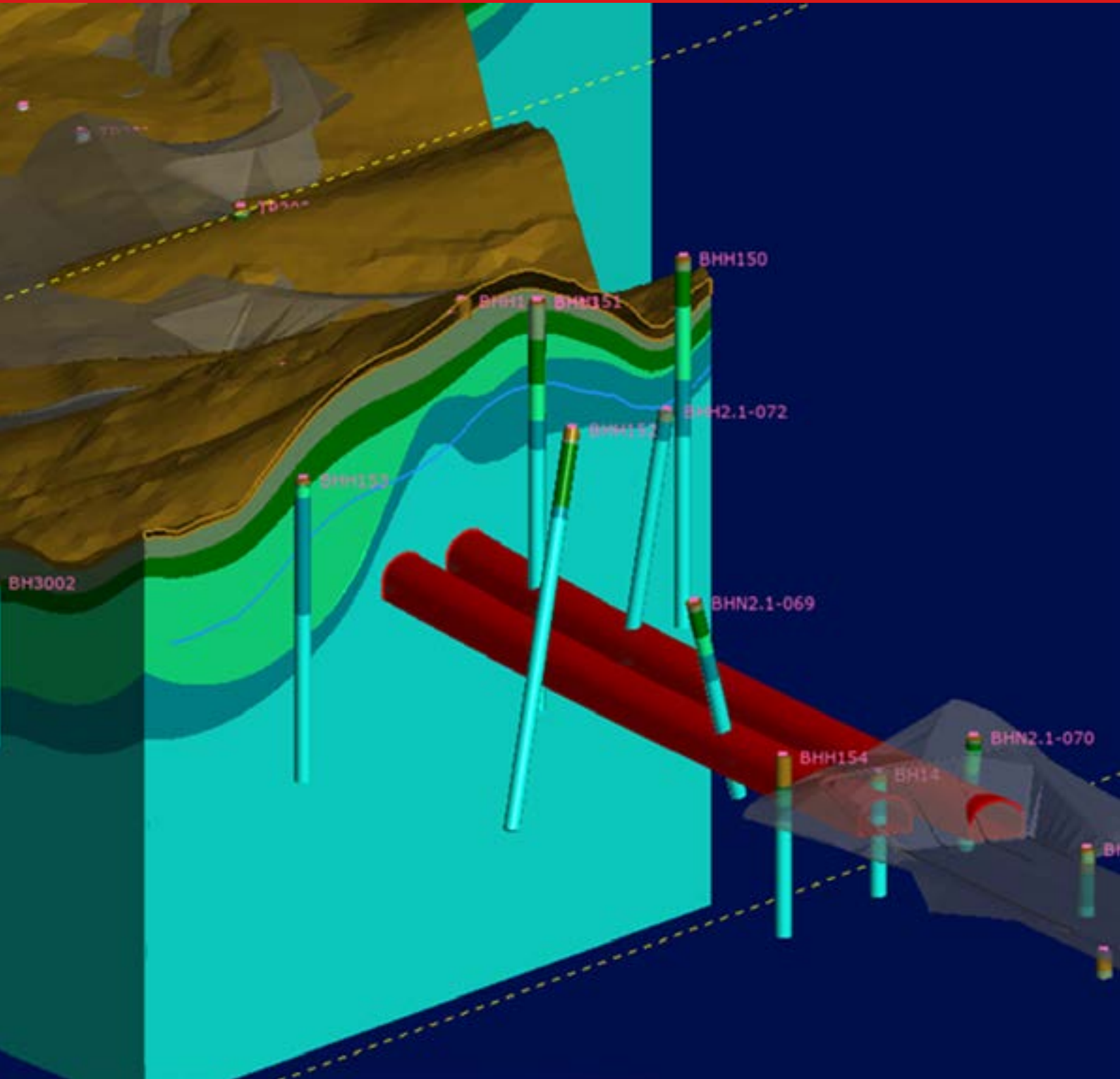




Geotechnics



About EIC Activities

EIC Activities is a leading provider of specialist engineering and technical services delivering a competitive advantage for profitable projects that generate value for clients.

We partner with clients to optimise designs, improve constructability, and achieve cost and schedule efficiencies. Our teams work across all phases of a project, from pre-bid, tender, and project establishment phases, where opportunities to add value are strongest, through to delivery and long-term asset management.

By challenging conventional approaches and applying proven innovative solutions, we help clients overcome technical complexities and deliver projects that meet performance, safety, and sustainability objectives.

Our geotechnical services

The EIC Activities geotechnics team provides the following services:

- provision of design delivery services for temporary and permanent works including concept design, detailed design, reporting and documentation, design verification and proof engineering
- review and challenge of designs to mitigate risk and optimise design outcomes
- assessment and provision of alternative cost-effective design solutions
- review of geotechnical reports and factual data to advise on geotechnical conditions and provision of geotechnical interpretive reports (GIR)
- provision of geological ground profile modelling and subsurface 3D visualisation
- advice on constructability and construction methods, and provision of construction phase services (CPS)
- provision of implementation and monitoring data management platform Geosens to improve efficiency of monitoring data collection, visualisation and reporting
- support with legal and commercial matters including claims, disputes and forensic engineering
- provision of design/technical management services.

Accreditations

EIC Activities hold the accreditations listed below, formally demonstrating our ability to provide geotechnical services at the highest level.

- ISO 9001
- QLD: GE3 (TMR), RPEQ. TMR01523 Specialist Technical Services Portal
- NSW: TfNSW TAO, TfNSW Technical Services Registration Scheme
- VIC: VICRoads, RPEV, MTM, ARTC, SRL-A
- SA: DIT
- ARTC, SRLA



Our geotechnical capabilities

EIC Activities' geotechnics team has engineers with a diverse range of experience and capability to provide support throughout the project life-cycle - extending from site investigations and design, through to construction phase services and defect liability assessments.

The geotechnics team brings together a group of industry experts and highly experienced geotechnical professionals with consulting, design and construction experience.

The geotechnics team maintains close ties with Australian universities and undertakes cutting-edge research into construction industry challenges, continually improving solutions.

Our geotechnical capabilities and expertise include:

Geotechnical investigation

Provision of site investigation services including planning, scoping, management and engagement of site investigation contractors, including logging and mapping of ground conditions.

Geotechnical interpretation

Interpretation of geotechnical data for determination of parameters and profiles.

Soft soil engineering

Detailed assessment and review of soft soil parameters and design of ground improvement techniques such as preloading and surcharge, dynamic compaction, concrete injected columns, deep soil mixing, and stone columns.

Piling and foundations

Design of pile foundations, pile group analysis, review of pile test results, pile driveability assessments and constructability of cast in-situ piles and driven piles.





Retaining structures

Design and construction of all types of retaining structures including soil nail walls, bored pile walls, secant pile walls, diaphragm walls and reinforced soil walls.

Numerical modelling

Capability to undertake complex 2D/3D numerical modelling to appreciate soil-structure-interaction behaviour using advanced geotechnical packages such as PLAXIS 2D/3D, RS2/RS3, MIDAS, and Strand7.

Earthworks

Advice on earthworks, slope stability assessment and design of slope stabilisation measures, earthworks testing and quality assurance/quality control, quarry material and reactive soils.

Geotechnical Interpretation for linear projects using GIS

EIC has developed in-house automation tools that integrate GIS software into geotechnical interpretation for large-scale linear projects.

This provides a unified map interface with direct access to geotechnical information, geological maps, ground parameters, and other project data across all areas.

