TOPCLIFF AVENUE EROSION CONTROL AND SLOPE STABILIZATION PROJECT

CITY OF TORONTO

Class Environmental Assessment for Remedial Flood and Erosion Control Projects

PROJECT PLAN

JANUARY 8, 2021

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Glossary

Channel – akin to the term watercourse, a channel is a passage through which water flows.

Crest of slope – the point at which the top of a slope meets the tableland.

Erosion – the displacement of soil particles by the forces of wind or water.

Geogrid – is a geosynthetic material used to reinforce soils. Commonly used to reinforce retaining walls.

Geomorphic Engineering – is the scientific discipline concerned with interaction between the earth surface processes (i.e. water flow) and the surrounding environment.

Geotechnical Engineering – is the branch of civil engineering concerned with behavior of earth materials.

Gully – a land formation, often down a hillside or slope, that is created by running water eroding sharply into the soil. Gullies can range in size and can resemble a large ditch or small valley.

Over-steepened – when the angle of a slope is greater than the stable inclination of its composite materials.

Ravine – a type of landform characterized by a low area of land bounded by steep sides. A watercourse typically runs through this feature. Ravines are similar in form to a valley but at a smaller scale.

Riverine – relating to something that is situated adjacent to a watercourse or riverbank, also referred to as riparian.

Seepage – the escape of liquid or gas through a porous material.

Slope stability – the capacity for a slope to withstand movement. Slope stability is dependent on the inclination of a slope and the ability of slope materials to resist loading forces.

Toe of slope – the point at which the bottom of a slope meets the ground.

Topographic – the study of the forms and features of land surfaces.

Tributary – a river, stream, or other form of watercourse that flows into a larger river or waterbody.

Undercutting – the act of material being removed from the base of a feature.

Valley – a type of landform characterized by a depression in the Earth's surface that exists in between natural bounding features, such as hills. A watercourse typically runs through this feature.

Watercourse – a natural or artificial channel through which water flows.

Watershed – an area of land where precipitation collects and drains off into a single outlet, such as a river or other body of water. A watershed is also referred to as a drainage basin or catchment area.

Executive Summary

Toronto and Region Conservation Authority (TRCA) works toward safeguarding people and property from the adverse impacts of flooding and other natural hazards and enhancing the health of watershed communities. Through programs that balance human, environmental, and economic needs, TRCA promotes healthy rivers and shorelines, protection of greenspaces and biodiversity, and sustainable and safe communities. TRCA's Erosion Risk Management Program (ERMP) is one such initiative established to encourage proactive prevention, protection, and management of erosion hazards on private and public property. The proposed works outlined in this Project Plan are remedial erosion control works supported by the ERMP to provide long-term protection for life and property.

The Topcliff Avenue Erosion Control and Slope Stabilization Project is being completed in accordance with Conservation Ontario's Class Environmental Assessment for Remedial Flood and Erosion Control Projects, amended in 2013 (Class EA), with the objective of reducing risk to life and property, as per the mandate of Conservation Authorities under the Conservation Authorities Act (R.S.O 1990).

Three primary objectives were identified for this project through the Class EA process:

1. **Risk Mitigation** To protect human life and property from the hazards of erosion
2. **Naturalization** To support a native terrestrial ecosystem habitat
3. **Compatibility** To ensure the project is compatible with existing infrastructure and the surrounding environment

Concerns regarding slope instability behind 37 and 39 Topcliff Avenue were first identified to TRCA staff following the July 8, 2013 severe storm event. The Project limits incorporate a segment of valley slope located behind residential properties 37 – 43 Topcliff Avenue and include a tributary of Black Creek where ongoing erosion at the toe of slope has created a risk to five (5) privately owned dwellings at the top of the valley slope. Following visual inspections in 2013 by TRCA Erosion Risk Management staff, this site was recommended to undergo a detailed slope stability and erosion risk assessment (SS&ERA) to determine the type and extent of risk to essential structures at the top of slope. The SS&ERA was completed by Cole Engineering Group Ltd. in 2015 and identified two (2) private residential dwellings, located at 35 and 37 Topcliff Avenue, to be at long-term risk from upper slope instability should no works take place. In 2019, TRCA retained Central Earth Engineering to extend the Project area to include the properties from 31 – 43 Topcliff Avenue. This updated study confirmed the risk at 35 and 37 Topcliff Avenue and identified additional risk to surrounding properties located at 31, 33 and 39 Topcliff Avenue. Based on the results of these assessments, remedial works are recommended to provide long-term, low-maintenance protection to the five (5) affected properties at the top of slope from risks of erosion and upper slope instability.

The Class EA for the Project was officially initiated on February 13, 2020 with the publication of a Notice of Intent in the North York Mirror. The Notice of Intent and subsequent official project update notices were also distributed to Indigenous communities, local community groups, homeowners within the vicinity of the Project, and regulatory agencies including Conservation Ontario (CO), the Ministry of Environment, Conservation and Parks (MECP), the Ministry of Natural Resources and Forestry (MNRF), and the City of Toronto.

As part of the Class EA process, a range of slope stabilization solutions were developed and evaluated with input from an Interested Stakeholder Engagement Committee (ISEC). The ISEC was comprised of technical staff, stakeholders, and interested members of the public. The outcome of the Class EA planning process determined that construction of a combination of slope stabilization and erosion control solutions is preferred.

TRCA's preferred combination of a Mechanically Stabilized Earth (MSE) wall structure along the upper slope behind the affected properties on Topcliff Avenue, coupled with Channel Realignment (Reach 1) and armourstone toe protection (Reach 2) within the valley corridor is the preferred solution to address the issues at the Project site.

Following a sixty (60) day public review period of this Class EA report and the successful resolution of any concerns received during this review, TRCA intends to finalize the detailed design of the MSE structure in combination with the proposed channel improvements and obtain the necessary approvals to proceed with implementation.

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1 INTRODUCTION

Toronto and Region Conservation Authority (TRCA) has proposed to undertake erosion control and slope stabilization works to address upper slope instability along a valley slope behind multiple residential properties located along Topcliff Avenue, in the City of Toronto. The project site is generally located east of Jane Street and Finch Avenue West within the Humber River Watershed (**Figure 1**). TRCA was notified of the slope failure behind Topcliff Avenue following the July 8, 2013 severe weather event.

This Project is being planned in accordance with Conservation Ontario's Class Environmental Assessment for Remedial Flood and Erosion Control Projects (Class EA, amended 2013). The purpose of the Topcliff Avenue Erosion Control and Slope Stabilization Project (hereafter referred to as "the Project"), is to take action to protect human life and property from the hazards of riverine and valley slope erosion by providing long-term, low maintenance protection for the private properties within the Project limits.

This Project Plan has been prepared to document the decision-making process exercised when selecting the preferred measure(s) for carrying out the proposed remedial work. This Project Plan includes:

- The situation or problem to be addressed, including the cause(s) and history of the problem;
- The preparation of the baseline inventory to provide the information needed to evaluate the alternative measures;
- The examination of a full range of alternative remedial measures and the selection of a preferred alternative. Advantages and disadvantages of each alternative are considered in the analysis, including a "Do Nothing" option;
- The rationale underlying the selection of the preferred alternative method to carry out the remedial work;
- An environmental analysis of the preferred alternative, including a detailed study of the temporary and permanent net impacts of the proposed project;
- Identification of methods for avoiding or mitigating negative impacts;
- A record of consultation with interested persons, indigenous communities, government agencies, and community groups;
- An outline of the monitoring program which will commence upon completion of the work.

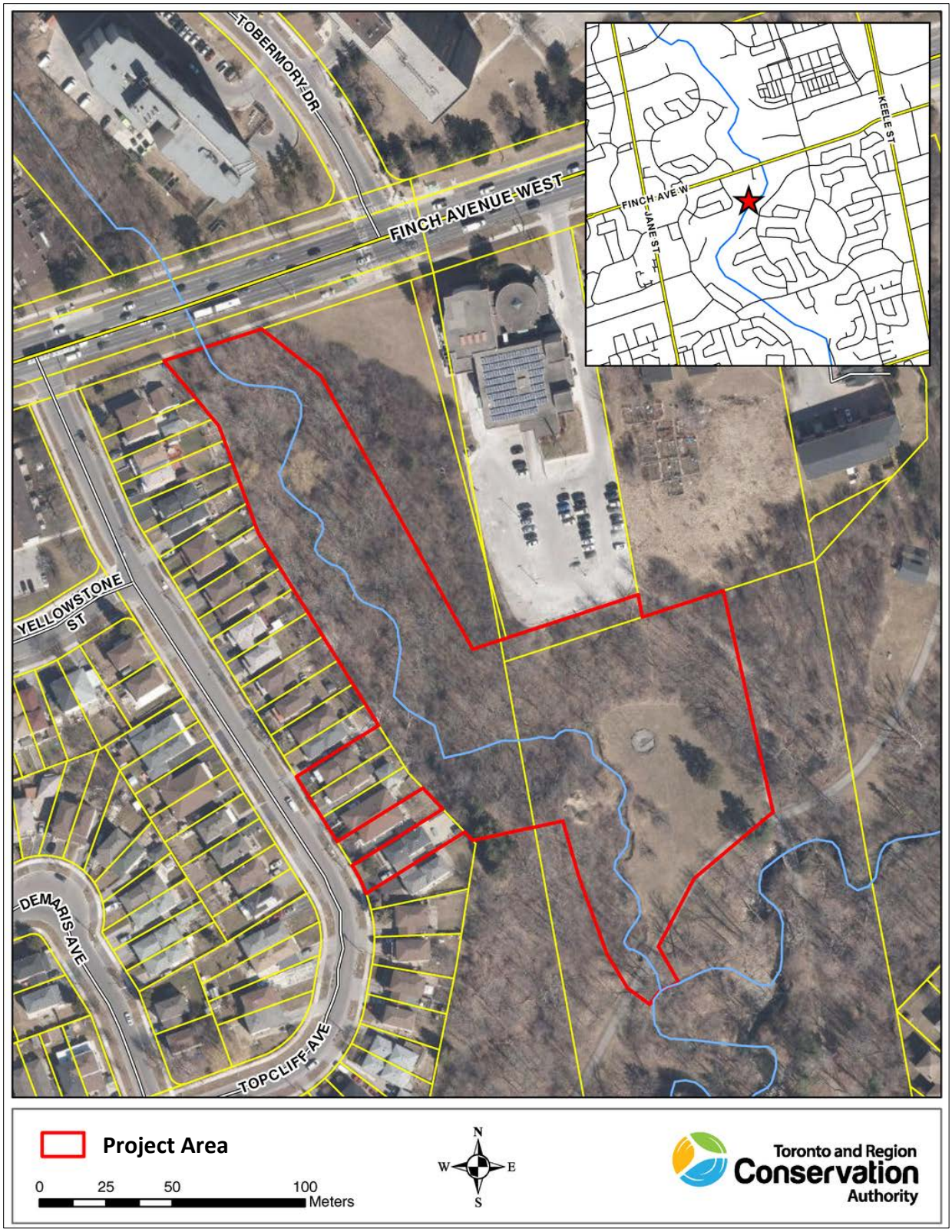

Figure 1: The approximate location of the Project area behind Topcliff Avenue is denoted by a red polygon.
Source: TRCA, 2019

1.1 Relationship of the Undertaking to the Environmental Assessment Act

TRCA is defined as a public body in Section 3 of Regulation 334/90 in the Environmental Assessment Act (R.S.O 1990, EA Act) and must conduct its remedial flood and erosion control projects in accordance with said Act.

Recognizing that common elements exist in addressing flood and erosion problems, a coordinated approach to environmental assessments was developed by Conservation Ontario (CO) in 1993 for use by all Conservation Authorities (CAs), referred to as the Class Environmental Assessment for Remedial Flood and Erosion Control Projects (Class EA). This project was planned and will be completed in accordance with the Class EA process and aligns with the following excerpt from the CO Class EA document:

"Remedial Flood and Erosion Control Projects refer to those Projects undertaken by Conservation Authorities, which are required to protect human life and property, in previously developed areas, from an impending flood or erosion problem. Such Projects do not include works which facilitate or anticipate development. Major flood and erosion control undertakings which do not suit this definition, such as multipurpose Projects, lie outside the limits of this Class and require an Individual Environmental Assessment" (CO, 2013).

Over twenty years of experience have demonstrated that using the Class EA approach is an effective way of complying with the EA Act's requirements. Approval of the Class EA allows CAs to carry out these types of projects without applying for formal approval under the EA Act on the condition that all other necessary federal and provincial approvals are obtained (CO, 2013). A chart illustrating the key steps of the Class EA planning and design process is shown in **Figure 2.**

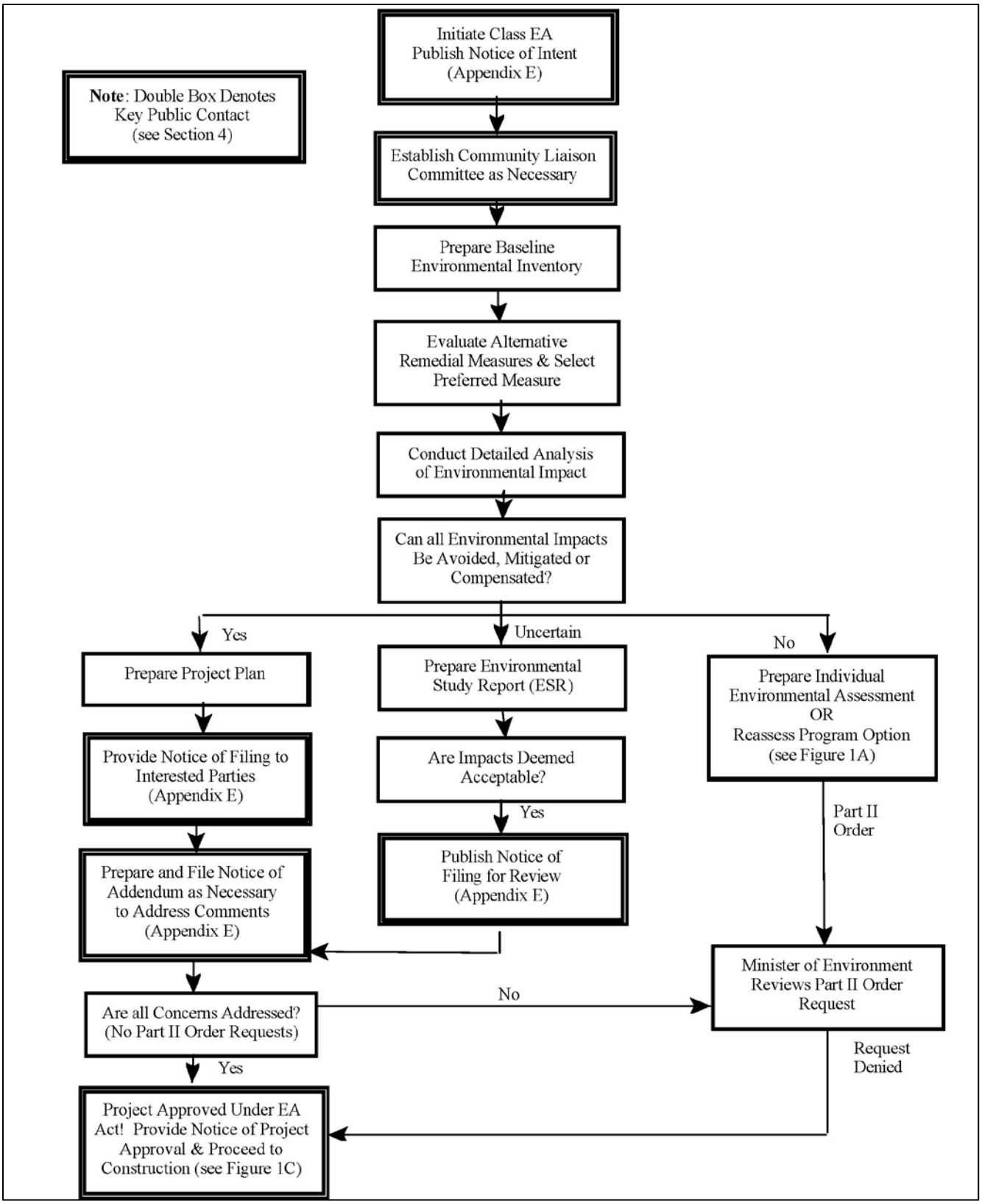

Figure 2: Class EA planning and design process. *Source: Conservation Ontario, 2013*.

1.2 Purpose of the Undertaking

1.2.1 Risk Mitigation

The primary objective of the Project is to take action to protect human life and property from the hazards of riverine erosion and slope instability by providing long-term, low maintenance protection for surrounding private properties within the Project limits.

