Don Mouth Naturalization And Port Lands Flood Protection Project

Appendix E

Step 4 Assumptions, Comparative Evaluation, Criteria and Indicators

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Appendix E-1 Step 4 Assumptions

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The following sections describe the critical assumptions that the study team took into account when completing the Step 4 effects assessment and evaluation of alternatives. The first section (General Assumptions) describes assumptions made regarding inherent characteristics of the project itself, and includes sediment management, infrastructure, contaminated soils, and constructability and costs. The second section (Objective Specific Assumptions) describes the assumptions made regarding each of the project objectives while doing the effects assessment.

General Assumptions

Sediment Management

Operational costs of the primary sediment and debris trap are the same for all alternatives as trap design and functionality is common to all. Costs of secondary management activities (to deal with residual sediment that is not captured in the trap) depend on the length and depth of the channel and the adjacent wetland areas as required.

Infrastructure

As described previously, only the infrastructure that will be modified or relocated as a result of the DMNP project have been considered in the assessment of effects. The following assumptions were used for the Step 4 evaluation:

i) It was assumed that Lake Shore Boulevard will be moved to the north to be positioned along the southern edge of the rail lands (with the exception of Alternative 3) in order to facilitate both development activities and the naturalization of the Don Mouth; however, it will provide the same traffic capacity as today. The location and span of bridges for Lake Shore Boulevard to cross the revised floodplain will depend on the alternative. The utilities located under Lake Shore Boulevard will only be moved for those alternatives where the existing right-of-way (ROW) becomes part of the low flow channel.

ii) All major roads and bridges can be graded to accommodate transit (i.e., streetcars). Potential transit routes include Cherry St. and Commissioners St.

iii) For roads that are relocated, all buried utilities within road allowances will have to be moved accordingly with the exception of Lake Shore Boulevard where buried utilities could stay in place.

iv) Servicing and stormwater management will be addressed during precinct planning and will be fed into the Step 5 conceptual design development; however, it was recognized that there are servicing constraints west of the existing river that could be lessened depending on the configuration of the developable area.

v) It was assumed that the Don Roadway would eventually span the Ship Channel; however, the extension of this road is not part of this project.

vi) The City has plans for a new CSO tunnel, low level interceptors, and other stormwater outfalls along the waterfront and the lower Don River that this project must be aware of; however, these projects are further back in the planning process and must reflect the decisions made as part of this EA.

vii) Queens Quay will eventually be extended east to Cherry St. but this was not considered as part of this assessment.

viii) The Gardiner Expressway remained in place for the purposes of this assessment.

ix) All rail spurs north of the Keating Channel must be maintained. All other spurs will be decommissioned.

x) All rail spurs north of the Keating Channel will be maintained at the current grade, and appropriate flood protection works to remove them from the regulatory floodplain will be identified as part of Step 5.

xi) Commissioners Street, Cherry Street, Villiers Street, Munition Street, and Polson Street will likely be moved, removed or modified as a result of development.

xii) The high voltage Hydro One transmission lines and the Hydro One bridge over the river and its associated substation cannot be moved.

xiii) Dock walls may be buried or removed depending on what is being constructed. Walls that may be partly removed will have to be rebuilt.

xiv) The existing Don River pedestrian bridge will be replaced for all alternatives and therefore was not considered to be a 'new' pedestrian bridge in the process of evaluating the alternatives.

Contaminated Soils

In preparing the estimate of the distribution of environmental contamination across the Project Study Area (i.e., anticipated areas of soil impact including areas with the potential for the presence of hazardous soil and the presence of non-aqueous phase liquids (NAPL), the following assumption was made:

> *Contamination documented in existing information sources was assumed to extend to the next clean borehole/test pit location (horizontal delineation) and to the next clean sample at individual borehole/test pit locations (vertical delineation).*

An assumption in this regard was required in order to generate anticipated volumes and the spatial distribution of contamination within the Project Study Area as defined above. This approach is in accordance with accepted MOE practice. In some instances, professional judgment was used to modify this approach where the information suggested that the basic assumption was not reasonable.

In terms of the assessment of the management of contaminated soil and groundwater, it was assumed that:

> *Conventional excavation and removal procedures would be employed to clean up the subject site if risk management procedures are not being considered. Implementation of a remedial program to meet applicable regulatory requirements needs to be considered for all contaminants exceeding the generic cleanup Standards for the intended land uses identified [terrestrial/parkland, residential (Table 3), wetlands and aquatic environments (sensitive - Table 1)].*

This assumption is reasonable insofar as the presence of soil (and groundwater) contaminated by several contaminant types (i.e., inorganic, petroleum hydrocarbon and chlorinated solvents) is likely to occur.

Assumptions were required in order to provide a reasonable estimation of the quantities of soil requiring management during both remediation and construction works. These assumptions are listed below.

- Lake level – 74.3 m (December 2007 published measurement).
- Wetlands final design grade – 75.2 m.
- Terrestrial area/open space – sloped from wetlands edge to existing surface grade.
- Existing surface grade – ranges from approximately 77.0 to 77.5 m.
- Elevation of native sediments below fill (fill thickness) – 69.0 to 72.0 m.
- Excavation anticipated to extend 2.0 m below lake level within footprint of narrow river channel (for Alternatives 4W, 4S, and 4WS) and 4.0 m below lake level within the footprint of wide river channel (for Alternatives 2 and 3).
- Landscape features accompanying the alternatives have not been considered in the evaluation save for the promontory incorporated into Alternative 4WS.

