



8. ENVIRONMENTAL ACOUSTIC REPORT

Acoustics and Audio Production

SITE doc ref: 230420 AAP VCA001.2023.Rev1.Lot501.1.Curtis.Way.GIRRAWHEEN



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Ref: VCA001.2023
20th April 2023

ACOUSTIC REPORT

PROPOSED VIETNAMESE CULTURAL CENTRE

LOT 501, (#1) CURTIS WAY, GIRRAWHEEN WA 6064

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INTRODUCTION

It is proposed to build a Vietnamese community centre at Lot 501, Curtis Way, GIRRAWHEEN WA 6064. The Vietnamese community centre includes a large floor space for health and fitness sessions and other activities.

Site Planning and Design has commissioned Acoustics & Audio Production to undertake a preliminary assessment of the acoustic considerations for the DA stage of this project. This report identifies the potential noise expected to be produced by the proposed development that may potentially impact current and future noise sensitive receivers.

The relevant assessment criteria for each identified noise source has been determined and preliminary guidelines for noise control treatments have been provided.

A glossary of acoustic terminology is provided in *Appendix A* of this report.

This report addresses the mandatory acoustic requirements for this project including:

- Environmental noise emissions (compliance with the Environmental Protection (noise) Regulations 1997;
- Australian / New Zealand Standard AS/NZS 2107:2016: 'Acoustics – Recommended sound design levels and reverberation times for building interiors – (AS/NZS 2107:2016);
- Part F5 'Sound Transmission and Insulation' of the Building Code of Australia; and
- External noise intrusion.

The acoustic assessment addresses the following acoustic impacts:

- The potential impact of noise emanating from the development i.e.;
 - Operational noise;
 - Community youth gatherings;
 - Senior dancing sessions;
 - Music rehearsals;
 - Youth fitness and sport sessions; and
 - Functions – fetes, weddings etc.
- The potential impact of the existing environmental noise intrusion onto the proposed development from vehicles travelling along Marrangaroo Drive.

This report presents the findings of the acoustic assessment. It includes measured environmental noise survey data and environmental noise limits based on the measured noise levels of the area. Compliance to these limits will ensure any noise from the proposed community centre will not negatively impact on the nearest noise sensitive receivers. The report also provides recommendations for appropriate internal noise level for the proposed centre.

DOCUMENTS REVIEWED

The assessment is based on floor plans, and elevations as shown in drawings provided by *Site Planning and Design* as shown below.

Table 1: Documents reviewed for the acoustic assessment

DRAWING NO.	TITLE	DATE
DA1.01 RevA	Site Plan	20/07/2022
DA2.01 RevA	Floor Plan	
DA2.02 RevA	Upper Floor Plan	
DA2.03 RevA	Roof Plan	
DA3.01 RevA	Elevations	
DA4.01 RevA	Site Sections	

PROJECT DESCRIPTION

The proposed site is located at Lot 501, (#1) Curtis Way, GIRRAWHEEN WA 6064 is situated on Public Purpose – MRS zoned land with the surrounding area identified as Residentially zoned. The proposed Vietnamese cultural centre development is intended to be utilised for the following:

- The activities intended to be carried out within the proposed Vietnamese cultural centre development include the following:
 - Providing indoor sports such as badminton, volleyball, basketball and netball, table tennis, aerobics, coaching and rehearsal space for cultural or music performance;
 - Providing an assembly area with staging provisions for entertaining and events, which also includes a commercial kitchen, toilets, classrooms and office spaces;
 - The site is also intending to provide language and coaching sessions to the community; and
 - Cater for the Vietnamese Chess Club WA and the Ao Dai Club Australia (ADCA)
- The proposed site is applying for a maximum of 300 patrons at any one time, however the expected number of people at the site is as follows:
 - 50 to 100 people are expected to patron the Vietnamese cultural centre each day between the hours of 9am to 9pm, typically comprising of senior dancing classes in the mornings and youth fitness and sports in the afternoon / night time periods;
 - Approximately one time per month a larger event or function, such as a wedding reception is expected to occur, accommodating for up to 200 patrons;
 - A capacity event of 300 people is expected to occur 1 to 2 times a year, such as the Lunar New Year Festival which the VCA has an agreement with the Girrawheen Senior High School to use the School Oval (directly adjacent to the proposed centre) together with the proposed Vietnamese Cultural Centre;
- 62 standard parking spaces provided onsite directly adjacent to the South of the proposed Vietnamese cultural centre.
- The intended operating hours of the proposed cultural centre are as follows:

Table 2: Intended operating hours

DAY	TIME PERIOD
Monday to Sunday	9:00am to 9:00pm



Figure 1: Aerial imagery of proposed site, nearest noise sensitive receivers and measurement location

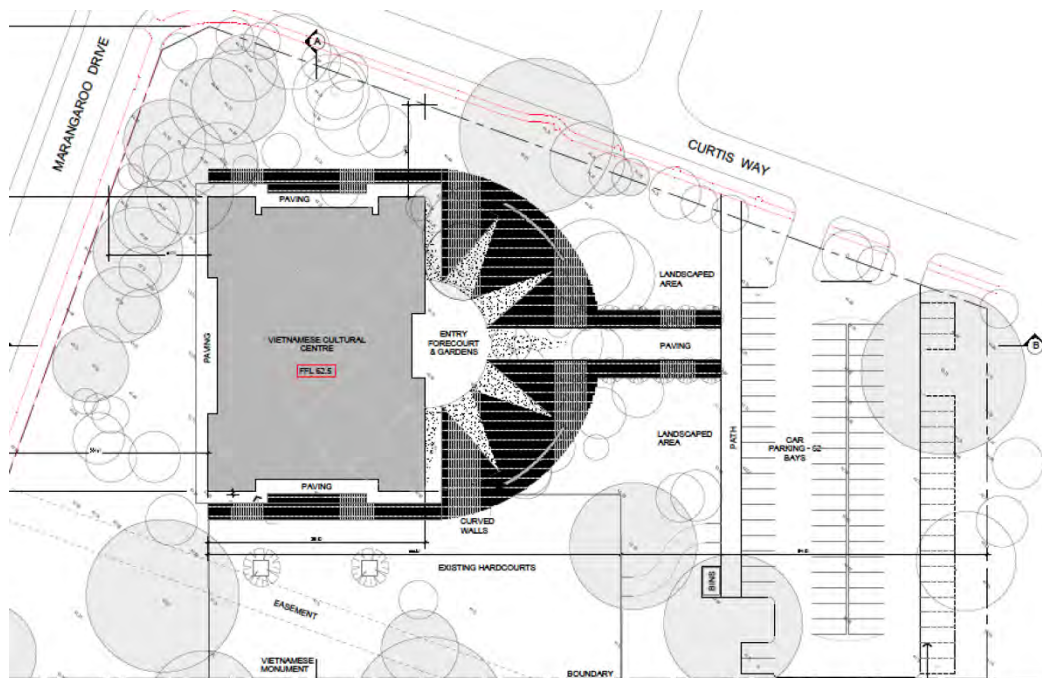


Figure 2: Proposed Vietnamese Cultural Centre Site Plan

Table 3: Nearest noise receiver(s) to the proposed community centre site.

NOISE RECEIVER	LOCATION
R1	9 Sepplet Place, MARANGAROO WA 6064
R2	10 Weaber Court, MARANGAROO WA 6064
R3	9 Weaber Court, MARANGAROO WA 6064
R4	10 Allott Place, MARANGAROO WA 6064
R5	7 Allott Place, MARANGAROO WA 6064
R6	9 Allott Place, MARANGAROO WA 6064
R7	11 Allott Place, MARANGAROO WA 6064
R8	15 Allott Place, MARANGAROO WA 6064
R9	180 Marangaroo Drive, GIRRAWHEEN WA 6064
R10	2 Curtis Way, GIRRAWHEEN WA 6064
R11	65 Curtis Way, GIRRAWHEEN WA 6064
R12	56 Curtis Way, GIRRAWHEEN WA 6064
R13	10 Curtis Way, GIRRAWHEEN WA 6064
R14	12 Curtis Way, GIRRAWHEEN WA 6064

Table 4: Onsite noise logging locations

MEASUREMENT LOCATION	LOCATION
M1	65 Curtis Way, GIRRAWHEEN WA 6064
M2	South facing property boundary of 10 Allott Place, MARANGAROO WA 6064

EXTERNAL NOISE INTRUSION (STATE PLANNING POLICY 5.4)

The proposed nearest residential noise sensitive receivers are located North and East of the proposed development. The potential traffic noise intrusion from vehicles travelling along Marangaroo Drive the proposed site has been considered by way of undertaking a ‘Screening Assessment’ in accordance with Appendix A of the ‘Implementation Guidelines for State Planning Policy 5.4’. The ‘Screening Assessment’ considers the following factors to calculate an L_{Aeq} (Day) traffic noise level:

- Proximity of Marangaroo Drive to the nearest façade of the development;
- The traffic pass-by frequency.

Where the ‘screening assessment’ estimates a traffic noise level of L_{eq} (Day) 55 dB(A) or less, no further consideration of traffic noise is required. Our ‘screening assessment’ suggests an L_{Aeq} (Day) traffic noise level of 55 dB(A) which indicates that a detailed assessment of traffic noise is not required.

1.1 Meteorological data during screening assessment

The following meteorological conditions were present during the onsite monitoring conducted on Friday 24th March 2023.

Table 5 – Meteorological Conditions

PARAMETER	RESULT
Temperature (°C)	28°C
Wind Speed (m/s)	2.77m/s
Wind Direction	West South West
Humidity (%)	68%

ENVIRONMENTAL NOISE EMISSIONS

In Western Australia, noise transmission from one premises to another is governed by the Environmental Protection (Noise) Regulations 1997. These regulations establish the 'Assigned Levels', which are the noise levels that shall not be exceeded at the façade/boundary of surrounding noise sensitive premises. Noise transmission to the surrounding residential properties requires consideration. The noise transmission to the noise sensitive premises must not exceed the 'Assigned Levels' outlined in Table 7.3 page 8 of this report.

