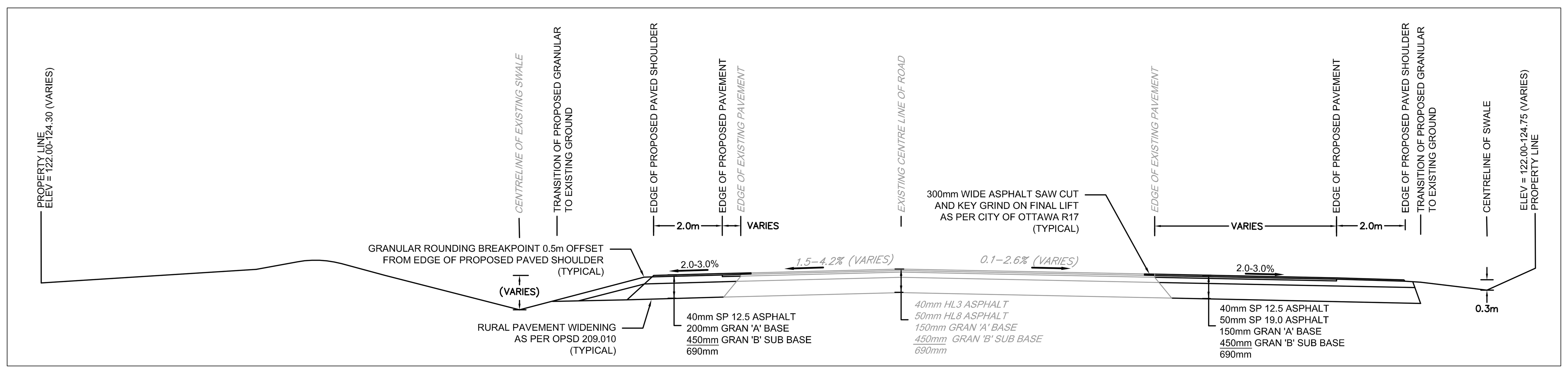
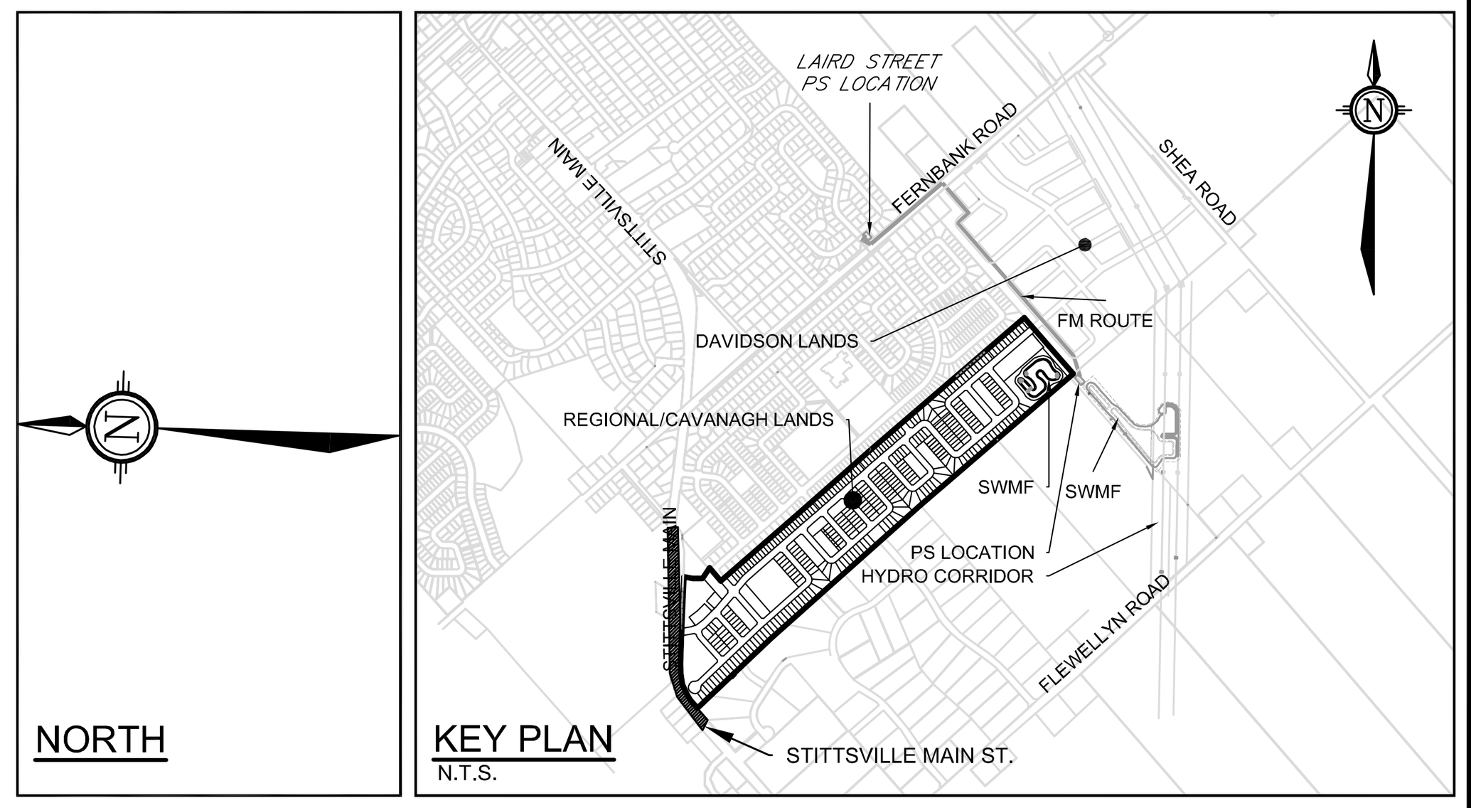
