Class summary

This unique class will review key workflows required to go from concept design proposals to detailed design cost estimates. Our mission is to create 2 concept-level designs for a new municipal spine roadway and trunk sewer and compare the cost of works for each scenario. We will start with a detailed look at InfraWorks 360 software and demonstrate the workflows required to build our 2 new proposals. Then we will connect our concept-level design to AutoCAD Civil 3D software to detail the roadway and sewer designs. We will look at the various quantity takeoff tools found in AutoCAD Civil 3D software and export both AutoCAD software and AutoCAD Civil 3D object data to formats that you can use for estimating. To complete the class we will introduce a new cloud-based cost-estimating system called AEC Tender. Using AEC Tender, we can connect to data extracted from our detailed design and generate detailed cost estimates for both scenarios within minutes using past project construction unit costs.

CI10743 - From Concept to Cost Estimating Using InfraWorks 360

Jeffrey Lyons

VP Sales and Marketing, AEC Solutions Inc.

www.aecsolutions.ca

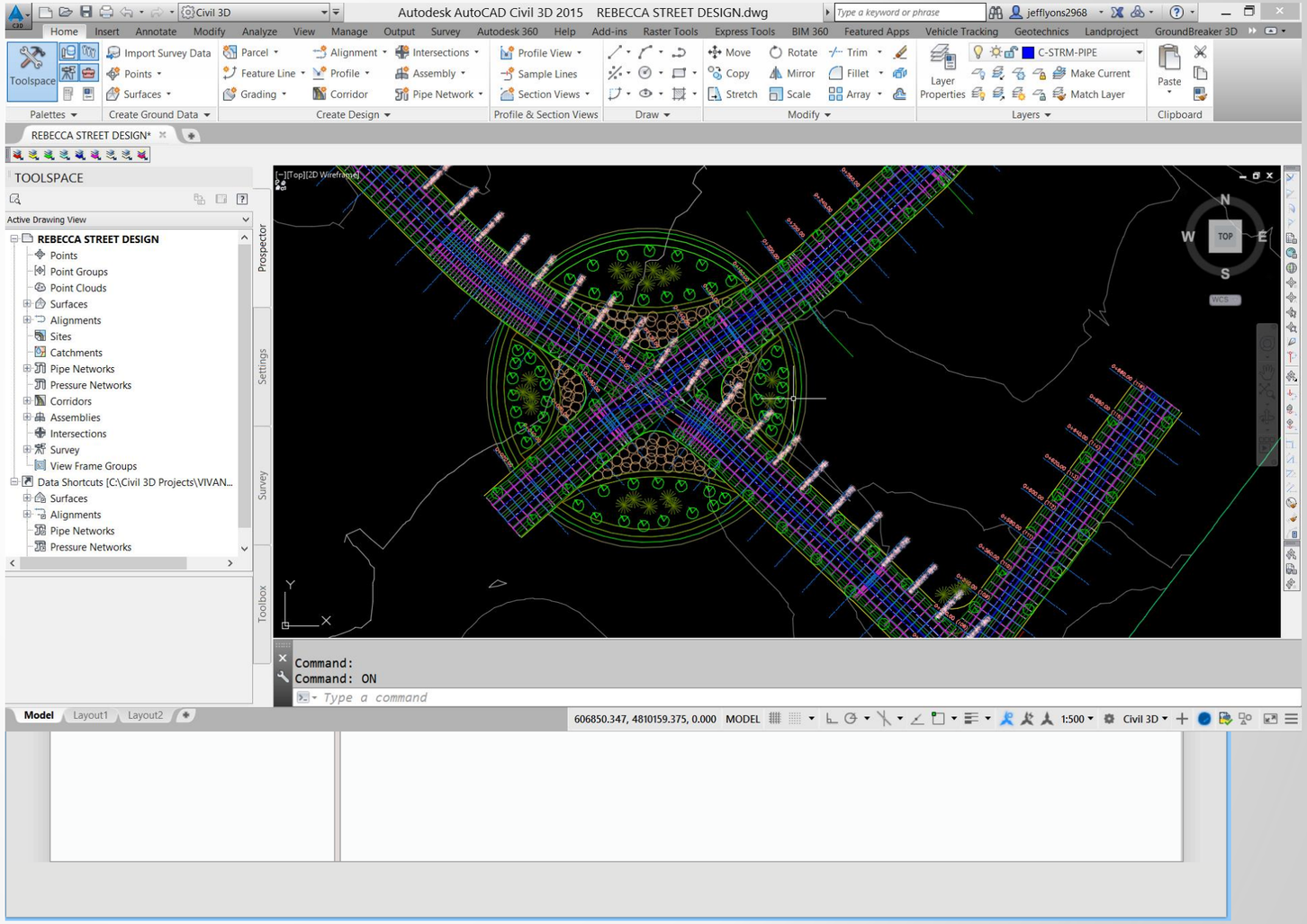
Key learning objectives

At the end of this class, you will be able to:

- Learning Objective 1 - Learn about building multiple concept design proposals using InfraWorks 360
- Learning Objective 2 - Learn how to connect concept design with AutoCAD Civil 3D
- Learning Objective 3 - Learn about AutoCAD Civil 3D Quantity Takeoff
- Learning Objective 4 - Learn about a new cost estimating system used to generate cost estimates from Quantity Takeoff data sets

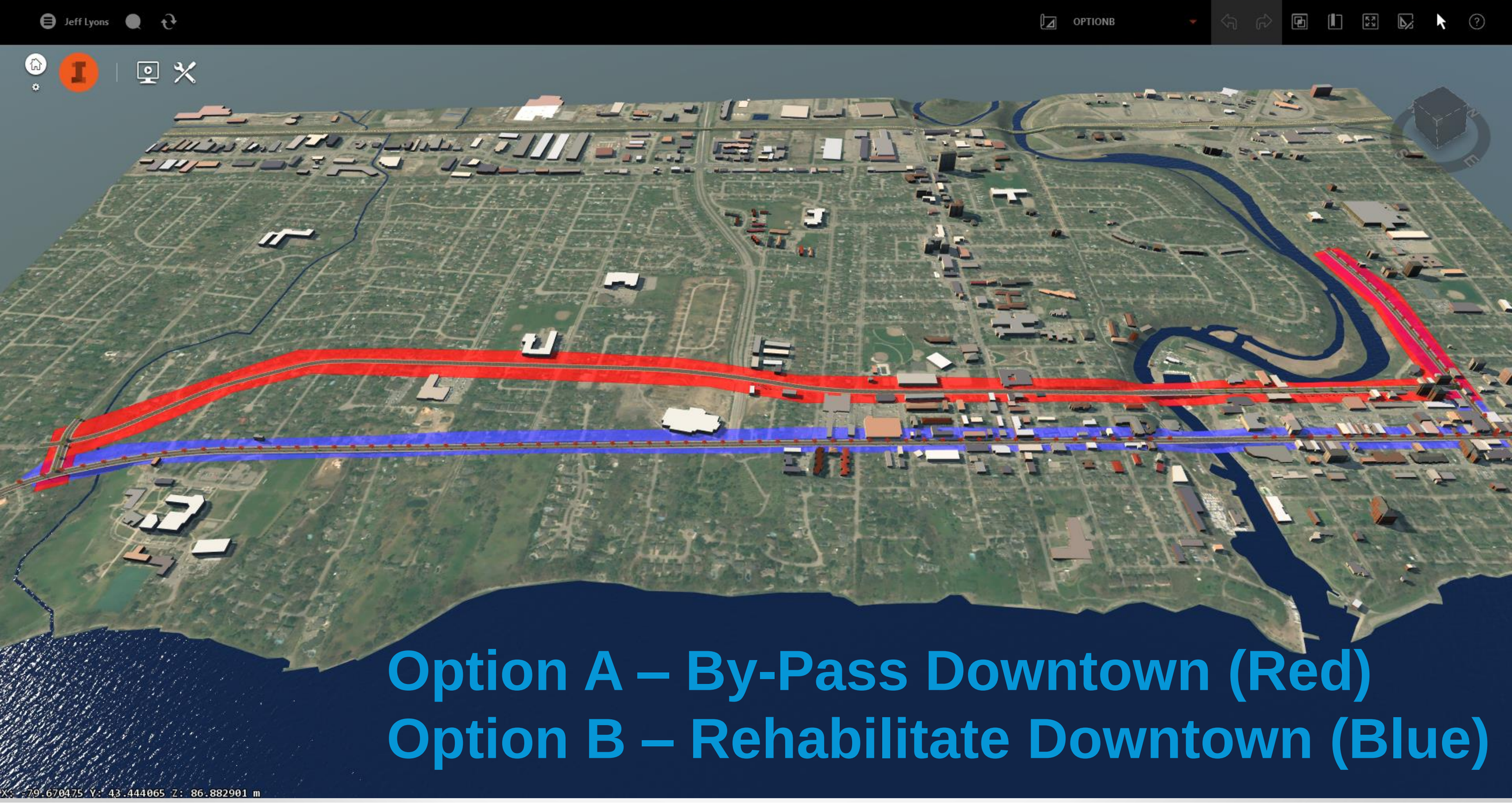
THIS IS A 3 PART SESSION

1. PART A - Autodesk Infraworks 360 for Concept Design for Roads, Bridges and Streetscape
2. PART B – Intro to AEC Tender – Software-As-A-Service for Cost Estimating, Bid Preparation and Bid Analysis
3. Part C - Autodesk AutoCAD Civil 3D for Detailed Design QTO ready for Cost Estimating and Bid Preparation



Our Primary Objective

- Create TWO (2) Concept Proposals for a Rapid Bus Transitway to improve Traffic Flow in the Downtown Core
- Determine Preliminary Costs for each Concept
- Provide Detailed Costs on selected Detailed Design

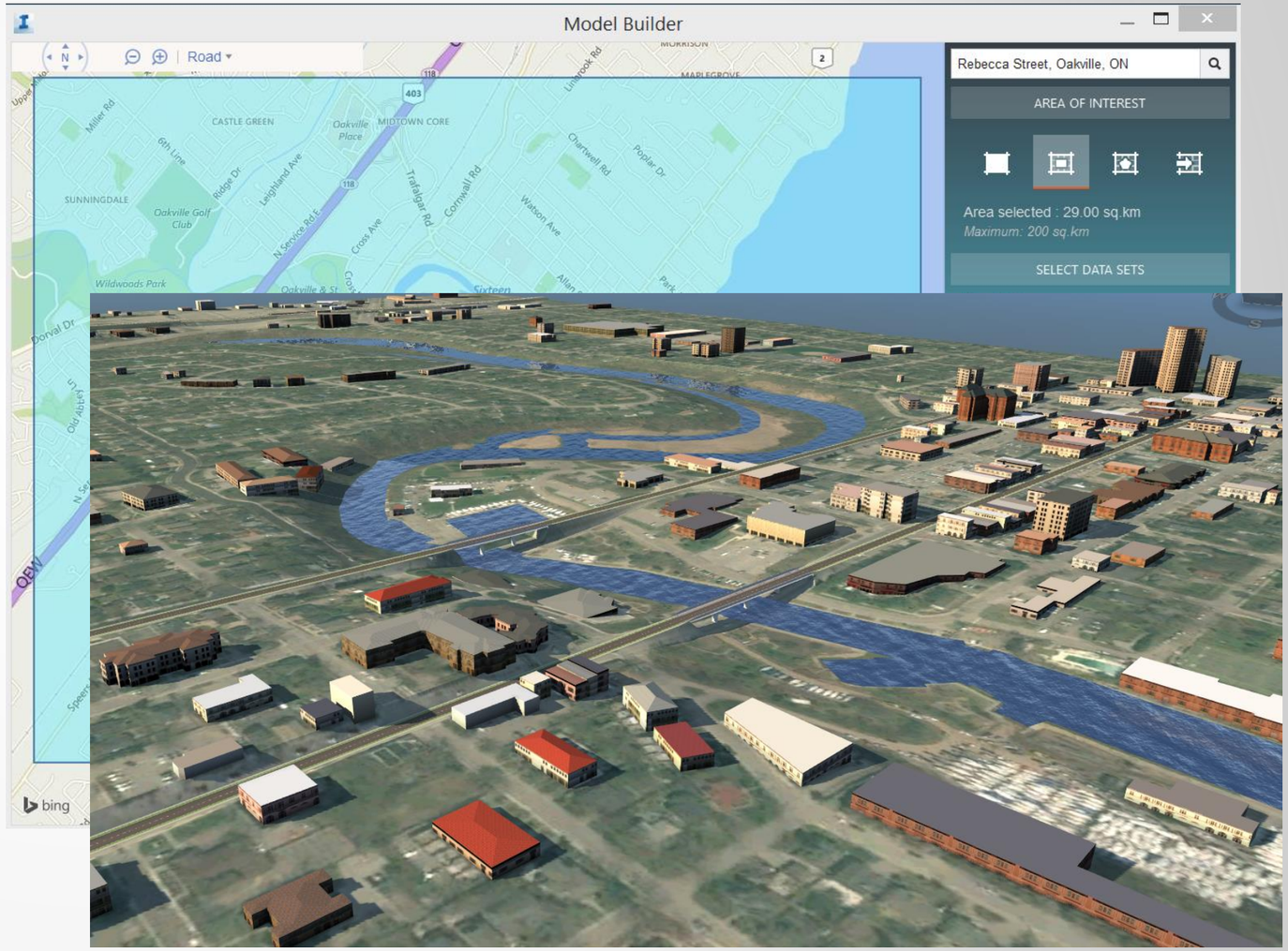

Jeff Lyons
OPTIONB
Option A – By-Pass Downtown (Red)
Option B – Rehabilitate Downtown (Blue)
X: -79.670475 Y: 43.444065 Z: 86.882901 m

Our Starting Point - Base Infraworks Model

Model Builder

- Zoom to Area
- Extract up to 200 sq.km
- 15 Minutes Later…

Our Basic Model Starting Point with Elevation Model, Roads, Imagery, Buildings, Water



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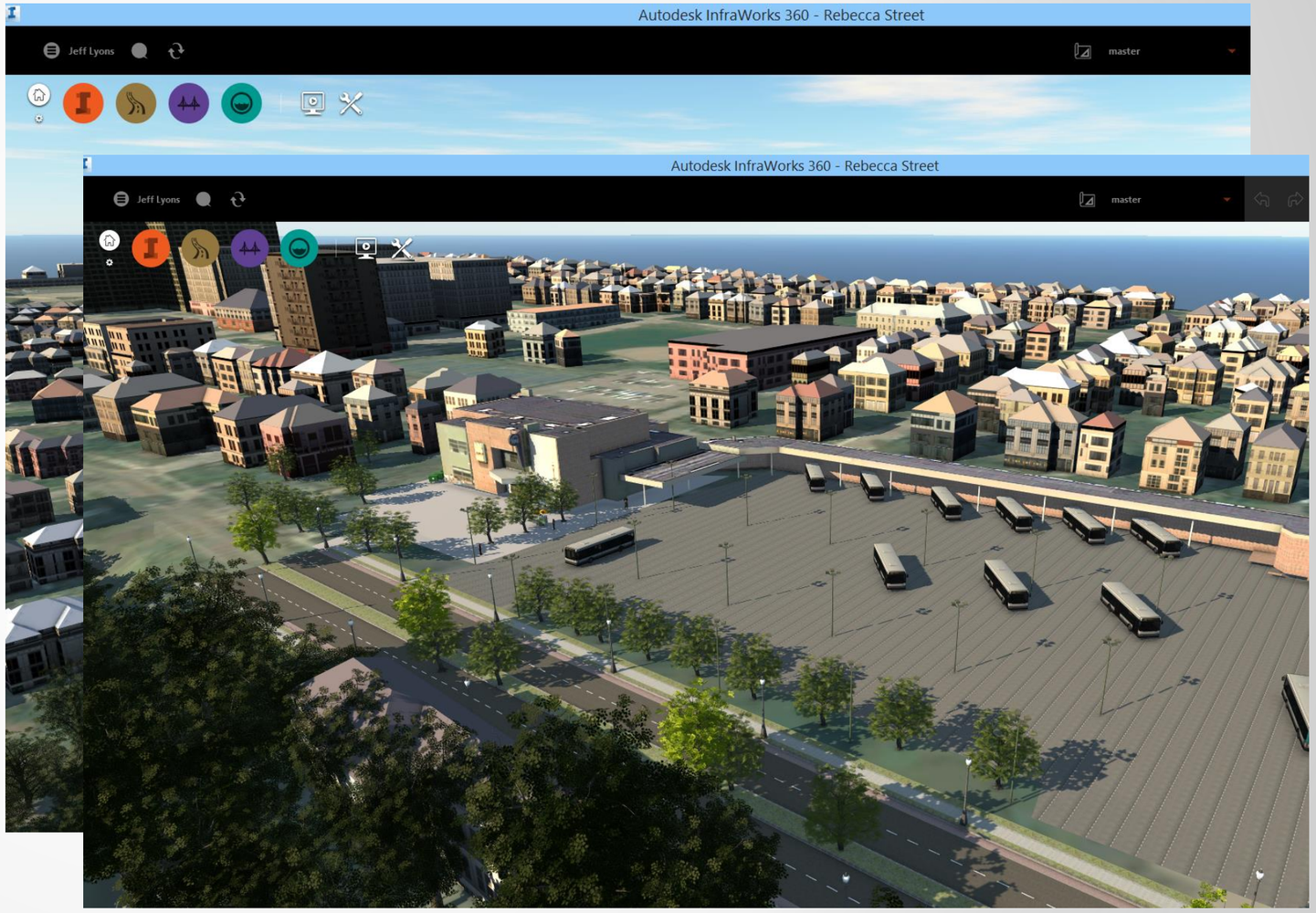
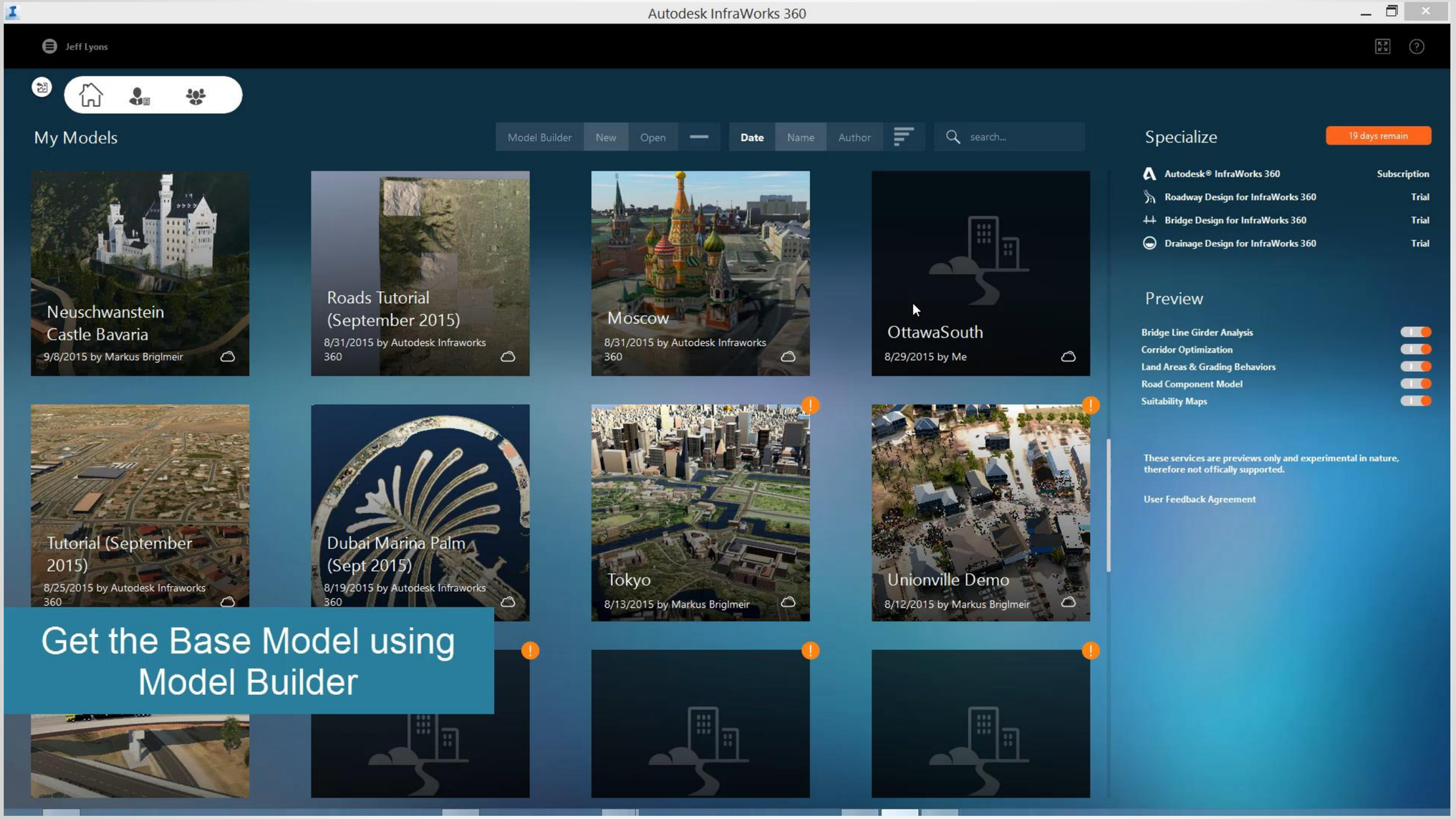
Augment Base Model with GIS Data…

