DAY DESIGN PTY LTD
CONSULTING ACOUSTICAL ENGINEERS

SUITE 17, 808 FOREST ROAD, PEAKHURST ABN 73 107 291 494
ACOUSTICS@DAYDESIGN.COM.AU WWW.DAYDESIGN.COM.AU P. 02 9046 3800

Environmental Noise Impact Assessment

Proposed Child Care Centre

274-276 Hector Street, Bass Hill, NSW

REPORT No
7453-1.1R Rev A

DATE ISSUED
6 October 2022

Prepared For:
Abbas Jacobs Lawyers
C/ - ES Design
Level 1, Suite 10, 1 Cooks Avenue
Canterbury NSW 2193

Attn: Mr Michel Toubia

Revision History

Report	Date	Prepared	Checked	Comment
Final	23/05/2022	Ricky Thom	Stephen Gauld	
Rev A	06/10/2022	Ricky Thom	Stephen Gauld	

Document 7453-1.1R REV A, 44 pages plus attachments

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1.0 EXECUTIVE SUMMARY

A new child care centre (The Centre) is proposed to be constructed at 274-276 Hector Street, Bass Hill, NSW (the Site). The Site is located on land zoned R2 – *Low Density Residential* under the Bankstown Local Environmental Plan (LEP) 2015.

The Site is bounded by residential premises to the north, south and west, and Hector Street to the east. Residential properties are also located on the opposite side of Hector Street to the east. The Site and nearby receptors are shown in Figure 1.

The proposal will involve the demolition of the current residences and construction of a new two storey child care centre building. The Centre will comprise of three outdoor play areas, five indoor play areas, cot room, staff room, office and meeting rooms, kitchen, amenities, and a single-level basement level car park with capacity for 42 vehicles.

The Centre will have a total capacity for 160 children, comprising of:

- 0-2 years old – 30 children;
- 2-3 years old – 50 children; and
- 3-5 years old – 80 children.

The proposed hours of operation for the Centre are:

- Monday to Friday: 7.00 am – 6.00 pm.

Nearby premises may be affected by the following noise sources at the Centre:

- Children playing both outside and inside;
- Car park and on-road traffic; and
- Mechanical plant.

City of Canterbury Bankstown requires an acoustic assessment to demonstrate that the noise impact from the Centre will not adversely affect the acoustic amenity of nearby residential premises.

Acceptable noise limits have been derived from the Association of Australasian Acoustical Consultants' (AAAC) '*Guideline for Child Care Centres Acoustic Assessment*' and the Environmental Protection Authority's (EPA) *Road Noise Policy* (RNP).

Calculations show that, provided the recommendations in Section 8.0 are implemented, the levels of noise emission from the Centre and of intrusive noise at the Centre will meet the acoustic requirements established in Section 5.5, and will therefore be acceptable.

2.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by ES Design on behalf of Abbas Jacobs Lawyers to assess the potential environmental noise impact from a proposed Child Care Centre to be constructed at 274-276 Hector Street, Bass Hill. 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
- Prepare a site plan identifying the development and nearby noise sensitive locations
- Quantify noise emissions from the proposed Child Care Centre
- Calculate the level of noise emission, taking into account building envelope transmission loss, screen walls and distance attenuation
- Provide recommendations for noise control; and,
- Prepare an Environmental Noise Impact Assessment Report.

3.0 SITE AND DEVELOPMENT DESCRIPTION

3.1 Site Description

The Centre is proposed to be constructed at 274-276 Hector Street, Bass Hill, NSW. The Site is located on land zoned R2 – *Low Density Residential* under the Bankstown Local Environmental Plan (LEP) 2015.

The Site currently consists of a single-storey residential dwelling at 276 Hector Street and a double-storey residential dwelling with two sheds in the backyard at 274 Hector Street. Site access is via Hector Street.

The Site is bounded by residential premises to the north, south and west, and Hector Street to the east. Residential properties are also located on the opposite side of Hector Street to the east. The Site and nearby receptors are shown in Figure 1.

The nearest noise sensitive receptors to the site are also shown in Figure 1, and are presented below in Table 1.

Table 1 Noise Sensitive Receptors

Receptor and Type	Address	Receptor Location	Direction from site
R1 – Residential	1 Doust Street	Rear Yard	North
R2 – Residential	272 A Hector Street	Ground Floor, Side (Southern) Window	North
R3a – Residential	272 Hector Street	Ground Floor, Side (Southern) Window	North
R3b – Residential		Ground Floor, Front (Eastern) Façade	
R4 – Residential	271 Hector Street	Ground Floor, Front (Western) Façade	East
R5a – Residential	278-280 Hector Street	Ground Floor, Front (Eastern) Façade	South
R5b – Residential		Ground Floor, Side (Northern) Façade	
R5c – Residential		Ground Floor, Side (Northern) Façade	
R6 – Residential	1/45A Robertson Road	Ground Floor, Rear (Eastern) Façade	West
R7a – Residential	43 Robertson Road	Ground Floor, Rear (Eastern) Façade	West
R7b – Residential		First Floor, Rear (Eastern) Facade	

As the noise sources on the Site are at varying distances from the receptors, specific distances between each noise source and receptor are used in all calculations. All distances are based upon the architectural drawings prepared by ES Design dated 29 September 2022.

Figure 1 - Location Plan - 274–276 Hector Street, Bass Hill, NSW

3.2 Development Description

The proposal will involve the demolition of the two existing residences and the construction of a new two storey child care centre with single-level basement car park, to be used as a Child Care Centre for up to 160 children.

The Centre is proposed to include three outdoor play areas, five indoor play areas, cot room, staff room, office and meeting rooms, kitchen, amenities, and a single-level basement level car park with capacity for 42 vehicles, with driveway access via Hector Street.

The proposed layout of the Centre can be seen in the architectural drawings prepared by ES Design dated 29 September 2022 and attached as Appendix C.

The proposed hours of operation for the Centre are:

- Monday to Friday: 7.00 am – 6.00 pm.

The Centre will have a total capacity for 160 children, comprising of:

- 0-2 years old – 30 children;
- 2-3 years old – 50 children; and
- 3-5 years old – 80 children.

4.0 MEASURED NOISE LEVELS

Noise survey instrumentation used in this assessment is listed in Appendix A.

Noise descriptors used in this assessment include:

L_{Aeq} The equivalent continuous noise level is the A weighted sound pressure level, energy averaged over a period of time. 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 noise level events. Many studies show that human reaction to level-varying sounds tends to relate closely to the L_{Aeq} noise level.

L_{90} 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).

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

4.1 Measured Ambient Noise Levels

The background noise level should be measured at a location most representative of the potentially affected receptors, in the absence of any noise sources that may be associated with the proposed development.

As specified in Section 3.1 "Background Noise Monitoring" of the AAAC's *'Guideline for Child Care Centre Acoustic Assessment'*, where a consultant is unable to measure the background noise level at the most affected residential receiver location, the consultant *'shall select another suitable and equivalent location. This measured representative noise environment should be used to establish relevant criteria for all sensitive receivers.'*

It was not considered feasible for Day Design to gain access and measure the background noise levels at all 11 potentially affected receiver locations around the site (*access to all seven properties to conduct simultaneous measurements would be required*). During our site inspection it was determined that the potentially *most affected sensitive receiver locations* are 'R2' and 'R3' to the north and 'R5' to the south of the proposed Centre. Therefore, a suitable and equivalent location - Location 'A' (see below) was selected to represent *the most affected sensitive receivers*. This measured representative noise environment has been used to establish the relevant criteria for all other sensitive receivers.

