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July 09, 2020 Project Number: P1581-17

David Schaeffer Engineering Ltd
120 Iber Road, Unit 203
Ottawa, Ontario
K2S 1E9

Attention: **Kevin Murphy, P.Eng.**

Subject: **7000 Campeau Drive Subdivision - Preliminary Stormwater Management Plan**

Introduction

The proposed residential development at 7000 Campeau Drive in Kanata, Ontario, consists of four individual parcels equating to approximately 70.9 ha. These lands are a part of the Kanata Golf and Country Club and are currently zoned as Parks and Open Space (O1A). The proposed development will consist of single detached homes, front drive towns, back to back towns, stacked towns and medium density blocks. The proposed development will be serviced by five (5) Stormwater Management Facilities (SWMF). Four (4) of the facilities will have stormwater management (SWM) ponds and will be equipped with oil-grit separators (OGS). Due to the small drainage area, one SWMF will be serviced solely by an OGS unit (SWMF 3). The stormwater management facilities have been strategically located at low points within the proposed development, where each facility can outlet to the existing trunk storm sewer that runs along Knudson Drive and Weslock Way. Figure 1 provides an overview of the proposed development area relative to existing infrastructure along with the respective locations of the proposed SWM facilities. This memo intends to assess and ensure that the preliminary design of the proposed development meets several fundamental stormwater management requirements. As such, this memo will document and assess:

(i) The adequacy of the proposed minor system to convey the 2- and 100-year storm flows from within the development to the stormwater management (SWM) facilities.

(ii) The capacity of the proposed major system to safely convey the excess 100-year flows to the SWM facilities.

(iii) The operation of the proposed SWM facilities based on quality and quantity control requirements.

(iv) The hydraulic impacts of the proposed subdivision and SWM facilities on the upstream and downstream existing SWM infrastructure.

(v) The peak flows into the Beaver Pond Facility for pre- and post-development conditions.

(vi) The emergency overflow from the proposed development under the 100 Year + 20% stress test.

All analyses documented in this memo were completed using the PCSWMM hydrologic and hydraulic modelling software package. The City of Ottawa provided JFSA with an existing condition PCSWMM model of the study area, which this study has built upon. The following discusses in detail the pre- and post-development PCSWMM modelling components and the findings of this preliminary analysis.

Figure 1: Development Overview and Proposed SWM Facilities

Existing Conditions Model

Model Overview

To assess the stormwater operations of the proposed development the City of Ottawa provided JFSA with a detailed PCSWMM (hydrologic & hydraulic) model of the existing major and minor stormwater system that discharges to the Beaver Pond. This model is highly detailed and was developed using the vast amounts of GIS data available to the City (natural topography, minor system pipe network, catch basin locations etc.).The City model consists of two individual models, the Kinematic Wave model and the Dynamic Wave model. The Kinematic Wave model is used to simulate the subcatchment runoff, the major system flow paths and the total flow into the minor system. Note that the representation of the major system flow paths in the Kinematic Wave model is simplistic and does not fully consider the existing grading and topography of the land. The major system in this model simply allows for any excess flow that can not enter a catchbasin to flow to the next nearest catchbasin. The flows diverted to the minor system network simulated by the Kinematic model are then extracted into an Interface File (text file). The Interface File contains approximately 734 individual hydrographs at all inflow locations into the minor system. This interface file is then read into the Dynamic Wave model to simulate the operations of the minor system.

Modifications and Corrections

A few minor errors/issues were noted in the City models as provided. This included minor system pipe inverts that were incorrect (STM12459 & STM11997) which were corrected to reflect as-built values collected by DSEL from the City of Ottawa. One minor system node (MHSTM12321) had an invert elevation of 0 m, which resulted in inflows to pond at this node until the water surface reached the elevation of the outlet pipe invert (98.43 m). A detailed review of the external drainage areas to the Beaver Pond was completed by DSEL, based on City of Ottawa 1K mapping data, which found that there were several locations along the drainage boundary that would drain to external subcatchments and not to the Beaver Pond. This generally included developed lands that had minor system infrastructure that would direct flow to neighbouring watercourses. Some 1.445 ha of land was added to the model's total drainage area and 1.975 ha removed from the model's total drainage area, resulting in a net 0.53 ha (0.2% of the total model drainage area) reduction in the total modelled drainage area. Images of the identified issues addressed above have been documented in Attachment A.

Field Verification

The City model was reviewed against the data obtained from the flow monitoring program completed by JFSA from June 2019 to October 2019 within the Campeau Drive and Weslock Way minor systems. Full details of this monitoring program have been provided in JFSA's July 2020 report titled "Kanata Golf & Country Club - 2019 Monitoring & Hydrologic Model Calibration Report". Refer to Attachment A for plots comparing the simulated and observed flows for all "Significant Events[1]" recorded during the 2019 monitoring period at Campeau Drive and Weslock Way.

[1] A "Significant Event" is defined as a rainfall event with a total rainfall volume greater than 5 mm which was followed by at least 12 hours without any additional rainfall.

From visual inspection of the results, it appears that the City's model is generally (but not always) overestimating the peak flows into the minor system at both locations; with the peak flows simulated by the model overestimating slightly more at Weslock Way than at Campeau Drive. Numerically reviewing the two datasets it was found that on average the City model appears to overestimate the peak flows into the minor system by 47% and 26% at Weslock Way and Campeau Drive, respectively. It was also found that the City model overestimated the total runoff volume into the minor system at both locations, with the simulated total volumes being 69% and 27% larger than the observed volumes at Weslock Way and Campeau Drive, respectively.

The models have a reasonable coefficient of determination (R^2) of 0.64 and 0.75 at Weslock Way and Campeau Drive, respectively. Although the Nash-Sutcliffe model efficiency coefficients for these locations do not present such a positive outlook, with values of -0.2 and 0.38 at Weslock Way and Campeau Drive, respectively. Note that the closer the coefficient of determination (R^2) and Nash-Sutcliffe model efficiency coefficient are to 1.0, the better the fit. Based on the statistical analysis the model appears to produce a better fit for the observed flows at Campeau Drive than at Weslock Way for both the R^2 and Nash Sutcliffe efficiency. Full statistical summaries have been provided in Tables 1 & 2 below. Note that no events greater than the 2-year event were observed during this monitoring period.

Table 1: Weslock Way 2019 Monitoring Summary – Field observations vs City Model

Parameter	Value
Total Rainfall Volume (mm)	264.04
Minimum Peak Flow Ratio (Sim/Meas)	0.58
Average Peak Flow Ratio (Sim/Meas)	1.47
Maximum Peak Flow Ratio (Sim/Meas)	2.09
Measured Volume (m^3)	46696
Simulated Volume (m^3)	78903
Volume Difference (m^3)	32207
Volume Ratio (Sim/Meas)	1.69
R^2	0.64
Nash-Sutcliffe	-0.2

Table 2: Campeau Drive 2019 Monitoring Summary – Field observations vs City Model

Parameter	Value
Total Rainfall Volume (mm)	239.43
Minimum Peak Flow Ratio (Sim/Meas)	0.56
Average Peak Flow Ratio (Sim/Meas)	1.26
Maximum Peak Flow Ratio (Sim/Meas)	1.78
Measured Volume (m^3)	11714
Simulated Volume (m^3)	14890
Volume Difference (m^3)	3177
Volume Ratio (Sim/Meas)	1.27
R^2	0.75
Nash-Sutcliffe	0.38

Based on the above findings, it is concluded that the City's model is not a perfect reflection of the existing stormwater operations of the area, as it tends to overestimate both the peak flows and total flows into the system. Although this model has been considered a reasonable representation for the purposes of this study, as it generally tends to produce a conservative estimate of peak flows and total volume into the existing minor system, based on the field data currently available. As such, this model has been used to establish the existing hydraulic and hydrologic conditions of the study area.

Downstream Boundary Condition and Hot Start File

The City model, as provided, assumed a free outlet at the Beaver Pond. To ensure that the analysis completed in this study is conservative the downstream boundary of the model was fixed to the 100-year peak water level in the Beaver Pond of 92.55 m. The new downstream boundary created a backwater that propagates up the existing storm sewer system. To ensure this boundary was stable, a hot start file was generated to allow the backwatered storm sewer to stabilize before a simulated event. After making the above refinements the model was simulated using the 5-year 3-hour Chicago storm, 100-year 24-hour SCS storm and 100-year +20% 24-hour SCS storm. The results of this analysis would function as the existing conditions targets for the proposed development.

Proposed Conditions Model

Model Overview

Like the existing conditions modelling, the proposed condition analysis consisted of two models, the Kinematic Wave model and the Dynamic Wave model. For the proposed conditions, the Kinematic Wave model was adjusted to contain only the existing external lands to the development site, and the area that makes up the proposed development lands was removed, as it would be simulated in the Dynamic Wave model. The following sections document the development of the proposed conditions model and the results of this analysis.

Subcatchments

To ensure that there was no overlap or gaps in subcatchments between the two models, the Kinematic Wave model subcatchment boundaries had to be slightly adjusted to ensure that they would match up with the proposed development boundaries in the Dynamic Wave model. This required either slightly clipping or slightly extending the existing subcatchment boundaries in the Kinematic Wave model, this was primarily completed along the rear yards of the existing residential developments. After ensuring that there were no intersections of subcatchment boundaries between the two models, the drainage areas of the Kinematic Wave model were updated based on their new drainage area. If a subcatchment area changed by more than 10% that subcatchment Width / Flow Length parameter was also recalculated. The remaining subcatchment parameters in the Kinematic Wave model remained unaltered. Figures B1 & B2 in Attachment B provides an overview of the subcatchment areas simulated in the Kinematic and Dynamic models.

The drainage areas within the proposed development were provided by DSEL. As the development is only at the preliminary design stage, the majority of the subcatchments have been assumed to be 64% impervious (Runoff Coefficient=0.65). Default Manning's and depression storage values of 0.013, 0.25, 1.57 mm & 4.67 mm have been applied for impervious and pervious surfaces, respectively. City default Horton's infiltration values of 76.2 mm/hr, 13.2 mm/hr, 4.14 1/hr & a 7 Day drying time have also been applied to the model. Note that these above parameters conform to the parameters used in the City's Kinematic Wave model.

Nodes, Links & Interfacing Files

The entire existing minor system included in the City's PCSWMM model was imported into the development Dynamic Wave model, along with all the "Mid-Point" nodes and associated links. These "Mid-Point" nodes were imported into the Dynamic model to ensure that the flows external to the development simulated in the Kinematic Wave model are appropriately passed and represented in the Dynamic Wave model. In locations where there is an existing major system spill to the golf course, additional nodes were added to the Kinematic Wave model from the Dynamic Wave model. The inclusion of these nodes allows for the external flows onto the golf course simulated by the Kinematic Wave model to be passed to the correct location within the Dynamic Wave model, these include external major system flows into the development.

Development Major system

Preliminary grading of the proposed major system has been included in the model, with generic road cross-section transects reflective of the proposed Right of Way (ROW) at each respective location. Roads with preliminary centreline grades less than 0.65% will be designed with a 'saw tooth' or 'sagged' road profile. The runoff from the development will be conveyed to catchbasins located at low points on the street. Flows above the minor system capture rate will temporarily be stored within the surface storage present within these sags and released slowly to the storm sewers. If the low point storage is surpassed, the flow will be conveyed overland to the next downstream road segment. Note that as the development is only at the preliminary design stage, the exact details of the saw toothing have not been included in the model and only overall high and low points within the development have been included. Note that the future inclusion of the road saw toothing will provide greater storage within the development major system than what has been simulated in this model. Refer to Figure B3 in Attachment B for an overview of the major system flow routes and general high and low points within the proposed development.

As per City standards, for the 100-year storm, the maximum total depth of water (static + dynamic) on all roads shall not exceed 35 cm at the gutter and product of the maximum flow depths on streets and maximum flow velocity must be less than 0.60 m^2/s on all roads. Table C-1 in Attachment C provides a summary of the maximum major system flow depths along with the flow depth velocity product for the 100-year SCS 24 hour and Chicago 3-hour storm. From this preliminary analysis, it was found that all flow depths within the development for both 100-year events are less than 0.35 m and the depth velocity product is less than 0.60 m^2/s.

Development Minor System

Per the City of Ottawa standards, the minor system has been designed to accommodate, at a minimum, the 2-year post-development flows from within the site. The minor system surrounding the existing development was designed with a 5-year level of service, and as such, any external lands that will discharge to the development's minor system have been sized to ensure that the 5 year level of service will be maintained. Refer to the following section "External Minor system" regarding the checks completed to ensure the same level of service will be provided. The minor system within the development was preliminarily sized based on Rational Method calculations, refer to the Rational Method design sheets provided by DSEL in Attachment B for full details. The pipe sizes determined from the Rational Method calculations were included in the Dynamic Wave model. A Manning's roughness of 0.013 was applied to all proposed pipes within the development and minor system loss coefficients applied to all pipes based on each pipe's respective orientation, refer to Attachment B for the respective minor system loss coefficients applied in this model.

A minor system hydraulic grade line (HGL) analysis was completed for the proposed development based on the 100-year 3-hour Chicago and 100-year 24-hour SCS design storms. From this analysis it was found that the maximum pipe velocities are no greater than 6.0 m/s for all proposed pipes, in locations where the proposed simulated pipe velocities are less than 0.8 m/s, these pipes can be downsized at detailed design. Table C2 in Attachment C provided the maximum HGL with the minor system for these design storms. These results show that on average the maximum depth within the proposed storm sewer is 2.641 m below the top of the maintenance hole, and no maintenance holes are surcharged. Note that due to grading constraints within the development sump pumps will service several homes. Further details of these exact locations will be provided at the detailed design stage. There are a few locations where the 100-year hydraulic grade line is less than 1.8 m below the proposed ground elevation, these locations are either located within the pond block, do not have storm sewer connections to buildings, or the buildings that connect to these locations will be on sump pumps; therefore the high 100-year hydraulic grade line at these locations will not have any negative impacts.

Major/Minor System Connections

Within the development, flows have been passed from the major system to the minor system using outlet links. These outlets have been included in the model to function as an approximate representation of the flow capture provided by the proposed catch basins within the development. Depth/Flow curves for each outlet were generated based on the 2-year peak flow from the proposed development and 5-year peak flow from the existing external rear yards that will discharge to the proposed storm sewer at each respective location. The flow for each of these curves was increased by 14% at a depth of 0.3 m to account for additional inflows due to the increased head applied to standard inlet control devices and catch basins during the 100-year storm. To ensure that major system flow does not spill back onto the existing development, 100% capture for the 100-year event has been implemented at several locations within the proposed development.

SWM Ponds

The preliminary SWM pond sizes have been based on the “Kanata Golf and Country Club SWM Sizing” analysis completed by JFSA in September 2019, and has been updated based on the latest erosion threshold requirements set out by GEO Morphix July 2020 report “ Kizell Drain Downstream of 7000 Campeau Drive -Geomorphological and Erosion Threshold Assessment”. The total drainage area to each of the SWM Facilities is approximately 57.87 ha, 26.22 ha, 48.50 ha, 9.34 ha and 12.66 ha for SWMF’s 1, 2, 3, 4 & 5, respectively. Note that due to the small drainage area to SWMF 3 (9.34 ha), it was determined that this location would be better serviced solely by an OGS unit. Stage-Storage-Outflow curves have been provided for all SWM ponds in Attachment B. Each SWM pond will also be equipped with an oil-grit separator (OGS) and provide greater than 80% TSS removal. The exact sizing of each of these OGS units have been provided in Attachment B. Figure B5 in Attachment B (produced by DSEL) provides an overview of the drainage areas to each of the SWM facilities.

The SWM ponds have been represented in the model using storage nodes, which use a depth/area relationship to represent the pond footprint and storage volume provided. Note that as some of these ponds will have submerged inlets, the total pond storage volume (permanent pool and active storage) have been included in the model, with an initial depth applied to all of the ponds to fill the permanent pool before the start of the simulation. Tables 3 - 6 summarize the peak water levels, inflow, outflow and storage volume used in each of the ponds for the 5-year 3 hour Chicago storm, 100-year 3 hour Chicago storm, 100-year 24-hour SCS and 100-year 24-hour SCS +20%.

Table 3: SWMF 1 – Pond Summary
Drainage Area: 57.87 ha

Event	Max WSE (m)	Max Inflow (m^3/s)	Max Outflow (m^3/s)	Max Storage Volume (m^3)
5 Year Chicago 3Hr	95.972	5.840	0.091	11,020
100 Year Chicago 3hr	96.724	8.858	0.157	21,430
100 Year SCS 24hr	96.966	8.670	0.173	25,150
100 Year SCS 24hr +20%	97.307	10.150	0.198	30,700

Table 4: SWMF 2 – Pond Summary
Drainage Area 26.22 ha

Event	Max WSE (m)	Max Inflow (m^3/s)	Max Outflow (m^3/s)	Max Storage Volume (m^3)
5 Year Chicago 3Hr	96.441	3.628	0.084	5,702
100 Year Chicago 3hr	97.403	8.454	0.383	12,642
100 Year SCS 24hr	97.500	7.158	0.400	13,392
100 Year SCS 24hr +20%	97.905	9.924	1.012	16,722

Table 5: SWMF 4 - Pond Summary
Drainage Area: 45.50 ha

Event	Max WSE (m)	Max Inflow (m^3/s)	Max Outflow (m^3/s)	Max Storage Volume (m^3)
5 Year Chicago 3Hr	94.878	5.934	0.094	10,340
100 Year Chicago 3hr	95.750	11.750	0.161	22,440
100 Year SCS 24hr	95.956	10.340	0.173	25,560
100 Year SCS 24hr +20%	96.363	11.980	0.338	32,040

Table 6: SWMF 5 - Pond Summary
Drainage Area: 12.66 ha

Event	Max WSE (m)	Max Inflow (m^3/s)	Max Outflow (m^3/s)	Max Storage Volume (m^3)
5 Year Chicago 3Hr	95.650	1.934	0.082	2,885
100 Year Chicago 3hr	96.403	4.017	0.137	6,036
100 Year SCS 24hr	96.584	3.542	0.147	6,903
100 Year SCS 24hr +20%	96.851	4.821	0.539	8,267

As a part of this analysis, a design stress test has been completed, based on a 20% increase in the intensity of the 100-year 24-hour SCS design storm. Each of the proposed SWM ponds will have emergency flow routes implemented to deal with such an event. Under this stress test, Pond 1 will discharge a peak flow of 0.005 m³/s to the proposed road within the development downstream of the pond. Pond 2 will discharge a maximum flow of 0.549 m³/s to an emergency overflow drop structure that will connect to the existing trunk sewer on Weslock Way. This analysis showed that the additional flow will increase the max HGL in the trunk system by a maximum of 3 cm without increasing the risk of basement flooding. Pond 4 will discharge 0.144 m³/s to a ditch in Weslock Park, and Pond 5 will spill 0.379 m³/s to Weslock Park. The above is a preliminary assessment of the emergency overflow measures. A comprehensive assessment of each of these measures will be completed at the detailed design stage.

External Minor system

There are currently eleven (11) locations where the minor system of the existing developed lands can freely discharge to the golf course. Under post-development conditions, these inflows to the site will be picked up by the proposed development's minor system and directed to the respective SWM ponds. The minor system within the development has been sized to ensure that there will be no increases in the existing storm sewer HGL once it is connected to the proposed development's minor system. Table C3 in Attachment C provides a complete summary of the existing and proposed peak HGLs at the outlets of the existing storm sewers. From this analysis, it is seen that there will be no increases in the existing HGL storm sewers due to the connection of these outlets to the proposed development minor system for the various design storms. Note that MHST12204 & MHST01107 see slight increases (maximum 3 cm) in HGL, these increases are due to the slight difference created in making the existing development drainage areas abut with the proposed development drainage boundaries in the proposed condition modelling, and are simply a modelling artifact and not a true HGL increase.

Downstream Impacts

The peak inflows to the Beaver Pond on the Knudson Drive / Weslock Way trunk sewer have been extracted based on existing and proposed conditions detailed modelling. Table 7 below provides a full summary of the existing and proposed peak flows and total volumes to the Beaver Pond from the Knudson Drive / Weslock Way trunk sewer.

Table 7: Peak flow and total volume into the Beaver Pond from Knudson Drive / Weslock Way trunk storm sewer

Event	Existing Conditions		Proposed Conditions		Difference	
	Peak Flow (m^3/s) [1]	Total Volume (m^3) [2]	Peak Flow (m^3/s) [3]	Total Volume (m^3) [4]	Peak Flow (m^3/s) [3]-[1]	Total Volume (m^3) [4]-[2]
5 Year Chicago 3Hr	6.707	21,190	6.315	34,590	-0.392	13,400
100 Year Chicago 3hr	10.03	44,580	9.933	81,230	-0.097	36,650
100 Year SCS 24hr	10.24	61,690	10.2	113,000	-0.04	51,310
100 Year SCS 24hr +20%	10.69	73,240	11.02	137,100	0.33	63,860

From this analysis it was found that peak flows to the Beaver Pond for the simulated design storms are either equal to or less than pre-development conditions due to the proposed SWM ponds, except for the stress test (100 Year SCS 24Hr +20%). As expected, the total runoff volume to the Beaver Pond has increased under proposed conditions. The impacts of these volumetric increases due to the development have been assessed in a separate memo by JFSA "Downstream of 7000 Campeau Drive – Hydrologic Assessment" July 2020, which reviews and quantifies the downstream impacts of the development on the greater Watts Creek watershed.

Table C4 in Attachment C provides a comparison of the existing and proposed HGL in the existing Knudson Drive / Weslock Way trunk sewer at the various SWMF outlet locations and the minor system connection to the Beaverbrook trunk sewer. From these results, it is seen that the proposed development either matches or reduces the existing peak HGL in this system.

Conclusion

The detailed PCSWMM models provided by the City for the lands draining to the Beaver Pond were updated to correct a few minor issues and compared with field measured flows from 2019. This investigation showed that this model provided a reasonably good correlation with the field observed data, and accordingly this model was used to establish the existing hydraulic and hydrologic conditions of the study area. This model was then updated to reflect the proposed development at 7000 Campeau Drive. Full details of this update have been outlined in this memo. From this analysis, it was found that:

- The proposed minor system within the development is adequately sized to safely convey the 5- and 100-year storm flows to the proposed SWM facilities.
- The proposed major system within the development is adequately sized to safely convey the excess 100-year flows to the proposed SWM facilities.
- The operation of the proposed SWM facilities has been shown to meet quantity control requirements, with quality control requirements assessed at detailed design through the implementation of OGS units.
- The proposed development will not result in any HGL increases on the existing stormwater infrastructure upstream or downstream of the proposed development.
- The proposed development peak flows into the Beaver Pond from the Knudson Drive / Weslock Way trunk sewer, are either equal to or less than existing peak flows.
- The peak HGL in the existing Knudson Drive/ Westlock Way will not be increased due to the proposed development.

Yours truly,
J.F Sabourin and Associates Inc.

Jonathon Burnett, B.Eng, P.Eng
Water Resources Engineer

cc: J.F Sabourin, M.Eng, P.Eng
Director of Water Resources Projects

Figures:

Tables:

Attachments:

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Attachment A

Existing Conditions Model Overview

Legend

- Area Added
- Area Removed
- City Model Subcatchments

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david schaeffer engineering ltd

SCALE : 1:2500

0 50 100 150 m

PROJECT :

7000 Campeau Drive

TITLE :

Figure A1:
Subcatchment Area Adjustments

PROJECT	1581-17
DRAWN:	JB
DATE:	May 2020

Legend

- Area Added
- Area Removed
- City Model Subcatchments

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david schaeffer engineering ltd

SCALE : 1:2500

0 50 100 150 m

PROJECT :

7000 Campeau Drive

TITLE :

Figure A2:
Subcatchment Area Adjustments

PROJECT	1581-17
DRAWN:	JB
DATE:	May 2020

Legend

- Area Added
- Area Removed
- City Model Subcatchments

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DSEL
david schaeffer engineering ltd

SCALE : 1:2500

0 50 100 150 m

PROJECT :

7000 Campeau Drive

TITLE :

Figure A3:
Subcatchment Area Adjustments

PROJECT	1581-17
DRAWN:	JB
DATE:	May 2020

Figure A4: MHSTM12321 – Node invert set to 0m

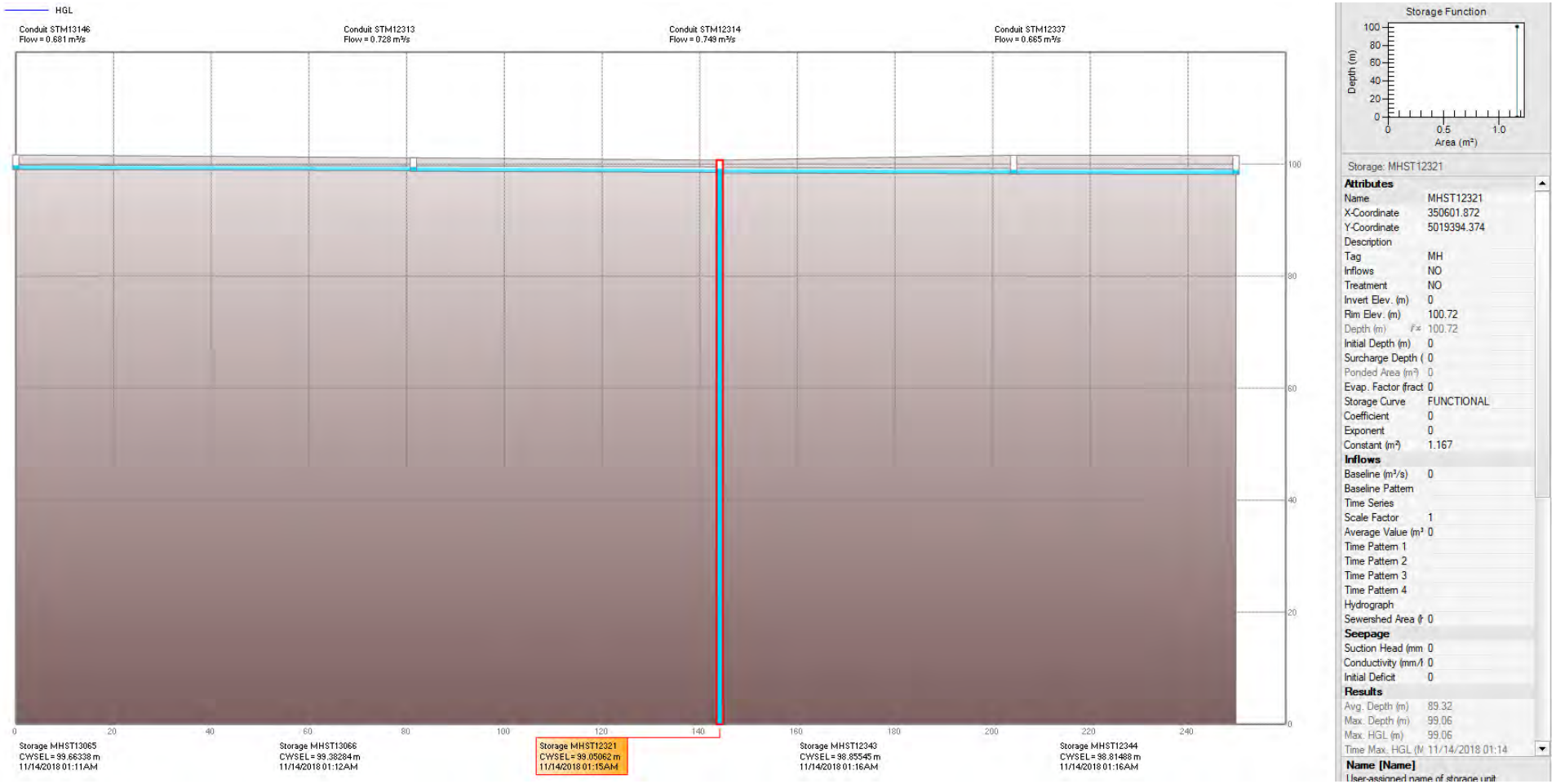


Figure A5: STM12459 – Link inlet and outlet elevations do not match neighbouring pipes

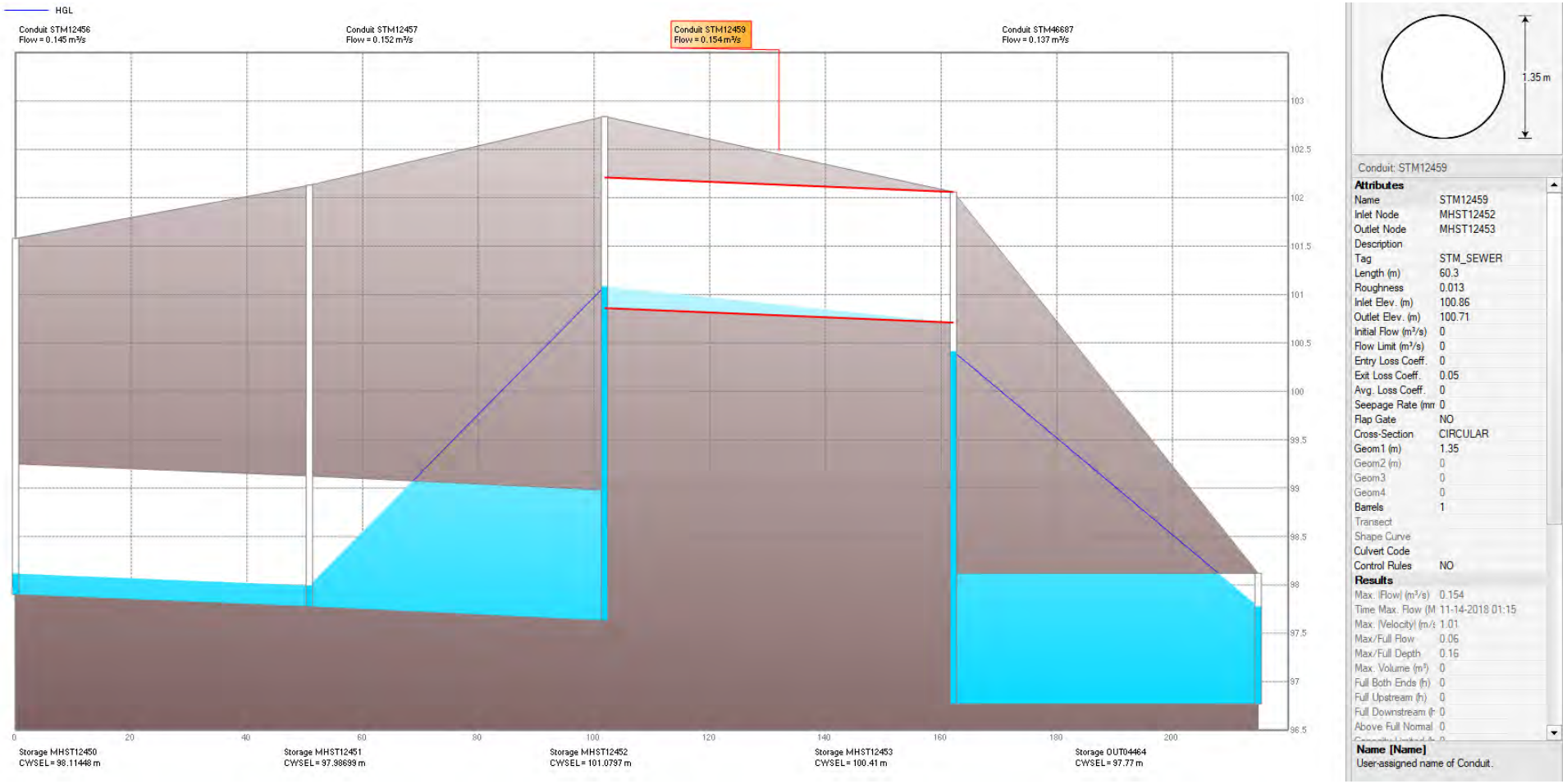
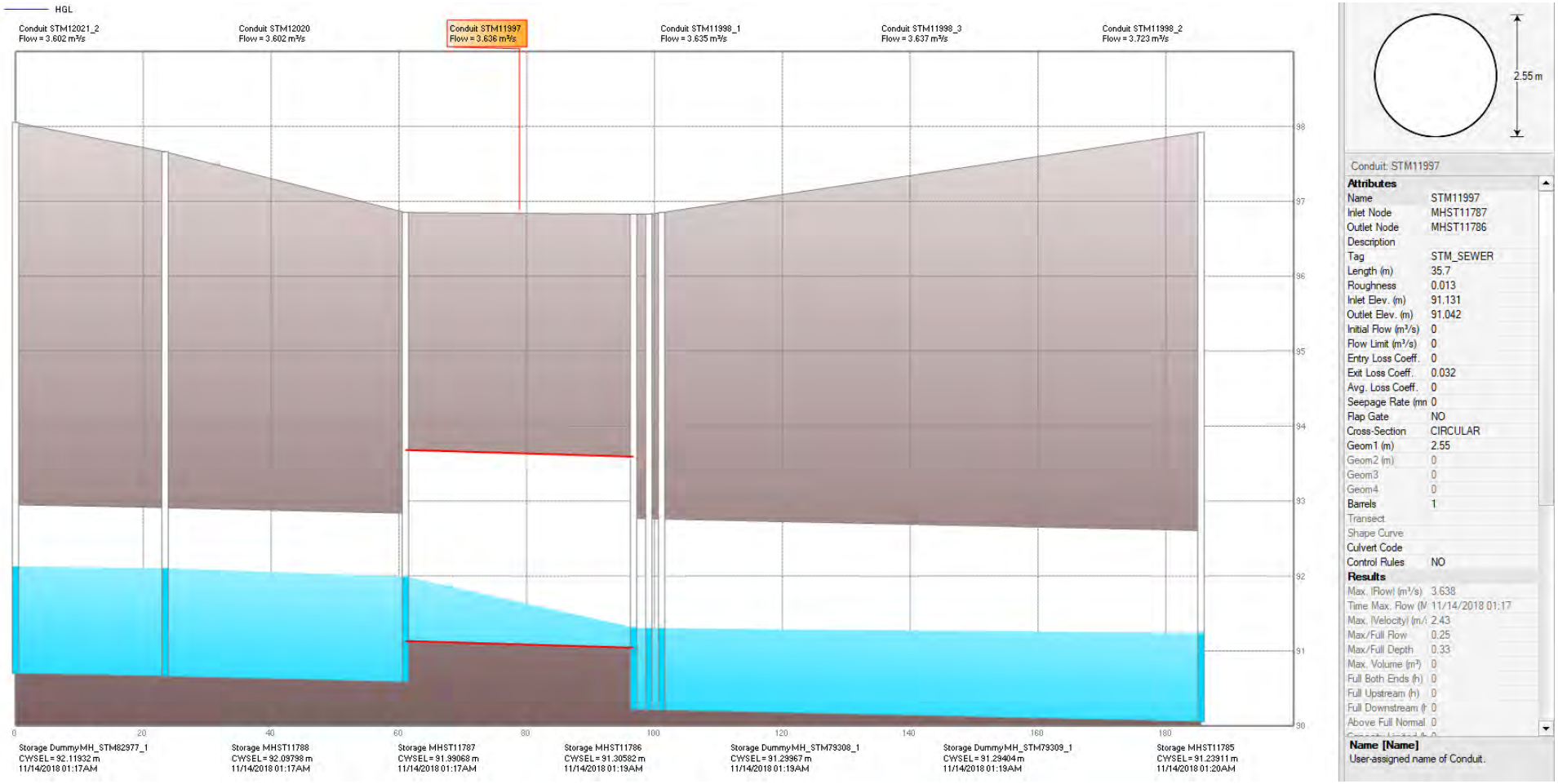
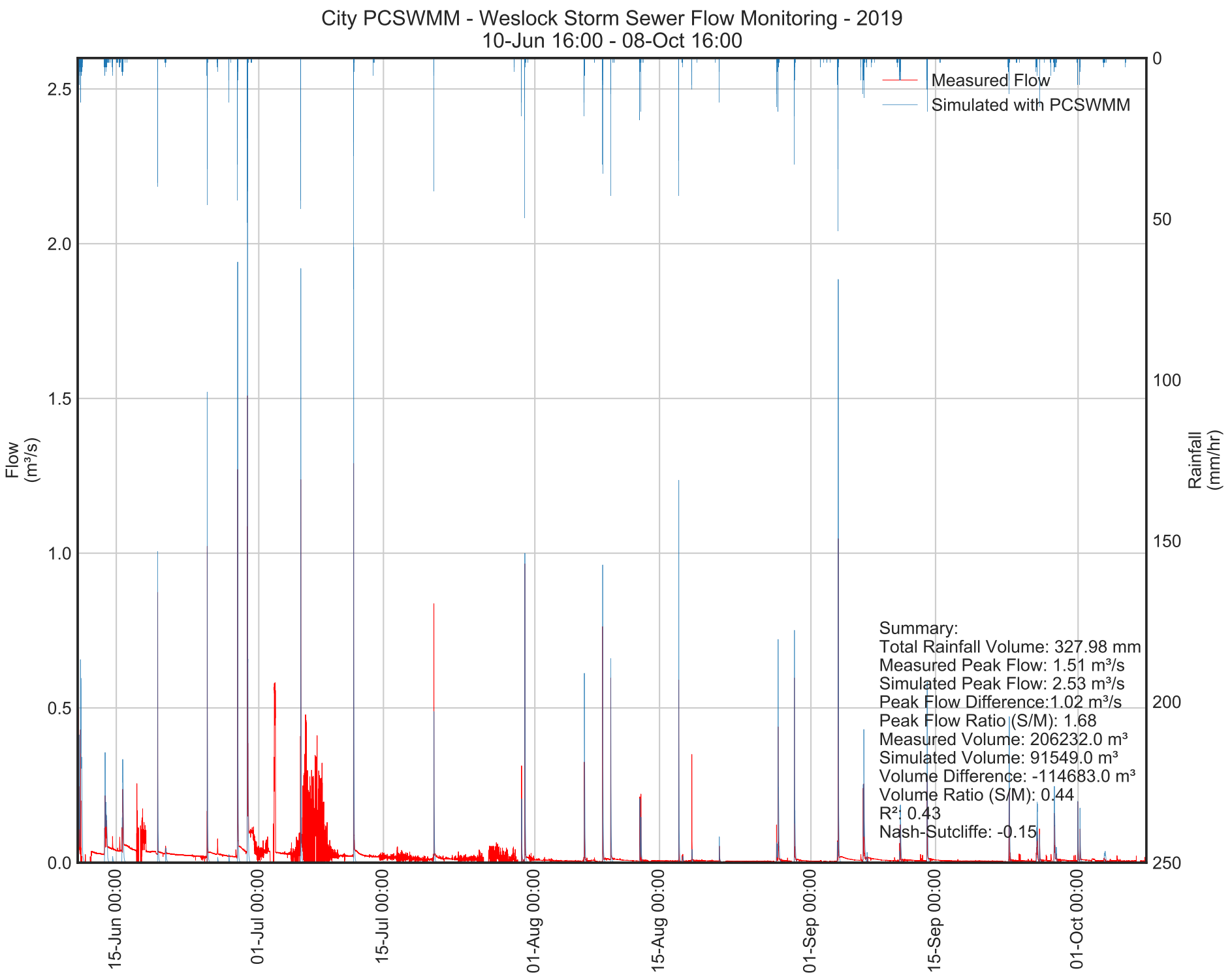
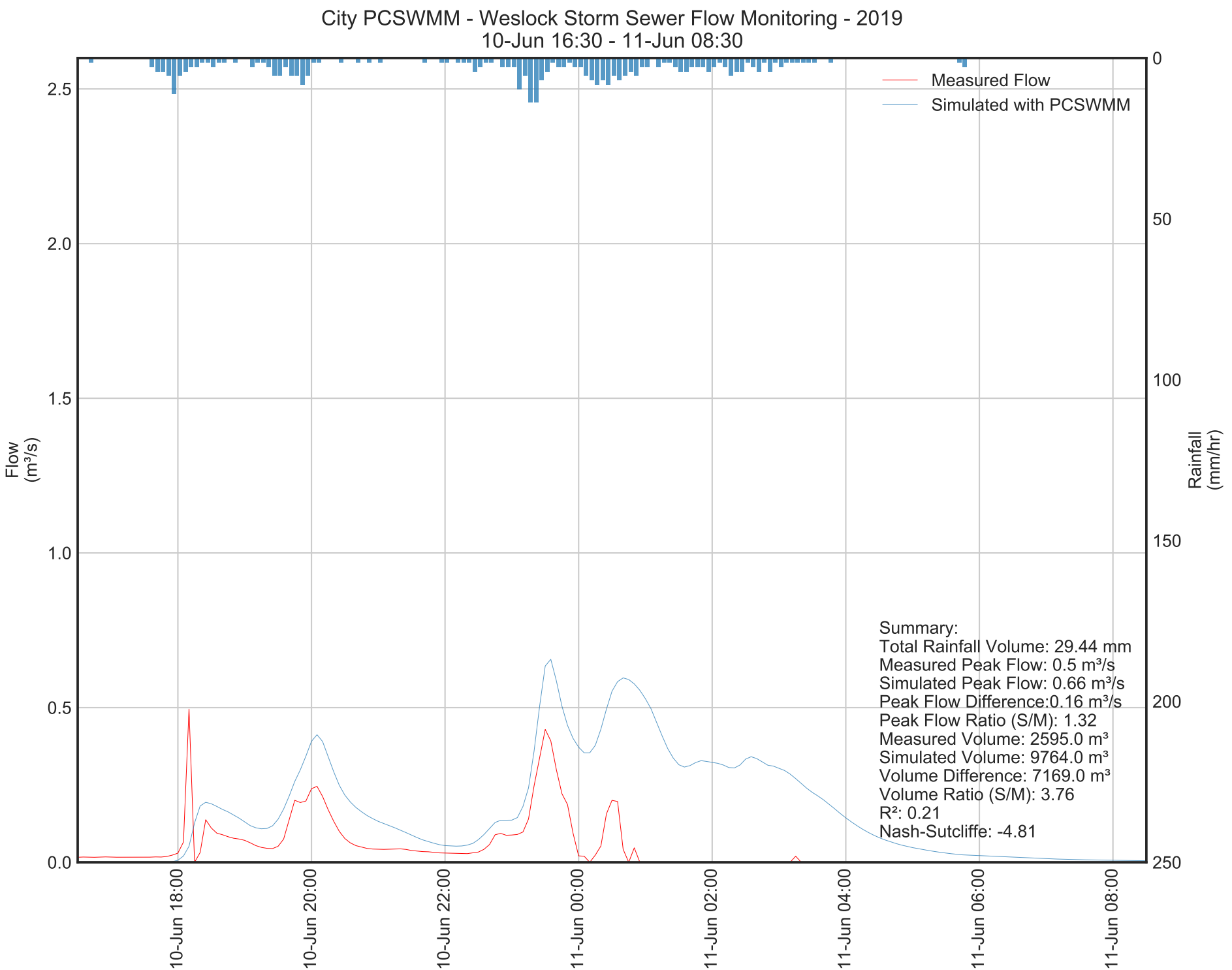
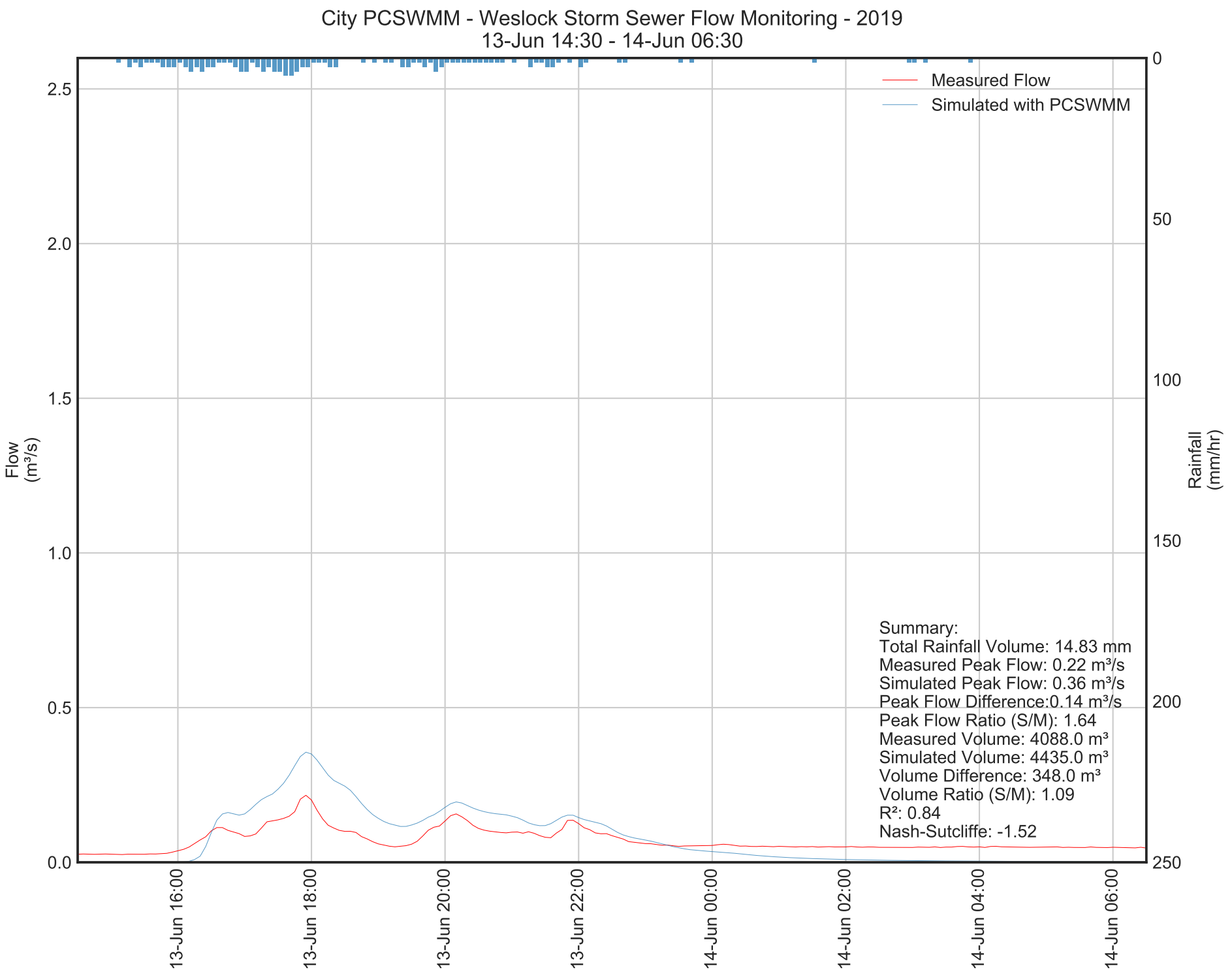


