



ENGINEERING
CONSULTANTS LTD

Stormwater Needs Study: Tara

Municipality of Arran-Elderslie

Project 21-015

June, 2024

Prepared By:

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TARA STORMWATER NEEDS STUDY REPORT

Municipality of Arran-Elderslie

June, 2024

21-015

1 INTRODUCTION AND PURPOSE OF STUDY

GSS Engineering Consultants Ltd. was retained by the Municipality of Arran-Elderslie to undertake a stormwater needs study for three communities: Chesley, Paisley and Tara. This report focuses on the evaluation of the stormwater system for Tara.

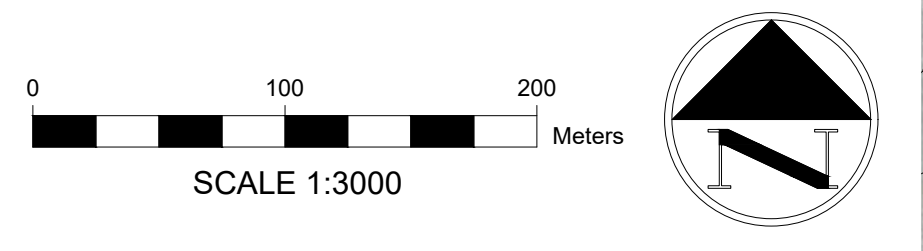
The community of Tara is located on the Sauble River approximately 6.5 km south of Highway 21 and 2.5 km west of the Grey-Bruce Line. Tara has a population of approximately 1,119 and 476 dwellings (as per 2021 census). Tara is spread over approximately 2.4 km² of land with a north-west length of 2.1 km and an east-west width of 1.6 km and has approximately 1,000 residential and commercial buildings.

The Sauble River winds through Tara, entering from the south and travelling to the north end of the community where it turns and exits to the southwest. The majority of Tara slopes toward the Sauble River (elevation of Sauble River varying from ± 221.0 in north part to ± 228.0 in south part through Tara) with high points in the south (EL: 237.0), middle (EL: 236.0), and north (EL: 243.0) end of the community.

Figure 1 overleaf provides an aerial view of Tara and the Sauble River complete with 1.0 m interval topographic contours provided by Bruce County.

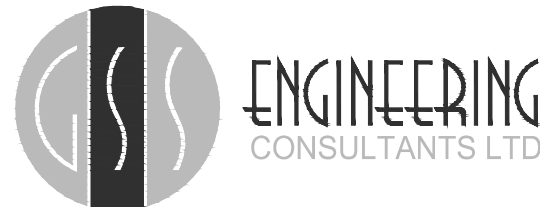
The aim of the stormwater needs study is to identify assets of the existing stormwater system (sewers, structures, overland flow paths, outlets, etc.) that are deficient in capacity, and propose upgrades to mitigate the identified deficiencies. The report further outlines priority of upgrades, preliminary cost estimates of the upgrades, as well as the total asset cost for the entire stormwater system.

The report focuses on eliminating the flooding over the storm structures during 1:5 year storm, while permitting some surcharging within storm sewers and structures. The provincial guidelines recommend the design and construction of storm sewers without any hydraulic overloading. However, for Tara's stormwater system, this effort may lead to the need for exceptionally large capital, which may not be very practical or affordable. Therefore, eliminating flooding over storm structures was the primary focus of the study.



CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

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Unit 230 945 3rd Avenue East, Owen Sound, ON, N4K 2K8
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Title:
 AERIAL VIEW OF TARA
 C/W TOPOGRAPHIC CONTOURS
 TARA STORMWATER NEEDS STUDY

Client:
 MUNICIPALITY OF ARRAN-ELDERSLIE

Design:	RS	Scale:	1:3000
Drawn:	JTB	Approved:	Design Engineer
Checked:	RS		
Date:	APRIL 2024		

Drawing No. FIGURE 1

2 EXISTING STORMWATER SYSTEM

In general, catchbasins collect stormwater runoff and carry it through storm sewers to a dedicated outlet. Such runoff transportation network is termed as the *minor stormwater system*. The minor stormwater system is generally intended to carry runoff from a 1:2-year or 1:5-year storm event. For larger storms, the excess stormwater runoff (that cannot be conveyed by the minor system) is carried overland (usually in road corridors and ditches) to a dedicated outlet. This is referred to as the *major stormwater system*.

The stormwater system in Tara consists of storm structures, sewers, ditches, road corridors, and two stormwater management ponds. As outlined in **Section 1**, the majority of Tara area naturally slopes toward the Sauble River, therefore, the majority of the stormwater system outlets to the river.

The following sub-sections provide details regarding the minor and major stormwater systems in Tara as well as general deficiencies affecting them. **Figure 2** overleaf provides a depiction of the existing stormwater system (all sewers and structures), with a few select attributes highlighted and described as follows:

- There are several existing storm sewers that have reverse slope. They are identified in “red.”
- A few storm structures were noted without any known outlets. They are identified in “orange.”
- Some storm sewers and appurtenances are located on private properties with no easements. They are indicated in “blue.”
- All roads without curb and gutter are highlighted in yellow. Absence of curb and gutter, as well as roadside ditches, could pose challenges related to carrying a major storm runoff.

2.1 Minor Stormwater System: Sewers and Structures

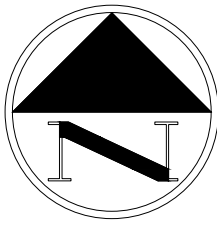
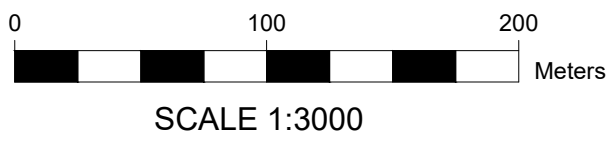
Tara stormwater system contains approximately 5 km of total storm sewer with sizes ranging from 100 mm $\varnothing$ to 675 mm $\varnothing$. **Table 2.1** outlines the approximate length of each sewer size.

As per **Table 2.1**, 200 mm $\varnothing$ sewer is the most abundant and 61 % of all sewers are 300 mm $\varnothing$ or less. MECP Design Guidelines require that storm sewers should be a minimum of 200 mm $\varnothing$ in size.

As previously stated, the minor stormwater system is generally designed to convey the runoff from the 1:5-year (or sometime the 1:2-year) return storm.

As noted later in this report, the most common cause of insufficient capacity of sewers appear to be small diameter pipes or not a large enough slope. At various locations, sewers possess a reverse slope, therefore, water will not flow by gravity and must back up in the system to develop enough head to flow through the sewer. Sewers that have a reverse slope are shown in red on **Figure 2**.

The stormwater system currently contains approximately 208 storm structures of a wide variety. **Table 2.2** provides a breakdown of the quantity of each structure type in the existing stormwater system.



STORM SEWERS WITH REVERSE SLOPE HAVE BEEN DEPICTED IN **RED**,
 STORM STRUCTURES WITH NO OUTLET HAVE BEEN DEPICTED IN **ORANGE**,
 PORTIONS OF THE STORM SYSTEM ON PRIVATE PROPERTY HAVE BEEN DEPICTED IN **BLUE**,
 AND ROADS WITH NO CURB/GUTTER OR DITCH HAVE BEEN HIGHLIGHTED IN **YELLOW**.



KEY PLAN



LEGEND

- CATCHBASIN
 ○ STORM MANHOLE
 → STORM SEWER (FLOW DIRECTION)
 CB CATCHBASIN
 CBMH CATCHBASIN MANHOLE
 STMMH STORM MANHOLE
 DICB DITCH INLET CATCHBASIN
 DCB DOUBLE CATCHBASIN
 DICBMH DITCH INLET CATCH BASIN MANHOLE
 FDSWS FIRST DEFENSE STORMWATER SEPARATOR
 — 231.00 CONTOUR (1.0m)

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Design:	RS	Scale:	1:3000
Drawn:	JTB	Approved:	Design Engineer
Checked:	RS		
Date:	JUNE 2024		

Drawing No. FIGURE 2

TABLE 2.1

**Storm Sewer Sizes and Lengths
Tara Stormwater System**

Storm Sewer Diameter (mm)	Total Length of Sewer (m)
100	108.6
150	201.1
200	1,086.0
250	1,017.8
300	623.5
375	276.3
400	239.1
450	765.4
500	120.2
600	184.6
675	325.1
Total	4,947.7

TABLE 2.2
Storm Structures
Tara Stormwater System

Storm Structure Type	Storm Structure Legend	Quantity
Catch Basin	CB	134
Catch Basin Manhole	CBMH	29
Ditch Inlet Catch Basin	DICB	22
Storm Manhole	STMMH	12
Ditch Inlet Catch Basin Manhole	DICBMH	4
Double Catch Basin	DCB	3
Rear Yard Catch Basin	RYCB	3
Oil Grit Separator	OGS	1
Total		208

Storm structures denoted as a catchbasin (CB, CBMH, DICB, DICBMH, DCB, RYCB) possess a grate cover and are intended to collect surface runoff for conveyance through connecting sewers. Remaining structures (STMMH) possess pick cover (or similar). These structures are not intended to collect runoff but rather provide a junction in which multiple sewers can be connected to converge. There is only one Oil Grit Separator structure which is intended to separate suspended particles and oil from the stormwater runoff to provide enhanced water quality.

There are select structures in the stormwater system with no discernible sewer outlet. Without a proper sewer outlet, all upstream structures will fill up during a rainfall event and eventually flood the surrounding area. The storm structures with no identified sewer outlet have been shown in orange on **Figure 2**.

2.2 Stormwater Management Ponds

There are only two stormwater management ponds that collect the stormwater runoff from the Tower Hill Crescent Subdivision located north of Brook Street and West of Yonge Street.

The stormwater management ponds were designed and constructed to collect the runoff from Tower Hill Crescent Subdivision, reduce the peak flow and discharge it to storm sewer. An orifice is placed at the outlet of each stormwater management pond to control the runoff exiting the pond.

The main stormwater management pond, hereinafter referred to as SWM Pond 1 collects the stormwater from the majority of northwest portion of the development. The second stormwater management pond, hereinafter referred to as SWM Pond 2, collects the runoff from the two townhouse rows in the eastern portion of the development.

The information in **Tables 2.3 and 2.4** was derived from the Stormwater Management Report for the Tower Hill Crescent Subdivision, prepared by COBIDE Engineering in 2018. The table summarizes the performance of SWM Pond 1 and SWM Pond 2, respectively, for various return period storm events.

The two stormwater management ponds as well as the Tower Hill Subdivision are depicted on **Figure 2**.

2.3 Major Stormwater System

When stormwater runoff exceeds the capacity of the minor stormwater system, the excess runoff must be conveyed overland to an appropriate outlet. The overland conveyance is considered as the major stormwater system. An inadequate major stormwater system can lead to flooding of buildings and streets and can be catastrophic during large rainfall events.

During larger rainfall events the flooding of catchbasins occur, thereby leading to spilling of runoff on to road corridors. The road corridors are generally sloped to convey the floodwater to an appropriate outlet. However, this is only viable where the catchbasins are within the road corridor and the road corridor contains proper curb and gutter. On streets without curb and gutter, the runoff is normally collected within roadside ditches and is carried to an outlet. However, like with storm structures if the road corridors/ditches do not have a proper outlet, the runoff can back up and cause flooding of adjacent lands that may include residences. The flooding can also occur if the road has dips/valleys and no well designed outlet.

TABLE 2.3

**Stormwater Management Pond 1 Performance
Tower Hill Subdivision - Tara Stormwater System**

Storm Return Period	Pond W/L (m)	Storage (m³)	Discharge (L/s)
2 Year	234.24	635	19.03
5 Year	234.66	1,033	20.76
25 Year	234.83	1,164	94.62
50 Year	234.92	1,265	99.47
100 Year	235.07	1,428	109.36

TABLE 2.4

**Stormwater Management Pond 2 Performance
Tower Hill Subdivision - Tara Stormwater System**

Storm Return Period	Pond W/L (m)	Storage (m³)	Discharge (L/s)
2 Year	231.44	40	11.72
5 Year	231.62	67	12.88
25 Year	231.90	119	14.42
50 Year	232.02	145	14.83
100 Year	232.13	173	15.24

The majority of existing roads in Tara do not contain curb and gutter or roadside ditches, or a proper outlet for the major stormwater event. At some locations, there are curbs with curb faced sidewalk, but they are not deep enough and have been considered deficient. Elgin Avenue (Brooke St. to Matilda St.) has a dip in the middle of the block, and is a concern, as there is no major rainfall event outlet. Such locations are highlighted in yellow on **Figure 2**.

2.4 Stormwater System on Private Property

Municipal storm structures, sewers, minor system outlets, and major system outlets should all be located within property (roadway) owned by the municipality. However, there are various areas in the Tara stormwater system where stormwater assets are located on private property as highlighted in blue on **Figure 2**.

3 LIMITATIONS OF THE STUDY

The stormwater system was investigated to identify deficiencies as accurately as reasonably possible. However, there are limitations that somewhat hinder the accuracy of this report. They are as follows:

- Insufficient or potentially incorrect information recorded in municipal database. Some of the information, wherever possible was verified in the field, however, all areas could not be verified. Suitable assumptions were made for such areas.
- There may be potential for blockages, collapsed sewers and plugged outlets that are currently not known but can be identified only with intensive CCTV inspection of the sewer system.
- The computer model prepared for this investigation was not checked for calibration to determine its accuracy. The only way to verify calibration of the model is by way of flow monitoring and local rainfall data collection. The flow monitoring is an expensive and time consuming exercise.

4 METHODOLOGY

4.1 Existing Stormwater System Information Collection

The existing storm sewer system attributes (storm structure top of grades, inverts, sewer slopes, diameter and lengths, etc.) were collected from various sources.

An overall map of the stormwater system prepared by Genivar in 2012 was used as the basis for the storm structure locations. An excel file with the storm sewer and structure information was provided by the municipality based on a previous field survey performed with a laser meter and a GPS survey unit. The information in select areas (Ann St., North St. Tower Hill Crescent, and Hamilton St.) was refined through construction project record drawings. It was assumed that the storm sewers in the Tower Hill Crescent subdivision that outlet into the stormwater management ponds are of sufficient size and therefore, the stormwater system in this area was only evaluated downstream of the ponds outlet.

Wherever necessary GSS Engineering performed various field surveys to confirm storm sewer inverts and collect missing information. In a few select locations, missing information could not be collected or verified in the field. In such areas reasonable assumptions were made regarding sewer slope, size, and length. The missing asset information is indicated by way of **Figure 10** in **Appendix D**.

All of the stormwater system information provided by the municipality (maps, survey data, and record drawings) are provided in **Appendix A**.

By incorporating information from above mentioned sources, a stormwater system map was prepared as outlined in **Figure 2**.

4.2 Existing Stormwater Catchment Areas and Hydrology

For analyzing the stormwater system, the entire storm sewer system was divided into 25 drainage basin/catchment areas. These basins were labeled alphabetically starting with “CA-A” in the north end of Tara and ending with “CA-Y” in the south end. The basins were further delineated into catchment areas of storm structures (catchbasin, ditch inlets, etc.) as much as possible.

The catchment area for each storm structure was defined based on the surrounding area sloping to structure as per 1 m topography contours and accounting for any drainage block such as a roadway with no culvert.

Figure 3 overleaf provides a layout of the various drainage basins utilized to breakdown the Tara stormwater system. The overall drainage area of the Tara stormwater system is approximately 110 ha.

The overland flow length and slope for each catchment area was determined from the contours. The percent of impervious area for each catchment area was determined from aerial photography. **Appendix B** provides the attributes for each catchment area, which were utilized in the model.

From soil maps as shown on **Figure 4** in **Appendix C**, it was determined that the soil in Tara consists mainly of loam and silt loam, with good drainage. It was assumed that the Tara drainage



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KEY PLAN



LEGEND

- CATCHBASIN
- STORM MANHOLE
- STORM SEWER (FLOW DIRECTION)
- CATCHBASIN
- CATCHBASIN MANHOLE
- STORM MANHOLE
- DITCH INLET CATCHBASIN
- DOUBLE CATCHBASIN
- DITCH INLET CATCH BASIN MANHOLE
- FIRST DEFENSE STORMWATER SEPARATOR
- CONTOUR (1.0m)
- CATCHMENT AREA

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Design:	RS	Scale:	1:3000
Drawn:	JTB	Approved:	Design Engineer
Checked:	RS		
Date:	JUNE 2024		

Drawing No. FIGURE 3

area belongs to soil group B. This soil group indicates a moderate infiltration rate with moderately well drained soils.

A runoff SCS curve number of 75 was utilized for the pervious area in Tara, indicative of residential area in soil group B.

4.3 Return Storms and Rainfall Data

As noted in **Section 2** the minor stormwater system (sewers and structures) should convey the 1:5-year storm. Accordingly, the stormwater system was evaluated for 1:5-year storm to determine if the storm sewer system has adequate capacity. The system was also evaluated for the 1:100-year storm to determine areas that can be expected to experience large amounts of flooding during a severe storm event. Both storm events were modelled as 12-hour Chicago storms with the rainfall data obtained by the MTO's IDF Curve Lookup tool. **Table 4.1** summarizes the information from MTO's website.

The rainfall distribution was also derived using VO-SWMM 5.2 software for the 1:5-year return storm, which is indicated in **Table 4.2**.

The rainfall distribution was also derived using VO-SWMM 5.2 software for the 1:100-year return storm, which is indicated in **Table 4.3**.

4.4 Stormwater System Modelling

The stormwater system was modelled with VO-SWMM version 5.2 software. The model output helped in identifying storm sewers that surcharge and storm structures that surcharge or flood for the 1:5-year and the 1:100-year storms. The results of this analysis are discussed further in **Section 5.1**.

Storm sewer surcharge occurs when the maximum flow to be conveyed by the sewer exceeds the capacity of the sewer. The capacity of the sewer is influenced by inlet losses, outlet losses, water levels in upstream and downstream storm structures, pipe materials, etc.

Surcharging of a storm structure occurs when the water level in the structure exceeds the elevation of the sewer obvert. Flooding of a storm structure occurs when the water level exceeds the top of grate elevation of the structure. For structures that flood, the model estimates the total volume of flooding for the given rainfall event.

Based on modelling results, stormwater system upgrades were identified to eliminate flooding of all storm structures during the 1:5-year storm. The stormwater system with the identified upgrades was remodelled to verify the adequacy of the upgrades. The results of this analysis are discussed in **Section 5.3**.

TABLE 4.1

**12-Hour Duration Rainfall Data
From MTO's IDF Curve Lookup**

Storm Event Return Period	Average Rainfall Intensity (mm/hr.)
1:5-year	5.2
1:100-year	8.6

TABLE 4.2**1:5-year Return Storm, 12-hour Duration, Chicago****Rainfall Distribution**

Time (hours)	Rainfall Intensity (mm/hr.)	Total Rainfall Depth (mm)
1	1.83	1.83
2	2.54	4.37
3	4.91	9.28
4	30.43	39.71
5	6.09	45.80
6	3.72	49.52
7	2.80	52.32
8	2.28	54.60
9	1.95	56.55
10	1.71	58.26
11	1.53	59.79
12	1.39	61.18

TABLE 4.3

**1:100-year Return Storm, 12-hour Duration, Chicago
Rainfall Distribution**

Time (hours)	Rainfall Intensity (mm/hr.)	Total Rainfall Depth (mm)
1	3.04	7.26
2	4.22	11.48
3	8.17	19.65
4	50.86	70.51
5	10.15	80.66
6	6.19	86.85
7	4.65	91.50
8	3.79	95.29
9	3.24	98.53
10	2.84	101.37
11	2.54	103.91
12	2.31	106.22

5 DISCUSSION OF RESULTS

The stormwater system was modelled as outlined in the methodology in **Section 4** of this report. The results of the analysis are discussed in **Section 5.1** below.

Proposed upgrades to eliminate stormwater system flooding for the 1:5-year storm are discussed in **Section 5.2** below and the results of modelling the upgraded systems are outlined in **Section 5.3**.

5.1 Existing Conditions Model Results

Figure 5 overleaf provides the 1:5-year storm modelling results for the entire system, with flooded structures shown in red and surcharged structures and sewers shown in orange.

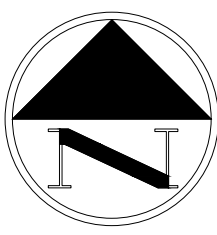
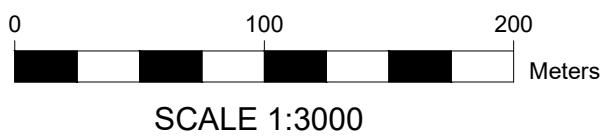
The modelling results indicate that 22 out of 208 storm structures will experience flooding during the 1:5-year storm and 79 structures will surcharge. The total estimated volume of flooding is 3,654 m³. The structures with a large flood volume are DICBMH 318 (on John St. between Heather Lynn Blvd. and Hamilton St.) with 578 m³, CBMH 248 (on Yonge St. just north of the bridge) with 969 m³, and CB 215 (on Union St.) with 1,025 m³. These three (3) structures account for 70% of total flooding. The suggested upgrades to mitigate storm structure flooding during the 5-year rainfall event are detailed in **Section 5.2**.

As indicated in **Figure 5**, sections on Brook St. E., Yonge St., Francis St., Elgin Ave., and John St. contain a large proportion of the surcharging sewers and structures.

Figure 6 provides the results for the 1:100-year storm.

During the 1:100-year storm, 52 structures will experience flooding and 118 structures will surcharge. As discussed earlier in **Section 2**, the high proportion of flooding and surcharging is expected for the 1:100-year storm as the minor stormwater system is designed to convey only 1:5-year storm. The model indicates that 16,544 m³ of flooding is expected for the 1:100-year storm. The three (3) (DICBMH 318, CBMH 248, and CB 215) structures, as identified earlier, experience the largest amount of flooding as in the 1:5-year storm. These three structures account for a total of 8,863 m³ of flooding or 54% of total flooding.

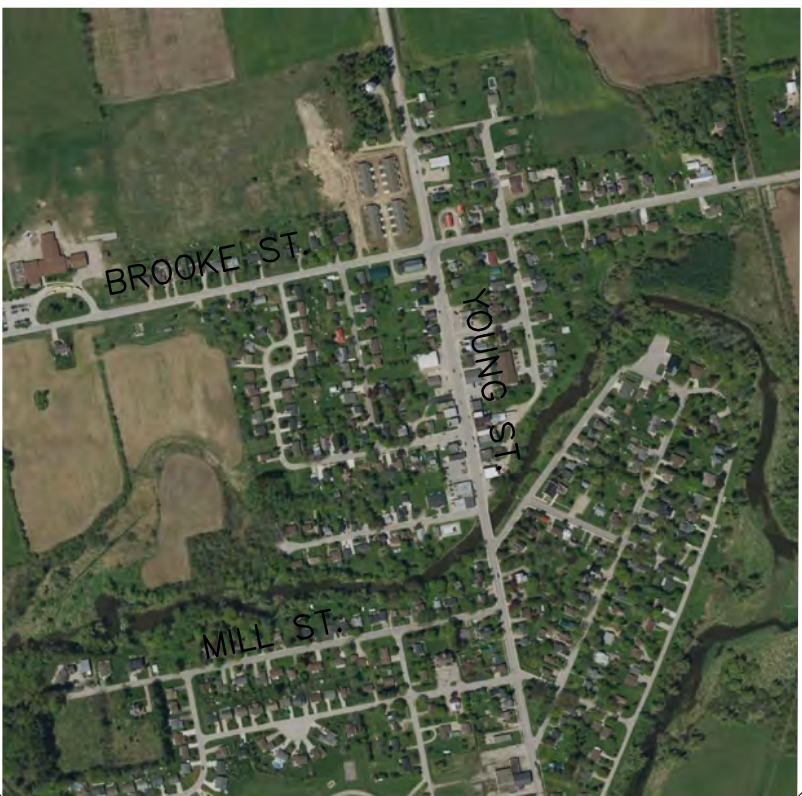
Stormwater flooding from structures during a severe storm, such as the 1:100-year storm, is to be conveyed overland within the road corridor or roadside ditches to an appropriate outlet. Therefore, flooding in areas without proper curb and gutter or ditching is a major concern. In several areas Tara, such as Francis St., Elgin Ave., Maria St., Matilda St., Market St., River St., Whites Ave., Main St., and John St., flooding is expected during the 1:100-year storm, but no curb and gutter or sufficient ditches exist. Elgin Avenue has an additional problem of a dip in the Brooke-Matilda block. The dip does not provide a proper outlet within the road corridor and will lead to accumulation of flood water in the area. This outlines the need for proper curb and gutter or roadside ditches and vertical realignment of road during any road reconstruction project. Furthermore, a survey of finished ground floor elevations or basement opening is required to confirm the flooding impact on residential properties, if any, during major storms.



FLOODED STORM STRUCTURES HAVE BEEN DEPICTED IN RED,
 WHILE SURCHARGED STRUCTURES AND SEWERS HAVE BEEN DEPICTED IN ORANGE.



KEY PLAN



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- CATCHBASIN
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- CONTOUR (1.0m)
- CATCHMENT AREA

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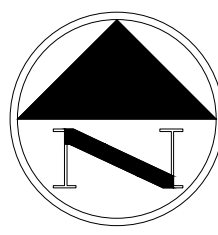
Unit 230 945 3rd Avenue East, Owen Sound, ON, N4K 2K8
 Telephone: (519) 372-4828

Title:
 EXISTING STORMWATER SYSTEM
 5-YEAR STORM RESULTS
 TARA
 STORMWATER NEEDS STUDY

Client:
 MUNICIPALITY OF ARRAN-ELDRSLIE

Design:	RS	Scale:	1:3000
Drawn:	JTB	Approved:	Design Engineer
Checked:	RS		
Date:	JUNE 2024		

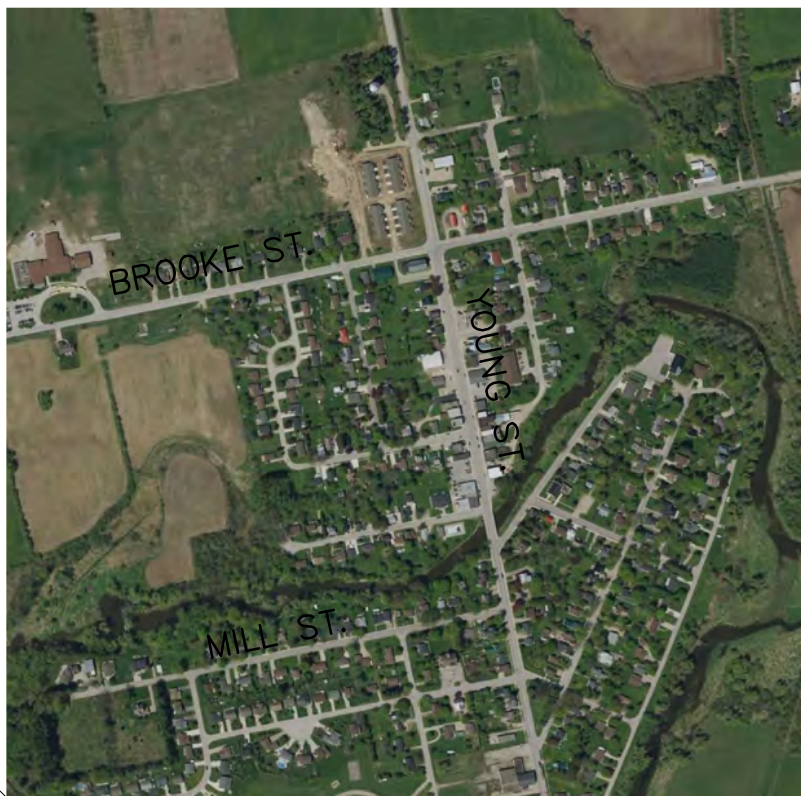
Drawing No. FIGURE 5



FLOODED STORM STRUCTURES HAVE BEEN DEPICTED IN RED,
WHILE SURCHARGED STRUCTURES AND SEWERS HAVE BEEN DEPICTED IN ORANGE.



KEY PLAN

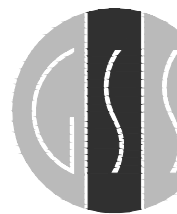


LEGEND

- | | |
|---|---------------------------------------|
|  | CATCHBASIN |
|  | STORM MANHOLE |
|  | STORM SEWER (FLOW DIRECTION) |
|  | CATCHBASIN |
|  | CATCHBASIN MANHOLE |
|  | STORM MANHOLE |
|  | DITCH INLET CATCHBASIN |
|  | DOUBLE CATCHBASIN |
|  | DITCH INLET CATCH BASIN MANHOLE |
|  | FIRST DEFENSE
STORMWATER SEPARATOR |
|  | CONTOUR (1.0m) |
|  | CATCHMENT AREA |

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ENGINEERING
CONSULTANTS LTD

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Telephone: (519) 372-4828

EXISTING STORMWATER SYSTEM
100-YEAR STORM RESULTS
TARA
STORMWATER NEEDS STUDY

Client: MUNICIPALITY OF ARRAN-ELDERSLIE

Design:	RS	Scale:	1:3000
	ITD	Approved:	Design Engineer

Drawn:	JTB
Checked:	RS

Drawing No. FIGURE 6

5.2 Proposed Upgrades

Based on the modelling results for the existing conditions of stormwater system and as discussed in **Section 5.1**, 12 system upgrades have been identified to mitigate flooding during the 1:5-year storm. These upgrades range from replacement of an odd sewer to complete reconstruction of a section of the stormwater system.

The twelve (12) identified system upgrades are depicted in green on **Figure 7**. **Table 5.1 and 5.2** provide a priority list of the 12 proposed upgrades, strictly based on the volume of flooding eliminated. The table includes a brief description of each upgrade. Note that five (5) upgrading projects as outlined in **Table 5.2** are on County Road but are included as they are needed to achieve overall improvement.

No upgrade has been proposed to eliminate the flooding at CB 215 on Union Street as the stormwater system in this area is owned by Bruce County and not the Municipality of Arran-Elderslie. There could be more than one solution to prevent flooding at CB215 and Bruce County should be part of the decision making. It is recommended that Bruce County be notified of the deficient portion of their stormwater system and a detailed analysis of this area should be completed to determine required upgrades to eliminate flooding.

5.3 Upgraded System Model Results

Figure 8 overleaf provides the 1:5-year storm modelling results for the Tara stormwater system with the proposed upgrades.

The model indicates that with the proposed upgrades, one (1) storm structure will flood (down from 22) and 36 storm structures will surcharge (down from 79) during the 1:5-year storm. The remaining flooded storm structure is CB 215 on Union Street. As discussed in **Section 5.2**, no upgrade is proposed as part of this study to mitigate flooding of this structure as it is owned by Bruce County. Therefore, the model indicates that the proposed upgrades completely eliminate flooding of Municipal storm structures in Tara for the 1:5-year storm.

Figure 9 provides the 1:100-year storm modelling results for the stormwater system with the proposed upgrades.

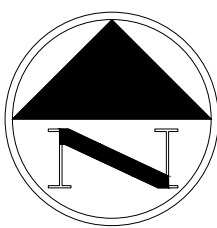
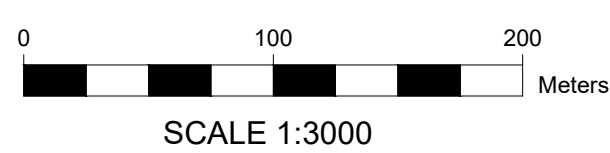
The model indicates that 26 structures will flood (down from 52) and 89 structures will surcharge (down from 118) during the 1:100-year storm. The total storm flooding volume is reduced from 16,544 m³ to 5,111 m³, with the majority of remaining flooding (76%) at CB 215 on Union Street. As noted earlier, the storm sewer system is not designed to convey the 1:100-year storm, however, the upgrades, if implemented, will greatly improve the conveyance of the 1:100-year storm in the storm sewers and decrease in the flooding.

TABLE 5.1 Priority of Stormwater System Upgrades Tara Stormwater Needs Study													
May, 2024		21-015											
Priority Ranking*	Description of Upgrade	New Structures (#)	Length of New Sewers (m)							Catchment Area	Location	Reduction in Flooding Volume 1:5-year Storm (m³)	Existing Flooding Structures
			300 mm ø	375 mm ø	450 mm ø	600 mm ø	675 mm ø	750 mm ø	1050 mm ø				
1	Reconstruction of John St. (from Hamilton St. to Heather Lynn Blvd.) and Heather Lynn Blvd. (from John St. to Mill St.).	13	46.1	-	81.0	-	41.0	27.9	360.7	R	John St. and Heather Lynn Blvd.	580	DICBMH 318, CB 363
2	Reconstruction of Elgin St. and Matilda St. (from Elgin St. to Francis St.).	9	11.3	204.8	186.7	-	-	-	-	H	Elgin St. and Matilda St.	490	CB 294, CB 1, CB 2, Other 1006, CB 290
3	Install outlet sewer from CB 357 to the Sauble River.	1	40.0	-	-	-	-	-	-	K	River St. north of Market St.	181	CB 357
4	Replace sewer from Junction to STM 1001 and from STM 1001 to Outlet.	2	-	77.8	119.4	-	-	-	-	P	Main St. from Yonge St. to Ann St. and Ann St. from Main St. to River St.	102	CBMH 238
5	Reconstruction of Francis St. (from Brook St. W to Matilda St.).	17	210.3	-	114.7	49.8	-	-	-	H	Francis St.	92	CB 305, CB 306
6	Replace sewer from CB 312 to CB 310.	4	65.6	-	-	-	-	-	-	L	Whites Ave.	16	CB 313
7	Replace sewer from CB 345 to CB 343.	2	70.7	-	-	-	-	-	-	J	River St. west of Main St.	1	CB 344

* Priority ranking based solely on reduction in flooding during 1:5-year storm

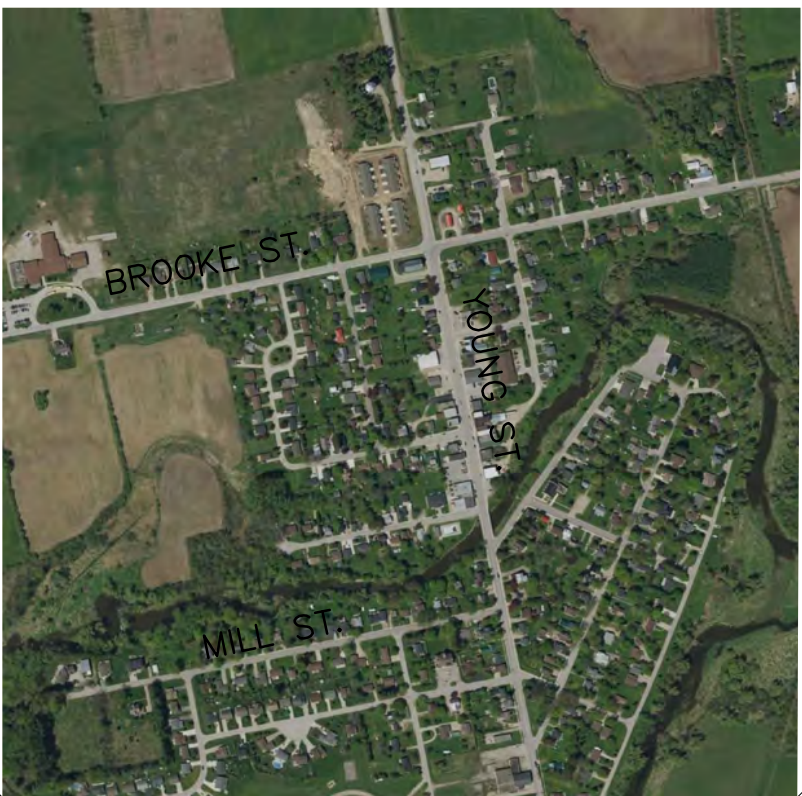
TABLE 5.2 Priority of Bruce County Stormwater System Upgrades Tara Stormwater Needs Study													
May, 2024		21-015											
Priority Ranking*	Description of Upgrade	New Structures (#)	Length of New Sewers (m)							Catchment Area	Location	Reduction in Flooding Volume 1:5-year Storm (m ³)	Existing Flooding Structures
			300 mm ø	375 mm ø	450 mm ø	600 mm ø	675 mm ø	750 mm ø	1050 mm ø				
1	Replace sewer outlet from CBMH 248.	1	-	-	-	-	30.3	-	-	A	Yonge St. North, just north of bridge	971	CB 361, CB 247, CBMH 248
2	Replace sewer from DICB 224 to STM 1000, from CB 226 to CB 227 and sewer outlet from CB 227.	6	53.4	-	51.8	-	-	-	-	U	Intersection of Yonge St. South and Union St.	96	DICB 223
3	Replace sewer from CB 237 to CB 236 and from CB 236 to Junction .	2	13.1	-	-	-	-	-	-	P	Intersection of Yonge St. South and Main St.	51	CB 237
4	Replace sewer from CB 241 to CB 244.	2	19.9	-	-	-	-	-	-	P	Intersection of Yonge St. South and Ann St.	38	CB 241
5	Replace sewer from CB 264 to CB 265 and from CB 265 to CB 266.	3	13.5	-	-	-	-	-	-	A	Brook St. E between Yonge St. and Maria St.	12	CB 264

* Priority ranking based solely on reduction in flooding during 1:5-year storm



STORM SEWERS AND STRUCTURES THAT ARE PROPOSED TO BE UPGRADED HAVE BEEN DEPICTED IN GREEN.

KEY PLAN



LEGEND

- CATCHBASIN
- STORM MANHOLE
- STORM SEWER (FLOW DIRECTION)
- CATCHBASIN
- CATCHBASIN MANHOLE
- STORM MANHOLE
- DITCH INLET CATCHBASIN
- DOUBLE CATCHBASIN
- DITCH INLET CATCH BASIN MANHOLE
- FIRST DEFENSE STORMWATER SEPARATOR
- CONTOUR (1.0m)
- CATCHMENT AREA

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Telephone: (519) 372-4828

Client: MUNICIPALITY OF ARRAN-ELDRSLIE
Title: PROPOSED STORMWATER SYSTEM UPGRADES
TARA
STORMWATER NEEDS STUDY

Design:	RS	Scale:	1:3000
Drawn:	JTB	Approved:	Design Engineer
Checked:	RS		
Date:	JUNE 2024		

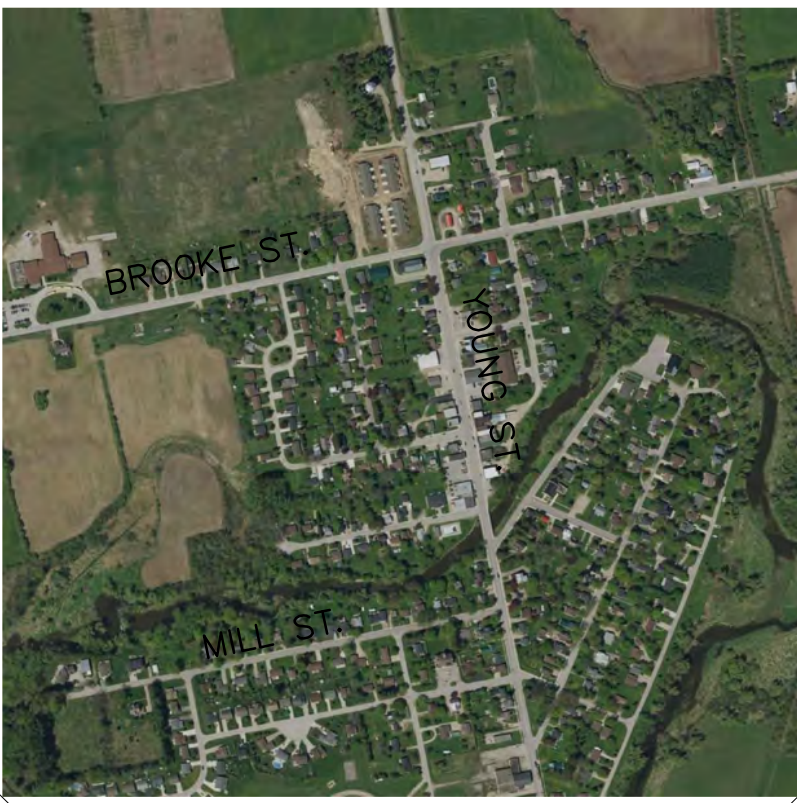
Drawing No. FIGURE 7



FLOODED STORM STRUCTURES HAVE BEEN DEPICTED IN RED,
WHILE SURCHARGED STRUCTURES AND SEWERS HAVE BEEN DEPICTED IN ORANGE.

STORM SEWERS AND STRUCTURES THAT ARE PROPOSED
TO BE UPGRADED HAVE BEEN DEPICTED IN GREEN.

KEY PLAN



LEGEND

- CATCHBASIN
- STORM MANHOLE
- STORM SEWER (FLOW DIRECTION)
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Telephone: (519) 372-4828

Title:
UPGRADED STORMWATER SYSTEM
5-YEAR STORM RESULTS
TARA
STORMWATER NEEDS STUDY

Client:
MUNICIPALITY OF ARRAN-ELDRSLIE

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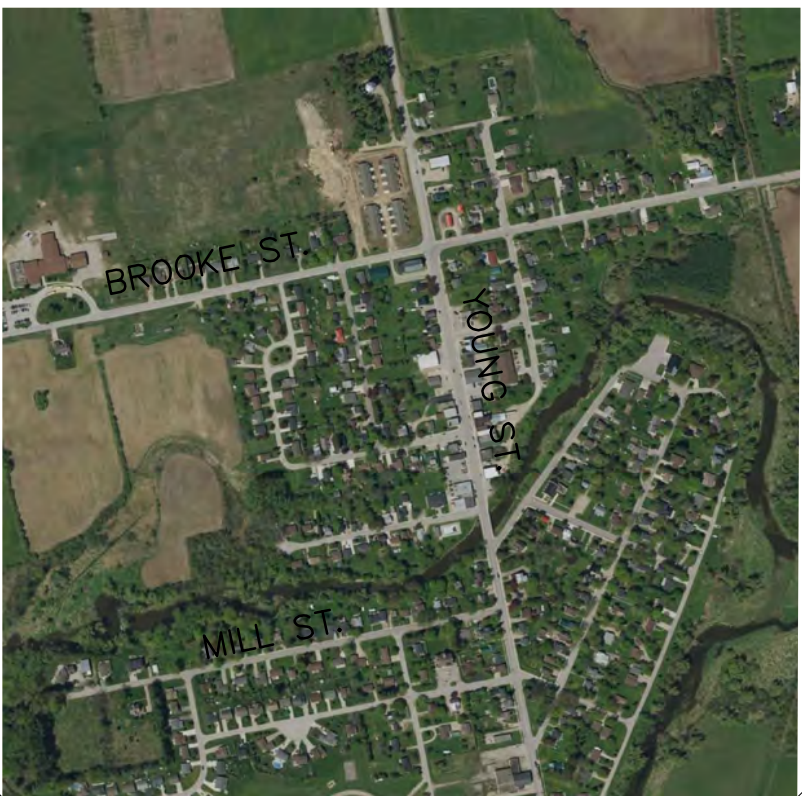
Drawing No. FIGURE 8



FLOODED STORM STRUCTURES HAVE BEEN DEPICTED IN RED,
WHILE SURCHARGED STRUCTURES AND SEWERS HAVE BEEN DEPICTED IN ORANGE.

STORM SEWERS AND STRUCTURES THAT ARE PROPOSED
TO BE UPGRADED HAVE BEEN DEPICTED IN GREEN.

KEY PLAN



LEGEND

- CATCHBASIN
- STORM MANHOLE
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Title:
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100-YEAR STORM RESULTS
TARA
STORMWATER NEEDS STUDY

Client:
MUNICIPALITY OF ARRAN-ELDRSLIE

Design:	RS	Scale:	1:3000
Drawn:	JTB	Approved:	Design Engineer
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Date:	JUNE 2024		

Drawing No. FIGURE 9

6 STORM INFRASTRUCTURE COST ESTIMATES

An approximate cost estimate of the entire stormwater system was prepared by utilizing current replacement value of storm sewers, storm structures and curb and gutter, and culverts. A rough estimate of ditch construction cost was also included in the total asset cost.

It may be noted that the some of the streets in Tara have curb and gutter on one side of the road and ditches on the other side, as indicated in **Table 6.1**. On some streets, the ditches appear to have been filled in by residents. However, those streets have been estimated as if the ditch exists, since streets should have ditches or storm sewers to manage runoff. The existing storm infrastructure estimate is on the high side.

Table 6.1 provides a street-wide breakdown of replacement cost of the existing storm infrastructure. The unit prices included are based on the most recent prices in tendered project. The total asset value is estimated at \$5.63 Million in 2024 (in dollar value). Any future use of indicated prices should be based on price adjustments for construction inflation, which tend to be much higher than posted inflation rate.