2.1 Equipment

The following equipment was used to record existing ambient noise levels:

- Cirrus CR171 Type 1 Sound Level Meter
- Cirrus CR515 Acoustic Calibrator

Both the Cirrus Sound Level Meter and Acoustical Calibrator hold current NATA Laboratory Certification and had been field calibrated before and after the noise-monitoring period. No significant drift from the reference signal was recorded. Laboratory certificates may be provided upon request.

2.2 Noise Monitoring

A Cirrus CR171 Type 1 Sound Level Meter was used at to measure ambient noise levels. The monitor was located in a free field position with the microphone approximately 1.4m above the ground surface level.

The sound level meter was set to record in "A" Weighting, fast response using 15-minute statistical intervals in the following measurement types; L_{Aeq} , L_{A10} , L_{A1} , L_{A90} and L_{Amax} . Ambient noise monitoring was conducted generally in accordance with Australian Standard AS1055:1997 'Acoustics – Description and measurement of environmental noise'.

2.3 Existing Ambient Sound Levels

Table 6 below shows the results of our sound level measurements conducted on Friday 24th March 2023 in the locations identified in Figure 1 of page 5 of this report. The purpose of these measurements was to determine the existing ambient noise environment experienced at the nearest noise sensitive premises.

Table 6 – Measured Existing Ambient Sound Levels, SPL dB(A)

Location	Time Period	Measured Sound Levels, dB(A)				
		L_{Aeq}	L_{A90}	L_{A10}	L_{A1}	L_{Amax}
M1	9:05am to 9:35am	55.0	50.1	59.4	62.9	70.8
M2	9:45am to 10:15am	53.4	46.6	55.9	60.3	71.9
M1	7:10pm to 7:40pm	44.8	39.0	46.9	48.8	68.1
M2	7:55pm to 8:25pm	43.2	37.2	46.5	47.1	66.3

2.4 Nature of noise sources

It is not expected that the activities occurring within the day-to-day operations of the proposed Vietnamese cultural centre will create any significant noise impact on the existing and future residential properties surrounding the site.

An assessment has been carried out on the potential noise impact the proposed cultural centre will have on the nearest residential receivers during sites proposed hours of operation, modelled under a 'worst case scenario' for noise emissions expected from the site while under maximum capacity. The following noise sources expected to be present as part of our assessment are as follows:

- Noise from health and fitness activities (e.g. basketball, volleyball, dance classes) within the community centre;
- Noise from activities associated with music rehearsals within the cultural centre;
- Noise from activities associated with coaching and language teaching sessions;
- Noise associated with outdoor activities such as fetes or functions;
- Patron conversation noise (i.e. 50% of patrons conversing at the same time under maximum capacity of 300 people)
- Noise associated with the kitchen area operations;
- Noise from mechanical plant; and
- Noise from vehicles accessing the site;
- Noise from deliveries and waste collection.

2.5 Assigned Levels for the nearest noise sensitive receivers

The allowable noise levels at the surrounding noise sensitive areas are determined by the Environmental Protection (Noise) Regulations 1997. Regulations 7 & 8 stipulate the allowable external noise levels determined by the calculation of an influencing factor, which is then added to the base levels shown below. As the site is intending to operate from 9am to 9pm, our assessment will be based on the assigned outdoor noise levels for the daytime and evening period for the general operations of the proposed site under a 'worst case scenario' of noise emissions expected at the site.

It is noted that mechanical plant such as condensers is expected to be running 24hrs a day in order to maintain cool room temperatures for produce storage, therefore the night-time assessment criterion will be utilised for the assessment of mechanical plant.

Table 7.1 – Baseline Assigned Outdoor Noise Level

Description	Time of Day	Assigned Level (dB)		
		L _{A10}	L _{A1}	L _{A(max)}
Noise Sensitive Premises	0700 – 1900 hours Monday to Saturday	45 + IF	55 + IF	65 + IF
	0900 – 1900 hours Sunday and Public Holidays	40 + IF	50 + IF	65 + IF
	1900 – 2200 hours all days	40 + IF	50 + IF	65 + IF

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.
IF is the influencing factor.

Table 7.2 – Influencing Factor Calculation

Description	450m Radius	100m Radius	Influencing Factors
Commercial	4%	0%	0.2dB
Industrial	0%	0%	0dB
Major Roads	Nil	Nil	2dB
Secondary Roads	Nil	Yes – Marangaroo Drive	
Sports Venues	Nil	Nil	0dB
Total Influencing Factor = 2.2dB i.e. 2dB			

Based on the information in Table 7.2, an influencing factor of 2 is applied to the base line assigned noise levels for all of the nearest noise sensitive receivers identified, with the applicable assigned outdoor noise levels identified in Table 7.3 below.

Table 7.3 – Applicable Assigned Outdoor Noise Level

Description	Time of Day	Assigned Level (dB)		
		L _{A10}	L _{A1}	L _{A(max)}
Noise Sensitive Premises	0700 – 1900 hours Monday to Saturday	47	57	67
	0900 – 1900 hours Sunday and Public Holidays	42	52	67
	1900 – 2200 hours all days	42	52	67

2.6 Noise emission from mechanical services

At this early stage of the project the mechanical equipment has not been selected or specified. Therefore, we have based our modelling of condenser units that have been used in previous projects that have similar sized refrigeration requirements. The units that were used in previous projects were Kirby Titan Refrigeration Units (models PPA205LMA1-4 and PPH217MHA1-2) and according to the manufacturer, the PWL were 76dB(A) (fridge) and 84dB(A) (freezer) for each unit.

It is noted that any condenser unit must be designed and specified to fully comply with the Environmental Protection (Noise) Regulations 1997. Based on our experience of previous similar projects, consideration will need to be given to the following:

- Condensing units – The condensing units will generally be located in roof mounted compounds; Condensers with low Sound Power Levels shall be specified.
- Toilet exhaust fans – Toilet Exhaust Fans with low Sound Power Levels shall be specified. In some situations, it may be necessary to oversize the fans and run them at lower speeds in order to achieve compliant noise levels. The above information is provided for information, but the actual requirements will be determined via detailed noise modelling based on actual equipment selections prior to the

Building Permit submission. If the mechanical services are compliant with the Environmental Protection (Noise) Regulations 1997, there is very little chance of complaint from the nearest noise sensitive receivers identified. The reason being is that the strict criteria (the 'Assigned Levels') of the aforementioned regulations are typically lower than the actual ambient noise levels experienced. In other words, distant traffic, wind in the trees, etc, will be louder than the criteria we are needing to achieve for the mechanical services.

The noise impact from all mechanical plant to be installed on-site is to be reviewed during the detail design stage of the project, however the following control measures are to be incorporated.

- Selection of appropriate quiet equipment;
- Strategically locating noisy equipment away from noise sensitive areas;
- Use of noise barriers, shielding or construction of acoustic enclosures; and
- Provision of attenuators, internally lined ductwork and plena, and acoustic louvers.

2.7.1 Noise modelling of noise emissions associated with the proposed site

The SoundPLAN 8.0 software has been utilised in order to predict the potential noise emissions from general operations of the proposed site. This software produces noise contour plans over a given area based on inputs such as noise source levels, topography, building heights and forms, and meteorological conditions.

The proposed site layout was input into the noise model based on the architectural drawings. Point receivers were attached to the nearest facades of the surrounding noise sensitive receivers identified, in order to predict the expected noise to be received from the operations proposed site under a 'worst case scenario' of vehicle access, truck deliveries and mechanical plant in full operation and occurring simultaneously.

The meteorological conditions used for the noise modelling is outlined in Table 8 below. These are considered the worst-case for noise propagation, and are taken from the document titled EPA Guidance for the Assessment of Environmental Factors – No.8 Environmental Noise.

Table 8 – Acoustic Modelling: Weather Conditions

CONDITION	DAY
Temperature	20°C
Relative Humidity	50%
Pasquil Stability Class	E
Wind Speed	4m/s*

* From sources, towards receivers.

2.7.2 Sound source noise levels

The sound source noise levels used to conduct our modelling are shown in the Tables 9.1 to 9.6 below.

Table 9.1: Car Park Noise Emissions, Sound Power Levels

Description	Sound Power levels (dB) at Octave Band Centre Frequencies (Hz)								
	dB(A)	63	125	250	500	1k	2k	4k	8k
L _{Aeq, 30 second} one car passing at approximately 20km/h	86	92	83	83	87	80	75	71	65
L _{Aeq, 30 second} car door slam, ignition and drive away	77	89	81	74	72	71	68	66	60

Table 9.2: Conversational noise, Sound Power Level

Description	Sound Power levels (dB) at Octave Band Centre Frequencies (Hz)								
	dB(A)	63	125	250	500	1k	2k	4k	8k
1 person talking	66	57	57	63	66	59	55	51	46

Table 9.3: Toilet Exhaust Fan, Sound Power Levels, L_{Aeq, 15-minute} dB(A)

Description	Sound Power levels (dB) at Octave Band Centre Frequencies (Hz)								
	dB(A)	63	125	250	500	1k	2k	4k	8k
Toilet Exhaust Fan	70	63	64	70	64	67	63	55	60

Table 9.4: Sound Pressure Level of various activities within the community centre

Description	Sound Pressure Level, SPL dB(A)
Sports (e.g. basketball, vollyball)	75
Group Prayers / Discussions	65
Coaching and Language Sessions	66
Music Performance (with amplification)	85

Table 9.5: Garbage Truck sound power level

Description	Sound Power Level, L _w
Garbage Truck	90

Table 9.6: Delivery Truck, Sound Power Levels, dB

Description	Sound Power levels (dB) at Octave Band Centre Frequencies (Hz)								
	dB(A)	63	125	250	500	1k	2k	4k	
Normal Deliveries	104	111	109	105	99	97	96	95	

2.7.3 Predicted noise levels at the surrounding receivers'

General Operations – 'worst case scenario' of noise emissions

The predicted noise transmission to the surrounding lots are summarised in Tables 10.1 and 10.2 below. The modelled noise levels are assessed under a 'worst case scenario' of noise emissions expected from the site during its intended hours of operation.

