Albert Street Cavern Assessment Report
Albert Street - Future Over Station Development
Brisbane, QLD

Prepared for:
Albert Street Trust

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Appendices

1 Project Background

The CRR Albert Street Pty Ltd (ACN 660 319 693), as trustee for the CRR Albert Street Trust (Albert Street Trust), has been awarded the development rights for the Cross River Rail (CRR) precincts, including the proposed development at Albert Street in the Brisbane CBD.

The development of the 101 Albert Street mixed-use precinct will comprise a commercial tower approximately 180 m high, comprising approximately 42 levels above ground and a single-level basement. The development must be designed to satisfy the requirements of the Cross River Rail Delivery Authority (CRRDA), due to the presence of CRR infrastructure and assets located below the site.

Albert Street Trust engaged EDG Consulting Pty Ltd (EDG) to provide geotechnical services for the project, with involvement commencing in 2022 and contributing to Development Approval (DA) being granted in 2023. Following approval of the DA, Multiplex Pty Ltd (MPX) was engaged to progress the design, with HERA Engineering Pty Ltd (HERA) engaged to undertake the structural design.

As part of the design development undertaken following DA approval, the structural arrangement has been updated, including:

- The structure has changed from a steel–concrete composite system to a reinforced concrete framed structure.
- The basement arrangement has been reduced to a single basement level.
- The piled foundation arrangement has been revised.

Accordingly, a DA change application is currently being prepared to incorporate the above updates to the proposed development.

1.1 Scope and Purpose

The proposed development is located adjacent to, and partially above, the Albert Street Cross River Rail (CRR) cavern, with the top of the cavern located approximately 17m below ground level. As part of the DA change application, an updated assessment is required (that represents the recent updates to the structural design) to determine whether loads associated with the proposed development could adversely affect the cavern lining system or associated CRR assets.

The assessment is presented herein and considers ground loads, cavern lining normal stresses and cavern deformations associated with the proposed building loads. The assessment will form part of the DA change application submission and provides a comparison between the ground loads, cavern lining normal stresses and cavern deformations arising from the proposed development loading and the design load cases nominated in the CRR Project Scope and Technical Requirements (PSTR).

The assessment is based on the principle that the cavern lining has previously been designed to safely withstand a range of project-specific loading conditions (as defined in the PSTR), and therefore, if the stresses and ground loads generated by the proposed building are demonstrated to be less than those associated with the PSTR load cases, then the proposed development can be considered to fall within the established design envelope of the cavern.

Under these circumstances, it would then be inferred that the proposed building does not introduce loading conditions that exceed those already considered in the original cavern design and therefore does not detrimentally affect the structural integrity or serviceability of the cavern lining.

The assessment is not intended to reassess the structural capacity of the cavern lining. Rather, it seeks to establish whether the proposed building generates ground loading effects that remain within the range of conditions previously considered during cavern design.

2 Site Details

Site details, including the development location, ground stratigraphy, soil and rock parameters, and groundwater conditions, are documented in our Geotechnical Engineering Report (Ref. B01493-1AC, dated 21 December 2022).

Details relating to the structural arrangement of the development, foundation system and retention system are presented in the schematic design report prepared by HERA (Ref. 2411-RE-001_0, dated 19 June 2026).

This report must therefore be read in conjunction with the B01493-1AC Geotechnical Engineering Report and the HERA schematic design report.

3 Finite Element Analysis

3.1 Analytical Model

To provide a comparison between the cavern design load cases and the proposed building loads, we have developed a 3D finite element model to assess ground stresses and cavern liner distortions associated with the proposed building loads and the load cases nominated in the CRR Project Scope and Technical Requirements (PSTR).

We have carried out the following comparisons to gain confidence that the cavern design modelling and the modelling as part of this assessment are similar:

- The ground stratigraphy adopted for this assessment was compared with the ground stratigraphy adopted for the cavern design analysis (as presented in the CRR Geotechnical Interpretative Report GIR Ref. CRRTSD-000-0351-RPT-PSMQ-1120-030021), and both were assessed to be sufficiently similar at the cavern location.
- The soil and rock material parameters adopted in the cavern assessment were all the same or similar to those adopted for the cavern design analysis, as presented in the CRR GIR. Please refer to our Geotechnical Engineering report for further details regarding development of the ground model (Ref. B01493-1AC). Note that our assessment has considered continuum scale and tunnel scale rock mass stiffness parameters as defined in the CRR GIR.
- The cavern permanent lining details adopted in the cavern assessment, were based on the IFC drawings and were consistent with the details adopted in the cavern design. Note that the cavern geometry and lining thickness was based on the CRR drawing set: CRRTSD-300-0323-DRG-PSMQ-1330-190000s series.

3.2 Material Parameters

Modelling of the proposed works was carried out using the commercially available finite element software package Plaxis 3D (v24). The assessment considered the interpreted ground conditions as shown on the geological cross sections in Appendix A, along with the interpreted groundwater conditions described our Geotechnical Engineering Report (Ref. B01493-1AC, dated 21 December 2022).

Soil and rock behaviour was represented by a linear-elastic perfectly plastic continuum constitutive model for all material units apart from the Alluvium, where the Hardening Soil constitutive model was used. Plasticity was controlled by a stress-dependent Mohr-Coulomb failure criterion for all soil and rock types, based on the material parameters presented in Table A1, included in Appendix A. Drained shear strength parameters were used for all materials in all stages.

3.2.1 Rock Mass Stiffness

As the current assessment has been undertaken using a continuum-based finite element model, the rock mass properties adopted for the analysis have been based on the continuum-scale parameters presented in the CRR GIR.

It is noted that the assessment of ground loads undertaken by PSM (Ref. PSM3700-1102M – Assessment of Ground Loads) was based on discontinuum-based finite element analyses, in which the rock mass behaviour was represented using discontinuum-scale parameters together with discrete geological defects explicitly incorporated within the model. As a result, the effective rock mass stiffness adopted in the PSM analyses is expected to be higher than that represented by the equivalent continuum-scale parameters adopted for the current assessment.

To assess the influence of this difference in modelling approach and the associated range in rock mass stiffness, analyses have been undertaken in which the rock mass stiffness has been varied between 5GPa and 9GPa. The lower bound value represents the continuum-scale rock mass stiffness adopted for the current assessment, while the upper bound value represents the higher stiffness associated with the discontinuum-scale parameters used in the PSM analyses. This range provides an assessment of the influence of rock mass stiffness on the calculated cavern lining stresses, ground loads and deformation response, and provides confidence that the assessment outcomes remain valid across the range of credible rock mass stiffness assumptions.

3.3 Structural Loads and Elements

Structural loads were defined by HERA and were applied as point loads at the pile heads. A loading plan showing the magnitude and location of structural loads is provided in Appendix B. Details of the structural elements used in the analysis are presented in Table 1.

Table 1 – Finite Element Model Structural Elements

Component	Plaxis Element Type	Details
Cavern Liner	Plate	The crown and sidewalls are modelled as a 700mm thick plate element. An elastic modulus value of 32.8GPa has been assigned to both plates.
Cavern Invert Slab	Plate	The invert slab is modelled as a 300mm thick plate element. To represent the construction joint between the kicker and the invert slab, a reduced elastic modulus of 10GPa has been assigned to the plate element. This corresponds to a compressive stiffness of approximately 1000MPa/m at the invert-kicker interface, which is consistent with the design basis adopted in PSM's Cavern Sidewall and Corbel Design report (Ref. PSM3700-742M).
Waterproofing Layer	Interface	The waterproofing layer was modelled as a material interface. A shear stiffness of 200MPa/m and a normal stiffness of 2000MPa/m have been adopted for the interface stiffness parameters. This is consistent with the design basis adopted in PSM's Design of Permanent Linings report (Ref. PSM3700-1102M).
Retention Piles	Plate	The soldier pile retention wall is modelled as a plate element with equivalent stiffness properties representing 0.9m diameter piles at 1.8m centre-to-centre spacing. An elastic modulus value of 32.8GPa has been assigned to the plate.

Component	Plaxis Element Type	Details
Temporary Retention Prop	Node to Node Anchor	All props are modelled as node to node anchors. No pre-stress was included in any of the props.
Temporary Construction Platform Slab	Plate	The construction platform concrete slab acting as a temporary prop is modelled as a 300mm thick plate element. An elastic modulus value of 39.8GPa has been assigned to this plate.
Core Piles	Embedded Beam	All core piles are modeled as 1.2m diameter embedded beams. An elastic modulus value of 34.8GPa has been assigned to all beams. Skin friction values as per report Ref. B01493-1AC are adopted for the material units.
Tower Column Piles	Embedded Beam	All tower column piles are modeled as 1.35m diameter embedded beams. An elastic modulus value of 34.8GPa has been assigned to all beams. Skin friction values as per report Ref. B01493-1AC are adopted for the material units.
Podium Piles	Embedded Beam	All podium piles are modeled as 0.75m diameter embedded beams. An elastic modulus value of 34.8GPa has been assigned to all beams. Skin friction values as per report Ref. B01493-1AC are adopted for the material units.

The finite element model is shown indicatively in Diagrams 1 and 2.

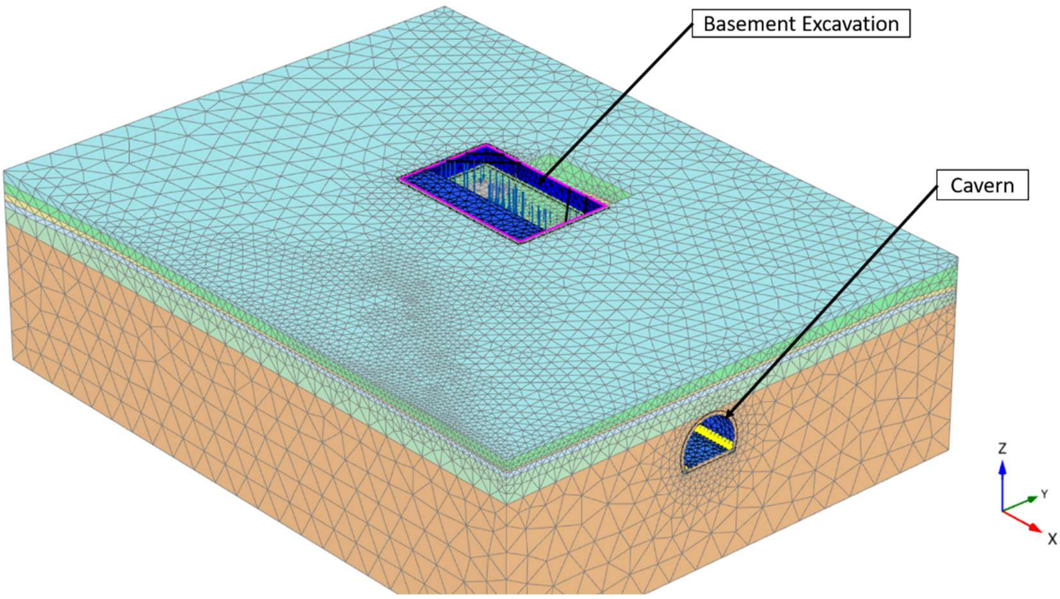


Figure 1 – Finite Element Model Markup 1

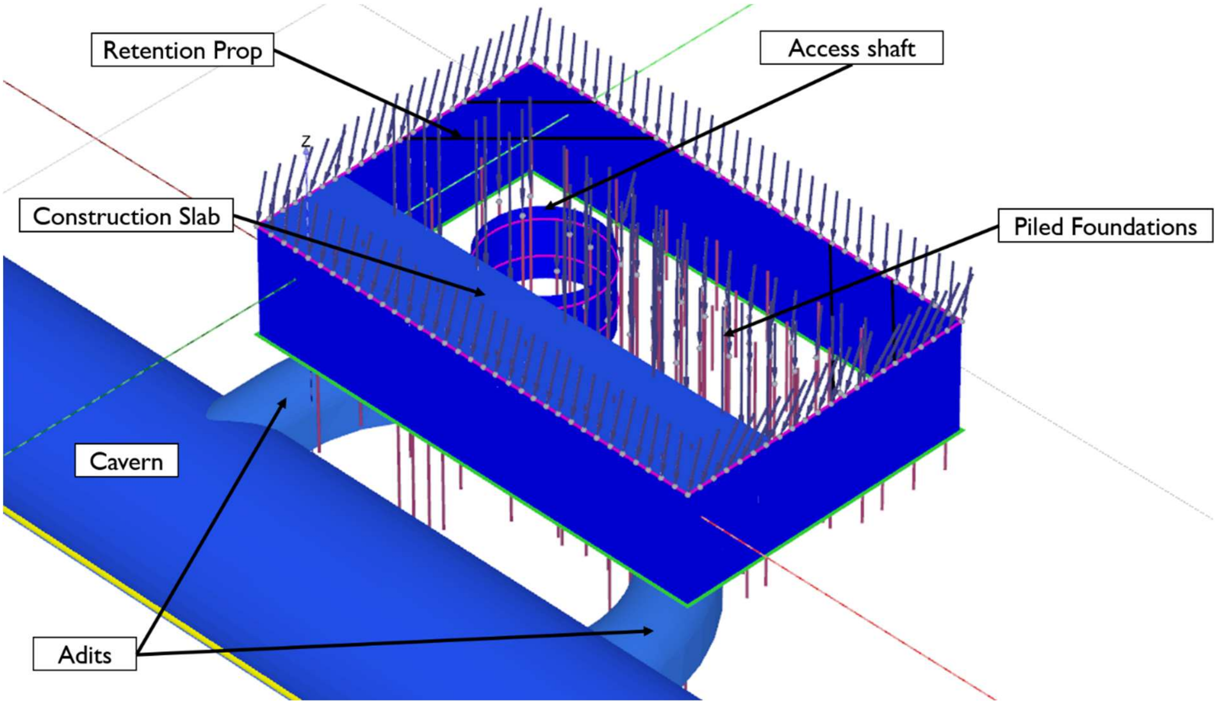


Figure 2 – Finite Element Model Markup 2

3.4 Construction Stages

The analysis adopted the construction stages as presented in Table 2.

Table 2 – Construction Sequence

Analysis Stage	Description	Details
1	Initial stage	Initial stresses are defined in the model using the K_0 procedure.
2	Excavation of adjacent building basement	Bulk excavation of the adjacent building (110 Mary St) to basement level to represent the historical excavation conditions.
3	Install shaft piles	Retention piles around the perimeter of the circular shaft structure are activated. The retention piles are modelled as a circular plate element.
4	Shaft Excavation	Excavation of soil and rock materials inside temporary access shaft.
5	Adit excavation	The two adits are excavated across the model. Stress relaxation of the adits is represented using an ΣM_{Stage} factor of 0.6.
6	Adit liner installation	The adit liner is activated after stress relaxation from the previous stage. The adit liner is modelled as plate elements.
7	Cavern excavation	The cavern is excavated across the model. Stress relaxation of the cavern is represented using the ΣM_{Stage} factor. A range of tunnel relaxation factors have been used ranging between 0.5 and 0.7.
8	Cavern liner installation	The cavern liner is activated after stress relaxation from the previous stage. The cavern liner is modelled as plate elements.

Analysis Stage	Description	Details
9	Acoustic shed piles installation	Acoustic shed piles are activated. The acoustic shed piles are modelled as embedded beam elements.
10	Backfill shaft and adits	The temporary shaft and adits are backfilled with mass poured grout. The concrete is modelled as material volume elements.
11	Retention piles installation	Retention piles around the perimeter of the site are activated. The retention piles are modelled as plate elements.
12	Installation of propping system at ground level	The propping system consisting of the concrete construction slab and the temporary retention props are activated. The construction slab is modelled as a plate. The props are modelled as node to node anchors.
13	Bulk excavation	Bulk excavation is undertaken in one stage.
14	Core piles, tower piles and podium piles installation	All core piles, tower piles and podium piles are installed in a single stage. The individual piles are modelled as embedded beam rows.
15	Apply loading	Axial and lateral loads for the piles, as provided by HERA, are applied at the head of each individual piles as point loads.

3.5 Cavern Construction

We have made allowance for the progressive installation of primary lining by assessing the stress relaxation prior to support installation following the method by Hoek (2008[1]). This method assesses the proportion of convergence experienced at a point of interest back from the tunnel face. Using this method, the relative proportion of convergence due to tunnelling that would have occurred prior to installation of the primary lining was estimated. The proportion of total convergence at each analysis stage is considered in the Finite Element (FE) analysis via the PLAXIS "M_{Stage}" factor input.

The tunnel relaxation depends on a several factors associated with the method of construction including the plastic radius and the unsupported length prior to support installation. To assess an appropriate range of values that might apply a parametric study considering these variables has been carried out.

Assessment of the M_{Stage} factor was carried out in accordance with the following process:

1. The equivalent cavern radius was adopted based on the cavern cross section dimensions.
2. The plastic zone radius was assessed by running an FE model to identify yield points around the cavern. As the model showed no yield points around the cavern, the plastic radius is assessed to equals the cavern radius. This is as expected for cavern excavations in medium to high strength Neranleigh-Fernvale Group rock.

   For the purpose of this assessment, two scenarios of plastic zone radius have been adopted; 0m based on these FE results and a 2m plastic zone radius to allow for possible rock mass disturbance during cavern excavation.

[1] Hoek, E., Carranza-Torres, C., Diederichs, M.S. and Corkum, B. 2008. Integration of geotechnical and structural design in tunnelling. Proceedings University of Minnesota 56th Annual Geotechnical Engineering Conference. Minneapolis, 29 February 2008, 1-53

3. The assessment of the unsupported cavern length was based on the details of the primary support design for the cavern. Three primary support types are nominated for the cavern, as shown on the CRR drawing set: CRRTSD-300-0322-DRG-PSMQ-1330-180000s series. These support types are summarised in Table 3.

Table 3 – Primary Support Types

Support type	Max. Face Advance (m)	Max. Distance to Bolts (m)	Distance to ≥ 200mm Shotcrete (m)	Unsupported Cavern Length Based on		Bolt Spacing (m)
				Max. Distance to Completed Primary Shotcrete (m)	Max. Distance to any Shotcrete With 15MPa Strength (m)	
AC1-1	1.5	2.5	2.5	4	5.5	1.5
AC1-2	1.25	2.25	2.25	3.5	4.75	1.25
AC1-3	1.5	2.5	4	8.5	5.5	1.5

Based on the support types in Table 3, we have considered scenarios that cover the range of unsupported cavern length to any shotcrete with minimum strength of 15MPa and completed primary shotcrete. All scenarios have considered a Plastic Radius of both 0m and 2m. The calculated M_{Stage} factors are summarised in Table 4.

Table 4 – Summary of Calculated M_{Stage} Factors

Cavern Primary Support Type	Distance Description	Distance Length (m)	Plastic Radius (m)	Calculated M_{Stage} Factor
AC1-1	Distance to any shotcrete with minimum strength of 15MPa	5.5	0	0.69
AC1-1	Distance to any shotcrete with minimum strength of 15MPa	5.5	2	0.64
AC1-1	Distance to completed primary shotcrete	4	0	0.61
AC1-1	Distance to completed primary shotcrete	4	2	0.56
AC1-2	Distance to any shotcrete with minimum strength of 15MPa	4.75	0	0.65
AC1-2	Distance to any shotcrete with minimum strength of 15MPa	4.75	2	0.60
AC1-2	Distance to completed primary shotcrete	3.5	0	0.58
AC1-2	Distance to completed primary shotcrete	3.5	2	0.53
AC1-3	Distance to any shotcrete with minimum strength of 15MPa	5.5	0	0.69
AC1-3	Distance to any shotcrete with minimum strength of 15MPa	5.5	2	0.64
AC1-3	Distance to 200mm thick shotcrete	4	0	0.61
AC1-3	Distance to 200mm thick shotcrete	4	2	0.56

Our calculations indicate that based on the various scenarios considered, the calculated M_{Stage} factor typically varies between 0.5 and 0.7. To consider the potential variability in the degree of stress relaxation of the tunnel, a range of tunnel relaxation factors are adopted ranging between 0.5 and 0.7.

3.6 PSTR Load Cases

The CRR PSTR nominates that design of the cavern lining must consider several FOSD load cases. Those load cases are defined in PSTR clauses OSD-31, OSD-46, OSD-47 and OSD-48. For ease of reference, those clauses are presented in Figure 3 and Figure 4, and are shown graphically on the attached sketches attached in Appendix C.

5.6.4.2 Albert Street Station

a)	Not used.	Note
b)	The CRR System shall allow for the Albert Street FOSD.	OSD-29
c)	The CRR System shall allow for retail within the Underground Station and the station precinct.	OSD-30
d)	Albert Street Station shall provision for FOSD loading of 375 kPa working load applied over part or the entire Albert Street Lot 2 site, applied between RL+4.0m and RL-8.0m, to give the most unfavourable loading conditions on the Station.	OSD-31
e)	Not used.	OSD-32
f)	Not used.	OSD-33
g)	Not used.	OSD-34
h)	Not used.	Note
i)	Albert Street Station shall allow for excavation over the entire Albert Street Lot 2 site to RL-8.0m.	OSD-46
j)	Albert Street Station shall allow for excavation over the entire Albert Street Lot 2 site (excluding the volumetric zone described in the Project Agreement Schedule G1) to RL-20.0m.	OSD-47
k)	Albert Street Station shall allow for future development loading and unloading cases as detailed in Appendix B2 Table B2-A for case 1 and Table B2-B for case 2.	OSD-48

Figure 3 – PSTR Over Station Development Load Cases

Additional Loading	**Continuous Excavation**
i) Building vertical loading up to 50 kPa (working load) acting on the ground at a level of 1m above the Tunnel crown and in uniform and patterned (including symmetric and unsymmetrical) arrangements which give the most unfavourable loading condition on the Tunnel; and ii) allow for buildup of surface level with a minimum of one metre of fill equivalent to 20 kPa.	i) Up to 7m below natural surface to allow for future development; ii) with a minimum of 'X'm residual ground cover above the Tunnel crown; and iii) with a minimum 'X'm pillar width between the side wall of the Tunnel and any adjacent building basement excavation. Note: 'X'=7m for running tunnels, and 10m for station caverns.
Note: The design must allow for the additional loadings and excavation above to be applied separately and together, including asymmetrical arrangements, and in any order to give the most unfavourable loading condition on the Tunnel.	

Figure 4 – Table B2-A (CRR PSTR)

Given that the proposed development includes only a single-level basement, the excavation depth is substantially less than the excavation allowances considered within the PSTR. The reduction in overburden associated with the proposed basement excavation is significantly less than that considered in the PSTR design scenarios. Consequently, this assessment focuses primarily on loading-related load cases rather than unloading-related load cases.

The assessment presented herein focuses on the loading effects associated with the proposed development. The PSTR load cases that impose loading on the cavern and are considered in this assessment are as follows:

- 50 kPa working load applied at 1m above the cavern crown combined with a 20 kPa working load applied at ground level RL +4m **(OSD-48)**.
- 375 kPa working load applied over part or the entire Albert St Lot 2 site, applied at RL +4m **(OSD-31)**. 50 kPa working load applied at 1m above the cavern crown combined with a 20 kPa working load applied at ground level RL +4m **(OSD-48)**.
- 12m excavation to RL -8m **(OSD-46)**. 375 kPa working load applied over part or the entire Albert St Lot 2 site, applied at RL -8m **(OSD-31)**. 50 kPa working load applied at 1m above the cavern crown combined with a 20 kPa working load applied at ground level RL +4m **(OSD-48)**.

Examples of the applied PSTR loads in the finite element modelling carried out by PSM are presented in PSM's Design Memorandum (Ref. PSM3700-1102M, dated 03/12.2020), and for ease of reference presented in Figure 5.

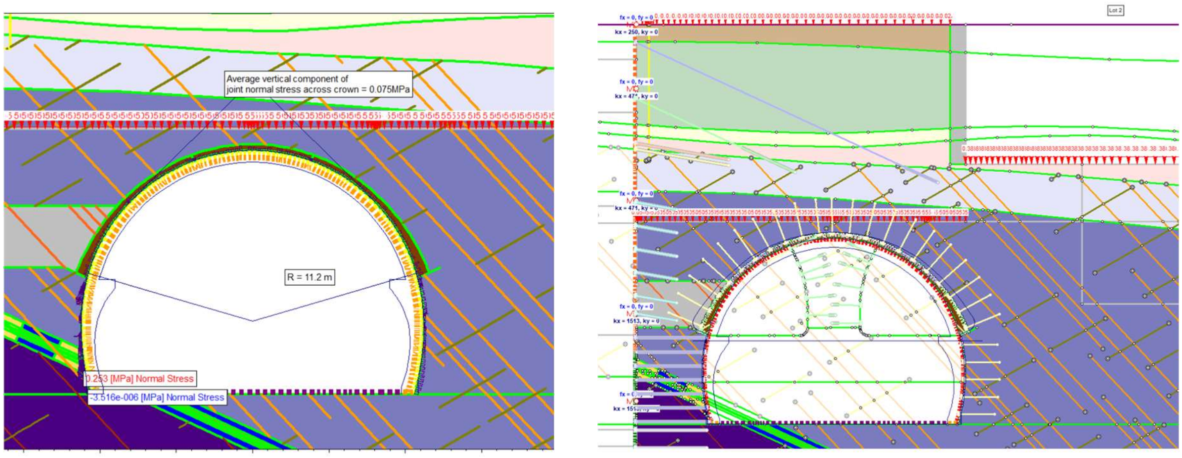


Figure 5 – Examples of Applied PSTR Loads from PSM's Finite Element Analyses

3.7 Proposed Building Load Case

Structural loading associated with the proposed development has been determined by the project structural engineer (HERA) and supplied to EDG for use in the assessment. These loads have been incorporated into a three-dimensional geotechnical finite element model through representation of the proposed piled foundation system.

The pile foundations are modelled using the proposed pile diameters, toe levels and appropriate geotechnical and structural pile properties to accurately represent load transfer mechanisms between the structure and the ground. The resulting stress changes within the ground mass and their influence on the Albert Street cavern are then evaluated.

The following working load combinations have been considered in the analysis:

- 1.1 * (G + 0.4Q + 0.64W)
- 1.1 * (G + 0.7Q)

Note that a 10% contingency has been applied to the structural loads to allow for minor changes to the structural loads that may occur during finalisation of the design.

3.8 Analysis Cases

The assessment has considered the PSTR and proposed building load cases, which are presented below in Table 5 and schematically shown in Appendix C.

Table 5 – Analysis Cases

Load Case	Description	Figure
1	Future development allowance of 50 kPa applied at 1m above cavern crown, and 20 kPa working load applied at ground level at RL +4m. (OSD-48)	Appendix C1
2	375 kPa load applied over Albert St Lot 2 site, applied at RL +4m (OSD-31). Future development allowance of 50 kPa applied at 1m above cavern crown, and 20 kPa working load applied at ground level at RL +4m. (OSD-48)	Appendix C2
3	12m excavation to RL -8m (OSD-46). 375 kPa load applied over Albert St Lot 2 site, applied at RL +4m (OSD-31). Future development allowance of 50 kPa applied at 1m above cavern crown, and 20 kPa working load applied at ground level at RL +4m. (OSD-48)	Appendix C3
4	Building Load Combination 1: 1.1 * (G + 0.4Q + 0.64W)	Appendix C4
5	Building Load Combination 2: 1.1 * (G + 0.7Q)	

3.9 Assessed Values

The three-dimensional finite element analysis has been used to calculate the changes in stress state within the ground mass resulting from both the PSTR load cases and also from the proposed development loading and the corresponding interaction with the cavern lining.

The effect of the proposed building loading on the cavern is assessed by a comparison of the following calculated values:

- Calculated normal stresses acting on the cavern lining from the geotechnical analysis
- Calculated vertical ground loads acting on the cavern lining, determined using a methodology consistent with that adopted by PSM for the original cavern lining design
- Calculated horizontal grounds loads
- Calculated cavern liner deformations.

3.9.1 Normal Stresses

Normal stresses acting at the ground–lining interface have been extracted directly from the model along the permanent cavern lining boundary. These interface stresses provide a measure of the load transferred to the lining system and have been processed to assess the governing stress components and distributions for comparison with the PSTR load cases.

3.9.2 Vertical Ground Load

As described in the PSM design documentation (Ref. PSM3700-1102M – Assessment of Ground Loads), two methods were adopted to assess the vertical ground load acting on the crown of the tunnel lining:

- The average vertical component of the calculated normal stress acting at the ground–permanent lining interface; and
- The average vertical component of the equivalent normal stress calculated based on a hoop stress analogy.

For the assessment of vertical ground load, the normal stresses acting over an approximately 16m wide section of the cavern crown have been extracted from the finite element model. This approach is consistent with the methodology adopted by PSM for the original cavern design assessment and the extraction locations are shown graphically in Figure 6.

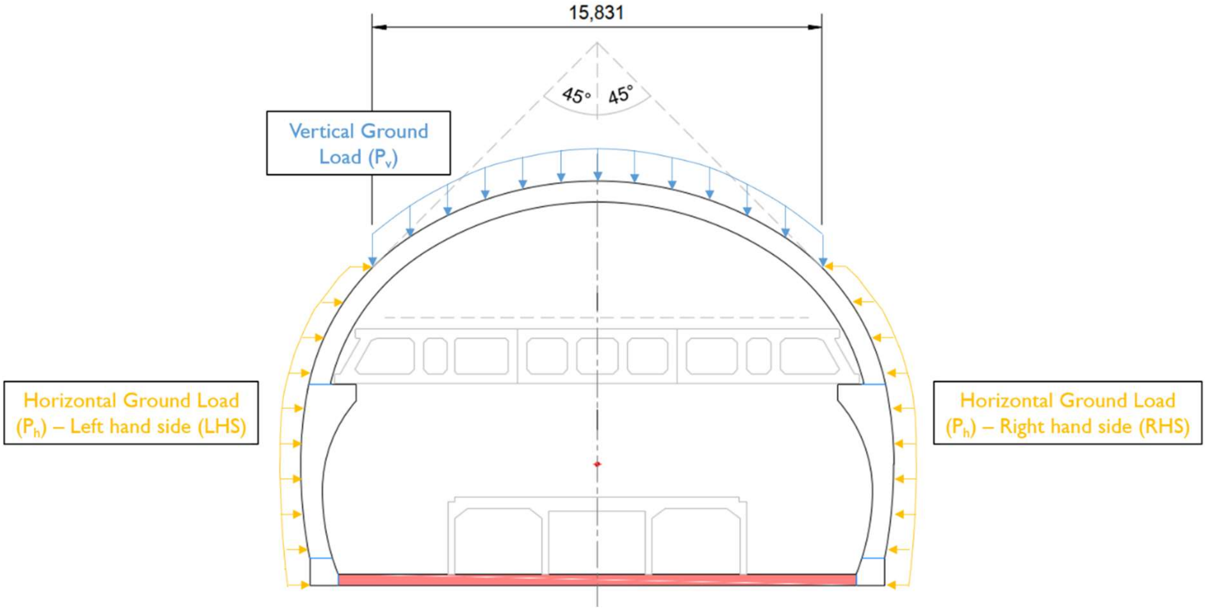


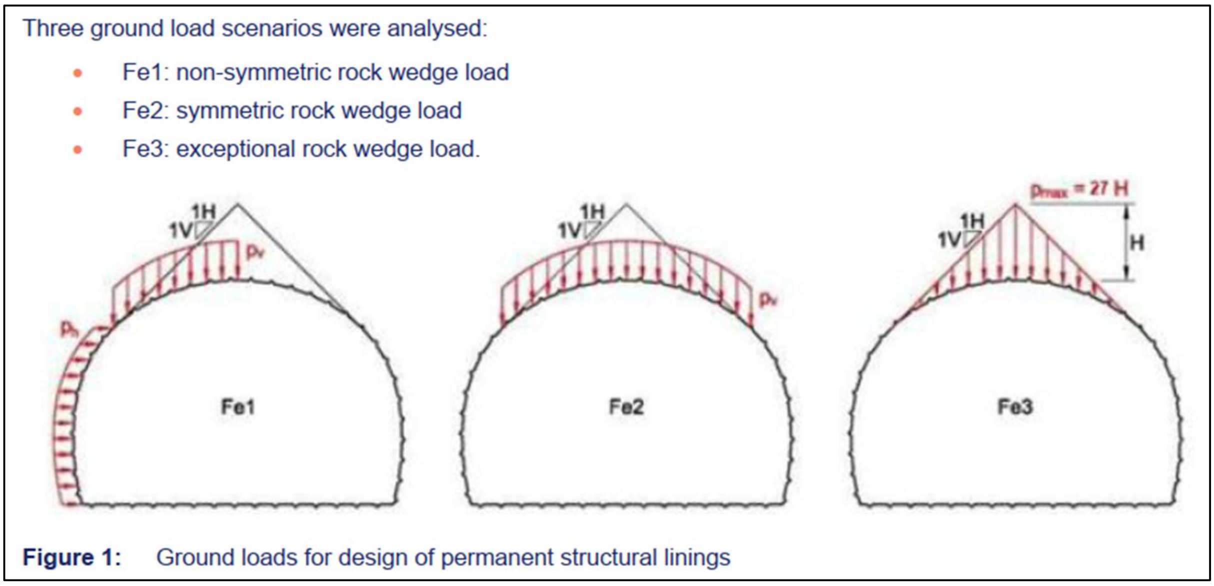
Figure 6 – Vertical And Horizontal Ground Loads

3.9.3 Horizontal Ground Load

The horizontal ground load has been assessed as follows:

- Extracting the average horizontal component of the liner normal stress at each side of the cavern sidewall.
- The horizontal ground load is calculated by assessing the difference between the average horizontal component of the liner normal stress at each side.

This is consistent with PSM's definition as no horizontal ground load is defined under symmetrical loading conditions as shown in PSM's design documentation (Ref. PSM3700-1102M – Assessment of Ground Loads) and reproduced below in Figure 7.


Three ground load scenarios were analysed:

- Fe1: non-symmetric rock wedge load
- Fe2: symmetric rock wedge load
- Fe3: exceptional rock wedge load.

Figure 1: Ground loads for design of permanent structural linings

Figure 7 – Ground Loads (PSM3700-1102M)

3.9.4 Liner Displacements

Cavern liner displacements have been extracted directly from the model along the permanent cavern lining boundary. Note the calculated displacements relate to construction stages subsequent to construction of the cavern lining.

3.10 Analysis Results

The vertical and horizontal deformation, along with the normal stress acting on the cavern liner, resulting from all load cases previously described in Table 5 are presented as graphical plots in Appendix D, as a 2D cross section and along the liner length. The results are grouped according to the tunnel relaxation (M_{Stage}) factor and the rock mass stiffness parameters adopted for each load case, as shown in Table 6.

Table 6 – Analysis Group

Analysis Group	M_{Stage}	Rock Mass Stiffness Parameters	Plots
1	0.5	Continuum rock mass stiffness parameters: • 1 GPa for NFG3 • 5 GPa for NFG2	Figure 1a to 1e
2	0.6		Figure 2a to 2e
3	0.7		Figure 3a to 3e
4	0.5	Discontinuum rock mass stiffness parameters: • 2 GPa for NFG3 • 9 GPa for NFG2	Figure 4a to 4e
5	0.6		Figure 5a to 5e
6	0.7		Figure 6a to 6e

The vertical and horizontal ground loads, calculated using the methodology described in Section 3.9, are summarised in Table 7 and Table 8 for the analyses adopting the continuum and discontinuum rock mass stiffness parameters, respectively.