A slope failure behind properties located at 37 and 39 Topcliff Avenue, in the City of Toronto, was first identified to TRCA following the July 8, 2013 severe weather event. TRCA subsequently retained Cole Engineering Group Ltd. to conduct a slope stability and erosion risk assessment to determine the extent of risk to essential structures at 37 and 39 Topcliff Avenue. As part of this Class EA process, the site was expanded to include 31 to 43 Topcliff Avenue and Central Earth Engineering and Palmer Environmental Consulting Group were retained to complete additional geotechnical and geomorphic investigations of the extended Project area.

The decision to proceed with remedial work was informed by a range of technical assessments to confirm the extent of risk to essential infrastructure within and surrounding the Project limits. A geomorphic assessment was undertaken to gain insight into the existing conditions and processes of the tributary within the Project area, and a computerized slope stability analysis was completed to delineate the position of the Long-Term Stable Slope Crest (LTSSC) using a factor of safety of 1.3. The LTSSC is the maximum extent of slope crest recession in the long-term, which determines the limit of hazard on the tableland. A summary of the assessments can be found in **Section 2.2 Identification of Previous Studies.**

In addition to being planned in accordance with the Class EA process, the Project will also be carried out in accordance with *The Living City Policies for Planning and Development in the Watersheds of the Toronto and Region Conservation Authority* (TRCA, 2014), which seeks to reduce and eliminate existing flood and erosion hazards and to rehabilitate valley and stream corridors on private and public lands (**Appendix A**).

1.2.2 Naturalization

The second objective of the Project is to implement a solution that will help improve environmental conditions along Black Creek within the proposed limits of disturbance of this Project. Channel work within the watercourse, removal of invasive species where present, and restoration with native species grown in Ontario will improve aquatic and terrestrial habitat conditions in this degraded area, and over the long-term will:

- Improve linkages between habitats;
- Increase resiliency to erosion forces within the tributary of Black Creek;
- Enhance biodiversity of aquatic and terrestrial habitat species; and
- Improve ecological health of the surrounding community by providing better resiliency to future changes in the environment.

1.2.3 Compatibility

The third objective recognizes that there are existing essential structures and infrastructure adjacent to the Project limits, which must be considered when developing remedial design options to ensure compatibility between proposed works and the built environment. This will be accomplished through evaluating a range of

conceptual design solutions to stabilize key areas of instability and erosion and integrating design elements to tie in with the physical, biological, and social environment where possible.

1.3 Description of the Project Area

The Project is located near the intersection of Jane Street and Finch Avenue West, in the City of Toronto (**Figure 3**). The Project area encompasses a 230-metre section of a Black Creek tributary flowing between Finch Avenue West and Grandravine Drive. The Project limits are situated within Derrydowns Park and include the private properties located at 35, 37, 39 and 43 Topcliff Avenue.

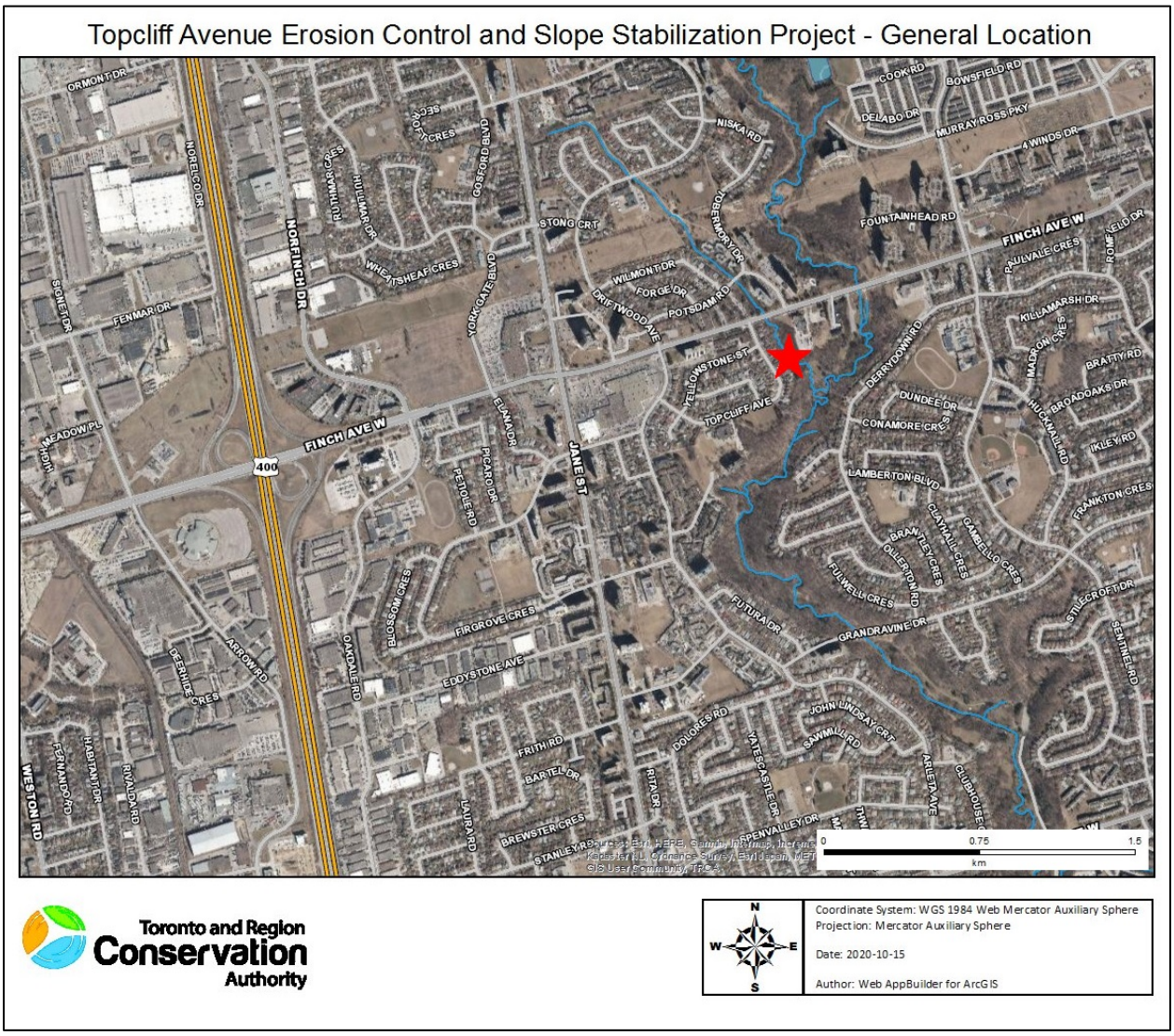

Figure 3: General Project location. *Source: TRCA, 2020*.

1.3.1 Private Properties

The Project site includes a confined riverine corridor (including tableland and slope) that follows a Black Creek tributary. The Project site is located within the broader Humber River watershed. The Black Creek tributary is located adjacent to the toe of the slope below Topcliff Avenue, where it converges with the main branch of Black Creek approximately 60 metres southeast of the site. The private properties within the Project limits contain semi-detached residential dwellings that are setback 7.5 to 13.2 metres from the valley slope crest (Central Earth Engineering, 2020).

Tableland structures at these private properties include various property fences along the rear and side property lines, sheds, gardens, landscaping, patios, and a shared detached garage located at 37 and 39 Topcliff Avenue (see **Figure 4** to **Figure 10**). Makeshift and un-engineered retaining walls are located at the slope crest behind 31 to 39 Topcliff Avenue. The makeshift retaining walls from 33 to 41 Topcliff Avenue are approximately 1 metre high and are constructed of various materials including wood railway ties, wood logs, cinderblocks, and other rubble (Central Earth Engineering, 2020).

Drainage on the tableland typically occurs as sheet drainage toward the slope crest as the backyards grade toward the slope. Downspouts from the dwellings and other structures outlet onto the tableland and create additional surficial runoff over the slope.

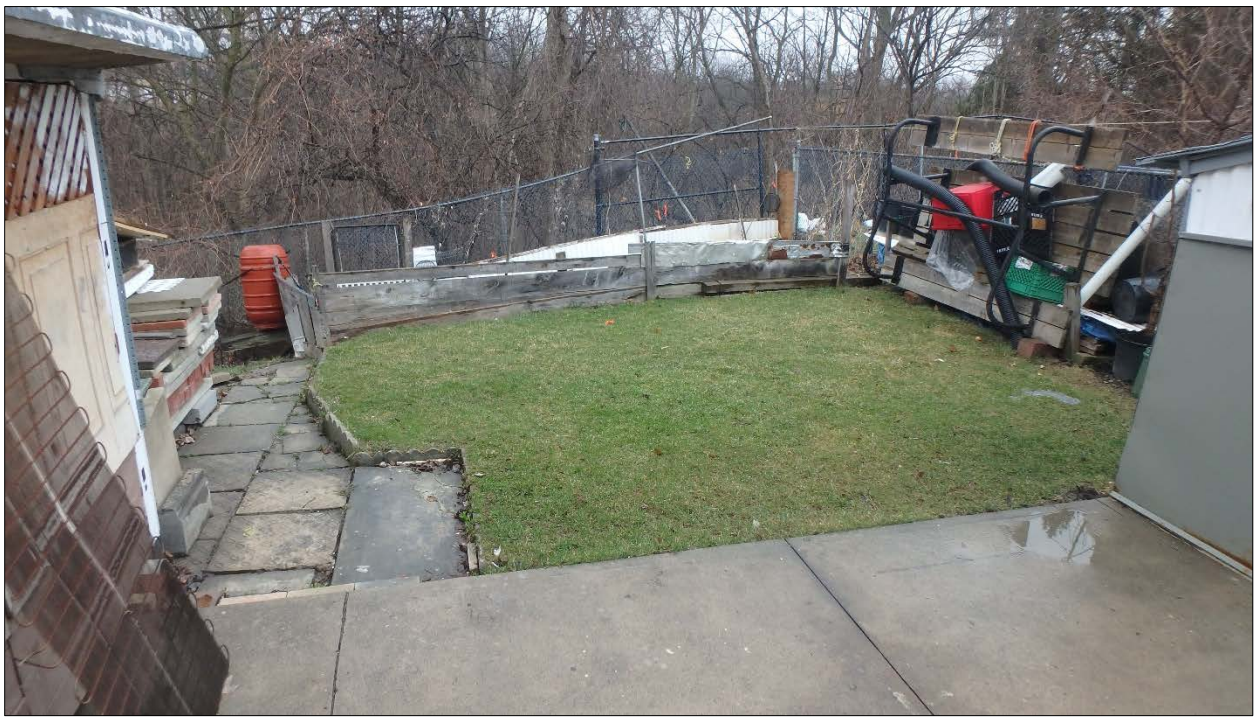

Figure 4: Rear tableland behind 39 Topcliff Avenue, facing west. *Source: TRCA, 2020*.

Figure 5: Shared detached garage located at 37 and 39 Topcliff Avenue. *Source: TRCA, 2019.*

In their 2020 geotechnical investigation, Central Earth Engineering (CEE) noted significant slumping in the area directly behind the shared garage located behind 37 and 39 Topcliff Avenue. This area has a lower topographic elevation which concentrates drainage over the slope behind the garage.

Figure 6: Red arrow highlights the concentrated overland drainage behind the shared garage at 37 and 39 Topcliff Avenue. *Source: TRCA 2020.*

Figure 7: Patio area behind 37 Topcliff Avenue, facing northwest. *Source: TRCA, 2020*

Figure 8: Rear tableland area behind 37 Topcliff Avenue, facing west. *Source: TRCA, 2020*

Figure 9: Facing southeast across 35 Topcliff Avenue towards 37 Topcliff Avenue. *Source: TRCA, 2020*

Figure 10: Patio area behind 35 Topcliff Avenue. *Source: TRCA, 2020.*

1.3.2 Description of the Ravine Slope

The slope is approximately 9 to 11 metres in height, and inclinations range from near-vertical in over-steepened areas to 2.1H:1V in flatter areas. Bare areas are associated with the slope failure between 37 and 39 Topcliff Avenue behind the shared detached garage. A gully, caused by concentrated runoff from the tableland, extends down the slope face. The red arrow shown in **Figure 11** depicts the location of this gully.

Figure 11: Valley slope and gully behind 37 and 39 Topcliff Avenue. *Source: TRCA, 2020*

1.3.3 Description of Watercourse

Within the Project area, a Black Creek tributary flows under Finch Avenue West through a large culvert located near the northern limit of Topcliff Avenue (**Figure 12**). This tributary channel extends for approximately 300 metres downstream from the Project area before reaching Black Creek. The upstream section of this tributary has been characterized as being braided with multiple channel formations meandering through the floodplain. This tributary flows through a forested ravine system that, in some areas like behind 37 and 39 Topcliff Avenue, comes in close contact with the toe of the valley slope, which is causing toe erosion. Within the Project area, the creek has been divided into three (3) reaches based on channel gradient, form and dominant geomorphic processes (**Figure 13)**:

- **Reach 1** originates at the outfall south of Finch Avenue and extends approximately 100 metres downstream
- **Reach 2** spans for approximately 170 metres to the edge of Topcliffe Park
- **Reach 3** extends for approximately 150 metres along the western edge of Topcliffe Park before discharging into Black Creek

Where the creek tributary flows behind Topcliff Avenue, a significant amount of garbage debris and tree jams have accumulated. This is influencing the stability of the creek, negatively affecting aquatic habitat, and changing the trajectory of flows within the watercourse (Palmer Environmental Consulting Group, Inc., 2020).

Figure 12: Black Creek tributary crosses Finch Avenue West though an 80-metre-long corrugated steel pipe culvert. *Source: TRCA, 2020*

The Black Creek tributary culvert located below the northern limit of Topcliff Avenue (**Figure 12**) has been identified as needing replacement under the Major Rehabilitation Category in the Ontario Structure Inspection Manual report completed by the City of Toronto in May 2013. As part of Finch West Light Rail Transit (LRT)

Project, this culvert will be replaced in 2021 to allow for the construction of Light Rail Transit along Finch Avenue West.

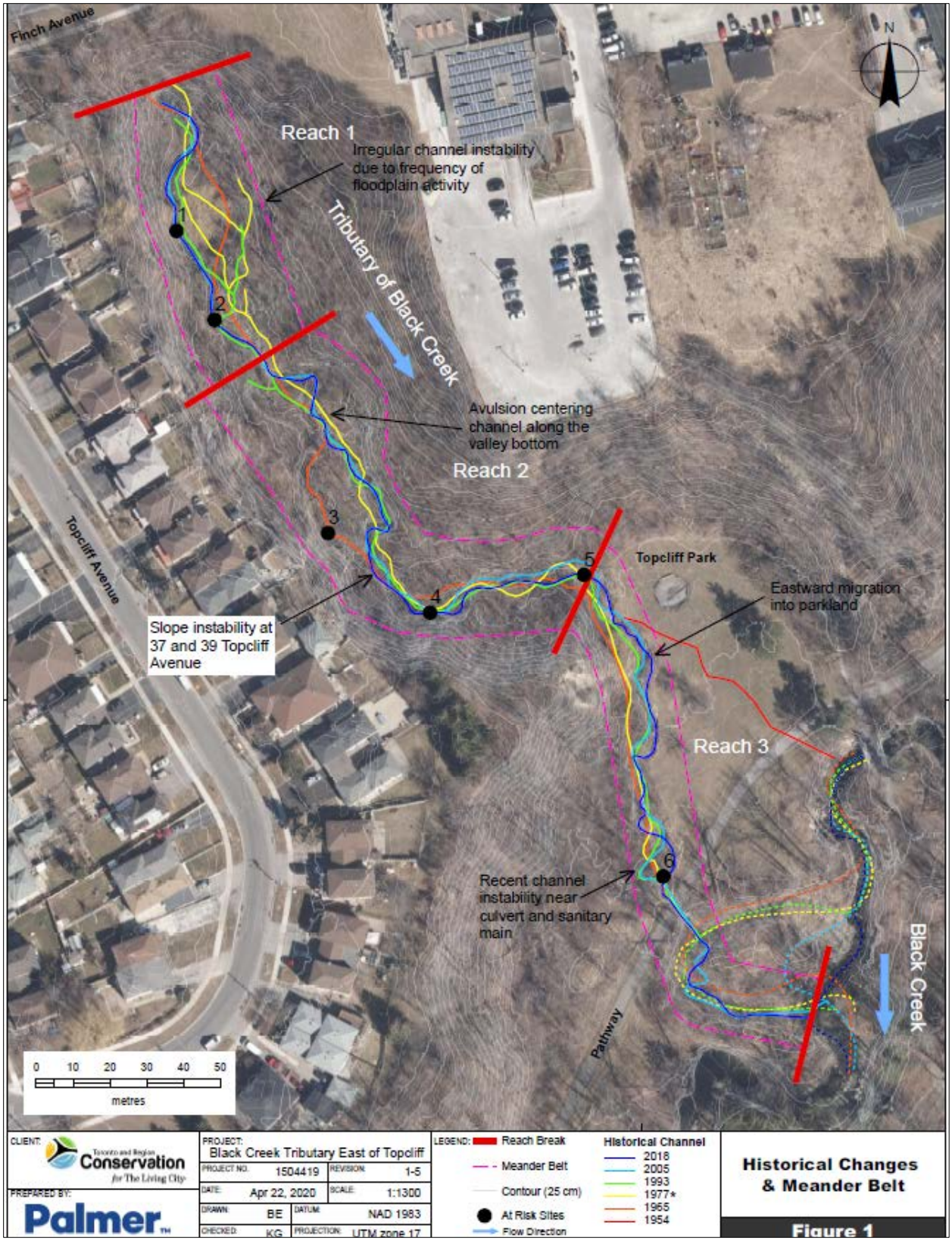

Figure 13: Map delineating the general location of reaches 1 – 3 behind Topcliff Avenue. *Source: Palmer, 2020.*

Figure 14: Large debris jam within the watercourse, looking North. *Source: TRCA, 2019.*

In the downstream section of the Project area, the floodplain to the east opens into manicured parkland and crosses beneath a multi-use public recreational trail before reaching Black Creek (**Figure 15**).

