

Our ref: 430797

ATTACHMENT B

Water Supply & Sewerage Capacity Assessment



ANNANDALE CHRISTIAN COLLEGE

WATER SUPPLY & SEWERAGE CAPACITY ASSESSMENT

**Date: 7 April 2026
(Revision B)**

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REPORT AUTHORISATION				
Revision	Revision Date	Details	Prepared by	Signature
A	30/03/2026	Original Report	Desmond Moseley (RPEQ 7565)	
B	07/04/2026	Updated Report (Minor Changes)	Desmond Moseley (RPEQ 7565)	

1 INTRODUCTION

The Annandale Christian College is located on the northern side of the Yolanda Drv and eastern side of Cypress Drv in Annandale. The northern boundary of the site is accessed off Jonquil Cres. The extract from Council's GIS below illustrates the location of the Annandale Christian College site. The property at No 9 Jonquil Cres is also part of the college site.



Figure 1.1 – Annandale Christian College Site

The existing school and facilities are serviced with a potable water system and reticulated sewer system. To ensure the existing water & sewer infrastructure has sufficient capacity to cater for the projected number of students and staff in accordance with Council standards, an assessment of the system capacities have been undertaken.

This report summarises the assessment of the existing water and sewerage network capacity to service the projected number of students and staffs, with this illustrating:

- The water network modelling shows the existing trunk and reticulation water mains that service the Annandale area, including the DN100 water mains along Jonquil Cres are adequately sized to service the projected number of students and staff at Annandale Christian College.
- The existing water mains on Jonquil Cres are also adequately sized to service No 9 Jonquil Cres which has been purchased by the school for an office/learning support.
- An existing DN150 gravity sewer that is located at the north east corner of the school and provides the sewage service to the site. This gravity sewer extends from MH 7/S4A7A to the east and into PS S4A. The existing gravity sewers along with PS S4A have sufficient capacity to service the 5xADWF flows from the school site.
- The existing DN150 gravity sewer from MH 1/S4A7B1 that services No 9 Jonquil Cres has sufficient capacity to service the 5 x ADWF.

The water network modelling and sewer system capacity assessment undertaken for the Annandale Christian College are summarised in the following report sections.

2 POPULATION ASSESSMENT

The following section provides the projected equivalent population (EP) assessment for the Annandale Christian College. The following Tables 2.1 and 2.2 detail the projected equivalent population for the primary and secondary students along with the staff. The equivalent population loading rates for the students and staff is based on Council's Planning Scheme.

The projected equivalent population in the tables below incorporates the equivalent population for the building at No 9 Jonquil Cres as it also forms part of the Annandale Christian College site.

Table 2.1 – ACC Development - Water Projected Equivalent Population Assessment

Student Type	Number	Rate	EP
Kindy	25	0.14 EP/student	3.5 EP
Prep	50	0.14 EP/student	7.0 EP
Primary	318	0.14 EP/student	44.5 EP
Secondary	377	0.28 EP/student	105.6 EP
Staff	98	0.28 EP/student	27.4 EP
Totals			188.0 EP

Table 2.2 – ACC Development - Sewer Projected Equivalent Population Assessment

Student Type	Number	Rate	EP
Kindy	25	0.22 EP/student	5.5 EP
Prep	50	0.22 EP/student	11.0 EP
Primary	318	0.22 EP/student	70.0 EP
Secondary	377	0.43 EP/student	162.1 EP
Staff	98	0.43 EP/student	42.1 EP
Totals			290.7 EP

The above equivalent projected population assessment has been used in the water supply and sewer system capacity assessment for the school.

3 WATER SUPPLY PLANNING

3.1 Water Demand

Water demands have been calculated in accordance with Townsville City Council planning scheme and CTM Code. The following table provides the “residential” water demand parameters for the Townsville Planning Scheme for each equivalent person (EP).

Table 3.1 - Water Supply Unit Demand Parameters

Parameter	Unit Demand	Peaking Factor
Average Day (AD)	600 L/day/EP	
Mean Day Max Month (MDMM)	900 L/day/EP	1.5 AD
Peak Day (PD)	1125 L/day/EP	1.25 MDMM
Peak Hour (PH)	0.0333 L/s/EP	2.56 PD

The CTM Code and associated water network model includes water demand patterns for a range of uses, including school sites. The water demand pattern for school sites from the WaterGEMS network model is provided as Figure 3.1 below. The TCC water demand pattern for schools has a high peaking factor of 7.0 x ADWF in the middle of the day which is when students have their lunch break.

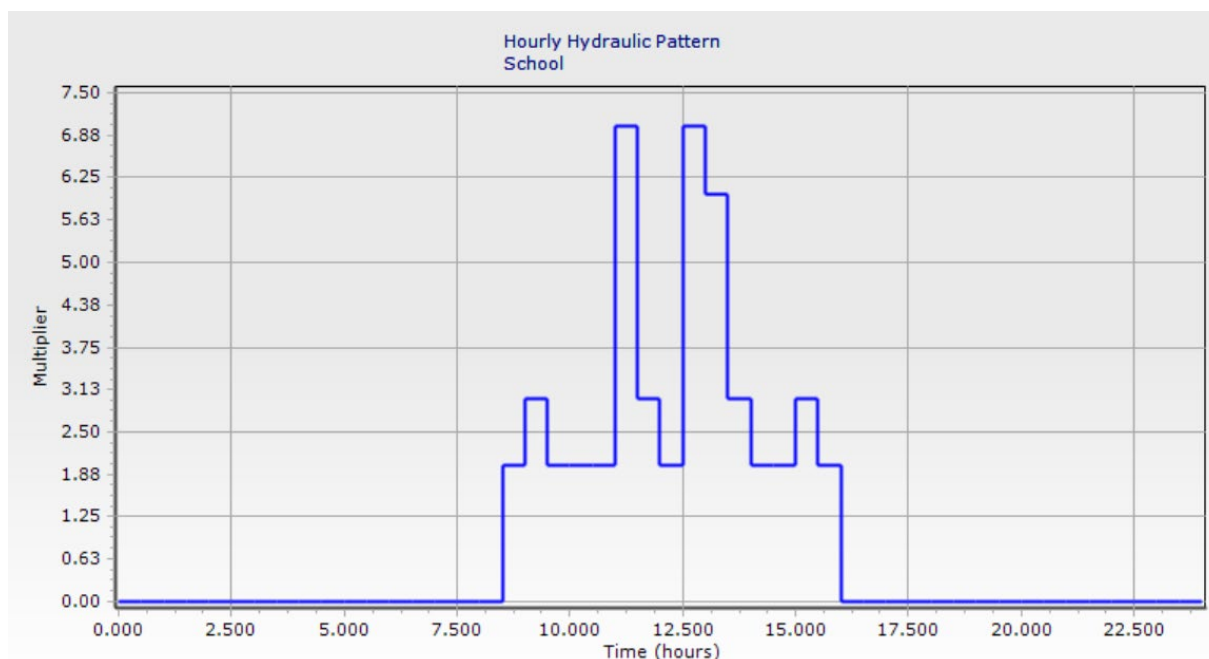


Figure 3.1 - School Water Demand Diurnal Pattern

The above school site diurnal water demand pattern has been applied to the Annandale Christian College site and its estimated projected equivalent population to assess the water network performance.

Due to the type of development, it is assumed that a 15 l/s fire flow is required in accordance with Council's design standards. This fire flow has been used to assess the theoretical performance of the water network. It is noted that the Building Code may require a 10 l/s @ 200 kPa fire flow depending on the actual building classification. This fire flow assessment has not specifically assessed the performance against the building code requirements.

