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Environmental Noise Assessment

Proposed Redevelopment
Castle Cove Golf Club
76 Deepwater Road, Castle Cove, NSW

REPORT No
7817-1.1R

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Prepared For:
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Attention: Mr Maureece Xuereb

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1.0 EXECUTIVE SUMMARY

Castle Cove Country Club at 68-74 Deepwater Road, Castle Cove, NSW, is proposing to redevelop a portion of their site to include a new clubhouse and independent living units constructed at the eastern end of the site. Willoughby City Council requires an acoustic report be prepared that assesses the environmental noise impact of the redevelopment on the surrounding area.

The Castle Cove Country Club currently operates from 6.30 am to 6.00 pm Monday to Sunday.

The Castle Cove Country Club is located within *R2 – Low Density Residential,* under the *Willoughby Local Environmental Plan 2012 (LEP).* The nearest potentially affected residences are located to the east along the eastern boundary at 76 Deepwater Road. To the north, east and south are residential buildings and to the west is the golf course of the Castle Cove Golf Club.

A total of fourteen (17) independent living units (ILU) are proposed on the upper elevated portion of the site across four levels and a basement car park that is accessible by the Deepwater Road access ramp. The new golf club house is proposed to be on the lower elevated portion of the site. It is proposed to have an on grade ground level carpark with access to Deepwater Road. The single upper level will serve as the new clubhouse and will include as follows:

- Function/dining space;
- Kitchen;
- Bathroom;
- Amenities;
- Pro shop;
- Buggy store;
- Workshop.

Acceptable noise limits are derived from the EPA's Noise Policy for Industry for intrusive noise impacts and sleep disturbance, between 10 pm and midnight, at each residential receptor.

Noise levels from the Castle Cove Country Club have been calculated at the nearest residential and commercial premises and comply with EPA's Noise Policy for Industry.

Recommendations are made in Section 6 of this report to reduce the noise emission from Castle Cove Country Club to within acceptable limits. These include limiting the level of noise from amplified music and orientating speakers toward the south west.

2.0 CONSULTING BRIEF

Day Design Pty Ltd has been engaged by Taylor Development Group to assess the environmental noise impact of proposed new Club house and residential building development located at 68-74 Deepwater Road, Castle Cove, NSW. This commission involves the following:

Scope of Work:

- Inspect the site and environs
- Measure the background noise levels at critical locations and times
- Establish acceptable noise level criterion
- Quantify noise emissions from the proposed redevelopment
- Calculate the level of noise emission, taking into account building envelope transmission loss, screen walls, and distance attenuation
- Prepare a site plan identifying the development and nearby noise sensitive locations
- Provide recommendations for noise control (if necessary)
- Prepare an Environmental Noise Assessment Report.

3.0 PROJECT DESCRIPTION

3.1 Site Description

Castle Cove Country Club at 68-74 Deepwater Road, Castle Cove, NSW is proposing to redevelop a portion of their site, including a new clubhouse and independent living units to be constructed at the eastern end of the site. Willoughby City Council requires an acoustic report be prepared that assesses the environmental noise impact of the redevelopment on the surrounding area.

Castle Cove Country Club is located within *R2 – Low Density Residential,* under the *Willoughby Local Environmental Plan 2012 (LEP).* The nearest potentially affected residences are located to the east the eastern boundary at 76 Deepwater Road. To the north, east and south are residential buildings and to the west is the Castle Cove Golf Club.

The nearest noise sensitive receptors to the property, in various directions, are shown in Figure 1 and as follows in Table 1.

Table 1 Noise Sensitive Receptors

Receptor and Type	Address	Direction from site
R1 – Residence	15 Amaroo Avenue	North east
R2 – Residence	12 Amaroo Avenue	South east
R3 – Residence	76 Deepwater Road	South
R4 – Residence	113 Deepwater Road	South West

3.2 Development Description

Castle Cove Country Club currently operates from 6.30 am to 6.00 pm Monday to Sunday.

Independent living units (ILU's) and a new club house are proposed across two buildings in a proposed lot subdivision of the existing site. 17 ILU's are proposed on the upper elevated portion of the site across four levels and a basement car park that is accessible by the Deepwater road ramp. The new golf club house is proposed to be on the lower elevated portion of the site. It is proposed to have an on grade ground level carpark with access to Deepwater road. The single upper level will serve as the new club and will include as follows:

- Function/dining space;
- Kitchen;
- Bathroom;
- Amenities;
- Pro shop;
- Buggy store;
- Workshop.

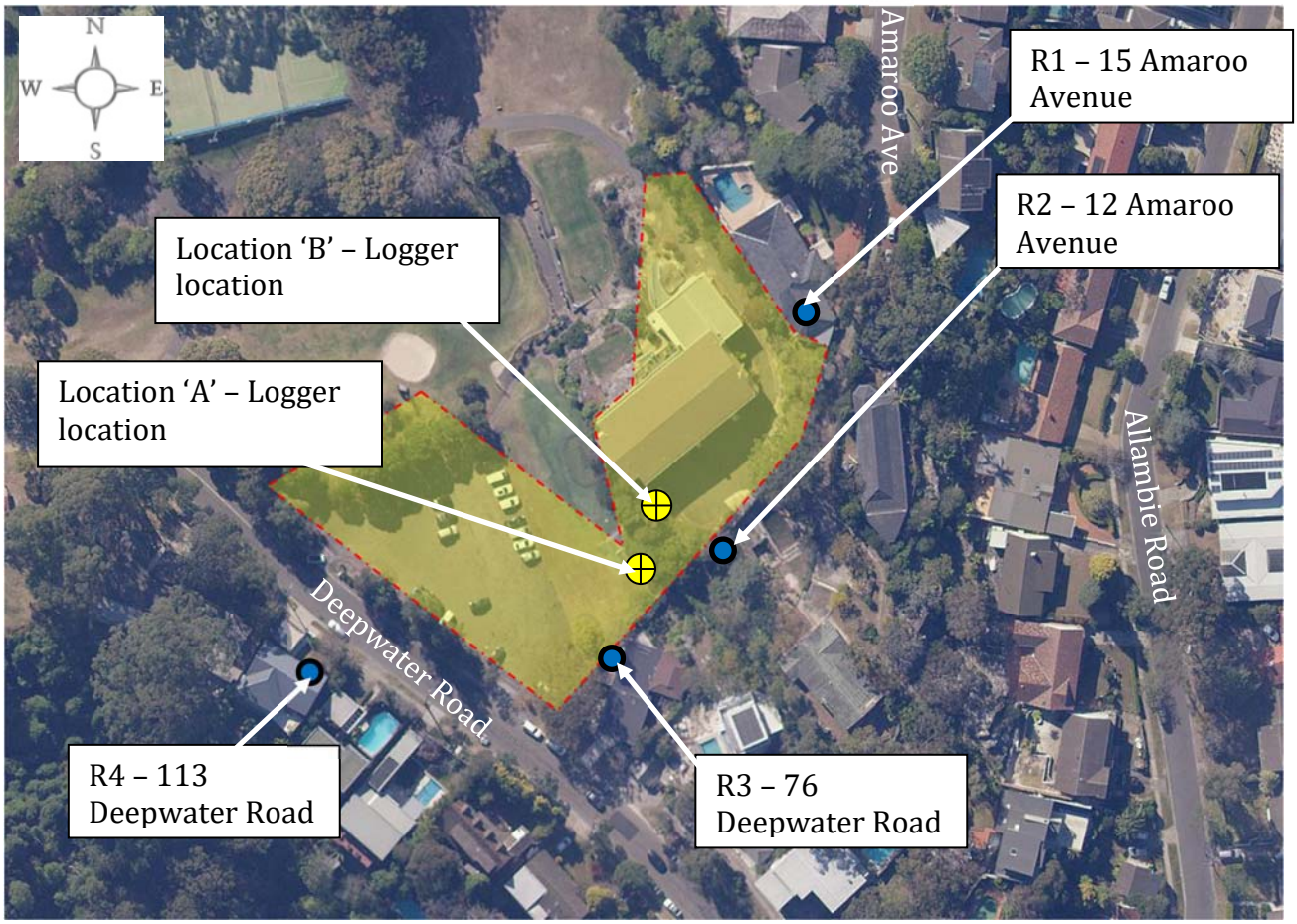


Figure 1 - Location Plan, 68-74 Deepwater Road, Castle Cove

4.0 NOISE CRITERIA

4.1 Background Noise Level

In order to assess the severity of a possible environmental noise problem in a residential area it is necessary to measure the ambient background noise level at the times and locations of worst possible annoyance. The lower the background noise level, the more perceptible the intrusive noise becomes and the more potentially annoying.

The ambient L_{90} background noise level is a statistical measure of the sound pressure level that is exceeded for 90% of the measuring period (typically 15 minutes).

The Rating Background Level (RBL) is defined by the NSW EPA as the median value of the (lower) tenth percentile of L_{90} ambient background noise levels for the day, evening or night time periods, measured over a number of days during the proposed days and times of operation.

The places of worst possible annoyance are the two-storey residential units located to the south of Castle Cove Country Club. These potentially affected locations can be seen in Figure 1 above. The times of greatest annoyance will be during the early night when the Castle Cove Country Club is operating.

Two environmental noise logger was placed on the site, with one near the practice nets which are near the golf course carpark and a second near the adjoining future residential development to the north to determine the Rating Background Level. These locations are shown on Figure 1 as Location 'A' and 'B' respectively.

The measured noise levels are presented in the attached Appendix B and also in Table 2.

Table 2 Ambient Noise Levels – 68-74 Deepwater Road, Castle Cove

Location	Time Period	L_{90} Rating Background Level	Existing L_{eq} Noise Level
Location 'A' – [74 Deepwater Road] – Lower Level (Near Deepwater Road)	Early Morning (6 am to 7 am)	**45 dBA**	**49 dBA**
	Day (7 am to 6 pm)	**45 dBA**	**60 dBA**
	Evening (6 pm to 10 pm)	**41 dBA**	**48 dBA**
	Early Night (10 pm to 12 am)	**34 dBA**	**45 dBA**
	Night (10 pm to 7 am)	**32 dBA**	**44 dBA**
Location 'B' – [74 Deepwater Road] – Upper Level (Near Amaroo Avenue)	Early Morning (6 am to 7 am)	**46 dBA**	**49 dBA**
	Day (7 am to 6 pm)	**47 dBA**	**56 dBA**
	Evening (6 pm to 10 pm)	**43 dBA**	**49 dBA**
	Early Night (10 pm to 12 am)	**36 dBA**	**46 dBA**
	Night (10 pm to 7 am)	**34 dBA**	**46 dBA**

Background noise levels were also measured in octave bands during the night at the logger location. The measured data is shown in Table 3.

Table 3 Short-term L_{90} Background Noise Levels – Castle Cove

Description	dBA	Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Background noise spectrum 5 – 5.15 pm	**46**	52	53	46	44	42	44	38	29	18
Background noise spectrum 9 – 9.15 pm	**42**	48	48	40	39	37	40	32	24	16
Background noise spectrum 11 – 11.15 pm	**35**	43	44	37	34	32	32	25	20	15

Meteorological conditions during the testing typically consisted of cloudy skies with some rain and a temperature of 7 to 22°C. Atmospheric conditions were ideal for noise monitoring. Noise measurements were therefore considered reliable and typical for the receptor area. Rain affected data has been removed from the assessment period.

4.2 Willoughby City Council DCP

Willoughby City Council in its Development Control Plan (DCP), 2006, Section E.1.8, 'Acoustic Privacy', state:

> **Acoustic Privacy**
>
> *Intent*
>
> To ensure the provision of maximum acoustic privacy, both within the development itself and between the development and adjoining properties.
>
> *Performance Criteria*
>
> 1. Development is to be designed and constructed for effective sound insulation against road and rail traffic noise and the need for reasonable acoustic privacy for occupants of the development and neighbouring properties.
> 2. The use of noise resistant construction techniques may be used to reduce the infiltration of noise into buildings. These may include:
>   - The mass and materials, including insulation, selected for the walls and roof;
>   - The use of thicker or double glazing to windows;
>   - Limitations of the proportion of openings to solid walls; and
>   - The insulation of cracks and gaps in the façade facing the noise source.
> 3. Mechanical plant and equipment should be designed and located to minimise noise nuisance, particularly in business zones where retail and commercial uses may impact on residential development. See also E1.11.
> 4. Council may require a noise assessment report to be submitted by a qualified acoustic consultant to identify noise mitigation measures.

