Attachment A16

Geotechnical Desktop Investigation

Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Geote□□ni□al Desktop Investigation

Proposed Commer□ial Development
□□□ Kent Street□Sydney

Prepared □or
C□arter □all □oldings Pty Ltd

Pro□e□t □□□□□□□□□
□une □□□□

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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Table of Contents

Report on Geotechnical Desktop Investigation
Proposed Commercial Development
[illegible] Kent Street, Sydney

1. Introduction

This report presents the results of a geotechnical desktop investigation undertaken for a proposed commercial development at [illegible] Kent Street, Sydney. The desktop study was carried out for the Planning Proposal stage, with the project seeking approval for a building envelope only. The report has been prepared on behalf of Charter Hall Holdings (the proponent) and it was undertaken in accordance with Douglas Partners' proposal [illegible].P[illegible].Rev[illegible] dated [illegible] September [illegible].

It is understood the proposed development will comprise a [illegible] sqm GFA office tower with a single basement level car park below Sussex Street, with premium grade services.

The aim of the desktop study was to provide preliminary geotechnical advice comprising the following:

- Geology (including groundwater);
- Excavatability of materials likely to be encountered;
- Shoring/retention systems;
- Foundations;
- Impact on Transport for New South Wales (TfNSW) assets (the CBD Rail Link tunnels (Up and Down tracks));
- Further geotechnical work.

2. Site Description

The proposed development covers [illegible] Kent Street, Sydney (DP [illegible]) as shown in Figure [illegible]. The site is approximately rectangular shaped, bounded by Kent Street to the east, Sussex Street to the west, [illegible] Kent Street to the south, [illegible] Kent Street to the north-east and [illegible] Sussex Street to the north-west. The site has an area of approximately [illegible] m² and has a street frontage of approximately [illegible] m on Sussex Street and [illegible] m on Kent Street (refer Detail Survey Plan Drawing 'Detail [illegible]D[illegible]' prepared by Beveridge Williams, Appendix B). The ground surface level along Kent Street boundary and the Sussex Street boundary is approximately RL [illegible] m and RL [illegible] m respectively.

The site is currently occupied by a mixed-use building consisting of [illegible] levels of public car park and [illegible] levels of commercial space above. The site has three existing basement levels below Kent Street, which extends horizontally towards Sussex Street ground level. There is vehicle access from both Kent Street and Sussex Street. It is further understood the site is constrained by the future CBD Rail Link rail reserve with proposed tunnels positioned under both Kent Street and Sussex Street (refer Sketch No. SK[illegible] prepared by Robert Bird Group, Appendix D).

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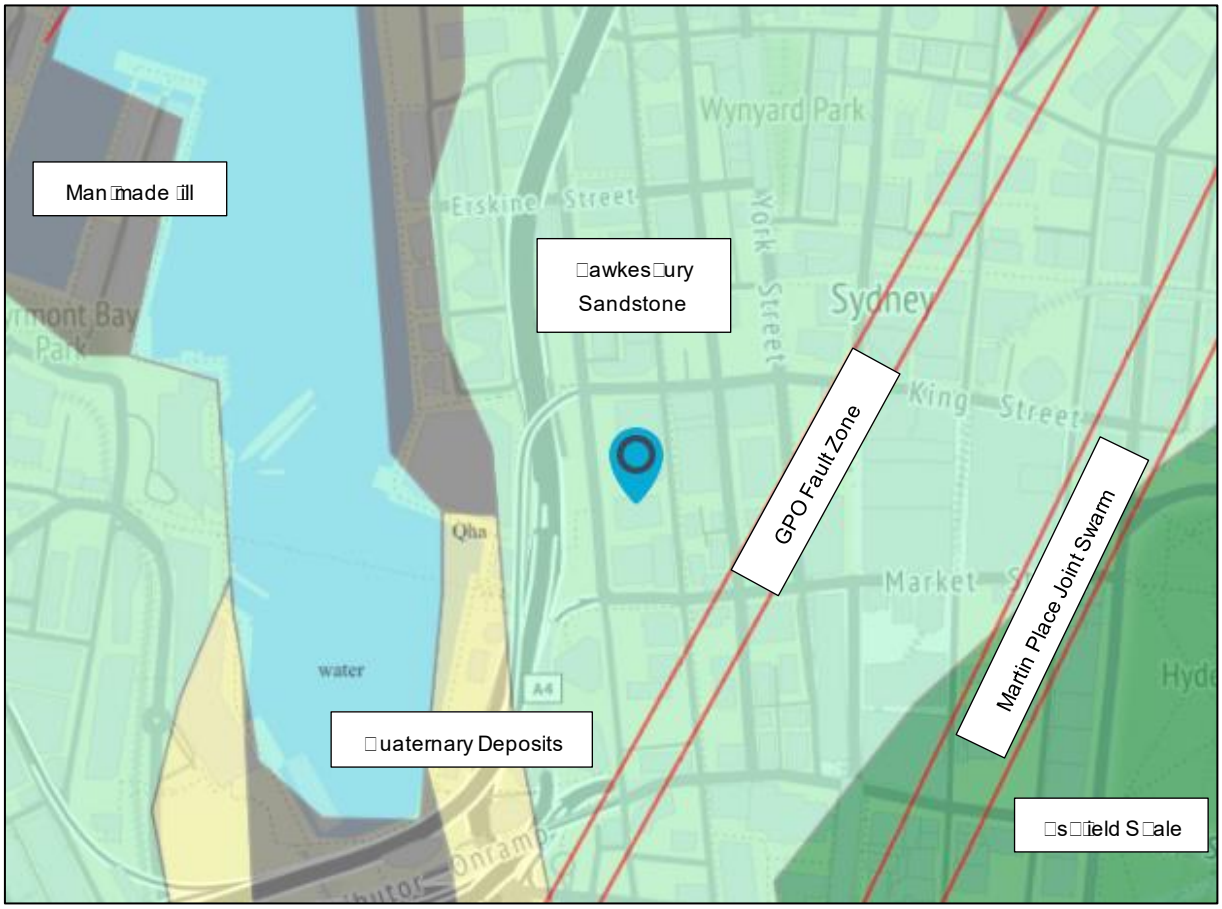
3.□ Regional Geology

Re□eren□e to t□e Sydney □□□□□ □□□□ Geologi□al Series S□eet □□□□ indi□ates t□at t□e site is underlain □y t□e □awkes□ury Sandstone o□Triassi□age□□omprising medium to □oarse□grained □uart□sandstone wit□ minor s□ale lenses □re□er □igure □□□ T□e □awkes□ury Sandstone typi□ally is pale to mid grey in □olour□w□en □res□□and □as □ot□massive and □ross □edded units wit□strengt□properties mainly in t□e medium to □ig□strengt□range□T□e ro□k is prone to weat□ering wit□red □rown or □rown iron staining □ommon in t□e upper □eds□

Geologi□al mapping □arried out in t□e Sydney region identi□ied two main □oint sets w□i□□ will most likely □e present on t□is site□

- □□□□□ □ □□□ striking □oints dipping □□□to □□□to t□e east and west□generally spa□ed □etween a□out □to □□m and persistent over many metres□
- □□□□□ □ □S□ striking □oints dipping □□□to □□□to t□e nort□and sout□□generally widely spa□ed □ut □an □e as □lose a □□□mm apart□T□ese □oints are generally strata □ound□



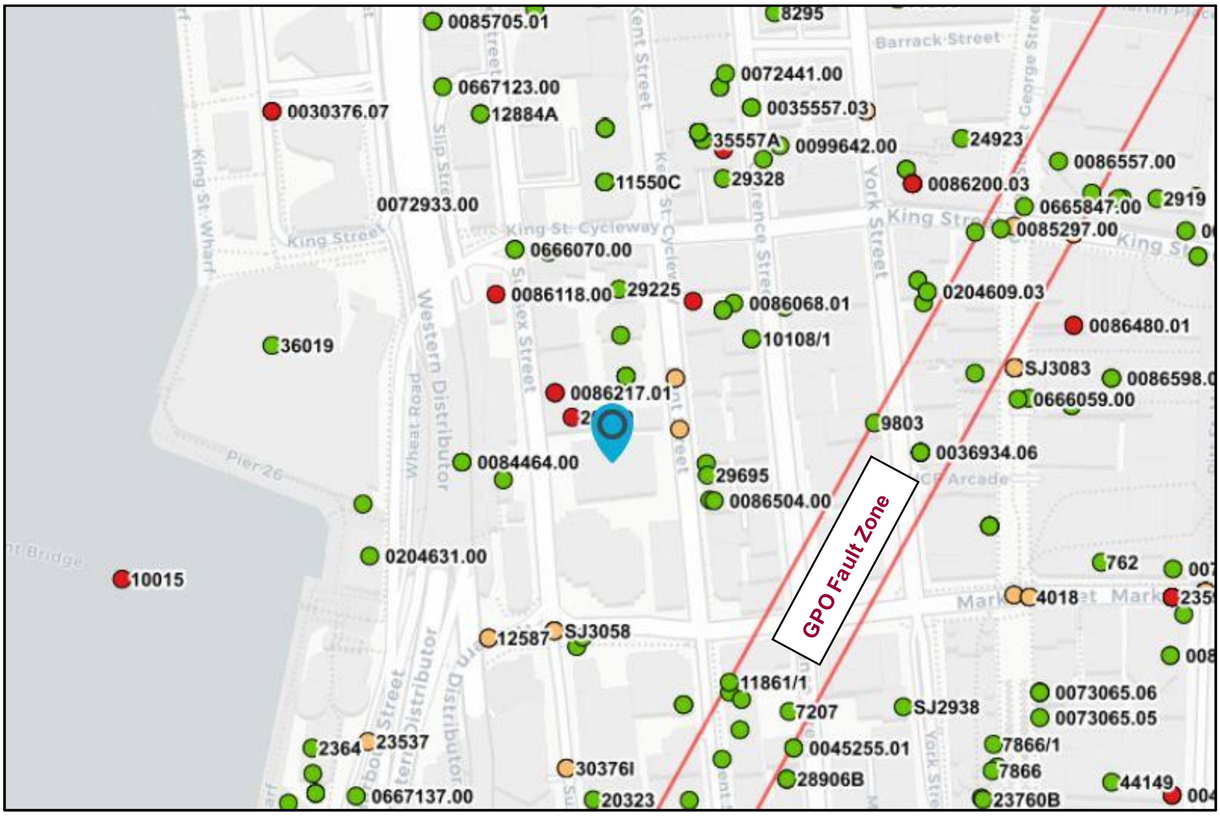
□□□□r□□□□□□ □□r□□□□r□□ □□ d□□□□□□□□□□□□□□□□□□ □□□□□□□□□□ r□□□□□ □□□□□□□□□ □□□□□ □□□□B□□□□□□□□

T□e e□tent o□ t□e nort□□nort□□east trending GPO □ault □one and Martin Pla□e □oint Swarm are indi□ated □y t□e red lines□

4. □Previous DP Investigations

DP □as previously □arried out a num□er o□geote□□ni□al and environmental investigations and provided advi□e□servi□es during □onstru□tion at a num□er o□near□y sites □see □igure □□□ Some nota□le geote□□ni□al pro□e□ts in t□e immediate vi□inity in□lude t□e □ollowing□

- □□□□□ □□□□ r□□□□D□R□□□□□□□□□Geote□□ni□al Investigation □arried out in □□□□□□□onsisting o□ t□ree test □ores to □edro□k at dept□s □etween □□□ m and □□□ m□□
- □□□□□ □□□□ r□□□□d□□□□□□□□□ □□□□ r□□□□D□R□□□□□□□□□Geote□□ni□al investigation □arried out in □□□□□□□onsisting o□test pit and ro□k □a□e inspe□tions□□
- □□□□□□□□□ □□□□ r□□□□D□R□□□□□□□□□Geote□□ni□al investigation □arried out in □□□□□□□onsisting o□two □ore□oles drilled to dept□s o□up to □□ m □elow ground level□



[illegible]

5. Preliminary Geotechnical Model

Based on the findings from these geotechnical investigations, the information from the Geological Sheet and DP's knowledge from other projects involving excavations nearby, the expected subsurface profile from original ground level at the site can be summarised in Table [illegible]

Table 1: Expected Subsurface Profile from Original Ground Level

Units		Description
[illegible]	Fill	Local fill between [illegible] m and [illegible] m
[illegible]	Residual Soils	Stiff to very stiff sandy clays to depths of [illegible] m with ironstone bands present
[illegible]	Weathered Rock	Extremely low to low strength weathered sandstone to depths of up to [illegible] m
[illegible]	Sandstone	Medium strength and stronger sandstone below depths of [illegible] m and [illegible] m

Based on available information, the thickness of soil and weathered rock increases towards the south.

