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Executive Summary

This report presents a design project to create an accessible pathway connecting the Keele Street entrance of High Park to the High Park Nature Centre. The goal is to provide a safe, year-round route for individuals with mobility challenges and families with strollers to travel while preserving the Black Oak Savanna ecosystem and enhancing the park's amenities. The need for this project arises from an accessibility gap identified by the High Park Nature Centre, the client. The project scope excludes improving other park trails and entrances, will not interfere with the intersection with Spring Road, and supports year-round accessibility.

The service environment experiences temperatures -25 ℃ to +35 ℃, with moderate monthly precipitation. The ground consists of uneven asphalt and compacted soil with slopes from 4° to 7°. The area supports diverse vegetation and wildlife and experiences regular pedestrian and cycling traffic with moderate noise and vibration from users and maintenance vehicles. The park also provides a cellular network and GPS connectivity.

To develop a design that meets the client's requirements, the interests of key stakeholders must also be considered. The Parks, Forestry and Recreation requires a durable, safe, and compliant design that integrates with the existing park. Another stakeholder, the Ontario Ministry of Citizenship and Multiculturalism, may require archaeological assessments that could restrict construction areas. Furthermore, the TRCA must ensure the design protects natural systems, stormwater flow, and erosion control. Finally, Indigenous Peoples expect the design to preserve the cultural significance of High Park and the Black Oak Savanna. The design should ensure safe year-round access. It should also provide high slip resistance with a wet DCOF above 0.65 for stability in wet conditions, and maintain a running slope under 7% to improve accessibility. Waste receptacles will be positioned at 30m intervals to encourage proper disposal.

52 full solutions were generated through brainstorming, morph charts, and brainwriting, and then narrowed to 3 feasible ideas through multivoting. The *Elevated Platform* features a raised ramp with handrails, a slip-resistant rubber surface, bins, and signage. The *Solar-Heated Conveyor Belt* features a bidirectional, slightly elevated conveyor belt system to provide a level-assisted mobility route with solar-heated high-grip belts, handrails, and bins. Lastly, the *Rope and Pulley System* includes a rope assist to support the user while walking along challenging areas of the path, high-contrast edge bands, a levelled concrete pathway, and an electrically heated mat powered by a generator to prevent snow buildup.

Using the Pugh Chart, the team selected the *Solar-Heated Conveyor Belt* as the most effective solution for the client's requirements, as it addressed all proposed design objectives and outperformed the other alternative concepts in accessibility, safety, and year-round usability.

1.0 Introduction

High Park contains the Black Oak Savanna, a rare ecosystem and a vital part of Toronto's natural heritage, sustained for centuries through the stewardship of Indigenous peoples [1]. Its preservation is essential, as it supports rare plant and animal species.

Our client, the High Park Nature Centre, seeks to address accessibility changes along several trails due to uneven terrain and limited access to improve travel for visitors using mobility devices and strollers, thereby enhancing their exposure and understanding of the Black Oak Savanna. This project focuses on the route from the Keele and Bloor Street West entrance to the Nature Centre, which passes through this ecosystem.

This report outlines the accessibility conditions that influence this route. We will define the problem, gap, and scope, analyze the service environment (physical, living, and virtual conditions), examine interest holders, and establish the necessary functions, objectives, constraints and requirements to guide the development of the final design.

2.0 Problem Statement

Park users, especially individuals with mobility challenges and families with strollers, who enter from Keele Station towards the High Park Nature Centre, are forced to navigate an alternative pathway along Bloor Street West and other roadways, thereby missing the experience of walking through the Black Oak Savanna. Our client has identified this as a significant gap: the lack of a safe and accessible pathway through the Black Oak Savanna from Keele Station to High Park Nature Centre, as illustrated in Figure 1.

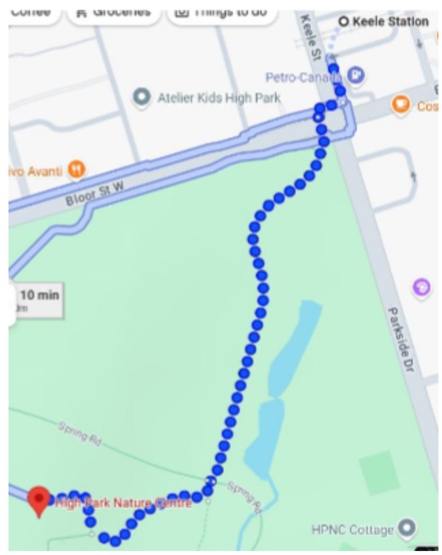

Figure 1. Path from entrance on Spring Road to the High Park Nature Centre [1]

Therefore, our team recognized the need to refine and improve the current pathway to ensure equitable access for all users, while enhancing amenities and preserving the historical significance of the Black Oak Savanna.
The scope focuses on the section from the south entrance on Spring Road to the southeast entrance of the High Park Nature Centre, where the trail divides, due to its steepest incline and lack of amenities and signage, as illustrated by the dotted line in Figure 2. This section represents the physical area under consideration. Areas outside this defined route, such as alternative entrances or other park trails, are beyond the current project scope to avoid interfering

with the surrounding nature. The proposed design considers year-round accessibility and will not interfere with the intersection at Spring Road (indicated by the client).

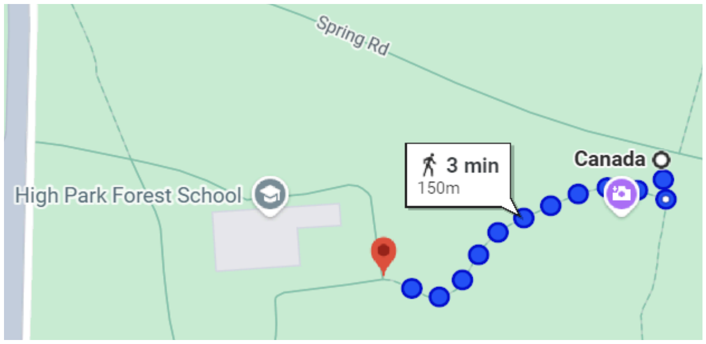

Figure 2. Path from entrance on Spring Road to the south-east High Park Nature Centre intersection [1]

3.0 Service Environment

This section summarizes the physical environment, living things, and the virtual environment in which a future design will operate.

3.1 Physical Environment

The design is intended for outdoor use, exposing it to physical elements such as weather, pressure, humidity, and other environmental conditions (Table 1).

Table 1. Elements in the physical environment

Element	Description
Temperature Range	-25 ℃ (99% low) to +35 ℃ (1% high) [3] (Appendix A).
Precipitation	≈ 40.2 mm of rain and ≈ 2.87 cm of snow per month (Nov, Dec, Jan, Feb, Mar) [3] (Appendix A).
Humidity	55 % (99% low) to 85 % (1% high) [3].
Pressure range	100.8 kPa (99% low) to 101.9 kPa (1% high); annual mean ≈ 101.4 kPa [3].
Noise level	Average of 66.4 dBA [4].
Ground Surface	Asphalt and compacted soils with cracks ≈ 200 mm wide and ≈ 2 m long;

Conditions	Erosion ≈ 100 mm deep and ≈ 50 mm diameter; exposed tree roots and crushed stones on the ground (Figures 3, 4, 5, 6) (Appendix B).
Slope Angle	Typically ≈ 4°; steep segment ≈ 7° [5].
Vibration Sources	Foot & bike traffic and occasional maintenance vehicles (Appendix B).

Figure 3. Cracks

Figure 4. Crushed stones

Figure 5. Erosion

Figure 6. Exposed tree roots

3.2 Living Things

The design will interact with several living things. Table 2 summarizes the key living organisms and human activities, including animals, plants, and people, influencing the space along the route**.**

Table 2. Living things in the surrounding environment

Element	Description	
	Type	**Description**
Animals	Birds	267 species in total. Cormorants, herons, hawks, and woodpeckers are spotted. [5]
	Mammals	18 species in total. Coyote, grey squirrel, and raccoon are spotted. [5]
	Amphibians/Reptiles	9 species in total. Turtles and snakes are most prevalent. [5]
Plants	Trees	Black Oak, sassafras. [5]
	Shrubs	Little bluestem, northern dewberry. [5]
	Grass	Big bluestem, bottlebrush grass. [5]
	Frobs/wildflowers	Blazing star, hoary vervain. [5]
Humans	Park visitors, including tourists, children, joggers, seniors, and bikers.	
Malevolent Agents	Vandalism, graffiti, litter (Figures 7 and 8).	

Figure 7. Vandalism on signs

Figure 8. Vandalism on signs

3.3 Virtual Environment

Table 3 summarizes the virtual environment, including lighting, cellular network, and GPS services.

Table 3. Elements in the virtual environment

Element	Description
Cellular Network	Major cellular network providers (Rogers, Bell, Freedom) cover 4G and 5G networks [6].
GPS Services	Reliable for smartphones and navigation.

4.0 Interest Holders

Table 4 presents a list of identified key interest holders, ranked by their influence on the path design using a Stakeholder Matrix, as shown in Appendix C.

Table 4. Interest holders involved in the design of the path

Ranking	Interest Holder	Explanation
1	Parks, Forestry and Recreation Department	The Toronto Parks, Forestry and Recreation Department (PFR), the legal owner of High Park and the ultimate authority over all park operations, is able to dictate the budget, demand adherence to existing legislation, as well as requiring durable, vandal-resistant materials that are easy to service, while assessing ease of use [7]. They have three main interests: meeting asset management goals for long-term durability and cost-effective maintenance, acting as a regulatory body to ensure compliance with legislation, public safety, and minimize liability, and requiring operational integration so that the final design is able to seamlessly integrate to existing infrastructure.
2	Ontario Ministry of Citizenship and Multiculturalism	Under the Ontario Heritage Act, an investigation is required before land alterations if the area has "archaeological potential" [8]. High Park meets this criteria, having remained relatively untouched. The Ministry and its Archaeological Consultants will likely mandate an assessment before construction. If significant artifacts or features are discovered, that area of the park may be designated off-limits, and our design would require an alternative site.

3	Toronto and Region Conservation Authority (TRCA)	The TRCA is an independent, provincially mandated inter-municipal agency that manages natural resources and hazards in the region [9]. They are a critical interest holder due to their statutory authority over High Park's water resources and natural hazards. Their primary interest is to ensure the project maintains environmental integrity, does not interfere with stormwater runoff, or compromise sediment and erosion control near park water bodies. They must also review the design's compliance with the Conservation Authorities Act [10].
4	Indigenous Peoples (Wendat, Haudenosaunee, the Anishinaabe, and the Mississaugas of the Credit)	Indigenous peoples will request a design that respects the cultural significance of the park and the Black Oak Savanna, while still accommodating traditional practices like controlled burning and minimizing ground intrusion/soil disturbance [11]. As key stakeholders with a deep, inherent historical connection to the land, their involvement ensures proper preservation of the Black Oak Savanna. The design must protect the cultural landscape and historically/culturally significant areas.

5.0 Detailed Requirements

This section outlines the route's functions, objectives, and constraints, spanning from the park's entrance on Keele and Bloor Street West to the High Park Nature Centre.

5.1 Functions

The route's primary function is to provide access between Spring Road and the High Park Nature Centre. The design must perform the following essential actions, as listed in Table 5, developed using the black-box method (Appendix D).

Table 5. Functions of the pathway design

Primary Functions	Secondary Functions
Facilitate pedestrian movement	Mark pedestrian and dog-off-leash zones/paths
	Allow pedestrians to move horizontally
	Allow pedestrians to move vertically

5.2 Objectives

The project's primary goal is to enhance accessibility and amenities along the pathway from the south entrance of Spring Road to the southeast entrance of High Park Nature Centre, while preserving the surrounding vegetation, by confining all design changes to the existing path. To ensure the project's successful implementation, the design must achieve the objectives listed in Table 6, developed using a How-Why-Tree (Appendix E). They were then ranked by a Pairwise Matrix (Appendix F).

Table 6. Objectives of the pathway design

Description	Metric	Goal	Justification
Should maximize the traction (Slip resistance)	Wet Dynamic Coefficient of Friction (DCOF)	More than 0.65 [12]	DCOF refers to the friction that a surface provides under wet weather. The design should provide a wet dynamic coefficient of friction greater than 0.65 in outdoor inclined areas to support wheelchair braking and crutch stability.
Should minimize the running slope (steepness)	Slope gradient (%)	Less than 7% [13]	The design should minimize the running slope to less than 7% (the greatest slope of the path) to improve its ease of use.
Should maximize disposal convenience	Distance between bins, measured in meters (m)	Less than 30m [14]	The design should minimize the distance between bins to less than 30m. According to behavioural research ("30 steps rule"), users will drop trash on the ground if they have to carry it more than 29 steps.
Should maximize the operation season	Operation duration (Months per year)	12 months	Ideally, the path is operational for the full 12 months of the year. The design should maximize the operation duration to 12 months.

