ROW MANAGEMENT

Lessons Learned on Major Infrastructure Projects

Presented by:

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Infrastructure Projects + Utilities = Risk

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- What the Conceptual Design Report said.
  - Minor Utility Relocations will be required, total Project Budget $14M.

- What was NOT done!
  - SUE was not completed within the EA process…
  - An experienced Utility Coordinator was not used on the project…

Infrastructure Projects + Utilities = Risk

- Water
- Sewer
- Telecom
- Gas
- Electrical

Infrastructure Projects + Utilities = Risk

- Results
  - Original estimate within the EA was ~$14M
  - Utility impacts increase cost to **~$105M ++**

- What could they have done?
  - Early SUE and UC would have provided better budget and schedule certainty.

What have we learned?

- Raise the Profile and Importance on Utility Engineering
  - UESI
- Follow Industry Best Practices
  - TAC Guideline
  - ASCE 38-02
- Utilize Technology
  - Multi-Channel GPR
  - LIDAR
  - 3D Modeling
- Sample Project
  - Hamilton LRT

Utility Engineering

- Raise the Profile and Importance of Utility Engineering on Infrastructure Projects
  - SUE Professionals
  - UC Professionals
  - Survey Professionals

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Utility Engineering

UESI

ASCE

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Ontario Regional
ORCGA
Common Ground Alliance

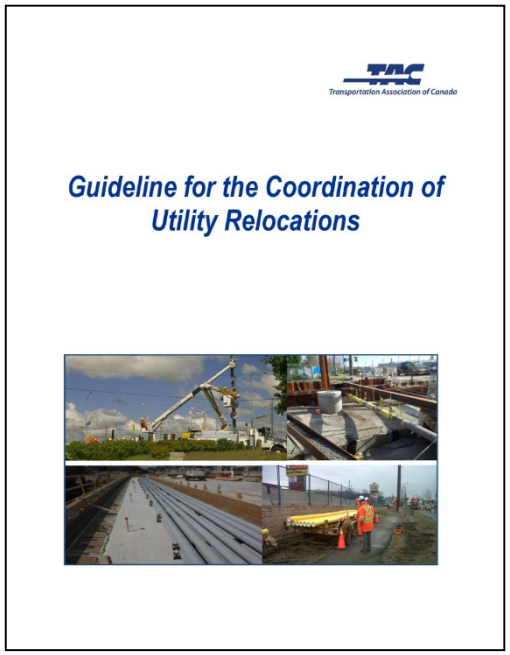
CSCE
CCGC
1887

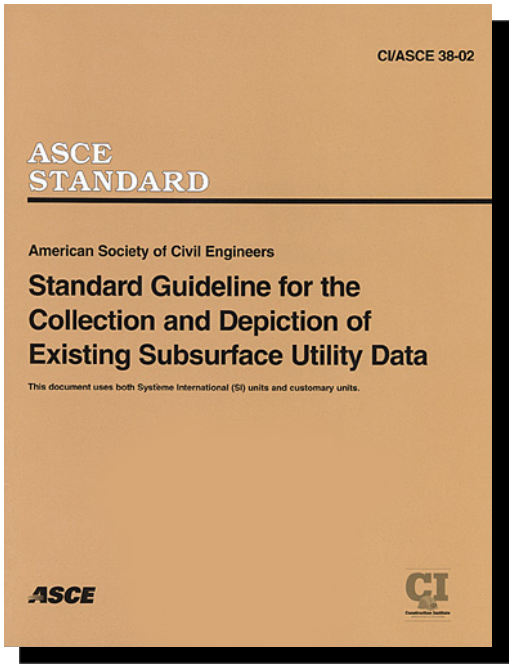
CENTRE for ADVANCEMENT of TRENCHLESS TECHNOLOGIES
CATT
AT WATERLOO

