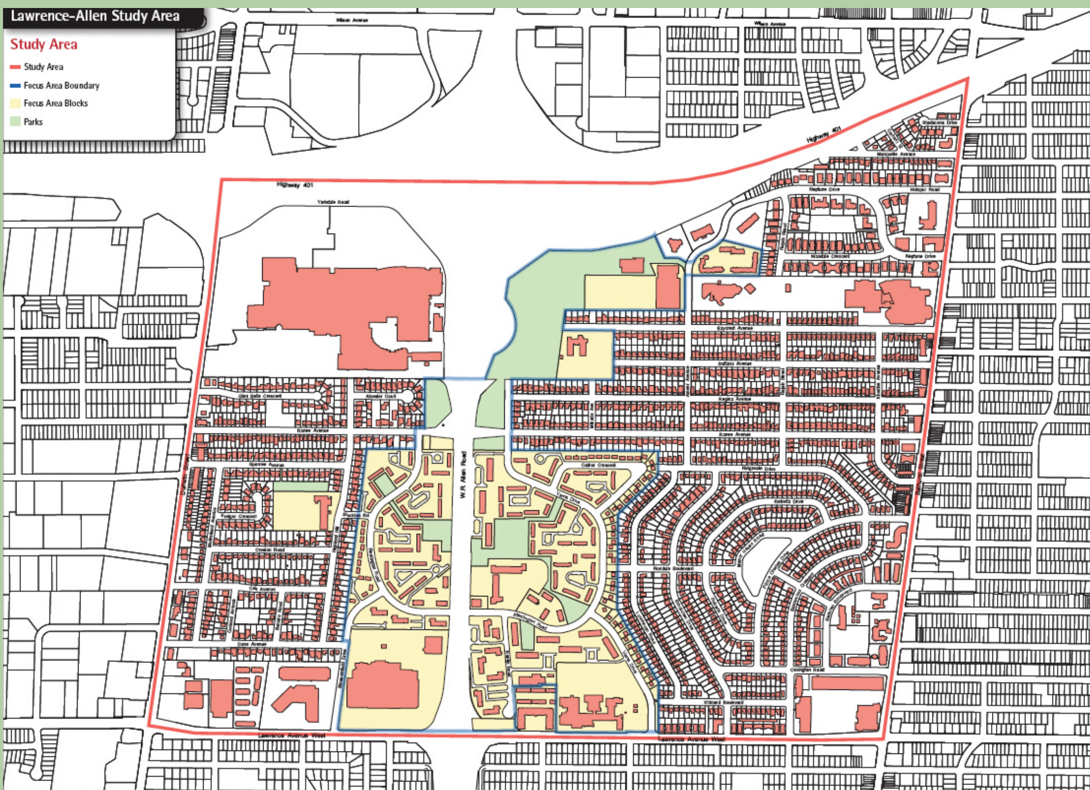
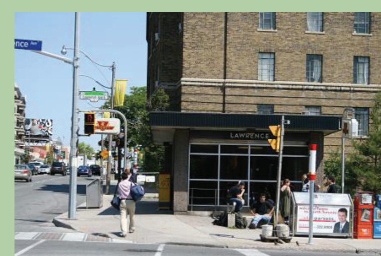
# Attachment 7: Lawrence-Allen Infrastructure Master Plan



# Lawrence-Allen Revitalization Study

## Infrastructure Master Plan

MMM GROUP

September 2011 | Project No. 10-08043

D10-010-14

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**List of Abbreviations**

LARS: Lawrence-Allen Revitalization Study

EA: Environmental Assessment

TCHC: Toronto Community Housing Corporation

TDSB: Toronto District School Board

LHR: Lawrence Height Revitalization

WWFMG: Wet Weather Flow Management Guidelines

# 1 INTRODUCTION & STUDY BACKGROUND

## 1.1 Purpose

The City of Toronto has initiated a comprehensive Revitalization Study for the Lawrence-Allen area. The Revitalization Study (Study) creates a vision for the area in order to guide decision-making, provide a basis for a comprehensive planning framework and serves as a background study for the Secondary Plan for the Area. The purpose of the Study is to comprehensively plan for future development, parks and open space, transportation infrastructure, servicing infrastructure, community facilities, schools and environmental sustainability in the Study Area. The Study works to meet the aspirations of community stakeholders, build on existing strengths and opportunities, and achieve broader City objectives, including those contained in the Official Plan.

MMM Group Limited (MMM) forms part of the Consulting Team currently undertaking the Lawrence-Allen Revitalization Study (LARS). The specific role of the MMM Group is to prepare an Infrastructure Master Plan for the Study Area. This Infrastructure Master Plan identifies improvements to the local infrastructure in the Study Area and proceeds through Phases 1 and 2 of the Municipal Engineers Association "*Municipal Class Environmental Assessment (EA) Process*" (October 2000, amended 2007)as it relates to EA Master Plans. This Infrastructure Master Plan is limited to the identification of municipal servicing needs, including public sanitary sewers, storm sewers, watermains and roads. The scope of this study is: (1) to evaluate and present the existing conditions of the Study Area; (2) to determine the infrastructure needs and feasibility within the study area, (3) present infrastructure design criteria to address these needs; (4) to identify post development stormwater management objectives; (5) to prepare preliminary order of magnitude cost estimates; and (6) identify any further studies required. Completion of this Master Plan will provide a framework for future servicing projects as they go into detail design.

An Existing Infrastructure Analysis has been completed for the Study Area and is available from the City of Toronto's website. It presents our findings for item (1) as noted above and will be used as a reference in completing items (2) through (5) as part of the Infrastructure Master Plan Study. The conclusions of the Existing Infrastructure Analysis will also be carried forward as infrastructure recommendations for the preferred master plan.

## 1.2 Study Area

The Lawrence-Allen Study Area in the City of Toronto is bound by Bathurst Street to the East, Lawrence Avenue West to the South, Dufferin Street to the West and Highway 401 to the North. The Allen Road Expressway, a truncated highway, runs North-South through the middle of the site. The Study Area covers approximately 342 hectares with various land uses including residential, commercial and institutional. **Figure 1-1** shows the location plan of the Study Area.

The area is home to over 17,000 residents including single detached homes, apartment buildings, and rent geared to income housing. There are four existing public schools in the Study Area, as well as the Bathurst Heights site, a closed secondary school on Lawrence Avenue. Commercial land uses are located along Bathurst Street, Lawrence Avenue and Dufferin Street. Yorkdale Mall, a major shopping centre, occupies over 11 hectares of the Northwest corner of the Study Area. A medium sized shopping centre, Lawrence Square, is located at the corner of Allen Road and Lawrence Avenue.

There are ten parks in the Study Area as well as TCHC owned open space.

Within the Study Area is the Focus Area of the Lawrence-Allen Revitalization Project. The Focus Area includes lands on either side of the Allen Road Corridor that are Owned by the Toronto Community Housing Corporation, Toronto District School Board, RioCan and the City of Toronto. The Focus Area lands comprise approximately 75 hectares.

Lawrence Heights has been an established community in the North York district of the City of Toronto since the 1950s. There was significant development in the area throughout the 1970s and 1980s with very little development occurring recently.

Not all of the Study Area is expected to undergo redevelopment. The new development is primarily expected on lands owned by the TCHC, TDSB, the City, on the Lawrence Square Shopping Centre site, and on the Dufflaw site at the corner of Dufferin Street and Lawrence Avenue West.

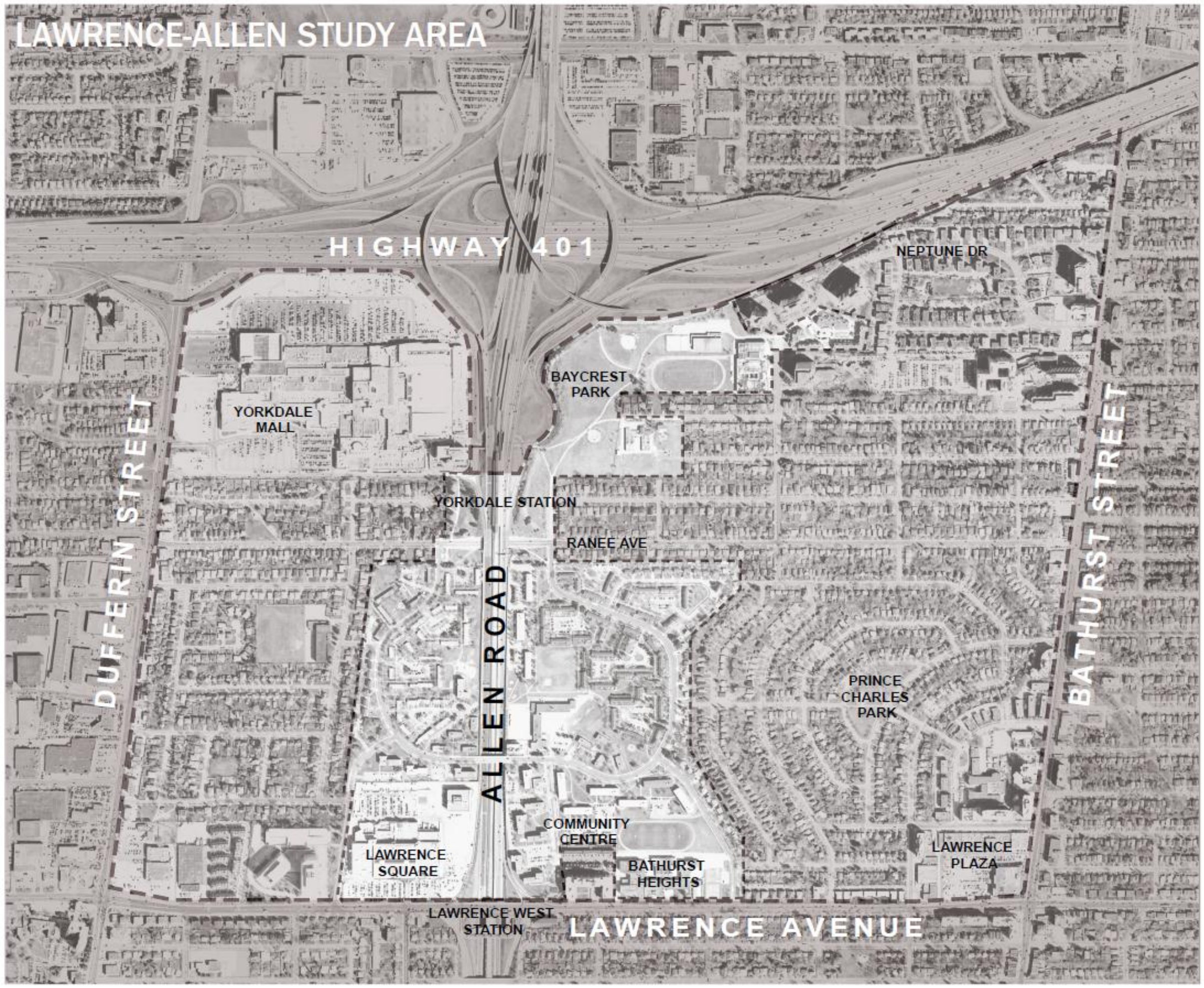
## 1.3 Overview of the Planning Process Followed for the Project

The LARS Study was undertaken as an integrated Planning Act and Environmental Assessment Act initiative with the integrated Infrastructure Master Plan addressing the first two phases of the Municipal Class Environmental Assessment Process (MEA, 2000, amended 2007).

### 1.3.1 *Environmental Assessment Act*

The Ontario Environmental Assessment Act (EA Act) identifies two types of environmental assessment planning and approval processes; Individual Environmental Assessment and Class Environmental Assessments. The Municipal Class Environmental Assessment, October 2000 (as amended in 2007) provides a process in accordance with the EA Act, for municipal infrastructure projects including Master Plans and Integrated Municipal Class EA/Planning Act processes. Once approved, the Class EA establishes a process whereby the municipal projects as defined in the Municipal Class EA and any subsequent modifications, can be planned, designed, constructed, operated, maintained, rehabilitated and retired without having to obtain project specific approval under the EA Act, provided the approved environmental assessment process is followed.

**Figure 1-1: Study Area Location**

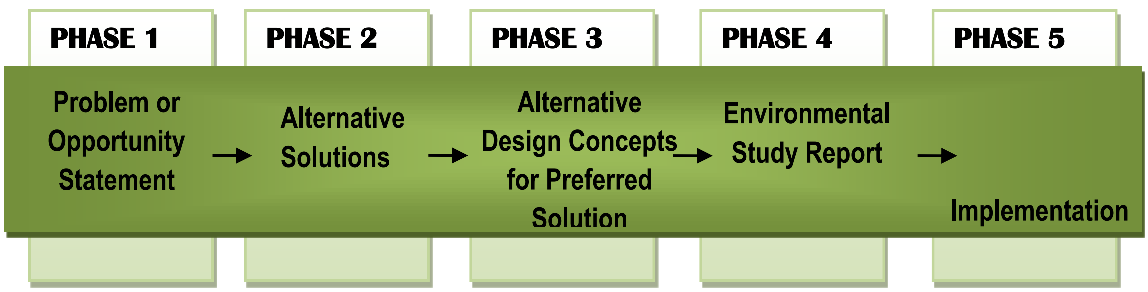


### 1.3.2 *Overview of the Municipal Class Environmental Assessment Process*

The Municipal Class EA process is completing the following five phase process (**Figure 1-2**). The process addresses projects by classifying them into three schedules according to the significance of their likely environmental impacts (Schedule A, B or C). The level of complexity, construction cost and the potential impacts of a project combine to determine the schedule of the project that in turn will determine which phases need to be addressed. The schedule of projects undertaken in the LARS Area will vary as to their potential environmental affect(s).

The five phases of the Class EA are summarized as follows:

**Figure 1-2: The Class EA Process**




Schedule A and A+ projects are limited in scale, have minimal adverse effects and include the majority of municipal road maintenance and operational activities. These projects are approved and may proceed directly to Phase 5 for implementation, without following Phases 2 to 4 of the Class EA process.

Schedule B projects generally include improvements and minor expansions to existing facilities. These projects have some potential for adverse environmental impacts, and consultation with those who may be affected is required. Examples of Schedule B projects include; the installation of traffic control devices, smaller road-related works or the extension of certain types of municipal water/wastewater infrastructure. These projects require completion of phases 1 and 2 of the Class EA Process.

Schedule C projects generally include the construction of new facilities and major expansions to existing facilities. Examples of Schedule C projects include construction of new roads, or significant widenings, construction of underpasses or overpasses, or construction of new water or waste water treatment systems.

## 1.4 Municipal Class EA Master Plan Process

Class EA Master Plans are long range plans which integrate infrastructure requirements for existing and future land uses with environmental assessment principles. The Class EA Master Plan process examines infrastructure system(s) or groups of related projects in order to outline a framework for implementation.

It is beneficial to begin the process by considering a group of related projects or an overall system e.g., water, wastewater and/or roads network, or a number of integrated systems, e.g., infrastructure master plan, prior to dealing with project specific issues. By using this process, the need and justification for individual projects and the associated broader context are better defined.

The Class EA Master Plan typically differs from the project specific studies in several key areas. Long range infrastructure planning enables the proponent to comprehensively identify need and establish broader infrastructure options. The combined impact of alternatives is also better understood, possibly leading to other more positive solutions. The opportunity to integrate with land use planning also enables the proponent to consider different perspectives when looking at the full impact of decisions.

The Infrastructure Master Plan has been conducted following the integrated EA process and satisfies Phases 1 (Problem/Opportunity Statement) and 2 (Alternative Solutions) of the Municipal Class EA. Phases 3, 4 and 5 will need to be completed as part of separate project initiatives prior to implementing specific infrastructure elements recommended and the Secondary Plan.

Remaining future phases of the Municipal Class EA process will be completed separately for specific infrastructure projects. Requests to the Minster of Environment for a Part II Order (to require an individual EA) are possible only for specific projects identified in the Master Plan, not the Plan itself. This Plan provides a link towards implementing the Infrastructure Master Plan, which sets out the vision of the overall Revitalization Plan.

## 1.5 The Lawrence-Allen Revitalization Plan

This Infrastructure Master Plan is part of the overall Lawrence-Allen Revitalization Plan. This Plan serves as a basis for the Secondary Plan for the area, and as a broad strategy for revitalization by the City. The catalyst for this Plan is the need for housing renewal in the

Lawrence Heights neighbourhood and Toronto Community Housing Corporation's (TCHC) response to this issue. This Plan also helps to achieve the goals of the Official Plan, namely renewal of social housing stock, intensification along a subway route, sustainable development, improved delivery of community services, improved public realm and creation of high quality usable parkland.

This process is guided by a 20-year vision for the Lawrence-Allen area. Revitalization, renewal, growth and change will happen over the long-term. The vision statement is:

> *The Lawrence-Allen community is a mixed-income, mixed-use community located in central Toronto's urbanizing suburbs. The community is at once distinct, celebrating the area's rich cultural diversity and sense of community, and fully integrated with the broader city.*
>
> *The community showcases an innovative approach to revitalization, one that prioritizes the development of a complete community through coordinated public and private investment in housing, infrastructure and the public realm. Innovative building and municipal infrastructure technologies ensure the long-term sustainability of the community. As a complete, liveable community, the Lawrence-Allen area offers residents of all ages and backgrounds a range of housing options – including revitalized social housing – as well as a range of employment, social and recreational options.*
>
> *The Lawrence-Allen community is a beautiful and human-scaled place. New connections across Allen Road and to neighbouring communities provide safe, pedestrian-oriented links between neighbourhoods and to the community commons, where community services, facilities, schools, recreational programming and local retail come together in a park setting. A distributed system of neighbourhood parks offers all residents access to both passive and active recreational programming.*
>
> *The community includes connections for all modes of transportation in a manner that prioritizes pedestrians, cyclists and transit users over drivers. A fine-grain mix of land uses around Lawrence West and Yorkdale subway stations enables transit-supportive densities, recognizing the unique potential of the community to support intensification around existing transit infrastructure. Access to transit is improved and many residents live within a five-minute walk of a subway station.*

In addition to this vision, this process is built on four themes of revitalization. These four themes also guide the development of the Infrastructure Master Plan. They are

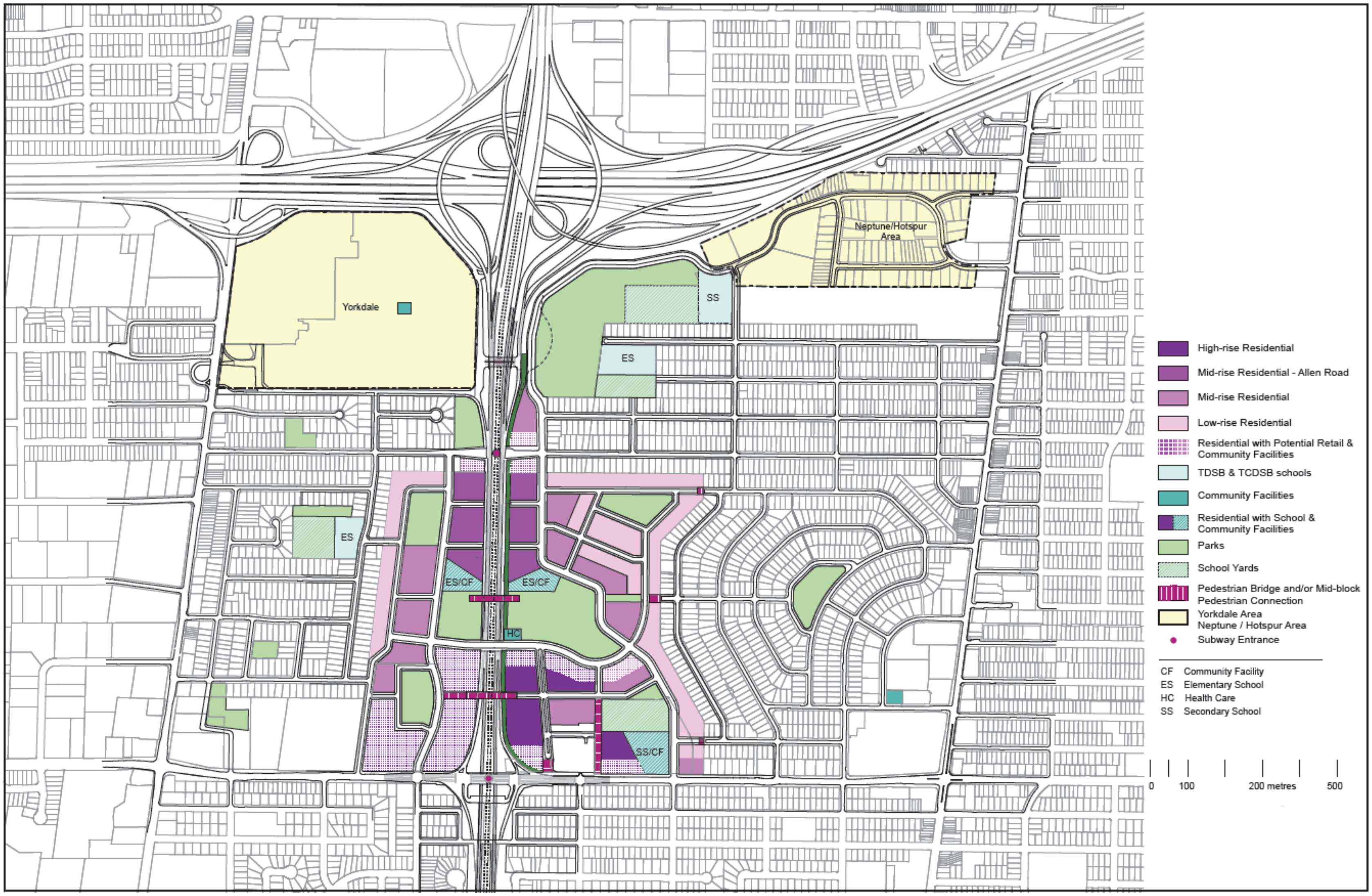
- **Reinvestment** - the growth proposed for the Lawrence-Allen Area does not just represent new development and population, but also investment. This includes creating a context for where investment should occur; including when new public infrastructure should be constructed.
- **Mobility** – the area will need to be supported by a strong transportation system to enable residents to access opportunities across the City and enjoy their community.
- **Liveability** – The area needs to be supported by an array of community institutions that foster community health and social networks including; parks, schools and community facilities.
- **Place-Making** – the creation of public spaces will contribute to the strengthening of community identify, promoting public safety and fostering vibrant public spaces.

### 1.6 Preferred Master Plan

The Preferred Plan shown in **Figure 1-3** indicates the areas of LARS which will undergo redevelopment. Redevelopment will occur primarily in the Focus Area with incremental redevelopment and growth within the Study Area over the next 20 years. Key features of the Preferred Master Plan include a Community Park, which is the central feature of a network of neighbourhood parks distributed throughout the Study Area; a Greenway linking Yorkdale and Lawrence West TTC stations along Allen Road; a clear and direct street network; and appropriate transitions between new and existing buildings. The plan comprises five key areas, each of which provides for full replacement of TCH social housing, new market housing, a neighbourhood park, community facilities, and retail opportunities in locations closest to the subways.

The Preferred Plan more than doubles the amount of parkland in Lawrence Heights. The increased parkland and range of park sizes means that there is opportunity for many kinds of park programs and facilities to meet the diverse needs of residents

## Figure 1-3: Preferred Plan



A Greenway along Allen Road will help connect different parts of the community and provide a park-like route for pedestrians and cyclists through the Lawrence Heights neighbourhood.