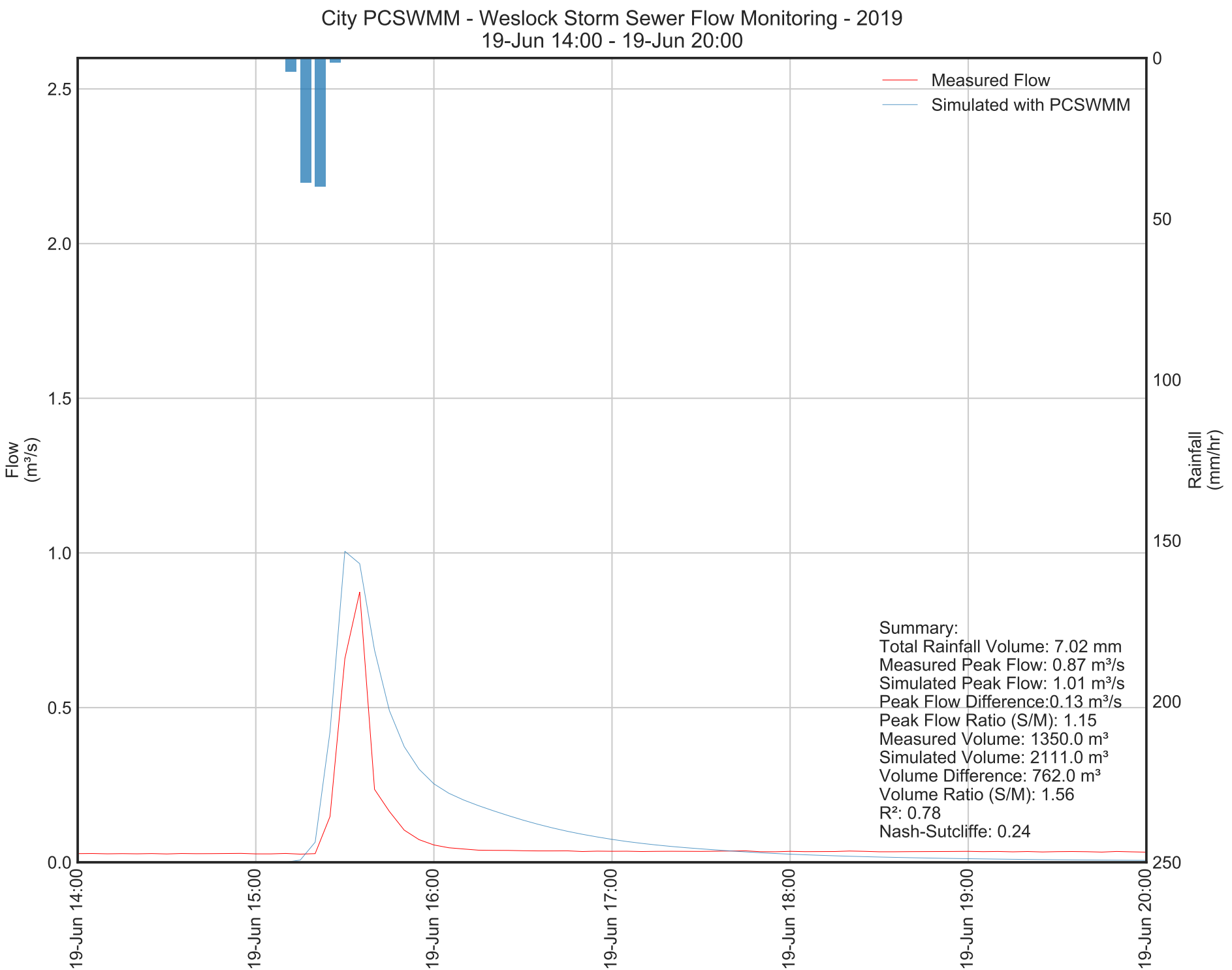
Figure A6: STM11997 – Link inlet and outlet elevations do not match neighbouring pipes

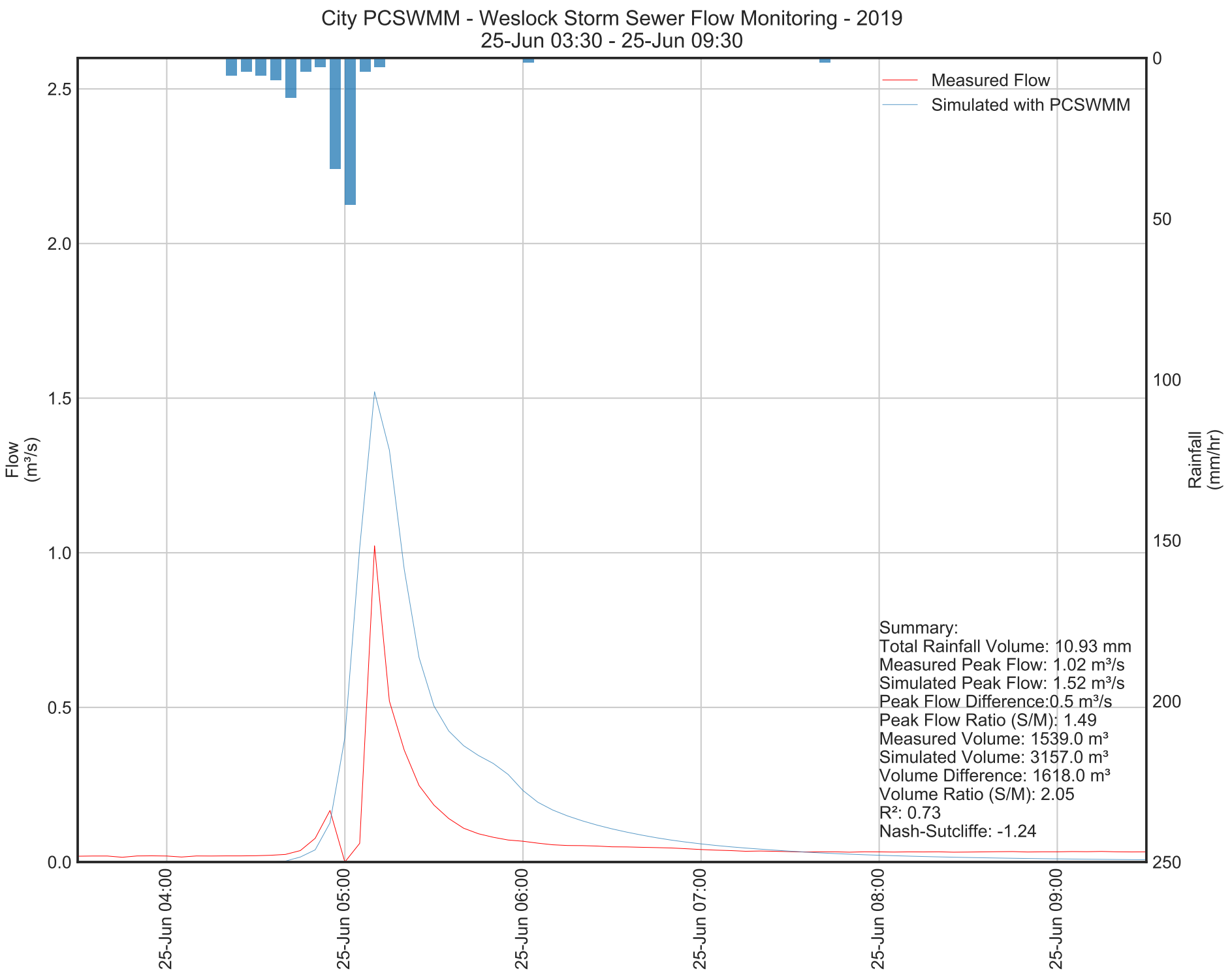


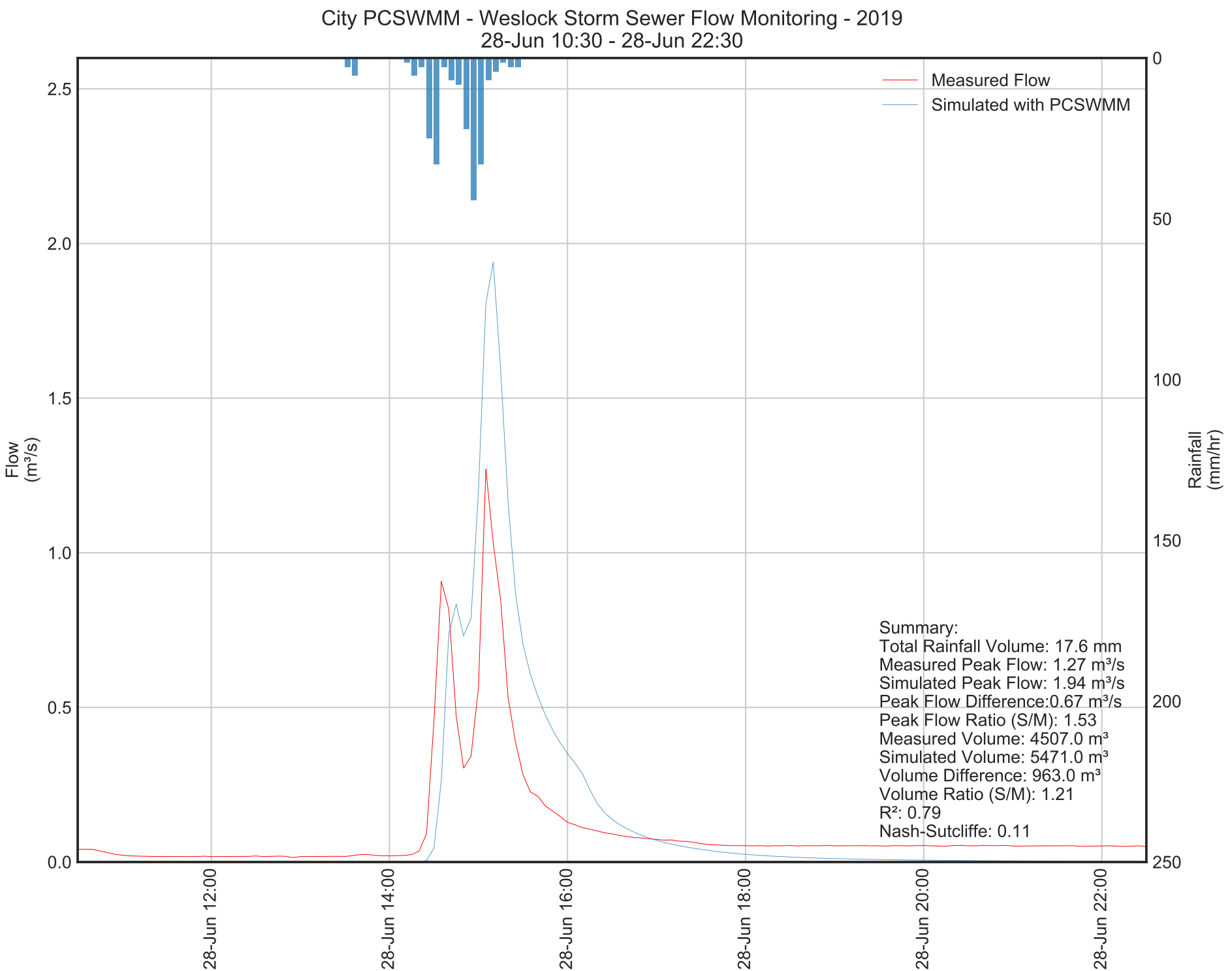

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
10-Jun 16:00 - 08-Oct 16:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
2.5
2.0
1.5
1.0
0.5
0.0
0
50
100
150
200
250
15-Jun 00:00
01-Jul 00:00
15-Jul 00:00
01-Aug 00:00
15-Aug 00:00
01-Sep 00:00
15-Sep 00:00
01-Oct 00:00
Summary:
Total Rainfall Volume: 327.98 mm
Measured Peak Flow: 1.51 m³/s
Simulated Peak Flow: 2.53 m³/s
Peak Flow Difference:1.02 m³/s
Peak Flow Ratio (S/M): 1.68
Measured Volume: 206232.0 m³
Simulated Volume: 91549.0 m³
Volume Difference: -114683.0 m³
Volume Ratio (S/M): 0.44
R²: 0.43
Nash-Sutcliffe: -0.15

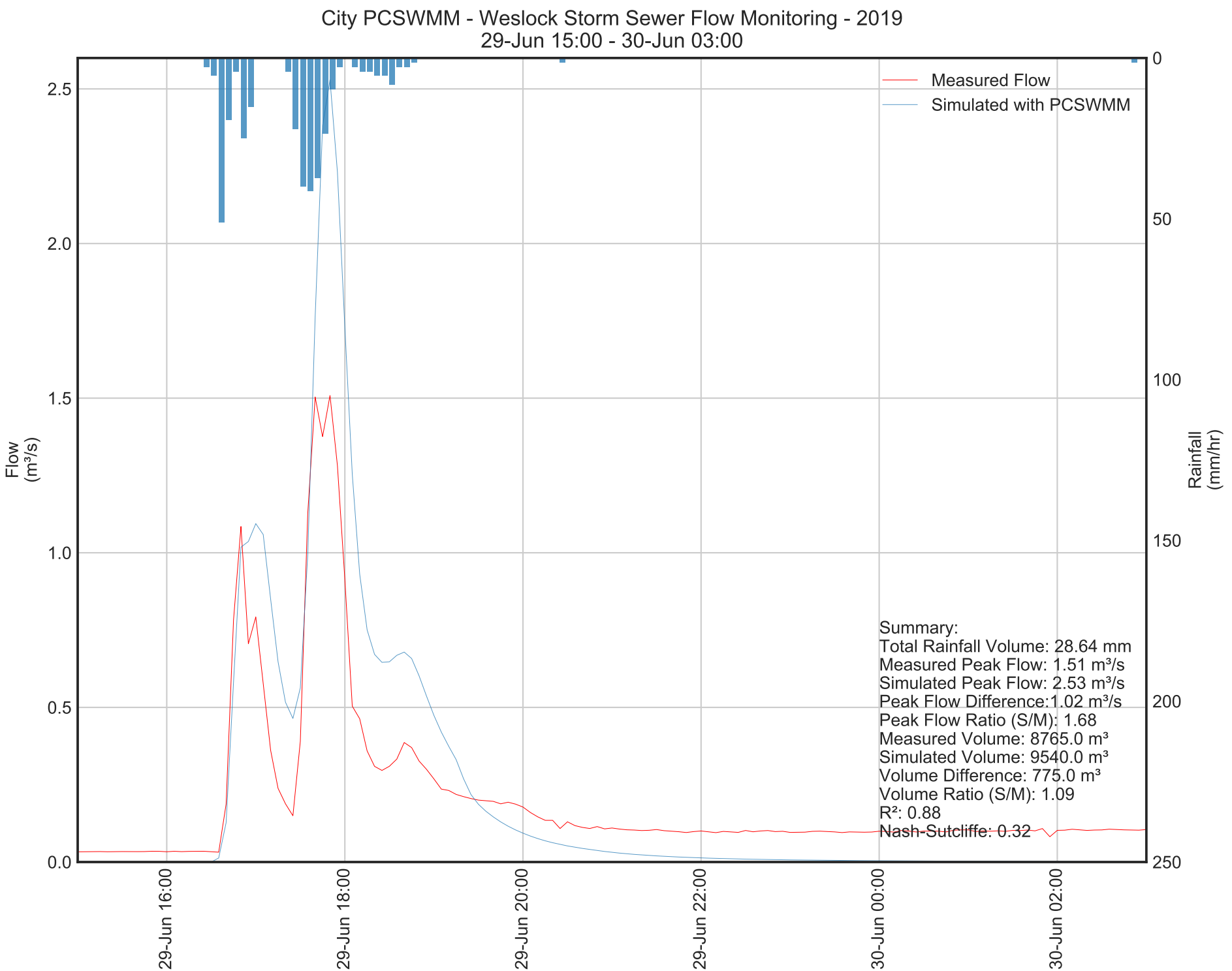

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
10-Jun 16:30 - 11-Jun 08:30
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
10-Jun 18:00
10-Jun 20:00
10-Jun 22:00
11-Jun 00:00
11-Jun 02:00
11-Jun 04:00
11-Jun 06:00
11-Jun 08:00
Summary:
Total Rainfall Volume: 29.44 mm
Measured Peak Flow: 0.5 m³/s
Simulated Peak Flow: 0.66 m³/s
Peak Flow Difference:0.16 m³/s
Peak Flow Ratio (S/M): 1.32
Measured Volume: 2595.0 m³
Simulated Volume: 9764.0 m³
Volume Difference: 7169.0 m³
Volume Ratio (S/M): 3.76
R²: 0.21
Nash-Sutcliffe: -4.81

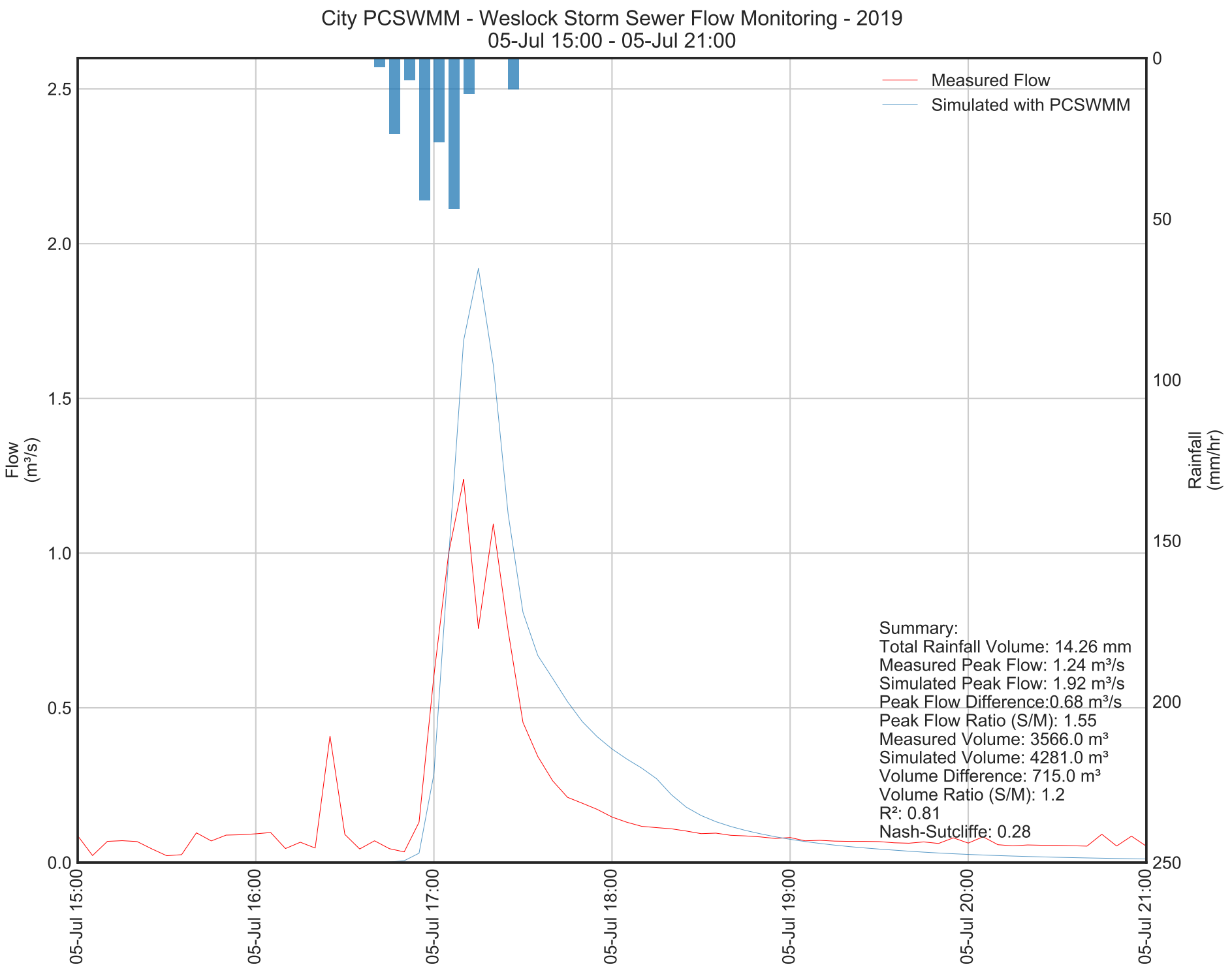

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
13-Jun 14:30 - 14-Jun 06:30
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
2.5
2.0
1.5
1.0
0.5
0.0
0
50
100
150
200
250
13-Jun 16:00
13-Jun 18:00
13-Jun 20:00
13-Jun 22:00
14-Jun 00:00
14-Jun 02:00
14-Jun 04:00
14-Jun 06:00
Summary:
Total Rainfall Volume: 14.83 mm
Measured Peak Flow: 0.22 m³/s
Simulated Peak Flow: 0.36 m³/s
Peak Flow Difference:0.14 m³/s
Peak Flow Ratio (S/M): 1.64
Measured Volume: 4088.0 m³
Simulated Volume: 4435.0 m³
Volume Difference: 348.0 m³
Volume Ratio (S/M): 1.09
R²: 0.84
Nash-Sutcliffe: -1.52

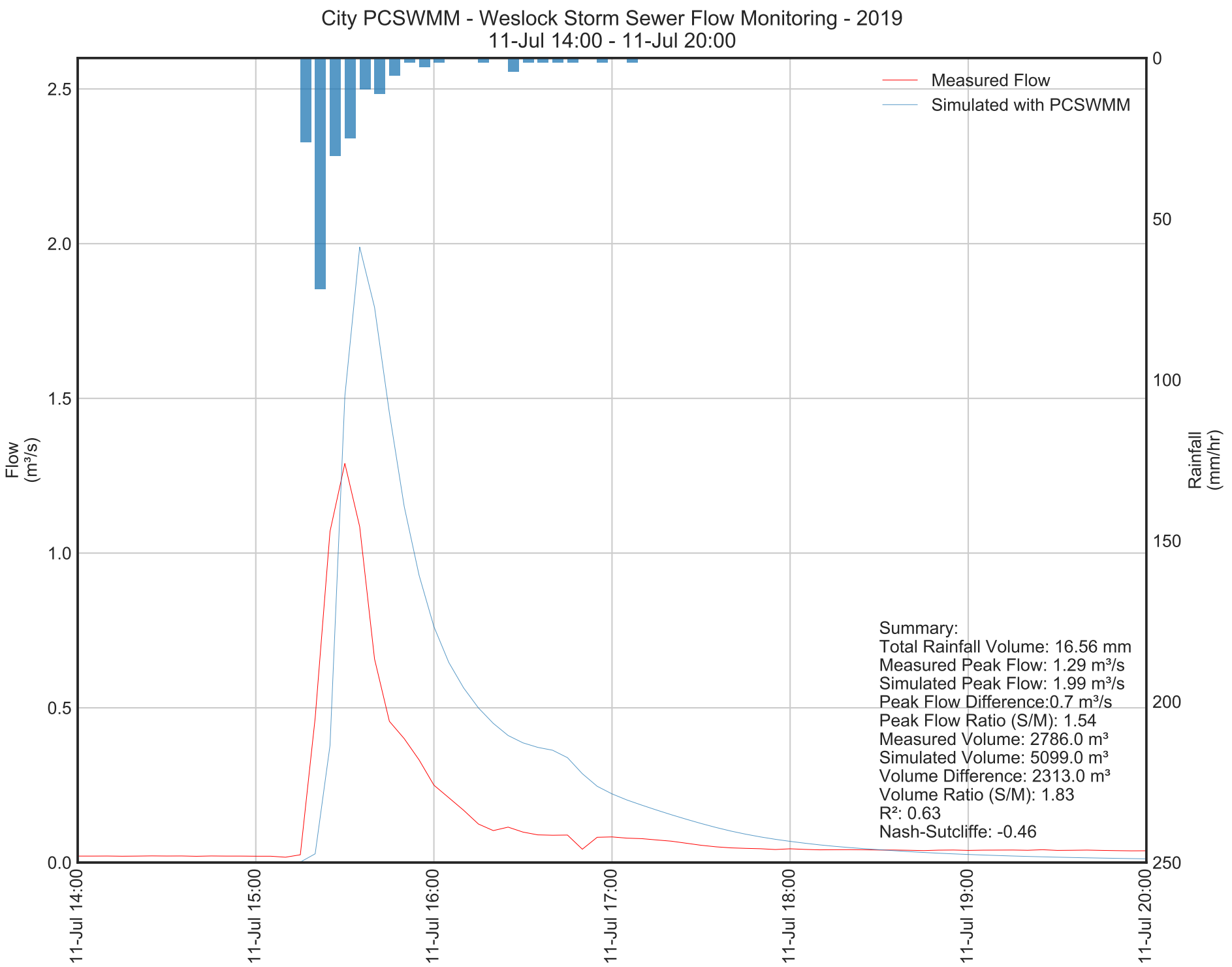

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
19-Jun 14:00 - 19-Jun 20:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
19-Jun 14:00
19-Jun 15:00
19-Jun 16:00
19-Jun 17:00
19-Jun 18:00
19-Jun 19:00
19-Jun 20:00
Summary:
Total Rainfall Volume: 7.02 mm
Measured Peak Flow: 0.87 m³/s
Simulated Peak Flow: 1.01 m³/s
Peak Flow Difference:0.13 m³/s
Peak Flow Ratio (S/M): 1.15
Measured Volume: 1350.0 m³
Simulated Volume: 2111.0 m³
Volume Difference: 762.0 m³
Volume Ratio (S/M): 1.56
R²: 0.78
Nash-Sutcliffe: 0.24

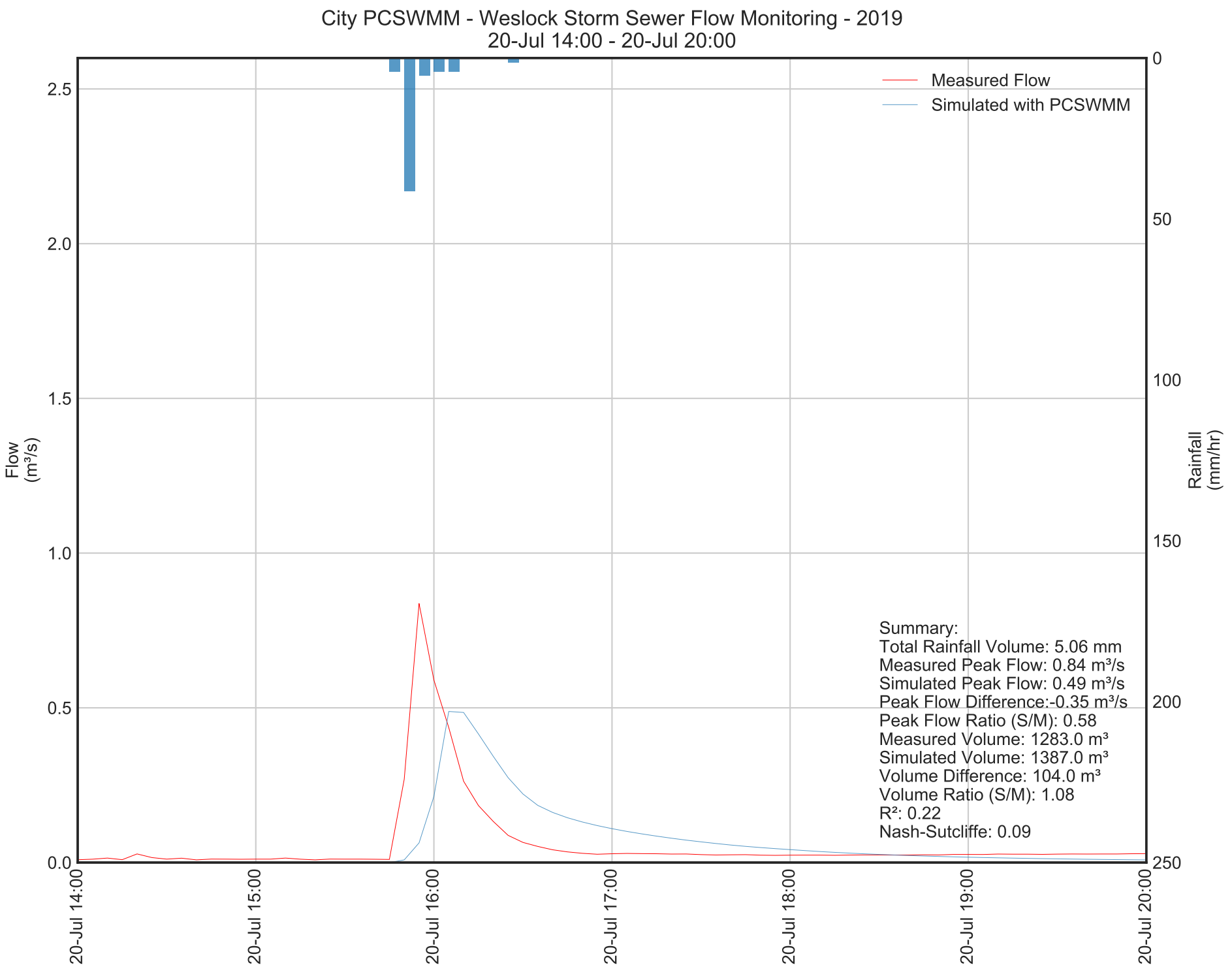

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
25-Jun 03:30 - 25-Jun 09:30
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
25-Jun 04:00
25-Jun 05:00
25-Jun 06:00
25-Jun 07:00
25-Jun 08:00
25-Jun 09:00
Summary:
Total Rainfall Volume: 10.93 mm
Measured Peak Flow: 1.02 m³/s
Simulated Peak Flow: 1.52 m³/s
Peak Flow Difference:0.5 m³/s
Peak Flow Ratio (S/M): 1.49
Measured Volume: 1539.0 m³
Simulated Volume: 3157.0 m³
Volume Difference: 1618.0 m³
Volume Ratio (S/M): 2.05
R²: 0.73
Nash-Sutcliffe: -1.24

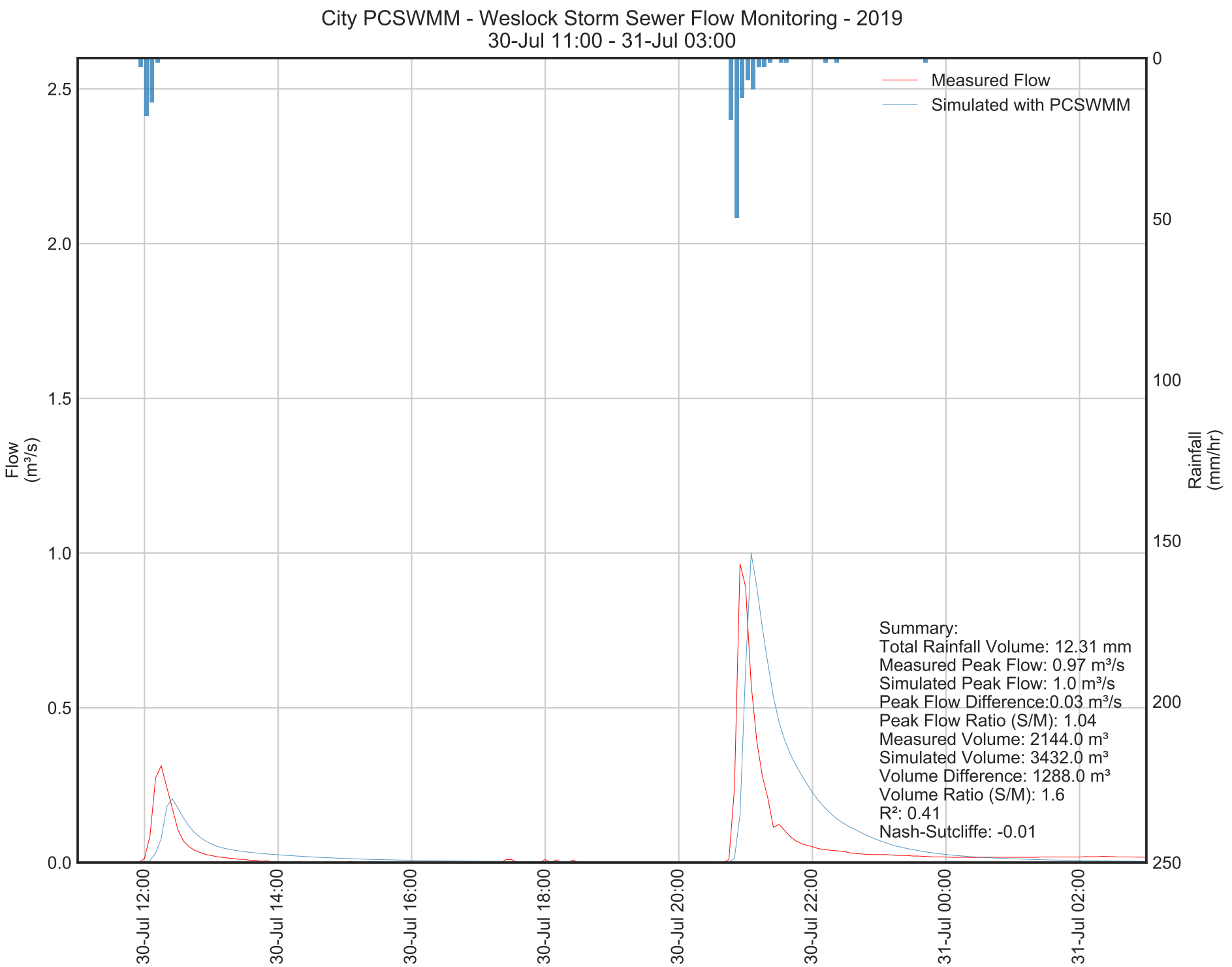

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
28-Jun 10:30 - 28-Jun 22:30
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
28-Jun 12:00
28-Jun 14:00
28-Jun 16:00
28-Jun 18:00
28-Jun 20:00
28-Jun 22:00
Summary:
Total Rainfall Volume: 17.6 mm
Measured Peak Flow: 1.27 m³/s
Simulated Peak Flow: 1.94 m³/s
Peak Flow Difference:0.67 m³/s
Peak Flow Ratio (S/M): 1.53
Measured Volume: 4507.0 m³
Simulated Volume: 5471.0 m³
Volume Difference: 963.0 m³
Volume Ratio (S/M): 1.21
R²: 0.79
Nash-Sutcliffe: 0.11

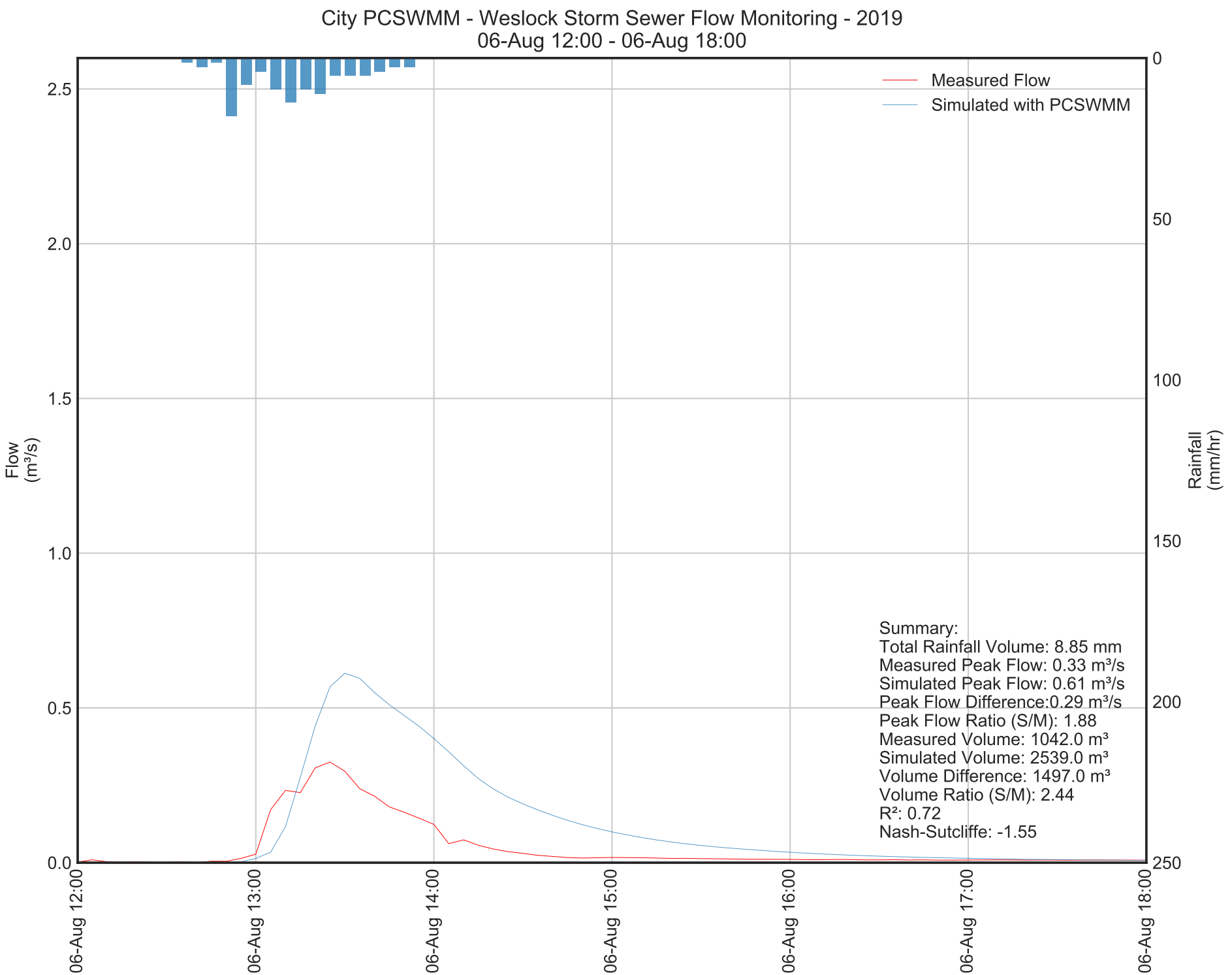

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
29-Jun 15:00 - 30-Jun 03:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
29-Jun 16:00
29-Jun 18:00
29-Jun 20:00
29-Jun 22:00
30-Jun 00:00
30-Jun 02:00
Summary:
Total Rainfall Volume: 28.64 mm
Measured Peak Flow: 1.51 m³/s
Simulated Peak Flow: 2.53 m³/s
Peak Flow Difference:1.02 m³/s
Peak Flow Ratio (S/M): 1.68
Measured Volume: 8765.0 m³
Simulated Volume: 9540.0 m³
Volume Difference: 775.0 m³
Volume Ratio (S/M): 1.09
R²: 0.88
Nash-Sutcliffe: 0.32

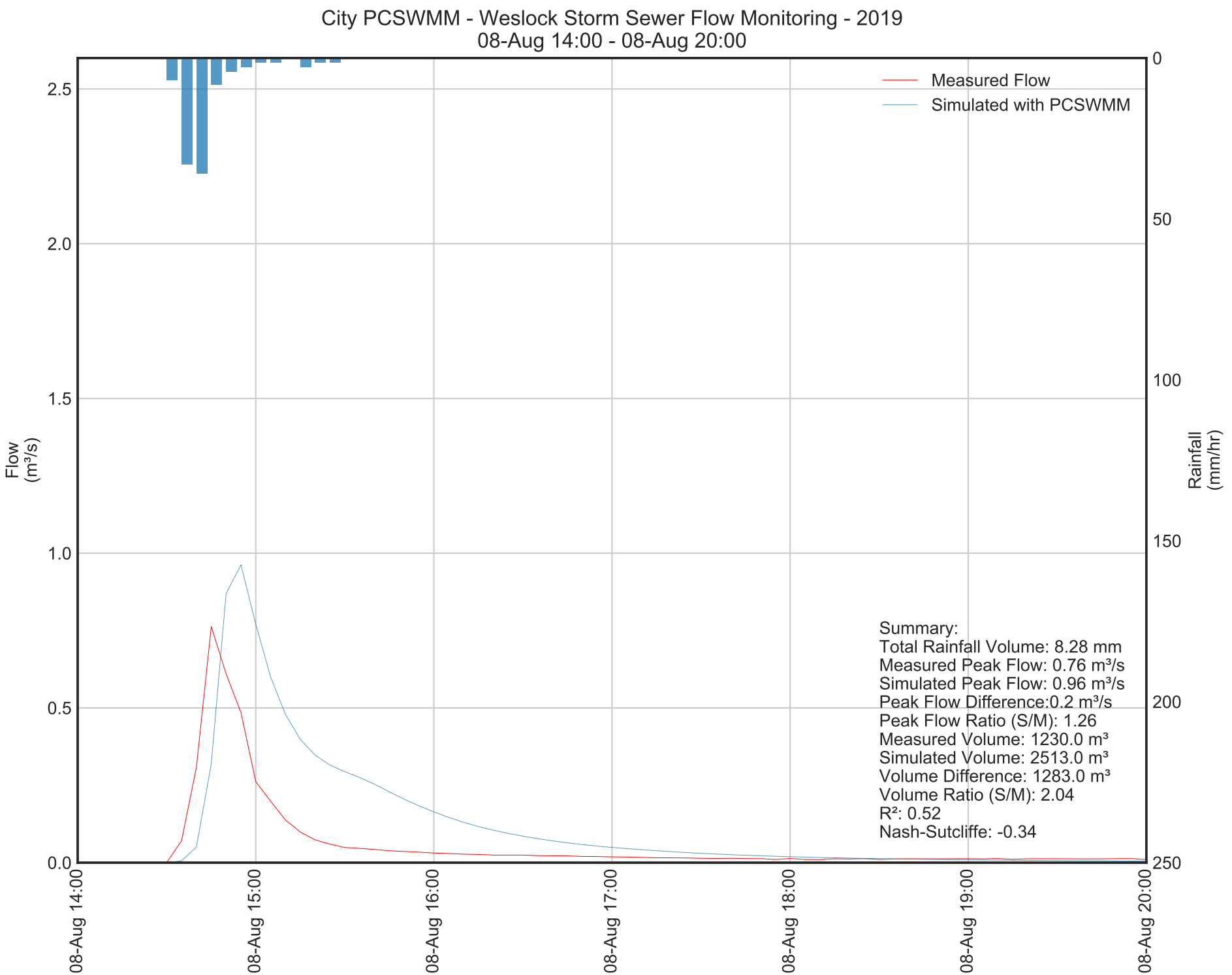

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
05-Jul 15:00 - 05-Jul 21:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
05-Jul 15:00
05-Jul 16:00
05-Jul 17:00
05-Jul 18:00
05-Jul 19:00
05-Jul 20:00
05-Jul 21:00
Summary:
Total Rainfall Volume: 14.26 mm
Measured Peak Flow: 1.24 m³/s
Simulated Peak Flow: 1.92 m³/s
Peak Flow Difference:0.68 m³/s
Peak Flow Ratio (S/M): 1.55
Measured Volume: 3566.0 m³
Simulated Volume: 4281.0 m³
Volume Difference: 715.0 m³
Volume Ratio (S/M): 1.2
R²: 0.81
Nash-Sutcliffe: 0.28

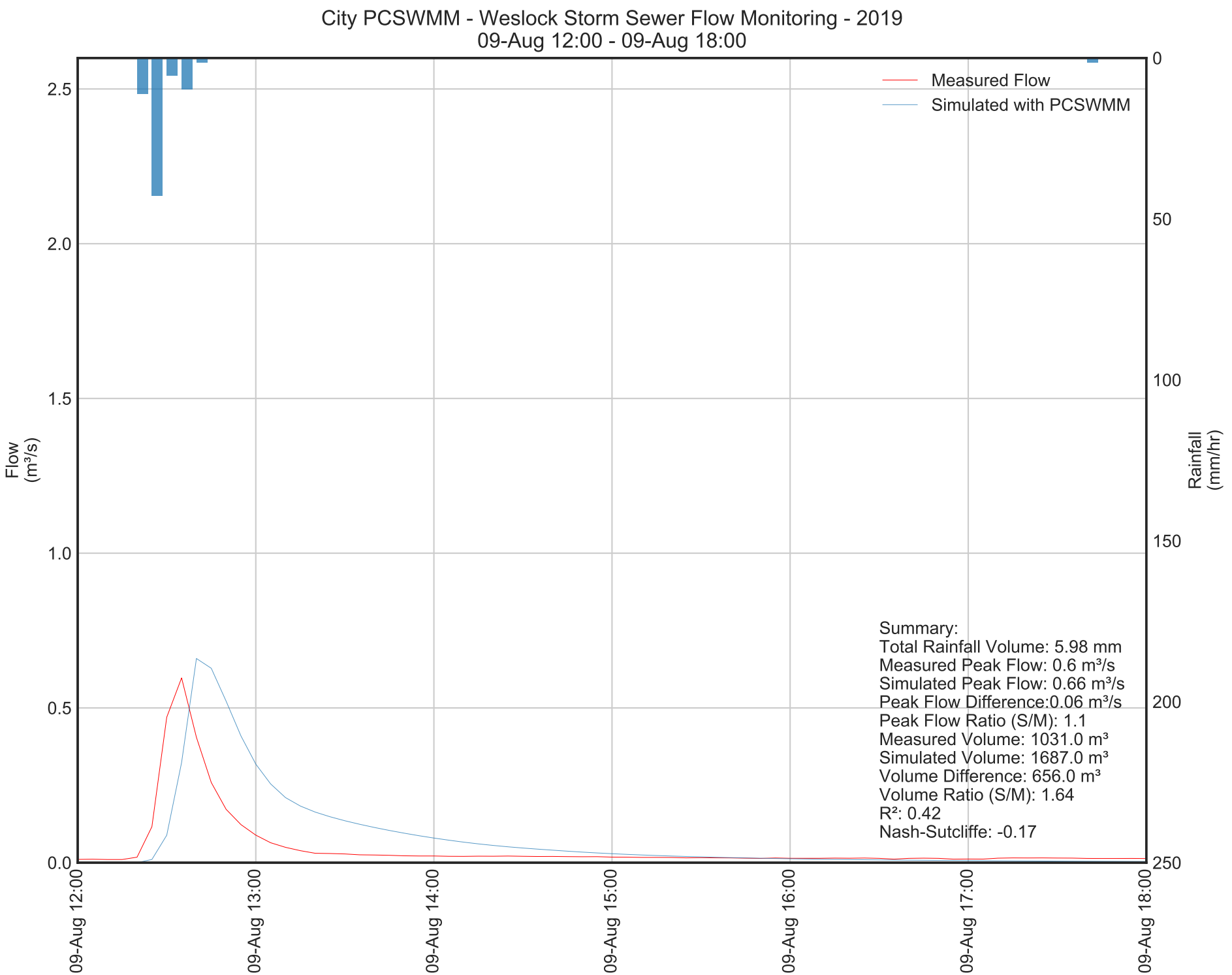

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
11-Jul 14:00 - 11-Jul 20:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
11-Jul 14:00
11-Jul 15:00
11-Jul 16:00
11-Jul 17:00
11-Jul 18:00
11-Jul 19:00
11-Jul 20:00
Summary:
Total Rainfall Volume: 16.56 mm
Measured Peak Flow: 1.29 m³/s
Simulated Peak Flow: 1.99 m³/s
Peak Flow Difference:0.7 m³/s
Peak Flow Ratio (S/M): 1.54
Measured Volume: 2786.0 m³
Simulated Volume: 5099.0 m³
Volume Difference: 2313.0 m³
Volume Ratio (S/M): 1.83
R²: 0.63
Nash-Sutcliffe: -0.46

