TTW Structural Civil Traffic Façade

In collaboration with

RICHARD GREEN CONSULTING

Structural Schematic Design Report

Kambala School Sports Precinct

Prepared for CTPG / 23 July 2020

201058

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Your Partner in Engineering

Contents

1.0 Introduction

This report supports a State Significant Development Application (SSDA) submitted to the Department of Planning, Industry and Environment (DPIE) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), for the proposed redevelopment of the sports precinct of Kambala School at 794 -796 New South Head Road, Rose Bay.

This application is SSD by way of clause 8 and schedule 1 under State Environmental Planning Policy (State and Regional Development) 2011 on the basis that the development is for the purpose of an existing school and has a Capital Investment Value of more than $20 million.

This report has been prepared having regard to the Secretary's Environmental Assessment Requirements issued for the project by DPIE, ref no SSD-10385 issued on 24 November 2019.

1.1 The site

Kambala is located at 794 -796 New South Head Road, Rose Bay and is within the Woollahra Council local government area (LGA). Situated in the eastern suburbs of Sydney, the School is approximately 8km east of the Sydney CBD. The School is located on New South Head Road which is a classified road connecting the City with the eastern beaches. The School is surrounded by predominantly residential uses.

The campus is bound by New South Head (to the east), Bayview Hill Road (to the north) and Tivoli Avenue (to the west). Fernbank Boarding House is located at 1A -3 Bayview Hill Road opposite the Kambala School grounds. No works are proposed to this part of the campus in this DA. Figure 1 provides an aerial map of the School and its immediate surrounds.

The School campus slopes down from New South Head Road in the east to the west and comprises a series of existing buildings in the western part of the campus that range in height and age. The south western and north western part of the campus accommodates much of the school's existing built form, while the eastern part has the school's sporting fields and courts.

Within the School campus, the site of this SSDA is illustrated in Figure 2. The site proposed for new buildings is on top of the existing sports field and music building, as shown in green. The site proposed for demolition works and associated façade redevelopment and landscaping works is shown in red and is limited to a portion of the existing Hawthorne Building and the Arts building.

It is anticipated that the construction works will be staged, so the construction site for any given stage will be smaller than the overall site identified in Figure 2. The four key main buildings proposed at identified in Figure 3.

Figure 1: Aerial Map of the Kambala Campus

Source: Near Map, Ethos Urban

Figure 2: Project Scope

Source: AJ+C

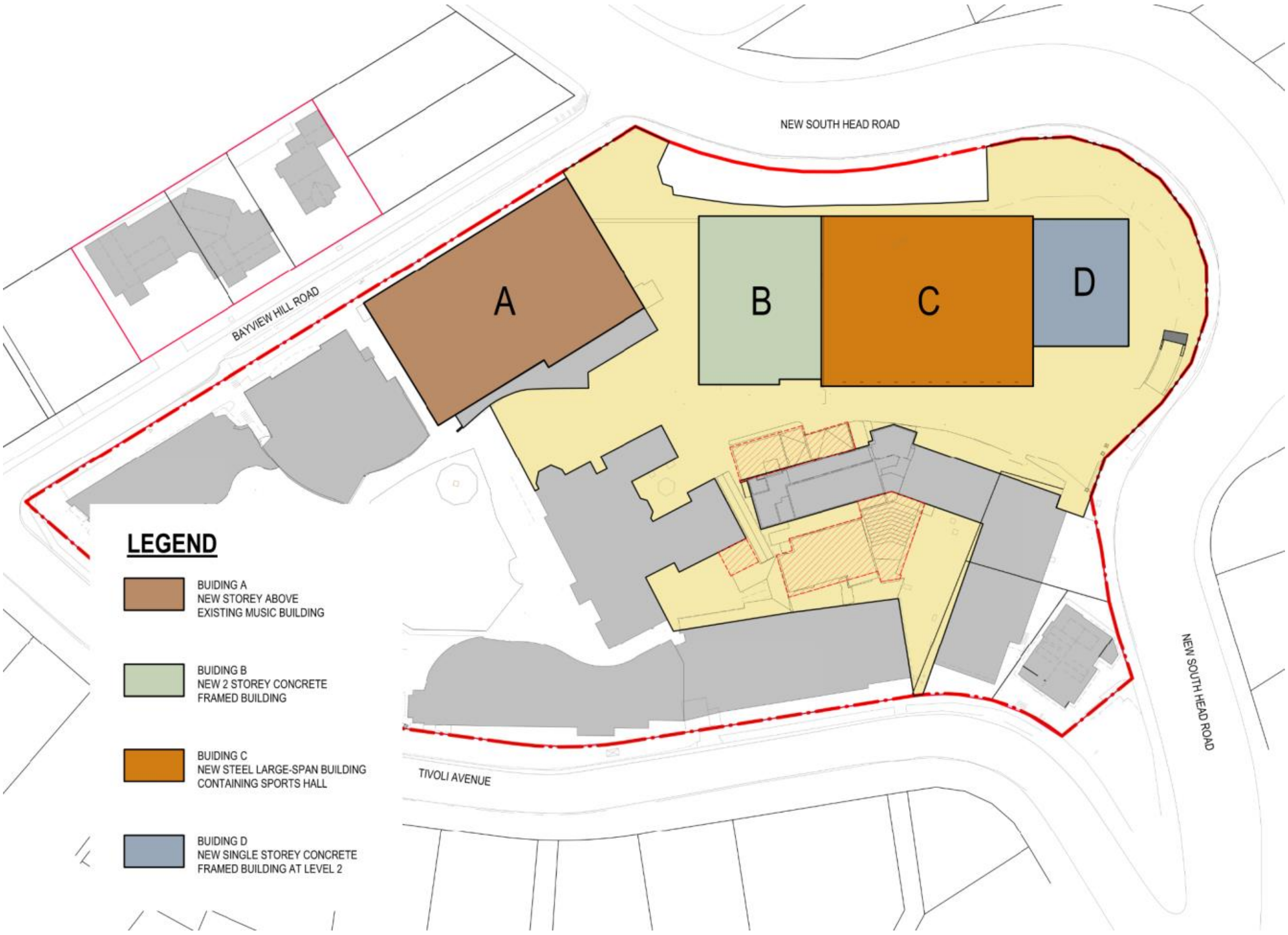

Figure 3: Key Plan

Source: AJ+C

As shown in Figure 3 the development can be considered as five different segments.

Working from the north:

Building A (Part 1 and Part 2)

Consists of an additional storey above the existing music school and outdoor sports courts reinstated on the new roof .

Building B

Consists of a new two story concrete building containing teaching spaces, and the part of the playing fields on the roof.

Building C

Consists of a new single storey high-ceiling long-span building containing a multi-purpose sports hall, and part of the playing fields on the roof.

Building D

Consists of a part one and part two story building constructed over the realigned stormwater easement, and houses part of the playing field on the roof.

Hawthorne Building

The front section of the building will be removed and the original façade reinterpreted.

Figure 3 illustrates the proposed footprint of the new building (building B,C,D) and vertical extension of the music building (Building A).

2.0 Site overview

2.1 Existing Structures

2.1.1 Existing music building (East)

The existing single storey building dates from circa 1982 and was designed by Fowell Mansfield Jarvis & Maclurcan Pty Ltd Architects, with Murray Low Consultants as the Structural Engineer.