Table 7 – Vertical and Horizontal Ground Loads for Continuum Rock Mass Stiffness Parameters

Load Case	Description NOTE 1	Ground Loads (kPa)											
		M_{Stage} = 0.5				M_{Stage} = 0.6				M_{Stage} = 0.7			
		P_v	σ_h (LHS)	σ_h (RHS)	P_h	P_v	σ_h (LHS)	σ_h (RHS)	P_h	P_v	σ_h (LHS)	σ_h (RHS)	P_h
1	50 kPa at 1m above cavern, 20 kPa at ground level (OSD-48)	136	158	162	4	115	134	137	3	93	107	105	2
2	375kPa at RL +4m (OSD-31)	167	177	202	25	146	152	178	26	124	126	151	25
3	375kPa at RL -8m (OSD-31)	138	156	170	14	116	131	145	14	94	106	119	13
4	Building Load Combination 1 1.1*(G+0.4Q+0.64W)	119	135	160	25	98	109	135	26	78	84	109	25
5	Building Load Combination 2 1.1*(G+0.7Q)	118	134	157	23	97	109	132	23	77	83	107	24

Notes: 1 – Refer to Table 5 for full description
2 – The values of Pv calculated from the average vertical component of normal stress and also from the hoop stress analogy as per Section 3.9.2 were typically within 1kPa

Table 8 – Vertical and Horizontal Ground Loads for Discontinuum Rock Mass Stiffness Parameters

Load Case	Description NOTE 1	Ground Loads (kPa)											
		M_{Stage} = 0.5				M_{Stage} = 0.6				M_{Stage} = 0.7			
		P_v	σ_h (LHS)	σ_h (RHS)	P_h	P_v	σ_h (LHS)	σ_h (RHS)	P_h	P_v	σ_h (LHS)	σ_h (RHS)	P_h
1	50 kPa at 1m above cavern, 20 kPa at ground level (OSD-48)	101	123	123	0	85	103	104	1	69	83	83	0
2	375kPa at RL +4m (OSD-31)	123	137	151	14	107	118	132	14	91	98	113	15
3	375kPa at RL -8m (OSD-31)	102	121	127	6	86	101	107	6	70	82	88	6
4	Building Load Combination 1 1.1*(G+0.4Q+0.64W)	90	107	121	14	74	87	101	14	58	67	82	15
5	Building Load Combination 2 1.1*(G+0.7Q)	89	107	119	12	73	87	100	13	58	67	80	13

Notes: 1 – Refer to Table 5 for full description
2 – The values of Pv calculated from the average vertical component of normal stress and also from the hoop stress analogy as per Section 3.9.2 were typically within 1kPa

4 Discussion

The calculated normal stresses, ground loads (as defined above and within the PSM design documentation), and liner displacements were obtained from the three-dimensional finite element modelling undertaken for both the proposed development load case and the relevant PSTR load cases.

The analysis included sensitivity assessments in which the rock mass stiffness and ground relaxation factor (representing partial stress relief prior to installation of the lining) were varied within credible ranges. The purpose of these sensitivity assessments was to assess whether variations in these parameters could result in the proposed development load case generating cavern loads greater than those associated with the relevant PSTR load cases, or whether the PSTR load cases remained governing under all reasonable parameter combinations.

Plots of liner normal stresses and liner deformations are presented in Appendix D. The calculated vertical and horizontal ground loads are summarised in Tables 7 and 8. Based on the comparison of analysis results, the following conclusions are made:

- The normal stresses acting on the cavern liner are greater for the PSTR load cases than for the proposed building load case. This remains the case for all sensitivity analyses undertaken, including variations in both rock mass stiffness and ground relaxation factor.
- The calculated vertical ground loads (as defined in the PSM design documentation) are greater for the PSTR load cases than for the proposed building load case. This remains the case for all sensitivity analyses undertaken that varied the rock mass stiffness and ground relaxation factor.
- The calculated horizontal ground loads (as defined in Section 3.9.3) are equal to the PSTR load cases than for the proposed building load case. This remains the case for all sensitivity analyses undertaken, including variations in both rock mass stiffness and ground relaxation factor.
- The proposed building load case results in a small increase in vertical displacement of approximately 1mm above that of the vertical displacement relating to the PSTR load cases. This indicates that the cavern experiences a very minor rotation due to load transfer into the surrounding rock mass from the proposed pile foundation system. The predicted movement mechanism is associated with elastic deformation of the surrounding rock mass and does not represent a change in the cavern cross-sectional geometry. Rather, the calculated liner distortion represents a small rigid-body translation/rotation of the cavern system. This slight increase in vertical displacement reduces to approximately 0.5mm when considering the tunnel scale rock mass stiffness values.

5 Basis for Acceptance

The Albert Street cavern lining system was designed to accommodate the loading conditions associated with the original Cross River Rail design scenarios, as defined by the PSTR load cases. The acceptance criterion for this assessment is that the loads induced in the cavern lining by the proposed development are demonstrated to be no greater than those associated with the governing PSTR design load cases.

The assessment has compared the calculated normal stresses acting on the cavern lining, and the corresponding vertical and horizontal ground loads, for the proposed building load case against the relevant PSTR load cases. The proposed development results in lower cavern loads in all cases than the governing PSTR cases and therefore it is considered that the proposed development does not increase loading demands beyond the established cavern design envelope.

This conclusion is supported by the sensitivity assessments, which demonstrate that the PSTR load cases remain governing across the full range of credible variations in rock mass stiffness and ground relaxation factor.

On this basis, it is concluded that the proposed development does not introduce adverse loading effects that would compromise the structural performance or serviceability of the Albert Street cavern.

6 Further Work

This assessment will be revisited once the information from the additional geotechnical investigation that is being carried out at the site becomes available.

For and on behalf of EDG Consulting Pty Ltd

David Cunliffe
Senior Principal

Ground conditions and the natural environment often present the highest potential risks to project construction and operation. Helping our clients manage their geotechnical risk is fundamental to the role of EDG. We have prepared these notes to assist our clients to understand the information we provide and to help them to manage their risk. Where there is uncertainty about the site, project or geotechnical conditions, contact EDG for assistance.

Scope of Services

The information provided in this document is based on the scope of services defined in the client's agreement with EDG Consulting Pty Ltd (EDG). In undertaking the work, EDG has relied on information provided by the client and other individuals and organisations. Unless stated in the document, EDG has not verified the accuracy of that information and does not accept responsibility for the conclusions, recommendations or designs developed based on that information should it be incorrect, misrepresented or withheld.

Unless specifically stated to the contrary, this document does not cover geo-environmental issues, which require significantly different equipment, techniques and personnel. A geo-environmental specialist should be engaged to provide such advice.

The document is based on specific project details

The information provided in this document is relevant to the subject site and project only. The document has been prepared based on the specific details and requirements of your project and may not be relevant if any changes to the project occur. Should changes occur, must review the report to identify if and how such changes will affect the conclusions, recommendations or designs provided. EDG accepts no responsibility if the client elects not to consult in the event of changes to the project.

The document is prepared for a specific purpose

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The document is for our client only

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Should you choose to engage an alternative party for advice based on the information in the document, it must be understood that the alternative party will be less familiar with the site conditions and basis of information provided, and there is a potential for misinterpretation. EDG will not be held liable in any way from such misinterpretation.

EDG will not be liable to update or revise the document to take into account information any events or circumstances or facts occurring or becoming apparent after the date of the report.

All site conditions cannot be identified

The scope of work undertaken represents a professional assessment of the information cited to develop a basic geotechnical model of the site based on EDG's understanding of the client's risk profile. In some cases, increasing the frequency of investigations and/or sampling, or considering alternative investigation techniques may improve the interpretation, but may not identify all relevant subsurface conditions at the site.

The document presents an interpretation

Geotechnical information is an interpretation of conditions evident based on a limited number of facts established during a site investigation. Engineering logs are an interpretation of observations of samples and test results at discrete locations in the subsurface profile. A geotechnical model is an interpretation of site conditions, developed using information from discrete locations on the site and an understanding of geological processes. Interpreted conditions at and between investigation locations may be different to those inferred on the engineering logs and geotechnical model. The client must consider how variations in conditions could affect the project and seek advice to reduce risk if it is unacceptable to the client.

Conditions can change

The geotechnical information provided is based on the conditions observed at the time of the investigation. Such conditions may be time dependent and subject to external influences. Many things could influence the site conditions, including geological processes, variation in groundwater or surface water levels, other natural cycles and influence from human activities (on this site or nearby sites). Specific advice should be sought if conditions on site change from those observed at the time the report was prepared.

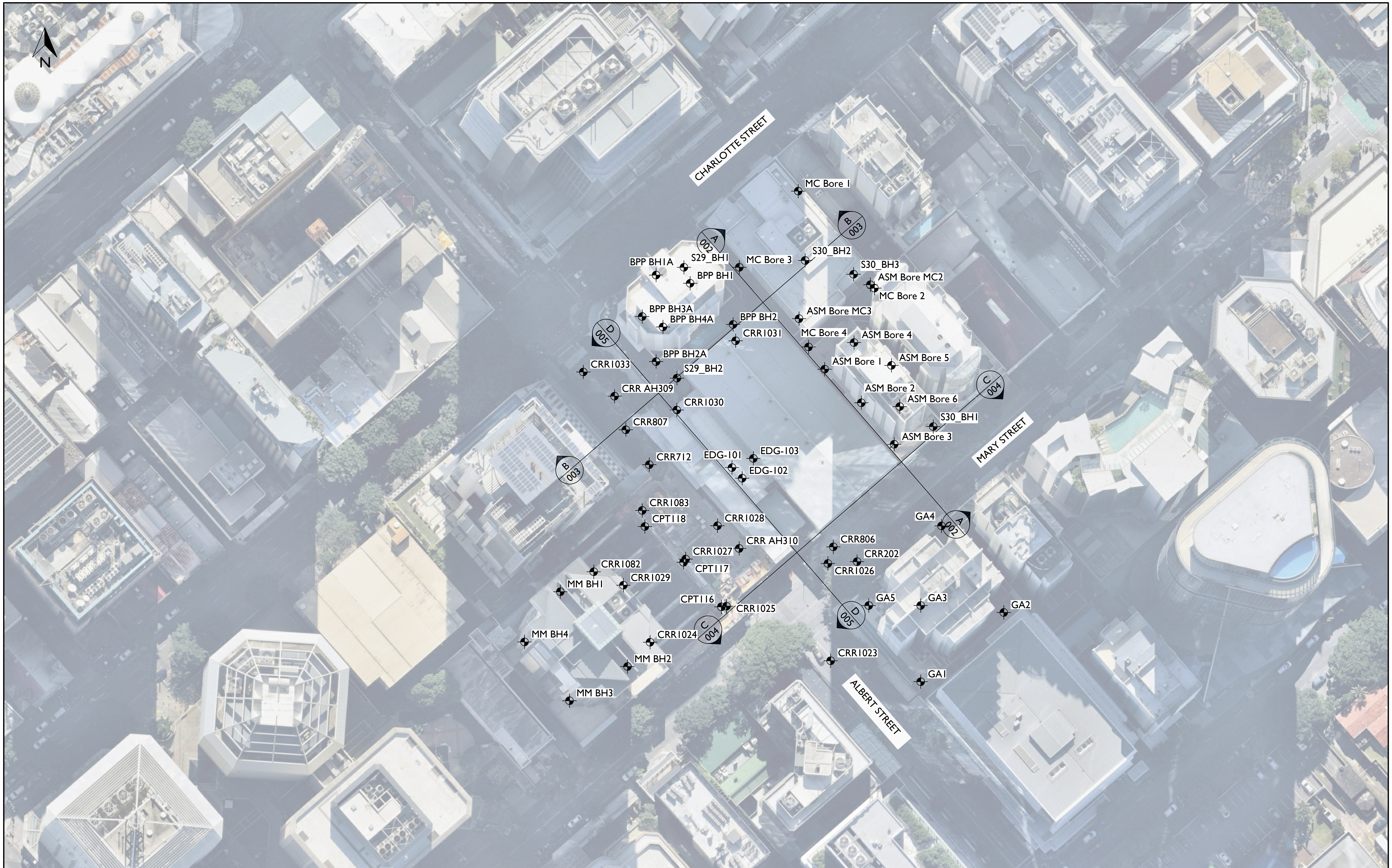
How to deal with different site conditions

The sub-surface conditions on the site may not be as inferred in this report. Geotechnical uncertainties can be managed throughout the project life cycle, but particularly during construction.

Knowledge of site conditions must be further developed as the ground is exposed during construction and/or operation. It is essential that the client implements the nominated design and construction requirements, including observation, interpretation and assessment of the exposed conditions during construction and operation using skilled staff familiar with the design assumptions and assumed geotechnical conditions, or engaging EDG to undertake this role on your behalf. EDG will not be held liable in any way from such misinterpretation.

Appendix A

Geological Cross Sections and Material Parameters



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A	INITIAL ISSUE	DL	30/09/2022	SP
	Revisions/Descriptions	Drawn	Date	Approved

Dwg_Filename.dwg

SURVEY DATA

Coordinate System

Height Datum

Base Plan

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Dimensions shown in metres except where shown otherwise

ENGINEERING CERTIFICATION (RPEQ)

ENG. AREA	NAME	SIGNATURE	NO.	DATE

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ALBERT STREET DEVELOPMENT
BRISBANE
PLAN

Job No.	B01493-01	
DRG No.	B01493-01_001	B
Client Ref.	Client Ref.	

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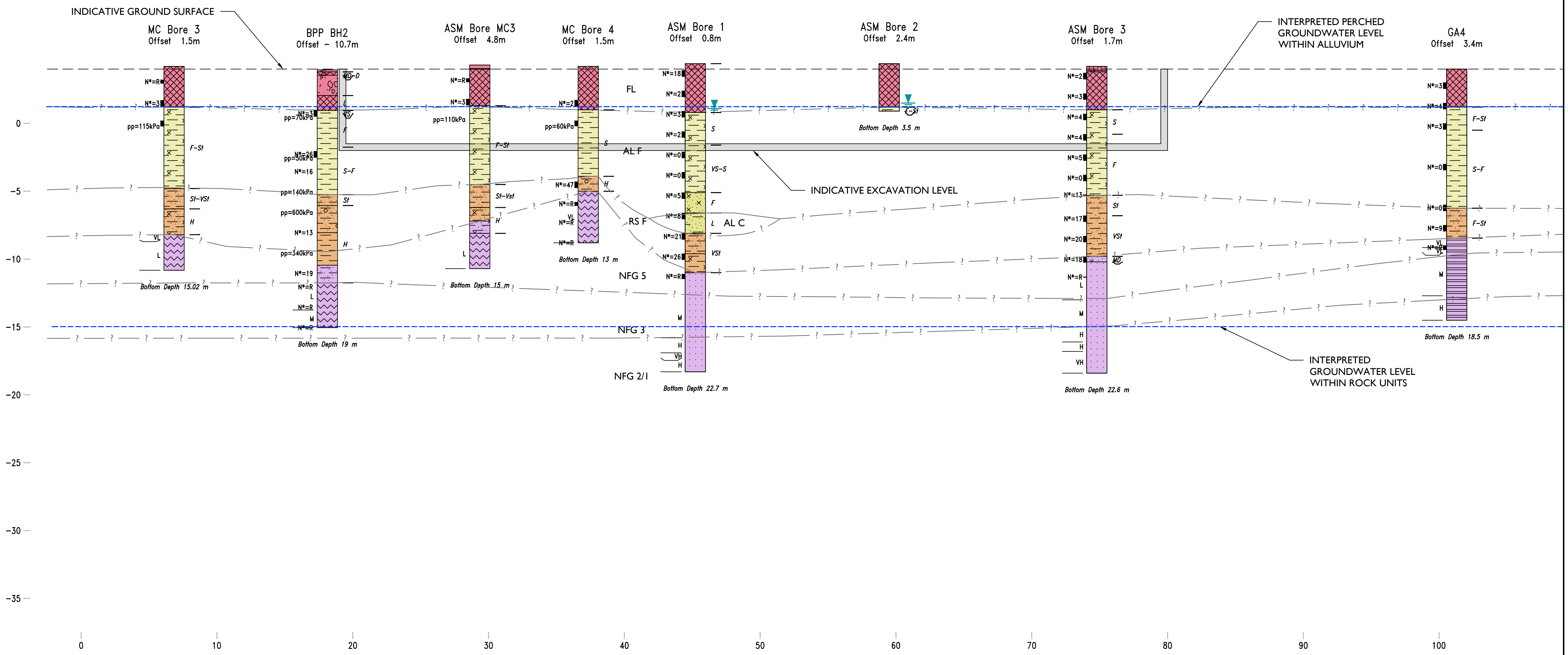

LEGEND

▼	Water Level
N*=17	Standard Penetration Test Results
IV	Rock Classification (Pells et al, 1998)
XW	Weathering (see Explanation Sheets)

FILL
SILTY CLAY
SANDY SILT
CLAYEY SAND
SANDY CLAY
GREYWACKE
TOPSOIL
CONCRETE
SILTY SAND
GRAVEL
CLAYEY GRAVEL
ASPHALT
CLAY
PHYLLITE
SILTY SANDY CLAY
SANDY GRAVELLY CLAY
CORE LOSS
GRAVELLY CLAY
FL
RS F
AL F/AL C
NFG

Rev	Revisions/Descriptions	Drawn	Date	Approved
B	ADDITIONAL INVESTIGATIONS	DL	22/03/2023	DJC
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SURVEY DATA

Coordinate System

Height Datum

Base Plan

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Dimensions shown in metres except where shown otherwise

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SECTION A - NORTH EAST

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DRG No.	B01493-01_002	B
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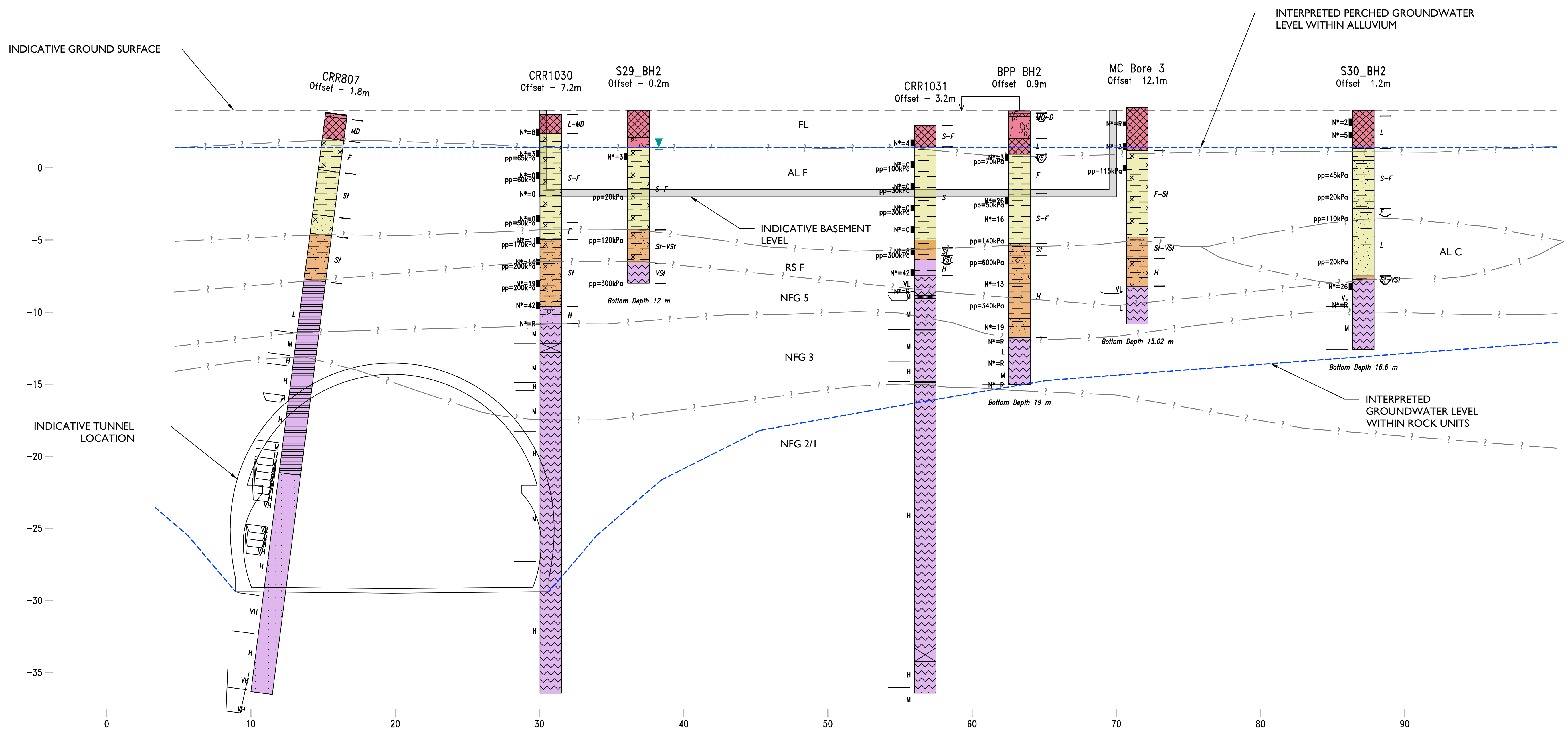

LEGEND

▼	Water Level
N*=17	Standard Penetration Test Results
IV	Rock Classification (Pells et al, 1998)
XW	Weathering (see Explanation Sheets)

FILL
SILTY CLAY
SANDY SILT
CLAYEY SAND
SANDY CLAY
GREYWACKE
TOPSOIL
CONCRETE
SILTY SAND
GRAVEL
CLAYEY GRAVEL
ASPHALT
CLAY
PHYLLITE
SILTY SANDY CLAY
SANDY GRAVELLY CLAY
CORE LOSS
GRAVELLY CLAY
FL
RS F
AL F/AL C
NFG

	Revisions/Descriptions	Drawn	Date	Approved
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SURVEY DATA

Coordinate System

Height Datum

Base Plan

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Dimensions shown in metres except where shown otherwise

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BRISBANE
SECTION B - NORTH WEST

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DRG No.	B01493-01_003	B
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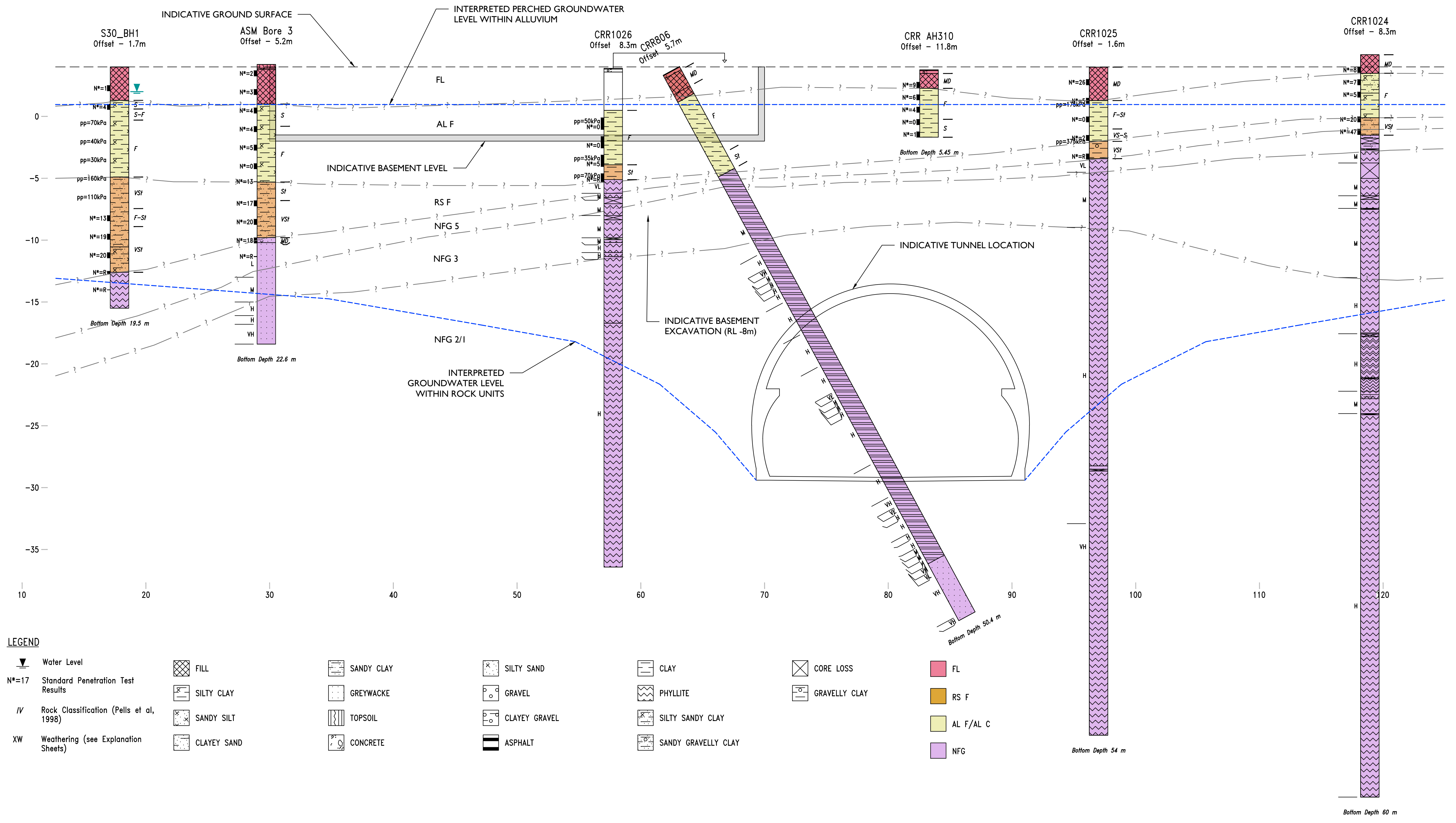

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SURVEY DATA

Coordinate System

Height Datum

Base Plan

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Dimensions shown in metres except where shown otherwise

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SECTION C - SOUTH EAST

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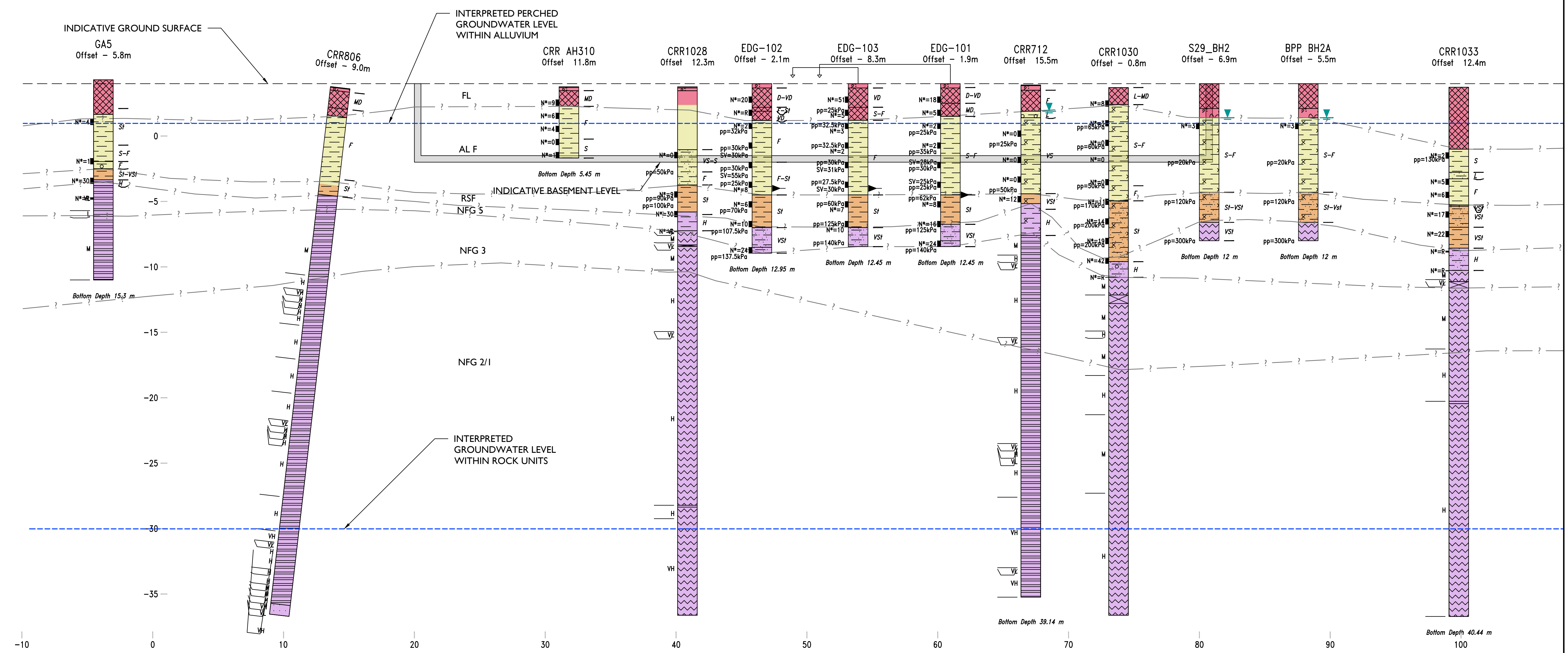

LEGEND

Water Level	FILL	SANDY CLAY	SILTY SAND	CLAY	CORE LOSS	FL
N*=17 Standard Penetration Test Results	SILTY CLAY	GREYWACKE	GRAVEL	PHYLLITE	GRAVELLY CLAY	RS F
IV Rock Classification (Pells et al, 1998)	SANDY SILT	TOPSOIL	CLAYEY GRAVEL	SILTY SANDY CLAY		AL F/AL C
XW Weathering (see Explanation Sheets)	CLAYEY SAND	CONCRETE	ASPHALT	SANDY GRAVELLY CLAY		NFG

Rev	Revisions/Descriptions	Drawn	Date	Approved
B	ADDITIONAL INVESTIGATIONS	DL	22/03/2023	DJC
A	INITIAL ISSUE	DL	30/09/2022	SP

SURVEY DATA

Coordinate System

Height Datum

Base Plan

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Dimensions shown in metres except where shown otherwise

ENGINEERING CERTIFICATION (RPEQ)

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ALBERT STREET DEVELOPMENT
BRISBANE
SECTION D - SOUTH WEST

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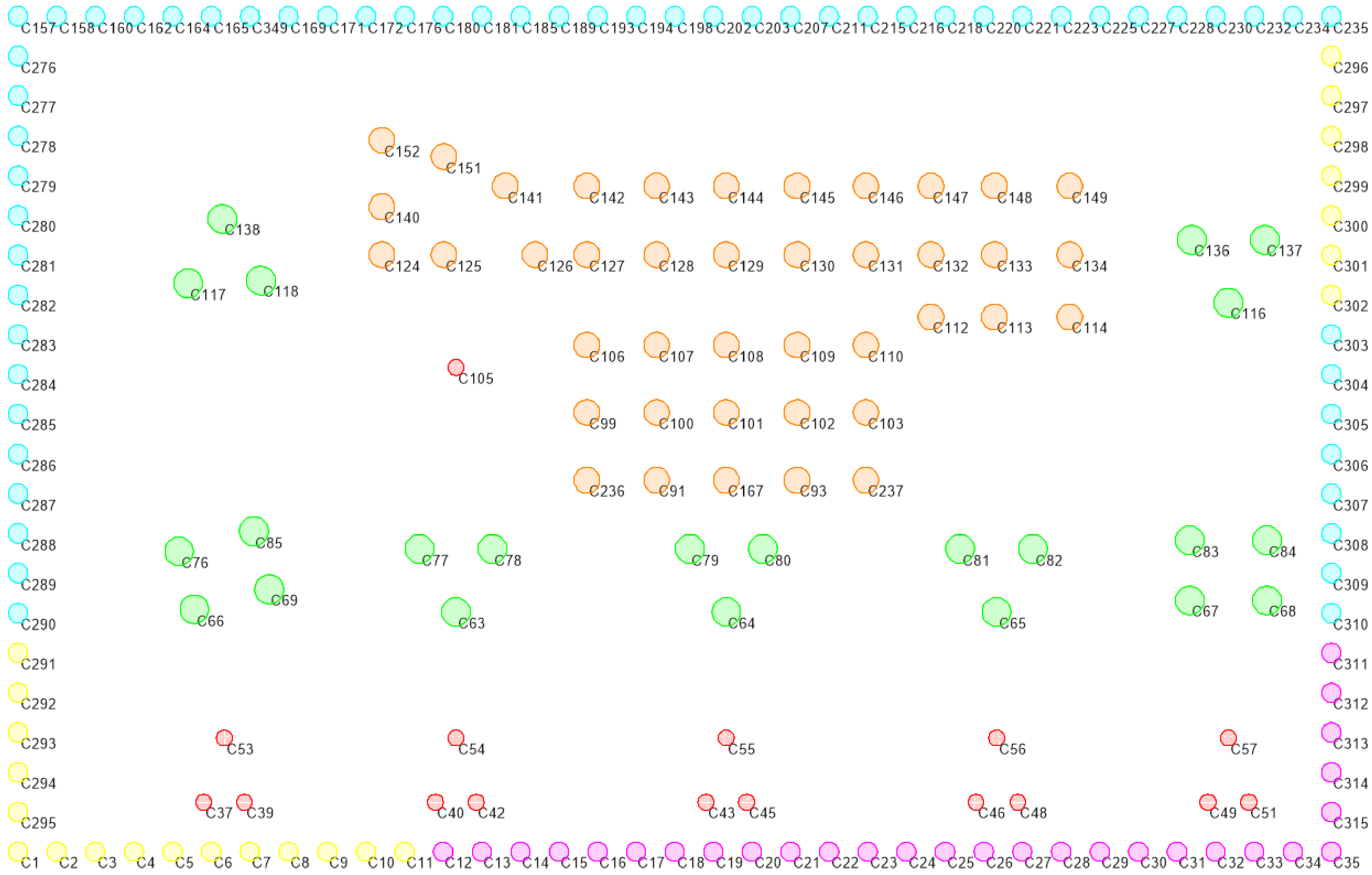
Table A1 – Summary of Material Parameters

Geological Age	Unit	Sub Unit	Materials	Unit Weight	Undrained Shear Strength	Drained Cohesion	Drained Friction Angle	Tensile Strength	Drained Young's Modulus	Drained Poisson's Ratio	Secant Stiffness in Standard Drained Triaxial Test [1]	Tangent Stiffness for Primary Oedometer Loading [1]	Unloading / Reloading Stiffness [1]	Over Consolidation Ratio	At Rest Earth Pressure Coefficient [2]	Vertical Coefficient of Permeability	Horizontal Coefficient of Permeability
				(kN/m³)	s_u (kPa)	c' (kPa)	θ' (degrees)	σ_t (kPa)	E' (MPa)	ν'	E_{50}^{ref} (MPa)	E_{oed}^{ref} (MPa)	E_{ur}^{ref} (MPa)	OCR	K_0	k_v (m/s)	k_h (m/s)
Holocene	Fill	Fill (FL)	Various material including concrete, bricks, granular and fine grained fill	17	N/A	0	25	N/A	10	0.3	N/A	N/A	N/A	N/A	0.7	1E-06	1E-06
		Mass Pour Grout	Grout backfill for temporary access shaft and adits	24	N/A	N/A	N/A	N/A	300	0.2	N/A	N/A	N/A	N/A	1	N/A	N/A
	Holocene Alluvium	Holocene Clay (AL F)	Mainly clay (soft to firm)	17	25 + 2z	4	26	N/A	5 + 0.4z	0.3	3.0	2.0	20	1.5	0.7	1E-07	1E-07
Devonian	Neranleigh Fernvale Beds	Residual Soil (RS F)	Mainly clay (stiff to hard)	20	100	10	30	N/A	25	0.3	N/A	N/A	N/A	3.0	1	1E-09	1E-09
		Extremely Weathered Material to Very Low Strength Rock (NFG 5)	Silt and sand sized sedimentary rocks; slightly metamorphosed (typically called greywacke, phyllite, argillite)	23	N/A	20	30	N/A	50	0.3	N/A	N/A	N/A	N/A	1	1E-07	1E-07
		Medium Strength Rock (NFG 3) [1-5m³ scale (discontinuum)]		27	N/A	250	45	15	1,000	0.2	N/A	N/A	N/A	N/A	1	1E-07	1E-07
		Medium Strength Rock (NFG 3) [tunnel/cavern scale (continuum)]				300	50	75	2,000								
		High to Very High Strength Rock (NFG 2/1) [1-5m³ scale (discontinuum)]		27	N/A	400	55	70	5,000	0.2	N/A	N/A	N/A	N/A	1	1E-07	1E-07
		High to Very High Strength Rock (NFG 2/1) [tunnel/cavern scale (continuum)]				1000	55	300	9,000								

Notes: [1] All stiffness parameters associated with the Hardening Soil Model are presented based on a reference pressure equal to 100 kPa.
[2] Based on $K_0 = (1-\sin(\phi))(OCR)^{\sin(\theta')}$. (Mayne P.W. and Kulhawy F.H., 1982)
[3] The permeability values shown for the rock units do not consider the presence of fault and/or sheared zones.

