

6. DESCRIPTION OF THE PREFERRED ALTERNATIVE

This chapter describes the refinements to the Preferred Alternative, the conceptual design of the Preferred Alternative, construction techniques to build the SWP, a proposed construction phasing plan, and high-level costing for construction. To ensure that the EA captures the greatest potential negative effects from the SWP, the SWP Preferred Alternative presented in this chapter, and the effects assessment presented in **Chapter 7**, is based on maximizing trail widths and construction footprints. During Detailed Design there may be opportunity to refine the design to reduce effects.

6.1 Refinements to the Preferred Alternative

After the completion of the Alternatives evaluation documented in **Section 5.4**, the results were presented to the public for review and comment (at PIC #2 in June 2016) and were also reviewed with other stakeholders including various City of Toronto departments, interest groups, and government agencies. A number of meetings with community groups and neighbourhood groups were held to discuss proposed refinements and try to create understanding around various components of the Preferred Alternative (refer to **Chapter 10**). Through the input received from these additional consultations the Preferred Alternative was further refined. The refinements are presented in the following sections and have been organized by the three Project Area segments.

6.1.1 West Segment

The Preferred Alternative for the West Segment as documented in **Section 5.4.2** is the *Wide Beach* concept. Based on input received from the public and various stakeholders, no significant refinements are required to the concept. The one minor refinement made was regarding the shape of the Bluffer's Park headland which was modified to include a small cobble beach to provide access to the water by park users and better opportunities for fish habitat enhancement. The overall size of the headland was not substantially changed.

The redesign of the headland addressed comments with respect to ensuring that any land creation activities result in improvements to the aquatic habitat. The headland was refined to reduce the overall extent of infill, while accommodating the addition of a cobble beach, which further improves the nearshore aquatic habitat. The headland is an integral component of the Project and its purpose and function are intertwined with other components. There are two key problems the headland is part of addressing. First, ongoing sedimentation in the entrance to the marina is a navigation and cost concern for the City. The proposed headland addresses this sedimentation by directing the material

onto the existing sand beach, and into deeper water, where it is removed through coastal processes. Second, there is the need to provide a safe trail connecting the east end of Bluffer's Park Beach to the existing shoreline protection works at Meadowcliffe. The size and shape of the headland is the result of coastal modelling. As the Project proceeds into detailed design TRCA has committed to continuing to work with the surfing community to see if additional changes may be made to the headland to meet both the needs of the project, the requirements of regulators, and maintain the lighthouse surf break. The level of design and modelling necessary to resolve this issue can only occur during detailed design.

The modified headland configuration is shown in **Figure 6-1**.

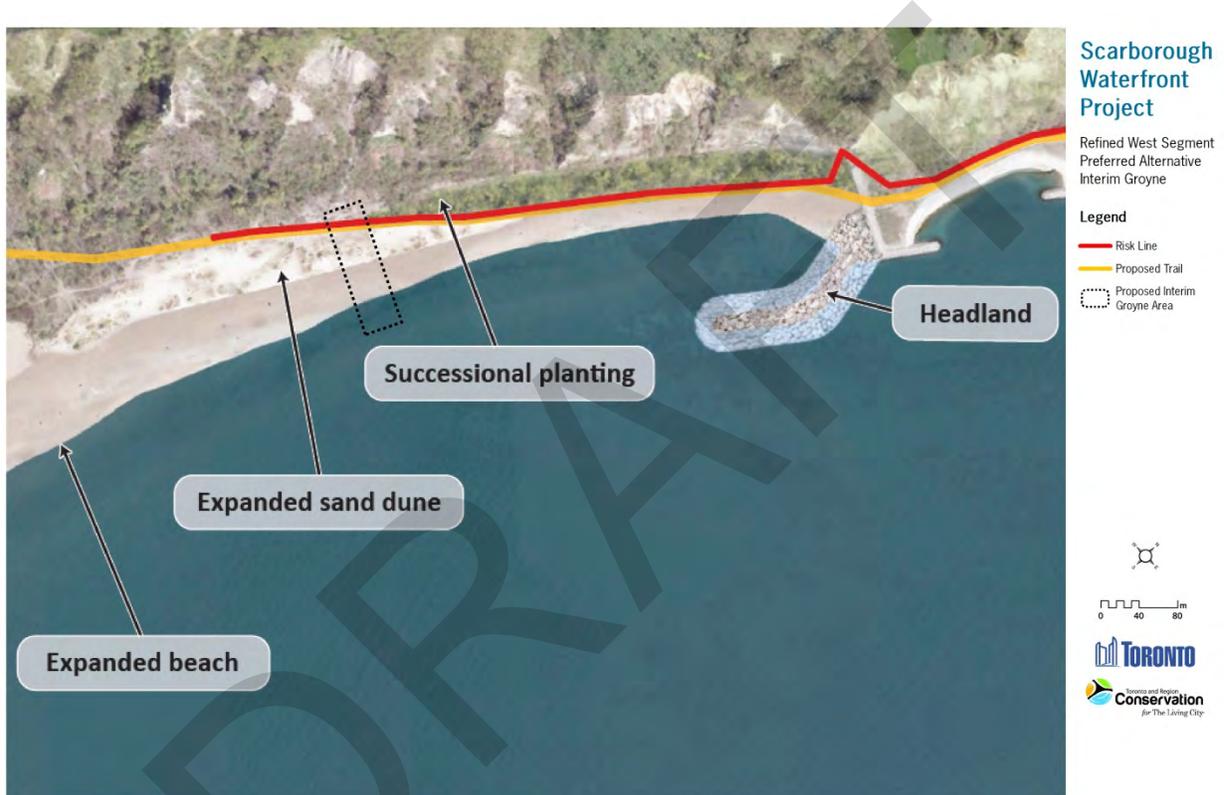
Figure 6-1 Refined West Segment Preferred Alternative - Bluffer's Park Headland.



Also, considering that the *Wide Beach* concept would take decades to form through sediment capture after the headlands are in place, it is proposed that the beach build-up be accelerated through the importation of fill material and the potential use of dredge material from the Bluffer's marina entrance. This was determined by the Project Team to be desirable to allow for the creation of a connection at the east end of the beach to allow for construction access for the Central Segment and to allow for trail connection in the near to medium term. It is proposed that a berm be constructed through this area to

allow for immediate access to the Central Segment. This would be a raised berm and positioned an adequate distance from the bluff (~30 m) to minimize the risk due to landslides. The inside of the berm would collect talus from the self-stabilization of the bluff and eventually could be filled with sand. Cobble and or sand would be placed along the front of the berm (lake side). It will be necessary to construct a temporary groyne about mid-way along the beach to keep the sand/cobble in place (**Figure 6-2**). After construction is complete the raised berm could be shaved down.

Figure 6-2 Refined West Segment Preferred Alternative - Interim Groyne.



6.1.2 Central Segment

Refinements to the Central Segment were proposed for two sections as described below.

Sylvan Section

The Sylvan section is located at the west end of the Central Segment in the vicinity of the Doris McCarthy trail exit/entrance. As previously presented in **Section 5.4.3**, the preferred shoreline treatment through the Sylvan section is a headland beach. This headland beach concept has been modified considering:

- The MNRF has requested that areas of infill be minimized to the extent possible;
- The desire to further enhance aquatic habitat along the shoreline; and,
- Avoid impacts to marine archaeological resources.

A refined headland beach concept was developed through this section that is presented in **Figure 6-3**. Generally, this revision has resulted in a smaller footprint.

Figure 6-3 Refined Central Segment Preferred Alternative – Sylvan Headland Beach.



Guild Park and Gardens Section

The Guild Park and Gardens shoreline is located approximately in the middle of the Central Segment and extends west of the Guild construction access route. As previously presented in **Section 5.4.3**, the preferred shoreline treatment through the Guild Park and Gardens shoreline is a headland beach. In reviewing this concept, the following was considered:

- A bump-out into the lake is still desired at the base of the Guild construction access route;
- The MNRF has requested that areas of infill be minimized to the extent possible; and,
- During Project planning it was recognized that until recently, the existing shoreline was functioning well; however, high water levels, large waves and storms in April 2017 caused damage.

Considering the above, the recommended improvement through this section is to apply a veneer of rock/stone material on top of the existing revetment to create a shoreline regeneration zone (**Figure 6-4**). Additional analysis has been done in this area to determine that a primary to high-capacity multi-use trail can be moved out of the risk line within the existing land base and aquatic habitat improvements can be achieved through refinements to the revetment and enhancements to the nearshore area. These refinements will still meet Project Objectives.