In order to predict the noise levels to the nearest residential receivers the following factors have been considered.

- All potential noise sources associated within the site occurring simultaneously, including 150 patron's conversion at the same time within the community centre i.e. ;
 - Noise from health and fitness activities (e.g. basketball, volleyball, dance classes) within the community centre;
 - Noise from activities associated with music rehearsals within the cultural centre;
 - Noise from activities associated with coaching and language teaching sessions;
 - Noise associated with outdoor functions / activities;
 - Patron conversation noise (i.e. 50% of patrons conversing at the same time under maximum capacity of 300 people)
 - Noise associated with the kitchen area operations;
 - Noise from mechanical plant;
 - Noise from vehicles accessing the site.
- The distance between the source and the receivers;
- The presence of acoustic screening from buildings, walls and other structures;
- The ground between the source and receiver, i.e. grass, bitumen etc
- The presence of hard reflective surfaces that may enable additional noise paths.

A 3D model of the proposed community centre and the existing surrounding environment has been created using SoundPLAN. This model has been used to predict of the site to the nearest noise sensitive receivers. Data for the model has been sourced from both public aerial photography (City of Wanneroo - Intramaps), building heights estimated during our onsite inspection and our visual inspection of the area.

The SoundPLAN digital model has been used to calculate noise levels using the International Standard ISO 9613-2: 1996 *Acoustics – Attenuation of sound propagations outdoors – Part 2: General Method of Calculation (ISO 9613)* which is the general environmental calculation method used extensively through Australia. The modelling software also provides multiple sound transmission paths to be accounted for in the calculated noise levels.

Table 10.1 – Assessment of noise levels of the proposed development against the applicable assigned outdoor noise criterion (daytime)

RECEIVER LOCATION	SCENARIO	Calculated noise level predicted to be received under a 'worst case scenario', vehicles entering and exiting the premises, deliveries, 50% of patrons conversing at the same time within the community centre, car ignition/door closure and drive by at 20km/h, indoor sport activities (e.g basketball, volleyball, table tennis), coaching and language sessions, senior dancing sessions, music rehearsal and outdoor activities - all occurring simultaneously (Note: All external doors and windows closed within the Vietnamese Cultural Centre during operations)					Assigned outdoor noise level target L _{A10} SPL dB(A)	Compliance to the applicable assigned outdoor noise criterion
		Time	L _{A10}	Adj. for Intrusive characteristics	Façade adjustment	Assessable Level		
R1	Noise receivers' windows and doors open	Daytime	31	N/A	+2.5	33.5	47	Yes
R2			31			33.5		Yes
R3			34			36.5		Yes
R4			34			36.5		Yes
R5			32			34.5		Yes
R6			32			34.5		Yes
R7			33			35.5		Yes
R8			33			35.5		Yes
R9			40			42.5		Yes
R10			40			42.5		Yes
R11			40			42.5		Yes
R12			38			40.5		Yes
R13			38			40.5		Yes
R14			36			38.5		Yes

Table 10.2 – Assessment of noise levels of the proposed development against the applicable assigned outdoor noise criterion (evening)

RECEIVER LOCATION	SCENARIO	Calculated noise level predicted to be received under a 'worst case scenario', vehicles entering and exiting the premises, deliveries, 50% of patrons conversing at the same time within the community centre, car ignition/door closure and drive by at 20km/h, indoor sport activities (e.g basketball, volleyball, table tennis), coaching and language sessions, music rehearsal and outdoor activities - all occurring simultaneously (Note: All external doors and windows closed within the Vietnamese Cultural Centre during operations)					Assigned outdoor noise level target L _{A10} SPL dB(A)	Compliance to the applicable assigned outdoor noise criterion
		Time	L _{A10}	Adj. for Intrusive characteristics	Façade adjustment	Assessable Level		
R1	Noise receivers' windows and doors open	Evening	31	N/A	+2.5	33.5	42	Yes
R2			31			33.5		Yes
R3			34			36.5		Yes
R4			34			36.5		Yes
R5			32			34.5		Yes
R6			32			34.5		Yes
R7			33			35.5		Yes
R8			33			35.5		Yes
R9			40			42.5		+0.5
R10			40			42.5		+0.5
R11			40			42.5		+0.5
R12			38			40.5		Yes
R13			38			40.5		Yes
R14			36			38.5		Yes

As shown in Table 10.1 and 10.2 above, compliance to the Environmental Protection (Noise) Regulations 1997 can be achieved throughout the entirety of the site's operation, provided the following recommendations within this report are adhered to.

2.7.4 Predicted noise levels at the surrounding receivers'

As shown in Table 10.1 and 10.2 above, the proposed site has been found to be able to achieve compliance to the Environmental Protection (Noise) Regulations 1997 during all hours of operations including the evening period which is considered the most stringent assessment criterion for the proposed cultural centre. Our modelling indicates that with the implementation of the recommendations put forth within this report, noise associated with the community centre would be adequately maintained as to not create unwanted sound at the nearby properties as per the requirements of Environmental Protection (Noise) Regulations 1997.

2.8 Traffic noise from the development affecting the neighbourhood

The proposed site is intending to include a total of 62 parking bays, with all traffic accessing the site via Curtis Way. Based on the distance and acoustic shielding in place at the nearest residential receivers, the traffic noise impact on residential receivers along Curtis Avenue is considered marginal, with no additional noise impact to the current ambient noise levels experienced at the surrounding nearest noise sensitive receivers identified in this report.

2.9 Delivery and service vehicles

Deliveries are expected to occur within the carpark of the Southern side of the proposed development in order to drop off and pick up goods. Given the nature of the development, deliveries are recommended to occur between the hours of 7 am to 7 pm, Monday to Saturday. Furthermore, signage shall be installed at the site to instruct drivers to switch off their vehicles whilst unloading to mitigate engine idling noise. If deliveries are limited to the aforementioned hours, then the following 'Assigned Levels' apply under the Environmental Protection (Noise) Regulations 1997. The L_{A1} Assigned Levels are applicable given that the noise associated with delivery vehicles will be present for less than 10% of the time:

Noise modelling of delivery vehicles was undertaken using the SoundPLAN software. The assessment was based on the delivery truck delivery bay of the facility, with modelling conducted using Sound Power Levels identified in page 11 of this report:

The results of our modelling indicate that the noise transmission to the nearest residential noise sensitive receivers identified within this report, fall within the applicable assigned noise levels and therefore compliance to the Environmental Protection (Noise) Regulations 1997 is achievable during the sites intended operations. As shown in table 10.1 above, noise transmission to the nearest residentially zoned premises was also found to fall within the assigned daytime outdoor noise criterion during the sites intended operations.

2.10 Waste collection vehicles

Regulation 14A of the Environmental Protection (Noise) Regulations 1997 addresses the noise emissions associated with waste collection. Fundamentally, waste collection activities are exempt from complying with the 'Assigned Levels', provided the collection only occurs between the hours of 7 am and 7pm Monday to Saturday.

AS/NZS 2107:2016 'ACOUSTICS - RECOMMENDED DESIGN SOUND LEVELS AND REVERBERATION TIMES FOR BUILDING INTERIORS

Recommended ambient noise levels and reverberation times for internal spaces are given in a number of publications including Table 1 of Australian / New Zealand Standard 2107:2016 "Acoustics - Recommended design sound levels and reverberation times for building interiors". Unlike the previous version of this Standard, this latest edition recommends a range with lower and upper levels (rather than "satisfactory" and "maximum" internal noise levels) for building interiors based on room designation and location of the development relative to external noise sources.

This change has occurred due to the fact that sound levels below 'satisfactory' could be interpreted as desirable, but the opposite may in fact be the case. Levels below those which were listed as 'satisfactory' can lead to inadequate acoustic masking resulting in loss of acoustic isolation and speech privacy. Internal noise levels due to the combined contributions of external noise intrusion and mechanical ventilation plant should not exceed the maximum levels recommended in this Standard. The levels for areas relevant to this development are given in Table 6 below.

Table 11 – Recommended design sound levels and reverberation times

Type of occupancy / activity	Design Sound Level Range	Project Design Noise Level
Reception Area	40 to 45	40
Toilets	<55	50
Open plan teaching spaces	35 to 45	40
Function Areas	40 to 45	45
Indoor sports – Basketball, volleyball, Table Tennis	40 to 50	45
Kitchen	<55	45

ACOUSTIC PERFORMANCE REQUIREMENTS

The following minimum acoustic performance of the proposed Vietnamese cultural centre and 'deemed-to-satisfy' construction examples are as follows:

Table 12 – Minimum acoustic performance requirements

Situation	BCA requirement
Walls	Rw + Ctr 50
Walls separating a wet area from a Habitable room	Rw + Ctr 50 + Discontinuous construction
Walls to public corridors, lobbies and stairs	Rw 50
Walls between ducts and habitable rooms	Rw + Ctr 40
Walls between ducts and wet areas	Rw + Ctr 25

3.1.1 External Walls

In order to achieve the minimum sound reduction of $R_w + C_{tr}$ 50 for external walls, the following 'deemed-to-satisfy' construction examples are provided below.

