Ganatchio Gardens Inc.

Official Plan and Zoning By-Law Amendments

Stormwater Management Report

Southwest Corner of Florence Avenue & Wyandotte Street East

Windsor, Ontario

June 2022, Revised March 2023 – 21-1691

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1.0 Introduction

Dillon Consulting Limited (Dillon) has been retained by Ganatchio Gardens Inc. to complete the detailed design for a proposed multi-storey residential development in the City of Windsor. This Stormwater Management Report has been prepared to support the detailed design of the proposed development.

The proposed development consists of 275 multi-unit residential buildings and 28 townhome residential buildings. The total site area is 3.30 ha (8.15 ac) and is located in the City of Windsor at the south west corner of Wyandotte Street and the proposed Florence Avenue extension. The proposed development will drain into the existing 1.95 m diameter storm sewer main along the west boundary of the site that conveys flows south and drains into a storm water management pond south west of the development site. Under existing conditions, the site is undeveloped and consists of grassed land cover. The general slope of the ground directs flows northwards. The location and the layout of the site boundary is shown in Figure 1 and the site plan is in Appendix A

Figure 1: Project Site Location

The purpose of this report is to assess the storm water management requirements for the proposed development while restricting the peak outflow from the site to an allowable release rate. Storage on-site is to be recommended to attenuate peak flow rates for all events, including the governing 1:100 year event and the Urban Stress Test.

1.1 Background

In 2018, Dillon completed a storm water assessment study of the North Neighbourhood Development for the City of Windsor (the City). The details of the previously completed study can be found in the North Neighbourhood Development Storm Water Management Analysis Report (Dillon 2018). The current development was part of the ultimate future build out area considered in the 2018 study. As such, the currently proposed development was assessed to the North Neighbourhood SWM Pond and the Wyandotte Street storm sewer.

1.2 SWM Design Criteria

Design criteria for the stormwater design and servicing were based on review of the following reference documents:

- Stormwater Management Planning and Design Manual (Ministry of the Environment [MECP], 2003);
- Windsor/Essex Region Stormwater Management Standards Manual (WERSMSM) (2018); and
- North Neighbourhood Stormwater Management Study (Dillon, 2018).

The corresponding criteria are described below.

1.2.1 Quantity Control

1.2.1.1 Minor System Conveyance

Hydraulic Grade Lines in the minor system have been assessed for the 1:5 year 4 hour storm (with 15 minute time intervals and using the Chicago distribution). Storm sewers have been designed to allow minimal surcharging, where the HGL is below the lowest catch-basin (CB) grate elevation.

1.2.1.2 Climate Change Resiliency Assessment

The stormwater management system's performance has been examined under conditions more intense than the 1:100 year design storm event to assess potential impacts of climate change and the system's resiliency using the Urban Stress Test design storm event. As far as possible, provided surrounding grades allow, the site grading is designed to contain the runoff generated from this design storm event without overflowing onto neighbouring properties or right-of-way (ROW).

The following design storm events were used for the analysis:

- 1:5 year 4 hour design storm using Chicago distribution with a 15 minute time interval and a total rainfall depth of 49.5 mm.
- 1:100 year 4 hour design storm using Chicago distribution with 15 minute time interval with a total rainfall depth of 81.6 mm. Used to assess the major system HGL corresponds to a maximum surface ponding of 0.3 m depth.
- 1:100 year 24 hour design storm using SCS Type-II distribution with a 2 hour time interval and a total rainfall depth of 108 mm. Used to assess the major system HGL corresponds to a maximum surface ponding of 0.3 m depth.
- 1:100 year 24 hour design storm using Chicago distribution with 15 minute time interval and an additional 42 mm uniformly distributed, with a total rainfall depth of 150 mm - Urban Stress Test Storm.

1.2.2 Quality Control

Since the subject development lands result in an increase in paved surface in the development area, measures have to be undertaken to treat the quality of the stormwater runoff being discharged into receiving watercourses/sewers. Stormwater quality treatment will be provided using an oil-grit separator (OGS) positioned upstream of the outlet storm sewer. The OGS unit is designed to meet the Ministry of Environment, Conservation and Parks (MECP) design requirements for 70% TSS removal (normal level of protection).

2.0 Allowable Release Rate

The subject development lands were assessed to the Wyandotte Street storm sewer in the 2018 North Neighbourhood Study. In the proposed conditions PCSWMM model set up as part of this study, the development lands were included with an imperviousness percentage of 55%.

As such, the release rate of the proposed site was estimated considering a percentage imperviousness of 55% in the modelling analysis. The estimated maximum allowable stormwater flow release rates for the subject site is 457 L/s. This is the 1:5 year, 4 hour design storm event, post-development peak flow rate from the subject site.

In order to prevent any adverse impacts on the downstream system due to the proposed development, the maximum flow rate from the site is expected to be maintained at or below the allowable release rate for all events up to and including the 1:100 year event.

2.1 Downstream Capacity Analysis

The PCSWMM model developed as part of the North Neighbourhood Stormwater Management Study (Dillon, 2018) was utilized to determine upstream and downstream impacts on the Wyandotte Street storm sewer system. The model was simulated using the 1:100 year 4 hour, 1:100 year 24 hour and the 1:5 year, 4 hour design storm events, with and without the inflow from the proposed development. Comparing the Hydraulic Grade Lines (HGLs) along Wyandotte, there was no observed increase in HGLs during the 1:5 year or the 1:100 year event simulations.

This is understood to be because the flows from the proposed development are a much smaller value compared to the peak flows in the larger Wyandotte Street storm sewer. Additionally, the proposed development is near the downstream end of the Wyandotte Street storm sewer system. The peak flow from the development occurs before the peak flows and HGLs in the Wyandotte St storm sewer occur due to a larger upstream drainage area of the 1.95 m diameter storm sewer on Wyandotte Street.

Therefore, it was concluded that the release rate from the proposed site will not have a significant impact on the receiving sewer system. Profiles of the Wyandotte Street sewer showing HGLs in the sewer, with and without the new development inflow, are included in Appendix C

3.0 Proposed Condition Analysis

3.1 Proposed Condition Hydrologic Assessment

Under proposed conditions, the 3.3 ha site area consists of 275 multi-unit residential buildings and 28 townhome residential buildings. Sub catchment attributes for the proposed development were selected based on the ERCA SWM standard and are summarized in below Table 1. Additional details of the modelling parameters and other model details for proposed conditions are provided in Appendix B

Table 1: Post Development Sub-Catchment Parameters for the Site

Attribute	Development
Land Use	Residential
Area (ha)	3.3
Flow Length* (m)	340
Imperviousness (%)	90
Slope (%)	1
Manning's n Impervious	0.013
Manning's n Pervious	0.24
Depression Storage Impervious (mm)	2.5
Depression Storage Pervious (mm)	7.5
Maximum Infiltration Rate (mm/hr)	75
Minimum Infiltration Rate (mm/hr)	0.5
Decay Constant (mm/hr)	4
Drying Time (days)	7

*Maximum flow path to outlet

3.1.1 Tail Water Conditions

The impact of downstream tailwater conditions occurring due to high Hydraulic Grade Line (HGL) elevations in the receiving Wyandotte Street storm sewer, on the site's stormwater management system was accounted for in the PCSWMM model. Head time-series were extracted from the North Neighbourhood Model for the 1:5 year, 4 hour; 1:100 year, 4 hour; 1:100 year, 24 hour and UST events, for the node MH 6R3879. These time-series were then applied to the outfall node in the proposed condition PCSWMM model to represent tail water conditions.

The head time series used to simulate tailwater conditions for different storm events are shown in Figure 2.

