
GEO BIM
Sub Surface

BS MUKUND
HEAD – BUILDING INFORMATION MODELING
L&T CONSTRUCTION

Mukund heads the BIM team in L&T Construction. In this role, he is responsible for providing strategic direction to the company, for providing digitally enabled value propositions, leveraging the power of BIM and digital solutions on engineering and construction projects. This includes development and deployment of new BIM technologies, processes and analytics for the organization to harness efficiency and productivity gains through project implementation.

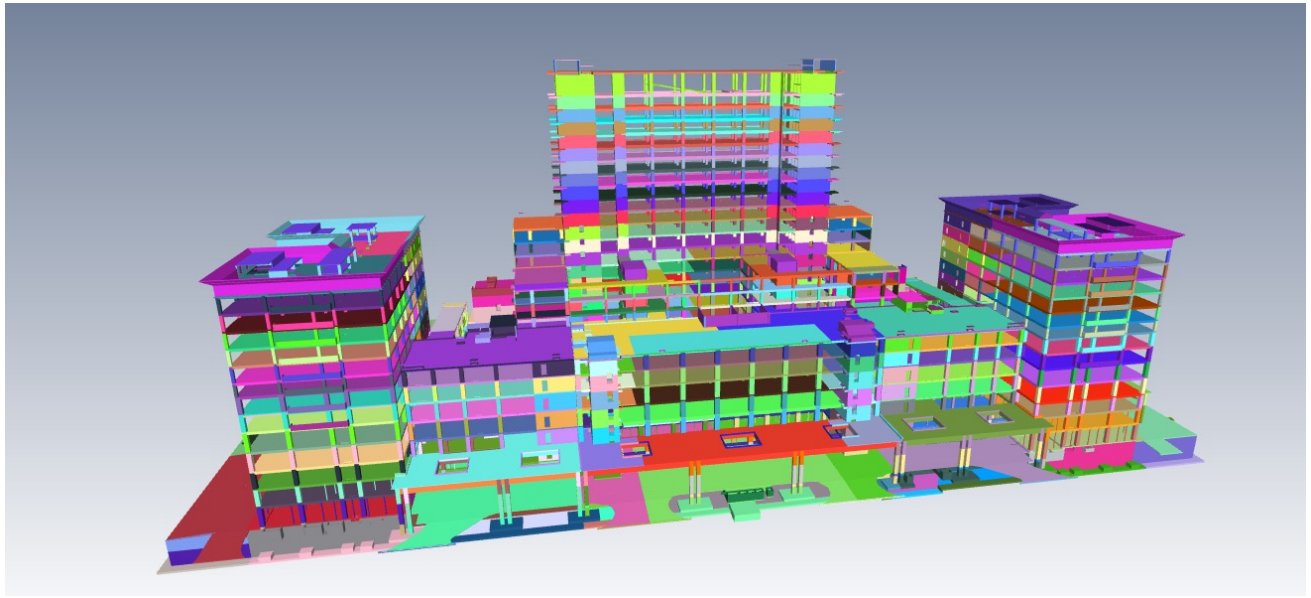
He can be contacted at
Email:bsmukund@lntecc.com / Phone:+91 8149074358

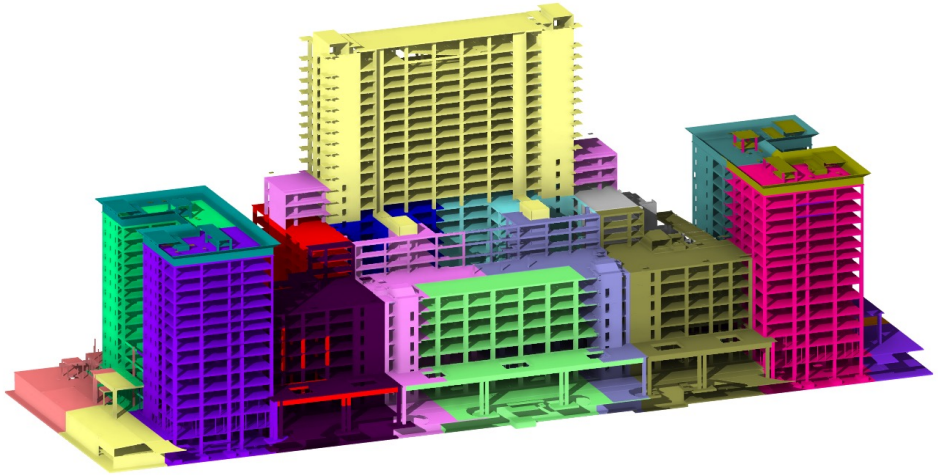
Who are we?

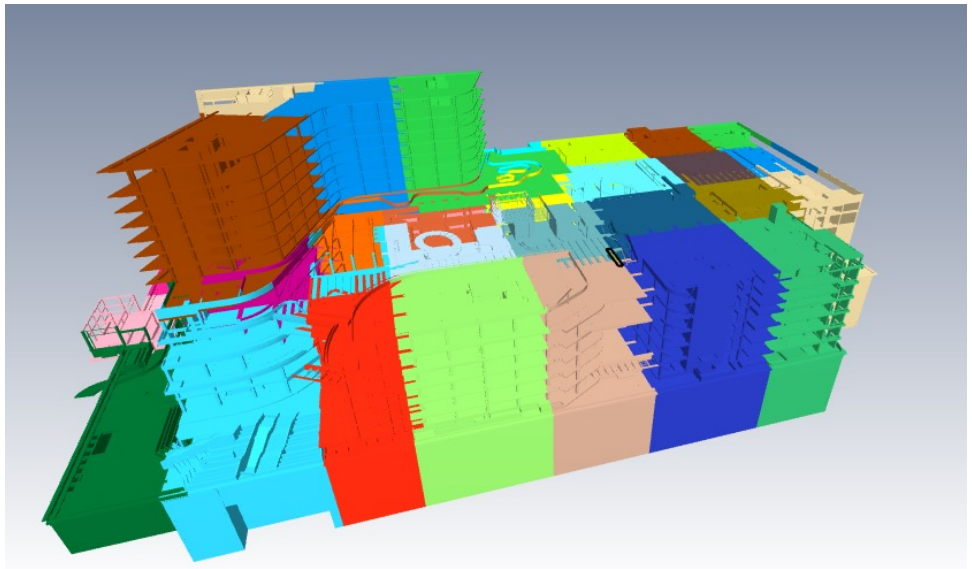
L&T Construction is a division of Larsen & Toubro (L&T) a major Indian technology, engineering, construction, manufacturing, and financial services conglomerate, with global operations. L&T addresses critical needs in key sectors - Hydrocarbon, Infrastructure, Power, Process Industries and Defence - for customers in over 30 countries around the world.

Our Business:

- Buildings
- Heavy Civil Infrastructure
- Power Transmission & Distribution
- Water & Effluent Treatment
- Minerals & Metals
- Transportation Infrastructure
- Railways







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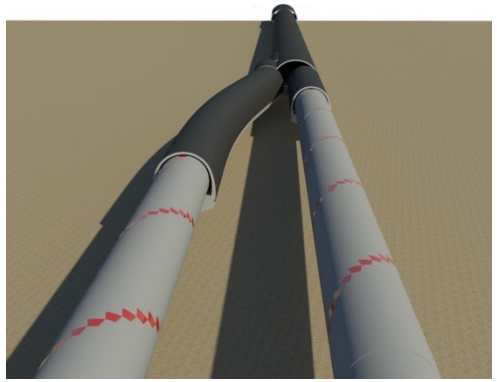
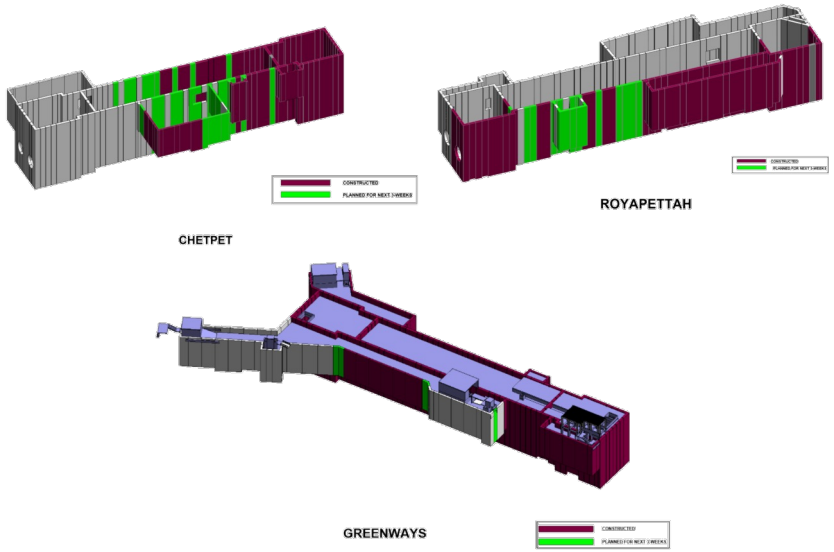
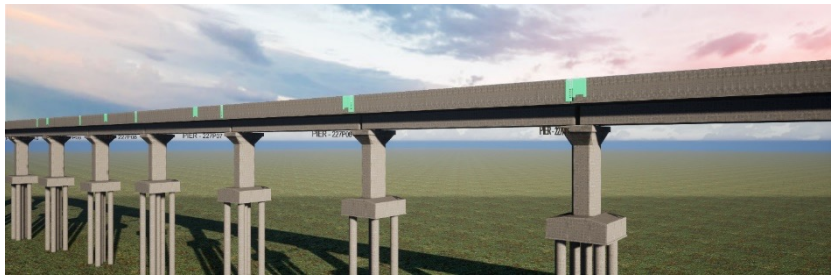


TBM & NATM Tunnel

CMRL - TU02



MAHSR C4



Bridges

Casting yard

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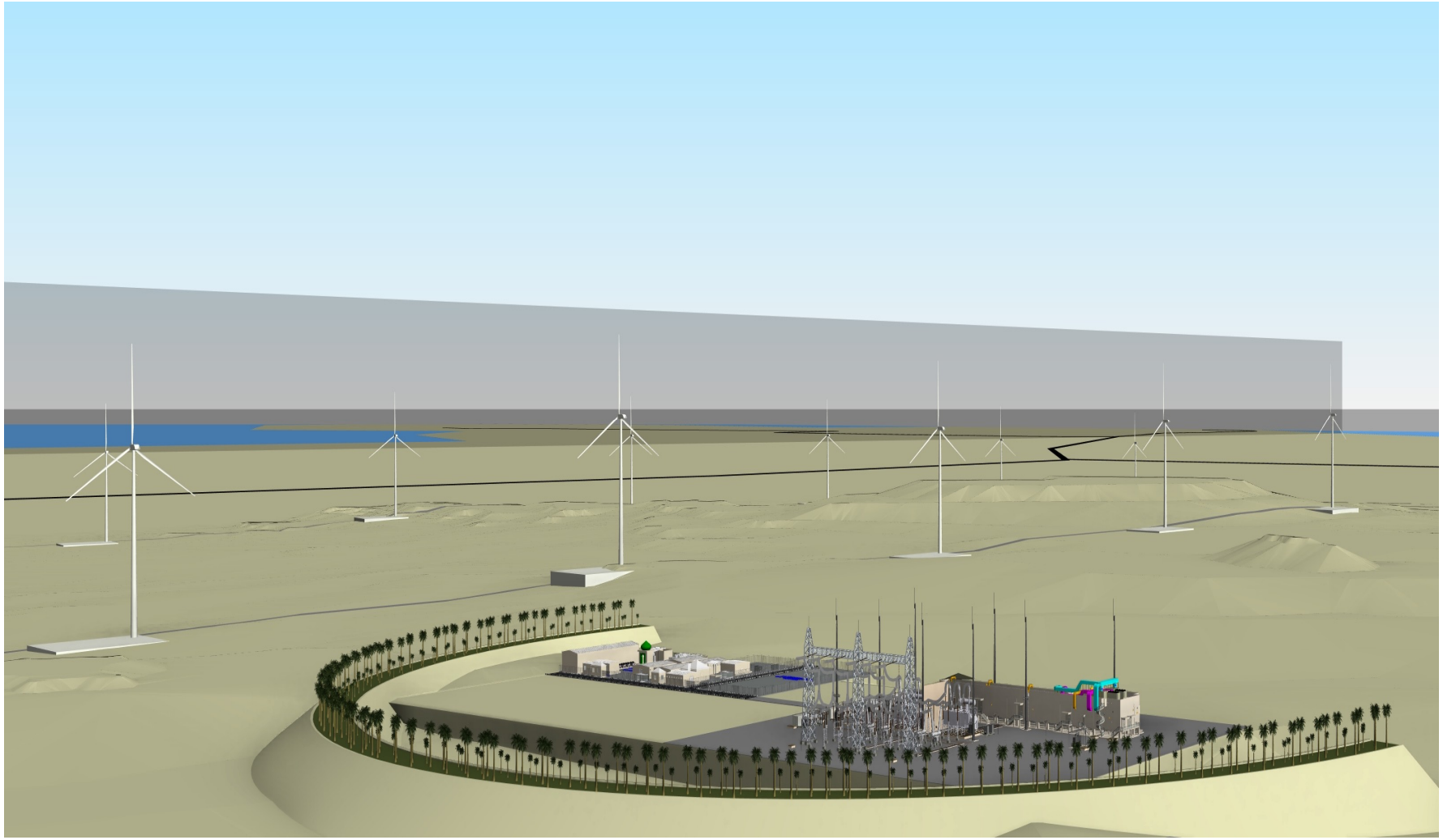