Options include:

- External cavity brick wall consisting of 90 mm brick masonry + 50 mm gap + 90 mm brick masonry;
- 125mm concrete panel with a row of 64mm steel studs at 600mm centres, spaced 20mm from the concrete panel + 70mm polyester insulation with a density of 9kg/m^3 , positioned between the studs + 1 layer of 13mm plasterboard fixed to the outside face of the studs;
- Minimum 150 mm concrete panel wall (eg AFS 162);
- 200mm thick concrete panel with 13mm plasterboard or 13mm render on each face;
- Dual stud wall consisting of 2 layers of 13 mm fire-rated plasterboard + minimum 64 mm studs with 75 mm glasswool insulation + 20 mm gap + minimum 64 mm studs + 2 layers of 13 mm fire-rated plasterboard (this is a deemed to satisfy construction);
- Dual stud wall consisting of 2 layers of 13 mm fire-rated plasterboard + minimum 64 mm studs with 75 mm glasswool insulation + 20 mm gap + minimum 64 mm studs with 75 mm glasswool insulation + 1 layer of 13 mm fire-rated plasterboard;
- 2 layers of 13 mm fire-rated plasterboard + 92 mm Rondo Quietstuds + 90 mm glasswool insulation + 2 layers of 13 mm fire-rated plasterboard; or
- Any agreed performance solution that achieves a certified minimum $R_w + C_{tr}$ 50

All external walls must go full-height to effectively seal to the underside of the concrete slab or roof sheeting above.

3.1.2 Walls onto the public corridors, lobbies, stairs.

As per Part F5.5(a)(ii), the walls of units onto the public corridors, lobbies, stairs, and parts of a different classification shall achieve a sound reduction of R_w 50.

Options include:

- 2 layers of 13 mm plasterboard + 76 mm stud frame with 75 mm glass-wool insulation + 2 layers of 13 mm plasterboard; and
- 2 layers of 13 mm fire-rated plasterboard + 92 mm studs with 75 mm glass-wool insulation + 1 layer of 13 mm fire-rated plasterboard; and
- Any agreed performance solution that achieves a certified minimum R_w 50.

3.1.3 General detailing of walls

Specification F5.2(2) of the BCA establishes the following detailing requirements:

- Services must not be chased into concrete or masonry elements. Note – This statement does not apply to fully grouted electrical conduits.

- Electrical outlets – Within masonry/concrete walls electrical outlets must be offset by more than 100 mm. In stud framed walls electrical outlets must be offset by at least 300 mm, or a vertical stud must be positioned between the electrical outlets of adjacent rooms.
- Sheeting of stud walls – If one layer of plasterboard is required on each side of the studs, then it must be fastened to the studs with joints staggered on opposite sides. Where two layers of plasterboard are required on one side of a stud then the second layer must be fastened over the first layers so the joints do not coincide with those of the first layer. Joints between sheets and between sheets and adjoining construction must be taped and sealed.
- Steel framed construction – Perimeter framing members must be securely fixed to the adjoining structure, and bedded in resilient compound, or the joints must be caulked so that there are no voids between the framing members and the adjoining structure.
- The glasswool insulation shall have a minimum density of 14 kg/m³ (eg Bradford Acoustigard). If polyester insulation is to be used then it must achieve a minimum Noise Reduction Coefficient (NRC) of 0.9 at 75 mm thickness.

3.2 Recommended glazing requirements of the development

The minimum required sound reduction performance (R_w) of the external glazing for the site is shown in Table 13 below. The stated minimum R_w rating is for the entire glazing suite inclusive of glass and framing. ‘Glass only’ acoustic ratings must not be used when selecting glazing systems. It is common for the sound reduction of a glazing suite to be 2 to 3 points lower than the glass only values due to the framing, quality of seals, etc. It is critical that the contractor only uses glazing suites that have acoustic laboratory test reports to verify the sound reduction (R_w) performance.

Table 13 – Example ‘deemed-to-satisfy’ glazing systems

Type of Glazing	Weighted sound reduction index	Example of external glazing system
Fixed Glazing	R _w (C, C _{tr}) of 36 (-1,-3) Glazing covering up to 60% of floor area	10.38 mm laminated glass or toughened safety glass
Adjustable Louvers	R _w (C, C _{tr}) of 36 (0,-1)	10.38 mm laminated glass with gasket and seals

3.3 Floor construction

The BCA Part F5.4(a) sets out the acoustic requirement for the floors in terms of both air-borne and structure-borne (impact) noise transmission. The requirements are:

- Airborne sound insulation rating R_w + C_{tr} 50; and,
- Impact sound insulation rating L’_{nT,w} not greater than 62 dB(A).

The BCA establishes the following deemed-to-satisfy floor constructions for achieving the above requirements:

- 200 mm solid concrete slab with carpet on underlay;
- Minimum 150 mm concrete slab + 28 mm furring channels on resilient mounts + 65 mm fibrous insulation (density > 8 kg/m³) + 13 mm plasterboard ceiling;
- 19mm thick chipboard / wooden floor sheeting + steel joists at 450mm centres + R2.5 glass wool insulation positioned between the steel joists + 28 mm furring channels on resilient mounts fixed to the underside of joists. Isolation mounts to be made of natural rubber with a dynamic factor of not more than 1.1 and static deflection of not less than 3mm at actual operating load + 2 layers of fire-protective grade plasterboard affixed to furring channels.
- Or any other construction that achieves a certified (airborne) $R_w + C_{tr}$ 50 and (impact – no more than) 62 dB(A).

Specification F5.2 of the BCA does not allow services to be chased into concrete or masonry elements. As such, soil and waste pipes must not be embedded or encased in the concrete slab.

3.4 External Doors

External doors are to achieve a minimum sound reduction of R_w 32. This can be achieved by specifying 50 mm solid core doors with full-perimeter heavy duty acoustic seals (eg Raven Rp 24 and Rp38 seals). Door grilles are not permitted in these doors.

Glazed external doors are to achieve a minimum R_w 32. This can be achieved via 6.38mm toughened safety glass unit including frames, ensuring all external doors must have compressible silicon-based rubber seals to the full perimeter and a drop-down seal to provide an airtight seal when closed.

Table 14 – Example ‘deemed-to-satisfy’ external door system

External Door	Weighted sound reduction index	‘Deemed to satisfy’ construction example
Solid Core	R_w (C, C_{tr}) of 32 (-1,-3)	50mm solid core with full perimeter heavy duty weatherproof seals
Glazed Door System	R_w (C, C_{tr}) of 32 (-1,-3)	10.38mm toughened safety glass unit including frames with weatherproof compressible, silicon-based rubber seals to the full perimeter and a drop-down seal, to ensure an airtight seal is provided when closed

3.5 Ceiling / roof construction

The ceiling and roof system is to achieve a minimum combined sound reduction of R_w 41, with a ‘deemed to satisfy’ construction example shown in Table 15 below.

Table 15 – Example ‘deemed-to-satisfy’ combined ceiling and roof system construction example

Ceiling and Roof System	Weighted sound reduction index	‘Deemed to satisfy’ construction example
Ceiling and Roof System	R_w (C, C_{tr}) of 41 (-1,-3)	<ul style="list-style-type: none"> • 1 layer of 13mm plasterboard, with • R3.0+ insulation within the cavity; and • Sheet metal roof with foil backed R2.0+ insulation between steel sheeting and roof battens

3.6 Plumbing ducts and hydraulic services above ceilings

Part F5.6 of the BCA establishes acoustic requirements this includes ducts, waste pipes, water supply pipes, and rain water pipes.

The acoustic requirements are detailed below:

3.6.1 Duct walls onto habitable rooms ($R_w + C_{tr}$ 40 construction)

Where a common duct (ie plumbing duct) adjoins another habitable room, the duct wall must achieve a minimum sound reduction of $R_w + C_{tr}$ 40. Options include:

- Pipe lagged with Pyrotek Soundlag 4525) + duct wall consisting of minimum 64 mm studs (with 75 mm glass-wool partition batts) + 13 mm plasterboard lining. Please note that the BCA requires a minimum 10 mm clearance between lagged pipes and the studs/plasterboard lining; or,
- Rehau Raupiano Plus piping + duct wall consisting of minimum 64 mm studs (with 75 mm glass-wool partition batts) + 13 mm plasterboard lining.

NOTE – If the plumbing riser is continuous down the building (ie the concrete slab does not close off the riser at each level), then the plasterboard lining of the riser will need to be upgraded to 13 mm fire rated plasterboard in order to maintain $R_w + C_{tr}$ 50 separation.

As per Specification F5.2(2)(e)(iii), a water supply pipe must –

- Only be installed within a cavity of a discontinuous construction; and,
- Not be fixed to the wall leaf and have a clearance not less than 10 mm to the other wall leaf.

Note – the above requirements also apply to the enclosed storm-water pipes.

3.6.2 Duct walls onto wet-areas ($R_w + C_{tr}$ 25 construction)

Duct wall must achieve a minimum sound reduction of $R_w + C_{tr}$ 25. This can be achieved by the same constructions outlined in Section 3.2.1, but without insulation between the studs.

NOTE – If the plumbing riser is continuous down the building (ie the concrete slab does not close of the riser at each level), then the riser wall will need to consist of stud with 75 mm glass-wool insulation lined with 13 mm fire-rated plasterboard, in order to maintain $R_w + C_{tr}$ 50 separation between the vertically stacked apartments.

As per Specification F5.2(2)(e)(iii), a water supply pipe must –

- Only be installed within a cavity of a discontinuous construction; and,
- Not be fixed to the wall leaf and have a clearance not less than 10 mm to the other wall leaf.

Note – the above requirements also apply to the enclosed storm-water pipes.

3.6.3 Services located above ceilings of habitable areas

Where soil and waste pipes are located above the ceilings of a habitable area, the Rw + Ctr 40 requirements must be met. This can be achieved by the following options:

- Wrap the pipe with Pyrotek Soundlag 4525 + install 75 mm glasswool insulation blanket above the ceiling within a minimum 1500 mm zone each side of the pipe; or,
- Use Rehau Raupiano Plus piping + install 75 mm glasswool insulation above the ceiling within a minimum 1500 mm zone each side of the pipe.