5.3 Constraints

The constraints define the absolute limit for the pathway from the south entrance of Spring Road to the southeast entrance of High Park Nature Centre. For this project, "accessible" is defined by the Accessibility for Ontarians with Disabilities Act (AODA) [15] and the Toronto Accessibility Design Guidelines [16], which govern exterior paths of travel.

Table 7. Constraints of pathway design

Adherence to code/section	Descriptor	Metric	Limit
AODA	Width	Meter (m)	The width must be more than 1.5m (Accessible Exterior Paths of Travel) [13].
CAN-ASC-2.1 – Outdoor spaces:	Gradient	Percentage (%)	The slope percentage must be no greater than 10% (6.10.11.3 Maximum slope) [13].
Toronto Accessibility Design Guidelines	Overhead Clearance	Meter (m)	The overhead clearance must be more than 2.1m (.1.9. Exterior Ramps) [15]

6.0 Generation, Selection and Description of Alternative Designs

This section details the design process for High Park walkway.

6.1 Idea Generation Process

Our team utilized the idea generation process to generate solution concepts that align with the FOCs and the client's needs (Figure 9). AI was used to help generate partial solutions, as recorded in Appendix G. To minimize bias and maximize creativity, we combined individual ideation using morph charts (Appendix H, I). Following a collaborative refinement phase, the resulting ideas were organized into three categories, preservation of Black Oak Savanna, Implementation of Amenities, and accessibility for all users, ensuring all designs address the project's objectives. The full brainstorming list is recorded in Appendix J. All tools for the idea generation process is recorded in Appendix K.

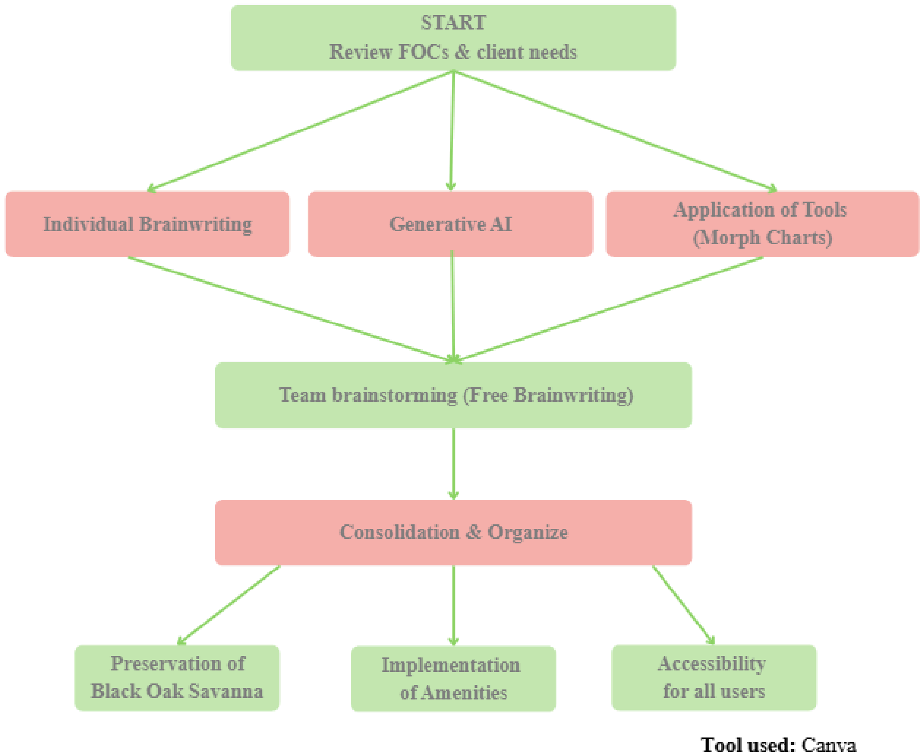

Figure 9. Idea generation flow chart

6.2 Alternative Design Selection Process

Our team used a systematic selection process to narrow the consolidated list of concepts into three alternative designs (Figure 10). We began by filtering through feasibility checks, reducing to 40 solutions, recorded in Appendix L. Two rounds of multivoting, as recorded in Appendix M, refined this list further, first narrowing the list to 20 options, and then to the top 10 options, recorded in Appendix N. Finally, we utilized a Graphical Decision Chart to evaluate these top solutions against our two most critical objectives: minimize running slope and maximize traction, resulting in the selection of the final three alternative designs, recorded in Appendix O.

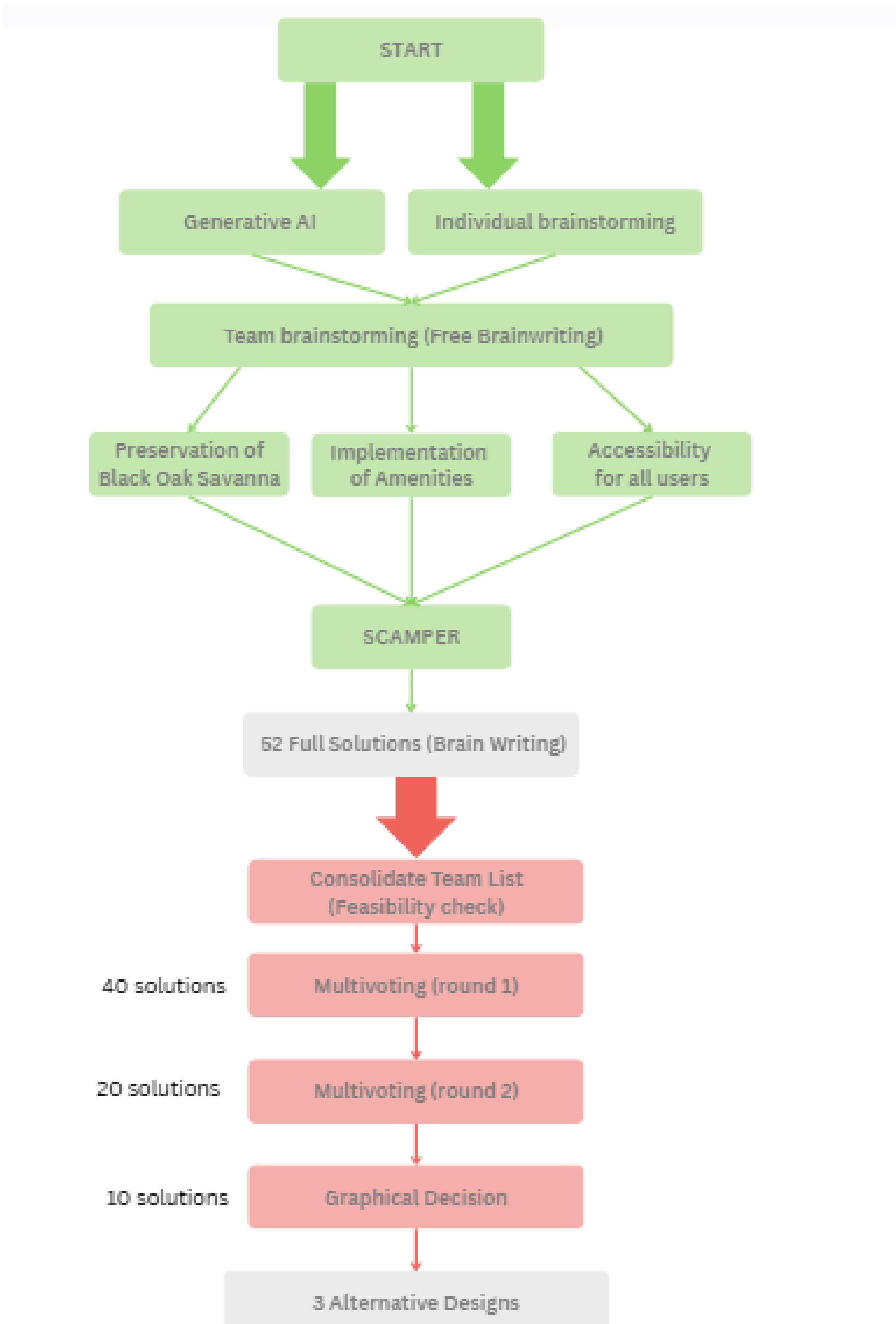

Figure 10. Idea selection flow chart

Tool used: Canva

6.3 Alternative Design Descriptions

This section provides an overview of our three alternative designs and how each approaches a solution to the problem, with explanations of how they cover as much of the design space as possible.

6.3.1 *Elevated Ramp* (#52)

The *Elevated Ramp* uses ground regrading, two elevated platforms, and a continuous level ramp with handrails to address steep slopes. It will span from the entrance of Spring Road to the dog off leash area, and from there to the southeast entrance of the Nature Centre (Figure 11). Bins will be placed every 30m to reduce litter, and signage near both entrances of the path support wayfinding. The ground material will use recycled rubber paving, offering a slip-resistant, durable surface (Figure 12).

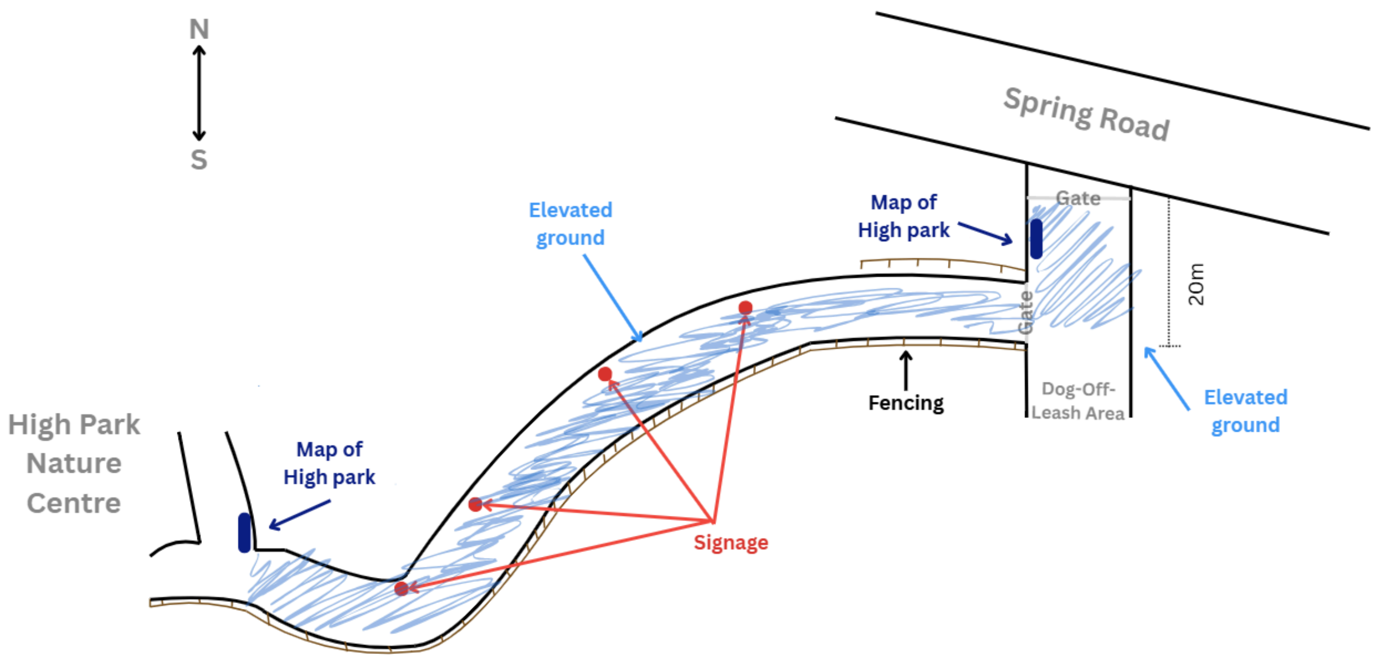

Figure 11. Bird-eye-view of elevated ramp

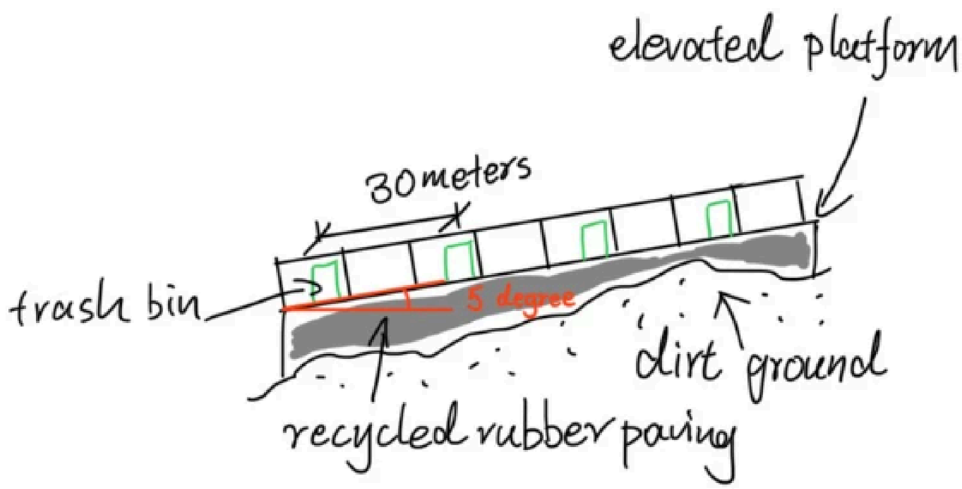

Figure 12. Side view of elevated ramp

An Objective Checklist Table for the *Elevated Ramp* is illustrated in Table 9.

