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|---|-------------------|--------------------------|----------------|
|  |                   | TITLE:                   |                |
|   |                   | <b>Working Procedure</b> |                |
| RECOMMENDED:  | <b>M. Lawton</b>  | NO:                      | <b>DFS0002</b> |
| APPROVED:   | <b>N. Sharma</b>  |                          |                |
| REV. DATE:  | <b>2022-08-17</b> |                          |                |
|   |                   |                          | REV:           |
|   |                   |                          | <b>4</b>       |

**ELECTRICAL & CIVIL DISTRIBUTION**

**AS-BUILT CONSTRUCTION DRAWINGS**

## REVISION SHEET

| Revision | Description  | Date       | Initial |
|----------|--|------------|---------|
| 0        | Original Document  | 2003-04-01 | mm/csm  |
| 1        | Updated for internal and external use, added overhead & underground trunk                            | 2008-08-26 | cp/csm  |
| 2        | Section 5.4 Substations added  | 2009-02-19 | cp/csm  |
| 3        | Removed Microstation references and updated As-Built examples  | 2019-09-06 | sk/sj   |
| 4        | Added Underground – 3 <sup>rd</sup> Party Duct Occupation, revised “manholes” to “maintenance holes” | 2022-07-07 | ml/ns   |

| TABLE OF CONTENTS   | PAGE                         |
|---|------------------------------|
| <b>1.0 Introduction</b> .....   | <b>5</b>                     |
| <b>2.0 Reference</b> .....  | <b>5</b>                     |
| <b>3.0 Scope</b> .....  | <b>5</b>                     |
| <b>4.0 Definitions</b> .....  | Error! Bookmark not defined. |
| <b>5.0 As-Built Drawing Submission</b> .....                                  | <b>5</b>                     |
| 5.1 General.....  | 5                            |
| 5.1.1 Format .....  | Error! Bookmark not defined. |
| 5.1.2 Media .....   | 5                            |
| 5.1.3 As-Built Information .....  | 6                            |
| 5.1.4 Addition and/or Removal of Electrical Distribution Equipment .....      | 6                            |
| 5.1.5 Deviation from Hydro Standard Wiring Practice .....                     | 6                            |
| 5.1.6 Faulted Circuit Indicator.....  | 6                            |
| 5.1.7 Surge Arresters .....   | Error! Bookmark not defined. |
| 5.1.8 Primary Metering Point.....   | 6                            |
| 5.1.9 Land, Access, and Operating / Maintenance Agreements .....              | 6                            |
| 5.2 Underground .....   | 6                            |
| 5.2.1 Underground Duct Banks .....  | 6                            |
| 5.2.2 Underground Chambers .....  | 7                            |
| 5.2.3 Typical Subdivision Layout .....  | 7                            |
| 5.2.4 Primary Cable Splice – Direct buried .....                              | 7                            |
| 5.2.5 Primary Cable Terminations .....  | 7                            |
| 5.2.6 Equipment Nomenclature and Underground Schematic.....                   | 7                            |
| 5.3 Overhead .....  | 8                            |
| 5.3.1 Setting Depth and Offset of Line Poles and Anchors .....                | 8                            |
| 5.3.2 Standard Framing and Construction of Overhead Pole Lines.....           | 8                            |
| 5.3.3 Ground Electrodes.....  | 8                            |
| 5.3.4 Pole Mounted Transformers .....   | 8                            |
| 5.3.5 Overhead Line Switches.....   | 8                            |
| 5.3.6 Overhead Line Connections .....   | 8                            |
| 5.3.7 Overhead Conductors .....   | 8                            |
| 5.3.8 Secondary Services From Overhead Supply Points .....                    | 8                            |
| 5.4 Substations .....   | 8                            |
| 5.4.1 General .....   | 8                            |
| 5.4.2 Civil Drawings.....   | 9                            |
| 5.4.3 Site layout drawings .....  | 9                            |
| 5.4.4 Electrical elementary and wiring drawings. ....                         | 9                            |
| 5.4.5 Electrical equipment drawings.....                                      | 9                            |
| 5.4.6 Update procedure for As-Built drawings.....                             | 9                            |
| <b>6.0 Drawing Author Information</b> .....                                   | <b>9</b>                     |
| <b>7.0 Plant Identifiers</b> .....  | <b>10</b>                    |
| <b>8.0 Incomplete Data</b> .....  | <b>10</b>                    |
| <b>9.0 Production of As-Built Drawings</b> .....                              | <b>10</b>                    |
| <br>  |                              |
| Schedule 1 – Example Residential Underground Cable Replacement Civil As-built |                              |
| Schedule 2 – Example Underground Residential Civil As-Built                   |                              |
| Schedule 3 – Example Overhead Distribution As-Built                           |                              |
| Schedule 4 – Example Underground Distribution Civil As-Built                  |                              |
| Schedule 5 – Example Underground Distribution Electrical As-Built             |                              |

**Schedule 6 – Example Underground Commercial Service Civil As-Built**  
**Schedule 7 – As-Built Field Collected Attributes**

# 1. Introduction

This document pertains to electrical power distribution systems constructed by Hydro Ottawa or constructed by others and will be owned by Hydro Ottawa.

# 2. Reference

Hydro Ottawa- DFS0004: Electrical Distribution CAD & GIS Construction Drawing Standard  
Hydro Ottawa- DFS0019: Technical Drawing Profiles Requirements  
Hydro Ottawa- DSS0006: Distribution & SCADA Drawing and Mapping Symbolology  
Hydro Ottawa - ESG0001: O. Reg. 22/04 Construction Verification Program  
Hydro Ottawa- GCS0012: Cable Tagging Identification  
Hydro Ottawa- NPS0001: Nomenclature for the Electrical System and Associated Functions  
Hydro Ottawa- UTS0005: Transformer Primary Wiring 1 Phase Padmount – Wiring Detail

# 3. Scope

This procedure identifies the requirements for as-built information to be recorded during construction and the requirements for the preparation and submission of as-built construction drawings to Hydro Ottawa.

# 4. Definitions

As-built: Recorded field changes to the approved design, submitted after installation.

Deviation: See ESG0001

Field Activity Worksheet: Any type of Construction Verification Program (CVP) sheet (green, blue, yellow, pink or orange)

# 5. As-Built Drawing Submission

## 5.1. General

As-built information shall be added to GIS in accordance with this document. As-built drawings shall be submitted within 7 working days of installation completion. In the case of large projects, the project manager may require the submission of partial as-built prior to the overall completion of the project. As-built drawings shall be delivered to the Hydro Ottawa project manager/designer for validation of the as-built information. If the drawings are being submitted by an outside agency, a request should be made by the agency for a receipt to ensure that all revisions have reached their proper destination. A Field Activity Work Sheet must be completed and submitted with the as-built drawings.

### 5.1.1. Format

Drawings may be submitted in digital format, such as .PDF or .DWG as well as paper copies

## 5.2. Media

The electronic as-built drawings shall be submitted via electronic mail, or paper formats.

#### 5.2.1. As-Built Information

All as-built measurements shall be taken from secure and visible above ground reference points, i.e. curbs, buildings, maintenance holes, hydrants, catch basins. As-built measurements which refer to items that could potentially be hidden, moved or are unstable i.e. trees, property bars shall not be used as primary dimensions but can be used as secondary measurements to compliment the primary dimension. The use of a GPS to produce as-built information is also acceptable provided it is submitted in NAD83, Zone 9, 3° projections. The global origin shall be -150,000, -4,800,000. Distribution equipment as-built information shall meet  $\pm 0.1\text{m}$  accuracy and station equipment shall meet  $\pm 0.01\text{m}$  accuracy.