- Buildings (Polygons)
- Buildings (Models)
- Trees
- Signage
- Traffic signals
- Lighting
- Point Clouds



Create the Model and Augment it with City Data



Option A – Construct a Downtown By-Pass

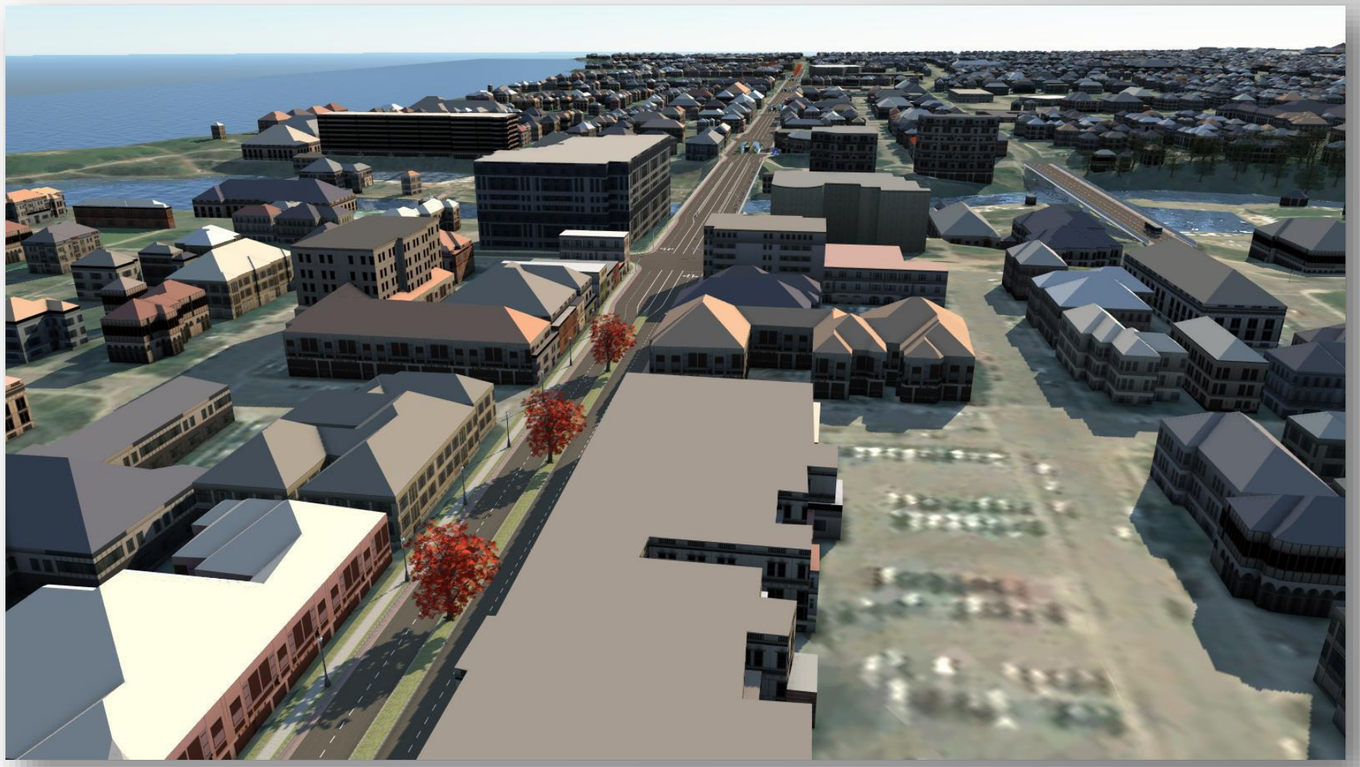
Key Design Scope:

- 2.5km of Development
- Mill and Overlay Current Street
- Road Section Expansion to accommodate Rapid Bus Corridor
- Expand Existing Bridge
- 12 New Station Stops

Option B – Rehabilitate Downtown Core and Improve Traffic

Key Design Scope:

- 3.5km of Development
- Downtown Rehabilitation with Streetscape
- Side Street Rehab
- Partial Rapid Bus Expansion of Right of Way
- Full Bridge Replacement
- 8 New Station Stops

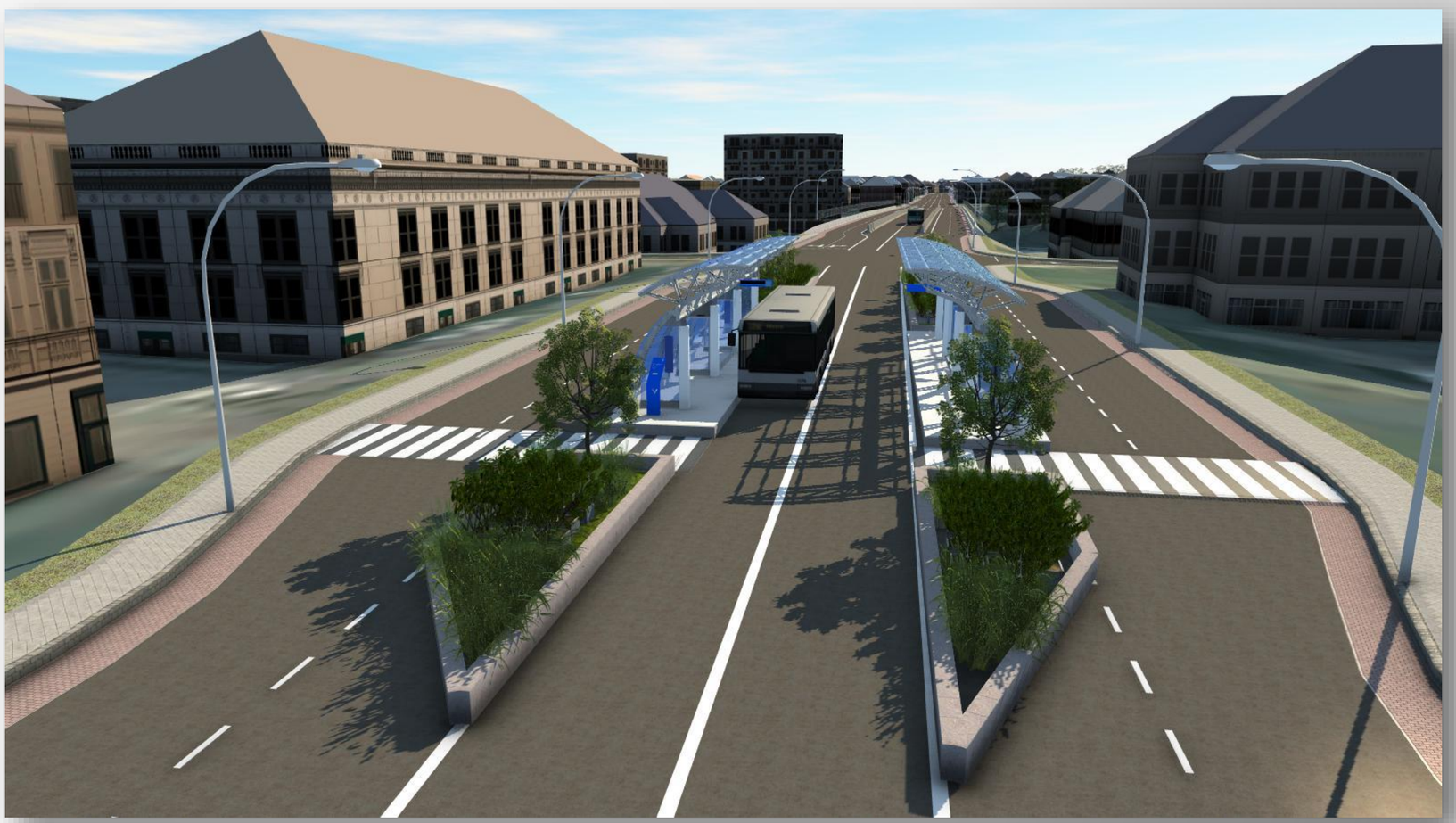


Common to Both Proposals

- Water, Sewer, Storm
- Utility Engineering
- Landscaping
- Signalization
- Lighting

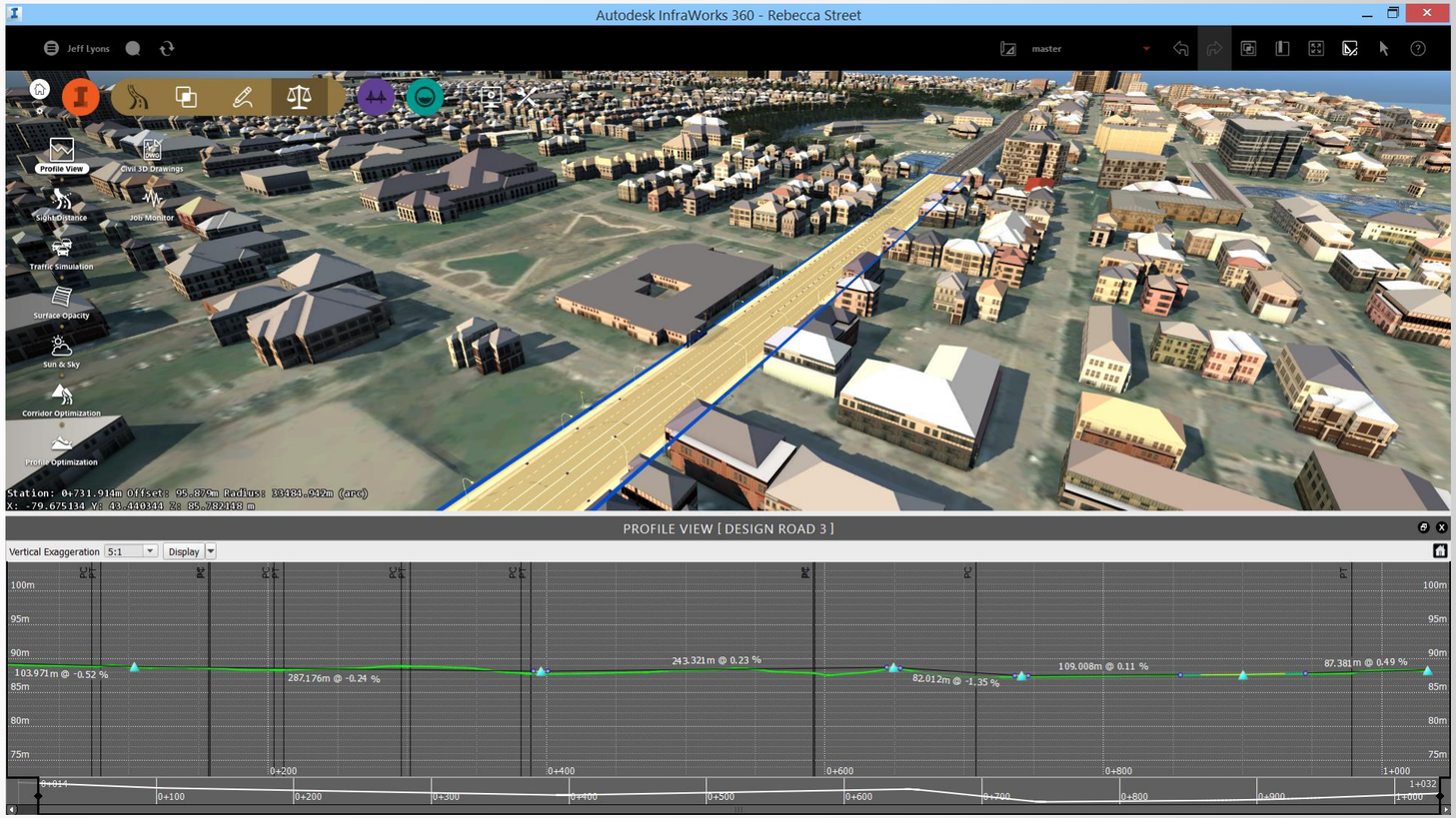
Part A: Building the Key Infraworks Proposal Objects

- Roads
- Bridge
- Rapid Bus Transit Stations
- Landscaping
- Street Features



Adding Conceptual Roads

- Infraworks 360
  - Draping the Road on Surface Model
  - Stylization to Control Components
- Infraworks 360 Roadway Design
  - Complete Vertical Design Profile Editing
  - Profile Optimization (Cloud Credits)
  - Quantity Takeoff and Section Reports
  - Component Road Stylization (Sandbox)

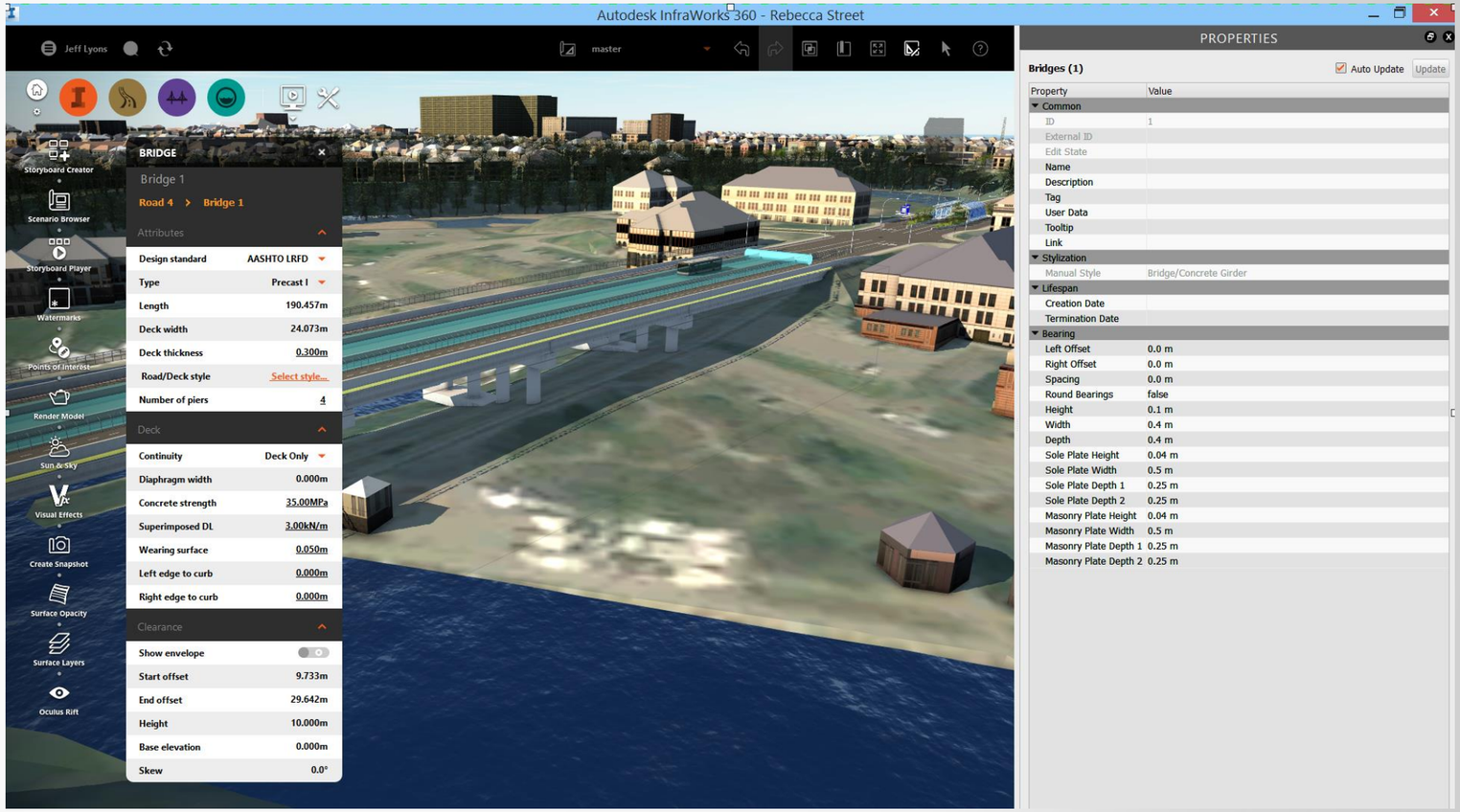


Click Image to Watch Video


Autodesk InfraWorks 360 - Rebecca Street
Jeff Lyons
master
Storyboard Creator
Scenario Browser
Storyboard Player
Watermarks
Points of Interest
Render Model
Sun & Sky
Visual Effects
Create Snapshot
Surface Opacity
Create the Proposal
Option A Road Design Objects
X: -79.674749 Y: 43.432530 Z: 74.842592 m

