The Effect of Path Materials and Design on The Usability of The Anewen Greenbelt

1.1 The Value of Parks

Toronto's Parks, Forestry, and Recreation department envisions a Toronto known by the world as "A City Within a Park" [1]. Parks are of immense value to Toronto and its citizens, providing recreation, ecological services, and preventing floods [1].
"Ontario residents overwhelmingly recognize that recreation and parks boost social cohesion and quality of life" [1]. Parks "improve physical and mental health, reduce healthcare costs, provide positive lifestyle choices for youth at risk, contribute to independent living among older adults and develop improved self-image" [1]. In total, Toronto is home to 10.2 million trees, forming an urban forest estimated to be worth over $7 billion [2].

However, when parks are difficult to use, their value is lessened. Consider the Anewen Greenbelt, a ravine park surrounding the Don River [figure 1]. The unofficial paths of the Anewen Greenbelt provide recreation for bikers, dog walkers, and families Unfortunately, the current informal dirt paths that give Anewen its character reduce the park's accessibility. In the Anewen Greenbelt, less physically able users experience difficulty navigating the park, and most users avoid the park after rains due to muddy conditions.

1.2 Characteristics Affecting the Accessibility of the Anewen Greenbelt

The current physical properties of the trail system make the park difficult to traverse. Precipitation flows from the surrounding neighbourhoods through the park and into the Don River, causing sections of the trail to frequently become saturated with water [B, D]. The large number of forks and informal paths make navigation difficult. Trail sections located on steep slopes [A] or escarpments [C] pose a safety risk to users due to low traction and a risk of erosion that is exacerbated by continued use of the trail. However, these "narrow, winding paths with sections of varying steepness" are the type preferred by existing park users [3]. They feel the paths provide a feeling of isolation from the city [3] that cannot be found at nearby Charles Sauriol Conservation Area, where wide asphalt trails and increased traffic provide a constant reminder that you are in a 'park within a city'. Nonetheless, the City of Toronto's Natural Environment Trail Strategy discourages the use of informal trails and highlights the importance of making trails as accessible as possible [3]. So, changes to the trail system must balance accessibility with the desire of existing users to maintain the natural feel of the park.

Figure 1. Current Trail Conditions. All photos taken by Chris Gusz.

This report considers the implementation of an asphalt path, but recommends modifications to the current dirt trail system to balance the desire for accessibility with the preservation of the park's ecological integrity and aesthetic value.

2.1 Evaluation Criteria

These objectives focus on maximizing stakeholder satisfaction while minimizing damage to the ecosystem.

Objective	Goal	Metric(s)
1. Safety and Accessibility	• Reduce likelihood of injuries.	• Friction coefficient. • Surface stability.
	• Allow easy access for emergency personnel	• Ease of access. • Furthest distance in on trail from access point.
	• Accommodate multiple recreation types and ability levels.	• Width, grade, stability, surface regularity.

2. Environmental Impact	• Mitigate Erosion.	• Centimetres lost per month from edge of bluffs • Change in slope of steep sections
	• Minimize area disrupted by trail.	• m^2 • Depth of foundations
	• Minimize precipitation run-off.	• m^3
3. Aesthetics	• Maintain natural appearance of park [3]	• Amount of foreign (ie non-wood) materials used. • Qualitative observation.

2.2 Possible Solutions

Two designs are considered. First, improvements on the existing dirt trail system provide a balance between usability and natural appearance. Secondly, implementation of an asphalt path is considered to maximize accessibility.

2.2.1 Modifications to Existing Dirt Paths

The main trail route was be chosen based on popularity, path quality, and proximity to access points. Informal trails will be temporarily fenced off; the compacted soil will be reworked, and regrowth of native vegetation will be facilitated to restore ecological integrity and form a physical barrier preventing trail users from deviating from the main path.

Comments

B. Puncheons [figure 3] will be installed to facilitate the use of this entrance in muddy conditions. This will allow park users to avoid the dangerously steep asphalt entrance at A.

