Figure 17a *Example of Exposed Armour - boulders and large cobbles are used in critical areas to resist erosion from flood events and provide access to the river's edge.*

Figure 17b *Example of Exposed Armour with Wetland Habitat*

Figure 18 *Example of Bioengineered Bank - soil at river's edge is encapsulated in biodegradable fabric to prevent erosion as plantings become established.*

Figure 19 *Example of Large Wood Stabilization - large wood installed in the bank toe provides erosion resistance, as well as excellent aquatic and terrestrial habitat.*

4.5.5 First Gulf/Unilever Flood Protection Landform (**Scope Item 9**)

A flood protection landform will be located on the east bank of the Don River between the Metrolinx Rail Bridge over the Don Valley Parkway and the Keating Yard on the First Gulf/Unilever site to permanently eliminate the risk of flooding to the east of the Don River, including the First Gulf/ Unilever site. The scope of the Project is limited to constructing only what is needed to ensure complete flood protection for the identified flood zone, without any gaps, and that does not require removing the existing structures on that site. If the redevelopment of the site proceeds on the timeline currently anticipated by the site's owners, alternative configurations of the flood protection landform may become possible; this would require coordinated effort during a future site planning and approval process. Should the owners elect to re-configure the landform to better suit their redevelopment plans it would be at their expense and must still meet the requirements of providing passive permanent flood protection acceptable to Ministry of Natural Resources and Forestry.

4.5.6 Sediment and Debris Management Area (**Scope Item 10**)

Regular sediment and debris removal is required to maintain safe navigation and flood protection through the river channel. Detailed design of the management area and selection of specific operational design will be refined as part of the next phase of design, through on-site testing of various operational systems and refinement of spatial design requirements. Coordination with the Gardiner East project is ongoing. See **Section 7.5: Coordination.**

4.5.7 Flow Control Weir System (**Scope Item 11**)

The weir system, which will control the water flow split between the Keating Channel and the naturalized mouth of the Don River, is a critical part of this Project and will have significant impacts on the flood conveyance of the river system, as well as the ecological systems in the naturalized channel. The adaptive weir system near the Lake Shore Bridge is a mixed fixed/adjustable weir system that will allow for control of the water flow split between the naturalized channel and the Keating Channel.

4.5.8 Keating Channel Modification (**Scope Item 16**)

The addition of the flow control weir system will reduce the flow from the Don River into the Keating Channel, therefore design solutions will be required to ensure that the Keating Channel does not become stagnant. Other changes include the addition of stone armouring and in-channel habitat structures along the edges of the Keating Channel, and several structures that currently protrude into the Keating Channel will be removed to increase water flow during flood events.

4.5.9 Eastern Avenue Flood Protection (**Scope Item 12**)

Grade modifications are required surrounding the Eastern Avenue underpass of the CN Rail line (a localized low-lying area northeast of the Project boundary) to protect against flooding during the Regulatory Flood event.

4.6 Hydraulic Validation

During the DMNP EA, a Delft3D hydraulic model was developed to define existing flood conditions in the study area and to further confirm the feasibility of implementing a construction phasing approach that would progressively eliminate flood risk within the Port Lands without increasing flood risk to the remaining unprotected lands. In order to reconfirm the DMNP EA results and to allow for scenario testing throughout the design development process, the Delft3D model was refined to a higher level of resolution with a denser and more extensive model grid system. The refined model produced results consistent with the original DMNP EA output for both the existing conditions and the construction phases that were proposed during the DMNP EA. Full details of the Delft3D model refinements and the process of testing them are in the appended Baird Report, *Lower Don River Delft3D Model Refinement*.

The refined model was used for a number of simulations in support of the due diligence process and for parallel planning initiatives in the Port Lands that have implications on the Project, specifically the Gardiner East EA and the Port Lands and South of Eastern Class EA Master Plan (see **Section 7.5: Coordination** for further detail).

Limnotech, a globally recognized leader in flow simulations development, was retained under contract with MVVA to complete a parallel review of flow characteristics achieved through the implementation of the MVVA river valley design. Findings were materially consistent with those developed by TRCA and their consultants. For further detail please refer to Appendices 1 and 2.

Using the refined Delft3D model, TRCA confirmed that the earthwork staging approach described in **Section 4.4: Earthwork Staging** did not increase flood risk in the Port Lands during the construction period. However, the modelling results indicated that flood protection work proposed for the First Gulf/Unilever site cannot be completed until all of the proposed flood control work has been completed in the Project area, including the reconstruction of the Lake Shore Boulevard bridge and the widening of the Don River north of Lake Shore Boulevard. Details of the preliminary modelling are provided in the appended TRCA Report, *Delft Modelling Results, February 2016*.

Hydraulic modelling will continue throughout design development to ensure that final designs fully address flood protection requirements.