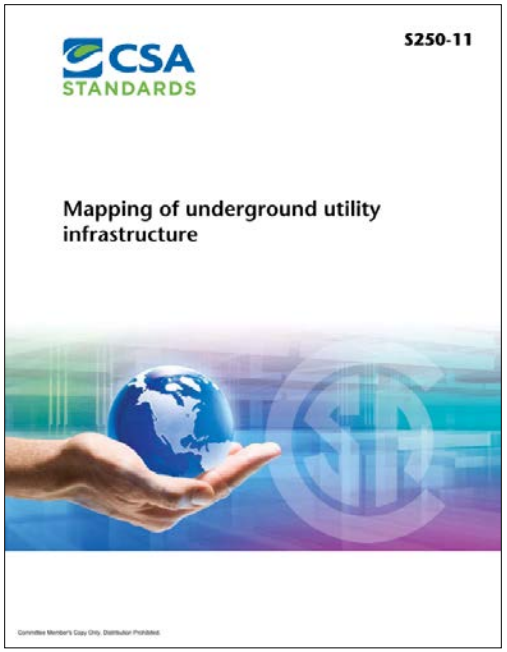
Professional Engineers
Ontario

ONTARIO PUBLIC WORKS ASSOCIATION
OPWA
A Chapter of APWA/CPWA

Industry Best Practices







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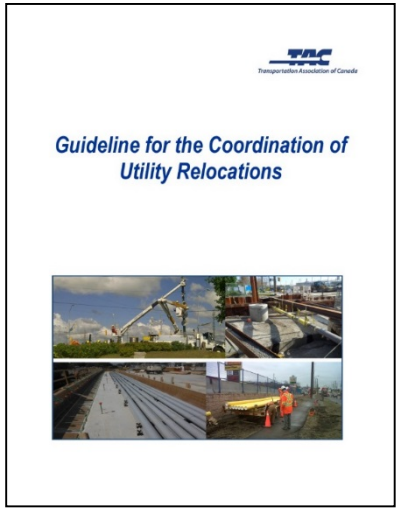
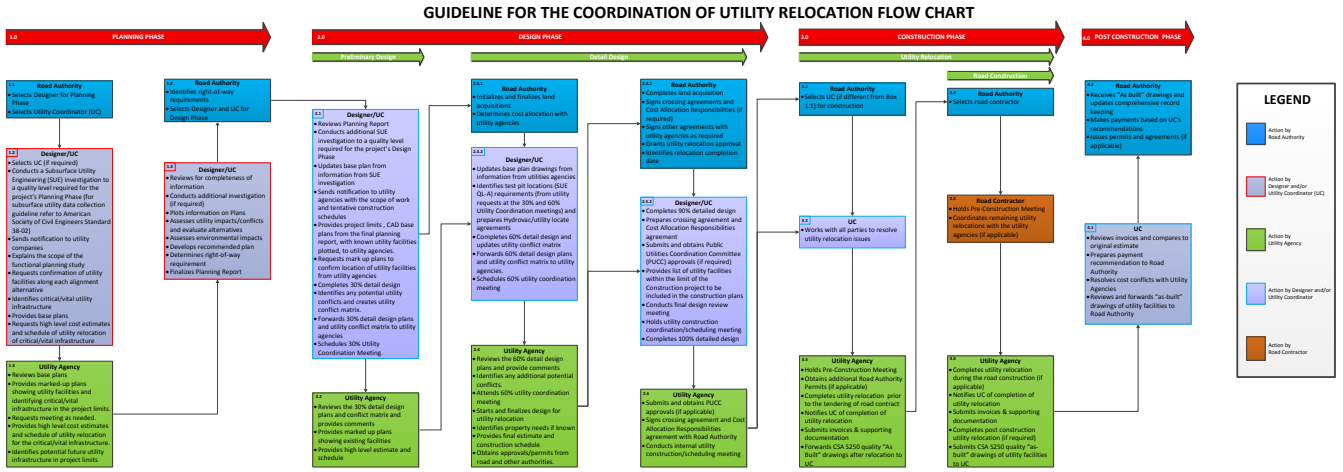
TAC Guideline





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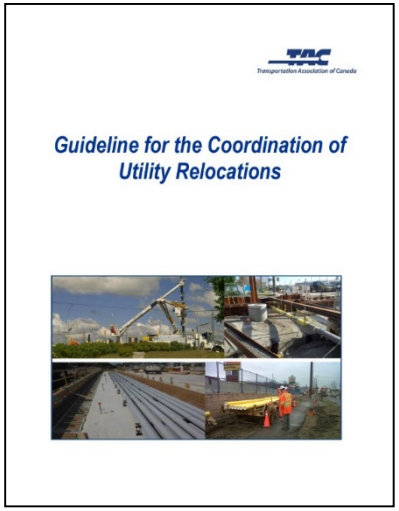
TAC Guideline

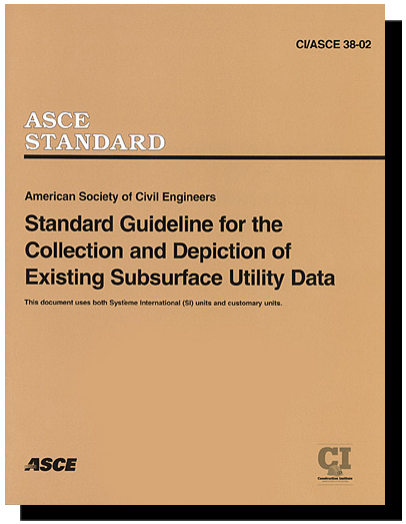


Presents a High Level Process for Utility Coordination on Infrastructure Projects

Being adopted by Agencies as a basis for their specific UC Guidelines

Currently being updated to outline the process for UC on PPP projects.

ASCE 38-02



Subsurface Utility Engineering

A specialty practice of civil engineering that investigates and depicts existing underground utilities through the collection and analysis of records, visual, geophysical, and/or exposure methods and assigns achieved Utility Quality Levels to Utility Segments based upon the integration of all the analyzed data with professional judgment at a defined point in time. SUE has evolved as a subset of Utility Engineering.

ASCE 38-02

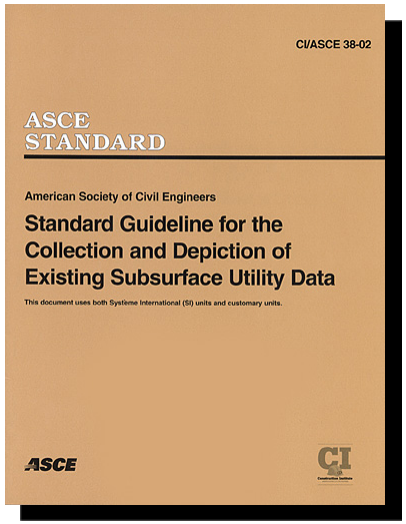
Quality Level D

Quality Level C

Quality Level B

Quality Level A

ASCE 38 Updates



- Definition of SUE
- Quality Level C
- Quality Level B
  - Designating Precision
  - Measuring, Documenting and Depicting Depths
- Quality Level A
- Measuring, Documenting and Depicting Vaults
- Inclusion of a Utility Report

