

GARDINER EXPRESSWAY AND LAKE SHORE BOULEVARD EAST RECONFIGURATION ENVIRONMENTAL ASSESSMENT

Stormwater Baseline Conditions Report - 2014



WATERFRONToronto



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1.0 INTRODUCTION

Waterfront Toronto and the City of Toronto (City) have jointly undertaken an Individual Environmental Assessment (EA) to determine the future of the eastern portion of the elevated Gardiner Expressway and Lake Shore Boulevard from approximately Lower Jarvis Street to approximately Leslie Street (referred to as the Gardiner East EA). The EA is being completed pursuant to the Ontario *Environmental Assessment Act* (EAA).

As part of the Gardiner East EA, this report documents the baseline stormwater management conditions within the Gardiner East EA study area.

1.1. Study Area

In 2009 the study area for the EA was defined in the ToR as the section of the Gardiner Expressway and Lake Shore Boulevard East that extends 2.4 km from approximately Lower Jarvis Street to Logan Avenue. Since 2009 this study area has been revised to a slightly greater area in order to capture transition areas to the east and west and the Richmond/Adelaide interchange with the Don Valley Parkway (DVP). The study area now extends from just west of Lower Jarvis Street to approximately Leslie Street. This study area is referred to as the Environmental and Urban Design Study Area. It includes the lands in the vicinity of the section of the Gardiner Expressway and Lake Shore Boulevard East that are being considered for reconfiguration. These are the areas that could potentially experience disruption effects and be transformed through redevelopment opportunities. Figure 1 illustrates the study area.

In some instances stormwater systems extend beyond the study area boundary and could influence roadway reconfiguration activities in the Gardiner Expressway – Lake Shore Boulevard corridor. This is an important consideration since changes in the corridor could have implications outside of the study area.

Figure 1: Study Area



1.2. Study Methodology

Existing and future stormwater management (SWM) baseline conditions were established by reviewing available historical records, Precinct Plans and conceptual stormwater plans for developing neighbourhoods. Federal, provincial and municipal SWM policy and guidelines were also reviewed to establish applicable SWM criteria.

A number of EAs have been carried out within the study area and were the main documents reviewed in establishing existing and future stormwater conditions. These include, but are not limited to the following:

- Don Mouth Naturalization and Port Lands Flood Protection Project EA (DMNP EA, 2013);
- Lower Don Lands Class EA (LDL EAMP, 2010);
- East Bayfront Class EA Master Plan (EBF Class EAMP, 2006); and,
- West Don Lands Class EA Master Plan (WDL Class EAMP, 2005).

Recent Addendums to the above EAs were also reviewed as part of this report. This information has been incorporated into this report and represented graphically where possible.

In addition to the above studies, the following reports, studies and documents have also been reviewed from a SWM perspective to understand the baseline conditions and identify constraints/opportunities in the study area (some of these are studies in progress while others are complete):

- Lower Don Lands Class EA Master Plan Addendum & Environmental Study Report (August 2014);
- Lower Yonge Transportation Master Plan EA (August 2014);
- Lower Yonge Urban Design Report Principles and Recommendations (August 2014);
- Strategic Plan for the Rehabilitation of the F.G. Gardiner Expressway (February 2014);
- Port Lands and South of Eastern Transportation and Servicing Master Plan EA, including Technical Memo #1 – Existing Conditions – Stormwater Management (February 2014);
- Lower Don Lands Infrastructure Master Plan ESR Addendum (January 2014);
- West Don Lands Class EA Master Plan Addendum for Stormwater Quality (July 2013);
- East Bayfront Class EA Master Plan Addendum for Stormwater Quality (July 2013);
- Port Lands Acceleration Initiative (PLAI), (August 2012);
- Don River and Central Waterfront Project (2012);
- Central Waterfront Secondary Plan (2007);
- Lower Don River West Remedial Flood Protection Project Class EA Environmental Study Report (2006);
- East Bayfront Precinct Plan (November 2005);
- West Don Lands Precinct Plan (May 2005); and,

- Wet Weather Flow Management Policy (August 2003)

1.3. Stormwater Management Policy and Criteria

SWM policies have evolved significantly since the development of the Gardiner Expressway and Lake Shore Boulevard. Most storm sewers in older neighbourhoods, such as those in the study area, were designed for minor system conveyance only (e.g., 2-year storm event) and do not include inlet control devices or ways to prevent sewer surcharge. As well, most neighbourhoods do not have engineered overland flow routes (for major system conveyance) to control pooling surface water depths. Where new development has occurred or is planned, the future conditions will reflect current and future policies and standards.

The SWM criteria for the study area are based on the following sources:

- Toronto Wet Weather Flow Management Guidelines (WWFMG, Nov 2006);
- Toronto Green Standard (TGS, Jan 2014);
- Toronto Design Criteria for Sewers and Watermains (Nov 2009);
- Ministry of the Environment (MOE) Stormwater Management Planning and Design Manual (MOE SWM Planning and Design Manual, March 2003); and,
- TRCA requirements.

The SWM criteria established from these sources for addressing SWM controls include the following:

- Water quantity;
- Water balance;
- Water quality; and
- Disinfection for discharge to lake.

The WWFMG provides detailed SWM considerations. Wet weather flow practices follow a hierarchy of source controls to conveyance controls to end-of-pipe controls. Wet weather flow management targets fall under three categories:

1. Water quantity - peak flow control for flood management, and both peak flow and runoff volume controls to mitigate erosion impacts;
2. Water balance (annual runoff volume) - for erosion control, GW recharge and downstream habitat protection; and,
3. Water quality - for protection of downstream water resources.

Quantity controls are intended to control peak flows from a proposed development in order to mitigate downstream impacts. SWM quantity controls within the study area will be designed to collect and convey flows under the following conditions:

- Minor System flows: runoff from rainfall events that can be contained within the storm sewer system (i.e. flows resulting from rainfall events equal to or less than the 2-year design storm event) which will be directed to a treatment facility and then discharged into a receiving watercourse; and,
- Major system flows: flows exceeding the capacity of the sewer system which will be conveyed via an overland flow route to a receiving watercourse.

The *Design Criteria for Sewers and Watermains Manual* released by the City in November 2009 outlines storm sewer design considerations. These criteria will be useful at the detailed design level of analysis. Inlet control devices must limit flow into pipes, causing excess flow to stay on the surface. Storms greater than the 10-year event and up to the 100-year event, must be controlled and conveyed overland. Streets that will act as open channels during severe events must be designed accordingly (e.g., no encroachment is allowed on any traffic lanes).

Water balance is the capture and management of stormwater runoff at or near its source in an attempt to preserve the natural or pre-development hydrologic conditions (i.e., surface runoff, infiltration, and evapotranspiration). Water balance is typically assessed on a seasonal or annual basis and consists of runoff volume source controls such as green roofs, bioretention cells, permeable pavement, soakaway pits, grass channels, dry swales, street tree plantings/tree clusterings, and rainwater harvesting systems (i.e., rain barrels and cisterns). For the study area, the water balance target is a minimum of 5 mm of onsite retention.

Water quality treatment controls are intended to reduce total loading and/or peak concentration of targeted pollutants. Within the study area, for discharges directly to Lake Ontario or the Toronto Waterfront, the WWFMG water quality target for E. Coli is the following:

- (a) Wet Weather Periods: E. coli < 1000/100 mL during swimming season (June 1 to September 30); and,
- (b) Dry Weather Periods: E. coli < 100/100 mL during swimming season.

General provisions include the provision of disinfection treatment (i.e., ultraviolet light radiation or equivalent) for storm runoff from the development site, which discharges through either a new or an existing outfall directly to the lake or waterfront areas.

For the Port Lands and South of Eastern portion of the study area, the water quality treatment plans are anticipated to be different based on plans in progress for the Port Lands and South of Eastern Transportation and Servicing Master Plan. For the Port Lands and South of Eastern study area, the water quality targets include the consideration of Total Suspended Solids (TSS) and E.Coli. The WWFMG's water quality target is the long-term average removal of 80 % of TSS on an annual loading basis from all runoff leaving the proposed development site based on the post-development level of imperviousness.