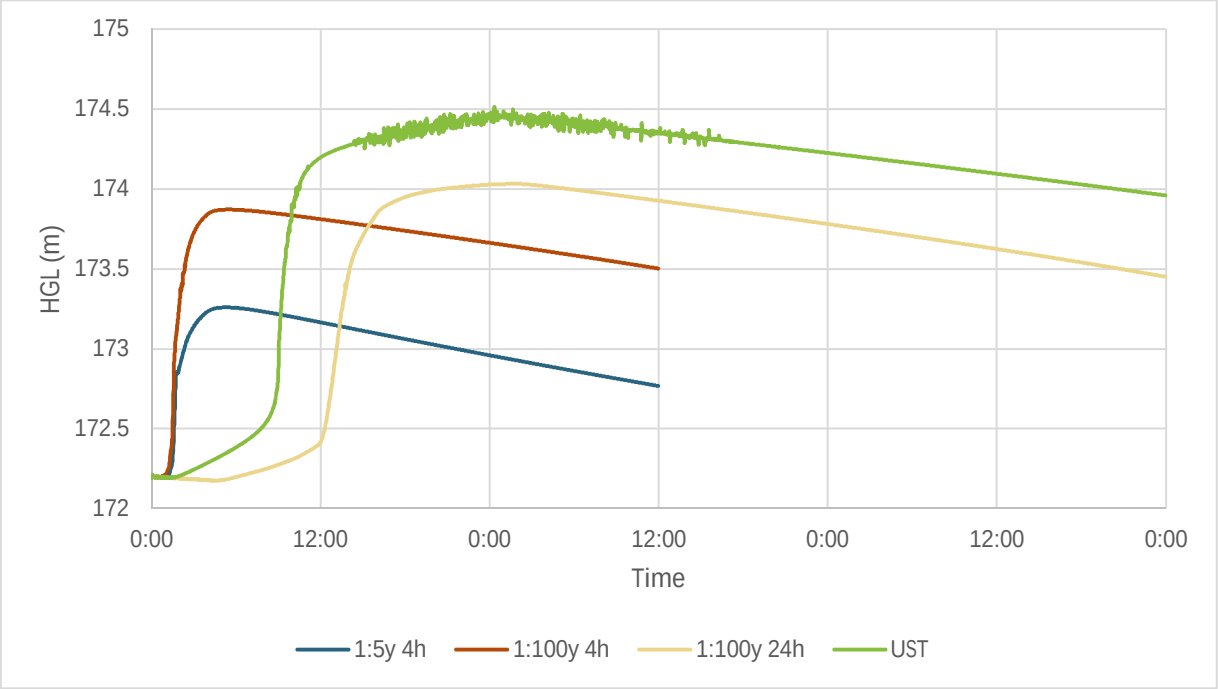


Figure 2: TW Time series for different storm events

3.2 Quantity Control

Stormwater storage on the site is proposed in the parking lot at catch-basin (CB) locations. A 675 mm diameter pipe and 480 mm circular orifice is proposed from the site to the outlet node (6R3879) to restrict the flow within the allowable rate.

The parking lot areas will be graded to include local sags at catch basin locations to allow for surface ponding during large storm events. Storage in the storm sewers and sewer structures has been taken into account in this analysis and incorporated into the stage-storage curve used to simulate on-site storage in the model.

The proposed condition model was simulated for different storm events. A summary of the surface storage depth and the on-site storage volume, along with the release rate for different storm event simulations is provided in below Table 2.

Table 2: Onsite Storage Depth, Storage Volume and Release for different Storms

Storm Type	Release Rate (m^3/s)	Surface Storage Depth (m)	Storage Volume (m^3)
1:5 year 4 hour Chicago	0.41	0	540
1:100 year 4 hour Chicago	0.45	0.18	980
1:100 year 24 hour SCS Type-II	0.22	0	510
Urban Stress Test	0.45	0.20	1082

Based on the modelling analysis summarized in Table 2, it is observed that the available surface storage provides adequate storage for the site to restrict the flow rate within the allowable release rate and restrict estimated surface ponding depth to less than 0.3 m during 1:100 year storm events.

From the above table, it is also observed that the 1:100 year, 4 hour storm (Chicago) event is the governing 1:100 year return period event regarding storage requirements. The maximum volume of storm water estimated to be stored on-site is 980 m^3, during the 1:100 year simulation. This corresponds to a maximum surface ponding depth of 0.18 m at CB locations. The details of the model inputs and outputs are provided in Appendix B

The Urban Stress Test (UST) storm event was also simulated to account for impacts of climate change. The estimated depth of storage during the UST event simulation shown in Table 3 is higher than the maximum estimated depth during the governing 1:100 year simulation and is estimated to be 0.20 m from the lowest CB grate elevation.

The flow from the site is conveyed via a 675 mm diameter conduit to the outfall (6R3879) of the Wyandotte Street East storm sewer system. Additionally, a 480 mm circular orifice is required to restrict the flow within the allowable limit.

3.3 Quality Control

As discussed in Section 1.2.2, the site will be required to meet Normal Protection Level water quality treatment (70% TSS removal). It is proposed that an oil and grit separator (OGS) unit be used to meet this target. The FD-4HC model supplied by ADS, or approved equivalent is recommended for this site. The details of this OGS sizing is provided in Appendix D

4.0 Conclusions

The stormwater management design for the proposed development meets the established SWM criteria for the overall site, and no negative impacts due to the site development are anticipated in the existing system.

Based on the analysis performed, the conclusions are listed as follows:

- The allowable release rate for this proposed development is estimated to be 0.457 m^3/s. This is based on a 1:5 year post-development release from the development area, assuming a post-development percentage imperviousness of 55% for the site.
- Available parking lot storage and pipe storage is adequate for the site to restrict the flow within the allowable release rate during the 1:100 year storm event simulation without surface ponding exceeding 0.30 m.
- A 675 mm diameter circular pipe and 480 mm diameter circular orifice is proposed at the outlet to provide flow restriction for maintaining outflow within the allowable release rate.
- On-site storage volume of 980 m^3 is required for the 1:100 year event to restrict flows from the site to the allowable release rate. This corresponds to a maximum estimated surface ponding depth of 0.18 m during this simulation.
- From the outlet capacity assessment analysis, no significant change in HGLs in the Wyandotte Street storm sewers, downstream of the development, is observed. Therefore, no negative impact to the hydraulic conditions of the downstream municipal sewer is expected due to the proposed development.
- Water quality control will be achieved through the use of an FD-4HC OGS unit to achieve 70% TSS removal over an average annual basis.

This report is respectfully submitted for review and approval. Should you have any questions, we would be pleased to discuss the results of our evaluation in further detail.