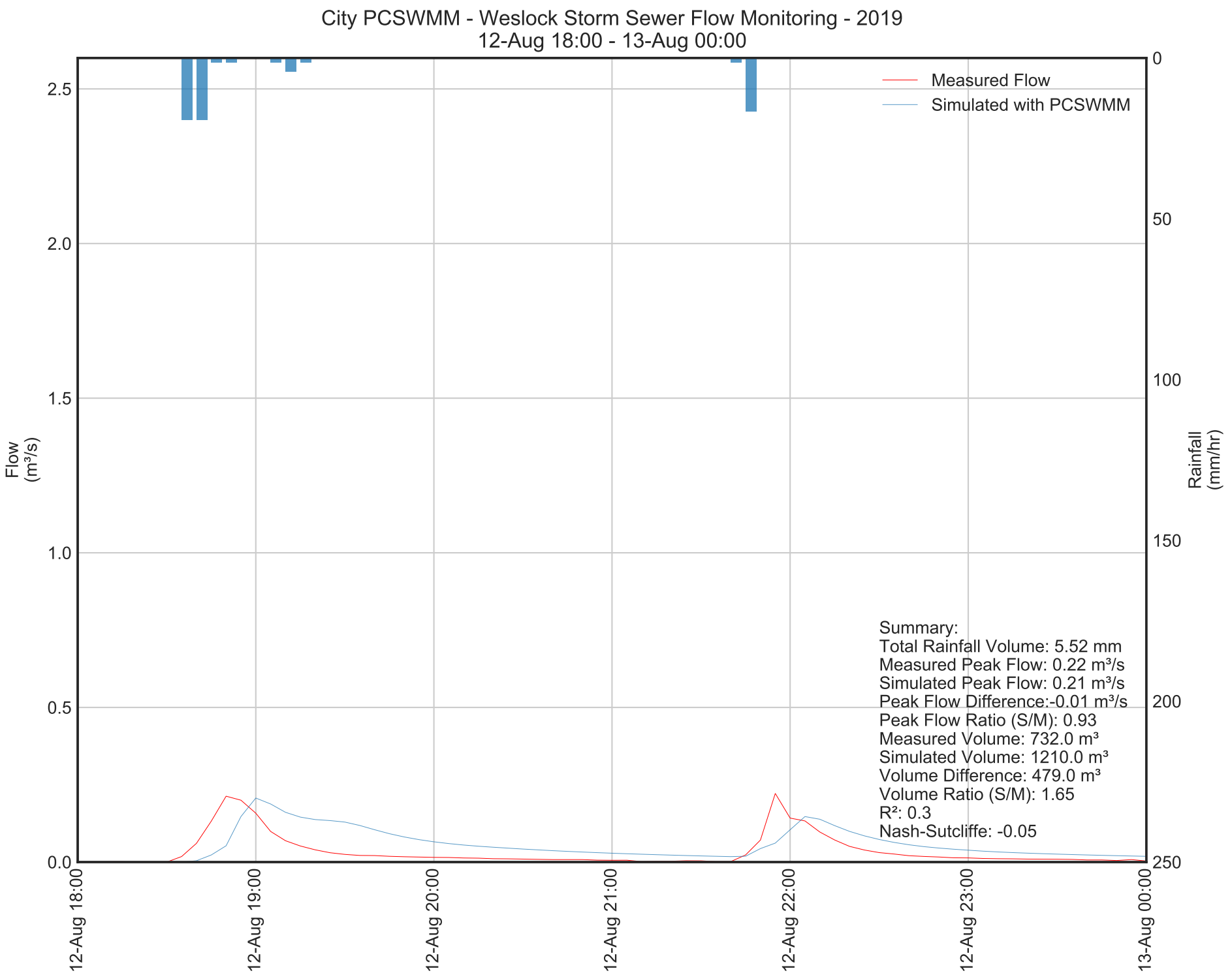

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
20-Jul 14:00 - 20-Jul 20:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
20-Jul 14:00
20-Jul 15:00
20-Jul 16:00
20-Jul 17:00
20-Jul 18:00
20-Jul 19:00
20-Jul 20:00
Summary:
Total Rainfall Volume: 5.06 mm
Measured Peak Flow: 0.84 m³/s
Simulated Peak Flow: 0.49 m³/s
Peak Flow Difference:-0.35 m³/s
Peak Flow Ratio (S/M): 0.58
Measured Volume: 1283.0 m³
Simulated Volume: 1387.0 m³
Volume Difference: 104.0 m³
Volume Ratio (S/M): 1.08
R²: 0.22
Nash-Sutcliffe: 0.09

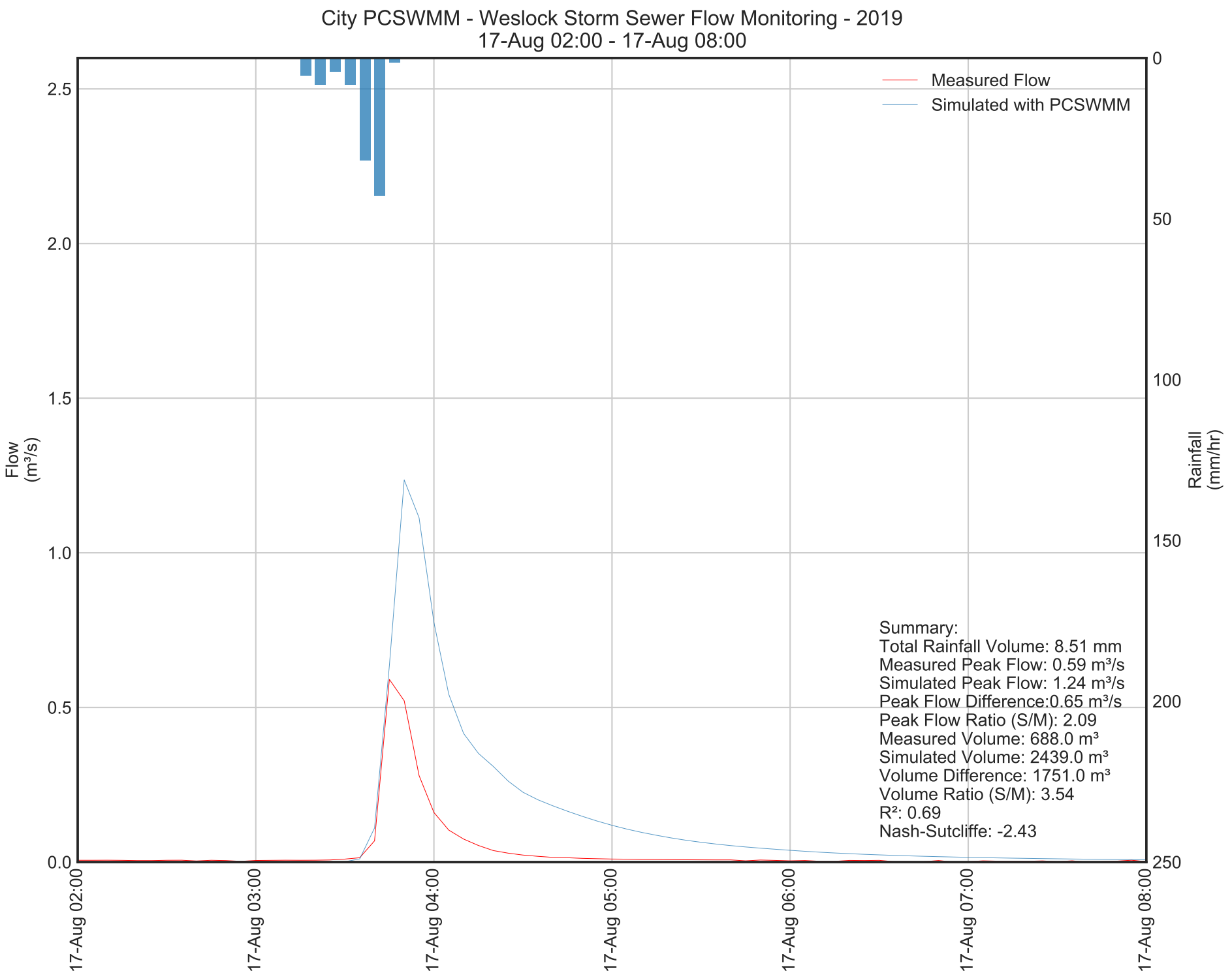

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
30-Jul 11:00 - 31-Jul 03:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
2.5
2.0
1.5
1.0
0.5
0.0
0
50
100
150
200
250
30-Jul 12:00
30-Jul 14:00
30-Jul 16:00
30-Jul 18:00
30-Jul 20:00
30-Jul 22:00
31-Jul 00:00
31-Jul 02:00
Summary:
Total Rainfall Volume: 12.31 mm
Measured Peak Flow: 0.97 m³/s
Simulated Peak Flow: 1.0 m³/s
Peak Flow Difference:0.03 m³/s
Peak Flow Ratio (S/M): 1.04
Measured Volume: 2144.0 m³
Simulated Volume: 3432.0 m³
Volume Difference: 1288.0 m³
Volume Ratio (S/M): 1.6
R²: 0.41
Nash-Sutcliffe: -0.01

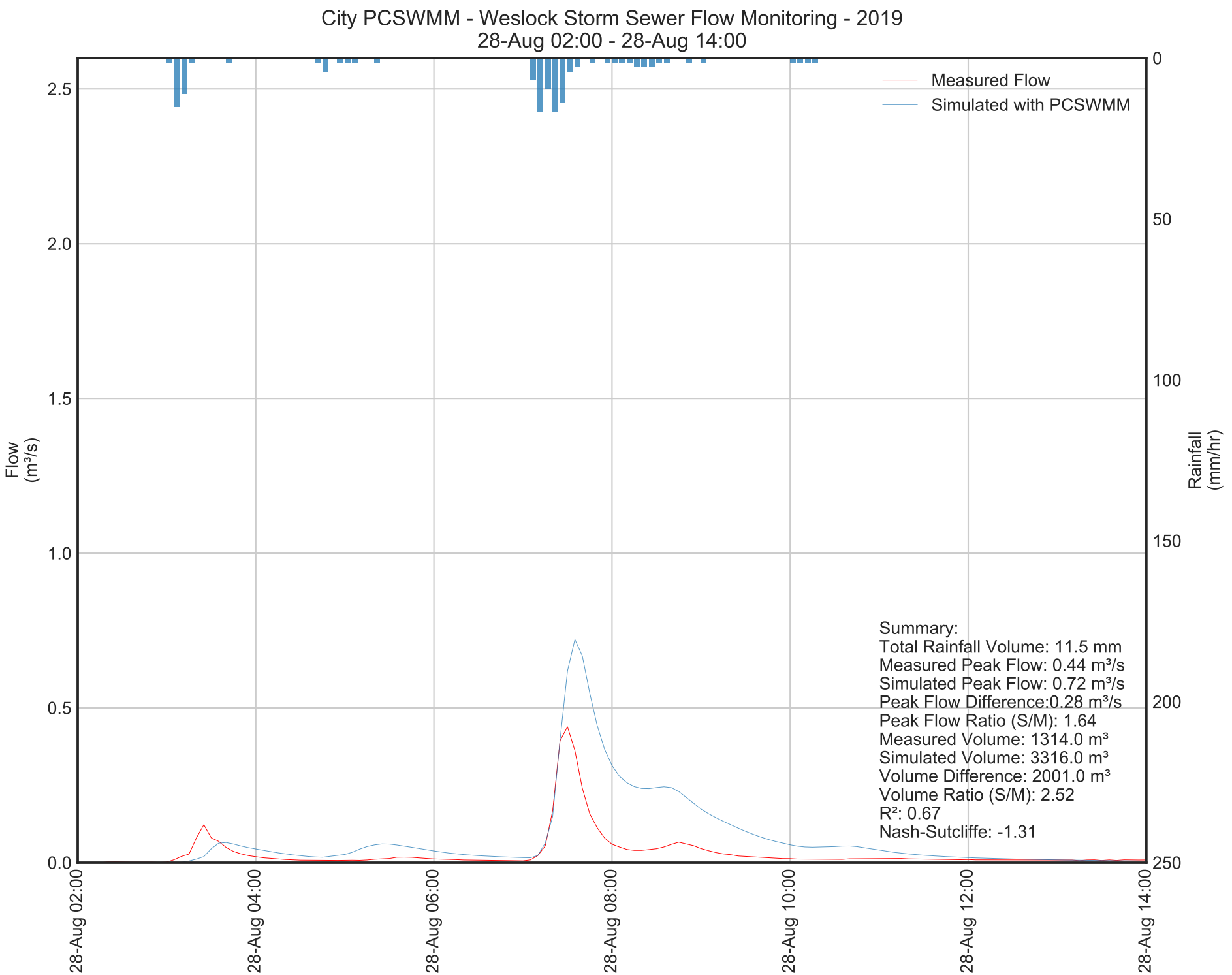

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
06-Aug 12:00 - 06-Aug 18:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
06-Aug 12:00
06-Aug 13:00
06-Aug 14:00
06-Aug 15:00
06-Aug 16:00
06-Aug 17:00
06-Aug 18:00
Summary:
Total Rainfall Volume: 8.85 mm
Measured Peak Flow: 0.33 m³/s
Simulated Peak Flow: 0.61 m³/s
Peak Flow Difference:0.29 m³/s
Peak Flow Ratio (S/M): 1.88
Measured Volume: 1042.0 m³
Simulated Volume: 2539.0 m³
Volume Difference: 1497.0 m³
Volume Ratio (S/M): 2.44
R²: 0.72
Nash-Sutcliffe: -1.55

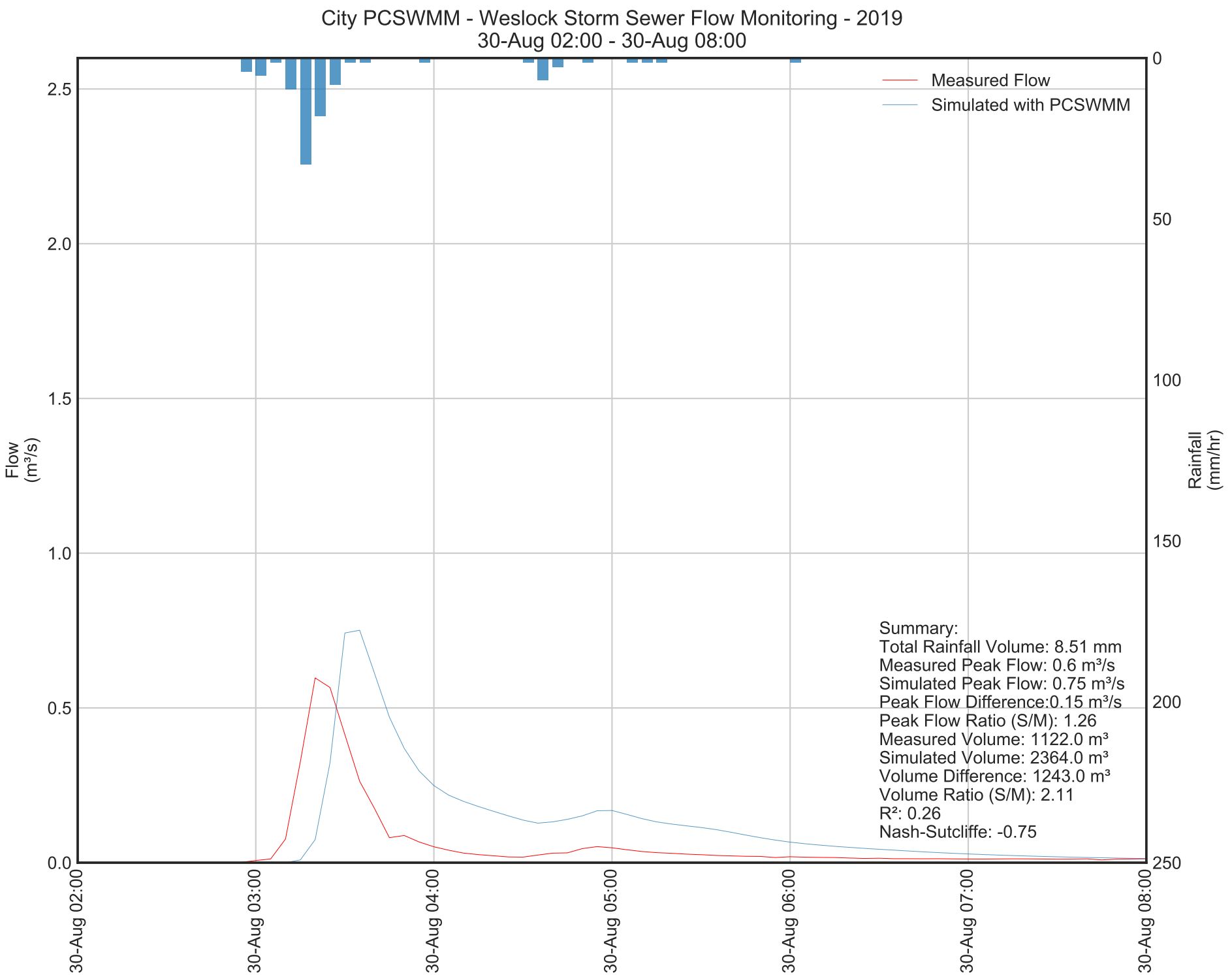

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
08-Aug 14:00 - 08-Aug 20:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
08-Aug 14:00
08-Aug 15:00
08-Aug 16:00
08-Aug 17:00
08-Aug 18:00
08-Aug 19:00
08-Aug 20:00
Summary:
Total Rainfall Volume: 8.28 mm
Measured Peak Flow: 0.76 m³/s
Simulated Peak Flow: 0.96 m³/s
Peak Flow Difference:0.2 m³/s
Peak Flow Ratio (S/M): 1.26
Measured Volume: 1230.0 m³
Simulated Volume: 2513.0 m³
Volume Difference: 1283.0 m³
Volume Ratio (S/M): 2.04
R²: 0.52
Nash-Sutcliffe: -0.34

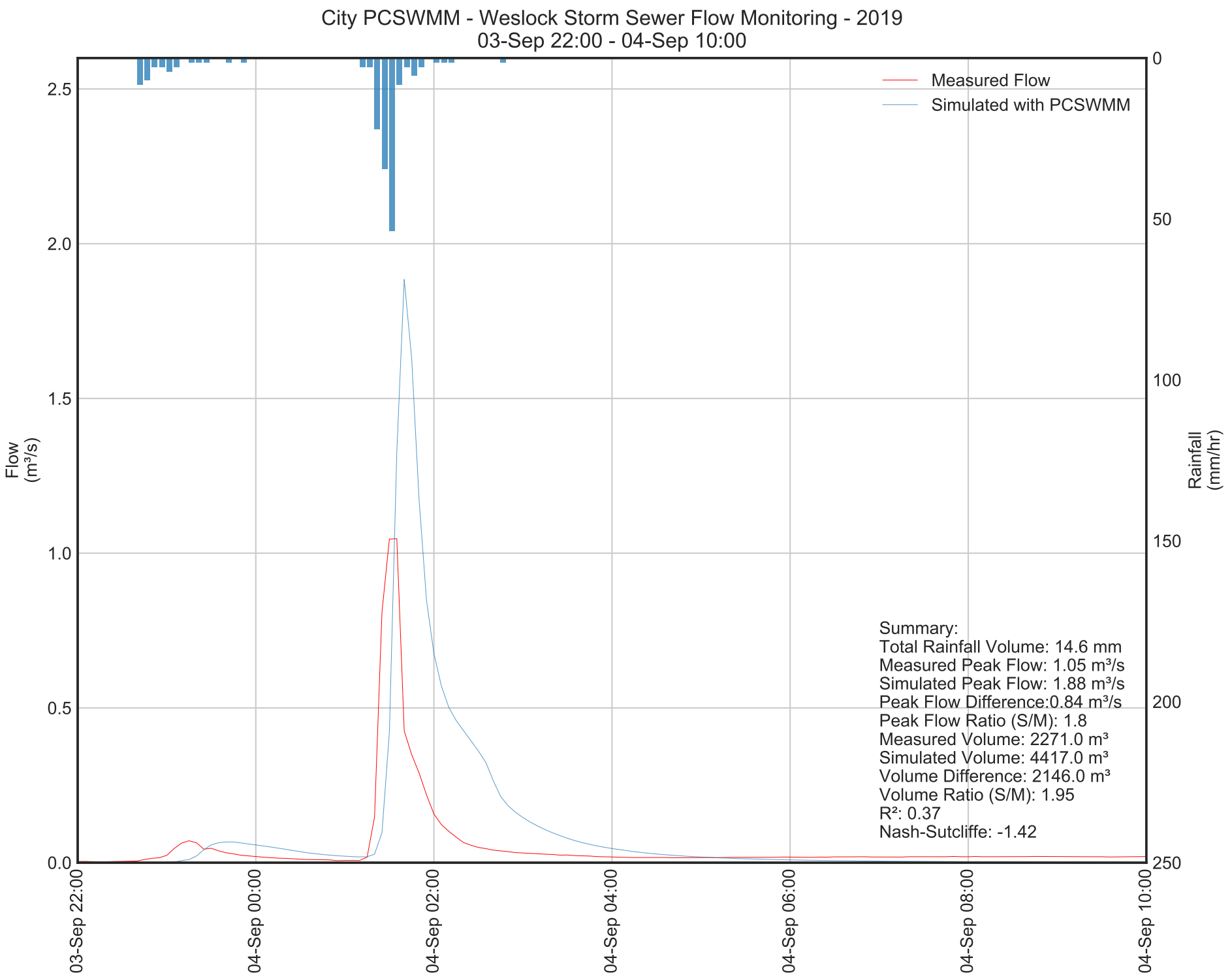

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
09-Aug 12:00 - 09-Aug 18:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
09-Aug 12:00
09-Aug 13:00
09-Aug 14:00
09-Aug 15:00
09-Aug 16:00
09-Aug 17:00
09-Aug 18:00
Summary:
Total Rainfall Volume: 5.98 mm
Measured Peak Flow: 0.6 m³/s
Simulated Peak Flow: 0.66 m³/s
Peak Flow Difference:0.06 m³/s
Peak Flow Ratio (S/M): 1.1
Measured Volume: 1031.0 m³
Simulated Volume: 1687.0 m³
Volume Difference: 656.0 m³
Volume Ratio (S/M): 1.64
R²: 0.42
Nash-Sutcliffe: -0.17

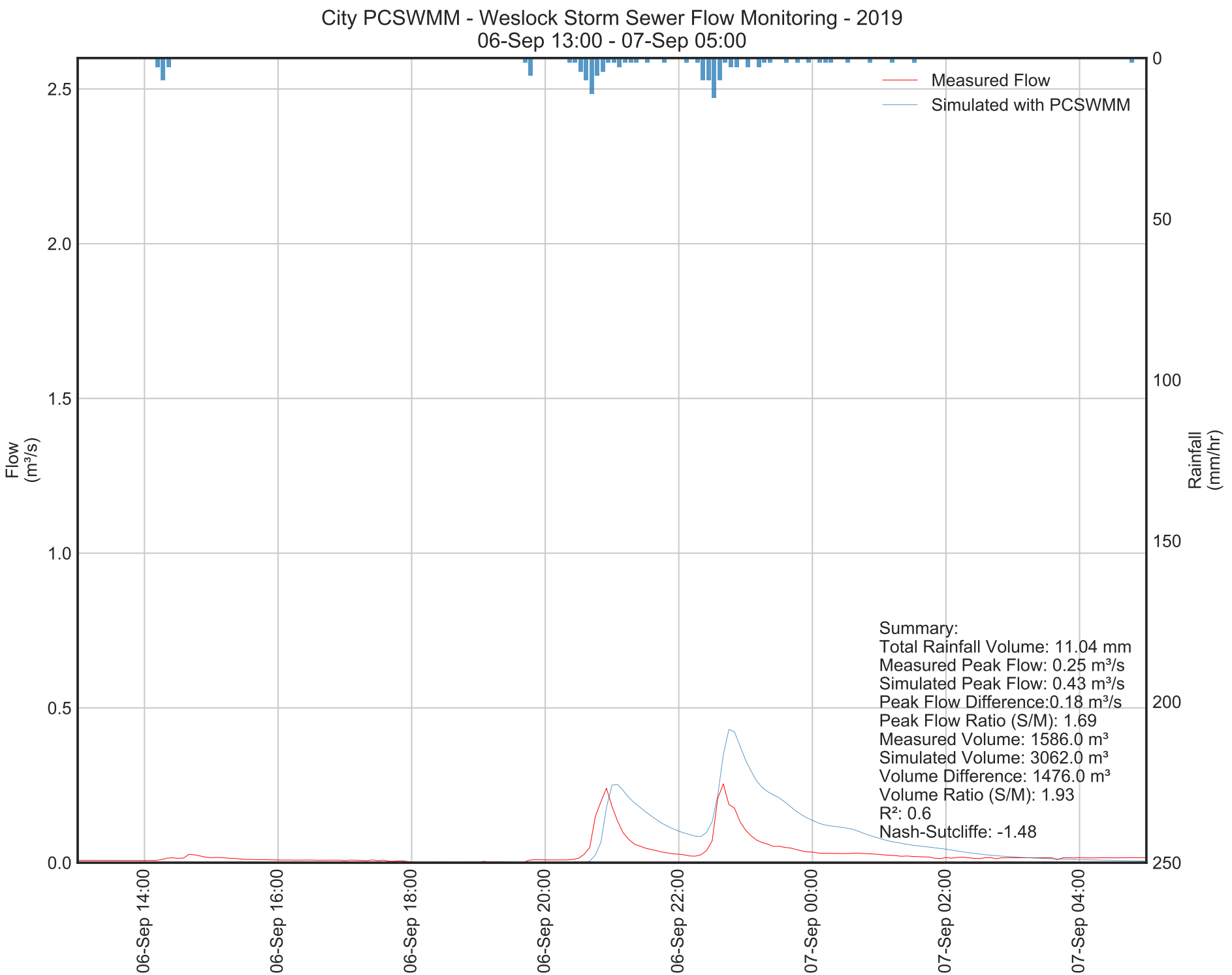

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
12-Aug 18:00 - 13-Aug 00:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
12-Aug 18:00
12-Aug 19:00
12-Aug 20:00
12-Aug 21:00
12-Aug 22:00
12-Aug 23:00
13-Aug 00:00
Summary:
Total Rainfall Volume: 5.52 mm
Measured Peak Flow: 0.22 m³/s
Simulated Peak Flow: 0.21 m³/s
Peak Flow Difference:-0.01 m³/s
Peak Flow Ratio (S/M): 0.93
Measured Volume: 732.0 m³
Simulated Volume: 1210.0 m³
Volume Difference: 479.0 m³
Volume Ratio (S/M): 1.65
R²: 0.3
Nash-Sutcliffe: -0.05

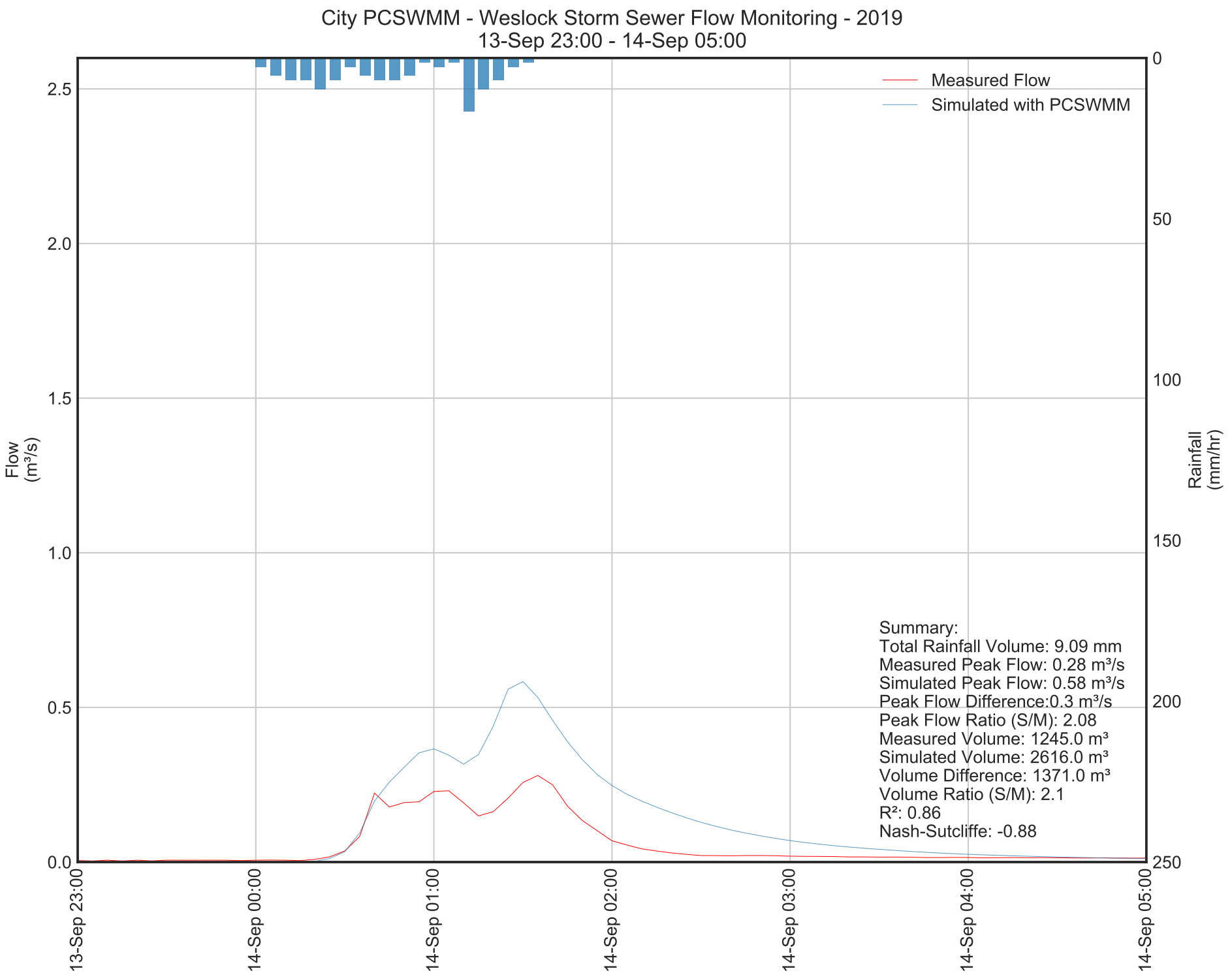

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
17-Aug 02:00 - 17-Aug 08:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
17-Aug 02:00
17-Aug 03:00
17-Aug 04:00
17-Aug 05:00
17-Aug 06:00
17-Aug 07:00
17-Aug 08:00
Summary:
Total Rainfall Volume: 8.51 mm
Measured Peak Flow: 0.59 m³/s
Simulated Peak Flow: 1.24 m³/s
Peak Flow Difference:0.65 m³/s
Peak Flow Ratio (S/M): 2.09
Measured Volume: 688.0 m³
Simulated Volume: 2439.0 m³
Volume Difference: 1751.0 m³
Volume Ratio (S/M): 3.54
R²: 0.69
Nash-Sutcliffe: -2.43

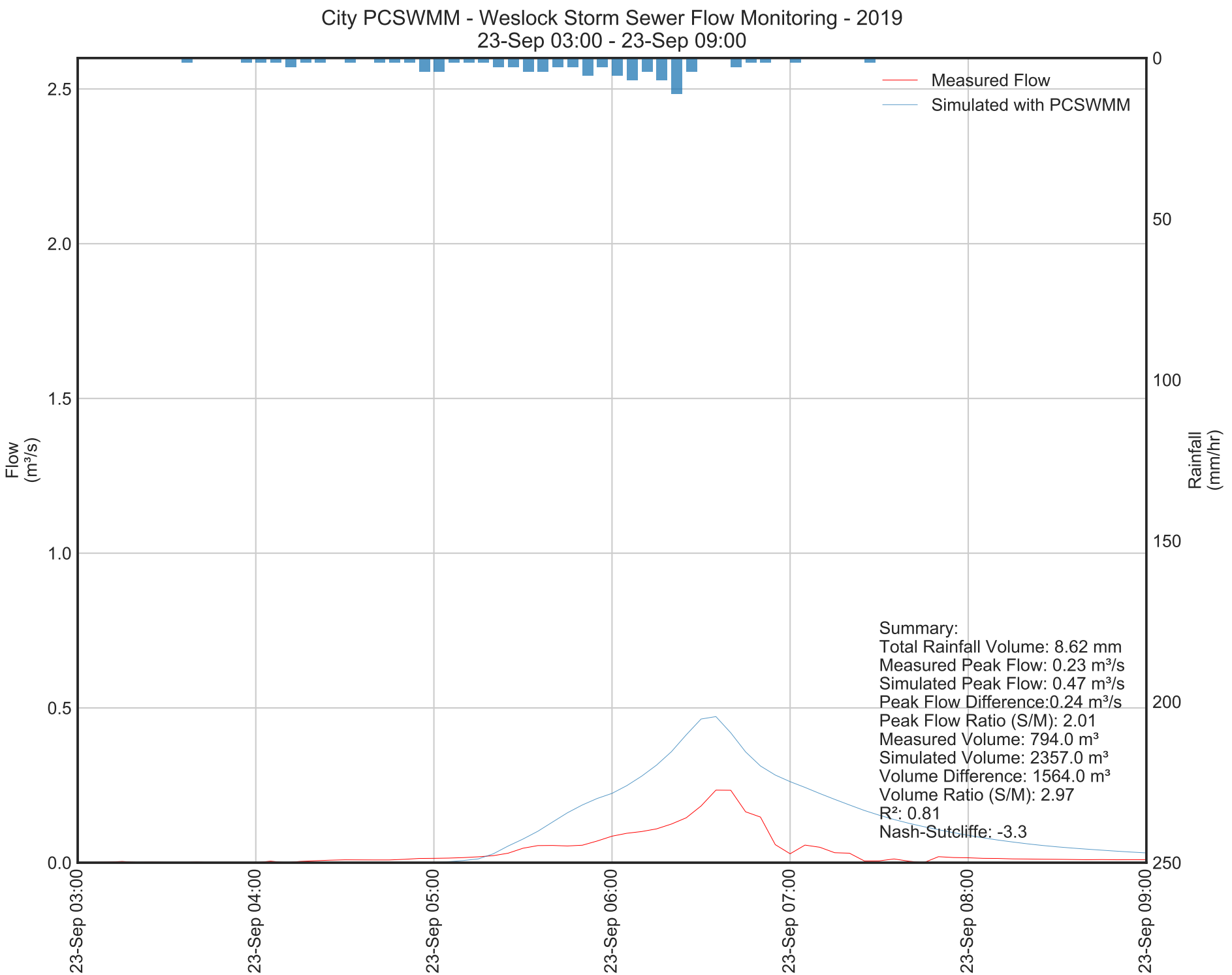

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
28-Aug 02:00 - 28-Aug 14:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
28-Aug 02:00
28-Aug 04:00
28-Aug 06:00
28-Aug 08:00
28-Aug 10:00
28-Aug 12:00
28-Aug 14:00
Summary:
Total Rainfall Volume: 11.5 mm
Measured Peak Flow: 0.44 m³/s
Simulated Peak Flow: 0.72 m³/s
Peak Flow Difference:0.28 m³/s
Peak Flow Ratio (S/M): 1.64
Measured Volume: 1314.0 m³
Simulated Volume: 3316.0 m³
Volume Difference: 2001.0 m³
Volume Ratio (S/M): 2.52
R²: 0.67
Nash-Sutcliffe: -1.31

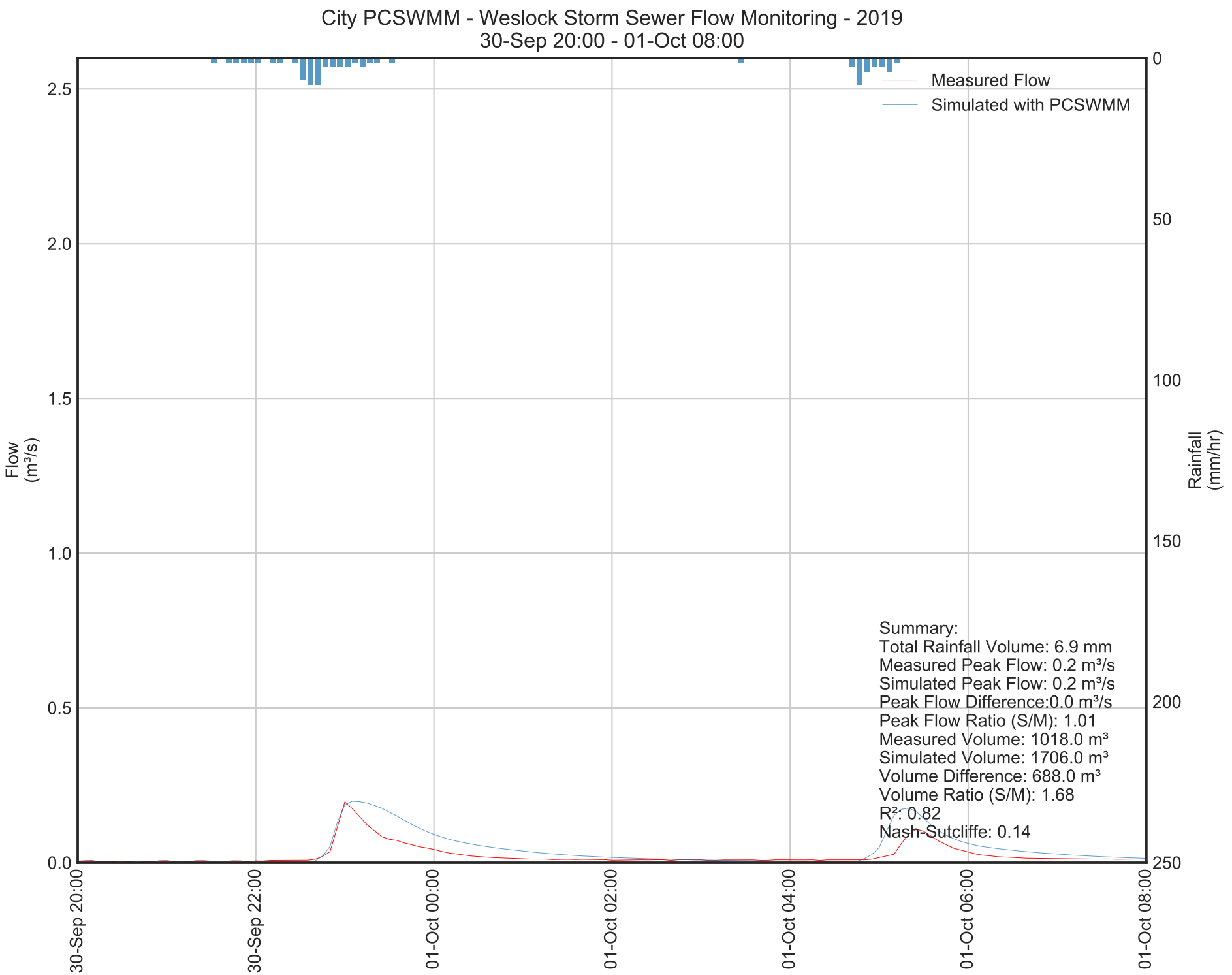

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
30-Aug 02:00 - 30-Aug 08:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
30-Aug 02:00
30-Aug 03:00
30-Aug 04:00
30-Aug 05:00
30-Aug 06:00
30-Aug 07:00
30-Aug 08:00
Summary:
Total Rainfall Volume: 8.51 mm
Measured Peak Flow: 0.6 m³/s
Simulated Peak Flow: 0.75 m³/s
Peak Flow Difference:0.15 m³/s
Peak Flow Ratio (S/M): 1.26
Measured Volume: 1122.0 m³
Simulated Volume: 2364.0 m³
Volume Difference: 1243.0 m³
Volume Ratio (S/M): 2.11
R²: 0.26
Nash-Sutcliffe: -0.75

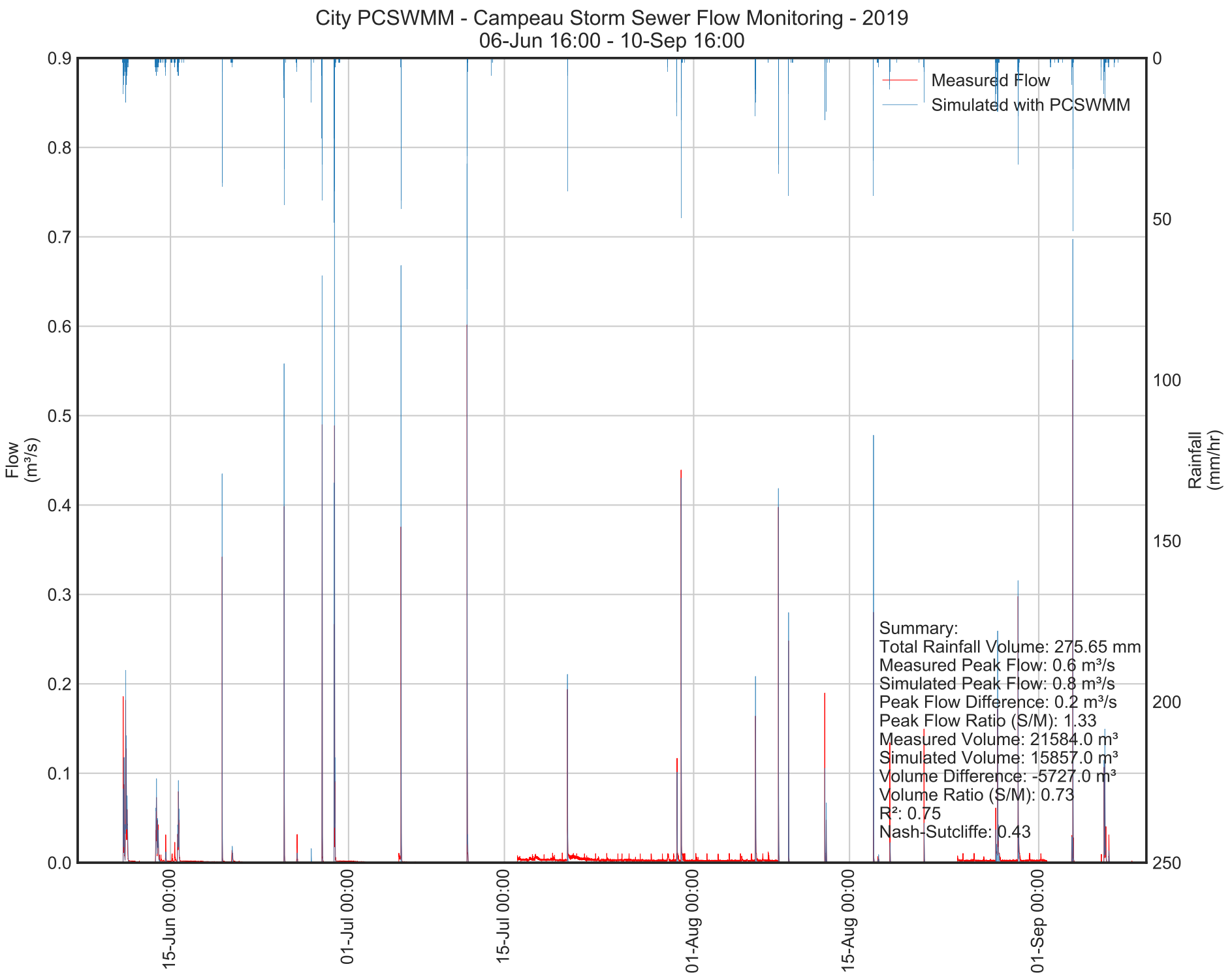

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
03-Sep 22:00 - 04-Sep 10:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
03-Sep 22:00
04-Sep 00:00
04-Sep 02:00
04-Sep 04:00
04-Sep 06:00
04-Sep 08:00
04-Sep 10:00
Summary:
Total Rainfall Volume: 14.6 mm
Measured Peak Flow: 1.05 m³/s
Simulated Peak Flow: 1.88 m³/s
Peak Flow Difference:0.84 m³/s
Peak Flow Ratio (S/M): 1.8
Measured Volume: 2271.0 m³
Simulated Volume: 4417.0 m³
Volume Difference: 2146.0 m³
Volume Ratio (S/M): 1.95
R²: 0.37
Nash-Sutcliffe: -1.42

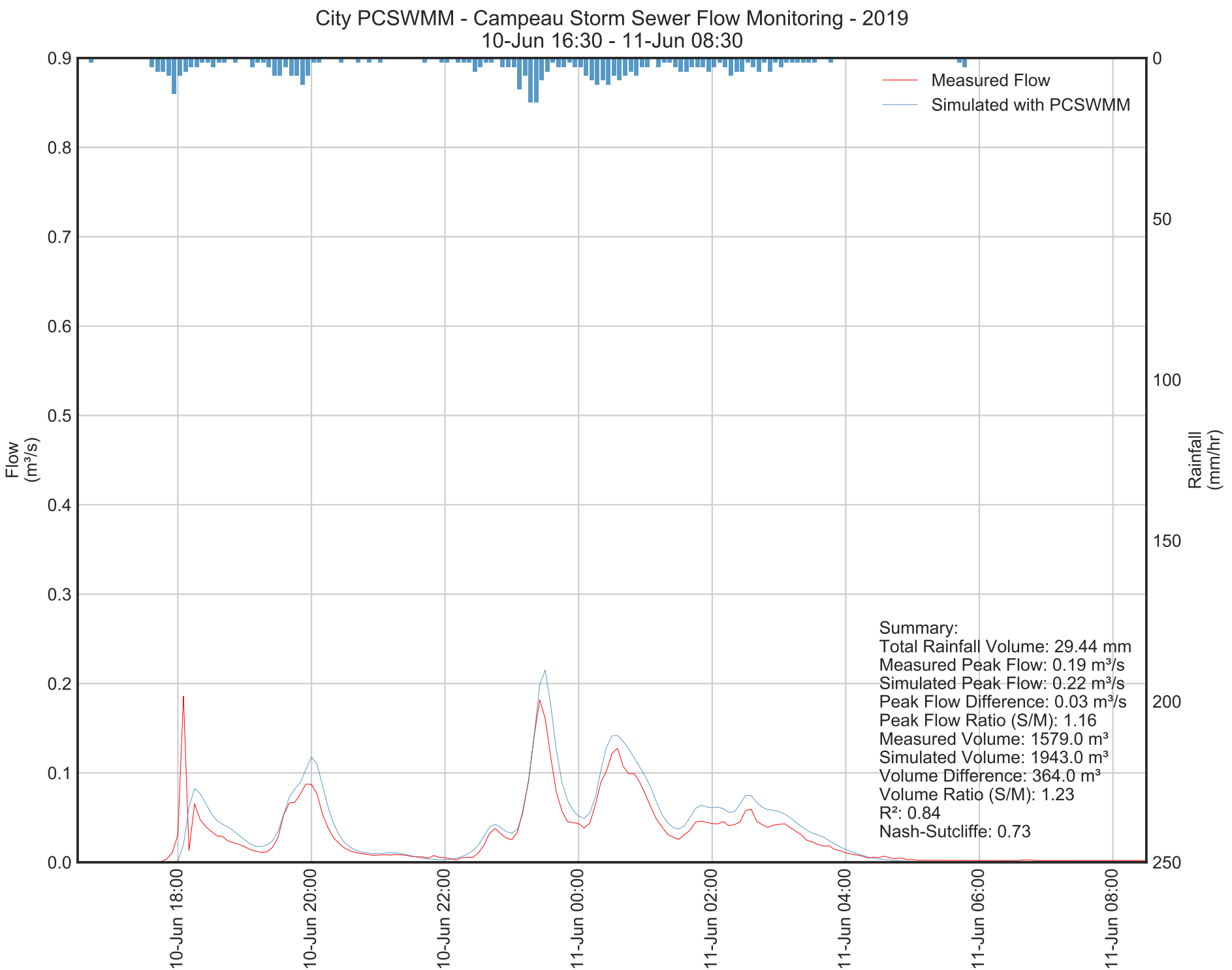

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
06-Sep 13:00 - 07-Sep 05:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
06-Sep 14:00
06-Sep 16:00
06-Sep 18:00
06-Sep 20:00
06-Sep 22:00
07-Sep 00:00
07-Sep 02:00
07-Sep 04:00
Summary:
Total Rainfall Volume: 11.04 mm
Measured Peak Flow: 0.25 m³/s
Simulated Peak Flow: 0.43 m³/s
Peak Flow Difference:0.18 m³/s
Peak Flow Ratio (S/M): 1.69
Measured Volume: 1586.0 m³
Simulated Volume: 3062.0 m³
Volume Difference: 1476.0 m³
Volume Ratio (S/M): 1.93
R²: 0.6
Nash-Sutcliffe: -1.48