We have sourced a set of the original structural drawings for the building, which show the building founded on solid rock via pads to the east side, and piers to the west. The ground floor slab is a 125thk conventional slab on ground, except in the North-West corner where a 175 thick suspended slab is supported on beams and piers.

The existing roof slab is a conventionally reinforced flat slab (thickness varies, 250 at North and 200 in the centre) with drop panels to the majority of the northern side, with a section of waffle slab (450 to 380 thick) to the south.

The existing roof has a fall, and is covered by a membrane, insulation and a 150thk concrete topping slab.

2.1.2 Existing music building (West)

The existing two storey building dates from circa 2010 and was designed by Gardner Wetherill & Associates, with TTW as the Structural Engineer.

The building is founded on piers on rock, the basement slab is a 120thk conventional slab on ground, with the basement extending to approximately the western half of the floor plate above. There is a contiguous piled wall along the North side of the building and a reinforced block retaining wall along the east side of the basement.

The ground floor slab is a conventionally reinforced suspended banded slab to the west side (above the basement) with a slab on ground to the east. The roof slab is a post tensioned banded slab which is laid to falls with a trafficable membrane.

2.2 Site Conditions and Geological and Subsurface Conditions

2.2.1 Existing batter slope to New South Head Road (RMS, TfNSW)

On the north-eastern boundary there is an existing sloping bank supporting New South Head Road. It has a layer of stones over the surface. The RMS have an easement over this bank and they maintain it. They also have a right of way over the existing playing field to gain access to maintain the bank.

The project team have held several meetings with RMS at which the following was agreed:

- The playing field is to be capable of taking a 5 tonne truck to access/service the bank.
    - The design of the roof is to be such that a zone 5 metres wide along the north-eastern edge is to take a load of 20 kPa
- It was agreed that the playing field could cantilever 4 metres over the bank
- The RMS is looking at doing remedial work on the bank in particular where the bank has slumped
    - Stone is to be replaced with shotcrete under the cantilever
- Temporary anchors permitted under the battered bank & New South Head Road

2.2.2 Geotechnical conditions

There are three reports covering the construction area of the new build, two by PSM and one by Douglas and Partners. In addition there are two reports by Douglas and Partners and one by Jeffery and Katauskis covering the area to the north of the music school.

The general profile is silty sandy fill over sandy natural soils, over medium strength weathered sandstone over high strength sandstone.

	Allowable bearing pressure	
Geotechnical report	**Medium strength sandstone**	**High strength sandstone**
Jk Geotechnics – 11826W/a May 1996	3,500 kPa	Not stated
Douglas Partners – 37034 June 2004	3,500 kPa	6,000 kPa
PSM – PSM3759-002L Jan 2019	5,000 kPa	10,000 kPa

Table 1 – Geotechnical allowable bearing summary

Refer to Appendix A for a consolidated markup of the borehole data on the subject site and interpolated medium strength sandstone contours.

Building B,C,D

Generally the rock at the base of the bank is 1 metre below the existing playing field level at the north end and the rock falls towards the internal school road and appears to shelve somewhere between the north end of the existing playing field and the music (Anne & John Lewis Wing) / Massie building to the northwest. The maximum depth is approximately 5 metres below existing ground level across the sports field.

2.3 Existing Services

2.3.1 Existing Stormwater Easement

At the south east end of the proposed Sports Building an existing stormwater line and associated easement cuts diagonally through the development site. As part of the project works it is proposed to realign the stormwater line and easement parallel to the grid of the proposed building, simplifying structure / stormwater coordination. The capacity of the pipe is proposed to be upgraded during the realignment works.

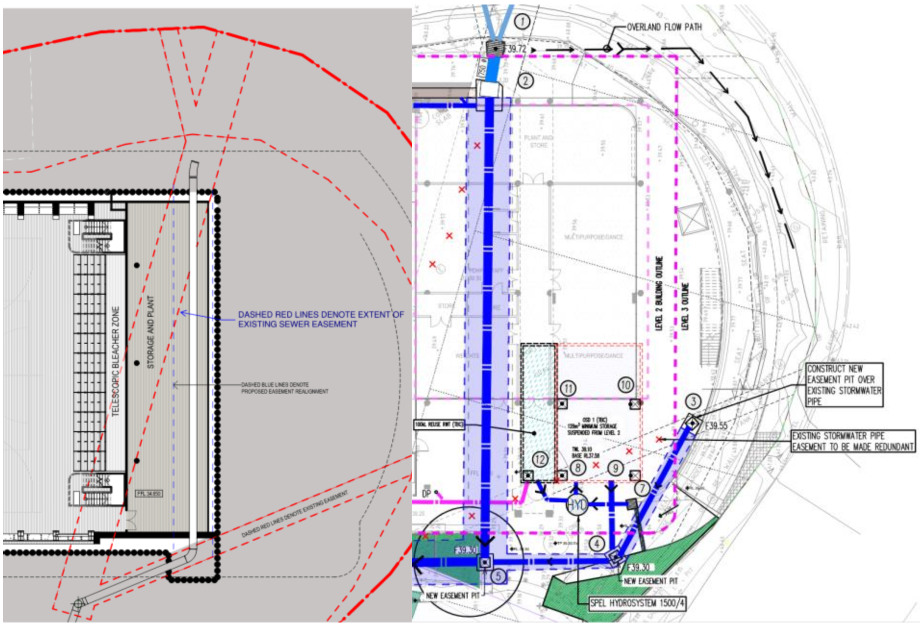

Figure 4: Proposed easement realignment

2.3.2 Other services

All other existing in ground services are to be removed and rediverted prior to excavation for the proposed building.

3.0 New Development

3.1 Foundations, Shoring and ground bearing slabs

3.1.1 Building B,C,D Foundations

At the level of the basketball courts nearly all the slab is on rock. The columns will be supported on pads on rock. In the small area where the rock falls away piers will be used.

3.1.2 Building B,C,D Shoring to NE elevation

From meetings between CTPG, Richard Green Consulting, AJ+C and RMS, TTW understand that approval in principal for the school to install temporary ground anchors under the existing embankment to New South Head Road was advised by RMS. As part of the detailed design and approval, it is expected that formal submission will be made by the school for the temporary ground anchors. The retention system under the toe of the bank is a contiguous piled wall up to approximately 3.5 metres deep with every fourth pile (at the location of the buttress) extending below the base of the excavation. This is done to retain the rock if it is jointed. Permanent rock bolts are required at the toes of the piles terminated at high level on the rock shelf.

In the permanent situation the top of the piles are restrained by a horizontal capping beam that spans between buttresses at 3.6 metre centres. The buttresses are prevented from overturning by vertical anchors into the rock.

The retaining wall between the internal school road and the multi-purpose sports hall varies in height from circa 4.5 metres to zero. This wall consists of a cantilevered contiguous piled wall.