Table 6.2 provides a cost breakdown of seven (7) municipal infrastructure improvements as recommended in **Table 5.1**. The table is self-explanatory. The total improvement cost based on 2024 dollar value is \$1.85 Million. As noted above, the dollar amounts should be adjusted for construction inflation when used in future.

Considering that seven (7) projects cannot be implemented simultaneously, the municipality can consider an annual fund contribution of \$100,000 per year towards storm infrastructure improvements.

TABLE 6.1
Cost Estimate
Storm Sewer System: Existing Conditions

21-015-01 A & B

Street Name	Street		Pipe			Curb & Gutter		Storm Structures		Ditches		Grand Total Cost (\$)
	From	To	Size (ø)	Length (m)	Cost	Length	Cost	#	Cost	Length (m)	Cost	
Heather Lynn Blvd	Mill St	John	300	15.7	\$25,237.50	0	\$0.00	2	\$10,000	178	\$32,040.00	\$67,277.50
			450	43								
John St	Heather Lynn Blvd	Hamilton St	450	87.7	\$127,515.00	0	\$0.00	5	\$25,000	558	\$100,440.00	\$252,955.00
			450	71.6								
			300	14.6								
			450	40.4								
			300	81.0								
			300	4.8								
	Hamilton St	Yonge St. S	200	7.4	\$6,200.00	254	\$31,750.00	6	\$30,000	60	\$10,800.00	\$78,750.00
			150	12.6								
			200	11.0								
	Private	John St	Mill St.	600	15.8	\$94,741.00	0	\$0.00	3	\$15,000	0	\$0.00
600				33.2								
600				27.9								
675				10.5								
675				41.0								
Mill		North End	675	63.3								
Private	Elgin St	Francis St	150	10.1	\$39,852.50	0	\$0.00	1	\$5,000	0	\$0.00	\$44,852.50
			200	9.8								
			250	71.0								
			300	25.3								
			150	11.9								
			300	14.8								
			200	12.4								
Mill St	Heather Lynn Blvd	Hamilton St	250	11.0	\$38,800.00	277	\$34,625.00	3	\$15,000	554	\$99,720.00	\$289,575.00
			450	43.6								
			450	11.1								
			400	17.2								
			150	22.0								
	Hamilton St	Yonge St. S	0	0		126	\$15,750.00		252	\$45,360.00		
	East End	Heather Lynn Blvd.	0	0		0	\$0.00		224	\$40,320.00		
River St E	Market St.	Ann St	300	14.4	\$60,478.50	0	\$0.00	4	\$20,000	644	\$115,920.00	\$338,318.50
			375	27.9								
			200	31.8								
			300	14.4								
	Market St	Main St	200	21.4		0	\$0.00	7	\$35,000	594	\$106,920.00	
			250	22.4								
			250	36								
			300	21.64								
			250	21.58								
			100	10.9								
River St W	Main St	Market St	200	3.0	\$41,087.50	213	\$26,625.00	5	\$25,000	381	\$68,580.00	\$183,252.50
			200	70.7								
			300	22.7								
			300	19.3								
			250	14.1								
			300	19.8								
	Market St	Yonge St. S	0	0.0		72	\$9,000.00		72	\$12,960.00		
Whites Ave	Matilda St	Mill St.	200	7.0	\$32,042.50	248	\$31,000.00	5	\$25,000	248	\$44,640.00	\$132,682.50
			200	65.6								
			200	5.5								
			250	51.3								
			200	24.4								

TABLE 6.1
Cost Estimate
Storm Sewer System: Existing Conditions

Cost Estimate

Storm Sewer System: Existing Conditions

21-015-01 A & B

Street Name	Street		Pipe			Curb & Gutter		Storm Structures		Ditches		Grand Total Cost (\$)										
	From	To	Size (ø)	Length (m)	Cost	Length	Cost	#	Cost	Length (m)	Cost											
Matilda St	Yonge St N	Elgin Ave	300	9.0	\$33,880.00	108	\$13,500.00	5	\$25,000	126	\$22,680.00	\$140,060.00										
			250	27.0																		
	Elgin Ave	Francis St	150	4.4		0	\$0.00			250	\$45,000.00											
			300	44.4																		
			300	18.4																		
Market St	Main	River St W	200	9.5	\$34,387.50	117.5	\$14,687.50	4	\$20,000	117.5	\$21,150.00	\$126,945.00										
			200	62.8																		
			200	59.4																		
			300	11.2																		
			250	17.1																		
	Main St	River St E	0	0.0		0	\$0.00		204	\$36,720.00												
Main St.	South End	Ann St	300	77.8	\$72,395.00	75	\$9,375.00	3	\$15,000	75	\$13,500.00	\$214,520.00										
	Ann St.	Market St				346	\$43,250.00			0	\$0.00											
			200	10.0																		
			150	6.1																		
	River St	Market St	10.2	200		200	\$25,000.00			200	\$36,000.00											
Brook St W	Yonge St N	Chestnut Hill Cres E	500	84.4	\$101,842.00	203	\$25,375.00	3	\$15,000	0	\$0.00	\$285,517.00										
	Chestnut Hill Cres E	Chestnut Hill Cres W	375	12.4		212	\$26,500.00	1	\$5,000	0	\$0.00											
			400	82.0																		
			300	29.5																		
	Chestnut Hill Cres W	West End	375	10.3		0	\$0.00	4	\$20,000	510	\$91,800.00											
			375	17.4																		
250			16.7																			
Maria St.	North St.	Brook St E	200	6.93	\$79,697.50	278	\$34,750.00	5	\$25,000	0	\$0.00	\$279,802.50										
			200	5.52																		
			200	10.3																		
			250	9.4																		
			250	22.8																		
	Brook St. E	Bruce St	250	51.9		109	\$13,625.00	3	\$15,000	218	\$39,240.00											
			250	69.6																		
	Brook St. E	South End	400	17.5		106	\$13,250.00	4	\$20,000	218	\$39,240.00											
			150	56.6																		
			400	20.5																		
			300	24.9																		
			Chestnut Hill Cres. E	North End									Brook St W	300	8.5	\$80,444.50	816	\$102,000.00	11	\$55,000	0	\$0.00
														300	12.8							
300	22.3																					
300	46.1																					
300	8.5																					
375	52.3																					
300	8.5																					
375	37.8																					
300	8.7																					
Chestnut Hill Cres W	North End	Brook St W	300	8.6	\$3,225.00	619	\$77,375.00	2	\$10,000	0	\$0.00	\$90,600.00										
Bruce St.	Yonge St N	Maria St	150	10.6	\$21,477.50	95	\$11,875.00	5	\$25,000	95	\$17,100.00	\$75,452.50										
			200	9.1																		
			200	7.6																		
			200	14.0																		
			200	7.4																		
			200	47.1																		
			250	10.3																		

TABLE 6.1
Cost Estimate
Storm Sewer System: Existing Conditions

21-015-01 A & B

Street Name	Street		Pipe			Curb & Gutter		Storm Structures		Ditches		Grand Total Cost (\$)
	From	To	Size (ø)	Length (m)	Cost	Length	Cost	#	Cost	Length (m)	Cost	
Elgin St	Brook St W	Matilda St	250	7.7	\$35,942.50	0	\$0.00	7	\$35,000	500	\$90,000.00	\$160,942.50
			100	80.3								
			100	40.5								
			100	45.2								
			150	10.1								
			150	5.9								
			200	9.8								
Francis St	Brook St W	Matilda St	375	72.0	\$42,112.50	0	\$0.00	9	\$45,000	682	\$122,760.00	\$209,872.50
			200	6.0								
			100	12.0								
			250	46.1								
Ann St	Yonge St S	Main St	0	0	\$44,775.00	50	\$6,250.00	2	\$10,000	50	\$9,000.00	\$109,265.00
	Main St	River St	300	119.4		0	\$0.00			218	\$39,240.00	
North Street	Yonge St N	Maria St	250	38.2	\$8,595.00	0	\$0.00	0	\$0	260	\$46,800.00	\$55,395.00
Heather Lynn Blvd	Midway on Heather Lynn Blvd	South End	450	21.4	\$60,830.00	0	\$0.00	9	\$45,000.00	1154	\$207,720.00	\$313,550.00
				43.5								
				35.4								
			400	22.9								
		Two (2) unknown pipes (unknown length & size)		300	15.9							
Hamilton Street	Mary Ann St	South End	300	12	\$129,055.00	270	\$33,750.00	12	\$60,000.00	0	\$0.00	\$356,005.00
			450	65.4								
			450	70.7								
			600	10								
			300	34								
			450	56								
			300	31.6								
	450	17.8										
	John St	Mary Ann St	0	0	0	\$0.00	556	\$100,080.00				
Mill St	John St	0	0	0	\$0.00	184	\$33,120.00					
Mary Ann St	Hamilton Street	Yonge St S	0	0	\$0.00	310	\$38,750.00	3	\$15,000.00	140	\$25,200.00	\$78,950.00
South of Union St	Union St	Parking Lot of Lallemand	200	3.2	\$640.00	0	\$0.00	1	\$5,000.00	0	\$0.00	\$5,640.00
220 culverts @ 6 m each, total length is 1320m @ 200\$/m												\$264,000.00
Asset Construction Cost												\$4,501,366.00
Engineering & Contingencies @ 25%												\$1,125,341.50
Total Asset Cost (Excluding HST)												\$5,626,707.50

TABLE 6.2 Priority of Stormwater System Upgrades Tara Stormwater Needs Study				
May, 2024				21-015
Priority Ranking*	Upgrade as Identified in Table 5.1	Catchment Area	Location	Budget Project Cost (Includes Storm Sewers, Structures, Curb & Gutter Removal and Replacement)
1	Reconstruction of John St. (from Hamilton St. to Heather Lynn Blvd.) and Heather Lynn Blvd. (from John St. to Mill St.).	R	John St. and Heather Lynn Blvd.	\$578,650.00
2	Reconstruction of Elgin St. and Matilda St. (from Elgin St. to Francis St.).	H	Elgin St. and Matilda St.	\$339,780.00
3	Install outlet sewer from CB 357 to the Sauble River.	K	River St. north of Market St.	\$94,500.00
4	Replace sewer from Junction to STM 1001 and from STM 1001 to Outlet.	P	Main St. from Yonge St. to Ann St. and Ann St. from Main St. to River St.	\$144,985.00
5	Reconstruction of Francis St. (from Brook St. W to Matilda St.).	H	Francis St.	\$182,050.00
6	Replace sewer from CB 237 to CB 236 and from CB 236 to Junction.	P	Intersection of Yonge St. South and Main St.	\$14,875.00
7	Replace sewer from CB 345 to CB 343.	J	River St. west of Main St.	\$129,125.00
Total Construction Cost				\$1,483,965.00
Engineering & Contingencies @ 25%				\$370,991.25
Total Project Cost (Excluding HST)				\$1,854,956.25

* Priority ranking based solely on reduction in flooding during 1:5-year storm. Projects on Bruce County roads are excluded from this spreadsheet.

7 CONCLUSIONS

- 1) Tara stormwater system database, which was utilized for the study has data gaps, some of which were eliminated during this study. However, there is a need to continue to reform the database.
- 2) Storm sewer system has deficiencies related to reverse slopes of storm sewers, storm structures without outlet and storm infrastructure on private properties that require municipality's attention.
- 3) Investigation Study was completed by undertaking computer modelling and no CCTV inspection of sewers or storm structures was completed as part of the investigation.
- 4) Storm sewer system created in the VO-SWMM version 5.2 computer model could not be checked for calibration for reasons as outlined in section 3.0 of this report.
- 5) The modelling results indicate that 22 storm structures experience flooding with a total volume of 3,654 m³ during the 1:5-year storm. And 52 storm structures experience flooding with a total volume of 16,544 m³ for the 1:100-year storm.
- 6) Seven (7) municipal project upgrades to the stormwater system are estimated at \$1.85 Million as described in **Table 5.1** and estimated in **Table 6.2**.
- 7) The proposed upgrades, if implemented, are anticipated to eliminate flooding of all municipal storm structures except one (1) structure during the 1:5-year storm and decrease flooding from 16,544 m³ to 5,111 m³ during the 1:100-year storm. The majority of flooding remaining on Union Street.
- 8) The modelling results identified several areas that are anticipated to experience flooding during severe storms but they do not have proper curb and gutter or ditches to convey flooding water. Those streets are Francis St., Elgin Ave., Maria St., Matilda St., Market St., River St., Whites Ave., Main St. and John St. Elgin Ave. also requires vertical realignment of the road to eliminate the dip in Brooke-Matilda block. A survey of the finished ground elevations or basement opening can confirm flooding implications, if any, during major storm events.

8 RECOMMENDATIONS

The following recommendations are presented:

- 1) The seven (7) storm system upgrades identified in this report and summarized in **Table 5.1** should be prioritized to eliminate flooding during the 1:5-year storm. However, they should be combined with future road reconstructions, watermain and sanitary sewer projects. Proper curb and gutter or roadside ditches are recommended to be added to ensure flooding during severe storms is conveyed to a sufficient outlet.
- 2) Bruce County be notified of the deficiencies on the Union Street stormwater system as an in-depth study should be conducted for this area to determine upgrades to eliminate flooding during the 1:5-year storm.
- 3) Arran-Elderslie is advised to consider an annual fund amount of \$100,000 towards storm sewer system upgrades, in order that deficiencies are eliminated by way of sustained effort to bring about improvements.

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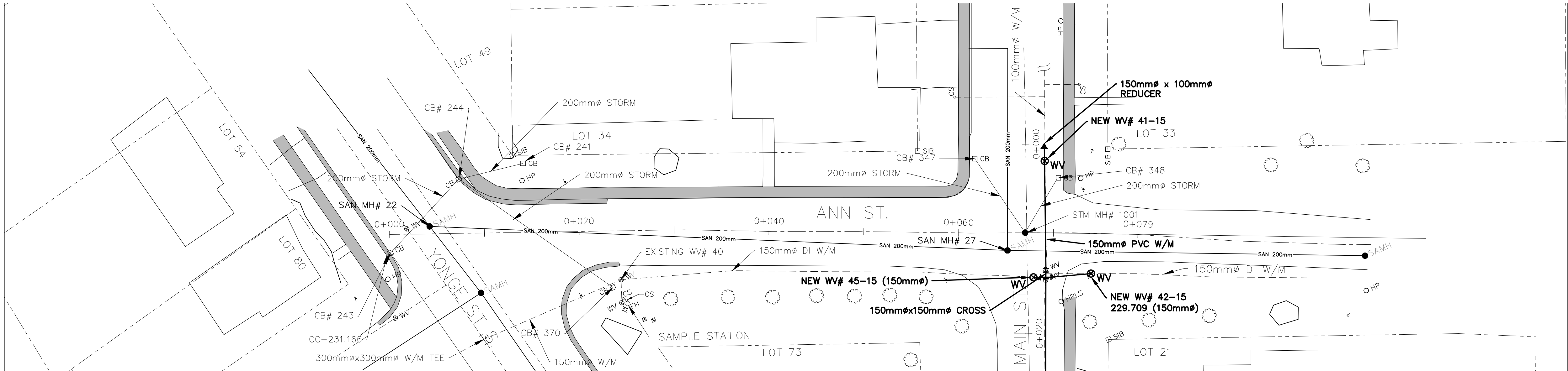
APPENDIX A

Existing Stormwater System Information, Data,
and Record Drawings

Street	CB_ID	TG Elevation	Type_1	Inv_N_Elev	Inv_E_Elev	Inv_S_Elev	Inv_W_Elev	PipeSize_N	PipeSize_E	PipeSize_S	PipeSize_W	PipeMat_N	PipeMat_E	PipeMat_S	PipeMat_W	Comments	N_INV	E_INV	S_INV	W_INV
Union Street	200	231.611	CBMH	230.050	0.000	230.090	0.000	400mm		400mm		HDPE		HDPE		SW ditch inlet	230.05 NE		230.09 SW	
Union Street	201	231.360	CBMH	0.000	229.760	229.880	0.000		400mm	400mm			HDPE	HDPE		east cross road, large 1.2-1.4m pipe arch, 2 outlets		229.76 E	229.88 SW	
Union Street	202	231.194	CB	230.040	229.910	0.000	230.040	100mm	300mm		200mm	Big O	HDPE		HDPE	east outlet cross road to open ditch	230.04 N	229.91 E		230.4 W
Union Street	203	231.374	CB	0.000	230.340	0.000	0.000		200mm				HDPE	HDPE				230.34 E		
Union Street	204	231.425	CB	230.180	0.000	230.440	230.180	300mm		100mm	300mm	HDPE		Big O	HDPE		230.18 NE		230.44 S	230.18 NW
Union Street	205	231.172	CBMH	229.770	229.490	229.510	0.000									NE invert 1.6 dip, east outlet across road to open ditch, cattail problems	229.77 NW	229.49 E	229.51 SW	229.57 NE
Union Street	206	231.303	CB	0.000	229.900	0.000	0.000		200mm				HDPE					229.9 E		
Union Street	207	231.779	CB	230.680	0.000	230.560	0.000	100mm		300mm		Big O		HDPE				230.68 NE		230.56 SW
Union Street	208	232.408	DICB	232.010	0.000	231.640	0.000	100mm		200mm		PVC		HDPE			232.01 NW		231.64 SE	
Union Street	209	232.826	CBMH	231.310	231.260	0.000	231.430	300mm	300mm		200mm	HDPE	HDPE		HDPE	west invert is NW, outlet east across road	231.31 NE	231.26 E		231.43 NW
Union Street	210	233.929	CB	0.000	0.000	232.359	0.000		300mm					HDPE					232.36 SW	
Union Street	211	234.440	CB	0.000	0.000	233.640	0.000		200mm					PVC		check directions, south should be east			233.64 S	
Union Street	212	234.481	CBMH	233.321	233.311	0.000	0.000	200mm	200mm			PVC	PVC			think east invert should be a west invert	233.32 N	233.31 E		
Union Street	213	232.471	STM MH	231.571	0.000	231.591	231.451	200mm	250mm	250mm		Conc	Conc	Conc		think east invert should be a west invert	231.57 N		231.59 S	231.45 W
Union Street	214	232.471	CB	0.000	0.000	231.721	0.000		200mm					Conc		check directions, south should be east			231.72 S	
Union Street	215	230.834	CB	0.000	0.000	229.834	0.000		200mm					Conc					229.83 S	
Union Street	216	230.762	CB	229.300	229.860	229.370	229.760	250mm	200mm	200mm	200mm	Conc	Conc	Conc	Conc		229.3 N	229.86 E	229.37 S	229.76 W
Union Street	217	230.815	CB	230.215	0.000	0.000	0.000	200mm				Conc					230.22 N			
Union Street	218	230.183	CB	228.900	0.000	228.920	0.000	250mm		250mm		PVC		Conc			228.90 N		228.92 S	
Union Street	219	230.002	CB	0.000	228.870	228.850	228.850		375mm	250mm	300mm		Conc	Conc	Conc			228.87 E	228.85 S	228.85 W
Union Street	220	229.969	CB	229.130	229.160	0.000	0.000	300mm	300mm			CSP	HDPE				229.13 N		229.16 E	
Union Street	221	229.853	DICB	0.000	0.000	229.433	0.000		300mm					CSP		grate homemade - open steel mesh			229.43 S	
Union Street	222	229.587	CB	0.000	228.850	0.000	0.000		250mm				HDPE			end of line		228.85 E		
Union Street	223	228.942	DICB	0.000	228.462	0.000	228.452		250mm		250mm		HDPE		HDPE			228.46 E		228.45 W
Union Street	224	229.267	CB	228.367	0.000	0.000	228.417	250mm			250mm	HDPE			HDPE		228.37 N			228.42 W
Union Street	225	229.263	CB	228.400	0.000	228.410	0.000	250mm		250mm		HDPE		HDPE			228.4 N		228.41 S	
Yonge Street S	226	229.207	CB	228.087	0.000	228.087	0.000	200mm		200mm		PVC		PVC		pipe half full of water	228.09 N		228.09 S	
Yonge Street S	227	229.214	CB	0.000	227.914	0.000	0.000		300mm	250mm			CSP	Conc				227.91 E		228.10 S
Yonge Street S	228	229.236	CB	228.126	0.000	0.000	0.000	250mm				HDPE					228.13 N			
Yonge Street S	229	228.947	CBMH	227.867	227.767	227.867	227.817	350mm	300mm	250mm	300mm	Conc	CSP	HDPE	CSP	need to check pipe size of north invert	227.87 N	227.77 E	227.87 S	227.82 W
Yonge Street S	230	229.404	CB	0.000	228.400	0.000	228.450		250mm		150mm		HDPE		PVC			228.4 E		228.45 W
Yonge Street S	231	229.440	DICB	0.000	228.470	0.000	228.590			150mm			PVC		CSP			228.47 E		228.59 W
Yonge Street S	232	229.494	CB	0.000	228.304	0.000	228.304		250mm		250mm		HDPE		HDPE			228.30 E		228.30 W
Yonge Street S	233	229.723	STM MH	228.243	0.000	0.000	228.243	250mm			250mm	Conc		Conc	Conc	north pipe must outlet to an underground structure	228.24 N			228.24 W
Yonge Street S	234	230.061	CBMH	0.000	0.000	228.551	228.651		300mm	250mm				Conc	Conc				228.55 S	228.65 W
Yonge Street S	235	229.993	CB	0.000	228.713	0.000	228.753		250mm		200mm		HDPE		PVC			228.71 E		228.75 W
Main Street	236	230.350	CB	229.200	0.000	229.230	0.000	200mm		150mm						need to verify NW pipe invert size	229.2 NW		229.23 SE	
Main Street	237	230.135	CB	229.680	0.000	229.540	229.530	150mm		100mm	200mm	Conc		Green Plastic	Conc	grate was homemade open in blvd, inverted CSP	229.68 N		229.54 S	229.53 W
Yonge Street S	238	230.080	CBMH	229.190	228.860	228.870	228.880	150mm	300mm	300mm	300mm	PVC	PVC	PVC		two pipes going NE 150mm on top of 300mm, north and east inverts are in NE direction	229.19 NE	228.86 NE	228.87 S	228.88 W
Main Street	239	230.075	CB	0.000	0.000	229.920	0.000									inverted CSP			229.92 SE	
Yonge Street S	240	230.313	CBMH	229.223	229.213	0.000	0.000	250mm	300mm			Conc	PVC			need to check pipe size & material of east invert	229.22 N	229.21 E		
Ann Street	241	230.550	CB	229.940	0.000	0.000	0.000	150mm				PVC				round open	229.94 N			
John Street	242	230.802	CB	230.170	0.000	0.000	230.200	150mm			100mm	PVC			Green Plastic		230.17 N			230.2 W
Yonge Street S	243	231.104	CBMH	0.000	229.754	229.720	0.000		200mm	200mm			Green Plastic	Green Plastic				229.27 E	229.72 S	
Young Street S	244	231.122	CB	0.000	230.032	230.082	229.922		150mm	150mm	250mm		PVC	PVC	PVC			230.03 E	230.08 S	229.92 W
River Street	245	228.538	CB	227.188	0.000	0.000	0.000	250mm				PVC					227.19 NW			
Yonge Street S	246	228.630	CB	227.950	0.000	0.000	0.000	150mm				PVC				PVC- Fitting/Bend	227.95 NW			
Yonge Street N	247	226.970	CB	0.000	0.000	0.000	225.800			250mm				HDPE						225.8 W
Yonge Street N	248	226.951	CBMH	225.170	225.360	0.000	225.070	675mm	300mm		250mm	Conc	Conc		Conc	need to confirm pipe size of west invert	225.17 N	225.36 E		225.07 W
Yonge Street N	249	227.690	CB	226.900	0.000	0.000	0.000	250mm				HDPE					226.9 NE			
Yonge Street N	250	227.823	CB	225.950	226.270	225.930	0.000	675mm	300mm	675mm		Conc	Conc	Conc		second north invert, dip 1.07, 200mm Conc	225.95 N	226.27 E	225.93 S	
Yonge Street N	251	227.803	CB	0.000	0.000	0.000	226.710			200mm				HDPE						226.71 W
Yonge Street N	252	227.930	CB	0.000	0.000	0.000	226.960			250mm				HDPE						226.96 W
Yonge Street N	253	227.984	CB	226.634	226.694	226.604	0.000	675mm	300mm	675mm		Conc	Conc	Conc			226.63 N	226.69 E	226.60 S	
Yonge Street N	254	228.874	CBMH	227.724	227.374	227.714	0.000	600mm	300mm	600mm		Conc	Conc	Conc			227.72 N	227.37 E	227.71 S	
Yonge Street N	255	228.811	CB	0.000	0.000	0.000	227.681				200mm			PVC						227.68 W
Yonge Street N	256	229.422	CB	0.000	0.000	0.000	228.132				250mm			PVC						228.13 W
Yonge Street N	257	229.447	CB	228.280	227.950	227.760	0.000	600mm	300mm	675mm		Conc	Conc	Conc			228.28 N	227.95 E	227.76 S	
Yonge Street N	258	230.028	CBMH	228.508	228.428	228.278	0.000	600mm	450mm	600mm		Conc	Conc	Conc			228.51 N	228.43 E	228.28 S	
Yonge Street N	259	229.962	CB	229.142	0.000	0.000	0.000	200mm				HDPE					229.14 NW			
Yonge Street N	260	230.067	STM MH	0.000	0.000	0.000	0.000									unable to open, black plastic lift ring stuck to grate				
Yonge Street N	261	230.551	CB	229.501	0.000	229.381	0.000	200mm		300mm		Conc		Conc			229.50 N		229.38 S	
Yonge Street N	262	232.604	CB	231.544	0.000	231.534	0.000	200mm		200mm		Conc		Conc			231.54 N		231.53 S	
Bruce Road 10	263	234.428	CB	0.000	0.000	233.388	0.000			200mm				Conc					233.39 S	
Brook Street E	264	230.187	CB	0.000	0.000	229.287	0.000			200mm				Conc					229.29 S	
Brook Street E	265	230.048	CB	229.198	0.000	229.198	0.000	150mm		150mm		HDPE		HDPE			229.20 N		229.20 S	
Brook Street E	266	230.133	CBMH	229.143	229.133	0.000	229.113	200mm	300mm		300mm	Conc	Conc		Conc	need to verify west invert pipe material	229.14 N	229.13 E		229.11 W
Brook Street E	267	230.643	CB	229.513	0.000	229.493	0.000	200mm		200mm		HDPE		HDPE			229.51 N		229.49 S	
Brook Street E	268	230.674	CB	229.414	229.414	0.000	229.414	200mm	250mm		400mm	Conc	Conc		Conc	east invert pipe size need to verify, could be 250mm or 300mm	229.41 N	229.41 E		229.41 W
Brook Street E	269	231.220	CB	0.000	0.000	230.170	0.000			150mm				HDPE					230.17 S	
Brook Street E	270	231.256	CB	229.976	0.000	0.000	229.956	150mm			200mm	HDPE			HDPE		229.98 N			229.96 W
Brook Street E	271	231.141	CB	229.921	229.871	0.000	0.000	150mm	200mm			HDPE	HDPE			north invert subdrain	229.92 N	229.87 E		
Brook Street E	272	231.112	CB	0.000	0.000	230.172	0.000</													

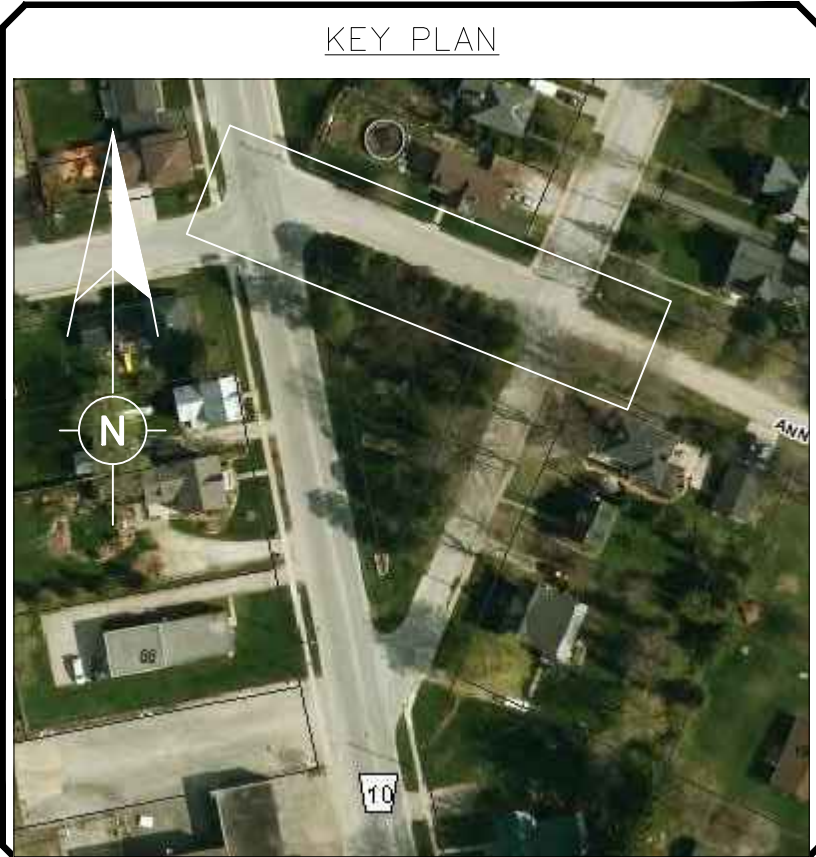
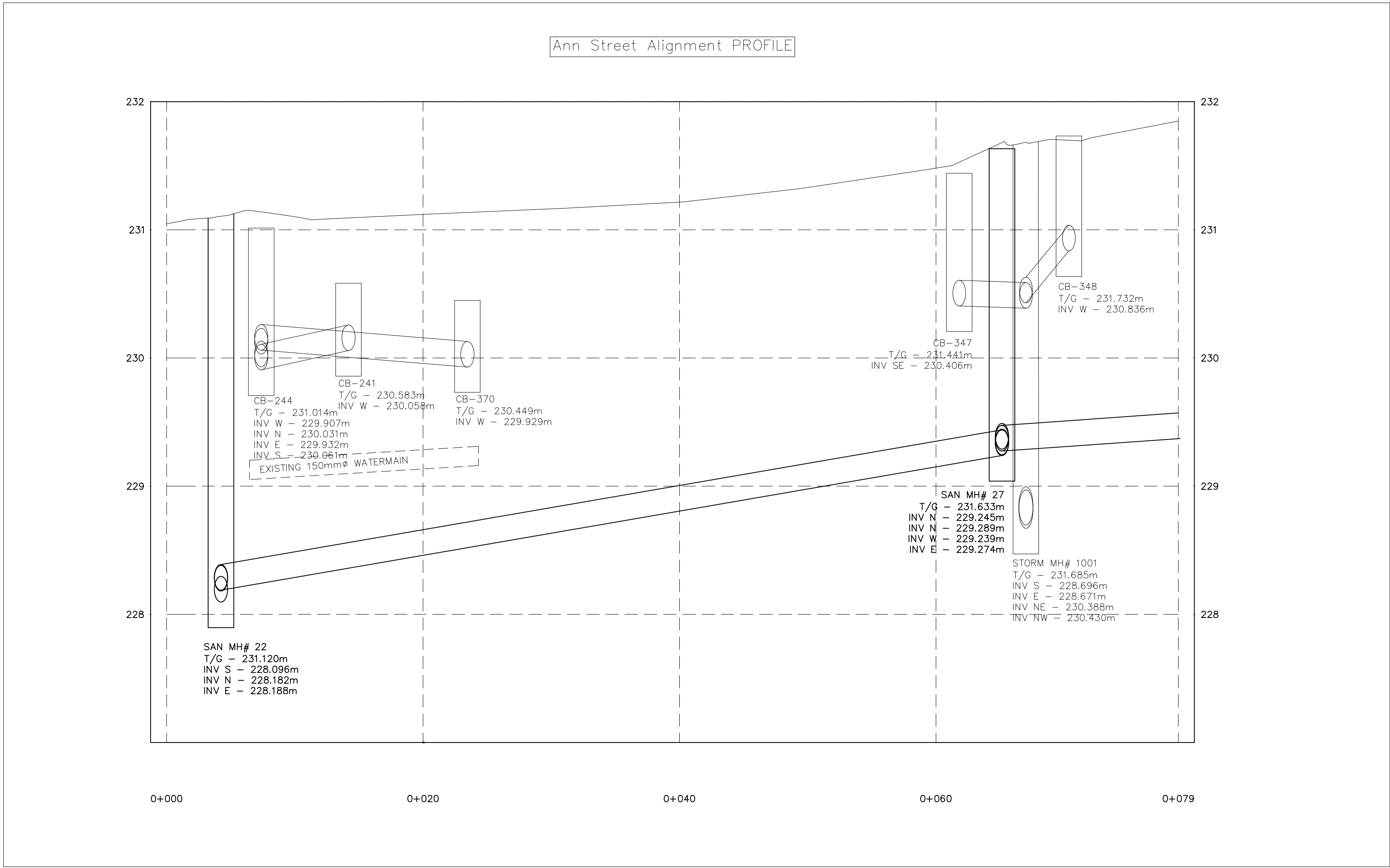
Street	CB_ID	TG Elevation	Type_1	Inv_N_Elev	Inv_E_Elev	Inv_S_Elev	Inv_W_Elev	PipeSize_N	PipeSize_E	PipeSize_S	PipeSize_W	PipeMat_N	PipeMat_E	PipeMat_S	PipeMat_W	Comments	N_INV	E_INV	S_INV	W_INV	
Matilda Street	292	227.588	CB	0.000	0.000	226.808	226.888			300mm	250mm			Conc	Conc	pipe material unsure			226.81 S	226.89 W	
Elgin Avenue	293	229.469	CB	229.159	229.199	229.109	0.000	150mm	75mm	250mm		CSP	Plastic	CSP		south pipe CSP under driveway into ditch	229.16 N	229.20 SE	229.11 S		
Elgin Avenue	294	229.263	CB	0.000	0.000	229.260	0.000			75mm				PVC		fabricated cover, outlet to ditch			229.26 S		
Elgin Avenue	295	227.706	CB	0.000	0.000	227.346	0.000			200mm				CSP		fabricated cover			227.35 S		
Elgin Avenue	296	227.515	CB	226.215	226.265	0.000	226.245	200mm	200mm		200mm	CSP	CSP		CSP	fabricated cover, west invert pipe size may be 200mm or 250mm, need to verify pipe material for east and west inverts	226.22 N	226.27 E		226.25 W	
Elgin Avenue	297	227.206	CB	0.000	225.956	0.000	0.000		150mm				PVC			homemade cover		225.96 E			
Francis Street	298	230.815	Other	0.000	0.000	0.000	0.000									driveway inlet, homemade, full of dirt and leaves, no invert visible					
Francis Street	300	227.448	DICB	226.228	226.048	226.228	226.008	150mm	250mm	150mm	300mm	PVC	Conc		CSP	need to confirm pipe material for east, south & west inverts	226.23 N	226.05 E	226.23 S	226.01 W	
Francis Street	301	228.252	CB	227.742	0.000	0.000	0.000	100mm								need to confirm pipe material, no outlet? 100mm faces uphill	227.74 N				
Francis Street	302	227.485	CB	0.000	0.000	226.785	0.000			150mm				CSP					226.79 S		
Francis Street	303	227.310	CB	0.000	225.820	0.000	225.910		300mm		250mm					cover handmade steel, need pipe material		225.82 E		225.91 W	
Francis Street	304	227.237	CB	225.897	225.837	225.827	0.000	150mm	200mm	375mm				CSP		open cover, need pipe material for north & east inverts	225.90 N	225.84 E	225.83 S		
Francis Street	305	226.634	CB	0.000	0.000	226.390	0.000			100mm						need pipe material			226.39 S		
Francis Street	306	226.401	CB	225.500	0.000	0.000	0.000			100mm						need pipe material, homemade cover	225.5 N				
Francis Street	307	226.439	CB	224.989	225.139	224.959	0.000	375mm	200mm	375mm		Steel	CSP			need to confirm material for all pipe inverts, cover handmade	224.99 N	225.14 E	224.96 S		
Francis Street	308	226.620	CB	0.000	0.000	0.000	225.630			150mm				CSP		handmade cover				225.63 W	
Whites Avenue	309	225.765	CB	0.000	0.000	0.000	225.115				200mm				Conc					225.11 W	
Whites Avenue	310	225.605	CB	224.810	224.675	224.585	224.675	200mm	200mm	250mm	200mm	Conc	Conc	CSP	CSP	south outlet to river	224.81 N	224.67 E	224.58 S	224.67 W	
Whites Avenue	311	225.696	CB	0.000	0.000	225.096	0.000			200mm					Conc				225.10 S		
Whites Avenue	312	225.690	CB	225.070	225.070	0.000	0.000	200mm	200mm			HDPE	Conc					225.07 N	225.07 E		
Whites Avenue	313	225.732	CB	0.000	0.000	225.182	0.000			200mm				HDPE					225.18 S		
John Street	314	227.546	DICBMH	225.956	0.000	225.976	0.000	600mm		600mm		Conc		Conc		alum 1200x800	225.96 N		225.98 S		
John Street	315	227.418	DICB	226.058	0.000	226.298	226.458	600mm		600mm	525mm	Conc	Conc	HDPE		cover flat alum 1200x800, check pipe size for north & south inverts	226.06 N		226.30 S	226.46 W	
John Street	316	227.612	DICB	226.762	226.592	0.000	226.652	300mm	450mm		450mm	PVC	HDPE		HDPE	1200x800 5:1 alum	226.76 N	226.59 E		226.65 W	
John Street	317	227.372	DICB	0.000	0.000	226.862	0.000			300mm				PVC					226.86 S		
John Street	318	226.876	DICBMH	0.000	225.896	0.000	225.916		450mm		450mm		HDPE		HDPE	alum 1200x800 5:1 top		225.90 E		225.92 W	
Heather Lynn Blvd	319	227.706	DICB	0.000	0.000	227.196	227.196			450mm	300mm			HDPE	PVC	1200x600 alum 2:1 grate			227.20 S	227.20 W	
Heather Lynn Blvd	320	227.702	DICB	0.000	227.182	0.000	0.000		300mm				PVC			alum 2:1		227.18 E			
Heather Lynn Blvd	321	228.546	DICB	227.356	0.000	0.000	0.000	300mm				PVC				alum 2:1	227.36 N				
Heather Lynn Blvd	322	229.022	STM MH	226.932	226.912	227.122	0.000	450mm	450mm	300mm		HDPE	HDPE	PVC		storm grate	226.93 N	226.91 E	227.12 S		
John Street	323	230.957	CB	0.000	229.607	229.597	0.000	200mm	250mm			PVC	Conc			need to check pipe size & material of south invert		229.61 E	229.60 S		
Heather Lynn Blvd	324	227.158	Other	0.000	0.000	0.000	0.000									alum. Grate over 600mm CSP					
Heather Lynn Blvd	326	226.805	DICB	0.000	0.000	0.000	226.450				450mm				HDPE	alum 2:1 grate				226.45 W	
Heather Lynn Blvd	327	227.331	CBMH	0.000	226.210	226.180	0.000		450mm	450mm			HDPE					226.21 E	226.18 S		
Heather Lynn Blvd	328	227.109	DICBMH	226.140	226.310	225.990	0.000	450mm	300mm	450mm		HDPE	HDPE	HDPE		alum 2:1 grate, north & east invert measurements are approx.	226.14 N	226.31 E	225.99 S		
Heather Lynn Blvd	329	227.475	DICB	0.000	0.000	0.000	226.320			300mm					HDPE					226.32 W	
Heather Lynn Blvd	330	227.805	DICBMH	225.900	0.000	0.000	225.870	450mm			450mm	HDPE				2:1 grate, need to verify pipe size, material	225.9 N			225.87 W	
Heather Lynn Blvd	331	233.716	DICB	233.180	0.000	233.190	0.000	400mm		400mm		HDPE		HDPE		open grate	233.18 N		233.19 S		
Hamilton Street	332	229.297	CB	228.447	228.447	0.000	0.000	300mm	300mm			CSP	CSP				228.45 N	228.45 E			
Hamilton Street	333	227.827	CB	227.477	0.000	227.627	226.707	150mm		300mm	250mm	CSP		CSP	PVC	handmade steel grate	227.48 N		227.63 S	226.71 W	
Mill Street	334	226.934	CB	226.164	226.204	226.364	0.000	450mm	400mm	150mm		CSP	CSP	CSP		handmade cover	226.16 N	226.20 E	226.36 S		
Mill Street	335	227.070	DCB	225.200	0.000	224.970	226.020	450mm		450mm	250mm			PVC		drain into 450mm culvert from CB 334, culvert 1.07 drop south to north, OPSD 705.020, new with Mill St. watermain replacement in 2012	225.2 N		224.97 S	226.02 W	
Mill Street	336	227.023	CB	0.000	226.100	0.000	0.000		250mm				PVC			CB clogged, new CB with Mill St. watermain replacement in 2012		226.10 E			
Mill Street	337	226.293	CBMH	224.863	0.000	224.893	0.000	675mm		675mm		HDPE		HDPE		should not have alum grate in asphalt?	224.86 N		224.89 S		
Mill Street	338	226.279	CBMH	224.959	0.000	224.969	225.649	675mm		675mm	250mm	HDPE		HDPE	PVC	second invert west under driveway 250mm CSP, elevation, also 150mm subdrain going into this CBMH from west and east, new with Mill St. watermain replacement in 2012	224.96 N		224.97 S	225.65 W	
Market Street	339	233.834	CB	232.854	232.854	0.000	0.000	200mm				HDPE				vertical CSP	232.85 NE				
River Street	340	226.039	CB	224.919	0.000	225.219	0.000	300mm		250mm		HDPE		PVC			224.92 NW		225.22 SE		
River Street	341	226.097	CB	224.430	0.000	0.000	0.000	300mm				HDPE					224.43 NW				
River Street	343	227.398	CB	226.298	0.000	226.378	0.000	300mm		300mm		HDPE		HDPE			226.30 NW		226.38 SE		
River Street	344	228.925	CB	228.565	0.000	0.000	0.000	200mm				HDPE				open grate	228.57 NW				
River Street	345	229.416	CB	228.636	0.000	228.826	0.000	200mm		150mm		HDPE			HDPE	open grate, inverted CSP	228.64 NW		228.83 S		
River Street	346	229.805	CB	0.000	229.565	0.000	0.000		100mm				HDPE					229.56 E			
Main Street	347	231.571	CB	0.000	0.000	230.451	0.000			250mm				Conc					230.45 S		
Main Street	348	231.819	CB	0.000	0.000	230.909	0.000			150mm				CSP					230.91 S		
River Street	350	229.571	CB	0.000	229.091	229.151	0.000		200mm	150mm			CSP	PVC				229.09 E	229.15 S		
River Street	351	229.681	CB	0.000	228.831	229.061	0.000		400mm	300mm			CSP	CSP		open grate		228.83 E	229.06 S		
River Street	352	229.890	CB	229.250	228.940	0.000	0.000	300mm	350mm			CSP	CSP			check pipe size of east invert	229.25 N	228.94 E			
River Street	353	229.902	CB	229.602	0.000	229.562	0.000	200mm		250mm		HDPE		CSP		drilled holes in grate	229.60 N		229.56 S		
River Street	354	229.926	CB	229.656	229.656	229.626	0.000	150mm	100mm	200mm		PE		HDPE		2 pipes north 100mm & 150mm, SUB-Con PE, drilled holes in grate, east invert is the second north invert	229.66 N	229.66 N	229.63 S		
River Street	355	229.834	CB	229.474	0.000	0.000	0.000	200mm				PVC					229.47 N				
River Street	356	229.722	CB	229.392	0.000	229.402	0.000	250mm		200mm		CSP		PVC		open grate	229.39 N		229.40 S		
River Street	357	229.553	CB	229.103	0.000	229.123	0.000	250mm		250mm		CSP				vertical culvert	229.10 N		229.12 S		
River Street	358	229.559	CB	229.239	0.000	229.159	229.409	100mm		150mm	100mm	HDPE		CSP	PVC		229.24 N		229.16 S	229.41 W	
River Street	359	229.493	CB	228.963	228.863	0.000	0.000	100mm	300mm			PVC	CSP				228.96 N	228.86 E			
River Street	360	229.277	CB	0.000	228.697	0.000	228.917		250mm		100mm			CSP	PVC	open grate		228.70 E		228.92 W	
Yonge Street N	361	227.092	CB	0.000	226.170	0.000	0.000		200mm				HDPE					226.17 E			
Maria Street	362	228.004	CB	0.000	227.630	0.000	0.000		150mm			Steel						227.63 E			
Brook Street E	600	232.355	CB	0.000	231.790	0.000	231.860		300mm		250mm		CSP		HDPE			231.79 E		231.86 W	
Brook Street E	601	231.115	CB	0.000	230.510	0.000	230.370			250mm		HDPE			CSP			230.51 E		230.37 W	
Brook Street E	602	230.165	CB	0.000	229.590	229.580	0.000		450mm	350mm			CSP	CSP				229.59 E	229.58 S		
Yonge Street S	1000	229.437	STM MH	228.240	0.000	228.260	0.000	250mm		250mm		Conc		Conc			228.24 N		228.26 S		
Ann Street	1001	229.867	STM MH	227.934	227.934	227.934	227.934	250mm	150mm	300mm	300mm	Conc	CSP	Conc	Conc	not surveyed, the west invert is an east invert, north invert is NW, east invert is NE					

