TORONTO

# REPORT FOR ACTION

# Encroachment Appeal - 100 Maclean Avenue

**Date:** May 30, 2019
**To:** Toronto East York Community Council
**From:** Manager, Permits and Enforcement, Transportation Services
**Wards:** Ward 19
**Ref. #:** P:\2019\Cluster B\TRA\Toronto and East York\Te2019016.te.row.docx

## SUMMARY

This staff report is about a matter for which Community Council has delegated authority from City Council to make a final decision.

The retaining wall does not meet the requirements of the City of Toronto Municipal Code, Chapter 743, Streets and Sidewalks, Use of, as it is not setback 0.5 meters from back of sidewalk on Avion Avenue and Maclean Avenue at 100 Maclean Avenue.

Transportation services has reviewed the application to maintain the retaining wall which is set back immediately from city's sidewalk in contravention with Municipal Code of City of Toronto, Chapter 743 City Streets and Sidewalks, Use of. It has been determined that it does not negatively impact the public right of way. The owner will be given an opportunity to make a deputation before Community Council.

## RECOMMENDATIONS

Transportation Services recommends that Toronto East York Community Council:

1. Approve the request to permit no setback from the rear edge of the sidewalk of ornamental retaining wall at 100 Maclean Avenue subject to the following conditions:

a) Indemnify the City from and against all actions, suits, claims or demands and from all loss, costs, damages, and expenses that may result from such permission granted;

b) Maintain the retaining wall at their own expense in good repair and a condition satisfactory to the General Manager of Transportation Services and will not make any additions or modifications to the encroachment beyond what is allowed under the terms of the Agreement.

c) Accept such additional conditions as the City Solicitor or the General Manager of Transportation Services may deem necessary in the interest of the City;

d) Remove the retaining wall upon receiving 90 days written notice to do so; and

e) The property owner will enter into an encroachment agreement with the City of Toronto, at the applicant's expense, and assume all liability and damages related to the encroachments.

## FINANCIAL IMPACT

There is no financial impact to the City as a result of this report.

## DECISION HISTORY

This report addresses a new initiative.

## COMMENTS

On December 17, 2018, an encroachment application was received for 100 Maclean Avenue requesting permission to maintain, on the public right of way, a 0.73 metre high ornamental retaining wall which does not comply in with the 0.5m setback from the rear edge of the sidewalk as required within the provisions of Chapter 743, Streets and Sidewalks, Use of.

An appeal was received from the property owner on December 17, 2018, for permission to maintain the retaining wall.

The Councillor has been advised about the existing retaining wall on the public right of way at 100 Maclean Avenue and has no objections to its maintenance.

A site plan, cross-section, survey and pictures showing the ornament wall and clearance from Toronto Hydro are included in attachments 1 through 4.

The proposed retaining wall at 100 Maclean Avenue does not meet the requirements of the City of Toronto Municipal Code, Chapter 743, Streets and Sidewalks, Use of. However, our assessment has indicated the retaining wall does not create sightline obstructions for driveways or pedestrians therefore, it does not negatively impact the public right of way. Transportation Services has no objections to the maintenance of the retaining wall within the public right of way.

## CONTACT

Antonia Markos, Manager, Permits and Enforcement,
Transportation Services
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E-mail: Antonia.Markos@toronto.ca