Table 8. Objective Check List Table for *Elevated Ramp*

Objective	Meets Objective	Justification
Should maximize the traction (Slip resistance)	Yes	The walking surface will be layered with recycled rubber paving, which offers a DCOF of 0.79 [17].
Should minimize the running slope (steepness)	Yes	The slope is reduced by building on the current path using ground regrading to achieve a level pathway with the greatest incline of 5°.
Should maximize disposal convenience	Yes	Disposal convenience is achieved by bins being placed every 30 meters along the path.
Should maximize the operation season	No	No methods are implemented to reduce snow accumulation, making the path inaccessible during winter months.

6.3.2 *Solar-Heated Conveyor Belt* (#2)

This design features a conveyor belt system located on either side of the trail that travels in both directions and functions as an assisted mobility pathway. It spans the trail from Spring Road to the Nature Centre entrance and is slightly elevated with an incline to provide a level pathway (Figure 13).

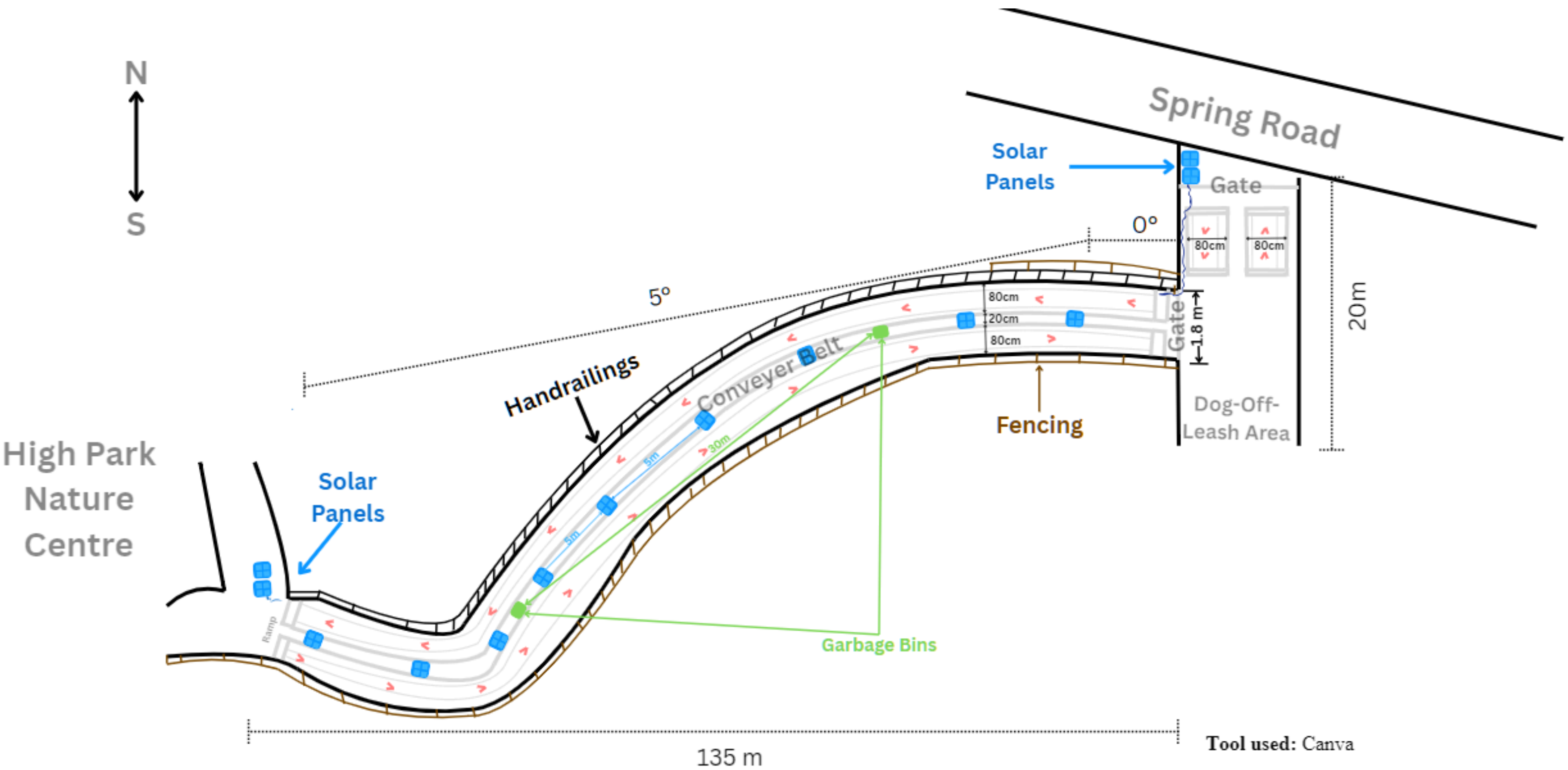

Figure 13. Bird-eye-view of solar heated conveyor belt

Handrails on both sides of each conveyor belt improve safety and protect surrounding vegetation by keeping users on the path, while bins reduce litter. The conveyor belt is heated by electricity generated by solar panels, which prevents snow accumulation and makes maintenance easier. A 5°, 2.3m by 80cm ramp leads to the user-activated button that, once pressed, will run at a speed of 0.7m/s for four minutes [18]. Solar panels are installed between the conveyor belt at 5m intervals, and the belt surface provides a wet DCOF greater than 0.65 (Figure 14).

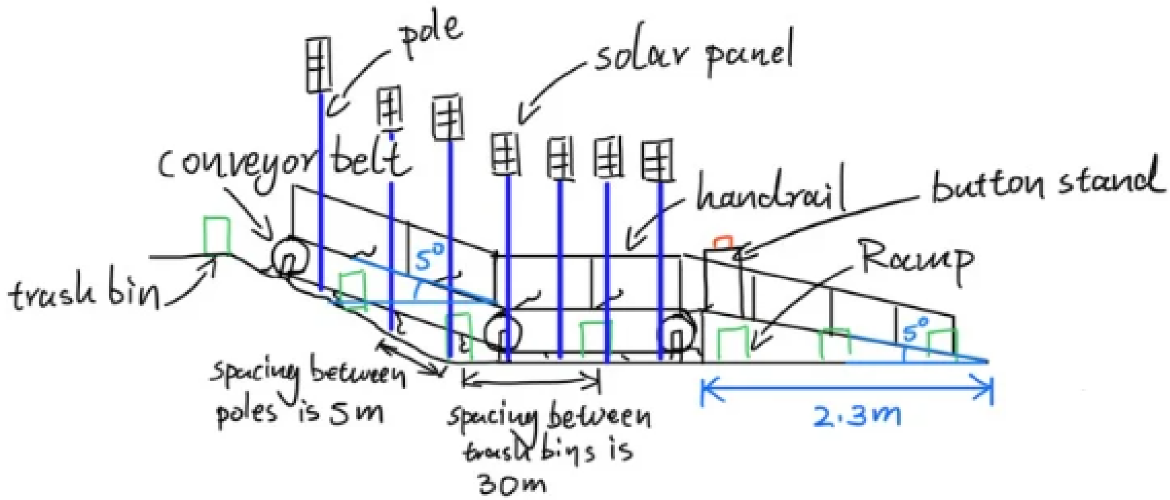

Figure 14. Side view of solar heated conveyor belt

An Objective Checklist Table for the *Solar-Heated Conveyor Belt* is illustrated in Table 9.

Table 9. Objective check list table for *Solar-Heated Conveyor Belt*

Objective	**Meets Objective**	**Justification**
Should maximize the traction (Slip resistance)	Yes	The rubber surface on the conveyor belt provides a high grip of an DCOF greater than 0.65 [19].
Should minimize the running slope (steepness)	Yes	The experienced slope is minimized to 5° by adjusting the conveyor belt's location and alignment with the area of steepest incline
Should maximize disposal convenience	Yes	Disposal convenience is achieved by bins being placed every 30 meters along the path.
Should maximize the operation season	Yes	The operation season allows for year-round access (12 months) due to its heated conveyor belt system that continuously melts snow that accumulates

6.3.3 *Rope and Pulley* (#50)

The multi-zone path design focuses on safety and clear organization, using high-contrast edge bands to direct and delineate pedestrian zones (Figure 15).

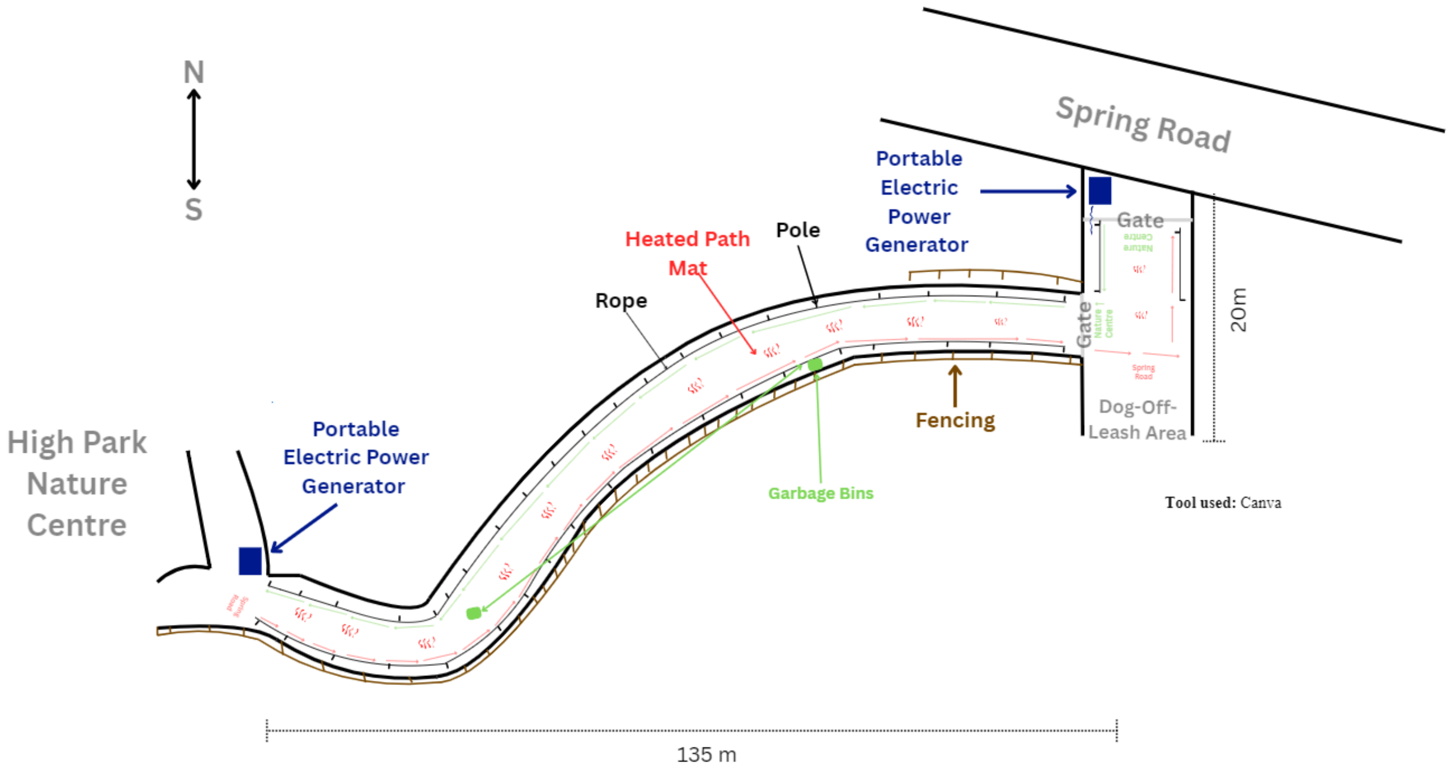

Figure 15. Bird-eye-view of rope and pulley

A level pathway will be implemented by adding layers of concrete to support an electrically heated pathway mat that prevents snow accumulation, powered by an electric generator (Figure 16).