PLOTTED: August-10-15 1:38:20 PM



DWG 15-019-03

NOTE: RECORD DRAWING HAS BEEN
 PREPARED BASED ON INFORMATION PROVIDED
 BY ARRAN-ELDERSLIE



LEGEND

EXISTING DETAILS

- EXISTING CURB & SIDEWALK
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING STORM SEWER
- APPROXIMATE PROPERTY LINE OR EASEMENT
- EXISTING GAS LINE
- EXISTING BELL LINE
- EXISTING CENTER LINE
- EXISTING HYDROPOLE & GUY WIRE
- EXISTING CATCHBASIN
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- EXISTING WATERVALVE
- EXISTING SIGN
- EXISTING TREE
- EXISTING SHRUB
- EXISTING FIRE HYDRANT
- STANDARD IRON BAR

PROPOSED CONSTRUCTION

- WATERMAIN 200Ø
- WATER VALVE
- FIRE HYDRANT WITH WATER VALVE AND TEE
- WATER SERVICE & CURB STOP
- SANITARY SERVICE & CLEAN OUT
- STORM SEWER
- CURB & SIDEWALK TO BE REMOVED

SURVEY COMPLETED BY SMC GEOMATICS IN MAY, 2015

BM1 - SW CORNER OF LOT 34 & SE CORNER LOT 49 (ANN ST.) - SIB 230.804m

BM2 - SE CORNER OF LOT 34 (ANN ST.) - SIB 231.399m

BM3 - SW CORNER OF LOT 33 (ANN ST.) - SIB 231.964m

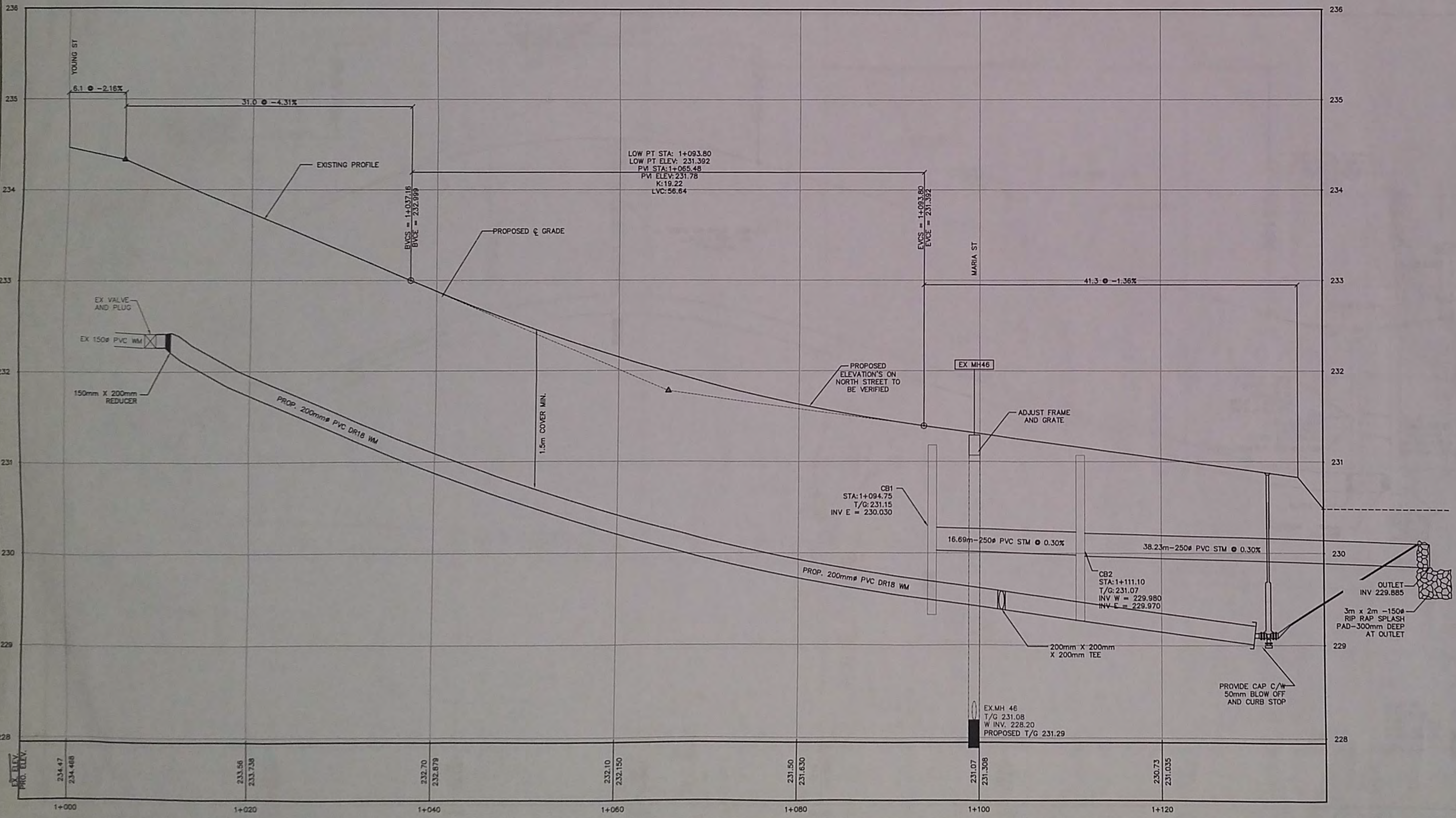
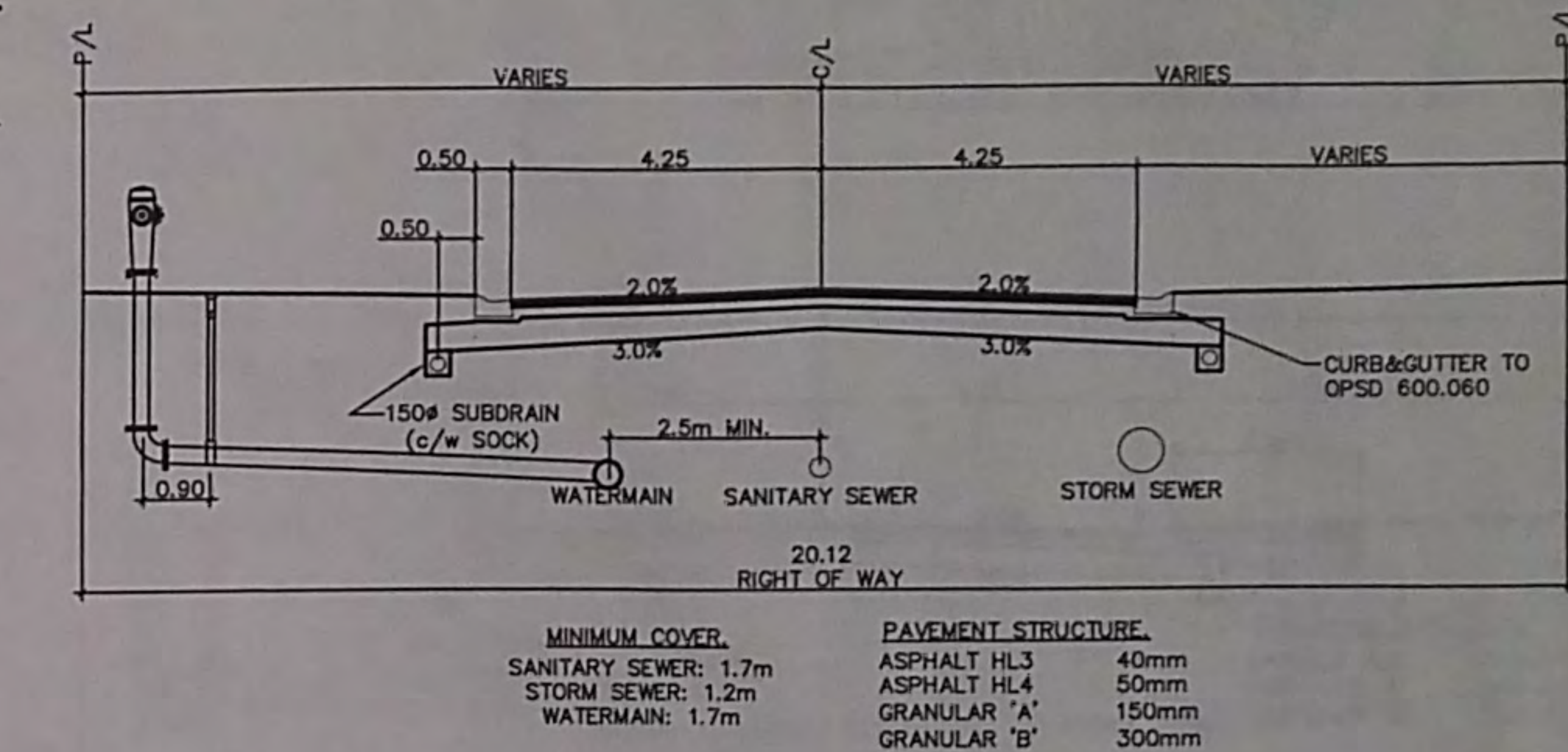
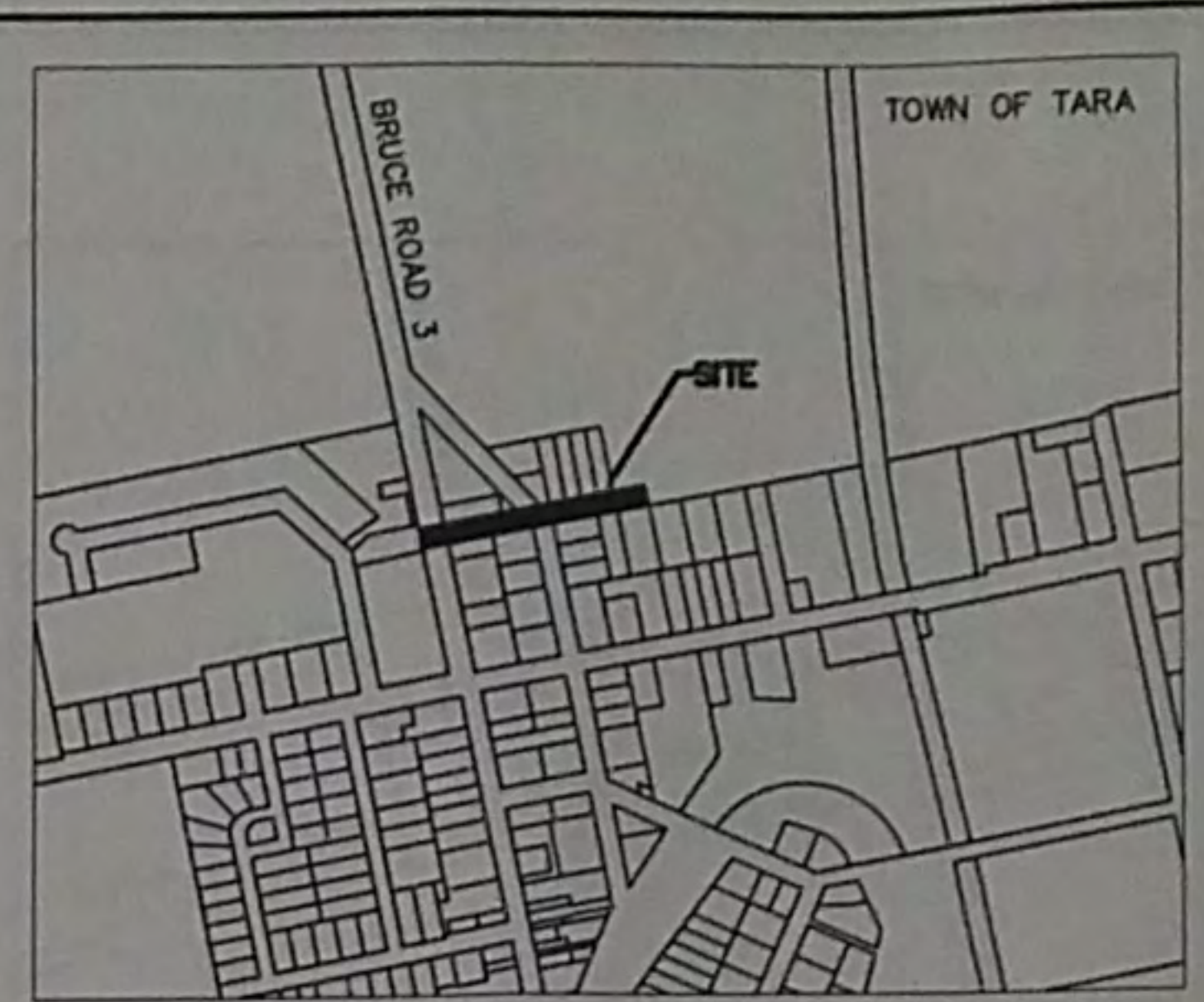
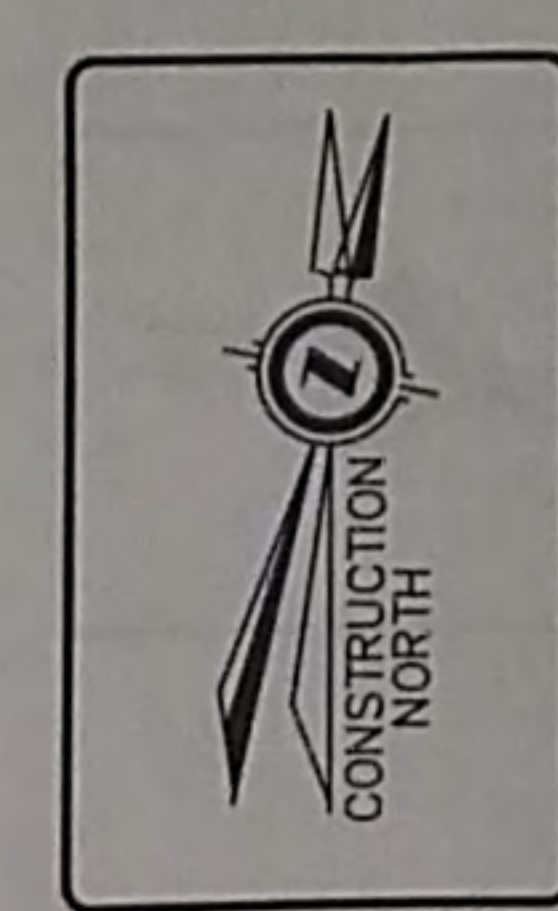
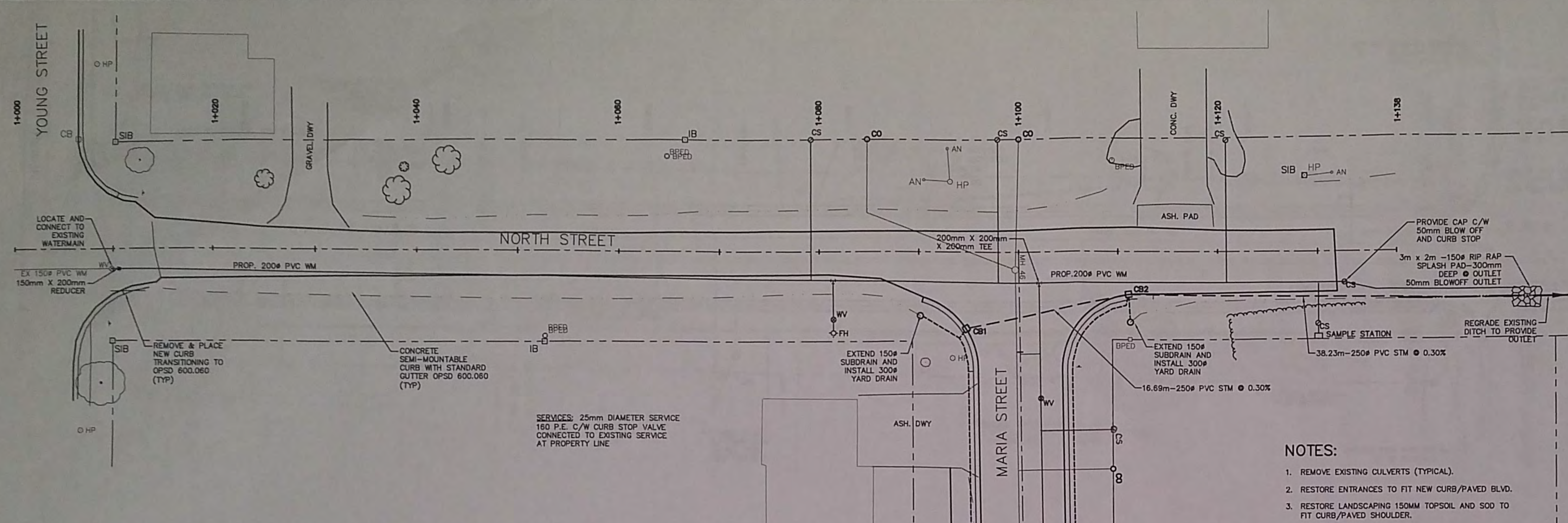
BM4 - SW CORNER OF LOT 21 (MAIN ST.) - SIB 231.717m

BM5 - NW CORNER OF LOT 15 (MAIN ST.) - IB 231.363m

BM6 - SW CORNER OF LOT 105 (MAIN ST & YOUNGE ST. S) RIB 230.582m

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE 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, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

17/07/15	RECORD DRAWING
26/05/15	ISSUE FOR CONSTRUCTION
DD/MM/YY	DESCRIPTION
	REVISION / ISSUE
Seal not valid unless signed and dated	
Unit 104D 1010 9th Avenue West, Owen Sound, ON, N4K 5R7 Telephone: (519) 372-4828	
Title: ANN ST. PLAN AND PROFILE STA 0+000 TO STA 0+079	
Client: MUNICIPALITY OF ARRAN-ELDERSLIE	
Design: RS	Scale: 1:250 H / 1:25 V
Drawn: TDL	Approved:
Checked: RS	Design Engineer
Date: MAY, 2015	
Drawing No. 15-019-02	



BENCH MARK No.1 ELEVATION 232.177
 NAIL IN WEST FACE OF HYDRO POLE #28004 ON PARK STREET
 AT SOUTH EAST CORNER OF BROOK ST AND PARK ST

CAUTION:
 THE POSITION OF POLE LINES, CONDUITS, WATERMANS, 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, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

11/11/22	RECORD DRAWING
11/03/24	FOR REVIEW BY MUNICIPALITY.
DATE	DESCRIPTION
	REVISION / ISSUE

Seal not valid unless signed and dated

GENIVAR
 R. SHABMA
 LICENSED PROFESSIONAL ENGINEER
 PROVINCE OF ONTARIO

GENIVAR
 945 Third Ave E, Suite 212, Owen Sound, ON, N4K 2K6
 Telephone: (519) 376-7612 / Fax: (519) 376-8008
 Toll Free: 1-888-376-7612

PLAN AND PROFILE
 STA 1+000 TO 1+131.68
 WATERMAIN REPLACEMENT
 NORTH STREET, TARA, ONTARIO

Client: **ARRAN-ELDESLIE**

Design: **R S** Scale: **1:250**

Drawn: **KDC/MDH** Approved:

Checked: **R S**

Date: **MARCH 2011** Design Engineer

DRAWING No. **09-115-11-03**

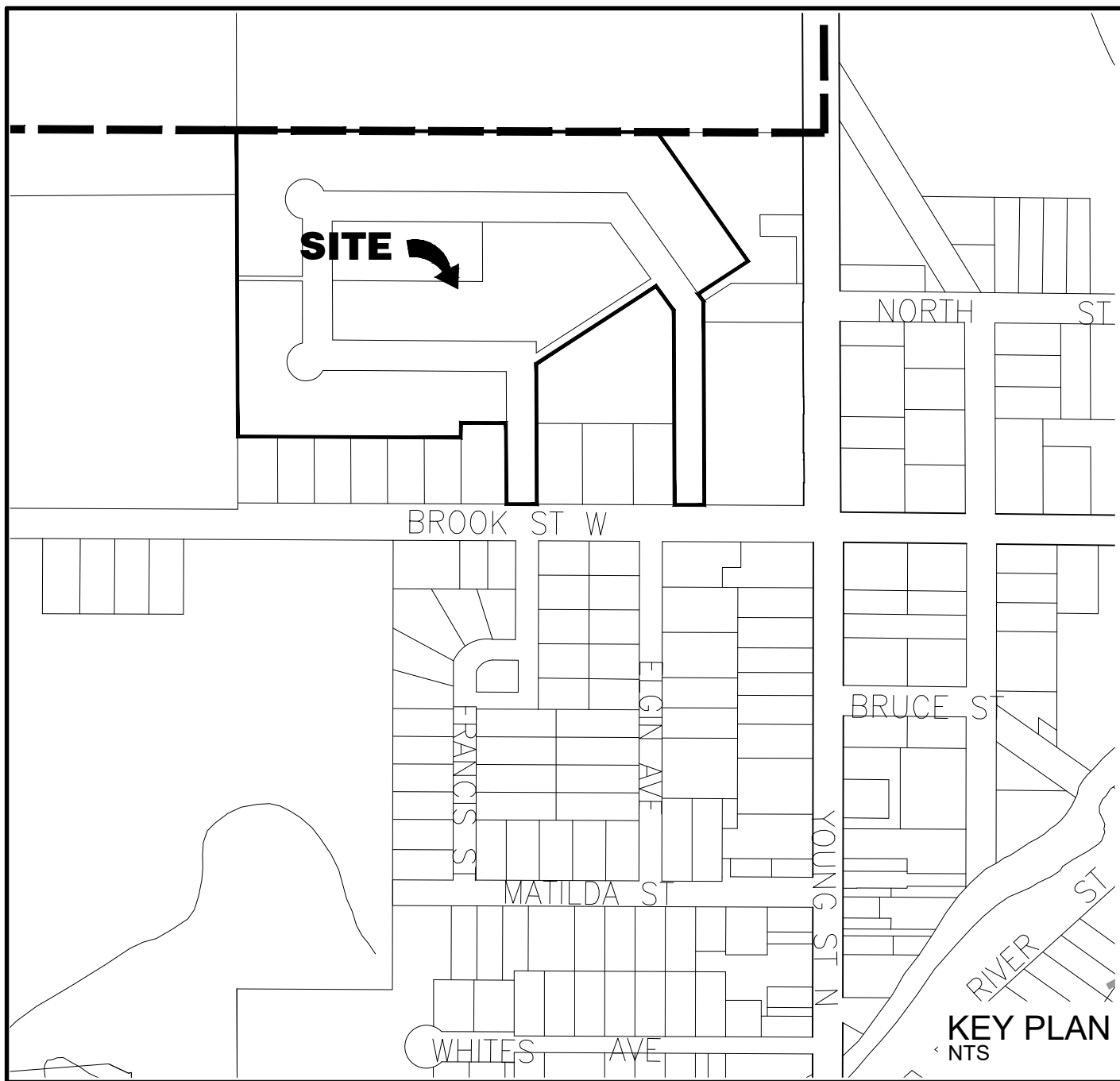
TOWERHILL CRESCENT SUBDIVISION
MUNICIPALITY OF ARRAN ELDERSLIE

CONTRACT NO. 18-01812-01

MAYOR : MR. PAUL EAGLESON
CLERK : MS. PEGGY ROUSE
WORKS MANAGER : MR. SCOTT MCLEOD

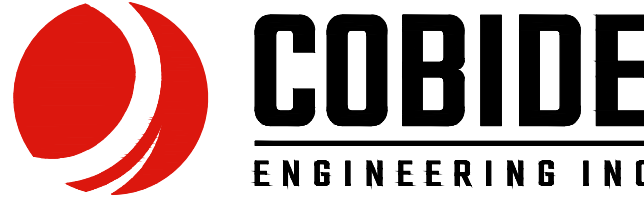
OWNER :
2582030 ONTARIO INC. c/o BILL CLANCY

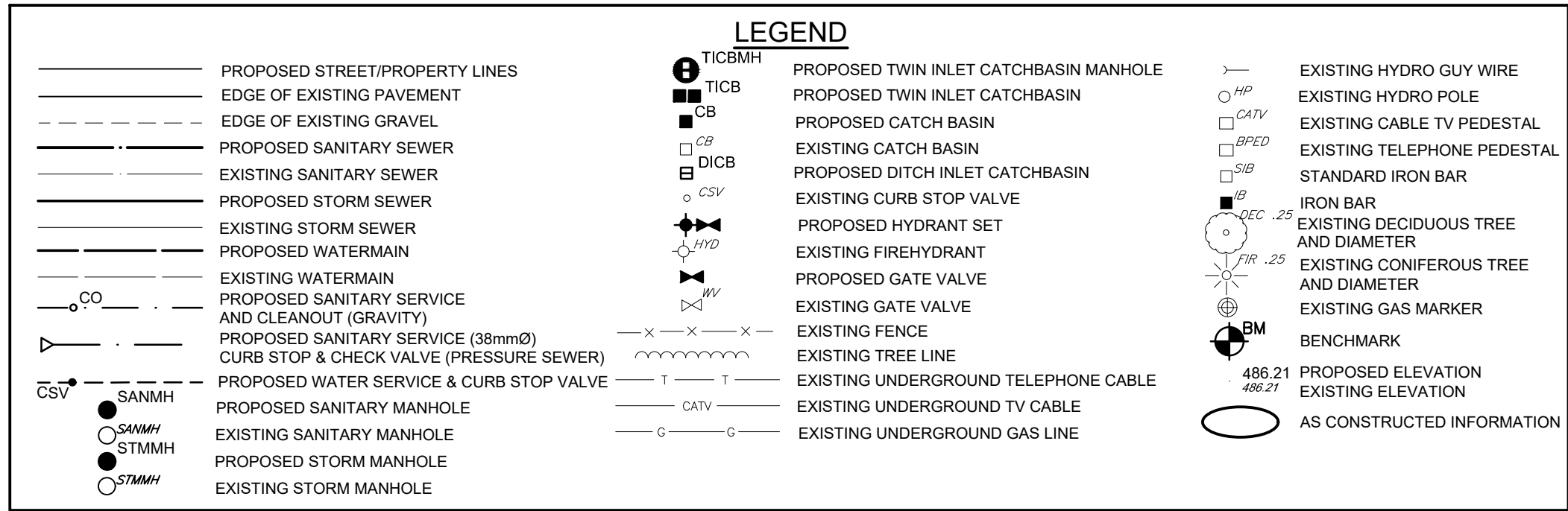
CAUTION:
THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS
AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND
STRUCTURES IS NOT NECESSARILY SHOWN ON THE DRAWINGS, AND,
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UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING
WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT
LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL
ASSUME ALL LIABILITY FOR DAMAGE TO THEM.



index

SHEET No.	DESCRIPTION
01812-SP1	DEVELOPMENT SITE PLAN
01812-C1	TOWERHILL CRESCENT STA. 0+000 TO STA. 0+160 PLAN AND PROFILE
01812-C2	TOWERHILL CRESCENT STA. 0+160 TO STA. 0+240 PLAN AND PROFILE
01812-C3	TOWERHILL CRESCENT STA. 0+240 TO STA. 0+400 PLAN AND PROFILE
01812-C4	TOWERHILL CRESCENT STA. 0+400 TO STA. 0+530 PLAN AND PROFILE
01812-C5	TOWERHILL CRESCENT STA. 0+530 TO STA. 0+660 PLAN AND PROFILE
01812-C6	TOWERHILL CRESCENT STA. 0+660 TO STA. 0+720 PLAN AND PROFILE
01812-C7	LOT GRADING PLAN
01812-DET1	ENGINEERING STANDARDS, MISCELLANEOUS DETAILS & TYPICAL CROSS-SECTIONS
01812-DET2	MISCELLANEOUS DETAILS 1
01812-DET3	MISCELLANEOUS DETAILS 2

4 MAY 10/19		AS RECORDED		TLB	TLB
3 MAY 30/18		ISSUED FOR CONSTRUCTION		TLB	TLB
2 APR 23/18		REVISED MOECC SUBMISSION		TLB	TLB
1 JAN 17/18		MOECC SUBMISSION		TLB	TLB
0 DEC 15/17		FIRST SUBMISSION		TLB	TLB
No.	DATE	DESCRIPTION	BY	APPD	
REVISION / ISSUE					
Seal not valid unless signed and dated					
 464A - 10th STREET, Hanover, Ontario N4N 1R1 Telephone: (519) 506-5959 www.cobideeng.com					
Title: TOWER HILL CRESCENT SUBDIVISION Municipality of Arran-Elderslie TITLE SHEET					
Client: 2582030 Ontario Inc. c/o Bill Clancy					
Design: TLB		Scale:			
Drawn: TLB		Approved:			
Checked: SJC		Design Engineer			
Date: MAY 2017					
DRAWING No.		01812-TS			

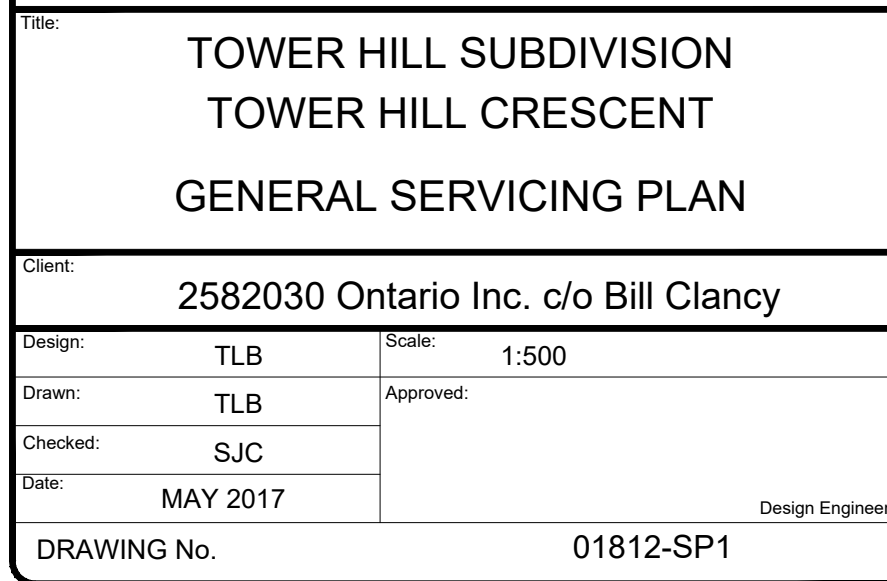


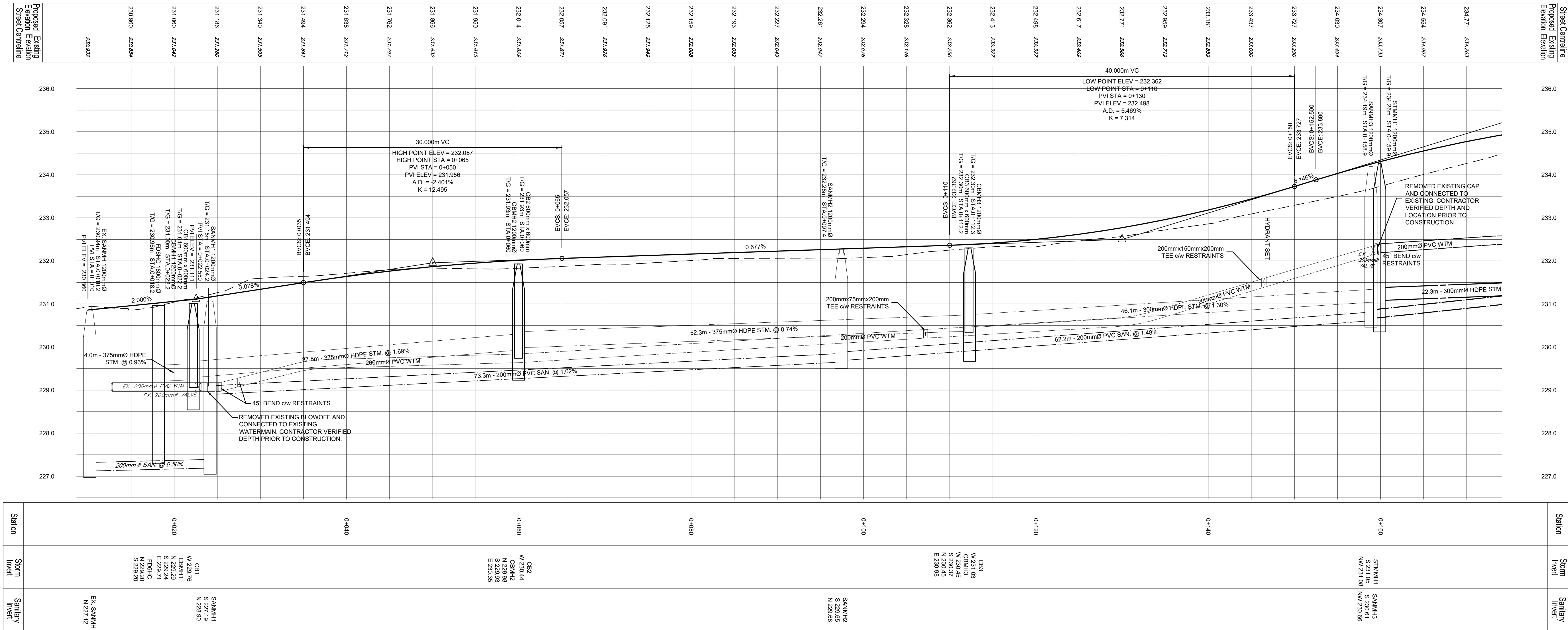
Notes	
1.	PROPERTY BOUNDARY DERIVED FROM INFORMATION SHOWN ON PLAN M-89 DATED JUNE 1, 1981 PREPARED BY IVAN DINSMORE O.L.S.
2.	SEE DETAIL SHEET FOR TYPICAL CROSS SECTION AND PAVEMENT DESIGN.
3.	ALL ORGANIC MATERIAL WITHIN 12 IN. OF FINISHED PROFILE GRADE WAS REMOVED FROM ALL UNPAVED AREAS AND ALL UNPAVED PORTION OF THE ROAD COVER OVER WATERMAIN 1.8m MINIMUM AT ALL POINTS.
4.	SANITARY SEWER INSTALLED ARE PVC SDR35.
5.	ALL STORM CATCHBASINS HAVE A MINIMUM SUMP OF 600mm AND ALL STORM MANHOLES HAVE A MINIMUM SUMP OF 300mm.
6.	ALL WATERMANS INSTALLED ARE PVC DR18.
7.	THIS DRAWING IS NOT USED FOR CONSTRUCTION PURPOSES UNTIL TYPED AND ISSUED FOR CONSTRUCTION.
9.	ALL CONSTRUCTION WAS COMPLETED TO MUNICIPAL SERVICING STANDARDS FOR THE MUNICIPALITY OF ARRAN-ELDERLSIE.



4	MAY 10'19	AS RECORDED	TLB	TL
3	MAY 30'18	ISSUED FOR CONSTRUCTION	TLB	TL
2	APR 23'18	REVISED MOECC SUBMISSION	TLB	TL
1	JAN 17'18	MOECC SUBMISSION	TLB	TL
0	DEC 15'17	FIRST SUBMISSION	TLB	TL
No.	DATE	DESCRIPTION	BY	APP
REVISION / ISSUE				

15 JULY 2004





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

- Notes
1. PROPERTY BOUNDARY DERIVED FROM INFORMATION SHOWN ON PLAN M-89 DATED JUNE 1, 1981 PREPARED BY IVAN DINSMORE O.L.S.
 2. SEE DETAILS SHEET FOR TYPICAL CROSS SECTION AND PAVEMENT DESIGN.
 3. ALL ORGANIC MATERIAL WITHIN 1.2m OF FINISHED PROFILE GRADE WAS REMOVED FROM ALL AREAS UNDER THE TRAVELLED PORTION OF THE ROAD.
 4. COVER OVER WATERMAIN 1.8m MINIMUM AT ALL POINTS.
 5. SANITARY SEWER INSTALLED ARE PVC SDRS.
 6. ALL STORM CATCHBASINS HAVE A MINIMUM SUMP OF 600mm AND ALL STORM MANHOLES HAVE A MINIMUM SUMP OF 300mm.
 7. ALL WATERMAINS INSTALLED ARE PVC DR18.
 8. THIS DRAWING IS WAS NOT USED FOR CONSTRUCTION PURPOSES UNTIL STAMPED ISSUED FOR CONSTRUCTION
 9. ALL CONSTRUCTION WAS COMPLETED TO MUNICIPAL SERVICING STANDARDS FOR THE MUNICIPALITY OF ARRAN-ELDERSLIE.

LEGEND

PROPOSED STREET/PROPERTY LINES	PROPOSED TWIN INLET CATCHBASIN MANHOLE	EXISTING HYDRO GUY WIRE
EDGE OF EXISTING PAVEMENT	PROPOSED TWIN INLET CATCHBASIN	EXISTING HYDRO POLE
EDGE OF EXISTING GRAVEL	PROPOSED CATCH BASIN	EXISTING CABLE TV PEDESTAL
PROPOSED SANITARY SEWER	EXISTING CATCH BASIN	EXISTING TELEPHONE PEDESTAL
EXISTING SANITARY SEWER	PROPOSED DITCH INLET CATCHBASIN	STANDARD IRON BAR
PROPOSED STORM SEWER	EXISTING CURB STOP VALVE	IRON BAR
EXISTING STORM SEWER	PROPOSED HYDRANT SET	EXISTING DECIDUOUS TREE AND DIAMETER
PROPOSED WATERMAIN	EXISTING FIREHYDRANT	EXISTING CONIFEROUS TREE AND DIAMETER
EXISTING WATERMAIN	PROPOSED GATE VALVE	EXISTING GAS MARKER
PROPOSED SANITARY SERVICE AND CLEANOUT (GRAVITY)	EXISTING GATE VALVE	BENCHMARK
PROPOSED SANITARY SERVICE (PRESSURE SEWER)	EXISTING TREE LINE	PROPOSED ELEVATION
CURB STOP & CHECK VALVE (PRESSURE SEWER)	EXISTING UNDERGROUND TELEPHONE CABLE	EXISTING ELEVATION
PROPOSED WATER SERVICE & CURB STOP VALVE	EXISTING UNDERGROUND TV CABLE	AS CONSTRUCTED INFORMATION
PROPOSED SANITARY MANHOLE	EXISTING UNDERGROUND GAS LINE	
EXISTING SANITARY MANHOLE		
PROPOSED STORM MANHOLE		
EXISTING STORM MANHOLE		

Benchmark Information

BM1	TOP NUT OF FIRE HYDRANT LOCATED AT STA. 0+023 RIGHT	232.22m
BM2	TOP NUT OF FIRE HYDRANT LOCATED AT STA. 0+750 RIGHT	235.66m

No.	DATE	DESCRIPTION	BY	APPD
4	MAY 10/19	AS RECORDED	TLB	TLB
3	MAY 30/18	ISSUED FOR CONSTRUCTION	TLB	TLB
2	APR 23/18	REVISED MOECC SUBMISSION	TLB	TLB
1	JAN 17/18	MOECC SUBMISSION	TLB	TLB
0	DEC 15/17	FIRST SUBMISSION	TLB	TLB

Seal not valid unless signed and dated

REVISION / ISSUE	BY	APPD

COBIDE ENGINEERING INC

464A - 10th STREET, Hanover, Ontario N4N 1R1
Telephone: (519) 506-5959
www.cobideeng.com

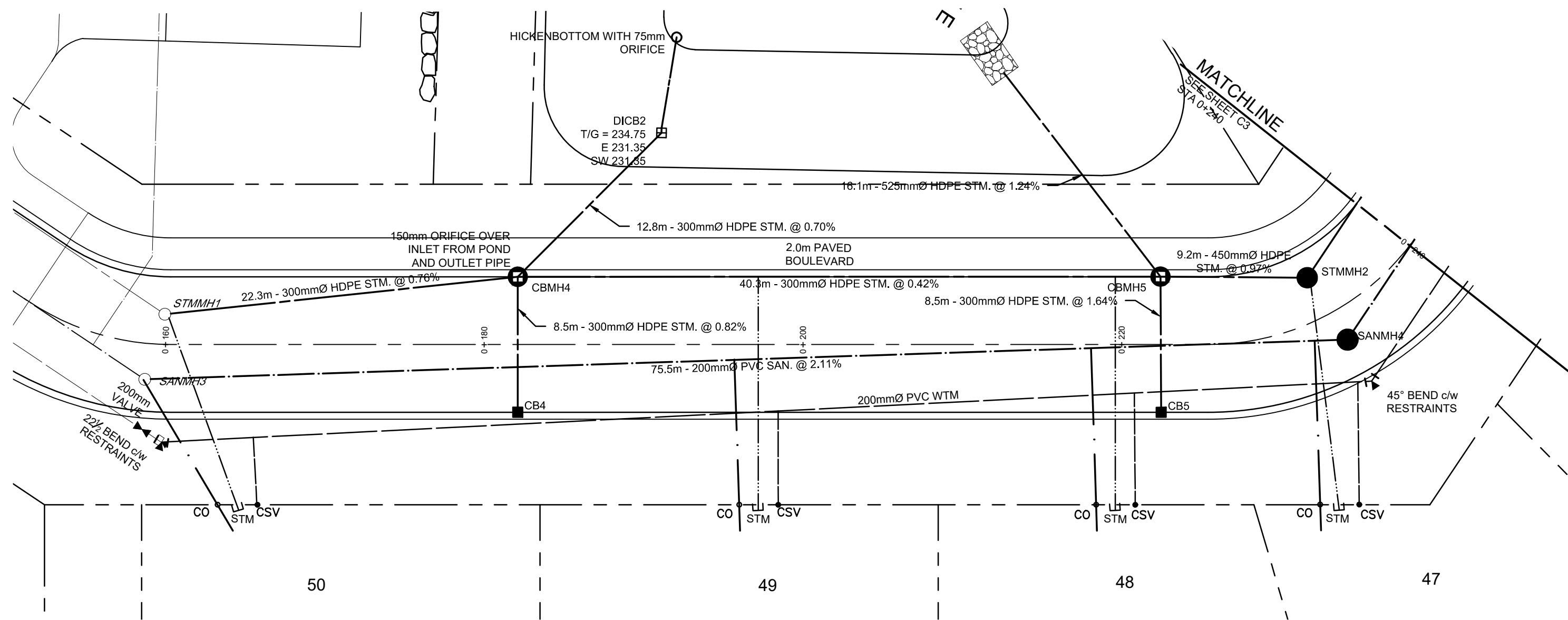
Title: **TOWER HILL SUBDIVISION
TOWER HILL CRESCENT
PLAN AND PROFILE
STA 0+000 TO STA 0+160**

Client: **2582030 Ontario Inc. c/o Bill Clancy**

Design: TLB
Drawn: TLB
Checked: SJC
Date: MAY 2017

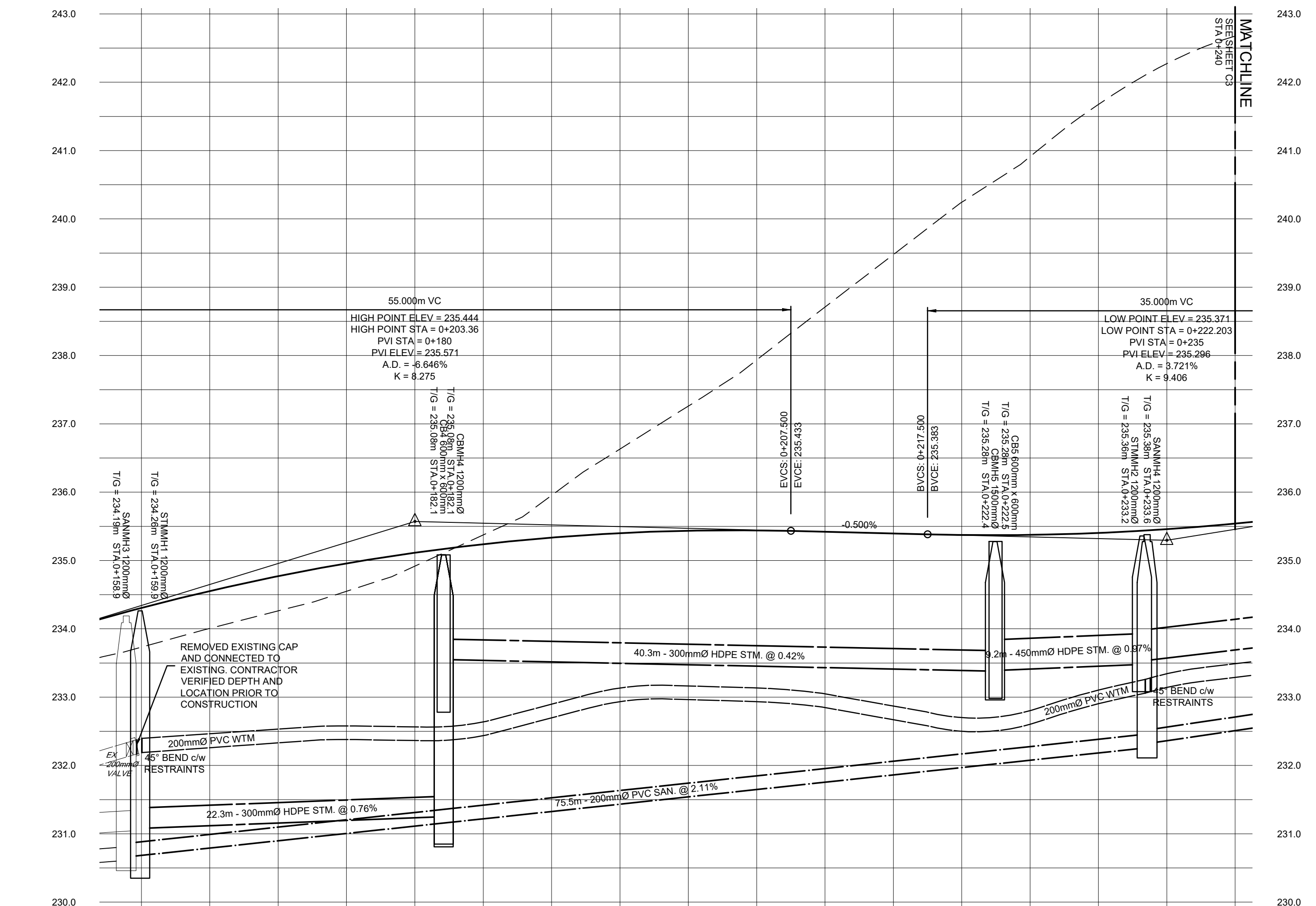
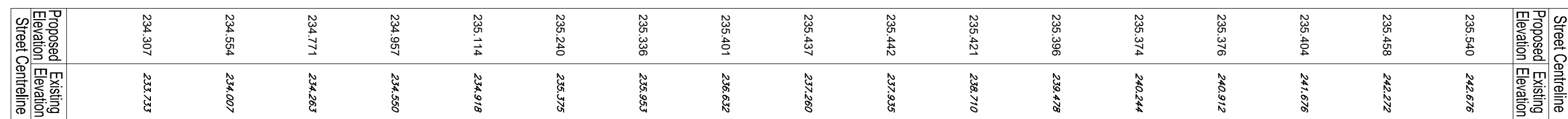
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Approved: [Signature]
Design Engineer

DRAWING No. **01812-C1**



Notes

1. PROPERTY BOUNDARY DERIVED FROM INFORMATION SHOWN ON PLAN M-89 DATED JUNE 1, 1981 PREPARED BY IVAN DINSMORE O.L.S.
2. SEE DETAILED SHEET FOR TYPICAL CURB DESIGN AND PAVEMENT DESIGN.
3. ALL ORGANIC MATERIAL WITHIN 1.2m OF FINISHED PROFILE GRADE WAS REMOVED TO 40% A.F. AND REPLACED WITH 10% FILLER. UNFILLED PORTION OF THE ROAD COVER OVER WATERMAN 1.8m MINIMUM AT ALL POINTS.
4. SANITARY SEWER INSTALLED ARE PVC SDR35.
5. ALL STORM CATCHBASINS HAVE A MINIMUM SUMP OF 600mm AND ALL STORM MANHOLES HAVE A MINIMUM SUMP OF 300mm.
6. ALL WATERMANS INSTALLED ARE PVC DR18.
7. THIS DRAWING IS WAS NOT USED FOR CONSTRUCTION PURPOSES UNTIL STAMPED AND SIGNED FOR CONSTRUCTION.
8. ALL CONSTRUCTION WAS COMPLETED TO MUNICIPALITY SERVICING STANDARDS FOR THE MUNICIPALITY OF ARRAN-ELDERSLIE.