Day Design notes that the background noise in the area is mainly influenced by local fauna and some neighbourhood noises (pets, people talking and occasional yard work).

An environmental noise monitor was placed in the rear yard of 276 Hector Street, Bass Hill, NSW, from Monday 11 April to Thursday 21 April 2022, to determine the Rating Background Level. The monitor was installed in the centre of the backyard of 276 Hector Street (Location 'A'), at a height of approximately 1.5 metres above ground level.

The background noise level at Location 'A' is considered to be representative of the noise levels at other nearby receptors to the north and south which are exposed to similar local noise sources.

As the Centre is not proposed to operate on weekends, ambient noise levels measured on Saturday 16 and Sunday 17 April 2022, have been excluded from the assessment period.

The results of the background noise survey at Location 'A' are shown in the attached Appendix B, and below in Table 2.

Table 2 Ambient Background Levels – 276 Hector Street, Bass Hill, NSW

Noise Measurement Location	**Time Period** ***11 – 21/04/2022***	**L_{90} Rating Background Level**
Location 'A'- Rear Yard, 276 Hector Street	Shoulder Period (6:30 am – 7 am)	**41**
	Day (7 am to 6 pm)	**40**

Meteorological conditions during the measurement surveys typically consisted of overcast and clear skies with temperatures ranging from 11°C to 29°C. Periods of rainfall were recorded during the evenings of Wednesday 13 April and Tuesday 19 April. Noise level measurements adversely affected by weather have been removed from the above calculations. As such, noise level measurements are considered reliable and representative of the background noise levels at all nearby receptor locations.

4.2 Measured Road Traffic Noise Levels

The proposed development is affected by road traffic noise from Hector Street which carries low traffic volumes.

The weekday $L_{Aeq,\ 1\ hour}$ traffic noise levels measured at Location 'A' are shown below in Table 3.

Table 3 Measured $L_{Aeq,\ 1\ hour}$ Road Traffic Sound Pressure Levels – Location 'A'

Time	$L_{Aeq,\ 1\ hour}$ Road Traffic Noise (dBA)						
	Tues 12/04	Wed 13/04	Thurs 14/04	Fri 15/04	Mon 18/04	Tues 19/04	Wed 20/04
7 – 8 am	51	49	49	46	45	48	*59*[1]
8 – 9 am	51	48	49	45	49	48	*60*[1]
9 – 10 am	50	50	51	47	46	48	*68*[1]
10 – 11 am	50	54	53	52	53	47	*61*[1]
11 – 12 pm	51	51	51	50	48	48	50
12 – 1 pm	52	*67*[1]	55	48	45	54	50
1 – 2 pm	48	49	50	50	48	49	50
2 – 3 pm	53	51	53	48	47	*61*[1]	50
3 – 4 pm	52	54	50	50	50	50	48
4 – 5 pm	52	*56*	48	49	*61*[1]	51	48
5 – 6 pm	51	54	*60*[1]	51	50	*57*[1]	50

Based on the long-term measurements at Location 'A', and the calculation method show in Appendix B, Section B3 of the NSW Road Noise Policy for the 'overall $L_{Aeq,\ (1\ hour)}$', the calculated day time traffic noise level is 52 dBA at Location 'A'. These levels are used in the calculation of traffic noise intrusion for the existing site within Section 7.0 of this report.

[1] *We are of the opinion that noise levels shown in italics are not the result of local traffic noise, and have therefore been excluded from this assessment. It is likely that the noise measured during this period originated closer to the monitor position than Hector Street, and is likely attributed to the residents living in the surrounding premises, pets associated with the surrounding premises and/or local fauna.*

5.0 ACOUSTIC CRITERIA

This Section presents the noise guidelines applicable to this proposal and establishes the project noise trigger levels.

5.1 City of Canterbury Bankstown - Development Control Plan

City of Canterbury Bankstown in its Bankstown Development Control Plan (DCP) 2015, Part B6 'Child Care Centres' Section 5 – Acoustic Privacy and Management outlines the following requirements in relation to acoustics:

Objective

The objectives are:

a) *To have child care centres that do not adversely impact on the residential amenity of adjoining dwellings and the surrounding area.*

b) *To have development that installs appropriate acoustic privacy measures which are compatible with the prevailing character of residential areas.*

c) *To have the ongoing operation and management of child care centres maintain residential amenity.*

Development controls

The development controls to achieve the objectives are:

Acoustic privacy

1. *Air conditioning, mechanical ventilation or any other continuous noise source must not exceed the ambient level at any specific boundary by more than 5 dB(A).*
2. *The location and design of child care centres must consider the projection of noise from various activities to avoid any adverse impacts on the residential amenity of adjoining land.*

   For the purpose of this clause, Council requires development applications to submit an Acoustic Report prepared by a suitably qualified acoustic consultant to determine:

   a) *Existing noise levels at the identified sensitive receiver locations;*

   b) *Likely noise levels to emanate from the child care centre at the identified sensitive receiver locations;*

   c) *Whether the development must apply measures to ensure the noise of the children playing in outdoor areas does not exceed 10 dB(A) above the background noise level;*

   d) *Whether the location and setbacks of the development are sufficient to protect the acoustic privacy of adjacent dwellings;*

   e) *Whether the location of outdoor areas should avoid living areas and bedrooms of adjacent dwellings;*

f) Whether the development must install certain noise attenuation measures to protect the acoustic privacy of adjacent dwellings.

The Acoustic Report must measure the noise readings over a 15 minute period and must provide details of all modelling assumptions including source noise data, noise monitoring positions, receiver heights and locations, prevailing meteorological conditions during the monitoring, confirmations of the methodology adopted along with a copy of the model input and output data.

3. *The maximum height for the noise for noise attenuation walls and fences along the boundary of an allotment is 2 meters.*

Hours of operation

4. *Council may limit the hours of operation of child care centres to 7.00 am to 6.00 pm Monday to Friday*

Management plans

5. *Council must require the operator of a child care centre in Zone R2 Low Density residential … to organise and chair a Neighbourhood Liaison Committee. The purpose of the Committee is for the operator and neighbours to resolve any issues, such as traffic and noise, arising from the operation of the child care centre. The operation of the Committee must ensure:*

   a) The membership of the Neighbourhood Liaison Committee must include residents who live next to and opposite the child care centre.

   b) The neighbourhood Liaison Committee must meet at least four times during the first 24 months of the child care centre operating.

   c) The operator of the child care centre must forward the meeting minutes to Committee members.

   d) The operator of the child care centre may forward the meeting minutes to Council for information purposes.

   e) The operator of the child care centre may terminate the Committee once it meets at least four times during the first 24 months of the child care centre operating, or may choose to extend the functions of the Committee over a longer period of time.

5.2 NSW Department of Planning, Industry and Environment

5.2.1 State Environmental Planning Policy - (Educational Establishments and Child Care Facilities) 2017

The NSW Department of Planning, Industry and Environment (DoPIE) published the State Environmental Planning Policy (SEPP) – (Educational Establishments and Child Care Facilities) 2017 – issued under the Environmental Planning and Assessment Act 1979 – aims to facilitate educational establishments and early education and care facilities across the State.