Instrumentation and monitoring

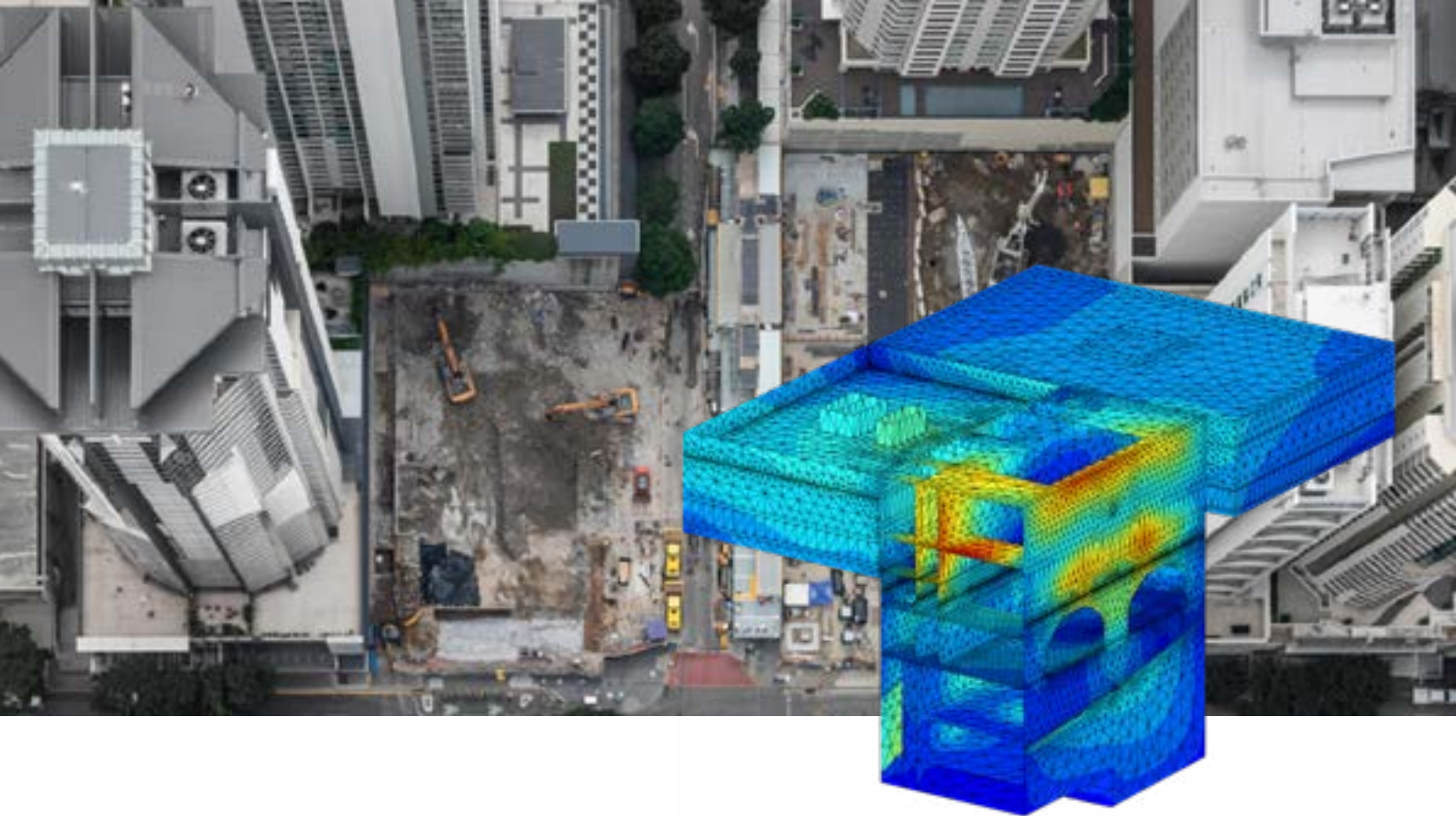
Implementation of CIMIC Group's proprietary Geosens solution - an intelligent multi-source data capture, analysis and reporting solution for real-time geotechnical condition monitoring and risk management.

Construction phase services

Qualified personnel to undertake site-based inspections to validate design assumptions.

Automation and AI

We are continuously advancing our engineering practice through the development of digital automation tools and the application of artificial intelligence, enabling faster and more comprehensive results. This includes creating digital tools to streamline numerical analyses, incorporating AI-driven data analysis into our geotechnical interpretative reports and optimising design workflows to deliver actionable outcomes in record time.



Automation of standard design procedures using Viktor

EIC Activities has developed a suite of applications within the Viktor platform to automate routine geotechnical design tasks. These tools streamline processes such as:

- temporary piling pad design
- pile analysis
- consolidation analysis

By embedding these procedures into Viktor, EIC Activities enhances consistency, reduces manual effort, and accelerates design workflows - ultimately improving project delivery efficiency.

In-house data analysis application – efficiency gamechanger

To enhance efficiency in geotechnical reporting, EIC Activities has developed a powerful in-house application designed for rapid data analysis. This tool integrates all project laboratory testing data and borehole information into a single platform, enabling users to:

- generate customisable graphs using any available dataset
- quickly identify trends and interpret laboratory results across the project
- eliminate manual formatting typically required in Excel, saving significant time and effort
- accelerate the preparation of geotechnical interpretive reports with consistent and professional outputs.

This application represents a transformative shift in how geotechnical data is processed and understood, offering both speed and clarity in project analysis.

Our projects - Australia

- CopperString 2.0
(UGL/CPB Contractors - QLD)
 - geotech GIR
- Cross River Rail - Rail Integration and Systems (RIS)
(CPB Contractors - QLD)
 - geotech design
- Cross River Rail - RIS
(CPB Contractors - QLD)
 - design optimisation of piles, retaining walls and construction platforms
- Cross River Rail Tunnels, Stations and Development
(CPB Contractors - QLD)
 - 2D and 3D soil-structure interaction analysis for shaft and station box designs and seismic assessment of underground structures for deformation compatibility checks
- Logan and Gold Coast Faster Rail
(CPB Contractors - QLD)
 - geotech design
- Mackay Ring Road
(CPB Contractors - QLD)
 - short term embankment settlement assessment during construction and optimisation of construction platforms
- M80 Freeway Upgrade
(CPB Contractors - VIC)
 - soil nail wall optimisations for temporary excavations and stability assessments
- Melbourne Metro Rail Infrastructure Alliance
(CPB Contractors - VIC)
 - jet grouting advice, batter assessments, dewatering assessments, diaphragm wall movement assessments and temporary works advice
- The Northern Road Upgrade
(CPB Contractors - NSW)
 - reactive soils, retaining walls and earthworks advice
- Suburban Rail Loop East
(CPB Contractors - VIC)
 - geotech/structures SETS; tunnel lining design and XP temporary works
- West Gate Tunnel
(CPB Contractors - VIC)
 - design optimisation of ground improvement works, piles, retaining walls and construction platforms
- WestConnex M8
(CPB Contractors - NSW)
 - rectification works geotech /structures
- WestConnex Stage 1B M4 East
(CPB Contractors - NSW)
 - 3D modelling of a trifoliate-shaped ventilation shaft for design optimisation
- WestConnex Stage 2 M8
(CPB Contractors - NSW)
 - advice on ground improvement works, piled pavement settlement, retaining walls, foundations and earthworks
- WestConnex 3B
Rozelle Interchange
(CPB Contractors - NSW)
 - construction advice on retaining walls and prediction of ground settlement due to dewatering resulted from tunnel excavation
- Western Sydney International Airport
(CPB Contractors - NSW)
 - reactive soils and bulk earthworks advice.