These assumptions were used to facilitate the development of costs associated with the risk management/remediation of the environmental impacts occurring within the Project Study Area of each of the alternatives as well as forecast costs of construction of the naturalization features associated with each design alternative.

Constructability and Cost

Overall site preparation costs were developed for each alternative using three approaches to estimate the cost of construction:

i) As if no contamination were present to permit an evaluation to be made of the conceptual scope of work associated with each;

ii) Assuming that remedial work will be undertaken to clean up all portions of the realigned river to meet generic Standards established by the Ministry of the Environment (MOE). It was assumed, in this regard, the adoption of full depth Table 1 Background Standards for all portions of each alternative that are situated within 30 m of the Harbour, Ship Channel, Keating Channel (when left intact) and the new river alignments and when situated below wetland zones, all of which would be designated as “sensitive”, and Table 3 Parkland/Residential Standards for the balance of the lands; and

iii) To meet property-specific standards developed by risk assessment and enabled by the application of risk management measures such as engineered controls (including barriers, caps, in situ treatment, NAPL removal) and administrative and institutional controls (including limiting access to selected receptors, limiting exposure terms, monitoring, documentation and training, etc.), to permit safe use of the lands without the need to effect full scale cleanup. Retention of contaminants in place can reduce overall costs and the time to prepare the site significantly.

Subset cost estimates were also prepared to assess:

- Assumptions relating to the application of recommended protective cover thicknesses for uplands (500 mm), wetland (1,000 mm) and riverbed (1,500 mm) areas and greater cover thicknesses often requested by City of Toronto staff (1,500 mm); and
- The inclusion of outlying “development areas” for which topographic information has been developed by MVVA, in addition to the more limited parkland/wetland/river alignment lands.

The assessment of constructability and the cost estimates were based on the following assumptions:

i) Dock wall demolition including the extraction of steel sheet piling (SSP), extraction and disposal of timber sheeting from Wakefield walls and timber relieving structures and deadmen, and the breakup and disposal of concrete cope walls along the dockwall edge where river realignment or design specifics dictate (e.g., Keating Channel, the Ship Channel, Cousens Quay).

ii) Reconstruction of new SSP dockwalls to contain wetland and upland areas constructed into the lake or up to existing Wakefield wall structures, to permit the excavation of soil exceeding Table 1 Standards (assumed to involve removal of all fill down to and into underlying native soil) in river and wetland areas.

iii) Dock wall installation work was estimated to proceed at a rate of 12 linear metres of SSP per day. Pile extraction and Wakefield wall demolition was estimated to proceed at a rate of 25 metres per day.

iv) Construction of cofferdams at the river mouth outlets at the Ship Channel and Cousens Quay to permit construction of a protective sill.

v) Installation of permanent Waterloo Wall shoring equipped with gaskets to restrict ground and surface water inflow through SSP knuckle joints to train the banks of new river alignments and protect against scour (other treatments such as gabions may be preferred aesthetically. However, we have selected SSP for ease of estimation) and of temporary SSP shoring to support remedial excavations that extend below the phreatic surface.

vi) Dewatering within excavations by pumping, assuming the use of settling and filtration equipment with an oil/grease removal circuit operating at a nominal 1000 m^3 per day with one operator. It was assumed that remedial excavations are backfilled behind the face as they advance to limit the open area subject to flooding.

vii) Excavation work was estimated to proceed at a rate of 2,000 m^3 per day. The duration of the project was factored by a multiplier of 1.25 to cover backfilling following excavation work, bad weather, poor ground conditions and other delays.

viii) A portion of excavated material will be stockpiled and the balance will be direct-placed or hauled directly for off-site disposal. For the wetted (below phreatic surface) portion of the river and wetland area, soil would be removed down to design grade, all subgrade soil would be excavated from below the phreatic surface and 50% of the soil would be excavated from between current surface and design grade from the upland/parkland portions of the site will require stockpiling to permit drainage to occur and to provide a float to allow backfilling to continue when excavation delays occur. Given the size of the site, local stockpiles would be preferable to a centralized facility.

ix) Laboratory testing costs for soil were assessed on the basis of one suite of analyses for inorganics, benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl (PCB) and volatile organic compounds (VOCs) for each 500 m^3 of soil excavated. Groundwater analyses were estimated on the basis of one suite of analyses per day of pumping. A 10% duplicate allowance and tabulation time was allowed for.

x) No attempt was made to incorporate soil treatment into the remedial approach. While a significant amount of soil across the Toronto Port Lands exhibits petroleum hydrocarbon, and to a lesser extent VOC-related contamination which can be broken down in situ or in a biocell, the majority of the soil exhibits co-contamination including metals and PAHs (both in residual fuels and coal) which are not amenable to treatment. Biotreatment would thus result in destruction of a portion of the contamination only, leaving the material unsuitable to be left in place under a generic cleanup scenario. In any

event, the cost of treating soil for PHCs, when combined with the cost of disposal as clean, would be equivalent to the cost of disposal as contaminated. Encapsulation was not considered to comprise a suitable treatment process although it would immobilize metals and other inorganics as well as some heavier organic compounds. Unfortunately, the chemical constituents would remain in the stabilized matrix and thus may not be left on site without a risk assessment.

xi) No special equipment or techniques will be required to complete the work as envisaged.

xii) River, wetland and upland areas will have to be lined when running through zones in which underlying contaminated soil is present. Soil that is suitable as a growing medium will also be required to ensure that plant life can become readily established. Much of the port area exhibits soil that will not support plant life. Where full-scale cleanup has been carried out, no liner will be necessary although soil additions will be necessary. Where risk assessment is to be used, we have assumed a cover of 500 mm thickness over upland areas, 1000 mm beneath wetlands and 1500 mm beneath river beds which will also be supplied with a 100 mil geomembrane and protective geotextile layers.

xiii) Sediments from the upper 500 mm of the bed of Keating Channel and, in the case of Alternative 4WS, the Inner Harbour, are assumed to be dredged for disposition in the confined disposal facility at Tommy Thompson Park.