Utilize Technology

Leverage Existing Proven Technologies

Take Advantage of New Technologies

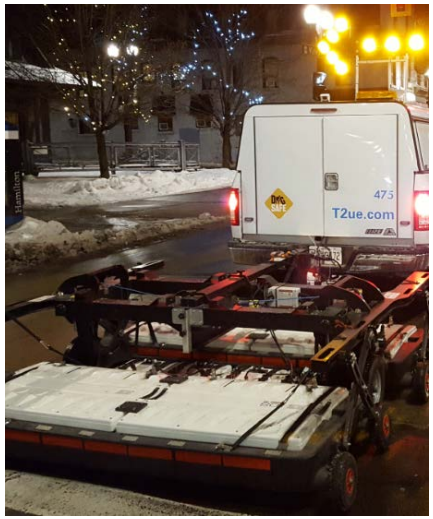
- Multi-Channel GPR
- 3D Utility Models
- LIDAR

Multi-Channel GPR

STREAM EM

STREAM C

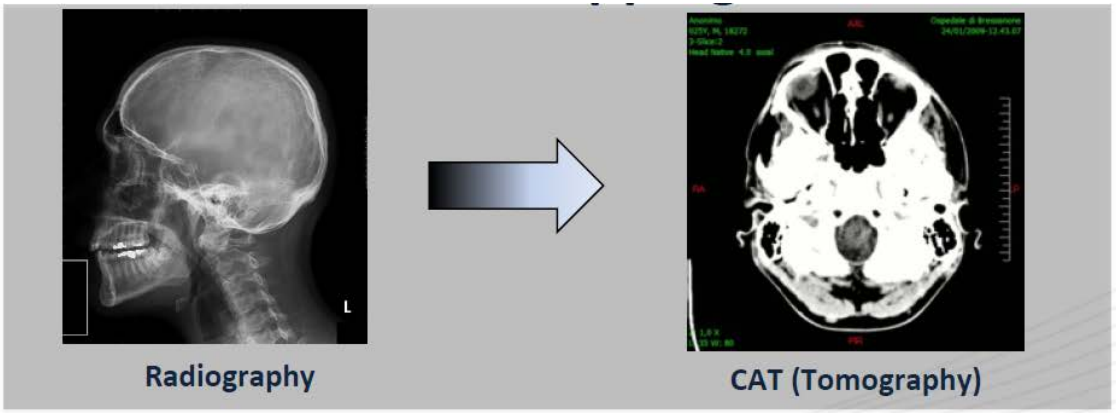
Multi-Channel GPR

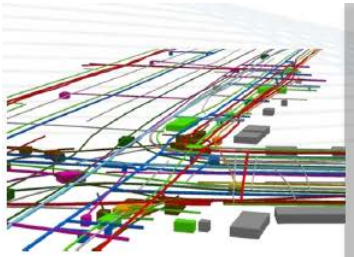


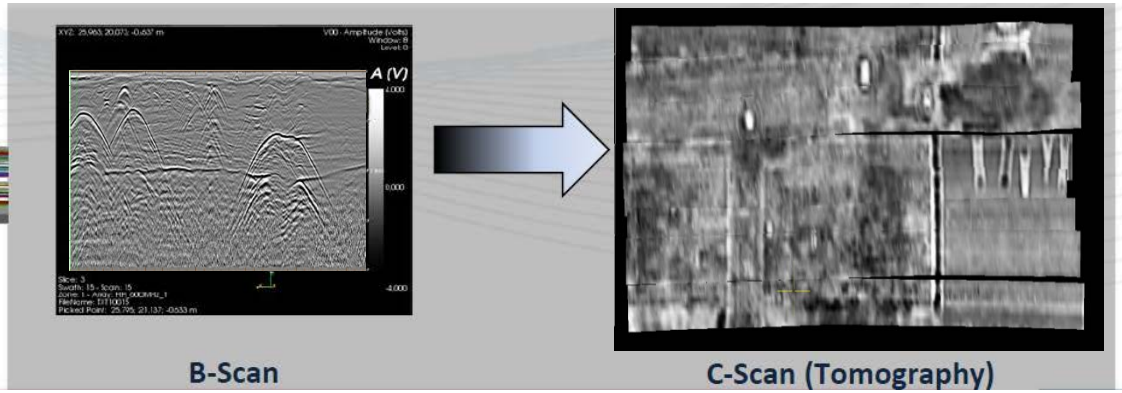
STREAM Units

- Multi-Channel ground penetrating radar
- 40 separate channels
- double polarized (VV and HH) antennas
- dual 200 and 600 MHz antennas
- Data is spatially tied to survey coordinates