Appendix B

Structural Loads



SECANT PILE WALL - 900DIA @ 1.8m C/C
STIFFNESS: AXIAL 200 MN/m/m LATERAL 50MN/m/m

SECANT PILE WALL - 900DIA @ 1.8m C/C
STIFFNESS: AXIAL 800 MN/m/m LATERAL 50MN/m/m

SECANT PILE WALL - 900DIA @ 1.8m C/C
STIFFNESS: AXIAL 1000 MN/m/m LATERAL 50MN/m/m

BORED PILE - 1350DIA
STIFFNESS: AXIAL 7500 MN/m LATERAL 135 MN/m

BORED PILE - 1200DIA
STIFFNESS: AXIAL 5300 MN/m LATERAL 120 MN/m

BORED PILE - 750DIA
STIFFNESS: AXIAL 1500 MN/m LATERAL 75 MN/m

24111-SK019-A-PILE LOADS KEYPLAN

27 Feb 26 GM

Element	Action	Load Case	P (kN)	V (kN)
C1	Dead max	Gmax	-491	38
C1	Dead min	Gmin	-373	28
C1	Live	Q	-67	10
C1	Earthquake Tens	EQt	457	315
C1	Earthquake Comp	EQc	-457	315
C1	Wind Tens	Wt	486	261
C1	Wind Comp	Wc	-597	261
C2	Dead max	Gmax	-436	13
C2	Dead min	Gmin	-333	9
C2	Live	Q	-63	6
C2	Earthquake Tens	EQt	305	236
C2	Earthquake Comp	EQc	-305	236
C2	Wind Tens	Wt	330	110
C2	Wind Comp	Wc	-405	110
C3	Dead max	Gmax	-406	16
C3	Dead min	Gmin	-311	12
C3	Live	Q	-65	8
C3	Earthquake Tens	EQt	199	245
C3	Earthquake Comp	EQc	-199	245
C3	Wind Tens	Wt	220	106
C3	Wind Comp	Wc	-270	106
C4	Dead max	Gmax	-396	26
C4	Dead min	Gmin	-303	19
C4	Live	Q	-71	11
C4	Earthquake Tens	EQt	127	252
C4	Earthquake Comp	EQc	-127	252
C4	Wind Tens	Wt	147	106
C4	Wind Comp	Wc	-180	106
C5	Dead max	Gmax	-402	39
C5	Dead min	Gmin	-306	28
C5	Live	Q	-81	15
C5	Earthquake Tens	EQt	81	256
C5	Earthquake Comp	EQc	-81	256
C5	Wind Tens	Wt	102	112
C5	Wind Comp	Wc	-126	112
C6	Dead max	Gmax	-405	49
C6	Dead min	Gmin	-307	34
C6	Live	Q	-89	19
C6	Earthquake Tens	EQt	55	258
C6	Earthquake Comp	EQc	-55	258
C6	Wind Tens	Wt	77	115
C6	Wind Comp	Wc	-94	115
C7	Dead max	Gmax	-392	49
C7	Dead min	Gmin	-297	35
C7	Live	Q	-96	22
C7	Earthquake Tens	EQt	37	260
C7	Earthquake Comp	EQc	-37	260

C7	Wind Tens	Wt	56	117
C7	Wind Comp	Wc	-69	117
C8	Dead max	Gmax	-365	45
C8	Dead min	Gmin	-276	32
C8	Live	Q	-98	27
C8	Earthquake Tens	EQt	23	265
C8	Earthquake Comp	EQc	-23	265
C8	Wind Tens	Wt	38	119
C8	Wind Comp	Wc	-47	119
C9	Dead max	Gmax	-333	44
C9	Dead min	Gmin	-251	31
C9	Live	Q	-96	30
C9	Earthquake Tens	EQt	14	267
C9	Earthquake Comp	EQc	-14	267
C9	Wind Tens	Wt	26	120
C9	Wind Comp	Wc	-32	120
C10	Dead max	Gmax	-294	45
C10	Dead min	Gmin	-221	31
C10	Live	Q	-84	29
C10	Earthquake Tens	EQt	11	268
C10	Earthquake Comp	EQc	-11	268
C10	Wind Tens	Wt	21	121
C10	Wind Comp	Wc	-25	121
C11	Dead max	Gmax	-243	48
C11	Dead min	Gmin	-181	33
C11	Live	Q	-66	24
C11	Earthquake Tens	EQt	12	268
C11	Earthquake Comp	EQc	-12	268
C11	Wind Tens	Wt	20	121
C11	Wind Comp	Wc	-23	121
C12	Dead max	Gmax	-759	50
C12	Dead min	Gmin	-561	35
C12	Live	Q	-186	19
C12	Earthquake Tens	EQt	43	265
C12	Earthquake Comp	EQc	-43	265
C12	Wind Tens	Wt	76	120
C12	Wind Comp	Wc	-91	120
C13	Dead max	Gmax	-578	49
C13	Dead min	Gmin	-425	34
C13	Live	Q	-141	20
C13	Earthquake Tens	EQt	33	267
C13	Earthquake Comp	EQc	-33	267
C13	Wind Tens	Wt	61	120
C13	Wind Comp	Wc	-75	120
C14	Dead max	Gmax	-463	54
C14	Dead min	Gmin	-339	37
C14	Live	Q	-128	30
C14	Earthquake Tens	EQt	13	269

C14	Earthquake Comp	EQc	-13	269
C14	Wind Tens	Wt	27	120
C14	Wind Comp	Wc	-34	120
C15	Dead max	Gmax	-436	61
C15	Dead min	Gmin	-315	41
C15	Live	Q	-136	37
C15	Earthquake Tens	EQt	7	270
C15	Earthquake Comp	EQc	-7	270
C15	Wind Tens	Wt	9	119
C15	Wind Comp	Wc	-11	119
C16	Dead max	Gmax	-432	64
C16	Dead min	Gmin	-305	41
C16	Live	Q	-136	38
C16	Earthquake Tens	EQt	10	269
C16	Earthquake Comp	EQc	-10	269
C16	Wind Tens	Wt	4	118
C16	Wind Comp	Wc	-4	118
C17	Dead max	Gmax	-417	57
C17	Dead min	Gmin	-288	36
C17	Live	Q	-120	33
C17	Earthquake Tens	EQt	34	267
C17	Earthquake Comp	EQc	-34	267
C17	Wind Tens	Wt	16	116
C17	Wind Comp	Wc	-15	116
C18	Dead max	Gmax	-385	43
C18	Dead min	Gmin	-264	26
C18	Live	Q	-94	23
C18	Earthquake Tens	EQt	6	263
C18	Earthquake Comp	EQc	-6	263
C18	Wind Tens	Wt	7	114
C18	Wind Comp	Wc	-6	114
C19	Dead max	Gmax	-361	34
C19	Dead min	Gmin	-247	19
C19	Live	Q	-76	16
C19	Earthquake Tens	EQt	33	267
C19	Earthquake Comp	EQc	-33	267
C19	Wind Tens	Wt	15	114
C19	Wind Comp	Wc	-16	114
C20	Dead max	Gmax	-368	36
C20	Dead min	Gmin	-253	21
C20	Live	Q	-81	18
C20	Earthquake Tens	EQt	8	269
C20	Earthquake Comp	EQc	-8	269
C20	Wind Tens	Wt	6	114
C20	Wind Comp	Wc	-6	114
C21	Dead max	Gmax	-401	47
C21	Dead min	Gmin	-277	29
C21	Live	Q	-104	26

C21	Earthquake Tens	EQt	6	269
C21	Earthquake Comp	EQc	-6	269
C21	Wind Tens	Wt	7	113
C21	Wind Comp	Wc	-6	113
C22	Dead max	Gmax	-427	58
C22	Dead min	Gmin	-299	37
C22	Live	Q	-128	35
C22	Earthquake Tens	EQt	13	268
C22	Earthquake Comp	EQc	-13	268
C22	Wind Tens	Wt	7	114
C22	Wind Comp	Wc	-6	114
C23	Dead max	Gmax	-431	61
C23	Dead min	Gmin	-309	40
C23	Live	Q	-139	38
C23	Earthquake Tens	EQt	27	266
C23	Earthquake Comp	EQc	-27	266
C23	Wind Tens	Wt	12	114
C23	Wind Comp	Wc	-11	114
C24	Dead max	Gmax	-425	58
C24	Dead min	Gmin	-311	39
C24	Live	Q	-131	35
C24	Earthquake Tens	EQt	22	264
C24	Earthquake Comp	EQc	-22	264
C24	Wind Tens	Wt	14	115
C24	Wind Comp	Wc	-16	115
C25	Dead max	Gmax	-432	54
C25	Dead min	Gmin	-319	37
C25	Live	Q	-113	27
C25	Earthquake Tens	EQt	30	267
C25	Earthquake Comp	EQc	-30	267
C25	Wind Tens	Wt	33	118
C25	Wind Comp	Wc	-39	118
C26	Dead max	Gmax	-481	52
C26	Dead min	Gmin	-354	36
C26	Live	Q	-111	20
C26	Earthquake Tens	EQt	27	268
C26	Earthquake Comp	EQc	-27	268
C26	Wind Tens	Wt	53	121
C26	Wind Comp	Wc	-66	121
C27	Dead max	Gmax	-471	51
C27	Dead min	Gmin	-347	35
C27	Live	Q	-110	21
C27	Earthquake Tens	EQt	23	267
C27	Earthquake Comp	EQc	-23	267
C27	Wind Tens	Wt	46	122
C27	Wind Comp	Wc	-58	122
C28	Dead max	Gmax	-442	50
C28	Dead min	Gmin	-326	34

C28	Live	Q	-120	26
C28	Earthquake Tens	EQt	22	265
C28	Earthquake Comp	EQc	-22	265
C28	Wind Tens	Wt	32	121
C28	Wind Comp	Wc	-38	121
C29	Dead max	Gmax	-418	51
C29	Dead min	Gmin	-313	36
C29	Live	Q	-129	32
C29	Earthquake Tens	EQt	12	260
C29	Earthquake Comp	EQc	-12	260
C29	Wind Tens	Wt	18	119
C29	Wind Comp	Wc	-21	119
C30	Dead max	Gmax	-419	53
C30	Dead min	Gmin	-315	38
C30	Live	Q	-129	32
C30	Earthquake Tens	EQt	42	260
C30	Earthquake Comp	EQc	-42	260
C30	Wind Tens	Wt	20	119
C30	Wind Comp	Wc	-23	119
C31	Dead max	Gmax	-432	54
C31	Dead min	Gmin	-323	38
C31	Live	Q	-114	27
C31	Earthquake Tens	EQt	35	259
C31	Earthquake Comp	EQc	-35	259
C31	Wind Tens	Wt	44	119
C31	Wind Comp	Wc	-53	119
C32	Dead max	Gmax	-476	50
C32	Dead min	Gmin	-350	35
C32	Live	Q	-105	19
C32	Earthquake Tens	EQt	68	256
C32	Earthquake Comp	EQc	-68	256
C32	Wind Tens	Wt	92	117
C32	Wind Comp	Wc	-113	117
C33	Dead max	Gmax	-442	37
C33	Dead min	Gmin	-323	25
C33	Live	Q	-84	12
C33	Earthquake Tens	EQt	137	249
C33	Earthquake Comp	EQc	-137	249
C33	Wind Tens	Wt	160	113
C33	Wind Comp	Wc	-191	113
C34	Dead max	Gmax	-376	22
C34	Dead min	Gmin	-276	15
C34	Live	Q	-63	7
C34	Earthquake Tens	EQt	290	239
C34	Earthquake Comp	EQc	-290	239
C34	Wind Tens	Wt	296	111
C34	Wind Comp	Wc	-345	111
C35	Dead max	Gmax	-336	37

C35	Dead min	Gmin	-248	26
C35	Live	Q	-48	10
C35	Earthquake Tens	EQt	626	321
C35	Earthquake Comp	EQc	-626	321
C35	Wind Tens	Wt	613	312
C35	Wind Comp	Wc	-710	312
C157	Dead max	Gmax	-326	45
C157	Dead min	Gmin	-267	34
C157	Live	Q	-14	8
C157	Earthquake Tens	EQt	771	394
C157	Earthquake Comp	EQc	-771	394
C157	Wind Tens	Wt	1038	274
C157	Wind Comp	Wc	-920	274
C158	Dead max	Gmax	-536	43
C158	Dead min	Gmin	-419	33
C158	Live	Q	-67	9
C158	Earthquake Tens	EQt	397	324
C158	Earthquake Comp	EQc	-397	324
C158	Wind Tens	Wt	578	100
C158	Wind Comp	Wc	-511	100
C160	Dead max	Gmax	-730	47
C160	Dead min	Gmin	-560	36
C160	Live	Q	-124	11
C160	Earthquake Tens	EQt	195	334
C160	Earthquake Comp	EQc	-195	334
C160	Wind Tens	Wt	328	104
C160	Wind Comp	Wc	-289	104
C162	Dead max	Gmax	-875	49
C162	Dead min	Gmin	-666	38
C162	Live	Q	-165	12
C162	Earthquake Tens	EQt	102	341
C162	Earthquake Comp	EQc	-102	341
C162	Wind Tens	Wt	216	111
C162	Wind Comp	Wc	-185	111
C164	Dead max	Gmax	-1033	48
C164	Dead min	Gmin	-783	37
C164	Live	Q	-202	12
C164	Earthquake Tens	EQt	78	346
C164	Earthquake Comp	EQc	-78	346
C164	Wind Tens	Wt	199	117
C164	Wind Comp	Wc	-167	117
C165	Dead max	Gmax	-1170	44
C165	Dead min	Gmin	-884	34
C165	Live	Q	-228	12
C165	Earthquake Tens	EQt	67	347
C165	Earthquake Comp	EQc	-67	347
C165	Wind Tens	Wt	243	119
C165	Wind Comp	Wc	-205	119

C169	Dead max	Gmax	-961	35
C169	Dead min	Gmin	-732	27
C169	Live	Q	-185	11
C169	Earthquake Tens	EQt	67	356
C169	Earthquake Comp	EQc	-67	356
C169	Wind Tens	Wt	233	123
C169	Wind Comp	Wc	-195	123
C171	Dead max	Gmax	-868	30
C171	Dead min	Gmin	-665	23
C171	Live	Q	-163	11
C171	Earthquake Tens	EQt	71	361
C171	Earthquake Comp	EQc	-71	361
C171	Wind Tens	Wt	285	125
C171	Wind Comp	Wc	-242	125
C172	Dead max	Gmax	-791	26
C172	Dead min	Gmin	-612	19
C172	Live	Q	-149	11
C172	Earthquake Tens	EQt	101	362
C172	Earthquake Comp	EQc	-101	362
C172	Wind Tens	Wt	404	124
C172	Wind Comp	Wc	-346	124
C176	Dead max	Gmax	-731	22
C176	Dead min	Gmin	-571	17
C176	Live	Q	-148	13
C176	Earthquake Tens	EQt	114	361
C176	Earthquake Comp	EQc	-114	361
C176	Wind Tens	Wt	457	120
C176	Wind Comp	Wc	-387	120
C180	Dead max	Gmax	-718	21
C180	Dead min	Gmin	-564	16
C180	Live	Q	-163	16
C180	Earthquake Tens	EQt	122	360
C180	Earthquake Comp	EQc	-122	360
C180	Wind Tens	Wt	479	115
C180	Wind Comp	Wc	-403	115
C181	Dead max	Gmax	-690	19
C181	Dead min	Gmin	-543	15
C181	Live	Q	-173	18
C181	Earthquake Tens	EQt	102	364
C181	Earthquake Comp	EQc	-102	364
C181	Wind Tens	Wt	336	112
C181	Wind Comp	Wc	-288	112
C185	Dead max	Gmax	-655	21
C185	Dead min	Gmin	-516	16
C185	Live	Q	-175	20
C185	Earthquake Tens	EQt	76	368
C185	Earthquake Comp	EQc	-76	368
C185	Wind Tens	Wt	247	112

C185	Wind Comp	Wc	-211	112
C189	Dead max	Gmax	-643	21
C189	Dead min	Gmin	-507	16
C189	Live	Q	-178	21
C189	Earthquake Tens	EQt	36	371
C189	Earthquake Comp	EQc	-36	371
C189	Wind Tens	Wt	193	112
C189	Wind Comp	Wc	-157	112
C193	Dead max	Gmax	-648	21
C193	Dead min	Gmin	-512	16
C193	Live	Q	-182	21
C193	Earthquake Tens	EQt	30	373
C193	Earthquake Comp	EQc	-30	373
C193	Wind Tens	Wt	178	111
C193	Wind Comp	Wc	-145	111
C194	Dead max	Gmax	-638	21
C194	Dead min	Gmin	-504	16
C194	Live	Q	-185	21
C194	Earthquake Tens	EQt	35	370
C194	Earthquake Comp	EQc	-35	370
C194	Wind Tens	Wt	165	109
C194	Wind Comp	Wc	-135	109
C198	Dead max	Gmax	-618	20
C198	Dead min	Gmin	-489	15
C198	Live	Q	-191	20
C198	Earthquake Tens	EQt	27	365
C198	Earthquake Comp	EQc	-27	365
C198	Wind Tens	Wt	143	105
C198	Wind Comp	Wc	-116	105
C202	Dead max	Gmax	-629	20
C202	Dead min	Gmin	-498	15
C202	Live	Q	-208	20
C202	Earthquake Tens	EQt	31	372
C202	Earthquake Comp	EQc	-31	372
C202	Wind Tens	Wt	140	106
C202	Wind Comp	Wc	-113	106
C203	Dead max	Gmax	-634	20
C203	Dead min	Gmin	-503	15
C203	Live	Q	-226	20
C203	Earthquake Tens	EQt	32	375
C203	Earthquake Comp	EQc	-32	375
C203	Wind Tens	Wt	147	106
C203	Wind Comp	Wc	-119	106
C207	Dead max	Gmax	-618	21
C207	Dead min	Gmin	-490	15
C207	Live	Q	-230	20
C207	Earthquake Tens	EQt	37	375
C207	Earthquake Comp	EQc	-37	375

C207	Wind Tens	Wt	149	104
C207	Wind Comp	Wc	-120	104
C211	Dead max	Gmax	-609	20
C211	Dead min	Gmin	-483	15
C211	Live	Q	-232	20
C211	Earthquake Tens	EQt	54	373
C211	Earthquake Comp	EQc	-54	373
C211	Wind Tens	Wt	175	103
C211	Wind Comp	Wc	-143	103
C215	Dead max	Gmax	-612	20
C215	Dead min	Gmin	-486	15
C215	Live	Q	-236	19
C215	Earthquake Tens	EQt	81	370
C215	Earthquake Comp	EQc	-81	370
C215	Wind Tens	Wt	243	103
C215	Wind Comp	Wc	-197	103
C216	Dead max	Gmax	-583	20
C216	Dead min	Gmin	-468	15
C216	Live	Q	-225	19
C216	Earthquake Tens	EQt	102	366
C216	Earthquake Comp	EQc	-102	366
C216	Wind Tens	Wt	385	104
C216	Wind Comp	Wc	-313	104
C218	Dead max	Gmax	-537	21
C218	Dead min	Gmin	-438	15
C218	Live	Q	-205	20
C218	Earthquake Tens	EQt	171	368
C218	Earthquake Comp	EQc	-171	368
C218	Wind Tens	Wt	658	107
C218	Wind Comp	Wc	-536	107
C220	Dead max	Gmax	-499	21
C220	Dead min	Gmin	-418	15
C220	Live	Q	-187	20
C220	Earthquake Tens	EQt	308	369
C220	Earthquake Comp	EQc	-308	369
C220	Wind Tens	Wt	1166	110
C220	Wind Comp	Wc	-950	110
C221	Dead max	Gmax	-425	22
C221	Dead min	Gmin	-379	16
C221	Live	Q	-147	21
C221	Earthquake Tens	EQt	593	368
C221	Earthquake Comp	EQc	-593	368
C221	Wind Tens	Wt	2151	108
C221	Wind Comp	Wc	-1755	108
C223	Dead max	Gmax	-340	24
C223	Dead min	Gmin	-334	18
C223	Live	Q	-98	23
C223	Earthquake Tens	EQt	959	363

C223	Earthquake Comp	EQc	-959	363
C223	Wind Tens	Wt	3425	102
C223	Wind Comp	Wc	-2794	102
C225	Dead max	Gmax	-418	29
C225	Dead min	Gmin	-381	21
C225	Live	Q	-107	26
C225	Earthquake Tens	EQt	844	355
C225	Earthquake Comp	EQc	-844	355
C225	Wind Tens	Wt	3038	132
C225	Wind Comp	Wc	-2479	132
C227	Dead max	Gmax	-627	35
C227	Dead min	Gmin	-511	25
C227	Live	Q	-156	30
C227	Earthquake Tens	EQt	483	355
C227	Earthquake Comp	EQc	-483	355
C227	Wind Tens	Wt	1765	155
C227	Wind Comp	Wc	-1440	155
C228	Dead max	Gmax	-813	36
C228	Dead min	Gmin	-633	26
C228	Live	Q	-195	31
C228	Earthquake Tens	EQt	298	353
C228	Earthquake Comp	EQc	-298	353
C228	Wind Tens	Wt	1021	152
C228	Wind Comp	Wc	-834	152
C230	Dead max	Gmax	-940	32
C230	Dead min	Gmin	-717	24
C230	Live	Q	-211	28
C230	Earthquake Tens	EQt	211	345
C230	Earthquake Comp	EQc	-211	345
C230	Wind Tens	Wt	685	136
C230	Wind Comp	Wc	-559	136
C232	Dead max	Gmax	-983	24
C232	Dead min	Gmin	-744	19
C232	Live	Q	-208	21
C232	Earthquake Tens	EQt	220	335
C232	Earthquake Comp	EQc	-220	335
C232	Wind Tens	Wt	552	126
C232	Wind Comp	Wc	-451	126
C234	Dead max	Gmax	-875	18
C234	Dead min	Gmin	-664	14
C234	Live	Q	-171	11
C234	Earthquake Tens	EQt	356	322
C234	Earthquake Comp	EQc	-356	322
C234	Wind Tens	Wt	542	120
C234	Wind Comp	Wc	-444	120
C235	Dead max	Gmax	-680	19
C235	Dead min	Gmin	-525	14
C235	Live	Q	-128	5

C235	Earthquake Tens	EQt	686	385
C235	Earthquake Comp	EQc	-686	385
C235	Wind Tens	Wt	793	316
C235	Wind Comp	Wc	-652	316
C276	Dead max	Gmax	-529	32
C276	Dead min	Gmin	-412	23
C276	Live	Q	-65	6
C276	Earthquake Tens	EQt	338	288
C276	Earthquake Comp	EQc	-338	288
C276	Wind Tens	Wt	415	290
C276	Wind Comp	Wc	-372	290
C277	Dead max	Gmax	-643	45
C277	Dead min	Gmin	-493	33
C277	Live	Q	-106	11
C277	Earthquake Tens	EQt	211	299
C277	Earthquake Comp	EQc	-211	299
C277	Wind Tens	Wt	317	308
C277	Wind Comp	Wc	-280	308
C278	Dead max	Gmax	-762	58
C278	Dead min	Gmin	-577	43
C278	Live	Q	-133	16
C278	Earthquake Tens	EQt	71	307
C278	Earthquake Comp	EQc	-71	307
C278	Wind Tens	Wt	25	322
C278	Wind Comp	Wc	-29	322
C279	Dead max	Gmax	-792	63
C279	Dead min	Gmin	-598	47
C279	Live	Q	-130	17
C279	Earthquake Tens	EQt	21	314
C279	Earthquake Comp	EQc	-21	314
C279	Wind Tens	Wt	7	336
C279	Wind Comp	Wc	-8	336
C280	Dead max	Gmax	-747	61
C280	Dead min	Gmin	-563	45
C280	Live	Q	-110	17
C280	Earthquake Tens	EQt	36	314
C280	Earthquake Comp	EQc	-36	314
C280	Wind Tens	Wt	66	336
C280	Wind Comp	Wc	-57	336
C281	Dead max	Gmax	-842	56
C281	Dead min	Gmin	-628	41
C281	Live	Q	-123	16
C281	Earthquake Tens	EQt	143	313
C281	Earthquake Comp	EQc	-143	313
C281	Wind Tens	Wt	186	338
C281	Wind Comp	Wc	-217	338
C282	Dead max	Gmax	-800	53
C282	Dead min	Gmin	-593	39

C282	Live	Q	-101	16
C282	Earthquake Tens	EQt	59	309
C282	Earthquake Comp	EQc	-59	309
C282	Wind Tens	Wt	86	336
C282	Wind Comp	Wc	-73	336
C283	Dead max	Gmax	-814	54
C283	Dead min	Gmin	-605	39
C283	Live	Q	-107	17
C283	Earthquake Tens	EQt	33	315
C283	Earthquake Comp	EQc	-33	315
C283	Wind Tens	Wt	13	342
C283	Wind Comp	Wc	-11	342
C284	Dead max	Gmax	-886	58
C284	Dead min	Gmin	-660	42
C284	Live	Q	-118	18
C284	Earthquake Tens	EQt	28	321
C284	Earthquake Comp	EQc	-28	321
C284	Wind Tens	Wt	35	351
C284	Wind Comp	Wc	-38	351
C285	Dead max	Gmax	-839	60
C285	Dead min	Gmin	-629	43
C285	Live	Q	-108	19
C285	Earthquake Tens	EQt	88	321
C285	Earthquake Comp	EQc	-88	321
C285	Wind Tens	Wt	137	349
C285	Wind Comp	Wc	-116	349
C286	Dead max	Gmax	-902	59
C286	Dead min	Gmin	-676	43
C286	Live	Q	-123	18
C286	Earthquake Tens	EQt	74	320
C286	Earthquake Comp	EQc	-74	320
C286	Wind Tens	Wt	102	348
C286	Wind Comp	Wc	-118	348
C287	Dead max	Gmax	-864	58
C287	Dead min	Gmin	-651	42
C287	Live	Q	-113	17
C287	Earthquake Tens	EQt	14	320
C287	Earthquake Comp	EQc	-14	320
C287	Wind Tens	Wt	20	348
C287	Wind Comp	Wc	-18	348
C288	Dead max	Gmax	-806	53
C288	Dead min	Gmin	-611	38
C288	Live	Q	-110	15
C288	Earthquake Tens	EQt	25	311
C288	Earthquake Comp	EQc	-25	311
C288	Wind Tens	Wt	9	337
C288	Wind Comp	Wc	-10	337
C289	Dead max	Gmax	-876	46

C289	Dead min	Gmin	-667	32
C289	Live	Q	-134	12
C289	Earthquake Tens	EQt	100	303
C289	Earthquake Comp	EQc	-100	303
C289	Wind Tens	Wt	128	328
C289	Wind Comp	Wc	-149	328
C290	Dead max	Gmax	-876	38
C290	Dead min	Gmin	-675	26
C290	Live	Q	-144	10
C290	Earthquake Tens	EQt	68	304
C290	Earthquake Comp	EQc	-68	304
C290	Wind Tens	Wt	100	327
C290	Wind Comp	Wc	-88	327
C291	Dead max	Gmax	-322	32
C291	Dead min	Gmin	-247	23
C291	Live	Q	-56	9
C291	Earthquake Tens	EQt	43	300
C291	Earthquake Comp	EQc	-43	300
C291	Wind Tens	Wt	54	321
C291	Wind Comp	Wc	-65	321
C292	Dead max	Gmax	-380	34
C292	Dead min	Gmin	-292	24
C292	Live	Q	-65	10
C292	Earthquake Tens	EQt	70	296
C292	Earthquake Comp	EQc	-70	296
C292	Wind Tens	Wt	80	316
C292	Wind Comp	Wc	-99	316
C293	Dead max	Gmax	-413	36
C293	Dead min	Gmin	-317	26
C293	Live	Q	-66	10
C293	Earthquake Tens	EQt	105	284
C293	Earthquake Comp	EQc	-105	284
C293	Wind Tens	Wt	110	299
C293	Wind Comp	Wc	-134	299
C294	Dead max	Gmax	-463	37
C294	Dead min	Gmin	-353	27
C294	Live	Q	-71	10
C294	Earthquake Tens	EQt	210	271
C294	Earthquake Comp	EQc	-210	271
C294	Wind Tens	Wt	238	283
C294	Wind Comp	Wc	-292	283
C295	Dead max	Gmax	-475	40
C295	Dead min	Gmin	-361	29
C295	Live	Q	-65	10
C295	Earthquake Tens	EQt	299	258
C295	Earthquake Comp	EQc	-299	258
C295	Wind Tens	Wt	319	267
C295	Wind Comp	Wc	-391	267

C296	Dead max	Gmax	-245	19
C296	Dead min	Gmin	-190	13
C296	Live	Q	-60	13
C296	Earthquake Tens	EQt	118	271
C296	Earthquake Comp	EQc	-118	271
C296	Wind Tens	Wt	137	323
C296	Wind Comp	Wc	-112	323
C297	Dead max	Gmax	-296	33
C297	Dead min	Gmin	-228	24
C297	Live	Q	-80	25
C297	Earthquake Tens	EQt	73	279
C297	Earthquake Comp	EQc	-73	279
C297	Wind Tens	Wt	79	338
C297	Wind Comp	Wc	-65	338
C298	Dead max	Gmax	-337	44
C298	Dead min	Gmin	-258	32
C298	Live	Q	-93	31
C298	Earthquake Tens	EQt	43	285
C298	Earthquake Comp	EQc	-43	285
C298	Wind Tens	Wt	44	348
C298	Wind Comp	Wc	-36	348
C299	Dead max	Gmax	-366	45
C299	Dead min	Gmin	-278	33
C299	Live	Q	-95	26
C299	Earthquake Tens	EQt	24	288
C299	Earthquake Comp	EQc	-24	288
C299	Wind Tens	Wt	25	355
C299	Wind Comp	Wc	-21	355
C300	Dead max	Gmax	-378	46
C300	Dead min	Gmin	-285	33
C300	Live	Q	-88	18
C300	Earthquake Tens	EQt	16	288
C300	Earthquake Comp	EQc	-16	288
C300	Wind Tens	Wt	8	357
C300	Wind Comp	Wc	-8	357
C301	Dead max	Gmax	-350	53
C301	Dead min	Gmin	-264	38
C301	Live	Q	-74	16
C301	Earthquake Tens	EQt	22	287
C301	Earthquake Comp	EQc	-22	287
C301	Wind Tens	Wt	13	357
C301	Wind Comp	Wc	-15	357
C302	Dead max	Gmax	-298	59
C302	Dead min	Gmin	-225	43
C302	Live	Q	-58	16
C302	Earthquake Tens	EQt	9	283
C302	Earthquake Comp	EQc	-9	283
C302	Wind Tens	Wt	3	353

C302	Wind Comp	Wc	-3	353
C303	Dead max	Gmax	-816	64
C303	Dead min	Gmin	-616	46
C303	Live	Q	-159	17
C303	Earthquake Tens	EQt	36	290
C303	Earthquake Comp	EQc	-36	290
C303	Wind Tens	Wt	48	362
C303	Wind Comp	Wc	-39	362
C304	Dead max	Gmax	-647	66
C304	Dead min	Gmin	-493	47
C304	Live	Q	-126	19
C304	Earthquake Tens	EQt	20	293
C304	Earthquake Comp	EQc	-20	293
C304	Wind Tens	Wt	19	367
C304	Wind Comp	Wc	-16	367
C305	Dead max	Gmax	-597	63
C305	Dead min	Gmin	-456	46
C305	Live	Q	-119	19
C305	Earthquake Tens	EQt	14	295
C305	Earthquake Comp	EQc	-14	295
C305	Wind Tens	Wt	12	369
C305	Wind Comp	Wc	-10	369
C306	Dead max	Gmax	-561	65
C306	Dead min	Gmin	-429	47
C306	Live	Q	-107	19
C306	Earthquake Tens	EQt	13	294
C306	Earthquake Comp	EQc	-13	294
C306	Wind Tens	Wt	7	368
C306	Wind Comp	Wc	-8	368
C307	Dead max	Gmax	-503	72
C307	Dead min	Gmin	-384	52
C307	Live	Q	-82	20
C307	Earthquake Tens	EQt	26	293
C307	Earthquake Comp	EQc	-26	293
C307	Wind Tens	Wt	33	366
C307	Wind Comp	Wc	-40	366
C308	Dead max	Gmax	-438	77
C308	Dead min	Gmin	-337	56
C308	Live	Q	-61	19
C308	Earthquake Tens	EQt	52	289
C308	Earthquake Comp	EQc	-52	289
C308	Wind Tens	Wt	59	361
C308	Wind Comp	Wc	-72	361
C309	Dead max	Gmax	-400	75
C309	Dead min	Gmin	-310	55
C309	Live	Q	-55	18
C309	Earthquake Tens	EQt	9	283
C309	Earthquake Comp	EQc	-9	283

C309	Wind Tens	Wt	10	353
C309	Wind Comp	Wc	-11	353
C310	Dead max	Gmax	-353	69
C310	Dead min	Gmin	-275	50
C310	Live	Q	-61	20
C310	Earthquake Tens	EQt	48	287
C310	Earthquake Comp	EQc	-48	287
C310	Wind Tens	Wt	52	358
C310	Wind Comp	Wc	-42	358
C311	Dead max	Gmax	-362	59
C311	Dead min	Gmin	-281	42
C311	Live	Q	-77	20
C311	Earthquake Tens	EQt	29	288
C311	Earthquake Comp	EQc	-29	288
C311	Wind Tens	Wt	28	359
C311	Wind Comp	Wc	-23	359
C312	Dead max	Gmax	-317	49
C312	Dead min	Gmin	-245	35
C312	Live	Q	-68	17
C312	Earthquake Tens	EQt	17	287
C312	Earthquake Comp	EQc	-17	287
C312	Wind Tens	Wt	9	357
C312	Wind Comp	Wc	-7	357
C313	Dead max	Gmax	-307	45
C313	Dead min	Gmin	-232	31
C313	Live	Q	-58	14
C313	Earthquake Tens	EQt	36	282
C313	Earthquake Comp	EQc	-36	282
C313	Wind Tens	Wt	23	350
C313	Wind Comp	Wc	-25	350
C314	Dead max	Gmax	-319	43
C314	Dead min	Gmin	-236	30
C314	Live	Q	-55	12
C314	Earthquake Tens	EQt	109	274
C314	Earthquake Comp	EQc	-109	274
C314	Wind Tens	Wt	101	340
C314	Wind Comp	Wc	-115	340
C315	Dead max	Gmax	-324	40
C315	Dead min	Gmin	-238	28
C315	Live	Q	-51	11
C315	Earthquake Tens	EQt	274	262
C315	Earthquake Comp	EQc	-274	262
C315	Wind Tens	Wt	272	324
C315	Wind Comp	Wc	-315	324
C349	Dead max	Gmax	-1063	40
C349	Dead min	Gmin	-806	30
C349	Live	Q	-205	12
C349	Earthquake Tens	EQt	61	347

