TREK GEOTECHNICAL Quality Engineering | Valued Relationships

June 7, 2022 Our File No. 0015-044-00

Ryan Gama
Contract Administrator
Water and Waste Engineering Division
City of Winnipeg
110-1199 Pacific Ave.
Winnipeg, MB R3E 3S8

RE: North Drive Watermain Installations
Trenchless Installation Recommendations

This letter report summarizes the results of a desktop study completed by TREK Geotechnical Inc. (TREK) to provide recommendations for the installation of seven new water main connections beneath North Drive, which also acts as a flood dike that is part of the primary line of defence (PLD) for the City of Winnipeg (the City). The terms of reference for the investigation are included in our proposal to Ryan Gama of the City dated April 1, 2022.

The scope of work includes a desktop review of existing sub-surface information (if available) and the provision of geotechnical design and construction recommendations for excavations within PLD limits, trenchless installations across the PLD, backfill following installation, supervision/testing requirements during construction, and commentary relative to temporarily raising the dike during flood events and the increased stresses this will induce on the watermain connections beneath the dike.

Background

A new 200 mm diameter PVC watermain is being installed roughly parallel to and approximately 1.5 to 2 m below the outside toe of the North Drive PLD dike, and service connections need to be installed beneath the dike to tie-in to existing 150 mm diameter cast iron watermains servicing four residential bays: Wildwood Park A, B, C and D. Preliminary drawings for the project provided by the City are attached.

The connections will likely be installed using either horizontal directional drilling (HDD) or Atkins trenchless methods. Based on the watermain tee connection elevations shown on City drawings D-16136, 16137, 16138 and 16139 the connections will be installed 2.5 to 2.8 m below the top of dike/top of road. Provincial LiDAR captured in 2019 indicates the ground surface beyond the toes of the dike/road (original grade) is at approximately El. 230 m, which suggests the connections will be installed within native soils beneath the dike/road (connection invert elevations range between ~El. 227.9 and 228.5).

Based on existing soil information in the area and the proximity of the site to the Red River, we anticipate the native soils beneath the dike/road to consist of alluvial deposits overlying lacustrine clay underlain by silt till at a depth of approximately 10 to 15 m.

Temporary Excavations

Excavations must be carried out in compliance with the appropriate regulations under the Manitoba Workplace Safety and Health Act. Any open-cut excavation greater than 3 m deep must be designed and sealed by a professional engineer and reviewed by the geotechnical engineer of record (TREK). If space is limited or the

stability of adjacent structures or infrastructure may be endangered by an excavation, a shoring system may be required to prevent damage to, or movement of, any part of adjacent structures, and the creation of a hazard to workers and the public. Hydraulic jacking pits and pipe jacking reaction systems should be designed by a qualified structural engineer to support anticipated jacking forces based on the soil conditions at the site.

Excavation stability is the responsibility of the Contractor for the duration of construction. Excavations should be monitored regularly and flattened as necessary to maintain stability recognizing that excavation stability is time and weather dependent. Excavated slopes should be covered with polyethylene sheets to prevent wetting and drying. Stockpiles of excavated material and heavy equipment should be kept away from the edge of any excavation by a distance equal to or greater than the depth of excavation.

Stockpiles of excavated material and heavy equipment should be kept away from the edge of any excavation by a distance equal to or greater than the depth of the excavation. Dewatering measures may be required to maintain a dry excavation and permit proper completion of the work. If seepage is encountered, it should be collected and pumped out of the excavation. If saturated silts or sands are encountered, shoring or slope flattening may be required. To prevent wet silts and sands from entering the excavation, gravel buttressing could be used in conjunction with sump pits for dewatering. Surface water should be diverted away from the excavation and the excavation should be backfilled as soon as possible following construction.

Cantilevered (un-braced or braced) walls will be required for deep excavations or physically constrained areas where temporary shoring is necessary. Table 01 provides the recommended earth pressure coefficients and bulk unit weight for use in the calculation of lateral earth pressures. Surcharge loads and hydrostatic water pressure should be incorporated into the design of retaining walls and shoring, as well as an adequate factor of safety against instability.

Table 01. Recommended Design Parameters for Retaining Walls and Shoring

Design Parameter	Silt Till
Active Earth Pressure Coefficient (Ka)	0.5
At-rest Earth Pressure Coefficient (Ko)	0.7
Passive Earth Pressure Coefficient (Kp)	1.9
Bulk Unit Weight, Y (kN/m³)	18

Trenchless Installation

TREK anticipates the watermain tie-ins will be installed within alluvial deposits (or possibly lacustrine if alluvial deposits at this site are thin) that may consist of a combination of clay, silt and sand. In the absence of site-specific sub-surface information, contractor installing the tie-ins should be prepared to encounter soft, wet silt and clay, and potentially loose wet sand. Given the age of the road, fill soils of differing compositions may be present. If the groundwater level is above the tie-in elevation, these materials have the potential to behave in a squeezing or raveling manner as defined by the Tunnelman's Soil Classification (Terzaghi, 1950)[1]. For

[1] Terzaghi, K. (1950). Geologic aspects of soft ground tunnelling. In Applied Sedimentation. John Wiley &

the purpose of design and construction, the groundwater level should be assumed to be at El. 229.0 m.

The Atkins method and HDD installation techniques have varying levels of control over the alignment of the casing pipe as installation proceeds. The target grade for the carrier pipe should be considered relative to the potential for misalignment of the casing pipe. Depending on the level of alignment control, measures could be taken that allow for adjustments to be made to the carrier pipe within the casing pipe to achieve the design grade (e.g. oversized casing pipe).

The following considerations and recommendations were developed in consultation with local contractors and TREK's geotechnical assessment of potential sub-surface conditions. The recommendations relate to settlement and heave. The considerations and recommendations are provided to aid the Contractor in anticipating conditions that may be encountered during the installation and may not be inclusive of all adverse conditions that may arise.

Settlement

The trenchless installation may create a larger opening than the outside diameter of the watermain (rough opening) to facilitate installation. The annulus is the space between the rough opening and the outer edge of pipe; settlement can occur due to the collapse of the annulus, so to limit the potential for settlement the size of the annulus should be minimized. If the pre-reaming occurs, as is common with Atkins and HDD installations, the borehole will be open for a period between the end of pre-reaming and the pipe installation. In this scenario, full collapse of the borehole could occur.

When considering soil collapse, the maximum theoretical settlement that can occur at ground surface above the borehole results from a shear failure of the column of soil directly above the borehole that is equal to either the size of the annulus (if the pipe is installed as the borehole is reamed) or the diameter of the borehole (if pre-reaming occurs). Based on the proposed depth of the tie-ins below the dike (approximately 2.5 m) TREK estimates total collapse of the borehole (if it occurs) could result in up to approximately 75 mm of settlement at ground surface.