This long-term average of removal of 80% of TSS requirements is consistent with the “enhanced protection” recommended in the current MOE SWM Planning and Design Manual (March 2003).

2.0 OVERVIEW OF EXISTING DRAINAGE CONDITIONS

2.1 The Don River Watershed

The entire watershed area of the Don River is 360 km². The Don River Watershed possesses a dendritic drainage pattern that flows southward for 38 km, from the river headwaters in the Oak Ridges Moraine to the river outlet in the Inner Harbour of Toronto. There are two main branches of the Don River: the East and West Don, each consisting of many smaller sub-watershed systems (Figure 2). The Lower Don subwatershed is located downstream of the confluence of the East and West branches and includes all of the Don Narrows into the Keating Channel.

Flooding along the Don River has been recorded since the mid-1870s; however significant urbanization of the watershed has severely altered the hydrogeological functioning of the natural watershed. Most of the flooding over the past few decades has resulted in nuisance type flooding, however the watershed would be subject to extensive flooding under a tropical storm similar to Hurricane Hazel (the regulatory flood event). The application of this storm over the Don River Watershed defines the Regulatory Floodplain (DMNP EA, 2013).

Under existing conditions the regulatory floodplain covers an area of 290 ha from the Don River to Woodbine Avenue in the east (refer to Figure 3). The floodplain can be divided into two areas: Spill Zone 1 (south of the Keating Channel and Lake Shore Boulevard), and Spill Zone 2 (east of the Don River). Prior to the construction of the Lower Don River West Flood Protection Landform (referred to as the West Don Lands FPL) there was a third Spill Zone which extended west of the Don River. The reduction in the floodplain area was achieved through the construction of the flood protection landform which allowed the development of the West Don Lands to proceed.

Spill Zone 1 and 2 still exist but will be eliminated with the implementation of the DMNP as the naturalization of the Don River Mouth, with a newly designed spillway, will accommodate stormwater from peak storm events. The implementation of the DMNP would therefore open up the land in Spill Zones 1 and 2 for redevelopment. This is discussed further in Section 4.3, Lower Don Lands, Keating Channel Precinct and Don River Mouth.

Figure 2: Don River Watershed

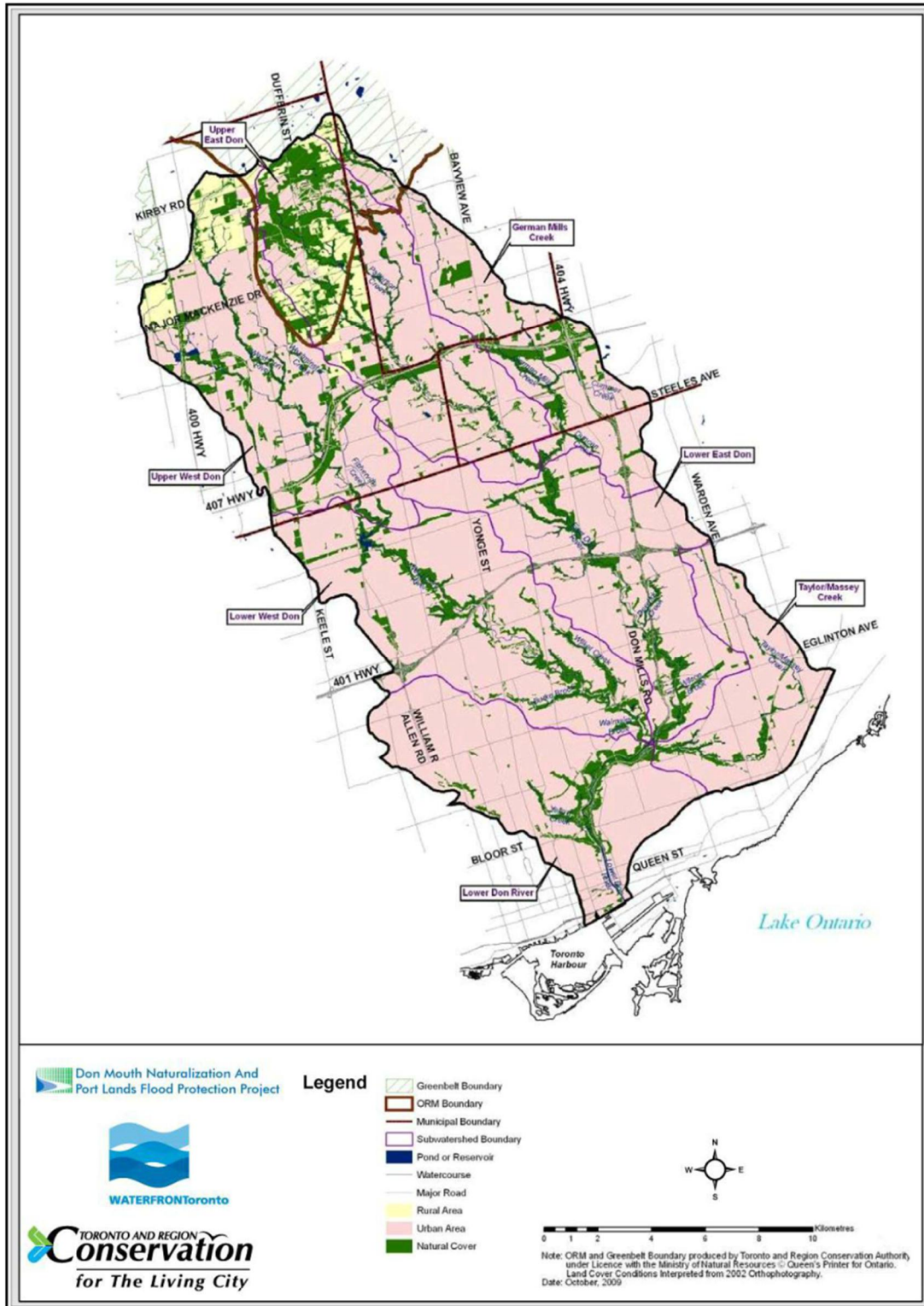
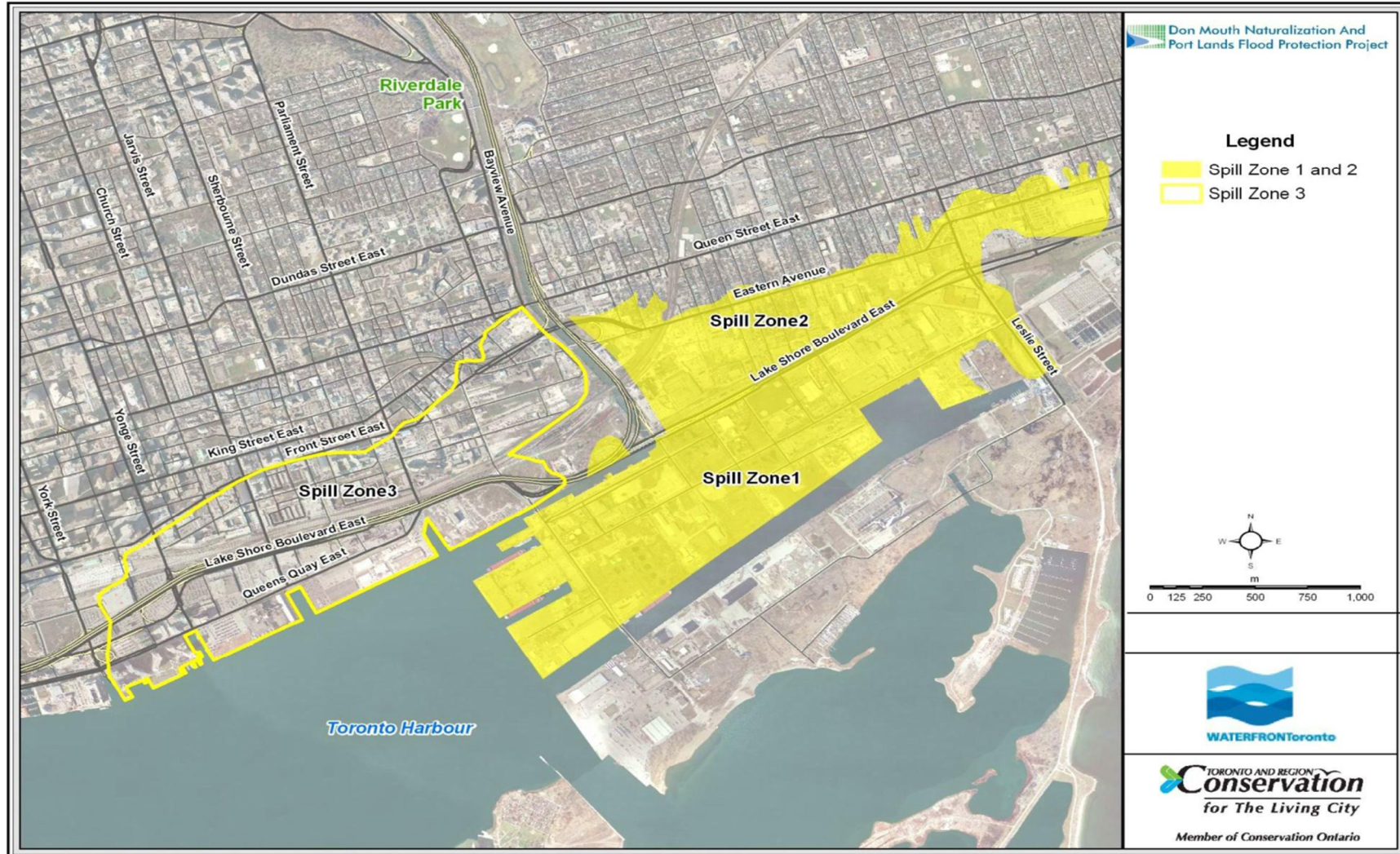