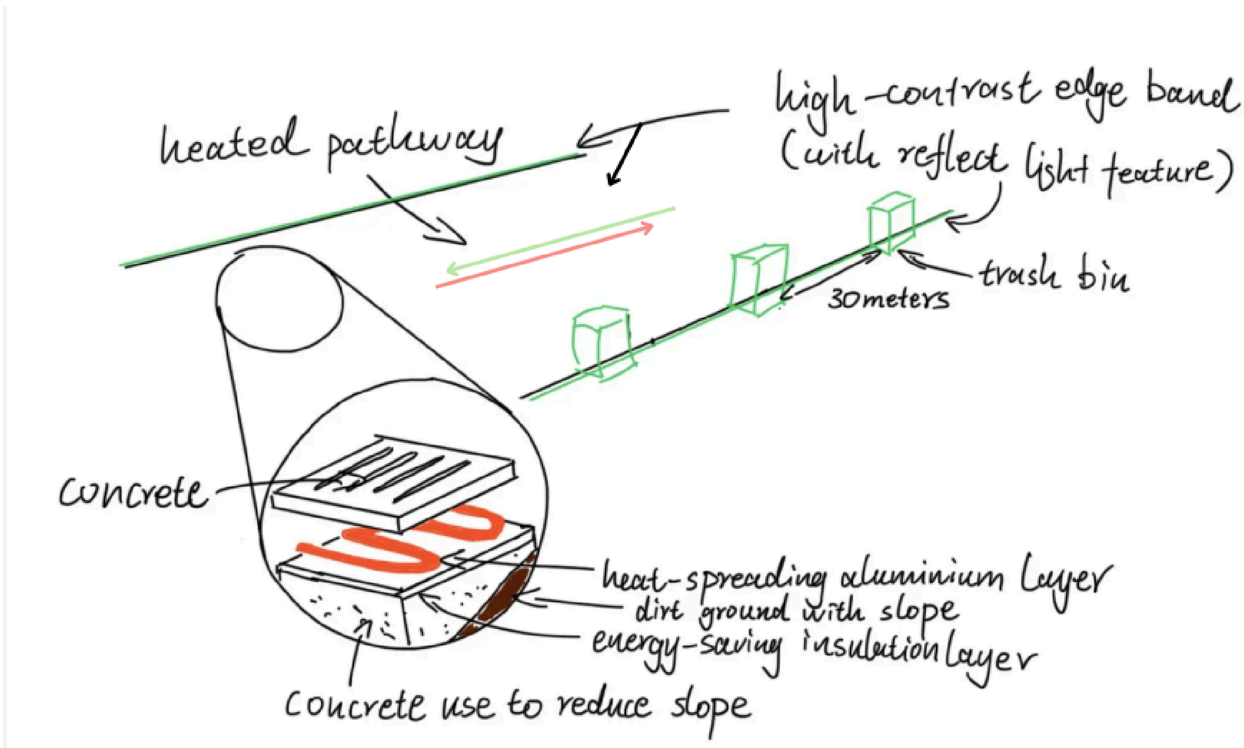

Figure 16. Heated pathway mat

A rope pulley system is installed on both sides of the trail, allowing users to hold on to assist on sloped or challenging sections (Figure 17). Garbage bins will also be placed at 30-meter intervals to help reduce litter.

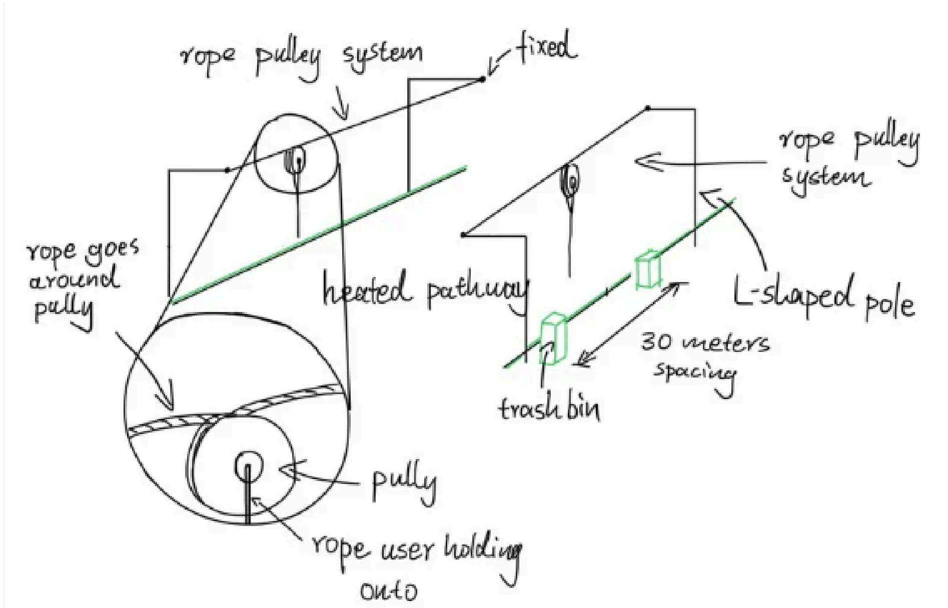

Figure 17. Rope and pulley system

An Objective Checklist Table for the *Rope and Pulley* is illustrated in Table 10.

Table 10. Objective Checklist Table for the *Rope and Pulley*

Objective	Meets Objective	Justification
Should maximize the traction (Slip resistance)	No	The resurfaced ground will have a polished concrete walking surface with a DCOF of 0.42 [20].
Should minimize the running slope (steepness)	Yes	The ground is regrounded to accommodate a heated floor, resulting in a 5 ° slope.
Should maximize disposal convenience	Yes	Disposal convenience is achieved by bins being placed every 30 meters along the path.
Should maximize the operation season	Yes	The operation season is maximized for year-round usage (12 months) through the use of the electrically heated pathway mat that prevents snow accumulation

A table of comparison of the 3 designs is recorded in Appendix P.

7.0 Proposed Conceptual Design

We utilized a structured five steps selection process, culminating in a Pugh Chart analysis, introduced in Appendix Q, to evaluate the three alternative designs. The *Solar-Heated Conveyor Belt* was selected as the optimal solution because it is the only concept that addresses the accessibility gap through passive mobility. While the *Elevated Ramp* complies with basic accessibility standards, it still relies on the user's physical strength to navigate the incline over a long distance, posing a risk of fatigue for manual wheelchair users or elderly visitors. Similarly, the *Rope and Pulley* was rejected because it relies on manual interaction that may risk users with limited upper body strength. The Conveyor Belt system completely decouples the user’s physical capability from the ability to traverse the steep terrain, ensuring equitable access for all users.

Furthermore, the design maximizes safety through its active environmental control. While a standard ramp relies on reactive maintenance, the conveyor integrated solar heating ensures year-round accessibility through automated snow removal. Ultimately, this design best fulfills the project’s functions, objectives, and constraints by maximizing user comfort and safety while strictly adhering to the scope to preserve the surrounding Black Oak Savanna.

Figure 18 illustrates the front view and specifications of the *Solar-Heated Conveyor Belt*. Rectangle solar panels are mounted on poles spaced 5 meters apart to supply electricity for both conveyor belt and heat generator [21][18][23]. The conveyor belts, 80 cm wide and 20cm tall, are equipped with handrails for user safety. There is a 20cm spacing in the middle to implement garbage bins placed every 30 cm apart.

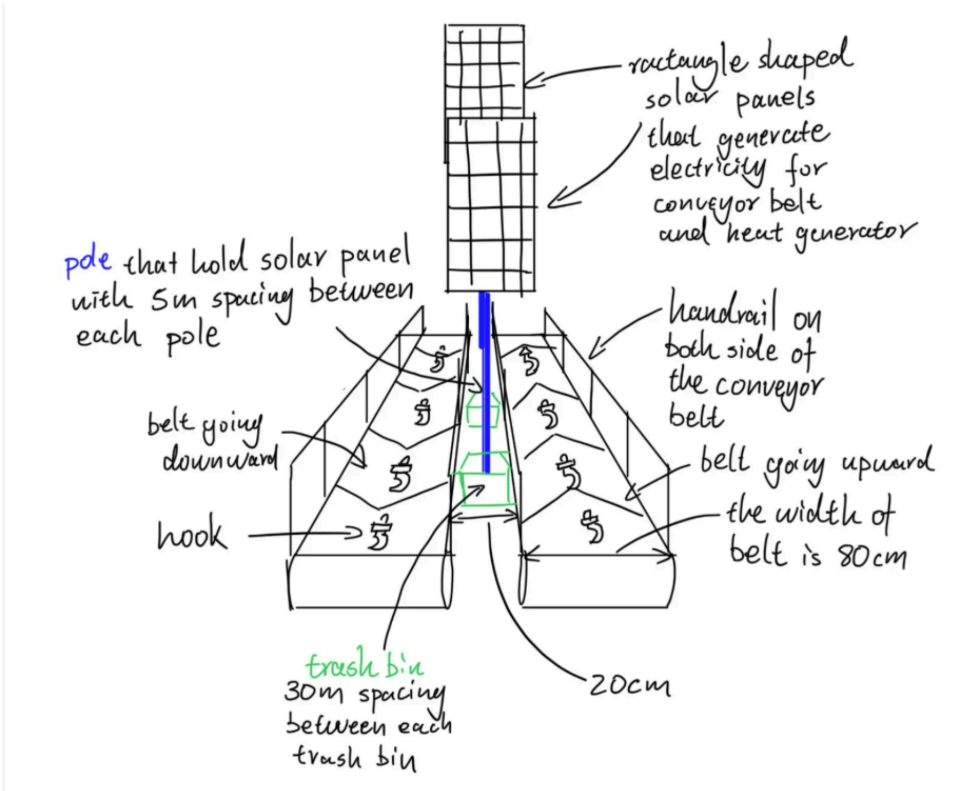

Figure 18: Front view and specifications of conveyor belt

Figure 19 illustrates the side view of the conveyor belt system; the belt contains wheelchair locking hooks on the surface, cylindrical rollers at both ends, and a heat generator positioned beneath the belt.