Adding Conceptual Bridge

- Infraworks 360
  - Splitting the Road Feature
  - Stylization to Control Bridge Visualization
  - No Underground Design
- Infraworks 360 Roadway Design
  - Complete Dynamic Bridge Component Design
  - Underground Design
  - Bridge Quantities for Concrete and Steel



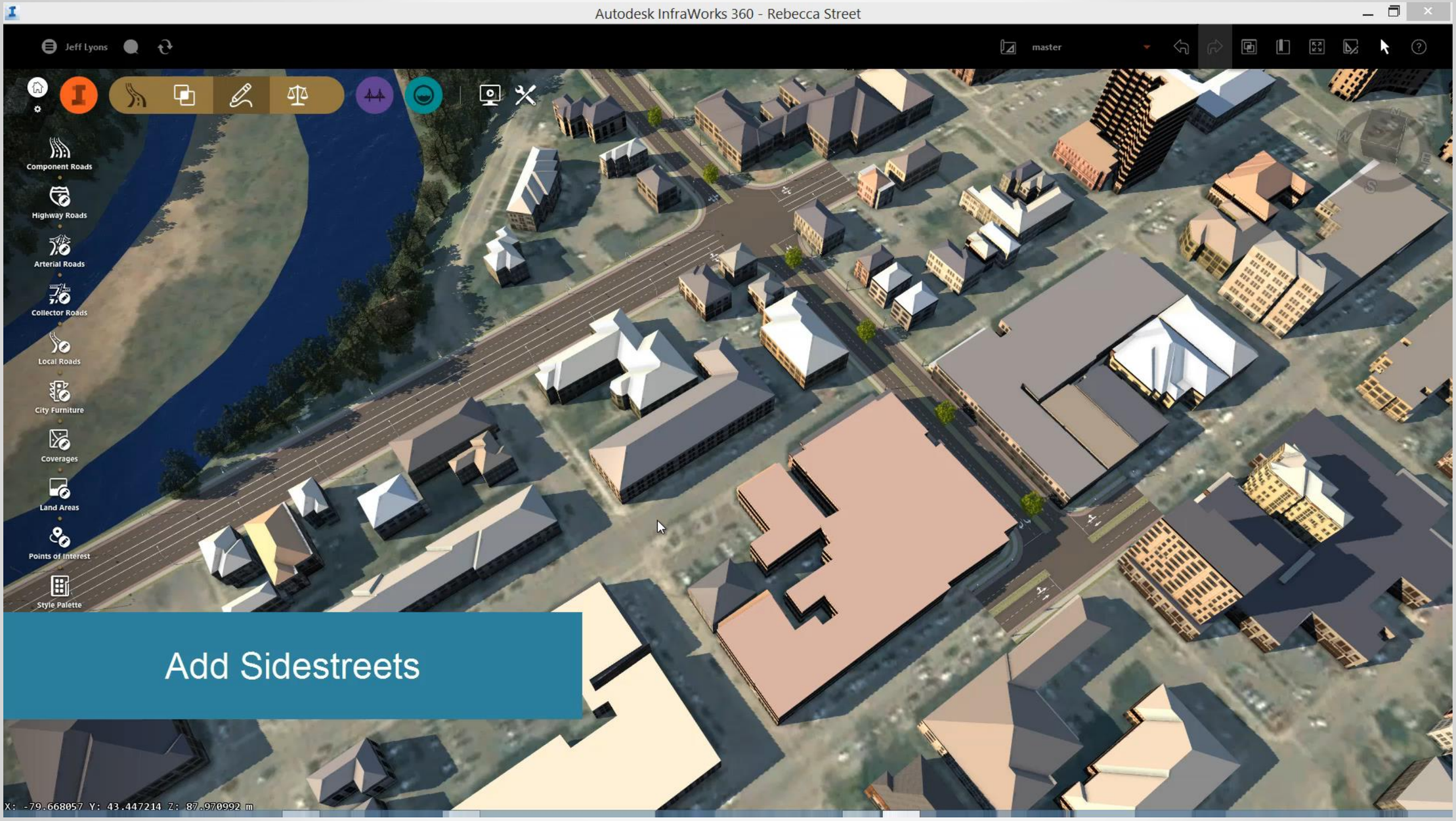
Click Image to Watch Video


Autodesk InfraWorks 360 - Rebecca Street
Jeff Lyons
master
Precast I Girder Bridge
Steel Plate Girder Bri...
Add a Bridge to Option A Proposal
X: -79.673262 Y: 43.442559 Z: 85.338579 m

Adding Intersections, Landscape, Street and Station Features

- Intersections with Paint
- Signalization
- Signage
- Landscape Design
- Station Platforms and Shelters

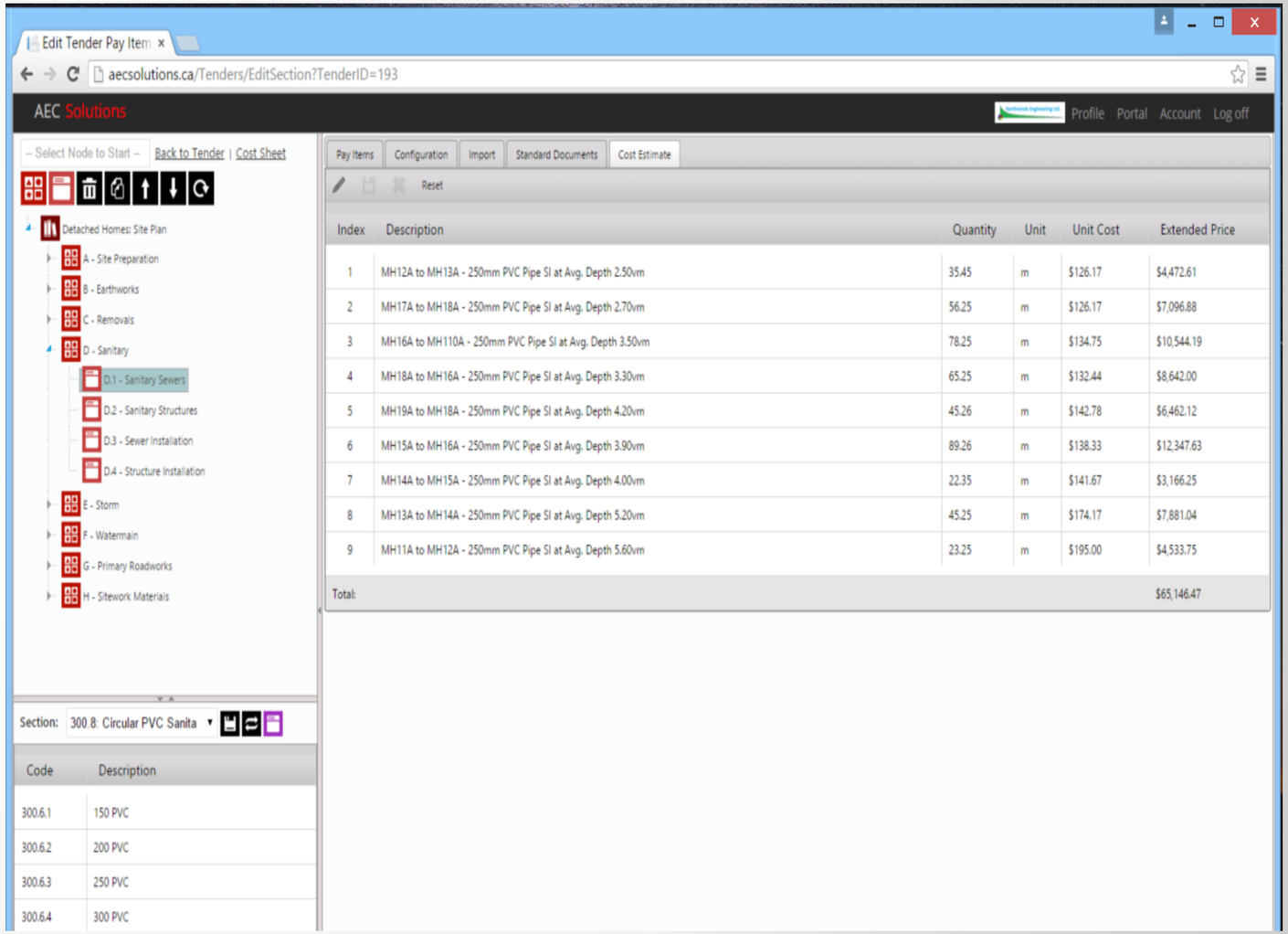
Click Image to Watch Video


Autodesk InfraWorks 360 - Rebecca Street
Jeff Lyons
master
Component Roads
Highway Roads
Arterial Roads
Collector Roads
Local Roads
City Furniture
Coverages
Land Areas
Points of Interest
Style Palette
Add Sidestreets
X: -79.668057 Y: 43.447214 Z: 87.970992 m

PART B: Brief Introduction to AEC Tender

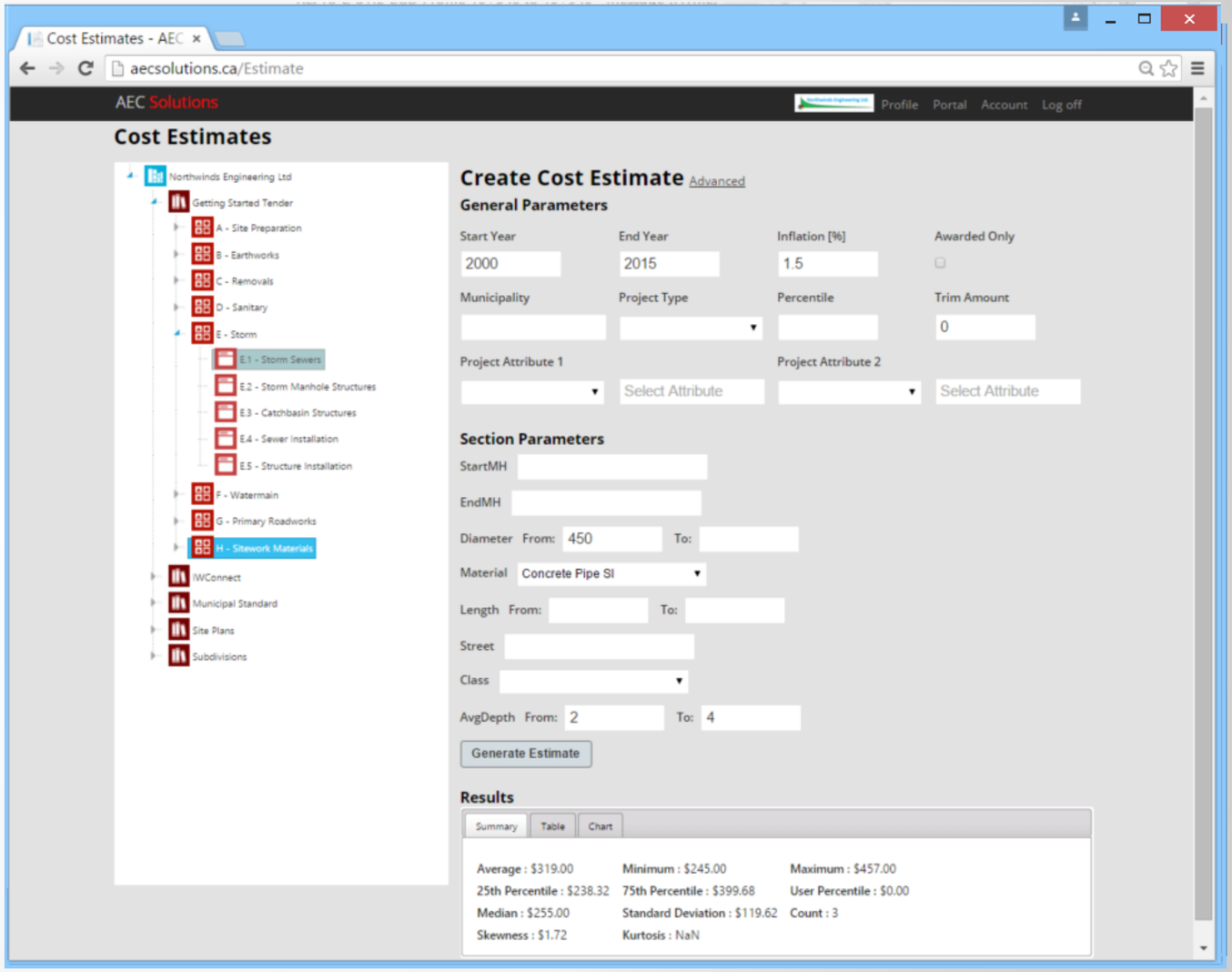
AEC Tender is THE Best Solution on the market today to:

- Manage, Create and Analyze Contractor Bids for Project Construction
- Perform Real-time Cost Estimating on any project using YOUR data

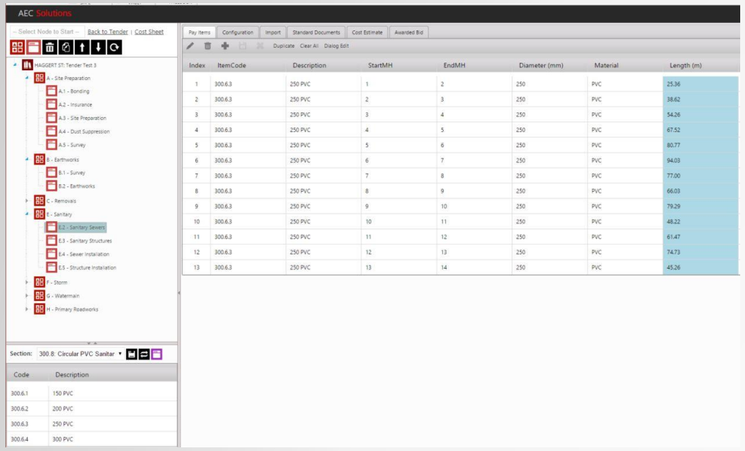


Top 5 Productivity Features of AEC Tender

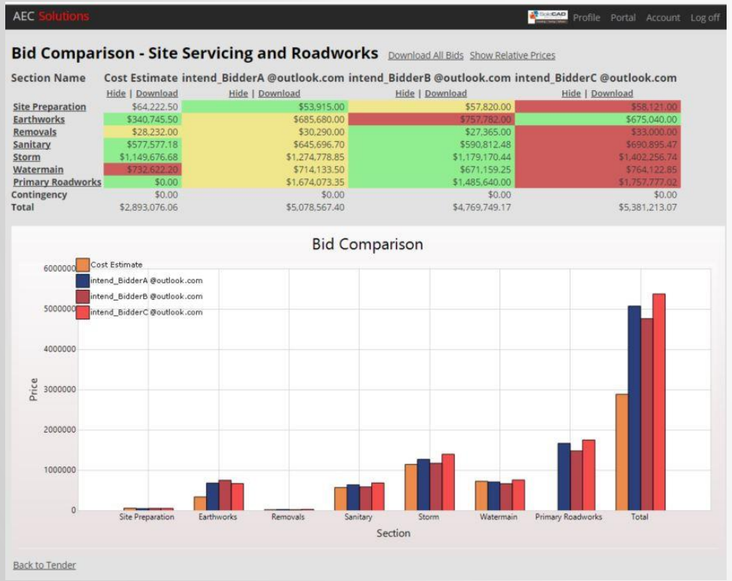
1. Standardization of Catalogs for any Project Type
2. Fast and Easy Cost Sheet Creation for Bidders using Drag n Drop from Catalog
3. Instantly Import Items direct from CAD or Civil 3D
4. Analyze Bids submitted from Contractors
5. Real-time Cost Estimates from past project pricing