Figure 3: Regulatory Flood Spill Zones for the Lower Don River



3.0 EXISTING BASELINE CONDITIONS

3.1. Gardiner Expressway and Lake Shore Boulevard

The construction of the Gardiner Expressway and Lake Shore Boulevard occurred before the stringent policies for water quantity and quality control existed. As such, there are limited SWM quantity or quality controls in place.

Stormwater drainage from the Gardiner Expressway does not outlet directly to the Lower Don River. Deck drainage along the elevated Gardiner Expressway is collected in depressed basins (hoppers) on the roadway shoulders and discharged through pipes that convey drainage to the ground beneath the Expressway. Where this is not possible, drainage is discharged into the City's sewers along Lake Shore Boulevard. Along Lake Shore Boulevard, storm sewers are separated from sanitary sewers; however, many storm sewers discharge into combined sewer overflows (CSO trunks). Between Yonge Street and Logan Avenue, there are five storm/CSO trunks that cross Lake Shore Boulevard (at Lower Yonge, Lower Jarvis, Lower Sherbourne, Small and Cherry Streets); the latter three serve as outlets for storm sewers servicing Lake Shore Boulevard from Lower Jarvis Street to just east of Cherry Street. Some storm systems originate beyond the study area (e.g., west of Lower Yonge Street) and flow into the study area while others are confined to the boundaries.

East of Cherry Street there are several direct storm outfalls: five outfalls from Lake Shore Boulevard sewers to the Keating Channel, two outfalls from Don Valley Parkway ramp sewers to the Lower Don River and one further storm sewer outlets from the Gardiner Expressway to the Don River.

Existing storm sewers discharge to outfalls or CSOs without any stormwater management quantity or quality controls.

The current storm sewers within the project limits will not be adequate to meet the future waterfront redevelopment needs. Therefore, it is expected that all the existing storm sewers within the study area will be replaced over time as the study area evolves and redevelopment occurs. All new storm sewers will be sized in accordance with the WWFMG, such that these systems will convey runoff equal to the 2-year pre-development flow rate. Therefore, the allowable release rate from any portion of a site draining to the municipal storm sewer system is the 2-year pre-development flow rate based on a runoff coefficient value of 0.50 (WWFMG, Section 2.2.3.8).

Additional details regarding underground storm sewers in the Gardiner – Lake Shore Boulevard right of way corridor are presented in the Infrastructure Baseline Report for the Gardiner East EA, which provides documentation on the conditions of the roadway and underground utilities of significance within the right-of way.

3.2. Port Lands and South of Eastern

Background studies completed for the Port Lands and South of Eastern Transportation and Servicing Master Plan indicate that there is limited existing SWM infrastructure within this area.

Within the Port Lands, in the South of Ship Channel area, stormwater runoff typically drains via overland flow routes to the Ship Channel or into Lake Ontario. During heavy rainfall, informal ponding of runoff in low-lying areas and open ditches usually occurs. North of the Ship Channel, south of Lake Shore Boulevard, drainage routes flow from north to south and there is some infrastructure in place to meet immediate needs of each development. North of Lake Shore Boulevard, south of Eastern Avenue and east of the Don River, storm servicing ranges from 300 to 600 mm diameter pipes, which outlet directly to the Don River.

In the South of Eastern area, west of Leslie Street, minor system flows are conveyed south and downstream to the Port Lands and discharges into Turning Basin. This area experiences chronic basement flooding and is identified in City of Toronto Basement Flooding Protection Program (Part of Study Area 32). East of Leslie Street, minor system flows are conveyed south and outlet into Ashbridges' Bay. There is an existing network of sanitary and combined sewers that appear to be outside the Port Lands study area. It appears that these combined sewers overflow directly to the Don River and have little influence on the Port Lands and South of Eastern area.

The water quality of stormwater discharges poses additional concerns due to the existing combined sewers that have the potential to spill untreated into Lake Ontario. The Don River and Central Waterfront EA includes plans to capture and treat polluted stormwater and raw sewage from combined sewer overflows before they reach the lakefront. There are little to no SWM measures within the area that meet the requirements of the City of Toronto's Wet Weather Flow Management for stormwater quality and quantity.

3.3. West Don Lands Precinct

The majority of the West Don Lands (WDL) Precinct is serviced by separate storm sewers with a small area serviced by combined sewers. Approximately 60% of the storm system drains to the Don River via five outfalls: one storm and one CSO/storm outlet at Queen Street East, one storm outlet under the Richmond-Adelaide-Eastern ramps, one CSO/storm outlet on Eastern Avenue and one storm outlet at Front Street East.

The remaining 40% of the storm system drains via CSOs on Parliament/Small and Cherry Streets to the Toronto Inner Harbour. The Cherry Street sewer also services areas north of Eastern Avenue. Under heavy rainfall, the Cherry Street underpass under the railway corridor experiences flooding due to the large catchment area draining to this point. The CSO on Cherry Street south of the underpass is also surcharged under current development under the City of Toronto 2-year design flow rate. Periods of high Lake Ontario water level conditions further exasperate the situation as backwater extends into the CSO outlet in these conditions (WDL Class EAMP, 2005).

The stormwater system for the WDL Precinct involves using existing storm sewers of acceptable condition; rehabilitating existing sewers of poor conditions but with sufficient capacity and reconstructing sewers without adequate capacity; constructing new storm sewers in new and realigned roadways; using stormwater as a resource; and constructing end-of-pipe SWM facilities to improve water quality. The recent SWM works that have been developed as part of the WDL Precinct redevelopment are compatible with the Lower Don River West Remedial Flood Protection Class EA study recommendations (approved in October 2005), as well as adherence to the City's WWFMG (2006).

The WDL Class EA MP recommended that stormwater be treated by an end-of-pipe facility located on the north side of the railway corridor, east of Cherry Street. The treatment facility process was to consist of an oil-grit separator (OGS), filtration and ultra-violet disinfection.

Two addenda to the WDL Class EAMP were completed in June 2010 and July 2013. The June 2010 addenda relocated the proposed Stormwater Quality Facility (SWQF) immediately south of the railway corridor at 480 Lake Shore Boulevard, to offer the ability to service a larger area of the Waterfront. The relocation allowed for future inclusion of storm drainage from the easterly portion of the North Keating Area (NK2- east of Cherry Street) in the Lower Don Lands (LDL) Precinct. The treatment process was revised to consist of sedimentation (with an underground sedimentation tank) rather than filtration. The addendum also addressed phasing the implementation of the ultra-violet equipment.