C349	Earthquake Comp	EQc	-61	347
C349	Wind Tens	Wt	231	119
C349	Wind Comp	Wc	-197	119

Element	Action	Load Case	P (kN)	V (kN)
C37	Dead max	Gmax	-3424	20
C37	Dead min	Gmin	-2425	15
C37	Live	Q	-1049	24
C37	Earthquake Tens	EQt	199	42
C37	Earthquake Comp	EQc	-199	42
C37	Wind Tens	Wt	524	44
C37	Wind Comp	Wc	-647	44
C39	Dead max	Gmax	-3410	15
C39	Dead min	Gmin	-2414	12
C39	Live	Q	-1020	20
C39	Earthquake Tens	EQt	210	43
C39	Earthquake Comp	EQc	-210	43
C39	Wind Tens	Wt	541	44
C39	Wind Comp	Wc	-648	44
C40	Dead max	Gmax	-2797	47
C40	Dead min	Gmin	-1950	35
C40	Live	Q	-909	39
C40	Earthquake Tens	EQt	145	44
C40	Earthquake Comp	EQc	-145	44
C40	Wind Tens	Wt	436	58
C40	Wind Comp	Wc	-541	58
C42	Dead max	Gmax	-2788	45
C42	Dead min	Gmin	-1944	34
C42	Live	Q	-902	38
C42	Earthquake Tens	EQt	165	44
C42	Earthquake Comp	EQc	-165	44
C42	Wind Tens	Wt	456	57
C42	Wind Comp	Wc	-544	57
C43	Dead max	Gmax	-3643	51
C43	Dead min	Gmin	-2522	40
C43	Live	Q	-1049	37
C43	Earthquake Tens	EQt	149	34
C43	Earthquake Comp	EQc	-149	34
C43	Wind Tens	Wt	560	54
C43	Wind Comp	Wc	-698	54
C45	Dead max	Gmax	-3508	58
C45	Dead min	Gmin	-2432	45
C45	Live	Q	-1018	39
C45	Earthquake Tens	EQt	148	34
C45	Earthquake Comp	EQc	-148	34
C45	Wind Tens	Wt	556	53
C45	Wind Comp	Wc	-689	53
C46	Dead max	Gmax	-3067	40
C46	Dead min	Gmin	-2150	30
C46	Live	Q	-993	34
C46	Earthquake Tens	EQt	164	42
C46	Earthquake Comp	EQc	-164	42
C46	Wind Tens	Wt	462	57
C46	Wind Comp	Wc	-567	57

C48	Dead max	Gmax	-2909	41
C48	Dead min	Gmin	-2038	31
C48	Live	Q	-946	35
C48	Earthquake Tens	EQt	138	41
C48	Earthquake Comp	EQc	-138	41
C48	Wind Tens	Wt	426	57
C48	Wind Comp	Wc	-529	57
C49	Dead max	Gmax	-2507	18
C49	Dead min	Gmin	-1733	15
C49	Live	Q	-692	19
C49	Earthquake Tens	EQt	166	41
C49	Earthquake Comp	EQc	-166	41
C49	Wind Tens	Wt	410	47
C49	Wind Comp	Wc	-501	47
C51	Dead max	Gmax	-2599	30
C51	Dead min	Gmin	-1802	23
C51	Live	Q	-747	26
C51	Earthquake Tens	EQt	149	41
C51	Earthquake Comp	EQc	-149	41
C51	Wind Tens	Wt	401	47
C51	Wind Comp	Wc	-495	47
C53	Dead max	Gmax	-1638	19
C53	Dead min	Gmin	-1184	14
C53	Live	Q	-863	24
C53	Earthquake Tens	EQt	171	45
C53	Earthquake Comp	EQc	-171	45
C53	Wind Tens	Wt	112	44
C53	Wind Comp	Wc	-91	44
C54	Dead max	Gmax	-1859	46
C54	Dead min	Gmin	-1297	35
C54	Live	Q	-1034	38
C54	Earthquake Tens	EQt	169	46
C54	Earthquake Comp	EQc	-169	46
C54	Wind Tens	Wt	140	57
C54	Wind Comp	Wc	-113	57
C55	Dead max	Gmax	-1787	53
C55	Dead min	Gmin	-1175	42
C55	Live	Q	-1003	38
C55	Earthquake Tens	EQt	151	37
C55	Earthquake Comp	EQc	-151	37
C55	Wind Tens	Wt	182	52
C55	Wind Comp	Wc	-146	52
C56	Dead max	Gmax	-1960	41
C56	Dead min	Gmin	-1376	30
C56	Live	Q	-1061	34
C56	Earthquake Tens	EQt	152	44
C56	Earthquake Comp	EQc	-152	44
C56	Wind Tens	Wt	114	56
C56	Wind Comp	Wc	-92	56
C57	Dead max	Gmax	-1525	34

C57	Dead min	Gmin	-1073	26
C57	Live	Q	-763	28
C57	Earthquake Tens	EQt	148	44
C57	Earthquake Comp	EQc	-148	44
C57	Wind Tens	Wt	106	47
C57	Wind Comp	Wc	-89	47
C63	Dead max	Gmax	-35911	13
C63	Dead min	Gmin	-26497	12
C63	Live	Q	-9106	11
C63	Earthquake Tens	EQt	1264	299
C63	Earthquake Comp	EQc	-1264	299
C63	Wind Tens	Wt	3401	142
C63	Wind Comp	Wc	-4218	142
C64	Dead max	Gmax	-26186	24
C64	Dead min	Gmin	-19362	15
C64	Live	Q	-5996	27
C64	Earthquake Tens	EQt	1506	317
C64	Earthquake Comp	EQc	-1506	317
C64	Wind Tens	Wt	7074	189
C64	Wind Comp	Wc	-8838	189
C65	Dead max	Gmax	-35704	23
C65	Dead min	Gmin	-26355	19
C65	Live	Q	-9204	10
C65	Earthquake Tens	EQt	1279	284
C65	Earthquake Comp	EQc	-1279	284
C65	Wind Tens	Wt	3534	135
C65	Wind Comp	Wc	-4356	135
C66	Dead max	Gmax	-29630	64
C66	Dead min	Gmin	-21700	48
C66	Live	Q	-6368	16
C66	Earthquake Tens	EQt	934	269
C66	Earthquake Comp	EQc	-934	269
C66	Wind Tens	Wt	2323	87
C66	Wind Comp	Wc	-2865	87
C67	Dead max	Gmax	-29382	17
C67	Dead min	Gmin	-21484	14
C67	Live	Q	-6360	6
C67	Earthquake Tens	EQt	958	235
C67	Earthquake Comp	EQc	-958	235
C67	Wind Tens	Wt	2187	58
C67	Wind Comp	Wc	-2707	58
C68	Dead max	Gmax	-29322	79
C68	Dead min	Gmin	-21440	58
C68	Live	Q	-6351	21
C68	Earthquake Tens	EQt	899	230
C68	Earthquake Comp	EQc	-899	230
C68	Wind Tens	Wt	2390	58
C68	Wind Comp	Wc	-2809	58
C69	Dead max	Gmax	-29414	24
C69	Dead min	Gmin	-21541	17

C69	Live	Q	-6326	9
C69	Earthquake Tens	EQt	901	262
C69	Earthquake Comp	EQc	-901	262
C69	Wind Tens	Wt	1841	88
C69	Wind Comp	Wc	-2267	88
C76	Dead max	Gmax	-29419	78
C76	Dead min	Gmin	-21552	57
C76	Live	Q	-6325	21
C76	Earthquake Tens	EQt	900	279
C76	Earthquake Comp	EQc	-900	279
C76	Wind Tens	Wt	974	85
C76	Wind Comp	Wc	-1152	85
C77	Dead max	Gmax	-34403	54
C77	Dead min	Gmin	-25398	38
C77	Live	Q	-8719	26
C77	Earthquake Tens	EQt	1173	303
C77	Earthquake Comp	EQc	-1173	303
C77	Wind Tens	Wt	1310	133
C77	Wind Comp	Wc	-1573	133
C78	Dead max	Gmax	-34352	52
C78	Dead min	Gmin	-25356	37
C78	Live	Q	-8715	26
C78	Earthquake Tens	EQt	1122	297
C78	Earthquake Comp	EQc	-1122	297
C78	Wind Tens	Wt	1159	140
C78	Wind Comp	Wc	-1355	140
C79	Dead max	Gmax	-24913	68
C79	Dead min	Gmin	-18437	48
C79	Live	Q	-5672	36
C79	Earthquake Tens	EQt	1300	310
C79	Earthquake Comp	EQc	-1300	310
C79	Wind Tens	Wt	4738	175
C79	Wind Comp	Wc	-5872	175
C80	Dead max	Gmax	-24887	66
C80	Dead min	Gmin	-18415	47
C80	Live	Q	-5675	36
C80	Earthquake Tens	EQt	1301	311
C80	Earthquake Comp	EQc	-1301	311
C80	Wind Tens	Wt	4819	178
C80	Wind Comp	Wc	-5863	178
C81	Dead max	Gmax	-34177	48
C81	Dead min	Gmin	-25243	34
C81	Live	Q	-8787	26
C81	Earthquake Tens	EQt	1134	289
C81	Earthquake Comp	EQc	-1134	289
C81	Wind Tens	Wt	1125	133
C81	Wind Comp	Wc	-1374	133
C82	Dead max	Gmax	-34241	44
C82	Dead min	Gmin	-25289	31
C82	Live	Q	-8815	25

C82	Earthquake Tens	EQt	1164	290
C82	Earthquake Comp	EQc	-1164	290
C82	Wind Tens	Wt	1443	126
C82	Wind Comp	Wc	-1560	126
C83	Dead max	Gmax	-28978	24
C83	Dead min	Gmin	-21198	16
C83	Live	Q	-6258	14
C83	Earthquake Tens	EQt	930	243
C83	Earthquake Comp	EQc	-930	243
C83	Wind Tens	Wt	621	57
C83	Wind Comp	Wc	-725	57
C84	Dead max	Gmax	-29075	80
C84	Dead min	Gmin	-21268	59
C84	Live	Q	-6283	24
C84	Earthquake Tens	EQt	924	238
C84	Earthquake Comp	EQc	-924	238
C84	Wind Tens	Wt	924	56
C84	Wind Comp	Wc	-918	56
C85	Dead max	Gmax	-29192	49
C85	Dead min	Gmin	-21384	35
C85	Live	Q	-6281	16
C85	Earthquake Tens	EQt	1010	274
C85	Earthquake Comp	EQc	-1010	274
C85	Wind Tens	Wt	426	86
C85	Wind Comp	Wc	-502	86
C91	Dead max	Gmax	-20170	66
C91	Dead min	Gmin	-15189	46
C91	Live	Q	-4506	19
C91	Earthquake Tens	EQt	4447	604
C91	Earthquake Comp	EQc	-4447	604
C91	Wind Tens	Wt	19565	218
C91	Wind Comp	Wc	-24223	218
C93	Dead max	Gmax	-19499	60
C93	Dead min	Gmin	-14639	42
C93	Live	Q	-4509	17
C93	Earthquake Tens	EQt	4380	611
C93	Earthquake Comp	EQc	-4380	611
C93	Wind Tens	Wt	19829	226
C93	Wind Comp	Wc	-24019	226
C99	Dead max	Gmax	-16664	71
C99	Dead min	Gmin	-12729	50
C99	Live	Q	-3553	20
C99	Earthquake Tens	EQt	4772	617
C99	Earthquake Comp	EQc	-4772	617
C99	Wind Tens	Wt	10994	208
C99	Wind Comp	Wc	-13256	208
C100	Dead max	Gmax	-15316	66
C100	Dead min	Gmin	-11677	46
C100	Live	Q	-3338	19
C100	Earthquake Tens	EQt	2585	605

C100	Earthquake Comp	EQc	-2585	605
C100	Wind Tens	Wt	9760	215
C100	Wind Comp	Wc	-11953	215
C101	Dead max	Gmax	-14853	65
C101	Dead min	Gmin	-11299	45
C101	Live	Q	-3307	18
C101	Earthquake Tens	EQt	1080	601
C101	Earthquake Comp	EQc	-1080	601
C101	Wind Tens	Wt	9001	218
C101	Wind Comp	Wc	-11232	218
C102	Dead max	Gmax	-14168	60
C102	Dead min	Gmin	-10766	42
C102	Live	Q	-3219	17
C102	Earthquake Tens	EQt	2361	611
C102	Earthquake Comp	EQc	-2361	611
C102	Wind Tens	Wt	9766	225
C102	Wind Comp	Wc	-11436	225
C103	Dead max	Gmax	-15927	61
C103	Dead min	Gmin	-12090	42
C103	Live	Q	-3678	17
C103	Earthquake Tens	EQt	4443	626
C103	Earthquake Comp	EQc	-4443	626
C103	Wind Tens	Wt	12120	228
C103	Wind Comp	Wc	-13519	228
C105	Dead max	Gmax	-2014	8
C105	Dead min	Gmin	-1511	6
C105	Live	Q	-408	6
C105	Earthquake Tens	EQt	318	23
C105	Earthquake Comp	EQc	-318	23
C105	Wind Tens	Wt	489	3
C105	Wind Comp	Wc	-592	3
C106	Dead max	Gmax	-12813	71
C106	Dead min	Gmin	-9928	50
C106	Live	Q	-2572	20
C106	Earthquake Tens	EQt	4084	623
C106	Earthquake Comp	EQc	-4084	623
C106	Wind Tens	Wt	4503	212
C106	Wind Comp	Wc	-4734	212
C107	Dead max	Gmax	-10766	64
C107	Dead min	Gmin	-8351	45
C107	Live	Q	-2195	18
C107	Earthquake Tens	EQt	2197	610
C107	Earthquake Comp	EQc	-2197	610
C107	Wind Tens	Wt	2307	215
C107	Wind Comp	Wc	-2421	215
C108	Dead max	Gmax	-9687	60
C108	Dead min	Gmin	-7498	42
C108	Live	Q	-2010	17
C108	Earthquake Tens	EQt	781	605
C108	Earthquake Comp	EQc	-781	605

C108	Wind Tens	Wt	1114	220
C108	Wind Comp	Wc	-1376	220
C109	Dead max	Gmax	-10477	57
C109	Dead min	Gmin	-8100	39
C109	Live	Q	-2243	17
C109	Earthquake Tens	EQt	2096	616
C109	Earthquake Comp	EQc	-2096	616
C109	Wind Tens	Wt	2257	227
C109	Wind Comp	Wc	-2030	227
C110	Dead max	Gmax	-11856	58
C110	Dead min	Gmin	-9135	40
C110	Live	Q	-2612	17
C110	Earthquake Tens	EQt	3557	631
C110	Earthquake Comp	EQc	-3557	631
C110	Wind Tens	Wt	4271	232
C110	Wind Comp	Wc	-3869	232
C112	Dead max	Gmax	-10526	40
C112	Dead min	Gmin	-8065	26
C112	Live	Q	-2235	13
C112	Earthquake Tens	EQt	2056	647
C112	Earthquake Comp	EQc	-2056	647
C112	Wind Tens	Wt	3586	222
C112	Wind Comp	Wc	-3539	222
C113	Dead max	Gmax	-11627	29
C113	Dead min	Gmin	-8848	17
C113	Live	Q	-2491	11
C113	Earthquake Tens	EQt	3609	653
C113	Earthquake Comp	EQc	-3609	653
C113	Wind Tens	Wt	5855	208
C113	Wind Comp	Wc	-6165	208
C114	Dead max	Gmax	-11811	12
C114	Dead min	Gmin	-8958	5
C114	Live	Q	-2592	7
C114	Earthquake Tens	EQt	4482	664
C114	Earthquake Comp	EQc	-4482	664
C114	Wind Tens	Wt	7061	193
C114	Wind Comp	Wc	-7265	193
C116	Dead max	Gmax	-19821	17
C116	Dead min	Gmin	-14567	13
C116	Live	Q	-4112	5
C116	Earthquake Tens	EQt	754	191
C116	Earthquake Comp	EQc	-754	191
C116	Wind Tens	Wt	1623	63
C116	Wind Comp	Wc	-1353	63
C117	Dead max	Gmax	-21711	22
C117	Dead min	Gmin	-15918	17
C117	Live	Q	-4559	6
C117	Earthquake Tens	EQt	857	219
C117	Earthquake Comp	EQc	-857	219
C117	Wind Tens	Wt	2218	92

C117	Wind Comp	Wc	-1996	92
C118	Dead max	Gmax	-22327	19
C118	Dead min	Gmin	-16366	14
C118	Live	Q	-4696	8
C118	Earthquake Tens	EQt	841	210
C118	Earthquake Comp	EQc	-841	210
C118	Wind Tens	Wt	2219	95
C118	Wind Comp	Wc	-1882	95
C124	Dead max	Gmax	-13348	123
C124	Dead min	Gmin	-10426	89
C124	Live	Q	-2166	29
C124	Earthquake Tens	EQt	4622	663
C124	Earthquake Comp	EQc	-4622	663
C124	Wind Tens	Wt	5721	163
C124	Wind Comp	Wc	-6248	163
C125	Dead max	Gmax	-18056	104
C125	Dead min	Gmin	-14116	75
C125	Live	Q	-2960	26
C125	Earthquake Tens	EQt	5287	662
C125	Earthquake Comp	EQc	-5287	662
C125	Wind Tens	Wt	7097	176
C125	Wind Comp	Wc	-7874	176
C126	Dead max	Gmax	-15756	76
C126	Dead min	Gmin	-12331	54
C126	Live	Q	-2651	21
C126	Earthquake Tens	EQt	3398	661
C126	Earthquake Comp	EQc	-3398	661
C126	Wind Tens	Wt	5649	203
C126	Wind Comp	Wc	-6034	203
C127	Dead max	Gmax	-14216	65
C127	Dead min	Gmin	-11163	45
C127	Live	Q	-2418	19
C127	Earthquake Tens	EQt	2519	660
C127	Earthquake Comp	EQc	-2519	660
C127	Wind Tens	Wt	6535	215
C127	Wind Comp	Wc	-6246	215
C128	Dead max	Gmax	-11937	62
C128	Dead min	Gmin	-9381	43
C128	Live	Q	-2071	18
C128	Earthquake Tens	EQt	1401	649
C128	Earthquake Comp	EQc	-1401	649
C128	Wind Tens	Wt	5902	220
C128	Wind Comp	Wc	-5240	220
C129	Dead max	Gmax	-13092	56
C129	Dead min	Gmin	-10272	39
C129	Live	Q	-2331	16
C129	Earthquake Tens	EQt	756	645
C129	Earthquake Comp	EQc	-756	645
C129	Wind Tens	Wt	5940	223
C129	Wind Comp	Wc	-4867	223

C130	Dead max	Gmax	-12853	54
C130	Dead min	Gmin	-10068	38
C130	Live	Q	-2370	16
C130	Earthquake Tens	EQt	1024	655
C130	Earthquake Comp	EQc	-1024	655
C130	Wind Tens	Wt	6124	231
C130	Wind Comp	Wc	-4970	231
C131	Dead max	Gmax	-13117	48
C131	Dead min	Gmin	-10250	32
C131	Live	Q	-2506	14
C131	Earthquake Tens	EQt	1821	666
C131	Earthquake Comp	EQc	-1821	666
C131	Wind Tens	Wt	6320	233
C131	Wind Comp	Wc	-5201	233
C132	Dead max	Gmax	-13125	42
C132	Dead min	Gmin	-10199	28
C132	Live	Q	-2597	13
C132	Earthquake Tens	EQt	2536	672
C132	Earthquake Comp	EQc	-2536	672
C132	Wind Tens	Wt	5252	225
C132	Wind Comp	Wc	-4426	225
C133	Dead max	Gmax	-14123	32
C133	Dead min	Gmin	-10941	21
C133	Live	Q	-2870	10
C133	Earthquake Tens	EQt	3742	679
C133	Earthquake Comp	EQc	-3742	679
C133	Wind Tens	Wt	5885	214
C133	Wind Comp	Wc	-5573	214
C134	Dead max	Gmax	-13642	26
C134	Dead min	Gmin	-10537	17
C134	Live	Q	-2851	8
C134	Earthquake Tens	EQt	4822	690
C134	Earthquake Comp	EQc	-4822	690
C134	Wind Tens	Wt	6857	201
C134	Wind Comp	Wc	-6485	201
C136	Dead max	Gmax	-19109	33
C136	Dead min	Gmin	-14048	24
C136	Live	Q	-3957	9
C136	Earthquake Tens	EQt	938	197
C136	Earthquake Comp	EQc	-938	197
C136	Wind Tens	Wt	2698	64
C136	Wind Comp	Wc	-2221	64
C137	Dead max	Gmax	-19205	48
C137	Dead min	Gmin	-14120	35
C137	Live	Q	-3980	11
C137	Earthquake Tens	EQt	964	201
C137	Earthquake Comp	EQc	-964	201
C137	Wind Tens	Wt	2881	66
C137	Wind Comp	Wc	-2388	66
C138	Dead max	Gmax	-21567	39

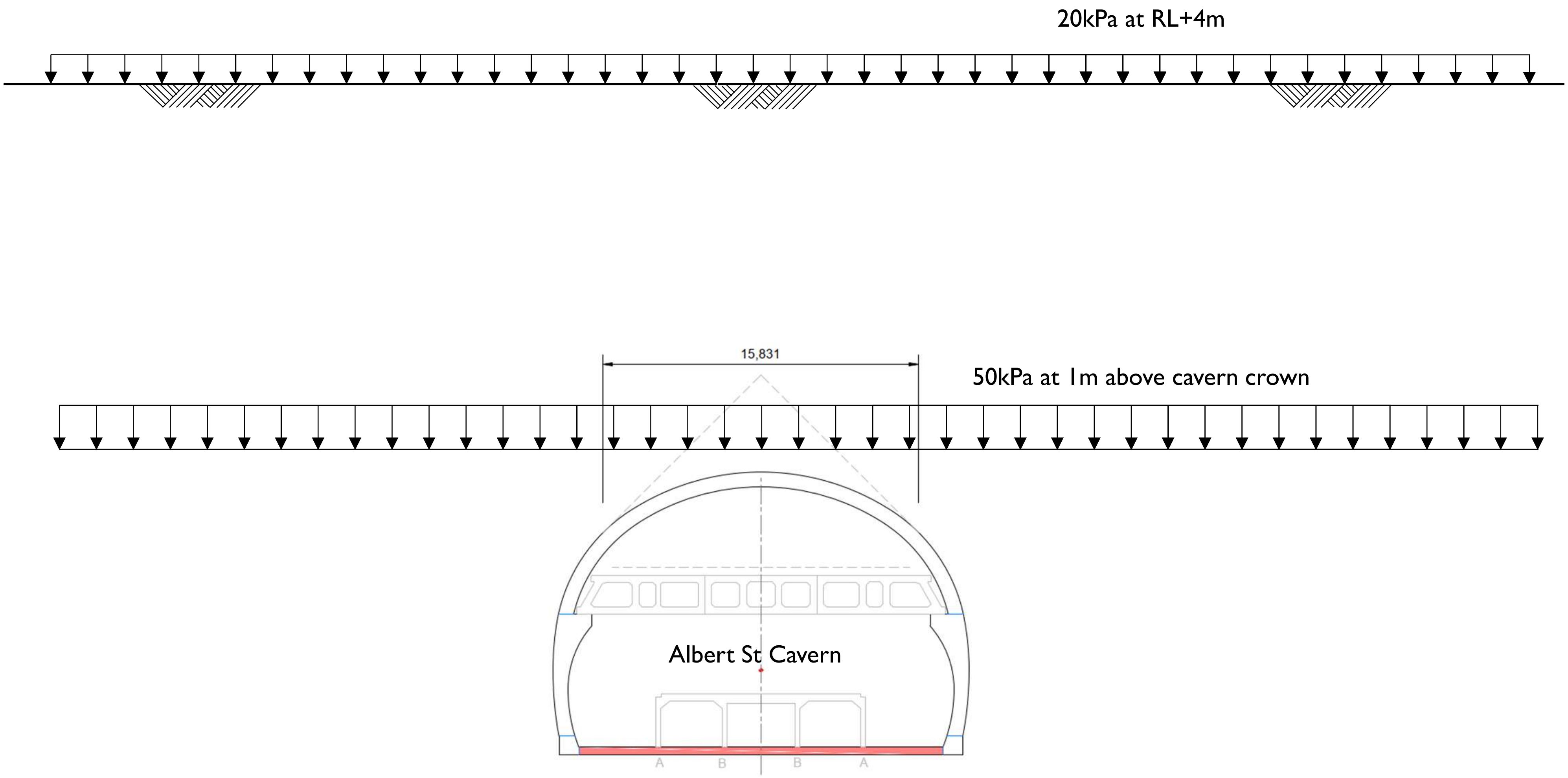
C138	Dead min	Gmin	-15814	29
C138	Live	Q	-4536	12
C138	Earthquake Tens	EQt	887	222
C138	Earthquake Comp	EQc	-887	222
C138	Wind Tens	Wt	3427	97
C138	Wind Comp	Wc	-2934	97
C140	Dead max	Gmax	-10520	119
C140	Dead min	Gmin	-8342	86
C140	Live	Q	-1570	28
C140	Earthquake Tens	EQt	3964	675
C140	Earthquake Comp	EQc	-3964	675
C140	Wind Tens	Wt	8871	174
C140	Wind Comp	Wc	-8699	174
C141	Dead max	Gmax	-14039	86
C141	Dead min	Gmin	-11235	61
C141	Live	Q	-2076	22
C141	Earthquake Tens	EQt	4228	684
C141	Earthquake Comp	EQc	-4228	684
C141	Wind Tens	Wt	16844	206
C141	Wind Comp	Wc	-15123	206
C142	Dead max	Gmax	-13717	71
C142	Dead min	Gmin	-11005	50
C142	Live	Q	-2062	20
C142	Earthquake Tens	EQt	3682	684
C142	Earthquake Comp	EQc	-3682	684
C142	Wind Tens	Wt	18007	220
C142	Wind Comp	Wc	-15588	220
C143	Dead max	Gmax	-11432	63
C143	Dead min	Gmin	-9173	44
C143	Live	Q	-1766	18
C143	Earthquake Tens	EQt	2458	677
C143	Earthquake Comp	EQc	-2458	677
C143	Wind Tens	Wt	15181	222
C143	Wind Comp	Wc	-12711	222
C144	Dead max	Gmax	-12667	60
C144	Dead min	Gmin	-10159	42
C144	Live	Q	-2024	17
C144	Earthquake Tens	EQt	2425	675
C144	Earthquake Comp	EQc	-2425	675
C144	Wind Tens	Wt	16842	223
C144	Wind Comp	Wc	-13613	223
C145	Dead max	Gmax	-12118	56
C145	Dead min	Gmin	-9708	39
C145	Live	Q	-2013	16
C145	Earthquake Tens	EQt	2574	685
C145	Earthquake Comp	EQc	-2574	685
C145	Wind Tens	Wt	16695	230
C145	Wind Comp	Wc	-13434	230
C146	Dead max	Gmax	-12246	54
C146	Dead min	Gmin	-9794	38

C146	Live	Q	-2119	15
C146	Earthquake Tens	EQt	3331	695
C146	Earthquake Comp	EQc	-3331	695
C146	Wind Tens	Wt	17582	236
C146	Wind Comp	Wc	-14248	236
C147	Dead max	Gmax	-11646	47
C147	Dead min	Gmin	-9290	32
C147	Live	Q	-2108	13
C147	Earthquake Tens	EQt	3761	702
C147	Earthquake Comp	EQc	-3761	702
C147	Wind Tens	Wt	16899	229
C147	Wind Comp	Wc	-13770	229
C148	Dead max	Gmax	-12027	42
C148	Dead min	Gmin	-9560	29
C148	Live	Q	-2273	12
C148	Earthquake Tens	EQt	4613	708
C148	Earthquake Comp	EQc	-4613	708
C148	Wind Tens	Wt	17218	222
C148	Wind Comp	Wc	-14113	222
C149	Dead max	Gmax	-10302	37
C149	Dead min	Gmin	-8169	27
C149	Live	Q	-2020	9
C149	Earthquake Tens	EQt	4843	718
C149	Earthquake Comp	EQc	-4843	718
C149	Wind Tens	Wt	14813	213
C149	Wind Comp	Wc	-12212	213
C151	Dead max	Gmax	-9007	104
C151	Dead min	Gmin	-7266	75
C151	Live	Q	-1243	25
C151	Earthquake Tens	EQt	3742	688
C151	Earthquake Comp	EQc	-3742	688
C151	Wind Tens	Wt	13698	202
C151	Wind Comp	Wc	-12337	202
C152	Dead max	Gmax	-3195	122
C152	Dead min	Gmin	-2631	88
C152	Live	Q	-365	29
C152	Earthquake Tens	EQt	2270	691
C152	Earthquake Comp	EQc	-2270	691
C152	Wind Tens	Wt	7479	190
C152	Wind Comp	Wc	-6741	190
C167	Dead max	Gmax	-20569	62
C167	Dead min	Gmin	-15463	43
C167	Live	Q	-4671	18
C167	Earthquake Tens	EQt	3715	599
C167	Earthquake Comp	EQc	-3715	599
C167	Wind Tens	Wt	19483	221
C167	Wind Comp	Wc	-24329	221
C236	Dead max	Gmax	-19838	66
C236	Dead min	Gmin	-14974	46
C236	Live	Q	-4350	20

C236	Earthquake Tens	EQt	5801	616
C236	Earthquake Comp	EQc	-5801	616
C236	Wind Tens	Wt	19493	219
C236	Wind Comp	Wc	-23920	219
C237	Dead max	Gmax	-18812	55
C237	Dead min	Gmin	-14115	38
C237	Live	Q	-4422	16
C237	Earthquake Tens	EQt	5563	625
C237	Earthquake Comp	EQc	-5563	625
C237	Wind Tens	Wt	20371	235
C237	Wind Comp	Wc	-23921	235

Appendix C

PSTR Load Cases



PSTR Load Case:
Future Development Allowance - Case 1 (OSD-48)

by:	DL	*client:*	QIC
date:	25/06/2026	*project:*	Albert St Development
approved:	DJC	*location:*	Brisbane, QLD
scale:	NTS	*title:*	*Assessed Load Cases*
		job no:	B01493-1

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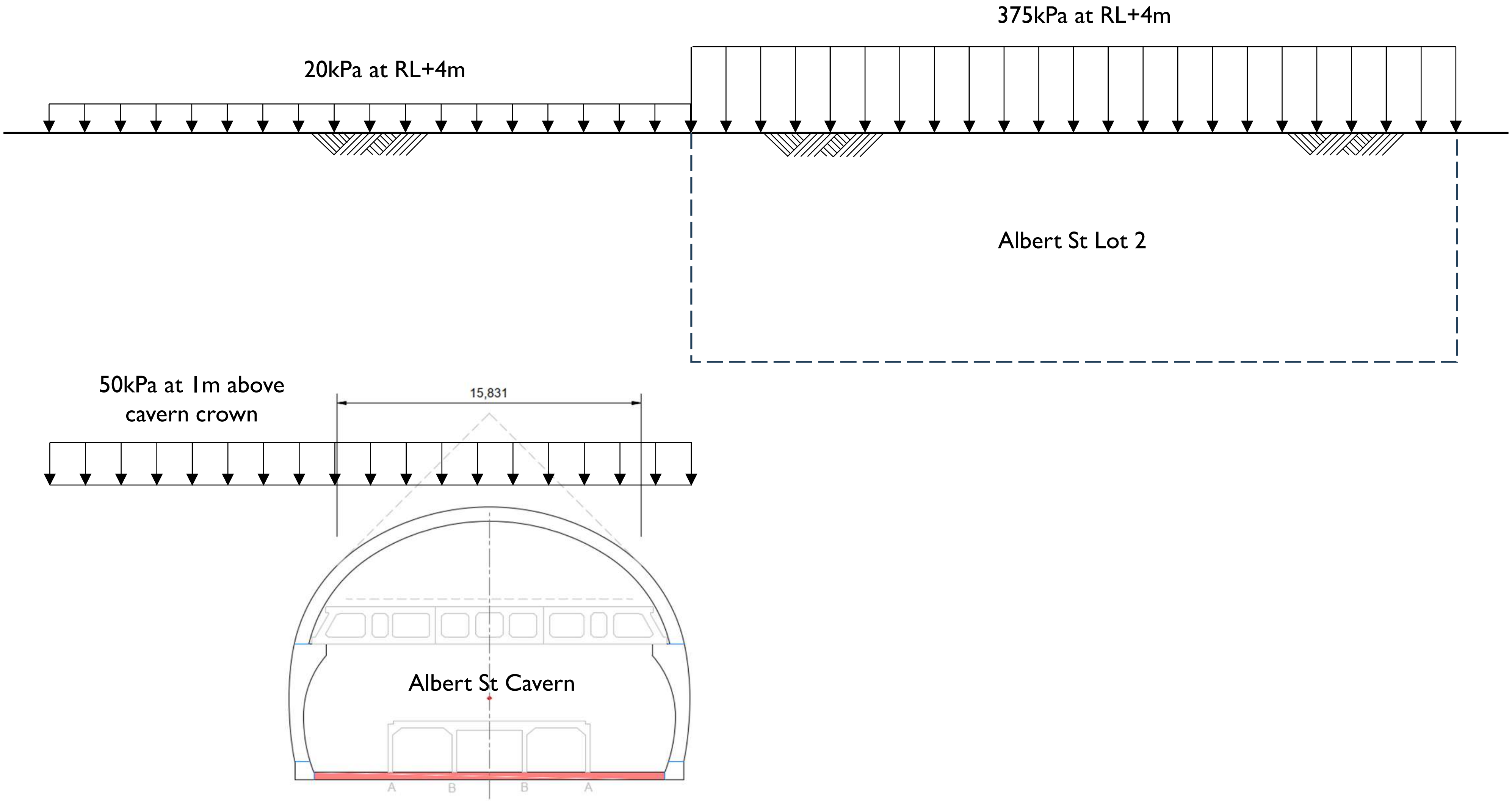
figure: C1



PSTR Load Case:
375kPa at RL +4m (OSD-31)
Future Development Allowance - Case 1 (OSD-48)

by:	DL	client:	QIC
date:	25/06/2026	project:	Albert St Development
approved:	DJC	location:	Brisbane, QLD
scale:	NTS	title:	*Assessed Load Cases*
		job no:	B01493-1

