24th January 2018

Engineers

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RobertsDay
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Attention: Mr Oliver Klein

Dear Oliver,

Macquarie University propose to undertake refurbishment works to the existing W6B building which is closest to the Rail Corridor. Part of the 1st and 2nd Reserve pass underneath the existing building.

Taylor Lauder Bersten Pty Ltd is the consulting structural engineers for the project.

This letter is to be read in conjunction with the Geotechnical Engineer's Letter prepared by JK Geotechnics Ref No. 29807ZRlet and drawing numbers APP STR-SK00010/B, APP STR-SK00011/B , APP STR – SK00012/B and APP STR – SK0013/A and drawing numbers 25WWA STR-0501/B, 25WWB STR-0502/B and 25WWB STR-0503/B.

This assessment has been made with reference to the document T HR CI 12051 ST "Development Near Rail Tunnels" using Epping to Chatswood Rail Line (ECRL) and SEPP **"Excavation in, above or adjacent to rail corridors"**

The Main Works

i) Building 25WWA (Old Building name W6B)

There are generally no proposed structural works to the building footings of 25WWA (Old building name W6B) except for 4 locations where new columns are being introduced due to the removal of 4 existing concrete columns. The new steel columns will be supported on 4 new shallow pad footings which will be founded on class V rock approximately 1500 -1900mm below ground level. These new shallow pad footings are well outside the 1st Reserve Rail corridor. The size of these pad footings have been designed so that the bearing pressure on the rock is less than 500kPa.

The drawing number APP STR – SK0012/A is a section through the building and it shows the location of the new pads relative to the 1st and 2nd Reserve. It is stated in section ECRL Tunnels Table 8 = Load Limits on ECRL Tunnels (T HRCI 12051 ST Development Near Rail Tunnels Document) that ***provided a shallow pad has a maximum 500kPa footing load and is above the 2nd Reserve (and within 2 m of ground) then no further assessment required.***

Therefore with respect to the proposed column removal and new columns/footings in building 25WWA (old building designation W6B), TLB Engineers advises as follows:-

- We have reviewed the effect of the proposed shallow pad footings (onto the class 5 rock) for the relocated column loads and these new loads will not impact the underground railway tunnel as we are well **outside the 1st Reserve exclusion (red) zone (shallow footings) and the footing excavations are less than the 2m depth within the 2nd Reserve Influence zone**.

- Conversely any vibrations emanating from the rail corridor will not impact on the function of the building.

In relation to **Clause 86 of the Infrastructure SEPP "Excavation in, above or adjacent to rail corridors"** we comment that:-

> (1) This clause applies to development (other than development to which clause 88 applies) that involves the penetration of ground to a depth of at least 2m below ground level (existing) on land:
>
> (a) within or above a rail corridor, or
>
> (b) within 25m (measured horizontally) of a rail corridor, or
>
> (c) within 25m (measured horizontally) of the ground directly above an underground rail corridor.

In four locations there will be a need to excavate up to approx 1500-1900mm to install new shallow pad footings which will trigger the above Clause 86 of the Infrastructure SEPP, however our comments in relation to their impact (as stated above) remain valid – that there will be negligible effect on the railway reserve as these pad footings are within the 2m depth and are loaded to below 500kPa.

ii) Building 25WWB (Old Building name W6A)

There will be a demolition of the existing central 9 storey core - approximate plan area of 15m x 19m of Building 25WWB (old name W6A) and the construction of a new 9 storey core to replace the existing. The new building loads from the central core will be similar to the old original loads. The new central core is being built to the existing building which will consist of 9 new concrete floors 250mm thick (over a footprint of 19m x 19m) and these new floors are being supported on concrete in-situ bored piers founded on class IV shale which is suitable for an allowable bearing pressure of 3500kPa. The maximum design bearing pressure is 3000kPa. Some of these new piers are being founded within the second reserve.

The deepest pier will be approximately 5.120m below ground and will be located 12.3m to the south of the 1st Reserve and also 19m above the 1st reserve **and over 29m above the crown of the tunnel**. The approximate stress contours have been determined by JK Geotechnics (refer to their report for more details). The stress contours have been plotted for the new core (width of 19m) individual piles and pad footings. All the stress contours fall outside the First Reserve.

The drawing number APP STR – SK0012/A is a section through the building and it shows the location of the new bored piers relative to the 1st and 2nd Reserve.

The construction methodology for the new bored piers will be to drill the holes using an drilling auger plant. Once the hole is drilled to the required depth the hole is filled with a steel reinforcement cage and concrete is poured.

Therefore with respect to the proposed new concrete bored piers TLB Engineers advises as follows:-

- We have reviewed the effect of the proposed new bored piers (into class 4 rock) and these new loads will have **negligible** impact at the depth of underground railway tunnel.
- The pressure below the toes of individual piles and footings will be localized and minimal bearing pressure will be imposed at depth equivalent to 2x pile diameter for piles and 3x footing width for pad footings.
- As the proposed new pile depths will be similar to existing piles, the current pressure distribution associated with the pile group is expected to remain unchanged.