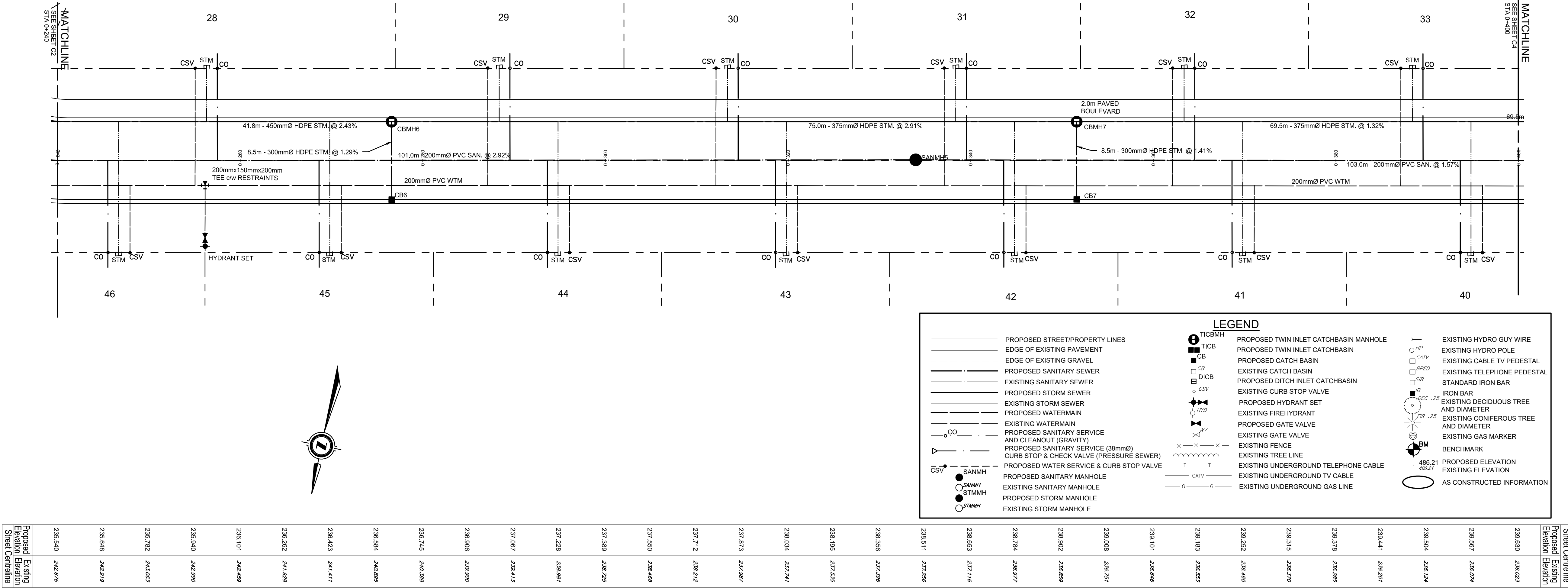
Station	Storm Invert	Sanitary Invert
0+240	STWAK S 231.05 SE 233.48 SAMBA SE 232.26 W 232.32	
0+220	CHAKS NE 233.28 S 233.36 NE 233.54 SE 233.98 CRS SW 233.95	
0+200		
0+180	CHAKI NE 233.41 SE 231.25 W 231.25 NW 234.35 SW 233.49	
0+160	STMAH S 231.05 NW 231.08 SANAG S 236.61 NW 230.66	
Station	Storm Invert	Sanitary Invert

Benchmark Information		
BM1	TOP NUT OF FIRE HYDRANT LOCATED AT STA. 0+023 RIGHT ELEVATION	232.22m
BM2	TOP NUT OF FIRE HYDRANT LOCATED AT STA. 0+750 RIGHT ELEVATION	235.66m

4	MAY 10/19	AS RECORDED	TLB	TLB	
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1	JAN 17/18	MOECC SUBMISSION	TLB	TLB	
0	DEC 15/17	FIRST SUBMISSION	TLB	TLB	
No.	DATE	DESCRIPTION	BY	APP	

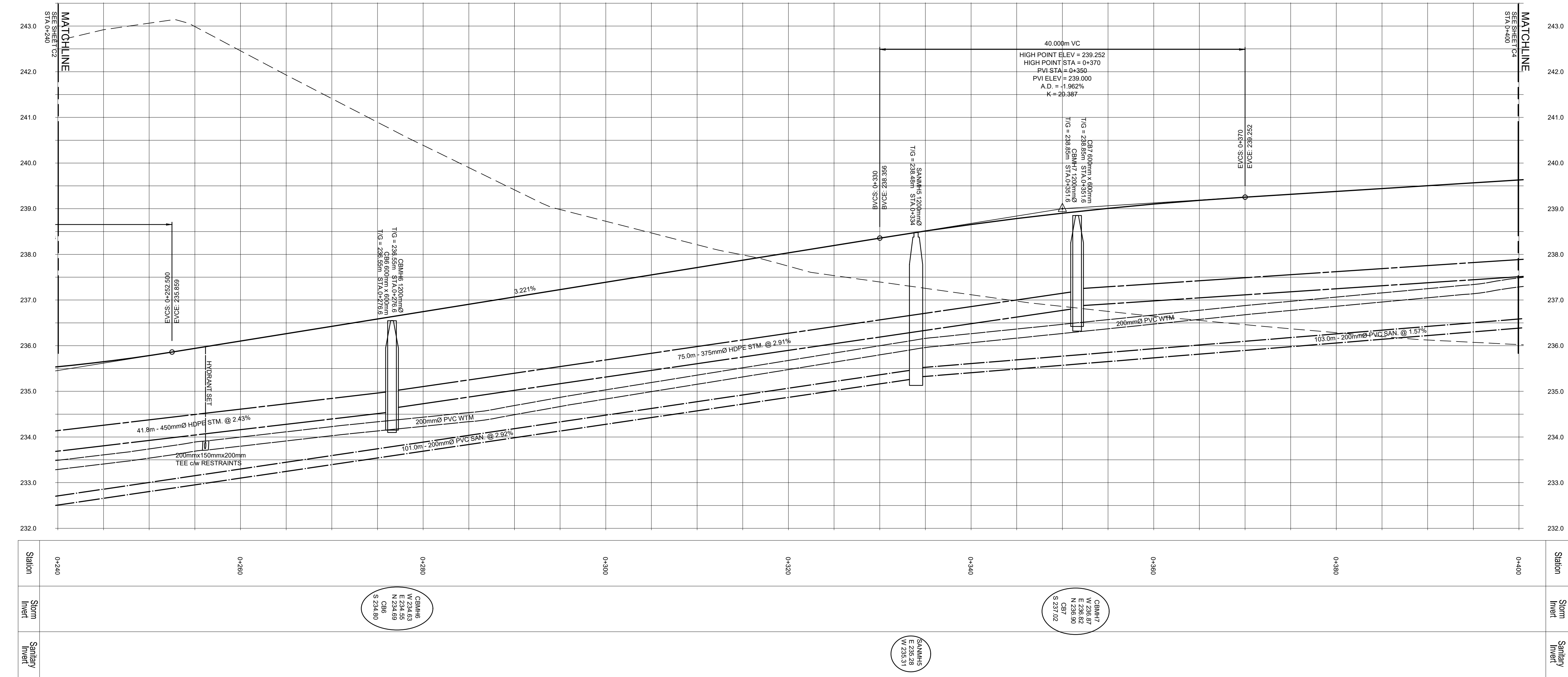
Seal not valid unless signed and dated





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- Notes**
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 - SEE DETAILS SHEET FOR TYPICAL CROSS SECTION AND PAVEMENT DESIGN.
 - ALL ORGANIC MATERIAL WITHIN 1.2m OF FINISHED PROFILE GRADE TO BE REMOVED FROM ALL AREAS UNDER THE TRAVELLED PORTION OF THE ROAD.
 - COVER OVER WATERMAIN 1.8m MINIMUM AT ALL POINTS.
 - SANITARY SEWER INSTALLED ARE PVC SDR35.
 - ALL STORM CATCHBASINS HAVE A MINIMUM SUMP OF 600mm AND ALL STORM MANHOLES HAVE A MINIMUM SUMP OF 300mm.
 - ALL WATERMAINS INSTALLED ARE PVC DR18.
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 - ALL CONSTRUCTION WAS COMPLETED TO MUNICIPAL SERVICING STANDARDS FOR THE MUNICIPALITY OF ARRAN-ELDERSLIE.



Benchmark Information

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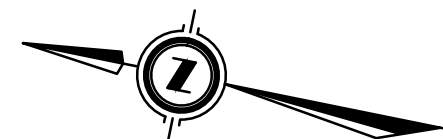
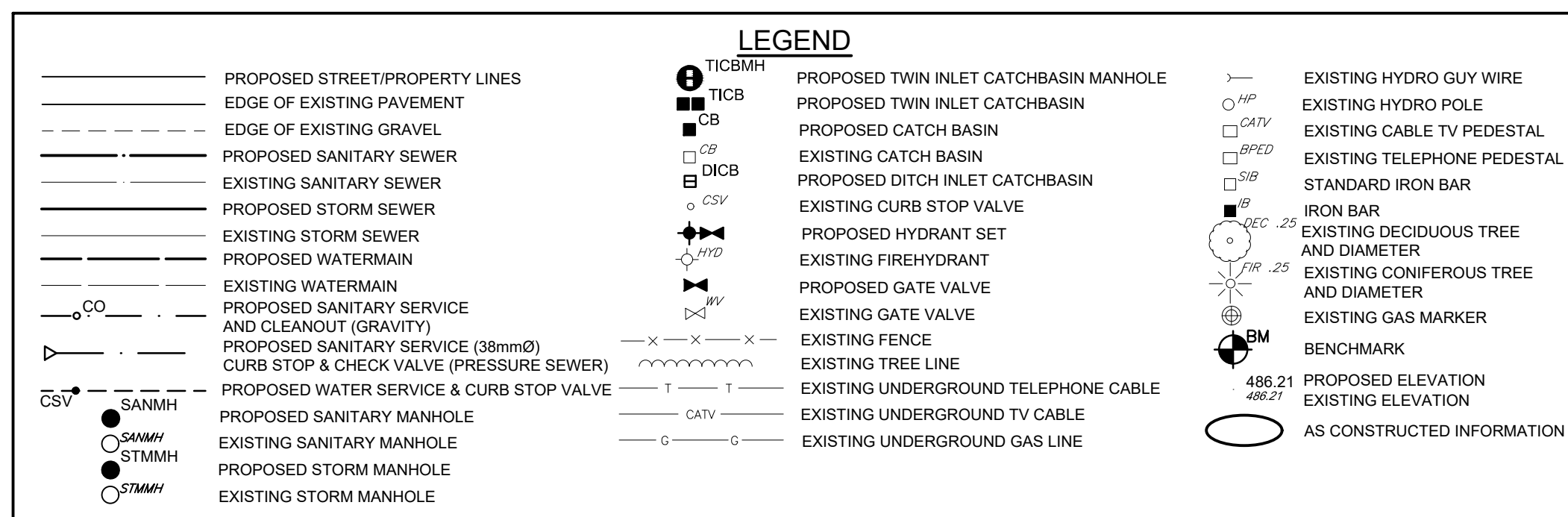
COBIDE ENGINEERING INC

464A - 10th STREET, Hanover, Ontario N4N 1R1
Telephone: (519) 506-5959
www.cobideeng.com

**TOWER HILL SUBDIVISION
TOWER HILL CRESCENT
PLAN AND PROFILE
STA 0+240 TO STA 0+400**

Client: 2582030 Ontario Inc. c/o Bill Clancy

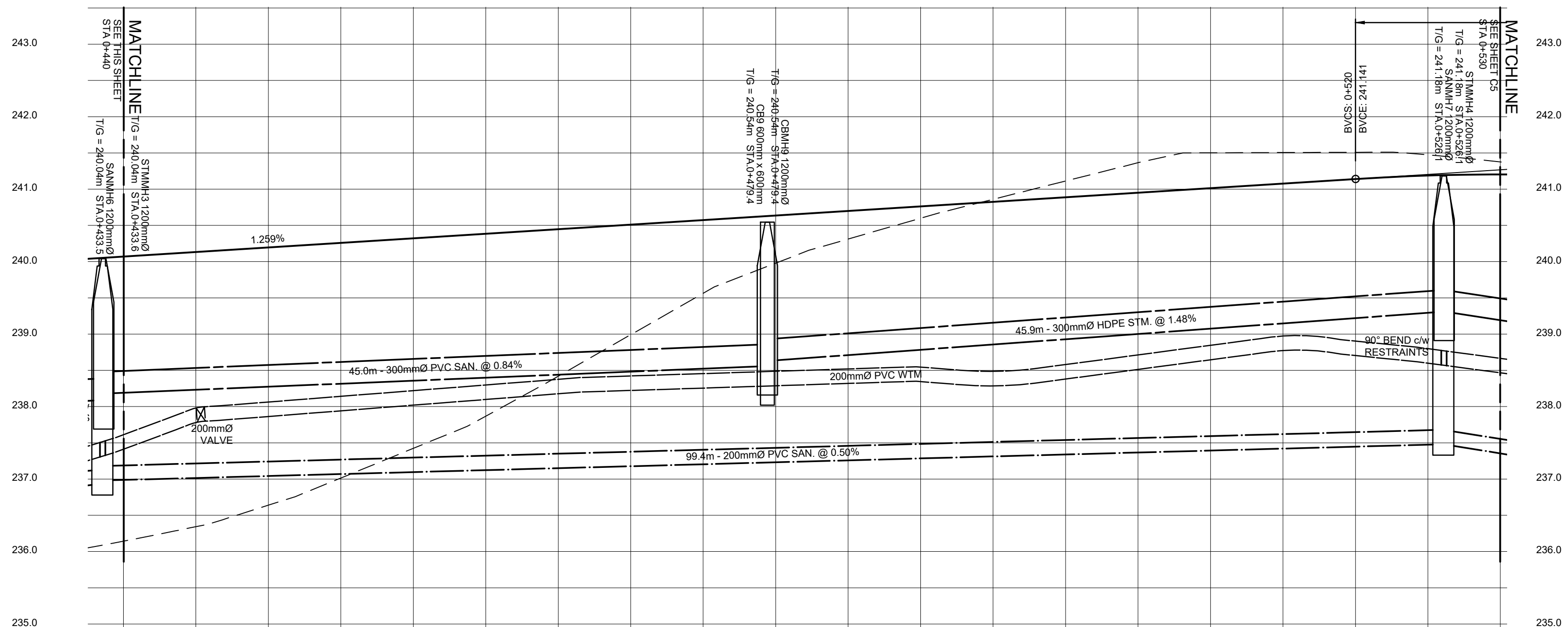
Design: TLB Scale: H 1:250 V 1:50
Drawn: TLB Approved:
Checked: SJC
Date: MAY 2017
DRAWING No. 01812-C3



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

1. PROPERTY BOUNDARY DERIVED FROM INFORMATION SHOWN ON PLAN M-89 DATED JUNE 1, 1981 PREPARED BY IVAN DINSMORE O.L.S.
2. SEE DETAILS SHEET FOR TYPICAL CROSS SECTION AND PAVEMENT DESIGN.
3. ALL ORGANIC MATERIAL WITHIN 12m OF FINISHED PROFILE GRADE WAS REMOVED FROM THE AREAS UNDER THE TRAVELLED PORTION OF THE ROAD COVER OVER WATERWAYS AND POINTS.
4. SANITARY SEWER INSTALLED ARE PVC SDR35.
5. ALL STORM CATCHBASINS HAVE A MINIMUM SUMP OF 600mm AND ALL STORM MANHOLES HAVE A MINIMUM SUMP OF 300mm.
6. ALL WATERMANS INSTALLED ARE PVC DR18.
7. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNTIL THE STAMPED ISSUED FOR CONSTRUCTION IS RECEIVED.
8. ALL CONSTRUCTION WAS COMPLETED TO MUNICIPAL SERVING STANDARDS FOR THE MUNICIPALITY OF ARRAN-ELDSLIERIE.

Proposed Elevation	Existing Elevation	Street Centreline
241.504	241.276	Street Centreline
241.188	241.223	
241.141	241.039	
240.952	241.065	
240.889	241.112	
241.078	241.208	
241.015	241.522	
240.826	240.060	
240.763	240.599	
240.637	239.979	
240.574	239.664	
240.511	238.932	
240.448	238.419	
240.385	237.868	
240.322	237.423	
240.259	237.014	
240.196	236.640	
240.133	236.443	
240.070	236.434	

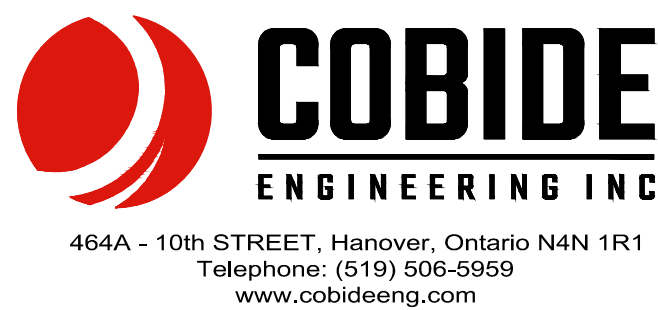


Station	Storm Invert	Sanitary Invert
0+500	STWMA4 N 239.31 E 239.31	SANMA7 N 237.48 E 237.48
0+900		
0+400	STWMA5 N 238.65 E 238.72	
0+400		
0+400		

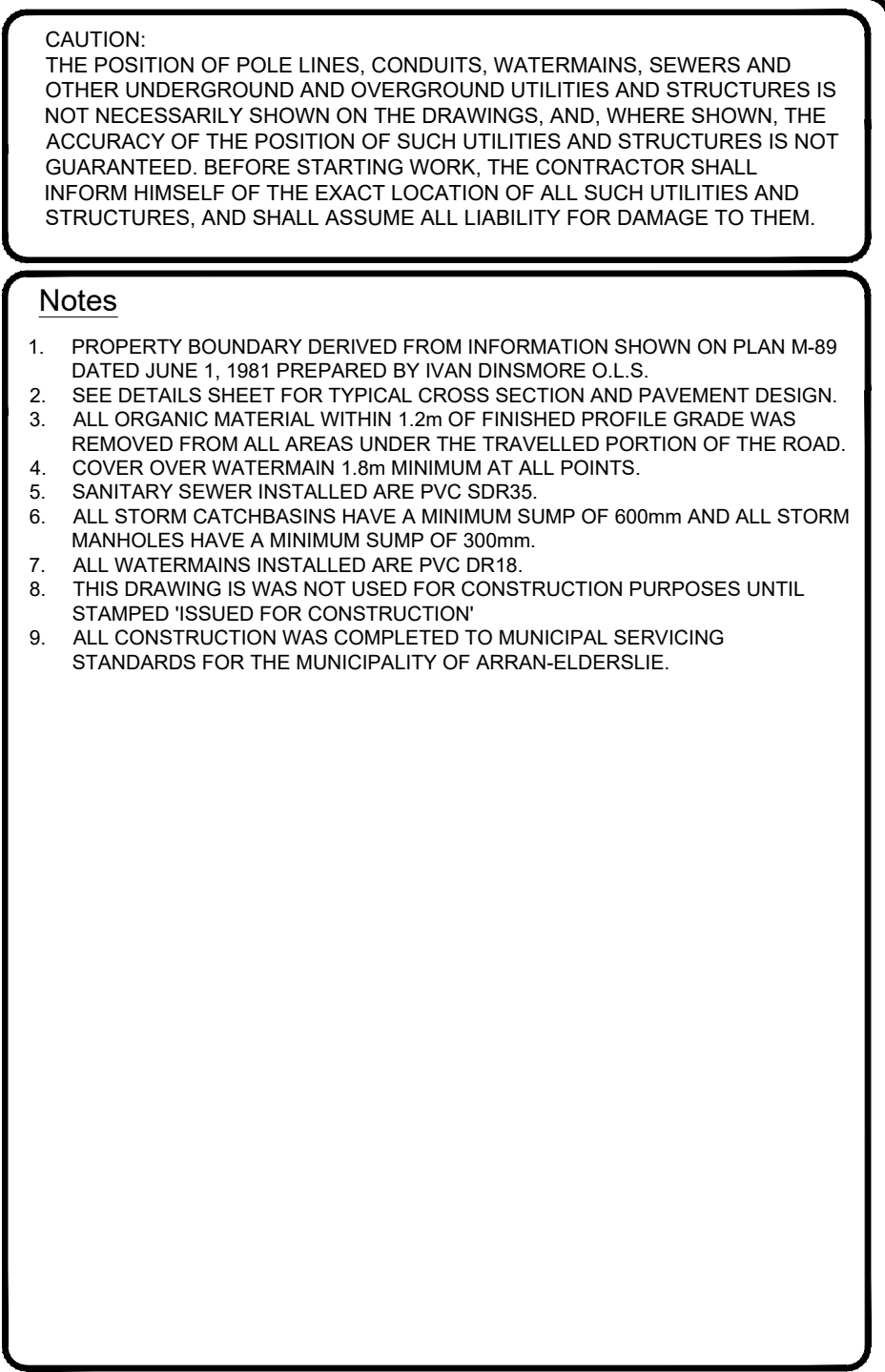
	BM1 TOP NUT OF FIRE HYDRANT LOCATED AT STA. 0+023 RIGHT ELEVATION	232.22m
	BM2 TOP NUT OF FIRE HYDRANT LOCATED AT STA. 0+750 RIGHT ELEVATION	235.66m

No.	DATE	DESCRIPTION	BY	APP
REVISION / ISSUE				
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2	APR 23/18	REVISED MOECC SUBMISSION	TLB	TL
1	JAN 17/18	MOECC SUBMISSION	TLB	TL
0	DEC 15/17	FIRST SUBMISSION	TLB	TL

Seal not valid unless signed and dated



TOWER HILL SUBDIVISION TOWER HILL CRESCENT PLAN AND PROFILE STA 0+400 TO STA 0+530	
Client: 2582030 Ontario Inc. c/o Bill Clancy	
Design: TLB	Scale: H 1:250 V 1:50
Drawn: TLB	Approved:
Checked: SJC	
Date: MAY 2017	Design Engineer:
DRAWING No.	01812-C4



Station	Stom Invert	Sanitary Invert
0+680	OCBANH8 N 234.88 SW 234.85 NE 233.88 S 233.87 NE 234.85	SANINH8 W 233.16 S 233.10
0+640	STINH5 W 234.18 NE 234.05	
0+620		
0+600	CBANH10 S 237.42 E 237.42 W 237.80 CS10 N 237.84	SANINH8 W 235.42 E 235.37
0+580		
0+540	STINH4 E 238.51 N 238.51	SANINH7 N 237.48 E 237.48
Station	Stom Invert	Sanitary Invert

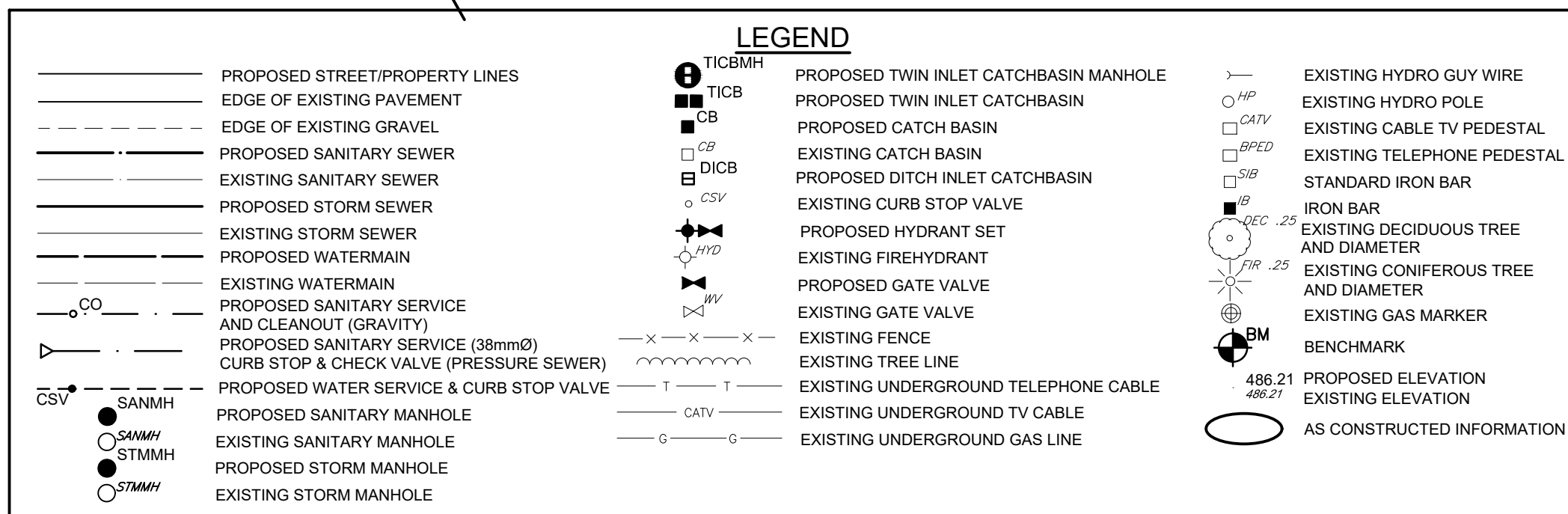
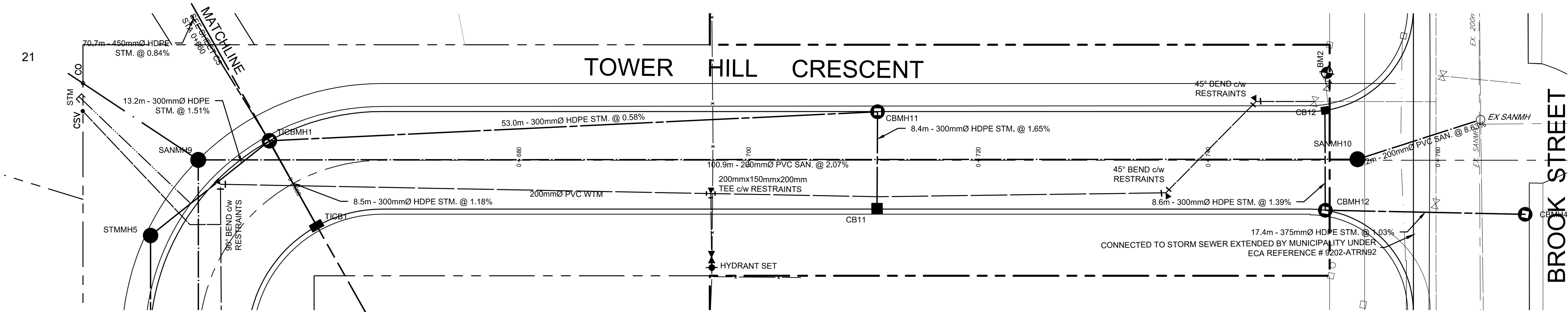
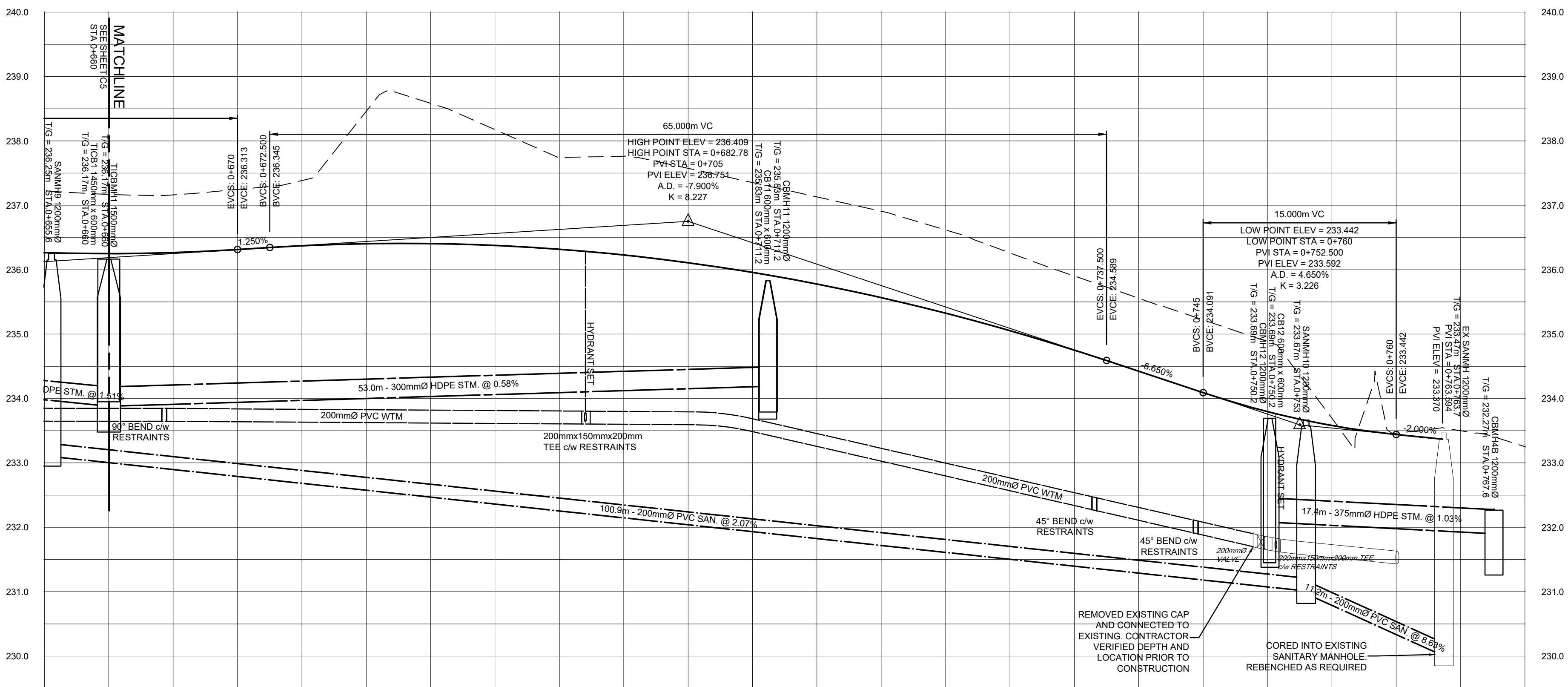
Benchmark Information				
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No.	DATE	DESCRIPTION	BY	APPD
REVISION / ISSUE				
Seal not valid unless signed and dated				

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 Telephone: (519) 506-5959
www.cobideeng.com

Title:	TOWER HILL SUBDIVISION TOWER HILL CRESCENT PLAN AND PROFILE STA 0+530 TO STA 0+660
Client:	2582030 Ontario Inc. c/o Bill Clancy
Design:	TLB
Drawn:	TLB
Checked:	SJC
Date:	MAY 2017
Scale:	H 1:250 V 1:50
Approved:	
Design Engineer	

DRAWING No.
01812-C5

[illegible]

Station	Storm Invert	Sanitary Invert
0+760	GBMH4B N 231.90	SANMH10 N 231.01 SE 230.97
0+740	GB17 W 232.15 NE 231.71 S 232.08	
0+720	GBMH1 W 234.24 NE 234.19 GB17 E 234.35	
0+700		
0+680		
0+660	TGBMH1 W 233.88 NE 233.83 NE 233.89 S 233.85 TCB1 NE 234.05	SANMH9 W 233.18 S 233.10

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Notes

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4. COVER OVER WATERSHEDS TO BE 100mm MINIMUM AT ALL POINTS.
5. SANITARY SEWER INSTALLED ARE PVC SDR35.
6. ALL STORM CATCHBASINS HAVE A MINIMUM SUMP OF 600mm and ALL STORM MANHOLES HAVE A MINIMUM SUMP OF 300mm.
7. ALL WATERMANS INSTALLED ARE PVC DR18.
8. THIS DRAWING IS VALID FOR CONSTRUCTION PURPOSES UNTIL STAMPED "ISSUED FOR CONSTRUCTION".
9. ALL CONSTRUCTION WAS COMPLETED TO MUNICIPAL SERVING STANDARDS FOR THE MUNICIPALITY OF ARRAN-ELDERSLIE.

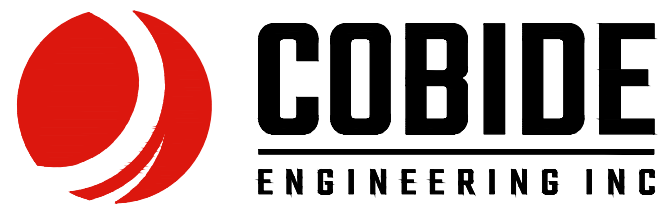
Benchmark Information

- | | | |
|---|--|---------|
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TOP NUT OF FIRE HYDRANT LOCATED AT STA. 0+023 RIGHT
ELEVATION | 232.22m |
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TOP NUT OF FIRE HYDRANT LOCATED AT STA. 0+750 RIGHT
ELEVATION | 235.66m |

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No.	DATE	DESCRIPTION	BY	APP	

REVISION / ISSUE

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Title:

TOWER HILL SUBDIVISION
TOWER HILL CRESCENT
PLAN AND PROFILE
STA 0+660 TO STA 0+760

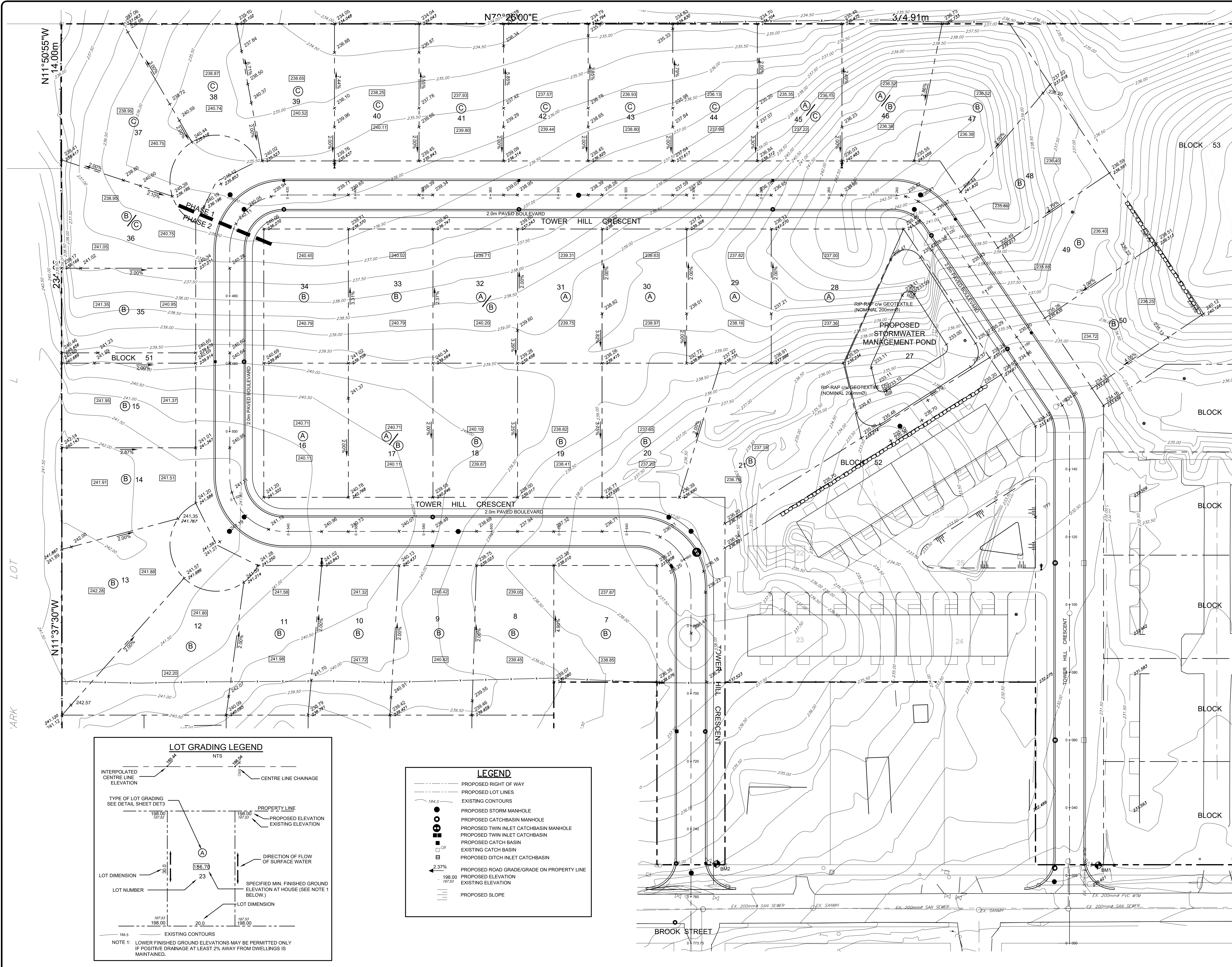
Client: 2582030 Ontario Inc. c/o Bill Clancy

Design:	TLB	Scale:	H 1:250 V 1:50
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Drawn: TLB	Approved:
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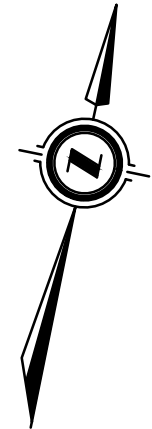
Checked:	SJC
Date:	

MAY 2017		Design Engineer
DRAWING No.		01812-C6



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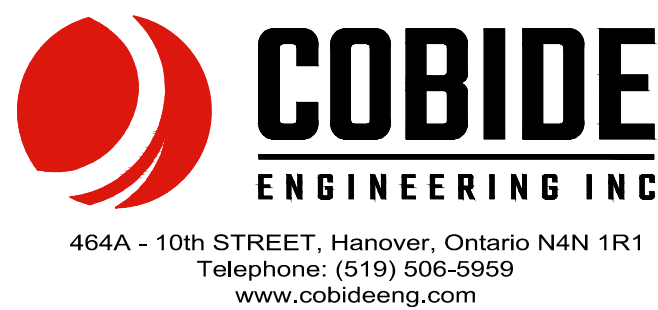
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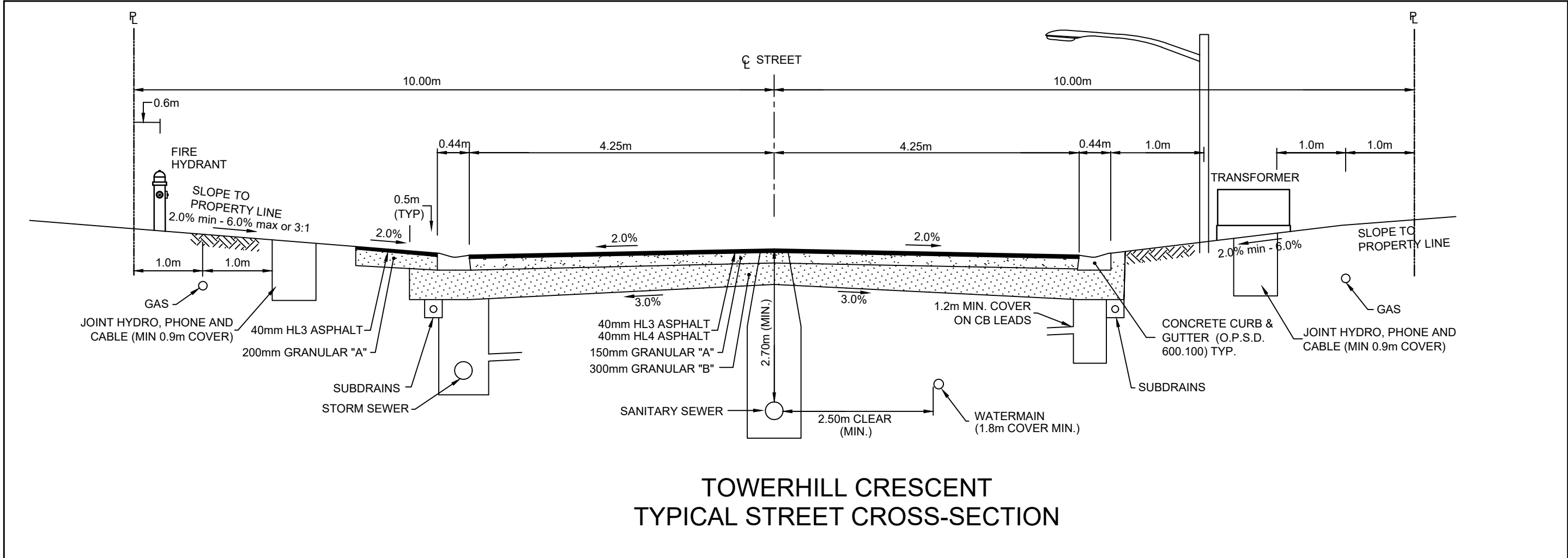
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No.	DATE	DESCRIPTION	BY	APPD	
REVISION / ISSUE					