3.6.4 Services located above ceilings of wet-areas

Where soil and waste pipes of one unit are located above the ceilings of a wet-area of another habitable room, the Rw + Ctr 25 requirements must be met. Options include:

- Lag the PVC pipes with Bradford Acoustilag 45 or Pyrotek Soundlag 4525; or,
- Use Rehau Raupiano Plus piping; or,
- Unlagged PVC pipe + 13 mm plasterboard ceiling with 75 mm glass-wool insulation over (ceiling insulation within a 1500 mm zone either side of the pipe)

3.7 Bathroom exhausts

From an acoustics point of view, the best approach is to have individual in-line exhaust fans, ducted to an external louvre/grille. It is critical that the ductwork does not compromise the sound reduction requirement of Rw + Ctr 50.

NOISE CONTROL RECOMMENDATIONS

To ensure compliance to the Environmental Protection (Noise) Regulations 1997, the following noise control recommendations are given.

NOISE MANAGEMENT PLAN

One of the most effective measures that should be implemented in conjunction with the physical noise control measures recommended within this report is the Noise Management Plan (NMP). The NMP should be incorporated within the Vietnamese Cultural Centre overall management plan with respect to functions such as weddings etc.

- All external doors and windows are to be closed during functions;
- All external doors and windows are to be closed during music rehearsals;
- Not permitting more than the acceptable maximum number of patrons to be present on the premises at any given time;
- If live or pre-recorded music is to be played outside during a function, it is to be limited to 85dB(A) at 1m from the source during the daytime and 80dB(A) during the evenings;
 - In order to practically achieve the noise levels identified above, it is recommended to install a noise limiter within the PA system audio signal chain. Noise limiters are digital electronic devices commonly fitted with a microphone that monitor and attenuate the sound pressure level emitted from the PA system, adjusting to a predetermined loudness. In practice, sound / noise limiters are commonly connected between the mixer outputs and the Poweramp inputs;
 - Speakers in an outdoor function (if utilised) are to be positioned on the western side of the proposed cultural centre as close to building as feasible and are to be pointing towards the Girrawheen Senior High School Oval in a West South Westerly direction, away from the surrounding noise sensitive receivers identified within this report.
 - Periodic noise monitoring by staff during these times is recommended at the boundary of the nearest receiver(s) at the measurement locations as shown in Figure 1 of this report, to ensure music levels comply with the regulations assigned outdoor noise levels.
- Background music is to be at low levels for ambience and to not promote the raising of voices;
- Loud or 'boisterous' patrons are to be attended to and asked to be mindful of the surrounding residential premises;
- Maintain a compliant register and train staff in the use of handling complaints;
- Staff closing procedures are to be designed in order to minimize the risk of noise disturbance being caused to the surrounding noise sensitive receivers;
- To prevent disturbance of amenity in the area, deliveries are to occur between 7am and 7pm Monday to Saturday only;
- Incorporate a zero-tolerance policy for rowdy and aggressive behaviour;
- A complaints file is to be available to all staff to record any complaints received in person or by any other means. This insures complaints can be addressed at the time and ensures the applicant can review any complaints over time to identify problems and address issues; and

- After a function, glass should only be emptied into the outside bins during the hours of 7am to 7pm (9am to 7pm Sunday and Public Holidays);

NOISE CONTROL DURING FUNCTIONS

In order to minimise antisocial behaviour including excessive noise, the following is proposed:

- Create and maintain a high-quality premise in all respects, both physically and operationally as studies conducted have indicated that poorly lit, badly maintained premises have a greater likelihood of violence, trouble and antisocial behaviour;
- Provide more than ample seating for patrons;
- Create a warm, relaxed and inviting atmosphere to minimise the risk of antisocial behaviour.

SERVICE OF ALCOHOL DURING FUNCTIONS

If the service of alcohol occurs during a function such as a wedding the following noise control measures are recommended.

- Adhere to RSA principles with the aim of reducing the likelihood of patrons causing noise and participating in other antisocial activities;

RSA PRINCIPLES

**Recognize and refuse liquor services to intoxicated patrons.
Drunk or disorderly patrons are not allowed on the premises.
Do not supply alcohol to anyone under 18.**

Discourage patrons to take part in activities that may cause harm to themselves or others.

STAFF TRAINING

In addition to the 'Provide Responsible Service of Alcohol' requirements, all staff members are to be trained using an in-house Policy and Procedure manual that sources units of competency from relevant training packages. For example:

- Manage conflict;
- Interact with customers;
- Manage incidents;
- Managing unacceptable behaviour; and
- Monitor individual and/or crowd behaviour.

Staff members are also to be trained in the areas of:

- Risk identification;
- Risk control procedures;
- Warning signs;
- Appropriate responses;
- Interpersonal/diffusing aggression skills;
- Recognizing signs of potential trouble; and
- How to deal with bad behaviour.

CONCLUSION

The objective of this assessment was to establish noise levels attributable to proposed Vietnamese cultural centre development, particularly patron conversational noise, sports and fitness related noise, music rehearsals, mechanical plant, vehicle access and all other noise sources identified which are associated with the operations of the proposed site under a 'worst case scenario'. For this assessment, the L_{A10} day-time noise criteria has been used for the purpose of this study, as it represents the most practical criterion due to the manner of operations intended at the site.

Based on our calculations, noise levels expected under a 'worst case scenario' have been predicted to fall within the assigned outdoor noise criterion at during its intended hours of operation. We also note that the mechanical plant can achieve compliance to the most stringent assessment criterion L_{A10} 42dB(A) for residential receivers and, provided the recommendations put forth within this report are fulfilled. With the implementations of the recommendations put forth in this acoustic report, we believe that the operations of the proposed Vietnamese cultural centre can achieve compliance with the Environmental Protection (Noise) Regulations 1997 during it's intended operational hours.

I trust the above meets your requirements on the matter. Should you have any queries do not hesitate to contact our office.

Regards,



Ian Burman

(A.A.A.S)

Noise Officer: 14009

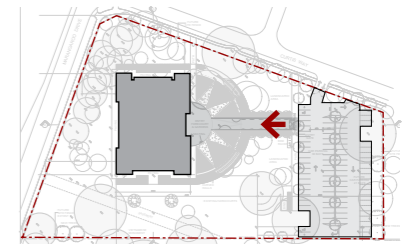
ACOUSTICS & AUDIO PRODUCTION

APPENDIX A: GLOSSARY OF TERMS

SPL or L_p	<u>Sound Pressure Level</u> A logarithmic ratio of sound pressure measured at a distance, relative to the threshold of hearing (20 μ Pa RMS) and expressed in decibels.
SWL or L_w	<u>Sound Power Level</u> A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
dB	<u>Decibel</u> The unit of sound level Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r = 20 \mu\text{Pa}$ i.e. $\text{dB} = 20 \times \log (P/P_r)$.
dB(A)	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely represent the frequency bias of the human ear.
A-weighting	The process by which noise levels are corrected to adjust for the non-linear frequency response of the human ear.
$L_{Aeq}(t)$	The equivalent continuous (time-averaged) A-weighted sound level. This is often referred to the averaged noise level. The suffix "t" represents the measurement time period; e.g. an (8h) represents a measurement period for 8 hours, (15min) represents a measurement period of 15 minutes and (2200 to 0700) represents a measurement period between 10pm and 7am.
$L_{A90}(t)$	The A-weighted noise level equalled or exceeded for 90% of the total measurement period. This is often referred to as the background noise level. The suffix "t" represents the measurement time period.
L_{Amax}	The A-weighted maximum noise level. The highest noise level that occurred during the measurement period.