Our projects - International

- Auckland Airport Taxiway
(CPB Contractors - New Zealand)
 - temporary foundation for batch plant
- Bayfair to Baypark
(CPB Contractors - New Zealand)
 - stone columns advice
- Christchurch Metro Sports Facility
(CPB Contractors - New Zealand)
 - groundwater and ground improvement advice
- Southern Corridor Improvements
(CPB Contractors - New Zealand)
 - advice on pile and retaining wall designs
- Transmission Gully Motorway
(CPB Contractors - New Zealand)
 - advice on slope remediation and landfill spoil mound stability
- Waikeria Prison
(CPB Contractors/Pacific Partnerships - New Zealand)
 - assessment of pile drivability and performance
- Hong Kong International Airport Terminal 2 Expansion
(Leighton Asia - Hong Kong)
 - GeoView for management of monitoring data and 3D numerical modelling of excavation and ground support
- Hong Kong-Zhuhai-Macau Bridge Hong Kong Port Passenger Clearance Building
(Leighton Asia - Hong Kong)
 - advice on dewatering for foundation excavation in reclaimed fill adjacent to the sea
- Shatin to Central Link, Exhibition Station and Western Approach Tunnels
(Leighton Asia - Hong Kong)
 - construction sequence optimisation
- CALAX Cavote-Laguna Expressway
(Leighton Asia - Philippines)
 - groundwater and soft soil advice
- North South Transportation Corridor 103
(Leighton Asia - Singapore)
 - 3D numerical modelling for diaphragm wall design optimisation
- Oyu Tolgoi Mine
(Thiess - Mongolia)
 - design of canopy tubes at tunnel portals and 3D numerical modelling of tunnel support with cable bolts
- North South Commuter Railway (NSCR) package 03b
(Leighton Asia - Philippines)
 - design of excavation support for underground station, TBM shaft and dive structure
 - design of primary support for pedestrian tunnels and mainline tunnel cross passages

Our key people



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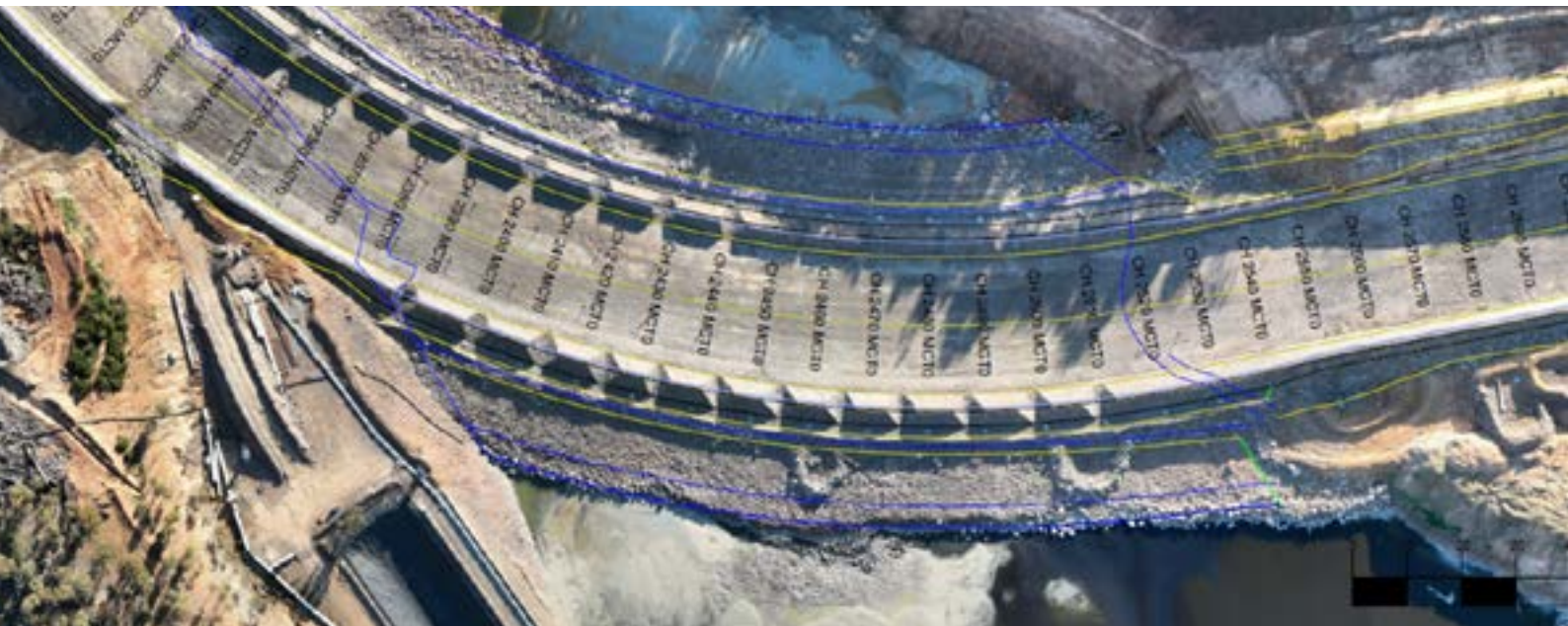
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Case studies