Yours sincerely,

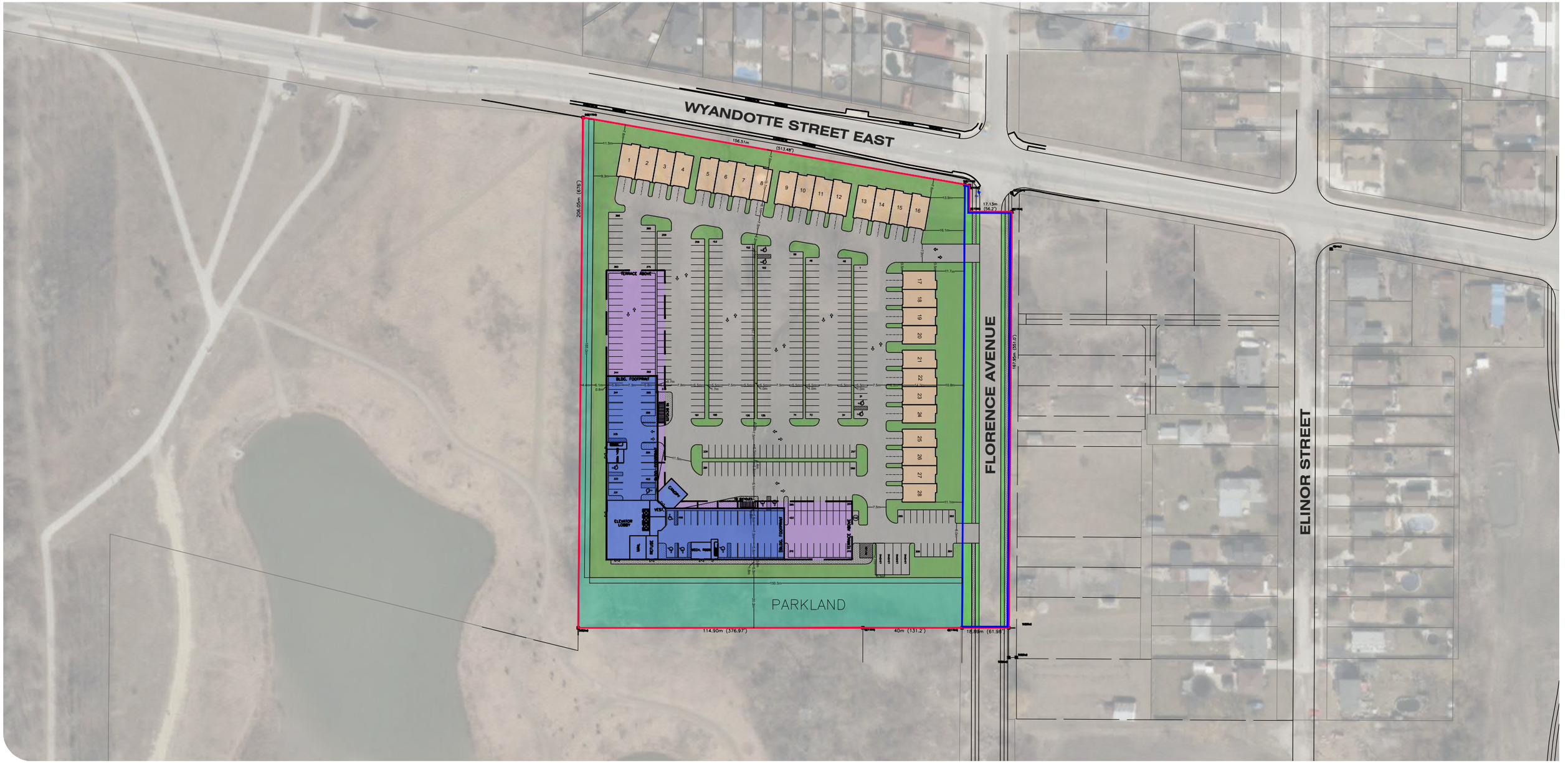
DILLON CONSULTING LIMITED

Aakash Bagchi, P.Eng. M.Eng.,
Water Resources Engineer

Monika Saha, EIT
Water Resources Designer

Appendix A

Ganatchio Garden Site Plan



GANATCHIO GARDENS INC.
WYANDOTTE STREET EAST
AT FLORENCE AVENUE

CONCEPTUAL DEVELOPMENT PLAN
FEBRUARY 16, 2023

SUBJECT AREA (± 3.30ha / 8.15ac)

LAND CONVEYANCE (± 0.32ha / 0.79ac)

PROPOSED TOWNHOME UNITS (28 UNITS)

PROPOSED PARKLAND

PROPOSED MULTI-UNIT RESIDENTIAL BUILDING (275 UNITS)

PROPOSED LANDSCAPING

PROPOSED ELEVATED TERRACE

PROPOSED SIDEWALK

UNIT COUNT

MULTI- UNIT RESIDENTIAL:	275 units
TOWNHOME:	28 units
TOTAL:	303 units

PARKING COUNT:

PARKING MULTI-UNIT:	: 432 SPACES
TOWNHOME (GARAGE, 2 / UNIT)	: 56 SPACES
TOWNHOME (SURFACE, 2 / UNIT)	: 56 SPACES
TOTAL	: 544 SPACES

PARKING DETAILS:

PARKING/UNIT RATIO (MULTI-UNIT)	: 1.57 SPACES / UNIT
PARKING/UNIT RATIO (TOWNHOME) (GARAGE + SURFACE PARKING)	: 4 SPACES / UNIT
LOADING SPACES	: 4 SPACES
ACCESSIBLE SPACES PROVIDED (TYPE A/TYPE B)	: 12 SPACES

File Location:
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February, 16, 2023 3:08 PM

SOURCE: THE COUNTY OF ESSEX INTERACTIVE MAPPING (2019)

MAP/DRAWING INFORMATION
THIS DRAWING IS FOR INFORMATION PURPOSES ONLY. ALL DIMENSIONS AND BOUNDARY INFORMATION SHOULD BE VERIFIED BY AN O.L.S PRIOR TO CONSTRUCTION.
CREATED BY: MRU
CHECKED BY: MAM
DESIGNED BY: MRU

SCALE: 1:1500 (11x17)

N W E S

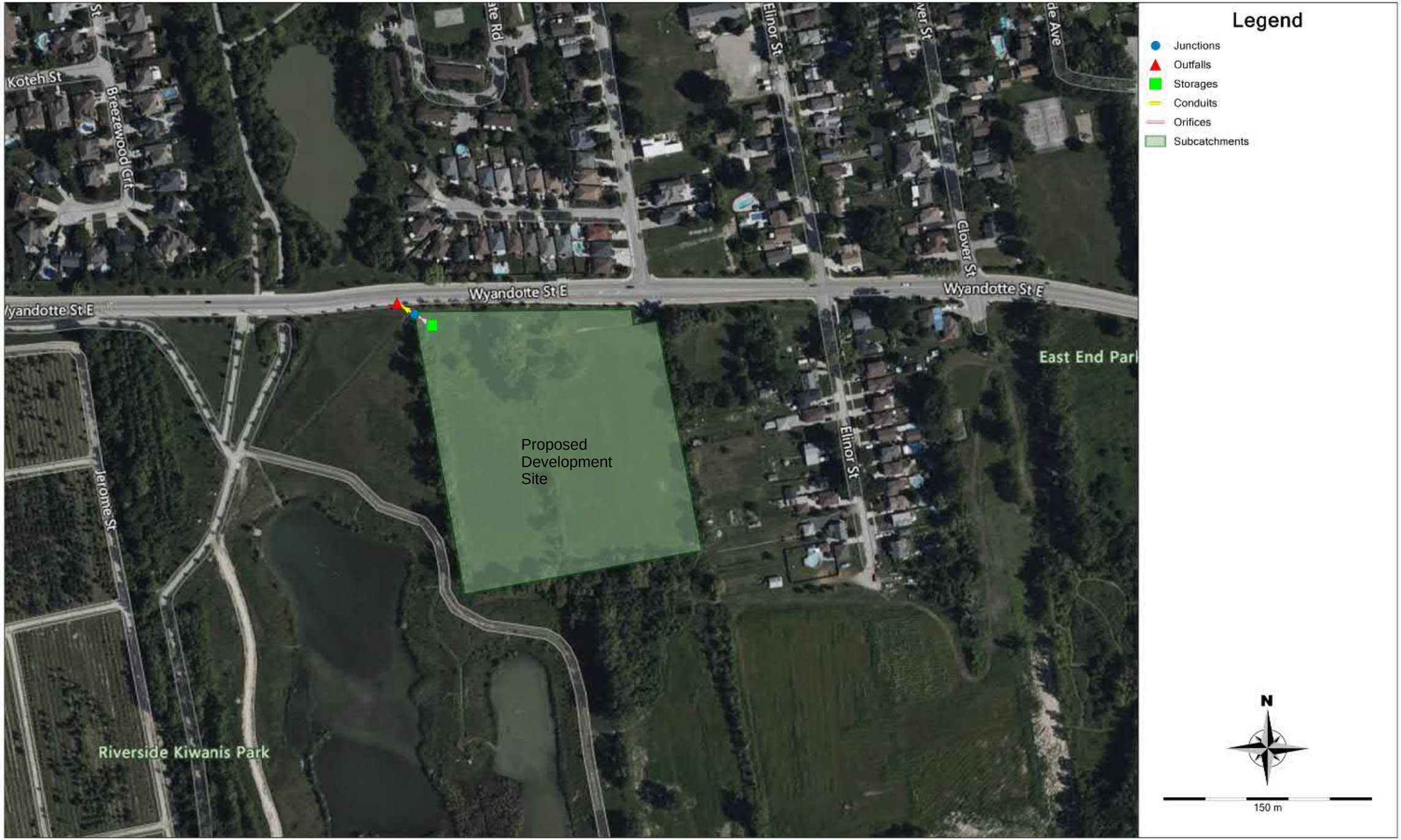
DILLON CONSULTING

PROJECT: 21-1691
STATUS: DRAFT
DATE: 2023/02/10

Appendix B

Modelling Input and Output Reports

Model Schematic



PCSWMM Input Report

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           04/11/2022
START_TIME           00:00:00
REPORT_START_DATE    04/11/2022
REPORT_START_TIME    00:00:00
END_DATE             04/12/2022
END_TIME             12:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         1
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Raingage1        INTENSITY 0:15     1.0      TIMESERIES 5y4h15mDistribution

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
S1               Raingage1        SU1              3.2978   90       96.994   1        0

[SUBAREAS]
```

```
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
S1               0.013      0.24       2.5        7.5        25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
S1               75         0.5        4          7          0

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
J1               174.07     1.74       0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
6R3879           174.05     TIMESERIES TW_5y4h_NorthNeighbourhood NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- -------- -------- -------- --------
SU1              174.1    1.7        0          TABULAR    pipe_storage                 0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
C1_2             J1               6R3879           14.951     0.013      0          0          0          0

[ORIFICES]
;;Name           From Node        To Node          Type         Offset     Qcoeff     Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- ----------
C1_1             SU1              J1               SIDE         0          0.63       NO       0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
C1_2             CIRCULAR     0.525            0          0          0          1
C1_1             CIRCULAR     0.48             0          0          0