Figure 6-4 Refined Central Segment Preferred Alternative – Guild Park and Gardens Shoreline.



6.1.3 East Segment

As previously presented in **Section 5.4.4**, the Preferred shoreline treatment through the East Segment was a headland beach to East Point Park just south of the baseball diamonds with a trail transition from the toe to the top of the bluffs. This headland beach concept has been modified considering:

- The MNRF has requested that areas of infill be minimized to the extent possible;
- Stakeholder requests to make the headland beach concept less uniform in its designs by incorporating different sized headlands and length of beach area;
- Stakeholder request to introduce smaller size cobbles in the beach areas and retain existing sandy shoreline; and,
- Relocation of the transition between the toe and top of bluffs further to the west to minimize impacts to vegetation communities of concern, the sandy shoreline, and continue to achieve AODA accessibility.

Refinements to this Alternative included shortening the headland beach system to the east side of Grey Abbey Ravine and transitioning the trail up from the toe to the top of the bluffs. This refined Alternative would not provide safe, formal access to the sandy shoreline along East Point Park, but it would allow this shore to continue in its current state. Shoreline toe protection works are required to east side of Grey Abbey Ravine to halt/slow erosion below Greyabbey Trail (e.g., road and associated infrastructure) and Grey Abbey Park. This area is at risk within the design life of the SWP. The refined East Segment Preferred Alternative consists of a headland beach system extending from below just south of Morna Avenue to the east side of Grey Abbey Ravine, which has been designed to provide a continuous shoreline connection from Guildwood Parkway in the Central Segment to the eastern edge of the ravine (**Figure 6-5**). The shoreline connection will then transition to the tableland by way of a corkscrew ramp from the shoreline to the tablelands. A similar Alternative was considered in **Chapter 5** with a staircase up the west side of the ravine and a bridge across it but was rejected because of significant impacts to Grey Abbey Ravine. In order to refine the Alternative, the Project Team studied the opportunity to move the transition point to the east side of the ravine and propose a freestanding structure which will connect to the top of the bluff by a bridge (**Figure 6-6**). This can meet AODA grade standards and City multi-use/high capacity trail standards. The resulting structure is quite large but it is hoped that it will become an iconic feature on the Scarborough shoreline. Other options will be explored during detailed design. The trail along the tablelands will be designed to screen the adjacent industrial and infrastructure uses and to prohibit access. The tablelands trail would continue through East Point Park to continue the connection to the Port Union Waterfront Park to the east of the Project Study Area (see **Section 6.2.3.3**).

Figure 6-5 Refined East Segment Preferred Alternative – Headland Beach.



Figure 6-6 Proposed tableland connection on the east side of Grey Abbey Ravine.



6.2 Overview of the Conceptual Design

The conceptual design for the SWP includes the following components:

- shoreline configuration and protection features;
- naturalization (i.e., habitat features);
- recreational features (i.e., trails); and,
- site access routes.

The various shoreline components and protection features are described in their built-out state by Project Study Area segment in **Section 6.2.1**, including a description of how each Segment is connected to the next. Recommended habitat targets for both terrestrial and aquatic habitats in each Segment are described in **Section 6.2.2**. These recommended habitat targets reflect approximate dimensions that were developed during conceptual design and should be maintained (or enhanced) during Detailed Design. Approximate placement and required design specifications of recreational features (i.e., trails) are discussed in **Section 6.2.3**, while site access routes between the tablelands and shoreline are detailed in **Section 6.2.4**.

6.2.1 Shoreline Configuration and Protection Features

The shoreline features of the SWP conceptual design vary by Shoreline Segment. The following subsections describe the conceptual details of these shoreline protection features.

6.2.1.1 West Segment

The Preferred Alternative for the West Segment, shown in **Figure 6-7** is a refined version of West Alternative 5B – Beach Expansion (Wide). It involves lakeward extensions of both the east headland at Bluffer's Park and the west headland at Meadowcliffe Drive to allow for the accumulation of sand along Bluffer's Park beach. The expansion of Bluffer's Park beach has been designed to blend easily with the existing headland beach system at Meadowcliffe, closing the gap below Cudia Park and providing a continuous connection between the West and Central Segments.

The headland extensions will be constructed with approved fill material protected by armourstone revetments. Any structure that will protect against stronger easterly waves is considered exposed. The exposed revetments will have both primary and secondary armour layers backed by rip rap. The sheltered revetments (those not subjected to easterly waves) will have a single armour layer plus rip rap. The required infill area will be approximately 111,000 m², including the full area of the expanded beach. While there is a minor increase in the infill area as a result of the refinements to the headland expansion, the addition of a cobble beach in this area will further enhance the aquatic habitat.

Bluffer's Park Headland Expansion

In order to retain the wider beach, the Bluffer's Park headland will be extended approximately 250 m into the lake. The headland will contain a south-facing cobble beach, which will further enhance the aquatic habitat.

Bluffer's Park Beach

On average, the built-out shoreline for the wider beach will be approximately 60 m further offshore than the current shoreline and will protect the Bluff toe in front of Cudia Park, eliminating toe erosion. This will be wide enough to support a trail outside of the risk line established in **Section 3.1.10.2** of **Chapter 3**. The beach widening will be partly accomplished through the natural accumulation of sediment trapped by the proposed headlands. Clean material from Bluffer's Park dredging activities may be used to expedite this natural accumulation.

Figure 6-7 Refined West Segment Preferred Alternative.

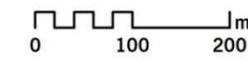


Scarborough Waterfront Project

Refined West Segment Preferred Alternative

Legend

- Risk Line
- Proposed Trail



Meadowcliffe Drive Headland Expansion

In order to retain the wider beach, the westernmost headland below Meadowcliffe Drive will also be extended approximately 230 m into the lake.

6.2.1.2 Central Segment

The Preferred Alternative for the Central Segment, shown in **Figure 6-8**, includes a new headland-cobble beach system at the base of the Doris McCarthy Trail, an outlook headland at the base of the Guild construction access route, and a regeneration of the Guild Park and Gardens shoreline. As a result of the refinements undertaken to the shoreline, the overall infill area for the Central Segment has been reduced from approximately 65,000m² to approximately 18,000 m².

Headland Beach System

While an informal rubble revetment is currently providing protection to the shoreline at the base of Doris McCarthy Trail, the existing informal shoreline protection does not allow for suitable pedestrian access and is subject to high wave overtopping and potential winter icing.

The refined headland beach system at the base of the Doris McCarthy Trail will consist of two headlands and one cobble beach. The eastern-most headland will be approximately 150 m wide and will tie into an existing headland from the headland beach system below Sylvan Drive. The western-most headland will also be approximately 150 m wide and will tie into the existing headland of the Meadowcliffe Drive sector headland beaches.

Both the eastern end of the west headland and the central headland will extend approximately 70 m out from the current shoreline. The total infill area for the new headland beach system will be approximately 11,500 m².

Guild Public Gathering Space

An outlook headland is proposed at the base of the existing Guild construction access road, and will extend approximately 90 m offshore. The artificially created wetland area at the base of the access road will be relocated and expanded. This wetland area will be replicated on either side of the headland by dismantling a portion of the existing Guildwood Parkway revetment on the east side of the headland, and then adding an approximately 40 m long breakwater shoal on the west side of the headland. This will produce two low elevation areas beside the headland where wetland flora and fauna can establish. The total infill area for the new headland will be approximately 6,500 m².

Figure 6-8 Refined Central Segment Preferred Alternative.

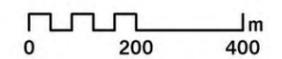


Scarborough Waterfront Project

Refined Central Segment Preferred Alternative

Legend

- Risk Line
- Proposed Trail



Guild Park and Gardens Shoreline Regeneration Zone

While an informal rubble revetment is currently providing protection to the Bluff below Guild Park and Gardens, the existing informal shoreline protection does not allow for suitable pedestrian access and is subject to high wave overtopping and potential winter icing. The regeneration of this shoreline will include a new shoal and reinforcement of the informal revetment to improve stability, reduce wave overtopping, improve aesthetics, provide safer public access and improve aquatic habitat. As noted in **Section 6.1.2**, the exact location of the trail will be further investigated during Detailed Design.

The lakebed in front of the berm will be surcharged with boulders to create a shoreline shoal. The existing rubble will then be graded to smooth out any rough features on the slope, and exposed reinforcing steel will be removed. A layer of armourstone will be added to cover the rubble slope. A cap stone row will be added at the top of the armoured slope to reduce overtopping volumes during extreme storm events.