A key aim of the SEPP is to establish consistent State-wide assessment requirements and design considerations for educational establishments and early education and care facilities to improve the quality of infrastructure delivered and to minimise impacts on surrounding areas. Clause 26 of the SEPP states the following with regard to Local Council Development Control Plans that contain specific requirements, standards or controls related to Child Care Centres:

> *'Clause 26: Centre-based child care facility—development control plans*
>
> *(1) A provision of a development control plan that specifies a requirement, standard or control in relation to any of the following matters (including by reference to ages, age ratios, groupings, numbers or the like, of children) does not apply to development for the purpose of a centre-based child care facility:*
>
> *(a) operational or management plans or arrangements (including hours of operation),*
>
> *(b) demonstrated need or demand for child care services,*
>
> *(c) proximity of facility to other early childhood education and care facilities,*
>
> *(d) any matter relating to development for the purpose of a centre-based child care facility contained in:*
>
> *(i) the design principles set out in Part 2 of the Child Care Planning Guideline, or*
>
> *(ii) the matters for consideration set out in Part 3 or the regulatory requirements set out in Part 4 of that Guideline (other than those concerning building height, side and rear setbacks or car parking rates).*
>
> *(2) This clause applies regardless of when the development control plan was made."*

5.2.2 NSW DoPIE – Child Care Planning Guideline

The NSW DoPIE published the Child Care Planning Guideline (CCPG) in August 2017 as a supplement to the SEPP (Educational Establishments and Child Care Facilities) 2017.

The SEPP states that "*a consent authority must take into consideration this Guideline* (CCPG) *when assessing a development application (DA) for a centre-based child care facility.*" The SEPP also determines the Guideline "*will take precedence over a Development Control Plan (DCP), with some exceptions, where the two overlap in relation to a child care facility."*

The Guideline was introduced to *'assist industry to deliver early childhood education facilities that are of the highest standards'* and *'to align NSW planning controls with the National Quality Framework for early education and care, creating more certainty for developers and operators seeking service approval'.*

Section 3, *Matters for Consideration*, Subsection 3.5 Visual and acoustic Privacy, contains the following for consideration:

Objective: To minimise the impact of child care facilities on the acoustic privacy of neighbouring residential developments.

C23

A new development, or development that includes alterations to more than 50 percent of the existing floor area, and is located adjacent to residential accommodation should:

- *provide an acoustic fence along any boundary where the adjoining property contains a residential use. An acoustic fence is one that is a solid, gap free fence*
- *ensure that mechanical plant or equipment is screened by solid, gap free material and constructed to reduce noise levels eg acoustic fence, building or enclosure.*

C24

A suitably qualified acoustic professional should prepare an acoustic report which will cover the following matters:

- *Identify an appropriate noise level for a child care facility located in residential and other zones*
- *Determine an appropriate background noise level for outdoor play area during times they are proposed to be in use*
- *Determine the appropriate height of any acoustic fence to enable the noise criteria to be met.*

Subsection 3.6 Noise and air pollution, contains the following for consideration:

'Considerations

Objective: To ensure that outside levels on the facility are minimized to acceptable levels.

C25

Adopt design solutions to minimise the impacts of noise, such as:

- *creating physical separation between buildings and the noise source*
- *orienting the facility perpendicular to the noise source and where possible buffered by other uses*
- *using landscaping to reduce the perception of noise*
- *limiting the number and size of openings facing noise sources*
- *using double or acoustic glazing, acoustic louvres or enclosed balconies (wintergardens)*
- *using materials with mass and/or sound insulation or absorption properties, such as solid balcony balustrades, external screens and soffits*
- *locating cot rooms, sleeping areas and play areas away from external noise sources.'*

C26

An acoustic report should identify appropriate noise levels for sleeping areas and other non play areas and examine impacts and noise attenuation measures where a child care facility is proposed in any of the following locations:

- *on industrial zoned land*
- *where the ANEF contour is between 20 and 25, consistent with AS2021:2000*
- *along a railway or mass transit corridor, as defined by State Environmental Planning Policy (Infrastructure) 2007*
- *on a major road or busy road*
- *other land that is impacted by substantial external noise.*

5.3 AAAC – Guideline for Child Care Centres Acoustic Assessment

The Association of Australasian Acoustical Consultants (AAAC) first published the *Guideline for Child Care Centre Acoustic Assessment* (Guideline), in May 2008. The guideline was updated in October 2013 and again in September 2020 to assist both AAAC members and local Councils to assess the noise impact from proposed child care centres both accurately and fairly (see www.aaac.org.au).

Section 3 of the September 2020 AAAC Guideline states the following in relation to noise generation from child care centres, while Section 5.0 states the following in relation to noise impact on children:

'3.2 Criteria - Residential Receptors

3.2.1 Outdoor Play Area

The noise impact from children at play in a child care centre differs from the domestic situation in that it is a business carried out for commercial gain, the number of children can be far greater than in a domestic situation and the age range of the children at the centre does not significantly vary over time as it would in a domestic situation. However, the noise from children is vastly different, in both character and duration, from industrial, commercial or even domestic machine noise. The sound from children at play, in some circumstances, can be pleasant, with noise emission generally only audible during the times the children play outside. Night time, weekend or public holiday activity is not typical and child care centres have considerable social and community benefit.

Base Criteria *– With the development of child care centres in residential areas, the background noise level within these areas can at certain times, be low. Thus, a base criterion of a contributed* $L_{eq,15min}$ *45 dB(A) for the assessment of outdoor play is recommended in locations where the background noise level is less than 40 dB(A).*

Background Greater Than 40 dB(A) *– The contributed* $L_{eq,15min}$ *noise level emitted from an outdoor play and internal activity areas shall not exceed the background noise level by more than 5 or 10 dB at the assessment location, depending on the usage of the outdoor play area. AAAC members regard that a total time limit of approximately 2 hours outdoor play per morning and afternoon period should allow an emergence above the background of 10 dB (ie background +10 dB if outdoor play is limited to 2 hours in the morning and 2 hours in the afternoon).*

Up to 4 hours (total) per day *– If outdoor play is limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed* $L_{eq,15min}$ *noise level emitted from the outdoor play shall not exceed the background noise level by more than 10 dB at the assessment location.*

More than 4 hours (total) per day *– If outdoor play is not limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed* $L_{eq,\ 15min}$ *noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.*

The assessment location is defined as the most affected point on or within any residential receiver property boundary. Examples of this location may be:

- *1.5 m above ground level;*
- *On a balcony at 1.5 m above floor level;*
- *Outside a window on the ground or higher floors.*

3.2.2 Indoor Play Area, Mechanical Plant, Pick up and Drop off

The cumulative $L_{eq,\ 15\ minute}$ noise emission level resulting from the use and operation of the child care centre, with the exception of noise emission from outdoor play discussed above, shall not exceed the background noise level by more than 5 dB at the assessment location as defined above. This includes the noise emission resulting from:

- *Indoor play;*
- *Mechanical plant;*
- *Drop off and pick up;*
- *Other activities/operations (not including outdoor play).*

3.2.3 Sleep Disturbance

The noise impact of staff arrivals, setup, cleaning or other on-site activities prior to 7 am or during night-time hours should be assessed at nearby residential premises. The L_{Amax} noise level emitted from vehicles arriving and parking, depending on the requirements of the state or territory where the centre is located shall not exceed the background noise level by more than 15 dB outside the nearest habitable room window.'

Section 5 of the AAAC Guideline states the following in relation to external noise impacts on children within Child Care Centres:

'***5.0 External Noise Impact on Children***

For proposals that are located within 60 metres of an arterial road, railway line, industry or within close proximity to an airport, a noise intrusion assessment should be submitted with the development application.