#### 5.2.2. Addition and/or Removal of Electrical Distribution Equipment

Addition and/or removal of electrical distribution equipment including type, ratings, and nomenclature, shall be recorded on the drawing and noted on the electrical single line diagram(s) including type, ratings, and nomenclature.

#### 5.2.3. Deviation from Hydro Standard Wiring Practice

Changes to Hydro standard wiring practice shall be recorded on the drawing and the electrical single line diagram including the wire types, wire sizes, connector types, nomenclature, and loads installed.

#### 5.2.4. Faulted Circuit Indicator

Location of faulted circuit indicators shall be recorded at each geographical location on the drawing e.g. specific cable at transformer and switch location or pole number and the electrical single line diagram.  
Surge Arresters

#### 5.2.5. Surge Arrestors

The location of all surge arresters shall be recorded on the drawing and the electrical single line diagram except when used as part of an overhead transformer, primary metering or riser pole installation.

#### 5.2.6. Primary Metering Point

The location of a primary metering point shall be recorded on the drawing and the single line diagram.

#### 5.2.7. Land, Access, and Operating / Maintenance Agreements

If any change occurred with land rights, access, or operating / maintenance agreements during construction note specific changes.

### 5.3. Underground

#### 5.3.1. Underground Duct Banks

It is most imperative that the duct run plans are updated immediately after construction with accurate as-built measurements. Any change in line or grade as a result of unforeseen circumstances in the field, shall be duly noted, recorded and submitted to the project manager. If special protection (such as steel plates) is installed, the location of the special protection must be clearly identified on the drawings and profiles.

The exact location of the installed underground duct bank shall be recorded; see section 5.1.3 for offset measurements. The location of all cable placed in the duct bank must be identified as to duct position, voltage and cable size and type.

A minimum of two unique measurements shall be recorded from permanent and visible reference points to identify ends of duct, ends of concrete encased duct bank, duct transposition points and/or deflection points.

The plant depth where it deviates from standard (vertical measurements from top of underground plant to final grade) and installation offset (horizontal measurements from the center of underground plant) shall be recorded at a minimum of every 20m, as well at all plant deflection points and crossings of other utilities.

#### 5.3.2. Underground Chambers

Maintenance hole details shall be recorded and submitted to the project manager prior to the installation of any electrical plant. Once the electrical plant has been installed, the location of the plant shall be recorded and submitted to the project manager. See DFS0004, for maintenance hole details.

#### 5.3.3. Typical Subdivision Layout

The location of buried cables, ducts, transformer pads, vaults, switches, maintenance holes, pedestals, service entrances, and poles shall be clearly identified on the as-built drawings as per Section 5.1.3. If the cables and duct are installed in joint trenches with other utilities, the type of joint trench used is to be indicated on the as-built drawings including the utilities that are placed in the trench. A cross-section of the trench is to be shown showing the relative location of the utilities to each other.

All customer owned underground electrical plant including streetlight and telecommunication supply points that is directly energized from Hydro Ottawa owned equipment shall be shown on the as-built drawing.

Where known, the general location and routing of private underground service cables may be recorded, but it is not necessary to show the same detail as for Hydro Ottawa plant. No dimensions are expected and only a line showing the approximate location and marked "NTS" (Not to Scale) is required.

#### 5.3.4. Primary Cable Splice – Direct buried

A minimum of two unique measurements shall be recorded from permanent and visible reference points to identify the location of a direct buried primary cable splice; see Section 5.1.3

#### 5.3.5. Primary Cable Terminations

Primary cable terminations are to be recorded as to type, voltage rating and energize voltage. Inside transformer enclosure the terminations shall be identified using the cable nomenclature identifier (such as H1A, H1B etc. See UTS0005 and GCS0012) and shall be recorded on the electrical single line diagram.

#### 5.3.6. Equipment Nomenclature and Underground Schematic

Equipment nomenclature and phase identifiers (R/W/B) shall be recorded. A schematic representation of the underground cable system showing the relationship between the system, the streets and each structure on the street is to be prepared and submitted to the project manager.

## **5.4. Overhead**

### **5.4.1. Setting Depth and Offset of Line Poles and Anchors**

The specified pole setting depth and horizontal offset of the pole to the property and/or easement line shall be recorded on the drawing and profiles for each pole. See Section 5.1.3.

### **5.4.2. Standard Framing and Construction of Overhead Pole Lines**

Deviations from the specified pole framing standard e.g. insulation level, pole height type or class, line anchor type, anchor setting depth, or lead length shall be recorded on the drawing with all appropriate pole number.

### **5.4.3. Ground Electrodes**

The location of ground electrodes whether single, grid or radial formation or deep driven shall be recorded on the drawing with the appropriate pole number.

### **5.4.4. Pole Mounted Transformers**

The location of all single phase or banked overhead transformers shall be recorded on the drawing with the appropriate pole number.

### **5.4.5. Overhead Line Switches**

The location of overhead line switches, their nomenclature, ampacity and where applicable, fuse size shall be recorded on the with the appropriate pole number and on the electrical single line diagram.

### **5.4.6. Overhead Line Connections**

The connectivity and phase of all line connections shall be recorded on the drawing and the single line diagram.

### **5.4.7. Overhead Conductors**

The location, conductor type and size of all overhead primary conductors and the location, supply point, voltage level, conductor type and size of all overhead secondary bus shall be recorded on the drawing and the single line diagram.

### **5.4.8. Secondary Services From Overhead Supply Points**

The connection point of all overhead or underground services either Hydro or customer owned, metered or flat rate, at the appropriate pole or mid span connection point shall be recorded on the drawing with the appropriate pole number.

## **5.5. Substations**

### **5.5.1. General**

All drawings electronic drawing shall be produced in AutoCad 2010 format, with an approved Hydro Ottawa title block.



### 5.5.2. Civil Drawings

All civil drawings shall indicate exact locations of underground duct banks, maintenance holes, foundations and above ground structures. All high voltage structure drawings shall indicate dimensions, bolt patterns, phase-to-phase separation and type of equipment mounted on the structure. All indoor-mounted electrical mounted equipment shall be properly dimensioned with offsets from walls, doors, etc.

### 5.5.3. Site layout drawings

Site layout drawing shall indicate exact location of the installed fences, buildings, transformer foundations, oil containment facilities, switchgear foundations, duct bank locations and ground grid layout. Offsets between property line and substation fence shall be noted along each stretch of fence and at every corner post. Ground wires installed outside fence and offset to property line shall be noted on the drawing. Duct bank offset locations from buildings and foundations shall be noted on the drawing.

### 5.5.4. Electrical elementary and wiring drawings.

Electrical elementary drawings shall indicate in schematic format breaker tripping and closing circuits including all device contact numbers, device ANSI designation, panel or switchgear terminal blocks and wire numbers.

### 5.5.5. Electrical equipment drawings.

Manufacturer's drawings shall indicate all technical data of the equipment including but not limited to dimensions, weights, type and nameplate rating.

### 5.5.6. Update procedure for As-Built drawings

Once project is fully completed, and field marked-up copies received from construction crews, drawings will be sent for electronic modifications. If as-built prints are being done by a drawing service provider, Hydro Ottawa Project Manager will post original prints on FTP site for download by the drawing service provider

Upon completion of as-built electronic copies, Hydro Ottawa Project Manager will receive as-built prints. The prints will be sent to the stations crew that performed the work for verification and comparison between field and newly modified prints.