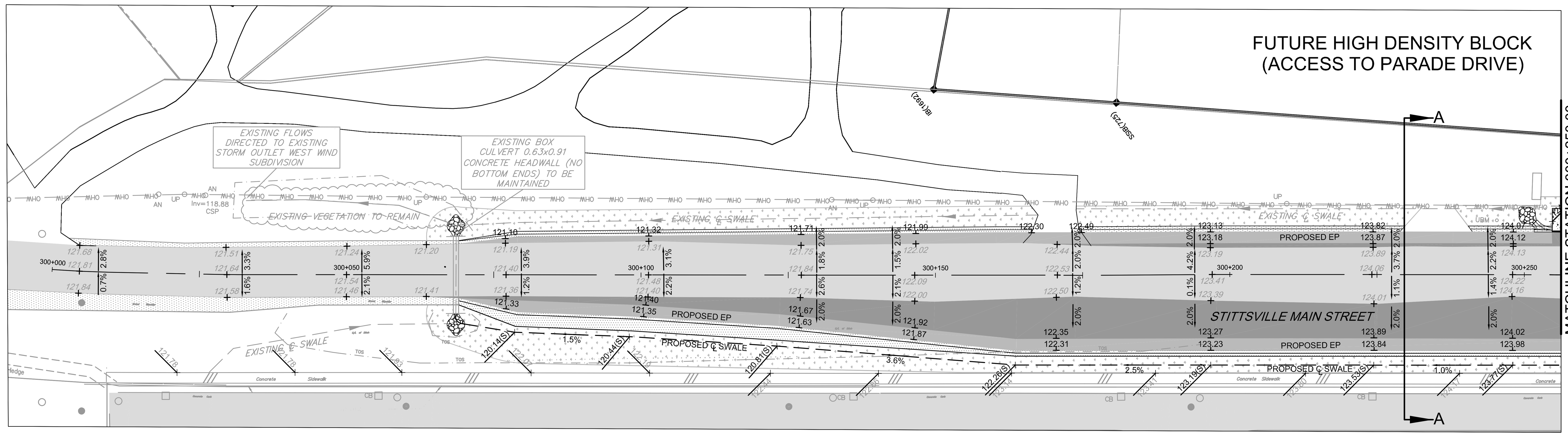