3.2 Water Supply Assessment & Network Modelling

The Annandale Christian School is located on the 6.13ha site in Annandale that is generally bounded by Yolanda Drv to the south and Cypress Drv to the west in Annandale. The college site also incorporates the building at No 9 Jonquil Cres. The existing water infrastructure that services the Annandale Christian College site includes:

- Water is supplied from the Douglas No 1A/B reservoirs that are located on the northern foothills of Mt Stuart in Douglas. The Douglas No 1A/B reservoirs are 2 x 41 ML tanks.
- Water is delivered from the two reservoirs along a DN900 MSCL pipe on University Drv and Stuart Drv. The DN900 MSCL pipe is a bulk water main that delivers water to Sun Metals & Alligator Ck.
- Water is also delivered from the Douglas reservoirs along a DN600 MSCL pipe on University Drv and Stuart Drv through to the intersection with Hynch St. The DN600 MSCL pipe is the bulk supply main to deliver water into the Wulguru reservoir.
- A DN375 AC trunk water main is also located along the southern side of University Drv. There are connections off this DN375 AC main to deliver water into the Annandale area.
- There are a number of reticulation water main connections off the above trunk mains that service the Annandale residential area including the Annandale Christian College development site. The water main offtake and network that services the school includes:
 - o A DN375 water main crossing of University Rd to Casuarina Drv. This main connects off the existing DN375 AC trunk main along the northern side of University Rd and the DN525 AC on the southern side of University Rd. This DN375 AC main extends to the end of Casuarina Drv.
 - o A DN225 AC main extends from the end of the DN375 AC main to the east and west along Yolanda Drv. The DN225 AC main on Yolanda Drv connects to an existing DN300 AC trunk main on Cypress Drv. The DN300 AC main on Cypress Drv extends to the north east and reduces to a DN225 AC main. The DN225 AC main passes both intersections with Jonquil Cres.
 - o A DN100 AC water main extends from both the intersections of Jonquil Cres and Cypress Drv to the east along the northern side of Jonquil Cres. A DN100 AC road crossing extends to the south where the site will connect to and be serviced from. This main is to the north of the school site.

The image below from Council's GIS illustrates the existing water mains in the vicinity of the proposed development site.



Figure 3.1 – Council GIS Plot of Water Infrastructure

Theoretical water network modelling has been undertaken to assess the capacity of the existing water network. The modelling was undertaken using the Council's WaterGEMS network model for both the peak hour demands and fire flows.

The extract from the WaterGEMS model that illustrates the water mains that service the school is provided in Figure 3.2 below.

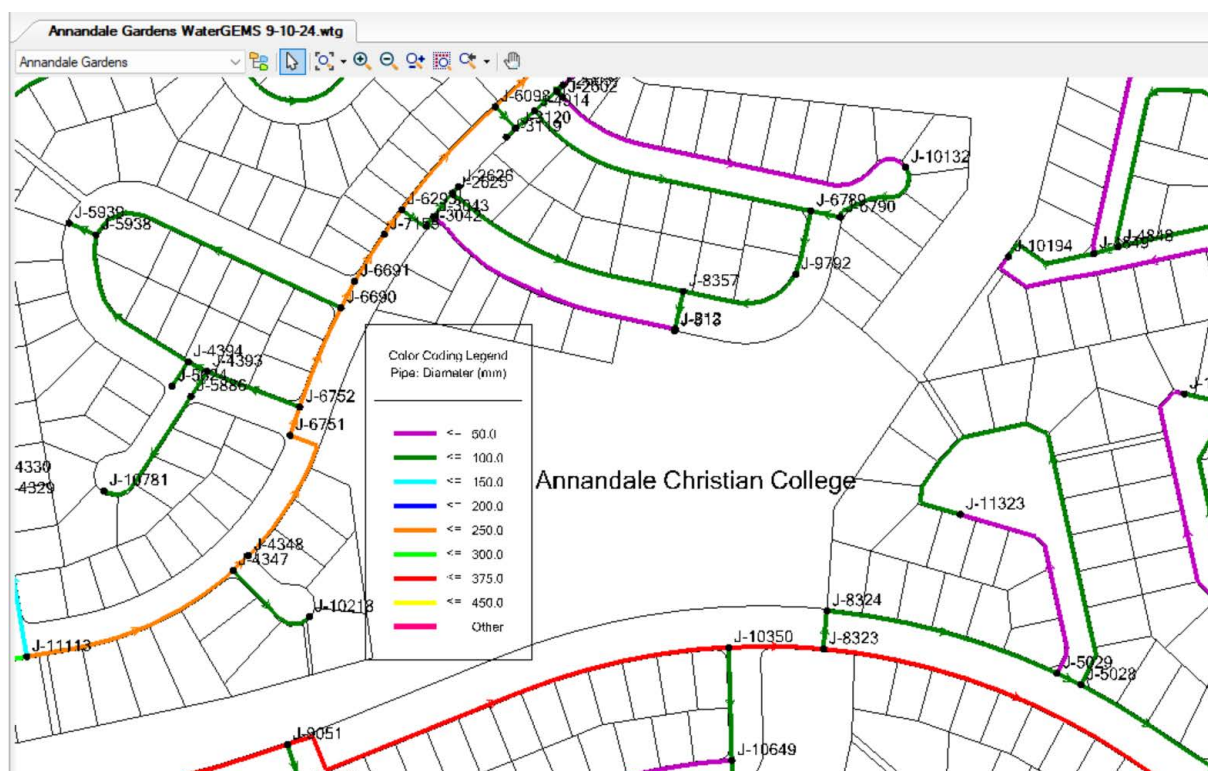


Figure 3.2 – Water Mains that Service Annandale Christian College

The WaterGEMS network modelling has been undertaken to confirm the surrounding water network can service the projected equivalent population at the Annandale Christian College with a reticulated water supply. The WaterGEMS network modelling has shown:

- The existing water mains that service the school site off Jonquil Cres are adequately sized to service the school with peak hour and fire flows. This includes the building at No 9 Jonquil Ave that is part of the school. The peak hour pressures at 7 pm (ie the peak residential demand period) are reduced to 456 kPa within the surrounding water network. This meets the minimum pressure requirement of 220 kPa.
- The peak hour pressures at 12:30 noon (ie the peak school demand period) are reduced to 518 kPa at the water main offtake to the school site on Jonquil Cres. This higher water pressure at the peak school demand period of 12:30pm is due to the remainder of the surrounding water network servicing residential houses which have a low demand during the middle of the day.
- The headloss gradient along the existing water mains that service the school site off Jonquil Ave are generally up to 0.002 m/m with the pipe velocities up to 0.32 m/s at the peak residential demand period of 7pm, which meets the CTM code recommended standards. The headloss gradient at the peak school demand period of 12:30pm along the existing DN100 AC water main along Jonquil Ave is increased to 0.028 m/m, with the DN100 AC crossing of Jonquil Ave and the final short DN100 DICL water service connection to the school site having a headloss gradient of 0.060 m/m. These headloss gradients exceed the recommended CTM Code valves but this is only due to the high theoretical school water demand peaking factor in the middle of the day. Since the velocities along the existing water mains are well under the CTM Code maximum velocity of 2.5 m/s, and the water pressures in the network are well above the minimum requirements, these short period higher headloss gradients are not an issue.
- With the inclusion of the 15 l/s residential fire flow on the DN100 DICL main that services the site, the water pressure is reduced to 404 kPa. This achieves the minimum pressure requirement of 120 kPa.
- The WaterGEMS figure and results table are provided in Appendix B. Figure 3.3 below illustrates the water pressures at the connection to the site.

