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Leapfrog Works – 3D Geological Modelling

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Agenda

1. **Who is Seequent**
2. **Challenges Customers Face**
3. **Leapfrog Works as a Solution**
4. **Key features of Leapfrog Works**
5. **Integration into Geotechnical Workflow**
6. **Success Stories**
7. **Q&A**

Conclusions



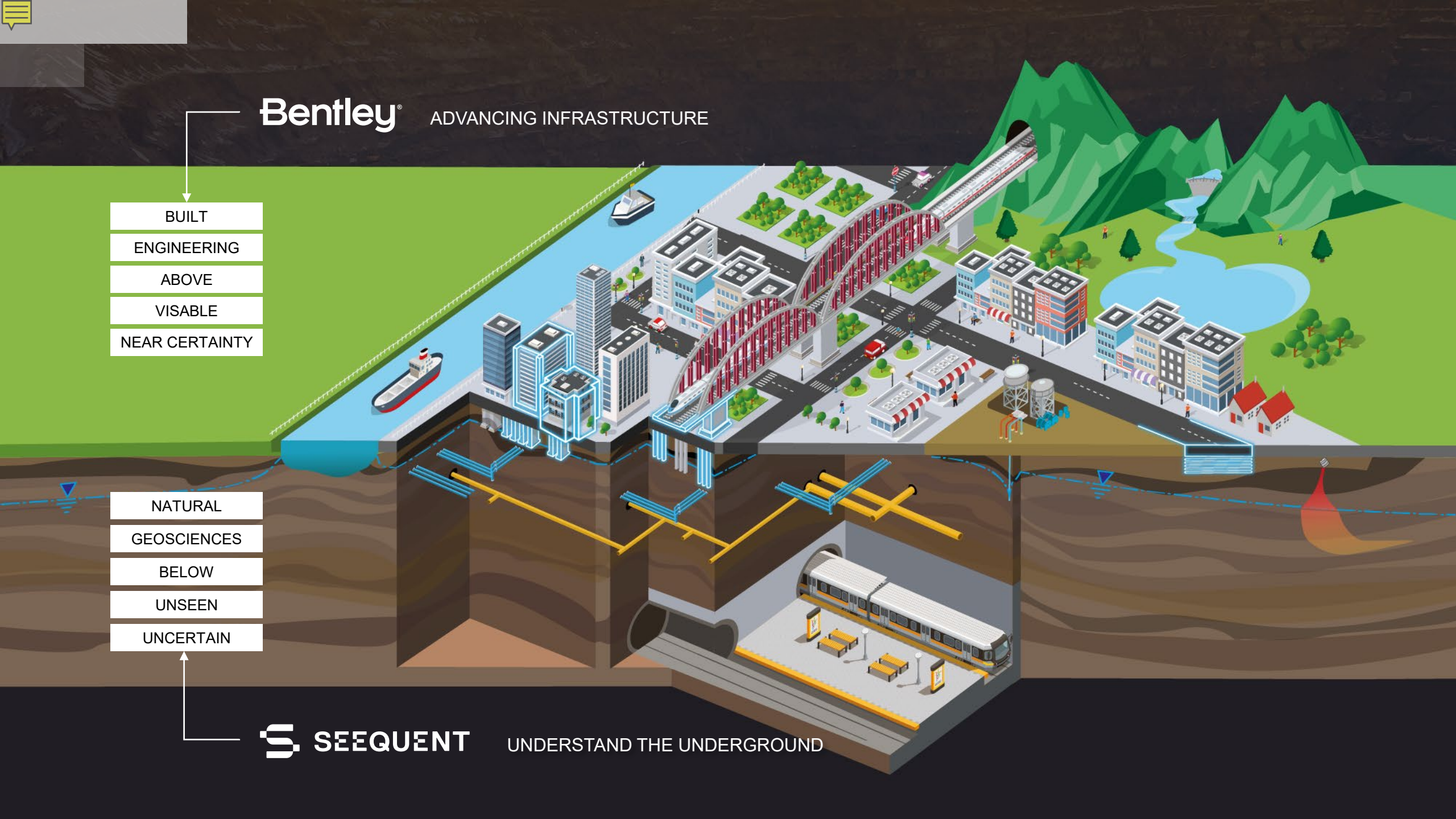
Who is Seequent?

Bentley ADVANCING INFRASTRUCTURE

BUILT
ENGINEERING
ABOVE
VISABLE
NEAR CERTAINTY

NATURAL
GEOSCIENCES
BELOW
UNSEEN
UNCERTAIN

SEEQUENT UNDERSTAND THE UNDERGROUND





Challenges Faced by Customers in Civil and Environmental Projects

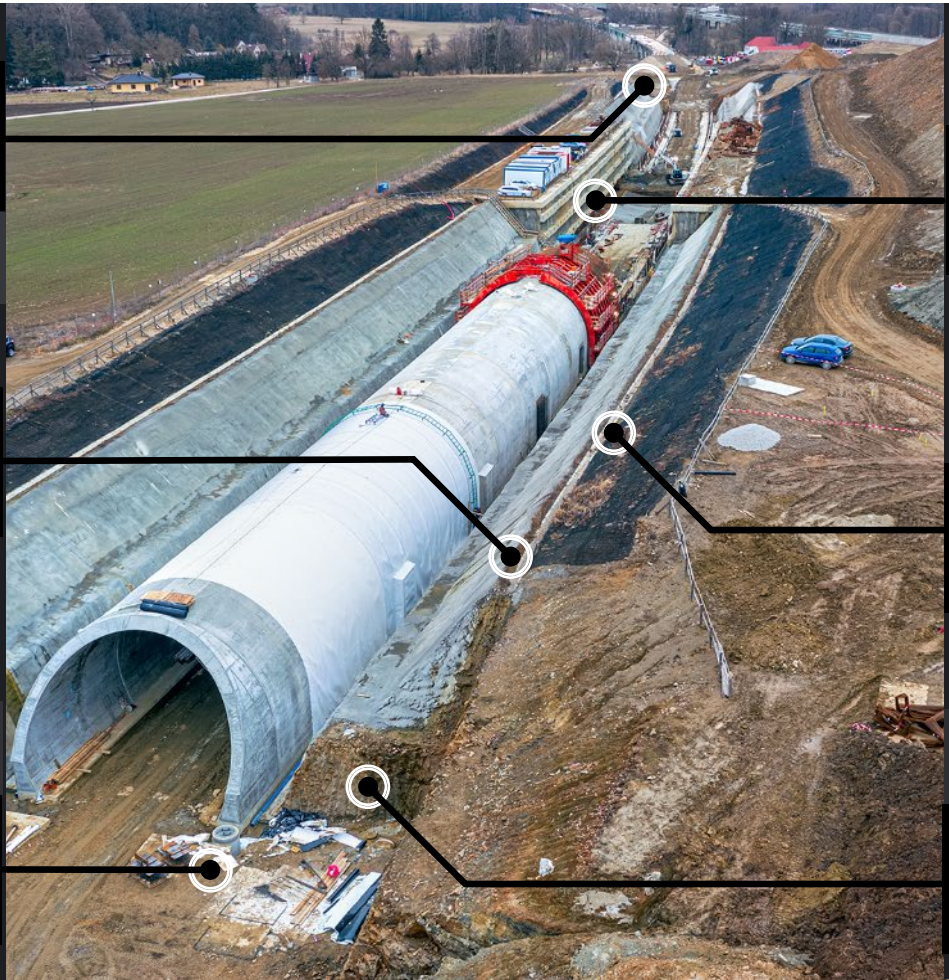


Typical ground risks driving unforeseen costs on infrastructure projects

Seepage problems, dewatering

Misclassified or mischaracterized subgrade

Mischaracterized rock for drilled shaft construction



Pile overruns

Unanticipated rock excavation

Groundwater shallower than expected



Unforeseen ground conditions among the top reasons for claims



2023 6th Annual CRUX report "Forewarned is forearmed"