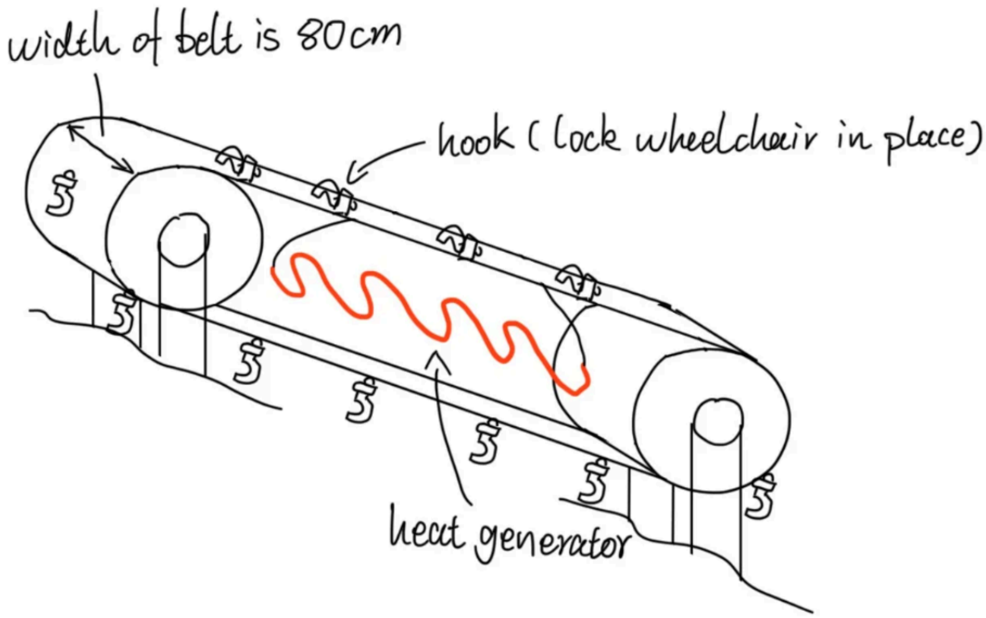

Figure 19: Specifications of conveyor belt

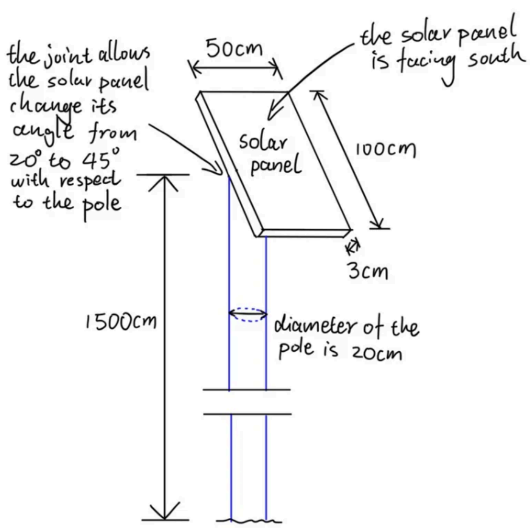

Figure 20: Specifications of solar panels

Figure 20 illustrates a solar panel mounted on a support pole. The solar panel measured 100 cm in length, 50 cm in width, and 3 cm in thickness. [21] It is positioned at the top of a vertical pole that stands 1500 cm tall from the ground. The angle between the solar panel and the ground varies from 20° to 45° throughout the year, facing south [22]. The pole has a diameter of 20 cm and supports the solar panel at its peak.

8.0 Conclusion

This document presents our team's final conceptual design: the *Solar-Heated Conveyor Belt*. Selected after evaluating alternatives using functional decomposition and the Pugh method, this design offers the most effective solution by eliminating slope burden through automated movement and ensuring year-round operation by solar-powered snow prevention. We now require the client's input on pathway width, slope tolerance and signage preferences to refine the design. The next stages include site-specific layout planning, energy analysis, safety feature integration, detailed specification, cost estimation, and risk analysis. We are confident that this design meets all accessibility and environmental requirements while being innovative and inclusive, supporting the long term preservation of the Savanna.

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8.0 Appendix

Appendix A: Temperature and Precipitation Graph for 1991 to 2020 Canadian Climate Normals [3]

Weather information on High Park was taken from weather data in Toronto, as illustrated in Figure 20.

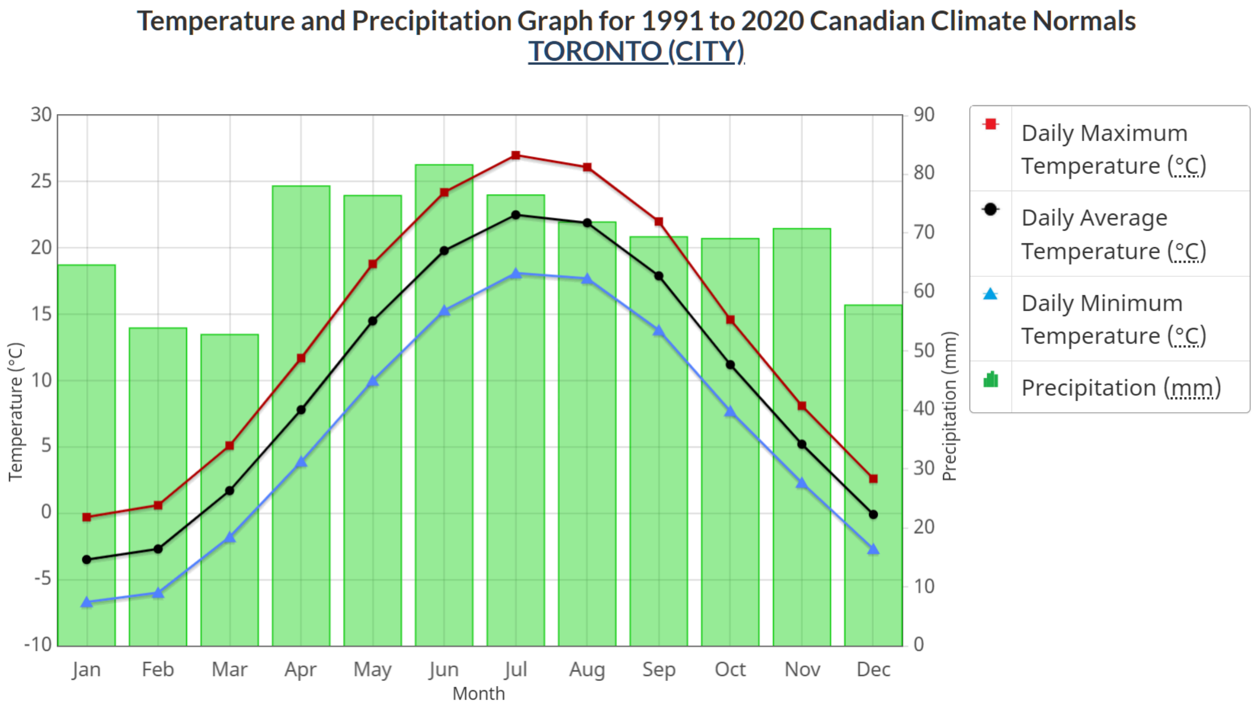


Figure 20. Temperature and precipitation graph for Toronto

Appendix B: Site Visit
A site visit took place on October 9, 2025, at 16:47 under clear weather conditions, where path measurements and observations, including identification of vibration sources, ground conditions, and the virtual environment, illustrated in figure 21.

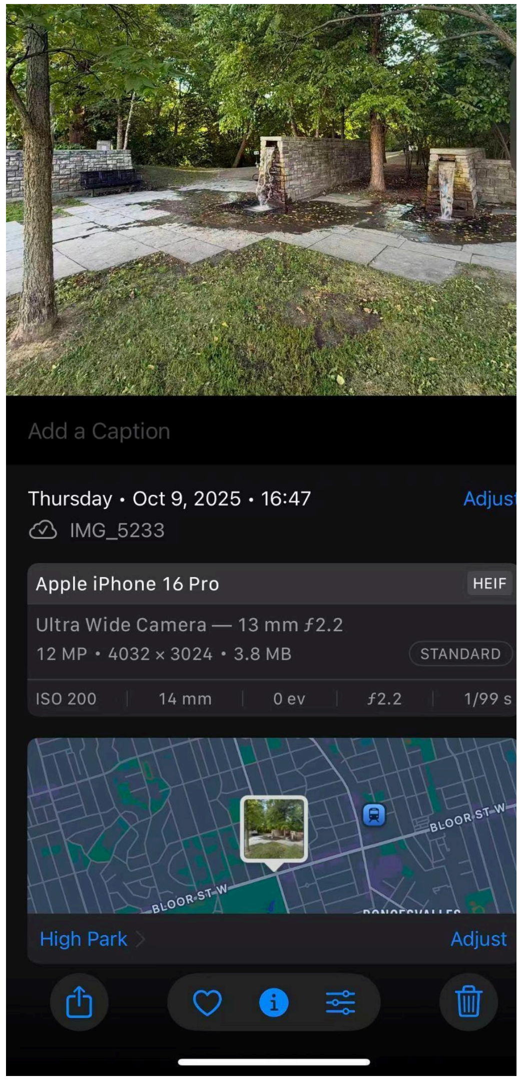


Figure 21. Evidence of site visit

Appendix C: Interest Holder Matrix

Interest holders were ranked using an Interest Holder Matrix, illustrated in Figure 22:

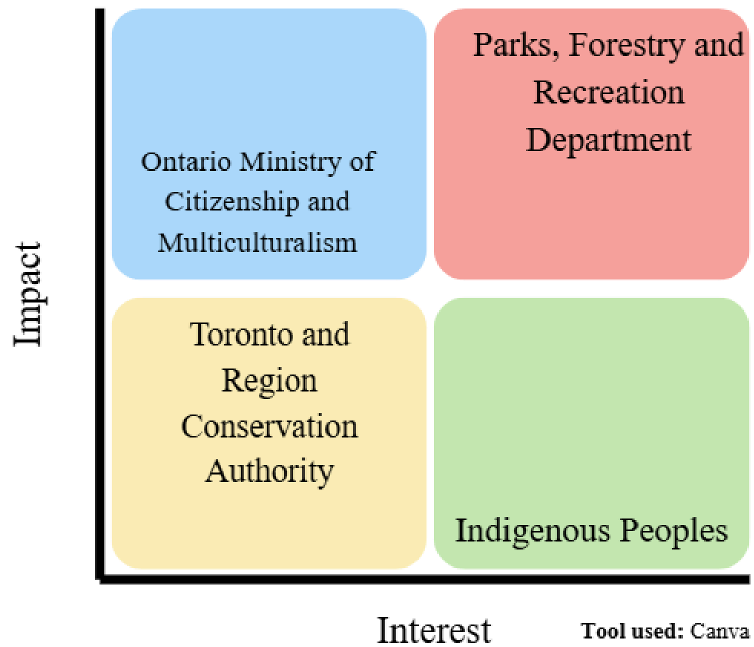


Figure 22. Interest Holder Matrix

Appendix D: Black Box Method

The black box method was used to determine the primary and secondary functions of the path that align with the client's objective, illustrated in Figure 23.

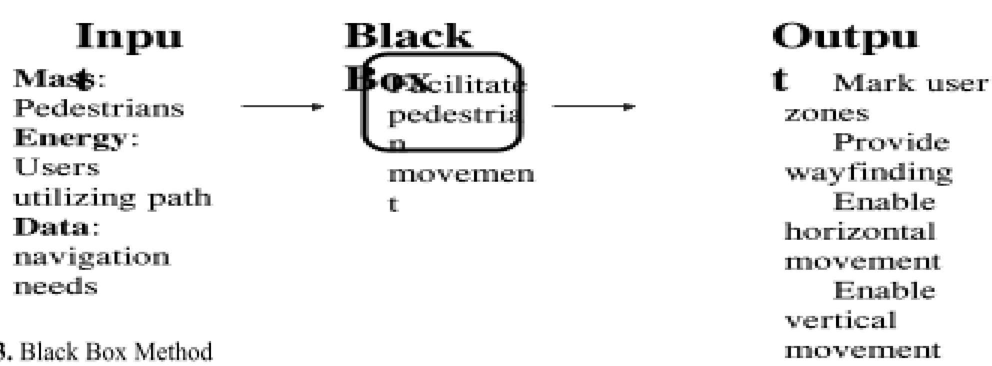


Figure 23. Black Box Method

Appendix E: How-Why-Tree and Pairwise Comparison Matrix

The How-Why-Tree was used to determine the solution's objectives, categorized by the client's requirements for preservation of the Black Oak Savanna, implementation of amenities, and user accessibility, as shown in Figure 24.