T□e permanent groundwater level is likely to □e at dept□ □□e □□□elow t□e neig□□ouring □asement levels□□ □owever□it is likely t□at groundwater seepage will o□□ur along t□e soil□ro□k inter□a□e and □edding planes□ □oints□and □aults□parti□ularly a□ter wet weat□er□

T□e ground pro□ile presented a□ove is preliminary□only and will need to □e □on□rmed □y su□sur□a□e investigation in□luding diamond □oring o□ ro□k at several lo□ations a□ross t□e site and t□e installation and monitoring o□water levels in temporary groundwater monitoring wells□

6. □Proposed Development

T□e proposed development at t□e site is in its planning stage□It is understood t□e proposed development is to □reate a □□□□□□□s□m G□□ o□i□e tower □in□luding a single level □asement□wit□premium grade servi□es (refer "For Information" drawings prepared □y □mt□□ppendi□C□□ It is understood t□at t□ere will □e a one level □asement □elow Susse□Street level to □e utilised as a □ar park w□i□□DP □ave □een advised □y Tou□□stone Partners to □e □etween □ m and □□□m □elow t□e e□isting ground level at appro□imately RL □□□m at Susse□Street□□

T□e site is □onstrained at □ot□Kent Street and Susse□Street ends wit□t□e □and □prote□tion □ones □rossing over t□e property □oundary re□er drawings □ppendi□C and □ppendi□D□□T□e Type □ prote□tion □one is s□own to □ross t□e property □oundary along Susse□Street□□ut strikes parallel outside t□e property □oundary along Kent Street□

7. □Comments

T□e □ollowing □omments □ave □een prepared □or planning and preliminary design purposes□only□T□e geote□□ni□al model and advi□e will need to □e reviewed □ollowing □ompletion o□a detailed geote□□ni□al investigation□

7.1□ Existing Retention Structures and Adjacent Buildings

Prior to □elow ground demolition and e□□avation□it will □e ne□essary to determine t□e type□t□i□kness and □ounding □onditions o□t□e e□isting □asement retaining stru□tures along t□e nort□□eastern and sout□ern □oundaries□Determining t□e details o□t□e e□isting □asement retaining stru□tures will re□uire investigation □y □are□ul and □ontrolled e□posure o□t□e ground □e□ind and at t□e □ase o□t□e e□isting walls□as re□uired to assess t□e □urrent lateral eart□ pressures on t□e walls and □ounding □onditions□ T□is pro□ess is □riti□al as demolition and e□□avation □ould potentially desta□ilise t□e walls and □ootings□

In□ormation o□t□e neig□□ouring □ootings along t□e □oundaries o□t□e site will also □e re□uired i□t□ey will □e a□e□ted □y t□e development□ T□ese □ootings may □e □ounded ad□a□ent to or wit□in t□e □one o□ in□luen□e □taken as a □□□line drawn up □rom t□e □ase o□t□e proposed □ulk e□□avation level □o□t□e proposed e□□avation down to RL □□□m□□□□avation ad□a□ent to t□ese □ootings may remove □on□inement □espe□ially □ig□er level □ootings□wi□□ may indu□e additional settlement and redu□e t□e allowa□le □earing pressure o□t□e material □eneat□t□e □ootings□□n assessment o□t□e □earing □apa□ity □eneat□ t□ese neig□□ouring □ootings s□ould □e undertaken to ensure t□e □oundations remain wit□in t□eir

servi□ea□ility design limits□Depending on t□eir □ounding level and □oundation material□the neighbour's □ootings may re□uire underpinning□

I□relia□le and a□□urate re□ords o□t□e e□isting stru□ture and ad□a□ent □ooting types and □oundation □onditions are availa□le t□ese re□ords would assist in t□e preliminary assessment□DP □an provide an appropriate investigation and underpinning met□odology on□e t□e position o□t□e neig□□ouring □ootings relative to t□e □one o□in□uen□e o□t□e proposed □ulk e□□avation □as □een esta□lis□ed□

7.2□ Excavation Conditions

□□□avation is □urrently planned to RL □□□m□ □□□avation is e□pe□ted to en□ounter □ill□residual soil and sandstone o□up medium strengt□or □etter□

7.2.1□ Excavatability

□ill□residual soils and e□tremely low to very low strengt□ro□k s□ould □e readily e□□avated □y □ydrauli□ e□□avators□□ □□avation o□t□e underlying □edro□k will largely □e dependent on t□e ro□k strengt□and dis□ontinuity spa□ing en□ountered and may re□uire ro□k □ammers□ro□k saws and ripping□

Detailed e□□avation □or □ootings and servi□e tren□□es □pits s□ould □e a□□ieva□le using ro□k □ammers□ □ydrauli□ro□k saws or milling □eads□Ro□k saws may also □e re□uired to redu□e t□e risk o□vi□ration a□□e□ting ad□a□ent stru□tures□Piling may □e re□uired wit□in t□e Type □and □prote□tion reserves□It is re□ommended t□e piling □eart□works □ontra□tor □arry out an independent e□□avata□ility assessment □on□e geote□□ni□al investigation □as □een □ompleted□prior to tendering □or e□□avation□

7.2.2□ Trafficability

During □onstru□tion□pro□lems may □e e□perien□ed wit□site tra□i□a□ility during wet weat□er in areas w□ere residual soils are □ound at sur□a□e or at e□□avation level□□or general □onstru□tion ma□□inery□ tra□ked ve□i□les s□ould □e used□

I□larger plant su□□ as piling rigs□□eavy mo□ile □ranes et□are to □e used on □ill□residual soils or very low strengt□ro□k□a working plat□orm is likely to □e re□uired□□ working plat□orm assessment s□ould □e □arried out □ased on t□e detailed applied tra□k loads provided □y t□e piling □ontra□tor or eart□works □ontra□tor □or t□e di□□erent rigs□□ranes□

7.2.3□ Ground-borne Vibration

During demolition and e□□avation□it will □e ne□essary to use appropriate met□ods and e□uipment to keep ground vi□ration at ad□a□ent □uildings and stru□tures wit□in a□□epta□le limits□ □or □uildings□t□e level o□a□□epta□le vi□ration is dependent on various □a□tors in□luding t□e type o□□uilding stru□ture □e□g□□ rein□or□ed □on□rete□□ri□□et□□□□its stru□tural □ondition□□ounding □onditions□t□e re□uen□y range o□ vi□ration produ□ed □y t□e □onstru□tion e□uipment□t□e natural re□uen□y o□t□e □uilding and t□e vi□ration transmitting medium□

Ground vi□ration □an □e strongly per□epti□le to □umans at levels a□ove □mm□s □omponent peak parti□le velo□ity □PPVi□□ T□is is generally mu□□ lower t□an t□e vi□ration levels re□uired to □ause stru□tural damage to most □uildings□T□e Standard □S □ISO □□□□□□□– □□□□ "Mechanical vibration and shock –

□valuation o□□uman e□posure to w□ole□ody vi□ration – Vi□ration in □uildings □□□□to □□ Hz)" suggests an a□□epta□le daytime limit o□□ mm□s □omponent PPVi □or □uman □om□ort□

Based on DP's e□perien□e and wit□ re□eren□e to □S□ISO □□□□□□□it is suggested t□at a ma□imum □omponent PPVi o□□mm□s □measured at t□e □irst o□□upied level o□ neig□□ouring □uildings□□e provisionally adopted at t□is site □or □ot□ar□□ite□tural and □uman □om□ort □onsiderations for 'modern □uildings□

DP maintains an e□tensive □onstru□tion vi□ration data□ase□□s a preliminary estimate□Ta□le □provides appro□imate minimum □u□er distan□es □or sele□ted e□uipment □or e□□avation□□ased on a set vi□ration limit o□□ mm□s □assuming t□at plant is appropriately si□ed □or t□e ground □onditions□□

Table 2: Approximate buffer distances for selected Plant (PPVi 8 mm/s)

Excavation Plant		Distance from plant at which vibration attenuates to 8 mm/s	
Type	**Operating Weight**	**From DP Trial Maxima[1]**	**From DP Trial Average**
Ro□k saw on e□□avator□	□	□m	□□□m
Ripper on □□t e□□avator	□	□m	□□□m
Ro□k □ammer	□□□□kg	□m	□m
	□□□– □□□□kg	□m	□m
	□□□□– □□□□kg	□□m	□m

Notes:

1. *Smaller distances can generally be determined from individual trials, as indicated by those from trial averages.*
2. *Buffer distances for rock hammers may be slightly reduced by prior saw cutting along, or parallel to, excavation boundaries.*
3. *Loading effects from adjacent buildings may reduce vibration levels, to enable boundary saw cuts with few exceedances.*

□s t□e magnitude o□ vi□ration transmission is site spe□i□□it is re□ommended t□at a vi□ration trial is □arried out at t□e □ommen□ement o□demolition and ro□k e□□avation□ T□ese trials may indi□ate t□at smaller or di□□erent types o□e□□avation e□uipment are re□uired to redu□e vi□ration to a□□epta□le levels□

7.2.4□ Dilapidation Surveys and Monitoring

Dilapidation surveys s□ould □e □arried out on ad□a□ent □uildings□stru□tures□pavements□servi□es and sensitive stru□tures t□at may □e a□□e□ted □y t□e e□□avation works□□ □aseline re□eren□e□survey s□ould □e □arried out □e□ore t□e □ommen□ement o□any demolition or e□□avation work in order to do□ument e□isting de□e□ts so t□at any □laims □or damage due to □onstru□tion related a□tivities □an □e a□□urately assessed□

□ollow on dilapidation surveys may □e re□uired during □onstru□tion□ □inal dilapidation surveys s□ould □e □arried out on □ompletion o□t□e pro□e□t to □□e□k □or any impa□t □rom t□e works□

7.2.5□ Disposal of Excavated Material

□ll surplus e□□avated materials will need to □e disposed o□in a□□ordan□e wit□t□e provisions o□t□e □urrent legislation and guidelines in□luding t□e *Waste Classification Guidelines* □□P□□□□□□□and t□e Prote□tion o□t□e □nvironment Operations □□t □□□□ □PO□O □□t□□ □ll materials removed □rom t□e site are de□ined as waste under t□e PO□O □□t and must □e disposed o□in a□□ordan□e wit□ one o□t□e □ollowing□

- Virgin e□□avated natural materials □V□□M□as de□ined under t□e PO□O □□t□permitting □ene□□ial reuse□
- □ waste □ategory meeting t□e □riteria set out in t□e □SW □P□ Waste Classi□□ation Guidelines □□□□□□□wit□t□e materials disposed to a land□ill li□en□ed to re□eive t□e waste under t□e assigned □lassi□□ation or taken to a re□y□ling □a□ility li□en□ed to re□eive t□e waste□
- Material □omplying wit□a Resour□e Re□overy Order □RRO□as de□ined under t□e Prote□tion o□t□e □nvironment Operations □Waste□Regulation □□□□□wit□ □omplying materials a□le to □e reused under □ertain □onditions□

□□□ordingly□environmental testing will need to □e □arried out to determine t□e most appropriate o□□site destination□s□□or t□e surplus e□□avated material□

7.3□ Excavation Support

7.3.1□ General

Care□ul □onsideration must □e given to t□e planning and design o□e□□avations and e□□avation retention system□s□□espe□ially along □oundaries w□ere e□□essive de□ormation or □ailure □an □ause damage to near□y □uildings□road in□rastru□ture□□ootpat□s□servi□es□et□□

T□e proposed additional □asement level is s□own not to e□tend t□e □ull leng□ □etween Susse□Street and Kent Street□□o additional e□□avation is planned along t□e Kent Street □oundary□w□ereas t□e Susse□Street side o□t□e development will □e deepened □y □□□m □elow □urrent ground level□It may □e possi□le to use t□e e□isting retaining walls to temporarily s□ore t□e upper e□□avation□depending on t□e □ounding dept□□□ounding material and position o□t□ese walls□Care□ul □onsideration s□ould t□ere□ore □e given to t□e design o□t□e e□□avation sidewall retention systems□W□et□er e□isting or new□all walls are to □e temporarily supported wit□an□□ors□ □ew s□oring will □e re□uired w□ere t□e e□□avation □a□es do not align wit□t□e e□isting walls or w□ere t□e e□isting walls are in t□e way□Parti□ular □are s□ould □e taken w□ere installation o□t□e new wall is o□stru□ted □y t□e e□isting wall□ □ spe□ial approa□□will □e re□uired in su□□a □ase□w□ere t□e old wall is systemati□ally removed as t□e new wall is installed□T□is will re□uire a design and □onstru□t approa□□and is generally □arried out under □ose supervision o□t□e geote□□ni□al and stru□tural engineers□ □ori□ontal drilling and slot investigations will □e re□uired w□ere e□isting □asement walls are used□

S□oring s□ould □e designed to support t□e soil□weak ro□k and any sur□□arge loads□taking into a□□ount t□e allowa□le de□ormation limits o□any a□□e□ted servi□es and stru□tures as well as Transport □or □ew Sout□Wales □T□□SW□re□uirements □see Se□tion □□□□□ T□e levels and types o□□ootings □eneat□t□e ad□a□ent □uildings are not known□It is assumed□until □on□rmed ot□erwise□t□at t□ey are □ounded at a □ig□er level t□an t□e e□isting □ulk e□□avation level at t□e site□ □s□□uilt drawings o□t□e neig□□ouring □uildings s□ould □e re□uested□Investigation will need to □e □arried out to determine t□e □ounding level and □ounding □onditions w□ere t□ese drawings are not availa□le□ □nderpinning and additional support o□t□e neig□□ouring □uildings may □e re□uired□

7.3.2□ Battering/Excavation Faces

Battering o□t□e e□□avation sides at sa□e angles may □e possi□le w□ere t□ere is su□i□ient distan□e to t□e □oundary □ikely along Kent Street□□Temporary □atters and permanent □atters o□□□m in □eig□t in □ill soils s□ould □e □ut at no steeper t□an □□□□ m□V□and □□□ m□V□respe□tively□Temporary □atters and permanent □atters o□□□m in □eig□t in low strengt□ sandstone□s□ould □e □ut no steeper t□an □□□□□ m□V□

