

AUTODESK UNIVERSITY

# Bringing the Underground to the Cloud

**Stephen McDonald**

BIM Collaboration Lead - AECOM

**Courtney Hawkins**

Civil Engineer - AECOM

**Sean Hulbert**

Senior Implementation Consultant - Autodesk



#### LOCATION

 Toronto, Ontario

#### CONTACT DETAILS

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 [Stephen's Profile](#)

## Stephen McDonald, CET

BIM Collaboration Lead

#Transportation #CivilEngineering #Civil3D #BIM360

- Civil engineer with 13 years of industry experience
- Combines software expertise and collaboration methods to help design teams deliver projects
- Current focus includes adoption of BIM360 as the common data environment for digital files on large scale infrastructure projects



#### INDUSTRY FOCUS

Transportation, Civil Engineering



#### EXPERTISE

Civil 3D, BIM360, Autodesk Docs, BIM Collaboration

Stephen is a Civil Engineering Technologist graduating from Dublin Institute of technology, Ireland. He is a registered Civil Engineering Technologist in Ontario.



My passion involves helping large groups of people work together in a smarter, more effective way so that company and project goals are achieved, while also ensuring more time is spent with friends and family



#### LOCATION

 Toronto, Ontario

#### CONTACT DETAILS

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 [Courtney's Profile](#)

## Courtney Hawkins, EIT

Transportation Designer

#Transportation #CivilEngineering #Civil3D #BIM360

- Transportation EIT with 3 years of industry experience
- Currently working in the Municipal Transportation department at AECOM
- Frequent user of Civil 3D and BIM360



#### INDUSTRY FOCUS

Transportation, Civil Engineering



#### EXPERTISE

Transportation Design, Civil 3D and BIM360

Courtney is a Transportation Designer in Toronto and holds a Bachelor's Degree from Carleton University. She has experience working with Autodesk products such as Civil 3D and BIM360.



My passion includes working on complex transportation design projects and finding new and effective ways to collaborate with team members.



#### LOCATION

 Portland, Oregon

#### CONTACT DETAILS

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 [Sean's Profile](#)

## Sean Hulbert, PE

Senior Implementation Consultant

#CivilEngineering #Civil3D #InfraWorks

- Civil engineer with 30 years of industry experience
- Combines IT and software expertise with a background in CAD and BIM training
- Current focus includes the rollout of BIM 360 Design for Civil 3D



#### INDUSTRY FOCUS

AEC, Civil Engineering



#### EXPERTISE

Civil 3D, InfraWorks, Autodesk Docs, Hydrology and Hydraulic Analysis tools

Sean is a registered Professional Engineer in Oregon and holds an Associate's Degree from South Florida Community College. He is an Autodesk University Certified Professional in BIM for Transportation.



My passion remains working with our end users, rolling my sleeves up and getting my hands dirty on real projects, and embracing their successes—as well as their deltas.

## Project Overview

Major component of South Civil project:

- 6.7km of segregated guideway.
- 7 Stations (6 Underground + Exhibition station at grade).
- 3 interchange stations (2 with line 1 + Exhibition station with GO services).