Figure 15: Black Creek tributary adjacent to Derrydowns Park, facing north. *Source: TRCA, 2020*

1.4 General Description of the Undertaking

There are four scenarios in which remedial flood erosion control projects may be undertaken within the Class EA framework:

1. Riverine flooding
2. Riverine and valley slope erosion
3. Shoreline flooding
4. Shoreline erosion

In accordance with the Class EA planning process, a full range of alternatives must be developed, including both traditional and innovative approaches. The type and range of alternatives developed will vary by project as they are based on the nature, cause, and extent of the problem. The options developed must be tailored to the individual characteristics of each site.

Given the unique characteristics at the Project site, Central Earth Engineering and Palmer Environmental Consulting Group Inc. worked together to develop a range of remedial alternative solutions to facilitate both riverine erosion control and slope stabilization. Both critical aspects have been considered together so that the options will function together.

The Project examined three (3) remedial alternative solutions to achieve the objectives for *riverine erosion control*:

- Concept – "Do Nothing"
- Concept 1 – Channel Realignment and Decommission secondary braid-like channels
- Concept 2 – Vegetated Revetment /Channel Enhancement and Armourstone Wall

The Project examined four (4) remedial alternative solutions to achieve the objectives for *slope stabilization:*

- Concept 1 – "Do Nothing"
- Concept 2 – Improve Drainage, Minor Earthworks & Surficial Erosion Protection
- Concept 3 – Soil Nailing System
- Concept 4 – Reinforced Soil Slope System or Mechanically Stabilized Earth Wall

In determining the preferred method of remediation for the erosion risk and slope instability problem, two major factors were considered: (1) risk to structures and (2) the causes of the hazard. According to TRCA's design criteria, the potential risk to existing structures is the most important factor and subsequently given greater weight than the physical and geological condition associated with the cause of erosion. During evaluation of the preliminary alternatives, preference was also given to alternatives with a smaller construction footprint and machine access requirements to reduce impacts to the surrounding natural and built environment.

In all cases, the design of slope stability and erosion control works must provide protection compatible with TRCA's design criteria, which includes improvements to, or enhancements of, the existing terrestrial and aquatic habitat conditions through natural designs. Upon review, the proposed undertaking meets all TRCA planning and policy objectives and satisfies the needs and concerns of the affected property owners and general public based on the input received during the Interested Stakeholder Engagement (ISE) outreach activities.

The decision-making process used in the selection of the preferred remedial solution is documented in detail in **Section 4.**

A record of consultation activities, including copies of all ISE materials, can be found in **Appendix D.**

1.5 Rationale for the Undertaking

As part of its primary objective to prevent, eliminate, or reduce the risk of life and property from flooding and erosion, TRCA has an Erosion Risk Management Program (ERMP) which monitors erosion and slope instability within TRCA's jurisdiction. The ERMP includes monitoring private residential properties, at the request of landowners, and assessing risks to public property or infrastructure. One component of the program is to monitor the rate of erosion at a site in relation to the position of permanent structures (e.g. houses, infrastructure). Signs of accelerated erosion may prompt further study through a formal investigation by a geotechnical engineer.

TRCA plans and implements major maintenance and remedial flood and erosion control works on a priority basis due to the limit of available funding each year. Prioritization is based on the results from annual monitoring through the ERMP. Out of the hundreds of properties with reported damage following the July 8, 2013 severe storm event, properties on Topcliff Avenue were prioritized for remedial work based on a variety of factors:

- The location of the projected Long-Term Stable Slope Crest (LTSSC) in relation to permanent and essential structures at the top of slope
- The presence of a tributary at the base of slope
- The absence of a toe protection structure at the base of slope within the Project limits

Prior to deciding to proceed with remedial action at the site, TRCA evaluated the "Do Nothing" option, which assessed what would happen if no remedial works were implemented. The slope stability and erosion risk assessment undertaken by Cole Engineering Group Ltd. (2015), and recently updated by Central Earth Engineering (2020) indicated a high likelihood of continued bank erosion resulting in ongoing destabilization of the valley slope.

Considering the potential risks if a "Do Nothing" approach was taken, TRCA made the decision to proceed with this Class EA. Upon approval of this Class EA Project Plan, TRCA intends to proceed with developing the detailed design of the MSE structure in combination with the proposed channel improvements, and obtain the necessary approvals to proceed with implementation.

2 BACKGROUND

This section provides an overview of the causes and extent of erosion and slope instability hazards impacting the Project site and includes justification for TRCA's involvement and approach to developing a remedial solution. The studies and assessments undertaken by TRCA to evaluate the Project site are listed herein and discussed in further detail under **Section 3.0 – Baseline Inventory.**

2.1 Justification of Conservation Authority Involvement

TRCA has a mandate to carry out remedial erosion control works as set out in Chapter 27, Section 20 of the Conservation Authorities Act (R.S.O. 1990):

"The objects of an authority are to establish and undertake, in the area which it has jurisdiction, a program designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals (R.S.O. 1990, C.27, s.20)."

As part of this goal, CAs are considered to have prime responsibility over water management in terms of water quantity and related hazards through administrative and regulatory powers. In the 1980 Watershed Plan, TRCA developed and implemented its Erosion and Sediment Control Program (ESCP) with two major directions:

"To minimize the aggravation or creation of erosion or sediment problems as a result of new development, and to rectify existing problems through protective works" (TRCA, 1980).

These directions are categorized as either preventative or protective, respectively. The Project falls under the protection component of the ESCP, which is designed to protect lives and minimize loss of property through the construction of suitable remedial works. Through annual capital funding from its member municipalities, TRCA is able to implement a program of major remedial works for slope stabilization throughout the watersheds of the Greater Toronto Area.

2.2 History of the Problem

On the evening of July 8th, 2013, a severe storm event in the Greater Toronto Area resulted in widespread flooding, erosion, and slope failures in the west end and downtown areas of the City of Toronto. Flash flooding and accelerated soil erosion resulted in extensive damage to river and valley systems and has put many residential properties at risk. City of Toronto water infrastructure and many park amenities also suffered damage due to the extensive flooding. In the days following the July 8th, 2013 storm, TRCA responded to more than 450 reports of damage to private property, ranging from minor bank erosion and collapsing retaining walls to major landslides.

Based on visual inspections by TRCA staff, additional subsurface investigations were recommended for approximately 150 properties with the most severe damage in order to determine the risk to existing structures. The purpose of the geotechnical assessments was to assist TRCA in further ranking the hundreds of private properties affected by the July 8, 2013 severe storm event based on a variety of factors including risk to human life, property, and essential structures. TRCA retained Cole Engineering Group Ltd. in 2015 to complete a subsurface investigation at Topcliff Avenue to determine the extent of risk from the hazards of erosion and slope instability (**Appendix A**).

2.3 Supporting Studies and Assessments

2.3.1 Geotechnical and Geomorphic Assessments

A) Slope Stability & Erosion Risk Assessment-July 8, 2013 Storm Damage – Phase 2 – Toronto, Ontario (Terraprobe Inc., 2013)

Terraprobe was retained by TRCA to conduct a preliminary visual assessment of slope stability and erosion risk for seventy-two properties across Toronto. The seventy-two properties were considered the second phase of high priority sites in the wake of the record rainfall of July 8, 2013. The scope of work included slope inspections, slope rating, mapping, visual observations, photographs, summary of assessments of the sites, potential causes of failure/instability, preliminary assessment of risk, potential stabilization options and ballpark cost estimates. 37 and 39 Topcliff Avenue were included as two of the seventy-two properties chosen.

The report is provided in **Appendix A.**

B) TRCA Contract RSD 14-03 Storm Damage Detailed Slope Stability and Erosion Risk Assessment – Area E Properties, City of Toronto (Cole Engineering Group Ltd., 2015)

In 2015, a geotechnical investigation was completed by Cole Engineering Group Ltd. to determine the position of the LTSSC along a section of valley slope behind 37-39 Topcliff Avenue at a factor of safety of 1.5. Cole Engineering Group Ltd. Worked with Soil Engineers Ltd. To advance three (3) boreholes, one of which was used as a monitoring well to assess ground water conditions, to determine the composition and existing conditions of subsurface materials and proved recommendations from a geotechnical perspective.

The geotechnical report is provided in **Appendix A.**

C) Black Creek Tributary East of Topcliff Avenue – Detailed Fluvial Geomorphic Analysis and Concept Designs for Channel Improvements (Palmer, 2020)

Palmer Environmental Consulting Group (Palmer), in association with Greck and Associates Limited (Greck), completed a detailed fluvial geomorphic analysis along a tributary of Black Creek east of Topcliff Avenue, in Toronto, as a basis for developing conceptual designs for mitigating erosion-related risk along the western valley wall.

The fluvial geomorphic analysis and concept design report is provided in **Appendix A.**

D) Geotechnical Investigation, Slope Stability Analysis, Erosion Risk Assessment and Conceptual Remediation Designs – 31 to 43 Topcliff Avenue, Toronto, Ontario (Central Earth Engineering, 2020)

Central Earth Engineering Inc. (CEE) was retained by the Toronto and Region Conservation Authority (TRCA) to complete an additional geotechnical investigation and an updated slope stability and erosion risk assessment at 31 to 43 Topcliff Avenue in Toronto, Ontario.

The geotechnical report is provided in **Appendix A.**

2.3.2 Biological Studies

A) Ecology Survey (TRCA, 2019)

A terrestrial biological survey of the natural area within and surrounding the Project area was undertaken by TRCA's Environmental Monitoring and Data Management (EMDM) to inventory existing flora, fauna, and vegetation communities within the Project area. This data was gathered to inform planning and design activities and to ensure decisions are made with consideration of the local ecosystem.

The ecological summary report is provided in **Appendix C**.

B) Butternut Heath Assessor's Report #631-001 (TRCA, 2020)

Butternut is listed as an endangered species on the Species at Risk in Ontario list, and as such, is protected under the Endangered Species Act (ESA) from being killed, harmed or removed. A butternut health assessment within the Project area was undertaken by a certified TRCA butternut health assessor. The data was gathered to inform planning and design activities and to ensure decisions are made with consideration of all SARs within and surrounding the Project limits.

The report can be found in **Appendix C.**

2.3.3 Archaeological Assessments

A) Stage 1-2 Archaeological Assessment – Black Creek Tributary Behind Topcliff Avenue Slope Stabilization – Lots 20 & 21, Concession IV West in the Geographic Township of York (TRCA, 2020)

A Stage 1 and 2 archaeological assessment was triggered by internal Toronto and Region Conservation Authority (TRCA) policy outlined in the Archaeology Resource Management Services Guidelines and Procedures. The review of historic land use, geographic and cultural features, with careful consideration of available aerial photography and property inspection has indicated that no further archaeological assessment is necessary within the agreed upon Project area.

For a full account of the socioeconomic and cultural history within and near the Project limits, please refer to the Stage 1-2 Archaeological Assessment report provided in **Appendix A.**

2.4 Planning Documents

In developing the range of alternative solutions for evaluation under the Class EA guidelines, TRCA incorporated the applicable guidelines from several municipal, provincial, and federal guidance and policy documents, as follows:

Valley and Stream Corridor Management Program (1994)

The Valley and Stream Corridor Management Program (VSCMP) is a guidance document developed by TRCA to direct land use activities and development within valley and stream corridors. The program acknowledges the need for risk management related to flooding, erosion, and slope instability, while ensuring that future policies and criteria govern any change to existing resource-based uses of valley and stream corridors. The program also offers recommendations for the rehabilitation of valley and stream corridors that help to direct short and long-term resource planning activities.

Toronto and Region Remedial Action Plan (1994)

The Toronto and Region Remedial Action Plan (RAP) was developed by all levels of government and other stakeholders. The RAP encompasses a 2,000 km2 area within TRCA's jurisdiction in the City of Toronto. This area includes the Lake Ontario waterfront and the watersheds between Etobicoke Creek in the west and Rouge River in the east. The Toronto RAP is managed by representatives from Environment and Climate Change Canada, Ontario Ministry of the Environment, Conservation and Parks, MNRF, City of Toronto, and TRCA. The RAP has been working towards the following goals:

- Clean waters
- Healthy habitats
- Science and monitoring
- Sustainability
- Education and involvement

Terrestrial Natural Heritage System Strategy (2006)

TRCA's Terrestrial Natural Heritage System Strategy (TNHSS) was designed to enhance biodiversity and quality of life for residents by increasing the amount of forest and wetland habitats. It uses a science-based analytical tool based on ecological criteria to identify an expanded and targeted land base for inclusion in a terrestrial natural heritage system. TNHSS was designed for the entire TRCA jurisdiction as terrestrial systems and their interactions span watershed boundaries. The target system relates to the terrestrial component of the natural heritage system. TNHSS contains several strategic directions including proposed land use planning policies, land management, stewardship and education opportunities, and long-term monitoring.

Planning and Development Procedural Manual (2007)

TRCA's Planning and Development Procedural Manual provides a comprehensive summary of the legislative and policy framework that guides TRCA's decisions and actions with respect to planning and regulatory responsibilities, as outlined in Ontario Regulation 166/06.

The Living City Policies for Planning and Development in the Watersheds of the Toronto and Region Conservation Authority (2014)

The Living City Policies for Planning and Development in the Watersheds of the Toronto and Region Conservation Authority (LCP) is a CA policy document that guides the implementation of TRCA's legislated and delegated roles and responsibilities in the planning and development approvals process. Comparable to a combined municipal official plan and zoning bylaw, the LCP represents a compilation of existing plan and permit review policies and practices that have evolved over time. It also contains new policies related to TRCA programs, scientific research, and external planning and development initiatives.

TRCA's main program previously guiding the Authority in its planning and regulatory roles was the VSCMP endorsed by the Authority in October 1994. The LCP supersedes the VSCMP while continuing and expanding on the VSCMP's valuable foundation of principles and policy intent.

3 BASELINE ENVIRONMENTAL INVENTORY

Once it has been determined that remedial works are warranted at a given site, a baseline inventory is prepared. The baseline inventory provides the information needed to evaluate the alternative options developed through

the Class EA process, and to evaluate the types and level of environmental impacts that may result from implementing the preferred alternative.

The inventory involves the examination and documentation of:

- the erosion problem
- existing site conditions, including physical, biological, cultural, and socioeconomic characteristics
- engineering/technical aspects to be considered
- previous protective measures that have been implemented within the Project limits
- whether the site falls within a vulnerable area as identified in the local assessment report prepared under the *Clean Water Act*, 2006

This baseline environmental inventory takes into consideration the directly and indirectly affected environment. The private properties adjacent to the Project site, the Toronto Public Library – York Woods Branch and users of the Derrydowns Park may experience minor noise disturbances from the use of large machinery. However, all work will comply with the City of Toronto's Noise Bylaw.

Baseline environmental data was collected from the following organizations due to their specific expertise relevant to the regional and local Project area:

- City of Toronto
- Toronto and Region Conservation Authority
- Ontario Ministry of Natural Resources and Forestry (MNRF)
- Ontario Ministry of the Environment, Conservation and Parks (MECP)
- Environment Canada

3.1 Existing Site Conditions

In accordance with the Class EA process, the broad definition of 'environment' as provided in the Environmental Assessment Act is applied to this section. The prepared environmental description is "an inventory of elements for which a given project is likely to have an impact" (CO, 2013). The inventory includes an evaluation of the presence and extent of physical, biological, cultural, social, economic, and technical engineering elements applicable to the Project limits.

An existing condition drawing of the Project limits is included in **Appendix B.**

3.1.1 Physical Environment

Unique Landforms

There are no known unique landforms within or adjacent to the Project limits; therefore, there will be no impacts resulting from the proposed works.

Existing Mineral/Aggregate Resource Extraction Industries

There are no existing mineral/aggregate resource extraction industries within or adjacent to the Project limits; therefore, there will be no impacts resulting from the proposed works.