By late 2012, a new stormwater outfall was constructed to convey and treat stormwater for the WDL, primarily consisting of:

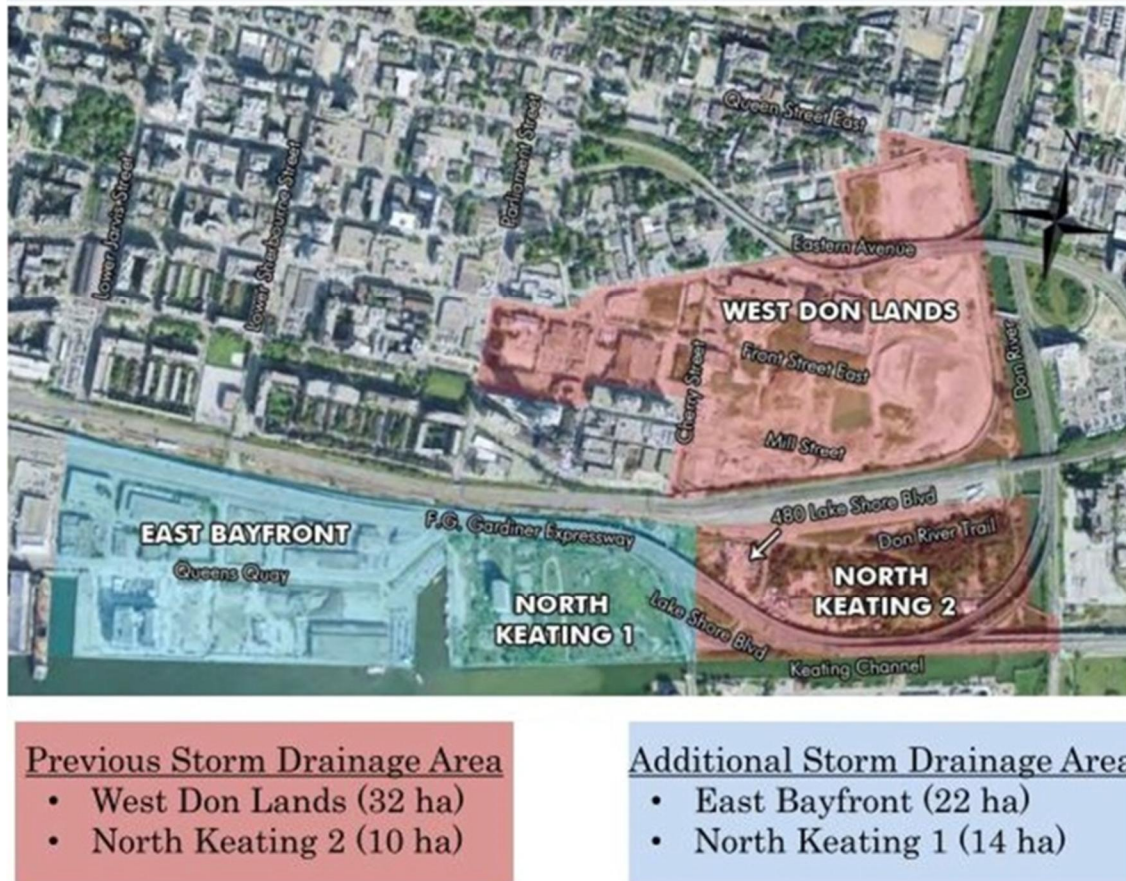
- Outfall tunnel to Keating Channel
- Stormwater storage shaft and pumping at 480 Lake Shore Boulevard
- Major system inlet (for overland flow) from the low point at Cherry Street
- Minor system inlet (for local storms) from the WDL
- Oil-grit separator in the WDL

The 2013 addendum for the WDL Class EAMP revised the proposed end-of-pipe facility to service the WDL. The 2013 modifications expanded the treatment capacity of the SWQF at 480 Lake Shore Boulevard to include East Bayfront and North Keating 1 areas; an additional 36 hectares, for a total of 78 hectares. The stormwater quality treatment process was also updated to include a ballasted flocculation clarifier at 480 Lake Shore Boulevard. The additional areas have flow equalization tanks with pumps and force mains in order to convey stormwater to the proposed facility at a controlled rate. Figures 4 and 5 show the storm drainage service areas for the SWQF at 480 Lake Shore Boulevard, and the new stormwater quality facilities that have been constructed for the WDL, respectively.

UV equipment phasing was also updated in the 2013 addendum.

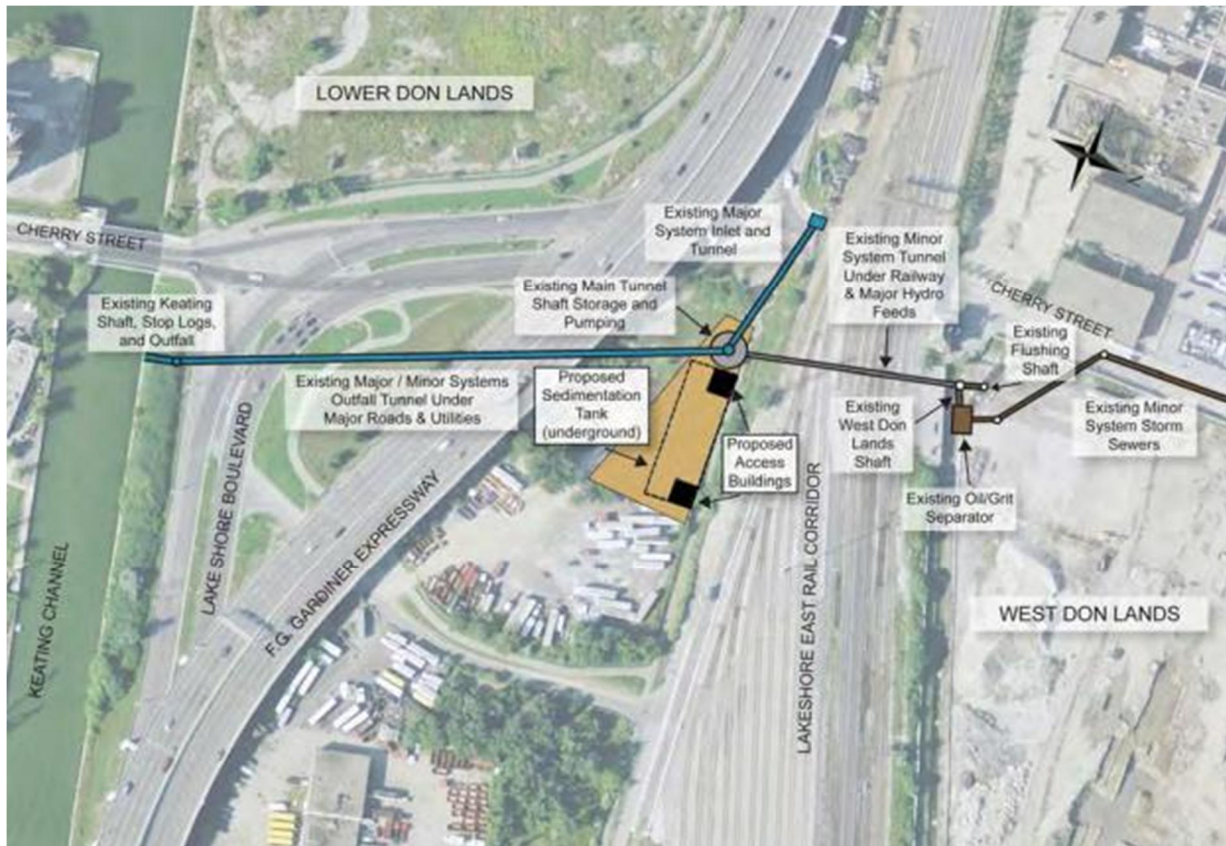
The planned end-of-pipe facility within the WDL satisfies the City's WWFMG water quality criteria which specify that E. Coli concentrations in discharges to Lake Ontario be reduced to less than 1000 counts/100 mL during the swimming season under wet weather conditions.