Multi-Channel GPR

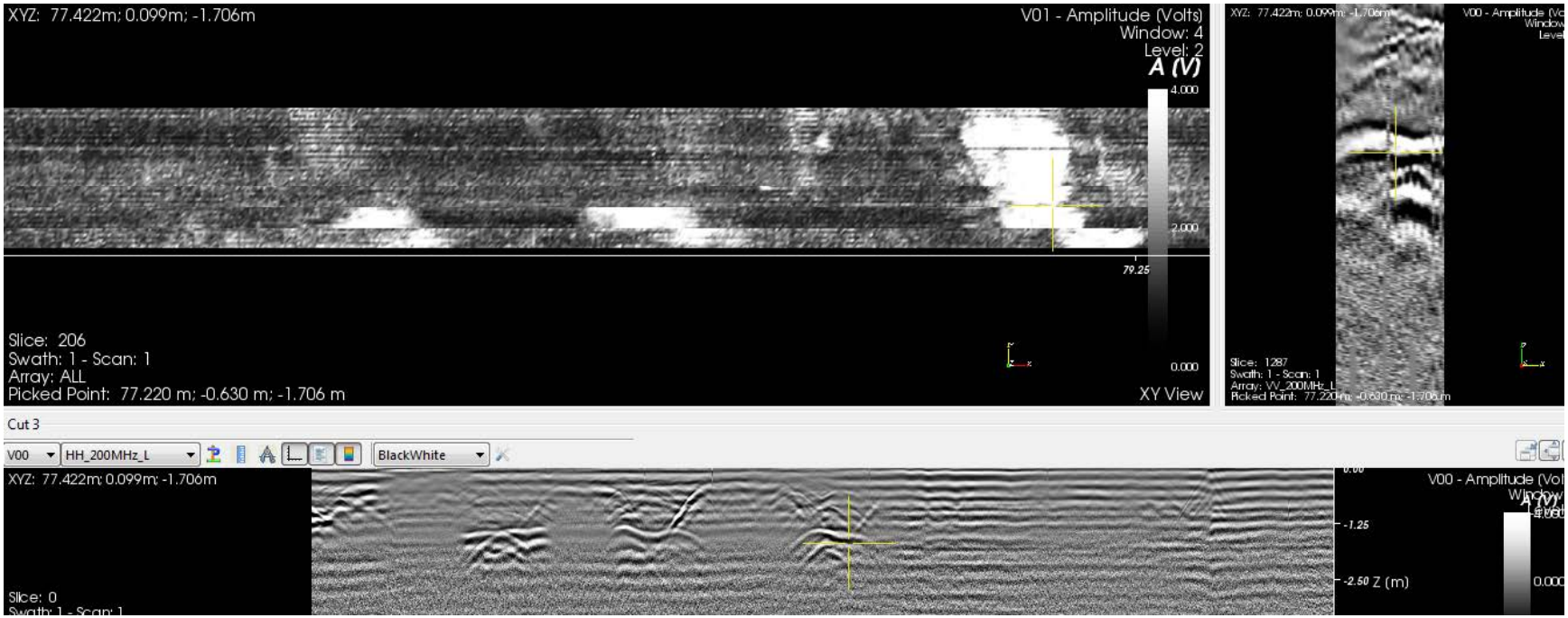




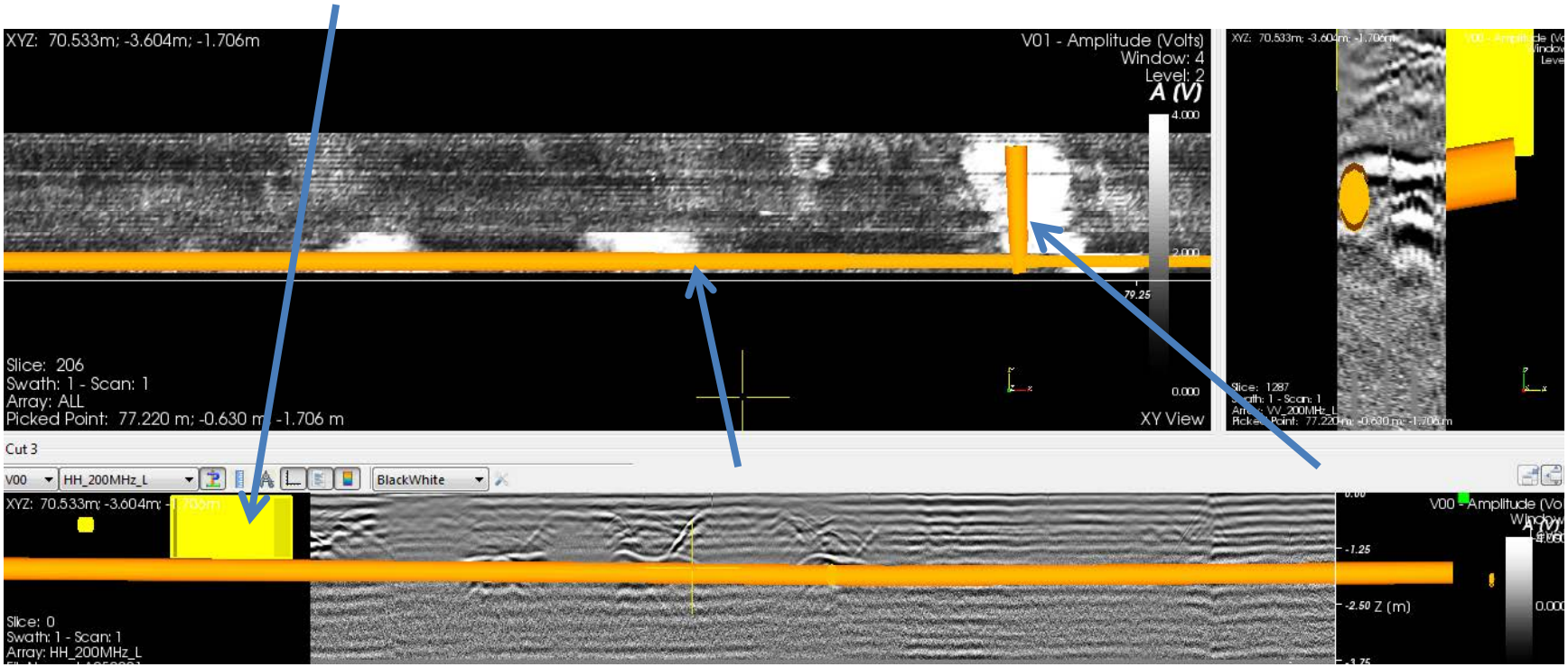


From Detection to Mapping

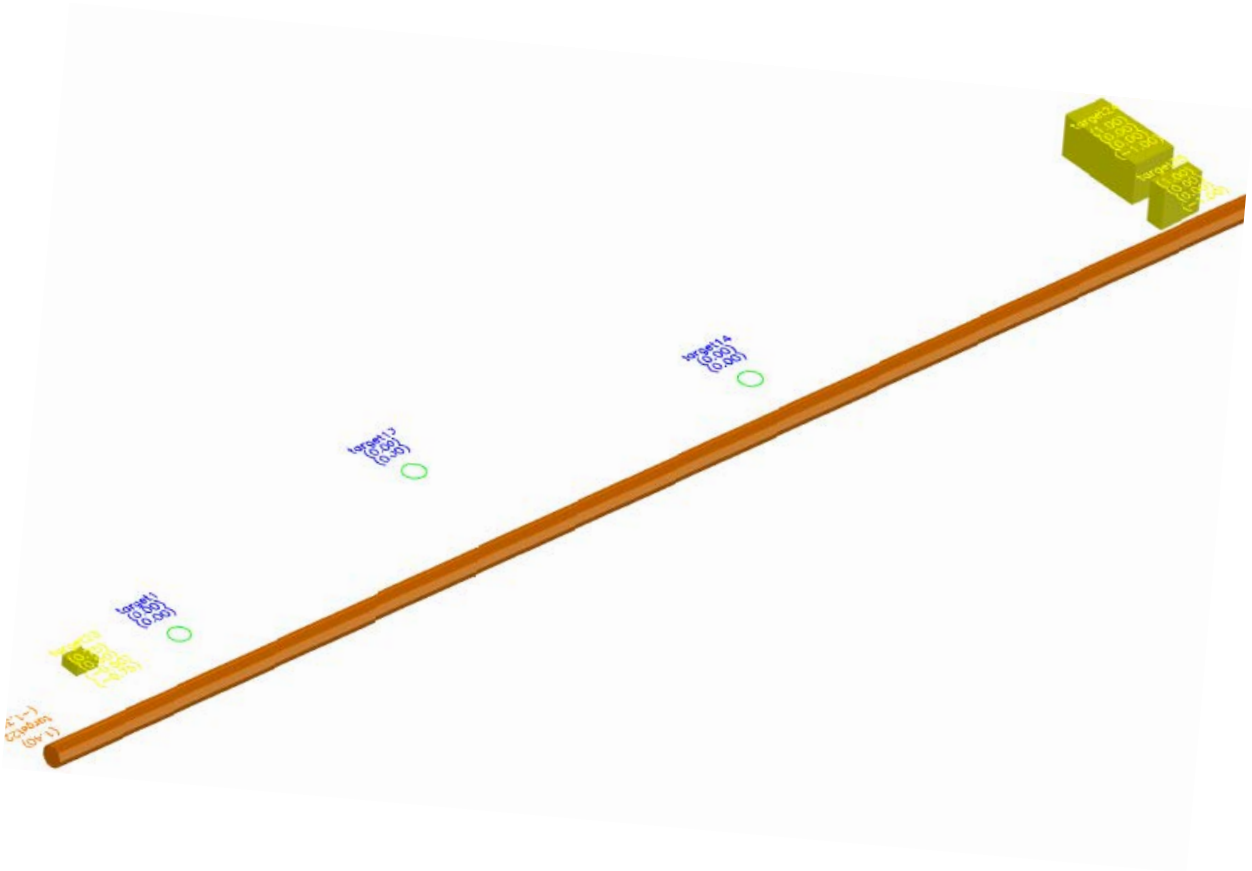