ROW CROSS SECTION A-A (300+075.00 TO 300+385.00)

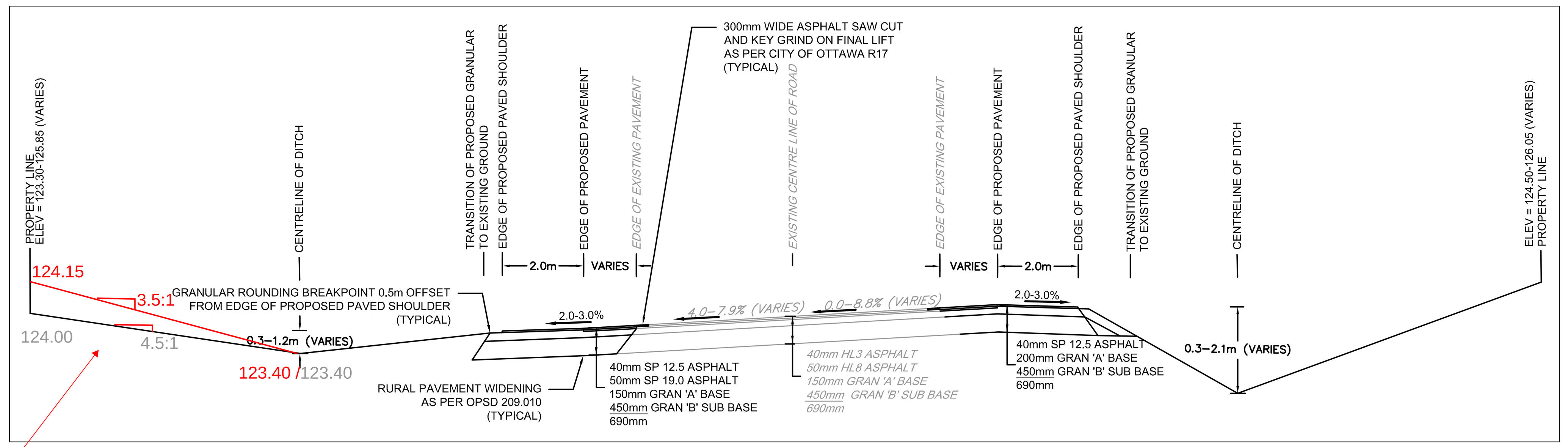
LEGEND

- PROPOSED CONCRETE SIDEWALK & RAISED MEDIAN
- PROPOSED ASPHALT ROADWAY
- PROPOSED ASPHALT SHOULDER
- EXISTING ASPHALT ROADWAY
- PROPOSED GRAVEL SHOULDER
- GRAVEL SHOULDER TO REMAIN
- TOPSOIL AND HYDRO SEED
- PROPOSED BARRIER CURB (BARRIER SC 1.1)
- DC — DEPRESSED CURB
- PROPOSED SWALE
- EXISTING SWALE
- 121.45 — EXISTING PAVEMENT ELEVATION
- 121.45 — PROPOSED PAVEMENT ELEVATION
- 122.10(S) — PROPOSED REALIGNED SWALE ELEVATION
- 122.10 — PROPOSED ELEVATION
- PROPOSED RIP RAP AS PER OPSD 810.010
- PROPOSED ASPHALT SPILLWAY AS PER OPSD 605.010
- PROPOSED CULVERT
- OHW — EXISTING OVERHEAD HYDRO WIRE
- OHW — RELOCATED OVERHEAD HYDRO WIRE
- EXISTING UTILITY POLE
- TUBULAR FOUNDATION T-21
- JOINT USE FOUNDATION T-23
- MAST ARM FOUNDATION T-22
- DISCONNECT PAD T-26 FOUNDATION
- CONTROLLER FOUNDATION T-24
- UTILITY POLE
- TRAFFIC HANDHOLE T-1 (FRAME & COVER AS PER T2/T3)
- TRAFFIC MANHOLE T-4 (FRAME & COVER AS PER T5/T6)
- STREET HANDHOLE
- PROPOSED STREETLIGHT
- EXISTING STREETLIGHT