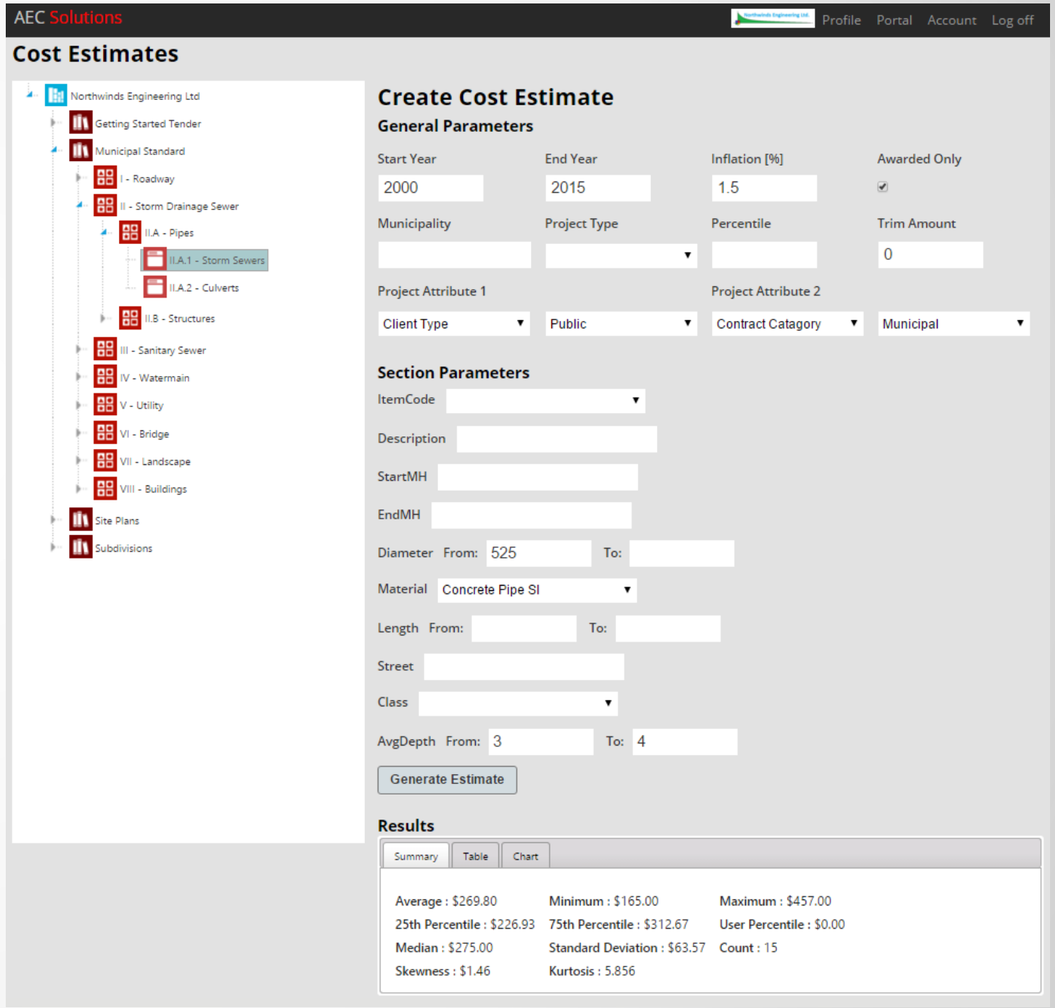
Create Cost Estimate from Items…



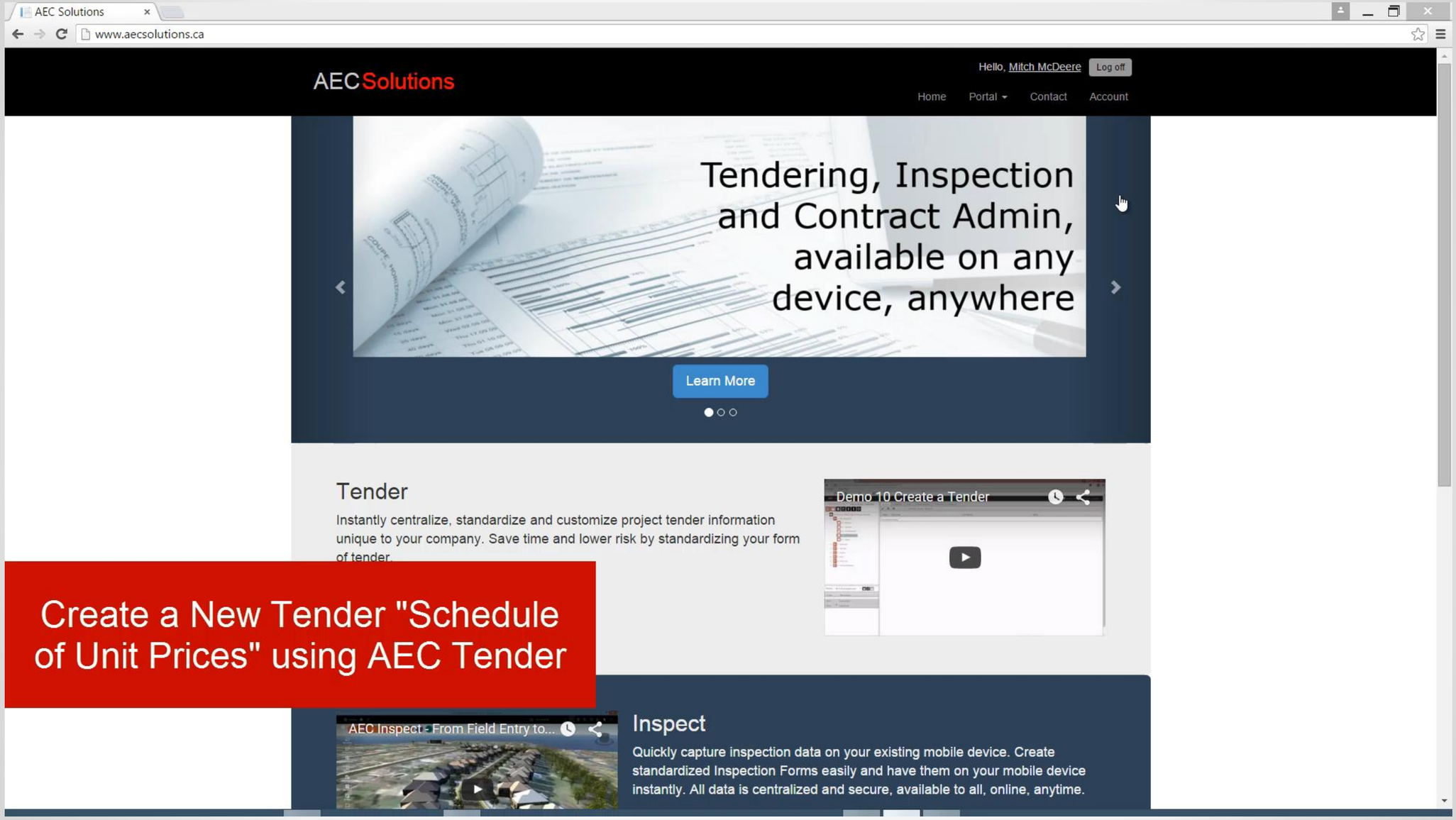
Analyze Bid Pricing from Contractors…



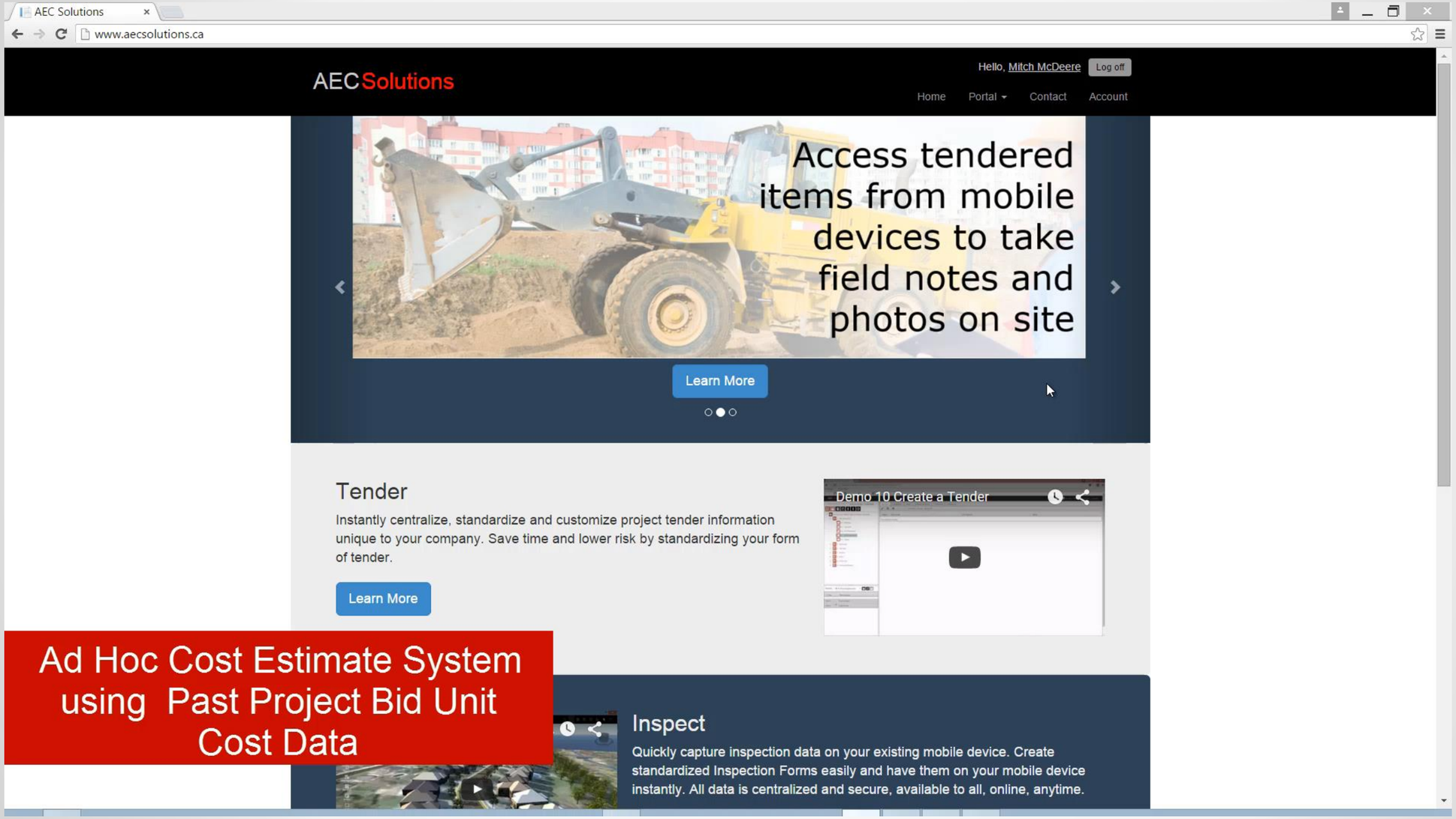
Perform ad Hoc Cost Estimates for any Template Items using Past Bids and Awarded Projects…



AEC Tender Introduction to Cost Estimating and Bid Preparation



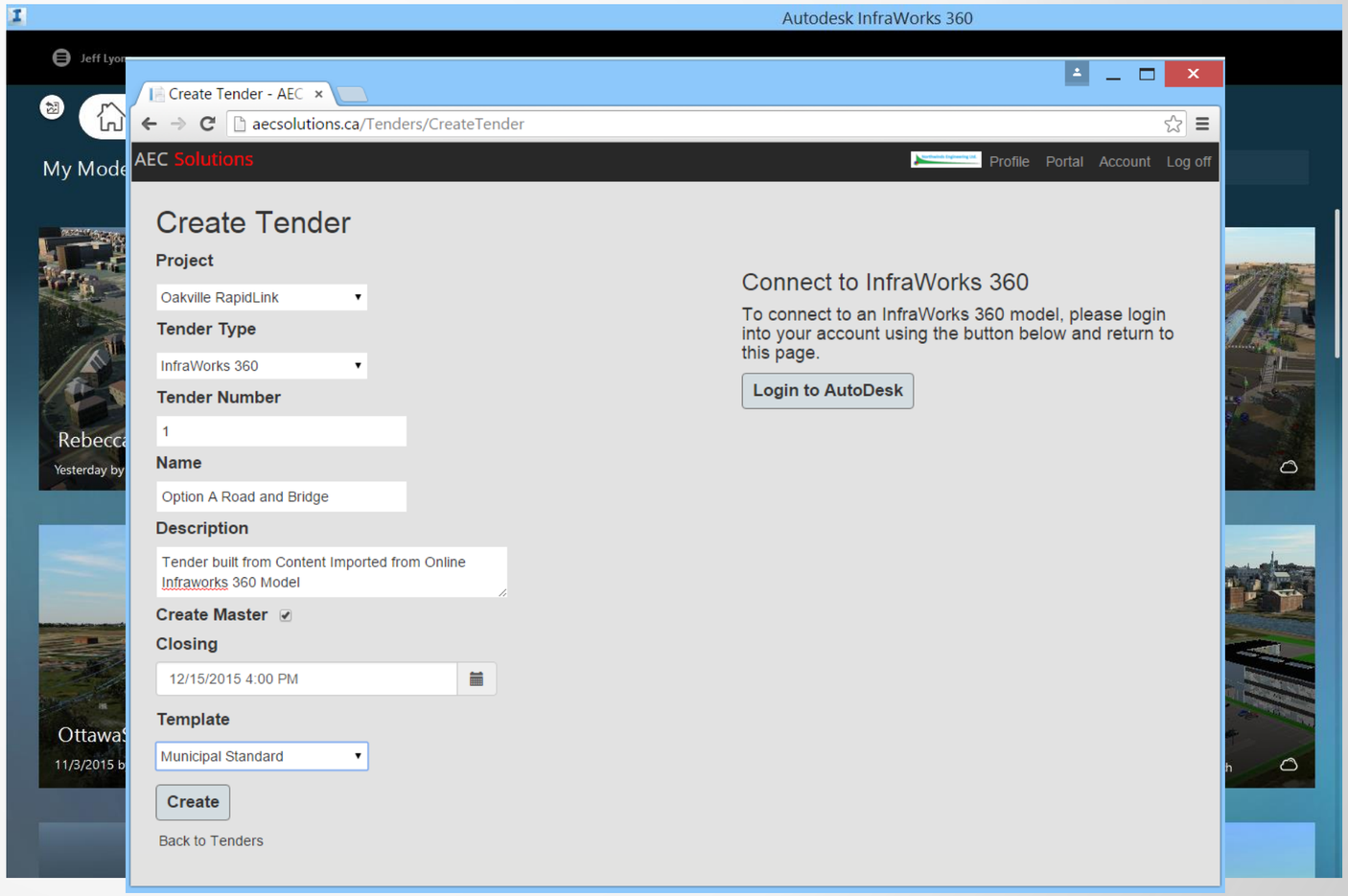
Ad-Hoc Cost Estimate using Past Project Bids



Now Back to our Project! Connecting Infraworks 360 Online Model with AEC Tender for Cost Estimating

- Using Infraworks 360, you can post the Model to the Online Collaboration Site

- Using AEC Tender, we can “Connect” to the Online Model to Auto-Populate the Tender Section Table(s) with Content found in the Model



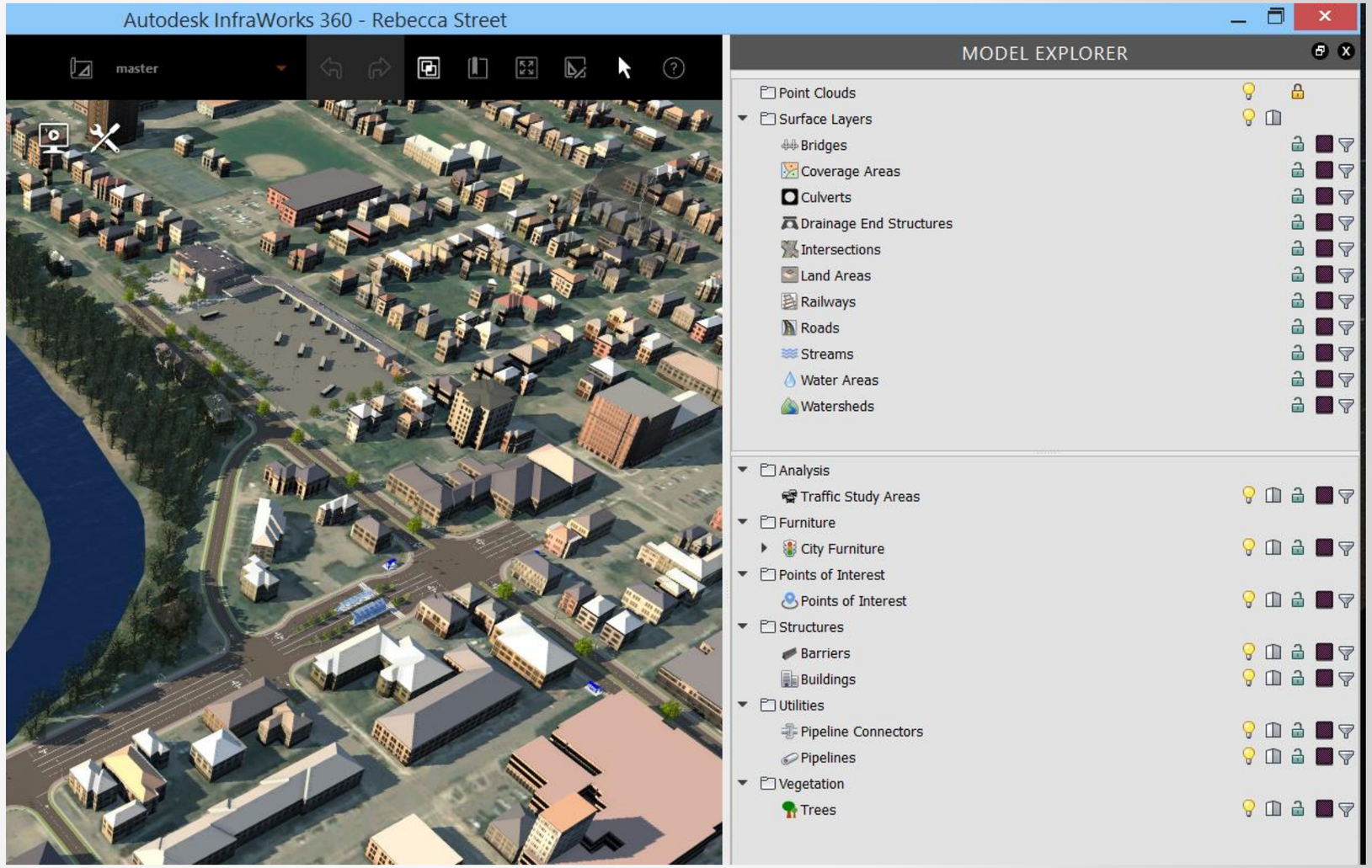
A Quick Look under the Hood…
Review 3 Key Concepts

- Infraworks Objects ARE ready for Cost Estimating
- We ARE Linking Infraworks Objects to AEC Tender Pay Items
- Mapping Object Properties with Pay Item Entry uses Expressions (Just like Civil 3D)

Infraworks Objects subject to Cost Estimating

List of Objects and their “Default” Quantity Measurement Types:

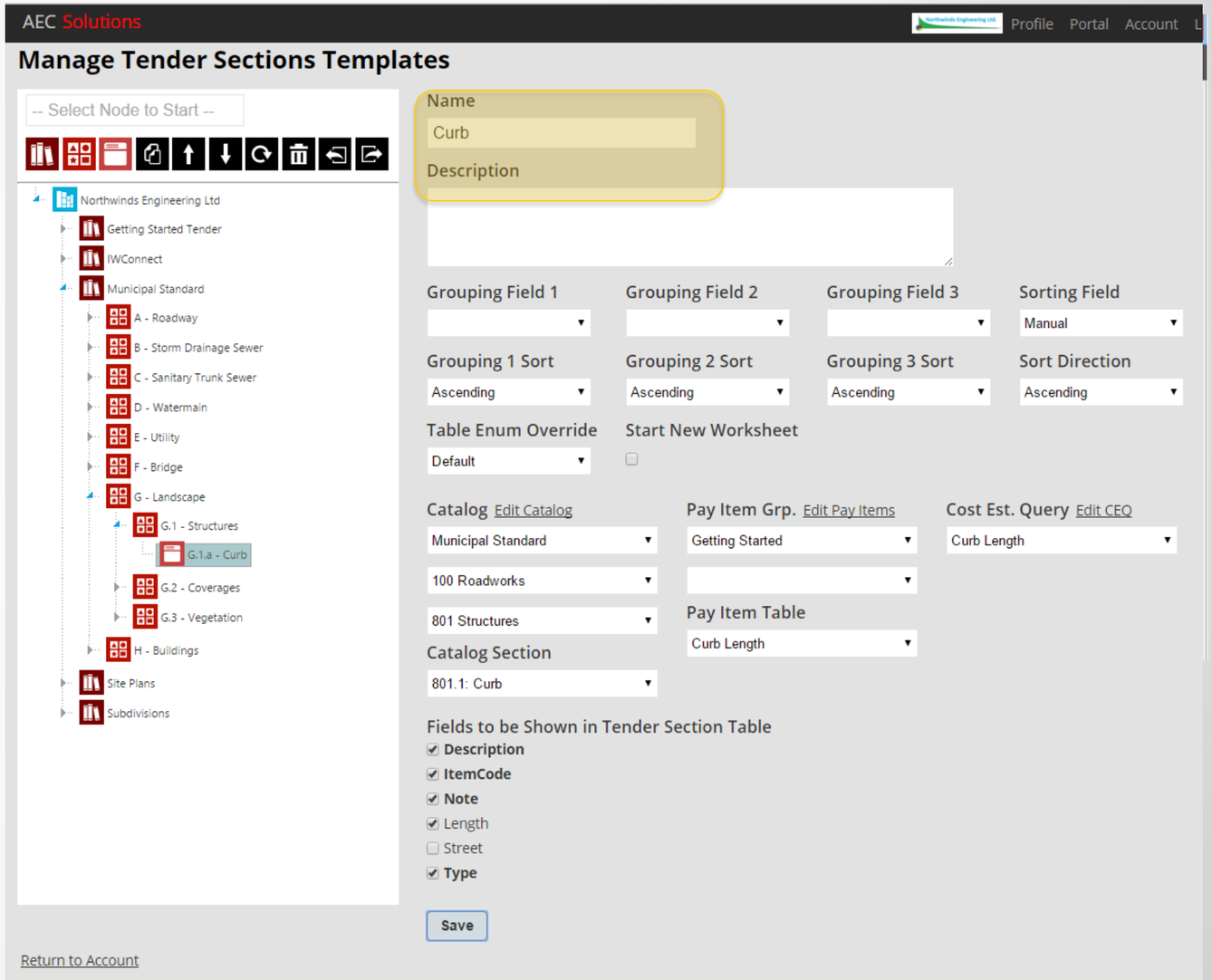
- Coverages = Area
- Culverts = Length
- Drainage End Structures = Each
- Land Areas = Area
- Railways = Length
- Roads = Length
- City Furniture = Each
- Points of Interest = Each
- Barriers = Length
- Buildings = Each
- Pipeline Connectors = Each
- Pipelines = Length
- Trees = Each