- Vibrations from the drilling operations will have NIL impact on the 1st Reserve and Tunnell and therefore no monitoring of tunnel is required.

Also in relation to **Clause 86 of the Infrastructure SEPP "Excavation in, above or adjacent to rail corridors"** we comment that:-

> (1) This clause applies to development (other than development to which clause 88 applies) that involves the penetration of ground to a depth of at least 2m below ground level (existing) on land:
>
> (a) within or above a rail corridor, or
>
> (b) within 25m (measured horizontally) of a rail corridor, or
>
> (c) within 25m (measured horizontally) of the ground directly above an underground rail corridor.

There will be bored piers that need to be installed to depths of approximately 5.2m below ground. The drilling of these piers will trigger the above Clause 86 of the Infrastructure SEPP, however our comments above in relation to the impact of the piers to the first serve remain valid – that there will be NIL to negligible impact on the railway1st reserve.

iii) Building 25WWC (New Museum Building)

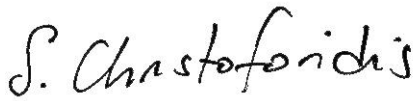
The construction of a new 4 storey Museum and Office building which is located to the south of the new site and well outside the 2nd Reserve and southern boundary corridor easement. The footings for this building are bored piers embedded approximately 2.5m into rock. These founding levels are well outside any influence zones of the 2nd reserve let alone the 1st Reserve.

Also in relation to **Clause 86 of the Infrastructure SEPP "Excavation in, above or adjacent to rail corridors"** we comment that:-

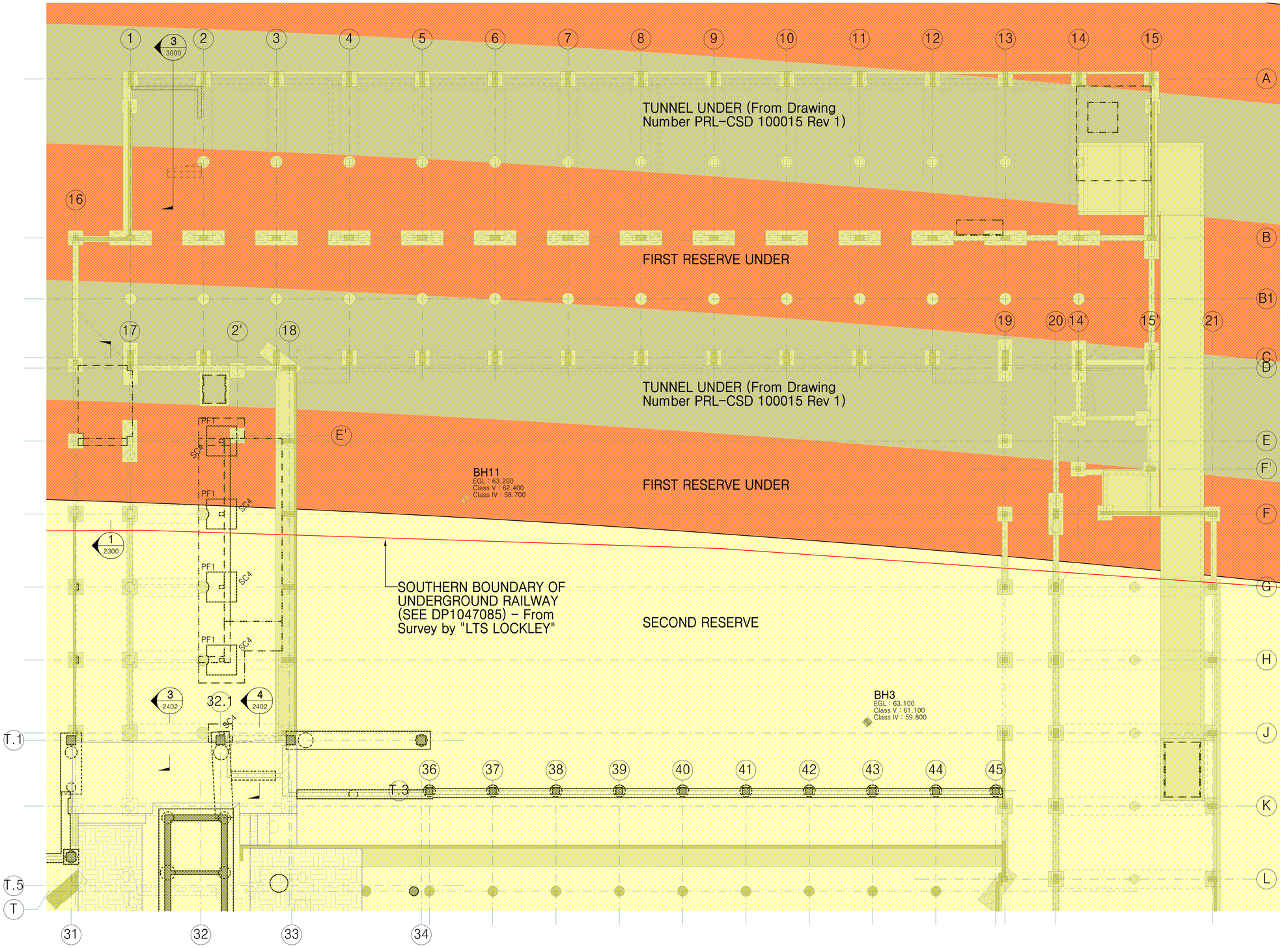
> (1) This clause applies to development (other than development to which clause 88 applies) that involves the penetration of ground to a depth of at least 2m below ground level (existing) on land:
>
> (a) within or above a rail corridor, or
>
> (b) within 25m (measured horizontally) of a rail corridor, or
>
> (c) within 25m (measured horizontally) of the ground directly above an underground rail corridor.