Once station crew confirms the accuracy of as-built prints, the hard copies denoted as "As Built" shall be placed in Stations Department filing cabinets. One copy of the print shall be posted in a filing cabinet locally at the station.

If Stations crew determine that "As-Built" print is inconsistent with manual mark-ups, the print shall be re-sent for repeated electronic modification, verification and filing.

Upon completion of the "As-Built" prints, one hard copy should be filed in the Stations area, one hard copy should be filed in the Substation and a soft copy should be filed on the network drive in Stations section.

## 6. Drawing Author Information

All as-built drawing submissions shall be dated and have the name (printed) and signature of the person(s) who completed the as-built information.

The project manager is to ensure that all as-built drawings submitted to records shall have name of the developer/builder/designer and the company responsible for preparation of the drawing in a floating text

box located within a clear area of the drawing. In addition, the date range of the installation shall be indicated.

## **7. Plant Identifiers**

All devices used to identify the location of Hydro Ottawa plant (eg markers, tags and signs, bars, pipe posts, plastic warning tape, electronic marker systems, etc), if installed, are to be recorded on the drawing and the electrical single line diagram.

## **8. Incomplete Data**

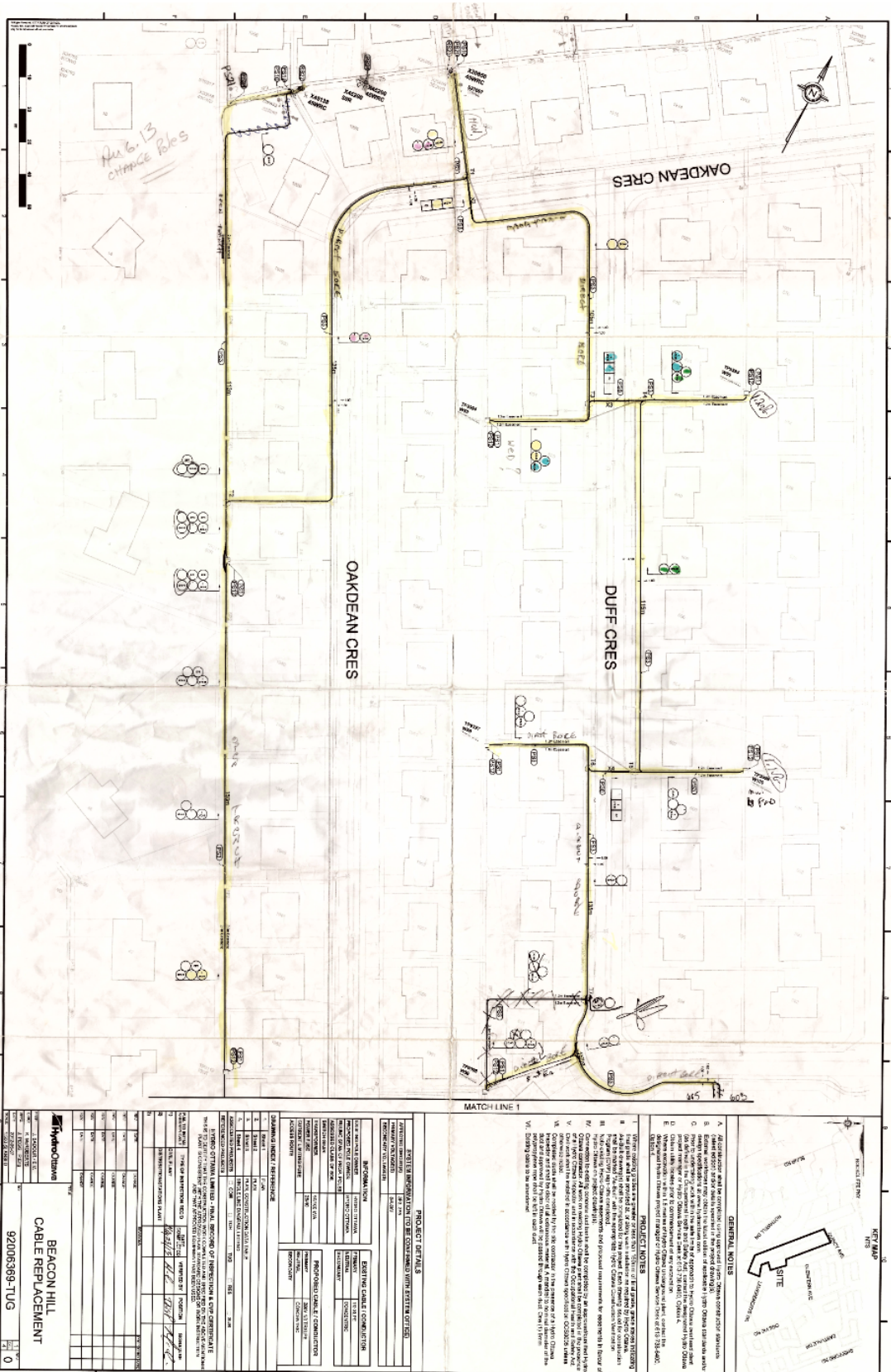
Inaccurate or incomplete as-built drawings shall result in a return of the data to the originator for correction. For as-built drawings submitted by an outside agency, any additional review or field checks required to be performed by Hydro Ottawa staff will be invoiced hourly according to the agreement under which the drawings are being completed.

## **9. Production of As-Built Drawings**

If as-built drawings are being submitted by an outside agency, all information (see Section 5.0) shall be added to the original approved construction drawing(s).

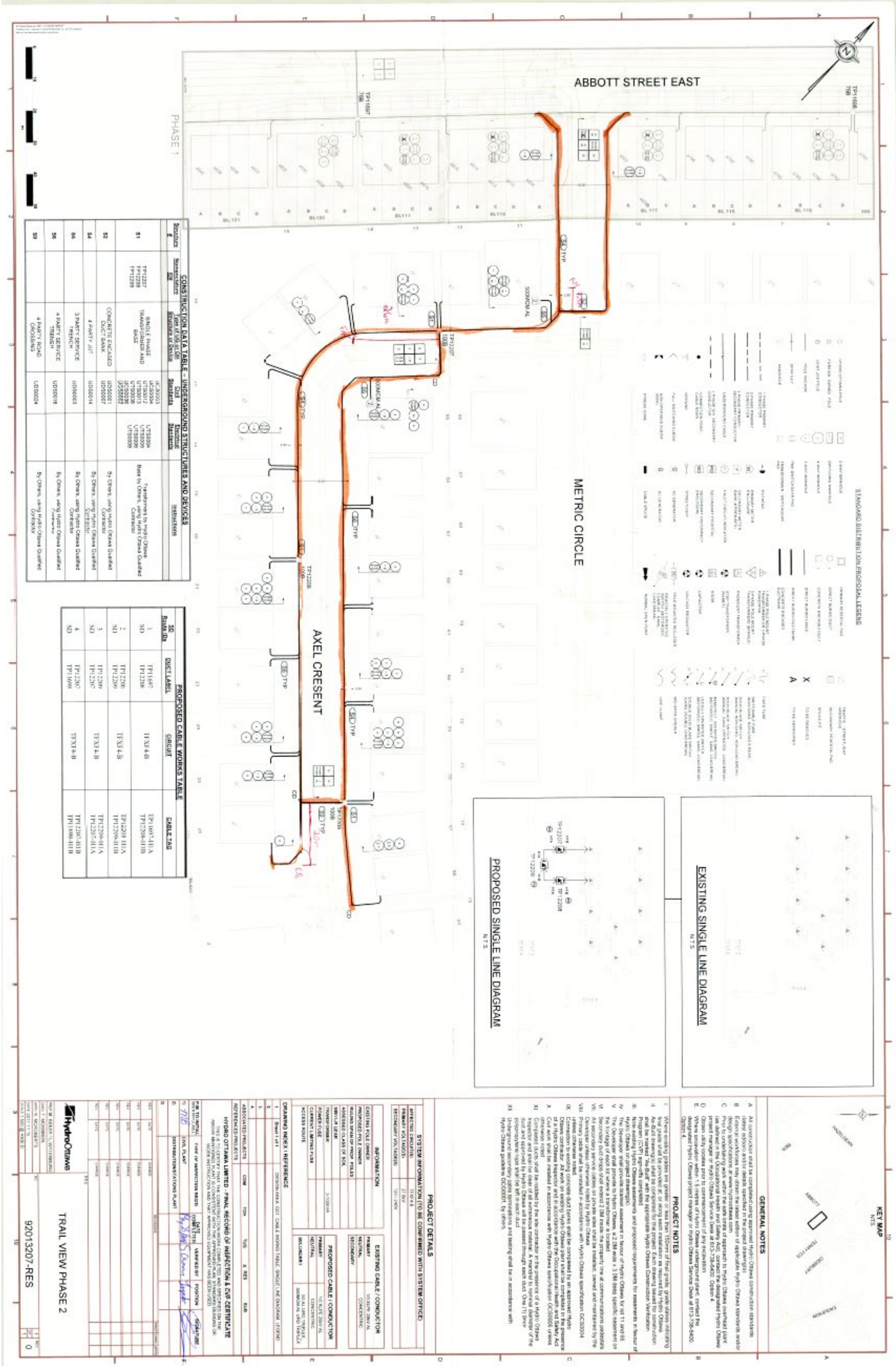
If drawings are being submitted in paper format, changes to the original approved drawing(s) shall be clearly marked/documented as shown in the attached examples: Schedule 1 – 6.