Challenges to overcome when making smarter subsurface decisions

1



Understanding Ground Conditions

Limited data
Geological uncertainty

2



Communicating insights

Technical and non-technical
Geoscience and engineering

3



Tight Budget and Timelines

Data management
Net-zero targets

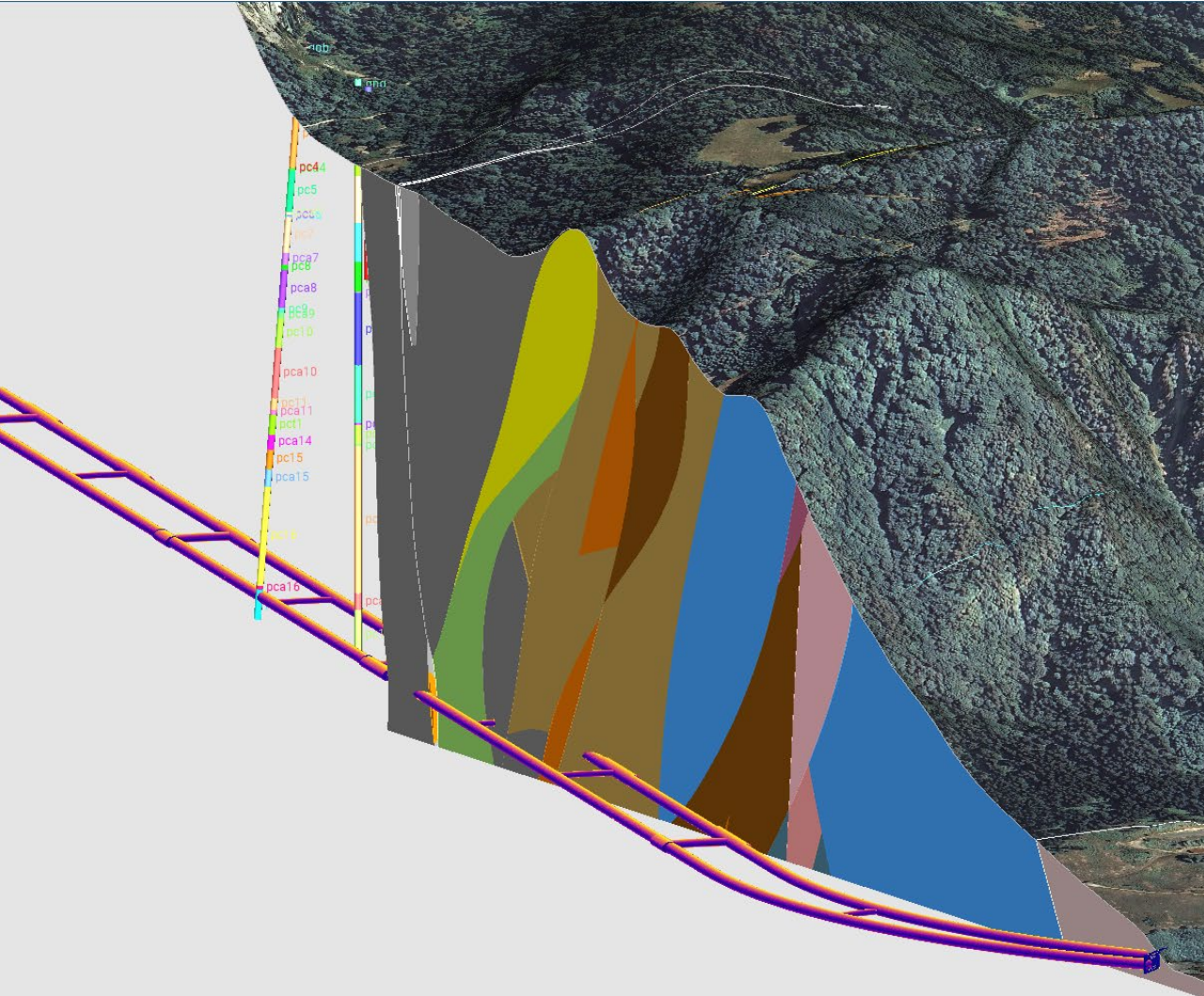




Leapfrog Works as a Solution



What is Leapfrog Works



Leapfrog Works is a 3D 3D implicit geological modeling software designed for civil and environmental industries. It allows you to quickly construct models directly from various sources including boreholes, points, and surfaces.

Visualize complex geotechnical, geological, and environmental data in one environment, enhancing understanding of subsurface conditions and managing uncertainty.

Widely used in infrastructure, tunneling, ground engineering, and contaminated site remediation projects,



Why Leapfrog Works

3D Visualization	Intuitive Interface	Data Integration	Dynamic Updating	Risk Management
<p>Allows teams to visualise the underground environment in 3D making complex data easier to understand and communicate.</p>	<p>User-friendly interface with logical workflows and context-aware tools, to quickly get started with minimal training.</p>	<p>Integrates geophysical, geological, hydrogeological, and geotechnical data in one space, for easy interpretation.</p>	<p>Changes in data or project specifications automatically reflect in the models, reducing the chance of working with outdated information.</p>	<p>Helps identify and mitigate potential subsurface risks, increasing confidence in project decisions.</p>



Key features of Leapfrog Works



1-INTEGRATION OF MULTIDISCIPLINARY DATA

 Elevation Grid	 Geophysical Data
 GIS Vector Data	 Structural Data
 2D Grids	 Meshes
 Images (Maps/Photos)	 Cross Sections
 Borehole Data	 Block Models
 Points	 FEFLOW Models
 Polylines	 MODFLOW Models
 Designs	