Logan to Gold Coast Faster Rail - Activus JV

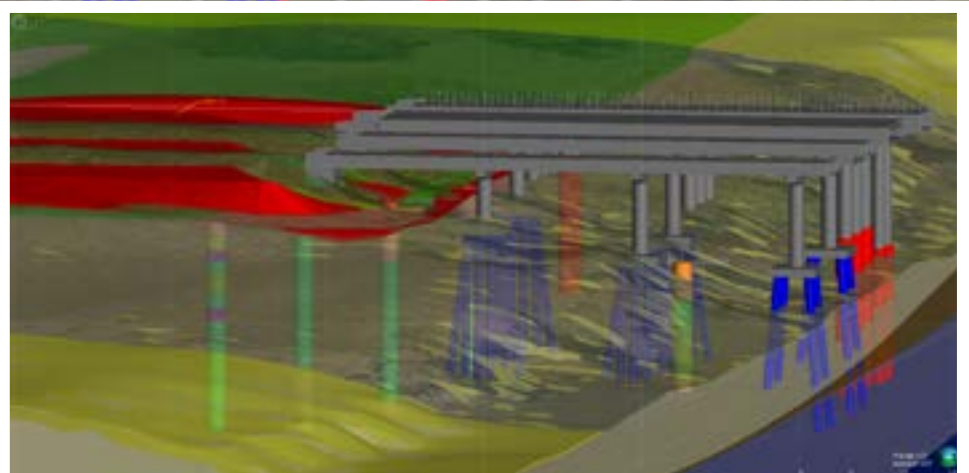
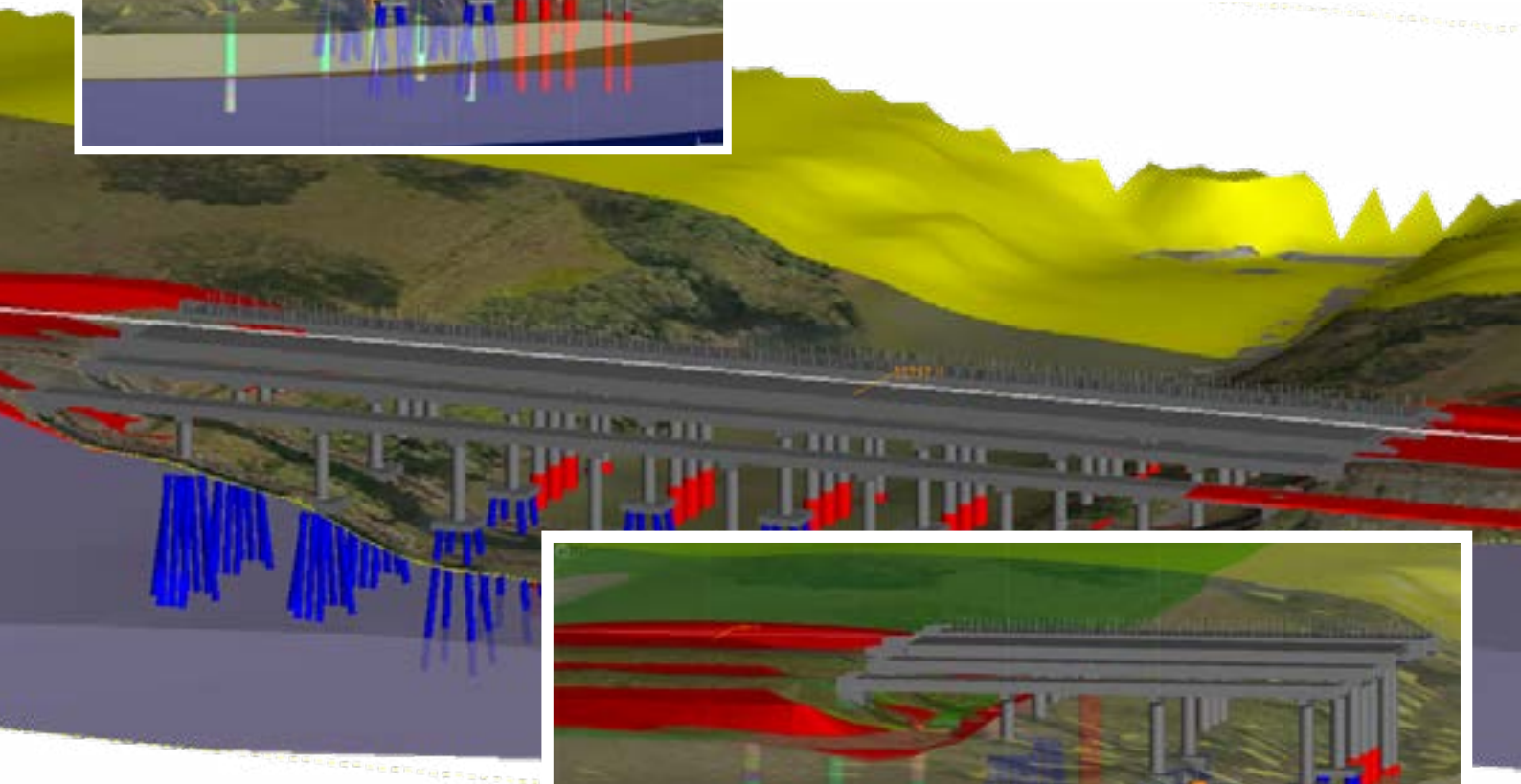
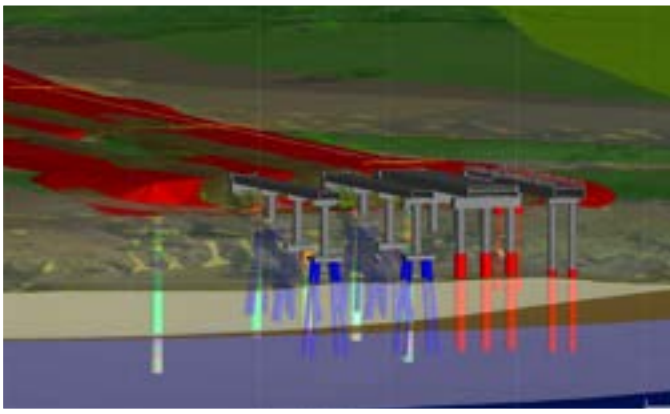
3D Leapfrog geological modelling

3D Ground interpretation:

- used Leapfrog software to visualise ground strata and structure interfaces
- identified existing raked piles terminating above top-of-rock at Logan River Bridge
- adjusted bridge alignment to avoid impacting existing piles.

Mechanistic formation design:

- tailored treatment solutions using actual ground strength and rail loading
- applied PLAXIS 3D finite element modelling to predict stress and deformation
- based on proven methodology (Li & Selig, 2016), used successfully on other major rail projects
- adopted parametric design solutions due to the large number and length of retaining walls along the alignment. Enabled design and construction efficiencies, reducing time and cost.



Case studies

WestConnex Stage 2 M8 - CPB Contractors Dragados Samsung C&T JV

Reinforced soil wall design review

The EIC Activities geotechnical team was engaged by the project team to support construction of the project. CPB Contractors was a Joint Venture partner with Dragados and Samsung C&T.

About the project

The M8 Motorway runs via twin tunnels from the existing M5 East at Kingsgrove to an interchange at St Peters, more than doubling the corridor capacity and substantially improving east-west corridor access between the Sydney CBD, Port Botany and Sydney Airport precincts and the south-west growth areas.

Scope of work included:

- approximately 9km of new tunnels, motorway to motorway connections to the King Georges Road Interchange Upgrade at Beverly Hills; and
- a new interchange at St Peters.

Challenge

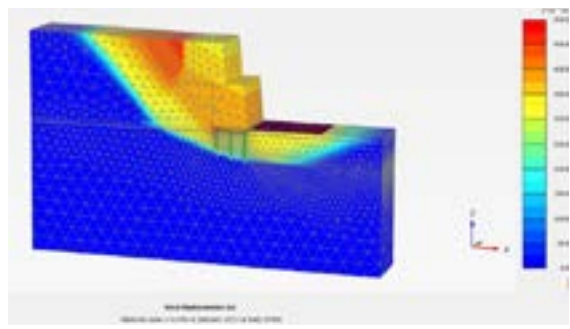
A two-tiered reinforced soil wall (RSW) up to 21m high was proposed to retain an existing landfill batter at the St Peters Interchange. The RSW design specification required a cut back of up to 15m behind the RSW for the placement of high-quality fill.

Solution

EIC Activities proposed replacing this zone with a 50° active wedge that reduced the amount of excavation into the existing landfill batter behind the wall.

Finite element modelling was used to illustrate the geometric zone behind the wall beyond which the materials had minimal impact on the wall, thus leading to its acceptance by Transport for NSW.

This resulted in approximately 20,000m³ of landfill being retained on site.



Case studies

Sydney Metro - Western Sydney Airport - CPB Ghella JV

Site support - station boxes and tunnels (SBT)

The EIC Activities geotechnical team was engaged by the project team to support construction of the project.

About the project

CPB Contractors, in joint venture with Ghella, was selected by the NSW Government to deliver the Sydney Metro – Western Sydney Airport, Station Boxes and Tunnelling works.

It involved the design and construction of 9.8km of twin tunnels and excavations for five stations at St Marys, Orchard Hills, Airport Business Park, Airport Terminal and Aerotropolis, and service facilities at Bringelly and Claremont Meadows.

Challenge

Ground anchors at the SBT package were consistently failing pull-out tests during construction, raising concerns about design adequacy, ground conditions, and installation practices.

Solution

EIC Activities provided comprehensive geotechnical support, including:

- design advisory: refined anchor designs during detailed design and construction phases
- ground profile interpretation: assessed subsurface conditions to identify failure causes
- risk mitigation: recommended design modifications to improve anchor reliability
- construction supervision: ensured installation aligned with design specifications
- documentation: maintained detailed records to support quality assurance and traceability.



