility, narrow rights-of-way, or during steep inclines/declines exist due to their ability to warn users that it is unsafe to pass other users. For example, a solid yellow line can be placed in an area where there is reduced visibility due to there being a corner with foliage covering sightlines, suggesting to users that it may be unsafe to pass due to a lack of visibility of oncoming traffic.

Figure 11: OTM Book 18 multi-use pathway pavement markings.

It should be noted that there is some conflicting guidance about where and when to use pavement markings on multi-use trails. In The British Columbia Active Transportation Design Guide (BCATDG), the design guidance is that the use of centrelines on multi-use trails should only be used during potentially hazardous situations. In this guide, the use of centrelines is generally discouraged as there is a perception that they can promote a false sense of there being traffic rules among trail users. In many cases, centrelines along multi-use pathways are not enforceable due to a lack of by-laws and traffic laws requiring users to adhere to the desired placement on the trail. The conflicting ways that centrelines are perceived may create tension when conflicts between users occur due to there being a sense that traffic rules are in place when a centreline is present. However, in the context of an area where pedestrian and bicycle conflicts are common, the benefits of using centrelines may outweigh the potential risks.

HAZARD STRIPING

Where non-user conflicts may exist such as lamp posts, hydro poles, bollards, etc. hazard striping pavement markings can be used. These pavement markings can guide users around a potentially hazardous object along a multi-use pathway, guiding users to avoid colliding with the object (**Figure 12**). This pavement marking can also signal to other users that the trail is narrowing in the area, so they should exercise caution when passing other users.

Figure 12: A hazard stripe painted around a lamppost in North Vancouver, BC.

EBIKES ON TRAILS

The proliferation of ebikes has made bicycle mobility more accessible than ever. However, despite their ubiquity among those using them for working, commuting, and recreational activities, a number of tensions have emerged with their use among both pedestrians and cyclists. Across many jurisdictions, ebikes are classified into 3 categories:

- Class One – Pedal assisted bikes that have a maximum speed of 32 km/h
- Class Two – Throttle assisted bikes that have a maximum speed of 32km/h

- Class Three – Throttle or pedal assisted bikes that have a maximum speed of 45km/h

The Ontario Highway Traffic Control Act regulates ebikes to fall within either Class One or Class Two, strictly prohibiting the use of Class Three ebike systems. As a result of the recent popularization of ebikes regulating them to improve trail safety has been a contentious issue across Canada and beyond.

In August 2022 the Town of Midland introduced a speed limit by-law across all municipal trails that regulates the speed of all bicycles to 20km/h. The move also enshrined a prohibition on all motorized vehicles from using trail facilities across the municipal network, with the exception of Class One e-bikes. The enforceable bylaw was developed to reduce resident concerns over how the town's trail system was being used by motor assisted vehicles and cyclists. Due to the recent enactment, there is little data about the efficacy of the bylaw, but it is an approach that is being followed by multiple municipalities across Canada.

The North Okanagan Regional District took a similar approach to Midland in 2021 by restricting the use of ebikes solely to Class 1 use on the regions section of the Okanagan Rail Trail (**Figure 12**).

Figure 13: Bylaw signage banning the use of Class 2 and Class 3 ebikes from the North Okanagan Regional District's section of the Okanagan Rail Trail

The ban on Class 2 and Class 3 ebikes was met with opposition from local and regional trail users as well as local bike shops due to the change being made without consulting residents and taking the regional significance of the trail into account. Residents created a petition and organized a delegation to attend an advisory committee to advocate for Class 2 ebikes to be used along the trail again. In June 2022, Class 2 bikes were permitted along the trail.

Since 2019 the City of Calgary has also banned the use of all Class 3 ebikes along with other motor assisted vehicles on multi-use pathways. The city also implemented a rule that all multi-use pathways have a standard speed limit of 20km/h unless otherwise indicated (refer to **Figure 8**). The use of Class 2 and Class 1 ebikes is still allowed under the system so long as there is compliance with the speed bylaw. While there has been some controversy about the speed bylaw on trails (most bikes are not equipped with a speedometer, making it difficult for people cycling to know when they are going too fast along a trail, for example), the majority of the trail user community understands that the bylaw is meant as more of a guideline, so it has been beneficial in creating better relationships between trail users.

For the City of Brantford, there is a rationale for considering how e-bikes can be included on the City's Trails networks. In some jurisdictions the heavier electric moped-style 'e-bikes' are not permitted on multi-use trails, where Class 1 and 2 ebikes are allowed as long as they are being operated in pedal assist mode and not using throttle for propulsion. Regardless of the approach taken, the City should ensure that there is a period of education – aiming to let residents know what types of vehicles are and are not allowed on the trails, before any enforcement action takes place.

5.2.2 TRAIL ETIQUETTE

MULTI-USE TRAIL ETIQUETTE FUNDAMENTALS – SOCIAL MEDIA MESSAGING

The use of Social Media platforms to share trail use etiquette fundamentals is a low-cost way to introduce users to new ideas about how to share the trail with other users. It should be noted that posts about cycling or trails do tend to attract a high volume of negative engagements, but the value in sharing messaging that can support safer behaviours on the trail should outweigh the fear of attracting negative comments. Below are some examples that the City of Brantford could modify for use in future campaigns to broaden awareness about how to share the trails safely with other users.

CYCLINGSAVVY

CyclingSavvy is a cycling training organization that teaches a style of riding known as 'vehicular cycling'. While this model of cycling education has generally been acknowledged as a style of cycling that caters only to the "strong and fearless" cycling population, some of the fundamental messages about sharing trails with other users still provide universal value to users of all ages and abilities. Some examples of the messaging shared on the CyclingSavvy webpage that could be adapted for use in Brantford are included in **Figure 13**.

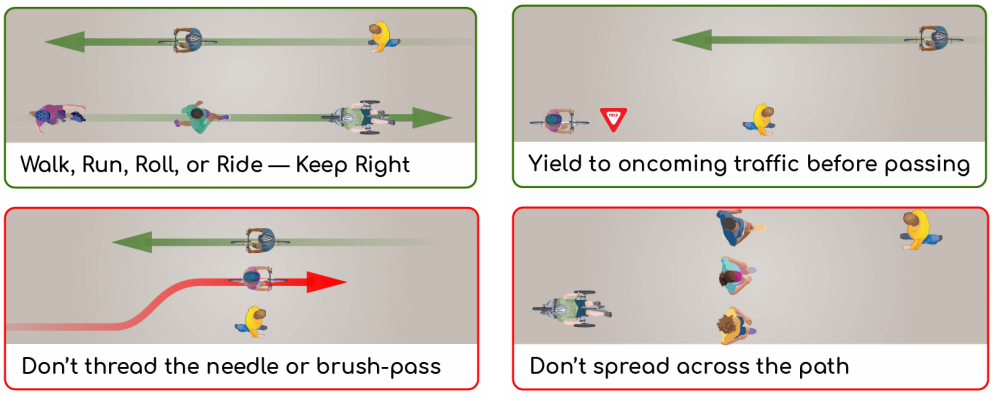


Figure 14: CyclingSavvy education examples

BIKE BRAMPTON

Bike Brampton, in partnership with the City of Brampton have developed trail safety guidelines for both pedestrians and cyclists that highlights rules and courtesies that both trail users can practice, enhancing overall user experience and safety. Like many of the resources previously mentioned in this section, the guidelines clearly identify how trail users can take actions to improve the safety and comfort of other users while also protecting themselves. The shared responsibility messaging in this campaign helps to create common expectations on the trails, which is an important step in creating a more harmonious relationship between the various trail user groups. (**Figure 14: Bike Brampton Trail User Safety Card**).

Figure 15: Bike Brampton Trail User Safety Card

The trail user safety card can either be replicated online or printed in a number of different forms such as business cards, flyers, or larger posters at trail heads. Bike Brampton also provides resources to the Pedalwise program that teaches cycling skills training, shared space etiquette, and road cycling.

5.3 ACTIVE PROGRAMS

Active programs involve interacting directly with trail users to introduce trail etiquette and safety standards while on the Trails themselves. Programs in this section involve careful consideration and planning, since they require bringing users onto trails but they can provide a significant benefit to users. Introducing etiquette and trail safety practices through real-life experience makes the messaging 'stickier', increasing the likelihood that users retain the information presented, and continue to behave in a safe, considerate way on the Trails.

5.3.1 TRAIL AMBASSADORS

One of the most effective ways to develop better relationships and behaviours on the Trail is to have an on-the-ground presence that is specifically dedicated to both demonstrating positive trail etiquette and educating users about how to use trails. Communities such as Newmarket, which has also seen a significant increase in trail use during the pandemic, have introduced Trail Ambassadors during the spring and summer months to help users navigate the trails, share information with users and conduct trail counts and site inspections. With the growing popularity of Brantford's Trails, introducing a similar program in the community could serve as a powerful symbol of the City's commitment to enhancing safety for all users, and making the trails more welcoming and enjoyable spaces. A Trail Ambassador position would be an excellent summer job to host through the City's Parks and Facilities department, and could be funded through programs like the Canada Summer Jobs Grants to provide employment opportunities for students and youth.