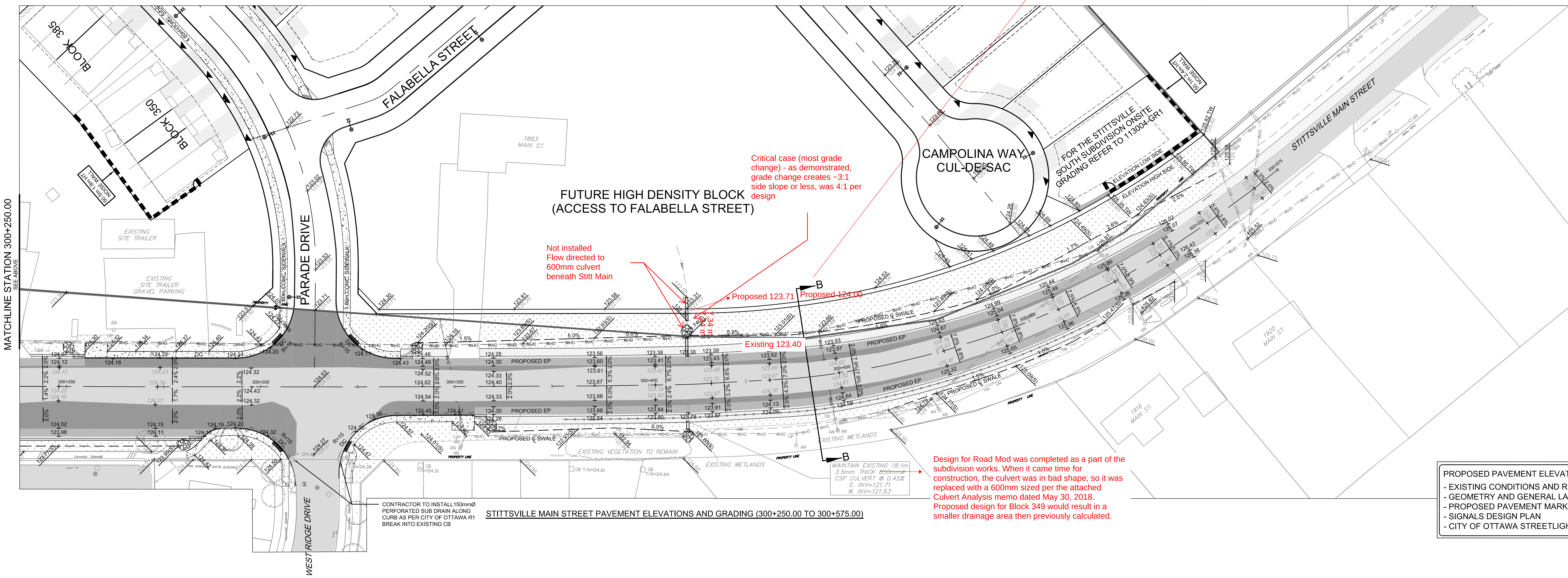




STITTSVILLE MAIN STREET PAVEMENT ELEVATIONS AND GRADING (300+000.00 TO 300+250.00)



ROW CROSS SECTION B-B (300+385.00 TO 300+575.00)



STITTSVILLE MAIN STREET PAVEMENT ELEVATIONS AND GRADING (300+250.00 TO 300+575.00)

GRADING NOTES:

1. CO-ORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
2. REMOVE ALL ORGANIC MATTER AND TOPSOIL FROM AREAS THAT ARE TO BE PAVED.
3. GRADE AND/OR FILL WHERE REQUIRED.
4. MATCH EXISTING ELEVATIONS AT ALL PROPERTY LINES.
5. ENSURE POSITIVE DRAINAGE WHETHER INDICATED OR NOT.
6. MAXIMUM TERRACING GRADE IS 3:1, UNLESS OTHERWISE NOTED ON THE DRAWINGS.
7. DETERMINE THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES WHETHER OR NOT SHOWN ON THIS DRAWING.
8. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE INSTRUCTED BY ENGINEER. EXCAVATE AND REMOVE FROM SITE ALL ORGANIC MATERIAL AND DEBRIS UNLESS OTHERWISE INSTRUCTED BY ENGINEER.

PAVEMENT STRUCTURE NOTES:

1. SUBGRADE MATERIAL SHALL BE PLACED IN MAXIMUM 300mm LIFTS AND COMPACTED TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY
2. ROADWAY GRANULAR MATERIAL SHALL BE PLACED IN MAXIMUM 300mm LIFTS AND COMPACTED TO AT LEAST 98% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY.
3. ASPHALTIC CONCRETE TO BE COMPACTED TO AT LEAST 97% OF MARSHALL DENSITY.
4. ROADWAY SUBGRADE TO BE INSPECTED BY THE GEOTECHNICAL ENGINEER AT THE TIME OF CONSTRUCTION TO REVIEW THE GRANULAR 'B' DEPTH AND FOR THE NECESSITY OF A WOVEN GEOTEXTILE BELOW THE GRANULAR MATERIALS.

PROPOSED PAVEMENT ELEVATIONS & GRADING PLAN TO BE READ IN CONJUNCTION WITH:

- EXISTING CONDITIONS AND REMOVALS	DWG NO. 113004-RM
- GEOMETRY AND GENERAL LAYOUT	DWG NO. 113004-GGL
- PROPOSED PAVEMENT MARKINGS & SIGNAGE PLAN	DWG NO. 113004-PM
- SIGNALS DESIGN PLAN	DWG NO. 113004-SD
- CITY OF OTTAWA STREETLIGHTING PLAN	DWG NO. SL1 & SL2 (SLD 2016-016)

REVIEWED BY DEVELOPMENT REVIEW BRANCH
Signed ______
Date ______ 2017
Plan Number 17274 D07-16-13-0033

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
10.	REVISED AND REISSUED FOR CONSTRUCTION	MAY 16/18	BHB
9.	REVISED AND REISSUED FOR CONSTRUCTION	MAY 2/16	BHB
8.	ISSUED FOR CONSTRUCTION	APR 4/18	BHB
7.	ISSUED FOR COMMENCE WORK NOTIFICATION	NOV 28/17	BHB
6.	ISSUED FOR MUNICIPAL CIRCULATION	SEPT 26/17	BHB
5.	ISSUED FOR UTILITY CIRCULATION	SEPT 19/17	BHB
4.	REVISED AS PER CITY COMMENTS	APR 04/17	BHB
3.	REVISED AS PER CITY COMMENTS	DEC 16/16	BHB
2.	ISSUED FOR CITY REVIEW	APR 05/16	BHB
1.	ISSUED FOR TENDER	FEB 08/16	BHB

