SECTOR BROCHURE

UNDERGROUND DEVELOPMENT



SYSTRA

BG&E Part of SYSTRA

UNDERGROUND DEVELOPMENT



Underground infrastructure demands specialist knowledge, sound engineering judgement and the ability to solve complex challenges below the surface.

With decades of global experience, SYSTRA has delivered tunnels, underground stations and deep excavations in some of the world's most demanding environments — from dense urban centres to mountains and subsea crossings.

From traditional tunnelling methods to tunnel boring machines (TBMs), we understand how to design and deliver underground structures across diverse geological and geotechnical conditions. Our expertise also extends to the critical interfaces between tunnels, utilities, rail infrastructure and above-ground developments.

OUR SERVICES

Design

- Alignment design.
- Architecture and landscape design.
- Concept design.
- Constructability.
- Detailed design.
- Feasibility studies.
- Geological, geotechnical and hydrogeological studies.
- Microtunnel Boring Machine (MTBM) and tunnel design.
- Pipeline design.
- Preliminary design.
- Shaft design settlement analysis.
- Temporary works design.

Management & Advisory

- Commercial management.
- Delivery partner.
- Project development.
- Project planning.
- Project risk assessment.
- Transaction management.

Mechanical, Electrical & Plumbing (MEP) Design

- CFD simulation.
- Commissioning support.
- Complete safety system design.
- Definition of ventilation strategies.
- Ventilation and fire safety.

Value Engineering

- Advanced FE Simulation.
- Asset management.
- Implementation of new technologies.
- Project optimisation.

Construction Management

- Construction design and surveillance.
- Construction planning and methodologies.
- Construction risk assessment.
- Project engineering.
- Technical assistance.

BIM Modelling

- Civil and tunnel works.
- Finishes and Mechanical, Electrical and Plumbing (MEP).
- Road and terrain.

Independent Check

- Code compliance.
- Independent certification and verification.

Tender Assisstance

- Communication strategy.
- Illustrative videos.
- Professional graphic support.
- Schematics and renderings.

Impact Assessment

- Condition evaluation and inspection.
- Design or repair works.
- Impact assessment.
- Rehabilitation.
- Structural assessment.

LIFECYCLE PARTNER: INCEPTION TO DELIVERY

We provide critical infrastructure advisory and design services from inception through to delivery, including condition, impact, structural and geotechnical assessments; inspection and monitoring of underground assets; tunnel design and engineering; project advisory; and impact assessments for adjacent and over-site developments.

- Feasibility & Options Analysis
- Design Development & Constructability
- Advisory & Procurement Management
- Impact & Risk Assessment
- Delivery Support & Construction Engineering
- Temporary Works & Interface Management
- Geotechnical & Underground Utilities
- IV/IC & Claims Support

INFRASTRUCTURE EXPERIENCE

Asset	Client	Services & Capability							
		Deliver Partner	Asset Management	Tunnel Engineering	Constructability (Methods)	Tunnel Systems Engineering	Fire & Life Safety	Materials Engineering	Independent Estimator
M4 East	Westconnex	✓			✓		✓		
M8	Westconnex	✓			✓		✓		
M4M8	Westconnex	✓				✓	✓		
Roselle Interchange	Westconnex	✓	✓		✓	✓	✓		✓
Lane Cove	Transurban		✓	✓	✓	✓	✓	✓	
NorthConnex	Lendlease & Transurban					✓	✓		
ED	Transurban		✓	✓			✓		
Cross-City	Transurban		✓	✓			✓		
M2 Hills	Transurban		✓	✓			✓		
Coffs Harbour Bypass	TfNSW	✓			✓		✓		
M6 Stage 1	TfNSW	✓		✓	✓	✓	✓		
M6 Stage 2	TfNSW			✓	✓	✓	✓		
Greater Western	TfNSW			✓	✓	✓	✓		
Domain Tunnel	TfNSW		✓		✓	✓	✓		
Mascot Airport	TfNSW					✓	✓		✓
MP Ped Link	Lendlease & Macquarie	✓		✓	✓			✓	
Darling Point	Private	✓		✓	✓			✓	✓

SERVICES

TUNNEL ENGINEERING IMPACT ASSESSMENT

SYSTRA's specialist tunnel engineers provide technical advisory and assessment services to support development applications requiring statutory consent or approval from tunnel and transport asset owners.







TUNNEL IMPACT ASSESSMENTS

Working across the development lifecycle, we bring together oversite development plans with third party tunnel assets to provide the objective and quantified tunnel risk assessments that are mandated through the asset protection guidelines of most operators of critical transport infrastructure.