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------
C1_2             0.5        0.5        0          YES        0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
1                Storage    0          0.1
1                           1          0.1
1                           1.01       0.1
1                           1.4        0.1
1                           1.401      0.1
1                           1.7        8400

pipe_storage     Storage    0          800
pipe_storage                0.675      800
pipe_storage                0.676      0.7
```

```
pipe_storage                1.4         0.7
pipe_storage                1.7         8400

pipe_storage_2   Storage     0          800
pipe_storage_2               1          800
pipe_storage_2               1.01       0.7
pipe_storage_2               1.4        0.7
pipe_storage_2               1.7        8400

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
100y24h2hDistribution            0:00       0
100y24h2hDistribution            2:00       1.08
100y24h2hDistribution            4:00       1.62
100y24h2hDistribution            6:00       1.62
100y24h2hDistribution            8:00       2.16
100y24h2hDistribution            10:00      3.24
100y24h2hDistribution            12:00      25.92
100y24h2hDistribution            14:00      8.64
100y24h2hDistribution            16:00      3.24
100y24h2hDistribution            18:00      2.16
100y24h2hDistribution            20:00      1.62
100y24h2hDistribution            22:00      1.62
100y24h2hDistribution            24:00      1.08

100y4h15mDistribution            0:00       3.95
100y4h15mDistribution            0:15       4.87
100y4h15mDistribution            0:30       6.36
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100y4h15mDistribution            4:00       0

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5y4h15mDistribution            2:15       6.99
5y4h15mDistribution            2:30       5.33
5y4h15mDistribution            2:45       4.31
5y4h15mDistribution            3:00       3.64
```

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5y4h15mDistribution	3:30	2.78
5y4h15mDistribution	3:45	2.49
5y4h15mDistribution	4:00	0

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5y4h-6R3879	11:55:00	171.989105
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5y4h-6R3879	12:20:00	172.175262
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TW_100y24h	0:30:00	171.977737
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TW_100y24h	0:45:00	171.978729
TW_100y24h	0:50:00	171.979172
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TW_100y24h	12:55:00	172.597778
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TW_100y24h	20:30:00	172.744629
TW_100y24h	20:35:00	172.744446
TW_100y24h	20:40:00	172.744492
TW_100y24h	20:45:00	172.744614
TW_100y24h	20:50:00	172.744553
TW_100y24h	20:55:00	172.744415
TW_100y24h	21:00:00	172.744583
TW_100y24h	21:05:00	172.74472
TW_100y24h	21:10:00	172.744553
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TW_100y24h	21:25:00	172.744675
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TW_100y24h	21:40:00	172.744476
TW_100y24h	21:45:00	172.744598
TW_100y24h	21:50:00	172.744171
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TW_100y24h	22:20:00	172.743713

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TW_100y24h                  22:40:00   172.742477
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TW_100y24h                  23:15:00   172.740051
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TW_100y24h                  23:40:00   172.737289
TW_100y24h                  23:45:00   172.736847
TW_100y24h                  23:50:00   172.736374
TW_100y24h                  23:55:00   172.73584
TW_100y24h                  24:00:00   172.735413

TW_100y24h_Northneighbourhood 4/11/2022  0:00       172.1956
TW_100y24h_Northneighbourhood 4/11/2022  0:02       172.1925
TW_100y24h_Northneighbourhood 4/11/2022  0:04       172.2101
TW_100y24h_Northneighbourhood 4/11/2022  0:06       172.1977
TW_100y24h_Northneighbourhood 4/11/2022  0:08       172.2034
TW_100y24h_Northneighbourhood 4/11/2022  0:10       172.1968
TW_100y24h_Northneighbourhood 4/11/2022  0:12       172.1996
TW_100y24h_Northneighbourhood 4/11/2022  0:14       172.2007
TW_100y24h_Northneighbourhood 4/11/2022  0:16       172.1944
TW_100y24h_Northneighbourhood 4/11/2022  0:18       172.1977
TW_100y24h_Northneighbourhood 4/11/2022  0:20       172.1961
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Too many data points (2160 in total).

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TW_100Y4h                   0:15:00    171.937683
TW_100Y4h                   0:20:00    171.938492
TW_100Y4h                   0:25:00    171.940002
TW_100Y4h                   0:30:00    171.94194
TW_100Y4h                   0:35:00    171.943878
TW_100Y4h                   0:40:00    171.946487
TW_100Y4h                   0:45:00    171.949646
TW_100Y4h                   0:50:00    171.9534
TW_100Y4h                   0:55:00    171.959442
TW_100Y4h                   1:00:00    171.962891
TW_100Y4h                   1:05:00    171.97084
TW_100Y4h                   1:10:00    171.978561
TW_100Y4h                   1:15:00    171.98642
TW_100Y4h                   1:20:00    172.012711
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TW_100Y4h                   1:45:00    172.347977
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TW_100Y4h	2:10:00	172.456833
TW_100Y4h	2:15:00	172.485352
TW_100Y4h	2:20:00	172.506775
TW_100Y4h	2:25:00	172.528168
TW_100Y4h	2:30:00	172.548935
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TW_100Y4h	2:55:00	172.616302
TW_100Y4h	3:00:00	172.624084
TW_100Y4h	3:05:00	172.632553
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TW_100Y4h	3:45:00	172.683319
TW_100Y4h	3:50:00	172.688583
TW_100Y4h	3:55:00	172.691223
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TW_100Y4h	4:50:00	172.708618
TW_100Y4h	4:55:00	172.708664
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TW_100Y4h	5:15:00	172.707794
TW_100Y4h	5:20:00	172.707352
TW_100Y4h	5:25:00	172.706894
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TW_100y4h_NorthNeighbourhood	4/11/2022	0:00	172.1956
TW_100y4h_NorthNeighbourhood	4/11/2022	0:02	172.1925
TW_100y4h_NorthNeighbourhood	4/11/2022	0:04	172.2101
TW_100y4h_NorthNeighbourhood	4/11/2022	0:06	172.1977
TW_100y4h_NorthNeighbourhood	4/11/2022	0:08	172.2034
TW_100y4h_NorthNeighbourhood	4/11/2022	0:10	172.1968
TW_100y4h_NorthNeighbourhood	4/11/2022	0:12	172.1996
TW_100y4h_NorthNeighbourhood	4/11/2022	0:14	172.2007
TW_100y4h_NorthNeighbourhood	4/11/2022	0:16	172.1944
TW_100y4h_NorthNeighbourhood	4/11/2022	0:18	172.1977
TW_100y4h_NorthNeighbourhood	4/11/2022	0:20	172.1961

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Too many data points (1080 in total).

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TW_5y4h_NorthNeighbourhood 4/11/2022  0:02       172.1925
TW_5y4h_NorthNeighbourhood 4/11/2022  0:04       172.2101
TW_5y4h_NorthNeighbourhood 4/11/2022  0:06       172.1977
TW_5y4h_NorthNeighbourhood 4/11/2022  0:08       172.2034
TW_5y4h_NorthNeighbourhood 4/11/2022  0:10       172.1968
TW_5y4h_NorthNeighbourhood 4/11/2022  0:12       172.1996
TW_5y4h_NorthNeighbourhood 4/11/2022  0:14       172.2007
TW_5y4h_NorthNeighbourhood 4/11/2022  0:16       172.1944
TW_5y4h_NorthNeighbourhood 4/11/2022  0:18       172.1977
TW_5y4h_NorthNeighbourhood 4/11/2022  0:20       172.1961
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Too many data points (1080 in total).

TW_UST_Northneighbourhood 4/11/2022  0:00       172.1956
TW_UST_Northneighbourhood 4/11/2022  0:02       172.1925
TW_UST_Northneighbourhood 4/11/2022  0:04       172.2101
TW_UST_Northneighbourhood 4/11/2022  0:06       172.1977
TW_UST_Northneighbourhood 4/11/2022  0:08       172.2034
TW_UST_Northneighbourhood 4/11/2022  0:10       172.1968
TW_UST_Northneighbourhood 4/11/2022  0:12       172.1996
TW_UST_Northneighbourhood 4/11/2022  0:14       172.2007
TW_UST_Northneighbourhood 4/11/2022  0:16       172.1944
TW_UST_Northneighbourhood 4/11/2022  0:18       172.1977
TW_UST_Northneighbourhood 4/11/2022  0:20       172.1961
......
Too many data points (2160 in total).

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UST                       0:45       2.46
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UST                       1:15       2.51
UST                       1:30       2.53
UST                       1:45       2.55
UST                       2:00       2.58
UST                       2:15       2.61
UST                       2:30       2.64
UST                       2:45       2.67
UST                       3:00       2.71
UST                       3:15       2.74
UST                       3:30       2.79
UST                       3:45       2.83
UST                       4:00       2.88
UST                       4:15       2.94
UST                       4:30       3
UST                       4:45       3.07
UST                       5:00       3.15
UST                       5:15       3.23
UST                       5:30       3.33
UST                       5:45       3.45
UST                       6:00       3.59
UST                       6:15       3.75
```