Multi-Channel GPR



Multi-Channel GPR



Multi-Channel GPR



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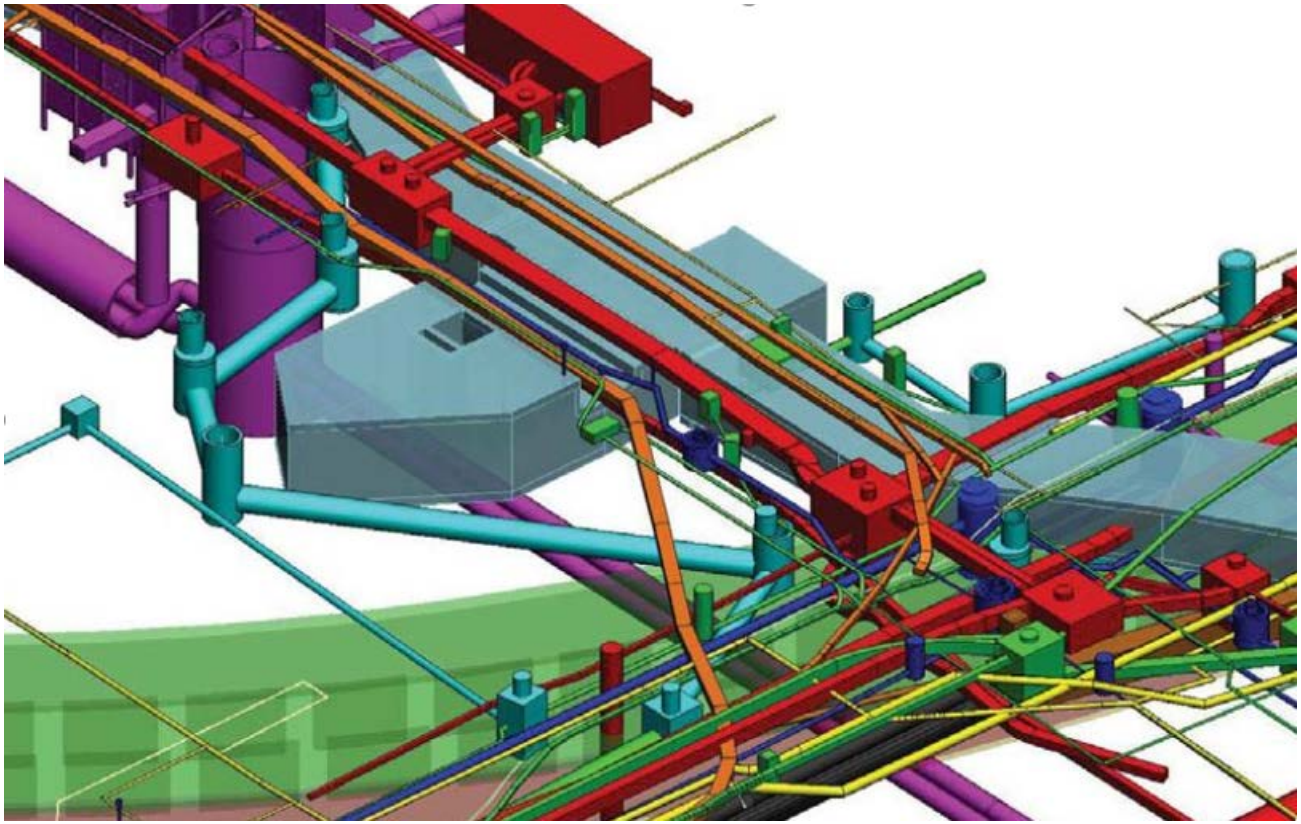