Case studies

Haul Road (East) - Decant Crossing - Tailings Project Alliance

Site supervision of temporary platform on tailings mine waste

Challenge

- design and construction support for haul road embankment across underwater decant with very soft tailings
- extremely soft tailings posed high risk of instability
- required safe construction methodology to protect operators and equipment
- regulatory scrutiny and performance expectations were high.

Solution

- innovative use of large site-won boulders to penetrate soft tailings and form a stable foundation
- excavator placement strategy ensured operator safety by avoiding exposure to leading edge
- observational method adopted during construction with full-time geotechnical presence
- performance verified through CPT, boreholes, settlement monitoring, and back-analysis.



Case studies

West Gate Tunnel - CPB John Holland JV

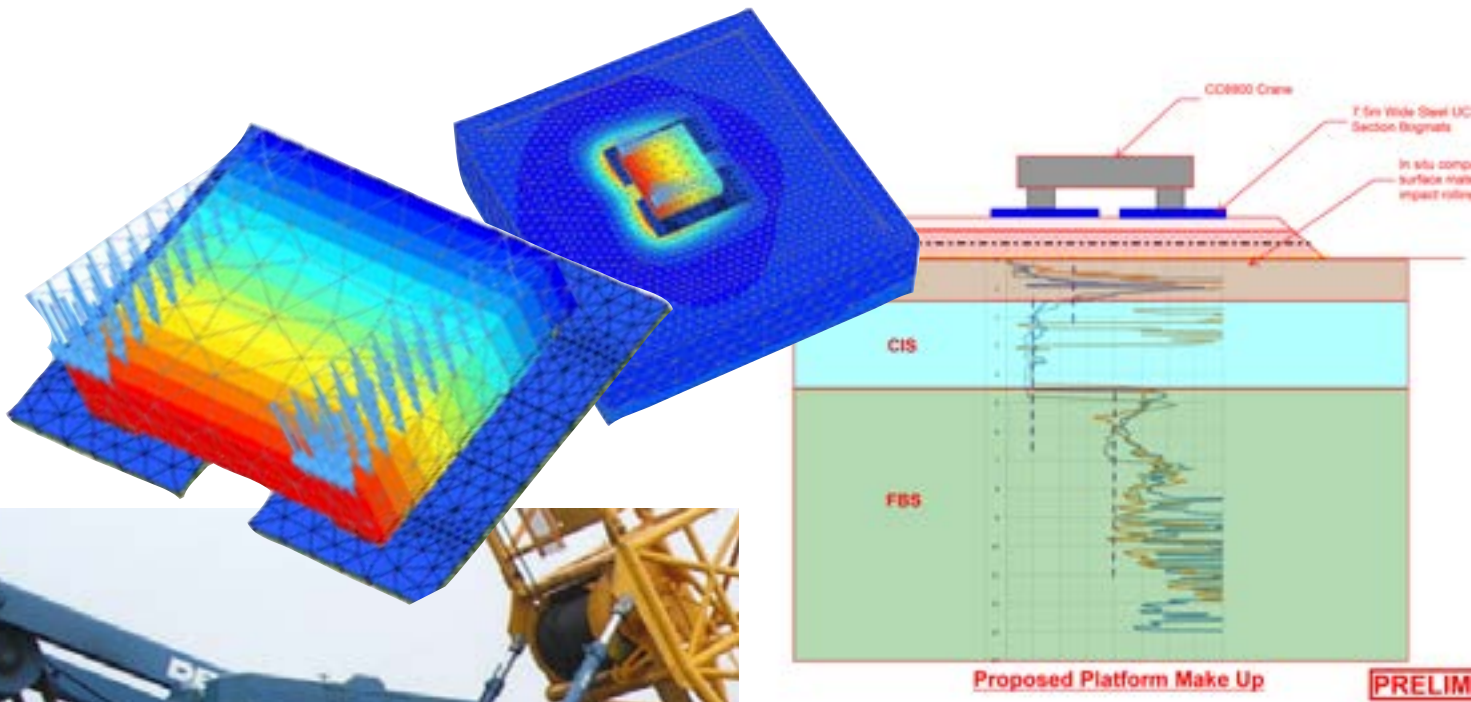
Review of working platform for heavy lift on soft soil

Eight heavy crane lifts were required along the east bank of Maribyrnong River underlain by soft soils.

The temporary works designer proposed piled reinforced concrete slab as working platform for these lifts. EIC Activities proposed a working platform comprised of crushed rock and a cement treated crushed rock layer (CTCR) replacing the expensive structural piled slab foundation.

EIC Activities assessed the flexible working platform using 3D numerical finite element models which confirmed that the crane would remain stable with minimal tilt and settlement at the outriggers.

EIC Activities' proposal was adopted by CPBJH JV and the temporary works designer.



Key feature:
Heavy Crane Lift Platform

Cost benefit:
Saving over \$10m across the whole project.

Case studies

Wagga Wagga Water Treatment Plant PPP - CPB Contractors

Cofferdam design

A cofferdam was required as part of the Wagga Wagga treatment plant construction to enable construction of an inlet structure on the Murrumbidgee River.

EIC Activities provided the design of the double skin sheet pile cofferdam, undertook groundwater inflow and seepage assessment, provided advice on dewatering requirements and offered geotechnical support during construction.



Key feature:
Cofferdam Design

Cost benefit:
Avoid program delay.