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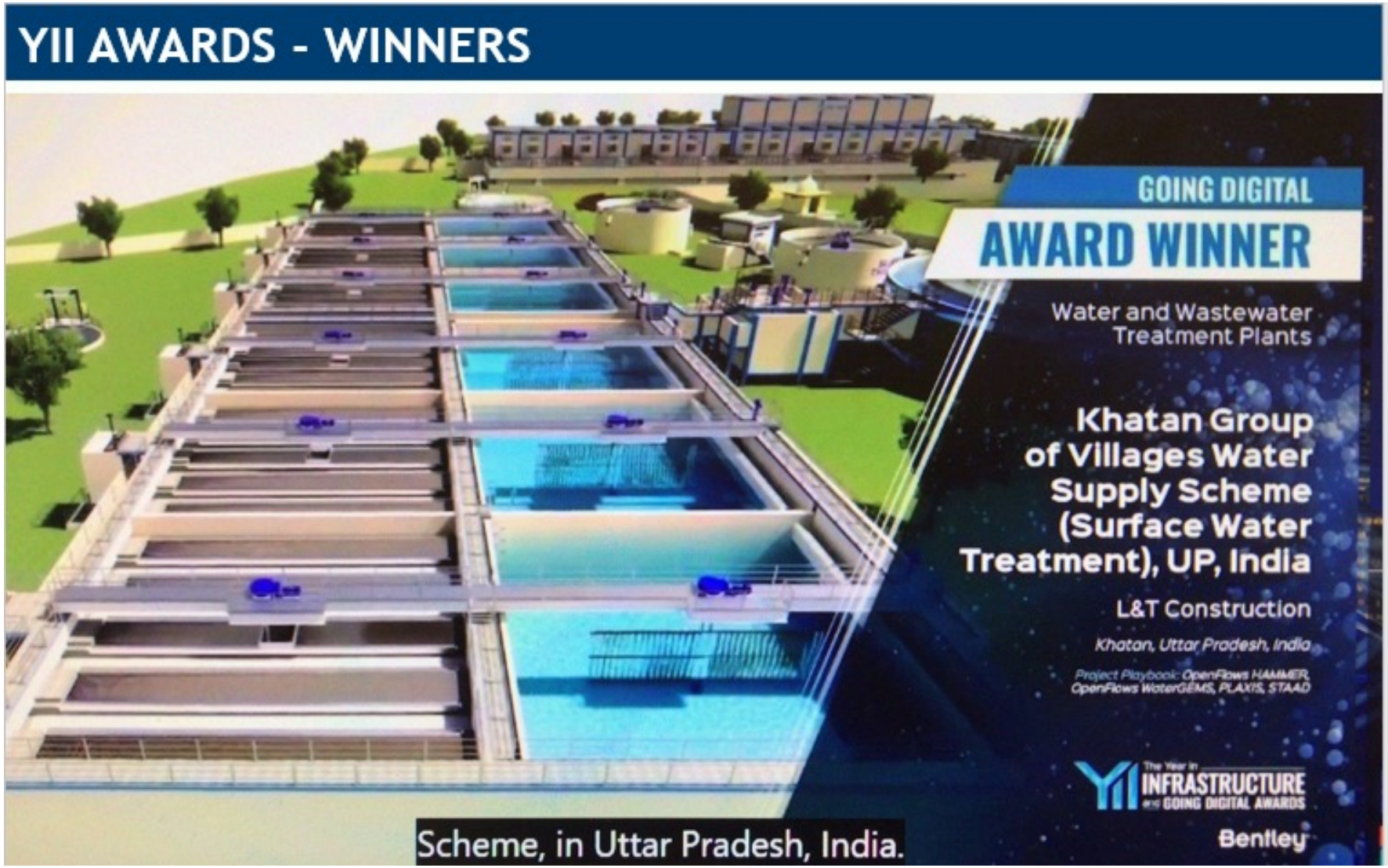

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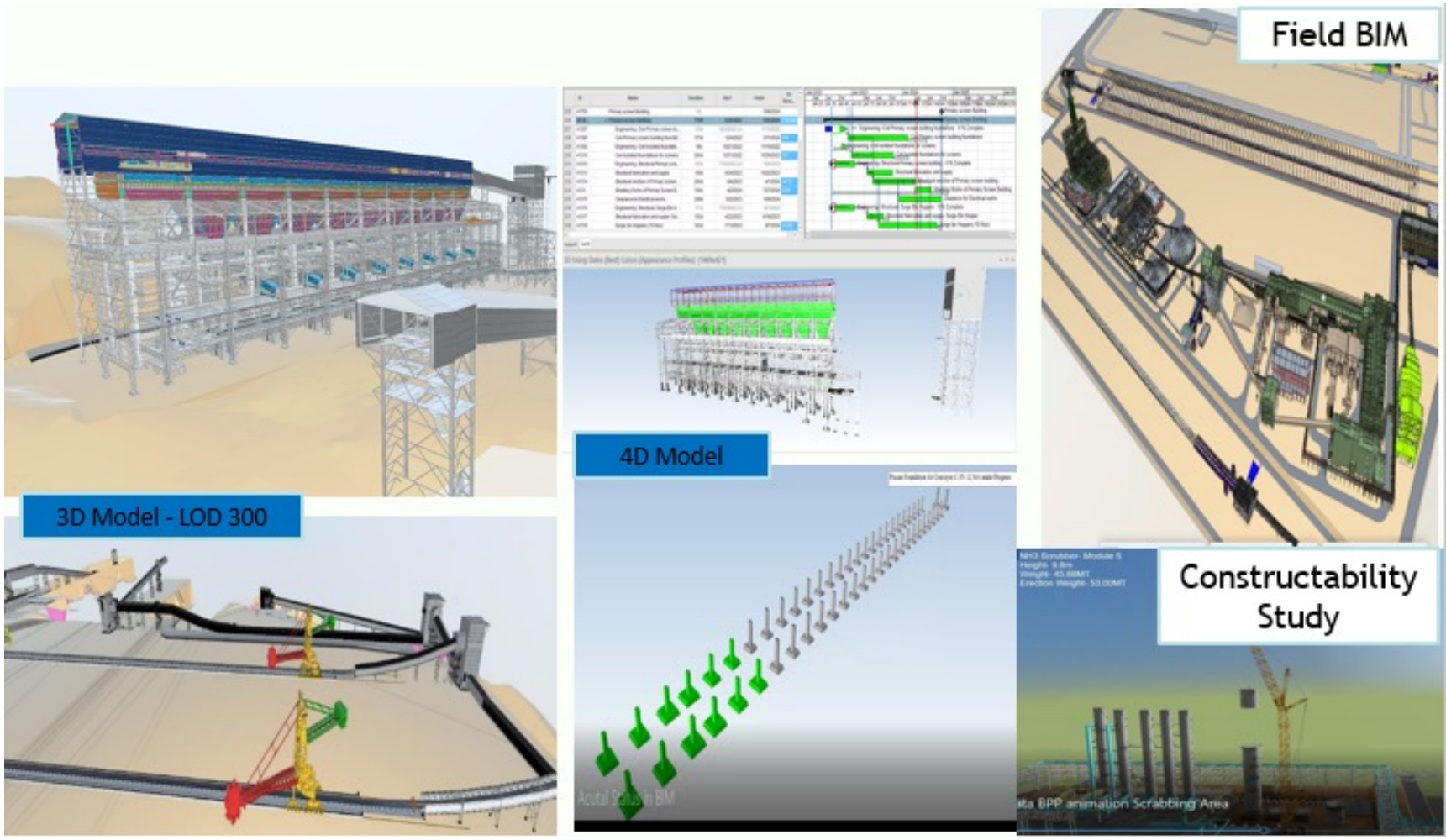

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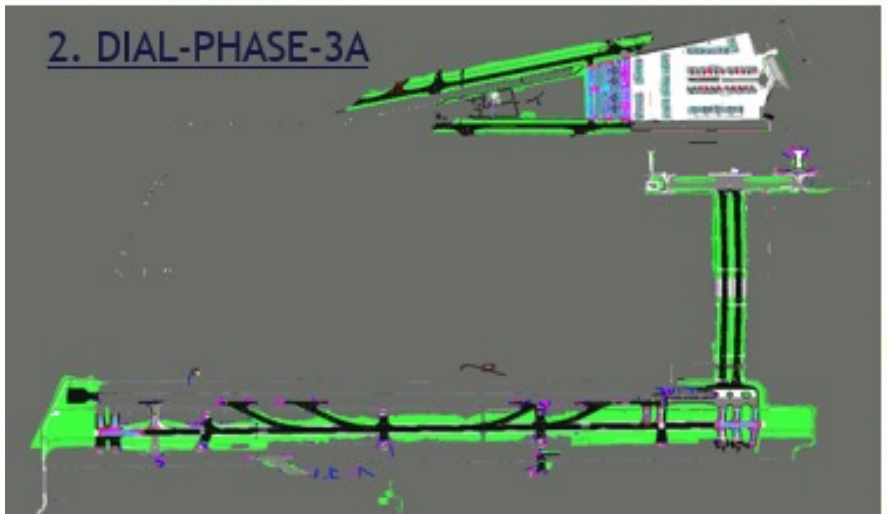

