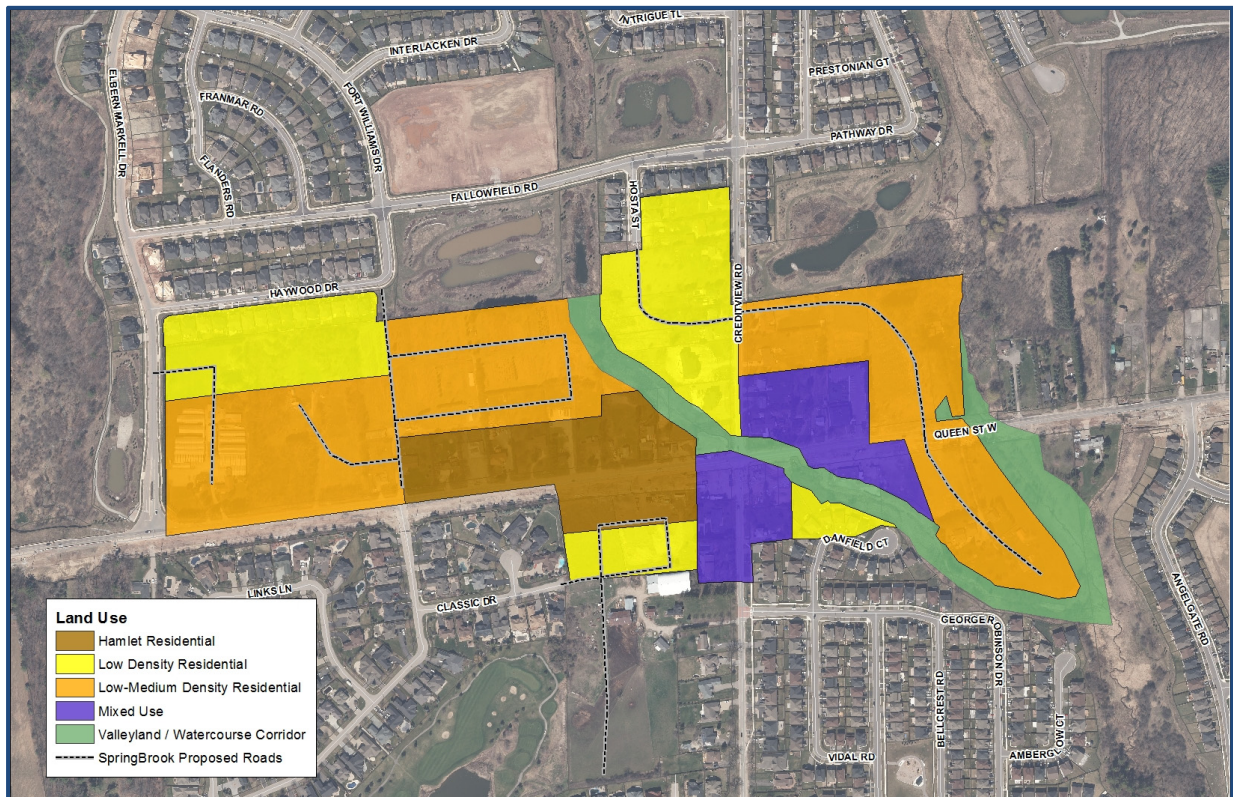


Springbrook Settlement Area Study - City of Brampton

Analysis in support of the growth-related water and wastewater servicing plan



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Appendices

Appendix A – Hydraulic Water Modelling Results

Appendix B – Hydraulic Wastewater Modelling Results

Executive Summary

The City of Brampton is proposing to develop the Springbrook Settlement Area, located at the intersection of Queen Street West and Creditview Road in the City of Brampton. A water and wastewater servicing study is required to evaluate the servicing alternatives and develop a servicing strategy which will align with the Region's current Water and Wastewater Master Servicing Plan.

The proposed development includes properties north and south of Queen Street West, east of Elbern Markell Drive, and west of Angelgate Road. The total site area is approximately 30 hectares (75 acres). The proposed land use within the proposed development area is primarily comprised of residential land use based on applications received to date but could also include mixed uses around Creditview Road.

Planning	Water Servicing	Wastewater Servicing
<u>Key Concepts</u> <ul style="list-style-type: none"> The proposed development crosses four SGUs (B0239, B0340, B0256, and B0057). Based on a weighted proportion of the projected population forecasts for this area, the proposed development is slightly greater than the Region's planned 2041 projections (SGU Scenario 15, September 2017). The proposed development consists primarily of residential singles, semi-detached, and townhomes. Several environmental features surround the study area, including Huttonville Creek to the west and Springbrook Creek to the east. Queen Street West has been undergoing construction over the past few years to widen the road to four lanes. The Queen Street road right of way in this area is considered constrained, with multiple underground servicing. 	<u>Key Concepts</u> <ul style="list-style-type: none"> Water servicing to the development will be provided entirely by Pressure Zone 5, via the 600 mm sub-transmission main on Queen Street West. Meadowvale North and West Brampton pumping stations provide local Zone 5 water service. Storage to the area will be provided by the future Alloa Reservoir (to be commissioned in 2018). Treatment, pumping and transmission are assumed to be sufficient to service the proposed development based on the estimated population. Connections to the existing system should be made primarily on Queen Street West and Creditview Road. No new vertical water infrastructure projects were identified to service the proposed development. 	<u>Key Concepts</u> <ul style="list-style-type: none"> All flows are conveyed to the existing 1500 mm Creditvalley Trunk Sewer. Wastewater flows from the area drain south via the Creditvalley North Sewershed in the West Trunk System to the Clarkson Wastewater Treatment Facility. The hamlet residential area within the Springbrook Settlement Area is currently on private septic systems. The proposed development is serviceable entirely by gravity and provides opportunity to extend municipal servicing to the entire Springbrook Settlement Area. Treatment is sufficient to service the proposed development based on future planned infrastructure. Connections to the existing system should be made primarily on Queen Street West and Creditview Road.
<u>Next Steps</u> <p>Program Planning will be informed of any changes to the projections.</p>	<u>Next Steps</u> <p>Final connection points and fire flow requirements will be discussed.</p>	<u>Next Steps</u> <p>Final connections and sanitary sewer extensions will be discussed.</p>

1 Introduction and Background

1.1 Background

The Springbrook Settlement Area is an historic hamlet, located at the intersection of Queen Street West and Creditview Road in the City of Brampton. In August 2005, City of Brampton Council adopted a resolution to initiate a study for the Springbrook Settlement Area.

The Springbrook Settlement Area study was commenced in 2007. Work was paused in 2008 due to factors including the Region of Peel's proposed widening of Queen Street West. In 2013, a Preferred Land Use Option was prepared by the City. The reconstruction and widening of Queen Street West, including the installation of storm sewers, Low Impact Development (LID) and utility relocation has been ongoing since July of 2016. Construction work on Queen Street West in this area is anticipated to be complete by Fall of 2018.

In light of increased development pressures in the area, the City is now proceeding to finalize the Springbrook Settlement Area Study and complete a Tertiary Plan for the study area. This Functional Servicing Report will provide guidance for the provision of municipal water and wastewater infrastructure to inform the City's Tertiary Plan for the Springbrook Settlement Area.

1.2 Objectives

The purpose of this report is to demonstrate the adequacy of the existing water and wastewater infrastructure as well as the proposed water and wastewater infrastructure to satisfy the servicing needs of the proposed development. The intent is also to present the detailed servicing analysis of the proposed development undertaken as part of this study including:

- Establishing water and wastewater servicing requirements
- Identifying opportunities and constraints
- Identifying servicing alternatives
- Evaluating the water and wastewater servicing alternatives, if applicable
- Recommending a preferred water and wastewater servicing strategy for the development

Details of the analysis are based on the proposed land use, development size and location and the relationship with any other relevant studies that have been completed within the proposed development area.

2 Planning Context

The study area is bordered by Elbern Markell Drive to the west, Angelgate Road to the east, Fallowfield Road to the north, and George Robinson Drive to the south, as shown in Figure 1. The proposed development is comprised of Low and Medium Density Residential (Single/Semi-Detached/Townhouse), Hamlet Residential and Mixed Use. Details of the population breakdown is provided below.

TABLE 1 PROPOSED DEVELOPMENT RESIDENTIAL AND EMPLOYMENT FORECASTS

Block	Description	Number of Residential Units	Residential Population	Employment Population	Total Population
A	N of Queen St, E of Elbern Markell Dr (SD & TH)	50	175	0	175
B	N of Queen St, E of Elbern Markell Dr (SD)	20	76	0	76
C	N of Queen St, across Links Ln (S/D & TH)	90	317	0	317
D	Hamlet Residential, N of Queen St	0	80	10	90
E	N of Queen St, W of Creditview Rd (LDR)	27	103	0	103
F	N of Queen St, E of Creditview Rd (Mixed Use, MDR)	0	60	30	90
G	N of Queen St, E of Creditview Rd to limit (MDR)	12	46	0	46
H	Hamlet Residential, S of Queen S (LDR)	25	96	0	96
I	Creditview Rd, S of Queen St (Mixed Use)	0	0	24	24
J	E of Creditview Rd, S of Queen St (Mixed Use)	0	0	20	20
K	E of Creditview Rd, S of Queen St to limit (MDR)	50	165-175	0	175
TOTAL		274	1,138	84	1,212

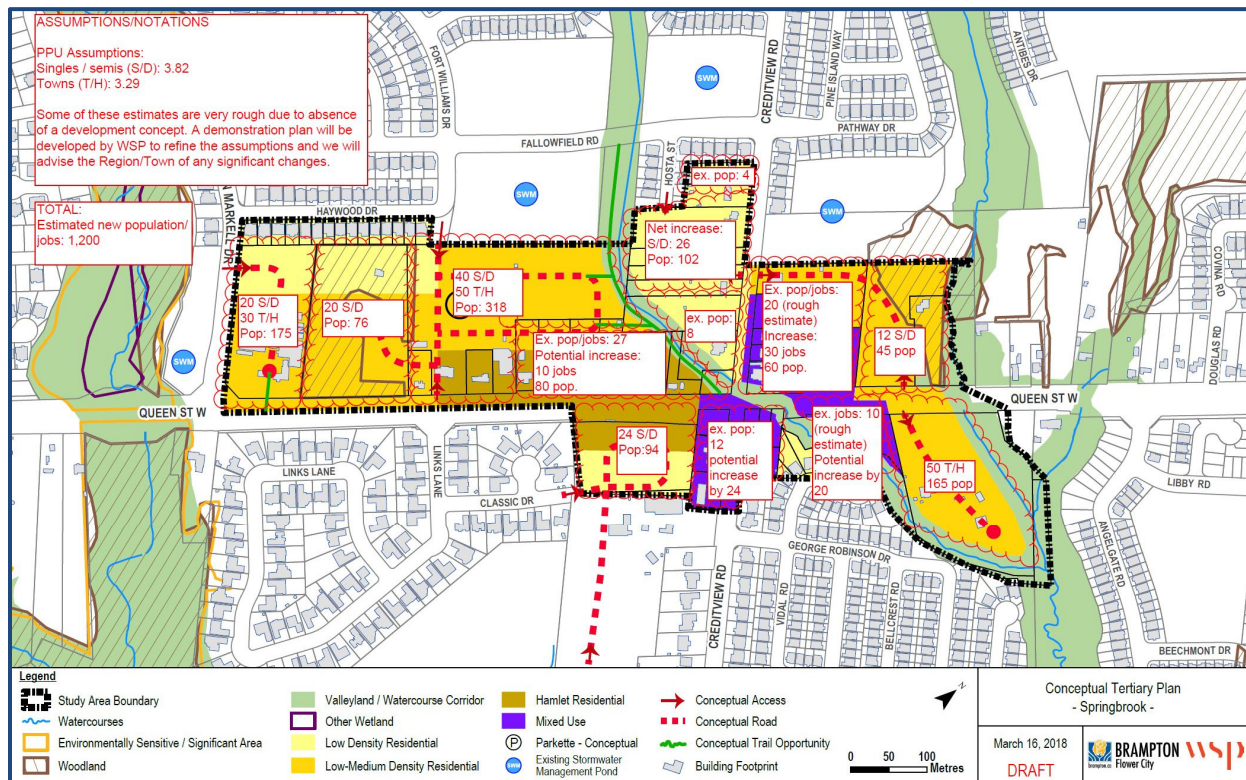


FIGURE 1 CONCEPTUAL TERTIARY PLAN

Based on the existing population identified in the Conceptual Tertiary Plan, the existing population is estimated to be approximately 81 people and jobs.

The Region of Peel provides population and employment projections by small geographic unit (SGU) across the Region, the latest of which is referred to as SGU Scenario 15 which aligns with the new provincial growth plan requirements. The proposed development lies within four adjacent SGUs: B0239, B0340, B0256 and B0057 as shown in Figure 2. This figure also shows another development area to the north (around the Mount Pleasant GO station), at Bovaird Drive and Creditview Road. This development proposes to add a significant amount of growth that needs to be considered, as it falls within the same sewershed and is supplied by the same water transmission system as the Springbrook Settlement Area.

The SGUs surrounding the Springbrook Settlement study area are much more widespread in area and it is difficult to estimate what portion of the forecast was allocated to the Springbrook Settlement study area. However, based on a rough area-based proportion of SGUs, the existing population is estimated to be 635 people and jobs, which is higher than the existing population of 81 people and jobs estimated in the Conceptual Tertiary Plan.

Based on the area-based proportion of SGUs, the population and employment forecasts for the Springbrook Settlement Area were established and are summarized in Table 2. The City's planning forecasts for the Springbrook Settlement Area are greater than the Region's 2041 forecasts, using either the existing population of 81 or 635 people and jobs.