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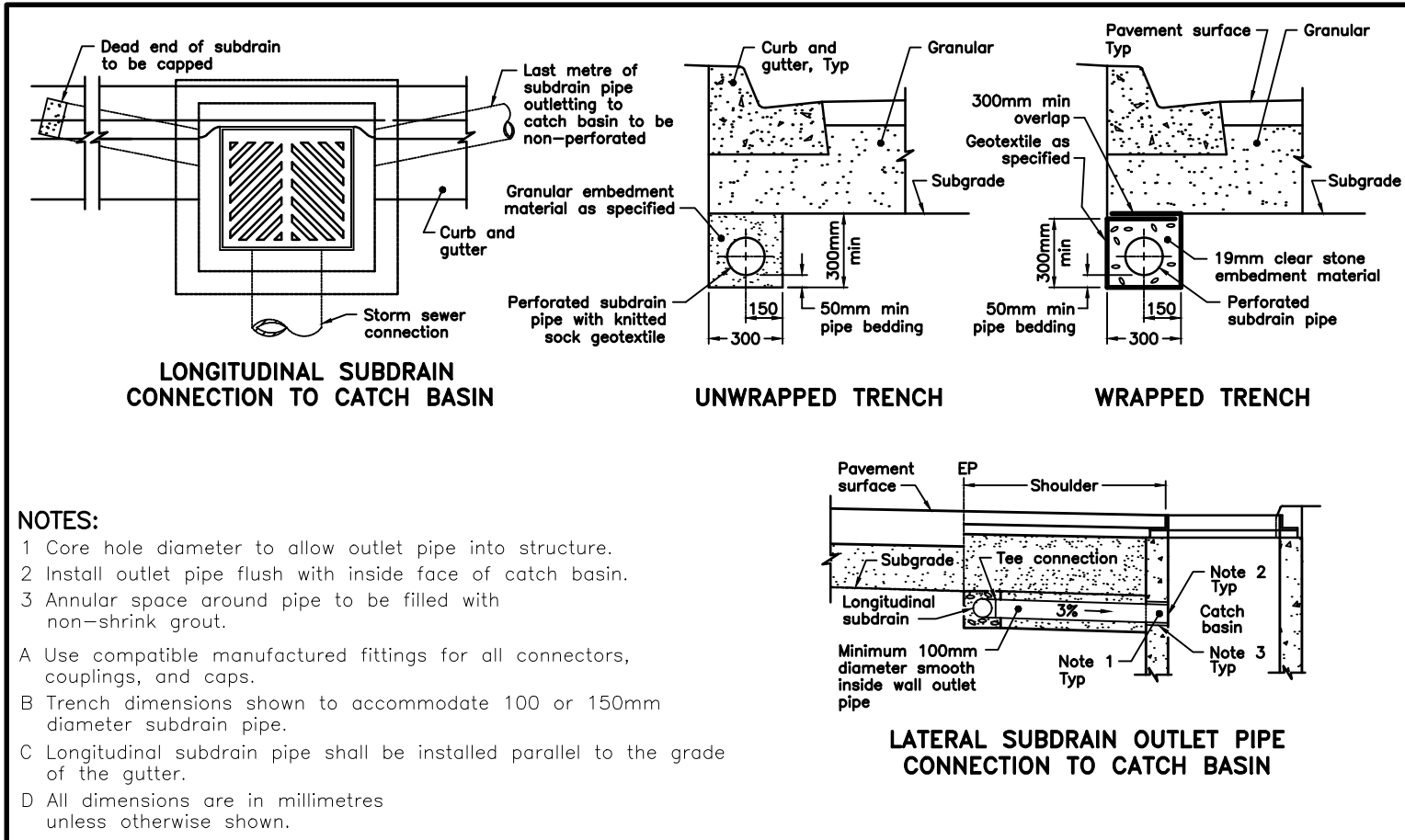


Title:		TOWER HILL SUBDIVISION TOWER HILL CRESCENT LOT GRADING PLAN	
Client:		2582030 Ontario Inc. c/o Bill Clancy	
Design:	TLB	Scale:	1:500
Drawn:	TLB	Approved:	
Checked:	SJC		
Date:	MAY 2017	Design Engineer	
DRAWING No.		01812-C7	

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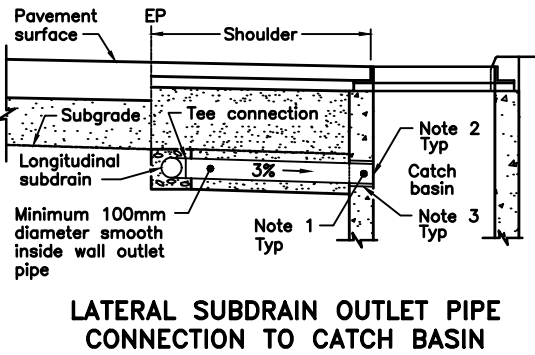
TOWERHILL CRESCENT
TYPICAL STREET CROSS-SECTION



LONGITUDINAL SUBDRAIN
CONNECTION TO CATCH BASIN

UNWRAPPED TRENCH

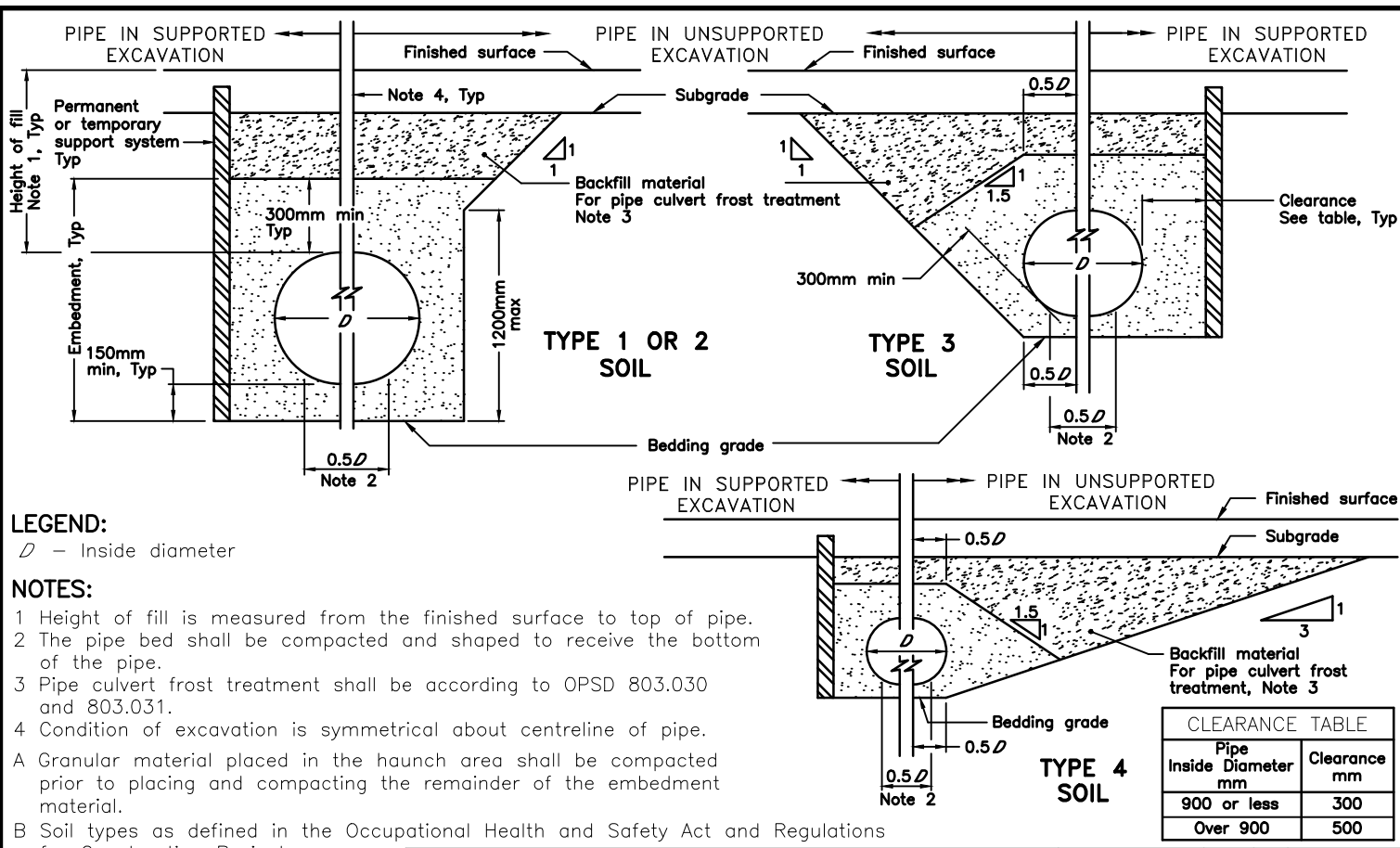
WRAPPED TRENCH



LATERAL SUBDRAIN OUTLET PIPE
CONNECTION TO CATCH BASIN

- NOTES:
- 1 Core hole diameter to allow outlet pipe into structure.
 - 2 Install outlet pipe flush with inside face of catch basin.
 - 3 Annular space around pipe to be filled with non-shrink grout.
 - 4 Use compatible manufactured fittings for all connectors, couplings, and caps.
 - 5 Trench dimensions shown to accommodate 100 or 150mm diameter subdrain pipe.
 - 6 Longitudinal subdrain pipe shall be installed parallel to the grade of the gutter.
 - 7 All dimensions are in millimetres unless otherwise shown.

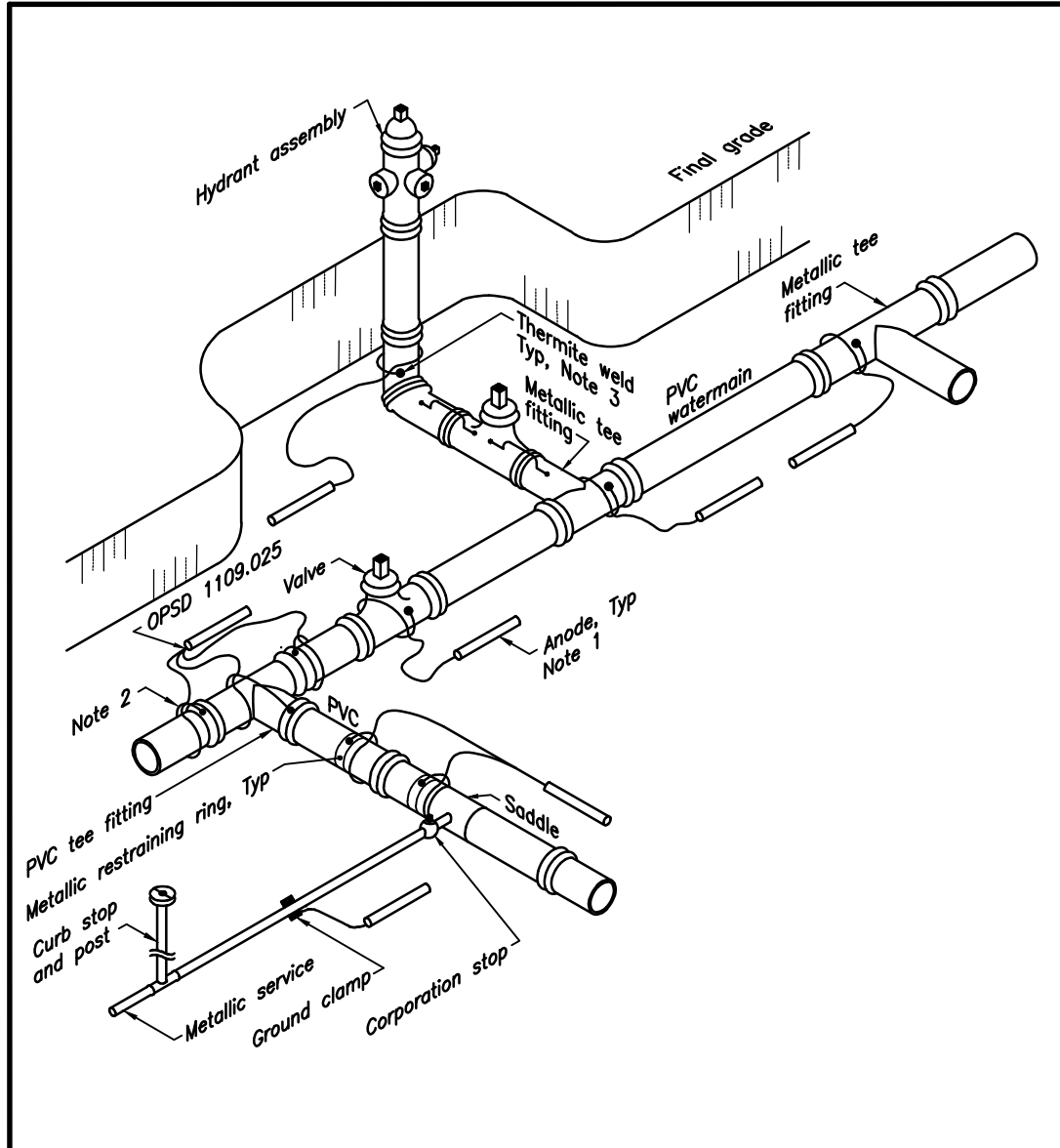
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev 2	OPSD 216.021
SUBDRAIN PIPE CONNECTION AND OUTLET URBAN			



- LEGEND:
- $\varnothing$ - Inside diameter
- NOTES:
- 1 Height of fill is measured from the finished surface to top of pipe.
 - 2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
 - 3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
 - 4 Condition of excavation is symmetrical about centreline of pipe.
 - 5 Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.
 - 6 All types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
 - 7 All dimensions are in metres unless otherwise shown.

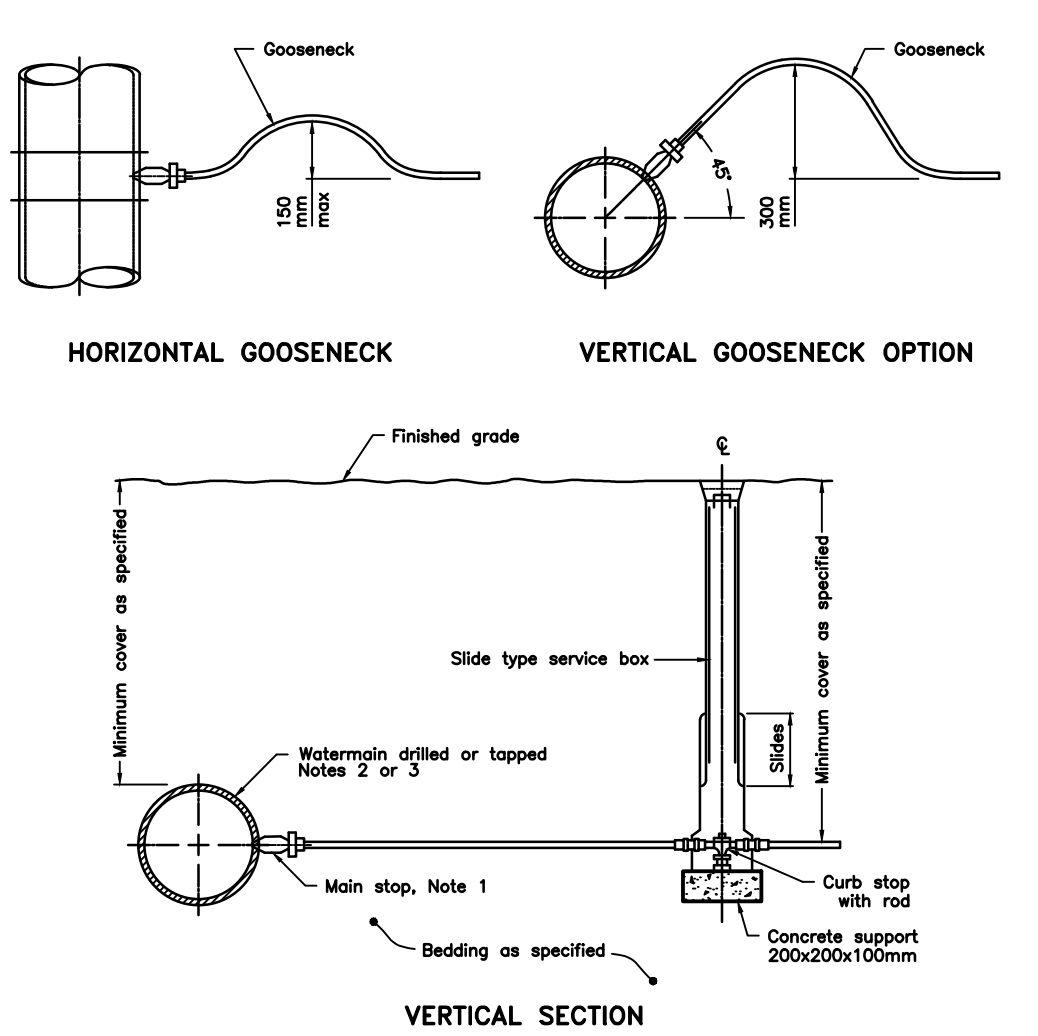
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3	OPSD 802.010
FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION			

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500



- NOTES:
- 1 Anodes shall be placed at least 1.0m away from the water system pipe and appurtenances and as deep as the bottom of the pipe and appurtenances. Minimum distance between anodes shall be 1.0m.
 - 2 Anode connecting wire shall be loosely wrapped around pipes and fittings and knotted.
 - 3 Protective coating shall be applied to all thermite welds.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2	OPSD 1109.011
CATHODIC PROTECTION FOR PVC WATERMAIN SYSTEMS			



HORIZONTAL GOOSENECK

VERTICAL GOOSENECK OPTION

- NOTES:
- 1 For plastic service pipes, install main stop at 15' above horizontal with a minimum 1.2m long gooseneck.
 - 2 Direct tap ductile iron pipe with approved tool with standard AWWA inlet thread.
 - 3 Service connections to plastic watermains shall be made using service saddles or factory made tees.
 - 4 When specified, the vertical gooseneck option shall be used.
 - 5 Couplings shall not be permitted unless the service length exceeds 20m between the main stop and curb stop.
 - 6 All water services shall be installed 90° to the longitudinal axis of the watermain.
 - 7 Backfill material within 500mm of service box shall be native or imported, as specified.
 - 8 All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2013	Rev 3	OPSD 1104.010
WATER SERVICE CONNECTION 19 and 25mm DIAMETER SIZES			

ENGINEERING STANDARD NOTES

GENERAL - CONSTRUCTION

1. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH MUNICIPALITY OF ARRAN ELDERSLIE STANDARDS AND OPSS. WHERE CONFLICT OCCURS, MUNICIPAL STANDARDS GOVERN.
2. DEWATERING TO BE CARRIED OUT IN ACCORDANCE WITH OPSS 517 AND 518 TO MAINTAIN ALL TRENCHES IN A DRY CONDITION.
3. ALL ENGINE DRIVEN PUMPS TO BE ADEQUATELY SILENCED, SUITABLE FOR OPERATION IN A RESIDENTIAL DISTRICT.
4. DISTURBED AREAS TO BE REINSTATED TO PREVIOUS CONDITION OR BETTER.
5. ALL MAINTENANCE HOLE FRAMES AND COVERS TO BE INITIALLY SET TO BASE COURSE HL4 ASPHALT ELEVATION AND SHALL BE TELESCOPING FRAME AND GRATES.
6. ALL EXISTING MAINTENANCE HOLES TO BE RAISED OR LOWERED TO PROPOSED GRADE. MAXIMUM ALLOWABLE HEIGHT OF ADJUSTMENT TO BE 300mm.
7. ALL EXISTING HYDRANTS AND VALVES TO BE RAISED OR LOWERED TO PROPOSED GRADE.
8. TRENCHES FOR UTILITIES TO BE MINIMUM 600mm WIDE BACKFILLED WITH APPROVED NATIVE MATERIAL AND COMPACTED ALL TO THE SATISFACTION OF THE LOCAL UTILITY.
9. CONDUITS FOR ROAD CROSSINGS TO EXTEND 1.0m BEYOND CURB C/W PULL ROPES. INSTALL CONDUITS TO LOCAL STANDARDS.
10. MAINTAIN A 150mm VERTICAL SEPARATION (MINIMUM) BETWEEN SEWERS AT CROSSINGS.
11. CONTRACTOR IS RESPONSIBLE TO NOTIFY ALL UTILITY COMPANIES PRIOR TO COMMENCING WORK AND COORDINATE CONSTRUCTION ACCORDINGLY.
12. TOPSOIL TO BE STRIPPED FROM SITE SHALL BE STOCKPILED AS DIRECTED BY ENGINEER.

ROADWAYS

1. CONCRETE CURB AND GUTTER TO OPSD 600.040, 600.060 OR 600.110 AS INDICATED.
2. CURB AND GUTTER TERMINATION TO OPSD 608.010.
3. CURB AND GUTTER CONSTRUCTION SHALL CONFORM TO OPSS 353.
4. CONTRACTOR TO SUPPLY AND INSTALL STREET AND TRAFFIC SIGNS TO MUNICIPAL STANDARD. SIGNS TO BE INSTALLED ON U-FRAME POSTS IN ACCORDANCE WITH OPSD 990.110.
5. SUBGRADE TO BE COMPACTED TO A MAXIMUM DRY DENSITY OF 95% OF THE MATERIAL'S MAXIMUM DRY DENSITY (MDD). COMPACTION AS PER OPSS 501.
6. GRANULAR 'A' AND 'B' MATERIALS TO BE COMPACTED TO 100% MDD, AS PER OPSS 501.
7. BOULEVARD COMPACTION TO 95% OF MATERIAL'S MDD.
8. ROADWAY SUBGRADE TO BE PROOF ROLLED IN PRESENCE OF GEOTECHNICAL ENGINEER.
9. STANDARD ROAD BASE SHALL CONSIST OF 300mm GRANULAR 'B' AND 150mm GRANULAR 'A'.
10. PAVEMENT ON NEW ROADS TO BE HOT MIX HL4 (40mm) BASE COURSE AND HL3 (40mm) AS PER OPSS 310.

SANITARY SEWERS AND SERVICES

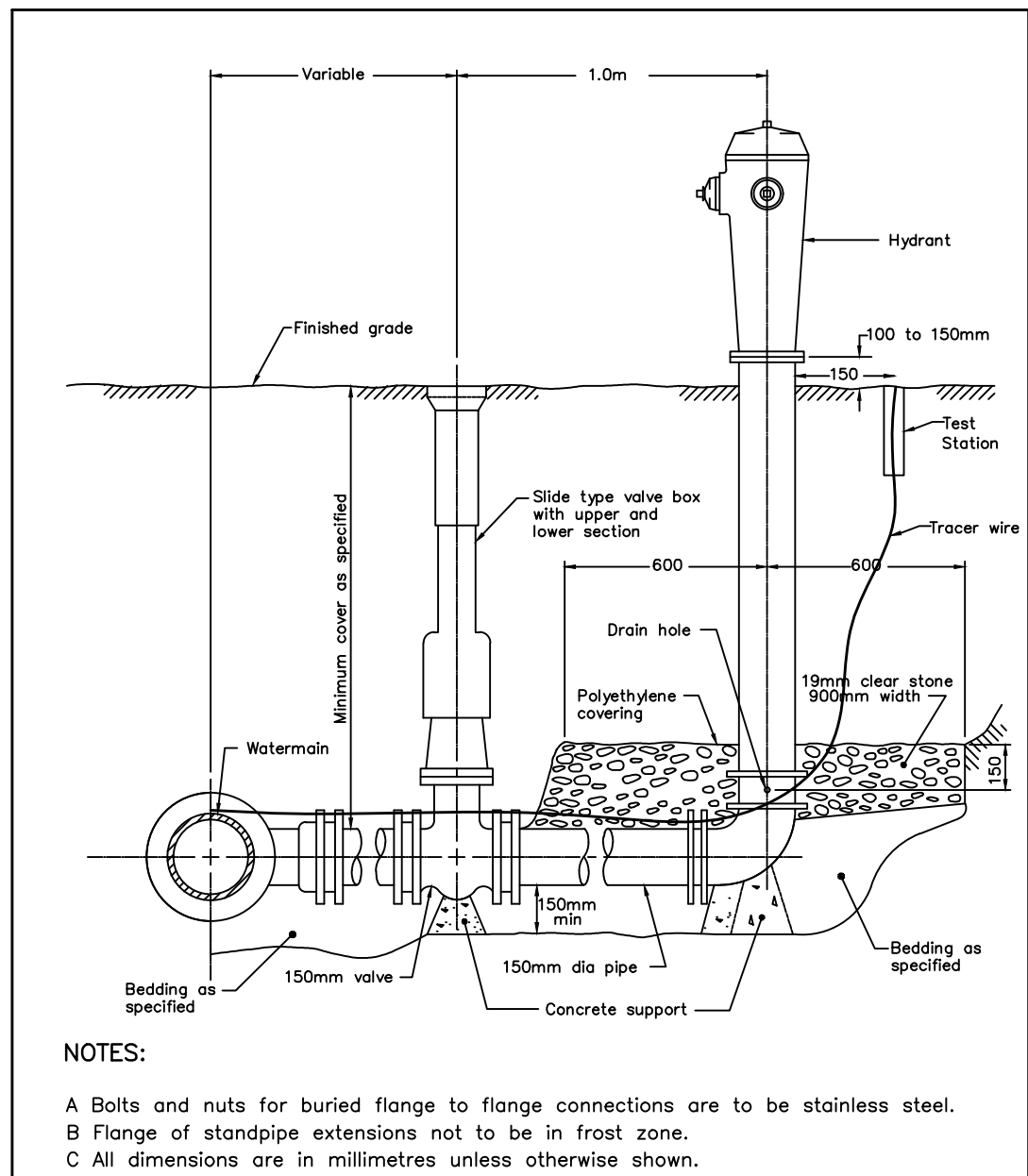
1. MAINTENANCE HOLES TO OPSD 402, 407 AND 1351.
2. BENCHING TO OPSD 701.021
3. FRAMES AND COVERS TO BE TELESCOPING WITH OPSD 401.01 TYPE 'A', CLOSED COVER.
4. SERVICE CONNECTIONS TO BE 125mm, TERMINATED AT THE PROPERTY LINE WITH A 125x125x100mm WYE C/W CAP, A 100mm Ø RISER C/W 100mmØ LONG SWEEP CAPPED AT SURFACE. SEE STANDARD DRAWING.
5. SERVICE CONNECTIONS TO OPSD 1006.020 WITH SUITABLE NATIVE BEDDING OR GRANULAR 'A'. SEE TOWN STANDARD ON DWG. No. C10.
6. BEDDING MATERIAL FOR SANITARY SEWER AND SERVICES SHALL BE APPROVED GRANULAR 'A' OR CLEAR STONE WRAPPED IN GEOTEXTILE.
7. BACKFILL AS PER OPSD 802.01 USING APPROVED NATIVE BACKFILL.
8. BACKFILL AND BEDDING MATERIAL TO BE COMPACTED AS PER OPSS 410 AND 514.
9. TESTING TO OPSS 410 AND CONTRACT DOCUMENTS.

WATERMAIN AND WATER SERVICES

1. THRUST BLOCKS AS PER OPSD 1103.010 AND 1103.020.
2. SERVICE CONNECTIONS AS PER OPSD 1104.01.
3. HYDRANT INSTALLATION AS PER OPSD 1105.01.
4. USE GRANULAR 'A' BEDDING.
5. WATERMAIN, SERVICES, AND HYDRANTS TO BE INSTALLED AS PER OPSS 441.
6. ALL PVC WATERMAIN TO HAVE TRACER WIRE BETWEEN HYDRANTS AND OTHER CONDUCTING APPURTENANCES.
7. MINIMUM COVER TO BE 1.8m.

MATERIALS

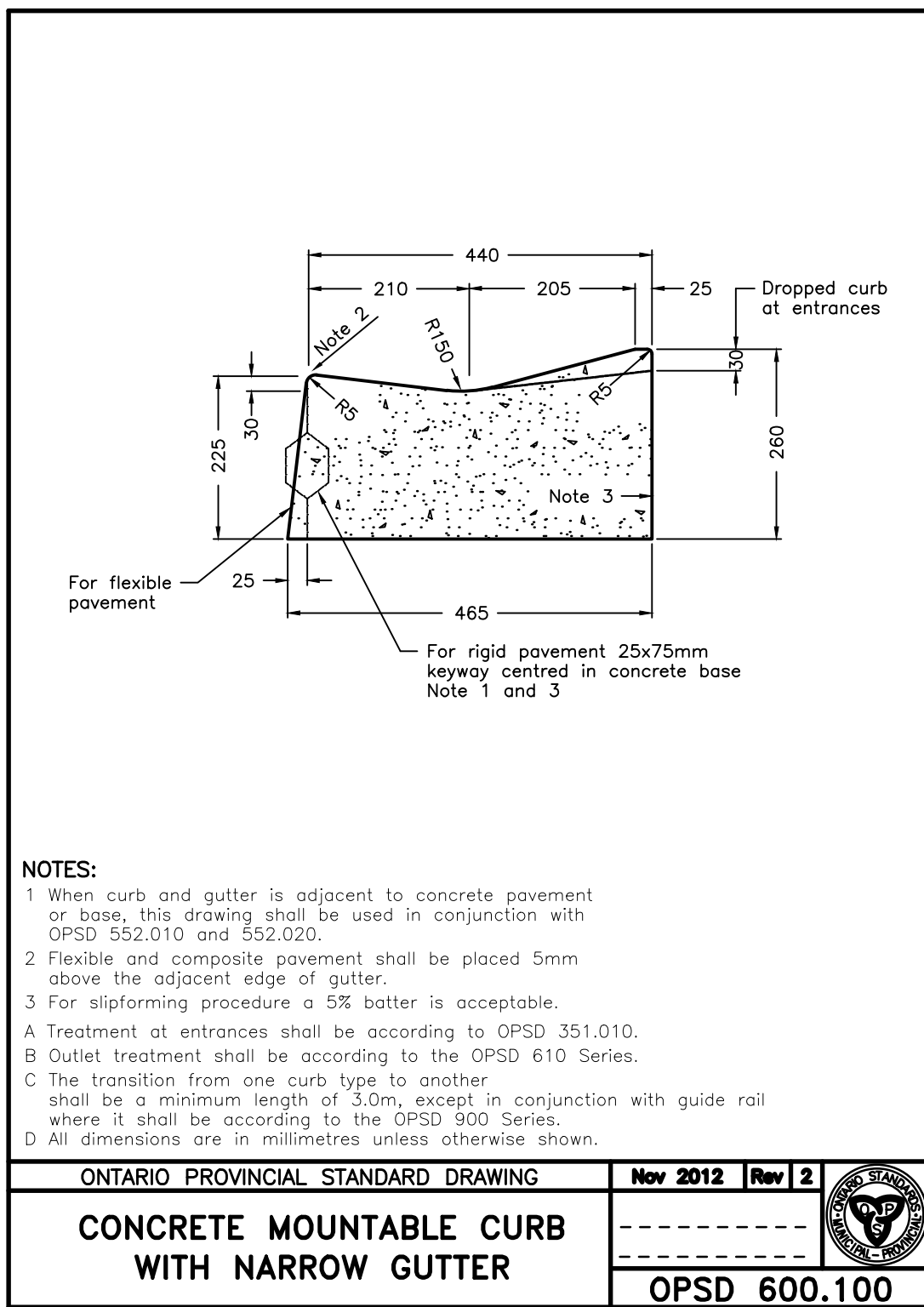
1. SANITARY SEWER - SDR35 PVC.
2. SANITARY SERVICES - SDR28 PVC, 1250 USING TEE CONNECTIONS TO MAIN.
3. STORM SEWER - HDPE (PS 320) AS SHOWN.
4. ALL DRAINAGE PIT MATERIAL TO BE PERFORATED P.E. (PS 320) STORM SEWER.
5. WATERMAIN - DR18 PVC INCLUDING 12 AWG TWU TRACER WIRE. ALL MECHANICAL JOINTS TO BE EQUIPPED WITH GRIP RINGS.
6. WATERMAIN SERVICES - 20mmØ, MUNICIPEX PIPE, MAIN STOP MUELLER 15008, CURB STOP (MUELLER H 15209) C/W CURB BOX (MUELLER A-726). SERVICE SADDLES SHALL BE ROBAR S.S. -2616 DB.
7. HYDRANTS - CENTURY WITH 2-63.5mm PORTS AND 1000 STORTZ PUMPER PORT, OR AS APPROVED BY THE FIRE CHIEF OF THE MUNICIPALITY OF ARRAN-ELDERSLIE. MUELLER A2360-3 WEDGE STYLE GATE VALVE SHALL BE PLACED 1.0m FROM HYDRANT. EACH HYDRANT TO BE C/W 50mm DIA. UNDERGROUND TEST STATION.
8. ALL HYDRANT INSTALLATIONS WILL ALSO INCLUDE A 50mm DIA. UNDERGROUND TEST STATION. THE TEST STATION WILL BE APPROX. 300m BEHIND EACH HYDRANT AND COME COMPLETE WITH 2 TERMINALS ON THE TERMINAL BLOCK THAT IS FASTENED TO THE LID. THE LID SHALL HAVE A PERMANENT MAGNET AND/OR A METAL LID FOR EASY DETECTION WITH AN ELECTRONIC LOCATOR. THE TOP OF THE TEST STATION SHALL BE INSTALLED FLUSH TO THE PROPOSED FINISH GRADE ELEVATION. TEST STATIONS SHALL BE SUPPLIED BY HANDLEY INDUSTRIES OR APPROVED EQUIVALENT.
9. VALVES - AWWA C509 RESILIENT SEATED GATE VALVES (RIGHT HAND CLOSING) WITH MECHANICAL JOINT ENDS. VALVE BOX SHALL BE 130 MAX. DIA. CAST OR DUCTILE IRON SLIDER TYPE WITH STANDARD LOWER SECTION AND GUIDE PLATE BY BIBBY-ST. CROIX. PREFABRICATED HOLES SHALL BE PLACED NEAR TOP OF VALVE BOX FOR TRACER WIRE.
10. "STOP AND DRAIN" VALVES ARE TO BE USED AT BLOW-OFFS. MUELLER H-15219 OR APPROVED EQUIVALENT TO BE USED.
11. HYDRANTS TO BE PAINTED YELLOW BARREL WITH YELLOW TOP. 100mm(4") DIAMETER CONNECTION CAP IN BLACK. OTHER CONNECTION CAPS TO BE YELLOW. SUPPLY AND PLACE FIBERGLASS POST AND SIGN ON 63.5mm(2-1/2") PORT TO INDICATE LOCATION IN WINTER WEATHER.
12. UTILITY ROAD CROSSING CONDUITS - 100mmØ TYPE II PVC.



NOTES:

- A Bolts and nuts for buried flange to flange connections are to be stainless steel.
- B Flange of standpipe extensions not to be in frost zone.
- C All dimensions are in millimetres unless otherwise shown.