2-IMPLICIT MODELLING

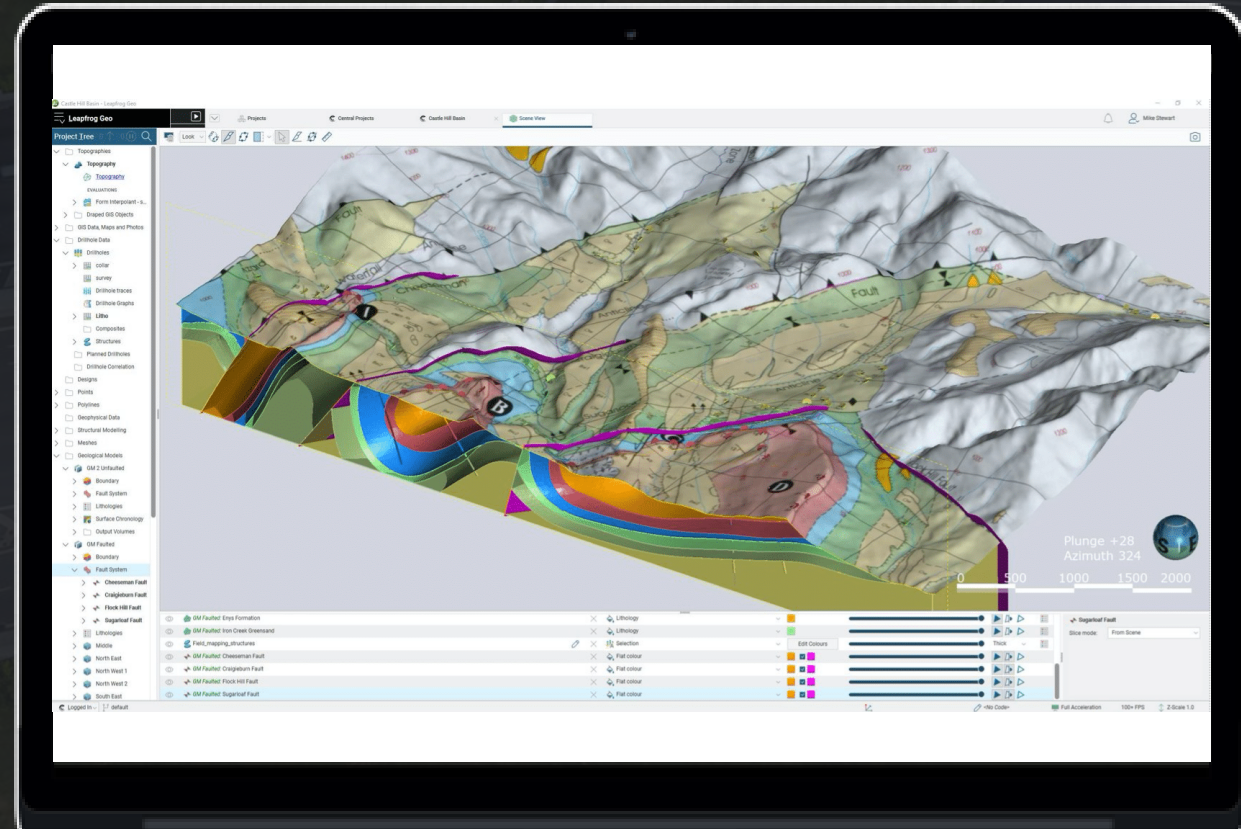


Quickly construct models directly from various sources:

- Boreholes
- Points
- Surfaces



Construct first-pass surfaces quickly; **modified** as needed to fit your **geological interpretations**



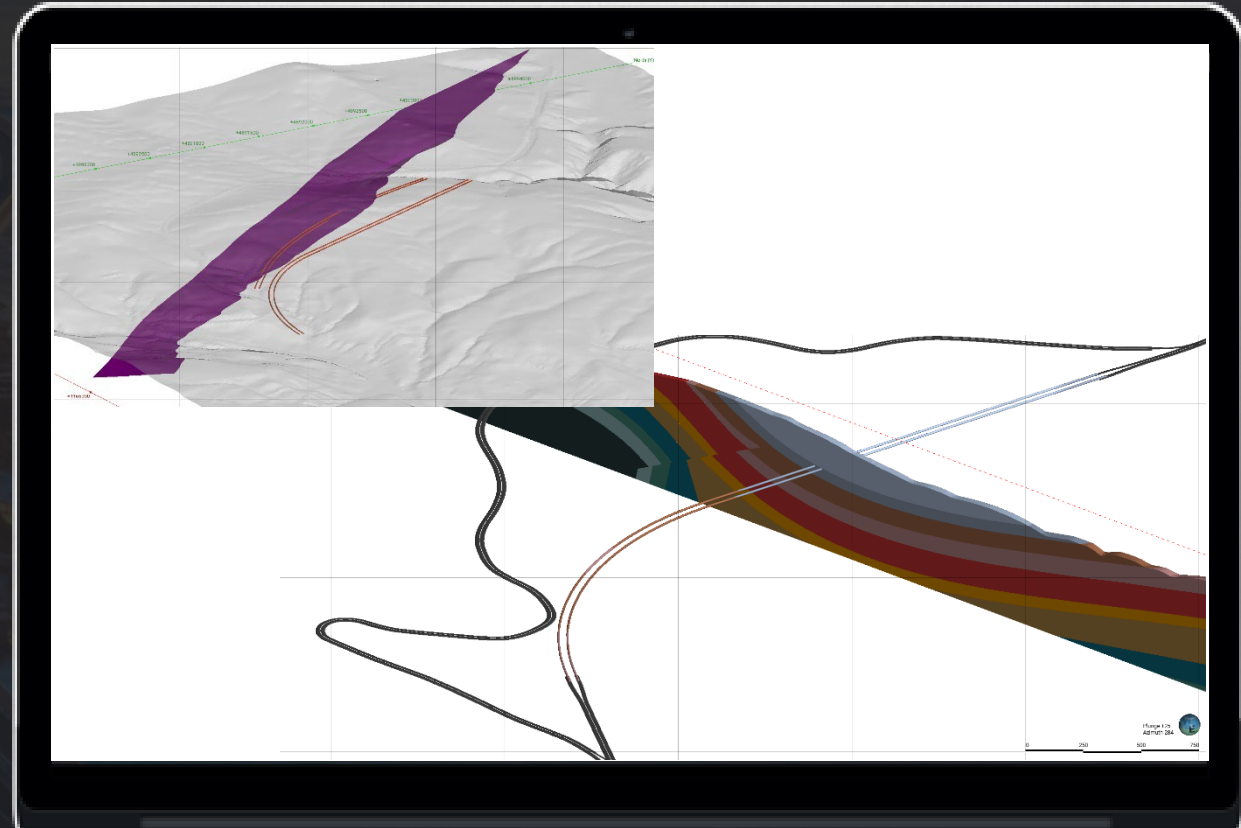
3-DYNAMIC UPDATING



Due to its **implicit** nature, your models can be **dynamically updated** to honour new input data at any time



Identify and communicate where **more data** is required





4-COMPREHENSIVE DATA OUTPUTS

3D Surfaces/Volumes

GIS Lines, 2D Grids

Images (Maps/Photos)