APPENDIX B: SITE PLANS

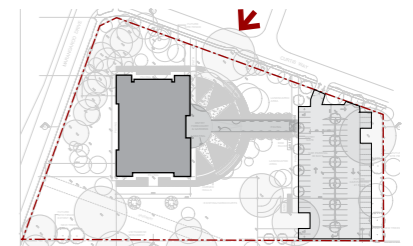
South View



key plan



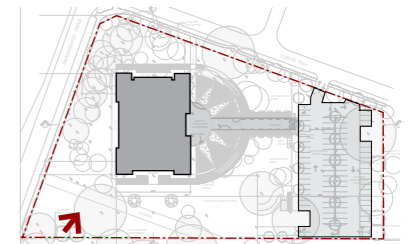
South East View



key plan

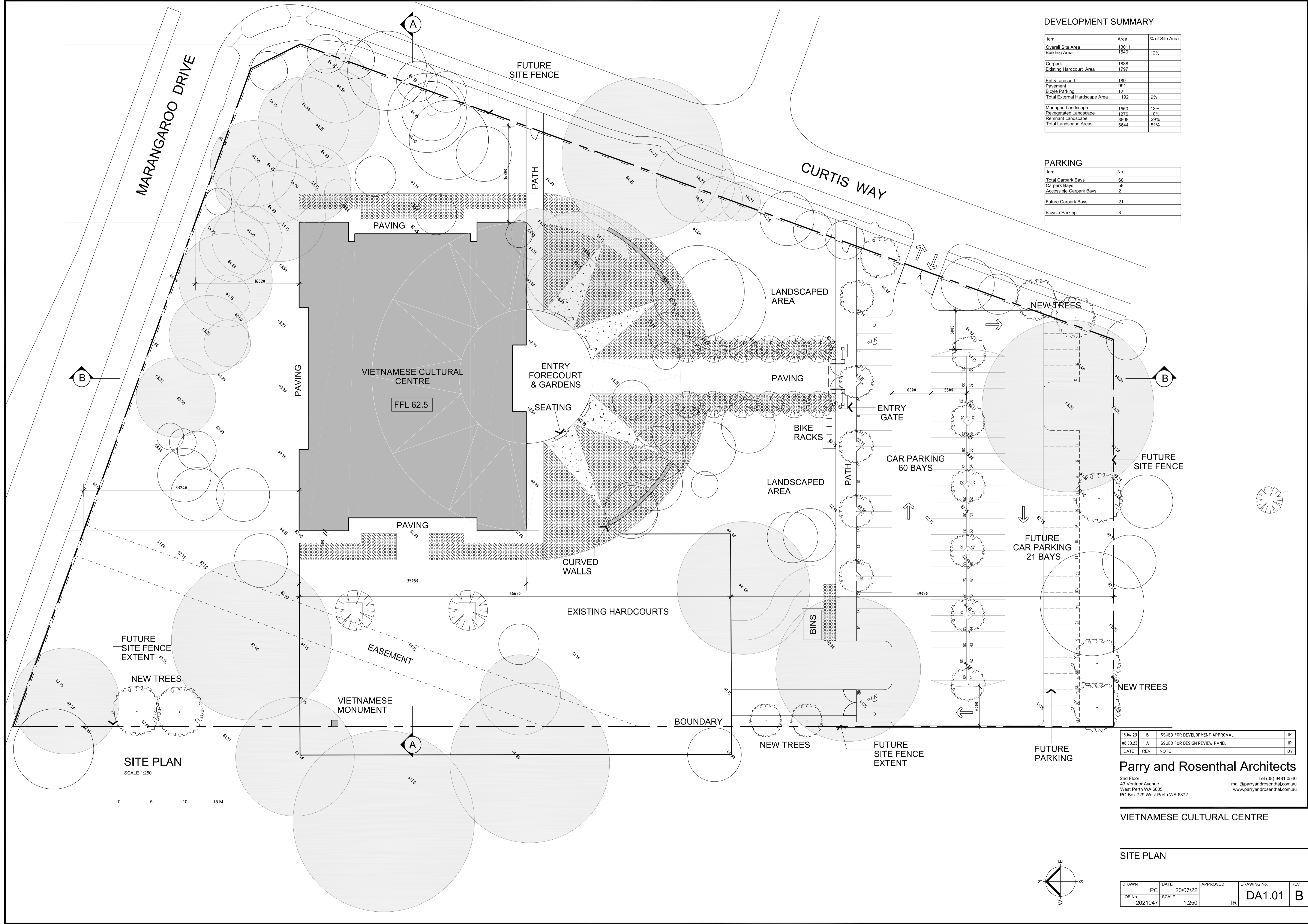


North West View



key plan





DEVELOPMENT SUMMARY

Item	Area	% of Site Area
Overall Site Area	13011	
Building Area	1540	12%
Carpark	1838	
Existing Hardcourt Area	1797	
Entry forecourt	189	
Pavement	991	
Bicycle Parking	12	
Total External Hardscape Area	1192	9%
Managed Landscape	1560	12%
Revegetated Landscape	1276	10%
Remnant Landscape	3808	29%
Total Landscape Areas	6644	51%

PARKING

Item	No.
Total Carpark Bays	60
Carpark Bays	58
Accessible Carpark Bays	2
Future Carpark Bays	21
Bicycle Parking	8

SITE PLAN
SCALE 1:250

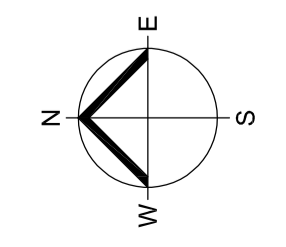
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08.03.23	A	ISSUED FOR DESIGN REVIEW PANEL	IR
DATE	REV	NOTE	BY

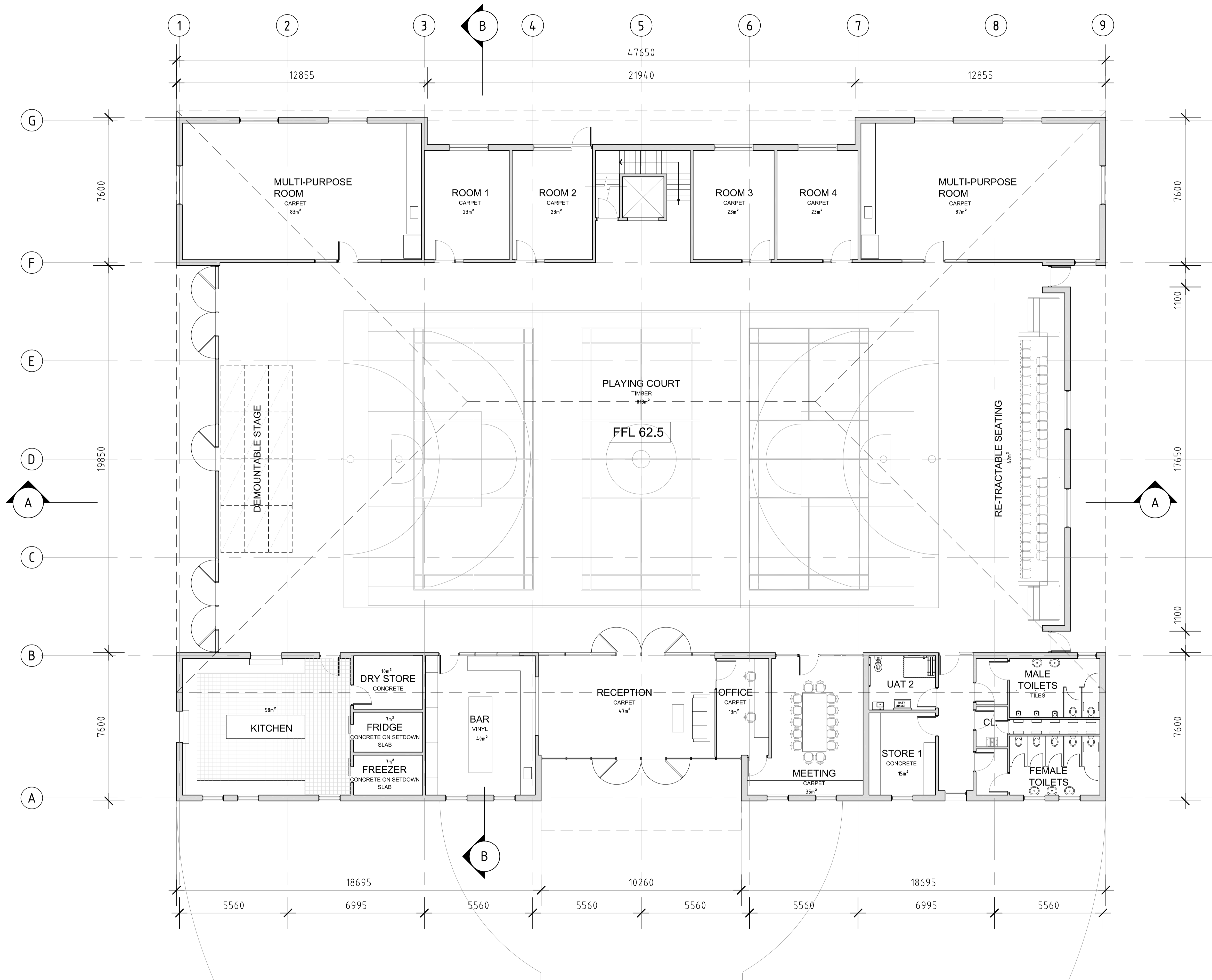
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VIETNAMESE CULTURAL CENTRE

SITE PLAN

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2021047	1:250			





FLOOR PLAN
SCALE 1:100

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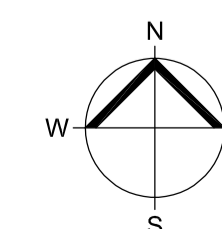
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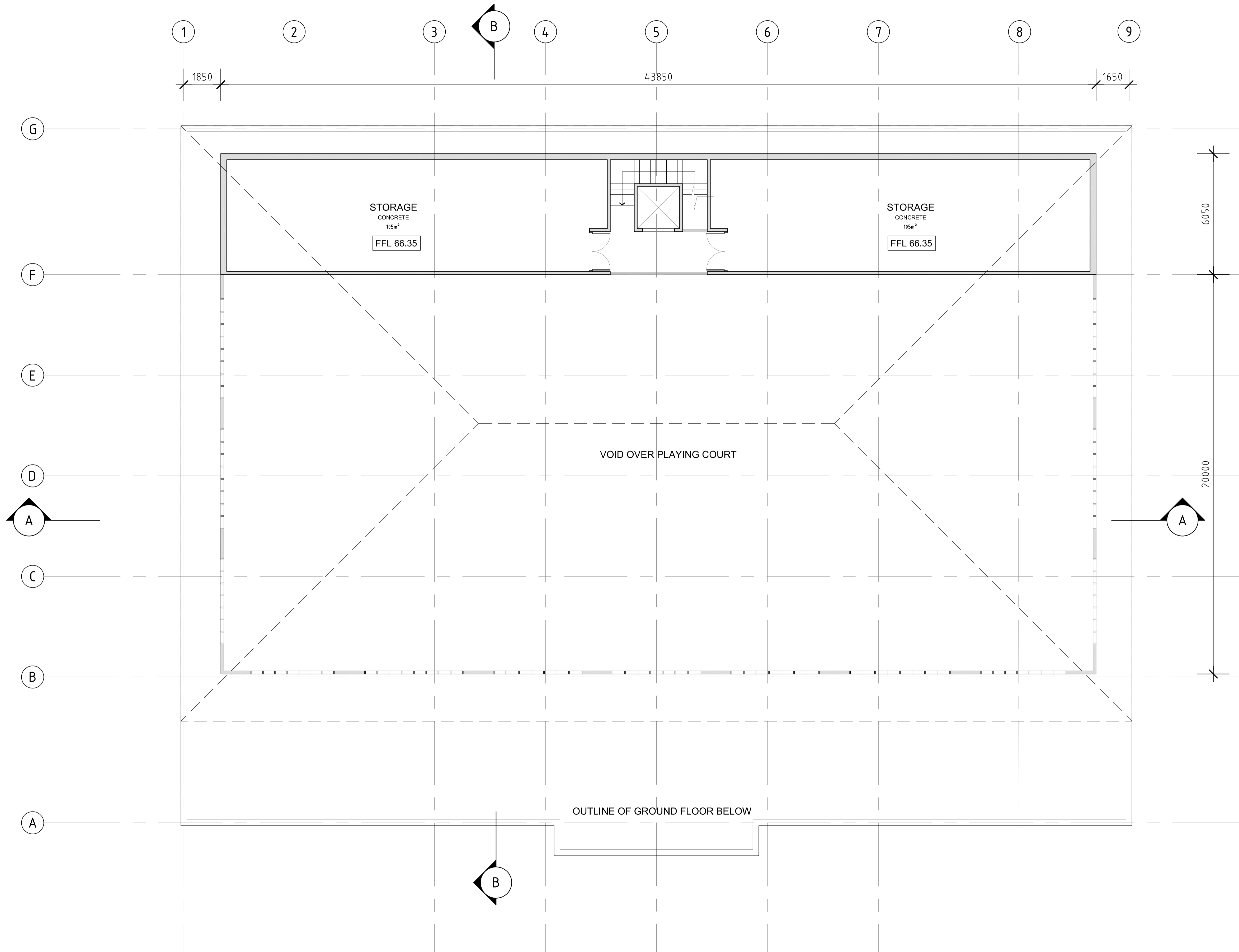
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FLOOR PLAN