HYDRANT INSTALLATION
WITH TEST STATION

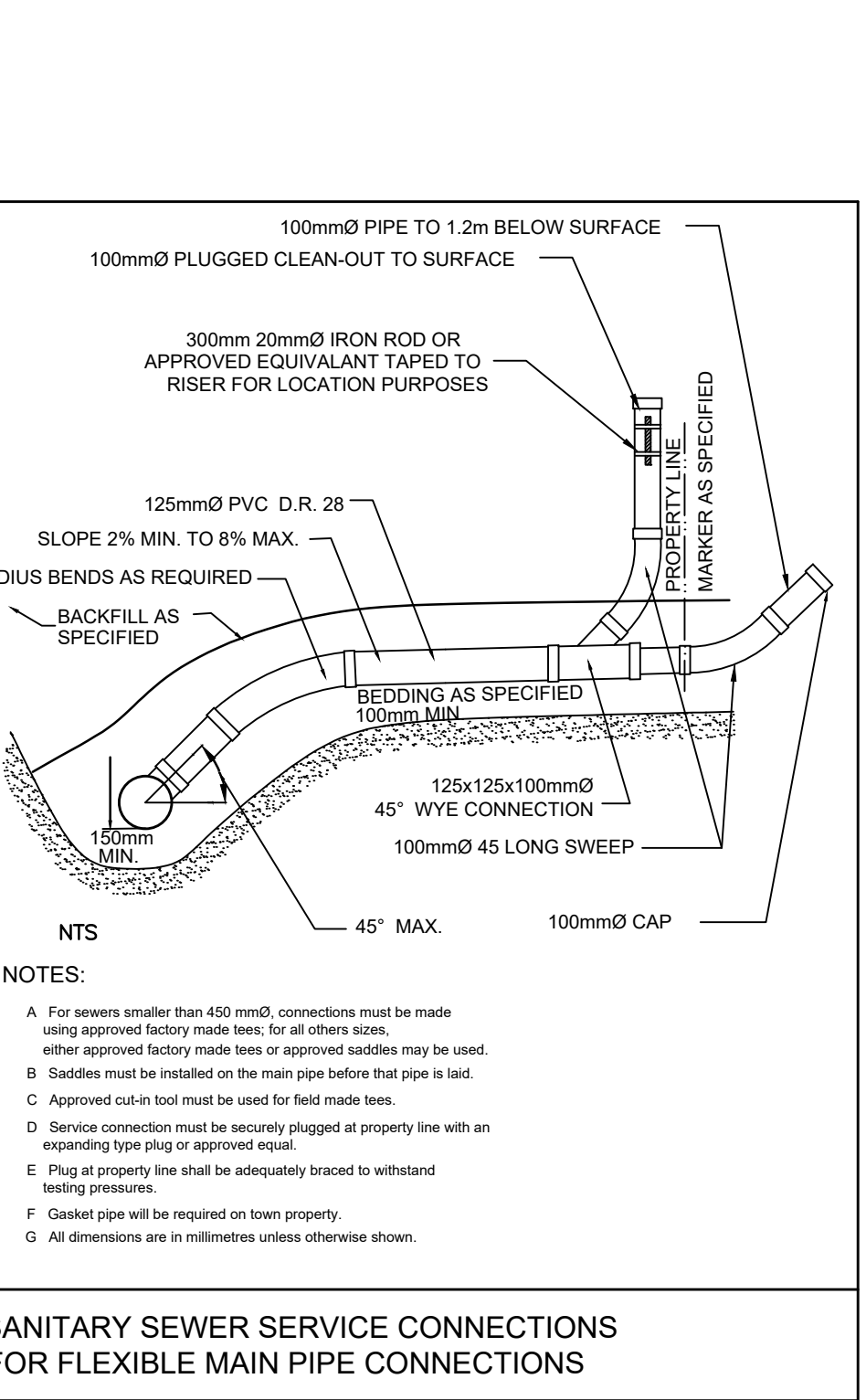
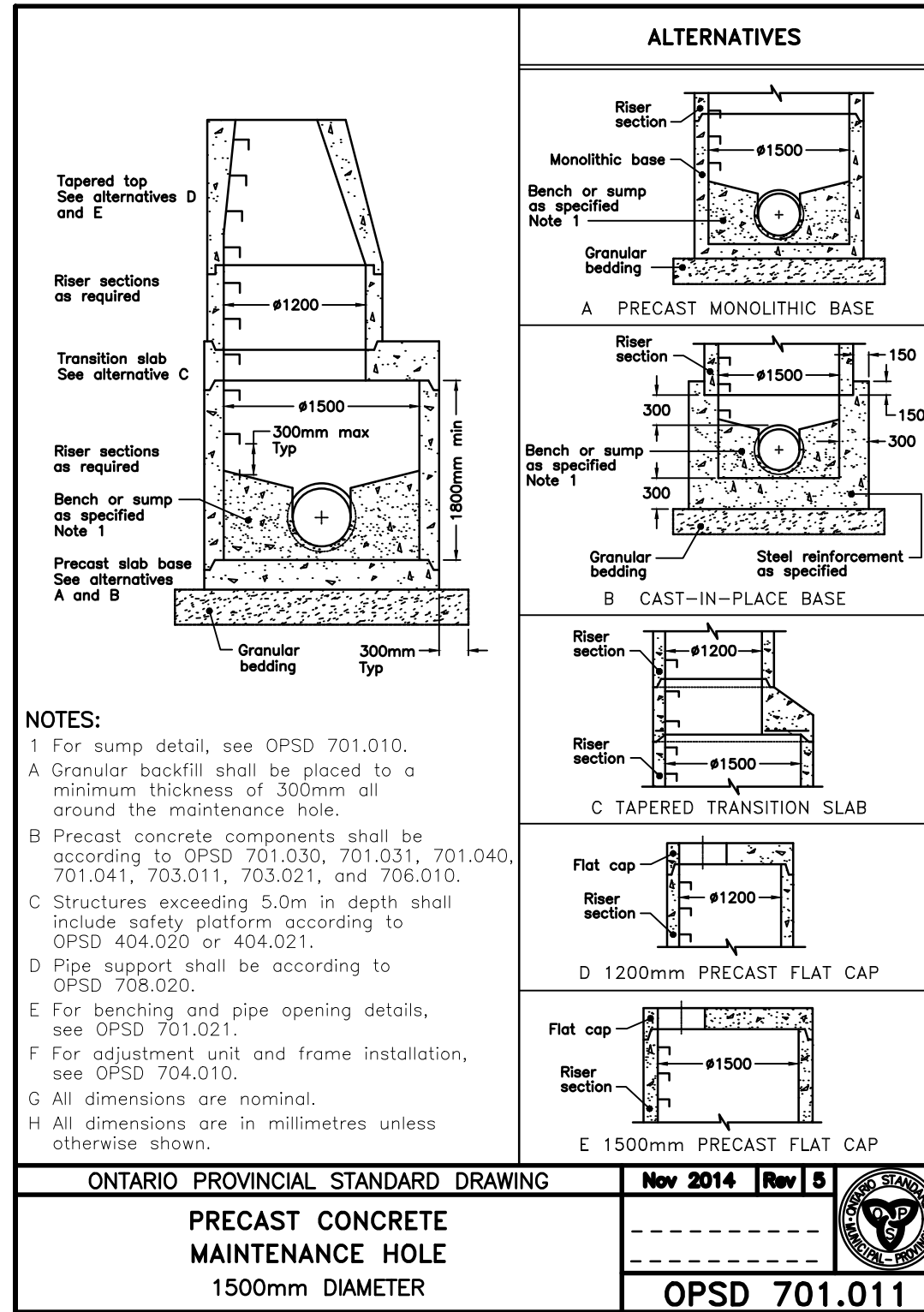
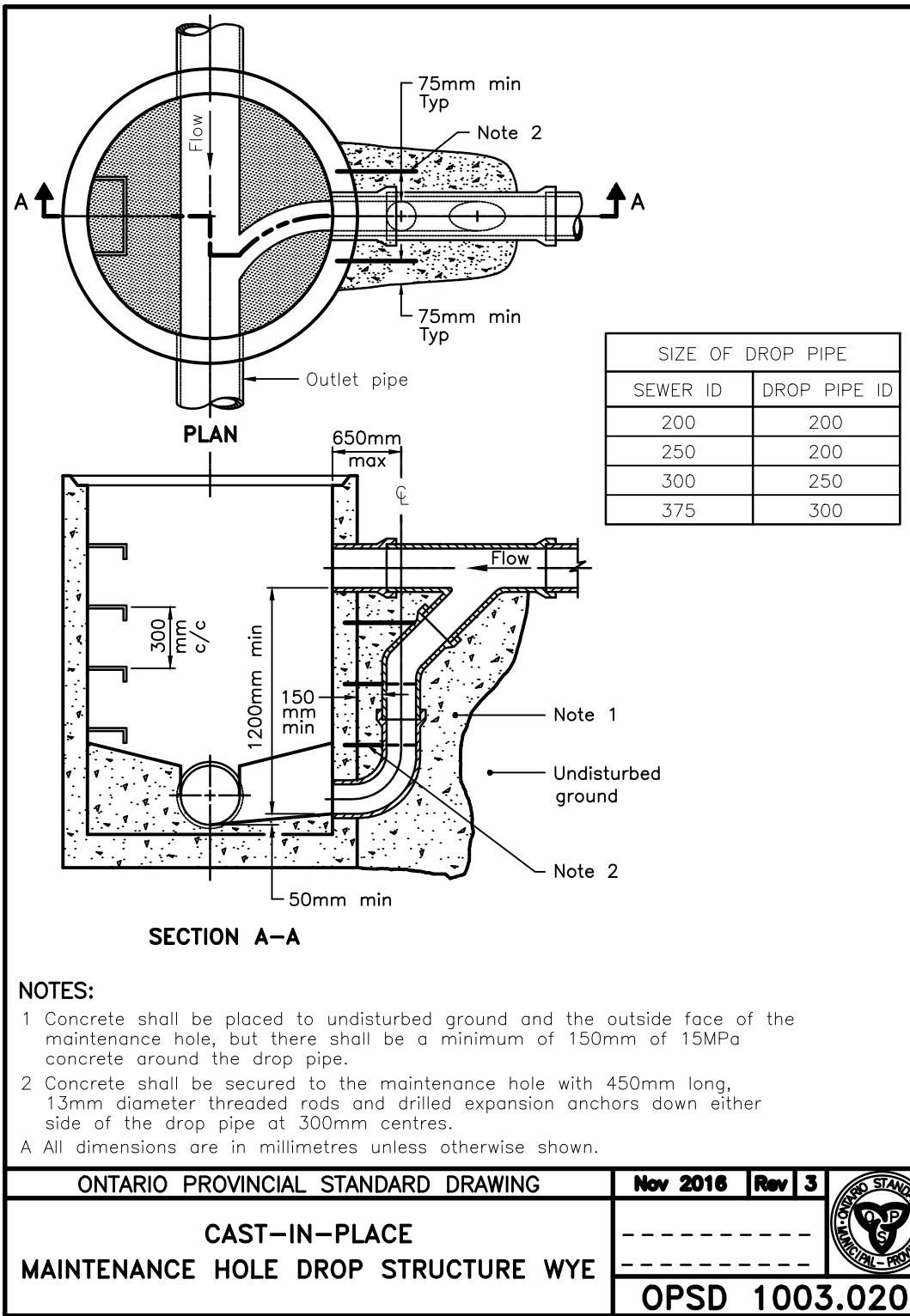
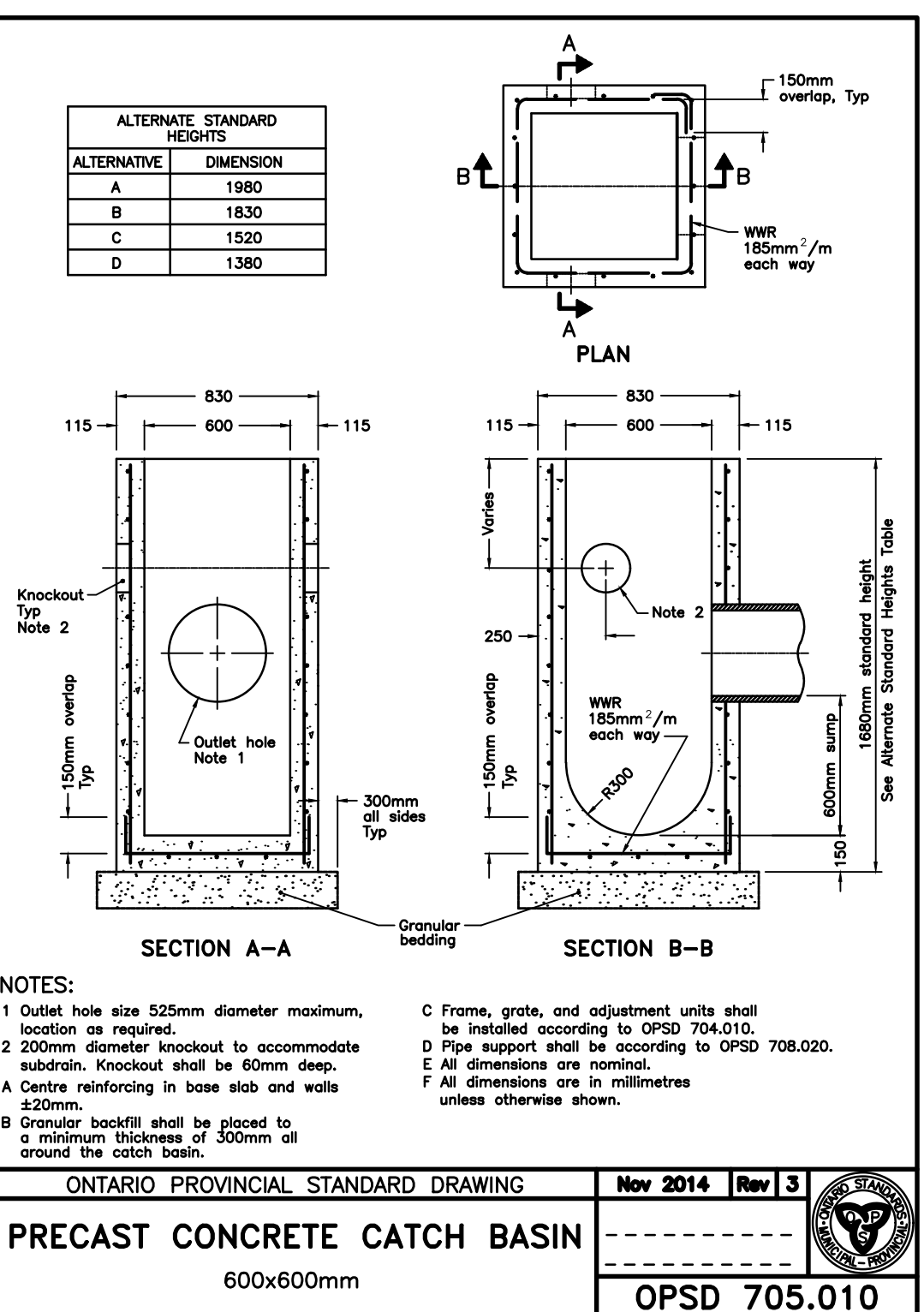
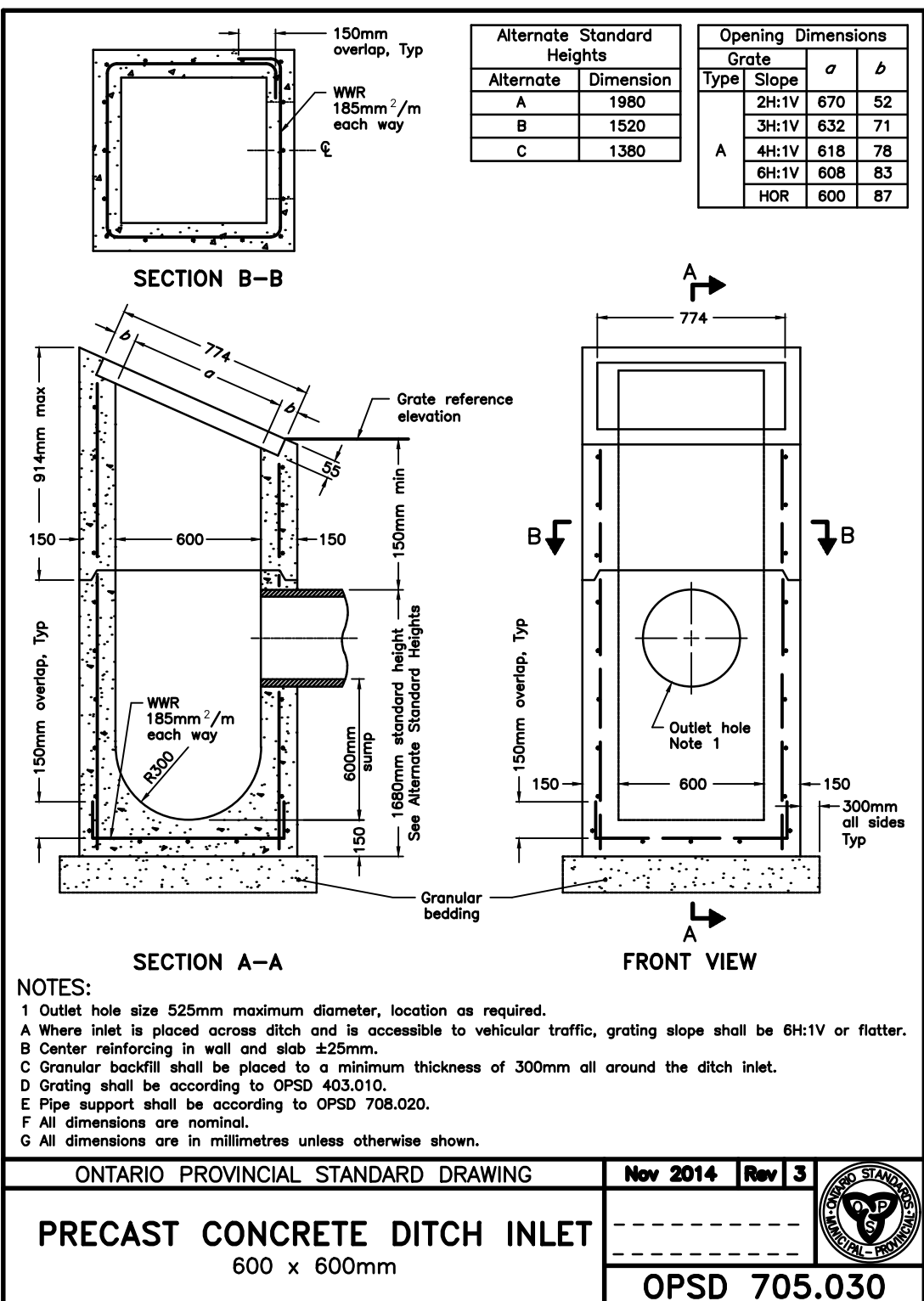
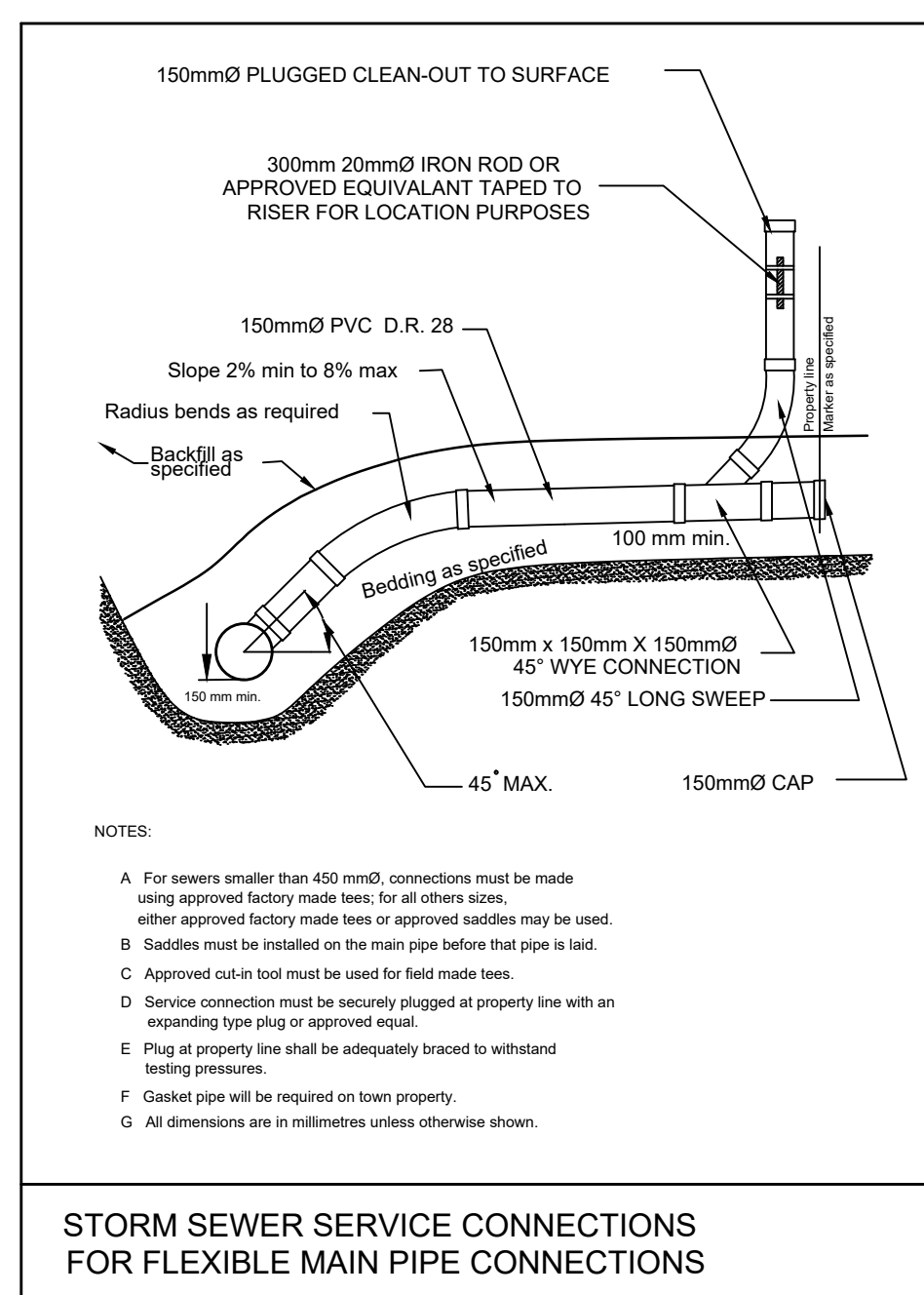
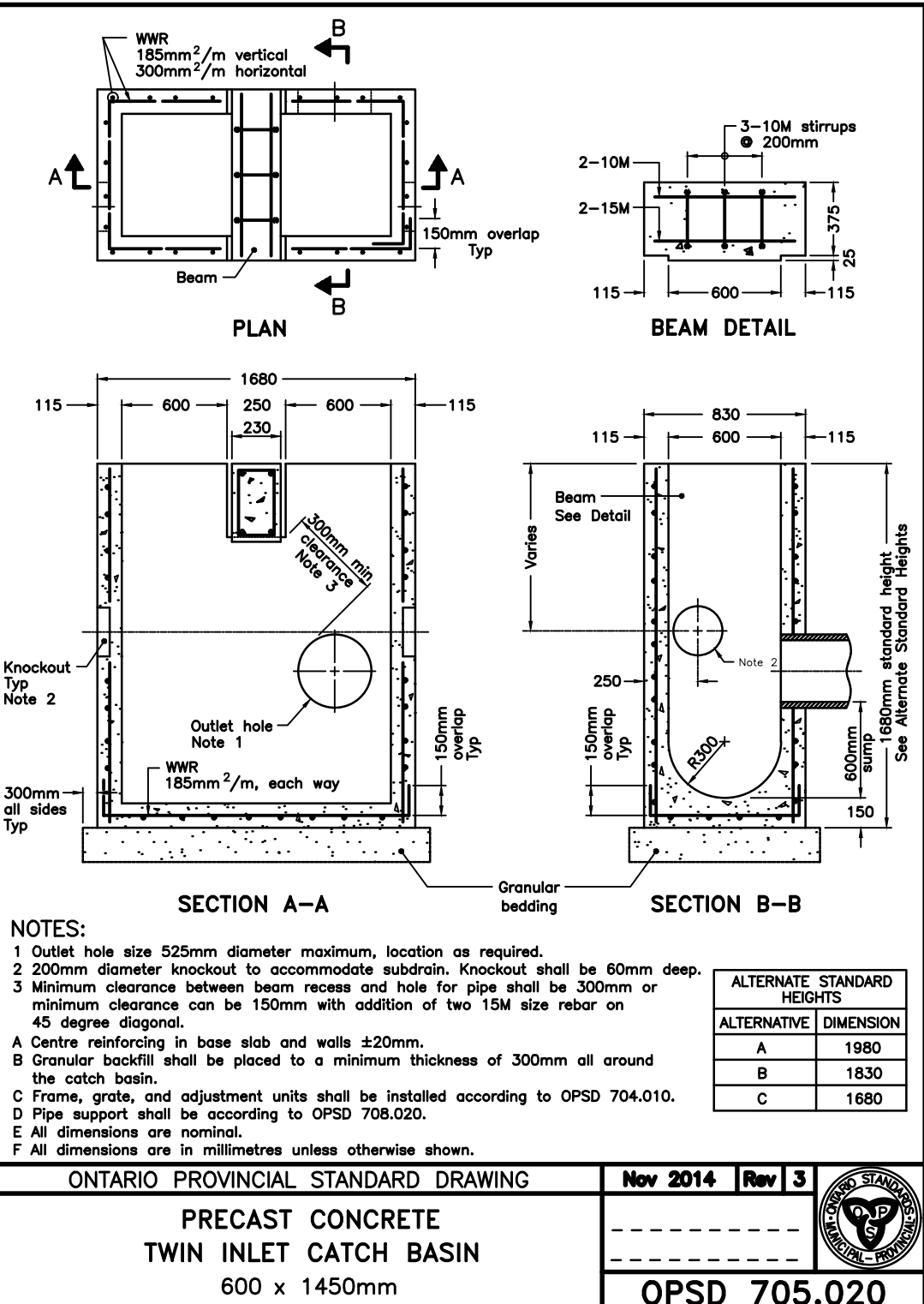
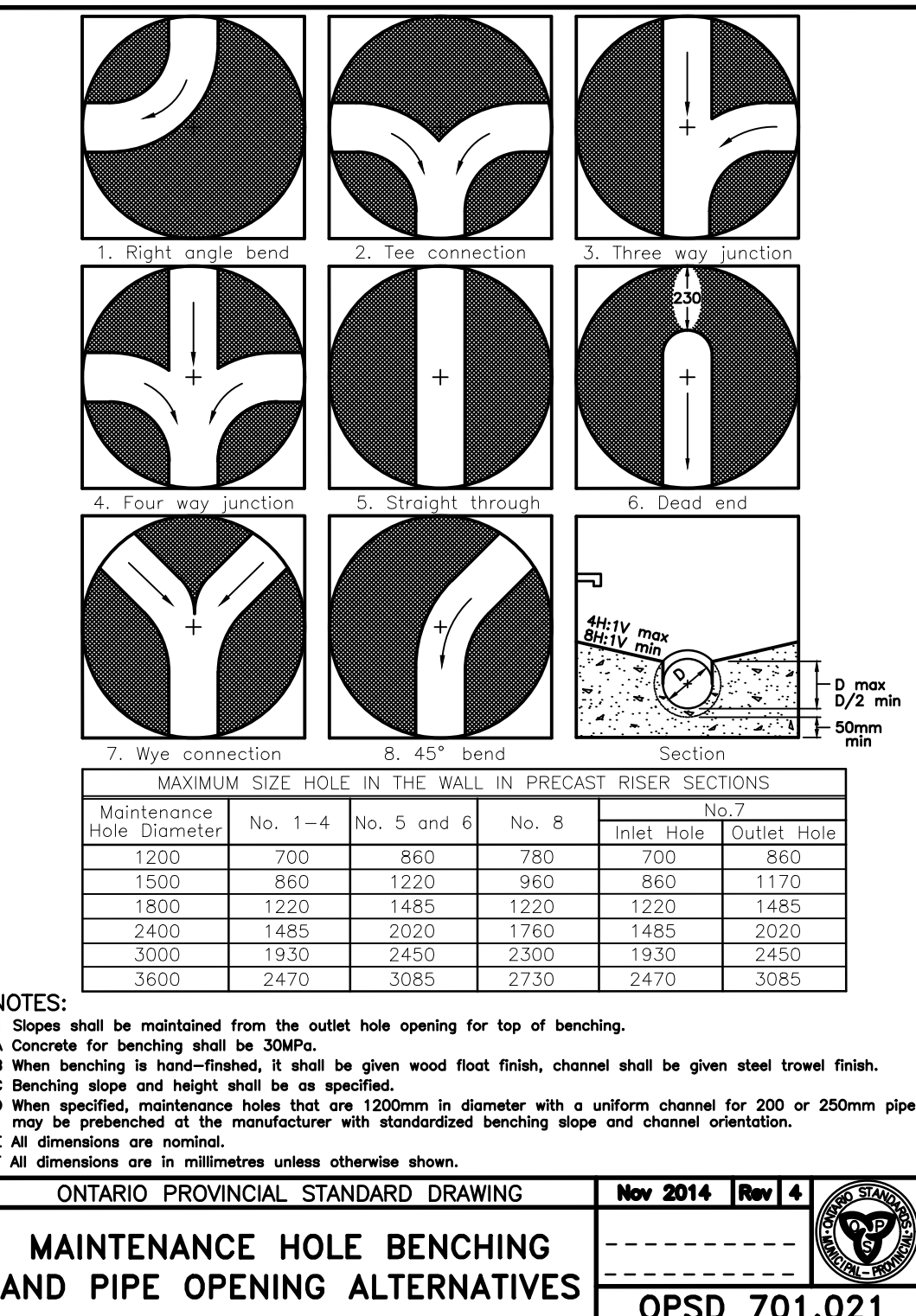
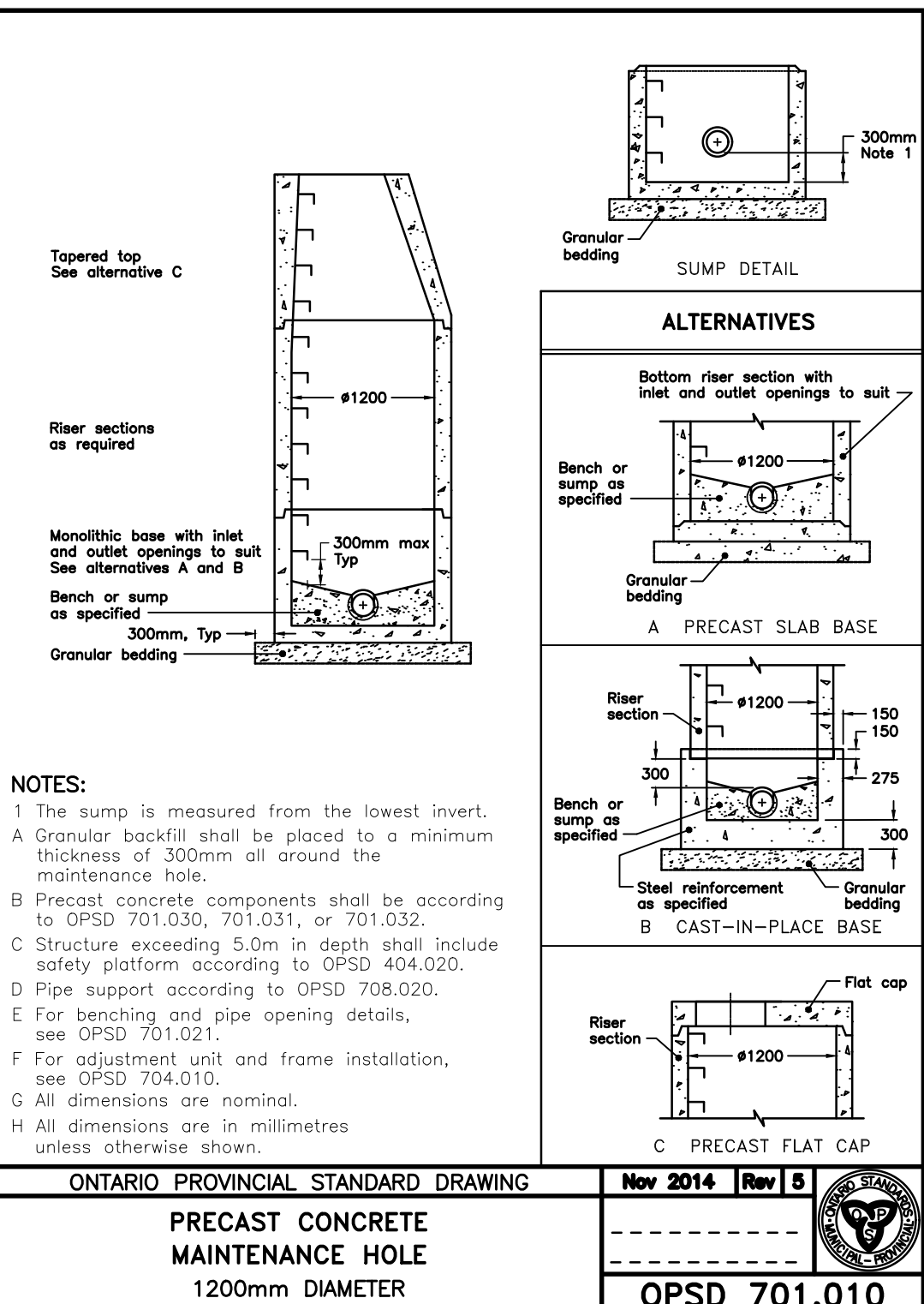
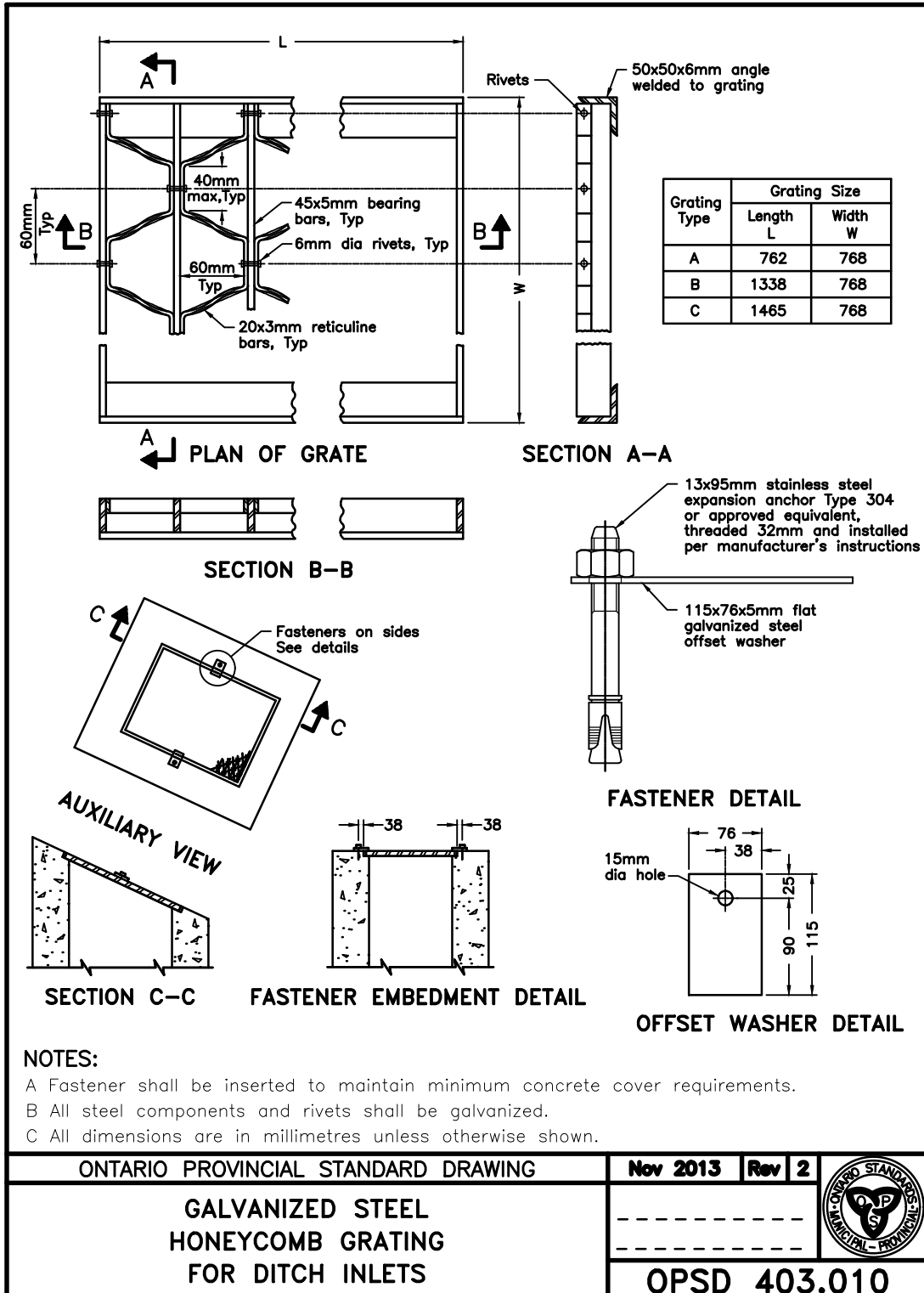
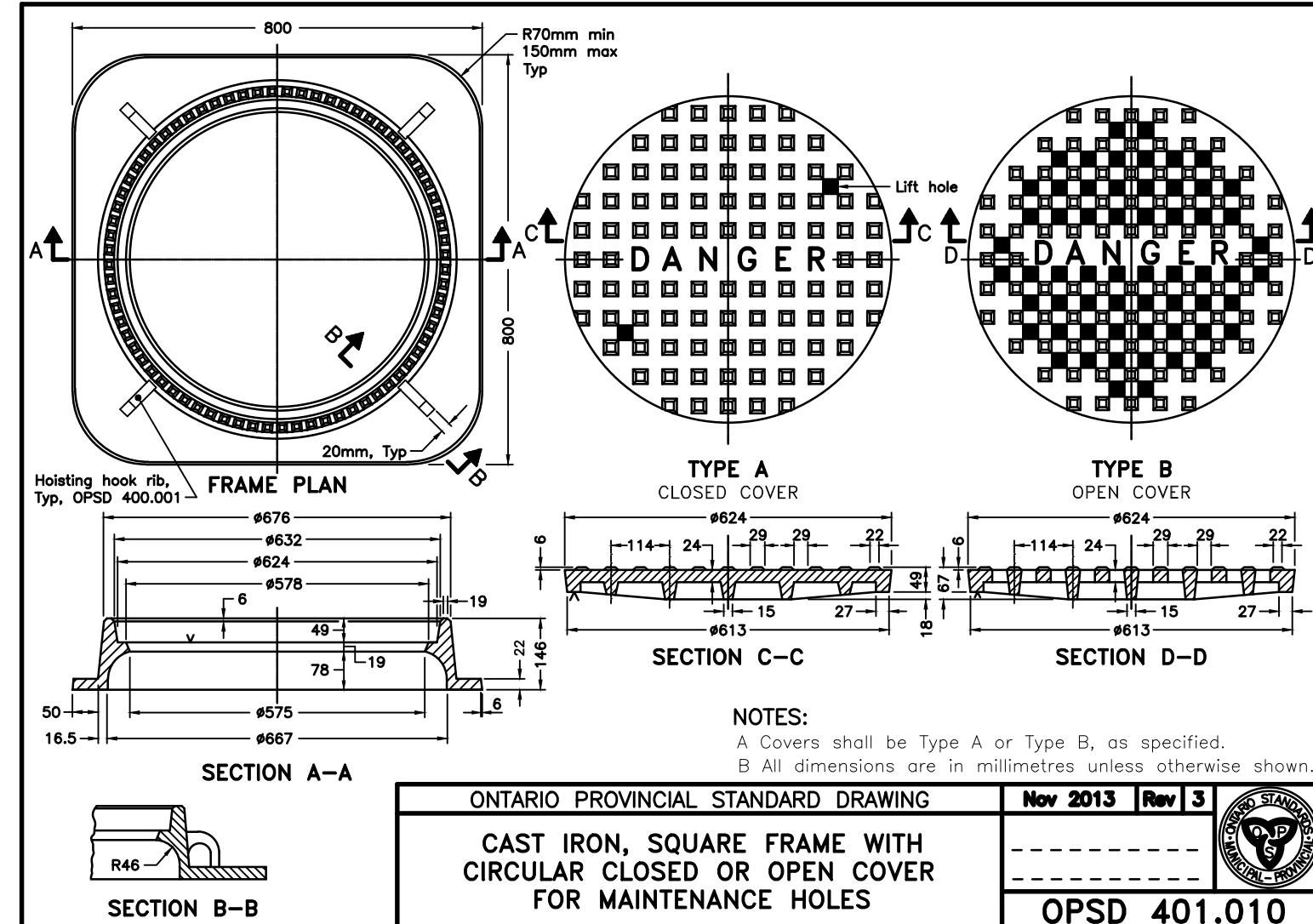
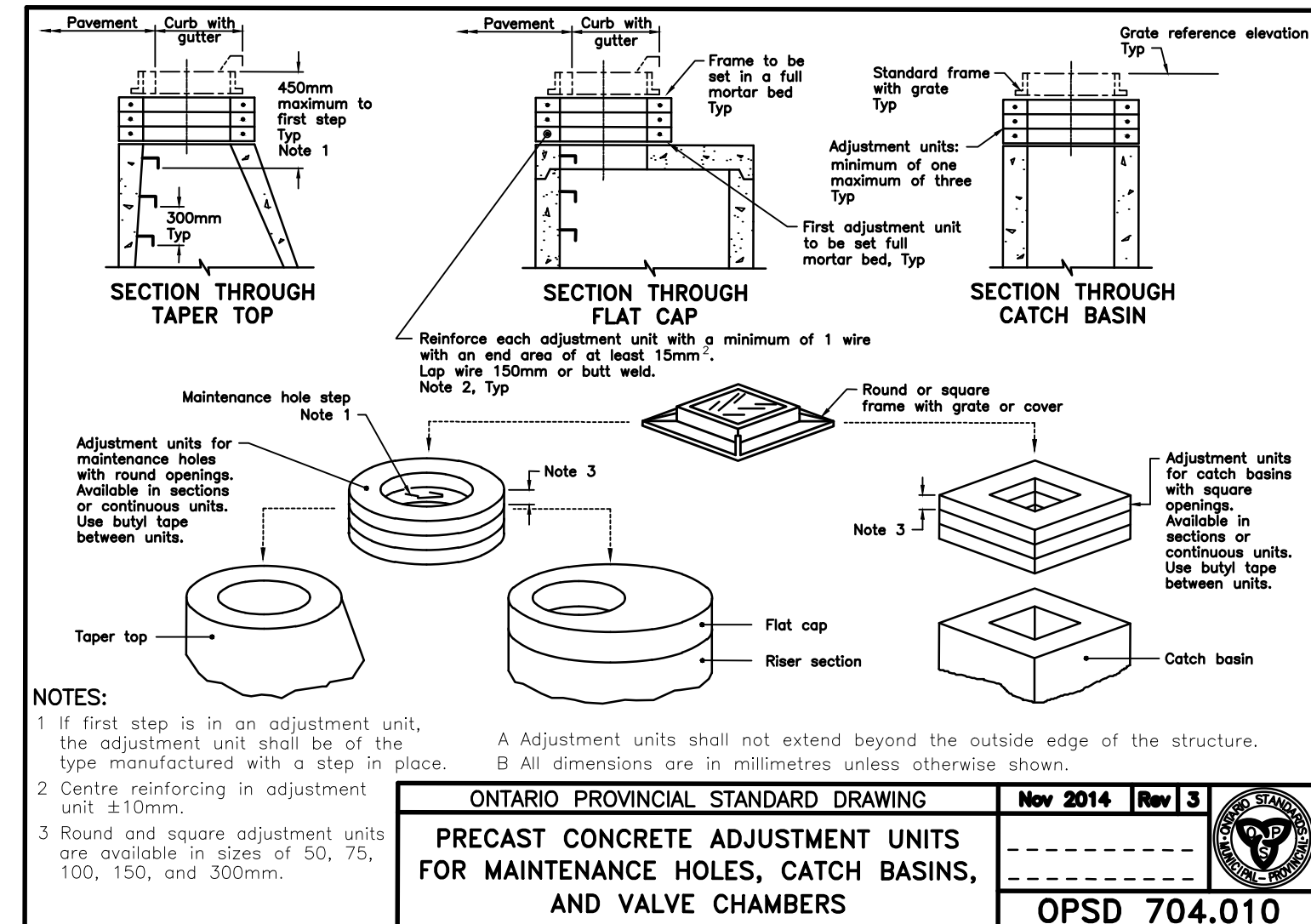
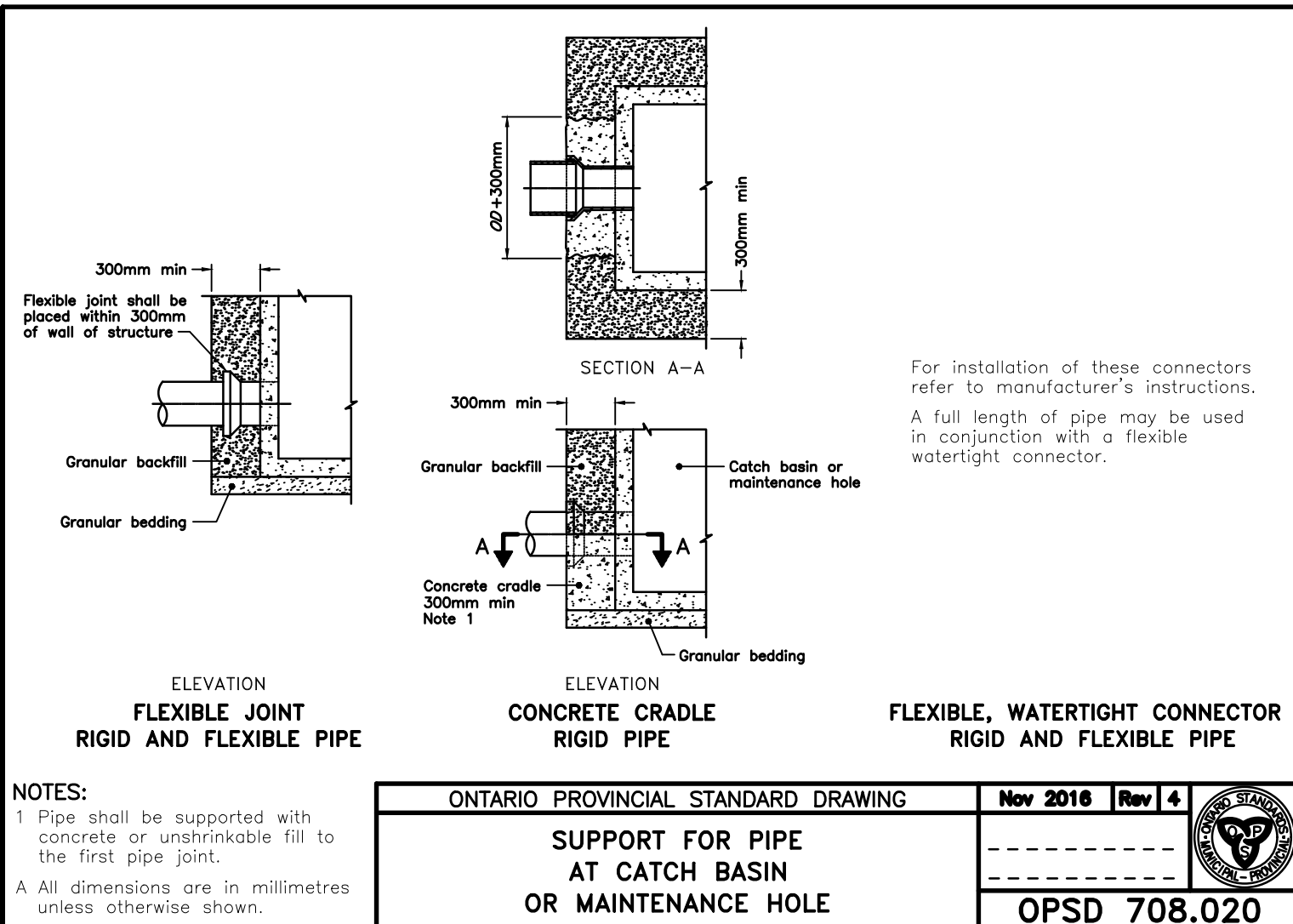
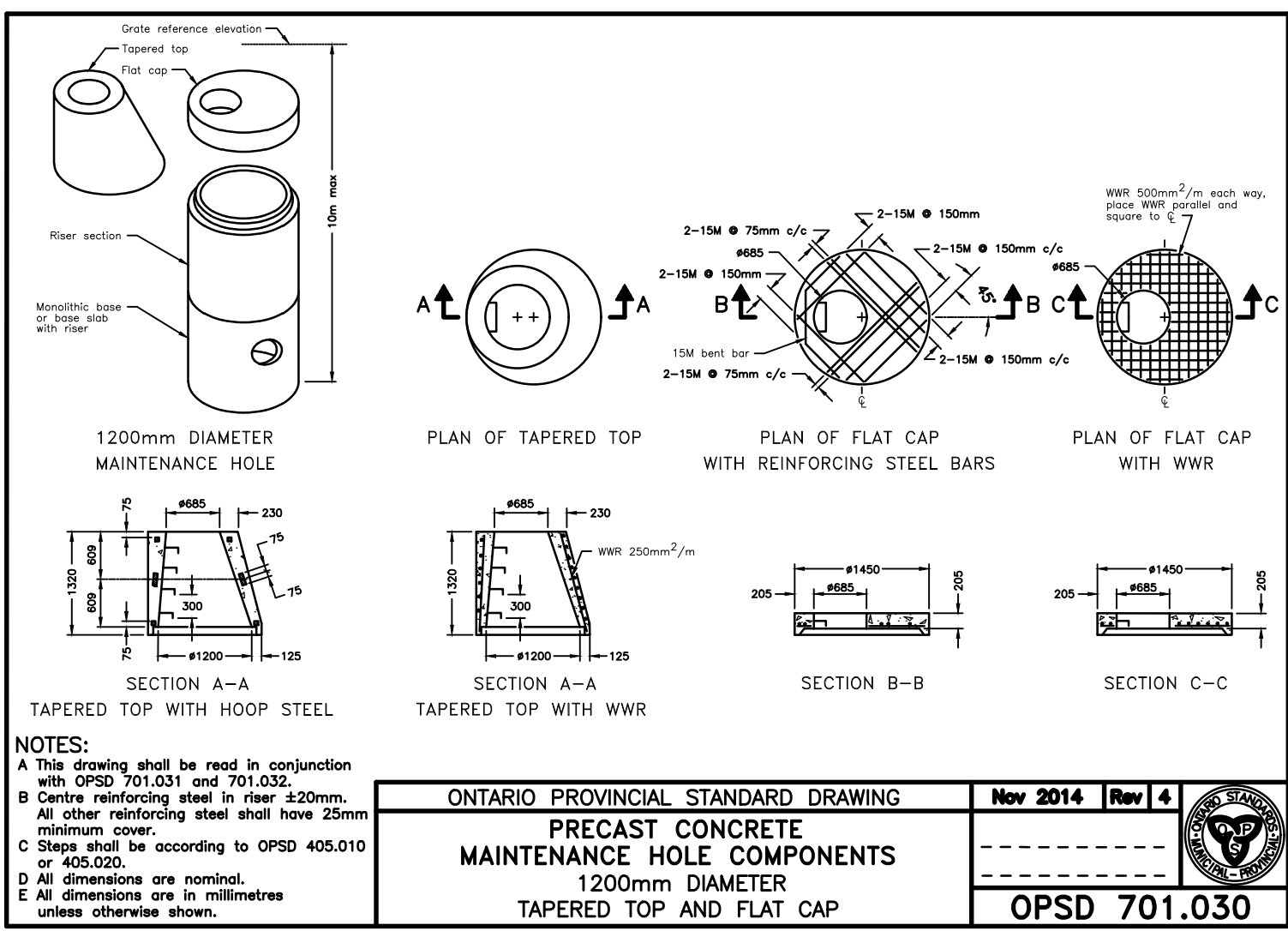