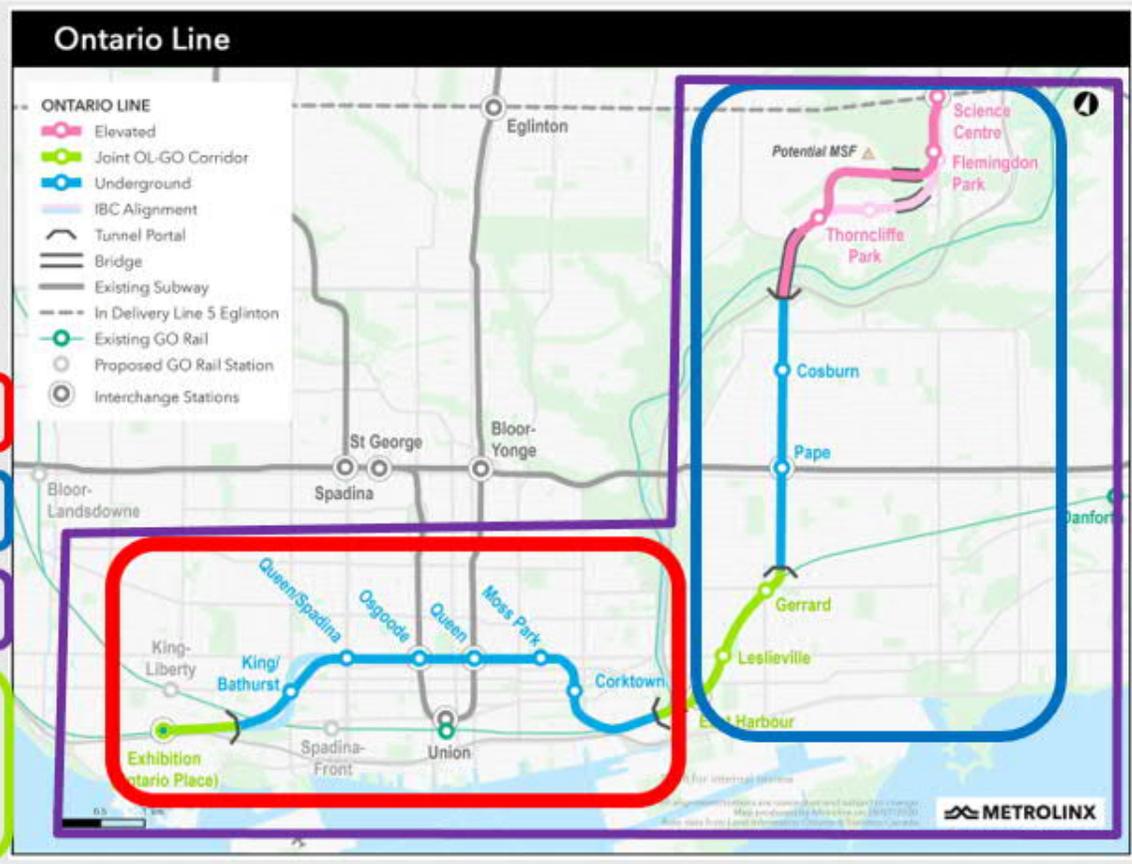
**South Civil Stations Tunnel Contract**

**North Civil Stations Tunnel Contract**

**RSSOM Contract**

### Early Work Packages:

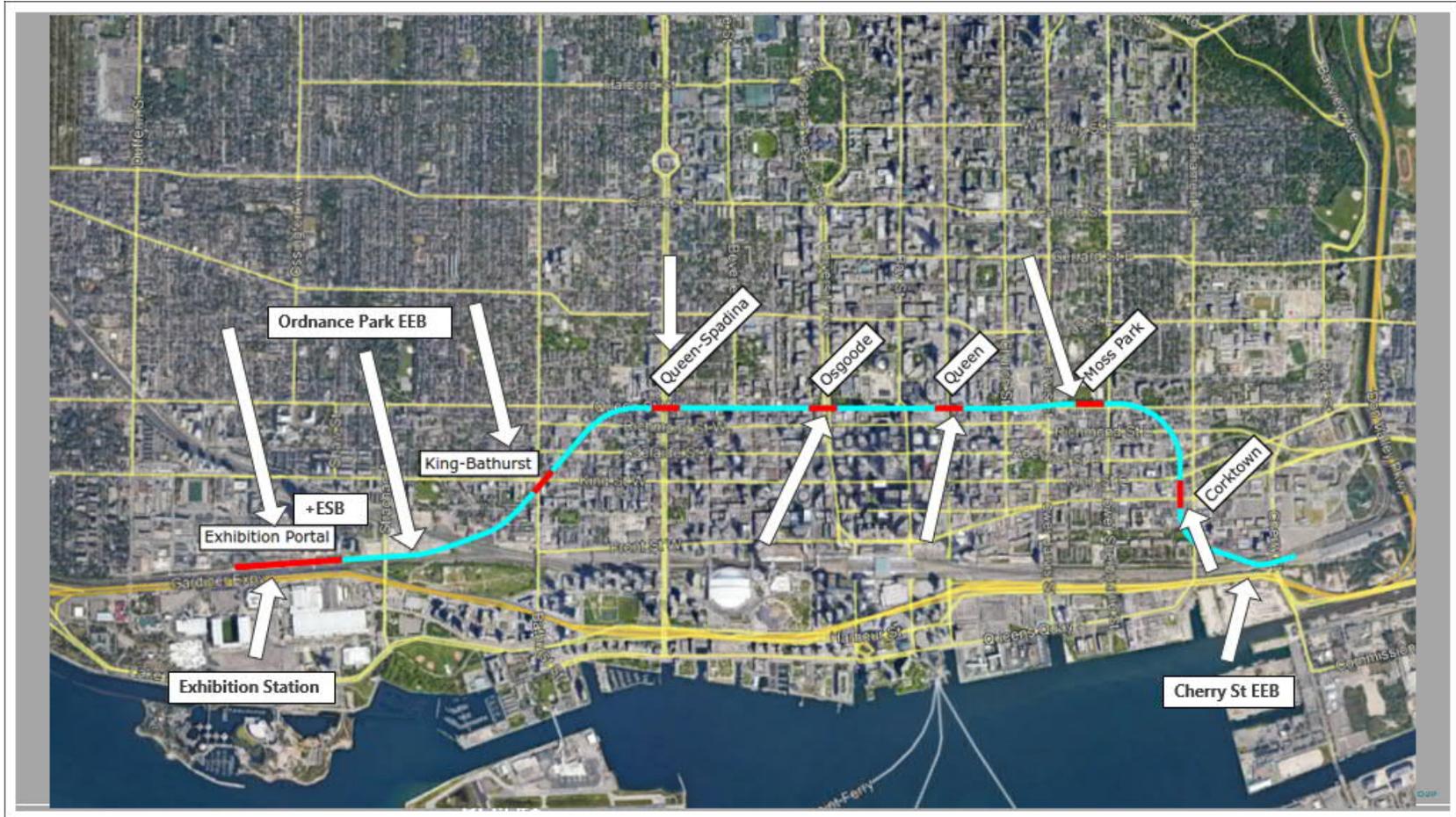
- Exhibition station
- DonYard Portal and new bridge.
- OL-GO joint Corridor