TABLE 2 POPULATION GROWTH FORECAST COMPARISON

Scenario / Year	Population	Employment	Total
Growth to 2041 based on Weighted SGUs ¹	440	50	490
Proposed Development Growth ²	1,128	84	1,202
¹ Weighted growth takes proportion of SGUs based on area, using 2016 and 2041 forecasts from SGU Scenario 15 (September, 2017).			
² City of Brampton Estimated Planning Forecasts for Springbrook Settlement Area (March 16, 2018)			

Figure 2 also shows the current development applications received to date, within and around the Springbrook Settlement Area. These applications and their corresponding population estimates are considered as part of the hydraulic and modelling analyses that are managed by Program Planning.

Appendix D

Springbrook Settlement Area Study - City of Brampton

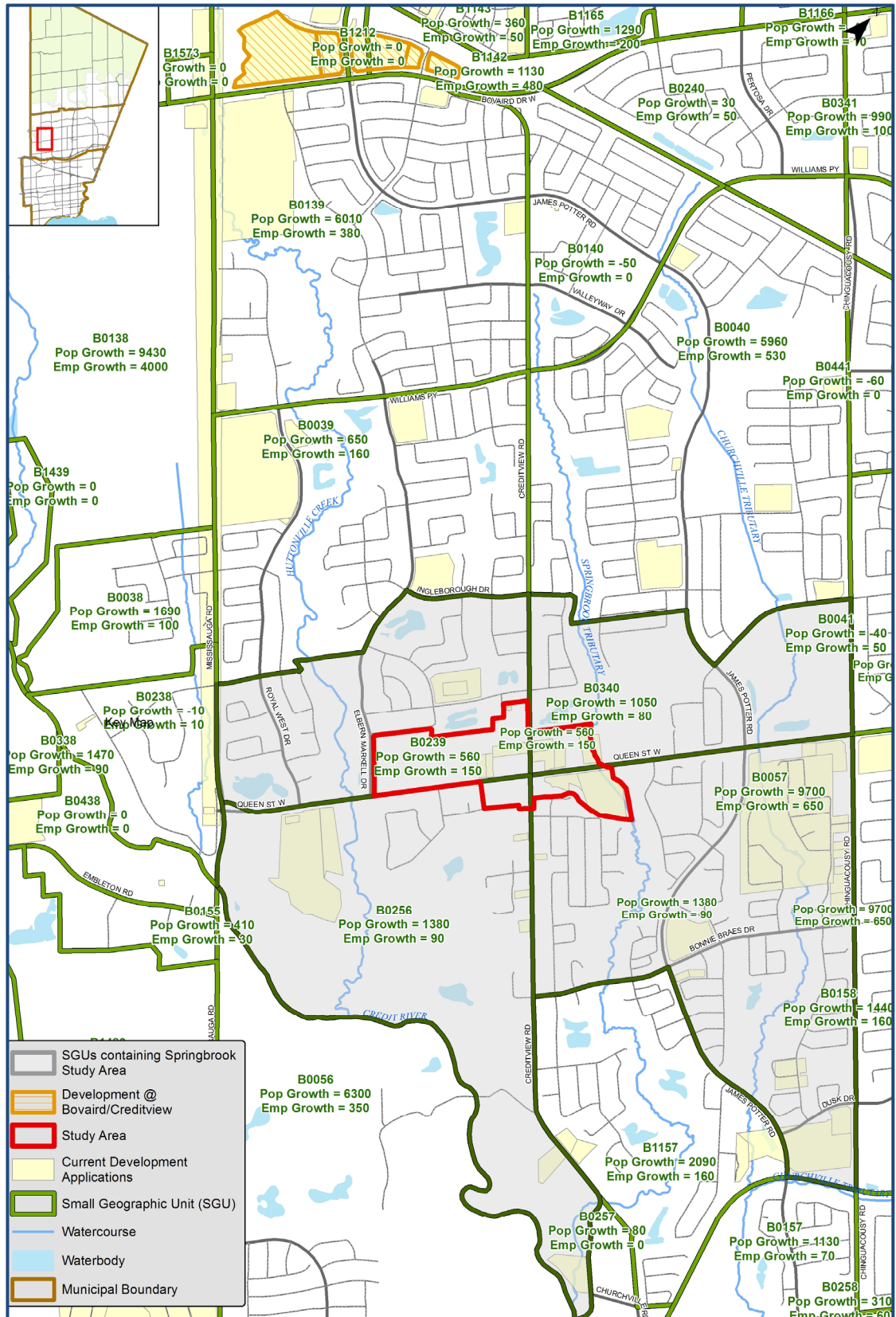


FIGURE 2 POPULATION & EMPLOYMENT FORECASTS AROUND PROPOSED DEVELOPMENT AREA BY SGU

3 Water Servicing

There is water infrastructure surrounding the proposed development which services existing land uses in the area. The development falls within the service boundary of water Pressure Zone 5.

3.1 Existing Infrastructure

The major feed to the area is a 600 mm PZ 5 sub-transmission main on Queen Street that connects to a 300 mm distribution main on Creditview Road (south-side). There is limited internal servicing provided through smaller 150 mm distribution mains on Queen Street and Creditview Road (north-side). The pressure zone changes to Zone 6 north of Fallowfield Road.

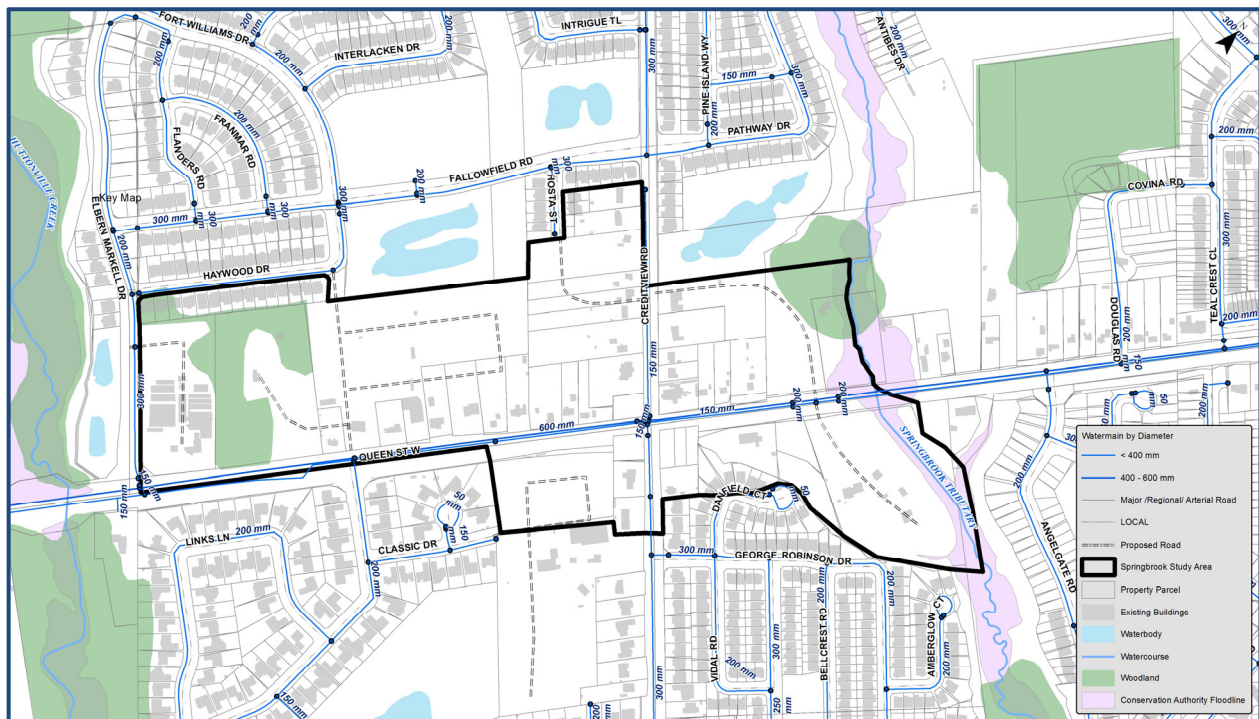


FIGURE 3 EXISTING WATER INFRASTRUCTURE IN THE VICINITY OF PROPOSED DEVELOPMENT

3.2 Planned Water Infrastructure

Based on the Region's latest population and employment growth projections, the existing trunk infrastructure in the area is sufficient to service 2041 demands and there is allowance for growth beyond the 2041 time frame.

There is no new local infrastructure planned in the vicinity of the proposed development in the near term.

3.3 Water Design Criteria and Service Levels

Demands for the proposed development were calculated using the Region's latest water design criteria. The design criteria are summarized as follows:

- 270 Lpcd for average day water consumption for residential area
- 250 Lpcd for average day water consumption for employment area
- A maximum day peaking factor of 1.8 for residential and 1.4 for employment growth
- A peak hour factor of 3.0

Establishing hydraulic performance criteria is required in determining the project requirements to service new growth. Assessing the impact of growth on the existing water distribution system was undertaken following the 2013 Water and Wastewater Master Servicing Plan approach.

A linear water project is triggered or flagged for further analysis if it meets one or more of the following criteria:

- Under maximum day demand scenario pipe velocity exceeds 1.5 m/s;
- Under maximum day demand scenario pressure in the system drops below 40 psi or drops by more than 10 psi, reducing the level of service for existing users;
- Pressure in the system drops below 20 psi under a maximum day plus fire scenario

The trigger for a pumping station upgrade is based on exceeding the firm capacity of the station feeding the area. Firm capacity of a pumping station is defined as the sum of the all the pump capacities minus the largest pump capacity and is calculated separately for each pressure zone the station discharges to. The station's firm capacity should be able to handle peak hour demands when distributing flow into the local system.

Water storage requirements for the Springbrook Settlement Area are calculated in accordance with MOECC Guidelines as follows:

Total Storage Requirements = A + B + C where,

- A = Equalization Storage (25% of maximum day demand of zone)
- B = Fire storage in accordance with the standard of Municipal Fire Protection of the Canada Underwriter's Association (modified from the MOECC criteria)
- C = Emergency Storage (25% of A + B)

3.4 Water Servicing Analysis

The objective of the hydraulic water servicing analysis is to identify alternatives for servicing the development and select a servicing strategy that considers the following key impacts:

- Existing level of service
- Water quality
- Security of supply and system redundancy
- Flexibility of servicing
- Complexity and cost of infrastructure
- Opportunity to support long term servicing of existing and other growth areas

The Springbrook Settlement Area is situated within the serviceable range of Pressure Zone 5. The pressure zone boundary runs north of Fallowfield Road, north of the development but no boundary changes are expected in the near future. The area will be supplied by the existing Zone 4 pumping stations along the west spine (Meadowvale North and West Brampton) to a greater extent than the central/east transmission system. The future Alloo Reservoir will provide floating storage for this area.

Treatment, pumping and transmission capacities are sufficient to service the proposed development based on future planned infrastructure.

3.4.1 Water Demand Requirements

Using the design criteria outlined in Section 3.3, the average day, maximum day and peak hour demands for the proposed development were calculated. These demands are summarized in Table 3.

TABLE 3 WATER DEMANDS FOR SPRINGBROOK SETTLEMENT AREA

Demand Scenario	Proposed Development	SGU Estimate (2041)
Average Day (m ³ /d)	326	3,669
Maximum Day (m ³ /d)	578	6,534
Peak Hour (m ³ /d)	977	11,006

The proposed development is only a part of the overall SGU and contributes a portion of the forecasted demand requirements across the four SGUs, as outlined in Table 2.

3.4.2 Storage Requirements

As stated earlier, storage will be provided from the future Alloo Reservoir (to be commissioned in 2018). All storage facilities have sufficient available storage capacity to 2031 and beyond. The proposed development shows a marginal increase in required storage. It was confirmed that the existing and planned storage in the system is sufficient to meet the additional requirement and no new storage upgrades are required.

3.4.3 Servicing Alternatives

Typically, a number of alternative servicing strategies are identified and further evaluated to select the most preferred servicing option. In this case, the area is surrounded by existing and there is no planned infrastructure within the 2041 timeframe. Therefore, only one servicing alternative was identified as shown in Figure 4.

Appendix D

Springbrook Settlement Area Study - City of Brampton

Primary supply to the development is provided via the 600 mm sub-transmission main on Queen Street West (via the 150 mm distribution main) and the 300 mm distribution main on Creditview Road. Local 150 mm distribution mains on Queen Street and Creditview Road can provide direct service connections to residential blocks while the mixed land uses could connect to the larger diameter mains.

