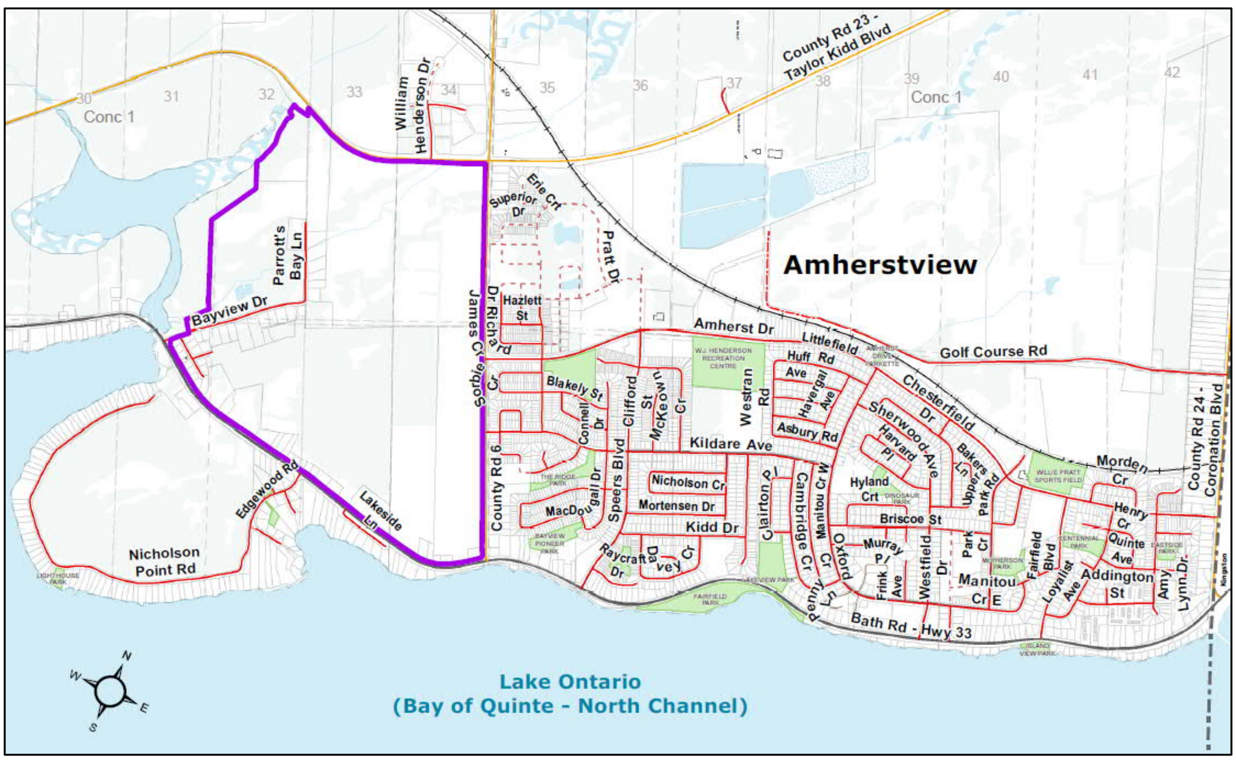
Amherstview West Secondary Plan

Water and Sanitary Infrastructure Servicing Report

JULY 15, 2024

FINAL



Amherstview West Secondary Plan

Water and Sanitary Infrastructure Servicing Report

Loyalist Township

FINAL

PROJECT NO.: 211-01353-00
DATE: JULY 15, 2024

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1 Introduction

1.1 Background

The Loyalist Township is a lower-tier municipality located in the County of Lennox and Addington in Eastern Ontario. It has a land area of approximately 341.02 km^2 (2016 Census) and consists of several communities, including Amherstview; Bath; Amherst Island; Odessa; the hamlets of Millhaven, Morven, Stella, Violet, and Wilton; and surrounding agricultural, rural, and residential communities.

The Loyalist Township is undertaking a Secondary Plan for Amherstview West. The Secondary Plan will provide a policy and implementation framework to guide the future growth and development of this area for the next 25 years. The Secondary Plan will address the extension of Amherstview to the west, to accommodate future growth and development in the community for the next 25 years. It will consider future needs and priorities for the new community, including housing types, urban design, community amenities, protection of the natural environment, and transportation, including active transportation.

1.2 Study Area

The study area for the Amherstview West Secondary Plan is located on the west edge of County Road 6, south of Taylor-Kidd Boulevard (County Road 23), north of Bath Road (Highway 33), and east of Parrott’s Bay Conservation Area. The study area is primarily undeveloped except for Parrott’s Bay Lane, Bayview Drive, Brooklands Park Avenue, and Harrow Court.

Figure 1-1 illustrates the study area for the Amherstview West Secondary Plan.

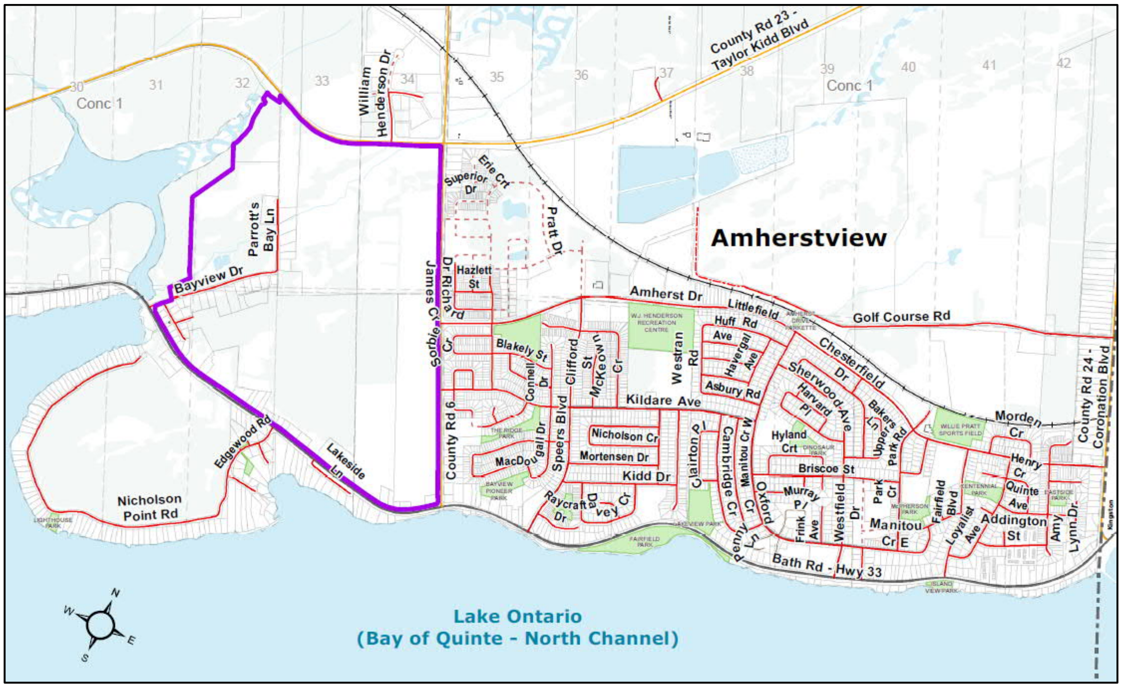

Figure 1-1: Amherstview West Secondary Plan Study Area

1.3 Report Scope

The Water and Sanitary Sewer Infrastructure Servicing Report is based on the review of available background documents and includes a review & summary of the governing design drivers for new infrastructure. This includes a high-level review of design standards and applicable regulatory frameworks. In addition, a review of the existing systems surrounding the Secondary Plan area to determine the opportunities & constraints connecting to existing municipal systems and to identify the optimal connecting points to Amherstview infrastructure.

Municipal services are subject to review and approval under the Ontario Environmental Assessment Act (EA), in accordance with the Municipal Class Environmental Assessment (MCEA) process. The identification of new infrastructure, including pumping station facilities, was conducted at a high level during the background study to determine the anticipated approvals required under the MCEA process. The background study includes a summary of the water and sanitary infrastructure requirements and identifies the applicable MCEA process for each component.

The determination of the sewer and watermain capacity requirements for new infrastructure is also outlined in the report based on the projected growth density. Capacity was reviewed in the Secondary Plan Area in accordance with Ministry of Environment, Conservation and Parks (MECP) design guidelines, and American Water Works Association (AWWA) standards. WSP coordinated with Township staff on the results and outputs of the study and based the Level of Service (LOS) and design criteria for new infrastructure to align with the Township's ongoing Infrastructure Master Plan (IMP) and draft Technical Design Guidelines currently being developed.

2 Information Analysis

2.1 Provided Data

The following documents have been provided by Loyalist Township to complete the review for site servicing and to perform an information gap analysis. These documents include:

- 2023 Lakeview Sewage Pumping Station – Capacity Assessment DRAFT (Completed by RVA)
- 2023 Taylor-Kidd (Loyalist East Business Park) Sewage Pumping Station – Capacity Assessment (Completed by RVA)
- 2006 Central Cataraqui Region Natural Heritage Study Report
- 2014 County of Lennox and Addington Official Plan
- 2014 County of Lennox and Addington Transportation Master Plan Update (Completed by AECOM)
- Loyalist Township Building By-law
- 2014 Loyalist Township By-law 2001-38
- 2015 Loyalist Township Development Charges Background Study (Completed by Hemson Consulting)
- 2020 Loyalist Township Draft Official Plan
- 2019 Loyalist Township Growth Projection Study (Completed by Hemson Consulting)
- 2020 Loyalist Township Interim Development Charges Study (Completed by Hemson Consulting)
- 2019-2023 Loyalist Township Strategic Plan
- 2019 Loyalist Township Water and Sewer User Rates Study
- 1430 Sanitary sewer design chart
- 1999 Harewood-Brooklands Watermain Extension Highway 33 (Bath Road) As-builts
- 2002 KoSa Hwy 33 (Bath Road) Watermain Extension As-builts
- 1998-2019 Building Permit Summaries
- 2014 County Transportation Master Plan (Completed by AECOM)
- 2015 DC Background Study
- 2019 Drainage Report (Completed by Robinson Engineers)
- 2014 Lennox and Addington - Offical Plan (Completed by Meridian Planning)
- 2019 Population Housing and Employment Projections (Completed by Hemson)
- Sanitary Design - County Road 6

- Sanitary Design – Taylor-Kidd to SPS
- 1988 Township of Ernestown - Official Plan
- 2020 Water Modelling - Final Report (Completed by J.L Richards)

2.2 Data Requests

The following additional documents and data were requested by WSP:

- Township Base Mapping (CBM) / GIS Background Information in ArcGIS geodatabase (including Storm, Sanitary, and Water Pipe Material Information)
- Existing GIS storm and sanitary sub-catchment area mapping
- Central Cataraqui Natural Heritage Study - 2006 by the Cataraqui Region Conservation Authority (Study and GIS layers)
- Loyalist Township Hydraulic Water Model Update (March 9, 2020, by J.L. Richards in WaterCAD format)
- Highway 33 Watermain Design Drawings
- Sanitary Design- Taylor-Kidd Boulevard and Count Road 6 and Sanitary Design Calculations (January and April 2020 by Josselyn Engineering Inc.)

3 Legislative Review

The following Federal and Provincial legislation apply for the establishment and expansion of water and sanitary linear networks in Ontario and apply to any proposed development in the Secondary Plan area.

3.1 Federal Legislation

3.1.1 Canada Water Act (1985)

The Canada Water Act, passed in 1970 and revised in 1985, provides management of water resources in Canada. The purpose of the Act is to provide a framework for cooperation with the provinces and territories regarding research, planning, and implementation of programs linked to water use, conservation, and development. The federal government has outlined regulations under the Canada Water Act, including policies for fisheries, navigation, and the conduct of external affairs.

3.1.2 Fisheries Act (1985)

The Fisheries Act contains habitat and pollution protection provisions that apply to all levels of government and the public. Subsection 35(1) of this Act states "no person shall carry out any work or undertaking that results in the harmful alteration, disruption or destruction (HADD) of fish habitat" unless authorized by the Minister of Fisheries and Oceans Canada. A subsection 35(2) Fisheries Act authorization may be issued when adverse effects cannot be avoided.

3.1.3 Canadian Environmental Protection Act (1999)

The Canadian Environmental Protection Act is intended to provide for the protection and conservation of the natural environment, by controlling discharges to air, land, and water. Regulations made under the Act propose limits on what can be discharged to the environment and allow for fines & other penalties when unauthorized discharges occur. This Act affects how a community can dispose of materials and approach its construction activities to ensure that there are no harmful effects on the environment.

3.1.4 Wastewater Systems Effluent Regulations (2012)

The Wastewater Systems Effluent Regulations address the largest point source of pollution in Canadian waters. The purpose of the regulations is to reduce the threats to fish, fish habitat, and human health by decreasing the number of harmful substances deposited into waters from wastewater effluent. The regulations set national effluent quality standards that are achievable through secondary wastewater treatment. Wastewater systems that do not meet the effluent quality standards must upgrade to secondary treatment. The effluent quality standards are as follows:

- Average carbonaceous biochemical oxygen demand ($cBOD_5$) concentration must not exceed 25 mg/L
- Average total suspended solids (TSS) concentration must not exceed 25 mg/L
- Average total residual chlorine (TRC) concentration must not exceed 0.02 mg/L

- Average unionized ammonia concentration must not exceed 1.25 mg N/L

3.2 Provincial Legislation and Regulations

3.2.1 The Planning Act (1990)

The Planning Act, R.S.O. 1990, as amended, is the primary legislation governing land use planning in Ontario. It outlines matters of provincial interest and enables the Province to issue Policy Statements to provide direction to municipalities on these matters. The Planning Act enables municipal Councils to pass tools to plan & regulate the use of land and the location of buildings & structures on a lot. Under Section 16 of the Act, most municipalities, including Lennox and Addington County (upper-tier) and Loyalist Township (lower-tier), are required to prepare and adopt Official Plans in accordance with the Act. Official Plans contain a vision, objectives, and policies to guide decision making on land use planning matters. Municipal decisions, by-laws, and public works are required to conform to the policies of the Official Plan (Section 24(1)). The Act also enables municipalities to provide more detailed land use policy direction for specific areas or neighbourhoods, by way of a secondary plan, which is added to an official plan by amendment (Section 22(1)(1)).

3.2.2 Ontario Water Resources Act (1990)

The Ontario Water Resources Act was passed for the purpose of conservation, protection, and management of Ontario waters. The act identifies requirements for water works, including wells and sewage works in relation to planning, design, siting, public notification & consultation, establishment, insurance, facilities, staffing, operation, maintenance, monitoring, and record-keeping. The Act is a general water management statute which applies to both groundwater and surface water. This Act specifies the requirements that the community must satisfy in order for the provincial government to grant approval for establishing, altering, extending, or replacing water &wastewater system components.

3.2.3 Safe Drinking Water Act (2002)

The Safe Drinking Water Act is in place to provide protection for human health and prevent drinking water health hazards. The Act controls and regulates drinking water systems and drinking water testing. Regulations made under the Act, such as Regulation 268/03 – Ontario Drinking Water Quality Standards, stipulate detailed requirements regarding drinking water systems, testing services, drinking water quality standards, certification of drinking water system operators & drinking water quality analysts, compliance, and enforcement. This Act specifies the quality of the drinking water that any community is responsible for producing and delivering as well as how the area’s drinking water treatment systems must be operated and managed.

3.2.4 Clean Water Act (2006)

Ontario’s Clean Water Act is intended to ensure that communities are able to protect their municipal drinking water supplies through the development of collaborative, locally driven, and science-based protection plans (source water protection plans). The Act requires that local communities evaluate existing and potential threats to their water source(s) and subsequently implement the required actions to reduce or eliminate these threats. The community can use this information to make choices about the size and locations of water & wastewater servicing elements (e.g. treatment plants, pumping stations, transmission mains, and collection mains).

3.2.5 Safeguarding and Sustaining Ontario's Water Act (2007)

The Province of Ontario passed the Safeguarding and Sustaining Ontario's Water Act to enable implementation of the Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement and other amendments to the Permit to Take Water program.

The principles of the Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement include the Premiers of Ontario and Quebec and the Governors of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin. This agreement recognizes the following:

- The water of the Basin are a shared public treasure and the parties to the Agreement have a shared duty to protect, conserve and manage the waters.
- Conserving and restoring the waters and water dependent natural resources of the Basin will improve them.
- Continued sustainable, accessible, and adequate water supplies for the people and economy of the Basin are important.

3.3 Provincial Guidelines/Policies

3.3.1 MOE Guideline F-5 (1994)

The Ontario Ministry of the Environment (MOE) (now Ministry of Environment, Conservation and Parks (MECP)) requires that municipal and private sewage treatment works, outfall structures and emergency overflow facilities be located, designed, constructed, and operated so as to minimize pollution of receiving waters and interference with water uses.

The primary purpose of Guideline F-5 is to describe the levels of treatment required for municipal and private sewage treatment works discharging to surface waters. This Guideline is supported by the following Procedures:

1. Procedure F-5-1: Determination of Treatment Requirements for Municipal and Private Sewage Treatment Works Discharging to Surface Waters
2. Procedure F-5-2: Relaxation of Normal Level of Treatment for Municipal and Private Sewage Treatment Works Discharging to Surface Waters
3. Procedure F-5-3: Derivation of Sewage Treatment Works Effluent Requirements for the Incorporation of Effluent Requirements into Certificates of Approval for New or Expanded Sewage Treatment Works
4. Procedure F-5-4: Effluent Disinfection Requirements for Sewage Works Discharging to Surface Waters

5 Procedure F-5-5: Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewer Systems

Guideline F-5 states that the level of treatment for new or expanded sewage treatment works must be in accordance with Procedures F-5-1 and F-5-2. Effluent requirements, including both waste loadings and concentrations, must be derived in accordance with Procedure F-5-3 or those established in the Wastewater System Effluent Regulations, whichever are stricter.

3.3.2 MOE Procedure D-5 (1996)

The primary purpose of D-5 is to guide municipal planning for sewage and water servicing. It describes an approach for municipal planning for sewage and water services to ensure an acceptable quantity and quality of water supply and the proper collection, treatment, and disposal of sewage wastewater for development. It is consistent with the Provincial goal to manage growth and change to foster communities that are socially, economically, environmentally & culturally healthy, and that makes efficient use of land, new and existing infrastructure, and public service facilities.

1. Procedure D-5-1: Calculating and reporting uncommitted reserve capacity at sewage and water treatment plants
2. Procedure D-5-2: Application of Municipal responsibility for communal sewage and water services
3. Procedure D-5-3: Servicing options statement
4. Procedure D-5-4: Technical guidelines for individual on-site sewage systems: Water Quality impact risk
5. Procedure D-5-5: Technical Guidelines for Private Wells; Water supply assessment

Procedure D-5-1 is used to ensure that sanitary flow generation from approved development applications will not exceed the design capacity of the sewage treatment plant(s). To ensure that capacity is not exceeded it is necessary to determine what uncommitted reserve capacity is available based on historic flows and existing development. The water distribution network will provide the necessary water capacity to service the approved development.

3.4 Environmental Assessment Act

The Ontario Environmental Assessment Act and the associated Codes of Practice require proponents to examine and document the environmental effects that might result from major projects or activities. The purpose of the Act is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation, and wise management of the environment in the Province (RSO1990, c. 18, s.2).

The Act sets a structure for a systematic, rational, and replicable environmental planning process that is based on five key principles, as follows:

- Consultation with affected parties: Consultation with the public and government review agencies is an integral part of the planning process. Consultation allows the proponent to identify and address concerns cooperatively before final decisions are made. Consultation should begin as early as possible in the planning process.

- Consideration of a reasonable range of alternatives: Alternatives to include functionally different solutions to the proposed undertaking as well as alternative methods of implementing the preferred solution. The "do nothing" alternative must also be considered.
- Identification and consideration of the effects of each alternative on all aspects of the environment: This includes the natural, social, cultural, technical, and economic environments.
- Systematic evaluation of alternatives in terms of their advantages and disadvantages, to determine their net environmental effects: The evaluation shall increase in the level of detail as the study moves from the evaluation of alternatives to the proposed undertaking to the evaluation of alternative methods.
- Provision of clear and complete documentation of the planning process followed: This will allow traceability of decision-making with respect to the project. The planning process must be documented in such a way that it may be repeated with similar results.

3.4.1.1 Municipal Class Environmental Assessment (2023)

The Environmental Assessment Act (EAA) allows for certain "classes" of routine projects that have predictable environmental effects that can be readily managed to follow a streamlined Environmental Assessment process, referred to as a Class EA. Provided the approved process is followed, projects and activities included in a Class EA do not require individual review and approval under the EAA. This project is being conducted in accordance with the MCEA process, described in the MCEA guide prepared by the Municipal Engineers Association (MEA) (October 2000, as amended in 2007, 2011, 2015, & 2023).

The Class EA planning process requires the integration of sound engineering judgement, prudent long-term planning, and protection of all aspects of the environment (natural, social, economic, and cultural). This includes consultation with the public and affected agencies, to obtain comments and input throughout the decision-making process before identifying a preferred alternative. The overall result of the Class EA process is the identification of a recommended plan that considers and minimizes impacts on the environment.

The MCEA process is made up of five phases: (1) definition of problems/opportunities; (2) development and evaluation of alternative solutions; (3) development and evaluation of alternative design concepts; (4) preparation of an Environmental Study Report for public review; and (5) implementation. Since projects undertaken by municipalities can vary in their environmental impact, projects are classified under the MCEA in terms of "Schedules." The project Schedule dictates which phases of the MCEA process must be completed before proceeding to implementation.

The following provides a high-level overview of the current MCEA Schedules:

Exempt Projects

On March 3, 2023, the Government of Ontario enacted Amendments to the MCEA process approved under the Ontario *Environmental Assessment Act*. Under the amendments, projects that were formerly Schedule A and A+ projects, including various municipal maintenance, operational activities, rehabilitation works, minor reconstruction or replacement of existing facilities and new facilities that are limited in scale and have minimal adverse effects on the environment are now exempt from the requirements of the *Environmental Assessment Act* under the amended MCEA process. These projects may now proceed without fulfilling the process requirements of the MCEA.

Schedule B

Schedule B projects have the potential for some adverse environmental effects. As such, the proponent is required to undertake a screening process, involving mandatory contact with directly affected public and relevant review agencies, to ensure that they are aware of the project and that their concerns are addressed through the planning and decision-making process.

Schedule B projects must complete Phases 1 and 2 of the MCEA process to proceed to implementation. At the completion of the Schedule B MCEA process, a Project File Report is made available for public and stakeholder review for a period of 30 days. During this time, a request may be made to MECP to require a higher level of study (e.g., an individual or comprehensive EA approval before being able to proceed) or that conditions be imposed (e.g., require further studies) on the grounds that the project could introduce adverse impacts on constitutionally protected Aboriginal or Treaty rights. This was previously known as a “Part II Order” or “bump up” request.

Schedule B projects generally include improvements and minor expansions to existing facilities. Examples include the construction of new water storage facilities and water/wastewater conveyance facilities (pumping stations), among others.

Schedule C

Schedule C projects have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified by the MCEA process. Schedule C projects require that an Environmental Study Report be prepared and filed for review by the public and review agencies.

Schedule C projects must complete Phases 1, 2, 3 and 4 of the MCEA process to proceed to implementation. At the completion of the Schedule C MCEA process, an Environmental Screening Report is made available for public and stakeholder review for a period of 30-days. During this time, requests may be made to MECP for a higher-level of study or that conditions be imposed, as described above for Schedule B projects.

Schedule C projects generally include the construction of new facilities and major expansions to existing facilities. Examples of a Schedule C project include construction of a new water system including water supply & distribution system and expansion of a wastewater treatment plant.

Agreements or commitments to further study and mitigation measures identified as part of the MCEA process must be followed through and implemented during later stages of design and construction.

Eligibility for Exemption

Under the 2023 MCEA amendments, projects that are identified as eligible for screening in the Project Tables of the MCEA may be exempt from the requirements of the *Environmental Assessment Act* based on the results of the Archaeological Screening Process and/or the Collector Roads Screening Process. Proponents must fully and accurately complete the screenings for a project to be considered exempt. Completing the screening process is voluntary and proponents may choose to proceed with Schedule B or C instead.

The Class EA process flowchart is provided in Figure 3-1.

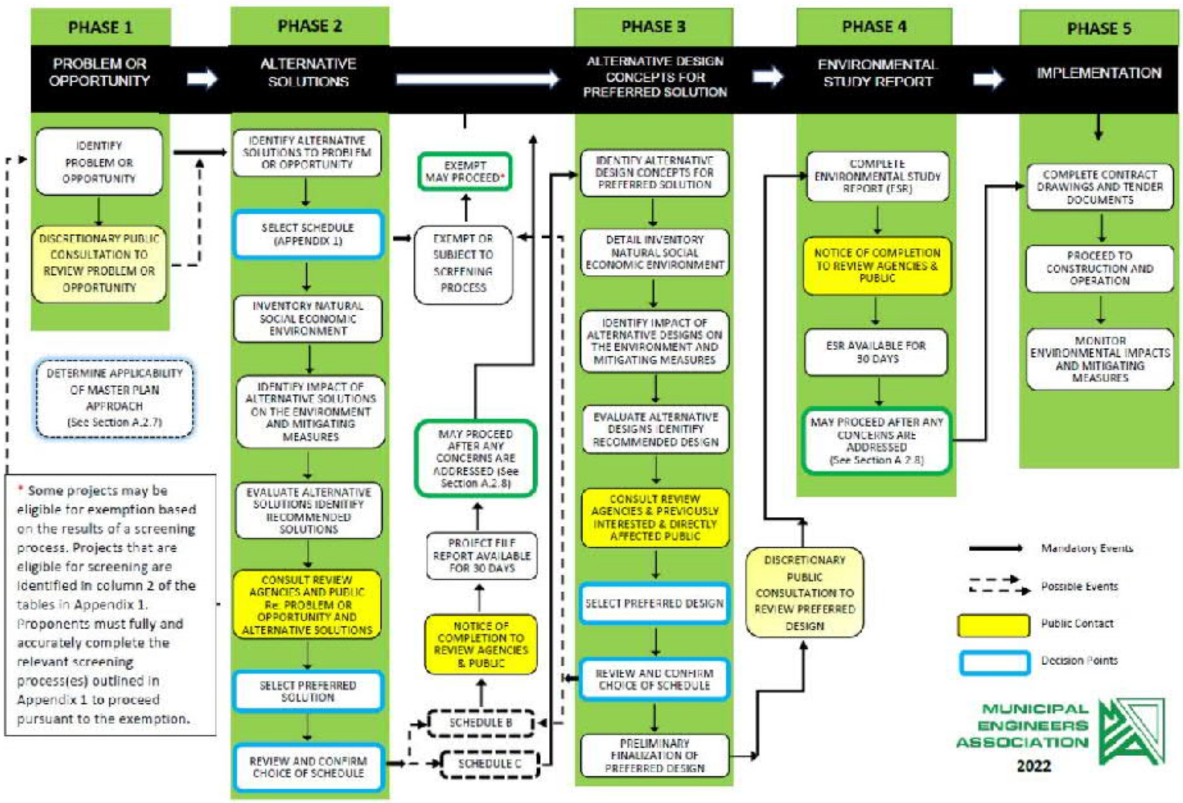

Figure 3-1: Municipal Class EA Process (Municipal Class EA Document, October 2000, as amended in 2015 and 2023)

3.4.1.1.1 Master Plans

The MCEA planning and design process applies primarily to municipal works considered on a project-by-project basis, the MCEA allows for a "Master Plan" approach when it is beneficial to consider 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). By planning in this way, the need and justification for individual projects and the associated broader context are better defined.

Master Plans are long-range plans which examine infrastructure systems or groups of related projects to outline a framework for planning of subsequent projects and/or development.

The following are distinguishing features of Master Plans:

- Their scope is broad and usually includes a system-level analysis to outline a framework for future works. Plans are typically not focused on a site-specific problem.
- Plans typically recommend a set of works which are distributed geographically throughout the study area and which are to be implemented over an extended period of time.

- Plans provide the context for the implementation of specific projects which make up the plan and satisfy, as a minimum, Phases 1 and 2 of the Class EA process. Notwithstanding that these works may be implemented as separate projects, collectively these works are part of a larger management system. Master Plan studies in essence conclude with a set of preferred alternatives and, therefore, by their nature, Master Plans limit the scope of alternatives which can be considered at the implementation stage.

The MCEA document (Appendix 4) outlines several approaches to conducting Master Plans, including an approach that is integrated with Planning Act approval.

3.4.2 Provincial Policy Statement (2020)

The Provincial Policy Statement (PPS) is an integral part of Ontario's planning system. The PPS sets policy direction on matters of provincial interest related to land use planning, growth management, environmental protection, public health, and public safety while aiming to provide a stronger policy structure that guides communities in Ontario toward a higher quality of life and a better long-term future.

The PPS establishes the various municipalities' roles in planning for growth, intensification, and redevelopment. New settlement area policies will only permit expansions when it is demonstrated that opportunities for growth are not available through intensification, redevelopment or in designated areas. The PPS also requires municipalities to coordinate and provide direction on policies with cross municipal boundaries, such as natural heritage systems and resource management. The PPS provides the basis or context for all Provincial Plans and Municipal Official Plans.

The PPS outlines policies and policy reviews related to water, sewage, and storm water infrastructure planning. These policies are based on addressing long-term population projections while creating sustainable, reliable, and financially feasible resources for the Province.

3.5 Planning Rationale

To achieve a successful design requires meeting all necessary policies, acts, and regulations as outlined by the MECP. The MECP design criteria that apply to the Amherstview West Secondary Plan based on the policies/guidelines are as follows:

1. Design Guidelines for Drinking Water Systems
2. Design Guidelines for Sewage Works

In general, the objectives of the Planning Rationale are to:

1. Present a planning analysis of the proposed development concept based on a defensible municipal driven mechanism used to facilitate and support inclusion of the proposed development within the study area. i.e.: facilitate inclusion through a logical boundary adjustment of an existing study area.
2. Maximize existing infrastructure within and around the subject site to minimize the need for new infrastructure as well as provide phasing of the proposed development.

The Rationale is intended to demonstrate that the intended use of the subject lands will become an attribute and desirable by accommodating the forecasted growth within a logical development boundary while preserving the unique character of the existing study area.

3.6 Servicing

Servicing, for the purpose of a planning context, is to be presented in a Master Servicing concept. A layout of the general framework for external services and internal spine services plus integration with existing services is to be presented. The following components must be considered, as a minimum:

1. Potable water supply
2. Potable water distribution
3. Sanitary collection and conveyance
4. Sanitary treatment

3.7 Land Use Concept Plans

In general, the land use concepts illustrate the proposed road layout and desired land use within the subject site. Detailed in this component is a concept layout and land use designation outlining what area of land will be proposed for specified land use (low density residential, high density residential, parks, Stormwater Management (SWM), etc.). Three land use concept plan options are being reviewed for the Secondary Plan with servicing based on the same growth projection objective.

4 Site Description

4.1 Land Use and Topography

This section provides an overview of the current physical attributes and historical land use of the site. The following details will provide this overview:

- Topography highlights
- Site limits and size
- Existing land use
- Existing structures
- Drainage paths / direction

This detailed description is to be accompanied by a site aerial view and a site survey showing topography, as shown in Figure 4-1.

Figure 4-1: Existing Conditions Within Study Area

Topography:

- Split drainage – the Secondary Plan area's high point is located between the Amherstview Drive and County Road 6 intersection and Parrott's Bay Lane. From this point, the elevation dips lower towards Lost Creek to the north and south towards Lake Ontario. The split drainage is shown by the contour map shown in **Appendix D** Figure D-1.

Site Limits and Size:

- Area – the study area has an area of approximately 177.46 ha.
- Site limits – the study area is bound by Bath Road to the south, County Road 6 to the east, Taylor-Kidd Boulevard to the north, and Parrott's Bay to the west.
- Shallow bedrock – throughout the Secondary Plan area there are locations where shallow bedrock is notable. Geological background studies indicate that rock excavation may be necessary for the installation of new pipe systems in the area.

Existing Land Use:

- Land use – the existing study area includes private property, single residential, forest, open space, farmland, wetlands, and Lost Creek.

Existing Structures:

- Existing watermains – the study area contains a 150 mm watermain within the south portion of the study area slightly north of Edgewood Road, a 200 mm watermain running to Harrow Court, a 150 mm watermain on Bayview Drive, and a 25 mm service watermain along Brooklands Park Avenue.

Drainage Paths / Directions:

- Catchment areas – due to the topography of the study area the subject site will be split into two primary catchment areas for the gravity sewers to provide sanitary servicing. The first catchment areas will be located on the north side of the site and the second on the south side of the site. Refer to **Appendix C** Figure C-1 for details on the potential catchment areas.

4.2 Natural Heritage

A Natural Heritage Study was completed in August 2006 by the Cataraqui Region Conservation Authority. The Natural Heritage Study was performed to ensure the municipalities, in consultation and partnership with the community, might develop a strategy to protect and enhance the habits and biological diversity of the system.

Natural heritage features and functions of provincial significance that were found in the study area (Kingston and Loyalist) include:

- Wetlands, such as the Little Cataraqui Creek Wetland and Parrott's Bay.
- Areas of Natural and Scientific Interest (ANSI) such as the Collins Lake Upland Forest and the Asselstine Alvar.

- Environmentally Sensitive Areas, such as the Abbey Dawn Forest and the Kingston Mills Gorge.
- Significant Woodlands, such as the Leo Lake Forest.
- Significant Valleylands such as those along Wilton Creek and the Little Cataraqui Cree.
- Significant Wildlife Habitat areas, including the Owl Woods on Amherst Island.
- Areas of fish habitat.
- Areas of Significant Habitat for Threatened and Endangered species, such as Black Rat Snakes, Five-lined Skinks, and Eastern Loggerhead Shrike.

These significant features and functions will be investigated prior to any development to protect and ensure negative impacts due to development are removed or limited.

A Natural Heritage Existing Conditions Report (2021) was completed by WSP as part of the Amherstview West Secondary Plan study. The main objective of the report is to conduct an ecological assessment to characterize a baseline/preliminary evaluation of the natural heritage features within and adjacent to the Amherstview West Secondary Plan area. This work was carried out to identify natural heritage constraints and to document sensitive natural features to inform future development within the study area. Ecological constraints within the Secondary Plan area were identified through the following methods:

- A desktop background review of available online biodiversity databases to determine which wildlife/SAR have a record/likelihood of occurrence within the study area, as well as any significant natural heritage features.
- An ecological field survey to confirm the presence or absence of wildlife/SAR habitat and record any direct observations of wildlife within the project study area.
- A risk level assessment (High, Medium, Low) for each SAR with the potential to conflict with future development plans based on field survey results and a habitat suitability analysis.

The identification of potential Significant Wildlife Habitat (SWH), candidate Species at Risk (SAR) habitat, provincially and regionally significant natural heritage features, and associated environmental setbacks provides the necessary framework to identify areas that should be considered a constraint to development. These areas are illustrated in Figure 4-2 and depict a range in the level of constraint from minimal to high constraint dependant on its significant feature, likelihood of SAR, or connectivity to adjacent ecologically significant areas.

Figure 4-2: Natural Heritage Constraints and Opportunities

4.3 Growth Management

WSP reviewed the “Population, Housing and Employments Projections 2046” study, prepared by Hemson Consulting (September 19, 2019). We understand that the study establishes population, housing, and employment growth allocations for the entire Township, including the Amherstview community but it does not specify the allocations for Amherstview West in particular.

After further discussion and review of the “Growth Management Report for Amherstview West Secondary Plan”, prepared by the Loyalist Township (June 2, 2021), WSP established population, housing, and employment growth allocations for the Amherstview West Secondary Plan study area. The Population, Housing and Employment Projections to 2046, Hemson Consulting (2019) and Update Letter (2022) as also reviewed under growth management

Based on the Amherstview West Secondary Plan Growth Management Analysis two scenarios were created to predict the increase in population in the Amherstview West Secondary Plan study area. The Growth Management Analysis for scenario one utilizes the current 2021 average household size (2.42 persons per residential unit) and applies the Hemson’s assumption of 1,000 residential units added to Amherstview West by 2046. For scenario two, the Growth Management Analysis utilizes the average projected household size for the township from 2021 to 2046 to be 2.28 persons per residential unit. Using this projection and again the Hemson's assumption of 1,000 residential units the population of Amherstview West in 2046 was calculated. The below Table 4-1 summarizes the projected values in 2046 within Amherstview West for residential units and population.

Table 4-1: Amherstview West Population Scenarios for the Year 2046

	Population/Unit	Units	People in 2046
Scenario 1	2.42	1,000	2,420
Scenario 2	2.28	1,000	2,280

The two scenarios which result in two populations also differed the projection for gross hectares of commercial land area. Both scenarios use an employment density of 3.8 commercial jobs per 100 people calculated based on existing Amherstview commercial jobs and population. The number of commercial jobs available in the year 2046 due to the development of the Amherstview West Secondary Plan was calculated based on an employment density of 3.8 commercial jobs per 100 people. The number of commercial jobs was multiplied by 35 m^2 (the required commercial floor space per employee) to get the projected area of commercial floor space. Each scenario then calculated a Floor Space Index (FSI) of 24.4% based on approximations of commercial floor save that exists on a total area made by Hemson. Using the FSI calculated and a 25% gross-up factor the projected net commercial land area within the Amherstview West Secondary Plan study area by the year 2046 for each scenario was calculated as shown in Table 4-2 below.

Table 4-2: Amherstview West Commercial Land Area for the Year 2046

	Population in the year 2046	Commercial Jobs in the year 2046	Gross Hectares of Commercial Land Area[1]
Scenario 1	2420	92	1.65
Scenario 2	2280	87	1.56

1 – Gross Hectares of Commercial Land Area based on Growth Management Study Findings

Based on Amherstview West Secondary Plan Growth Management Analysis, scenario one projects a population of 2,420 and a gross hectares of commercial land area of 1.65. In addition, scenario two projects a population of 2,280 and a gross hectares of commercial land area of 1.56 in Amherstview West in the year 2046. WSP completed calculations for the Maximum Day Demand plus Fire Flow and the Peak Daily Sanitary Flow based on scenario one due to the larger population of 2,420 people and the larger gross hectares of commercial land resulting in higher flow rates.

For the purposes of evaluating infrastructure impacts Scenario 1 is considered the higher growth density design case scenario for PPU which is carried forward in the analysis. Furthermore, an additional design case representing PPU of 2.7 following Loyalist Draft Technical Design Guidelines for Water and

Sanitary systems was also evaluated and carried forward in the analysis to determine the worst-case peak demand and peak flow conditions for pipe sizing.

4.3.1 Other Growth Development Considerations

4.3.1.1 Lakeview Ponds Development

The Lakeview Ponds development is projected full buildout of the proposed development by 2022. As of 2022 however, only some of the proposed residential portions have been constructed, with the remainder of the development including the full commercial and industrial sectors still to be constructed. The traffic counts for this study were collected in 2022, these will account for the Lakeview Ponds construction to date the development is east of Amherstview West and will provide for additional potential connection points to the Sanitary sewer and water systems for future consideration at County Road 6 Crossings. Residential growth is not anticipated to impact the growth projection for Amherstview West.

4.3.1.2 Umicore Plant

The 2022 Hemson update letter identified a growth of approximately 900 industrial jobs west of Amherstview as a result of the proposed Umicore Plant, Latham Group pool manufacturing facility, and other industrial development. As specific servicing studies for these developments have not yet been prepared the industrial growth impacts to the local Amherstview Water Distribution and Sanitary Collection System have not been analysed further in this secondary plan given that the there is minimal projected changes in commercial and residential development demand anticipated for the Amherstview west Secondary Plan area.

4.3.1.1 Future Build-out Areas

Beyond the 25-year growth projection there is approximately 177 ha of potential residential area and 1.8 ha of commercial area projected as ‘Potential Future Development Area’ within the Secondary Plan study extents based on identified land use allocation. These areas were further delineated in the development of conceptual land use option mapping as shown in figures **D-2** in **Appendix D**. Areas were evaluated for potential future servicing connections. Analysis estimates are detailed in this report for total projected demand and average daily flow anticipated if these lands are fully built-out beyond the 25 years of growth. Refer to tables A-1 and A-2 in Appendix C for details.

4.4 Water and Sanitary Constraints and Opportunities

Strategies for servicing in the presence of environmental constraints are developed through characterisation of the existing system and identifying the governing constraints. The governing environmental constraints can be grouped into the following categories:

- Natural heritage features (e.g., watercourses, significant woodlands).
- Edgewood Municipal Drain catchment area.
- Topography and resultant drainage patterns.
- Quantitative limitation, if applicable, imposed by servicing and intersection capacities, and access opportunities.

- Compatibility in relation to surrounding uses and built forms.

4.4.1 Water Constraints and Opportunities

4.4.1.1 Water Management

To effectively develop the Amherstview West Secondary Plan area, water servicing will be implemented to supply adequate pressures and flows. The water services will be designed as per the design criteria and MECP guidelines.

The watermain distribution system must provide sufficient flows and pressures to all users within the Secondary Plan area. The flows and pressures must satisfy all servicing scenarios, including average day conditions, peak flow conditions, and max day plus fire flow conditions.

4.4.1.2 Watermain Existing Conditions

Currently there are some existing watermains within the Amherstview West study area. There is a watermain that lays under Bath Road (Highway 33) which is located within the right of way on the north side of Bath Road (Highway 33) and services houses on Brooklands Park Avenue, Harrow Court, Edgewood Drive, Compton Court, and some houses on Bath Road (Highway 33). There are also watermains that extend off Bath Road (Highway 33) to the east end of Brookland Park Avenue, the north end of Harrow Court, and 14 Bayview Drive. On the east side of the study area there is also a watermain that lays under County Road 6 which services many houses in the subdivisions to the east of the Amherstview West study area. The County Road 6 watermain also extends north and provides water services to houses to the north of the Amherstview West study area. There is also a 400 mm trunk watermain on the west side of County Road 6 which extends north to Odessa. This connection was recently constructed at the intersection of Walden Pond and County Road 6. The 400 mm trunk watermain includes connections to the east at Kildare Avenue and Walden Pond Drive as well as to the Loyalist East Business Park. All current watermains have the required watermain appurtenances in place, such as fire hydrants, to provide fire flows and pressures in the occurrence of a fire emergency.

Located just north of the study area on County Road 6 is a reservoir and booster pumping station. Located on the north-east corner of County Road 23 & County Road 6 and east of the corner of County Road 6 and Bath Road (Highway 33) are drain chambers that connect to the watermain. This infrastructure provides water storage to the entire Fairfield water service area and boosts pressures to provide reliable service to the community of Odessa. Below is a list of all water facilities around the Amherstview West Secondary Plan area:

- County Road 6 Reservoir and Booster Station
- Fairfield Water Treatment Plant
- Amherstview Water Tower

Figure 4-3 shows all existing watermains, valves, and water facilities around and in the Amherstview West study area. Include in the figure at 1-8 potential watermain connection locations.