ONTARIO TRANSIT GROUP



# Downtown Toronto



# Technology Stack

 **AUTODESK® BIM 360®**

BIM360 – Common Data Environment

 **AUTODESK® REVIT®**

- Revit 2021 – Stations (All Disciplines) and Tunnels

 **AUTODESK® CIVIL 3D®**

Civil 3D 2021.2 – All Civil Files

# Getting Started

Project Kick Off

**Once the decision was made to use the technology stack it was vitally important to make sure all CAD/BIM Staff on the project were up to date with Revit/Civil 3D/Autodesk Desktop Connector versions.**

- Cleaning files inherited from the client.
- Ensuring weekly meetings were conducted to allow staff to raise issues they were having with speed of files and how to bring sheets together correctly.
- Moving the teams forward to host Data Shortcuts on BIM360.
- Training provided to make sure the engineers were educated on how Autodesk desktop connector was interacting with the local cache.
- Understanding the importance of saved path on XREF files.

# Challenges

Main Issued experienced working in Civil 3D on BIM360

## **Training new BIM360 users**

- BIM360 training for users and project managers
- Setting up data shortcuts

## **File speed and issues saving to the cloud**

- CAD files had a large number of audit errors and registered applications (regapps)
- Files with broken references
- Files with references saved outside of BIM360
- Large file size

# Overcoming Challenges

Communication with Autodesk in the early days was vital for project success

## **Regular communication with Autodesk**

### **Learning Best Practice Tips**

- Keeping software up to date (Civil 3D and Desktop Connector)
- Checking local hard drive space (allows local files to sync)
- File maintenance
  - Removing all broken references from CAD files
  - Regularly purge and audit CAD files
  - Cleaning inherited files

### **Locating the problem**

- Using reference explorer and health checker to find the root of our problems

### **Recovering files from temporary folder**

- BIM360 regularly saves temporary files so no data is lost

# Learning through Practice

The importance of constant communication through Teams with all stakeholders of the files in BIM360.

**The pandemic affected everyone across the planet, how design teams pivoted to remote working and utilizing Teams to increase communication was exceptional on a project of this scale.**

- Daily/Weekly check in meetings sharing screen and talking through issues within certain files that were starting to show signs of slowing.
- Working Closely with Autodesk to identify issues early and mitigate any issues to avoid major issues later in the project.