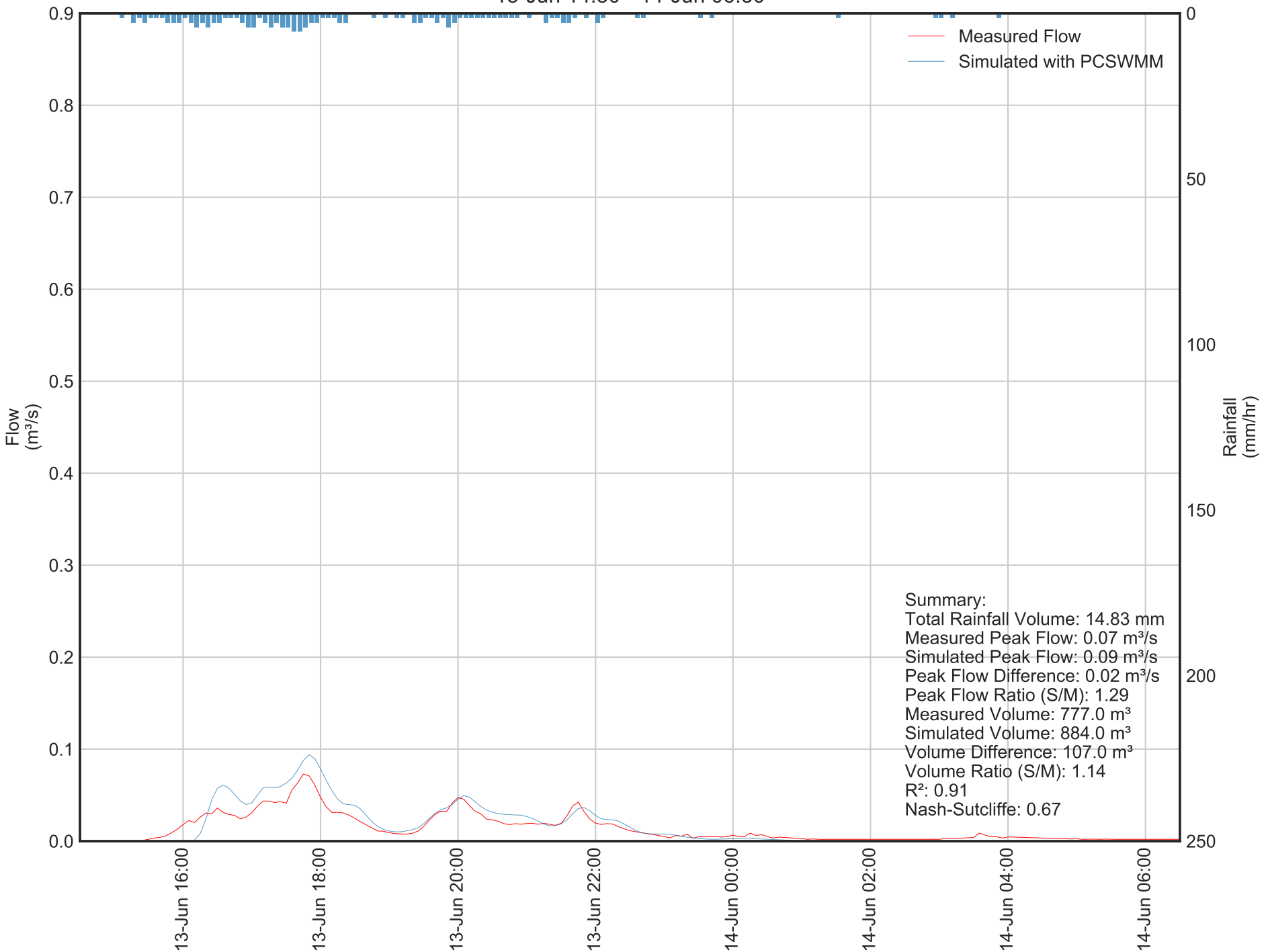

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
13-Sep 23:00 - 14-Sep 05:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
13-Sep 23:00
14-Sep 00:00
14-Sep 01:00
14-Sep 02:00
14-Sep 03:00
14-Sep 04:00
14-Sep 05:00
Summary:
Total Rainfall Volume: 9.09 mm
Measured Peak Flow: 0.28 m³/s
Simulated Peak Flow: 0.58 m³/s
Peak Flow Difference:0.3 m³/s
Peak Flow Ratio (S/M): 2.08
Measured Volume: 1245.0 m³
Simulated Volume: 2616.0 m³
Volume Difference: 1371.0 m³
Volume Ratio (S/M): 2.1
R²: 0.86
Nash-Sutcliffe: -0.88

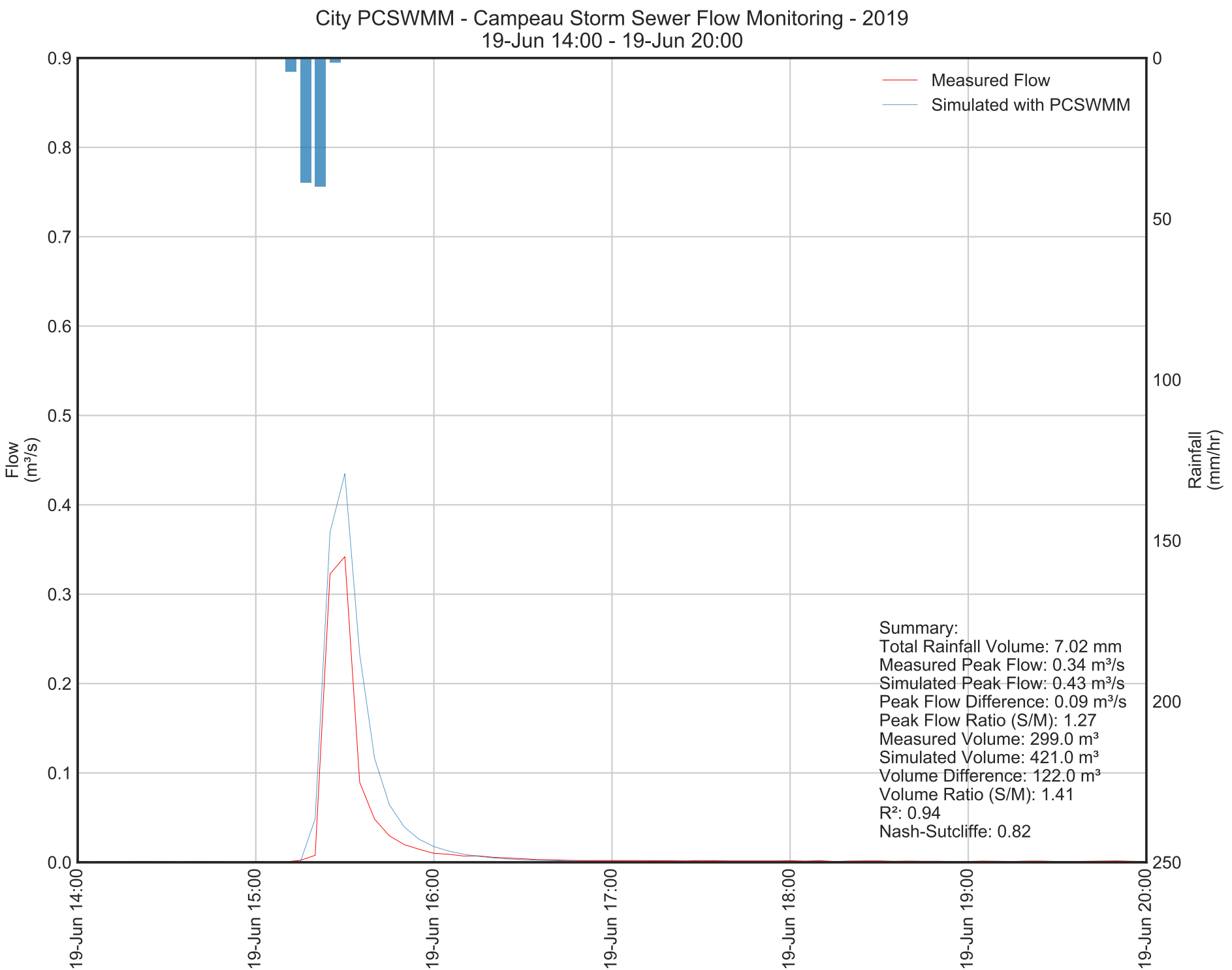

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
23-Sep 03:00 - 23-Sep 09:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
23-Sep 03:00
23-Sep 04:00
23-Sep 05:00
23-Sep 06:00
23-Sep 07:00
23-Sep 08:00
23-Sep 09:00
Summary:
Total Rainfall Volume: 8.62 mm
Measured Peak Flow: 0.23 m³/s
Simulated Peak Flow: 0.47 m³/s
Peak Flow Difference:0.24 m³/s
Peak Flow Ratio (S/M): 2.01
Measured Volume: 794.0 m³
Simulated Volume: 2357.0 m³
Volume Difference: 1564.0 m³
Volume Ratio (S/M): 2.97
R²: 0.81
Nash-Sutcliffe: -3.3

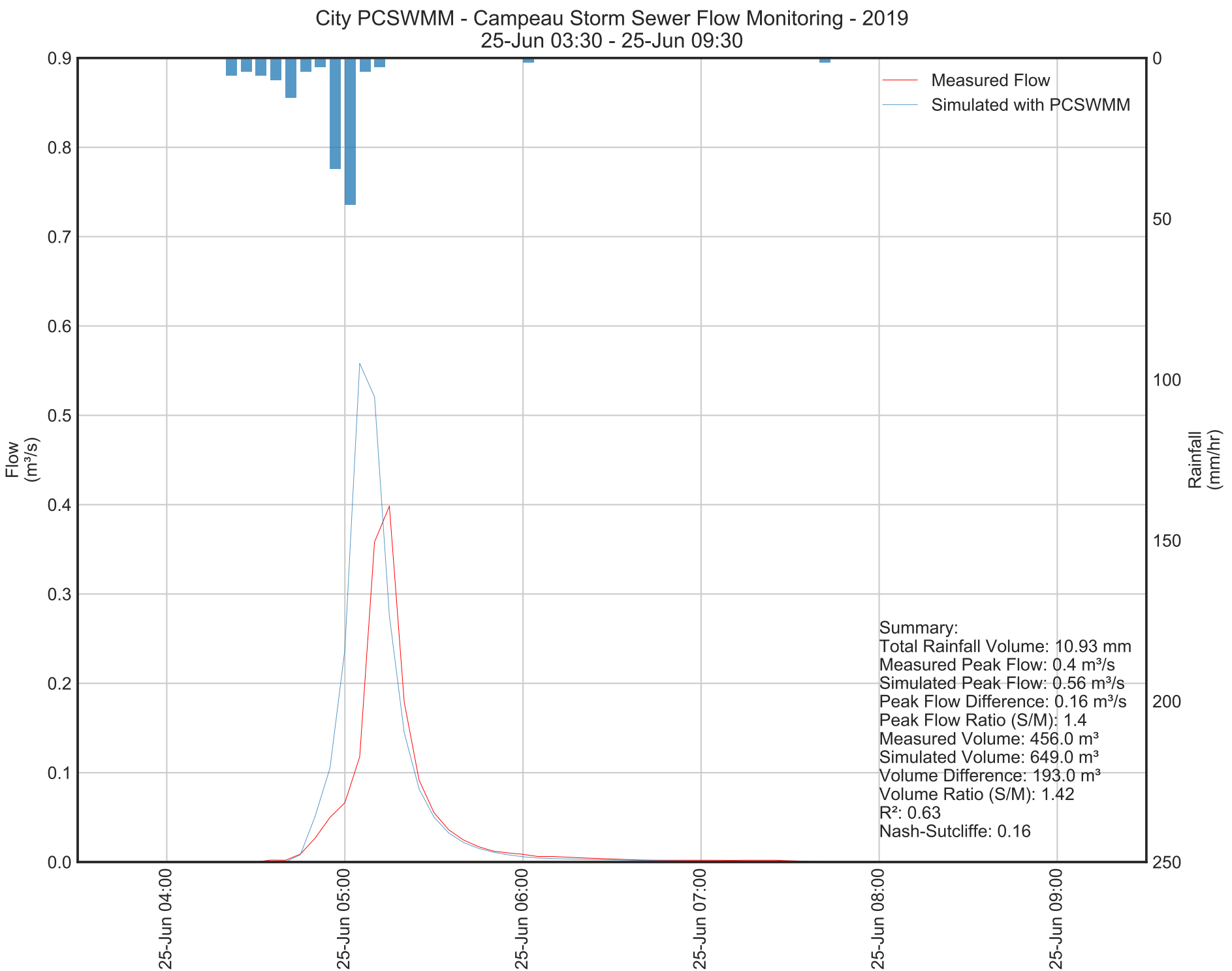

City PCSWMM - Weslock Storm Sewer Flow Monitoring - 2019
30-Sep 20:00 - 01-Oct 08:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.5
1.0
1.5
2.0
2.5
0
50
100
150
200
250
30-Sep 20:00
30-Sep 22:00
01-Oct 00:00
01-Oct 02:00
01-Oct 04:00
01-Oct 06:00
01-Oct 08:00
Summary:
Total Rainfall Volume: 6.9 mm
Measured Peak Flow: 0.2 m³/s
Simulated Peak Flow: 0.2 m³/s
Peak Flow Difference:0.0 m³/s
Peak Flow Ratio (S/M): 1.01
Measured Volume: 1018.0 m³
Simulated Volume: 1706.0 m³
Volume Difference: 688.0 m³
Volume Ratio (S/M): 1.68
R²: 0.82
Nash-Sutcliffe: 0.14

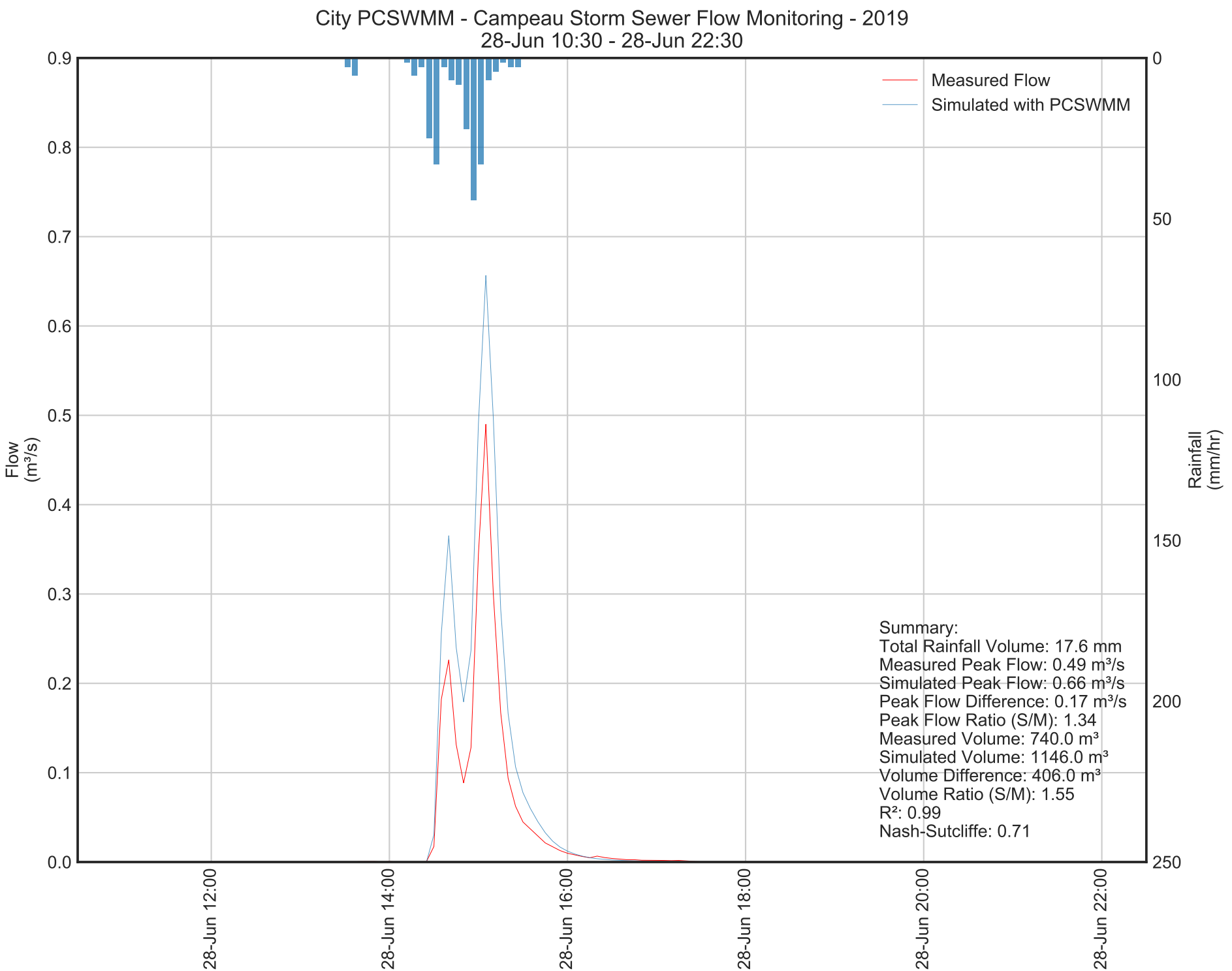

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
06-Jun 16:00 - 10-Sep 16:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
15-Jun 00:00
01-Jul 00:00
15-Jul 00:00
01-Aug 00:00
15-Aug 00:00
01-Sep 00:00
Summary:
Total Rainfall Volume: 275.65 mm
Measured Peak Flow: 0.6 m³/s
Simulated Peak Flow: 0.8 m³/s
Peak Flow Difference: 0.2 m³/s
Peak Flow Ratio (S/M): 1.33
Measured Volume: 21584.0 m³
Simulated Volume: 15857.0 m³
Volume Difference: -5727.0 m³
Volume Ratio (S/M): 0.73
R²: 0.75
Nash-Sutcliffe: 0.43

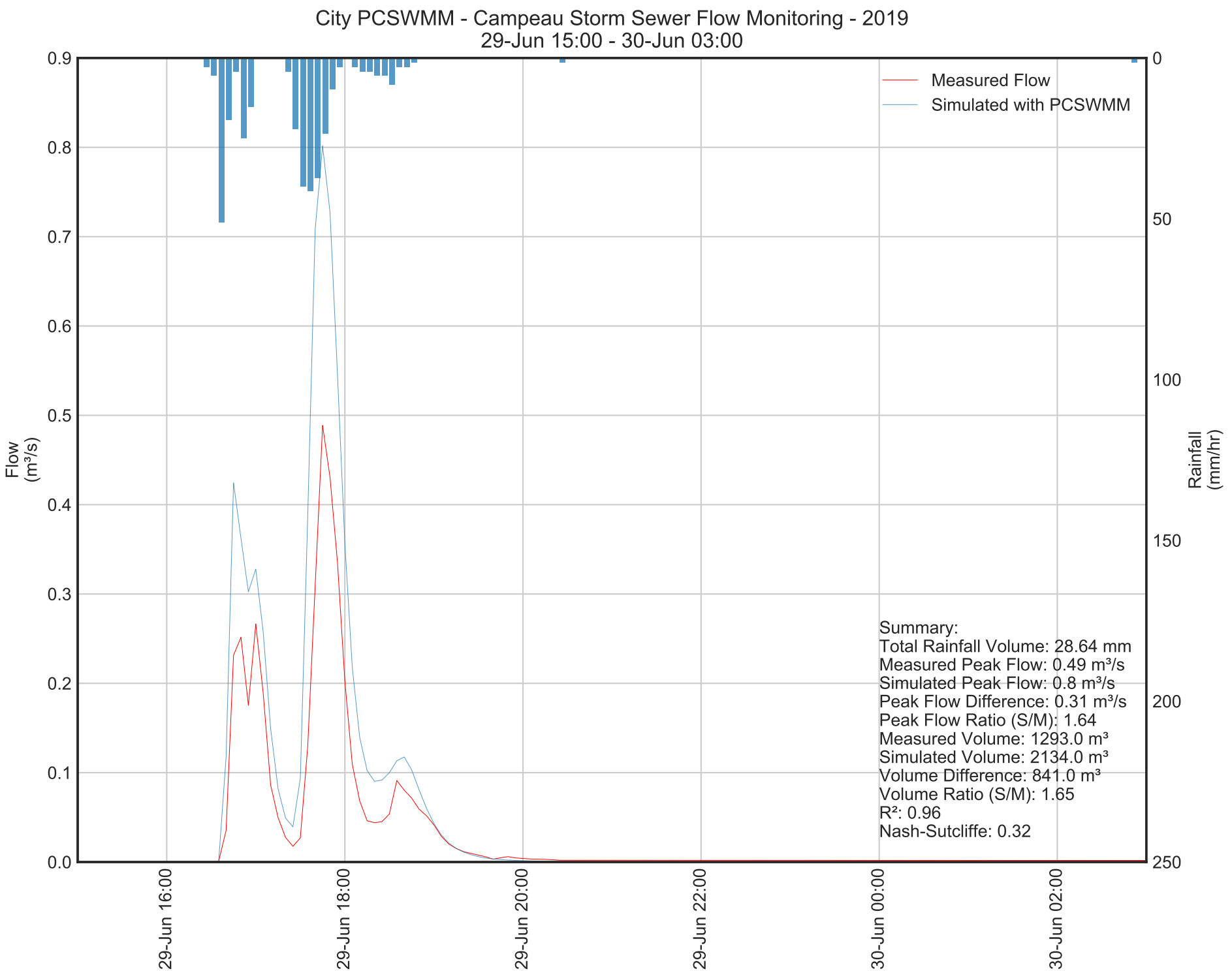

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
10-Jun 16:30 - 11-Jun 08:30
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
10-Jun 18:00
10-Jun 20:00
10-Jun 22:00
11-Jun 00:00
11-Jun 02:00
11-Jun 04:00
11-Jun 06:00
11-Jun 08:00
Summary:
Total Rainfall Volume: 29.44 mm
Measured Peak Flow: 0.19 m³/s
Simulated Peak Flow: 0.22 m³/s
Peak Flow Difference: 0.03 m³/s
Peak Flow Ratio (S/M): 1.16
Measured Volume: 1579.0 m³
Simulated Volume: 1943.0 m³
Volume Difference: 364.0 m³
Volume Ratio (S/M): 1.23
R²: 0.84
Nash-Sutcliffe: 0.73

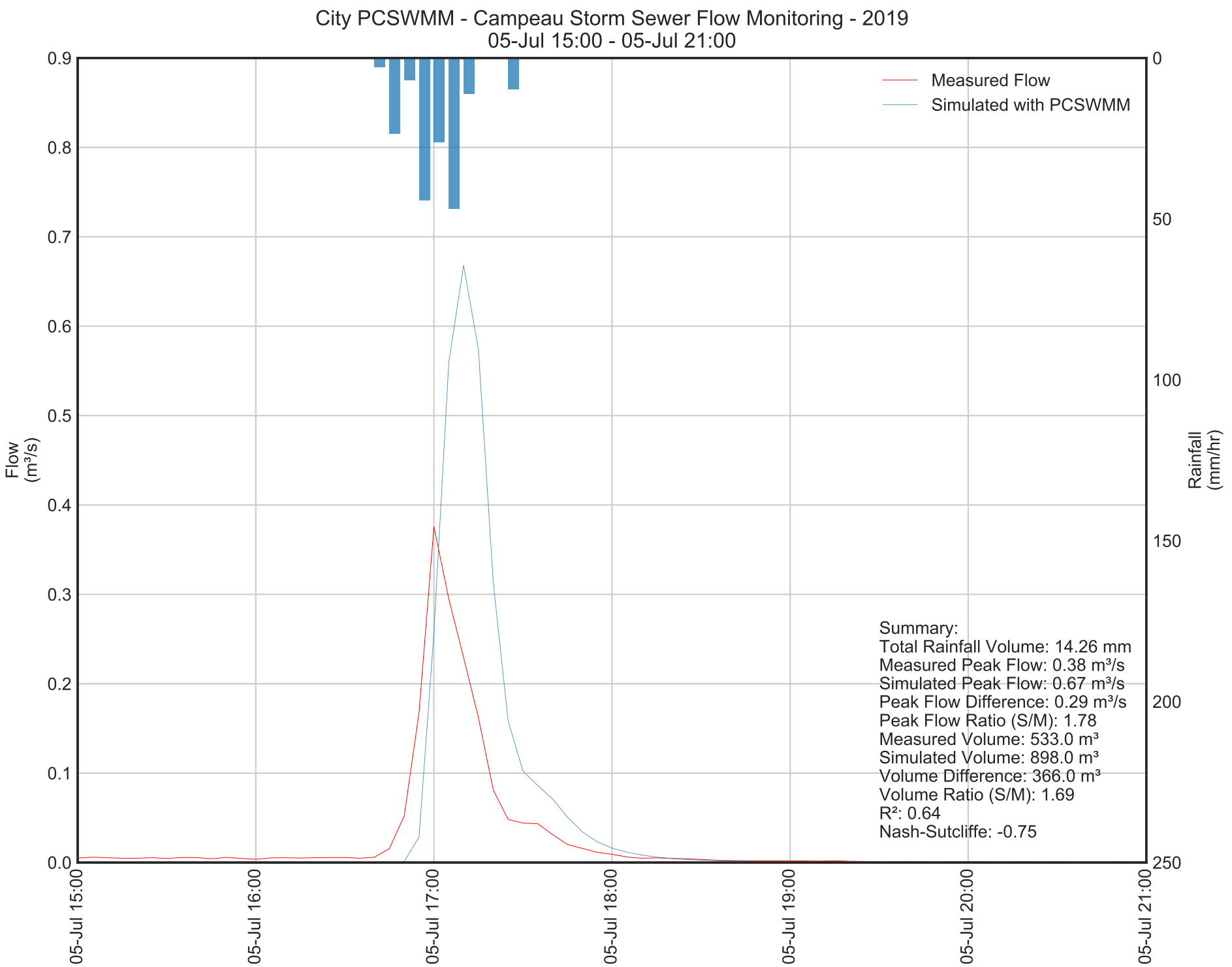

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
13-Jun 14:30 - 14-Jun 06:30
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
13-Jun 16:00
13-Jun 18:00
13-Jun 20:00
13-Jun 22:00
14-Jun 00:00
14-Jun 02:00
14-Jun 04:00
14-Jun 06:00
Summary:
Total Rainfall Volume: 14.83 mm
Measured Peak Flow: 0.07 m³/s
Simulated Peak Flow: 0.09 m³/s
Peak Flow Difference: 0.02 m³/s
Peak Flow Ratio (S/M): 1.29
Measured Volume: 777.0 m³
Simulated Volume: 884.0 m³
Volume Difference: 107.0 m³
Volume Ratio (S/M): 1.14
R²: 0.91
Nash-Sutcliffe: 0.67

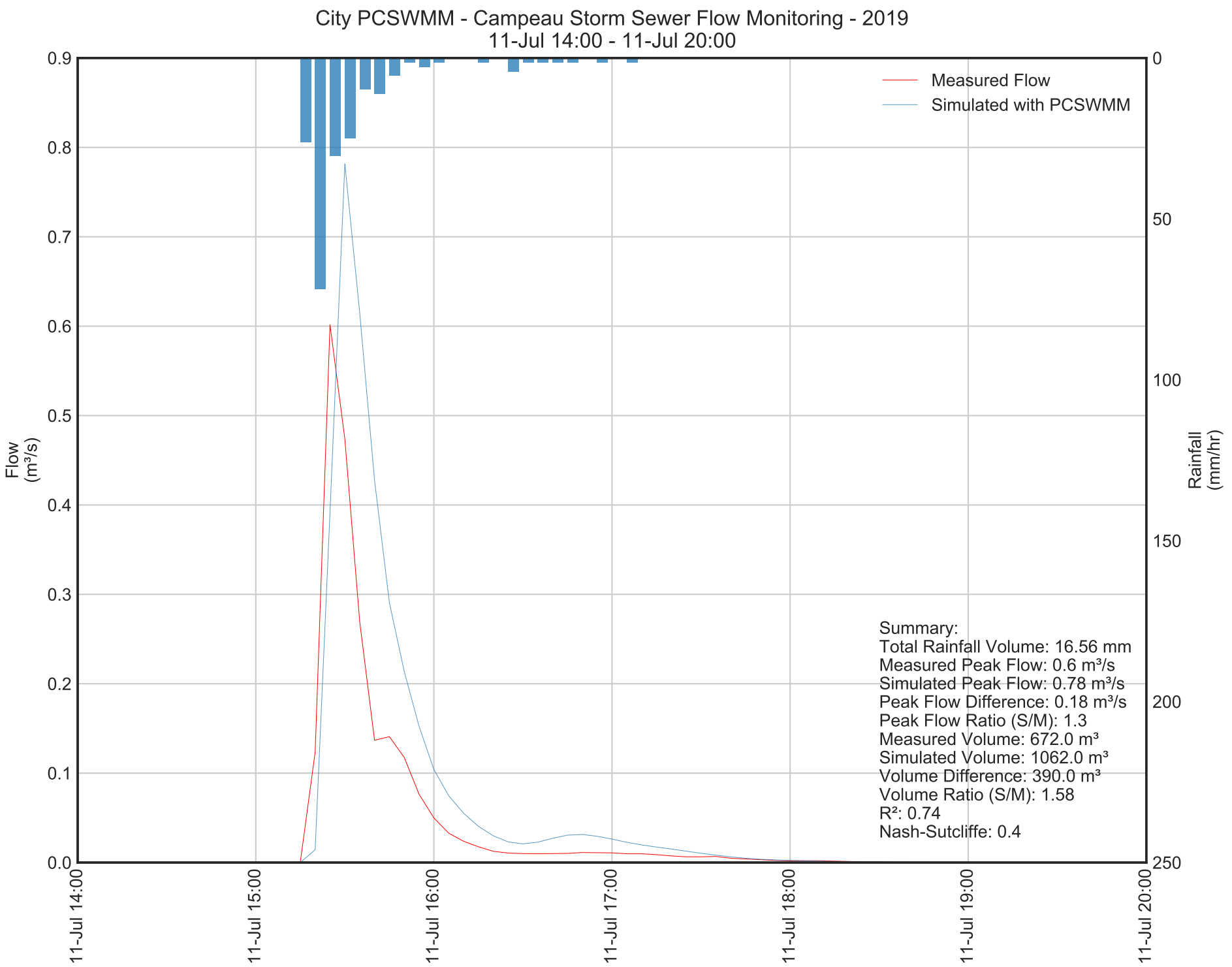

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
19-Jun 14:00 - 19-Jun 20:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
19-Jun 14:00
19-Jun 15:00
19-Jun 16:00
19-Jun 17:00
19-Jun 18:00
19-Jun 19:00
19-Jun 20:00
Summary:
Total Rainfall Volume: 7.02 mm
Measured Peak Flow: 0.34 m³/s
Simulated Peak Flow: 0.43 m³/s
Peak Flow Difference: 0.09 m³/s
Peak Flow Ratio (S/M): 1.27
Measured Volume: 299.0 m³
Simulated Volume: 421.0 m³
Volume Difference: 122.0 m³
Volume Ratio (S/M): 1.41
R²: 0.94
Nash-Sutcliffe: 0.82

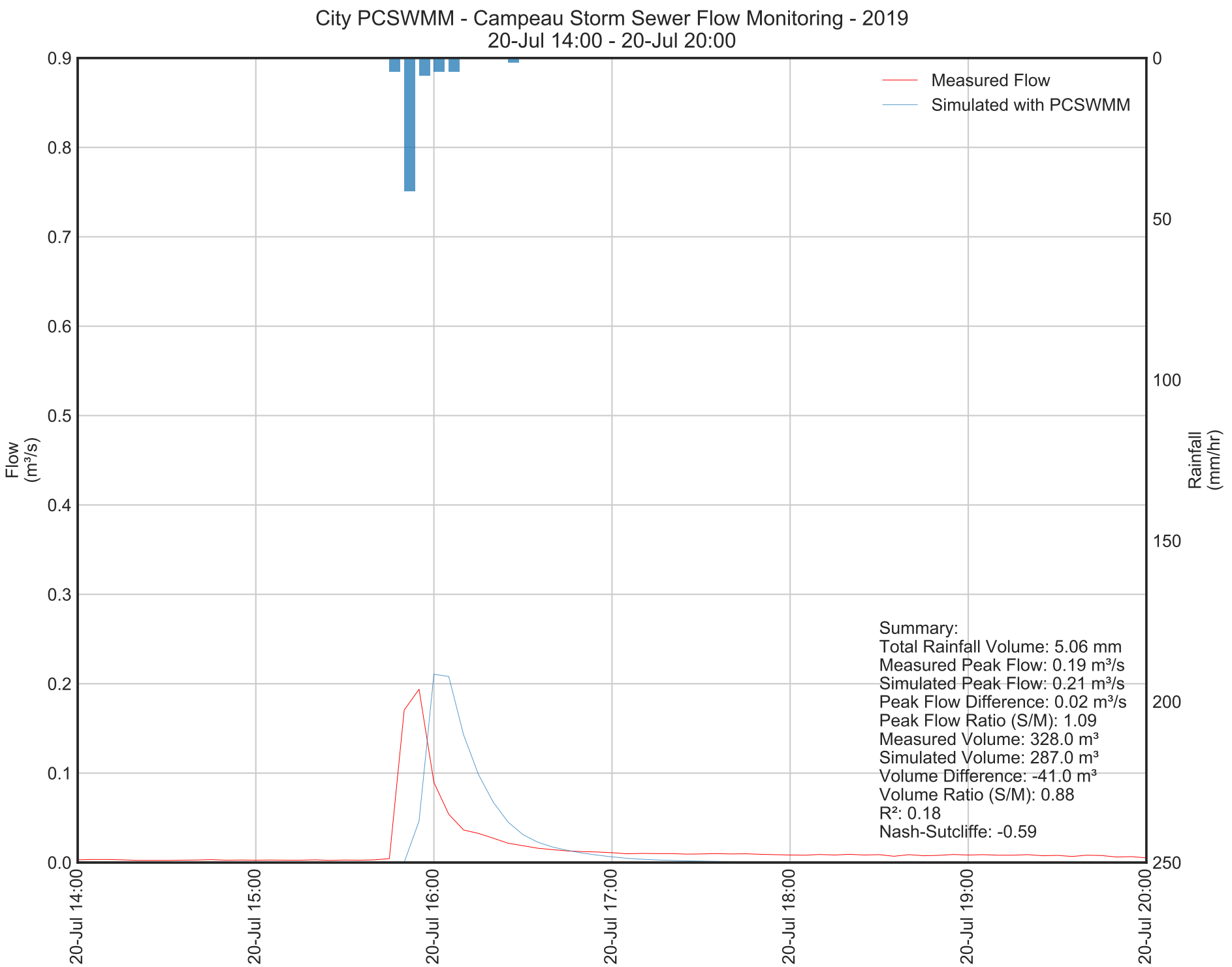

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
25-Jun 03:30 - 25-Jun 09:30
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
25-Jun 04:00
25-Jun 05:00
25-Jun 06:00
25-Jun 07:00
25-Jun 08:00
25-Jun 09:00
Summary:
Total Rainfall Volume: 10.93 mm
Measured Peak Flow: 0.4 m³/s
Simulated Peak Flow: 0.56 m³/s
Peak Flow Difference: 0.16 m³/s
Peak Flow Ratio (S/M): 1.4
Measured Volume: 456.0 m³
Simulated Volume: 649.0 m³
Volume Difference: 193.0 m³
Volume Ratio (S/M): 1.42
R²: 0.63
Nash-Sutcliffe: 0.16

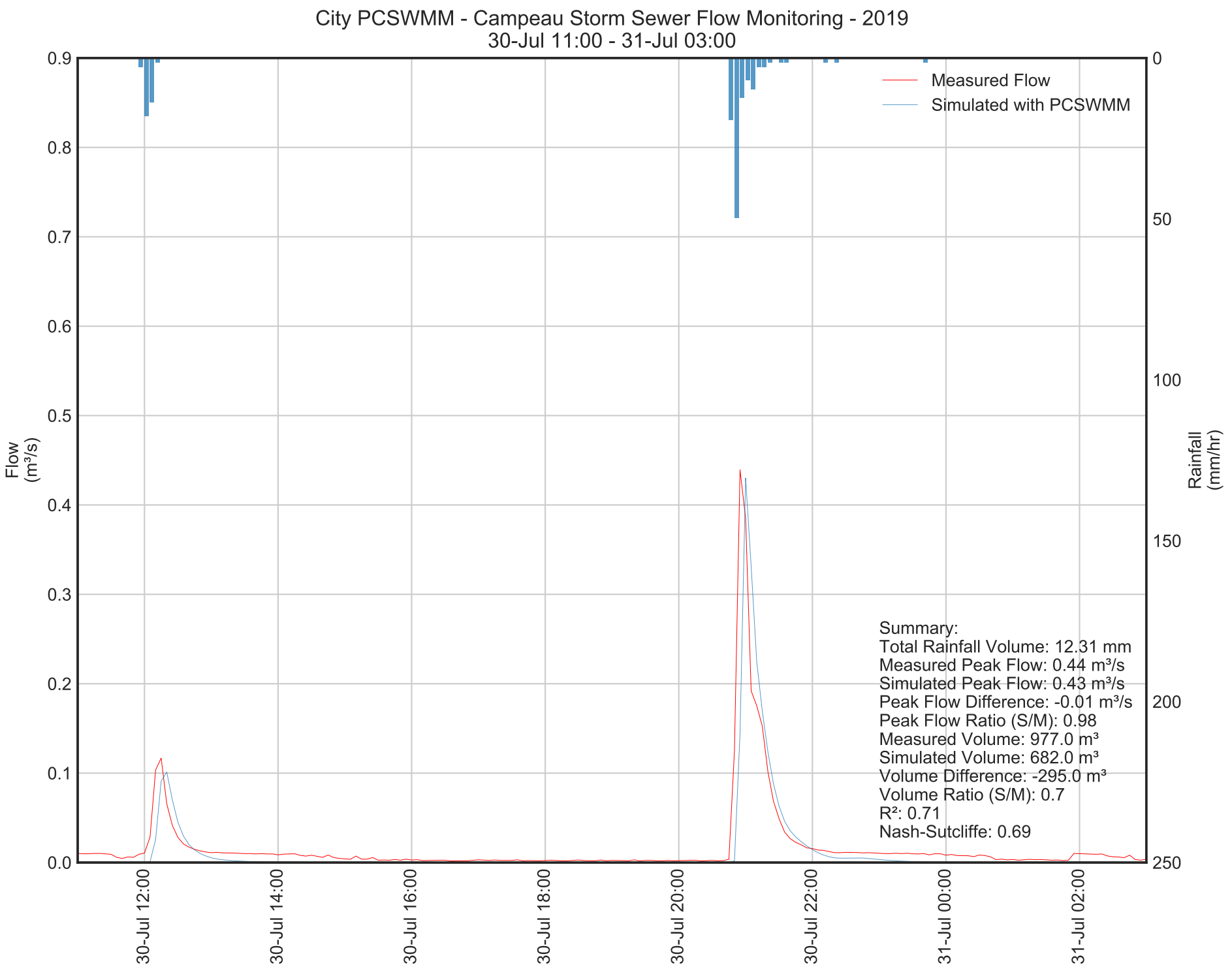

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
28-Jun 10:30 - 28-Jun 22:30
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
28-Jun 12:00
28-Jun 14:00
28-Jun 16:00
28-Jun 18:00
28-Jun 20:00
28-Jun 22:00
Summary:
Total Rainfall Volume: 17.6 mm
Measured Peak Flow: 0.49 m³/s
Simulated Peak Flow: 0.66 m³/s
Peak Flow Difference: 0.17 m³/s
Peak Flow Ratio (S/M): 1.34
Measured Volume: 740.0 m³
Simulated Volume: 1146.0 m³
Volume Difference: 406.0 m³
Volume Ratio (S/M): 1.55
R²: 0.99
Nash-Sutcliffe: 0.71

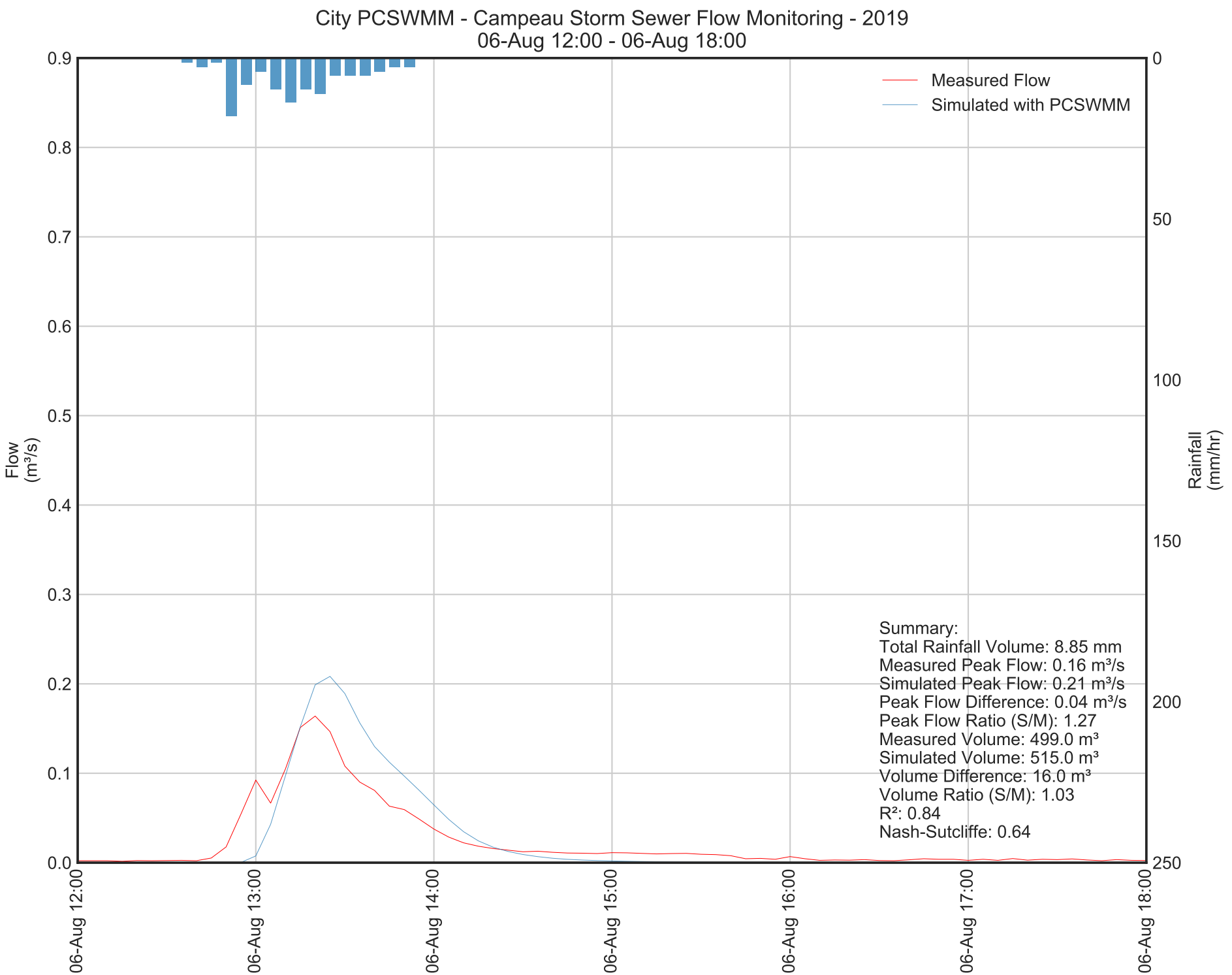

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
29-Jun 15:00 - 30-Jun 03:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
29-Jun 16:00
29-Jun 18:00
29-Jun 20:00
29-Jun 22:00
30-Jun 00:00
30-Jun 02:00
Summary:
Total Rainfall Volume: 28.64 mm
Measured Peak Flow: 0.49 m³/s
Simulated Peak Flow: 0.8 m³/s
Peak Flow Difference: 0.31 m³/s
Peak Flow Ratio (S/M): 1.64
Measured Volume: 1293.0 m³
Simulated Volume: 2134.0 m³
Volume Difference: 841.0 m³
Volume Ratio (S/M): 1.65
R²: 0.96
Nash-Sutcliffe: 0.32