3D Utility Models



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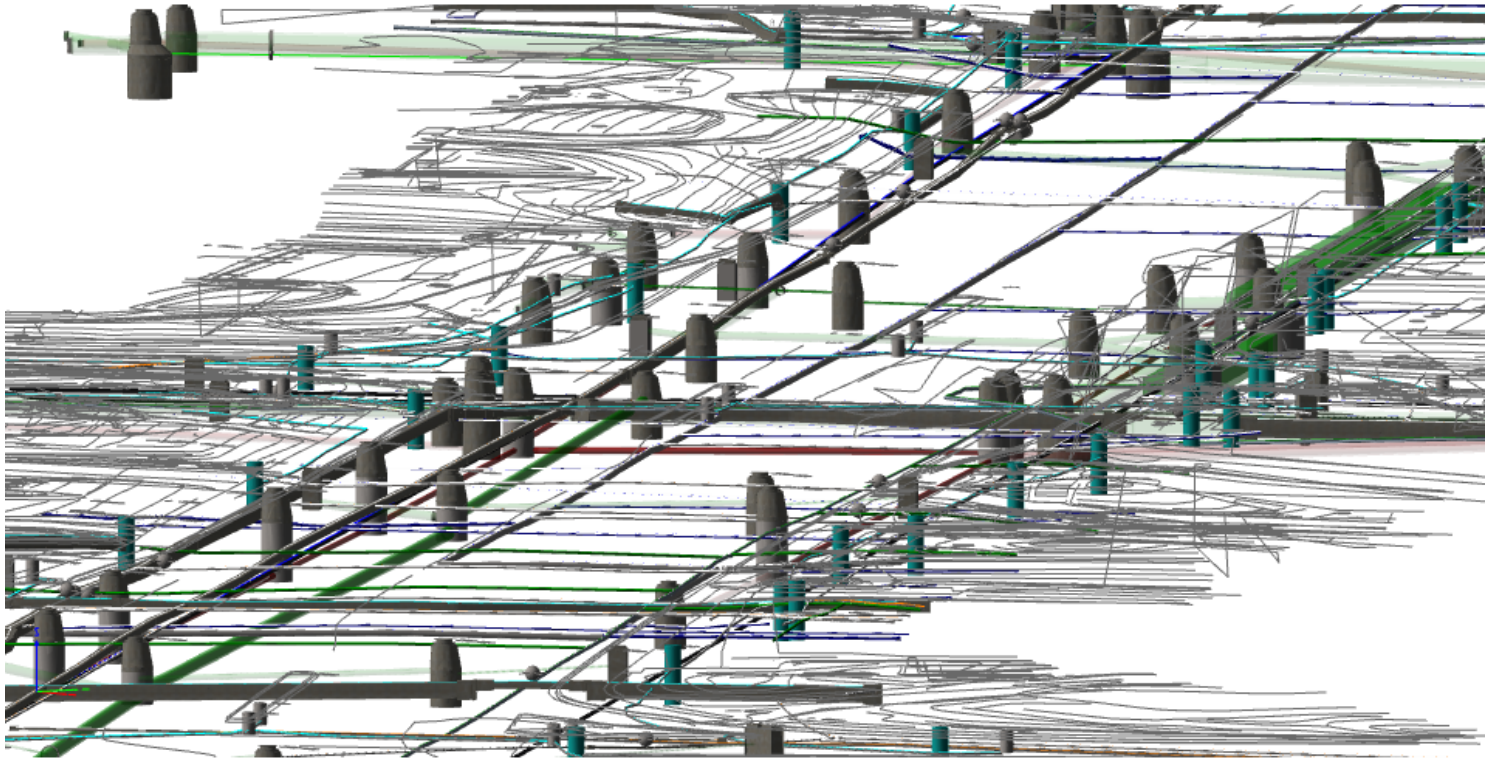
3D Utility Models