6.2.1.3 East Segment

The headland beach system will extend from below Grey Abbey Park to the east side of Grey Abbey Ravine, as shown in **Figure 6-9**. The offshore extent of the proposed headlands vary from 40 m to 90 m with the headland beach system extending along approximately 1,250 m (or 1,100 linear metres) of shoreline. Portions of this shoreline have already been modified with toe protection works (approximately 490 m); therefore only approximately 760 m of the existing shoreline will actually change character. Further, 540 m of the existing shoreline is in private ownership; therefore, approximately 1.3 km of publicly inaccessible shoreline will become accessible as a result of Project implementation. No shoreline protection works are proposed east of Grey Abbey Ravine.

6.2.2 Naturalization

A variety of naturalized terrestrial and aquatic habitats will be created and/or enhanced as a result of the implementation of the SWP. A summary of the various habitat creation opportunities and enhancement techniques, by Project Study Area Segment, is provided below.

The habitats described in this section are at a coarse community level. Site level details and specific plantings will be determined at the Detailed Design stage of the SWP planning. These habitat types are recommended based on similar shoreline sites found along the north shore of Lake Ontario. Species will be selected that are consistent with TRCA and the City of Toronto's approved planting lists. All vegetation to be installed will be approved by TRCA, the City of Toronto, and other applicable agencies.

Figure 6-9 Refined East Segment Preferred Alternative.



6.2.2.1 Terrestrial Habitat

Approximately 17.6 ha of new naturalized terrestrial habitat is proposed in the refined Preferred Alternative conceptual design for the SWP (**Table 6-1**). It should be noted that manicured areas are not considered terrestrial habitat enhancements, as they do not provide any meaningful habitat; therefore they are not included in the total area of terrestrial habitat enhanced. Terrestrial habitat features include meadow and successional habitats, as well as sand dune, and wetland habitats. **Table 6-1** details the various terrestrial naturalization/enhancements and their contributing area per Project Study Area Segment. Native species that may be used in restoration plantings are outlined in **Table 6-2**.

Table 6-1 Terrestrial habitat enhancements by Project Study Area Segment.

Habitat Type	West	Central	East	Total
	Approximate ha			
Beach	6.4	--	--	6.4
Sand Dunes	1.3	--	--	1.3
Meadow	1.6	0.4	1.6	3.6
Successional	1.8	1.5	2.1	5.4
Wetlands	--	0.2	0.1	0.3
Wet Features	--	0.1	--	0.1
Forest	--	--	0.5	0.5
Manicured	--	0.3	--	0.3
Unvegetated shoreline	1.6	1.2	1.8	4.6

Table 6-2 Native species that may be included in restoration plantings.

Common Name	Scientific Name
Beach marram grass	<i>Ammophila breviligulata</i>
Switchgrass	<i>Panicum virgatum</i>
Black-eyed Susan	<i>Rudbeckia hirta</i>
Heath aster	<i>Symphyotrichum ericoides</i>
New England aster	<i>Symphyotrichum novae-angliae</i>
Common milkweed	<i>Asclepias syriaca</i>
Hairy beardtongue	<i>Penstemon hirsutus</i>
Wild bergamot	<i>Monarda fistulosa</i>
Canada wild rye	<i>Elymus canadensis</i>
Staghorn sumac	<i>Rhus typhina</i>
Red-osier dogwood	<i>Cornus stolonifera</i>
Serviceberry	<i>Amelanchier sp.</i>
Chokecherry	<i>Prunus virginiana</i>
Ninebark	<i>Physocarpus opulifolius</i>
Speckled alder	<i>Alnus incana</i>
Willow species	<i>Salix sp.</i>
Eastern cottonwood	<i>Populus deltoides</i>
Trembling aspen	<i>Populus tremuloides</i>
White birch	<i>Betula papyrifera</i>

Beaches and Sand Dunes

Beaches are areas that are sparsely vegetated and are typically subject to natural or human disturbance. Sand dunes are vegetated ridges that form just landward of the beach backshore and run parallel to the shoreline. Wind-blown sand from the dry beach is trapped by vegetation, allowing an undisturbed dune to continually grow in width and height.

Coastal sand dune systems, such as the one currently at Bluffer's Park beach, are considered to be one of the rarest and most fragile ecosystems in Canada, as they are literally held together by beach grasses (e.g., marram grass) and other vegetation (Peach, 2006). Very specialized tree, shrub and grass communities have also become adapted to these systems.

Implementation of the SWP will result in an increase in the amount of beach and sand dune habitat within the Project Study Area. Beaches and sand dunes provide habitat for species such as shorebirds and turtles.

Meadow

Meadows typically consist of a mixture of grasses and wildflowers with less than 25% shrub cover, and are generally formed following a natural or human disturbance, such as flooding, wind or land-clearing, which result in the removal of woody species and allow for the colonization of herbaceous plants and grasses, or in the case of the SWP, newly created land.

The meadow habitats will be designed to provide a number of habitat functions, including but not limited to habitat elements for butterflies and other pollinators, migratory and breeding birds and mammals. Newly created meadow habitat within the Study Area is expected to be temporary or transitional; that is, it will not be maintained as meadow and will be allowed to naturally succeed over time. For example, the newly created headland at Bluffer's Park will initially be planted as a meadow with shrub and tree nodes, with installation of native species; however, over time as the soil community matures, and seeds arrive via wind and wildlife, shrubs and trees are expected to colonize the site resulting in the transition of the meadow to successional habitat and eventually to woodland. The habitats that are restored immediately after construction will not be maintained as static communities; rather they will naturally transition to other vegetation communities based on natural conditions.

Successional

Successional habitats are those that are transitioning from being primarily unvegetated or dominated by herbaceous vegetation (i.e., containing grasses and forbs) to

vegetation communities that have more woody vegetation such as thickets (i.e., containing shrubs) and eventually into woodland and forest communities (i.e., containing trees). In the case of SWP new or restored natural habitats will be planted with native species appropriate to the specific site conditions (i.e., soil composition and moisture regime); however, those communities will be allowed to ecologically succeed, that is communities will naturally transition to different communities - nature will do what it wants to do.

Similar to the meadows, the successional habitats will be designed to provide a number of habitat functions, including but not limited to habitat elements for butterflies and other pollinators, migratory and breeding birds, and mammals, as well as habitat features suitable for amphibians and reptiles.

Wetlands and Wet Features

Wetlands are areas of land that are seasonally or permanently covered by shallow water, or lands where the water table is close to or at the surface (MNR, 2010).

Wetland creation and enhancement for the SWP will focus on establishment of marsh communities at several locations along the shoreline. These constructed wetlands will be designed to capture water from stormwater outfalls to improve aesthetics and contribute to minor improvements in water quality, through minor reductions in **Total Suspended Solids (TSS)**.

Coastal wetlands share similar characteristics to their land-based counterparts; however, they have a direct connection to the lake for all or part of the year, depending on water levels.

Wet features are landscape elements that contain water. These features include engineered ponds which may or may not be vegetated. In the case of SWP wet features will be designed to accommodate stormwater flows and improve aesthetics.

Forest

Forests are vegetation communities that have greater than 60% tree cover. Forests can be dominated by native or exotic species and may include coniferous, deciduous or mixed species. Forest habitat will be restored as part of the SWP and as it matures will provide habitat for various wildlife species including birds and mammals and will improve terrestrial connectivity.

Manicured

Manicured areas refer to non-naturalized areas that could include mowed grass or gathering spaces that lack natural vegetation cover. Manicured areas with the SWP

helps provides gathering areas for the public which helps minimize impact on adjacent natural vegetation communities.

Unvegetated

Unvegetated shoreline refers to man-made areas of the shoreline that lack vegetation. These could include armourstone or boulder shorelines and revetments. Unvegetated shorelines are used by species such as purple sandpiper and American mink.

In general habitat enhancements will focus on the provision of elements that facilitate natural succession and functional habitat for wildlife life stages.

6.2.2.1.1 West Segment

The headland at Bluffer's Park is approximately 2.8 ha and will be graded to a gently rolling topography (see **Figure 6-7** in **Section 6.2.1.1**). Natural vegetation communities will begin initially as meadow communities (approximately 1.6 ha) with strategic areas of native trees and shrubs. Over time the meadow community will naturally transition to successional communities. In addition to naturalized habitat, the Headland will also contain manicured areas.