Primary streets will be designed as public places, with wide sidewalks, trees, and bicycle lanes. High traffic speeds will be discouraged with on-street parking and appropriate traffic calming design. Primary streets will offer direct, usable, and convenient routes for pedestrians, cyclists, buses, and cars to move through the community. The Primary street network has been developed with direct and convenient travel routes for all uses inside and outside the Study Area. Local Streets were not used to accommodate any vehicle traffic capacity from new development.

The plan places higher density, mixed-use buildings within convenient walking and cycling distance to subway stations and bus routes, and takes advantage of opportunities to upgrade subway stations and improve surface transit.

In the revitalized community, market and social housing will be mixed throughout the community. Taller buildings are transit-supportive, and are located close to Allen Road and close to the Lawrence West Subway station. Midrise apartment buildings are located to frame the edges of the primary streets and larger parks. Low rise townhouses are located on the edges of the plan area to provide appropriate transition to existing low rise houses.

Over a 20-year period, the community will experience population growth. Currently, there are 1,208 housing units in Lawrence Heights, and approximately 3,500 people live in the community. In Lawrence Heights, TCHC proposes to replace the 1,208 existing homes and build between 4,300 and 4,800 new units. In Lawrence Square, RioCan proposes to build between 900 and 1,100 new housing units. The current retail uses at Lawrence Square will be kept or replaced. At Bathurst Heights, TDSB proposes to build a new secondary school and is considering 300 to 400 new housing units.

TCHC, RioCan and TDSB have proposed between 5,500 and 6,300 new units for the area. The total number of units proposed for the area over a 20-year period is between 6,700 and 7,500.

The proposed development plan has generally been divided into four phases as outlined below.

- Phase 1 – northeast quadrant of the Focus Area
- Phase 2 – the central portion of the Focus Area, east of Allen Road
- Phase 3 – the Focus Area west of Allen Road

- Phase 4 – the southeast quadrant of the Focus Area

**Opportunity Statement**

The City of Toronto recognizes that the redevelopment of the Lawrence-Allen Revitalization study area is important and requires a planned and phased approach for successful implementation. However, it is important to note that the phased approach for the Preferred Plan, identified in **Figure 1-7**, has not been developed from a detailed analysis of the most cost effective and efficient manner for the implementation of the servicing infrastructure. Rather, the four phases, as outlined in **Figure 1-7**, have been developed in order to encourage and ensure the best opportunity for reinvestment in the community, from both public and private sectors. A key component of this revitalization strategy is completing a Infrastructure Master Plan to identify community needs, in order for the City to prioritize requirements and budget for them.

## 1.7 Inventory of Existing Environment

The Lawrence-Allen Area is an extensively developed area. In the heart of the Study Area, there is an existing social housing community owned by Toronto Community Housing Corporation (TCHC). The TCHC's property comprises over 35 acres of land in the Study Area. The building in Lawrence Heights Area is made up of mainly two and three-storey walk-up apartments. The Study Area is bound by Highway 401 to the north, and the Allen Road expressway bisects the Study Area north to south. The total area of the study is 342 acres, with large parts being occupied by single-family detached homes and apartment buildings. A large shopping centre; Yorkdale Shopping Centre is located in the northwest corner of the Study Area, as well as the Baycrest community; a major institutional area use.

Significant work has been conducted on a number of background studies for the Lawrence-Allen Revitalization Study, including the Lawrence-Allen Revitalization Area Profile. This section provides a high-level overview of the existing conditions in the area, however it should be read in conjunction with the Area Profile, for an in-depth analysis of the existing conditions.

### 1.7.1 *Natural Environment*

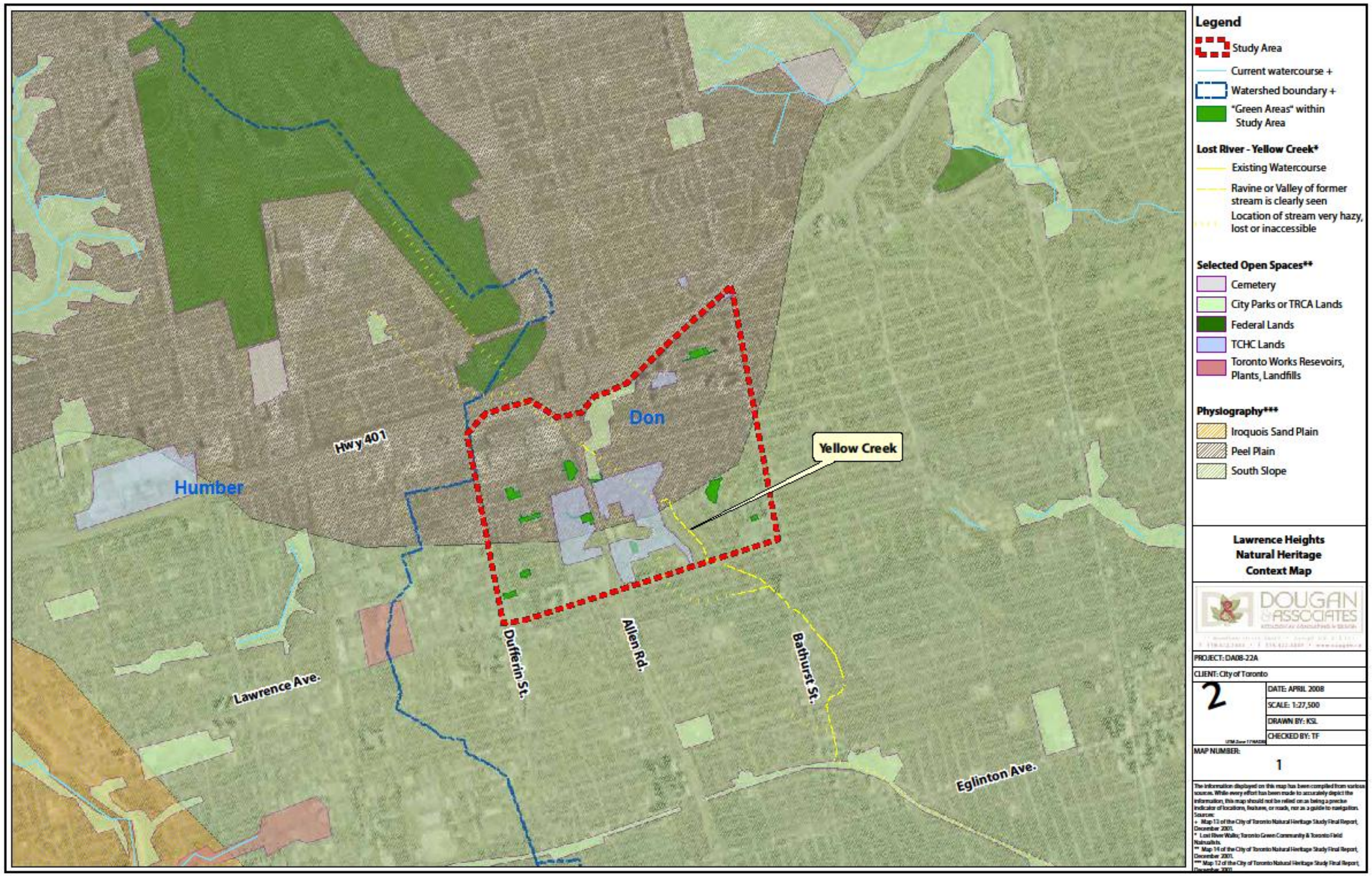
The Study Area is located within the Don River Watershed and likely contains very little natural features or ecological communities due to being intensely urbanized (Lawrence- Allen Revitalization Sustainability and Natural Environment Profile). The Study Area straddles the border between the Lower Don West Don River Sub-watershed and the Lower Don River Sub-watershed. The Study Area is also located in the Peel Plain and South Slope physiographic regions, with no significant earth science features in the Study Area. Additionally, there are no watercourses found in the Study Area and groundwater recharge in this area may be very low. Existing stormwater infrastructure in this area is lacking, and is in need of improvement.

Although there are no identifiable watercourses in the area, the site is located within Fish Management Zone 5, which covers the entire Don River Watershed. This area is characterized with warm water conditions, with the exception of some cold water conditions on tributaries of the West Don River, likely from groundwater recharges occurring on the Lake Iroquois Shoreline. The dominant fish community in this watershed is warm water species (native and invasive). In general, there is limited fish habitat as a result of urbanization and stormwater overflows.

Historical photos show the area as agricultural land up to 1939 with drainage to the southeast and little natural vegetation communities present today. There are limited to natural meadows that are found in the cloverleaf 401/Allen Expressway interchange. This habitat has been scored as “poor” to “very poor” on the regional scale. There is one patch of “fair” habitat to the north of the Study Area between Allen Road and Wilson Heights Boulevard. The tree canopy in the Study Area is 11%, with some of the neighbourhoods being densely treed. The Study Area contains 18.46Ha of public parkland and an additional 14.2Ha of school open space. There are no records of species of concern in this area.

The Natural Heritage System can be found in **Figure 1-4.**

**Figure 1-4: Study Area Natural Heritage Profile**



### 1.7.2 *Socio-Economic Environment*

***Historic Land Uses***

1965 Aerial Photo of Lawrence- Allen Study Area

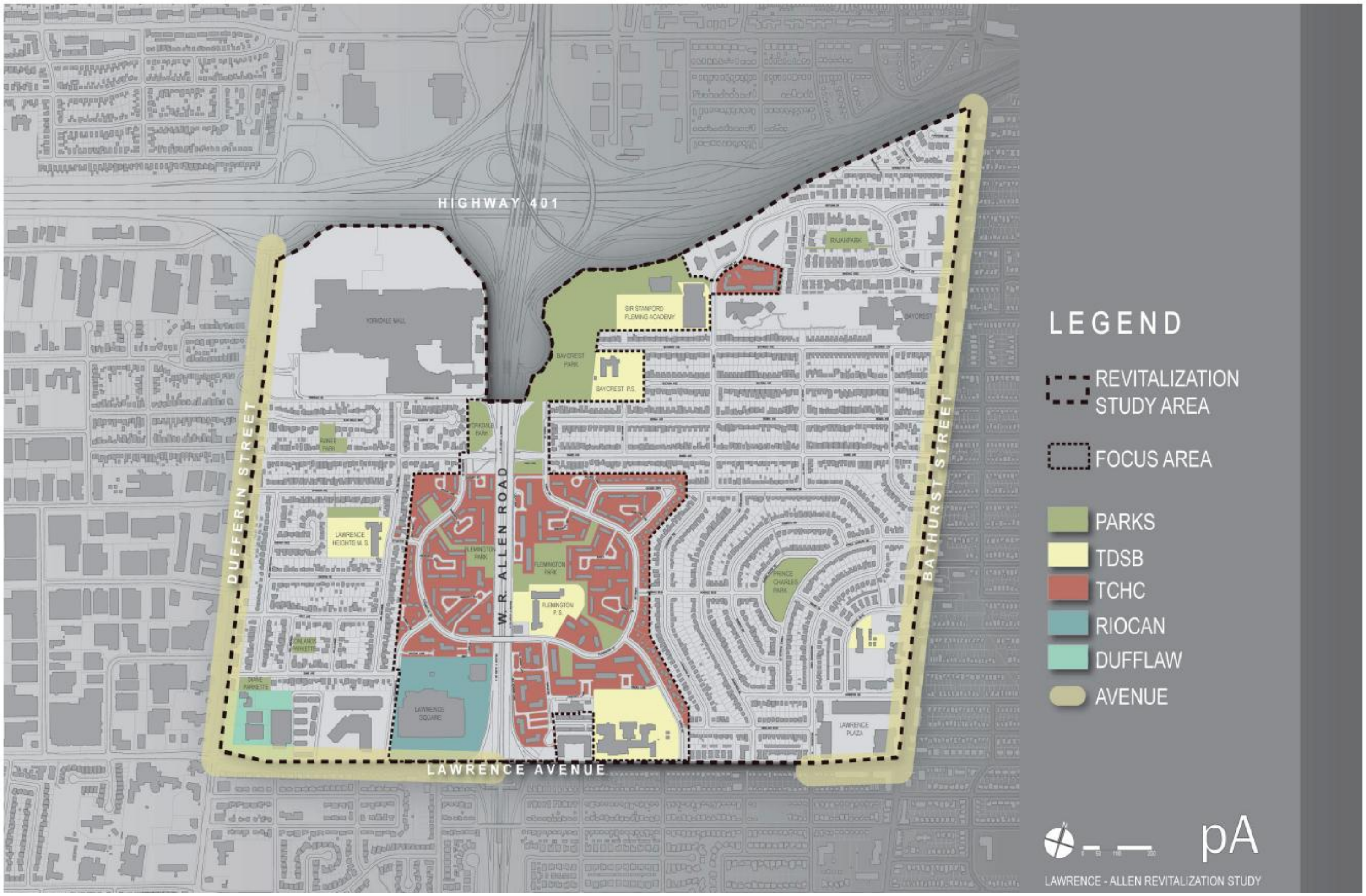
The neighbourhoods north of Lawrence Avenue West, between Bathurst Street and Dufferin Street, began to emerge from farmland outside of Toronto in the 1930s. Years before the Allen Road bisected the area, Canada Mortgage and Housing Corporation purchased large tracts of land north of Lawrence Avenue West. CMHC was eager to address Toronto's post-war housing shortage and led development of private single-family homes in Lawrence-Allen in the 1940s. In 1954 CMHC began working with Metropolitan Toronto to build social housing on the area's remaining land – the beginnings of the Lawrence Heights neighbourhood. Lawrence-Allen area was largely built in the post-war era as a suburban community on the outskirts of Toronto.

***Land Ownership***

There is a variety of land ownership in the Study Area. School properties (Baycrest Public School, Sir Sandford Fleming Academy, Flemington Public School and Bathurst Heights Secondary School) are all owned by the Toronto District School Board. A large portion of land (Lawrence Heights) is owned by Toronto Community Housing Corporation. The City of Toronto owns a number of parks located with the Study Area. Finally, the remainder of the land is owned by private landowners including Baycrest Centre for Geriatric Care and shopping centres that include Yorkdale Shopping Centre, Lawrence Square Mall, and Lawrence Plaza.

A map of property ownership is found in **Figure 1-5**

**Figure 1-5 Existing Landowners in the Study Area**



### *Current Land Use Designations*

Land use designations in the Study Area are derived from the City of Toronto Official Plan. Eventually, a Secondary Plan, when prepared, will become part of the Official Plan, and the development of the Secondary Plan will be guided by the policies contained in the Official Plan. The land use designations from the Official Plan can be found in **Figure 1-6**.

The Official Plan applies various land use designations to lands within the Lawrence-Allen Study Area: Neighbourhoods, Apartment Neighbourhoods, Mixed Use Areas, and Parks and Open Space Areas.

- A majority of lands within the Study Area are designated ‘Neighbourhoods’. Neighbourhoods are considered physically stable areas made up of residential uses in lower scale buildings. Parks, low scale institutions, home occupations, cultural and recreational facilities and small-scale retail, service and office uses are also provided for in Neighbourhoods.

- ‘Apartment Neighbourhoods’ are made up of apartment buildings and parks, local institutions, cultural and recreational facilities, and small-scale retail, service and office uses that serve the needs of area residents. Like Neighbourhoods, built up Apartment Neighbourhoods are stable areas of the City where significant growth is generally not anticipated.

- ‘Mixed Use Areas’ are made up of a broad range of commercial, residential and institutional uses, in single use or mixed use buildings, as well as parks and open spaces and utilities. Mixed Use Areas line all of Dufferin Street and nearly all of Bathurst Street in the Study Area. Lands on the north side of Lawrence Avenue West between Dufferin Street and Allen Road are also designated Mixed Use Areas, as is Yorkdale Shopping Centre. Site- and area-specific Official Plan policy numbers 93, 94, and 95 further define provisions for development on certain properties on the south side of Baycrest Avenue and on the west side of Bathurst Street between Baycrest Avenue and Prince Charles Drive.

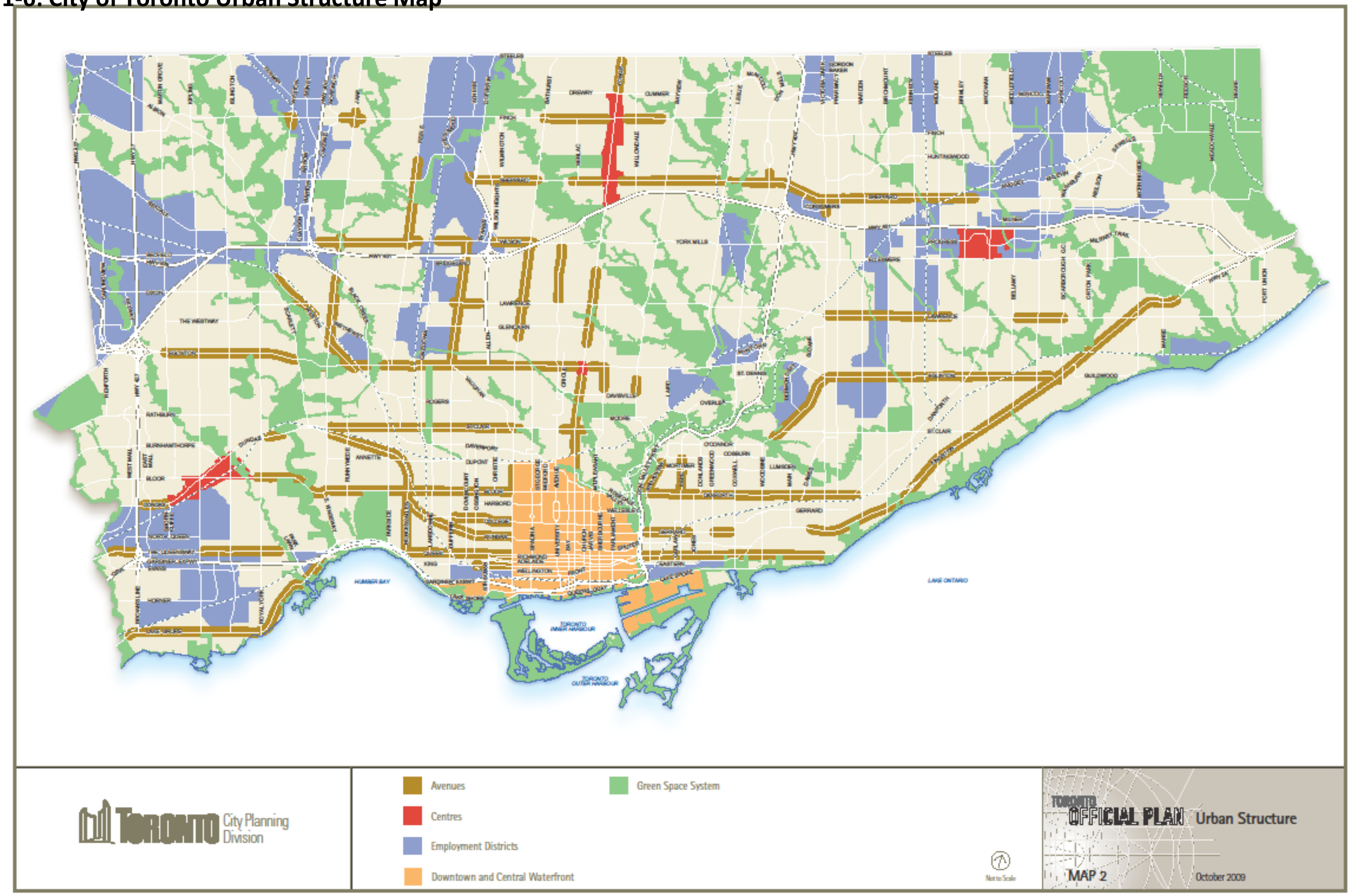
- City-owned parkland in the area is designated ‘Parks and Open Space’.

- Lands that are part of the Baycrest Hospital campus are designated ‘Institutional’.

In addition to land use designations, the urban structure map of the Official Plan identifies Dufferin Street, Bathurst Street, and parts of Lawrence Avenue West as Avenues – important corridors along major streets where reurbanization is anticipated and encouraged. Dufferin Street and Bathurst Street are also identified as Surface Transit Priority Routes.

An additional land use consideration is the location of Downsview Airport. The Study Area is located within an Airport hazard Zone, limiting the surrounding building and structure heights.

**Figure 1-6: City of Toronto Urban Structure Map**



***Population and Socio-Economic Profile***

The population in the Study Area is seen to have rapid growth from the 2001 through the 2006 census period. In 2006, there were 17,505 residents living in the Study Area, which is an 8.1% increase over the 2001 population level. The overall growth rate for the City of Toronto is 0.9%, therefore the area has a much greater rate of population growth.

The age structure in the area is considered to be a large population of the very young and the very old. The proportion of children between 0 and 14 in the Study Area is somewhat higher than the City average, while the proportion of youth and adults is somewhat lower. The proportion of seniors over the age of 80 is substantially higher than the City of Toronto as a whole, which can be attributed to the Baycrest Centre for Geriatric Care located within the Study Area.

Families in the Study Area generally have fewer children (71.5%) than the City average (67.3%), and fewer couple-based families (68.1%) than the City average (79.7%). This suggests an aging populationcomprising many ‘empty-nester’ couples whose children have grown up and left home, while also suggesting that a new, younger generation of residents beginning to emerge and start young families.

More seniors are classified as non-family persons (44.5%) than the City average (36.4%). These are seniors who do not live with a family member. They are thus likely to have fewer day-to-day need requirements. Most of these seniors also tend to live alone (37.5%) as compared with the entire City (26.9%).

The Study Area comprises a higher rate of immigrants (51%) as compared with the City average (49.4%). Most of the immigrants come from the Philippines (14.9%), Italy (13.1%), Jamaica (8.8%), Poland (6.6%), as well as Romania (3.2%), which differs from the City where immigrants’ origins include China (8.4%), followed by Italy (6.1%), the Philippines (5.6%), India (5.3%) and the United Kingdom (5.3).

The average 2000 family income in the area ($50,667) is considerably less than the average for the City ($76,082) and less than half of that for the context area ($113,698). More households in the Study Area (32.2%) are classified as low income than the City average (22.6%). The labour force participation rate (57.2%) is lower in the Study Area than the City as a whole (65.3%) Similarly, the employment-population ratio (52.4%) is lower in the Study Area than the City as a whole (60.8%). Finally, the unemployment rate is higher in the Study Area (8.4%) than the City average (7%).

Residents' occupations in the Study Area are similar to those of the City as a whole, with somewhat more employed in sales and service occupations (25.6% vs. 21.6%), however, within the Study Area there is considerable variation. Within the Study Area fewer residents are working in manufacturing, information and cultural industries and professional, scientific and technical services than the City as a whole. More are working in retail trade, transportation and warehousing, administrative and support, waste management and remediation services and health care and social assistance.

In summary, the Study area has experienced growth over the last few years. This growth has been fuelled by the arrival of new, young families with young children. Lower than average family income is generally consistent with the higher level of unskilled immigrants from countries outside of North America. This emerging demographic is balanced off by the older, independent-living senior citizen who have resided in this community for many years, helping to create a stable and attractive community for families.

### 1.7.3 *Cultural Heritage and Archaeology*

***Cultural Heritage***

Cultural heritage resources fall into two categories; listed and designated. Designated properties have a designation under the Ontario Heritage Act (OHA) and listed properties have been identified as having cultural and/or historical significance and are placed on the City of Toronto's Inventory of Heritage Properties.