Objective Specific Assumptions

Naturalization

i) Concerning the indicator *potential for enhancement for migratory bird habitat* (internal linkages as well as links external to the project to both existing and planned habitat), no difference was assumed between north-south linkage and east-west linkage.

ii) In general, any habitat created under the Gardiner Expressway was counted in the evaluation, with the exception of the criterion *potential for negative and/or beneficial effect on resident wildlife species or communities* as this criterion measures the area of habitat not disturbed. Since the Gardiner Expressway is a source of disturbance the area of habitat under the road was not included.

iii) All at-grade road and rail crossings were considered to act as barriers to the creation of quality habitat so any measurements of patch sizes did not include habitat bisected by road or rail crossings.

iv) Concerning the indicator total area of wetland within the Alternative, the river was assumed to bisect habitat so the largest patch did not have a river crossing.

v) Length of channel measured from the rail bridge to the end of Essroc Quay (alternatives 2 and 4W) or the Ship Channel (alternatives 3 and 4S) or the end of the river mouth (alternative 4WS).

Flood Protection

i) Related to property area removed from flood risk is the indicator property area removed from flood risk within Port Lands. For this indicator only land currently within Spill Zones 1 and 2 was considered as potentially being removed from flood risk.

Co-ordination with Other Planning Efforts

i) If a land use was partially displaced by the development of each alternative it would be counted as totally displaced.

ii) Land area not being used for naturalization or recreation was available for development.

iii) Terrestrial and wetland are surrogate for 'naturalized edge'.

iv) Terrestrial area is a surrogate for 'parkland'.

v) Development areas that were separated from terrestrial areas by a road were still considered to be 'parkfront'.

Consistency with WT Sustainability Framework

i) Regarding the management of contaminated soils, assumptions made for this project objective are listed in the Contaminated Soils section above.

ii) Estimates for overall site preparation costs and subset costs were developed for each alternative using the approaches described in the Constructability and Cost section above.

Don Mouth Naturalization And Port Lands Flood Protection Project

Appendix E-2 Comparative Evaluation Criteria for Step 4 of the Don Mouth Naturalization Project

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Appendix E-2 Comparative Evaluation Criteria for Step 4 of the Don Mouth Naturalization Project

Objective	Criteria	Indicator(s)	Rationale
1. Naturalization	Total naturalized area		The total naturalized area provides an indication of the potential habitat that can be optimized through design to provide high quality wildlife habitat. Alternatives with a larger total naturalized area will have a larger amount of habitat and provide the potential for greater habitat diversity.
	Area of wetland habitat types created (designed to respond to ecosystem constraints)	Total area of wetland within the Alternative	Measure reflects that type and number of species unique to wetlands that may be expected in each of the alternatives. This indicator measures all habitat independent of connectivity.
		Largest single patch size of wetland.	As habitat patch area increases, independent of habitat shape, the probability that species sensitive to habitat area will occur also increases. Therefore, a measure that evaluates the area of the largest patch may be an indicator of enhanced function.
	Area of upland open space / terrestrial habitat	Total area of potential open space / terrestrial within the Alternative (measured as total of non-manicured upland, parkland and recreational fields.)	Upland habitat associated with wetland and aquatic habitat serves to increase the diversity and sustainability of the naturalized area. The buffer provided by upland areas to the wetland also helps to increase the probability of occurrence for a wider range of species. A larger area of upland habitat can support a greater population of terrestrial birds, mammals and insects. This indicator measures all habitat independent of connectivity.
	Potential for negative and/or beneficial effect on wildlife species or communities (i.e. minimizing disturbance and connecting habitat)	Ratio of perimeter to area of the largest contiguous wetland habitat patch (measure of largest circle within patch)	Many species are sensitive to human disturbance along the edge of habitat and prefer undisturbed interior habitat. Blocks of habitat such as squares or circles are preferred. A target of 10 ha was developed however function would be maximized if the patch were uniform in shape to maximize the amount of habitat that is unaffected by surrounding uses. Ideally, a diameter of 300 m or larger would increase the probability of habitat that is protected from edge effects.
		Ratio of perimeter to area of the largest contiguous terrestrial / open space patch (measure of largest circle within patch)	
	Potential for negative and/or beneficial effects on native fish habitat or aquatic communities	Total area of aquatic habitat	The amount of aquatic habitat at the mouth of the Don River will influence the population and species diversity of fish and waterfowl that could utilize the area. The greater the area of habitat created, the more likely that it is able to support a variety of habitat forms.
		Length of channel	Long river-shoreline interfaces offer better opportunities for shallow productive zones to exist. These areas are often used for foraging and spawning and are among the most productive aquatic zones. The length of river within a given area is an indicator of the potential for sinuosity. The actual form (sinuosity) of the river will be determined through design in Step 5.
	Potential for hydraulics and hydrology to affect sustainability of vegetation communities and associated fauna	Flexibility in design to allow management of full range of flows without adverse impact on vegetation communities (high erosional stress, sediment deposits)	The ability of the design to manage a range of flow rates is very important. The scouring effect of high flow rates can be detrimental to vegetation communities. Designs with multiple outlets have the advantage of being able to accommodate higher flow rates.
	Potential to maintain and improve connection for aquatic species	Orientation of the connection to the Inner Harbour that encourages fish access	Fisheries data indicates that fish tend to use the harbour and related shoreline in much greater densities than the Ship Channel . It is therefore advantageous for the river to connect directly to the harbour instead of via the Ship Channel. Furthermore, direct access for migratory aquatic species and resident open water species to move into the channel mouth and upstream to feed or spawn is encouraged by direct connection with the harbour.
	Quality of habitat types created	Density of infrastructure within or adjacent to habitat measured as a ratio of length of crossing to area of habitat patch	Roads are known to have negative impacts on wetland habitat. This is due to habitat fragmentation, road salt and pollution run-off and the introduction of invasive species. Therefore length of the crossing compared to the area of wetland provides valuable information pertaining to potential impacts of road density and potential for increased habitat quality.