Earth Science – Areas of Natural and Scientific Interest (ANSI)

There are no existing earth science areas of natural and scientific interest (ANSI) within or adjacent to the Project limits; therefore, there will be no impacts resulting from the proposed works.

Specialty Crop Area / Agricultural Lands or Production

There are no specialty crops or agricultural lands or production areas within or adjacent to the Project limits; therefore, there will be no impacts resulting from the proposed works.

Niagara Escarpment / Oak Ridges Moraine

The Project limits do not fall within the boundaries of the Niagara Escarpment or the Oak Ridges Moraine; therefore, there will be no impacts resulting from the proposed works.

Environmentally Significant Areas (ESA) – Physical

There are no physical environmentally significant areas (ESA) within or adjacent to the Project limits; therefore, there will be no impacts resulting from the proposed works.

Air Quality

At a local scale, no significant sources of air pollution exist within or immediately surrounding the Project limits. No component of the Project is anticipated to significantly degrade air quality or be influenced by local or regional sources of air pollution. Any impacts from machinery and/or vehicles used as part of the construction phase will be temporary and minimal and therefore, deemed insignificant.

Agricultural Tile or Surface Drains

There are no known agricultural tiles or surface drains within or adjacent to the Project limits. Improvements to surface drainage will be made through the design and implementation of TRCA's proposed remedial slope stabilization works, including mitigating surficial erosion issues within the Project limits.

Noise Levels and Vibration

The Project area is primarily surrounded by low to medium density residential land use. There are no current noteworthy sources of noise or vibration within or near the Project area. Most noise is typically associated with vehicular traffic along Finch Avenue West, located to the north of the Project site. All construction operations will conform to the City of Toronto's noise bylaw (Toronto Municipal Code, Chapter 591). Construction activities will also be monitored for vibration levels as per municipal construction vibration standards (Toronto Municipal Code, Chapter 363, Article 5).

Water flow Regime (baseflow conditions and storm conditions)

In their 2020 geomorphic assessment, Palmer notes that expanding residential development north of Finch Avenue in the 1960's was likely the cause of insufficient stormwater management controls within the sub-watershed where the Project site is located. Poor stormwater management combined with the hardening of natural landscapes through increased urbanization, historical channel realignments, and disposal of residential garbage, yard waste, and slope debris within the ravine lands have inevitably resulted in channel instability within the Project limits (Palmer, 2020). The Black Creek tributary located within the ravine lands below Topcliff Avenue

is considered a flashy watercourse where, as pointed out by Palmer, even during moderate rain events the tributary exhibits uncharacteristically high flows. High flows increase the erosive capability of tributary flows which in turn results in increased bank and channel erosion. Significant storm events result in even greater erosive power thereby causing further erosion within the tributary channel in addition to flooding within the adjacent floodplain. This flooding and erosion caused by heightened flows is ultimately contributing to slope instability within the Project area. For more information on the water flow regime impacting the Project area, please refer to Palmer's Detailed Fluvial Geomorphic Analysis and Concept Design for Channel Improvements Report, found in **Appendix A**.

Existing Surface Drainage / Groundwater Seepage / Groundwater Recharge and Discharge Zones

Based on their analysis of existing site conditions, Central Earth Engineering (CEE) and Palmer both identified that concentrated surface runoff originating from residential development near the Project site is one of the key issues contributing to the erosion hazard behind Topcliff Avenue. As properties at the top of slope generally slope towards the adjacent ravine lands, overland runoff is concentrated and channelized down the slope, particularly behind 37 and 39 Topcliff Avenue. This runoff has and continues to erode gullies, over-steepen the slope gradient, and ultimately contribute to destabilization of the slope at the Project site.

Eavestrough and roof leaders attached to main dwellings and ancillary backyard structures located at the top of slope are also releasing captured stormwater directly towards the ravine lands. This stormwater discharge adds to the amount of runoff draining across the slope behind Topcliff Avenue and further exacerbates erosion issues across the slope caused by concentrated runoff. The proposed remedial works described in this Project Plan will result in improvements to localized stormwater management at the Project site. These improvements will mitigate continued impacts of uncontrolled and concentrated overland runoff impacting the slope behind Topcliff Avenue.

Littoral Drift / Other Coastal Processes

The Project limits are not located within a coastal setting; therefore, there will be no impacts to littoral drift or other coastal processes resulting from the proposed works.

Water Quality

The water quality is currently considered in poor condition due to pollution from run-off (residential and road catchment area), overland flow/drainage and general channel instability which contributes to frequent sediment disturbance.

Soil/Fill Quality

Based on the results of CEE's geotechnical investigation, the crest of slope at the Project site has a layer of earth fill underlying a layer of topsoil. The fill layer varies from 0.8 to 4 m below grade and consisted of clayey and sandy silt with trace gravel. Inclusions of topsoil, organics, and brick fragments were encountered within the fill (Central Earth Engineering, 2020). Ultimately, the extent of fill material at the top of slope within the Project site was a significant contributor to the slope failure that occurred behind Topcliff Avenue following the July 8, 2013 severe storm event. The thick layer of fill resulted in overloading of the upper slope and undermined the natural soil strength of upper slope materials.

For more detail on existing subsurface soil conditions within the Project area, please refer to Central Earth Engineering's Geotechnical Investigation, Slope Stability Analysis, Erosion Risk Assessment, and Conceptual Remediation Designs Report found in **Appendix A**.

Contaminated Soils / Sediment / Seeps

There are no known contaminated soils, sediment, or seeps within the Project limits.

Existing Transportation Routes

The main transportation routes surrounding the Project limits are Finch Avenue West to the North. The closest major transportation route is Highway 400, which lies approximately 2.5 kilometers west of the Project site. Major arterial roads that service the Project site include Finch Avenue West and Jane Street. Construction activities are anticipated to result in minor and temporary impacts to existing transportation routes. No major alterations to existing transportation routes will be required to implement TRCA's proposed remedial works.

Future projects along Finch Avenue West include the development of a Light Rail Transit (LRT) project. The Finch Avenue West LRT project is being managed and implemented by Metrolinx. Major construction of the LRT was scheduled to begin in 2019 and completion is expected to be achieved in 2023. TRCA Project Management staff will be working closely with TRCA's internal permitting department and Metrolinx to ensure that TRCA's proposed remedial works will be planned to account for the Finch Avenue West LRT project to mitigate potential project conflicts.

Constructed Crossings

There is one constructed crossing overtop the Black Creek tributary located downstream of TRCA's intended work area (**Figure 16**). The closed-bottom culvert crossing runs underneath the pedestrian trail located in Derrydowns Park. TRCA does not anticipate any impacts to this constructed crossing as a result of the proposed remedial works as the crossing lies beyond the limits of TRCA's work area.

Figure 16: Constructed crossing located in Derrydowns Park near the southern limit of the Project area. *Source: TRCA, 2019*.

Geomorphology

In Palmer's 2020 geomorphic assessment, it was identified that the Black Creek tributary channel located below Topcliff Avenue is experiencing irregular channel instability. This channel instability is characterized by the collapse of eroded banks, increased flooding, and creation of secondary overflow channels throughout the tributary's floodplain. These flooding and erosion issues are a direct result of surging channel flows during precipitation events. As discussed, under the Water Flow Regime section of this Project Plan, the Black Creek tributary channel is a flashy watercourse. Flow volumes drastically increase during precipitation events which exacerbate erosion and flooding issues within the channel and at the Project site.

Ultimately, active channel and floodplain erosion at the Project site is eroding the toe of the valley slope below Topcliff Avenue. Unchecked toe erosion will continue to over-steepen channel banks and undercut the toe of the coincident valley slope, which further adds to slope destabilization concerns. Therefore, TRCA's proposed remedial works incorporate channel remediation measures to address channel hazards that are contributing to slope stability hazards below Topcliff Avenue. Channel remediation below Topcliff Avenue is an integral part of the solution to provide long-term protection to at-risk private properties located at the top of slope within the Project area.

3.1.2 Biological Environment

A detailed review of the biological conditions within and surrounding the Project limits was compiled by TRCA ecologists in 2019 based on field work completed in 2016 and a review of existing TRCA, federal, provincial, and municipal data. The findings of this ecological review are discussed below. A complete copy of the Topcliff Avenue Background Ecological Summary report and other supporting documentation can be found in **Appendix C**.

Wildlife Habitat

The slope and ravine parkland within and surrounding the Project site are densely vegetated with many undergrowth and forest communities which provide habitat for urban wildlife species. TRCA's proposed remedial works will result in moderate, but temporary, disturbances to local wildlife habitat. Disturbance is anticipated to result through the select removal of trees and vegetation to facilitate construction activities; and increased noise and vibration levels resulting from the operation of heavy machinery. To minimize impacts, all construction activities are selected and planned to have the smallest construction footprint possible and will occur outside of key migration and breeding windows when habitat use is not as crucial. Implementation of a comprehensive restoration plan will follow construction activities to compensate for and remediate disturbance to existing habitat through intensive planting of suitable native species.

Habitat Linkages or Corridors

The Project site is located within Derrydowns Park, which is part of a greater parkland corridor system that follows the Black Creek riverine system. Further downstream, just north of St Clair Avenue West, the Black Creek corridor eventually connects to the Humber River riverine corridor. **Figure 17** illustrates the extent of habitat connectivity surrounding the Project site. Although the Black Creek and Humber River corridors are fragmented by many local and major arterial roadways, these corridor systems are recognized Natural Heritage Systems by the City of Toronto as they provide crucial habitat linkages for urban and migrating wildlife. TRCA's proposed works at the Project site will result in localized improvements to habitat within Derrydowns park below Topcliff Avenue, however, there will be no significant impacts to habitat connectivity as a result of the proposed remedial works.

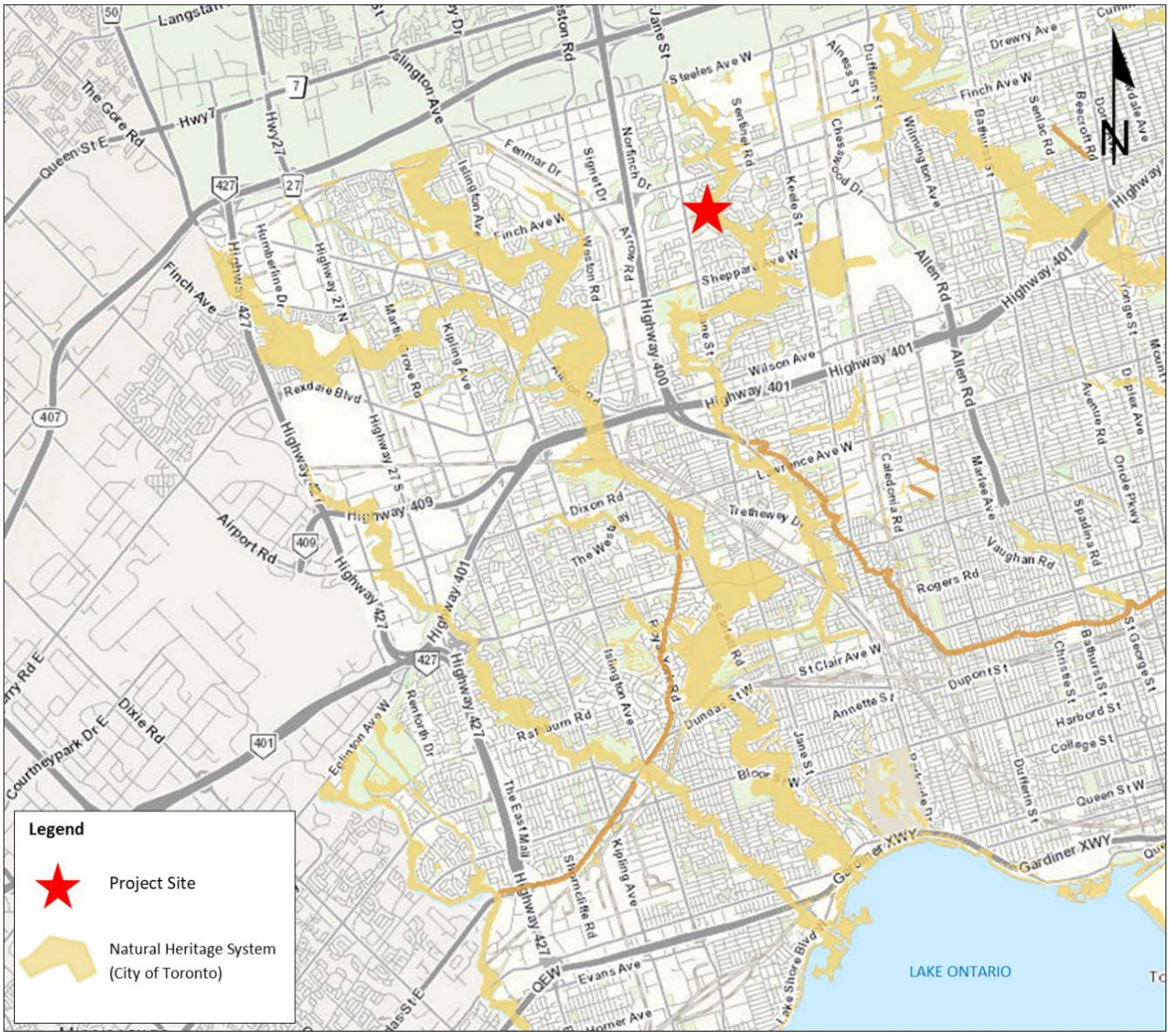

Figure 17: City of Toronto Natural Heritage Systems representing habitat linkages and corridors near the Project site. *Source: City of Toronto, 2021*.

Significant Vegetation Communities

There are no significant vegetation communities within or near the Project site. The Project and surrounding area are comprised of both upland and lowland vegetation communities, none of which are considered to be of conservation concern. As part of TRCA's proposed works, selective tree and shrub clearing will be required to facilitate construction operations, including allowing for the operation of heavy machinery and stockpiling material and equipment. However, the extent of tree and shrub removals will be minimal and no significant negative impact to the welfare of vegetation communities within the parkland corridor behind Topcliff Avenue is anticipated as a result of TRCA's proposed works. Any disturbance to vegetation communities will be mitigated through a comprehensive restoration plan, which will focus on planting suitable native species and ultimately help to create a more robust local environment.

Environmentally Significant Areas (ESA) – Biological

There are no Environmentally Significant Areas (ESA) within or adjacent to the Project limits; therefore, there will be no impact from the proposed works.

Fish Habitat

TRCA staff visited the site on June 12, 2019 to assess the current aquatic habitat conditions. TRCA staff sampled the west-side tributary that flows into Black Creek. The creek was approximately 1-3 m wide with a mainly sandy bottom sediment. The downstream culvert (Reach 3, Figure 13) under the paved pedestrian pathway was noted as slightly perched at the downstream end and limited water was running through the culvert which may be acting as an impediment to fish movement. Staff also noted that there was "a lot of garbage" within and near the Project site, further lowering the quality of potential fish habitat.

Species of Concern – Flora

Butternut trees were identified with the Project limits. There have been impacts to the butternut populations across North America due to a disease known as butternut canker. Butternuts are classified as an endangered species and are protected under Ontario's Endangered Species Act. A full Butternut Health Assessment report of all identified butternuts can be found in **Appendix C.**

Although the removal of certain trees and shrubs will be necessary to accommodate the operation of heavy machinery within the Project limits, the impacts resulting from the proposed works on the aforementioned species of concern will be minimal. Tree and shrub removals will be planned, and post-construction restoration activities will focus on replanting suitable native species to compensate for those that were removed. Species selection will also aim to enhance biodiversity at the Project site. Where possible, protection zones will also be erected during construction to protect sensitive native trees and shrubs within the vicinity of the worksite from undue harm.

Species of Concern – Fauna

Observations of eight (8) different bird species of concern have been documented within the vicinity of the Project site. These species include the Eastern wood-peewee (*Contopus virens*), Wood thrush (*Hylocichla mustelina*), Chimney swift (*Chetura pelagica*), Least flycatcher (*Empidnax minimus*), Northern flicker (*Colaptes auratus*), Red-eyed vireo (*Vireo olivaceus*), Cooper's hawk (*Accipiter cooperii*), and Eastern meadowlark (*Sturnella magna*). Due to the age and/or nature of observations and records for these species, there is a lack of evidence that suggests any of these species have established nesting territory within the Project limits. Regardless, TRCA will undertake a survey of the Project site prior to the commencement of tree removals and general construction activities to ensure no breeding bird species of concern exist within TRCA's work area. To further limit potential impact to these species, TRCA will also plan for all vegetation removals and construction activities to occur outside of the bird breeding window in compliance with the Migratory Bird Convention Act.

For more information regarding fauna species within and near the Project site, please refer to **Appendix C**.