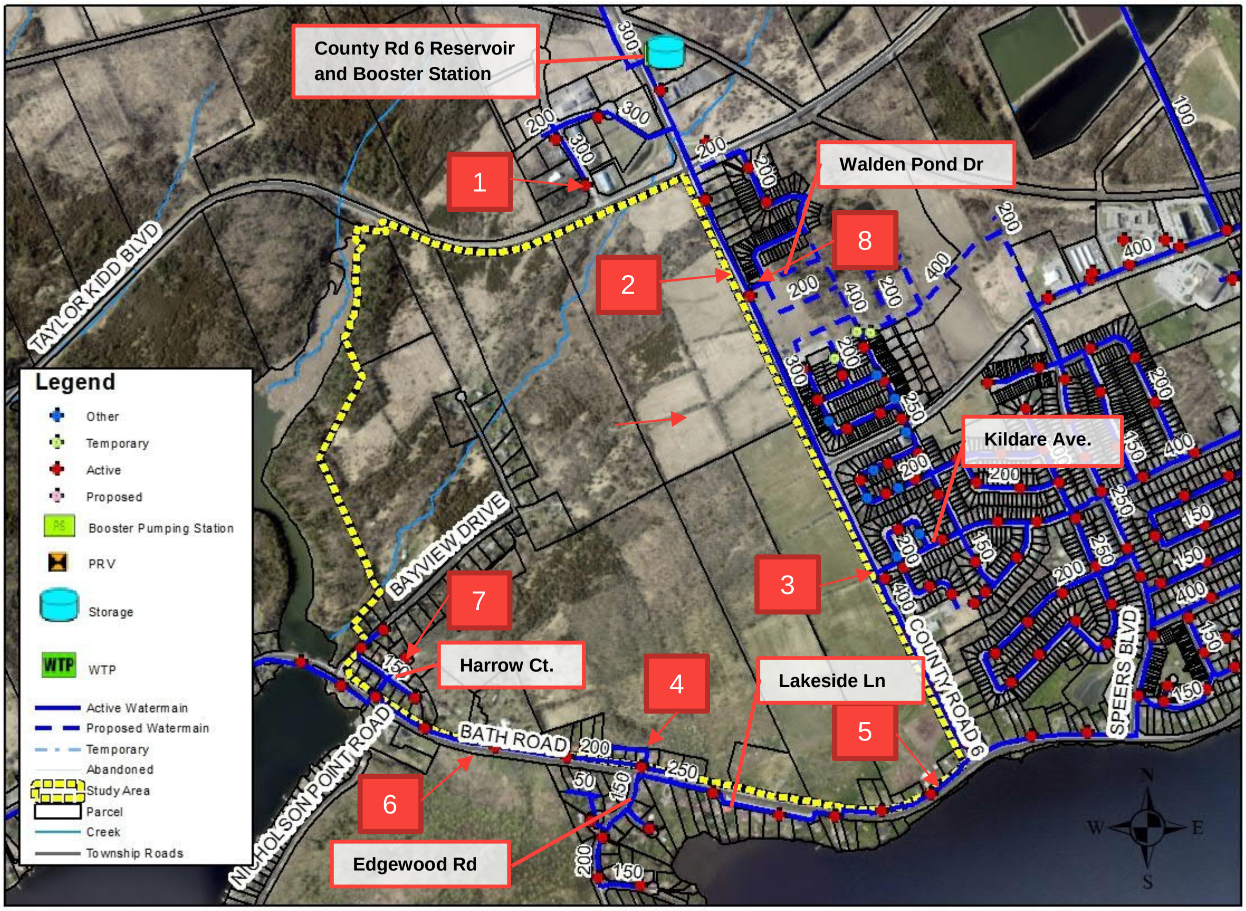

Figure 4-3: Existing Watermain Servicing

Around the study area there are eight potential areas to connect watermain servicing. Each of these locations allows for the possibility to extend the watermain servicing for proposed development of the Amherstview West Secondary Plan area. The eight possible watermain connection locations are as follows:

1. 300 mm watermain that ends at the south end of William Henderson Drive
2. 400 mm watermain along County Road 6 with a possible connection point anywhere along the east side of the secondary plan lands between Hwy 33 and Taylor-Kidd Boulevard
3. 400 mm watermain across Country Road 6 at the Kildare Avenue Intersection
4. 200 mm watermain on the north edge of Bath Road north-east of Edgewood Road
5. 250 mm watermain on Bath Road between Lakeside Lane and County Road 6
6. 200 mm watermain on Bath Road between Lakeside Lane and Bayview Drive
7. 150 mm watermain that ends at the north end of Harrow Court – (Candidate connection with upsizing to a 300mm watermain to provide looping and fire flow benefit)

8. 400mm watermain at the recently constructed Walden Pond and County Road 6 intersection

4.4.2 Sanitary Constraints and Opportunities

4.4.2.1 Sanitary Sewer Management

To successfully develop the Amherstview West Secondary Plan area, sanitary servicing will be designed to adequately collect and convey sewage generated by the residents, businesses, and industries within the subject site. The sanitary services will be designed as per the design criteria and MECP guidelines.

The sanitary system will maximize the use of the existing collection system and pumping stations by determining the appropriate locations for connection to the existing sewer network and utilizing existing reserve pumping capacities available.

4.4.2.2 Sanitary Sewer Existing Conditions

Currently there are no existing sanitary sewers that directly connect to the Amherstview West study area. The houses/properties located within the study area that currently use septic systems are as follows:

- 19 houses located on the north side of Bath Road (Highway 33)
- 8 houses located on the south-west side of Brooklands Park Avenue
- 5 houses located on the north-east side of Brooklands Park Avenue
- 1 house located on the north-west side of Harrow Court
- 13 houses located on the south side of Bayview Drive
- 4 houses located on the north side of Bayview Drive
- 7 houses located on the east side of Parrott’s Bay Lane
- 1 house located on the west side of Parrott’s Bay Lane

This results in a total of 58 houses located within the Amherstview Secondary Plan study area that rely on septic systems to dispose of sanitary waste. Houses south of the study area on the south side of Bath Road (Highway 33) and around Nicholson Point also all use septic systems.

North and east of the Amherstview West study area, properties are connected to the municipal sanitary system by means of sanitary service laterals. Around the study area there are six (6) sanitary maintenance holes that could be connected to for the provision of sanitary services to the Amherstview West Secondary Plan area using the existing system. These sanitary maintenance holes are possible locations to extend the sanitary systems to develop the Amherstview West area. The six (6) possible maintenance hole locations with sanitary pipes that could extend the sanitary sewer are as follows:

1. 200 mm sewer that ends at the north end of Dr. Richard James Crescent; 200 mm sewer that ends at the north end Pearce Street; (Note: Both currently limited as a connection point per the Lakeside Ponds Phase 2 Draft Plan servicing)
2. 200 mm sewer that ends at the south end of William Henderson Drive (Currently limited as a connection via gravity sewer due to topography).

3. 450 mm sewer at the southeast corner of Taylor-Kidd Blvd and County Road 6 which will be extended to the southwest corner during the County's intersection work
4. 200 mm sewer at County Road 6 and future Jack Kippen Place (Lakeview Phase 8, Dance Hall Property). Currently a sanitary block and easement is being established and 200 mm sanitary sewer connection is available via McDonough Rd.
5. 525 mm sewer at Speers Blvd and Raycraft Drive.
6. Potential 200 mm sewer on Kildare approximately 200 m east of County Road 6. Connection subject to sewer extension and final capacity review.

Another connection location for consideration would be the extension of the Pratt and Amherst Drive sewer across County Road 6 via forcemain to the existing 250mm trunk sewer. Connection to this sewer would be subject to capacity considerations for the downstream Lakeview Pumping Station and receiving sewer.

Located on the north-east corner of County Road 23 and County Road 6 is the Taylor-Kidd pumping station. The pumping station was built in 2008 and pumps sanitary flow through a forcemain running east along County Road 23 to the Amherstview Wastewater Treatment Plant and was original designed for future growth and expansion. A connection to the pumping station or to the forcemain is another possible option to extend the sanitary servicing if the pumping station can support the additional flows. The use of the existing pumping station should be maximized prior to developing the Amherstview study area. Below is a list of all sanitary facilities around the Amherstview West Secondary Plan area:

- Amherstview Wastewater Pollution Control Plant (WPCP)
- Taylor-Kidd Pumping Station
- Lakeview Pumping Station

Figure 4-4 shows existing sanitary pipes, maintenance holes, and facilities around the perimeter of the Amherstview West Secondary Plan area along with potential connection point locations from 1-6.

Based on capacity assessments completed by RVA in 2022-23 the Taylor-Kidd Pumping Station and Lakeview Pumping station have residual capacities of approximately 52 L/s and 41 L/s respectively when comparing the measured capacity to the current historical peak flow. Both stations were reported to have available space for future upgrades to increase capacity.

Figure 4-4: Existing Sanitary Services

The topography of the study area includes a lower elevation on the southside of the study area and a higher elevation on the north side of the study area. Refer to **Appendix D**, Figure D-1 contour map for additional details. Due to this topography, to service the study area with sanitary services will likely require a sanitary pumping station(s) in lower lying areas, however there are opportunities to direct flows between areas using deeper sewers and/or by building up areas. Gravity sewers are limited in areas due to the elevation changes without significant excavation of shallow bedrock which is found to be present throughout the area. While shallow bedrock excavation is prevalent, it is common in this area for many developments to combine pipe trench excavation and re-use of rock shatter for road construction.

5 Water Servicing

5.1 Water Servicing Management Criteria

The water servicing management The following requirements were requested by the Loyalist Township in the draft "Technical and Development Guidelines" which are currently being developed under the Infrastructure Master Plan:

- An assumed 2.7 PPU for residential population and equivalent population is to be used for system design.
- The watermain shall be at a minimum size of 300 mm PVC. 150/200 mm PVC watermains may be approved in some circumstances such as small cul-de-sacs, existing dead-ends, etc. Consideration shall be given to fire flow requirements.
- The Peak Hour Rate factor shall be 4.25 unless approved otherwise by Loyalist Township.
- The required minimum water distribution system pressure will be 275 kPa.
- The maximum allowable water distribution system pressure will be 700 kPa.
- Under conditions of simultaneous maximum day and fire flow demands, the pressure should not be less than 140 kPa.
- The minimum average water demand utilized for the design of the water distribution system shall be as follows:
  - Domestic: 350 litres per capita per day
  - Commercial: 3,750 litres per 1,000 square metres per day (based on total floor area)
  - Schools: 105 litres per student per day
  - Industrial: 27,000 litres per gross hectare
- The minimum depth of cover shall be 1.7 metres and 2.0 metres maximum.
- Hydrant valves shall open in the direction as the mainline valves: Amherstview right hand open (clockwise).

5.2 Water Design Criteria

Additional design criteria based on the Township's draft Technical Design Guidelines were reviewed as part of the background study. A summary of reviewed design criteria has been summarized in **Appendix A.**

5.2.1 Unit Water Demands

The water demand criteria adopted for this study are summarized below. These unit demand criteria are based on rates generated from the Design Guidelines for Drinking-Water Systems (MOE, 2008) and the Township's draft Technical Design Guidelines.

Population Per Unit (PPU) of 2.7 was assumed to formulate water demand flow rates as recommended in the Loyalist Township Draft Technical Guidelines.

Other assumed values are as listed below:

- Residential Flow Generation – 350 L/cap/day
- Commercial Flow Generation – 3,750 L/1000m^3/day
- Max Day Demand Multiplier – 1.5 (Loyalist model)
- Peak Hour Demand Multiplier – 2.5 (Loyalist model)
- Fire Flow Demand – 275 L/s (Loyalist model)
- Number of Units – 1,000
- Commercial Area to be developed – 1.65 ha

Based on these assumptions the following unit water demand design assumptions were calculated:

- PPU of 2.7:
    - Average Day Demand: 11.74 L/s
    - Max Day Demand: 17.61 L/s
    - Peak Hour Demand: 29.35 L/s
    - Max Day + Fire Flow: 292.61 L/s

Maximum day and peak hour demands are obtained by multiplying the average day demand by the corresponding peaking factors for the population growth in the study area. The water demand calculations are shown in **Appendix B**, Table B-1. **Appendix B** also includes the theoretical demand for PPC of 2.42 for reference, Table B-2.

For the purposes of this study, a fire flow requirement of 275 L/s for worse-case servicing of potential for high density residential, commercial, and institutional sites was calculated based using the largest buildings within Amherstview, the formulas, and recommended values in the Fire Underwriters Survey (FUS) "Water Supply for Public Fire Protection" document (FUS, 2020). The corresponding fire duration is three hours with the completed calculations shown in **Appendix B.** It's to be noted that this value is only required for high demand structures while low density residential does not require this type of fire flow and developers would not be expected to provide this unless high density residential/commercial/ institutional building is being developed on a subject site.

Theoretical Full-Build Out Demand

To calculate the theoretical demand for the full-build out scenario projection the PPU of 2.7 was assumed and a residential unit density of 11.25 units/ha for approximately 177 Ha of residential area was calculated for potential future development land including 1.8 Ha of commercial area.

Based on these assumptions the following unit water demand was calculated:

- Average Day Demand: 22.34 L/s
- Max Day Demand: 33.50 L/s
- Peak Hour Demand: 55.84 L/s
- Max Day + Fire Flow: 308.50 L/s

Refer to **Appendix B**, Table B-3 for additional details.

5.3 Water: Level of Service Criteria

Following the review of design criteria and discussions with Loyalist Township, the desired Level of Service (LOS) was reviewed and selected. These criteria are used to forecast future requirements for the water and wastewater systems. The criteria are based on historical water demand trends using the Loyalist Township water model provided for the study and water demands based on the MOE Design Guidelines.

5.3.1 Water Treatment

5.3.1.1 Municipal Servicing

Water treatment plants provide treated water to their respective distribution systems from untreated sources (lakes, wells, streams, etc.) through a variety of treatment processes. Water treatment facilities must be designed in accordance with the Procedure for Disinfection of Drinking Water in Ontario (Ontario, 2006). Drinking water treatment systems that obtain water from a surface water or groundwater under direct influence (GUDI) well supply must achieve an overall performance providing as a minimum a 2-log (99%) removal or inactivation of *Cryptosporidium* oocysts, 3-log (99.9%) removal or inactivation of *Giardia* cysts, and 4-log (99.99%) removal or inactivation of viruses prior to the water being delivered to the first customer. At a minimum 0.5-log removal or inactivation of *Giardia* cysts and 2-log removal or inactivation of viruses must be provided through disinfection, while the remaining removal may be achieved through filtration or other equivalent treatment processes.

The MOE Design Guidelines for Drinking-Water Systems (MOE, 2008) indicates that plant capacity should be greater or equal to the maximum day with an allowance for water need for plant use. Additionally, water treatment plants should be designed for a minimum of 10 years (20 years preferred). Accordingly, the MOE Design Guidelines (MOE, 2008) criterion will be adopted as the LOS required for this study, the number of lots in approved plans of subdivisions, developments committed by virtue of approved zoning, new official plans, or site-specific official plan amendments, should not exceed the design capacity of the sewage and/or water system. The LOS refers to an acceptable servicing requirement to satisfy design criteria selected for the study or as prescribed by the MECP, which accounts for acceptable servicing risk and meets industry standards.

5.3.1.2 Private Wells

Existing residents along Bayview Drive and Parrott's Bay Lane are currently serviced by private wells, while residents along the permitter of the study area connect directly to the municipal water system. Municipal servicing of lots currently not connected to the Township's water system is not urgently required as the existing condition of the private services have not been indicated as a concern by the public or Township during the background review. It has been determined that municipal servicing of existing and proposed subdivisions with current private well systems would not need to be considered in this study. This is largely due to preference expressed by residents in these areas to maintain their current private systems, as well as the financial implications of providing municipal water servicing to areas outside of the projected growth development areas.

5.3.2 Booster Pumping

Pumping stations are rated based on their firm capacity. If sufficient floating storage is available in a specific pressure district, the MECP defines firm capacity as the capacity of the station with the largest pump out of service. If there is insufficient or no floating storage, firm capacity is defined as the capacity with the two largest pump out of service (MOE, 2008). The Township's system includes a booster station located north-east of the study area near the intersection of Taylor-Kidd Boulevard and Country Road 6. (Country Road 6 Reservoir and Booster Station).

Pumping stations must be designed to provide peak hour or maximum day plus fire demands (whichever are greater) for each pressure district if no floating storage is available. If sufficient floating storage is available, then the pumping station only needs to be designed to provide maximum day demands. The development of the Amherstview West secondary plan is not expected to create any new pressure zones given that is centered in the existing servicing area along similar topographic elevation to the existing Amherstview village. Elevation ranges that make-up pressure districts are typically within 25-35m elevation range for adequate operations.

Based on the review of existing conditions using the Loyalist Water model, it is not anticipated that additional boosting pumping stations will be required or any upgrades to existing stations to service new anticipated growth within the Amherstview West area for short-, medium- and long-term development if looping of the system is completed as part of the distribution network strategy.

5.3.3 Treated Water Storage

A water storage facility is typically designed such that it will provide sufficient pressure to the water distribution system when in use. LOS design criteria for fire-fighting capability in the Amherstview West area are:

- A flow of 388.6 L/s, based on the suggested required fire flow in the "Water Supply for Public Fire Protection" (Fire Underwriters Survey, 1999, Part II, Note J) for exposure distances of less than 3 m.
- A minimum distribution system pressure under maximum day demand plus fire flow conditions of 140 kPa.

The function of the water storage facility will be to provide continuity of supply, maintain system pressure, and meet critical water demands during fire flow and emergency conditions. The MOE Design Guidelines for Drinking-Water Systems (MOE, 2008) provides the following formula for calculating the required water storage:

$$Total\ Treated\ Water\ Storage\ Requirements = A + B + C$$

Where: A = Fire Storage
B = Equalization Storage (25% of Maximum Day Demand)
C = Emergency Storage (25% of A+B)

Fire storage is the product of the maximum fire flow required in the system and the corresponding fire duration of three hours. When the system can supply more than just the maximum day demand but less than the peak demand as is the case in Amherstview, the fire storage requirements can be determined using the following formula:

$$A = (Peak\ Demand - Pumping\ Station\ Installed\ Capacity) \times Fire\ Duration$$

Where: Peak demand is the greater of the peak hour demand and the maximum day plus fire demand

Floating storage should be designed such that the elevation of the equalization volume (B) is able to maintain a minimum pressure of 275 kPa (40 psi) in the system under peak hour flow conditions. The fire (A) and emergency (C) volumes should be at elevations that sustain 275 kPa (40 psi) during peak hour demand conditions and 140 kPa (20 psi) under the maximum day plus fire flow condition (MOE, 2008).

5.3.4 Distribution

Distribution systems convey treated water from the treatment plants and booster stations to the location of the water demand. Watermains are to be sized to carry the greater of the maximum day plus fire flow or peak hour demand, while maintaining adequate pressures in the system. A summary of applicable design criteria as outlined in the MOE Design Guidelines for Waterworks (MOE, 2008) is presented in Table 5-1.

Table 5-1: Water System Level of Service Design Criteria

Parameter	MOE Design Guidelines Value	Loyalist Draft Technical Guidelines Value (2021)	Selected Design Value
Residential Water Consumption Rate	270-450 L/cap/d	350 L/cap/d	350 L/cap/d
Fire Flow Requirements Population 500 – 1,000 Population 1,000 Population 1,500 Population 2,000	 38 L/s 64 L/s 79 L/s 95 L/s	 - - - -	 38 L/s 64 L/s 79 L/s 95 L/s
FUS Calculated Fire Flow Requirement	-	-	275 L/s[1]
Maximum Day Peaking Factors Population 500 – 1,000 Population 1,001 – 2,000 Population 2,001 – 3,000	 2.75 2.50 2.25	2.7	2.7
Minimum Distribution System Pressure Under Maximum Day Demand + Fire Flow (MDD+FF) Conditions	140 kPa (20 psi)	140 kPa (20 psi)	140 kPa (20 psi)
Preferred Operating Pressure Under Average Day Demand (ADD) Conditions	350 – 480 kPa (50 – 70 psi)	275 – 480 kPa (40 – 70 psi)	350 – 480 kPa (50 – 70 psi)
Minimum Operating Pressure Under ADD Conditions	275 kPa (40 psi)	275 kPa (40 psi)	275 kPa (40 psi)
Maximum Distribution System Pressure	700 kPa (100 psi)	N/A	700 kPa (100 psi)

1 - FUS calculated fire flow requirement is based on a standard mid-rise residential development. The fire flow requirement is only for high demand structures such as multi-storey construction or high density residential/commercial and institutional development, and typically does not apply to low density residential development. Typical low density residential targets may range from 75-150L/s.

5.4 Water Servicing Management Strategy

Based on the growth management projections, water flows were estimated. Water flows were estimated based off the Loyalist Township Engineering Technical Guidelines. The following table, Table 5-1 shows a summary of the demands calculated by WSP for the Amherstview West Secondary Plan area. A further calculation summary is included in **Appendix B**.

Table 5-2: Water Demands

Flow Category	Average Day Demand (L/s)	Max Day Demand (L/s)	Peak Hour Demand (L/s)	Max Day Demand + Fire Flow (L/s)
Residential Zones	10.94	16.41	27.34	16.41
Commercial Zones	0.80	1.20	2.01	1.20
Fire Flow Demand	0.00	0.00	0.00	275.00
Total Demand	11.74	17.61	29.35	292.61

5.5 Future Water System Requirements

5.5.1 Water Demands and Supply Capacity Requirements

The unit flow criteria were used to estimate the future water demands in the Township. Table 5-2 presents the projected water demand for three (3) growth scenario projections based on the Growth Management Analysis (PPU=2.7). One additional scenario was reviewed under a full-build out condition of the Amherstview West Secondary Plan which includes all future projected developable area beyond the growth projection horizon.

Table 5-2: Water Demand Projections

Growth Scenario	Projected Average Day Water Demand	Projected Maximum Day Water Demand	Projected Peak Hour Water Demand
Short-Term (0 – 10 years)	507 m^3/day	761 m^3/day	1,268 m^3/day
Mid-Term (10 – 15 years)	761 m^3/day	1,141 m^3/day	1,901 m^3/day

Long-Term (15 – 25 years)	1,014 m^3/day	1,521 m^3/day	2,535 m^3/day
Full Build-Out	1,930 m^3/day	2,895 m^3/day	4,825 m^3/day

The long-term scenario for the water demand projections only considers the areas that are to be developed as shown in **Appendix D** Figure D-2. The additional areas shown as potential future development are not included in the above growth scenarios for the 25-year projection. If a similar amount of area is built out in the future compared to the scheduled development the demands values will approximately double (Full Build-Out.)

5.5.1.1 Preferred Land Use Option – Future Development Areas

Since the original analysis, a planning exercise was carried out to project the potential land uses for the future development area to represent a full build-out conditions. This preferred land use alternative was used to inform the future development area analysis and land use plan and proposed infrastructure routing, connections and sizing was updated to reflect the overall post-development catchment areas impacted. Refer to **Appendix D** Figure D-3 for details showing the preferred watermain connection locations.

5.5.2 Water Distribution System Analysis

The "all-pipe" hydraulic network water model was previously developed and built using the program WaterCAD by Bentley™, an industry standard software modelling program, to represent the existing Township water distribution system parameters and water demands. The model was built by J.L. Richards Consulting Inc. for Loyalist Township in 2020 using GIS data and other water servicing infrastructure information provided by the Township. Unlike simplified models that could have been created, the detailed "all-pipe" model supports this Secondary Plan as well as future updates and "what-if" investigations beyond the Secondary Plan scope of works. In this respect, the model is an information asset that can be maintained and reused.

The Amherstview West growth scenarios were developed in the WaterCAD model to allow for various steady-state and extended period simulations (EPSs) to be run which represent different demand loading conditions including peak conditions over a period of 24 hours. The simulation settings ensure that a conservative model representation of the Amherstview West proposed system is used for the purposes of infrastructure service gap analysis and review of suitable alternatives for servicing.

Extended period simulations were run for each growth scenario under the following water demand conditions:

- Average Day Demand – Average Hour (ADD)
- Maximum Day Demand – Average Hour (MDD)
- Maximum Day – Maximum Hour - Peak Hour Demand (PHD)
- Maximum Day Demand Plus Fire Flow (MDD+FF)

The results of the fire flow analysis indicate that there are a few existing gaps in Amherstview for fire fighting capacity in the water system, regardless of fire location; however, the ADD and MDD servicing is adequate under existing conditions for the area. The provision of watermain looping which connects

County Road 6 to Bath Road (Highway 33) watermains provided an increase in water supply and resiliency during MDD+FF Maximum Day Demand plus Fire Flow events, while pressures were found to be stabilized in the Amherstview.

5.5.3 Pumping and Water Storage

Given the projected demands and fire flow requirements, an assessment was carried out of the available pumping capacity and storage available within the water system. A combination of pumping and storage is necessary to adequately supply the system during maximum day demand and fire flow conditions.

To assess the suitability of the existing distribution system, a two-step approach was taken:

- **Step 1:** Compare the firm capacity of the WTP pumping to the estimated peak flows (i.e. maximum day demand plus fire flow) during the planning horizon.
- **Step 2:** Determine the storage requirements for the pressure zone.

A system is considered to be adequate if the firm capacity of a pumping station and/or the water treatment plant is greater than the maximum day demand and the available storage is greater than or equal to the required storage (calculated per MOE Design Guidelines and FUS design criteria). Using the MOE Design Guidelines (MOE, 2008) formula, the total water storage volume required for growth projection scenario is met. Detailed calculations and summaries are provided in **Appendix B and C**.

5.5.3.1 Review of Watermain Looping Alternatives and Available Fire Flow

A MDD+FF simulation was completed for the existing, near-term and long-term scenarios to determine the area of the system that limits fire flow in the secondary plan area and across the pressure district. For all scenarios, the area to the far east as well as the area directly east of the watermain on highway 6 were found to limit the fire flow throughout the system. That is, services on Coronation Boulevard and along Pratt Drive that have elevations ranging between 99 - 105 m as shown in Figure 5-1. This range is at the higher end of the zone elevation, which in itself is 77 – 107 m. From this review the available fire flow throughout the system, and more particularly within the secondary plan area, appears to be limited by system head.

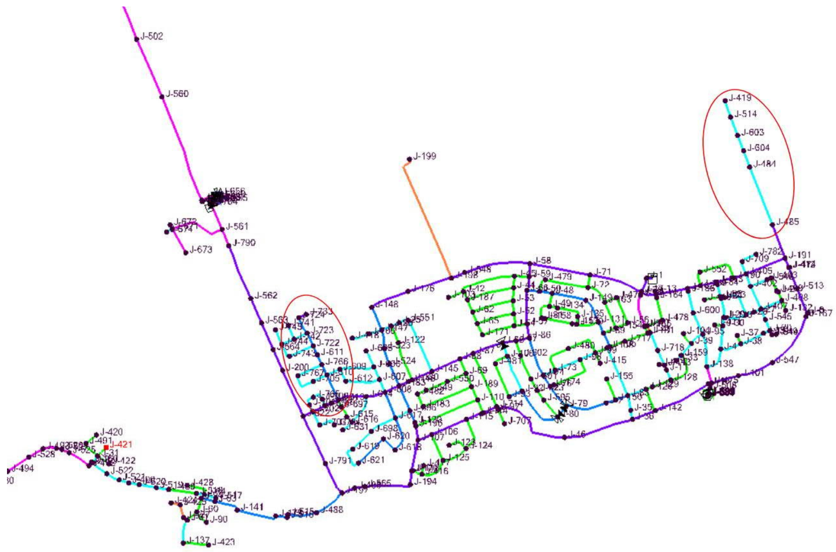

Figure 5-1: Location of Existing System Fire Flow Limitations – Amherstview

To validate this conclusion, WSP investigated various watermain sizing scenarios for existing watermains and proposed secondary plan area watermains. Three scenarios were simulated to evaluate the impact a larger volume main along specific corridors – some existing and some future proposed.

- For the existing watermain, WSP considered upsizing the Highway 6 watermain from a 300mm to 400 mm main. Fire flow runs were repeated accordingly. The results showed negligible change in Available Fire Flow (AFF) under existing conditions. Under near-term and long-term conditions, there was an increase in fire flow of up to 67 L/s but only along the upsized watermain and in the junctions immediately following, leading north to Odessa. The network wide impact of upsizing the Highway 6 watermain to a 400mm main was insignificant.
- The alternative option to upsizing the existing watermain considered adding a new loop to the existing Taylor-Kidd Industrial Park area and pipe upsizing. The existing connection to this industrial park was upsized to 400mm, which also provides an additional 400mm connection into the secondary plan area. Similar to the Highway 6 and baseline conditions modeling, the AFF in the area showed pressure limiting junctions on the east end of Amherstview and immediately east of Highway 6 that prevented a significant increase in AFF.
- Finally, WSP considered upsizing the proposed watermain looping within the secondary plan area to evaluate its impact on local fire flows in the Taylor-Kidd Industrial Park, and in the services west of Parrot's Bay. For the looping option, the new watermain was tested as 300mm and 400mm in segments to determine if available fire flow in the watermain connecting to the Bath Rd area could be improved. Alternative scenarios were run with the three sections of the looped portion of the watermain (as shown in Figure 5-2) upsized to 400 mm. It was found that the greatest impact was simulated by increasing both pipe sections 1 and 2 to 400mm. This increases the average available fire flow by 0.83 L/s, with a maximum increase of 84 L/s leading to the Bath Rd area from segment 1. The size of the new watermain had no significant impact on the system aside from the junctions to which the 400mm main will immediately connect to.

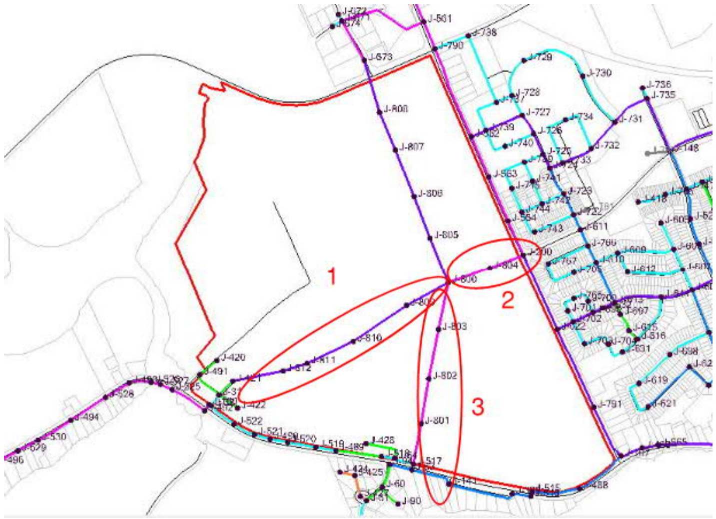

Figure 5-2: Amherstview West Secondary Plan Watermain Looping Alternatives

The results of the review indicate that the Amherstview West current distribution system and tie-ins have sufficient firm capacity to meet maximum day demands for anticipated future development of the Secondary Plan area. MDD+FF demands exceed the firm pumping capacity of the high lift pumps under all scenarios in the area; however, this is also a condition within the existing Amherstview Village and the available watermain connections located at the boundary conditions along County Road 6. To resolve this, watermain looping connections which connect County Road 6 and Bath Road may be installed to improve available water supply to the Secondary Plan area. Its to be noted that future proposed developments that do not meet the fire flow requirements will be required to address any available flow deficiencies during site plan/building permit stage and may need to include on-site water storage and/or on site booster pumps that are sized to accommodate their facilities.

6 Sanitary Servicing

6.1 Sanitary Sewer Servicing Management Criteria

- The following requirements were requested by Loyalist Township in the draft “Technical and Development Guidelines” which are currently being developed under the Infrastructure Master Plan: The gravity sewer shall be at a minimum size of 250 mm. Smaller sizes may be approved in some circumstances on a case-by-cases.
- The Peak Hour Rate factor shall be based on the Harmon Peaking Factor Method unless approved otherwise by Loyalist Township.
- The required minimum sanitary velocity by pipe size for both gravity sewers and forcemains is to be based on the MECP Design Guidelines for Sewage Works (2008).
- The minimum depth of cover shall be 1.7 metres and 2.0 metres maximum.

6.2 Sanitary Design Criteria

Additional design criteria based on the Township’s draft Technical Design Guidelines were reviewed as part of the background study. A summary of reviewed design criteria has been summarized in **Appendix A**.

6.2.1 Unit Wastewater Generation Rates

The wastewater generation criteria adopted for this study are summarized below. These criteria are based on Growth Management Analysis projected flow rates and the design criteria. Recommended design values were then compared to the Design Guidelines for Sewage Systems (MOE, 2008).

One PPUs was assumed to formulate sanitary flow rates, as described previously:

- 2.7 (as recommended in the Loyalist Township Technical Guidelines)

Other assumed values are as listed below:

- Residential Flow Generation – 350 L/cap/day
- Commercial Flow Generation – 350 L/cap/day
- Inflow and Infiltration – 0.14 L/s/ha
- Commercial Peaking Factor – 2.5
- Number of Units – 1,000
- Commercial Area to be developed – 1.65 ha

Based on the previous page assumptions, the following sanitary flows were calculated when accounting for inflow and infiltration within the study area:

- PPU of 2.7:
  - Average Daily Flow: 11.27 L/s (974 m^3/day)
  - Peak Flow: 38.91 L/s
  - Peak Daily Flow: 47.20 L/s

Maximum day and peak hour flows are obtained by multiplying the average day flow by the corresponding peaking factors. The sanitary demand calculations are shown in **Appendix B**, Table B-4. Additionally in **Appendix B**, Table B-5, shows the flows for PPU of 2.4 for reference.

<u>Theoretical Full-Build Out Flow</u>

To calculate the theoretical flow for the full-build out scenario projection the PPU of 2.7 was assumed and a residential unit density of 11.25 units/ha for approximately 177 Ha of residential area was calculated for potential future development land including 1.8 Ha of commercial area.

Based on these assumptions the following unit wastewater flow was calculated:

- Average Daily Flow: 21.90 L/s (1,893 m^3/day)
- Peak Flow: 70.28 L/s
- Peak Daily Flow: 95.32 L/s

Refer to **Appendix B**, Table B-6 for additional details.

6.3 Wastewater: Level of Service Criteria

The level of service provided by wastewater infrastructure should be evaluated for both dry and wet weather events. There are two considerations when assigning the overall level of service: the hydraulic condition occurring in the infrastructure and the scenario during which this hydraulic condition occurs.

6.3.1 Gravity Sewers

Sanitary sewer systems should be designed with the objective of conveying all the flows to be treated at the sewage treatment plant. Overflows within the sanitary sewer systems should be designed for emergency and unavoidable conditions only (MOE, 2008). The MOE also recommends that gravity sewers be designed to less than 100% full under normal conditions. During large rain events, trunk sewers may become surcharged due to inflow and infiltration. Allowing these sewers to surcharge provides storage capacity thereby reducing by-pass volume. However, this increase in the elevation of the hydraulic grade line in the sewer may have adverse effects depending on site-specific factors. The increase in the elevation of the hydraulic grade line is a result of capacity limitations resulting in bottlenecks and backup of the system. The two primary considerations are the amount of surcharging (elevation of hydraulic grade line) and the elevation of hydraulic grade line relative to adjacent finished ground. The identified LOS is based on satisfying the MOE Design Guidelines (MOE, 2008) for gravity sewers and maximizing storage capacity while minimizing the risk of basement flooding. Table 6-1 presents the hydraulic condition criteria for gravity sewers and Table 6-2 presents the LOS for gravity sewers considered for this study.

Table 6-1: Gravity Sewers Hydraulic Condition

FLOW CONDITION	HYDRAULIC CONDITION OF SEWERS		
	FAIR	MODERATE	SEVERE
Dry Weather	Flow < 85% of pipe capacity	Flow > 85% of pipe capacity < 100% of pipe capacity	Flow > 100% of pipe capacity
Wet Weather (up to and including 100-year return event)	Hydraulic Grade Line (HGL) < 0.3 m above pipe obvert and > 2 m below finished ground	HGL < 0.3 m above pipe obvert and > 2 m below finished ground	HGL within 2 m of finished ground

Table 6-2: Gravity Sewers Level of Service

PARAMETER	LEVEL OF SERVICE OF SEWERS		
	GOOD	REVIEW	GAP
Facility Level of Service	HGL from the 100-yr storm is more than 2 m below the finished ground Dry weather flow is less than the sewer capacity	HGL from the 25-yr storm flows and larger, is within 2 m of the finished ground HGL from the 10-yr storm flows and larger, is between 0.3 m of the obvert of the pipe and 2 m of the finished ground Dry weather flows > 85% of the sewer capacity but < 99% of the sewer capacity	HGL from the 10-yrs storm flows and smaller, is within 2 m of the finished ground Cannot convey the dry weather flows without surcharging.

6.3.2 Pumping Stations

The MECP requires that sanitary sewer systems be able to pump the design peak instantaneous flow. Pumping stations that service combined sewer systems are required to have a capacity sufficient to pump all the dry weather flow plus 90% of the volume resulting from the design wet weather flow for an average year. The MECP does not specify a design storm; therefore, a review of Intensity-Duration-Frequency (IDF) curves for the area and assumptions regarding climate change were reviewed and detailed in the Natural Hazards and Stormwater Management Report prepared for this study. For a comparison, a review of other Ontario municipalities' design storm criteria was completed and is presented in Table 6-3.

Table 6-3: Sanitary Pumping Station Design Storm Review for Other Ontario Municipalities

MUNICIPALITY	DESIGN STORM
Kingston	1:10yr
Cambridge	1:25yr
Region of Peel	1:5yr
Sudbury	1:2yr
Guelph	1:25yr
South Glengarry	1:10yr

The 10-year storm was selected for the review of Amherstview West as this is in line with other municipalities within the region including Kingston, Ontario. The level of service criteria is sufficient to satisfy the MECP requirements regarding wet weather flows.

The flows experienced at sanitary pump stations and in the respective forcemains include flows generated from new development and include the existing peak dry and wet weather flows anticipated. This study is limited to only evaluating the peak loading anticipated from the proposed development and does not include an evaluation of existing pumping station capacities.

Multiple flow conditions may be applied to a review of a pump station's level of service for each growth scenario. The flow conditions analyzed included the dry weather as well as multiple return periods for wet weather events ranging from the 2-year to 100-year design storm. The recommended sanitary pump station level of service is outlined in Table 6-4 and

Table 6-5.

Table 6-4: Sanitary Pump Station Hydraulic Condition

WEATHER SCENARIO	HYDRAULIC CONDITION OF PUMP STATION		
	FAIR	MODERATE	SEVERE
Dry Weather and Wet Weather (up to and including 10-yr return event)	Measured flow < 85% of firm capacity	Measured flow > 85% of firm capacity and < 100% of firm capacity	Measured flow > 100% of firm capacity
Wet Weather (above 10-yr up to 100-yr return event)	Measured flow < peak capacity and no bypass at the station	Measured flow > peak capacity and bypass at the station	Measured flow > peak capacity and local flooding

Table 6-5: Sanitary Pump Station Recommended Level of Service

PARAMETER	PUMP STATION LEVEL OF SERVICE		
	GOOD	REVIEW	GAP
Facility Level of Service	Dry weather flows and 10-yr storm flows are less than the pumping stations' firm capacity	10-yr storm flows are greater than the firm but less than the peak capacity	10-yr storm flows are greater than the pumping station peak capacity

6.3.3 Forcemains

In addition to the pumping requirements, the MECP also provides design standards for forcemains. At design pumping rates, a cleansing velocity of at least 0.6 m/s should be maintained. At peak flow, the maximum velocity should be limited to 3 m/s. Consideration also needs to be made for air/vacuum relief valves as well as the operating pressure in the forcemain.

The recommended criterion for evaluating the LOS is limited at a high level to the velocity in the forcemain. Considering operating pressures and requirements for air and vacuum relief valves requires further hydraulic analysis beyond the scope of this study. The recommended forcemain level of service for this study is outlined in Table 6-6 and Table 6-7.

Table 6-6: Sanitary Forcemain Hydraulic Condition

PARAMETER	HYDRAULIC CONDITION OF FORCEMAIN		
	FAIR	MODERATE	SEVERE
Level of Service	Velocity < 2 m/s	Velocity > 2 m/s and < 3 m/s	Velocity > 3 m/s

Table 6-7: Sanitary Forcemain Recommended Level of Service

PARAMETER	FORCEMAIN LEVEL OF SERVICE		
	GOOD	MONITOR	GAP
Level of Service	Velocity in pipe is less than 2 m/s	Velocity in pipe is greater than 2 m/s and less than 3 m/s	Velocity in pipe is greater than 3 m/s

6.3.4 Wastewater Treatment

6.3.4.1 Treatment Processes

The MECP requires that treatment process units at wastewater treatment plants be sized based on various design parameters. Table 6-8 details the process design basis required by the MECP.

Table 6-8: WPCP Design Basis Requirements (MOE Design Guidelines for Sewage Works, 2008)

TREATMENT UNIT	DESIGN BASIS
Sewage Pumping Stations	Design Peak Instantaneous Flow
Screening	Design Peak Instantaneous Flow
Grit Removal	Design Peak Hourly Flow, Peak Hourly Grit Loading
Primary Sedimentation	Design Peak Daily Flow
Aeration (without nitrification)	Average Daily BOD_5 Loading (based on Design Average Daily Flow)
Aeration (with nitrification)	Average Daily BOD_5 loading (based on Design Average Daily Flow), Peak Daily TKN Loading (based on Design Peak Daily Flow)
Secondary Sedimentation	Design Peak Hourly Flow, Peak Daily Solids Loading
Sludge Return for Activated Sludge	50% to 200 % of Design Average Daily Flow
Disinfection	Design Peak Hourly Flow
Effluent Filtration	Design Peak Hourly Flow
Outfall Sewer	Design Peak Instantaneous Flow
Sludge Treatment (Digestion and Dewatering)	Maximum Monthly Mass Loading and Flow Rates

The MECP indicates a sewage treatment plant should be able to treat the flows of sewage generated within buildings serviced by the sewer system exclusive of any extraneous flows (i.e. the average daily flow). The MOE Design Guidelines (MOE, 2008) indicate that “during wet weather, the minimum level of treatment required for flows above the dry weather flows from combined sewer system is primary treatment.”

Therefore, based on the above MECP criteria, the recommended LOS for wastewater treatment plants is to provide full treatment to all average daily flow. Additionally, based on the identified MECP criteria, MECP Procedure F-5-5 (i.e. 90% of the wet weather flow) the level of service for wet weather flows is to provide primary treatment, as a minimum, up to and including the 10-year storm.

6.3.4.2 Effluent Criteria

Should an expansion of the Amherstview Wastewater WPCP be necessary and additional capacity be required to accommodate the design flows, the MECP will need to approve the proposed upgrade design and may adjust the current effluent requirements under a plant re-rating. The scope of this review does not include a review of Treatment Plant capacity; however, the peak wastewater generation rates may be used for future studies or plans, such as the Infrastructure Master Plan to evaluate treatment plant capacity impacts.

6.3.4.3 Private Septic Systems

Within the study area, several properties are currently running on private septic systems. These properties include residences located along Bayview Drive and Parrott's Bay Lane and along the perimeter of the Amherstview West Secondary Plan area to the south along Bath Road (Highway 33) where there are currently no existing municipal sanitary sewer systems. Municipal servicing of lots currently not connected to the Township's wastewater system is not urgently required as the existing condition of the private systems have not been raised by current residents as a concern. The extension of municipal sanitary collection systems to existing properties will not be considered further for municipal servicing in this Secondary Plan study, largely due to preference expressed by residents via the township in these areas to maintain their current private systems, as well as the financial implications of providing municipal wastewater servicing to these areas.

6.4 Sanitary Servicing Management Strategy

Based on the growth management projections for the 25-year horizon, sanitary flows were estimated. Sanitary flows were estimated based on the draft Loyalist Township Engineering Technical Guidelines (2021). The following Table 6-9 shows the flows calculated by WSP for the Amherstview West Secondary Plan area. (PPU=2.7)

Table 6-9: Sanitary Flows

Land Use	Average Daily Flow (m^3/day)	Peak Flow (L/s)	Peak Daily Flow (m^3/day)[1]
Residential Zones	945	38.91	3,985.54
Commercial Zones	28.88	0.84	92.15
Total	973.88	39.75	4,077.69

1 – Includes infiltration and inflow.

6.5 Future Wastewater System Requirements

6.5.1 Wastewater Flows and Treatment Capacity Requirements

The design influent wastewater flows were estimated using historical operating data and the design criteria identified in Table 6-10. The average daily flow (ADF) for the new service population was calculated assuming a flow rate of 350 L/cap/d and an inflow and infiltration (I/I) flow rate of 0.14 L/s/ha.

The maximum day flow (MDF) for growth scenarios were calculated by applying the Harmon Peaking factor to the design average daily flow (ADF). Table 6-10 presents a summary of the design flows. The Full Build-Out scenario presents a summary of future development design flow considerations if areas located to the west and designated as “potential future development” areas are to be developed, as well this development is assumed to include existing residents along Parrott’s Bay Road and Bayview Drive.