Linking Infraworks Objects with AEC Tender Template Groups and Items

- The Infraworks object “Tag” and “User Data” properties are used to “Link” Infraworks Object(s) to an AEC Tender Cost Estimating Section Table Item

- Back in AEC Tender, the Tender Section Table Name and Pay Item Configuration determines Auto-Population of the Tender Items



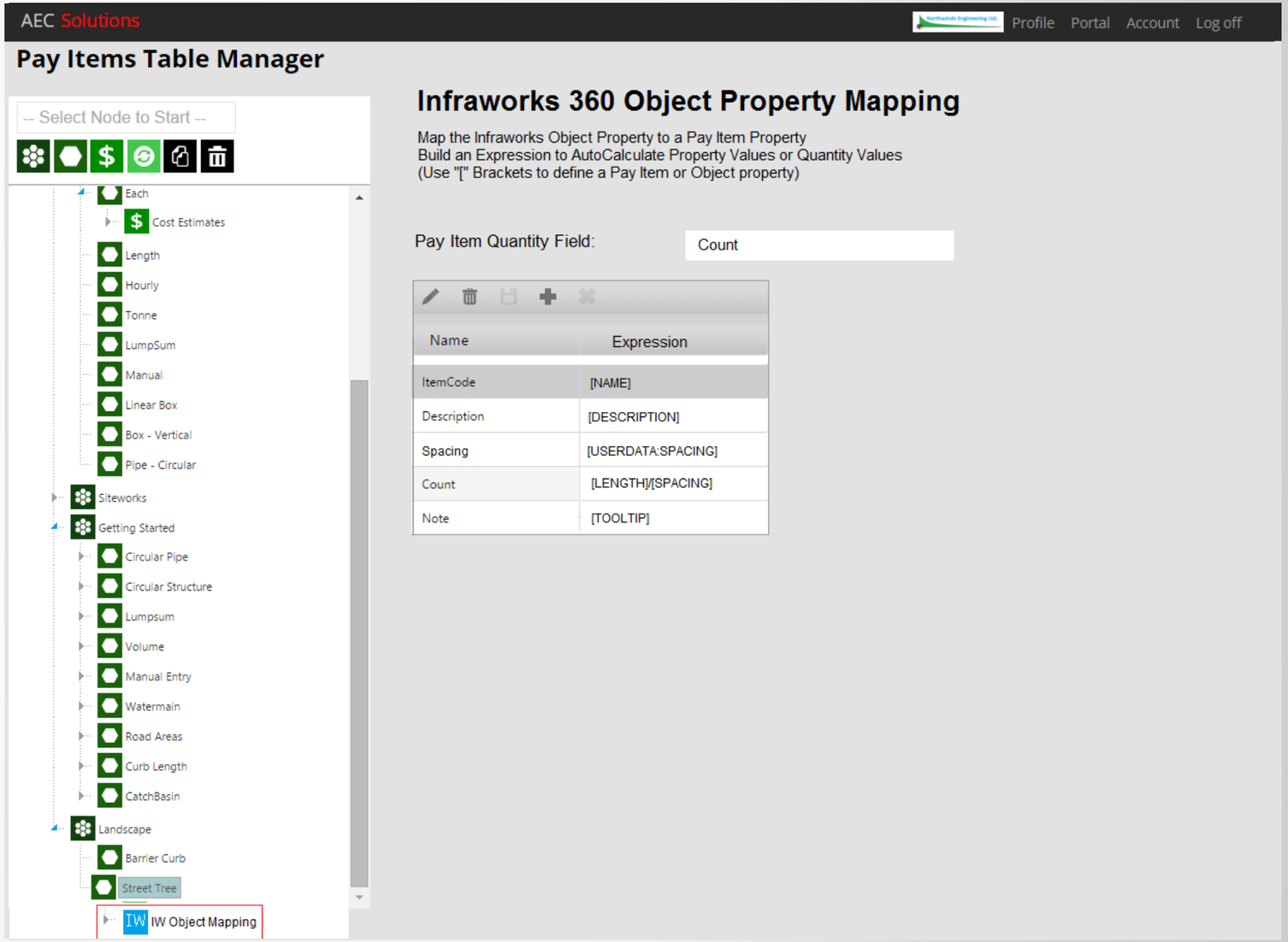
Mapping Infraworks Object Properties to AEC Tender Pay Item Properties using Expressions

Using Infraworks,

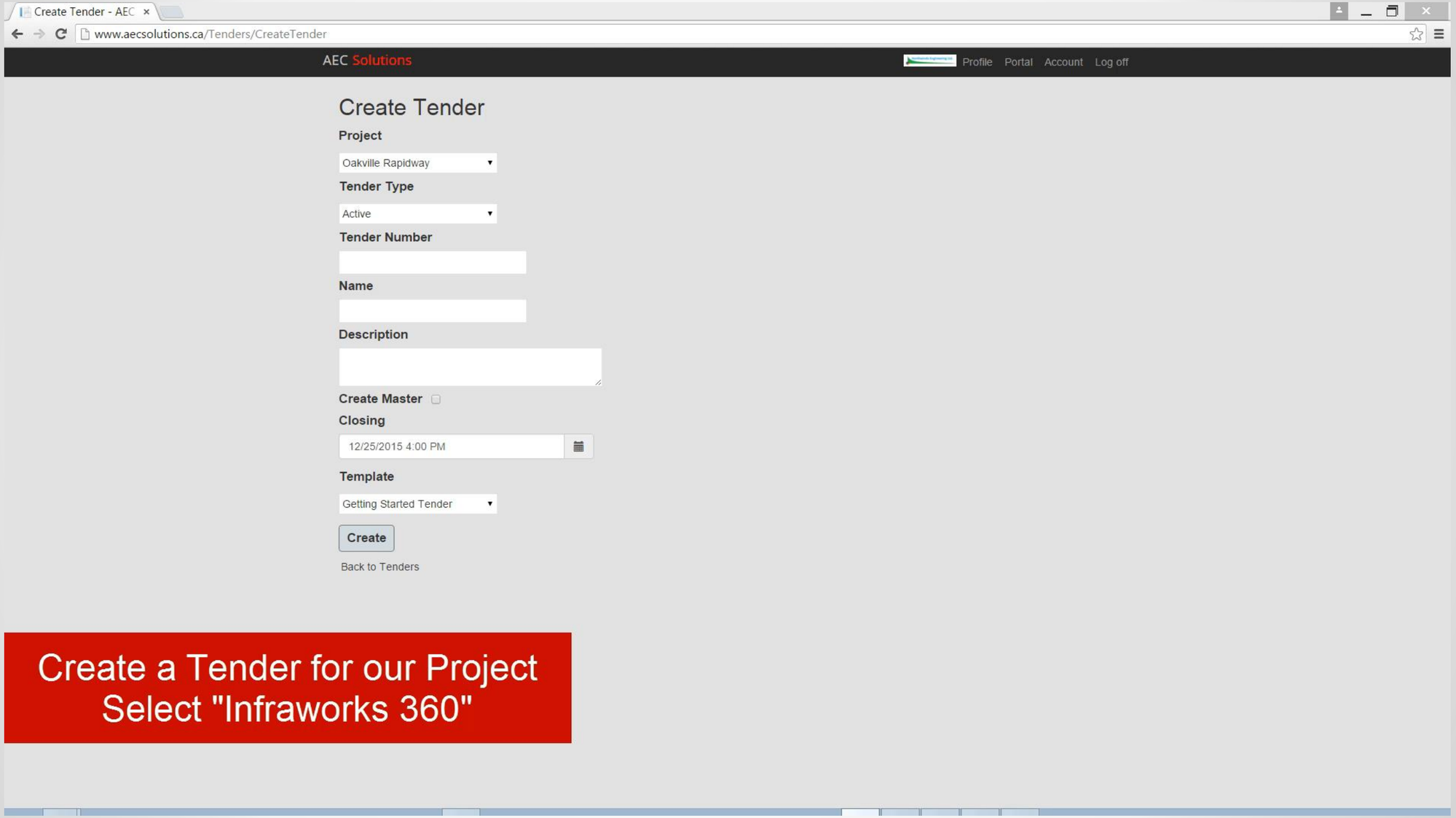
1. Select Design Road
2. Edit Tag: **Roadway**
3. Add User Data: **Width=12**

Using AEC Tender,

1. Create or Verify that “**Roadway**” is a Section Group Name in the Tender Section Template to be used
2. Review the Pay Items used to build the Roadway Tender Section
3. Configure the Pay Item “IW Object Mapping” to Automatically populate and calculate Tender Pay Item Fields from Object Property and User Data Fields



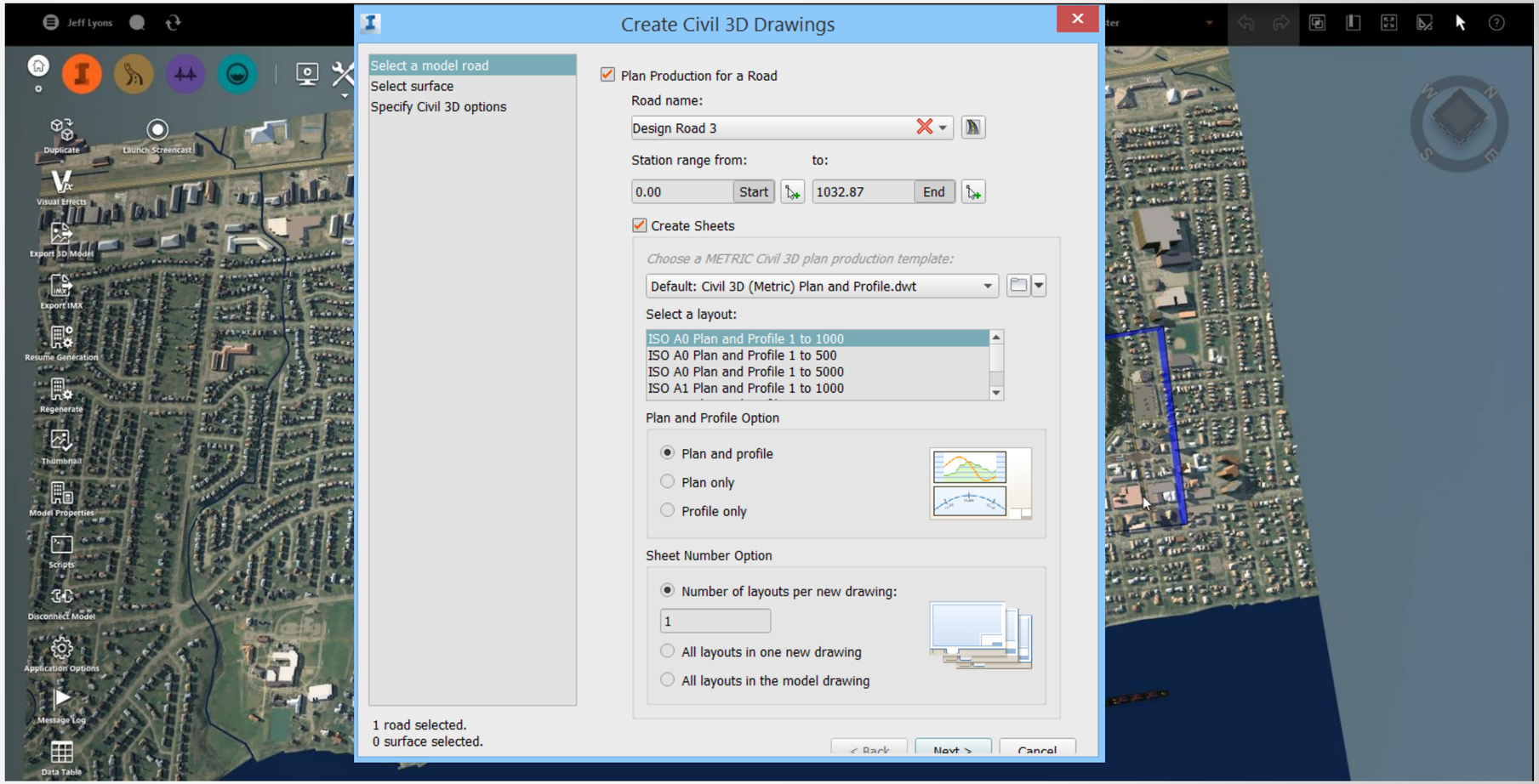
Building a Cost Estimate from Infraworks 360 Model



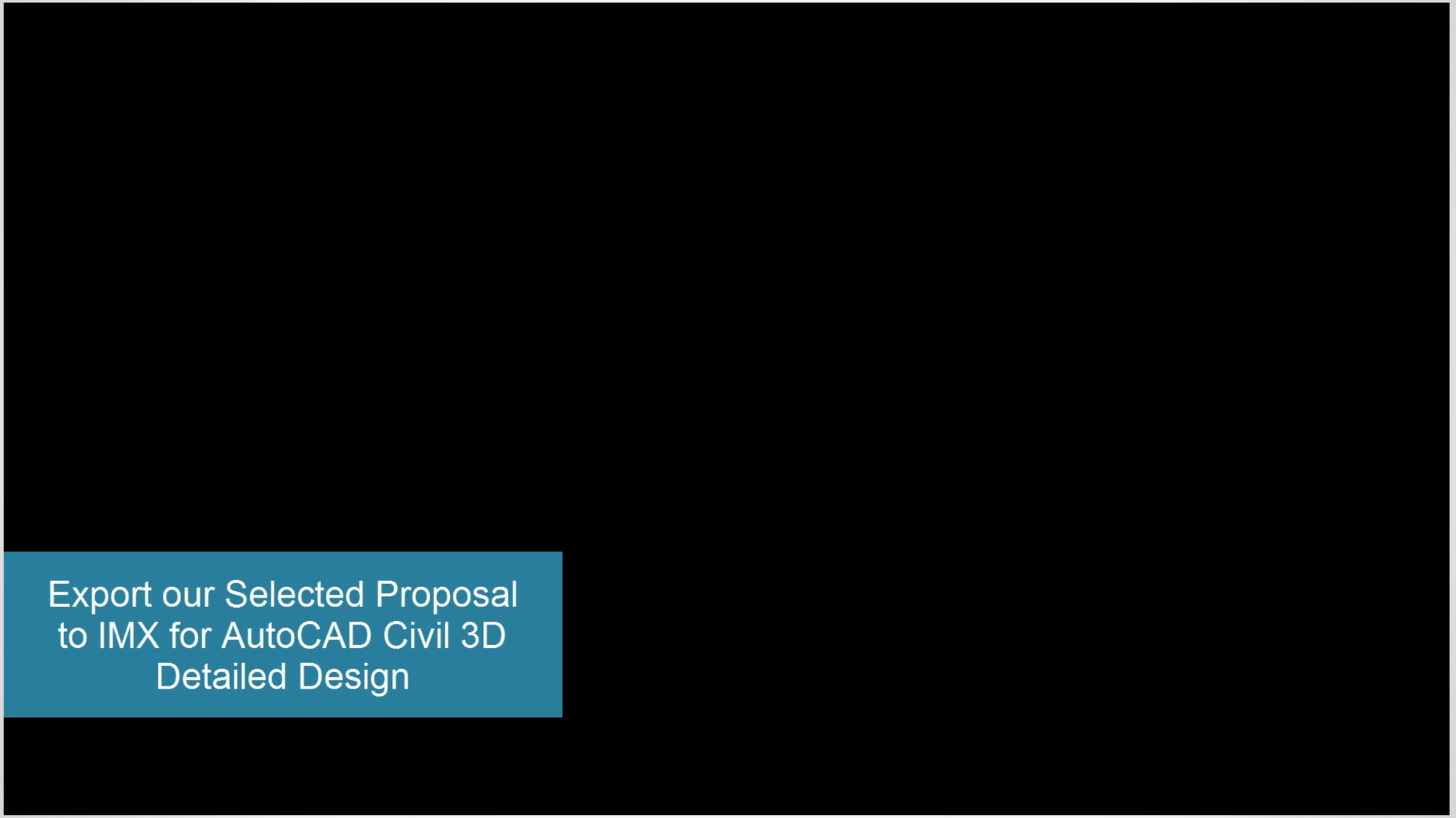
PART C: From Concept to Detailed Design

Options to Export,

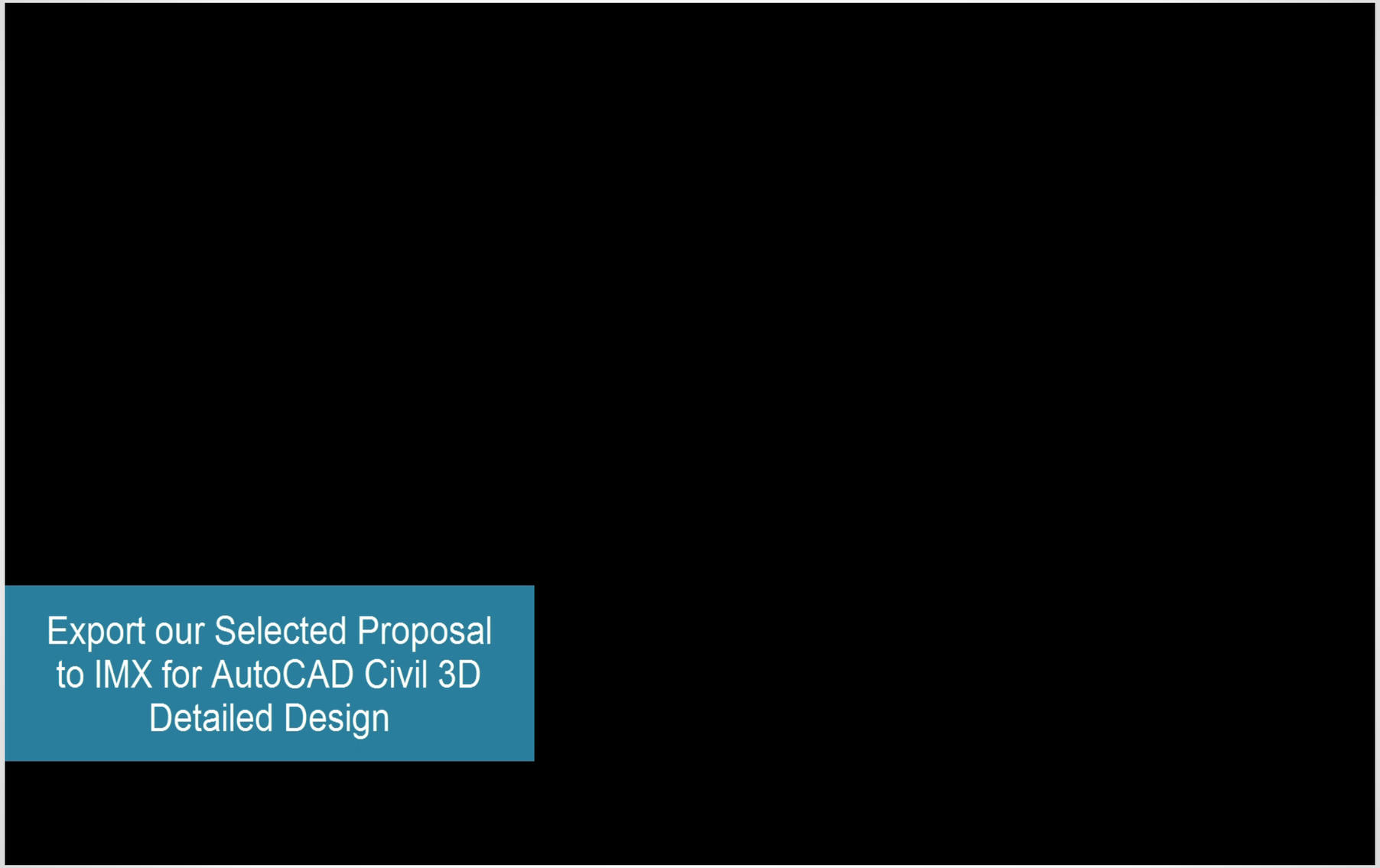
- Export Selected area or entire model to IMX
- Export Design Road to Civil 3D using Plan Production Tools (360 Version Only)