All dimensioning shall be legible. Enlargements of measurement details will be necessary within areas of high congestion on the drawing.



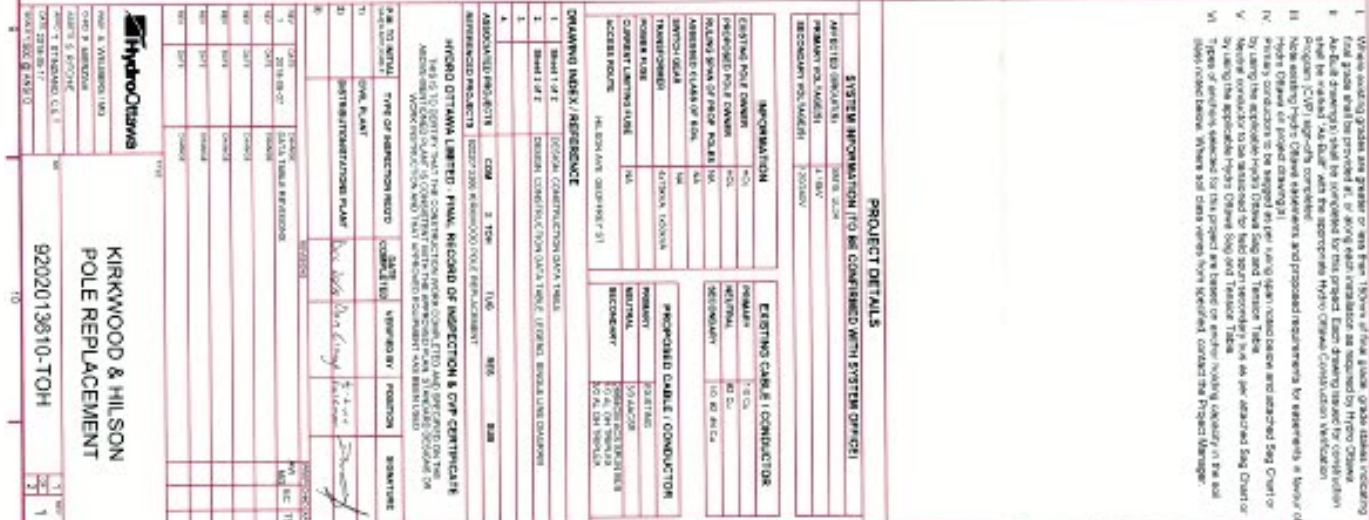