Figure 16 Cycling and Trail Ambassadors in the United Counties of Stormont, Dundas and Glengarry

5.3.2 YOUTH BIKE TRAINING

The City of Brantford offers a wide variety of Day Camps and other Recreational Programming throughout the year, yet none of the camps offered include mention of the City's abundant trails. Day Camps and recreational programs are an excellent place to introduce children and youth to trail etiquette by integrating cycling into daily activities. It is important to note that cycling and trail use need not be the focus of the camps, but by considering what destinations are nearby the central camp location and developing daily itineraries that take children out onto the trails, these camps can be used as an opportunity to introduce new riders to trail etiquette standards and teach effective trail use behaviours. An excellent example of a Camp program that integrates trail use and cycling can be found in Collingwood, Ontario where The Environment Network runs established Day Camps that take children on trails and cycling facilities every day as part of their regular programming. These trail rides, while not a core part of the curriculum for the camps, help students to learn trail riding skills and etiquette, improve their confidence on bikes and help to provide a wider range of activity options by expanding the amount of ground that can be covered during the day by campers.

Figure 17 - Day Camp attendees travelling between destinations by bike (Image Credit Peterborough GreenUp)

5.3.3 FAMILY TRAIL EVENTS

On any given weekend, hundreds of families take to the City of Brantford's trails to walk or bike for recreation. By providing opportunities for families to gather and learn together, the City can take these impromptu rides and walks being done by families and bring them together into a social event and an opportunity to increase awareness about trail etiquette. These types of events would be an ideal place for Trail Ambassadors to take a lead role in organizing and leading the events – they can connect with family friendly businesses to offer incentives / places to start and end the event, promote the events, lead the events and develop messaging to share with participants at the start and end of the event.

6 PHASING PRIORITIES

The phasing priorities found below are a high-level summary of the Proposed Treatments, Estimated Cost and Recommended Implementation Year found in the **Table 6 Audit Findings and Remediation Recommendations**.

Factors including level of risk and work proximity have been taken into account. The capital budget approved for works includes $125,000.00 per year from 2022 to 2031. High level estimated costs were provided for each year. Efforts have been made to streamline the task treatment types and locations to maximize efficiency in work completion. The assumption has been made that all tasks will be contracted out. Contingencies and inflation were not accounted for.

Prioritization was based on the following rationale. Safety issues considered top priority were those that could actively or passively cause injury to a user travelling on the path alone regardless of interactions between users. For example, a hazard tree could fall on a trail user, or a trail user could trip over uneven asphalt. These include:

- Hazard trees capable of falling onto the trail
- Encroaching vegetation within the trail clear zone
- Degraded asphalt
- Loose granular
- Excessive slopes
- Trail erosion

Of these safety issues, all hazard trees and encroaching vegetation were given top priority, after which spot fixes of particularly uneven asphalt and trail erosion throughout the city were prioritized.

In choosing between the remediation efforts, type/location of work and amount of budget available per year were considered in order to streamline work efficiency and pricing. In order to do this, one type of work should be performed in a localized area. For example, asphalt degradation should all be performed on Powerline Trail within one year.

Items considered next were those that mitigate conflicts between users and with adjacent uses. These are items that generally only impact safety if two different users come in close proximity. This includes linepaint and signs. Considered of similar priority are those aspects that improve user access, such as those related to AODA compliance.

Last in priority were amenity items that would enhance the user experience along the trail, such as benches, waste receptacles and bike racks. While these are integral pieces to the full enjoyment of a trail system by all users, they rarely impact user safety. That being said, these items should be considered in the future if budget becomes available.

6.1 2022 PHASING

The tasks included in this year are considered the highest priority. They generally include:

- High priority asphalt degradation remediation items on trails throughout the city.
- Vegetation encroachment remediation throughout the city
- Hazard tree and branch removal throughout the city
- Fordview Trail and Gilkinson Trail spot fixes of asphalt degradation
- SC Johnson Trail between Wilkes Dam and Powerline Road spot fix of erosion and asphalt degradation

Estimated Cost: $116,600.00

6.2 2023 PHASING

The tasks included in this year generally include:

- D'Aubigny Trail asphalt degradation remediation along soccer fields at river (trail currently closed)
- Wayne Gretzky Parkway Trail south of Dunsdon Street to 405 Wayne Gretzky Parkway asphalt degradation remediation
- Royal Oak Park footpath upgrade to 2 metre wide asphalt path

Estimated Cost: $114,120.00

6.3 2024 PHASING

The tasks included in this year generally include:

- Wayne Gretzky Parkway Trail from 405 Wayne Gretzky Parkway to just south of Hwy 403 asphalt degradation remediation.

Estimated Cost: $131,140.00

6.4 2025 PHASING

The tasks included in this year generally include:

- Wayne Gretzky Parkway Trail south of Hwy 403 and along Henry Street asphalt degradation remediation.
- L.E. & N Trail and Veteran's Memorial Trail remediation of asphalt degradation.
- S.C Johnson Trail and Oak Hill Trail signing and understory removal at blind corners.

Estimated Cost: $135,400.00

6.5 2026 PHASING

The tasks included in this year generally include:

- Remediation of excessive longitudinal slope and slope instability at trouble location along Hamilton – Brantford Rail Trail west of Colborne Street trail crossing. Detailed design, topographic survey, geotechnical report and environmental studies required are not included in the estimated cost.

Estimated Cost: $120,000.00

6.6 2027 PHASING

The tasks included in this year generally include:

- Hamilton-Brantford Rail Trail from River Road east remediation of loose granular surfaces.
- S.C. Johnson Trail between Icomm Drive and Earl Haig Family Fun Park full asphalt repaving.

Estimated Cost: $108,775.00

6.7 2028 PHASING

The tasks included in this year generally include:

- Fordview Trail between Veteran's Memorial Parkway and Pedestrian Bridge full asphalt repaving.
- S.C. Johnson Trail asphalt paving of uneven granular trail at Eagle Ave.

Estimated Cost: $110,200.00

6.8 2029 PHASING

The tasks included in this year generally include:

- Powerline Trail east from King George Road full asphalt repaving.

Estimated Cost: $125,000.00

6.9 2030 PHASING

The tasks included in this year generally include:

- Wayne Gretzky Parkway Trail along Henry Street (between Petsmart, Princess Auto and BB&B plaza entrances) asphalt repaving.
- D'Aubigny Trail from soccer fields to Ballantyne Road asphalt repaving.

Estimated Cost: $133,800.00

6.10 2031 PHASING

The tasks included in this year generally include:

- Hamilton – Brantford Trail between Colborne Street and Hwy 18 additional granular surfacing and drain tile to remediate saturation.

Estimated Cost: $110,850.00

6.11 2032 AND ALTERNATIVE PHASING

These tasks include both safety remediation and amenity upgrades. They fall outside the allotted capital budget. The below safety related items have been deemed lower priority than the main items. Regardless, efforts should be made to remediate these safety issues. If budget becomes available, or previous phases are completed through alternative capital budget an effort should be made to expedite upgrade of lighting in key areas, install of railings at steep side slopes, update of paint and signs at key trail locations (trail intersections with roads, sidewalks and other trails), and upgrade of AODA related items prior to 2032.

The amenity related recommendations are considered bonus items where budget is available after safety related items have been remediated. Seating allows for increased enjoyment of the trail system by users with reduced stamina, and directional signs are integral for new trail users to successfully navigate the system.

- Safety
    - Hamilton – Brantford Trail between Greenwich Street and Mohawk Street full asphalt repaving.
    - Fordview trail between pedestrian bridges full asphalt repaving.
    - Narrow width granular trails on Shallow Creek Trail
    - Lighting upgrades at two CPTED related locations
    - Provide railings at steep side slopes in three locations
    - OTM Book 18 line paint and sign upgrades at key trail locations throughout the city
    - OTM Book 18 line paint and sign upgrades at intersections throughout the city
    - AODA upgrade of tactile plates at key crossings
    - AODA signs installed at key locations throughout the city
- Amenities
    - Seating, bike rack and waste receptacle recommendations throughout the city
    - Directional signs throughout the city

Estimated Cost: $730,760.00

6.12 2032 AND ALTERNATIVE PHASING (GENERAL)

The tasks in **Table 13** include general upgrades to the trail system related to OTM Book 18 line paint/sign upgrades on asphalt trails. Recommendations for line paint/signs are split between asphalt and granular paths due to the functional limitation of line painting.

Table 13 Sign and Linepaint Upgrades

	Treatment Description	Report Reference #	Estimated Overall Cost
OTM Book 18 Line Paint and Sign Updates for Asphalt Trails	Provide centre lines (L2 - Continuous Permanent Paint), pedestrian, arrow and cycle symbols (L3 @ 300m Intervals Durable Paint). Provide Shared Use Path Signs (S4 @ 300m). Design and implement trail etiquette signs at entrances and other key locations (Per education section). - WG Parkway Trail - 4,800m - Henry Street MUT – 1,200m - SC Johnson Trail (Wilkes Dam to River Road) - 6,500m - Fordview and Gilkinson Trail - 4,800m - Shellard Lane MUT - 3,200m - Oak Hill Trail - 3,800m - Veteran's Memorial Pkwy Trail - 1,700m - D'Aubigny Trail - 1,400m	L2, L3, S4, D23	$219,200.00
OTM Book 18 Sign Updates for Granular Trails	Provide Shared Use Path Signs (S4 @ 300m). Design and implement trail etiquette signs at entrances and other key locations (Per education section). - SC Johnson Trail (Powerline Rd to Kraemer's Way) – 3,560m - SC Johnson Trail (Hardy Rd to Dufferin Ave) – 2,630m/3 - SC Johnson Trail (Hardy Rd to Oak Hill Trail) – 1,540m - CN Rail Trail (T.H&B. Rail Trail to Pleasant Ridge Rd) – 3,355m - LE&N Trail (Franklin Grobb Memorial Forest Trail to Conklin Rd) – 1,240m - Shallow Creek Trail (East Ave to Glebe Farm Trail) – 1,350m - Hamilton-Brantford Rail Trail (Brant County Rd. #18 to Lynwood Dr) – 3,810m - Hamilton-Brantford Rail Trail (Erie Ave to Birkett Ln) – 425m	S4, D23	$17,910.00

Table 14 Pedestrian Lighting Upgrades include upgrades to the trail system related to pedestrian lighting. Recommendations for lighting have been limited to asphalt trails on the assumption that they are higher traffic locations.