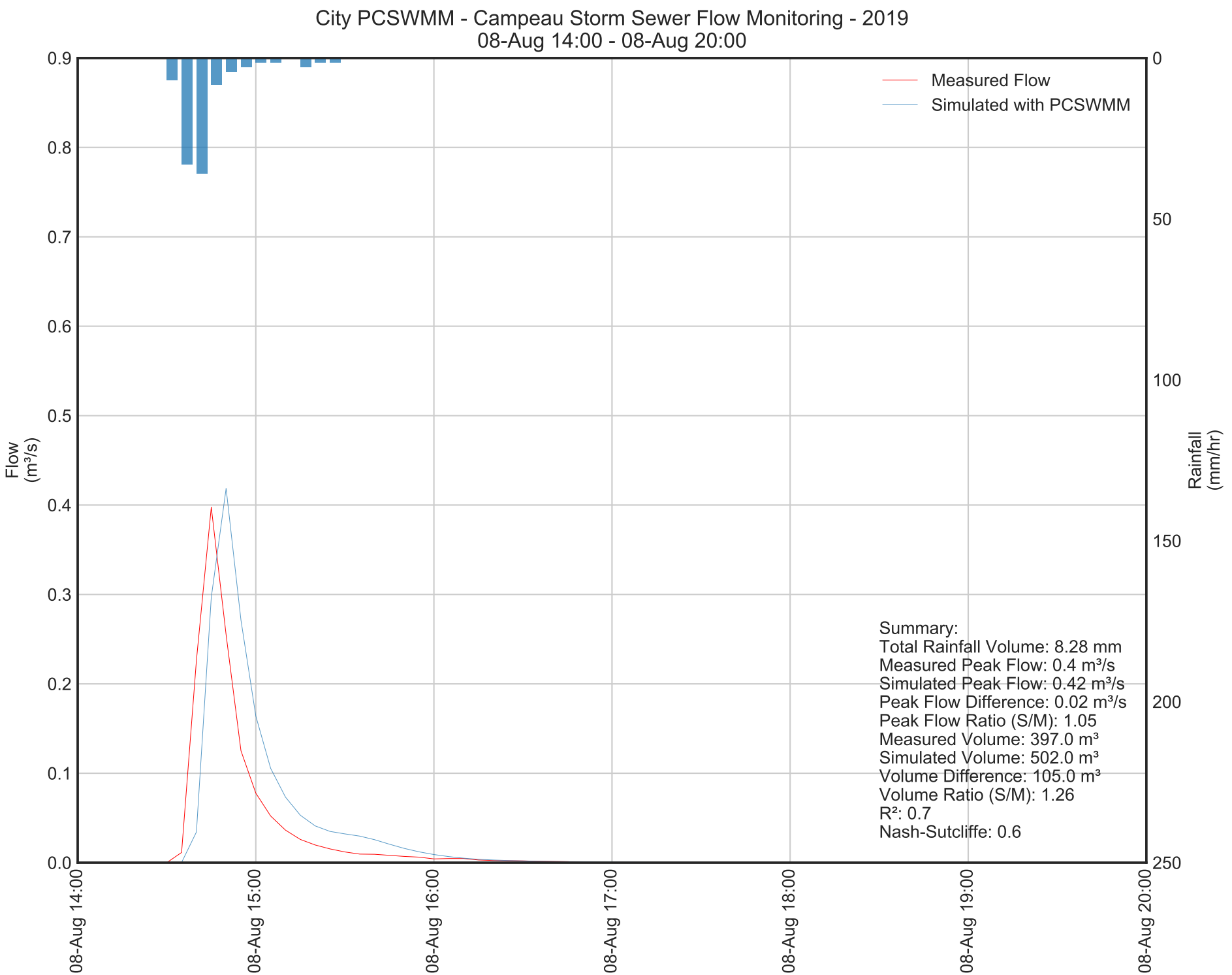

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
05-Jul 15:00 - 05-Jul 21:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
05-Jul 15:00
05-Jul 16:00
05-Jul 17:00
05-Jul 18:00
05-Jul 19:00
05-Jul 20:00
05-Jul 21:00
Summary:
Total Rainfall Volume: 14.26 mm
Measured Peak Flow: 0.38 m³/s
Simulated Peak Flow: 0.67 m³/s
Peak Flow Difference: 0.29 m³/s
Peak Flow Ratio (S/M): 1.78
Measured Volume: 533.0 m³
Simulated Volume: 898.0 m³
Volume Difference: 366.0 m³
Volume Ratio (S/M): 1.69
R²: 0.64
Nash-Sutcliffe: -0.75

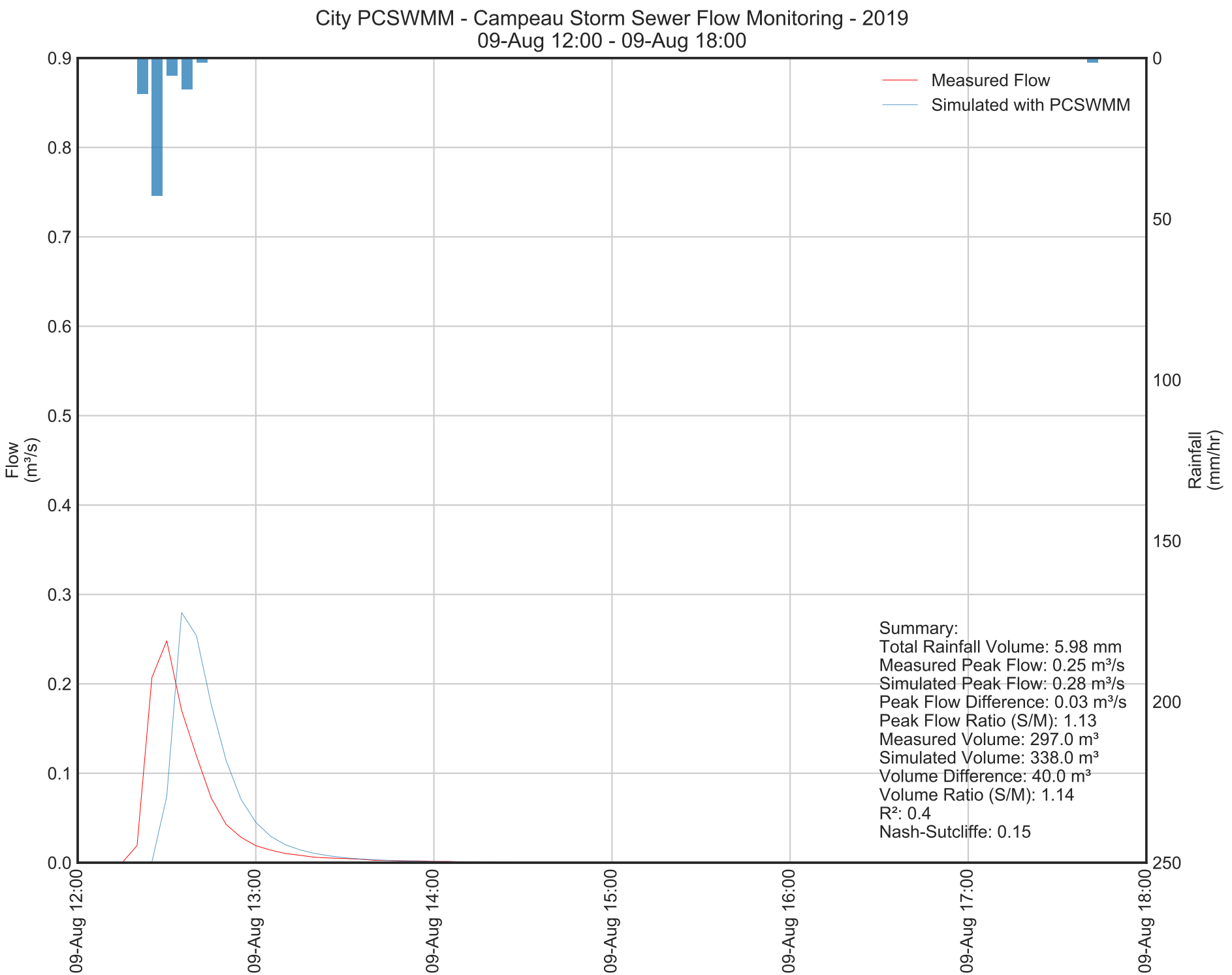

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
11-Jul 14:00 - 11-Jul 20:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
11-Jul 14:00
11-Jul 15:00
11-Jul 16:00
11-Jul 17:00
11-Jul 18:00
11-Jul 19:00
11-Jul 20:00
Summary:
Total Rainfall Volume: 16.56 mm
Measured Peak Flow: 0.6 m³/s
Simulated Peak Flow: 0.78 m³/s
Peak Flow Difference: 0.18 m³/s
Peak Flow Ratio (S/M): 1.3
Measured Volume: 672.0 m³
Simulated Volume: 1062.0 m³
Volume Difference: 390.0 m³
Volume Ratio (S/M): 1.58
R²: 0.74
Nash-Sutcliffe: 0.4

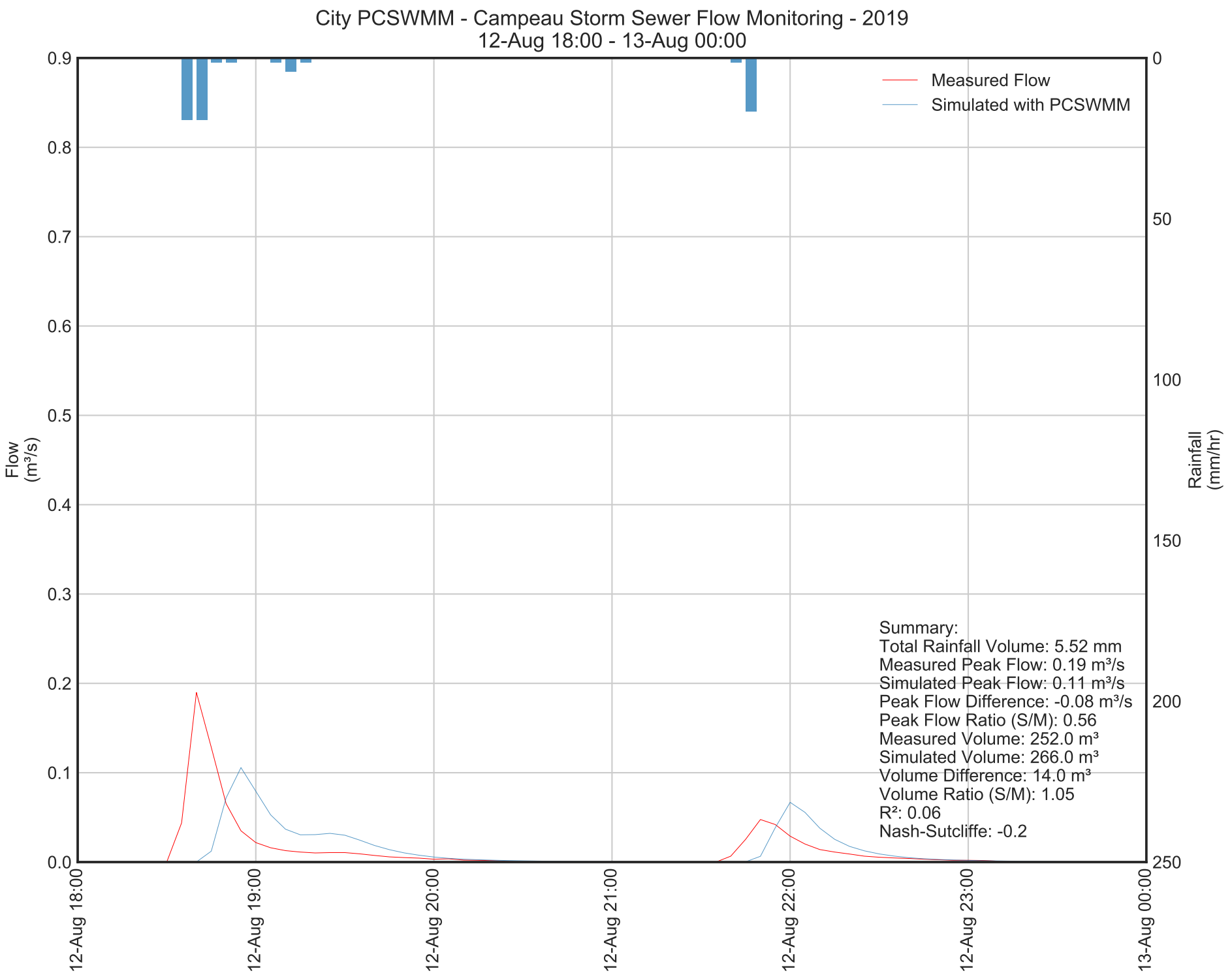

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
20-Jul 14:00 - 20-Jul 20:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
20-Jul 14:00
20-Jul 15:00
20-Jul 16:00
20-Jul 17:00
20-Jul 18:00
20-Jul 19:00
20-Jul 20:00
Summary:
Total Rainfall Volume: 5.06 mm
Measured Peak Flow: 0.19 m³/s
Simulated Peak Flow: 0.21 m³/s
Peak Flow Difference: 0.02 m³/s
Peak Flow Ratio (S/M): 1.09
Measured Volume: 328.0 m³
Simulated Volume: 287.0 m³
Volume Difference: -41.0 m³
Volume Ratio (S/M): 0.88
R²: 0.18
Nash-Sutcliffe: -0.59

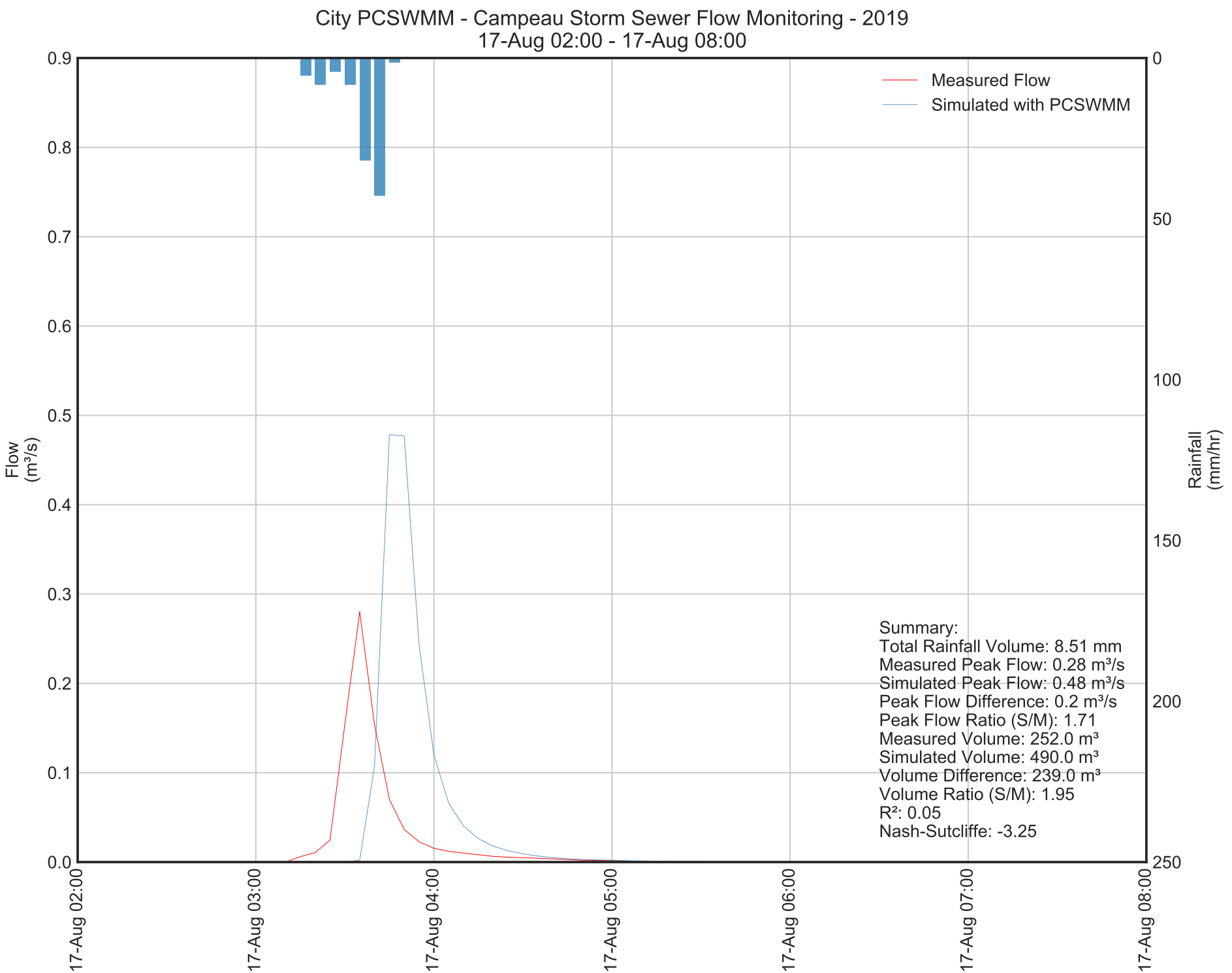

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
30-Jul 11:00 - 31-Jul 03:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
30-Jul 12:00
30-Jul 14:00
30-Jul 16:00
30-Jul 18:00
30-Jul 20:00
30-Jul 22:00
31-Jul 00:00
31-Jul 02:00
Summary:
Total Rainfall Volume: 12.31 mm
Measured Peak Flow: 0.44 m³/s
Simulated Peak Flow: 0.43 m³/s
Peak Flow Difference: -0.01 m³/s
Peak Flow Ratio (S/M): 0.98
Measured Volume: 977.0 m³
Simulated Volume: 682.0 m³
Volume Difference: -295.0 m³
Volume Ratio (S/M): 0.7
R²: 0.71
Nash-Sutcliffe: 0.69

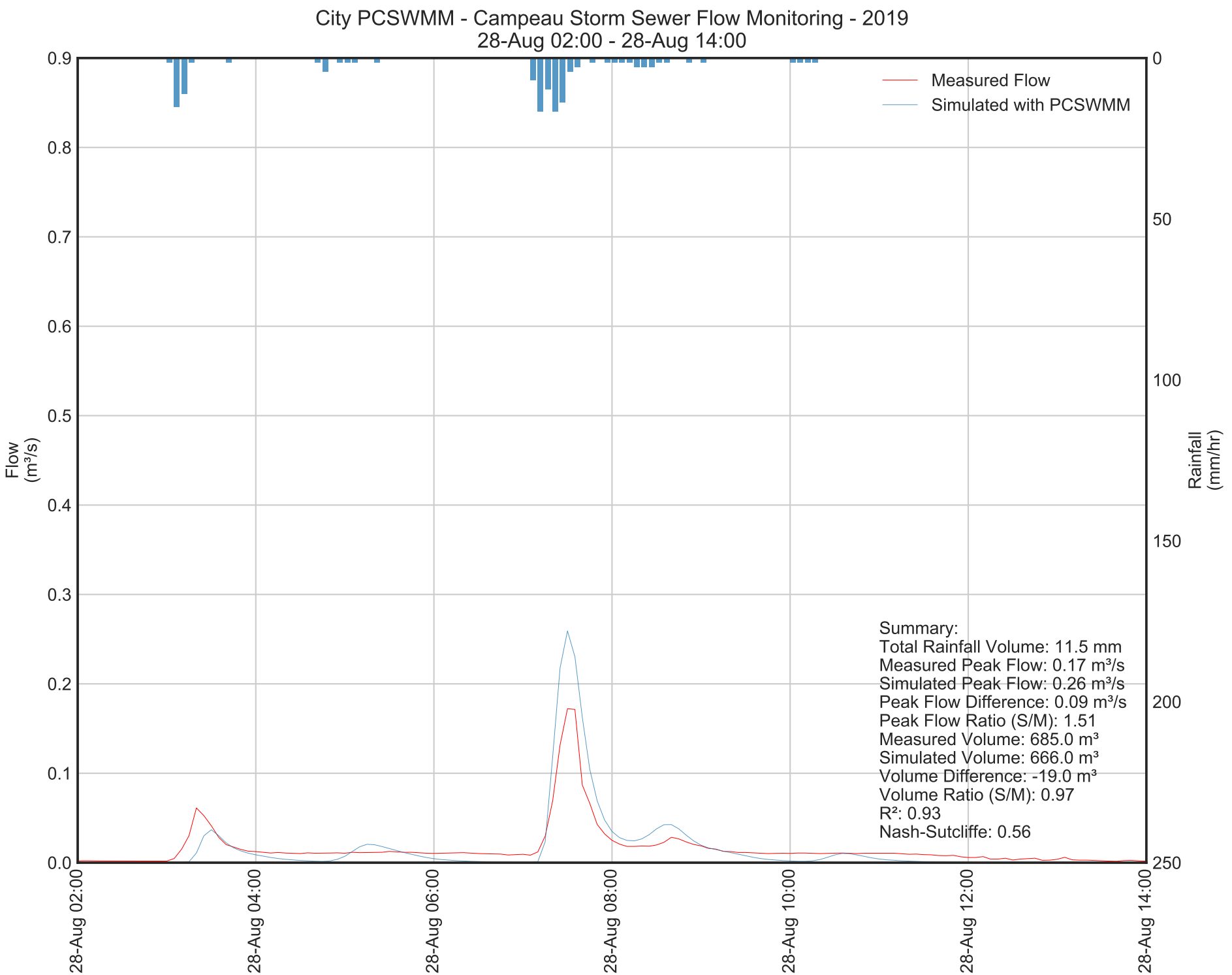

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
06-Aug 12:00 - 06-Aug 18:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
06-Aug 12:00
06-Aug 13:00
06-Aug 14:00
06-Aug 15:00
06-Aug 16:00
06-Aug 17:00
06-Aug 18:00
Summary:
Total Rainfall Volume: 8.85 mm
Measured Peak Flow: 0.16 m³/s
Simulated Peak Flow: 0.21 m³/s
Peak Flow Difference: 0.04 m³/s
Peak Flow Ratio (S/M): 1.27
Measured Volume: 499.0 m³
Simulated Volume: 515.0 m³
Volume Difference: 16.0 m³
Volume Ratio (S/M): 1.03
R²: 0.84
Nash-Sutcliffe: 0.64

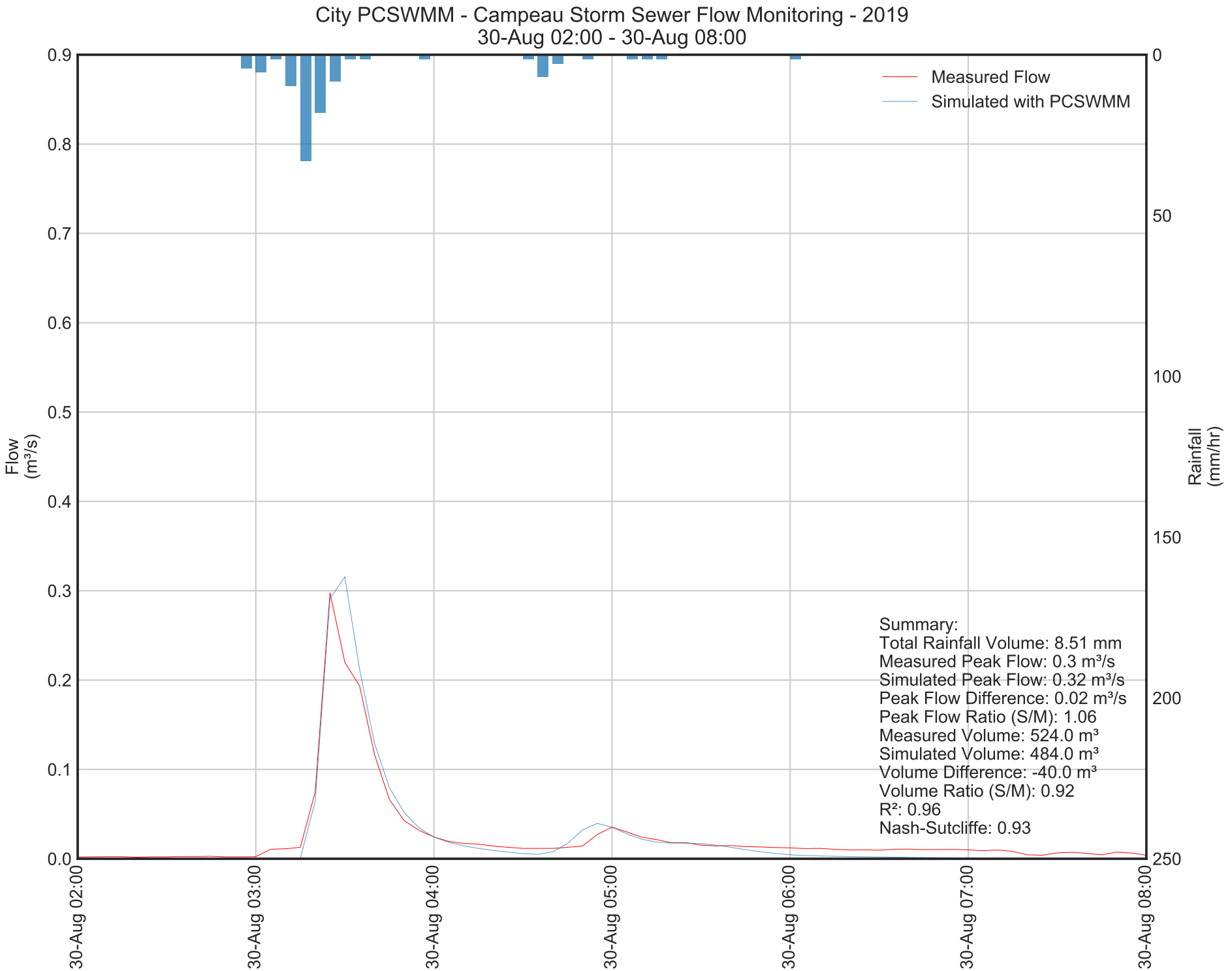

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
08-Aug 14:00 - 08-Aug 20:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
08-Aug 14:00
08-Aug 15:00
08-Aug 16:00
08-Aug 17:00
08-Aug 18:00
08-Aug 19:00
08-Aug 20:00
Summary:
Total Rainfall Volume: 8.28 mm
Measured Peak Flow: 0.4 m³/s
Simulated Peak Flow: 0.42 m³/s
Peak Flow Difference: 0.02 m³/s
Peak Flow Ratio (S/M): 1.05
Measured Volume: 397.0 m³
Simulated Volume: 502.0 m³
Volume Difference: 105.0 m³
Volume Ratio (S/M): 1.26
R²: 0.7
Nash-Sutcliffe: 0.6

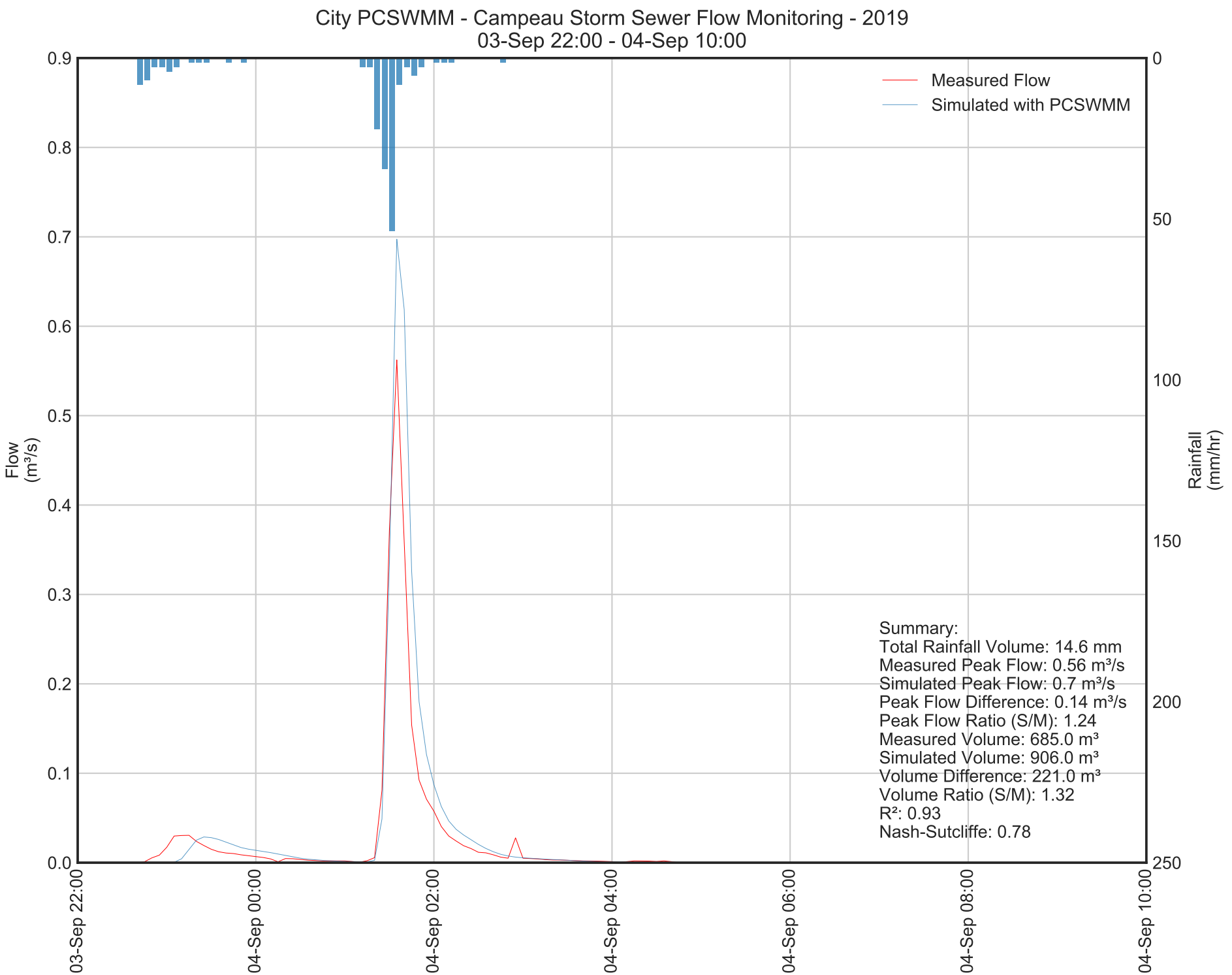

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
09-Aug 12:00 - 09-Aug 18:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
09-Aug 12:00
09-Aug 13:00
09-Aug 14:00
09-Aug 15:00
09-Aug 16:00
09-Aug 17:00
09-Aug 18:00
Summary:
Total Rainfall Volume: 5.98 mm
Measured Peak Flow: 0.25 m³/s
Simulated Peak Flow: 0.28 m³/s
Peak Flow Difference: 0.03 m³/s
Peak Flow Ratio (S/M): 1.13
Measured Volume: 297.0 m³
Simulated Volume: 338.0 m³
Volume Difference: 40.0 m³
Volume Ratio (S/M): 1.14
R²: 0.4
Nash-Sutcliffe: 0.15

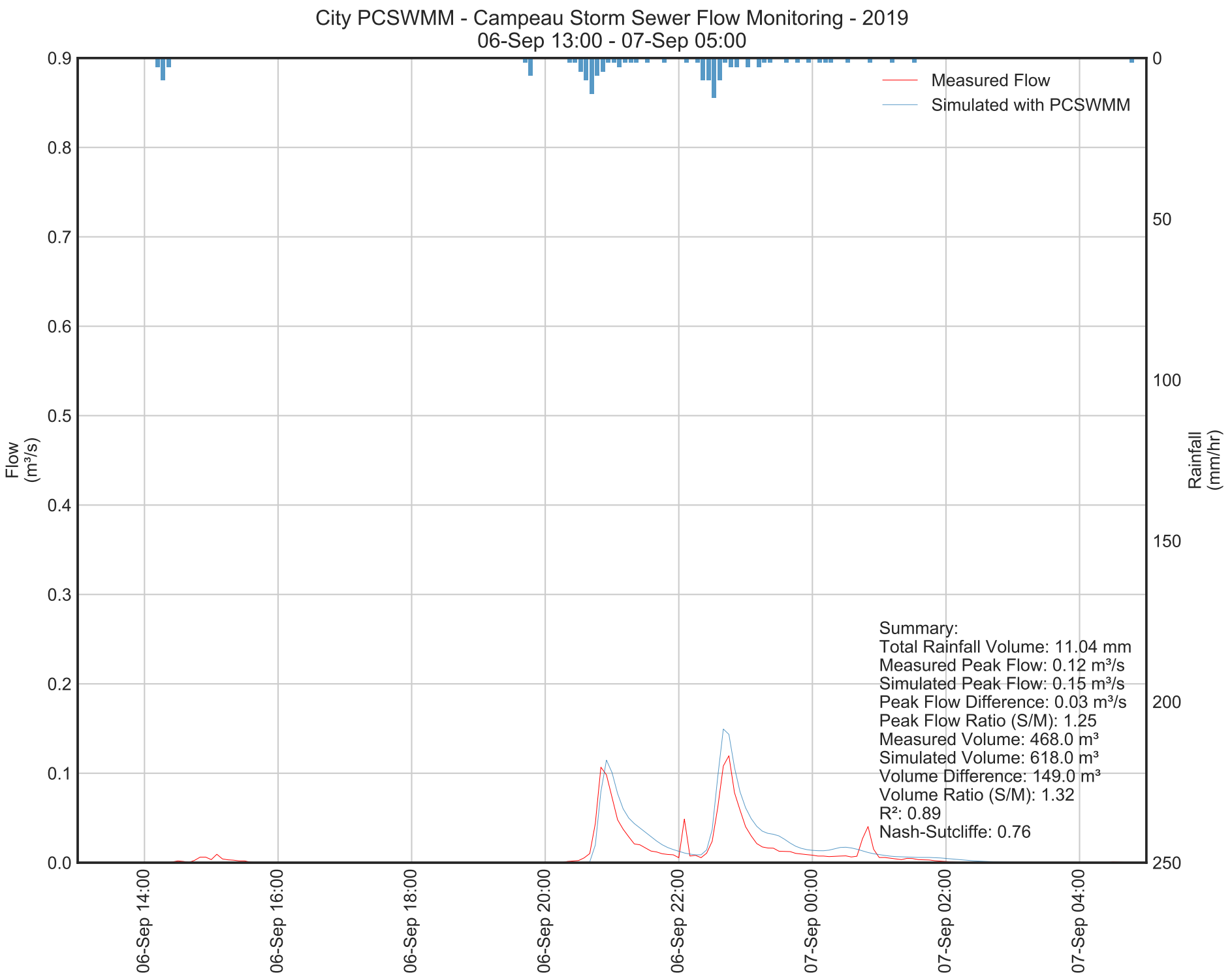

City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
12-Aug 18:00 - 13-Aug 00:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
12-Aug 18:00
12-Aug 19:00
12-Aug 20:00
12-Aug 21:00
12-Aug 22:00
12-Aug 23:00
13-Aug 00:00
Summary:
Total Rainfall Volume: 5.52 mm
Measured Peak Flow: 0.19 m³/s
Simulated Peak Flow: 0.11 m³/s
Peak Flow Difference: -0.08 m³/s
Peak Flow Ratio (S/M): 0.56
Measured Volume: 252.0 m³
Simulated Volume: 266.0 m³
Volume Difference: 14.0 m³
Volume Ratio (S/M): 1.05
R²: 0.06
Nash-Sutcliffe: -0.2


City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
17-Aug 02:00 - 17-Aug 08:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
17-Aug 02:00
17-Aug 03:00
17-Aug 04:00
17-Aug 05:00
17-Aug 06:00
17-Aug 07:00
17-Aug 08:00
Summary:
Total Rainfall Volume: 8.51 mm
Measured Peak Flow: 0.28 m³/s
Simulated Peak Flow: 0.48 m³/s
Peak Flow Difference: 0.2 m³/s
Peak Flow Ratio (S/M): 1.71
Measured Volume: 252.0 m³
Simulated Volume: 490.0 m³
Volume Difference: 239.0 m³
Volume Ratio (S/M): 1.95
R²: 0.05
Nash-Sutcliffe: -3.25


City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
28-Aug 02:00 - 28-Aug 14:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
28-Aug 02:00
28-Aug 04:00
28-Aug 06:00
28-Aug 08:00
28-Aug 10:00
28-Aug 12:00
28-Aug 14:00
Summary:
Total Rainfall Volume: 11.5 mm
Measured Peak Flow: 0.17 m³/s
Simulated Peak Flow: 0.26 m³/s
Peak Flow Difference: 0.09 m³/s
Peak Flow Ratio (S/M): 1.51
Measured Volume: 685.0 m³
Simulated Volume: 666.0 m³
Volume Difference: -19.0 m³
Volume Ratio (S/M): 0.97
R²: 0.93
Nash-Sutcliffe: 0.56


City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
30-Aug 02:00 - 30-Aug 08:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
30-Aug 02:00
30-Aug 03:00
30-Aug 04:00
30-Aug 05:00
30-Aug 06:00
30-Aug 07:00
30-Aug 08:00
Summary:
Total Rainfall Volume: 8.51 mm
Measured Peak Flow: 0.3 m³/s
Simulated Peak Flow: 0.32 m³/s
Peak Flow Difference: 0.02 m³/s
Peak Flow Ratio (S/M): 1.06
Measured Volume: 524.0 m³
Simulated Volume: 484.0 m³
Volume Difference: -40.0 m³
Volume Ratio (S/M): 0.92
R²: 0.96
Nash-Sutcliffe: 0.93


City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
03-Sep 22:00 - 04-Sep 10:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
03-Sep 22:00
04-Sep 00:00
04-Sep 02:00
04-Sep 04:00
04-Sep 06:00
04-Sep 08:00
04-Sep 10:00
Summary:
Total Rainfall Volume: 14.6 mm
Measured Peak Flow: 0.56 m³/s
Simulated Peak Flow: 0.7 m³/s
Peak Flow Difference: 0.14 m³/s
Peak Flow Ratio (S/M): 1.24
Measured Volume: 685.0 m³
Simulated Volume: 906.0 m³
Volume Difference: 221.0 m³
Volume Ratio (S/M): 1.32
R²: 0.93
Nash-Sutcliffe: 0.78


City PCSWMM - Campeau Storm Sewer Flow Monitoring - 2019
06-Sep 13:00 - 07-Sep 05:00
Measured Flow
Simulated with PCSWMM
Flow (m³/s)
Rainfall (mm/hr)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
06-Sep 14:00
06-Sep 16:00
06-Sep 18:00
06-Sep 20:00
06-Sep 22:00
07-Sep 00:00
07-Sep 02:00
07-Sep 04:00
Summary:
Total Rainfall Volume: 11.04 mm
Measured Peak Flow: 0.12 m³/s
Simulated Peak Flow: 0.15 m³/s
Peak Flow Difference: 0.03 m³/s
Peak Flow Ratio (S/M): 1.25
Measured Volume: 468.0 m³
Simulated Volume: 618.0 m³
Volume Difference: 149.0 m³
Volume Ratio (S/M): 1.32
R²: 0.89
Nash-Sutcliffe: 0.76

J.F. Sabourin and Associates Inc.
52 Springbrook Drive,
Ottawa, ON K2S 1B9
T 613-836-3884 F 613-836-0332

jfsa.com

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Paris. ON
Gatineau. QC
Montréal. QC
Québec. QC

Attachment B

Proposed Conditions Model Overview

Legend

Kinematic Model Subcatchments

J.F. Sabourin and Associates Inc.
WATER RESOURCES AND ENVIRONMENTAL CONSULTANTS
52 Springbrook Drive
Ottawa, ON, K2S 1B9
(613) 836-3884
www.jfsa.com

david schaeffer engineering ltd

SCALE : 1:10,000

0 250 500 750 1,000 m

PROJECT :

7000 Campeau Drive

TITLE :

Figure B-1: Kinematic Model Subcatchments

PROJECT	1581-17
DRAWN:	JB
DATE:	May 2020

Legend

Dynamic Model Subcatchments

J.F. Sabourin and Associates Inc.
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(613) 836-3884
www.jfsa.com

david schaeffer engineering ltd

SCALE : 1:10,000

0 250 500 750 1,000 m

PROJECT :

7000 Campeau Drive

TITLE :

Figure B-2: Dynamic Model Subcatchments

PROJECT	1581-17
DRAWN:	JB
DATE:	May 2020

Legend

SWM Pond

Major System
Low Point
High Point

Major

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david schaeffer engineering ltd

SCALE : 1:7,500

0 100 200 300 400 m

PROJECT :

7000 Campeau Drive

TITLE :

Figure B-3: Major System Overview

PROJECT	1581-17
DRAWN:	JB
DATE:	May 2020

Legend

- Proposed Minor System
- Existing Minor System
- Proposed SWM Ponds
- Proposed MH
- Existing MH
- Connection to Existing

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52 Springbrook Drive
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(613) 836-3884
www.jfsa.com

DSEL
david schaeffer engineering ltd

SCALE : 1:7,500

0 100 200 300 400 m

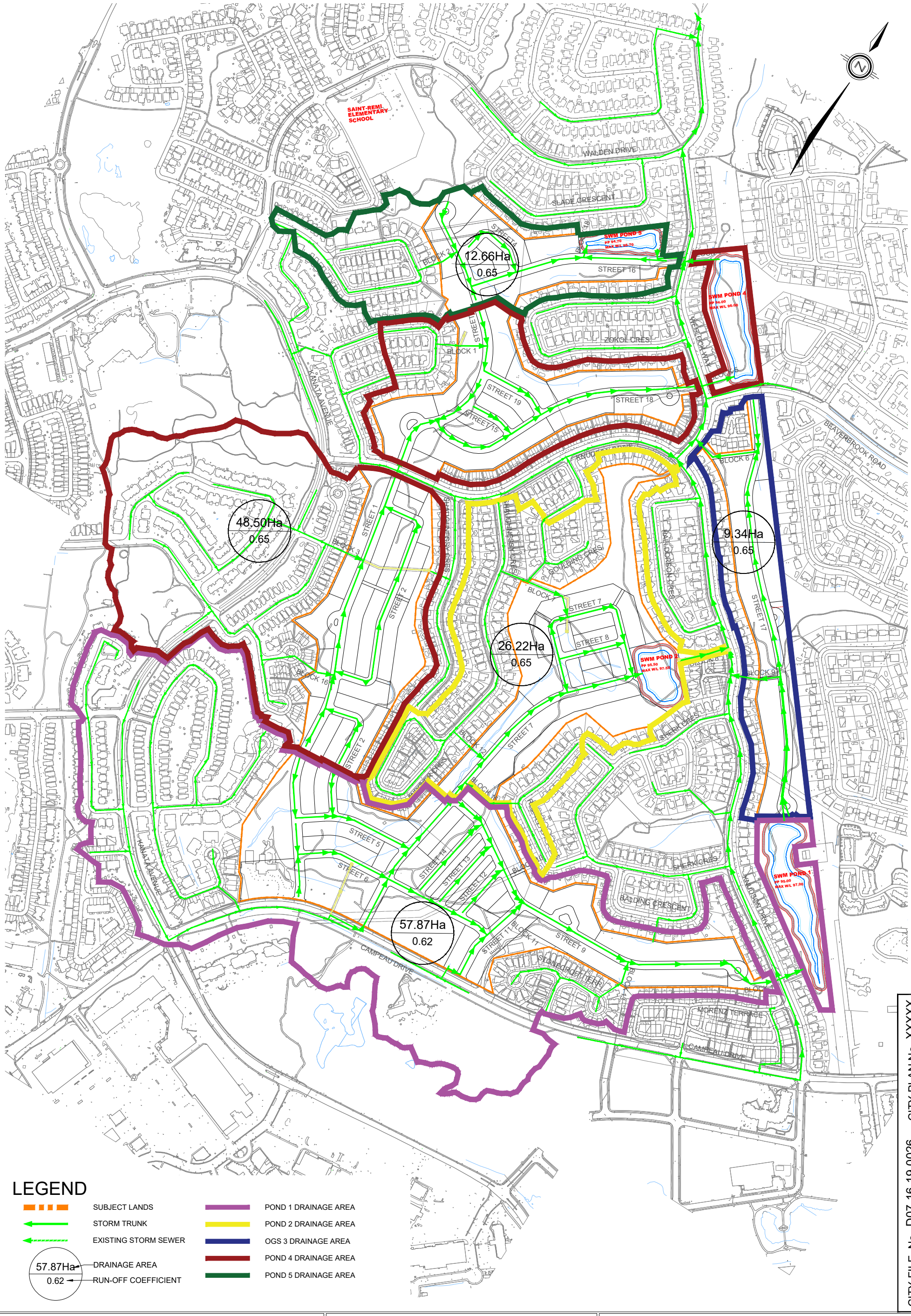
PROJECT :

7000 Campeau Drive

TITLE :

Figure B-4: Minor System Overview

PROJECT	1581-17
DRAWN:	JB
DATE:	May 2020



LEGEND

- SUBJECT LANDS
- STORM TRUNK
- EXISTING STORM SEWER
- 57.87Ha / 0.62 — DRAINAGE AREA / RUN-OFF COEFFICIENT
- POND 1 DRAINAGE AREA
- POND 2 DRAINAGE AREA
- OGS 3 DRAINAGE AREA
- POND 4 DRAINAGE AREA
- POND 5 DRAINAGE AREA

CITY FILE No. D07-16-19-0026 CITY PLAN No. XXXXX

david schaeffer engineering ltd

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www.DSEL.ca

7000 CAMPEAU DRIVE

CITY OF OTTAWA

STORM DRAINAGE FIGURE

SCALE:	1:7000	PROJECT No.:	1061
DATE:	MAY 2020	FIGURE:	B5

Table B-1: Stage-Storage-Outflow Curve for SWM Facility 1 (Free Outfall Conditions)

			Quantity Control 1		Quantity Control 2		Emergency Overflow			
			Vertical Orifice		Vertical Orifice		Broad Crested Weir			
			Dia (m)	0.153	Width (m)	0.350	L (m)	5.000		
					Height (m)	0.100				
			Area (m^2)	0.019	Area (m^2)	0.035				
			Invert (m)	95.000	Invert (m)	95.70	C_w	1.800		
			C_o	0.62	C_o	0.62	Invert (m)	97.30		
			Q @ D	0.014	C_w	1.800	n contr.	0		
Elevation	Depth	Active Sto.	Head	Outflow	Head	Outflow	Head	Outflow	Outflow	Storage
(m)	(m)	(m^3)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m^3/s)	(ha·m)
95.00	1.50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
95.10	1.60	985	0.100	0.009	0.000	0.000	0.000	0.000	0.009	0.099
95.20	1.70	2,001	0.200	0.018	0.000	0.000	0.000	0.000	0.018	0.200
95.30	1.80	3,047	0.300	0.024	0.000	0.000	0.000	0.000	0.024	0.305
95.40	1.90	4,125	0.400	0.029	0.000	0.000	0.000	0.000	0.029	0.412
95.50	2.00	5,233	0.500	0.033	0.000	0.000	0.000	0.000	0.033	0.523
95.60	2.10	6,372	0.600	0.037	0.000	0.000	0.000	0.000	0.037	0.637
95.70	2.20	7,542	0.700	0.040	0.000	0.000	0.000	0.000	0.040	0.754
95.80	2.30	8,742	0.800	0.043	0.100	0.019	0.000	0.000	0.062	0.874
95.90	2.40	9,974	0.900	0.046	0.200	0.037	0.000	0.000	0.083	0.997
96.00	2.50	11,236	1.000	0.049	0.300	0.048	0.000	0.000	0.097	1.124
96.10	2.60	12,529	1.100	0.051	0.400	0.057	0.000	0.000	0.108	1.253
96.20	2.70	13,853	1.200	0.054	0.500	0.064	0.000	0.000	0.118	1.385
96.30	2.80	15,207	1.300	0.056	0.600	0.071	0.000	0.000	0.127	1.521
96.40	2.90	16,593	1.400	0.058	0.700	0.077	0.000	0.000	0.136	1.659
96.50	3.00	18,009	1.500	0.061	0.800	0.083	0.000	0.000	0.144	1.801
96.60	3.10	19,456	1.600	0.063	0.900	0.089	0.000	0.000	0.151	1.946
96.70	3.20	20,934	1.700	0.065	1.000	0.094	0.000	0.000	0.158	2.093
96.80	3.30	22,442	1.800	0.067	1.100	0.098	0.000	0.000	0.165	2.244
96.90	3.40	23,982	1.900	0.069	1.200	0.103	0.000	0.000	0.172	2.398
97.00	3.50	25,552	2.000	0.070	1.300	0.107	0.000	0.000	0.178	2.555
97.10	3.60	27,153	2.100	0.072	1.400	0.112	0.000	0.000	0.184	2.715
97.20	3.70	28,785	2.200	0.074	1.500	0.116	0.000	0.000	0.190	2.878
97.30	3.80	30,447	2.300	0.076	1.600	0.120	0.000	0.000	0.195	3.045
97.40	3.90	32,141	2.400	0.077	1.700	0.123	0.100	0.285	0.486	3.214
97.50	4.00	33,865	2.500	0.079	1.800	0.127	0.200	0.805	1.011	3.386
97.60	4.10	35,620	2.600	0.081	1.900	0.131	0.300	1.479	1.690	3.562
97.70	4.20	37,406	2.700	0.082	2.000	0.134	0.400	2.277	2.493	3.741
97.80	4.30	39,222	2.800	0.084	2.100	0.138	0.500	3.182	3.403	3.922
97.90	4.40	41,070	2.900	0.085	2.200	0.141	0.600	4.183	4.409	4.107
98.00	4.50	42,948	3.000	0.087	2.300	0.144	0.700	5.271	5.502	4.295