As part of the larger Lawrence-Allen Revitalization Plan, a Heritage Impact Statement and Cultural Heritage Resources Assessment were conducted. This section provides a brief overview of the resources contained in the Study Area. Additional information can be found in the Impact Assessment.

The cultural heritage value in the Study Area is connected to the integration of Clarence Perry's planning principles in the overall configuration of the neighbourhood, as opposed to architectural expression. There were four key elements that define the original design of the neighbourhood. These include:

- A continuous system of parks and playgrounds;
- A central location for community facilities;

- A clear hierarchy of roads; and
- A clear prioritization of various modes of transportation.

Although the Study Area contains a large number of buildings of heritage interest, there are no designated properties under the OHA and there are no listed properties in the City of Toronto Inventory of Heritage Properties.

***Archaeology***

A Stage 1 Archaeological Resource Assessment for the Lawrence-Allen Revitalization Study Area was conducted and revealed that no archaeological sites have been previously registered within the limits of the Study Area. Review of the general physiography and historic local land use within the Study Area suggested that it exhibited archaeological site potential prior to the consequent destruction of landscape integrity throughout the vast majority of the Study Area. One area of archaeological potential was identified as a result of detailed review of aerial photographic records for the area and an examination of existing conditions. The potential landscape is located in Baycrest Park between Sandford Fleming High School and the Allen Road Expressway/Highway 401 interchange. Any new developments within this area must be preceded by a Stage 2 archaeological assessment.

### 1.7.4 *Noise*

A noise control programme was adopted by City Council in December 1973 to ensure that future construction and development be evaluated in light of their impact on Toronto's acoustical environment. Major noise concerns found within the City included noise from air conditioning units, construction, loud music, loading and unloading vehicles, industrial sources, security alarms, animals, construction and public transit.

Noise by-laws within the City restrict the time of day during which construction can take place. All major construction sites, public and private, are regularly inspected to make sure that excessive noise is not being generated from equipment on-site. The Noise By-Law is enforced by both Toronto Police Services and the City of Toronto's Noise Control Branch.

### 1.7.5 *Infrastructure*

An Existing Infrastructure Analysis for the Lawrence-Allen Revitalization Area was completed by MMM Group. This study was completed to review the state of existing the watermains, sanitary sewer and storm drainage within the Study Area. An analysis of downstream sewer capacities was also completed. The general conclusions of this report are identified below.

Computer modelling demonstrates that the existing water distribution system within the Lawrence Heights neighbourhood is sufficiently sized to meet the existing peak hour, maximum day demands, and the maximum day plus fire demands.

A number of the existing municipal storm sewers within the Focus Area have constraints. The local storm sewers within the Focus Area will be replaced as part of the Lawrence Heights Revitalization (LHR) Project. The impact on the downstream storm sewers as a result of the preferred plan has been reviewed as part of this Infrastructure Master Plan.

There are two areas within the Study Area that have existing overland flow constraints. One area is within the Focus Area and will be rectified as part of the Master Plan development. The second area has been discussed in more detail in Section 7 of this report.

The existing local sanitary sewers within the Focus Area will be replaced as part of redevelopment. There are sections of external downstream sanitary sewers that are constrained under existing conditions. There are additional sections of downstream sanitary sewers that are impacted by the proposed Preferred Master Plan development. Recommendations for the external sanitary sewer system are included as part of this Infrastructure Master Plan.

The Existing Infrastructure Analysis forms a basis on which the Infrastructure Master Plan was developed. The Infrastructure Master Plan provides an overview of the water distribution system, storm drainage, sanitary drainage, stormwater management and roads for the Preferred Master Plan.

**Figure 1-7 Phasing Plan**

# 2 WATER DISTRIBUTION

## 2.1 Existing Water Distribution System

The existing water distribution system in the Lawrence-Allen Study Area was analyzed in the "Lawrence-Allen Revitalization Study - Existing Infrastructure Analysis Report" dated April 2009. The report concluded that the existing water distribution system was adequate to meet the existing peak hour and maximum day demands and was able to provide adequate fire flows for the existing development.

## 2.2 Rationale for the Systems

Servicing is required to meet the needs of the community while being sustainable, and delivered at the least overall cost. Since the Lawrence-Allen Revitalization project is in an existing built-up area there is existing water servicing in the area. Based on the modeling and analysis conducted for the "Existing Infrastructure Analysis Report" it was determined that the existing water distribution system would be adequate to support the proposed growth and redevelopment in the Study Area. Significant modeling and analysis was conducted which provides background on the rationale for the system.

***Design Criteria***

The modeling criteria used to determine the capabilities of the proposed system were based on the City of Toronto "Design Criteria for Sewers and Watermains dated November 2009. The following criteria were used in our modelling.

- Maximum Hour = 2.48 times average day
- Maximum Day = 1.65 times average day
- Minimum Hour = 0.7 times average day
- Average Consumption Rate of 320 litres/capita/day for single family units
- Average Consumption Rate of 191 litres/capita/day for multi-unit blocks
- Preferred Pressure Range during average day and maximum day of 350 kPa to 550 kPa

- Minimum pressure range during a peak hour of 275 kPa
- Maximum pressure during a minimum hour of 700 kPa
- Minimum pressure during a maximum day plus fire demand of 140 kPa.
- Fire Flow requirements for New Develops
    - Multi-family up to two stories, closely built – 7,570 l/min
    - Multi-family (attached) 11,360 l/min
    - Commercial up two stories 11,360 l/min
    - Commercial - over two stories 19,000 l/min
    - High Rise 19,000 l/min

***Proposed Water Distribution System***

The proposed water distribution system will follow the proposed road network with all the watermains within the existing and new rights-of-way. No municipal watermains will be located outside of the proposed rights-of-way. The ultimate build out will continue to have the 300 mm diameter primary loop in a similar manner as the existing system, with 200 mm diameter watermains branching off the primary loop for low rise residential. For short streets with only low rise residential or side streets where no building connections are anticipated, the watermains are proposed to be 150mm. The proposed size of watermains and phasing of the water system is shown in attached Drawing WAT-1 of **Appendix E**.

Fire and domestic water services will be provided to the high and medium density development blocks as well as the commercial and retail sites. Single domestic water services will be provided to the low density residential units. It is anticipated that the water meters will be located within the buildings that occupy the development blocks. If there are multiple buildings within a development site that are under the same ownership, bulk water meters may be required. The location of the proposed water services and water meters will be confirmed by the Civil and Mechanical consultants during detailed design.

Fire hydrants and isolation valves will be installed in the new water distribution system to City of Toronto standards. A fire hydrant must be within 45m of a new building Siamese connection to meet fire code requirements. Three isolation valves will be installed at all municipal tee connections, and four isolation valves will be installed at all municipal cross connections to ensure redundancy in the water distribution system.

***Proposed Water Distribution Modelling***

In order to evaluate the proposed and existing watermains in the Study Area, a watermain distribution model was created. The peak hour, minimum hour, and maximum day plus fire demands were modelled to ensure the proposed and existing distribution system could satisfy the design criteria. The computer model used to analyse the proposed water distribution system was WATERWORKS which is an iterative node balancing type program designed to simulate distribution networks. The model contains all the existing watermain in and around the Lawrence Heights neighbourhood, ranging in diameter from 150mm to 900mm. The intent of the water model is to determine if the existing water distribution system is adequate to meet current demands while maintaining adequate residual pressures throughout the entire neighbourhood.

A schematic of the proposed and existing distribution system for the Lawrence Heights neighbourhood is attached as Drawing WAT-2 of **Appendix E**. The results of the WATERWORKS model are available in **Appendix A**.

***Peak Hour Demand***

The peak hour demand was modelled to determine if any areas within the Lawrence Heights neighbourhood would have pressures below 275 kPa. The results of the analysis were then compared to the modelling results from the Existing Infrastructure Analysis Report dated November 2009. The results of the peak hour distribution modelling are outlined in the table below.

**Table 2-1: Peak Hour Distribution Modeling**

| Model Condition | Minimum Pressure | | Maximum Pressure | |
|---|---|---|---|---|
| | Model | Node | Model | Node |
| Existing Condition | 358 kPa | 4011828 | 472 kPa | 4019890 |
| With Proposed Redevelopment | 347 kPa | 4011828 | 466 kPa | 4019890 |

As shown in the table above, the minimum pressure during the peak demand model for Lawrence Heights was above the design criteria of 275 kPa and the proposed redevelopment resulted in a very minor reduction in pressures during a peak hour demand.

**Minimum Hour**

The minimum hour demand was modelled to determine if any areas within the Lawrence Heights neighbourhood would have pressures that exceed 700 kPa. The results of the analysis were then compared to the modelling results from the Existing Infrastructure Analysis Report dated November 2009. The results of the minimum hour distribution modelling are outlined in the table below.

**Table 2-2: Minimum Hour Distribution Modeling**

| **Model Condition** | **Minimum Pressure** | | **Maximum Pressure** | |
|---|---|---|---|---|
| | **Model** | **Node** | **Model** | **Node** |
| Existing Condition | 362 kPa | 4011828 | 475 kPa | 4019890 |
| With Proposed Redevelopment | 361 kPa | 4011828 | 475 kPa | 4019890 |

The table above shows that the maximum pressure during the minimum hour model for the Lawrence Heights neighbourhood was below the design criteria of 700 kPa and that the proposed development did not have any impact on the pressures during a minimum hour demand.

**Maximum Day plus Fire**

The proposed distribution system was modelled based on City of Toronto Design Criteria to determine what fire flows would be available from the proposed system. For areas within the proposed development, the fire flow analysis was completed to confirm that the residual pressures would exceed 140 kPa for the required fire flows. In the existing distribution system, the available fire flow at a residual pressure of 140 kPa was calculated and then compared to the results from the Existing Infrastructure Analysis Report dated November 2009.

The table below summarizes the results of the maximum day plus fire demand simulations within the proposed development area.

**Table 2-3: Results of the Maximum Day plus Fire Modelling with Proposed Development Area**

| Fire Node | Maximum Available Fire Flow | Maximum Pressure | Land Use |
|---|---|---|---|
| 4012095 | 19,000 l/min | 336 kPa | High-rise |
| 4012899 | 11,360 l/min | 270 kPa | Multi-Family (Attached) |
| 4013011 | 19,000 l/min | 333 kPa | High-Rise |
| 4017256 | 19,000 l/min | 309 kPa | High-Rise |
| 5000001 | 19,000 l/min | 285 kPa | High-Rise |
| 5000002 | 19,000 l/min | 298 kPa | High Rise |
| 5000003 | 19,000 l/min | 307 kPa | High Rise |
| 5000004 | 11,360 l/min | 230 kPa | Multi-Family (Attached) |
| 5000005 | 11,360 l/min | 338 kPa | Multi-Family (Attached) |

| Fire Node | Maximum Available Fire Flow | Maximum Pressure | Land Use |
|---|---|---|---|
| 5000006 | 19,000 l/min | 320 kPa | High Density |
| 5000007 | 11,360 l/min | 347 kPa | Multi-Family (Attached) |
| 5000008 | 19,000 l/min | 323 kPa | High-Density |
| 5000009 | 11,360 l/min | 317 kPa | Multi-Family (Attached) |
| 5000010 | 19,000 l/min | 241 kPa | High-Rise |
| 5000011 | 11,360 l/min | 316 kPa | Multi-Family (Attached) |
| 5000012 | 19,000 l/min | 213 kPa | High-Density |
| 5000013 | 11,360 l/min | 299 kPa | Multi-Family (Attached) |
| 5000014 | 11,360 l/min | 319 kPa | Multi-Family (Attached) |
| 5000015 | 19,000 l/min | 190 kPa | High-Density |
| 5000016 | 11,360 l/min | 318 kPa | Multi-Family (Attached) |
| 5000017 | 11,360 l/min | 279 kPa | Multi-Family (Attached) |
| 5000018 | 19,000 l/min | 330 kPa | High-Rise |

The table above confirms that the proposed water distribution system can provide the required fire flow at all locations within the proposed development area at pressures exceeding the minimum pressure of 140 kPa. For each of the Fire Nodes, the maximum available fire flow is adequate for the associated land use.

The table below compares the available fire flows during a maximum day demand at a residual pressure of 140 kPa for the existing water distribution system (from the Existing Infrastructure Analysis Report dated November 2009) within the available fire flow based on the proposed water distribution system for the proposed redevelopment area.

**Table 2-4: Results of the Existing Maximum Day plus Fire Modelling**

| Fire Node | Available Fire Flow in Existing Distribution System | Available Fire Flow in Proposed Distribution System | Change in Available Fire Flow | Residual Pressure in System |
|---|---|---|---|---|
| 4004971 | 2,575 l/min | 2,625 l/min | + 50 l/min | 140 kPa |
| 4013610 | 10,325 l/min | 10,325 l/min | 0 l/min | 140 kPa |
| 4013721 | 16,150 l/min | 16,300 l/min | +150 l/min | 140 kPa |
| 4015032 | 9,490 l/min | 10,300 l/min | +810 l/min | 140 kPa |
| 4017055 | 2,940 l/min | 2,920 l/min | -20 l/min | 140 kPa |
| 4017721 | 6,150 l/min | 6,300 l/min | +150 l/min | 140 kPa |
| 4013273 | 2,550 l/min | 2,540 l/min | -10 l/min | 140 kPa |
| 4012037 | 17,950 l/min | 17,770 l/min | -250 l/min | 140 kPa |
| 4013666 | 3,275 l/min | 3,265 l/min | -10 l/min | 140 kPa |
| 4013632 | 7,900 l/min | 8,300 l/min | +400 l/min | 140 kPa |
| 4019993 | 9,550 l/min | 12,500 l/min | +2,950 l/min | 140 kPa |

The table above illustrates that the proposed redevelopment has only a minor impact on the available fire flows within the existing community and in many cases; the proposed water distribution system within the proposed redevelopment area will improve the available fire flows within the existing community.

Prior to new development of an area within LARS, site specific watermain testing and analysis will be required.  This watermain analysis is required to confirm that the water distribution system can provide the required levels of domestic and fire flows for the proposed development for both the interim and ultimate condition.

**Rationale Overview**

It is the intent of the City of Toronto to replace the existing municipal watermains in the LARS area that is being redeveloped. It is anticipated that these upgrades to the existing water system would take place with the development of each phase and will include the replacement of the existing watermain with a new watermain to service the proposed development.

Table 2-5 shows the list of proposed infrastructure improvements and applicable Class EA schedules for each of proposed potential water servicing options. The proposed infrastructure improvements may include upgrades to existing watermains (rehabilitation) or the construction of new watermains within the existing ROW.

**Table 2-5: Proposed Water System Improvements and Applicable Class EA Schedules**

| Proposed Infrastructure Improvement | MEA Class EA Schedule | Rationale (applicable section of MEA Class EA Document) |
|---|---|---|
| Rehabilitate Existing Watermains to re-establish design capacity and provide interim servicing capacity | Schedule 'A' | Normal or emergency operation activities/ on-going maintenance activities (#1 bullet 2) |
| Reconstruct or enlarge existing watermains in existing road allowances because of poor condition or because additional capacity is required | Schedule 'A' | Establish, extend or enlarge a water distribution system and all works necessary to connect the system to an existing system or water source, provided all such facilities are in either an existing road allowance or and existing utility corridor (#9) |
| Construct new watermains in proposed road allowances to service development | Schedule 'B' | Establish, extend or enlarge a water distribution system and all works necessary to connect the system to an existing system or water sources, where such facilities are not in either an existing road |

| Proposed Infrastructure Improvement | MEA Class EA Schedule | Rationale (applicable section of MEA Class EA Document) |
|---|---|---|
| | | allowance or an existing utility corridor ( #1) |

## 2.3 Alternative Solutions

### 2.3.1 *Alternative Solutions to the Problem*

There are a series of existing watermains within the Study Area. The majority of the existing 150mm diameter watermains are located within the single detached residential areas of the Study Area. These watermains provide the existing domestic water connections to the individual houses and the road side fire hydrants. There are also sections of 300mm diameter municipal watermains that service institutional, commercial and retail uses. These 300mm watermains strengthen the existing water distribution network.

The modeling conducted, demonstrates that the existing distribution system within the Study Area is sufficiently sized to meet the existing peak hour and maximum day demands. It is the intent of the City of Toronto to replace the existing aging watermains in the Focus Area as part of Lawrence-Allen Revitalization.

To address the water supply services within the proposed revitalization area, the following table **(Table 2-6)** lists the alternative solutions that were identified.

**Table 2-6: Alternative Solutions for Water System**

| Alternative Solutions | Details | Conclusions |
|---|---|---|
| DO NOTHING | | • No changes, use existing watermains without upgrade or replacement<br>• Implement water conservation |

| Alternative Solutions | Details | Conclusions |
|---|---|---|
| | | strategies |
| ALTERNATIVE ‘A’ | Reconstruct/Rehabilitate Existing Watermains | • Reconstruct or rehabilitate existing watermains and construct new watermains in existing ROW<br>• Implement water conservation strategies |
| ALTERNATIVE ‘B’ | Combination of Existing and New Watermains | • Implement water conservation strategies<br>• Use existing watermains where possible if capacity is sufficient to service new development and pipes are in good condition<br>• Reconstruct or rehabilitate existing watermains if pipe conditions are poor or if pipe capacities are insufficient to serve new development<br>• Construct new watermains for new and realigned roads. |

### 2.3.2 *Evaluation Criteria*

In order to evaluate the alternative solutions, detailed criteria was developed based on general evaluation criteria representing the broad definition of the environment, as defined in the Municipal EA Act **(Table 2-7).** Within each category, the project specific evaluation criteria were developed based on the existing characteristics of the Study Area, and the alternative solutions, as described in the following table.

**Table 2-7: Evaluation Criteria- Water System**

| MAIN CRITERION | SUB-CRITERIA |
|---|---|
| **NATURAL ENVIRONMENT** | Having regard for protecting the natural and physical components of the environment, included considerations of terrestrial habitat, aquatic habitat, surface water quality, ground water quality, aesthetics and landscaping as:<br>• Terrestrial Habitat<br>• Land<br>• Water |
| **SOCIAL AND ECONOMIC** | Having regard for the potential impact related to private property, archaeological and cultural heritage resource, employment activity, noise and vibration, and health and safety as:<br>• Cultural Heritage Resource<br>• Traffic Considerations<br>• Health and Safety<br>• Employment<br>• Noise and Vibration |
| **OPPORTUNITY FOR REVITALIZATION** | Having regard for the extent to which each alternative supports the planning and urban design goals of the LARS is as: |

| MAIN CRITERION | SUB-CRITERIA |
|---|---|
| | • Supports the planning and urban design goals |
| **FEASIBLITY AND COST** | Having regard for the cost associated with each alternative, and the capability of each alternative to adequately service the Study Area is considered as:<br>• Feasibility of construction (implementation)<br>• Cost- capital and operational |
| **TECHNICAL** | Having regard for the technical suitability, reliability, longevity, and other engineering aspects of each alternative solution is considered as:<br>• Reliability of service<br>• Flexibility to provide capacity for future growth and/or improved service level<br>• Life expectancy<br>• Maintenance requirements |

### 2.3.3 *Assessment and Evaluation of the Alternative Solutions to the Problem*

Using the evaluation criteria identified in **Table 2-7,** the three alternative solutions to the problem were subjected to a net effects comparative evaluation. Through an evaluation of the advantages and disadvantages a ranking of the alternatives was established. This ranking allowed for the identification of a recommended alternative. The evaluation is summarized in Table 3-8 with an additional discussion of the evaluation rationale below.

***'Do Nothing***

This solution to do nothing was ranked lower than Alternative 'A' because it did not have the same advantages of replacing the existing watermains within the existing ROWs. The financial costs associated with this alternative are lower than both Alternative 'A' and 'B', however this does not meet the City's intent to replace the aging existing infrastructure in the LARS area

***Alternative 'A' – Reconstruct/Rehabilitate Existing***

Solution 'A' was the least preferred solution as it only reconstructed the watermains that are currently in the focus area. Since there are new proposed roadways, the servicing infrastructure will be built within these proposed ROWs. Although the financial costs of this alternative are lower, it does not satisfy the needs for new water infrastructure nor does it address the fact that watermains will be required to be built within new ROWs.

***Alternative 'B' - Combination of Existing and New Watermains***

The preferred solution was identified as the combination of existing and new watermain construction. The City has made it their intention to replace the existing watermains in the area, within the proposed ROWs to upgrade the infrastructure in the revitalization area. Some watermains in the area may need to be rehabilitated in order to provide interim servicing through construction phasing to provide additional capacity when other watermains are unavailable. This alternative satisfies the technical requirements such as service reliability, future growth flexibility, life expectancy and maintenance, without significant adverse effects on other aspects of the environment.

**Table 2-8: Water Services Evaluation**

| **CRITERIA** | | **ALTERNATIVE** | | |
|---|---|---|---|---|
| | | **WATER SERVICES** | | |
| | | **Do Nothing** | **A** | **B** |
| **NATURAL ENVIRONMENT** | Terrestrial | • | • | • |
| | Land | • | ● | ● |
| | Water | • | • | • |

| CRITERIA | | ALTERNATIVE | | |
|---|---|---|---|---|
| | | WATER SERVICES | | |
| | | Do Nothing | A | B |
| **SOCIAL & ECONOMIC** | Cultural Heritage | ● | • | • |
| | Recreation and Tourism | • | • | • |
| | Traffic | • | • | • |
| | Health and Safety | • | • | • |
| | Employment | · | ● | ● |
| | Noise and Vibration | ● | • | • |
| **OPPORTUNITY FOR REVITALIZATION** | | • | ● | ● |
| **FEASIBLITY & COST** | Feasibility | • | ● | ● |
| | Cost | ● | · | • |

| **CRITERIA** | | **ALTERNATIVE** | | |
|---|---|---|---|---|
| | | **WATER SERVICES** | | |
| | | **Do Nothing** | **A** | **B** |
| **TECHNICAL** | Service Reliability | • | ● | ⬤ |
| | Future Growth Flexibility | • | ● | ⬤ |
| | Life Expectancy | • | ● | ⬤ |
| | Maintenance Requirements | • | ⬤ | ⬤ |
| **RECOMMENDED ALTERNATIVE SOLUTION** | | | | ✓ |

| | | | |
|---|---|---|---|
| **KEY** | • Poor | ● Average or Neutral | ⬤ Good |

## 2.4 Preferred Solution

The preferred solution for the City of Toronto is to replace the existing municipal watermains in the Focus Area within proposed new ROWs. When each phase of the Revitalization Plan is developed, the existing watermain will be replaced with a new watermain within the proposed ROW to provide more reliable long term service to the proposed development. Existing watermains may have to be maintained in certain circumstances to accommodate water service requirements during the interim condition during phasing. The precise phasing of construction will determine the need for interim water servicing and will be evaluated during detailed design. Consideration may also be given to watermains that are in acceptable condition to be reused in the new development.

## 2.5 Future Studies Required

As discussed, each new development within LARS will require development specific watermain tests and analyses to determine that the water distribution system can provide the required levels of service for the development in the interim and ultimate condition.

Each new phase of development will also require an analysis of the watermain break history of the existing municipal watermains to determine if there is any merit in preserving any existing watermains and if any upgrades or replacement is required for any external existing watermains.