Table 14 assumes provision of pedestrian scale lighting spaced at increments of approximately 25 metres. Lighting and electrical design are required and are not included in the estimated cost. A cost assumption of $7,000 has been used per fixture including all appurtenances and connections. Cost estimates for lighting are high level, and preliminary in nature.

Based on proximity to the downtown urban core, and higher population density, the SC Johnson Trail (#7 between Colborne St W and Veteran's Memorial Parkway) and the Fordview Trail (#9 between Colborne St W and Veteran's Memorial Parkway) are anticipated to have the highest night-time trail use, and therefore the greatest need for pedestrian scale lighting. It is recommended that trail counters capable of determining usage based on time of day be utilized to confirm night-time trail use numbers on the trail lengths in **Table 14**.

Table 14 Pedestrian Lighting Upgrades

	Trail Name	Trail Subsection	Length	Estimated Cost
1)	Wayne Gretzky Parkway Trail	Powerline Rd to Hwy 403	2,800m	$784,000.00
2)	Wayne Gretzky Parkway Trail	Hwy 403 to Elgin St	1,700m	$476,000.00
3)	Henry Street Trail	Wayne Gretsky Pkwy to Middleton St	1,200m	$336,000.00
4)	Powerline Rd Trail	East of King George Rd	650m	$182,000.00
5)	SC Johnson Trail	Wilkes Dam to Morrell St	3,300m	$924,000.00
6)	SC Johnson Trail	Morrell St to Colborne St W	1,900m	$532,000.00
7)	SC Johnson Trail	Colborne St W to Veteran's Memorial Pkwy	1,350m	$378,000.00
8)	SC Johnson Trail	Colborne St W to River Rd	650m	$182,000.00
9)	Fordview Trail	Colborne St W to Veteran's Memorial Pkwy	950m	$266,000.00
10)	Fordview/Gilkinson Trail	Veteran's Memorial Pkwy to Mt Pleasant St along Gilkinson St	1,900m	$532,000.00
11)	Gilkinson Trail	Gilkinson Flats Loop	2,200m	$616,000.00

12)	Shellard Lane MUT	TH&B Trail to Veteran's Memorial Pkwy	3,200m	$896,000.00
13)	Oak Hill Trail	Kraemer's Way to Grand River Pedestrian Bridge	2,300m	$644,000.00
14)	Oak Hill Trail	Grand River Pedestrian Bridge to Oak Hill Cemetery	1,600m	$448,000.00
15)	Veteran's Memorial Pkwy Trail	Colborne St W to Mt Pleasant St	1,700m	$476,000.00
16)	D'Aubigny Trail	Spalding Dr to Ballantyne Dr	1,400m	$392,000.00

7 TRAIL SURFACING COST-BENEFIT ANALYSIS

The following analysis in **Table 13 Trail Conversion to Asphalt Financial Cost - Benefit Analysis** breaks down the cost-benefit of converting existing granular multi-use trails into asphalt trails per City of Brantford Standard Detail (D11). Costs in the chart below are based on the following financial factors:

1) Cost to convert granular trail to a 3.0m wide asphalt trail. (Assumes full depth reconstruction and remediation of adjacent softscape (Standard Detail D11). Not including design and background studies. Assumes asphalt life span of 20 years).
2) Cost to Implement current OTM Book 18 line paint and signs. (Assumes reapplication of permanent line paint every 3rd year. Replacement of signs over 20-year span).
3) Elimination of yearly maintenance cost of granular surface (Assumes maintenance of a 2.0m wide trail over a 20-year span).

Factors such as vegetation control and waste/debris cleanup are expected to remain constant and were therefore not factored into the analysis.

Table 15 Trail Conversion to Asphalt Financial Cost - Benefit Analysis

Figure #	Trail Name	Length (m)	Cost / Benefit	Action (Includes upkeep over 20-year span)	Unit	Estimated Unit Cost	Estimated Total Cost
1b	SC Johnson Trail (Powerline Rd to Kraemer's Way)	3,560	Cost	Convert to asphalt trail.	Lin M	$150.00	$534,000.00
				Implement and upkeep line paint and signs.	Lin M	$21.00	$74,760.00
			Benefit	Maintenance of granular surface.	Lin M	$40.00	-$142,400.00
				Total Cost			**$466,360.00**
1b	SC Johnson Trail (Hardy Rd to Dufferin Ave)	2,630	Cost	Convert to asphalt trail.	Lin M	$150.00	$394,500.00
				Implement and upkeep line paint and signs.	Lin M	$21.00	$55,230.00
			Benefit	Maintenance of granular surface.	Lin M	$40.00	-$105,200.00

Figure #	Trail Name	Length (m)	Cost / Benefit	Action (Includes upkeep over 20-year span)	Unit	Estimated Unit Cost	Estimated Total Cost
				Total Cost			**$344,530.00**
1b	SC Johnson Trail (Hardy Rd to Oak Hill Trail)	1,540	Cost	Convert to asphalt trail.	Lin M	$150.00	$231,000.00
				Implement and upkeep line paint and signs.	Lin M	$21.00	$32,340.00
			Benefit	Maintenance of granular surface.	Lin M	$40.00	-$61,600.00
				Total Cost			**$201,740.00**
1c	CN Rail Trail (T.H&B. Rail Trail to Pleasant Ridge Rd)	3,355	Cost	Convert to asphalt trail.	Lin M	$150.00	$503,250.00
				Implement and upkeep line paint and signs.	Lin M	$21.00	$70,455.00
			Benefit	Maintenance of granular surface.	Lin M	$40.00	-$134,200.00
				Total Cost			**$439,505.00**
1c	LE&N Trail (Franklin Grobb Memorial Forest Trail to Conklin Rd)	1,240	Cost	Convert to asphalt trail.	Lin M	$150.00	$186,000.00
				Implement and upkeep line paint and signs.	Lin M	$21.00	$26,040.00
			Benefit	Maintenance of granular surface.	Lin M	$40.00	-$49,600.00
				Total Cost			**$162,440.00**
1d	Shallow Creek Trail (East Ave to Glebe Farm Trail)	1,350	Cost	Convert to asphalt trail.	Lin M	$150.00	$202,500.00
				Implement and upkeep line paint and signs.	Lin M	$21.00	$28,350.00
			Benefit	Maintenance of granular surface.	Lin M	$40.00	-$54,000.00

Figure #	Trail Name	Length (m)	Cost / Benefit	Action (Includes upkeep over 20-year span)	Unit	Estimated Unit Cost	Estimated Total Cost
				Total Cost			**$176,850.00**
1d	Hamilton-Brantford Rail Trail (Brant County Rd. #18 to Lynwood Dr)	3,810	Cost	Convert to asphalt trail.	Lin M	$150.00	$571,500.00
				Implement and upkeep line paint and signs.	Lin M	$21.00	$80,010.00
			Benefit	Maintenance of granular surface.	Lin M	$40.00	-$152,400.00
				Total Cost			**$499,110.00**
1d	Hamilton-Brantford Rail Trail (Erie Ave to Birkett Ln)	425	Cost	Convert to asphalt trail.	Lin M	$150.00	$63,750.00
				Implement and upkeep line paint and signs.	Lin M	$21.00	$8,925.00
			Benefit	Maintenance of granular surface.	Lin M	$40.00	-$17,000.00
				Total Cost			**$55,675.00**

While an overall cost is shown for each of the trail sections, intangible factors must also be weighed when determining the overall benefit of converting trail surfacing. See **Table 14 Trail Conversion to Asphalt Intangible Cost - Benefit Analysis** for intangible cost benefits associated with converting granular trail to asphalt.

Table 16 Trail Conversion to Asphalt Intangible Cost - Benefit Analysis

	Intangible Factor
Cost	Implementing asphalt trails, especially through existing woodlots can require wider trail footprint that may cause stress on, and decline of, adjacent trees. Conversion can change the "look and feel" from a rugged natural area to a more developed urban area.
	Some users prefer more rugged granular trail conditions for mountain biking.
	Time spent by City staff coordinating design and implementation of asphalt trails. This can reduce capacity to focus on other projects. This may be considered an additional financial cost, but has not been factored into the financial cost-benefit table.