SCALE 1:500

DESIGN BCS · CHECKED BHB · DRAWN BCS · CHECKED BHB · APPROVED JGR

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER B. H. BAHIA 100164647 PROVINCE OF ONTARIO

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Website www.novatech-eng.com

CITY OF OTTAWA
STITTSVILLE SOUTH - AREA 6

STITTSVILLE MAIN STREET ROAD MODIFICATION

PROPOSED PAVEMENT ELEVATIONS AND GRADING

PROJECT No. 113004-00
REV # 10
DRAWING No. 113004-PE

NOVATECH
Engineers, Planners & Landscape Architects

M E M O R A N D U M

DATE: **MAY 30, 2018**

TO: **SAM BAHIA**

FROM: **CONRAD STANG**

RE: **STITTSVILLE SOUTH (AREA 6)**
CULVERT CROSSING FOR STITTSVILLE MAIN STREET

CC: **BEN SWEET**

This memorandum provides hydrologic and hydraulic design information pertaining to the proposed replacement of the existing culvert crossing Stittsville Main Street. The replacement of the existing culvert crossing is proposed as part of the road modifications to Stittsville Main Street. The culvert crossing is located approximately 150m south of Parade Drive.

Proposed Works

It was noticed that the existing 850mm CSP culvert is in poor condition and needs to be replaced (City of Ottawa structure ID: A751930).

A proposed 600mm diameter CSP culvert is to replace the existing 850mm CSP culvert. The replacement of the existing 850mm CSP culvert with a 600mm CSP culvert is due to site constraints.

Refer to the following Stittsville Main Street Road Modification Drawings for details:

- Geometry and General Layout
  - Drawing 113004-GGL (Rev. 9)
- Proposed Pavement Elevations and Grading
  - Drawing 113004-PE (Rev. 10)

Culvert Design Criteria

Stittsville Main Street is classified as an 'Urban Arterial Road', as per the City of Ottawa Transportation Master Plan.

As per Table 6.4 in the City of Ottawa Sewer Design Guidelines (October, 2012), a culvert crossing an urban arterial road needs to convey the 100-year storm.

Drainage Areas

Drainage to the culvert crossing is from a roadside ditch along the eastern portion of Stittsville Main Street. In addition, based on existing topography, the roadside ditch also receives drainage from part of the lands for the future high-density block (Block 349) within the Stittsville South development.

When developed, Block 349 will be serviced by the recently constructed storm sewer system and stormwater management facility within the Stittsville South development. Uncontrolled runoff to the Stittsville Main roadside ditch from the future development of Block 349 is anticipated to be minimal.

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The attached **Figure 1** shows the 1.24 ha drainage area to the culvert crossing, after the road modifications to Stittsville Main Street. Also shown on **Figure 1**, is the 0.55 ha area within Block 349 that will be removed from the drainage area to the culvert crossing when developed.

Peak Flows

The Rational Method was used to estimate peak flows for the drainage area to the culvert crossing when Block 349 is undeveloped and developed. **Table 1** provides a summary of the catchment parameters and peak flows are shown in **Table 2**. Sample calculations are attached.

Table 1: Catchment Parameters

Scenario	Areas (ha)			Runoff Coefficient		% Imperv.
	Total	Hard Surfaces (C=0.90)	Soft Surfaces (C=0.20)	C_{avg}	C_{100yr}[1]	
Block 349 Undeveloped	1.24	0.26	0.98	0.35	0.41	21%
Block 349 Developed	0.69	0.26	0.43	0.46	0.53	38%

[1]*Runoff coefficient increased by 25%, up to a maximum value of 1.00, for a 100-year storm.*

Table 2: Peak Flows

Scenario	Rainfall Intensity (mm/hr)[1]			Peak Flows (L/s)		
	2-year	5-year	100-year	2-year	5-year	100-year
Block 349 Undeveloped	76.81	104.19	178.56	92	125	251
Block 349 Developed	76.81	104.19	178.56	68	93	182

[1]*Rainfall intensity (IDF data) from the City of Ottawa Sewer Design Guidelines (October, 2012); Tc = 10-minutes.*

Based on the Rational Method calculations, the proposed 600mm CSP culvert will need to convey a 100-year peak flow of 251 L/s. This will later reduce to 182 L/s after the development of Block 349.

Culvert Analysis

MTO Design Chart 2.32 for circular CSP culverts was used to calculate the culvert capacity, assuming projecting culverts with inlet control and a HW/D = 1.0.

Based on the MTO Design Chart, the capacity of the proposed 600mm CSP culvert is approximately 340 L/s; therefore, the proposed 600mm CSP culvert can convey the 100-year storm, with and without the development of Block 349.

For reference, the capacity of the existing 850mm CSP culvert is approximately 750 L/s.