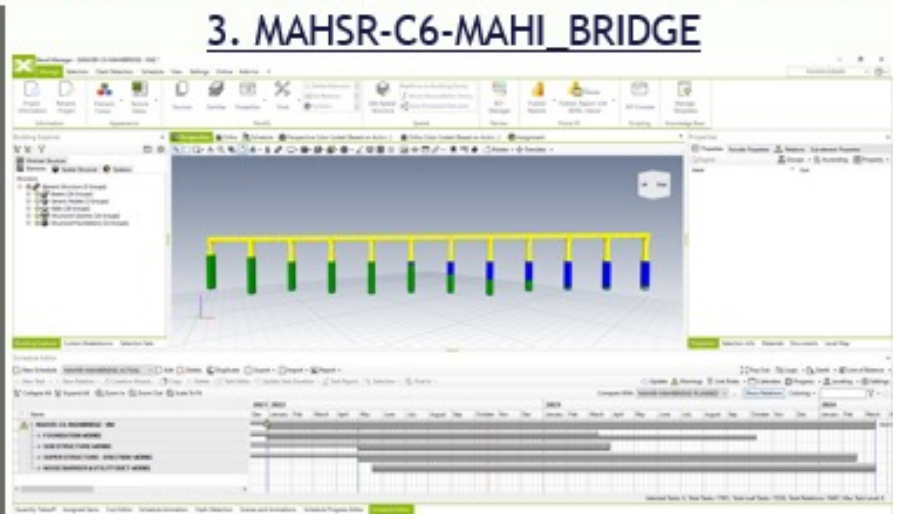

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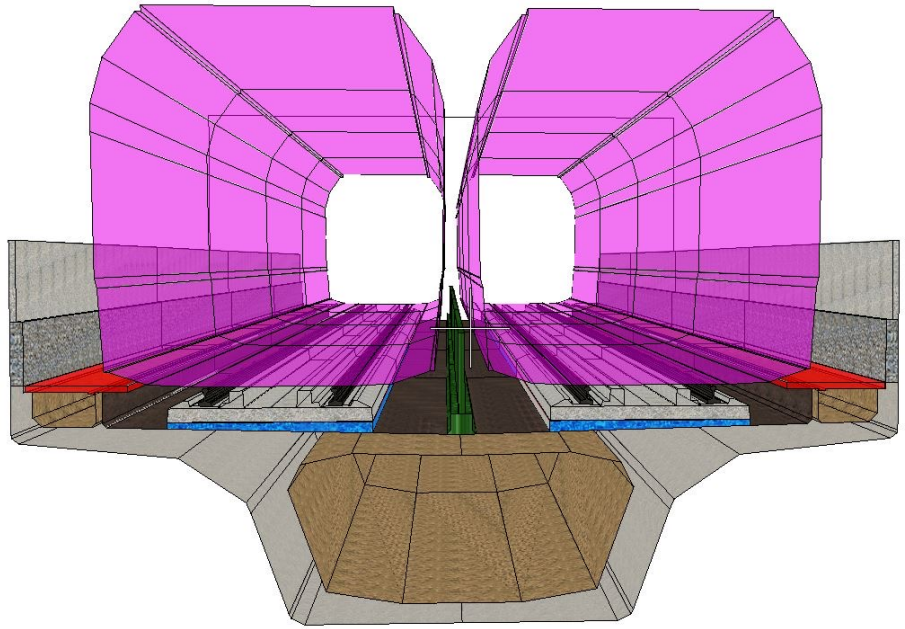
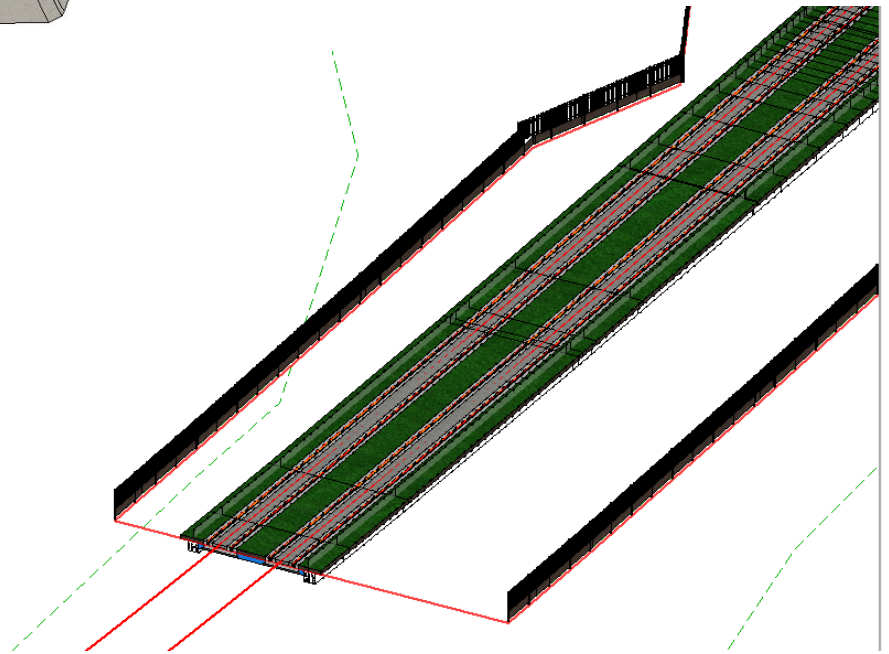




What is GEO BIM – Subsurface

- Geolocating subsurface utility networks is essential for planning and constructing construction projects. Advanced technologies like LiDAR, mobile laser scanners, and thermal imaging systems are helpful in mapping subsurface utilities.
- The use of Building Information Modeling (BIM) in construction has increased, which reduces risks and uncertainties in underground construction sites.
- A fully integrated BIM software can minimize costs and inefficiencies in managing underground facility records.
- Integrating BIM with geospatial solutions can improve the detection and management of subsurface infrastructure throughout its lifecycle, thereby reducing risks.

How to Do BIM – GIS Integration

Data Source Layer

- UAV Photogrammetric Images
- Underground Electromagnetic GPR Scans
- Existing Underground Utilities Drawings
- GIS Data Sets
- Field Observations
- Reports
- 2D Design Drawings

Data Processing Layer

- 3D Point Cloud Data
- 2D Electromagnetic Scans

Integrated BIM - GIS Platform

BIM Environment

- 3D Surface Model
- 3D Utility Infrastructure Model
- Attribute Information

BIM-GIS Integration

- Exchange Platform

GIS Environment

- Geographical Surface Model
- Underground Utility Network
- Semantic Information
- Surrounding Model

Application Layer

- 3D Visualization During Excavation
- 3D Smart Drawings
- Cost Estimation
- Facilitate Management
- Design Optimization

What we do in L&T on Subsurface BIM

BIM (Building Information Modelling)

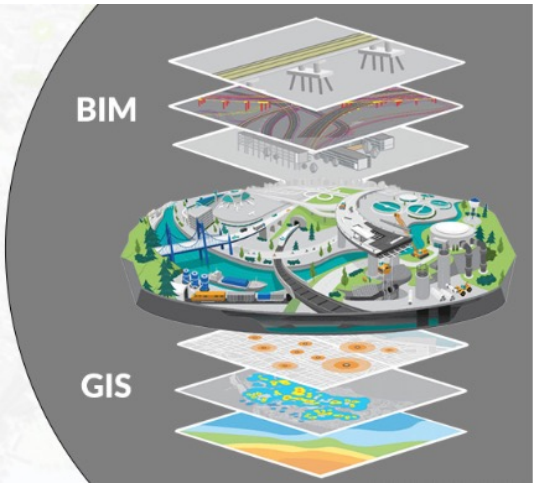
or

TIM (Tunnelling Information Modelling)

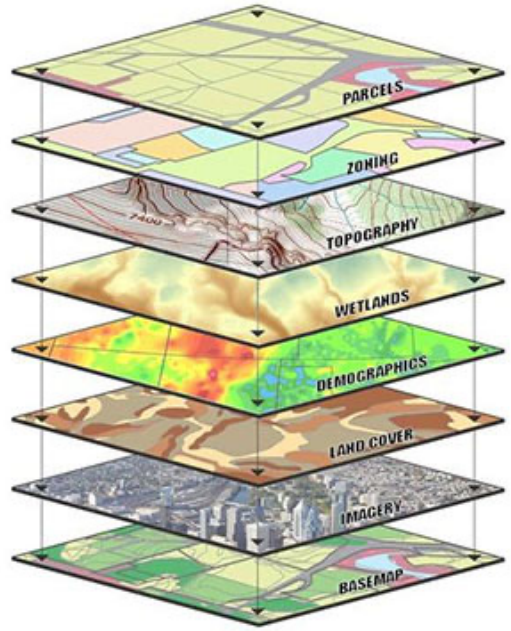
Underground Utility Model

GIS Model

→ Integrated GEO BIM Model



BIM – GIS integration, Source: United BIM



GIS Model, Source: MCNC

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GIS – BIM Integrated Visualization of Underground Utilities for Tunnel and Metro Station

What we do in L&T on Subsurface BIM

TUNNEL PROJECT

IMAGE

3D POINT CLOUD

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MUMBAI METRO

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ROHA VERNA KONKAN RAILWAY ELECTRIFICATION

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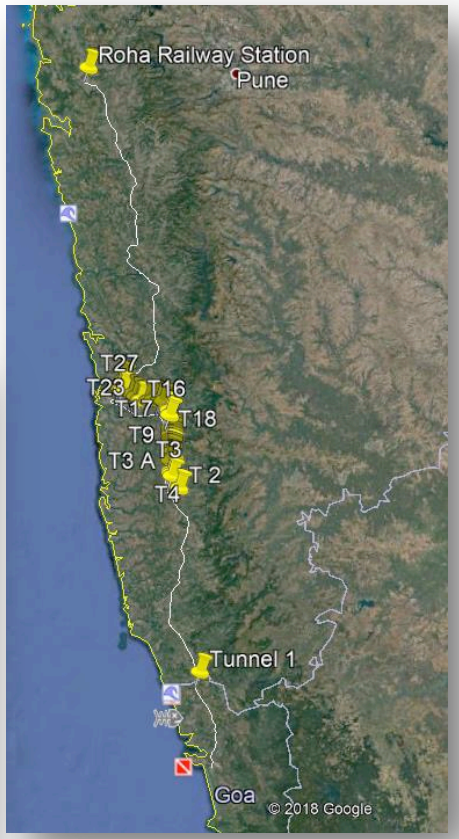

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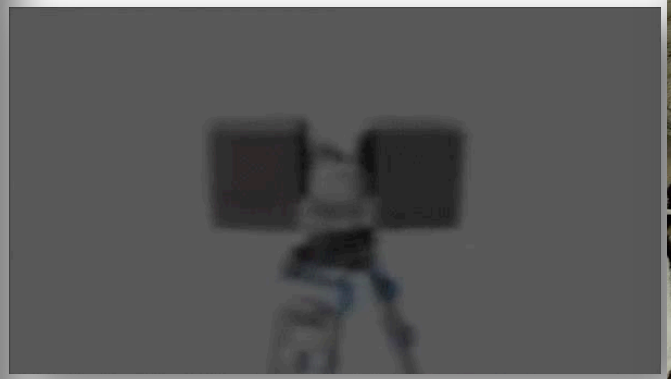

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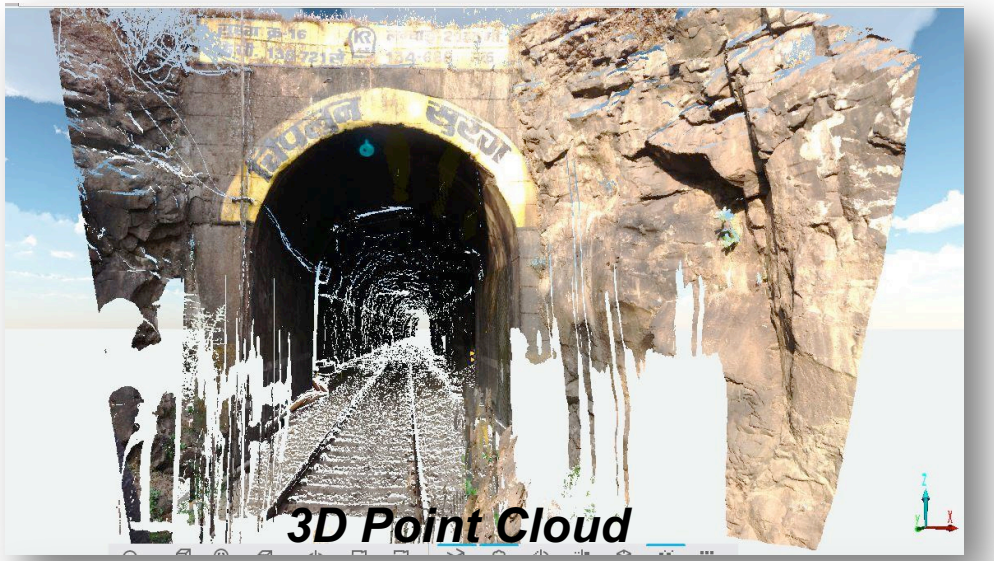