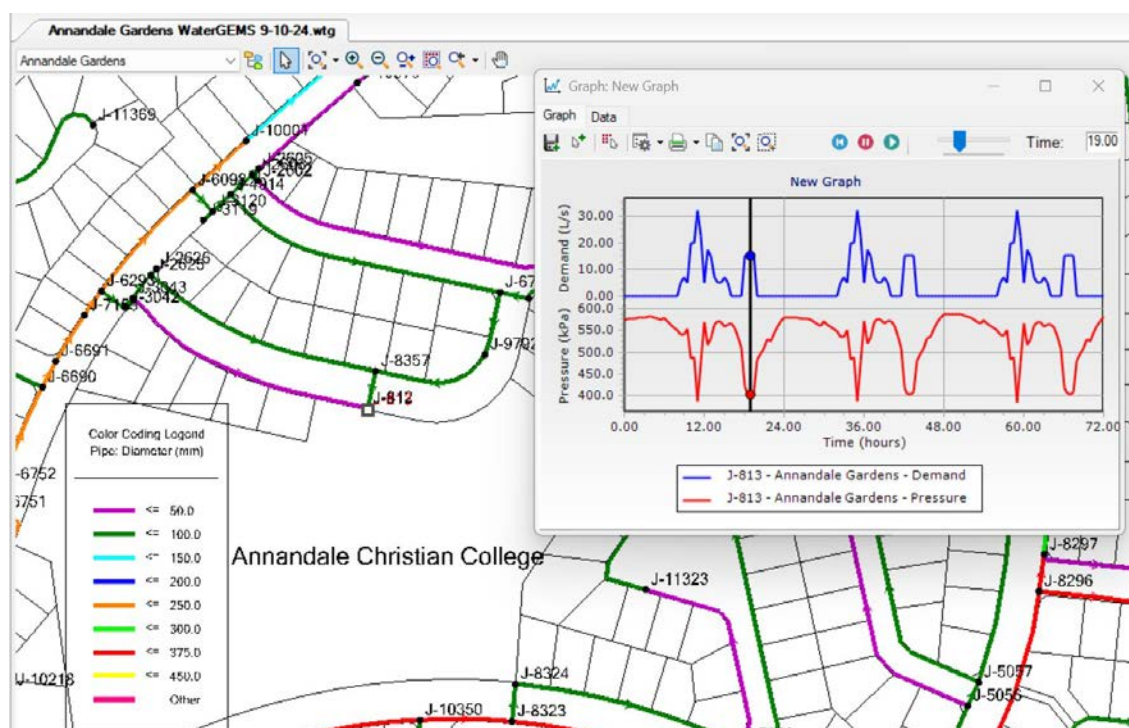


Figure 3.3 – Annandale Christian College Peak Hour Water Pressures

It is noted that the fire flow WaterGEMS network modelling is to assess the water network performance at the Annandale Christian College against Townsville Council planning standards. Based on the type/classification of the school, the Building Code may require different fire flow and pressure standards, including a fire tank and booster pump system. This assessment has not specifically assessed the performance against the building code requirements.

4 SEWAGE SYSTEM PLANNING

The Annandale Christian College site is serviced with a reticulated gravity sewer system. The existing gravity sewer system that services the school site consists of:

- The school is serviced with a reticulated sewer system from existing MH 3/S4A7A that is located in the north east corner of the property, off Jonquil Cres.
- An existing DN150 gravity sewer system extends to the north east from MH 3/S4A7A to 1/S4A7. A short section of DN150 then connects to existing MH 7/S4A that is located on the eastern side of the large open drain behind the residential houses off Indigo Cres.
- The school building on No 9 Jonquil Cres is serviced with a reticulated sewer system from existing MH 1/S4A7B1 that is located on the Jonquil Cres frontage of the site. The DN150 sewer from this MH extends to the north west and onto existing MH 1/S4A7 (being the same MH that the reminder of the school site is also directed to).
- Existing MH 7/S4A is located on a DN300 trunk gravity sewer. The DN300 trunk gravity sewer extends to the north then the east from MH 7/S4A to the zero MH at PS S4A (Eucalyptus Ave). The final section of sewer into PS S4A is DN375. PS S4A then pumps sewage to the east, under a large open stormwater drain to direct sewage into the existing trunk gravity sewer system in the catchment of major PS S6 (Cluden).

Figure 4.1 below is a plot from the Council GIS that illustrates the gravity sewers that services the Annandale Christian College site. The capacity of the existing sewer system is provided in the following report sections.

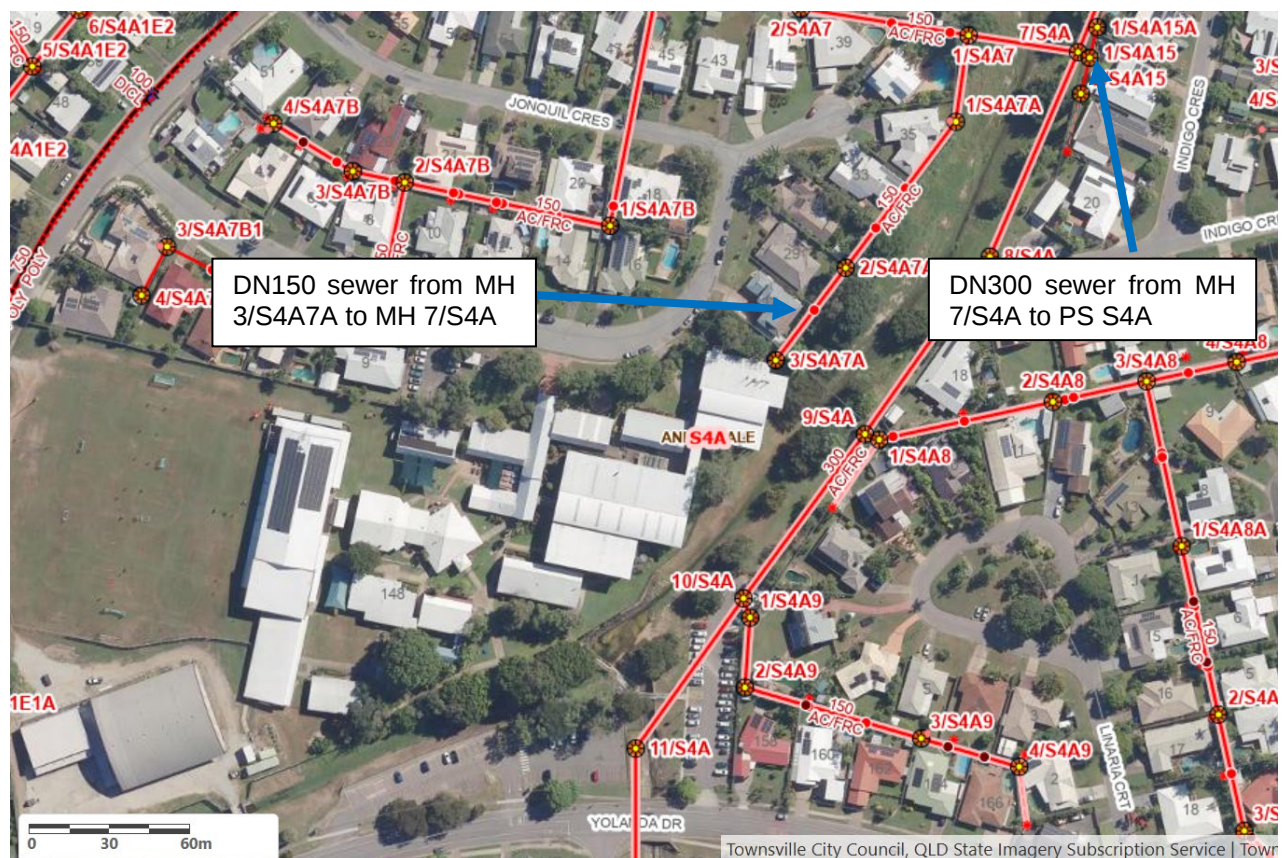


Figure 4.1 – GIS Plot of Existing Sewer System

4.1 Sewage Infrastructure Capacity

The capacity of the existing gravity sewer system to cater for the projected number of students and staff at the Annandale Christian College was assessed using the SewerGEMS model developed for the Southern Suburbs Sewer System.

The SewerGEMS model includes the existing reticulation and trunk gravity sewer system from the school site through to PS S4A. The SewerGEMS model was updated to include the projected equivalent population based at the school with this applied to the existing sewer MH 3/S4A7A that services the school and MH 1/S4A7B1 that services the school building at No 9 Jonquil Cres. This is to confirm that the existing sewer system is adequately sized to service the projected equivalent population for the school site.