As we are outside the **distances mentioned above we do not trigger the clause 86 of the Infrastructure SEPP.**

Yours faithfully



Savas Christoforidis BE (Hons), MIE Aust, CP Eng, NER
Director



SCALE 1 : 100

PLAN ON FOOTINGS

BH6 DENOTES APPROX. LOCATION OF TEST BORES
—— : RL 172.3 BY ——————————.
—— : RL 167.6 —— : ——————.
—— : ——————.

Prefix Legend – Foundations		
PREFIX	DESCRIPTION	DETAIL & SCHEDULE REFERENCE
FB	Footing Beam	S0570
LP	Lift Pit Base	S0575
PB	Piered Pile	S0510
PC	Pile Cap	S0555
PF	Pad Footing	S0560

Prefix Legend – Concrete		
PREFIX	DESCRIPTION	DETAIL & SCHEDULE REFERENCE
C	Concrete Column	S0600 - S0799
CJ	Construction Joint	S2215
HR	Reinforced Concrete Wall	S2210
PL	Concrete Plinth	S2210
ST	Straight Joint	S3000
UP	Reinforced Concrete Upstand	S2210

Prefix Legend – Walls		
PREFIX	DESCRIPTION	REFERENCE
BW	Block Wall	S0800 - S0999
G	Grits	
LW	Lift Pit Wall	S0575
W	Concrete Wall	S0800 - S0999

Prefix Legend – Steel		
PREFIX	DESCRIPTION	DETAIL & SCHEDULE REFERENCE
BR	Bracing	4000: 6xxx Series
FR	Welded Frame	53xx Series
H	Hanger	4000: 6xxx Series
L	Lintel / Shelf Angle	4000: 6xxx Series
S	Strut	4000: 6xxx Series
SB	Steel Beam	4000: 6xxx Series
SC	Steel Column	4000: 6xxx Series
TBR	Temporary Brace	S0140
TR		
UB	Underpinning Beam	4000: 6xxx Series
VB	Vertical Brace	
WB	Wind Beam	
WS	Wall Stiffener	

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Rev.	Date	Description	Drawn	Design
A	11.08.17	50% ISSUE	A.C.	S.C.
B	20.09.17	ISSUE FOR RAIL REVIEW	A.C.	S.C.