Movies

Borehole Tables

Planned Boreholes

Points, Polyline

Designs

Geophysical Data

Stereonets

Structural Data

Cross Sections

3D Scene Files

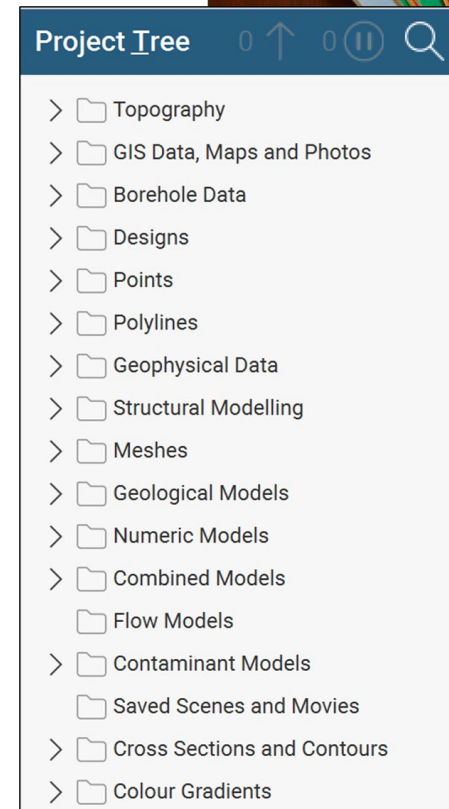
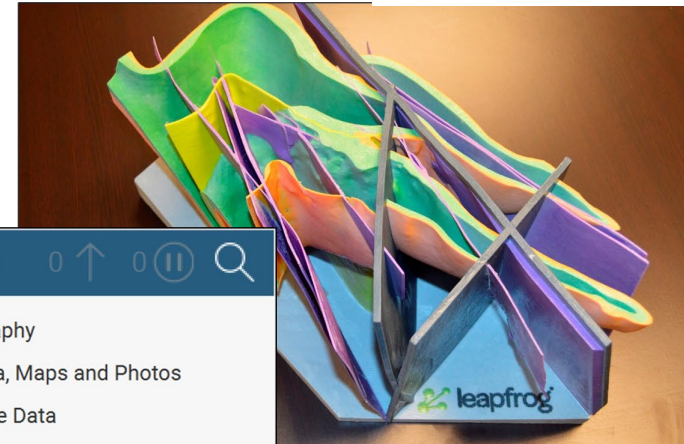
Block Models*
(*with Contaminants extension)

Graphs and Statistics

FEFLOW & MODFLOW Models**
(**with Hydrogeology extension)

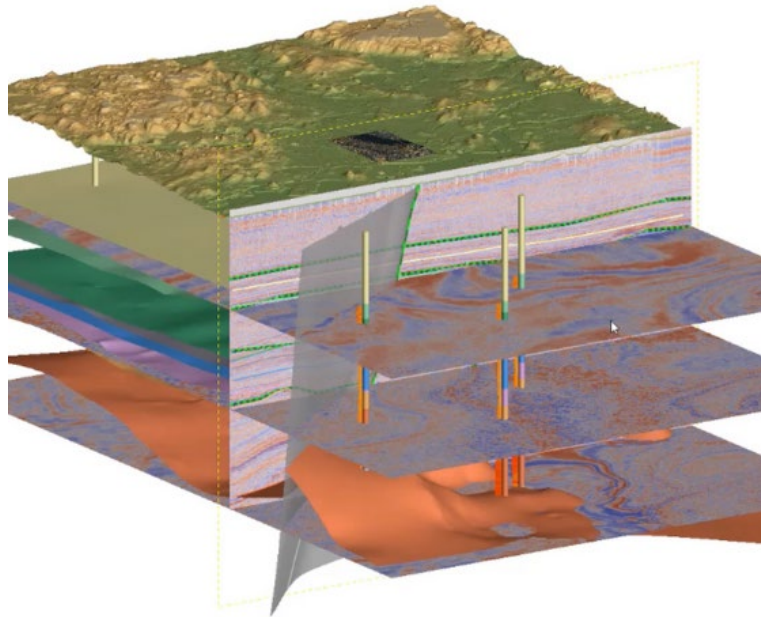
3D Printed Models

Publish Projects to Central

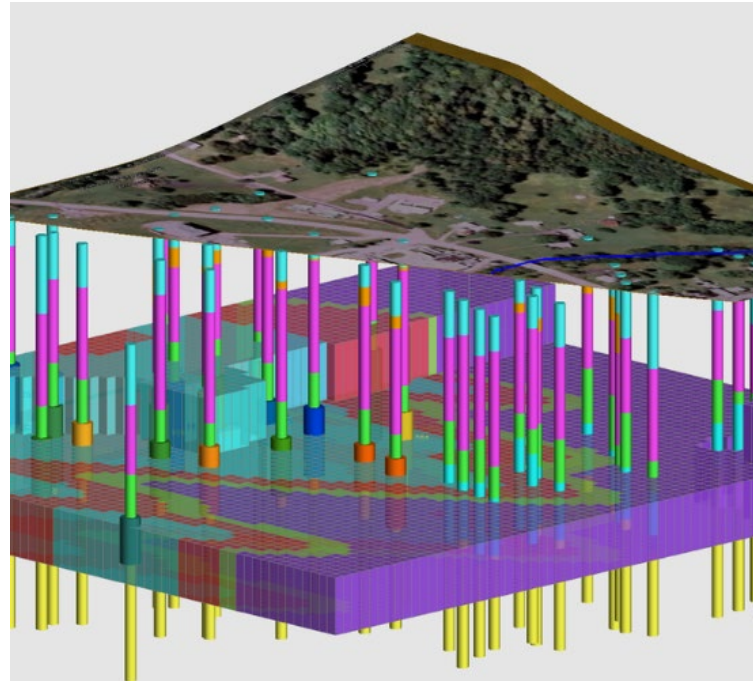




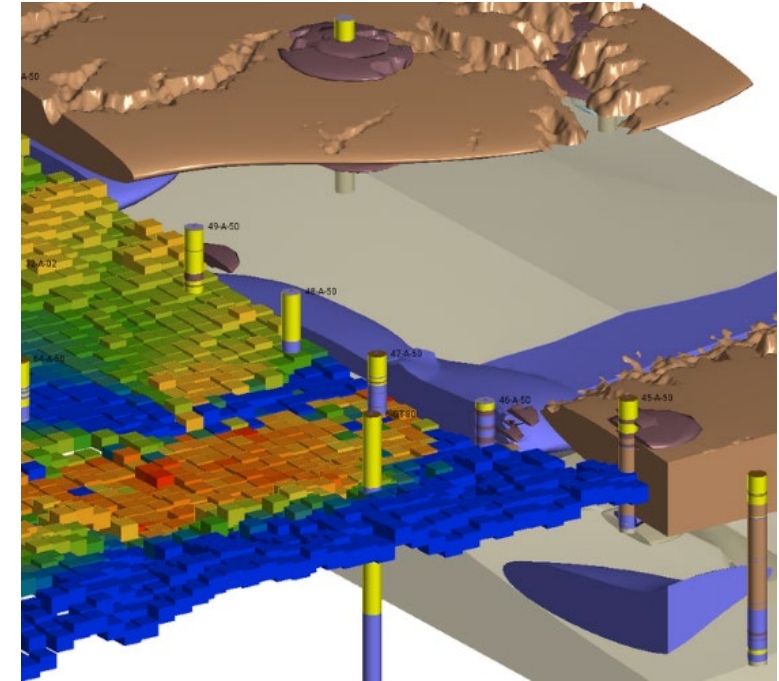
Leapfrog Works Extensions



- **Geophysics Extension**
- Adds geophysical data for a more detailed subsurface understanding.