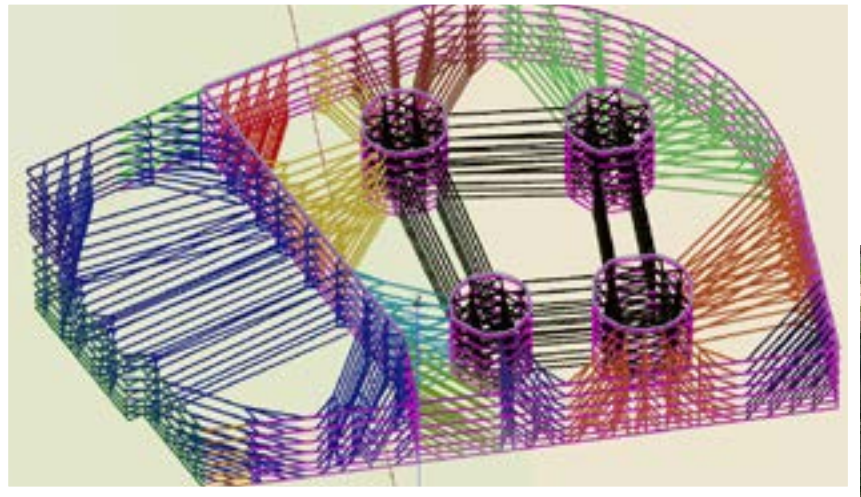
Case studies

United Christian Hospital Expansion - CPB Unistress JV

Review of strutting requirements

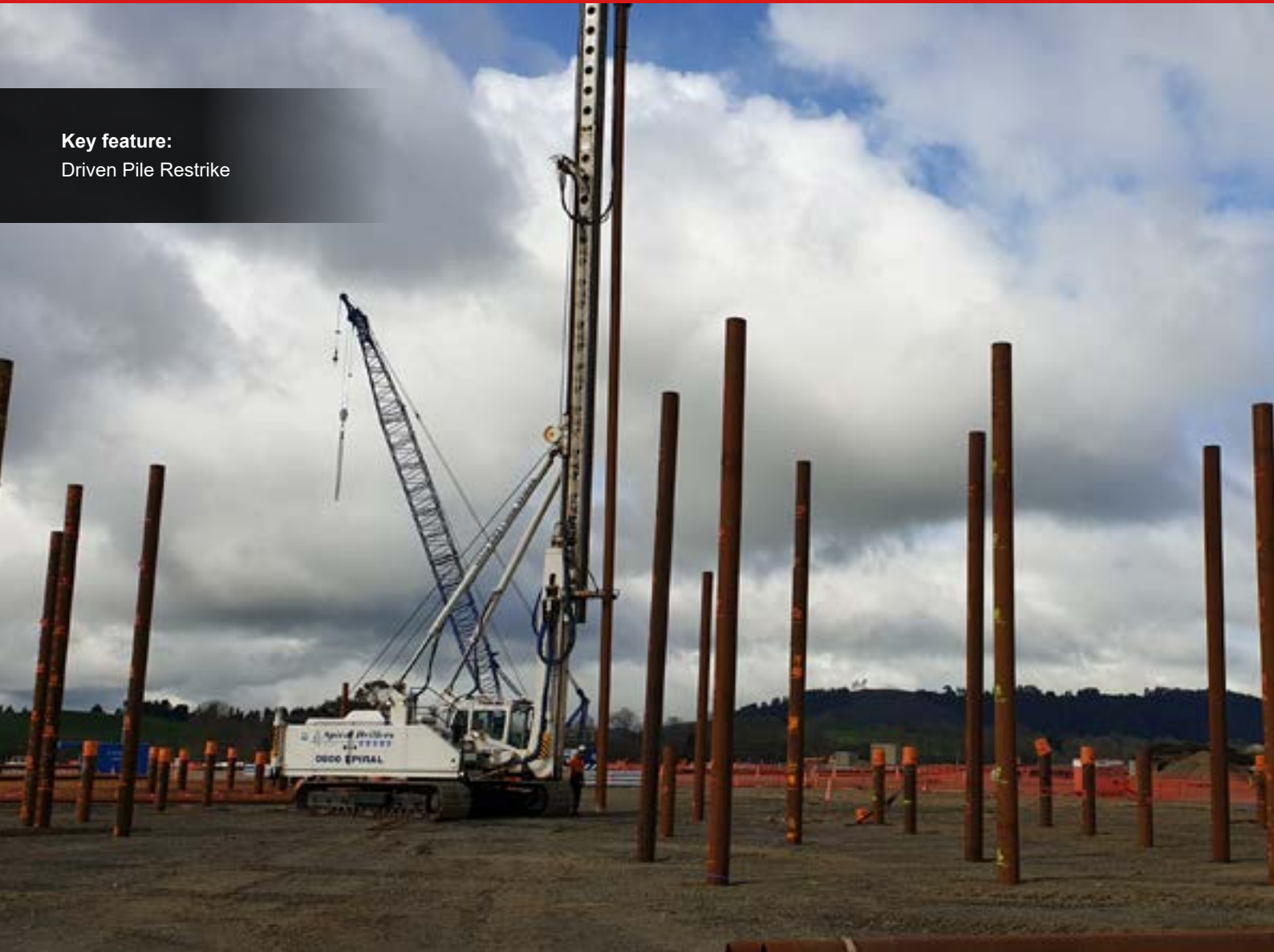
Excavation for a three level basement would be completed in two stages with the first already underway. Initial 2D assessments indicated that the second stage would need more strutting than previously allowed for and this strutting could not be accommodated in the program requirements.

EIC Activities undertook 3D analyses which could take into account the full stiffness of the structure. This showed that the original strutting was sufficient and the program requirements could be met.



Case studies

Key feature:
Driven Pile Restrike



Waikeria Prison Development - CPB Contractors

Foundation design assessment

Challenge

In the original design, over 3000 steel tubes of 275mm diameter were proposed as the foundation to support the Waikeria prison buildings.

This required all of the piles to be re-struck upon driving to a specified set, resulting in an unforeseen increase in the cost and duration of construction.

Solution

EIC Activites carried out a detailed assessment of the design and concluded that re-striking the piles was unnecessary.

Following EIC Activities' advice, the requirement for re-strike was relaxed to an as-needed basis, leading to significant time and cost savings.

Case studies

Cross River Rail Tunnel, Stations and Development (TSD) -
CPB BAM Ghella UGL JV

Review of soil structure interaction

Challenge

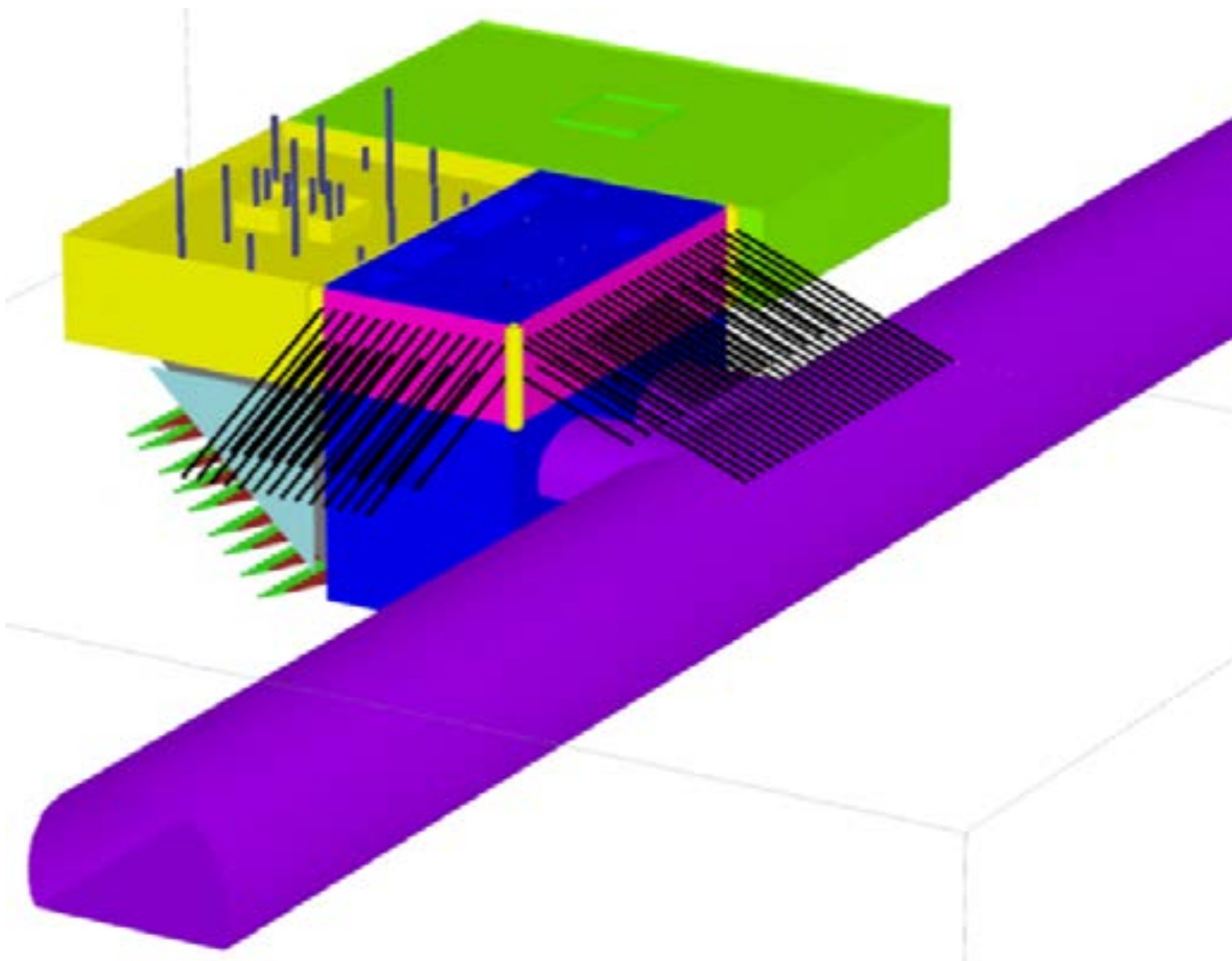
In order to determine the anticipated structural forces and required structural dimensions on station entry shafts, complicated soil structure interactions needed to be modelled.