Schedule 2 Example – Underground Residential Civil As-Built

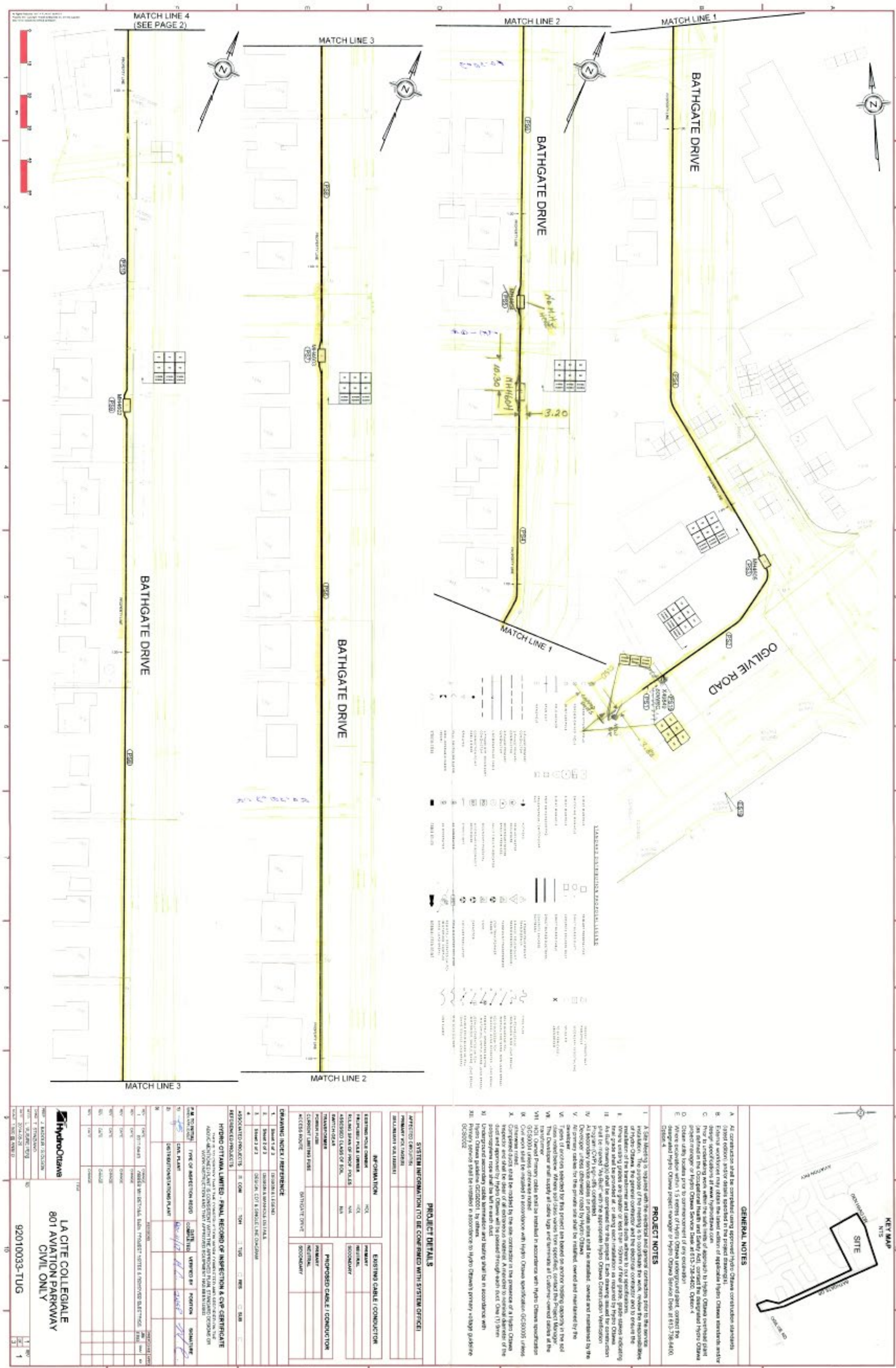




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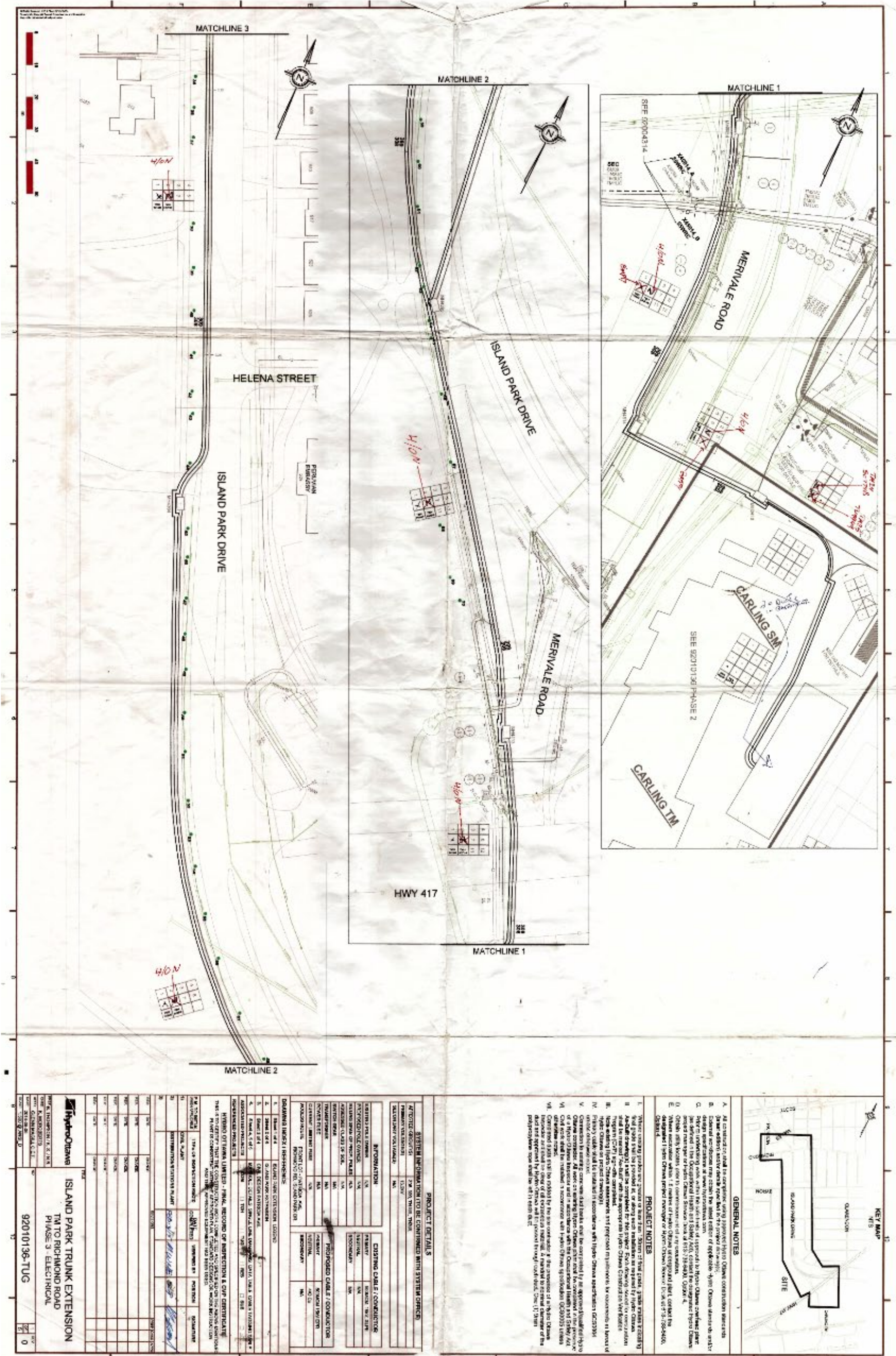
[illegible]