The Bluffer's Park sand beach will be extended to the Meadowcliffe shoreline and is expected to increase by approximately 6.4 ha. The associated sand dune community is projected to increase by approximately 1.3 ha over time as sand accumulates on the beach. Dune species will likely colonize the area from the adjacent dune vegetation; however strategic plantings will also advance the establishment of dune communities.

The area at the base of the Cudia Park Bluffs will be enhanced to facilitate the development of approximately 1.8 ha of successional habitat, and the area will be strategically planted with site appropriate native species. The area is expected to experience sedimentation from the Bluffs over the long term which may result in natural changes to the vegetation communities.

6.2.2.1.2 Central Segment

The headland beach system at the base of Doris McCarthy Trail will allow for the creation of a constructed wet feature, approximately 0.1 ha in size that will capture baseflow from Bellamy Ravine (see **Figure 6-8** in **Section 6.2.1.2**). It will function primarily to improve aesthetics and contribute to minor water quality improvements, through a small reduction in TSS. Species expected to colonize the wet feature include cattail. The wet feature will be designed to retain baseflows flowing through to the Lake. During periods of high flow water would bypass the wetlands and flow directly into the lake.

An approximately 0.1 ha public gathering space at the base of the Bellamy Ravine, adjacent to the wetland will be a combination of mowed grass and a hard surface gathering area. The area at the base of the Bluffs will be actively restored to approximately 1.5 ha of successional habitat, which will succeed naturally over time.

The Guild public gathering space will be actively restored to a combination of approximately 0.2 ha of mowed grass and approximately 0.4 ha of meadow habitat. It is anticipated that the manicured areas will be positioned around the perimeter of the new public gathering space, while the middle will consist of meadow habitat.

Two wetland features are expected to develop on each side of the Guild public gathering space that will occupy a total area of approximately 0.2 ha. These wetlands will be connected to the lake and appropriately incorporated at the base of the Guild Park and Gardens to provide shoreline vegetation and sheltered areas for fauna such as waterfowl. The wetlands will be designed so that wave action is buffered through the use of boulders to allow wetland vegetation such as cattails to become established.

6.2.2.1.3 East Segment

The area at the base of the Bluffs will become the future backshore area and will be dominated by successional habitat (see **Figure 6-9** in **Section 6.2.1.3**). Approximately 2.1 ha of successional habitat will be developed that will provide a vegetated buffer between the trail and the Bluffs, providing wildlife corridor along the shoreline.

The shoreline of the headland beach system which includes cobble beaches between the headlands provides suitable stopover habitat for species such as Purple Sandpiper that prefer rocky shorelines.

Habitats on the headland will begin primarily as meadow, but are expected to naturally transition over time to successional habitats. A total of approximately 1.6 ha of meadow habitat will be created along with strategically planted shrub nodes.

A small 0.1 ha wetland feature at Grey Abbey Ravine will be designed to capture baseflow before allowing it to return to the Lake. During periods of high flow (e.g., storm events) flows will be conveyed directly to the Lake.

In the area where the corkscrew ramp will be constructed to facilitate the access to the shoreline in the east segment, the existing slope is oversteepened at the top of the bluff and will experience crest migration in the long term. To minimize the risk to the foundations of the corkscrew ramp due to talus runout, where the upper slope is oversteepened it should be trimmed back to a stable inclination prior to construction. This slope trimming will affect the existing terrestrial habitat.

A portion of the industrial tableland in the East Segment will be regraded to create a berm or hill with a perimeter fence to separate the industrial site from the SWP area. The hill will be planted with native shrubs to both shield the industrial site from public views, as well as discourage public access into the industrial site.

East Point Park contains some of the most significant habitat within the Study Area; however, a network of approximately 8 km of informal trails has resulted in habitat fragmentation. These informal trails will be decommissioned using techniques such as installation of habitat piles that block access, installation of native plants such as wild rose, hawthorn and raspberries and signage. Community stewardship of East Point Park will play a significant role in providing observations and advice to the City of Toronto and TRCA on trail use and management; as well as contribute directly to efforts to decommission trails via the techniques outlined above. Community stewardship efforts will also play a significant role in communicating the rationale for informal trail decommissioning to park users, policing the site and passing on observations of new trails to the City and TRCA. It is recommended that a Management Plan be developed for East Point Park that includes further detail on continued trail management as well as habitat restoration and management.

Approximately 0.5 ha on the north side of the hill east of Beechgrove Drive will be restored to a forest community which will improve forest connectivity between Highland Creek and East Point Park.

6.2.2.2 Aquatic Habitat

The SWP refined Preferred Alternative results in the increase in sand shoreline length of close to 400 m, and an additional 1,000 m of cobble beach.

Naturalization of the aquatic habitat within the Project Study Area includes retrofitting existing shoreline structures and enhancing and/or designing the proposed structures such that their ecological value is maximized. Headland beach systems provide better aquatic habitat over the traditional linear revetment as they lengthen the shoreline, and increase the diversity of the substrate and shoreline, providing improved cover and foraging opportunities. Aquatic habitat enhancements beyond these features maximize the potential to contribute to functional nearshore open coast habitat.

The summary of individual naturalization/habitat enhancement techniques that may be implemented for the Refined Preferred Alternative is provided in **Table 6-3**, and detailed below. Where possible, combinations of techniques will be used.

Table 6-3 Overview of potential naturalization/habitat enhancement techniques.

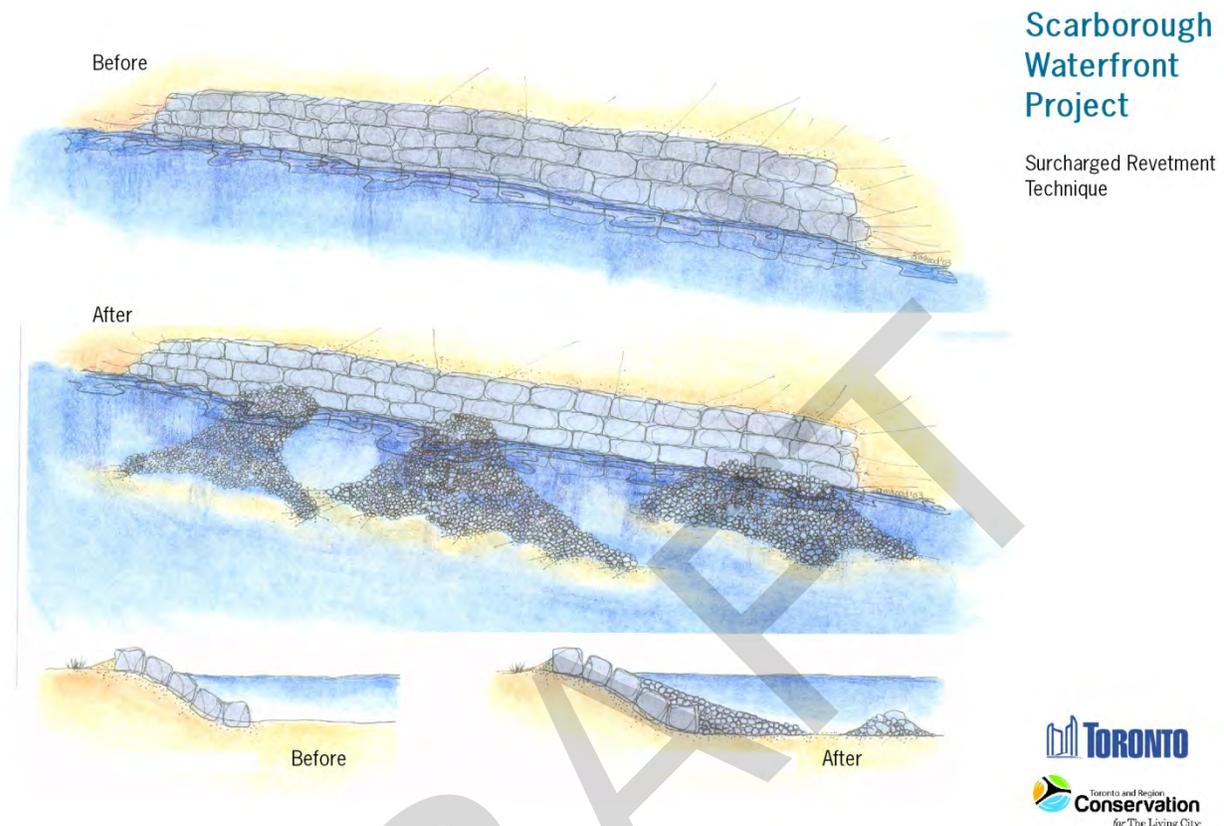
Naturalization/Habitat Enhancement Technique	Target/Benefit
Surcharging (Revetments and Headlands/Groynes)	Improves habitat quality by diversifying habitat structure and shoreline profile.
Shoreline Shoals	Adds structural elements to improve nearshore habitat quality: improves foraging opportunities, increases essential habitat for cool and cold water species (open coast) and improves submergent vegetation (sheltered embayment)
Boulder Pavement Restoration	Replaces coarse substrate to re-instate substrate diversity and increase habitat structural elements.