The risk of soil collapse can be mitigated by using drill fluid to support a pre-reamed borehole prior to watermain installation. The drill fluid pressure should match the overburden pressure at the depth of installation. In this case a bulk unit weight of 18 kN/m^3 may be used for design. Alternatively, the watermain can be installed while the borehole is being reamed to reduce the potential for full borehole collapse; however, this approach does carry additional risks associated with heave due to excessive borehole pressure.

If a portion of the borehole does collapse additional reaming will be required, and settlement can also occur as a result of excess soil being removed (commonly referred to as ground loss). The magnitude of ground loss varies depending on the installation methodology selected and is also highly dependent on the workmanship of the contractor. Ground losses, expressed as a percentage of the borehole volume, typically vary from 0.5% for good practice in favourable soil conditions to 4% or more for poor practice with little face control in unfavourable soil conditions (Hung et al. 2009)[2]. The borehole should be supported using drill fluid pressure,

---

Sons, Inc. .

[2] Hung, J., Monsees, J., Munfah, N., & Wisniewski, J. (2009). *Bridges & Structures Technical Manual for Design and Construction of Road Tunnels - Civil Elements* (Issue FWHA-NHI-09-010).

mechanical support, or a combination thereof to prevent excessive ground loss. If applicable, the contractor should select an appropriate drill fluid mix and pump rate to prevent ground loss resulting from drill fluid eroding (widening) the borehole behind the reamer.

Heave

Surficial heave can be a result of the installation technique such as pumping too much drill fluid after a circulation loss, inappropriate drill fluid viscosity, insufficient cover for the tooling used, or pulling/pushing the tooling or pipe through too quickly. Excessive installation pressures associated with heave can also result in hydraulic fracturing, which is an uncontrolled hydraulic connection that develops through cracking between the borehole and the ground surface. Blow-out has the potential to compromise surficial infrastructure (e.g. dike or roadway).

The contractor should select the appropriate installation methodology and modify their approach to suit site conditions; pre-reaming the borehole and removing excess cuttings is one way to reduce the risk of heave and hydraulic fracturing. Furthermore, the contractor should provide a detailed hydraulic fracturing recovery plan for review and approval prior to mobilizing to site. The plan should include how to detect and mitigate imminent hydraulic fracturing and steps that will be taken to seal off hydraulic fractures if they occur to facilitate completing the installation. If hydraulic fracturing occurs within the PLD limits, dike repairs will likely be required and TREK should be contacted to provide further recommendations.

Summary

The consequence of settlement and heave should be considered in the context of the infrastructure at risk. For this project, TREK recommends implementing measures during construction to mitigate the risk of heave, while understanding that doing so may increase the risk of settlement. The priority at this site is maintaining the integrity of the dike. Cracking and preferential seepage paths associated with heave and hydraulic fracturing during installation is a higher consequence outcome to the performance of the dike than surficial settlement that can be identified and repaired. TREK should be on-site during all pre-reaming and tie-in installation activities to observe the sub-surface conditions on site and address construction concerns relative to this report if necessary.

Backfill

Temporary excavations and/or the pipe annulus need to be backfilled appropriately to prevent preferential seepage paths forming beneath the dike along the watermain. TREK recommends the following backfill procedures for the watermain tie-in depending on the method of installation selected.

Seal Sending/Receiving Pits

The borehole annulus will likely not be filled with drill fluid if the Atkins method is used. In this case, the sending and receiving pit excavations on both sides of the dike should be backfilled with clay fill to act as a low permeability plug that is highly plastic (Liquid Limit greater then 50), well mixed, homogeneous, unfrozen, and free from organic matter, debris and deleterious material. Clay fill should be placed in lifts no greater than 150 mm and compacted to 95% of the standard proctor maximum dry density (SPMDD) within 2% of the optimum moisture content to the top of the excavation. If this level of compaction is not achievable in the vicinity of the new watermain pipes and tee (e.g. to avoid damage) a stab fill mixture with bentonite should be used. The stab fill should have a hydraulic conductivity of $1x10^{-9}$ m/s or less.

Seal Borehole Annulus

If the tie-ins are installed using HDD, drill fluid can be circulated through the annulus and formed at the ends to seal the borehole. The annulus should be filled with bentonitic grout with hydraulic conductivity of $1x10^{-9}$ m/s or less.

Quality Control During Construction

TREK recommends the following quality control measures be implemented during construction:

1. TREK personnel should be on site during the excavation of the sending and receiving pits to confirm the sub-surface conditions are consistent with TREK's recommendations and the contractor's installation methodology.
2. TREK personnel should be on site during pre-reaming and pipe installation activities to observe and document the installation.
3. The contractor's proposed bentonitic grout or stab fill mixtures (if applicable) should be submitted prior to construction and may be subject to additional testing to confirm the hydraulic conductivity meets project specifications depending on the mix design information provided.
4. Backfill compaction testing should be completed on the sending/receiving pits on the outside (north side) of the dike if the backfill is being relied upon to seal off the installation.

Temporarily Raising Dikes

The City anticipates the South Drive dike may need to be temporarily raised by up to 0.9 m to accommodate future flood events. A simple finite element load deformation model was created using typical PVC pipe properties and elastic settlement theory using typical soil parameters to estimate the potential stress increase in the soil surrounding the pipe, settlement and also structural loading on the pipe associated with temporary fill placement.

TREK expects around 60 to 70% of the applied vertical stress at the road surface will transfer down to the watermain (approximately 3 m below road surface), which could deform (elastic settlement and may potentially rebound) in the order of 5 to 15 mm. Using von Mises combined equivalent stress theory, the combined equivalent stress increase in the pipe is anticipated to be less than 1 MPa, which TREK anticipates being well below the typical range of Specified Minimum Yield Strength of PVC watermain pipe. This should be confirmed by the City.

Closure

The geotechnical information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation and laboratory testing). Soil conditions are natural deposits that can be highly variable across a site. If subsurface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work or standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.

This report has been prepared by TREK Geotechnical Inc. (the Consultant) for the exclusive use of the City of Winnipeg (the Client) and their agents for the work product presented in the report. Any findings or recommendations provided in this report are not to be used or relied upon by any third parties, except as agreed to in writing by the Client and Consultant prior to use.