# Civil 3D 2021.2 and BIM360

## **How the BIM360 CDE platform helped our Teams to work and communicate more effectively.**

- Hosting .dwg files on BIM360 allowed our teams access to view files online, this helped reduce the total number of users opening AutoCad software to do simple tasks thus lowering the cost to the project.
- Utilizing BIM360 Docs as a host for the PDF drawings. Project standards problems allowed to be highlighted early.
- Utilizing functionality in BIM360 and training the project teams how to use the tools to successfully QAQC drawings using markups and version control for back checks.
- Utilizing Issues functionality between design teams to request information and track items to closure.
- Versioning control of the drawing files themselves to ensure no data was lost and all files were easily recoverable and reinstated on the project.

# Data Shortcuts and Pipe Networks on BIM360

**This was the first project where we attempted to host our data shortcuts on BIM360 based on new updates in Desktop Connector.**

- The civil teams on the project agreed to host their data shortcuts for the project on BIM360. Surfaces, Track Alignments, Pipe Networks and Pressure Pipe Networks were all posted to the same data shortcuts project folder and managed on the cloud.
- Similar to the referencing of CAD files into another file, the reference path of the data shortcuts became an issue that would require some attention.
- Data referencing the surface file became a challenge on the project as the surface file was large. Working with Autodesk we arrived at a solution where when a surface file was data shortcut in as a “reference only” we experienced a much smoother experience working within the files, including a marked reduction in file size.
- Successfully utilized the data shortcuts folder to create “container” files of any proposed works that could be shared in Model Coordination on BIM360 to allow design teams to view their 3D elements with the stations and tunnels Revit Models in a Federated Model.

# Drawing Management on BIM360

Folders   Reviews   Transmittals   Issues

View by

Folders

Sets

- 04 - Osgoode Station
- 05 - Queen Station
- 06 - Moss Park
- 07 - Corktown
- 08 - Exhibition ESB
- 09 - Ordinance Park EEB
- 10 - Cherry Street EEB
- 13 - Tunnels
- 99 - Civil
  - Civil
    - Composite Utilities
    - Drainage
    - Wet Utilities
- Project Files
  - 000\_PreContract
  - 100\_Contract
  - 200\_Project\_Control
  - 300\_Communications
  - 400\_Technical
  - 500\_Deliverables
  - 600\_Construction\_Support
  - 700\_Quality\_Env\_Sust