Table B-2: Stage-Storage-Outflow Curve for SWM Facility 2 (Free Outfall Conditions)

			Quantity Control 1		Quantity Control 2		Emergency Overflow			
			Vertical Orifice		Vertical Orifice		Broad Crested Weir			
			Dia (m)	0.095	Width (m)	0.650	L (m)	5.000		
					Height (m)	0.200				
			Area (m^2)	0.007	Area (m^2)	0.130				
			Invert (m)	95.500	Invert (m)	96.300	C_w	1.800		
			C_o	0.62	C_o	0.62	Invert (m)	97.75		
			Q @ D	0.004	C_w	1.800	n contr.	0		
Elevation	Depth	Active Sto.	Head	Outflow	Head	Outflow	Head	Outflow	Outflow	Storage
(m)	(m)	(m^3)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m^3/s)	(ha·m)
95.50	1.50	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
95.60	1.60	543	0.100	0.004	0.000	0.000	0.000	0.000	0.004	0.054
95.70	1.70	1,099	0.200	0.008	0.000	0.000	0.000	0.000	0.008	0.110
95.80	1.80	1,668	0.300	0.010	0.000	0.000	0.000	0.000	0.010	0.167
95.90	1.90	2,249	0.400	0.011	0.000	0.000	0.000	0.000	0.011	0.225
96.00	2.00	2,844	0.500	0.013	0.000	0.000	0.000	0.000	0.013	0.284
96.10	2.10	3,452	0.600	0.014	0.000	0.000	0.000	0.000	0.014	0.345
96.20	2.20	4,072	0.700	0.016	0.000	0.000	0.000	0.000	0.016	0.407
96.30	2.30	4,705	0.800	0.017	0.000	0.000	0.000	0.000	0.017	0.471
96.40	2.40	5,351	0.900	0.018	0.100	0.036	0.000	0.000	0.054	0.535
96.50	2.50	6,010	1.000	0.019	0.200	0.098	0.000	0.000	0.117	0.601
96.60	2.60	6,682	1.100	0.020	0.300	0.160	0.000	0.000	0.179	0.668
96.70	2.70	7,367	1.200	0.021	0.400	0.196	0.000	0.000	0.216	0.737
96.80	2.80	8,065	1.300	0.022	0.500	0.226	0.000	0.000	0.247	0.806
96.90	2.90	8,775	1.400	0.022	0.600	0.252	0.000	0.000	0.275	0.878
97.00	3.00	9,499	1.500	0.023	0.700	0.277	0.000	0.000	0.300	0.950
97.10	3.10	10,235	1.600	0.024	0.800	0.299	0.000	0.000	0.323	1.023
97.20	3.20	10,984	1.700	0.025	0.900	0.319	0.000	0.000	0.344	1.098
97.30	3.30	11,746	1.800	0.026	1.000	0.339	0.000	0.000	0.364	1.175
97.40	3.40	12,521	1.900	0.026	1.100	0.357	0.000	0.000	0.383	1.252
97.50	3.50	13,309	2.000	0.027	1.200	0.374	0.000	0.000	0.401	1.331
97.60	3.60	14,110	2.100	0.028	1.300	0.391	0.000	0.000	0.419	1.411
97.70	3.70	14,923	2.200	0.028	1.400	0.407	0.000	0.000	0.435	1.492
97.80	3.80	15,750	2.300	0.029	1.500	0.422	0.050	0.101	0.552	1.575
97.90	3.90	16,589	2.400	0.030	1.600	0.437	0.150	0.523	0.990	1.659
98.00	4.00	17,442	2.500	0.030	1.700	0.452	0.250	1.125	1.607	1.744
98.10	4.10	18,307	2.600	0.031	1.800	0.465	0.350	1.864	2.360	1.831
98.20	4.20	19,185	2.700	0.031	1.900	0.479	0.450	2.717	3.227	1.918
98.30	4.30	20,076	2.800	0.032	2.000	0.492	0.550	3.671	4.195	2.008
98.40	4.40	20,979	2.900	0.033	2.100	0.505	0.650	4.716	5.254	2.098
98.50	4.50	21,896	3.000	0.033	2.200	0.517	0.750	5.846	6.396	2.190

Table B-3: Stage-Storage-Outflow Curve for SWM Facility 4 (Free Outfall Conditions)

			Quantity Control 1		Quantity Control 2		Emergency Overflow			
			Vertical Orifice		Vertical Orifice		Broad Crested Weir			
			Dia (m)	0.141	Width (m)	0.350	L (m)	5.000		
					Height (m)	0.100				
			Area (m^2)	0.016	Area (m^2)	0.096				
			Invert (m)	94.000	Invert (m)	94.50	C_w	1.800		
			C_o	0.62	C_o	0.62	Invert (m)	96.30		
			Q @ D	0.011	C_w	1.800	n contr.	0		
Elevation	Depth	Active Sto.	Head	Outflow	Head	Outflow	Head	Outflow	Outflow	Storage
(m)	(m)	(m^3)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m^3/s)	(ha·m)
94.00	1.50	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
94.10	1.60	1083.95	0.100	0.008	0.000	0.000	0.000	0.000	0.008	0.108
94.20	1.70	2191.90	0.200	0.015	0.000	0.000	0.000	0.000	0.015	0.219
94.30	1.80	3323.85	0.300	0.020	0.000	0.000	0.000	0.000	0.020	0.332
94.40	1.90	4479.80	0.400	0.024	0.000	0.000	0.000	0.000	0.024	0.448
94.50	2.00	5659.76	0.500	0.028	0.000	0.000	0.000	0.000	0.028	0.566
94.60	2.10	6863.72	0.600	0.031	0.100	0.019	0.000	0.000	0.050	0.686
94.70	2.20	8091.69	0.700	0.034	0.200	0.102	0.000	0.000	0.136	0.809
94.80	2.30	9343.66	0.800	0.036	0.300	0.132	0.000	0.000	0.169	0.934
94.90	2.40	10619.63	0.900	0.039	0.400	0.156	0.000	0.000	0.195	1.062
95.00	2.50	11919.60	1.000	0.041	0.500	0.177	0.000	0.000	0.218	1.192
95.10	2.60	13243.58	1.100	0.043	0.600	0.196	0.000	0.000	0.239	1.324
95.20	2.70	14591.56	1.200	0.045	0.700	0.213	0.000	0.000	0.258	1.459
95.30	2.80	15963.54	1.300	0.047	0.800	0.229	0.000	0.000	0.276	1.596
95.40	2.90	17359.52	1.400	0.049	0.900	0.244	0.000	0.000	0.293	1.736
95.50	3.00	18779.51	1.500	0.051	1.000	0.258	0.000	0.000	0.308	1.878
95.60	3.10	20223.50	1.600	0.053	1.100	0.271	0.000	0.000	0.323	2.022
95.70	3.20	21691.50	1.700	0.054	1.200	0.283	0.000	0.000	0.338	2.169
95.80	3.30	23183.50	1.800	0.056	1.300	0.295	0.000	0.000	0.351	2.318
95.90	3.40	24699.50	1.900	0.058	1.400	0.307	0.000	0.000	0.365	2.470
96.00	3.50	26239.50	2.000	0.059	1.500	0.318	0.000	0.000	0.377	2.624
96.10	3.60	27803.49	2.100	0.061	1.600	0.329	0.000	0.000	0.390	2.780
96.20	3.70	29391.49	2.200	0.062	1.700	0.339	0.000	0.000	0.402	2.939
96.30	3.80	31003.48	2.300	0.064	1.800	0.350	0.000	0.000	0.413	3.100
96.40	3.90	32639.48	2.400	0.065	1.900	0.359	0.100	0.285	0.709	3.264
96.50	4.00	34299.49	2.500	0.066	2.000	0.369	0.200	0.805	1.240	3.430
96.60	4.10	35983.50	2.600	0.068	2.100	0.378	0.300	1.479	1.925	3.598
96.70	4.20	37691.51	2.700	0.069	2.200	0.387	0.400	2.277	2.733	3.769
96.80	4.30	39423.52	2.800	0.070	2.300	0.396	0.500	3.182	3.649	3.942
96.90	4.40	41179.54	2.900	0.072	2.400	0.405	0.600	4.183	4.660	4.118
97.00	4.50	42959.56	3.000	0.073	2.500	0.414	0.700	5.271	5.757	4.296

Table B-4: Stage-Storage-Outflow Curve for SWM Facility 5 (Free Outfall Conditions)

			Quantity Control 1		Quantity Control 2		Emergency Overflow			
			Vertical Orifice		Vertical Orifice		Broad Crested Weir			
			Dia (m)	0.065	Width (m)	0.425	L (m)	5.000		
					Height (m)	0.100				
			Area (m^2)	0.003	Area (m^2)	0.043				
			Invert (m)	94.700	Invert (m)	95.20	C_w	1.800		
			C_o	0.62	C_o	0.62	Invert (m)	96.73		
			Q @ D	0.002	C_w	1.800	n contr.	0		
Elevation	Depth	Active Sto.	Head	Outflow	Head	Outflow	Head	Outflow	Outflow	Storage
(m)	(m)	(m^3)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m^3/s)	(ha·m)
94.70	1.50	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
94.80	1.60	246.72	0.100	0.002	0.000	0.000	0.000	0.000	0.002	0.025
94.90	1.70	506.86	0.200	0.004	0.000	0.000	0.000	0.000	0.004	0.051
95.00	1.80	780.44	0.300	0.005	0.000	0.000	0.000	0.000	0.005	0.078
95.10	1.90	1067.44	0.400	0.005	0.000	0.000	0.000	0.000	0.005	0.107
95.20	2.00	1367.88	0.500	0.006	0.000	0.000	0.000	0.000	0.006	0.137
95.30	2.10	1681.74	0.600	0.007	0.100	0.023	0.000	0.000	0.030	0.168
95.40	2.20	2009.04	0.700	0.007	0.200	0.045	0.000	0.000	0.053	0.201
95.50	2.30	2349.76	0.800	0.008	0.300	0.058	0.000	0.000	0.066	0.235
95.60	2.40	2703.92	0.900	0.008	0.400	0.069	0.000	0.000	0.077	0.270
95.70	2.50	3071.50	1.000	0.009	0.500	0.078	0.000	0.000	0.087	0.307
95.80	2.60	3452.52	1.100	0.009	0.600	0.087	0.000	0.000	0.096	0.345
95.90	2.70	3846.96	1.200	0.010	0.700	0.094	0.000	0.000	0.104	0.385
96.00	2.80	4254.84	1.300	0.010	0.800	0.101	0.000	0.000	0.111	0.425
96.10	2.90	4676.14	1.400	0.011	0.900	0.108	0.000	0.000	0.118	0.468
96.20	3.00	5110.88	1.500	0.011	1.000	0.114	0.000	0.000	0.125	0.511
96.30	3.10	5559.04	1.600	0.011	1.100	0.120	0.000	0.000	0.131	0.556
96.40	3.20	6020.64	1.700	0.012	1.200	0.125	0.000	0.000	0.137	0.602
96.50	3.30	6495.66	1.800	0.012	1.300	0.130	0.000	0.000	0.142	0.650
96.60	3.40	6984.12	1.900	0.012	1.400	0.136	0.000	0.000	0.148	0.698
96.70	3.50	7486.00	2.000	0.013	1.500	0.141	0.000	0.000	0.153	0.749
96.80	3.60	8001.30	2.100	0.013	1.600	0.145	0.070	0.167	0.325	0.800
96.90	3.70	8530.03	2.200	0.013	1.700	0.150	0.170	0.631	0.794	0.853
97.00	3.80	9072.19	2.300	0.014	1.800	0.154	0.270	1.263	1.431	0.907
97.10	3.90	9627.78	2.400	0.014	1.900	0.159	0.370	2.026	2.198	0.963
97.20	4.00	10196.81	2.500	0.014	2.000	0.163	0.470	2.900	3.077	1.020
97.30	4.10	10779.26	2.600	0.014	2.100	0.167	0.570	3.873	4.055	1.078
97.40	4.20	11375.14	2.700	0.015	2.200	0.171	0.670	4.936	5.122	1.138
97.50	4.30	11984.45	2.800	0.015	2.300	0.175	0.770	6.081	6.271	1.198
97.60	4.40	12607.20	2.900	0.015	2.400	0.179	0.870	7.303	7.497	1.261
97.70	4.50	13243.37	3.000	0.015	2.500	0.183	0.970	8.598	8.796	1.324

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name:	7000 Campeau Drive	**Engineer:**	**DSEL**
Location:	Kanata, ON	**Contact:**	S. Merrick, P.Eng.
OGS #:	1	**Report Date:**	15-May-20

Area	54.99	ha	**Rainfall Station #**	215	
Weighted C	0.62		**Particle Size Distribution**	FINE	
CDS Model	5668	(TWIN)	**CDS Treatment Capacity**	1076	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.2%	9.2%	47.4	47.4	4.4	97.6	8.9
1.0	10.6%	19.8%	94.8	94.8	8.8	96.3	10.2
1.5	9.9%	29.7%	142.2	142.2	13.2	95.1	9.4
2.0	8.4%	38.1%	189.6	189.6	17.6	93.8	7.9
2.5	7.7%	45.8%	237.0	237.0	22.0	92.5	7.1
3.0	5.9%	51.7%	284.3	284.3	26.4	91.3	5.4
3.5	4.4%	56.1%	331.7	331.7	30.8	90.0	3.9
4.0	4.7%	60.7%	379.1	379.1	35.2	88.8	4.1
4.5	3.3%	64.0%	426.5	426.5	39.6	87.5	2.9
5.0	3.0%	67.1%	473.9	473.9	44.0	86.2	2.6
6.0	5.4%	72.4%	568.7	568.7	52.8	83.7	4.5
7.0	4.4%	76.8%	663.5	663.5	61.7	81.2	3.5
8.0	3.5%	80.3%	758.2	758.2	70.5	78.7	2.8
9.0	2.8%	83.2%	853.0	853.0	79.3	76.1	2.1
10.0	2.2%	85.3%	947.8	947.8	88.1	73.6	1.6
15.0	7.0%	92.3%	1421.7	1076.2	100.0	53.1	3.7
20.0	4.5%	96.9%	1895.6	1076.2	100.0	39.8	1.8
25.0	1.4%	98.3%	2369.5	1076.2	100.0	31.9	0.5
30.0	0.7%	99.0%	2843.4	1076.2	100.0	26.6	0.2
35.0	0.5%	99.5%	3317.3	1076.2	100.0	22.8	0.1
40.0	0.5%	100.0%	3791.2	1076.2	100.0	19.9	0.1
45.0	0.0%	100.0%	4265.1	1076.2	100.0	17.7	0.0
50.0	0.0%	100.0%	4739.0	1076.2	100.0	15.9	0.0
							83.5

Removal Efficiency Adjustment[2] = 0.0%

Predicted Net Annual Load Removal Efficiency = 83.5%

Predicted % Annual Rainfall Treated = 94.4%

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

3 - CDS Efficiency based on testing conducted at the University of Central Florida

4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name:	7000 Campeau Drive	**Engineer:**	**DSEL**
Location:	Kanata, ON	**Contact:**	S. Merrick, P.Eng.
OGS #:	2	**Report Date:**	15-May-20

Area	24.96	ha	**Rainfall Station #**	215	
Weighted C	0.65		**Particle Size Distribution**	FINE	
CDS Model	5678		**CDS Treatment Capacity**	708	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.2%	9.2%	22.6	22.6	3.2	97.9	9.0
1.0	10.6%	19.8%	45.1	45.1	6.4	97.0	10.3
1.5	9.9%	29.7%	67.7	67.7	9.6	96.1	9.5
2.0	8.4%	38.1%	90.2	90.2	12.7	95.2	8.0
2.5	7.7%	45.8%	112.8	112.8	15.9	94.3	7.2
3.0	5.9%	51.7%	135.3	135.3	19.1	93.4	5.5
3.5	4.4%	56.1%	157.9	157.9	22.3	92.5	4.0
4.0	4.7%	60.7%	180.4	180.4	25.5	91.6	4.3
4.5	3.3%	64.0%	203.0	203.0	28.7	90.6	3.0
5.0	3.0%	67.1%	225.5	225.5	31.9	89.7	2.7
6.0	5.4%	72.4%	270.6	270.6	38.2	87.9	4.7
7.0	4.4%	76.8%	315.7	315.7	44.6	86.1	3.7
8.0	3.5%	80.3%	360.8	360.8	51.0	84.2	3.0
9.0	2.8%	83.2%	405.9	405.9	57.3	82.4	2.3
10.0	2.2%	85.3%	451.0	451.0	63.7	80.6	1.8
15.0	7.0%	92.3%	676.5	676.5	95.6	71.5	5.0
20.0	4.5%	96.9%	902.1	708.0	100.0	55.1	2.5
25.0	1.4%	98.3%	1127.6	708.0	100.0	44.1	0.6
30.0	0.7%	99.0%	1353.1	708.0	100.0	36.7	0.2
35.0	0.5%	99.5%	1578.6	708.0	100.0	31.5	0.1
40.0	0.5%	100.0%	1804.1	708.0	100.0	27.5	0.2
45.0	0.0%	100.0%	2029.6	708.0	100.0	24.5	0.0
50.0	0.0%	100.0%	2255.1	708.0	100.0	22.0	0.0
							87.8
						Removal Efficiency Adjustment[2] =	6.5%
						Predicted Net Annual Load Removal Efficiency =	**81.3%**
						Predicted % Annual Rainfall Treated =	**97.6%**

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
3 - CDS Efficiency based on testing conducted at the University of Central Florida
4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name:	7000 Campeau Drive	**Engineer:**	**DSEL**
Location:	Kanata, ON	**Contact:**	S. Merrick, P.Eng.
OGS #:	3	**Report Date:**	15-May-20

Area	9.34	ha	**Rainfall Station #**	215	
Weighted C	0.65		**Particle Size Distribution**	FINE	
CDS Model	5640		**CDS Treatment Capacity**	255	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.2%	9.2%	8.4	8.4	3.3	97.9	9.0
1.0	10.6%	19.8%	16.9	16.9	6.6	97.0	10.3
1.5	9.9%	29.7%	25.3	25.3	9.9	96.0	9.5
2.0	8.4%	38.1%	33.8	33.8	13.2	95.1	8.0
2.5	7.7%	45.8%	42.2	42.2	16.6	94.1	7.2
3.0	5.9%	51.7%	50.6	50.6	19.9	93.2	5.5
3.5	4.4%	56.1%	59.1	59.1	23.2	92.2	4.0
4.0	4.7%	60.7%	67.5	67.5	26.5	91.3	4.3
4.5	3.3%	64.0%	75.9	75.9	29.8	90.3	3.0
5.0	3.0%	67.1%	84.4	84.4	33.1	89.4	2.7
6.0	5.4%	72.4%	101.3	101.3	39.7	87.5	4.7
7.0	4.4%	76.8%	118.1	118.1	46.4	85.6	3.7
8.0	3.5%	80.3%	135.0	135.0	53.0	83.7	3.0
9.0	2.8%	83.2%	151.9	151.9	59.6	81.8	2.3
10.0	2.2%	85.3%	168.8	168.8	66.2	79.9	1.7
15.0	7.0%	92.3%	253.2	253.2	99.3	70.4	4.9
20.0	4.5%	96.9%	337.5	254.9	100.0	53.0	2.4
25.0	1.4%	98.3%	421.9	254.9	100.0	42.4	0.6
30.0	0.7%	99.0%	506.3	254.9	100.0	35.3	0.2
35.0	0.5%	99.5%	590.7	254.9	100.0	30.3	0.1
40.0	0.5%	100.0%	675.1	254.9	100.0	26.5	0.1
45.0	0.0%	100.0%	759.5	254.9	100.0	23.6	0.0
50.0	0.0%	100.0%	843.9	254.9	100.0	21.2	0.0
							87.4

Removal Efficiency Adjustment[2] = 6.5%

Predicted Net Annual Load Removal Efficiency = 80.9%

Predicted % Annual Rainfall Treated = 97.4%

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

3 - CDS Efficiency based on testing conducted at the University of Central Florida

4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name:	7000 Campeau Drive	**Engineer:**	**DSEL**
Location:	Kanata, ON	**Contact:**	S. Merrick, P.Eng.
OGS #:	4	**Report Date:**	15-May-20

Area	55.46	ha	**Rainfall Station #**	215	
Weighted C	0.65		**Particle Size Distribution**	FINE	
CDS Model	5668	(TWIN)	**CDS Treatment Capacity**	1076	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.2%	9.2%	50.1	50.1	4.7	97.5	8.9
1.0	10.6%	19.8%	100.2	100.2	9.3	96.2	10.2
1.5	9.9%	29.7%	150.3	150.3	14.0	94.9	9.4
2.0	8.4%	38.1%	200.4	200.4	18.6	93.5	7.8
2.5	7.7%	45.8%	250.5	250.5	23.3	92.2	7.1
3.0	5.9%	51.7%	300.6	300.6	27.9	90.8	5.4
3.5	4.4%	56.1%	350.8	350.8	32.6	89.5	3.9
4.0	4.7%	60.7%	400.9	400.9	37.2	88.2	4.1
4.5	3.3%	64.0%	451.0	451.0	41.9	86.8	2.9
5.0	3.0%	67.1%	501.1	501.1	46.6	85.5	2.6
6.0	5.4%	72.4%	601.3	601.3	55.9	82.8	4.5
7.0	4.4%	76.8%	701.5	701.5	65.2	80.2	3.5
8.0	3.5%	80.3%	801.7	801.7	74.5	77.5	2.7
9.0	2.8%	83.2%	901.9	901.9	83.8	74.8	2.1
10.0	2.2%	85.3%	1002.2	1002.2	93.1	72.2	1.6
15.0	7.0%	92.3%	1503.2	1076.2	100.0	50.3	3.5
20.0	4.5%	96.9%	2004.3	1076.2	100.0	37.7	1.7
25.0	1.4%	98.3%	2505.4	1076.2	100.0	30.2	0.4
30.0	0.7%	99.0%	3006.5	1076.2	100.0	25.1	0.2
35.0	0.5%	99.5%	3507.6	1076.2	100.0	21.5	0.1
40.0	0.5%	100.0%	4008.6	1076.2	100.0	18.8	0.1
45.0	0.0%	100.0%	4509.7	1076.2	100.0	16.8	0.0
50.0	0.0%	100.0%	5010.8	1076.2	100.0	15.1	0.0
							82.8

Removal Efficiency Adjustment[2] = 0.0%

Predicted Net Annual Load Removal Efficiency = 82.8%

Predicted % Annual Rainfall Treated = 93.9%

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

3 - CDS Efficiency based on testing conducted at the University of Central Florida

4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name:	7000 Campeau Drive	**Engineer:**	**DSEL**
Location:	Kanata, ON	**Contact:**	S. Merrick, P.Eng.
OGS #:	5	**Report Date:**	15-May-20

Area	11.83	ha	**Rainfall Station #**	215	
Weighted C	0.65		**Particle Size Distribution**	FINE	
CDS Model	5653		**CDS Treatment Capacity**	396	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.2%	9.2%	10.7	10.7	2.7	98.1	9.0
1.0	10.6%	19.8%	21.4	21.4	5.4	97.3	10.3
1.5	9.9%	29.7%	32.1	32.1	8.1	96.5	9.6
2.0	8.4%	38.1%	42.8	42.8	10.8	95.8	8.0
2.5	7.7%	45.8%	53.4	53.4	13.5	95.0	7.3
3.0	5.9%	51.7%	64.1	64.1	16.2	94.2	5.6
3.5	4.4%	56.1%	74.8	74.8	18.9	93.4	4.1
4.0	4.7%	60.7%	85.5	85.5	21.6	92.7	4.3
4.5	3.3%	64.0%	96.2	96.2	24.3	91.9	3.0
5.0	3.0%	67.1%	106.9	106.9	27.0	91.1	2.8
6.0	5.4%	72.4%	128.3	128.3	32.3	89.6	4.8
7.0	4.4%	76.8%	149.6	149.6	37.7	88.0	3.8
8.0	3.5%	80.3%	171.0	171.0	43.1	86.5	3.1
9.0	2.8%	83.2%	192.4	192.4	48.5	84.9	2.4
10.0	2.2%	85.3%	213.8	213.8	53.9	83.4	1.8
15.0	7.0%	92.3%	320.7	320.7	80.9	75.7	5.3
20.0	4.5%	96.9%	427.5	396.5	100.0	65.1	3.0
25.0	1.4%	98.3%	534.4	396.5	100.0	52.1	0.8
30.0	0.7%	99.0%	641.3	396.5	100.0	43.4	0.3
35.0	0.5%	99.5%	748.2	396.5	100.0	37.2	0.2
40.0	0.5%	100.0%	855.1	396.5	100.0	32.5	0.2
45.0	0.0%	100.0%	962.0	396.5	100.0	28.9	0.0
50.0	0.0%	100.0%	1068.8	396.5	100.0	26.0	0.0
							89.6

Removal Efficiency Adjustment[2] = 6.5%

Predicted Net Annual Load Removal Efficiency = 83.1%

Predicted % Annual Rainfall Treated = 98.5%

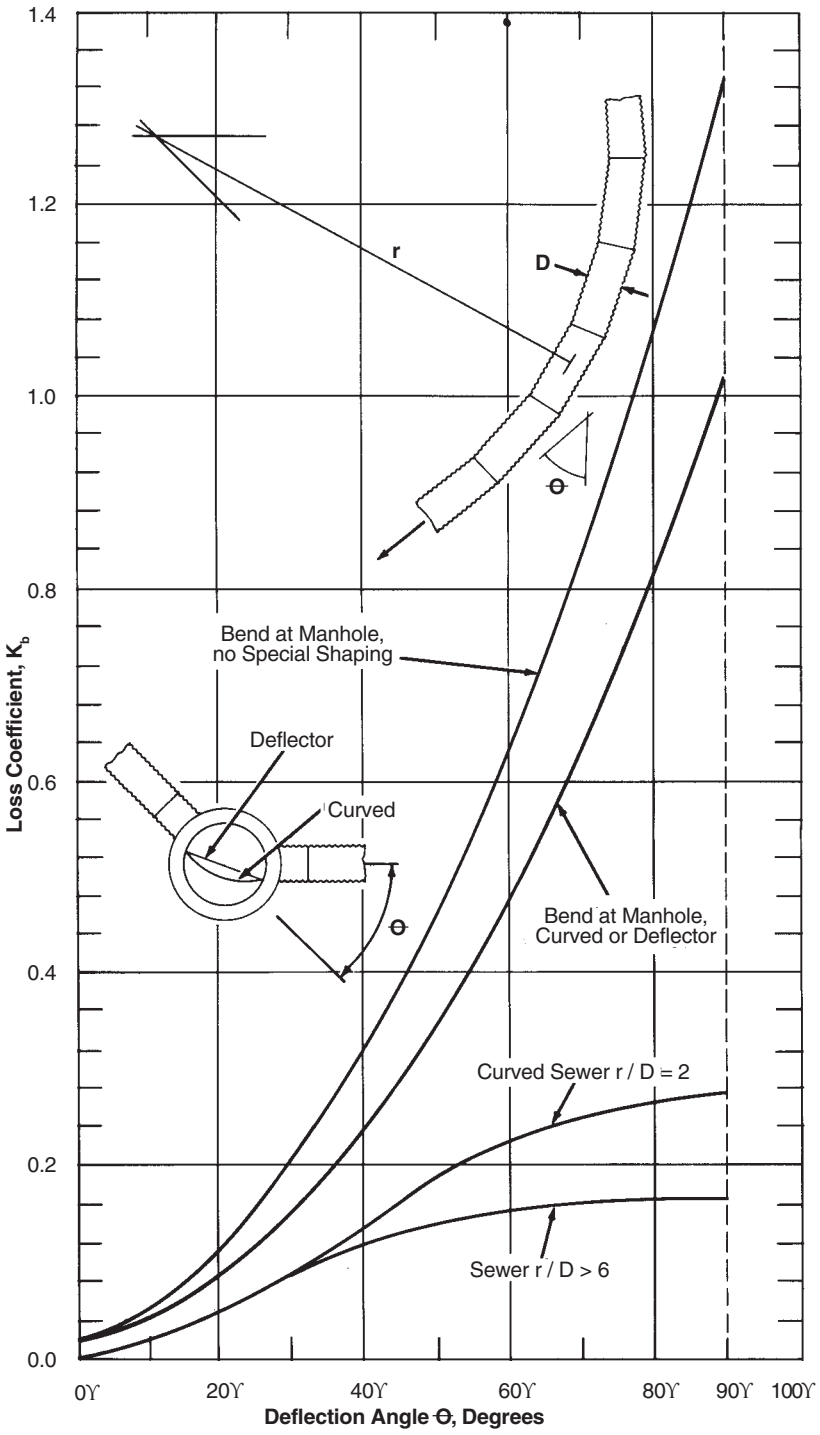
1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

3 - CDS Efficiency based on testing conducted at the University of Central Florida

4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

MANHOLE LOSS COEFFICIENT NOMOGRAPH AND TABLE



Angle	Exit Loss
0	0.02
5	0.035
10	0.055
15	0.08
20	0.11
25	0.16
30	0.21
35	0.26
40	0.32
45	0.39
50	0.47
55	0.54
60	0.635
65	0.73
70	0.84
75	0.95
80	1.07
85	1.19
90	1.33

Figure 4.13 Sewer bend loss coefficient[16]

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha) 2 YEAR				AREA (Ha) 5 YEAR				AREA (Ha) 10 YEAR				AREA (Ha) 100 YEAR				FLOW						SEWER DATA							
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	Conc. (min)	2 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)	100 Year (mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
BLOCK 17																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						104									
	5018	5019			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	104	675	675	CONC	1.00	19.0	840.6	2.35	0.13	0.12
To STREET 16, Pipe 5019 - 5020						0.00				0.00				0.00				0.00	10.13					104									
BLOCK 4																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						264									
	4053	4054			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	264	825	825	CONC	1.00	69.5	1435.4	2.69	0.43	0.18
To WESLOCK WAY, Pipe 4054 - 5020						0.00				0.00				0.00				0.00	10.43					264									
BLOCK 6																																
Contribution From STREET 17, Pipe 6011 - 6014						11.29				1.97				0.00				0.00	21.27													
Contribution From STREET 17, Pipe 6013 - 6014						0.61				0.42				0.00				0.00	12.05													
	6014	6015			0.00	11.91			0.00	2.39			0.00	0.00			0.00	0.00	21.27	50.08	67.59	79.08	115.36	758	975	975	CONC	0.20	14.0	1002.2	1.34	0.17	0.76
	6015	6016			0.00	11.91			0.00	2.39			0.00	0.00			0.00	0.00	21.44	49.82	67.24	78.67	114.76	754	975	975	CONC	0.20	77.0	1002.2	1.34	0.96	0.75
	6016	6017			0.00	11.91	0.39	0.25	0.27	2.66			0.00	0.00			0.00	0.00	22.40	48.47	65.39	76.50	111.58	751	975	975	CONC	0.20	48.5	1002.2	1.34	0.60	0.75
To WESLOCK WAY, Pipe 6017 - 212						11.91				2.66				0.00				0.00	23.00													
BLOCK 8																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						275									
	2022	2023			0.00	0.00	0.15	0.65	0.27	0.27			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	303	675	675	CONC	1.60	61.0	1063.3	2.97	0.34	0.29
	2023	6019			0.00	0.00			0.00	0.27			0.00	0.00			0.00	0.00	10.34	75.52	102.42	120.05	175.49	303	825	825	CONC	0.35	42.0	849.2	1.59	0.44	0.36
To KNUDSON DRIVE, Pipe 6019 - 154						0.00				0.27				0.00				0.00	10.78					275									
Contribution From KNUDSON DRIVE, Pipe 146 - 148						0.00				38.08				0.00				0.00	27.81					186									
	148	6019			0.00	0.00			0.00	38.08			0.00	0.00			0.00	0.00	27.81	42.11	56.74	66.35	96.71	2347	2100	2100	CONC	0.15	5.2	6804.3	1.96	0.04	0.34
To KNUDSON DRIVE, Pipe 6019 - 154						0.00				38.08				0.00				0.00	27.86					186									
STREET 17																																
			0.34	0.65	0.61	0.61			0.00	0.00			0.00	0.00			0.00	0.00														
	6012	6013			0.00	0.61	0.60	0.25	0.42	0.42			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	91	600	600	CONC	0.15	85.5	237.8	0.84	1.69	0.38
	6013	6014			0.00	0.61			0.00	0.42			0.00	0.00			0.00	0.00	11.69	70.86	96.02	112.52	164.42	84	600	600	CONC	0.15	18.0	237.8	0.84	0.36	0.35
To BLOCK 6, Pipe 6014 - 6015						0.61				0.42				0.00				0.00	12.05													
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						186									
	1062	1063			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	186	1050	1050	CONC	0.40	49.5	1727.1	1.99	0.41	0.11
	1063	1064			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.41	75.25	102.06	119.63	174.86	186	1200	1200	CONC	0.15	46.0	1510.0	1.34	0.57	0.12
	1064	1065			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.99	73.21	99.25	116.32	170.01	186	1200	1200	CONC	0.15	61.5	1510.0	1.34	0.77	0.12
	1065	1066			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	11.76	70.66	95.75	112.20	163.96	186	1200	1200	CONC	0.15	73.5	1510.0	1.34	0.92	0.12
	1066	1067			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	12.67	67.87	91.92	107.69	157.33	186	1200	1200	CONC	0.15	57.0	1510.0	1.34	0.71	0.12
To BLOCK 9, Pipe 1067 - 1068						0.00				0.00				0.00				0.00	13.38					186									
					0.00	0.00	0.16	0.25	0.11	0.11			0.00	0.00			0.00	0.00														
			0.44	0.65	0.80	0.80			0.00	0.11			0.00	0.00			0.00	0.00														
	6000	6001			0.00	0.80	1.05	0.25	0.73	0.84			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	149	525	525	CONC	0.20	42.0	192.3	0.89	0.79	0.77
	6001	6002	0.34	0.65	0.61	1.41			0.00	0.84			0.00	0.00			0.00	0.00	10.79	73.91	100.21	117.45	171.66	188	600	600	CONC	0.15	45.5	237.8	0.84	0.90	0.79
					0.00	1.41	0.27	0.25	0.19	1.03			0.00	0.00			0.00	0.00														
	6002	6003	0.43	0.65	0.78	2.19			0.00	1.03			0.00	0.00			0.00	0.00	11.69	70.87	96.04	112.54	164.46	254	675	675	CONC	0.15	62.5	325.6	0.91	1.14	0.78
					0.00	2.19	0.18	0.25	0.13	1.15			0.00	0.00			0.00	0.00														
					0.00	2.19	0.23	0.25	0.16	1.31			0.00	0.00			0.00	0.00														
	6003	6004	0.91	0.65	1.64	3.83			0.00	1.31			0.00	0.00			0.00	0.00	12.83	67.40	91.28	106.93	156.22	378	825	825	CONC	0.15	116.5	555.9	1.04	1.87	0.68
					0.00	3.83	0.14	0.25	0.10	1.41			0.00	0.00			0.00	0.00														
	6004	6005	0.35	0.65	0.63	4.46			0.00	1.41			0.00	0.00			0.00	0.00	14.70	62.48	84.53	99.00	144.58	398	825	825	CONC	0.15	51.0	555.9	1.04	0.82	0.72
	6005	6006	0.35	0.65	0.63	5.10			0.00	1.41			0.00	0.00			0.00	0.00	15.52	60.57	81.92	95.92	140.06	424	825	825	CONC	0.15	53.5	555.9	1.04	0.86	0.76
					0.00	5.10	0.32	0.25	0.22	1.63			0.00	0.00			0.00	0.00														
	6006	6007	0.65	0.65	1.17	6.27			0.00	1.63			0.00	0.00			0.00	0.00	16.38	58.70	79.36	92.92	135.65	498	900	900	CONC	0.15	81.5	701.1	1.10	1.23	0.71
					0.00	6.27	0.22	0.25	0.15	1.79			0.00	0.00			0.00	0.00														
	6007	6008	0.70	0.65	1.26	7.54			0.00	1.79			0.00	0.00			0.00	0.00	17.61	56.23	75.98	88.94	129.82	559	900	900	CONC	0.20	74.0	809.6	1.27	0.97	0.69

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 1 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha)														FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
					0.00	7.54	0.27	0.25	0.19	1.97			0.00	0.00			0.00	0.00															
	6008	6009	0.87	0.65	1.57	9.11			0.00	1.97			0.00	0.00			0.00	0.00	18.58	54.44	73.54	86.07	125.61	641	900	900	CONC	0.20	94.5	809.6	1.27	1.24	0.79
	6009	6010	0.20	0.65	0.36	9.47			0.00	1.97			0.00	0.00			0.00	0.00	19.82	52.33	70.66	82.69	120.65	635	900	900	CONC	0.20	22.0	809.6	1.27	0.29	0.78
	6010	6011	0.21	0.65	0.38	9.85			0.00	1.97			0.00	0.00			0.00	0.00	20.10	51.87	70.02	81.94	119.56	649	900	900	CONC	0.25	21.5	905.2	1.42	0.25	0.72
	6011	6014	0.80	0.65	1.45	11.29			0.00	1.97			0.00	0.00			0.00	0.00	20.36	51.47	69.48	81.31	118.62	718	975	975	CONC	0.20	73.5	1002.2	1.34	0.91	0.72
To BLOCK 6, Pipe 6014 - 6015						11.29				1.97				0.00				0.00	21.27													
BLOCK 9																																
Contribution From STREET 17, Pipe 1066 - 1067						0.00				0.00				0.00				0.00	13.38					186								
	1067	1068			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	13.38	65.86	89.17	104.45	152.58	186	1200	1200	CONC	0.15	42.5	1510.0	1.34	0.53	0.12
	1068	1069			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	13.92	64.45	87.23	102.18	149.24	186	1200	1200	CONC	0.15	56.0	1510.0	1.34	0.70	0.12
To KNUDSON DRIVE, Pipe 1069 - 146						0.00				0.00				0.00				0.00	14.61					186								
KNUDSON DRIVE																																
					0.00	0.00	6.71	0.70	13.06	13.06			0.00	0.00			0.00	0.00	14.00														
	112	113			0.00	0.00			0.00	13.06			0.00	0.00			0.00	0.00	14.00	64.23	86.93	101.82	148.72	1135	750	750	CONC	0.35	62.8	658.6	1.49	0.70	1.72
	113	114			0.00	0.00			0.00	13.06			0.00	0.00			0.00	0.00	14.70	62.48	84.53	99.00	144.58	1104	750	750	CONC	0.39	64.9	690.8	1.56	0.69	1.60
	114	115			0.00	0.00			0.00	13.06			0.00	0.00			0.00	0.00	15.39	60.85	82.31	96.38	140.74	1075	750	750	CONC	0.35	103.7	655.8	1.48	1.16	1.64
					0.00	0.00	1.26	0.65	2.28	15.33			0.00	0.00			0.00	0.00	10.00														
	115	116			0.00	0.00			0.00	15.33			0.00	0.00			0.00	0.00	16.56	58.32	78.84	92.31	134.76	1209	750	750	CONC	0.60	112.5	859.5	1.95	0.96	1.41
	116	132			0.00	0.00			0.00	15.33			0.00	0.00			0.00	0.00	17.52	56.39	76.21	89.21	130.22	1169	750	750	CONC	0.68	110.8	916.0	2.07	0.89	1.28
					0.00	0.00	5.41	0.65	9.78	25.11			0.00	0.00			0.00	0.00	15.00														
	132	133			0.00	0.00			0.00	25.11			0.00	0.00			0.00	0.00	18.41	54.73	73.94	86.55	126.31	1857	1050	1050	CONC	0.58	45.2	2070.7	2.39	0.32	0.90
					0.00	0.00	3.25	0.25	2.26	27.37			0.00	0.00			0.00	0.00	25.00														
	133	138			0.00	0.00			0.00	27.37			0.00	0.00			0.00	0.00	25.00	45.17	60.90	71.22	103.85	1667	1050	1050	CONC	0.73	61.8	2329.9	2.69	0.38	0.72
					0.00	0.00	1.21	0.65	2.19	29.56			0.00	0.00			0.00	0.00	12.00														
	138	139			0.00	0.00			0.00	29.56			0.00	0.00			0.00	0.00	25.38	44.72	60.29	70.51	102.81	1782	1050	1050	CONC	0.61	78.8	2131.0	2.46	0.53	0.84
	139	140			0.00	0.00			0.00	29.56			0.00	0.00			0.00	0.00	25.92	44.12	59.47	69.55	101.40	1758	1050	1050	CONC	0.57	51.1	2058.0	2.38	0.36	0.85
					0.00	0.00	3.33	0.65	6.02	35.57			0.00	0.00			0.00	0.00	12.00														
	140	144			0.00	0.00			0.00	35.57			0.00	0.00			0.00	0.00	26.28	43.73	58.93	68.92	100.47	2096	1050	1050	CONC	0.65	72.6	2196.5	2.54	0.48	0.95
	144	145			0.00	0.00			0.00	35.57			0.00	0.00			0.00	0.00	26.75	43.21	58.23	68.10	99.27	2072	1050	1050	CONC	0.43	34.9	1790.7	2.07	0.28	1.16
	145	1069			0.00	0.00			0.00	35.57			0.00	0.00			0.00	0.00	27.03	42.91	57.83	67.63	98.58	2057	2100	2100	CONC	0.17	42.5	7043.1	2.03	0.35	0.29
Contribution From BLOCK 9, Pipe 1068 - 1069						0.00				0.00				0.00				0.00	14.61					186								
	1069	146			0.00	0.00			0.00	35.57			0.00	0.00			0.00	0.00	27.38	42.55	57.34	67.05	97.73	2226	2100	2100	CONC	0.14	21.2	6417.8	1.85	0.19	0.35
					0.00	0.00	1.39	0.65	2.51	38.08			0.00	0.00			0.00	0.00	20.00														
	146	148			0.00	0.00			0.00	38.08			0.00	0.00			0.00	0.00	27.57	42.36	57.08	66.74	97.28	2360	2100	2100	CONC	0.16	29.2	6957.2	2.01	0.24	0.34
To BLOCK 8, Pipe 148 - 6019						0.00				38.08				0.00				0.00	27.81					186								
Contribution From BLOCK 8, Pipe 148 - 6019						0.00				38.08				0.00				0.00	27.86					186								
Contribution From BLOCK 8, Pipe 2023 - 6019						0.00				0.27				0.00				0.00	10.78					275								
	6019	154			0.00	0.00			0.00	38.36			0.00	0.00			0.00	0.00	27.86	42.07	56.68	66.28	96.60	2635	2100	2100	CONC	0.16	52.1	7000.3	2.02	0.43	0.38
					0.00	0.00	1.13	0.65	2.04	40.40			0.00	0.00			0.00	0.00	12.00														
	154	155			0.00	0.00			0.00	40.40			0.00	0.00			0.00	0.00	28.29	41.65	56.11	65.60	95.61	2728	2100	2100	CONC	0.17	53.7	7149.1	2.06	0.43	0.38
	155	156			0.00	0.00			0.00	40.40			0.00	0.00			0.00	0.00	28.72	41.23	55.54	64.93	94.63	2705	2100	2100	CONC	0.18	96.7	7437.6	2.15	0.75	0.36
					0.00	0.00	3.94	0.65	7.12	47.52			0.00	0.00			0.00	0.00	11.00														
	156	158			0.00	0.00			0.00	47.52			0.00	0.00			0.00	0.00	29.47	40.52	54.58	63.81	92.99	3054	2100	2100	CONC	0.18	101.5	7335.9	2.12	0.80	0.42
	158	159			0.00	0.00			0.00	47.52			0.00	0.00			0.00	0.00	30.27	39.80	53.60	62.66	91.31	3008	2100	2100	CONC	0.21	45.6	8002.3	2.31	0.33	0.38
	159	210			0.00	0.00			0.00	47.52			0.00	0.00			0.00	0.00	30.60	39.51	53.21	62.20	90.63	2989	2100	2100	CONC	0.18	46.1	7397.1	2.14	0.36	0.40
To WESLOCK WAY, Pipe 210 - 6017						0.00				47.52				0.00				0.00	30.96					461								
WESLOCK WAY																																
Contribution From KNUDSON DRIVE, Pipe 159 - 210						0.00				47.52				0.00				0.00	30.96					461								
Contribution From STREET 18, Pipe 209 - 210						0.00				28.91				0.00				0.00	20.47													
	210	6017			0.00	0.00			0.00	76.43			0.00	0.00			0.00	0.00	30.96	39.20	52.79	61.71	89.91	4496	2250	2250	CONC	0.17	55.1	8643.5	2.17	0.42	0.52
Contribution From BLOCK 6, Pipe 6016 - 6017						11.91				2.66				0.00				0.00	23.00													
	6017	212			0.00	11.91			0.00	79.09			0.00	0.00			0.00	0.00	31.38	38.85	52.30	61.14	89.08	5060	2250	2250	CONC	0.16	39.2	8362.6	2.10	0.31	0.61
	212	213			0.00	11.91			0.00	79.09			0.00	0.00			0.00	0.00	31.69	38.59	51.95	60.73	88.47	5029	2250	2250	CONC	0.16	44.9	8336.6	2.10	0.36	0.60