4.3 NSW Noise Policy for Industry

The NSW Environment Protection Authority (EPA) published the NSW Noise Policy for Industry (NPI). The policy is specifically aimed at assessing noise from industrial noise sources scheduled under the Protection of the Environment Operations Act 1997. Local government may find the policy helpful in the carrying out of its land use planning responsibilities. (INP Section 1.3)

The objective of the policy is to establish noise criteria that will protect the community from excessive intrusive noise and to preserve amenity for particular land uses.

4.3.1 Controlling Intrusive Noise Impacts

The EPA in Section 2.1 of its NSW Noise Policy for Industry states that: *"The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor) measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB.'*

Where the noise source contains characteristics such as prominent tonal components, impulsiveness, intermittency, irregularity or dominant low-frequency content adjustments to the measured level are applied to allow for the increase in the annoyance value.

The RBLs at Logger Location 'A' are shown in Table 2. The acceptable L_{eq} noise intrusiveness criteria for each area are as shown in Table 4.

Table 4 Project Intrusiveness Level

Location	Time Period	L_{90} Rating Background Level (dBA)	Project L_{eq} Intrusiveness Criteria (dBA)
Nearby Residential Receptors Near Deepwater Road	Early Morning (6 am to 7 am)	45	(45 + 5 =) **50**
	Day (7 am to 6 pm)	45	(45 + 5 =) **50**
	Evening (6 pm to 10 pm)	41	(41 + 5 =) **46**
	Early Night (10 pm to 12 am)	34	(34 + 5 =) **39**
	Night (10 pm to 7 am)	32	(32 + 5 =) **37**
Nearby Residential Receptors Near Amaroo Avenue	Early Morning (6 am to 7 am)	46	(46 + 5 =) **51**
	Day (7 am to 6 pm)	47	(47 + 5 =) **52**
	Evening (6 pm to 10 pm)	43	(43 + 5 =) **48**
	Early Night (10 pm to 12 am)	36	(36 + 5 =) **41**
	Night (10 pm to 7 am)	34	(34 + 5 =) **39**

4.3.2 Protecting Noise Amenity

Depending on the type of area in which the noise is being made, there is a certain reasonable expectancy for noise amenity. The NSW *NPI* provides a schedule of recommended L_{eq} industrial noise levels that under normal circumstances should not be exceeded. If successive developments occur near a residential area, each one allowing a criterion of background noise level plus 5 dB, the ambient noise level will gradually creep higher.

The recommended L_{eq} noise levels below in Table 5 are taken from Section 2.4, Table 2.2 of the *NPI*.

Table 5 Amenity Criteria

Receiver	Noise Amenity Area	Time of Day	Recommended L_{eq}, dBA Amenity Noise Level
Residential	Suburban	Day	55
		Evening	45
		Night	40

The project specific amenity noise level is determined by subtracting 5 dB from the recommended amenity noise level.

The L_{Aeq} is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, the *NPI* assumes that the **$L_{Aeq,15min}$** will be taken to be equal to the **$L_{Aeq,\ period}$ + 3 decibels (dB)**.

The NPI states "*The level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the LAeq noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the LAeq, period(traffic) minus 15 dB(A).*"

The existing L_{eq} noise levels at Location 'A' are shown in Table 2, with the dominant acoustic environment being road traffic noise from Deepwater Road and Eastern Valley Way in the distance.

The acceptable L_{eq} amenity criteria for the residential receptors in this area are as shown in Table 6.

Table 6 Project Amenity Level

Location	Time Period	Existing L_{eq} Noise Level (dBA)	Project L_{eq} Amenity Criteria (dBA)
Nearby Residential Receptors Near Deepwater Road	Day (7 am to 6 pm)	60	(55 – 5 + 3 =) **53**
	Evening (6 pm to 10 pm)	48	(45 – 5 + 3 =) **43**
	Early Night (10 pm to 12 am)	45	(40 – 5 + 3 =) **38**
	Night (10 pm to 7 am)	44	(40 – 5 + 3 =) **38**
Nearby Residential Receptors Near Amaroo Avenue	Day (7 am to 6 pm)	56	(55 – 5 + 3 =) **53**
	Evening (6 pm to 10 pm)	49	(45 – 5 + 3 =) **43**
	Early Night (10 pm to 12 am)	46	(40 – 5 + 3 =) **38**
	Night (10 pm to 7 am)	46	(40 – 5 + 3 =) **38**

4.4 Modifying Factors

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Correction factors are to be applied to the noise from the source measured or predicted at the receiver before comparison with the criteria. AC500-10, in the Appendices is extracted from Table C of the NPI.

4.5 Liquor and Gaming NSW

Liquor and Gaming NSW typically requires the following in relation to noise emission from music and patrons inside licensed premises:

> *"The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8 kHz inclusive) by more than 5 dB between 07:00 am and 12:00 midnight at the boundary of any affected residence.*
>
> *The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8 kHz inclusive) between 12:00 midnight and 07:00 am at the boundary of any affected residence.*
>
> *Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00 am".*

4.6 Sleep Disturbance Criteria

The EPA's *Noise Policy for Industry* states in Section 2.5 that the potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Sleep may be disturbed if the subject development night-time noise levels at a residential location exceed the following:

- $L_{Aeq,\ 15min}$ 40 dBA or the prevailing RBL plus 5 dB, whichever is greater; and/or
- L_{AFmax} 52 dBA or the prevailing RBL plus 15 dB, whichever is greater.

Where either of the above criteria are triggered, a detailed maximum noise level event assessment should be undertaken.

In this instance, consideration is given to the potential for sleep disturbance for noise associated with cars leaving the car park at night.

Table 7 Sleep Disturbance Criteria

Location	Time Period	L_{90} Rating Background Level (dBA)	Sleep Disturbance L_{Max} Noise Level (dBA)
Nearby Residential Receptor	Early Night (10 pm to 12 am)	**37**	(37 + 15 =) **52**
	Night (12 am to 7 am)	**35**	**52**

The assessment location should be outside the bedroom window of the most affected nearby residential receiver.

4.7 Road Traffic Noise Criteria

The NSW Road Noise Policy, in Section 2.3.1, sets out road traffic noise assessment criteria for residential land uses in Table 3. The information in that table is extracted below in Table 8.

Table 8 Road Traffic Noise Assessment Criteria - Residential

Road Category	Type of project/land use	Assessment Criteria – dB(A)	
		Day (7 am – 10 pm)	**Night (10 pm – 7 am)**
Local roads	1. Existing residences affected by noise from **new** local road corridors	$L_{Aeq, (15\ hour)}$ 55 (external)	$L_{Aeq, (9\ hour)}$ 50 (external)
	2. Existing residences affected by noise from **redevelopment** of existing local roads		
	3. Existing residences affected by **additional traffic** on existing local roads generated by land use developments		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP for sensitive developments near busy roads.

4.8 Project Specific Noise Criteria

4.8.1 Project Specific L_{eq} Noise Criteria

When all the above factors are considered, we find that the most applicable noise criterion for the car park and mechanical plant is as shown in Table 9.

Table 9 Project Specific Noise Criteria

Location	Time Period	Project L_{eq} Criteria (dBA)
Nearby Residential Receptors Near Deepwater Road	Early Morning (6 am to 7 am)	**50**
	Day (7 am to 6 pm)	**50**
	Evening (6 pm to 10 pm)	**43**
	Early Night (10 pm to 12 am)	**38**
	Night (10 pm to 7 am)	**37**
Nearby Residential Receptors Near Amaroo Avenue	Early Morning (6 am to 7 am)	**51**
	Day (7 am to 6 pm)	**52**
	Evening (6 pm to 10 pm)	**43**
	Early Night (10 pm to 12 am)	**38**
	Night (10 pm to 7 am)	**38**

These criteria apply at the most-affected point on or within the residential property boundary – or, if that is more than 30 metres from the residence, at the most-affected point within 30 metres of the residence. For upper floors, the noise is assessed outside the nearest window.

4.8.2 Sleep Disturbance Criteria

The following criteria will be applied for sleep disturbance:

- **60 dBA** L_{AMax} between 6 am and 7 am.
- **52 dBA** L_{AMax} between 10 pm and 12 am.

4.8.3 On-Road Traffic Noise Criterion

The following criterion will be applied at 1 metre from the most affected façades of all receptors for on – road traffic noise:

- **55 dBA** (external) $L_{eq,\ 1\ hour}$ between 7 am and 10 pm.
- **50 dBA** (external) $L_{eq,\ 1\ hour}$ between 10 pm and 7 am.

4.8.4 Project Specific L_{10} Noise Criteria

Noise emission from amplified music and patrons within the Clubhouse is to be assessed against the Liquor and Gaming NSW noise criteria as follows in Table 10.

Table 10 L_{10} Noise Level Criteria for Residence Receptors

Description	dBA	Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Residences Along Deepwater Road										
Daytime (7 am – 6 pm)	**50**	56	57	50	48	46	48	42	33	22
Evening (6 pm – 10 pm)	**46**	52	52	44	43	41	44	36	28	20
Early Night (10 pm – midnight)	**39**	47	48	41	38	36	36	29	24	19
Night (midnight – 7 am)	**32**	40	41	34	31	29	29	22	17	12
Residences Along Amaroo Avenue										
Daytime (7 am – 6 pm)	**52**	58	59	52	50	48	50	44	35	24
Evening (6 pm – 10 pm)	**48**	54	54	46	45	43	46	38	30	22
Early Night (10 pm – midnight)	**41**	49	50	43	40	38	38	31	26	21
Night (midnight – 7 am)	**34**	42	43	36	33	31	31	24	19	14

The residential criteria apply at the boundary of any affected residence at ground level. At upper floors, the noise is assessed outside the nearest window.

5.0 NOISE EMISSION

The main sources of noise from the Castle Cove Country Club are the people inside and outside the Club restaurant, car movements within the site and mechanical plant noise. The Castle Cove Country Club will cater to a maximum of approximately 200 people and will operate from 7 am to 12 midnight.

Calculations are based on plans prepared by Antoniades Architects Pty Ltd dated 7 November 2023 as shown in Appendix C.

The Castle Cove Country Club is proposed to include several areas that have the potential to create a noise impact, including Dining Room and Bar, Terrace, Car Park and Mechanical Plant.

The noise impact from each area has been calculated and the cumulative noise impact established for the most affected receptors in Castle Cove.

5.1 Dining Areas

A Bar and dining room is proposed with seating for 128 people inside and 60 people outside.

To be conservative, we have assumed that the bar and dining room will operate at full capacity during trading.

We have modelled the noise emission from Bar and Dining patrons talking with a raised voice (20%), talking normally (30%) and the rest not talking or listening (50%).

The windows and front entry doors of the dining room have been modelled as being fully open. We have assumed that the floor inside the dining room will be tiled.

Based on information in Harris and in our noise level database gathered over many years, we calculate the sound power levels for people talking as shown in Table 11.

Table 11 L_{10} Sound Power Levels – Bar and Dining Area

Description	dBA	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Bar and Dining: 128 people (20% talking with raised voice, 30% talking normally).	**88**	72	77	77	83	87	82	78	73	66
Terrace: 60 people (20% talking with raised voice, 30% talking normally).	**84**	69	74	74	80	84	79	75	70	63
Background Music	**83**	68	73	87	79	81	77	75	71	66

5.2 Car Park

The club house car park on Deepwater Road will have capacity for 76 cars.

The traffic consultants CJP Consulting Engineers have completed a traffic survey of the existing Clubs traffic generation, resulting in 24 vehicle trips in AM peak and 23 vehicle trips in PM peak. Given the proposed Clubhouse will have the same floor areas as the existing Club, it is estimated that there will be negligible change in traffic generation.

We have assumed a flow of cars equivalent to (24 / 4 =) 6 cars in any 15 minute period arriving and leaving the car park at any time during trading hours.

The residential independent living car park will have a capacity for 37 cars. For the purpose of assessing the maximum typical noise emission from the residential car park entry/exit, traffic movement has been calculated using the RTA's Technical Direction (TDT 2013/04a) for the 'Guide to Generating Traffic Developments' for 'Housing for seniors' criterion of criterion of 0.4 vehicle trips/per hour/per unit for the am peak period. This results in a typical worst-case scenario of (32 x 0.4 ÷ 4 =) 3 car movements in any given 15 minute period during the morning peak periods.

The use of the car park will significantly decrease during the night time period, however, as a worst-case scenario we have assumed a scenario equivalent to the peak traffic flow (6 cars in any given 15 minutes for the Club and 3 car movements in any given 15 minute period for the ILUs) during the night time.

Service vehicles for waste collection are likely to access the site twice a week.

The L_{eq} sound power level and spectrum of such noise was previously measured by Day Design and is given in Table 12.