- **Contaminants Extension**
- Integrates contaminant data to model and visualise plumes.



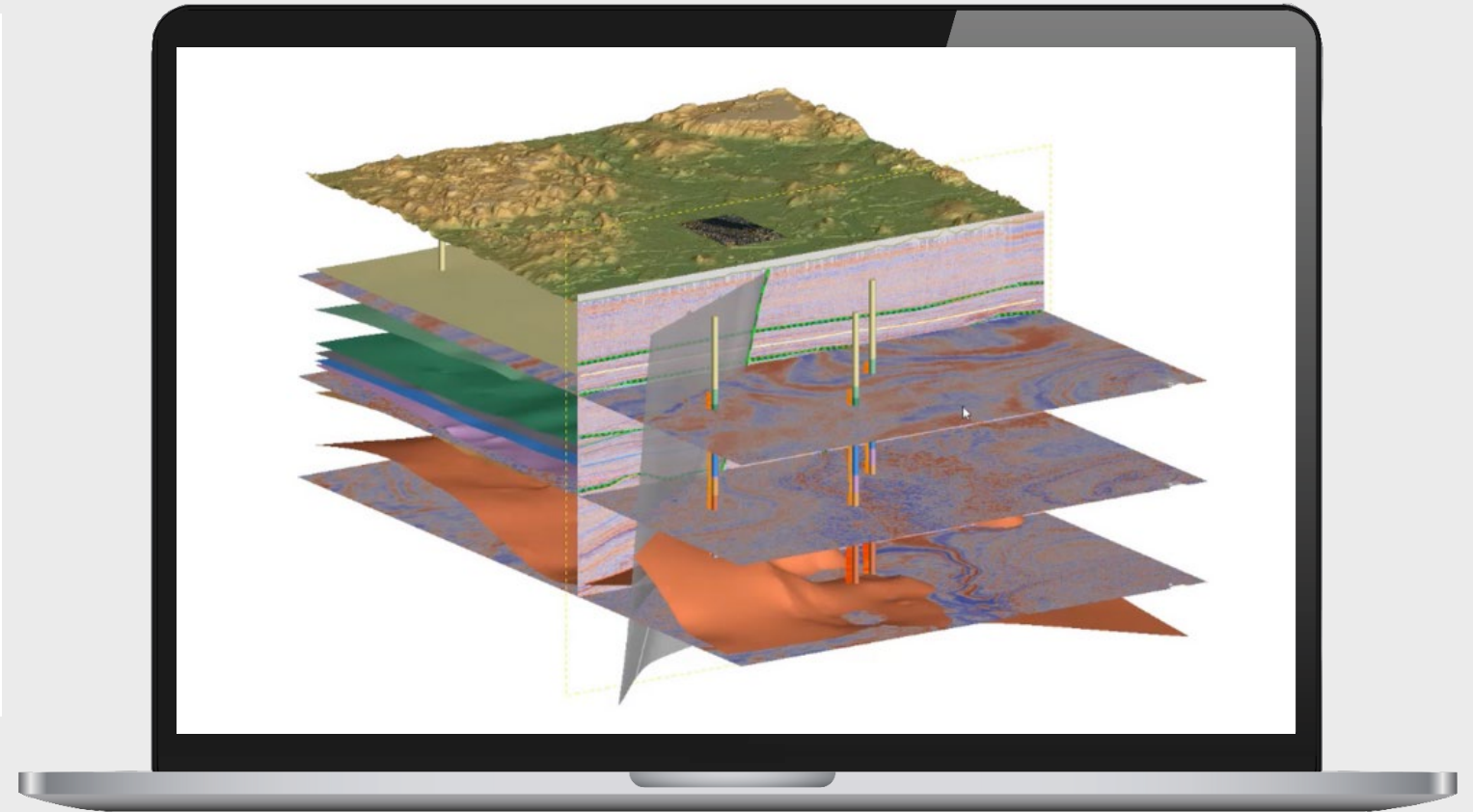
- **Hydrogeology Extension**
- Incorporates groundwater data to model flow and transport.



Geophysics Extension

Adds geophysical data for a more detailed subsurface understanding.

Leverage the power of your geophysical data in Leapfrog Works to visualise, analyse and guide interpretation of Seismic data and Ground Penetrating Radar (GPR), in the context of your 3D geological model.