Showing 83 items

Search

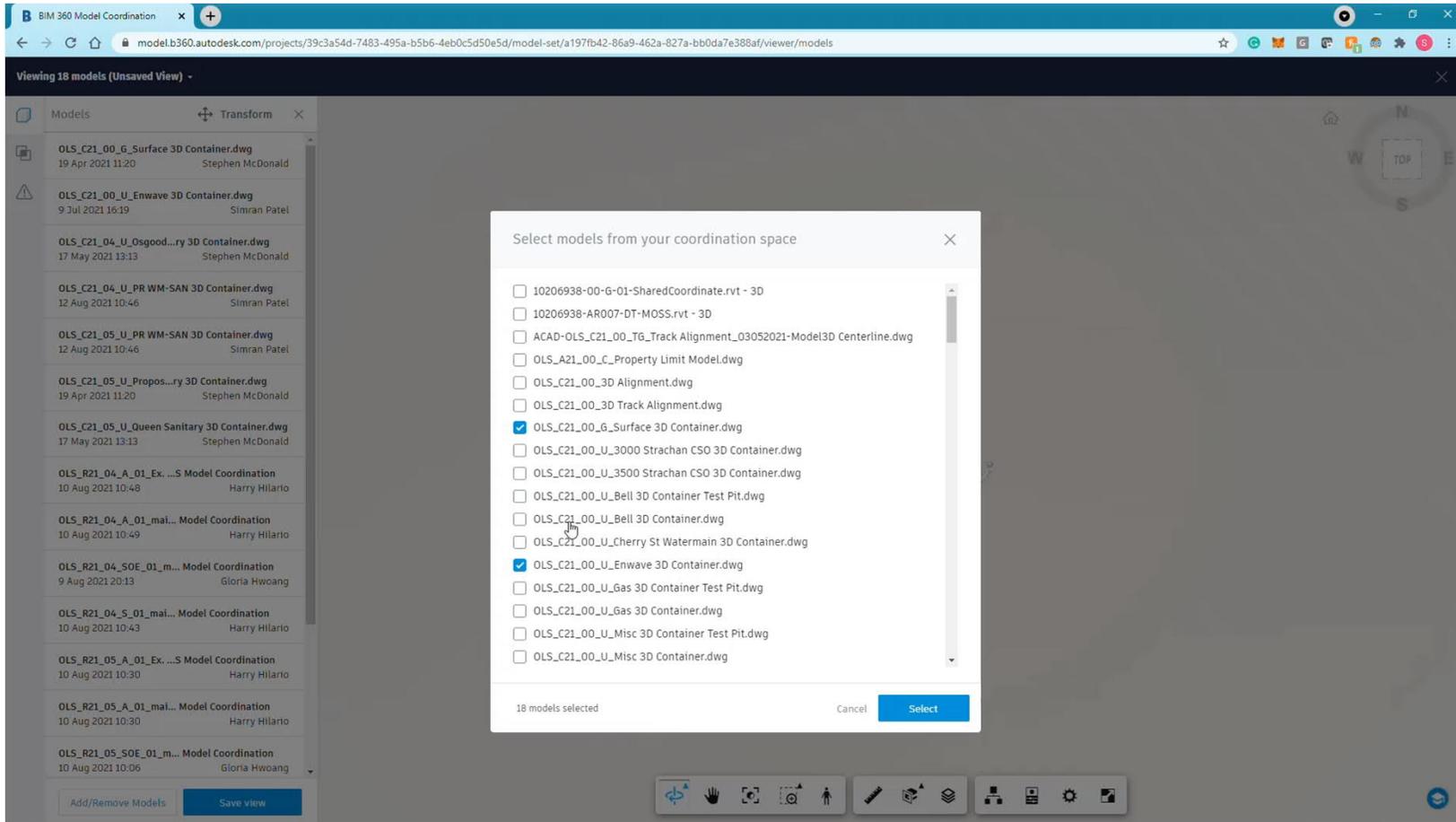
Name	Title	Set	Vers...	Last updated	Updated by	Markup	Issue	Location	Review status	File Name
OLS_xx000_C1000	KEY PLAN		V2	Aug 9, 2021 3:43 PM	Simran Patel	1	0			OLS_xx000_C1000.p...
OLS_xx010_C1001	EXHIBITION STATION REM...		V2	Aug 6, 2021 1:54 PM	Jenny Robayo Ladino	4	0			OLS_xx010_C1001.pdf
OLS_xx010_C1002	EXHIBITION STATION REM...		V2	Aug 6, 2021 1:54 PM	Jenny Robayo Ladino	3	0			OLS_xx010_C1002.pdf
OLS_xx010_C1003	EXHIBITION STATION NEW...		V1	Aug 4, 2021 11:32 AM	Stephen McDonald	2	0		✓	OLS_xx010_C1003.pdf
OLS_xx010_C1004	EXHIBITION STATION GRA...		V2	Aug 6, 2021 10:21 AM	Jenny Robayo Ladino	3	0			OLS_xx010_C1004.p...
OLS_xx010_C1005	EXHIBITION STATION GRAD...		V2	Aug 6, 2021 10:21 AM	Jenny Robayo Ladino	3	0			OLS_xx010_C1005.p...
OLS_xx010_C1006	EXHIBITION STATION NEW...		V1	Aug 4, 2021 11:32 AM	Stephen McDonald	1	0		✓	OLS_xx010_C1006.p...
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OLS_xx010_C1011	EXHIBITION STATION LIBE...		V1	Aug 6, 2021 10:21 AM	Jenny Robayo Ladino	3	0			OLS_xx010_C1011.pdf
OLS_xx010_C1012	EXHIBITION STATION LIBE...		V1	Aug 6, 2021 10:21 AM	Jenny Robayo Ladino	3	0			OLS_xx010_C1012.pdf
OLS_xx010_C1013	EXHIBITION STATION LIBE...		V1	Aug 6, 2021 10:21 AM	Jenny Robayo Ladino	5	0			OLS_xx010_C1013.pdf
OLS_xx010_C1014	EXHIBITION STATION LIBE...		V1	Aug 6, 2021 10:21 AM	Jenny Robayo Ladino	3	0			OLS_xx010_C1014.pdf
OLS_xx010_C1301	EXHIBITION STATION STOR...		V1	Aug 6, 2021 10:21 AM	Jenny Robayo Ladino	2	0			OLS_xx010_C1301.pdf
OLS_xx010_C1302	EXHIBITION STATION STOR...		V1	Aug 6, 2021 10:21 AM	Jenny Robayo Ladino	2	0			OLS_xx010_C1302.pdf