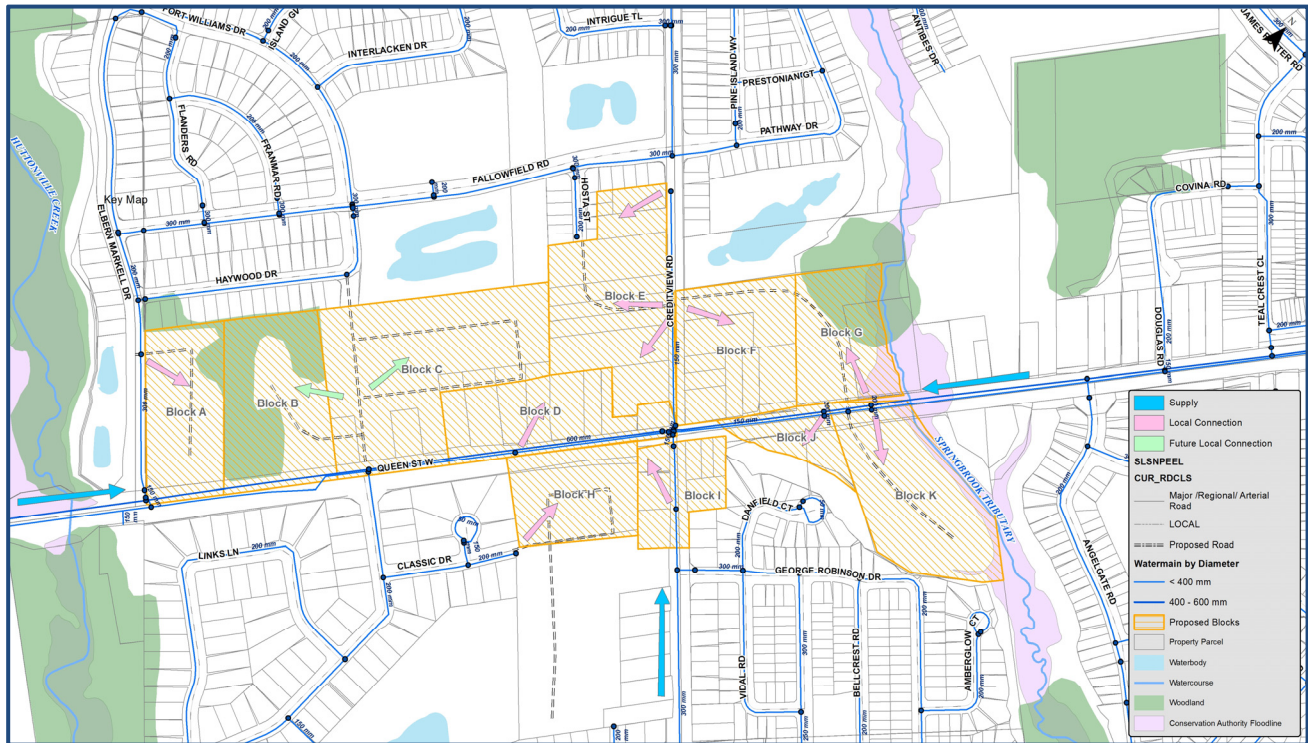


FIGURE 4 WATER SERVICING ALTERNATIVE 1

Connections to existing mains will provide service to the blocks as follows:

- Block A – connection to 300 mm main on Elbern Markell Drive
- Block D – connection to 150 mm main on Queen Street
- Block B, C – connections to 200 mm main on Haywood Drive and 200 mm main on Links Lane via a proposed north-south main
- Block E, F – connections to 150 mm main on Creditview Road; proposed upsized main on Creditview Road, approximately 160 m north of Queen Street; and, extension of servicing on proposed road right of way (through Block E) and on Creditview Road to enhance connectivity.
- Blocks G – connection to 600 mm sub-transmission main via 200 mm stub on Queen Street
- Blocks J, K – connections to 600 mm sub-transmission main via 200 mm stub on Queen Street
- Block H – connection to 200 mm main on Classic Drive
- Block I – connection to 300 mm main on Creditview Road

Connections to the 600 mm main on Queen Street West shall be minimized to ensure that the integrity of the sub-transmission main is maintained. Hydraulic modeling was performed to identify impacts to the existing water distribution system and to assess future infrastructure and potential water service connection points. Details of the hydraulic analysis for each scenario is provided in Appendix A.

It was determined that assumed fire flow for the development can be supported by the existing and proposed watermain in the area.

3.5 Preferred Servicing Strategy

The preferred servicing strategy is based on providing water service to the blocks via connections to the existing mains on Queen Street West, Elbern Markell Drive, Haywood Drive, Creditview Road, and Classic Drive. There are two watermain within the study area that are proposed to enhance water distribution to the proposed development that includes both residential and mixed land use.

A proposed 200 mm north-south watermain connecting to Haywood Drive and Queen Street West will provide additional looping to system, enhancing security of supply. This 200 mm main will provide service to future buildings located more internal to the development. The proposed servicing strategy also includes upsizing the existing 150 mm distribution main on Creditview Road north of Queen Street to a 300 mm watermain to service the proposed mixed use areas around Creditview Road.

Figure 5 shows the recommended connection points along the existing and proposed network. The connection sizes, including fire connections, in all cases should be smaller than the watermain size. The internal looping of mains connecting Haywood Drive to Links Lane will enhance security of supply and is required for the purpose of servicing this new development. It is also recommended that a new main along the proposed road right of way through Block E from Creditview Road to Hosta Street be provided to enhance connectivity. Extension of the existing 150 mm on Creditview Road to Fallowfield Road will also enhance connectivity providing security of supply and quality to the area. Street-by-street servicing is not currently shown and will be required as detailed site plan information becomes available.

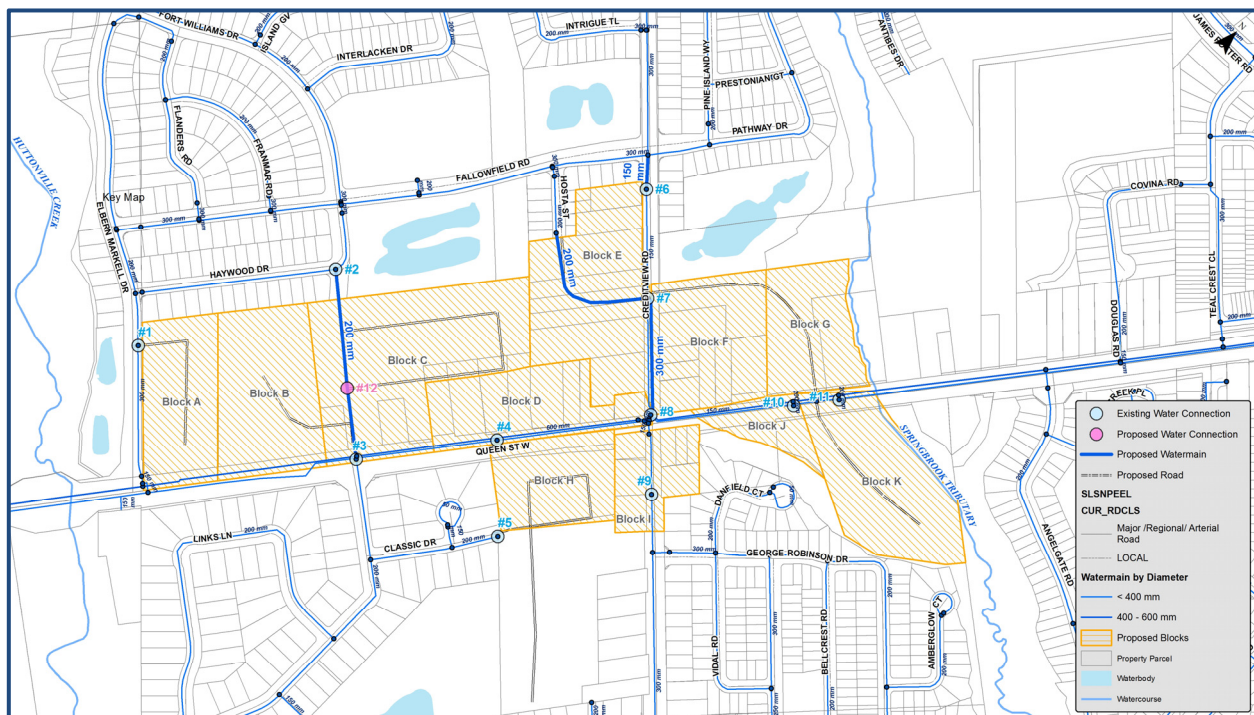


FIGURE 5 PREFERRED WATER SERVICING STRATEGY

4 Wastewater Servicing

There is existing wastewater infrastructure surrounding the Settlement Area Study, which services the existing land uses in the area. The area is located within the Creditvalley North Sewershed and is serviced via the Creditview Trunk Sewer (West Trunk System), where flows are ultimately treated at the Clarkson Wastewater Treatment Facility.

The hamlet residential area within the Springbrook Settlement Area is not currently serviced by the municipal wastewater system. Property owners in this hamlet area have previously expressed interest through a Local Improvement Process. The proposed development provides opportunity to extend municipal services to the entire Springbrook Settlement Area.

4.1 Existing Infrastructure

The existing sanitary sewers adjacent to study area (from west to east) are as follows:

- 1500 mm trunk sanitary sewer along Queen Street, from Mississauga Road to Creditview Road
- 450 mm local sanitary sewer along Elbern Markell Drive, from Fallowfield Road to Queen Street
- 250 mm sewer on Links Lane, from south of Queen Street to Natural Trail/Creditview Road
- 250 mm sewer along Creditview Road, north and south of Queen Street
- 600 mm sewer on Queen Street, from eastern limit to Creditview Road

There are no local sanitary sewers on Queen Street, between Elbern Markell and Creditview Road. All flow ultimately makes its way to the 1500 mm Creditview Trunk Sewer. Existing wastewater infrastructure in the vicinity of the proposed development is shown in Figure 6.

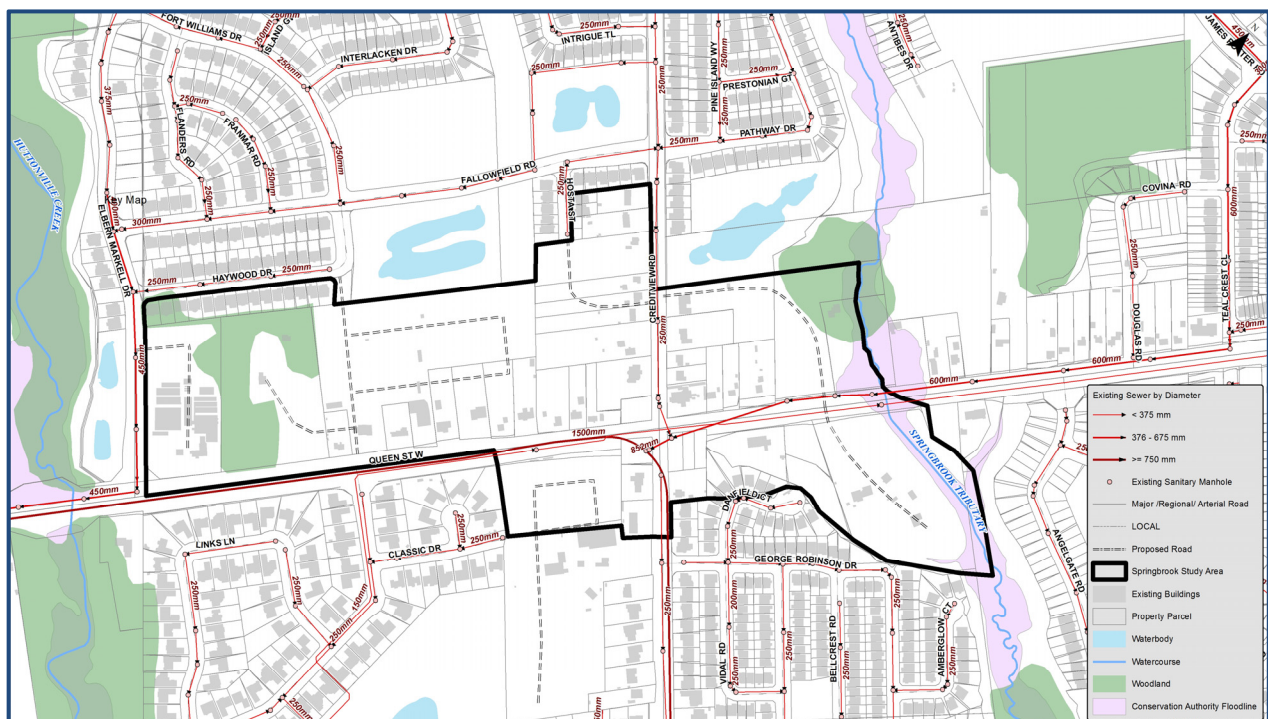


FIGURE 6 EXISTING WASTEWATER INFRASTRUCTURE IN THE VICINITY OF PROPOSED DEVELOPMENT

4.2 Planned Wastewater Infrastructure

There are no major planned projects around the development area. The existing 450 mm sanitary sewer along Elebern Markell Drive and Queen Street West was built in 2011. This sewer conveys sanitary flows from the subdivision, north of the subject property to the existing 1500 mm Creditview Road trunk sewer on Queen Street West at intersection of Mississauga Road and Queen Street West.

The existing 600 mm sanitary sewer on Queen Street West was built in 2013. This sewer conveys sanitary flows from the existing build out east of Creditview Road subdivision to the existing 1500 mm Creditview Road trunk sewer at intersection of Creditview Road and Queen Street West.

4.3 Wastewater Design Criteria and Service Levels

Wastewater flows for the proposed development were calculated using the Region's latest revised wastewater design criteria. The wastewater design criteria are summarized as follows:

- 290 Lpcd for average day wastewater generation rate for residential area
- 270 Lpcd for average day wastewater generation rate for employment area
- Peaking factor is based on the Harmon formula
- Inflow and infiltration allowance is based on 0.26 L/s/ha

Establishing hydraulic performance criteria is required in determining the project requirements to service new growth. Assessing the impact of growth on the existing wastewater collection system was undertaken following the 2013 Water and Wastewater Servicing Master Plan approach.

A linear wastewater project is triggered or flagged for further analysis if it meets the following criteria:

- Pipe (less than 675 mm diameter) is surcharged under 1 in 5 year design storm of Soil Conservation Service (SCS) Type II.
- Pipe (675 mm diameter and up) is surcharged under 1 in 5 year design storm of Atmospheric Environmental Service (AES).
- Pipe is surcharged under 1 in 25 year design storm and,
- Maximum water level is within 1.8 meters of ground level, indicating the potential for basement flooding

The trigger for a pumping station upgrade is based on exceeding the firm capacity of the station servicing the area. Firm capacity of a pumping station is defined as the sum of all the pump capacities minus the largest pump capacity. The station's firm capacity should be able to handle peak wet weather flows.

4.4 Wastewater Servicing Analysis

The objective of the hydraulic wastewater servicing analysis is to identify alternatives for servicing the development and select a servicing strategy that considers the following key impacts:

- Existing level of service
- System capacity
- Complexity and cost of infrastructure
- Opportunity to support long term municipal servicing of existing and other growth areas

The Springbrook Settlement Study Area is located within the west drainage area. The area drains by gravity via the Creditview Trunk Sewer and West Trunk Sewer to the Clarkson Wastewater Treatment Facility. It was confirmed that treatment capacity is sufficient to service the subject development.