Benefit	Conversion to asphalt allows for an increase in diversity of trail usership due to the smoother surface. This allows for increased mobility aid, stroller, roller blade, inline skate, skateboard and scooter usage.
	Upgrading to the minimum standard 3.0 metre wide asphalt trail from a 2.0-2.5 metre wide granular trail allows for an increase in user traffic, and reduces conflicts between passing users.
	Asphalt surfacing and the implementation of OTM Book 18 line paint provides a heightened standard of trail safety.
	Asphalt surfacing allows for the option of winter maintenance of trails.

8 TRAIL MAINTENANCE RECOMMENDATIONS

8.1 MAINTENANCE MANAGEMENT

Guiding next steps in the management and maintenance of trails, the City of Brantford should consider adopting a trail maintenance log to document maintenance activities. The log should be updated when features are repaired, modified, replaced, removed, or when new features are added.

Accurate trail logs also become a useful resource for determining maintenance budgets for individual items and tasks, and in determining total maintenance costs for the entire trail. In addition, they are a useful source of information during the preparation of tender documents for trail contracts, and to show the location of structures and other features that require maintenance.

Leveraging technology to collect maintenance data can be a powerful tool for finding efficiencies and more accurately budgeting for need. Digital dashboard style programs can be an effective interface for staff to organize inputs and action items. This type of technology can be linked to digital trail logging, user reporting systems, and on-site sensors (such as waste bin sensors) to create the ability for on-demand service and strategic deployment of resources. On demand service styles can replace regular maintenances practices and reduce overall demand on resources.

Figure 18 – Trail erosion in need of maintenance

Reducing maintenance through strategic infrastructure investments, including trail realignment, surface treatment and use of structures should be considered for areas of reoccurring maintenance issues.

Using the maintenance strategies outline on existing trail infrastructure maintenance practices should be a starting point from which a trail specific maintenance plan and budget be developed. In addition, annual maintenance budgets should be refined to accommodate the maintenance of trail facilities.

8.2 MAINTENANCE SERVICE RESPONSE

Table 17 Maintenance Service Response

FREQUENCY	MAINTENANCE TASK
IMMEDIATE (within 24 hours of becoming aware of the situation through a "hotline", email or other notification or observation)	– As a minimum, mark, barricade and sign the subject area to warn trail users or close the trail completely until the problem can be corrected. – Remove vegetation and/or windfalls, downed branches etc., where traffic flow on the trail is being impaired or the obstruction is resulting in a sight line issue. Remove hazard trees that have been identified. – Repair or replace items that have been vandalized or stolen/removed. This is especially important for regulatory signs that provide important information about trail hazards such as road crossings, steep grades, and sharp curves. – Removal of trash in overflowing containers or material that has been illegally dumped. – User safety addressed for obstructed drainage systems causing flooding that poses a hazard to trail users or that is resulting in deterioration that poses an immediate safety hazard. – Monitor trail areas and structures that are prone to erosion after severe summer storms and repair as required. – Repairs to structural elements on bridges such as beams, railings, access barriers and signs.
REGULARLY (weekly / biweekly / monthly)	– Trail patrols/inspections should review the trail conditions (as often as weekly in high-use areas), to assess conditions and prioritize maintenance tasks and monitor known problem areas. – Mow grass along edges of trails (in parks and open meadow settings only). Depending on the trail location, this may be done weekly, bi-weekly, or monthly. – Regular garbage pickup (10-day cycle or more frequent for heavily used areas). – Repair within 30 days or less, partially obstructed drainage systems causing intermittent water backups that do not pose an immediate safety hazard, but that if left unchecked over time will adversely affect the integrity of the trail and/or any other trail infrastructure or the surrounding area.

ANNUALLY	– Conduct an annual safety audit. This task can be efficiently included with general annual safety audits for parks and other recreation facilities. – Evaluate support facilities/trailside amenities to determine repair and/or replacement needs. – Examine trail surface to determine the need for patching and grading. – Grading/grooming the surface of granular trails and topping up of wood chip trails. – Pruning/vegetation management for straight sections of trail and areas where branches may be encroaching into the clear zone. This task is more of a preventative maintenance procedure. Consider completing once in June and once again in September. Remove branches from the site unless they can be used for habitat (i.e., brush piles in a woodlot setting) or used as part of the rehabilitation of closed trails. Where invasive species are being pruned and/or removed, branches and cuttings should be disposed of in an appropriate manner. – Inspect, identify and treat hazardous plants such as Giant Hogweed and Poison Ivy. Place signs at location identifying plant and noting treatment strategy (See image). – Inspect and secure all loose side rails, bridge supports, decking (ensure any structural repairs meet the original structural design criteria). 
EVERY 3 TO 5 YEARS	– Cleaning and refurbishment of signs, benches and other trailside amenities. – Reapplication of line paint as necessary.
EVERY 10 TO 20 YEARS	– Resurface asphalt trails (assume approximately every 20 years). – Major renovation or replacement of large items such as bridges, kiosks, gates, parking lots, benches etc.

9 CONCLUSIONS

The Trail Safety Audit provides a comprehensive review of the City of Brantford's Shared Use Paths. Roughly 15km of Multi-use Paths and 40km of off-road trails have been included in the audit. The WSP trails team performed a full cycling tour of Shared Use Paths. The audit has identified safety concerns, as well as other items of concern for trail users. The audit includes a review of wayfinding signage, a lens for Crime Prevention Through Environmental Design (CPTED) and a review of AODA compliance. Amenity upgrades have also been identified by city staff and the design team.

An engagement strategy was undertaken including interviews with City Councillors, special interest stakeholders and online public input.

Remediation recommendations and amenity opportunity recommendations have been laid out based on priority and cost. Overall, three-hundred seven (307) recommendations have been made throughout the city for a total approximate cost of just under $1.9 million. A capital budget of $1.25 million has been set aside for the priority works between 2022 and 2031. Phasing priority has been given to issues thought to have the highest impact on the safety of users. Some safety issues, and the majority of amenity upgrade opportunities have been excluded from the priority works but should be considered at a later date if budget becomes available.

Trail maintenance standard best practices have been identified in the report. It is recommended that City Staff identify and implement a trail maintenance strategy.

Prior to engaging in any construction works, it is recommended that City Staff plan works in coordination with the required regulatory agencies.

10 LIMITATION OF LIABILITY

It is our policy to attach the following clause regarding limitations. We do this to ensure that the client is aware of what is technically and professionally realistic in a safety audit. The assessment of the trails presented in this report has been made using accepted trail design, AODA, CPTED and vegetation management techniques. These included a visual examination of the surface components of the trail and surrounding area. Subsurface components were not investigated. Specific topographic information was also not collected.

Notwithstanding the recommendations and conclusions made in this report, it must be recognized that trail status changes with time and by season. While reasonable efforts have been made to document any unsafe conditions, no guarantees are offered, or implied, that these conditions will remain as they were during the time of the audit.

Although every effort has been made to ensure that this assessment is reasonably accurate, the trails should be re-assessed periodically. The assessment presented in this report is valid at the time of inspection.

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APPENDIX

A AUDIT REFERENCE MAPS

FIGURE 1a

2022-09-01

Audit Reference Map

City of Brantford - Northeast Quadrant Trail Safety Audit

Issues and Opportunities

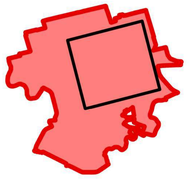
- Amenity Opportunity
- Asphalt Degradation
- Blind Corner
- CPTED (e.g. potential for criminal behaviour)
- Erosion
- Excessive Longitudinal Slopes
- Hazard Tree/Branch
- Loose Surface
- Narrow Width
- Ponding/Saturation
- Slope Stability
- User Conflict Zone
- Vegetation Encroachment
- Other

Active Transportation Network

- Shared Use Trails
- Park Path
- On Road Connection
- Foot Path
- Bike Routes
- Bike Lanes

Base Features

- Railroads
- Road Centrelines
- Six Nations Territory
- Waterbodies
- Municipal Boundary



Notes:

1. Data obtained through Land Information Ontario (LIO) GeoHub and the City of Brantford.

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King George Rd
Tollgate Rd
Fairview Dr
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Hwy 403 East
North Park St
Park Rd N
Brantwood Park Rd
Lynden Rd
West St
Morton Ave E
Charing Cross St
Paris Rd
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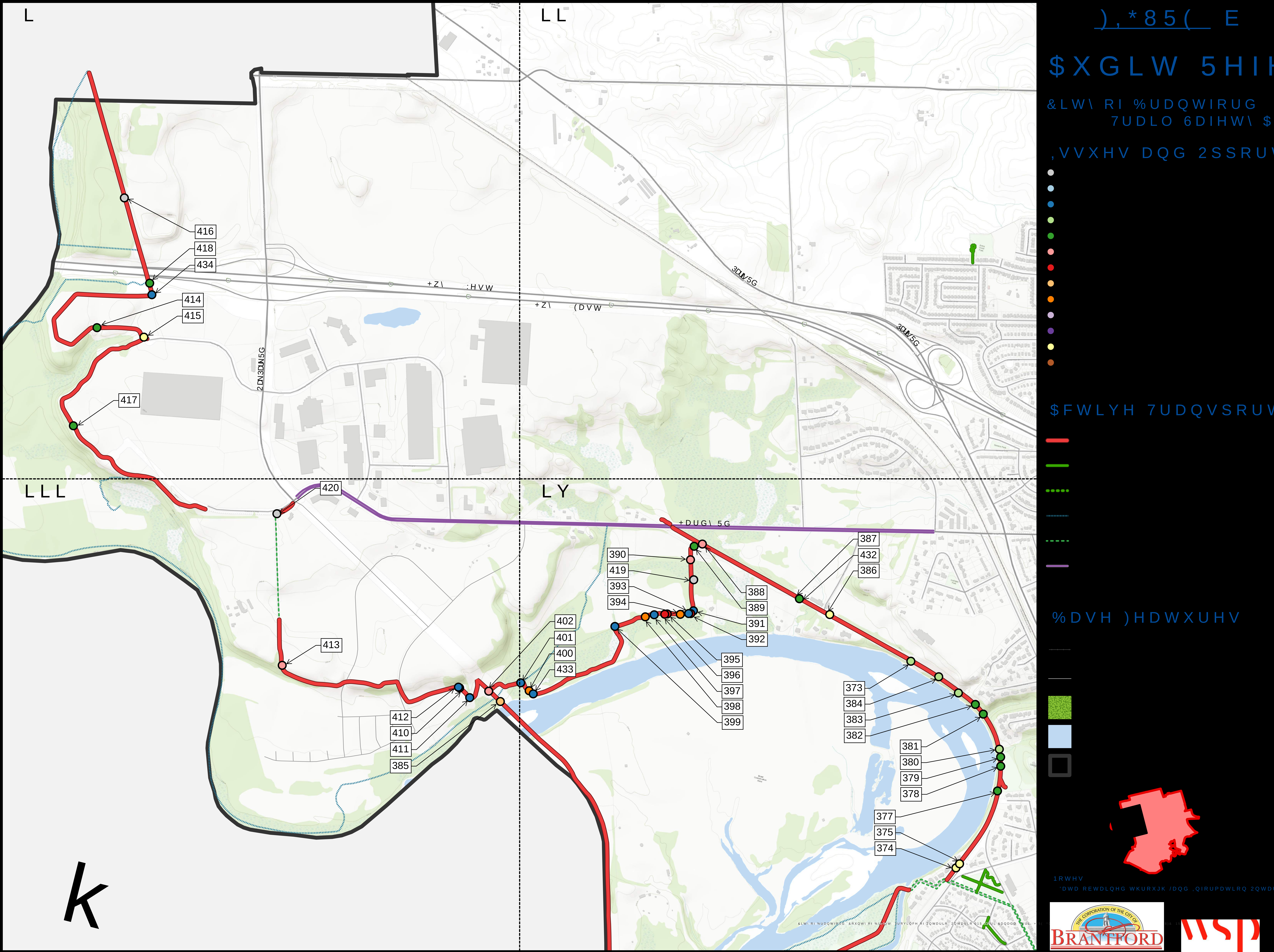

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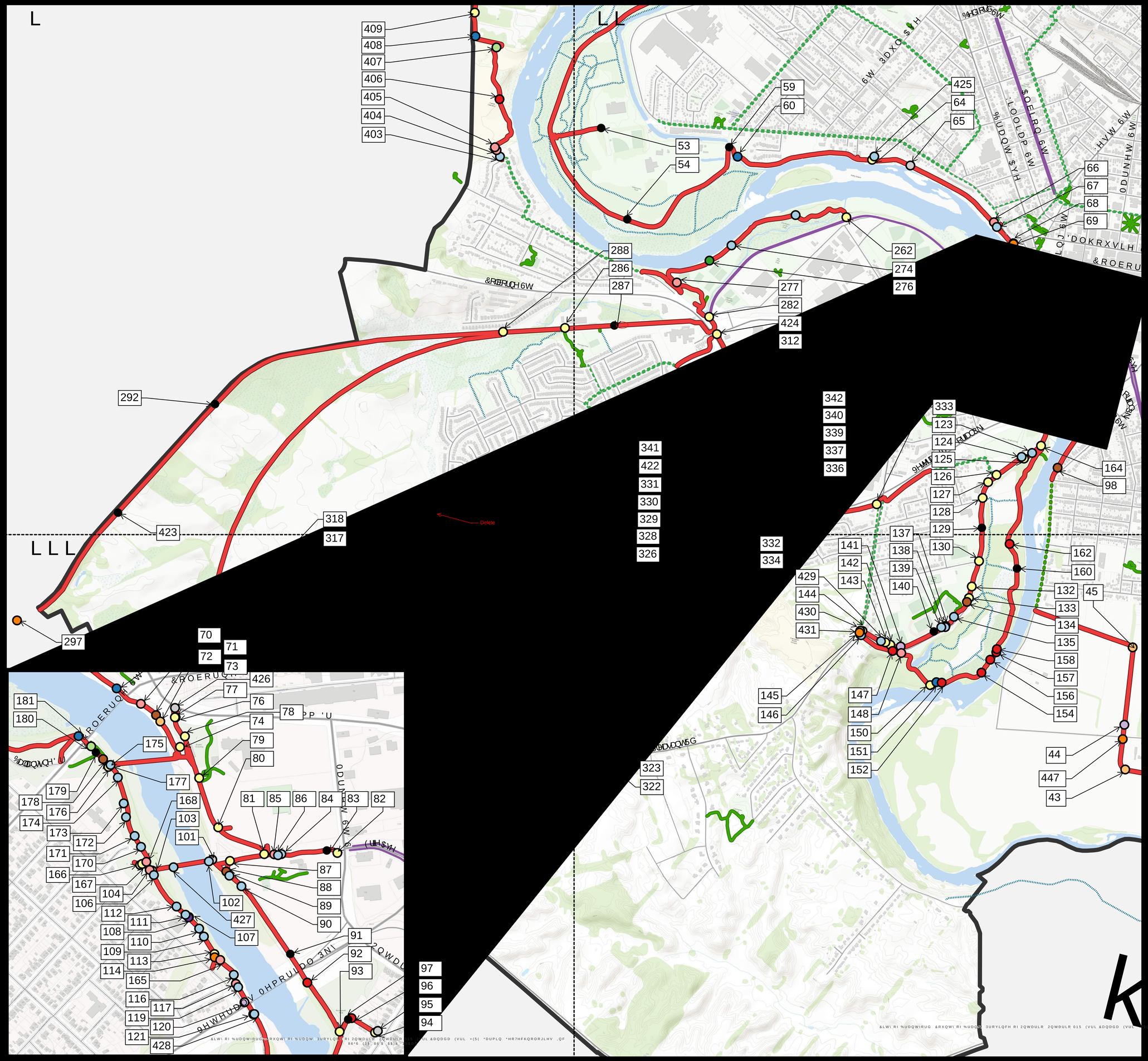