Kind Regards,

TREK Geotechnical Inc.
Per:

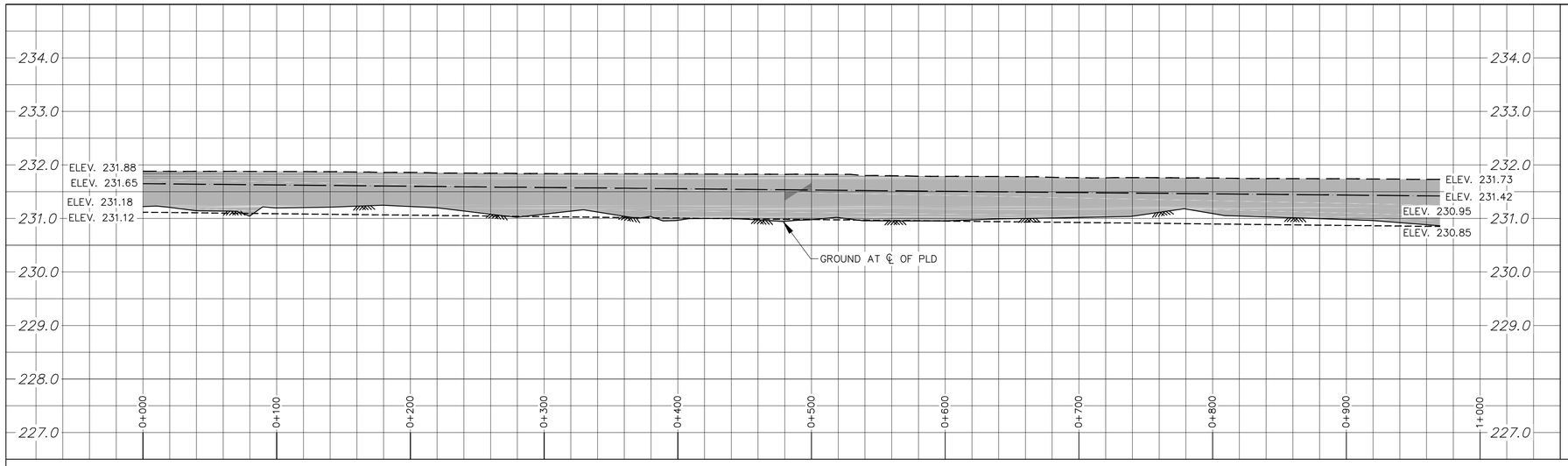
PROVINCE OF MANITOBA
S.M.
HARMS
Member
36160
Jun 7/22
REGISTERED PROFESSIONAL ENGINEER

Steven Harms, M.Sc., P.Eng.
Geotechnical Engineer

Reviewed by:

Nelson Ferreira, Ph.D., P.Eng.
Senior Geotechnical Engineer

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
TREK GEOTECHNICAL INC.
No. 4877 Date: Jun 7, 2022



VOLUME FOR PRIMARY DIKE			
RIVER STAGE AT JAMES' (ft.)	GEODETIC RIVER ELEVATION (m)	GEODETIC TOP OF DIKE ELEVATION (m)	VOLUME (m3)
28.0	231.20	231.81	3791
27.5	231.04	231.65	2872
27.0	230.89	231.50	1978
26.5	230.73	231.34	1157
26.0	230.56	231.17	458
25.5	230.40	231.01	57
25.0	230.26	230.87	53

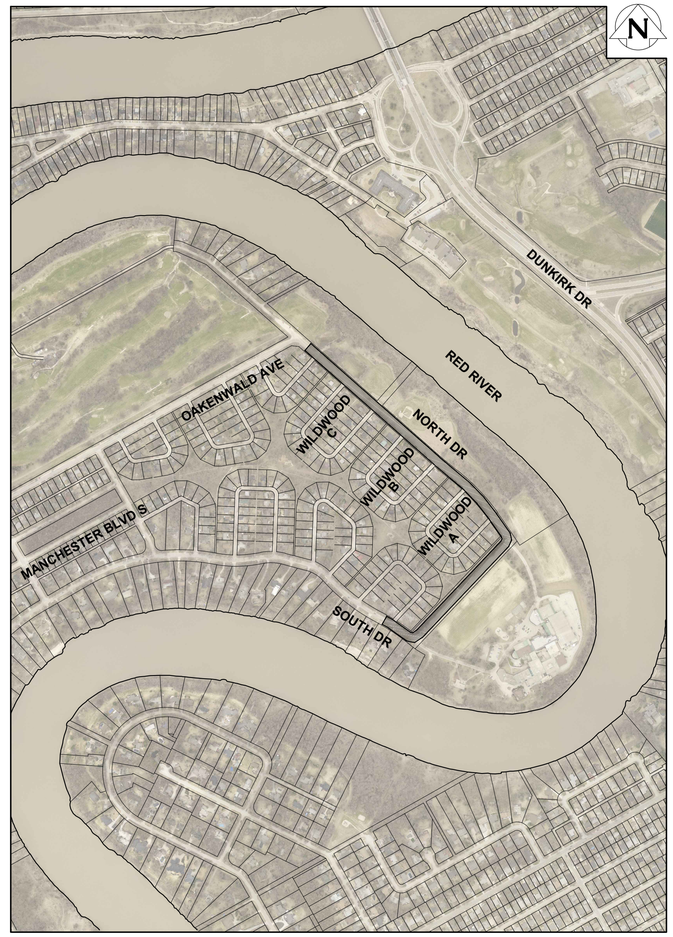
TOTAL VOLUME OF "COMPACTED" MATERIAL TO RAISE PRIMARY DIKE AT THE ASSOCIATED ELEVATION. THE VOLUMES ARE CALCULATED USING VARYING SIDE SLOPES AS DESCRIBED IN THE TEMPORARY PRIMARY DIKE CONSTRUCTION MEMORANDUM (2015)

*JAMES AVE LEVELS ARE BASED OFF OF JAMES AVE REFERENCE METHOD (2015)

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

0.0 50.0 100.0 150.0 200.0

PLAN VIEW
SCALE 1:2000



KEY MAP
NTS

LEGEND—PROFILE

	SYMBOL
FLOOD MANUAL UPPER BOUND+2ft (FMUB+2ft)	
TOP OF GROUND	
1997+2ft FPL (1997+2ft+2ft FREEBOARD)	
1981 FPL (25.8ft+2ft)	
DEFICIENCIES (BELOW FMUB)	

LEGEND—PLAN

	SYMBOL
MANHOLE	
CATCHBASIN	
CURB INLET	
SEWERS (COMBINED, FORCEMAIN, LAND DRAINAGE, STORM RELIEF AND WASTEWATER)	

NOTES:
1. DOES NOT NECESSARILY REPRESENT UP-TO-DATE AND/OR COMPLETELY ACCURATE AS-BUILT INFORMATION
2. ALL CHAINAGES ARE ALONG CENTRE LINE OF RIGHT-OF-WAY
3. USE THE FOLLOWING SCALES FOR THE APPROPRIATE DRAWING SIZE

B.M.
ELEV.