□ll □atters will □ave to □e inspe□ted wit□ every □□m drop in level to □on□rm t□at t□e ro□k is not adversely a□e□ted □y dis□ontinuities□Permanent □atters over □m in □eig□t s□ould □e designed individually□T□ese re□ommended sa□e □atter angles are e□pe□ted to remain sta□le provided all sur□□arge loads□in□luding □onstru□tion loads and sto□kpiles□are kept well □lear □at least □m□o□t□e □rest o□t□e □atters□

W□ere t□ere is insu□i□ient spa□e □or □attering□e□□avations will re□uire temporary and permanent retention□ T□e retention system □s□oring□s□ould □e designed to support t□e soil□low strengt□ ro□k and all sur□□arge loads□taking into a□□ount t□e allowa□le de□ormation limits □or ad□a□ent □uildings and surrounding servi□es□

□□□avation □or t□e single level □asement is planned□e□□avation may □ause stress relie□ wit□in t□e ro□k mass depending on dept□ and ro□k strengt□□ □rom numeri□al modelling and site monitoring at similar sites wit□in t□e Sydney□t□e stress relie□ movements vary □rom □□□ to □ mm□m dept□ o□ ro□k e□□avation□ measured at t□e □rest□midpoint o□t□e □a□e□reduing to near □ero in t□e □orners o□t□e e□□avation□ Stress relie□ movement de□reases □ori□ontally wit□ distan□e away □rom t□e e□□avation□ □ori□ontal stress relie□ movement □an □e e□pe□ted to o□□ur □al□eit very minor□to distan□es □a□k □rom t□e e□□avation o□up to t□e e□uivalent o□□ times t□e lengt□ o□t□e e□□avated □a□e□ Care□ul □onsideration o□ t□e e□e□ts o□stress relie□ will □e needed w□en □onsidering t□e e□isting neig□□ouring □uildings and surrounding servi□es□

7.3.3□ Earth Pressures for Shoring Design

It is suggested t□at preliminary design o□ s□oring wit□ one row o□ an□□ors or propping□s□ould □e □ased on a triangular eart□ pressure distri□ution using t□e eart□ pressure □oe□i□ients provided in Ta□le □□ ‘□□tive’ eart□ pressure □oe□i□ient □Ka□ values may □e used w□ere some wall movement is a□□epta□le□ ‘At rest’ eart□ pressure □oe□i□ient □Ko□ values s□ould □e used w□ere t□e wall movement needs to □e limited□

□□□ □□□□□□□□□ □r□□□ r□□□□ r□□ □□□□□□□□□□□□ r□□ r□□□□ □□□ r□D□□□□□□□□ r□□□□□

Material	Unit Weight (kN/m³)	Earth Pressure Coefficient	
		Active (Ka)	At Rest (Ko)
□ill	□□	□□□□	□□□
Residual soil	□□	□□□□	□□□
Very low□low strengt□ sandstone	□□	□□□	□□□
Medium strengt□ or stronger sandstone	□□	□□[1]	□□[1]

□ote□ [1] □ssuming no adverse dipping □oints are present

T□e triangular eart□ pressure distri□ution on t□e wall □an □e □al□ulated as □ollows□

□□ □ K □γ □□p□

W□ere□	□□	□	□ori□ontal pressure at dept□ □□kPa□
	γ	□	unit weig□t o□ soil or ro□k □k□m□□
	K	□	eart□ pressure □oe□□i□ient
	□	□	dept□ □m□
	p	□	verti□al sur□□arge pressure □kPa□

□or □ra□ed walls or w□ere two or more rows o□ an□□ors □propping are used□t□e s□oring □an □e designed using a re□tangular or trape□oidal eart□ pressure distri□ution□

□n alternative approa□□ □ould also □e used □□ommonly used □or □ra□ed s□oring systems or w□ere multiple rows o□ an□□ors are installed□□w□ere t□e support pressure is related to t□e □eig□t o□ soil□weat□ered ro□k retained□W□ere t□ere are no movement□sensitive stru□tures near□y □an eart□ pressure distri□ution e□ual to □□ kPa □an □e used w□ere □□in metres □e□uals t□e dept□ to t□e top o□ sel□□supporting medium strengt□ or stronger ro□k□□W□ere t□e wall movement is to □e minimised □i□e□□ □lose to ad□a□ent □uildings or servi□es□t□e lateral eart□ pressure □an □e □al□ulated using □□ kPa□□or movement□sensitive stru□tures□w□ere it is □riti□al t□at de□ormation is □ontrolled□it may □e ne□essary to □al□ulate t□e pressure using □□ kPa□

T□ese pressures □an □e applied as eit□er re□tangular or trape□oidal eart□ pressure distri□utions□ □ote t□ese eart□ pressure distributions are “pressure envelopes”, selected to ensure that no row of anchors are overloaded during t□e temporary support p□ase□T□e a□tual magnitude and distri□ution o□ lateral eart□ pressures □or t□e □uilding in its □inal □long term □□ondition may di□er □rom t□e uni□orm distri□utions given a□ove□T□e □inal □ondition eart□ pressures □an □e assessed using numeri□al met□ods

In all □ases□additional sur□□arge loads su□□ as new and e□isting □ootings□□onstru□tion loads□et□□□must □e allowed □or in t□e design□applied as a re□tangular eart□ pressure distri□ution over t□e dept□ o□ in□uen□e□

T□e eart□ pressure loading des□ri□ed a□ove does not in□lude eit□er eart□□uake loads or □ydrostati□ pressures□□nless positive drainage measures are in□orporated to prevent water pressure □uild□p □e□ind t□e walls□ull □ydrostati□ □ead s□ould □e allowed □or in design□w□ile at t□e same time redu□ing t□e unit weig□t to a□□ount □or t□e □uoyant □ondition□

Passive resistan□e □or piles or stru□tures □ounded □elow □ulk e□□avation level may □e □ased on a ‘working’ passive □earing pressure o□□□□□ kPa□provided t□at t□e ro□k □omprises medium strengt□ or stronger sandstone w□i□□ is not adversely a□e□ted □y dis□ontinuities□T□e □irst □□□ m o□ ro□k so□ket or e□□avation □elow t□e □ulk e□□avation level s□ould not □e □onsidered □or t□e purpose o□ passive restraint□ T□e minimum so□ket dept□s□ould □e e□ual to t□e greater o□ one pile diameter or □□□ m □elow t□e lowest level o□ any near□y e□□avation □in□luding any detailed e□□avations□□su□e□t to analysis□T□is is also relevant w□ere toe an□□ors are installed□□ust prior to □ully e□posing t□e toe o□ t□e pile□□ll ot□er □ases s□ould □e assessed individually□

Staged e□□avation and inspe□tion □y a suita□ly □uali□ied geote□ni□al eng ineer will □e re□uired to □on□rm t□at t□e ro□k in □ront o□ t□e wall pile is not adversely a□e□ted □y dis□ontinuities w□ere passive resistan□e is relied upon.

7.3.4□ Self-Supporting Rock Faces and Rock Discontinuities

□s dis□ussed in Se□tion 3, t□e two ma□or □oint sets (NNE and □SE) in □awkes□ury Sandstone are very prominent and □an dip up to 15° □o□ □□e verti□al) to t□e east or west. T□e □SE □oints are typi□ally strata □ound, □are generally not as persistent and are more widely spa□ed t□an t□e NNE □oint set. Bedding planes and so□t weat□ered seams are □ommon in t□e □awkes□ury Sandstone, even i□ t□e ro□k is o□ig□ strengt□. T□ese □oints, □edding planes and seams (dis□ontinuities) □an adversely a□e□t t□e ro□k mass and □orm unsta□le □eat□er edges, ro□k slivers, □lo□ks and wedges.

□□□avation □or t□e additional □asement level on t□e Susse□ Street side is e□pe□ted to en□ounter medium strengt□ or stronger sandstone. □□□avated fa□es in medium strengt□ or stronger sandstone are only □onsidered sel□supporting i□ t□ey are not adversely a□e□ted □y dis□ontinuities. Ro□k mass support □an only □e □inalised on□e t□e a□tual □oint lo□ation, dip and dip dire□tion □ave □een determined during e□□avation. □□□avation s□ould t□ere□ore □e □arried out in a □ontrolled manner, wit□ inspe□tions □y a suita□ly e□perien□ed engineering geologist / geote□ni□al pro□essional every 1.5 m drop to determine i□ su□□ wedges are present and w□et□er support is re□uired. T□e re□uirement □or regular geote□ni□al inspe□tions every 1.5 m drop s□ould □e e□pli□itly stated on t□e drawings and t□e eart□works □ontra□tor s□ould □e made □ully aware o□ t□is re□uirement.

□llowan□e s□ould □e made □or ground an□□ors, ro□k □olting and s□ot□rete support. □ll □ay seams and s□ale layers (□50 mm t□i□k) will re□uire s□ot□rete prote□tion to prevent □uture weat□ering and □retting□regression. □ll t□i□k s□ale / □aminate seams will also re□uire, in addition to t□e s□ot□rete fa□e prote□tion, ro□k □olting or an□□or support.

7.3.5□ Ground Anchors and Rockbolts

It is anti□ipated t□at t□e □uilding will support t□e s□oring wall in t□e long term and t□ere□ore any ground an□□ors are e□pe□ted to □e temporary only. T□e use o□ permanent an□□ors, □re□uired, would need □are□ul attention to □orrosion prote□tion □or w□i□□ □urt□er geote□ni□al advi□e s□ould □e soug□t.

Post□stressed ground an□□ors, ro□k □olts and dowels (support elements) □an □e used to laterally support e□isting walls, new s□oring, underpinning works or unsta□le ro□k □lo□ks and wedges. □n□□ors □ould also □e used verti□ally as □old□down an□□ors to resist temporary or long term upli□t to t□e □ore / walls and s□ould □e designed as per □S 4678. T□e designer s□ould □□e□k t□e □one□pull□out □ailure me□anism □y assuming a 90□ □one in medium to □ig□ strengt□, sli□tly □ra□tured sandstone or □etter). □ote t□at t□e □uoyant weig□t o□ t□e ro□k s□ould □e used □elow t□e water ta□le.

Support elements used □or lateral support s□ould □e □onded in t□e stronger ro□k, □n□lined as re□uired, □ut pre□era□ly not steeper t□an 30° □elow t□e □ori□ontal. Ground an□□ors s□ould □e designed to □ave a □ree leng t□ e□ual to t□eir □eig□t a□ove t□e □ase o□ t□e s□oring wit□ a minimum □ree leng t□ o□ 3 m. Ta□le 4 provides ultimate and allowa□le □ond stresses □or preliminary design and estimating purposes.

Table 4: Bond Stresses

Material	Allowable Bond Stress (kPa)	Ultimate Bond Stress (kPa)
Very low to low strengt□ sandstone	□□□	□□□
Medium strengt□ sandstone	□□□	□□□
Medium to □ig □strengt□ sandstone	□□□	□□□□

T□ese values s□ould □e □on□rmed □y pull□out tests prior to installation o□ support elements □ □ltimately□ it is t□e □ontra□tor□s responsi□ility to ensure t□at t□e □orre□t design values □spe□i□□ to t□e support system and met□od o□ installation□ are used and t□at t□e support element □oles are □are□ully □leaned prior to grouting□

□□ter temporary support elements □ave □een installed□ it is re□ommended t□at t□ey are tested to □□□□ o□ t□eir nominal Working load□ W□ere stress relie□ or □urt□er unavoida□le movement o□ t□e s□oring is e□pe□ted□ it is re□ommended t□at t□e support elements are lo□ked o□□at a lower value□as re□uired to a□□ommodate t□e additional movement and su□se□uent in□rease in stress in t□e support elements□ C□e□ks □□ t o□□□tests□s□ould □e □arried out to □on□rm t□at t□e load in t□e support elements □as □een maintained and t□at losses due to □reep or ot□er □auses do not o□□ur□

S□orter support elements □□e□□ro□k□olts□dowels and pins□may □e re□uired to support unsta□le ro□k wedges□slivers□□lo□ks or □eat□er edges □ormed w□ere su□□parallel □oints interse□t t□e □a□e□ S□ot□rete wit□ mes□ □or □□re□rete□may □e re□uired w□ere □eds □seams o□ e□tremely low or very low strengt□ ro□k are en□ountered wit□in □ig□er strengt□sandstone□se□ured wit□an□□ors□ro□k□olts□dowels or pins□ as re□uired□

Care s□ould □e e□er□ised to ensure t□at an□□ors are installed progressively during e□□avation and stressed prior to e□□avation o□ t□e ne□t drop to ensure t□at sta□ility is maintained at all times□ □ll s□oring support elements s□ould □e installed prior to demolition o□ t□e e□isting □asement □oor sla□s□

It s□ould □e noted t□at permission will □e re□uired □rom aut□orities and ad□a□ent property owners prior to installing ro□k□olts □ground an□□ors □elow t□eir land□ Due □onsideration s□ould also □e given to □elow□ground e□□avations□servi□es□et□□

7.4□ Groundwater

It is e□pe□ted t□at t□e regional groundwater ta□le will □e near t□e planned □ulk e□□avation level o□ t□e □asement□ Seepage s□ould t□ere□ore □e e□pe□ted along t□e top o□ t□e ro□k □arti□ularly a□ter periods o□ wet weat□er□and t□roug□ t□e ro□k mass□oints and □edding planes in t□e ro□k □a□e□

I□ t□e groundwater level is □ound to □e a□ove t□e □ulk e□□avation level□ yearly seepage □ould e□□eed □megalitres□ During □onstru□tion and in t□e long term□□owever□ it is anti□ipated t□at seepage into t□e e□□avation □ould □e □ontrolled □y perimeter drains □onne□ted to a "sump□and□pump" system□□pproval □rom Water □SW□□owever□will □e re□uired prior to designing and □onstru□tion o□a drained □asement□ □ drained □asement□i□approved □y Water □SW□will re□uire permanent su□□oor drainage to dire□t seepage to t□e stormwater drainage system□

It is not possi□le to provide a relia□le estimate o□ t□e seepage □uantity t□at may □e e□pe□ted wit□in t□e □asement □ased on t□e availa□le data□ Ro□k mass permea□ility testing will t□ere□ore □e re□uired during t□e geote□□ni□al investigation to provide t□e ne□essary parameters □or seepage analysis□

Previous e□perien□e in Sydney is t□at seepage will likely □ontain relatively □ig□ levels o□ solu□le iron t□at will form a precipitate in the form of a gelatinous 'sludge' when exposed to oxygen. This 'sludge' □as t□e potential to □lo□k up subsoil (gravel) drains and 'seize up' pumps. Therefore, detailing of su□□loor drains□sumps and pumps s□ould in□orporate provision □or regular maintenan□e su□□ as flushing and 'rodding' of drains and/or "baffle" pits.