C. Stairs and handrails [figures 5 & 6] will be implemented together.

D. A puncheon [figure 2] will installed in place of the current logs.

E. The path along the railway will be eliminated due to safety concerns.

F. Retaining walls will be constructed ehre.

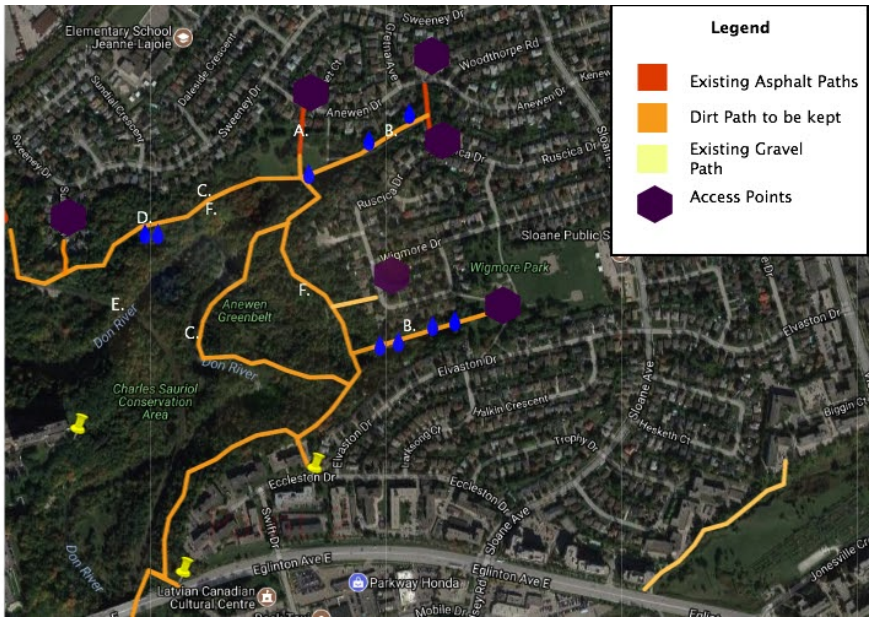

Figure [2]: Outline of path locations.

Wood infrastructure will be built to improve accessibility and reduce erosion.

First, puncheons [figure 3] will be installed over muddy sections of the trail, improving accessibility for pedestrians and bikers [cite]. Puncheons are preferable to boardwalks because they are closer to the ground and do not require railings, so they are easier to assemble than boardwalks.

Secondly, retaining walls [figure 4] will be installed on the edges of some trails to prevent erosion. Because the edges of trails will be clearly defined, trampling and trail widening will be prevented.

Thirdly, two feet wide steps [figure 5] will be installed on one side of the path. Adjacent handrails [figure 6] will be constructed out of treated and sanded lumber. The rest of the path's width will be left as is to allow use for mountain bikers.

Figure 3. A Puncheon [4]

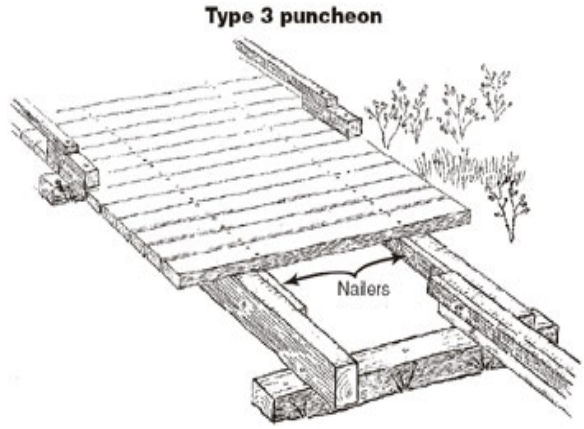

Figure 4. Retaining Wall [5]

Figure 5. Wooden Steps [6]

Figure 6. Wooden Railings [7]