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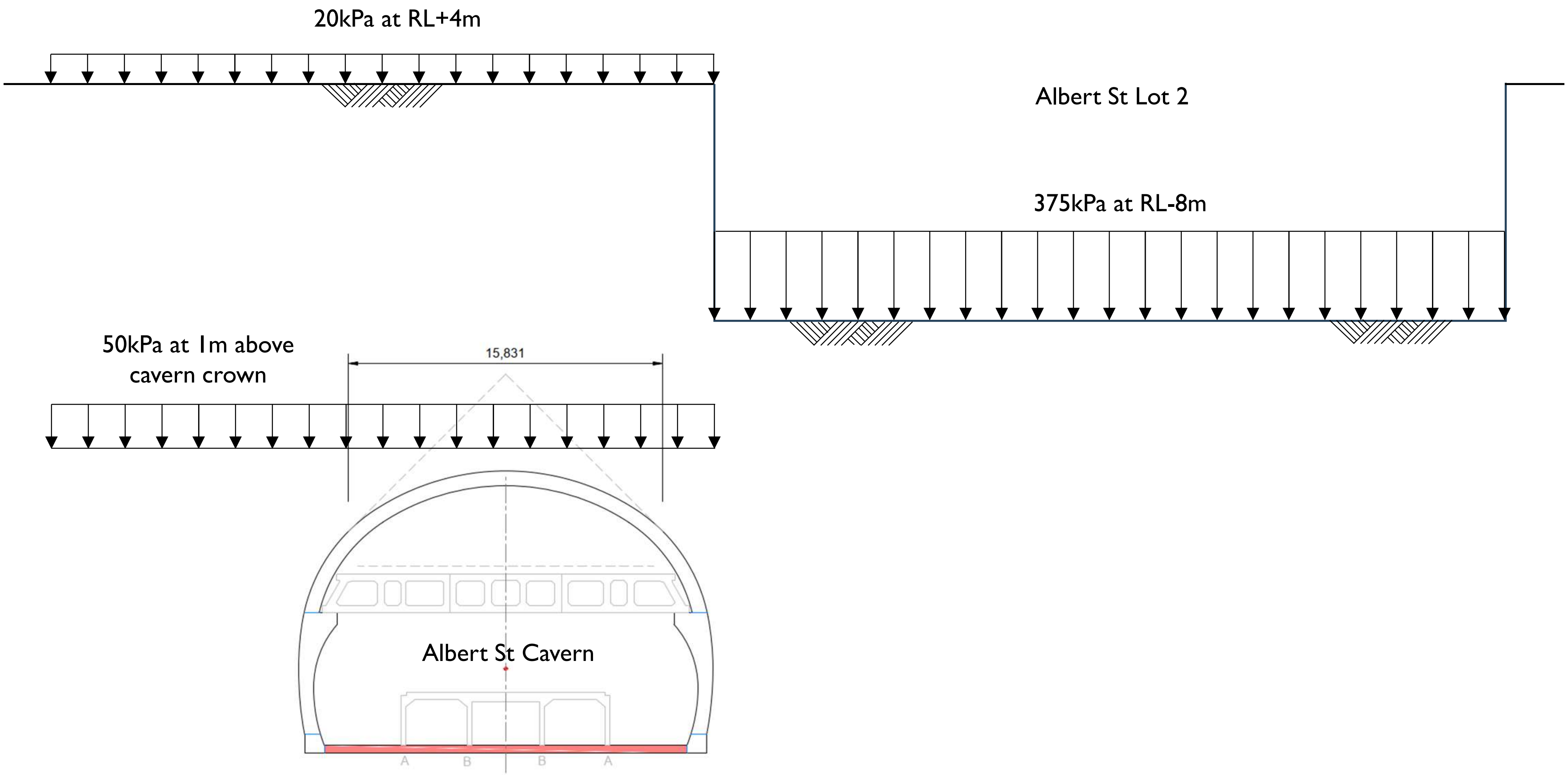
figure: C2



PSTR Load Case:
375kPa at RL -8m (OSD-31)
Future Development Allowance - Case 1 (OSD-48)

by:	DL	*client:*	QIC
date:	25/06/2026	*project:*	Albert St Development
approved:	DJC	*location:*	Brisbane, QLD
scale:	NTS	*title:*	*Assessed Load Cases*
		job no:	B01493-1

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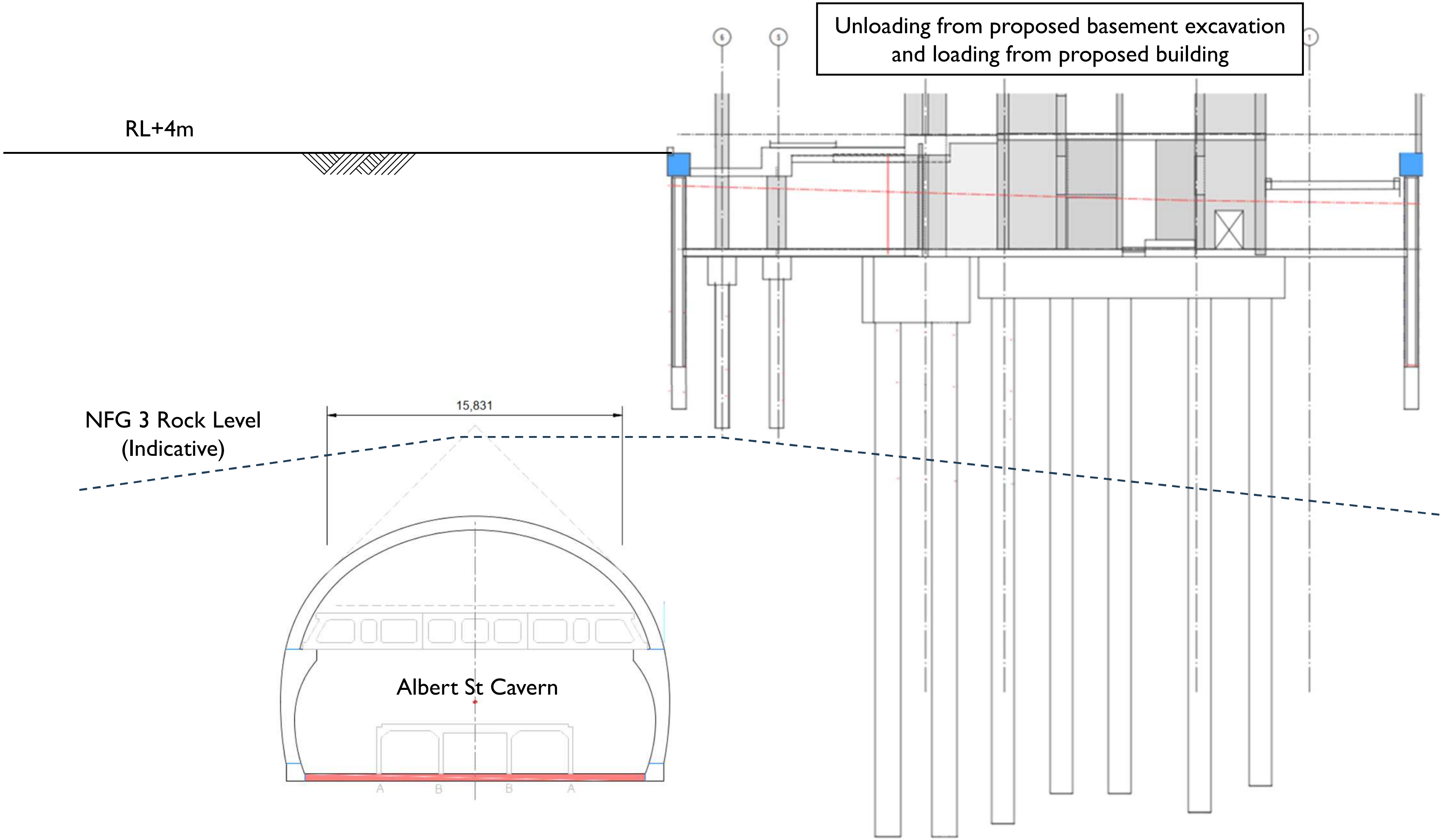
figure: C3



Multiplex Load Cases:
Load Case 1 = 1.1*(G+0.4Q+0.64W)
Load Case 2 = 1.1*(G+0.7Q)

by:	DL	client:	QIC
date:	25/06/2026	project:	Albert St Development
approved:	DJC	location:	Brisbane, QLD
scale:	NTS	title:	*Assessed Load Cases*
		job no:	B01493-1

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TYPSA Group

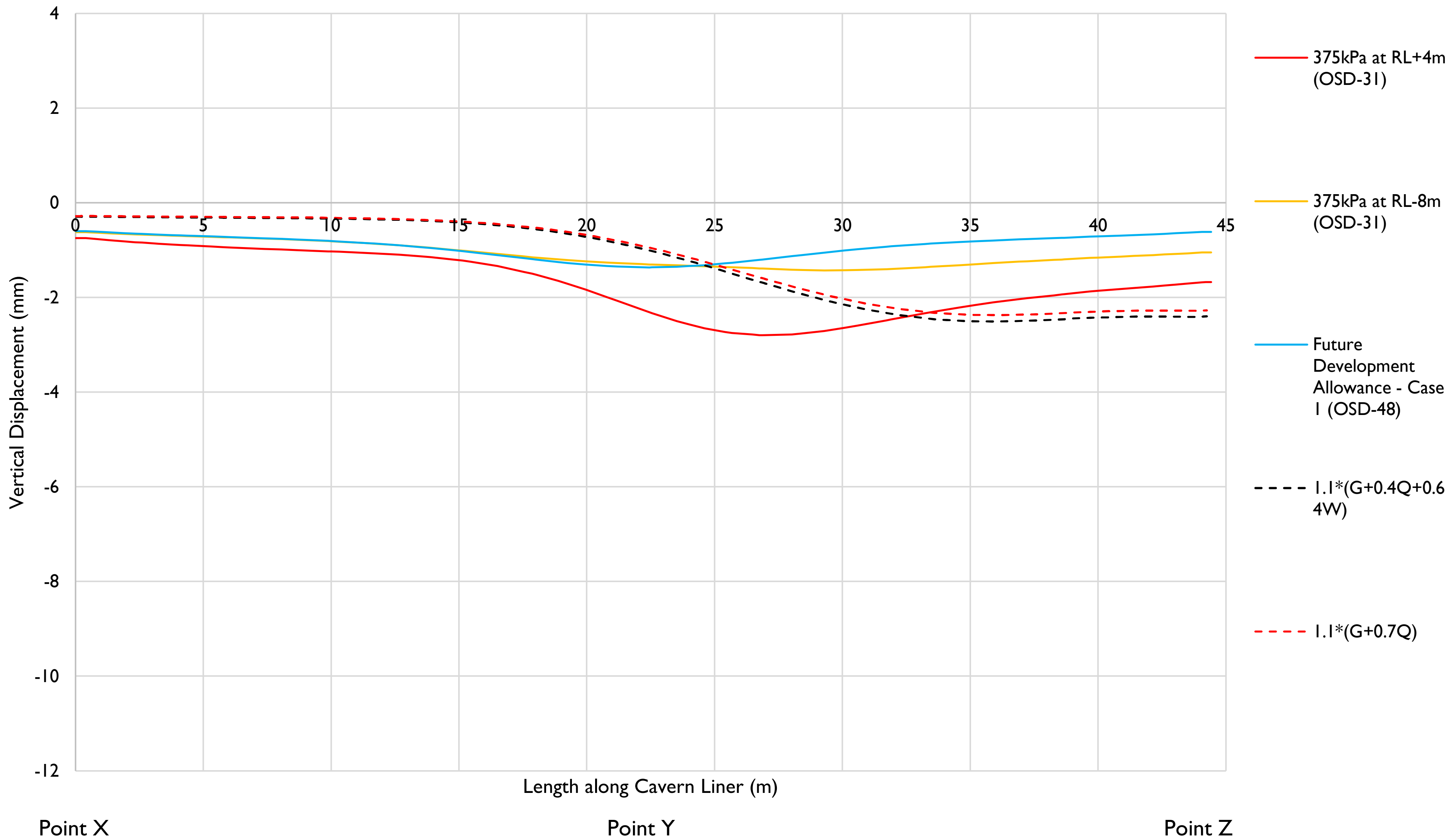
figure: C4

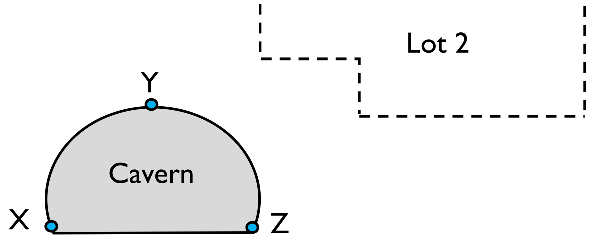
Appendix D

Analysis Results

<table>
<thead>
<tr><th>Analysis Group</th><th>M_{Stage}</th><th>Rock Mass Stiffness Parameters</th><th>Plots</th></tr>
</thead>
<tbody>
<tr><td>1</td><td>0.5</td><td rowspan="3">Continuum rock mass stiffness parameters:
• 1 GPa for NFG3
• 5 GPa for NFG2</td><td>Figure 1a to 1e</td></tr>
<tr><td>2</td><td>0.6</td><td>Figure 2a to 2e</td></tr>
<tr><td>3</td><td>0.7</td><td>Figure 3a to 3e</td></tr>
<tr><td>4</td><td>0.5</td><td rowspan="3">Discontinuum rock mass stiffness parameters:
• 2 GPa for NFG3
• 9 GPa for NFG2</td><td>Figure 4a to 4e</td></tr>
<tr><td>5</td><td>0.6</td><td>Figure 5a to 5e</td></tr>
<tr><td>6</td><td>0.7</td><td>Figure 6a to 6e</td></tr>
</tbody>
</table>

Analysis Group 1 (1a) - Change in Vertical Displacement on Cavern Liner





by:	DL	*client:*	RCP
date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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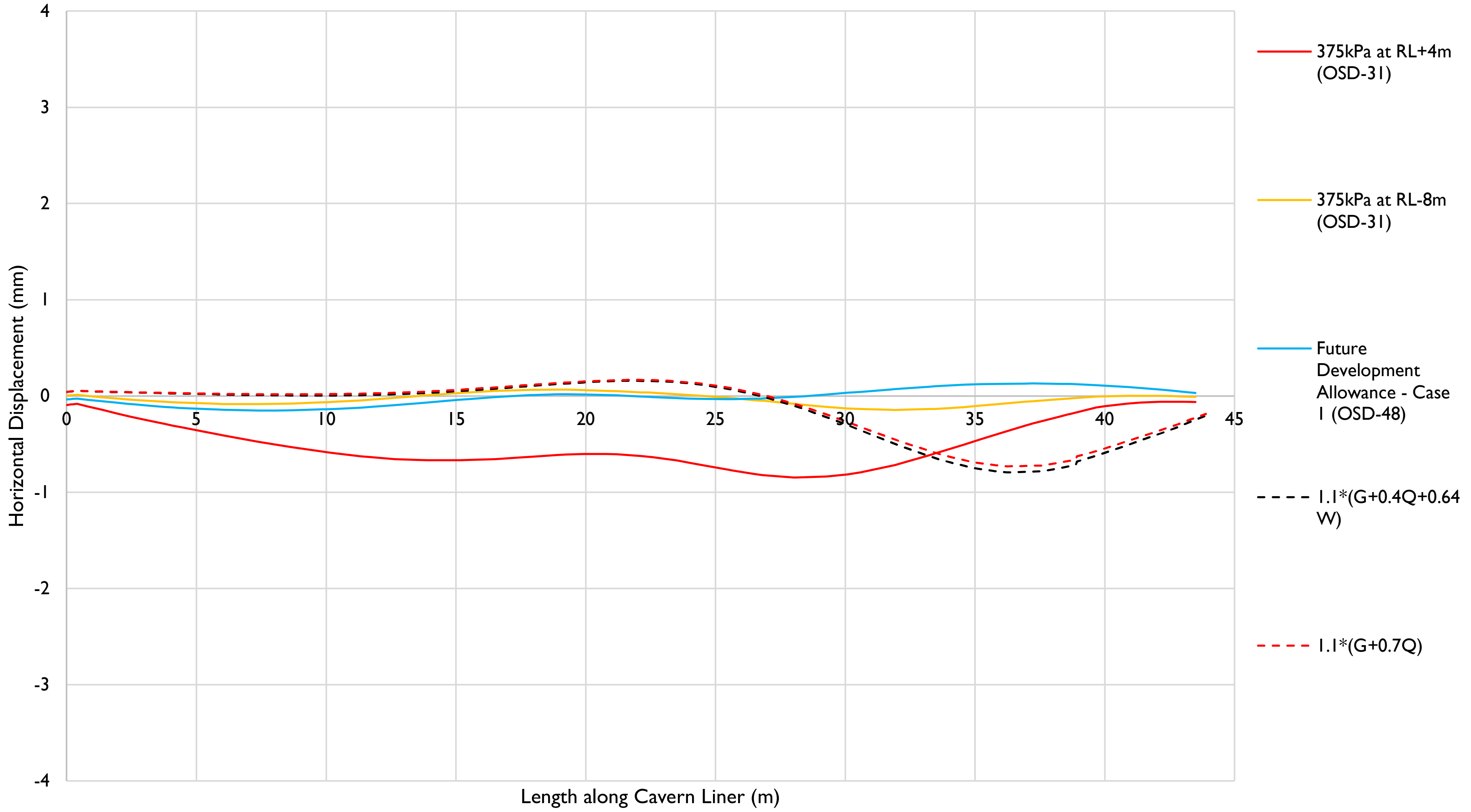
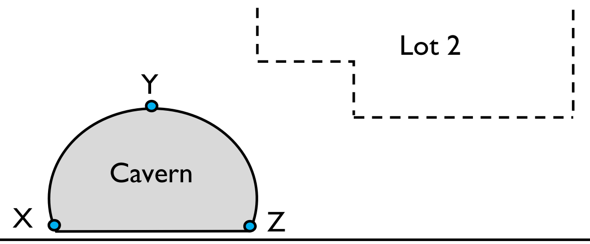
figure: *1a*

Analysis Group 1 (1b) - Change in Horizontal Displacement on Cavern Liner



Point X Point Y Point Z



by:	DL	*client:*	RCP
date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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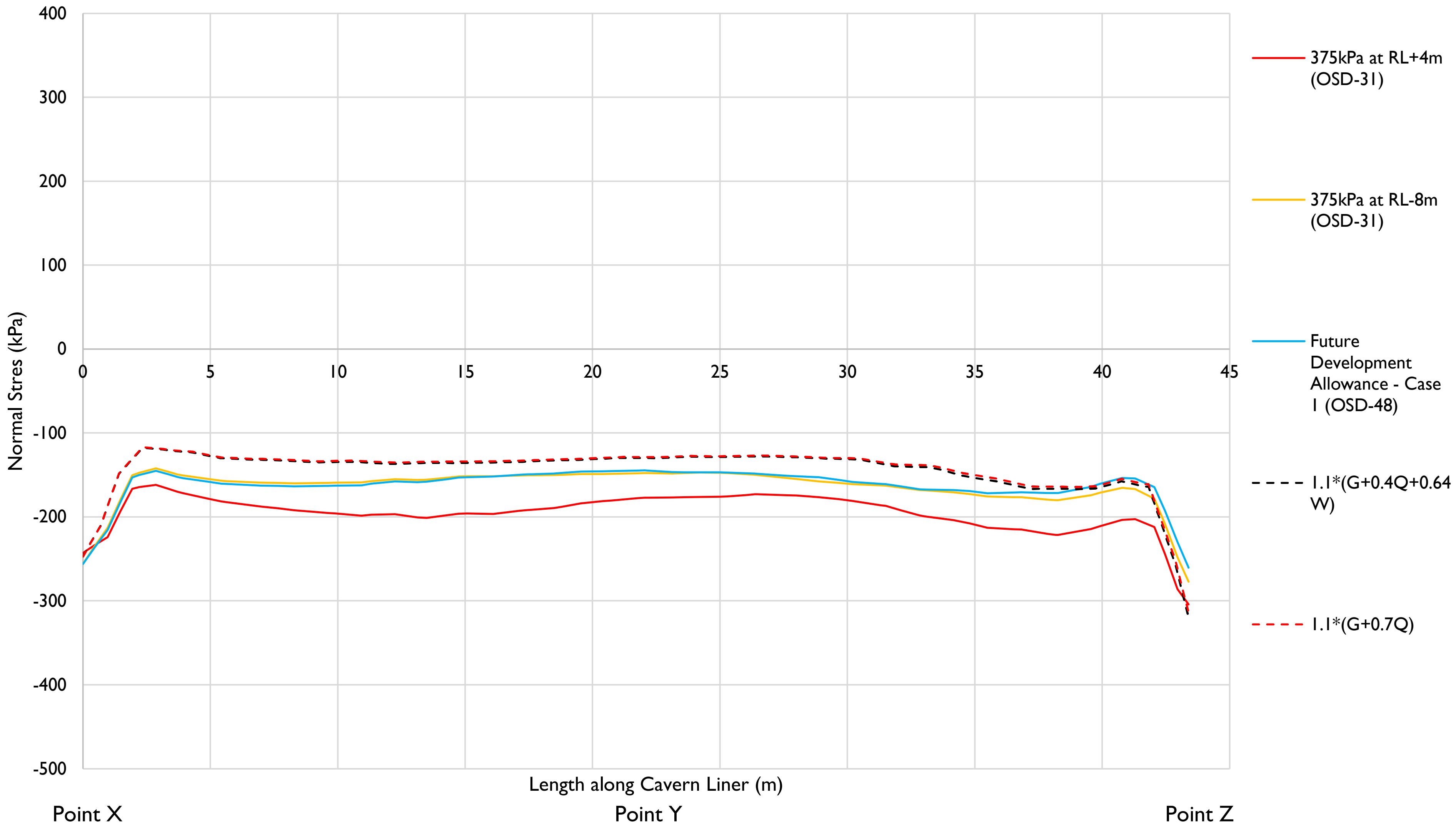
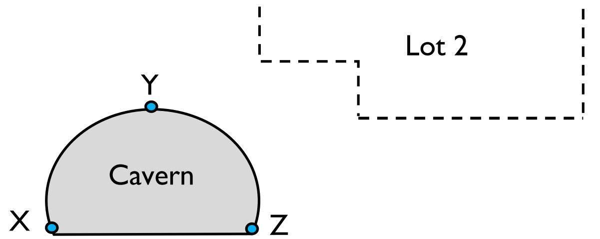
figure: *1b*

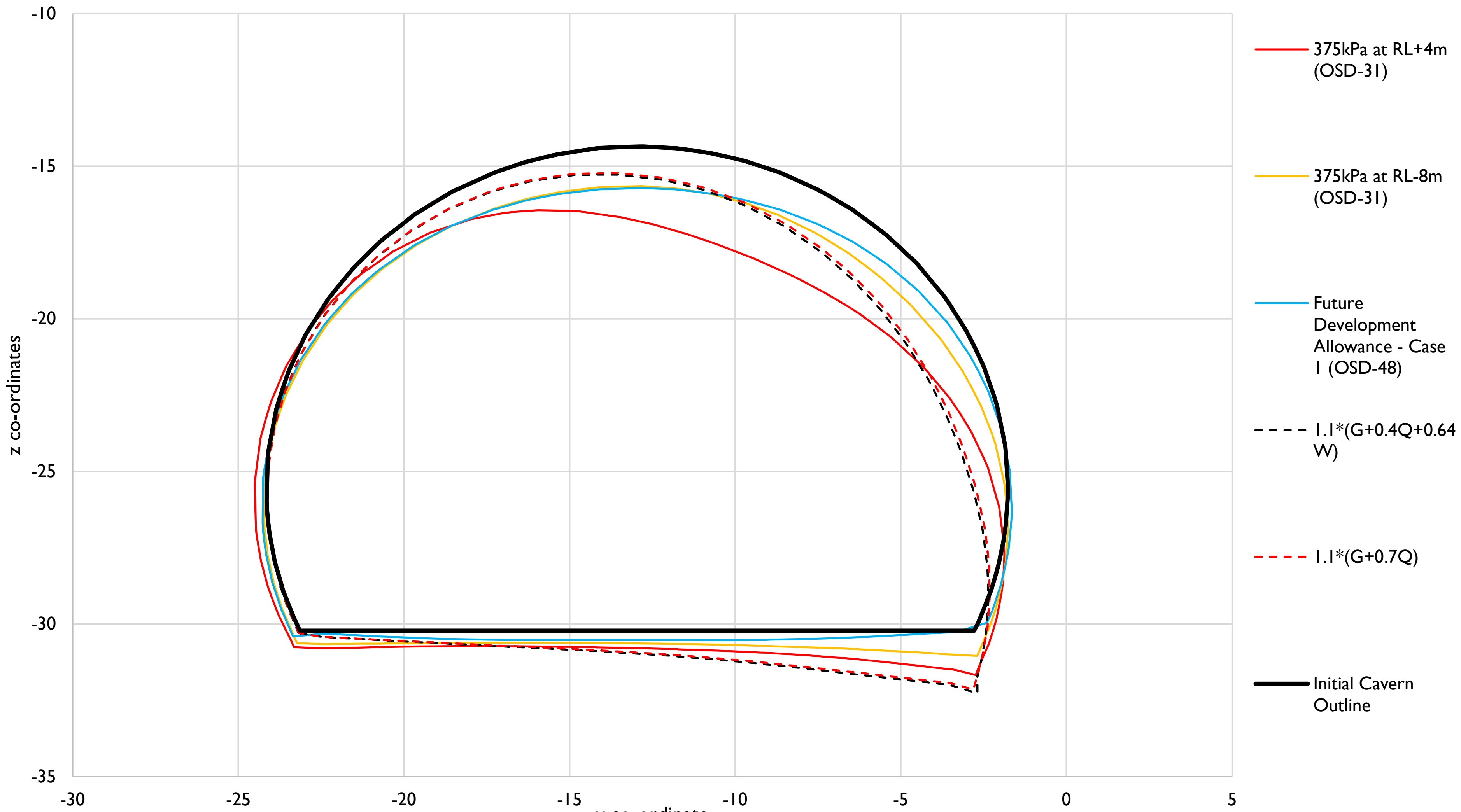
Analysis Group 1 (1c) - Normal Stress on Cavern Liner



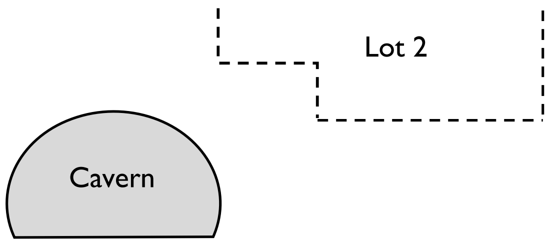


by:	DL	*client:*	RCP	EDG consulting engineering | design | geosciences
date:	29/06/2026	*project:*	Albert Street Development	
approved:	DJC	*location:*	Brisbane	
scale:	NTS	*title:*	*Finite Element Outputs*	*figure:* 1c
		job no:	B01493-1	

Analysis Group 1 (1d) - Change in Displacement on Cavern Liner

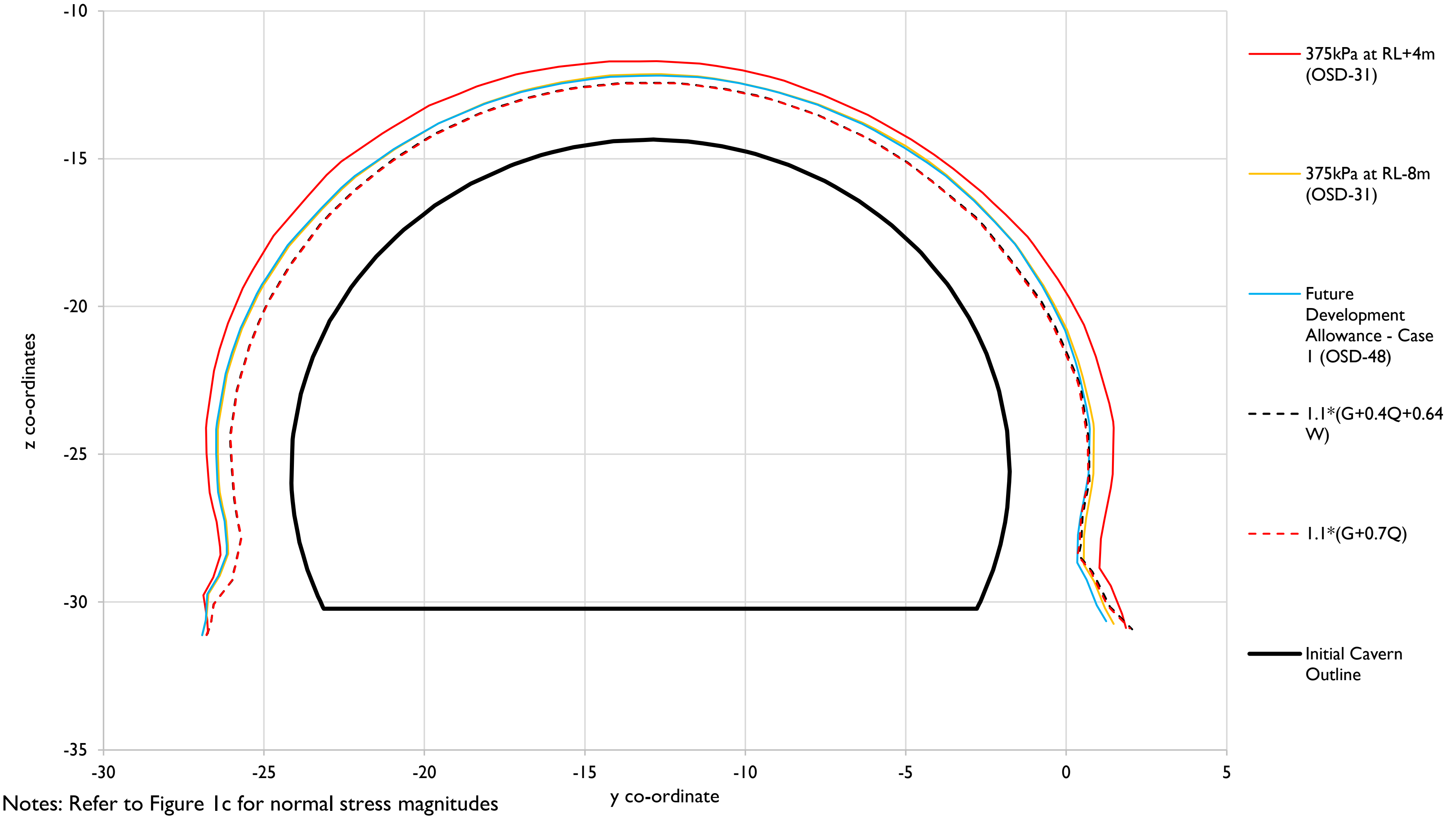


Notes: Deformation are 1000 times exaggerated

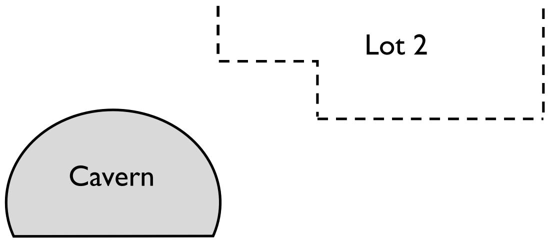


by:	DL	*client:*	RCP	EDG consulting engineering | design | geosciences
date:	29/06/2026	*project:*	Albert Street Development	
approved:	DJC	*location:*	Brisbane	
		title:	*Finite Element Outputs*	
scale:	NTS	*job no:*	B01493-1	*figure:* *1d*

Analysis Group 1 (1e) - Normal Stress on Cavern Liner



Notes: Refer to Figure 1c for normal stress magnitudes



by:	DL	*client:*	RCP
date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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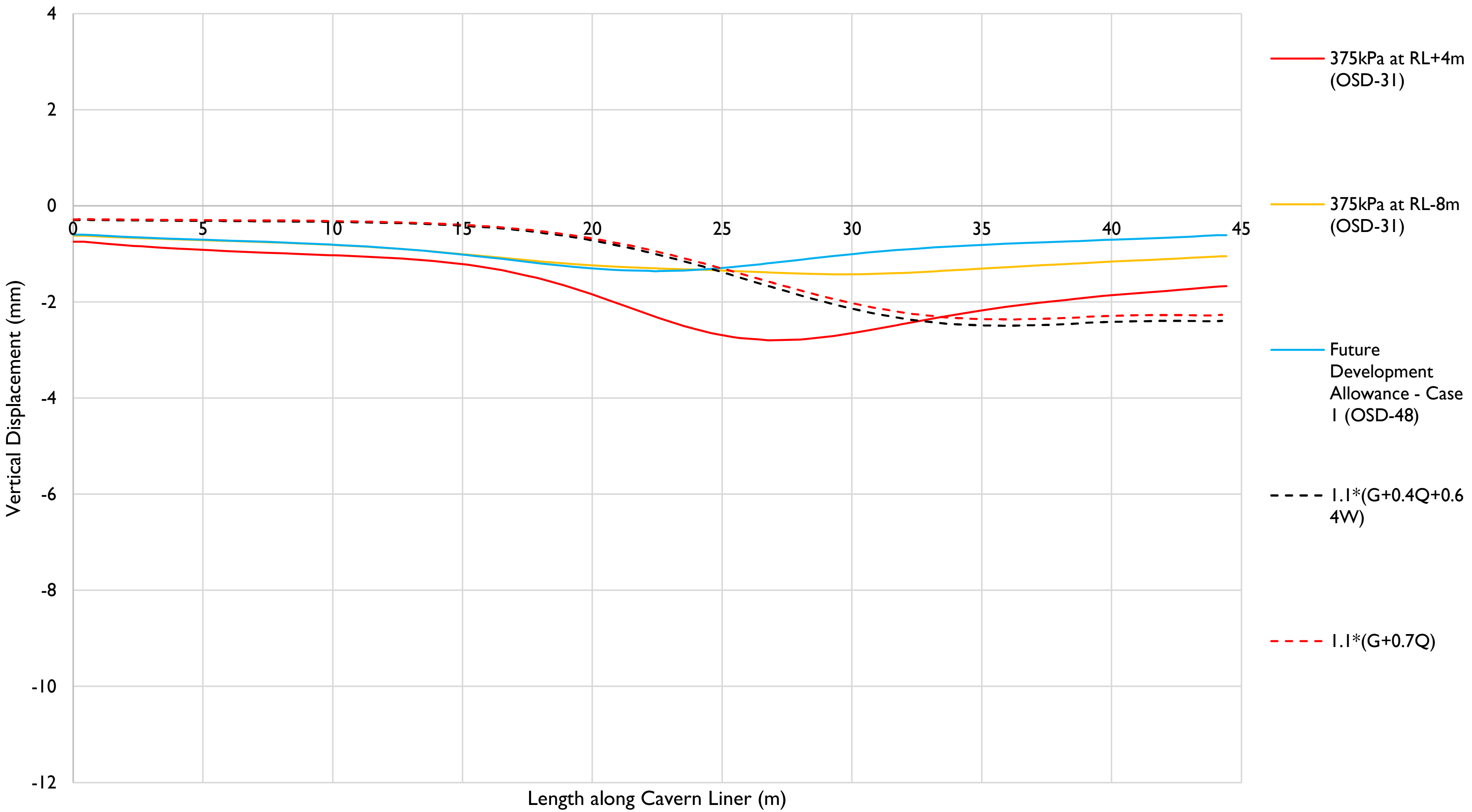
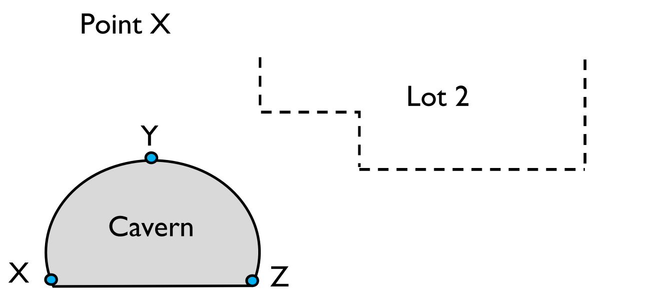
figure: *1e*