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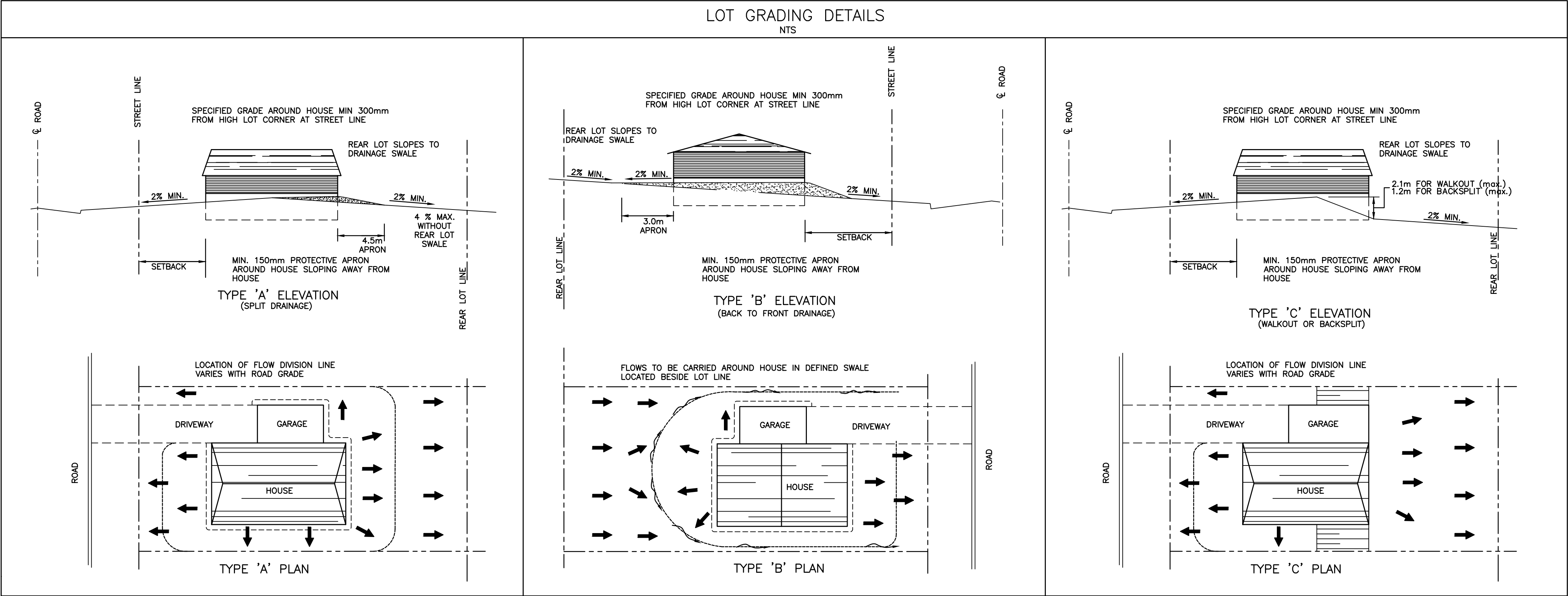
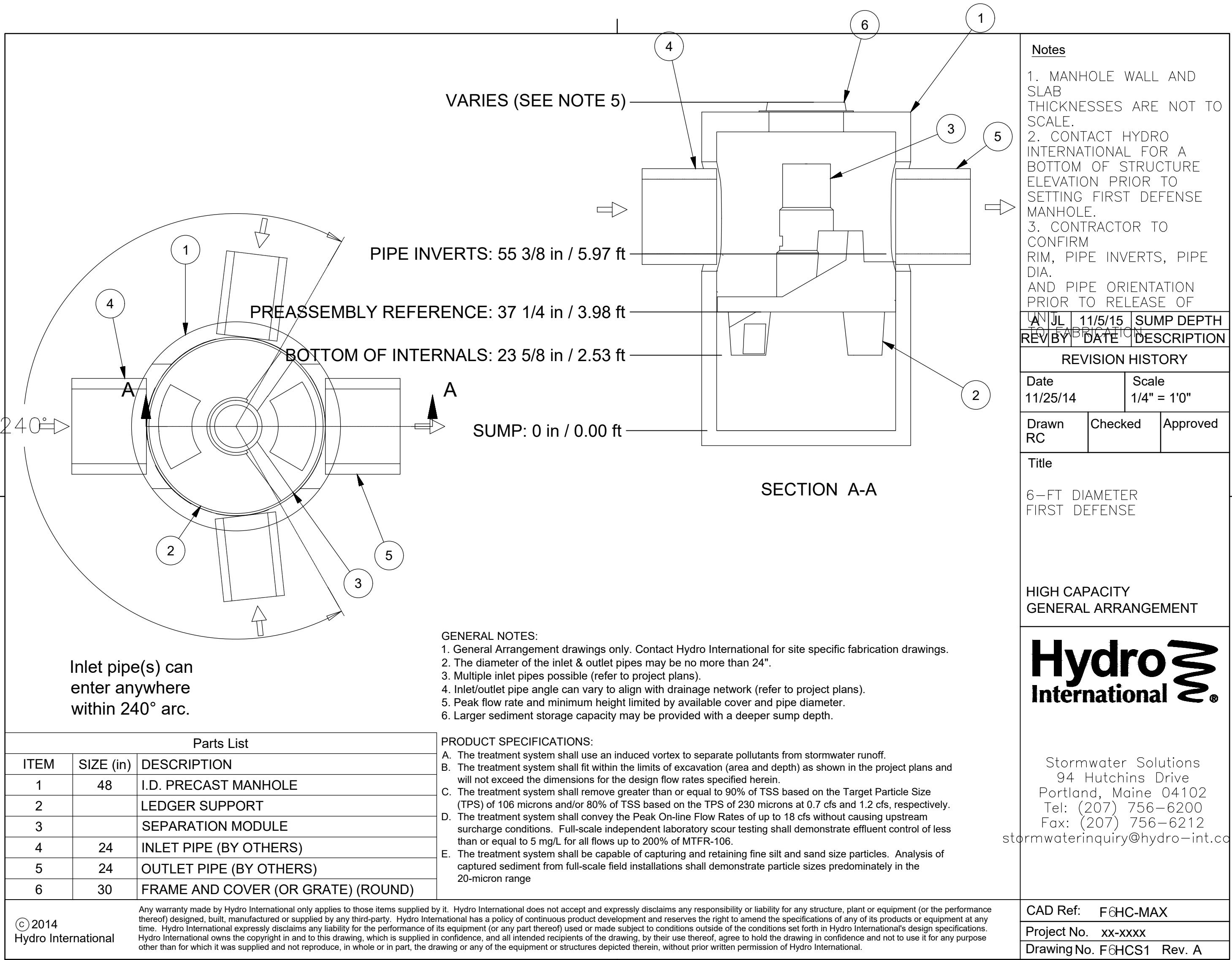
- 1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.
- 2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.
- 3 For slipforming procedure a 5% batter is acceptable.
- 4 Treatment at entrances shall be according to OPSD 351.010.
- 5 Outlet treatment shall be according to the OPSD 610 Series.
- 6 The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
- 7 All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2	OPSD 600.100
CONCRETE MOUNTABLE CURB WITH NARROW GUTTER			

4	MAY 10/19	AS RECORDED	TLB	TLB	
3	MAY 30/18	ISSUED FOR CONSTRUCTION	TLB	TLB	
2	APR 23/18	REVISED MOECC SUBMISSION	TLB	TLB	
1	JAN 17/18	MOECC SUBMISSION	TLB	TLB	
0	DEC 15/17	FIRST SUBMISSION	TLB	TLB	
No.	DATE	DESCRIPTION	BY	APPD	
REVISION / ISSUE					
Seal not valid unless signed and dated					

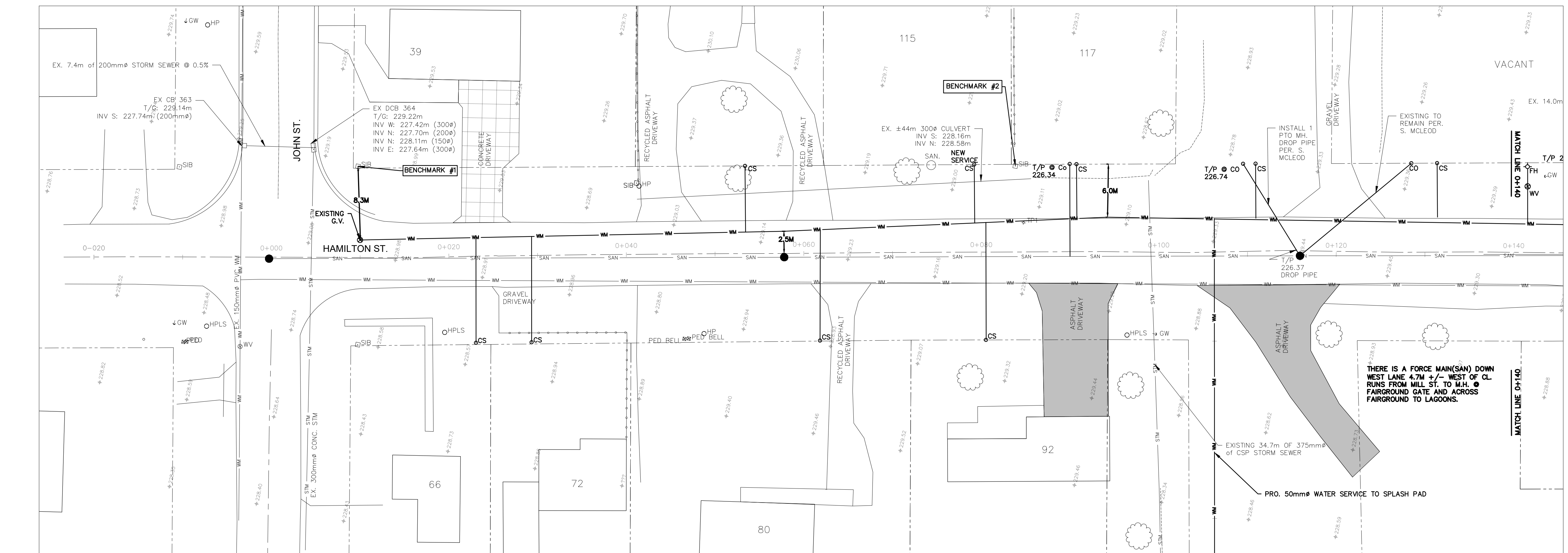
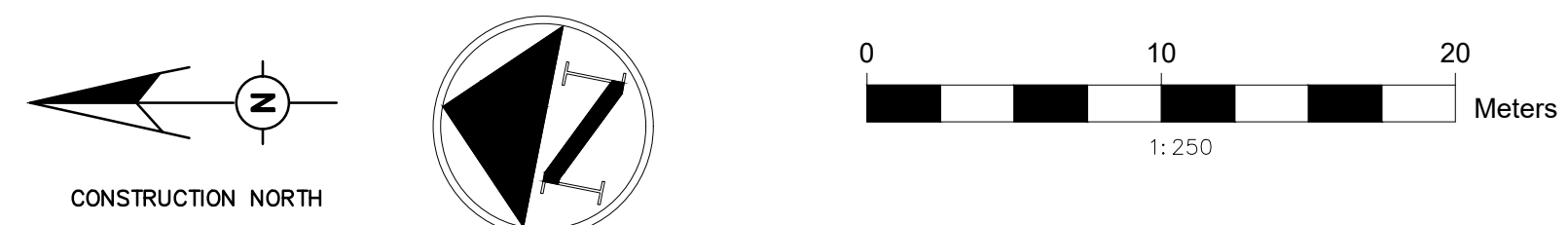


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3	MAY 30/18	ISSUED FOR CONSTRUCTION	TLB	TLB
2	APR 23/18	REVISED MOECC SUBMISSION	TLB	TLB
1	JAN 17/18	MOECC SUBMISSION	TLB	TLB
0	DEC 15/17	FIRST SUBMISSION	TLB	TLB
No.	DATE	DESCRIPTION	BY	APPD
REVISION / ISSUE				
Seal not valid unless signed and dated				



4	MAY 10/19	AS RECORDED		TLB	TLB
3	MAY 30/18	ISSUED FOR CONSTRUCTION		TLB	TLB
2	APR 23/18	REVISED MOECC SUBMISSION		TLB	TLB
1	JAN 17/18	MOECC SUBMISSION		TLB	TLB
0	DEC 15/17	FIRST SUBMISSION		TLB	TLB
No.	DATE	DESCRIPTION		BY	APPD

	COBIDE ENGINEERING INC
464A - 10th STREET, Hanover, Ontario N4N 1R1 Telephone: (519) 506-5959 www.cobideeng.com	
TOWER HILL CRESCENT SUBDIVISION Municipality of Arran-Elderslie MISCELLANEOUS DETAILS 2	
Client: 2582030 Ontario Inc. c/o Bill Clancy	
Design: TLB	Scale: AS SHOWN
Drawn: TLB	Approved:
Checked: SJC	Design Engineer
Date: MAY 2017	
DRAWING No. 01812-DET3	

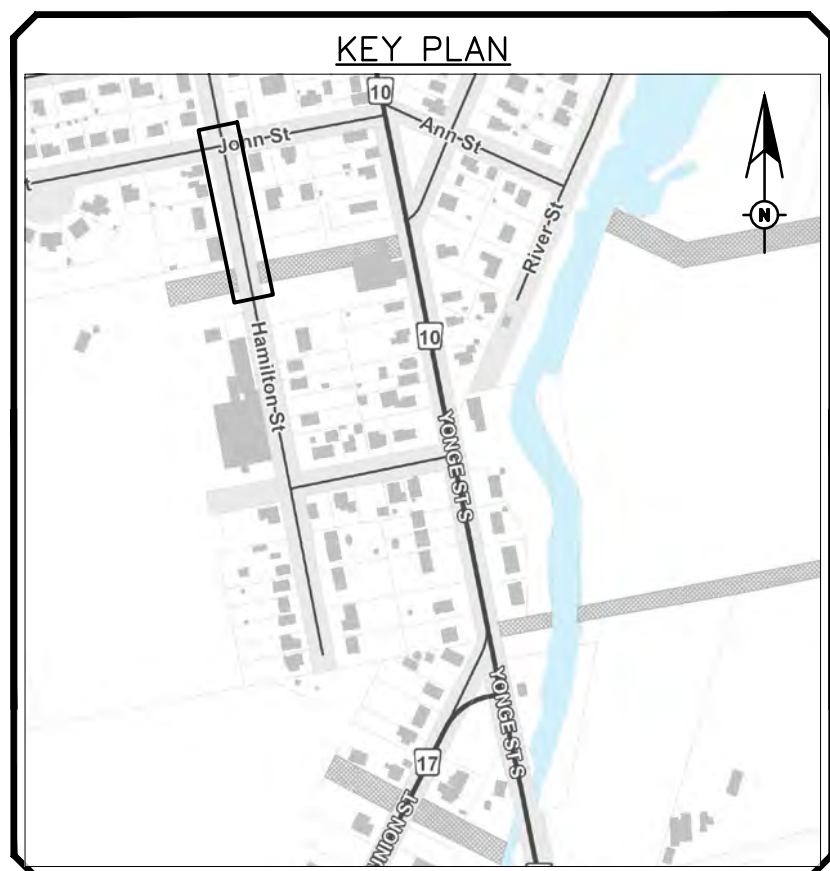
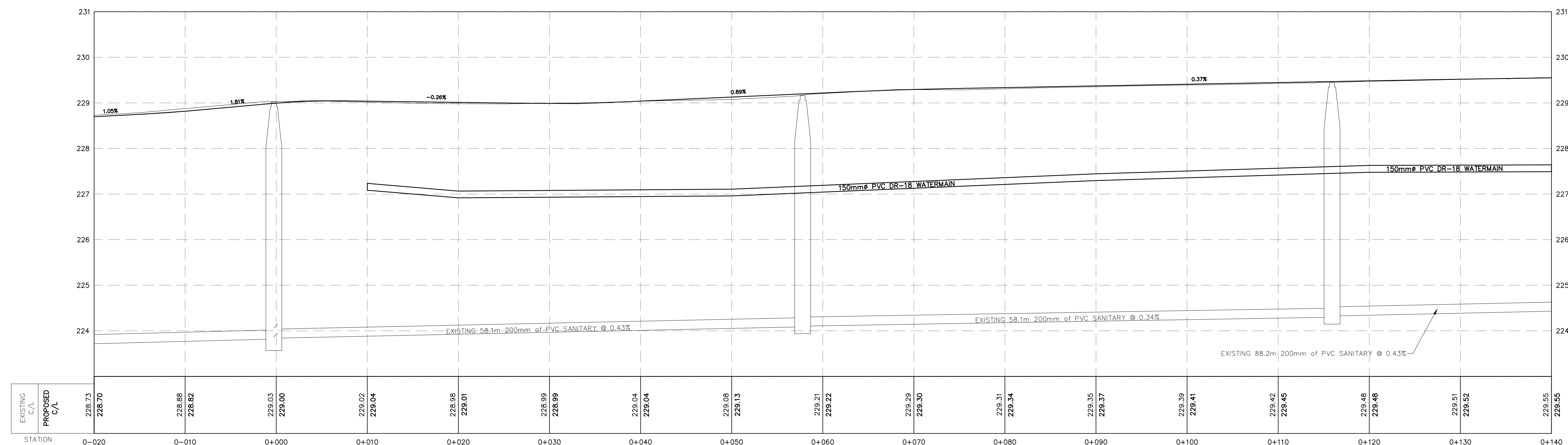


ROAD RESTORATION
• 50mm HL3 • 150mm GRANULAR A • 300mm GRANULAR B

NOTES:

1. EXISTING WATERMAIN TO BE ABANDONED.

SEE DRAWING 22-050-09



LEGEND

EXISTING DETAILS

_____	EXISTING ROAD
_____ WM	EXISTING WATERMAIN
_____ STM	EXISTING STORM SEWER
_____ SAN	EXISTING SANITARY SEWER
-----	APPROXIMATE PROPERTY LINE OR EASEMENT
-----	EXISTING CENTER LINE
○ HP	EXISTING HYDROPOLE & GUY WIRE
□ CB	EXISTING CATCHBASIN
⊗ WV	EXISTING WATERVALVE
⊗	EXISTING TREE
◇ FH	EXISTING FIRE HYDRANT
□ SIB	STANDARD IRON BAR
■	ASPHALT DRIVEWAY

PROPOSED CONSTRUCTION

_____	PROPOSED ROAD
_____ WM _____	PROPOSED WATERMAIN
_____ STM _____	PROPOSED STORM SEWER
_____	PROPOSED SANITARY SEWER
$\begin{array}{r} 330.55 \\ 330.70 \\ \hline \end{array}$	EX. CENTRELINE ELEVATION PRO. CENTRELINE ELEVATION
1+170	STATION NUMBER

BENCHMARKS:

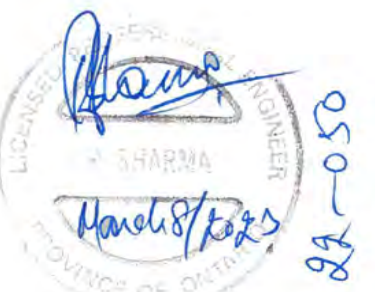
BM1: 229.098m - SIB SE CORNER OF JOHN ST. AND HAMILTON
ST. NW CORNER OF LOT #39 ON JOHN ST.

BM2: 229.207m - SIB NE CORNER OF LOT #117 ON HAMILTON ST.

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

20/04/23	CONSTRUCTION ISSUE
08/03/23	TENDER ISSUE
DD/MM/YY	DESCRIPTION
	REVISION / ISSUE

Seal not valid unless signed and dated



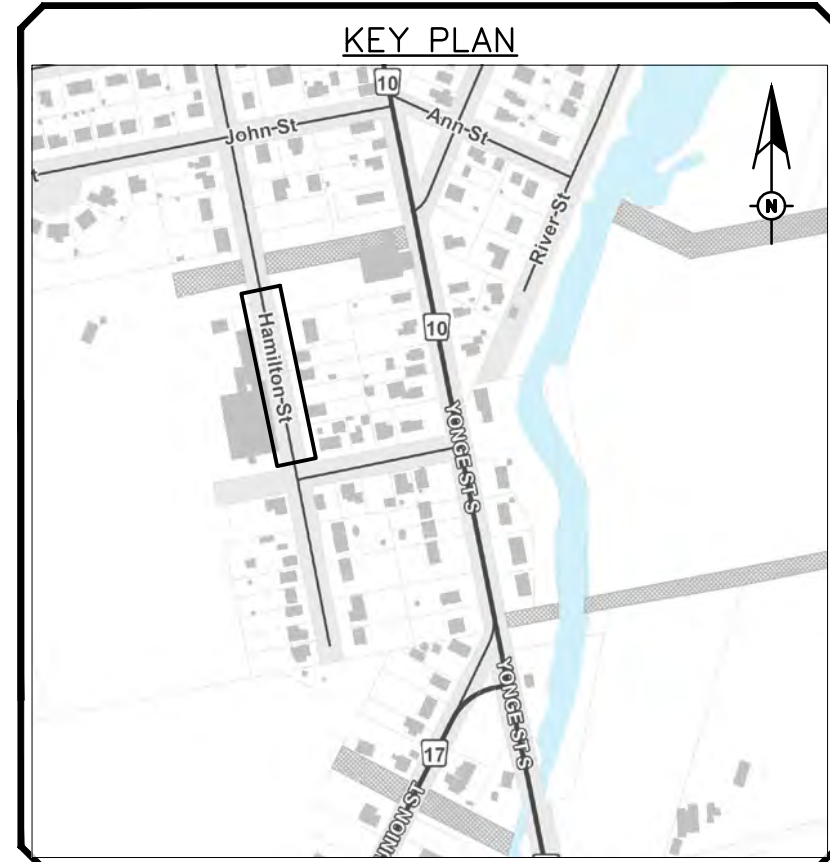
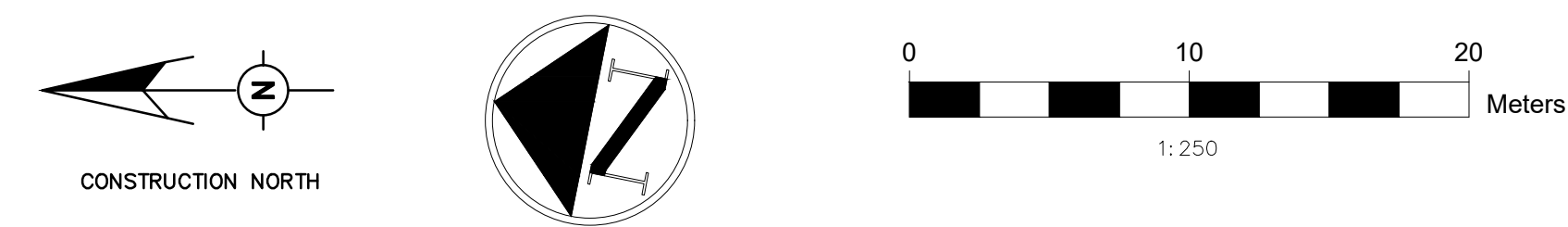
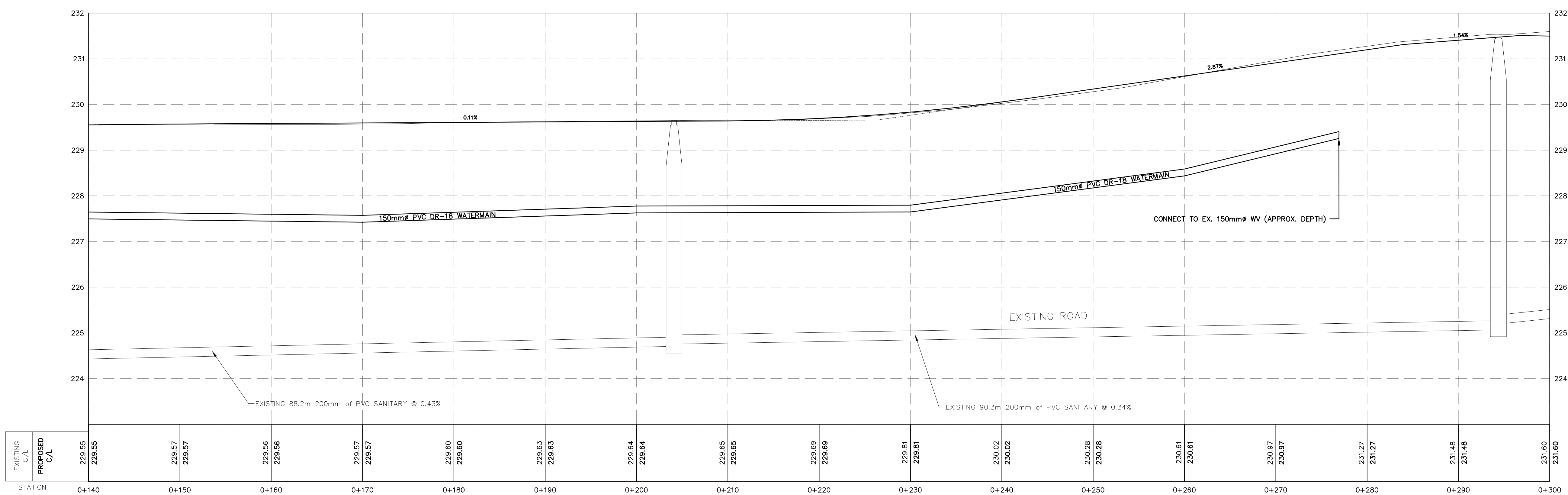
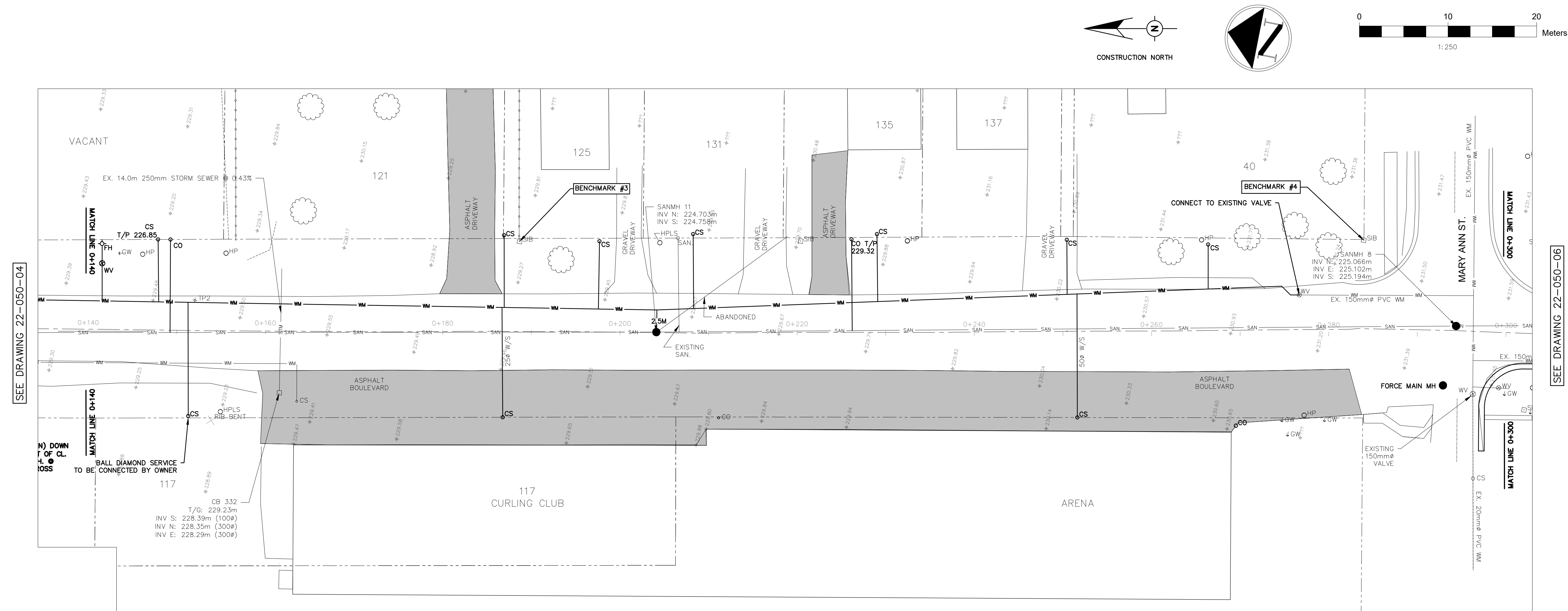
945-3rd Ave. East, Unit #230, Owen Sound, ON, N4K 2K8
Telephone: (519) 372-4828

Title: HAMILTON ST.
PLAN & PROFILE
TARA, ARRAN-ELDERSLIE
0-020 - 0+140

Client: MUNICIPALITY OF ARRAN-ELDERSLIE

Design:	RS	Scale:	HORZ. 1:250 / VERT. 1:50
Drawn:	TDL	Approved:	Design Engineer
Checked:	RS		
Date:	JAN 2023		

Drawing No. 22-050-04



LEGEND EXISTING DETAILS	
	EXISTING ROAD
 WM	EXISTING WATERMAIN
 STM	EXISTING STORM SEWER
 SAN	EXISTING SANITARY SEWER
	APPROXIMATE PROPERTY LINE OR EASEMENT
	EXISTING CENTER LINE
 HP	EXISTING HYDROPOLE & GUY WIRE
 CB	EXISTING CATCHBASIN
 WV	EXISTING WATERVALVE
	EXISTING TREE
 FH	EXISTING FIRE HYDRANT
 SIB	STANDARD IRON BAR
	ASPHALT DRIVEWAY
PROPOSED CONSTRUCTION	
	PROPOSED ROAD
 WM	PROPOSED WATERMAIN
 STM	PROPOSED STORM SEWER
	PROPOSED SANITARY SEWER
	
330.55 330.70	EX. CENTRELINE ELEVATION PRO. CENTRELINE ELEVATION
1+170	STATION NUMBER

BENCHMARKS:

BM3: 229.318m – SIB NW CORNER OF LOT #125 ON HAMILTON ST.

BM4: 231.352m – SIB NE CORNER OF MARY ANN ST. AND HAMILTON ST. SW CORNER OF LOT #40 ON HAMILTON ST.

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS OR ANYWHERE. THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

20/04/23	CONSTRUCTION ISSUE
08/03/23	TENDER ISSUE
DD/MM/YY	DESCRIPTION
	REVISION / ISSUE

Seal not valid unless signed and dated



945-3rd Ave. East, Unit #230, Owen Sound, ON, N4K 2K8
Telephone: (519) 372-4828

Title: HAMILTON ST.
PLAN & PROFILE
TARA, ARRAN-ELDERSLIE
0+140 - 0+300

Client: MUNICIPALITY OF ARRAN-ELDERSLIE

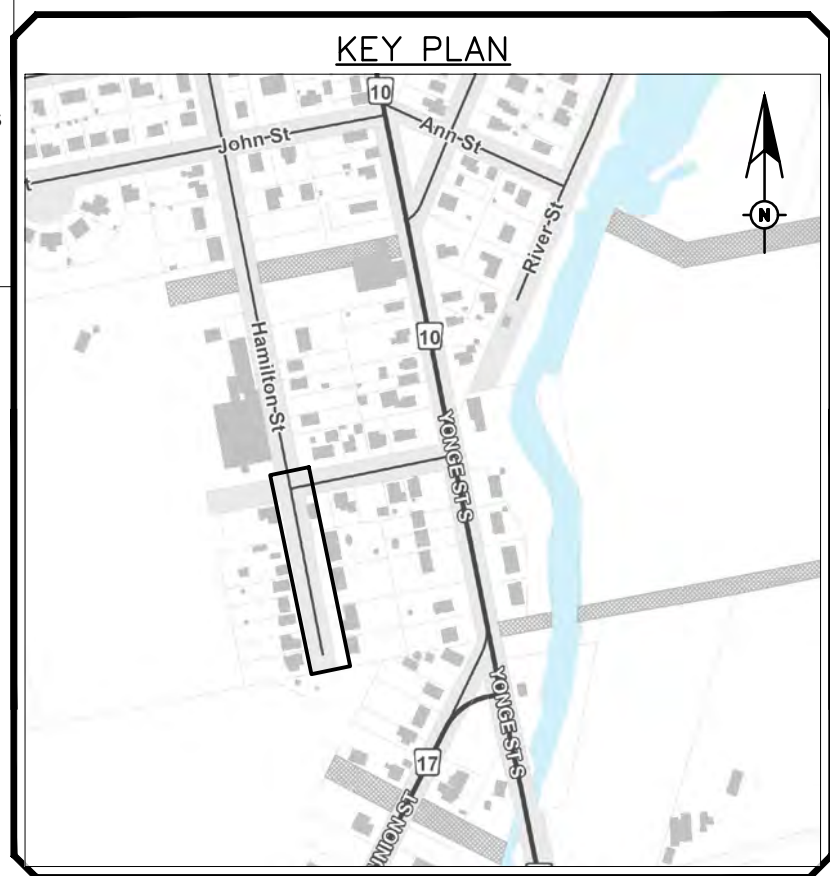
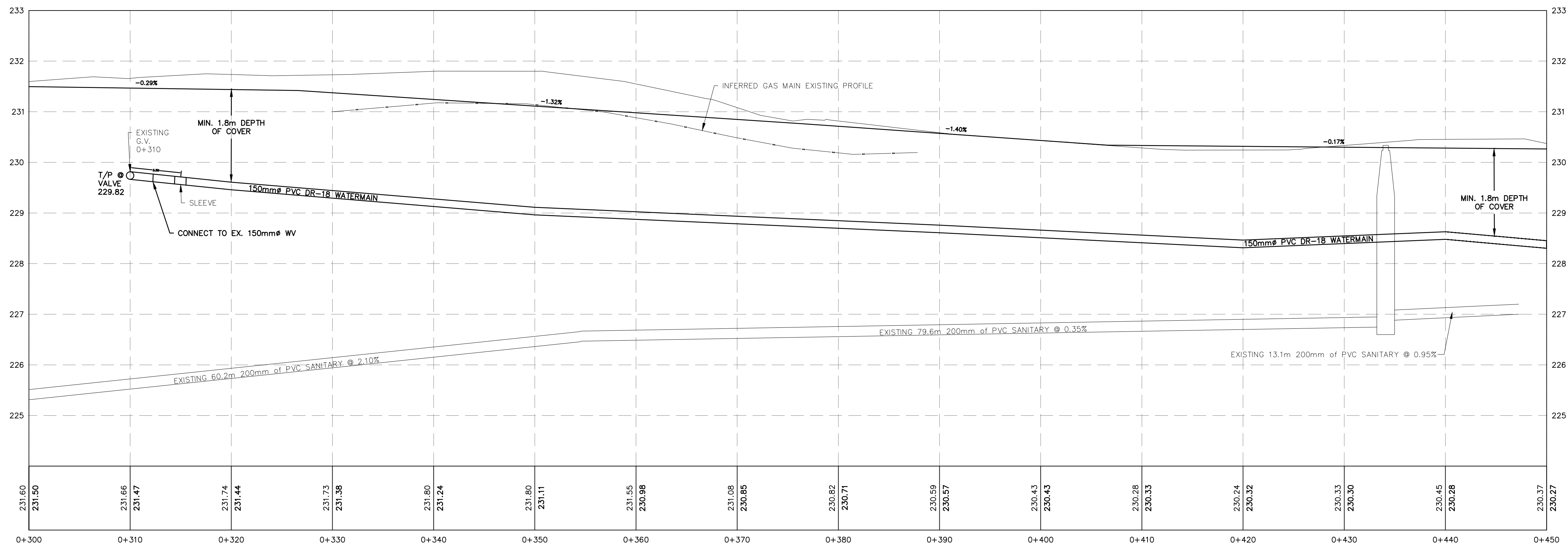
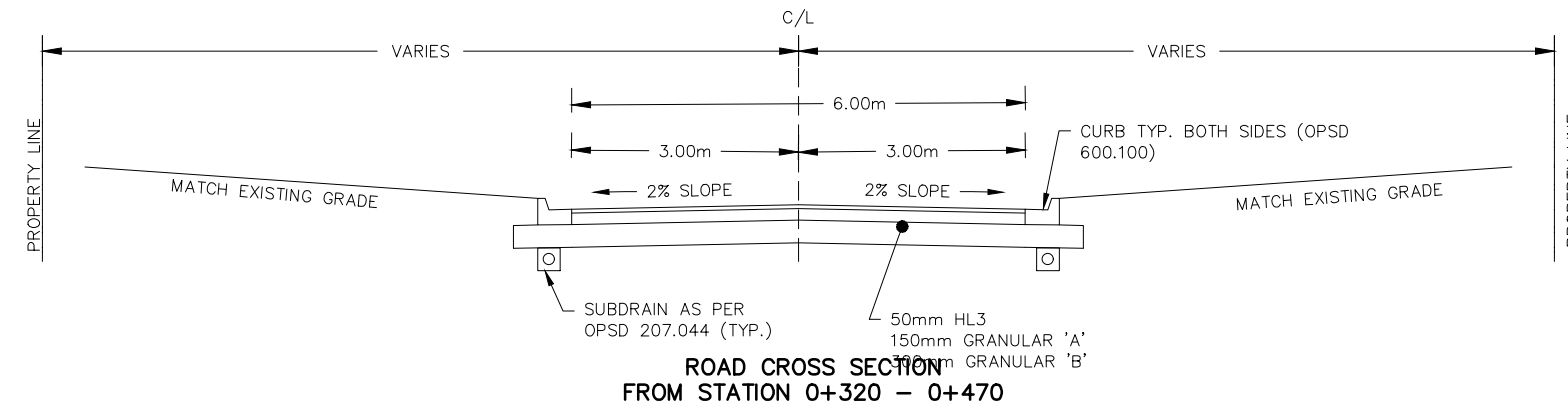
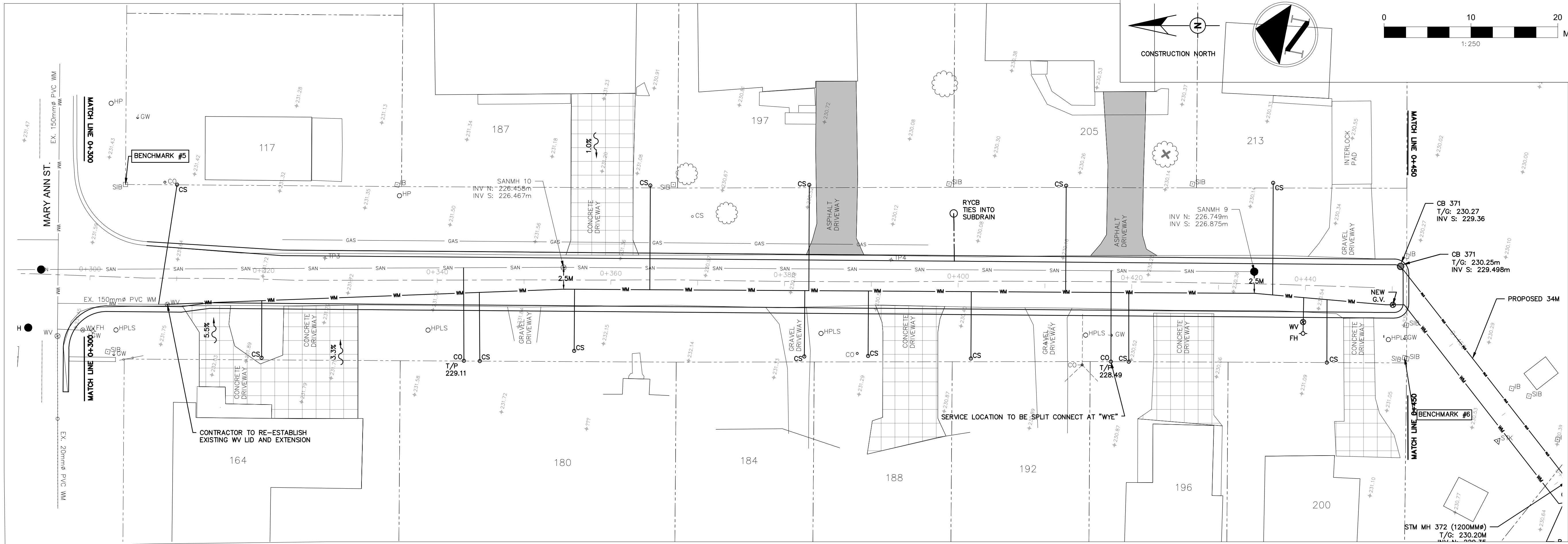
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Drawn:	TDL	Approved:  Design Engineer
Checked:	PS	

Checked:	RS	
Date:	DEC. 2022	

Drawing No. 22-050-05

SEE DRAWING 22-050-05



LEGEND	
EXISTING DETAILS	
WM	EXISTING ROAD
STM	EXISTING WATERMAIN
SAN	EXISTING STORM SEWER
---	EXISTING SANITARY SEWER
---	APPROXIMATE PROPERTY LINE OR EASEMENT
---	EXISTING CENTER LINE
○HP	EXISTING HYDROPOLE & GUY WIRE
□CB	EXISTING CATCHBASIN
⊗WV	EXISTING WATERVALVE
○	EXISTING TREE
◇FH	EXISTING FIRE HYDRANT
□SIB	STANDARD IRON BAR
■	ASPHALT DRIVEWAY
PROPOSED CONSTRUCTION	
WM	PROPOSED ROAD
WM	PROPOSED WATERMAIN
STM	PROPOSED STORM SEWER
---	PROPOSED SANITARY SEWER
330.55	EX. CENTRELINE ELEVATION
330.70	PRO. CENTRELINE ELEVATION
1+170	STATION NUMBER

BENCHMARKS:
BM5: 231.389m - SIB SE CORNER OF MARY ANN ST. AND HAMILTON ST. NW OF LOT #117 ON MARY ANN ST.
BM6: 230.450m - SIB SW CORNER OF LOT #200 ON HAMILTON ST.