NO.	REVISIONS	DATE	BY

DESIGNED BY –
CHECKED BY –
DRAWN BY RS
APPROVED BY –
SCALE:
HORIZONTAL 1:2000
VERTICAL 1:50
RELEASED FOR CONSTRUCTION
DATE 2018 08 03
DATE
PLOT DATE: 2018 05 02

ENGINEER'S SEAL

CONSULTANT DRAWING NUMBER
–

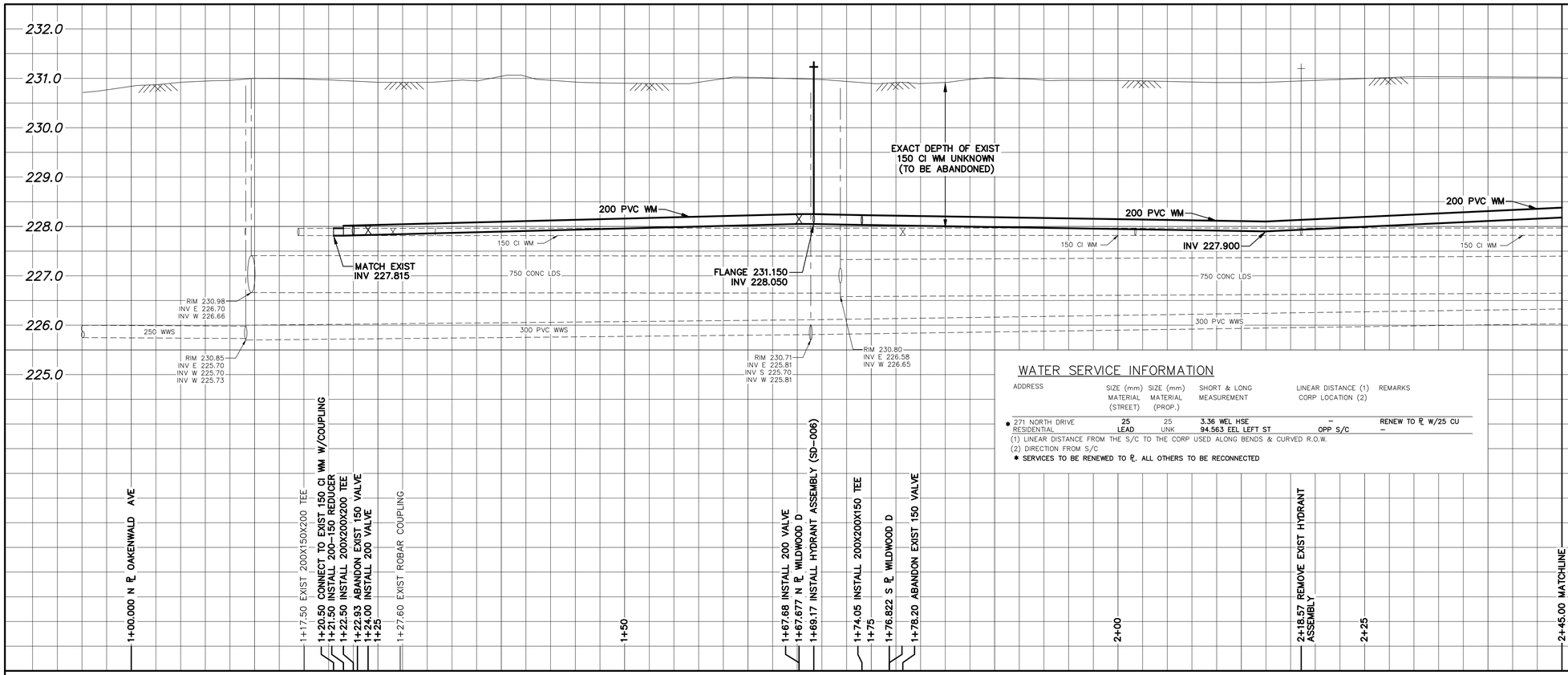
Winnipeg

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

2016 FLOOD MANUAL
PRIMARY LINE OF DEFENCE (PLD)
SERIES 400
FOLLOWS SOUTH DR AND NORTH DR FROM 15m WEST OF WILDWOOD J (E. LEG) TO 25m SOUTH OF OAKENWALD AVE

CITY DRAWING NUMBER PLD 419
SHEET 19 OF 28

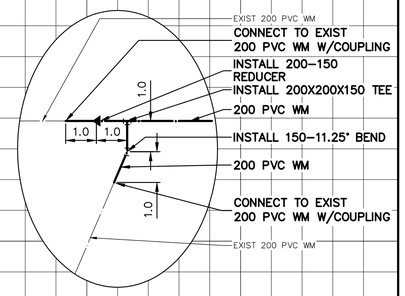
FILE PATH: R:\DRAWINGS\PLD\UPDATED PLD DWG\PLD Dwg\PLD 400 SERIES\UPDATED PLD\
FILE NAME: PLD 419.dwg



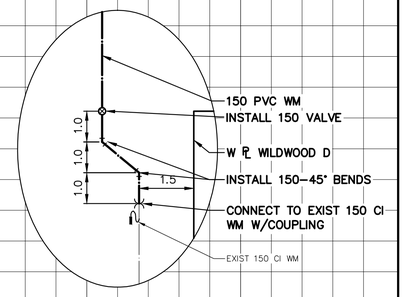
WATER SERVICE INFORMATION

ADDRESS	SIZE (mm) MATERIAL (STREET)	SIZE (mm) MATERIAL (PROP.)	SHORT & LONG MEASUREMENT	LINEAR DISTANCE (1) CORP LOCATION (2)	REMARKS
* 271 NORTH DRIVE RESIDENTIAL	25 LEAD	25 UNK	3.36 WEL HSE 94.563 EEL LEFT ST	– OPP S/C	RENEW TO ℄ W/25 CU –

(1) LINEAR DISTANCE FROM THE S/C TO THE CORP USED ALONG BENDS & CURVED R.O.W.
(2) DIRECTION FROM S/C
* SERVICES TO BE RENEWED TO ℄. ALL OTHERS TO BE RECONNECTED