Table 12 L_{eq} Sound Power Levels – Car Park

Description	dBA	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
SEL of car drive-by at approximately 10 km/h	**88**	92	88	84	83	84	79	76	70
SEL of car drive-by at approximately 50 km/h	**97**	99	97	94	93	95	87	77	70
Rigid Waste Truck L_{eq}	**105**	81	75	83	91	103	97	95	96
L_{Amax} of car door close	**96**	105	103	95	96	87	83	82	77
L_{Amax} of car entering driveway	**92**	98	92	90	88	88	83	80	76
Clubhouse: L_{eq} level of car park noise (6 cars/15 minutes)	**66**	70	66	62	61	62	57	54	50
Residential ILU: L_{eq} level of car park noise (3 cars/15 minutes)	**63**	67	63	59	58	59	54	51	47

5.3 Mechanical Plant

The architectural drawings indicate there will be a waste room on the basement level of the Clubhouse and residential building. We have assumed that the mechanical plant for the kitchen exhaust fan will be mounted on the roof above the Clubhouse.

The mechanical plant hasn't been selected yet and therefore we have only assumed typical noise levels used on similar developments. We have assumed the kitchen exhaust fan and air conditioning will only operate during trading hours.

A schedule of the sound power levels for mechanical plant is given in Table 13.

Table 13 Mechanical Plant L_{eq} Sound Power Levels

Description	dBA	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Kitchen Exhaust Fan	**90**	91	89	89	87	87	81	71	68	91
Toilet Exhaust Fan	**59**	48	48	56	57	54	53	45	38	48
Air Conditioner Unit	**80**	86	78	76	74	75	65	58	86	78
Freezer Condenser	**80**	69	69	72	68	77	73	71	65	69
Cool Room Condenser	**75**	64	64	67	63	72	68	66	60	64

5.4 Predicted Noise Levels

Knowing the sound power level of a noise source (see Tables 11-13), the sound pressure level (as measured with a sound level meter) can be calculated at a remote location using suitable formulae to account for building envelope transmission, distance losses, sound barriers and sound absorption.

5.4.1 Music and Patron Noise Levels At Residential Receptors

The cumulative noise level from music and patrons at the residential receptors in Castle Cove from the proposed Clubhouse is shown below in Tables 14 and 15.

All predictions in Tables 14 and 15 are based on the assumptions outlined above and the proposed construction detailed in the architectural drawings, attached.

Table 14 details noise emission from both the outdoor terrace and indoor dining areas. After 10 pm, the outdoor terrace is to be closed to patrons, with patrons redirected inside (Table 15).

Table 14 Calculated Evening L_{10} Noise Levels Outside the Nearest Residences

Description	dBA	Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
R1 – 15 Amaroo Avenue										
Terrace (Outside)	**14**	8	13	10	13	14	9	0	0	0
Bar and Dining (Inside)	**16**	11	16	18	11	13	9	9	8	8
Cumulative Noise Level	**18**	**13**	**18**	**19**	**15**	**16**	**12**	**9**	**9**	**8**
Evening Criteria (6 pm – 10 pm)	**48**	54	54	46	45	43	46	38	30	22
Compliance		✓	✓	✓	✓	✓	✓	✓	✓	✓
R2 – 12 Amaroo Avenue										
Terrace (Outside)	**41**	22	27	28	35	41	36	32	26	17
Bar and Dining (Inside)	**38**	30	35	40	35	38	31	28	22	13
Cumulative Noise Level	**43**	**35**	**36**	**40**	**38**	**43**	**37**	**33**	**28**	**18**
Evening Criteria (6 pm – 10 pm)	**48**	54	54	46	45	43	46	38	30	22
Compliance		✓	✓	✓	✓	✓	✓	✓	✓	✓
R3 – 76 Deepwater Road										
Terrace (Outside)	**36**	22	27	27	33	37	31	26	20	10
Bar and Dining (Inside)	**34**	29	34	38	29	32	28	25	19	11
Cumulative Noise Level	**38**	**30**	**35**	**39**	**34**	**38**	**33**	**28**	**23**	**14**
Evening Criteria (6 pm – 10 pm)	**46**	52	52	44	43	41	44	36	28	20
Compliance		✓	✓	✓	✓	✓	✓	✓	✓	✓
R4 – 113 Deepwater Road										
Terrace (Outside)	**26**	18	23	22	26	27	19	12	0	0
Bar and Dining (Inside)	**33**	28	33	36	28	32	28	25	20	13
Cumulative Noise Level	**34**	**28**	**33**	**36**	**30**	**33**	**29**	**25**	**20**	**13**
Evening Criteria (6 pm – 10 pm)	**46**	52	52	44	43	41	44	36	28	20
Compliance		✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 15 Calculated Early Night L_{10} Noise Levels Outside the Nearest Residences

Description	dBA	Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
R1 – 15 Amaroo Avenue										
Bar and Dining (Inside)	**17**	16	21	23	15	16	12	9	9	8
Early Night Criteria (10 pm – 12 midnight)	**41**	49	50	43	40	38	38	31	26	21
Compliance		✓	✓	✓	✓	✓	✓	✓	✓	✓
R2 – 12 Amaroo Avenue										
Bar and Dining (Inside)	**38**	30	35	40	35	38	31	28	22	13
Early Night Criteria (10 pm – 12 midnight)	**41**	49	50	43	40	38	38	31	26	21
Compliance		✓	✓	✓	✓	✓	✓	✓	✓	✓
R3 – 76 Deepwater Road										
Bar and Dining (Inside)	**34**	29	34	38	29	32	28	25	19	11
Early Night Criteria (10 pm – 12 midnight)	**39**	47	48	41	38	36	36	29	24	19
Compliance		✓	✓	✓	✓	✓	✓	✓	✓	✓
R4 – 113 Deepwater Road										
Bar and Dining (Inside)	**33**	28	33	36	28	32	28	25	20	13
Early Night Criteria (10 pm – 12 midnight)	**39**	47	48	41	38	36	36	29	24	19
Compliance		✓	✓	✓	✓	✓	✓	✓	✓	✓

The predicted L_{10} levels of noise from the proposed Clubhouse during the evening and early night are summarised in Tables 12 and 13 above at the nearest affected residences. The predicted levels of noise comply with the evening and early night noise criteria in Section 4.8.4 of this report and will therefore be acceptable.

5.4.2 Car Park and Mechanical Plant Noise Levels At Residential Receptors

The car park and mechanical plant are to be assessed against the project specific L_{eq} noise criteria. The early night period noise criteria has been used to assess the cumulative noise source as outlined below, taking into consideration the noise control recommendations in Section 5.

Table 16 Predicted $L_{eq,\ 15\ minute}$ Noise Levels –Early Night

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – 15 Amaroo Avenue			
- Car Park	< 20		
- Mechanical Plant	< 20		
- AC Unit	< 20		
Cumulative Total	20	38	Yes
R2 – 12 Amaroo Avenue			
- Car Park	< 20		
- Mechanical Plant	31		
- AC Unit	35		
Cumulative Total	37	38	Yes
R3 – 76 Deepwater Road			
- Car Park	30		
- Mechanical Plant	24		
- AC Unit	35		
Cumulative Total	37	38	Yes
R4 – 113 Deepwater Road			
- Car Park	38		
- Mechanical Plant	20		
- AC Unit	28		
Cumulative Total	38	38	Yes

The predicted $L_{eq,\ 15\ minute}$ level of noise from mechanical plant and car park is as shown in Table 16. The predicted level of noise is below the early night time criteria and will therefore be acceptable.

Service vehicles for waste collection are likely to access the site twice a week. We have allowed for waste collection to occur during the day period only.

We have assumed the recommendation for a 2.4 metre high acoustic barrier along the residential driveway to the ILU has been implemented (Section 6.1).

Table 17 Predicted $L_{eq,\ 15\ minute}$ Noise Levels – Daytime Waste Collection

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – 15 Amaroo Avenue			
- Waste Vehicle	25	52	Yes
R2 – 12 Amaroo Avenue			
- Waste Vehicle	48	52	Yes
R3 – 76 Deepwater Road			
- Waste Vehicle	50	50	Yes
R4 – 113 Deepwater Road			
- Waste Vehicle	53	50	**No (+ 3 dB)**

The predicted $L_{eq,\ 15\ minute}$ level of noise from service vehicles accessing the car park during the daytime as shown in Table 17 is below the daytime time criteria and will therefore be acceptable, with the exception of R4, directly across from the access driveway to the Clubhouse basement car park.

There is a small exceedance of 3 dB for a waste service vehicle accessing the basement car park of the Clubhouse. Given the service vehicle is expected to occur twice per week, and the existing ambient L_{eq} noise level is 60 dBA (refer Table 2), although strictly not meeting the acceptable noise criteria is considered minimal impact at the nearest residential receiver.

5.4.3 Car Park Sleep Disturbance At Residential Receptors

The level of noise resulting from cars accessing the car park causing sleep disturbance has been assessed during the early morning period before 7 am and in the early night after 10 pm. During the early morning, cars will be arriving for the day, while in the early night, cars will be exiting to leave the Clubhouse.

Table 18 Predicted L_{Max} Noise Levels – Sleep Disturbance

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
Early Morning			
R1 – 15 Amaroo Avenue			
- Car Enter Car Park	25	60	Yes
R2 – 12 Amaroo Avenue			
- Car Enter Car Park	27	60	Yes
R3 – 76 Deepwater Road			
- Car Enter Car Park	51	60	Yes
R4 – 113 Deepwater Road			
- Car Enter Car Park	60	60	Yes
Early Night			
R1 – 15 Amaroo Avenue			
- Car Door Slam, Exit Car Park	20	52	Yes
R2 – 12 Amaroo Avenue			
- Car Door Slam, Exit Car Park	23	52	Yes
R3 – 76 Deepwater Road			
- Car Door Slam, Exit Car Park	47	52	Yes
R4 – 113 Deepwater Road			
- Car Door Slam, Exit Car Park	55	52	**No (+ 3 dB)**

The predicted L_{Max} level of noise from cars accessing the car park during the early morning and early night as shown in Table 18 is below the sleep disturbance criteria and will therefore be acceptable, with the exception of R4, directly across from the access driveway to the Clubhouse basement car park.

There is a small exceedance of 3 dB for a car exiting the basement car park of the Clubhouse. An exceedance of 3 dB is considered a marginal to moderate impact of residual noise (refer Table 4.1 of the NPI). Without any practical methods to reduce noise from acing a car park, and the creation of on-road traffic being a similar level, the impact from sleep disturbance is considered negligible.

5.4.4 On-Road Traffic Noise Emission At Residential Receptors

The level of noise resulting from additional cars on the local road as a result of the Clubhouse development has been assessed the night time period. Compliance with the night time period will also ensure compliance during the day time period.

To assess the level of on road traffic, we have used the peak traffic generation as counted on site by CJP Consulting Engineers with a total of 24 vehicle movements on the local road over a 1 hour period on Deepwater Road. The results are shown in 19.

Table 19 Predicted $L_{eq,\ 1\ hour}$ Noise Levels – On-Road Traffic

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
Daytime			
R1 – 15 Amaroo Avenue			
- Cars on Deepwater Road	< 20	55	Yes
R2 – 12 Amaroo Avenue			
- Cars on Deepwater Road	20	55	Yes
R3 – 76 Deepwater Road			
- Cars on Deepwater Road	51	55	Yes*
R4 – 113 Deepwater Road			
- Cars on Deepwater Road	51	55	Yes*
Night-time			
R1 – 15 Amaroo Avenue			
- Cars on Deepwater Road	< 20	50	Yes
R2 – 12 Amaroo Avenue			
- Cars on Deepwater Road	20	50	Yes
R3 – 76 Deepwater Road			
- Cars on Deepwater Road	51	50	Yes*
R4 – 113 Deepwater Road			
- Cars on Deepwater Road	51	50	Yes*

*An exceedance of 1 dB at night is considered negligible and acceptable.

The predicted L_{eq} level of noise from cars on Deepwater Road as shown in Table 19 is below the daytime on-road traffic criteria and will therefore be acceptable. At night, a small exceedance of 1 dB is predicted at peak traffic generation, which is unlikely to occur at night.

6.0 NOISE CONTROL RECOMMENDATIONS

All predicted noise levels in Section 5 assume the noise control recommendations in Sections 6.1 to 6.5 below have been implemented and adhered to:

6.1 ILU Driveway Acoustic Barrier

To reduce the level of noise impact from vehicles using the driveway to access the ILU basement car park, we recommend that the eastern side of the driveway have an acoustic barrier, built to a height of 2.4 metres above the finished level of the driveway.

The acoustic barrier may be constructed from 3 rail 'solid capped and lapped' timber, 9 mm fibre cement sheeting on steel posts or masonry. The construction shall be free of visible air gaps to provide an impervious sound barrier.