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 2 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha)														FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
					0.00	11.91	1.75	0.65	3.16	82.25			0.00	0.00			0.00	0.00	15.00														
	213	220			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	32.05	38.30	51.56	60.26	87.79	5158	2550	2550	CONC	0.36	125.0	17507.9	3.43	0.61	0.29
	220	221			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	32.66	37.81	50.90	59.49	86.66	5098	2550	2550	CONC	0.13	46.4	10451.4	2.05	0.38	0.49
	221	226			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	33.03	37.52	50.49	59.02	85.97	5061	2550	2550	CONC	0.15	42.2	11419.3	2.24	0.31	0.44
	226	4054			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	33.35	37.27	50.17	58.63	85.41	5031	2700	2700	CONC	0.10	70.4	10929.3	1.91	0.61	0.46
Contribution From BLOCK 4, Pipe 4053 - 4054						0.00				0.00				0.00				0.00	10.43					264									
	4054	5020			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	33.96	36.81	49.54	57.90	84.33	5238	2700	2700	CONC	0.07	8.1	9237.9	1.61	0.08	0.57
Contribution From STREET 16, Pipe 5019 - 5020						0.00				0.00				0.00				0.00	10.50					104									
	5020	228			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	34.05	36.75	49.45	57.80	84.19	5334	2700	2700	CONC	0.07	59.5	9244.1	1.61	0.61	0.58
					0.00	11.91	9.43	0.65	17.04	99.29			0.00	0.00			0.00	0.00	14.00														
					0.00	11.91	1.47	0.65	2.66	101.95			0.00	0.00			0.00	0.00	10.00														
					0.00	11.91	0.72	0.65	1.30	103.25			0.00	0.00			0.00	0.00															
	228	242			0.00	11.91	1.84	0.65	3.32	106.58			0.00	0.00			0.00	0.00	34.66	36.30	48.85	57.09	83.14	6467	2700	2700	CONC	0.08	160.6	9465.1	1.65	1.62	0.68
	242	243			0.00	11.91			0.00	106.58			0.00	0.00			0.00	0.00	36.28	35.18	47.32	55.30	80.52	6291	2700	2700	CONC	0.21	55.1	15567.5	2.72	0.34	0.40
	243	244			0.00	11.91			0.00	106.58			0.00	0.00			0.00	0.00	36.62	34.95	47.01	54.94	80.00	6256	2700	2700	CONC	0.10	44.4	10770.5	1.88	0.39	0.58
					0.00	11.91	2.75	0.65	4.97	111.54			0.00	0.00			0.00	0.00	14.00														
					0.00	11.91	1.98	0.65	3.58	115.12			0.00	0.00			0.00	0.00	10.00														
	244	254			0.00	11.91			0.00	115.12			0.00	0.00			0.00	0.00	37.01	34.69	46.66	54.53	79.40	6614	2700	2700	CONC	0.12	132.6	11934.0	2.08	1.06	0.55
	254	255			0.00	11.91			0.00	115.12			0.00	0.00			0.00	0.00	38.07	34.02	45.75	53.46	77.83	6501	2700	2700	CONC	0.05	32.8	7728.2	1.35	0.41	0.84
To BLOCK 1, Pipe 255 - 256						11.91				115.12				0.00				0.00	38.48					829									
STREET 8																																	
	2008	2018	0.27	0.65	0.49	0.49			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	37	600	600	CONC	0.15	67.0	237.8	0.84	1.33	0.16
	2018	2019	0.34	0.65	0.61	1.10			0.00	0.00			0.00	0.00			0.00	0.00	11.33	72.06	97.67	114.46	167.27	79	600	600	CONC	0.15	67.0	237.8	0.84	1.33	0.33
To STREET 7, Pipe 2019 - 2020						1.10				0.00				0.00				0.00	12.66														
BLOCK 7																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						555									
	2011	2012			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	555	900	900	CONC	0.15	76.0	701.1	1.10	1.15	0.79
	2012	2015			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	11.15	72.66	98.49	115.43	168.69	555	900	900	CONC	0.15	43.0	701.1	1.10	0.65	0.79
To STREET 7, Pipe 2015 - 2016						0.00				0.00				0.00				0.00	11.80					555									
STREET 7																																	
	2008	2009	0.63	0.65	1.14	1.14			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	87	600	600	CONC	0.15	68.5	237.8	0.84	1.36	0.37
To STREET 7, Pipe 2009 - 2010						1.14				0.00				0.00				0.00	11.36														
					0.00	0.00	0.36	0.65	0.65	0.65			0.00	0.00			0.00	0.00															
	2008	2013	0.83	0.65	1.50	1.50			0.00	0.65			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	183	600	600	CONC	0.15	67.5	237.8	0.84	1.34	0.77
					0.00	1.50	0.28	0.65	0.51	1.16			0.00	0.00			0.00	0.00															
	2013	2014	0.47	0.65	0.85	2.35			0.00	1.16			0.00	0.00			0.00	0.00	11.34	72.02	97.62	114.40	167.19	282	750	750	CONC	0.15	12.5	431.2	0.98	0.21	0.65
					0.00	2.35	0.17	0.65	0.31	1.46			0.00	0.00			0.00	0.00															
	2014	2015	0.34	0.65	0.61	2.96			0.00	1.46			0.00	0.00			0.00	0.00	11.55	71.32	96.66	113.27	165.52	353	825	825	CONC	0.15	28.0	555.9	1.04	0.45	0.63
Contribution From BLOCK 7, Pipe 2012 - 2015						0.00				0.00				0.00				0.00	11.80					555									
					0.00	2.96	0.21	0.65	0.38	1.84			0.00	0.00			0.00	0.00															
	2015	2016	1.07	0.65	1.93	4.90			0.00	1.84			0.00	0.00			0.00	0.00	12.00	69.89	94.70	110.96	162.13	1072	1200	1200	CONC	0.15	89.0	1510.0	1.34	1.11	0.71
					0.00	4.90	0.57	0.65	1.03	2.87			0.00	0.00			0.00	0.00															
					0.00	4.90	0.77	0.65	1.39	4.26			0.00	0.00			0.00	0.00															
	2016	2017	1.61	0.65	2.91	7.81			0.00	4.26			0.00	0.00			0.00	0.00	13.11	66.62	90.20	105.67	154.37	1460	1200	1200	CONC	0.25	12.5	1949.4	1.72	0.12	0.75
					0.00	7.81	0.25	0.65	0.45	4.72			0.00	0.00			0.00	0.00															
	2017	2019	0.65	0.65	1.17	8.98			0.00	4.72			0.00	0.00			0.00	0.00	13.23	66.28	89.74	105.13	153.57	1574	1350	1350	CONC	0.15	67.5	2067.2	1.44	0.78	0.76
Contribution From STREET 8, Pipe 2018 - 2019						1.10				0.00				0.00				0.00	12.66														
	2019	2020	0.26	0.65	0.47	10.55			0.00	4.72			0.00	0.00			0.00	0.00	14.01	64.21	86.90	101.78	148.66	1642	1350	1350	CONC	0.20	68.0	2387.0	1.67	0.68	0.69
To STREET 7, Pipe 2020 - 2021						10.55				4.72				0.00				0.00	14.69					555									

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 3 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha) 2 YEAR				5 YEAR				10 YEAR				100 YEAR				FLOW						SEWER DATA							
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	Conc. (min)	2 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)	100 Year (mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
BLOCK 12																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						581									
	2003	2004			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	581	600	600	CONC	0.95	32.5	598.5	2.12	0.26	0.97
To STREET 7, Pipe 2004 - 2005						0.00				0.00				0.00				0.00	10.26					581									
BLOCK 15																																
					0.00	0.00	1.48	0.65	2.67	2.67			0.00	0.00			0.00	0.00	12.00														
	2000	2002			0.00	0.00			0.00	2.67			0.00	0.00			0.00	0.00	12.00	69.89	94.70	110.96	162.13	253	600	600	CONC	0.87	63.5	572.7	2.03	0.52	0.44
To STREET 7, Pipe 2002 - 2004						0.00				2.67				0.00				0.00	12.52														
BLOCK 1																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						223									
	4040	4041			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	223	375	375	CONC	1.25	55.0	196.0	1.77	0.52	1.14
To STREET 1, Pipe 4041 - 4042						0.00				0.00				0.00				0.00	10.52					223									
Contribution From WESLOCK WAY, Pipe 254 - 255						11.91				115.12				0.00				0.00	38.48					829									
	255	256			0.00	11.91			0.00	115.12			0.00	0.00			0.00	0.00	38.48	33.77	45.41	53.06	77.25	6459	2700	2700	CONC	0.13	20.2	12405.9	2.17	0.16	0.52
STREET 19																																
Contribution From STREET 1, Pipe 4041 - 4042						2.64				0.61				0.00				0.00	11.91					223									
					0.00	2.64	0.12	0.65	0.22	0.83			0.00	0.00			0.00	0.00															
	4042	4043	0.58	0.65	1.05	3.69			0.00	0.83			0.00	0.00			0.00	0.00	11.91	70.18	95.08	111.41	162.80	561	750	750	CONC	0.50	95.0	787.2	1.78	0.89	0.71
					0.00	3.69	0.04	0.65	0.07	0.90			0.00	0.00			0.00	0.00															
	4043	4044	0.17	0.65	0.31	3.99			0.00	0.90			0.00	0.00			0.00	0.00	12.80	67.51	91.42	107.10	156.47	575	750	750	CONC	1.05	17.0	1140.8	2.58	0.11	0.50
	4044	4045	0.24	0.65	0.43	4.43			0.00	0.90			0.00	0.00			0.00	0.00	12.91	67.19	90.99	106.59	155.73	603	750	750	CONC	1.15	35.0	1193.9	2.70	0.22	0.50
To STREET 18, Pipe 4045 - 4046						4.43				0.90				0.00				0.00	13.12					223									
STREET 15																																
	4034	4035	0.41	0.65	0.74	0.74			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	57	300	300	PVC	1.35	53.0	112.4	1.59	0.56	0.51
	4035	4036	0.06	0.65	0.11	0.85			0.00	0.00			0.00	0.00			0.00	0.00	10.56	74.73	101.35	118.79	173.63	63	300	300	PVC	1.05	11.0	99.1	1.40	0.13	0.64
	4036	4037	0.13	0.65	0.23	1.08			0.00	0.00			0.00	0.00			0.00	0.00	10.69	74.27	100.70	118.03	172.52	81	300	300	PVC	1.25	31.0	108.1	1.53	0.34	0.74
To STREET 18, Pipe 4037 - 4045						1.08				0.00				0.00				0.00	11.02														
BLOCK 3																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						958									
	4013	4014			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	958	900	900	CONC	0.20	81.5	809.6	1.27	1.07	1.18
To STREET 1, Pipe 4014 - 4020						0.00				0.00				0.00				0.00	11.07					958									
STREET 2																																
	4009	4010	0.26	0.65	0.47	0.47			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	36	300	300	PVC	0.40	67.0	61.2	0.87	1.29	0.59
To STREET 1, Pipe 4010 - 4011						0.47				0.00				0.00				0.00	11.29														
					0.00	0.00	0.09	0.65	0.16	0.16			0.00	0.00			0.00	0.00															
	4009	4015	0.29	0.65	0.52	0.52			0.00	0.16			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	57	300	300	PVC	0.55	10.5	71.7	1.01	0.17	0.80
					0.00	0.52	0.29	0.65	0.52	0.69			0.00	0.00			0.00	0.00															
	4015	4016	1.40	0.65	2.53	3.05			0.00	0.69			0.00	0.00			0.00	0.00	10.17	76.15	103.29	121.08	177.00	303	600	600	CONC	0.50	115.5	434.2	1.54	1.25	0.70
					0.00	3.05	0.20	0.65	0.36	1.05			0.00	0.00			0.00	0.00															
	4016	4017	0.95	0.65	1.72	4.77			0.00	1.05			0.00	0.00			0.00	0.00	11.43	71.73	97.22	113.93	166.50	444	675	675	CONC	0.50	103.0	594.4	1.66	1.03	0.75
					0.00	4.77	0.25	0.65	0.45	1.50			0.00	0.00			0.00	0.00															
	4017	4018	0.85	0.65	1.54	6.31			0.00	1.50			0.00	0.00			0.00	0.00	12.46	68.50	92.78	108.70	158.82	571	750	750	CONC	0.50	103.5	787.2	1.78	0.97	0.73
					0.00	6.31	0.13	0.65	0.23	1.73			0.00	0.00			0.00	0.00															
	4018	4019	0.14	0.65	0.25	6.56			0.00	1.73			0.00	0.00			0.00	0.00	13.43	65.75	89.01	104.26	152.30	586	750	750	CONC	0.45	9.0	746.8	1.69	0.09	0.78
	4019	4020	0.27	0.65	0.49	7.05			0.00	1.73			0.00	0.00			0.00	0.00	13.52	65.51	88.68	103.88	151.74	615	825	825	CONC	0.45	68.5	962.9	1.80	0.63	0.64
To STREET 1, Pipe 4020 - 4021						7.05				1.73				0.00				0.00	14.15														

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 4 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha) 2 YEAR				AREA (Ha) 5 YEAR				AREA (Ha) 10 YEAR				AREA (Ha) 100 YEAR				FLOW						SEWER DATA							
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	Conc. (min)	2 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)	100 Year (mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
BLOCK 16																																
					0.00	0.00	6.02	0.30	5.02	5.02			0.00	0.00			0.00	0.00	14.00														
	4007	4008			0.00	0.00			0.00	5.02			0.00	0.00			0.00	0.00	14.00	64.23	86.93	101.82	148.72	436	825	825	PVC	0.30	33.5	786.2	1.47	0.38	0.56
To STREET 1, Pipe 4008 - 4010						0.00				5.02				0.00				0.00	14.38														
STREET 18																																
					0.00	0.00	8.99	0.65	16.24	16.24			0.00	0.00			0.00	0.00	20.00														
					0.00	0.00	1.43	0.65	2.58	18.83			0.00	0.00			0.00	0.00	17.00														
					0.00	0.00	0.82	0.65	1.48	20.31			0.00	0.00			0.00	0.00	15.00														
					0.00	0.00	4.76	0.65	8.60	28.91			0.00	0.00			0.00	0.00	13.00														
	209	210			0.00	0.00			0.00	28.91			0.00	0.00			0.00	0.00	20.00	52.03	70.25	82.21	119.95	2031	1200	1200	CONC	0.15	38.0	1510.0	1.34	0.47	1.35
To WESLOCK WAY, Pipe 210 - 6017						0.00				28.91				0.00				0.00	20.47														
Contribution From STREET 1, Pipe 4023 - 4028						20.74				11.07				0.00				0.00	19.66					958									
Contribution From STREET 1, Pipe 4027 - 4028						1.21				0.29				0.00				0.00	12.44														
	4028	4029			0.00	21.96			0.00	11.36			0.00	0.00			0.00	0.00	19.66	52.59	71.01	83.11	121.27	2920	1650	1650	CONC	0.20	12.5	4076.1	1.91	0.11	0.72
	4029	4030	0.21	0.65	0.38	22.33			0.00	11.36			0.00	0.00			0.00	0.00	19.77	52.41	70.77	82.82	120.84	2933	1650	1650	CONC	0.20	21.5	4076.1	1.91	0.19	0.72
					0.00	22.33	0.15	0.65	0.27	11.63			0.00	0.00			0.00	0.00															
	4030	4031	0.22	0.65	0.40	22.73			0.00	11.63			0.00	0.00			0.00	0.00	19.95	52.11	70.35	82.33	120.13	2961	1650	1650	CONC	0.20	25.5	4076.1	1.91	0.22	0.73
					0.00	22.73	0.06	0.65	0.11	11.74			0.00	0.00			0.00	0.00															
	4031	4032	0.29	0.65	0.52	23.26			0.00	11.74			0.00	0.00			0.00	0.00	20.18	51.75	69.87	81.76	119.29	2982	1650	1650	CONC	0.45	30.5	6114.2	2.86	0.18	0.49
					0.00	23.26	0.10	0.65	0.18	11.92			0.00	0.00			0.00	0.00															
	4032	4033	0.30	0.65	0.54	23.80			0.00	11.92			0.00	0.00			0.00	0.00	20.35	51.47	69.48	81.31	118.63	3011	1650	1650	CONC	0.45	34.5	6114.2	2.86	0.20	0.49
					0.00	23.80	0.12	0.65	0.22	12.14			0.00	0.00			0.00	0.00															
	4033	4037	0.35	0.65	0.63	24.43			0.00	12.14			0.00	0.00			0.00	0.00	20.56	51.15	69.06	80.81	117.89	3046	1650	1650	CONC	0.45	51.0	6114.2	2.86	0.30	0.50
Contribution From STREET 15, Pipe 4036 - 4037						1.08				0.00				0.00				0.00	11.02														
					0.00	25.51	0.17	0.65	0.31	12.45			0.00	0.00			0.00	0.00															
	4037	4045	0.38	0.65	0.69	26.20			0.00	12.45			0.00	0.00			0.00	0.00	20.85	50.70	68.43	80.08	116.82	3138	1800	1800	CONC	0.20	70.5	5140.6	2.02	0.58	0.61
Contribution From STREET 19, Pipe 4044 - 4045						4.43				0.90				0.00				0.00	13.12					223									
					0.00	30.63	0.07	0.65	0.13	13.48			0.00	0.00			0.00	0.00															
	4045	4046	0.15	0.65	0.27	30.90			0.00	13.48			0.00	0.00			0.00	0.00	21.43	49.83	67.25	78.69	114.79	3627	1800	1800	CONC	0.25	34.5	5747.4	2.26	0.25	0.63
					0.00	30.90	0.08	0.65	0.14	13.62			0.00	0.00			0.00	0.00															
					0.00	30.90	0.08	0.65	0.14	13.77			0.00	0.00			0.00	0.00															
	4046	4047	0.40	0.65	0.72	31.62			0.00	13.77			0.00	0.00			0.00	0.00	21.69	49.46	66.75	78.10	113.92	3664	1800	1800	CONC	0.25	42.5	5747.4	2.26	0.31	0.64
					0.00	31.62	0.09	0.65	0.16	13.93			0.00	0.00			0.00	0.00															
					0.00	31.62	0.10	0.65	0.18	14.11			0.00	0.00			0.00	0.00															
	4047	4048	0.40	0.65	0.72	32.35			0.00	14.11			0.00	0.00			0.00	0.00	22.00	49.02	66.14	77.38	112.87	3700	1800	1800	CONC	0.25	39.0	5747.4	2.26	0.29	0.64
					0.00	32.35	0.07	0.65	0.13	14.24			0.00	0.00			0.00	0.00															
					0.00	32.35	0.09	0.65	0.16	14.40			0.00	0.00			0.00	0.00															
	4048	4049	0.36	0.65	0.65	33.00			0.00	14.40			0.00	0.00			0.00	0.00	22.29	48.62	65.59	76.74	111.93	3730	1800	1800	CONC	0.25	48.5	5747.4	2.26	0.36	0.65
					0.00	33.00	0.14	0.65	0.25	14.65			0.00	0.00			0.00	0.00															
					0.00	33.00	0.14	0.65	0.25	14.90			0.00	0.00			0.00	0.00															
	4049	4050	0.65	0.65	1.17	34.17			0.00	14.90			0.00	0.00			0.00	0.00	22.65	48.13	64.93	75.96	110.78	3793	1800	1800	CONC	0.25	71.0	5747.4	2.26	0.52	0.66
To BLOCK 5, Pipe 4050 - 4051						34.17				14.90				0.00				0.00	23.17					1181									
BLOCK 5																																
Contribution From STREET 18, Pipe 4049 - 4050						34.17				14.90				0.00				0.00	23.17					1181									
					0.00	34.17	0.19	0.65	0.34	15.25			0.00	0.00			0.00	0.00															
					0.00	34.17	0.38	0.65	0.69	15.93			0.00	0.00			0.00	0.00															
	4050	4051	0.64	0.65	1.16	35.33			0.00	15.93			0.00	0.00			0.00	0.00	23.17	47.43	63.98	74.84	109.15	3876	1800	1800	CONC	0.25	96.5	5747.4	2.26	0.71	0.67
	4051	4052			0.00	35.33			0.00	15.93			0.00	0.00			0.00	0.00	23.88	46.52	62.74	73.39	107.01	3824	1800	1800	CONC	0.25	65.0	5747.4	2.26	0.48	0.67
BLOCK 13																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						219									
	1053	1054			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	219	525	525	CONC	2.25	43.5	645.1	2.98	0.24	0.34
To STREET 9, Pipe 1054 - 1055						0.00				0.00				0.00				0.00	10.24					219									

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: 7000 Campeau Drive		
Checked: ADF	LOCATION: City of Ottawa		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 5 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha) 2 YEAR				AREA (Ha) 5 YEAR				AREA (Ha) 10 YEAR				AREA (Ha) 100 YEAR				FLOW						SEWER DATA							
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
																			Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
STREET 6																																	
Contribution From STREET 1, Pipe 1010 - 1012						2.39				0.00				0.00				0.00	11.27														
Contribution From STREET 1, Pipe 1011 - 1012						1.73				0.38				0.00				0.00	11.22														
	1012	1013	0.26	0.65	0.47	4.59			0.00	0.38			0.00	0.00			0.00	0.00	11.27	72.24	97.91	114.75	167.69	369	675	675	CONC	0.30	66.0	460.4	1.29	0.85	0.80
	1013	1014	0.10	0.65	0.18	4.77			0.00	0.38			0.00	0.00			0.00	0.00	12.13	69.49	94.15	110.31	161.19	367	675	675	CONC	0.30	19.5	460.4	1.29	0.25	0.80
	1014	1023	1.33	0.65	2.40	7.17			0.00	0.38			0.00	0.00			0.00	0.00	12.38	68.73	93.10	109.08	159.37	528	900	900	CONC	0.15	106.0	701.1	1.10	1.60	0.75
Contribution From STREET 7, Pipe 1022 - 1023						1.32				38.56				0.00				0.00	21.76														
	1023	1019	0.50	0.65	0.90	9.40			0.00	38.94			0.00	0.00			0.00	0.00	21.76	49.36	66.60	77.93	113.67	3057	1650	1650	CONC	0.20	64.5	4076.1	1.91	0.56	0.75
	1019	1018	0.50	0.65	0.90	10.30			0.00	38.94			0.00	0.00			0.00	0.00	22.33	48.57	65.52	76.66	111.81	3052	1650	1650	CONC	0.20	45.5	4076.1	1.91	0.40	0.75
	1018	1017			0.00	10.30			0.00	38.94			0.00	0.00			0.00	0.00	22.73	48.02	64.79	75.79	110.54	3017	1650	1650	CONC	0.20	50.0	4076.1	1.91	0.44	0.74
	1017	1016	0.16	0.65	0.29	10.59			0.00	38.94			0.00	0.00			0.00	0.00	23.16	47.44	64.00	74.86	109.18	2994	1650	1650	CONC	0.20	44.0	4076.1	1.91	0.38	0.73
	1016	1047	0.11	0.65	0.20	10.79			0.00	38.94			0.00	0.00			0.00	0.00	23.55	46.95	63.32	74.07	108.01	2972	1650	1650	CONC	0.20	24.0	4076.1	1.91	0.21	0.73
To STREET 11, Pipe 1047 - 1048						10.79				38.94				0.00				0.00	23.76														
STREET 11																																	
					0.00	0.00	3.11	0.50	4.32	4.32			0.00	0.00			0.00	0.00	13.00														
	1044	1045			0.00	0.00			0.00	4.32			0.00	0.00			0.00	0.00	13.00	66.93	90.63	106.17	155.11	392	525	525	CONC	2.25	28.0	645.1	2.98	0.16	0.61
					0.00	0.00	3.32	0.20	1.85	6.17			0.00	0.00			0.00	0.00	25.00														
					0.00	0.00	0.04	0.65	0.07	6.24			0.00	0.00			0.00	0.00															
					0.00	0.00	0.11	0.65	0.20	6.44			0.00	0.00			0.00	0.00															
	1045	1046	0.59	0.65	1.07	1.07			0.00	6.44			0.00	0.00			0.00	0.00	25.00	45.17	60.90	71.22	103.85	440	750	750	CONC	0.25	64.5	556.6	1.26	0.85	0.79
	1046	1047	0.23	0.65	0.42	1.48			0.00	6.44			0.00	0.00			0.00	0.00	25.85	44.19	59.57	69.66	101.56	449	750	750	CONC	0.30	32.0	609.8	1.38	0.39	0.74
Contribution From STREET 6, Pipe 1016 - 1047						10.79				38.94				0.00				0.00	23.76														
					0.00	12.27	0.10	0.65	0.18	45.56			0.00	0.00			0.00	0.00															
	1047	1048	0.76	0.65	1.37	13.64			0.00	45.56			0.00	0.00			0.00	0.00	26.24	43.76	58.99	68.98	100.56	3285	1950	1950	CONC	0.15	84.5	5511.2	1.85	0.76	0.60
	1048	1049			0.00	13.64			0.00	45.56			0.00	0.00			0.00	0.00	27.00	42.95	57.88	67.68	98.65	3223	2100	2100	CONC	0.15	12.0	6715.4	1.94	0.10	0.48
To STREET 9, Pipe 1049 - 1050						13.64				45.56				0.00				0.00	27.11														
STREET 12																																	
	1039	1040	0.21	0.65	0.38	0.38			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	29	300	300	PVC	0.70	49.0	80.9	1.14	0.71	0.36
	1040	1041	0.36	0.65	0.65	1.03			0.00	0.00			0.00	0.00			0.00	0.00	10.71	74.17	100.57	117.87	172.29	76	375	375	PVC	0.70	60.0	146.7	1.33	0.75	0.52
	1041	1042			0.00	1.03			0.00	0.00			0.00	0.00			0.00	0.00	11.47	71.60	97.04	113.71	166.18	74	375	375	PVC	0.40	10.5	110.9	1.00	0.17	0.67
To STREET 9, Pipe 1042 - 1043						1.03				0.00				0.00				0.00	11.64														
STREET 13																																	
	1035	1036	0.30	0.65	0.54	0.54			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	42	300	300	PVC	0.35	67.0	57.2	0.81	1.38	0.73
	1036	1037	0.34	0.65	0.61	1.16			0.00	0.00			0.00	0.00			0.00	0.00	11.38	71.88	97.43	114.18	166.86	83	450	450	CONC	0.20	75.5	127.5	0.80	1.57	0.65
	1037	1038			0.00	1.16			0.00	0.00			0.00	0.00			0.00	0.00	12.95	67.07	90.83	106.40	155.45	78	450	450	CONC	0.20	11.5	127.5	0.80	0.24	0.61
To STREET 9, Pipe 1038 - 1042						1.16				0.00				0.00				0.00	13.19														
STREET 14																																	
	1030	1031	0.33	0.65	0.60	0.60			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	46	300	300	PVC	0.35	85.0	57.2	0.81	1.75	0.80
	1031	1032	0.50	0.65	0.90	1.50			0.00	0.00			0.00	0.00			0.00	0.00	11.75	70.68	95.77	112.23	164.00	106	450	450	CONC	0.25	79.5	142.6	0.90	1.48	0.74
	1032	1033			0.00	1.50			0.00	0.00			0.00	0.00			0.00	0.00	13.23	66.29	89.75	105.14	153.59	99	450	450	CONC	0.20	3.0	127.5	0.80	0.06	0.78
	1033	1034			0.00	1.50			0.00	0.00			0.00	0.00			0.00	0.00	13.29	66.12	89.52	104.86	153.19	99	450	450	CONC	0.20	13.0	127.5	0.80	0.27	0.78
To STREET 9, Pipe 1034 - 1038						1.50				0.00				0.00				0.00	13.56														
STREET 2																																	
					0.00	0.00	0.03	0.65	0.05	0.05			0.00	0.00			0.00	0.00															
	1003	1004	0.20	0.65	0.36	0.36			0.00	0.05			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	33	300	300	PVC	2.50	17.5	152.9	2.16	0.13	0.22
					0.00	0.36	0.02	0.65	0.04	0.09			0.00	0.00			0.00	0.00															
	1004	1005	0.18	0.65	0.33	0.69			0.00	0.09			0.00	0.00			0.00	0.00	10.13	76.29	103.49	121.31	177.34	62	300	300	PVC	2.40	22.5	149.8	2.12	0.18	0.41
					0.00	0.69	0.04	0.65	0.07	0.16			0.00	0.00			0.00	0.00															
	1005	1006	0.29	0.65	0.52	1.21			0.00	0.16			0.00	0.00			0.00	0.00	10.31	75.63	102.57	120.24	175.76	108	300	300	PVC	2.55	49.5	154.4	2.18	0.38	0.70
To STREET 5, Pipe 1006 - 1007						1.21				0.16				0.00				0.00	10.69														

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: 7000 Campeau Drive		
Checked: ADF	LOCATION: City of Ottawa		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 6 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha)														FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
					0.00	0.00	0.11	0.65	0.20	0.20			0.00	0.00			0.00	0.00															
	4000	4001	0.48	0.65	0.87	0.87			0.00	0.20			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	87	375	375	PVC	0.40	54.5	110.9	1.00	0.90	0.79
					0.00	0.87	0.07	0.65	0.13	0.33			0.00	0.00			0.00	0.00															
	4001	4002	0.28	0.65	0.51	1.37			0.00	0.33			0.00	0.00			0.00	0.00	10.90	73.50	99.65	116.79	170.69	133	450	450	CONC	0.35	35.0	168.7	1.06	0.55	0.79
					0.00	1.37	0.09	0.65	0.16	0.49			0.00	0.00			0.00	0.00															
	4002	4003	0.23	0.65	0.42	1.79			0.00	0.49			0.00	0.00			0.00	0.00	11.45	71.64	97.09	113.78	166.27	176	525	525	CONC	0.30	10.0	235.6	1.09	0.15	0.75
	4003	4006	0.26	0.65	0.47	2.26			0.00	0.49			0.00	0.00			0.00	0.00	11.61	71.14	96.40	112.97	165.09	208	600	600	CONC	0.20	66.5	274.6	0.97	1.14	0.76
To STREET 1, Pipe 4006 - 4008						2.26				0.49				0.00				0.00	12.75														
STREET 5																																	
Contribution From STREET 1, Pipe 1001 - 1002						2.19				0.76				0.00				0.00	11.00														
	1002	1006	0.28	0.65	0.51	2.69			0.00	0.76			0.00	0.00			0.00	0.00	11.00	73.17	99.20	116.26	169.92	272	600	600	CONC	0.35	74.5	363.3	1.28	0.97	0.75
Contribution From STREET 2, Pipe 1005 - 1006						1.21				0.16				0.00				0.00	10.69														
	1006	1007	0.06	0.65	0.11	4.01			0.00	0.92			0.00	0.00			0.00	0.00	11.96	70.00	94.85	111.14	162.40	368	600	600	CONC	0.60	15.0	475.6	1.68	0.15	0.77
	1007	1008	0.24	0.65	0.43	4.45			0.00	0.92			0.00	0.00			0.00	0.00	12.11	69.54	94.22	110.39	161.30	396	675	675	CONC	0.35	30.5	497.3	1.39	0.37	0.80
					0.00	4.45	0.15	0.65	0.27	1.19			0.00	0.00			0.00	0.00															
	1008	1025	0.93	0.65	1.68	6.13			0.00	1.19			0.00	0.00			0.00	0.00	12.48	68.44	92.70	108.61	158.68	530	825	825	CONC	0.30	121.5	786.2	1.47	1.38	0.67
To STREET 7, Pipe 1025 - 1026						6.13				1.19				0.00				0.00	13.86														
STREET 7																																	
					0.00	0.00	21.34	0.65	38.56	38.56			0.00	0.00			0.00	0.00	20.00														
	1020	1021			0.00	0.00			0.00	38.56			0.00	0.00			0.00	0.00	20.00	52.03	70.25	82.21	119.95	2709	1350	1350	CONC	0.25	68.5	2668.7	1.86	0.61	1.02
	1021	1022			0.00	0.00			0.00	38.56			0.00	0.00			0.00	0.00	20.61	51.07	68.94	80.66	117.68	2658	1500	1500	CONC	0.25	17.0	3534.4	2.00	0.14	0.75
	1022	1023	0.73	0.65	1.32	1.32			0.00	38.56			0.00	0.00			0.00	0.00	20.75	50.85	68.64	80.32	117.17	2714	1650	1650	CONC	0.15	100.0	3530.0	1.65	1.01	0.77
To STREET 6, Pipe 1023 - 1019						1.32				38.56				0.00				0.00	21.76														
	6020	1024	0.12	0.65	0.22	0.22			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	17	300	300	PVC	2.50	25.5	152.9	2.16	0.20	0.11
	1024	1025	0.18	0.65	0.33	0.54			0.00	0.00			0.00	0.00			0.00	0.00	10.20	76.06	103.17	120.93	176.78	41	600	600	CONC	0.15	44.5	237.8	0.84	0.88	0.17
Contribution From STREET 5, Pipe 1008 - 1025						6.13				1.19				0.00				0.00	13.86														
	1025	1026	0.16	0.65	0.29	6.96			0.00	1.19			0.00	0.00			0.00	0.00	13.86	64.61	87.45	102.43	149.61	554	825	825	CONC	0.25	40.5	717.7	1.34	0.50	0.77
					0.00	6.96	0.15	0.65	0.27	1.46			0.00	0.00			0.00	0.00															
	1026	1027	0.68	0.65	1.23	8.19			0.00	1.46			0.00	0.00			0.00	0.00	14.36	63.32	85.69	100.36	146.57	644	900	900	CONC	0.20	93.5	809.6	1.27	1.22	0.80
To STREET 9, Pipe 1027 - 1028						8.19				1.46				0.00				0.00	15.58														
					0.00	0.00	0.09	0.65	0.16	0.16			0.00	0.00			0.00	0.00															
	2001	2002	0.21	0.65	0.38	0.38			0.00	0.16			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	46	600	600	CONC	0.15	30.0	237.8	0.84	0.59	0.19
Contribution From BLOCK 15, Pipe 2000 - 2002						0.00				2.67				0.00				0.00	12.52														
					0.00	0.38	0.11	0.65	0.20	3.04			0.00	0.00			0.00	0.00															
					0.00	0.38	0.13	0.65	0.23	3.27			0.00	0.00			0.00	0.00															
	2002	2004	0.56	0.65	1.01	1.39			0.00	3.27			0.00	0.00			0.00	0.00	12.52	68.31	92.52	108.40	158.38	398	825	825	CONC	0.15	59.0	555.9	1.04	0.95	0.72
Contribution From BLOCK 12, Pipe 2003 - 2004						0.00				0.00				0.00				0.00	10.26					581									
					0.00	1.39	0.16	0.65	0.29	3.56			0.00	0.00			0.00	0.00															
					0.00	1.39	0.20	0.65	0.36	3.92			0.00	0.00			0.00	0.00															
	2004	2005	0.85	0.65	1.54	2.93			0.00	3.92			0.00	0.00			0.00	0.00	13.47	65.64	88.86	104.09	152.04	1122	1200	1200	CONC	0.15	82.5	1510.0	1.34	1.03	0.74
					0.00	2.93	0.14	0.65	0.25	4.17			0.00	0.00			0.00	0.00															
					0.00	2.93	0.15	0.65	0.27	4.45			0.00	0.00			0.00	0.00															
	2005	2006	0.70	0.65	1.26	4.19			0.00	4.45			0.00	0.00			0.00	0.00	14.50	62.98	85.22	99.80	145.76	1224	1200	1200	CONC	0.20	63.0	1743.6	1.54	0.68	0.70
					0.00	4.19	0.15	0.65	0.27	4.72			0.00	0.00			0.00	0.00															
	2006	2007	0.65	0.65	1.17	5.37			0.00	4.72			0.00	0.00			0.00	0.00	15.18	61.35	82.98	97.18	141.90	1302	1200	1200	CONC	0.20	48.5	1743.6	1.54	0.52	0.75
	2007	2009			0.00	5.37			0.00	4.72			0.00	0.00			0.00	0.00	15.70	60.16	81.35	95.26	139.09	1288	1200	1200	CONC	0.20	22.5	1743.6	1.54	0.24	0.74
Contribution From STREET 7, Pipe 2008 - 2009						1.14				0.00				0.00				0.00	11.36														
					0.00	6.51	0.14	0.65	0.25	4.97			0.00	0.00			0.00	0.00															
	2009	2010	0.58	0.65	1.05	7.55			0.00	4.97			0.00	0.00			0.00	0.00	15.95	59.62	80.62	94.40	137.82	1432	1200	1200	CONC	0.25	68.5	1949.4	1.72	0.66	0.73
					0.00	7.55	0.24	0.65	0.43	5.40			0.00	0.00			0.00	0.00															
	2010	2020	1.01	0.65	1.83	9.38			0.00	5.40			0.00	0.00			0.00	0.00	16.61	58.21	78.70	92.13	134.51	1552	1350	1350	CONC	0.50	65.5	3774.1	2.64	0.41	0.41

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 7 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha) 2 YEAR				AREA (Ha) 5 YEAR				AREA (Ha) 10 YEAR				AREA (Ha) 100 YEAR				FLOW						SEWER DATA							
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	Conc. (min)	2 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)	100 Year (mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
Contribution From STREET 7, Pipe 2019 - 2020						10.55				4.72				0.00				0.00	14.69					555									
	2020	2021			0.00	19.93			0.00	10.12			0.00	0.00			0.00	0.00	17.02	57.37	77.54	90.78	132.52	3064	1350	1350	CONC	0.55	20.0	3958.3	2.77	0.12	0.77
STREET 9																																	
Contribution From STREET 7, Pipe 1026 - 1027						8.19				1.46				0.00				0.00	15.58														
	1027	1028	0.16	0.65	0.29	8.47			0.00	1.46			0.00	0.00			0.00	0.00	15.58	60.43	81.72	95.69	139.72	632	975	975	CONC	0.15	34.0	868.0	1.16	0.49	0.73
					0.00	8.47	0.06	0.65	0.11	1.57			0.00	0.00			0.00	0.00															
	1028	1029	1.05	0.65	1.90	10.37			0.00	1.57			0.00	0.00			0.00	0.00	16.07	59.35	80.25	93.96	137.19	742	975	975	CONC	0.20	38.0	1002.2	1.34	0.47	0.74
	1029	1034			0.00	10.37			0.00	1.57			0.00	0.00			0.00	0.00	16.54	58.35	78.88	92.36	134.83	729	975	975	CONC	0.20	5.5	1002.2	1.34	0.07	0.73
Contribution From STREET 14, Pipe 1033 - 1034						1.50				0.00				0.00				0.00	13.56														
					0.00	11.87	0.10	0.65	0.18	1.75			0.00	0.00			0.00	0.00															
	1034	1038	0.22	0.65	0.40	12.27			0.00	1.75			0.00	0.00			0.00	0.00	16.61	58.21	78.69	92.13	134.50	852	975	975	CONC	0.25	47.0	1120.5	1.50	0.52	0.76
Contribution From STREET 13, Pipe 1037 - 1038						1.16				0.00				0.00				0.00	13.19														
					0.00	13.43	0.12	0.65	0.22	1.97			0.00	0.00			0.00	0.00															
	1038	1042	0.25	0.65	0.45	13.88			0.00	1.97			0.00	0.00			0.00	0.00	17.13	57.15	77.25	90.43	132.01	945	975	975	CONC	0.30	52.0	1227.5	1.64	0.53	0.77
Contribution From STREET 12, Pipe 1041 - 1042						1.03				0.00				0.00				0.00	11.64														
					0.00	14.91	0.09	0.65	0.16	2.13			0.00	0.00			0.00	0.00															
	1042	1043	0.27	0.65	0.49	15.40			0.00	2.13			0.00	0.00			0.00	0.00	17.66	56.13	75.85	88.78	129.59	1026	1050	1050	CONC	0.25	63.5	1365.4	1.58	0.67	0.75
					0.00	15.40	0.01	0.65	0.02	2.15			0.00	0.00			0.00	0.00															
			0.05	0.65	0.09	15.49			0.00	2.15			0.00	0.00			0.00	0.00															
	1043	1049	0.05	0.65	0.09	15.58			0.00	2.15			0.00	0.00			0.00	0.00	18.33	54.88	74.14	86.78	126.65	1014	1050	1050	CONC	0.25	12.0	1365.4	1.58	0.13	0.74
Contribution From STREET 11, Pipe 1048 - 1049						13.64				45.56				0.00				0.00	27.11														
	1049	1050			0.00	29.22			0.00	47.71			0.00	0.00			0.00	0.00	27.11	42.84	57.73	67.51	98.40	4006	1950	1950	CONC	0.15	10.5	5511.2	1.85	0.09	0.73
					0.00	29.22	0.16	0.65	0.29	48.00			0.00	0.00			0.00	0.00															
					0.00	29.22	0.46	0.65	0.83	48.83			0.00	0.00			0.00	0.00															
	1050	1051	1.48	0.65	2.67	31.89			0.00	48.83			0.00	0.00			0.00	0.00	27.20	42.74	57.59	67.35	98.17	4176	1950	1950	CONC	0.15	110.0	5511.2	1.85	0.99	0.76
					0.00	31.89	0.15	0.65	0.27	49.10			0.00	0.00			0.00	0.00															
					0.00	31.89	0.27	0.65	0.49	49.59			0.00	0.00			0.00	0.00															
	1051	1052	1.03	0.65	1.86	33.75			0.00	49.59			0.00	0.00			0.00	0.00	28.19	41.74	56.23	65.75	95.83	4197	1950	1950	CONC	0.15	114.0	5511.2	1.85	1.03	0.76
	1052	1054			0.00	33.75			0.00	49.59			0.00	0.00			0.00	0.00	29.22	40.75	54.89	64.18	93.52	4098	1950	1950	CONC	0.15	7.5	5511.2	1.85	0.07	0.74
Contribution From BLOCK 13, Pipe 1053 - 1054						0.00				0.00				0.00				0.00	10.24					219									
					0.00	33.75	0.04	0.65	0.07	49.66			0.00	0.00			0.00	0.00															
	1054	1055	0.22	0.65	0.40	34.15			0.00	49.66			0.00	0.00			0.00	0.00	29.29	40.69	54.81	64.08	93.38	4330	1950	1950	CONC	0.15	21.0	5511.2	1.85	0.19	0.79
					0.00	34.15	0.15	0.65	0.27	49.93			0.00	0.00			0.00	0.00															
					0.00	34.15	0.52	0.65	0.94	50.87			0.00	0.00			0.00	0.00															
	1055	1056	0.80	0.65	1.45	35.60			0.00	50.87			0.00	0.00			0.00	0.00	29.48	40.51	54.57	63.80	92.97	4437	1950	1950	CONC	0.15	89.5	5511.2	1.85	0.81	0.81
					0.00	35.60	0.11	0.65	0.20	51.07			0.00	0.00			0.00	0.00															
					0.00	35.60	0.84	0.65	1.52	52.59			0.00	0.00			0.00	0.00															
	1056	1057	0.88	0.65	1.59	37.19			0.00	52.59			0.00	0.00			0.00	0.00	30.29	39.79	53.58	62.64	91.27	4516	1950	1950	CONC	0.15	89.5	5511.2	1.85	0.81	0.82
To BLOCK 14, Pipe 1057 - 1058						37.19				52.59				0.00				0.00	31.10					219									
BLOCK 14																																	
Contribution From STREET 9, Pipe 1056 - 1057						37.19				52.59				0.00				0.00	31.10					219									
	1057	1058			0.00	37.19			0.00	52.59			0.00	0.00			0.00	0.00	31.10	39.09	52.63	61.52	89.63	4440	1950	1950	CONC	0.15	5.0	5511.2	1.85	0.05	0.81
					0.00	37.19	0.07	0.65	0.13	52.72			0.00	0.00			0.00	0.00															
	1058	1059	0.32	0.65	0.58	37.77			0.00	52.72			0.00	0.00			0.00	0.00	31.14	39.05	52.57	61.46	89.54	4465	1950	1950	CONC	0.15	54.0	5511.2	1.85	0.49	0.81
			0.14	0.65	0.25	38.02			0.00	52.72			0.00	0.00			0.00	0.00															
	1059	1060			0.00	38.02	0.18	0.65	0.33	53.04			0.00	0.00			0.00	0.00	31.63	38.64	52.02	60.81	88.59	4447	1950	1950	CONC	0.15	48.5	5511.2	1.85	0.44	0.81
	1060	6018			0.00	38.02			0.00	53.04			0.00	0.00			0.00	0.00	32.07	38.28	51.53	60.24	87.76	4408	1950	1950	CONC	0.15	40.5	5511.2	1.85	0.37	0.80
	6018	1061			0.00	38.02			0.00	53.04			0.00	0.00			0.00	0.00	32.43	37.99	51.13	59.77	87.07	4376	1950	1950	CONC	0.15	21.0	5511.2	1.85	0.19	0.79
STREET4																																	
	5008	5009	0.34	0.65	0.61	0.61			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	47	300	300	PVC	0.65	39.5	78.0	1.10	0.60	0.61
					0.00	0.61	0.08	0.65	0.14	0.14			0.00	0.00			0.00	0.00															
	5009	5010	0.19	0.65	0.34	0.96			0.00	0.14			0.00	0.00			0.00	0.00	10.60	74.59	101.14	118.55	173.28	86	375	375	PVC	0.50	12.5	124.0	1.12	0.19	0.69
					0.00	0.96	0.11	0.65	0.20	0.34			0.00	0.00			0.00	0.00															
	5010	5011	0.42	0.65	0.76	1.72			0.00	0.34			0.00	0.00			0.00	0.00	10.78	73.93	100.23	117.48	171.71	161	450	450	CONC	0.65	54.5	229.9	1.45	0.63	0.70