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project
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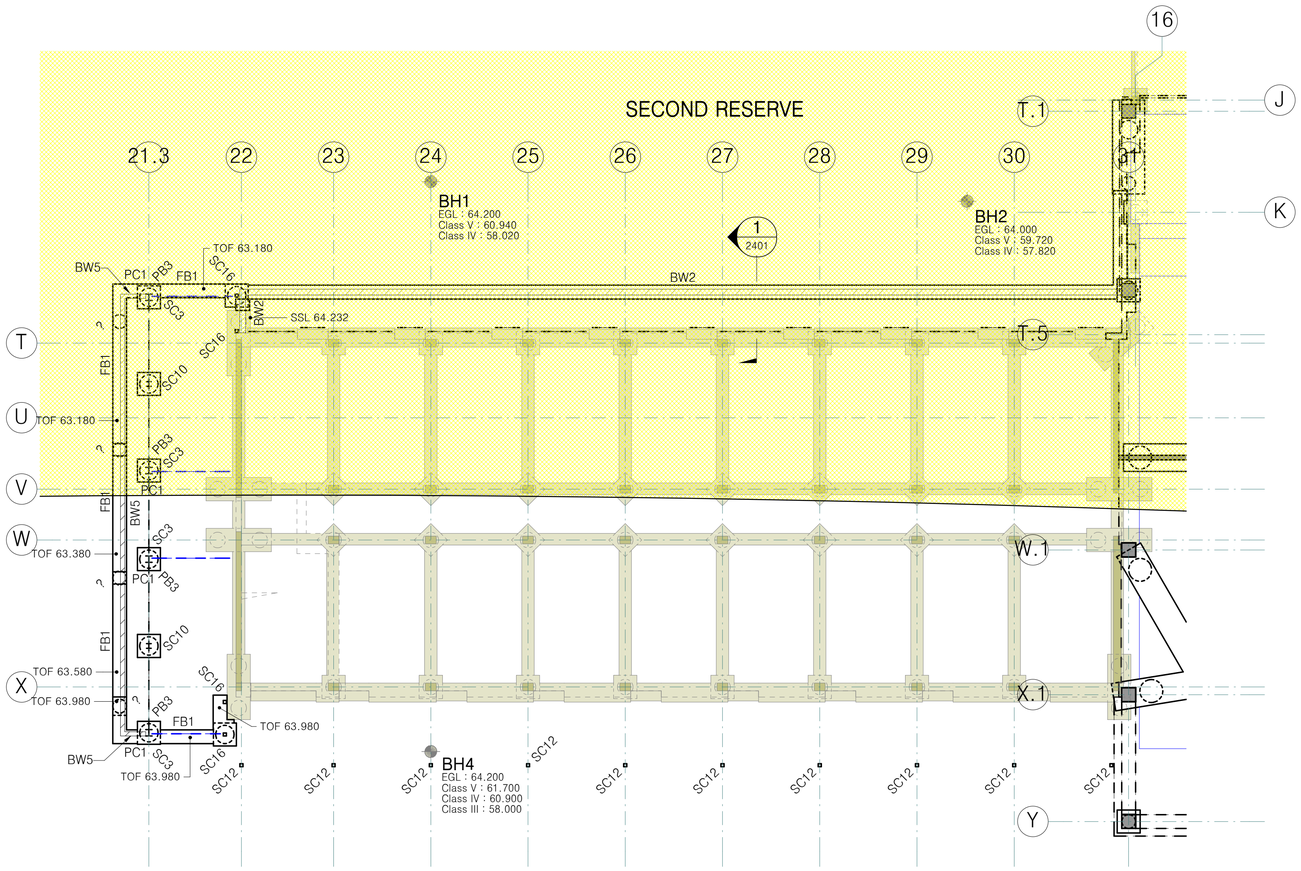
drawing
WWA FOOTINGS - SHEET 1

scale: As indicated@A1
drawing no.: **25WWA STR-0501**
Director : S. Christoforidis
project no: **16331**
issue: **B**

2017-09-20 5:10:13 PM



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PLAN ON FOOTINGS

BH6 DENOTES APPROX. LOCATION OF TEST BORES
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-- : RL 167.6 -- : -----.
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Prefix Legend – Foundations		
PREFIX	DESCRIPTION	DETAIL & SCHEDULE REFERENCE
FB	Footing Beam	S0570
LP	Lift Pit Base	S0575
PB	Bored Pile	S0550
PC	Pile Cap	S0555
PF	Pad Footing	S0560

Prefix Legend – Concrete		
PREFIX	DESCRIPTION	DETAIL & SCHEDULE REFERENCE
C	Concrete Column	S0600 – S0799
CJ	Construction Joint	S2215
HB	Reinforced Concrete Hob	S2210
PL	Concrete Plinth	S2210
ST	Straight Joint	S2000
UP	Reinforced Concrete Upstand	S2210

Prefix Legend – Walls		
PREFIX	DESCRIPTION	REFERENCE
BW	Block Wall	S0800 – S0999
G	Girts	
LW	Lift Pit Wall	S0575
W	Concrete Wall	S0800 – S0999

Prefix Legend – Steel		
PREFIX	DESCRIPTION	DETAIL & SCHEDULE REFERENCE
BR	Bracing	4000; 6xxx Series
FR	Welded Frame	53xx Series
H	Hanger	4000; 6xxx Series
L	Lintel / Shelf Angle	4000; 6xxx Series
S	Strut	4000; 6xxx Series
SB	Steel Beam	4000; 6xxx Series
SC	Steel Column	4000; 6xxx Series
TBR	Temporary Brace	S0140
TR		
UB	Underpinning Beam	4000; 6xxx Series
VB	Vertical Brace	
WB	Wind Beam	
WS	Wall Stiffener	