Appendix E-2 Comparative Evaluation Criteria for Step 4 of the Don Mouth Naturalization Project

Objective	Criteria	Indicator(s)	Rationale
	Potential for negative and/or beneficial effect on wildlife species or communities (i.e. minimizing disturbance and connecting habitat)	Potential for enhancement for migratory bird habitat (internal linkages as well as links external to the project to both existing and planned habitat)	Habitat connectivity is important for many species to provide adequate habitat for feeding and breeding. This indicator provides a measure of the potential for the length of connectivity within the study area which would then link to external resources.
2. Flood Protection	Potential to impact flooding conditions elsewhere	Extent of flooding that will continue to occur in developed areas or beyond the naturalization study area	During Step 1 of the EA, the alternative methods were optimized such that they could convey the Regulatory flood within the defined floodplain. However, the addition of infrastructure, recreational features, and habitat types added during Step 3 may influence flood conveyance and result in flooding outside the floodplain. Alternatives that can convey the flood within the floodplain are preferred over those that cannot.
		Need for additional flood protection or flood proofing works to eliminate flood risks	
		Need for erosion protection to eliminate flood risks	
	Potential for sediment to affect flooding and conveyance of flow	Adaptability of design to allow conveyance of sediments under low flow and range of flood conditions.	Sediment deposited on the bed of the river can smother habitat and impede water flow.
	Land area removed from flood risk	Property area removed from flood risk within Port Lands	One of the major objectives of the project is to remove properties from flood risk
		Potential improvement in assessment values as a result of removal of flood risk	Once properties are removed from flood risk assessment values will rise.
	Ability to accommodate potential changes in extreme precipitation and water flows resulting from climate change	Capacity for future modification to the design to respond to trends toward substantial increases in water volumes due to climate change	In the event that the size of the Regulatory Flood were to increase due to climate change, the alternatives should have some built-in extra capacity to be able to handle larger volumes, or be able to be adapted or modified in the future to be able to handle larger volumes.
3. Operational Management and Constructability	Potential to phase implementation of river modifications	Ease of construction	It is desirable to chose an alternative that is relatively easy to construct to minimize cost and complexity
		Ability to divert roads and maintain access during construction	As construction will take a number of years there will be the need to divert roads but maintain access to remaining businesses
		Ability to manage 5-year flood events during construction	There is the potential for flood events, including the regulatory flood, during construction and as such each alternative provides different opportunities to manage these events
		Ability to minimize temporary relocations of infrastructure	It is desirable to avoid temporary relocations of infrastructure to minimize disruption and cost
	Accessibility of river mouth for operational management (i.e. dredge, barge, etc.)	Accessibility to sediment trap location and low flow channel to facilitate operational management related to sediment, debris and ice.	The sediment trap and low flow channel will require management and maintenance as a result of sediment and debris accumulation and ice damage. This indicator measures the ease with which these areas can be accessed for these activities.
		Need for access roads to sediment and debris management areas	There may be the need to provide an access road to the sediment and debris management areas for some of the alternatives.

Appendix E-2 Comparative Evaluation Criteria for Step 4 of the Don Mouth Naturalization Project

Objective	Criteria	Indicator(s)	Rationale
	Potential for adverse effects/ improvements to Port operations	Displacement / disruption of yards operations	The Port Authority operations yard will be displaced or disrupted by all of the alternatives.
		Length of dock wall modified or buried	Modifications or burial of dockwalls are likely to remove the walls from use by the Toronto Port Authority and will have cost and constructability implications.
		Disruption to Port operations	The Toronto Port Authority operates the Port of Toronto, located to the west of Cherry St. south of the Ship Channel. Port operations may be affected by the removal of dockwall or the changes to the Ship Channel. Sediment, debris, and ice management may affect their operations, depending on where materials are deposited or management access points.
		Qualitative assessment of effects on shipping activities	Changes to Port Operations, the Ship Channel and the Inner Harbour may affect Shipping Activities
	Annual operations and maintenance costs	Annual cost of sediment and debris management activities	Flood protection activities include dredging, and ice and debris removal. These costs will vary depending on the discharge point and the recreational and habitat features associated with the river mouth.
		Annual cost of maintenance of naturalized areas and flood protection works	It is desirable that the project be as self-sustaining as possible and that maintenance costs to not add to the annual burden of those agencies who may be responsible for maintenance activities.
4. Integration with Infrastructure	Potential for changes to existing, planned and proposed roads solely due to DMNP	Potential modifications to Lake Shore Boulevard at the Don Roadway, Cherry Street, Commissioners Street, and/or Gardiner Expressway substructure to accommodate alternatives	The river mouth may potentially cross a number of existing, planned, and proposed roads, depending on its alignment.
		Long-term maintenance implications for Gardiner Expressway substructure	Maintenance/rehabilitation of existing transportation structures that are not currently located over a body of water will be more difficult and costly if they are located over a body of water in the future
	Potential need for new bridges	Length of new vehicular bridges by location Length of new pedestrian bridges by location	New bridges represent a significant cost and construction effect with respect to access, noise and dust
	Modifications required to accommodate surface transit	Cherry Street Commissioners Street	There are on-going projects to bring light rapid transit to the Port Lands and as such grading of bridges must be able to accommodate transit
	Potential for changes to existing rail lines or yards or access roads leading to rail yards	Potential for modifications to Villiers spur	The river mouth may potentially cross these rail spurs and associated rail infrastructure. Removals or modifications to rail spurs and associated rail infrastructure will affect the businesses that rely on the spurs for the transportation of supplies and goods.
		Potential for modifications to the Keating Yard and rail connection to mainline/Don Yard	
		Redpath Sugar spur, and Don Yard access road	
	Potential for changes to existing, planned and proposed underground utilities	Potential for modifications to: • Enbridge gas pipeline • water and wastewater utilities • other underground utilities	The river mouth may potentially necessitate the modification or movement of underground utilities such as water and sewer utilities and gas pipelines.
		Potential effects on servicing from alignment of river mouth	The alignment of the river mouth may facilitate or create a capacity constraint for underground services given issues with the existing system.