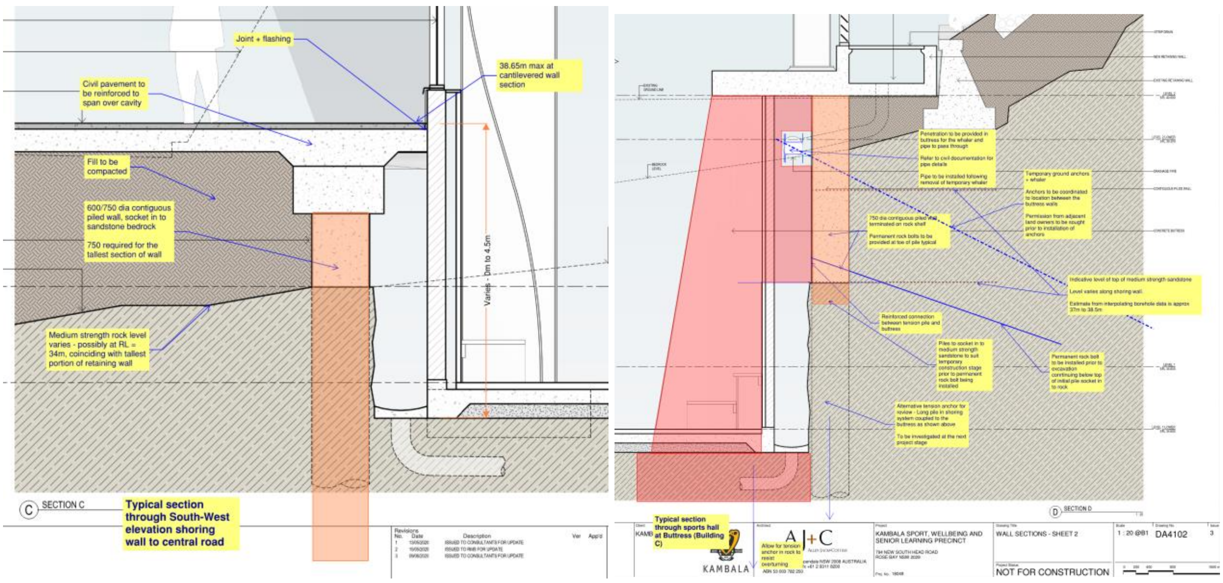

Figure 5: Left – section through shoring wall to central access road at sports hall. Right – section through shoring wall to embankment at sports hall

Building B,C,D ground bearing slab

Following bulk excavation it is expected that rock will be encountered across the majority of the building footprint. Conventional slabs on ground poured over a 100mm granular drainage layer, a double concrete underlay separated by 30mm of sand will be utilised for all habitable areas. A grillage of agg line drainage under the granular drainage layer is to be provided, and be connected in to the perimeter drains.

3.2 Building B

This is a new building which has a grid of circa 9 metres with maximum band spans of 10 metres and 4 metre cantilevers. It is proposed that this building will be a post tensioned concrete building with band beam floor plates. The band depth will be 450 mm except for the cantilever near the RMS bank which will be 500 mm deep. This depth will extend back one span. The lateral loads will be taken by the core walls. The slab will have insulation, a topping slab and 30 mm of artificial grass.

Refer to section 3.7 for commentary on proposed staged construction.

3.3 Building C

This is a single story building but with a clear height of 7.2 metres and a 34 metre span The grid will be 3.6 metres. The main structure will be steel portal frames with a depth of 1500 mm. There will be 150 mm thick precast formwork slabs to form the roof slab. On top will be insulation, a structural slab and 30 mm of artificial grass. The slab will act compositely with the steel beams. A vibrational analysis of the beams has been carried to ensure that the field will not adversely vibrate under the student activities.

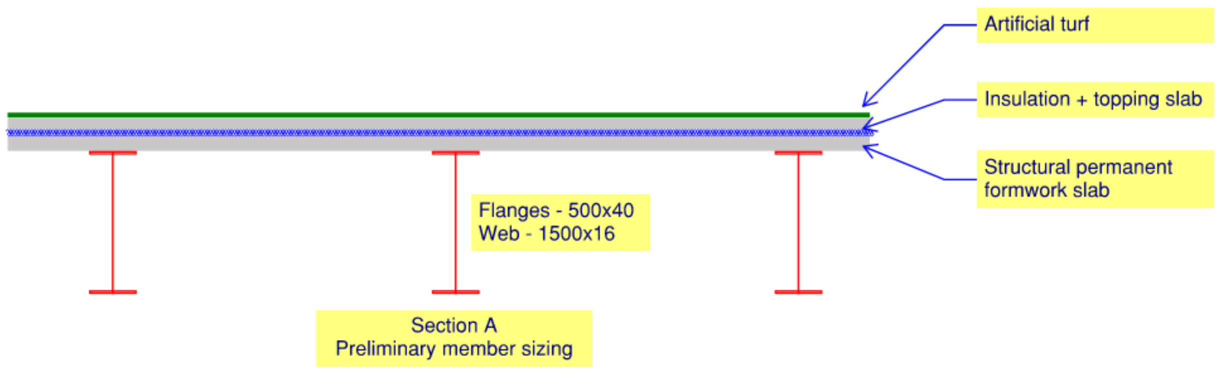

Figure 6: Preliminary steel member sizing

3.4 Building D

The last section is a part one and part two story building. The grid has been determined by the position of the relocated stormwater line and its easement. The grid is circa 9 metres with a maximum band spans of 10 metres . The structure will be similar to building A. The playing field slab is extended to form raking seats on the south-western end. This section of the slab will be supported by the lift and perimeter columns/edge beam.

3.5 Sports field access ramp

The ramp is a single lane vehicle ramp and will be supported by a series of beams at approx 7.5 metres centres. The ramp provides access for both Kambala staff and for the RMS to access the easement for the battered slope.

3.6 Alterations to existing structures

3.6.1 Existing music building (East)

The existing building was not designed to take an extra floor, however, by removing the topping slab, limiting the live load on the existing roof (new level 2) to classroom, using a lightweight timber floor to level the slab, allowing for an increase in concrete strength with age and an increase in the foundation allowable bearing stress, the additional floor is possible. Our assumptions regarding concrete strength gain are to be validated through on site sampling and lab testing during the next phase of the project.

If all the columns are extended up to support the new roof slab, the roof slab can be a 200 mm thick slab with insulation and a topping slab. Part of the new tennis court is reinstated on the new topping slab.

The eastern elevation of the existing building will be opened up into a new courtyard, with a line of steel columns and beams provided to support the L2 slab edge.

3.6.2 Existing music building (West)

This building was not designed for an additional slab but the top floor was designed for a heavy load (noted as SDL = 10kPa and LL 5kPa in the record drawings). By allowing for an increase in concrete strength, a lightweight timber levelling floor and a normal classroom live load on the existing roof, a new slab can be added. If all the columns are extended up the slab can be a 180/190 mm thk slab supported on 1800w x 600 dp band beams. The grid is approximately 5 metres with bands spanning up to 12 metres. There will be a membrane, insulation and a topping slab. Part of the tennis court is reinstated on the topping slab. Our assumptions regarding concrete strength gain are to be validated through on site sampling and lab testing during the next phase of the project. Allowance for some column strengthening is to be made.

3.6.3 Music building Stability

To increase the capacity of the buildings to take the increased lateral loads due to the vertical extension of the buildings and the introduction of revisions to wind and earthquake design standards, we have inserted concrete walls between some of the columns. The strengthened building will take the standard wind and earthquake loads.

3.6.4 Music building spatial planning

To facilitate the vertical extension, it is proposed to extend all existing columns up to support the additional level. This minimises the additional load on to any one of the existing columns, and avoids the requirement for transfer structures.