Surcharging (Revetments, Headlands and Groynes)

Revetments, headlands, and groynes are widely used in coastal engineering for shoreline stabilization and enabling shoreline use. While these structures typically lack the physical habitat complexity of historically unaltered shorelines, they can be designed and/or enhanced to incorporate more ecological functions. Surcharging, in particular, is an effective method of improving the quality of aquatic habitat associated with these structures.

Surcharging involves placing coarse substrate (e.g., rubble, boulders and cobble) underwater within the wave zone along the revetments, vertical walls, headlands or groynes. In headland beach systems, the material can be placed both within and at the end of beach cells. Larger material is typically arranged to protect smaller material from being moved offsite, and reworked by wave action into nearshore shoals and bars, as illustrated in **Figure 6-10**.

Surcharging revetments results in an improvement of habitat quality and benefits aquatic organisms utilizing the shoreline. Surcharging provides for aquatic habitat physical structure diversity along revetments, headlands and groynes, therefore making these otherwise uniform, linear (in the case of walls and revetments) shorelines more functional and attractive to fish and other aquatic life.

Figure 6-10 Surcharged revetment technique.

Shoreline Shoals

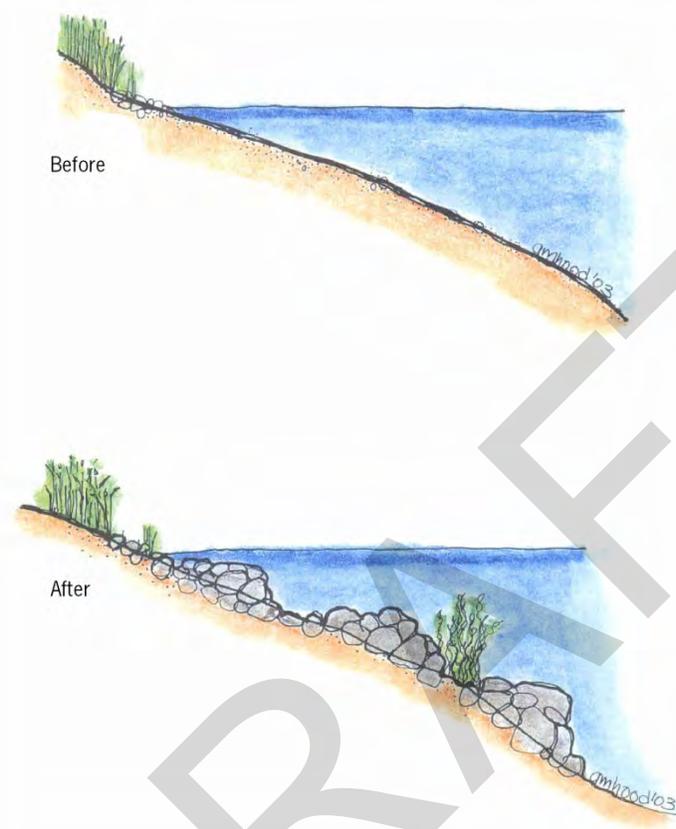
Used in areas with uniform substrates and general lack of habitat structural diversity, shoreline shoals are aggregations of coarse materials placed along the shoreline in sheltered embayment and open coast habitat. These structures improve shoreline structural habitat, providing cover and improving foraging opportunities for various aquatic organisms.

Shoreline shoals are typically connected to the shoreline (see **Figure 6-11**). Materials such as armourstone, boulders, rubble, rip rap, cobble and gravel are selected and placed (typically, with an extended reach excavator) according to coastal conditions and area use. If conditions allow, stepped shoals may be constructed by forming ridges that further increase habitat diversity.

Shoreline shoals improve habitat quality for many fish and benthic invertebrate species by providing cover and improved foraging opportunities. They can also provide spawning habitat for certain fish species (e.g., Lake Trout), where shoal location, size,

configuration, and aggregate materials of appropriate size would be selected based on the spawning habitat requirements of that species.

Figure 6-11 Shoreline shoal treatment technique.



Scarborough Waterfront Project

Shoreline Shoal
Treatment Technique



Boulder Pavement Restoration

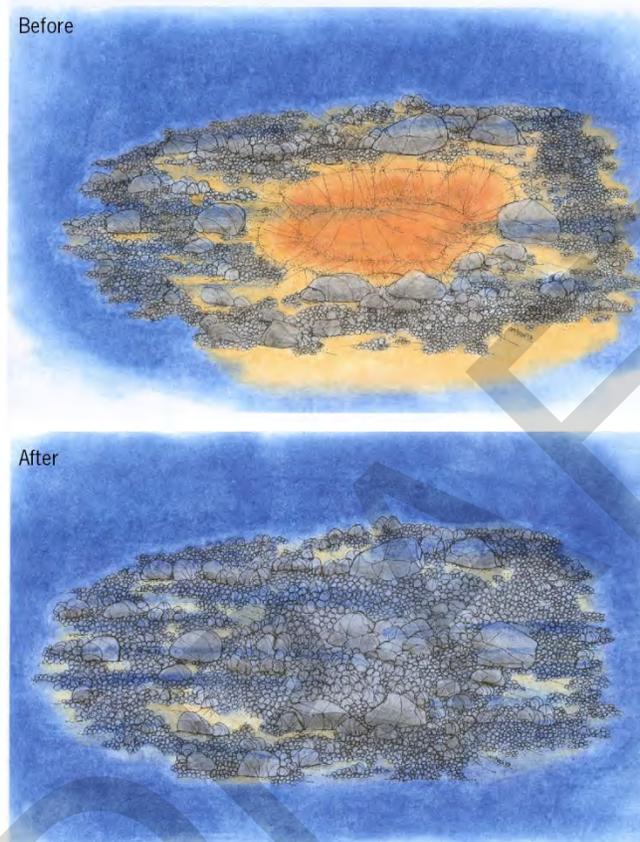
Boulder pavement is formed by aggregations of coarse material such as cobble, gravel and boulders that were eroded from the shore. It provides essential habitat for fish species utilizing the shoreline. Historically, boulder pavement has been degraded by stonehooking activities that resulted in the partial, but substantial, removal of aggregates that formed the pavement. However, restoration can be achieved within the areas that need repair, identified by shallow depressions along the shoreline.

Boulder pavement repair consists of filling the depleted areas with boulders and cobble and bringing the materials to grade with the surrounding areas, as illustrated in **Figure 6-12**. Typically, material greater than 20 cm in diameter remains within the repair location and traps and holds smaller materials such as sand and gravel.

Boulder pavement repair replaces lost coarse substrate to re-instate substrate diversity and increase habitat structural elements. Improved habitat is better able to meet the

requirements of the various life stages of fish and other aquatic organisms that utilize the Scarborough shoreline. For example, certain species of macroinvertebrates and fish require interstitial spaces within stable, coarse cobble and boulder substrates, which may serve as cover and shelter from predators.

Figure 6-12 Boulder pavement restoration technique.



Scarborough
Waterfront
Project

Boulder Pavement
Restoration Technique



6.2.2.2.1 West Segment

In the West Segment, open coast techniques will be used at the Bluffer's Park headland expansion, as well as the Meadowcliffe Drive headland expansion.

The Bluffer's Park headland expansion presents an excellent opportunity for installation of a Lake Trout spawning shoal/reef, contributing to re-instatement of the habitat lost to stonehooking activities of the 1800s. Spawning shoals/reefs with a range of depths are thought to provide optimal conditions for Lake Trout reproduction. By inclining the structure into deeper water, a range of water depths and associated water currents would be available for spawning such that during any given year, conditions would be optimal along some portion of the structure for optimal egg retention and survival (**Appendix D**). In addition, the positioning of this headland would provide the shortest

route for the young life stages of Lake Trout to reach deep water, therefore potentially reducing predation.