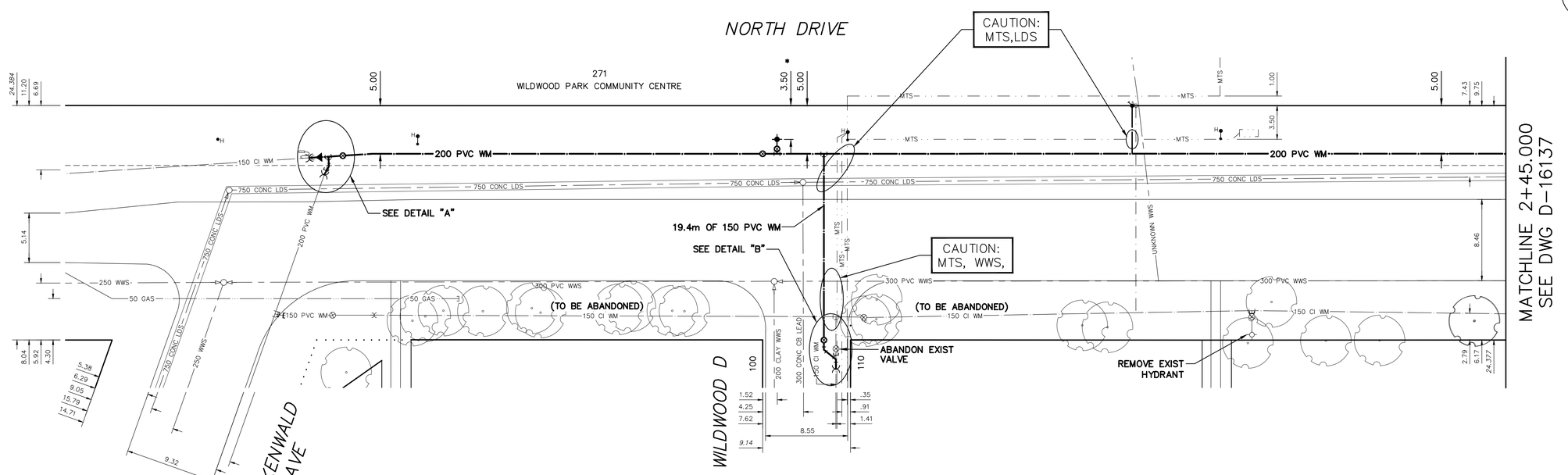


DETAIL "A"
SCALE N.T.S.



DETAIL "B"
SCALE N.T.S.

NOTE: CHAINAGES SHOWN ARE ALONG S. ℄ OF NORTH DRIVE



WATER SERVICE INFORMATION

WATER SERVICES TO ALL HOUSES ON WILDWOOD A, B, C, AND D SERVICED FROM WATER MAINS LOCATED ON THOSE PARTICULAR STREETS.

FOR INDEX SEE D-16133

NOTE: ALL VALVES TO BE INSTALLED CLOCKWISE TO CLOSE

WARNING

IF POWER EQUIPMENT OR EXPLOSIVES ARE TO BE USED FOR EXCAVATION ON THIS PROJECT THE CONTRACTOR MUST:

1) NOTIFY THE GAS COMPANY OF THE PROPOSED LOCATION OF EXCAVATION.

2) TAKE PRECAUTION TO AVOID DAMAGE TO GAS COMPANY INSTALLATIONS.

SEE PROVINCIAL REGULATION 210/72 FOR DETAILS

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

0.0 5.0 10.0 15.0 20.0 25.0

LOCATION APPROVED
UNDERGROUND STRUCTURES

SUPV. U/G STRUCTURES COMMITTEE _____ DATE _____

NOTE:
LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.

VERTICAL DATUM: CGVD28 (HT2.0 Geoid)
HORIZONTAL DATUM: NAD83 (June 1990), Zone 14

NO.	REVISIONS	DATE	BY

DESIGNED BY	RG	CHECKED BY	SC
DRAWN BY	AJ/AOM	APPROVED BY	KZ
SCALE: HORIZONTAL	1:250	RELEASED FOR CONSTRUCTION	
VERTICAL	1:50		
DATE	2022 03 09	DATE	