One shaft was 50m deep, embedded in non-uniform geology adjacent to two 40+ storey buildings.

Solution

Until EIC Activities' involvement, simple 2D models had been used to assess a complex 3D problem. EIC Activities' 3D model showed that a 2D model would not be able to capture the ground behaviour accurately.

Forces acting on the structure were reduced and the impact on surrounding structures evaluated. At one station, EIC Activities' 3D model outcomes reduced the wall thicknesses by up to 30%, allowing the station to fit within the limited space constraints.



Case studies

North West Rail Link OTS - CPB Contractors

Review of ground pressures

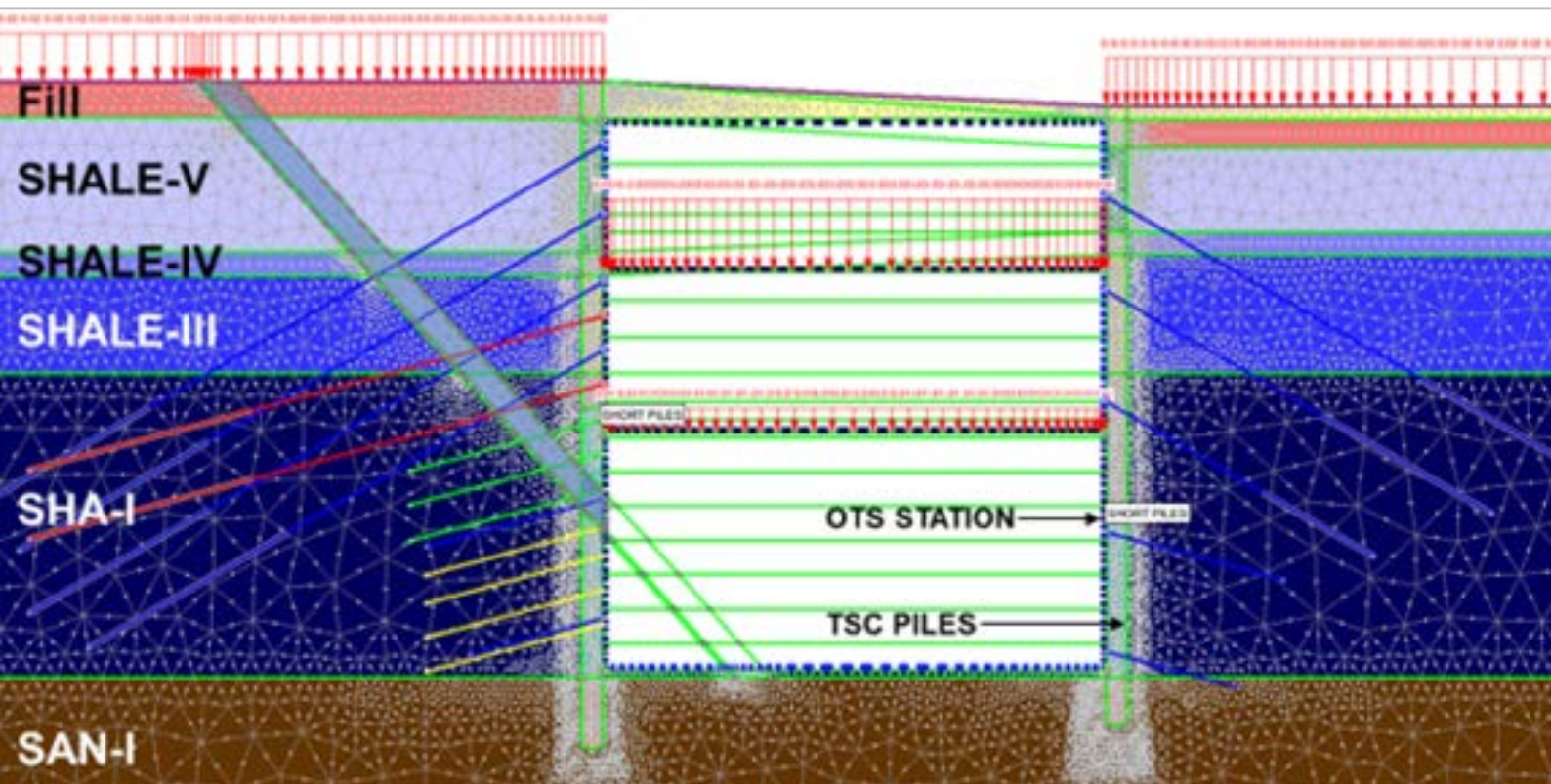
Challenge

During detailed design of the station boxes, the impact of temporary support was not considered and there was significant uncertainty about the ground pressures on the station walls.

Solution

EIC Activites proposed a rationalised approach that involved the use of numerical modelling which could take into account stress relief during excavation.

Using this approach the forces on the station box were significantly reduced leading to wall thicknesses decreasing by roughly half.