Although there is a large number of columns in both buildings, the architect has planned the building to achieve flexible spaces.

3.6.5 Hawthorne Building

Richard Green Consulting has recently done work on the Hawthorne Building. It is good that the extension to the building is being removed as RGC question the adequacy of the existing structure. The original roof framing is still there with the extension built on top so the original roof can be readily reinstated. The original brick façade at ground level is not apparent so the façade will need to be rebuilt.

3.7 Constructability

Through early coordination with the architect, a rationalised structure has been coordinated into the architectural planning. This should facilitate a relatively traditional construction methodology, with the difficult part being access to the site.

The additional slab to the music school (building A) is intended to be constructed during construction stage four. If the school is prepared to sacrifice part of the new playing field, this could be used for site sheds and light storage. If the slab is constructed during the school holidays the area in front of the music school could be used for concrete pumps and concrete trucks, a detailed study would need to be done to ensure the trucks can turn. For buildings B,C,D it is suggested that the construction starts at the north-west and moves towards the south-east. It is assumed that it will be built mainly using mobile cranes. The concrete could be pumped from the south.

Staged construction

The project is proposed to be constructed in stages, with the broad scope of each being;

- Stage 1 – Primary structure for buildings B,C,D (except Building B, level 2)
- Stage 2A – Building B, level 2 + fitout of Building B
- Stage 2B – Building D, level 2 fitout
- Stage 2C – Partial demolition of Hawthorne + New façade to Hawthorne, reinstatement of Hawthorne original roof pitch, landscape works to the main spine
- Stage 2D – Landscape works between Music and Tivoli
- Stage 3 – Partial demolition of Arts and Tivoli building, landscaping works to central courtyard
- Stage 4 – Internal alterations and vertical extension to Music building. Link bridge from elevated sports field to Minter Level 3

From a structural perspective, the majority of the work can be broken down into separate buildings, the tennis courts (building A), the double story building (building B), the gym (building C) and the single story building (building D).

Each building can be built as an individual building with pour strips between them. However, it is further proposed that buildings B and D will be built in two stages. Building B will have level 2 and the fit out constructed in Stage 2B. The structure will be designed to be stable under the lateral loads without the level 2 slab and so the level 2 slab can be built at a later time.

In Building D, the full structure is to be built in Stage 1, with the delayed fit out of building D undertaken in Stage 2B, this has no adverse effect on the structure.

Consideration and adoption of appropriate durability criteria, considering both the structural elements exposure in its initially constructed (i.e. initially external) and final (i.e. finally enclosed) will be made during detailed design.

4.0 Design Parameters

4.1 Design Life

The design life for all new structural elements is to be 50 years.

4.2 Structural Importance Level

The structure is viewed as being a secondary school building with expected population exceeding 250, thus the adopted Importance Level = 3.

This importance level will be used in determining the wind and seismic loads on the structure.

4.3 Design loadings

In general, all loads and load combinations shall comply with AS/NZS 1170 Parts 0 to 4 Structural Design Actions. Live load reductions will be applied as permitted by AS/NZS 1170.1. Generally, the floor design loads are:

4.3.1 Permanent Actions – Dead and Superimposed Dead Loads

Dead load shall be considered as the self-weight of the structure plus an allowance for services, walls and ceilings which vary significantly throughout the building. Refer to the table below for superimposed dead load to be included in the design.

4.3.2 Imposed Actions – Live Loads

Generally for this Sports Precinct project, the floor design live loads and superimposed dead loads are:

Occupancy Type	Live Load (kPa)	SDL (kPa)
Elevated playing field	5.0 20kPa to RMS access zone	3.0 + 1.0
Tennis court	5.0	3.0 + 1.0
Teaching areas	3.0	1.0
Stores and plantrooms	5.0	1.0
Dance rooms	5.0	1.0
Change rooms and amenities	2.5	2.5
Stairs	4.0	0.5
Indoor on grade sports court	5.0	-
Existing music building – Level 2	3.0 [note: LL limited to facilitate vertical extension]	1.0

4.3.3 Barriers

Barriers including parapets, balustrades and railings are to be designed in accordance with Table 3.3 of AS/NZS 1170.1.

4.3.4 Wind Loads

Wind loads are in accordance with AS1170.2 and based on the following parameters:

Region	A2
Importance Level (BCA Table B1.2a)	3
Annual probability of exceedance (BCA Table B1.2b):	1000 years
Regional Wind Speed	46 m/s
Terrain Category:	2

4.3.5 Earthquake Loads

Earthquake loadings shall be in accordance with AS1170.4 – 2007 (Earthquake actions in Australia) and AS/NZS1170.0 – 2002.

Hazard Factor (Z):	0.08
Site Sub-Soil Class:	Be
Importance Level (BCA Table B1.2a)	3
Annual probability of exceedance (BCA Table B1.2b):	1000
Earthquake Design Category:	II
Probability Factor (Kp)	1.3

4.3.6 Load Combinations

The basic combinations for the ultimate limit states used in checking strength are as follows. These are based upon AS1170.0 section 4.

LOAD COMBINATION	G	Q	W_u	E_u
1	1.2	1.5		
2	1.2	Ψ_c	1.0	
3	1.0	Ψ_c		1.0
4	1.2	$1.5\Psi_l$		
5	1.35			
6	0.9		1.0 up	

The basic combinations for the serviceability limit states used in checking service are as follows. They are based upon AS1170.0 section 4.

LOAD COMBINATION	G	Q	W_s	E_s
7	1.0			
8		Ψ_s		
9		Ψ_l		
10			1.0	
11				1.0

G	:	structure self weight plus superimposed dead loads
Q	:	imposed action
W_u	:	ultimate wind action
W_s	:	serviceability wind action
E_u	:	ultimate earthquake action
E_s	:	serviceability earthquake action
Ψ_c	:	combination factor for imposed action
Ψ_s	:	short-term factor
Ψ_l	:	long-term factor

Load Duration Factors	Ψ_s	Ψ_l	Ψ_c
Distributed Actions - Floors	0.7	0.4	0.4
Distributed Actions – Roofs (concrete)	0.7	0.4	0.4
Distributed Actions – Roofs (steel)	0.7	0.0	0.4
Concentrated Actions - Floors	1.0	0.6	0.4
Concentrated Actions – Roofs (concrete)	1.0	0.6	0.4
Concentrated Actions – Roofs (steel)	1.0	0.0	0.0

4.3.7 Design Standards

The structural design will be in accordance with the latest revision of all relevant Australian Design Standards, Codes and other statutory requirements. As a minimum requirement, the design shall be based on, but not limited to;

Number	Edition	Title
AS/NZS 1170.0	2002	Structural design actions Part 0: General Principles
AS/NZS 1170.1	2002	Structural design actions Part 1: Permanent, imposed & other actions
AS/NZS 1170.2	2002	Structural design actions Part 2: Wind actions
AS 1170.4	2007	Structural design actions Part 4: Earthquake loads
AS 2159	2009	Piling – Design and installation
AS 3600	2018	Concrete Structures[*1]
AS 3700	2001	Masonry Structures
AS 4100	1998	Steel Structures
AS 2870	2011	Residential Slabs and Footings

4.4 Serviceability

4.4.1 Deflection Limits

Deflection limits for the concrete structures are generally as follows;

	Maximum Floor Deflection Limit			
Element	**Dead**	**Incremental**	**Live**	**DL + LL**
Elements supporting masonry walls	Span/500	Span/750 [1.]	Span/500	Span/300 25mm max.
Other floor areas	Span/360 (25mm max)	N/A	Span/500	Span/300 30mm max.