5.1 Road, Rail Traffic and Industry

The $L_{Aeq,1hr}$ noise level from road traffic, rail or industry at any location within the outdoor play or activity area during the hours when the Centre is operating should not exceed 55 dB(A).

The $L_{Aeq,1hr}$ noise level from road traffic, rail or industry at any location within the indoor activity or sleeping areas of the Centre during the hours when the centre is operating shall be capable (ie with doors and/or windows closed) of achieving 40 dB(A) within indoor activity areas and 35 dB(A) in sleeping areas.'

5.4 NSW Environment Protection Authority – NSW Road Noise Policy

The NSW Road Noise Policy (RNP), 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 4.

Table 4 Road Traffic Noise Assessment Criterion - Residential

Road Category	Type of project/land use	Assessment Criteria – dB(A) Day (7 am – 10 pm)
Local roads	6. Existing residences affected by **additional traffic** on existing local roads generated by land use developments	$L_{Aeq,\ (1\ hour)}$ 55 (external)

5.5 Project Noise Trigger Levels

Based on the measured background noise levels and the relevant planning instruments and legislation, the Project Noise Trigger Levels at each receptor location are as follows:

5.5.1 Residential Receivers

For Residential Receptors 'R1' to 'R7'– based on the measured background noise levels at Location 'A' and the Bankstown DCP 2015 –

- (40 + 10 =) **50 dBA** $L_{eq,\ 15\ minute}$ for outdoor play;
- (40 + 5 =) **45 dBA** $L_{eq,\ 15\ minute}$ for all other noise sources including car park, mechanical plant and indoor play areas; and
- (41 + 5 =) **46 dBA** for staff arriving at the Centre during the early morning shoulder period.

The assessment location is defined as the most affected point on or within any residential receiver property boundary. Examples of this location may be:

- 1.5 m above ground level;
- On a balcony at 1.5 m above floor level;
- Outside a window on the ground or higher floors.

5.5.2 Sleep Disturbance

Consideration has been given to sleep disturbance caused by noise generated from staff arriving prior to 7 am, and parking within the basement level car park.

The following criteria is applied at the residential receptors closest to the designated staff parking spaces in the basement level car park, 'R3b', 'R4' and 'R5a', during the early morning shoulder period of 6.30 am to 7 am. Compliance at the most affected receptors will ensure compliance at all other potentially affected receptor locations:

For residential facades 'R3b', 'R4' and 'R5a'– based on the measured background noise levels at Location 'A' –:

- (41 + 15 =) **56 dBA** L_{Amax} at the closest affected habitable room window of the residential premises between 6.30 am and 7 am.

5.5.3 On-Road Traffic Noise Criterion

The following criterion will be applied at 1 metre from the most affected residential façades 'R3b', 'R4' and 'R5a', for on – road traffic noise. Compliance at the most affected receptors will ensure compliance at all other potentially affected receptor locations further away from Hector Street:

- **55 dBA** (external) $L_{Aeq,\ 1\ hour}$ between 7 am and 6 pm.

5.5.4 Noise Intrusion Criteria

Road Traffic Noise Intrusion - in accordance with the AAAC Guideline:

- Internal traffic levels within sleeping areas (Cot Rooms) of the Centre should not exceed $L_{Aeq,\ 1\ hour}$ 35 dBA during operating hours.
- Internal traffic noise levels within indoor activity areas of the Centre should not exceed $L_{Aeq,\ 1\ hour}$ 40 dBA during operating hours.
- External traffic noise levels in any outdoor play or activity area of the Centre should not exceed $L_{Aeq,\ 1\ hour}$ 55 dBA during operating hours.

6.0 CHILD CARE CENTRE NOISE EMISSION

The main sources of noise from the Centre will be as follows:

- Children playing both outside and inside;
- Cars entering and exiting the car park; and
- Mechanical plant serving the Centre.

Noise modelling is based on the architectural drawings prepared by ES Design dated 29 September 2022 and attached as Appendix C.

6.1 Indoor and Outdoor Play Areas

The AAAC has presented a range of A-weighted sound power levels per child in Table 1 of its *'Guideline for Child Care Centre Acoustic Assessment'.* The sound power levels of each group are presented in Table 5 and have been adopted to assess noise emissions from children in this assessment.

The sound power levels for each group are presented in Table 5 and used in this assessment.

Table 5 L_{eq} Sound Power Levels - Children Engaging in Active Play

Number and Age of Children	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
10 children, 0 to 2 years	**78**	54	60	66	72	74	71	67	64
10 children, 2 to 3 years	**85**	61	67	73	79	81	78	74	70
10 children, 3 to 5 years	**87**	64	70	75	81	83	80	76	72

In the notes to Table 1 of the AAAC's *Guideline*, where passive/quiet activities are engaged in by children, the noise generated by children is generally 6 dB lower than active play.

6.2 Car Park Noise Emission

Based on the RTA's 'Guide to Traffic Generating Developments' prediction of 0.8 peak (morning 7 am-9 am) vehicle trips per child for Child Care Centres (Long-day care), we have assumed, as a worst-case scenario, a flow of cars equivalent to 128 cars in 1 hour arriving or leaving the Centre in the morning peak. This is equivalent to 32 vehicle trips in a 15-minute period.

For the assessment of sleep disturbance and staff arriving during the early morning shoulder period, we have assumed that four staff vehicles will arrive at the Centre between 6.30 am and 7 am and park in the designated staff parking spaces in the basement level car park.

For the assessment of staff leaving the Centre between 6.00 pm and 6.30 pm, we have assumed that four staff vehicles will depart the site within a single 15-minute period.

For the assessment of vehicular activity associated with the car park area, we have assumed vehicles will travel at a rate of 20 km/h as they descend or ascend the entry or exit driveway respectively, and will travel at a rate of 10 km/h as they manoeuvre within the car park. For additional noise generated by on-road traffic, we have assumed vehicles will travel at a rate of 50 km/h as they approach or leave the site.

The Sound Exposure Level[2] (SEL) and $L_{AF,\,max}$ sound power level and spectra of vehicle noise is shown below in Table 6 and is based on previous measurements by Day Design.

Table 6 SEL & L_{Amax} Sound Power Levels – Car Park Noise

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**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 driving downhill at approximately 20 km/h	**87**	99	88	84	81	82	79	80	76
SEL of car driving uphill at approximately 20 km/h	**90**	105	98	89	85	85	80	79	71
SEL of car drive-by at approximately 50 km/h	**97**	99	97	94	93	95	87	77	70
L_{Amax} of car entering basement car park	**92**	98	92	90	88	88	83	80	76

[2] *SEL is the total sound energy of a single noise event condensed into a one second duration.*

6.3 Mechanical Plant

The mechanical plant, including air conditioning condensers, kitchen and bathroom exhaust fans, lift motor and car park exhaust fan have not been selected at this stage. Therefore, a preliminary noise assessment will be based on typical units for the size of the development, with sound power levels from typical units being used.

The air conditioning condensers are assumed to be located on the northern side of the building, within the landscape zone area adjacent to the reception. The lift motor for the development is assumed to be located within a pit at the bottom of the proposed lift shaft.

We have assumed that the kitchen and toilet exhaust fans will be ducted through the façades of the development. The car park exhaust fan has been assumed to be ducted to the riser adjacent to the lift shaft.

The assumed locations of these items of mechanical plant can be seen within the marked up architectural drawings attached as Appendix D.

Sound power levels used in the calculation of the noise contribution from the mechanical plant are shown in Table 7.