Attachments:

- Figure 1 – Drainage Areas
- Sample Rational Method Flow Calculations
- MTO Culvert Design Charts for 850mm and 600mm Culverts

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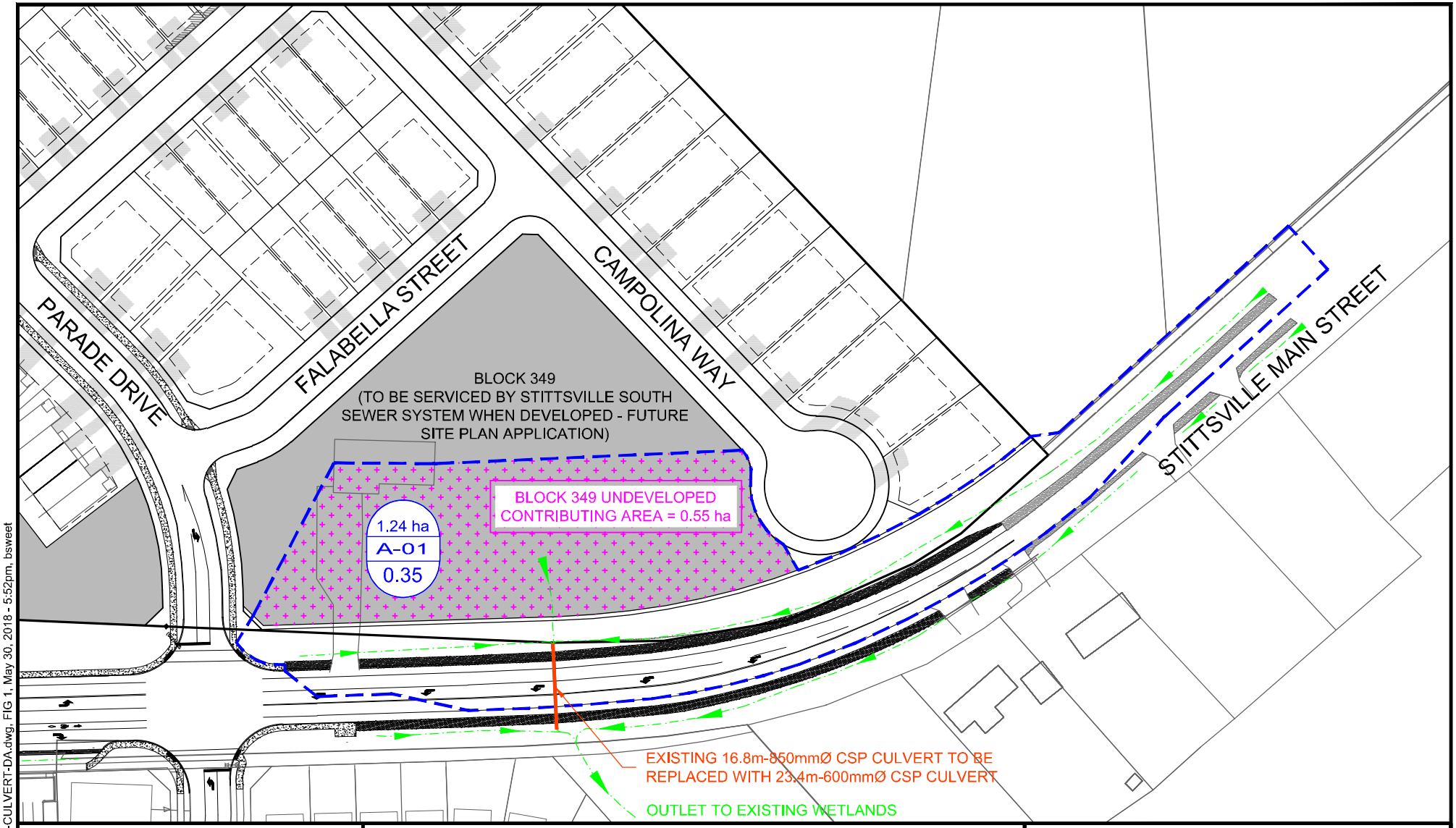

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LEGEND

- DRAINAGE AREA BOUNDARY
- SWALE AND DIRECTION OF FLOW
- CULVERT CROSSING

2.24 ha
EX-01
0.35

- CATCHMENT AREA (ha)
- AREA ID
- RUNOFF COEFFICIENT

CITY OF OTTAWA
STITTSVILLE SOUTH - AREA 6

DRAINAGE AREA TO CULVERT CROSSING
STITTSVILLE MAIN STREET

SCALE 1 : 1500 (0, 15, 30, 45, 60)

DATE	JOB	FIGURE
MAY 2018	113004-03	FIG-1

SHT8X11.DWG - 216mmx279mm

M:\2013\113004\CAD\Design\Figures\SWM\FIG-1-CULVERT-DA.dwg, FIG 1, May 30, 2018 - 5:52pm, bsweet