Port Lands and South of Eastern Class EA Master Plan

TRCA assisted the City of Toronto and Waterfront Toronto in developing a grading plan for the First Gulf/Unilever site that is consistent with the Project activities, while also providing for a new grade separation for the proposed Broadview Avenue extension under the elevated railway corridor.

Gardiner East EA

Delft3D modelling was applied to the City Council-approved Hybrid Three alternative for the Gardiner East EA. The modelling assumed that the existing DVP-Gardiner ramps and piers will be relocated further north and that the Logan ramp portion of the Gardiner Expressway will be removed. The results of the modelling suggest that the Hybrid Three alternative presents opportunities, such as improved sediment and debris management north of Lake Shore Boulevard, and improved flow conveyance and freeboard under Lake Shore Boulevard. Additional modelling will be required as the design of both flood protection and the Gardiner East alignment is refined.

Please refer to **Section 7.5: Coordination** for details on the coordination committee being established to ensure the successful delivery of the various infrastructure projects that will be underway in the immediate area.

4.7 Land Creation

The Project includes the creation of a new land base by lakefilling around Essroc Quay (**Scope Item** 1), which will ultimately accommodate the re-alignment of Cherry Street and much of the proposed Promontory Park North. The lakefilling operation also provides an opportunity in terms of managing excess soils generated during the excavation of the new river valley and the Don Greenway.

Conceptual design of the new land base has been completed by marine engineering specialists Riggs Engineering Ltd. (Riggs), with input from MVVA, in order to ensure coordination with the overall vision for this area. The appended Riggs Report, *Marine Engineering Services to Develop Preliminary Designs for Land Creation Works Surrounding Essroc Quay,* provides details. The conceptual design considers a wide range of constraints and opportunities while achieving the following objectives:

- Providing design hydraulic capacity;
- Effectively using surplus materials generated during demolition and the construction of other Project components, including flexibility to accommodate a range of fill materials;
- Securely containing fill materials;
- Accommodating existing and future municipal infrastructure (primarily to meet stormwater management requirements);
- Stabilizing the shoreline under flood conditions;
- Enhancing aquatic habitat;
- Accommodating proposed programming and design for Promontory Park; and
- Allowing for staged construction, consistent with overall Project needs, particularly the required timing for building the Cherry Street North Bridge and re-aligning Cherry Street.

Further geotechnical data is being collected to confirm or modify assumptions made with respect to the foundation design for the fill containment structure and to enable design refinement.

4.8 Marine Structures

Riggs was retained by the Toronto Port Lands Company to carry out a visual assessment of the dockwalls within the study area and to provide estimates for recommended rehabilitation or modifications necessary to achieve Project objectives. Their full work is presented in the appended report, *Dockwall Structural Assessment, Lower Don Lands.*

The dockwalls within the study area were built between 1912 and 1939 and comprise three different types of structures: timber cribs, timber sheet piling and steel sheet piling. The timber and steel sheet pile walls are secured with tie rods to an anchorage component set inland from the face of the wall. It is worth noting that almost all of these dockwalls are beyond their theoretical service life and most of them would require considerable rehabilitation if they were to stay in service.

The evaluation and recommendations related to each of these structures varies based on the proposed change of use and related structural changes. In most cases, the significant structural concerns with the existing dockwalls are irrelevant as they will be either encapsulated by rock revetment or removed (see items labelled *Removal of Existing Structures* and *New Rock Revetment* in **Figure 20**). There are a few new sections of dockwall that have been added where the proposed Project changes results in exposed earth (see items labelled *New Retaining Wall* in **Figure 20**).