With the inclusion of the updated equivalent population, the SewerGEMS model has illustrated:

- The existing DN150 gravity sewer system to MH 7/S4A that will service the school flows up to 57% full for the projected 5xADWF.
- The existing DN150 gravity sewer from MH 1/S4A7B1 that services the school building at No 9 Jonquil Cres to MH 1/S4A7 flows up to 48% full for the projected 5xADWF.
- The existing DN300 trunk gravity sewers from MH7/S4A to MH 1/S4A that will service the school site and surrounding residential lots flows up to 71% full.
- The existing DN375 trunk gravity sewers from MH 1/S4A to PS S4A flows up to 49% full.
- All the existing sewers flow less than 75% full which is the maximum value allowable in the CTM code.

The following Figure 4.3 provides the flows and performance of the existing gravity sewer system with the inclusion of the projected equivalent population from Annandale Christian College. A larger version of the modelling results is provided in Appendix C.

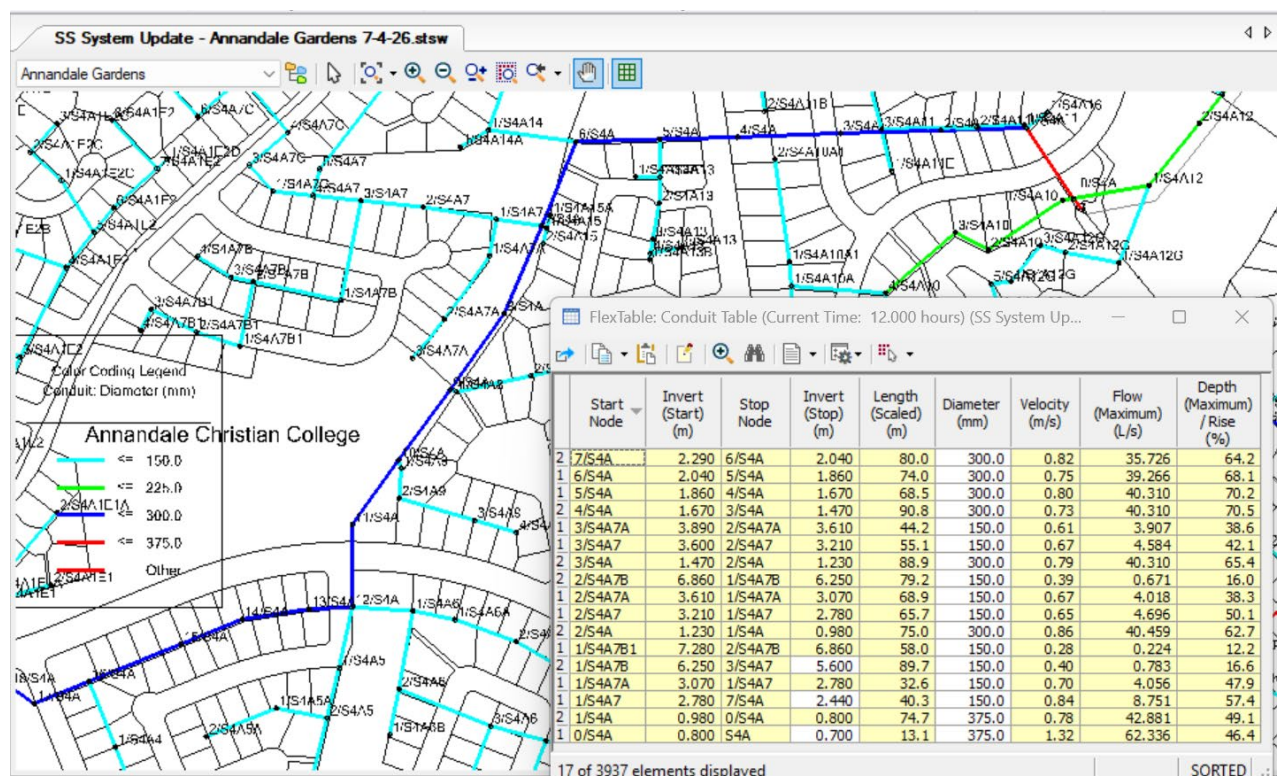
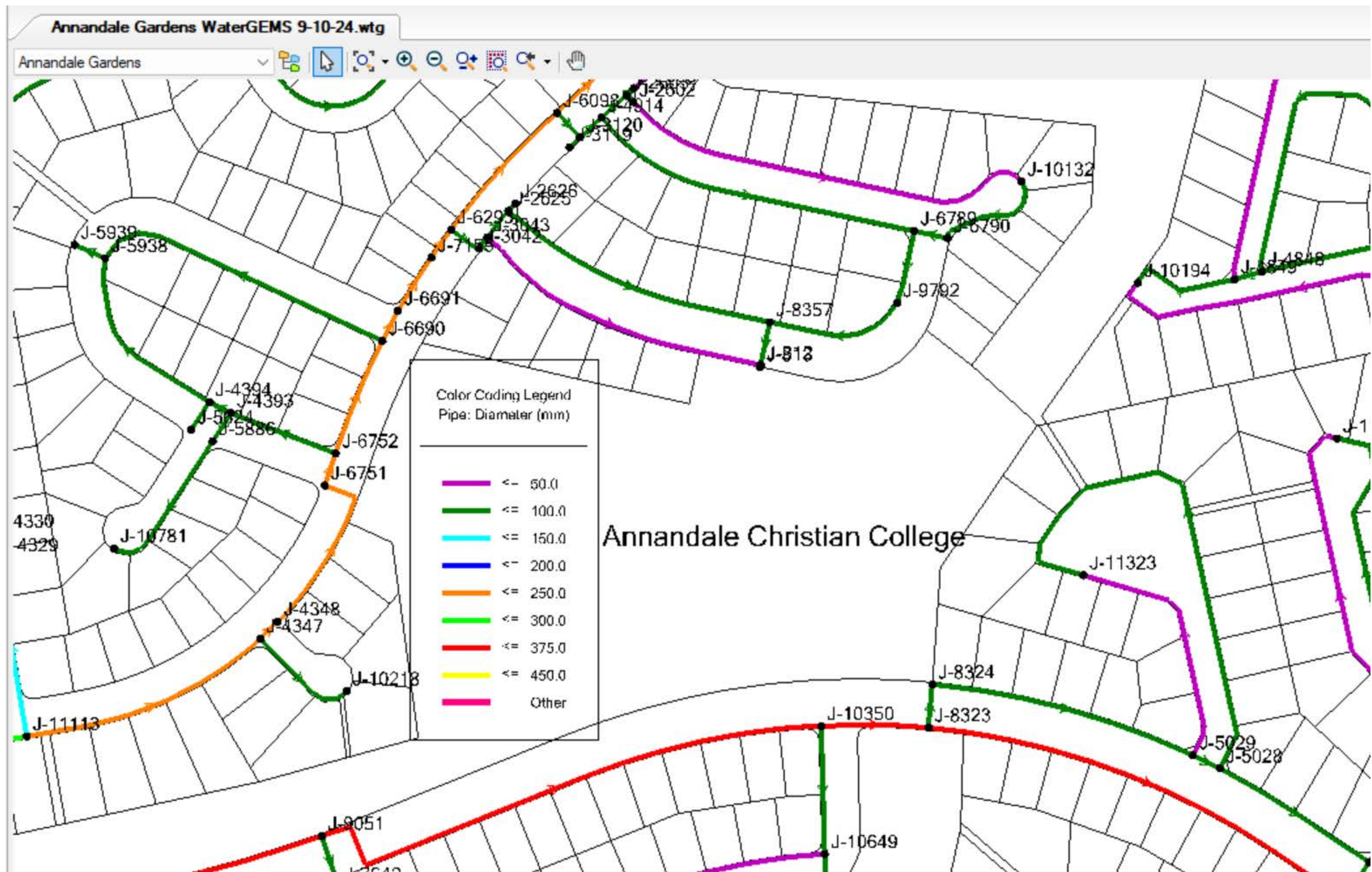