Table 6-10: Design Wastewater Flows

Growth Scenario	Design Average Day Flow	Design Maximum Day Flow	Design MDF Peaking Factor
Short-Term (0 – 10 years)	597 m^3/day	2,500 m^3/day	2.7
Mid-Term (10 – 15 years)	731 m^3/day	3,061 m^3/day	2.7
Long-Term (15 – 25 years)	974 m^3/day	4,078 m^3/d	2.7
Full Build-Out	1,893 m^3/day	8,235 m^3/day	2.7

6.5.1.1 Preferred Land Use Option – Future Development Areas

Since the original analysis, a planning exercise was carried out to project the potential land uses for the future development area to represent a full build-out conditions. This preferred land use alternative was used to inform the future development area analysis and land use plan and proposed infrastructure routing, connections and sizing was updated to reflect the overall post-development catchment areas impacted. Refer to **Appendix D** Figure D-2 and D-3 for details showing the preferred trunk sewer connections, potential forcemain routing, and locations of potential wastewater facilities for new pumping station locations at low-lying areas within the secondary plan area (beyond the 25-year planning horizon) connection locations.

6.5.2 Sewer Modelling Findings

An “all-pipe” hydraulic network wastewater model was built by WSP using the program SewerGEMS by Bentley™, an industry standard software modeling program, to represent the boundary conditions for potential connections of Amherstview West wastewater systems and wastewater flows to the existing Amherstview Village wastewater collection system. The model was built using GIS data and other wastewater servicing infrastructure information provided by the Township. GIS information was entered into ArcMAP©, which was selected as the data compiling and auditing platform. This information was then compared with As-Built drawings to verify critical infrastructure features such as pipe inverts and slopes. Information collected and checked was then imported into SewerGems© using the ModelBuilder tools.

The growth scenarios were developed in the SewerGEMS model to allow for various dry-weather loading and wet-weather loading simulations to be run to simulate average and peak flow conditions in the collection system. A summary of simulation results is as follows:

- Under dry-weather conditions, proposed pipes were found to provide sufficient servicing.
- Under wet-weather conditions (100-year storm), there is a risk of surcharging existing gravity sewer pipes (full pipes) under existing conditions. These risks occur at the connecting boundary of the Amherstview West Secondary Plan area, along County Road 6.

6.5.3 Impacts on Future Wastewater System Requirements

Due to the current topography of the area, the gravity sewers which provide sanitary servicing to the study area will have to be split into two gravity systems flowing towards different pumping stations if connecting to the existing Amherstview system. The two systems will be divided into two catchment areas which require a division at the high point which divides the study area into approximately half. Refer to **Appendix C,** Figure C-1 and **Appendix D** for catchment area mapping and locations of potential connections of gravity sewers and forcemains.

The first gravity system will be located on the north half of the study area and will utilize gravity sewers that flow to the Taylor-Kidd Blvd Pumping Station. This pumping station currently includes additional capacity and existing residual capacity estimated at 52 L/s (RVA, 2023). Additional investigation and design must be considered in the detailed design stage to determine if the pumping station will require further upgrades, however based on residual capacity alone its not anticipated that the station will require any upgrades for the projected 25-year horizon.

The second gravity system will be located within the south half of the study area along CR 6 and will utilize gravity sewers which may connect to existing gravity sewers along CR 6 or to a future pumping station in full build-out conditions. Splitting the projected 25-year horizon development peak flows between north and south limits would optimize the existing available residual capacity of the Lakeview PS estimated at 41 L/s (RVA,2023) while also providing future gravity sewer connections the ability to convey flow from the potential connections and capacity of each connection are shown in Table 6-11 below. This may include, for example, subcatchment areas such as SAN6 (Figures D-2 and D-3, Appendix D) which are located on along the potential Amherst Drive extension and given the topography have the opportunity to direct flows to the pumping station catchments that have remaining capacity.

Table 6-11: Potential Gravity Sewer Connection Points and Respective Capacities

Maintenance Hole Connection Opportunity	Sewer Size (mm)	Sewer Capacity (L/s)
Southeast corner of Taylor-Kidd Blvd and County Road 6	450	120
County Road 6 and future Jack Kippen Place (Lakeview Phase 8, Dance Hall Property)	200	15
Speers Blvd and Raycraft Drive	525	236
Kildare approximately 200 m east of County Road 6	200	23

Given the limited capacity of the existing connection at Country Road 6 and future Jack Kippen Place, its anticipated that most of the development flow may be directed north towards the Taylor-Kidd Blvd PS and the full 25 year projected sanitary flow may be split between north and south using the available connection points via gravity sewer connections. Its to be noted that shifting the high-point near Amherst Drive along CR 6 may have impacts to the existing stormwater drainage catchment areas including the

Edgewood Road Municipal Drain. Reducing the stormwater runoff to the Edgewood Road Municipal Drain area by redirecting flows to the north catchment or to a dedicated SWM facility would have an overall net-benefit however, as long as the post-development stormwater flows are captured by the new proposed municipal SWM facility which aims to limit discharge into the Lost Creek near the Taylor-Kidd Blvd and CR6 intersection or to HWY 33/CR 6 existing ditches which drain into Lake Ontario.

6.5.4 Other Considerations

6.5.4.1 Sanitary and Storm Catchment Areas in Post-Development Conditions

Further to matching identified existing catchment areas from topography there is now an opportunity to re-grade the existing landscape to direct sanitary flows via new proposed swales/ditches and/or gravity sewers north to the Taylor-Kidd Pumping Station Sanitary catchment area. This redirection against the current topography is an opportunity to remove the requirement for a new sanitary pumping station within the 25-year growth horizon. To accommodate this, the post-development sanitary and SWM catchment areas need to include surface regarding as well which is an opportunity to redirect flows away from the north-eastern extents of the Edgewood Municipal Drain toward the Lost Creek Watershed. This provides a benefit to mitigating runoff impacts to the Edgewood Municipal Drain outlet, if the SWM facilities and LID features proposed for the Lost Creek catchment area are sufficiently sized to accommodate. This approach is considered the preferred option for the Amherstview West Secondary Plan servicing furthered by analysis.

7 Gap Analysis

This section compares the technical design criteria and the Level of Service (LOS) that was applied during the analysis and planning of infrastructure for the Amherstview West Secondary Plan area for the water and wastewater systems as described in Section 5 to identify existing servicing gaps.

Table 7-1 provides information on the various water and wastewater infrastructure components in Amherstview West and discusses the LOS or design criteria (primarily recommendations from the MOE Design Guidelines) required for consideration for each component as part of this study. This assessment includes both the water distribution and wastewater collection systems.

Table 7-1: Level of Service Classification for Servicing

Parameter	Observations	LOS CLASSIFICATION
Water System		
WTP	The existing WTP capacity is sufficient for the near-, medium- and long-term growth scenario for water demands.	GOOD
Watermains	Existing watermains are sized for ADD, MDD, and PHD servicing for growth scenario water demands. However, existing watermains are not sized for maximum day demand plus fire flow conditions currently at the boundary conditions outside of the Amherstview West Secondary Plan area and are existing conditions. Watermain looping and upsizing at the boundary conditions should be considered during detailed design of the Amherstview West area. Preliminary FUS calculations have been completed and are shown in **Appendix B**.	REVIEW
Water Storage	According to the water model fire flow simulation results, the existing system does not have sufficient MDD+FF capacity for all building types. However, there is adequate storage to service the residential growth projection to the long-term.	REVIEW
Wastewater System		
Gravity Sewers	Under dry-weather conditions, all pipes were found to meet the LOS criteria at boundary connections. Under wet-weather conditions (100-year storm), the available connecting gravity sewers located at the boundary currently do not satisfy the LOS criteria. However as described in Tables A-1 and A-2 of Appendix C, the peak flow projection may be distributed between connection points locations to optimize the current capacities of existing pipes observed under existing conditions.	REVIEW
	Taylor-Kidd Boulevard PS - This PS is not currently sized to provide pumping capacity for all the Amherstview West study area. However, a connecting sewer pipe was constructed at the intersection of	GOOD

Pumping Stations and Forcemains	CR6/Taylor-Kidd Boulevard for the potential extension of a gravity sewer or forcemain to the PS. The existing residual capacity of this pumping station is approximately 52L/s (RVA, 2023). Further analysis will be completed to confirm the available PS and forcemain capacity under the Infrastructure Master Plan.	(Currently in REVIEW)
	Lakeview PS – The township has reported there is a large influence of wet-weather observed during design storm events in the catchment area upstream of the PS, this was further confirmed by a recent capacity assessment where only a residual of approximately 41L/s is available during peak flow conditions. Analysis is currently being completed to confirm the available PS and forcemain capacity under the Infrastructure Master Plan. The existing residual capacity of this pumping station is approximately 41 L/s (RVA, 2023).	GOOD (Currently in REVIEW)

8 Servicing Alternatives

8.1 Water System

The preferred water system servicing solution is the construction of looped watermain distribution network throughout the Amherstview West servicing area. This servicing strategy will provide the area with an adequate flow/pressure distribution to meet the ADD, MDD, and PHD. As required when boundary conditions are confirmed during a detailed design process, connections may be upgraded to suit the maximum day demand plus fire flow demand requirements to service proposed future development. The Amherstview Village available water storage network will need to be connected to meet the servicing objective and adequate storage needs may be confirmed under the Infrastructure Master Plan study. The existing water treatment plant modelled for the water distribution system will have sufficient capacity under current conditions to provide safe and reliable municipal drinking water to the service area. Upgrades to the distribution network, including watermain upsizing and installation of new hydrants, will be necessary to service maximum day demand plus fire flow conditions.

Table 8-1 includes a description of project recommendations as part of the preferred servicing strategy, the year when the project would need to be completed, and the corresponding MCEA Schedule. This list can be used to develop a capital investment program for the Township's Water System. Further details on preferred locations for water distribution network connections for the development area is presented in **Appendix D**.

Table 8-1: Water System Projects

Project	Year Required	MCEA Schedule	Trigger
Expansion of Amherstview water distribution network piping and looping	2022-2042	Exempt	Subject to Form 1 and Ontario Drinking Waterworks Amendments, the expansion of the existing distribution network piping into the new service area.
Upsizing of Existing Watermains and Addition of Hydrants along Boundary Secondary Plan Area	2022-2025	Exempt	Prioritized by areas with proposed commercial/institutional development within the expansion area. High fire flow demand requirements warrant the upsizing/addition of existing distribution piping along the boundary of the Secondary Plan area.

8.2 Wastewater System

The preferred wastewater system solution is a phased approach to the construction of wastewater gravity collection sewers and strategic pumping station/forcemains to convey flows to the existing Amherstview

Village collection system. The optimal site selection of new pumping stations is dependant on growth development in Amherstview West; however, lift stations will be necessary to avoid extensive bedrock excavation in the area and to follow the existing topography of land elevation. A new pumping station may divide the Secondary Plan area accordingly by catchment areas to provide which accounts for the attenuation of peak flows, mitigating the need for a wastewater treatment plant expansion. **Phase 1** of this servicing strategy includes:

- Completion of the sewer connections and completed review of existing Pumping Station Capacity (Taylor-Kidd Boulevard and Lakeview PS) as part of the Infrastructure Master Plan; and,
- Upgrades/extension of gravity sewer connections at the boundary of the Secondary Plan area.

Phase 2 would be extension of the gravity sewer system to the 25-year development horizon. The construction of new pumping station facilities or forcemains is not anticipated to be required in this time horizon given the available capacity of existing pumping stations and preferred conceptual land use concepts. The location and placement future lift stations for potential future development areas in build-out conditions may be determined through specific plans of subdivision and/or under Township development initiatives on owned or acquired lands. However, the requirement is dependent on the available locations where wastewater may drain by gravity to a common collection point. The location of optimal collection locations for an overall future development servicing strategy are presented in **Appendix D**.

Table 8-2 includes a description of each recommended project as part of the preferred wastewater servicing strategy, the year when the project needs to be completed, and the corresponding MCEA Schedule. This list can be used to develop a capital investment program for the Township's Wastewater Systems.

It is recommended that the Township develop a community growth strategy that targets priority areas to be developed. After this has been defined, the collection system upgrades can be implemented in a logical order.

Table 8-2: Wastewater System Projects

Project	Year Required	MCEA Schedule	Trigger
New Dedicated Amherstview West PS	Not Required within 25-year planning horizon Full Build Out (When Development extents into 'Future Development Area'	Eligible for Archaeological Screening Process or Schedule B	A new PS will be necessary to convey flow from low-lying areas of Amherstview West to existing boundaries and sanitary sewer connections as part of the Amherstview Village in order to provide municipal services. The PS may pump flows directly to the Wastewater Treatment plant, or existing gravity systems, or existing PSs if they have capacity (maximum peak flows of 47.2 L/s in 25-year horizong). Trigger to installation would be based on first plan of subdivision where potential future development areas are proposed in low lying areas that can't connect to the

			established or planned gravity sewer collection system.
Lakeview PS Upgrades	TBD	Eligible for Archaeological Screening Process or Schedule B	PS upgrades may be required if selected as the receiver for Amherstview West sanitary flows (maximum peak flows of 47.20 L/s in 25-year horizon). However, downstream capacity is required prior to upgrades. Trigger upgrades following review of peak inflow following I/I reduction initiatives and phasing of development during detailed design of proposed subdivisions.
Taylor-Kidd PS Upgrades	TBD	Eligible for Archaeological Screening Process or Schedule B	PS upgrades may be required if selected as the receiver for Amherstview West sanitary flows (maximum peak flows of 47.20 L/s in 25-year horizon). However, downstream capacity is required prior to upgrades. Trigger upgrades following review of peak inflow following I/I reduction initiatives and phasing of development during detailed design of proposed subdivisions.
Upsizing/extension of Sewer Network	2022-2025	Schedule B	At boundary connections to the Amherstview West service area, all gravity sewer extensions along County Road 6 and Bath Road will be required and initiated at the start of any planned development for servicing. Preferred options for connections include the Jack Kippen Sanitary connection and the

Appendix

A DESIGN CRITERIA

DESIGN CRITERIA MEMORANDUM

TO: Loyalist Township

FROM: WSP

SUBJECT: **Loyalist Amherstview West Secondary Plan – Design Criteria Rev. 00**

DATE: **May 2nd, 2022**

WSP Canada Inc. (WSP) was retained by Loyalist Township (the "Township") to prepare a design criteria memorandum pertaining to the Secondary Plan for the Amherstview West Area. The purpose of this memorandum is to summarize criteria that will be applied to the investigation and design of the Secondary Plan.

1 OVERVIEW

The project consists of developing a Secondary Plan for the Amherstview West area to accommodate growth and development in the community over the next 25 years. The development of the Secondary Plan will require site investigations, technical studies, and design process along with urban design standards and policies.

As part of the design process a hydraulic model and review will be undertaken in accordance with the Loyalist Township, Cataraqui Region Conservation Authority, and Ministry of the Environment, Conservation, and Parks' Technical Standards.

2 DESIGN CRITERIA

The following are tables detailing the technical standards that will be used for each aspect of design. WSP has been in contact with Jenna Campbell Engineering Manager, Loyalist Township regarding technical requirements. These requirements have been included in the following criteria.

WATER DISTRIBUTION SYSTEM

LINEAR INFRASTRUCUTRE

Pipe Sizing	• The watermain shall be at a minimum size of 200 mm PVC. 150 mm PVC watermains may be approved by the Director of EGCDS in some circumstances such as small cul-de-sacs, existing dead-ends ect. Consideration shall be given to fire flow requirements. (Loyalist, pp. 18)
Watermain	• PVC pipe shall be in accordance with CSA B137.3. (Loyalist, pp. 18) • Fittings shall be AWWA C153/A21.53 for Ductile, CSA B137.2 or CSA B137.3 for PVC. PVC fittings shall be blue in colour. (Loyalist, pp. 18) • The transportation, unloading, storing and handling of pipe shall comply with OPSS.MUNI 441 including the capping of the pipe ends. Any pipe with missing or damaged caps and all fittings shall be field cleaned with 1% sodium hypochlorite solution immediately prior to installation to remove all undesirable material. (Loyalist, pp. 18) • Fittings shall be AWWA C153/A21.53 for Ductile, CSA B137.2 or CSA B137.3 for PVC. PVC fittings shall be blue in colour. (Loyalist, pp. 18) • Service taps on PVC watermains will include a pre-manufactured tee or a single band, double stud Mueller stainless steel saddle or an approved equivalent. (Loyalist, pp. 18) • Other pipe materials may be accepted by the Township at the sole decision of the Director of EGCDS based on the acceptance of technical specification for that material. Pipe material must meet OPSS.MUNI 441 standard for pipe. (Loyalist, pp. 18) • All pipe materials must be NSF 61 and NSF 372 compliant. (Loyalist, pp. 18) • Cathodic protection to meet Ontario Provincial Standard Drawings & Specifications. Refer to OPSD 1109.010 for Ductile Iron Watermain, 1109.011 for Non-Metallic Watermain and OPSS.MUNI 442. (Loyalist, pp. 19)
Watermain Looping	• The distribution system shall be a looped network where dead-end mains are avoided. (Loyalist, pp. 17) • Developers within a plan of subdivision will be required to provide hydrants for flushing purposes and sampling devices as requested by the Township. (Loyalist, pp. 18) • All mains shall be looped except those servicing cul-de-sacs with not more than 40 dwelling units. (Loyalist, pp. 19)

Connections	• The work of connecting to existing watermains shall include the removal of all plugs, caps, blow offs and thrust blocks from an existing watermain or fitting, and installation of the connection. (Loyalist, pp. 17)
Location	• Watermain bedding shall be in accordance with OPSD 820 series. Bedding and cover shall conform to Granular 'A' as per OPSS specifications. (Loyalist, pp. 14) • Watermains and sewer/sewage works located parallel to each other shall be constructed in separate trenches maintaining a minimum clear horizontal separation distance of 2.5 m measured from edge to edge in accordance with MECP. Deviations due to unusual conditions may be permitted as described in the MECP F-6-1 procedure ONLY with written permission of the Director of EGCDS. (Loyalist, pp. 19) • A minimum 500mm vertical separation between the outside of the watermain and the outside of the sewer must be provided to allow for proper bedding and compaction of the watermain and the sewer pipe. A full length of watermain pipe should be centered on the passing sewer so that the watermain joints are equidistant and as far from the sewer pipe and crossing perpendicular is possible. (Loyalist, pp. 19) • The minimum depth of cover for all watermains and services shall be 1.7 m or as required by the Director of EGCDS. Insulation may only be specified where sufficient cover is not physically possible. (Loyalist, pp. 19) • Where it is not possible for the watermain to cross above the sewer, the watermain shall pass under the sewer providing a minimum of 500 mm vertical separation between the invert of the sewer and the crown of the watermain. The length of water pipe shall be centered on at the point of crossing so that the joints will be equal distance from the sewer. Where a clearance of 500 mm cannot be avoided, non-shrink grout shall be used extending one meter in either direction from the pipe. (Loyalist, pp. 19)

RESERVOIRS AND BOOSTER/PUMPING STATIONS

General	• Firm capacity to supply the maximum day demands in a distribution system with sufficient floating storage for equalization, fire and emergency conditions.
	• If sufficient floating storage were not available, then the pumping and booster stations must have the capacity for the extreme flow conditions that include both peak hour demand and maximum day plus fire flows.
	• Firm pumping capacity is defined by MOE as:
	  ○ Capacity of a pumping station with the largest unit out of service if the station supplies a pressure zone with floating storage available for fire protection and balancing;
	  ○ Capacity of a station with the two largest units out of service if the pumping station serves a zone that does not have floating storage available
	• Where more than one pumping/booster station supplies a pressure zone, the total firm capacity has been assumed as the cumulative capacity with the largest unit out of service in each station
	• Fire flow rate and duration based estimated populations; maximum fire flow would be 378 L/s for 6.0 hours for an equivalent population of 40,000 (MOE, 2008 Table 8-1)
	• Fire flow rate and duration based estimated populations; maximum fire flow would be 275 L/s for 3.0 hours based on the calculations completed for the largest building in Amherstivew using the formulas and values from the Fire Underwriters Survey.

Pipe Sizing	• To minimize headloss through pumping stations, pipe sizing within station will be based on maintaining water velocity of approx. 1.0 m/s in the pump suction piping, and approx. 1.5 m/s in the pump discharge piping.

OTHER CRITERIA

Max Day Factor	• Max Day at 2.75 times the ADD. (Loyalist, pp. 20) (In comment)
Peak Hour Rate Factor	• Peak Hour Rate factor shall be 4.25 unless approved otherwise by Loyalist Township

Modelling Criteria/ Operating Pressures	• ADD – normal operating pressure between 280 kPa (40psi) -700 kPa (101psi)
	• PHD
	  ○ Required minimum water distribution system pressure would be 275 kPa (40 psi). (Loyalist, pp. 19)
	  ○ Maximum allowable water distribution system pressure would be 700 kPa (101psi). (Loyalist, pp. 19)
	• Under conditions of simultaneous maximum day and fire flow demands, the pressure should not be less than 140 kPa. (Loyalist, pp. 19)

Consumption Rates/ Water Demand Allocations	• The minimum average water demand utilized for the design of the water distribution system shall be as follows:
	  ○ Domestic: 350 litres per capita per day
	  ○ Commercial: 3,750 litres per 1,000 square metres per day (based on total floor area)
	  ○ Schools: 105 litres per student per day
	  ○ Industrial: 27,000 litres per gross hectare

Future Growth	Two different Population Per Unit (PPU) were assumed to formulate two different water demand flow rates. The two PPU's are as listed below: • 2.7 (as recommended in the Loyalist Township Technical Guidelines) • 2.42 (as recommended in the Loyalist Township Growth Projection Study)

SANITARY GUIDLINES

GENERAL CRITERIA

Flow Rates	• Peaking factors shall be 2.75 for maximum flow and 4.0 for minimum flow as derived from the Harmon formulae.
Capacity	• Capacity of pumping station servicing a combined sewer system should be designed to pump all of the dry weather flow plus 90% of the volume resulting from the design peak wet weather flow that is above the design dry weather flow (for an average year flow) to satisfy the requirements of ministry Procedure F-5-5.
Flooding	• Sewage pumping stations and treatment plants should be protected against flooding. The treatment process units should be located at an elevation higher than the 100-year flood level or otherwise be adequately protected against 100-year flood damage. • Newly constructed plants should remain fully operational during a 100-year flood event (MOE, 2008).
Sewer Surcharge Analysis	• HGL computations for rain events with return period from 2 to 100 years • Surcharge <0.3 meters above pipe obvert, and >2 meters from ground surface

Sewers

Criteria	Size / Condition	Minimum	Maximum
Pipe Size	PVC	200mm	
Velocity (Design Flow)		0.6 m/s	3.0 m/s
Pipe Slopes	First 25 Upstream Dwelling Units	1.0%	
	Top reach (MH to MH)	1.0%	
	200mm	0.4%	
	250mm	0.3%	
	300mm and larger	MOE Guidelines	
Cover		1.7 m from the finished grade	
Peaking Factors	Determined by Harmon's equation	4.0	2.75
Average Daily Domestic Flow	Plus Infiltration		400 liters per person per day

- Infiltration rate of 0.00014 m^3 per second per hectare of contribution area.
- Manning's Roughness Coefficient shall meet the manufacturer's specification and MOE guidelines (Typically n=0.013).
- Service laterals for single lots shall be a minimum of 125 mm DR28 PVC from the sewer main to the property line and may be reduced to 100 mm from the property line to the building.
- Double service lateral design shall require the approval of the Director of EGCDS. (Loyalist, pp. 45)
- Laterals should be designed for 2% with a minimum allowable grade of 1%. (Loyalist, pp. 45)
- All service laterals shall be at a minimum depth of 1.7 m at the property line unless otherwise approved by the Township. (Loyalist, pp. 45)
- Slope
    - Sewers 1200 mm in diameter (NPS-48) or larger should be designed and constructed to give mean velocities, when full flowing, of not less than 0.9 m/s
    - Table 5-4 – Recommended Minimum Slopes for Various Sewer Sizes (MOE, 2008)
- Allowance for hydraulic losses
    - Straight Run = grade of sewer loss incurred
    - 45 degree turn = 0.03 m
    - 90 degree turn = 0.06 m
    - Junctions and Transitions = physical modeling recommended

	• Slopes less than those required for a 0.6 m/s velocity when flowing full may be considered when increasing the slope would require deepening of extensive sections of the system or the addition of a pumping station. In such instances, the reduction of the slope would only apply to 200 mm (NPS-8) and 250 mm (NPS-10) diameter pipes, with the minimum allowable slope being 0.28% for 200 mm pipe and 0.22% for 250 mm pipe. Such decreased slopes may be considered where the depth of flow will be 0.3 of the diameter or greater for design average daily flow (MOE, 2008)
Forcemains	• At design pumping rates, a cleansing velocity of at least 0.6 m/s should be maintained or a range of between 0.6 and 1.1 m/s; the maximum velocity should be limited to 3 m/s (MOE, 2008). • Minimum forcemain diameter for raw sewage >100mm, unless hydraulic computations are made (MOE, 2008). • If velocity in forcemain is <0.8 m/s, hydraulic computations should be made to determine the pipe diameter if it is to be <100 mm, although the pipe diameter should not be <50 mm (MOE, 2008).
Average Discharge	• The average sanitary sewage flows may be estimated on a per person usage where typically the following population densities shall apply, however, the actual values used must be approved by the Township. (Loyalist, pp. 44) ○ Residential 2.7 persons per unit ○ Commercial 50 persons per hectare ○ Industrial 60 persons per hectare ○ Institutional 50 persons per hectare
Manholes	• Sanitary manholes shall be installed at all changes in sewer grade, alignment, and pipe size. The maximum spacing of manholes shall be 110 m or less for mains up to 750 mm in diameter, 120 m or less for mains between 800 mm and 1200 mm, and 150 m or less for mains having a diameter greater than 1200 mm. Pre-cast manhole sections shall have rubber gaskets and the external joint shall be coated with an approved bituminous material. Lift holes shall be made watertight. All material shall conform to O.P.S.S. 1351 and be constructed as per O.P.S.S. 407. (Loyalist, pp. 46)

STORMWATER GUIDELINES

GENERAL GUIDELINES

Desktop Review Processes	• The analysis will be completed based on catchment mapping provided by the Loyalist Township and the Ontario Flood Assessment Tool (OFAT). The Loyalist Township mapping will be updated as necessary when compared to the OFAT mapping. • Design storms will consist of the 1:2 Year, 1:10 Year, 1:25 Year, 1:50 Year, and 1:100 Year. • Design stormwater flows will be developed using the Rational Method (catchment area <100Ha) and the Unified Ontario Flood Method (catchment area >100 Ha), whichever is applicable for the catchment area. • If the Rational Method is applicable, then individual catchment areas will be broken down to develop a weighted run-off coefficient based on aerial imaging and land use. The coefficients for various land use will be as follows; o Lakes/Wetlands – 0.05 o Landscaped – 0.25 o Granular – 0.9 o Asphalt/Concrete/Pavers – 0.9 o Buildings – 0.9 • The analysis will assume no upstream restrictions.
Modelling Processes	• SWMHYMO and Visual OTTHYMO are the preferred hydrologic models to be used. Most industry standard models will be considered For smaller sites , Rational Method or Modified Rational Method may be appropriate. (Loyalist, pp. 60)

Design Storm Selection	• In the design of site plans or subdivisions, the consulting engineer is required to evaluate the study area (i.e. total area, urban vs. rural) and recommend "critical storms" that generate the highest peak flow or the greatest volume. (Loyalist, pp. 61) • The storm duration should be selected dependent on the size of catchment and attenuation within the catchment. For smaller, urbanized catchments a shorter duration event (i.e. 3, 4, or 6 hour events) may be a reasonable duration. For larger, rural catchments a 12 or 24 hour event should be considered. Subwatershed studies should be reviewed for specified preferred watershed based design storms. (Loyalist, pp. 61) • The most common design storms distributions include the Chicago, Atmospheric Environmental Service (AES), and SCS Type II distributions. (Loyalist, pp. 61) • Rainfall intensity duration frequency (IDF) storm parameters for the Township are based on the Environment and Climate Change Canada February 2019 IDF update, with the exception of the 2-year event which remains consistent with the City's storm sewer design standards (Section 5, Figure 5.2). The table below includes a synthetic 25-mm event for application of the 4-hour water quality event (MOE, 2003). The UTRCA defines the Regional (i.e. regulatory) event as the 250-year event. The UTRCA's accepted IDF curve values for the 250-year event are included below and should be considered as part of major storm system evaluation for the protection of municipal infrastructure and public safety. (Loyalist, pp. 61)
Water Quality Targets	• The Township requires engineered stormwater management systems to satisfy water quality requirements for peak flows and volumes up to the 25 mm storm event. • A 25mm volume capture target represents the first flush runoff event and generally 90% of storm events in Ontario. The water quality event is also identified by the province to be a 25mm, 4 hour event in accordance with Section 4.6 of the 2003 MOE manual. • Development applications within a site plan or subdivision process, are encouraged to capture the first 25mm of any rain event on site within a stormwater management system to satisfy water quality and water balance criteria. • Implementing infiltration or filtration measures for a volume representing the 25mm event will be accepted to meet Total Suspended Solids (TSS) reduction target requirements. It should be noted that infiltration systems often require a water quality pre-treatment system to reduce sediment loading and prolong maintenance intervals.

3 CLOSING

We trust this memorandum is suitable to provide adequate design criteria for the design of the Amherstview West Secondary Plan. If you require any additional information or have any comments or concerns, please do not hesitate to contact our office.

Sincerely,

WSP Canada Inc.

Prepared by: Reviewed by:

Name Name
Position Position

I/We ______________________________, hereby accept the above Design Criteria for the design of the Amherstview West Secondary Plan.

_______________________________________ ______________________________

Signed *Date*

Appendix

B WATER AND SANITARY - CALCULATIONS

WSP Canada Inc.
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T: 613-634-7373
www.wsp.com

Amherstview West Service Area
Theoretical Demand (2046)

Table B-1: Theoretical Water Demands (PPU=2.7)

By-Law8499 Area	Land Use	Demand	Units	Population	Area (m^2)	Average Day Demand Required (L/s)	Maximum Day Demand Required (L/s)	Peak Hour Demand Required (L/s)	Maximum Day Demand + Fire Flow (L/s)
Residential Zones		350	L/Cap/Day	2700	1361500.00	10.94	16.40625	27.34375	16.41
	Sub-Total	350.00			1,361,500.00	10.94	16.41	27.34	16.41
Commercial Zones		3750	L/1000m^2/Day	92.50	18500.00	0.80	1.20	2.01	1.20
	Sub-Total	3750.00				0.80	1.20	2.01	1
Fire Flow Demand (L/s)						0	0	0	275
	Sub-Total	0.00				0.00	0.00	0.00	275
TOTAL						**11.74**	**17.61**	**29.35**	**292.61**

Assumptions:

Assumed Population Per Unit*	2.7
Residential flow Generation (l/cap/day)	350
Commercial flow Generation (l/1000m3/day)*	3750
Inflow and Infiltration (l/s/ha)*	0.14
Maximum Day Demand Multiplier	1.5
Peak Hour Demand Multiplier	2.5
Fire Flow Demand (L/s)	275

Note 2

1. Population per unit of 2.7

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Amherstview West Service Area
Theoretical Demand (2046)

Table B-2: Theoretical Water Demands (PPU=2.42)

Area	Land Use	Demand	Units	Population	Area (m^2)	Average Day Demand Required (L/s)	Maximum Day Demand Required (L/s)	Peak Hour Demand Required (L/s)	Maximum Day Demand + Fire Flow (L/s)
Residential Zones		350	L/Cap/Day	2420	1361500.00	9.80	14.70	24.51	14.70
	Sub-Total	350.00			1,361,500.00	9.80	14.70	24.51	14.70
Commercial Zones		3750	L/1000m^2/Day	92.50	18500.00	0.80	1.20	2.01	1.20
	Sub-Total	3750.00				0.80	1.20	2.01	1.20
Fire Flow Demand (L/s)						0	0	0	275
	Sub-Total	0.00				0.00	0.00	0.00	275.00
	TOTAL					**10.61**	**15.91**	**26.52**	**290.91**

Assumptions:

Assumed Population Per Unit*	2.42
Residential flow Generation (l/cap/day)	350
Commercial flow Generation (l/1000m3/day)*	3750
Inflow and Infiltration (l/s/ha)*	0.14
Maximum Day Demand Multiplier	1.5
Peak Hour Demand Multiplier	2.5
Fire Flow Demand (L/s)	275

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Amherstview West Service Area
Theoretical Demand (Full Build-Out)

Table B-3: Theoretical Demand (Full Build-Out Scenario)

Area	Land Use	Demand	Units	Population	Area (m^2)	Average Day Demand Required (L/s)	Maximum Day Demand Required (L/s)	Peak Hour Demand Required (L/s)	Maximum Day Demand + Fire Flow (L/s)
Residential Zones		350	L/Cap/Day	5316	1361500.00	21.53	32.30	53.83	32.30
	Sub-Total	350.00			1,361,500.00	21.53	32.30	53.83	32.30
Commercial Zones		3750	L/1000m^2/Day	92.50	18500.00	0.80	1.20	2.01	1.20
	Sub-Total	3750.00				0.80	1.20	2.01	1
Fire Flow Demand (L/s)						0	0	0	275
	Sub-Total	0.00				0.00	0.00	0.00	275
	TOTAL					**22.34**	**33.50**	**55.84**	**308.50**

Assumptions:

Assumed Population Per Unit*	2.7
Residential flow Generation (l/cap/day)	350
Commercial flow Generation (l/1000m3/day)*	3750
Inflow and Infiltration (l/s/ha)*	0.14
Maximum Day Demand Multiplier	1.5
Peak Hour Demand Multiplier	2.5
Fire Flow Demand (L/s)	275

Full Build-Out Assumption

Amherstview West Area	177	ha
Approx. Unit Density	11.25	units/ha
Approx. Number of Units	1969	units
Approx. Area for Commercial	1.3 to 1.8	ha
Approx. Population	5316	people

From Hemson Consulting Ltd. - 2020-2022 & Future Development Area

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Amherstview West Service Area
Theoretical Flow (2046)

Table B-4: Theoretical Sewage Flows - Scenario 2 (PPU - 2.7)

Area	Land Use	Area (ha)	Density (Units/ha)	# of Units	Population	Average Daily Flow (m^3/day)	Harmon Peaking Factor	Commercial Peaking Factor	Peak Flow (l/s)	I/I	Peak Daily Flow (l/s)
Residential Zones		57.55	11.25	1000	2700	945.00	3.48		38.07	8.06	46.13
	Sub-Total	57.55			2,700.00	945.00	3.48		38.07	8.06	46.13
Commercial Zones		1.65	50.00		82.50	28.88		2.50	0.84	0.23	1.07
	Sub-Total	1.65				29			0.8	0.23	1.07
Open Space (with Residentail Units)					0	0.00	4.00				0.00
	Sub-Total								0.0	0.00	0.0
TOTAL		**59**				**974**			**38.91**	**8.29**	**47.20**

Assumptions:

Assumed Population Per Unit*	2.7
Residential flow Generation (l/cap/day)	350
Commercial flow Generation (l/cap/day)*	350
Inflow and Infiltration (l/s/ha)*	0.14

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Amherstview West Service Area
Theoretical Flow (2046)

Table B-5: Theoretical Sewage Flows - Scenario 2 (PPU=2.42)

Area	Land Use	Area (ha)	Density (Units/ha)	# of Units	Population	Average Daily Flow (m^3/day)	Harmon Peaking Factor	Commercial Peaking Factor	Peak Flow (l/s)	I/I	Peak Daily Flow (l/s)
Residential Zones		57.55	11.25	1000	2420	847.00	3.52		34.51	8.06	42.56
	Sub-Total	57.55			2,420.00	847.00	3.52		34.51	8.06	42.6
Commercial Zones		1.65	50.00		82.50	28.88		2.50	0.84	0.23	1.07
	Sub-Total	1.65				29			0.8	0.23	1.1
Open Space (with Residentail Units)					0	0.00	4.00				0.00
	Sub-Total								0.0	0.00	0.0
TOTAL		**59**				**876**			**35.34**	**8.29**	**43.63**

Assumptions:

Assumed Population Per Unit*	2.42
Residential flow Generation (l/cap/day)	350
Commercial flow Generation (l/cap/day)*	350
Inflow and Infiltration (l/s/ha)*	0.14

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Amherstview West Service Area
Theoretical Flow (Full Build-Out)

Table B-6: Theoretical Sewage Flows - Full Build-Out

Area	Land Use	Area (ha)	Density (Units/ha)	# of Units	Population	Average Daily Flow (m^3/day)	Harmon Peaking Factor	Commercial Peaking Factor	Peak Flow (l/s)	I/I	Peak Daily Flow (l/s)
Residential Zones		177	11.25	1969	5316	1860	3.22		69.34	24.78	94.12
	Sub-Total	177			5,316	1,860	3.22		69.34	24.78	94.1
Commercial Zones		1.85	50.00		92.50	32.38		2.50	0.94	0.26	1.20
	Sub-Total	1.85				32			0.9	0.26	1.2
Open Space (with Residentail Units)					0	0.00	4.00				0.00
	Sub-Total								0.0	0.00	0.0
TOTAL		**179**				**1893**			**70.28**	**25.04**	**95.32**

Assumptions:

Assumed Population Per Unit*	2.7
Residential flow Generation (l/cap/day)	350
Commercial flow Generation (l/cap/day)*	350
Inflow and Infiltration (l/s/ha)*	0.14

Full Build-Out Assumption

Amherstview West Area	177	ha
Approx. Unit Density	11.25	units/ha
Approx. Number of Units	1969	units
Approx. Area for Commercial	1.3 to 1.8	ha
Approx. Population	5316	people

From Hemson Consulting Ltd. - 2020-2022 & Future Development Area

AMHERSTVIEW WEST SECONDARY PLAN
FIRE UNDERWRITERS SURVEY FIRE FLOW CALCULATION
HELEN HENDERSON CARE CENTRE

A = 8352 sq.m 89900 sq.ft (See FUS for high buildings)

Formula F = 220 x c x Sq. Root "A"

F = the required fire flow in litres per minute c = the coefficient related to type of construction
A = Floor Area (See FUS)

STEP 1: TYPE OF CONSTRUCTION TO DETERMINE "c" COEFFICIENT

c: 1.5 for Wood Frame Construction c: 1.0 for Ordinary Construction
c: 0.8 for Non-Combustible Construction c: 0.6 for Fire-Resistive Construction

F= 220 x c 1.0 x Sq. Root "A" 91.4 = 20105.6 LPM

STEP 2: INCREASE OR DECREASE FOR OCCUPANCY

Non-Combustible (+ 75%) Charge: Limited Combustible (+ 85%) Charge: Combustible (+ 100%)
Free Burning (+115%) Charge: Rapid Burning (+125%) Charge

"APPLY ONE OF THESE CHARGES TO THE VALUE OBTAINED IN STEP 1 ROUNDED OFF TO THE NEAREST 1000"

Value from Step 1 20000.0 x Charge 0.85 = 17000

STEP 3: DETERMINE THE DECREASE FOR SPRINKLER SYSTEM (See FUS for Details)

For Complete Automatic Sprinkler Protection (full supervision) -50%
For Automatic Sprinkler System Conforming to NFPA 13 -30%

Value from Step 2 17000 x Above Value 0.3 = 5100

Value from Step 2 17000 - Answer from Above 5100 = 11900

STEP 4: INCREASE FOR EXPOSURE FROM OTHER BUILDINGS

0 to 3 m (+ 25%); 3.1 to 10 m (+20%), 10.1 to 20 m (+ 15%); 20.1 to 30 m (+ 10%); >30 m (+0%)

THE TOTAL % SHALL BE THE SUM OF THE % FOR ALL SIDES, BUT SHALL NOT EXCEED 75%

Value from Step 2	17000	x	North Side Step Charge	0.00	=	0
Value from Step 2	17000	x	East Side Step Charge	0.00	=	0
Value from Step 2	17000	x	South Side Step Charge	0.00	=	0
Value from Step 2	17000	x	West Side Step Charge	0.00	=	0
			Total	0	=	0

Value from Step 3 11900 + Total 0 = 11900

STEP 5: TO DETERMINE THE FIRE FLOW

Round to nearest 1000

Take Value from Step 4 12000 Divide by 60 = 200.0 L/S

Designed By: Jared Delpellaro, Engineering Student	**Date:** 2022.04.21
Checked By: Micheal Flowers, P.Eng.	**Project Number:** 211-01353-00

AMHERSTVIEW WEST SECONDARY PLAN
FIRE UNDERWRITERS SURVEY FIRE FLOW CALCULATION
APPARTMENT COMPLEX

A = 6290 sq.m 67705 sq.ft (See FUS for high buildings)

Formula F = 220 x c x Sq. Root "A"

F = the required fire flow in litres per minute c = the coefficient related to type of construction
A = Floor Area (See FUS)

STEP 1: TYPE OF CONSTRUCTION TO DETERMINE "c" COEFFICIENT

c: 1.5 for Wood Frame Construction c: 1.0 for Ordinary Construction
c: 0.8 for Non-Combustible Construction c: 0.6 for Fire-Resistive Construction

F= 220 x c 1.5 x Sq. Root "A" 79.3 = 26172.1 LPM

STEP 2: INCREASE OR DECREASE FOR OCCUPANCY

Non-Combustible (+ 75%) Charge: Limited Combustible (+ 85%) Charge: Combustible (+ 100%)
Free Burning (+115%) Charge: Rapid Burning (+125%) Charge

"APPLY ONE OF THESE CHARGES TO THE VALUE OBTAINED IN STEP 1 ROUNDED OFF TO THE NEAREST 1000"

Value from Step 1 26000.0 x Charge 0.85 = 22100

STEP 3: DETERMINE THE DECREASE FOR SPRINKLER SYSTEM (See FUS for Details)

For Complete Automatic Sprinkler Protection (full supervision) -50%
For Automatic Sprinkler System Conforming to NFPA 13 -30%

Value from Step 2 22100 x Above Value 0.3 = 6630

Value from Step 2 22100 - Answer from Above 6630 = 15470

:XPOSURE FROM OTHER BUILDINGS

0.1 to 20 m (+ 15%); 20.1 to 30 m (+ 10%); >30 m (+0%)
THE % FOR ALL SIDES, BUT SHALL NOT EXCEED 75%

Value from Step 2	22100	x	North Side Step Charge	0.00	=	0
Value from Step 2	22100	x	East Side Step Charge	0.00	=	0
Value from Step 2	22100	x	South Side Step Charge	0.00	=	0
Value from Step 2	22100	x	West Side Step Charge	0.00	=	0
			Total	0	=	0

Value from Step 3 15470 + Total 0 = 15470

TERMINE THE FIRE FLOW

und to nearest 1000

Take Value from Step 4 15000 Divide by 60 = 250.0 L/S

Designed By: Jared Delpellaro, Engineering Student	**Date:** 2022.04.21
Checked By: Micheal Flowers, P.Eng.	**Project Number:** 211-01353-00

Table A1 - Proposed Development

Sub-Catchment Area	Size (Ha)	Average Day Flow (m^3/day)	Average Day Flow (L/s)	Peak Daily Flow (m^3/day)	Peak Daily Flow (L/s)	Development Timeframe
SAN1	4.2	115	1.33	480	5.55	25 Year
SAN2	3.0	82	0.95	343	3.97	25 Year
SAN3	5.0	136	1.58	571	6.61	25 Year
SAN4	5.1	139	1.61	583	6.74	25 Year
SAN5	2.0	55	0.63	228	2.64	25 Year
SAN6	5.7	156	1.80	651	7.54	25 Year
SAN7	3.4	22	0.25	97	1.13	Future Development
SAN8	3.8	24	0.28	109	1.26	Future Development
SAN9	3.5	22	0.26	100	1.16	Future Development
SAN10	2.90	79	0.92	331	3.83	25 Year
SAN11	35.1	222	2.57	1,006	11.65	Future Development
SAN12	17	106	1.23	482	5.57	Future Development
SAN13	46.9	301	3.48	1,356	15.70	Future Development
SAN14	14.4	91	1.06	413	4.78	Future Development
SAN15	4.9	31	0.36	140	1.63	Future Development
SAN16	2.2	14	0.16	63	0.73	Future Development
SAN17	2.9	18	0.21	83	0.96	Future Development
SAN18	7.8	203	2.34	848	9.82	25 Year
SAN19	12.2	77	0.89	350	4.05	Future Development
TOTAL	**178.9**	**1,893**	**21.91**	**8,235**	**95.32**	Full Build Out