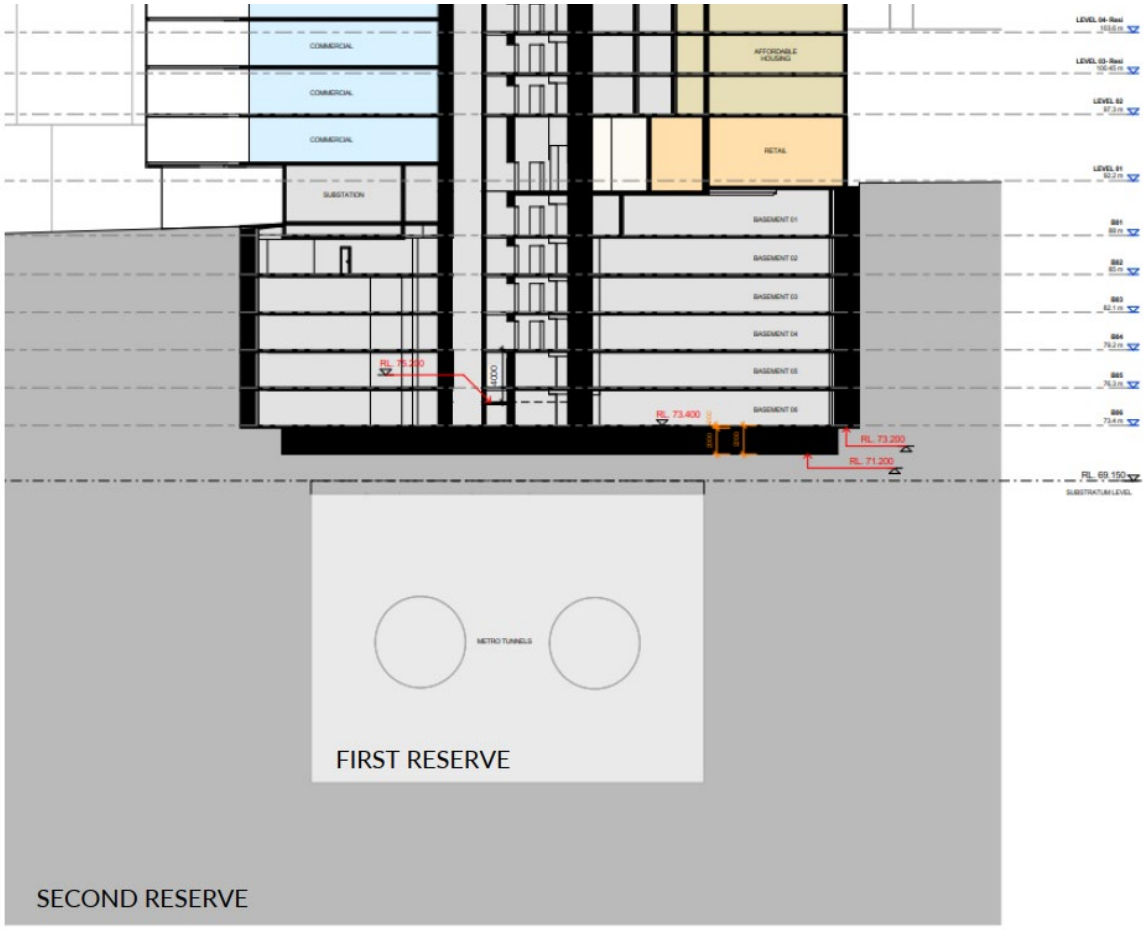
Our services include:

- Detailed staging analyses covering demolition, basement excavation, construction and use phases.
- Detailed structural analyses of existing and future tunnel infrastructure.
- Tunnel risk assessment.
- Rail operations impact assessment.
- Monitoring plans.
- Tunnel condition surveys.
- Tunnel surveillance and condition monitoring.

SERVICES

METRO INTERFACING

Asset	Project	Client	Services & Capability			
			Geo-structural Analysis	Tunnel Structural Analysis	Tunnel Eng. Impact Assessment	Structure Design (BG&E)
Sydney Metro	601 Pacific Highway	Stockland	✓	✓	✓	✓
Sydney Metro	Castle Towers Zone 3 Upgrade	QIC	✓	✓	✓	✓
Sydney Metro	Castle Towers Site B	QIC	✓		✓	✓





SERVICES

TUNNEL DESIGN & ENGINEERING

SYSTRA provides specialist engineering for new and existing tunnels, drawing on experience across design, construction, operations and maintenance. Services cover tunnel structures, ground–structure interaction, construction methodologies, asset integrity and long-term maintenance.

TUNNEL DESIGN

Our tunnel design expertise spans a range of ground conditions, construction methods and underground structures.