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drawing
WWB FOOTINGS - SHEET 2

scale: As indicated@A1
drawing no.: **25WWB STR-0502**

Director : S. Christoforidis

project no: **16331**
issue: **B**

2017-09-20 5:10:18 PM

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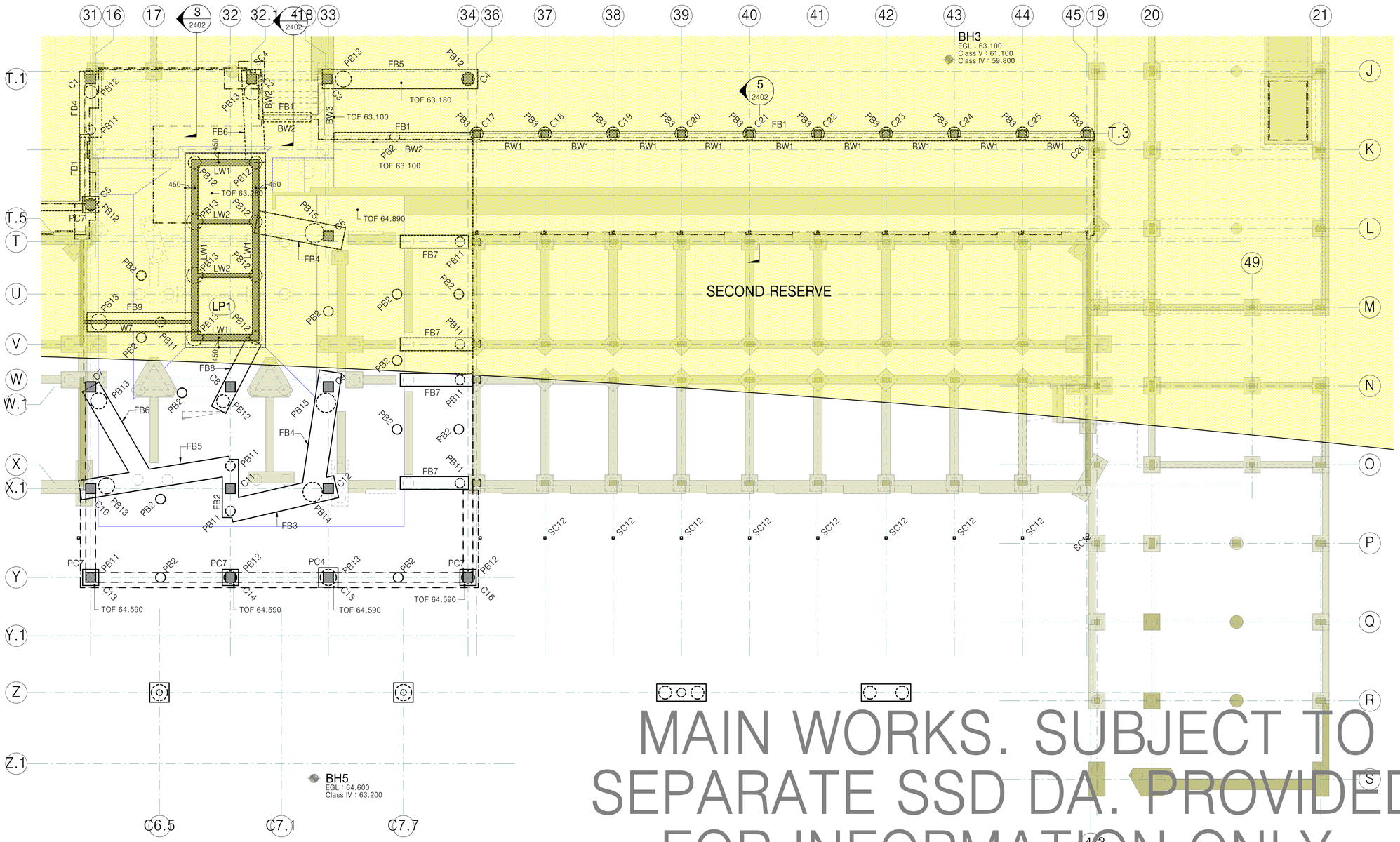

SCALE 1 : 100

PLAN ON FOOTINGS

BH6 DENOTES APPROX. LOCATION OF TEST BORES
-- : RL 172.3 BY ----------.
-- : RL 167.6 -- : -----.
-- : -----.

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PF	Pad Footing	S0560

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ST	Straight Joint	S2000
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TBR	Temporary Brace	S0140
TR		
UB	Underpinning Beam	4000: 6xxx Series
VB	Vertical Brace	
WB	Wind Beam	
WS	Wall Stiffener	