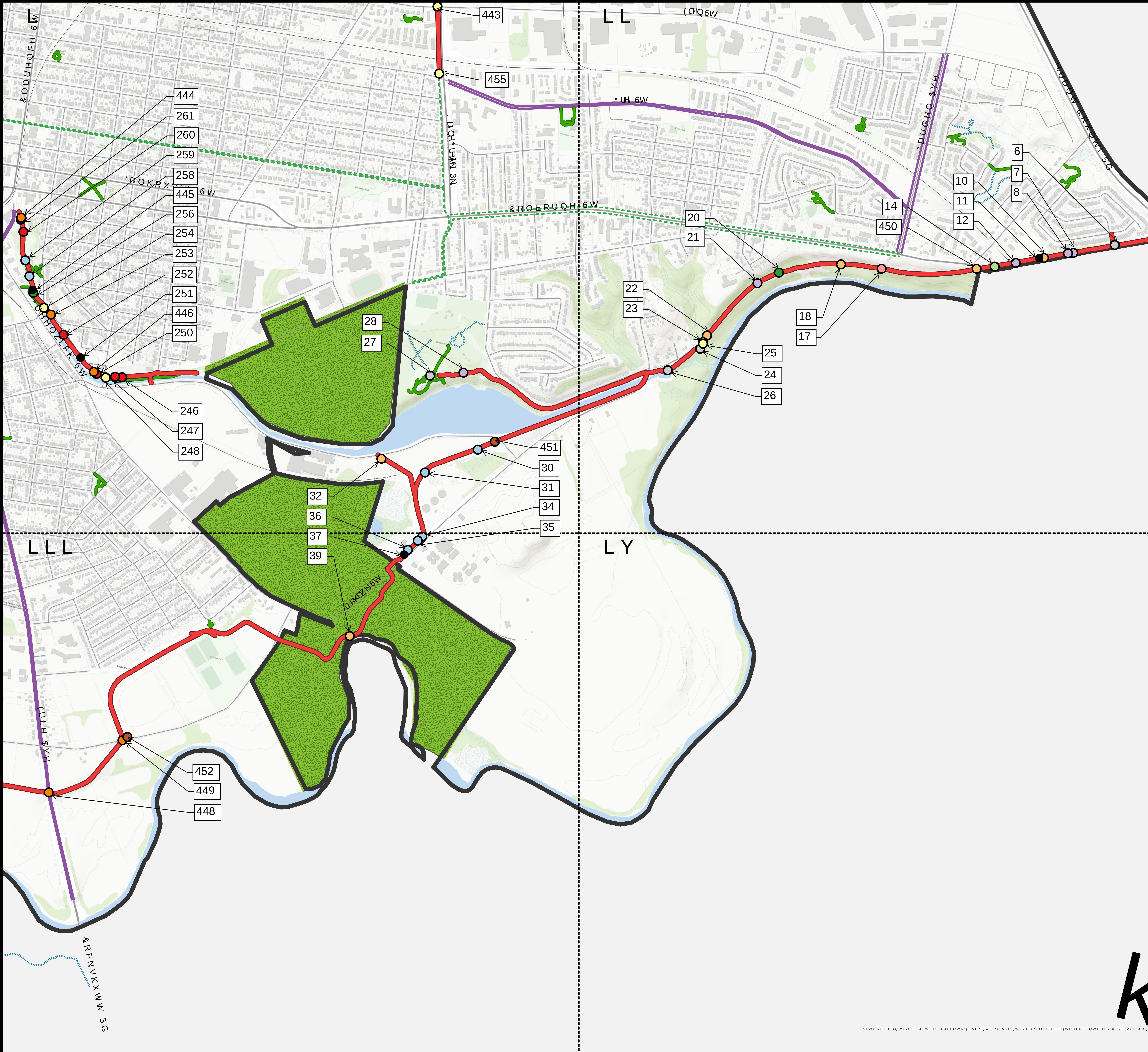

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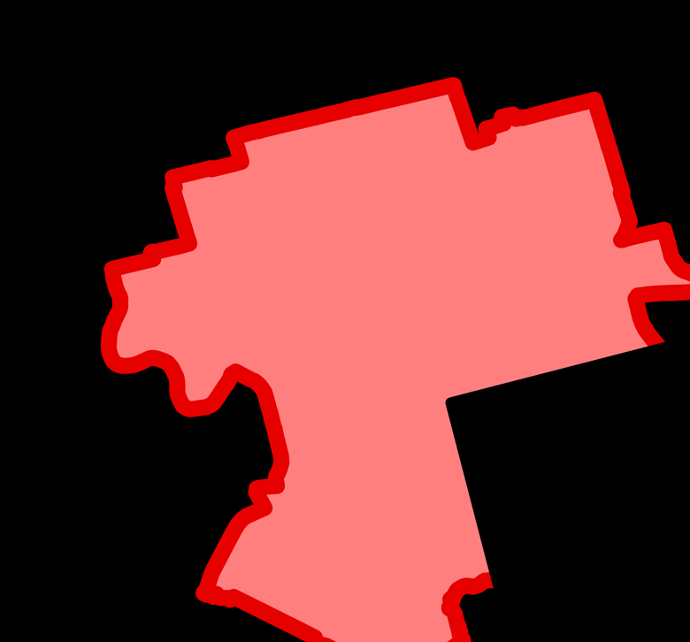

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APPENDIX

B STAKEHOLDER ENGAGEMENT SUMMARY

Stakeholder Engagement

Brant Waterways Foundation & Stakeholder Mapping Exercise

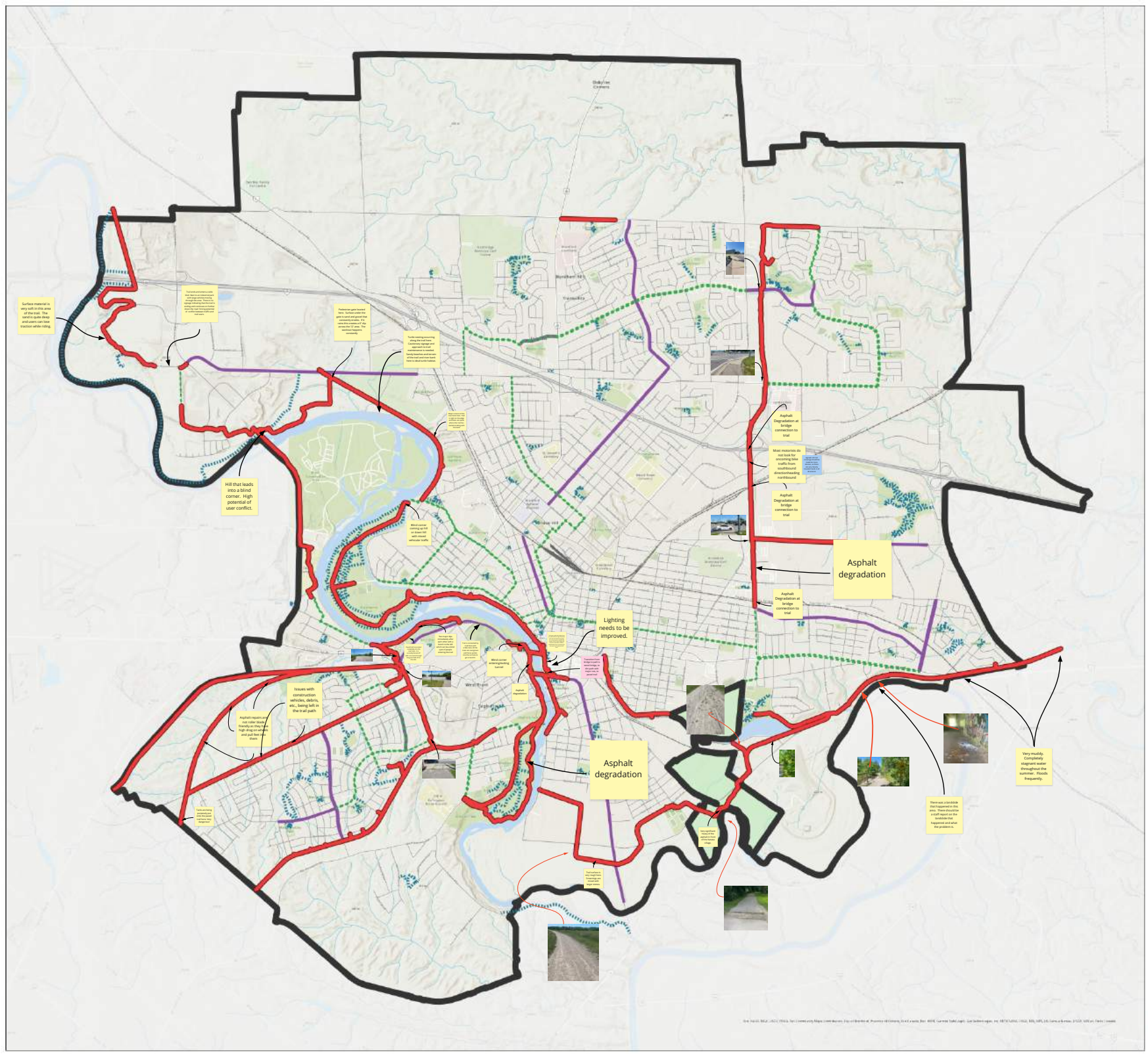

FIGURE 1

2022-06-30

Existing Active Transportation Network

City of Brantford
Trail Safety Audit

Active Transportation Network

- Shared Use Trails
- Bike Routes
- Bike Lanes
- Park Paths and Foot Paths

Base Features

- Railroads
- Road Centrelines
- Six Nations Territory
- Municipal Boundary
- Waterbodies

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Notes:

1. Data obtained through Land Information Ontario (LIO) GeoHub, United State Environmental Protection Agency (EPA), and the City of Sault Ste. Marie.