Case studies

Westconnex Stage 2 M8 - CPB Dragados Samsung JV

Model landfill behaviour

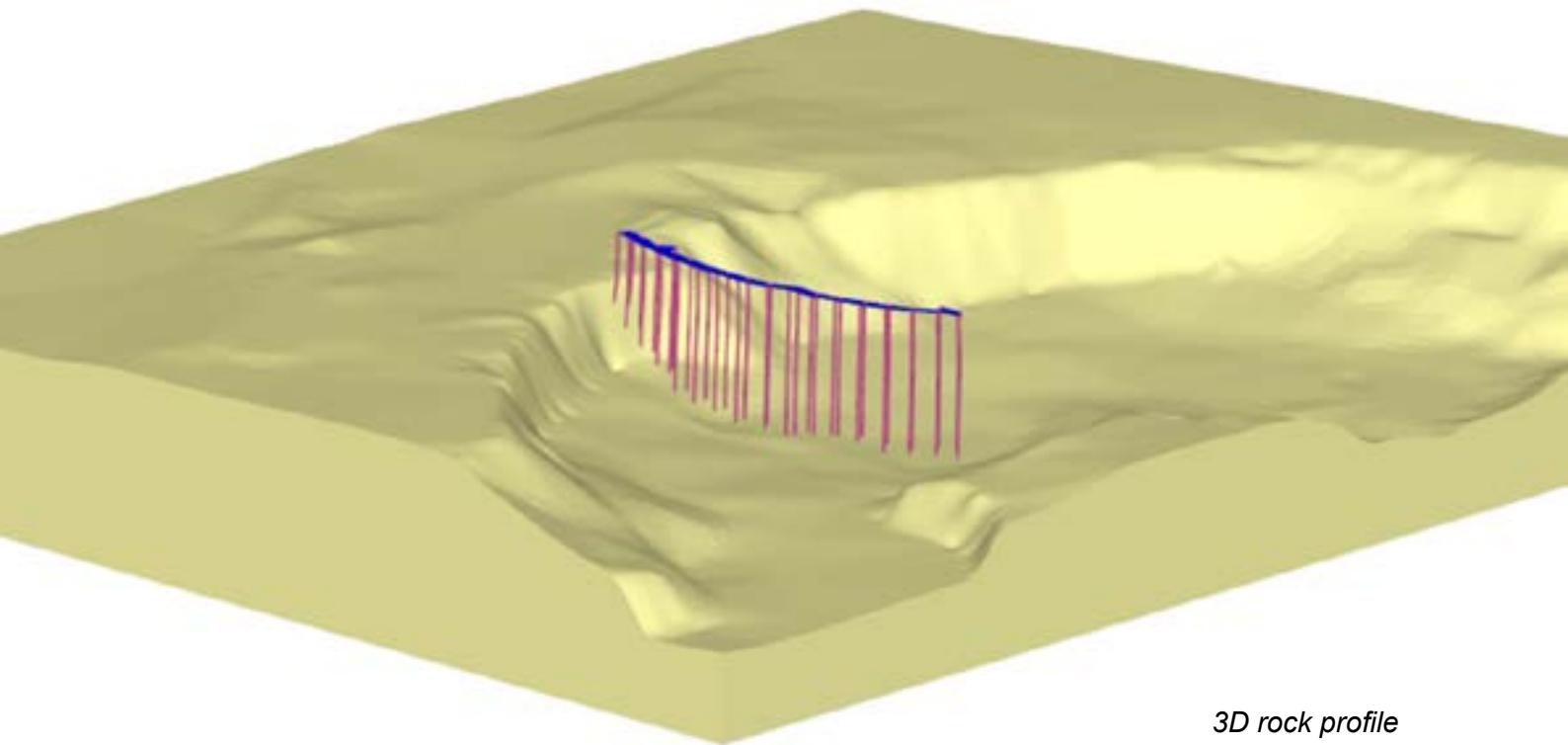
Challenge

A number of structures installed within the pre-existing Alexandria Landfill at St Peters Interchange had exhibited unexpected levels of post-construction movement.

Solution

In order to establish the cause and direction of ground movement, EIC Activities developed a PLAXIS 3D model using surveys of the historic ground level and post construction ground level.

A detailed and highly variable rock profile at the base of Alexandria Landfill was developed. The ability to model this detailed geometry allowed for a thorough understanding of the ground behaviour. This was paired with instrumentation data, INSAR data and research predictions to facilitate understanding of the landfill behaviour and develop robust remedial solutions.



*3D rock profile
within Alexandria Landfill
simulated in PLAXIS 3D*

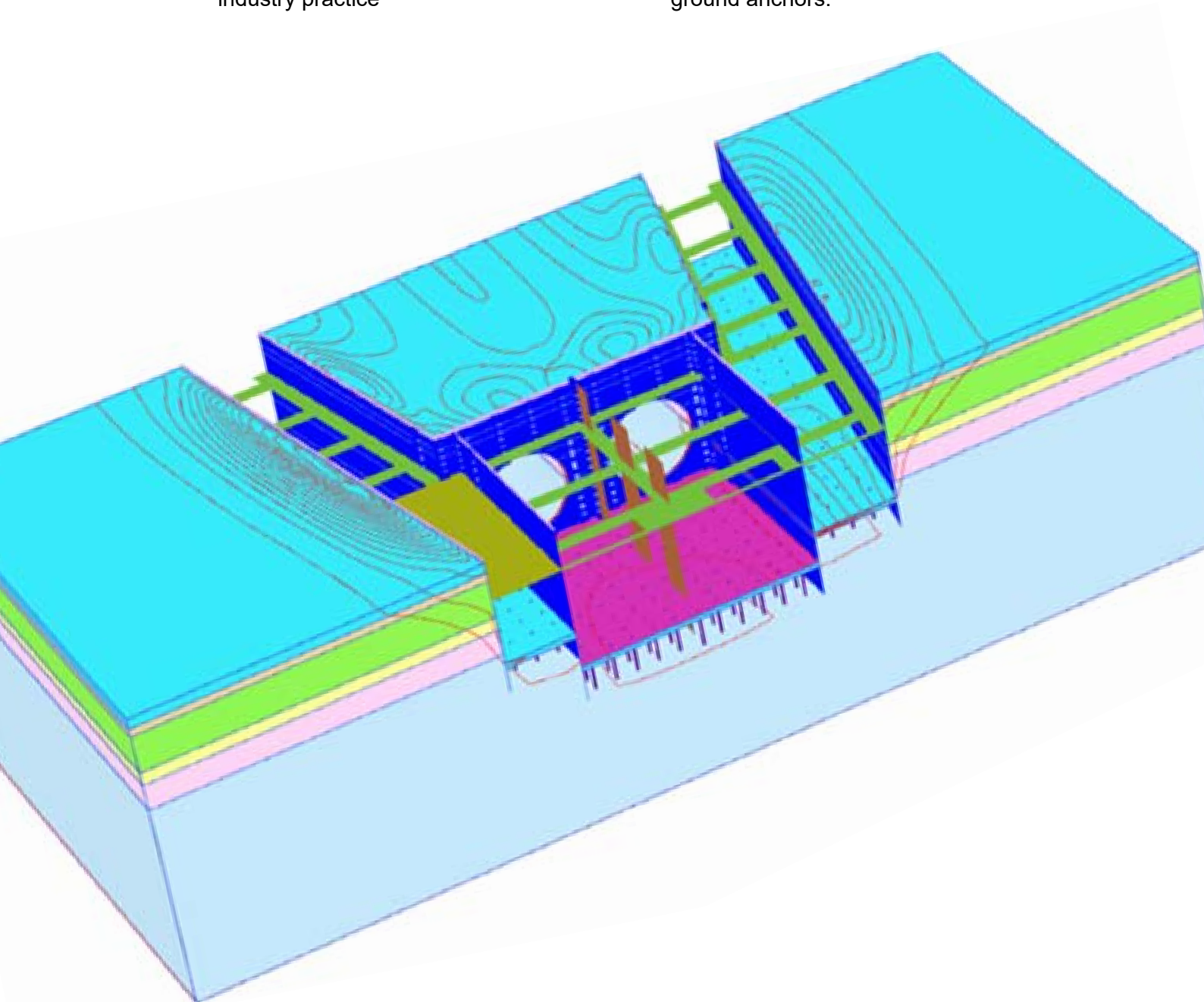
Case studies

North East Link - Spark Consortium (CPB Contractors, WeBuild, G&S)

Design challenge and proof engineering

EIC Activities provided design challenge and proof engineering services. Key highlights included:

- 3D numerical modelling to assess the impact of tunnelling on an existing shaft as a part of design optimisation
- review of geological interpretation and guidance to design consultants to ensure ground interpretation and design parameters are in line with industry practice
- finite element analysis and ground verification to optimise design outcomes
- proof engineering for Watsonia cut and cover tunnels and open cut troughs. Full soil-structure interaction analyses to assess the structural loads on wall and ground anchors.



Case studies

WestConnex Stage 2 M8 - CPB Dragados Samsung JV

Research to predict landfill behaviour

Challenge

EIC Activities conducted a joint research project with the University of Technology Sydney (UTS) in order to reliably characterise landfill behaviour.

Detailed site investigation and laboratory testing of landfill material was undertaken at the Alexandria Landfill above which Westconnex M8 St Peters Interchange was built.

Solution

Key research outcomes included developing a practical methodology for predicting landfill behaviour - based on closely correlating results of landfill properties from laboratory tests, InSAR satellite monitoring and advanced field instrumentation.

The monitoring data and predicted landfill properties proved invaluable for the calculation of future settlement and development of remedial solutions.



Field settlement monitoring devices installed at Alexandria landfill

Key feature:
Landfill Research



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