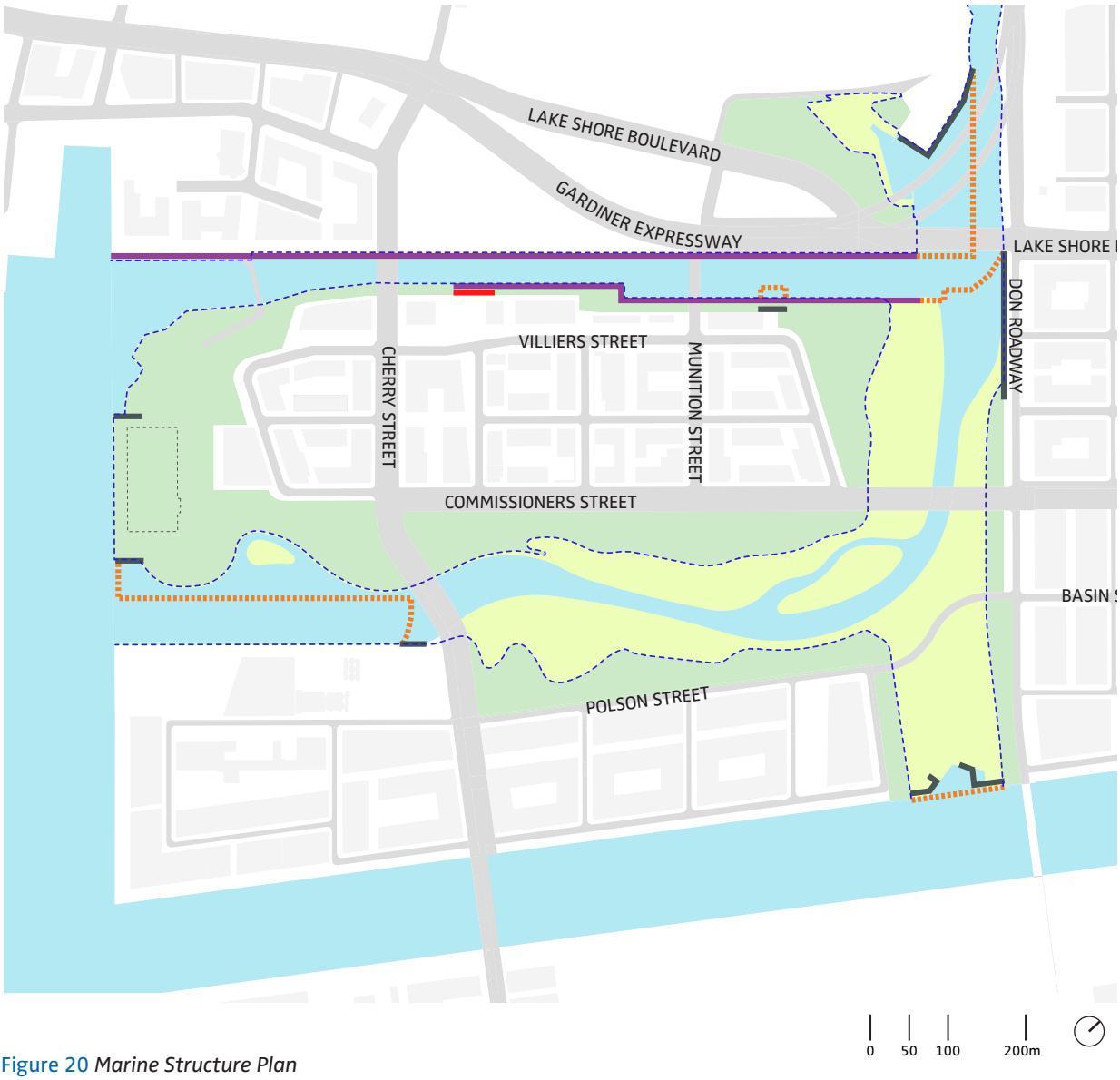

Figure 20 *Marine Structure Plan*

4.9 Public Realm, Parkland and Habitat Enhancement

The MVVA Plans and Report provide further detailed description of the long-term public realm vision for the river valley, including the landscape within the floodplain (forming part of **Scope Items** 2, 3 and 4) as well as adjacent parkland. In addition to 29 hectares (72 acres) of naturalized area within the new river valley, the conceptual design identifies an additional 16 hectares (39.5 acres) of parkland that is intended to accommodate passive and active recreational uses. This parkland includes Promontory Park North (**Scope Item** 17**a**), Promontory Park South (**Scope Item** 17**b**),Villiers Park (Future Scope), River Park North (**Scope Item** 20) and River Park South (**Scope Item** 21).

4.9.1 Planting

Approximately 32.7 hectares (81 acres) of naturalized area is proposed as part of the full vision conceptual design and consists of the following habitat types, as identified during the DMNP EA process:

- 5.4 hectares (13.3 acres) of terrestrial habitat above the Regulatory Flood line;
- 13 hectares (32 acres) of wetland habitat below the Regulatory Flood line; however, it has been identified as part of due diligence that some of this area will need to be armoured to resist erosion; and
- 14.3 hectares (35.3 acres) of permanent aquatic habitat.

The creation of new naturalized areas contributes positively to achieving the objectives of TRCA's Toronto Remedial Action Plan (RAP) for improving ecosystem health and rehabilitating fish and wildlife habitat. The habitat types that will be created comprise the vegetation communities identified in the DMNP EA, which include: forests, thickets, swamps and various types of marsh.

Additional planting will be carried throughout the parkland area, in some areas limited with more hard surface and paving, whereas other program areas, such as public gardens, will contribute significant planted area to the overall site.

Planting within the floodplain will create functional wetlands while accommodating flood conveyance for a regulatory storm event. The floodplain will also provide comfortable, safe, and pleasing spaces for public access and use.

4.9.2 Aquatic Habitat

One of the goals of the Project is to establish habitat to support game fish, including walleye, northern pike and other native species. Ongoing fish survey work by TRCA will be used to evaluate the priority of habitat creation for a range of native fish species. The river bottom has been designed to mimic natural river mouths and will include diversity of depths in various locations. The intent of the design is to provide a broad range of habitat that will accommodate changes in lake levels due to climate and the operation of water management features such as the Flow Control Weir System. The location of the large wood structures as well as the river bank design will accommodate recreational users and fish species at low water flow, while also providing the robust structure needed to remain secure in higher water flow events.