Wildlife / Bird Migration Patterns

To mitigate any potential impacts to migratory birds, TRCA shall follow the requirements of the Migratory Bird Convention Act, including abiding by the breeding bird timing window that occurs from the end of March to the

end of August. Although temporary disruption to existing wildlife habitat is likely during construction due to the removal of trees and other vegetation, this habitat disturbance will be offset through the implementation of a comprehensive restoration plan. The restoration plan for the Project will involve intensively planting all disturbed habitat areas with suitable native tree, shrub, and grass species. Overall, TRCA's proposed works will result in improvements to local habitat quality.

Exotic / Alien and Invasive Species

One of the main objectives of the proposed works is to enhance naturalization of the Project area. Thus, the proposed works will result in the removal of exotic and invasive species, such as garlic mustard (*Alliaria petiolate*), within the Project limits and compensated with additional plantings of suitable native species.

Wildlife Populations

There are no significant wildlife populations identified within the Project limits; therefore, there are no anticipated impacts resulting from the proposed works.

Wetlands

There are no wetlands within the Project limits, therefore, there will be no impact due to these works.

Microclimate

There is no known microclimate within the project limits, therefore, there will be no impact due to these works.

Unique Habitats

There are no unique habitats within the Project limits, therefore, there will be no impact due to these works.

Areas of Natural Scientific Interest – Life Science (ANSI-LS)

There are no Areas of Natural Scientific Interest – Life Sciences (ANSI-LS) within the Project limits, therefore, there will be no impact due to these works.

3.1.2 Cultural Environment

Traditional Land Uses

This Project is located within the Traditional Territories and Treaty Lands of the Mississaugas of the Credit First Nation, Williams Treaties First Nations, and the Huron-Wendat Nation. No adverse effects on traditional land uses were identified during engagement with Indigenous communities.

Indigenous Reserve or Community

There are no Indigenous reserves or communities within the Project limits; therefore, there will be no impact due to the proposed works.

Outstanding Native Land Claim or Treaty Rights

The Project is located within the boundaries of the Toronto Purchase Treaty and is adjacent to Black Creek, which is subject to the 2016 Water Claim filed by Mississaugas of the Credit First Nation.

Concern regarding potential impacts to archaeological resources was expressed by the Huron-Wendat Nation. The completed Stage 1-2 Archaeological Assessment was provided. The Huron-Wendat Nation requested to be informed of any further archaeological assessments. TRCA will provide information about any further assessments when available.

Transboundary Water Management Issues

There are no transboundary water management issues within the Project limits; therefore, there will be no impact due to these works.

Riparian Uses

There are no significant riparian uses within the Project limits; therefore, there will be no impact due to these works.

Recreational or Tourist Uses of a Waterbody and/or Adjacent Lands

The Project site is located in Derrydowns Park, which is actively used by the public for recreational purposes. The location of the construction access, stockpile and staging areas for the proposed works may have a temporary impact to ravine users as a portion of the Derrydowns parkland will need to be utilized by TRCA to facilitate construction operations. TRCA will ensure to post construction notices to inform the public of temporary restrictions and estimated construction timelines once known.

Aesthetic or Scenic Landscapes or Views

Derrydowns Park provides a unique natural landscape within the area surrounding the Project site. This parkland breaks up the monotony of the surrounding urban landscape and provides ravine users and overlooking properties with a natural view. Unfortunately, Derrydowns Park is impacted by significant accumulation of garbage and debris. In addition to causing jams within the Black Creek tributary channel, this garbage and other waste retracts from overall park aesthetics. As part of TRCA's proposed works, existing garbage, waste, and other debris within the Project limits will be cleaned up and improve local ravine aesthetics.

Archaeological Resources, Built Heritage Resources and Cultural Heritage Landscapes

In 2019, TRCA Archaeology staff undertook an assessment of the Project limits to determine whether there would be any resulting impacts to existing archaeologic or heritage resources from TRCA's proposed remedial works. This assessment was conducted in accordance with standards and guidelines set out by the Ministry of Heritage, Sport, Tourism, and Culture Industries. TRCA's archaeological investigation included a thorough examination of historical landuse and geographic and cultural features within the vicinity of the Project. l The results of this assessment confirmed that Project site is free to archaeological concerns; therefore, there will be no impacts to archaeological or heritage resources as a result of TRCA's proposed works.

For a full account of the archaeology assessment completed for the Project, please refer to the Stage 1 – 2 Archaeological Assessment report found in **Appendix A.**

Historic Canals

There are no historic canals within the Project limits; therefore, there will be no impact due to these works.

Federal Property

There is no federal property within the Project limits; therefore, there will be no impact due to these works.

Heritage River Systems

The Canadian Heritage Rivers System (CHRS) is a federal, provincial, and territorial program designated to recognize, conserve, and protect Canada's rivers, as created under the Parks Canada Agency Act (CHRS, 2020). The Humber River is one of 40 designated rivers in Canada and the only Canadian Heritage River in the GTA. Black Creek and its tributaries, including the watercourse located within the Project limits, are situated within the Humber River watershed and therefore fall under the CHRS program. Although there will be no significant impacts to the Humber River watershed as a result of TRCA's proposed works, the proposed remedial works will result in localized improvements to the Black Creek tributary channel that runs through the Project site. Improvements will include localized litter and garbage clean-up and enhanced channel bed and bank protection measures.

3.1.3 Socioeconomic Environment

Surrounding Neighbourhood or Community

The neighbourhood surrounding the Project is comprised predominantly of single detached family homes, classified as low to medium residential land-use (**Figure 18**). According to the 2016 Census, each household has an average of three (3) residents and a categorically middle-class average household income (Statistics Canada, 2016).

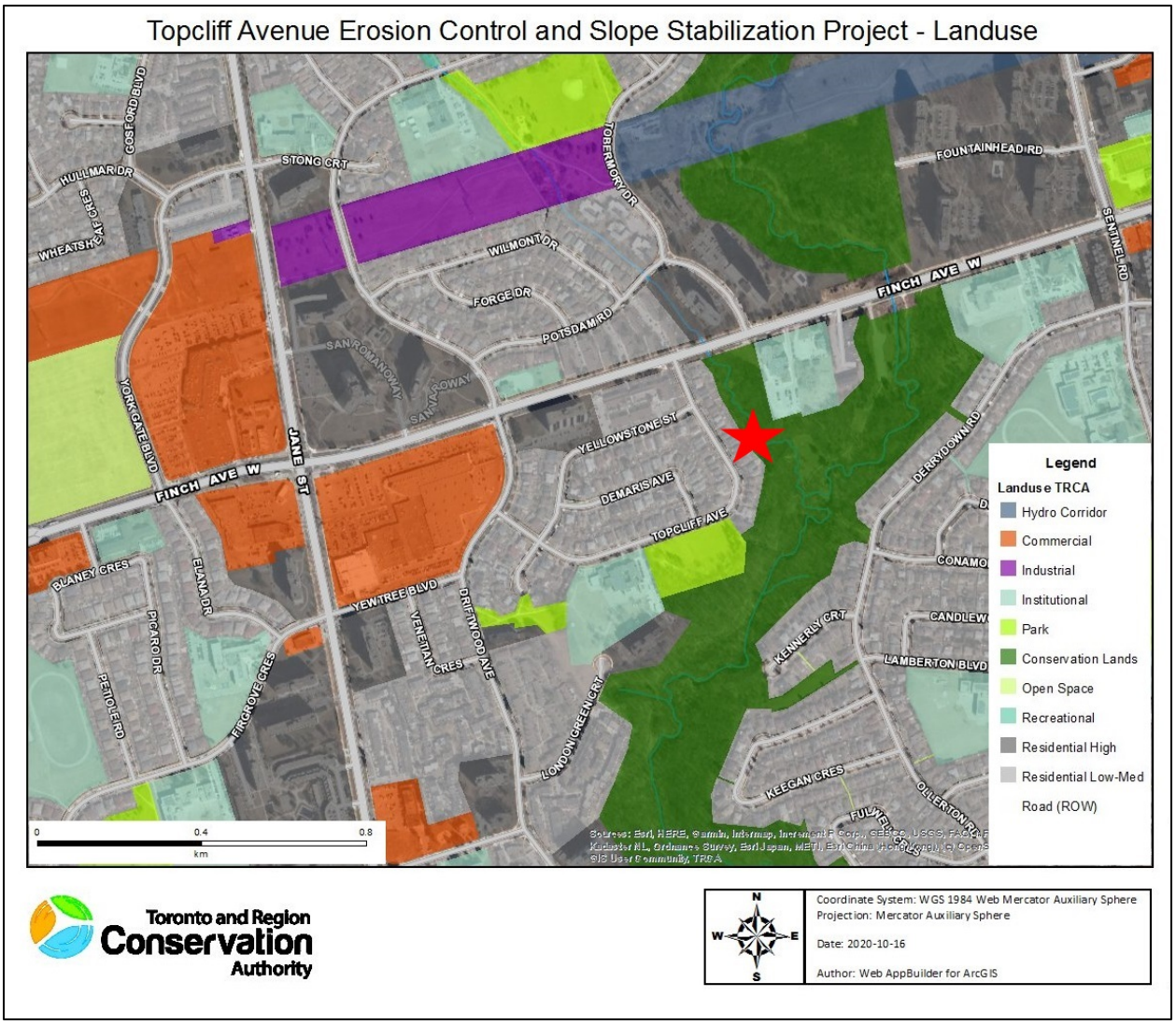

Figure 18: Landuse surrounding the Project limits (denoted by red star). Source: TRCA, 2020.

Surrounding Land Uses and Growth Pressure

Situated in the City of Toronto, the Project site is subject to significant pressures resulting from urbanization of surrounding areas. As can be observed in historical aerial photographs shown in **Figure 18** to **Figure 21** below, the region surrounding the Project has been subject to significant urbanization since the 1960s. Urbanization changes the composition of the Earth's natural surface and typically results in the severe limitation or complete eradication of natural areas, causing increased stresses on remaining natural areas and features and negatively impacts the health and wellbeing of local ecosystems.

Figure 19: 1954 historical aerial photograph of area surrounding the Topcliff Avenue Project (red polygon). *Source: TRCA, 2018*.

Figure 19: 1967 historical aerial photograph of area surrounding the Topcliff Avenue Project area (red polygon).
Source: TRCA, 2018

Figure 20: 1978 historical aerial photograph of area surrounding the Topcliff Avenue Project area (red polygon).
Source: TRCA, 2018.

Figure 21: 1978 historical aerial photograph of area surrounding the Topcliff Avenue Project (red polygon). *Source: TRCA, 2018.*

Although there are designated conservation and parklands to the east and south of Topcliff Avenue, much of the surface area within the vicinity of the Project site is covered with impervious surface material (i.e. driveways, roads, sidewalks, permanent built structures, etc.). Impervious surfaces drastically affect the way in which water flows and drains, changing the dynamics of the hydrological system and typically causing increased erosion and pollution. Although TRCA's proposed remedial works will not address the broader issue and effects of urbanization, the proposed works will result in improved stormwater and land management within the Project limits.

Existing Infrastructure, Support Services, Facilities

At the upstream limit of the Project area there is a large 2.20 metre culvert that conveys flows underneath Finch Avenue West into Derrydowns Park. This culvert outlets directly into a tributary channel behind Topcliff Avenue. These flows eventually convey into Black Creek further downstream. The size of this culvert plays a significant role in the level of flow that is discharged into the tributary below Topcliff Avenue. As part of Metrolinx's Finch West LRT Project, this culvert is planned to be replaced to accommodate Metrolinx's project needs. When developing detailed designs for channel remediation works below Topcliff Avenue, TRCA will ensure that the culvert replacement is a considered design criterion to ensure TRCA's proposed works can appropriately accommodate for any potential changes in flow capacities.

Pedestrian Traffic Routes

There is an existing multi-use paved pedestrian trail that passes through Derrydowns Park near the Project site. For the protection of public health and safety, TRCA's proposed works may result in temporary restrictions to pedestrian traffic within Derrydowns Park depending on construction needs. Specific details pertaining to pedestrian traffic restrictions will be determined when TRCA proceeds with developing detailed designs, following approval of this Project Plan. TRCA will ensure to post proper notices and signs to communicate any potential pedestrian traffic restrictions prior to the start of construction.

Property Values or Ownership

The Toronto Real Estate Board (TREB) lists the average semi-detached home within Ward 7 between $720,000.00 and $755,000.00. A portion of the upper slope within the Project limits is owned by private residential landowners along Topcliff Avenue. The remainder of the Project limits and adjacent parkland is owned by the City of Toronto and TRCA. The Project limits and surrounding ravine parkland are managed by TRCA under O. Reg. 166/06. The proposed works will result in conveyance of a small area of land along the upper slope into public ownership where the preferred slope stabilization solution will be constructed, as per TRCA's Private Landowner Contribution for Erosion Control Works policy. This land conveyance will facilitate future maintenance and monitoring of the slope stabilization structure and contribute to the overall expansion of public greenspace.

Existing Tourism Operation

There are no existing tourism operations within or adjacent to the Project limits; therefore, there will be no impacts resulting from the proposed works.

Property Accessibility

TRCA is currently contemplating two possible options to access the Project site. These options include accessing the Project site from the top of slope and establishing an access route between residential properties participating in the Project; or establishing construction access through Derrydowns Park to access the Project site form the toe of slope. The preferred access route will be determined when TRCA proceeds to detailed designs, following approval of this Project Plan. Identifying the preferred access will consider construction needs, such as type of heavy equipment, machinery, and material required to implement the proposed works, in addition to the extent of vegetation removals and/or removal of existing structures within the Project area.

3.1.4 Engineering / Technical Environment

Rate of Erosion in Ecosystem

The rate of erosion within the Project area is dependent on location. In general, the rate of erosion observed is relatively low due to the formation of debris jams and an easily accessible floodplain for flow to dissipate within. Future erosion and movement of the existing debris jams downstream may result in increased erosion if the creek is allowed to interact directly with the banks, causing accelerated scouring along the bottom of slope. The valley slope behind 31 – 43 Topcliff Avenue is expected to continue to erode and experience slope failures until a stable slope inclination is established if no suitable erosion protection is installed. Ultimately, TRCA's proposed works will implement suitable erosion control measures that will better control erosion hazards and will also ensure that the rate of erosion within the Project limits is not exacerbated.

Sediment Deposition Zones in Ecosystem

There are no sediment deposition zones within the Project limits; therefore, there will be no impacts resulting from the proposed works.

Flood Risk in Ecosystem

As noted in previous sections in this Project Plan, the flood risk is quite high within the Project area. Regular flooding occurs within the tributary channel below Topcliff Avenue, as well as within Black Creek, due to frequent overloading of the watercourse caused by rainfall events and lacking stormwater management within the surrounding area. The culvert at the upstream limit of the Project area conveys a large volume of water from residential areas north of Finch Avenue into the tributary below Topcliff Avenue, which, in its current state, is not adequate to handle this increased flow volumes. TRCA's proposed works will result in channel improvements below Topcliff Avenue that will better control heightened tributary flows and provide long-term bed and bank protection from ongoing erosion concerns.

Slope Stability

The slope behind Topcliff Avenue within the limits of the Project was identified by CEE in their geotechnical investigation to be at-risk of long-term slope instability. Slope instability is attributed to the presence of significant debris and garbage accumulation along the slope, deep fill material along the tableland and upper slope, and active toe erosion caused by flows within the tributary channel located at the bottom of slope. The proposed remedial works described herein aim to limit impacts of erosion and ultimately provide long-term protection to at-risk private properties located at the top of slope.

Existing Structures

The Project involves multiple private residential dwellings located at the top of slope along Topcliff Avenue. Private residential dwellings are deemed essential structures. As such, the objective of the Project is to implement slope stabilization and channel remediation measures that will provide long-term protection to these essential structures to safeguard human life and property from the hazards of erosion and slope instability.

Hazardous Lands / Sites

Property or land that could be unsafe for development because of naturally occurring processes associated with flooding, erosion, dynamic beaches or unstable soil or bedrock (Conservation Authorities Act, 1990) is defined as hazardous lands and would include the valley slope behind the affected properties on Topcliff Avenue.

The hazardous lands where the proposed stabilization works are located are to be transferred to TRCA as the benefiting landowner's contribution to the proposed works. This will allow TRCA to monitor and maintain the completed works; to foster resilient ravine systems; and to expand public greenspace.

4 EVALUATION OF PRELIMINARY ALTERNATIVE OPTIONS

TRCA retained Central Earth Engineering and Palmer Environmental Consulting Group, Inc. to develop preliminary geotechnical and geomorphic alternative solutions for the Project based on extent of risk to essential structures within the Project limits. The information obtained in the baseline data collection was used in the evaluation of each preliminary alternative, with specific consideration given to the advantages and disadvantages of each method based on the extent of risk. The preliminary alternative solutions and corresponding evaluations are discussed in further detail below.