DESIGNED BY: Michael Flowers, P.Eng.
CHECKED BY: Antoine Lahaie, P.Eng

Table A2 - Sanitary Sewer Calculation - Receiving Sewers Available Capacity

DRAINAGE DESCRIPTION						OUTLET PIPE DATA							
AREA DESCRIPTION	**FROM**	**TO**	**Projected Contributing Sub-Catchment Areas ID**	**Projected Average Day Flow (L/s)**	**Projected Peak Daily Flow (L/s)**	**SIZE (mm)**	**Slope (%)**	**Area m2**	**Wetted Perimeter**	**Hydraulic Radius**	**CAP (L/s)**	**Available[1] CAP (L/s)**	**Velocity (m/s)**
450mm Sewer - Southeast Corner of Taylor-Kidd Blvd and County Rd 6	Proposed MH	PS	SAN1-5, SAN7-9, SAN11-17 & SAN19	16.85	74.13	**450**	**1.00%**	**0.16**	**1.41**	**0.11**	**285.11**	**120.00**	**1.79**
(Taylor-Kidd Pumping Station Catchment Area Connection)													
200mm Sewer - County Rd 6 and future Jack Kippen Place	New Connection		SAN6, SAN10 & SAN18	5.06	21.19	**200**	**1.00%**	**0.03**	**0.63**	**0.05**	**32.80**	**15.00**	**1.04**
(Lakeview Pumping Station Catchment Area Connection)													
525mm Sewer - Speers Blvd and Raycraft Drive	MH 53	MH54		TBD		**525**	**0.30%**	**0.22**	**1.65**	**0.13**	**235.55**	**236.00**	**1.09**
(Lakeview Pumping Station Catchment Area Connection)													
200mm Sewer - Kildare Avenue	MH 707	MH 711				**200**	**0.50%**	**0.03**	**0.63**	**0.05**	**23.19**	**23.00**	**0.74**
(Lakeview Pumping Station Catchment Area Connection)	MH 711	MH 708				**200**	**1.00%**	**0.03**	**0.63**	**0.05**	**32.80**		**1.04**
	MH 708	MH 709				**200**	**1.00%**	**0.03**	**0.63**	**0.05**	**32.80**		**1.04**
	MH 709	MH 710				**200**	**1.00%**	**0.03**	**0.63**	**0.05**	**32.80**		**1.04**
	MH 710	MH 713				**200**	**0.44%**	**0.03**	**0.63**	**0.05**	**21.76**		**0.69**
	MH 713	MH 656				**200**	**0.40%**	**0.03**	**0.63**	**0.05**	**20.74**		**0.66**
	MH 656	MH 655		TBD		**200**	**0.50%**	**0.03**	**0.63**	**0.05**	**23.19**		**0.74**
	MH 655	MH 654				**200**	**0.50%**	**0.03**	**0.63**	**0.05**	**23.19**		**0.74**
	MH 654	MH 601				**200**	**0.00%**	**0.03**	**0.63**	**0.05**	**2.07**		**0.07**
	MH 601	MH 600				**200**	**0.48%**	**0.03**	**0.63**	**0.05**	**22.72**		**0.72**
	MH 600	MH 599				**200**	**0.40%**	**0.03**	**0.63**	**0.05**	**20.74**		**0.66**
	MH 599	MH 614				**300**	**1.39%**	**0.07**	**0.94**	**0.08**	**114.01**		**1.61**
	MH 614	MH 740				**300**	**1.00%**	**0.07**	**0.94**	**0.08**	**96.70**		**1.37**

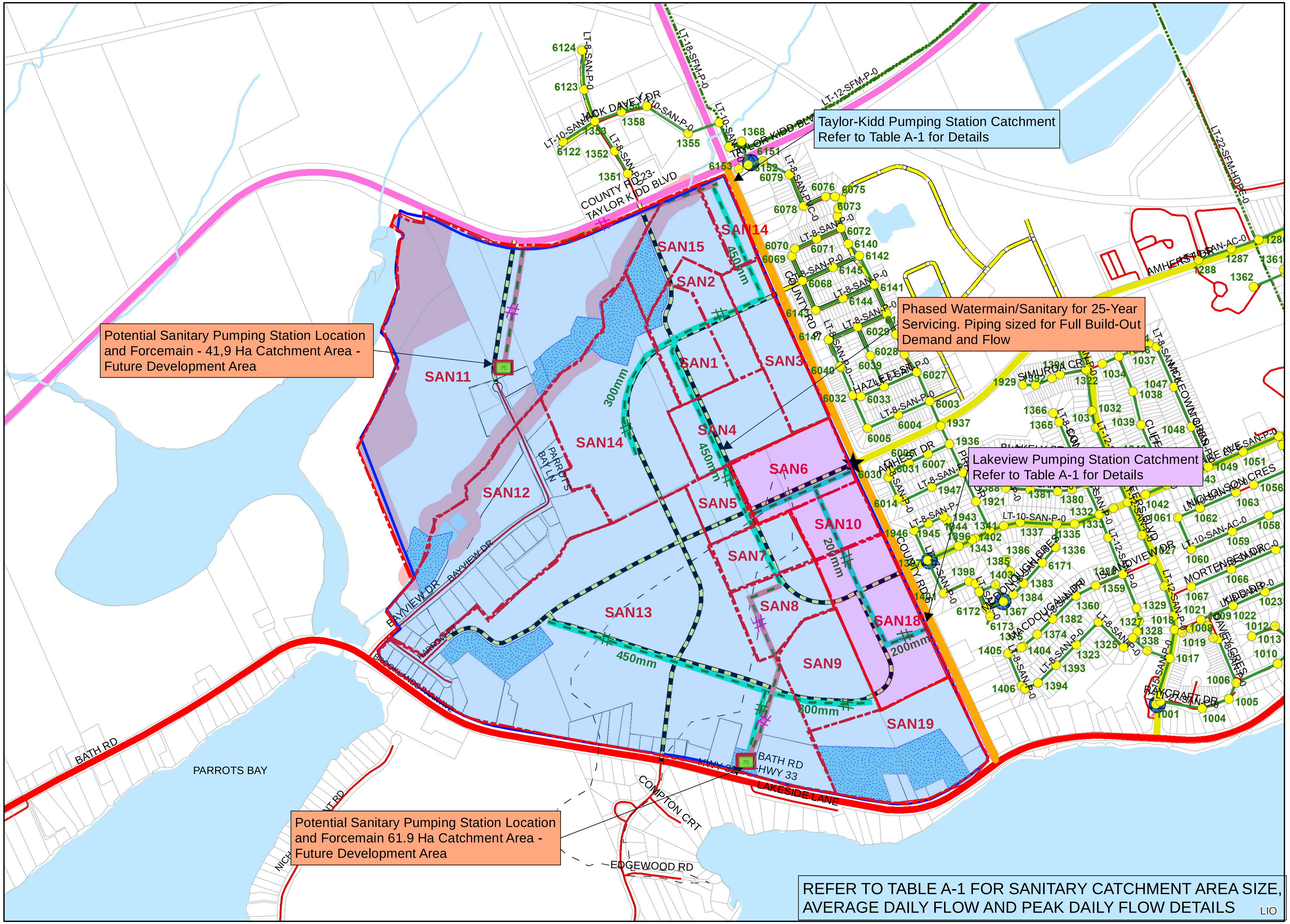
DESIGN PARAMETER			
Manning's n =	0.013		City of Kingston Site Plan Control Guidelines (2009)
Residential Flow Generation (q)=	350	L/cap/d	Loyalist Township Design Criteria
Commercial Flow Generation (q)=	350	L/cap/d	Loyalist Township Design Criteria
Infiltration Rate (I) =	0.14	L/s/Ha	City of Kingston Site Plan Control Guidelines (2009)

Notes: 1 - Per capacity review and Loyalist Township Infrastructure Master Plan Inputs
Refer to Drawings C-1 and D-2 for sub-catchment area locations and further details

Designed By:	**PROJECT:**
Michael Flowers, P.Eng	**Amherstview West Secondary Plan**
Checked By:	**LOCATION:**
Antoine Lahaie, P.Eng.	**Amherstview, Ontario**
Project Number: 211-01353-00	**Date: June, 2024**

Appendix

C WATER AND SANITARY – GAP ANALYSIS



wsp

1224 GARDINERS RD, SUITE 201
KINGSTON, ONTARIO,
CANADA, K7P 0G2
WWW.WSPGROUP.COM

Gateway Feature

Conceptual Road Network
Proposed Collector

Existing Road Network
Provincial Highway
Major Arterial
Urban Arterial
Urban Collector
Local

Future Roads
Collector Residential

Cultural Heritage
* Property with Potential Heritage Value

Development Constraint
** High Constraint - Natural Environment Area

Servicing
*** Edgewood Municipal Drain
Water Servicing Possible Connections
Sanitary Servicing Possible Conection

Sanitary Auxilliary Equipment
Air Release Valve
ByPass
ByPass Chamber
Diversion Chamber
Meter
Sanitary Pumping Station
Valve Chamber
Water Pollution Control Plant

Sanitary Manholes
Manhole

Sanitary Sewers
San Sewers

Sanitary Laterals
Sanitary Laterals

Potential Infrastructure
Potential Gravity Trunk Sewer
Potential Forcemain
Potential Sanitary Pumping Station Facility

Scale:
0 45 90 180 Meters
1:10,000

Project:
LOYALIST-AMHERSTVIEW WEST SECONDARY PLAN

Title:
AMHERSTVIEW WEST POTENTIAL SANITARY SERVICING OPTION SUBCATCHMENT AREAS

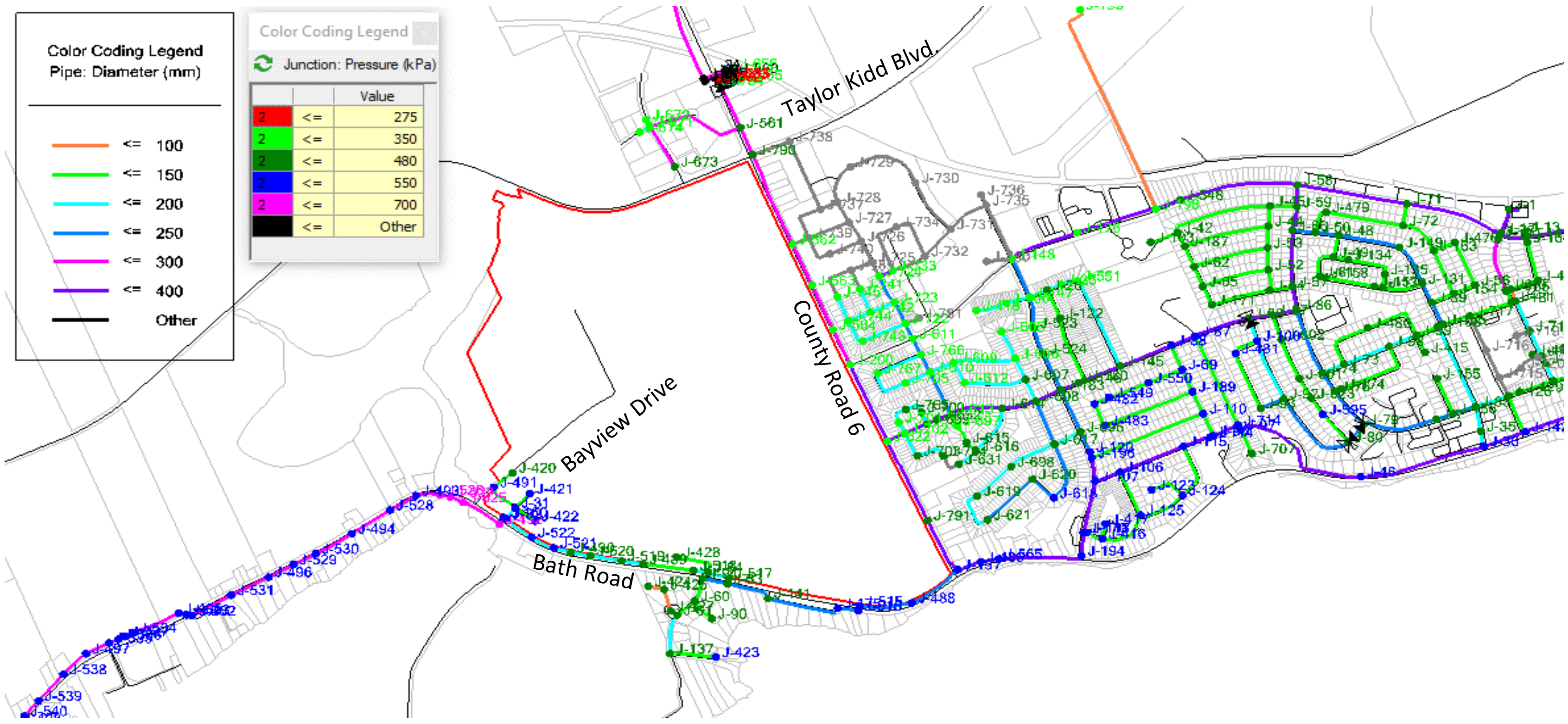
Project No.: 211-01353-00	Date: JULY 2024

Drawn By:	Checked By:	Figure No.:
DM	MF	C-1

File Location:C:\Pro\Amherstview\Servicing Map\211-01353-00_WaterSan-Preffered Option-C-1_REV6_.mxd

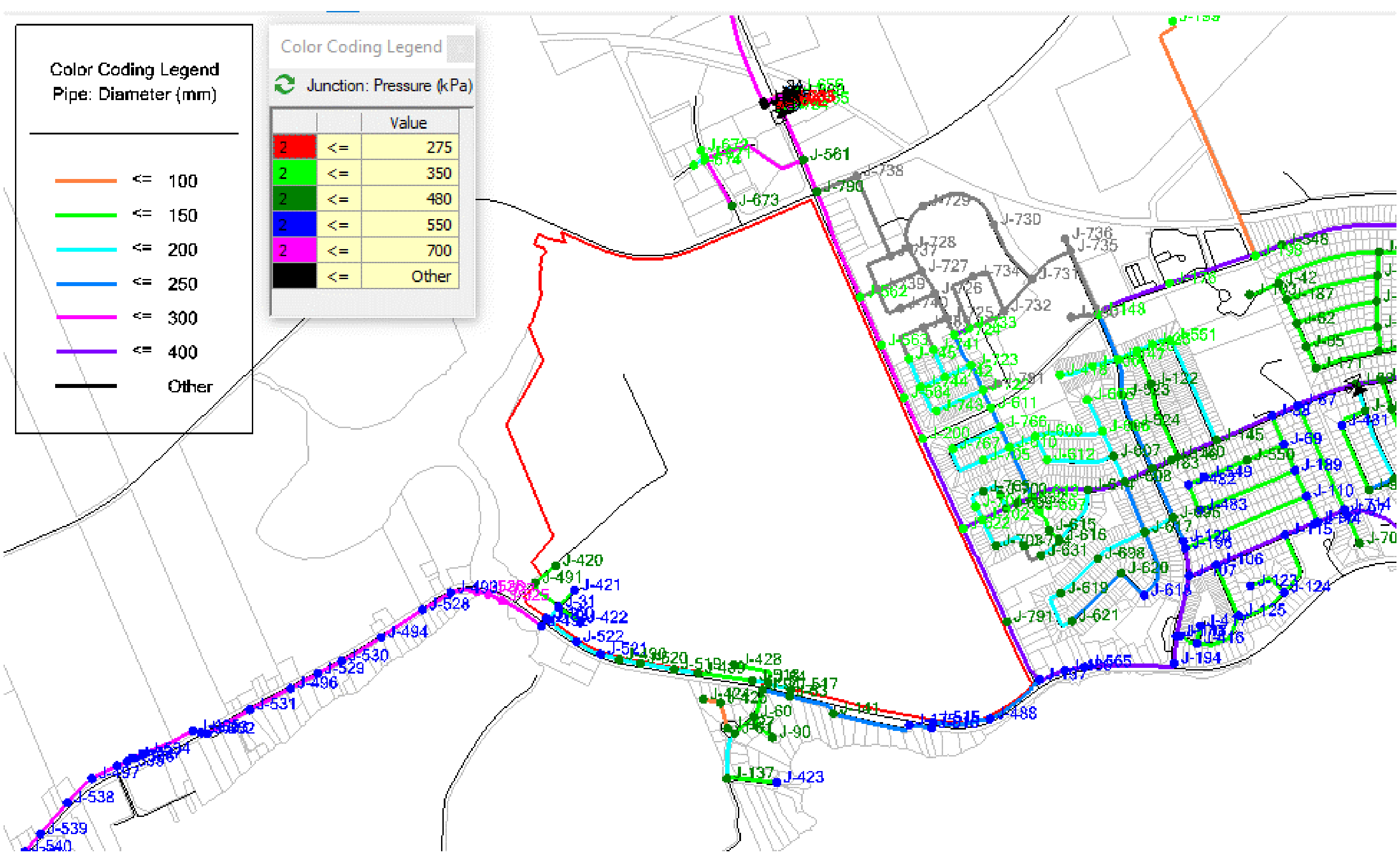
Existing Average Day - SS

Flow Supplied: 165 L/s



Existing Peak Hour - SS

ow Supplied: 166 L/s



Existing Max Day - SS

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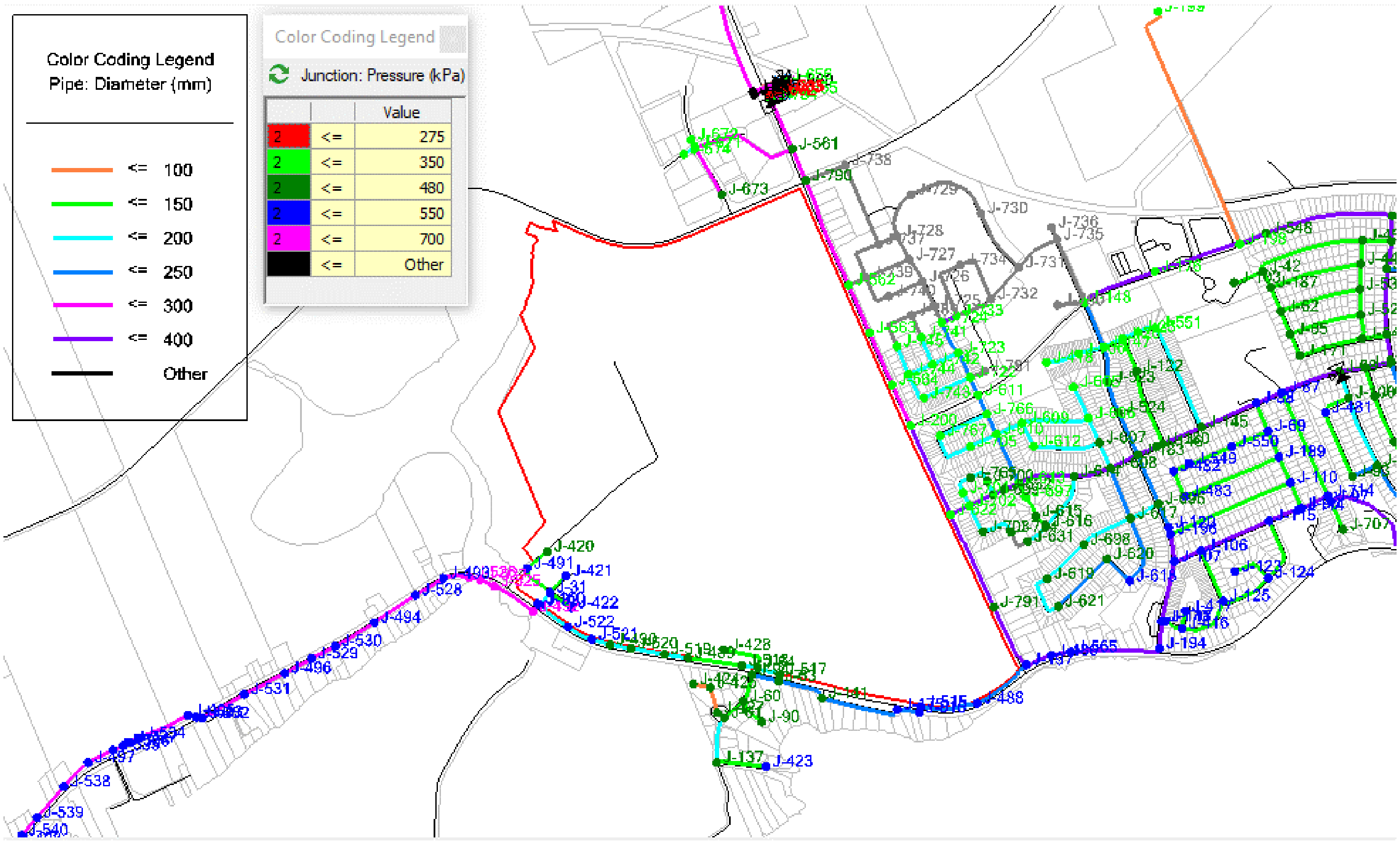

Near Term (2024) Average Day - SS

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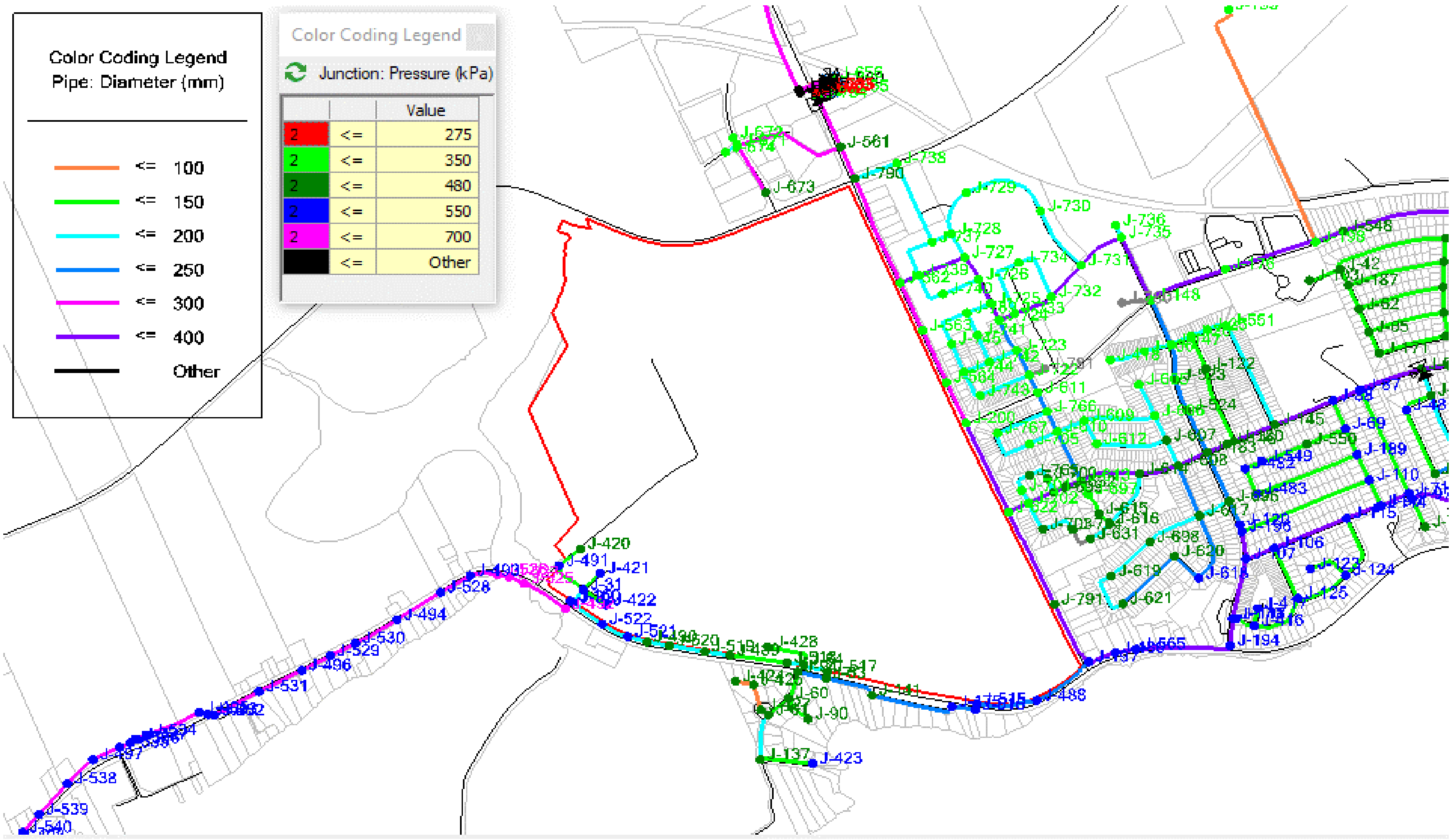
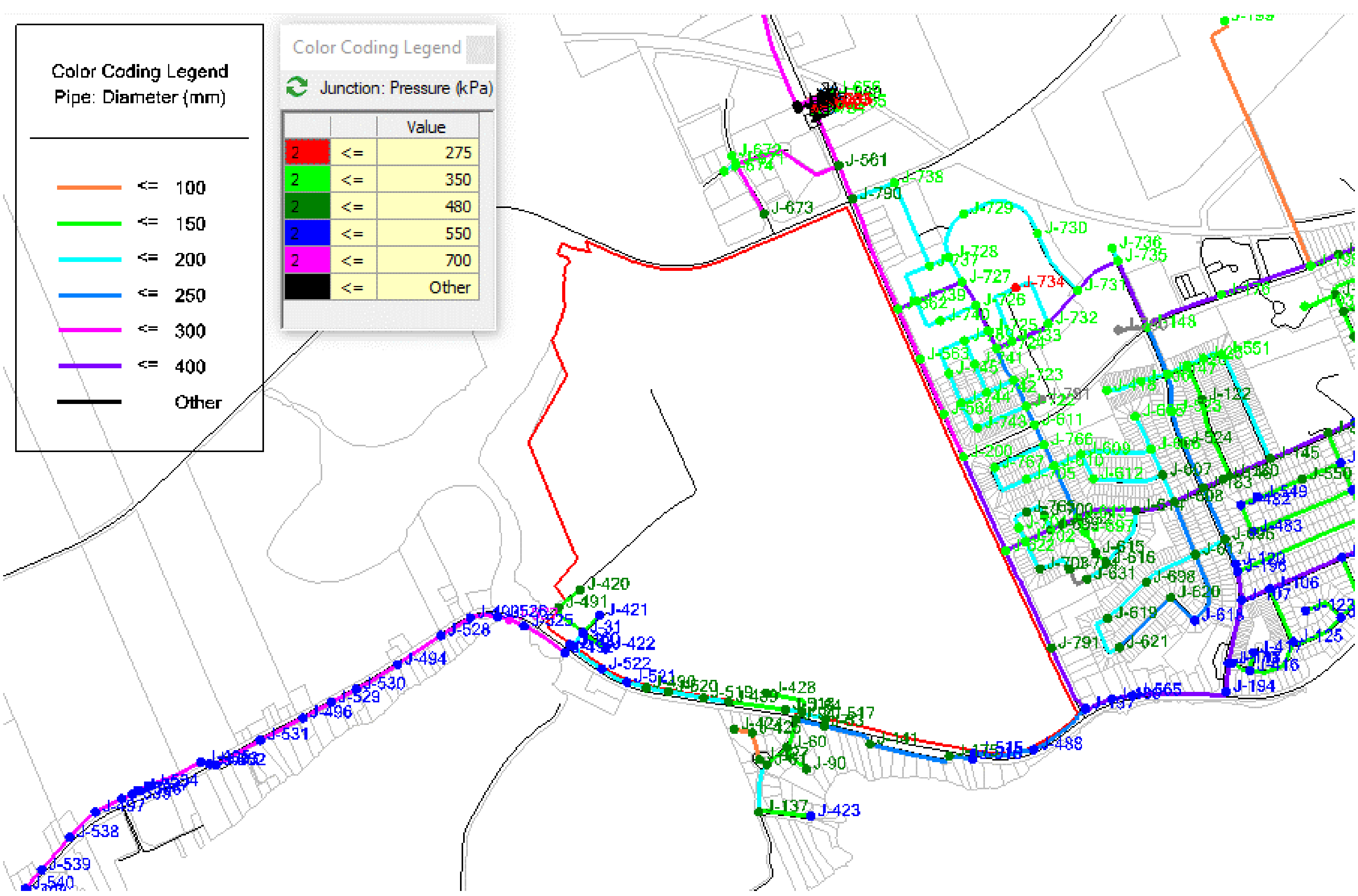