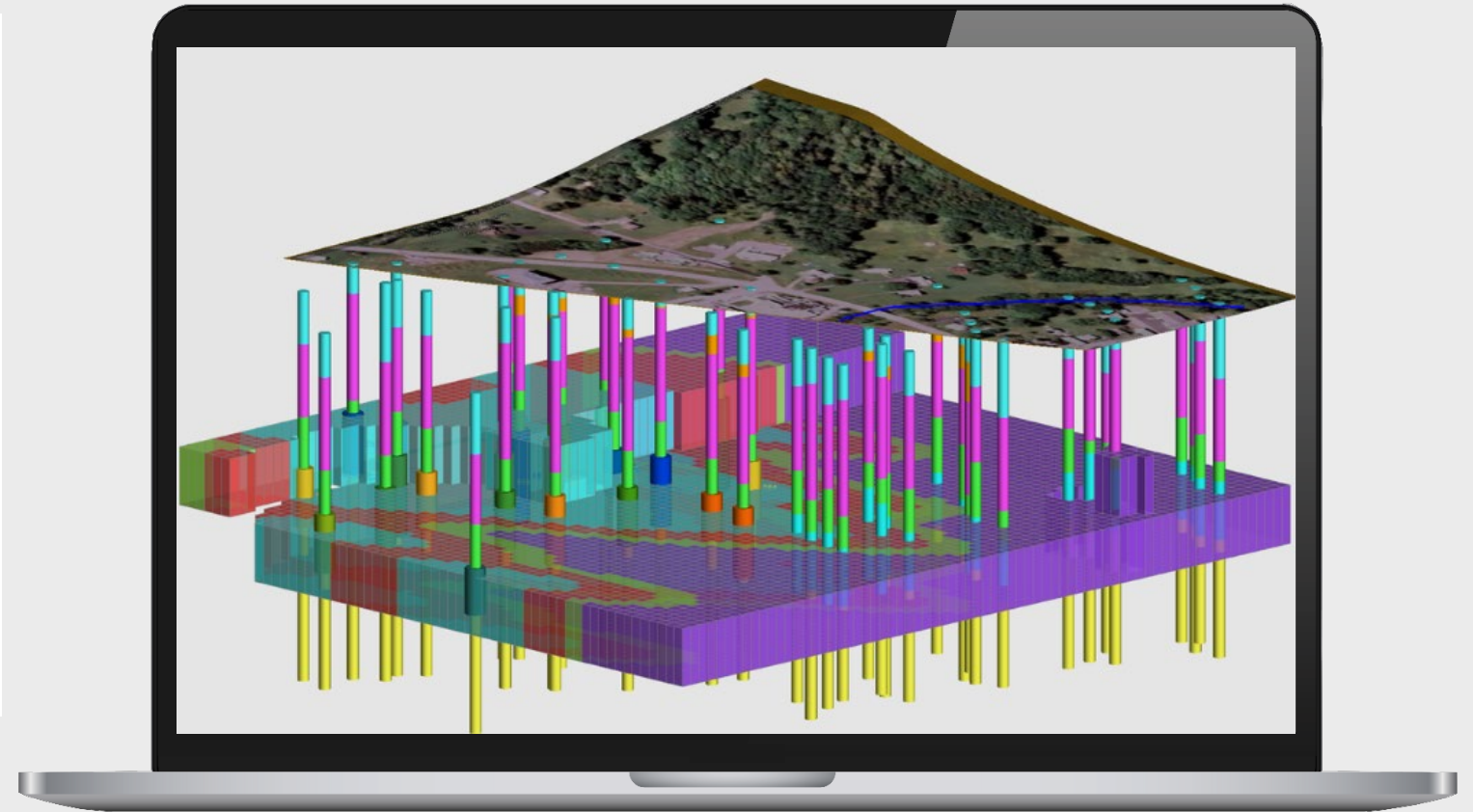


Contaminants Extension

Integrates contaminant data to model and visualise plumes.

Bring contaminant data directly into your Leapfrog Works 3D geological models.

This intuitive, interactive extension allows you to characterise, visualise, and create auditable geostatistical analysis of contaminant mass and location in a variety of subsurface environments.

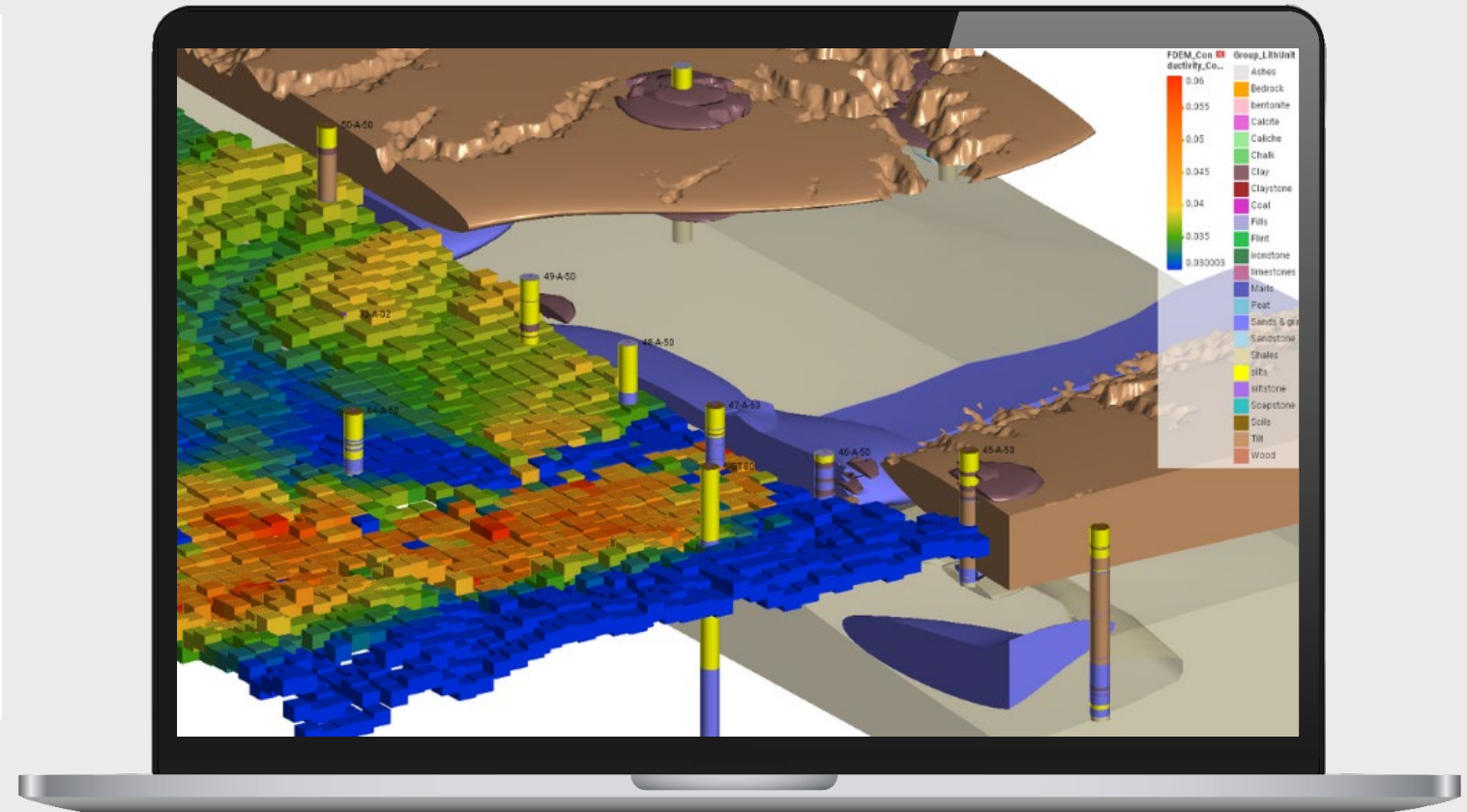


Hydrogeology Extension

Incorporates groundwater data to model flow and transport.

Incorporate MODFLOW, and FEFLOW models to aid understanding of flow conditions and further reduce risk.

Use geological and numerical models to inform flow models and deepen your understanding of hydrogeological properties of the subsurface environment.





Integration into Geotechnical Workflow



Enable your Geotechnical team to unlock a cloud connected workflow spanning **factual data**, **interpretive modelling**, and **numerical analysis** for better geotechnical design.