Figure 4.3 – SewerGEMS Modelling Results

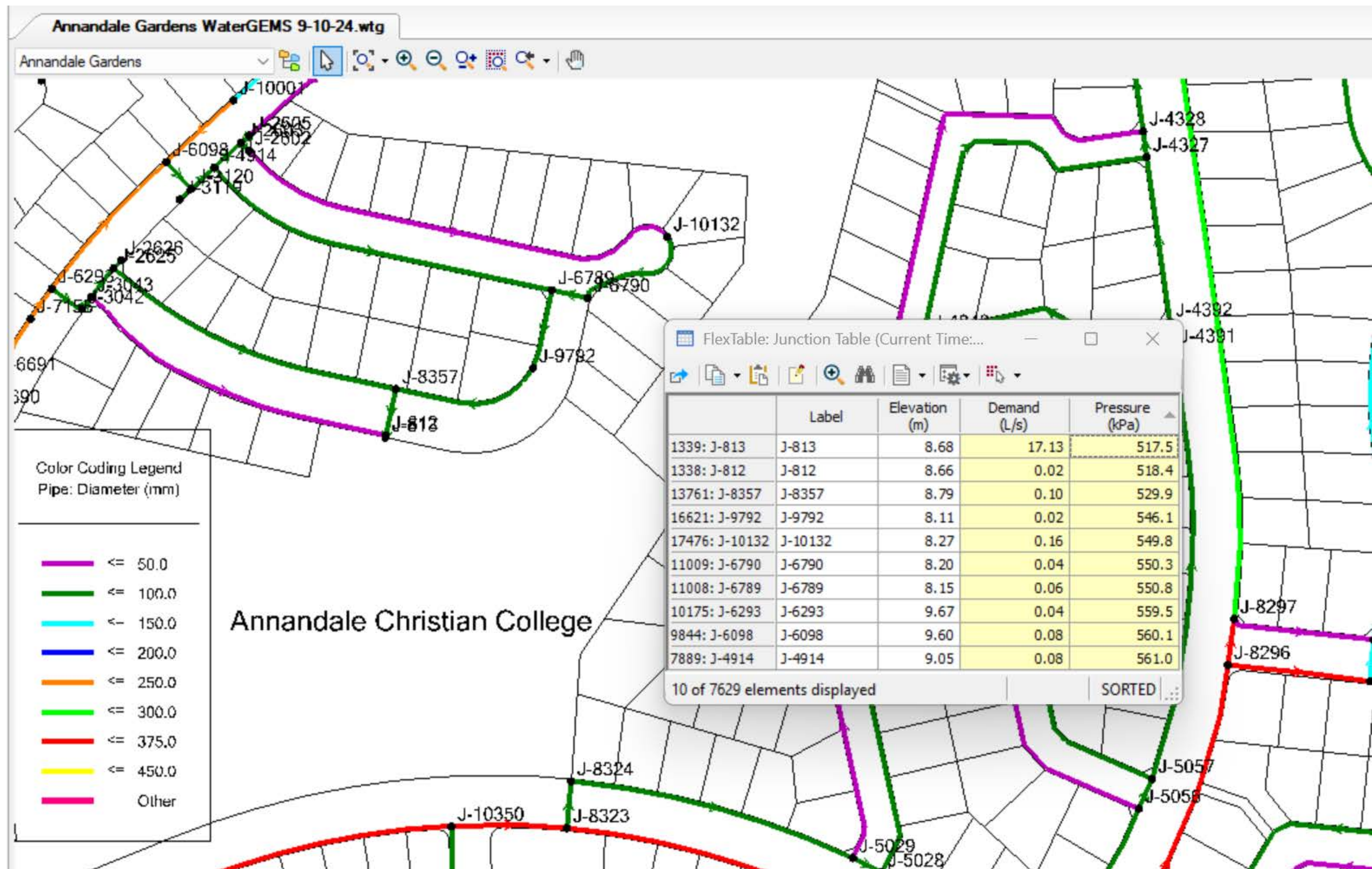
The above assessment illustrates the existing gravity sewer system has sufficient capacity to cater for the 5xADWF flows from projected student and staff numbers at the Annandale Christian College site and surrounding residential lots.