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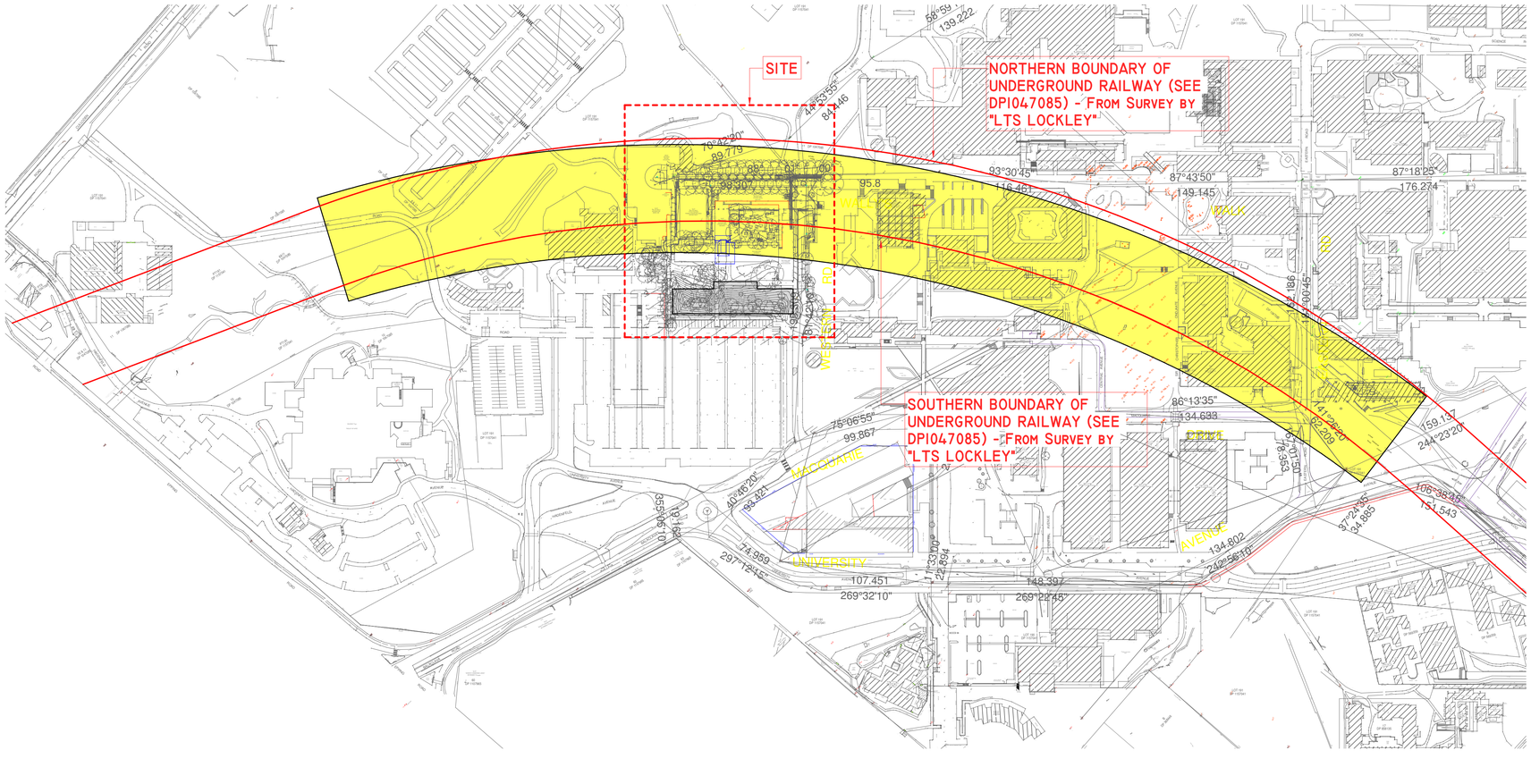
drawing
WWB FOOTINGS - SHEET 3

scale: As indicated@A1
drawing no.: **25WWB STR-0503**

Director : S. Christoforidis

project no: **16331**
issue: **B**

2017-09-20 5:10:25 PM



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Rev.	Date	Description	Drawn	Design
A	28.04.17	FOR INFORMATION	A.C.	S.C.
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drawing