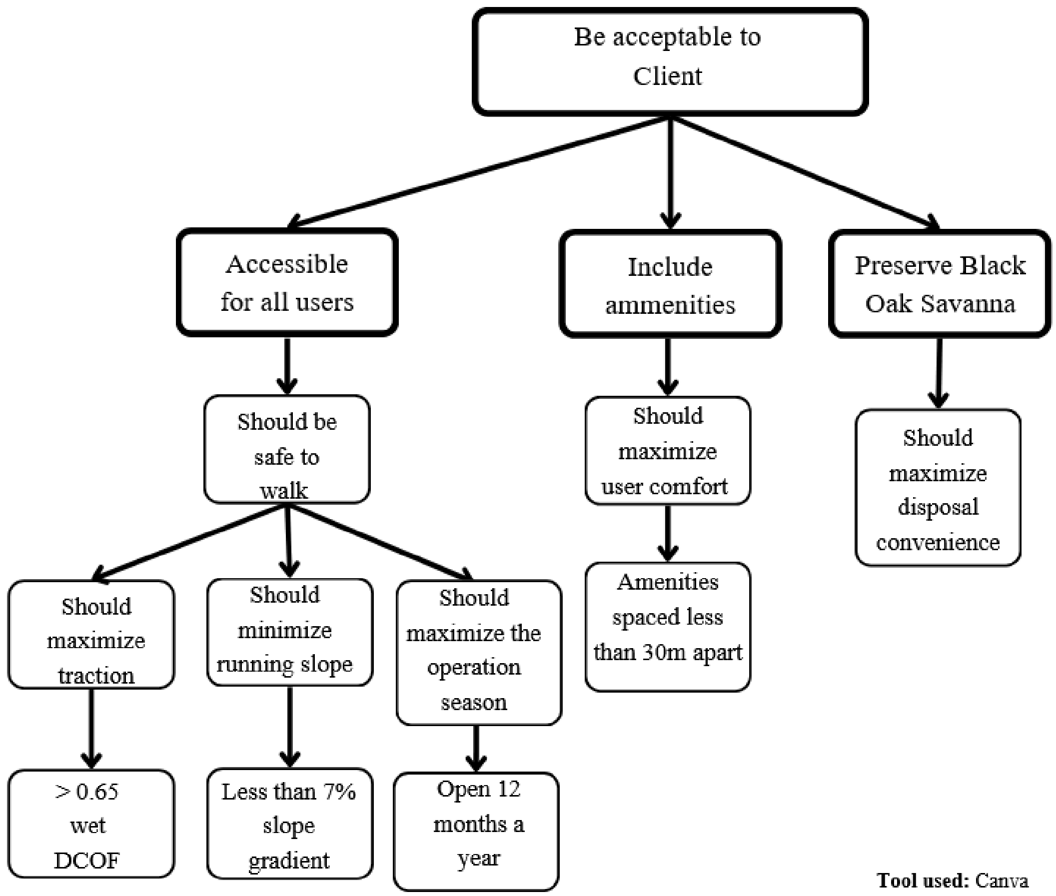


Figure 24. How-Why Tree Method

Appendix F: Pairwise matrix
Objectives were then ranked using a Pairwise Comparison Matrix, shown in Table 11.

Table 11. Pairwise matrix

Pairwise Matrix	Slope	Traction	Duration	Comfort	Disposal	**Total**	**Rank**
Slope	-	1	1	1	1	**4**	**1**
Traction	0	-	1	1	1	**3**	**2**
Duration	1	1	-	1	1	2	3
Disposal	0	0	0	0	-	**0**	**4**

Appendix G: AI Usage for Idea Generation

AI tool used: Chatgpt 5.1
Prompt: Generate some partial ideas for a path design, ideas must explore all design space
Screenshot of outputs, illustrated in figure 25:

Partial Path-Design Ideas (Exploring ALL Design Space)

(Grouped loosely for readability — not selection!)

---

1. Surface & Structural Concepts

- A raised **boardwalk** that floats above tree-root zones.
- A **curved timber walkway** that weaves between existing trees without altering terrain.
- A **flexible rubber-granulate path** that adapts to uneven forest floor.
- A **stabilized aggregate trail** using resin-bonded granite for permeability.
- **Interlocking recycled-plastic panels** that sit on a light subgrade and can be removed seasonally.
- **Modular aluminum frames** with replaceable surface inserts (wood, rubber, stone).
- A **dual-surface path** (paved lane + soft-surface lane).
- A **split-grade path** where the upper route is accessible and the lower one remains natural.

---

2. Accessibility & User-Support Features

- **Low-gradient switchbacks** to reduce steep elevation changes.
- **Rest pull-outs every 20–30 m** with benches and shade.
- **Guiding-edge tactile strips** for cane users.
- **Guardrails with integrated handholds** for steep forest sections.
- **QR-code audio navigation beacons** for visually impaired visitors.
- **Widened passing zones** at natural pinch points.
- A **continuous gentle-slope ramp** running parallel to the natural trail.

Figure 25. Output from the prompt using chatgpt

We reviewed the AI- generated ideas but did not find most of them suitable for our project. As a team, we evaluated the list, discarded the majority, and kept only a few concepts that aligned with our needs. All final design decisions were human verified and filtered to meet requirements.

Appendix H: Idea Generation - Free Brainstorming Design Elements

Partial solutions were generated independently by each team member categorized by the client's main requests, being the preservation of Black Oak Savanna, amenities, and accessibility, shown in Table 12.

Table 12. Partial Ideas Table,

Preservation of Black Oak Savanna	Implementation of Amenities	Accessibility for all users
1. Garbage bins on the path 2. Stay on path signage 3. Fences around the path 4. Rope fences around the path 5. Plant more plants related to black oak savanna around the path 6. Virtual tour guide app 7. Handheld audio players 8. Recyclable materials for the path 9. Solar panels for power 10. Signage of Black Oak Savanna history 11. Physical tour guides 12. Elevated path 13. Wildlife crossing areas 14. Qr code plant identifiers	1. Garbage bins on the path 2. Stay on path signage 3. Fences around the path 4. Rope fences around the path 5. Solar-powered heating mats 6. Snow plower 7. Snow shoveler 8. Benches 9. Handrails 10. Conveyor belt 11. Telecabin 12. Picnic area 13. Escalator 14. Water refill stations 15. Self opening Gate 16. Manual gate 17. Picnic tables 18. Hammock posts 19. Camping area 20. Mist cooling stations 21. Photography stands 22. Drainage system	1. High contrast colour or material at the path boundary 2. Textured surface area before the path divides 3. Emergency call buttons at rest areas 4. Handrails on the steep slope segment 5. Vertical grab bars next to the seating area in rest areas 6. Motion sensor detecting low intensity for lighting changes 7. Handrails on the side of the path 8. Integrate a rope guide on the side 9. Ear-level speakers for audio navigation 10. Conveyor belt 11. Telecabin 12. Escalator

	23. Bird watching telescope 24. Zoo 25. Viewing platforms 26. Wayfinding signage 27. Water fountain 28. Bike lane 29. Shaded seating areas 30. Bike racks 31. Dog park 32. Glass roof to block rain/snow 33. Emergency call boxes 34. Lamps on the path 35. Path outlined by light 36. Food truck on Spring Road 37. Vending machines	

Appendix I: Morph Chart

In order to help develop ideas for means, the Morph Chart was used, as illustrated in Figure 26.

FOCs	Means	Means	Means
Mark pedestrian, dog-off-leash and cyclist zones/paths (SF)	High-contract edge bands	Rope fencing / handrails	Signage
Allow pedestrians to move horizontally (SF)	Integrated stairs with handrails	Rope pulley system	Conveyer Belt
Allow pedestrians to move vertically (SF)	Continuous ramp and stairs	Elevator	Conveyer Belt
Should maximize the trction (O)	Rubber anti-slip panels	Textured tactile inserts	Raised traction strips
Should minimize the running slope (O)	Ground regrading	Stair	Conveyor
Should maximize disposal convenience (O)	Eco point reward system	Garbage bins	QR digital signage

Tool used: Canva

Figure 26. Morph Chart

Appendix J: Idea Generation - Full Solution Brain Writing

Appendix J represents the comprehensive consolidation list of 52 full solutions generated through the team's brainwriting process, developed by synthesizing the initial partial ideas. These solutions represent the complete set of ideas produced during the brainstorming process.

Full solutions based on partial solutions:

1. Continuous level ramp with stairs starting from Spring Road to the gate exiting the dog-off-leash area to provide grip stability and support for all users. There will also be handrails along the path to provide additional stability and limit trampling of plants. Benches will be placed along the path to provide rest. Bins and signage will be placed on both entrances and exits of the patio, cleared by a snow shoveler if there is enough snow. Lighting provided by solar-powered electricity by a dim outline of the path
2. A conveyor belt with one belt heading upwards and the other heading downwards from the exit of the dog-off leash to the southeast entrance of the nature centre to help mobility for elderly users located on either side of the trail, as it is the steepest part of the trail. Handrails prevent anyone from going off the path and trampling nature. The path is heated by solar power during the winter months to avoid snow buildup.
3. More plants are placed that are naturally grown from High Park on the side of the path with interactive QR code signs nearby that can be scanned by users, and implement weekly in-person tour guides to teach users about the path
4. 24-7 robot tour guide service that provides standing support for inaccessible users, that teaches users about the black oak savanna in order to preserve its heritage
5. Create an elevated wooden walkway with handrailings that tours surrounding trees/nature and has informative notes about the black oak savanna that takes users from Spring Road to High Park Nature Centre
6. Chairlifts tour the black oak savanna ecosystem, taking users from the entrance of Spring Road to the southeast entrance of the nature centre, allowing for accessibility for all users, and preservation of the black oak savanna through learning
7. An app that has an interactive map that provides information on the accessibility level of paths. The app will ask for personal details of accessibility and decide which path can be taken to go from one destination to another to maximize exposure to the black oak savanna. This will increase the preservation of black oak savanna and provide users with more accessible route options
8. Implement a greenhouse covering of path to avoid any snow/rain/leaves making the path more inaccessible. Handrails and benches found on either side of the path to help users with mobility
9. Telecabins tour black oak savanna ecosystem, taking users from the entrance of Spring Road to the southeast entrance of the nature centre, allowing for accessibility for all users, and preservation of black oak savanna through learning

10. Small elevator helps users move from the entrance of the dog off-leash area
11. Solar-powered lighting on handrails placed on the side of the path that illuminate the ground and provide standing support to users with limited mobility. Gate is replaced to account for wider passages and signage is updated to include no bikers allowed and provide wayfinding information
12. Add a map of all trails of high park on both entrances of the trail to users with wayfinding
13. Crushed granite aggregate mixed with resin binder, creating a smooth, high friction, and stable. Low-profile, solar powered bollards would be installed along the pathway, garbage and recycling bins will be placed along the pathway.
14. Elevated boardwalk with rope fencing and stay on path signage. It prevents soil compaction and protects Black Oak root zones.
15. Install garbage and recycling bins at controlled nodes to reduce litter accumulation and protect the Black Oak Savanna from waste disposal and to lower the risk of animals injuring themselves in the trash.
16. Install multiple weather-resistant, multi-functional information kiosks at various locations throughout the park, with info such as a map of the park, locations of key amenities, etc. It should be made easy for all audiences to read and understand using things like color coding and a legend.
17. A pathway surfaced entirely with a mixture of crushed granite and non-toxic and commercially available glow stone. This design eliminates the need for electrical lighting, relying solely on the stored energy in the stone.
18. Create a dedicated narrow strip running parallel to the most used pathways that contains a dense selection of native, low-maintenance, pollinator friendly shrubs and grasses. This would boost biodiversity and the health of the environment and not be very difficult to implement or maintain.
19. Install small solar panels to power low-energy lighting or audio devices, reducing reliance on non-renewable energy.
20. Accessible rest platform with shaded seating by building 1.8*1.8m rest platforms with benches, located under existing tree canopy to naturally provide shade without new structure. It improves comfort for users including seniors, families, and mobility impaired users.
21. Build winter safety zones with heating mats, they can be solar powered at high risk icing zones such as slopes and shaded curves to melt snow before accumulation. It helps maintain slip resistance in winter.
22. Line the path edges with short solar bollard lights that emit low intensity lighting after dark. It helps improve nighttime visibility while minimizing light disturbance to animals and the environment.
23. Building emergency assistance stations in each rest area with an emergency all button mounted at an accessible height (1.5m) to contact park staff. It ensures that users who experience health, mobility, or safety issues can quickly request help.

24. Install a weather protection system, such as a subtle, translucent canopy over the conveyor sections, to protect the user and the machine from rain and sun, making it useful in all weather, providing greater convenience to the user, and enhancing the mechanism's durability.
25. A low curb runs along both sides of the trail to keep users safe on the path. Distributed openings along the curb act as drainage ports, allowing water to exit. Below the curb, a “water tunnel” collects meltwater and rainwater.
26. A pathway with a series of open, shallow drainage channels beside the path, covered with fine leaf screens to prevent clogging. It helps reduce winter icing and prevent snow accumulation.
27. Continuous elevated walkway supported by small diameter piles. The walking surfaces consist of modular deck panels, with high contract edge bands and curbs that are detectable for canes. Rope and post boundary lines run along both sides. There are benches, grab bars, and accessible height emergency buttons. Solar lighting poles provide low intensity lighting, and heating mats are installed on steeper segments of the boardwalk to reduce winter icing. Interpretive signage and QR codes for ecology.
28. Add push button activated lights that blink briefly when a user approaches an intersection. It increases visibility without creating constant light pollution.
29. Create a series of wind-responding towers that can capture kinetic energy and serve as an air purifier system. These can help protect the environment against pollution and also integrate aesthetically with the rest of the park if designed properly.
30. Embed the pathway with pressure-sensing surfaces that can notify people elsewhere on the trail if someone is approaching, for example, a cyclist could be warned of high incoming foot traffic and move out of the way. This reduces the risk of any injuries or accidents occurring.
31. Planting certain species of fungi that are able to break down pollutants, known as mycoremediation fungi, offers an environmentally friendly way to combat pollution. Care must be taken to ensure the fungi will not interrupt the food chain in the environment.
32. A pathway that installs waist-height resting rails by removing all traditional seating along the path to maximize the clear path width.
33. Install low level lights aimed at reflective panels to diffuse soft, indirect lighting on the path.
34. Recycled rubber-surfaced accessible path with integrated tactile guidance. At specific root sensitive or slope areas, we use stairs to avoid root zones. Wayfinding clusters are located at every major intersection with directional symbols, distance markers, and QR codes. Grab bars, shade, and emergency call buttons are placed along the trail. There’re snow shedding surface geometry with slightly peaked centerline and slip-resistant inserts in shaded zones. Solar powered reflectors guide nighttime movement.