# 3 SANITARY SERVICING

## 3.1 Existing Municipal Sanitary Sewer System

From the information provided by the City of Toronto, the existing municipal sanitary sewer system for the Study Area has been tabulated and illustrated in the Existing Infrastructure Analysis Report. The existing sanitary sewers in the Study Area generally range in size from 150mm diameter to 600mm diameter. Records indicated that there is a section of 1500mm diameter sanitary sewer in Rajah Street and Ranee Avenue. This large diameter sewer was most likely installed to provide storage during wet weather flows to help alleviate basement flooding in this area. There are primarily 250mm municipal sanitary sewers throughout the residential areas. This is typical for low density residential neighbourhoods of this nature. The existing municipal sanitary sewer system collects waste water drainage from the residential, institutional and retail areas through municipal service connections and private on-site sanitary sewer systems.

As indicated in the Existing Infrastructure Analysis on Drawing SAN-1, six (6) drainage boundaries have been defined, all with sanitary sewer outlets from the Study Area. Sanitary drainage boundaries 4 and 5 encompass the Focus Area. Sanitary drainage boundary 4 outlets to a 600mm diameter sanitary sewer in Shermount Avenue, south of Lawrence Avenue. Sanitary drainage boundary 5 outlets to a 450mm diameter sanitary sewer in Bolingbroke Road, south of Lawrence Avenue. Both of these drainage areas ultimately outlet to the Hillhurst Boulevard trunk sewer.

## 3.2 Rationale for the System

The sanitary servicing system is required to service the proposed intensification in the LARS area. Servicing must be provided to meet the needs of the City and community while being sustainable, and delivered at the best value.

Upgrades to the existing sanitary servicing system are required to meet the needs of the proposed Preferred Plan while meeting the municipal servicing standards of the City of Toronto and various provincial regulatory agencies. An analysis of the sanitary constraints within the Study Area determined that nineteen (19) sections of existing sanitary sewer are currently over capacity. The City has provided modelling that indicates an additional eight (8) existing areas experiencing basement flooding. This information is illustrated on Drawings SAN-2 and SAN-4 of the Existing Infrastructure Analysis. Due to current capacity issues, and proposed intensification of the area, it has been determined that additional sewer capacity is needed. Modeling and analysis has been conducted which provides background on the rationale for the system.

***Design Criteria***

The following design parameters were used in creating the sanitary model for each Phase of redevelopment and the ultimate Master Plan build-out:

- Sanitary flow produced by Existing Residential Units = 240 l/cap/day
- Sanitary flow produced by New Residential Units = 450 l/cap/day
- Sanitary flow produced by Commercial/Industrial use = 180,000 l/floor ha/day Where floor area is taken as one half of the gross land area.
- Sanitary flow produced by Institutional use = 180,000 l/floor ha/day Where floor area is taken as the gross land area.
- Residential Density dependent on Census Area or 3.2 cap/unit if Census Data not available for Existing Units
- New Residential Population based on unit counts of the Preferred Plan
- Peaking Factor = Harmon formula
- Inflow and Infiltration Flow of 2.27 l/s/ha for Existing Sanitary Sewers
- Inflow and Infiltration Flow of 0.26 l/s/ha for New Sanitary Sewers

The following equations were used in the model:

$$M(r) = 1 + \frac{14}{4 + \sqrt{P}}$$

M(r) = Residential Peaking Factor (Harmon Formula)

P = population in the 1000s

$$Q(r) = \frac{p \times q(r) \times M(r)}{86400}$$

Q(r) = Peak sanitary flow (l/s)

q(r) = design sanitary flow per person (l/person/day)

p = population

In order to complete the sanitary design sheets, an Inflow and Infiltration (I&I) value has to be assigned based upon tributary area. The I & I value is flow that will theoretically get into the sanitary sewer by means other than direct sanitary service connections to buildings. Some examples of I&I flows that can get into a sanitary sewer system are as follows.

- Surface rainwater through maintenance hole lids
- Damaged sewers and loose joints that allow ground water into the pipe
- Cross connection of roof leaders or sump pumps from residential dwellings that connect to the sanitary sewer.

For new development areas, the I&I value used to design sanitary sewers will be the City standard of 0.26L/s/ha. It can be assumed that the new sanitary sewer will have water tight joints and there will be no cross connections with the storm sewer system or stormwater flows.

The majority of the external sanitary sewer system that will receive flows from the Focus Area was constructed in the 1950s. To determine an approximate I&I value to use for the external sanitary areas we coordinated with the City of Toronto. The City has completed preliminary sanitary sewer modeling for Study Area 17, which includes the LARS area. The City study includes wet weather data from actual monitoring and modeling based on the May 12, 2000 storm event. Our interpolation of the City data is a wet weather I&I value of 2.27 L/s/ha. Consequently, the infiltration value that has been used in analyzing the external sanitary sewer systems that will receive flows from the proposed redevelopment plan is 2.27 L/s/ha. The City modeling has been illustrated in the Existing Infrastructure Analysis Report.

Using the above noted information, sanitary design sheets have been prepared for the entire Study Area. Please refer to **Appendix B** for a copy of the sanitary design sheets for each phase and to Drawing SAN-1 of **Appendix E** for preliminary sanitary drainage areas. **The layout of the existing municipal sanitary sewer system as well as the existing maintenance hole numbering system was provided by the City. The scale of this information does not allow it to be effectively added to the MMM drawings that form part of this report. We have therefore included a CD in Appendix F of this report that contains the City sewer mapping and maintenance hole identification** (file name 08043bas). **This information can be related back to the MMM drawings and the MMM design sheets.**

***External Sanitary Constraints and Upgrades***

Sanitary drainage areas 4 and 5, as identified in the Existing Infrastructure Analysis, form part of the Focus Area for this Master Plan. As part of the redevelopment of the Lawrence Heights area, there will be significant intensification of the Focus Area. This will result in increased sanitary flows from drainage area 4. Consequently, the capacity of the external sanitary sewers that will receive drainage from the LARS Focus Area have been reviewed back to the Hillhurst Boulevard sanitary trunk sewer. Sanitary design sheets have been prepared for the external sanitary sewers based upon population and tributary area values provided by the City of Toronto. The external sanitary design sheet information has been added to the proposed sanitary design information for the four phases of development. As previously mentioned, the sanitary design sheets are included as part of **Appendix B.** Refer to **Figure 3-2** for the subrtunk system and new manhole ID used in the design sheets.

As a summary from the Existing Infrastructure Analysis Report, the below tables identify the sections of existing municipal sanitary sewer with constraints under pre-development conditions.

**Table 3-1: Sanitary Drainage Area 4 – External Sewer Constraints**

| Concern | Drainage Area | Street | From | To |
|---|---|---|---|---|
| Over Capacity | 4-External | Shermount Ave | Lawrence Ave (MH4165009511) | Meadowbrook Rd (MH999A) |
| Over Capacity | 4-External | Meadowbrook Rd | Shermount Ave (MH999A) | Englemount Ave (MH998A) |
| Over Capacity | 4-External | Reddick Crt | Englemount Ave (MH998A) | Easement (MH997A) |
| Over Capacity | 4-External | Easement | Reddick Ave (MH997A) | Dalemont Ave (MH996A) |
| Over Capacity | 4-External | Dalemont Ave | Easement (MH996A) | Shelborne Ave (MH995A) |
| Over Capacity | 4-External | Shelborne Ave | Dalemont Ave (MH995A) | Glenmont Ave (MH4) |
| Over Capacity | 4-External | Glenmount Ave | Shelborne Ave | Hillmount Ave |

| Concern | Drainage Area | Street | From | To |
|---|---|---|---|---|
| | | | (MH4) | (MH101) |
| Over Capacity | 4-External | Easement | Viewmont Ave (MH103) | Prue Ave MH104) |
| Over Capacity | 4-External | Prue Ave/ Easement | Easement (MH104) | Hillhurst Ave (MH108) |

**Table 3-2: Sanitary Drainage Area 5 – External Sewer Constraints**

| Concern | Drainage Area | Street | From | To |
|---|---|---|---|---|
| Over Capacity | 5-External | Bolingbroke Rd | Cork Ave (MH 10A) | Wenderly Dr (MH13A) |
| Over Capacity | 5-External | Wenderly Dr | Bolingbroke Rd (MH14A) | Lois Ave (MH15A) |
| Over Capacity | 5-External | Lois Ave | Wenderly Dr (MH15A) | Glengrove Ave (MH21A) |
| Over Capacity | 5-External | Glengrove Ave | Lois Ave (MH21A) | Marlee Ave (MH23A) |
| Over Capacity | 5-External | Marlee Ave | Glengrove Ave (MH23A) | Glencarin Ave (MH25A) |
| Over Capacity | 5-External | Danesbury Ave | Hillmount Ave (MH1010) | Stayner Ave (MH1006) |
| Over Capacity | 5-External | Stayner Ave | Danesbury Ave (MH1006) | Benner Ave (MH1002) |
| Over Capacity | 5-External | Benner Ave | Stayner Ave (MH1002) | Easement (MH1001) |
| Over Capacity | 5-External | Easement | Benner Ave (MH1001) | Shermount Ave (MH47A) |
| Over Capacity | 5-External | Shermount Ave | Easement (MH47A) | Viewmount Ave (MH48A) |

| Concern | Drainage Area | Street | From | To |
|---|---|---|---|---|
| Over Capacity | 5-External | Viewmount Ave | Shermount Ave (MH48A) | Glenmount Ave (MH103) |
| Basement Flooding | 5-External | Danesbury Ave | Lilywood Rd (Approx. MH1009) | Stayner Ave (Approx. MH1006) |
| Basement Flooding | 5-External | Stayner Ave | Danesbury Ave (Approx. MH1006) | Benner Ave (Approx. MH1002) |
| Basement Flooding | 5-External | Viewmount Ave | Englemount Ave (Approx. MH50A) | Glenmount Ave (Approx. MH103) |

The proposed sanitary flows from the LARS Focus Area have been added to the design sheets for the external sanitary sewer system. With the Phase 1 flows added, the entire external sanitary system from Lawrence Avenue to Hillhurst Boulevard is constrained. Refer to the Phase 1 sanitary design sheets included in **Appendix B**. The external system that is constrained is highlighted in red. Drawing San-2 of **Appendix E** provides an illustration of the external sanitary system that is constrained and requires upgrades.

As noted above, the Phase 1 development triggers the need to upgrade the external sanitary sewer system. The external sanitary system has been analysed for the full build-out of the LARS Focus Area to ensure the external system is upgraded to accommodate the entire Master Plan development. The below table identifies the sections of external sanitary sewer that require upgrades, and the size of the proposed sewer to accommodate the entire Focus Area build-out.

**Table 3-3: External Sanitary Sewer Upgrades**

| Street | From | To | Length (m) | Existing Pipe Size (mm) | Proposed Pipe Size (mm) |
|---|---|---|---|---|---|
| Shermount Ave | Lawrence Ave (MH4165009511) | Meadowbrook Rd (MH999A) | 270 | 600 | 825 |
| Meadowbrook Rd | Shermount Ave (MH999A) | Englemount Ave (MH998A) | 250 | 600 | 825 |
| Reddick Ct | Englemount Ave | Easement | 85 | 600 | 825 |

| Street | From | To | Length (m) | Existing Pipe Size (mm) | Proposed Pipe Size (mm) |
|---|---|---|---|---|---|
| | (MH998A) | (MH997A) | | | |
| Easement | Reddick Ct (MH997A) | Dalemount Ave (MH996A) | 110 | 600 | 825 |
| Dalemount Ave | Easement (MH996A) | Shelbourne Ave (MH995A) | 110 | 600 | 825 |
| Shelbourne Ave | Dalemount Ave (MH995A) | Glenmount Ave (MH4) | 110 | 600 | 825 |
| Glenmount Ave | Shelborne Ave (MH4) | Glengrove Ave (MH1) | 205 | 600 | 825 |
| Glenmount Ave | Glengrove Ave (MH1) | Viewmount Ave (MH103) | 405 | 600 | 900 |
| Easement | Viewmount Ave (MH103) | Prue Ave (MH104) | 100 | 600 | 900 |
| Prue Ave | Easement (MH104) | Easement (MH106) | 50 | 675 | 975 |
| Easement | Prue Ave (MH106) | Hillhurst Blvd (MH107) | 90 | 675 | 975 |
| Hillhurst Blvd | Easement (MH107) | Trunk (MH108) | 10 | 675 | 975 |
| Lawrence Ave | Marlee Ave (New MH3B-4A) | Replin Rd (MH4162509429) | 350 | N/A | 375 |

***Rationale Overview***

The proposed sanitary sewer system will be installed along the new municipal roadway network to provide service to the new development blocks. The proposed sanitary system will be comprised of gravity sewers. The proposed sanitary sewers will have a minimum size of 250mm and a minimum depth of 2.75m unless prohibited by existing infrastructure.

**Table 3-4** shows the list of proposed infrastructure improvements and applicable Class EA Schedules for the sanitary servicing system.

**Table 3-4: Proposed Sanitary Sewer System Improvements**

| Proposed Infrastructure Improvement | MEA Class EA Schedule | Rationale (applicable MEA Class EA Document reference) |
|---|---|---|
| Construct new sanitary sewers in existing road allowances to provide capacity for new development | Schedule 'A' | Establish, extend or enlarge a sewage system and all works necessary to connect the system to an existing sewage or natural drainage outlet, provided all such facilities are in either an existing road allowance or and existing utility corridor (#9) |
| Construct new sanitary sewers in new road allowances to service new development | Schedule 'B' | Establish, extend or enlarge a sewage collection system and all works necessary to connect the system to an existing sewage outlet where such facilities are not in an existing road allowance or existing utility corridor (#1) |
| Abandon existing sanitary sewers which are no longer | Not subject to Class EA | |

| Proposed Infrastructure Improvement | MEA Class EA Schedule | Rationale (applicable MEA Class EA Document reference) |
|---|---|---|
| required as part of the wastewater collection system | Process | |

## 3.3 Alternative Solutions

### 3.3.1 *Alternative Solutions to the Problem*

To address the existing and potential sanitary servicing problems associated with the Lawrence-Allen Revitalization, the following alternative solutions were identified.

**Table 3-5: Alternative Solutions for Sanitary Sewer System**

| Alternative Solutions | Description | Details |
|---|---|---|
| DO NOTHING | - | • No changes, use existing sanitary system without upgrade or replacement |
| ALTERNATIVE 'A' | Construct New Sanitary Sewers for the New and Realigned Roads | • Construct new sanitary sewers for new and realigned roads. |
| ALTERNATIVE 'B' | Combination of Water Conservation, Rehabilitation, Reconstruction and Construction of New Sanitary Sewers | • Implement water conservation strategies to reduce sanitary flow and utilize existing capacity if sufficient to service new development and pipes are in good condition.<br>• Rehabilitate existing pipes if pipe conditions are poor but that have adequate capacity to service new |

| Alternative Solutions | Description | Details |
|---|---|---|
| | | development.<br>• Reconstruct existing sanitary sewers if the pipes are in poor condition and rehabilitation cannot be justified, or if pipe capacities are insufficient to serve the new development.<br>• Construct new sanitary sewers for new and realigned roads. |

### 3.3.2 *Evaluation Criteria*

In order to evaluate the alternative solutions, detailed criteria was developed based on general evaluation criteria representing the broad definition of the environment, as defined in the EA Act **(Table 3-6).** Within each category, the project specific evaluation criteria were developed based on the existing characteristics of the Study Area, and the alternative solutions, as described in the following table. **Table 3-6: Evaluation Criteria- Sanitary Sewer System**

| MAIN CRITERION | SUB-CRITERIA |
|---|---|
| NATURAL ENVIRONMENT | Having regard for protecting the natural and physical components of the environment, included considerations of terrestrial habitat, aquatic habitat, surface water quality, ground water quality, aesthetics and landscaping as:<br>• Terrestrial Habitat<br>• Land<br>• Water |

| MAIN CRITERION | SUB-CRITERIA |
|---|---|
| SOCIAL AND ECONOMIC | Having regard for the potential impact related to private property, archaeological and cultural heritage resource, employment activity, noise and vibration, and health and safety as:<br>• Cultural Heritage Resource<br>• Recreation and Tourism<br>• Traffic Considerations<br>• Health and Safety<br>• Employment<br>• Noise and Vibration |
| OPPORTUNITY FOR REVITALIZATION | Having regard for the extent to which each alternative supports the planning and urban design goals of the LARS is as:<br>• Supports the planning and urban design goals |
| FEASIBLITY AND COST | Having regard for the cost associated with each alternative, and the feasibility of each alternative is considered as:<br>• Feasibility of construction (implementation)<br>• Cost- capital and operational<br>• Ease of operation/maintenance<br>• Implementation possibility |
| TECHNICAL | Refers to the capability of each alternative to adequately service the Focus Area. Including, having regard for the technical suitability, reliability, longevity, and other engineering aspects of each alternative solution is considered as:<br>• Reliability of service<br>• Flexibility to provide capacity for future growth and/or |

| MAIN CRITERION | SUB-CRITERIA |
|---|---|
| | improved service level<br>• Life expectancy |

### 3.3.3 *Assessment and Evaluation of the Alternative Solutions to the Problem*

Using the evaluation criteria identified in **Table 3-6,** the three alternative solutions to the problem were subject to a net effects comparative evaluation. The advantages and disadvantages of each alternative were compared in order to establish a ranking of the alternatives and identification of the recommended alternative. The evaluation is summarized in **Table 3-7 and an additional discussion of the evaluation rationale is provided below.**

***Alternative 'A'- Construct New Sanitary Sewers for the New and Realigned Roads***

Alternative 'A' was not deemed to be the most preferred as it simply identified the construction of new pipes within new roadways. To deal with the existing servicing issues, additional work will need to be conducted on the existing sanitary network as a number of the existing sanitary sewer pipes within the Study Area and outside the Study Area are over capacity. The new sanitary sewers will be developed in tandem with the new roads for the development blocks in order to upgrade the infrastructure in the revitalization area and provide much needed additional capacity. Although this alternative satisfies the technical requirements such as service reliability, future growth flexibility, life expectancy and maintenance without significant adverse effects on other aspects of the environment, it does not address the need to rehabilitate some of the existing infrastructure.

***Alternative 'B' – Combination of Water Conservation, Rehabilitation, Reconstruction and Construction of New Sanitary Sewers***

Alternative 'B' was the most preferred solution as it involved both the construction of new pipes on new road alignments, as well as the reconstruction of existing sanitary servicing. Currently, there are sections of the existing sanitary sewer network is over capacity. This alternative satisfies the technical requirements such as service reliability, future growth flexibility, life expectancy and maintenance, without significant adverse effects on other aspects of the environment. While its cost is higher than the 'do nothing' alternative, the sanitary servicing is required in order to meet the needs of the proposed development and future needs of the study area.

***'Do Nothing'***

This solution to do nothing was ranked last because it does not address the need for additional servicing in the LARS area.

**Table 3-7: Sanitary Services Evaluation**

| **CRITERIA** | | **ALTERNATIVE** | | |
|---|---|---|---|---|
| | | **SANITARY SERVICES** | | |
| | | **Do Nothing** | **A** | **B** |
| **NATURAL ENVIRONMENT** | Terrestrial | ● | ● | ● |
| | Land | • | ⬤ | ⬤ |
| | Water | • | ⬤ | ⬤ |
| **SOCIAL & ECONOMIC** | Cultural Heritage | ⬤ | ● | ● |
| | Recreation and Tourism | • | ● | ● |
| | Traffic | ⬤ | ● | ● |
| | Health and Safety | • | ⬤ | ⬤ |

| CRITERIA | | ALTERNATIVE | | |
|---|---|---|---|---|
| | | SANITARY SERVICES | | |
| | | **Do Nothing** | **A** | **B** |
| | Employment | • | ● | ⬤ |
| | Noise and Vibration | ⬤ | • | • |
| **OPPORTUNITY FOR REVITALIZATION** | | • | ● | ⬤ |
| **FEASIBLITY & COST** | Feasibility | ● | ● | ⬤ |
| | Cost | ⬤ | ⬤ | ● |
| | Maintenance Requirements | • | ● | ● |
| | Implementation Possibility | ● | ● | ⬤ |
| **TECHNICAL** | Service Reliability | • | ● | ⬤ |

| CRITERIA | | ALTERNATIVE | | |
|---|---|---|---|---|
| | | SANITARY SERVICES | | |
| | | **Do Nothing** | **A** | **B** |
| | Future Growth Flexibility | • | ● | ⬤ |
| | Life Expectancy | • | ● | ⬤ |
| **RECOMMENDED ALTERNATIVE SOLUTION** | | | | ✓ |

| KEY | • Poor | ● Average or Neutral | ⬤ Good |
|---|---|---|---|

## 3.4 Preferred Solution

The proposed sanitary sewer system will be installed within the new municipal roadway network to provide service to the new development blocks. The new sanitary system will be designed to the City of Toronto Design Criteria for Sewers and Watermains – November 2009, or the most current revision at the time of design. The proposed sanitary system will be comprised of gravity sewers. The connection of foundation drains for new development to either the storm or sanitary sewer will not be permitted.

The four Phases of development have been analyzed to determine the sanitary sewer sizing and the required upgrades for external sanitary sewers. In the analysis, it was assumed that the proposed sanitary sewers have a minimum slope of 0.5% and the design criteria outlined in Section 3.2 has been applied. The proposed sanitary sewer system is illustrated on Drawing SAN-1 of **Appendix E**.

Please note that the analysis included in this Master Plan does not include precise depths, invert elevations and exact maintenance hole locations. The analysis completed includes peak sanitary flows, minimum pipe sizing and impacts to the external sanitary sewer systems receiving flows from this redevelopment. The specific sewer arrangements for the proposed system can only be determined during detailed design. A number of factors come into play during detailed design including specific building elevations, proposed utility crossings, phasing of construction and maximizing pipe size to slope rations which cannot be determined at a Master Plan level.

***Phase 1*** services an approximate area of 10.41 ha and an approximate population of 2270. The Phase 1 area takes external drainage from both Ranee Avenue and Varna Drive. Existing sanitary flows that currently cross under Allen Road at Leila Lane can be redirected into the Phase 1 system to potentially eliminate the crossing of Allen Road. The Phase 1 area will require a core sanitary spine between MH1-1A and MH4-1A of 375mm diameter. The local roads connecting to the sanitary spine will have sewers of 250mm diameter. Refer to drawing SAN-1 of **Appendix E**.

The Phase 1 sanitary sewers outlet to the future Phase 4 lands through Existing Varna Drive at Rondale Boulevard. The proposed Phase 4 sanitary sewers that will receive the Phase 1 flows, will be constructed within new municipal roadways that follow the same alignment as the existing municipal roadways Flemington Road (Replacing Existing Varna Drive) and Replin Road. The Phase 1 sanitary design sheets indicate that the existing 250mm, 300mm and 600mm sanitary sewers on Varna Drive, Flemington Road and Replin Road do not have sufficient capacity for the Phase 1 development. Consequently, the future Phase 4 sanitary sewer along Varna Drive, Flemington Road and Replin Road will have to be front ended and constructed as part of the ultimate Phase 1 build-out. This section of sewer is identified on drawing SAN-1 as MH4-1A to MH4-2A to MH4-3A to MH4-4A to EX MH41625009429. The Phase 4 sewer that will be front-ended is located within existing municipal road allowances, and as a result a traffic management plan will be required for this sewer construction. The phase 4 sewers that will be pre-installed also receive sanitary drainage from the Phase 2 and Phase 3 areas. The City may consider flow monitoring of the existing sanitary sewers identified for reconstruction within the Phase 4 area to determine actual flows. Refer to **Appendix B** for the Phase 1 sanitary design sheets.