APPENDIX A

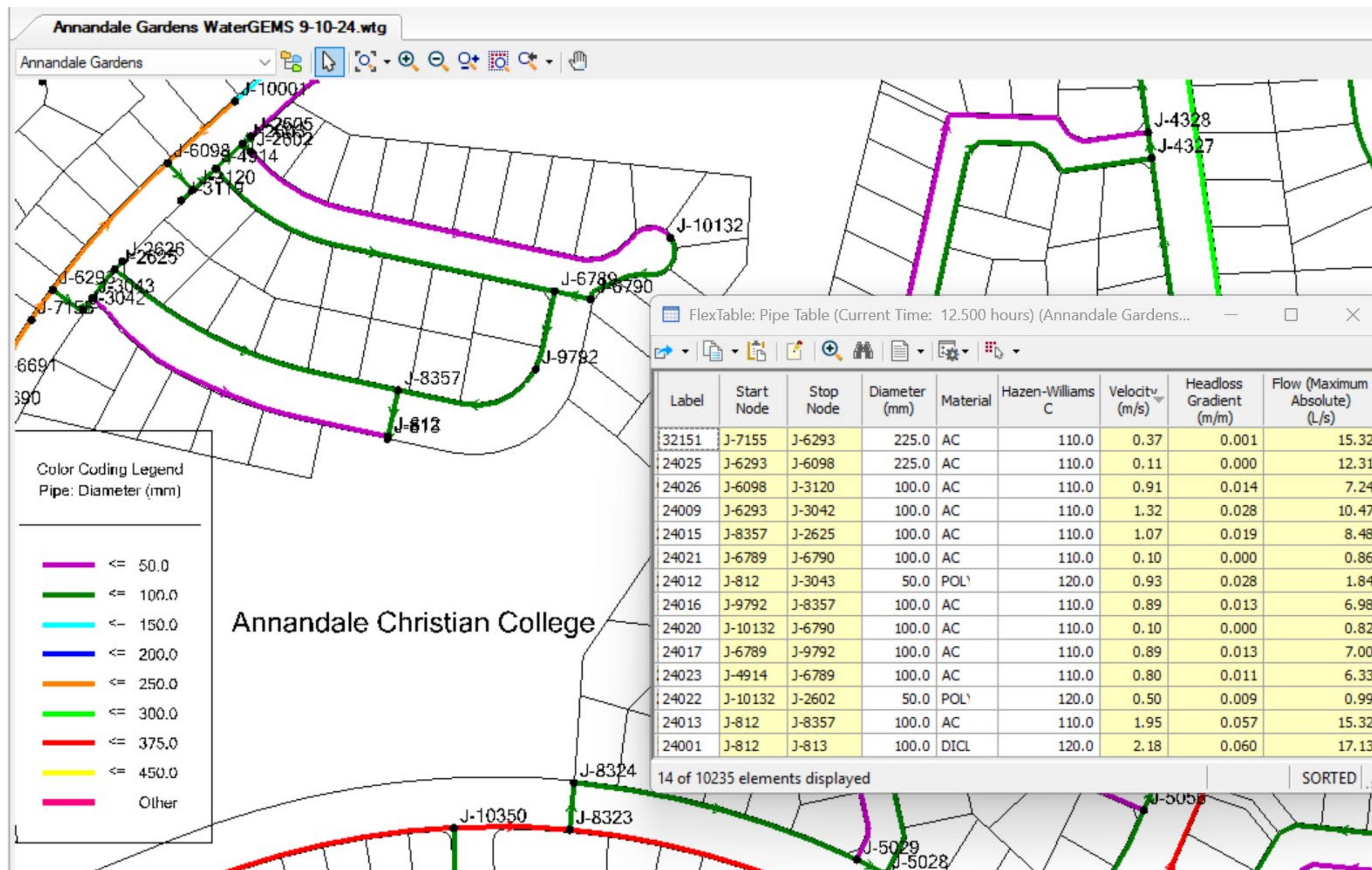
WATERGEMS MODELLING RESULTS



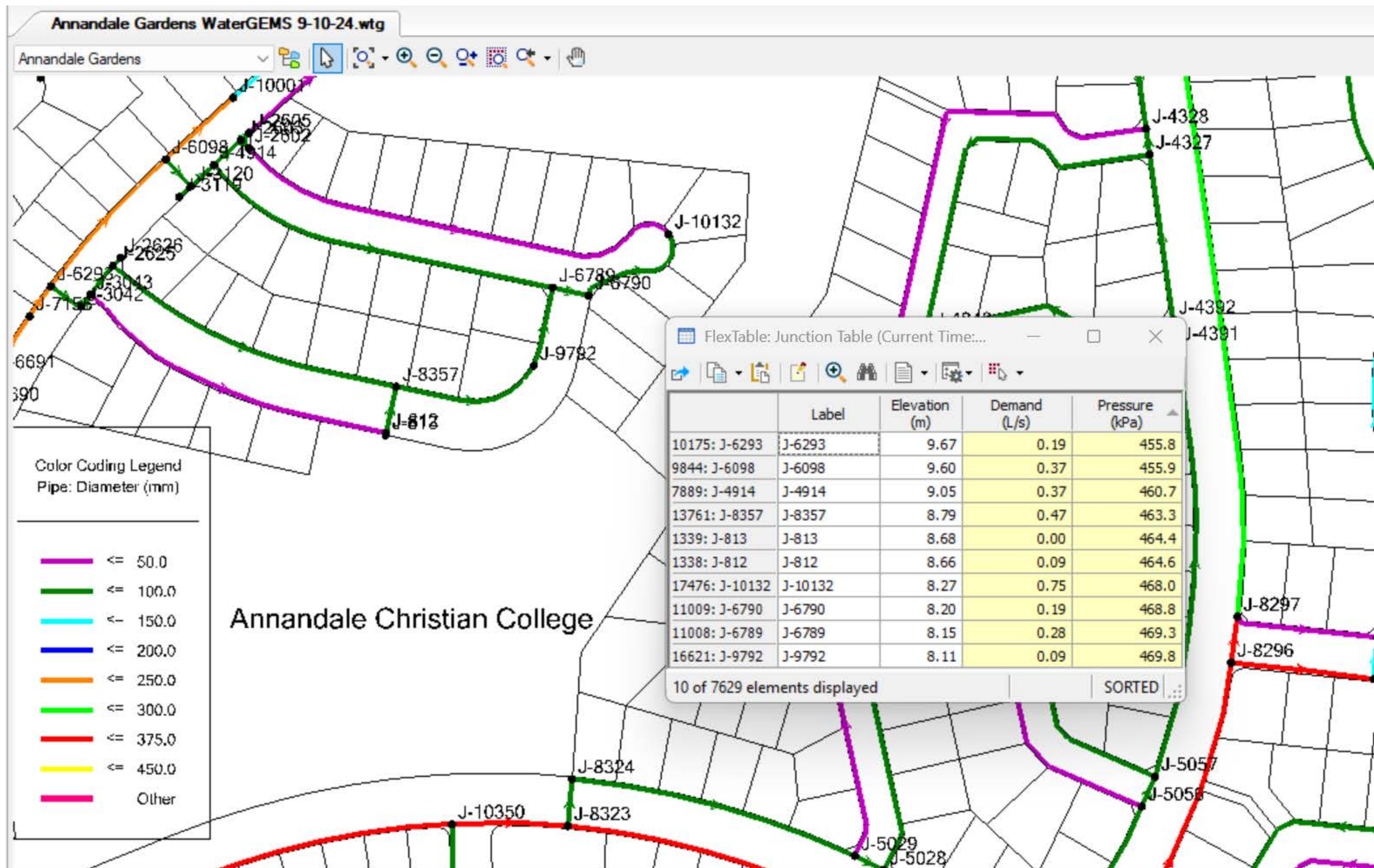
ACC Modelling – WaterGEMS Figure



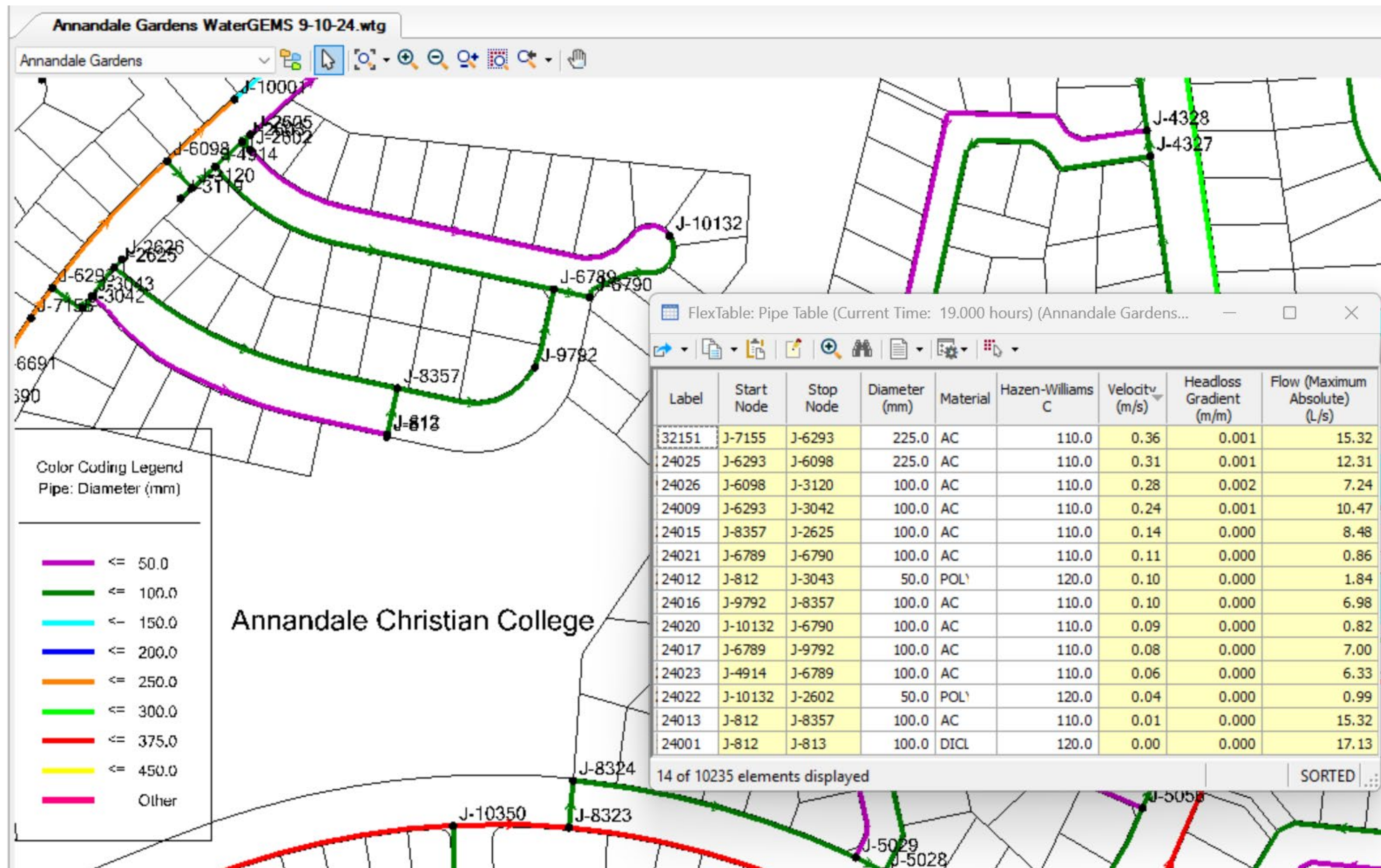
ACC Modelling - Peak Hour Node Modelling Results – 12:30 pm