6.2 Background Music

Background music should not exceed an energy-average sound pressure level ($L_{eq,\ 15\ minute}$) of **75 dBA** when measured at 1 metre from the speakers within the dining area of the restaurant. This level equates to a sound power level of 83 dBA which is based on, for example, low to medium level of pre-recorded amplified music.

No music is to be played outside the Clubhouse building.

6.3 Time Restriction

The outdoor terrace may not be used after 10 pm. Before 10 pm, staff/security are to direct patrons inside and the access doors to the outdoor terrace closed and locked.

Access may be provided at start of trade the next day.

6.4 Mechanical Plant

The selection of mechanical plant has not been finalised at this stage. The predicted level shown in Table 16 is based on the typical sound power levels of mechanical plant shown in Table 13 with typical noise control measures including acoustic barrier walls and ventilation screen louvres.

Once mechanical plant has been selected, a detailed noise assessment should be made, prior to the issue of a Construction Certificate to ensure compliance with the noise criteria.

6.5 Building Façade Construction

To reduce the level of noise transmission from within the Clubhouse, we recommend the following building construction to the external facades.

6.5.1 External Doors

All external doors facing north towards the residences should be kept closed when not in use to reduce noise emission as far as practicable.

The door to the west facing the Golf Course may remain open for access.

6.5.2 Roof Construction

The roof structure should have a minimum R_w 40. The following construction is acceptable:

- Metal deck roofing;
- 19 mm plywood or 9 mm fibre cement sheeting on battens;
- Minimum 135 mm ceiling cavity;
- 100 mm thick insulation (minimum density 11 kg/m^3) installed within the ceiling cavity; and
- 13 mm plasterboard ceiling.

Any penetrations through the ceiling should be acoustically treated.

6.5.3 Wall Construction

We recommend any external walls be constructed to have a minimum R_w 50. Examples of external walls meeting R_w 50 include double brick masonry, brick veneer construction and Hebel wall with internal stud framing.

6.5.4 Glazing

We recommend all external glazing be minimum 10.38 mm laminated glass (Rw 35). This includes the fixed glazing and the entry doors.

All operable glazing should be fitted with acoustic seals around the perimeter.

6.6 Construction Disclaimer

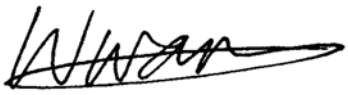
Recommendations made in this report are intended to resolve acoustical problems only. We make no claims of expertise in other areas of building construction and therefore the recommended noise controls should be implements into the building design in consultation with other specialists to ensure they meet the structural, fire, thermal or other aspects of building construction.

We encourage clients to check with us before using materials or equipment that are alternative to those specified in our Acoustical Report.

7.0 CONCLUSION

Day Design was engaged to assess the level of noise emission from the Castle Cove Country Club at 68-74 Deepwater Road, Castle Cove, NSW.

Measurements and calculations show that, provided the recommendations in Section 6 of this report are implemented, the level of noise emitted by the Castle Cove Country Club at 68-74 Deepwater Road, Castle Cove will meet the acceptable noise level requirements of Willoughby City Council and The NSW Environment Protection Authority's Noise Policy for Industry and Liquor and Gaming NSW as detailed in Section 4 of this report.



William Wang, BE(Mechatronics), MIEAust, MAAS
Senior Acoustical Engineer
for and on behalf of Day Design Pty Ltd

AAAC MEMBERSHIP
Day Design Pty Ltd is a member company of the Association of Australasian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.

APPENDICES
Appendix A – Instrumentation
Appendix B – Ambient Noise Survey
Appendix C – Architectural Plans
AC108-1 to 4 – Glossary of Acoustical Terms
AC500-10 –Noise Policy for Industry, Modifying Factor Corrections

NOISE SURVEY INSTRUMENTATION

Noise level measurements and analysis in this report were made with instrumentation as follows:

Table A1 Noise Survey Instrumentation

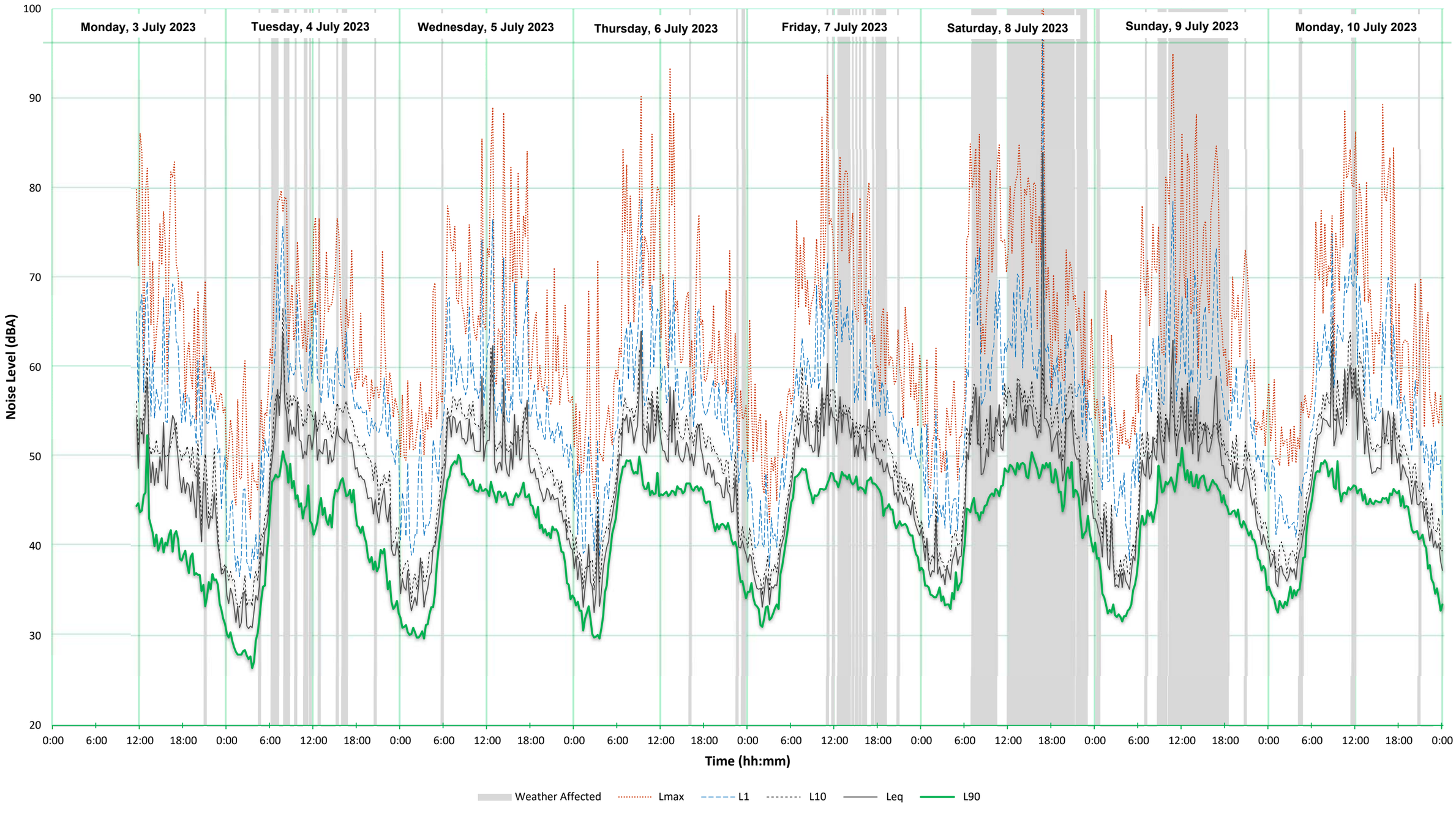
Description	Model No	Serial No
Infobyte Noise Logger (Type 1)	iM4	120
Condenser Microphone 0.5" diameter	MK 250	15361
Nti Audio Sound Level Meter (DD7)	NTi XL2	A2A-18446-E0
Preamplfier	MA220	9415
Condenser Microphone 0.5" diameter	MC2230	A23049
Acoustical Calibrator	B&K 4231	2721949

An environmental noise logger is used to continuously monitor ambient noise levels and provide information on the statistical distribution of noise during an extended period of time. The Infobyte Noise Monitor iM4 is a Type 1 precision environmental noise monitor meeting all the applicable requirements of AS1259 for an integrating-averaging sound level meter.

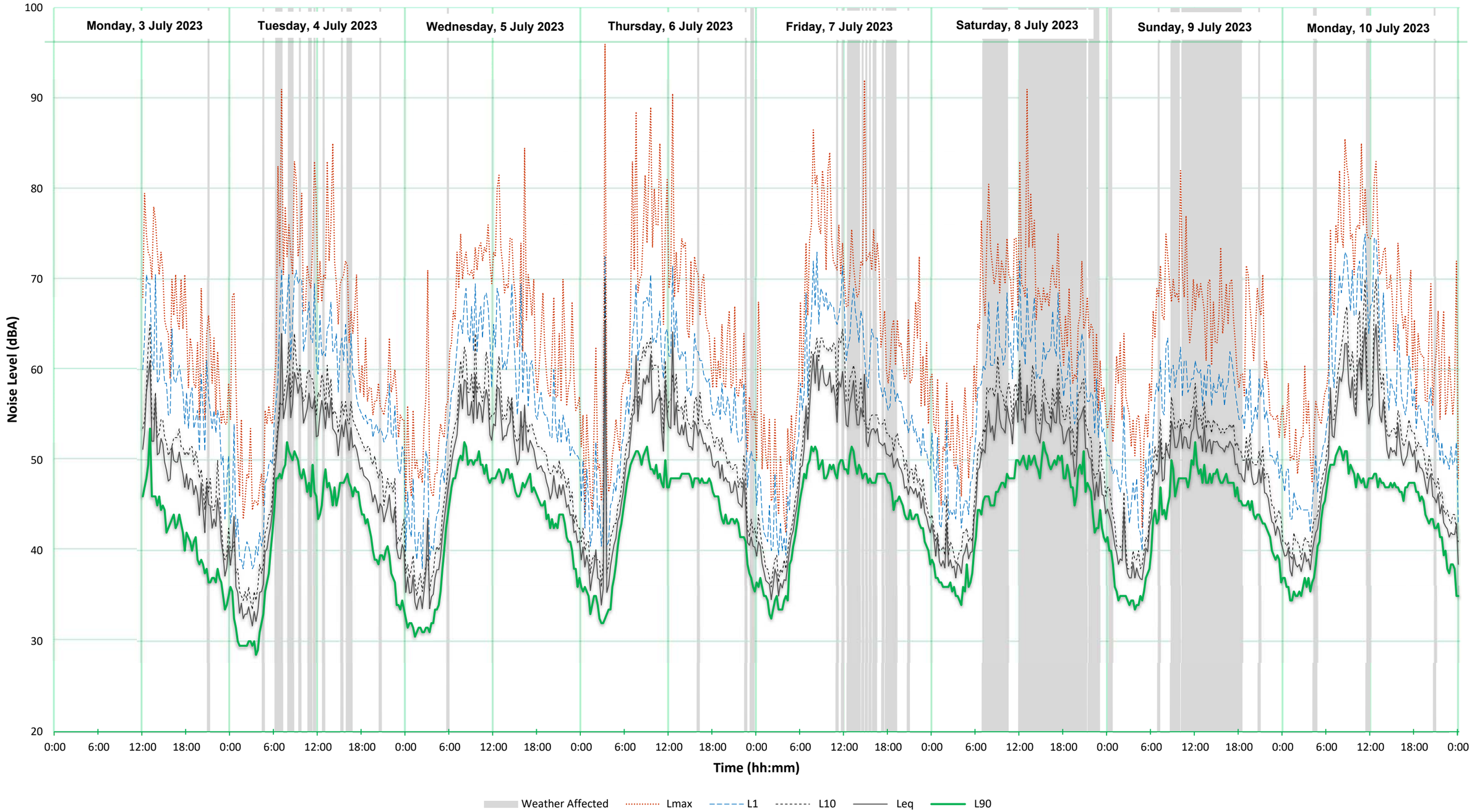
The Nti XL2 Sound Level Meter is a real-time precision integrating sound level meter with octave and third octave filters, that sample noise at a rate of 10 samples per second and provides L_{eq}, L_{10} and L_{90} noise levels using both Fast and Slow response and L_{peak} noise levels on Impulse response time settings. The meter is frequency weighted to provide dBA, dBC or Linear sound pressure level readings as required. Results are normally downloaded to computer for rapid processing.

All instrument systems had been laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 1 dB during attended and unattended measurements. No adjustments for instrument drift during the measurement period were warranted.