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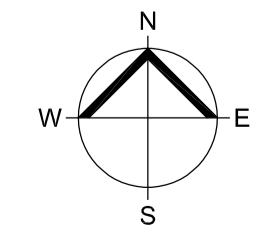
UPPER FLOOR PLAN
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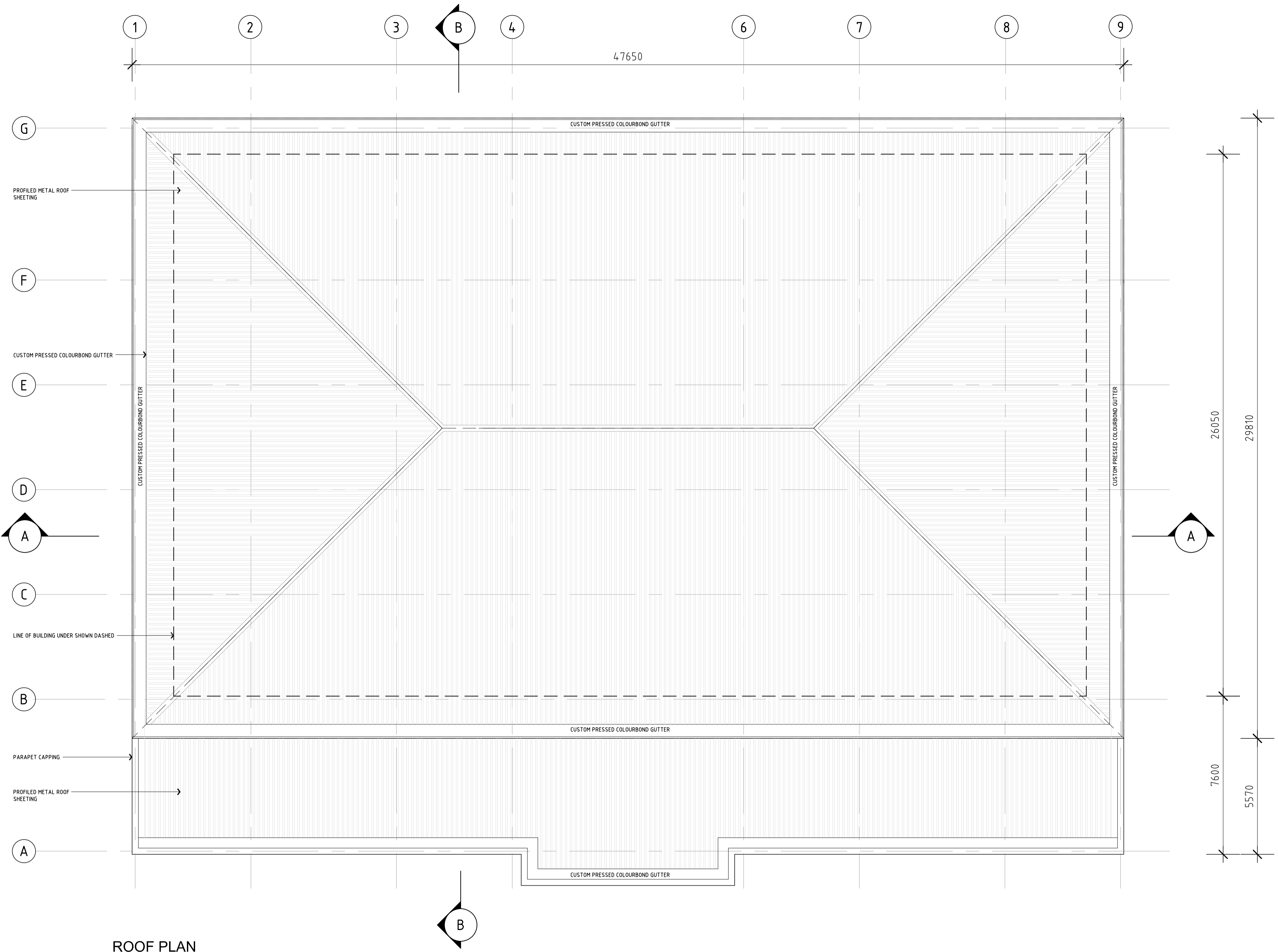
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UPPER FLOOR PLAN



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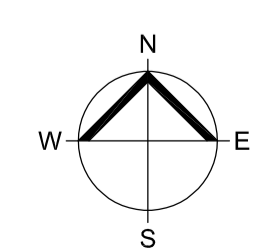


ROOF PLAN
SCALE 1:100

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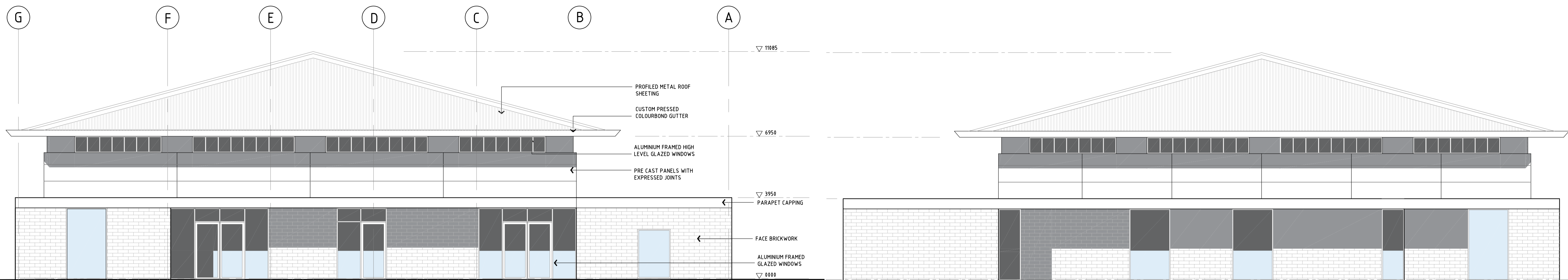
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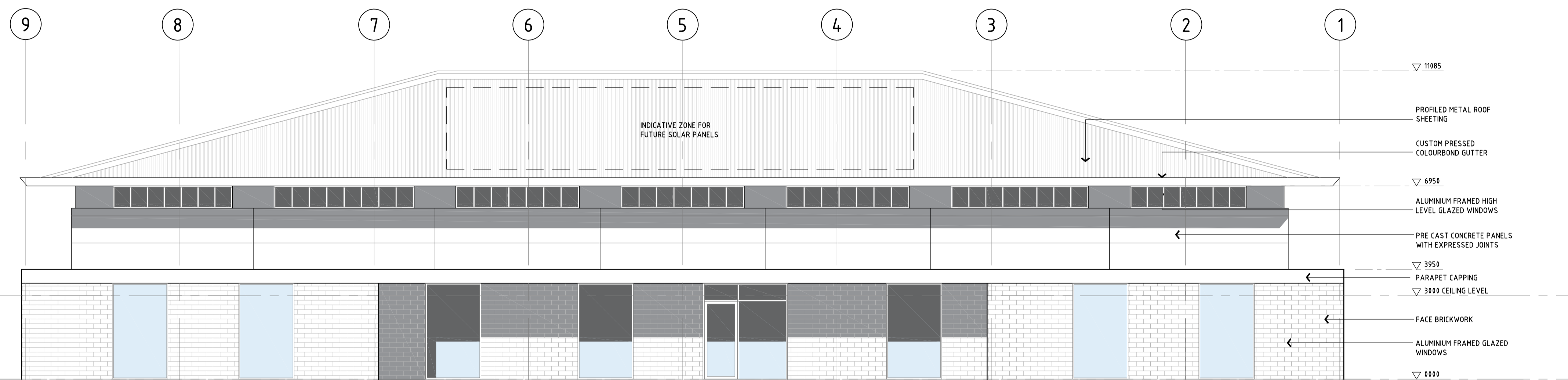
ROOF PLAN