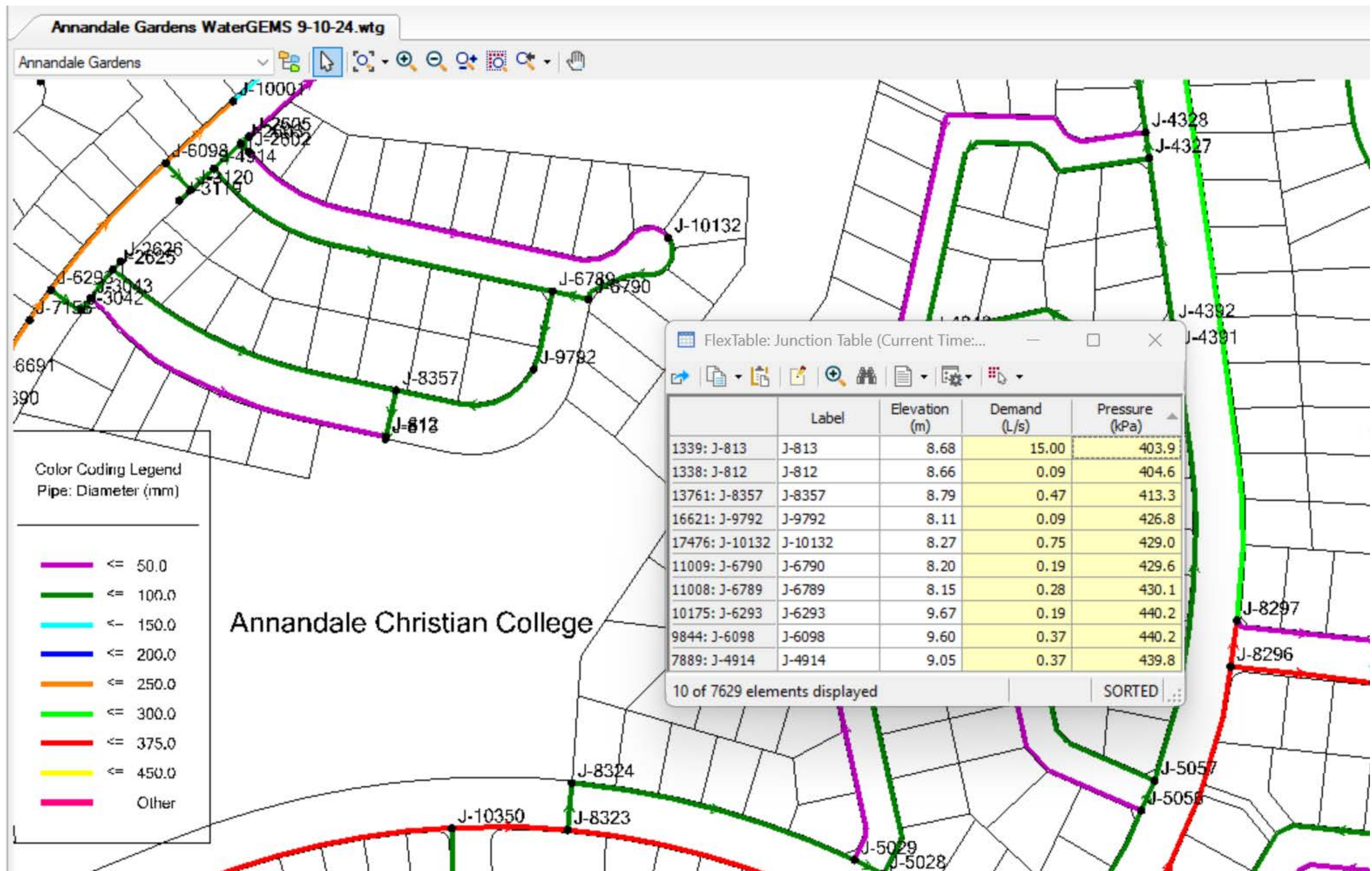
ACC Modelling - Peak Hour Pipes Modelling Results – 12:30 pm



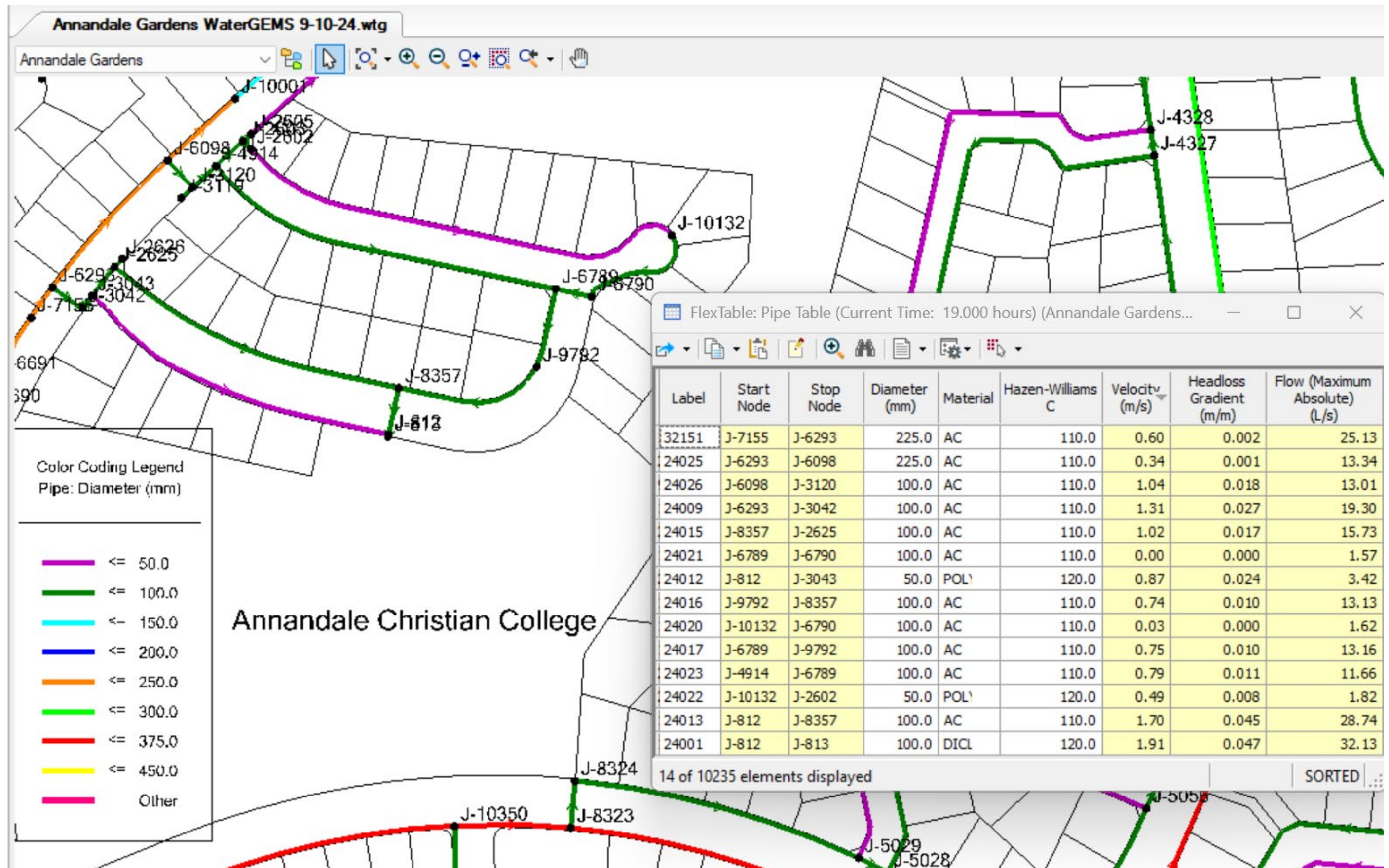
ACC Modelling - Peak Hour Node Modelling Results – 7 pm