In the Keating Channel, the placement of stone armouring (revetments) will act to stabilize existing dockwalls and simultaneously provide structure for fish habitat. (**Scope Item** 16)

4.10 Roads and Bridges

(**Scope Items** 7**a/b,** 14**a**, and 15**a/c** and **Scope Items** 6, 13, 14**b/c,** and 15**b,** respectively)

There are three new bridges proposed in the Project (**Scope Items** 6, 14**b/c**, and 15**b**). Bridges will reflect appropriate levels of utility and design excellence to complement the unique characteristics and qualities of the accompanying river and park system within the Project. Bridge design, described in detail in the appended MVVA Report, has been studied and refined in an effort to ensure that the structures, including deck, piers, and abutments, accommodate the water flow expected during the Regulatory Flood and also allow for adequate space to be maintained between the water and the bridge deck. In addition, overall road profiles have been modified where necessary to reflect required bridge elevations.

The bridge designs will require supplementary testing through flood modelling in subsequent design phases to ensure there is no impediment to flood water conveyance as a result of modifications to the quantity and arrangement of bridge piers, and the designs may require further refinement.

The construction of bridge crossings will be coordinated with the main river valley excavation. For preliminary planning purposes, it is assumed the foundations for the Cherry Street Bridge South and Commissioners Street Bridge across the Don River will be constructed before excavating to the final river valley depths.

The existing Lake Shore Boulevard bridge over the Lower Don River and the adjacent rail bridge (which accommodates a rail spur line serving the Port Lands) act as a pinch point that restricts the passage of water. The Project includes extending the Lake Shore Boulevard bridge at its west end by three spans in order to create a sufficiently wide opening over the river to convey the flows anticipated during a Regulatory Flood. (**Scope Item** 13)

Road cross-section designs have been refined from the EA configurations as a result of the parallel planning processes being undertaken for the Villiers Island and the Film Studio Precincts and the Port Lands Framework Plan. The quality of roads is intended to match surrounding urban conditions and promote pedestrian and bicycle access. Space will be provided to accommodate dedicated higher order transit lanes on Cherry Street and Commissioners Street and on the Cherry Street Bridge North, which will be used as a BRT for the interim period until it can be replaced by an LRT. Buses will join mixed traffic over the Cherry Street South and Commissioners Street bridges. Based on current demand projections, LRT will be implemented around 2033. The exact timing of implementation may be further influenced by the Waterfront Transit Reset Study that is currently underway.

In preparation for reconstructing Commissioners Street East (**Scope Item** 15**c**), the Don Roadway North (**Scope Item** 7**a**), and the Don Roadway Valley Wall Feature (**Scope Item** 8), it will be necessary to adjust portions of Hydro One's existing transmission line, located within or immediately adjacent to the road rights-of-way. A Hydro One utility bridge that currently crosses the Lower Don River north of the rail bridge also impedes flood water flows and will need to be modified in order to deliver flood protection. Hydro One has assessed options for modifying its network in order to accommodate the needs of the Project (**Scope Item** 18).