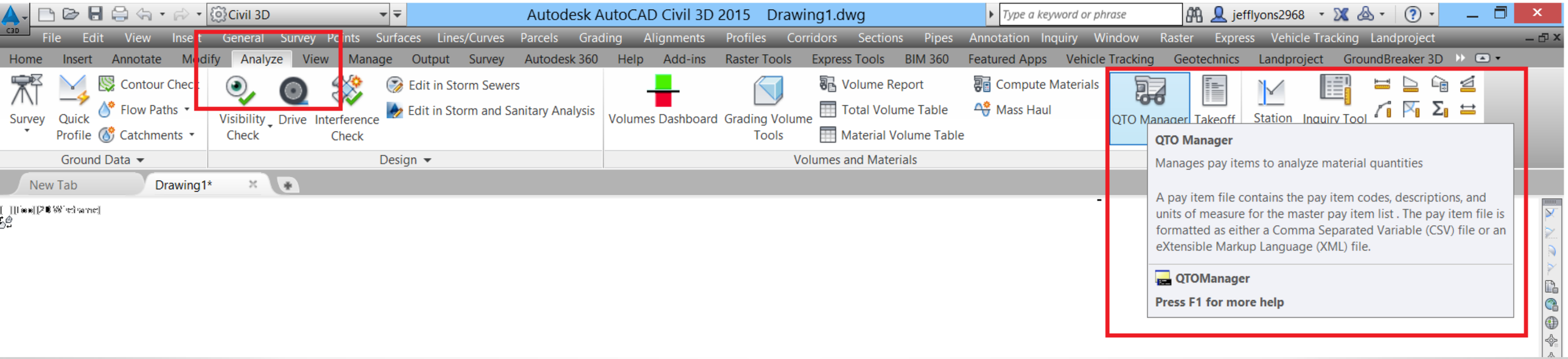
Export Concept Model Content



Import Concept Model Content



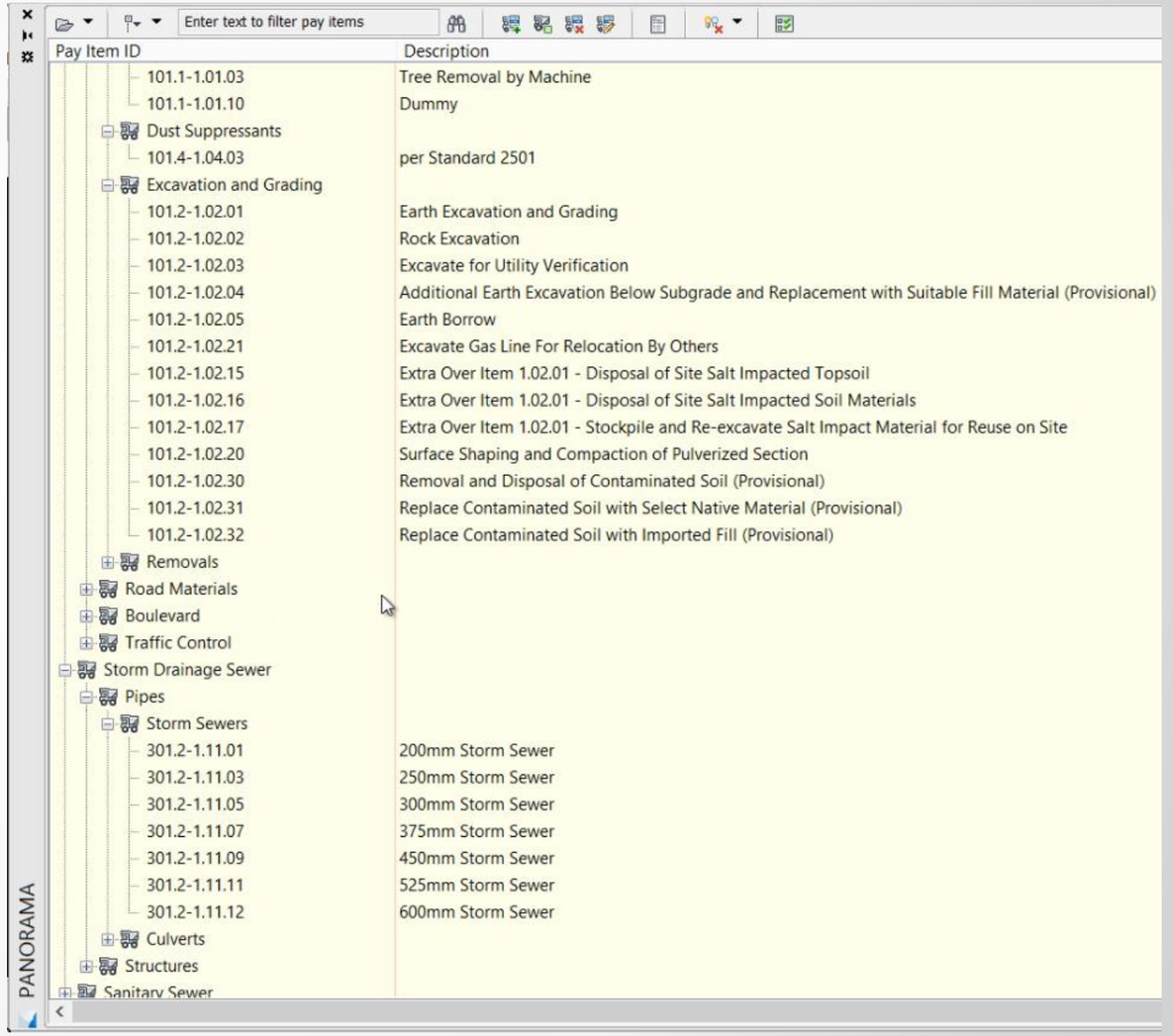
Detailed Design using AutoCAD Civil 3D

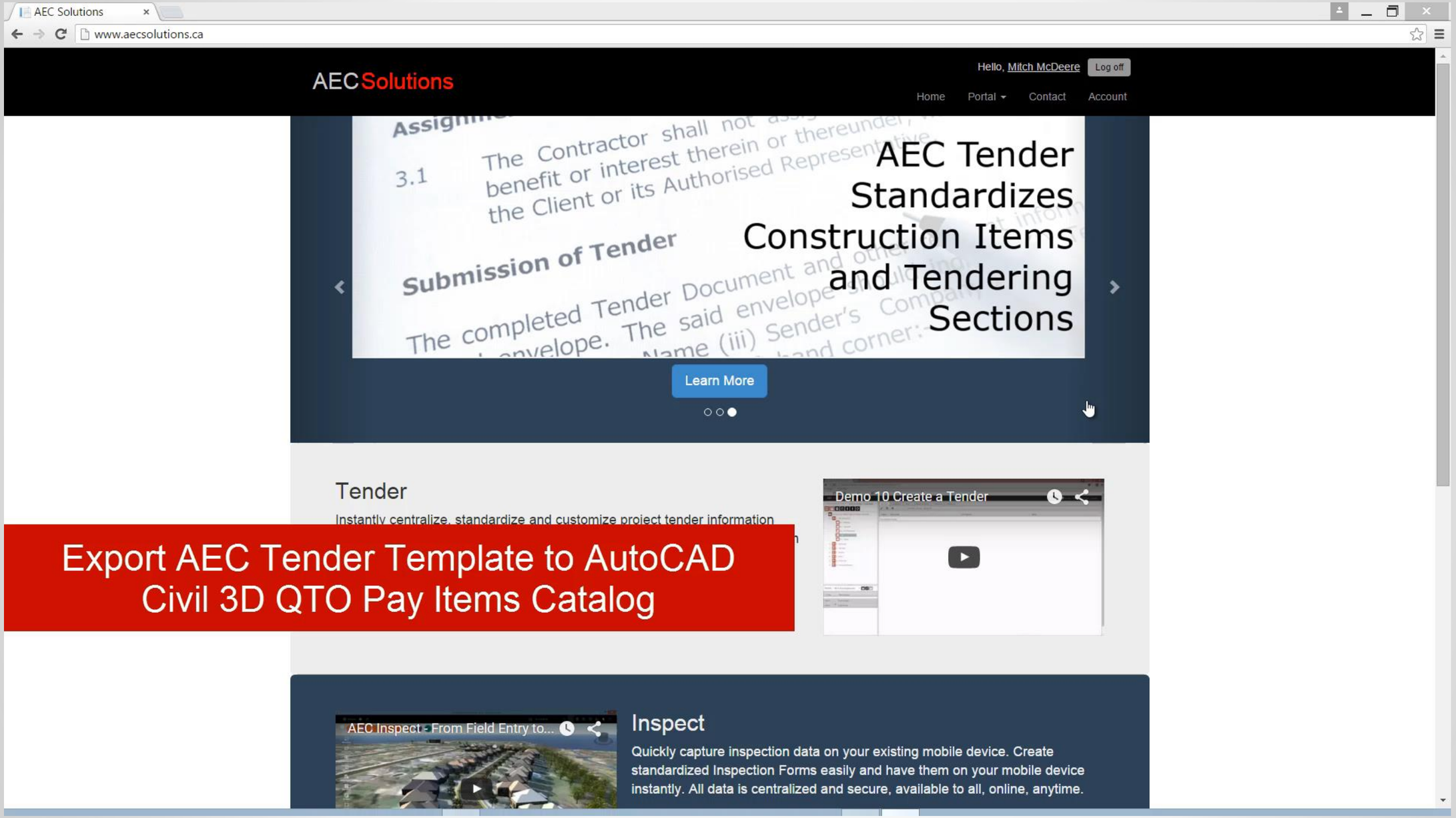


- Civil Objects
  - Road Corridor
  - Pipe Network
  - Pressure Pipe Network
- AutoCAD Objects
  - Walls, Fences, Barriers
  - Landscape Trees and Coverages
  - Utility Equipment and Conduit

Exporting the AEC Tender Template to AutoCAD Civil 3D QTO Pay Items Template

- Export Tender Section Groups, Tables and Items instantly to QTO Compatible Format
- Note: Import YOUR existing QTO Pay Items directly into AEC Tender Catalog

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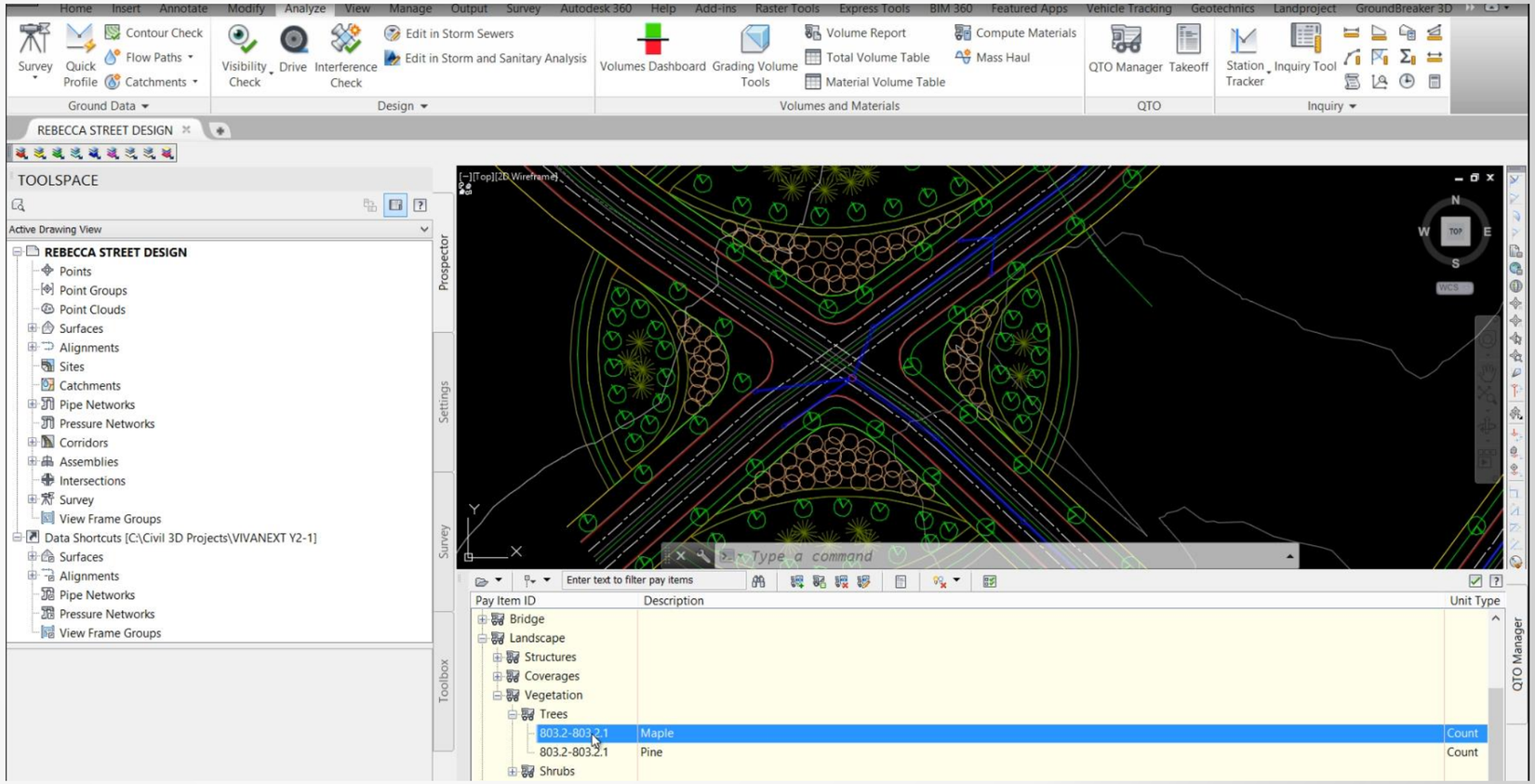
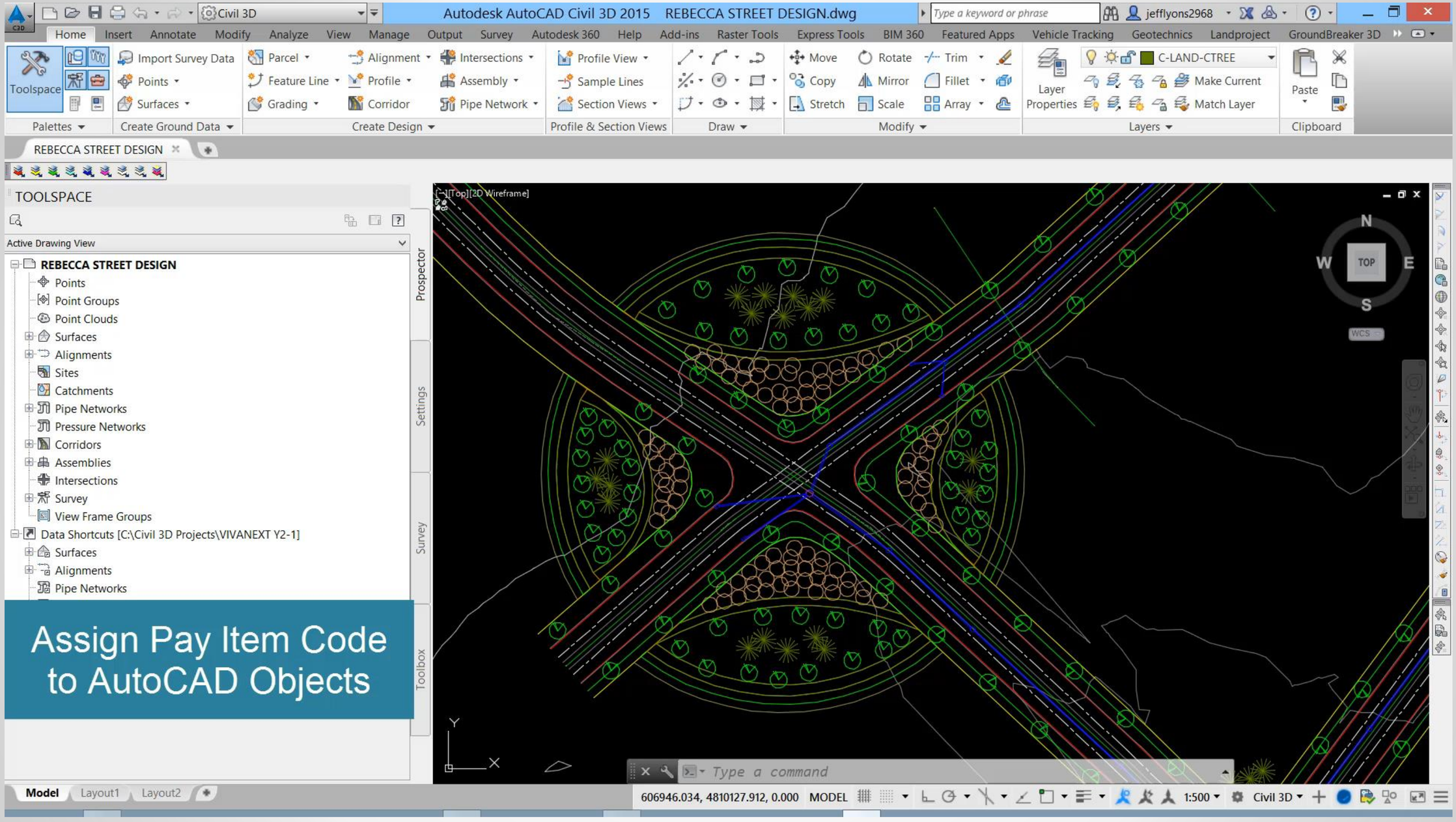
Demo 10 Create a Tender
Export AEC Tender Template to AutoCAD Civil 3D QTO Pay Items Catalog
AEC Inspect - From Field Entry to...
Inspect
Quickly capture inspection data on your existing mobile device. Create standardized Inspection Forms easily and have them on your mobile device instantly. All data is centralized and secure, available to all, online, anytime.