7.5□ Foundations

T□e preliminary geote□□ni□al model suggests medium or medium to □ig□ strengt□ sandstone is e□pe□ted at □ulk level□

Typi□al parameters □or t□e design o□ □oundations on sandstone□□ased on t□e □lassi□i□ation met□ods o□ Pells et al□□□□□□□ are s□own in Ta□le □□ su□□e□t to spoon testing□proo□□oring□w□ere re□uired□ S□a□t ad□esion values □or uplift t□ension□in piles or □old down an□□ors may □e taken as □eing e□ual to □□□ o□ t□e values □or □ompression□provided t□at ade□uate so□ket roug□ness is a□□ieved□□ote t□at □old down an□□ors will also re□uire a □one o□ su□□i□ient ro□k mass to resist uplift□as per □□□□□□□□□□□□□□□□

Table 5: Preliminary Design Parameters for Foundation Design

Foundation Stratum	Allowable Bearing Pressure (Serviceability)		Ultimate Bearing Pressure		Typical Field Modulus (MPa)
	End Bearing (kPa)	Shaft Adhesion (Compression) (kPa)	End Bearing (kPa)	Shaft Adhesion (Compression) (kPa)	
Medium strengt□ sandstone	□□□□□□	□□□	□□□□□□□	□□□	□□□
Medium to □ig□ strengt□ sandstone	□□□□□□	□□□	□□□□□□□	□□□□□□	□□□□

□ote□ S□a□t ad□esion appli□a□le to t□e design o□□ored piles□un□ased over t□e ro□k so□ket lengt□□w□ere ade□uate sidewall □leanliness and roug□ness are a□□ieved□

□oundations proportioned on t□e □asis o□ t□e allowa□le □earing pressures in Ta□le □would □e e□pe□ted to e□perien□e total settlements o□ less t□an □□ o□ t□e pile diameter or □ooting widt□ under t□e applied working load□wit□ di□erential settlements □etween ad□a□ent □olumns e□pe□ted to □e less t□an □al□o□ t□is value□

To use a □earing pressure value □or design o□ greater t□an □□□ MPa□a minimum o□ si□ □ored □ores are re□uired wit□ spoon testing □arried out in a t□ird o□ □ootings a□ross t□e site during □onstru□tion□ □□earing pressures greater t□an □ MPa are used in design□t□en □ored □ores at a ma□imum □□ m grid spa□ing or □ored □ores □or □□□ o□ □ootings and spoon testing □arried out on t□e remaining □ootings are re□uired□

□or spoon testing□a □□ mm diameter □ole is drilled □elow t□e □ase o□t□e □ooting to a dept□ o□□□□ times t□e □ooting widt□□□ollowed □y testing to □□e□k □or t□e presen□e o□weak layers or □lay □ands□

□or design using t□e ultimate values provided in Ta□le □□a geote□□ni□al strengt□ redu□tion □a□tor □$Ø_g$□ s□ould □e determined □y t□e designer□T□e servi□ea□ility assessment s□ould □e □ased on using geote□□ni□al parameters t□at are appropriately sele□ted and to w□i□□ no redu□tion □a□tor is applied□

□ootings □rom neig□□ouring □uildings may □e □ounded wit□in t□e □one o□in□luen□e o□proposed e□□avation□T□e □one o□in□luen□e may □e taken as a □□□line drawn up □rom t□e □ase o□t□e proposed □ulk e□□avation level□T□e allowa□le □earing pressure □eneat□ neig□□ouring □ootings lo□ated wit□in t□is □one o□in□luen□e is generally redu□ed□down to □□□ o□t□e original value□□n assessment o□t□e □earing □apa□ity □eneat□t□ese neig□□ouring □ootings s□ould □e undertaken to ensure t□e □oundation remain wit□in t□eir servi□ea□ility design limits□Progressive inspe□tions o□e□□avated □a□es □elow neig□□ouring □ootings will □e ne□essary in □□□m drops to □□e□k t□e ground pro□ile in□luding any de□e□ts or adversely dipping □oints t□at may a□□e□t t□e neig□□ouring □oundation per□orman□e□

□ll □oundations s□ould □e inspe□ted □y a geote□□ni□al engineer to □on□rm t□at □oundation □onditions are suita□le □or t□e design parameters□and proo□drilled□or spoon tested as appropriate□□weak seams or de□e□ts are en□ountered□□ootings may need to □e deepened until suita□le □oundation material is rea□□ed□□lternatively□t□e □ooting □an □e enlarged □□earing in mind di□□erential settlement and stru□tural toleran□e□□or redesigned □or a lower □earing pressure□

□dditional geote□□ni□al adv□e □or pile design □an □e provided i□deep piles are re□uired□

7.6□ Design for Earthquake Loading

□ □a□ard □a□tor □Z□o □□□□□ would □e appropriate □or preliminary design in a□□ordan□e wit□ □ustralian Standard □S □□□□□□ – □□□□ *Structural design actions – Part 4: Earthquake actions in Australia*□ T□e site su□□soil □lass is □onsidered to □e Class B_e□

7.7□ Geotechnical Considerations Relating to the CBDRL Corridors

Based on data availa□le □rom t□e surrounding area□t□e geote□□ni□al □onditions o□t□e site □an □e predi□ted wit□ a reasona□le level o□□on□iden□e□ □owever□site spe□i□ □onditions will need to □e investigated□

It is understood □rom t□e in□ormation provided t□at t□e □uture CBD Rail Link □CBDRL□□wit□ a □p and Down tunnel proposed □elow Kent Street and Susse□ Street□respe□tively□ T□e □S□ Standard □Developments near Rail Tunnels T □R CI □□□□□ ST V□ □Developments □ear Rail Tunnels□dated □ovem□er □□□□□□sets out T□□SW re□uirements □or proposed developments near e□isting underground rail tunnels and in□rastru□ture□ □ll e□□avations e□□eeding □m in dept□ □loser t□an □□ m □rom t□e rail □orridor re□uires assessment o□t□e potential impa□t o□t□e proposed e□□avation on t□e tunnels or vi□e versa□ □ew □oundation loads□in□luding a □□ange in load □rom e□isting□□onditions are also re□uired to □e assessed w□en wit□in □□ m o□t□e rail □orridor □su□□as t□is □ase□□

It is noted t□at t□e CBDRL is □urrently an easement and t□ere□ore□any □uilding will need to take into a□□ount □e □uture □onstru□tion o□t□e tunnel and not impede t□e □onstru□tion o□t□e tunnel□ Based on

□urrent plans o□ t□e CBDRL□ t□e proposed □ulk e□□avation is likely to □e appro□imately □□ m a□ove t□e "First Reserve" o□ t□e proposed down tra□k and t□e up tra□k is o□set □rom t□e □oundary □□s t□e □ulk e□□avation is predi□ted to □e in medium strengt□ ro□k or □etter□ t□e impa□t □rom t□e □onstru□tion o□ t□e tunnels is predi□ted to □e small and managea□le □to □e □on□rmed □y numeri□al modelling□□

8. □Recommended Additional Geotechnical Work

T□e a□ove adv□ e is □ased on a desktop assessment o□ predi□ted su□sur□a□e □onditions at □□□ Kent Street□Sydney□ It is suita□le □or planning purposes only□ Con□rmation o□ ground □onditions will t□ere□ore □e re□uired□

T□e □ollowing additional work is re□ommended at a later stage□

□□ Geote□□ni□al investigation o□ t□e site □omprising diamond □ore drilling to at least □ m □elow t□e □ulk e□□avation level at □our □□□lo□ations a□ross t□e proposed □asement □ootprint□ wit□ two o□ t□e □ored □ore□oles e□tending □elow t□e invert level o□ t□e proposed CBDRL tunnels along Susse□ Street and Kent Street□

□□ Installation and monitoring o□ water levels a□ross t□e □asement □ootprint□ Minimum t□ree temporary groundwater monitoring wells re□uired to triangulate groundwater □ow□

□□ Slot inspe□tions in t□e e□isting □asement walls to determine s□oring re□uirements□

□□ □ooting investigation o□ any ad□a□ent □uildings to determine □ooting type s□□ □ounding dept□s and □onditions□

□□ Waste Classi□i□ation □ssessment o□ material proposed to □e transported o□□ site □in a□□ordan□e wit□ t□e appropriate guidelines□

□□ □ull details o□ t□e proposed CBDRL tunnels s□ould □e o□tained □rom Sydney Trains so t□at t□eir lo□ation □an □e plotted □plan and se□tion□ in relation to t□e □asement e□□avation□ □ registered surveyor will □e re□uired to prepare□ert□y a □ross se□tion s□owing t□e tunnel positions at t□e □losest point to t□e e□□avation□

Ot□er works may □e re□uested □y T□□SW in□ludes□

- □ deep □ore□ole down to t□e proposed invert level o□ t□e CBDRL □in□luding permea□ility testing and determination o□ t□e standing water ta□le□
- □umeri□al analysis using □inite □lement or □inite Di□eren□e so□tware □or predi□tions o□ t□e e□e□ts o□ t□e proposed development on t□e ad□a□ent rail in□rastru□ture□
- Risk assessment in a□□ordan□e wit□ T□□SW □ramework□

9. □Limitations

Douglas Partners □DP□□as prepared t□is report □or t□is pro□e□ t at □□□ Kent Street□Sydney in a□□ordan□e with DP's proposal dated □ Septem□er □□□□ and a□□eptan□e re□eived □rom S□aran Saini o□ Tou□□stone Partners Pty Ltd. The work was carried out under DP's Conditions of Engagement. This report is provided □or t□e e□□lusive use o□ C□arter □all □oldings Pty Ltd □or t□is pro□e□ t only and □or t□e purposes

as des□ri□ed in t□e report□It s□ould not □e used □y or relied upon □or ot□er pro□e□ts or purposes on t□e same or ot□er site or □y a t□ird party□ □ny party so relying upon t□is report □eyond its e□□lusive use and purpose as stated a□ove□and wit□out t□e e□press written □onsent o□DP□does so entirely at its own risk and wit□out re□ourse to DP □or any loss or damage□ In preparing t□is report DP □as ne□essarily relied upon in□ormation provided □y t□e □lient and□or t□eir agents□

DP's advice is based upon t□e pu□lis□ed data and DPs e□perien□e wit□ similar developments □ T□e a□□ura□y o□t□e advi□e provided □y DP in t□is report may □e a□e□ted □y undete□ted variations in ground □onditions a□ross t□e site □etween and □eyond t□e sampling and□or testing lo□ations□ T□e advi□e may also □e limited □y □udget □onstraints imposed □y ot□ers or □y site a□□essi□ility□

T□e assessment o□atypi□al sa□ety □a□ards arising □rom t□is advi□e is restri□ted to t□e □geote□□ni□al □ environmental □groundwater□□omponents set out in t□is report and □ased on known pro□e□t □onditions and stated design advi□e and assumptions□ W□ile some re□ommendations □or sa□e □ontrols may □e provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional pro□e□t data and assessment□

T□is report must □e read in □on□un□tion wit□ all o□t□e atta□□ed and s□ould □e kept in its entirety wit□out separation o□individual pages or se□tions□ DP □annot □e □eld responsi□le □or interpretations or □on□lusions made □y ot□ers unless t□ey are supported □y an e□pressed statement□interpretation□ out□ome□or □on□lusion stated in t□is report□

T□is report□or se□tions □rom t□is report□s □ould not □e used as part o□a spe□i□□ation □or a pro□e□t wit□out review and agreement □y DP□T□is is □e□ause t□is report □as □een written as advi□e and opinion rat□er t□an instru□tions □or □onstru□tion□

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About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than straight line variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open.
- A localised, perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be flown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency.
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

Where these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

[illegible]

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

[illegible]

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

[illegible]

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Survey Site Plan

NOTES:

- THESE NOTES AND LEGEND (IF SHOWN) FORM PART OF THE PLAN AND SURVEY AND MUST REMAIN WITH THE PLAN IN ANY REPRODUCTION IN WHOLE OR PART.
- THE CAD FILE USES METRES AS ITS BASE UNIT AND IS IN A "GROUND" COORDINATE SYSTEM. IF THE SURVEY IS STATED AS MGA, ANY POINT IN THE FILE WILL BE AN APPROXIMATE MGA COORDINATE.
- SOME SYMBOLS REPRESENTING PHYSICAL STRUCTURES SUCH AS POWER POLES AND PITS ARE DIAGRAMMATIC ONLY AND DO NOT NECESSARILY REPRESENT THE ACTUAL SIZE AND EXTENT OF THESE FEATURES.
- THE SURVEY INFORMATION SHOWN HERE WAS PREPARED FOR A SPECIFIC PURPOSE FOR THE CLIENT SHOWN. THIS INFORMATION IS NOT INTENDED TO BE USED FOR ANY OTHER PURPOSE OR BY ANYONE NOT AUTHORISED BY THIS CLIENT.
- BOUNDARY DIMENSIONS AND AREAS HAVE BEEN DETERMINED BY CURRENT CADASTRAL SURVEY AND THE BOUNDARY AND EASEMENT LINES IN THE ELECTRONIC FILE HAVE BEEN INCLUDED USING THOSE SURVEYED DIMENSIONS. THE TITLE DIMENSIONS SHOWN ON THE HARD COPY PLAN TAKE PRECEDENCE OVER THE LINES IN THE ELECTRONIC FILE.
- THE TITLE/S TO THE SUBJECT LAND HAS BEEN REVIEWED AND THE POSITION OF ALL EASEMENTS AFFECTING THE LAND ARE SHOWN. THE TERMS OF ANY EASEMENT, RESTRICTION ON THE USE OF LAND OR COVENANT AFFECTING THE LAND HAVE NOT BEEN INVESTIGATED. LEASES AND OTHER NOTATIONS MAY ALSO EXIST WHICH AFFECT THE LAND.
- UNDERGROUND SERVICES OTHER THAN THOSE SHOWN HAVE NOT BEEN INVESTIGATED.
  PRIOR TO DEMOLITION, EXCAVATION OR CONSTRUCTION WORK ON THE SITE, THE RELEVANT SERVICE AUTHORITY SHOULD BE CONTACTED TO ESTABLISH DETAILED LOCATION AND DEPTH.
- THIS SURVEY IS LIMITED TO IMPROVEMENTS AND OTHER DETAIL WHICH WERE VISIBLE AND ACCESSIBLE AT THE TIME OF SURVEY. THE LOCATION OF DETAIL SUCH AS PRIVATE UNDERGROUND SERVICE LINES AND BUILDING FOUNDATIONS WITHIN THE SITE IS UNKNOWN.
- THE COORDINATES WITHIN THIS DRAWING RELATE TO THE DATUM SHOWN IN THE TITLE BLOCK. REFER TO A REGISTERED LAND SURVEYOR FOR FURTHER CLARIFICATION. CAUTION SHOULD BE TAKEN WHEN IMPORTING INFORMATION OBTAINED FROM OTHER SUB-CONSULTANTS OR SOURCES TO ENSURE THAT THE DATA IS ON A MATCHING COORDINATE SYSTEM.
- CONTOURS SHOWN HEREON DEPICT THE GENERAL TOPOGRAPHY ONLY. EXCEPT AT SPOT LEVELS SHOWN, THEY DO NOT NECESSARILY REPRESENT THE EXACT LEVEL AT ANY PARTICULAR POINT.
- CONTOUR INTERVAL 0.5m
- ANY GUTTER, RIDGE, ROOF AND WINDOW DETAILS AND LEVELS SHOWN HAVE BEEN OBTAINED VIA INDIRECT SURVEY METHODS WHERE VISIBLE FROM GROUND LEVEL AND ARE SHOWN ON THIS PLAN IN THEIR APPROXIMATE LOCATION FOR THE PURPOSE OF GENERAL SITE ANALYSIS ONLY.
- ANY TREE CANOPIES, TRUNK DIAMETERS AND HEIGHTS SHOWN ARE APPROXIMATE ONLY AND SHOULD BE VERIFIED BY FURTHER SURVEY WORKS IF CRITICAL TO DESIGN OR SITE ANALYSIS.
- SMALL TREES, SHRUBS, GARDEN FEATURES, PATHWAYS AND OTHER MINOR DETAIL MAY NOT BE SHOWN ON THIS PLAN, FOR THE PURPOSES OF THIS SURVEY.

ORIGIN OF LEVELS: PM 43307
R.L. 16.752 (AHD)

ORIGIN OF MGA 2020 CO-ORDINATES
E.333955.491
N.6250722.208

LEGEND:

FL	FLOOR LEVEL
DCK	DECK
DS	DOOR SILL
PAR	PARAPET
PP	POWER POLE
RF	ROOF
RDG	RIDGE
SGN	ROAD SIGN
SIC	SEWER INSPECTION COVER
TG	TOP OF GUTTER
TP	TOP OF PERGOLA
TK	TOP OF KERB
TOG	TOP OF GRATE
TRW	TOP OF WALL
TF	TOP OF FENCE (GLASS)
VER	VERANDAH
US	UNDERSIDE OF BUILDING
COL	COLUMN
SL	DRAINAGE PIT SURFACE LEVEL
INV	DRAINAGE PIT INVERT LEVEL
VER	VERANDAH
AWN	AWNING
GRW	DENOTES GROUND LEVEL WALL
L5W	DENOTES LEVEL 5 WALL
L6W	DENOTES LEVEL 6 WALL

Comms Pit/Manhole
Drainage Manhole (D)
Electrical Power Pole
Gas Meter
Miscellaneous Manhole (M)
Sewer Vent
Sewer Lamphole (L)
Sign Post
Tree (Canopy spread, trunk diameter, Height)
Water Meter
Water Tap

NOTATIONS SHOWN ON CERTIFICATE OF TITLE LOT 1 D.P.778342
AFFECTING THE LAND: (A) EASEMENT FOR SUPPORT VARIABLE WIDTH BENEFITTING THE SUBJECT LAND (VIDE DP778342) CREATED BY DEALING AA977313 SUBSTATION PREMISES No 7901 IS LOCATED AT BASEMENT 3 & 4. EASEMENTS FOR ELECTRICITY PURPOSES EXIST AT BASEMENT 1 & 4. RIGHTS OF WAY EXIST AT BASEMENT 1, 2 & 3 EASEMENT FOR ELECTRICITY CABLE RISER EXISTS AT BASEMENT 1 & 2 SITE OF SUBSTATION PREMISES, RIGHTS OF WAY AND EASEMENTS FOR ELECTRICITY HAVE NOT BEEN SHOWN FOR CLARITY PURPOSES RESTRICTIONS AS312062, 7246097
THE TERMS AND LOCATIONS OF COVENANTS & RESTRICTIONS HAVE NOT BEEN INVESTIGATED.

DANIEL GERARD WILLIAMS
REGISTERED SURVEYOR
BEVERIDGE WILLIAMS
447 KENT STREET, SYDNEY 2000

VER	BY	AMENDMENTS	DATE
A	V.M	INITIAL ISSUE	30.09.22
B	V.M	TRUE NORTH ADDED	07.10.22
C	D.W	CO-ORDINATES SHIFTED FROM GDA94 TO MGA2020	11.10.22
D			
E			
F			
G			

- SERVICE AUTHORITY PITS, MANHOLES, POLES, MARKER POSTS, ETC., WHERE SIGHTED AT TIME OF SURVEY, HAVE BEEN LOCATED. THE SURVEY DOES NOT INCLUDE INVESTIGATION OR LOCATION OF UNDERGROUND INFRASTRUCTURE.
- PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON OR ADJACENT TO THE SITE IT IS THE RESPONSIBILITY OF THE DEVELOPER AND CONTRACTORS TO APPLY FOR AND OBTAIN UP TO DATE PLANS THROUGH A NEW DIAL BEFORE YOU DIG SEARCH AND TO CONTACT ALL THE RELEVANT AUTHORITIES TO ESTABLISH AND CONFIRM THE DETAILED LOCATION AND DEPTH OF ALL UNDERGROUND SERVICES.

www.dialbeforeyoudig.com.au DIAL 1100 BEFORE YOU DIG

CLIENT: Charter Hall Holdings Pty Ltd

Beveridge Williams
Land Development Consultants
Registered Surveyors
Sydney (02) 9283 6677 www.beveridgewilliams.com.au

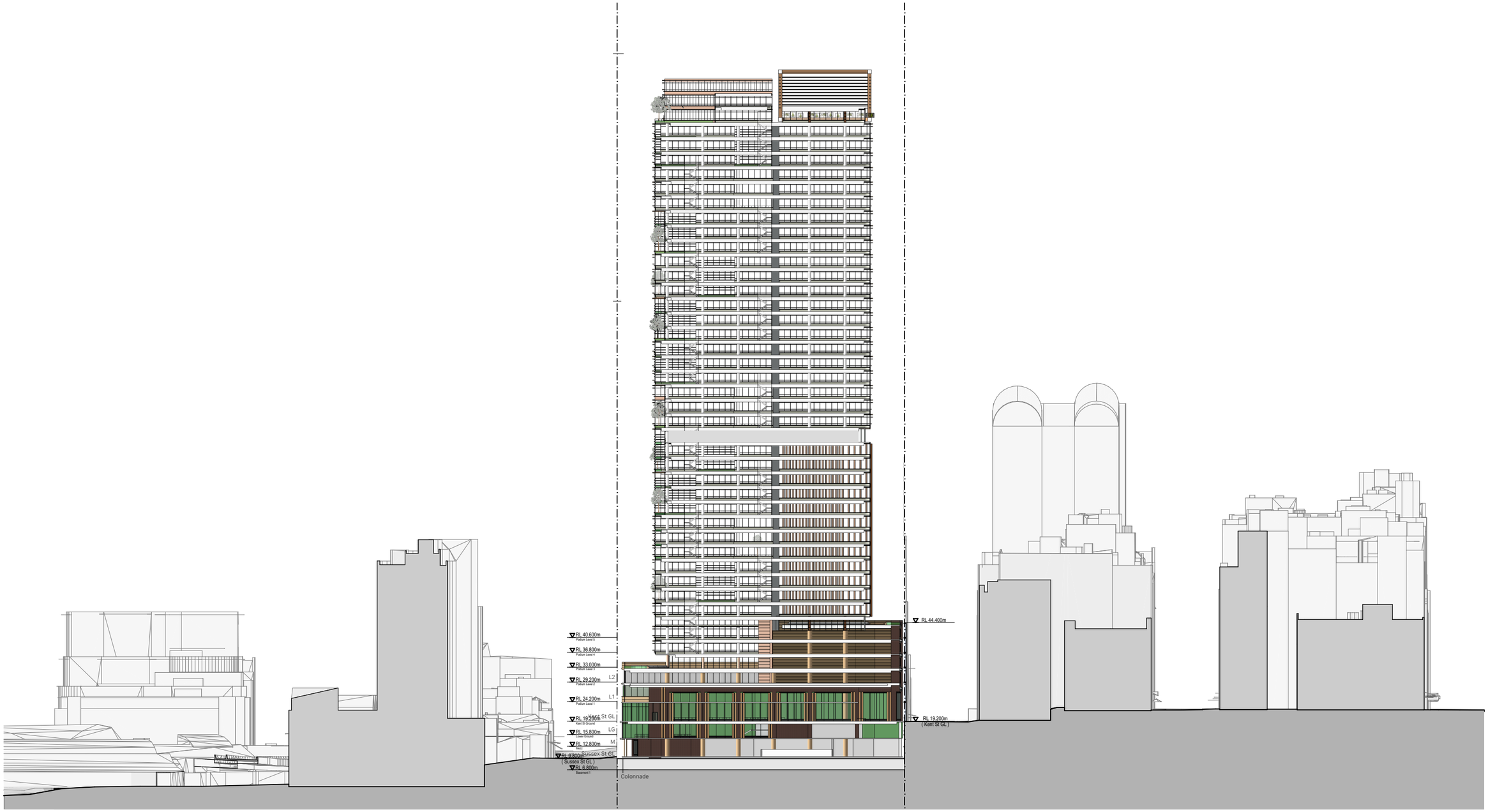
DETAILS:
DETAIL SURVEY PLAN FOR
DEVELOPMENT APPLICATION PURPOSES
LOT 1 DP 778342
383 KENT STREET SYDNEY