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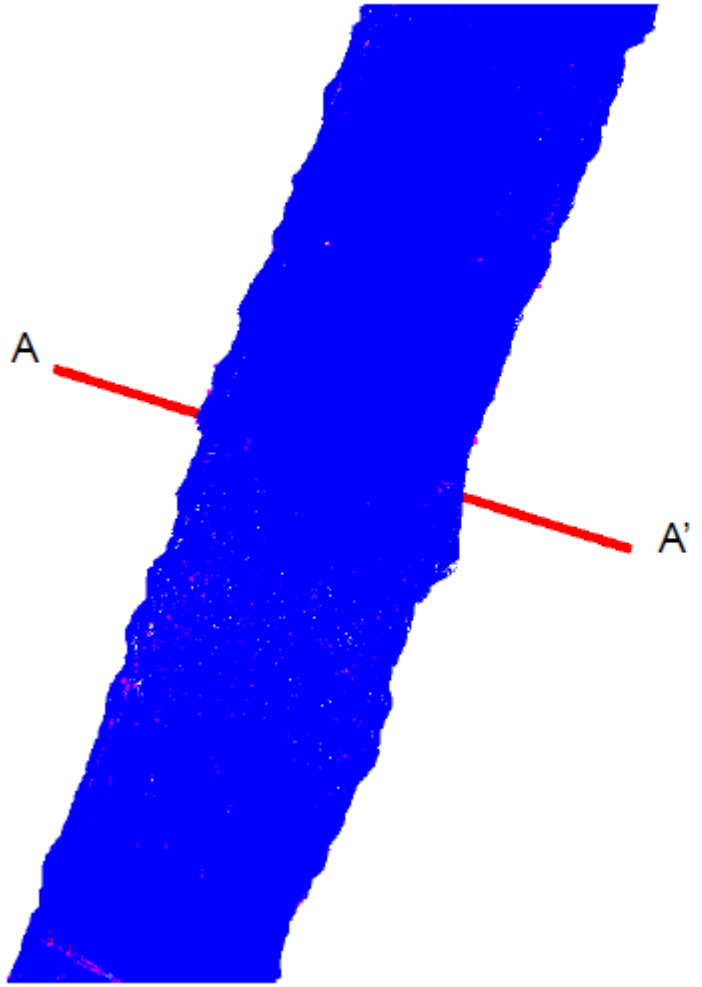
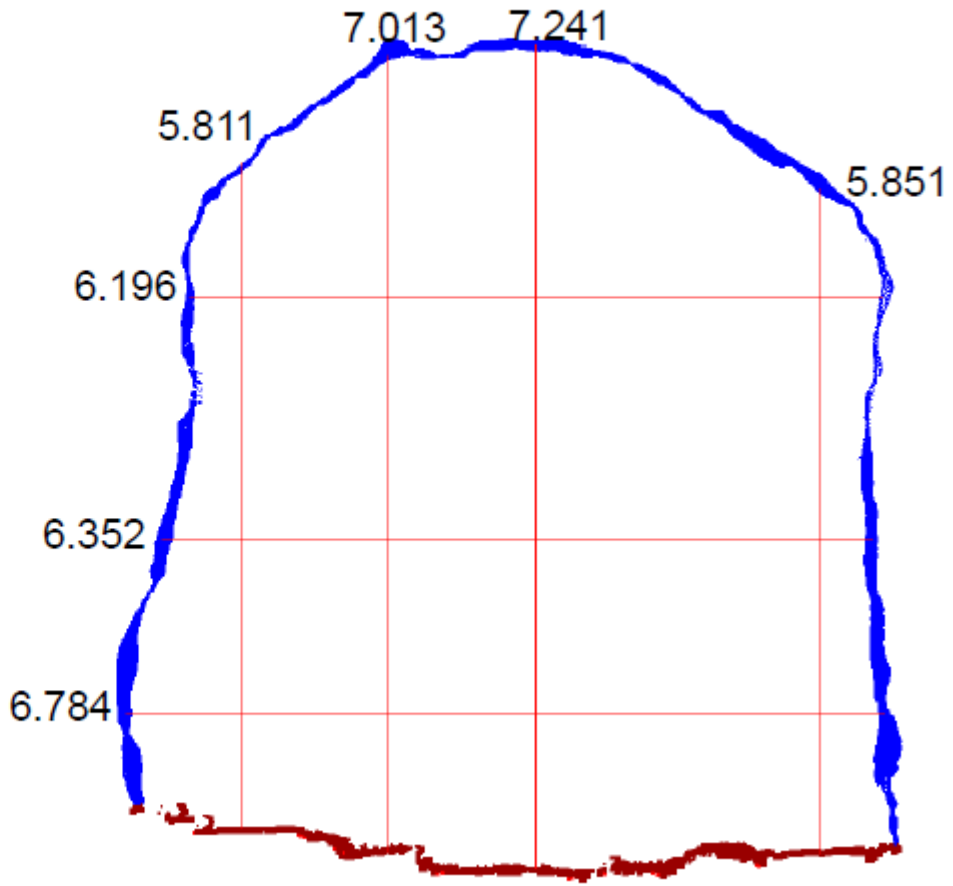
Measurement – LiDAR Point Cloud





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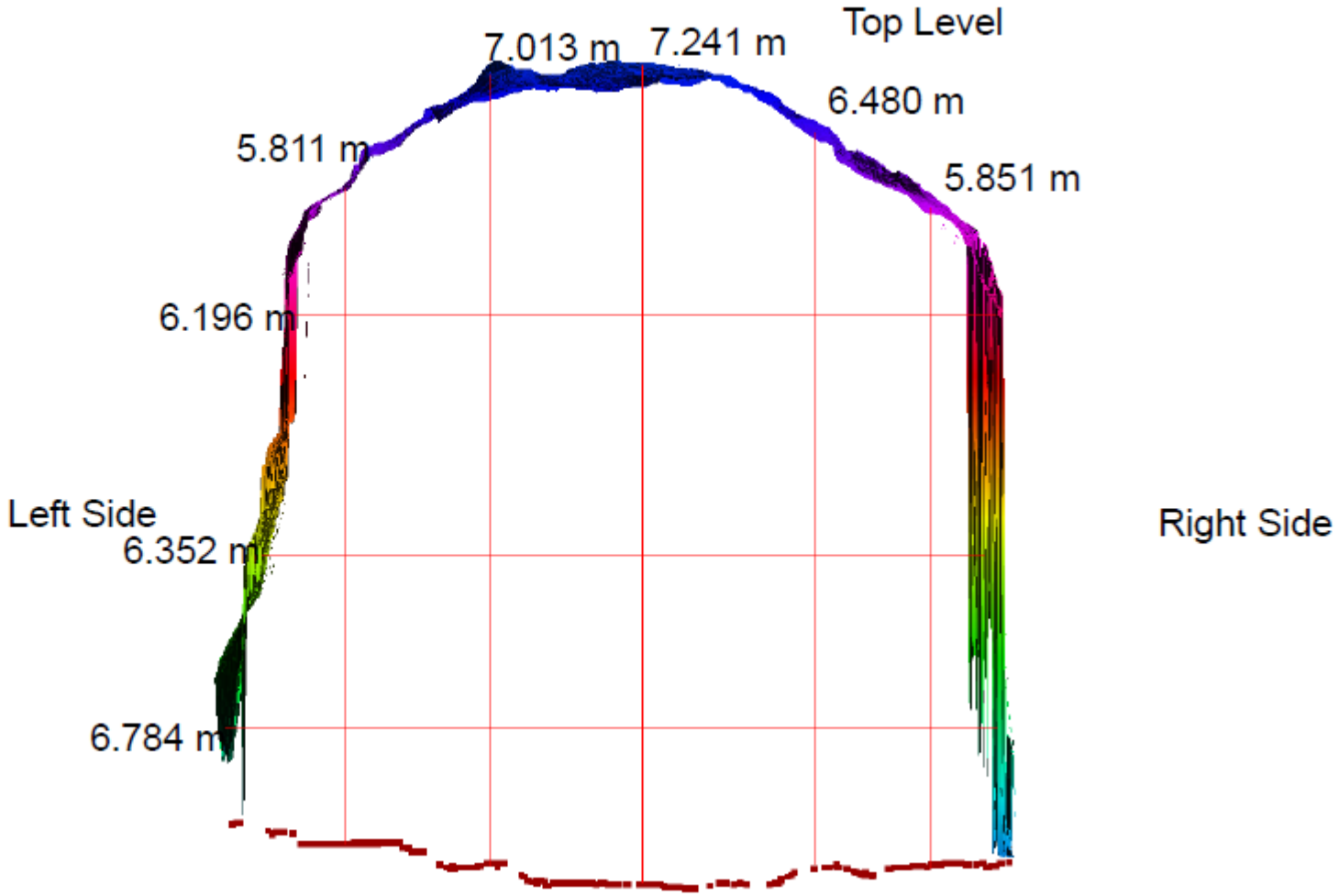
Measurement – LiDAR Surface



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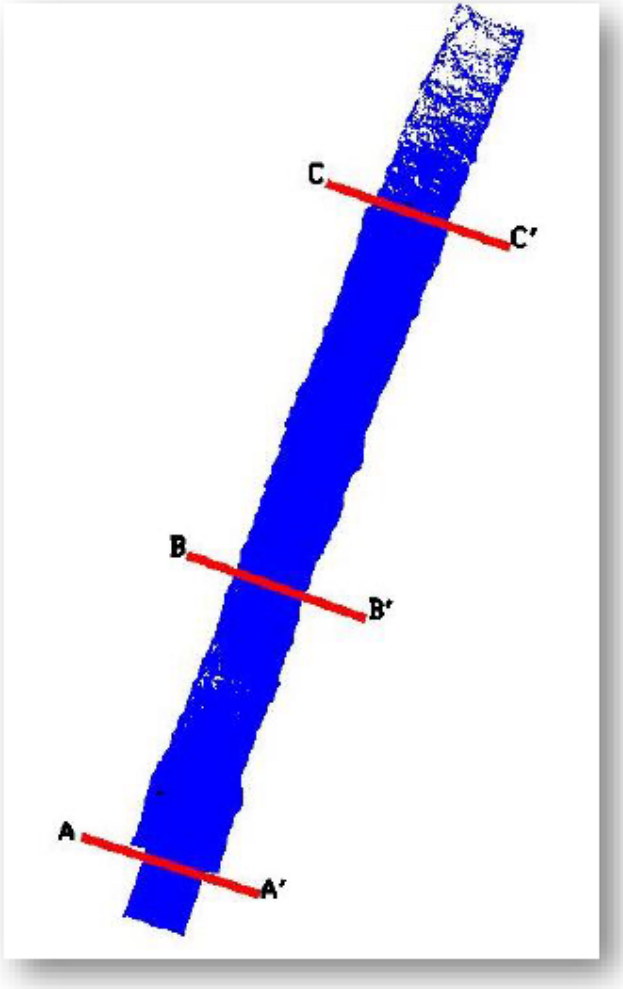
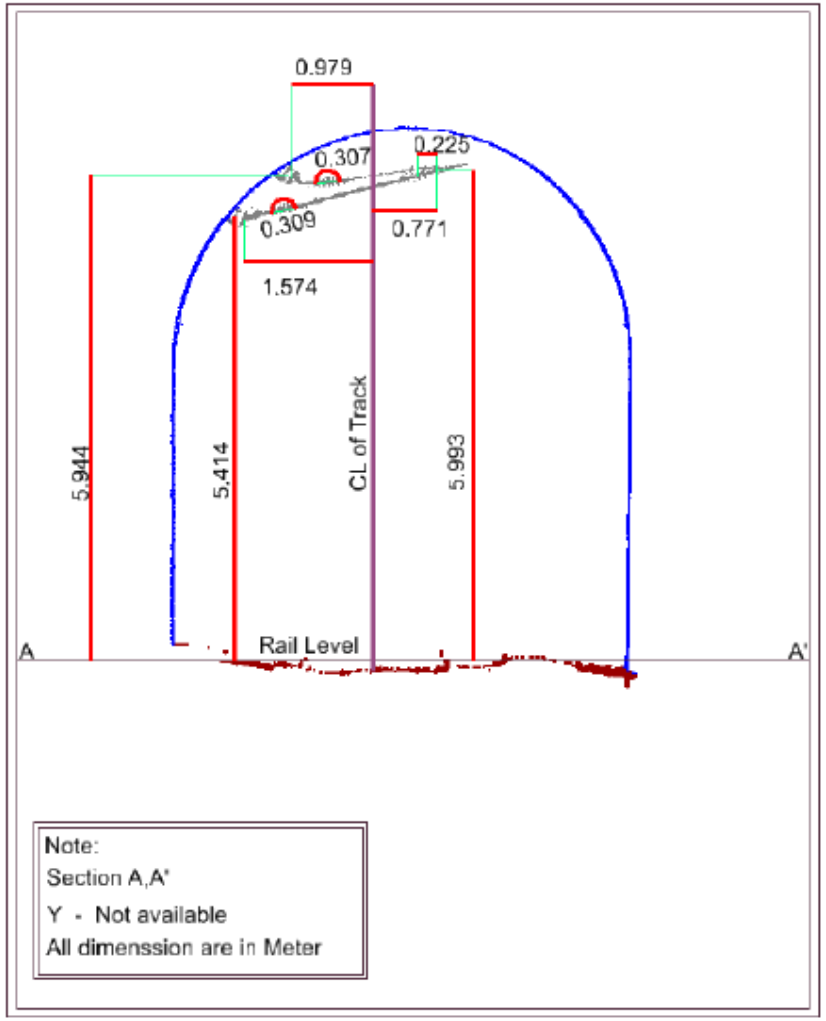
Measurement – LiDAR Profile View (A – A')