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Stakeholder Engagement

City Council & Staff Mapping Exercise

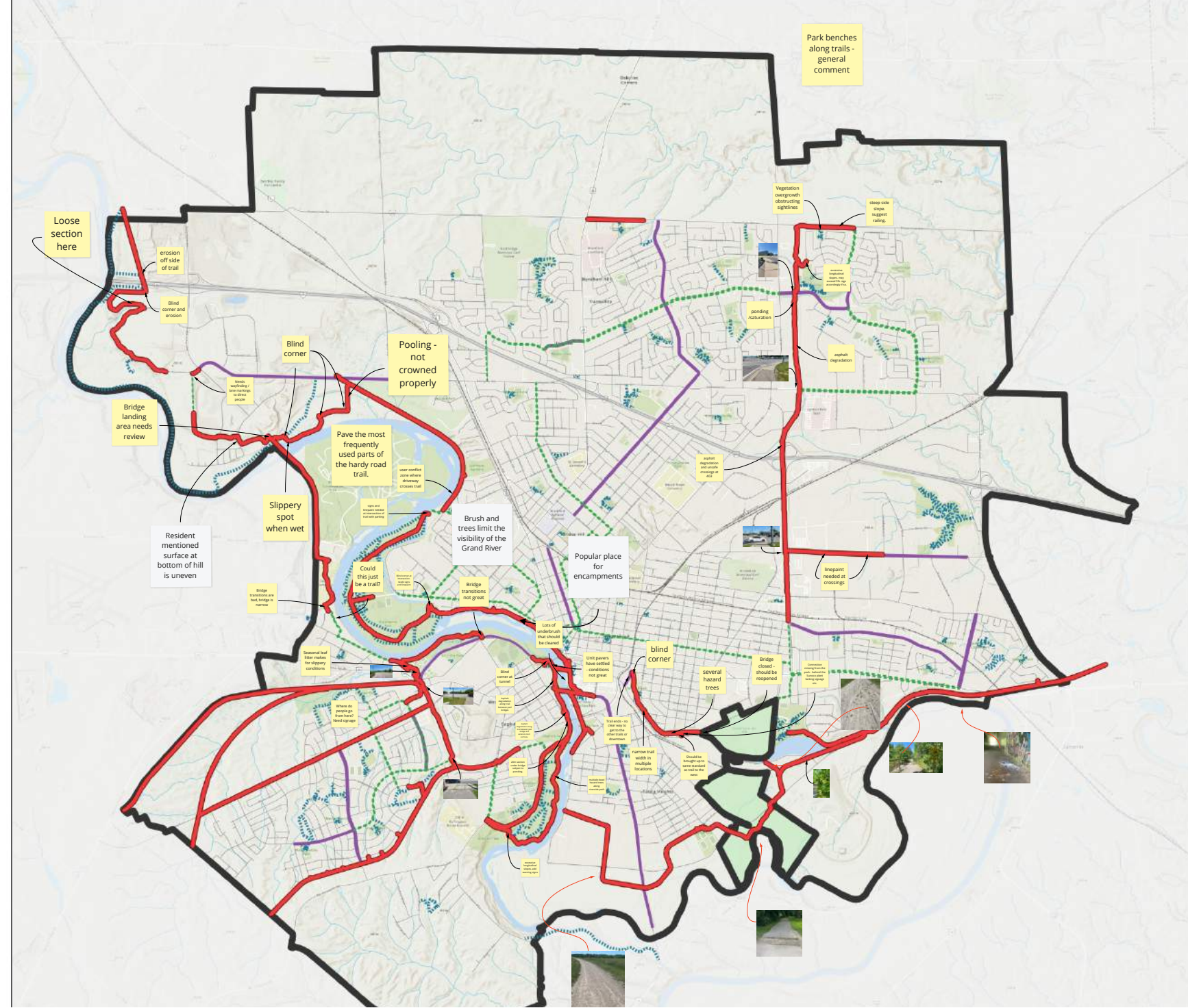

FIGURE 1

2022-06-30

Existing Active Transportation Network

City of Brantford
Trail Safety Audit

Active Transportation Network

- Shared Use Trails
- Bike Routes
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- Park Paths and Foot Paths

Base Features

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- Six Nations Territory
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Notes:

1. Data obtained through Land Information Ontario (LIO) GeoHub, United State Environmental Protection Agency (EPA), and the City of Sault Ste. Marie.

Stakeholder Engagement

Brant Waterways Foundation
Workshop Notes

MEETING NOTES

JOB TITLE	Trail Safety Audit		
PROJECT NUMBER	221-05994-00	**DATE**	14 July 2022
TIME	17:30 – 18:30	**VENUE**	Virtual – Cisco Webex
SUBJECT	Trail Safety Audit Stakeholder Meeting – Brant Waterways Foundation		
CLIENT	City of Brantford		

MATTERS ARISING

1.1 A member noted that at a high level there are conflicts between pedestrians (people walking) and cyclists.
- Noted that in their experience cyclists seldom ring bells and call ahead.
- In the Mount Pleasant area, tacks were put all over the trails multiple times. This is the culmination of this conflict between users.
- Suggested that trail etiquette is lacking across the city and needs to be improved.

1.2 Another member suggested that there needs to be an emphasis on educating users on courtesies and etiquette when using the trail.
- Agreed upon by another member of the foundation, noting that etiquette is a common problem across the municipal trail system.

1.3 A third member of the foundation noted that the Brant Waterways foundation is working on developing a regional trails council. Member wants to bring the user groups together to discuss common issues. One of those pieces is education.
- Suggested that there is nuance to this and that there are bad apples in every group of trail users, whether they are cyclists, pedestrians, dog walkers, etc.

1.4 Insurance and risk management over the lack of consistent maintenance along the trail system was discussed.
- Brant Waterways wishes to see land owners and trail groups to have a formal process where they can volunteer to expand and maintain the system.
- Suggested the City of Brantford needs to be able to document their maintenance process thoroughly to properly be able to defend itself in the event of a risk management issue.

1.5 Recommended adopting a high-quality and legible trail mapping and classification system.
- Suggested that certain trail classifications must be met with consistent maintenance standards for each type of facility.
- Having a high quality trail classification system available to users can help them make informed decisions about the trails they are taking and whether they have the ability to do so.

These minutes are considered to be accurate recording of all items discussed. Written notice of discrepancies, errors or omission must be given within seven (7) days, otherwise the minutes will be accepted as written.

Stakeholder Engagement

City Council, Staff & Stakeholder Workshop Notes

MEETING NOTES

JOB TITLE	Trail Safety Audit		
PROJECT NUMBER	221-05994-00	**DATE**	4 July 2022
TIME	17:30 – 18:30	**VENUE**	Virtual – Cisco Webex
SUBJECT	Trail Safety Audit Stakeholder Meeting – Stakeholder Meeting #1		
CLIENT	City of Brantford		

MATTERS ARISING

1.1 A member of a local advocacy group stated that defunct rail tracks have been raising along some of the trails and need to be removed due to them being a safety hazard.

1.2 Another community advocate noted that low lying tree branches impact the safety of all users across various parts of the network. Attributed this to the aggressive growth of Manitoba maples.
- Also stated that thumb tacks have been placed on the rail trail near Mt Pleasant School.

1.3 A member of the Brantford Cycling Club stated that a community wide education program across the city is needed to teach residents about fundamental trail etiquette. Started that many conflicts occur because of a lack of understanding of trail etiquette.
- Stated that dogs off leashes, motorized vehicles, and cyclists not knowing what to call out for are all issues.
- Another member suggested the introduction of line paint and pavement markings can address these issues.

1.4 A trails advocate stated that there are dangerous spots near the Lorne Bridge due to confusing trail markings and blind corners. Suggested the use of a “bell” or convex mirror to give more visibility to blind corners as a temporary solution.

1.5 A local committee member stated that there needs to be a balance between paving and gravel trails. Also stated that paved trails need to be patched due to significant gaps within the network.

1.6 A community advocate raised a concern over entry and exit point gates and bollards are a hazard. Noted a story of a trail user hitting one of the posts while riding their bicycle and wiping out as a result. The cyclists required shoulder surgery from the wipeout. Noted that these are supposed to prohibit motor vehicles on the network, however it appears that motorized vehicles managed to bypass the barriers, drawing into question their effectiveness.

1.7 A cycling advocate asked if there has been consideration for implementing a speed limit along the trail system and voiced support behind implementing one.

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MEETING NOTES

JOB TITLE	Trail Safety Audit		
PROJECT NUMBER	221-05994-00	**DATE**	7 July 2022
TIME	11:00 – 12:00	**VENUE**	Virtual – Cisco Webex
SUBJECT	Trail Safety Audit Stakeholder Meeting – Stakeholder Meeting #2		
CLIENT	City of Brantford		

MATTERS ARISING

1.1 A Councillor started the session by bringing up that they have received emails from residents noting that there are people on the trail who are potentially violent. Noted a situation where someone was carrying an axe along the trail network.

1.2 The same councillor stated that residents use dirt bikes on the trails in the Spring and cause damage to the network. Also these bikes ride close to hikers and cyclists.

- Finally, the councillor mentioned the ubiquity of encampments along the network. Noted that these three issues are the largest safety hazards that prohibit safe trail usage.

1.3 The second Councillor attending the meeting stated that there is a littering problem on the trail network. Suggested that this can be addressed by adding more trash cans and educating trail users.

1.4 The third councillor in attendance brought high level concerns about the physical state of the trail. Stated that the transitions and entry points for the trail are not done well within the City. Also stated that many of the steep grades within the town are surfaced with soft materials, which can be dangerous for people ascending and descending and can be a major barrier for people using a mobility device.

1.5 The councillor also wished to see a greater law enforcement presence along the trail to ensure that there is compliance with rules and to make people feel safer while using the network.

- Also wished to see enhanced lighting and security cameras along the network.

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MEETING NOTES

JOB TITLE	Trail Safety Audit		
PROJECT NUMBER	221-05994-00	**DATE**	7 July 2022
TIME	13:00 – 14:00	**VENUE**	Virtual – Cisco Webex
SUBJECT	Trail Safety Audit Stakeholder Meeting – Stakeholder Meeting #3		
CLIENT	City of Brantford		

MATTERS ARISING

1.1 A Councillor suggested that the Lorne Bridge has improved with the addition of a new painted centreline. Prior to the line there were many pedestrian-cyclist conflicts.

1.2 Another Councillor asked if there are cost effective surfaces that can be used that are more permeable than pavement or granular material.
- Councillor also suggested that the City of Brantford allow users to self-report deficiencies along the trial network using a digital mapping tool.

1.3 One councillor suggested that they are opposed to paving trails due to it not being a cost-effective strategy at making a trail system. Also noted that paved trails lead to more cyclists speeding along the system.
- Wants the road budget and maintenance to be prioritized prior to making a paved trail system
- Councillor also suggested that Ballantyne Road be closed entirely to vehicles and be made into a fully cyclin and pedestrian corridor.

1.4 A discussion was held about the need to build park benches, shelters, and other rest stop features along the network to improve accessibility.
- Councillors also discussed the need to clean up bushes and trees across the network. Noted that encampments of unhoused people form along the trail network downtown and this has resulted in trail users reporting that they feel unsafe.
- Discussion about the Mary Welsh Pavillion was held. Councillors noted that the pavilion has fallen into a state of disrepair and has been extensively vandalized.