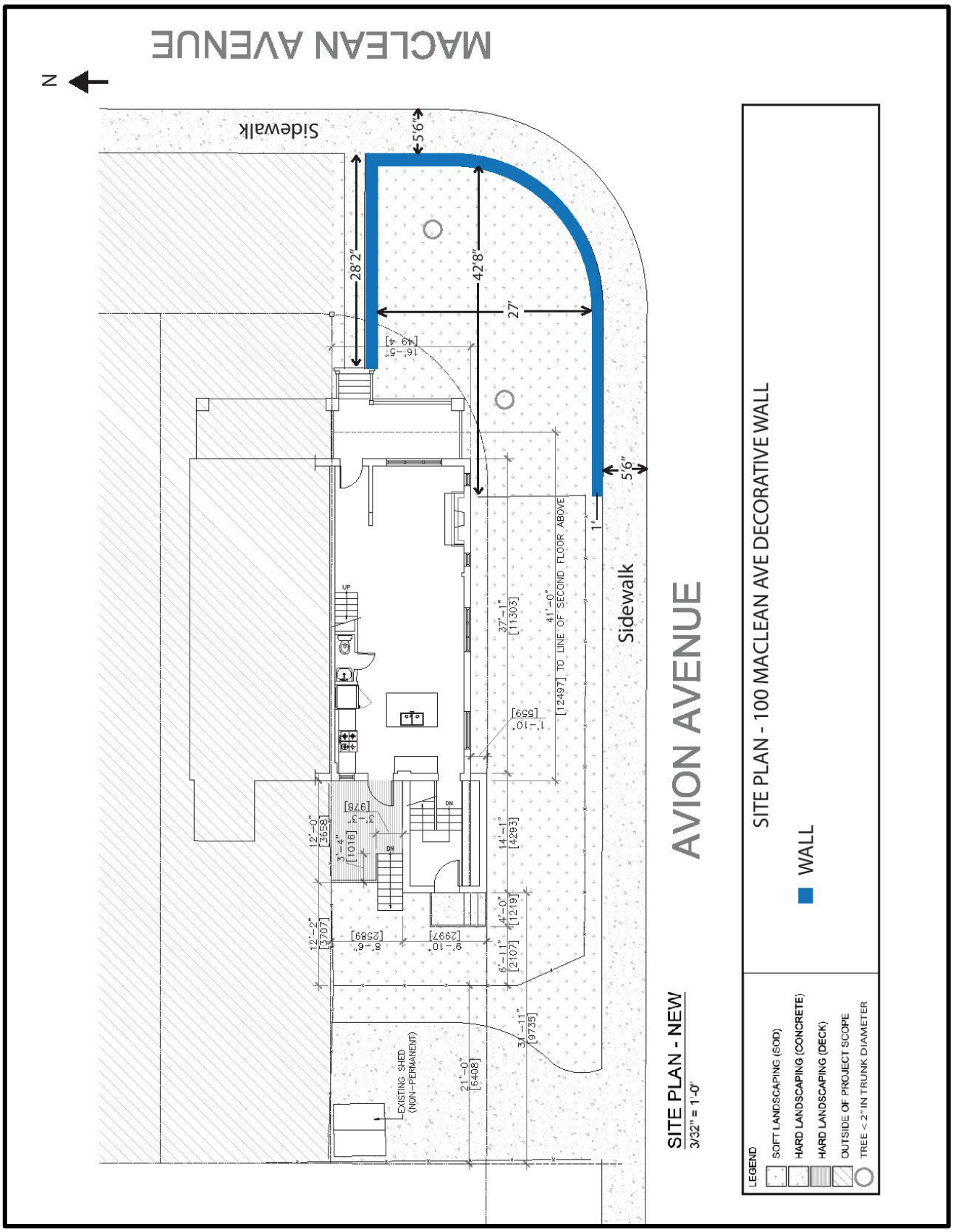
## SIGNATURE

Antonia Markos, Permits and Enforcement
Manager

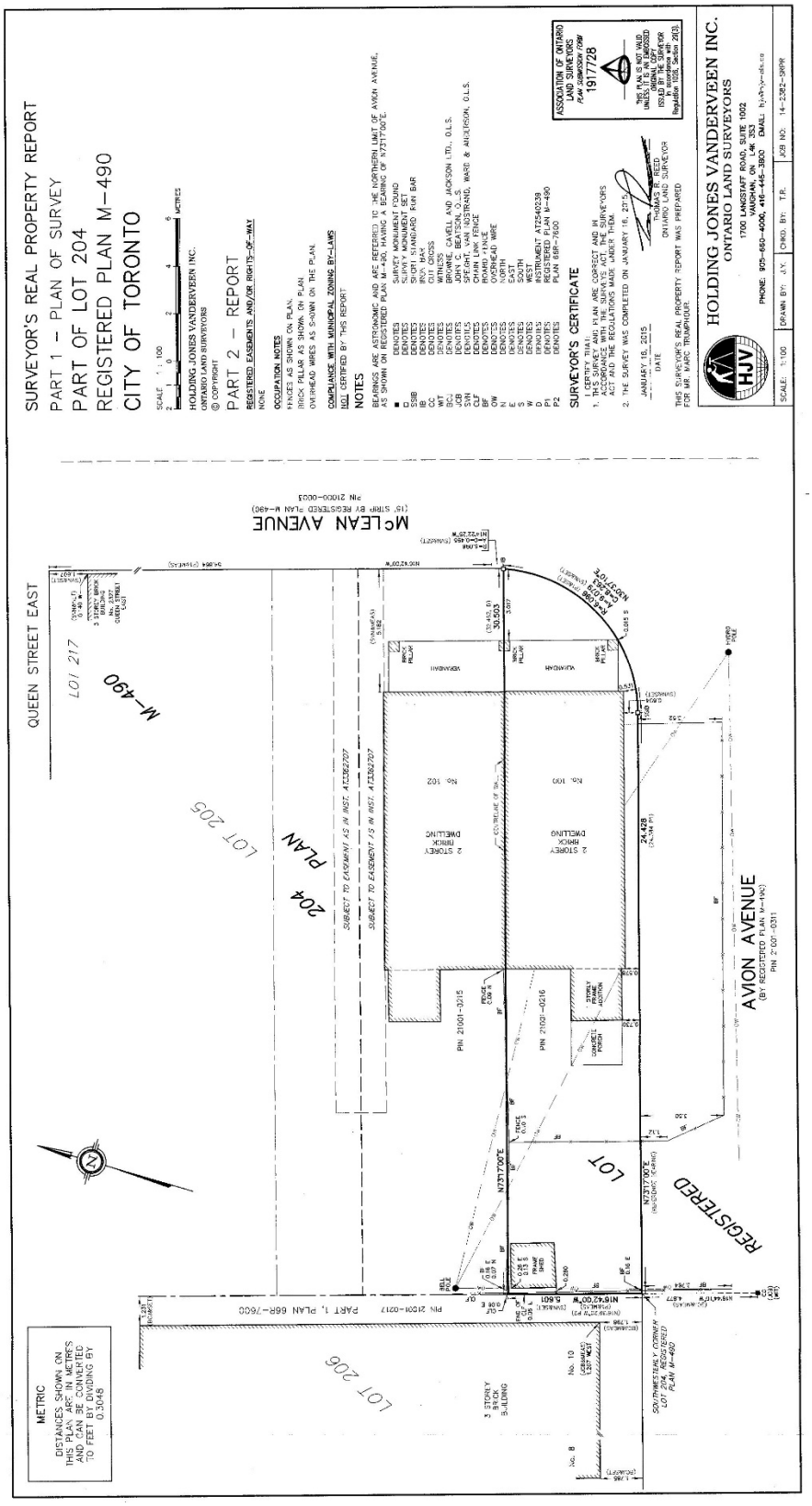
## ATTACHMENTS

| | |
|---|---|
| Attachment 1: | Site Plan |
| Attachment 2: | Survey |
| Attachment 3: | Retaining wall on Avion Road and Maclean Avenue |
| Attachment 4: | Toronto Hydro setback approval |