Located at Lower Level, 68 - 74 Deepwater Road, Castle Cove, NSW (Batting Cages)



Located at Upper Level, 68 - 74 Deepwater Road, Castle Cove, NSW (Behind Pro Shop)



Legend:

- Property Boundary
- Rear/Side Setbacks
- Front Setback
- Hidden
- RL. 0.00 — Level Marker (Plan)
- RL. 0.00 — Level Marker (Elevation)
- TOW 0.00 — Top of Wall Level

Material Tag

AB-XX — See Material Board for code reference

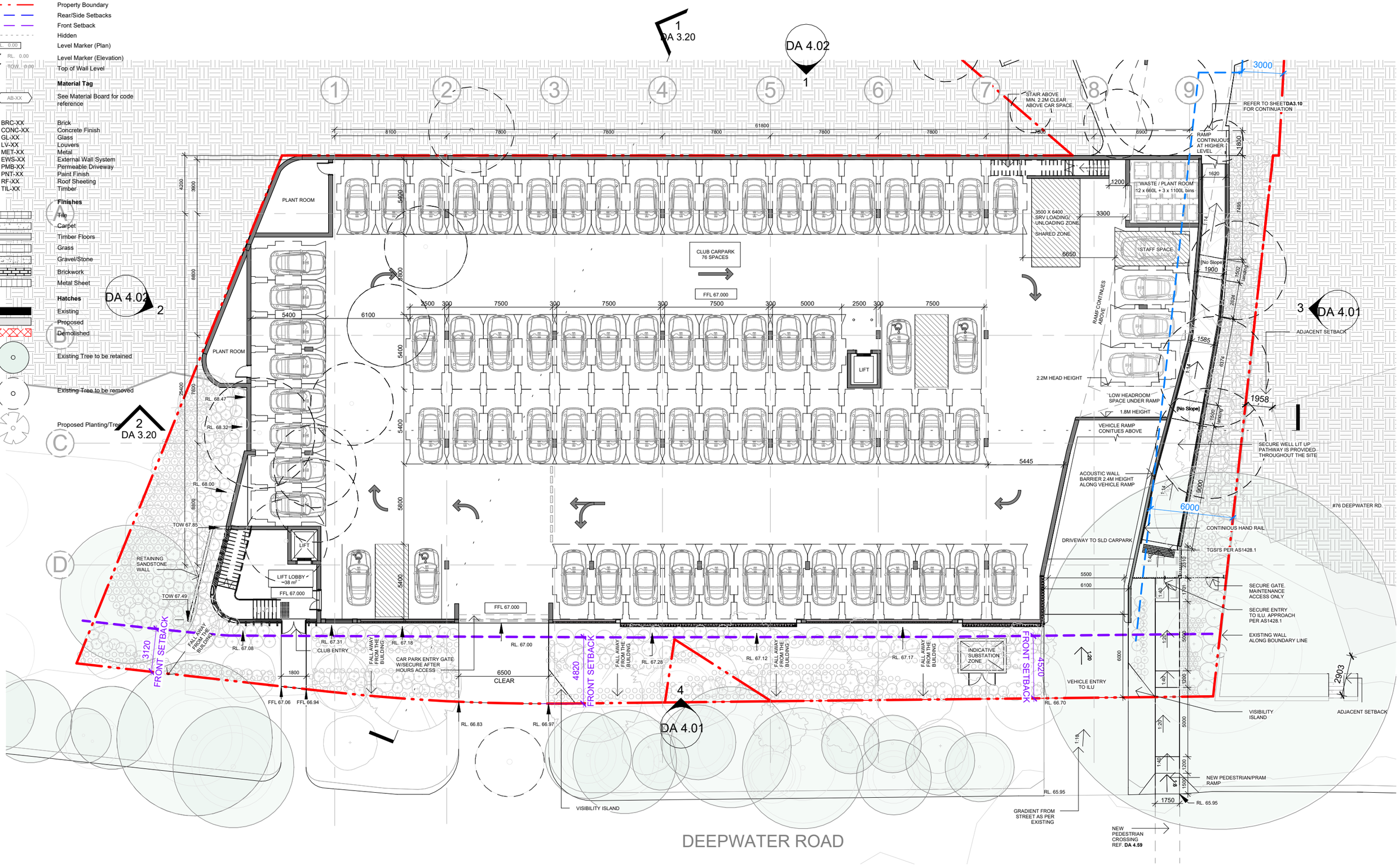
BRC-XX	Brick
CONC-XX	Concrete Finish
GL-XX	Glass
LV-XX	Louvers
MET-XX	Metal
EWS-XX	External Wall System
PMB-XX	Permeable Driveway
PNT-XX	Paint Finish
RF-XX	Roof Sheeting
TIL-XX	Timber

Finishes

- Tile
- Carpet
- Timber Floors
- Grass
- Gravel/Stone
- Brickwork
- Metal Sheet

Hatches

- Existing
- Proposed
- Demolished
- Existing Tree to be retained
- Existing Tree to be removed
- Proposed Planting/Tree



REV	DESCRIPTION	BY	DATE
A	FOR INFORMATION	MS	2023.11.07

ANTONIADES ARCHITECTS

www.antoniades.com.au
ACN 129 731 559

Nominated Architect: Andreas Antoniades
NSW Registration 7954

PROJECT PHASE: DEVELOPMENT APPLICATION

STATUS: FOR INFORMATION

PROJECT NO.: **22015DA**

PROJECT: **CC Country Club**

ADDRESS: Castle Cove Country Club

CLIENT: Taylor

DRAWING SERIES: **Plans - Club**

DRAWING TITLE: **Club - Ground Level**

DRAWING NO.: **DA 3.02**

REVISION: **A**

DRAWN BY: **MS**

CHECKED BY: **AA**

SCALE: As indicated @A3

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Legend:

- Property Boundary
- Rear/Side Setbacks
- Front Setback
- Hidden
- RL 0.00 — Level Marker (Plan)
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- TOW 0.00 — Top of Wall Level

Material Tag

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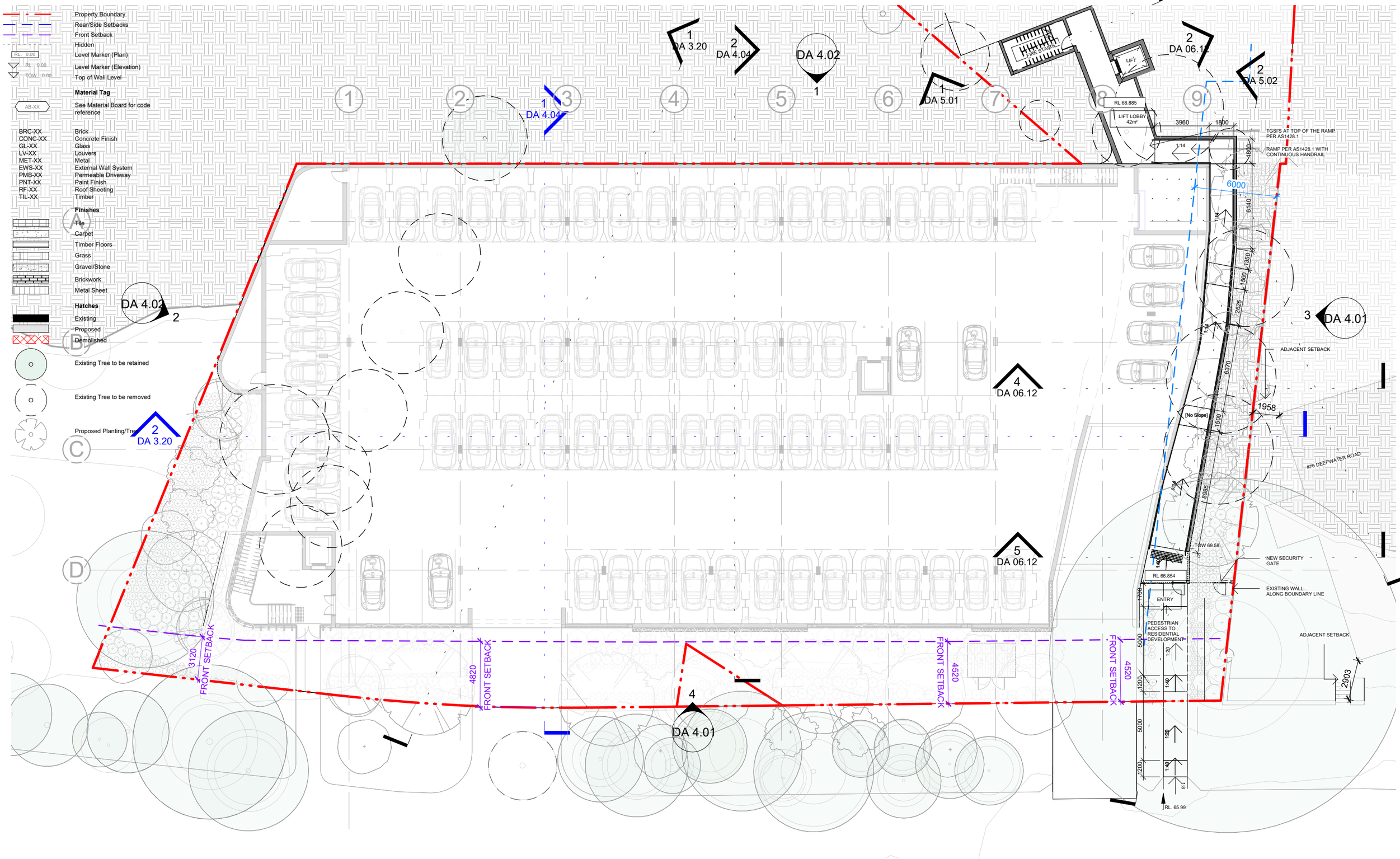

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Nominated Architect: Andreas Antoniades
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PROJECT PHASE
DEVELOPMENT APPLICATION

STATUS
FOR INFORMATION

PROJECT NO.
22015DA
PROJECT
CC Country Club
ADDRESS
Castle Cove Country Club
CLIENT
Taylor

DRAWING SERIES
Plans - Club

DRAWING TITLE
Club - Top of Ground Level

DRAWING NO.
DA 3.03

REVISION
A

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MS
CHECKED BY
AA

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Scale 1:250

NORTH

REFER TO SHEET **DA04.52** FOR CONTINUATION

Legend:

- Property Boundary
- Rear/Side Setbacks
- Front Setback
- Hidden
- RL 0.00 — Level Marker (Plan)
- RL 0.00 — Level Marker (Elevation)
- TOW 0.00 — Top of Wall Level

Material Tag

AB-XX — See Material Board for code reference

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EWS-XX	External Wall System
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Hatches

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C
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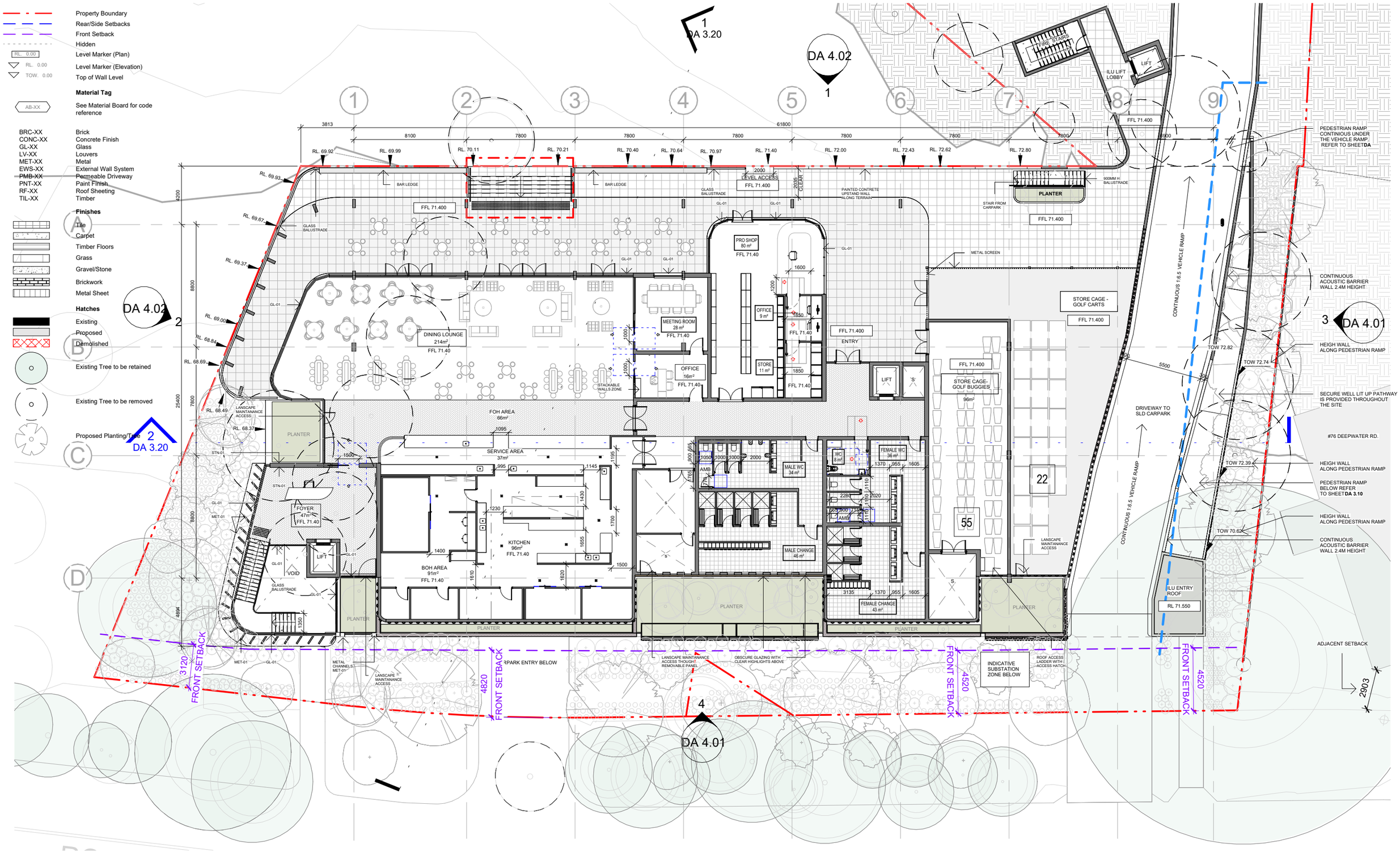