***Phase 2*** services an approximate area of 10.78 ha and an approximate population of 3,167. The Phase 2 area includes Varna Drive north of Ranee Avenue and the park area identified as Block 56. External drainage flows into this area of Phase 2 at EX MH4305909521 adjacent to Neptune

Drive. The sanitary flows from Phase 2 north of Ranee Avenue connect to the Phase 1 sanitary sewer at MH1-1A. The Phase 1 sanitary sewers have been sized for this flow.

The Phase 2 area also comprises that lands south of the Phase 1 area and northwest of the proposed Flemington Road. A new 375mm sanitary sewer between MH2-1A and MH4-2A is required to service this area. The front-ended Phase 4 sanitary sewer has been sized to accommodate the anticipated Phase 2 flows. Refer to Appendix B for the Phase 2 sanitary design sheets.

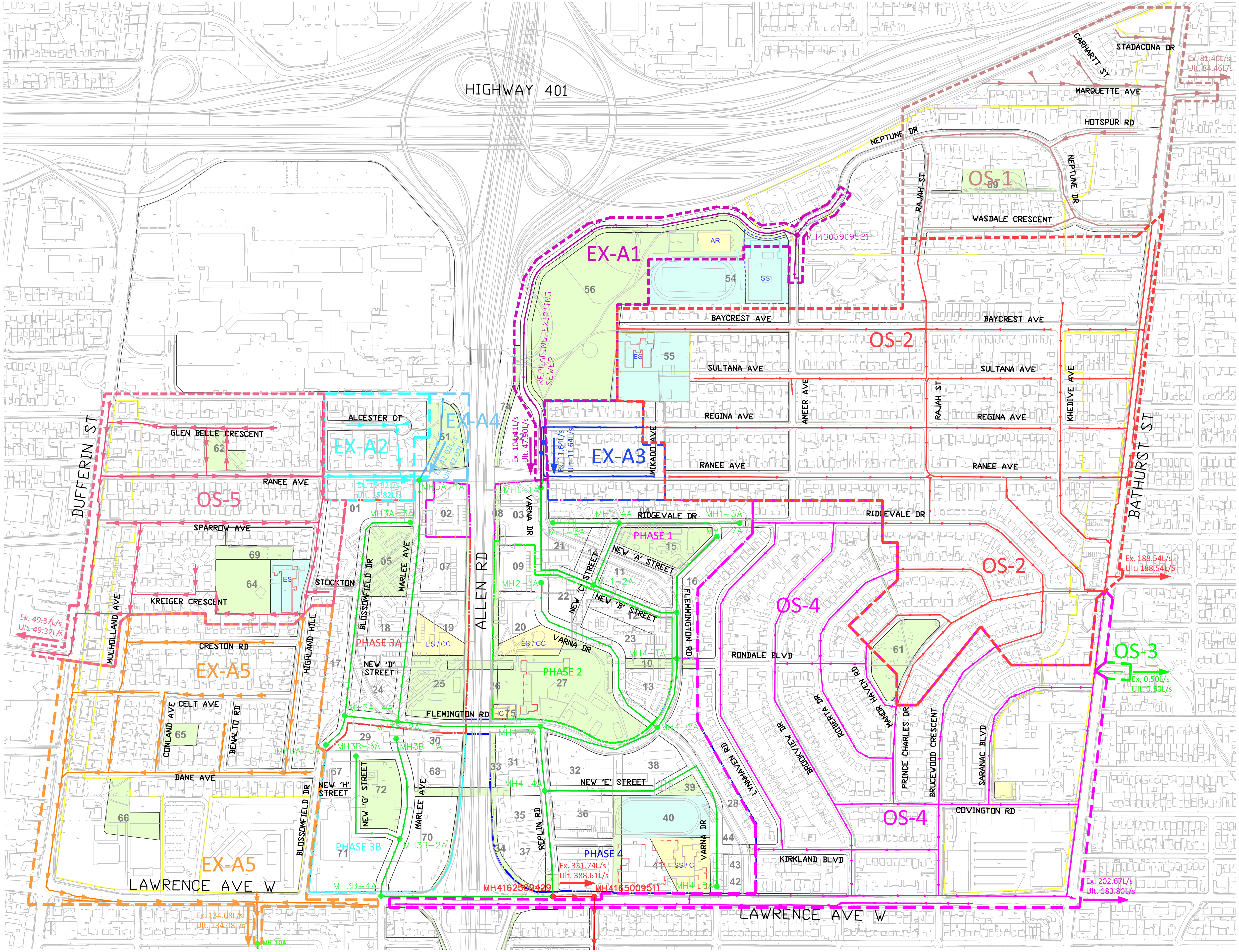
***Phase 3A*** services an approximate area of 12.65 ha and an approximate population of 3,543. The Phase 3A area receives external sanitary drainage from Alcester Court and Ranee Avenue. The Phase 3A area will require a core sanitary spine between MH3A-1A and MH4-3A of 450mm diameter. The local roads connecting to the sanitary spine will have sewers of 250mm diameter. The Phase 4 sanitary sewer has been sized to accommodate the Phase 3A flows. Refer to Appendix B for the Phase 3A sanitary design sheets.

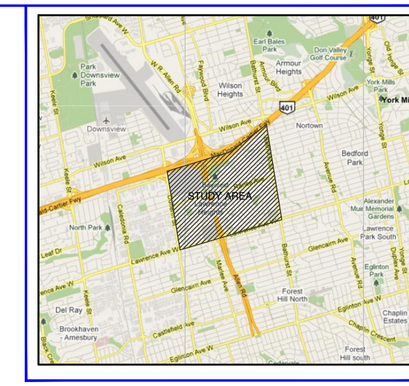
***Phase 3B*** services an approximate area of 9.25 ha and an approximate population of 3,996. Area 3B drains south to Lawrence Avenue and east along Lawrence Avenue crossing Allen Road. A new sanitary sewer is required between MH3B-1A and EX MH4162509429 ranging in size from 250mm to 375mm. The existing 250mm sanitary sewer along Lawrence Avenue will have to be replaced with a new 375mm sanitary sewer. Refer to Appendix B for the Phase 3B sanitary design sheets.

***Phase 4*** services an approximate area of 17.71 ha and an approximate population of 5,853. The sanitary sewers between MH4-1A and EX MH4162509429 has been preinstalled as part of the Phase 1 development. The local roads connecting to the sanitary spine will have sewers of 250mm diameter. The Phase 4 sanitary sewers outlet to the external municipal system at Lawrence Avenue and Shermount Avenue. Refer to Appendix B for the Phase 4 sanitary design sheets.

**Figures 3-1 and 3-2** illustrate the existing and ultimate sanitary flows at each of the boundary conditions. With the significant increase in population of the entire Focus Area redevelopment there was only a minor increase in proposed sanitary flows of approximately 8 L/s at the Hillhurst Boulevard Trunk Sewer due to a reduced I & I value for new development. There is also a decrease in flows of approximately 19 L/s from the area noted as OS-4; this decrease in flows is due to the redirection of the sanitary flows from Phase 3B to Subtrunk 2 and ultimately the Hillhurst Boulevard trunk sewer. An increase in proposed sanitary flow of approximately

57L/s to Subtrunk 2 at Lawrence Avenue West has been estimated. All remaining boundary condition flows will be unaffected by the redevelopment.




KEY PLAN NTS

LEGEND

- PROPOSED SANITARY SEWER
- SANITARY AREA BOUNDARY
- SANITARY MANHOLE
- OFFSITE AREA 1
- OFFSITE AREA 2
- OFFSITE AREA 3
- OFFSITE AREA 4
- OFFSITE AREA 5
- EXTERNAL AREA 1
- EXTERNAL AREA 2
- EXTERNAL AREA 3
- EXTERNAL AREA 4
- EXTERNAL AREA 5
- SUBTRUNK 1
- SUBTRUNK 2

CLIENT
CITY OF TORONTO

MUNICIPALITY
TORONTO

PROJECT TITLE
LAWRENCE HEIGHTS REVITALIZATION

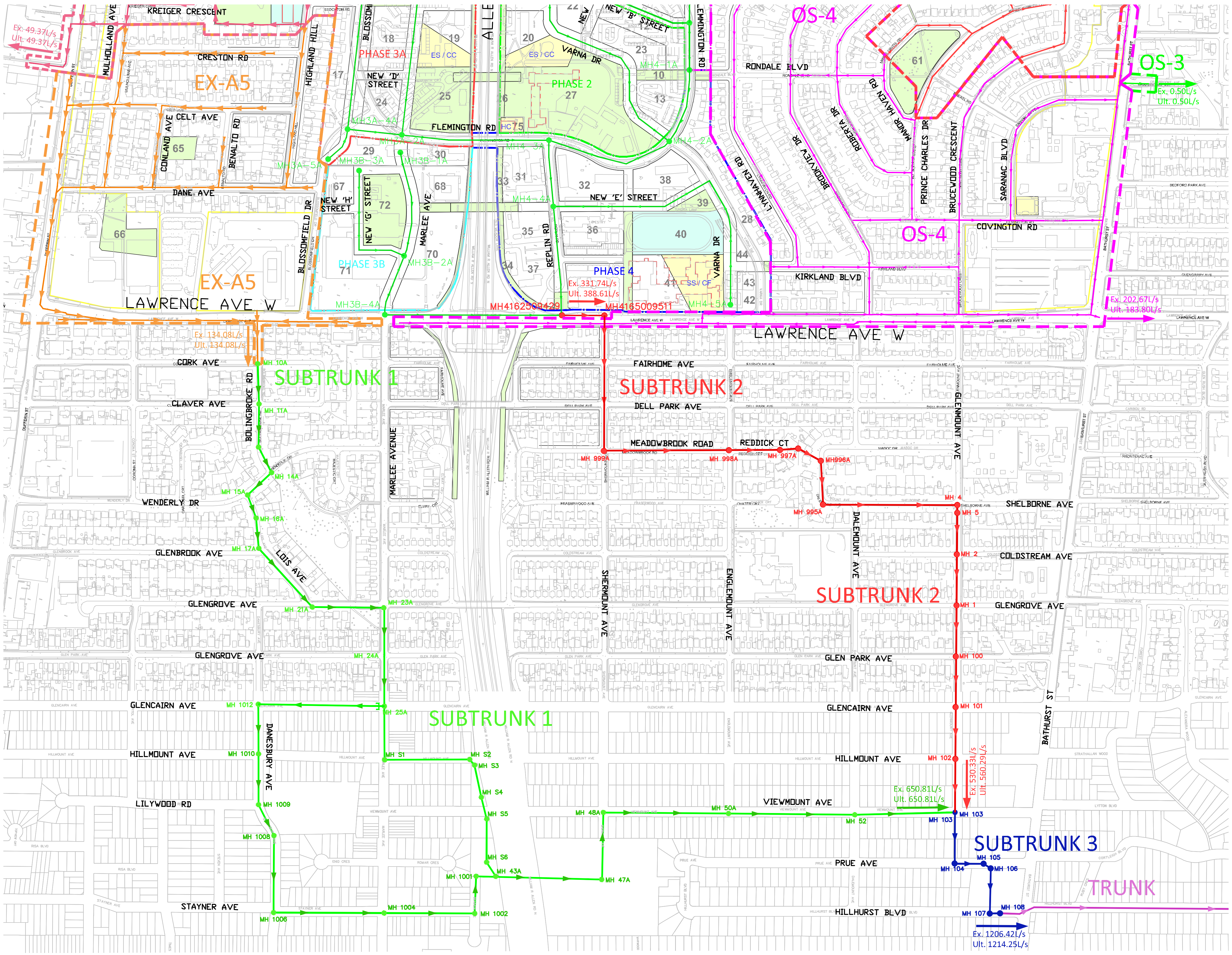
SHEET TITLE
SANITARY DRAINAGE PLAN

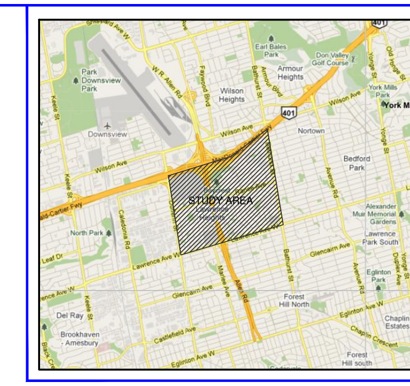
MMM GROUP
100 Commerce Valley Dr. West
Thornhill, Ont. L3T 0A1
Tel (905) 882-1100
Fax (905) 882-0055
www.mmm.ca

| DESIGNED | DRAWN | CHECKED |
|---|---|---|
| A.W. | S.W. | S.M.W |

| SCALE | DATE |
|---|---|
| 1:7500 | JUNE 2011 |

| PROJECT NUMBER | FIGURE |
|---|---|
| 10-08043 | 3-1 |



KEY PLAN

NTS

LEGEND

- PROPOSED SANITARY SEWER
- SANITARY AREA BOUNDARY
- SANITARY MANHOLE
- OFFSITE AREA 1
- OFFSITE AREA 2
- OFFSITE AREA 3
- OFFSITE AREA 4
- OFFSITE AREA 5
- EXTERNAL AREA 1
- EXTERNAL AREA 2
- EXTERNAL AREA 3
- EXTERNAL AREA 4
- EXTERNAL AREA 5
- SUBTRUNK 1
- SUBTRUNK 2

CLIENT
CITY OF TORONTO

MUNICIPALITY
TORONTO

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MMM GROUP
100 Commerce Valley Dr. West
Thornhill, Ont. L3T 0A1
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Fax (905) 882-0055
www.mmm.ca


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| A.W. | S.W. | S.M.W |

| SCALE | DATE |
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| 1:7500 | JUNE 2011 |

| PROJECT NUMBER | FIGURE |
|---|---|
| 10-08043 | 3-2 |

An overview of the phases and proposed construction of new pipelines and sewer upgrades are contained in **Table 3-8** and **3-9**, respectively.

**Table 3-8: Sanitary Sewer Project Class Environmental Assessment Schedule and Proposed New Sanitary Sewers in New Road Allowance**

| Location | From | To | Diameter (mm) | Length (m) | Class EA Schedule |
|---|---|---|---|---|---|
| New Street B | Varna Dr. | Flemington Rd | 375 | 300 | B |
| New Street C | Ridgevale Dr. | New Street B | 250 | 150 | B |
| New Street E | Varna Dr. | Replin Rd | 250 | 310 | B |
| New Street G | Marlee Ave. | End | 250 | 250 | B |

**Table 3-9: Sanitary Sewer Project Class Environmental Assessment Schedule and Proposed New Sanitary Sewers in Existing Road Allowance**

| Location | From | To | Diameter (mm) | Length (m) | Class EA Schedule |
|---|---|---|---|---|---|
| Varna Dr | Neptune Dr | Lawrence Ave W | 250-375 | 1880 | A |
| Ridgevale Dr | Flemington Rd | Varna Dr | 250 | 380 | A |
| Flemington Rd | Ridgevale Dr | Blossomfield Dr | 250-450 | 1100 | A |
| Replin Rd | Flemington Rd | Lawrence Ave W | 600 | 350 | A |
| Marlee Ave | Ranee Ave | Lawrence Ave W | 250-375 | 830 | A |
| Blossomfield Dr | Marlee Ave | Flemington Rd | 250 | 565 | A |
| Shermount Ave | Lawrence Ave | Meadowbrook Rd | 825 | 270 | A |
| Meadowbrook Rd | Shermount Ave | Englemount Ave | 825 | 250 | A |
| Reddick Ct | Englemount Ave | Easement | 825 | 85 | A |

| Location | From | To | Diameter (mm) | Length (m) | Class EA Schedule |
|---|---|---|---|---|---|
| Easement | Reddick Ct | Dalemount Ave | 825 | 110 | A |
| Dalemount Ave | Easement | Shelbourne Ave | 825 | 110 | A |
| Shelbourne Ave | Dalemount Ave | Glenmount Ave | 825 | 110 | A |
| Glenmount Ave | Shelborne Ave | MH1 | 825 | 205 | A |
| Glenmount Ave | MH2 | Viewmount Ave | 900 | 405 | A |
| Easement | Viewmount Ave | Prue Ave | 975 | 100 | A |
| Prue Ave | MH104 | MH106 | 975 | 50 | A |
| Easement | Prue Ave | Hillhurst Blvd | 975 | 90 | A |
| Hillhurst Blvd | MH7 | MH8 | 975 | 10 | A |
| Lawrence Ave | Marlee Ave | Replin Rd | 375 | 350 | A |

## 3.5 Water Conservation Strategies

All new development within the Study Area will aim to conserve water use and reduce the contribution to the sanitary system from the Study Area. The reduction in sanitary flows will help in alleviating downstream sanitary capacity and basement flooding issues. All new development should consult the current version of the City of Toronto`s Water Efficiency Plan for strategies and technologies that can be implemented such as:

- Faucet aerators to reduce water use in sinks;
- Use of hot water recirculation pumps;
- Installing high efficiency fixtures in all new buildings;
- Ensure all hot water pipes are insulated;
- Repair any dripping fixtures in areas to remain;
- Replace old out-dated fixtures with new high efficiency fixtures in areas to be maintained.

Educating staff, tenants and the general public on water conservation strategies is also a critical goal. This can include:

- Take short 5 minute showers;
- Do not run water when shaving or brushing teeth;
- Only run full loads in the washing machine;
- Only run full loads in the dishwasher and avoid pre-rinsing dishes;
- Wash vegetables and fruit in a bowl and then use the water for house plants.

### 3.6 Future Studies Required

At the detailed design stage for all phases of development, engineering drawings will be required for the new municipal infrastructure. The engineering drawings will include a plan and profile design for the new sanitary sewer system including specific requirements such as pipe elevations, slopes, inverts, service connections and maintenance hole locations. MOE certificates of approval will be required for the proposed public sewer systems.

For the block developments, functional servicing reports and detailed site servicing designs will be required for the rezoning, subdivision, and site plan applications of all the new proposed development. The above noted documents will also be required for the water and storm services. All future studies need to coordinate with the Basement Flooding Study for Area 17 by the City.

# 4 STORM SERVICING

## 4.1 Existing Municipal Storm Sewer System

From the information provided by the City of Toronto, the existing municipal storm sewer system for the Study Area has been tabulated and illustrated in the Existing Infrastructure Analysis Report. The existing municipal storm sewers range in size from 250mm diameter to 2550mm diameter, and are primarily located within the municipal road allowances. The existing storm sewer system collects the minor drainage from both the public road allowances as well as the private residential, institutional and retail areas within the Study Area. The roadway drainage is collected through a series of catchbasins, and the private site drainage is collected both by surface drainage as well as private site sewer systems.

The Existing Infrastructure Analysis indicates the approximate drainage boundaries for the existing sewer system. Ten (10) drainage boundaries have been defined, all with storm sewer outlets from the Study Area. As shown in Figure 4-1, storm drainage boundaries OS-5, OS-9, and the Allen Trunk Sewer Catchment encompass the Focus Area of the LARS site. As expected, the natural drainage gradient across the Study Area is essentially from north to south. The storm sewer systems generally flow in a north to south direction with the size of the sewer legs increasing as the tributary area grows. Generally, there are also sewer legs flowing east and west to follow the existing roadways that tie into the existing subtrunk storm sewer system.

## 4.2 Rationale for the System

The storm servicing system is required to service the proposed intensification in the LARS area. Servicing must be provided to meet the needs of the City and community while being sustainable, and delivered at the best value. The Existing Infrastructure Analysis determined that a number of constraints on the storm sewer system currently existed. Upgrades to the existing storm servicing system are required to meet the needs of the proposed preferred plan while meeting the municipal servicing standards of the City of Toronto and various provincial regulatory agencies.

Modeling and analysis has been completed which provides background on the rationale for the system.

***Design Criteria***

The following design parameters were used in creating the storm model for each Phase of redevelopment and the ultimate Master Plan build-out:

The Rational Method, as shown below, was used to determine unrestricted storm flows:

$$Qu = 2.778CIA$$

$Q_u$ = Unrestricted Flow in litres per second

C = Run-off Coefficient

I = Intensity of Rainfall in mm/hour

A = Drainage Area in hectares

A modification of the Rational Method, as shown below, was used to determine restricted storm flows:

$$Qr = 2.778I(CAu + CeAr)$$

$Q_r$ = Restricted Flow in litres per second

$A_u$ = Unrestricted Drainage Area in hectares

$C_e$ = Effective Impervious Coefficient

$A_r$ = Restricted Drainage Area in hectares

Rainfall intensity was calculated using the intensity duration frequency curve for the 2-year storm as follows:

$$I = 21.8T^{-0.78}$$

T = Time of Concentration in hours (10 minute inlet time)

The following run-off coefficients were applied based on particular land use:

- Parks and Open Space: 0.25
- Townhouse: 0.75
- Hi-rise Residential/Commercial/Institutional: 0.80
- Roads (including boulevard): 0.70
- Existing Residential: 0.55

***Rationale Overview***

The proposed storm sewer system will be installed along the new municipal roadway network to collect the drainage from the roadways and adjacent development blocks. The proposed storm sewer system will generally follow the roadway grading design and outlet to the low end of the site, which is an existing storm sewer at all the connections.

**Table 4-1** shows the list of proposed infrastructure improvements and applicable Class EA Schedules for the storm servicing system.

**Table 4-1: Proposed Storm Servicing System Improvements**

| Proposed Infrastructure Improvement | MEA Class EA Schedule | Rationale (applicable MEA Class EA Document reference) |
|---|---|---|
| Reconstruct storm sewers in existing road allowances to increase capacity for new development | Schedule 'A' | Establish, extend or enlarge a stormwater conveyance system and all works necessary to connect the system to an existing system, provided all such facilities are either in an existing road allowance or are in an existing utility corridor (#6) |
| Construct new storm sewers in new road allowances to service new development | Schedule 'B' | Establish, extend or enlarge a stormwater conveyance and all works necessary to connect the system to an existing system where such facilities are not in an existing road allowance or existing utility corridor (#1) |

## 4.3 Alternative Solutions

### 4.3.1 *Alternative Solutions to the Problem*

To address the existing and potential storm servicing problems associated with the Lawrence-Allen Revitalization, the following alternative solutions were identified.

**Table 4-2: Alternative Solutions - Storm System**

| Alternative Solutions | Details | Conclusions |
|---|---|---|
| DO NOTHING | - | • No changes, use existing stormwater system without upgrade or replacement |
| ALTERNATIVE ‘A’ | Rehabilitate Existing Stormwater Infrastructure | • Only rehabilitate the existing stormwater infrastructure |
| ALTERNATIVE ‘B’ | Combination of stormwater management techniques, rehabilitation and construction of new infrastructure | • Implement a series of stormwater management techniques that will assist in relieving the pressure on the existing and new system and will decrease overall stormwater flow.<br>• Rehabilitate or reconstruct existing stormwater infrastructure<br>• Construct new stormwater infrastructure for new municipal road network |

### 4.3.2 *Evaluation Criteria*

In order to evaluate the alternative solutions, detailed criteria was developed based on general evaluation criteria representing the broad definition of the environment, as defined in the EA Act **(Table 4-3).** Within each category, the project specific evaluation criteria were developed based on the existing characteristics of the Study Area, and the alternative solutions, as described in the following table.