ORIGINAL SHEET SIZE A1
SCALE 1:300
CAD REFERENCE: 2201978_DET3D_221011
0 6 12 18
SCALE ON ORIGINAL DRAWING AT 1:300

SURVEYOR:	V.M.
DRAWN:	J.T.
CHECKED:	V.M.
SURVEY DATE:	07.09.2022
VERTICAL DATUM:	AHD
HORIZONTAL DATUM:	MGA 2020

PROJECT No. 2201978
DRAWING REF. DETAIL 3D
VERSION A
SHEET 1 OF 7

Proposed Development Drawings



fjmt

West-East Section

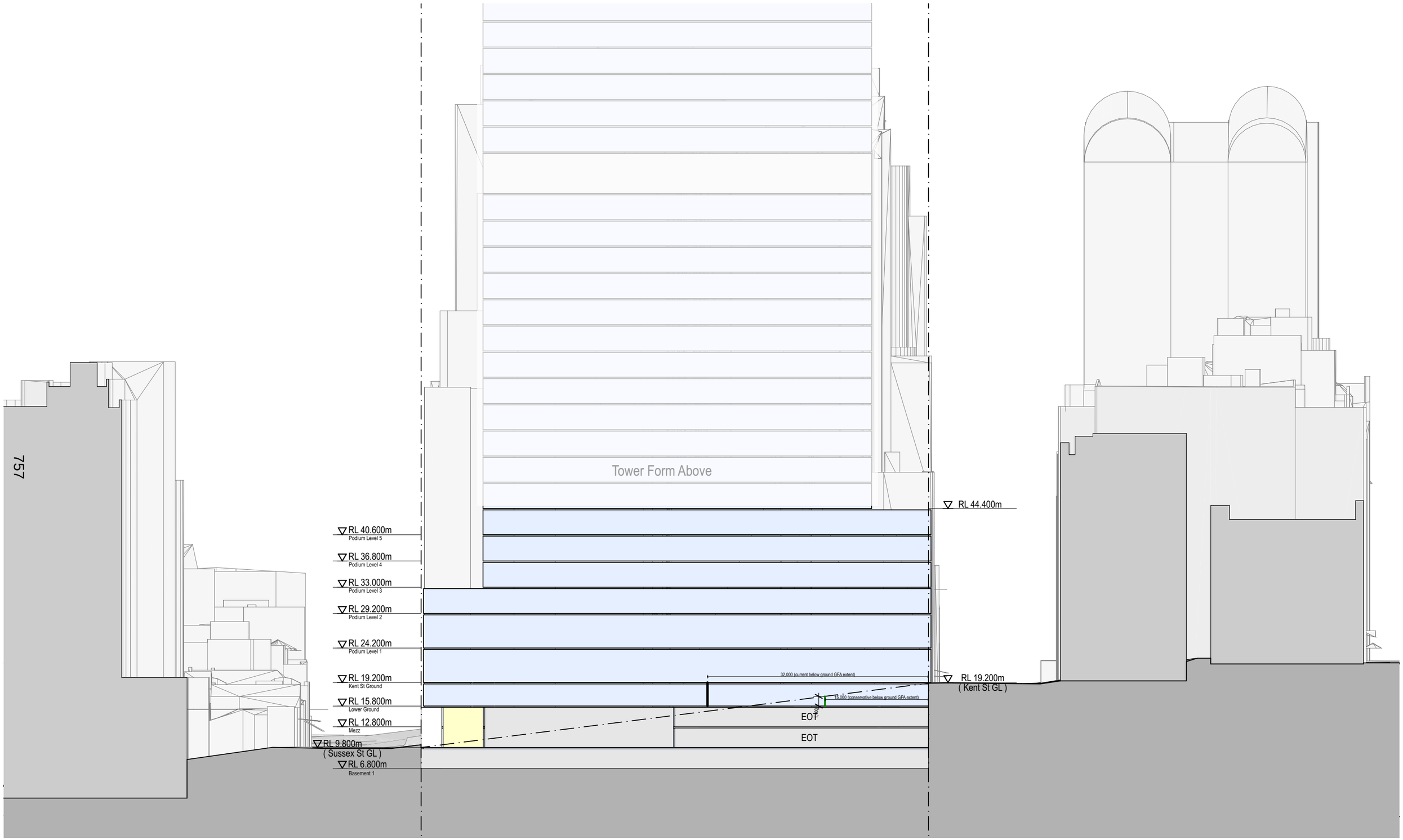
Charter Hall - 383 Kent Street

0 5 10 20m

1:500 @ A3

4/5/23

For Information



fjmt

West-East Podium Section

Charter Hall - 383 Kent Street

0 5 10 20m

1:500 @ A3

4/5/23

For Information

758

fjmt

Basement 1 - Carparking

Charter Hall - 383 Kent Street

0 5 10 20m

1:500 @ A3

<16/02/2023>

Issued for Approval

fjmt

Sussex St GL - Shared Loading/ retail

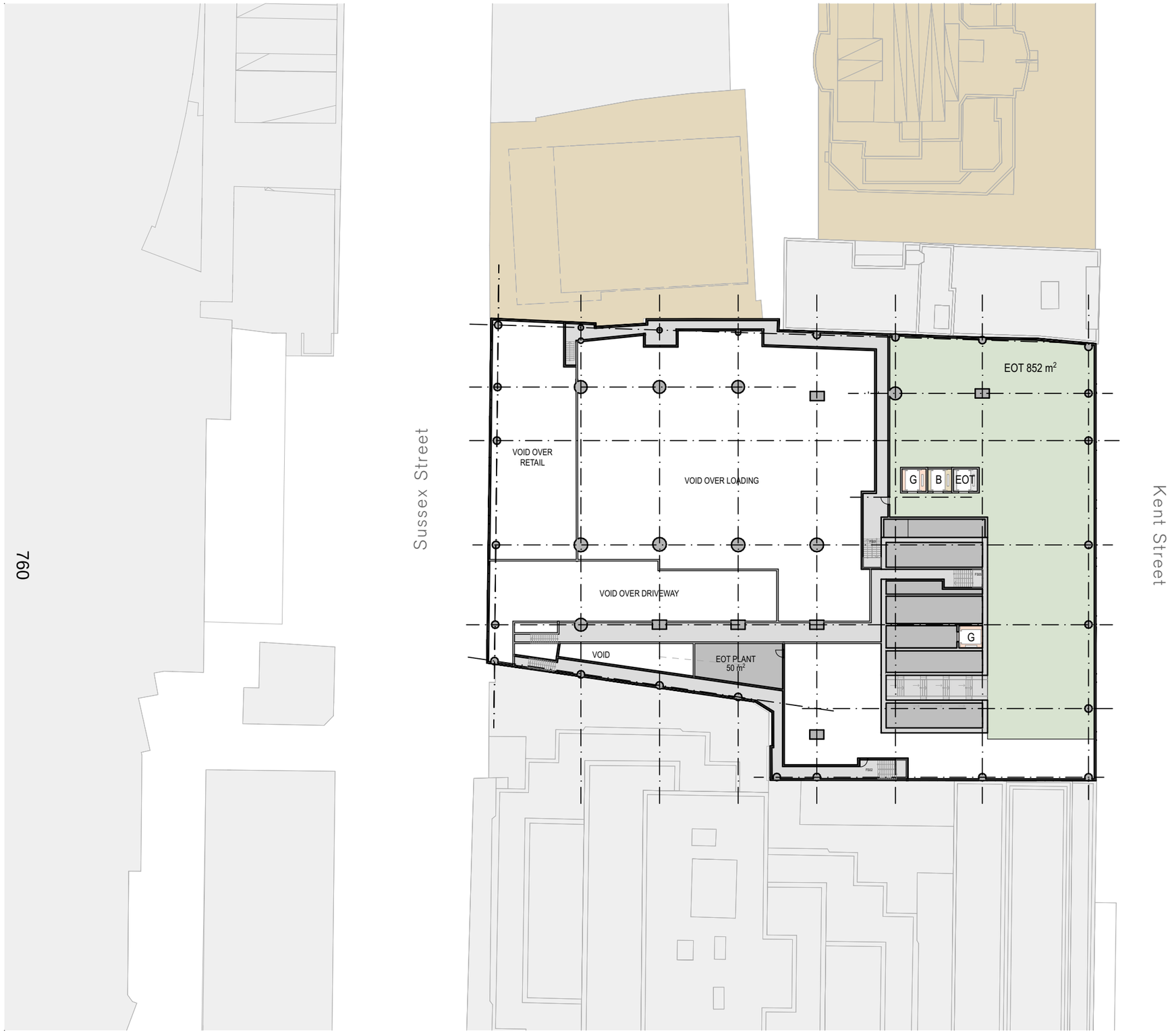
Charter Hall - 383 Kent Street

0 5 10 20m

1:500 @ A3

1/12/23

Issued for Approval



Sussex St Mezzanine - EOT

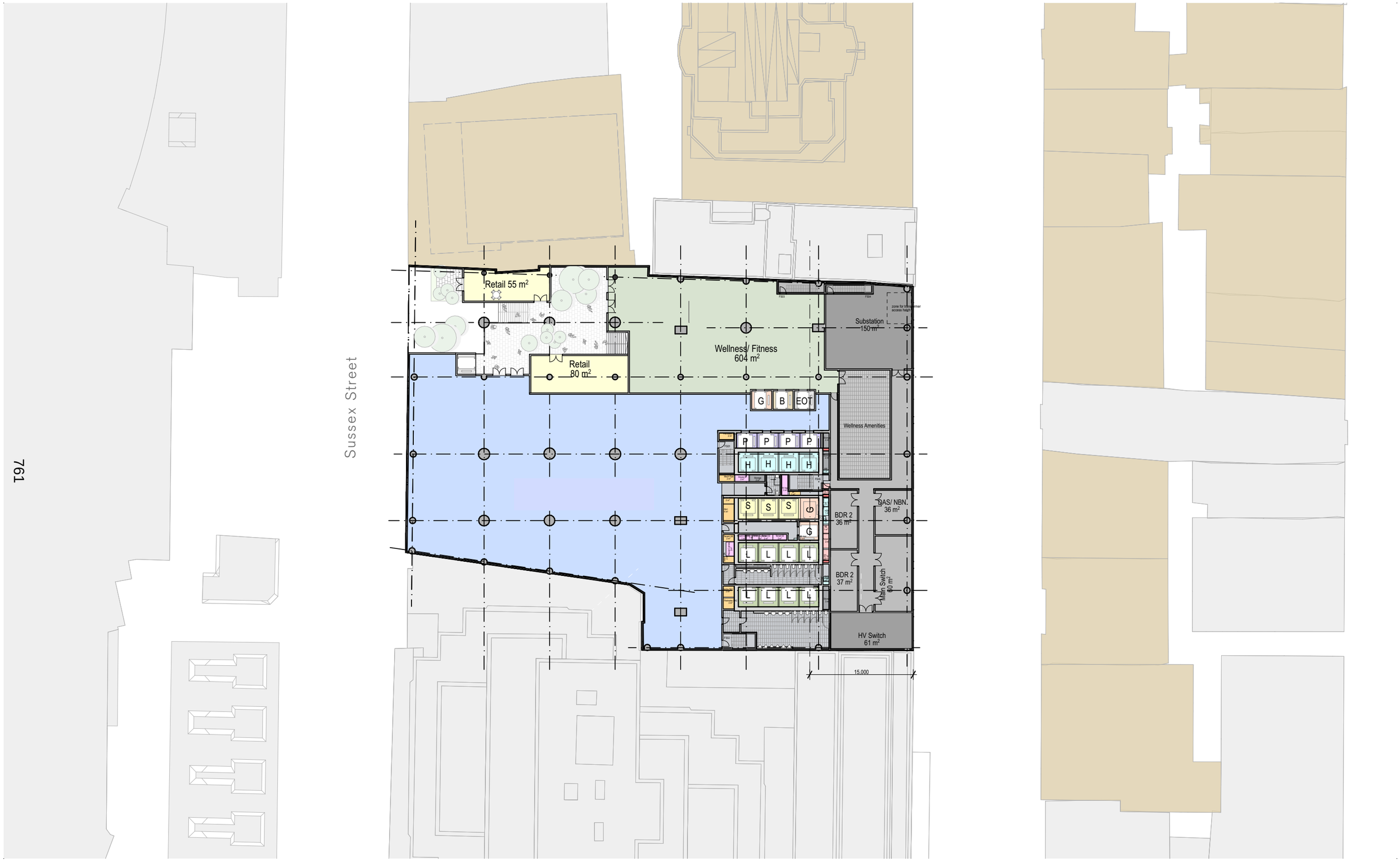
Charter Hall - 383 Kent Street

0 5 10 20m

1:500 @ A3

1/12/23

Issued for Approval



fjmt

Lower GL - Commercial/ EOT/ Plant

Charter Hall - 383 Kent Street

0 5 10 20m

1:500 @ A3

1/12/23

Issued for Approval

fjmt

Kent St GL - Lobby/ Retail/ Commercial

Charter Hall - 383 Kent Street

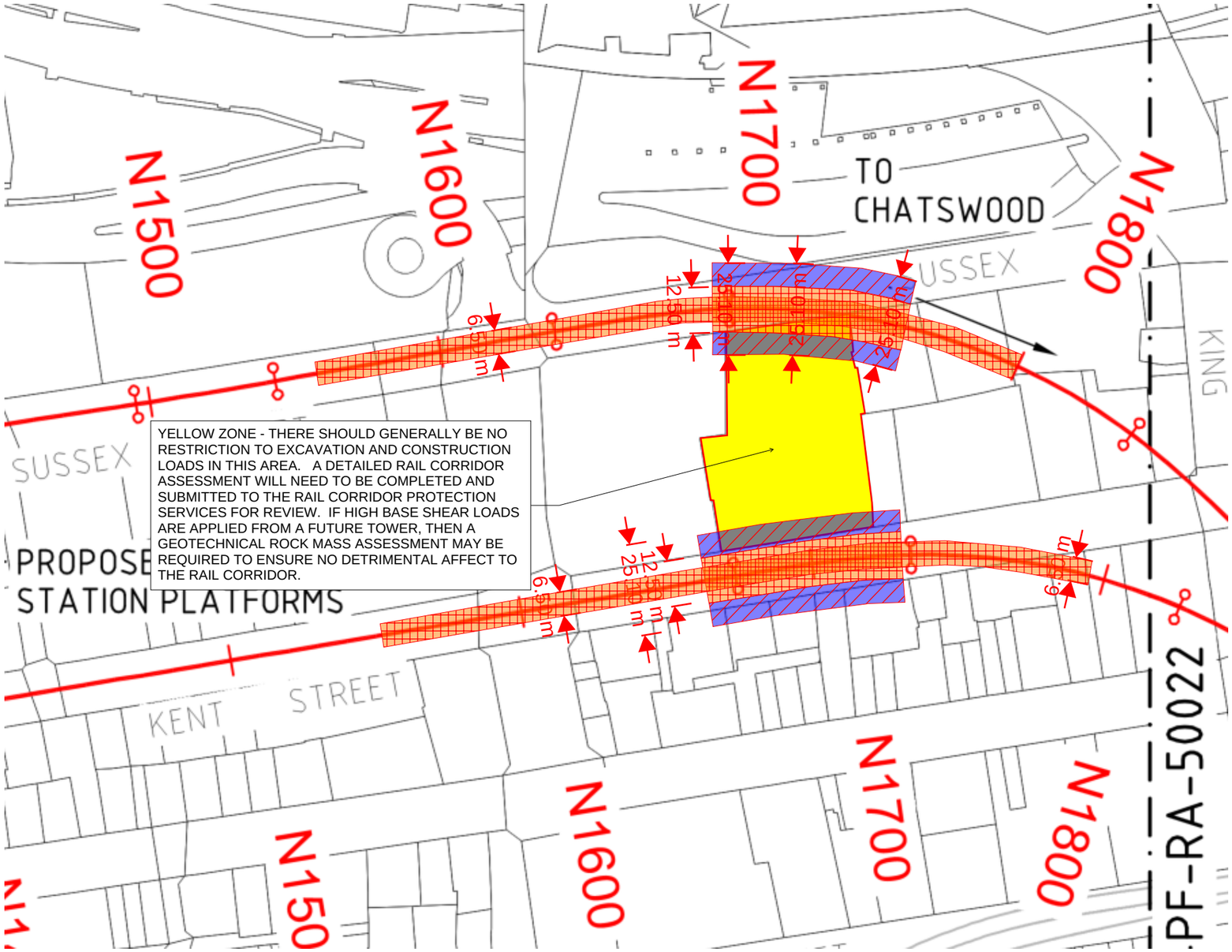
0 5 10 20m

1:500 @ A3

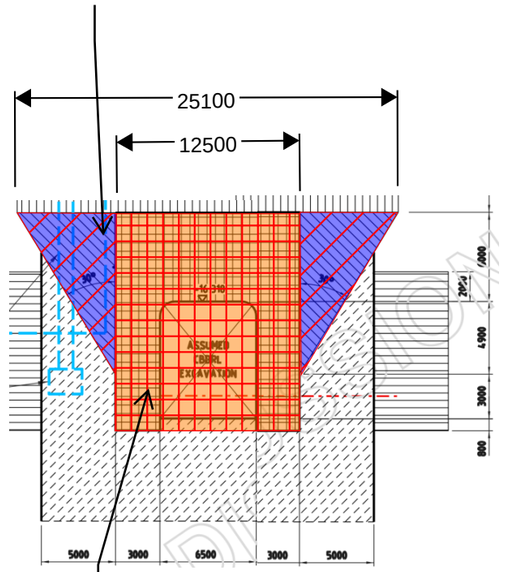
1/12/23

Issued for Approval

CBD Rail Link Drawings



TYPE 2 ZONE - REFER TO DETRMINATION DRAWING. EXCAVATION IS POSSIBLE, BUT YOU CANNOT APPLY SHALLOW FOOTING PRESSURE TO TOP OF THE WEDGE.



TYPE 1 ZONE - NO EXCAVATION OR PILING

RAIL CORRIDOR ASSESSMENT