PLOT DATE: 2022 03 09

ENGINEER'S SEAL

CONSULTANT DRAWING NUMBER
–

BID OPPORTUNITY: 882-2021
CONTRACT NUMBER: 12

Winnipeg

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

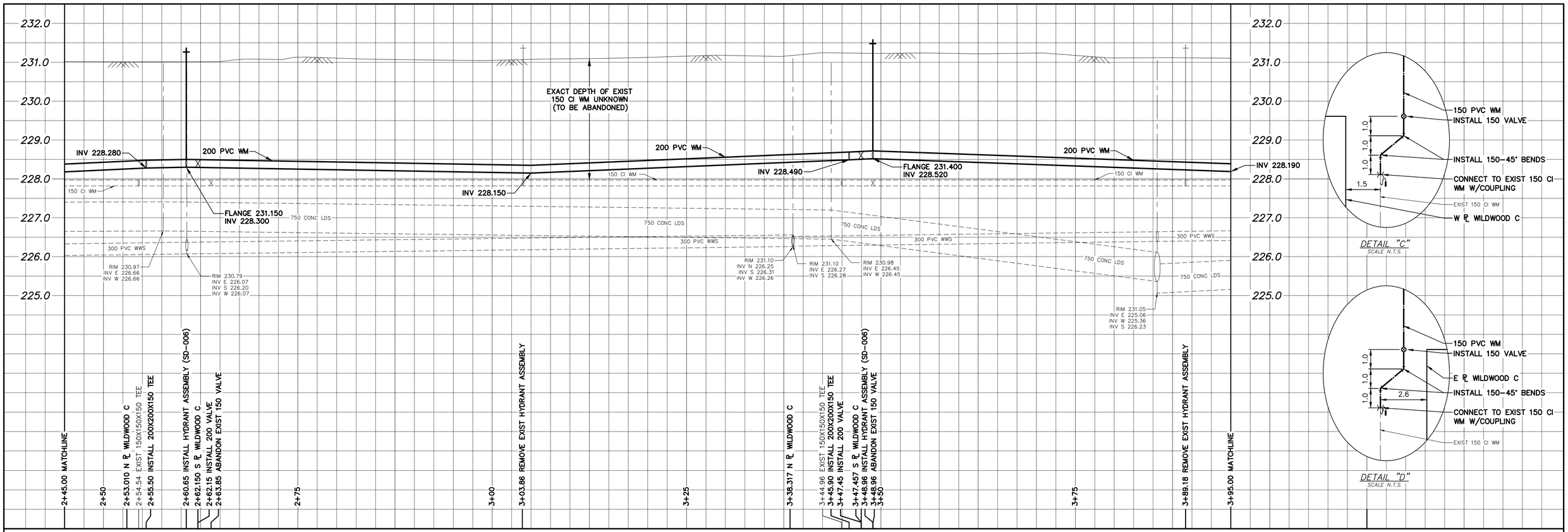
2022 WATER MAIN RENEWALS
CONTRACT 12

NORTH DRIVE
OAKENWALD AVENUE TO
145 S OF OAKENWALD AVENUE

SHEET 5 OF 11

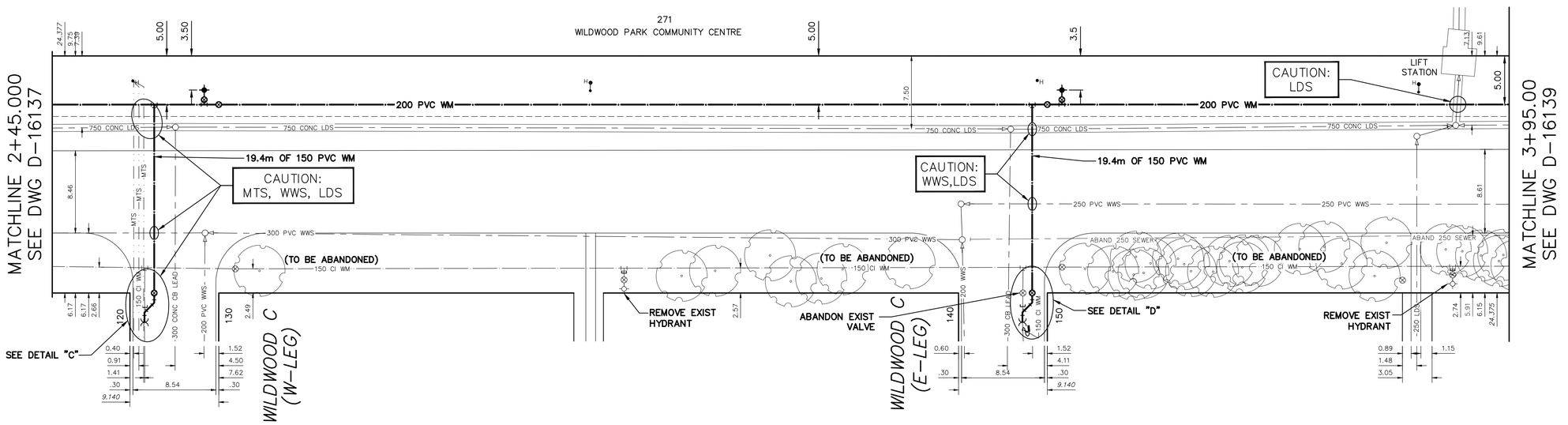
CITY DRAWING NUMBER
D-16136

FILE PATH: R:\DRAWINGS\WATER\RENEWAL\2022 RENEWALS\Contract 12\Construction dwg\
FILE NAME: NORTH DR.dwg



NOTE: CHAINAGES SHOWN ARE ALONG S. ℄ OF NORTH DRIVE

NORTH DRIVE



WATER SERVICE INFORMATION

WATER SERVICES TO ALL HOUSES ON WILDWOOD A, B, C, AND D SERVICED FROM WATER MAINS LOCATED ON THOSE PARTICULAR STREETS.

FOR INDEX SEE D-16133

NOTE: ALL VALVES TO BE INSTALLED CLOCKWISE TO CLOSE

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

0.0 5.0 10.0 15.0 20.0 25.0

WARNING

IF POWER EQUIPMENT OR EXPLOSIVES ARE TO BE USED FOR EXCAVATION ON THIS PROJECT THE CONTRACTOR MUST:

1) NOTIFY THE GAS COMPANY OF THE PROPOSED LOCATION OF EXCAVATION.

2) TAKE PRECAUTION TO AVOID DAMAGE TO GAS COMPANY INSTALLATIONS.

SEE PROVINCIAL REGULATION 210/72 FOR DETAILS

LOCATION APPROVED
UNDERGROUND STRUCTURES

SUPV. U/G STRUCTURES COMMITTEE _____ DATE _____

NOTE:

LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.

VERTICAL DATUM: CGVD28 (HT2.0 Geoid)

HORIZONTAL DATUM: NAD83 (June 1990), Zone 14

NO.	REVISIONS	DATE	BY

DESIGNED BY	RG	CHECKED BY	SC
DRAWN BY	AJ/AOM	APPROVED BY	KZ
SCALE:		RELEASED FOR CONSTRUCTION	
HORIZONTAL	1:250		
VERTICAL	1:50		
DATE	2022 03 09	DATE	

PLOT DATE: 2022 03 09

ENGINEER'S SEAL

CONSULTANT DRAWING NUMBER
–

BID OPPORTUNITY: 882-2021
CONTRACT NUMBER: 12

Winnipeg

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

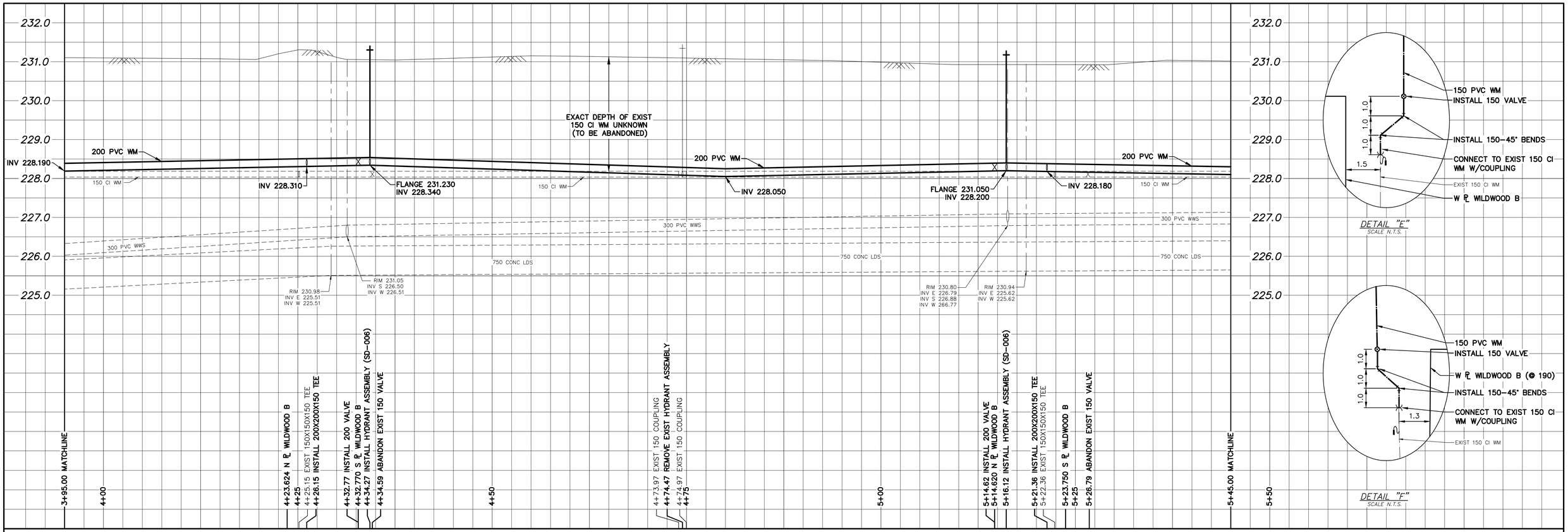
2022 WATER MAIN RENEWALS
CONTRACT 12

NORTH DRIVE
145 S OF OAKENWALD AVENUE TO
47.5 S OF WILDWOOD C (E-LEG)