Figure 4: Storm Drainage Service Areas for SWQF AT 480 Lake Shore Boulevard



Source: WDL Class EA Addendum for Stormwater Quality, 2013

Figure 5: Storm Water Quality New Facilities for WDL



Source: WDL Class EA Addendum for Stormwater Quality, 2013

As mentioned in Section 2.1, the WDL redevelopment included the creation of a Flood Protection Landform (FPL) on the western bank of the Lower Don River. The existing overland flow path to the Lower Don River has been obstructed with the FPL that protects the WDL area and beyond to the west, against floodwaters from the Don River. Corktown Common, a park located at the southeast corner of this area, is the primary feature for the FPL. As a result of the FPL, overland flow is directed towards the new Cherry Street storm sewer. The FPL, working in conjunction with the Don River Railway Bridge extension and pedestrian underpass (construction of the bridge extension and pedestrian underpass were completed in September 2007), removes the risk of flooding to 210 ha of land located west of the Lower Don River (including a stretch of Lake Shore Boulevard between Lower Jarvis Street to just west of Cherry Street), and has made the development of the WDL and the East Bayfront communities possible.

3.4. East Bayfront Precinct

The East Bayfront (EBF) Precinct lies between Lower Jarvis and Parliament Streets and is currently serviced by a separate storm sewer network. Storm service north of Queens Quay is provided by municipal storm sewers. These storm sewers run southerly along Lower Jarvis Street, Richardson Street

and Bonnycastle Street and connect to the Queens Quay sewers, which transverse easterly and connect to the CSO trunks at Lower Sherbourne and Small Streets. The two CSO trunks eventually discharge to Lake Ontario.

The 2006 EBF Class EA Master Plan was undertaken to support the redevelopment of the EBF Precinct with respect to storm, sanitary, water and transportation aspects. It was recommended that stormwater be treated by an end-of-pipe facility at two locations at Lower Sherbourne Street and Parliament Street. The treatment process at each location was to consist of sedimentation tanks, pumps, filters and ultra violet disinfection.

A 2009 addendum to the EBF Class EAMP was undertaken and the treatment process was revised to consist of oil-grit separators, one large sedimentation tank located inside the lake beneath the boardwalk, a wetland and UV disinfection. The addendum also provided the opportunity for a centralized UV disinfection facility to include flows from the westerly portion of the Keating Channel Precinct area via pumping and force main.

By mid-2011, stormwater quality features in Sherbourne Common Park were constructed and consisted of:

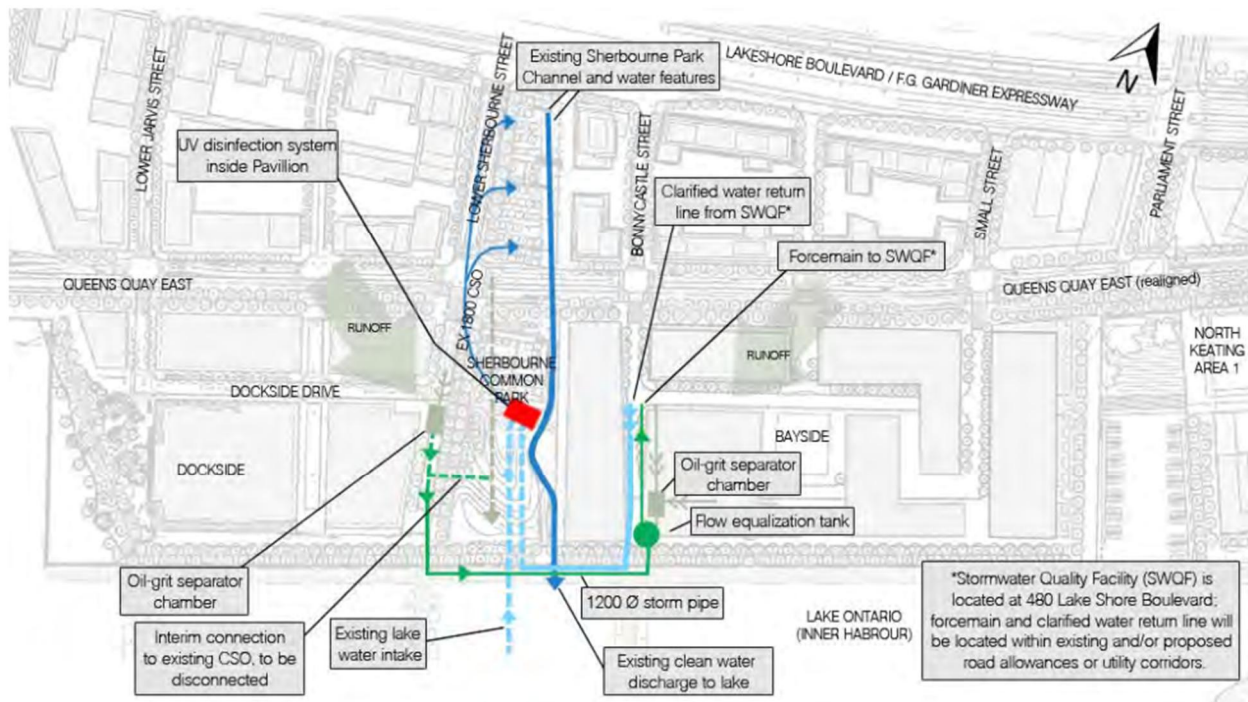
- Water channel (urban river) to Lake Ontario;
- Interim connection to the Lower Sherbourne combined sewer overflow (CSO) outfall to Lake Ontario;
- UV disinfection facility located inside the park's Pavilion;
- Oil-grit separator chamber; and
- 'Light Showers' landscape water art features.

These facilities are not designed to handle storm flows from the Gardiner Expressway and/or Lake Shore Boulevard. During the design stages, the 'dockwall' sedimentation tank and wetland became no longer feasible. A 2013 stormwater quality addendum to the EBF Master Plan EA was completed to re-evaluate storm treatment options with consideration of the aforementioned constructed SWM systems.

The revised stormwater quality concept was based on and integrated with the centralized ballasted flocculation facility proposed in the 2013 WDL Class EA Master Plan addendum. A flow equalization tank was required to attenuate the storm flows and mitigate the size of the downstream clarifier. Submersible pumps located at the base of the tank were included to be used to convey stormwater to the above-grade centralized SWQF via a forcemain. Clarified water returns from the SWQF and is directed to the existing UV disinfection system at Sherbourne Common Park. During large storms, a portion of the flow overflows the tank and discharges directly into Lake Ontario (Inner Harbour) via an outfall.

Figure 6 shows the stormwater quality facilities, including the 1200 mm diameter storm pipe from the Dockside (i.e., along the 'dockwall') and beneath the boardwalk.

Figure 6: East Bayfront Stormwater Quality Facilities



Source: East Bayfront Class EA Addendum for Stormwater Quality, 2013

3.5. Lower Don Lands and Keating Channel Precinct

The Lower Don Lands (LDL) area falls within the greater Port Lands area and is composed entirely of lands that were reclaimed from Lake Ontario and Ashbridge's Bay Marsh. The Keating Channel Precinct (also known as North Keating) makes up the northern part of the Lower Don Lands and is located north of the Keating Channel and south of the railway embankment.

Existing stormwater infrastructure in the LDL includes both separated storm and combined sewers. Combined sewers do not discharge directly to a receiving water body, rather they discharge to local sanitary sewers. Approximately 50% of the stormwater collected in the LDL discharges via storm sewers to Lake Ontario, the Inner Harbour and the Keating Channel.

Among the limited sewer outlets in the LDL, there is an existing 1350 mm x 1350 mm CSO outlet at Cherry Street and Lake Shore Boulevard. As previously mentioned, the area tributary to this outlet consists of approximately 40% of the existing WDL precinct area, and a significant area north of the WDL (LDL EAMP, 2010).

There are currently no existing water quality improvement facilities in the LDL. In the Keating Channel Precinct there is the newly constructed stormwater quality facility at 480 Lake Shore Boulevard as discussed in Section 3.3 above. The current storm sewers within the Keating Channel Precinct have not

been assessed for their capacity to address the future development, however, it is expected that due to the proposed changes to the land use for the area, and the need to address both SWM quality and quantity issues, the existing storm sewer system will not be adequate to meet the future needs. Therefore, it is expected that all the existing storm sewers within the Keating Channel Precinct will be replaced.