In shallower depths, other techniques appropriate for open coast habitat (surcharging, boulder pavement repair and/or shoreline shoals, in particular) will be used.

Specific locations, configuration and dimensions of the habitat enhancement features will be determined during the Detailed Design project phase.

6.2.2.2.2 Central Segment

In the Central Segment, combinations of open coast naturalization/habitat enhancement techniques will be used.

The proposed shoreline structures along Sylvan shoreline and at the base of Guild construction access route west would be enhanced through a combination of shoreline shoals and surcharging. Existing revetments along the South Marine and Guildwood Parkway shorelines would be retrofitted using a similar combination of surcharging and shoreline shoals. If possible, boulder pavement repair technique will be applied. At the Guild Park and Gardens Shoreline Regeneration zone, a large, continuous shoreline shoal would be installed along the shoreline.

Importantly, integrating habitat enhancements along the entire length of the Central Segment shoreline would achieve a synergistic effect.

Specific locations, configuration and dimensions of the habitat enhancement features will be determined during the Detailed Design project phase.

6.2.2.2.3 East Segment

In the East Segment, all three habitat enhancement techniques may be used to enhance the proposed shoreline structures. These enhancements will add structural habitat elements, increasing habitat complexity and partly re-instating substrates lost to stonehooking. Specific locations, configuration and dimensions of the habitat enhancement features will be determined during the Detailed Design project phase.

6.2.3 Recreational

As part of the conceptual design, a formalized waterfront trail is located at the base of the Bluffs on the lakeward side of the risk line in both the West and Central Segments. The trail remains at the base of the Bluffs within the East Segment for a portion of the length, but moves to the top of the Bluffs at the eastern edge of Grey Abbey Ravine to connect to a tableland trail. The tableland trail is positioned on the landward side of the risk line.

The trail will be designed to meet the City of Toronto's primary/high-capacity multi-use guidelines, where possible, which requires a minimum corridor width of 5.4 m, separated, with a paved or hardened surface of 3.0 m, a slope of not greater than 5% and a maximum turning radius of 20 m to provide clear sight lines for cyclists. Refinements were made where achieving these assumptions resulted in substantive alterations to the Bluffs. Trail configurations are described in more detail for each segment in the following sections.

6.2.3.1 West Segment

Through the West Segment, the Preferred Alternative for the proposed Waterfront Trail alignment will be at the base of the bluffs, lakeward of the risk line, through Bluffer's Park, and at the base of Cathedral Bluffs and Cudia Bluffs.

At the base of Cudia Bluffs, the proposed trail alignment is close to the risk line. The risk line was assessed at a preliminary level only (i.e., **LIDAR** data, cross-sections spaced at 200-300 m apart, at critical oversteepened locations only). At Detailed Design, further refinement of the risk line will be undertaken. This will include detailed survey data, more cross-sections and additional geotechnical engineering analysis. Refinements may include minor localized works (e.g., trail raising, **talus catchment areas** or minor trail berms) to keep the proposed trail lakeward of the risk line in this area while minimizing lake infilling.

It is expected that the entire length of trail through this Segment will conform to the specifications outlined in the City's primary/high-capacity multi-use pathway guidelines.

6.2.3.2 Central Segment

Through the Central Segment, the Preferred Alternative for the proposed Waterfront Trail alignment will be at the base of the bluffs, lakeward of the risk line, generally following the existing informal shoreline path alignment of the Guild construction access route. Along the Sylvan and Guild Park and Gardens shorelines, the proposed trail alignment is close to the risk line as presented in this EA. As is the case with Cudia Bluffs, further refinement of the position of the risk line at Detailed Design will be undertaken to keep the Waterfront Trail lakeward of the risk line in this area while minimizing lake infilling.

A crossing, such as a bridge, would be required for the trail over the proposed conveyance of flows from Bellamy Ravine.

It is expected that the entire length of trail through this Segment will conform to the specifications outlined in the City's primary/high-capacity multi-use pathway guidelines.

6.2.3.3 East Segment

Through the East Segment, the Preferred Alternative for the proposed Waterfront Trail alignment will be lakeward of the risk line, at the base of the bluffs along the shoreline below Grey Abbey Park to the east side of Grey Abbey Ravine.

A crossing, such as a bridge, would be required for the trail over the proposed conveyance of flows from Grey Abbey Ravine.

On the eastern side of Grey Abbey Ravine, a freestanding structure such as a corkscrew ramp will provide access between the shoreline and the tablelands. The corkscrew ramp is expected to have a ramp width of 2.4 m and grade of 7.5%, with level rest landings. The overall diameter of the corkscrew ramp is anticipated to be a maximum of 60 m. The ramp will be connected to the tablelands via an approximately 93 m long bridge. The primary to high-capacity multi-use trail will then continue along the tablelands, where it will split into two narrower (approximately 3m wide) paths within East Point Park, which will then connect to the parking lots at East Point Park and to the Port Union Waterfront Trail to the East along the top of the bluffs. Appropriate screenings will be placed along the trail to screen users from the adjacent industrial uses to discourage access. The tablelands in this area contain both private industry and critical infrastructure, both of which must be protected from inappropriate access. Discussions are on-going to attempt to secure this access to enable implementation of the refined East Segment Preferred Alternative. Users can continue to access the sandy shoreline below East Point Park east of the new access point at their own risk.

6.2.4 Shoreline Access Routes

Chapter 2 identified the need for additional access to the shoreline. Opportunities to provide additional access were studied considering the following:

- Grades
- Bluff erosion
- Existing formal and informal access points
- ESAs/ANSIs and other Natural Heritage features
- Private property

Given grades, erosion, vegetation communities of concern and private property no additional access points to the shore were identified other than the trail transition provided between the shore and tablelands in the East Segment.

Restoration or refinement of the four access routes within the Project Study Area was considered, from the tablelands to the shoreline, to connect the broader community to the primary/high-capacity multi-use trail. These shoreline access routes include:

- Brimley Road South
- Doris McCarthy Trail/Bellamy Ravine
- Guild Construction Route
- Beechgrove Drive

Multiple opportunities were considered for each shoreline access route, including the Do Nothing option. Additional constraints (i.e., physical) were also considered to determine each option's overall feasibility and necessity.

6.2.4.1 *Brimley Road*

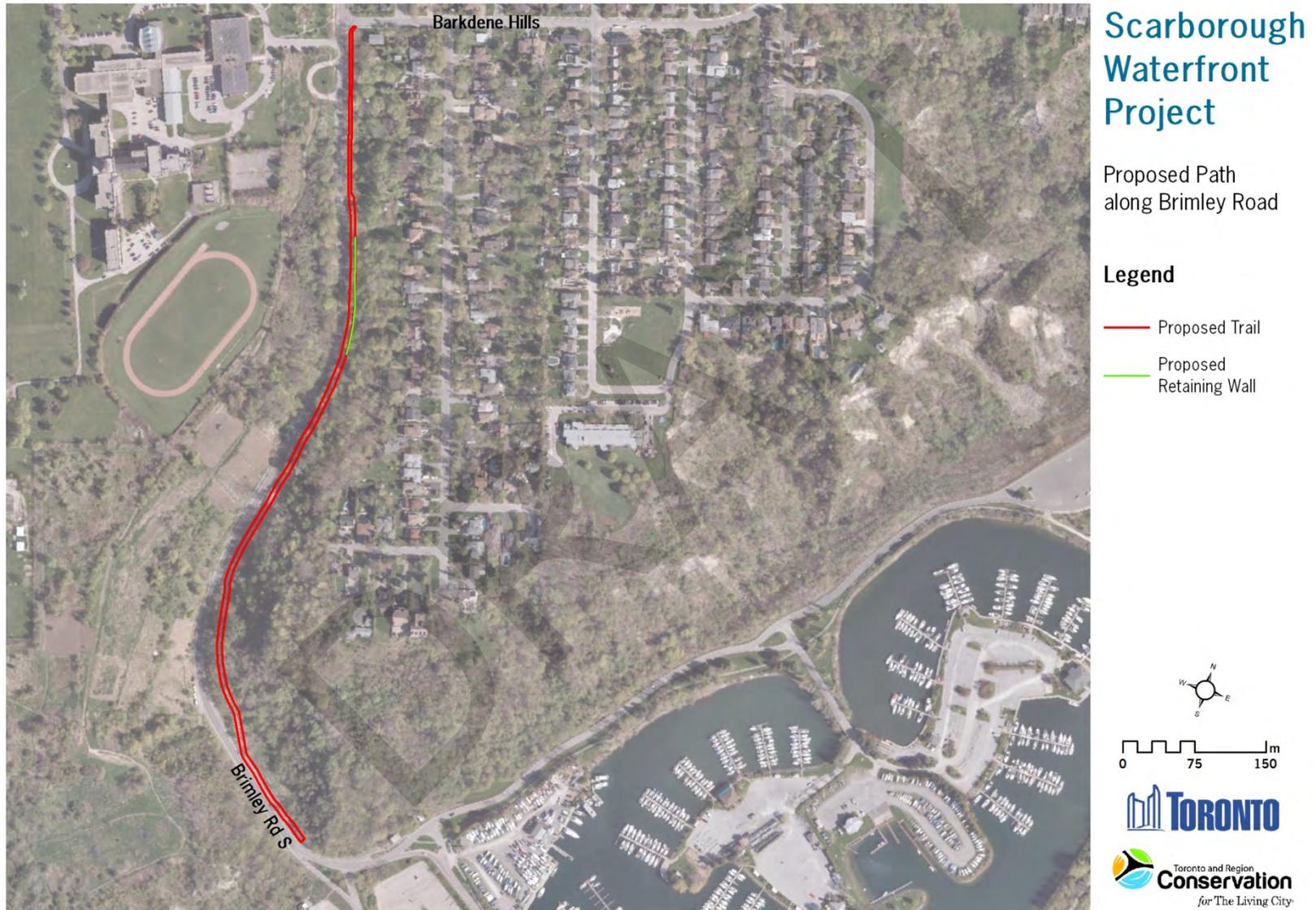
The current access to Bluffer's Park is via Brimley Road South.