35. Augmented Reality (AR) Maps: Creating AR experiences. When users point their phone's camera at the map, the map comes to life-which displays animated animals, real-time location of guide, or high lighting the steepness of different walkways
36. A vending machine that provides adjustable trekking poles at pathway entrance for users who need extra support walking.
37. Adding a geothermal heat trail for certain steep routes that are most possible to become icy/slippery, a closed-loop glycol heating system can be implemented beneath the trail surface. This system can be powered by a solar panel and a power battery. Providing continuous, low-energy cost for melting snow and ice, ensuring accessibility of the route all year round with low energy consumption
38. An "Eco point" system that allows users to collect points by recycling, attending Black Oak Savanna tours to redeem pins, patches, or small souvenirs.
39. Integrated moisture and temperature sensors along the full length of the path to monitor the surface condition. Once the sensors detected the presence of snow or ice it activated the de-icing system.
40. Porous resin-bonded gravel walkway. This design uses compacted gravel as a base, topped with porous resin-bonded aggregate. The surface of the road is stable, slip-resistant, and fully permeable, allowing rainwater and melted snow water to seep into the ground, nourishing the roots of nearby vegetation, reducing runoff, and protecting the black oak savanna.
41. Installing the fiber-reinforced grid pavement (a honeycomb grid system made from recycled plastic, filling it with soil, and seeding it with native grasses or gravel) helps provide a strong, vehicle-friendly surface while maintaining high permeability. Also visually it blends into the natural landscape
42. A path condition dashboard at both the entrance and exit with live updates on snow, wetness, temperature, and mechanic conditions, with de-icing, venting machine.
43. Night visible emergency path strips placed along the trail, glow bands that lead directly to the nearest emergency station
44. Adding topographic maps at the trail start point. For example, a permanent bronze or composite 3D topographic map will be installed at the entrances. This map will feature Braille labels and raised markings, allowing users to perceive change in elevation, the location of rest areas, and major landmarks through touch, providing information for all users, including the visually impaired.
45. Create a passive stormwater management ditch by planting water-tolerant native plants on both sides of the trail, especially on the uphill section. These landscape features naturally collect, filter, and slow down stormwater runoff, prevent slope erosion, and replenish the groundwater, protecting the ecosystem.
46. Modular information stand with replaceable panels: construct the stand using natural materials such as cedar to create sturdy and durable, waterproof structures. Each stand will be equipped with a large and permanent orientation map and protective panels,

allowing park staff to easily replace paper maps and seasonal information, and information and landmarks.

47. Create a series of sturdy wooden columns along the route, with each column containing a tactile element such as animal footprints or leaves and short story or fact inscribed in English and the indigenous language.
48. Use Rope fencing/ handrails to mark pedestrian, dog-off leash and cyclist zones and paths. Using continuous ramps and stairs with handrails to move horizontally and vertically. Using garbage bins on both entrances of the path to limit the amount of litter. Using shovelers to remove snow from the path to allow users to walk safely during the winter. Lamp posts to ensure safety during low-light hours.
49. Use Rope fencing/ handrails to mark pedestrian, dog-off-leash and cyclist zones and paths. Using eco point reward system to limit the amount of litter. Using a robot that cleans snowy pathways during winter time. Solar powered lights to ensure safety during low-light hours.
50. Use high-contrast edge bands to mark pedestrian, dog-off-leash and cyclist zones and paths. Install rope pulley system to enable horizontal and vertical movement. Place garbage bins on both entrances of the path. Heated pathway mat powered by electricity to prevent snow accumulation. The rope pulley system assists users on the horizontal and vertical segments of the path. There will also be a heated pathway powered by electricity to allow for safe walking if there is snow present. There will also be waste disposal signage at both entrances to reduce litter
51. The rope pulley system assists users on the horizontal and vertical segments of the path. There will also be a heated pathway powered by electricity to allow for safe walking if there is snow present. There will also be waste disposal signage at both entrances to reduce litter
52. Continuous level ramp and elevated platform including handrails with ground regrading to address the high slope and increase accessibility. There will also be optional stairs. There will also be signage at each entrance to inform users of wayfinding information to the path and bins to limit litter. Benches will be placed along the path to provide rest. Lighting provided by solar-powered electricity by a dim outline of the path.

Appendix K: Idea generation tools

The consolidated list was generated using tools, illustrated in Figure 27.

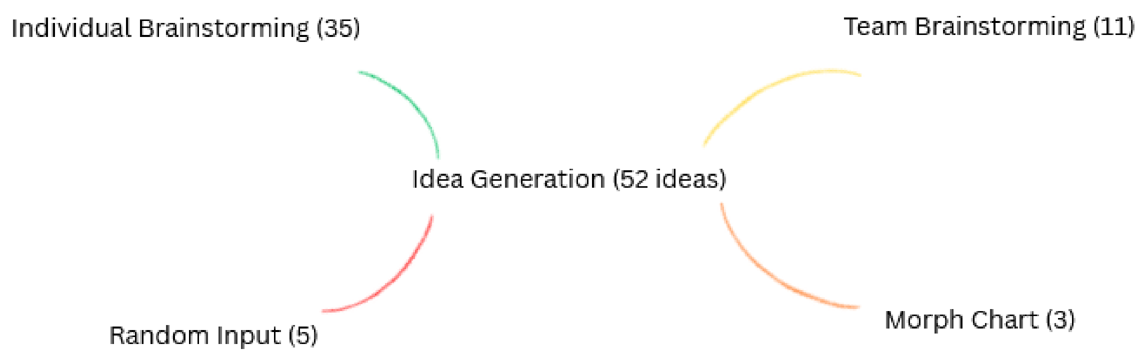


Figure 27. Idea generation tools

Tool used: Canva

Appendix L: Feasibility Check

The consolidation list of 52 solutions was subjected to a binary feasibility screening process. Each solution was evaluated against the project's functions and constraints, including environmental regulations and accessibility standards. Solutions that violated any constraints were eliminated, resulting in a list of 40 solutions.

The solutions that were eliminated during feasibility check and the specific justification for their rejection, illustrated in Table 13.

Table 13. Feasibility check table

#ID	Solution Concept	Justification for Rejection
6	Chairlift Tour System	Installing a chairlift with pylons and overhead cabling would require significant width, therefore it validates our scope on working on the pathway only.
9	Telecabins	Similar to the chairlift, the infrastructure required (tower, cables), which will validate our scope.
17	Glow Stone Illumination	This material fails to provide sufficient lux level for safe navigation which violated the primary function of facilitating pedestrian movement.
20	Rest Platforms under Tree Canopy	Rest platforms under tree canopy will validate the scope, since it needs to be implemented directly under the tree.

26	Open Drainage Channel	The open drainage channels create a trip hazard and a surface discontinuity greater than allowed by AODA standards.
28	Push Button Blinking Lights	Flashing or blinking lights can trigger seizures in individuals with photosensitive epilepsy, violating the ability to provide an accessible path for all users [24].
31	Mycoremediation	A surface made of organic fungal will have a low dynamic coefficient friction (DCOF), which violates the primary function of facilitating pedestrian movement
32	Waist Height Resting Rails	By replacing seated benches, this design violated the AODA requirements for exterior paths for providing accessible rest sections for users who cannot stand for long periods
33	Reflected Low Level Lighting	This system relies on precise alignment of emitters and reflectors, the plant and tree growth would easily misalign the system.
43	Glow Bands (Emergency Strips)	Edge only lighting fails to illuminate the entire path surface, which violates the primary function of facilitating pedestrian movement
45	Passive Stormwater Ditch	Ditch construction which involves excavation and trenching along the path will require significant soil displacement and root cutting, which was violated to preserve the Black Oak Savanna [25].
48	Manual Snow Shoveling Strategy	Relying solely on manual labor is not a valid design solution for year round accessibility.

Appendix M: Multivoting

After consolidating the team list for solution feasibility, the 52 developed full solutions were narrowed down into 40 solutions. Multivoting was then performed to identify the top 10 solutions, illustrated in Figure 28.

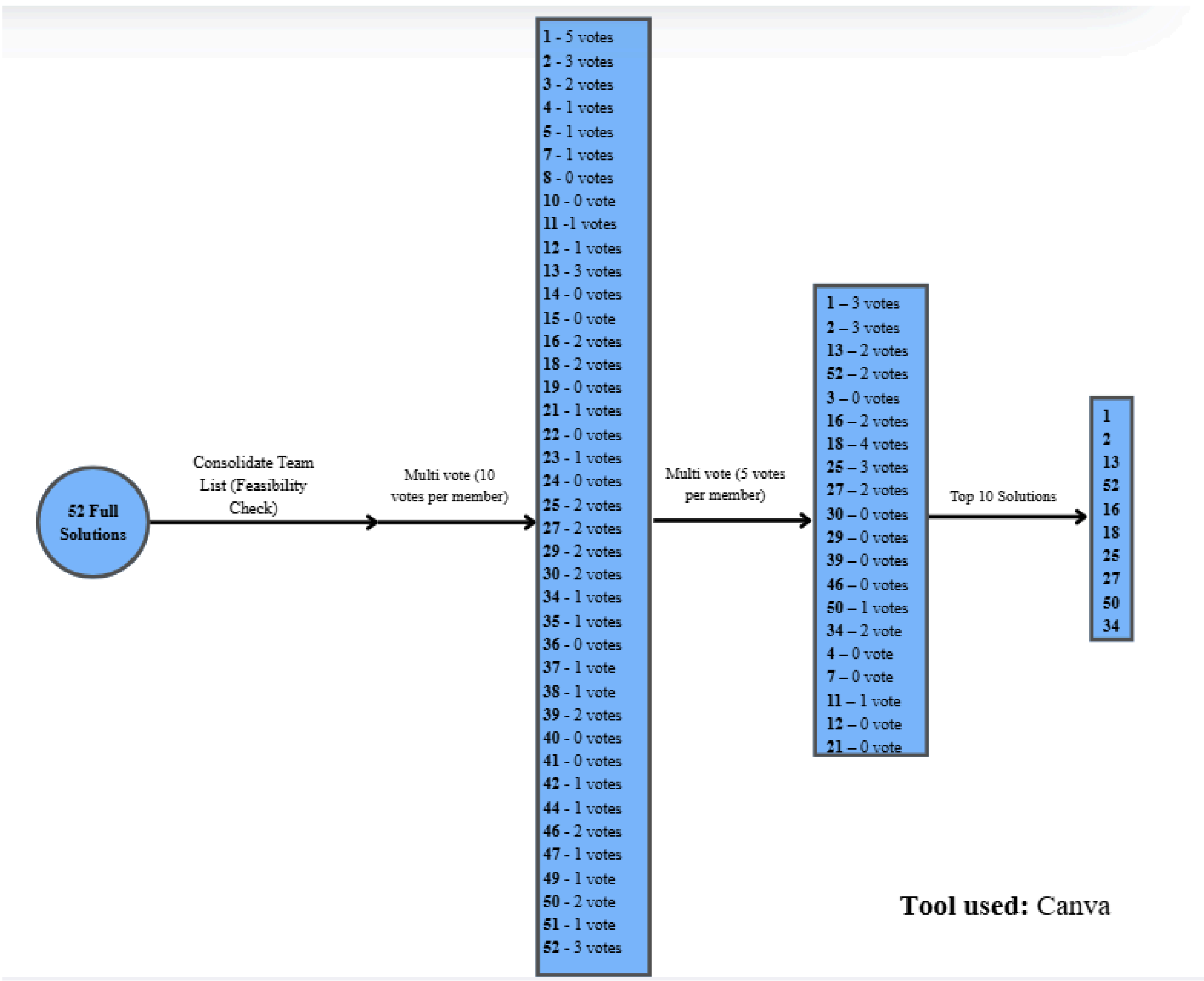


Figure 28. Multi-voting charts

Appendix N: Ten Feasible Solutions for Graphical Decision Chart:

1: Continuous level ramp with stairs starting from Spring Road to the gate exiting the dog-off-leash area to provide grip stability and support for all users. There will also be handrails along the path to provide additional stability and limit trampling of plants. Benches will be placed along the path to provide rest. Bins and signage will be placed on both entrances and exits of the path cleared by a snow shoveler if there is enough snow. Lighting provided by solar-powered electricity with a dim outline of the path

2: A conveyor belt with one belt heading upwards and the other heading downwards from the exit of the dog-off leash to the southeast entrance of the nature centre to help mobility for elderly users located on either side of the trail, as it is the steepest part of the trail. Handrails prevent anyone from going off the path and trampling nature. The path is heated by solar power during the winter months to avoid snow buildup.