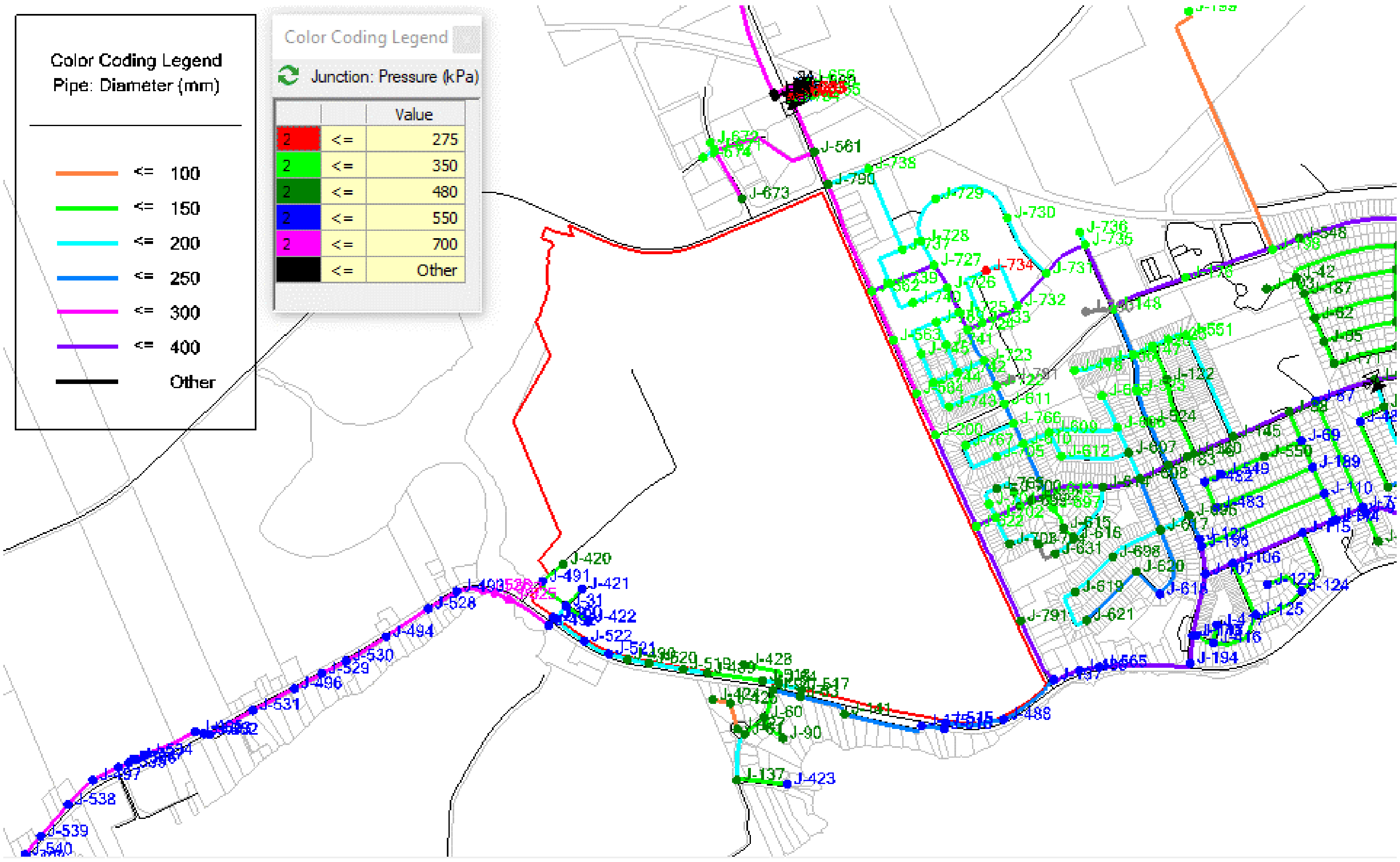
Near Term (2024) Peak Hour - SS

ow Supplied: 166 L/s



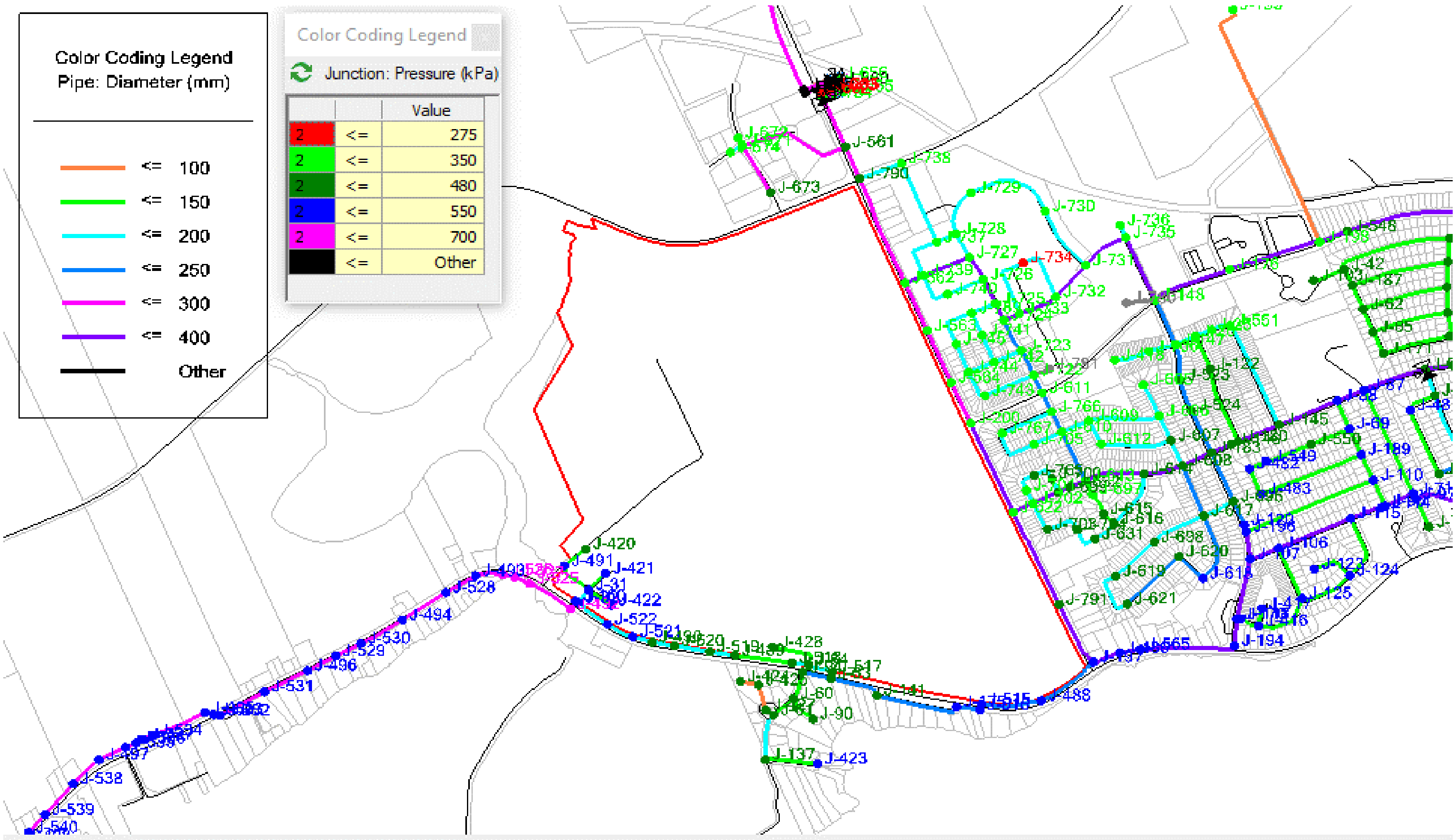
Near Term (2024) Max Day - SS

Flow Supplied: 166 L/s



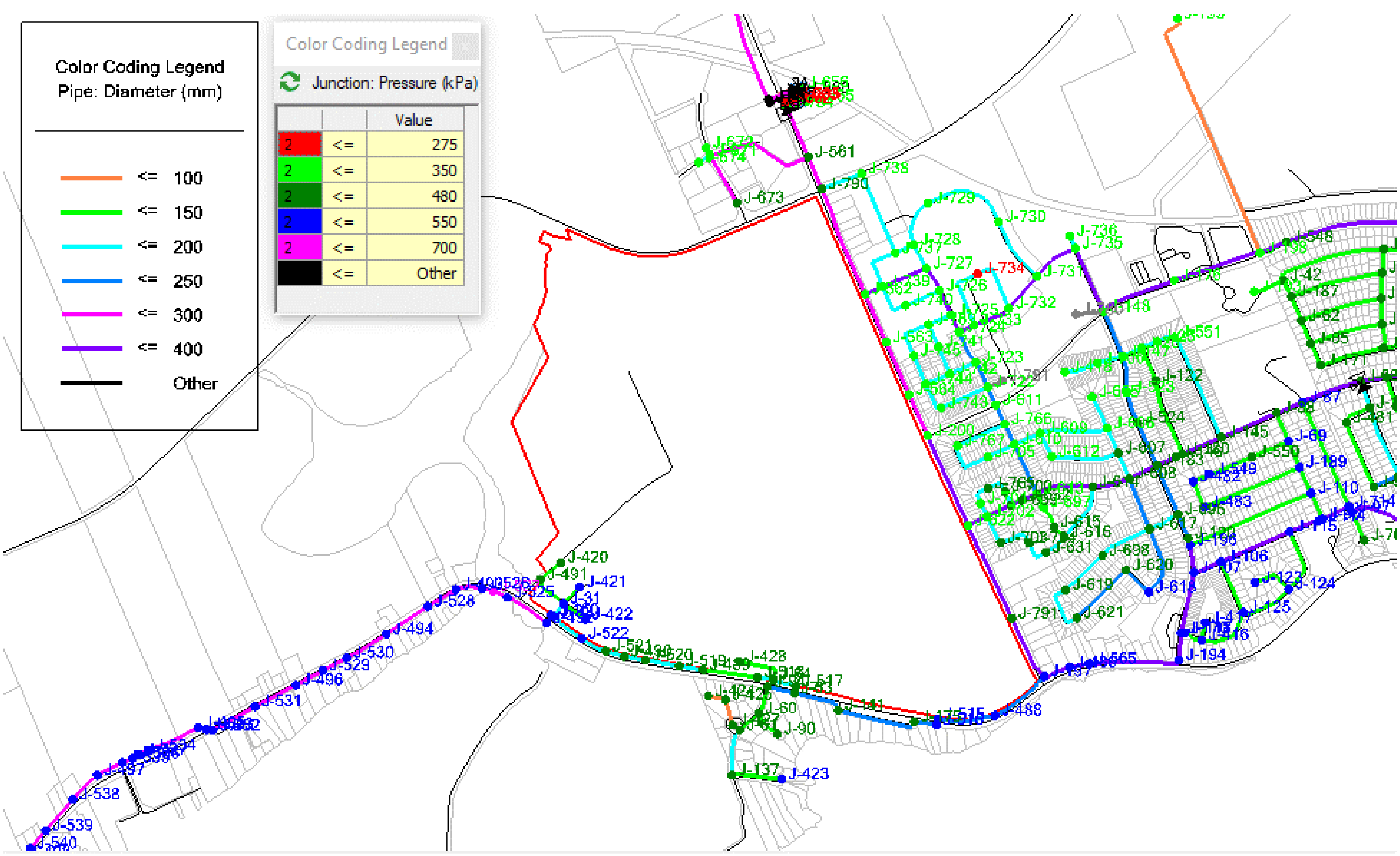
Mid Term (2034) Average Day - SS

Flow Supplied: 165 L/s



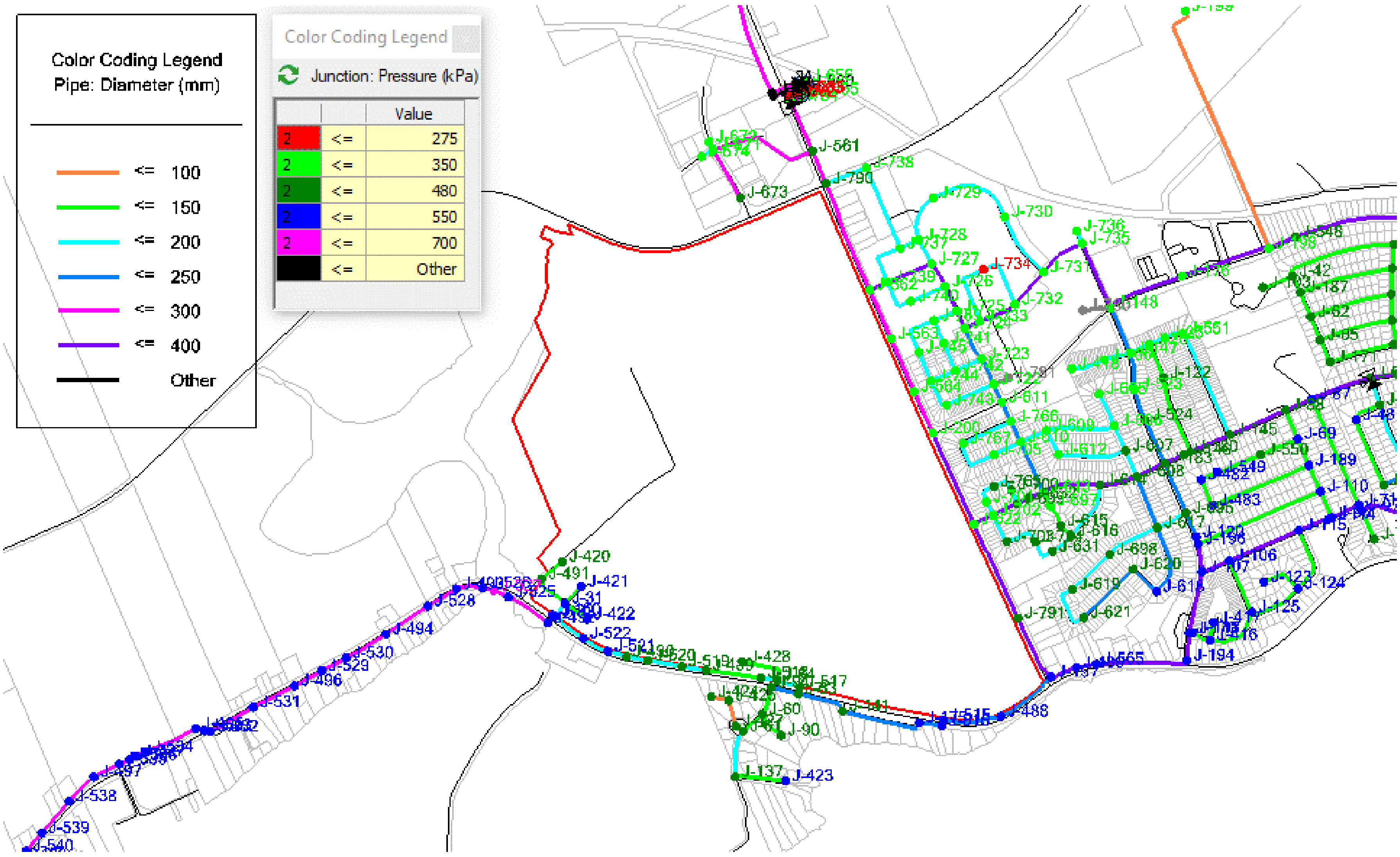
Mid Term (2034) Peak Hour - SS

Flow Supplied: 165 L/s



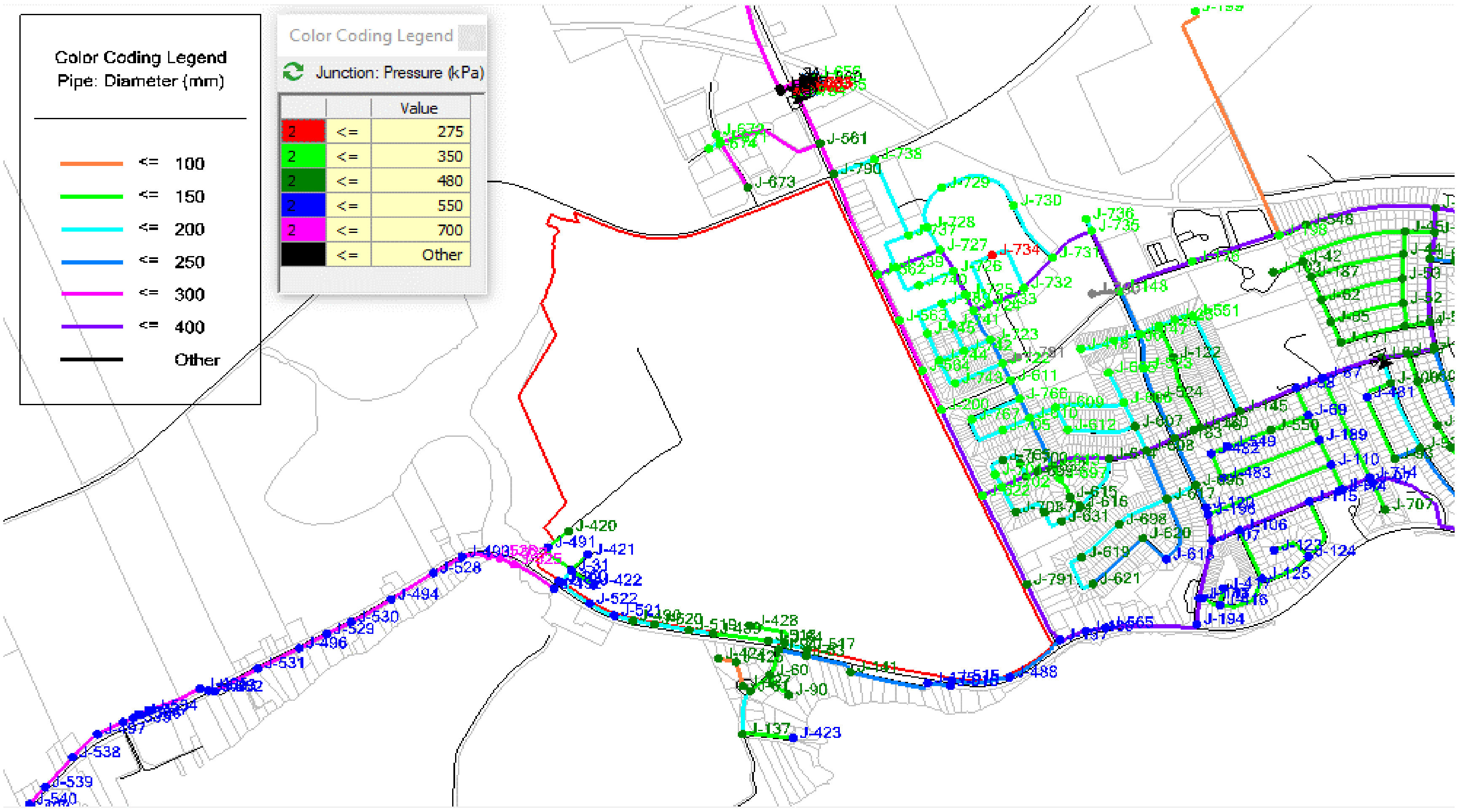
Mid Term (2034) Max Day - SS

Flow Supplied: 166 L/s



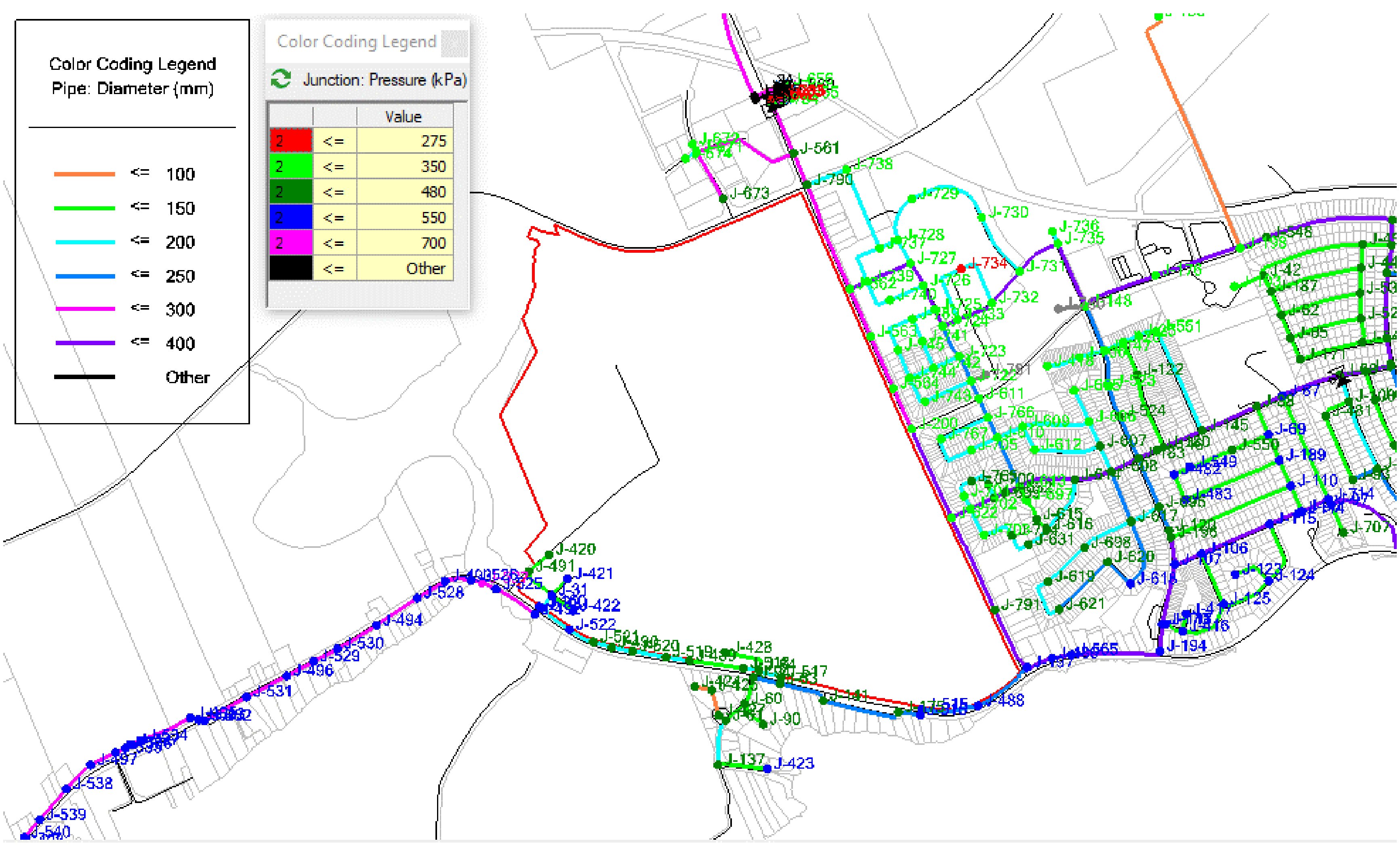
Long Term (2044) Average Day - SS

Flow Supplied: 165 L/s



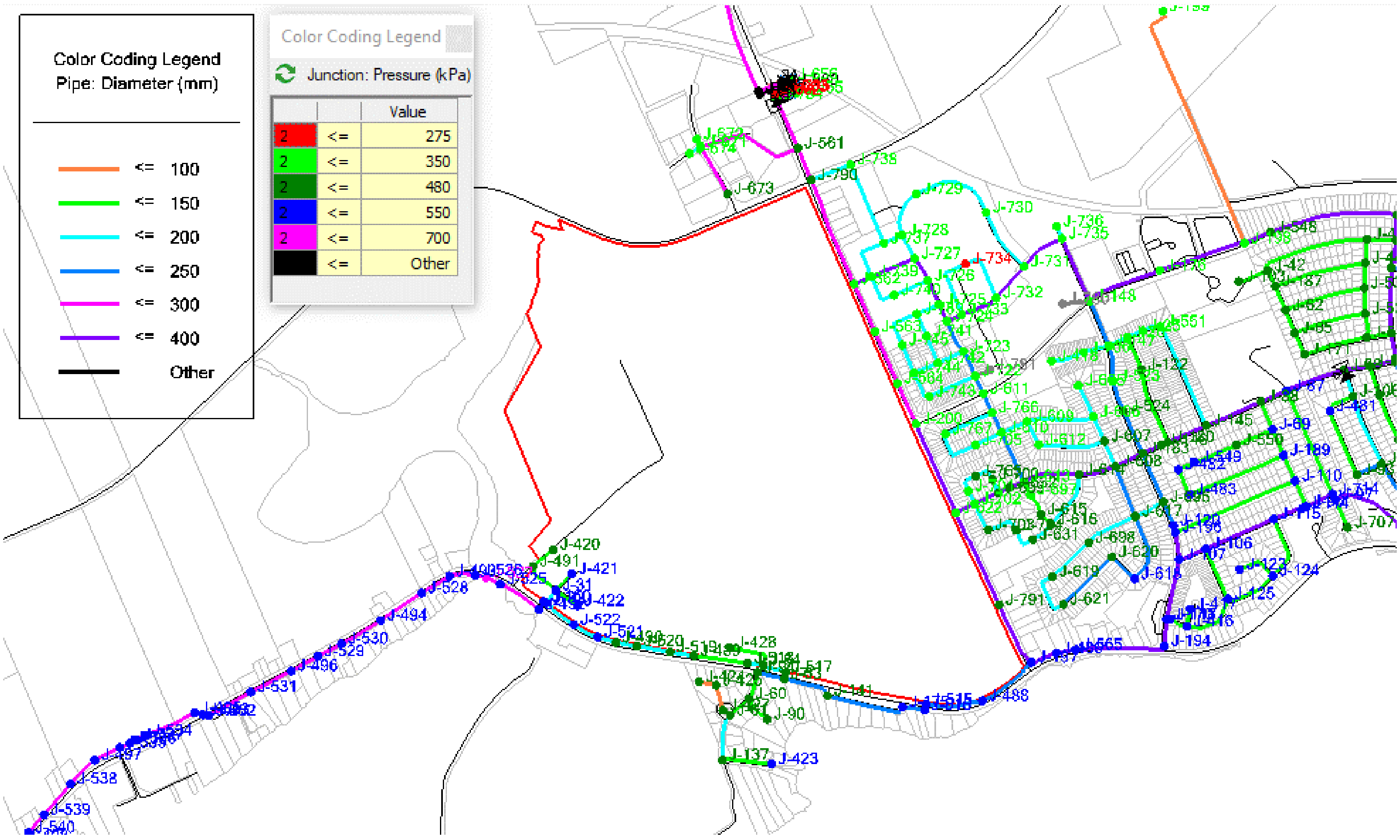
(2044) Peak Hour - SS

ow Supplied: 167 L/s



Long Term (2044) Max Day - SS

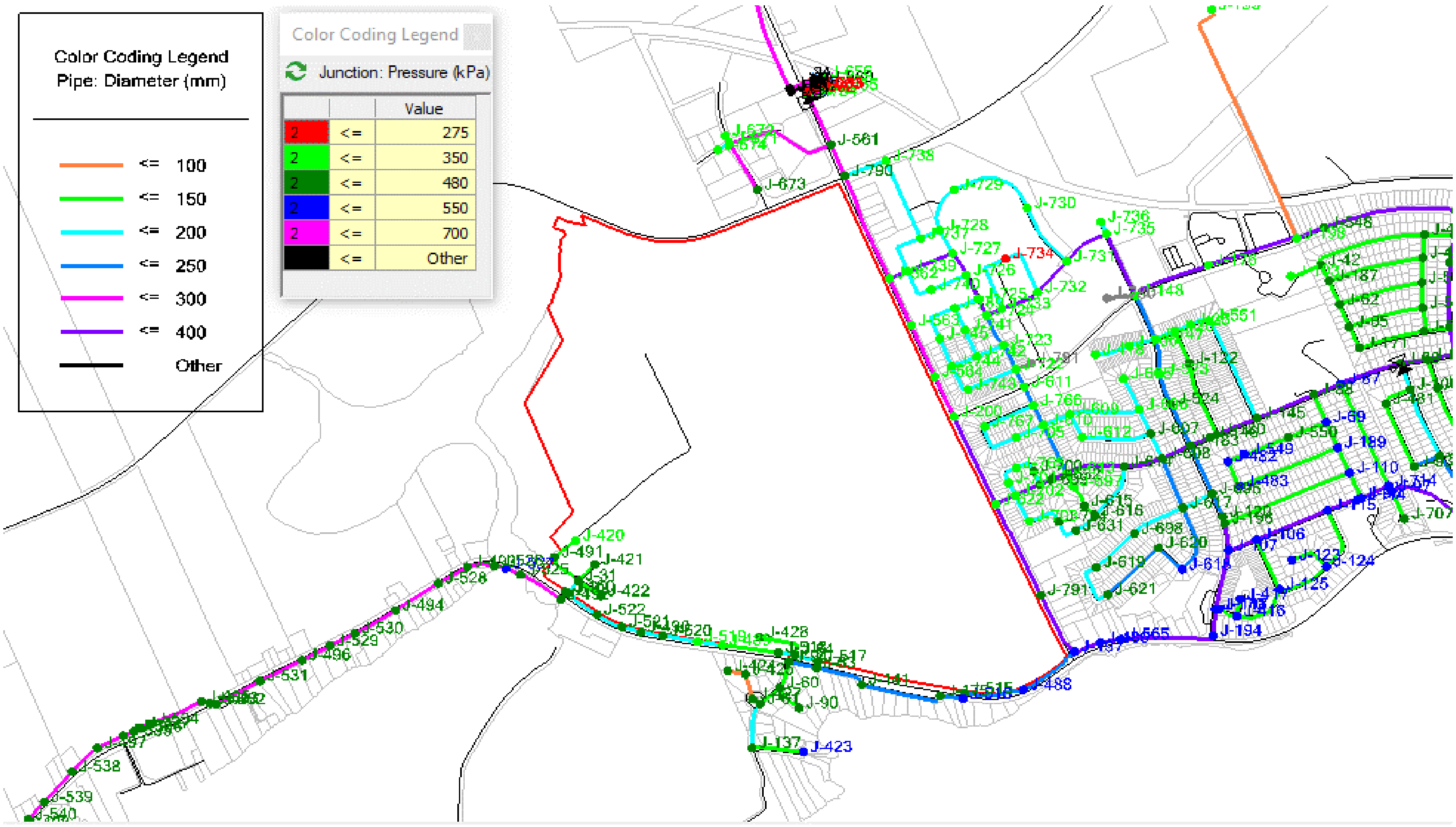
Flow Supplied: 166 L/s



Interconnected Long Term Average Day - SS

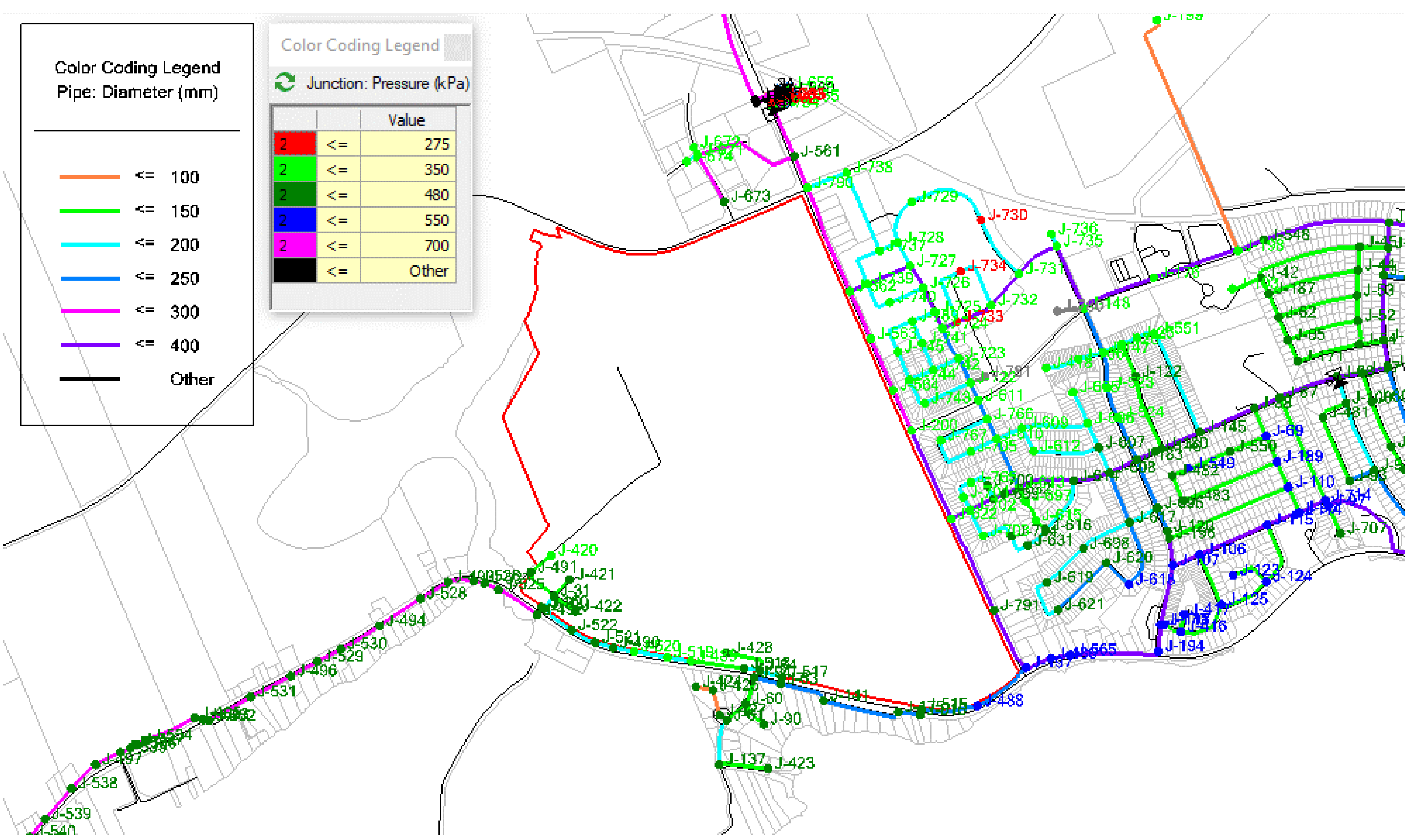
Flow Supplied: 166 L/s

Note: Int. refers to interconnection which is the connection between Bath watermain servicing and Amherstview watermain servicing



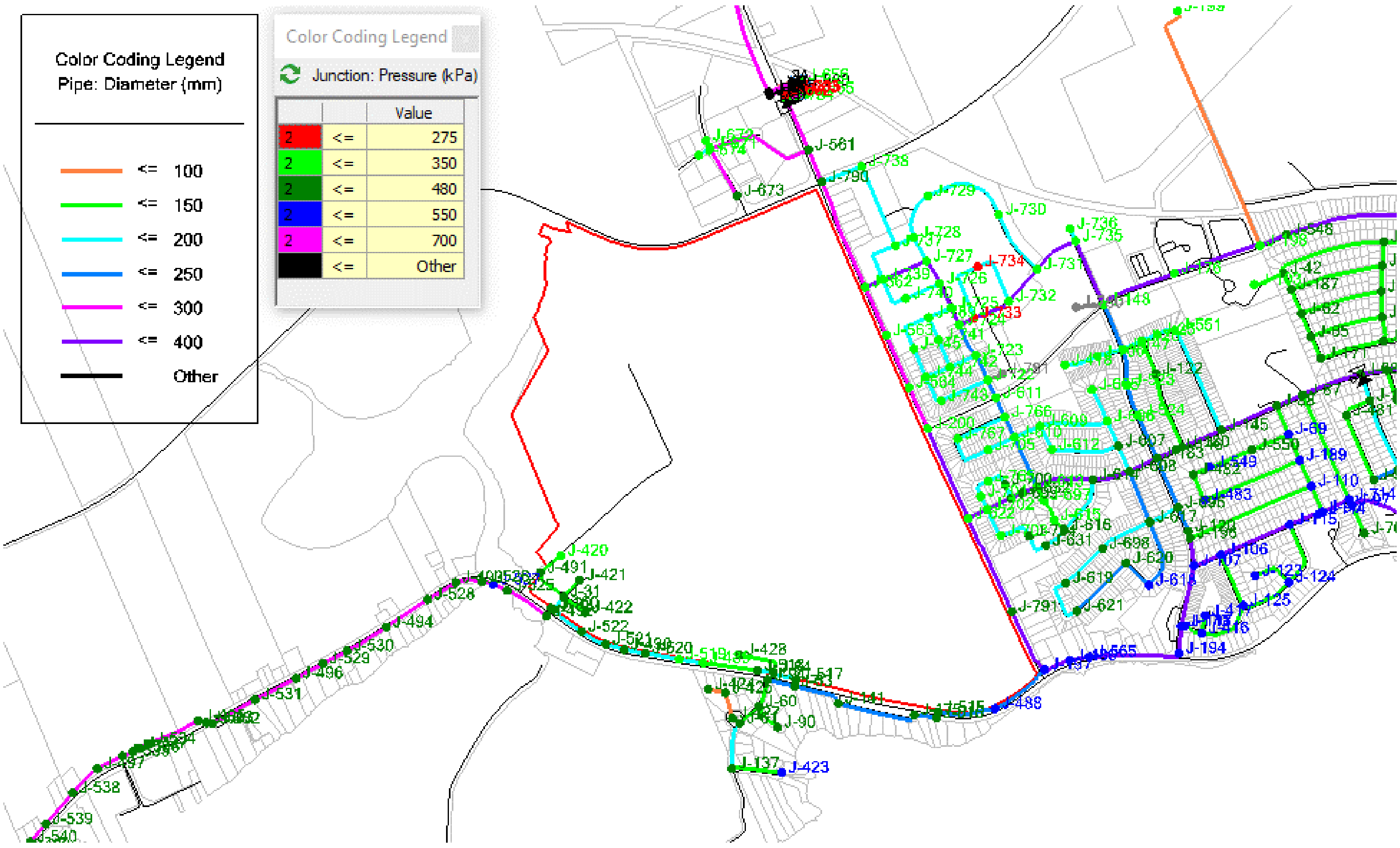
Long Term Peak Hour - SS

ow Supplied: 167 L/s



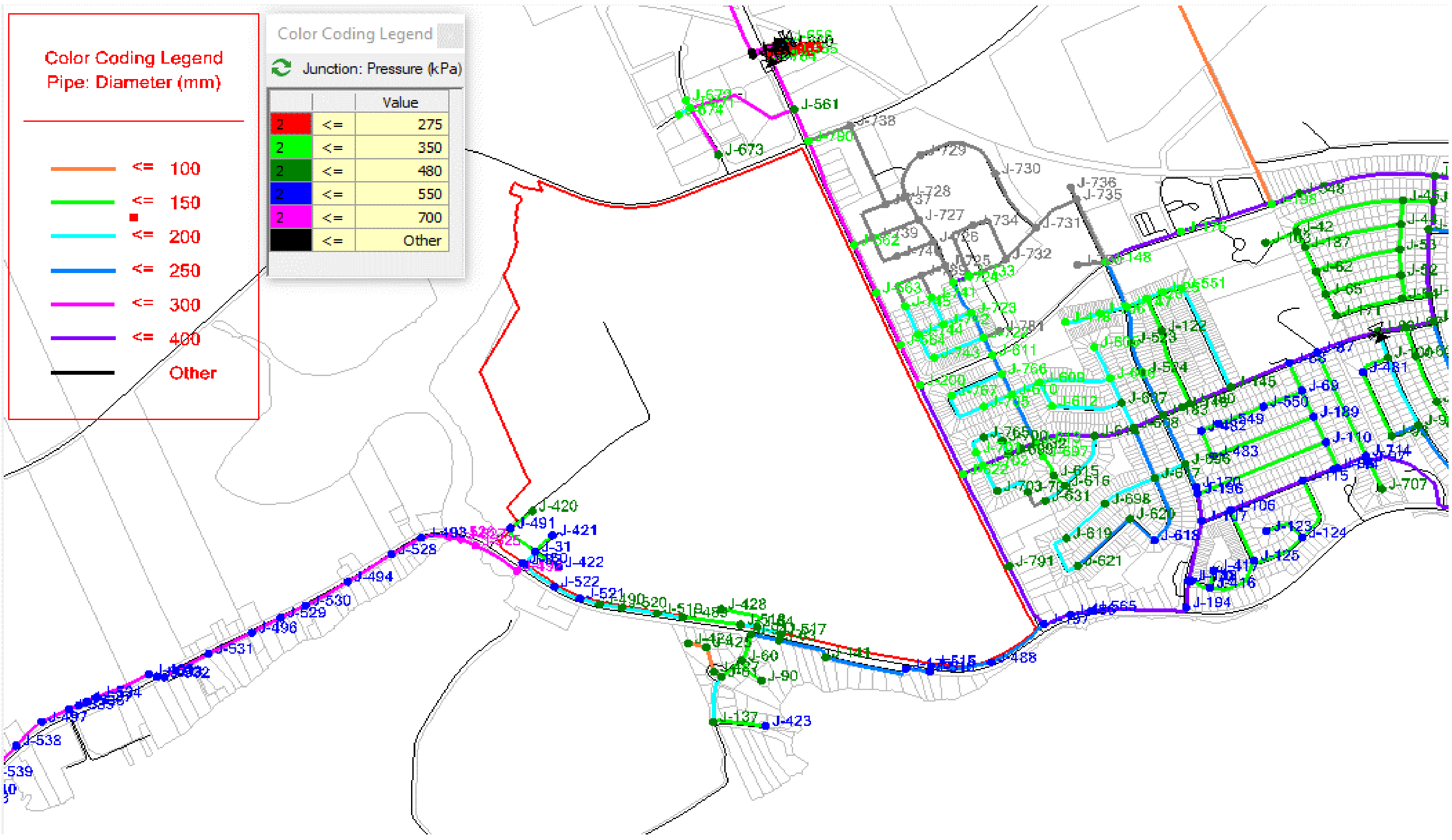
Interconnected Long Term Max Day - SS

Flow Supplied: 166 L/s

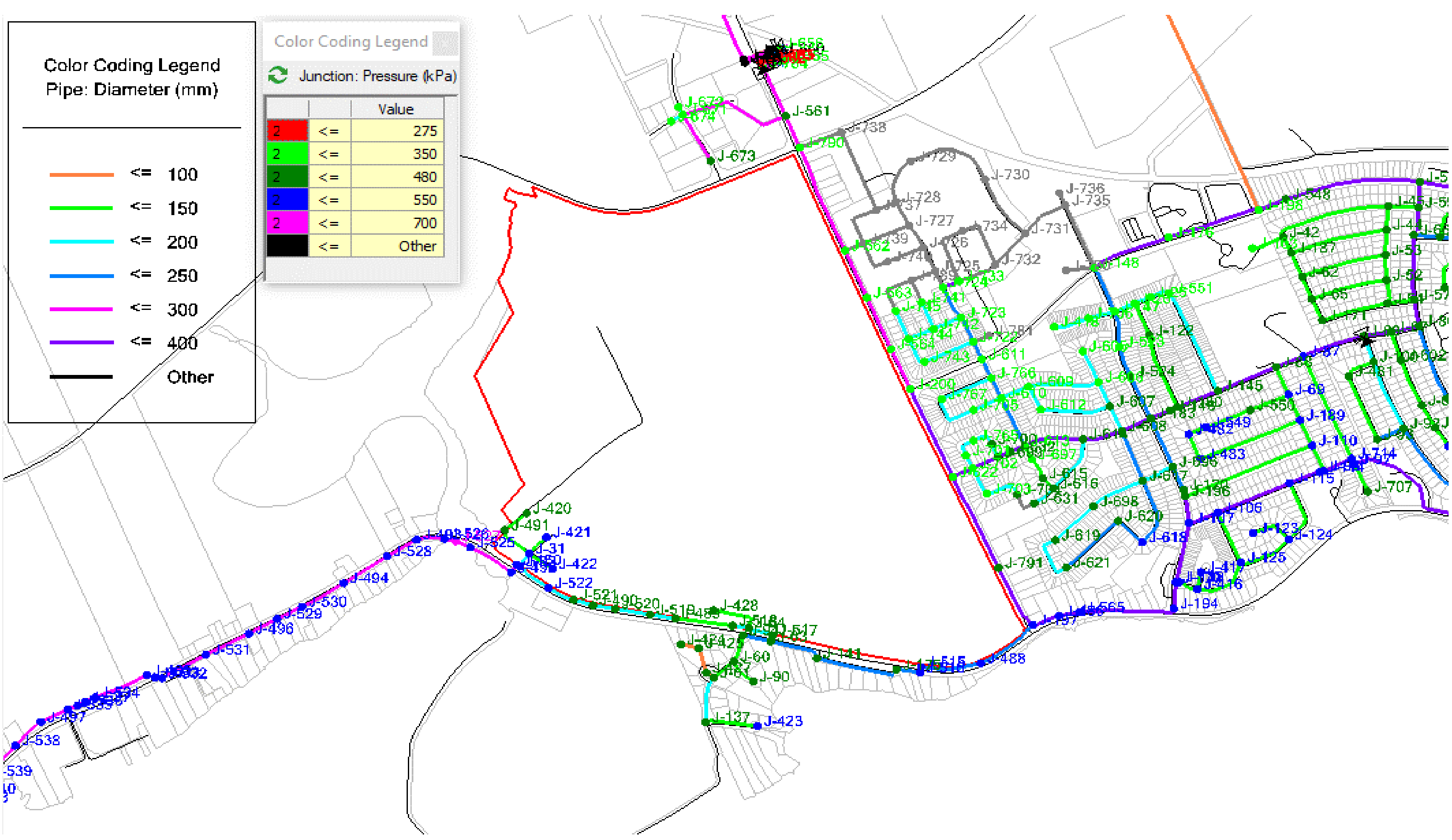


Amherstview West Existing Average Day - SS	
Flow Supplied:	165 L/s

Notes At node J200 (East end of Amherstview Drive)

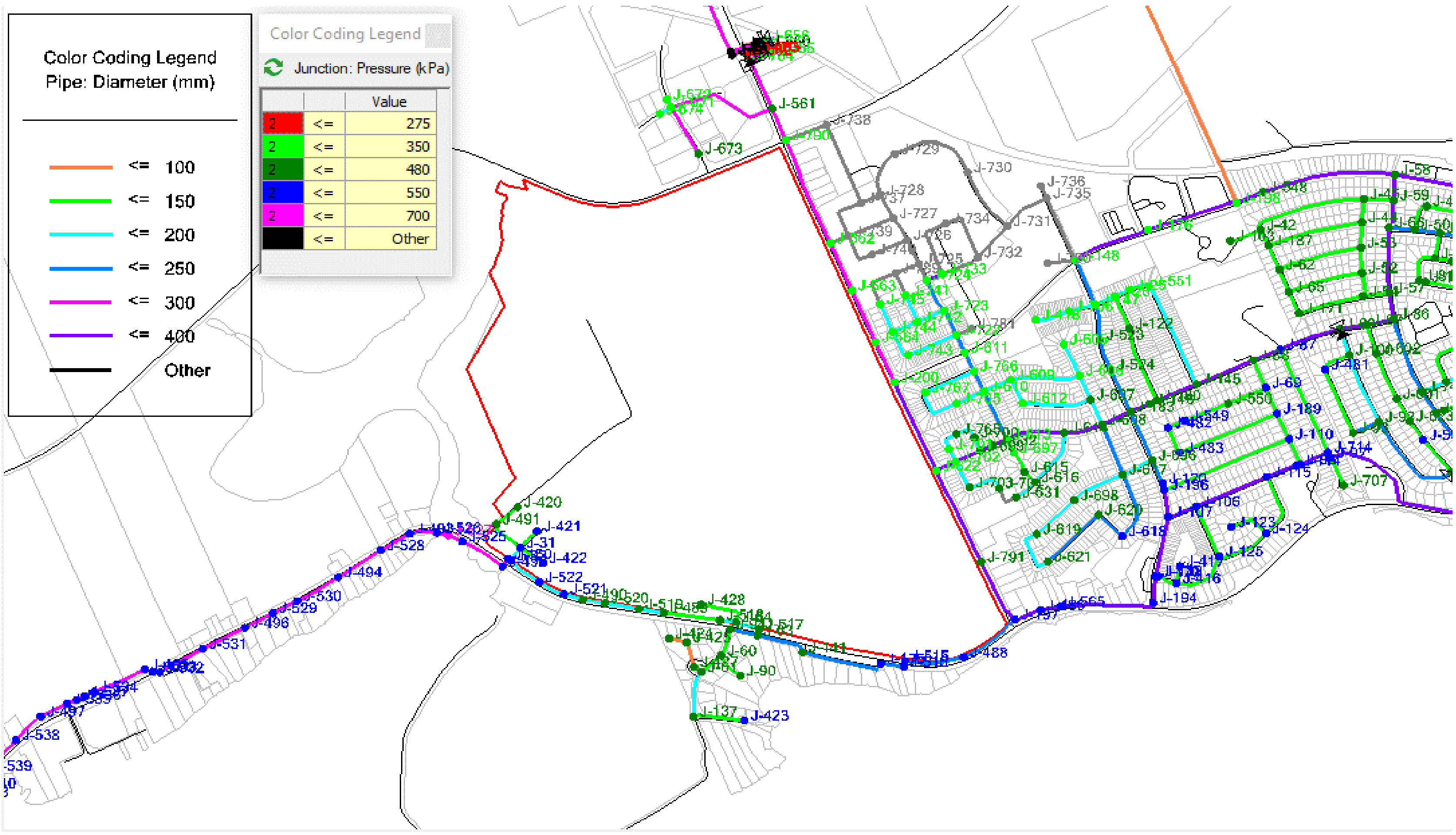


Amherstview West Existing Peak Hour - SS	
Flow Supplied:	166 L/s



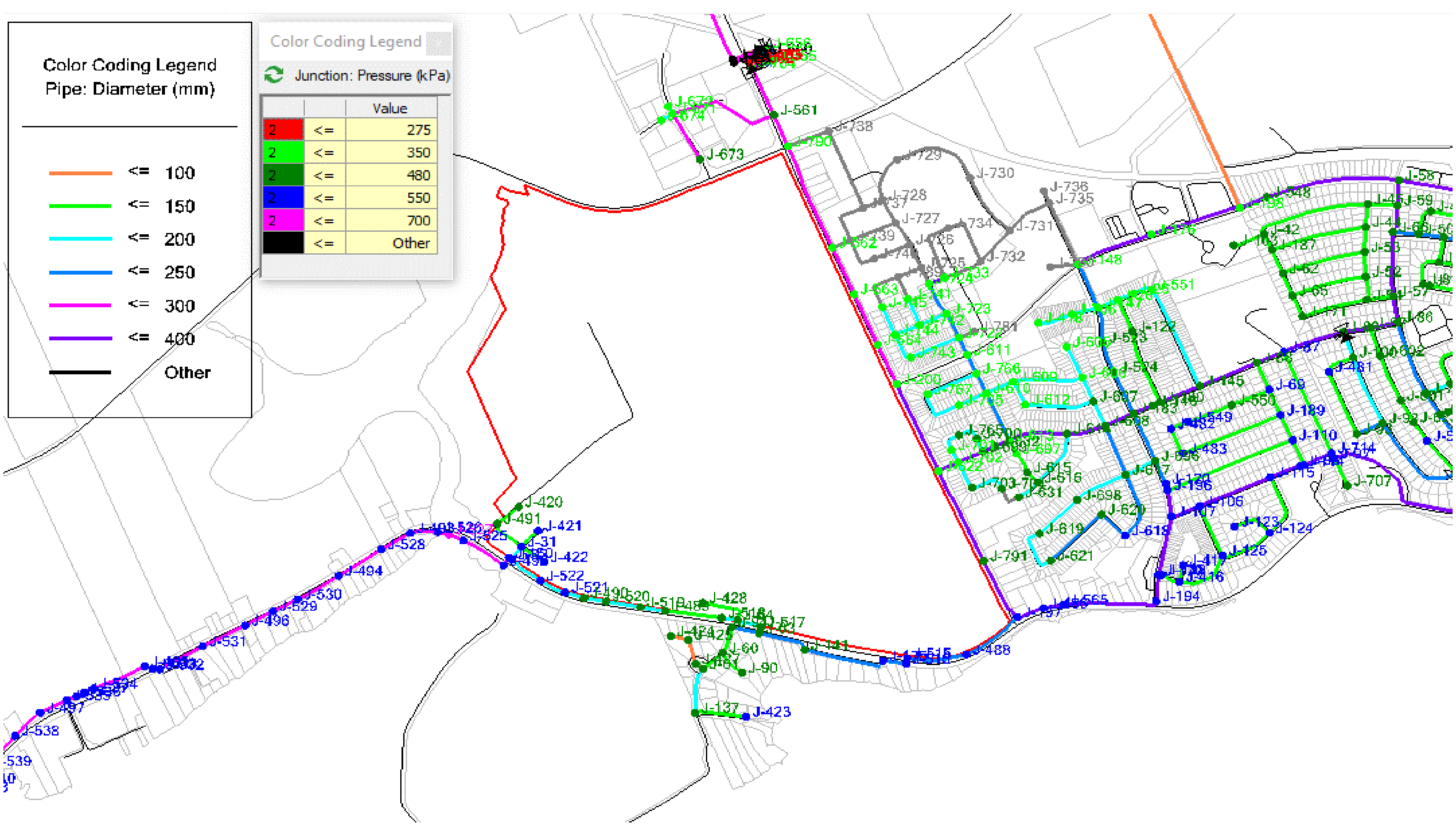
Amherstview West Existing Max Day - SS

Flow Supplied: 165 L/s



Amherstview West Existing Max Day + FF - SS

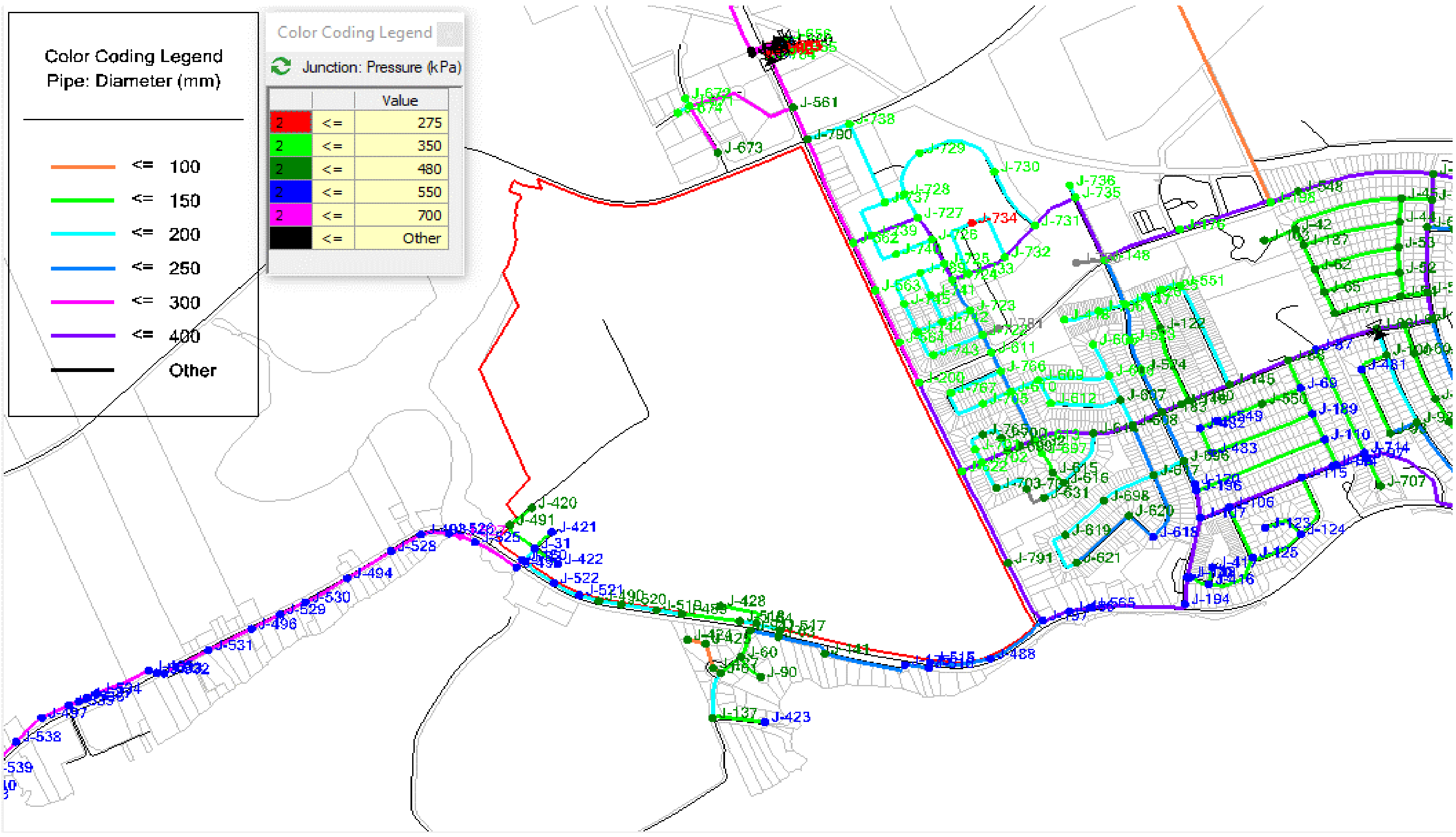
Flow Supplied: 165 L/s



Amherstview Drive - Sec. Plan Ex - Near Term Average Day - SS

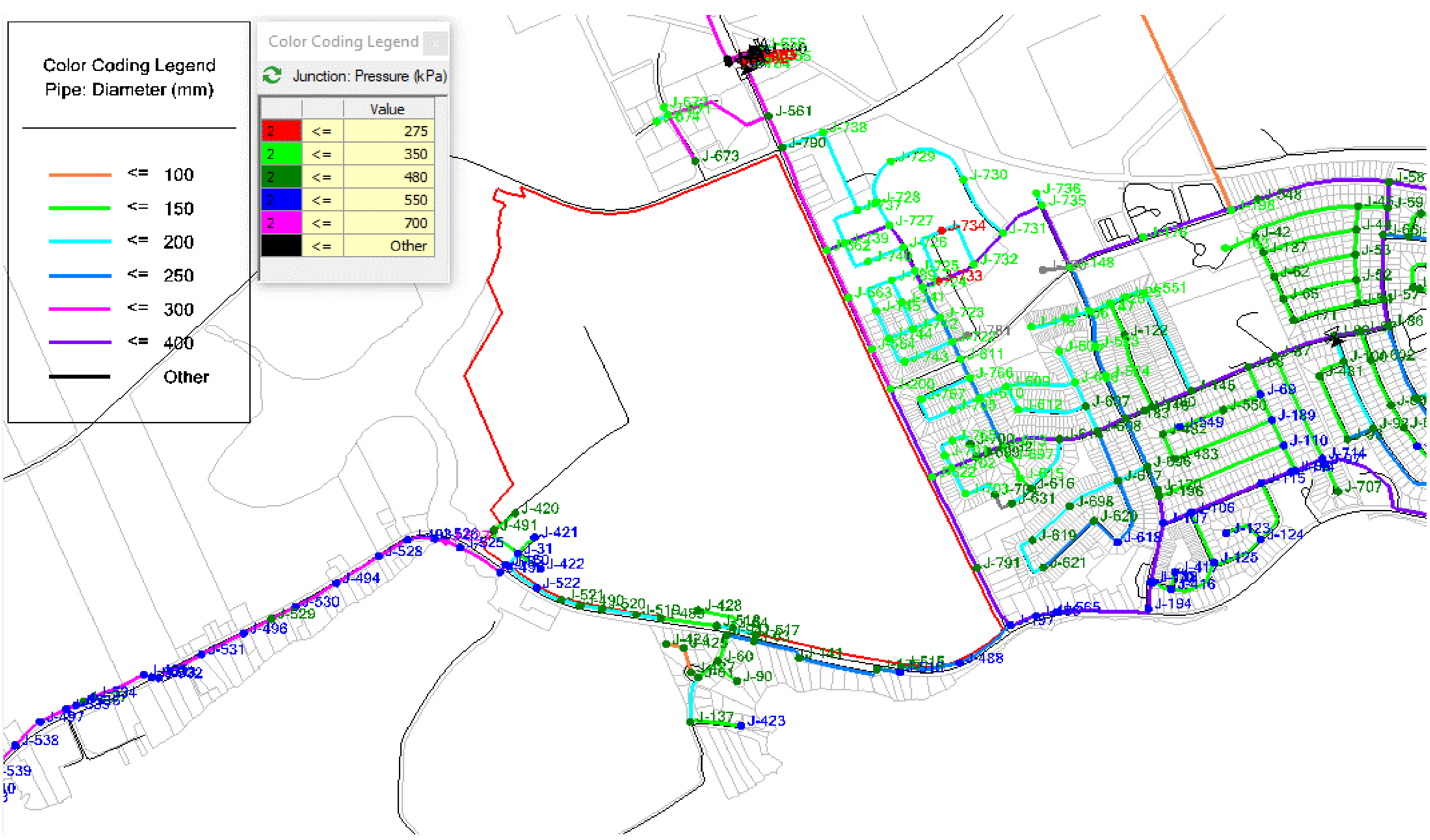
Flow Supplied: 165 L/s

Notes: At node J200 (East end of Amherstview Drive)