1.5 One councillor suggested hiring a trail and sidewalk inspector to have as a full-time staff member. Their role would be to seek ways to maintain and enhance the safety of the trail network..

These minutes are considered to be accurate recording of all items discussed. Written notice of discrepancies, errors or omission must be given within seven (7) days, otherwise the minutes will be accepted as written.

MEETING NOTES

JOB TITLE	Trail Safety Audit		
PROJECT NUMBER	221-05994-00	**DATE**	11 July 2022
TIME	13:30 – 14:30	**VENUE**	Microsoft Teams
SUBJECT	Trail Safety Audit Stakeholder Meeting – Stakeholder Meeting #4		
CLIENT	City of Brantford		

MATTERS ARISING

1.1 Council member noted that there is a massive gap in the trail system in the Southwest Quadrant between an industrial park and Mohawk Park. Noted that because they were familiar with the route they knew how to navigate the network, but they stated that a visitor to the town would not be able to safely navigate the detour.

1.2 Council member stated there are many parts of the trail that are washed out and susceptible to erosion.

1.3 Noted that there is a blind corner coming off the canal trail. Also noted that there are no good connections to the river trail system.

1.4 Suggested that there are trees and underbrush that needs to be cut back to increase the visibility of the river at the Two Bridges crossing. Suggested that increased visibility would make this location a destination and that it would decrease encampments from building in the brush.

These minutes are considered to be accurate recording of all items discussed. Written notice of discrepancies, errors or omission must be given within seven (7) days, otherwise the minutes will be accepted as written.

Community Engagement

Let's Talk Brantford Results

Summary of 'Places' Mapping Exercise

Project: Let's talk about Brantford Trails	
Map: Survey for Map - 3790 [2021-01-12 to 2022-08-18]	
Question: Your Comment	
No.	**Contribution**
1	There is hogweed that travels along the creek closer to this side of the trail. It is flowering and is getting closer to the trail. Extends possibly around a 10-20 meters estimate in the area.
2	There is hogweed that travels along the creek closer to this side of the trail. It is flowering and is getting closer to the trail. Extends possibly around a 10-20 meters estimate in the area.
3	Not possible to get from this point of the trail to the downtown.
4	To get from the bridge to the paved trail, you have to go up a steep grass hill.
5	Add side designated trail use off this hill leading to the bridge. Many cars drive too fast going into the parking area and dont watch for runners or cyclists
6	Some trees along the trail in this area are dying and branches are falling off on to trail area
7	Many people bring their off leash dogs to these fields and then walk them unleashed on the trails (or dogs chase people onto trails)
8	I've seen a couple of older people fall off their bikes near this hill because they aren't strong enough to pedal up the small incline (possibly just returning to biking and don't realize how weak they are compared to when they biked the last time many years before...)
9	There have been a few occasions where I've seen people with crossbows and even guns (twice) hunting in this area. I called police a couple of times...not sure if they responded based on reaction of dispatcher...
10	People walk their off leash dogs here...dogs chase deer, turkey vultures, people, etc. Need many signs all along trail telling people to keep dogs on leash. On a run around the river, I would say nearly 1/4 to 1/2 of dogs I see (depending on time of day) are off leash.
11	This area is not paved. Not a huge deal...just seems odd
12	This is probably the tightest corner on the trail and I've seen many people almost wipe out or collide with oncoming cyclists, runners
13	Large urban homes are being built too close to the trail. Hoping buffers are being put in, especially on the rear of the home.lots that are closer to the single track trail.
14	Put pedestrian crossing from the parking lot

Summary of 'Places' Mapping Exercise

15	Cars never stop at the white line here and always creep well into the path of cyclists or runners because of the angle of the street. Very dangerous
16	Speed bumps needed here Lots of car, foot, bike traffic and many drift into oncoming traffic lanes
17	The formal trail ends but then there are many informal trails in this area. Lots of motorized vehicles go in here and there a bunch of tents. However, it seems logical to extend the formal trail to mohawk Park as many people use it already
END OF REPORT	

Summary of 'Ideas' Exercise

Project: Let's talk about Brantford Trails	
Ideas: Do you have any general suggestions for how to make Brantford's Trails safer? [2021-01-12 to 2022-08-18]	
No.	**Contribution**
1	Idea: A trail or lane to Conklin along Mount pleasant would be wonderful. Also there is a large pothole on mount plesant while crossing veterans.
2	Idea: More Benches and garbage cans Description: Would be great to have a place to rest on most trails. Also garbage or recycling areas more frequently. Thanks!
3	Idea: Camera systems on the 2 walking Bridges behind the casino, more lighting on main trails and more garbage cans Description: More security and lights
4	Idea: General upkeep Description: Fixing the lower Gilkison trail so it can be properly accessed again. Clearly pavement is not the answer as it is way to expensive to repair when the river floods.

Summary Report

12 January 2021 - 17 August 2022

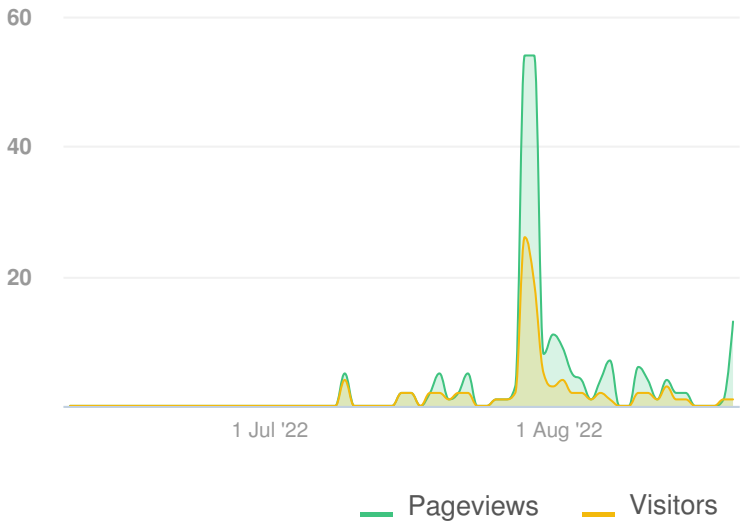
Let's Talk Brantford

Let's talk about Brantford Trails

FULL LIST AT THE END OF THE REPORT

BANG THE TABLE engagementHQ

Visitors Summary



Highlights

TOTAL VISITS	MAX VISITORS PER DAY	NEW REGISTRATIONS
103	26	5

ENGAGED VISITORS	INFORMED VISITORS	AWARE VISITORS
6	44	88

PARTICIPANT SUMMARY

ENGAGED

INFORMED

AWARE

6 ENGAGED PARTICIPANTS

	Registered	Unverified	Anonymous
Contributed on Forums	0	0	0
Participated in Surveys	0	0	0
Contributed to Newsfeeds	0	0	0
Participated in Quick Polls	0	0	0
Posted on Guestbooks	0	0	0
Contributed to Stories	0	0	0
Asked Questions	0	0	0
Placed Pins on Places	2	0	0
Contributed to Ideas	4	0	0

** A single engaged participant can perform multiple actions*

	(%)
Let's talk about Brantford Tr…	6 (6.8%)

** Calculated as a percentage of total visits to the Project*

ENGAGED

INFORMED

AWARE

44 INFORMED PARTICIPANTS

	Participants
Viewed a video	0
Viewed a photo	0
Downloaded a document	0
Visited the Key Dates page	7
Visited an FAQ list Page	0
Visited Instagram Page	0
Visited Multiple Project Pages	34
Contributed to a tool (engaged)	6

** A single informed participant can perform multiple actions*

	(%)
Let's talk about Brantford Tr…	44 (50.0%)

** Calculated as a percentage of total visits to the Project*

ENGAGED

INFORMED

AWARE

88 AWARE PARTICIPANTS

	Participants
Visited at least one Page	88

** Aware user could have also performed an Informed or Engaged Action*

Let's talk about Brantford Tr…	88

** Total list of unique visitors to the project*

ENGAGEMENT TOOLS SUMMARY

0	0	0	0	0	0	0	1
FORUM TOPICS	SURVEYS	NEWS FEEDS	QUICK POLLS	GUESTBOOKS	STORIES	Q&A'S	PLACES

1

PLACES SUMMARY

1	Places
2	Contributors
17	Pins

TOP 3 PLACES BASED ON CONTRIBUTORS

2
Contributors to

Trail Mapping

IDEAS SUMMARY

1	Ideas
4	Contributors
4	Contributions

TOP 3 IDEAS BASED ON CONTRIBUTORS

4
Contributed to

Do you have any general suggestions for how to make Brantford's Trails safer?

INFORMATION WIDGET SUMMARY

0	0	0	0	1
DOCUMENTS	PHOTOS	VIDEOS	FAQS	KEY DATES

KEY DATES

1	Key Dates
7	Visitors
7	Views

TOP 3 KEY DATES BASED ON VIEWS

7
Views

Let's talk about Brantford Trails

TRAFFIC SOURCES OVERVIEW

REFERRER URL	Visits
m.facebook.com	13
l.facebook.com	9
t.co	9
www.google.com	8
lm.facebook.com	7
duckduckgo.com	1
www.google.ca	1
www.peacekeeperhq.com	1

SELECTED PROJECTS - FULL LIST

PROJECT TITLE	AWARE	INFORMED	ENGAGED
Let's talk about Brantford Trails	88	44	6