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

14/07/23	HAMILTON ST. (SOUTH) ADJUSTED GRADES (R3)
20/04/23	CONSTRUCTION ISSUE
08/03/23	TENDER ISSUE
DD/MM/YY	DESCRIPTION
	REVISION / ISSUE

Seal not valid unless signed and dated

[Signature]
22-050

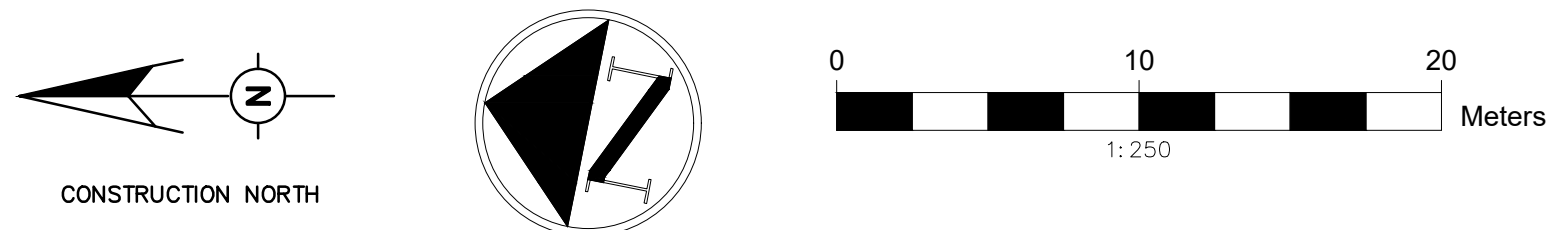
ENGINEERING CONSULTANTS LTD
945-3rd Ave. East, Unit #230, Owen Sound, ON, N4K 2K8
Telephone: (519) 372-4828

Title: **HAMILTON ST. PLAN & PROFILE**
TARA, ARRAN-ELDRSLIE
0+300 - 0+450

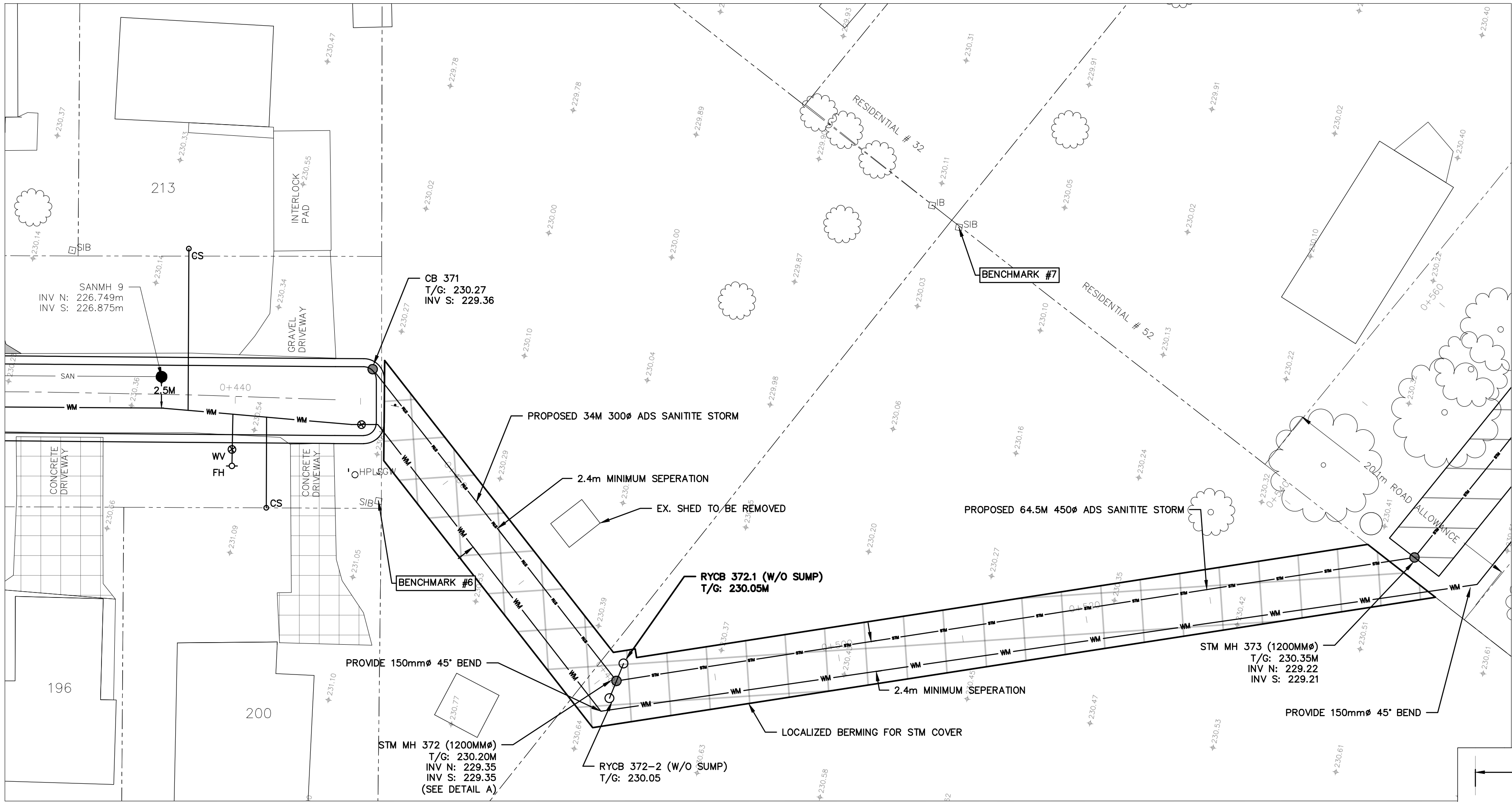
Client: **MUNICIPALITY OF ARRAN-ELDRSLIE**

Design: RS Scale: **HORIZ. 1:250 / VERT. 1:50**
Drawn: TDL Approved: *[Signature]* Design Engineer
Checked: RS
Date: DEC. 2022

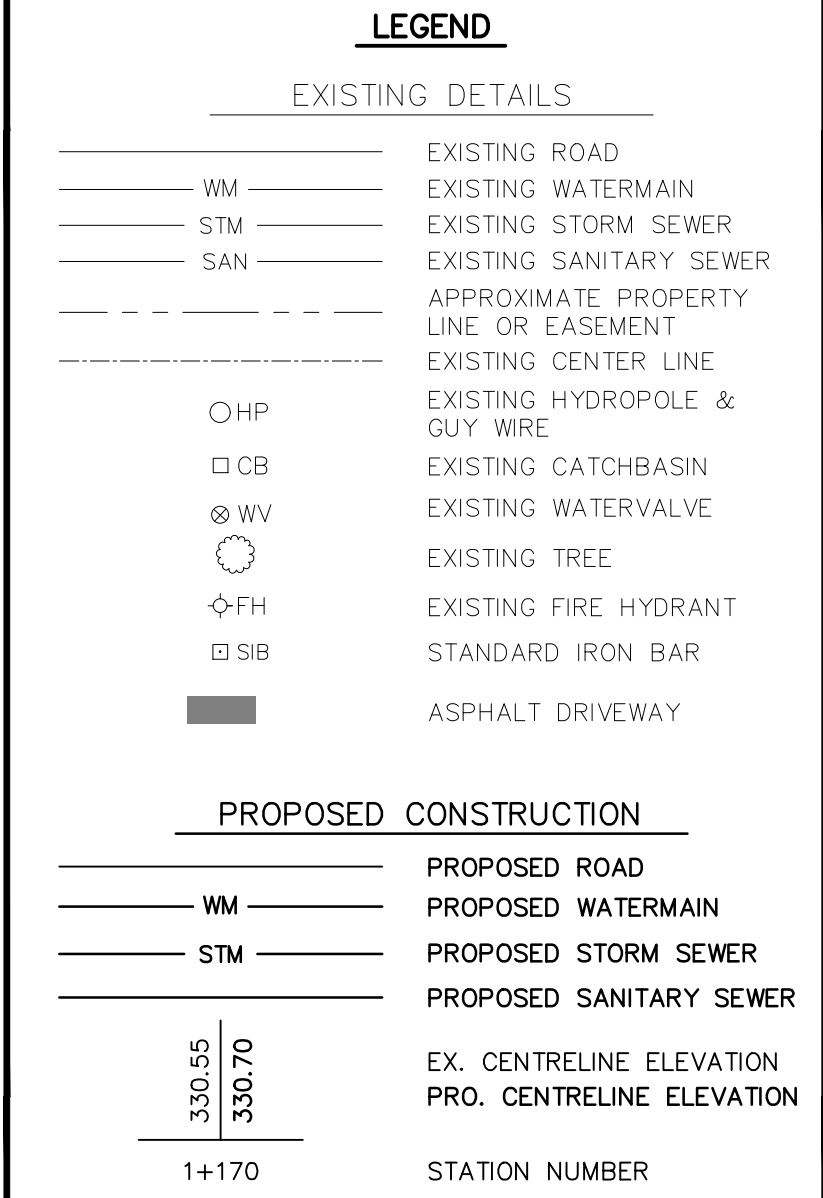
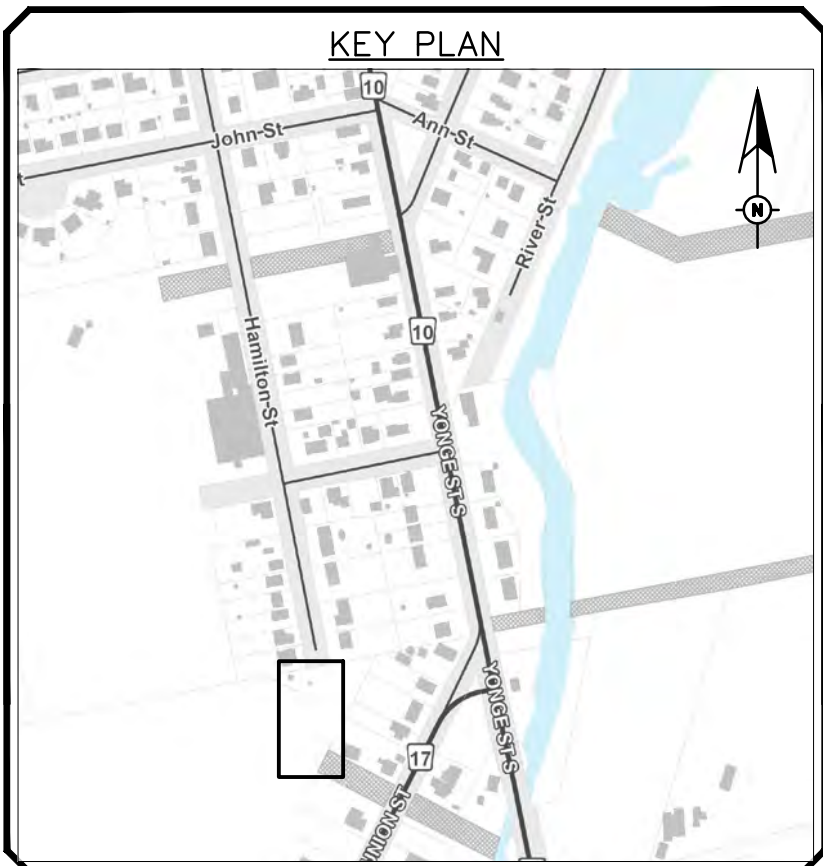
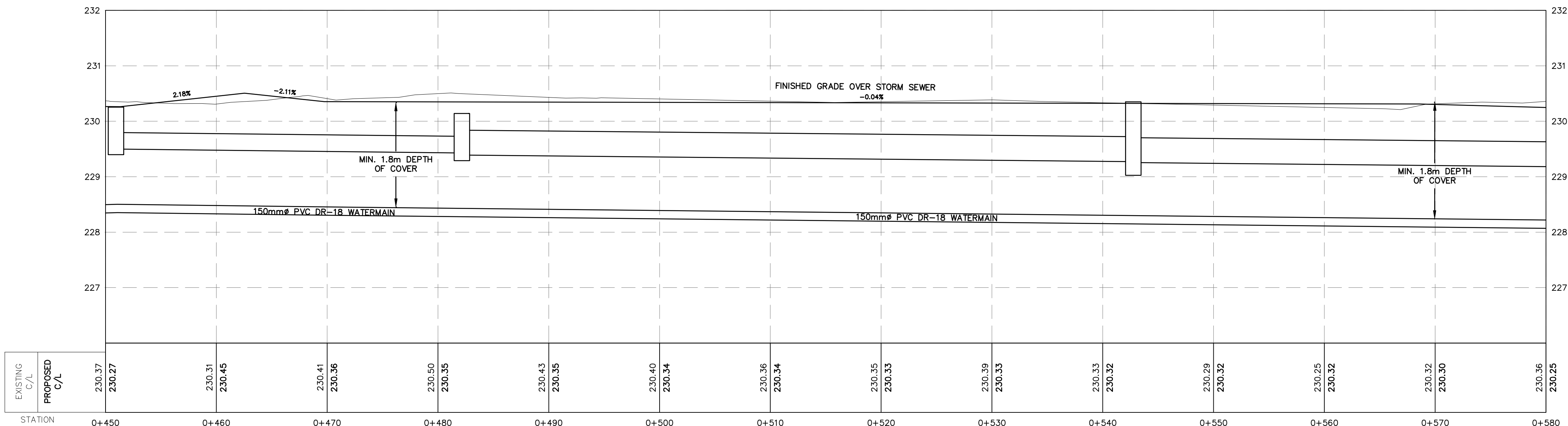
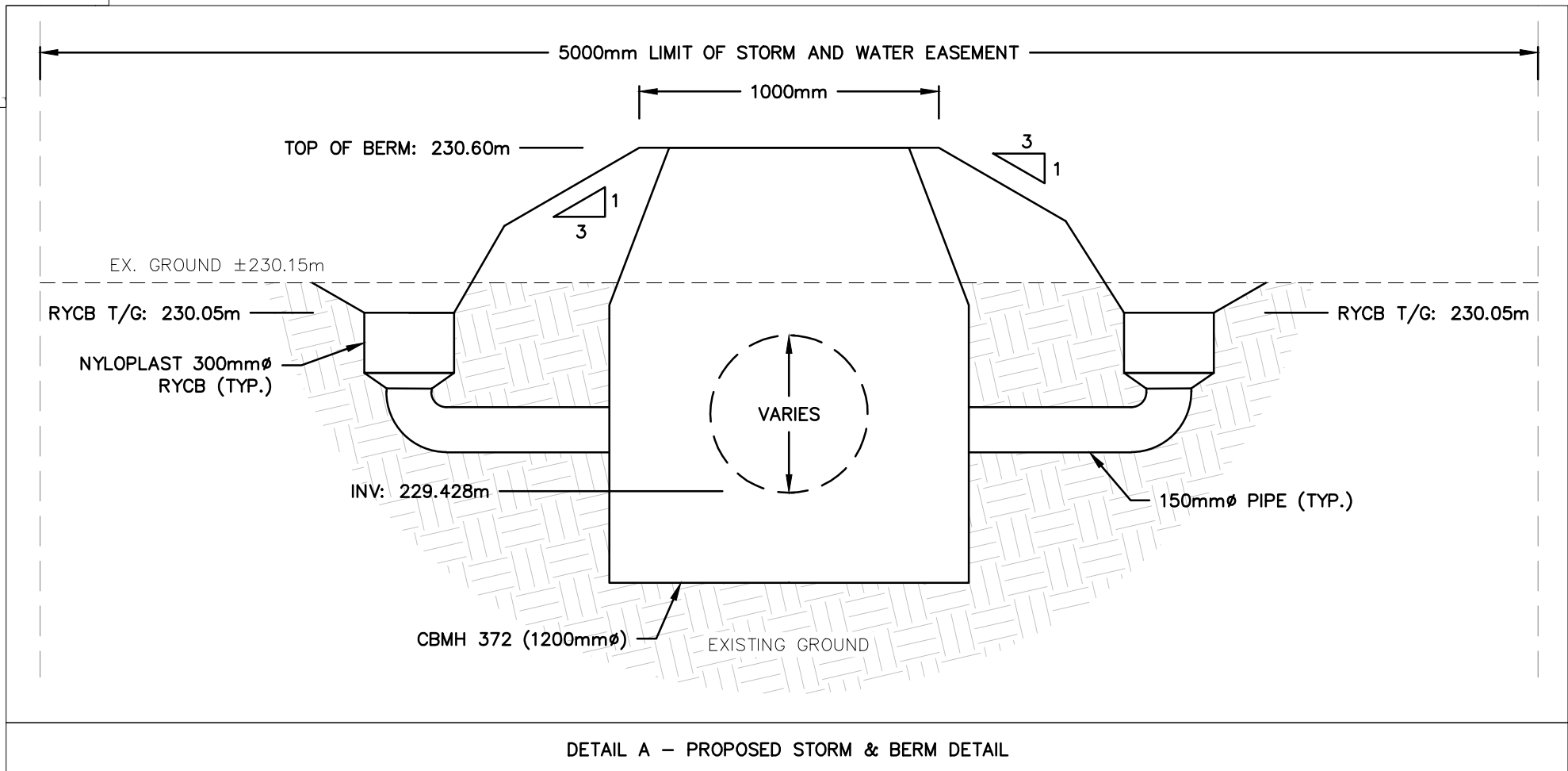
Drawing No. **22-050-06**



SEE DRAWING 22-050-06



SEE DRAWING 22-050-08



BENCHMARKS:

BM6: 230.450m - SIB SW CORNER OF LOT #200 ON HAMILTON ST.

BM7: 229.935m - SIB NE CORNER OF LOT #52 ON UNION ST. LOCATED ON TARA PARK LAND.

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21/07/23	EASEMENT RE-ADJUSTMENT (R4)
14/07/23	HAMILTON ST. (SOUTH) ADJUSTED GRADES (R3)
24/05/23	EASEMENT MODIFICATIONS ADDENDUM #2 (R2)
20/04/23	CONSTRUCTION ISSUE
28/03/23	TENDER ISSUE ADDENDUM #1 (R1)
DD/MM/YY	DESCRIPTION
	REVISION / ISSUE

Seal not valid unless signed and dated

SHARMA

22-050

ENGINEERING CONSULTANTS LTD

945-3rd Ave. East, Unit #230, Owen Sound, ON, N4K 2K8

Telephone: (519) 372-4828

Title:

HAMILTON ST. PLAN & PROFILE

TARA, ARRAN-ELDERSLIE

0+450 - 0+580

Client: MUNICIPALITY OF ARRAN-ELDERSLIE

Design: RS

Scale: HORZ. 1:250 / VERT. 1:50

Drawn: TDL

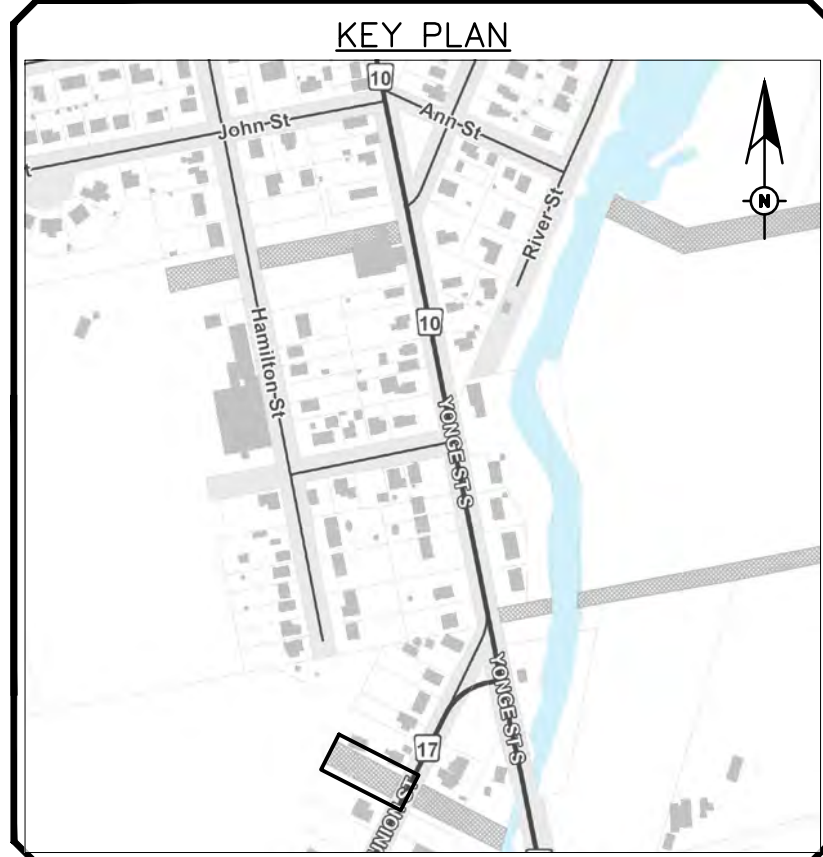
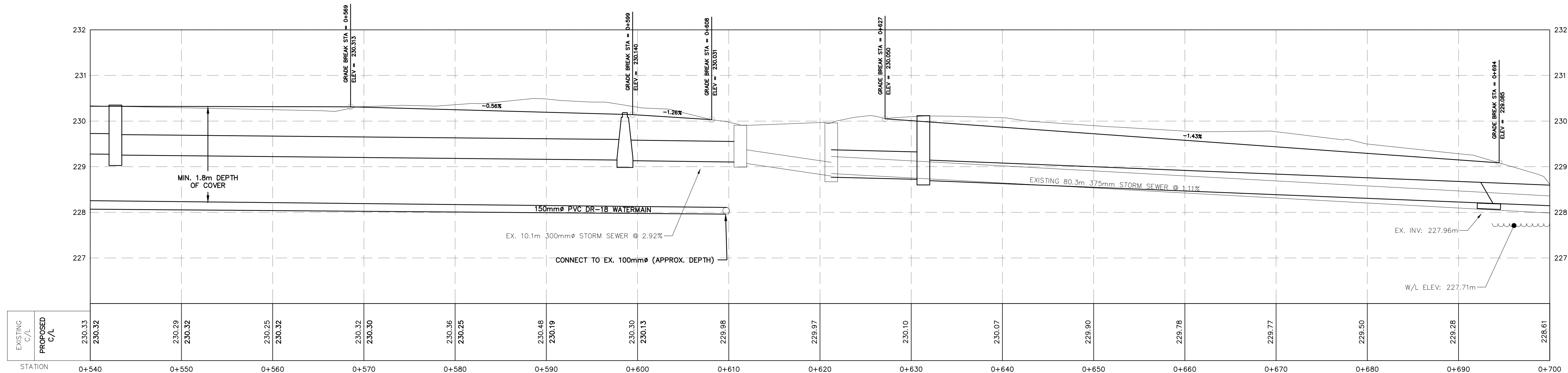
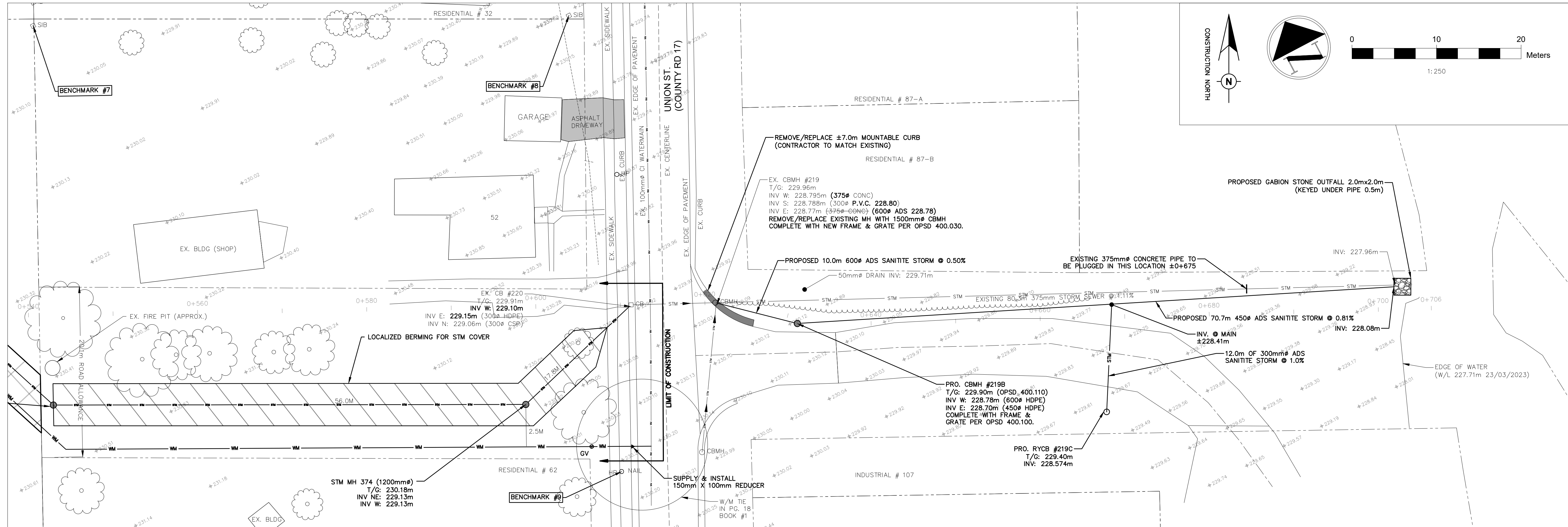
Approved: Design Engineer

Checked: RS

Date: DEC. 2022

Drawing No. 22-050-07

SEE DRAWING 22-050-07



LEGEND	
EXISTING DETAILS	
WM	EXISTING WATERMAIN
STM	EXISTING STORM SEWER
SAN	EXISTING SANITARY SEWER
---	APPROXIMATE PROPERTY LINE OR EASEMENT
---	EXISTING CENTER LINE
HP	EXISTING HYDROPOLE & GUY WIRE
CB	EXISTING CATCHBASIN
WV	EXISTING WATERVALVE
FT	EXISTING TREE
FH	EXISTING FIRE HYDRANT
SIB	STANDARD IRON BAR
AS	ASPHALT DRIVEWAY
PROPOSED CONSTRUCTION	
WM	PROPOSED WATERMAIN
STM	PROPOSED STORM SEWER
SAN	PROPOSED SANITARY SEWER
---	EX. CENTRELINE ELEVATION
---	PRO. CENTRELINE ELEVATION
---	STATION NUMBER

BENCHMARKS:
 BM 7: 229.935m - SIB NE CORNER OF LOT #52 ON UNION ST. LOCATED ON TARA PARK LAND.
 BM 8: 229.860m - SIB SE CORNER OF LOT #52 ON UNION ST.
 BM 9: 230.591m - NAIL IN HYDRO POLE LOCATED ON WEST SIDE OF UNION ST., IN FRONT OF LOT #62.
 CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

24/05/23	EASEMENT MODIFICATIONS ADDENDUM #2 (R2)
20/04/23	CONSTRUCTION ISSUE
28/03/23	TENDER ISSUE ADDENDUM #1 (R1)
08/03/23	TENDER ISSUE
DD/MM/YY	DESCRIPTION
	REVISION / ISSUE

Seal not valid unless signed and dated

ENGINEERING CONSULTANTS LTD
 945-3rd Ave. East, Unit #230, Owen Sound, ON, N4K 2K8
 Telephone: (519) 372-4828

Title: **HAMILTON ST. PLAN & PROFILE**
TARA, ARRAN-ELDERSLIE
O+540 - O+700

Client:	MUNICIPALITY OF ARRAN-ELDERSLIE
Design:	RS/JFM
Scale:	HORZ. 1:250 / VERT. 1:50
Drawn:	TDL
Checked:	RS
Date:	DEC. 2022
Drawing No.	22-050-08

APPENDIX B

Catchment Area Information

TABLE B1 Catchment Area Information Tara Stormwater Needs Study April, 2024 21-015				
Catchbasin ID	Catchment Area (ha)	Overland Flow Length (m)	Catchment Slope (%)	% Impervious Area
CA-A				
CBMH 10	0.076	11.39	12.26	40
CB 11	0.342	50.4	10.04	40
CBMH 6	0.024	4.59	3.49	100
CB 8	0.523	48.61	9.22	40
CBMH 4	0.438	43.18	5.2	50
CB 5	0.286	39.31	0.18	60
CBMH 2	0.076	2.85	5.61	45
CB 3	0.057	14.92	2.27	70
CBMH 1102	0.156	185.39	4.94	50
CB 34	0.058	10.63	6.41	100
CBMH 33	0.057	10.32	6.14	40
CBMH 35	0.116	71.5	7.69	40
CBMH 1103	0.321	122.44	5.91	35
CBMH 258	1.005	52.89	5.77	50
CB 263	0.078	21.11	2.33	75
CB 262	0.09	12.07	2.46	90
CB 261	0.09	12.05	2.85	90
CB 269	0.172	26.66	0.76	40
CB 270	0.066	10.2	0.26	30
CB 268	0.065	9.45	0.84	30
CB 1104	0.35	107.57	2.36	50
CB 1106	0.376	73.8	1	45
CB 267	0.098	115.4	0.87	100
CBMH 266	0.016	4.42	0.51	30
CB 264	0.525	47	2.75	50
CB 265	0.06	9.53	0.86	100
CBMH 259	0.055	10.14	0.5	25
CB 257	0.071	34.51	1.75	40
CB 256	0.425	58.98	1.29	25
CB 254	0.033	35.7	0.86	40
CB 255	0.057	11.05	2.78	100
CB 253	0.122	33.17	1.19	80
CB 252	0.092	20.99	1.62	100
CB 250	0.165	30.65	1.9	80
CB 251	0.29	46.39	3.54	60
CB 249	0.27	23.69	1.42	10

TABLE B1 Catchment Area Information Tara Stormwater Needs Study				
April, 2024			21-015	
Catchbasin ID	Catchment Area (ha)	Overland Flow Length (m)	Catchment Slope (%)	% Impervious Area
CB 361	0.17	45.51	0.44	80
CBMH 248	0.288	39.8	0.34	70
CB 247	0.245	20.93	0.4	90
CA-B				
CB 50	0.617	80.3	4.13	30
CB 51	0.177	69.43	2.06	70
CA-C				
CB 600	0.313	26.65	1.63	20
CB 601	0.33	39.46	3.64	15
CB 602	0.365	38.81	4	0
CA-D				
CB 272	0.197	23.02	0.25	70
CB 271	0.083	10.07	0.58	50
CB 273	0.073	10.09	0.71	50
CA-E				
DICB 276	0.924	88.55	5.47	40
CA-F				
DICB 275	1.38	86.39	3.87	25
DICB 274	0.12	10.23	2.31	50
CA-G				
CB 279	0.031	19.07	6.15	100
CB 278	0.132	53.6	0.12	70
CB 280	0.021	13.05	6.22	100
CB 281	0.039	24.81	6.49	70
CB 284	0.097	23.89	2.44	50
CB 285	0.076	25.55	1.37	60
CB 282	0.479	51.11	1.25	50
CB 283	0.278	30.63	1.67	60
CB 286	0.138	26.45	1.05	30
CA-H				
CB 293	0.185	56.48	4.88	65
CB 294	0.024	9.14	1.9	30
CB 1	0.917	110.21	1.72	10
CB 2	0.336	60.81	1.15	20
Other 1006	0.209	24.24	1.71	30
CB 296	0.061	19.57	0.13	30
CB 295	0.48	39.19	3.4	30
DICB 300	0.47	47.27	3.49	30

TABLE B1 Catchment Area Information Tara Stormwater Needs Study				
April, 2024			21-015	
Catchbasin ID	Catchment Area (ha)	Overland Flow Length (m)	Catchment Slope (%)	% Impervious Area
CB 302	0.128	35.31	1.65	20
Other 298	0.104	25.87	7.82	65
CB 303	0.167	42.69	0.97	50
CB 304	0.379	29.7	6.07	40
CB 307	0.19	27.28	0.77	60
CB 305	0.254	38.37	0.12	25
CB 306	0.12	23.22	0.33	20
CB 289	0.112	26.38	1.36	25
CB 308	0.146	27.56	0.85	60
CB 297	0.266	52.85	0.56	40
CB 290	0.71	113.28	0.94	40
CB 291	0.052	17.7	0.34	75
CB 292	0.611	47.42	0.72	50
CA-I				
CB 287	0.226	36.33	0.5	50
CB 362	0.25	44.43	2.2	70
CB 288	0.154	33.02	2.43	40
CA-J				
CB 345	0.753	37.41	2.17	50
CB 344	0.183	10.76	2.37	60
CB 343	0.171	21.02	3.63	60
CB 1003	0.299	33.53	5.73	50
CB 340	0.031	14.64	3.14	60
CB 341	0.572	49.92	6.22	30
CA-K				
CB 346	0.069	26.58	3.91	15
CB 360	0.123	30.88	4.59	30
CB 359	0.308	56.78	4.08	30
CB 358	0.153	26.73	6.41	25
CB 357	0.288	46.06	5.5	30
CB 355	0.168	25.88	6.17	30
CB 356	0.123	20.31	5.66	30
CA-L				
CB 313	0.643	83.67	1.8	35
CB 312	0.046	7.25	0.72	60
CB 310	0.016	7.81	1.48	85
CB 311	0.435	62.89	1.27	60
CB 309	0.033	6.74	1.69	90

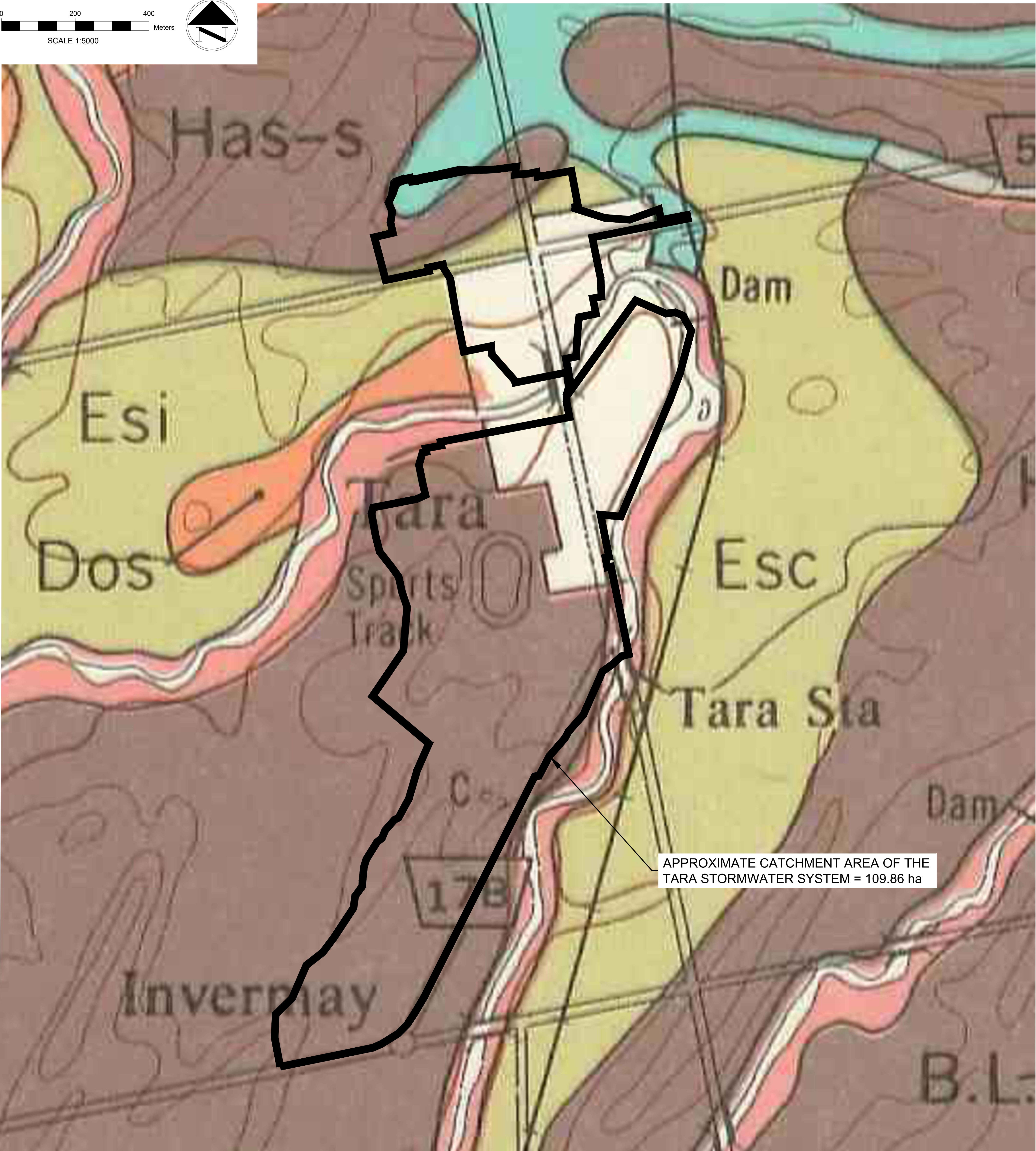
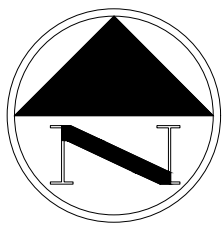
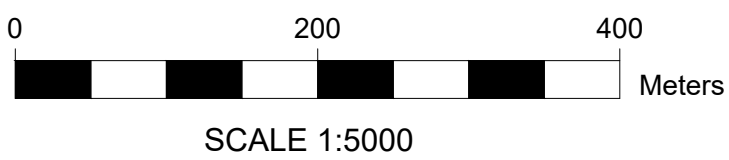
TABLE B1 Catchment Area Information Tara Stormwater Needs Study				
April, 2024		21-015		
Catchbasin ID	Catchment Area (ha)	Overland Flow Length (m)	Catchment Slope (%)	% Impervious Area
CA-M				
CB 245	0.727	52.25	3.71	40
CB 246	0.164	18.41	4.18	60
CA-N				
CB 339	0.395	37.14	0.66	40
CB 1009	0.036	12.36	0.97	60
CB 1010	0.208	33.08	6.14	40
CB 1002	0.197	34.17	5.33	50
DCB 1008	1.181	83.39	5.22	40
CA-O				
CB 354	0.306	44.75	5.97	40
CB 353	0.196	29.18	6.27	25
CB 352	0.12	18.97	6.55	50
CB 351	0.371	55.16	6.23	25
CB 350	0.605	50.2	2.37	40
CA-P				
CB 241	0.55	46.82	1.81	15
CB 244	0.055	6.48	0.39	40
CB 242	0.057	12.59	0.44	40
CB 323	0.117	13.78	0.39	50
CBMH 243	0.064	12.62	0.91	70
CBMH 240	0.665	39.71	0.79	60
CBMH 238	0.08	9.11	0.89	75
CB 239	0.086	20.54	2.26	15
CB 237	0.567	34.57	3.11	20
CB 236	0.238	30.65	3.17	50
CB 347	0.12	11.15	1.69	90
CB 348	0.49	43.7	1.96	30
CA-Q				
CB 333	0.091	24.41	2.32	40
CB 334	0.124	28.87	1.84	15
CB 34	0.828	58.52	2.69	50
DCB 335	0.149	10.07	2.88	90
CB 336	0.047	11.5	0.56	95
CA-R				
DICB 320	0.302	30.06	0.2	50
DICB 319	0.329	35.63	0.04	50
DICB 321	0.989	61.55	3.75	20

TABLE B1 Catchment Area Information Tara Stormwater Needs Study				
April, 2024			21-015	
Catchbasin ID	Catchment Area (ha)	Overland Flow Length (m)	Catchment Slope (%)	% Impervious Area
DICBMH 318	0.424	29.31	4.15	35
DICB 317	0.223	30.65	1.38	60
DICB 316	0.211	31.76	1.4	50
DICB 315	19.65	287.31	1.55	10
CB 363	0.13	74	2.7	60
DCB 364	2.55	296	0.68	25
DICBMH 314	0.235	22.83	1.88	70
CBMH 338	1.455	88.18	1.31	50
CBMH 337	0.184	14.26	1.22	95
CA-S				
Other 324	0.832	42.79	3.78	40
DICB 326	0.323	28.06	1.39	50
CBMH 327	0.103	33.85	0.95	60
DICBMH 328	0.149	35.39	0.26	25
DICB 329	1.873	102.47	3.86	15
DICBMH 330	0.726	35.44	3.88	25
CA-T				
CB 362-17	0.0915	89	0.56	25
CB 361-17	0.309	78	0.45	60
CB 235	0.576	106	1.09	60
CBMH 234	0.117	11	1.54	50
DICB 231	0.242	28.69	1.31	35
CB 230	0.094	71	0.9	40
CB 232	0.04	14.67	0.18	50
CA-U				
CB 222	0.05	12.92	0.63	60
DICB 223	0.434	43.33	0.57	40
DICB 224	0.055	8.36	0.02	100
DICB 225	0.033	13.25	1.85	100
CB 226	0.049	14.9	1.35	50
CB 227	4.446	144.73	1.65	20
CB 228	0.092	10.04	0.67	50
CBMH 229	0.128	12.16	0.07	50
CA-V				
CB 211	0.073	7.3	1.55	100
CBMH 212	0.064	9.4	1.54	25
STM 213	0.166	19.85	2.36	20
CB 214	0.062	7.44	2.46	100

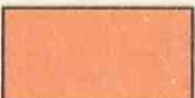
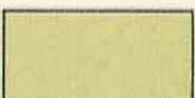
TABLE B1 Catchment Area Information Tara Stormwater Needs Study				
April, 2024			21-015	
Catchbasin ID	Catchment Area (ha)	Overland Flow Length (m)	Catchment Slope (%)	% Impervious Area
CB 216	0.038	4.76	1.76	50
CB 215	8.355	161.87	1.77	5
CB 217	0.25	30.14	1.96	10
CB 218	0.404	39.53	0.87	60
CBMH 219	0.035	15.86	0.27	60
CB 371	0.69	150	1.72	60
CBMH 372	0.247	80	1.99	10
CB 220	0.975	47.51	2.05	25
DICB 221	0.214	43.46	0.26	50
CA-W				
CB 210	0.062	7.58	2.72	100
DICB 208	1.624	117.86	3.18	10
CBMH 209	0.072	9.96	2.22	100
CA-X				
CB 1007	0.178	50.77	5.03	20
CB 204	0.036	8.71	0.96	100
CBMH 205	0.118	14.01	1.11	100
CB 206	1.717	101.77	2.33	15
CB 207	0.034	4.03	0.95	100
CA-Y				
CB 203	0.587	61.28	1.15	15
CB 202	0.088	9.9	0.39	90
CB 200	1.145	51.35	0.3	10
CB 201	0.092	14.24	1.19	90

APPENDIX C

Figure 4 – Soil Map



SOIL LEGEND

COLOUR	SYMBOL	SOIL SERIES AND TYPE	GREAT GROUP	SOIL MATERIALS	DRAINAGE	TOPOGRAPHY AND SURFACE STONINESS	PROFILE DESCRIPTION	
	Cc Csc Cs	Chesley	clay loam silty clay loam silt loam	Dark Grey Gleisolic	Lacustrine	Poor	Smooth, very gently sloping. Stonefree	5 inches grey silty clay loam, clay loam or silt loam over mottled poorly defined lower horizons; profile is poorly developed and shallow.
	Dos	Donnybrook	sandy loam	Grey-Brown Podzolic	Poorly sorted gravelly outwash	Good	Irregular, steeply sloping. Frequent stones	4 inches brown sandy loam underlain by well defined sandy loam A ₂ and B horizons; parent material variable with sand, gravel, and till occurring in association with one another. Profile well developed. Stones throughout.
	Ecl Esc Esi	Elderslie	clay loam silty clay loam silt loam	Brown Forest (Grey-Brown Podzolic Intergrade)	Lacustrine	Imperfect	Smooth, gently sloping. Stonefree	5 inches dark grey silty clay loam, clay loam or silt loam over slightly mottled A ₂ and B horizons; profile is shallow though fairly well developed; parent material is stonefree clay material.
	Hal Hal-s Has Has-s	Harkaway	loam loam, stony phase silt loam silt loam, stony phase	Brown Forest (Grey-Brown Podzolic Intergrade)	Medium textured till	Good	Smooth, moderately sloping. Few to moderate stones	4 inches dark grey-brown loam or silt loam over well developed B horizon. A ₂ horizon is lacking. Parent material is pale yellow-brown till, calcareous, very stony.

Reference: Published by Agriculture Canada (1983)
 Soil survey by the Department of Soils,
 Ontario Agricultural College, Guelph, and
 the Experimental Farm Service, Dominion
 Department of Agriculture Ottawa
*Soils of Bruce County South Sheet, Ontario,
 Soil Survey Report No. 16*

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

DD/MM/YY	DESCRIPTION
	REVISION / ISSUE
Seal not valid unless signed and dated	
Unit 230 945 3rd Avenue East, Owen Sound, ON, N4K 2K8 Telephone: (519) 372-4828	
Title: DRAINAGE AREA AND SOIL CHARACTERISTICS TARA STORMWATER NEEDS STUDY	
Client: MUNICIPALITY OF ARRAN-ELDERSLIE	
Design:	RS
Drawn:	JTB
Checked:	RS
Date:	APRIL 2024
Scale:	1:5000
Approved:	Design Engineer
Drawing No.	FIGURE 4

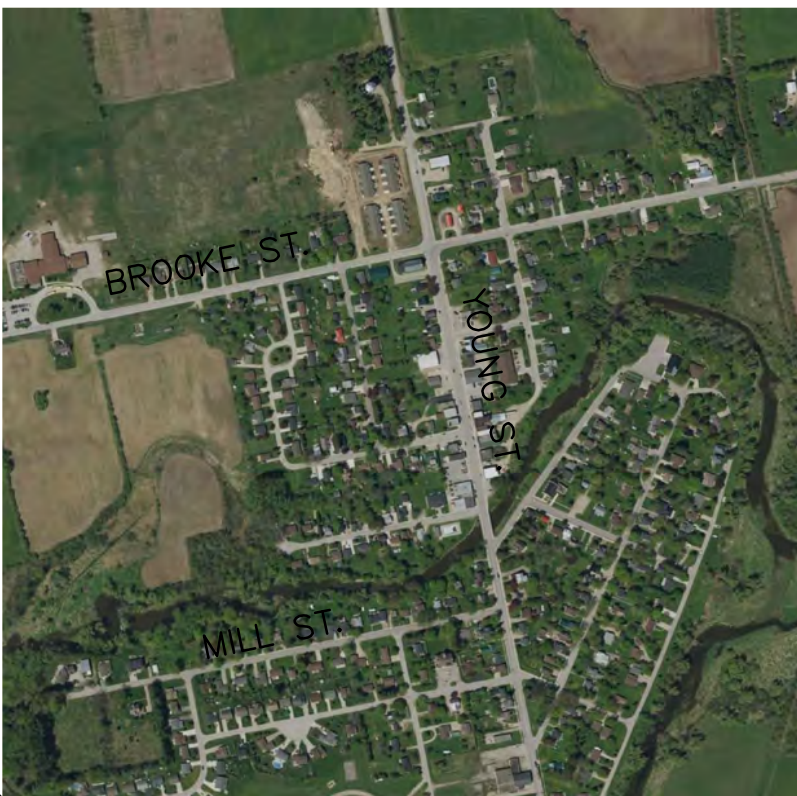
APPENDIX D

Figure 10 – Information Missing in Storm Sewer System



PORTIONS OF THE STORM SYSTEM THAT HAVE BEEN CONFIRMED THROUGH SURVEY OR RECORD DRAWINGS ARE SHOWN IN GREEN.
PORTIONS THAT HAVE BEEN ASSUMED ARE SHOWN IN RED.

KEY PLAN



LEGEND

- CATCHBASIN
- STORM MANHOLE
- STORM SEWER (FLOW DIRECTION)
- CATCHBASIN
- CATCHBASIN MANHOLE
- STORM MANHOLE
- DITCH INLET CATCHBASIN
- DOUBLE CATCHBASIN
- DITCH INLET CATCH BASIN MANHOLE
- FIRST DEFENSE STORMWATER SEPARATOR
- CONTOUR (1.0m)
- CATCHMENT AREA

CAUTION: THE POSITION OF POLE LINES, CONDUITS, WATERMANS, SEWERS, PROPERTY LINES AND OTHER UNDERGROUND AND OVERGROUND UTILITIES ARE STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES, PROPERTY LINES & STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES, PROPERTY LINES & STRUCTURES, AND SHOULD ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

DD/MM/YY	DESCRIPTION
REVISION / ISSUE	
Seal not valid unless signed and dated	



Unit 230 945 3rd Avenue East, Owen Sound, ON, N4K 2K8
Telephone: (519) 372-4828

Title:
CONFIRMED & ASSUMED PORTIONS OF STORMWATER SYSTEM
TARA
STORMWATER NEEDS STUDY

Client:
MUNICIPALITY OF ARRAN-ELDRSLIE

Design:	RS	Scale:	1:3000
Drawn:	JTB	Approved:	Design Engineer
Checked:	RS		
Date:	JUNE 2024		

Drawing No. FIGURE 10