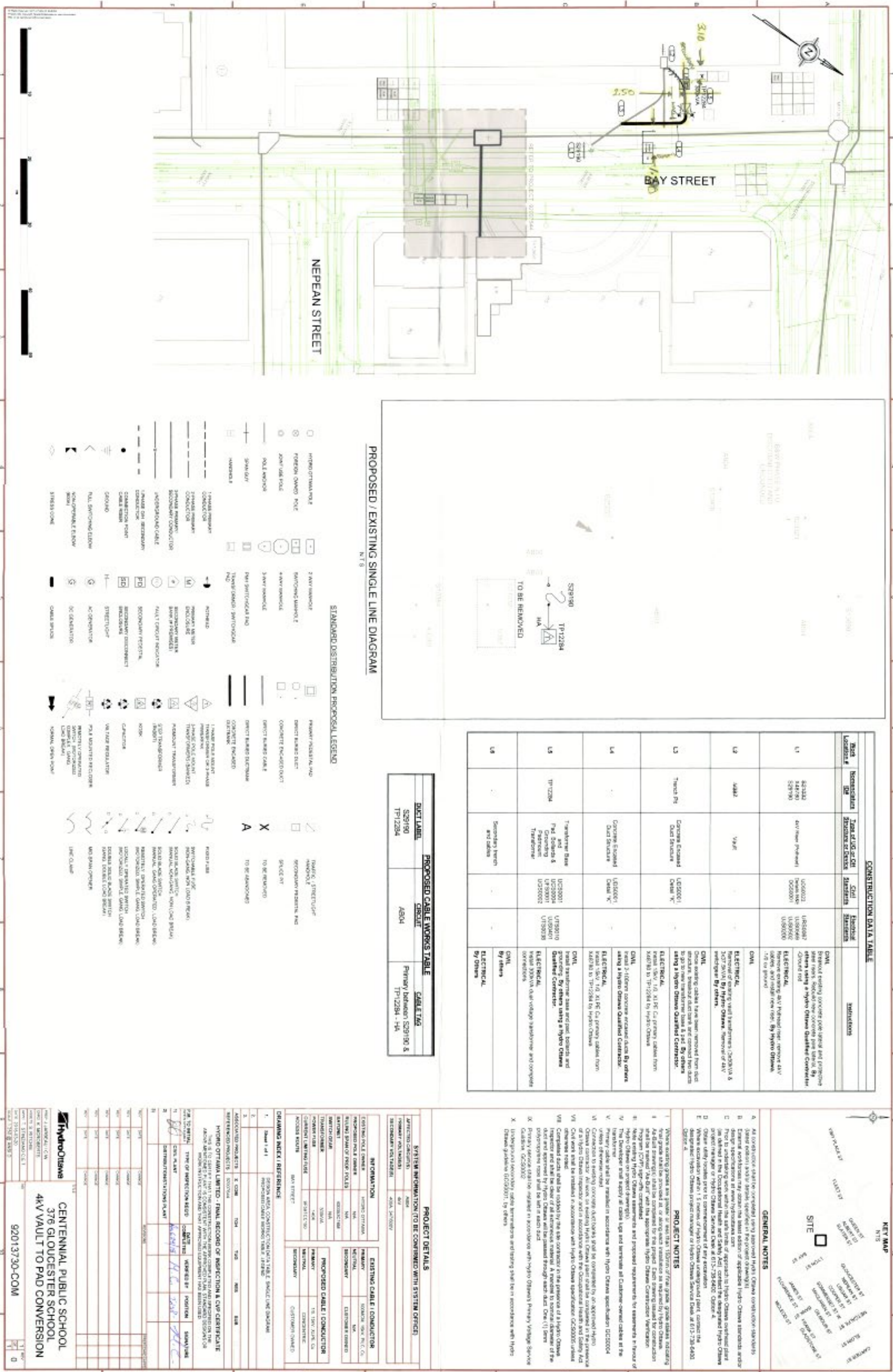


Schedule 5 Example - Underground Distribution Electrical As-Built Drawing





Schedule 6 Example – Underground Commercial Service Civil As-Built





## Schedule 7 As-Built Field Collected Attributes

| <b>Overhead – Pole</b><br>Pole locations should be dimensioned or GPS coordinates provided if not as shown on drawing. Use the pole staking detail to specify pole details or if using General Instruction Order you can use a single sheet for all identical poles and list the “X” numbers or use a single sheet for every pole. Forms – GIO/DSWS/SO Section 3 & FTR Section 4 |                             |              |                       |   |
|--|-----------------------------|--------------|-----------------------|---|
| Attributes   | Example                     | Default      | Forms                 | Comments  |
| <b>Pole Number</b>   | X12345                      |              | Nomenclature ID       | Nomenclature                                      |
| <b>Class</b>   | 3                           |              | Combine with Height   | Pole size and strength designated by manufacturer |
| <b>Height</b>  | 45 FT                       |              | 45 FT CL 3 RPP        |   |
| <b>Material</b>  | RPP                         |              | Combine with Height   | Concrete, Red Pine Pole etc..                     |
| <b>Treatment Type</b>  | Full Length                 | Full Length  | 9.1.1.1.1.1.1.1. Not  | Butt, Full Length, etc.                           |
| <b>Manufacturer</b>  | Guelph Utility Pole Limited |              | Place in Comment area | Name of Manufacturer                              |
| <b>Installation Type</b>   | Buried                      | Buried       | Place in Comment Area | Buried or Foundation.                             |
| <b>Grounding</b>   | Ground Rod                  | Ground Rod   | Place in Comment Area | Butt-Coil, Ground Rod, Ground Plate, etc.         |
| <b>Manufacture Date</b>  | 2008-01-01                  |              | Place in Comment Area | Date Manufactured                                 |
| <b>Ownership Authority</b>   | Bell Canada                 | Hydro Ottawa | Place in Comment Area | Same as Asset Owner, always.                      |
| <b>Maintenance Authority</b>   | Bell Canada                 | Hydro Ottawa | Place in Comment Area | If primary exists, usually Hydro Ottawa           |
| <b>Control Authority</b>   | Hydro Ottawa                | Hydro Ottawa | Place in Comment Area | If primary exists, usually Hydro Ottawa           |
| <b>Asset Owner</b>   | Bell Canada                 | Hydro Ottawa | Pole Owner            | Pole Owner  |
| <b>Installation Date</b>   | 2008-07-23                  | “Today”      | Date on Form          | Installation date                                 |

| <b>Overhead – Pole Attachments</b>   |             |         |       |   |
|--|-------------|---------|-------|---|
| Normally provided by Telecom applicant. Not required for pole like-for-like replacements |             |         |       |   |
| Attributes   | Example     | Default | Forms | Comments  |
| Pole Number  | X12345      |         |       | Nomenclature  |
| Attachment Type  | Full        | Full    |       | Full and Clearance  |
| Attachment Owner   | Bell Canada |         |       | Usually Bell, Rogers, Telecom Ottawa, Hydro One Telecom etc.. <b>NOT Hydro One Electrical</b> |
| Client Reference Number  | 0502638     |         |       | Attachment request Number   |
| Client Reference Date  | 2008-07-23  | "Today" |       | Date shown on application   |

| <b>Overhead – Guys</b>                                      |              |              |       |  |
|---|--------------|--------------|-------|--|
| Taken from the pole staking sheets or sketch area on forms. |              |              |       |  |
| Attributes  | Example      | Default      | Forms | Comments   |
| Pole Number   | X12345       |              |       | Nomenclature                                       |
| Type  | Down Guy     | Down Guy     |       | Down Guy, Span Guy, push brace or sidewalk strut   |
| Length  | 5            |              |       | Distance from pole in Meters                       |
| Direct  | 8 O'clock    |              |       | 12 O'clock is North. Drawing should have direction |
| Asset Owner   | Hydro Ottawa | Hydro Ottawa |       | Guy owner  |
| Installation Date   | 2008-07-23   | "Today"      |       |  |

| <b>Overhead – Conductor</b>               |              |              |       |   |
|---|--------------|--------------|-------|---|
| Should be available on drawing or sketch. |              |              |       |   |
| Attributes                                | Example      | Default      | Forms | Comments                                |
| System Voltage                            | 13.2kV       |              |       | Voltage of connected system             |
| Primary Breaker                           | TA06         |              |       | Station Breaker for circuit             |
| Circuit ID                                | 2205         |              |       | Circuit Name                            |
| Conductor Label                           | 2205         |              |       | Nomenclature that shows onscreen in GIS |
| Orientation                               | Overhead     | Overhead     |       |   |
| Phase                                     | R            |              |       | R, W, B or RWB                          |
| Neutral                                   | Yes          | Yes          |       | Yes or No                               |
| Neutral Size                              | 3/0          |              |       | Neutral conductor size                  |
| Neutral Material                          | Aluminum     | Aluminum     |       | Neutral material                        |
| Ownership Authority                       | Hydro Ottawa | Hydro Ottawa |       | Same as Asset Owner, always.            |
| Maintenance Authority                     | Hydro Ottawa | Hydro Ottawa |       | Usually HOL unless HONI                 |
| Control Authority                         | Hydro Ottawa | Hydro Ottawa |       | Usually HOL unless HONI                 |
| Asset Owner                               | Hydro Ottawa | Hydro Ottawa |       | Circuit owner                           |
| Phase Wire Size                           | 556.6 MCM    |              |       |   |
| Phase Wire Material                       | Aluminum     | Aluminum     |       |   |
| Installation Date                         | 2008-07-23   | "Today"      |       |   |