The complete geotechnical and geomorphic reports are provided in **Appendix A.**

4.1 Description of Preliminary Slope Stabilization Alternative Options

The following are the alternative conceptual solutions that were developed and evaluated as part of the Class EA process to address the **upper slope instability** behind Topcliff Avenue, in the City of Toronto. The alternative solutions were developed by Central Earth Engineering (2020) and are based on topographic data provided by TRCA and the subsurface data collected from the 2015 SS&ERA conducted by Cole Engineering Group Ltd (**Appendix A**).

Concept 1 – 'Do Nothing'

Concept 2 – Improve Drainage, Minor Earthworks and Surficial Erosion Protection

Concept 3 – Soil Nail System

Concept 4 – Reinforced Soil Slope (RSS) System or Mechanical Stabilized Earth (MSE) Wall

Note: Concept 3 and 4 are proposed in conjunction with concepts for channel work and toe protection within Mimico Creek.

The evaluation of each preliminary alternative option includes an examination of the types and extents of impacts, both positive and negative.

4.1.1 Concept 1 – 'Do Nothing'

The 'Do Nothing' alternative consists of leaving the slope in its current condition and allowing the slope to stabilize naturally in the long-term and is a mandatory alternative that must be considered during the Class EA process to justify the need to undertake remedial works within the Project limits. Should the 'Do Nothing' alternative or other Conservation Authority (CA) programs, such as land acquisition, be deemed a more

acceptable solution, then there shall be no further consideration for remedial action and the Class EA process terminates.

This alternative is the least disruptive to the slope and tableland, but structures at the slope crest (i.e. sheds, patios, and shared garage) will be impacted over time as the slope stabilizes to a flatter inclination. It is not expected that the residential dwellings would be at risk to long-term instability with the 'Do Nothing' option provided that channel toe erosion protection is implemented; however, the slope will continue to stabilize over time and the resulting failing material may have negative impacts on implemented channel work within the Project limits. Annual inspections are recommended with this option to monitor the slope conditions and to implement remedial maintenance works as needed.

4.1.2 Concept 2 – Improve Drainage, Minor Earthworks and Surficial Erosion Protection

This alternative includes a list of recommendations that are less disruptive to the slope and tableland but does not include an engineered structure that physically supports the soil in place to prevent slope movement. This alternative is a cost effective solution that may reduce risk during extreme storm events.

The summarized recommendations from Central Earth Engineering are as follows:

- **Drainage Trench** – A drainage trench is a depression in the tableland which provides surface water drainage from the tableland behind the dwellings. It is recommended that the trench be located approximately 3 metres from the crest of slope. This will help reduce temporary/infrequent elevated water conditions that develop during extended periods of rainfall (**Figure 22**).
- **Surficial Drainage** – Downspouts/drainage on several of the affected properties is currently draining directly onto the rear tableland. All drainage would be redirected to outlet to the front of the properties or extended to the bottom of the slope to reduce surface water drainage towards the slope crest (**Figure 22**).
- **Minor Earthworks** – Removal of un-engineered retaining structures and minor regrading at the slope crest across the project site to construct a stable slope angle. This proposed work does have the potential to reduce the amount of usable tableland on the affected private properties (**Figure 22**).
- **Surficial Erosion Protection and Re-vegetation** – Upon completion of minor regrading activities, the disturbed area at the top and face of slope would be covered with an erosion control blanket and planted with native plant species (**Figure 22**).

4.1.3 Concept 3 – Soil Nail System

This alternative is an engineered solution that involves implementation of a Soil Nail System to stabilize the slope above the channel. This involves removing un-engineered retaining walls from the top of slope, applying a synthetic grid (engineered to reinforce soil) on the valley slope face and anchoring it using deep-seated soil nails at regular intervals as shown in **Figure 23**.

After installation of the Soil Nail System, topsoil will be added and grasses and/or shrubs will be planted to establish vegetation and reduce surficial erosion. Trees will not be planted as part of the restoration plan but

may grow naturally over time. This is not expected to compromise the stabilization of the slope but will need to be monitor over the long term. This alternative is the costliest to implement and maintain overall and has a shorter expected life span then Concept 4.

This alternative relies on channel works (described in **Section 4.2**) providing long-term toe erosion protection at the bottom of slope to stabilize the over-steepened lower slope face (Central Earth Engineering, 2020).

4.1.4 Concept 4 – Reinforced Soil Slope (RSS) System or Mechanical Stabilized Earth (MSE) Wall

This alternative stabilizes the upper slope using an engineered solution of either a Reinforced Soil Slope (RSS) system or a Mechanically Stabilized Earth (MSE) wall, both of which would provide long-term stability to the upper slope (**Figure 24**). Both systems require excavation and removal of earth fill from the affected tablelands and valley slope face. The removed fill is replaced with granular material and reinforced with geogrid that will support a facing material that can either be planted (RSS system) or inclined at a steeper angle with a stone facing material (MSE system) (Central Earth Engineering, 2020).

The advantages of Concept 4 are the same as those of Concept 3 with the added benefit of having an overall lower cost to install and maintain.

This alternative relies on channel works (described in **Section 4.2**) providing long-term toe erosion protection at the bottom of slope to stabilize the over-steepened lower slope face (Central Earth Engineering, 2020).

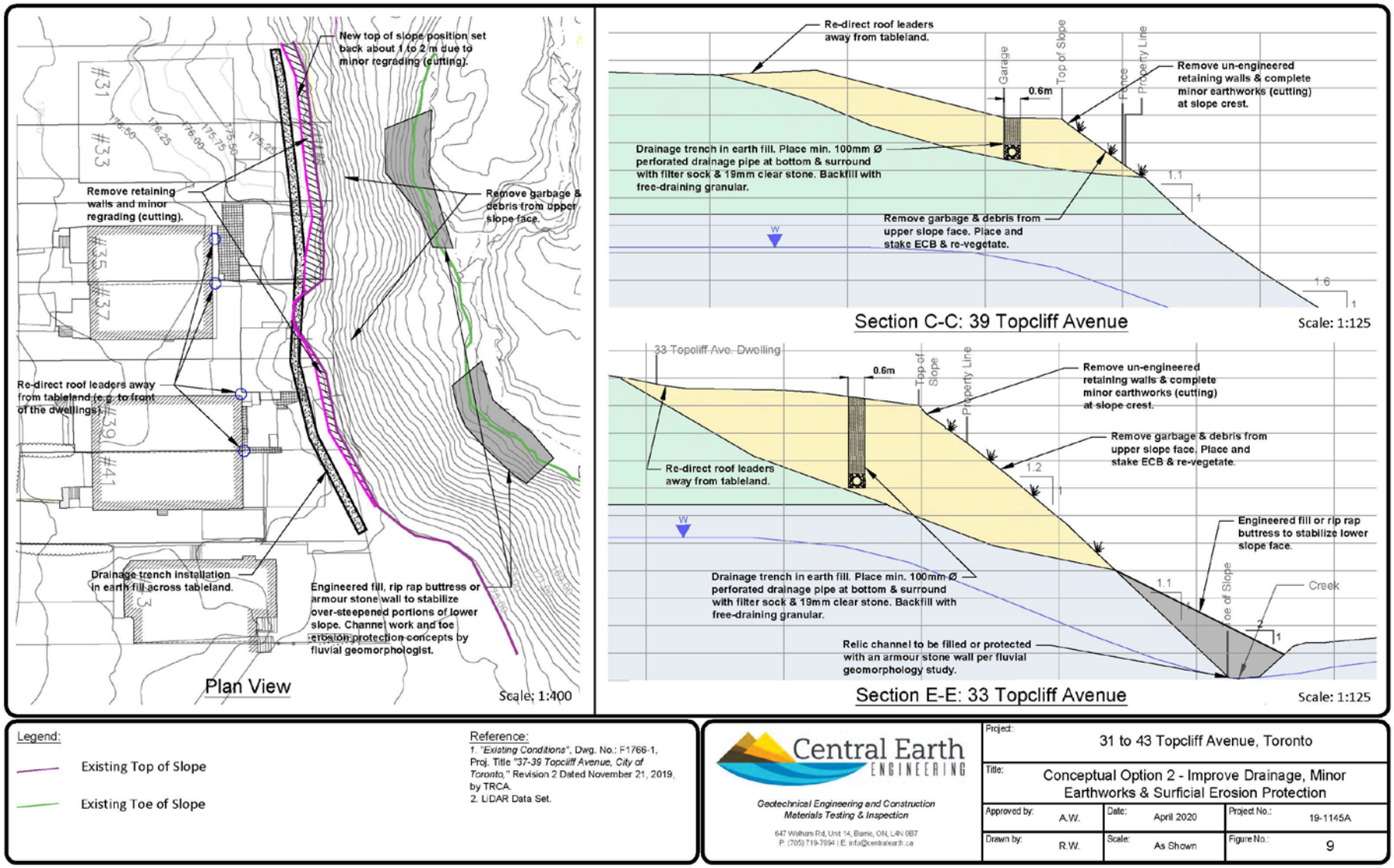

Figure 22: Concept 2 - Improvements for drainage with minor works and surface erosion protection. Source: (Central Earth Engineering, 2020)

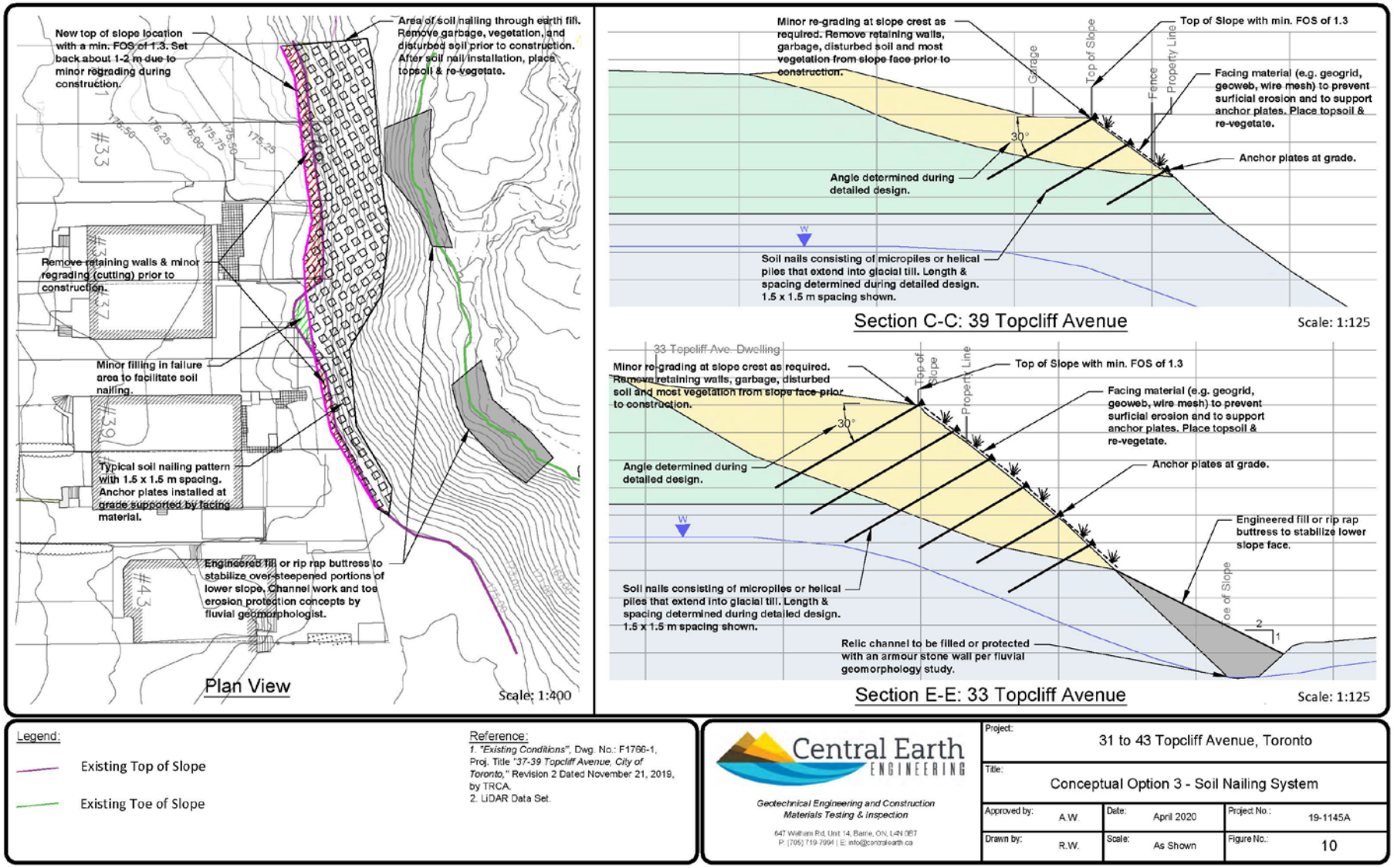

Figure 23: Concept 3 – Soil nailing, requires additional erosion control works in channel. Source: (Central Earth Engineering, 2020)

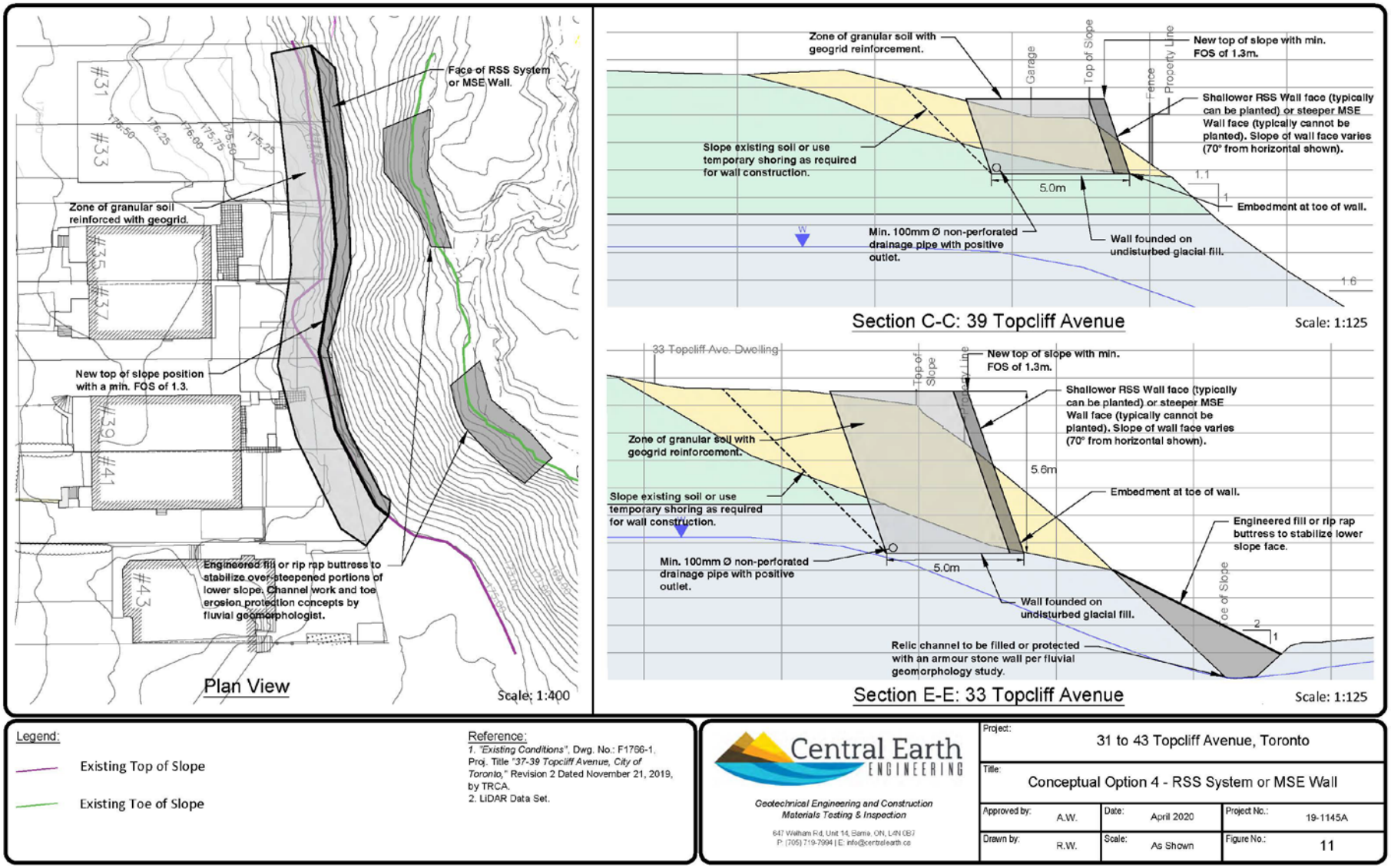

Figure 24: Concept 4 – RSS system or MSE wall, requires additional erosion control works in channel. Source: (Central Earth Engineering, 2020)

4.2 Description of Preliminary Watercourse Improvement Alternative Options

The alternatives proposed by Palmer Environmental Consulting Group Inc. include **channel restoration work** at strategic locations within the Project limits. These alternatives target priority problem locations and involve restoration works to mitigate localized erosion of the channel bed and banks. Where erosion is creating risk to the private properties on Topcliff Avenue, a combination of bank and slope stabilization treatments would be implemented. The benefits of selective work in strategic locations includes minimal disruption to the local natural environment.