Currently the Lower Don Lands cannot be redeveloped until flood protection for the area is completed. This will be done through the implementation of the Don Mouth Naturalization Project which will provide flood protection for the Lower Don Lands and the rest of the Port Lands. Details regarding this SWM improvement are presented in Section 4.2.

3.6. Distillery District and St. Lawrence Neighbourhood

The Distillery District is located on the north side of the rail line, between Parliament Street and Cherry Street. The Distillery District has local separated storm sewers that discharge to the Parliament and Cherry Street CSOs. West of the Distillery District is the St. Lawrence neighbourhood which runs west to Jarvis Street.

Most of the St. Lawrence Neighbourhood has local separated storm sewers that discharge to the Sherbourne Street CSO trunk, with a small portion of the area in the east draining to the Parliament/Small Street CSO sewer.

No existing water quality improvement facilities exist in either of these neighbourhoods. With the implementation of the WDL flood protection landform, these areas are protected from major storm events.

3.7. Lower Yonge Area

Stormwater system drainage in the study area between Lower Jarvis Street and Lower Yonge Street includes combined sewers that discharge to the Lower Jarvis CSO trunk. As well, some local separated storm sewers south of Wellington Street drain to the Lower Jarvis CSO trunk. There is a 2.3 m x 2.6 m storm sewer culvert running north-south along the west side of Yonge Street. At the time of this report there were no existing water quality improvement facilities to be reported in the Lower Yonge area.

4.0 OVERVIEW OF FUTURE DRAINAGE CONDITIONS

4.1 Introduction

The waterfront is an area of transition with new investment occurring rapidly. The future conditions are not static and the following sections reflect known information about development in the study area. The nature of this transitioning area is that even planned development may alter by 2031. Therefore, the future conditions represent the best reasonable representation of this area that is known at the time this review was completed. Figure 7 provides an overview of the significant SWM improvements that are anticipated to be in place by 2031 as described in the following sections. The figure focuses on flood protection plans; SWM measures such as sewers are not detailed in the figure.

The most significant changes in SWM conditions in the study area by 2031 will occur in the Lower Don Lands, Keating Channel Precinct, Don River Mouth, Port Lands and South of Eastern Area. This is primarily related to the naturalization of the Don River Mouth and the servicing improvements required to redevelop the Port Lands and South of Eastern. Improvements anticipated by 2031 are described in the subsequent sections.

Figure 7: Future 2031 Conditions



4.2. Lower Don Lands, Keating Channel Precinct and Don River Mouth

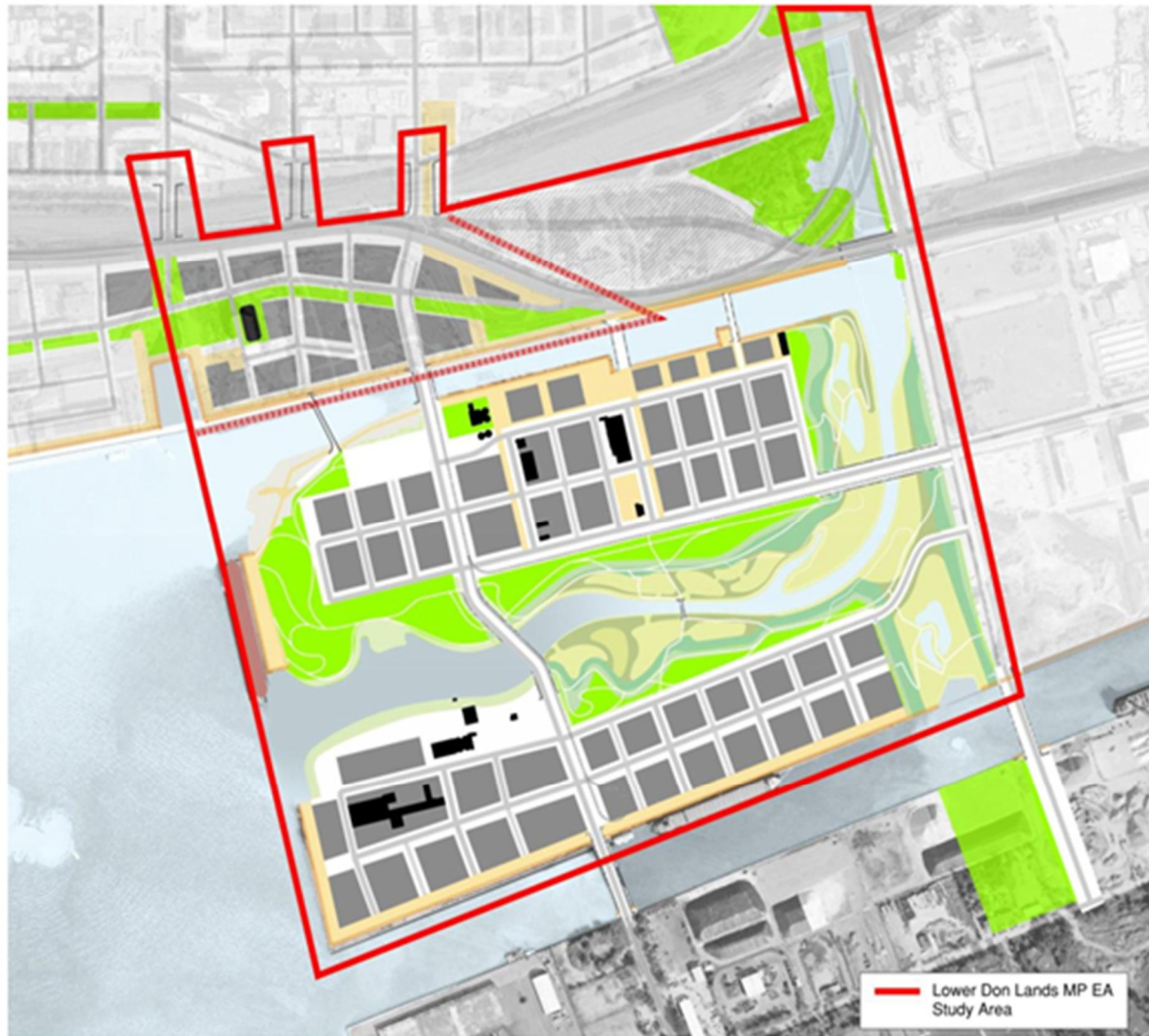
The DMNP EA was carried out to remove the risk of flooding to 290 hectares of urban land (Spill Zone 1 and Spill Zone 2 as illustrated in Figure 2, Section 2.1) and to naturalize the mouth of the Don River (Don Mouth). The result of this individual EA was a conceptual design of the DMNP consisting of:

- Flood protection features;
- Sediment, debris and ice management;
- Naturalization;
- Opportunities for recreation features associated with the new river valley system and parkland outside the floodplain; and
- Integration with the Lower Don Lands Planning and servicing.

Flood protection improvements anticipated through the implementation of the DMNP Plan and Lower Don Lands Plan and are shown in Figure 8. The plan includes the creation of a naturalized spillway / greenway for the Don River Mouth and the realignment of the Don River Mouth to more closely reflect the natural outflow of the river. This will provide the necessary flood protection for the Lower Don Lands and Port Lands that is required for redevelopment to occur in these areas. With the implementation of the DMNP, Spill Zones 1 and 2 will be eliminated as the area will be able to accommodate stormwater from peak storm events.

The 2010 Lower Don Lands Class Environmental Assessment Master Plan (LDL EAMP) was carried out in close coordination with the DMNP EA and integrates the results of the Port Lands Acceleration Initiative (PLAI). The study area for the DMNP EA is similar to that of the LDL EAMP. As such, the LDL EAMP also addresses the municipal infrastructure servicing requirements necessary to be relocated as a result of the DMNP EA and/or to support the land uses proposed as part of the revitalization of the LDL area.

Figure 8: Lower Don Lands and DMNP Plans



Source: 2014 LDL EAMP Addendum ESR

The 2010 LDL EAMP recommended an integrated treatment train approach to SWM planning within the LDL area, comprised of source controls, conveyance controls and end of pipe controls. The preferred stormwater quality treatment alternative for the Keating Channel Precinct was a common stormwater quality facility (SWQF) optimized to meet water quality targets and sized based on available space. This alternative consisted of oil-grit separators, ultra-violet treatment; storage areas and seepage/riverine wetlands.