Table 7 $L_{eq,\ 15\ minute}$ Sound Power Levels – Mechanical Plant

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Small kitchen exhaust fan[3]	**60**	61	67	62	54	54	50	45	39
Small exhaust fan (toilet)[4]	**60**	51	47	50	53	59	43	36	31
Hydraulic Lift Motor[5]	**63**	59	61	55	59	58	56	52	48
Medium (double fan) Outdoor Condenser Unit[6]	**69**	55	55	61	67	64	62	59	45
Medium condenser units *3 off*	**74**	60	60	66	73	69	67	64	54
Car Park Exhaust Fan[7]	**75**	73	72	70	76	70	64	54	46

We recommend a detailed analysis be carried out once the mechanical plant is selected and locations are finalised, prior to the issue of a Construction Certificate.

[3] *Spectral sound power level based on Fantech CPD01254FSC.*
[4] *Spectral sound power level based on Fantech TD-500/150 SIL.*
[5] *Spectral sound power level based on a residential lift system previously measured by Day Design.*
[6] *Spectral sound power level based on Daikin RZQ140LV1 outdoor condenser unit.*
[7] *Spectral sound power level based on Fantech RDE10010DP6/10 – Downflow Discharge Axial Fan.*

6.4 Predicted Noise Levels

Knowing the sound power level of a noise source (See Table 5 to Table 7), the sound pressure level (as measured with a sound level meter) can be calculated at a remote location using suitable formulae to account for distance losses, sound barriers, etc.

Where applicable, calculations include reductions for the acoustic screening provided by fences and the proposed Centre itself. Based upon the architectural drawings prepared by ES Design dated 29 September 2022 and attached as Appendix C, the following solid boundary heights are assumed for the Centre:

- 2.6-metre-high fence along the western boundary of the outdoor play area;
- 2.6-metre-high fence along the southern boundary of the outdoor play area, from the eastern façade to the western boundary of the Site;
- 1.8-metre-high fence along the northern boundary of the Site, from the eastern façade to the western boundary;
- 1.5-metre- high fence along the northern and southern boundaries of the Site, from the eastern boundary to the eastern façade;
- 1.39-metre-high balustrade around the perimeter of the first floor 2-3 Year Old outdoor play area; and
- No solid fence along the eastern boundary of the Site.

Calculations of noise emission from the indoor play area include reductions for operable glazing in the façade. For the purposes of our calculations, we have assumed all operable glazing to be of a standard construction (5 mm glass) and to be open (50% of the window area).

A source height level of 1 metre above floor level has been used for children of all age groups. As a worst-case scenario, noise emission has been modelled with all children engaged in simultaneous outdoor play, as discussed in Section 6.4.1.

Noise levels at ground floor level are calculated to the nearest most reasonably affected point 3 metres inside the property boundary within the yards of receptor location ‘R1’, and to the nearest most reasonably affected window/façade of receptor locations ‘R2’, ‘R3a’, ‘R3b’, ‘R4’, ‘R5a’, ‘R5b’, ‘R5c’, ‘R6’, ‘R7a’ and ‘R7b’.

Table 8 and Table 9 show the predicted noise levels at the residential receptors from the activities discussed previously, during the day periods. Table 10 shows the predicted noise levels at the residential receivers from staff vehicles arriving at the site during the morning shoulder period.

6.4.1 Outdoor Play Area Noise Levels

The following formula, which is well known to acoustic professionals, was used to calculate noise levels at the receptor locations:

$$L_p = L_w + 10\log(n/10) - 20\log(d) - 8 - B$$

Where: L_p = Sound Pressure Level at receptor

L_w = Sound Power Level for group of 10 children

n = number of children

d = distance from children playing to receptor

B = acoustic reduction due to barrier

The noise prediction was therefore determined by spacing the 150 children across the Centre's outdoor play areas as follows:

- Ground Floor 0-2 Year Old Outdoor Play Area = 3 groups of 10 x 0-2 year olds;
- Ground Floor 3-5 Year Old Outdoor Play Area = 8 groups of 10 x 3-5 year olds; and
- First Floor 2-3 Year Old Outdoor Play Area = 5 groups of 10 x 2-3 year olds.

The approximate locations of the noise sources (children) used for the assessment of the outdoor play area are shown in the attached Appendix D. All noise sources in each outdoor play area shown in Appendix D are assessed as being outside at the same time to achieve the overall worst case predicted noise levels at each of the receiver locations.

The $L_{eq,\ 15\ minute}$ noise levels at all receptor locations for children engaged in outdoor play are calculated to be as shown in Table 8.

Table 8 Predicted $L_{eq,\ 15\ minute}$ Noise Levels – Outdoor Play

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – Rear Yard, 1 Doust Street	51	50	**No (+ 1 dB)**
R2 – Ground Floor, Side (Southern) Window, 272A Hector Street	54	50	**No (+ 4 dB)**
R3a – Ground Floor, Side (Southern) Window, 272 Hector Street	44	50	Yes
R3b – Ground Floor, Front (Eastern) Façade, 272 Hector Street	38	50	Yes
R4 – Ground Floor, Front (Western) Façade, 271 Hector Street	30	50	Yes
R5a – Ground Floor, Front (Eastern) Façade, 278-280 Hector Street	39	50	Yes
R5b – Ground Floor, Side (Northern) Façade, 278-280 Hector Street	53	50	**No (+3 dB)**
R5c – Ground Floor, Side (Northern) Façade, 278-280 Hector Street	51	50	**No (+1 dB)**
R6 – Ground Floor, Rear (Eastern) Façade, 1/45A Robertson Road	48	50	Yes
R7a – Ground Floor, Rear (Eastern) Façade, 43 Robertson Road	47	50	Yes
R7b – First Floor, Rear (Eastern) Façade, 43 Robertson Road	53	50	**No (+3 dB)**

The predicted cumulative L_{eq} levels of noise from children playing outdoors are summarised in Table 8 at the receptors. The predicted levels of noise at receptor locations 'R3a', 'R3b', 'R4', 'R5a', 'R6' and 'R7a' complies with the criteria in Section 5.5 of this report. However, the predicted levels of noise at receptor locations 'R1', 'R2', 'R5b', 'R5c' and 'R7b' exceed the criteria in Section 5.5 of this report, and will therefore require noise controls, as recommended in Section 8.0.

6.4.2 Cumulative Noise Level - Indoor Play Area, Car Park and Mechanical Plant

The predicted worst case cumulative $L_{eq,\ 15minute}$ noise levels at all receptor locations are calculated to be as shown in Table 9.