SHEET 6 OF 11

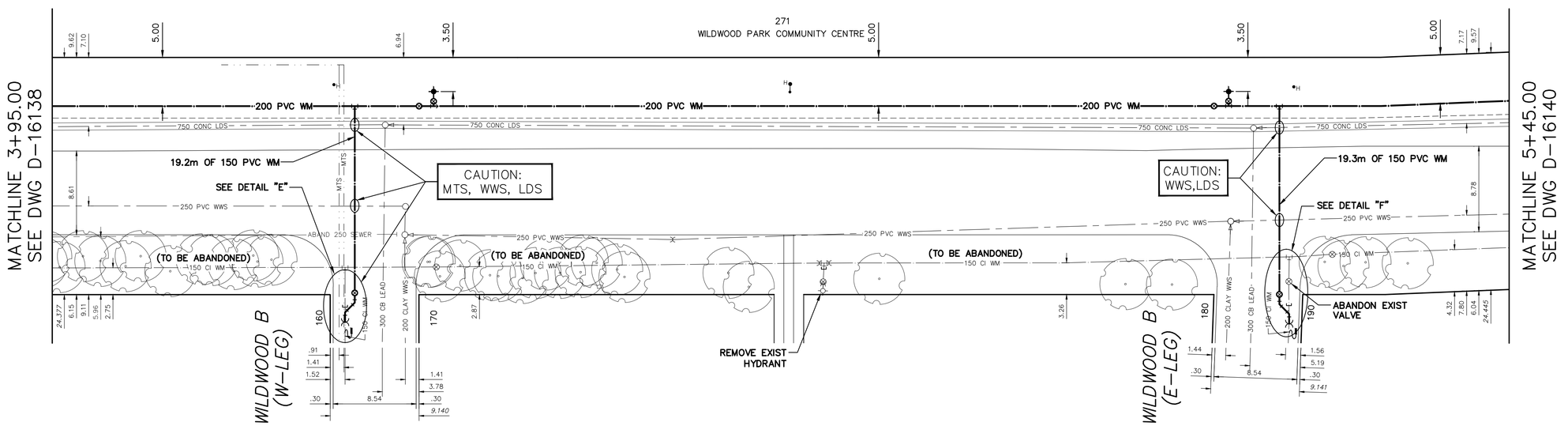
CITY DRAWING NUMBER
D-16137

FILE PATH: R:\DRAWINGS\WATER\RENEWAL\2022 RENEWALS\Contract 12\Construction dwg\
FILE NAME: NORTH DR.dwg



NOTE: CHAINAGES SHOWN ARE ALONG S. ℄ OF NORTH DRIVE

NORTH DRIVE



WATER SERVICE INFORMATION

WATER SERVICES TO ALL HOUSES ON WILDWOOD A, B, C, AND D SERVICED FROM WATER MAINS LOCATED ON THOSE PARTICULAR STREETS.

FOR INDEX SEE D-16133

NOTE: ALL VALVES TO BE INSTALLED CLOCKWISE TO CLOSE

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

0.0 5.0 10.0 15.0 20.0 25.0

WARNING

IF POWER EQUIPMENT OR EXPLOSIVES ARE TO BE USED FOR EXCAVATION ON THIS PROJECT THE CONTRACTOR MUST:

1) NOTIFY THE GAS COMPANY OF THE PROPOSED LOCATION OF EXCAVATION.

2) TAKE PRECAUTION TO AVOID DAMAGE TO GAS COMPANY INSTALLATIONS.

SEE PROVINCIAL REGULATION 210/72 FOR DETAILS

LOCATION APPROVED
UNDERGROUND STRUCTURES

SUPV. U/G STRUCTURES COMMITTEE _____ DATE _____

NOTE:

LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.

VERTICAL DATUM: CGVD28 (HT2.0 Geoid)

HORIZONTAL DATUM: NAD83 (June 1990), Zone 14

NO.	REVISIONS	DATE	BY

DESIGNED BY	RG	CHECKED BY	SC
DRAWN BY	AJ/AOM	APPROVED BY	KZ
SCALE:		RELEASED FOR CONSTRUCTION	
HORIZONTAL	1:250		
VERTICAL	1:50		
DATE	2022 03 09	DATE	