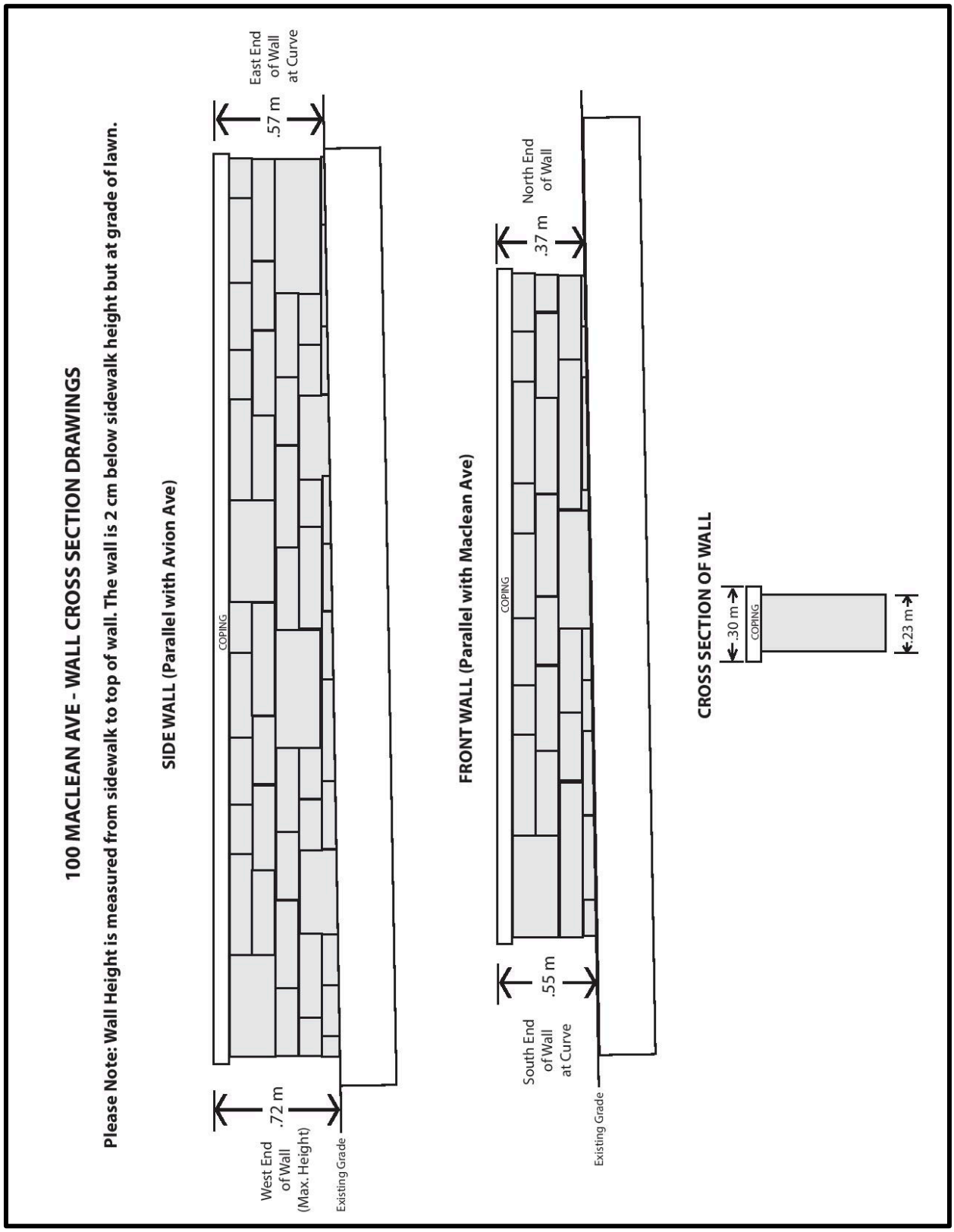
## ATTACHMENT 1: SITE PLAN



## ATTACHMENT 2: SURVEY



## ATTACHMENT 3 – RETAINING WALL ON AVION ROAD AND MACLEAN AVENUE



## ATTACHMENT 3 – RETAINING WALL ON AVION ROAD AND MACLEAN AVENUE

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## ATTACHMENT 4 – TORONTO HYDRO SETBACK APPROVAL

### UTILITY CIRCULATION RESPONSE
### FOR FULL-STREAM PERMIT APPLICATION TO THE CITY OF TORONTO

**APPLICANT NAME: Danijela and Marc Trumphour**

**TORONTO HYDRO FILE NUMBER: THU2019-00471CN**

**CLIENT'S PROJECT NUMBER: 100 Maclean Ave, Toronto**

**CLIENT'S DRAWING(S) & PHOTOS REVIEWED: Wall Away From Hydro Pole Both Sides; Wall Distance to Left Side of Pole; Wall Distance to Right Side of Pole; Wall Front View; 100 Maclean Survey; 100 Maclean Ave Cross Section Drawing; 100 Maclean Ave Wall SIte Plan Drawing.pdf**

**REPLY DATE: April 9, 2019**

### RESPONSE:

**NOT AWARE OF ANY CONFLICT**

Toronto Hydro is in receipt of your email sent to utility.circulations@torontohydro.com**.** We have reviewed your drawings, provided the requested information.

Accordingly, Toronto Hydro is providing its sign off pursuant to the City of Toronto's Municipal Consent Requirements and does not object to the proposed work with the following conditions.

This response is only valid for **6 months** from the reply date written above. After 6 months, the Public Utility Circulation must be resubmitted to Toronto Hydro for review and sign-off for the proposed work as part of the Full-Stream Permit Application process.

Comments: (The revised retaining wall has 600mm horizontal clearance away from existing hydro pole #8)

- Any proposed work must maintain the minimum horizontal and vertical clearances as per Toronto Hydro Construction Standard 31-0100, 31-0500 attached hereto. Clearance measurements are taken from the edge of the hydro plant to the edge of the proposed work.
- If the proposed work is within 1 m from a pole, and a pole support is required, all costs will be paid by the applicant.
- Mechanical equipment such as crane and hoist shall not be operated within 3 m of hydro lines or equipment.
- All the safety rules and regulation must be comply with and all the items listed in this document must be strictly adhered to
- Any damage done to Toronto Hydro's plant will be promptly repaired to Toronto Hydro's satisfaction at the owner's own expense.

### PRIOR TO CONSTRUCTION

Request locates from Ontario One Call at 1-800-400-2255 or online at http://www.on1call.com.

Review the ESA/TSSA Guideline for Excavation in the Vicinity of Utility Lines, available on the ESA Electrical Distribution Safety website: http://www.esaeds.info.

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## ATTACHMENT 4 – TORONTO HYDRO SETBACK APPROVAL

Please email thirdpartytransfers ( thirdpartytransfers@torontohydro.com ) for permit of Attachment & Leases.

Please email (customerrequest@torontohydro.com ) for hydro plant disconnection, removal or relocation prior to any demolishing and caisson construction work.

### Relocations

Toronto Hydro assets can be relocated at the expense of the Applicant.