# Coordinating with Revit

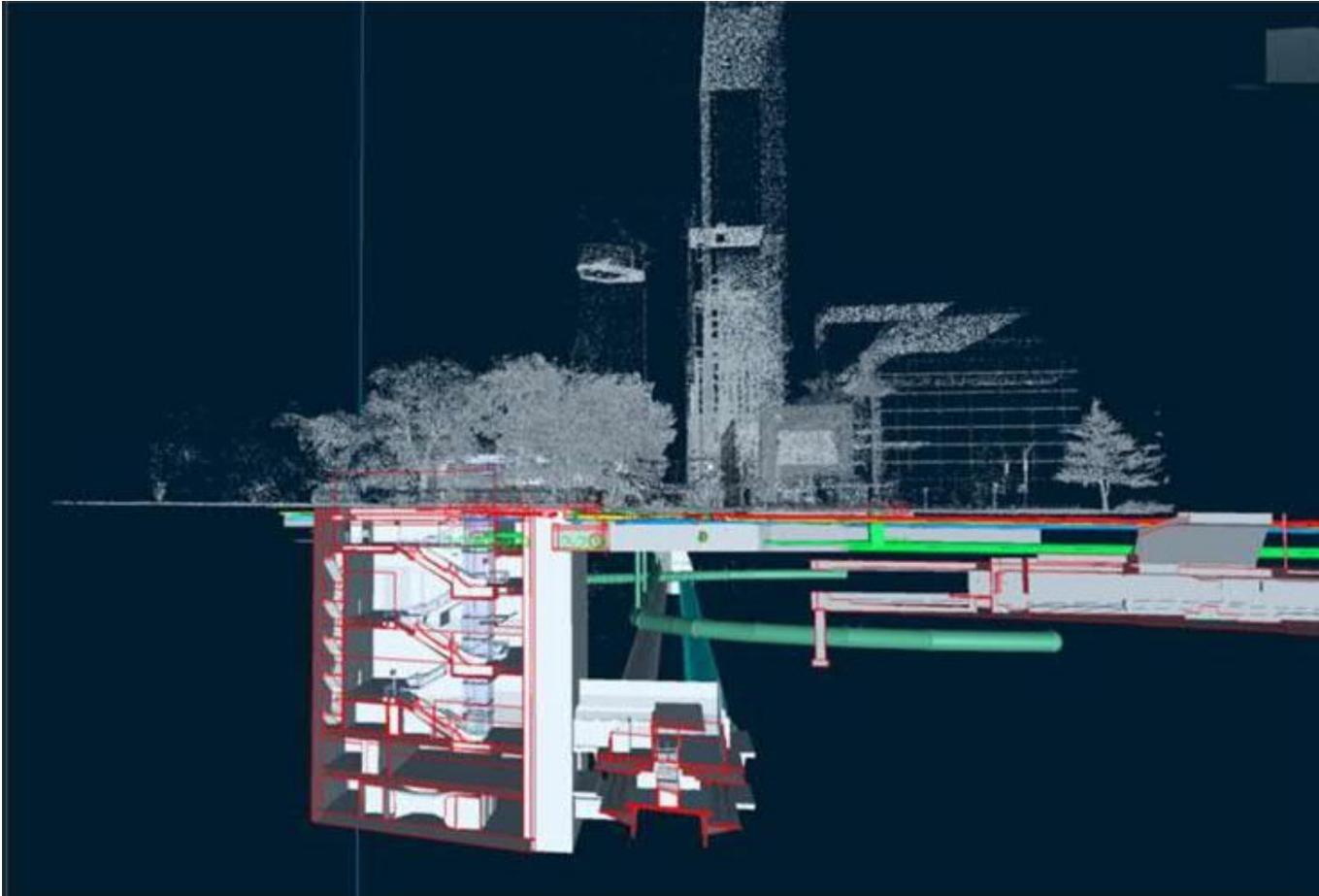
**One of the big challenges on the project was figuring out the workflow to coordinate seamlessly between Civil 3D and Revit utilizing the BIM360 Platform.**

- Ensure all Civil files were using the designated project coordinate system
- Setting up shared coordinates in the Revit Models to ensure they aligned geospacially with the Civil Files.
- Request weekly exports from the Revit Teams to a folder location on BIM360, export to include cleaned view and to be exported with the correct units and with shared coordinates turned on.
- File name remained the same on all export and the file was versioned up every time it was exported, allowing for Civil 3D sheet files to update automatically and also provide a historical log of all changes made in the exports over time.