Table 9 Predicted Cumulative $L_{eq,\ 15\ minute}$ Noise Levels – Indoor Play, Mechanical Plant & Car Park

Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – Rear Yard, 1 Doust Street			
- Indoor play areas	39		
- Car park	<20		
- Mechanical	23		
Cumulative Noise Level	39	45	Yes
R2 – Ground Floor, Side (Southern) Window, 272A Hector Street			
- Indoor play areas	40		
- Car park	<20		
- Mechanical	28		
Cumulative Noise Level	40	45	Yes
R3a – Ground Floor, Side (Southern) Window, 272 Hector Street			
- Indoor play areas	50		
- Car park	<20		
- Mechanical	44		
Cumulative Noise Level	51	45	**No (+6 dB)**
R3b – Ground Floor, Front (Eastern) Façade, 272 Hector Street			
- Indoor play areas	28		
- Car park	<20		
- Mechanical	43		
Cumulative Noise Level	43	45	Yes
R4 – Ground Floor, Front (Western) Façade, 271 Hector Street			
- Indoor play areas	27		
- Car park	33		
- Mechanical	34		
Cumulative Noise Level	38	45	Yes

Table 9 Predicted Cumulative $L_{eq,\ 15\ minute}$ Noise Levels – Indoor Play, Mechanical Plant & Car Park - Continued

Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R5a – Ground Floor, Front (Eastern) Façade, 278-280 Hector Street			
- Indoor play area	49		
- Car park	29		
- Mechanical	33		
Cumulative Noise Level	49	45	**No (+4 dB)**
R5b – Ground Floor, Side (Northern) Façade, 278-280 Hector Street			
- Indoor play area	56		
- Car park	<20		
- Mechanical	28		
Cumulative Noise Level	56	45	**No (+11 dB)**
R5c – Ground Floor, Side (Northern) Façade, 278-280 Hector Street			
- Indoor play area	49		
- Car park	<20		
- Mechanical	27		
Cumulative Noise Level	49	45	**No (+4 dB)**
R6 – Ground Floor, Rear (Eastern) Façade, 1/45A Robertson Road			
- Indoor play area	37		
- Car park	<20		
- Mechanical	26		
Cumulative Noise Level	37	45	Yes
R7a – Ground Floor, Rear (Eastern) Façade, 43 Robertson Road			
- Indoor play area	38		
- Car park	<20		
- Mechanical	22		
Cumulative Noise Level	38	45	Yes

Table 9 Predicted Cumulative $L_{eq,\ 15\ minute}$ Noise Levels – Indoor Play, Mechanical Plant & Car Park - Continued

Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R7b – First Floor, Rear (Eastern) Façade, 43 Robertson Road			
- Indoor play area	41		
- Car park	<20		
- Mechanical	28		
Cumulative Noise Level	41	45	Yes

The predicted cumulative L_{eq} levels of noise from the Centre are summarised in Table 9 at the receivers. The predicted levels of noise at receiver location 'R1', 'R2', 'R3b', 'R4', 'R6', 'R7a' and 'R7b' complies with the criteria in Section 5.5 of this report. However, the predicted levels of noise at receptor locations 'R3a', 'R5a', 'R5b' and 'R5c' exceeds the criteria in Section 5.5 of this report, and will therefore require noise controls, as recommended in Section 8.0.

6.4.3 Use of the Driveway by Staff During the Early Morning Shoulder Period

The predicted worst case cumulative $L_{eq,\ 15minute}$ noise levels at all receptor locations from staff arriving at the Centre during the early morning shoulder period are calculated to be as shown in Table 10.

Table 10 Predicted $L_{eq,\ 15\ minute}$ Noise Levels – Staff Arriving at Site

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
Early Morning Shoulder Period – 6.30 am to 7 am			
R1 – Rear Yard, 1 Doust Street	<20	46	Yes
R2 – Ground Floor, Side (Southern) Window, 272A Hector Street	<20	46	Yes
R3a – Ground Floor, Side (Southern) Window, 272 Hector Street	<20	46	Yes
R3b – Ground Floor, Front (Eastern) Façade, 272 Hector Street	<20	46	Yes
R4 – Ground Floor, Front (Western) Façade, 271 Hector Street	21	46	Yes
R5a – Ground Floor, Front (Eastern) Façade, 278-280 Hector Street	27	46	Yes
R5b – Ground Floor, Side (Northern) Façade, 278-280 Hector Street	<20	46	Yes
R5c – Ground Floor, Side (Northern) Façade, 278-280 Hector Street	<20	46	Yes
R6 – Ground Floor, Rear (Eastern) Façade, 1/45A Robertson Road	<20	46	Yes
R7a – Ground Floor, Rear (Eastern) Façade, 43 Robertson Road	<20	46	Yes
R7b – First Floor, Rear (Eastern) Façade, 43 Robertson Road	<20	46	Yes

As summarised in Table 10 the predicted level of noise from the use of the driveway by staff arriving at the Centre during the early morning should period complies with the criteria established in Section 5.5 for all receptor locations, and is therefore considered acceptable.

6.4.4 Sleep Disturbance

It is proposed that the Centre will accept children from 7 am. Four staff members are assumed to arrive prior to 7 am, to prepare for the arrival of the children, with more staff and parents arriving after 7 am. In order to assess the potential for sleep disturbance from staff vehicle activity, we have assumed that four staff vehicles will arrive between 6.30 am and 7 am.

As shown in the architectural drawings prepared by ES Design, dated 29 September 2022, and attached as Appendix C, the staff parking spaces are located on the southern side of the basement level car park, adjacent to the stairwell. As such, in our assessment of sleep disturbance we have assumed that the staff vehicles arriving between 6.30 am and 7 am will park in the designated staff parking spaces in the basement level car park.

The calculated L_{AFmax} noise levels at the nearest affected residential receptor locations to the car park are shown in Table 11 below.

Table 11 Calculated L_{AFmax} Noise Levels – Sleep Disturbance

Description	Calculated Noise Level - L_{AFmax} (dBA) at Receptor Locations		
	R3b	**R4**	**R5a**
Cars Pulling into Driveway	45	54	53
Acceptable Noise Limit	**56**	**56**	**56**
Compliance	Yes	Yes	Yes

As seen in Table 11, the predicted level of noise emission from staff arriving prior to 7 am will comply with the sleep disturbance criteria established in Section 5.5 at receptor locations 'R3b', 'R4' and 'R5a', and is therefore considered acceptable.

6.4.5 On-Road Traffic

The external $L_{eq,\ 1\ hour}$ noise levels at the most affected residential receiver locations 'R3b', 'R4' and 'R5a' from noise associated with on – road traffic throughout the day are calculated to be as shown below in Table 12.

Table 12 Predicted $L_{eq,\ 1\ hour}$ Noise Levels – On – Road Traffic

Receiver Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R3b – Ground Floor, Front (Eastern) Façade, 272 Hector Street	49	55	Yes
R4 – Ground Floor, Front (Western) Façade, 271 Hector Street	50	55	Yes
R5a – Ground Floor, Front (Eastern) Façade, 278-280 Hector Street	49	55	Yes

The predicted external noise levels from on – road traffic are within the noise criteria in Section 5.0, and are therefore acceptable.

7.0 NOISE INTRUSION – ROAD TRAFFIC NOISE

7.1 External Road Traffic Noise Levels – Outdoor Play Areas

The existing road traffic noise level was measured at Location 'A', at a distance of approximately 42 metres from the centre of Hector Street.

Hector Street carries low to moderate road traffic volumes. As discussed in Section 4.1, the ambient noise in the area is mainly influenced by local fauna and some neighbourhood noises (pets, people talking and occasional yard work).

Considering the above, both the GF OPA and FF OPA are predicted to be exposed to similar noise sources and, correspondingly, a similar ambient noise level - 53 dBA $L_{Aeq\ (1\ hour)}$ - as that measured at Location 'A'.

Taking into account the screening provided by the assumed sound barrier walls of the Centre (see Section 6.4 for detail) and the proposed building itself, the calculated $L_{Aeq\ (1\ hour)}$ traffic noise levels within the most affected locations of the proposed outdoor play areas are as follows:

- Centre of GF OPA = 44 dBA; and
- Centre of FF OPA = 47 dBA.

The predicted $L_{Aeq,\ 1\ hour\ (traffic)}$ noise level in the OPAs complies with the AAAC external noise limit for child care centres of $L_{eq,\ 1\ hour}$ 55 dBA, and is therefore acceptable.