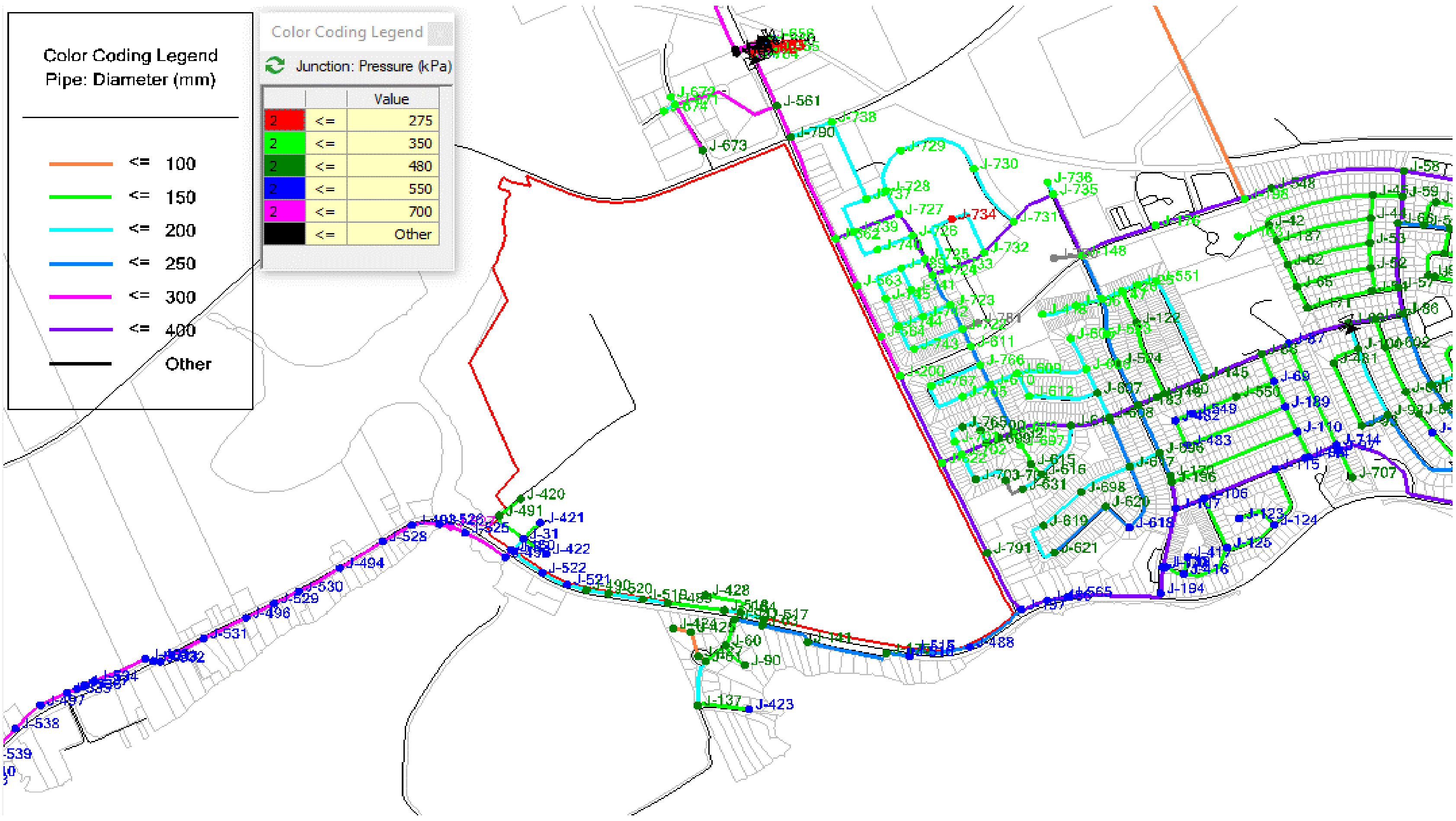
- Sec. Plan Ex - Near Term Peak Hour - SS

Flow Supplied: 167 L/s



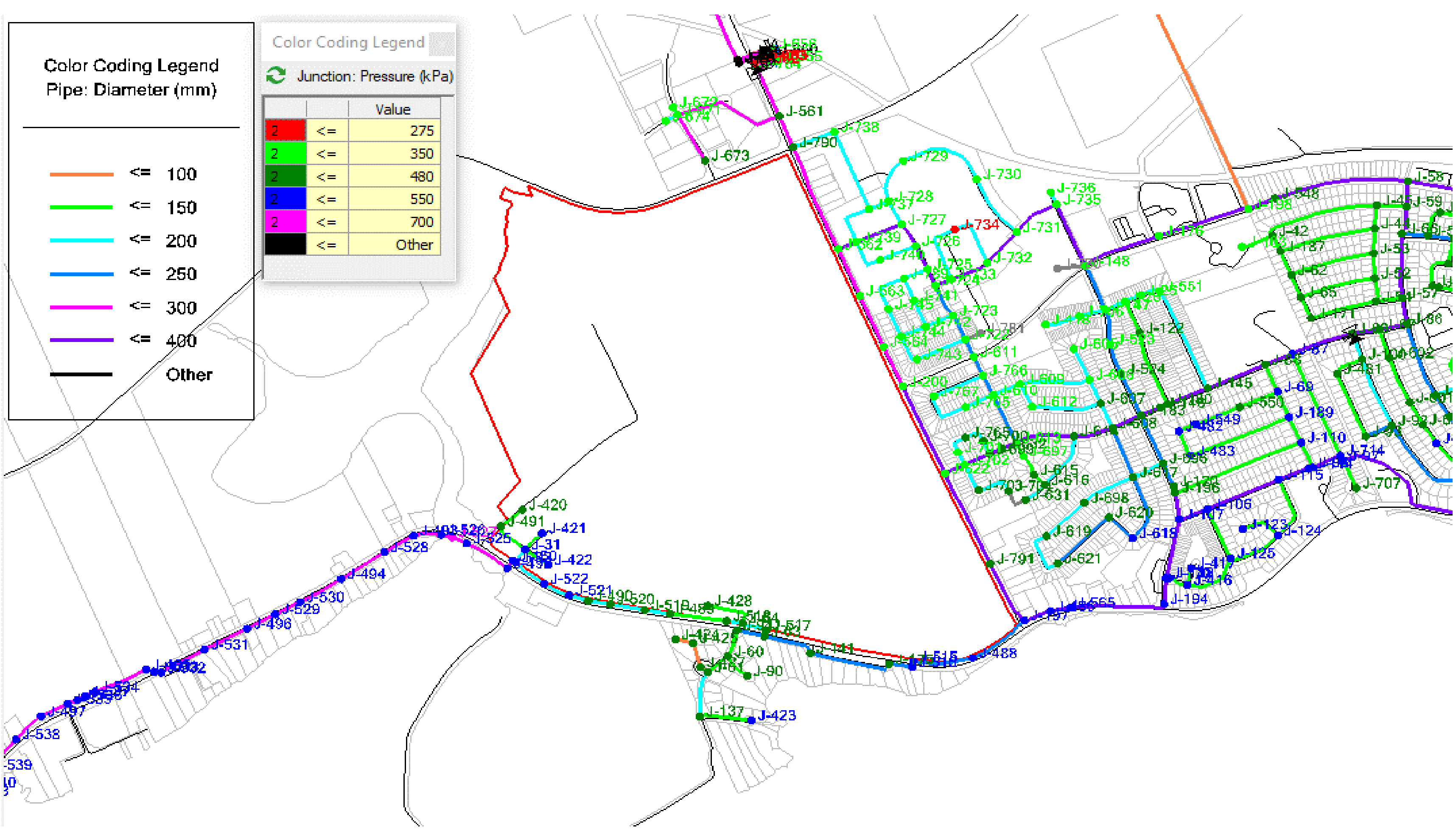
Amherstview Drive - Sec. Plan Ex - Near Term Max Day - SS

Flow Supplied: 166 L/s



Amherstview West Near Term Max Day + FF - SS

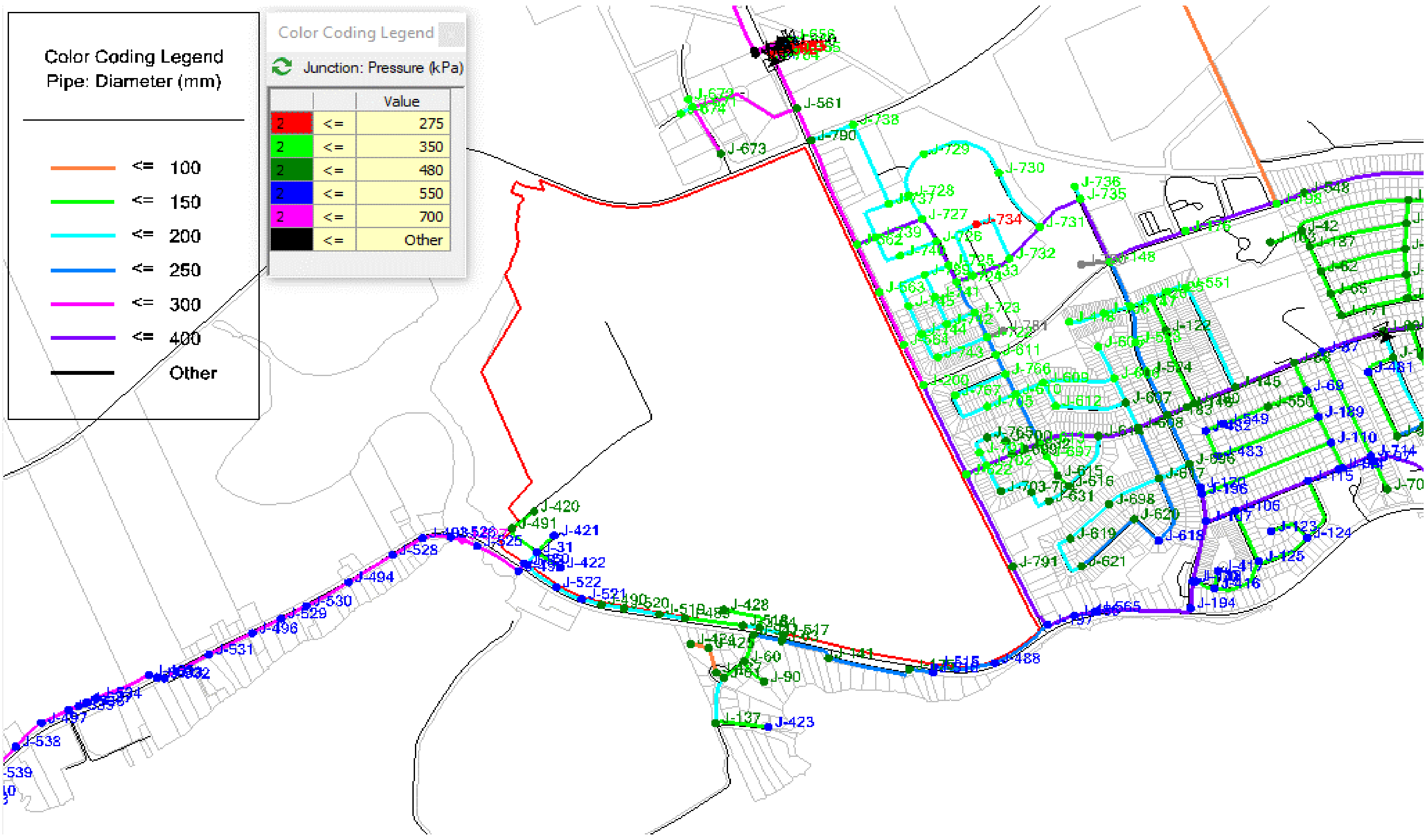
Flow Supplied: 166 L/s



Amherstview Drive - Sec. Plan Ex - Mid Term Average Day - SS

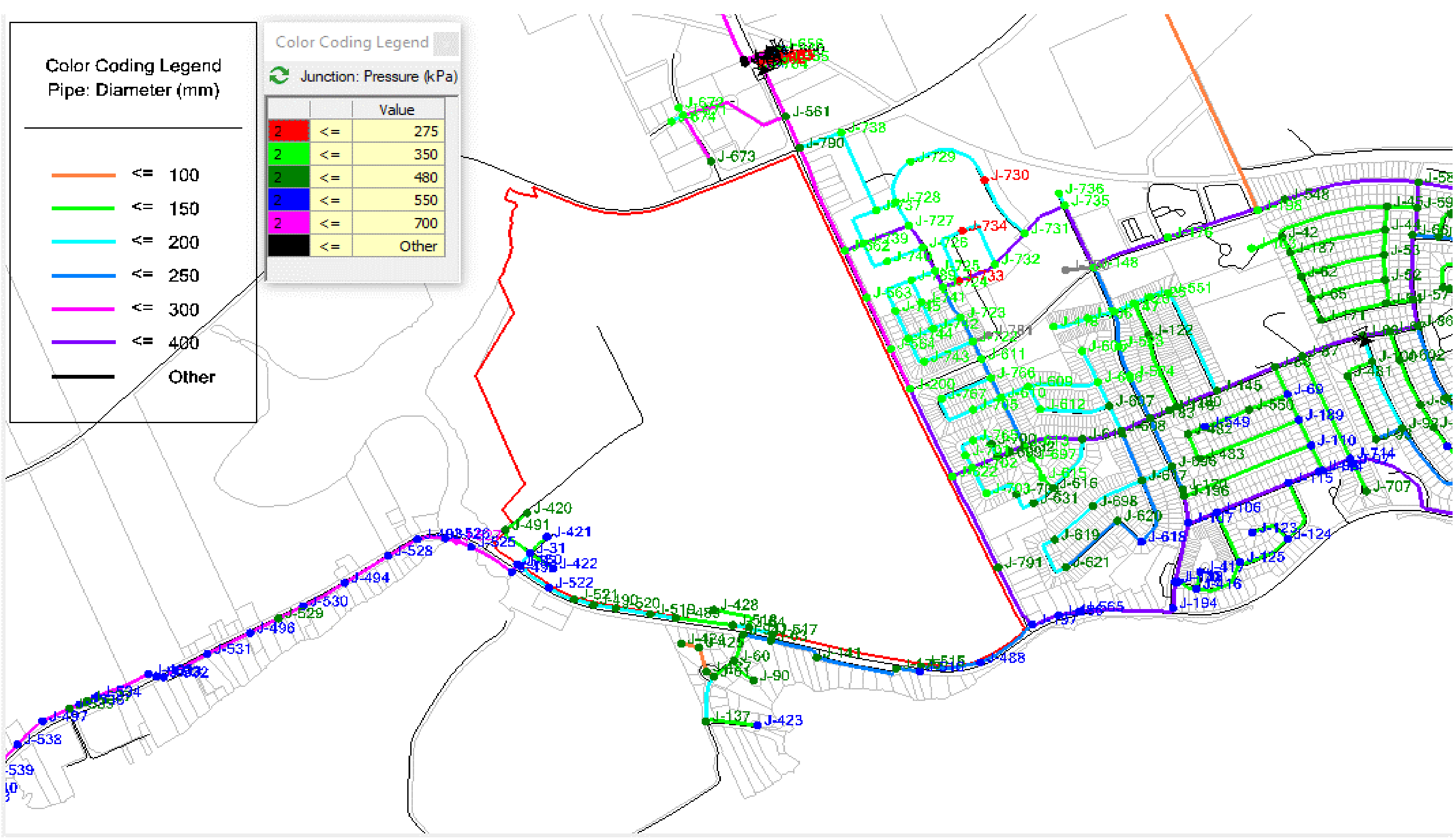
Notes: At node J200 (East end of Amherstview Drive)

Flow Supplied: 165 L/s



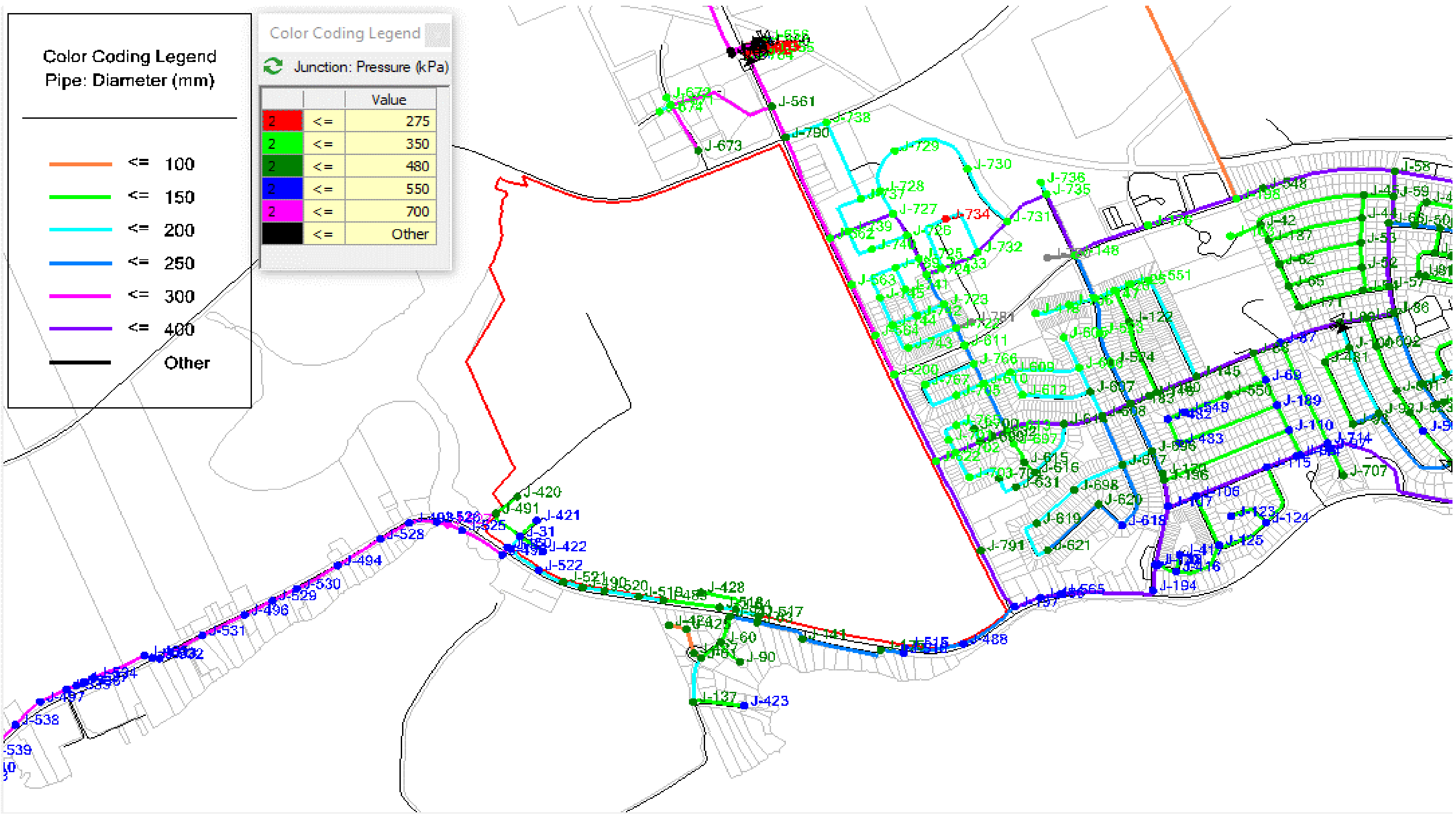
Amherstview Drive - Sec. Plan Ex - Mid Term Peak Hour - SS

Flow Supplied: 167 L/s



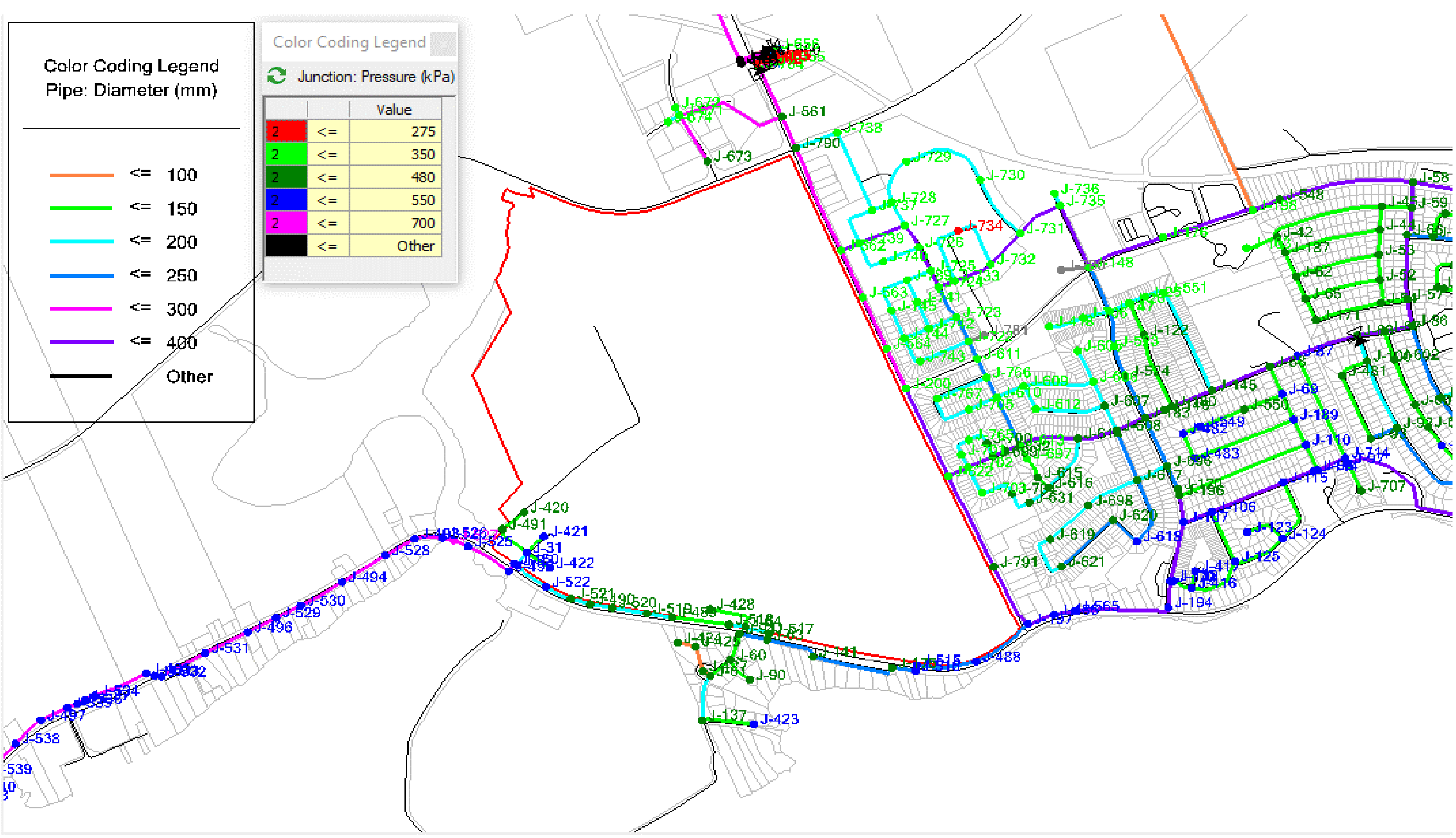
Amherstview Drive - Sec. Plan Ex - Mid Term Max Day - SS

Flow Supplied: 166 L/s



Amherstview Drive - Sec. Plan Ex - Mid Term Max Day + FF - SS

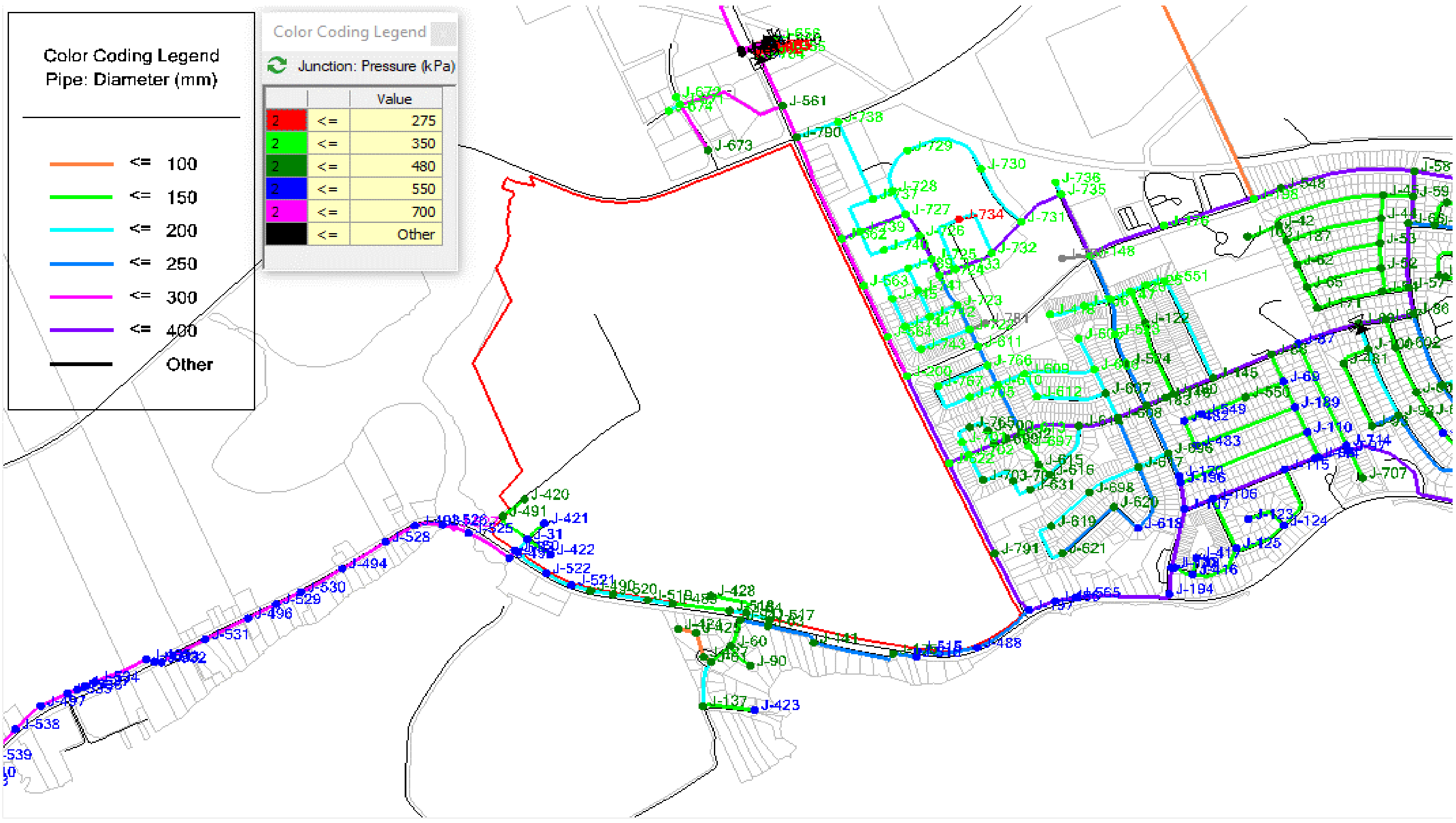
Flow Supplied: 166 L/s



Amherstview Drive - Sec. Plan Ex - Long Term Average Day - SS

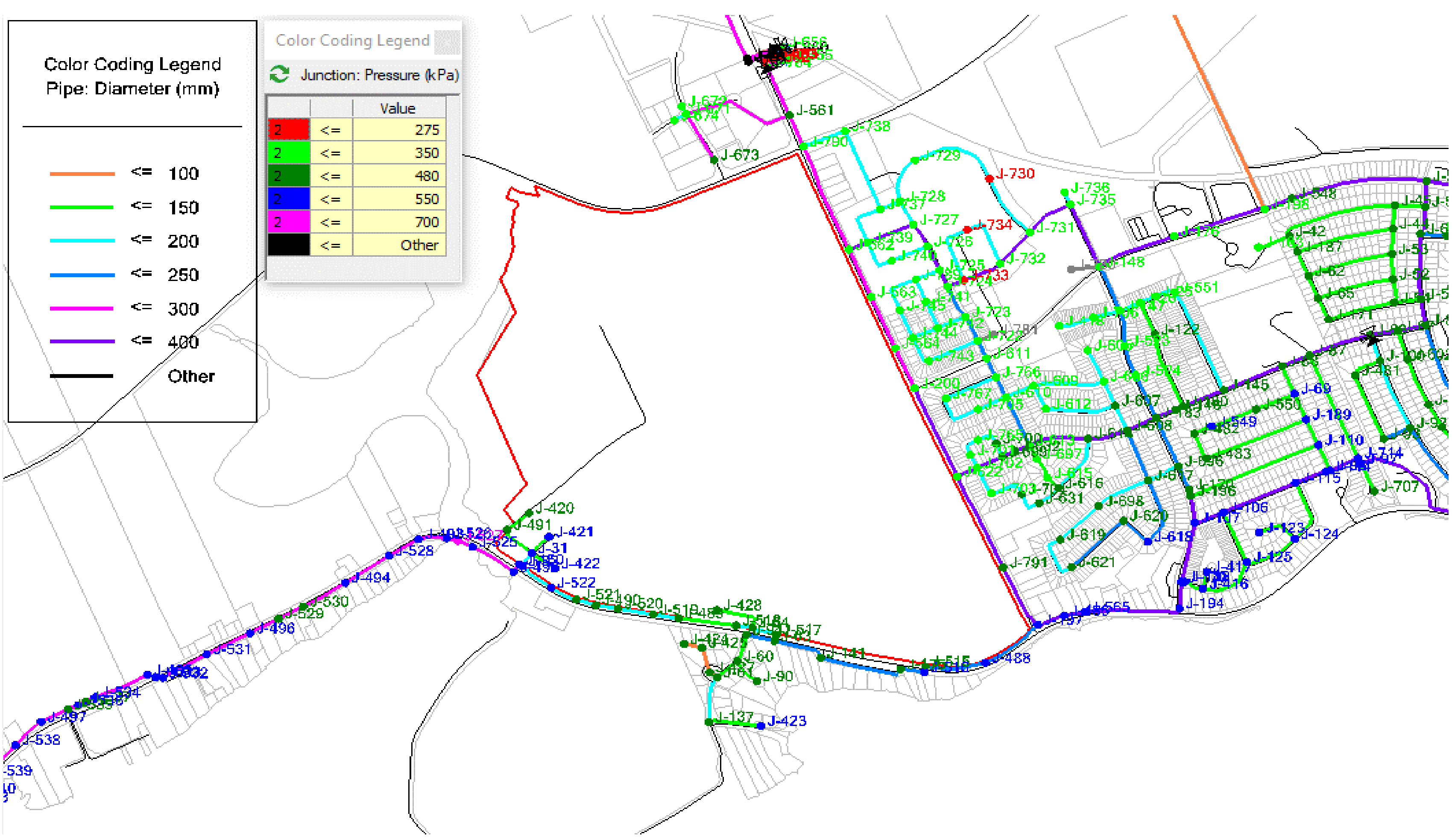
Notes: At node J200 (East end of Amherstview Drive)

Flow Supplied: 165 L/s



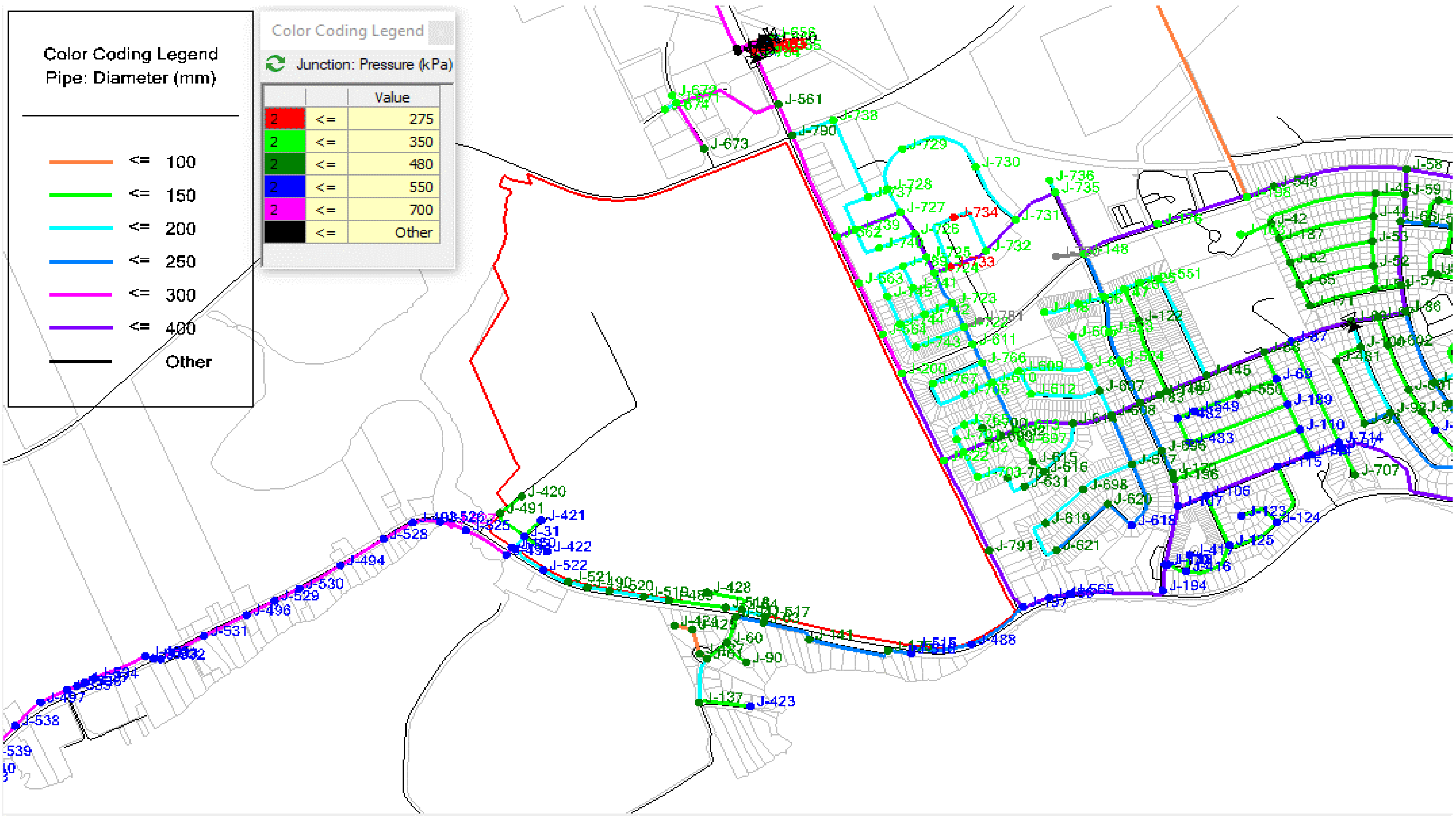
Amherstview Drive - Sec. Plan Ex - Long Term Peak Hour - SS

Flow Supplied: 167 L/s



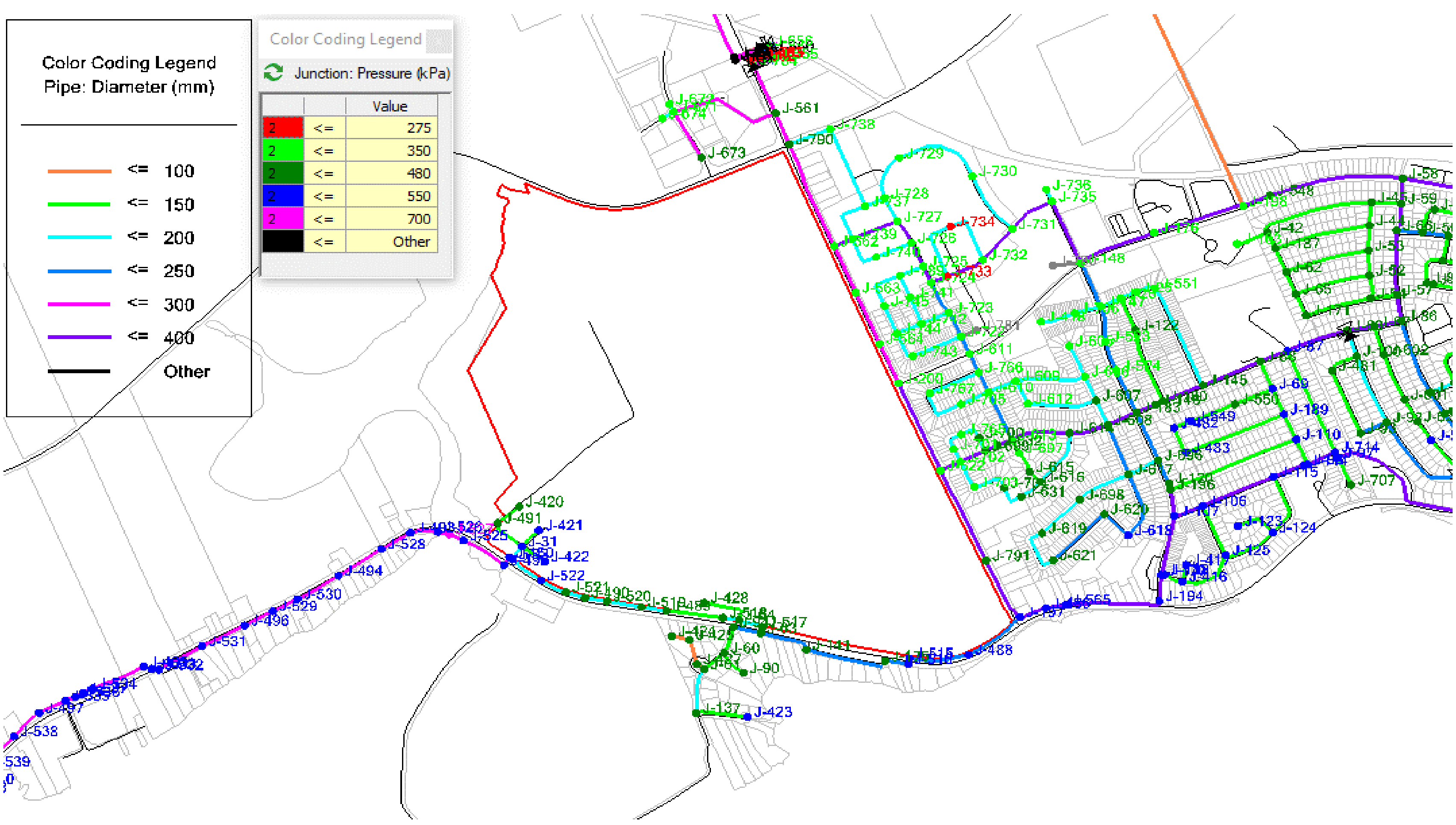
Amherstview Drive - Sec. Plan Ex - Long Term Max Day - SS