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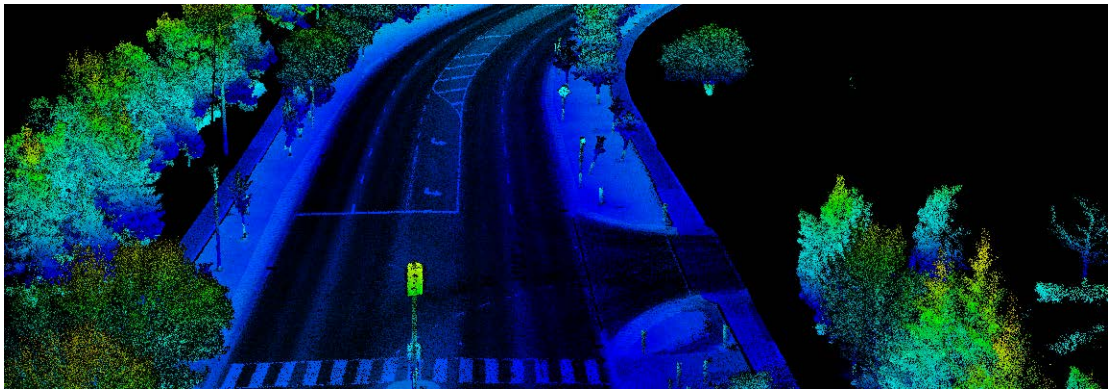
LIDAR



Sample Project - HaLRT

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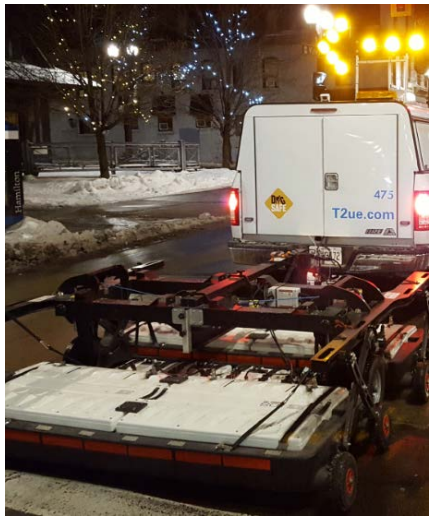
- ~13 kms
- Centre Alignment
- 17 At Grade Stops
- 1 Grade separation
- 1 Operations Maintenance and Storage Facility (OMSF)
- 3 Bridges over controlled access highways

Sample Project - HaLRT



- Followed TAC Guideline
- Completed a SUE Investigation following ASCE 38-02
- PSOS written to include use of CSA S250 for As-builts and Enabling Works
- STREAM EM / C Utilized
- 3D Model of Utilities Created
- LIDAR attempted