7.2 Road Traffic Noise Intrusion Assessment – Cot Room

The predicted $L_{Aeq,\ 1\ hour}$ external noise level outside the eastern façade of the "COT ROOM" is 45 dBA, taking into account the screening provided by the assumed sound barrier walls of the Centre (see Section 6.4).

Up to a 10 dB reduction can be achieved from outside to inside, with windows and doors open. The calculated internal noise level within the indoor play areas is 35 dBA with doors open.

This calculated level will comply the AAAC internal noise limit of $L_{Aeq,\ 1\ hour}$ 35 dBA for sleeping areas in child care centres, and is therefore acceptable.

7.3 Road Traffic Noise Intrusion Assessment – 0-2 Year Old Indoor Play Area

The predicted $L_{Aeq,\ 1\ hour}$ external noise level outside the western façade of the 0-2 Year Old indoor play area is 30 dBA, taking into account the screening provided by the proposed Centre building itself.

Up to a 10 dB reduction can be achieved from outside to inside, with windows and doors open. The calculated internal noise level within the indoor play areas is 20 dBA with doors open.

This calculated level complies with the AAAC internal noise limit of $L_{Aeq,\ 1\ hour}$ 40 dBA for indoor activity areas in child care centres, and is therefore acceptable.

7.4 Road Traffic Noise Intrusion Assessment – 3-5 Year Old Indoor Play Areas

The predicted $L_{Aeq,\ 1\ hour}$ external noise levels outside the south and western façades of the 3-5 Year Old indoor play areas are 46 dBA and 30 dBA respectively, taking into account the screening provided by the assumed sound barrier walls of the Centre (see Section 6.4), and the proposed Centre building itself.

Up to a 10 dB reduction can be achieved from outside to inside, with windows and doors open. The calculated internal noise level within the indoor play areas is 36 dBA with doors open.

This calculated level complies with the AAAC internal noise limit of $L_{Aeq,\ 1\ hour}$ 40 dBA for indoor activity areas in child care centres, and is therefore acceptable.

7.5 Road Traffic Noise Intrusion Assessment – 2-3 Year Old Indoor Play Areas

7.5.1 Northern 2-3 Year Old Indoor Play Area

The predicted $L_{Aeq,\ 1\ hour}$ external noise levels outside the northern and western façades of the northern 2-3 Year Old indoor play area are 50 dBA and 30 dBA respectively, taking into account the screening provided by the assumed sound barrier walls of the Centre (see Section 6.4), and the proposed Centre building itself.

Up to a 10 dB reduction can be achieved from outside to inside, with windows and doors open. The calculated internal noise level within the indoor play areas is 40 dBA with doors open.

This calculated level complies with the AAAC internal noise limit of $L_{Aeq,\ 1\ hour}$ 40 dBA for indoor activity areas in child care centres, and is therefore acceptable.

7.5.2 Southern 2-3 Year Old Indoor Play Area

The predicted $L_{Aeq,\ 1\ hour}$ external noise levels outside the eastern and southern façades of the southern 2-3 Year Old indoor play area are 55 dBA and 53 dBA respectively, taking into account the screening provided by the assumed sound barrier walls of the Centre (see Section 6.4), and the proposed Centre building itself.

Standard construction materials can achieve between a 15-18 dB from outside to inside with windows and doors closed. Providing the construction of the southern 2-3 Year Old Indoor Play Area is free of all gaps and windows are properly fitted and sealed, the calculated internal noise level within the southern 2-3 Year Old Indoor Play Area would be reduced to between 37 dB – 40 dB for traffic noise sources, with the eastern and southern windows closed.

This calculated level complies with the AAAC internal noise limit of $L_{Aeq,\ 1\ hour}$ 40 dBA for indoor activity areas in child care centres, and is therefore acceptable with the windows closed.

8.0 NOISE CONTROL RECOMMENDATIONS

8.1 Management Plan

We recommend the Centre's management implement a Noise Management Plan that should include, but not be limited to, the following:

- Ensuring all staff and parents are provided with a copy of the Centre's Noise Management Plan and its implications for them during their time at the Centre.
- The name and contact details of the Centre's Manager should be clearly displayed at the front of the building to ensure neighbours can contact that person at any time the Centre is operating.
- Ensuring a sufficient number of educators are provided to supervise children's outside play to discourage unnecessarily loud activities.
- Carers/staff should be educated to control the level of their voice while outdoors.
- Facilitating children's small group play when outside, and encouraging educators to engage in children's play and facilitate friendships between children.
- Crying children should be comforted as quickly as possible and moved indoors.
- Staff arriving prior to 7 am and parking in the 'Staff' area should ensure they do not create unnecessary noise.

8.2 Outdoor Play

The following outdoor play scenario is provided, with operational controls and corresponding sound barriers, in order to achieve the outdoor criteria of 50 dBA.

8.2.1 Separate Play Times for 3-5 Year Olds

We recommend that outdoor play be scheduled such that the 3-5 Year Olds are not outside at the same time as the 2-3 Year Olds and 0-2 Year Olds.

8.2.2 Sound Barrier Walls

In addition to the assumed barriers stated in Section 6.4, the following barriers are recommended for installation:

- 2.1-metre-high solid acoustic fence, constructed along the northern boundary of the ground floor outdoor play area, setback approximately 1.5 metres from the northern boundary of the Site;
- 2.9-metre-high solid acoustic fence, constructed along the southern boundary of the ground floor outdoor play area, setback approximate 1.5 metres from the southern boundary of the Site; and

- 2.9-metre-high solid acoustic fence, constructed along the western boundary of the ground floor outdoor play area, setback approximate 1.5 metres from the western boundary of the Site.

8.3 General Construction Method for Sound Barrier Walls

The sound barrier walls specified below may be constructed from 3 rail 'solid capped and lapped' timber, 10 mm thick solid polycarbonate (not hollow), 6.38 mm thick laminated glass or masonry. The construction shall be free of visible air gaps to provide an impervious sound barrier.

If required, where an existing boundary fence is to be maintained (and is of sound construction), and to achieve the required vertical heights recommended in the following sections, a new upper portion of fence should be constructed on top of the existing fence. A transparent material such as 10 mm thick UV resistant polycarbonate (not hollow) may be used, cantilevered inwards at 45 degrees, as shown in Appendix E1. The construction shall be free of visible air gaps to provide an impervious sound barrier.

Alternatively, steel posts may be placed 0.5 to 1 metre stepped in from the existing fences and have 10 mm thick polycarbonate sheeting installed vertically on the outside of the steel posts and then angled inwards to the required vertical height. The vertical section is required to start a minimum of 0.5 or 1 metre (relative to distance from the boundary fence) below the maximum height of the existing fence line, as shown in Appendix E2.

For boundary fences, the heights provided below are to be measured from the RL on the receiver's side of the fence line.

In line with the assumed barriers outlined in Section 6.4, we recommend the following barrier heights and locations. The location and heights of the barriers are shown in Appendix D:

8.4 Mechanical Plant & Equipment – Construction Certificate

The specifications for the mechanical plant have not yet been selected for this development. For typical mechanical plant and equipment with sound power levels not exceeding those listed in Table 7, it is reasonable and feasible to acoustically treat the associated plant area (absorptive lining, etc) or equipment itself so that noise will not impact the neighbouring properties.

Once mechanical plant has been selected, a detailed acoustic assessment should be made, prior to the issue of a Construction Certificate. We recommend that the mechanical services engineers select mechanical plant equipment with the lowest sound power levels to reduce the amount of acoustic treatment necessary to achieve the noise criteria at nearby residential receivers.