Stitsville Main Street Road Modifications
Peak Flows (Sample Rational Method Calculations)

NOVATECH
Engineers, Planners & Landscape Architects

Calculation of Peak Flows

$$Q_p = 2.78\ x\ C\ x\ I\ x\ A$$

**Rational Method Equation*

Where:

Q_p =	Peak Flow (L/s)
C =	Runoff Coefficient (increases by 25% for a 100-year event; max 1.0)
I =	Rainfall Intensity (mm)
	**Based on City of Ottawa IDF data using a 10-minute time-of-concentration (T_c)*
A =	Drainage Area (ha)

Sample Calculation for 100-year Storm Event:

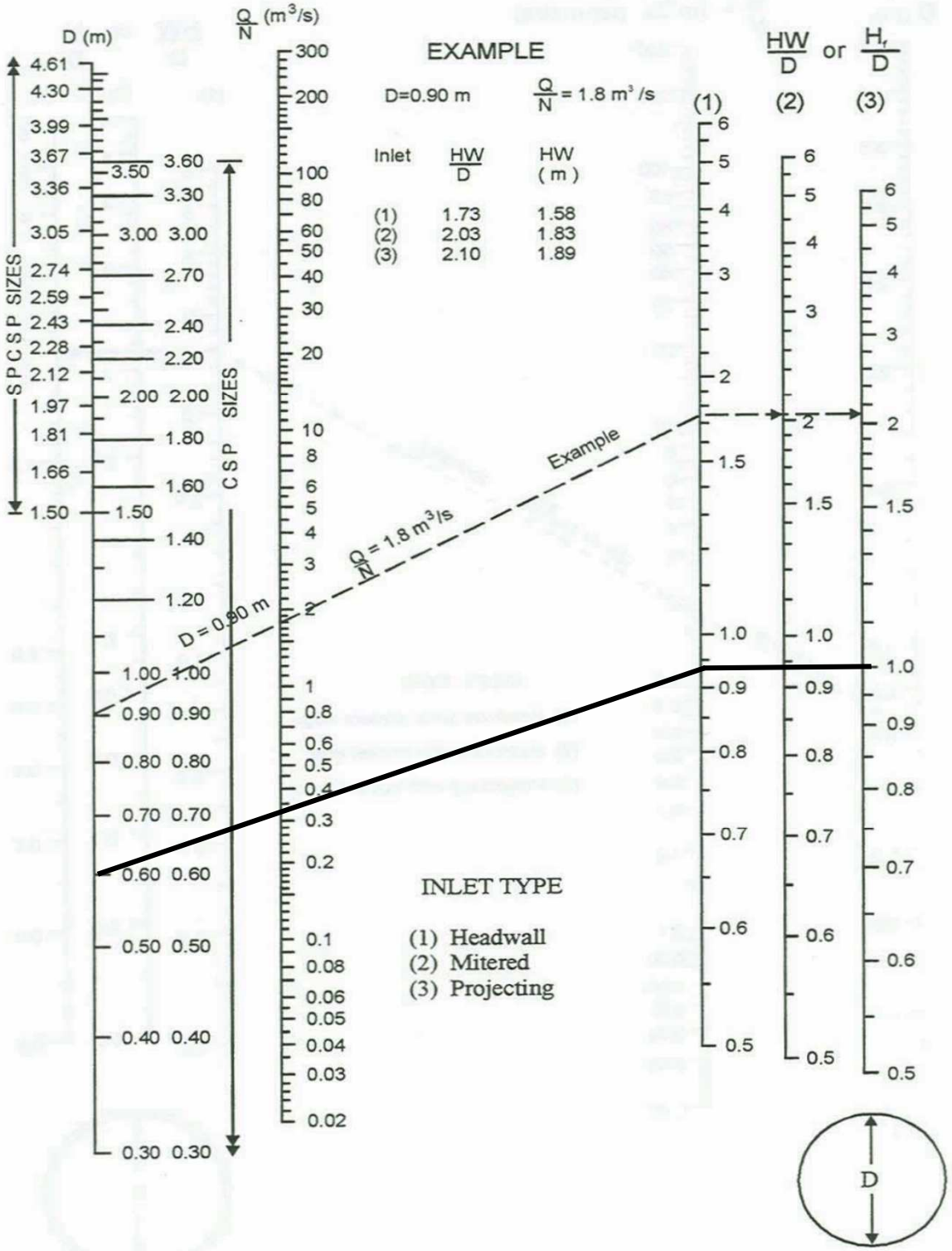
Drainage Area = 1.24 ha
Runoff Coefficient = 0.41 (100-year)
Rainfall Intensity = 178.56 mm/hr (based on 10-minute Tc; City of Ottawa IDF data)