Appendix E-2 Comparative Evaluation Criteria for Step 4 of the Don Mouth Naturalization Project

Objective	Criteria	Indicator(s)	Rationale
	Potential for modifications to dock walls	Potential need for dock wall reinforcement to prevent undermining from flood events	In some areas where the dock wall is to remain it may require reinforcement as a result of medications to adjacent sections
		Maintenance implications for dock walls	If dock walls are modified, buried or assigned a different use there may be maintenance implications associated with that change
	Potential for changes to existing above ground utilities	Length of above ground utilities to be modified	
		Potential for modifications to the hydro bridge and substation	
	Costs of infrastructure modification/ relocation	Total cost of infrastructure modification / relocation	Order of magnitude costs will be provided as an indicator of overall potential cost. Changes to infrastructure will have cost implications.
	Benefits of moving infrastructure associated with DMNP on other area projects		Benefits to the development potential for the Port Lands may be realized as a result of moving infrastructure.
5. Recreational and Cultural Opportunities	Potential for effect from construction on traditional uses of lands by Aboriginal peoples	Extent of traditional uses of lands within footprint of river mouth	The revitalized river mouth must respect and wherever possible enhance traditional uses of lands by Aboriginal peoples.
	Potential for effect from construction on archaeological resources	Significance of archaeological resources within footprint of river mouth	Depending on the nature of the archaeological resources, it may be necessary to assess the areas to be impacted prior to any soil disturbance, alteration, or any impacts from staging and storage areas, detours, access routes and other temporary measures required to undertake this project, and avoid or mitigate the impacts to any identified resources of cultural heritage value or interest.
	Sustainability of active and informal park spaces	Qualitative assessment of maintenance requirements of “park” space	Sustainability of the project is important and it is desirable to minimize active maintenance requirements
	Potential for changes to use of river mouth for boating	Compatibility of recreational boating with naturalization	Naturalized areas may limit the amount of the river mouth that can used for recreational boating, including non-motorized boats.
		Dimensions (depth, length, and width) of river mouth in context of navigable waterway	The dimensions of the river mouth will determine its navigability
	Potential to negatively or positively affect recreational boating in the Inner Harbour	Qualitative assessment of effects on recreational boating	Components of some of the alternatives may affect the recreational boating activities in the Inner Harbour
	Opportunity to enhance/degrade existing and proposed pedestrian/cycling linkages with and between waterfront areas and the rest of the city	Length of existing and potential pedestrian / cycling trails	Among the recreational features that will be considered as part of a revitalized river mouth include new pedestrian and cycling trails that will link the Port Lands to the Martin Goodman Trail, other water front areas and the rest of the city.
		Extent of linkages to parks within East Bayfront Precinct Plan, Distillery District, Lake Ontario Park, etc.	

Appendix E-2 Comparative Evaluation Criteria for Step 4 of the Don Mouth Naturalization Project