| <b>Overhead – Transformer</b><br>One transformer sheet required by location. |                                 |              |       |  |
|--|---------------------------------|--------------|-------|--|
| Attributes   | Example                         | Default      | Forms | Comments   |
| System Voltage   | 13.2kV                          |              |       | Voltage of connected system                            |
| Primary Breaker  | TA06                            |              |       | Station Breaker for circuit                            |
| Circuit ID   | 2205                            |              |       | Circuit Name   |
| Orientation  | Overhead                        | Overhead     |       |  |
| Phase  | RWB                             |              |       | R, W, B or RWB   |
| System Type  | Radial                          | Radial       |       | Usually Radial on Overhead                             |
| Location Number  | X12345                          | Pole ID      |       | On overhead use the pole ID                            |
| Bank Type  | 3 transformers -<br>3 Phase Wye |              |       | Connection Type – single phase or 3 phase wye or delta |
| Sub Type   | Banked                          |              |       | Single Phase – General<br>Three Phase - Banked         |
| Bank kVA Rating  | 150                             |              |       | Total kVA connected                                    |
| Secondary Voltage  | 600/347 v                       |              |       | 120/240V, 120/208V, 600/347V most typical              |
| Ownership Authority  | Hydro Ottawa                    | Hydro Ottawa |       | Same as Asset Owner, always.                           |
| Maintenance Authority  | Hydro Ottawa                    | Hydro Ottawa |       | Same as Asset Owner, usually.                          |
| Control Authority  | Hydro Ottawa                    | Hydro Ottawa |       | Usually Hydro Ottawa                                   |
| Asset Owner  | Hydro Ottawa                    | Hydro Ottawa |       | Transformer Owner                                      |
| Unit Serial Number 1   | 08C12345678                     |              |       | Transformer units used                                 |
| Unit Serial Number 2   | 08C12345679                     |              |       | Nameplate data comes from stores records               |
| Unit Serial Number 3   | 08C12345680                     |              |       |  |
| Installation Date  | 2008-07-23                      | "Today"      |       |  |

| <b>Overhead – Primary Switch</b><br>One sheet required by location. |             |             |       |  |
|---|-------------|-------------|-------|--|
| Attributes  | Example     | Default     | Forms | Comments   |
| System Voltage  | 13.2kV      |             |       | Voltage of connected system  |
| Primary Breaker 1   | TA06        |             |       | Station Breaker for circuit  |
| Circuit ID 1  | 2205        |             |       | Circuit Name   |
| Primary Breaker 2   | TA06        |             |       | If switch is normal open point Breaker 2 may be different then Breaker 1 |
| Circuit ID 2  | 2205        |             |       | If switch is normal open point Circuit 2 may be different then Circuit 1 |
| Normal Status   | Closed      |             |       | Open or Closed   |
| Orientation   | Overhead    | Overhead    |       |  |
| Phase   | RWB         |             |       | R, W, B or RWB   |
| Switch Number   | S98765      |             |       | Nomenclature received from Records Dep                                   |
| Type  | Solid Blade | Solid Blade |       | Solid Blade, Double load-break, Scadamate                                |
| Sub Type  | Non-gang    | Non-gang    |       | Gang operated, non-gang operated   |

| <b>Overhead – Primary Switch</b><br>One sheet required by location. |                    |                    |       |  |
|---|--------------------|--------------------|-------|--|
| Attributes  | Example            | Default            | Forms | Comments   |
| Rating  | 600 A              | 600 A              |       | Switch Rating in Amps  |
| Operator  | Manual from Bucket | Manual from Bucket |       | Manual from Bucket, Manual from ground , motorized local or motorized remote |
| Load Break  | No                 | No                 |       | Yes or No  |
| Switch Mount Style  | Pole Mount         | Pole Mount         |       | Pole Mount or In-Line  |
| Manufacturer  | S & C Electric     |                    |       | Name of Manufacturer   |
| Ownership Authority   | Hydro Ottawa       | Hydro Ottawa       |       | Same as Asset Owner, always.   |
| Maintenance Authority   | Hydro Ottawa       | Hydro Ottawa       |       | Usually HOL unless HONI  |
| Control Authority   | Hydro Ottawa       | Hydro Ottawa       |       | Usually HOL unless HONI  |
| Asset Owner   | Hydro Ottawa       | Hydro Ottawa       |       | Switch Owner   |
| Installation Date   | 2008-07-23         | "Today"            |       | Installation date  |

| <b>Overhead – Primary Fuse</b><br>One sheet required by location. |                |              |       |  |
|---|----------------|--------------|-------|--|
| Attributes  | Example        | Default      | Forms | Comments   |
| System Voltage  | 13.2kV         |              |       | Voltage of connected system  |
| Primary Breaker 1   | TA06           |              |       | Station Breaker for circuit  |
| Circuit ID 1  | 2205           |              |       | Circuit Name   |
| Primary Breaker 2   | TA06           |              |       | If switch is normal open point Breaker 2 may be different then Breaker 1 |
| Circuit ID 2  | 2205           |              |       | If switch is normal open point Circuit 2 may be different then Circuit 1 |
| Normal Status   | Closed         |              |       | Open or Closed   |
| Orientation   | Overhead       | Overhead     |       |  |
| Phase   | RWB            |              |       | R, W, B or RWB   |
| Fuse Number   | S98765         |              |       | Nomenclature   |
| Fuse Type   | K-speed        |              |       | SMD, K-speed, E-speed etc..  |
| Fuse Sub Type   | Switchable     | Switchable   |       | Switchable, non-switchable   |
| Holder Type   | Open Cutout    | Open Cutout  |       | Open Cutout, Closed Cutout, SMD-20, SMD-40                               |
| Mount Style   | Pole Mount     | Pole Mount   |       | Pole Mount and In-line   |
| Amp Rating  | 65             |              |       | Fuse Rating in Amps (Not rating of fuse holder)                          |
| Manufacturer  | S & C Electric |              |       | Name of Manufacturer   |
| Ownership Authority   | Hydro Ottawa   | Hydro Ottawa |       | Same as Asset Owner, always.   |
| Maintenance Authority   | Hydro Ottawa   | Hydro Ottawa |       | Usually HOL unless HONI  |
| Control Authority   | Hydro Ottawa   | Hydro Ottawa |       | Usually HOL unless HONI  |
| Asset Owner   | Hydro Ottawa   | Hydro Ottawa |       | Fuse Owner   |
| Installation Date   | 2008-07-23     | "Today"      |       | Installation date  |

| <b>Underground – Primary Conductor</b><br>Should be available on drawing or sketch. |                |                |              |   |
|---|----------------|----------------|--------------|---|
| <b>Attributes</b>   | <b>Example</b> | <b>Default</b> | <b>Forms</b> | <b>Comments</b>                         |
| <b>System Voltage</b>   | 13.2kV         |                |              | Voltage of connected system             |
| <b>Primary Breaker</b>  | TA06           |                |              | Station Breaker for circuit             |
| <b>Circuit ID</b>   | 2205           |                |              | Circuit Name                            |
| <b>Conductor Label</b>  | 2205           |                |              | Nomenclature that shows onscreen in GIS |
| <b>Orientation</b>  | Underground    | Underground    |              |   |
| <b>Phase</b>  | R              |                |              | R, W, B or RWB                          |
| <b>Neutral</b>  | No             | No             |              | Yes or No. Separate Neutrals only       |
| <b>Neutral Size</b>   |                |                |              | Neutral conductor size                  |
| <b>Neutral Material</b>   |                |                |              | Neutral material                        |
| <b>Ownership Authority</b>  | Hydro Ottawa   | Hydro Ottawa   |              | Same as Asset Owner, always.            |
| <b>Maintenance Authority</b>  | Hydro Ottawa   | Hydro Ottawa   |              | Usually HOL unless HONI                 |
| <b>Control Authority</b>  | Hydro Ottawa   | Hydro Ottawa   |              | Usually HOL unless HONI                 |
| <b>Asset Owner</b>  | Hydro Ottawa   | Hydro Ottawa   |              | Circuit owner                           |
| <b>Wire Size</b>  | 1/0            |                |              |   |
| <b>Wire Material</b>  | Aluminum       | Aluminum       |              |   |
| <b>Wire Insulation Voltage</b>  | 28 kV          | 28 kV          |              | Primary Insulation Voltage              |
| <b>Wire Insulation Material</b>   | TR-XLPE        | TR-XLPE        |              | TR-XLPE, XLPE, PILC etc...              |
| <b>Installation Date</b>  | 2008-07-23     | "Today"        |              |   |