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PROJECT PHASE
DEVELOPMENT APPLICATION

STATUS
FOR INFORMATION

PROJECT NO.
22015DA

PROJECT
CC Country Club

ADDRESS
Castle Cove Country Club

CLIENT
Taylor

DRAWING SERIES
Plans - Club

DRAWING TITLE
Club - Level 1

DRAWING NO.
DA 3.04

REVISION
A

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MS

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AA

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NORTH

Legend:

- Property Boundary
- Rear/Side Setbacks
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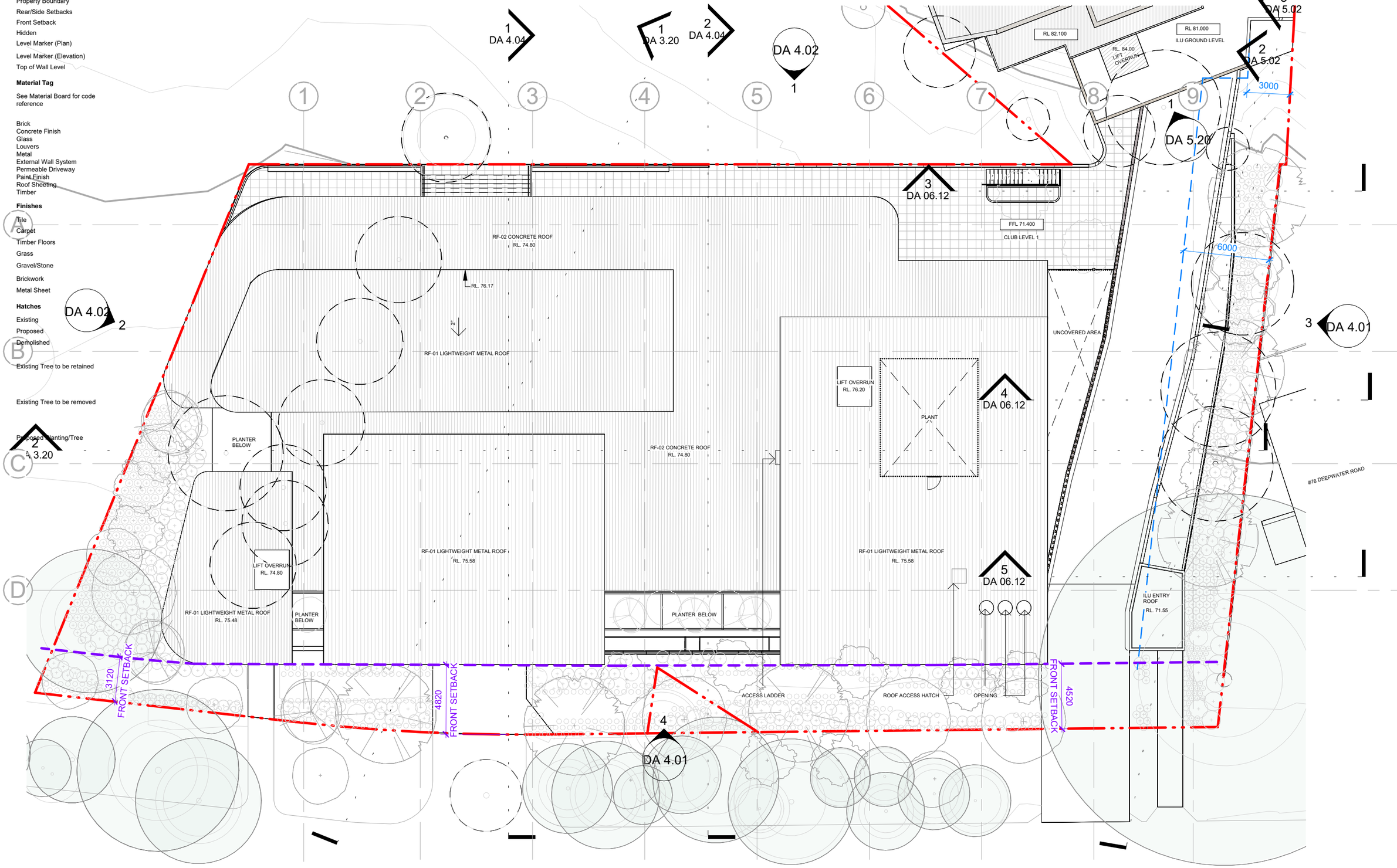
REFER TO SHEET **DA 4.53** FOR CONTINUATION



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PROJECT PHASE: DEVELOPMENT APPLICATION

STATUS: FOR INFORMATION

PROJECT NO.: **22015DA**

PROJECT: **CC Country Club**

ADDRESS: Castle Cove Country Club

CLIENT: Taylor

DRAWING SERIES: **Plans - Club**

DRAWING TITLE: **Club - Roof Level**

DRAWING NO.: **DA 3.05**

REVISION: **A**

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DRAWN BY: **MS**

CHECKED BY: **AA**

NORTH

Legend:

- Property Boundary
- Rear/Side Setbacks
- Front Setback
- Hidden
- RL 0.00 — Level Marker (Plan)
- RL 0.00 — Level Marker (Elevation)
- TOW 0.00 — Top of Wall Level

Material Tag

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BRC-XX	Brick
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GL-XX	Glass
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A	FOR INFORMATION	MS	2023.11.07

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NSW Registration 7954

PROJECT PHASE
DEVELOPMENT APPLICATION

STATUS
FOR INFORMATION

PROJECT NO.
22015DA
PROJECT
CC Country Club
ADDRESS
Castle Cove Country Club
CLIENT
Taylor

DRAWING SERIES
PLANS

DRAWING TITLE
ILU - Basement Level

DRAWING NO.
DA 4.51
REVISION
A
DRAWN BY
PV
CHECKED BY
AA
SCALE
As indicated @A3
0m 2 4 5m
Scale 1:250
NORTH

Legend:

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- Rear/Side Setbacks
- Front Setback
- Hidden
- RL 0.00 — Level Marker (Plan)
- RL 0.00 — Level Marker (Elevation)
- TOW 0.00 — Top of Wall Level

Material Tag

- AB-XX — See Material Board for code reference

BRC-XX	Brick
CONC-XX	Concrete Finish
GL-XX	Glass
LV-XX	Louvers
MET-XX	Metal
EWS-XX	External Wall System
PMB-XX	Permeable Driveway
PNT-XX	Paint Finish
RF-XX	Roof Sheeting
TIL-XX	Timber

Finishes

- Tile
- Carpet
- Timber Floors
- Grass
- Gravel/Stone
- Brickwork
- Metal Sheet

Hatches

- Existing
- Proposed
- Demolished

- Existing Tree to be retained
- Existing Tree to be removed
- Proposed Planting/Tree

Car spaces:

Total min.requirement:
23.5 car spaces
10% of which to be adaptable

Total number provided:
3 adaptable spaces
8 accessible
13 regular spaces
Total residential spaces: **24**

2 visitor spaces

NOTES:

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- To be read in conjunction with all other documents.
- Report any discrepancies to Antoniades Architects Pty Ltd.
- All boundary dimensions and bearings to be verified by licensed surveyor prior to proceeding with work.

REV	DESCRIPTION	BY	DATE
A	FOR INFORMATION	MS	2023.11.07

ANTONIADES ARCHITECTS
www.antoniades.com.au
ACN 129 731 559
Nominated Architect: Andreas Antoniades
NSW Registration 7954

PROJECT PHASE
DEVELOPMENT APPLICATION

STATUS
FOR INFORMATION

PROJECT NO.
22015DA
PROJECT
CC Country Club
ADDRESS
Castle Cove Country Club
CLIENT
Taylor

DRAWING SERIES
PLANS
DRAWING TITLE
ILU - Lower Ground Level

DRAWING NO.
DA 4.52
REVISION
A
SCALE
As indicated @A3
0m 2 4 5m
Scale 1:250
DRAWN BY
PV
CHECKED BY
AA
NORTH

Legend:

- Property Boundary
- Rear/Side Setbacks
- Front Setback
- Hidden
- RL. 0.00 — Level Marker (Plan)
- RL. 0.00 — Level Marker (Elevation)
- TOW. 0.00 — Top of Wall Level

Material Tag

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BRC-XX Brick
CONC-XX Concrete Finish
GL-XX Glass
LV-XX Louvers
MET-XX Metal
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PMB-XX Permeable Driveway
PNT-XX Paint Finish
RF-XX Roof Sheeting
TIL-XX Timber

Finishes

- Tile
- Carpet
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- Grass
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- Metal Sheet

Hatches

- Existing
- Proposed
- Demolished

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- Existing Tree to be removed
- Proposed Planting/Tree

REV	DESCRIPTION	BY	DATE
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ANTONIADES ARCHITECTS
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PROJECT PHASE
DEVELOPMENT APPLICATION 1

STATUS
FOR INFORMATION

PROJECT NO.
22015DA
PROJECT
CC Country Club
ADDRESS
Castle Cove Country Club
CLIENT
Taylor

DRAWING SERIES
PLANS

DRAWING TITLE
ILU - Ground Level

DRAWING NO.
DA 4.53
REVISION
A
DRAWN BY
PV
CHECKED BY
AA
SCALE
As indicated @A3
0m 2 4 5m
Scale 1:250
NORTH

Legend:

- Property Boundary
- Rear/Side Setbacks
- Front Setback
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Finishes