RAIL CORRIDOR IMPACT STUDY - MAIN WORKS

scale: 1 : 2000@A1

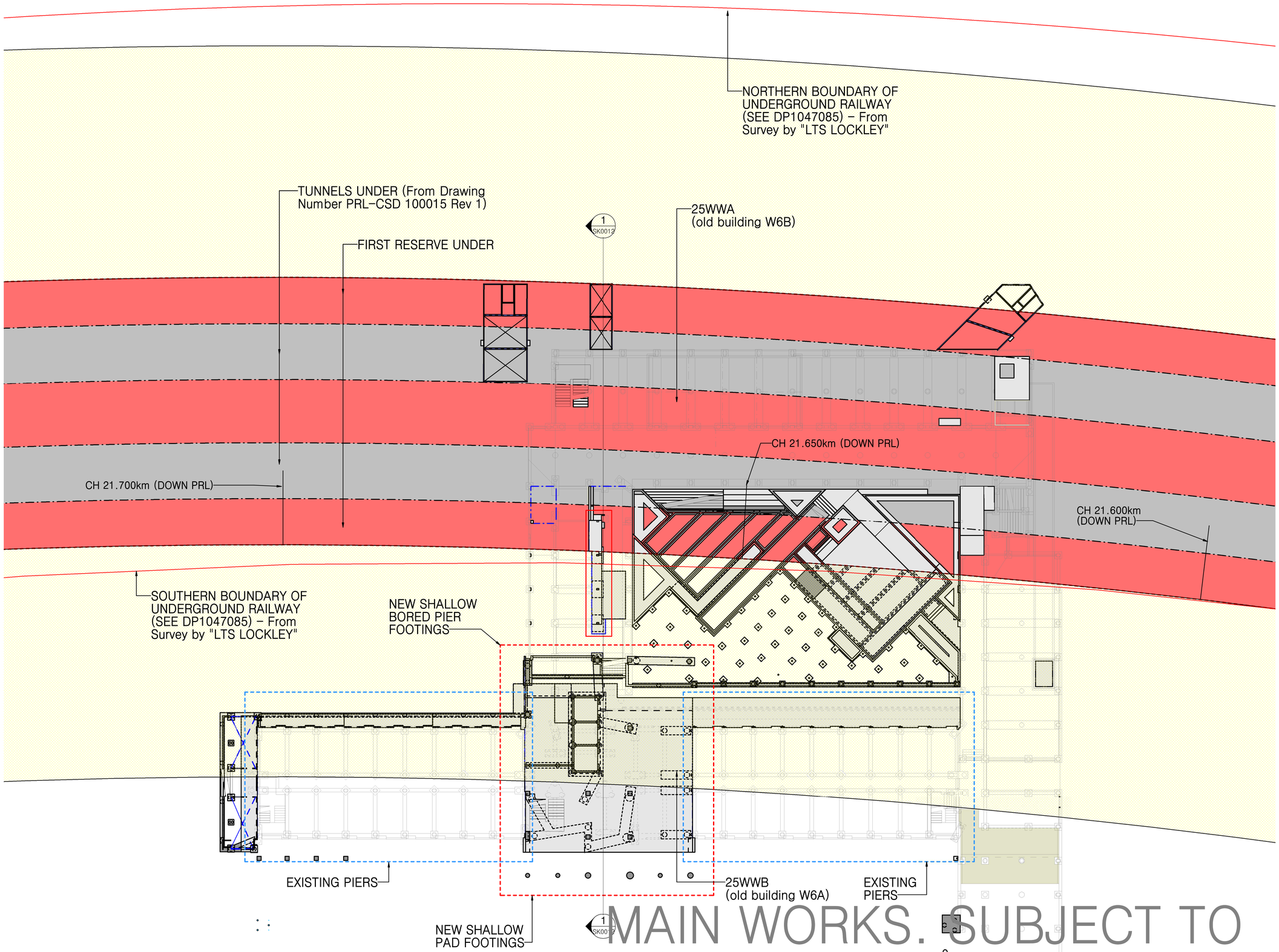
drawing no.: **APP STR-SK0010**

Director : S. Christoforidis

project no: **16331**

issue: **B**

2017-09-15 11:19:15 AM



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PLAN ON CORRIDOR IMPACT

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for tender

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drawing
RAIL CORRIDOR IMPACT STUDY - MAIN WORKS