OpenGround®



leapfrog®



CENTRAL

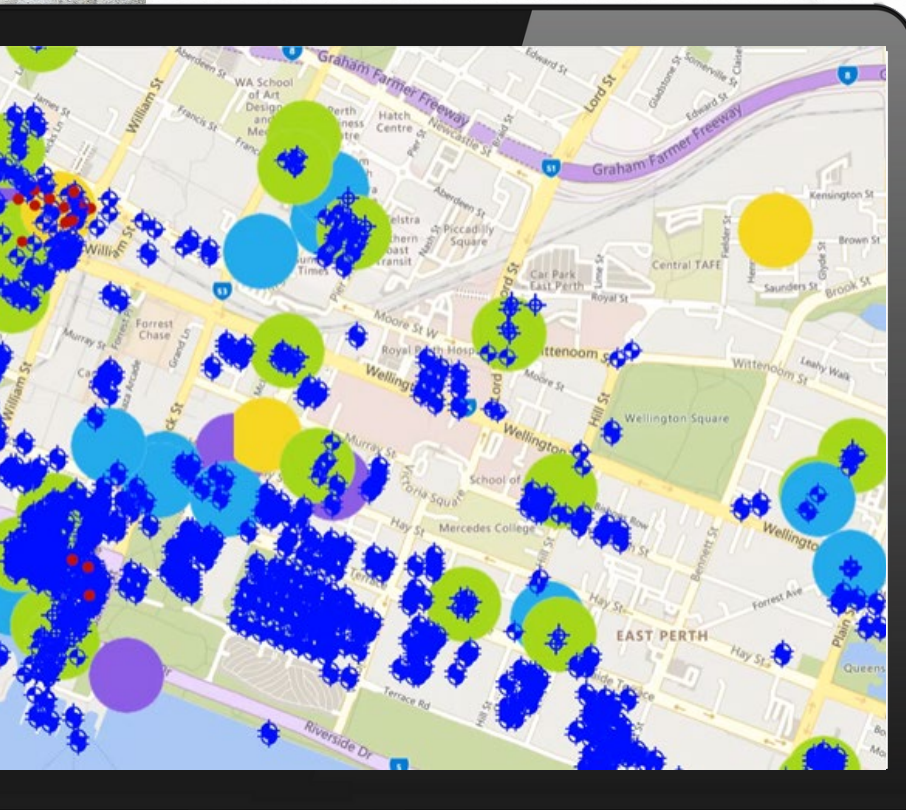


GeoStudio



PLAXIS®



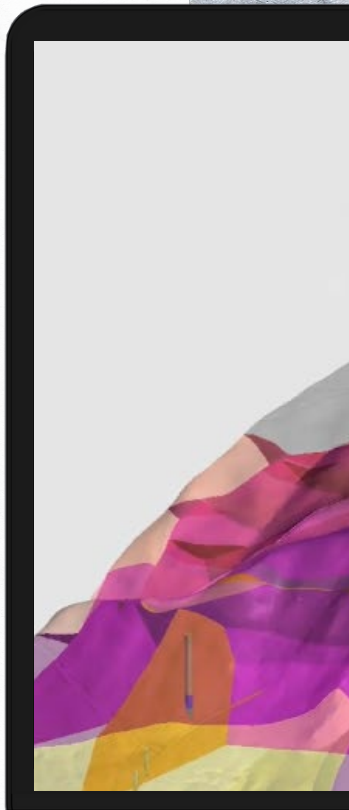


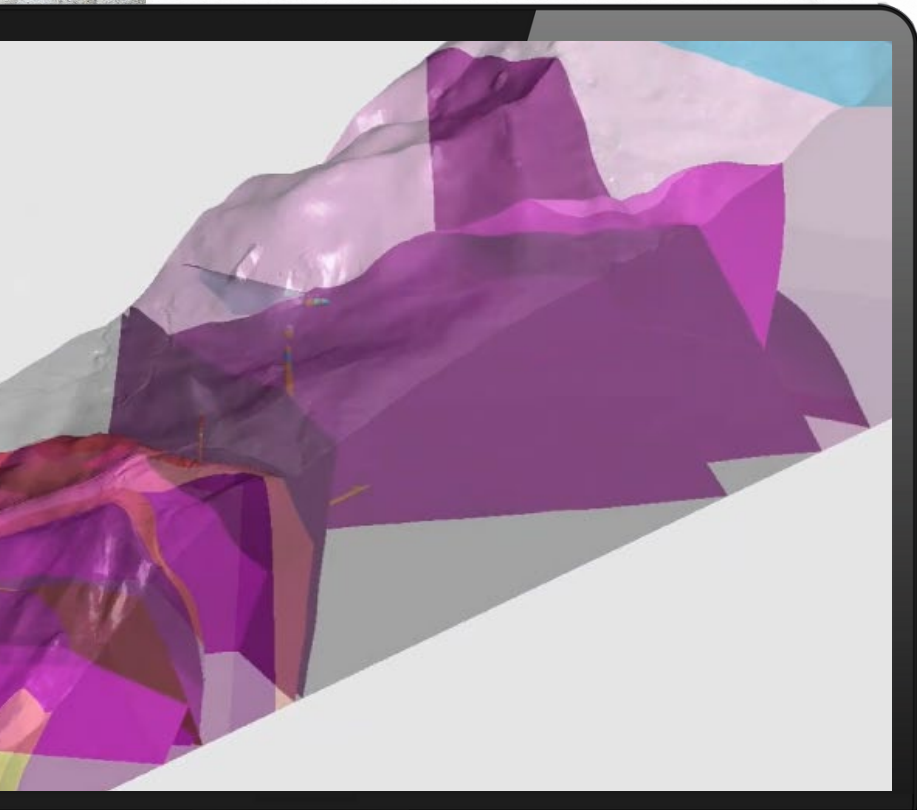
Geotechnical Data Management

- Streamline field to office and supply chain of custody
- Structured geotechnical data in the cloud
- Accessible reporting and modelling



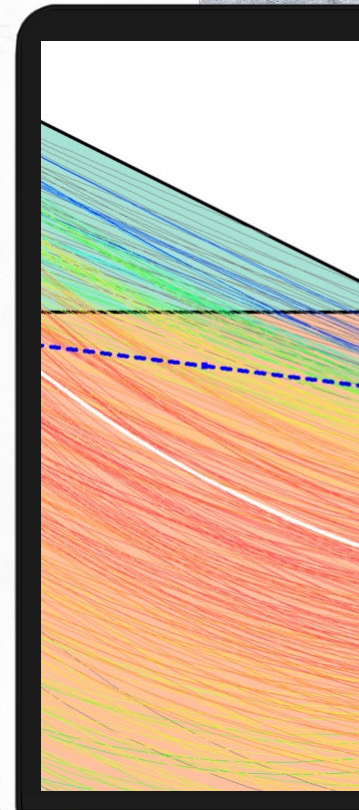
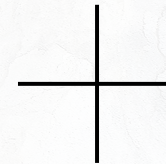
OpenGround®