The section of channel included in the Project limit runs from Finch Avenue West through Derrydowns Park where it connects with Black Creek (**Figure 13**) and is divided into three (3) Reaches. Reaches are based on the channel gradient, form and dominant geomorphic processes. Please note, there are no works proposed for Reach 3 as it is considered to be low risk for the purposes of this Project.

4.2.1 Concept – 'Do Nothing"

The 'Do Nothing' alternative consists of leaving the channel in its current condition, allowing the water flow and valley slope to stabilize naturally in the long-term and is a mandatory alternative that must be considered during the Class EA process to justify the need to undertake remedial works within the Project limits. Should the 'Do Nothing' alternative or other Conservation Authority (CA) programs, such as land acquisition, be deemed a more acceptable solution, then there shall be no further consideration for remedial action and the Class EA process terminates.

This alternative is the least disruptive, however risk to essential structures at the top of slope would increase exponentially as the unprotected toe of slope continues to be impacted by riverine erosion.

4.2.2 Concept 1 – Reach 1 (Channel Realignment) & Reach 2 Decommission Secondary "Braid-like" Channels

The proposed work for Reach 1 involves realigning this section of the existing channel slightly to the east, where the channel was located historically (circa 1965). This would minimize toe erosion along the valley wall adjacent to Topcliff Avenue as shown in **Figure 25**. The existing location of the channel would be backfilled with clean fill and planted with native vegetation to prevent high water flows from reoccupying the old channel during heavy rain events (Palmer Environmental Consulting Group, Inc., 2020).

The proposed work for Reach 2 involves decommissioning the section of channel directly adjacent to 37 and 39 Topcliff Avenue as shown in **Figure 25**. Similar to the proposed work for Reach 1 above, the existing channel would be backfilled and planted. In addition, a vegetated boulder revetment would be constructed upstream in the main channel along the outer bank to prevent the reestablishment of the secondary channel. This alternative may require a slight realignment of the main channel to implement (Palmer Environmental Consulting Group, Inc., 2020).

A copy of the conceptual design drawing for Concept 1 – Reach 1 & 2 can be found in **Appendix B**.

4.2.3 Concept 2 – Reach 1 (Vegetated Boulder Revetment & Channel Enhancement) & Reach 2 (Armourstone Wall)

The proposed work for Reach 1 involves the construction of two (2) vegetated boulder revetments along the toe of slope on the western valley wall as shown in **Figure 26**. Grade controls would also be constructed in the channel between Reach 1 and Reach 2.

The proposed work for Reach 2 involves the construction of an armourstone wall that would be extended to reduce the risk of erosion at the wall ends. Grade controls would be constructed to prevent damage to the channel bed.

The channel would be widened and deepened for both Reach 1 and Reach 2 to support the increase in flow volume and reduce the likelihood of debris build up within the channel (Palmer Environmental Consulting Group, Inc., 2020).

A copy of the conceptual design drawing for Concept 2 – Reach 1 & 2 can be found in **Appendix B**.

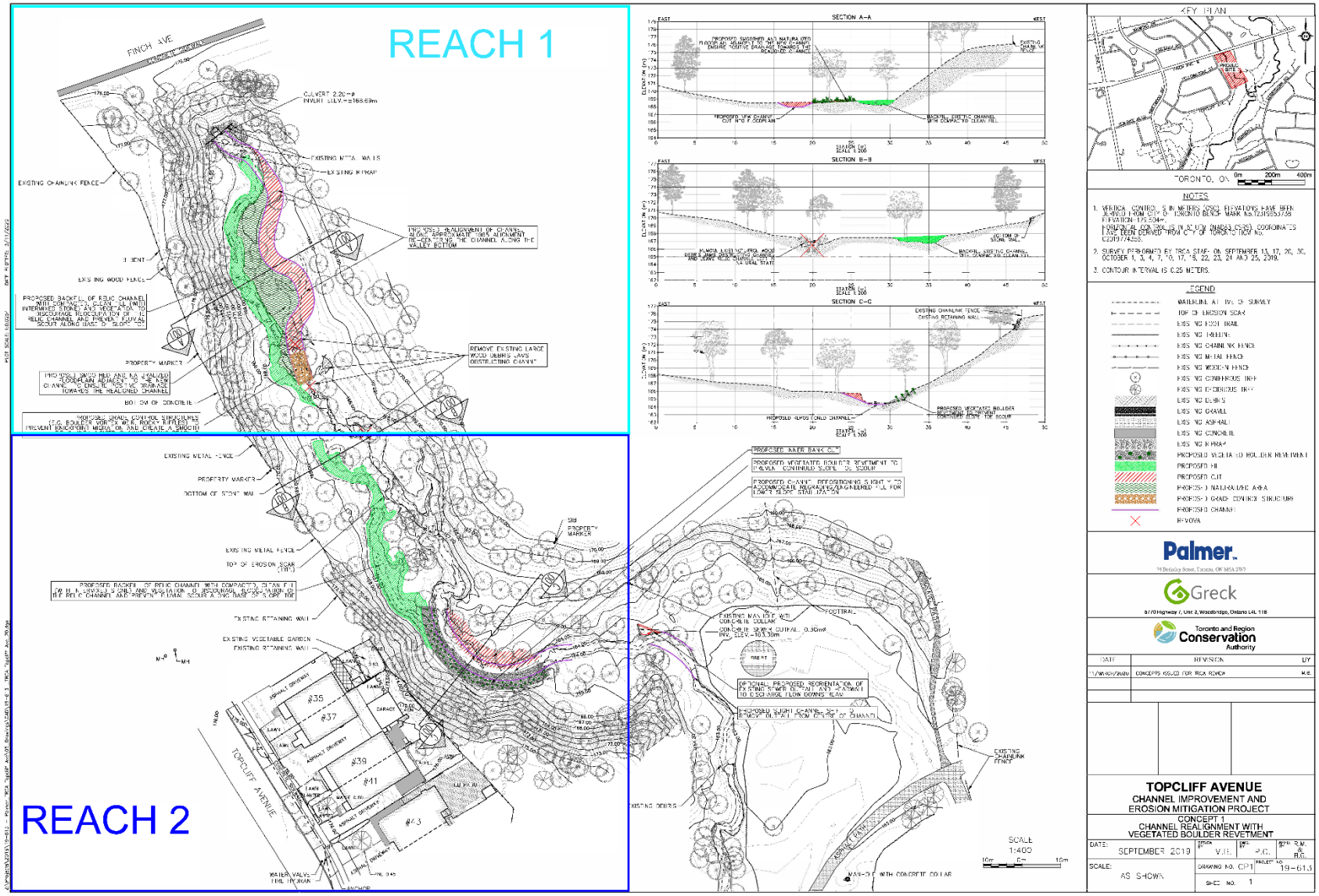

Figure 25: Concept 1 - Reach 1 (denoted by light blue square) and Reach 2 (denoted by dark blue square). Source: (Palmer Environmental Consulting Group, Inc., 2020)

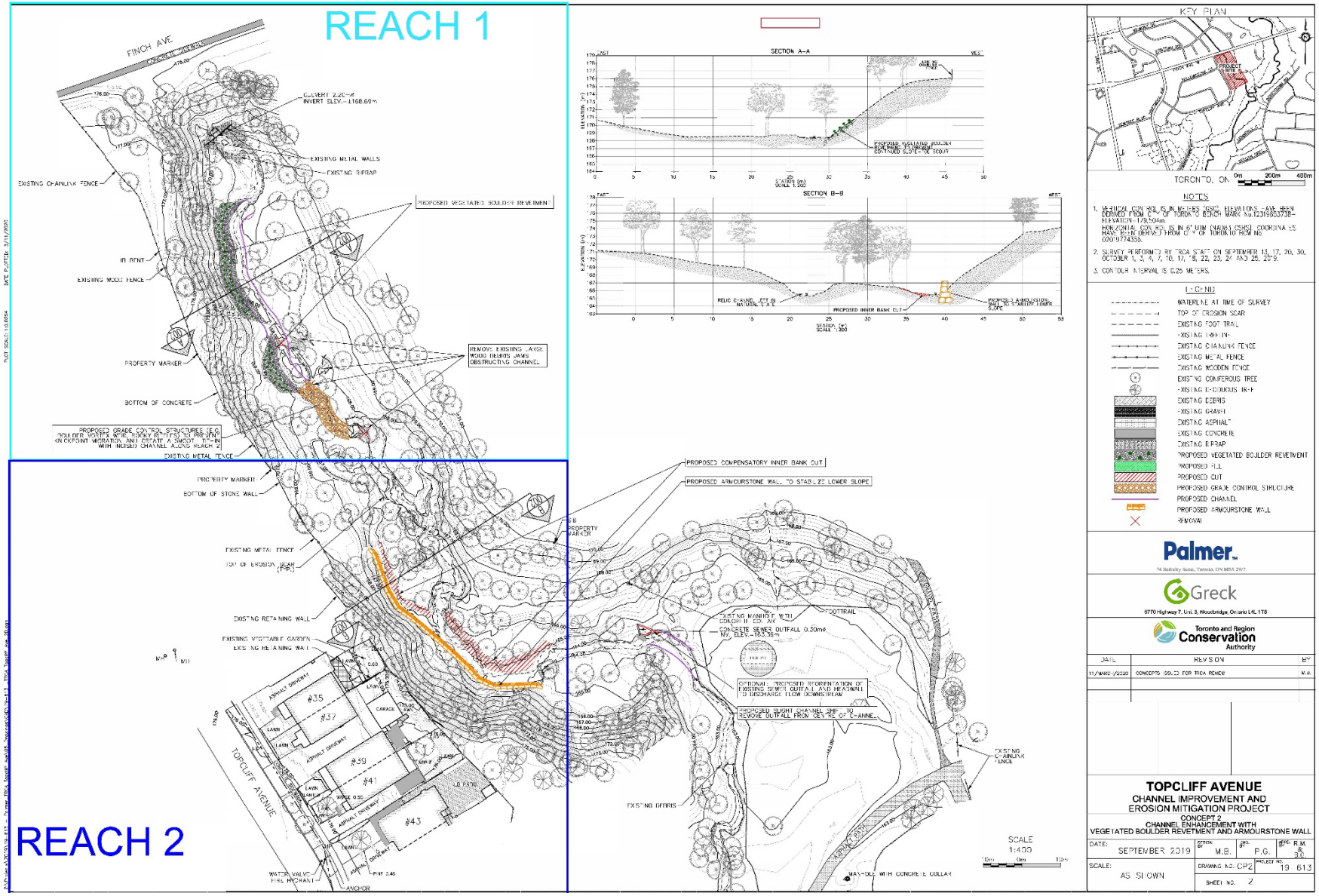

Figure 26: Concept 2 - Reach 1 (denoted by light blue square) and Reach 2 (denoted by dark blue square). Source: (Palmer Environmental Consulting Group, Inc., 2020)

4.3 Evaluation of Preliminary Alternative Options

As part of the Class Environmental Assessment process, each of the identified alternatives is rated against a consistent set of evaluation criteria set out by CO's Class EA for Remedial Flood and Erosion Control Projects. The evaluation criteria typically include consideration for technical, economic, environmental, and social factors or objectives. The evaluation of alternative solutions consisted of a qualitative ranking that considered the impact or effect of each alternative on technical, economic, environmental, and social factors. The evaluation of alternatives for the Project have been summarized in **Table 2** and **Table 3** and is based on the ranking scheme as outlined in **Table 1**.

Table 1: Evaluation ranking scheme

Rank		Relation to the associated criteria
Increasing Positive Rank ↑	**+H**	Most positive, or least negative impact; easiest to implement; lowest cost
	+M	Moderate positive impact; moderate implementation; moderate costs
	+L	Minor positive impact; lesser ease of implementation; high cost
	NIL	Neutral or no impact; no implementation; no associated costs
	-N	Overall negative impact / effect

4.3.1 Evaluation of Preliminary Slope Stabilization Alternative Options Criteria

Table 2: Alternative evaluation matrix using objectives with nested criteria and indicators to show advantages of slope stabilization alternatives.

Objective	Criteria	Description	Concept 1: "Do Nothing"	Concept 2: Drainage, Minor Grading	Concept 3: Soil Nailing System	Concept 4: RSS System or MSE Wall
Physical and Natural Environment	Flooding	Impact on surface drainage, flooding	NIL	+M	+M	+M
	Erosion	Impacts on soils, geology, rate of erosion	-N	+M	+H	+H
	Terrestrial Habitat	Impacts on connectivity, diversity, and sustainability	NIL	+L	+M	+H
Social & Cultural Environment	Aesthetic value	Impact on existing and proposed development aesthetic value	-N	+M	+H	+H
	Benefit to community	Access to trails, enjoyment of valley	NIL	+M	+H	+H
Technical Criteria	Regulatory agency acceptance	Satisfy TRCA and MNRF	NIL	+L	+M	+M
	Impact of Existing Infrastructure	Impact of the existing roads, culverts, trails, sanitary infrastructure on slope stabilization solution	-N	+M	+H	+H
	Maintenance Requirements	Requirements for regular maintenance and vegetation maintenance	-N	+L	+M	+H
Constructability	Complexity of Treatment	Requirement for the specialized services to design or install unique or proprietary specifications that must be completed by a certified contractor/consultant	NIL	+M	+H	+M
Financial Criteria	Capital Cost	Rough Order of Magnitude (ROM) capital costs for the Detailed Designs, permitting, installing proposed concept	NIL	+H	+L	+M
	Maintenance Costs	ROM costs to maintain the proposed structure	NIL	+L	+L	+H
Public Safety	Potential Risks to the Public	Impact to the public safety (trail and park) and requirement for safety features (e.g. fences)	-N	+L	+M	+M
Combined Rank			**-N**	**+L**	**+M**	**+H**

4.3.2 Evaluation of Preliminary Watercourse Improvement Alternative Options

Table 3: Alternative evaluation matrix using objectives with nested criteria and indicators to show advantages of channel improvement alternatives.

Objective	Criteria	Description	**Concept**: "Do Nothing"	**Concept 1:** Reach 1 Channel Realignment; Reach 2 Decommission Secondary "braid-like" Channels	**Concept 2:** Reach 1 Vegetated Boulder Revetment & Channel Enhancement; Reach 2 Armourstone Wall
Physical and Natural Environment	Flooding	Impact on surface drainage, flooding	-N	+M	+H
	Erosion	Impacts on soils, geology, rate of erosion	-N	+M	+M
	Aquatic Habitat	Impacts on connectivity, diversity and sustainability	NIL	NIL	NIL
Social & Cultural Environment	Aesthetic value	Impact on existing and proposed development aesthetic value	-N	+H	+H
	Benefit to community	Access to trails, enjoyment of valley	-N	+M	+M
Technical Criteria	Regulatory agency acceptance	Satisfy TRCA and MNRF	NIL	+H	+H
	Impact of Existing Infrastructure	Impact of the existing roads, culverts, trails, sanitary infrastructure on Bank Stabilization	-N	+M	+M
	Maintenance Requirements	Requirements for regular maintenance and vegetation maintenance	NIL	+M	+H
Constructability	Complexity of Treatment	Requirement for the specialized services to design or install unique or proprietary specifications that must be completed by a certified contractor/consultant	NIL	+H	+M
Financial Criteria	Capital Cost	Rough Order of Magnitude (ROM) capital costs for the Detailed Designs, permitting, installing proposed concept	NIL	+H	+M
	Maintenance Costs	ROM costs to maintain the proposed structure	-N	+M	+H
Public Safety	Potential Risks to Trail and Park Users	Impact to the public safety (trail and park) and requirement for safety features (e.g. fences)	NIL	+M	+M
Combined Rank			**-N**	**Combination Preferred**	

4.4 Selection of the Preferred Alternatives

The results of the evaluation of alternatives has identified the following combination of valley slope stabilization and channel improvement / erosion control works as the preferred alternative(s) for the Topcliff Avenue Erosion Control and Slope Stabilization Project:

- **Valley Slope Stabilization** - Concept 4 Reinforced Soil Slope (RSS) system or Mechanical Stabilized Earth (MSE) wall; and
- **Channel Improvement and Erosion Control** - includes a combination of Concept 2 - Reach 1 (Channel Realignment) and Concept 3 - Reach 2 (Armourstone wall).

This combined comprehensive solution will address the slope instability adjacent to the affected private properties and erosion concerns within the channel at the toe of slope. TRCA prefers stabilization methods that mimic the natural environment over "hard" alternatives where possible (**Figure 27**).