- Tile
- Carpet
- Timber Floors
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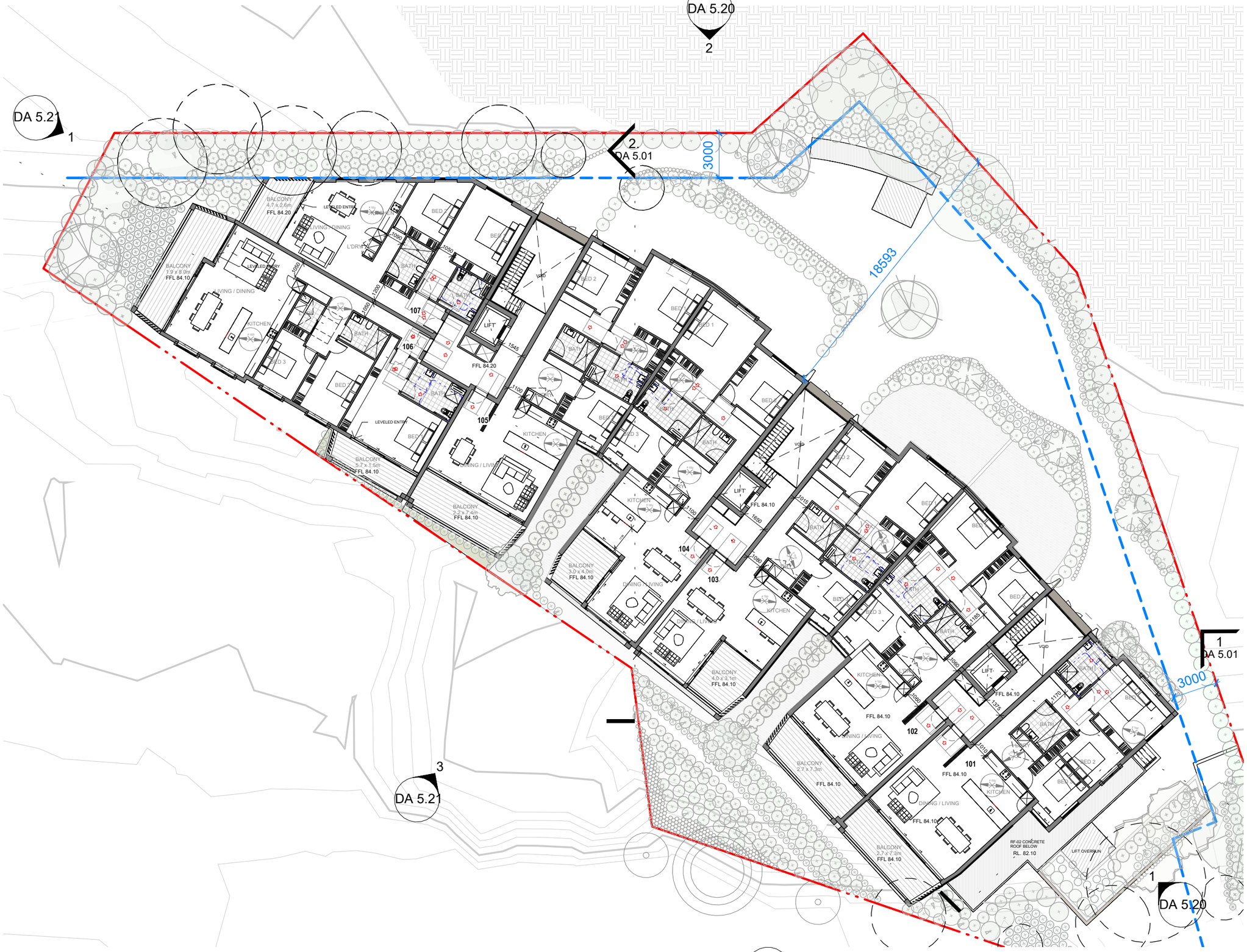
- Gravel/Stone
- Brickwork
- Metal Sheet

Hatches

- Existing
- Proposed
- Demolished

- Existing Tree to be retained
- Existing Tree to be removed
- Proposed Planting/Tree



REV	DESCRIPTION	BY	DATE
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PROJECT PHASE
DEVELOPMENT APPLICATION

STATUS
FOR INFORMATION

PROJECT NO.
22015DA
PROJECT
CC Country Club
ADDRESS
Castle Cove Country Club
CLIENT
Taylor

DRAWING SERIES
PLANS
DRAWING TITLE
ILU - Level 01

DRAWING NO.
DA 4.54
REVISION
A
SCALE
As indicated @A3
0m 2 4 5m
Scale 1:250

DRAWN BY
PV
CHECKED BY
AA
NORTH

Legend:

- Property Boundary
- Rear/Side Setbacks
- Front Setback
- Hidden
- RL. 0.00 — Level Marker (Plan)
- RL. 0.00 — Level Marker (Elevation)
- TOW. 0.00 — Top of Wall Level

Material Tag

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- Brickwork
- Metal Sheet

Hatches

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- Demolished
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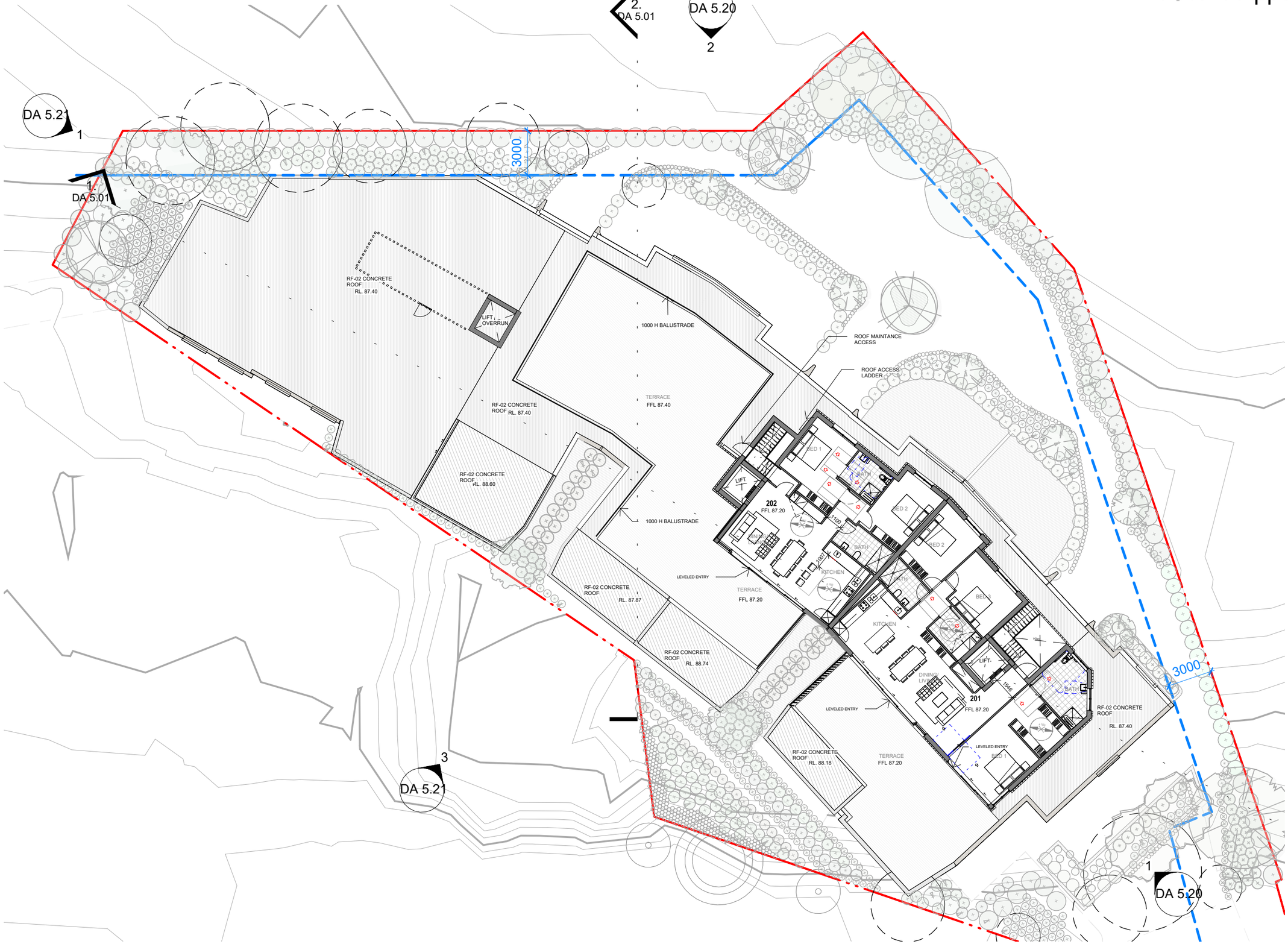
- Proposed Planting/Tree



NOTES:

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- Report any discrepancies to Antoniades Architects Pty Ltd.
- All boundary dimensions and bearings to be verified by licensed surveyor prior to proceeding with work.

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PROJECT PHASE
DEVELOPMENT APPLICATION

STATUS
FOR INFORMATION

PROJECT NO.
22015DA
PROJECT
CC Country Club
ADDRESS
Castle Cove Country Club
CLIENT
Taylor

DRAWING SERIES
PLANS

DRAWING TITLE
ILU - Level 02

DRAWING NO.
DA 4.55

REVISION
A

DRAWN BY
PV
CHECKED BY
AA

SCALE
As indicated @A3
0m 2 4 5m
Scale 1:250

NORTH

Legend:

- Property Boundary
- Rear/Side Setbacks
- Front Setback
- Hidden
- RL. 0.00 — Level Marker (Plan)
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- Brickwork
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Hatches

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- Demolished

- Existing Tree to be retained
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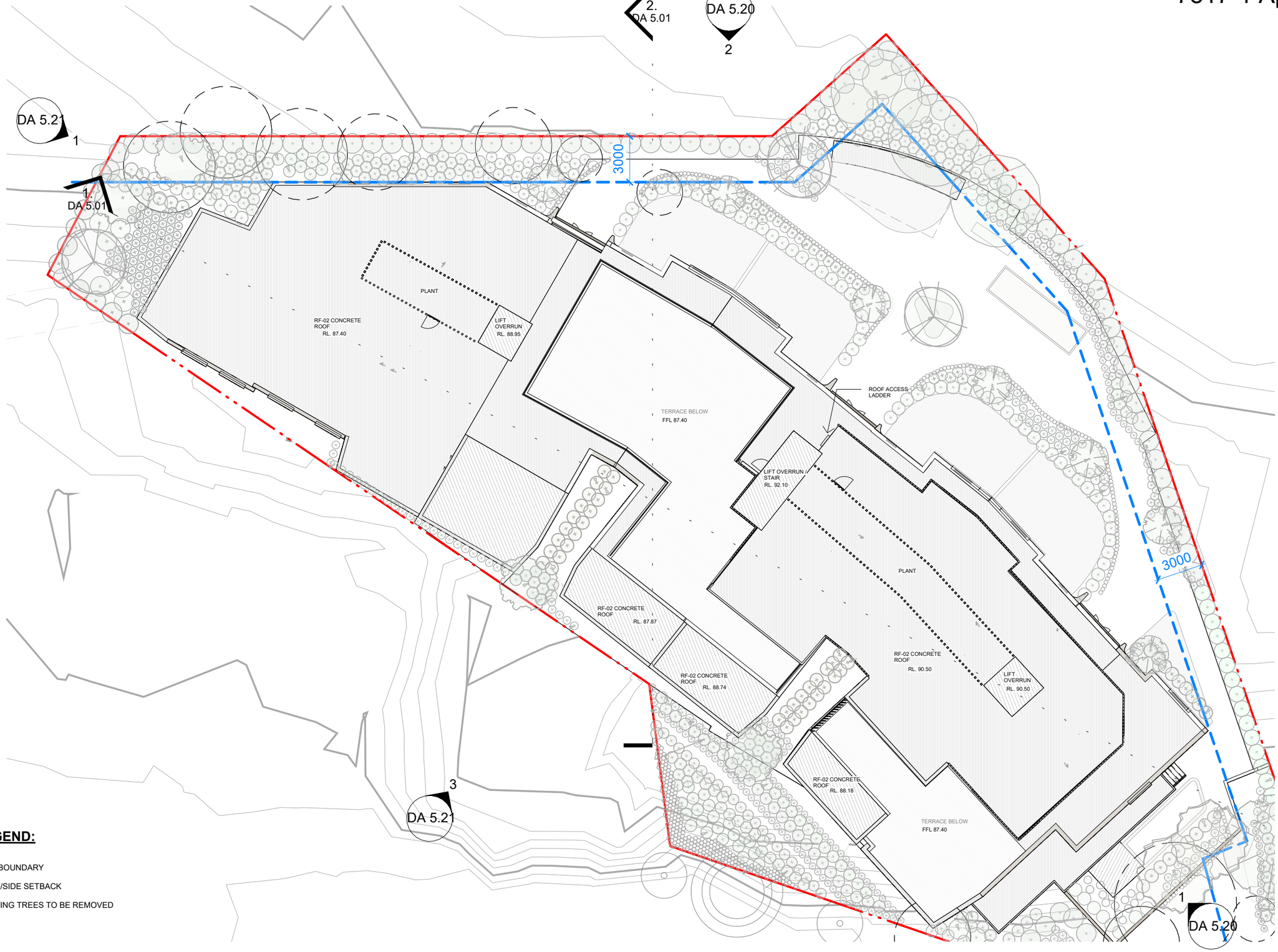

SITE LEGEND:

- SITE BOUNDARY
- REAR/SIDE SETBACK
- EXISTING TREES TO BE REMOVED

DA 4.02 1

REV	DESCRIPTION	BY	DATE
A	FOR INFORMATION	MS	2023.11.07

ANTONIADES ARCHITECTS

www.antoniades.com.au
ACN 129 731 559

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NSW Registration 7954

PROJECT PHASE
DEVELOPMENT APPLICATION

STATUS
FOR INFORMATION

PROJECT NO.
22015DA
PROJECT
CC Country Club
ADDRESS
Castle Cove Country Club
CLIENT
Taylor

DRAWING SERIES
PLANS

DRAWING TITLE
ILU - Roof Level

DRAWING NO.
DA 4.56
REVISION
A
DRAWN BY
PV
CHECKED BY
AA
SCALE
As indicated @A3
0m 2 4 5m
Scale 1:250
NORTH

ACOUSTICAL – Pertaining to the science of sound, including the generation, propagation, effects and control of both noise and vibration.