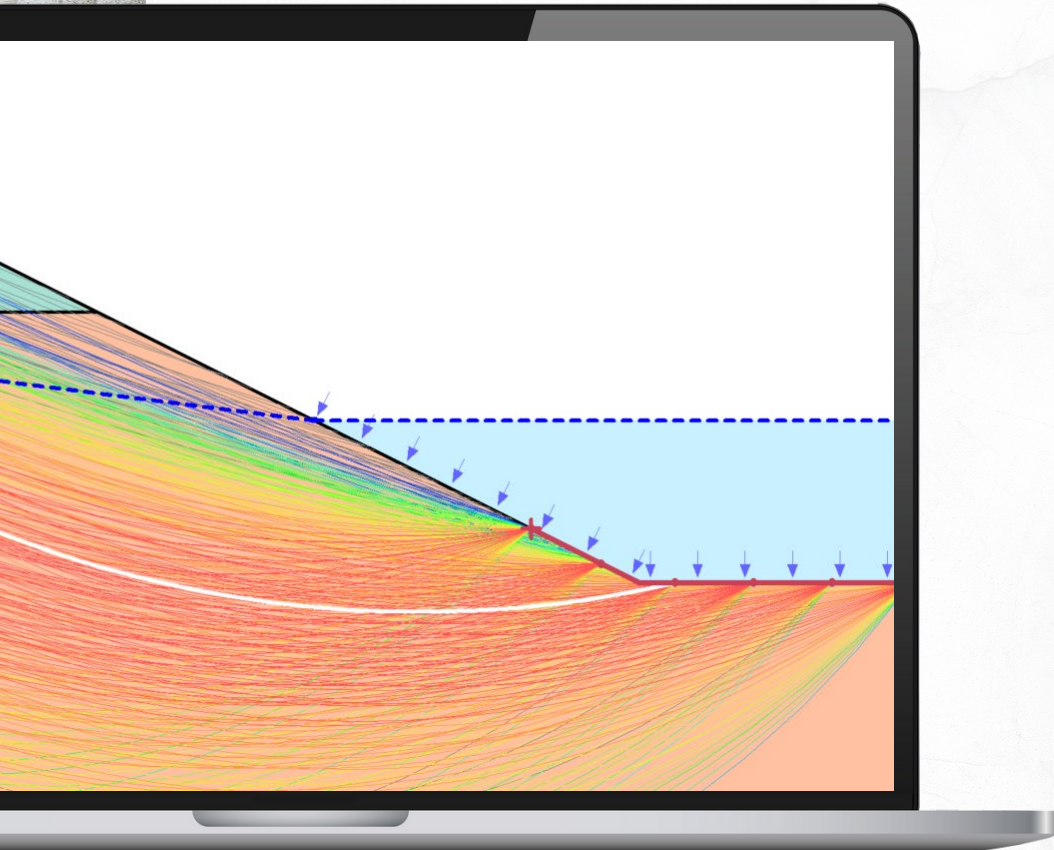




3D Geological Modelling

- Model from geotechnical single source of truth
- Models dynamically connected to data
- Manage and review model iterations in the cloud





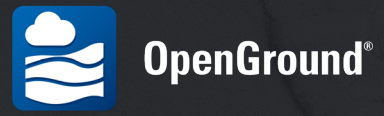
Geotechnical Analysis

- Connect to Geological models in the cloud
- 2D and 3D geometry for analysis
- Powerful trusted solvers for engineering problems





Geotechnical Connected Workflow





Geotechnical Connected Workflow Benefits

1

Get quality site investigations to clients and partners in minutes, not days

2

3D subsurface site modelling is faster and easier to maintain than 2D

3

Save days on geometry creation for geotechnical analysis. Faster analysis drives smarter solutions sooner

4

Influence conversations with intuitive 3D visualizations to empower decision-makers



Success Stories



De-risking tender submissions on City Rail Link

Centralised model management aligned bids around common understanding of ground risk

3.4km

Twin-tunnel underground rail link

2

Underground stations

42m

Below the city centre



The **3D model development process was very successful** and resulted in both tenderers having a very similar ground risk profile. This meant the tender process was not skewed by one tenderer having a higher project risk profile.



Philip Kirk

Geology Discipline Lead, Aurecon NZ

PROJECT PLAYBOOK

Leapfrog, Central

Going digital on subsurface bridge design

Challenging design with submerged abutment and bascule bridge lifting span in the heart of London's Docklands

85K

Pedestrians daily by 2031

35m

Lifting span with submerged abutments

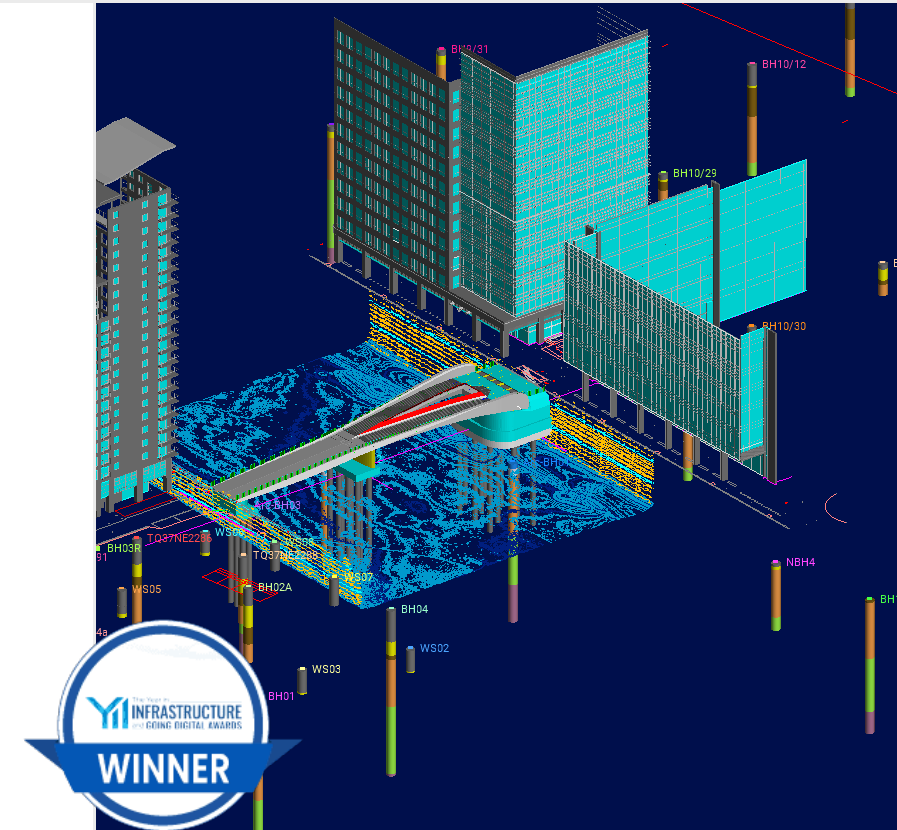
30%

Reduction in site investigation costs

“

Going digital has improved collaboration between clients, architects, and design disciplines, making it easier to obtain planning permissions, consents, and funding for this exciting South Dock Bridge project.

”



Andrea Gillarduzzi
Senior Technical Director, Arcadis

PROJECT PLAYBOOK
OpenGround, Leapfrog, Central, GeoStudio, PLAXIS



Conclusion

- Leapfrog Works: Your Comprehensive Geological Modelling Solution
- Data-Driven Implicit Modelling
- Dynamic Model Updates
- Integration and Collaboration
- Part of a Comprehensive Subsurface Ecosystem



Q&A