1. Areas supporting normal weight masonry partitions. Masonry to be articulated.

Long term deflections in the RMS maintenance zone are to be based on the typical sports roof loading, rather than the full 20kPa maintenance load, as it is considered that the maintenance load will be a short term, infrequent, unsustained loading scenario.

4.4.2 Durability

For concrete elements this will be achieved by specifying all elements in accordance with section 4 of AS 3600 which sets out requirements for plain, reinforced and post tensioned concrete structures and members with a design life of 40 to 60 years. Exposure classifications are as follows.

Exposure Classification	Elements
A2	Internal
B2	External

Protective coatings to structural steel elements shall comply with AS/NZS 2312 and ISO 2063 for the long-term protection category.

4.4.3 Crack Control

Crack propagation in concrete elements due to shrinkage and temperature effects will be controlled by providing reinforcement quantities sufficient for a 'strong' degree of crack control where concrete slabs or soffits are to remain exposed.

Internally, where slabs are concealed, reinforcement quantities will be provided sufficient for a 'moderate' degree of crack control.

4.4.4 Fire Resistance Levels

Fire Resistance Levels (FRL) for the structural elements is to be in accordance with Specification C1.1 of the BCA. Note the FRL requirement for columns are the same as the level they are supporting.

Typically, the FRL (minutes) for structural elements is generally 120/120/120 where required by the BCA.

4.4.5 Vibration

Footfall vibration of the new structure is to be analysed, with the adopted limits as per the table below for the various floor usages;

Usage Scenario	Response Factor (RF) Limit
Classrooms	8
Stairs – light use	24
Footbridge – passive persons	32
Footbridge – active persons	64
Rhythmic activities – passive bystanders/spectators	55-97
Rhythmic activities – active participants	250

Pacing rates and damping to be adopted in the design checks will vary depending on the usage of the space, and the selected finishes. These parameters will be confirmed during detailed design, with the below a range of expected values;

Usage Scenario	Pacing rates (Steps/second, Hz)
Walking – in rooms or closed spaces	1.2-1.8
Walking – corridors / footbridges	1.2-2.2
Running	2.0-4.0
Stairs	1.2-4.5
Rhythmic activities – individuals and small groups	1.5-3.5

It is expected that the response factor method outlined in the SCI P354 (2009) guide will be used for the checks.

For group rhythmic activities on the roof top sports field, a density of 0.25 persons / m^2 will be adopted, with group sizes of 30-60 people, with an average mass per person of 75kg.

5.0 ESD Initiatives

At the detailed design stage, the environmental influence of the structure will be considered and minimised through actions including;

Concrete

- Ordinary Portland cement replacement with SCMs
  - 20% in prestressed elements
  - Upto 30% in columns and walls
  - 40% in other ordinary reinforced concrete elements
- Nominate minimum appropriate concrete strength for the required performance (Strength and durability)
  - To minimise embodied energy
- Use of manufactured sand and captured/reclaimed water in all concrete mixes
- Recycled crushed concrete to be used within fill and drainage layers
- Prestressed concrete to be adopted where structural efficient
  - Minimises volume of concrete
- Timber formwork
  - To be sourced from a renewable source registered to a forest certification scheme
  - To be re-used minimum of 3 times, except to areas of off form finishes
- End of life – all demolished primary construction material will be recycled

Structural steelwork

- Most Australian steel members contain 20% recycled content on average
- End of life – facilitating the potential for re-use of steel members through marking of steel grade on installed steelwork
- End of life – at current rates, 89% of construction, demolition and scrap steel is recycled

Transport and material sources

- Locally sourced, Australian products to be used where practical and at a reasonable cost
- Offsite fabrication options will be considered in the schematic and detailed design stages

Lean, structurally efficient design

- Through lean design and selection of appropriate construction materials/methodologies, material usage is minimised

6.0 Risk & Opportunities

Risk/Opportunity	Description
Impact to School Operation	Construction projects around operating facilities are always complex in their execution. There are a number of aspects of the project which will have an ongoing interaction with the School during decanting, construction and operation. It is important that these impacts are relayed to the stakeholders in the project once a more developed series of construction methodology are available.
Construction risks	The proposed structure is located adjacent to four existing buildings (Music, Tivoli, Hawthorne and Minter). Monitoring during construction is recommended especially of vibration and shoring displacement during the basement excavation. Building adjacent and below the existing rock reinforced batter to New South Head Road. Works to an existing building – As-built differs from record drawings. Works to an existing building – Compliance with current design codes - allow to strengthen the existing Music building for Earthquake. Building over the existing/realigned stormwater easement. Contamination within the existing fill soils. Groundwater seepage during and post construction, especially at or just above the soil / rock interface. Gaining permission for temporary ground anchors for works adjacent to the existing rock reinforced batter.

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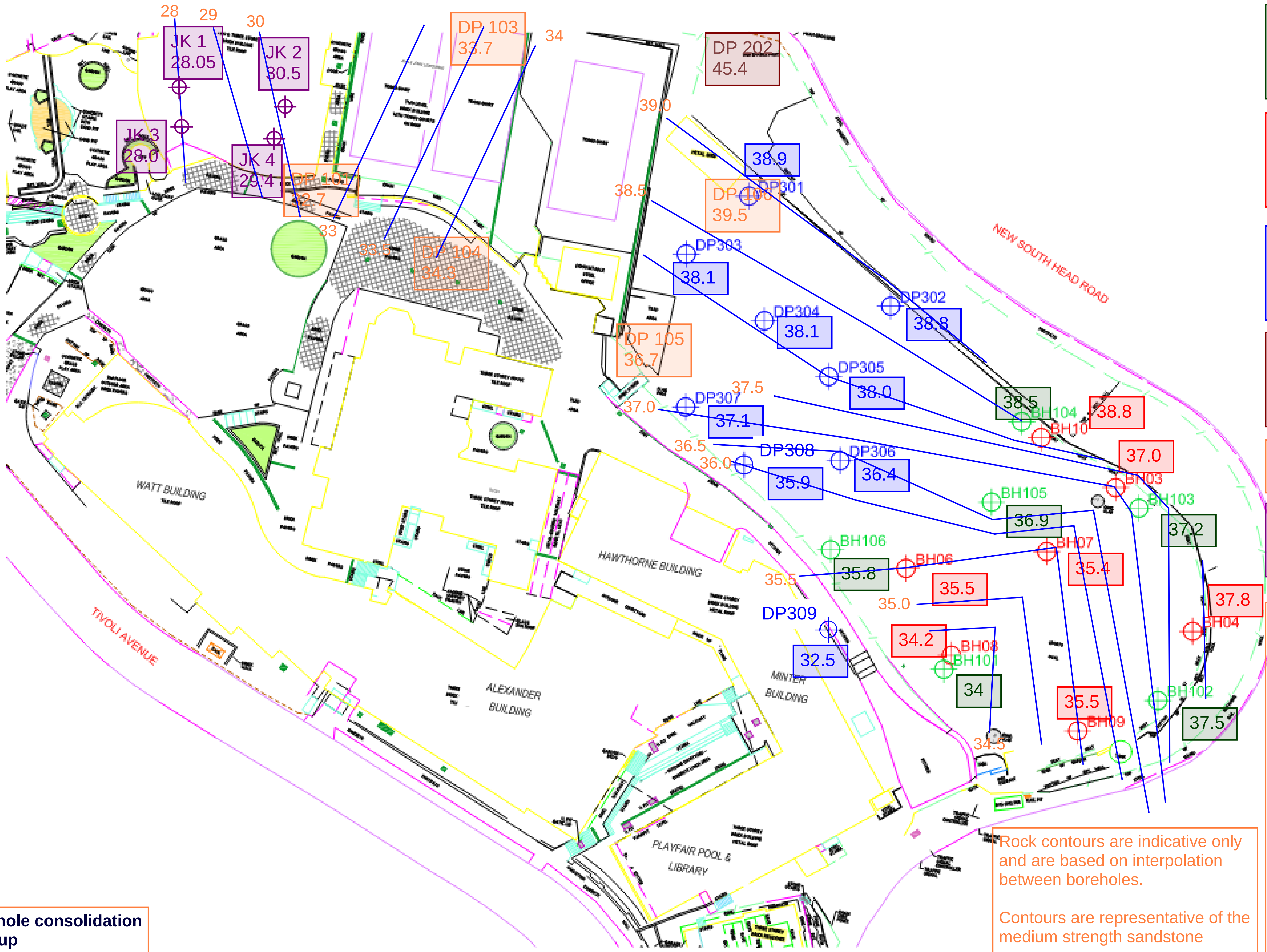
Appendix A