The road down to Bluffer's Park is steep, varying between 4% and 17%, and there is limited safe access for pedestrians and cyclists along this roadway. While a separated informal off-road path does exist on the east side of the road for the lower third of the ravine, pedestrians and cyclists need to walk along the road shoulder above this section without adequate separation from traffic. Pedestrian usage of the roadway can be significant during summer weekends when Bluffer's Park parking spaces are all used. Additionally, the ravine containing Brimley Road South is the site of a former landfill that limits the ability to cut into the ravine. The valley walls are steep and come down adjacent to the road.

Given the constraints outlined above, the construction of an at-grade path adjacent to Brimley Road with a signed downhill cyclist route was deemed to be the most viable improvement. A new 1,030± m trail is proposed to the east of the existing roadway, at existing grades, from Barkdene Hills to Bluffer's Park (**Figure 6-13**).

The north-most approximately 180 m of trail will extend south from Barkdene Hills on public land on the east side of the road, which is presently occupied by a small paved stormwater interceptor and a grassed boulevard. The existing boulevard is about 2.6 to 4.2± m wide. That boulevard is to be used to construct a new 3 m wide sidewalk, and the existing stormwater interceptor will be maintained. This portion of the access will not be consistent with the City's primary/high-capacity multi-use trail guidelines, due to existing space constraints. To offset the narrow trail at the top of this access route, cyclists travelling in both directions will be encouraged (through signage and pavement markings) to use the road in this location, as this part of the alignment is not the steepest, with grades ranging from 2.0% to 5.6%.

Figure 6-13 Proposed path along Brimley Road.



Below the north-most section, for a length of approximately 175 m, the east edge of the pavement of Brimley Road South is directly adjacent to the rear property line of ten dwellings. As a result, there is no public land available for the construction of new pedestrian access. To accommodate the City's primary/high-capacity multi-use trail guidelines, acquisition of the rear (western-most) 6.4 m of these properties will be required. Due to a grade drop of about 1.5 m at the side of the roadway in this area, a 2 m-high retaining wall will be required to accommodate a 5.4 m wide pathway. A signed and marked downhill route on the roadway will be provided for cyclists, acknowledging that many cyclists using this access want to use the road to descend.

Stormwater is currently managed by catch basins connected to the storm sewer within this narrow 175 m (approximately) long section. The addition of a paved trail on the east edge of the pavement will generate some additional overland flow. That minor amount of additional overland flow is to be directed into the existing stormwater interceptor or sub-drain to be maintained between the road and the trail and conveyed to the storm sewer. Another interceptor swale will be needed at the bottom of the retaining wall, to keep the wall foundation and backfill dry and thereby decreasing ongoing maintenance needs for that structure.

The south-most approximately 700 m of Brimley Road South exists on public lands. Most of the alignment in this section will replace the existing informal path on the east side of the roadway with a new trail in the same location. The new trail will be made to match existing grades, which are steep (9% to 17% in this section, and will be widened to a width of 5.4 m. A new stormwater interceptor or **swale** will be needed to manage stormwater runoff from the new paved trail. Cyclist usage and signage will be similar to the approximately 175 m-long section discussed above.

6.2.4.2 Doris McCarthy Trail/Bellamy Ravine

Within the Bellamy Road Ravine the Doris McCarthy trail runs down to the shoreline. This trail is in good condition (washed out sections were recently improved by the TRCA) with a surface consisting of crushed granular material. The grade of the trail is steep in sections (up to 13%), particularly through the uppermost 200 m and lower 350 m. The total length of the trail considered for realignment is about 950 m (from Ravine Drive to the shoreline). Bellamy Creek runs through the ravine on the west side of the trail. Several stormwater outfalls discharge into the creek. The side slopes of the ravine steep with sections of existing trail bench cut into the side slopes. Both cyclists and pedestrians utilize this trail, but the granular surface material and generally steep slopes limit access for a variety of users.

It was determined that the impact to the natural system in the ravine and the overall cost did not justify the benefit of reducing the trail grade. Additionally, the lack of parking and

facilities at the head of the trail would likely reduce the attractiveness of this trail to many users.

6.2.4.3 Guild Construction Access Route

Within the Guild Ravine the existing construction access route provides informal access for pedestrians and cyclists to the shoreline for a length of approximately 300 m. Emergency and maintenance vehicles also use this route to access the toe of the bluffs. As with other trails that connect the tablelands to the shoreline in the Project Study Area, the grade of Guild construction access route is relatively steep and uniform, with a typical grade of about 13-14%. Due to the steep grades and the surface type (highly degraded asphalt, unpaved in parts), the route is not accessible to all users. The side slopes of the ravine are steep in sections.

It was determined that, despite the access benefits of modifying the grade, the impacts to the ravine system, were too significant to justify these trail improvements, as significant cut, fill and vegetation removal would be required. Therefore, there will be no changes to the grade, however, minor improvements to the Guild construction access route including level rest areas will be explored at Detailed Design. It is anticipated that any rest areas would be within the existing footprint of the road.

6.2.4.4 Beechgrove Drive

The stretch of Beechgrove Drive, south of Copperfield Road is an unopened construction access route approximately 200 m long which terminates approximately 3-4 m above the sandy shoreline on the east of East Point Park. The overall grade of the unopened construction access route is relatively uniform at 15%. Informal visitor parking is available at the top of the path at Copperfield Road. A stormsewer outfall is located at the base; the resulting flow creates an open channel through the sand shoreline that creates a fairly wide obstacle and impedes east-west pedestrian movement along the shore. As a result, users must climb up and down irregularly placed rocks to access the shore. It is not possible to improve the grades along this access without having significant impacts on the adjacent areas and/or a large headland extending into the Lake.

6.3 Operations and Maintenance

The SWP will require ongoing maintenance for a number of the design components. This includes shoreline protection features, naturalization components, recreational trails, and site access routes. A description of the maintenance activities associated with each of the design components of the SWP is provided below.

6.3.1 Shoreline Protection Features

Following the construction of the shoreline protection features, several maintenance measures will be implemented, including:

- Post-construction monitoring of completed structures to ensure proper function;
- Annual inspections for at least 5 years after construction to monitor effectiveness of protection and to assess whether maintenance is required; and,
- Inspections as necessary based on circumstantial conditions (heavy rainfall, strong winds and waves) where new damage might be suspected or reported, dependent on available funding and resources.

6.3.2 Naturalization Components

Maintenance of the naturalization features will be detailed in an operations and maintenance plan to be developed with the City as part of Detailed Design. The operations and maintenance plan will include considerations for invasive species, stewardship, etc., in concordance with City policies.

Adaptive Environmental Management (AEM), as discussed in **Chapter 8**, is an approach to improving environmental management practices by actively reviewing and adjusting current methods. This will include monitoring of ecological elements, which may dictate additional actions required to sustain the intended ecological communities.