If the relocation of Toronto Hydro assets is necessary, please contact Utility Relocations group at utility.relocations@torontohydro.com to begin a relocation request.

After sufficient information has been received to process a relocation request, Toronto Hydro relocation projects typically require 12 to 18 months to be completed.

Toronto Hydro will require a deposit or full payment in advance of doing the work.

### Overhead Toronto Hydro Assets – General Guidelines

Mechanical equipment such as crane and hoist shall not be operated within 3 m of lines or equipment.

No awning, billboard, antenna mast, flag, roof or similar structure shall be installed on the public allowance or immediately adjacent to private property that is within 3 m of lines or equipment.

### Underground Toronto Hydro Assets – General Guidelines

For heavy equipment operation in the vicinity of Toronto Hydro underground plant, ensure the requirements from Toronto Hydro Distribution Construction Standard 31-0500 (attached hereto) are met.

Breaking into, or accessing, cable chambers, vaults and handwells is not permitted without consent from the relevant Toronto Hydro Dept., and anyone found to have so done will be prosecuted to the fullest extent of the law and pursued civilly for any damage.

Tunneling within 3m is deemed a conflict that requires a Professional Engineering report to resolve.

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## ATTACHMENT 4 – TORONTO HYDRO SETBACK APPROVAL

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## ATTACHMENT 4 – TORONTO HYDRO SETBACK APPROVAL

**RECOMMENDED UNDERGROUND CLEARANCES BETWEEN TORONTO HYDRO PLANT AND OTHER UTILITIES (MINIMUM CLEARANCE SET BY CITY MCR PUBLISHED 2016-05)**

| UTILITY OR PLANT | DESCRIPTION | | | CLEARANCES (EDGE TO EDGE) mm (ft-in) | |
|---|---|---|---|---|---|
| | | | | VERTICAL | HORIZONTAL |
| RAILWAY TRACKS | HEAVY RAIL (CN / CP / GO) | | | REFER TO STD. 31-1310 | |
| | LIGHT RAIL (TTC / LRT / METROLINX) | | | REFER TO STD. 31-1200 | |
| HYDRO ONE | DUCT BANK | | | 1000 (3'-4") | 1000 (3'-4") |
| BELL CANADA | MANHOLES | | | 1000 (3'-4") | 1000 (3'-4") |
| | CONCRETE ENCASED DUCT BANK (SEE NOTE 4) | | | 600 (1'-0") | 600 (2'-0") |
| | DIRECT BURIED, OR NON-CONCRETE ENCASED | | | 300 (1'-0") | 600 (2'-0") |
| ROGERS/TELUS/ETC | ALL INFRASTRUCTURE (SEE NOTE 4) | | | 300 (1'-0") | 600 (2'-0") |
| ENWAVE ENERGY CORPORATION | STEAM PIPELINES | | | 600 (2'-0") | 600 (2'-0") |
| | CHILLED WATER PIPELINES | | | 300 (1'-0") | 300 (1'-0") |
| ENBRIDGE GAS NATIONAL ENERGY BOARD | < 300 (1'-0") DIA. | | | 300 (1'-0") | 600 (2'-0") |
| | ≥ 300 (1'-0") DIA. | | | 600 (2'-0") | 600 (2'-0") |
| | NEB REGULATED PIPELINES AND VITAL MAINS | | | 600 (2'-0") | 1000 (3'-4") |
| | ALL PIPELINES (DIRECTIONAL DRILLING/BORING ) | | | 1000 (3'-4") | 1000 (3'-4") |
| CITY OF TORONTO | TREES | | | SEE NOTE 1 AND REFER TO STD. 31-0400 | |
| | TRAFFIC SIGNAL DUCT | | | 300 (1'-0") | 600 (2'-0") |
| | SEWERS | STORM | < 150 (6") | 150 (6") | 600 (2'-0") |
| | | | 150 (6") < 750 (2'-6") | 300 (1'-0") | 750 (2'-6") |
| | | | ≥ 750 (2'-6") | 500 (1'-8") | 900 (3'-0") |
| | | | MAINT. HOLE | - | 600 (2'-0") |
| | | SANITARY/ COMBINED | <100 (4") | 150 (6") | 600 (2'-0") |
| | | | 100 (4") < 375 (1'-3") | 300 (1'-0") | 750 (2'-6") |
| | | | ≥ 375 (1'-3") | 500 (1'-8") | 900 (3'-0") |
| | | | MAINT. HOLE | - | 600 (2'-0") |
| | WATERMAINS | | < 100 (4") | 150 (6") | 600 (2'-0") |
| | | | 100 (4") < 400 (1'-4") | 300 (1'-0") | 750 (2'-6") |
| | | | ≥ 400 (1'-4") | 500 (1'-8") | 900 (3'-0") |
| | | | VALVE CHAMBER | SEE NOTE 5 | 600 (2'-0") |
| TORONTO HYDRO | PADMOUNT OR SUB / SPLICE VAULT (GROUNDING LOCATED OUTSIDE STRUCTURE) | | | - | 1400 (4'-7") |
| | BASE MOUNTED POLES (REINFORCED SIDEWALK BAY OR POLE BASE) | | | - | 600 (2'-0") SEE NOTE 3 |