UST	6:30	3.94
UST	6:45	4.18
UST	7:00	4.49
UST	7:15	4.89
UST	7:30	5.43
UST	7:45	6.2
UST	8:00	7.41
UST	8:15	9.56
UST	8:30	14.29
UST	8:45	32.01
UST	9:00	145.13
UST	9:15	48.51
UST	9:30	23.13
UST	9:45	15.08
UST	10:00	11.35
UST	10:15	9.23
UST	10:30	7.88
UST	10:45	6.94
UST	11:00	6.25
UST	11:15	5.73
UST	11:30	5.32
UST	11:45	4.99
UST	12:00	4.72
UST	12:15	4.49
UST	12:30	4.29
UST	12:45	4.12
UST	13:00	3.98
UST	13:15	3.85
UST	13:30	3.74
UST	13:45	3.63
UST	14:00	3.54
UST	14:15	3.46
UST	14:30	3.39
UST	14:45	3.32
UST	15:00	3.26
UST	15:15	3.2
UST	15:30	3.15
UST	15:45	3.1
UST	16:00	3.05
UST	16:15	3.01
UST	16:30	2.97
UST	16:45	2.93
UST	17:00	2.9
UST	17:15	2.87
UST	17:30	2.84
UST	17:45	2.81
UST	18:00	2.78
UST	18:15	2.76
UST	18:30	2.73
UST	18:45	2.71
UST	19:00	2.69
UST	19:15	2.67
UST	19:30	2.65
UST	19:45	2.63
UST	20:00	2.61
UST	20:15	2.59
UST	20:30	2.57

```
UST                     20:45      2.56
UST                     21:00      2.54
UST                     21:15      2.53
UST                     21:30      2.51
UST                     21:45      2.5
UST                     22:00      2.49
UST                     22:15      2.47
UST                     22:30      2.46
UST                     22:45      2.45
UST                     23:00      2.44
UST                     23:15      2.43
UST                     23:30      2.42
UST                     23:45      2.41

WaterQualityTest        00:00      1.78
WaterQualityTest        00:15      2.13
WaterQualityTest        00:30      2.7
WaterQualityTest        00:45      3.72
WaterQualityTest        01:00      6.21
WaterQualityTest        01:15      16.41
WaterQualityTest        01:30      57.83
WaterQualityTest        01:45      11.58
WaterQualityTest        02:00      6.48
WaterQualityTest        02:15      4.53
WaterQualityTest        02:30      3.51
WaterQualityTest        02:45      2.88
WaterQualityTest        03:00      2.45
WaterQualityTest        03:15      2.14
WaterQualityTest        03:30      1.91
WaterQualityTest        03:45      1.72
WaterQualityTest        04:00      0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       341763.63845     4688380.22915    342012.07455     4688622.75385
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
J1               341797.404         4688593.489
6R3879           341784.931         4688601.73
SU1              341810.01          4688585.16

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[POLYGONS]
```

```
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
S1                341796.575         4688595.46
S1                341954.176         4688593.45
S1                341955.354         4688582.553
S1                341972.053         4688584.903
S1                342000.782         4688419.018
S1                341828.818         4688391.253
S1                341796.575         4688595.46

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

PCSWMM Output Report: 1:5 year 4 hour

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 1
Number of nodes ........... 3
Number of links ........... 2
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
------------------------------------------------------------------------
Raingage1            5y4h15mDistribution         INTENSITY   15 min.


*******************
Subcatchment Summary
*******************
Name                        Area     Width    %Imperv    %Slope Rain Gage           Outlet
-----------------------------------------------------------------------------------------------------
S1                          3.30     96.99     90.00    1.0000 Raingage1           SU1


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
------------------------------------------------------------------------
J1                   JUNCTION       174.07      1.74       0.0
6R3879               OUTFALL        174.05      0.53       0.0
SU1                  STORAGE        174.10      1.70       0.0


************
Link Summary
************
Name             From Node        To Node          Type             Length    %Slope Roughness
-------------------------------------------------------------------------------------------
C1_2             J1               6R3879           CONDUIT            15.0    0.1338    0.0130
C1_1             SU1              J1               ORIFICE


*********************
Cross Section Summary
*********************
                                     Full     Full     Hyd.     Max.   No. of     Full
```

Conduit	Shape	Depth	Area	Rad.	Width	Barrels	Flow
C1_2	CIRCULAR	0.53	0.22	0.13	0.53	1	0.16

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/11/2022 00:00:00
Ending Date 04/12/2022 12:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

**********	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
**********	---------	-------
Total Precipitation	0.163	49.475
Evaporation Loss	0.000	0.000
Infiltration Loss	0.010	2.889
Surface Runoff	0.149	45.068
Final Storage	0.006	1.698
Continuity Error (%)	-0.363	

**********	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
**********	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.149	1.486
Groundwater Inflow	0.000	0.000

RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.149	1.486
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.001
Continuity Error (%)	-0.017	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	0.50 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.01
Time Step Frequencies	:	
1.000 - 0.871 sec	:	100.00 %
0.871 - 0.758 sec	:	0.00 %
0.758 - 0.660 sec	:	0.00 %
0.660 - 0.574 sec	:	0.00 %
0.574 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	49.47	0.00	0.00	2.89	42.99	2.07	45.07	1.49	0.66	0.911

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.05	0.81	174.88	0 01:49	0.77
6R3879	OUTFALL	0.03	0.43	174.48	0 01:50	0.43
SU1	STORAGE	0.05	1.40	175.50	0 01:50	1.40

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	0.412	0 01:50	0	1.49	-0.014
6R3879	OUTFALL	0.000	0.412	0 01:50	0	1.49	0.000
SU1	STORAGE	0.665	0.665	0 01:45	1.49	1.49	-0.002

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	0.16	0.285	0.930

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.035	2	0	0	0.541	30	0 01:50	0.412

****

Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
6R3879	75.58	0.015	0.412	1.486
System	75.58	0.015	0.412	1.486

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1_2	CONDUIT	0.412	0	01:50	1.99	2.62	0.91
C1_1	ORIFICE	0.412	0	01:50			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1_2	0.01	0.16	0.01	0.93	0.01

Analysis begun on: Thu Jun 30 09:27:17 2022
Analysis ended on: Thu Jun 30 09:27:17 2022
Total elapsed time: < 1 sec

PCSWMM Output Report: 1:100 year 4 hour

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 1
Number of nodes ........... 3
Number of links ........... 2
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
----------------------------------------------------------------------
Raingage1            100y4h15mDistribution       INTENSITY   15 min.


*******************
Subcatchment Summary
*******************
Name                         Area     Width    %Imperv    %Slope Rain Gage           Outlet
-------------------------------------------------------------------------------------------------
S1                           3.30     96.99     90.00    1.0000 Raingage1           SU1


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------
J1                   JUNCTION       174.07      1.74       0.0
6R3879               OUTFALL        174.05      0.53       0.0
SU1                  STORAGE        174.10      1.70       0.0


************
Link Summary
************
Name             From Node        To Node          Type             Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C1_2             J1               6R3879           CONDUIT            15.0    0.1338    0.0130
C1_1             SU1              J1               ORIFICE