scale 1 : 200@A1

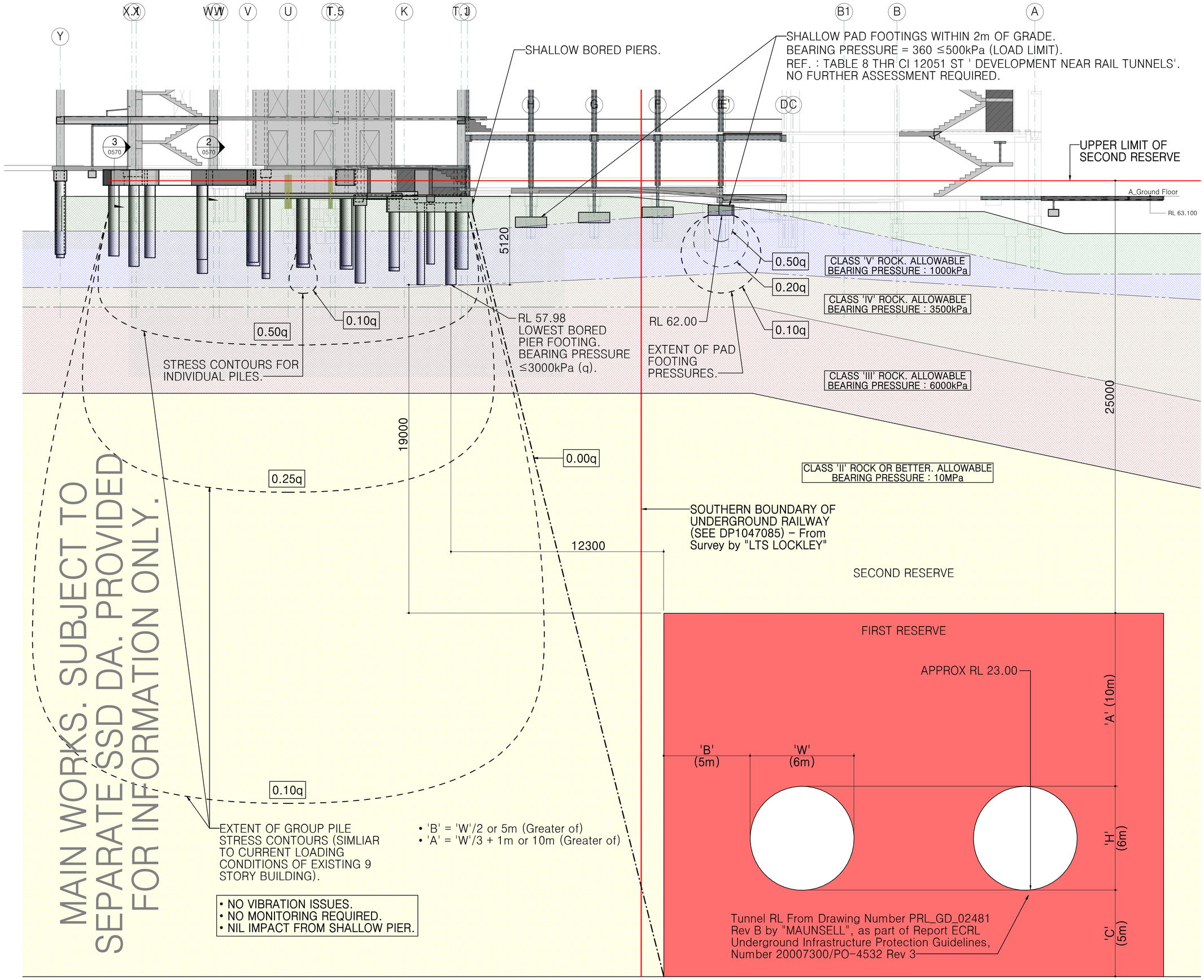
drawing no. **APP STR-SK0011**

Director : S. Christoforidis

project no **16331**

issue **B**

24/01/2018 9:15:48 AM



SCALE 1 : 100

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SK0011

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for tender

project
MACQUARIE UNIVERSITY ARTS PRECINCT

drawing
RAIL CORRIDOR IMPACT STUDY - MAIN WORKS

scale 1 : 100@A1

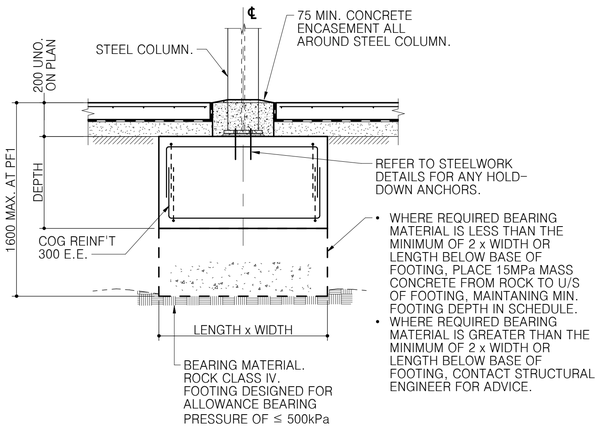
drawing no.
APP STR-SK0012

Director : S. Christoforidis

project no
16331

issue
B

24/01/2018 9:15:56 AM



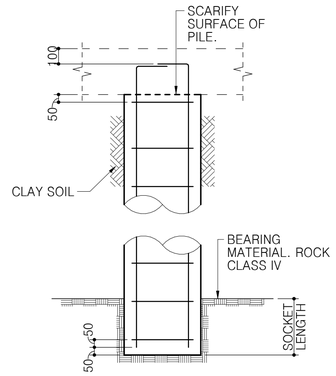
SCALE 1:20

TYPICAL PAD DETAIL

CONSTRUCTION METHOD

DUE TO CONFINED HEAD SPACE, MEN WITH SHOVELS &/OR SMALL BOBCAT OR BACKHOE TO EXCAVATE HOLE FOR PPOURING CONCRETE.

MAIN WORKS. SUBJECT TO SEPARATE SSD DA. PROVIDED FOR INFORMATION ONLY.



SCALE 1:20

TYPICAL IN-SITU BORED PIER DETAIL

CONSTRUCTION METHOD

DRILL HOLE TO DEPTH USING AUGER PLANT & THEN POUR CONCRETE INTO HOLE.

Do not scale drawings. Verify all dimensions on site

Rev.	Date	Description	Drawn	Design
A	20.09.17	ISSUE FOR RAIL REVIEW	A.C.	S.C.

client

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project

MACQUARIE UNIVERSITY ARTS PRECINCT

drawing

RAIL CORRIDOR IMPACT STUDY - FOOTING DETAILS

scale: 1 : 20@A1

drawing no.: **APP STR-SK0013**

Director : S. Christoforidis

project no: **16331**

issue: **A**

2017-09-20 4:53:06 PM