6.3.3 Recreational Trails

Following the completion of the project, trail maintenance in accordance with the City of Toronto management standards will be undertaken by the City. It is not anticipated that the trails will be maintained in the winter months.

6.3.4 Site Access Routes

Maintenance of the site access routes will be detailed in the operations and maintenance plan to be developed with the City of Toronto.

6.4 Construction Access

At present, there are two available construction access routes to the proposed shoreline protection works. The first route is Brimley Road to Bluffer's Park. The second route uses the existing Guild construction access route located within Guildwood Village. These access routes will allow trucks carrying construction materials to reach various sites along the shoreline. Although implementation is anticipated to take approximately 12 years, the duration may be longer or shorter depending on material and funding availability. It is assumed that Brimley Road will be used to construct the West Segment

components and potentially Sylvan, and will be used from October to April (offseason) and the Guild construction access route within Guildwood Village will be used to construct the remainder of the Central and East Segment components and will be used year-round.

A Traffic Impact Assessment (TIA) was undertaken to identify current traffic patterns and to predict future traffic patterns, including SWP construction traffic via Brimley Road and through Guildwood Village. The typical volume of trucks per day on any of the construction access route is 60-80, with a worst case of 220 trucks per day on Brimley Road, and 200 trucks per day on the Guild construction access route through Guildwood Village. A TIA will be redone at Detailed Design given the complexity of the additional traffic created by other projects in the area.

6.4.1 Brimley Road

Brimley Road is the primary access for the West segment. It is a two lane, north-south collector roadway with a posted speed limit of 50 km/h. This route is proposed to provide access for both inbound and outbound truck traffic from October to April for the construction of the West Segment components, and Sylvan headlands. A map of the Brimley Road access route is shown in **Figure 6-14**.

6.4.2 Guild Construction Access Route

The Guild construction access route was constructed in the 1980s for the purpose of constructing and maintaining shoreline protection structures along the base of the bluffs. This construction access route is shown in **Figure 6-15**.

6.4.3 Alternative Access Routes

Other access routes were considered in addition to Brimley Road and the Guild construction access road within Guildwood Village. These access routes were considered based on current trail systems and roads that approach or intersect the shoreline within the Project Area.

The Doris McCarthy Trail was not chosen as the alteration to the valley to reduce steepness and widen the trail would result in significant impact to the natural ravine system.

The East Point Park Trail was not considered as a viable access route for the shoreline protection structures, as the corkscrew ramp is anticipated to be constructed from the base of the bluffs to the tablelands. However, some construction traffic will be required to access through East Point Park to finish construction of the corkscrew ramp and formalize the trail system along the tablelands.

Figure 6-14 Brimley Road access route.



Figure 6-15 Guild Construction Access Route.



6.5 Construction Activities

Prior to construction of the Project, unpatented waterlots on the bed of Lake Ontario (Crown Land) or Crown Land Use Permits to access such lands will be acquired. At the same time private property acquisitions will occur.

Upon receipt of all required permits and approvals, construction activities will commence. The construction of each component will begin with site setup and will include, where necessary, the installation of site amenities (trailer, washroom, construction staff parking, etc.) temporary granular bases, perimeter fencing, tree protection, site drainage improvements, removal of vegetation, regarding, and etc. It is anticipated that construction site amenities will be located in the construction parking lot at the top of the Guild construction access route and on the eastern headland in Bluffer's Park. It is anticipated that during the winter months materials will be stockpiled on this headland to permit construction through the summer months when access along Brimley Road is not possible. During Detailed Design the possibility of construction of the Bluffer's Park Headland from the water using barges will be investigated in an attempt to minimize impacts on local residents and roadways.

As discussed in **Section 6.4**, construction access will be via Brimley Road between October and April and the Guild construction access route year-round. Construction activities will occur year round, on weekdays, approximately 8-12 hours per day.

Equipment to be utilized for construction may be left on site in their respective work locations at the end of each working day and includes: track loaders, dozers, dozer loaders, excavators, rock trucks, tri-axle trucks and others as required. Setbacks from sensitive habitats and natural hazard areas will be implemented, where possible. Appropriate setbacks will be determined through discussion with applicable agencies during Detailed Design. Equipment will be fuelled on site. An emergency spill response plan will be developed and spill kits will be available on site in case of any spills or leaks. A complete list of best practice mitigation measures for the construction activities anticipated is included in **Appendix H**.

In some cases, a portion of the existing shoreline protection will be removed to facilitate land creation activities. The bulk of the material removed will be reused in construction of the final shoreline protection.

A more detailed discussion of the construction of specific components is provided in the following sections.

6.5.1 Large Headlands (Bluffer's Park, Guild Public Gathering Space)

Two temporary structures (a groyne and a cobble beach) will be constructed at the eastern end of Bluffer's Park beach. The groyne will be constructed of approved fill, rip rap, and armourstone in the same way as the headlands. This structure will help to anchor the placed cobble material in order to expedite the beach widening in this area. It will also allow for construction vehicles to drive along the narrow eastern portion of the beach. These structures will likely be left in place until they are buried in accumulated or placed sand.

The headland at Bluffer's Park and the Guild public gathering space will be constructed by dividing the large areas to be filled into smaller cells which can be separated from Lake Ontario. This is accomplished by constructing perimeter berms using large armourstone material that encloses the core area. Perimeter berms act to protect the interior but also function as construction access to the outer portion of the cells. Once enclosed, smaller material can then be placed within the cell with less risk of displacement due to wave action. Once an appropriate amount of fill has been placed, the core material is capped with rip rap and armourstone.

6.5.2 Headlands within the Headland Beach System

The headlands within the headland beach system will be constructed in a similar manner to the components discussed above in **Section 6.5.1**. The headland will be created by placing a core of approved fill material, capping with rip rap and further capping with armourstone. Through Detailed Design, appropriate cell sizing will be determined based on anticipated ability to obtain rubble material, and fisheries timing windows, in order to allow construction to proceed year-round with the filling behind the containment cells. For each of these smaller components, perimeter berms will be constructed to isolate a work area from Lake Ontario. Again, these berms will act as construction access to the outer portion of the cell. Following isolation, the core of each cell will be constructed and then capped with rip rap and armourstone material.

6.5.3 Beaches within the Headland Beach System

Beaches will begin to be formed during the final stages of the construction of the adjacent headlands. As the headlands are nearing completion, the exterior slope of the perimeter berm between the headlands will be allowed to be flattened by wave action. This will enable each beach to find its natural formation. After material has settled and been shaped by the waves, cobble material will be placed on top to stabilize the beach.

6.5.4 Guild Park and Gardens Shoreline Regeneration

The shoreline shoals along the shoreline below Guild Park and Gardens will be created from the addition of randomly placed boulders to the nearshore. A temporary working platform will be created and extended from the existing rubble berm shoreline into Lake Ontario to facilitate the placement of the shoal material. Once the shoal has been created, the working platform will be removed as part of a final slope re-grading prior to the random placement of a single layer of armourstone along the shoreline.

6.5.5 Corkscrew Ramp

The corkscrew ramp on the east side of Grey Abbey Ravine will connect the eastern most section of the headland beach system to the trail across the tablelands. In order to construct the corkscrew ramp, standard construction techniques will be used within the footprint of the new land bases to cast concrete in place from the bottom of the ramp to the top. Groundwater control may be needed during construction at the base. As construction moves higher, some of the top sections, such as the connecting bridge, will be installed from the top of the bluffs. Therefore some construction access will be required through East Point Park.

6.5.6 Brimley Road Separated Pathway Access Improvement

This 3.0 to 5.4 m-wide pathway is proposed along the east side of Brimley Road south of Barkdene Hills. Implementation of this pathway requires an approximately 125 m long retaining wall along the upper portion of the ravine in order to limit encroachment onto ten private properties along Larwood Boulevard which back on to Brimley Road. Construction of the retaining wall along this stretch will require minor excavation along the eastern side of the ravine. Following excavation, the retaining wall will be constructed. While the retaining wall is being built, suitable well-draining fill material will be added behind the wall to the excavated area. Once the wall is constructed, a layer of topsoil will be added to the top of the structure as a restoration measure. Appropriate screenings will be placed along the east side of the trail, adjacent to the private properties.

6.6 Construction Phasing

Construction phasing for the project is generally anticipated to be carried out from west to east and is briefly outlined by segment below. Despite this general vision, it is expected that the construction of various components will be constructed concurrently providing the availability of funding and material. Further, it is expected that the order of construction may be altered during the refinement stages as logistical cost savings are explored in more detail.