Objective	Criteria	Indicator(s)	Rationale
	Potential to provide functional linkages to Martin Goodman Trail	Number of linkages	The revitalized river mouth should serve to enhance the utility and connectivity of the Martin Goodman Trail.
		Strategic location of linkages to achieve connectivity	
	Potential for displacement from construction of naturalized area on built heritage resources	Cultural heritage value of built heritage resources and cultural heritage landscapes within low flow channel	Depending on the nature of the built heritage and cultural heritage landscape resources it may be necessary to assess the areas to be impacted prior to any soil disturbance, alteration, or any impacts from staging and storage areas, detours, access routes and other temporary measures required to undertake this project, and avoid or mitigate the impacts to any identified resources of cultural heritage value or interest.
	Potential to provide cultural amenities	Number and type of cultural amenities provided	The revitalized river mouth should afford opportunity for cultural activities, education and interpretation.
	Potential for connectivity to waterfront promenade	Location and degree of connectivity to proposed waterfront promenade	The revitalized river mouth should provide opportunities for the extension of the proposed waterfront promenade.
	Potential to create cultural opportunities around archaeological resources	Number of archaeological resources within footprint of river mouth outside of low flow channel	As demonstrated in the East Bayfront Precinct Plan, redevelopment of the waterfront, including the river mouth, into a cultural focal point should incorporate archaeological resources wherever possible.
	Potential to create cultural heritage resource opportunities around built heritage and cultural heritage landscape resources	Number of built heritage resources and cultural heritage landscapes located within footprint of river mouth outside of low flow channel	As demonstrated in the East Bayfront Precinct Plan, redevelopment of the waterfront, including the river mouth, into a cultural focal point should incorporate built heritage and cultural heritage landscape resources.
6. Coordination with Other Planning Efforts	Consistency with the intent of the Central Waterfront Secondary Plan	Consistency of project with objectives of Central Waterfront Secondary Plan (cross referenced to other indicators as appropriate)	The revitalized river mouth must be consistent with other plans for the study area.
	Potential for removal of, or changes to, existing land use	Number and type of displaced land uses	The footprint of the revitalized river mouth will result in a change to existing land uses and the potential loss of employment.
		Employment lost as a result of land use removals	
	Potential for nuisance effects on the planned and proposed surrounding community	Location of operational management areas in relation to planned and proposed land uses	The operational management areas may have nuisance effects associated with them which would be felt by surrounding land uses.
	Land outside of regulatory floodplain available for development	Total land area available for development or development related amenities	Each alternative will have a different amount of area available for development yet the number of units to be developed remains the same.
	Amenity value created by river and naturalized areas	Length of naturalized edge adjacent to terrestrial areas	The proposed park areas and naturalized river mouth offer unique opportunities for recreation and public enjoyment. The feasibility and sustainability of the development is greatly increased with close proximity to these types of landscape amenities.
		Length of open space/ terrestrial	
		Accessibility to naturalized edge – development area within 200 m of naturalized edge	
		Accessibility to terrestrial area – development area within 200 m of terrestrial area	

Appendix E-2 Comparative Evaluation Criteria for Step 4 of the Don Mouth Naturalization Project

Objective	Criteria	Indicator(s)	Rationale
	Ability of location of river to support transit utilization	Development area within 400 m of potential transit routes	Transit oriented development is an essential component of the overall development strategy. Gaps in urban continuity will negatively affect the ability of transit lines to capture ridership effectively.
	Walkability - ability to create pedestrian connectivity between and within neighbourhoods	Number of linkages among neighbourhoods across park and naturalized areas less than 200 m	This criterion is based on a200 metre distance between development areas is an indicator of the ability to move easily and conveniently on foot from neighbourhood to neighbourhood within the Port Lands and to adjoining neighbourhoods.
	Potential to provide vistas to the downtown skyline	Extent of terrestrial/open space afforded with views of the skyline	
	Potential to facilitate development in the Portlands and East Bayfront (East of Parliament)	Compatibility of landscape / use within the river mouth lands with surrounding land uses	The naturalized river mouth must be compatible with proposed surrounding land uses.
		Density of proposed development areas	The number of units to be developed is constant but density will vary as a result of differing areas being available for development.
	Opportunity for visual integration with future development plans for the area	Consistency with urban design component of future development plans	The vision for the waterfront is driven by the need for inspiring urban design. The revitalized river mouth must be consistent with this vision.
	Employment created from construction activities	Direct employment and indirect employment	Direct and indirect employment will be created as a result of the construction of the river mouth
	Implications of construction activities on business operations	Access, noise, dust	Construction activities will produce nuisance effects for adjacent businesses
7. Consistency with TWRC Sustainability Framework	Potential for disturbance of contaminated soils	Area of contaminated soils to be managed / remediated for the project	Construction has the potential to disturb contaminated sites.
		Nature of contamination	
	Ability to manage contaminated soils and groundwater	Ease of remediation / risk management	Preference should be given to remediation / risk management options that limit the risk to human and environmental health and safety.
	Physical constraints imposed by existing soil and groundwater contamination	Extent of areas where remediation or risk management is not feasible	It is possible that certain areas of contamination are too difficult or too costly to address within the scope of this project. These areas nonetheless pose a risk to human and environmental health.
		Proximity to footprint of river mouth	
	Cost of management of groundwater and soil contamination	Total cost associated with remediation or risk management	The costs to remediate soils and the associated risk management are a significant component of the overall project costs.
	Consistency with objectives of TWRC Sustainability Framework	Discussion of consistency with objectives cross-referenced to other criteria/indicators as necessary	

Don Mouth Naturalization And Port Lands Flood Protection Project

Appendix E-3 Summary of Effects Assessment Methods by Criterion

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Appendix E-3 Summary of Effects Assessment Methods by Criterion