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**	
Checked: ADF	LOCATION: **City of Ottawa**	
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020
		Sheet No. SHEET 8 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha) 2 YEAR				5 YEAR				10 YEAR				100 YEAR				FLOW						SEWER DATA							
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	Conc. (min)	2 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)	100 Year (mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
	5011	5012	0.26	0.65	0.47	2.19			0.00	0.34			0.00	0.00			0.00	0.00	11.41	71.78	97.29	114.01	166.61	190	450	450	CONC	0.70	45.5	238.5	1.50	0.51	0.80
To STREET 16, Pipe 5012 - 5013						2.19				0.34				0.00				0.00	11.92														
BLOCK 2																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						352									
	5003	5004			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	352	450	450	CONC	1.17	35.5	308.4	1.94	0.31	1.14
To STREET 1, Pipe 5004 - 5005						0.00				0.00				0.00				0.00	10.31					352									
STREET 1																																	
					0.00	0.00	0.21	0.65	0.38	0.38			0.00	0.00			0.00	0.00															
	1011	1012	0.96	0.65	1.73	1.73			0.00	0.38			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	173	600	600	CONC	0.15	61.5	237.8	0.84	1.22	0.73
To STREET 6, Pipe 1012 - 1013						1.73				0.38				0.00				0.00	11.22														
			0.34	0.65	0.61	0.61			0.00	0.00			0.00	0.00			0.00	0.00															
	5006	5007			0.00	0.61	0.66	0.65	1.19	1.19			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	171	525	525	CONC	0.25	29.0	215.0	0.99	0.49	0.80
To STREET 16, Pipe 5007 - 5012						0.61				1.19				0.00				0.00	10.49														
					0.00	0.00	0.15	0.65	0.27	0.27			0.00	0.00			0.00	0.00															
	1000	1001	0.39	0.65	0.70	0.70			0.00	0.27			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	82	300	300	PVC	1.70	53.0	126.1	1.78	0.50	0.65
					0.00	0.70	0.27	0.65	0.49	0.76			0.00	0.00			0.00	0.00															
	1001	1002	0.82	0.65	1.48	2.19			0.00	0.76			0.00	0.00			0.00	0.00	10.50	74.95	101.65	119.14	174.15	241	450	450	CONC	1.70	70.5	371.7	2.34	0.50	0.65
To STREET 5, Pipe 1002 - 1006						2.19				0.76				0.00				0.00	11.00														
	1009	1010	0.14	0.65	0.25	0.25			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	19	300	300	PVC	0.35	23.5	57.2	0.81	0.48	0.34
	1010	1012	1.18	0.65	2.13	2.39			0.00	0.00			0.00	0.00			0.00	0.00	10.48	75.00	101.70	119.21	174.25	179	675	675	CONC	0.30	61.0	460.4	1.29	0.79	0.39
To STREET 6, Pipe 1012 - 1013						2.39				0.00				0.00				0.00	11.27														
					0.00	0.00	0.06	0.65	0.11	0.11			0.00	0.00			0.00	0.00															
					0.00	0.00	0.13	0.65	0.23	0.34			0.00	0.00			0.00	0.00															
	4038	4039	0.52	0.65	0.94	0.94			0.00	0.34			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	108	450	450	CONC	0.25	42.0	142.6	0.90	0.78	0.76
					0.00	0.94	0.09	0.65	0.16	0.51			0.00	0.00			0.00	0.00															
	4039	4041	0.38	0.65	0.69	1.63			0.00	0.51			0.00	0.00			0.00	0.00	10.78	73.93	100.24	117.49	171.72	171	525	525	CONC	0.25	32.0	215.0	0.99	0.54	0.80
Contribution From BLOCK 1, Pipe 4040 - 4041						0.00				0.00				0.00				0.00	10.52					223									
					0.00	1.63	0.06	0.65	0.11	0.61			0.00	0.00			0.00	0.00															
	4041	4042	0.56	0.65	1.01	2.64			0.00	0.61			0.00	0.00			0.00	0.00	11.32	72.09	97.71	114.51	167.35	473	750	750	CONC	0.30	49.0	609.8	1.38	0.59	0.78
To STREET 19, Pipe 4042 - 4043						2.64				0.61				0.00				0.00	11.91					223									
					0.00	0.00	0.05	0.65	0.09	0.09			0.00	0.00			0.00	0.00															
	4024	4025	0.22	0.65	0.40	0.40			0.00	0.09			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	40	300	300	PVC	0.35	27.0	57.2	0.81	0.56	0.70
					0.00	0.40	0.03	0.65	0.05	0.14			0.00	0.00			0.00	0.00															
	4025	4026	0.11	0.65	0.20	0.60			0.00	0.14			0.00	0.00			0.00	0.00	10.56	74.73	101.34	118.79	173.63	59	375	375	PVC	0.30	25.0	96.0	0.87	0.48	0.62
					0.00	0.60	0.04	0.65	0.07	0.22			0.00	0.00			0.00	0.00															
	4026	4027	0.18	0.65	0.33	0.92			0.00	0.22			0.00	0.00			0.00	0.00	11.04	73.05	99.03	116.06	169.62	89	450	450	CONC	0.20	36.5	127.5	0.80	0.76	0.70
					0.00	0.92	0.04	0.65	0.07	0.29			0.00	0.00			0.00	0.00															
	4027	4028	0.16	0.65	0.29	1.21			0.00	0.29			0.00	0.00			0.00	0.00	11.79	70.54	95.58	112.00	163.67	113	450	450	CONC	0.25	34.5	142.6	0.90	0.64	0.79
To STREET 18, Pipe 4028 - 4029						1.21				0.29				0.00				0.00	12.44														
					0.00	0.00	0.06	0.65	0.11	0.11			0.00	0.00			0.00	0.00															
	5000	5001	0.55	0.65	0.99	0.99			0.00	0.11			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	88	375	375	PVC	1.00	35.5	175.3	1.59	0.37	0.50
	5001	5002			0.00	0.99			0.00	0.11			0.00	0.00			0.00	0.00	10.37	75.40	102.26	119.87	175.22	86	375	375	PVC	1.45	6.0	211.1	1.91	0.05	0.41
					0.00	0.99	0.10	0.65	0.18	0.29			0.00	0.00			0.00	0.00															
			0.39	0.65	0.70	1.70			0.00	0.29			0.00	0.00			0.00	0.00															
	5002	5004			0.00	1.70	0.93	0.65	1.68	1.97			0.00	0.00			0.00	0.00	10.43	75.21	102.00	119.56	174.76	329	525	525	CONC	0.95	67.5	419.2	1.94	0.58	0.78
Contribution From BLOCK 2, Pipe 5003 - 5004						0.00				0.00				0.00				0.00	10.31					352									
					0.00	1.70	0.07	0.65	0.13	2.10			0.00	0.00			0.00	0.00															
	5004	5005	0.22	0.65	0.40	2.10			0.00	2.10			0.00	0.00			0.00	0.00	11.01	73.15	99.16	116.22	169.86	713	750	750	CONC	0.65	42.5	897.6	2.03	0.35	0.79

Definitions:
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A = Areas in hectares (ha)
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R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 9 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha) 2 YEAR				AREA (Ha) 5 YEAR				AREA (Ha) 10 YEAR				AREA (Ha) 100 YEAR				FLOW						SEWER DATA							
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	Conc. (min)	2 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)	100 Year (mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
					0.00	2.10	0.08	0.65	0.14	2.24			0.00	0.00			0.00	0.00															
	5005	5007	0.23	0.65	0.42	2.51			0.00	2.24			0.00	0.00			0.00	0.00	11.35	71.97	97.54	114.31	167.06	751	750	750	CONC	0.75	32.0	964.1	2.18	0.24	0.78
To STREET 16, Pipe 5007 - 5012						2.51				2.24				0.00				0.00	11.60					352									
					0.00	0.00	0.08	0.00	0.00	0.00			0.00	0.00			0.00	0.00															
	4004	4005	0.21	0.65	0.38	0.38			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	29	300	300	PVC	0.50	27.5	68.4	0.97	0.47	0.43
					0.00	0.38	0.17	0.65	0.31	0.31			0.00	0.00			0.00	0.00															
	4005	4006	0.37	0.65	0.67	1.05			0.00	0.31			0.00	0.00			0.00	0.00	10.47	75.03	101.75	119.27	174.34	110	450	450	CONC	0.50	58.0	201.6	1.27	0.76	0.55
Contribution From STREET 2, Pipe 4003 - 4006						2.26				0.49				0.00				0.00	12.75														
					0.00	3.31	0.33	0.65	0.60	1.39			0.00	0.00			0.00	0.00															
	4006	4008	0.44	0.65	0.80	4.10			0.00	1.39			0.00	0.00			0.00	0.00	12.75	67.65	91.61	107.33	156.81	405	675	675	CONC	0.40	68.5	531.6	1.49	0.77	0.76
Contribution From BLOCK 16, Pipe 4007 - 4008						0.00				5.02				0.00				0.00	14.38														
	4008	4010			0.00	4.10			0.00	6.41			0.00	0.00			0.00	0.00	14.38	63.27	85.62	100.27	146.45	809	825	825	CONC	0.50	8.0	1015.0	1.90	0.07	0.80
Contribution From STREET 2, Pipe 4009 - 4010						0.47				0.00				0.00				0.00	11.29														
					0.00	4.57	0.11	0.65	0.20	6.61			0.00	0.00			0.00	0.00															
	4010	4011	0.48	0.65	0.87	5.44			0.00	6.61			0.00	0.00			0.00	0.00	14.45	63.10	85.38	99.99	146.04	908	900	900	CONC	0.50	63.5	1280.1	2.01	0.53	0.71
					0.00	5.44	0.47	0.65	0.85	7.46			0.00	0.00			0.00	0.00															
	4011	4012	0.78	0.65	1.41	6.85			0.00	7.46			0.00	0.00			0.00	0.00	14.98	61.82	83.64	97.94	143.03	1047	900	900	CONC	0.55	63.5	1342.6	2.11	0.50	0.78
					0.00	6.85	0.22	0.65	0.40	7.86			0.00	0.00			0.00	0.00															
	4012	4014	0.80	0.65	1.45	8.29			0.00	7.86			0.00	0.00			0.00	0.00	15.48	60.66	82.05	96.07	140.29	1148	975	975	CONC	0.45	101.0	1503.3	2.01	0.84	0.76
Contribution From BLOCK 3, Pipe 4013 - 4014						0.00				0.00				0.00				0.00	11.07					958									
					0.00	8.29	0.25	0.65	0.45	8.31			0.00	0.00			0.00	0.00															
	4014	4020	0.90	0.65	1.63	9.92			0.00	8.31			0.00	0.00			0.00	0.00	16.31	58.83	79.54	93.13	135.96	2203	1500	1500	CONC	0.15	116.0	2737.8	1.55	1.25	0.80
Contribution From STREET 2, Pipe 4019 - 4020						7.05				1.73				0.00				0.00	14.15														
					0.00	16.97	0.15	0.65	0.27	10.32			0.00	0.00			0.00	0.00															
	4020	4021	0.58	0.65	1.05	18.02			0.00	10.32			0.00	0.00			0.00	0.00	17.56	56.32	76.10	89.09	130.03	2758	1650	1650	CONC	0.15	102.5	3530.0	1.65	1.03	0.78
					0.00	18.02	0.05	0.65	0.09	10.41			0.00	0.00			0.00	0.00															
	4021	4022	0.53	0.65	0.96	18.97			0.00	10.41			0.00	0.00			0.00	0.00	18.60	54.41	73.49	86.02	125.53	2755	1650	1650	CONC	0.15	53.5	3530.0	1.65	0.54	0.78
			0.10	0.65	0.18	19.15			0.00	10.41			0.00	0.00			0.00	0.00															
					0.00	19.15	0.33	0.65	0.60	11.00			0.00	0.00			0.00	0.00															
	4022	4023	0.71	0.65	1.28	20.44			0.00	11.00			0.00	0.00			0.00	0.00	19.14	53.46	72.21	84.51	123.32	2845	1650	1650	CONC	0.20	25.0	4076.1	1.91	0.22	0.70
					0.00	20.44	0.04	0.65	0.07	11.07			0.00	0.00			0.00	0.00															
	4023	4028	0.17	0.65	0.31	20.74			0.00	11.07			0.00	0.00			0.00	0.00	19.35	53.09	71.70	83.91	122.45	2853	1650	1650	CONC	0.20	34.5	4076.1	1.91	0.30	0.70
To STREET 18, Pipe 4028 - 4029						20.74				11.07				0.00				0.00	19.66					958									
STREET 16																																	
					0.00	0.00	0.16	0.65	0.29	0.29			0.00	0.00			0.00	0.00															
	5014	5015	0.28	0.65	0.51	0.51			0.00	0.29			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	69	600	600	CONC	0.15	57.0	237.8	0.84	1.13	0.29
					0.00	0.51	0.32	0.65	0.58	0.87			0.00	0.00			0.00	0.00															
	5015	5016	0.60	0.65	1.08	1.59			0.00	0.87			0.00	0.00			0.00	0.00	11.13	72.72	98.58	115.53	168.85	201	675	675	CONC	0.15	108.5	325.6	0.91	1.99	0.62
To BLOCK 18, Pipe 5016 - 5017						1.59				0.87				0.00				0.00	13.12														
Contribution From BLOCK 17, Pipe 5018 - 5019						0.00				0.00				0.00				0.00	10.13					104									
	5019	5020			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.13	76.29	103.49	121.31	177.34	104	675	675	CONC	1.20	56.0	920.8	2.57	0.36	0.11
To WESLOCK WAY, Pipe 5020 - 228						0.00				0.00				0.00				0.00	10.50					104									
Contribution From STREET 1, Pipe 5005 - 5007						2.51				2.24				0.00				0.00	11.60					352									
Contribution From STREET 1, Pipe 5006 - 5007						0.61				1.19				0.00				0.00	10.49														
					0.00	3.13	0.08	0.65	0.14	3.58			0.00	0.00			0.00	0.00															
	5007	5012	0.52	0.65	0.94	4.07			0.00	3.58			0.00	0.00			0.00	0.00	11.60	71.17	96.44	113.01	165.15	986	900	900	CONC	0.55	93.0	1342.6	2.11	0.73	0.73
Contribution From STREET4, Pipe 5011 - 5012						2.19				0.34				0.00				0.00	11.92														
					0.00	6.25	0.11	0.65	0.20	4.12			0.00	0.00			0.00	0.00															
					0.00	6.25	0.17	0.65	0.31	4.43			0.00	0.00			0.00	0.00															
	5012	5013	0.76	0.65	1.37	7.63			0.00	4.43			0.00	0.00			0.00	0.00	12.33	68.87	93.30	109.31	159.71	1290	900	900	CONC	1.10	91.0	1898.7	2.98	0.51	0.68
					0.00	7.63	0.08	0.65	0.14	4.57			0.00	0.00			0.00	0.00															
					0.00	7.63	0.10	0.65	0.18	4.75			0.00	0.00			0.00	0.00															
	5013	5016	0.41	0.65	0.74	8.37			0.00	4.75			0.00	0.00			0.00	0.00	12.84	67.38	91.25	106.90	156.17	1349	975	975	CONC	1.10	47.0	2350.4	3.15	0.25	0.57
To BLOCK 18, Pipe 5016 - 5017						8.37				4.75				0.00				0.00	13.09					352									

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: 7000 Campeau Drive		
Checked: ADF	LOCATION: City of Ottawa		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 10 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

	LOCATION		AREA (Ha) 2 YEAR				AREA (Ha) 5 YEAR				AREA (Ha) 10 YEAR				AREA (Ha) 100 YEAR				FLOW						SEWER DATA							
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	Conc. (min)	2 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)	100 Year (mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
BLOCK 18																																
Contribution From STREET 16, Pipe 5013 - 5016						8.37				4.75				0.00				0.00	13.09					352								
Contribution From STREET 16, Pipe 5015 - 5016						1.59				0.87				0.00				0.00	13.12													
	5016	5017			0.00	9.96			0.00	5.62			0.00	0.00			0.00	0.00	13.12	66.60	90.18	105.64	154.33	1521	975	975	CONC	0.75	25.5	1940.8	2.60	0.16	0.78

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 11 OF 11

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Québec. QC

Attachment C

Model Results Summary

Table C1 : Major System Depth Velocity Summary

	100 Year 24Hr SCS			100 Year 3Hr Chicago		
Node	Max Depth (m)	Max Velocity (m/s)	Depth x Velocity (m^2/s)	Max Depth (m)	Max Velocity (m/s)	Depth x Velocity (m^2/s)
Maj-000	0.26	1.59	0.41	0.30	1.69	0.51
Maj-001	0.25	1.91	0.48	0.29	2.01	0.59
Maj-002	0.11	0.00	0.00	0.26	0.09	0.02
Maj-004	0.24	1.79	0.43	0.27	1.90	0.51
Maj-005	0.24	1.79	0.43	0.27	1.90	0.51
Maj-006	0.25	1.61	0.41	0.29	1.70	0.49
Maj-007	0.25	1.91	0.48	0.29	2.03	0.58
Maj-008	0.25	1.90	0.48	0.29	2.03	0.60
Maj-009	0.23	2.10	0.49	0.34	1.36	0.47
Maj-010	0.05	0.85	0.05	0.06	0.27	0.06
Maj-010	0.06	0.21	0.01	0.07	0.95	0.02
Maj-011	0.11	0.64	0.07	0.13	1.03	0.13
Maj-012	0.06	1.02	0.06	0.07	1.11	0.07
Maj-013	0.08	0.36	0.03	0.10	0.39	0.04
Maj-014	0.10	0.45	0.04	0.11	0.50	0.05
Maj-016	0.11	0.43	0.05	0.13	0.48	0.06
Maj-017	0.15	0.83	0.12	0.17	0.93	0.16
Maj-018	0.14	0.65	0.09	0.16	0.73	0.12
Maj-019	0.19	0.73	0.14	0.20	0.81	0.17
Maj-020	0.08	0.35	0.03	0.10	0.41	0.04
Maj-020	0.08	0.38	0.03	0.10	0.38	0.04
Maj-021	0.08	0.33	0.03	0.10	0.51	0.03
Maj-021	0.08	0.47	0.04	0.08	0.29	0.04
Maj-022	0.07	0.96	0.07	0.08	0.60	0.09
Maj-022	0.07	0.55	0.04	0.08	1.19	0.05
Maj-023	0.09	0.20	0.02	0.10	0.15	0.01
Maj-024	0.11	0.58	0.06	0.13	0.64	0.08
Maj-025	0.06	0.80	0.05	0.07	1.09	0.06
Maj-025	0.05	1.00	0.05	0.06	0.86	0.07
Maj-026	0.05	0.84	0.04	0.05	0.91	0.05
Maj-027	0.10	0.45	0.04	0.11	0.49	0.06
Maj-028	0.14	0.58	0.08	0.16	0.53	0.09
Maj-029	0.11	1.00	0.11	0.10	0.90	0.09
Maj-030	0.05	1.02	0.05	0.05	1.16	0.06
Maj-031	0.05	0.85	0.04	0.05	1.00	0.05
Maj-032	0.08	0.26	0.02	0.10	0.27	0.03
Maj-033	0.07	0.44	0.03	0.08	0.56	0.05
Maj-034	0.05	0.22	0.01	0.07	0.24	0.02
Maj-035	0.07	0.95	0.07	0.08	1.04	0.09
Maj-036	0.08	0.95	0.07	0.08	1.03	0.09
Maj-037	0.17	0.65	0.11	0.19	0.60	0.12
Maj-038	0.12	1.25	0.15	0.13	1.35	0.18
Maj-039	0.18	0.80	0.14	0.20	0.89	0.18
Maj-040	0.12	1.77	0.21	0.13	1.81	0.24
Maj-041	0.11	0.97	0.11	0.13	1.04	0.14
Maj-042	0.11	1.83	0.20	0.13	1.70	0.21

Table C1 : Major System Depth Velocity Summary

	100 Year 24Hr SCS			100 Year 3Hr Chicago		
Node	Max Depth (m)	Max Velocity (m/s)	Depth x Velocity (m^2/s)	Max Depth (m)	Max Velocity (m/s)	Depth x Velocity (m^2/s)
Maj-043	0.07	1.67	0.12	0.11	1.59	0.17
Maj-044	0.04	1.04	0.04	0.10	1.30	0.12
Maj-045	0.08	0.25	0.02	0.13	0.44	0.06
Maj-046	0.10	0.30	0.03	0.11	0.26	0.05
Maj-046	0.08	0.24	0.02	0.10	0.42	0.02
Maj-047	0.11	0.77	0.09	0.13	0.88	0.12
Maj-048	0.12	0.80	0.10	0.14	0.72	0.10
Maj-049	0.14	0.80	0.11	0.16	0.91	0.14
Maj-050	0.14	0.96	0.14	0.17	1.09	0.18
Maj-051	0.19	0.62	0.12	0.22	0.71	0.15
Maj-052	0.13	0.66	0.08	0.14	0.61	0.10
Maj-052	0.18	0.53	0.10	0.21	0.75	0.13
Maj-053	0.08	0.46	0.04	0.10	0.55	0.05
Maj-054	0.16	0.85	0.14	0.19	1.00	0.19
Maj-055	0.26	1.52	0.39	0.31	0.96	0.50
Maj-055	0.22	0.84	0.18	0.24	1.62	0.23
Maj-056	0.10	0.51	0.05	0.11	0.61	0.07
Maj-057	0.13	1.01	0.13	0.16	1.18	0.18
Maj-058	0.08	0.71	0.06	0.09	1.00	0.09
Maj-059	0.12	1.05	0.13	0.14	1.14	0.16
Maj-060	0.14	0.77	0.11	0.17	0.85	0.14
Maj-061	0.20	1.00	0.20	0.23	1.09	0.26
Maj-062	0.26	1.17	0.31	0.31	1.24	0.38
Maj-063	0.27	1.18	0.32	0.31	1.25	0.39
Maj-064	0.27	1.19	0.32	0.31	1.26	0.39
Maj-065	0.27	1.20	0.32	0.32	1.28	0.41
Maj-066	0.26	1.25	0.33	0.31	1.34	0.42
Maj-067	0.17	0.58	0.10	0.20	0.70	0.14
Maj-068	0.27	1.19	0.32	0.31	1.27	0.40
Maj-069	0.01	0.40	0.00	0.01	0.57	0.01
Maj-070	0.07	0.39	0.03	0.07	0.25	0.04
Maj-070	0.05	0.20	0.01	0.05	0.55	0.01
Maj-071	0.13	0.75	0.10	0.15	0.85	0.13
Maj-072	0.06	1.00	0.06	0.07	0.51	0.06
Maj-072	0.07	0.56	0.04	0.07	0.93	0.04
Maj-073	0.12	0.83	0.10	0.14	0.93	0.13
Maj-074	0.13	0.74	0.10	0.15	0.84	0.13
Maj-075	0.15	0.68	0.10	0.17	0.81	0.14
Maj-076	0.22	1.03	0.22	0.24	1.17	0.28
Maj-077	0.24	0.99	0.24	0.27	1.11	0.30
Maj-078	0.24	1.77	0.42	0.27	1.88	0.51
Maj-079	0.15	0.10	0.02	0.18	0.31	0.03
Maj-079	0.06	0.22	0.01	0.08	0.19	0.03
Maj-080	0.07	0.84	0.06	0.07	0.89	0.06
Maj-081	0.07	0.34	0.02	0.08	0.15	0.02
Maj-081	0.09	0.13	0.01	0.10	0.22	0.02

Table C1 : Major System Depth Velocity Summary

	100 Year 24Hr SCS			100 Year 3Hr Chicago		
Node	Max Depth (m)	Max Velocity (m/s)	Depth x Velocity (m^2/s)	Max Depth (m)	Max Velocity (m/s)	Depth x Velocity (m^2/s)
Maj-082	0.12	1.25	0.15	0.13	1.34	0.18
Maj-083	0.16	0.54	0.08	0.17	0.56	0.10
Maj-084	0.12	1.22	0.15	0.13	0.71	0.16
Maj-084	0.09	0.74	0.07	0.10	1.18	0.07
Maj-085	0.16	1.06	0.17	0.17	1.06	0.18
Maj-086	0.13	0.96	0.12	0.14	1.17	0.15
Maj-086	0.13	1.07	0.13	0.14	1.06	0.16
Maj-087	0.11	0.94	0.11	0.13	1.03	0.13
Maj-088	0.00	0.00	0.00	0.00	0.00	0.00
Maj-089	0.11	0.80	0.09	0.13	0.90	0.11
Maj-090	0.08	0.93	0.07	0.09	0.84	0.08
Maj-091	0.10	0.39	0.04	0.11	0.45	0.05
Maj-092	0.13	0.80	0.10	0.14	0.89	0.12
Maj-093	0.17	0.94	0.16	0.19	0.93	0.17
Maj-094	0.19	0.86	0.16	0.20	0.86	0.18
Maj-095	0.27	0.96	0.26	0.30	1.05	0.32
Maj-096	0.25	1.16	0.29	0.28	1.25	0.35
Maj-098	0.07	0.33	0.02	0.08	0.36	0.03
Maj-099	0.11	0.20	0.02	0.13	0.22	0.03
Maj-102	0.13	0.82	0.10	0.14	0.90	0.13
Maj-103	0.13	0.50	0.07	0.14	0.47	0.07
Maj-104	0.14	0.85	0.12	0.16	0.98	0.15
Maj-105	0.13	1.31	0.17	0.14	1.29	0.18
Maj-106	0.10	1.17	0.11	0.11	1.30	0.14
Maj-107	0.04	0.00	0.00	0.05	0.00	0.00
Maj-108	0.16	1.41	0.22	0.18	1.37	0.29
Maj-108	0.15	1.20	0.18	0.17	1.60	0.24
Maj-109	0.14	1.09	0.15	0.16	1.06	0.20
Maj-109	0.12	0.91	0.11	0.14	1.27	0.15
Maj-111	0.11	1.50	0.17	0.13	1.46	0.19
Maj-112	0.10	0.77	0.07	0.11	0.64	0.07
Maj-113	0.07	0.81	0.06	0.08	0.62	0.08
Maj-113	0.08	0.58	0.05	0.10	0.95	0.06
Maj-114	0.11	0.51	0.06	0.13	0.56	0.07
Maj-115	0.11	2.48	0.27	0.13	2.47	0.31
Maj-117	0.16	1.41	0.22	0.18	1.61	0.29
Maj-118	0.11	1.07	0.12	0.13	1.20	0.16
Maj-119	0.11	1.02	0.12	0.13	1.14	0.15
Maj-120	0.10	0.61	0.06	0.11	0.66	0.07
Maj-121	0.14	0.65	0.09	0.16	0.75	0.12
Maj-122	0.17	0.93	0.16	0.19	1.07	0.20
Maj-123	0.01	0.06	0.00	0.01	0.07	0.00
Maj-124	0.14	0.67	0.10	0.15	0.71	0.11
Maj-125	0.17	0.85	0.14	0.17	0.90	0.16
Maj-126	0.11	1.56	0.18	0.12	1.60	0.19
Maj-127	0.00	0.00	0.00	0.01	0.12	0.00

Table C1 : Major System Depth Velocity Summary

Node	100 Year 24Hr SCS Max Depth (m)	100 Year 24Hr SCS Max Velocity (m/s)	100 Year 24Hr SCS Depth x Velocity (m^2/s)	100 Year 3Hr Chicago Max Depth (m)	100 Year 3Hr Chicago Max Velocity (m/s)	100 Year 3Hr Chicago Depth x Velocity (m^2/s)
Maj-128	0.00	0.00	0.00	0.01	0.01	0.00
Maj-129	0.05	0.06	0.00	0.05	0.07	0.00
Maj-130	0.14	0.59	0.08	0.14	0.62	0.09
Maj-131	0.14	0.67	0.10	0.15	0.71	0.11
Maj-132	0.17	0.84	0.15	0.18	0.86	0.15
Maj-133	0.18	0.84	0.15	0.18	0.86	0.15
Maj-134	0.18	0.93	0.17	0.19	0.94	0.17
Maj-135	0.17	2.06	0.36	0.18	2.06	0.37
Maj-136	0.14	1.07	0.15	0.14	1.09	0.16
Maj-137	0.14	1.41	0.19	0.17	1.49	0.25
Maj-138	0.02	0.25	0.00	0.05	0.39	0.02
Maj-138	0.04	0.07	0.00	0.06	0.44	0.02
Maj-139	0.16	1.56	0.25	0.22	1.55	0.34
Maj-141	0.14	1.13	0.16	0.17	1.10	0.19
Maj-142	0.15	2.12	0.32	0.17	2.17	0.38
Maj-143	0.11	0.41	0.05	0.14	0.44	0.06
Maj-145	0.04	0.09	0.00	0.04	0.08	0.00
Maj-147	0.17	0.97	0.17	0.18	0.97	0.17
Maj-148	0.24	1.80	0.43	0.27	1.90	0.51
Maj-149	0.07	1.05	0.07	0.08	1.15	0.09
Maj-150	0.16	0.82	0.13	0.18	0.92	0.17
Maj-151	0.03	0.61	0.02	0.04	0.62	0.02
Maj-152	0.23	0.80	0.19	0.27	0.84	0.23
Maj-153	0.26	1.18	0.31	0.31	1.24	0.38
Maj-154	0.11	0.57	0.06	0.13	0.64	0.08
Maj-155	0.13	0.35	0.04	0.14	0.40	0.06
Maj-156	0.11	0.62	0.07	0.13	0.75	0.09
Maj-157	0.10	0.36	0.04	0.11	0.41	0.05
Maj-158	0.14	0.95	0.14	0.16	1.07	0.17
Maj-159	0.08	0.60	0.05	0.09	0.66	0.06
Maj-160	0.16	1.01	0.16	0.18	1.13	0.20
Maj-161	0.27	1.18	0.32	0.32	1.26	0.40
Maj-162	0.11	0.77	0.09	0.13	0.85	0.11
Maj-163	0.16	0.47	0.07	0.18	0.52	0.09
Maj-164	0.27	1.19	0.32	0.32	1.27	0.40
Maj-165	0.11	0.20	0.02	0.13	0.21	0.03
Maj-166	0.11	0.32	0.04	0.11	0.33	0.04
Maj-167	0.13	0.66	0.09	0.14	0.75	0.10
Maj-168	0.15	0.64	0.10	0.16	0.68	0.11
Maj-169	0.26	0.96	0.25	0.30	1.04	0.31
Maj-170	0.16	0.88	0.14	0.17	0.89	0.15
Maj-171	0.17	0.74	0.12	0.17	0.77	0.13
Maj-172	0.17	0.86	0.15	0.18	0.88	0.16
Maj-173	0.18	0.82	0.15	0.19	0.84	0.16
Maj-174	0.21	0.85	0.18	0.25	0.97	0.24
Maj-175	0.25	1.92	0.48	0.29	2.03	0.58

Table C1 : Major System Depth Velocity Summary

	100 Year 24Hr SCS			100 Year 3Hr Chicago		
Node	Max Depth (m)	Max Velocity (m/s)	Depth x Velocity (m^2/s)	Max Depth (m)	Max Velocity (m/s)	Depth x Velocity (m^2/s)
Maj-176	0.25	1.92	0.48	0.29	2.03	0.60
Maj-177	0.25	1.92	0.48	0.29	2.03	0.60
Maj-178	0.11	0.33	0.04	0.12	0.43	0.05
Maj-179	0.16	0.29	0.05	0.17	0.31	0.05
Maj-180	0.09	3.06	0.28	0.11	3.05	0.35
Average	0.13	0.86	0.13	0.15	0.93	0.16
Max	0.27	3.06	0.49	0.34	3.05	0.60

Table C2 : Minor System Freeboard Summary

Name	Invert (m)	Top of MH (m)	100 Year 24Hr SCS		100 Year 3 Hr Chicago	
			Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)
MH-1000	101.307	104.01	101.487	2.523	101.487	2.523
MH-1001	100.256	103.11	100.566	2.544	100.566	2.544
MH-1002	98.889	101.89	99.409	2.481	99.299	2.591
MH-1003	101.283	103.99	101.373	2.617	101.373	2.617
MH-1004	100.812	103.55	100.942	2.608	100.942	2.608
MH-1005	100.242	102.97	100.452	2.518	100.452	2.518
MH-1006	98.598	101.64	99.278	2.362	99.038	2.602
MH-1007	98.433	101.59	99.213	2.377	98.943	2.647
MH-1008	98.176	101.48	99.136	2.344	98.856	2.624
MH-1009	99.7	102.4	100.520	1.880	101.340	1.060
MH-1010	99.243	102.36	100.463	1.897	101.343	1.017
MH-1011	98.921	101.92	99.851	2.069	100.341	1.579
MH-1012	98.754	102.15	99.844	2.306	100.344	1.806
MH-1013	98.526	102.02	99.256	2.764	99.496	2.524
MH-1014	98.242	101.98	99.042	2.938	99.212	2.768
MH-1016	95.878	104.27	98.338	5.932	98.068	6.202
MH-1017	96.296	103.25	98.426	4.824	98.166	5.084
MH-1018	96.416	102.1	98.496	3.604	98.236	3.864
MH-1019	96.527	101.97	98.557	3.413	98.307	3.663
MH-1021	97.079	103.5	98.859	4.641	98.619	4.881
MH-1022	96.886	103.5	98.846	4.654	98.606	4.894
MH-1023	96.676	101.77	98.646	3.124	98.406	3.364
MH-1024	98.041	101.19	98.901	2.289	98.641	2.549
MH-1025	97.749	101.06	98.899	2.161	98.639	2.421
MH-1026	97.573	100.94	98.813	2.127	98.553	2.387
MH-1027	97.311	100.68	98.561	2.119	98.281	2.399
MH-1028	97.23	100.99	98.510	2.480	98.240	2.750
MH-1029	97.124	101.32	98.454	2.866	98.174	3.146
MH-1030	99.233	101.93	99.453	2.477	99.453	2.477
MH-1031	98.779	101.67	99.089	2.581	99.099	2.571
MH-1032	98.55	101.43	98.900	2.530	98.900	2.530
MH-1033	98.514	101.42	98.884	2.536	98.884	2.536
MH-1034	97.083	101.37	98.443	2.927	98.173	3.197
MH-1035	99.386	102.09	99.586	2.504	99.586	2.504
MH-1036	99.001	101.97	99.291	2.679	99.291	2.679
MH-1037	98.82	101.84	99.140	2.700	99.140	2.700
MH-1038	96.945	101.8	98.345	3.455	98.075	3.725
MH-1039	100.4	103.11	100.530	2.580	100.530	2.580
MH-1040	99.97	102.76	100.170	2.590	100.170	2.590
MH-1041	99.519	102.33	99.829	2.501	99.829	2.501
MH-1042	96.714	102.28	98.214	4.066	97.934	4.346
MH-1043	96.525	102.87	98.055	4.815	97.765	5.105
MH-1044	100.945	103.18	101.205	1.975	101.195	1.985

Table C2 : Minor System Freeboard Summary

Name	Invert (m)	Top of MH (m)	100 Year 24Hr SCS		100 Year 3 Hr Chicago	
			Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)
MH-1045	100.395	104.47	101.225	3.245	101.185	3.285
MH-1046	100.204	104.78	100.914	3.866	100.894	3.886
MH-1047	95.83	104.84	98.230	6.610	97.960	6.880
MH-1048	95.703	103.2	98.143	5.057	97.863	5.337
MH-1049	95.595	102.98	98.015	4.965	97.735	5.245
MH-1050	95.549	103.08	97.999	5.081	97.709	5.371
MH-1051	95.364	103.96	97.784	6.176	97.504	6.456
MH-1052	95.163	103.44	97.533	5.907	97.243	6.197
MH-1053	99.839	103.12	100.149	2.971	100.159	2.961
MH-1054	95.132	103.4	97.512	5.888	97.232	6.168
MH-1055	95.07	103.31	97.440	5.870	97.160	6.150
MH-1056	94.916	102.9	97.236	5.664	96.946	5.954
MH-1057	94.752	102.46	96.982	5.478	96.722	5.738
MH-1058	94.714	102.46	96.974	5.486	96.724	5.736
MH-1059	94.573	102.39	96.973	5.417	96.723	5.667
MH-1060	93.933	102.31	96.973	5.337	96.723	5.587
MH-1061	93.82	101.03	96.970	4.060	96.730	4.300
MH-1062	95	97.1	95.230	1.870	95.220	1.880
MH-1063	94.635	96.99	94.905	2.085	94.895	2.095
MH-1064	94.536	96.87	94.806	2.064	94.796	2.074
MH-1065	94.414	96.7	94.704	1.996	94.674	2.026
MH-1066	94.274	96.51	94.694	1.816	94.664	1.846
MH-1067	94.128	96.37	94.668	1.702	94.648	1.722
MH-1068	94.034	96.55	94.654	1.896	94.634	1.916
MH-2000	97.35	98.9	98.000	0.900	97.880	1.020
MH-2001	96.894	100.63	97.764	2.866	97.754	2.876
MH-2002	96.624	100.54	97.764	2.776	97.754	2.786
MH-2003	96.77	98.95	98.270	0.680	98.120	0.830
MH-2004	96.16	100.36	97.710	2.650	97.780	2.580
MH-2005	96.006	100.11	97.656	2.454	97.686	2.424
MH-2006	95.85	99.93	97.590	2.340	97.590	2.340
MH-2007	95.723	99.79	97.543	2.247	97.503	2.287
MH-2008	95.847	99.93	97.517	2.413	97.407	2.523
MH-2009	95.271	99.72	97.511	2.209	97.461	2.259
MH-2010	94.92	99.71	97.500	2.210	97.410	2.300
MH-2011	96.657	98.77	97.747	1.023	97.567	1.203
MH-2012	95.961	99.99	97.631	2.359	97.461	2.529
MH-2013	96.257	101.04	97.517	3.523	97.407	3.633
MH-2014	96.163	100.96	97.523	3.437	97.403	3.557
MH-2015	95.746	100.75	97.516	3.234	97.406	3.344
MH-2016	95.552	100.06	97.502	2.558	97.412	2.648
MH-2017	95.371	99.98	97.501	2.479	97.411	2.569
MH-2018	95.726	99.71	97.506	2.204	97.406	2.304

Table C2 : Minor System Freeboard Summary

Name	Invert (m)	Top of MH (m)	100 Year 24Hr SCS		100 Year 3 Hr Chicago	
			Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)
MH-2019	95.25	99.47	97.500	1.970	97.410	2.060
MH-2020	94.572	99.71	97.502	2.208	97.402	2.308
MH-2021	94.462	99.71	97.502	2.208	97.402	2.308
MH-2022	95.5	98.19	95.790	2.400	95.780	2.410
MH-2023	94.374	97.88	94.874	3.006	94.864	3.016
MH-4000	101.487	104.36	102.097	2.263	102.077	2.283
MH-4001	101.194	104.21	101.954	2.256	101.934	2.276
MH-4002	100.996	104.12	101.866	2.254	101.846	2.274
MH-4003	100.891	104.09	101.821	2.269	101.801	2.289
MH-4004	101.558	104.36	101.788	2.572	101.768	2.592
MH-4005	101.261	104.22	101.771	2.449	101.751	2.469
MH-4006	100.668	103.92	101.678	2.242	101.668	2.252
MH-4007	100.59	102.33	101.850	0.480	101.830	0.500
MH-4008	100.242	103.57	101.482	2.088	101.472	2.098
MH-4009	100.998	103.81	101.388	2.422	101.378	2.432
MH-4010	100.12	103.53	101.410	2.120	101.380	2.150
MH-4011	99.772	103.2	100.962	2.238	100.952	2.248
MH-4012	99.343	102.88	100.383	2.497	100.373	2.507
MH-4014	97.703	102.36	99.533	2.827	99.513	2.847
MH-4015	100.656	103.76	101.056	2.704	101.056	2.704
MH-4016	100.003	103.18	100.493	2.687	100.483	2.697
MH-4017	99.413	102.66	100.023	2.637	100.013	2.647
MH-4018	98.865	102.15	99.675	2.475	99.665	2.485
MH-4019	98.734	102.09	99.584	2.506	99.574	2.516
MH-4020	97.454	101.77	99.274	2.496	99.254	2.516
MH-4021	97.199	101.35	99.039	2.311	99.029	2.321
MH-4022	97.089	101.33	98.879	2.451	98.859	2.471
MH-4023	97.009	101.31	98.769	2.541	98.759	2.551
MH-4024	98.5	101.3	98.690	2.610	98.690	2.610
MH-4025	98.33	101.3	98.560	2.740	98.570	2.730
MH-4026	98.18	101.3	98.510	2.790	98.520	2.780
MH-4027	98.077	101.33	98.467	2.863	98.467	2.863
MH-4028	96.791	101.3	98.121	3.179	98.111	3.189
MH-4029	96.736	101.21	97.996	3.214	97.986	3.224
MH-4030	96.663	101.01	97.863	3.147	97.853	3.157
MH-4031	96.516	100.8	97.716	3.084	97.716	3.084
MH-4032	96.229	100.53	97.439	3.091	97.439	3.091
MH-4033	95.871	100.22	97.081	3.139	97.111	3.109
MH-4034	98.31	101.12	98.460	2.660	98.460	2.660
MH-4035	97.564	100.39	97.754	2.636	97.754	2.636
MH-4036	97.411	100.25	97.651	2.599	97.651	2.599
MH-4037	95.491	99.79	96.891	2.899	96.941	2.849
MH-4038	98.282	101.23	98.572	2.658	98.572	2.658

Table C2 : Minor System Freeboard Summary

Name	Invert (m)	Top of MH (m)	100 Year 24Hr SCS		100 Year 3 Hr Chicago	
			Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)
MH-4039	98.102	101.3	98.442	2.858	98.442	2.858
MH-4040	98.53	101.99	98.950	3.040	98.950	3.040
MH-4041	97.57	101.36	98.190	3.170	98.190	3.170
MH-4042	97.352	101.3	97.872	3.428	97.872	3.428
MH-4043	96.847	100.13	97.337	2.793	97.337	2.793
MH-4044	96.629	99.92	97.209	2.711	97.209	2.711
MH-4045	95.173	99.43	96.703	2.727	96.773	2.657
MH-4046	95.057	99.15	96.597	2.553	96.677	2.473
MH-4047	94.921	98.81	96.461	2.349	96.541	2.269
MH-4048	94.793	98.49	96.323	2.167	96.423	2.067
MH-4049	94.642	98.09	96.152	1.938	96.282	1.808
MH-4050	94.434	97.5	95.954	1.546	96.074	1.426
MH-4051	94.163	96.54	95.973	0.567	95.753	0.787
MH-4052	94	97.64	95.960	1.680	95.750	1.890
MH-4053	93.695	95.74	93.905	1.835	93.895	1.845
MH-5000	100.375	103.25	100.465	2.785	100.475	2.775
MH-5001	99.99	102.9	100.070	2.830	100.090	2.810
MH-5002	99.315	102.78	99.615	3.165	99.625	3.155
MH-5003	98.995	101.26	99.405	1.855	99.405	1.855
MH-5004	98.443	101.76	99.103	2.657	99.013	2.747
MH-5005	97.987	101.42	99.077	2.343	98.847	2.573
MH-5006	98.148	101.2	98.978	2.222	98.678	2.522
MH-5007	97.7	101.15	98.850	2.300	98.670	2.480
MH-5008	98.644	101.515	99.564	1.951	99.434	2.081
MH-5009	98.309	101.34	99.289	2.051	99.159	2.181
MH-5010	98.021	101.195	99.211	1.984	99.091	2.104
MH-5011	97.637	100.93	98.947	1.983	98.827	2.103
MH-5012	97.125	100.6	98.605	1.995	98.385	2.215
MH-5013	96.088	99.53	97.518	2.012	97.328	2.202
MH-5014	95.44	97.25	97.030	0.220	96.770	0.480
MH-5015	95.354	97.69	97.004	0.686	96.724	0.966
MH-5016	94.891	98.92	96.731	2.189	96.611	2.309
MH-5017	94.625	98.23	96.915	1.315	96.495	1.735
MH-5018	94.7	96.96	94.940	2.020	94.930	2.030
MH-5019	94.06	97.24	94.260	2.980	94.250	2.990
MH-6000	94.805	97.1	95.285	1.815	95.435	1.665
MH-6001	94.646	96.99	95.226	1.764	95.366	1.624
MH-6002	94.503	96.87	95.173	1.697	95.333	1.537
MH-6003	94.259	96.7	95.129	1.571	95.329	1.371
MH-6004	94.054	96.39	95.054	1.336	95.274	1.116
MH-6005	93.947	96.26	95.007	1.253	95.187	1.073
MH-6006	93.792	96.11	94.952	1.158	95.092	1.018
MH-6007	93.64	95.9	94.860	1.040	94.970	0.930

Table C2 : Minor System Freeboard Summary

Name	Invert (m)	Top of MH (m)	100 Year 24Hr SCS		100 Year 3 Hr Chicago	
			Max HGL (m)	Freeboard (m)	Max HGL (m)	Freeboard (m)
MH-6008	93.462	95.7	95.162	0.538	94.802	0.898
MH-6009	93.243	95.45	94.673	0.777	94.543	0.907
MH-6010	93.169	95.39	94.529	0.861	94.469	0.921
MH-6011	93.04	95.34	94.430	0.910	94.400	0.940
MH-6012	93.393	94.81	94.163	0.647	94.123	0.687
MH-6013	93.235	95.08	94.205	0.875	94.115	0.965
MH-6014	92.758	95.18	94.208	0.972	94.118	1.062
MH-6015	92.71	95.5	94.170	1.330	94.080	1.420
MH-6016	92.496	97.25	93.886	3.364	93.826	3.424
MH-6018	93.852	101.47	96.972	4.498	96.732	4.738
MH-6020	98.979	101.62	99.049	2.571	99.049	2.571
			Average	2.641	Average	2.700
			Min	0.220	Min	0.480

Table C3 : Existing Upstream Minor System HGL Summary

		Existing Condition			Proposed Condition			Difference		
STM ID	Location	5 Year Chicago 3Hr [1]	100 Year Chicago 3Hr [2]	100 Year SCS 24Hr [3]	5 Year Chicago 3Hr [4]	100 Year Chicago 3Hr [5]	100 Year SCS 24Hr [6]	5 Year Chicago 3Hr [4]-[1]	100 Year Chicago 3Hr [5]-[2]	100 Year SCS 24Hr [6]-[3]
MHST12451	Campeau Drive West	98.84	99.18	99.18	98.55	98.94	99.17	-0.29	-0.24	-0.01
MHST12845	Hodgson Court	102.50	102.83	102.85	101.73	102.30	102.31	-0.77	-0.53	-0.54
MHST13136	Sherring Court	101.05	102.26	102.26	99.43	100.25	100.30	-1.63	-2.02	-1.96
MHST11761	Langford Crescent	100.35	100.64	100.66	100.00	100.32	100.32	-0.35	-0.32	-0.35
MHST12871	Kenins Crescent	100.49	100.79	100.81	100.38	100.76	100.75	-0.10	-0.02	-0.06
MHST11678	Goulding Crescent	97.88	99.04	99.16	97.69	98.12	98.30	-0.19	-0.92	-0.86
MHST11682	Shaughnessy Crescent North	97.83	99.13	99.17	97.51	98.06	98.24	-0.32	-1.06	-0.93
MHST11661	Shaughnessy Crescent South	97.968	98.76	98.83	97.646	98.60	98.76	-0.32	-0.16	-0.07
MHST12204*	Rosenfeld Crescent	98.27	98.75	98.78	98.29	98.66	98.72	0.02	-0.10	-0.06
MHST12962	Stonecroft Terrace	101.88	102.09	102.04	101.79	101.90	101.89	-0.09	-0.19	-0.15
MHST01107*	Campeau Drive East	101.87	102.04	102.06	101.90	102.05	102.06	0.03	0.01	0.01

*Increases in HGL due to increases in drainage area of the existing external development in the proposed conditions model, not due to HGL constrictions of the downstream minor system.

Table C4 : Existing Downstream Minor System HGL Summary

STM ID	Location	Description	Existing Condition			Proposed Condition			Difference		
			5 Year Chicago 3Hr [1]	100 Year Chicago 3Hr [2]	100 Year SCS 24Hr [3]	5 Year Chicago 3Hr [4]	100 Year Chicago 3Hr [5]	100 Year SCS 24Hr [6]	5 Year Chicago 3Hr [4]-[1]	100 Year Chicago 3Hr [5]-[2]	100 Year SCS 24Hr [6]-[3]
MHST11730	Knudson Drive	D/S SWMF Ponds 1 & 2	93.29	94.09	94.13	93.13	93.93	94.02	-0.15	-0.16	-0.11
MHST11789	Weslock Way	D/S SWMF 3	93.08	93.65	93.69	93.01	93.62	93.68	-0.07	-0.03	-0.01
MHST11927	Weslock Way	D/S Pond outlets 4 & 5	92.55	92.55	93.12	92.55	92.55	93.12	0.00	0.00	0.00
MHST11787	Beaverbrook Road	Connection to Beaverbrook Storm	92.94	93.37	93.40	92.90	93.35	93.39	-0.04	-0.01	-0.01