Analysis Group 2 (2a) - Change in Vertical Displacement on Cavern Liner





by:	DL	*client:*	RCP
date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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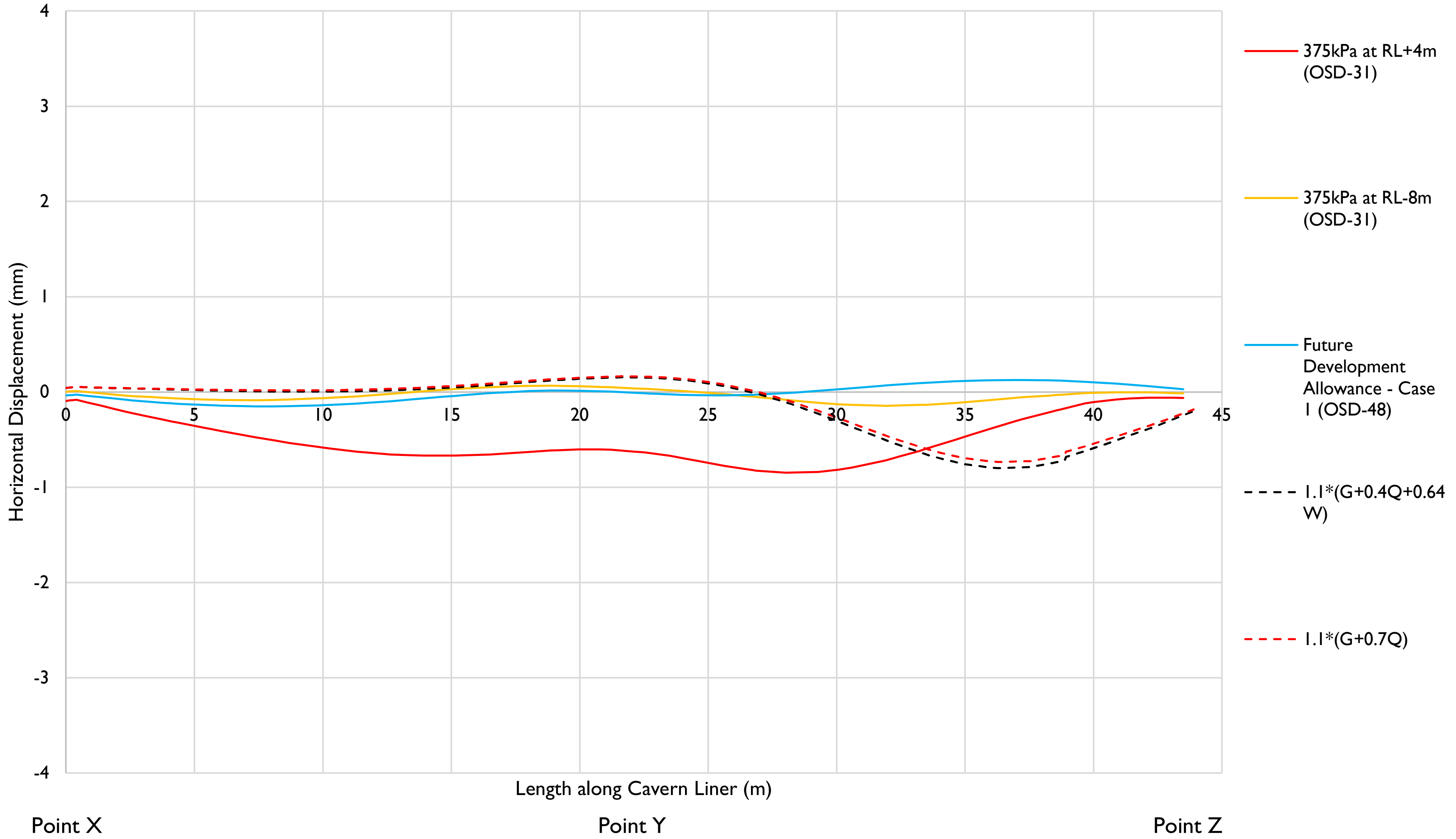
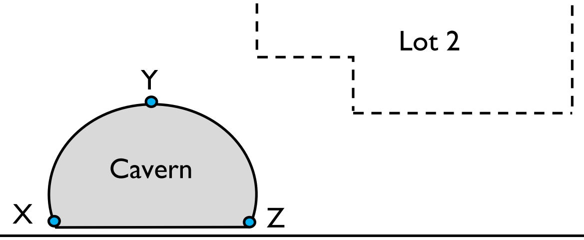
figure: 2a

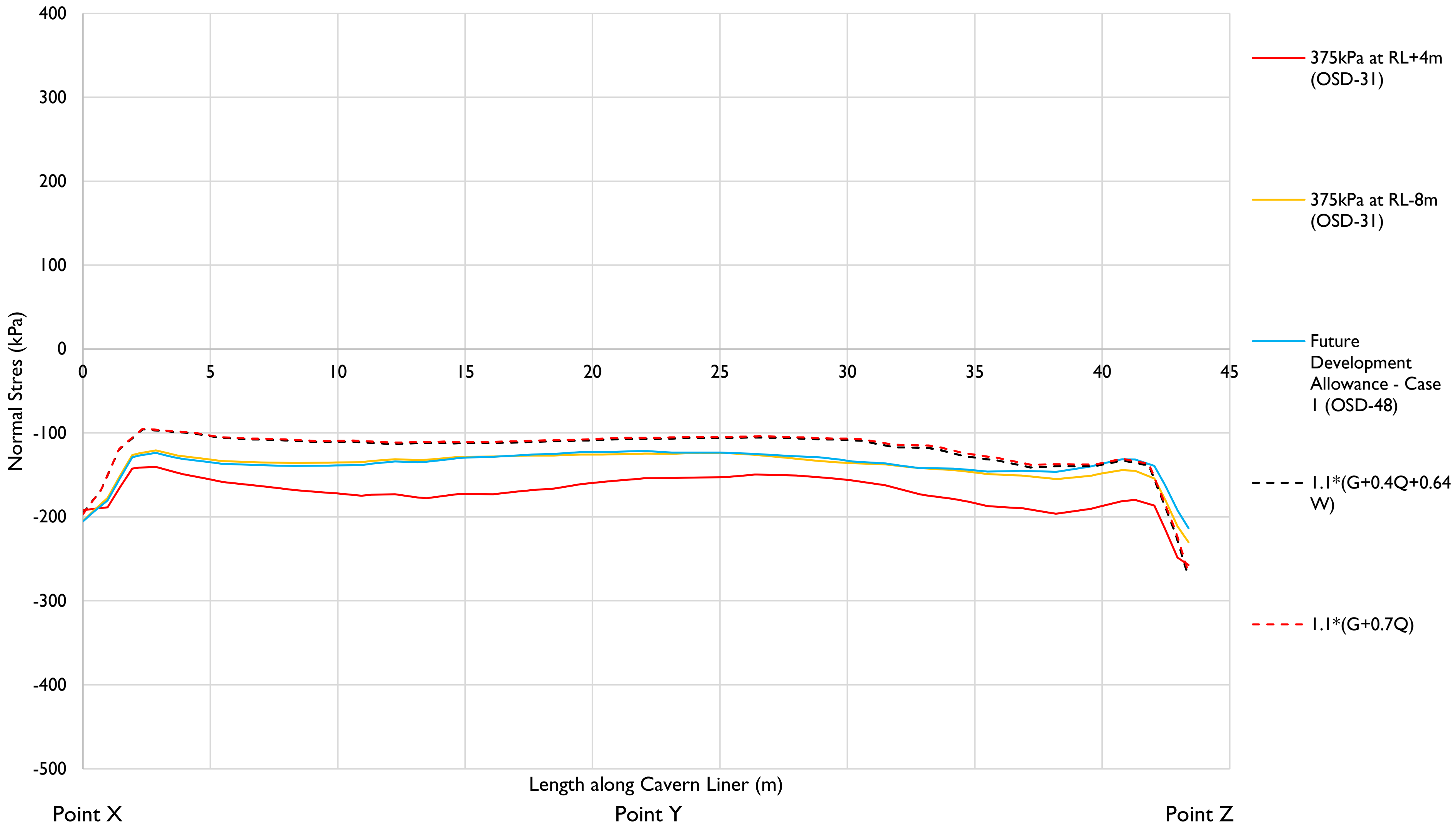
Analysis Group 2 (2b) - Change in Horizontal Displacement on Cavern Liner

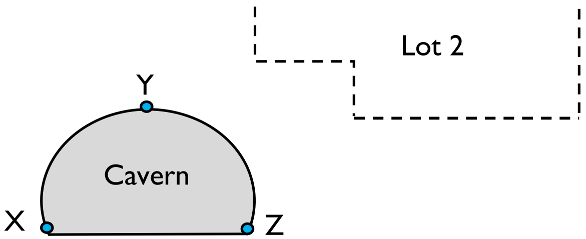




by:	DL	*client:*	RCP	EDG consulting engineering | design | geosciences
date:	29/06/2026	*project:*	Albert Street Development	
approved:	DJC	*location:*	Brisbane	
scale:	NTS	*title:*	*Finite Element Outputs*	
		job no:	B01493-1	*figure:* 2b

Analysis Group 2 (2c) - Normal Stress on Cavern Liner





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date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
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		job no:	B01493-1

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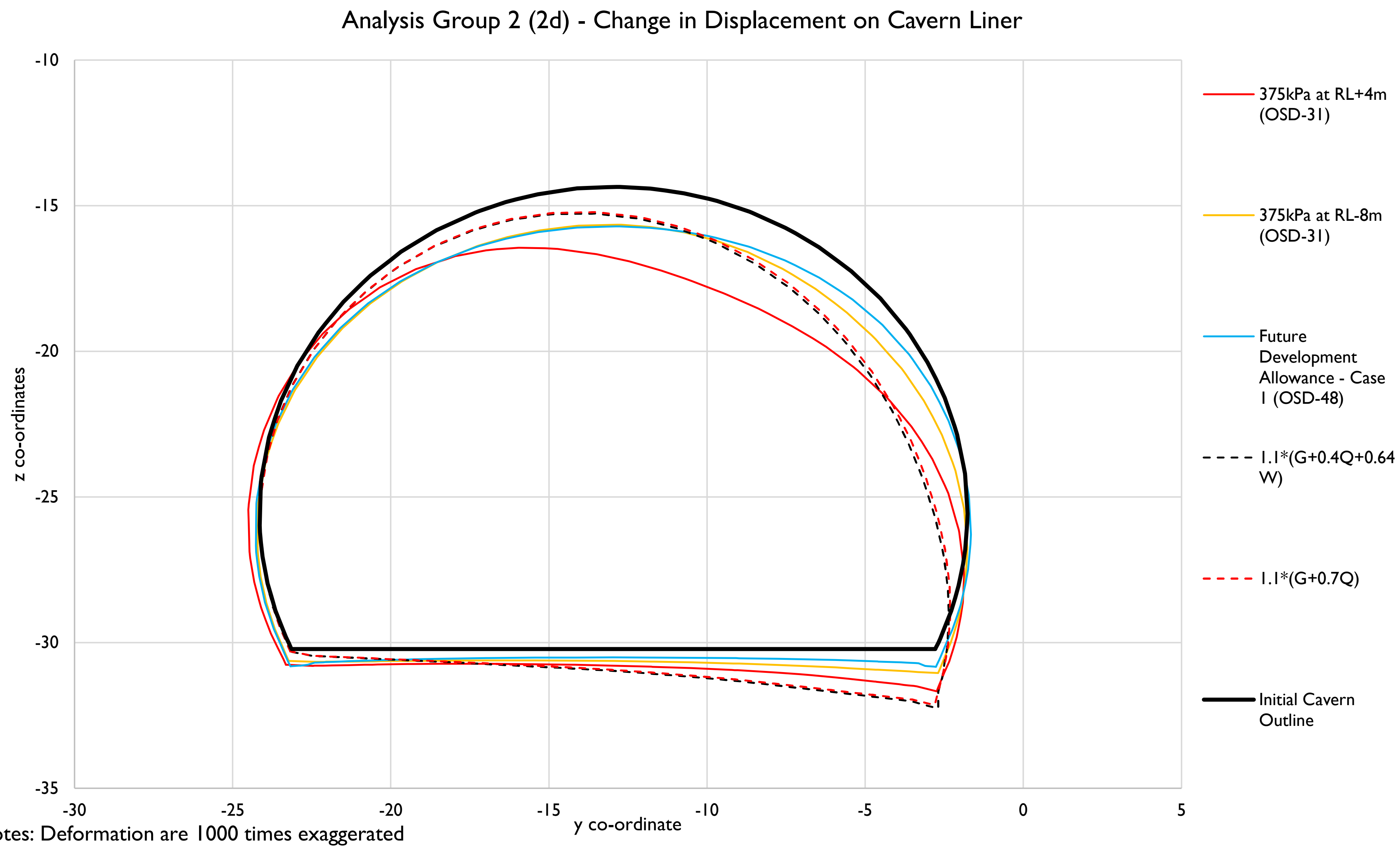
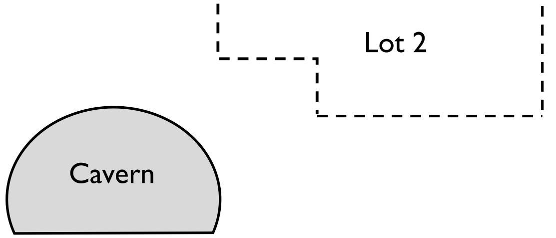
figure: 2c



Notes: Deformation are 1000 times exaggerated



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approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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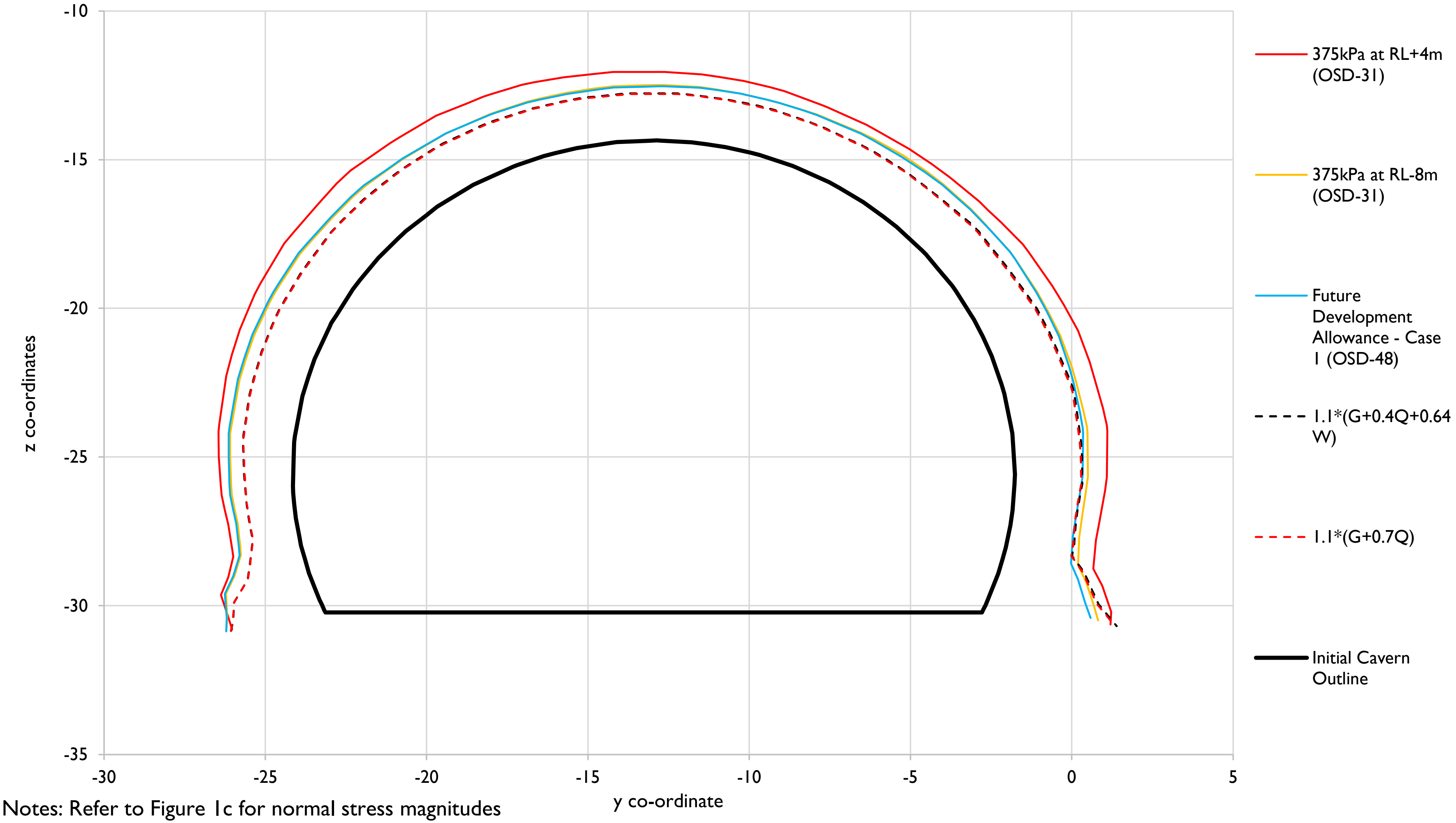
figure: 2d

Analysis Group 2 (2e) - Normal Stress on Cavern Liner



Notes: Refer to Figure 1c for normal stress magnitudes

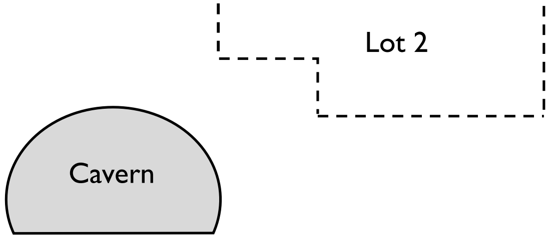


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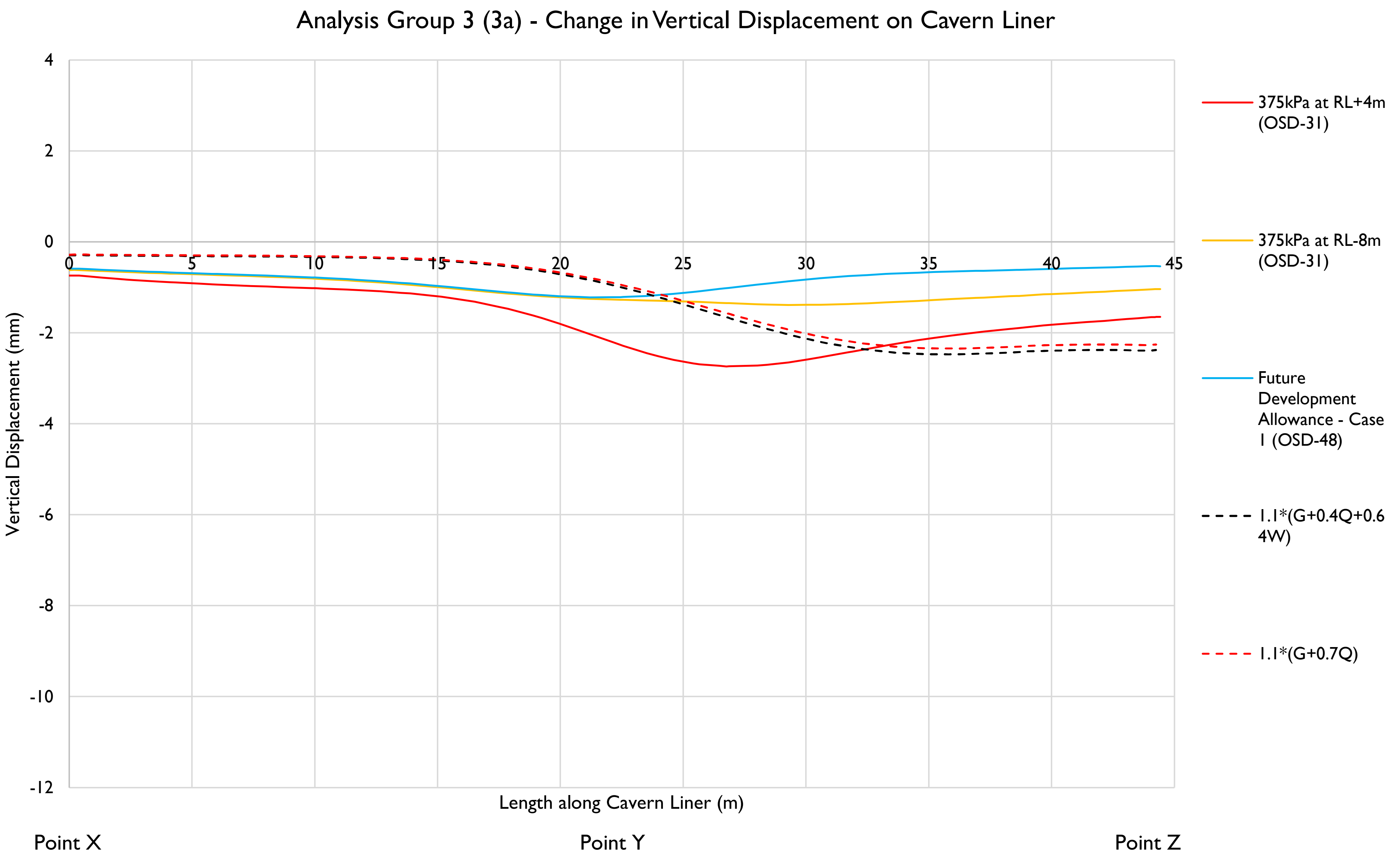
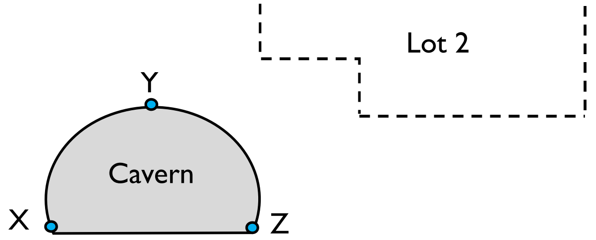
figure: 2e





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approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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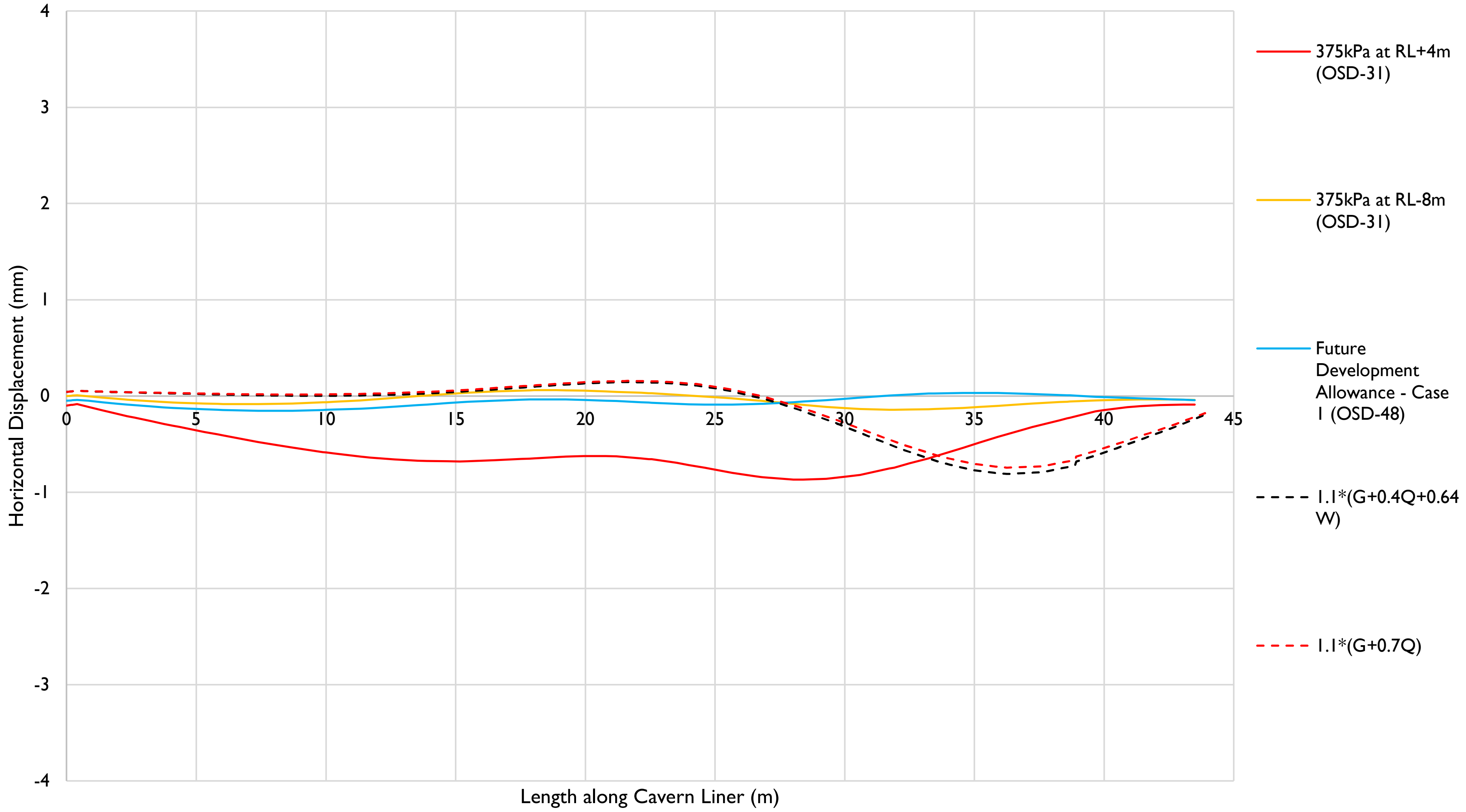
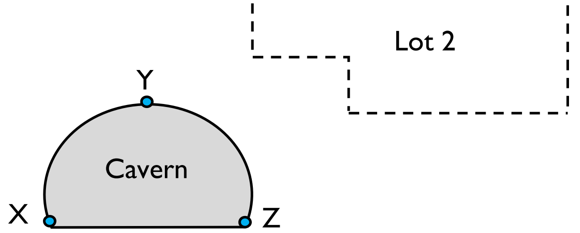
figure: *3a*

Analysis Group 3 (3b) - Change in Horizontal Displacement on Cavern Liner



Point X Point Y Point Z



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date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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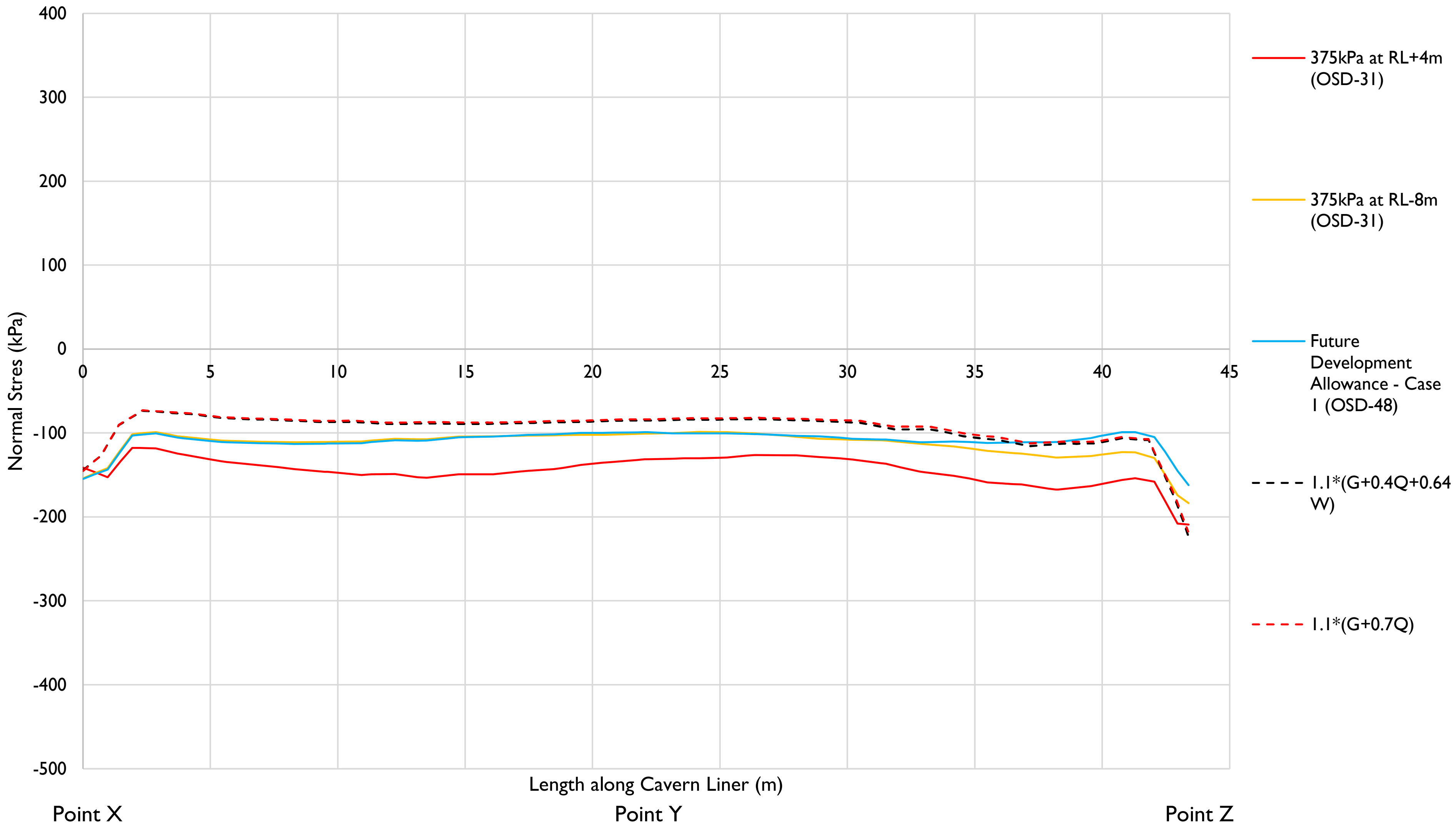
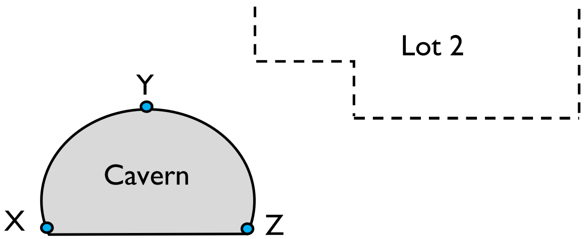
figure: 3b

Analysis Group 3 (3c) - Normal Stress on Cavern Liner





by:	DL	*client:*	RCP
date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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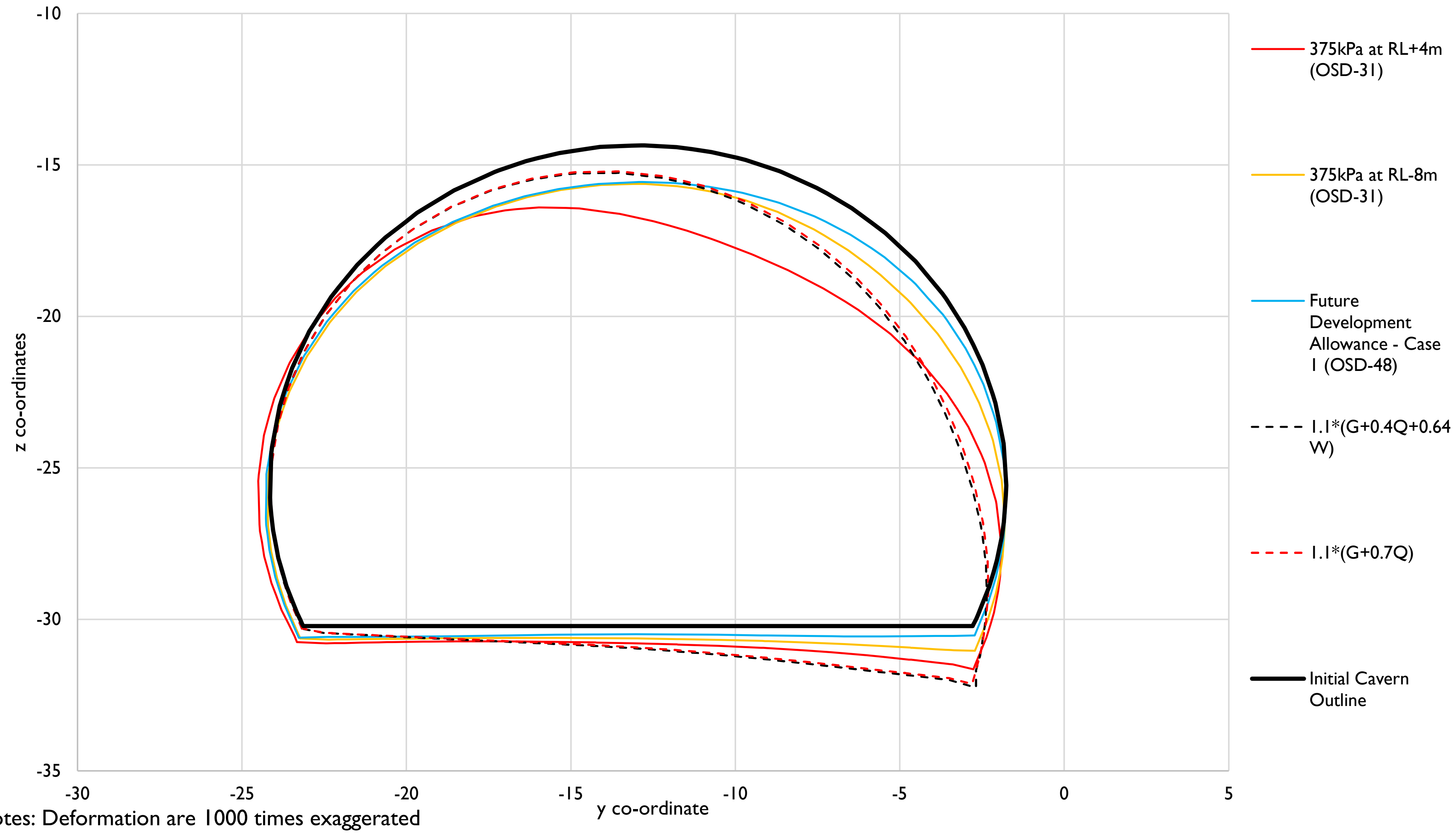
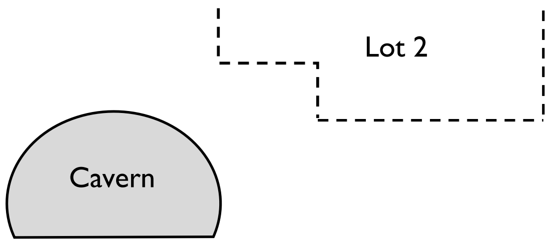
figure: 3c