| DISTRIBUTION CONSTRUCTION STANDARD CIVIL CONSTRUCTION | | | UNDERGROUND CLEARANCES | | | | |
|---|---|---|---|---|---|---|---|
| TORONTO HYDRO | Approved by: J.D. 2017-05-29 | | | | | | |
| | Drafted by: B.D. | Designed by: J.D. | Original issue: J.D. 2000-12-28 | Scale: N.T.S. | Rev. 7 | 31-0100 | 1/2 |

## ATTACHMENT 4 – TORONTO HYDRO SETBACK APPROVAL

NOTES:

1) ANY CONSTRUCTION ACTIVITY IN THE VICINITY OF TREES SHALL BE CARRIED OUT IN COMPLIANCE WITH LATEST CITY OF TORONTO'S "TREE PROTECTION POLICY AND SPECIFICATIONS FOR CONSTRUCTION NEAR TREES" DOCUMENT.

2) IF THE MINIMUM CLEARANCES SHOWN CANNOT BE MET, THE SUBJECT UTILITIES APPROVAL MAY BE OBTAINED FOR REDUCED CLEARANCES.

3) HORIZONTAL CLEARANCE SHALL BE FROM EDGE OF REINFORCED SIDEWALK BAY OR POLE BASE TO EDGE OF PROPOSED PLANT. CONTRACTOR SHALL AT NO TIME CUT INTO REINFORCED SIDEWALK BAYS AND POLE BASES. SIDEWALK BAYS AND POLE BASES PROVIDE LOADING SUPPORT FOR THE POLE. PLANT CAN BE INSTALLED UNDER REINFORCED SIDEWALK BAYS BY TUNNELING AT A MINIMUM VERTICAL CLEARANCE OF 600 mm (2'-0"). PLANT SHALL NOT BE INSTALLED UNDER POLE BASE.

4) IF THE MINIMUM HORIZONTAL CLEARANCE FOR UTILITIES INSTALLING PLANT CLOSE TO THESL PLANT CANNOT BE MET DUE TO EXISTING FIELD CONDITION, CLEARANCE CAN BE REDUCED TO 300 mm (1'-0") WITH THE CONTRACTOR/CUSTOMER PROVIDING THE FOLLOWING TO TORONTO HYDRO:

   A) A LETTER, STAMPED AND SIGNED BY A PROFESSIONAL ENGINEER OF ONTARIO, OUTLINING:
      - THAT THE CONTRACTOR/CUSTOMER IS RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH SUPPORT AND INSPECTION, AS WELL AS ANY DAMAGES AND ASSOCIATED COSTS;
      - THAT THE ACHIEVABLE CLEARANCE IS NOT LESS THAN 300 mm (1'-0");
      - THE METHOD OF PROTECTION AND/OR SUPPORT. SUPPORT IS REQUIRED IF TORONTO HYDRO PLANT IS UNDERMINED;
      - THAT THIS IS A UNIQUE SCENARIO THAT REQUIRES A DEVIATION FROM TYPICAL CONSTRUCTION STANDARD, AND IDENTIFY THAT THE DEVIATION IS ALSO FROM THE TYPICAL CLEARANCES SET OUT BY TORONTO HYDRO AND THE CITY OF TORONTO.

   B) DRAWING WHICH SHALL INCLUDE:
      - STAMP AND SIGNATURE OF A PROFESSIONAL ENGINEER IN THE PROVINCE OF ONTARIO;
      - LENGTH OF THE PLANT BEING SUPPORTED AND/OR PROTECTED;
      - METHOD OF PROTECTION AND/OR SUPPORT SYSTEM IN BOTH PLAN AND SECTION VIEWS;
      - MAXIMUM DEFLECTION OF THE PLANT WITH THE SUPPORT;
      - DEFLECTION MONITORING SYSTEM PLACEMENT IF SOIL SETTLEMENT WILL OCCUR ON SITE;
      - BACKFILLING PROCEDURES;
      - THAT THE ACHIEVABLE CLEARANCE IS NOT LESS THAN 300 mm (1'-0").