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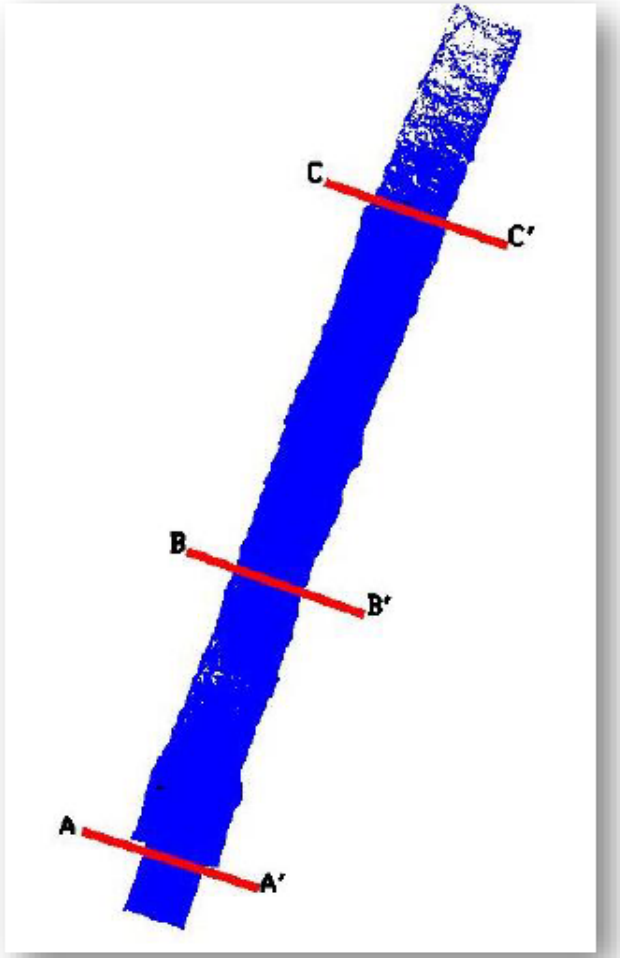
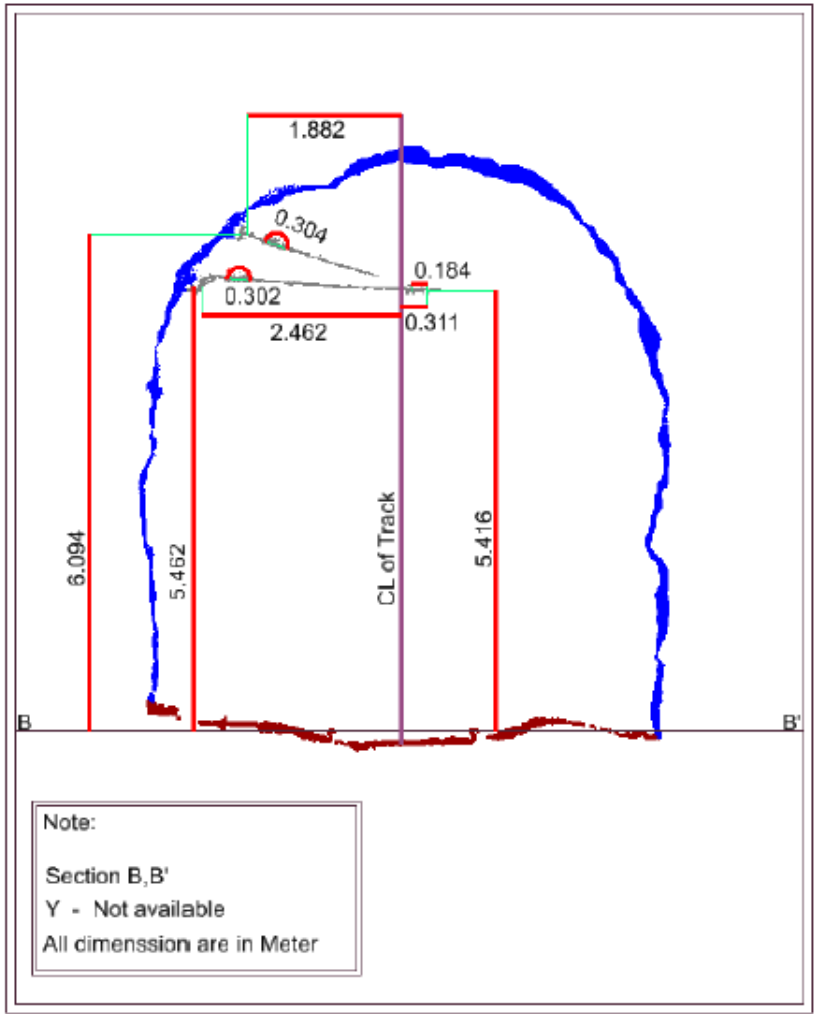
Measurement – LiDAR Profile View (B – B')





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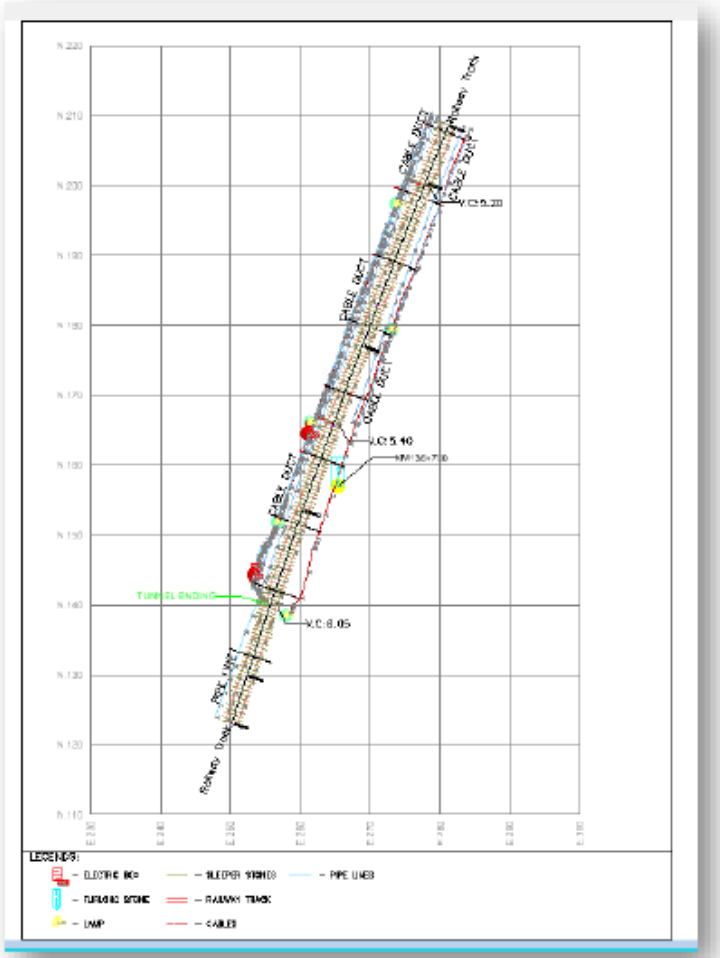

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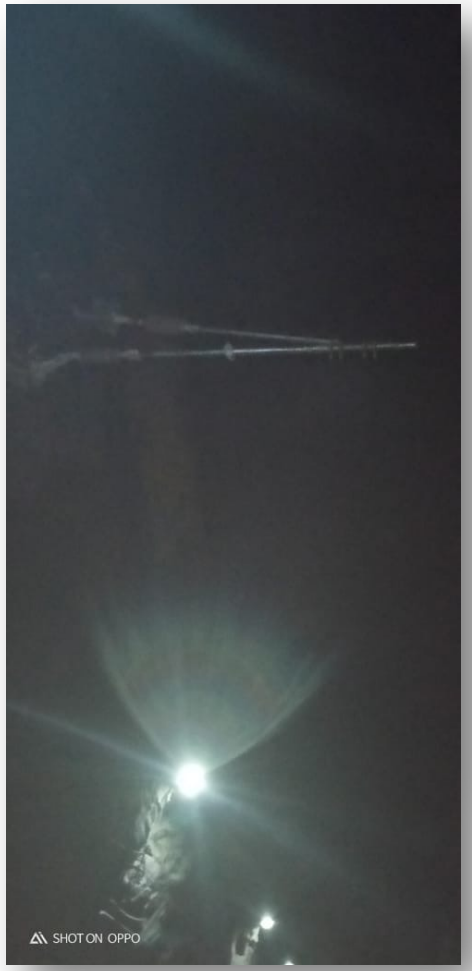