Objective	Criteria	Effects Assessment Method
1. Naturalization	Total naturalized area	Calculated from mapping of alternatives using GIS.
	Area of wetland habitat types created	
	Area of upland open space / terrestrial habitat/	
	Potential for negative and/or beneficial effect on wildlife species or communities	
	Potential for negative and/or beneficial effects on native fish habitat or aquatic communities	
	Potential for hydraulics and hydrology to affect sustainability of vegetation communities and associated fauna	Review of output from the hydraulic modeling, review of mapping for each alternative – especially single versus multiple channels and a qualitative evaluation of potential flow control options under normal and flood conditions for single and multiple channels.
	Potential to maintain and improve connection for aquatic species	Primary river outlet (normal discharge events) was determined visually, either as emptying directly into the Inner Harbour, or indirectly via the Ship Channel.
	Quality of habitat types created	Calculated as the length of level crossings (road and railway) in metres divided by the total area of wetland in hectares. The length of the Gardiner Expressway overpass was measured over the wetlands as a secondary source of impact.
2. Flood Protection	Potential to impact flooding conditions elsewhere	Review of output from hydraulic modeling model, review of mapping for each alternative – especially single versus multiple channels, qualitative evaluation of potential flow control options under normal and flood conditions for single and multiple channels, qualitative evaluation of potential modifications to flow control structures under climate change scenario and review of preliminary Delft-3D model results.
	Potential for sediment to affect flooding and conveyance of flow	Review of output from hydraulic modeling model, review of mapping for each alternative – especially single versus multiple channels and qualitative evaluation of sediment conveyance design options under normal and flood conditions for single and multiple channels.
	Land area removed from flood risk	Calculated property area removed from flood risk within Port Lands using GIS.
	Ability to accommodate potential changes in extreme precipitation and water flows resulting from climate change	Please see Potential to impact flooding conditions elsewhere criterion for effects assessment methods.
3. Operational Management and Constructability	Potential to phase implementation of river modifications	Assessed based on professional judgement.
	Accessibility of river mouth for operational management (i.e., dredge, barge, etc.)	Assessed by reviewing the dimensions of the river mouth against management options available at a coarse level of detail.
	Potential for adverse effects/ improvements to Port operations	The displacement/disruption of Port Authority works yard operations was carried out by assessing the location of the existing works yard against each alternative; the length of dock modified or buried was calculated using GIS; and the disruption to port operations and the assessment of effects on shipping activities was based on discussions with the Toronto Port Authority.
	Annual operations and maintenance costs	Qualitative evaluation of channel sediment and debris management costs for single and multiple channels for both primary and secondary management.
4. Integration with Infrastructure	Potential for changes to existing, planned and proposed roads solely due to DMNP	Assessed the quantities (length and area) of the existing infrastructure within the study area which will be subject to an impact (modification, relocation or removals).
	Potential need for new bridges	Verified the required bridge length by measuring the span using a scalable map.
	Modifications required to accommodate surface transit	Assessed the quantities (length and area) of the existing infrastructure within the study area which will be subject to an impact (modification, relocation or removals).
	Potential for changes to existing rail lines or yards or access roads leading to rail yards	

Appendix E-3 Summary of Effects Assessment Methods by Criterion

Objective	Criteria	Effects Assessment Method
	Potential for changes to existing, planned and proposed underground utilities	
	Potential for modifications to dock walls	
	Potential for changes to existing above ground utilities	
	Costs of infrastructure modification/ relocation	
	Benefits of moving infrastructure associated with DMNP on other area projects	
5. Recreational and Cultural Opportunities	Potential for effect from construction on traditional uses of lands by Aboriginal peoples	Professional judgement based on an understanding of the development history of the study area, its predevelopment environmental character and traditional Aboriginal land use practices.
	Potential for effect from construction on archaeological resources	Inventoried archaeological site/feature locations or reconstructed locations were overlaid on the maps of the alternatives and the number of features falling wholly or partially within the open space/terrestrial, wetland and aquatic zones were tallied and compared.
	Sustainability of active and informal park spaces	Professional judgement.
	Potential for changes to use of river mouth for boating	For compatibility of recreational boating with naturalization the effects assessment was based on discussions with team ecologists.
	Potential to negatively or positively affect recreational boating in the Inner Harbour	Assessed based on discussions with the Toronto Port Authority.
	Potential for change in landscape or views	Measured the width of 'Open space/terrestrial' areas that are situated between proposed development blocks and the downtown skyline using a scalable map.
	Opportunity to enhance/degrade existing and proposed pedestrian/cycling linkages with and between waterfront areas and the rest of the city	Extent of linkages determined through a review of the configuration/location of 'Open space/terrestrial' blocks in relation to their proximity to Lake Ontario Park, Don River Park, Distillery District and East Bayfront and the length of new pedestrian/cycling trails determined using a scalable map.
	Potential to provide functional linkages to Martin Goodman Trail	Prepared mapping to identify and count number of linkages with Martin Goodman Trail.
	Potential for connectivity to waterfront promenade	Determined using a scalable map.
	Potential for displacement from construction of naturalized area on built heritage resources	Overlaid mapped information on the alternatives.
	Potential to provide cultural amenities	
	Potential for connectivity to waterfront promenade	
	Potential to create cultural opportunities around archaeological resources	
	Potential to create cultural heritage resource opportunities around built heritage and cultural heritage landscape resources	
6. Co-ordination with Other Planning Efforts	Consistency with the intent of the City of Toronto Central Waterfront Secondary Plan	Looked at indicators which reflect principles explicit in the plan. These principles include: the creation of a network of waterfront parks, the removal of barriers and creation of connections, transit supportive development, creating walkable neighbourhoods.
	Potential for removal of, or changes to, existing land use	Mapped the existing uses against each of the alternatives to determine which uses would likely be displaced.
	Potential for nuisance effects on the planned and proposed surrounding community	Looked at the location of the operational management area in relation to planned residential uses that would be sensitive to noise and odour nuisances that may be associated with operational management.