Flow Supplied: 166 L/s

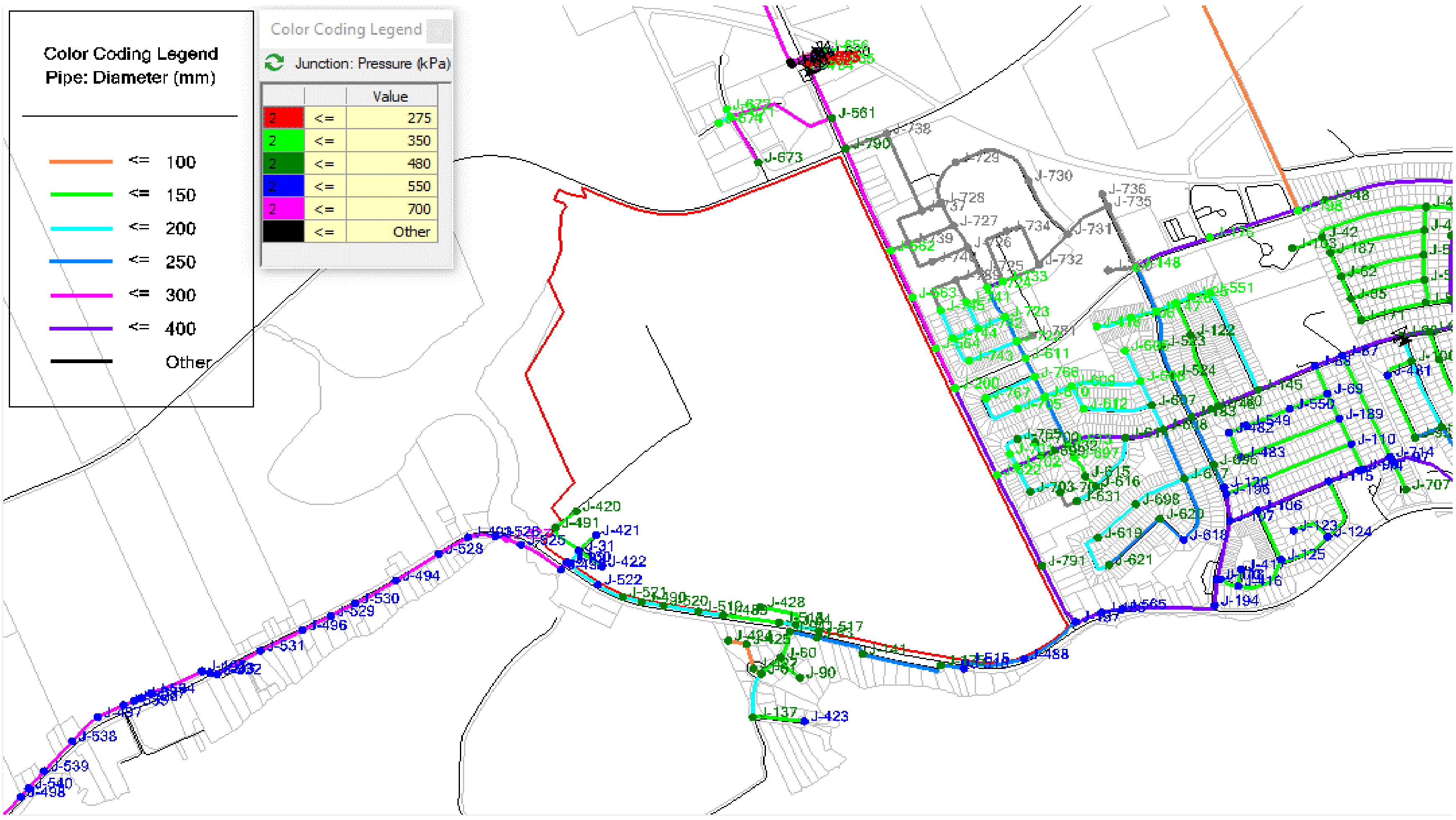


Amherstview Drive - Sec. Plan Ex - Long Term Max Day + FF - SS

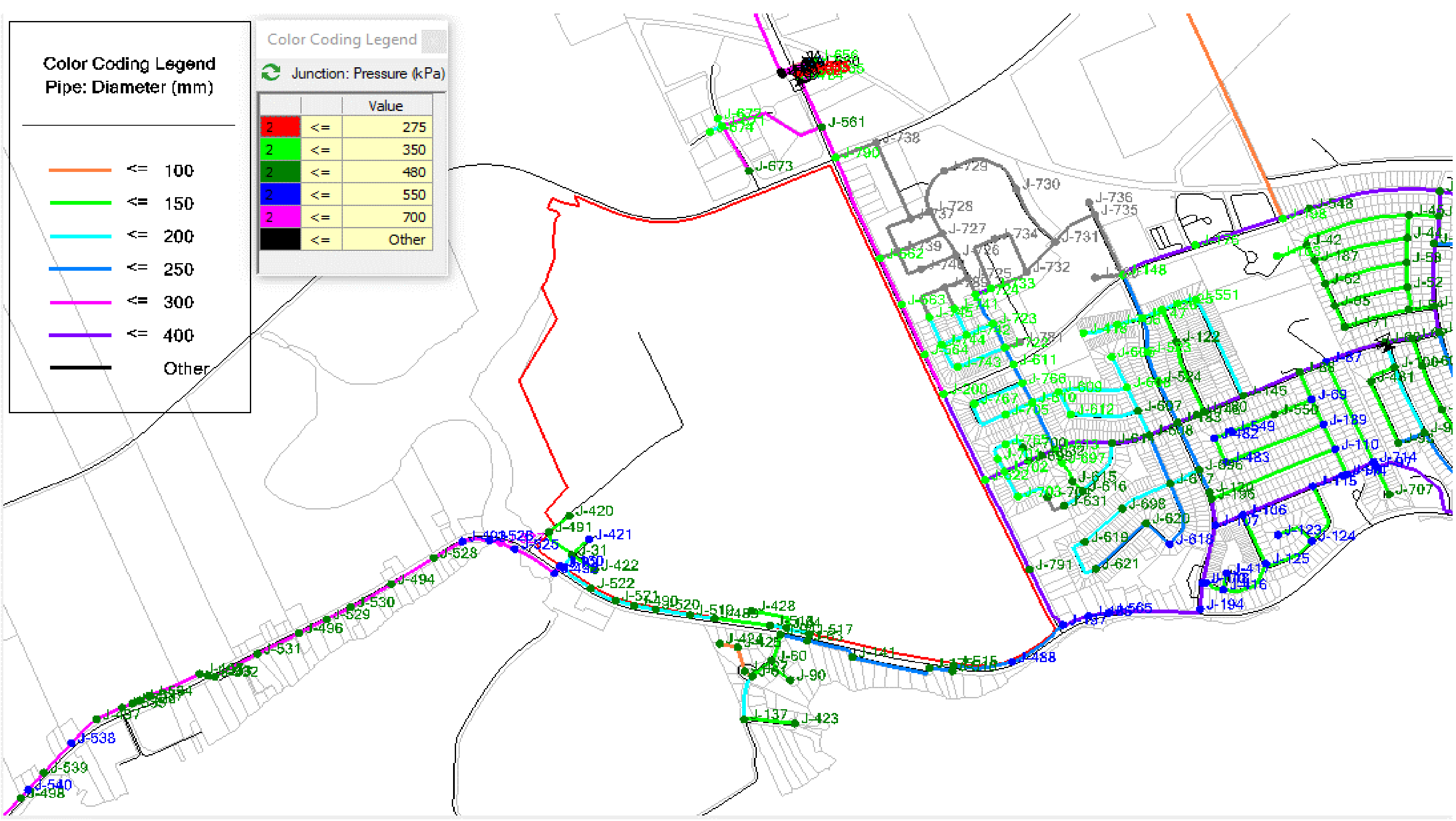
Flow Supplied: 166 L/s



Bath Road - Sec. Plan Ex. - Average Day - SS		Notes	At node J519 (North of Bath Road)
Flow Supplied:	165 L/s		

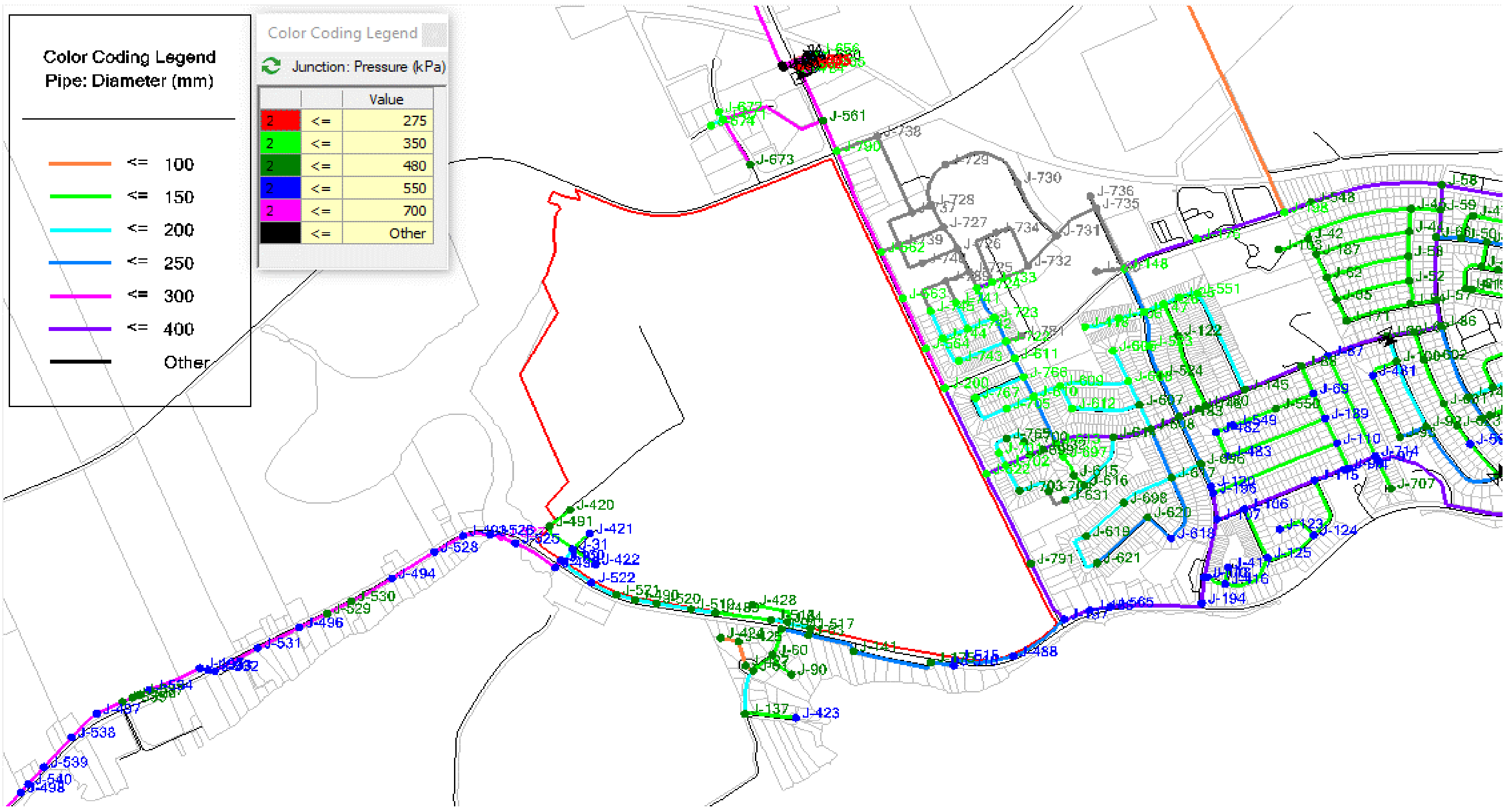


Bath Road - Sec. Plan Ex. - Peak Hour - SS	
Flow Supplied:	166 L/s



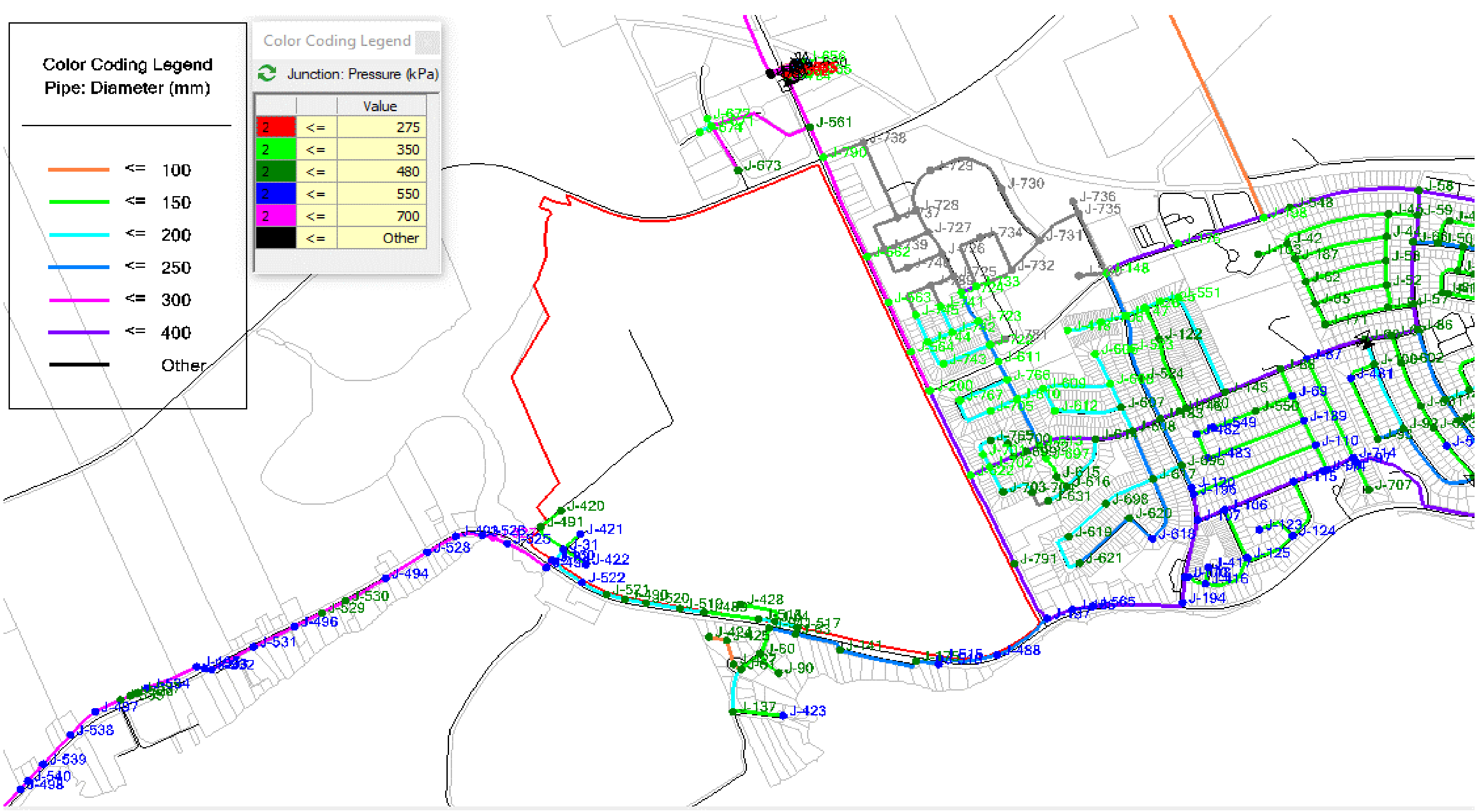
Bath Road - Sec. Plan Ex. - Max Day - SS

Flow Supplied: 165 L/s



Bath Road - Sec. Plan Ex. - Max Day + FF - SS

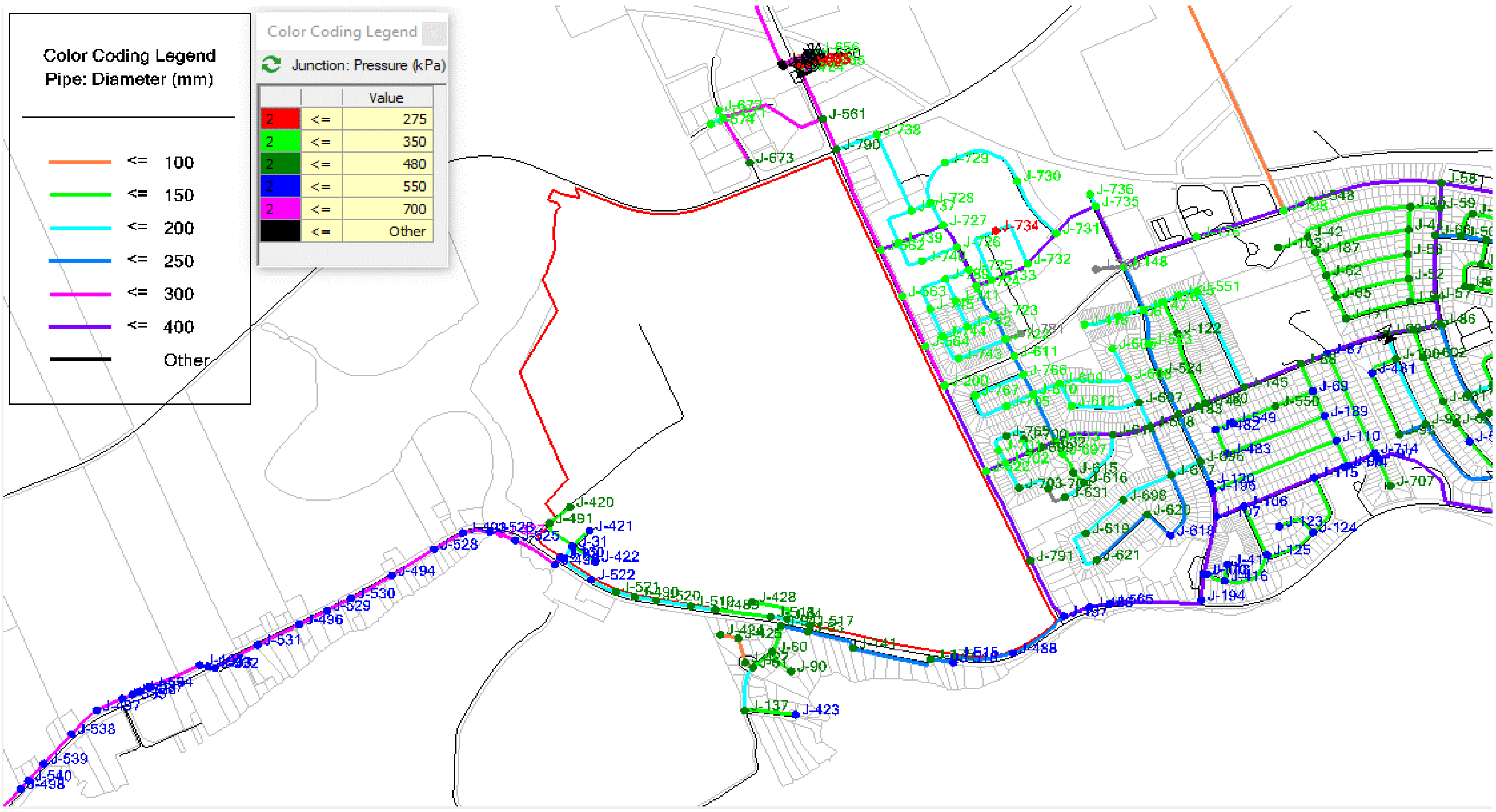
Flow Supplied: 165 L/s



Bath Road - Sec. Plan Ex. - Near Term Average Day - SS

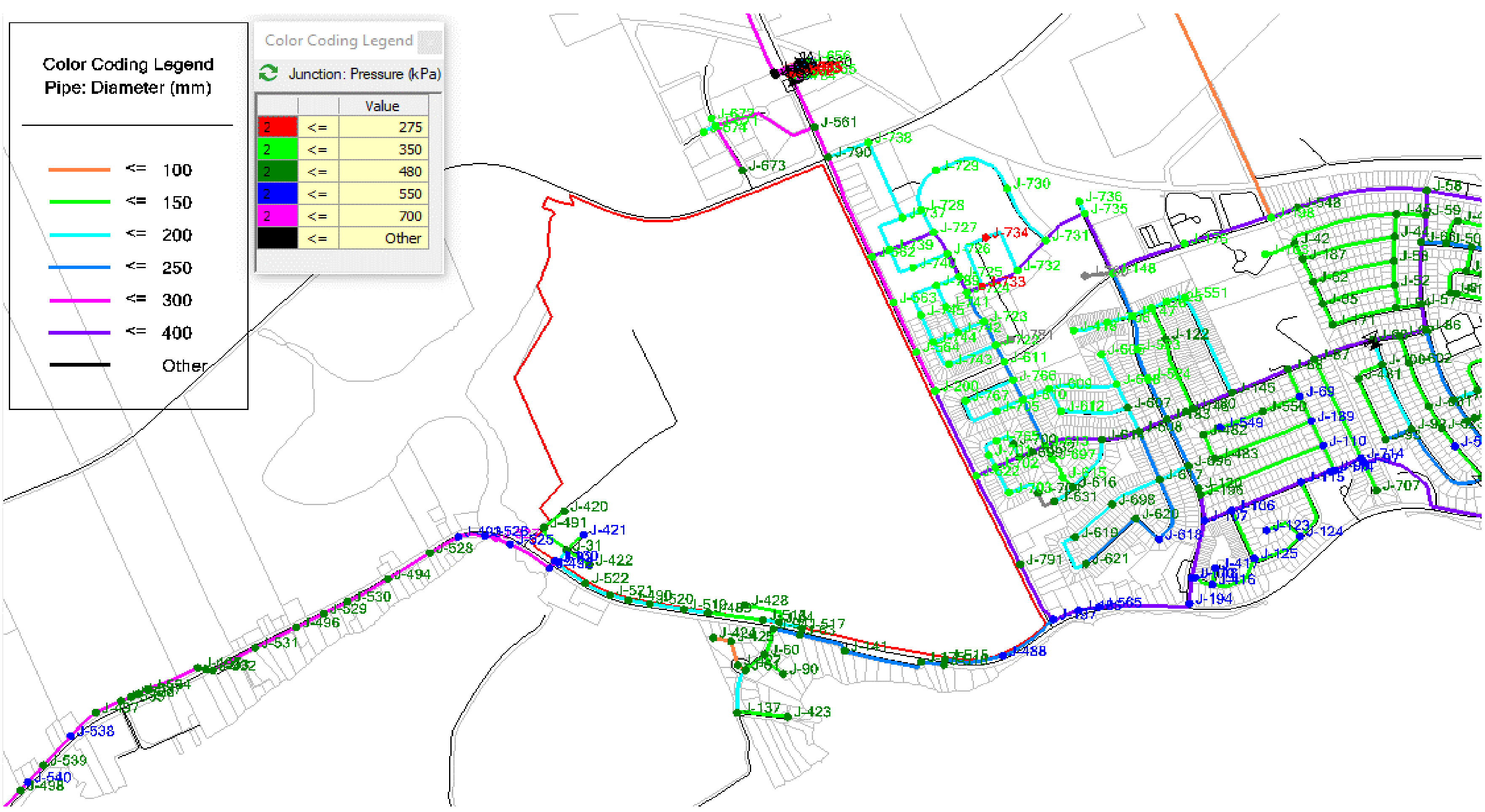
Notes At node J519 (North of Bath Road)

Flow Supplied: 165 L/s



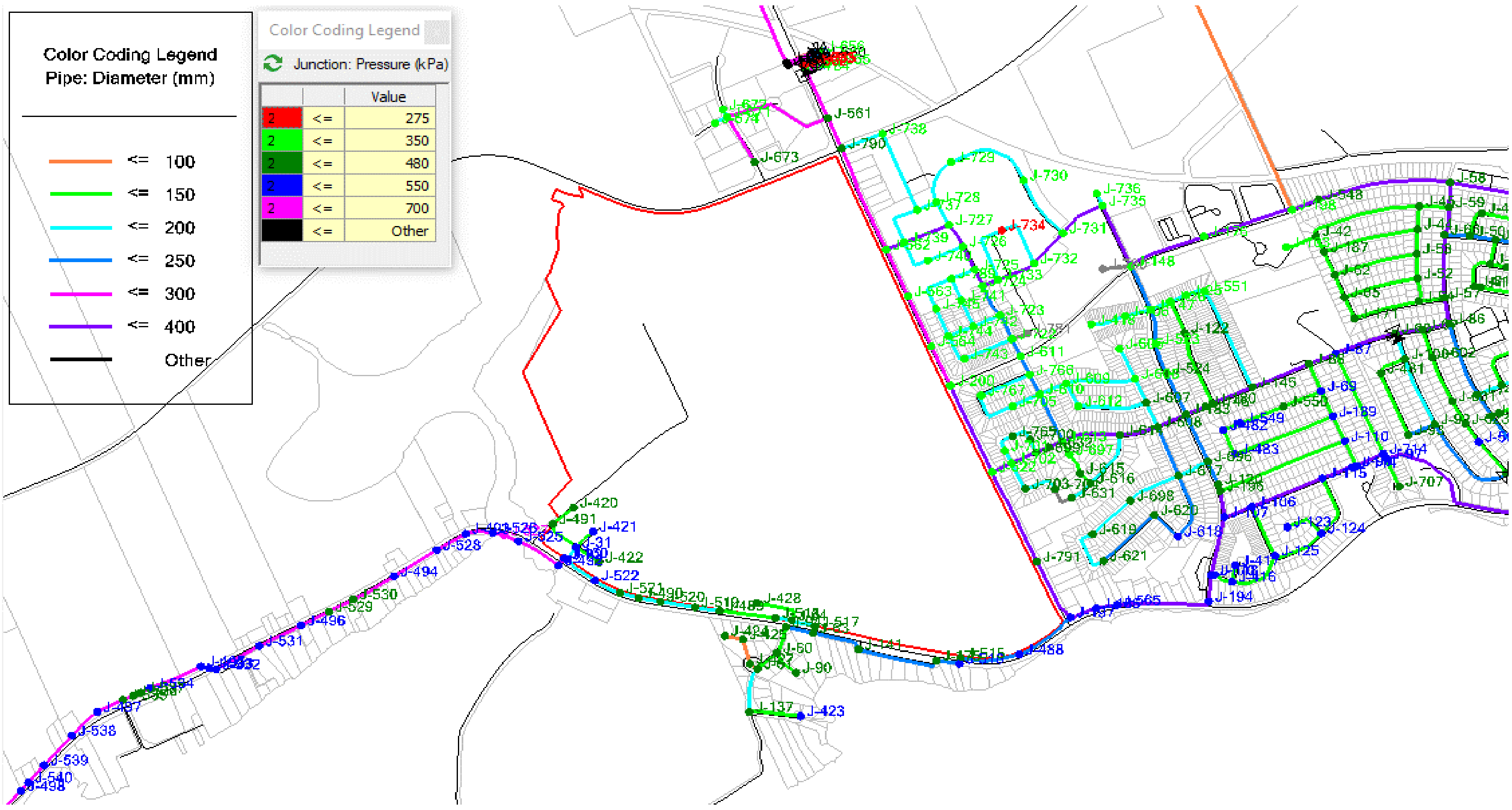
Bath Road - Sec. Plan Ex. - Near Term Peak Hour - SS

Flow Supplied: 167 L/s



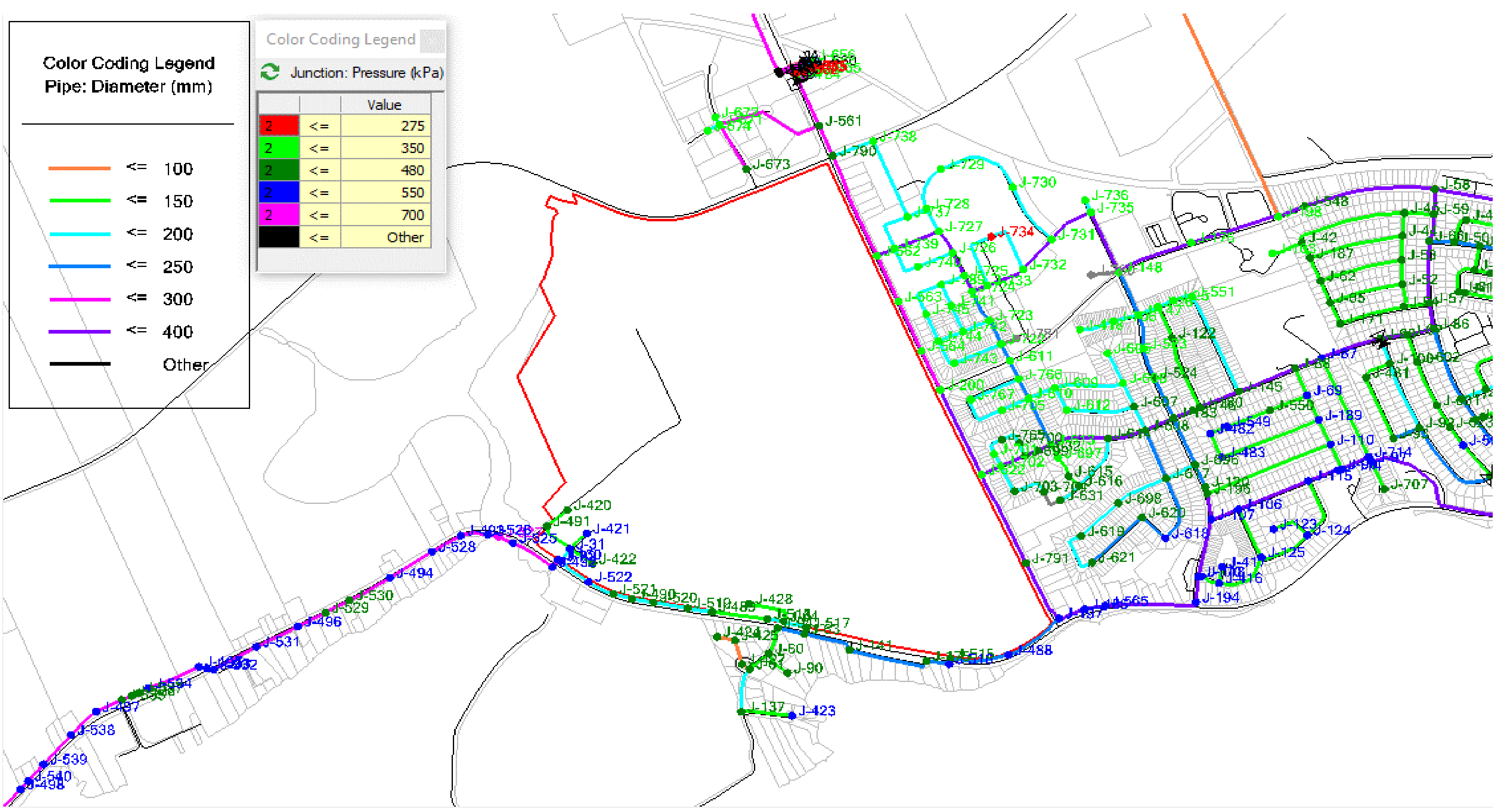
Bath Road - Sec. Plan Ex. - Near Term Max Day - SS

Flow Supplied: 166 L/s



est Near Term Max Day + FF - SS

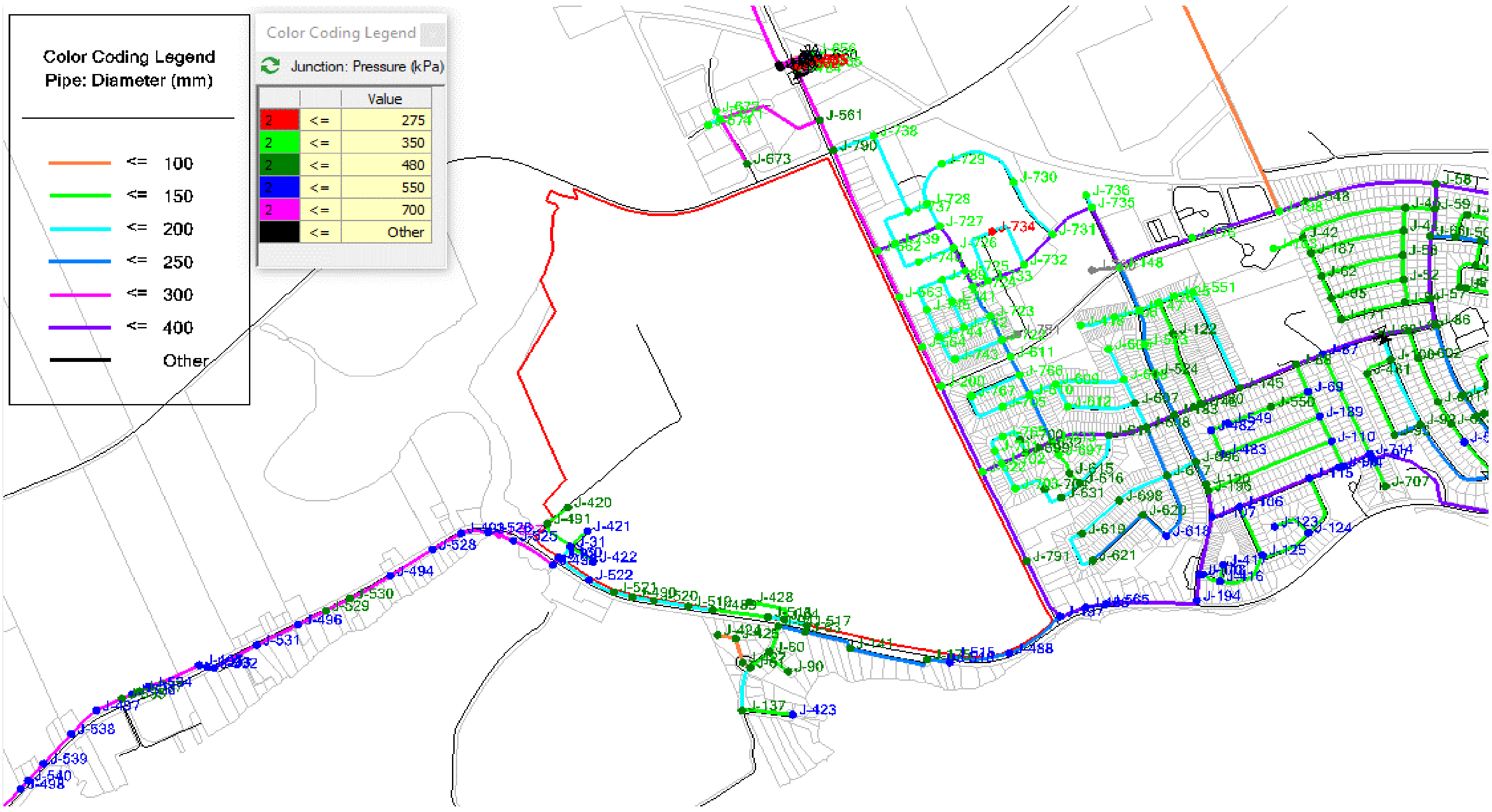
Flow Supplied: 166 L/s



Bath Road - Sec. Plan Ex. - Mid Term Average Day - SS

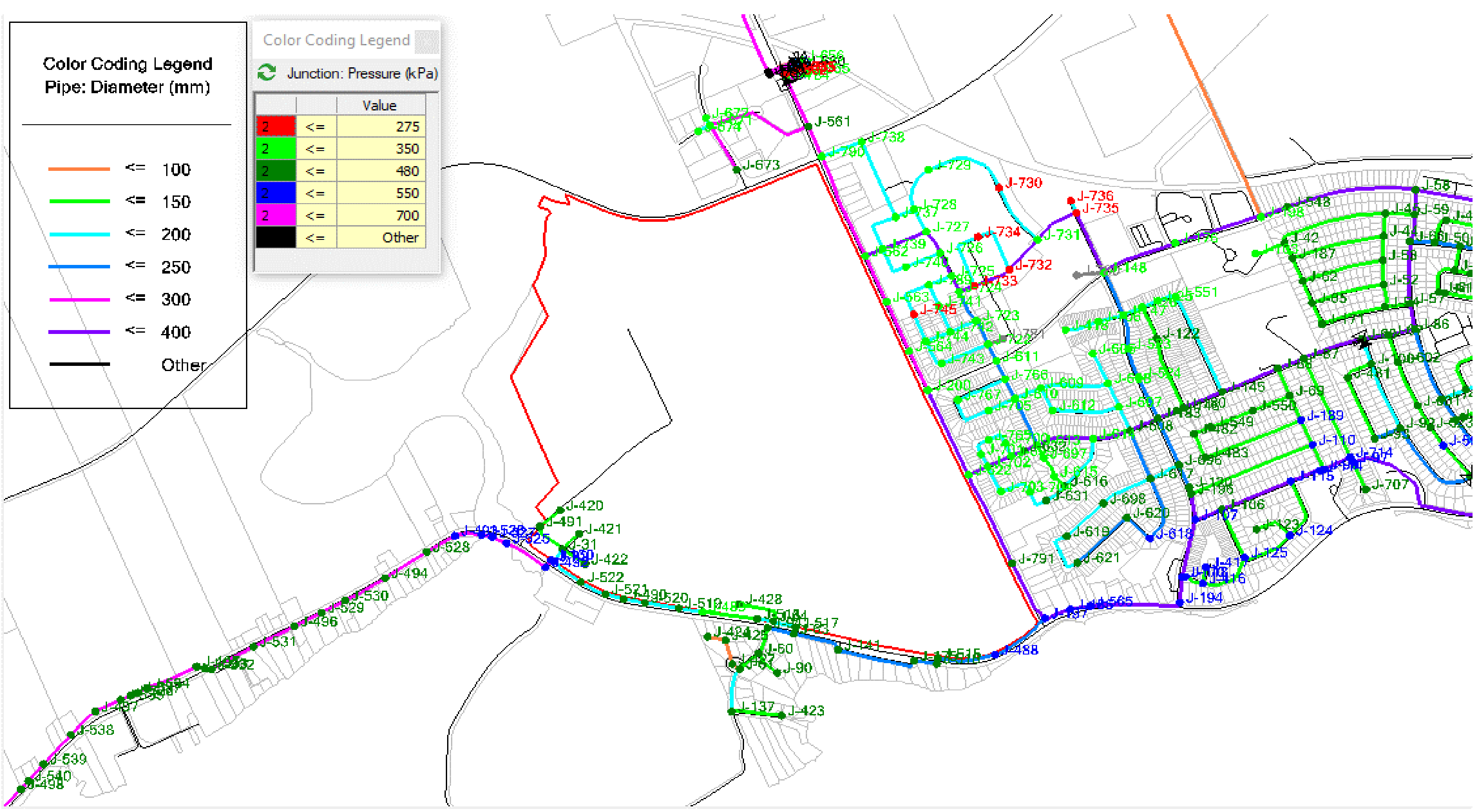
Notes: At node J519 (North of Bath Road)

Flow Supplied: 166 L/s



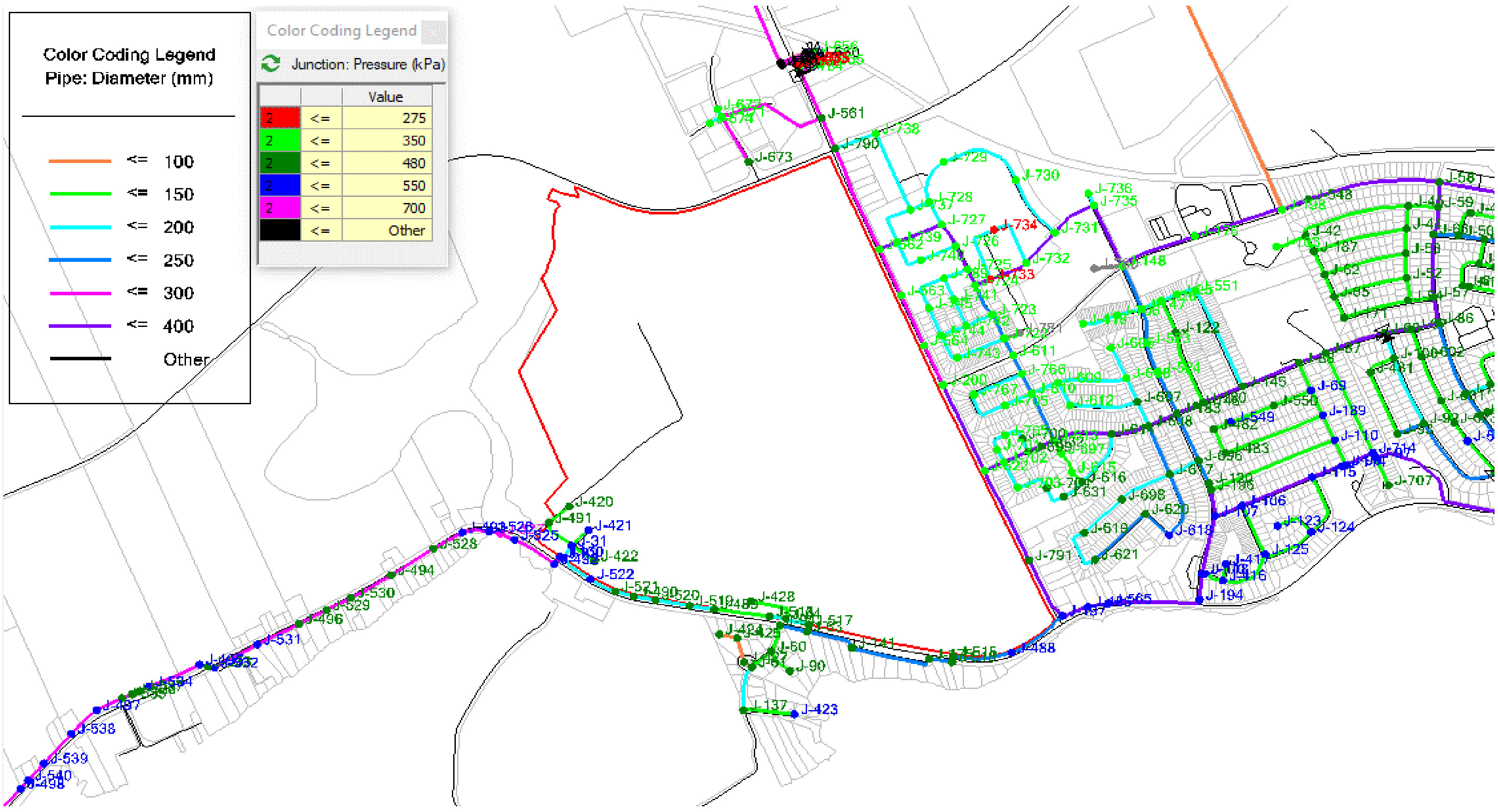
Bath Road - Sec. Plan Ex. - Mid Term Peak Hour - SS

Flow Supplied: 168 L/s



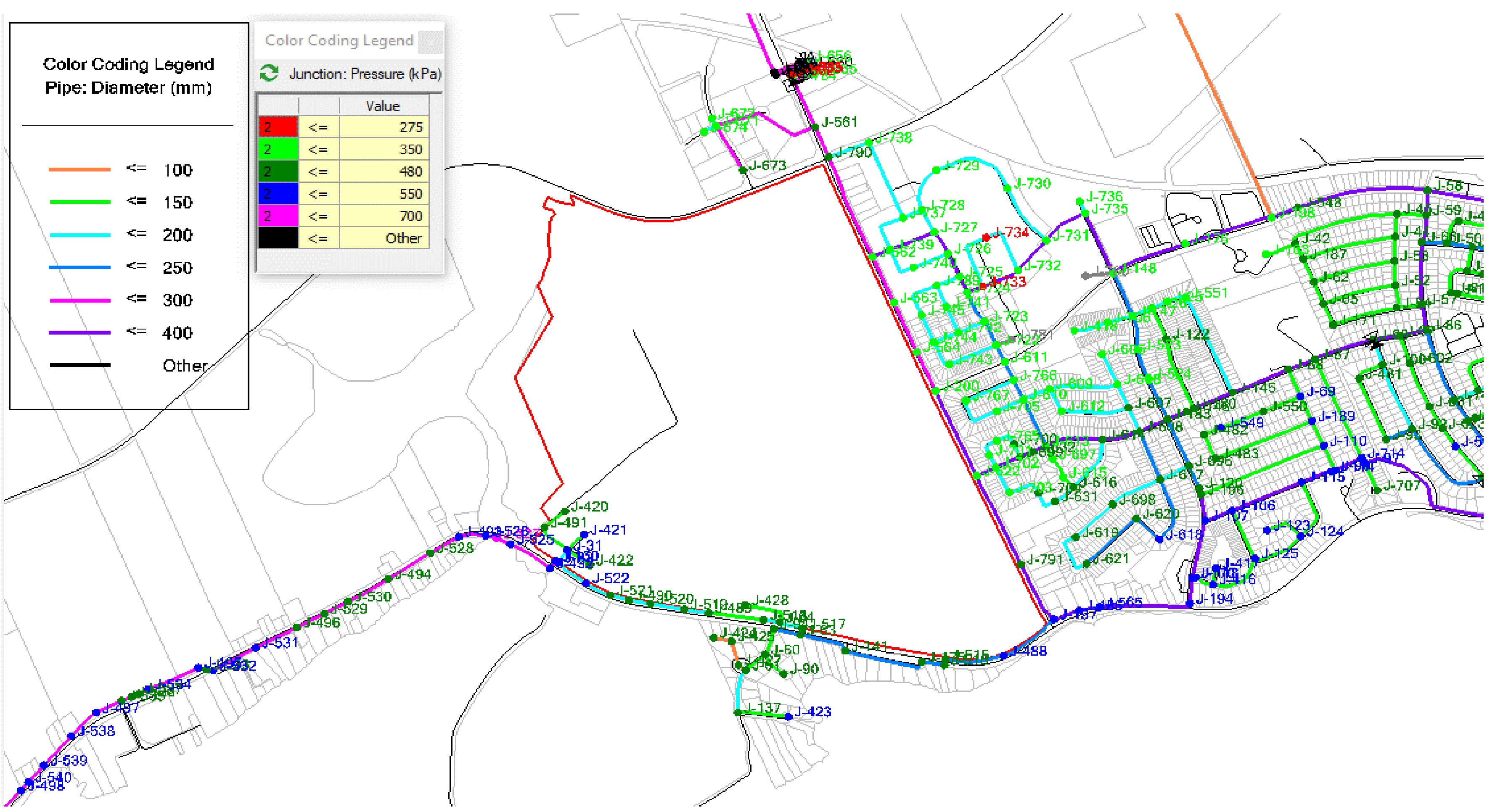
Bath Road - Sec. Plan Ex. - Mid Term Max Day - SS