4.4.1 Wastewater Flow Requirement

The theoretical average dry weather flow, peak dry weather flow and peak wet weather flows were calculated using the design criteria described in Section 4.3. The estimated wastewater flows for this development are presented in Table 4.

TABLE 4 WASTEWATER FLOWS FOR SPRINGBROOK SETTLEMENT AREA

Flow Scenario	Proposed Development	SGU Estimate (2041)
Average Dry Flow (L/s)	3.8	3.3
Peak Dry Flow (L/s)	14.4	12.6
Peak Wet Weather (L/s)	20.8	19.1

4.4.2 Capacity of the Existing Sewers adjacent to Springbrook Settlement Area

There are two sub trunk sewers (600 mm and 450 mm diameter) and three 250 mm local sanitary sewers adjacent to the study area. All of these sewers convey flows to the existing 1500 mm Creditview Trunk Sewer along Queen Street West and Creditview Road.

The peak wet weather flow from this development is estimated 20.8 (table 5) L/s and the existing 1500 mm Creditview Trunk Sewer has sufficient capacity to accommodate this flow.

The capacity of the existing 600 mm, 450 mm and 250 mm sewers were analyzed, utilizing the Region's hydraulic wastewater model based on a one in five year (SCS II) storm. Details of the hydraulic analysis for each of the receiving sewers is provided in Appendix B.

4.4.3 Servicing Alternatives

Two alternative servicing strategies were identified and assessed to select the most preferred servicing option. Common to both servicing options, are multiple connections to the existing sanitary sewers on Elbern Markell Drive, Creditview Road, Queen Street West (east of Creditview Road), and Classic Drive. These sewers will provide service to the blocks directly adjacent to these road rights of way, including Blocks A, E, F, G, H, I, J and K.

Blocks B, C and D which include the hamlet residential properties are not adjacent to any existing sanitary sewers and will require a proposed local sanitary sewer to convey flows either i) west to the 450 mm sanitary sewer at Queen Street West and Elbern Markell Drive, or ii) east to the 600 mm trunk sewer on Creditview Road/Queen Street West. These two options make up conceptual servicing alternatives 1 and 2.

Hydraulic modelling was performed to identify impacts to the existing wastewater collection system and to assess potential wastewater connection points.

4.4.3.1 Alternative 1 (Convey Flows West)

Alternative 1 conveys flows from Blocks B and C south to the existing and D west to the existing 450 mm sanitary sewer at Queen Street and Elbern Markell Drive, which ultimately connects to the 1500mm trunk sewer at Mississauga Road. The local 250 mm sewer will be approximately 640 m in length and may require a new easement north of the road right of way, as Queen Street West is already constrained by multiple watermains and the trunk sewer that continues south on Creditview Road.

This alternative avoids crossing Queen Street and its multiple watermains and sewer, and follows the natural direction of drainage, as the topography of the land falls from east to west.

Alternative 1 is shown in Figure 7 and is based on conveying flow from each block as follows:

- Block A – Drains to the 450 mm sewer on Elbern Markell Drive
- Blocks B, C, D – Drains to the 450 mm sewer on Elbern Markell Drive via a proposed 250 mm east-west sewer on the north side of Queen Street
- Blocks E, F – Drains to the 250 mm sewer on Creditview Road
- Blocks G, J, K – Drains to the 600 mm sewer on Queen Street
- Block H – Drains to the 250 mm sewer on Links Lane via the 250 mm sewer on Classic Drive
- Block I – Drains to the 250 mm sewer on Creditview Road

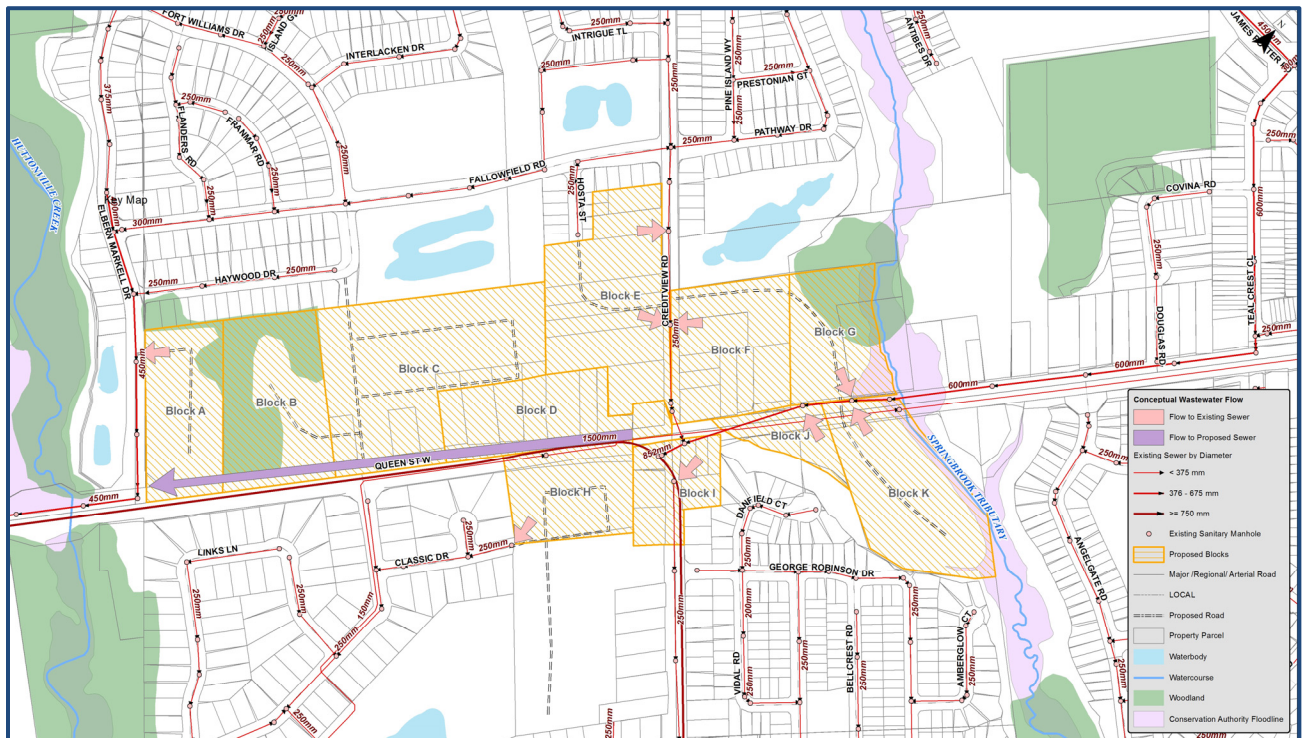


FIGURE 7 WASTEWATER SERVICING ALTERNATIVE 1

4.4.3.2 Alternative 2 (Convey Flows East)

Alternative 2 conveys flows from Blocks B, C and D east to the existing 600 mm sanitary sewer at Queen Street and Creditview Road. The local 250 mm sewers will be approximately 500 m in length and may require a new easement north of the road right of way, as Queen Street West is already constrained by multiple watermains and the trunk sewer that continues south on Creditview Road.

This alternative involves crossing Queen Street around the Creditview Road intersection and its multiple watermains and sewer. Although the sewer that follows Queen Street will be shorter than Alternative 1, it will be deeper, as the topography of the land falls from east to west.

Alternative 2 is shown in Figure 8 and is based on conveying flow from each block as follows:

- Block A – Drains to the 450 mm sewer on Elbern Markell Drive
- Block B, C and D – Drains east to the 600 mm sewer at Creditview Road and Queen Street, via a proposed 250 mm west-east sanitary sewer
- Blocks E, F – Drains to the 250 mm sewer on Creditview Road
- Blocks G, J, K – Drains to the 600 mm sewer on Queen Street
- Block H – Drains to the 250 mm sewer on Links Lane via the 250 mm sewer on Classic Drive
- Block I – Drains to the 250 mm sewer on Creditview Road

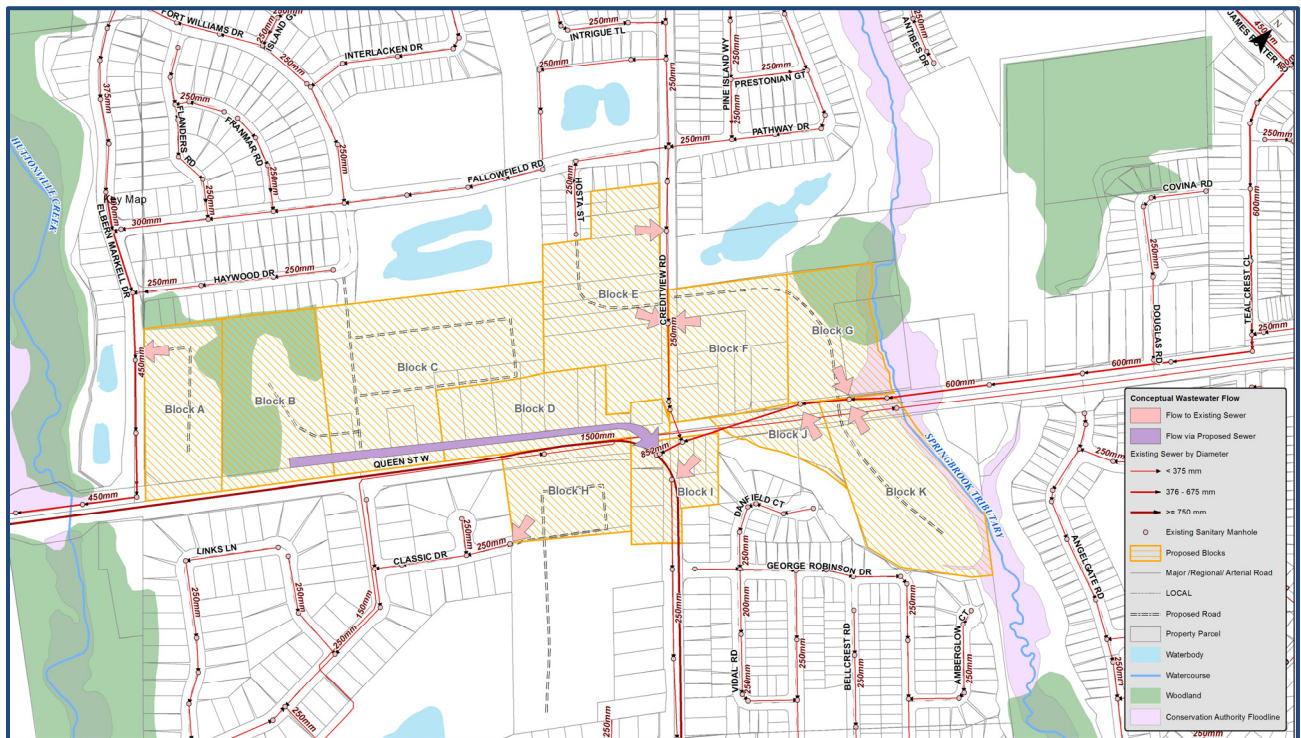


FIGURE 8 WASTEWATER SERVICING ALTERNATIVE 2

4.5 Preferred Servicing Strategy

The preferred wastewater servicing strategy is based on Conceptual Servicing Alternative 1, whereby flows from the existing hamlet residential area are conveyed west to the 1500 mm trunk sanitary sewer on Mississauga Road. This alternative was preferred over Alternative 2, as it minimizes crossing of multiple linear infrastructure on Queen Street West, in particular around the Creditview Road intersection.

Preliminary proposed sanitary sewers and manholes, along with potential service connections are shown in Figure 12. Approximately 640 m of 250 mm sanitary sewer will be required on the north side of Queen Street to convey flows west from properties fronting on the north side Queen Street, between Elbern Markell Drive and Creditview Road to the 450 mm sewer on Elbern Markell Drive. This east-west sewer may require a permanent easement, as the Queen Street West road right of way is already constrained with at least a sub-transmission watermain, a distribution watermain, and a trunk sanitary sewer. It is unknown whether or not the abandoned 300 mm watermain and the abandoned 150 mm sanitary forcemain have been physically removed.

This servicing strategy leverages the opportunity to extend municipal servicing to properties that are currently on private septic systems. Potential connection points are estimates and will be confirmed with Development Services at a later stage. All flows eventually drain to the 1500 mm Creditview Trunk Sewer, where they are conveyed by gravity via the West Trunk System to the Clarkson Wastewater Treatment Facility.