*********************
Cross Section Summary
*********************
                                     Full     Full     Hyd.     Max.   No. of     Full
```

Conduit	Shape	Depth	Area	Rad.	Width	Barrels	Flow
C1_2	CIRCULAR	0.53	0.22	0.13	0.53	1	0.16

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/11/2022 00:00:00
Ending Date 04/12/2022 12:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

**********	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
**********	---------	-------
Total Precipitation	0.269	81.587
Evaporation Loss	0.000	0.000
Infiltration Loss	0.010	2.908
Surface Runoff	0.255	77.317
Final Storage	0.006	1.698
Continuity Error (%)	-0.410	

**********	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
**********	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.255	2.550
Groundwater Inflow	0.000	0.000

RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.253	2.531
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.001
Continuity Error (%)	0.707	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	0.50 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
1.000 - 0.871 sec	:	100.00 %
0.871 - 0.758 sec	:	0.00 %
0.758 - 0.660 sec	:	0.00 %
0.660 - 0.574 sec	:	0.00 %
0.574 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	81.59	0.00	0.00	2.91	72.02	5.30	77.32	2.55	1.19	0.948

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.06	1.01	175.08	0 01:38	0.86
6R3879	OUTFALL	0.04	0.45	174.50	0 01:57	0.45
SU1	STORAGE	0.07	1.58	175.68	0 01:57	1.58

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	0.446	0 01:57	0	2.53	0.002
6R3879	OUTFALL	0.000	0.446	0 01:57	0	2.53	0.000
SU1	STORAGE	1.188	1.188	0 01:45	2.55	2.55	0.711

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	0.91	0.483	0.732

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.050	3	0	0	0.984	55	0 01:57	0.446

****

Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
6R3879	76.32	0.026	0.446	2.531
System	76.32	0.026	0.446	2.531

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1_2	CONDUIT	0.446	0	01:57	2.13	2.83	0.93
C1_1	ORIFICE	0.446	0	01:57			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1_2	0.01	0.91	0.01	1.41	0.01

Analysis begun on: Thu Jun 30 09:26:52 2022
Analysis ended on: Thu Jun 30 09:26:53 2022
Total elapsed time: 00:00:01

PCSWMM Output Report: 1:100 year 24 hour

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 1
Number of nodes ........... 3
Number of links ........... 2
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
------------------------------------------------------------------------
Raingage1            100y24h2hDistribution       INTENSITY  120 min.


*******************
Subcatchment Summary
*******************
Name                        Area     Width    %Imperv    %Slope Rain Gage           Outlet
-----------------------------------------------------------------------------------------------------
S1                          3.30     96.99     90.00    1.0000 Raingage1           SU1


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
------------------------------------------------------------------------
J1                   JUNCTION       174.07      1.74       0.0
6R3879               OUTFALL        174.05      0.53       0.0
SU1                  STORAGE        174.10      1.70       0.0


************
Link Summary
************
Name             From Node        To Node          Type             Length    %Slope Roughness
-------------------------------------------------------------------------------------------
C1_2             J1               6R3879           CONDUIT            15.0    0.1338    0.0130
C1_1             SU1              J1               ORIFICE


*********************
Cross Section Summary
*********************
                                     Full     Full     Hyd.     Max.   No. of     Full
```

Conduit	Shape	Depth	Area	Rad.	Width	Barrels	Flow
C1_2	CIRCULAR	0.53	0.22	0.13	0.53	1	0.16

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/11/2022 00:00:00
Ending Date 04/12/2022 12:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 2.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

**********	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
**********	---------	-------
Total Precipitation	0.356	108.000
Evaporation Loss	0.000	0.000
Infiltration Loss	0.010	3.121
Surface Runoff	0.339	102.841
Final Storage	0.007	2.078
Continuity Error (%)	-0.036	

**********	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
**********	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.339	3.392
Groundwater Inflow	0.000	0.000

RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.339	3.387
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.004
Continuity Error (%)	0.000	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	1.50 sec
Average Time Step	:	2.00 sec
Maximum Time Step	:	2.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
2.000 - 1.516 sec	:	100.00 %
1.516 - 1.149 sec	:	0.00 %
1.149 - 0.871 sec	:	0.00 %
0.871 - 0.660 sec	:	0.00 %
0.660 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	108.00	0.00	0.00	3.12	95.50	7.34	102.84	3.39	0.24	0.952

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.11	0.47	174.54	0 14:01	0.47
6R3879	OUTFALL	0.08	0.32	174.37	0 14:01	0.32
SU1	STORAGE	0.11	0.64	174.74	0 14:01	0.64

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	0.224	0 14:01	0	3.39	0.001
6R3879	OUTFALL	0.000	0.224	0 14:01	0	3.39	0.000
SU1	STORAGE	0.237	0.237	0 14:00	3.39	3.39	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.090	5	0	0	0.509	28	0 14:01	0.224

****
Outfall Loading Summary
****

	Flow Freq	Avg Flow	Max Flow	Total Volume

Outfall Node	Pcnt	CMS	CMS	10^6 ltr
6R3879	92.32	0.028	0.224	3.387
System	92.32	0.028	0.224	3.387

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1_2	CONDUIT	0.224	0	14:01	1.28	1.42	0.75
C1_1	ORIFICE	0.224	0	14:01			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1_2	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1_2	0.01	0.01	0.01	1.75	0.01

Analysis begun on: Thu Jun 30 09:27:45 2022
Analysis ended on: Thu Jun 30 09:27:45 2022
Total elapsed time: < 1 sec

PCSWMM Output Report: Urban Stress Test

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 1
Number of nodes ........... 3
Number of links ........... 2
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
----------------------------------------------------------------------
Raingage1            UST                         INTENSITY   15 min.


*******************
Subcatchment Summary
*******************
Name                         Area     Width    %Imperv    %Slope Rain Gage           Outlet
-------------------------------------------------------------------------------------------------
S1                           3.30     96.99     90.00    1.0000 Raingage1           SU1


************
Node Summary
************
                                    Invert      Max.    Ponded    External
Name                 Type            Elev.     Depth      Area    Inflow
------------------------------------------------------------------------
J1                   JUNCTION       174.07      1.74       0.0
6R3879               OUTFALL        174.05      0.53       0.0
SU1                  STORAGE        174.10      1.70       0.0


************
Link Summary
************
Name             From Node        To Node          Type             Length    %Slope Roughness
-----------------------------------------------------------------------------------------------
C1_2             J1               6R3879           CONDUIT            15.0    0.1338    0.0130
C1_1             SU1              J1               ORIFICE