13: Crushed granite aggregate mixed with resin binder, creating a smooth, high friction, and stable. Low-profile, solar powered bollards would be installed along the pathway, garbage and recycling bins will be placed along the pathway.

16: Install multiple weather-resistant, multi-functional information kiosks at various locations throughout the park, with info such as a map of the park, locations of key amenities, etc. It should be made easy for all audiences to read and understand using things like color coding and a legend.

18: Create a dedicated narrow strip running parallel to the most used pathways that contains a dense selection of native, low-maintenance, pollinator friendly shrubs and grasses. This would boost biodiversity and the health of the environment and not be very difficult to implement or maintain.

25: A low curb runs along both sides of the trail to keep users safe on the path. Distributed openings along the curb act as drainage ports, allowing water to exit. Below the curb, a “water tunnel” collects meltwater and rainwater.

27: Continuous elevated walkway supported by small diameter piles. The walking surfaces consist of modular deck panels, with high contract edge bands and curbs that are detectable for canes. Rope and post boundary lines run along both sides. There are benches, grab bars, and accessible height emergency buttons. Solar lighting poles provide low intensity lighting, and heating mats are installed on steeper segments of the boardwalk to reduce winter icing. Interpretive signage and QR codes for ecology.

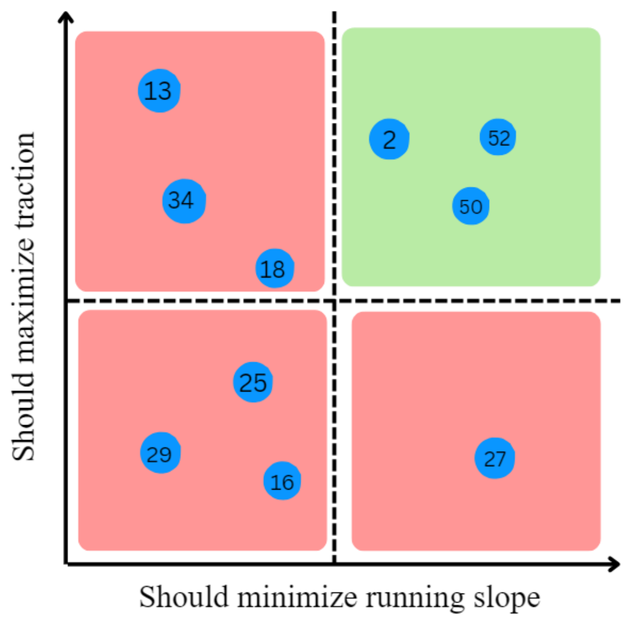
34: Recycled rubber-surfaced accessible path with integrated tactile guidance. At specific root sensitive or slope areas, we use stairs to avoid root zones. Wayfinding clusters are located at every major intersection with directional symbols, distance markers, and QR codes. Grab bars, shade, and emergency call buttons are placed along the trail. There’re snow shedding surface geometry with slightly peaked centerline and slip-resistant inserts in shaded zones. Solar powered reflectors guide nighttime movement.

50: Use high-contrast edge bands to mark pedestrian and dog-off-leash zones and paths. Install rope pulley system to enable horizontal and vertical movement. Place garbage bins on both entrances of the path. Heated pathway mat powered by electricity to prevent snow accumulation.

52: Continuous level ramp and elevated platform including handrails with ground regrading to address the high slope and increase accessibility. There will also be optional stairs. There will also be signage at each entrance to inform users of wayfinding information to the path and bins to limit litter. Benches will be placed along the path to provide rest. Lighting provided by solar-powered electricity by a dim outline of the path.

Appendix O: Graphical Decision Chart

The graphical decision chart evaluates the top ten solutions against the top 2 objectives of minimizing running slope and maximizing traction. The chart illustrates the optimal design in the top right quadrant, justifying the selection of the Solar Heated Conveyor Belt (#2), *Rope and Pulley* (#50), and *Elevated Ramp* (#52) as the final three solutions, shown in Figure 29.



Tool used: Canva

Figure 29. Graphical decision chart

Appendix P: Alternative Designs Comparison Table

Alternative Designs Comparison Table presents a side-by-side comparison of the three final alternative designs from Graphical Decision Chart. The table details how each concept addresses the project's critical requirements, including level pathway, slip-resistance, reducing litter, and snow management, illustrated in Table 14.

Table 14. Alternative designs comparison table

Design	Level Pathway	Slip-resistance	Reducing Litter	Snow Management
***Elevated Ramp* (#52)**	Features a continuous level ramp connected to an elevated platform	Material: Recycled rubber paving (0.79 DCOF)	Bins are placed at 30m intervals to encourage proper disposal	None
***Solar-Heated Conveyor belt* (#2)**	Install conveyor belts to assist and address the steep slope along the trail	The surface of the conveyor belt is engineered with DCOF higher than 0.65 [19]	Bins are placed at 30m intervals to encourage proper disposal	The surface of the conveyor belt will be heated by solar power, preventing snow accumulation
***Rope and pulley* (#50)**	Rope pulley system to enable horizontal + vertical movement High contrast bands clearly define path	Material: Concrete (>0.65 DCOF) [20]	Bins placed at 30m intervals to encourage proper disposal	Heated pathway mat powered by electricity generator to prevent snow accumulation

Appendix Q: Pugh Method

The Pugh Method evaluates the three alternative designs against the project's objectives. The *Solar-Heated Conveyor Belt* (#2) functions as the datum for this comparison, with the *Elevated Ramp* (#52) and *Rope and Pulley* (#50) measured against it regarding traction, slope, disposal convenience, and operation season. The analysis justifies the selection of the *Solar-Heated Conveyor Belt* as the optimal solution, as it outperformed the alternatives, which both received negative scores due to poorer performance in slip resistance, hence *Solar-Heated Conveyor Belt* is the final conceptual design, illustrated in Table 15.

Table 15. Pugh method table

Objectives	**Datum: Design 2 - *Solar-Heated Conveyor Belt***	**Design 1: *Elevated Ramp***	**Justification**	**Design 3: *Rope and Pulley***	**Justification**
Should maximize traction	S	-1	Less traction in wet/snow	-1	Concrete less slip-resistant
Should minimize running slope	S	0	Both reduce running slope	0	Both reduces running slope
Should maximize disposal convenience	S	0	Same bin spacing	0	Same bin spacing
Should maximize operation season	S	0	Both operate year-round	0	Both operate year-round
Total	0	-1		-1	

Tutorial #: 0133 | Team #: 189

Assignment: CDS | Date: 2025-11-23

The Attribution Table is a major resource used by your TA in determining whether there was equal contribution to the team assignment. If your TA determines that there was significant under contribution, then they may apply an individual penalty to the under contributing team members' grade. Grades lost to under contributing are simply lost. They are not redistributed to the other team members.

The Attribution Table describes the different work that each team member completed to create the submitted document. The Attribution Table should accurately reflect each team members' contribution to the document. It must be completed, signed by all team members, included as an appendix of your assignment AND uploaded to your MS Teams team channel. Be sure to keep a copy of this form for the team's records.

As a future professional engineer, you should NOT sign any document you have not read or do not agree with. The onus is on every team member to hold each other to account for accurately representing their contributions in the table.

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Section	Student Names					
	Alexandre Piguet	Kevin Subash	Charlie Lau	Guoyu Zhao	Magnus Ma	
Executive Summary	ET, WD, MR, FP	FP	ET,FP	ET, FP	FP	
Introduction	ET, FP	MR, FP	ET.FP	ET, FP	FP	
Service Environment	FP				RS9, ET, MR, FP	
Problem Statement	ET, FP		ET,FP	WD, ET, MR	FP	
Interest Holders	FP	WD, MR, ET, FP, RS1		FP	FP	
FOCs	ET, MR, RS7, FP		MR, ET, RS4, RS7, RS8,FP	FP	ET, FP	
Idea Generation	FP		WD, MR, ET, OR5, FP	WD, ET, MR, FP	WD, ET, FP	
					FP	

Alternative Design Selection Process	FP		FP	ET,FP	WD, ET, OR4, FP	
Alternative Design Descriptions	FP	WD, MR, ET, FP	ET,FP	WD, MR, ET, RS13, OR13, OR14, FP	ET, MR, RS10, RS11, RS12, RS13, FP	
Proposed Conceptual Design Specification	FP	WD, MR, ET, FP	WD,MR,RS2,FP	WD, MR, FP	ET, FP	
Conclusion		MR, ET		MR, FP	WD, MR, FP	
Referrence	ET, FP		ET,FP	ET, FP	WD, ET, MR, FP	
Appendix	MR, ET, OR2, OR4, OR9, OR10, OR11, OR12, FP	WD, MR, ET	WD, MR, ET, OR3, OR6, OR7, OR8, RS3, RS5, RS6,FP	MR, WD, ET, FP	ET, MR, FP	

Fill in abbreviations for the tasks you completed for each section of the report using the abbreviations below. You do not have to fill in every cell in the table.

RS – Research (give details below)

WD – Wrote Draft

MR – Major Revision

ET – Edited

FP – Final Proofread of COMPLETE DOCUMENT verifying for flow and consistency

AI – Used Generative AI (give details below)

OR – Other (give details below)

If you put RS (research) please add a number identifier such as RS1, RS2, etc. Give the research question below. Note: you are not limited to two research questions, add the correct number of entries below to capture your team's work.

RS1: Researched more info about existing interest holders as well as info about the new interest holders, TRCA and OMCM. Info such as their influence, jurisdiction and knowledge was obtained.

RS2: Researched the angle and direction of the solar panel

RS3: Researched photosensitivity and seizure

RS4: Researched the distance for garbage bins placement

RS5: Researched the coefficient of friction for conveyor belt

RS6: Researched the consequence of ditching to plants and trees

RS7: Researched the width, gradient, overhead clearance

RS8: Researched the slip resistant index

RS9: Researched species in high park

RS10 Researched surface material of elevated ramp

RS11 Researched conveyor belt electricity consumption

RS12 Researched solar panel electricity generation

RS13 Researched surface material of heating ground

RS14 Researched the Toronto accessibility requirements

Some examples include: conducting site visits, identifying and reviewing articles for information, meeting with a librarian for help, etc.

If you put AI (used Generative AI) please add a number identifier such as AI1, AI2, etc. Explain how you used Generative AI in the section or document. Note: you are not limited to two AI usages, add the correct number of entries below to capture your team's work.

AI1: Idea generation

AI2:

Some examples include: generating a draft for you to review, idea generation, editing a section you drafted, etc.

If you put OR (other) please add a number identifier such as OR1, OR2, etc. Explain what you did below. Note: you are not limited to 'other' types of work, add the correct number of entries below to capture your team's work.

OR1: Created Birds eye view of every design

OR2: Created Visuals of interest holder processes

OR3: Created visuals of idea generations tools

OR4: Created Visuals of interest holder processes

OR4 Created visuals of flow charts of idea selection process

OR5 Created visuals of flow charts of idea generation process

OR6	Created visuals of morph chart
OR7	Created pairwise chart visual
OR8	Created feasibility check table visual
OR9	Created Pairwise Comparison Matrix Table
OR10	Created How-Why Objective tree visual
OR11	Created multivoting visual
OR12	Created Black Box Method Visual
OR13	Created 2D visual for alternative design description side view
OR14	Created 3D visual for alternative design description

OR covers any work you did to develop the document that is not described by writing, editing, and/or researching. Some examples include: developing figures or diagrams to support multimodality, organizing references, meeting with your CI for guidance (out of tutorial), etc.

By typing your name below to sign, you verify that you have:

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Student #1 Name Charlie Lau

Student #4 Name Kevin Subash

Student #2 Name Alexandre Piguet

Student # 5 Name Guoyu Zhao

Student # 3 Name Mangus Ma