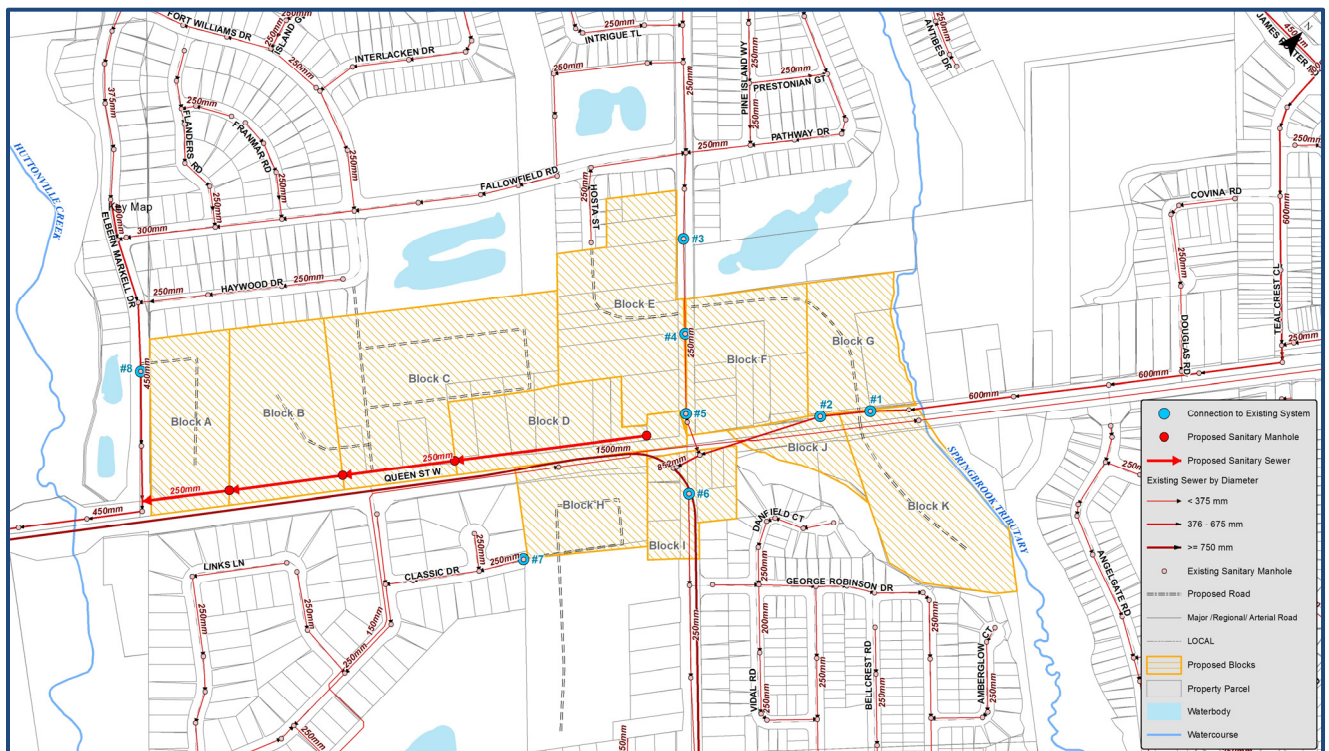


FIGURE 9 PREFERRED WASTEWATER SERVICING STRATEGY (ALTERNATIVE 1)

5 Conclusion

The proposed development is located within the City of Brampton along Queen Street, east and west of Creditview Road. The total site area is approximately 30.25 hectares (75 acres). The development plan includes a combination of single family, semi-detached and townhomes, along with mixed land use around Creditview Road.

The proposed development has an equivalent population of about 1,200 people and jobs (including approximately 275 residential units). The development crosses four SGUs (B0239, B0340, B0256 and B0057). Based on the residential and employment population projections proposed by the City, these are slightly greater than the Region's forecasted 2041 (SGU Scenario 15, Sep 2017) population.

Hydraulic modeling was performed to determine if the existing water distribution and wastewater collection systems have sufficient capacity to supply and collect the additional water demands and wastewater flows, respectively, generated by the proposed development.

Recommended Water Servicing

Water servicing to the proposed Springbrook development will be provided entirely by Pressure Zone 5 in Brampton. Zone 5 is serviced primarily by the Meadowvale North and West Brampton pumping stations. Storage to the area will be provided by the future Alloo Reservoir. The major feed to the area is a 600 mm sub-transmission main on Queen Street and a 300 mm watermain on Creditview Road. Local 150 mm distribution mains provide direct service to existing properties on Queen Street and Creditview Road.

To provide water service to the proposed development, the following water servicing components are recommended:

- Connections to adjacent watermains on existing road right of ways, including Queen Street, Elbern Markell Drive, Haywood Drive, Links Lane, Creditview Road, and Classic Drive
- A proposed north-south watermain connecting to the 200 mm main on Haywood Drive and the 200 mm main on Links Lane will provide additional looping, enhancing security of supply
- A proposed upsizing of the existing 150 mm main on Creditview Road, from Queen Street to 160 m north of Queen Street to service the proposed mixed use areas around Creditview Road.
- All service connections should be smaller than the watermain size to comply with Regional watermain design guidelines.

Potential connection points are estimates and will be confirmed with Development Services at a later stage.

Recommended Wastewater Servicing

Currently there is existing infrastructure in the area that will convey flow from the proposed Springbrook development. However, many of the homes in the Springbrook Settlement Area are currently on private septic systems. Property owners within this area have previously expressed interest in connecting to the municipal wastewater system, through a Local Improvement Process. The wastewater servicing strategy developed in this FSR supports the proposed Springbrook development and provides

opportunity to extend municipal services to the entire study area, including those currently on private wastewater systems.

The preferred wastewater servicing strategy is based on connecting to existing adjacent sanitary sewers and proposes a new east-to-west sanitary sewer to extend services to properties on the north side of Queen Street, west of Creditview Road. This proposed sewer avoids crossing Queen Street and its multiple watermains and sewer, and follows the natural direction of drainage, as the topography of the land falls from east to west.

To provide wastewater service to the proposed development, the following wastewater servicing components are recommended:

- Connections to adjacent sanitary sewers on existing road right of ways, including Queen Street, Elbern Markell Drive, Creditview Road and Classic Drive
- A proposed east-west local sewer along the north side of Queen Street connecting to the 450 mm sanitary sewer on Elbern Markell Drive, and could require a new permanent easement as Queen Street West is already constrained in this area by multiple existing infrastructure

Potential connection points are estimates and will be confirmed with Development Services at a later stage. All flows ultimately make their way to the Creditview Trunk Sewer where they are conveyed via the West Trunk System to the Clarkson Wastewater Treatment Facility.

Conclusions

It was confirmed that water treatment, transmission and planned pumping and storage capacity is sufficient to service the proposed development. Extension of Zone 5 existing watermains to support the proposed development will be required. It is recommended that a more detailed modelling and hydraulic analysis be performed once the final design of the proposed development is determined and internal servicing is developed.

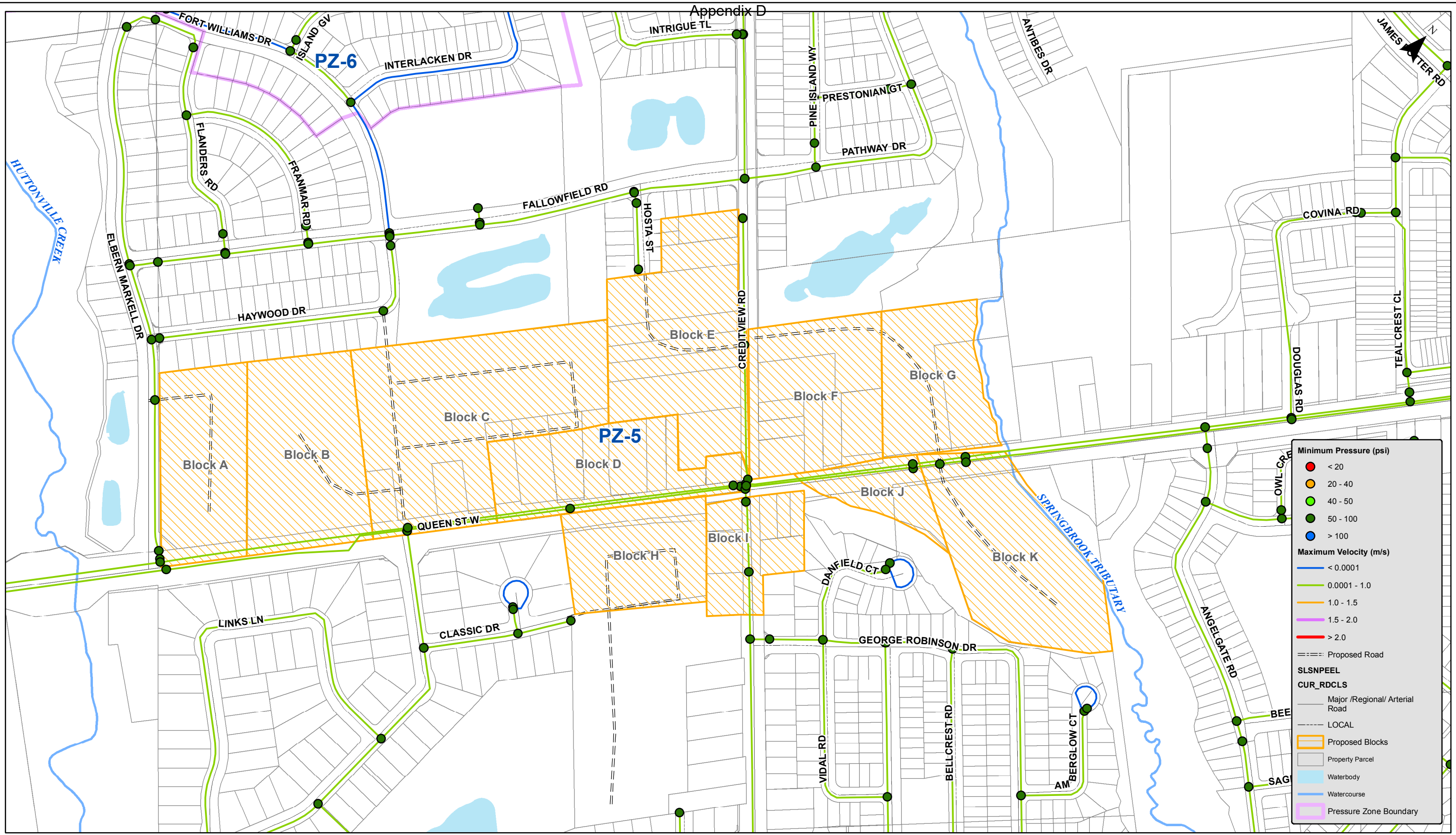
It was confirmed that wastewater treatment capacity is sufficient to service the proposed development based on the proposed population and employment projections. Extension of local sanitary sewers will provide municipal servicing to the entire Springbrook Settlement Area, some of which is currently serviced by private septic systems.

The cost of the above water and wastewater upgrades and improvements will be the developer's responsibility. An agreement between the various developers will be required to allocate costs within the proposed development lands. Recommendations could change should the population estimates change.