Appendix E-3 Summary of Effects Assessment Methods by Criterion

Objective	Criteria	Effects Assessment Method
	Land outside of regulatory floodplain available for development	Calculated using GIS.
	Amenity value created by river and naturalized areas	
	Ability of location of river to support transit utilization	
	Walkability - ability to create pedestrian connectivity between and within neighbourhoods	
	Potential to provide vistas to the downtown skyline	Measured the length of frontage of terrestrial habitat areas with direct views to skyline using scalable maps.
	Potential to facilitate development in the Portlands and East Bayfront (East of Parliament)	
	Opportunity for visual integration with future development plans for the area	
	Employment created from construction activities	
	Implications of construction activities on business operations	
7. Consistency with TWRC Sustainability Framework	Potential for disturbance of contaminated soils	Assessment of effects was conducted using contaminant and stratigraphic distribution mapping available in existing technical reports of the various affected properties. Generated estimated take-offs using map overlays. The interpretations surrounding the various information sources were applied as per the above noted assumptions. Where information gaps occurred, best professional judgment was used to extrapolate /interpolate existing data points. Contaminant distribution information was reviewed for each property and estimates of the quantity and depth of/to zones of affected soil and groundwater were prepared for each property. The information from each property was then assigned to each alternative layout on a proportional basis to represent the likely influence of contamination from any one site on the study area as a whole. Thus if a property is estimated to contain 20,000 m3 of contamination and 50% of its footprint was incorporated into a given alternative, its contribution to that alternative was estimated to total 10,000 m3.
	Ability to manage contaminated soils and groundwater	
	Physical constraints imposed by existing soil and groundwater contamination	
	Cost of management of groundwater and soil contamination	
	Consistency with objectives of TWRC Sustainability Framework	

Don Mouth Naturalization And Port Lands Flood Protection Project

Appendix E-4 Indicators Screened from Step 4 Evaluation

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Appendix E-4 Indicators Screened from Step 4 Evaluation

Objective	Criteria	Indicators Screened
Naturalization	Potential for negative and/or beneficial effect on wildlife species or communities (i.e., minimizing disturbance and connecting habitat)	Ratio of perimeter to area of the largest contiguous terrestrial habitat patch (measure of largest circle within patch)
Flood Protection	Potential to impact flooding conditions elsewhere	Extent of flooding that will continue to occur in developed areas or beyond the naturalization study area
	Land area removed from flood risk	Need for additional flood protection or flood proofing works to eliminate flood risks
		Property area removed from flood risk within Port Lands
Operational Management and Constructability	Potential to phase implementation of river modifications	Ability to divert roads and maintain access during construction
	Accessibility of river mouth for operational management (i.e., dredge, barge, etc.)	Need for access roads to sediment and debris management areas
	Potential for adverse effects/ improvements to Port operations	Displacement / disruption of yards operations
		Disruption to Port operations
Integration with Infrastructure	Potential for changes to existing above ground utilities	Potential for modifications to the hydro bridge and substation
Recreational and Cultural Opportunities	Potential for effect from construction on traditional uses of lands by Aboriginal peoples	Extent of traditional uses of lands within footprint of river mouth
	Sustainability of active and informal park spaces	Qualitative assessment of maintenance requirements of ‘park’ space
	Potential for changes to use of river mouth for boating	Compatibility of recreational boating with naturalization
	Potential to provide functional linkages to Martin Goodman Trail	Number of linkages
Co-ordination with Other Planning Efforts	Potential for removal of, or changes to, existing land use	Employment lost as a result of land use removals

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Appendix E-5 Step 4 Criteria and Indicators Deferred to Step 5 Evaluation

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Appendix E-5 Step 4 Criteria and Indicators Deferred to Step 5 Evaluation

Objectives	Criteria	Indicator	Why Moved to Step 5
1. Flood Protection	Land area removed from flood risk	Potential improvement in assessment values as a result of removal of flood risk	The potential to improve assessment values is being examined as part of a separate study the results of which were not available for the Step 4 evaluation
2. Operational Management and Constructability	Potential to phase implementation of river modifications	Ability to minimize temporary relocations of infrastructure	This indicator could not be measured effectively due to a lack of information with respect to construction staging.
	Annual operations and maintenance costs	Annual cost of maintenance of naturalized areas and flood protection works	This indicator could not be measured effectively due to a lack of information
3. Integration with Infrastructure	Potential for changes to existing, planned and proposed underground utilities	Potential effects on servicing from alignment of river mouth	This indicator could not be measured effectively due to a lack of information
	Costs of infrastructure modification/ relocation	Total cost of infrastructure modification / relocation	This indicator could not be measured effectively due to a lack of information
	Benefits of moving infrastructure associated with DMNP on other area projects		This indicator could not be measured effectively due to a lack of information
4. Recreational and Cultural Opportunities	Potential to provide cultural amenities	Number and type of cultural amenities provided	This indicator could not be measured effectively due to a lack of information
	Potential for connectivity to waterfront promenade	Location and degree of connectivity to proposed waterfront promenade	This indicator could not be measured effectively due to a lack of information
	Potential to create cultural opportunities around archaeological resources	Number of archaeological resources within footprint of river mouth outside of low flow channel	This indicator could not be measured effectively due to a lack of information
	Potential to create cultural heritage resource opportunities around built heritage and cultural heritage landscape resources	Number of built heritage resources and cultural heritage landscapes located within footprint of river mouth outside of low flow channel	This indicator could not be measured effectively due to a lack of information
5. Coordination with Other Planning Efforts	Potential for removal of, or changes to, existing land use	Employment lost as a result of land use removals	This indicator could not be measured effectively due to a lack of information
	Potential to facilitate development in the Portlands and East Bayfront (East of Parliament)	Compatibility of landscape / use within the river mouth lands with surrounding land uses	These indicators could not be measured effectively due to a lack of information
		Density of proposed development areas	
	Opportunity for visual integration with future development plans for the area	Consistency with urban design component of future development plans	This indicator could not be measured effectively due to a lack of information
	Employment created from construction activities	Direct employment and indirect employment	This indicator could not be measured effectively due to a lack of information
	Implications of construction activities on business operations	Access, noise, dust	This indicator could not be measured effectives due to a lack of information with respect to construction staging.
6. Consistency with TWRC Sustainability Framework	Consistency with objectives of TWRC Sustainability Framework	Discussion of consistency with objectives cross-referenced to other criteria/indicators as necessary	