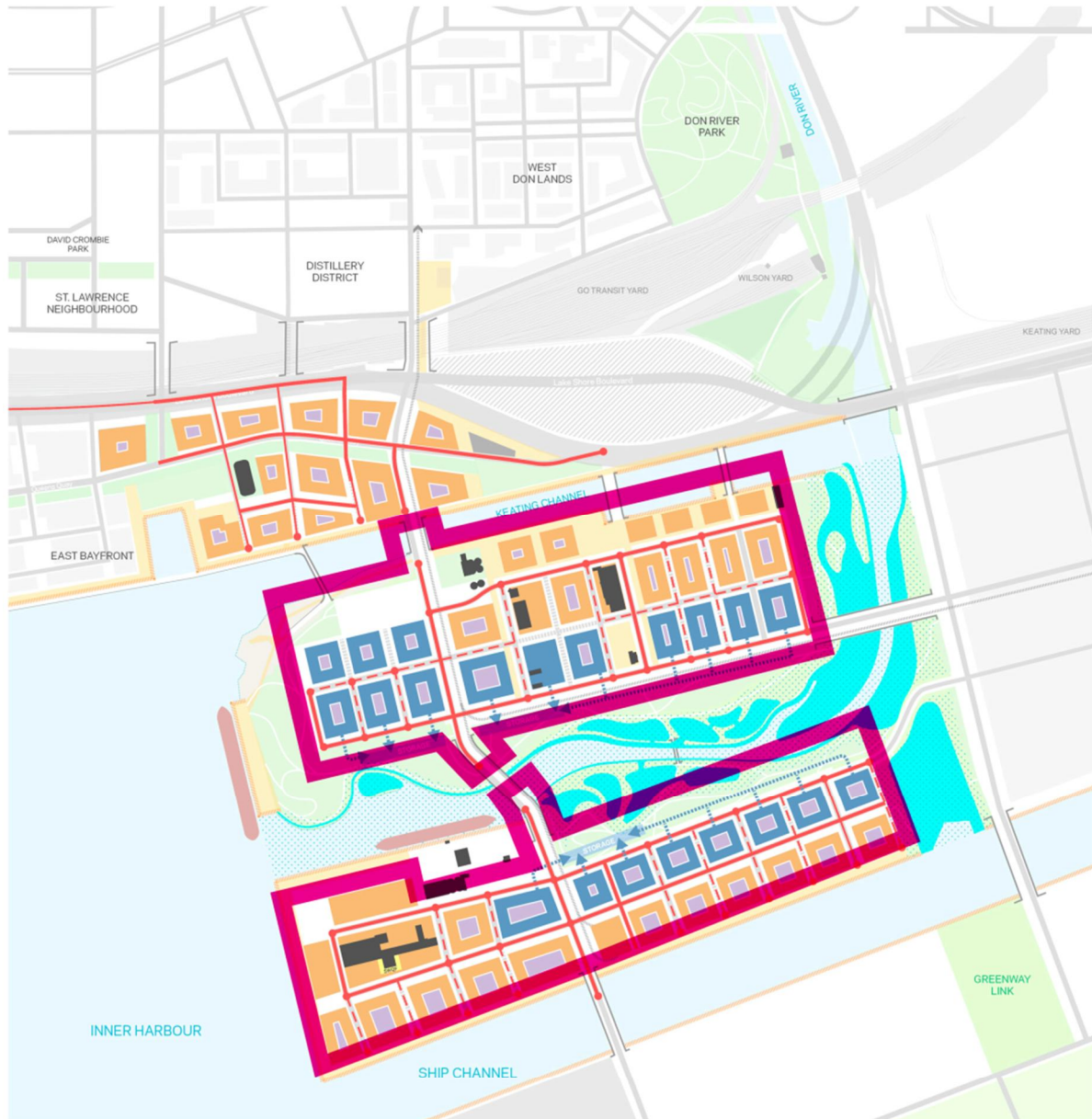
As a result of changes from the PLAI, the proposed infrastructure for stormwater drainage system within the LDL area was re-configured. A 2014 addendum to the LDL EAMP was subsequently carried out. The only significant change resulting from the PLAI was the re-location of the stormwater quality treatment

facilities. The facilities required new locations to correspond to changes in development blocks and open spaces. Figure 9 illustrates the revised stormwater drainage plans.

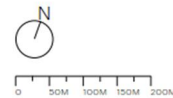
In the 2014 addendum to the LDL EAMP a high level review of the potential discharge locations from the LDL stormwater quality facility (SWQF) was also completed. This included a re-evaluation of the detailed design of the new Ballasted Flocculation Facility (BFF)/UV stormwater quality treatment concept adopted for the LDL. The re-evaluation resulted in a stormwater quality treatment solution that consisted of a conventional gravity piped system draining to an OGS for pre-treatment, then draining to a storage tank and subsequently pumped to a BFF and UV disinfection for a high level of stormwater quality treatment. The preferred alternative design for mechanical stormwater treatment was one BFF/UV facility to be constructed. Figure 10 shows the potential discharge locations for treated/clarified water from the BFF/UV SWQF that were reviewed in the 2014 addendum. It was determined that there were no clear differences in the various discharge locations that would strongly favour one location over another. It was recommended that the Precinct Plan detailed design process confirm the location and mitigation needed. This is now in progress.

Figure 9: Lower Don Lands Stormwater Drainage Plan

2013 LDL MP EA STUDY- STORMWATER DRAINAGE

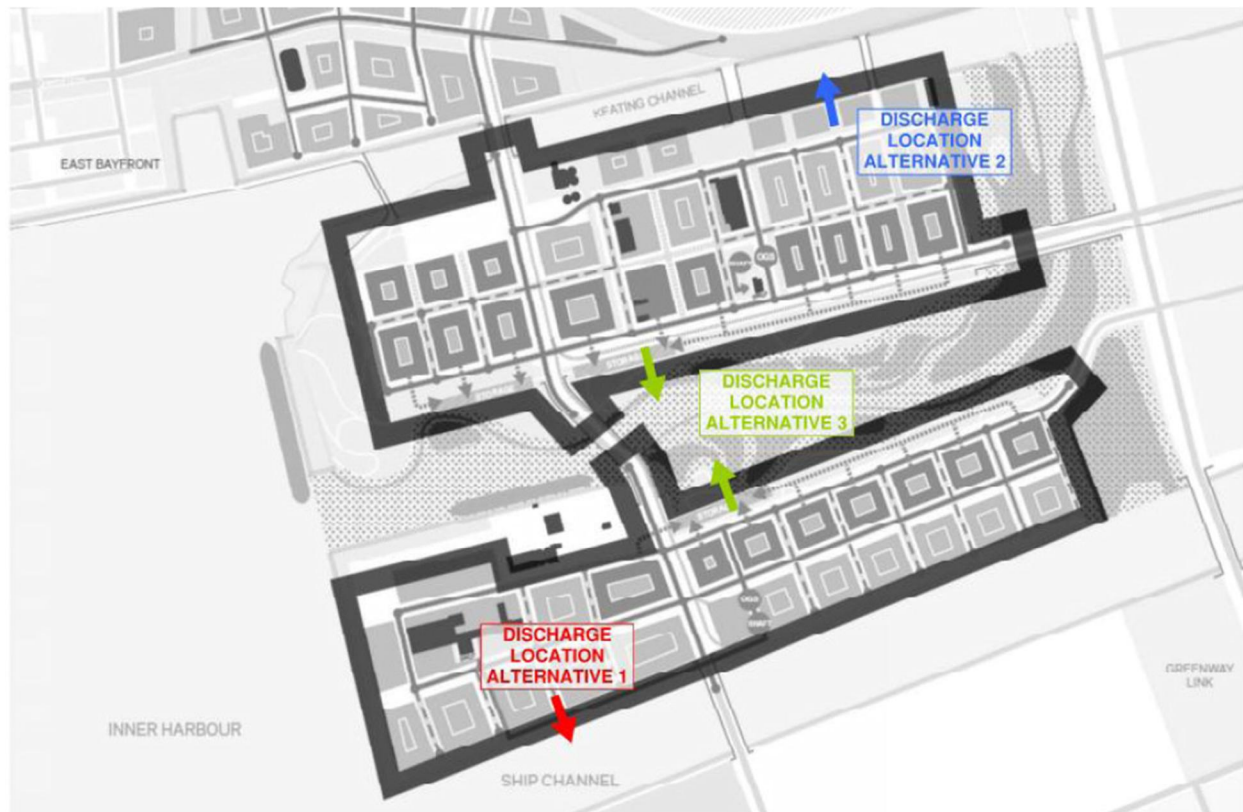


- ROOFS OF BLOCKS DRAINED TO HIGH-QUALITY WETLANDS
- ROOFS OF BLOCKS USED FOR STREET TREE IRRIGATION AND FLUSHING OF SALT RUNOFF
- STREET RUNOFF ACHIEVES MOE ENHANCED STORMWATER QUALITY
- NON-ROOF, NON-ROAD (PRIVATE)
- PARKLAND
- RIVERINE WETLAND
- POTENTIAL STORAGE