Flow Supplied: 167 L/s

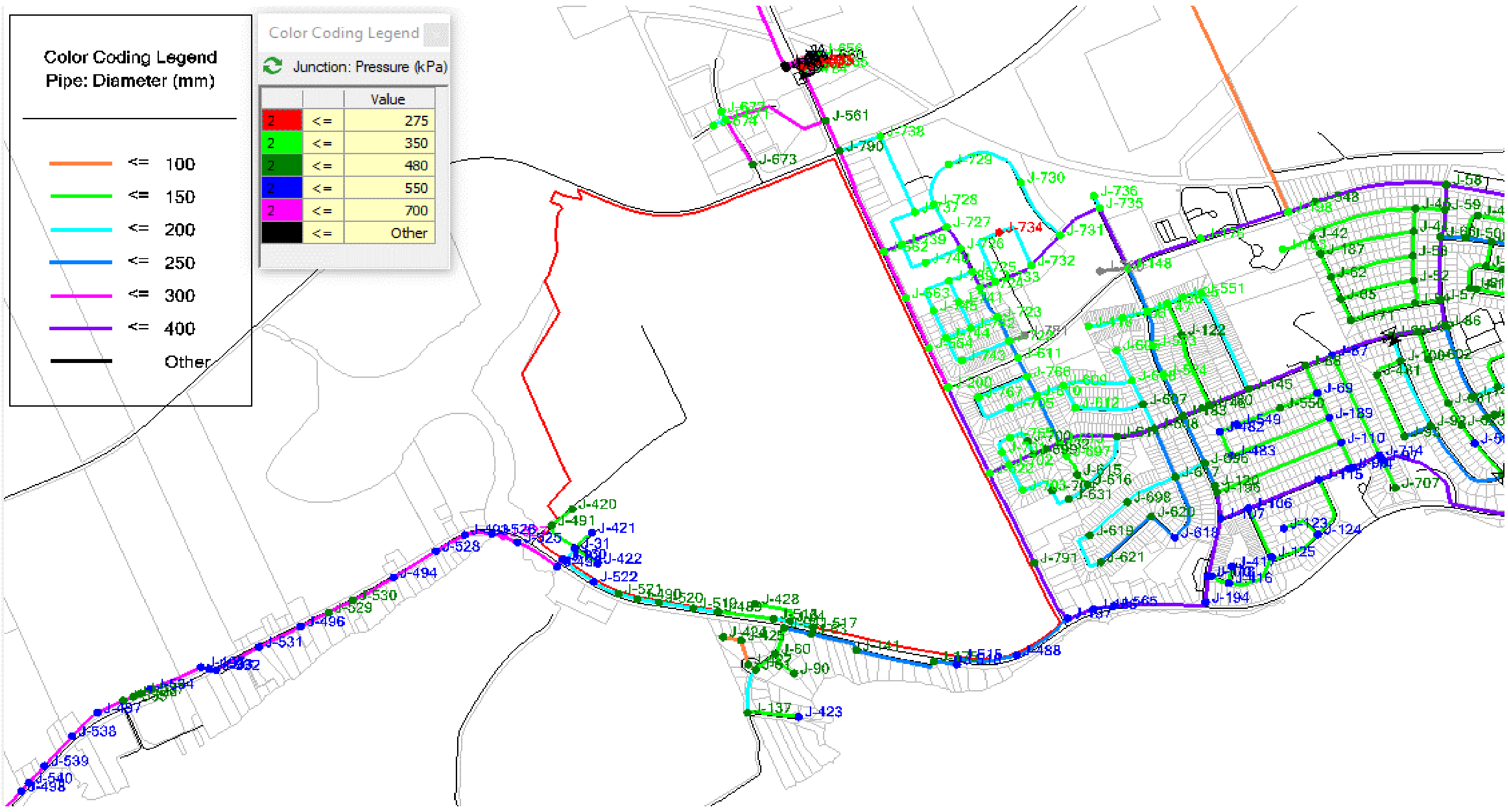


Bath Road - Sec. Plan Ex. - Mid Term Max Day + FF - SS

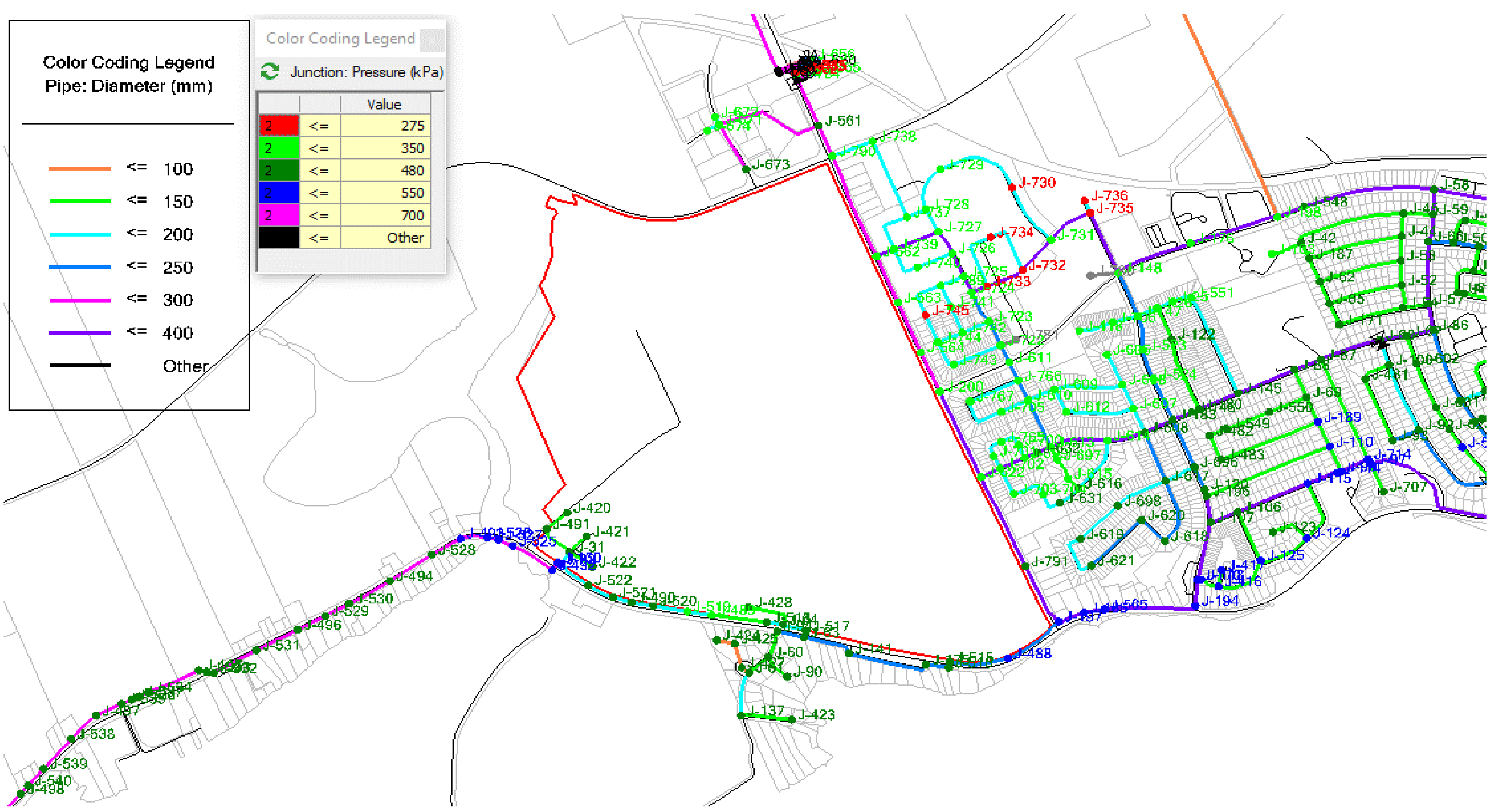
Flow Supplied: 167 L/s



Bath Road - Sec. Plan Ex. - Long Term Average Day - SS	Notes	At node J519 (North of Bath Road)
Flow Supplied:	165 L/s	

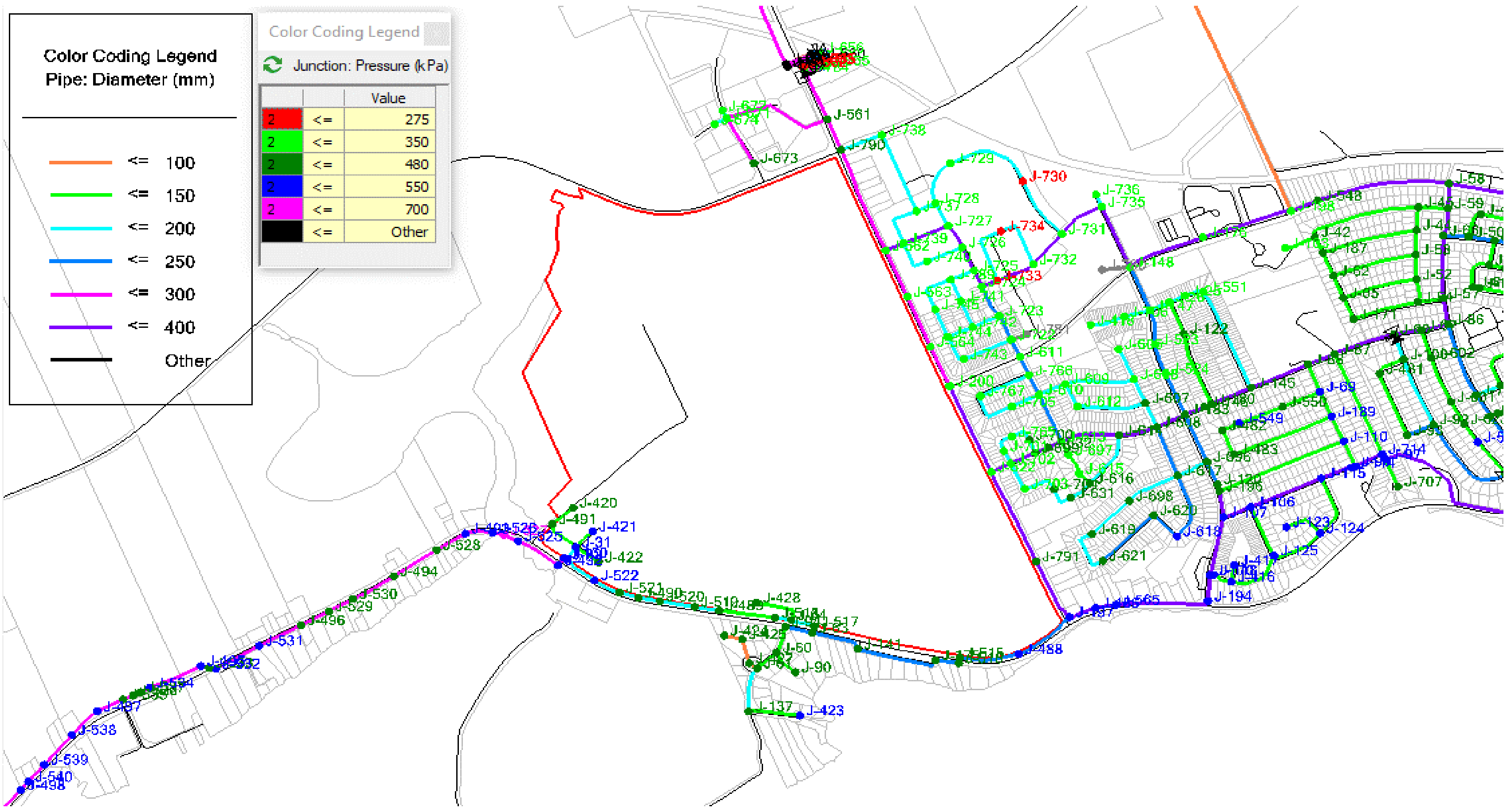


Bath Road - Sec. Plan Ex. - Long Term Peak Hour - SS	
Flow Supplied:	167 L/s



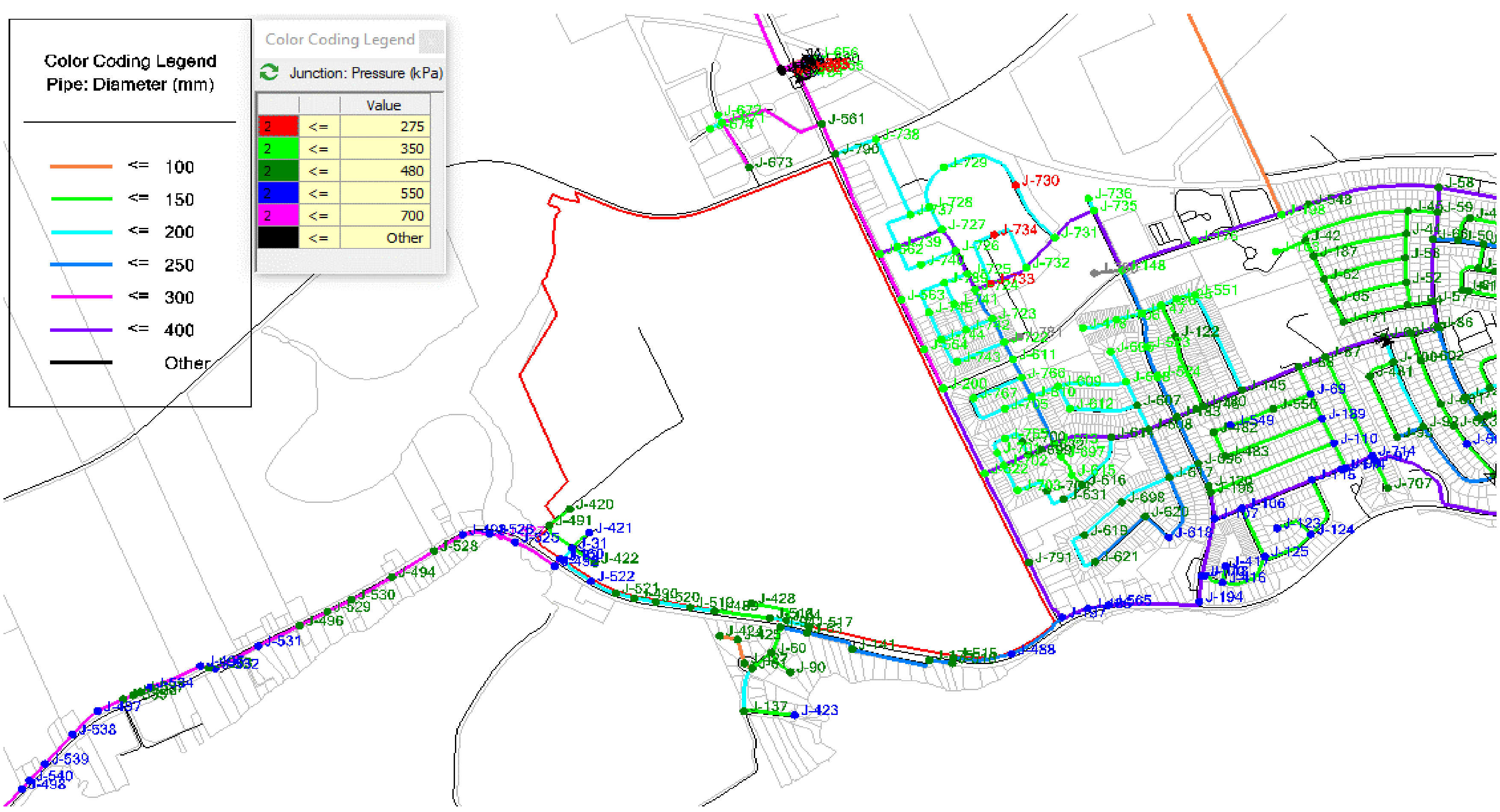
Bath Road - Sec. Plan Ex. - Long Term Max Day - SS

Flow Supplied: 166 L/s



Bath Road - Sec. Plan Ex. - Long Term Max Day + FF - SS

Flow Supplied: 166 L/s



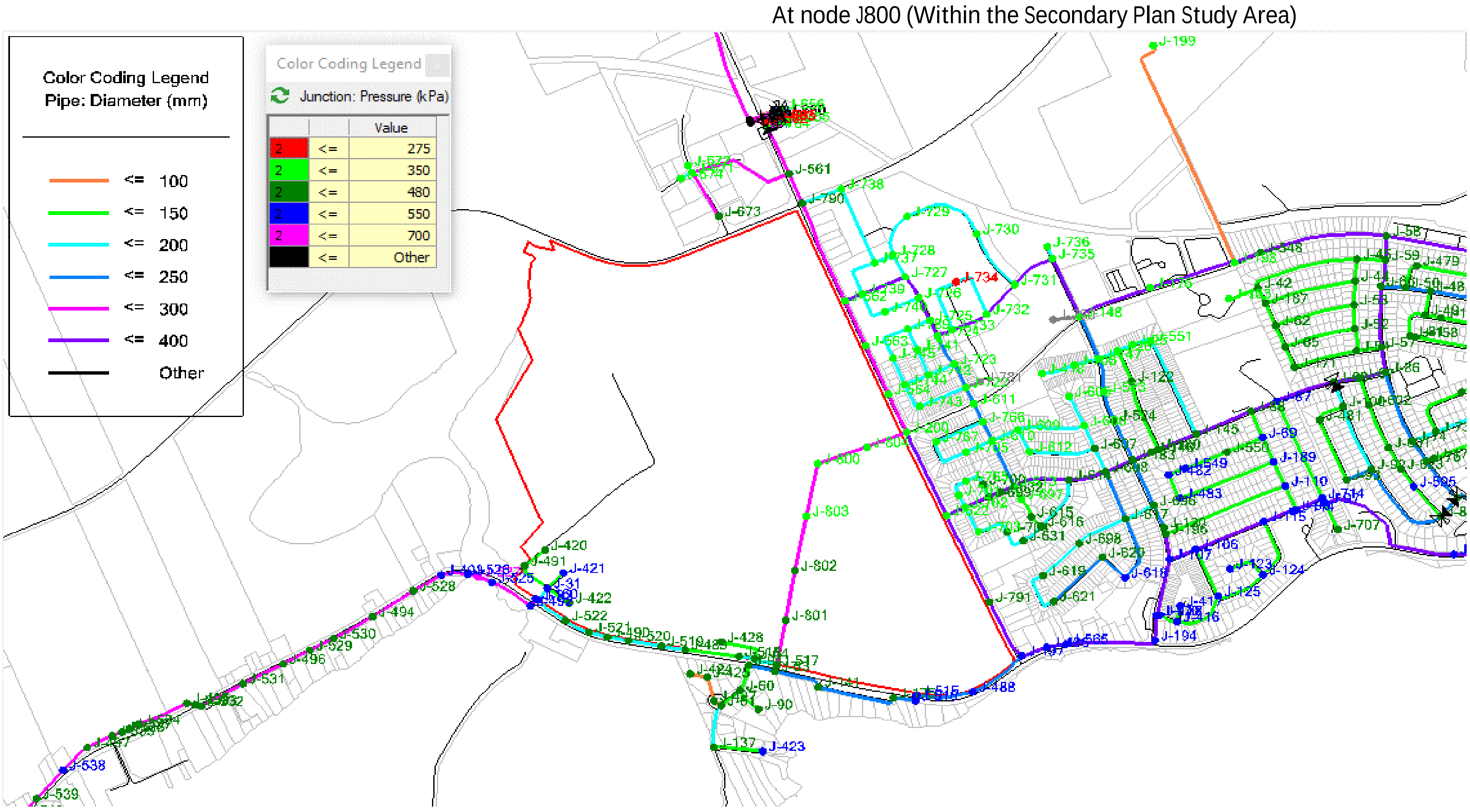
Loop - Sec. Plan Long Term Average Day - SS

Flow Supplied: 165 L/s

Notres:

Red joint J-734 @ 269 kPa

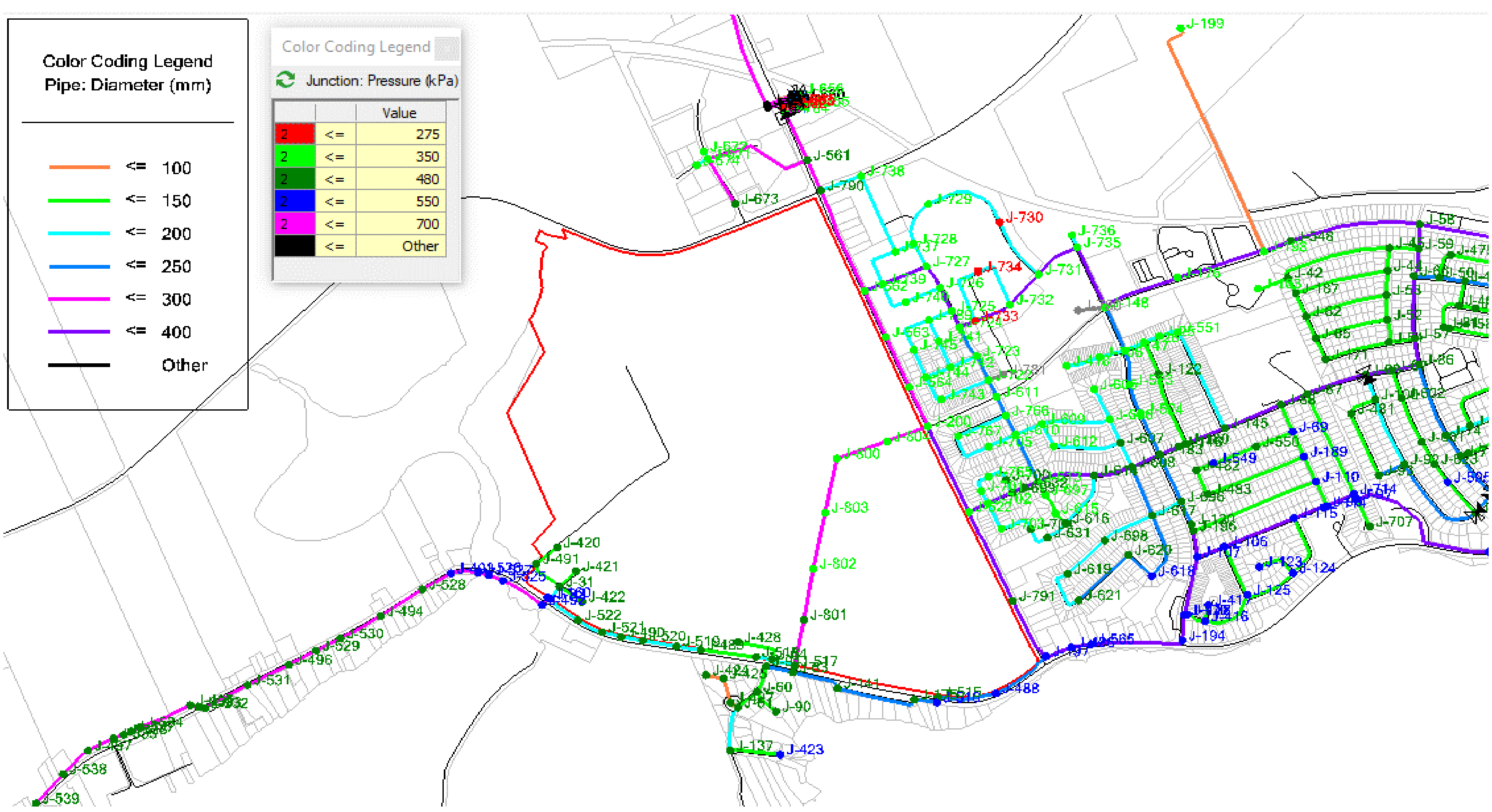
At node J800 (Within the Secondary Plan Study Area)



Plan Long Term Peak Hour - SS

Flow Supplied: 167 L/s

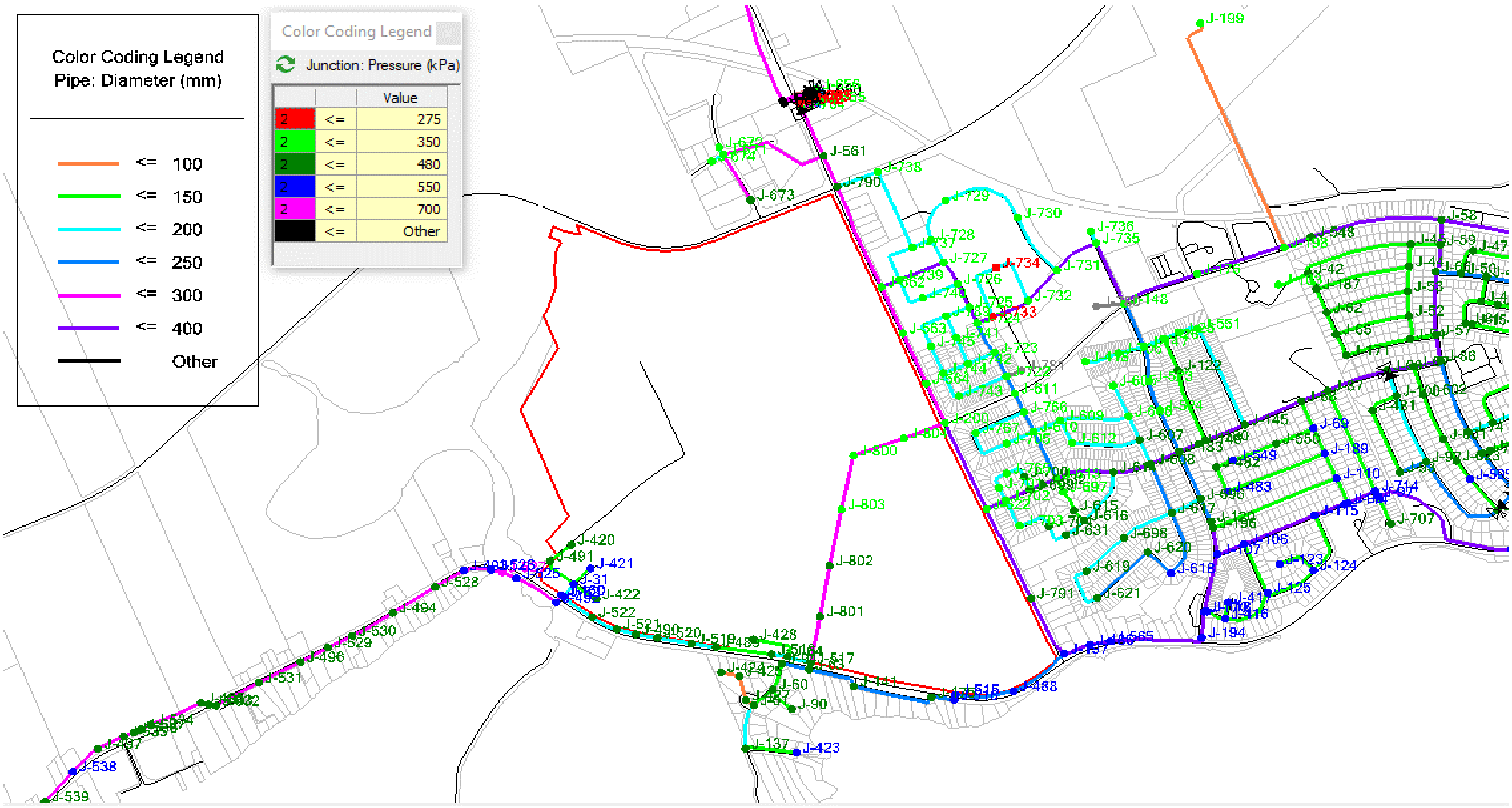
Red joint J-734 @ 264 kPa



Loop - Sec. Plan Long Term Max Day - SS

Flow Supplied: 166 L/s

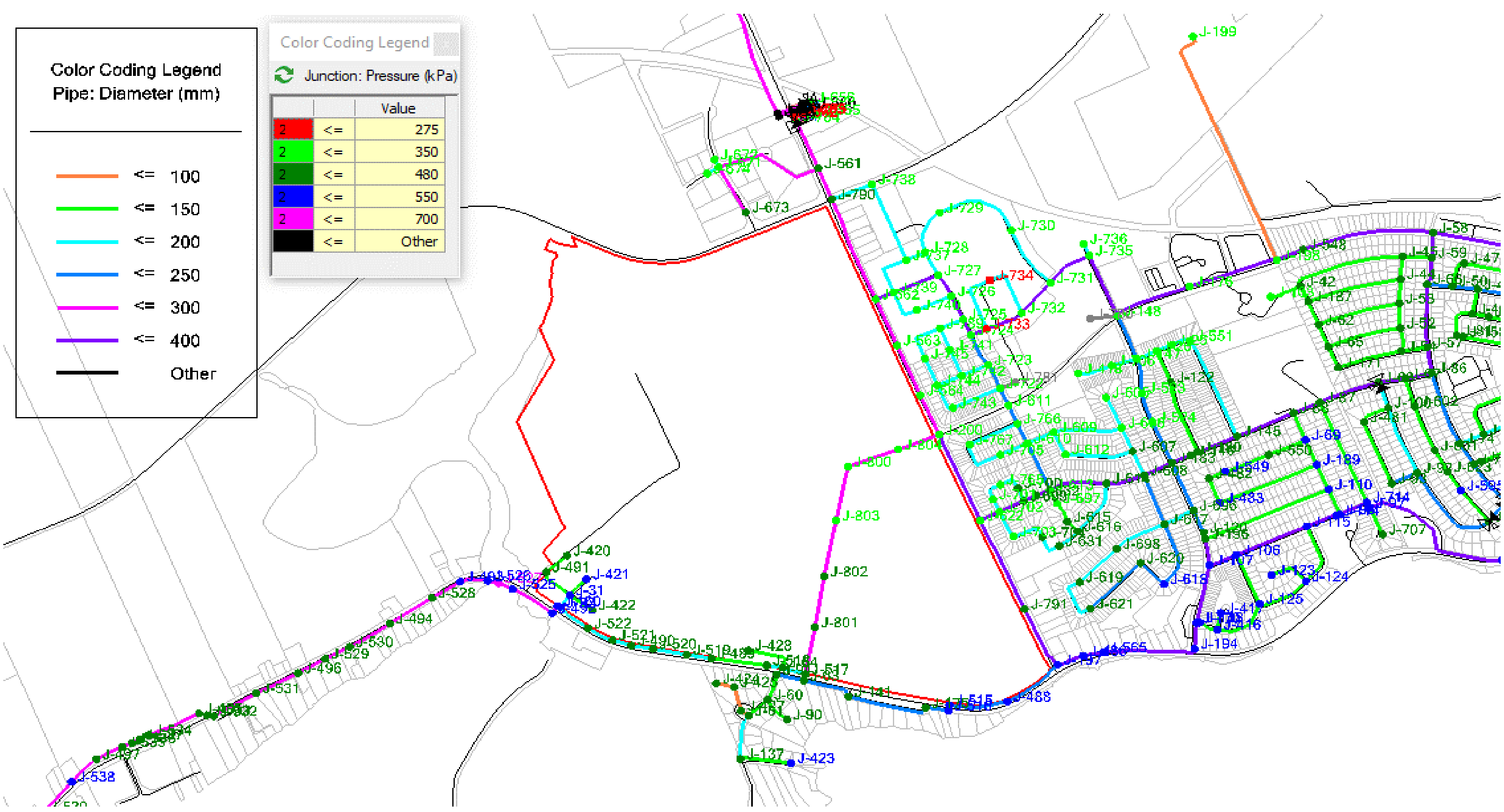
Red joint J-734 @ 267 kPa



Loop - Sec. Plan Long Term Max Day + FF - SS

Flow Supplied: 166 L/s

Red joint J-734 @ 267 kPa



Appendix

D

SERVICING STRATEGY MAPS

wsp

1224 GARDINERS RD, SUITE 201
KINGSTON, ONTARIO,
CANADA, K7P 0G2
WWW.WSPGROUP.COM

Loyalist TOWNSHIP

BOX 70, 263 MAIN STREET
ODESSA, ONTARIO,
CANADA K0H 2H0
WWW.LOYALIST.CA

Legend

- Study Area
- Contours (1m)
- Parcel
- Township Roads
- Railroad
- Watercourses
- Building
- Wetlands
- Waterbody
- Playgrounds
- Sports Fields
- Wooded Area
- CRCA Lands
- Loyalist Township Land

Scale:
0 70 140 280 Meters
1:5,000

N W E S

Project:

LOYALIST-AMHERSTVIEW WEST SECONDARY PLAN

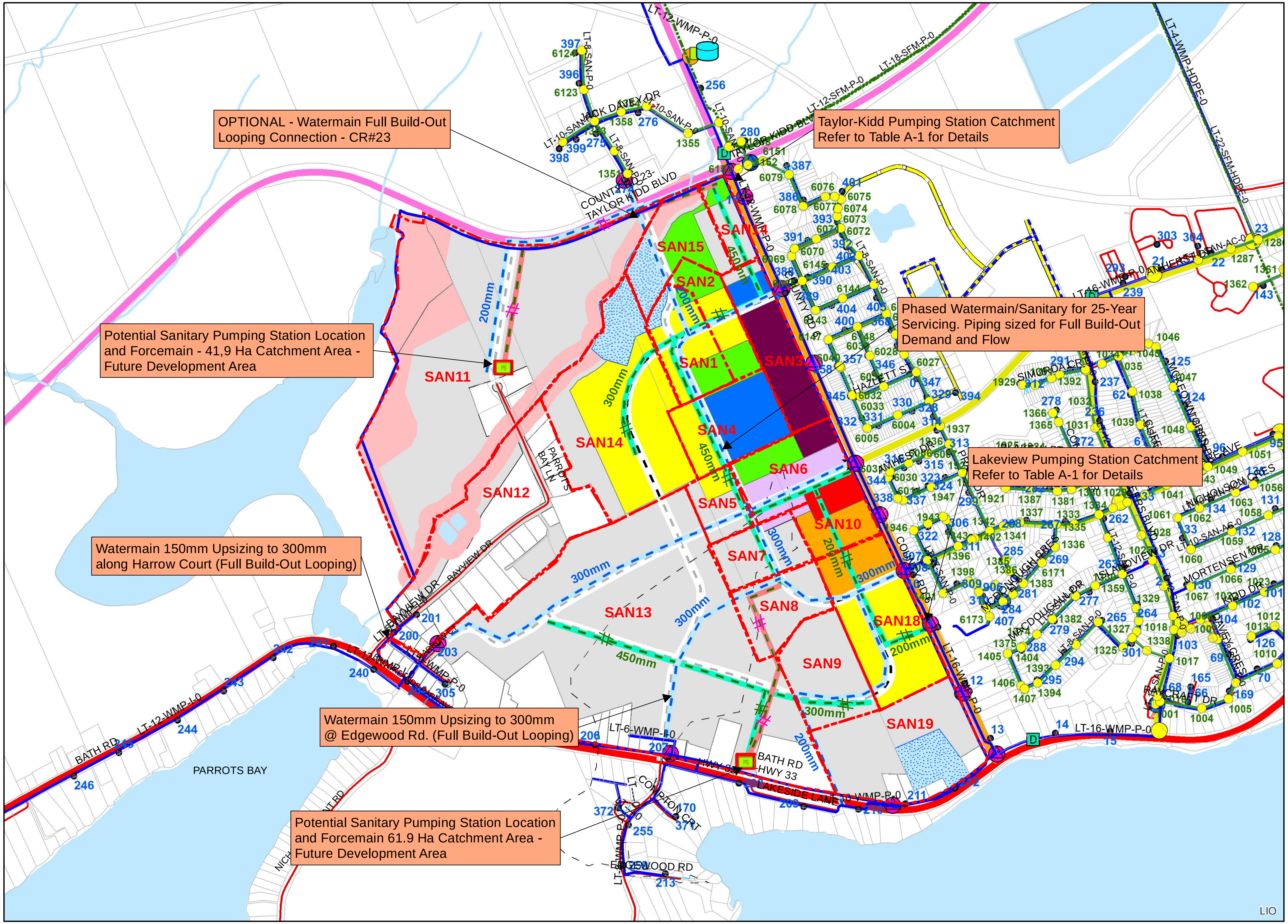
Title:

CONTOURS

Project No.:	Date:
211-01353-00	MARCH, 2021

Drawn By:	Checked By:	Figure No.:
CZ	MF	D-1

File Location:M:\2021\211-01353-00 Loyalist-Amherstview West Secondary Plan\21.0 - GIS\Internal Use\Land_Ownership.mxd



1224 GARDINERS RD, SUITE 201
KINGSTON, ONTARIO,
CANADA, K7P 0G2
WWW.WSPGROUP.COM

Secondary Plan Study Area

Conceptual Land Use
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Neighbourhood Commercial
- Highway Commercial
- Institutional
- Parks/Open Space
- Multi-Use Pathway with Linear Park
- Municipal Stormwater Management
- Municipal Wastewater Facilities
- Potential Future Development Area
- Gateway Feature

Conceptual Road Network
- Proposed Collector
- Proposed Multi-Use Pathway

Existing Road Network
- Provincial Highway
- Major Arterial
- Urban Arterial
- Urban Collector
- Local

Future Roads
- Collector Residential

Cultural Heritage
- * Property with Potential Heritage Value

Development Constraint
- ** High Constraint - Natural Environment Area

Servicing
- *** Edgewood Municipal Drain
- Water Servicing Possible Connections
- Sanitary Servicing Possible Conection

Hydrants
- Other
- Temporary
- Active

Water Facilities
- Water Booster Pumping Station
- PRV
- Storage
- WTP

WM Structures
- Diversion Chamber
- Drain Chamber
- Meter Chamber
- Valve Chamber

Water Laterals
- Water Service
- Hydrant Lead
- Blowoff Lead
- Sampling Station Lead

Water Valves
- Clockwise Turn
- Counter Clockwise Turn
- Unknown Direction

Watermains
- Active Watermain
- Proposed Watermain
- Temporary
- Abandoned

Sanitary Auxilliary Equipment
- Air Release Valve
- ByPass
- ByPass Chamber
- Diversion Chamber
- Meter
- Sanitary Pumping Station
- Valve Chamber
- Water Pollution Control Plant

Sanitary Manholes
- Manhole

Sanitary Sewers
- San Sewers

Sanitary Laterals
- Sanitary Laterals

Potential Infrastructure
- Potential Watermains
- Potential Gravity Trunk Sewer
- Potential Forcemain
- Potential Sanitary Pumping Station Facility

Scale:

0 45 90 180 Meters

1:10,000

Project:

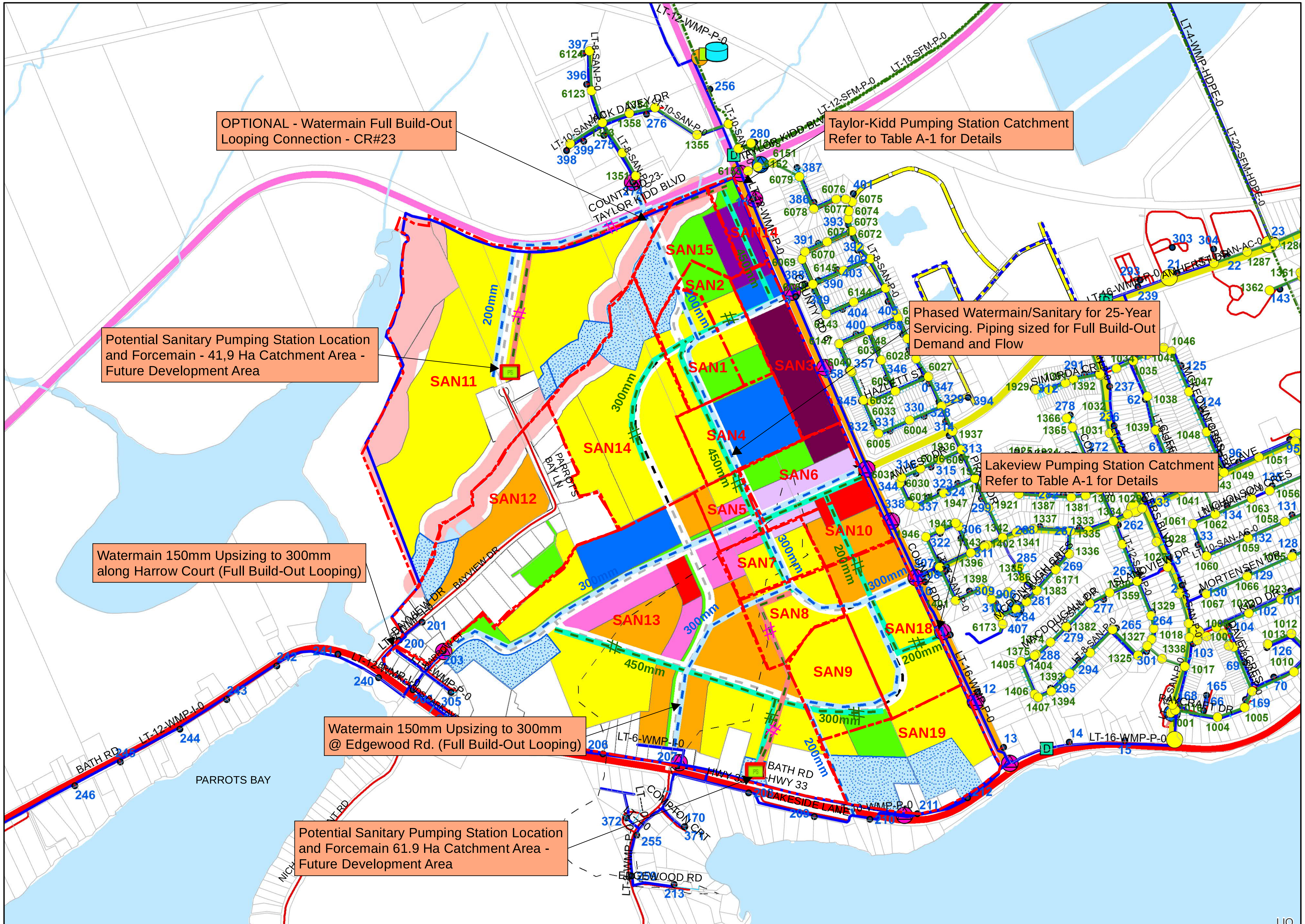
LOYALIST-AMHERSTVIEW WEST SECONDARY PLAN

Title:

CONCEPTUAL 25-YEAR LAND USE WITH EXISTING AND FUTURE INFRASTRCUTURE (FULL BUILDOUT)

Project No.: 211-01353-00		Date: JULY 2024
Drawn By: DM	Checked By: MF	Figure No.: D-2

File Location:C:\Pro\Amherstview\Servicing Map\211-01353-00_WaterSan-Preffered Option-D-2_REV6.mxd



1224 GARDINERS RD, SUITE 201
KINGSTON, ONTARIO,
CANADA, K7P 0G2
WWW.WSPGROUP.COM

Secondary Plan Study Area

Conceptual Land Use
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Neighbourhood Commercial
- Highway Commercial
- Institutional
- Parks/Open Space
- Multi-Use Pathway with Linear Park
- Municipal Stormwater Management
- Municipal Wastewater Facilities
- Potential Future Development Area
- Gateway Feature

Conceptual Road Network
- Proposed Collector
- Proposed Multi-Use Pathway

Existing Road Network
- Provincial Highway
- Major Arterial
- Urban Arterial
- Urban Collector
- Local

Future Roads
- Collector Residential

Cultural Heritage
- * Property with Potential Heritage Value

Development Constraint
- ** High Constraint - Natural Environment Area

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- *** Edgewood Municipal Drain
- Water Servicing Possible Connections
- Sanitary Servicing Possible Conection

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- Diversion Chamber
- Drain Chamber
- Meter Chamber
- Valve Chamber

Water Laterals
- Water Service
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- Blowoff Lead
- Sampling Station Lead

Water Valves
- Clockwise Turn
- Counter Clockwise Turn
- Unknown Direction

Watermains
- Active Watermain
- Proposed Watermain
- Temporary
- Abandoned

Sanitary Auxilliary Equipment
- Air Release Valve
- ByPass
- ByPass Chamber
- Diversion Chamber
- Meter
- Sanitary Pumping Station
- Valve Chamber
- Water Pollution Control Plant

Sanitary Manholes
- Manhole

Sanitary Sewers
- San Sewers

Sanitary Laterals
- Sanitary Laterals

Potential Infrastructure
- Potential Watermains
- Potential Gravity Trunk Sewer
- Potential Forcemain
- Potential Sanitary Pumping Station Facility

Scale:

0 45 90 180 Meters

1:10,000

Project:

LOYALIST-AMHERSTVIEW WEST SECONDARY PLAN

Title:

CONCEPTUAL FULL BUILD-OUT LAND USE WITH EXISTING AND FUTURE INFRASTRCUTURE

Project No.: 211-01353-00	Date: JULY 2024

Drawn By:	Checked By:	Figure No.:
DM	MF	D-3

File Location:C:\Pro\Amherstview\Servicing Map\211-01353-00_WaterSan-Preffered Option-D-3_REV6.mxd