2.2.2 Installation of Asphalt Path

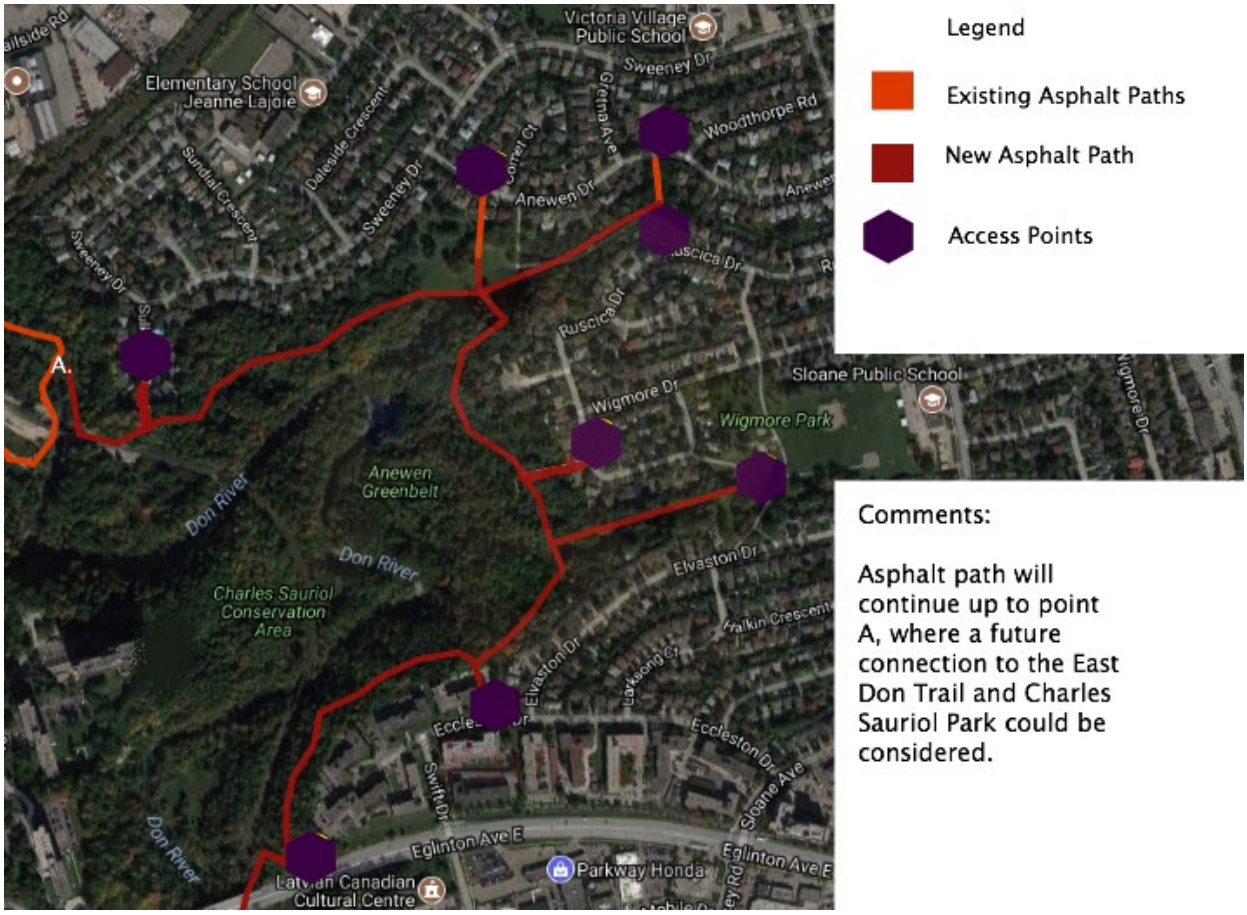

Figure 7: Asphalt Path Plan

An asphalt path will be installed along the most used route. The path will extend past the easternmost entrance to allow for a future connection to the East Don Trail. Construction of an asphalt trail must follow the guidelines outlined in figure 8.

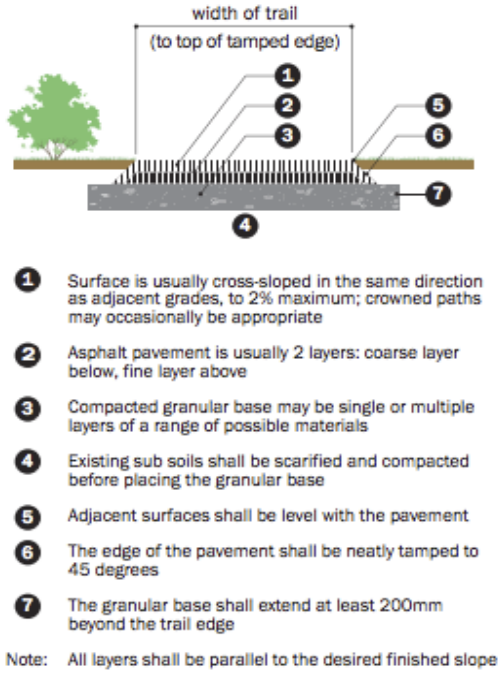

Figure 8. Guidelines for Asphalt Trails [8]