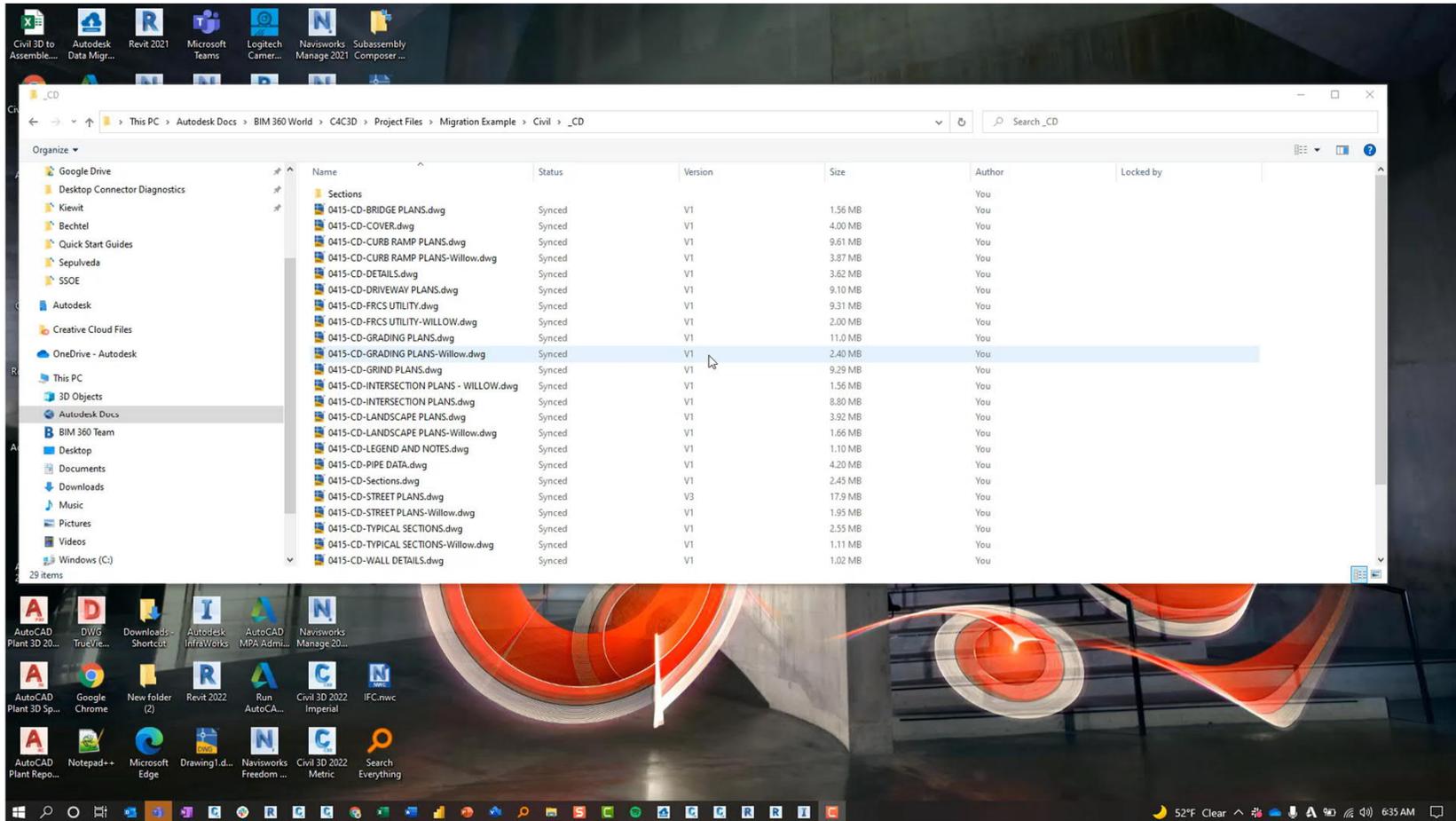
# Model Coordination



# Recap and Lidar



# Reference Explorer





**For a further deep dive please watch out for our other class at AU 2021**



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**Elevating Multidisciplinary  
Transportation Projects  
Through BIM 360**

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**SOOO...ANY QUESTIONS? CONCERNS?  
COMMENTS?**

**LET'S TALK!**

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