Sample Project - HaLRT

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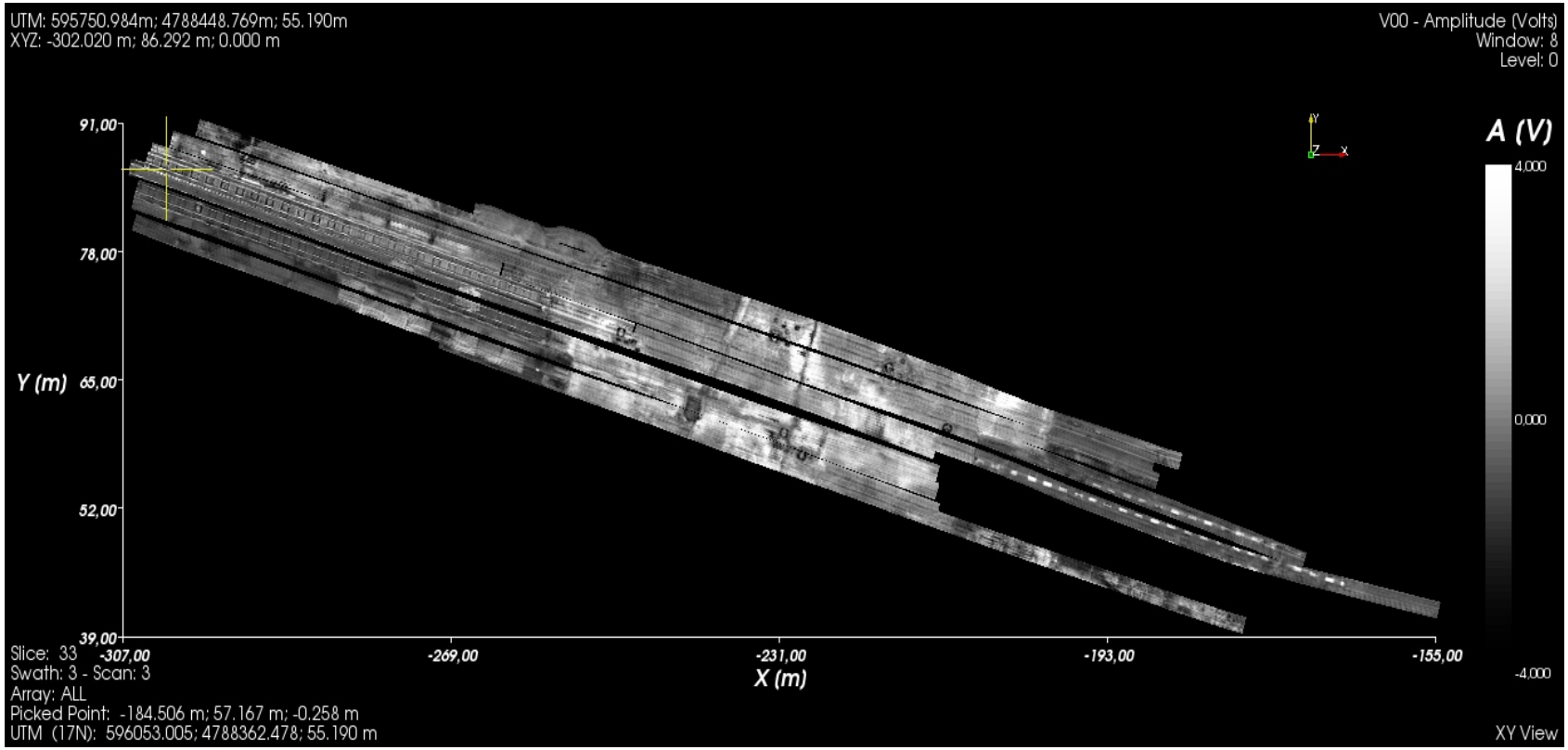
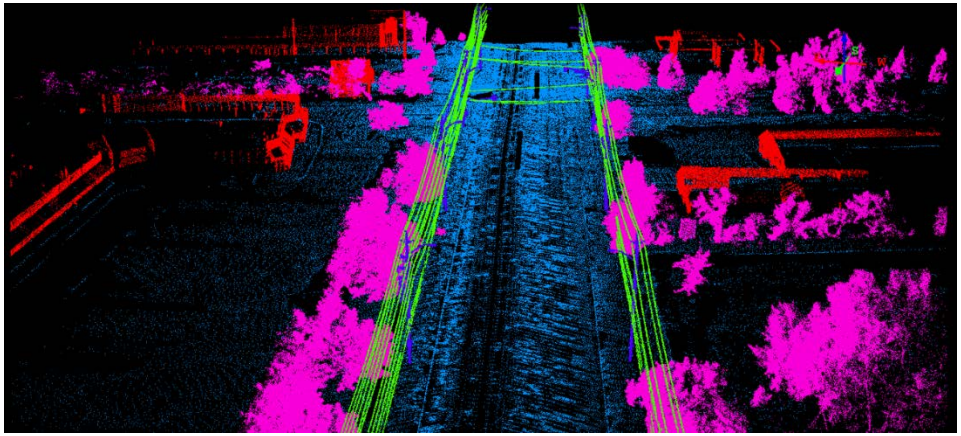
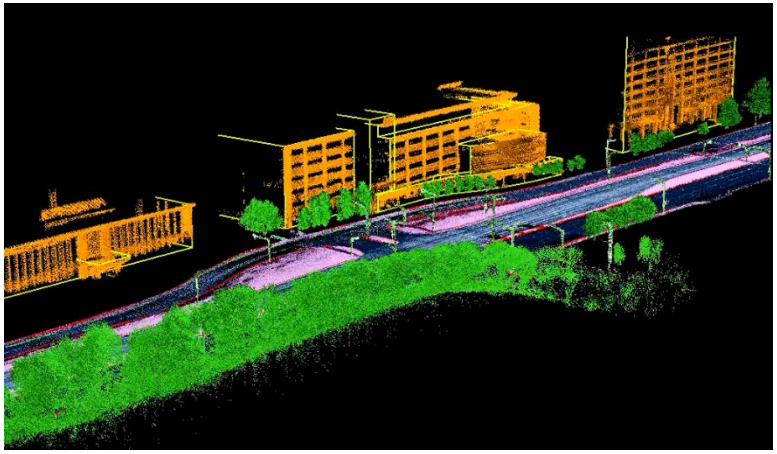


Sample Project - HaLRT

- Integrating LIDAR data with 3D Utility Model
- Challenges of tying LIDAR to project Survey Control.





Time to Take Action!

- Raise the Profile and Importance on Utility Engineering
  - UESI
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- Utilize Technology
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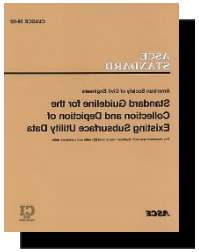

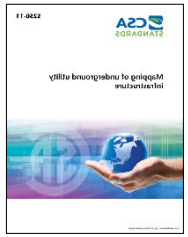

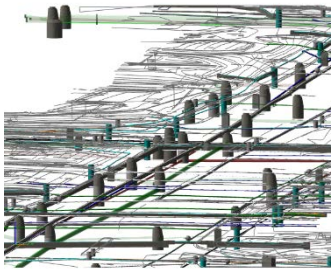

THANK-YOU!

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