Using AutoCAD Civil 3D Quantity Takeoff: The Basics of Counting Design Content

- Assigning Basic AutoCAD Objects
- Exporting to XML Ready for AEC Tender




Civil 3D
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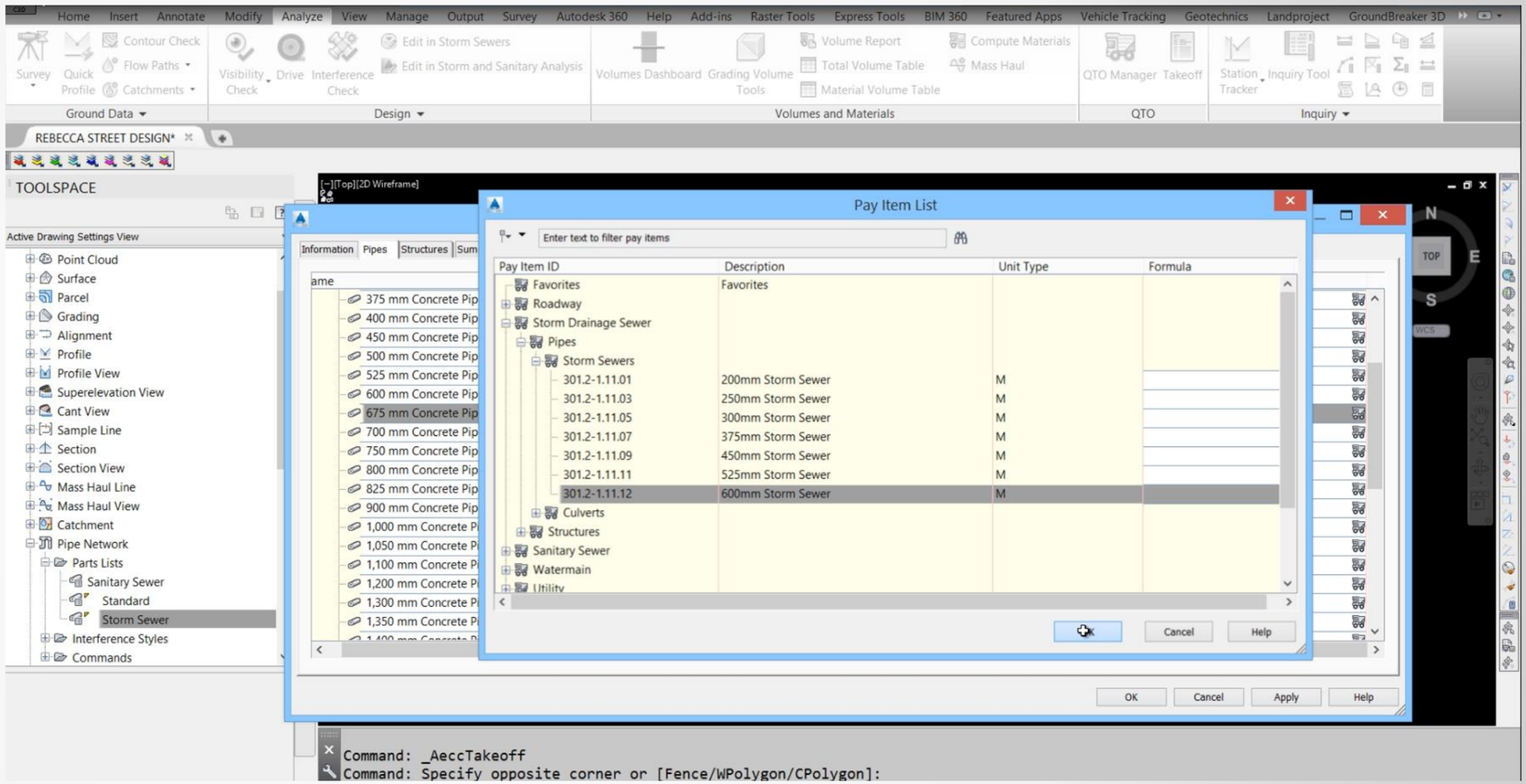
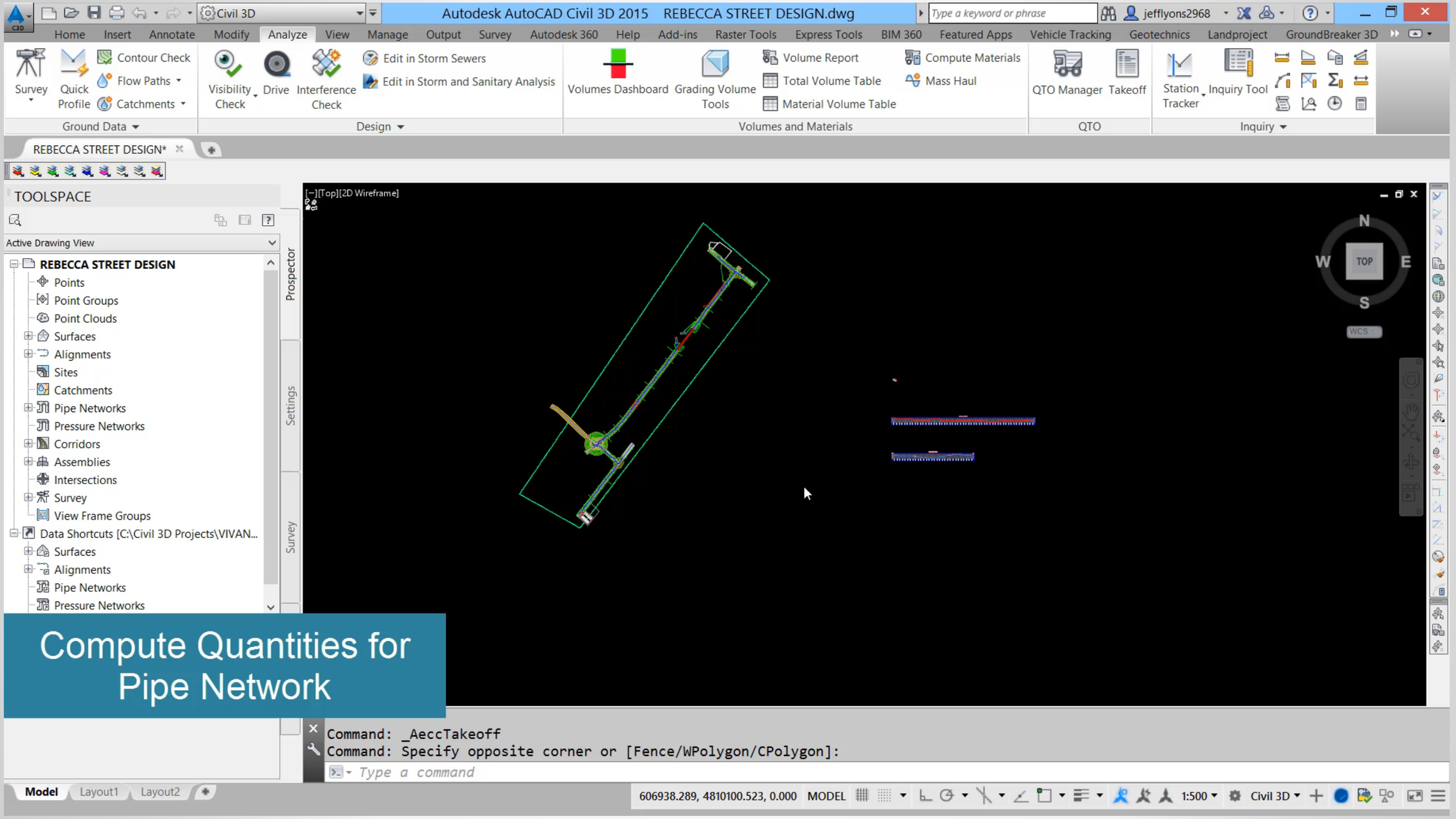
Extracting Pipe Network Content

- Assign Parts List Items with Pay Item Codes
- HINT: Assigning Pay Item Codes to the Parts List AFTER you create the Pipe Network will not automatically attach the code. Use SWAP or assign manually using QTO Manager

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Quick Profile
Contour Check
Flow Paths
Catchments
Ground Data
Visibility Check
Drive
Interference Check
Edit in Storm Sewers
Edit in Storm and Sanitary Analysis
Design
Volumes Dashboard
Grading Volume Tools
Volume Report
Total Volume Table
Material Volume Table
Compute Materials
Mass Haul
Volumes and Materials
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Takeoff
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Station Tracker
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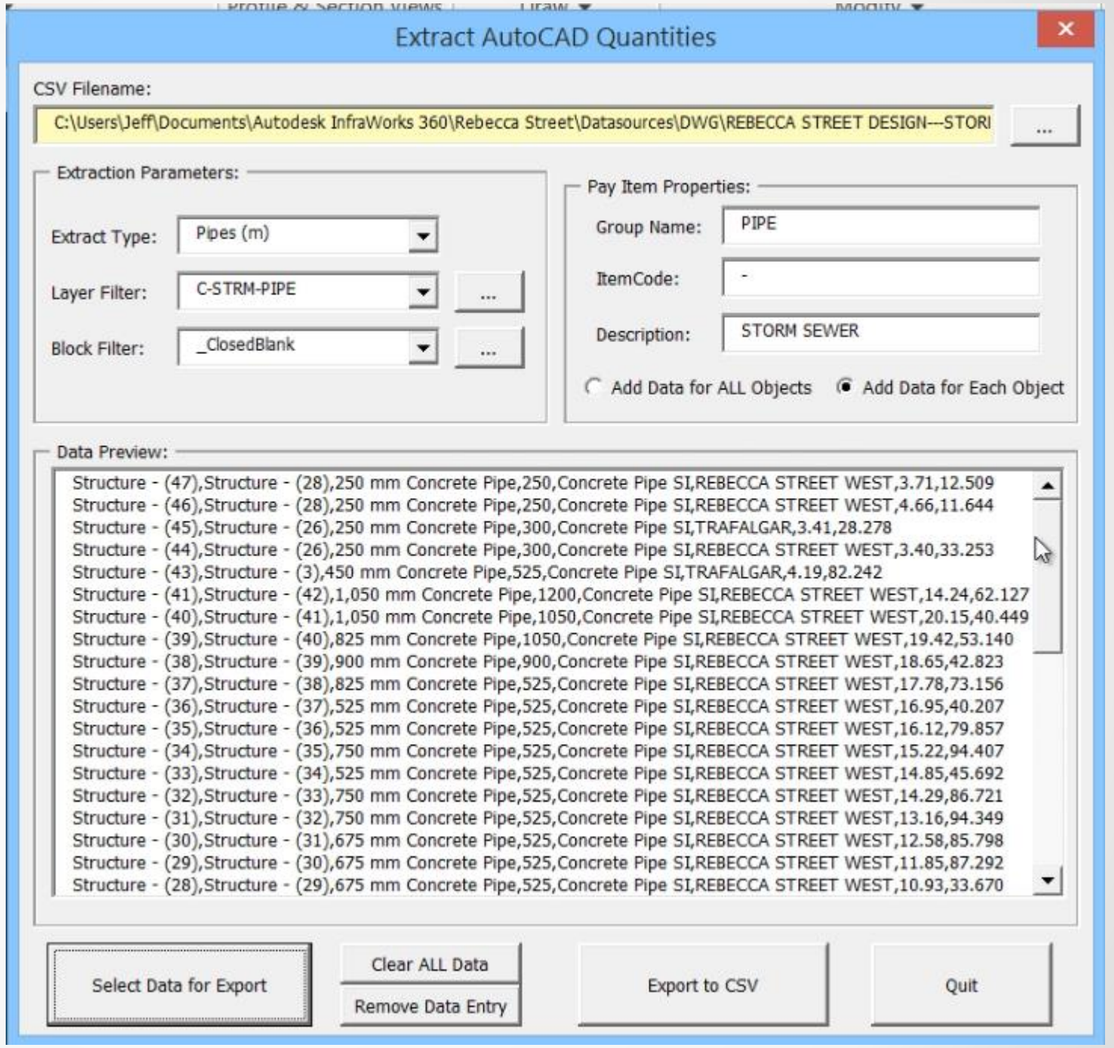
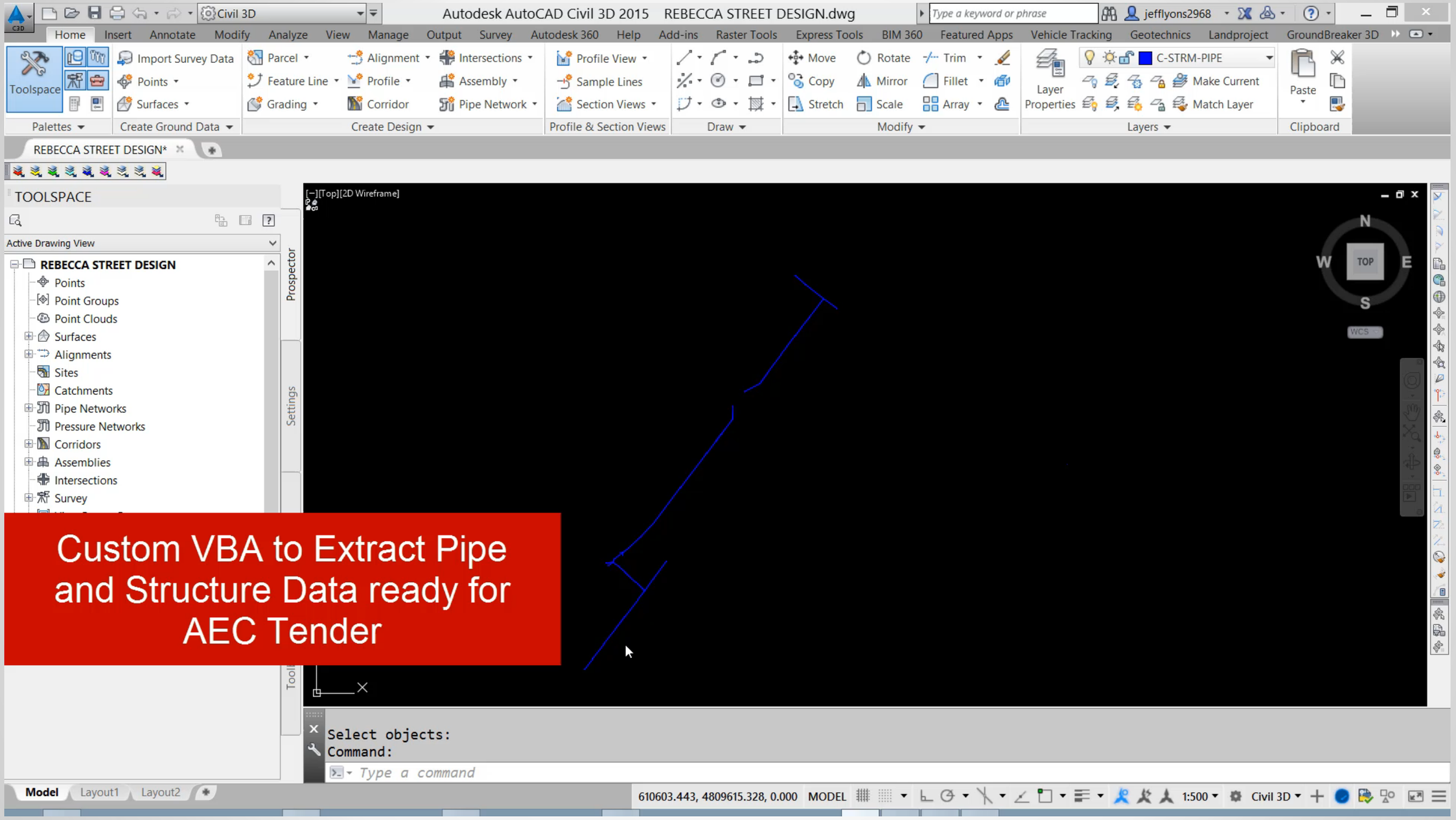
Extracting Pipe Network Content using Automation…

- For better Cost Estimating Results, you may have to create a Custom Automation to Extract pipe and structure properties