*********************
Cross Section Summary
*********************
                                     Full     Full     Hyd.     Max.   No. of     Full
```

Conduit	Shape	Depth	Area	Rad.	Width	Barrels	Flow
C1_2	CIRCULAR	0.53	0.22	0.13	0.53	1	0.16

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... HORTON
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 04/11/2022 00:00:00
Ending Date 04/12/2022 12:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 2.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

**********	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
**********	---------	-------
Total Precipitation	0.495	149.985
Evaporation Loss	0.000	0.000
Infiltration Loss	0.011	3.380
Surface Runoff	0.478	144.918
Final Storage	0.007	2.003
Continuity Error (%)	-0.211	

**********	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
**********	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.478	4.779
Groundwater Inflow	0.000	0.000

RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.457	4.573
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.019	0.195
Continuity Error (%)	0.232	

****
Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
Link C1_1 (54)

****
Routing Time Step Summary
****
Minimum Time Step	:	1.50 sec
Average Time Step	:	2.00 sec
Maximum Time Step	:	2.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.01
Time Step Frequencies	:	
2.000 - 1.516 sec	:	100.00 %
1.516 - 1.149 sec	:	0.00 %
1.149 - 0.871 sec	:	0.00 %
0.871 - 0.660 sec	:	0.00 %
0.660 - 0.500 sec	:	0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	149.98	0.00	0.00	3.38	133.55	11.37	144.92	4.78	1.21	0.966

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.27	0.95	175.02	0 09:08	0.84
6R3879	OUTFALL	0.27	0.46	174.51	1 00:20	0.46
SU1	STORAGE	0.28	1.60	175.70	0 09:32	1.60

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.000	0.449	0 09:32	0	4.57	-0.102
6R3879	OUTFALL	0.000	0.449	0 09:32	0	4.57	0.000
SU1	STORAGE	1.211	1.211	0 09:15	4.78	4.78	0.369

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	1.11	0.427	0.788

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU1	0.216	12	0	0	1.082	60	0 09:32	0.449

****

Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
6R3879	63.06	0.056	0.449	4.573
System	63.06	0.056	0.449	4.573

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1_2	CONDUIT	0.449	0	09:32	2.15	2.86	0.93
C1_1	ORIFICE	0.449	0	09:32			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

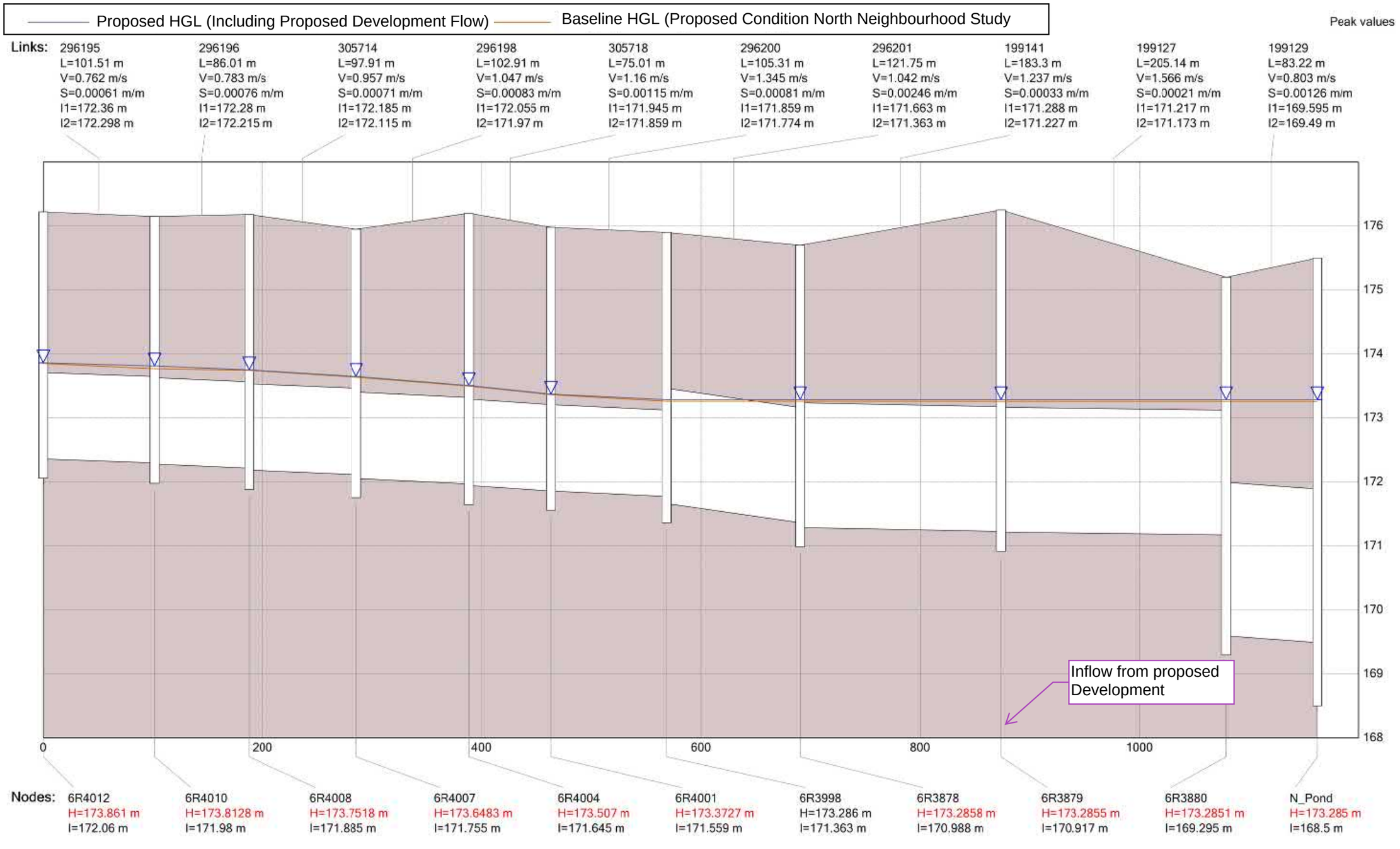
Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1_2	0.01	1.11	0.01	1.66	0.01

Analysis begun on: Thu Jun 30 09:28:59 2022
Analysis ended on: Thu Jun 30 09:29:00 2022
Total elapsed time: 00:00:01

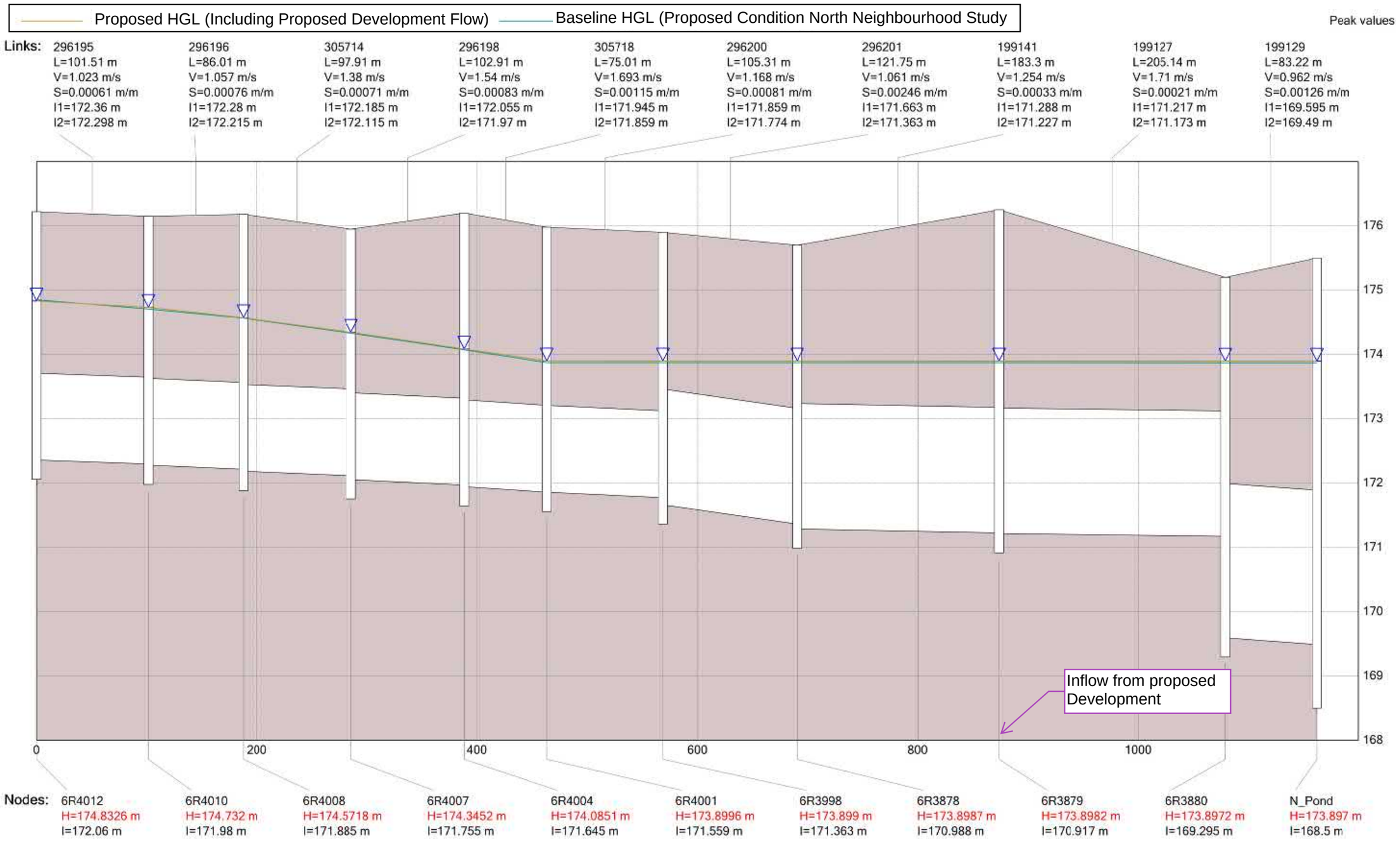
Appendix C

Wyandotte Street East Sewer Profile Comparison

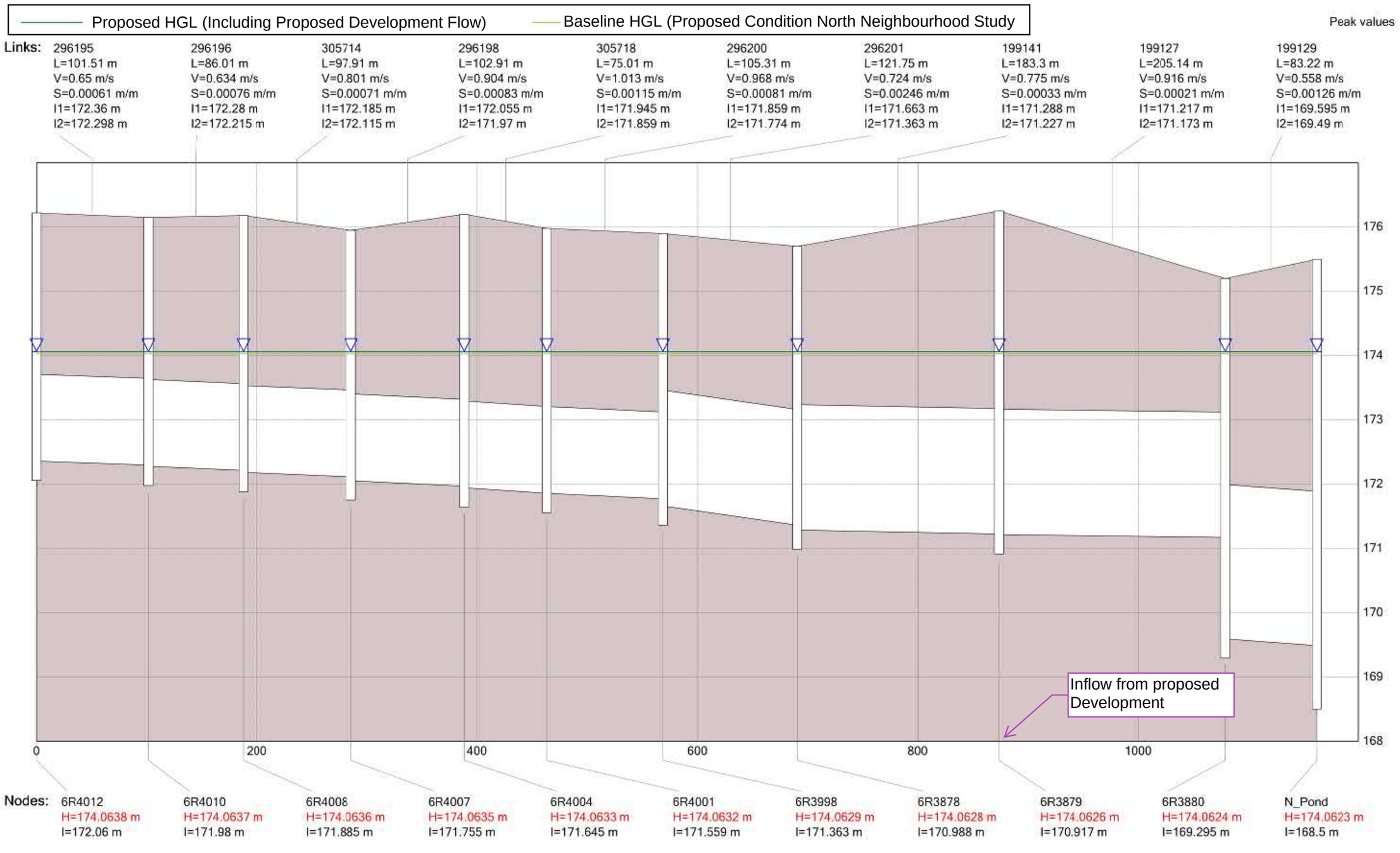