**Table 4-3: Evaluation Criteria- Storm System**

| MAIN CRITERION | SUB-CRITERIA |
|---|---|
| NATURAL ENVIRONMENT | Having regard for protecting the natural and physical components of the environment, included considerations of terrestrial habitat, aquatic habitat, surface water quality, ground water quality, aesthetics and landscaping as:<br>• Terrestrial Habitat<br>• Land<br>• Water |
| SOCIAL AND ECONOMIC | Having regard for the potential impact related to private property, archaeological and cultural heritage resource, employment activity, noise and vibration, and health and safety as:<br>• Cultural Heritage Resource<br>• Recreation and Tourism<br>• Traffic Considerations<br>• Health and Safety<br>• Employment<br>• Noise and Vibration |
| OPPORTUNITY FOR REVITALIZATION | Having regard for the extent to which each alternative supports the planning and urban design goals of the LARS is as:<br>• Supports the planning and urban design goals |
| FEASIBLITY AND COST | Having regard for the cost associated with each alternative, and the capability of each alternative to adequately service the Study Area is considered as: |

| MAIN CRITERION | SUB-CRITERIA |
|---|---|
| | • Feasibility of construction (implementation)<br>• Cost- capital and operational |
| TECHNICAL | Having regard for the technical suitability, reliability, longevity, and other engineering aspects of each alternative solution is considered as:<br>• Reliability of service<br>• Flexibility to provide capacity for future growth and/or improved service level<br>• Life expectancy<br>• Maintenance requirements<br>• Impact on the upstream and downstream existing storm sewers |

### 4.3.3 *Assessment and Evaluation of the Alternative Solutions to the Problem*

Using the evaluation criteria identified in **Table 4-3,** the three alternative solutions to the problem were subject to a net effects comparative evaluation. The advantages and disadvantages of each alternative were compared in order to establish a ranking of the alternatives and identification of the recommended alternative. The evaluation is summarized in **Table 4-4** in addition to a description of the evaluation rationale below.

***Alternative 'A'- Rehabilitate Existing Stormwater Infrastructure***

Alternative 'A', was the moderately preferred solution. This solution will provide some, but not all of the new stormwater infrastructure needed to service the redevelopment. This alternative simply looks at retrofitting the existing system; however the current system does not align with the preferred development plan.. Additionally, this alternative neglects to include a series of stormwater management techniques that will help to address peak flow issues.

***Alternative 'B' – Combination of Stormwater Management Techniques, Rehabilitation and Construction of New Infrastructure***

Alternative 'B' is the most preferred alternative as it includes rehabilitating and reconstructing existing infrastructure, as well as constructing new stormwater infrastructure within the new municipal road network. This will address the technical components of the project by allowing for future growth and make the system more reliable, but it also implements a series of stormwater management techniques, that will assist in reducing the overall rate of stormwater flow in a more sustainable manner. Section 5.0 provides an in-depth review of the potential stormwater management techniques that should be undertaken as part of this project.

***'Do Nothing***

This solution to do nothing was ranked lowest because it does not address the need for additional stormwater servicing in the LARS area. In addition, it does not satisfy the technical requirements to provide adequate stormwater collection services.

**Table 4-4: Storm Servicing Evaluation**

| **CRITERIA** | | **ALTERNATIVE** | | |
|---|---|---|---|---|
| | | **STORM SERVICES** | | |
| | | **Do Nothing** | **A** | **B** |
| **NATURAL ENVIRONMENT** | Terrestrial | ● | ● | ● |
| | Land | • | ● | ⬤ |
| | Water | • | ● | ⬤ |
| **SOCIAL & ECONOMIC** | Cultural Heritage | ⬤ | ● | ● |

| **CRITERIA** | | **ALTERNATIVE** | | |
|---|---|---|---|---|
| | | **STORM SERVICES** | | |
| | | **Do Nothing** | **A** | **B** |
| | Recreation and Tourism | · | • | • |
| | Traffic | · | ● | ● |
| | Health and Safety | · | • | • |
| | Employment | · | ● | ● |
| | Noise and Vibration | ● | · | · |
| **OPPORTUNITY FOR REVITALIZATION** | | · | ● | ● |
| **FEASIBLITY & COST** | Feasibility | • | ● | • |
| | Cost | ● | • | • |

| CRITERIA | | ALTERNATIVE | | |
|---|---|---|---|---|
| | | STORM SERVICES | | |
| | | **Do Nothing** | **A** | **B** |
| **TECHNICAL** | Service Reliability | • | ● | ⬤ |
| | Future Growth Flexibility | • | ● | ⬤ |
| | Life Expectancy | • | ● | ⬤ |
| | Maintenance Requirements | • | ● | ⬤ |
| | Existing Sewer Impacts | • | ● | ⬤ |
| **RECOMMENDED ALTERNATIVE SOLUTION** | | | | ✓ |

| | | | |
|---|---|---|---|
| KEY | • Poor | ● Average or Neutral | ⬤ Good |

## 4.4 Preferred Solution

The preferred solution involves installing the proposed storm sewer system along the new municipal roadway network to collect the drainage from the roadways and adjacent development blocks. The new storm system will be designed to the City of Toronto Design Criteria for Sewers and Watermains – November 2009, or the most current revision at the time of design. The proposed storm drainage system will be comprised of gravity sewers and will generally follow the roadway grading design and outlet to the low end of the site and connect to the existing municipal storm sewer system. The connection of foundation drains for new development to either the storm or sanitary sewer will not be permitted.

The four Phases of development have been analyzed to determine the storm sewer sizing. In the analysis, it was assumed that the proposed storm sewers have a minimum slope of 0.5% and the design criteria outlined in Section 4.2 has been applied. The proposed storm sewer system is illustrated on Drawing STM-1 of **Appendix E**. The storm sewer design sheets are included in **Appendix C.**

Similar to the sanitary section, the analysis included in this Master Plan does not include precise depths, invert elevations and maintenance hole locations. This level of analysis can only be completed as part of a detailed design.

The proposed intensification of the focus area of the LARS site will increase the impervious areas within this site and will impact the stormwater flow generated. The rate of stormwater flow from the redevelopment area must be controlled to the Cities Wet Weather Flow Master Plan Guidelines (WWFMP) and must also not increase from the pre-development condition. The stormwater generated by the proposed redevelopment plan has been analysed in relation to the WWFMP and a run-off coefficient of 0.5. Taking into account both the redevelopment area and the external areas contributing to the existing storm sewer outlets, there is a net increase in the rate of stormwater flow to the existing municipal system. The focus area of the Lawrence Heights site was therefore analysed to meet existing pre-development stormwater flow conditions. This analysis was conducted utilizing controlled stormwater release rates from the redevelopment blocks combined with external uncontrolled storm flows tributary to the existing outlets. This analysis determined that a controlled stormwater release rate of 80l/s/ha from the redevelopment blocks will control the stormwater flow to the existing municipal storm sewer systems to pre-development conditions.

During detail design, the consulting engineer of record will have to evaluate the existing storm sewer system based upon the actual proposed development plan to ensure pre-development stormwater flow rates are not increased. The existing flows cannot be exceeded at any time at the existing MH4151209086 at Lawrence Avenue West and Marlee Avenue, MH4163709513 at Lawrence Avenue West and Shermount Avenue, MH4182009199 at Allen Road between Lawrence Avenue West and Flemington Road, and the following manholes on the west or east side of Allen Road: MH4234509024, MH4236409089, MH4211809090, and MH4183909236.

***Phase 1*** has been divided into three drainage subcatchment areas. All three areas of Phase 1 are tributary to the existing 2100mm storm sewer in Allen Road that will be retained as part of the Master Plan development. The two subcatchment areas adjacent to the Allen have tributary areas of 0.94 ha. and 4.18 ha. These areas will connect to the Allen at existing storm maintenance holes EX MH4236409089 and EX MH4234509024 respectively. External drainage enters the Phase 1 area from Regina Avenue and will be accommodated in the proposed system. The third Phase 1 subcatchment area of 5.31ha drains to the Phase 4 proposed sewer at Varna Drive. The Phase 1 controlled storm flows may not necessitate the need to upgrade the future Phase 4 storm sewers, but this will have to be confirmed as part of the detailed design. With the new Phase 4 sanitary sewers along Varna Drive, Flemington Road and Replin Road being upgraded as part of the Phase 1 works, it is recommended to replace the storm sewers at the same time.

***Phase 2*** has been divided into two subcatchment areas. The land north of Ranee Avenue has an area of 9.50ha and is primarily park land. This area will drain to the Phase 1 storm sewers. The Phase 2 lands south of the Phase 1 development have a tributary area of 10.78 ha. This portion of the Phase 2 area connects to the future Phase 4 storm sewer at MH4-2. The full build out of the Phase 2 lands will necessitate the upgrade of the future Phase 4 storm sewer system receiving flow from this area.

***Phase 3A*** has been divided into two subcatchment zones with areas of 4.60 ha. and 8.05 ha. Phase 3A receives external drainage from Stockton Road and Blossomfield Drive. The entire Phase 3A area outlets to the existing 2100mm municipal storm sewer in Allen Road at EX MH4211809090.

***Phase 3B*** has been divided into two subcatchment zones. The first zone has an area of 2.31ha and drains north through the Phase 3A storm sewer system into the Allen Trunk Sewer. The second zone has an area of 6.94ha and outlets to the existing 675mm municipal storm sewer in Lawrence Avenue West at MH4151209086. This area does not receive external storm flows.

***Phase 4*** is broken into two subcatchment zones. The first zone has a tributary area of 16.69 ha and connects to the existing 975mm storm sewer in Old Meadow Land at EX MH4183909236, which is connected to the existing MH4183909236 at Allen Road. The second zone consists of one block with an area of 1.02ha. It is proposed that this block be serviced by the existing 600mm storm sewer in Lawrence Avenue West at EX MH4163709513. There are no external areas draining to the Phase 4 lands outside of the Focus Area.

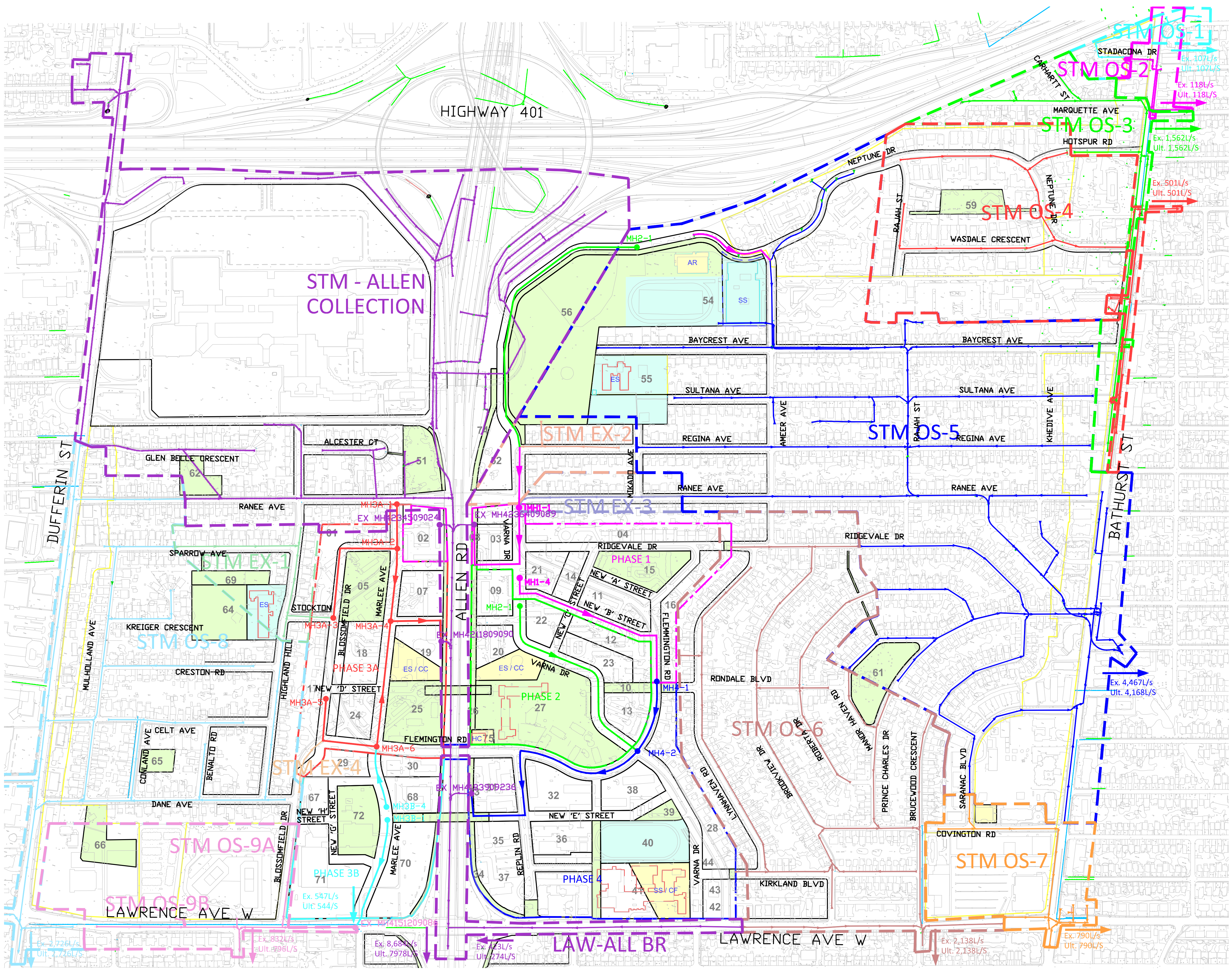
As noted in the sanitary section, a CD has been included in **Appendix F** of this report that identifies the existing municipal sewer layout and maintenance hole numbering (file name 08043bas).

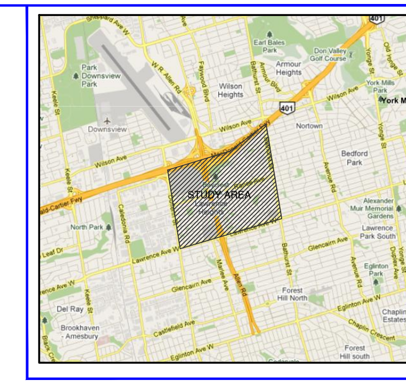
**Table 4-5** below presents the 2-year stormwater flows at the boundary connections for both the existing conditions and the ultimate build-out. Only subcatchments that have flows affected by the re-development have been shown. All other subcatchments are unaffected. The subcatchment areas for the study area are illustrated on **Figure 4-1**. As shown in **Table 4-5**, there is a decrease in the 2-year stormwater flows at outlets OS-5, OS-9 and the Allen Trunk Sewer. In the case of OS-5, this is due to a decrease in the drainage area, as a portion of the subcatchment will be collected by the proposed storm sewer system. In the case of OS-9 and the Allen Trunk Sewer catchments, their drainage areas have increased and with higher run-off coefficients due to high-density development. The expected additional flows are proposed to be mitigated by flow control of the proposed high density blocks. The stormwater flows shown in table 4-5 have utilized a control rate of 80 L/s/ha for all development blocks (roadways, parks and single detached homes were not controlled). During the detailed design, each new development must control the stormwater flows from the new development such that they do not increase the stormwater flows currently entering the existing storm system.

The development blocks will be designed so that the 100 year storm event is controlled on-site. The allowable release rate for the blocks is the 2 year event at a 0.5 run-off coefficient or the pre-development rate, whichever is lower. The proposed road allowances will be constructed with storm sewers to convey the minor storm events (2 year storm events). The major storm events, up to the 100 year storm return period, will be kept within the road allowance. Requirements on the overland flow drainage is identified in Section 7.

**Table 4-5: Stormwater Flows from LARS Subcatchment Area to Existing Storm Sewers under Existing Conditions and Ultimate Build-Out**

| Outlet | Drainage Area (ha) | | 2 Year Flows (L/s) | |
|---|---|---|---|---|
| | Existing | Ultimate | Existing | Ultimate |
| OS-5 | 81.44 | 78.34 | 4,467 | 4,168 |
| OS-9 | 17.07 | 18.43 | 832 | 798 |
| Allen Trunk Sewer | 161.25 | 165.51 | 8,684 | 7,978 |



KEY PLAN NTS

LEGEND

- PROPOSED STORM SEWER
- STORM MANHOLE
- STORM AREA BOUNDARY
- OFFSITE AREA 1
- OFFSITE AREA 2
- OFFSITE AREA 3
- OFFSITE AREA 4
- OFFSITE AREA 5
- OFFSITE AREA 6
- OFFSITE AREA 7
- OFFSITE AREA 8
- OFFSITE AREA 9
- EXTERNAL AREA 1
- EXTERNAL AREA 2
- EXTERNAL AREA 3
- EXTERNAL AREA 4
- LAWRENCE ALLEN COLLECTOR

| | |
|---|---|
| CLIENT | CITY OF TORONTO |
| MUNICIPALITY | TORONTO |
| PROJECT TITLE | LAWRENCE HEIGHTS REVITALIZATION |
| SHEET TITLE | STORM DRAINAGE PLAN |


MMM GROUP
100 Commerce Valley Dr. West
Thornhill, Ont. L3T 0A1
Tel (905) 882-1100
Fax (905) 882-0055
www.mmm.ca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|---|---|---|
| A.W. | S.W. | S.M.W |

| SCALE | DATE |
|---|---|
| 1:7500 | JUNE 2011 |

| PROJECT NUMBER | FIGURE |
|---|---|
| 10-08043 | 4-1 |

**Table 4-6** and **Table 4-7** below list the Storm Sewer Projects and indicate the Class Environmental Assessment Schedule for each.

**Table 4-6: Storm Sewer Project Class Environmental Assessment Schedule and Proposed New Stormwater Infrastructure in New Road Allowance**

| Location | From | To | Diameter (mm) | Length (m) | Class EA Schedule |
|---|---|---|---|---|---|
| New Street A | Flemington Rd | New Street C | 525 | 150 | B |
| New Street B | Flemington Rd | Varna Dr | 675 | 300 | B |
| New Street D | Blossomfield Dr | Marlee Ave | 525 | 120 | B |
| New Street E | Flemington Rd | Replin Rd | 1050 | 390 | B |
| New Street G | Marlee Ave | End | 600 | 250 | B |

**Table 4-7: Storm Sewer Project Class Environmental Assessment Schedule and Proposed New Storm Sewers in Existing Road Allowance**

| Location | From | To | Diameter (mm) | Length (m) | Class EA Schedule |
|---|---|---|---|---|---|
| Varna Dr | Neptune Dr | Lawrence Ave W | 675-1050 | 1880 | A |
| Ridgevale Dr | Flemington Rd | Varna Dr | 675 | 400 | A |
| Flemington Rd | Ridgevale Dr | Blossomfield Dr | 525-1200 | 820 | A |
| Replin Rd | Flemington Rd | Lawrence Ave W | 825-1200 | 280 | A |
| Marlee Ave | Ranee Ave | Lawrence Ave W | 300-975 | 850 | A |
| Blossomfield Dr | Marlee Ave | Flemington Rd | 250-825 | 615 | A |

***Impact on External Storm Sewers***

The external storm sewers that will be receiving flows from the redevelopment of the LARS Focus Area will be the 2100mm sewer in the Allen Road, the 675mm sewer in Lawrence Avenue West (from Phase 3B, west of the Allen) and the 600mm sewer in Lawrence Avenue West (from Phase 4, east of the Allen). As noted earlier, the rate of stormwater released from the proposed redevelopment of this site will be reduced to the 2 year event flows as described in the Wet Weather Flow Guidelines. However, additional control on the storm flows from the proposed high density blocks throughout the site will be required to reduce the storm flows discharging to both the 675mm sewer in Lawrence Avenue West and the 2100mm sewer in Allen Road to predevelopment conditions. By controlling the development blocks to a rate of 80 L/s/ha, the storm flows discharging to the 675mm sewer in Lawrence Avenue West are anticipated to decrease by approximately 35 L/s; and the storm flows discharging to the 2100 mm sewer in Allen Road are anticipated to decrease by approximately 700 L/s. During the redevelopment of the focus area some storm flows from drainage area OS-5 will be diverted to the 2100mm sewer in the Allen Road, which will help relieve surcharging in the existing municipal storm sewer system for area OS-5. In the Existing Infrastructure Analysis, the existing 2100mm and 675mm storm sewers identified above were not identified as constrained sewers. With the rate of flow being reduced to these sewers and adequate capacity available, an upgrade to the external storm sewer system is not recommended as part of the redevelopment of the LARS Focus Area. During detailed design it must be demonstrated that storm flows to boundary connections are not increased as a result of this development.

# 5 STORMWATER MANAGEMENT

## 5.1 Stormwater Management Report Objectives

The objectives of this stormwater management review are as follows:

- To provide an overview and evaluation of the various stormwater management practices that will be utilized in the LARS Master Plan redevelopment.
- To identify the stormwater management measures that will be most suitable for each type of development within the overall Master Plan, and explain how these measures will ensure that the project is developed in accordance with the 'Wet Weather Flow Management Guidelines' (November 2006, WWFMG) issued by the City of Toronto.
- To undertake a preliminary analysis of the individual development blocks within the Master Plan layout, and provide preliminary calculations to identify the maximum flows each development block will be permitted to discharge into the municipal storm sewer system and anticipated storage volume for each development block.

## 5.2 Stormwater Management Criteria

The City of Toronto has issued the WWFMG to provide direction on how to manage rainfall and runoff inside the City's jurisdiction. In accordance with this document, the overall stormwater management objective for the site is to reduce the quantity, and improve the quality of stormwater runoff. This objective will be realised in line with the WWFMG document itself, and with respect to the best management practice recommendations set out in the TRCA Low Impact Development (LID) Stormwater Management Guide.

As a priority, stormwater measures will be proposed which manage rainwater (and snowmelt) where it falls on the blocks and streets of the area, and particularly before it enters municipal storm sewers. This will be achieved through a 'natural' systems design approach which will seek to mimic the natural drainage patterns of the area in its pre-developed state, and minimise any on-going disruption to the hydrologic cycle. By reducing the demand on the municipal storm sewer system this approach will also bring benefits in terms of reduced flood risk to properties on the LARS site, as well as for developments further downstream.

A summary of the specific WWFMG stormwater management criteria applicable to this project is as follows:

- *Water Balance* – The WWFMG requires a site to "retain stormwater on-site, to the extent practicable, to achieve the same level of annual volume of overland runoff allowable from the development site under pre-development conditions".
- *Water Quality* – Under the WWFMG the site is required to provide long-term average annual removal of 80% of total suspended solids on an annual loading basis.
- *Erosion Control* – Currently, there are no specific requirements for erosion control of the Don River watershed downstream of Steeles Ave. However, the WWFMG indicates that the typical erosion control requirement is for detention of the post-development rainfall runoff from a 25 mm storm for a minimum of 24 hours. In addition, Best Management Practices and erosion control strategies must be in place during the construction phase of the project.
- *Water Quantity Control* – Runoff from the post-development site experienced under the 2-year to 100-year design storms must not exceed the peak runoff rate from the site under pre-development conditions experiencing similar precipitation events. If the primary offsite discharges for the plots are to municipal storm sewers then this runoff rate is often limited to the maximum permissible municipal discharge rate described below.
- *Municipal Discharge Criteria* – the WWFMG states that discharge rates to municipal storm sewer infrastructure must be controlled down to a runoff rate equivalent to that which would be generated from the undeveloped site (maximum runoff coefficient of 0.5) during a 2-year event (for the time of concentration at the outlet of the downstream system).