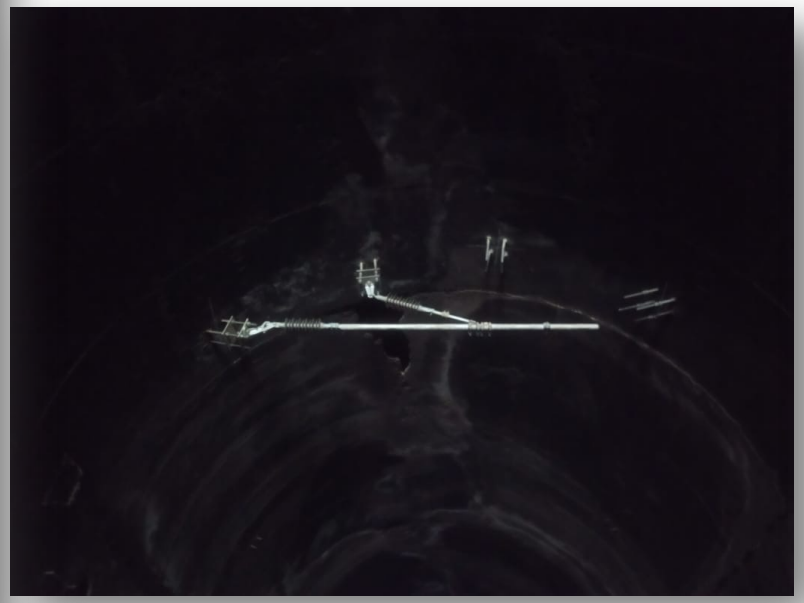

What we do in L&T on Subsurface BIM

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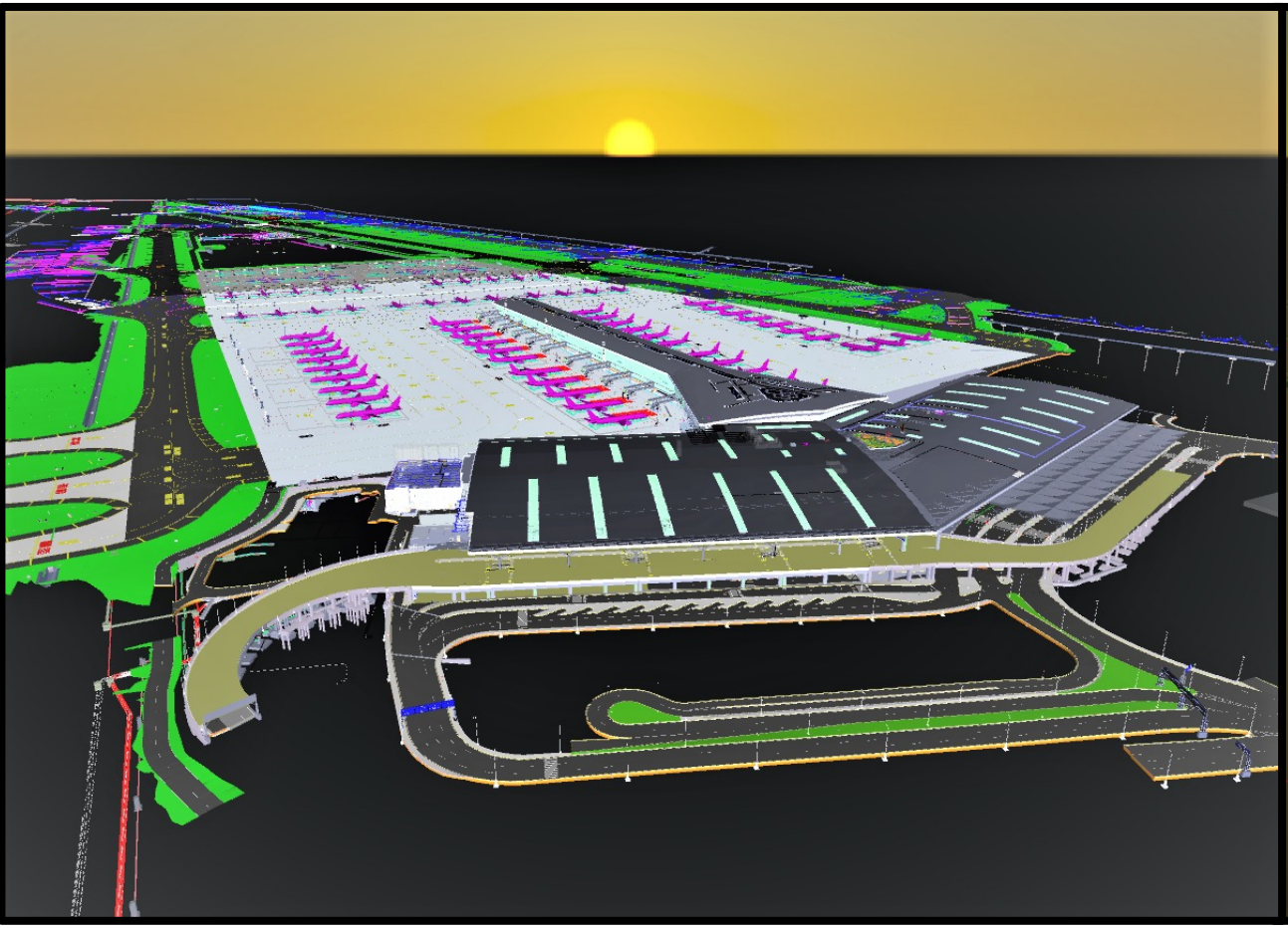
Airport Project



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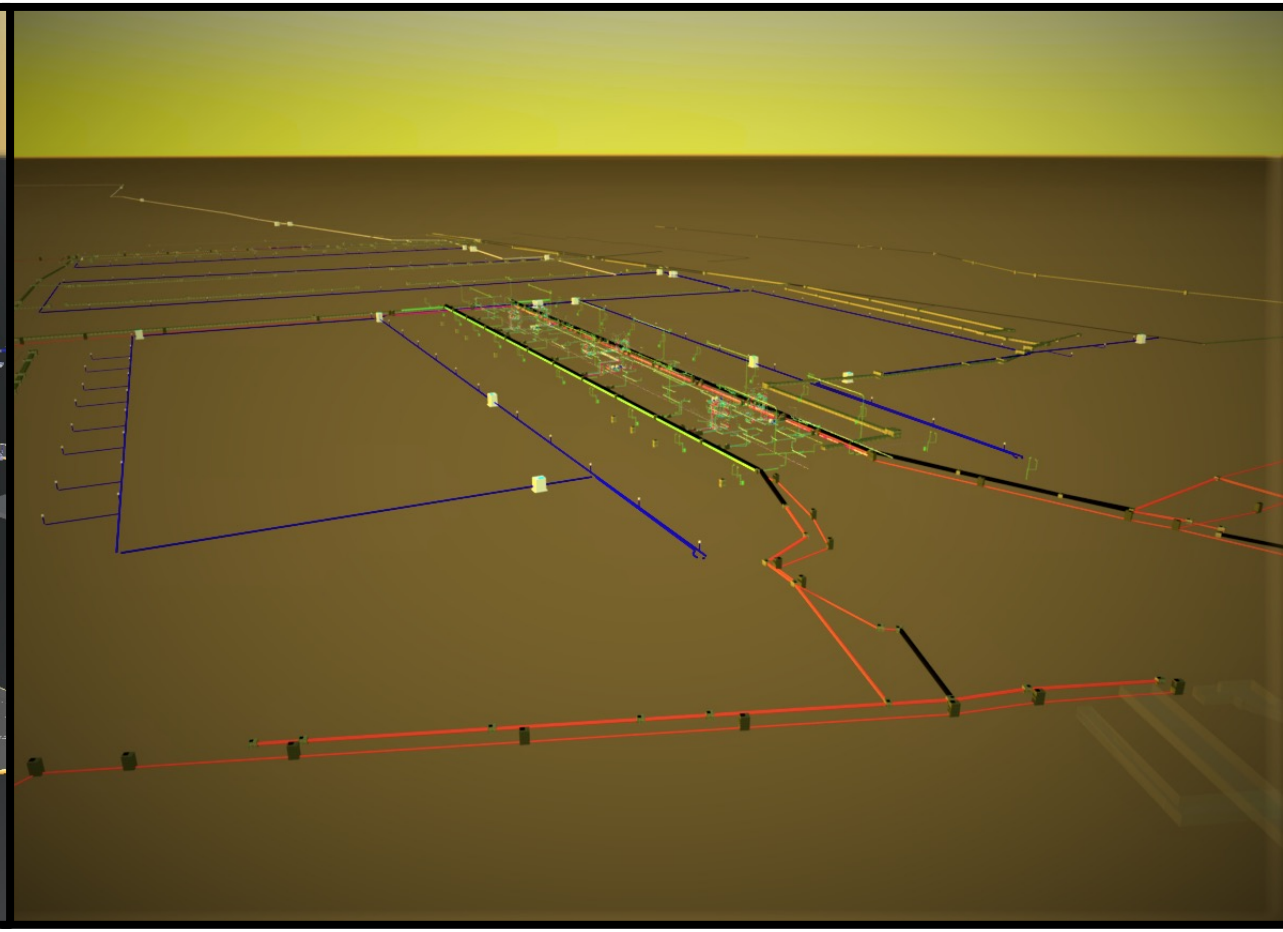

Utilities

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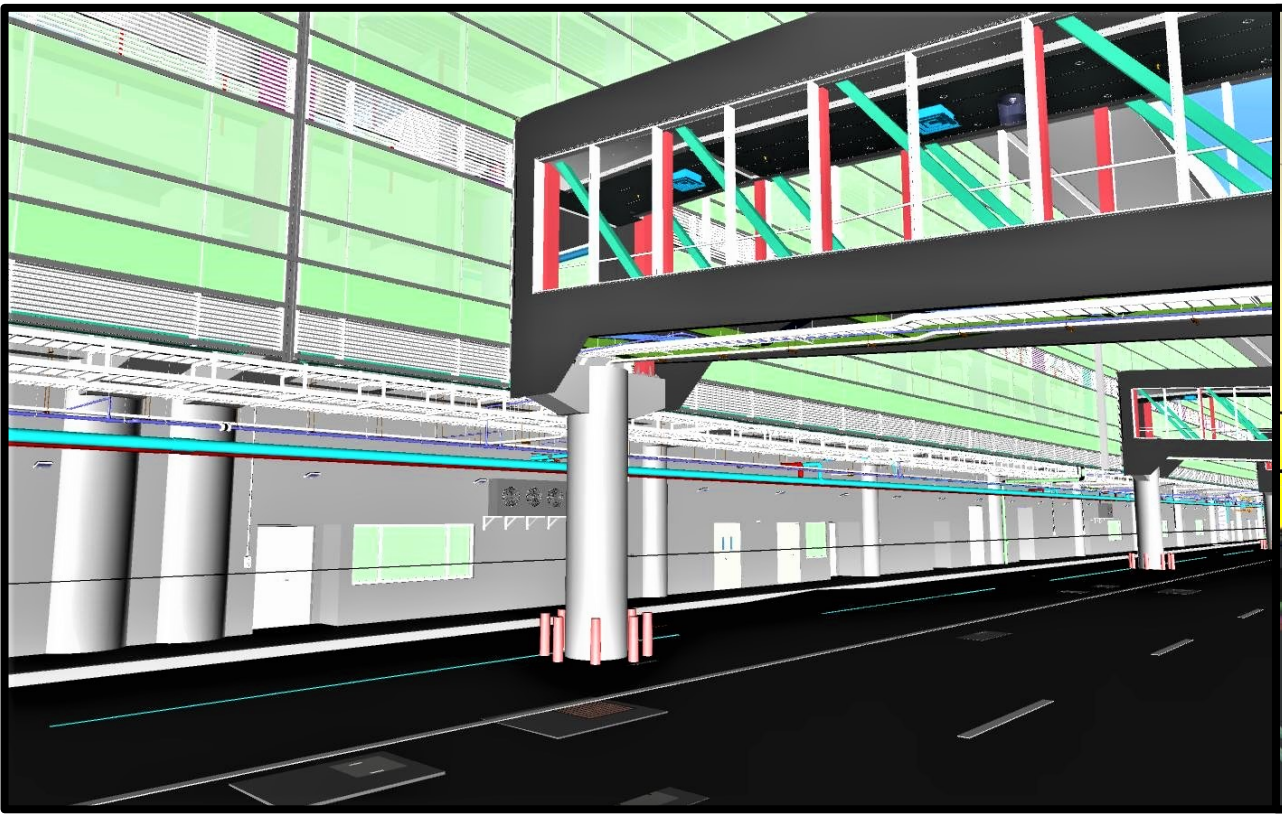