Consolidated geotechnical borehole markup



PSM Report
PSM3759-005L 30/7/19
Weathered rock - 5000kPa inferred

PSM Report
PSM3759-002L 29/1/19
Weathered rock - 5000kPa

DP Report 37034.04 Jun 2012
MS sandstone - 3500kPa inferred

DP Report 37034A Dec 04
MS sandstone - 3500kPa inferred

DP Report 37034 June 04
MS sandstone - 3500kPa

JK Report 11826W/a 28/5/96
MS sandstone - 3500kPa

Groundwater

Wet cuttings were recorded in the geotechnical investigation undertaken by PSM, generally following the top of sandstone

Refer to PSM report PSM3759-002L Section 4.1 for comments on seepage.

Some seepage noted in DP report 37034, none in 37034A or 37034.04.

Water recorded in JK augured boreholes

Rock contours are indicative only and are based on interpolation between boreholes.

Contours are representative of the medium strength sandstone

Borehole consolidation markup
Appendix A

HOLE LOCATION (BH)
)-002L)

0 10 20 30 40 50
Scale(m)
1:1000 @ A4

Carmichael Tompkins Property Group Pty Lt
Kambala Girls School
794 New South Head Rd, Rose Bay

Appendix B

Preliminary structural sketches

Job Name : Kambala Sports Precinct
Sketch Title:
Structural schematic sketches for SSDA report
Date: 23/07/2020
By: RM
TTW Structural Civil Traffic Facade
Job Number: 201058
Sketch No. : SK200723.01

Revisions No.	Date	Description
1	13/05/2020	ISSUED TO CONSULTANTS FOR UPDATE
2	15/05/2020	ISSUED TO RMS FOR UPDATE
3	22/05/2020	ISSUED TO CONSULTANTS FOR UPDATE
4	09/06/2020	ISSUED TO CONSULTANTS FOR UPDATE

Client: KAMBALA SCHOOL

Architect: AJ+C Allen Jack+Cottier
79 Myrtle Street Chippendale NSW 2008 AUSTRALIA
ph +61 2 9311 8222 fx +61 2 9311 8200
ABN 53 003 782 250

Project: KAMBALA SPORT, WELLBEING AND SENIOR LEARNING PRECINCT
794 NEW SOUTH HEAD ROAD
ROSE BAY NSW 2029
Proj. No. 18049

Drawing Title: LEVEL 1 PLAN

Project Status: NOT FOR CONSTRUCTION

Scale: 1 : 200 @B1

Drawing No.: DA2101

Issue: 4

Revisions No.	Date	Description	Ver	App'd
1	13/05/2020	ISSUED TO CONSULTANTS FOR UPDATE		
2	15/05/2020	ISSUED TO RMS FOR UPDATE		
3	22/05/2020	ISSUED TO CONSULTANTS FOR UPDATE		
4	09/06/2020	ISSUED TO CONSULTANTS FOR UPDATE		

Key

N

Client: KAMBALA SCHOOL

KAMBALA

Architect: AJ+C Allen Jack+Cottier

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Project: KAMBALA SPORT, WELLBEING AND SENIOR LEARNING PRECINCT

794 NEW SOUTH HEAD ROAD
ROSE BAY NSW 2029

Proj. No. 18049

Drawing Title: LEVEL 2 PLAN

Project Status: NOT FOR CONSTRUCTION

Scale: 1 : 200 @B1

0 2 4 8 16 m

Drawing No. DA2102

Issue 4

PLOTTED & CHECKED BY: Author

PLOT DATE & TIME: 9/06/2020 6:33:27 PM

Job Name : Kambala Sports Precinct
Sketch Title:
Structural schematic sketches for SSDA report
Date: 23/07/2020
By: RM
TTW Job Number: 201058
Sketch No. : SK200723.01

Revisions No.	Date	Description
1	13/05/2020	ISSUED TO CONSULTANTS FOR UPDATE
2	15/05/2020	ISSUED TO RMS FOR UPDATE
3	22/05/2020	ISSUED TO CONSULTANTS FOR UPDATE
4	09/06/2020	ISSUED TO CONSULTANTS FOR UPDATE