## 5.3 Proposed Stormwater Management Measures

This section of the report will outline stormwater management measures that are applicable for the different land uses within the Focus Area and provides an assessment of each with respect to the key WWFMG targets listed above.

It should be noted that the final selection of stormwater features will be based on the following hierarchy, as set out in the WWMFG and accepted as best practice.

1. Source Control – controls at the lot level are the preferred method for managing the impacts of wet weather flow.

2. Conveyance Control – control of runoff during conveyance is particularly suited to new road construction.

3. End-of-Pipe Control – end-of-pipe controls shall only be implemented when source controls and conveyance controls are unable to achieve the necessary control targets alone.

Often a number of these control measures will need to be combined in sequence in order to meet the necessary runoff treatment targets. This approach is known as the 'treatment train' and will be employed on the LARS project to ensure the required stormwater runoff targets are met.

It is important to state that a number of the potential stormwater management measures discussed here are highly dependent upon the ground conditions discovered on site – in particular the permeability of the soil, and the groundwater level. These are both important factors as they affect the ability of the ground to accept infiltration of stormwater. Detailed geotechnical investigations are necessary to determine the soil characteristics prior to the detailed design stage. Only once these factors are known will it be possible to select the most appropriate stormwater management measures for construction.

## 5.4 Proposed Roads

The proposed road cross-sections for the redeveloped areas of LARS have incorporated several means of reducing and treating the runoff from the road network. These will include bio-swales, permeable pavements, and twin pipe systems.

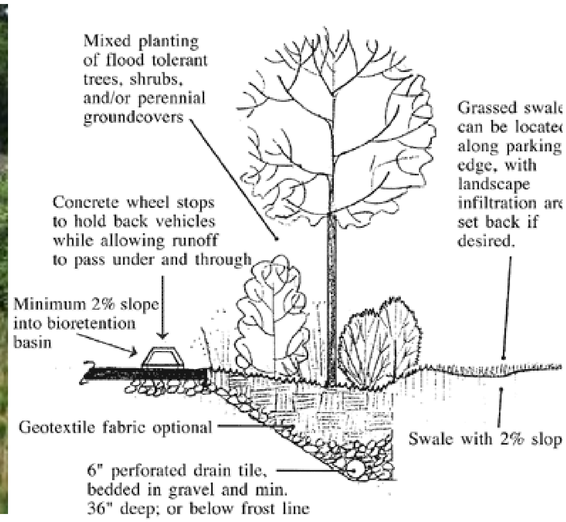
***BIO-SWALES***

Bio-swales are vegetated open channels specifically designed to attenuate and treat stormwater runoff. They convey stormwater from its source to a discharge point, but are designed to intentionally promote the slowing, cleansing and infiltration of runoff along the way.

They are classed as a conveyance control method with primary benefits in terms of water quality improvements – as long as the design velocity is kept within an acceptable range (usually to a maximum 0.5 m/s for a 25mm, 4-hour storm event) then the flow over (and through) the vegetated surfaces helps to remove a significant quantity of pollutants from the runoff.

Bio-swales can also provide secondary benefits in terms of water balance and water quantity. Their performance in these respects though is highly dependent upon the permeability of the soil in which they are constructed. If the ground can accept infiltration then the rate of discharge, as well as the overall volume of water reaching the discharge point will be reduced.

Where space permits bio-swales may be incorporated into the typical cross section for the proposed LARS roads, to accept sheet runoff from the new road surfaces. They are typically more suited to residential roads where volumes of traffic are lower; it may prove to be advantageous to incorporation bioswales in the 'greenway' areas identified immediately either side of Allen Road in the preferred plan.



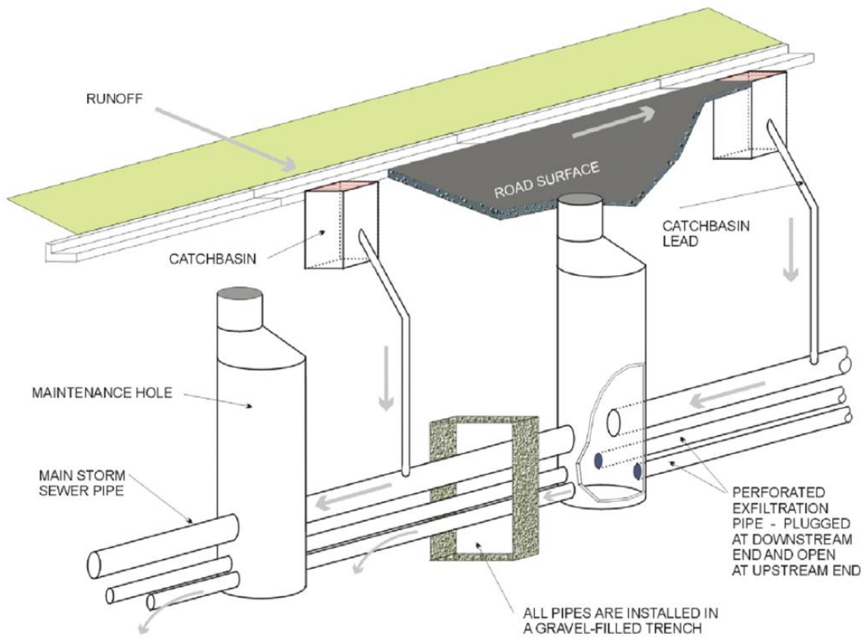

Typical Bioswale Construction Techniques

***TWIN PIPE (PERFORATED PIPE) SYSTEMS***

Twin pipe systems are a conveyance control method that relies on the permeability of surrounding soil to accept infiltration of stormwater as it passes along perforated pipes. They can be used in conjunction with, or as a less space intensive alternative to, other conveyance control measures such as bio-swales.

A twin pipe system can be configured in a number of ways, but typically it will consist of a perforated pipe surrounded by gravel, installed at a lower level than the standard storm sewer (which in this case acting as an overflow pipe only). Runoff is directed into the pipe system via a standard system of catchbasins and manholes. If the infiltration capacity of the soil is high enough then they can bring benefits in terms of water balance, water quality, and to a slightly lesser extent water quantity as well.

Ground conditions permitting, twin pipe systems may be installed to dispose of runoff from a number of areas across the LARS re-development site. They can be effective at treating runoff from low to medium traffic roads (as long as adequate pre-treatment is provided). Essentially, they can be used in place of traditional pipe systems wherever the ground conditions (permeability and ground water level) and topography is suitable.




Typical Twin Pipe Drainage System
(Image reproduced from CRCA/TVC stormwater management data sheet)

***PERMEABLE PAVEMENTS***

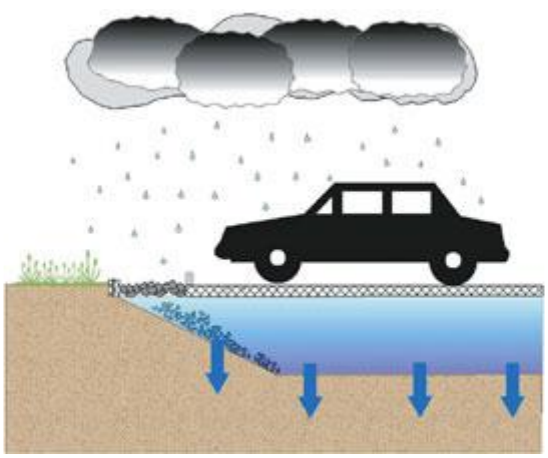
Permeable pavement systems are able to capture and treat water at source and are therefore a preferred stormwater management measure. There are various options available to designers – including interlocking block pavers, porous asphalt, and pervious concrete. These surfaces allow water to pass through them into an underlying stone reservoir layer where the water is temporarily detained, and/or allowed to infiltrate into the soil below.

If the surrounding soil has a high enough permeability (typically >15 mm/hr) the stone layer can be designed as a full infiltration system, with only a nominal overflow connection to the sewer system. If this is not possible then either a partial infiltration system (with underdrain pipework), or a lined system (with zero infiltration) can be specified.

Generally, the greater the infiltration permitted from the system, the greater the benefits it can offer for stormwater management. Returning water to the ground close to where it falls reduces the overall volume of runoff and hence addresses water balance issues. However if the system is lined and no water can escape then this has limited effect on the water balance.

In terms of water quantity, the attenuation provided by the stone layer reduces the peak flow rate, and therefore provides some benefit in this respect. If sufficient storage is available within the sub-base then a controlled outlet can also be provided which would improve the situation further. As stormwater runoff passes through a permeable pavement system the filtration action removes particles from the water, and hence addresses water quality issues as well.

Depending on the soil conditions encountered in the various areas of the site, permeable pavement systems can be considered for all appropriate areas of the Study Area. This could include low-traffic hard surface areas, school playgrounds, parking lots, and any hard surfacing that surrounds new development blocks.




Permeable Pavements

## 5.5 High Rise and Low-Rise Development Blocks

Typically high rise development blocks have only a limited amount of external space available outside the building footprint, and therefore stormwater management measures usually have to be provided as part of the structure itself. Suitable solutions in this situation include green roofs, water recycling and re-use systems, and below ground storage of rainwater.

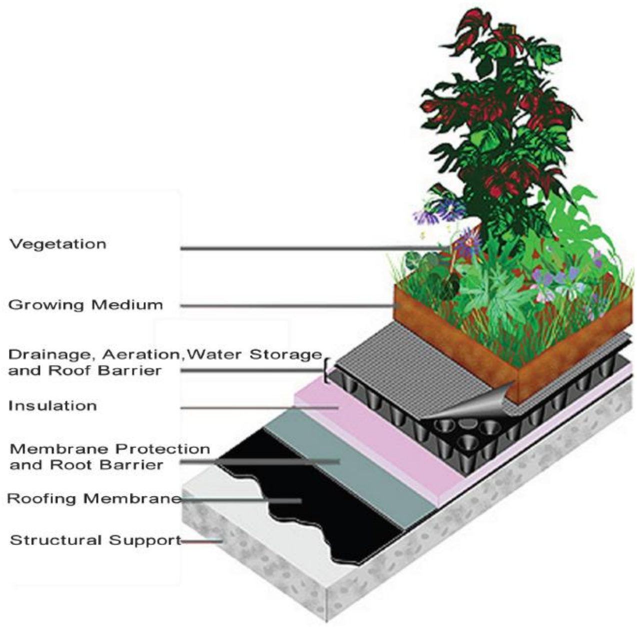
All of the solutions described below will be considered on an individual site by site basis for use on the LARS development blocks.

***GREEN ROOFS***

Green roofs are a highly desirable source control measure for addressing stormwater management issues. They are attractive for their water balance, water quality and peak flow (water quantity) control benefits. The systems vary slightly depending on their intended use, but essentially all green roofs are comprised of a thin layer of vegetation installed on top of a flat (or gently sloping) roof. The vegetation acts as a storage medium for the rainfall during storm events, and only once the soil is saturated will excess water overflow from the green roof system and be conveyed down through the building by the standard building roof drainage. After storm events the water left within the green roof will be evapotranspired by the vegetation, or will slowly evaporate.

Apart from their stormwater management benefits, green roofs also improve energy efficiency as a result of their insulating effect, as well as providing community green space which can be enjoyed by residents.

It is anticipated that all high rise and mid-rise buildings proposed as part of the LARS redevelopment will utilize green roof technology.




**Typical Green Roof Construction Buildups**
(Left image reproduced from CRCA/TVC stormwater management data sheet)

***SOFT LANDSCAPING***

It can sometimes be overlooked, but the provision of soft landscaping at ground level around high-rise properties is a simple but effective method of minimising stormwater management issues. If less impermeable surfaces are proposed, then less runoff will be generated. This results in immediate benefits in terms of water balance and water quantity, and a reduction in the runoff that needs to be treated to achieve water quality targets.

Increases in the provision of soft landscaping brings with it additional opportunities for re-use of water through irrigation, as well as amenity benefits for the local community.

***WATER RE-USE***

In an attempt to address water balance issues the City of Toronto WWFMG requires developers to retain all runoff from a small storm event (typically 5mm depth) on site through infiltration, evapotranspiration, or water recycling. The first two of these options are preferable as they keep water within the natural hydrological cycle; however water recycling can also provide valuable benefits.

Examples of water re-use options that will be pursued on the LARS project include irrigation of soft landscaping, flushing of toilets, and car-washing facilities.

It should be noted that whilst the minimum WWFMG requirement is for the first 5mm of rainfall to be retained on site, additional benefits can be gained if retention for 25mm of rainfall is provided. Designing for this increased volume would satisfy WWFMG water quality issues in accordance with MOE ‘first flush’ principles (<80% of contaminants on site are flushed by the first 25mm of rainfall) – it would also gain additional LEED credits which may be sought by the individual buildings.

***WATER STORAGE***

As noted above, high rise development blocks usually have limited land available outside the structure itself. To address water balance and water quantity issues it is therefore sometimes necessary to provide storage within the footprint of the building which can collect water and release it offsite at a controlled rate. This can be achieved in different ways. Some typical approaches include allowing roof areas to pond to a certain depth during intense rainfall events, or providing a cistern tank (usually below ground level) for detaining water temporarily. Below ground cisterns can also provide the combined benefit of acting as a stormwater collection facility for any water recycling measures proposed for the building (see above).

***PERMEABLE PAVEMENTS***

As described in detail above, permeable pavements will be considered for any suitable areas of hard surfacing within the LARS site. These systems are particularly suited to sites which have limited area available for alternative stormwater best management practice – for example, external areas surrounding high rise buildings with low traffic.

***OIL/GRIT SEPARATORS (OGS)***

The City of Toronto WWFMG requires developers to remove 80% of total suspended solids (TSS) from stormwater runoff to achieve desired water quality standards. While it is unlikely that an oil/grit separator can achieve this target alone, they will be employed as part of a treatment train approach to achieve the required reduction on the various plots of the LARS site.

Different proprietary OGS units are available from manufacturers. However most of them work on the same principles – sedimentation to remove suspended solids, and phase separation to remove oil. The units are particularly useful on blocks where space is limited and other water quality treatment measures (such as filter strips or bio swales) are not feasible for land take reasons.

***INFILTRATION***

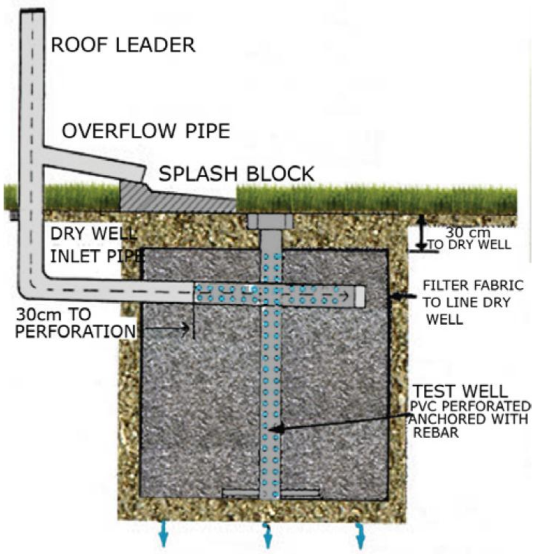
If ground conditions permit, infiltration features can be provided to aid groundwater recharge if soil conditions permit, and to minimise offsite discharge to the downstream sewers and/or watercourses.

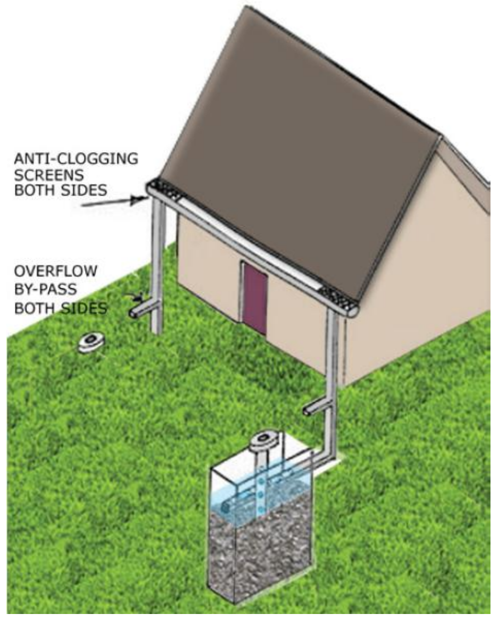
These features can be designed to suit all sizes of catchment areas and available land areas. At the small scale, individual soakaway pits can serve a single block or house, while at the larger scale infiltration galleries/chambers can be sized to serve whole neighbourhoods if necessary. Regardless of their size though, they operate on the same principles – water is directed toward a space below ground where it will be stored temporarily and allowed to infiltrate into the surrounding soil.

A typical individual soakaway consists of an excavation lined with geotextile fabric and filled with granular stone, or other void forming material, that receives runoff from a perforated pipe inlet. Refer to figure below for illustration. If space on site is limited then this same approach can be used but the excavation is configured instead as a linear trench. A series of these trenches is known as an infiltration gallery.

At the larger scale a typical chamber system will consist of a series of interconnected chambers below ground, linked by perforated pipework, laid on a granular stone base. The chamber units have large void spaces to allow detention of water while it infiltrates into the surrounding ground, and the whole system will be wrapped in a geotextile fabric to prevent migration of soil particles into the voids.

It is important to note that infiltration systems are highly dependent upon suitable ground conditions – in-depth geotechnical investigation and soakage tests are necessary prior to detailed design to determine if these features are suitable for the Focus Area, and if so where they should be considered.




Typical Individual Soakaway Construction Techniques
(Images reproduced from CRCA/TVC stormwater management data sheet)

## 5.6 Low Rise Development Blocks

All of the stormwater management technologies described above are also applicable to low rise developments. It may be more difficult to employ some of these technologies as in high rise buildings – for example, occupancy density will be lower therefore water recycling strategies may not be feasible – however the principles remain the same.

Typically low-rise developments will be less dense, and there will be more space available around the proposed buildings; therefore it will be easier to implement source control measures on site.

***INFILTRATION***

Ground conditions permitting, soakaways and infiltration trenches can be used to dispose of stormwater on site rather than allow it to discharge offsite to municipal storm sewers.

***PERMEABLE PAVEMENTS***

Permeable pavements will be considered for any suitable areas of hard surfacing within the LARS site. These systems are particularly suited for hard surfaces with relatively low vehicle trafficking, such as driveways and parking areas surrounding low to mid-rise developments.

***VEGETATED FILTER STRIPS***

Vegetated filter strips are typically used to treat sheet runoff from adjacent hard surfaced areas. They are gently sloping, densely vegetated strips of land, which slow down runoff and provide natural filtration to remove suspended solids and improve water quality. Depending on the infiltration capacity of the soil they can also offer some benefits in terms of water quantity and overall water balance.

Where space is available filter strips function well as a pre-treatment stage before runoff flows on to either a conveyance swale, or standard piped drainage system.

They will be considered for use on blocks in the Focus Area which require relatively large hard surfaced areas, such as parking lots associated with any mixed use or commercial development.

***ROOF LEADER DISCONNECTION***

Roof drainage downspouts on any new low-rise buildings will not be connected to the minor (piped) drainage system below ground. Instead they should be discharged onto a pervious area that drains away from the building (site grading will need to account for this). This is a simple but effective method of reducing the demand on the municipal storm sewer system, and increasing the amount of water that is returned to the natural hydrologic cycle via infiltration, evaporation or evapotranspiration.

For smaller properties the roof leaders can often be discharged directly into a rain barrel which will collect and store water for reuse on site.

These principles of roof leader disconnection can be applied to new structures, as well as any re-developments of existing low-rise buildings in the Focus Area.

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## 5.7 Open Green Spaces

A number of open green spaces and parks are proposed in the Focus Area. These are important public facilities which also provide an ideal opportunity for the provision of large stormwater management features. Refer to drawing SWM-1.

Each development block within the Master Plan will be subject to the WWFMG targets. However there may be opportunities to utilize Parks and Public Realm space to provide additional Stormwater Management features to treat runoff collected from both the existing impervious drainage areas outside the Focus Area and the public ROW system. For example, detention storage or exfiltration structures can be provided to manage with runoff collected on the surrounding public roads. Provision of these features can be considered in more detail during the development of the Parks & Public Realm Master Plan and at the detailed design stage.

***Greenway*** – Is a 10.0m Multi-Use trail, refer to Drawing RT-1 of **Appendix E** that will be located adjacent to Allen road. The trail will have a 4.0m hard surface trail with landscaping and a bioswale to the sides on both sides. An optional cross-section of the trail is illustrated in Fig 6-1.

***DRY PONDS***

Dry ponds (or detention basins) can be formed during site grading activities to provide a significant volume of water storage for large storm events. Recreational activities within the parks should not be adversely affected, as in these relatively large open spaces the depressions formed do not necessarily need to be that severe to create large potential volumes.

The flow attenuation provided by the water storage offers obvious benefits in terms of reduction in peak flows (i.e. water quantity), but the detention of the water also allows for sedimentation and filtration to occur which bring about improvements in water quality.

## 5.8 Preliminary Stormwater Analysis

Based on the Preferred Plan, some preliminary analysis has been undertaken to quantify the anticipated stormwater management measures for individual development blocks.

Please refer to the following table which summarises the calculations completed. Site references refer to numbers assigned to each development block on the Master Plan layout.

The following assumptions were made:

- For water balance storage calculations it was assumed that all surfaces on the site produce 5mm of runoff for a 5mm storm event, and 25mm of runoff for a 25mm event.

  The allowable offsite discharge rate refers to the WWFMG requirement for connections to municipal storm sewers – new or re-development sites under all the storm conditions can only discharge at a 2-year flow rate, or existing capacity of the receiving storm sewer, whichever is less. When the % imperviousness of a development site under pre-development condition is higher than 50% (regardless of what the post-development condition is), the maximum value of C (runoff coefficient) used in calculating the pre-development peak runoff rate is limited to 0.5 (refer to TW WWFM guidelines, Nov. 2006).

  Rainfall intensities were calculated in accordance with section 3.1 of the WWFMG document; $I = AT^C$ (where, for a 2-year storm, A = 21.8, C = -0.78, and T = time of concentration, assumed to be 10 minutes). It was determined that an allowable release rate for the development blocks of 80 L/s/ha was required to reduce the stormwater flows of predevelopment conditions entering the storm system .

- The Table below illustrates the maximum flows that each development block is permitted to discharge to the receiving storm sewer which is based on a 2-year storm event utilizing a controlled rate of 80 L/s/ha.

**Table 5-1: Allowable Release Rates – Storm Sewers**

| Block Reference | Area | | Allowable Release Rate to Storm Sewers |
|---|---|---|---|
| | sqm | ha | l/s |
| 52 | 7,898 | 0.79 | 63.2 |
| 02 | 8,401 | 0.84 | 67.2 |
| 07 | 8,340 | 0.83 | 66.4 |
| 19 | 11,379 | 1.14 | 91.2 |

| Block Reference | Area | | Allowable Release Rate to Storm Sewers |
|---|---|---|---|
| | sqm | ha | l/s |
| 18 | 11,607 | 1.16 | 92.8 |
| 24 | 8,060 | 0.81 | 64.8 |
| 29/67 | 9,736 | 0.97 | 77.6 |
| 30/68 | 12,271 | 1.23 | 98.4 |
| 71 | 21,356 | 2.14 | 171.2 |
| 70 | 18,049 | 1.80 | 144.0 |
| 03 | 7,754 | 0.78 | 62.4 |
| 09 | 6,716 | 0.67 | 53.6 |
| 21 | 5,685 | 0.57 | 45.6 |
| 22 | 5,308 | 0.53 | 42.4 |
| 20 | 11,722 | 1.17 | 93.6 |
| 23 | 7,398 | 0.74 | 59.2 |
| 13 | 6,989 | 0.70 | 56.0 |
| 31 | 9,360 | 0.94 | 75.2 |
| 32 | 10,782 | 1.08 | 86.4 |
| 38 | 8,820 | 0.88 | 70.4 |
| 35/37 | 14,902 | 1.49 | 119.2 |
| 36 | 8,239 | 0.82 | 65.6 |

# 6 MUNICIPAL ROAD ALLOWANCES

In order to support the redevelopment for the Focus Area, a new municipal road network is being proposed. The new municipal roadway network will be constructed along both existing municipal road allowances as well as new road allowances. In the event that a new municipal roadway is identified along the alignment of an existing municipal roadway, the roadway will be completely reconstructed to the new roadway classification.