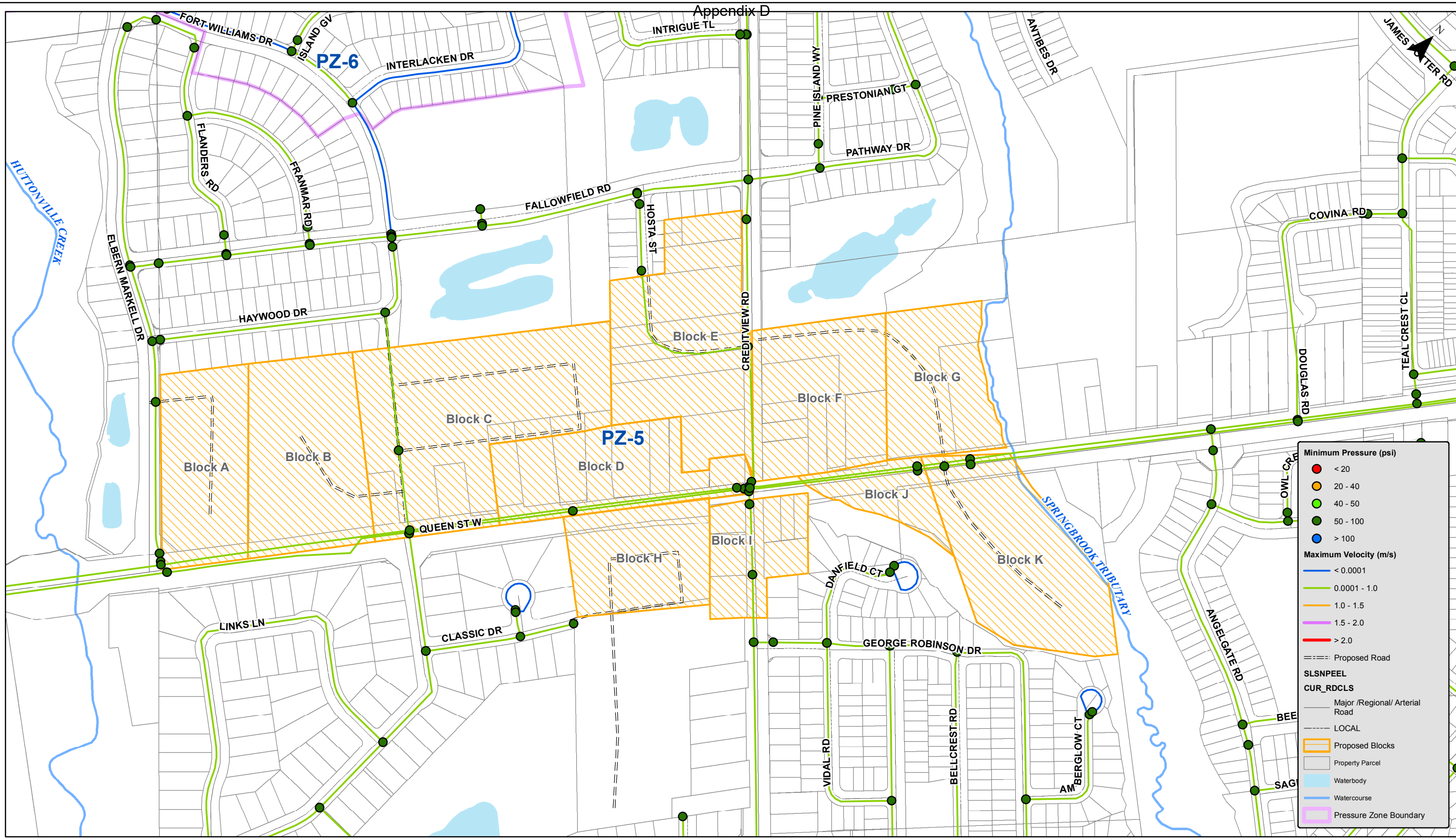
Appendix A

Water Modelling

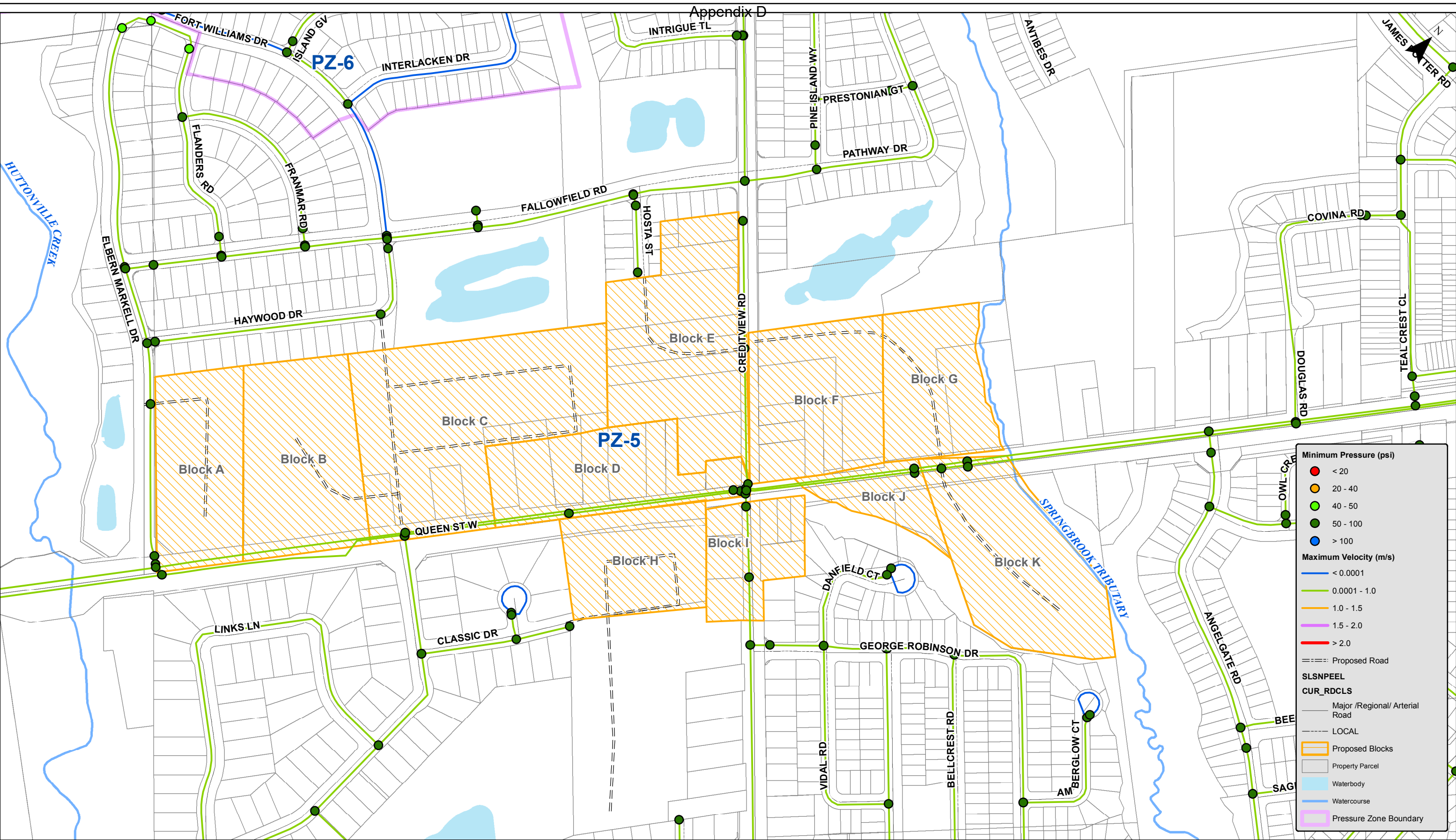
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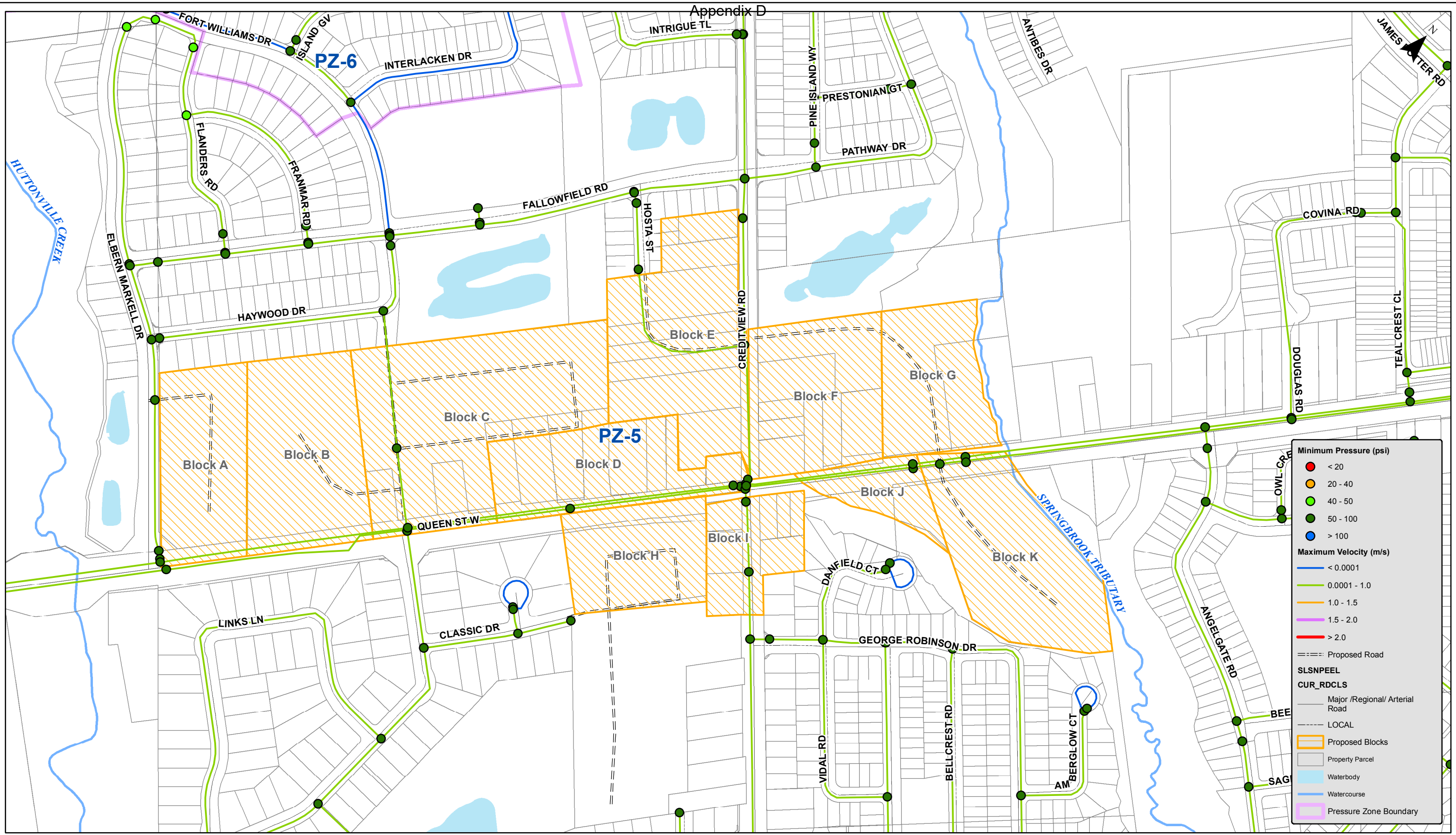
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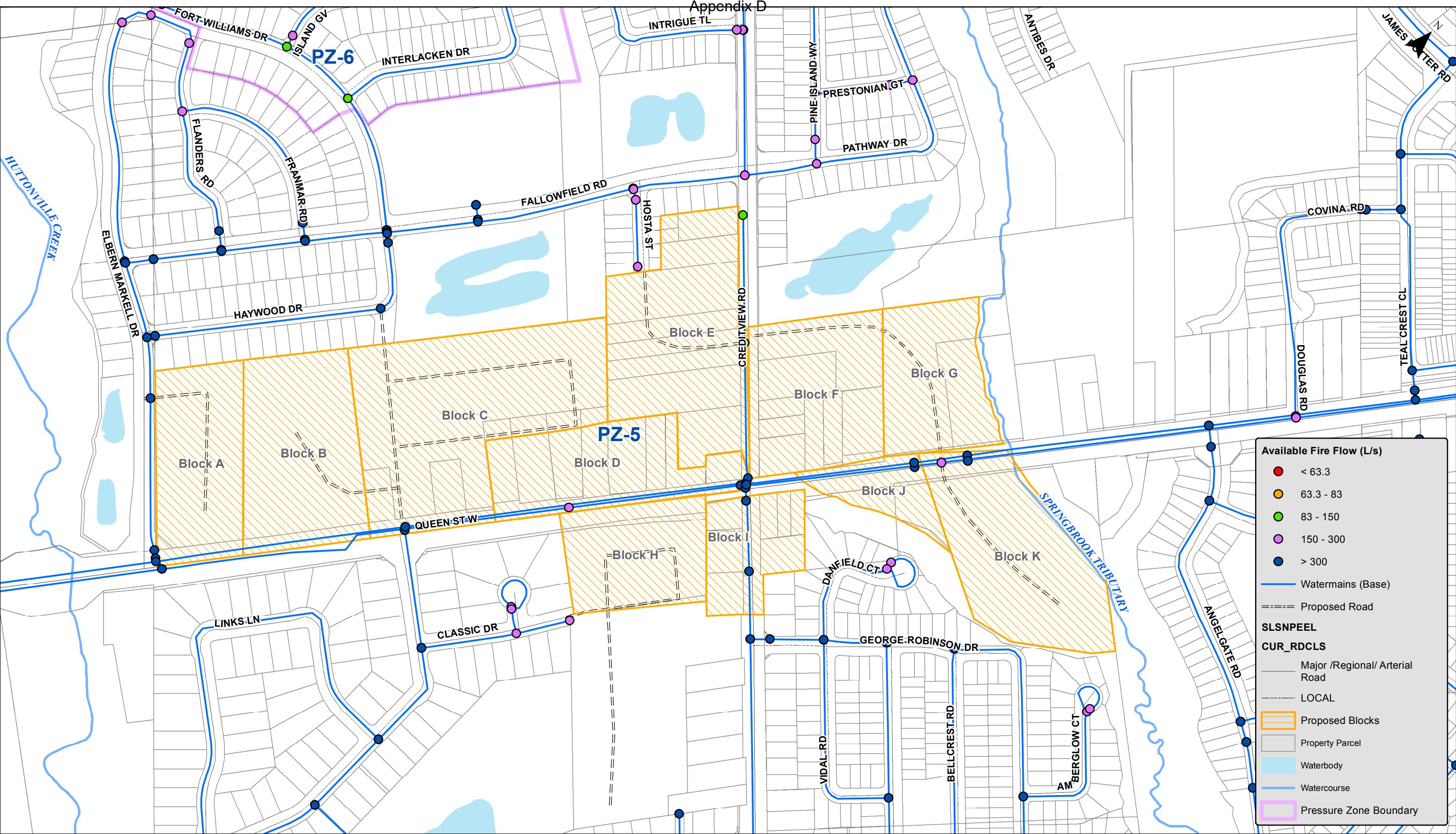
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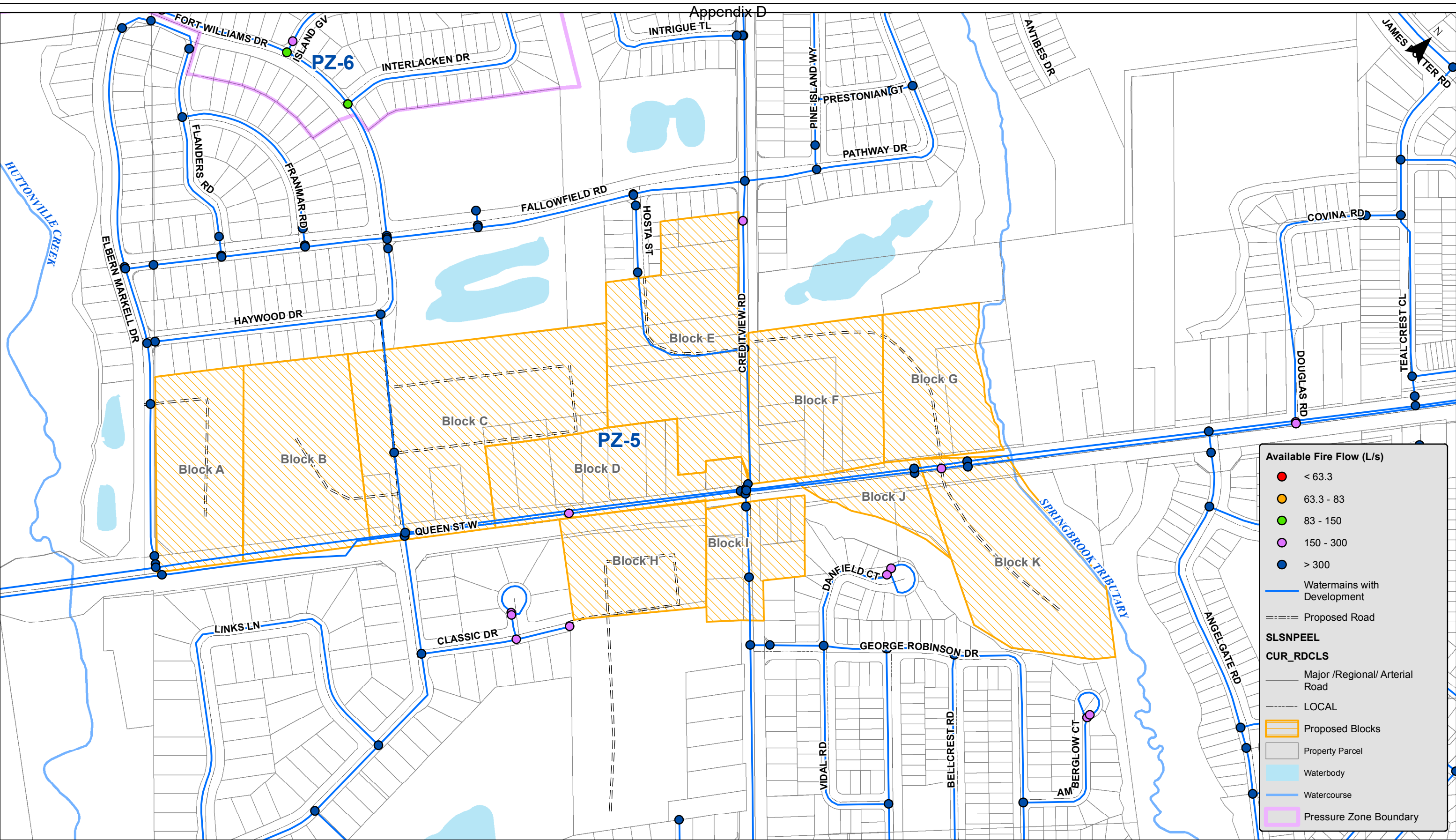
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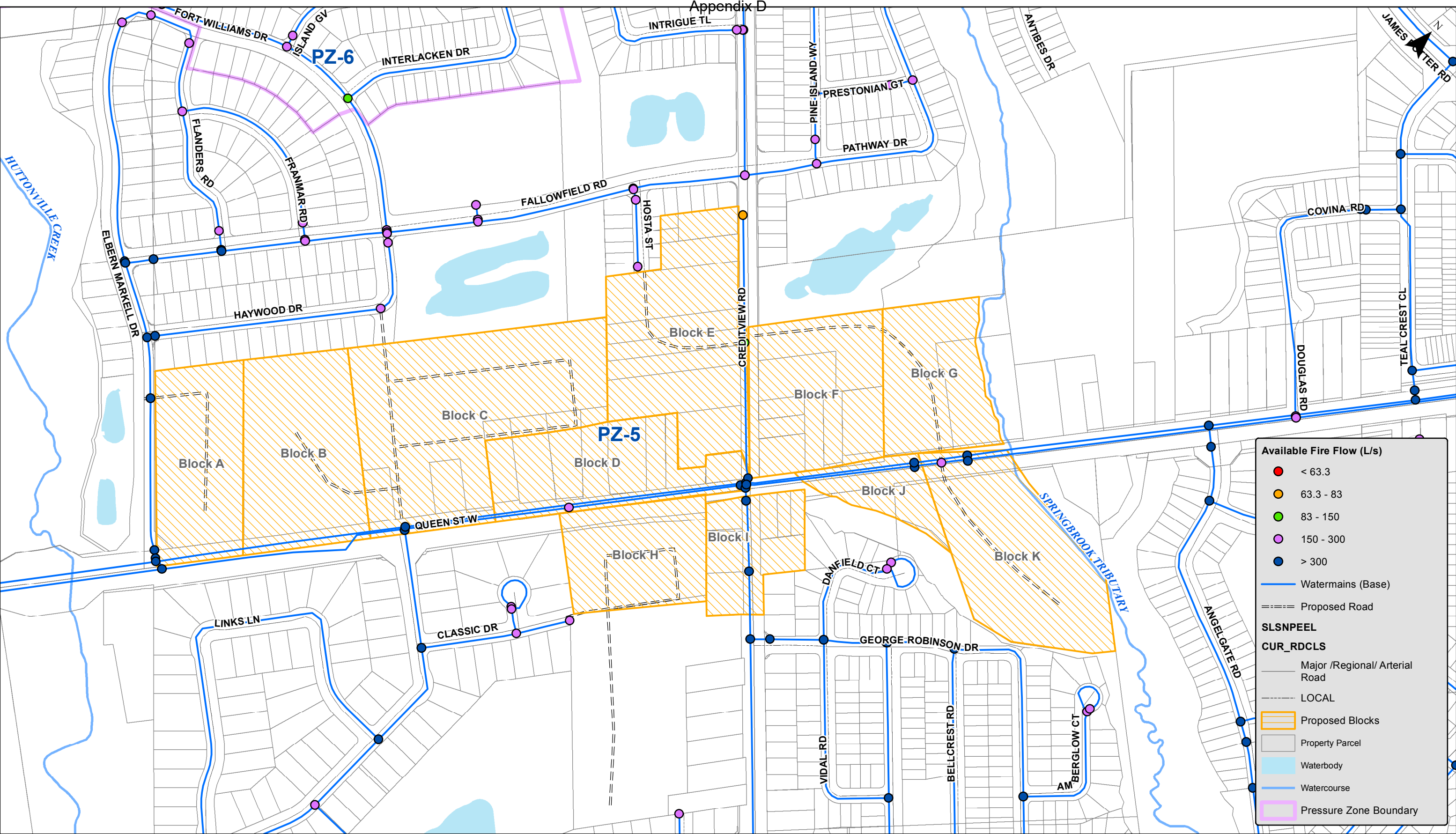
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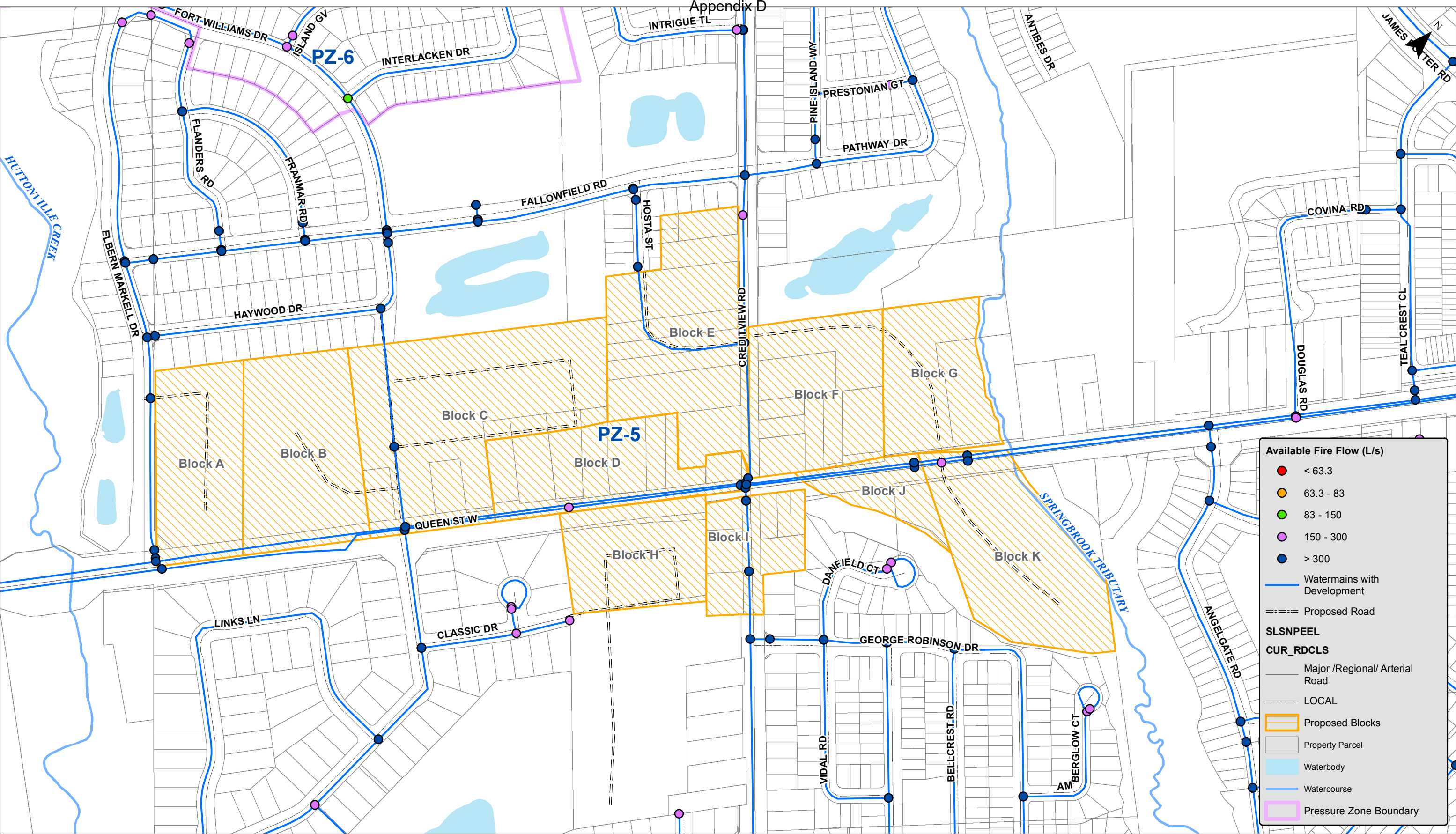
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Appendix B