   C) A PURCHASE ORDER FOR THE AMOUNT OF TIME A CIVIL INSPECTOR FROM TORONTO HYDRO WILL BE REQUIRED ON SITE. AN ESTIMATE WILL BE PROVIDED BY TORONTO HYDRO.

5) CONTACT THE CITY OF TORONTO FOR MINIMUM VERTICAL CLEARANCE TO WATER VALVE CHAMBER.

6) FOR ABOVE GRADE CLEARNACES REFER TO:
   - 03-2300 BUILDING AND PERMANENT STRUCTURES
   - 03-2400 POLES AND PRIVATE FENCES
   - 04-4100 POLE LOCATION GUIDELINES

| DISTRIBUTION CONSTRUCTION STANDARD **CIVIL CONSTRUCTION** | | | UNDERGROUND CLEARANCES | | | | |
|---|---|---|---|---|---|---|---|
| TORONTO HYDRO | Approved by: J.D. 2017-05-29 | | | | | | |
| | Drafted by: B.D. | Designed by: J.D. | Original issue: J.D. 2000-12-28 | Scale: N.T.S. | Rev. 7 | 31-0100 | 2/2 |

## ATTACHMENT 4 – TORONTO HYDRO SETBACK APPROVAL

**HEAVY EQUIPMENT OPERATION**
**IN THE VICINITY OF THE**
**TORONTO HYDRO UNDERGROUND PLANT**

**1.0 PURPOSE**

**1.1** To provide guidance to external party (contractor, developer or its agent) in the preparation of plans and proposals for the use of Heavy Equipment in the vicinity of the Toronto Hydro underground plant.

**1.2** To maintain the electrical supply and to ensure the safety of persons, the structural integrity of the Toronto Hydro underground plant shall not be compromised whenever Heavy Equipment is used by an external party.

**2.0 DEFINITIONS**

**2.1 Underground Plant**

- **Cable Chamber**
  A reinforced concrete structure (walls, floor & roof slab) housing cables to accommodate cable connections or a change in cable direction. A cable chamber roof slab has a round lid, used for entering and exiting the cable chamber. A cable chamber roof slab is usually installed at a depth ranging from approximately 600 mm (2'-0") to 1250 mm (4'-2") below finished grade. Refer to Toronto Hydro Distribution Construction Standards, Section 31 – Cable Chambers
- **Conduit**
  A grouping of PVC ducts housing cables, either direct buried or encased in concrete, installed at a depth ranging from approximately 800 mm (2'-8") to 1000 mm (3'-4") below finished grade. Refer to Toronto Hydro Distribution Construction Standards, Section 31 – Conduits.
- **Vault**
  A cast in place reinforced concrete structure (walls, floor & roof slab) used for the purpose of housing transformers, cables, switchgears and other electrical equipment. A vault roof is constructed flush with finished grade. Refer to Toronto Hydro Distribution Construction Standards, Section 31 – Vaults.
- **Submersible Vault**
  A precast reinforced concrete structure (walls and floor), used for the purpose of housing transformers in residential sub-divisions. A Submersible vault roof is made of steel and is constructed flush with finished grade. Submersible vaults are installed in grass boulevards or sidewalks. A vault roof is constructed flush with finished grade. Refer to Toronto Hydro Distribution Construction Standard 31-5100.
- **Handwell or Tap/Splice Box**
  A fiberglass box with either fiberglass or composite lid, used for the purpose of making multiple cable connection or terminating ducts, installed in grass boulevard or sidewalk. Refer to Toronto Hydro Distribution Construction Standards, Section 31 – Splice Boxes.
- **Direct Buried Cables**
  Cable installed without any mechanical protection.

| DISTRIBUTION CONSTRUCTION STANDARD **Civil Construction** | | | HEAVY EQUIPMENT OPERATION IN THE VICINITY OF THE TORONTO HYDRO UNDERGROUND PLANT | | | | |
|---|---|---|---|---|---|---|---|
| TORONTO HYDRO | Approved by: | | | | | | |
| | Drafted by: H.M. | Designed by: J.D. | Original issue: J.D. 2012-08-27 | Scale: N.T.S. | Rev 0 | 31-0500 | 1/3 |

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**2.2 Heavy Equipment**

Any equipment (cranes, trucks, bulldozers, compactors, etc.) having weights exceeding CSA-S6-06, clause A3.4.1 CL-625-ONT live truck loading.

**3.0 REFERENCES**

All construction work shall conform to all the latest issues of referenced codes, standards, regulations and by-laws:

- Canadian Highway Bridge Design Code CSA-S6-06;
- Occupational Health & Safety Act and Regulation for Construction Project 1990 and Ontario Regulations 213/91;
- The Electricity Act, 1998 and the Ontario Regulation 22/04 Electrical Distribution Safety Regulation and other regulations which apply under this Act.