2.4 Evaluation

	Dirt	Asphalt
2.1.1: Safety and Accessibility		
● Injury	● Handrails reduce severity of falls [9]. ● Steps and puncheons improve traction and surface stability.	● Ice accumulation in winter reduces traction. ● Asphalt is a harder surface than dirt - falling on asphalt poses a greater risk.
● Emergency Personnel Access	● Furthest distance from any access point: ~600 m ○ Estimated using Google Maps	● Furthest distance: ~300 m ○ Estimated using Google Maps ● Transportation of wheeled stretchers or medical equipment is possible.
● Recreation Types, Ability Levels	● Mountain bikers, pedestrians. ● Stairs and railings allow a wider range of users to navigate park. ● Puncheons make park more attractive for pedestrians who prefer not to get muddy.	● Wheelchairs, bikes, rollerblades, skateboards, scooters, strollers, and pedestrian modes of transportation are supported. ● Snow removal is possible, increasing accessibility in winter.
2.1.2: Environmental Impact		
● Erosion	● Stairs mimic effect of retaining walls by minimize shear from pedestrians' steps to mitigate erosion and increase surface stability.	● Asphalt paths minimize damage to soil [10]. ● Asphalt is not very affected by erosion [11].
● Area Disrupted	● Erosion, trail widening, and the trampling of vegetation on edges of path will be minimized	● Ground under path must excavated to lay gravel foundation. This harms

	because trail users will be less likely to need to go off the trail to avoid mud once puncheons are put in place.	trees whose roots might be disturbed.
● Drainage	● Good drainage.	● Impermeable surface increases water run-off.
2.1.3: Aesthetics		
1.3.a) Natural Appearance	● Dirt paths are preferred by existing users [3].	● Asphalt paths break the continuity of the natural aesthetic.

3.0 Recommendation

Maintaining one main dirt path with wood infrastructure build around muddy sections is the best solution, minimizing environmental disruption while increasing the usability of the Anewen Greenbelt. The park will remain attractive to mountain bikers and existing users while allowing pedestrians of a wider range of ability (and tolerance for mud) to use the park. Regrettably,paths do not have the correct surface characteristics to support other forms of wheeled transportation such as wheelchairs. However, these user types can utilize the nearby Charles Sauriol Conservation area for their recreation. So, by implementing the modifications to the trail indicated in 2.2.1, the majority of users will have access to a type of park that fits their needs; rugged, isolated, and natural, or accessible.

4.0 References

1. “An Ontario Perspective – Research Summary,” *Use and Benefits of Local Government Recreation and Parks Services: An Ontario Perspective – Research Summary.* Parks and Recreation Ontario, 2009.

2. U. Forestry, “Every Tree Counts: A Portrait of Toronto's Urban Forest,” *Trees & Ravines - Parks, Forestry & Recreation | City of Toronto*. [Online]. Available: https://www1.toronto.ca/wps/portal/contentonly?vgnextoid=5e6fdada600f0410VgnVCM10000071d60f89RCRD&vgnextchannel=470bdada600f0410VgnVCM10000071d60f89RCRD.

3. *Natural Environment Trail Strategy.* Toronto: City of Toronto, 2013.

4. *Type 3 Puncheon.* Ice Age Trail Alliance. [Online]. Available: http://atfiles.org/files/pdf/Ice-Age-Trail-Structures.pdf

5. *Timber Retaining Wall*. Ice Age Trail Alliance. [Online]. Available: http://atfiles.org/files/pdf/Ice-Age-Trail-Structures.pdf

6. R. Fraser, *Wooden Steps on Park Path*. Alamy. [Online]. Available: http://c8.alamy.com/comp/ANFY1A/wooden-steps-on-park-path-ANFY1A.jpg

7. T. Richter, *Railing-Away-forest-path-trail*. [Online]. Available: https://cdn.pixabay.com/photo/2014/11/23/10/33/railing-542510_960_720.jpg

8. *Multi-Use Trail Design Guidelines.* Toronto: City of Toronto, 2014

9. Maki, Perry, and McIlroy, “Efficacy of Handrails in Preventing Stairway Falls.” [Online]. Available: https://www.promenaid.com/media/blog/Maki-1998-Efficacy-of-handrails-in-preventing-stairway-falls.pdf.

10. J. M. Edington and M. A. Edington, *Ecology, Recreation, and Tourism*. Cambridge: Cambridge University Press, 1990.

11. “4.0 BACKGROUND RESEARCH ON TRAILS,” *Administrative Systems WWW Server*. [Online]. Available: http://www.adm.uwaterloo.ca/infowast/watgreen/projects/library/s97erosion/background.html.

12. S. Saitta, “Choosing the Right Trail Surface.” [Online]. Available: http://atfiles.org/files/pdf/ColumbiaMOsurface.pdf. [Accessed: 22-Sep-2017].