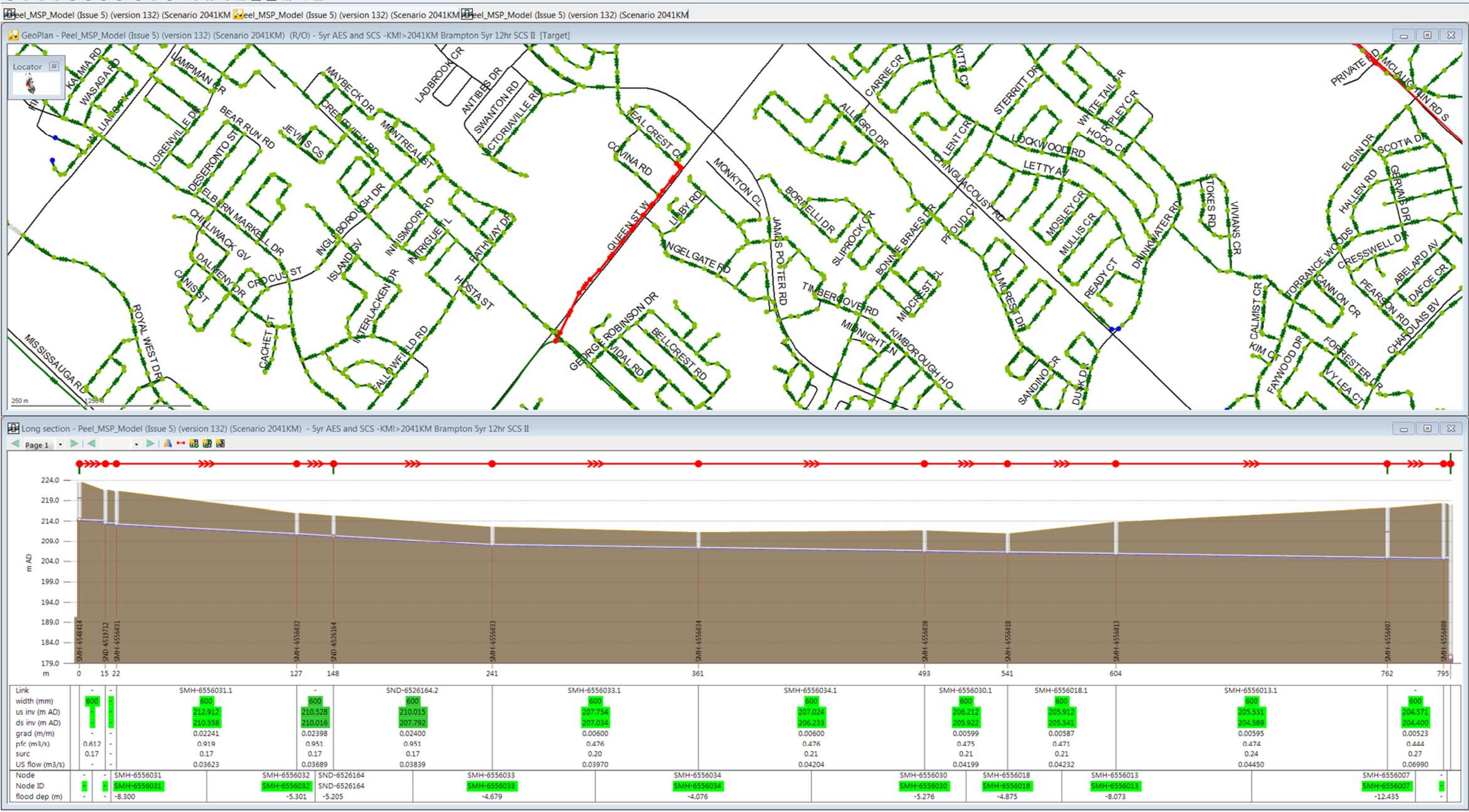
Wastewater Modelling

600 mm sewer on Queen Street West

The existing 600 mm sanitary sewer along Queen Street West, east of Creditview Road conveys flow to the 1500 mm Creditview trunk sewer at the intersection of Creditview Road and Queen Street West.

The minimum slope of the 600 mm diameter sanitary sewer along Queen Street West is 0.523%, and has a maximum capacity of 444 L/s. A modelling analysis of the existing wastewater system under 2041 flow conditions confirmed that the existing 600 mm sewer has sufficient capacity to accommodate additional wastewater flow from this development.

The plan and profile for the 600 mm sewer on Queen Street West is shown in Figure WW-01.



Appendix Figure WW-01: 5yr design storm and 2041 population scenario (without proposed development)

450 mm sewer along Elbern Markell Drive & Queen Street West

The 450 mm sanitary sewer conveys flows along Elbern Markell Drive towards Queen Street West, then heads west and is connected to the 1500 mm Creditview Trunk Sewer at the intersection of Mississauga Road and Queen Street West.

Overall, the minimum slope of the 450 mm diameter sanitary sewer is 0.79%, providing a maximum capacity of approximately 254 L/s. A modelling analysis of the existing wastewater system under 2041 conditions was undertaken to determine if there is sufficient conveyance capacity in the existing 450 mm sanitary sewer. Considering 2041 flow conditions, the results of the analysis revealed that the existing 450 mm sewer has sufficient capacity to accommodate additional wastewater flow from this development.

