Interoperability – The Software Unicorn
Regional Connector Transit Corridor Project (RCTC)

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About Us

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Mott MacDonald

- Global engineering, management and development consultancy focused on guiding our clients through many of the planet’s most intricate challenges
- Opening opportunities with connected thinking
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Class Summary

- Case study of the Los Angeles Regional Connector Transit Corridor Project and the workflows applied to integrate the Autodesk and Bentley platforms.
Key learning objectives

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

- Understand the Revit limitations
- Learn How to Bring Civil 3D Content into Revit
- Learn How to Bring Revit Content into Civil 3D
- The Future of the Software Unicorn
RCTC Project Overview
RCTC Project Overview

- Design-build contract - $1.55 billion
- Connects Metro’s existing Gold Line Little Tokyo/Arts District station to its 7th Street/Metro station downtown Los Angeles
- Project duration – 2016-2021
- Project length – 1.9 miles
  - 1 mile of twin tunnels and SEM Cavern
  - 0.7 miles of cut and cover tunnel
  - 0.2 miles of at-grade alignment
- Three new stations:
  - 1st St/Central Avenue
  - 2nd St/Broadway
  - 2nd Pl/Hope St
California Map
Los Angeles Map
Los Angeles Metro Map
Collaboration

- **Lead designer:** Mott MacDonald (MM)
  - 15 MM offices across North America
  - 20 sub-consultants

- **Constructor:** Regional Connector Constructors (RCC) joint venture
  - Skanska USA Civil West California District, Inc.
  - Traylor Bros, Inc. (Evansville Indiana based)
Diverse Collaboration Team
Locations of Contributing Project Team
Project Progress

- [https://www.metro.net/projects/connector/](https://www.metro.net/projects/connector/)

Utility Relocation

1st/Central Cut & Cover Station

TBM Ring
The Technology Used
The Technology Used

- **File Sharing Platform:**
  - ProjectWise

- **Modelling Software (main design tools):**
  - Revit 2014 – stations (architectural, structural, mechanical, electrical, plumbing)
  - AutoSprink – stations (fire protection)
  - Civil 3D 2014 – topo surface, utilities, tunnels
  - Navisworks 2014 – clash detection
  - BIM 360 Glue – model

- **Design Review Software:**
  - Bluebeam Studio – live review sessions
Revit Models

- MECHANICAL
- ELECTRICAL
- PLUMBING
- FIRE PROTECTION
- TRACTION POWER

- STRUCTURAL
- ARCHITECTURAL
Revit Models

SEM TUNNEL

EXISTING BUILDINGS
Civil 3D Models
Civil 3D with Revit Models

BRIDGES/TOPOGRAPHY

BORED TUNNELS
Civil 3D with Revit Models

WYE STRUCTURE
Civil 3D with Revit Models

TIEBACK REMOVAL
Computational Fluid Dynamics (CFD) Analysis
Navisworks Coordination

- Design resolutions with clash detection
  - Clash reports are shared, reviewed and returned with resolutions and comments
  - Design coordination workshops
Understand the Revit Limitations
The Revit Coordinates

LIMITATION:
- Revit 2014 has a 20 mile limit
  - This means all data created more than 20 miles away from the project origin point is subject to data loss or error

CHALLENGE:
- the original survey file > 20 miles
  - A process had to be created so all data fits within the 20 mile limit
Bringing Civil 3D Content into Revit
Civil 3D to Revit Workflow

- Translation process:
  - All Civil 3D files needed to be copied and manually moved to the new Revit origin point
Shared Xrefs

- All Civil 3D data
- Translated for Revit
Establish Information Sharing Process
Bringing Revit Content into Civil 3D
Revit to Civil 3D Workflow

- Revit Exports
  - Create 3D and 2D .dwg exports updated weekly and/or daily
Revit to Civil 3D Workflow

- Translation process:
  - All Revit files had to be inserted into Civil 3D at the new Revit origin point
Evolving Workflows

PIPE NETWORKS

- Adjustments:
  - Pipe networks to be split with worksets by discipline
  - Insert the pipe network file into a Revit family
  - Create master Revit files per area for existing, proposed, and relocated
  - 9 utilities Revit files: 3 stations with 3 types of utilities each
Evolving Workflows

TOPOSURFACES

- Adjustments:
  - Toposurfaces split into Roadway and Plaza grading worksets
  - Generate Revit toposurface from Civil 3D surface
  - Create master Revit files for all surfaces
Bringing AutoSprink Content into Revit
AutoSprink to Revit Workflow

- Fire protection design completed using AutoSprink design software
- Individual .mrv files, one file per level of the station, generated from AutoSprink
- Each .mrv file imported into an individual Revit file
- Individual Revit files linked into a master Revit file, used by the other disciplines for coordination
Revit and ProjectWise Workflow
Revit to ProjectWise Workflow

- Revit and ProjectWise are not known for working well together, especially on a project of this scale.
- Most of models were moved to a local server to maximize performance and minimize bandwidth latency.
  - Work in progress models on the local server.
  - Models uploaded in ProjectWise daily, for better design coordination.
  - Some live models with all shared models in ProjectWise.
How Has the Technology Helped?

- All disciplines were able to reference other discipline models for design coordination
- Model changes were captured in all drawings simultaneously (plans, sections, elevations, details)
- Conflict resolution was expedited with the ability to see elements in 3D
- Multiple users work in a single model, increasing efficiency
Issues and Their Resolution

- **Issue**: ProjectWise and Revit are not known to work well together, especially on a project this scale
  - **Resolution**: 13 of the 15 Revit models were moved from PW to a local server to maximize performance and minimize bandwidth latency

- **Issue**: Civil 3D cannot reference Revit models
  - **Resolution**: A 3D .dwg export system was created, so design information was interchangeable between Revit and Civil 3D (still required manual sync once or twice a week)

- **Issue**: Multiple users in multiple offices with different approaches, not always aligned with the team’s rules
  - **Resolution**: Strong project office based BIM/CAD management team, constant “policing”, ongoing training
The Future of the Unicorn
The Future of the Unicorn

- What is the future of the “Unicorn”?  
- Will the 20 mile limit be removed?  
- Do Civil 3D and Revit have a future together?  
- Can the files be interchangeable?  
- Revit and ProjectWise can work well together  
- What do YOU think?
How did I do?

- Your class feedback is critical. Fill out a **class survey** now.
- Use the AU mobile app or fill out a class survey online.
- Give feedback after each session.
- AU speakers will get feedback in real-time.
- Your feedback results in better classes and a better AU experience.
Questions?