| <b>Underground – Padmount Transformer</b><br>One transformer sheet required by location. |                                |                |              |  |
|--|--------------------------------|----------------|--------------|--|
| <b>Attributes</b>  | <b>Example</b>                 | <b>Default</b> | <b>Forms</b> | <b>Comments</b>  |
| <b>System Voltage</b>  | 13.2kV                         |                |              | Voltage of connected system                            |
| <b>Primary Breaker</b>   | TA06                           |                |              | Station Breaker for circuit                            |
| <b>Circuit ID</b>  | 2205                           |                |              | Circuit Name   |
| <b>Orientation</b>   | Underground                    | Underground    |              |  |
| <b>Phase</b>   | RWB                            |                |              | R, W, B or RWB   |
| <b>System Type</b>   | Loop                           | Loop           |              | Usually Loop on U/G                                    |
| <b>Location Number</b>   | TP1234                         |                |              | TP#### - received from Records Dep.                    |
| <b>Bank Type</b>   | 1 transformer -<br>3 Phase Wye |                |              | Connection Type – single phase or 3 phase wye or delta |
| <b>Sub Type</b>  | Pad                            | Pad            |              | Pad, Kiosk   |
| <b>Bank kVA Rating</b>   | 150                            |                |              | Total kVA connected                                    |
| <b>Secondary Voltage</b>   | 600/347 v                      |                |              | 120/240V, 120/208V, 600/347V most typical              |
| <b>Live Front (Yes/No)</b>   | No                             | No             |              | Live Front vs Elbows                                   |
| <b>Ownership Authority</b>   | Hydro Ottawa                   | Hydro Ottawa   |              | Same as Asset Owner, always.                           |
| <b>Maintenance Authority</b>   | Hydro Ottawa                   | Hydro Ottawa   |              | Same as Asset Owner, usually.                          |

| <b>Underground – Padmount Transformer</b><br>One transformer sheet required by location. |              |              |       |  |
|--|--------------|--------------|-------|--|
| Attributes   | Example      | Default      | Forms | Comments                                 |
| Control Authority  | Hydro Ottawa | Hydro Ottawa |       | Usually Hydro Ottawa                     |
| Asset Owner  | Hydro Ottawa | Hydro Ottawa |       | Transformer Owner                        |
| Unit Serial Number 1   | 08C12345678  |              |       | Transformer units used                   |
| Unit Serial Number 2   | N/A          |              |       | Nameplate data comes from stores records |
| Unit Serial Number 3   | N/A          |              |       |  |
| Installation Date  | 2008-07-23   | "Today"      |       |  |

| <b>Underground – Transformer Elbows</b><br>Need to specify what each elbow is connected to on map. |                |                |       |  |
|--|----------------|----------------|-------|--|
| Attributes   | Example        | Default        | Forms | Comments   |
| System Voltage   | 13.2kV         |                |       | Voltage of connected system  |
| Primary Breaker 1  | TA06           |                |       | Station Breaker for circuit  |
| Circuit ID 1   | 2205           |                |       | Circuit Name   |
| Primary Breaker 2  | TA06           |                |       | If switch is normal open point Breaker 2 may be different then Breaker 1 |
| Circuit ID 2   | 2205           |                |       | If switch is normal open point Circuit 2 may be different then Circuit 1 |
| Normal Status  | Closed         |                |       | Open or Closed   |
| Orientation  | Underground    | Underground    |       |  |
| Location Number  | TP1234         |                |       | Transformer Number   |
| Phase  | R              |                |       | R, W, B or RWB   |
| Elbow Number   | H1A            |                |       | Single phase –H1A or H1B 3 phase – HA or HB                              |
| Type   | 90 Degrees     | 90 Degrees     |       |  |
| Current Rating   | 200 Amps       | 200 Amps       |       | 200 Amps, 600 Amps   |
| Load Break   | Yes            | Yes            |       | Yes or No  |
| Operator Type  | Full Switching | Full Switching |       | Full Switching or Restricted Switching                                   |
| Manufacturer   | RTE            |                |       | Name of Manufacturer   |
| Ownership Authority  | Hydro Ottawa   | Hydro Ottawa   |       | Same as Asset Owner, always.   |
| Maintenance Authority  | Hydro Ottawa   | Hydro Ottawa   |       | Usually HOL unless HONI  |
| Control Authority  | Hydro Ottawa   | Hydro Ottawa   |       | Usually HOL unless HONI  |
| Asset Owner  | Hydro Ottawa   | Hydro Ottawa   |       | Switch Owner   |
| Installation Date  | 2008-07-23     | "Today"        |       | Installation date  |

| <b>Underground – Padmount Switchgear</b><br>One sheet required by location. |                |              |       |                              |
|---|----------------|--------------|-------|------------------------------|
| Attributes  | Example        | Default      | Forms | Comments                     |
| Location Number   | SC6340         |              |       | Received from Records        |
| Type  | PMH9           |              |       |                              |
| Insulation Type   | Air            |              |       | Air, gas, oil, vacuum        |
| Live Front (Yes/No)   | Yes            |              |       | Live Front vs Elbows         |
| Manufacturer  | S & C Electric |              |       | Name of Manufacturer         |
| Ownership Authority   | Hydro Ottawa   | Hydro Ottawa |       | Same as Asset Owner, always. |
| Maintenance Authority   | Hydro Ottawa   | Hydro Ottawa |       | Usually HOL unless HONI      |
| Control Authority   | Hydro Ottawa   | Hydro Ottawa |       | Usually HOL unless HONI      |
| Asset Owner   | Hydro Ottawa   | Hydro Ottawa |       | Switch Owner                 |
| Installation Date   | 2008-07-23     | "Today"      |       | Installation date            |

| <b>Underground – Manhole</b><br>One sheet required by location. Special requirements when manhole is "Cast in Place" |                  |              |       |                              |
|--|------------------|--------------|-------|------------------------------|
| Attributes   | Example          | Default      | Forms | Comments                     |
| Location Number  | MH3479           |              |       | Received from Records        |
| Chamber Type   | Maintenance hole |              |       | Maintenance hole, Handhole   |
| Chamber Sub Type   | 6x12 Precast     |              |       |                              |
| Ownership Authority  | Hydro Ottawa     | Hydro Ottawa |       | Same as Asset Owner, always. |
| Maintenance Authority  | Hydro Ottawa     | Hydro Ottawa |       | Usually HOL unless HONI      |
| Control Authority  | Hydro Ottawa     | Hydro Ottawa |       | Usually HOL unless HONI      |
| Asset Owner  | Hydro Ottawa     | Hydro Ottawa |       | Fuse Owner                   |
| Installation Date  | 2008-07-23       | "Today"      |       | Installation date            |

| <b>Underground – 3<sup>rd</sup> Party Chamber Attachment</b><br>Normally provided by Telecom applicant. |                  |         |       |   |
|---|------------------|---------|-------|---|
| Attributes  | Example          | Default | Forms | Comments  |
| Location Number   | MH3479           |         |       | Nomenclature  |
| Attachment Type   | Maintenance hole |         |       | Maintenance hole  |
| Attachment Owner  | Bell Canada      |         |       | Usually Bell, Rogers, Telecom Ottawa, Hydro One Telecom etc.. <b>NOT Hydro One Electrical</b> |
| Client Reference Number   | 0502638          |         |       | Attachment request Number   |
| Client Reference Date   | 2008-07-23       | "Today" |       | Date shown on application   |