**4.0 TECHNICAL INFORMATION**

**4.1** All Toronto Hydro underground plant is designed in accordance with the Canadian Highway Bridge Design Code CSA-S6-06, clause A3.4.1 CL-625-ONT live truck loading.

**4.2** The external party shall be responsible to confirm the depth and the location of the Toronto Hydro underground plant by having test holes excavated as necessary.

**4.3** The external party shall assume that all underground and overhead conductors if encountered are live unless otherwise notified by Toronto Hydro.

**4.4** The external party shall ensure that the Heavy Equipment is used in accordance with the manufacturers' instructions and all applicable regulations.

**4.5** The external party shall ensure that all the appropriate safety measures are considered when using Heavy Equipment in the vicinity of the Toronto Hydro underground plant.

**4.6** A minimum 2000 mm (6'-8") clearance is required between a conduit, direct buried and the Heavy Equipment. If minimum clearances cannot be met then the external party will have to submit a request to Toronto Hydro for approval as per clause 5.2 of this document.

**4.7** A minimum 2000 mm (6'-8") horizontal clearance is required between the handwell or tap/splice box and the Heavy Equipment. Handwell and tap/splice box lids are not designed to support heavy load from equipment, vehicular traffic or Heavy Equipment. If minimum clearances cannot be met then the external party will have to submit a request to Toronto Hydro for approval as per clause 5.2 of this document.

**4.8** A minimum 3000 mm (10'-0") horizontal clearance is required between submersible vault, cable chamber, vault, submersible vault and the Heavy Equipment. If minimum clearances cannot be met then the external party will have to submit a request to Toronto Hydro for approval as per clause 5.2 of this document.

**4.9** No equipment including Heavy Equipment will be allowed to be placed directly on top of vault and submersible vault roofs, handwells or tap/splice box lids.

| DISTRIBUTION CONSTRUCTION STANDARD **Civil Construction** | | | HEAVY EQUIPMENT OPERATION IN THE VICINITY OF THE TORONTO HYDRO UNDERGROUND PLANT | | | | |
|---|---|---|---|---|---|---|---|
| TORONTO HYDRO | Approved by: | | | | | | |
| | Drafted by: H.M. | Designed by: J.D. | Original issue: J.D. 2012-08-27 | Scale: N.T.S. | Rev. 0 | 31-0500 | 2/3 |

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**5.0 RESPONSIBILITIES**

**5.1 Toronto Hydro (Standards & Materials Section):**

- Review the external party submission;
- Provide the external party with Toronto Hydro Distribution Construction Standard 31-0500;
- Field inspect/assess the Toronto Hydro underground plant and provide information to the external party;
- Review the external party's submission (including type of work conducted, drawings, structural analysis of the design, and the geotechnical report and any other related information dealing with using Heavy Equipment) and provide a recommendation;
- Notify the external party if the Heavy Equipment is allowed or disallowed to be used in the vicinity of Toronto Hydro plant.

**5.2 External Party:**

- Submit a request to the Toronto Hydro Standards and Materials section when using Heavy Equipment that will be operated under the following conditions:

  1) Within 3000 mm (10'-0") of Toronto Hydro's cable chambers, vaults, direct buried cables or submersible vaults;

  2) Within 2000 mm (6'-8") of Toronto Hydro's conduits, handwells, direct buried cables or tap/splice boxes.

  3) Crossing over Toronto Hydro's underground plant.

- When submitting the initial request, the external party is to provide Toronto Hydro with the following information: including type of work conducted, drawings, structural analysis of the design, and the geotechnical report and any other related information dealing with using Heavy Equipment.
- Submit a geotechnical report and structural analysis of the design, signed by a professional engineer licensed in Ontario, stating the added forces applied to Toronto Hydro's underground plant with as much lead time as possible (2-4 weeks). Submit follow up structural analysis/design if required;
- Follow the Toronto Hydro Distribution Construction Standard 31-0500;
- Pay for any costs associated with the use of the Heavy Equipment that Toronto Hydro may request;
- Be liable for all damages caused to the Toronto Hydro underground plant.

| DISTRIBUTION CONSTRUCTION STANDARD **Civil Construction** | | | HEAVY EQUIPMENT OPERATION IN THE VICINITY OF THE TORONTO HYDRO UNDERGROUND PLANT | | | | |
|---|---|---|---|---|---|---|---|
| TORONTO HYDRO | Approved by: | | | | | | |
| | Drafted by: H.M. | Designed by: J.D. | Original issue: J.D. 2012-08-27 | Scale: N.T.S. | Rev. 0 | 31-0500 | 3/3 |

Records Services, Engineering Services