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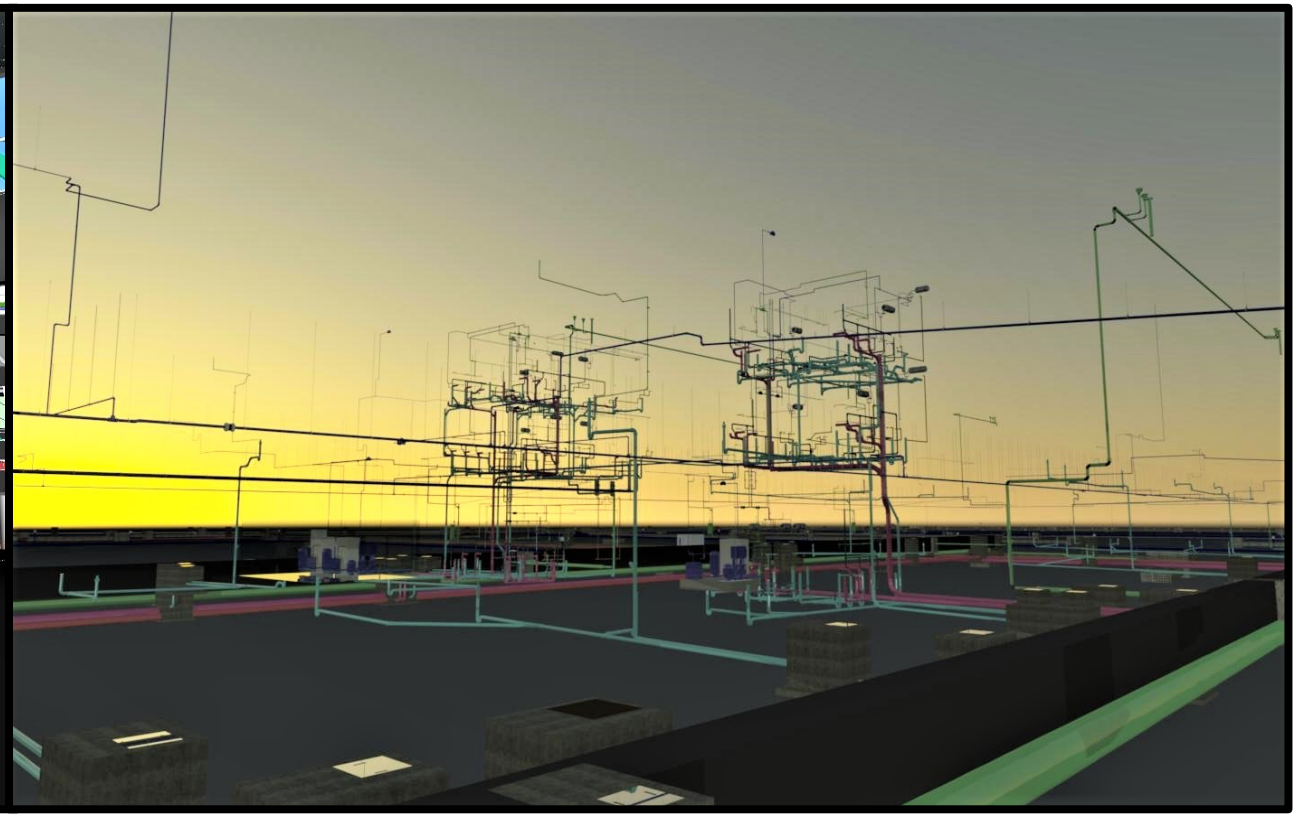

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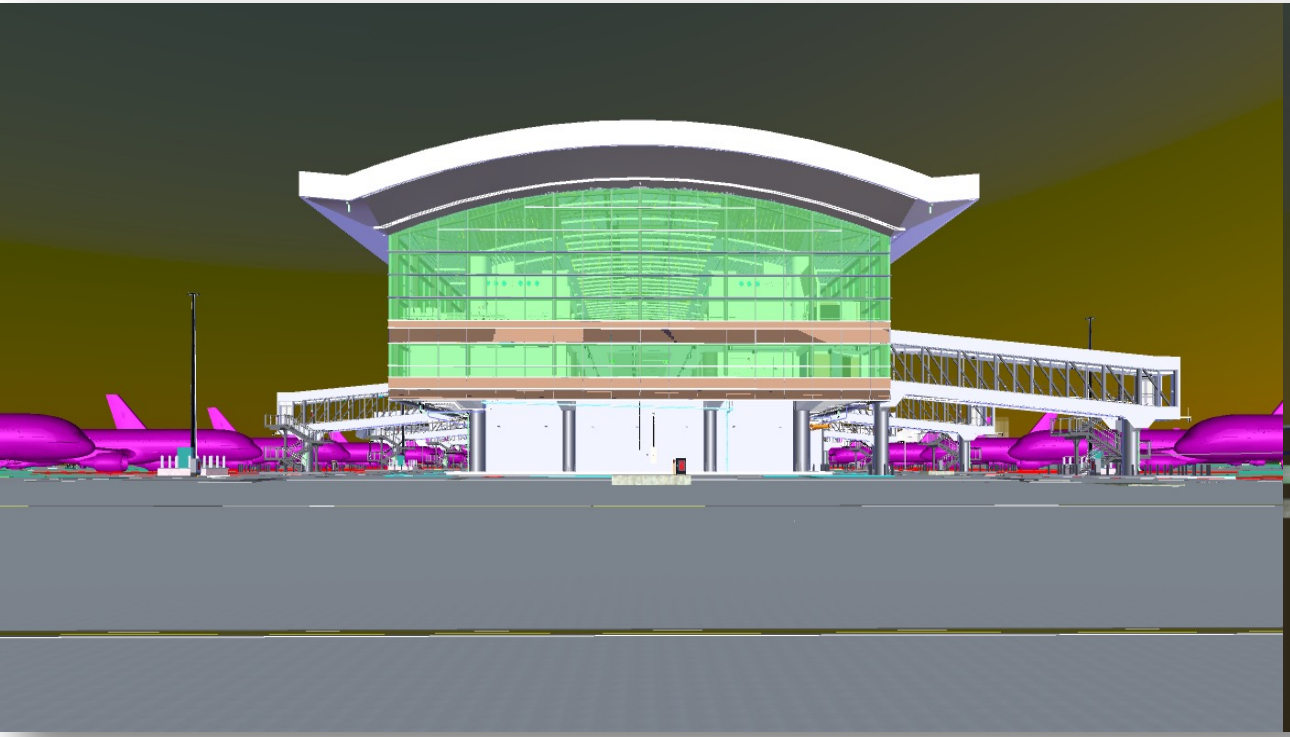

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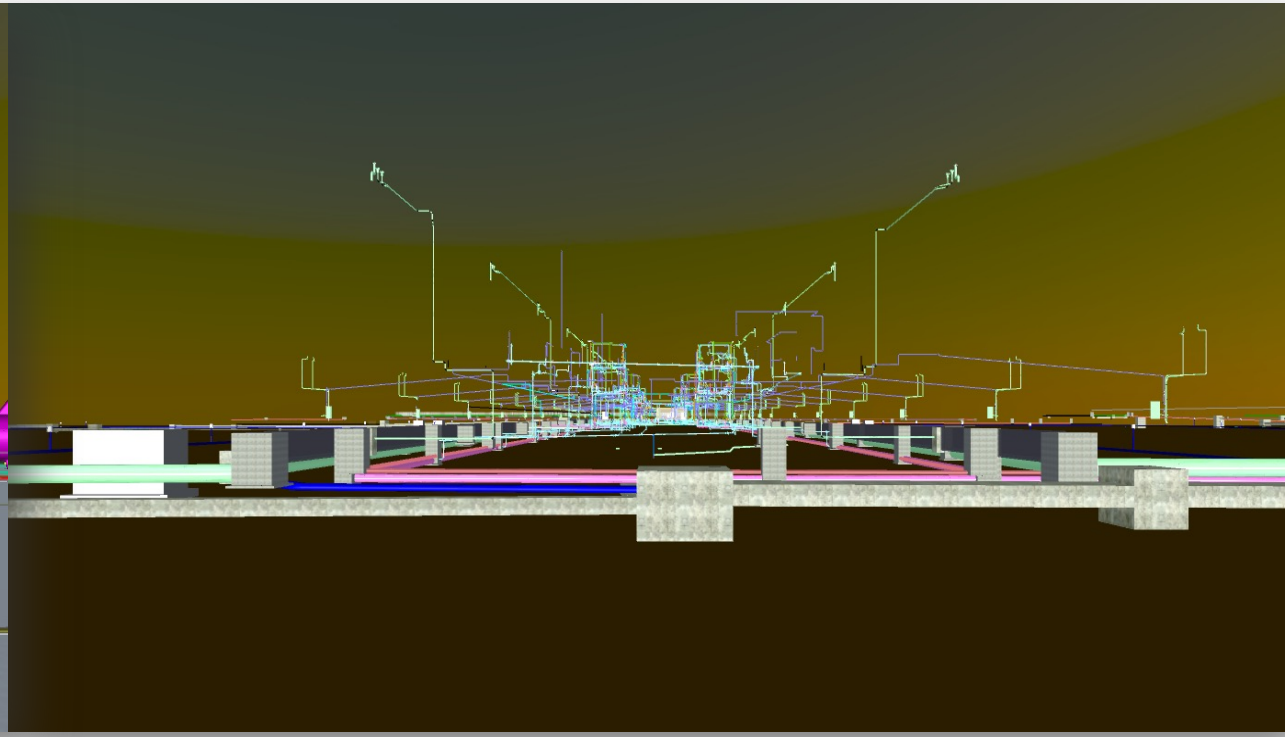

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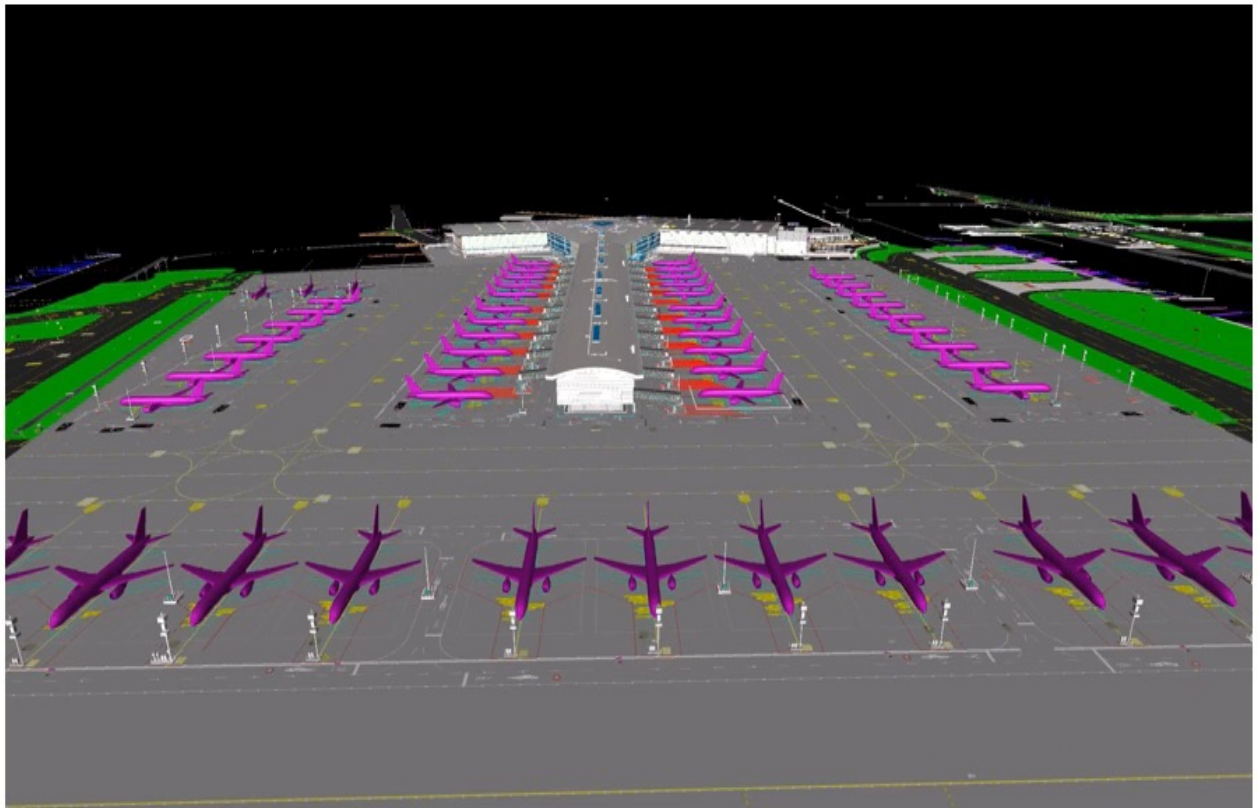