Key

Client: KAMBALA SCHOOL

KAMBALA

Architect: AJ+C ALLEN JACK+COTTIER
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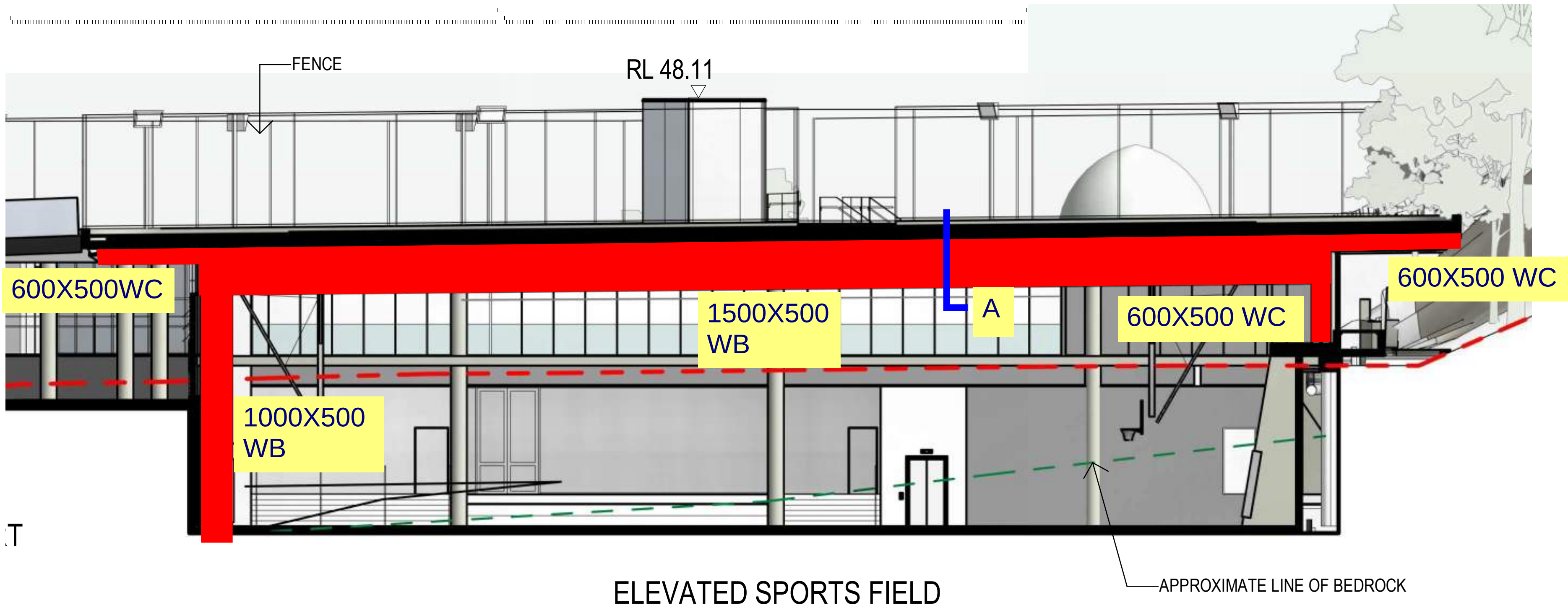
ABN 53 003 782 250

Project: KAMBALA SPORT, WELLBEING AND SENIOR LEARNING PRECINCT
794 NEW SOUTH HEAD ROAD
ROSE BAY NSW 2029
Proj. No. 18049

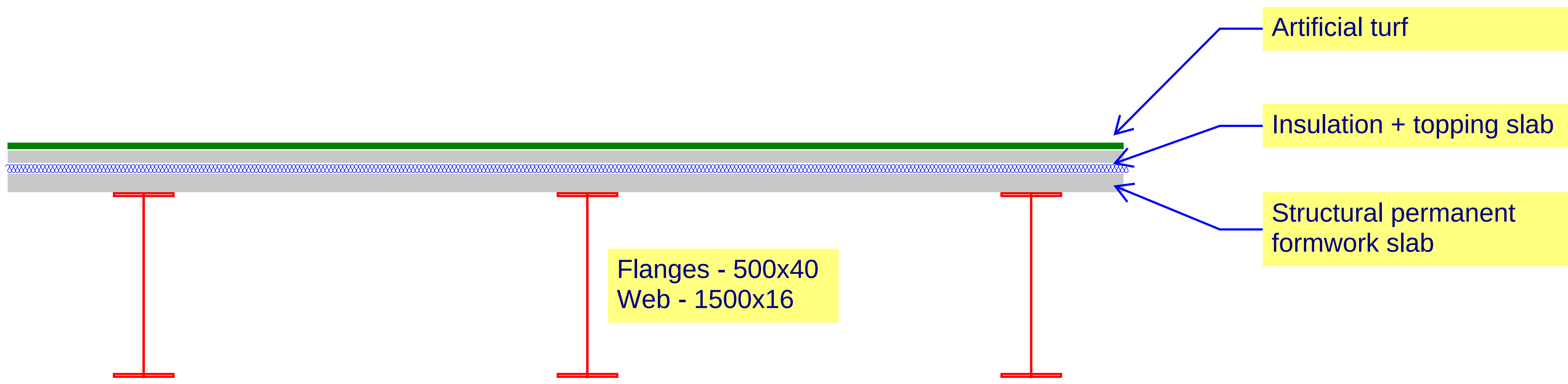
Drawing Title: LEVEL 3 PLAN

Project Status: NOT FOR CONSTRUCTION

Scale: 1 : 200 @B1
Drawing No.: DA2103
Issue: 4



Typical section through sports hall



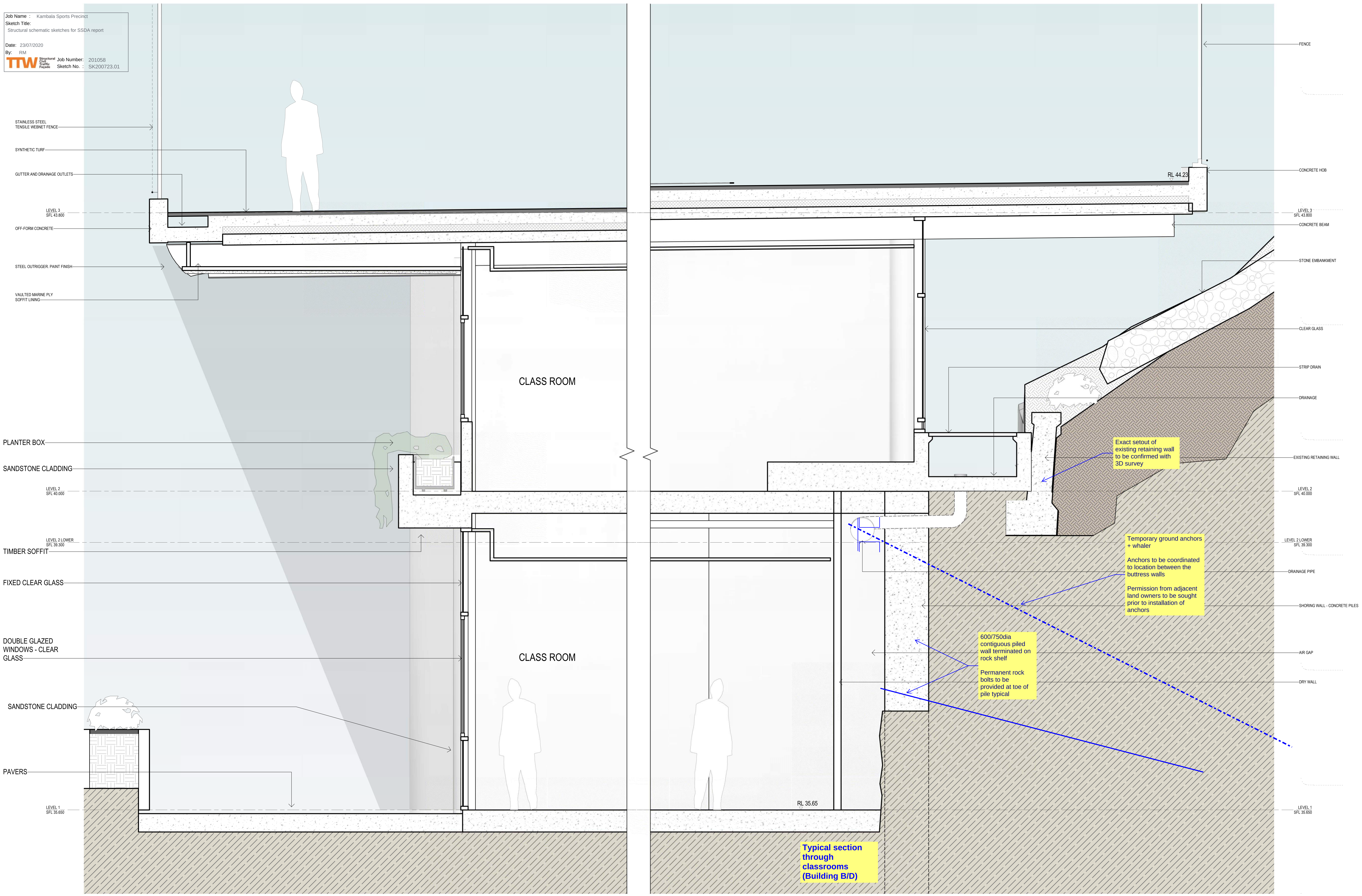
Section A
Preliminary member sizing

Job Name : Kambala Sports Precinct
Sketch Title:
Structural schematic sketches for SSDA report