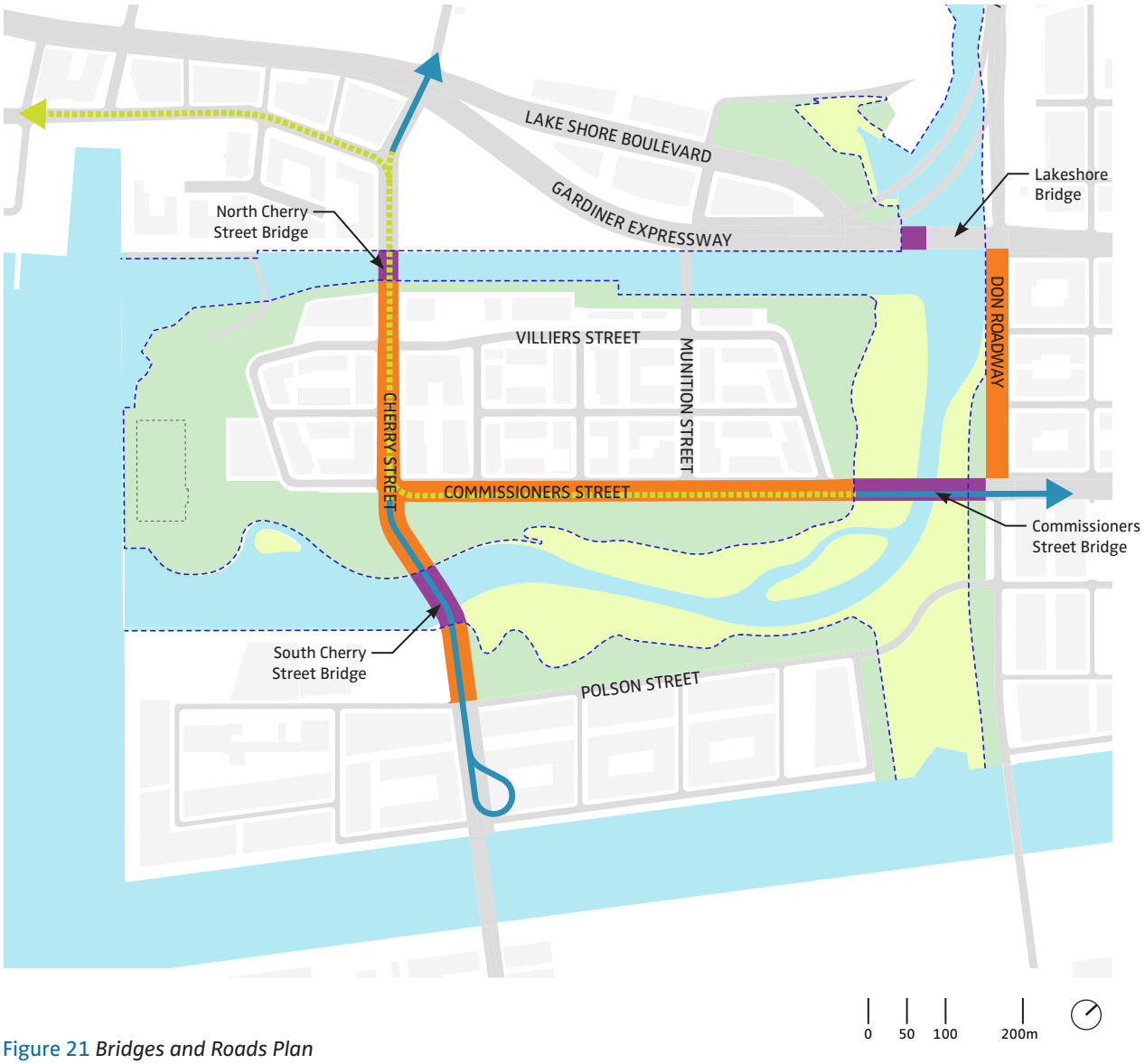

Figure 21 *Bridges and Roads Plan*

Legend

- Proposed Roads
- Proposed Bridges
- Bridges (not in scope)
- Interim BRT (Future LRT, not in scope)
- Regulatory Flood Line
- Bus Route (in mixed traffic)

Municipal services located within the road rights-of-way will generally be constructed in conjunction with the roads, except for certain deeply buried piping, which may be installed later by micro-tunnelling.

The need to raise grades within the rights-of-way provides an opportunity to address potential soil contamination existing in these areas. Although additional localized environmental risk management measures may be incorporated into road and sidewalk designs, where necessary.

The quality of streetscaping within the rights-of-way and the materials used are anticipated to match the quality of Cherry Street in the West Don Lands and the revitalized Queens Quay.

This work will continue to be refined and validated in upcoming design phases.

4.11 Existing Buildings: Relocations/Demolition

The Project Team has carefully considered and determined the best way to manage existing buildings and tenants in the Project site. Due to the extent of the required work, some buildings must be raised, relocated or removed. There are only a few privately-held properties that will be impacted by the Project, as the majority of the lands are government-owned (TPLC, Waterfront Toronto, The City of Toronto and Ports Toronto).

Recognizing that businesses will need to relocate from leased facilities in the planned construction area, impacted property owners and tenants will be notified of lease terminations as soon as possible, but no sooner than the receipt of Project funding. All current leases have termination provisions, which have been considered in the Project schedule.

Several buildings will need to be either fully or partially demolished in order to enable the construction of the river valley, future road alignments and the regrading required for flood protection. The MT35 building is located at the future mouth of the river and consequently at least a portion of the building will be demolished before the construction of the new river mouth commences.

The heritage buildings identified in **Figure 22** will be retained and selectively raised or relocated. Interim access and services will be provided during construction.

Figure 22 provides a comprehensive plan of buildings to be demolished or relocated during the construction of the Project. It also outlines the interim road access to be provided during construction and before the redevelopment of the Villiers Island and Polson Quay Precincts.

Costs for relocation, demolition, reconstruction, temporary access and maintenance of servicing utilities are accounted for in the Project cost estimate.

4.12 Municipal Services

Figure 23 illustrates the municipal services (watermains, wastewater, and stormwater sewers) required to support future development. The plan depicts the ultimate layout and configuration of proposed services within the Project boundary and also select services lying outside the boundary, as required to service private landowners and long-term lessees located on Polson Quay. To minimize overall Project construction and infrastructure costs, the Project includes pre-servicing portions of the ultimate municipal watermain, sanitary, and stormwater network as the means of providing interim servicing. Further analysis has been completed, assessing opportunities to improve on municipal servicing configurations shown in the EA to optimize construction costs realized prior to re-development of the River South Precinct.