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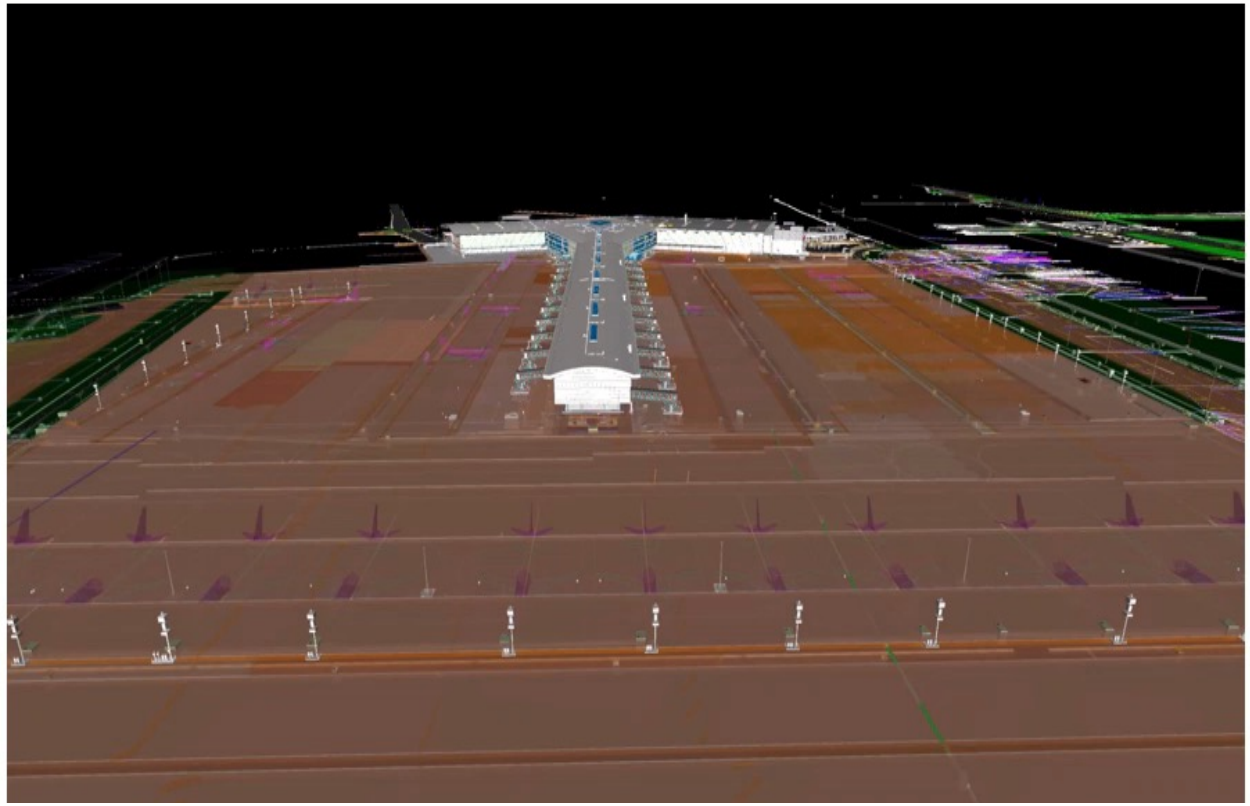

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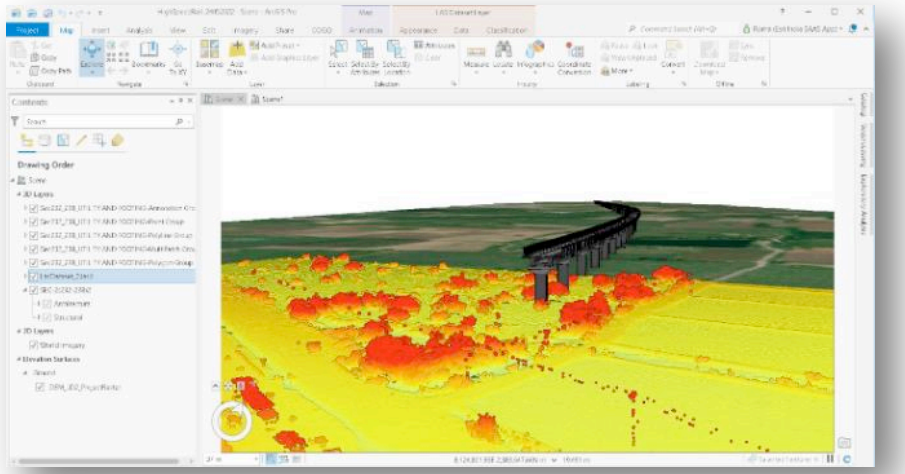
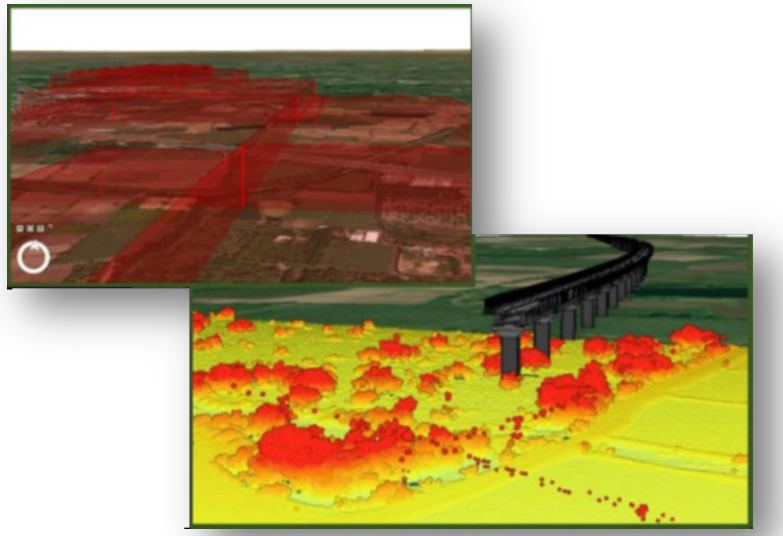
What we do in L&T on Subsurface BIM

MAHSR-C4 HIGH SPEED RAIL



Visualizing the point cloud LAS data



LIDAR Point cloud Dataset

- The LIDAR data was used to create a surface and contour for few kilometres, The ground level points in the LIDAR data were classified to create a DEM surface, which was used to determine the ground elevation. The Imagery base-map was draped over the DEM to create an elevation surface.

- In GIS platform, the point cloud dataset was color-coded so that higher elevations were indicated by red points and ground elevations by yellow ones. The LAS dataset layer was used to generate a digital elevation model, slope map, hill-shade, and contours.

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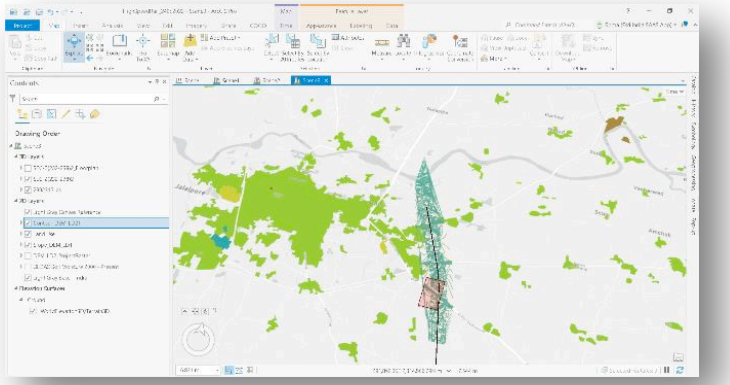


Contours and DEM dataset

Alignment of 2D/3D drawings:

The engineering drawings (2D CAD drawings and 3D BIM models) were georeferenced using the defined coordinate system and overlayed for visualization and exploration.

Visualizing the project in One Map
Web scene of the Viaduct and the Rail over pond

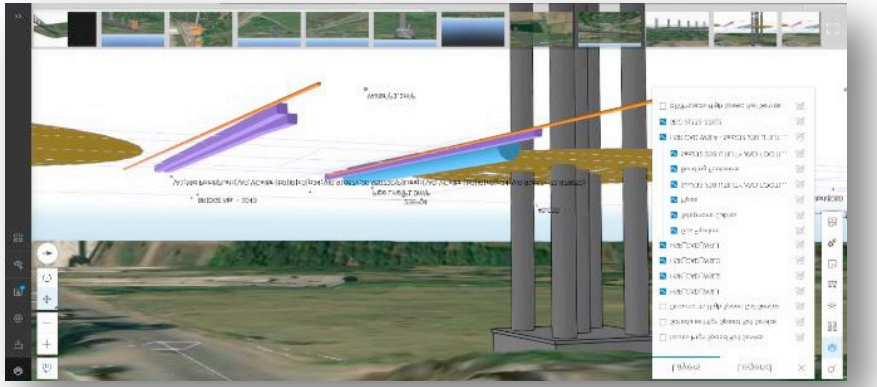
Web scene with the Revit dataset at a road junction

What we do in L&T on Subsurface BIM

MAHSR-C4 HIGH SPEED RAIL

Underground Utilities to GIS

The underground utilities data shared in CAD format was brought in GIS platform. 3D symbology was used to define the width of the utilities pipeline. The layer was later published in integrated GIS platform for visualization purpose.

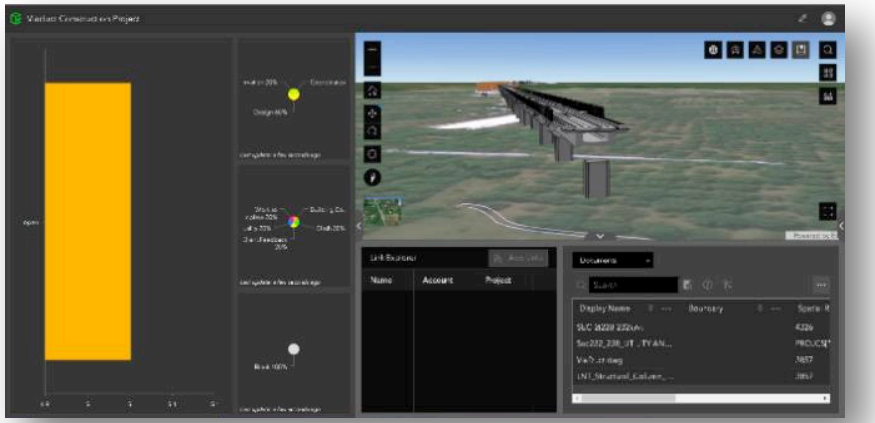


Visualizing the Underground Utilities

GIS Platform - Geo BIM:

The Geo BIM application provides a dashboard for monitoring BIM projects and issues, supporting data from various formats and the ACC cloud system.

It offers a user-friendly interface for exploring and collaborating, with linked data and documentation available in web apps. Users can also filter issues and 3D models based on time and levels.



GeoBIM Application Issues Dashboard

Benefits of BIM in Subsurface construction

- Contextualizing Underground Structures
- Less Invasive Construction
- Improved Safety
- More Sustainable Construction
- Optimized Collaboration