Date: 23/07/2020
By: RM
TTW Structural Civil Traffic Façade
Job Number: 201058
Sketch No. : SK200723.01

Job Name : Kambala Sports Precinct
Sketch Title:
Structural schematic sketches for SSDA report

Date: 23/07/2020
By: RM
TTW Structural Civil Traffic Façade
Job Number: 201058
Sketch No. : SK200723.01



A SECTION A 1 : 20

B SECTION B 1 : 20

Revisions No.	Date	Description	Ver	App'd
1	13/05/2020	ISSUED TO CONSULTANTS FOR UPDATE		
2	09/06/2020	ISSUED TO CONSULTANTS FOR UPDATE		

Key

Client
KAMBALA SCHOOL
KAMBALA

Architect
AJ+C ALLEN JACK+COTTIER
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ABN 53 003 782 250

Project
KAMBALA SPORT, WELLBEING AND SENIOR LEARNING PRECINCT
794 NEW SOUTH HEAD ROAD
ROSE BAY NSW 2029
Proj. No. 18049

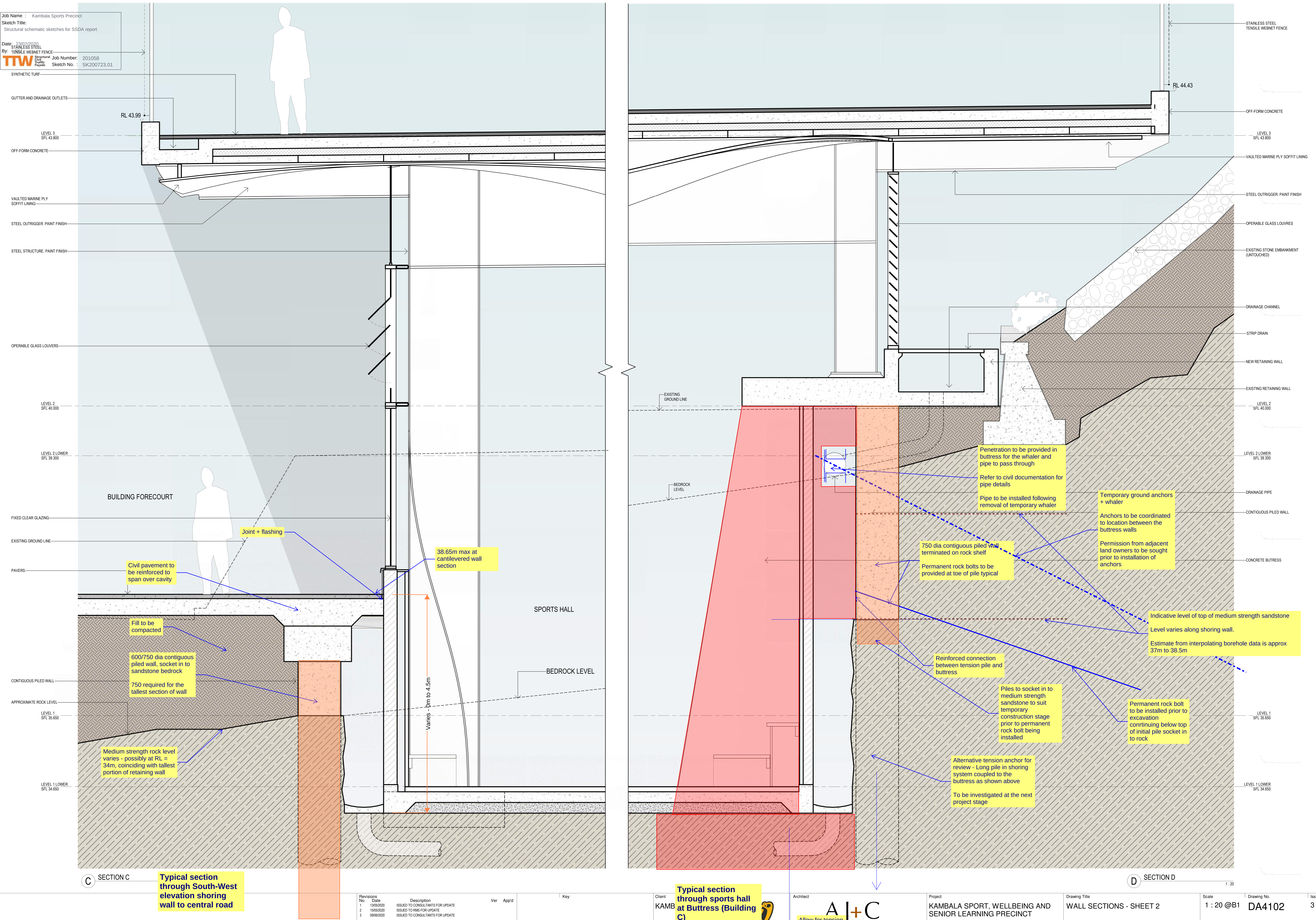
Drawing Title
WALL SECTIONS - SHEET 1

Project Status
NOT FOR CONSTRUCTION

Scale 1 : 20 @B1
Drawing No. DA4101
Issue 2
0 200 400 800 1600 mm

PLOT DATE & TIME: 9/06/2020 6:38:45 PM
PLOTTED & CHECKED BY: Author

Job Name : Kambala Sports Precinct
Sketch Title: Structural schematic sketches for SSDA report
Date: 23/07/2020
By: RM
Job Number: 201058
Sketch No. : SK200723.01



Revisions No.	Date	Description	Ver	App'd
1	13/05/2020	ISSUED TO CONSULTANTS FOR UPDATE		
2	15/05/2020	ISSUED TO RMS FOR UPDATE		
3	09/06/2020	ISSUED TO CONSULTANTS FOR UPDATE		

Key

Client: KAMBALA

Architect: AJ+C ALLEN JACK+COTTIER
...pendale NSW 2008 AUSTRALIA
...x +61 2 9311 8200
ABN 53 003 782 250

Project: KAMBALA SPORT, WELLBEING AND SENIOR LEARNING PRECINCT
794 NEW SOUTH HEAD ROAD
ROSE BAY NSW 2029
Proj. No. 18049

Drawing Title: WALL SECTIONS - SHEET 2

Project Status: NOT FOR CONSTRUCTION

Scale: 1 : 20 @B1
Drawing No.: DA4102
Issue: 3

0 200 400 800 1600 mm

PLOT DATE & TIME: 9/06/2020 6:38:54 PM
PLOTTED & CHECKED BY: Author