Source: 2014 LDL EAMP Addendum ESR

Figure 10: Potential Discharge Locations for LDL BFF/UV Facility



Source: LDL Class EA Addendum for Stormwater Quality, Jan 2014

Regarding stormwater quantity control, the proposed re-development of the LDL area will require the removal of much of the existing storm drainage infrastructure as the site is re-graded to elevate the existing ground for flood protection; to create the new river channel; and to create the flood protection spillway. The existing stormwater drainage system will need to be replaced with a modern SWM system as outlined in the LDL EAMP Addendum 2014.

Stormwater quality treatment for discharged from the Keating Channel Precinct will be directed to the ballasted flocculation facility at 480 Lake Shore Boulevard (which is described in Section 3.3 above). The Keating Channel Precinct will require flow equalization tanks incorporating pumps and force mains, or gravity sewers, in order to convey the flow to the stormwater quality facility.

4.3. Port Lands and South of Eastern

The SWM plans for the Port Lands and South of Eastern are being confirmed through the *Port Lands and South of Eastern Transportation and Servicing Master Plan EA* (TSMP EA) that is currently underway. The TSMP EA considers the recommendations of the completed Don River and Central Waterfront Project EA and is being coordinated with other EAs currently underway within and adjacent to the study area.

Typical stormwater related issues exist within the Port Lands and South of Eastern TSMP EA study area. In the Port Lands, there is little infrastructure south of the Ship Channel and as a result, all stormwater runoff is ponded in low lying areas or conveyed via overland flow routes via the Ship Channel or directly to Lake Ontario. North of the Ship Channel, drainage is directed from the north to the south. There is some infrastructure that has been designed and placed to meet the immediate needs of each development. Within the Port Lands little to no SWM measures exist to meet the requirements of the Toronto Wet Weather Flow Management Guidelines.

The South of Eastern area has been identified in the City's Basement Flooding Protection Program as part of Study Area 32 experiencing chronic basement flooding. The Class EA Study for Area 32 identified a number of sewer upgrade projects to mitigate current basement flooding risks. While the South of Eastern portion of the study area has no combined sewers, the planned sewer upgrades within Area 32 (along Eastern Avenue and to the north of Eastern Avenue) may cause a potential hydraulic impact.

The current sewer systems within the Port Lands and South of Eastern area had not at the time of this report been assessed for their capacity to address future development, however due to the changes to land use being considered for the area, and the need to address both SWM quality and quantity issues, it is expected that the existing storm sewer network will not be adequate to meet future needs.

It is expected that all existing storm sewers within the study area will be replaced and new storm sewers will be sized in accordance with the WWFMG such that these systems are able to convey runoff equal to the two-year pre-development rate.

SWM controls recommended for implementation in the Port Lands and South of Eastern area will be subject to boundary conditions for both major and minor system flows, and will be largely based on Lake Ontario water levels and recommendations from the DMNP EA (2013) and LDL EAMP Addendum (2014).

To satisfy the applicable SWM criteria and policies detailed in Section 2.2, the SWM strategy for the Port Lands and South of Eastern area will utilize a Best Management Practices (BMP) and consider source, conveyance and end-of-pipe control measures.

4.4. Lower Yonge

The Lower Yonge Transportation Master Plan EA and Urban Design Study were recently completed. The two studies assess the Lower Yonge area from a transportation and urban design planning perspective which will then be used to inform the future Lower Yonge Precinct Plan. It is expected that the Lower Yonge Precinct Plan will detail SWM infrastructure measures to be implemented or upgraded within the area; however in the interim, the future conditions are assumed to be reflective of existing conditions.

5.0 CONCLUSION

Overall, water quality for the Lakefront is similar to the discharges from the Don River; there are concerns with water quality due to the existing combined sewers that have the potential to spill directly into the lake untreated. The Don River and Central Waterfront Project EA, includes plans to capture and treat polluted stormwater and raw sewage from combined sewer overflows before they enter the lakefront. As a result, the investigations call for the upgrades to the City's critical sanitary trunk sewer infrastructure to improve operations and service future growth.

To improve stormwater quantity and quality in the study area it is the City's objective to reduce CSOs and mitigate the amount of pollution entering local water bodies. As part of the revitalization efforts in the study area and surrounding precincts, the City aims to eliminate all combined sewers and have the storm sewer discharge directly to the lake with the appropriate treatment. Where possible, sanitary sewers are to be separated from the storm sewers and these sanitary discharges are to be captured, redirected and treated at a wastewater treatment plant prior to discharge to the Lake. Under existing conditions the storm/CSO trunks that traverse the study area are generally surcharged with the exception of the Jarvis Street CSO. While combined sewers are not permitted for new construction, the City guidelines state that existing combined sewers may be rehabilitated or replaced by new combined sewers within the City's defined combined sewer area (Design Criteria for Sewers & Watermains, 2009).

A reconfiguration of Lake Shore Boulevard and the Gardiner Expressway provides an opportunity to address the degraded stormwater quality due to urbanization, in addition to assessing the impact of uncontrolled peak flows which may impact surrounding areas.

Between now and 2031, stormwater management in the study area will employ a number of techniques and methods to improve on current conditions. To satisfy the criteria that regulates SWM in the City, the undertaking will need to consider source, conveyance and end-of-pipe controls in detailed design. Source controls include the lot level SWM features described under water balance above. Conveyance controls include SWM measures along roadways and pathways such as infiltration basins/galleries, exfiltration trenches, enhanced ditches/swales and OGS units. End-of-pipe controls typically include SWM detention facilities such as underground tanks or surface ponds designed to address any water quality and quantity targets. Conveyance will be the most critical in the roadway design considerations.

6.0 REFERENCES

Central Waterfront Secondary Plan (2007)

Don Mouth Naturalization and Port Lands Flood Protection Project EA (DMNP EA, 2013)

East Bayfront Class EA Master Plan Addendum for Stormwater Quality (July 2013)

East Bayfront Class EA Master Plan (EBF Class EAMP, 2006)

East Bayfront Precinct Plan (November 2005)

Lower Don Lands Class EA Master Plan Addendum & Environmental Study Report (August 2014)

Lower Don Lands Infrastructure Master Plan ESR Addendum (January 2014)

Lower Don Lands Class EA (LDL EAMP, 2010)

Lower Don River West Remedial Flood Protection Project Class EA Environmental Study Report (2006)

Lower Yonge Transportation Master Plan EA (August 2014)

Lower Yonge Urban Design Report Principles and Recommendations (August 2014)

Port Lands Acceleration Initiative (PLAI), (August 2012)

Port Lands and South of Eastern Technical Memo #1 – Existing Conditions - Stormwater Management
(February 2014)

Strategic Plan for the Rehabilitation of the F.G. Gardiner Expressway (February 2014)

West Don Lands Class EA Master Plan Addendum for Stormwater Quality (July 2013)

West Don Lands Class EA Master Plan (March 2005)

West Don Lands Precinct Plan (May 2005)

Wet Weather Flow Management Policy (August 2003)