The plan and profile for the 450 mm sewer on Elbern Markell Drive and Queen Street West is shown in Figure WW-02.



Appendix Figure WW-02: 5yr design storm and 2041 population scenario (without proposed development)

250 mm sewer along Creditview Road, north of Queen Street West

The existing 250 mm sanitary sewer, north of Queen Street West conveys flows to 600 mm sewer which drains flows to 1500 mm Creditview trunk sewer. The minimum slope of the 250 mm diameter sanitary sewer, north of Queen Street West is 0.50%, having a maximum capacity of 42 L/s. A modelling analysis of the existing wastewater system under 2041 flow conditions identified some sections of the existing 250 mm sewer could be 60% full.

The plan and profile for the 250 mm sewer on Creditview Road north of Queen Street is shown in Figure WW-03.



Appendix Figure WW-03: 5yr design storm and 2041 population scenario (without proposed development)

250 mm sewer along Creditview Road, South of Queen Street West

The existing 250 mm sanitary sewer, south of Queen Street West conveys flows to 300 mm sewer which drains flows to 1500 mm Creditview trunk sewer. The minimum slope of the 250 mm diameter sanitary sewer, south of Queen Street West is 0.99%, having a maximum capacity of 60 L/s. A modelling analysis of the existing wastewater system under 2041 flow conditions identified that the existing 250 mm sewer has sufficient capacity for additional flow.

The plan and profile for the 250 mm sewer on Creditview Road south of Queen Street is shown in Figure WW-04.

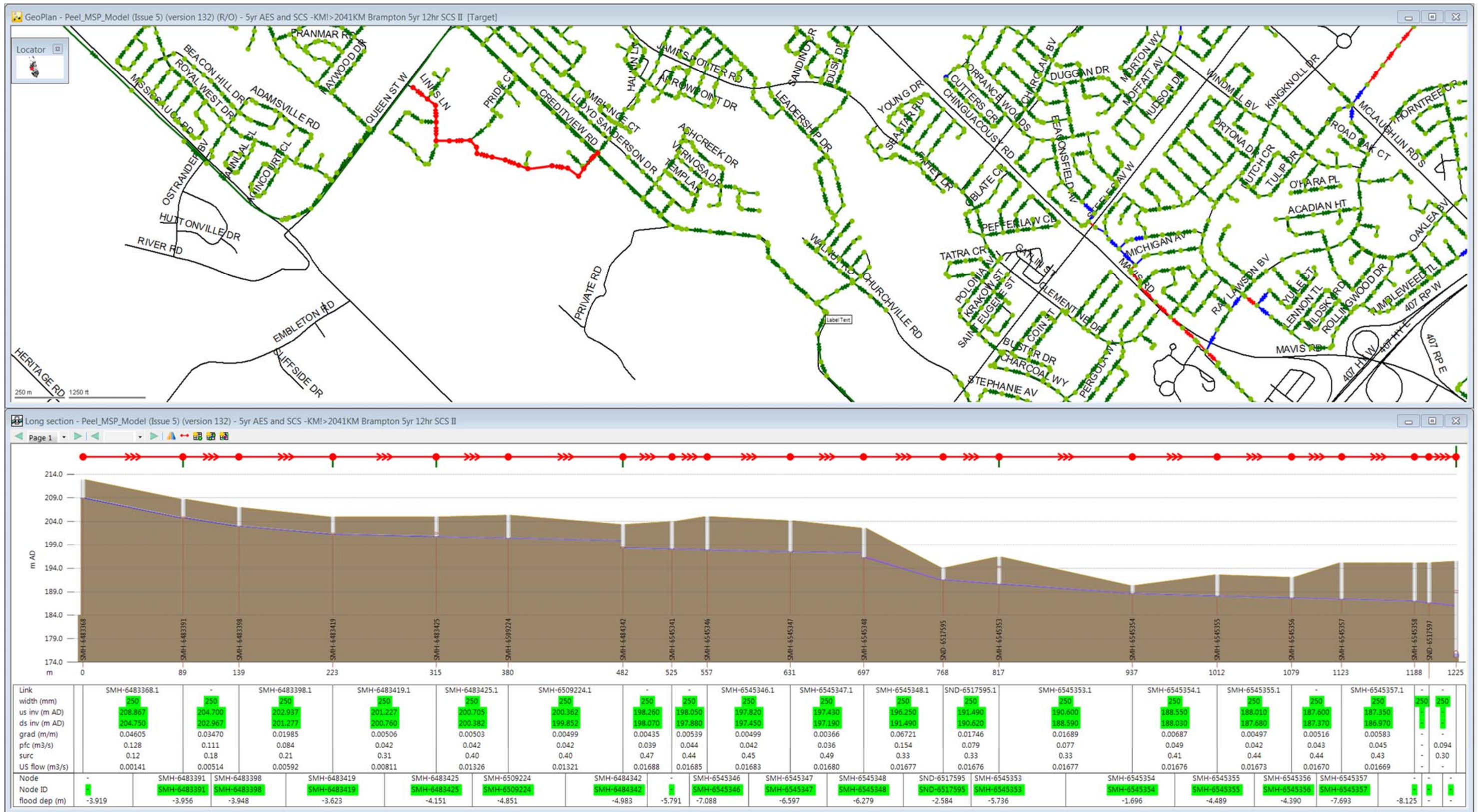


Appendix Figure WW-04: 5yr design storm and 2041 population scenario (without proposed development)

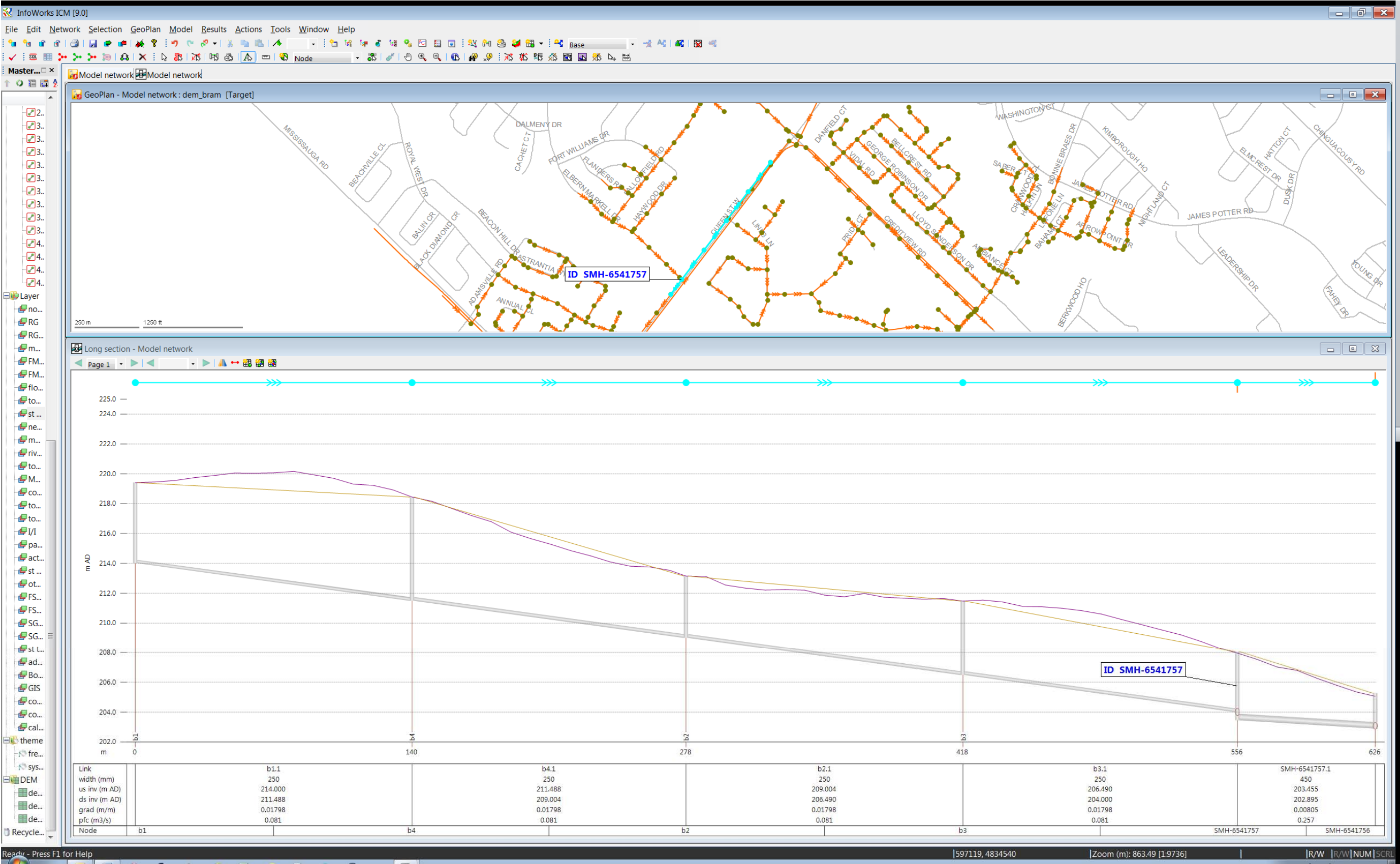
250 mm sewer on Links Lane, south of Queen Street West

The existing 250 mm sanitary sewer on Link LN, south of Queen Street West conveys flows to 1500 mm Creditview trunk sewer. The minimum slope of this sewer is 0.36%, having a maximum capacity of 36 L/s. A modelling analysis of the existing wastewater system under 2041 flow conditions identified that some sections of this sewer could be almost 50% full.

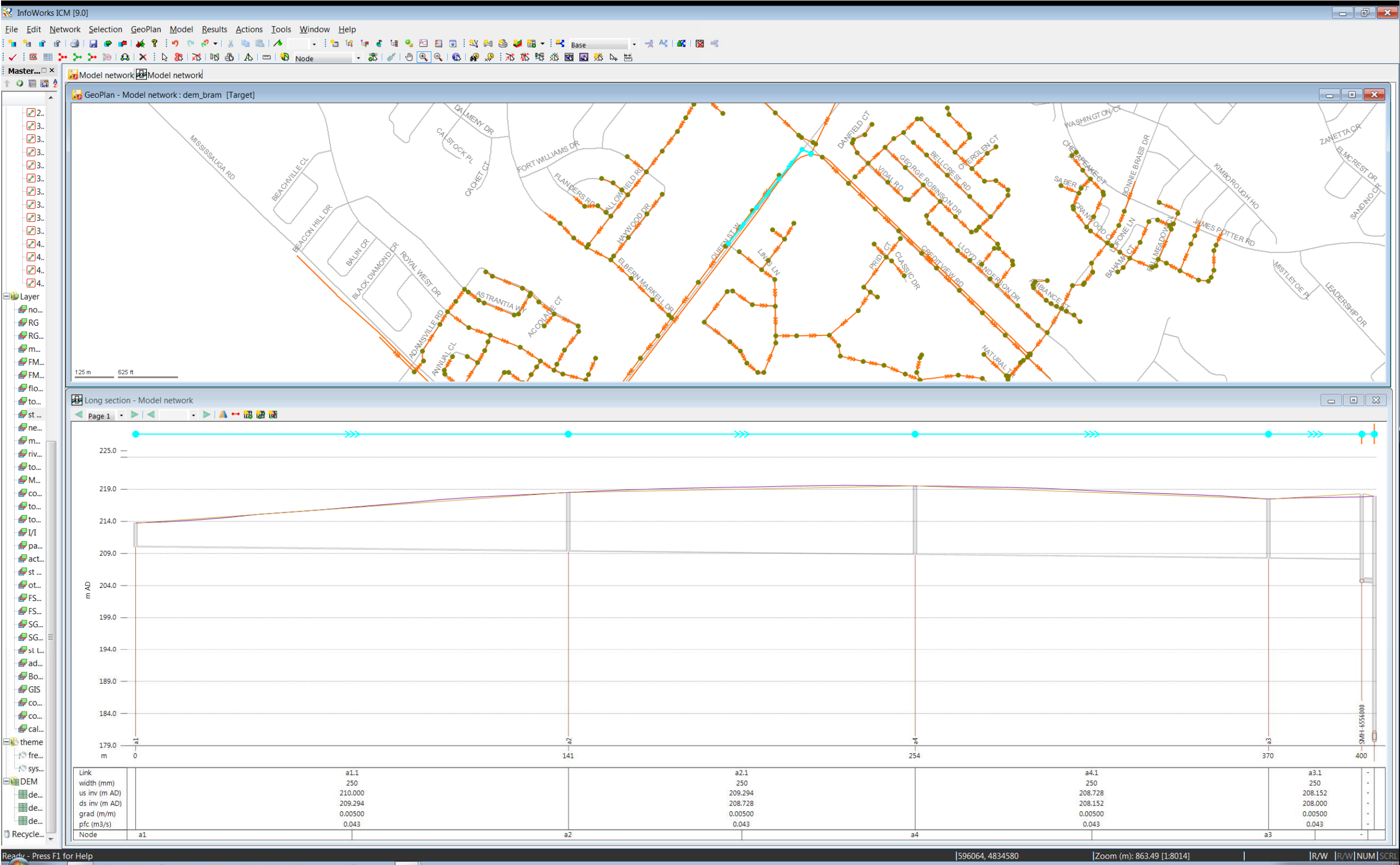
The plan and profile for the 250 mm sewer on Links Lane is shown in Figure WW-05.



Appendix Figure WW-05: 5yr design storm and 2041 population scenario (without proposed development)



Appendix Figure WW-06: Proposed 250 mm sanitary sewer on Queen Street West - Alternative 1



Appendix Figure WW-07: Proposed 250 mm sanitary sewer on Queen Street West - Alternative 2