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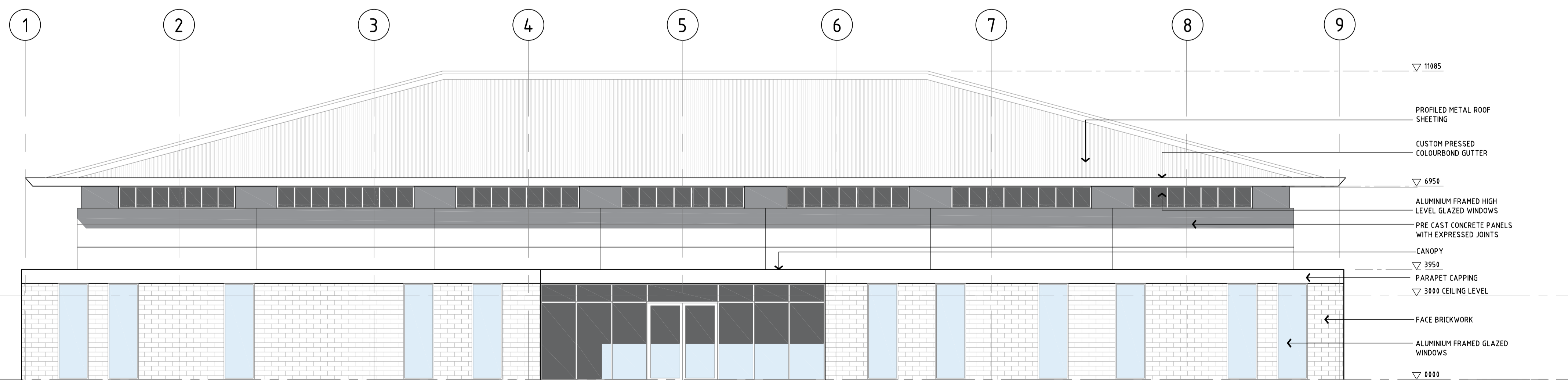


WEST ELEVATION
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EAST ELEVATION
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NORTH ELEVATION
SCALE: 1:100



SOUTH ELEVATION
SCALE: 1:100

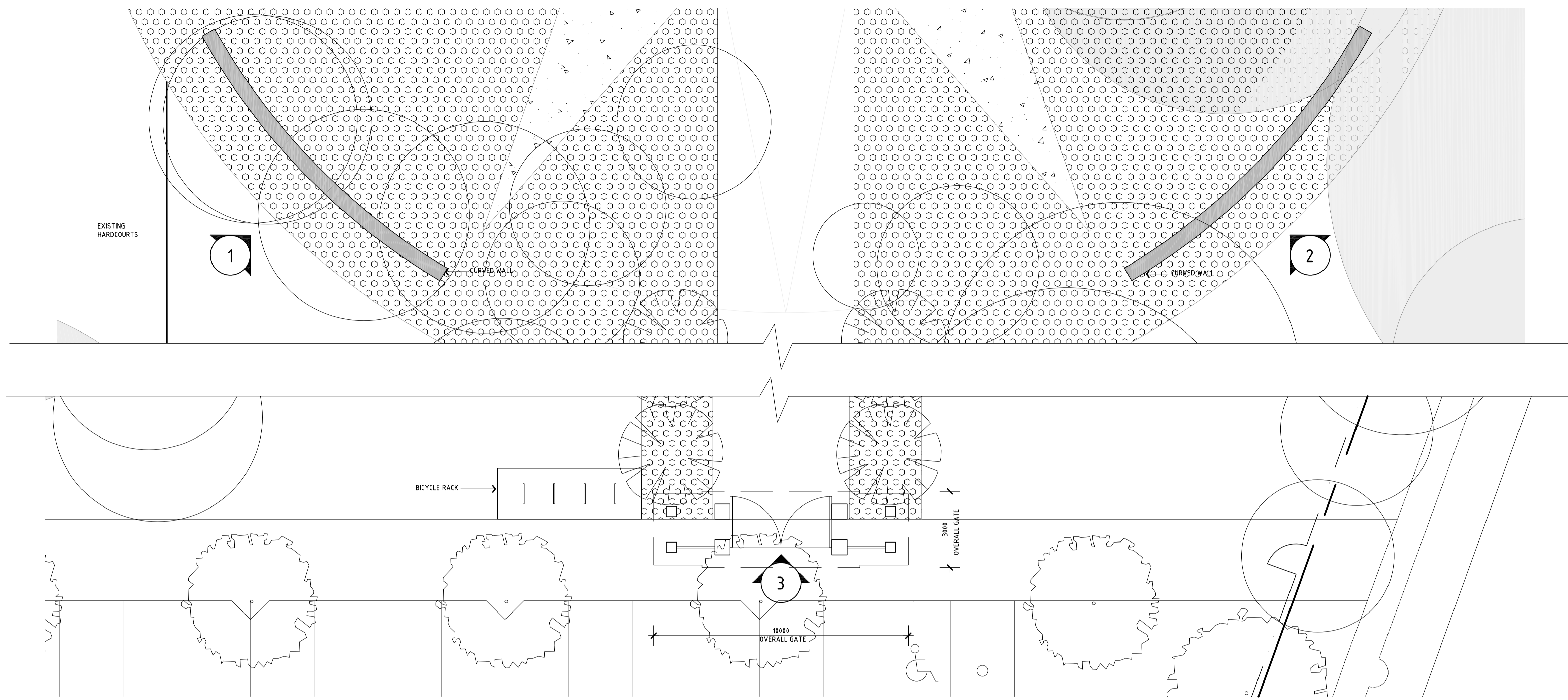
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ELEVATIONS

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PART- PLAN
SCALE: 1:100

ELEVATION 1 - CURVED WALL
SCALE: 1:100

ELEVATION 2 - CURVED WALL
SCALE: 1:100

ELEVATION 3 - GATE
SCALE: 1:100

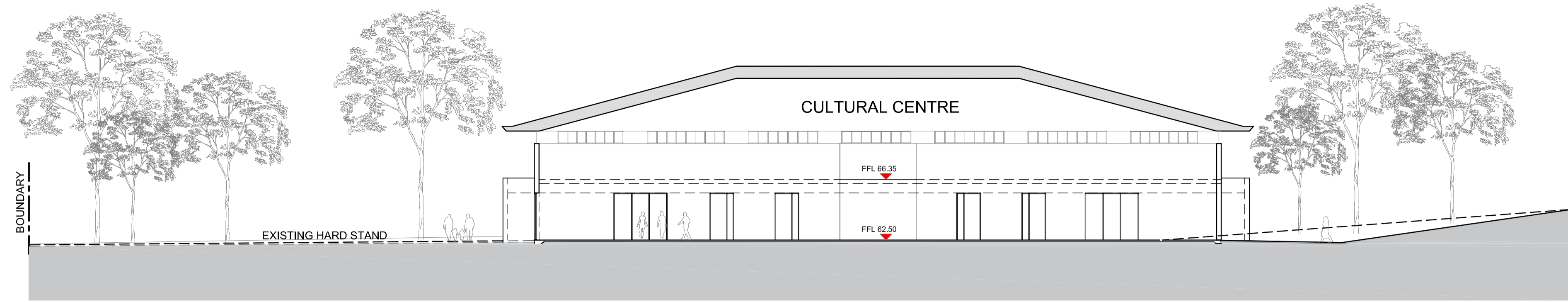
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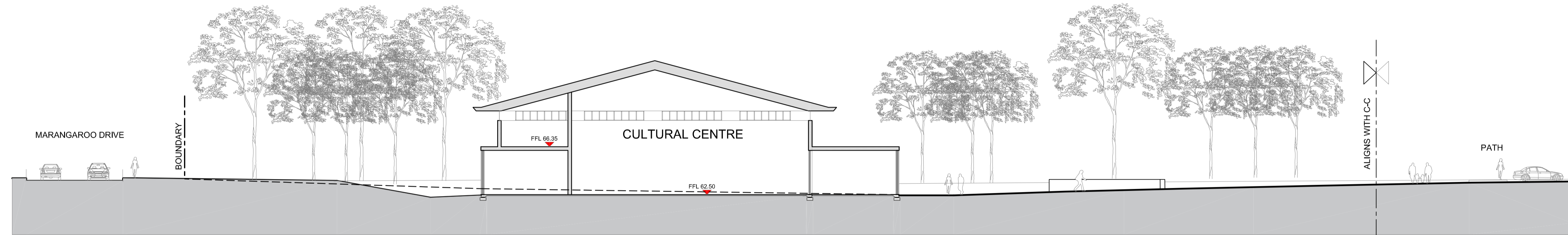
ELEVATIONS - CURVED WALLS

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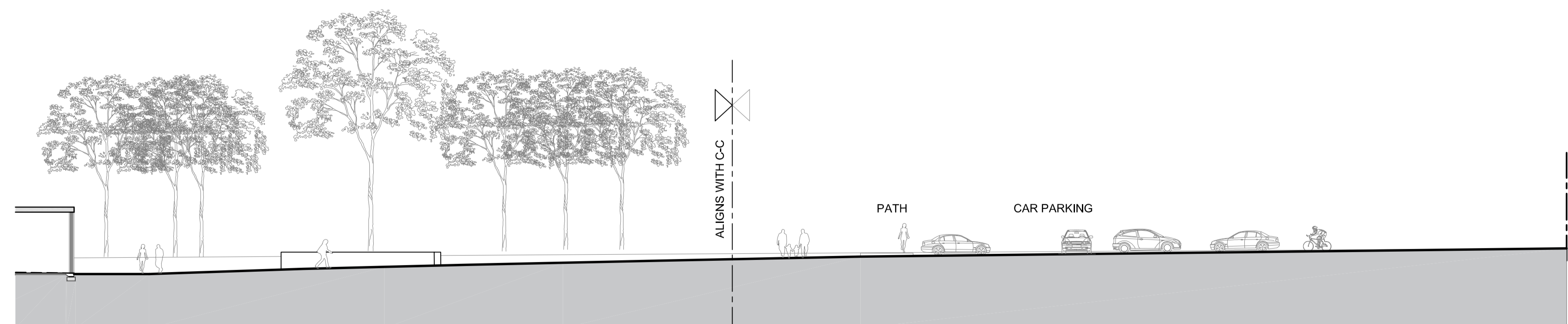
SITE SECTION A-A LOOKING NORTH

SCALE 1:200



SITE SECTION B-B LOOKING WEST

SCALE 1:200



SITE SECTION B-B LOOKING WEST

SCALE 1:200

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VIETNAMESE CULTURAL CENTRE

SITE SECTIONS

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