AMBIENT NOISE – The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including road traffic, factories, wind in the trees, birds, insects, animals, etc.

AUDIBLE – means that a sound can be heard. However, there are a wide range of audibility grades, varying from "barely audible" to "just audible", "clearly audible" and "prominent". Chapter 83 of the NSW Environment Protection Authority – Environmental Noise Control Manual (1985) states:
"noise from a particular source might be offensive if it is clearly audible, distinct from the prevailing background noise and of a volume or character that a reasonable person would be conscious of the intrusion and find it annoying or disruptive".

It follows that the word "audible" in an environmental noise context means "clearly audible".

BACKGROUND NOISE LEVEL – Silence does not exist in the natural or the built-environment, only varying degrees of noise. The Background Noise Level is the average minimum dBA level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by cicadas, lawnmowers, etc. It is quantified by the L_{A90} or the dBA noise level that is exceeded for 90 % of the measurement period (usually 15 minutes).

- **Assessment Background Level (ABL)** is the single figure background level representing each assessment period – day, evening and night (ie three assessment background levels are determined for each 24hr period of the monitoring period). Determination of the assessment background level is by calculating the tenth percentile (the lowest tenth percent value) of the background levels (L_{A90}) for each period (refer: NSW Industrial Noise Policy, 2000).
- **Rating Background Level (RBL)** as specified by the Environment Protection Authority is the overall single figure (L_{A90}) background noise level representing an assessment period (day, evening or night) over a monitoring period of (normally) three to seven days.

  The RBL for an assessment period is the median of the daily lowest tenth percentile of L_{90} background noise levels.

  If the measured background noise level is less than 30 dBA, then the Rating Background Level (RBL) is considered to be 30 dBA.

DECIBEL – The human ear has a vast sound-sensitivity range of over a thousand billion to one. The decibel is a logarithmic unit that allows this same range to be compressed into a somewhat more comprehensible range of 0 to 120 dB. The decibel is ten times the logarithm of the ratio of a sound level to a reference sound level. See also Sound Pressure Level and Sound Power Level.

Decibel noise levels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50 dBA, and another similar machine is placed beside it, the level will increase to 53 dBA, not 100 dBA. Ten similar machines placed side by side increase the sound level by 10 dBA, and one hundred machines increase the sound level by 20 dBA.

dBA – The human ear is less sensitive to low frequency sound than high frequency sound. We are most sensitive to high frequency sounds, such as a child's scream. Sound level meters have an inbuilt weighting network, termed the dBA scale, that approximates the human loudness response at quiet sound levels (roughly approximates the 40 phon equal loudness contour).

However, the dBA sound level provides a poor indication of loudness for sounds that are dominated by low frequency components (below 250 Hz). If the difference between the "C" weighted and the "A" weighted sound level is 15 dB or more, then the NSW Industrial Noise Policy recommends a 5 dBA penalty be applied to the measured dBA level.

dBC – The dBC scale of a sound level meter is similar to the dBA scale defined above, except that at high sound intensity levels, the human ear frequency response is more linear. The dBC scale approximates the 100 phon equal loudness contour.

EQUIVALENT CONTINUOUS NOISE LEVEL, L_{Aeq} – Many noises, such as road traffic or construction noise, vary continually in level over a period of time. More sophisticated sound level meters have an integrating electronic device inbuilt, which average the A weighted sound pressure levels over a period of time and then display the energy average or L_{Aeq} sound level. Because the decibel scale is a logarithmic ratio the higher noise levels have far more sound energy, and therefore the L_{Aeq} level tends to indicate an average which is strongly influenced by short term, high level noise events. Many studies show that human reaction to level-varying sounds tends to relate closely to the L_{Aeq} noise level.

FREE FIELD – This is a sound field not subject to significant reflection of acoustical energy. A free field over a reflecting plane is usually outdoors with the noise source resting on hard flat ground, and not closer than 6 metres to any large flat object such as a fence or wall; or inside an anechoic chamber.

FREQUENCY – The number of oscillations or cycles of a wave motion per unit time, the SI unit being the Hertz, or one cycle per second.

IMPACT ISOLATION CLASS (IIC) – The American Society for Testing and Materials (ASTM) has specified that the IIC of a floor/ceiling system shall be determined by operating an ISO 140 Standard Tapping Machine on the floor and measuring the noise generated in the room below. The IIC is a number found by fitting a reference curve to the measured octave band levels and then deducting the sound pressure level at 500 Hz from 110 decibels. Thus the higher the IIC, the better the impact sound isolation.

IMPACT SOUND INSULATION ($L_{nT,w}$) – Australian Standard AS ISO 717.2 – 2004 has specified that the Impact Sound Insulation of a floor/ceiling system be quantified by operating an ISO 140 Standard Tapping Machine on the floor and measuring the noise generated in the room below. The Weighted Standardised Impact Sound Pressure Level ($L_{nT,w}$) is the sound pressure level at 500 Hz for a reference curve fitted to the measured octave band levels. Thus the lower $L_{nT,w}$ the better the impact sound insulation.

IMPULSE NOISE – An impulse noise is typified by a sudden rise time and a rapid sound decay, such as a hammer blow, rifle shot or balloon burst.

INTRUSIVE NOISE LEVEL, L_{Aeq} – The level of noise from a factory, place of entertainment, etc. in NSW is assessed on the basis of the average maximum noise level, or the $L_{Aeq\ (15\ min)}$. This is the energy average A weighted noise level measured over any 15 minute period.

LOUDNESS – The degree to which a sound is audible to a listener is termed the loudness. The human ear perceives a 10 dBA noise level increase as a doubling of loudness and a 20 dBA noise increase as a quadrupling of the loudness.

MAXIMUM NOISE LEVEL, L_{Amax} – The rms maximum sound pressure level measured on the "A" scale of a sound level meter during a noise survey is the L_{Amax} noise level. It may be measured using either the Fast or Slow response time of the meter. This should be stated.

NOISE RATING NUMBERS – A set of empirically developed equal loudness curves has been adopted as Australian Standard AS1469-1983. These curves allow the loudness of a noise to be described with a single NR number. The Noise Rating number is that curve which touches the highest level on the measured spectrum of the subject noise. For broadband noise such as fans and engines, the NR number often equals the dBA level minus five.

NOISE – Noise is unwanted sound. Sound is wave motion within matter, be it gaseous, liquid or solid. "Noise includes sound and vibration".

NOISE REDUCTION COEFFICIENT – See: "Sound Absorption Coefficient".

OFFENSIVE NOISE - (Reference: Dictionary of the Protection of the Environment Operations Act 1997). *"Offensive Noise means noise:*

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

(i) is harmful to (or likely to be harmful to) a person who is outside the premise from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulations."

PINK NOISE – Pink noise is a broadband noise with an equal amount of energy in each octave or third octave band width. Because of this, Pink Noise has more energy at the lower frequencies than White Noise and is used widely for Sound Transmission Loss testing.

REVERBERATION TIME, T_{60} – The time in seconds, after a sound signal has ceased, for the sound level inside a room to decay by 60 dB. The first 5 dB decay is often ignored, because of fluctuations that occur while reverberant sound conditions are being established in the room. The decay time for the next 30 dB is measured and the result doubled to determine the T_{60}. The Early Decay Time (EDT) is the slope of the decay curve in the first 10 dB normalised to 60 dB.

SOUND ABSORPTION COEFFICIENT, α – α Sound is absorbed in porous materials by the viscous conversion of sound energy to heat energy as the sound waves pass through it. Sound is similarly absorbed by the flexural bending of internally damped panels. The fraction of incident energy that is absorbed is termed the Sound Absorption Coefficient, α. An absorption coefficient of 0.9 indicates that 90 % of the incident sound energy is absorbed. The average α from 250 to 2000 Hz is termed the Noise Reduction Coefficient (NRC).

SOUND ATTENUATION – If an enclosure is placed around a machine, or a silencer is fitted to a duct, the noise emission is reduced or attenuated. An enclosure that attenuates the noise level by 30 dBA, reduces the sound energy by one thousand times.

SOUND EXPOSURE LEVEL (SEL) – The total sound energy of a single noise event condensed into a one second duration or in other words it is an L_{eq} (1 sec).

SOUND PRESSURE LEVEL, L_p – The level of sound measured on a sound level meter and expressed in decibels, dB, dBA, dBC, etc. $L_p = 20 \times \log (P/P_o)$ ... dB

where P is the rms sound pressure in Pascal and P_o is a reference sound pressure of 20 µPa. L_p varies with distance from a noise source.

SOUND POWER LEVEL, L_w – The Sound Power Level of a noise source is an absolute that does not vary with distance or with a different acoustic environment.

$L_w = L_p + 10 \log A$ ... dB, re: 1pW,
where A is the measurement noise-emission area in square metres in a free field.

SOUND TRANSMISSION CLASS (STC) – An internationally standardised method of rating the sound transmission loss of partition walls to indicate the decibels of noise reduction of a human voice from one side to the other. (Refer: Australian Standard AS1276 – 1979)

SOUND TRANSMISSION LOSS – The amount in decibels by which a random sound is reduced as it passes through a sound barrier. A method for the measurement of airborne Sound Transmission Loss of a building partition is given in Australian Standard AS1191 - 2002.

STATISTICAL EXCEEDENCE SOUND LEVELS, L_{A90}, L_{A10}, L_{A1}, etc – Noise which varies in level over a specific period of time (usually 15 minutes) may be quantified in terms of various statistical descriptors:

The L_{A90} is the dBA level exceeded for 90 % of the time. In NSW the L_{A90} is measured over periods of 15 minutes, and is used to describe the average minimum or background noise level.

The L_{A10} is the dBA level that is exceeded for 10 % of the time. In NSW the L_{A10} measured over a period of 10 to 15 minutes. It was until recently used to describe the average maximum noise level, but has largely been replaced by the L_{Aeq} for describing level-varying noise.

The L_{A1} is the dBA level that is exceeded for 1 % of the time. In NSW the L_{A1} may be used for describing short-term noise levels such as could cause sleep arousal during the night.

STEADY NOISE – Noise, which varies in level by 6 dBA or less, over the period of interest with the time-weighting set to "Fast", is considered to be "steady". (Refer AS 1055.1 1997)

WEIGHTED SOUND REDUCTION INDEX, R_w – This is a single number rating of the airborne sound insulation of a wall, partition or ceiling. The sound reduction is normally measured over a frequency range of 100 to 3,150 Hertz and averaged in accordance with ISO standard weighting curves (Refer AS/NZS 1276.1:1999).

Internal partition wall $R_w + C$ ratings are frequency weighted to simulate insulation from human voice noise. The $R_w + C$ is always similar in value to the STC rating value. External walls, doors and windows may be $R_w + C_{tr}$ rated to simulate insulation from road traffic noise. This is normally a lower number than the STC rating value.

WHITE NOISE – White noise is broadband random noise whose spectral density is constant across its entire frequency range. The sound power is the same for equal bandwidths from low to high frequencies. Because the higher frequency octave bands cover a wider spectrum, white noise has more energy at the higher frequencies and sounds like a hiss.

Table C.1 Modifying factor corrections
(See definitions in Section C2)

Factor	Assessment/ Measurement	When to apply	Correction[1]	Comments
Tonal noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (*ISO1996.2-2007 – Annex D*).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB [2, 3]	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. **Note:** Narrow-band analysis using the reference method in *ISO1996-2:2007, Annex C* may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10–160 Hz	Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2dB(A) positive adjustment applies for the daytime period.	2 or 5 dB[2]	A difference of 15 dB or more between C- and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.

Table C.1 Modifying factor corrections – continued

Factor	Assessment/ Measurement	When to apply	Correction[1]	Comments
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB	Adjustment to be applied for **night-time only**
Duration	Single-event noise duration may range from 1.5 min to 2.5 h.	One event in any assessment period.	0 to 20 dB(A)	The project noise trigger level may be increased by an adjustment depending on duration of noise (see Table C3).
Maximum Adjustment	Refer to individual modifying factors.	Where two or more modifying factors are indicated.	Maximum correction of 10 dB(A)[2] (excluding duration correction).	

Notes:

1. *Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.*
2. *Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.*
3. *Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.*