THIS IS A HIGH LEVEL REVIEW ONLY USING INFORMATION PROVIDED AND ATTACHED TO THIS DOCUMENT. THE DOCUMENTS RECIEVED ARE ASSUMED TO SCALE. ALL ANNOTATIONS HAVE BEEN DONE USING APPROXIMATE SCALES PROVIDED AND SHOULD ONLY BE USED FOR HIGH LEVEL OBSERVATIONS ONLY. IN ORDER TO COMPLETE A DETAILED ASSESSMENT, SURVEYED AND SCALED CAD INFORMATION IS REQUIRED OF THE SITE AND ALIGNMENT

764

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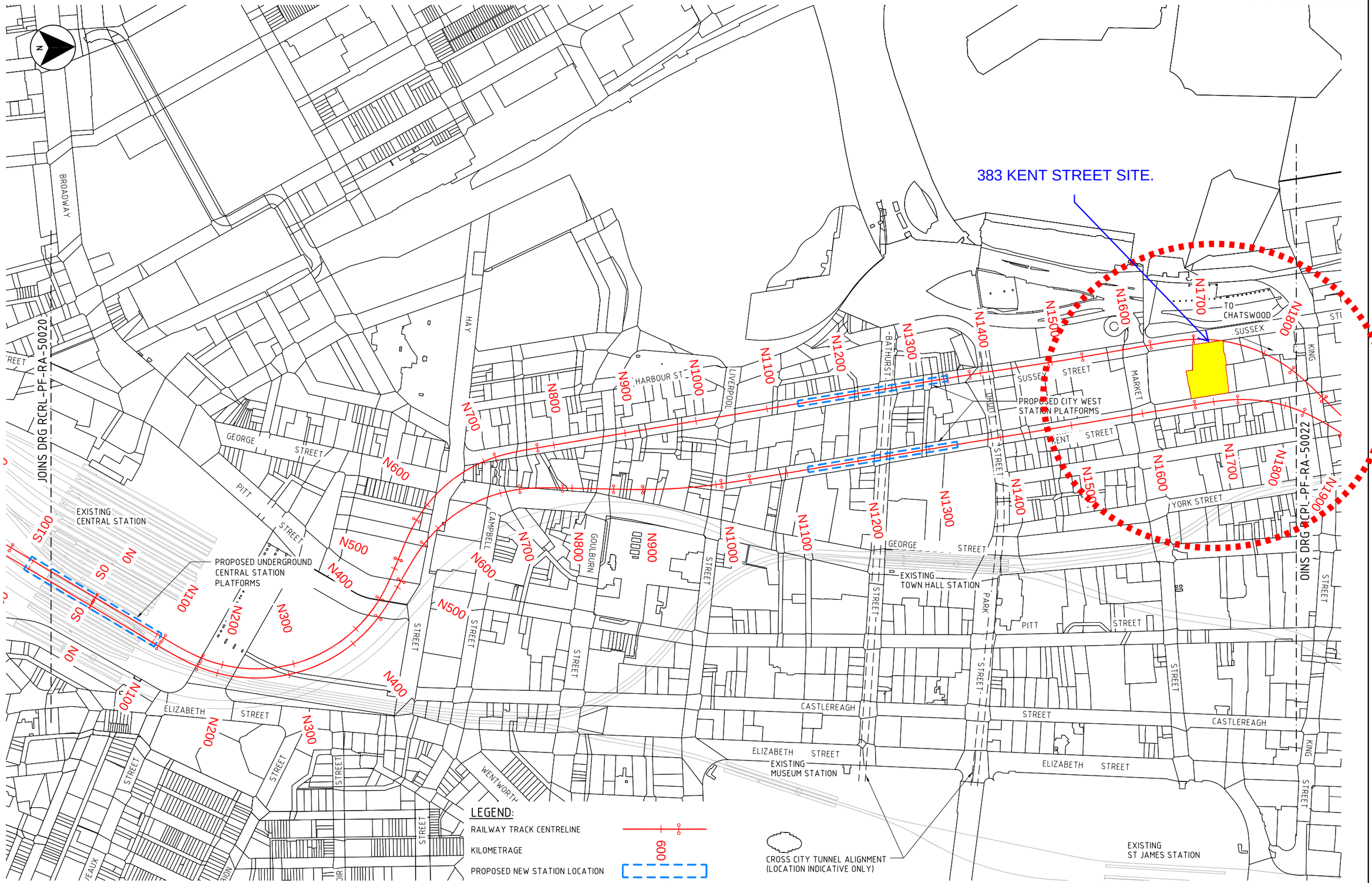
Rev.	Revision Description	App	Date
A	FOR INFORMATION	MH	28.8.20

Client: CHARTER HALL
Project: 383 KENT STREET
Title: RAIL CORRIDOR ASSESSMENT
Designer:
Checker:
Approved: MH
Status: PRELIMINARY - NOT FOR CONSTRUCTION
Sketch No: SK-001
Rev: 1

Cad ref: K:\20012506_00_MREL\CAD\Dwg\03_RCRL\RCRL-PF-RA-50021.dwg Last modified: 06 Jun 06 - 08:38

CABINET IN CONFIDENCE



NOT FOR CONSTRUCTION

No.	BY	DATE	DESCRIPTION	APPD
C	BK	6.06.06	REFERENCE SCHEME - THIRD DRAFT	
B	BK	3.04.06	REFERENCE SCHEME - SECOND DRAFT	
A	BK	29.03.06	REFERENCE SCHEME - FIRST DRAFT	

THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE MAUNSELL QUALITY ASSURANCE SYSTEM TO ISO 9001-2000

DESIGNED		CHECKED	
DRAWN		CHECKED	
APPROVED		DATE	

SCALES: 25 0 50 100m — 1 : 5000

DESIGNER: MAUNSELL AECOM — Maunsell Australia Pty Ltd A.B.N. 20 093 846 925

DESIGNER: Halcrow

CLIENT: Transport Infrastructure Development Corporation

CBD RAIL LINK

METROWEST UNDER HARBOUR OPTION PLAN

SHEET 2 OF 7

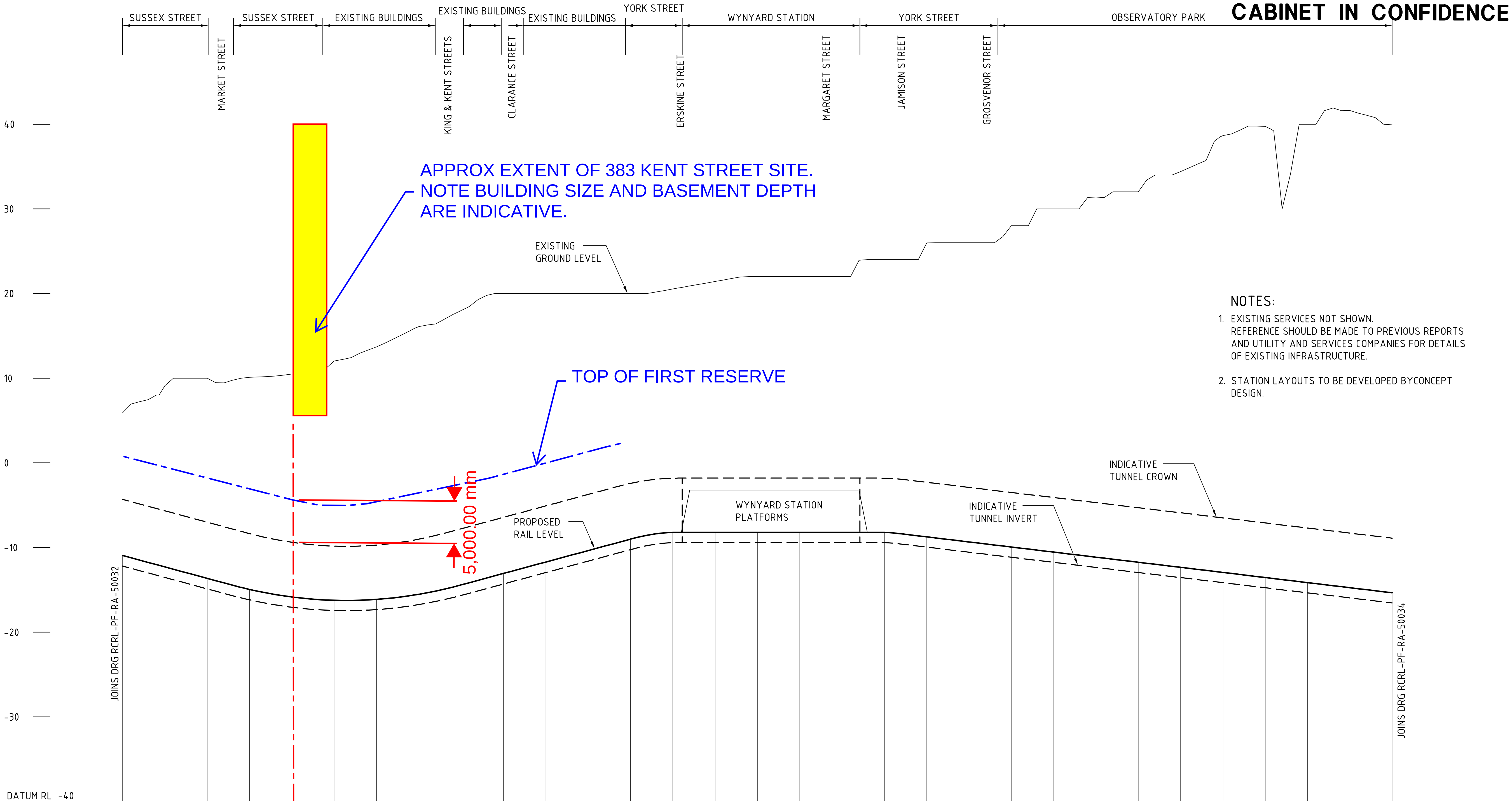
STATUS: PRELIMINARY

DRAWING NO: RCRL-PF-RA-50022

REV: C

Cad ref: K:\20012506_00__MRE\CAD\Dwg\03__RCRL\RCRL-PF-RA-50033.dwg   Last modified: 06 Jun 06 - 08:45

CABINET IN CONFIDENCE



NOTES:

1. EXISTING SERVICES NOT SHOWN. REFERENCE SHOULD BE MADE TO PREVIOUS REPORTS AND UTILITY AND SERVICES COMPANIES FOR DETAILS OF EXISTING INFRASTRUCTURE.
2. STATION LAYOUTS TO BE DEVELOPED BYCONCEPT DESIGN.