The preferred alternative(s) also meets all three of the Project's objectives:

Objective 1 – Risk mitigation

The preferred erosion control and slope stabilization alternatives will incorporate an upper slope stabilization solution combined with channel erosion control works that will effectively provide long-term, low maintenance protection to the dwellings at top of slope. The proposed works thereby effectively protects properties and human life from the hazards of erosion and slope instability.

Objective 2 – Naturalization

The preferred erosion control and slope stabilization alternatives will improve existing terrestrial habitat by increasing local biodiversity and resiliency through incorporation of suitable native vegetation within the Project limits. Due to fish barriers both upstream and downstream of the Project limits improvement of the aquatic habitat within the channel is limited.

Objective 3 – Compatibility

While evaluating alternatives, preference was given to alternatives which would have a minimal construction footprint and machine access requirements in effort to reduce impacts to the surrounding natural and built environments. Resulting impacts to public safety was also considered during the evaluation process.

Figure 27: Existing slope behind affected properties on Topcliff Ave (left) and rendered photo of what the preferred alternative of an implemented RSS system with armourstone toe protection may look like (right). *Source: TRCA, 2020*.

5 ENVIRONMENTAL SCREENING

5.1 Detailed Environmental Analysis of the Preferred Alternative Options

To complete the detailed environmental analysis of the preferred alternative, the information collected for the baseline inventory is examined in greater detail to confirm potential impacts, refine methods of mitigation, and to identify any unforeseen impacts. The evaluation of impacts includes both temporary impacts during construction of the undertaking, and permanent impacts due to function and maintenance of the works after construction. **Table 4** evaluates the potential negative and positive effects of the proposed undertaking on the environment during construction and maintenance phases. It includes the consideration of the magnitude, geographic extent, duration, frequency, permanence or reversibility and ecological context of the effects, as well as proposed mitigation measures and any residual effects.

Environmental components that have been identified as potentially having an effect on the environment, both positive and negative, are discussed herein. Those that have been determined as not applicable (NA) have been omitted from further discussion**.**

Screening of potential effects are considered to be negative (-), neutral (NIL) or positive (+) and are rated as relatively high (H), medium (M), low (L) or not applicable (NA) (*CO, 2013).*

Table 4: Detailed Environmental Analysis of the Preferred Alternatives – RSS or MSE Structure and Armourstone Wall

Screening Criteria	**Rating of Potential Effects**								
	-H	-M	-L	NIL	+L	+M	+H	NA	**Comments**
Physical									
Unique Landforms								•	There are no unique landforms within the Project limits
Existing Mineral/Aggregate Resources Extraction Industries								•	There are no existing mineral/aggregate resources or extraction industries within the Project limits
Earth Science - Areas of Natural and Scientific Interest								•	There are no Earth Science - Areas of Natural and Scientific Interest in the Project limits
Specialty Crop Areas/Agricultural Lands or Production								•	There are no specialty crop areas/agricultural lands or production in the Project limits
Niagara Escarpment/Oak Ridges Moraine								•	The Niagara Escarpment/Oak Ridges Moraine is not located within the Project limits

Screening Criteria	Rating of Potential Effects								
	-H	-M	-L	NIL	+L	+M	+H	NA	**Comments**
Environmentally Sensitive/Significant Areas (physical)								•	There are no environmentally sensitive/significant areas (physical) in the Project limits
Air Quality				•					Temporary impact only
Agricultural Tile or Surface Drains								•	There are no agricultural tile or surface drains in the Project limits
Noise Levels and Vibration				•					Temporary impact only
Water Flow Regime						•			Debris clean-up and widening of channel will improve water flow regime
Existing Surface Drainage/Groundwater Seepage/ Groundwater Recharge/Discharge Zones						•			The proposed remedial works described in this Project Plan will result in improvements to localized stormwater management at the Project site
Littoral Drift/ Other Coastal Processes								•	There are no littoral drift or other coastal processes in the Project limits
Water Quality					•				Removal of garbage debris from channel will have a positive impact on the water quality
Soil/Fill Quality							•		Removal of failed fill material and replace with engineered fill material will improve the soil quality
Contaminated Soils/Sediment/Seeps (Sediment Quality)								•	There are no known contaminated soils/sediment/seeps in the project limits
Existing Transportation Routes				•					Temporary impacts only
Constructed Crossings (e.g. bridges, culverts)								•	There are no constructed crossing within the project limits.
Geomorphology							•		Channel remediation below Topcliff Avenue will provide long-term protection to at-risk private properties located at the top of slope within the Project area.

Screening Criteria	Rating of Potential Effects								
	-H	-M	-L	NIL	+L	+M	+H	NA	Comments
Biological									
Wildlife Habitat						•			A comprehensive restoration plan will follow construction activities to compensate for and remediate disturbance to existing habitat through intensive planting of suitable native species.
Habitat Linkages or Corridors				•					There will be no significant impacts to habitat connectivity as a result of the proposed remedial works.
Significant Vegetation Communities				•					There will be no significant negative impact to vegetation communities within the parkland corridor behind Topcliff Avenue as a result of the proposed works
Environmentally Sensitive/ Significant Areas (biological)								•	There are no environmentally sensitive/ significant areas (biological) in the Project limits
Fish Habitat				•					There is currently limited fish movement due to existing structures within channel both upstream and downstream of the Project limits
Species of Concern				•					Tree and shrub removals will be planned, and post-construction restoration activities will focus on replanting suitable native species to compensate for those that were removed.
Exotic/Alien and Invasive Species							•		The proposed works will result in the removal of exotic and invasive species within the Project limits
Wildlife/Bird Migration Patterns				•					Temporary impact only
Wildlife Population				•					Temporary impact only
Wetlands								•	There are no wetlands in the Project limits

Screening Criteria	Rating of Potential Effects								
	-H	-M	-L	NIL	+L	+M	+H	NA	**Comments**
Microclimate								•	There are no microclimate in the Project limits
Unique Habitats								•	There are no unique habitats in the Project limits
Life Science - Areas of Natural and Scientific Interest								•	There are no Life Science - Areas of Natural and Scientific Interest in the Project limits
Cultural									
Traditional Land Uses								•	There are no traditional land uses within the Project limits
Indigenous Reserve or Community								•	There is no Indigenous Reserve or Community within the Project limits
Outstanding Native Land Claim or Treaty Rights				•					The proposed works will not have an impact 2016 Water Claim filed by Mississaugas of the Credit First Nation
Transboundary Water Management Issues								•	There are no Transboundary Water Management Issues in the Project limits
Riparian Uses								•	There are no riparian uses in the Project limits
Recreational/Tourist Uses of Water Body and/or Adjacent Land				•					Temporary impact only
Aesthetic or Scenic Landscapes or Views								•	There are no scenic landscapes or views within the Project limits
Culturally Significant Resources				•					Archaeologically cleared of culturally significant resources
Historic Canals								•	There are no historic canals within the Project limits
Federal Property								•	There is no federal property within the Project limits
Heritage River System				•					The proposed works will have no impact on a heritage river system.
Socioeconomic									

Screening Criteria	Rating of Potential Effects								
	-H	-M	-L	NIL	+L	+M	+H	NA	**Comments**
Surrounding Neighbourhood or Community				•					Temporary impacts only
Surrounding Land Uses or Growth Pressure								•	Proposed works will have no impact on surrounding land use or growth pressure.
Existing Infrastructure, Support Services, Facilities				•					No infrastructure within proposed work limits
Pedestrian Traffic Routes				•					Temporary impacts only
Property Values or Ownership				•					The proposed works will result in conveyance of a small portion of the privately owned land along the upper slope into public ownership for the purpose of monitoring and maintenance of the structure.
Existing Tourism Operations								•	There are no existing tourism operations in the Project limits
Property Accessibility				•					Temporary impacts only
Engineering/Technical									
Rate of Erosion in Ecosystem							•		Proposed works will implement suitable erosion control measures that will better control erosion hazards and ensure that the rate of erosion within the Project limits is not exacerbated.
Sediment Deposition Zones in Ecosystem				•					There are no sediment deposition zones within the Project limits; therefore, there will be no impacts resulting from the proposed works.
Flood Risk in Ecosystem							•		Proposed works will result in channel improvements below Topcliff Avenue that will better control heightened tributary flows
Slope Stability							•		Option 4 – RSS or MSE system stabilizes the upper slope using an engineered solution to provide long-term stability.

Screening Criteria	Rating of Potential Effects								
	-H	-M	-L	NIL	+L	+M	+H	NA	**Comments**
Existing Structures							•		Implement of slope stabilization and channel remediation measures will provide long-term protection to existing essential (residential) structures at the top of slope.
Hazardous Lands/Hazardous Sites						•			Hazardous lands, as defined by Conservation Authorities Act, 1990, to be transferred into public ownership as landowner contribution towards proposed works.

6 SUMMARY OF COMMENTS

This section of the Project Plan provides a summary of comments received during the planning and design phases of the Project, a discussion of how these concerns have been addressed, and an outline of the monitoring program once the Project is complete.

Documents related to the public outreach component of this project, including all published notices, meeting materials and minutes, and comment forms, are included in **Appendix D**.

6.1 Public Notifications and Consultation

In accordance with the Class EA process, the first point of public contact occurred with the publication of the Notice of Intent on February 13, 2020 in the North York Mirror, as well as provided to community groups, homeowners in the vicinity of the Project site, Indigenous Communities, and government regulatory agencies including CO, MECP, MNRF, and the City of Toronto.

The NOI requested that individuals contact the Project Manager if they wish to participate further in the EA process or to be kept informed about the Project's status. Individuals who expressed an interest in receiving updates were added to the Stakeholder's Mailing List.

A summary of the individuals and community groups that expressed interest in the Project after distribution of the NOI is summarized in **Appendix D**.

6.1.1 Role of the Community Liaison Committee (CLC)

Due to the unprecedented health crisis of COVID-19 in 2020, TRCA issued an Interested Stakeholder Engagement Package digitally to all Stakeholders that expressed an interest in the Project. The purpose of this Engagement is to provide the opportunity for public involvement while maintaining social distancing requirements. This package included:

- Presentation slides in .pdf format

- Comment forms for Stakeholder feedback; and
- TRCA's Private Landowner Contribution for Erosion Control Works Policy (2017)

The Project aligns with the following excerpt from CO's Class EA document:

"*In an effort to facilitate more on-going public involvement at the project level, the Conservation Authority shall, based on its contact group mailing lists and expressions of interest from the local landowners, members of the general public, interest groups, or agencies, establish a Community Liaison Committee (CLC) to assist the Authority by obtaining additional public input concerning the planning and design process of an individual flood and/or erosion control project, and to review information and provide input to the Conservation Authority throughout the process. The Conservation Authority shall strive to ensure that the membership of the CLC is representative of all views respecting a proposed remedial and erosion control project.*

As the name implies, the function of the CLC, in the Class EA process, will be to assist the Conservation Authority to reach out and maintain contact with community residents, groups, associations and organizations. The CLC will provide direct input into the process. At the end of the process, the entire committee will have been exposed to the entire process, will have understood how decisions have been reached and will have had their questions answered during the process.

To fulfill its function, the CLC will:

- *Identify items of public concern with regard to the impact and design of proposed erosion control alternatives*
- *Provide direct input on these concerns to the Conservation Authority to be utilized throughout the planning and design process*
- *Co-host, with Authority Staff, meetings organized by the Authority to facilitate the resolution of concerns relating to a proposed remedial work*
- *Review any Part II Order Requests made by members of the public and attempt to resolve the issues of concern between the Part II Order requesters and the Conservation Authority before the request gets referred to the Minister of the Environment for a decision: and*
- *Where appropriate, submit an assessment to the Conservation Authority, upon project completion, commenting on the effectiveness of the Class EA process for meeting public concerns for the specific project, and where relevant, identify possible improvements (CO, 2013)."*

6.1.2 Interested Stakeholder Engagement

An Interested Stakeholder Engagement (ISE) package was digitally issued on October 6, 2020. TRCA provided a presentation outlining the events following the July 8, 2013 severe storm event, TRCA's response to the storm,

the findings of the detailed slope stability and erosion risk assessment, an evaluation of preliminary alternative solutions, and the proposed next steps. This package served as a forum for interested residents and stakeholders to ask questions regarding the proposed erosion control and slope stabilization works.

Comment forms were distributed with this package to ensure an understanding of the Project objectives, to solicit input into the planning and design process, and to address any questions or concerns identified by stakeholders about the preliminary alternative options being evaluated. TRCA requested forms be returned no later than October 28, 2020 and no concerns have been received.

Documentation related to this ISE package can be reviewed in **Appendix D**.

6.1.3 Notice of Filing and Notice of Project Approval

As per the requirements of the Class EA document, the Project Plan shall be filed and made available online for the duration of sixty (60) day review period. The Project Plan shall be circulated digitally to the formal Interested Stakeholder list and hard copies will be provided upon request.

Following the 60-day review period of this Class EA report and the successful resolution of any concerns received during the review period, TRCA intends to develop the detailed design of the preferred solution and obtain the necessary approvals to proceed with the implementation phase.

A Notice of Project Approval and a Notice of Project Completion shall be sent to all parties who expressed an interest in the Project, in addition to Conservation Ontario and the MECP.

6.2 Indigenous Engagement

Indigenous Communities have a range of views and experience to contribute to a project, thus engagement may take on different forms in each community, depending on both the scope of the project and interests of the community. Indigenous Engagement is intended to provide Indigenous Communities with an opportunity to receive information about and have input to the project proposal and, equally allows TRCA to identify and consider the concerns and issues of those communities.

6.2.1 Indigenous Community Consultation

Prior to the delivery of any notifications, the Ministry of the Environment, Conservation, and Parks (MECP) was contacted for advice and information on the Indigenous communities that should be contacted during the Indigenous Engagement process. Additional Indigenous community contact lists were also considered, including ones held by TRCA and Infrastructure Canada. The following communities and agencies were engaged based on asserted or establish interest:

- Alderville First Nation
- Beausoleil First Nation
- Chippewas of Georgina Island First Nation
- Chippewas of Rama First Nation
- Curve Lake First Nation

- Huron-Wendat Nation
- Coordinator for the Williams Treaties First Nation
- Hiawatha First Nation
- Mississaugas of the Credit First Nation
- Mississaugas of Scugog Island First Nation

Table 5: Summary of Indigenous Community consultation for the Project.

Communication	Date	Method of Communication
Notice of Intent	February 13, 2020	Courier, Email
Notice of Filing	January 8, 2021	Courier, Email

A full record of Indigenous community consultation including copies of all correspondence can be found in the Record of Indigenous Engagement for the Topcliff Avenue Erosion Control and Slope Stabilization Project in **Appendix D.**

6.3 Discussion of Concerns

6.3.1 Discussion of Public Concerns

There have been no major concerns raised about this Project from any member of the public.

6.3.2 Discussion of Indigenous Community Concerns

Huron-Wendat Nation: Potential Impact to Archaeological Resources

The Huron-Wendat Nation indicated an interest in the archaeological assessment completed for the Project. The completed Stage 1-2 Archaeological Assessment was provided on October 19, 2020. The Huron-Wendat Nation requested to be informed of any further archaeological assessments. TRCA will provide additional information when it is available.

7 SUMMARY

As per the requirements of the Class EA document, the Project Plan shall be filed and made publicly available for a sixty (60) day review period. The Project Plan will be circulated digitally to the formal Interested Stakeholder Engagement list and hard copies provided upon request.

Following the 60-day review period of this Class EA Project Plan and the successful resolution of any concerns received during the review period, TRCA intends to develop the detailed design of the preferred solution and obtain the necessary approvals to proceed with the implementation phase of the preferred alternative.

8 MONITORING PROGRAM

Once construction of the works is deemed complete, regular inspections will be completed by staff through TRCA's long-standing Erosion Management Program to ensure the works are performing as expected. These inspections will flag any maintenance that may be required so it can be scheduled and carried out in a timely manner. The erosion control and slope stabilization structure shall be included in TRCA's Stream and Infrastructure Database (SEID) where construction specifications, photos, and structure conditions will be documented. Visual inspections will be completed following major storm events for a 1-year period. Site inspections will be conducted annually until a 3-year period has passed, after which timed inspections will be adjusted to an appropriate frequency depending on the condition of the structure. Copies of these inspection reports can be provided to parties of interest upon formal request to TRCA's Erosion Risk Management group.

If a significant deviation from expected performance is noted during a visual inspection, additional surveys will be undertaken immediately. If a survey detects a significant deviation from expected performance, then maintenance will be planned and implemented on a priority basis to the limit of available funding each year.

9 REFERENCES

Central Earth Engineering. (2020). *Geotechnical Investigation, Slope Stability Analysis, Erosion Risk Assessment and Conceptual Remediation Designs.* Toronto.

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10 APPENDICES

For digital copies of **Appendices A, B, C, & D**, please contact:

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