ACC Modelling - Peak Hour Pipes Modelling Results – 7 pm



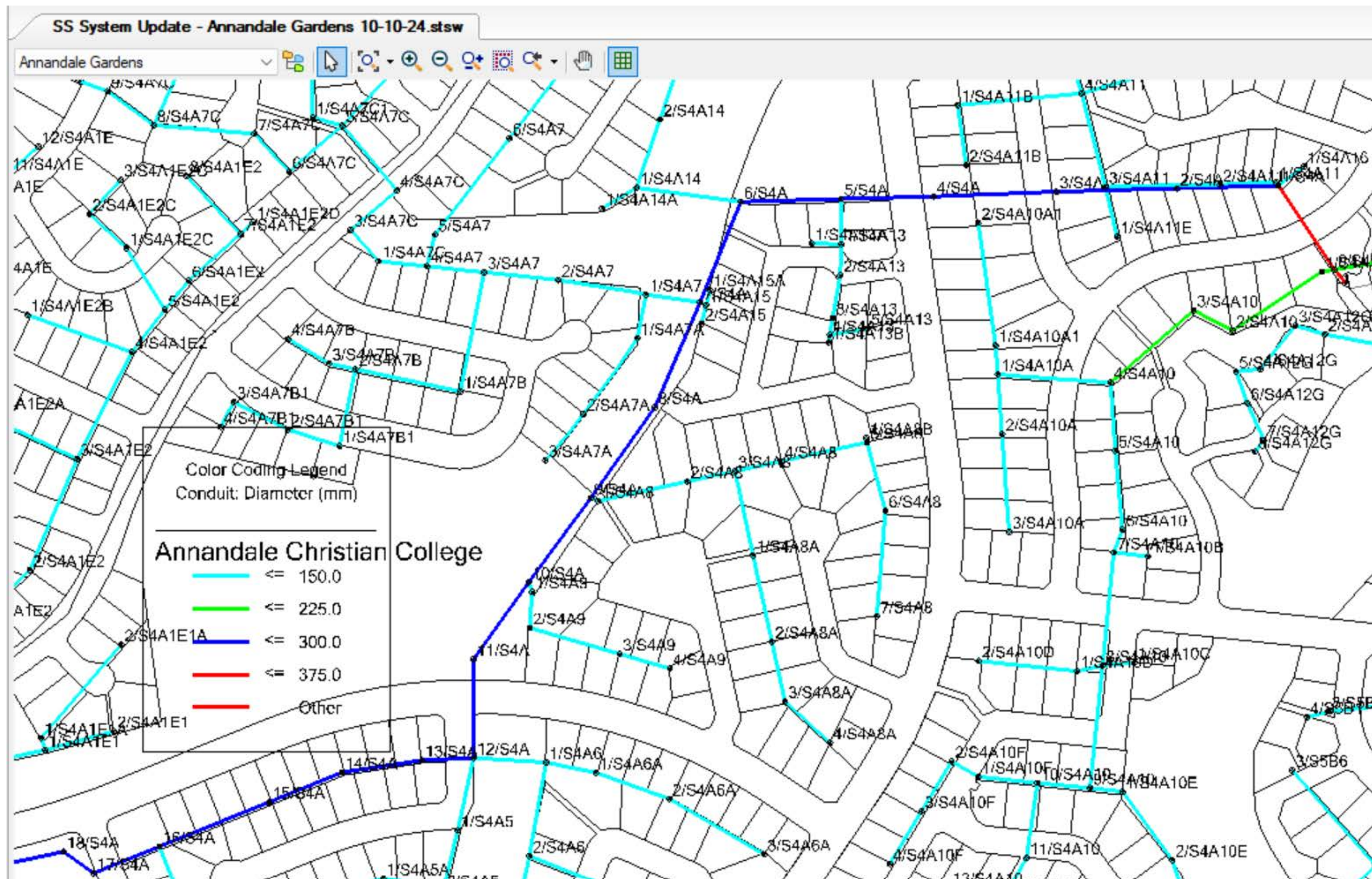
ACC Modelling - Peak Hour Node + 15 l/s Residential Fire Flow Results – 7 pm

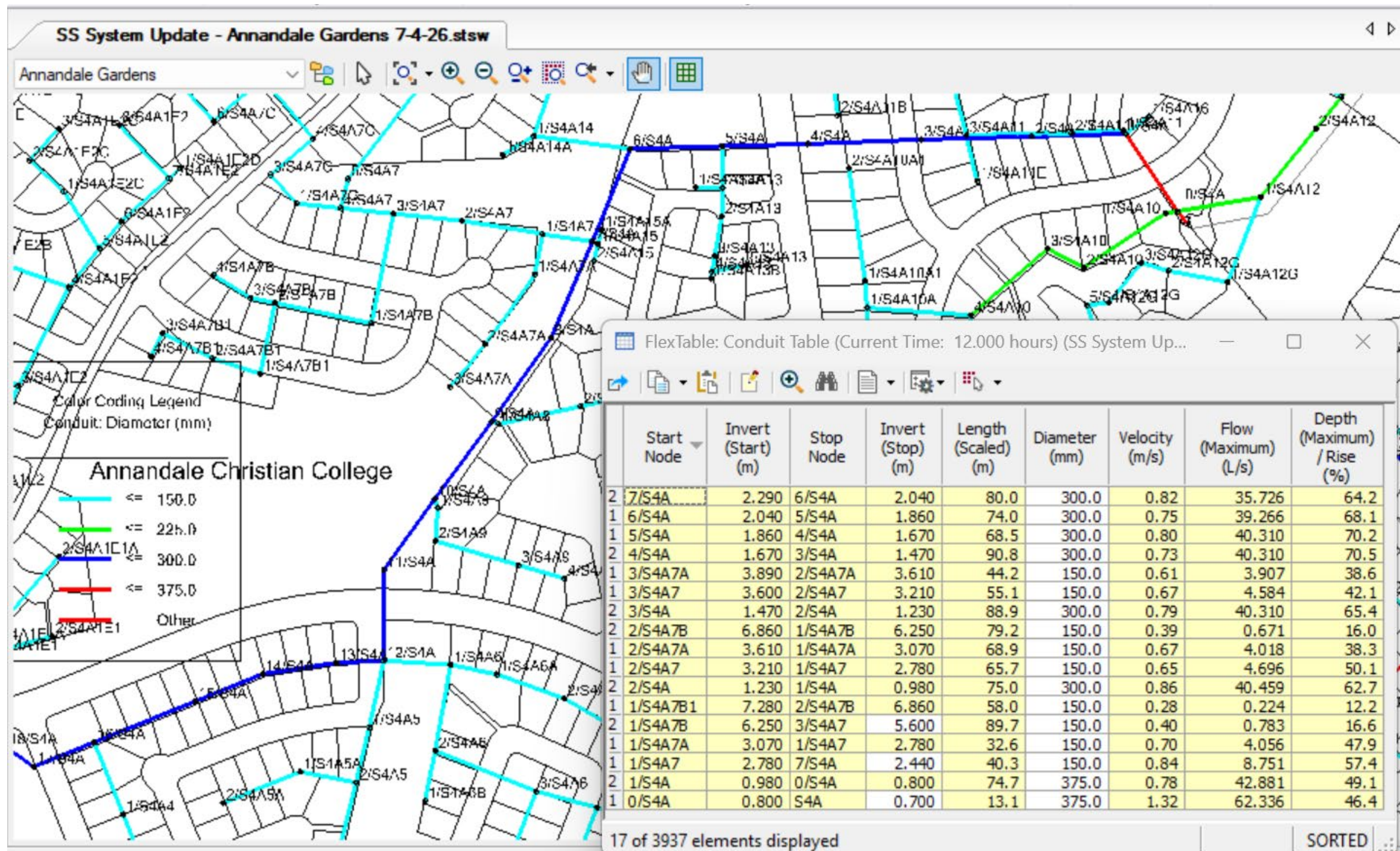


ACC Modelling - Peak Hour Pipes + 15 l/s Residential Fire Flow Results – 7 pm

APPENDIX B

SEWERGEMS MODELLING RESULTS & FIGURES





PWWF Sewer Capacity Assessment Results