New municipal infrastructure is planned to be installed to depths below the water table. A

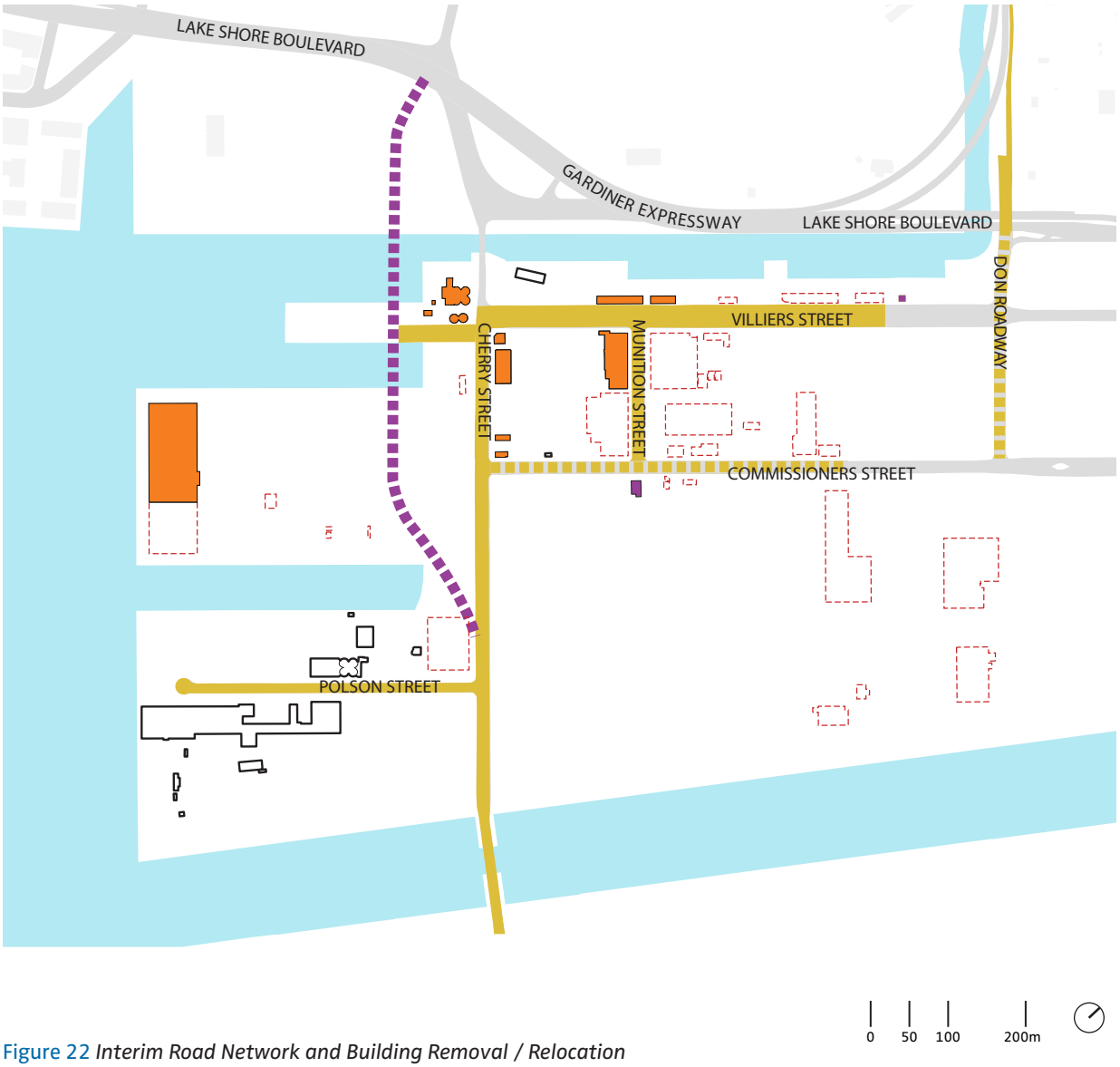

Figure 22 *Interim Road Network and Building Removal / Relocation*

robust dewatering program will be required during construction due to the high permeability of the soil, shallow groundwater table, and the depth of services. Watertight shoring technology will be required to provide a suitable trench condition during installation of the municipal services. It is anticipated that groundwater collected during construction will be contaminated due to the historical industrial uses of the Port Lands and will require treatment before it is discharged.