$$Q_p = 2.78\ x\ 0.41\ x\ 178.56 mm/hr\ x\ 1.24 ha$$
$$Q_p = 251\ L/s$$

Proposed 600mm CSP Culvert Crossing Stittsville Main Street

Culvert Dia.	Culvert Capacity	HW/D
600mm	340 L/s	1.0

**Projecting*

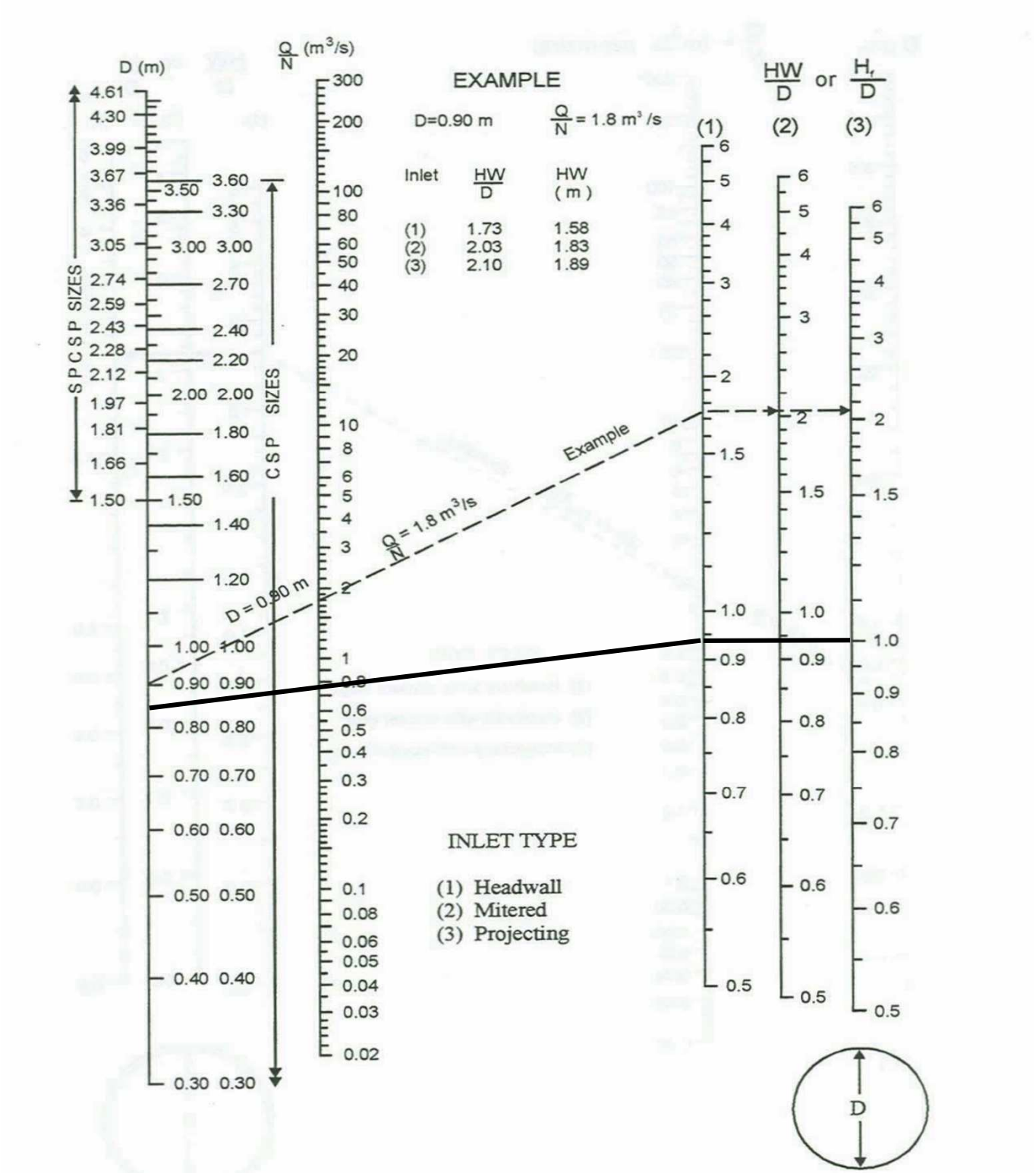


MTO Drainage Management Manual (Source: Herr, 1977)
Design Chart 2.32: Inlet Control: Circular Culverts

Existing 850mm CSP Culvert Crossing Sittssvile Main Street

Culvert Dia.	Culvert Capacity	HW/D
850mm	750 L/s	1.0

**Projecting*



MTO Drainage Management Manual (Source: Herr, 1977)
Design Chart 2.32: Inlet Control: Circular Culverts