Analysis Group 3 (3d) - Change in Displacement on Cavern Liner



Notes: Deformation are 1000 times exaggerated



by:	DL	*client:*	RCP
date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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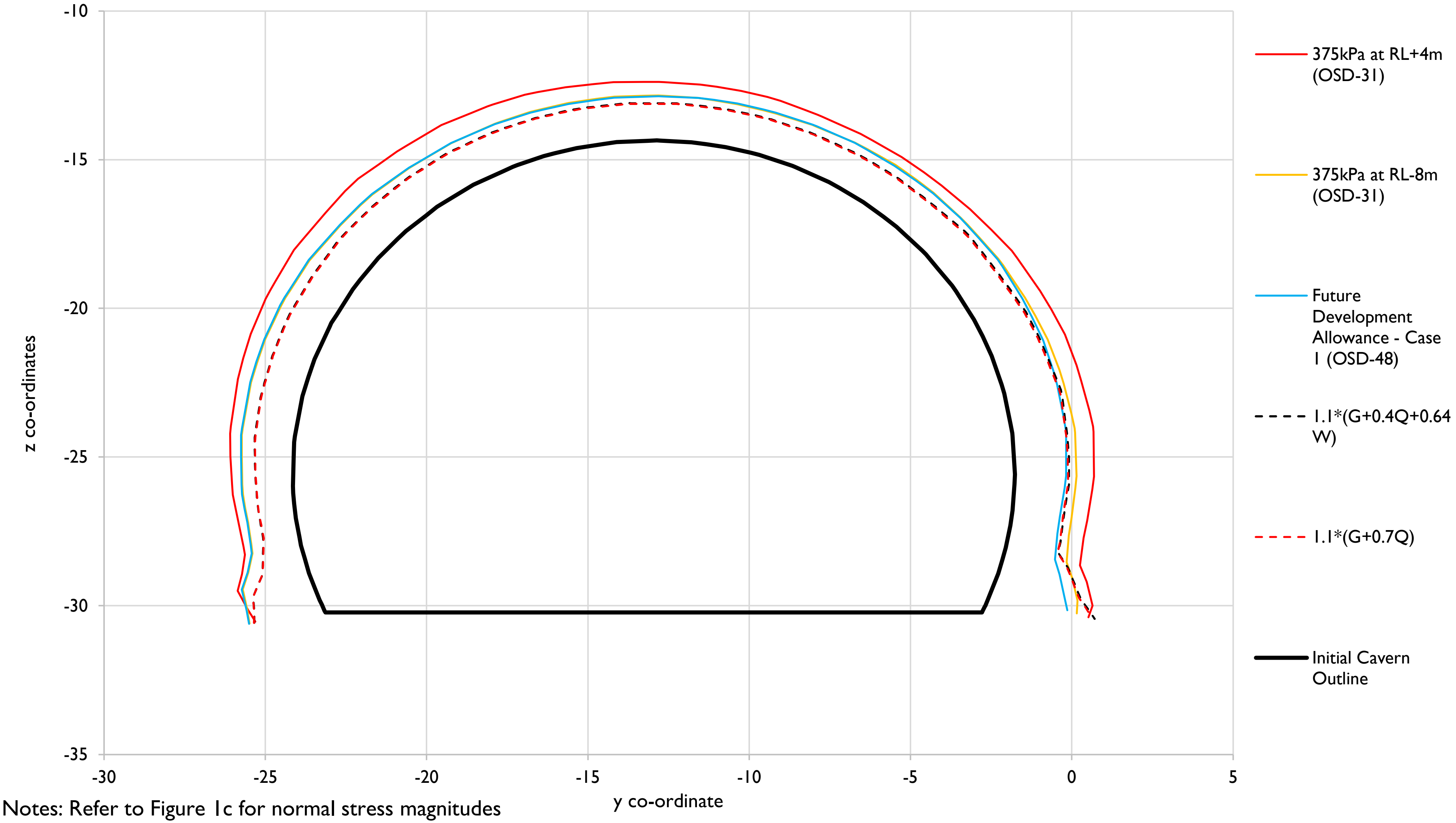
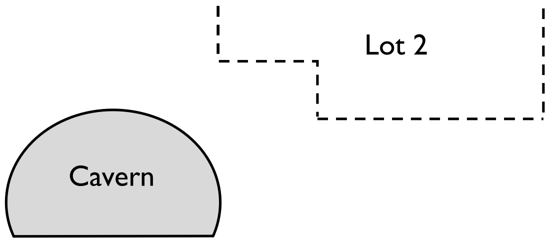
figure: *3d*

Analysis Group 3 (3e) - Normal Stress on Cavern Liner



Notes: Refer to Figure 1c for normal stress magnitudes



by:	DL	*client:*	RCP
date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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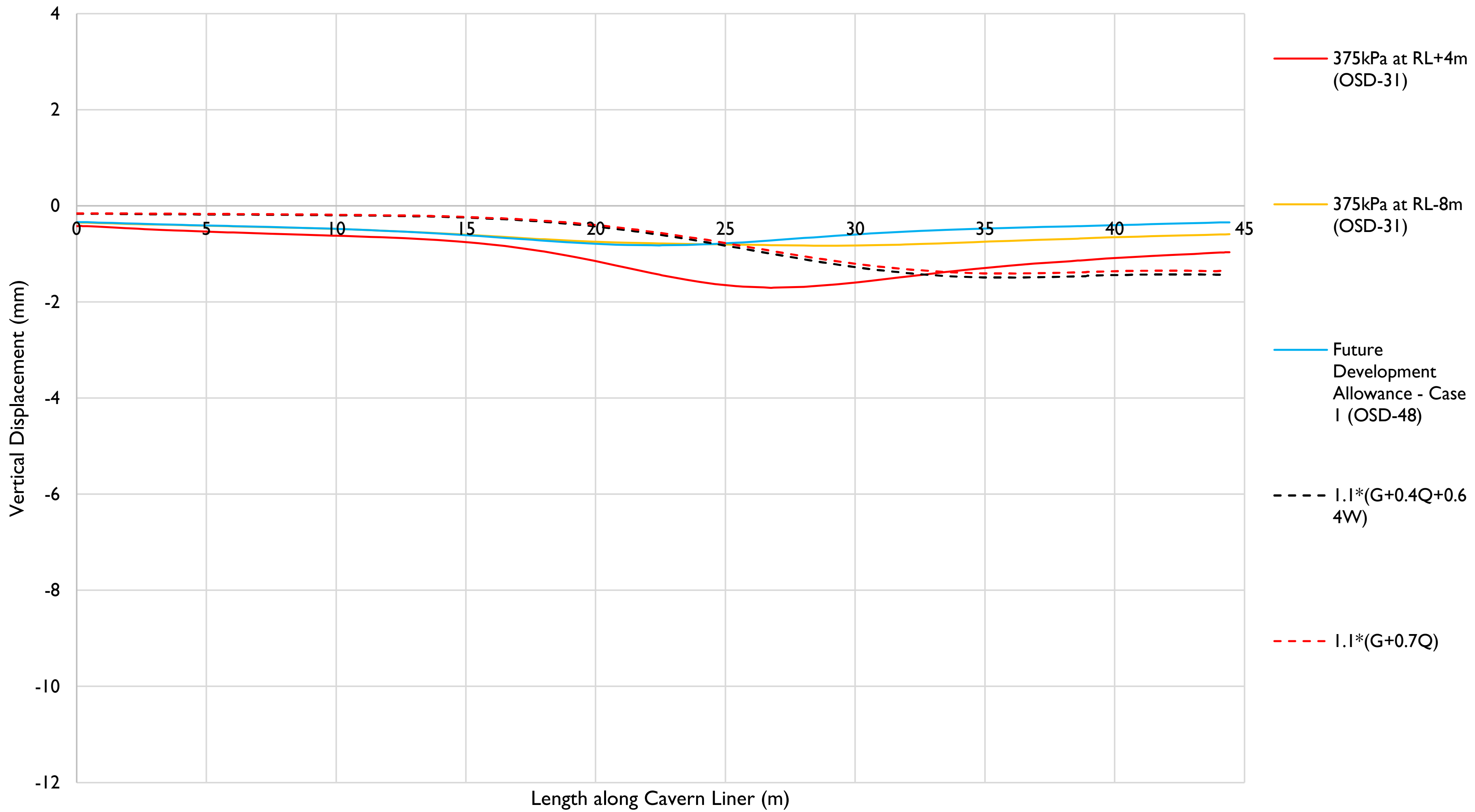
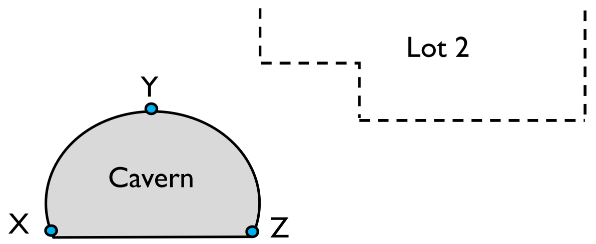
figure: 3e

Analysis Group 4 (4a) - Change in Vertical Displacement on Cavern Liner





by:	DL	client:	RCP
date:	29/06/2026	project:	Albert Street Development
approved:	DJC	location:	Brisbane
scale:	NTS	title:	*Finite Element Outputs*
		job no:	B01493-1

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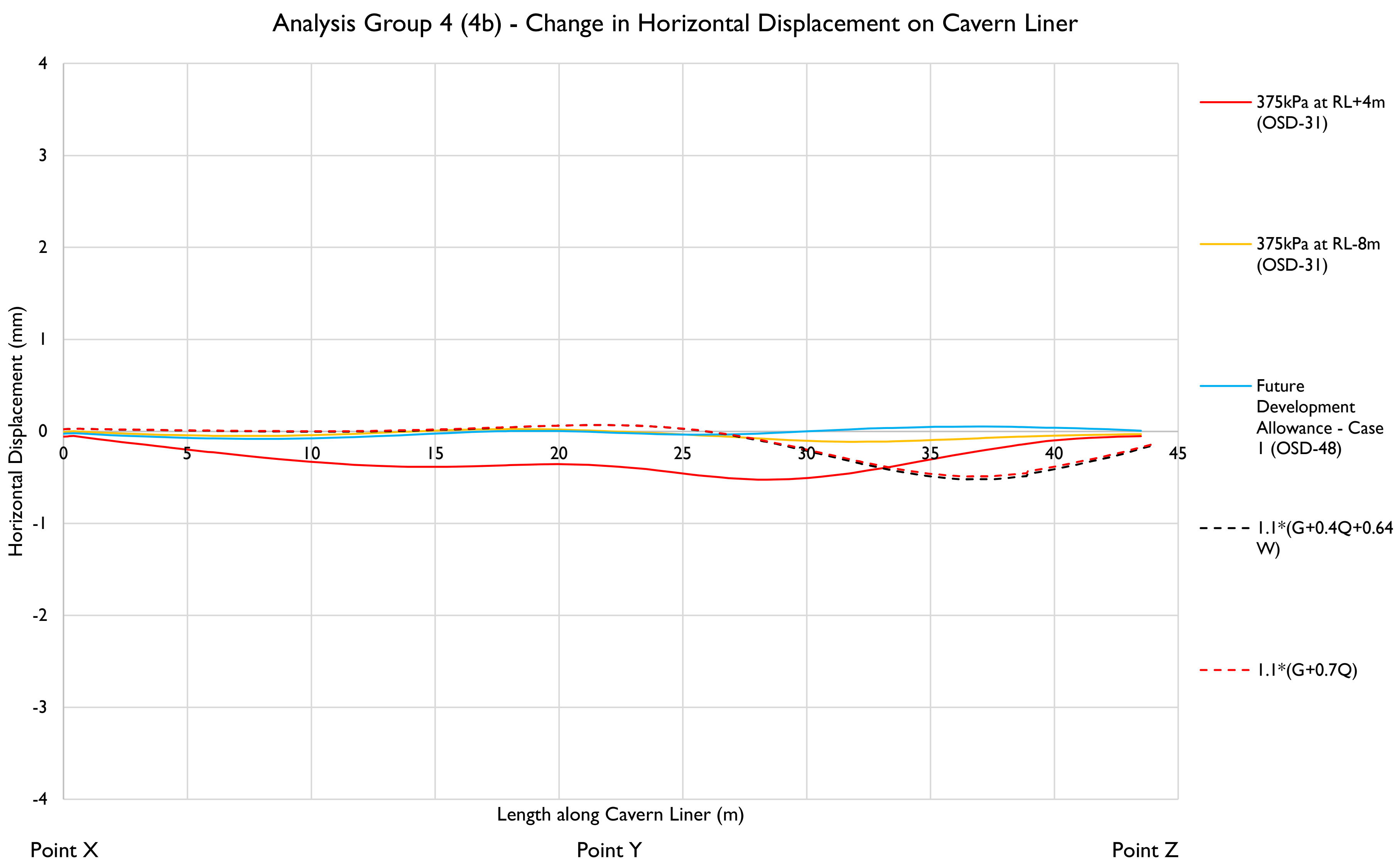
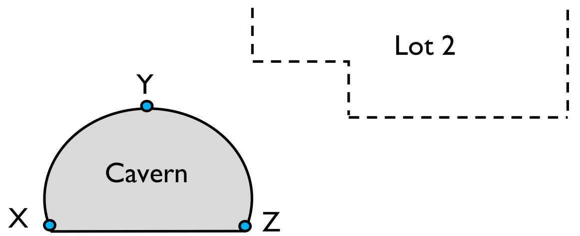
figure: 4a





by:	DL	*client:*	RCP
date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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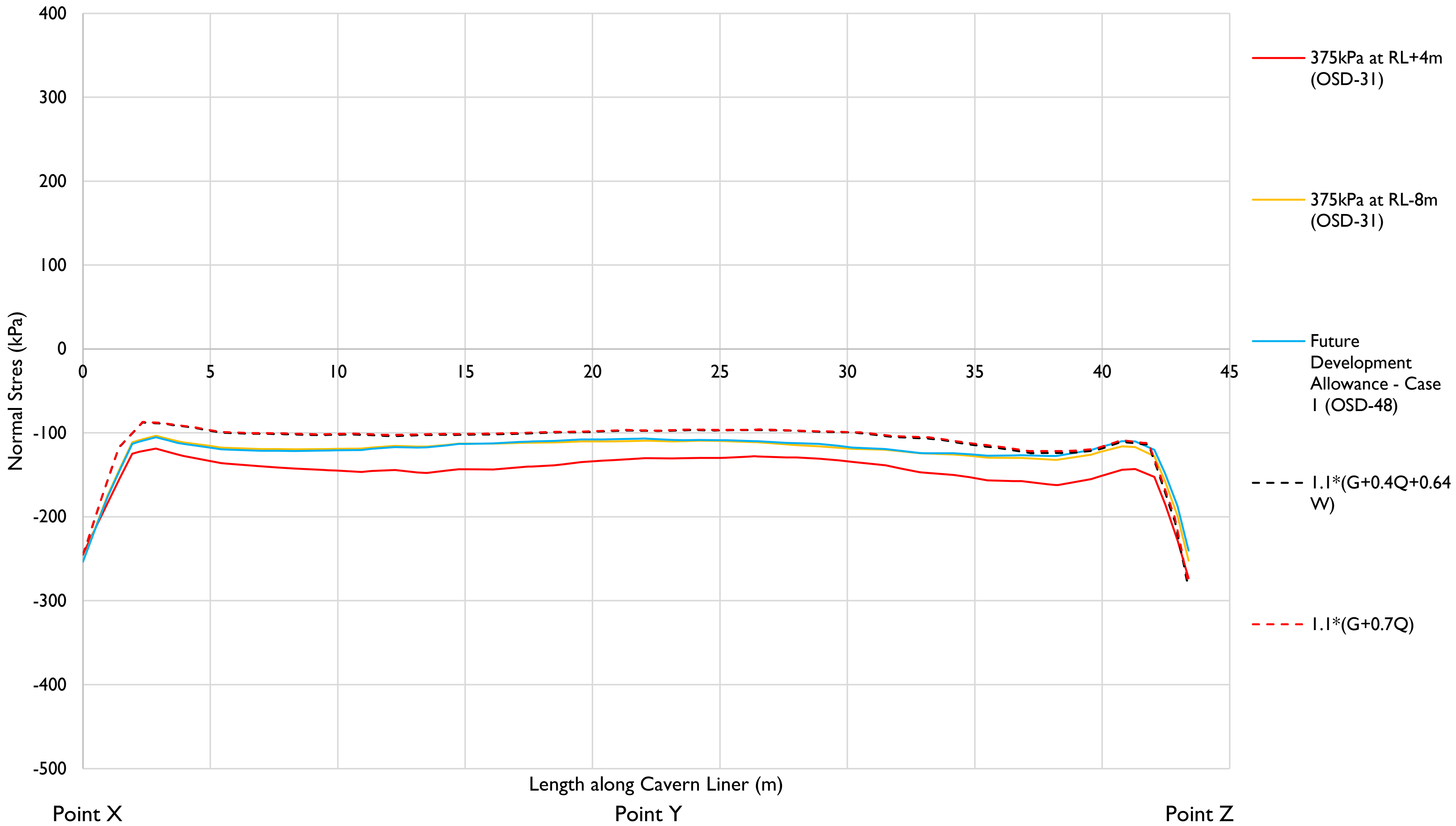
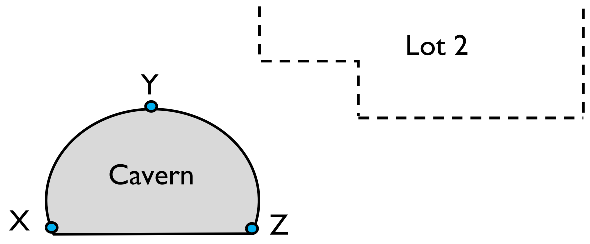
figure: 4b

Analysis Group 4 (4c) - Normal Stress on Cavern Liner





by:	DL	client:	RCP
date:	29/06/2026	project:	Albert Street Development
approved:	DJC	location:	Brisbane
scale:	NTS	title:	*Finite Element Outputs*
		job no:	B01493-1

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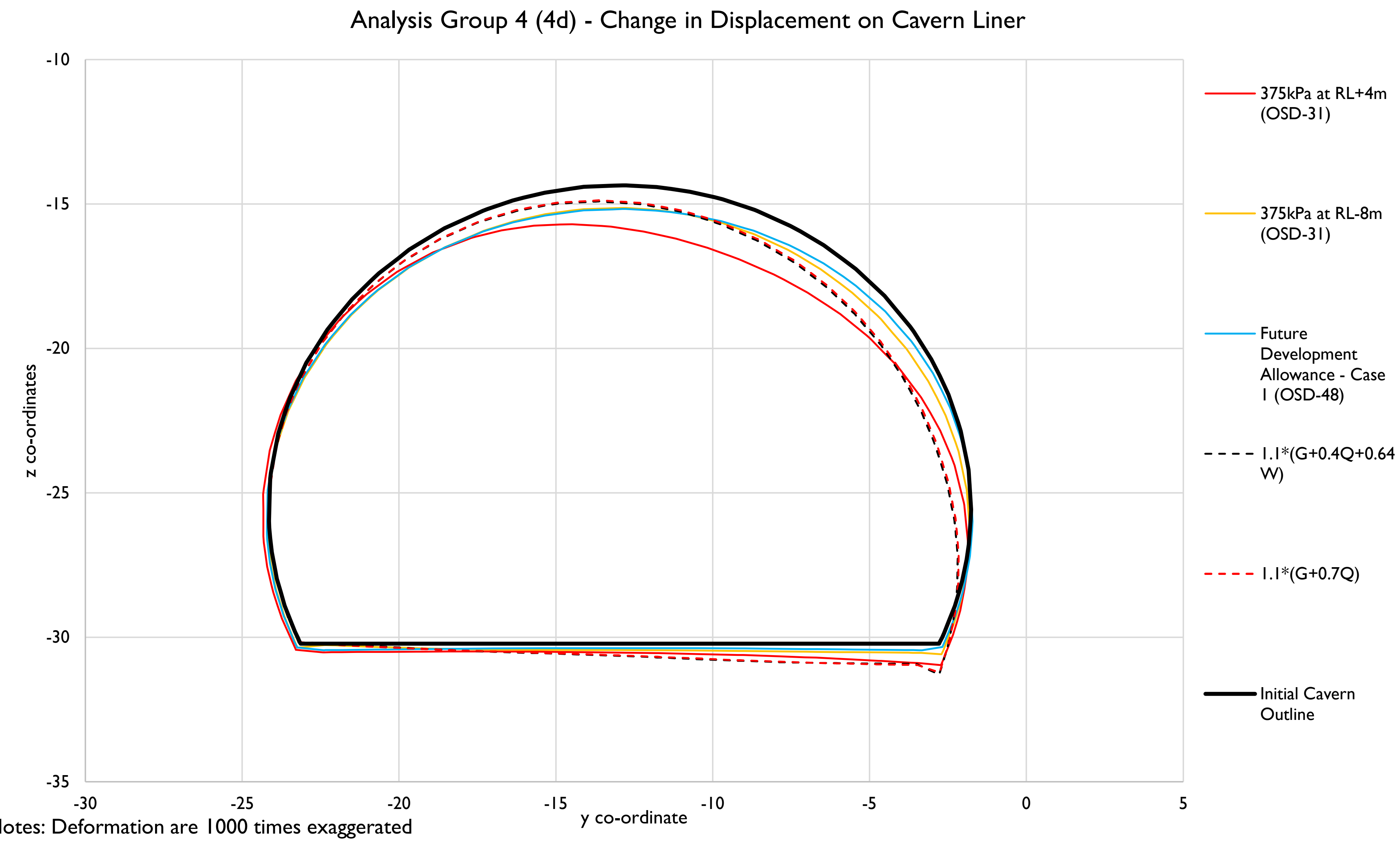
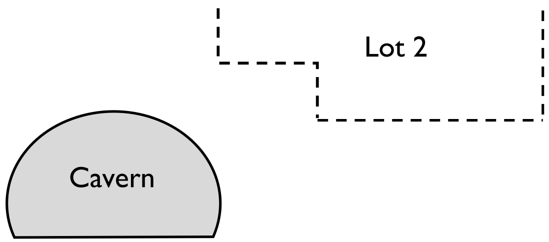
figure: 4c

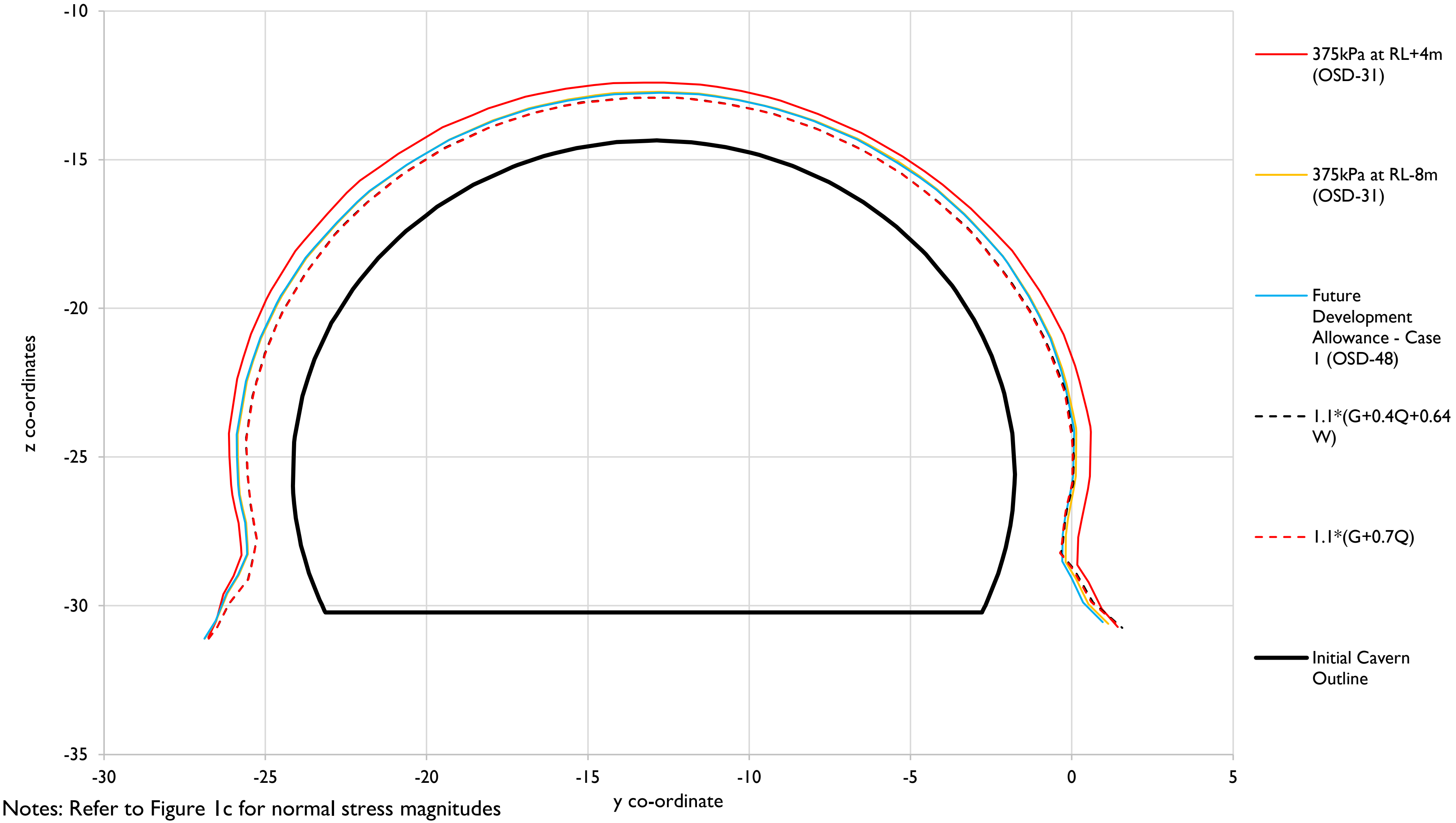


Notes: Deformation are 1000 times exaggerated

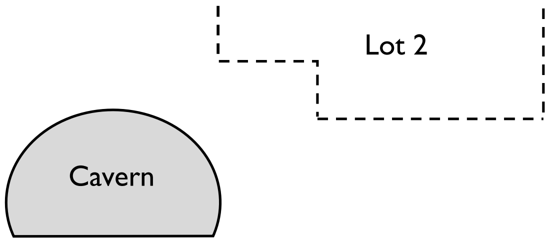


by:	DL	*client:*	RCP	EDG consulting
date:	29/06/2026	*project:*	Albert Street Development	engineering | design | geosciences
approved:	DJC	*location:*	Brisbane	
scale:	NTS	*title:*	*Finite Element Outputs*	
		job no:	B01493-1	*figure:* *4d*

Analysis Group 4 (4e) - Normal Stress on Cavern Liner

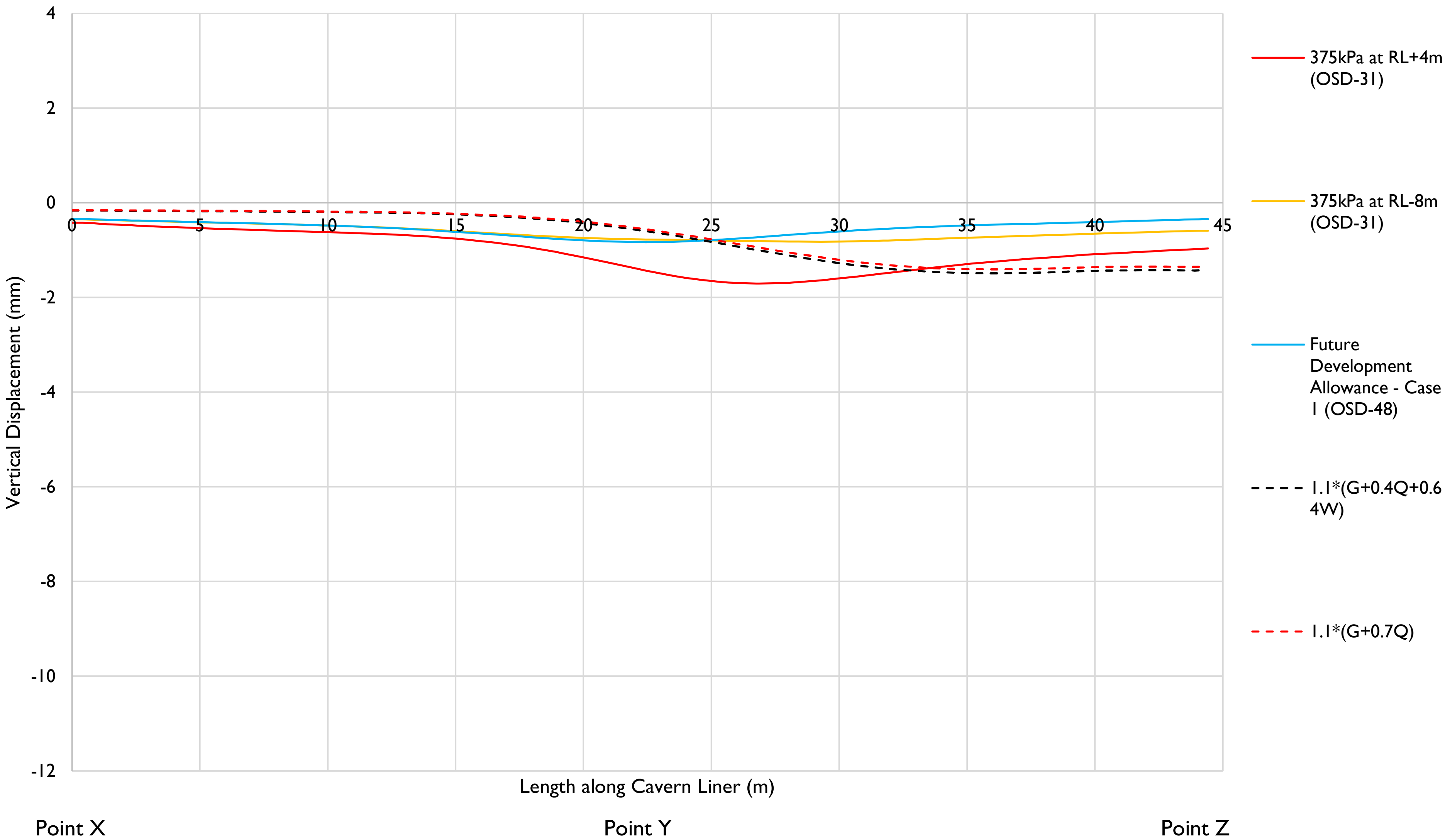


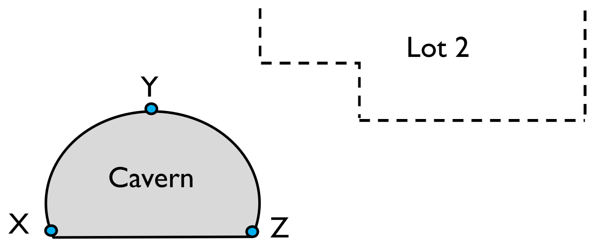
Notes: Refer to Figure 1c for normal stress magnitudes



by:	DL	*client:*	RCP	EDG consulting engineering | design | geosciences
date:	29/06/2026	*project:*	Albert Street Development	
approved:	DJC	*location:*	Brisbane	
scale:	NTS	*title:*	*Finite Element Outputs*	
		job no:	B01493-1	*figure:* 4e

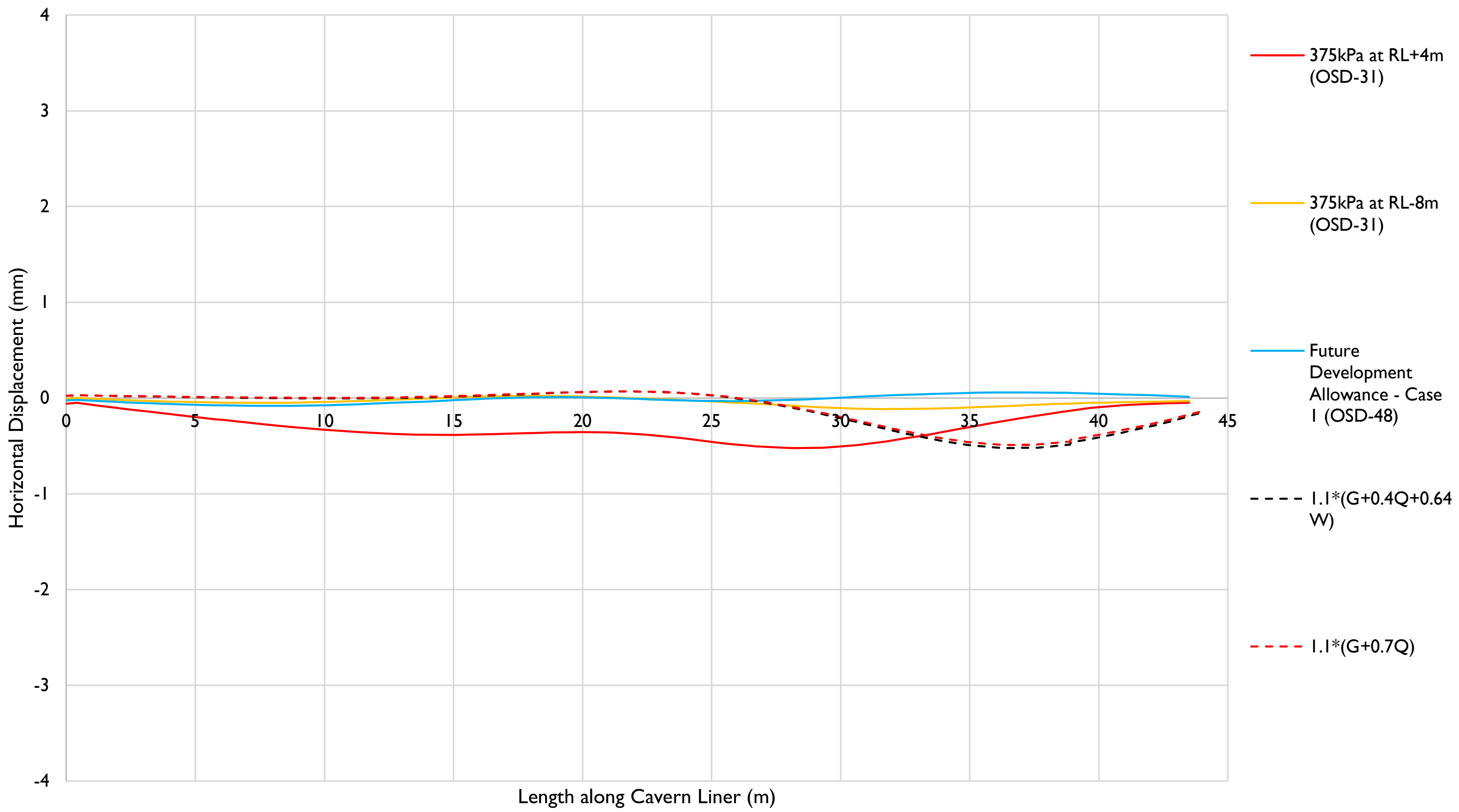
Analysis Group 5 (5a) - Change in Vertical Displacement on Cavern Liner



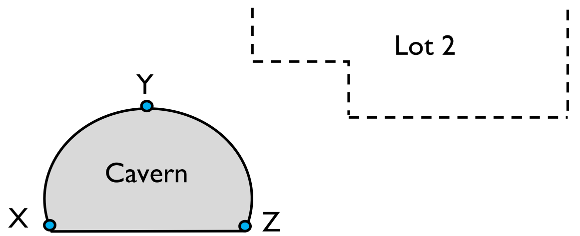


by:	DL	*client:*	RCP	EDG consulting
date:	29/06/2026	*project:*	Albert Street Development	
approved:	DJC	*location:*	Brisbane	
scale:	NTS	*title:*	*Finite Element Outputs*	*figure:* 5a
		job no:	B01493-1	