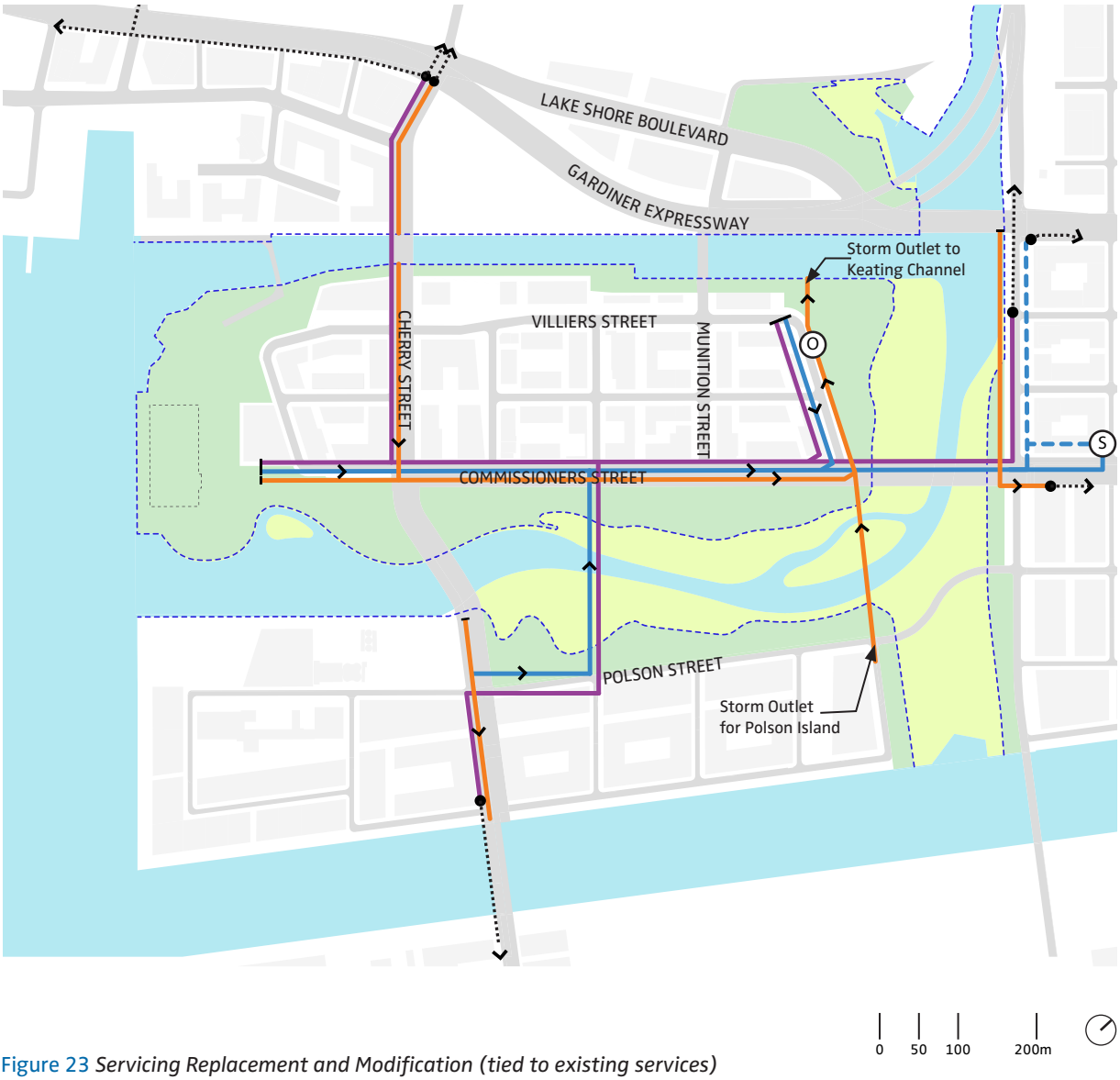

Figure 23 *Servicing Replacement and Modification (tied to existing services)*

In addition to the services described above, the Project also includes the construction of a temporary wastewater pumping station to accommodate interim flows and the underground portion of a future Stormwater Treatment Facility.

Locations for these facilities are shown notionally on the appended MVVA Plans, but location suitability is being assessed and the facilities may be relocated as a result.