PLOT DATE: 2022 03 09

ENGINEER'S SEAL

CONSULTANT DRAWING NUMBER
–

BID OPPORTUNITY: 882-2021
CONTRACT NUMBER: 12

Winnipeg

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

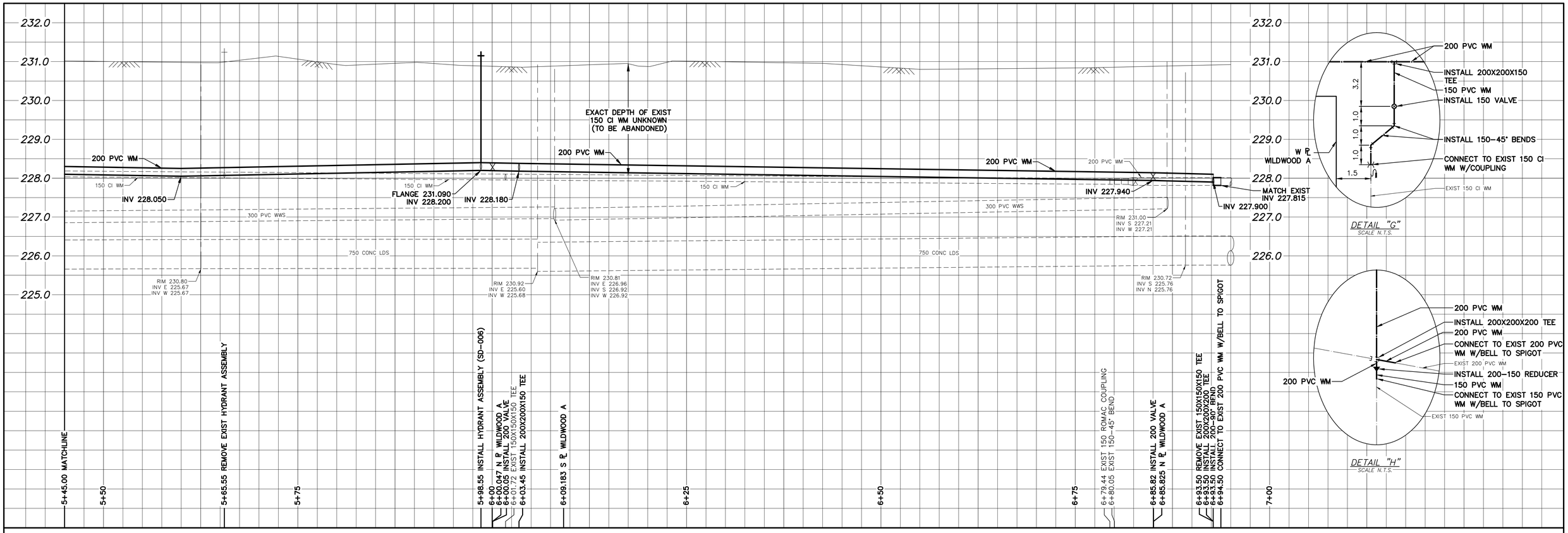
2022 WATER MAIN RENEWALS
CONTRACT 12

NORTH DRIVE
47.5 S OF WILDWOOD C (E-LEG) TO
18.2 S OF WILDWOOD B (E-LEG)

SHEET 7 OF 11

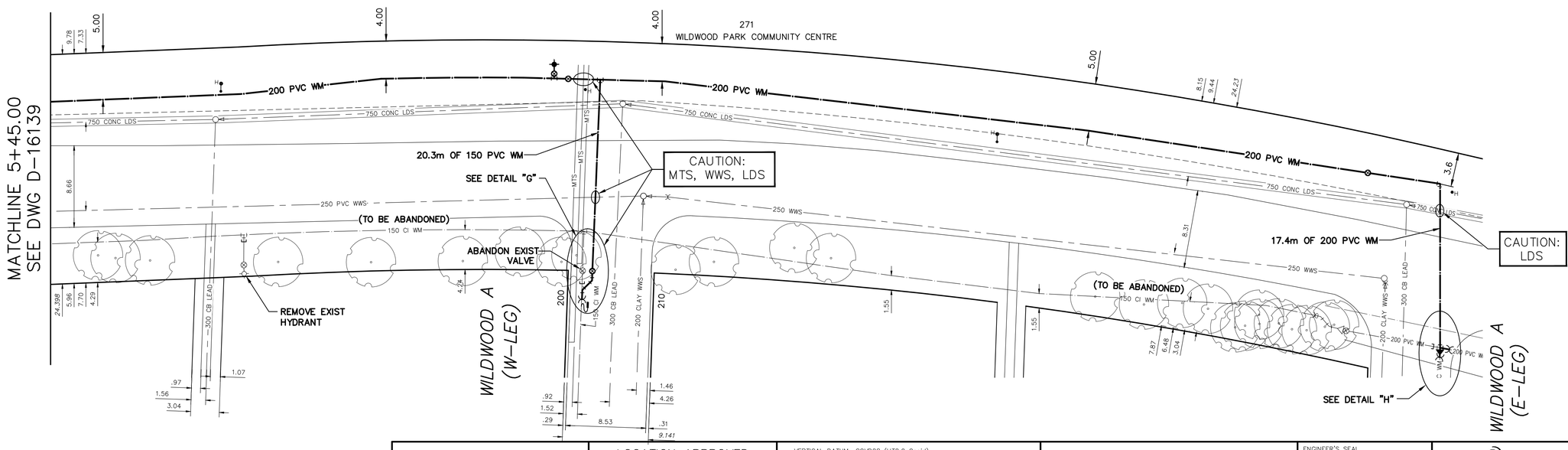
CITY DRAWING NUMBER
D-16138

FILE PATH: R:\DRAWINGS\WATER\RENEWAL\2022 RENEWALS\Contract 12\Construction dwg\
FILE NAME: NORTH DR.dwg



NOTE: CHAINAGES SHOWN ARE ALONG S. ℄ OF NORTH DRIVE

NORTH DRIVE



WATER SERVICE INFORMATION

WATER SERVICES TO ALL HOUSES ON WILDWOOD A, B, C, AND D SERVICED FROM WATER MAINS LOCATED ON THOSE PARTICULAR STREETS.

FOR INDEX SEE D-16133

NOTE: ALL VALVES TO BE INSTALLED CLOCKWISE TO CLOSE

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

0.0 5.0 10.0 15.0 20.0 25.0

WARNING

IF POWER EQUIPMENT OR EXPLOSIVES ARE TO BE USED FOR EXCAVATION ON THIS PROJECT THE CONTRACTOR MUST:

1) NOTIFY THE GAS COMPANY OF THE PROPOSED LOCATION OF EXCAVATION.

2) TAKE PRECAUTION TO AVOID DAMAGE TO GAS COMPANY INSTALLATIONS.

SEE PROVINCIAL REGULATION 210/72 FOR DETAILS

LOCATION APPROVED
UNDERGROUND STRUCTURES

SUPV. U/G STRUCTURES COMMITTEE _____ DATE _____

NOTE:

LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.

VERTICAL DATUM: CGVD28 (HT2.0 Geoid)

HORIZONTAL DATUM: NAD83 (June 1990), Zone 14

NO.	REVISIONS	DATE	BY

DESIGNED BY	RG	CHECKED BY	SC
DRAWN BY	AJ/AOM	APPROVED BY	KZ
SCALE: HORIZONTAL	1:250	RELEASED FOR CONSTRUCTION	
VERTICAL	1:50		
DATE	2022 03 09	DATE	

PLOT DATE: 2022 03 09

ENGINEER'S SEAL

CONSULTANT DRAWING NUMBER
–

Winnipeg

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION

2022 WATER MAIN RENEWALS
CONTRACT 12

NORTH DRIVE
18.2 S OF WILDWOOD B (E-LEG) TO
89.0 S OF WILDWOOD A (E-LEG)

SHEET 8 OF 11

CITY DRAWING NUMBER
D-16139

BID OPPORTUNITY: 882-2021
CONTRACT NUMBER: 12

FILE PATH: R:\DRAWINGS\WATER\RENEWAL\2022 RENEWALS\Contract 12\Construction dwg\
FILE NAME: NORTH DR.dwg