Analysis Group 5 (5b) - Change in Horizontal Displacement on Cavern Liner

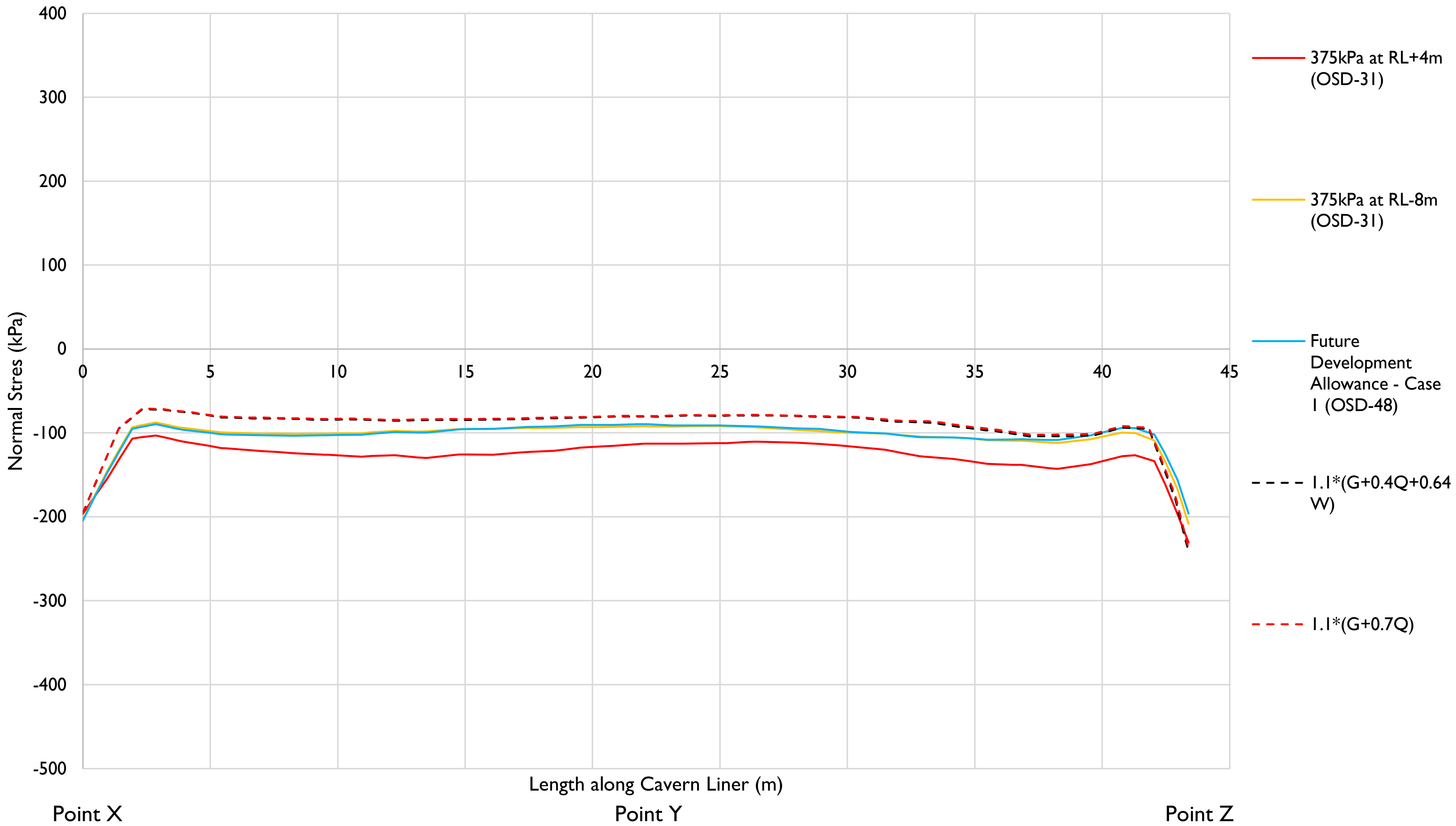


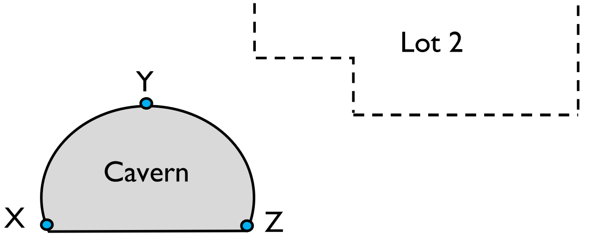
Point X Point Y Point Z



by:	DL	*client:*	RCP	EDG consulting engineering | design | geosciences
date:	29/06/2026	*project:*	Albert Street Development	
approved:	DJC	*location:*	Brisbane	
scale:	NTS	*title:*	*Finite Element Outputs*	
		job no:	B01493-1	*figure:* 5b

Analysis Group 5 (5c) - Normal Stress on Cavern Liner





by:	DL	*client:*	RCP
date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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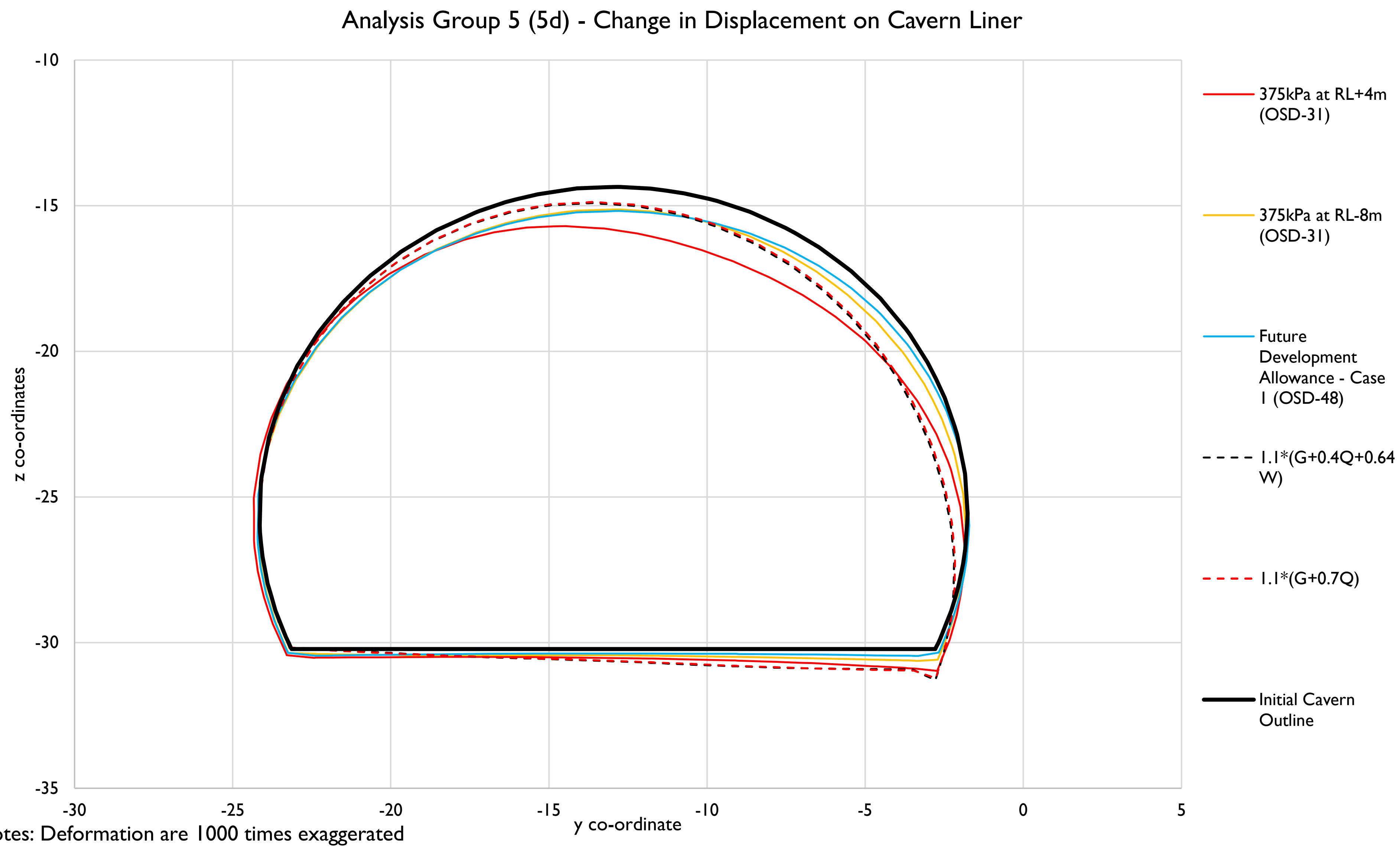
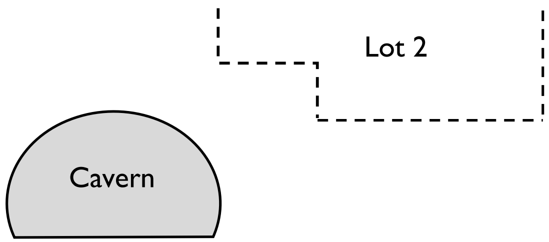
figure: 5c

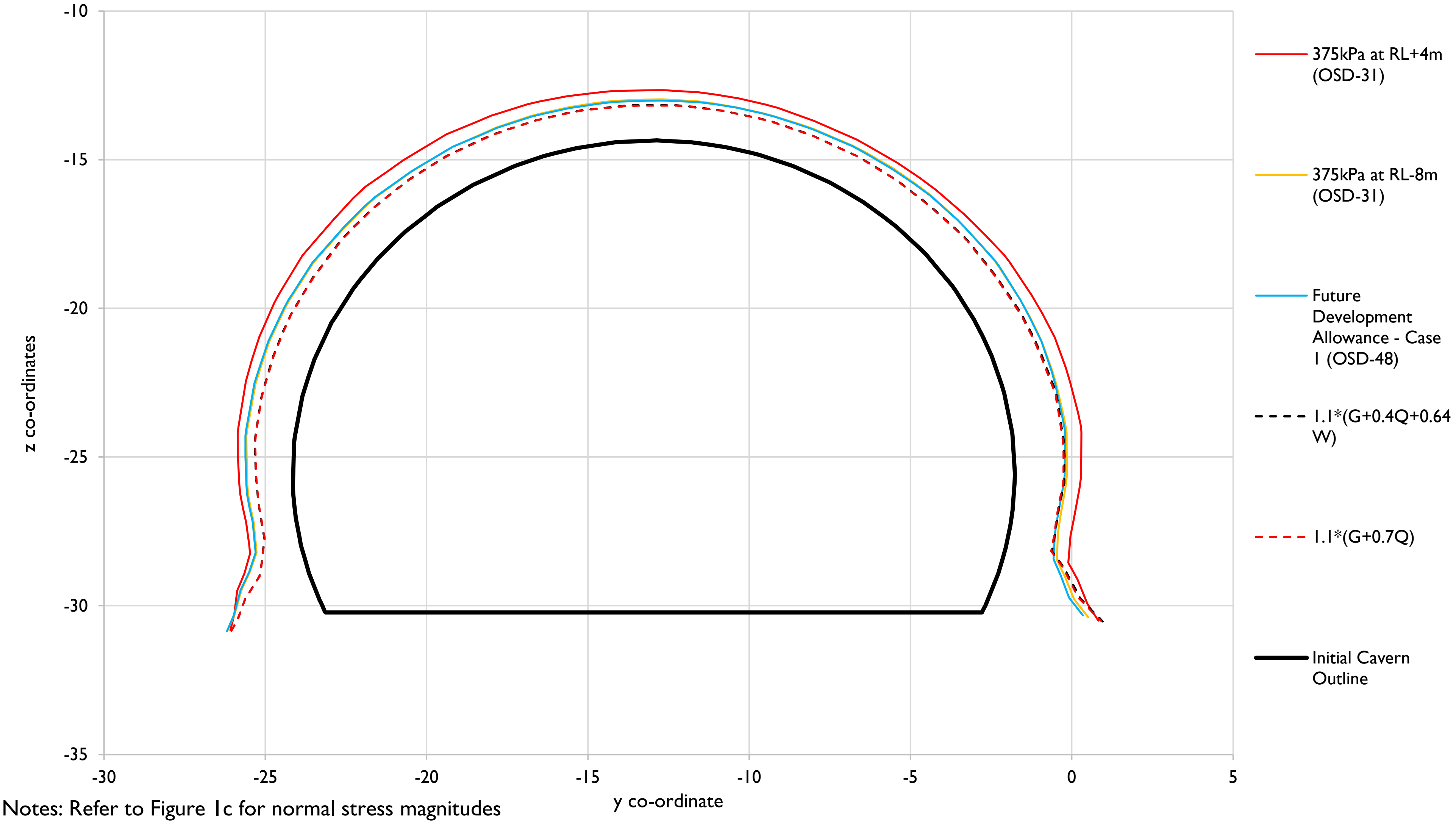


Notes: Deformation are 1000 times exaggerated

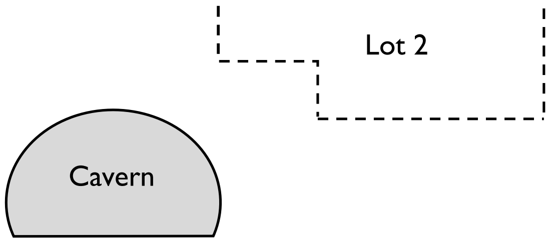


by:	DL	*client:*	RCP	EDG consulting engineering | design | geosciences
date:	29/06/2026	*project:*	Albert Street Development	
approved:	DJC	*location:*	Brisbane	
		title:	*Finite Element Outputs*	
scale:	NTS	*job no:*	B01493-1	*figure:* 5d

Analysis Group 5 (5e) - Normal Stress on Cavern Liner



Notes: Refer to Figure 1c for normal stress magnitudes



by:	DL	*client:*	RCP
date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
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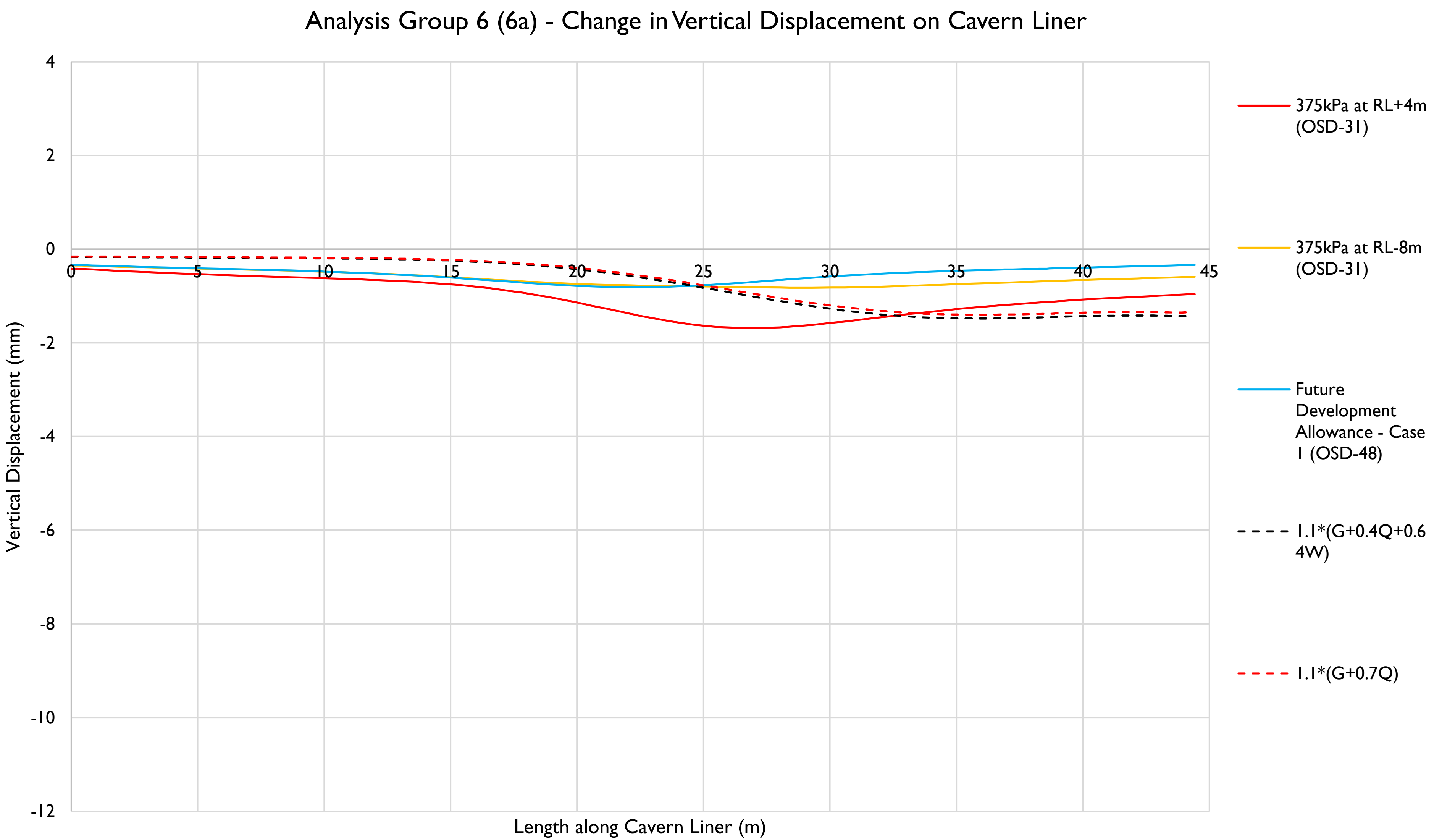
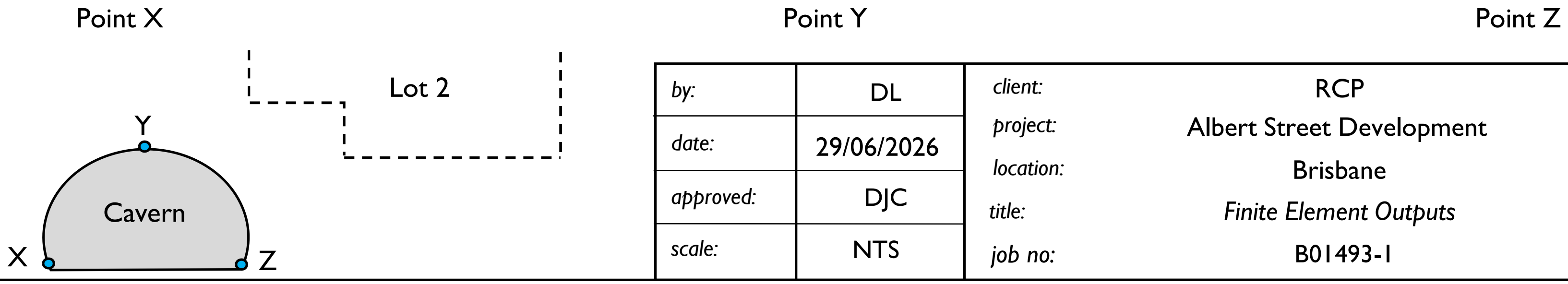
figure: 5e





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date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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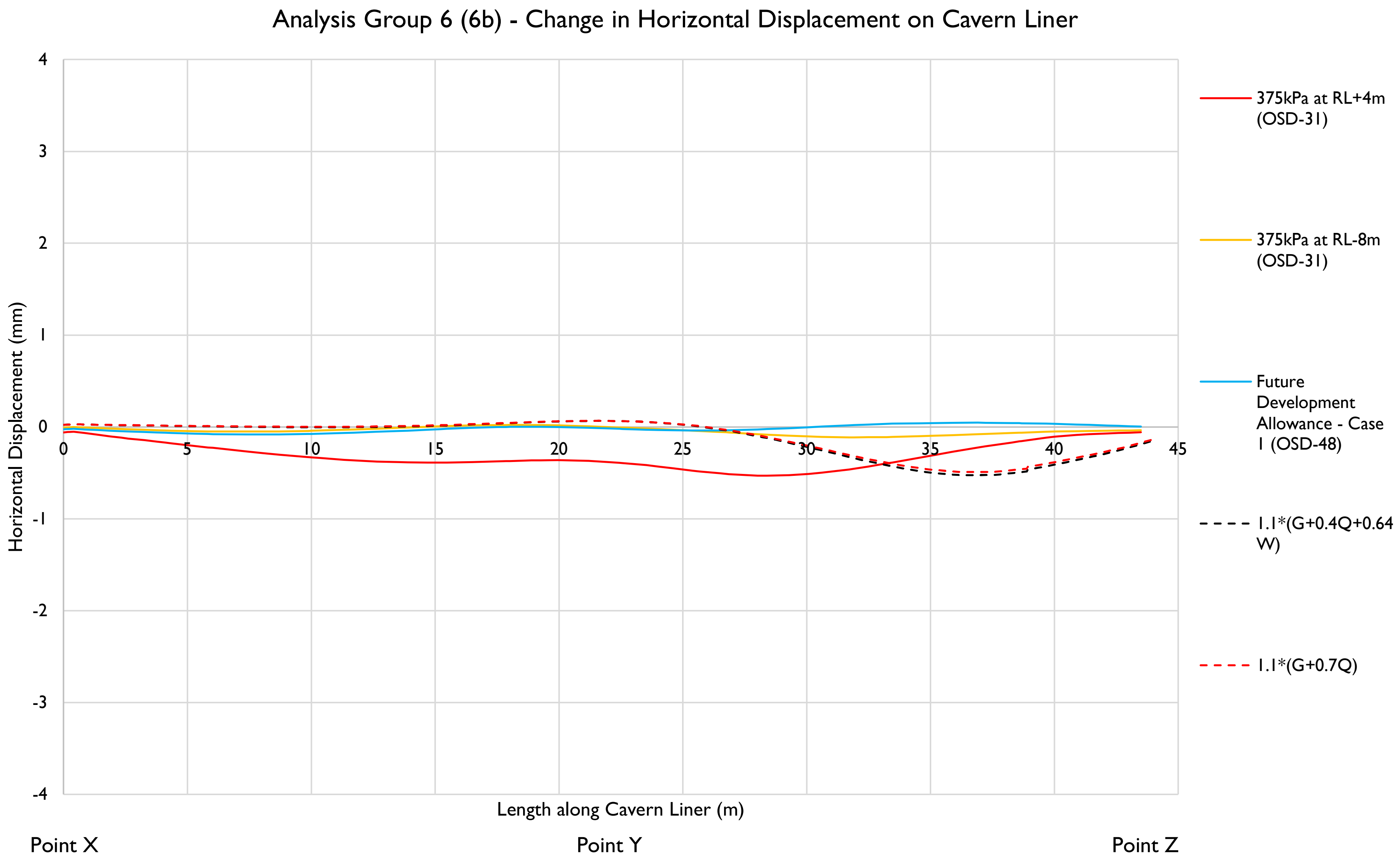
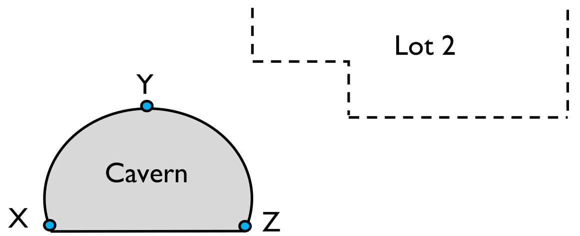
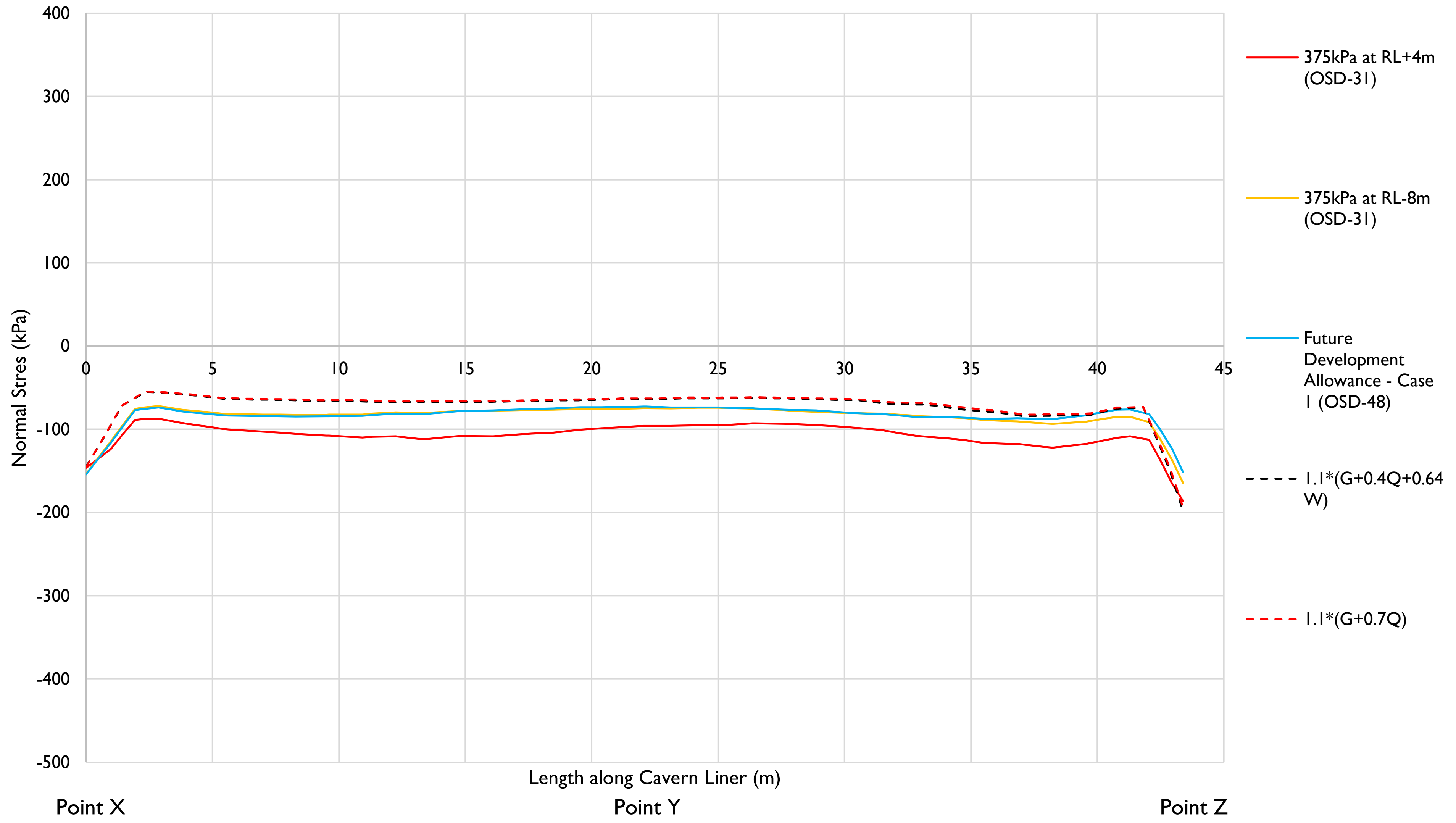
figure: *6a*

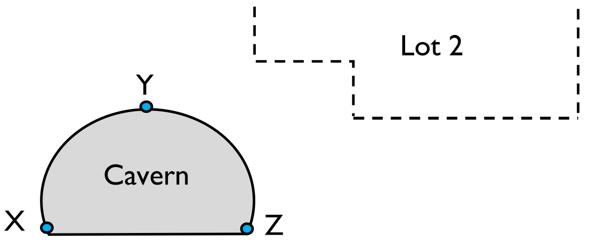




by:	DL	client:	RCP	EDG consulting engineering | design | geosciences
date:	29/06/2026	project:	Albert Street Development	
approved:	DJC	location:	Brisbane	
scale:	NTS	title:	*Finite Element Outputs*	
		job no:	B01493-1	figure: 6b

Analysis Group 6 (6c) - Normal Stress on Cavern Liner





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date:	29/06/2026	*project:*	Albert Street Development
approved:	DJC	*location:*	Brisbane
scale:	NTS	*title:*	*Finite Element Outputs*
		job no:	B01493-1

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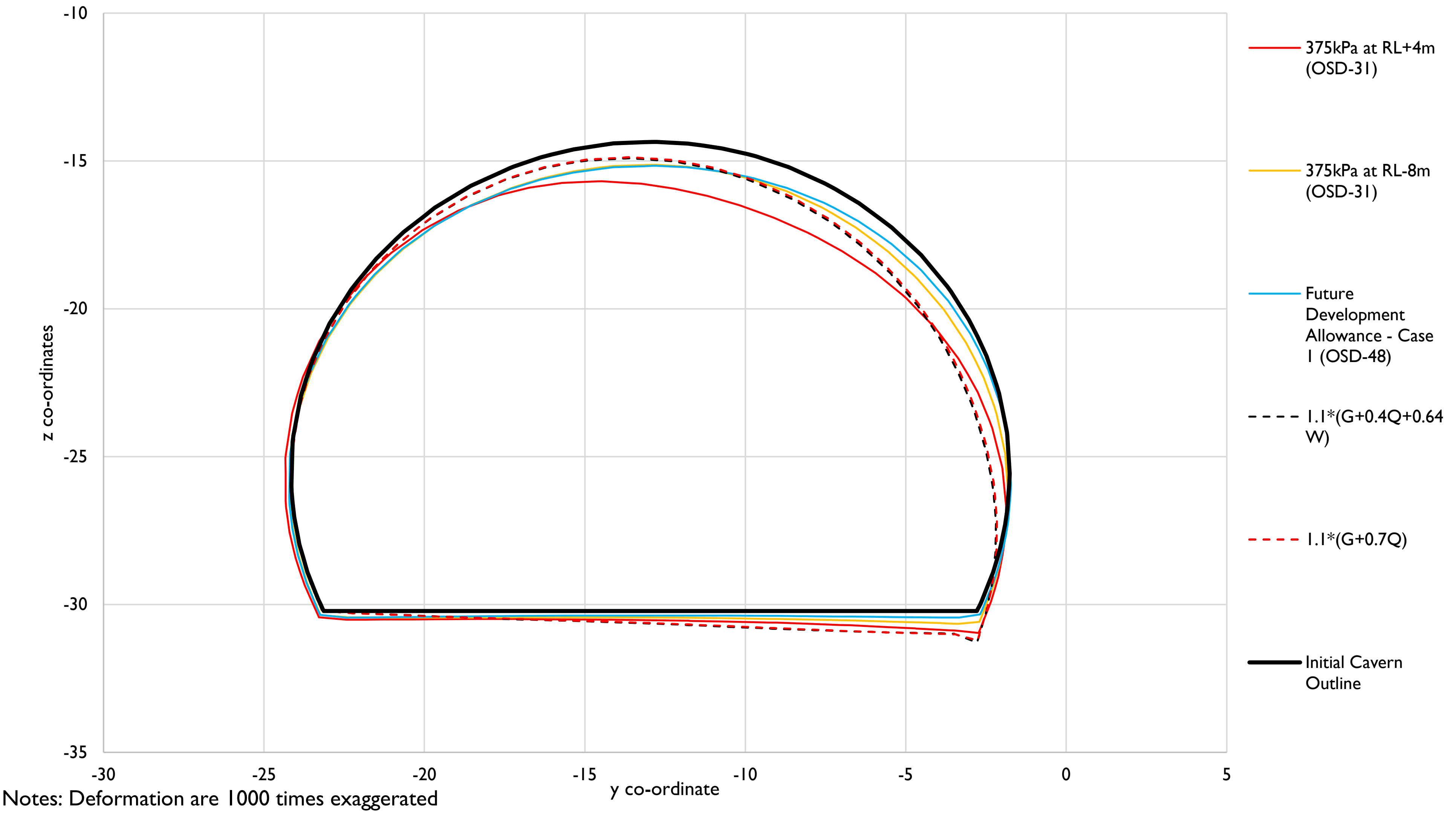
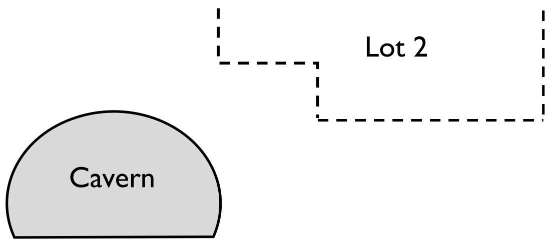
figure: 6c

Analysis Group 6 (6d) - Change in Displacement on Cavern Liner

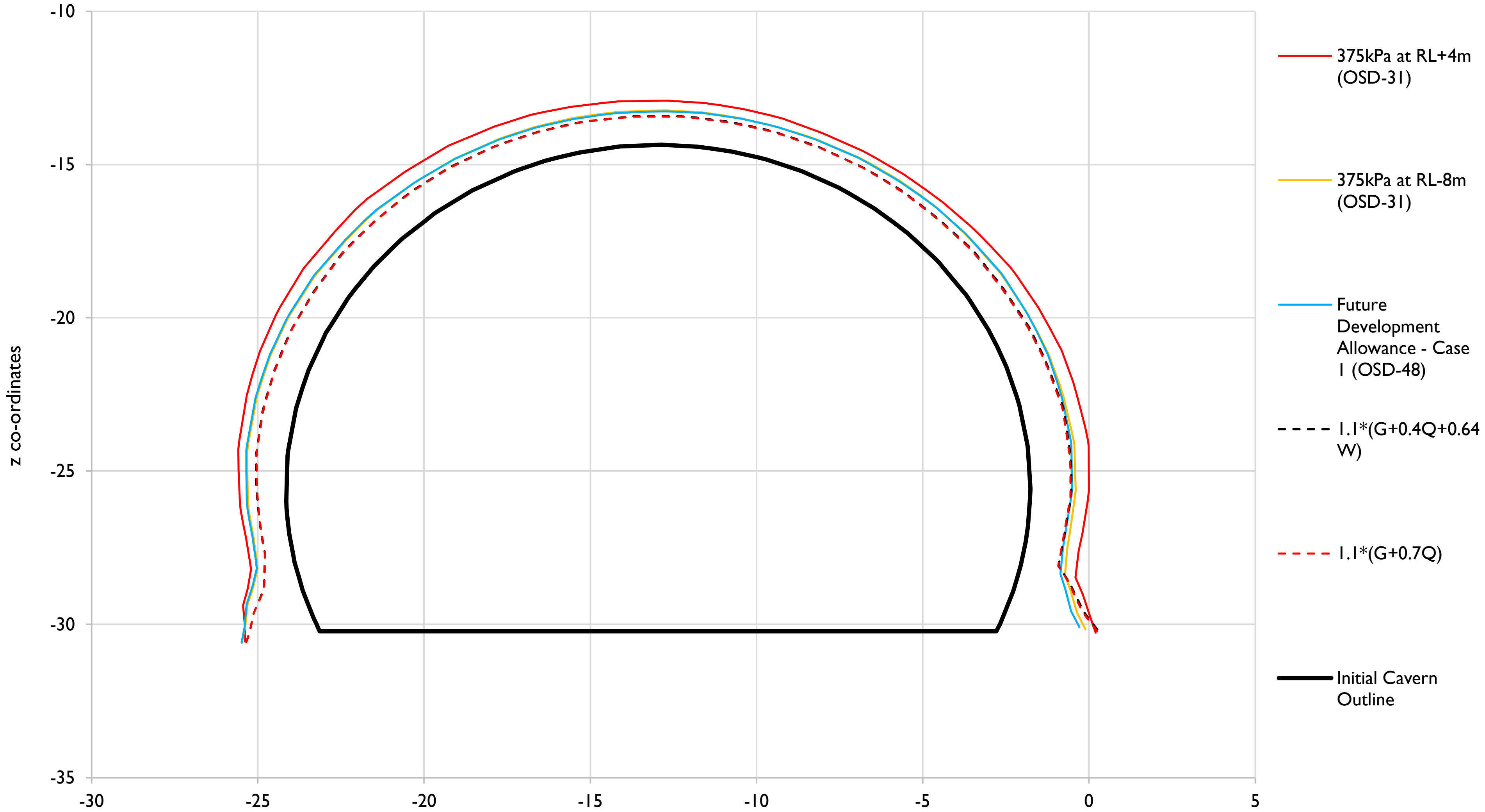


Notes: Deformation are 1000 times exaggerated

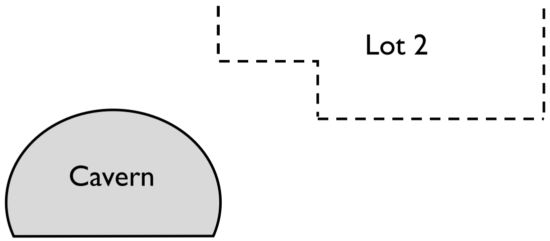


by:	DL	*client:*	RCP	EDG consulting engineering | design | geosciences
date:	29/06/2026	*project:*	Albert Street Development	
approved:	DJC	*location:*	Brisbane	
scale:	NTS	*title:*	*Finite Element Outputs*	
		job no:	B01493-1	*figure:* *6d*

Analysis Group 6 (6e) - Normal Stress on Cavern Liner



Notes: Refer to Figure 1c for normal stress magnitudes



by:	DL	*client:*	RCP	EDG consulting engineering | design | geosciences
date:	29/06/2026	*project:*	Albert Street Development	
approved:	DJC	*location:*	Brisbane	
scale:	NTS	*title:*	*Finite Element Outputs*	
		job no:	B01493-1	*figure:* 6e

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