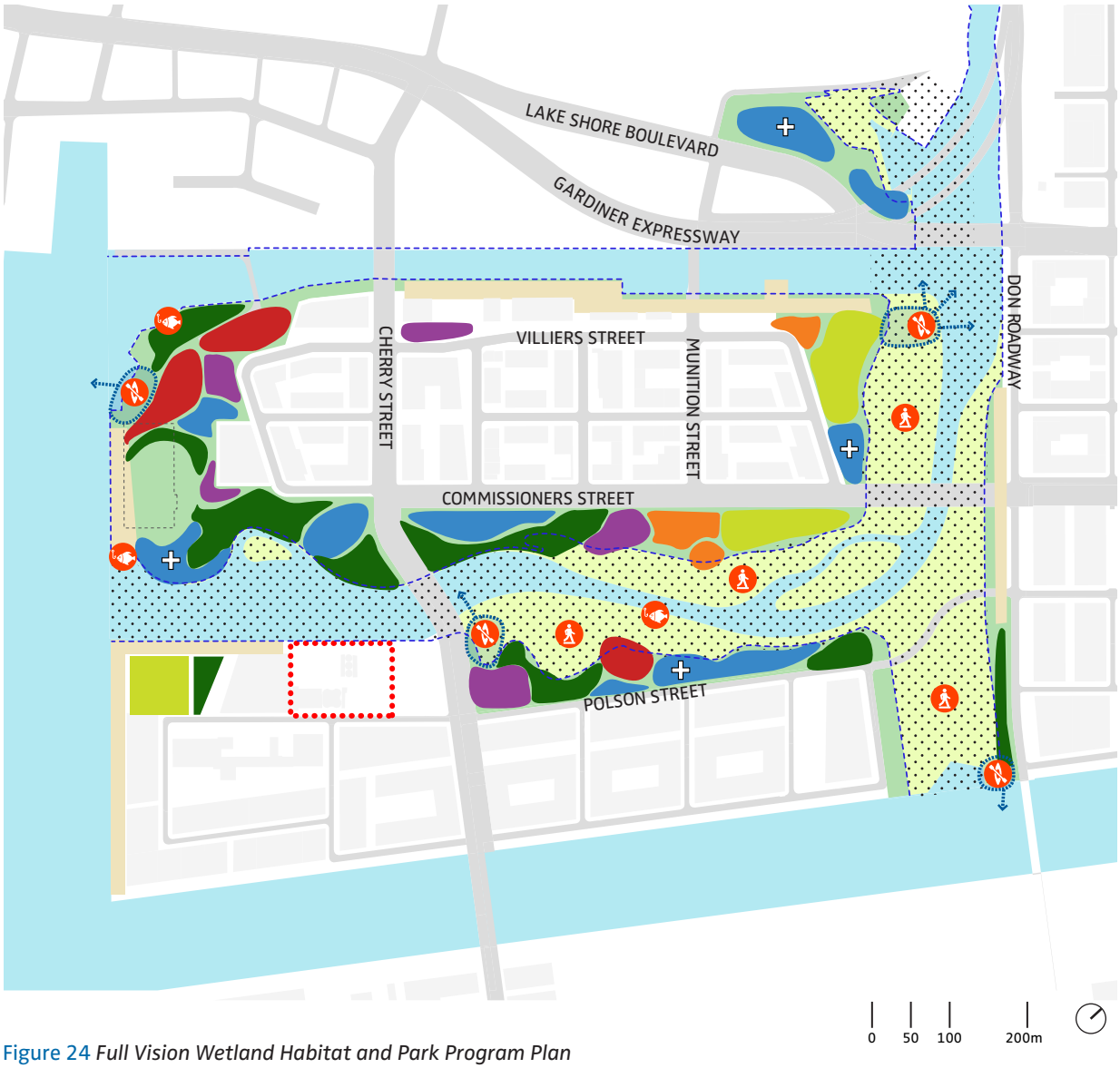

Figure 24 *Full Vision Wetland Habitat and Park Program Plan*

Legend

- River Valley + Wetlands
- Wooded Upland
- Passive Use Lawn
- Active Recreation
- Water Access
- Esplanade
- Playground
- Public Gardens
- Event Space
- Prospect / Overlook
- Other Parkland
- Floodplain
- Private Land
- Regulatory Flood Line
- Trail
- Small Boat Launch
- Fishing Area

Figure 25 *Water Access at Brooklyn Bridge Park, Brooklyn, NY (Michael Van Valkenburgh Associates, Inc.)*

4.13 Park Program

Figure 24 illustrates a full and long-term vision for park programming. The distribution of these program types considers access, views from the island, proposed topography, and distribution of activity across the site. As the public realm and parkland components of the design are primarily located outside of the naturalized areas and floodplain, there are minimal technical issues or constraints, although some consideration of settlement mitigation measures will be required following the raising of the grade in many of the park areas. Within the floodplain, in the area noted on the MVVA Plans as River Valley and Wetlands, passive program use such as trails, boardwalks, overlooks, a small boat launch, and fishing sites will be provided. **Figure 25** provides an example of an armoured boat launch, showing the quality of material and construction intended for these elements. There will be limited active recreational facilities, and there will not be light poles or ancillary features (such as parking) within the floodplain.

Examples of park programming include paths, planted woodlands (**Figure 26**), water's edge promenade (**Figure 27**), upland prospects (**Figure 28**) and children's playground (**Figure 29**) as well as active recreation, such as tennis or basketball courts.

The Project cost estimate reflects park elements of a quality consistent with the programming elements illustrated in **Figure 24** and waterfront parks delivered to date. Future programming decisions and design refinements will be undertaken within the confines of this budget.

The Recommended Scope includes the parks which, together with the naturalized river, will facilitate development and act as a catalyst to unlock residential and commercial uses. Specifically, this includes River Park North, River Park South and Promontory Park South. This Recommended Scope is outlined in **Figure 33a/b.**

Figure 26 *Wooded Upland at Corktown Common, Toronto, ON (Michael Van Valkenburgh Associates, Inc.)*

Figure 27 *Esplanade at East Bayfront Water's Edge Promenade, Toronto, ON (West 8)*