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Make Current
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Create Ground Data
Create Design
Profile & Section Views
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Modify
Layers
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TOOLSPACE
Active Drawing View
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Points
Point Groups
Point Clouds
Surfaces
Alignments
Sites
Catchments
Pipe Networks
Pressure Networks
Corridors
Assemblies
Intersections
Survey
Prospector
Settings
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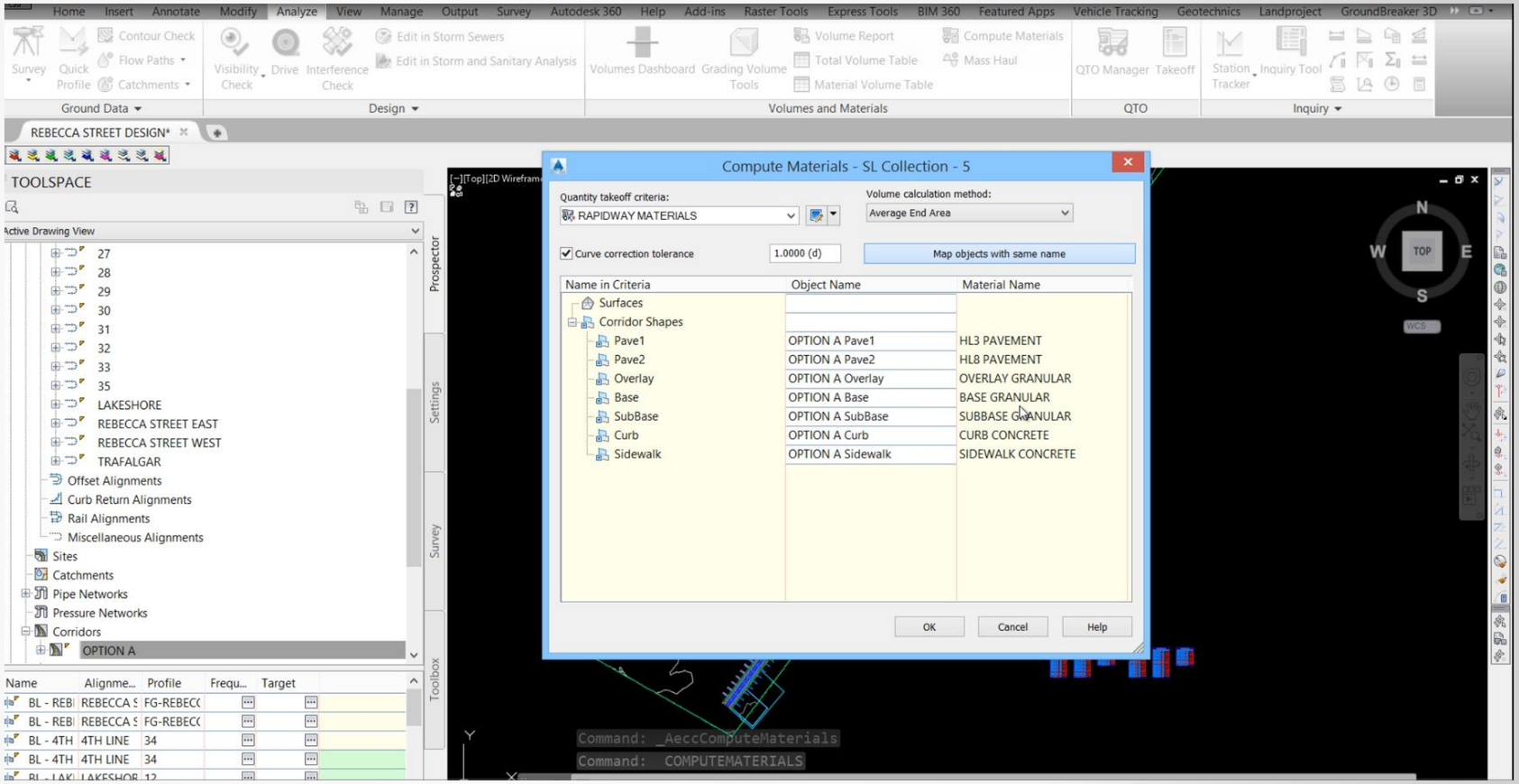
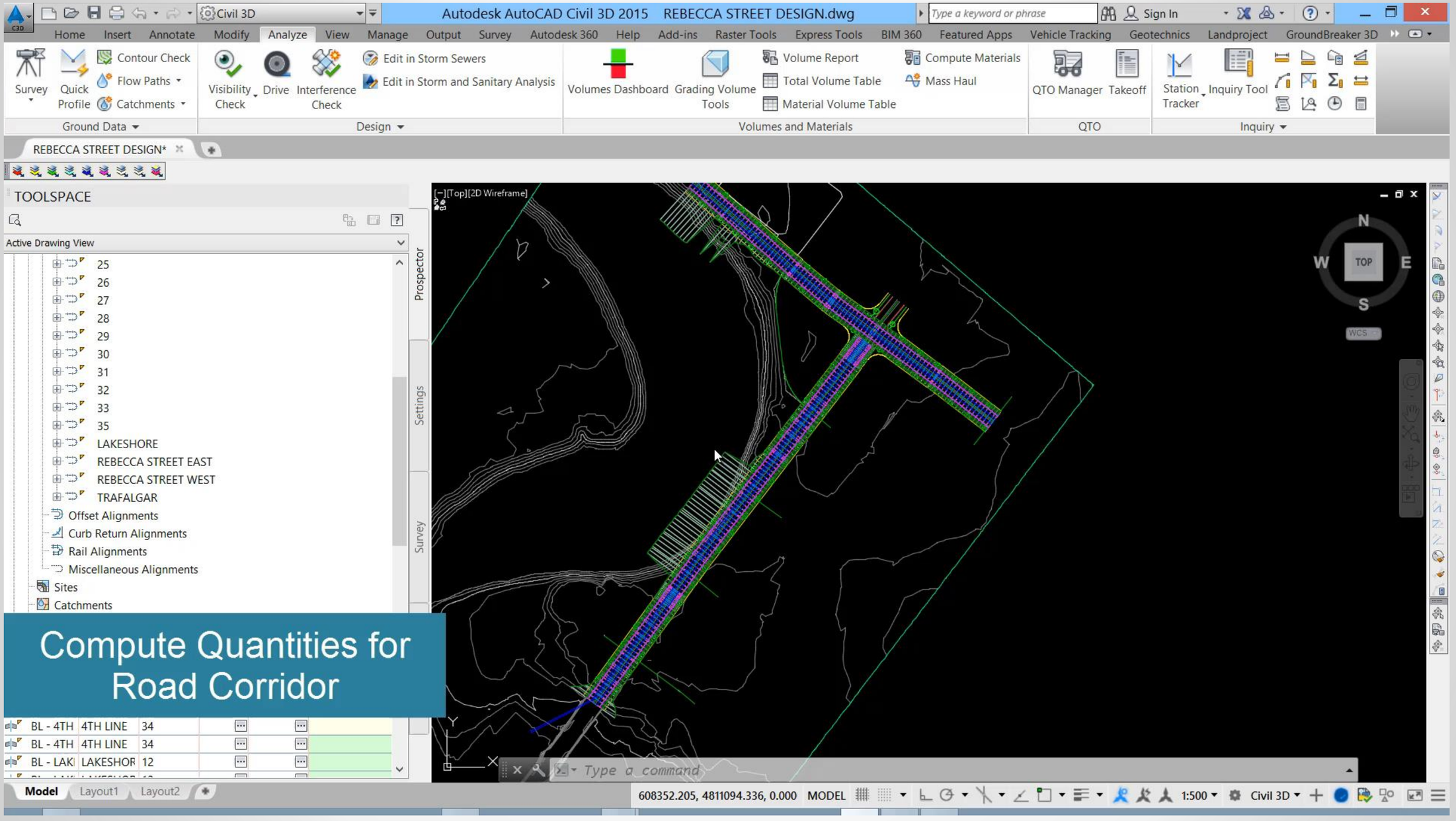
Custom VBA to Extract Pipe and Structure Data ready for AEC Tender
Select objects:
Command:
Type a command
Model
Layout1
Layout2
610603.443, 4809615.328, 0.000
MODEL
1:500
Civil 3D

Extracting Road Corridor Material Quantity

- Use standard Average End Area Volume method to Compute and Report Materials based on Corridor Assembly
- Export Material Report to XML




Civil 3D
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Visibility Check
Drive
Interference Check
Edit in Storm Sewers
Edit in Storm and Sanitary Analysis
Design
Volumes Dashboard
Grading Volume Tools
Volume Report
Total Volume Table
Material Volume Table
Compute Materials
Mass Haul
Volumes and Materials
QTO Manager
Takeoff
QTO
Station Tracker
Inquiry Tool
Inquiry
REBECCA STREET DESIGN*
TOOLSPACE
Active Drawing View
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LAKESHORE
REBECCA STREET EAST
REBECCA STREET WEST
TRAFALGAR
Offset Alignments
Curb Return Alignments
Rail Alignments
Miscellaneous Alignments
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Compute Quantities for Road Corridor
BL - 4TH 4TH LINE 34
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Type a command
Model
Layout1
Layout2
608352.205, 4811094.336, 0.000 MODEL
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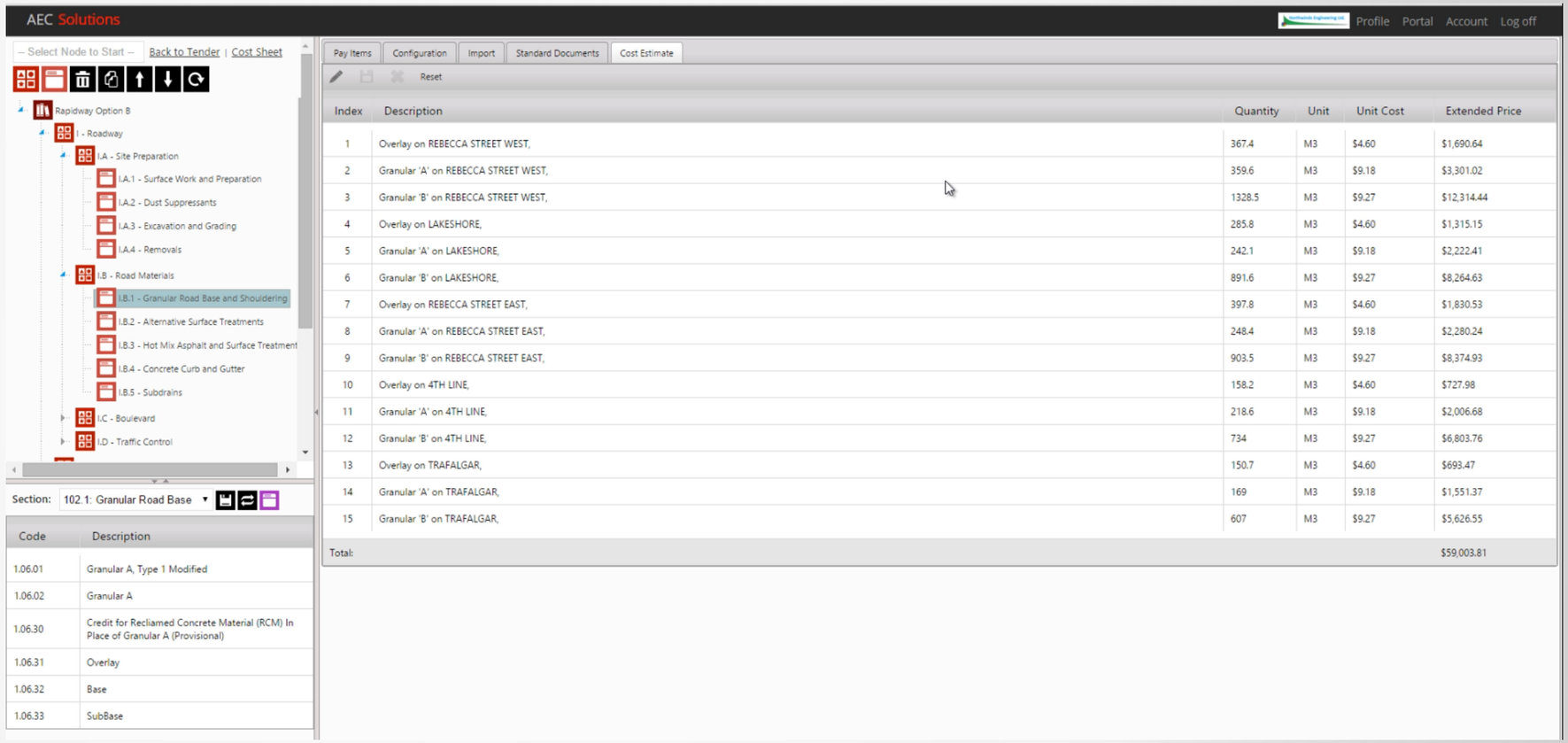
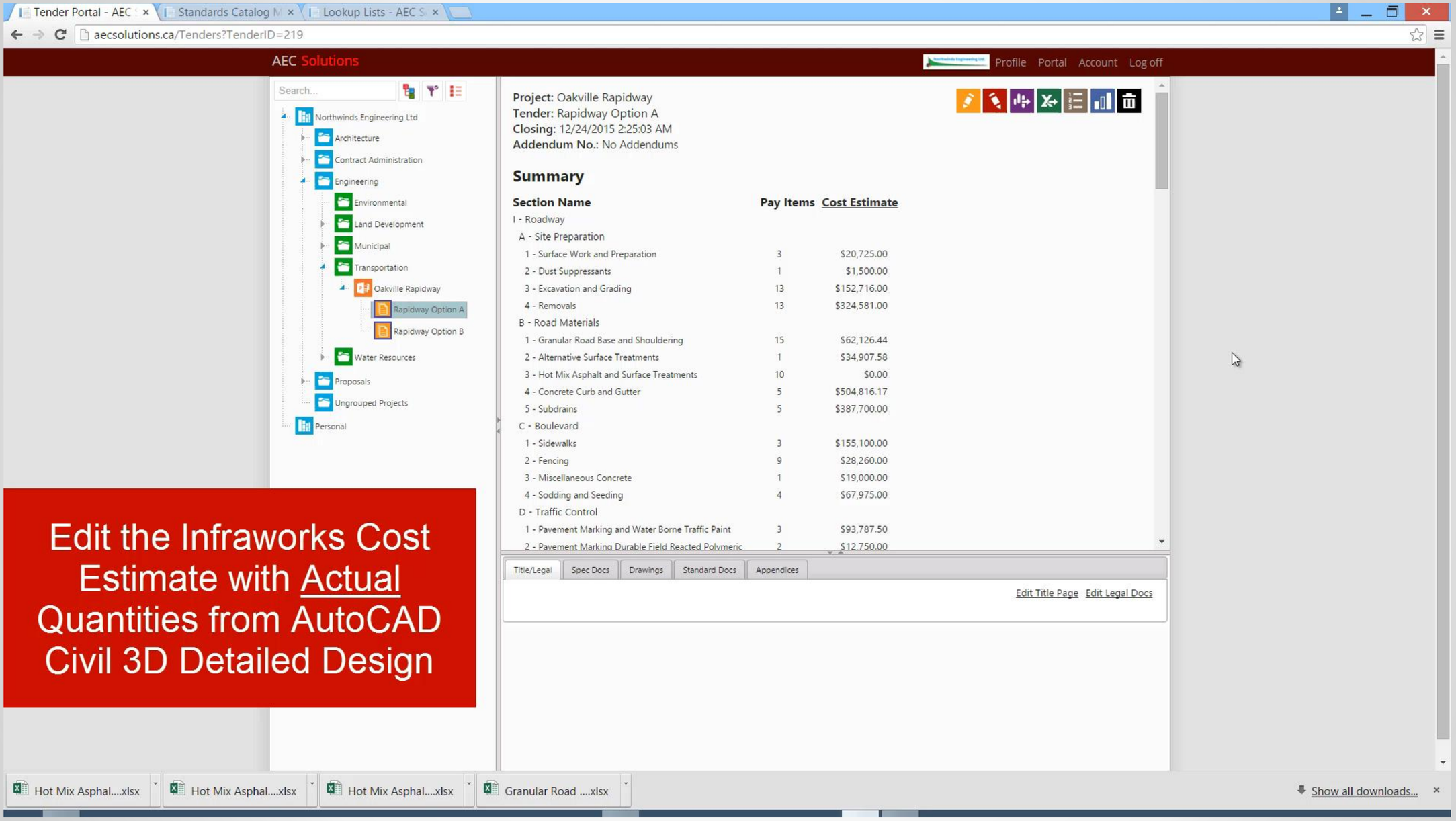
Civil 3D

Detailed Cost Estimate using Detailed Design Takeoffs and AEC Tender Data Import from CSV

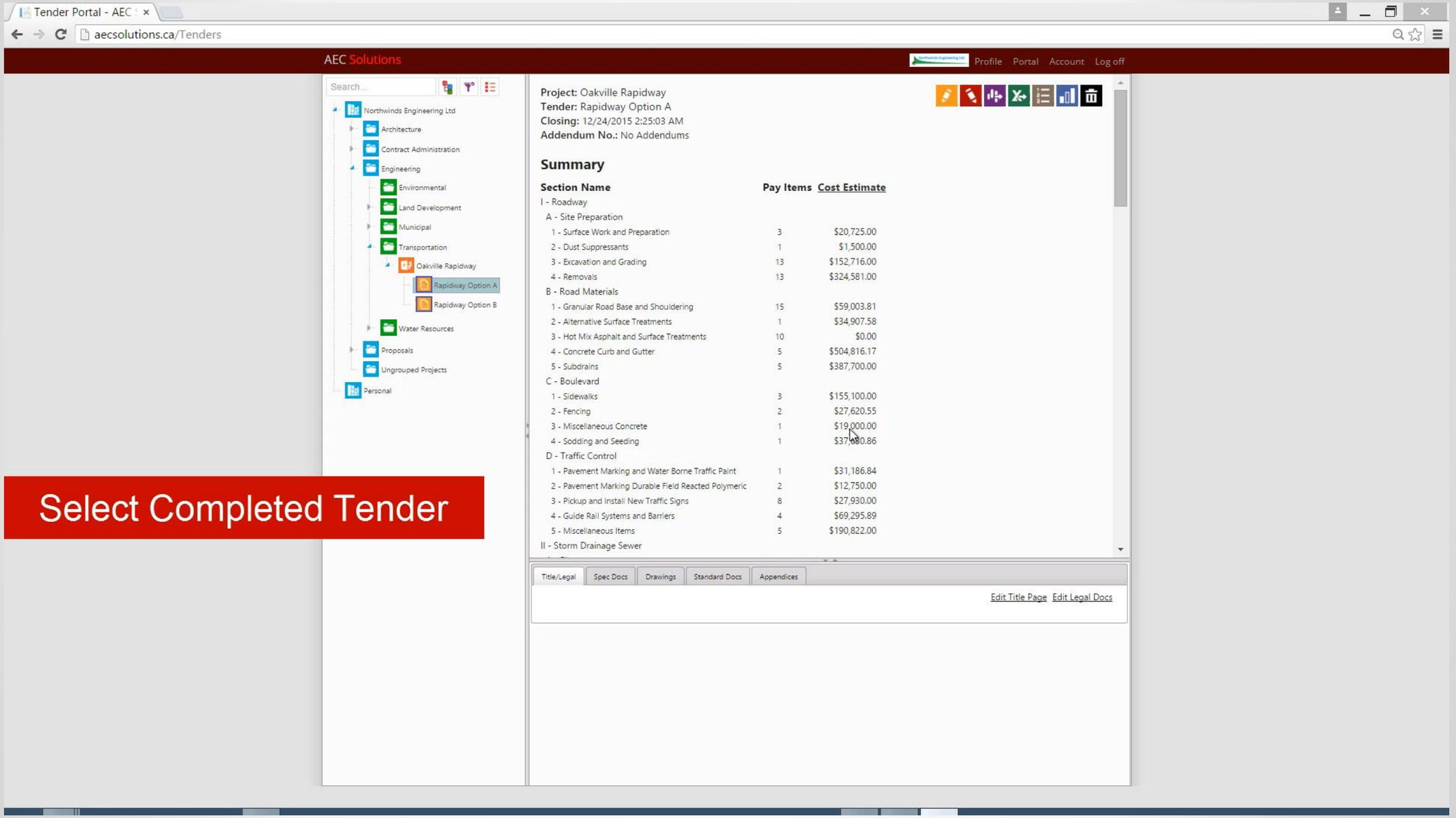
- Clear Concept Data from Tender Tables
- Import Actual Quantity Takeoff Data from Civil 3D
- Cost Estimates are performed in Real-time





Edit the Infraworks Cost Estimate with Actual Quantities from AutoCAD Civil 3D Detailed Design

Export the AEC Tender “Schedule of Unit Pricing” Ready for Contractor Bidding



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