Wyandotte Sewer HGL Profile Comparison (1:5 year 4 hour)



Wyandotte Sewer HGL Profile Comparison (1:100 year 4 hour)



Wyandotte Sewer HGL Profile Comparison (1:100 year 24 hour)



Appendix D

Details of the OGS Unit

ADS OGS Sizing Summary

Project Name: Ganatchio Gardens

Consulting Engineer: Dillon

Location: Windsor, ON

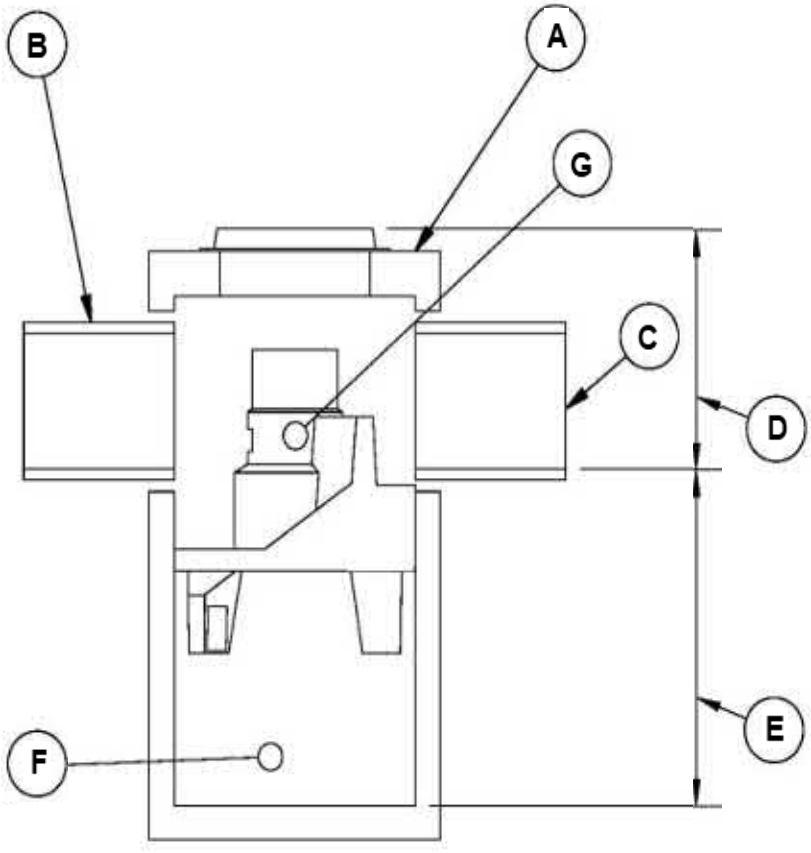
Sizing Completed By: C. Neath **Email:** cody.neath@ads-pipe.com

Treatment Requirements		
Treatment Goal:	Normal (MOE)	
Selected Parameters:	70% TSS	90% Volume
Selected Unit:	**FD-5HC**	

Site Details	
Site Area:	3.3 ha
% Impervious:	90%
Rational C:	0.84
Rainfall Station:	Windsor, ONT
Particle Size Distribution:	Fine
Peak Flowrate:	417 L/s

Summary of Results		
Model	**TSS Removal**	**Volume Treated**
FD-4HC	69.0%	78.2%
FD-5HC	72.0%	>90%
FD-6HC	74.0%	>90%
FD-8HC	79.0%	>90%
FD-10HC	82.0%	>90%

FD-5HC Specification	
Unit Diameter (A):	1,500 mm
Inlet Pipe Diameter (B):	300 mm
Outlet Pipe Diameter (C):	300 mm
Height, T/G to Outlet Invert (D):	2000 mm
Height, Outlet Invert to Sump (E):	1780 mm
Sediment Storage Capacity (F):	1.29 m³
Oil Storage Capacity (G):	1,135 L
Recommended Sediment Depth for Maintenance:	475 mm
Max. Pipe Diameter:	600 mm
Peak Flow Capacity:	566 L/s



Site Elevations:	
Rim Elevation:	100.00
Inlet Pipe Elevation:	98.00
Outlet Pipe Elevation:	98.00

Notes:

Removal efficiencies are based on NJDEP Test Protocols and independently verified.

All units supplied by ADS have numerous local, provincial, and international certifications (copies of which can be provided upon request). The design engineer is responsible for ensuring compliance with applicable regulations.

Project Name:	Ganatchio Gardens
Consulting Engineer:	Dillon
Location:	Windsor, ON

Net Annual Removal Efficiency Summary: FD-5HC

Rainfall Intensity[(1)]	Rational Equation Flowrate	Surface Loading Rate	Fraction of Rainfall[(1)]	FD-5HC Removal Efficiency	Weighted Net-Annual Removal Efficiency
mm/hr	L/s	L/min/m^2	%	%	%
3.00	23.1	784	13.2%	81%	10.7%
4.00	30.8	1046	9.6%	79%	7.6%
5.00	38.5	1307	7.5%	78%	5.8%
6.00	46.2	1569	6.0%	76%	4.6%
7.00	53.9	1830	4.8%	75%	3.6%
8.00	61.6	2092	4.1%	74%	3.0%
9.00	69.3	2353	3.6%	73%	2.6%
10.00	77.0	2614	3.2%	73%	2.3%
11.00	84.7	2876	2.8%	72%	2.0%
12.00	92.4	3137	2.5%	71%	1.8%
15.00	115.5	3922	6.6%	70%	4.6%
20.00	154.0	5229	8.3%	68%	5.7%
25.00	192.5	6536	5.8%	67%	3.9%
30.00	231.0	7843	4.6%	66%	3.0%
35.00	269.5	9150	3.8%	65%	2.5%
40.00	308.0	10458	2.9%	64%	1.9%
45.00	346.5	11765	2.4%	63%	1.5%
50.00	385.0	13072	1.8%	63%	1.1%
65.00	500.5	16994	6.6%	61%	4.0%
				Total Net Annual Removal Efficiency:	72.0%
				Total Runoff Volume Treated:	99.9%

Notes:

(1) Based on Windsor/Essex Region Stormwater Manual 2018, Table 3.4.1.5

(2) Based on third party verified data and appoximating the removal of a PSD similar to the STC Fine distribution