The new municipal road allowances will be designed to current City of Toronto Standards and Specifications. However, in addition to the above urban cross-section standards for various roadway classifications in the Study Area, a variety of alternative cross-sectional options for the road allowances have been explored. These alternatives have incorporated new and innovative stormwater management features within the new municipal road allowance to treat runoff within the roadway.

Special consideration will be given to the street trees to ensure there are sufficient soil volumes. The use of Silva Cells may be considered within the boulevards of some of the proposed road allowances. The Silva Cells are used to provide large volumes of un-compacted planting soil for trees in dense urban centres. The system also has the advantage of managing storm water at the source.

The following is a classification of the roadways for the Study Area:

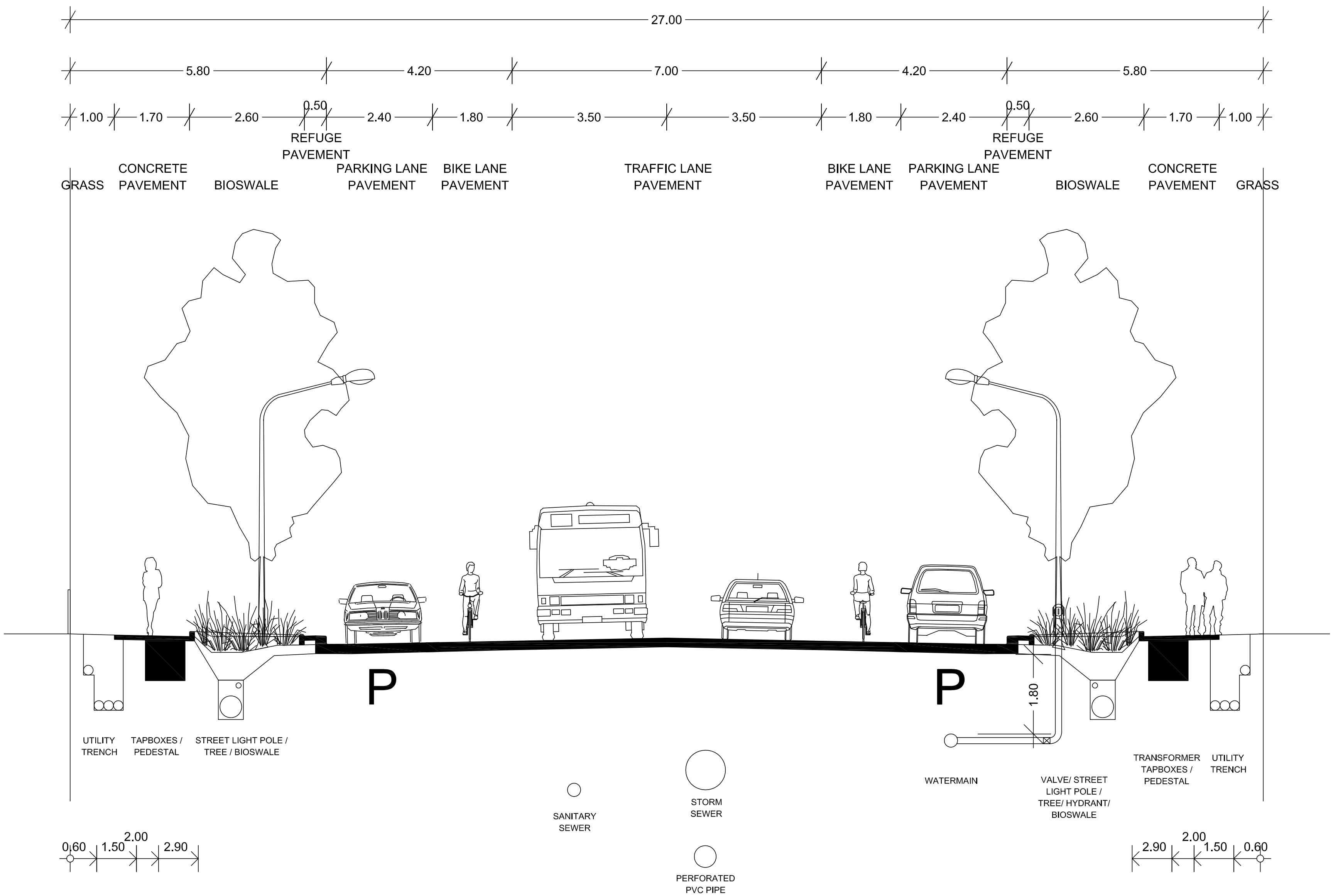
- <u>Highways - Hwy</u> 401, Allen Rd.
- <u>Major Streets</u>- arterial roads such as Bathurst St., Lawrence Ave. W., Dufferin St.
- <u>Primary Streets</u>- collector roads such as Ranee Ave., Varna Dr., Flemington Rd., Neptune Dr.,etc.
- <u>Local Streets</u>- local roads such as Kirkland, Ridgevale, Replin, etc.

***Primary Streets*** – are collector type roads with a typical 27.0m wide road allowance that includes a 15.4m wide asphalt surface. The roadway typically consists of two travel lanes, two bike lanes and there may be locations to accommodate two outside lanes for on-street parking. The preferred option for this development is an alternative collector road cross-section that utilizes bioswales and a perforated pipe system to collect drainage from the boulevard areas as well as the paved portion of the roadway. Pedestrian sidewalks will be provided along both sides of the roadway. The cross-section for the preferred option of the Primary Street is illustrated in **Figure 6-1**.

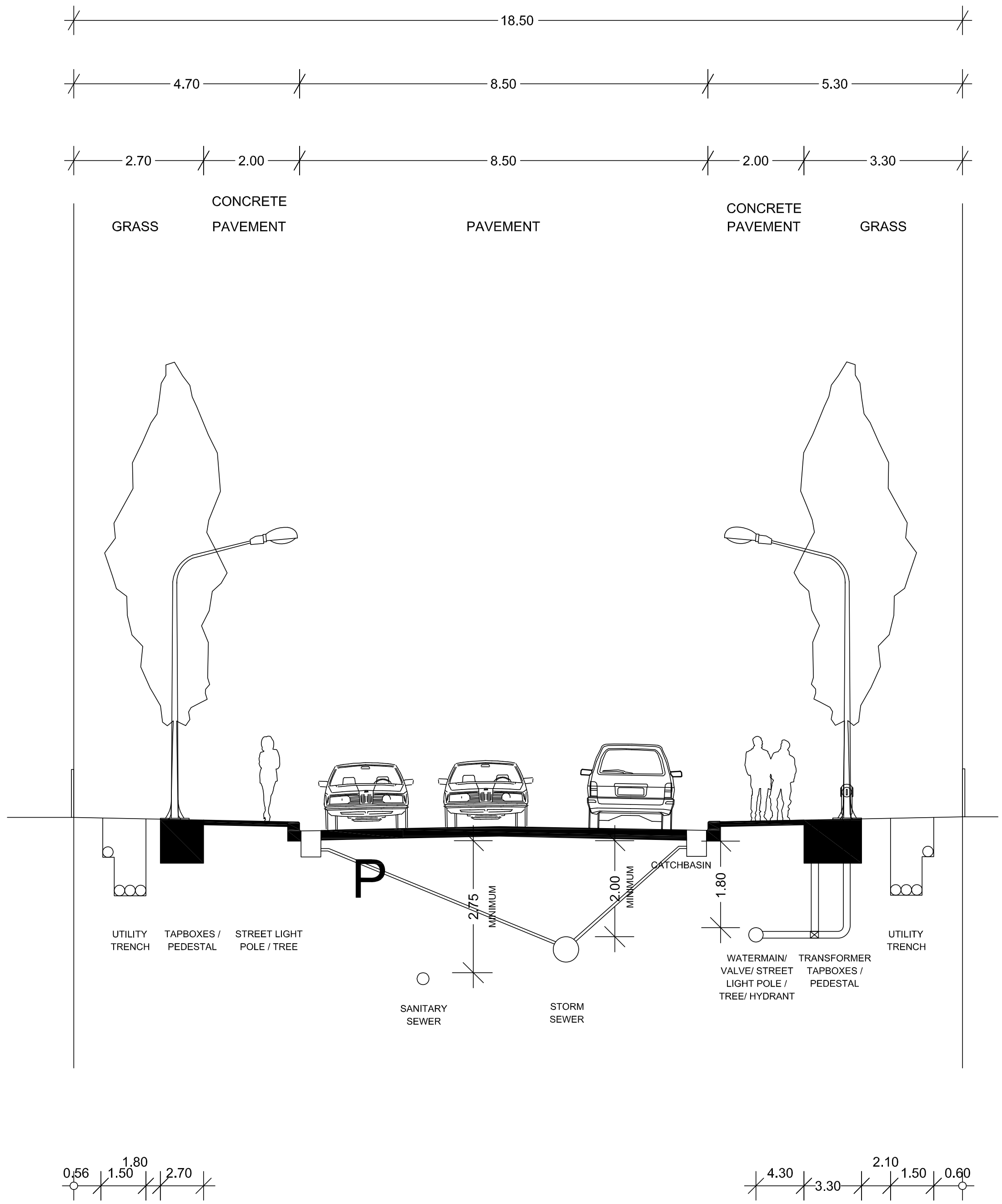
***Local Streets*** – are local type roads with a typical 20-18.5m wide road allowance that includes an 8.5m wide asphalt surface. The 8.5m of asphalt allows for two travel lanes and on-street parking on one side of the roadway. Pedestrian sidewalks will be located on both sides of the roadway adjacent to the curbs. The sidewalks will have a 2.0m width. The roadway typically has centerline crowned asphalt with drainage to road side catchbasins. **Figure 6-2** illustrates the typical City of Toronto standard cross-section.

Local Streets (Green Street) - An alternative to the typical local road cross-section is illustrated in **Figure 6-3**, which utilizes bioswales and perforated pipe systems to collect drainage from the boulevard areas as well as the paved portion of the roadway. The sidewalk on the side of the bioswale will be 1.7m wide and will be located between the bioswale and the property line.

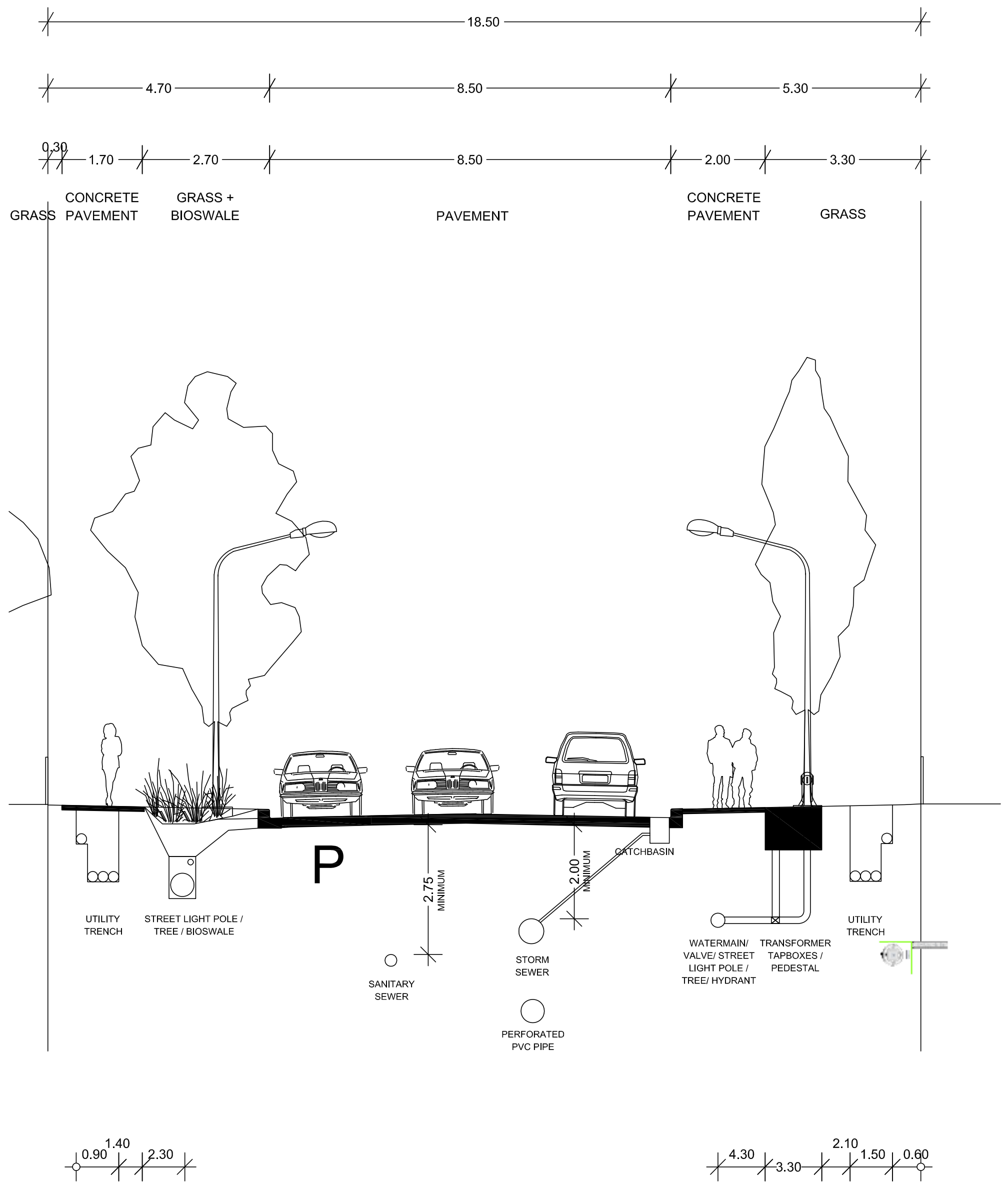
# Primary Street



# Local Street



# Local Street
# (Green Street)



# 7 OVERLAND FLOW

## 7.1 Overland Flow Focus Area

The City of Toronto has provided the MMM Group with topographic survey information for the Study Area. From the survey information a digital surface of the existing ground elevations was created for the entire Study Area. The drainage paths for the existing surface areas were established using the computer modeling. These existing surface drainage paths have been used to establish the overland flow routes for the Study Area. The existing overland flow routes were defined prior to the utilization of dual drainage systems and thus overland flow routes are not confined to the roadways. In large storm events the overland flow will flood or flow across private property. Please refer to attached drawings OLF-1 and OLF-2 of **Appendix E** for a delineation of the respective existing or proposed overland flow routes in the Study Area. The overland flow routes are generally north to south outletting to Lawrence Avenue.

As part of the redevelopment of the Focus Area, new roadways will be constructed with new grading parameters. The development blocks will be designed so that the 100year storm event is controlled on-site. The allowable release rate for the blocks is the 2 year event at a 0.5 run-off coefficient or the pre-development rate, whichever is lower. The proposed road allowances will be constructed with storm sewers to convey the minor storm events (2 year storm events). The major storm events, up to the 100 year storm return period, will be kept within the road allowance. The major storm events must be accommodated with overland flow routes. Included on attached drawing OLF-1, the preliminary overland flow routes for the redeveloped Focus Area have been identified. The overland flow routes for the Focus Area are intended to follow the new road allowance and outlet to Lawrence Avenue. During the ultimate and all interim conditions there cannot be an increase in the overland flows from the study area at any of the existing outlet points.

On drawing OLF-1 eight (8) areas have been identified within the Focus Area where existing grading patterns cannot be maintained, and new roadway grading will be required to allow for overland flow. With the entire Focus Area being reconstructed, the establishment of the appropriate elevations to ensure the proposed overland flow route will form part of the detailed design for the impacted development blocks and road allowances. Overland flow characteristics such as depth of flow and volumes will be analyzed as part of the detailed design.

## 7.2 Further Studies Required

The overland flow evaluation that formed part of the Existing Infrastructure Analysis identified a zone within the Study Area with an apparent overland flow constraint. This area is outside of the Focus Area, so there is no intent of reconstruction in this vicinity. The area in question is at the intersection of Sultana Avenue and Rajah Street. The topographic mapping indicates that the surface elevations drain to this intersection from all four directions. From further review of this intersection, it can be confirmed that the areas to the north and the west are at a higher elevation at this intersection. There is a drainage divide to the south east of this intersection between Ridgevale Drive and Ranee Avenue. The overland flow route appears to be in the rear yards of the dwellings moving south east from Rajah Street. It is recommended that the City complete a field topographic survey of the surrounding south east area to determine if there is an actual overland flow route from the intersection in question. The City of Toronto will need to develop options that would allow an overland release in a major storm event.

Overland Flows from upstream tributary areas will flow through the LARS area during extreme rainfall events. The process of reconstructing the LARS area to current standards will eliminate runoff ponding / flooding private and public lands / roads within the LARS area, and convey runoff to the downstream end of the LARS area. There is not an Overland Flow Route meeting current standards downstream of the LARS area, runoff leaving the LARS site will potentially contribute to flooding of private and public property. Unless the (unintended defacto) runoff retention and detention provided by the existing LARS drainage system & topography is replicated, runoff rates and volumes leaving the LARS area will potentially increase. An analysis of the retention / detention of upstream runoff provided by the existing LARS drainage system & topography must be undertaken, so that during detailed design measures may be identified and implemented to ensure that the LARS development does not exacerbate downstream flooding.

# 8 INFRASTRUCTURE COST ESTIMATES

As part of the Master Plan, Order of Magnitude Cost Estimate for the Municipal Services has been completed for the Lawrence Heights redevelopment. Following the completion of Phases 1 and 2 of the Municipal Class E

A (conducted as part of this Maser Infrastructure Plan), separate EA studies will be required for various components of this Master Plan. **Table 8-1** outlines the projects required as part of this Master Plan with respect to the EA, the associated cost, and the EA schedule that will be required. The cost range shown in **Table 8-1** accounts the construction costs associated with the work required to service each phase, this cost range does not include the cost of removing the existing infrastructure or soft costs such as engineering and legal fees.

An Order of Magnitude Cost Estimate was completed for all proposed Above Ground and Below Ground Infrastructure required for the development of the Master Plan and is available in **Appendix D**.

**Table 8-1: Infrastructure Cost Estimates and EA Requirements Overview**

| Description | TCHC Phase | Cost ($) | EA Schedule |
|---|---|---|---|
| Water Distribution | | | |
| Phase 1 Watermain | 1 | 1,300,000 – 2,000,000 | A, B |
| Phase 2 Watermain | 2 | 1,000,000 – 1,500,000 | A, B |
| Phase 3A Watermain | 3 | 1,100,000 – 1,600,000 | A, B |
| Phase 3B Watermain | 3 | 300,000 –500,000 | A, B |
| Phase 4 Watermain | 4 | 500,000 – 800,000 | A, B |
| Sanitary Servicing | | | |
| Phase 1 Sanitary Sewer | 1 | 5,100,000 – 7,600,000 | A,B |
| Phase 2  Sanitary Sewer | 2 | 1,000,000 – 1,500,000 | A,B |

| Description | TCHC Phase | Cost ($) | EA Schedule |
|---|---|---|---|
| Phase 3A Sanitary Sewer | 3 | 1,100,000 – 1,700,000 | A,B |
| Phase 3B Sanitary Sewer | 3 | 900,000 – 1,300,000 | A,B |
| Phase 4 Sanitary Sewer | 4 | 500,000 – 800,000 | A,B |
| Storm Servicing | | | |
| Phase 1 Storm Sewer | 1 | 3,400,000 – 5,100,000 | A,B |
| Phase 2 Storm Sewer | 2 | 3,500,000 – 4,000,000 | A,B |
| Phase 3A Storm Sewer | 3 | 2,900,000 – 4,400,000 | A,B |
| Phase 3B Storm Sewer | 3 | 900,000 – 1,300,000 | A,B |
| Phase 4 Storm Sewer | 4 | 1,400,000 – 2,000,000 | A,B |

# 9 CONCLUSIONS

The proposed revitalization of the Lawrence-Allen Neighbourhood will result in complete redevelopment of approximately 75 hectares which makes up the Focus Area. The Focus Area includes lands on either side of the Allen Road Corridor that are owned by the Toronto Community Housing Corporation, Toronto District School Board, RioCan and the City of Toronto.

The existing infrastructure has been analyzed and the information is available in the Existing Infrastructure Analysis Report. The proposed redevelopment of the Lawrence Allen Revitalization Focus Area has been reviewed as part of this Infrastructure Master Plan.

Drawings SRV-PH1, SRV-PH2, SRV-PH3, SRV-PH4, and SRV-ULT of **Appendix E** illustrate the combined Water, Sanitary and Storm Servicing for each of the interim phases and ultimate condition.

***Water Distribution***

An analysis of the existing municipal water system was completed as part of the Existing Infrastructure Analysis Report, which found that the existing system was adequate for the existing development in the Study Area.

A water distribution model has been completed for the proposed development area. The model indicates that the proposed watermain system in combination with the existing external system is sufficient to accommodate the ultimate build out of the preferred plan. The proposed water system is illustrated on Drawing WAT-1 of **Appendix E**.

As new development occurs within the Study Area, additional studies will be required to ensure that the water system at the time is adequate for both the interim and ultimate build-out conditions.

***Sanitary Servicing***

An analysis of the existing sanitary system was completed as part of the Existing Infrastructure Analysis. Constrained areas due to capacity or basement flooding have been identified within the Study Area and downstream of the site as part of the Existing Infrastructure Analysis.

The proposed sanitary sewer system required to service the redevelopment area is included on drawing SAN-1 of **Appendix E**. With the intensification of the Focus Area there are impacts on the external municipal sanitary sewer system. Drawing SAN-2 of **Appendix E** identifies the external sanitary sewers that need to be upgraded as part of the Focus Area redevelopment.

***Storm Servicing***

An analysis of the existing storm system was completed as part of the Existing Infrastructure Analysis. Constrained areas due to capacity have been identified within the Study Area and downstream of the site as part of the Existing Infrastructure Analysis.

The proposed storm sewer system required to service the redevelopment area is included on drawing STM-1 of **Appendix E**. The redevelopment of the Focus Area will reduce the rate of stormwater release to the external municipal storm sewer system. Upgrades to the external storm sewer systems are not recommended at part of this report. Overland flow for the redeveloped Focus Area will be accommodated along the proposed municipal roadway system.

***Stormwater Management***

Proposed stormwater management objectives and techniques have been identified for the redevelopment area. Stormwater management techniques have been illustrated for the alternative proposed road allowance cross-sections, development blocks and green spaces. A specific stormwater management plan for the development sites will be completed during detailed designs when site specifics and geotechnical information is available.