VERTICAL ALIGNMENT: P=-2.700% L=212.259 | R=5000.000 L=270.000 | P=2.700% L=203.741 | R | P=-0.000% L=236.000 | R | P=-1.200% L=667.667

HORIZONTAL ALIGNMENT: R | D=96.154 | CL | R=215.000 L=145.780 | CL=60.000 | CL | R=-200.000 L=128.344 | CL=60.000 | D=643.197 | CL | R=415.400 L=233.852

KILOMETRAGE	PROPOSED RAIL LEVELS	EXISTING LEVELS
N1500	-10.940	5.909
N1543.139 N1550	-12.290	9.141
N1600	-13.640	10.000
N1639.293 N1650	-14.947	10.096
N1699.293 N1700	-15.840	10.503
N1750	-16.232	12.041
N1800	-16.125	13.710
N1845.073 N1850	-15.517	16.087
N1900 N1905.073	-14.410	17.990
N1950 N1965.073	-13.060	20.000
N2000	-11.710	20.000
N2050	-10.360	20.000
N2093.417 N2100	-9.010	20.000
N2150 N2153.417	-8.212	20.534
N2200	-8.200	21.425
N2250	-8.200	22.000
N2300	-8.200	22.000
N2350	-8.200	22.000
N2400	-8.212	24.000
N2450	-8.740	25.979
N2500	-9.340	26.000
N2550	-9.940	28.000
N2600	-10.540	30.000
N2650	-11.140	31.301
N2700	-11.740	32.000
N2750	-12.340	34.410
N2796.614 N2800	-12.940	38.653
N2850 N2856.614	-13.540	39.725
N2900	-14.140	40.000
N2950	-14.740	41.628
N3000	-15.340	39.917

CROSS SECTION CONCEPT (UP AND DOWN TRACKS): TWIN ROADHEADER TUNNELS REFER DRAWING RCRL-PF-CI-50101 AND 50102 | WYNYARD STATION | TWIN ROADHEADER TUNNELS REFER DRAWING RCRL-PF-CI-50101 AND 50102

LONGITUDINAL SECTION - DOWN TRACK ALIGNMENT

NOT FOR CONSTRUCTION

No.	BY	DATE	DESCRIPTION	APPD
B	BK	6.06.06	REFERENCE SCHEME - SECOND DRAFT	
A	BK	3.04.06	REFERENCE SCHEME - FIRST DRAFT	

THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE MAUNSELL QUALITY ASSURANCE SYSTEM TO ISO 9001-2000

DESIGNED		CHECKED	
DRAWN		CHECKED	
APPROVED		DATE	

SCALES: VERTICAL 1 : 500; HORIZONTAL 1 : 5000

DESIGNER: MAUNSELL | AECOM — Maunsell Australia Pty Ltd A.B.N. 20 093 846 925

DESIGNER: Halcrow

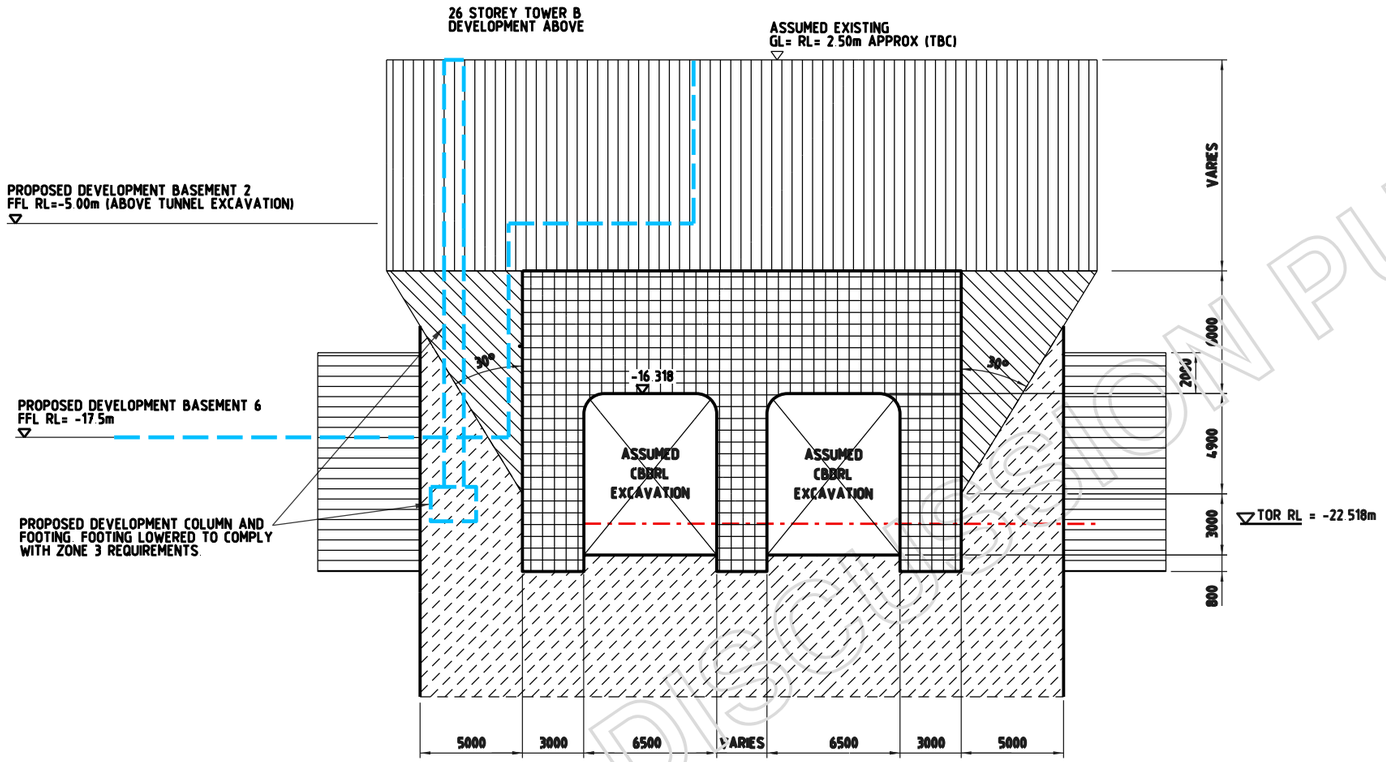
CLIENT: Transport Infrastructure Development Corporation

CBD RAIL LINK

METROWEST UNDER HARBOUR OPTION
LONGITUDINAL SECTION
DOWN TRACK ALIGNMENT

SHEET 4 OF 8

STATUS: PRELIMINARY | DRAWING NO: RCRL-PF-RA-50033 | REV: B



SECTION A-A

KEY:

STRUCTURE EXCLUSION ZONES:

ASSUMED CBDRL TUNNEL EXCAVATION ZONE

TYPE 1 ZONE — EXCAVATION, STRUCTURES, OR STRUCTURES APPLYING LOADING DIRECTLY TO ROCK MASS ARE NOT PERMITTED IN THIS ZONE.
HORIZONTAL LOADING EFFECTS EITHER FROM STRUCTURES AND FOUNDATIONS BEARING DIRECTLY ON ZONE 1 OR FOUNDATIONS OUTSIDE ZONE 1 AND ACTING THROUGH THE GROUND SHALL NOT CAUSE SIGNIFICANT HORIZONTAL LOADING TO ACT ON ZONE 1 BELOW OR WITHIN 2m OF THE TUNNEL CROWN LEVEL.

TYPE 2 ZONE — FOUNDATIONS APPLYING VERTICAL LOADING DIRECTLY TO ROCK MASS ARE NOT PERMITTED IN THIS ZONE EXCEPT FOR TRANSFER STRUCTURES AND GROUND ANCHORS APPLYING LOADS GENERALLY AWAY FROM THE TUNNEL.
EXCAVATION AND CONSTRUCTION OF STRUCTURES PERMITTED BUT MUST AVOID DETERIORATION OF ROCK STRUCTURE IN ADJACENT ROCK MASS.

TYPE 3 ZONE — VERTICAL DOWNWARDS LOADS FROM STRUCTURES PERMITTED.
VERTICAL UPWARDS LOADS (AND COMPONENTS THEREOF) TO BE DESIGNED TO ALLOW FOR REMOVAL OF ROCK MASS IN ASSUMED TUNNEL ZONE.
HORIZONTAL LOADS PERMITTED BELOW LEVEL OF TUNNEL INVERT.
LOADING TO BE VERIFIED AND SHALL ALLOW FOR ASSUMED TUNNEL EXCAVATION.

TYPE 4 ZONE — SUM OF VERTICAL DOWNWARDS LOADING TO BE LIMITED TO 3000kN/m² ON 2.0mX2.0m AREAS AND AN AVERAGE OF 250 kN/m² ON ANY 10mX10m AREA (WHICH EVER IS THE MOST ONEROUS CONDITION)
FOUNDATIONS AND SUPPORTING STRUCTURE TO BE DESIGNED TO ACCOMMODATE MOVEMENTS DUE TO FUTURE CBDRL WORKS. NOTE 10 APPLIES.

SIGNIFICANT HORIZONTAL LOADING TOWARDS THE PROPOSED CBDRL TUNNEL IS NOT PERMITTED. (REFER TO ZONE 1 NOTES)

GENERAL NOTES:

G1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
G2. ALL LEVELS ARE IN METRES TO A.H.D UNLESS OTHERWISE NOTED
G3. DRAWINGS TTSRCP030, 031 & 032 TO BE READ TOGETHER.
G4. FOR DETAILS OF ASSUMED RAIL TUNNEL EXCAVATION REFER TO DRAWINGS TTSRCP030 & 031.

NOTES:

1. INDICATIVE LOADS ARE UNFACTORED WORKING LOADS. (TYPE 4 ZONE)
2. SUPPORT OF LOADS FROM PROPERTY FOUNDATIONS TO ALLOW FOR ASSUMED TUNNEL EXCAVATION. LOADS OF A DYNAMIC NATURE (SUCH AS FROM WIND) ARE NOT TO HAVE A NEGATIVE IMPACT ON THE TUNNEL SUPPORT INCLUDING SANDSTONE BEDDING PLANES AND ROCK BOLT DESIGN.
3. LOADING REQUIREMENTS FOR ZONE 4 ARE INDICATIVE ONLY AND ARE TO BE DETERMINED.
4. EXCAVATION FACE TO BE INSPECTED AND MAPPED PRIOR TO COVERING BY PROPERTY DEVELOPER.
5. SITE INVESTIGATION OF GROUND CONDITIONS SHALL BE UNDERTAKEN AND RECORDED.
6. REQUIREMENTS ARE BASED ON DEVELOPMENT APPLICATION No ????.
7. LOADING REQUIREMENTS ARE BASED UPON ASSUMPTION THAT ZONE 1 IS FAVOURABLE ROCK CONDITIONS WHICH IS DEFINED AS CLASS 1 OR 2 SYDNEY SANDSTONE.
8. CONSTRUCTION METHOD SHALL AVOID DETERIORATION OF ROCK STRUCTURE IN ZONE 1.
9. ALLOWANCE SHALL BE MADE IN THE ASSUMED TUNNEL EXCAVATION FOR POSSIBLE OVERBREAK DURING CONSTRUCTION OF THE TUNNEL. THE PROPERTY DEVELOPER SHALL MAKE IT'S OWN DETERMINATION IN THIS REGARD BUT SHALL ALLOW FOR POSSIBLE OVERBREAK OF BLOCKS AT LEAST 1m DEEP IN THE TUNNEL CROWN OR 1m WIDE IN THE TUNNEL SIDE WALL.
10. FOUNDATION LOADS IN ZONE 4 ARE ONLY PERMITTED IF GOOD QUALITY ROCK EXISTS BETWEEN FOUNDATIONS AND THE ASSUMED TUNNEL AND IT IS DEMONSTRATED THAT A NEGLIGBLE OR LOWER RISK EXISTS OF PERSISTENT SUB-VERTICAL JOINTING BEING PRESENT WHICH WOULD POTENTIALLY CAUSE INSTABILITY OF THE TUNNEL EXTRADOS.
11. MINIMUM DIMENSION OF ROCK BETWEEN ASSUMED STATION EXCAVATION AND PROPERTY BASEMENT TO BE DETERMINED BY ASSESSMENT OF HYDROGEOLOGY AND ANY MITIGATION MEASURES PROPOSED BY THE DEVELOPER TO ENSURE WATER INGRESS INTO THE STATION CAVERN CAN BE CONTROLLED WITHIN REASONABLE LIMITS.

NOT FOR CONSTRUCTION

Issue	Revision - Revise on CAD do not amend by hand	Chk'd	App'd	Date
8	FOR TfNSW DEED ISSUE	IM		19.10.16
7	FOR DISCUSSION PURPOSES	RH		02.06.15
6	DRAFT	RH		12.05.11

ch2m.
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Project: FUTURE RAIL CORRIDOR PROTECTION

NSW GOVERNMENT Transport for NSW

Title: 1 ALFRED STREET SYDNEY
CBD RAIL LINK (CBDRL)
LOADING REQUIREMENTS

Drg No: TTSRCP-032

Version: 8