Key services include:

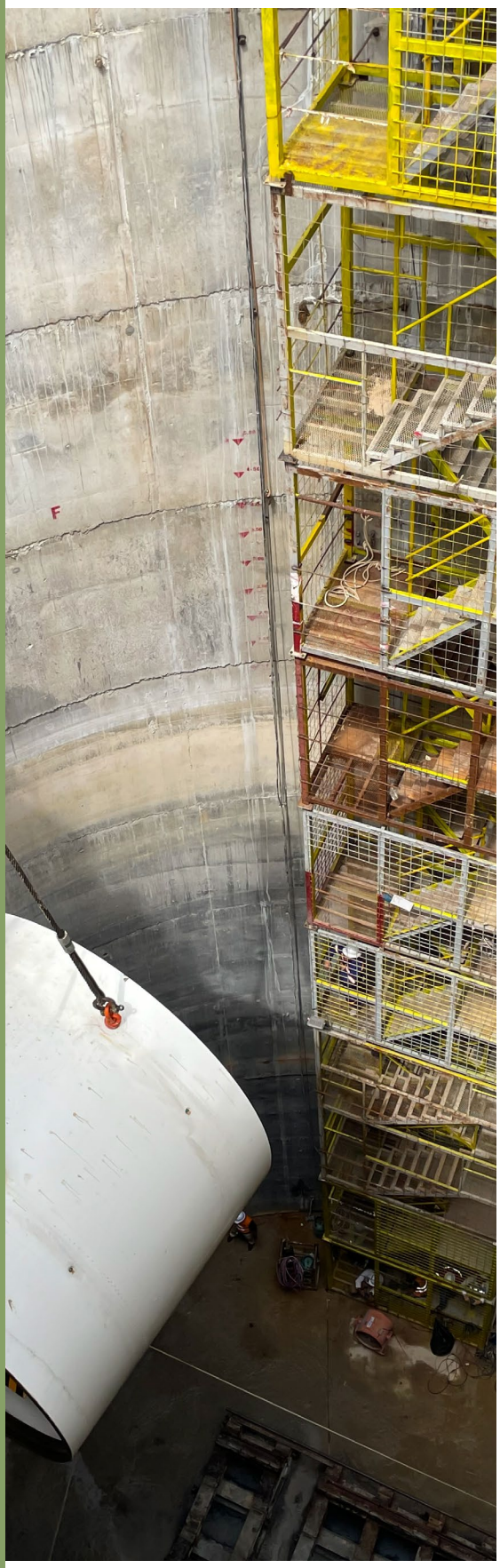
- Hard rock and soft soil tunnel design.
- Soil-structure interface analysis.
- Tunnel boring machine (TBM), New Austrian Tunnelling Method (NATM) and cut-and-cover tunnels.
- Caverns, shafts and cross passages.
- Ground freezing.
- Rock and sprayed-concrete linings, mined-tunnel support, drill-and-blast design and rock bolting.
- Finite-element modelling and analysis.
- Geotechnical and hydrogeological investigation and interpretation.

SHOTCRETE

SYSTRA designs shotcrete-lined tunnels and caverns across a range of soil and rock conditions, including NATM thin linings that utilise the ground's own capacity, mined-tunnel ground support and drill-and-blast design.

Our expertise also covers geotechnical and hydrogeological investigation and ground modelling; ground movement, settlement and monitoring; ground improvement, including jet grouting, cement and chemical grouting, soil mixing and artificial ground freezing; and finite-element analysis.

We have also value-engineered polymer-reinforced shotcrete and steel-fibre-reinforced linings to reduce on-site work.



TUNNEL GUARDIAN

SYSTRA acts as tunnel guardian for multiple road tunnels, monitoring structural integrity and changes in geological and geotechnical conditions through instrumentation, survey equipment and inspections. Our services include structural analysis of adjacent developments, assessment of ground movement impacts on tunnels, and review of InSAR data and ground settlement monitoring results.

Experience includes tunnel monitoring for the M6 Stage 1 motorway, alongside tunnel impact assessment services for Sydney Metro, both in Sydney.

TUNNEL LINING

Shotcrete as tunnel lining has become an efficient way to build NATM tunnels but comes with specific and ongoing operational risk.

Key services include:

- Shotcrete inspection and inspection methodologies.
- Repair designs and methodologies.
- Failure mode, effects and criticality analysis (FMECA).
- Rock bolting design.
- Tunnel lining, rock bolt and structural analysis.

Experience includes advising on shotcrete and tunnel lining risks and repairs at WestConnex in Sydney since the programme's inception in 2015.

MAINTENANCE DESIGN

Key maintenance design services include:

- Tunnel maintenance concept design.
- Code of Maintenance Standard design and refinement.
- Maintenance job plan development.
- Maintenance frequency determination and design based on in-tunnel conditions.

Experience includes development of the Tunnel Seepage Inspection and Maintenance plan for the NSW tunnel assets on behalf of Transurban. The document provided detailed guidance on inspection, selection, installation and ongoing requirements for the WestConnex assets, Eastern Distributor, Cross City Tunnel, M2 and Lane Cove Tunnel across Sydney.

BG&E and SYSTRA joined forces in 2025, combining BG&E's civil and structural engineering expertise with SYSTRA's global capability in public transport, mobility and infrastructure.

With more than 1,000 people across Australia and New Zealand, the partnership strengthens our reach and position in one of the world's most dynamic infrastructure markets.

UND_DIS_BR_R0_P1026

SYSTRA

BG&E Part of SYSTRA