The cumulative noise emissions from the mechanical plant system, and use of the indoor play areas and car park is not to exceed the project noise trigger levels specified in Section 5.5.

We offer to provide detailed noise controls when specifications of the mechanical plant equipment have been finalised.

Rooms are to be ventilated to the standards set out in clause F4.5 of the Building Code of Australia and Australian Standards AS1668.2:1991.

8.5 Indoor Play Areas

8.5.1 Northern 2-3 Year Old Indoor Play Area – Northern Façade Glazing

We recommend that the northern windows of the northern 2-3 Year Old indoor play area remain closed while the area is in use, to limit the noise emission to receptor 'R3a'. The locations of these glazing elements are highlighted in the attached Appendix D.

The western door may remain open while the area is in use, to provide adequate ventilation to the space. Rooms are to be ventilated to the standards set out in clause F4.5 of the Building Code of Australia and Australian Standard AS1688.2:1991.

8.5.2 Southern 2-3 Year Old Indoor Play Area – Southern Façade Glazing

We recommend that the eastern and southern windows of the southern 2-3 Year Old indoor play area remain closed while the area is in use, to limit the noise emission to receptors 'R5a', 'R5b' and 'R5c', and to limit the road traffic noise intrusion into the indoor play area. The locations of these glazing elements are highlighted in the attached Appendix D.

The western door may remain open while the area is in use, to provide adequate ventilation to the space. Rooms are to be ventilated to the standards set out in clause F4.5 of the Building Code of Australia and Australian Standard AS1688.2:1991.

8.5.3 Southern 3-5 Year Old Indoor Play Area – Southern Façade Glazing

We recommend that the southern windows of the southern 3-5 Year Old indoor play area remain closed while the area is in use, to limit the noise emission to receptors 'R5a', 'R5b' and 'R5c', and to limit the road traffic noise intrusion into the indoor play area. The locations of these glazing elements are highlighted in the attached Appendix D.

The western door may remain open while the area is in use, to provide adequate ventilation to the space. Rooms are to be ventilated to the standards set out in clause F4.5 of the Building Code of Australia and Australian Standard AS1688.2:1991.

8.6 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 implemented 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.

The integrity of acoustic structures is very dependent on installation techniques. Therefore the use of contractors that are experienced in acoustic construction is encouraged. Furthermore, two insulation products may have the same thermal R rating but the sound absorption of one may be entirely deficient, therefore the use of materials and equipment that are supported by acoustic laboratory test data is encouraged.

9.0 PREDICTED NOISE LEVELS - AFTER NOISE CONTROLS

9.1 Outdoor Play Areas

Once the noise control recommendations in Section 8.2 are incorporated into the design, the calculated outdoor play area sound pressure level at the potentially most affected receptors will be as shown in Table 13.

The noise levels in Table 13 are for the 3-5 Year Olds engaged in outdoor play as a worst-case scenario, as they are louder than the 2-5 Year Old and 0-2 Year Old age groups.

Table 13 Predicted $L_{eq,\ 15\ minute}$ Noise Levels - Outdoor Play For More than 4 Hours Total of Outdoor Play Per Day – After Noise Controls

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – Rear Yard, 1 Doust Street	48	50	Yes
R2 – Ground Floor, Side (Southern) Window, 272A Hector Street	50	50	Yes
R3a – Ground Floor, Side (Southern) Window, 272 Hector Street	41	50	Yes
R3b – Ground Floor, Front (Eastern) Façade, 272 Hector Street	31	50	Yes
R4 – Ground Floor, Front (Western) Façade, 271 Hector Street	26	50	Yes
R5a – Ground Floor, Front (Eastern) Façade, 278-280 Hector Street	30	50	Yes
R5b – Ground Floor, Side (Northern) Façade, 278-280 Hector Street	50	50	Yes
R5c – Ground Floor, Side (Northern) Façade, 278-280 Hector Street	48	50	Yes
R6 – Ground Floor, Rear (Eastern) Façade, 1/45A Robertson Road	45	50	Yes

Table 13 Predicted $L_{eq,\ 15\ minute}$ Noise Levels - Outdoor Play For More than 4 Hours Total of Outdoor Play Per Day – After Noise Controls – Continued

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R7a – Ground Floor, Rear (Eastern) Façade, 43 Robertson Road	44	50	Yes
R7b – First Floor, Rear (Eastern) Façade, 43 Robertson Road	50	50	Yes

The predicted L_{eq} levels of noise from the outdoor play areas are summarised in Table 13 at the potentially most affected receptors. Once noise controls are incorporated as recommended in Section 8.0, the predicted levels of noise at all receiver locations comply with the criteria in Section 5.5.1 of this report, and will therefore be acceptable.

9.2 Indoor Play Areas

Once the noise control recommendations in Section 8.0 are incorporated into the design, the calculated sound pressure level at the nearby residential receptors 'R3a', 'R5a', 'R5b' and 'R5c' from indoor play, mechanical plant and use of the car park will be as shown in Table 14.

Table 14 Predicted Cumulative $L_{eq,\ 15\ minute}$ Noise Levels – Indoor Play, Mechanical Plant & Car Park

Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R3a – Ground Floor, Side (Southern) Window, 272 Hector Street			
- Indoor play areas	30		
- Car park	<20		
- Mechanical	44		
Cumulative Noise Level	44	45	Yes
R5a – Ground Floor, Front (Eastern) Façade, 278-280 Hector Street			
- Indoor play area	27		
- Car park	29		
- Mechanical	32		
Cumulative Noise Level	35	45	Yes
R5b – Ground Floor, Side (Northern) Façade, 278-280 Hector Street			
- Indoor play area	32		
- Car park	<20		
- Mechanical	28		
Cumulative Noise Level	34	45	Yes
R5c – Ground Floor, Side (Northern) Façade, 278-280 Hector Street			
- Indoor play area	37		
- Car park	<20		
- Mechanical	28		
Cumulative Noise Level	38	45	Yes

The predicted L_{eq} levels of noise from the indoor play, mechanical plant and use of the car park are summarised in Table 14 at the potentially most affected receivers. Once noise controls are incorporated as recommended in Section 8.0, the predicted levels of noise at all receiver location comply with the criteria in Section 5.5 of this report, and will therefore be acceptable.

10.0 CONCLUSION

Day Design Pty Ltd was engaged by ES Design on behalf of Abbas Jacobs Lawyers to assess the potential environmental noise impact from a proposed Child Care Centre to be constructed at 274-276 Hector Street, Bass Hill.

Calculations show that the intrusive noise levels will meet the noise level requirements of the NSW Department of Planning and Environment's *Child Care Planning Guideline* and the Association of Australasian Acoustical Consultants' *Guideline for Child Care Centres Acoustic Assessment*, and be considered acceptable.

Calculations also show that, provided the noise control recommendations made in Section 8.0 of this report are implemented, the level of noise emitted by the proposed Child Care Centre at 274-276 Hector Street, Bass Hill, will meet the acceptable noise level requirements of the Association of Australasian Acoustical Consultants' *Guideline for Child Care Centres Acoustic Assessmen*t and the Environmental Protection Authority's *NSW Road Noise Policy,* as detailed in Section 5.5 of this report, and is considered acceptable.

Ricky Thom, BA, BE(Mech)Hons, GradIEAust
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 Drawings
Appendix D – Approximate Nosie Source Locations and Noise Control Recommendations Mark-up
Appendix E – Sound Barrier Wall Construction Methods
AC108-1 to 4 – Glossary of Acoustical Terms

NOISE SURVEY INSTRUMENTATION

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

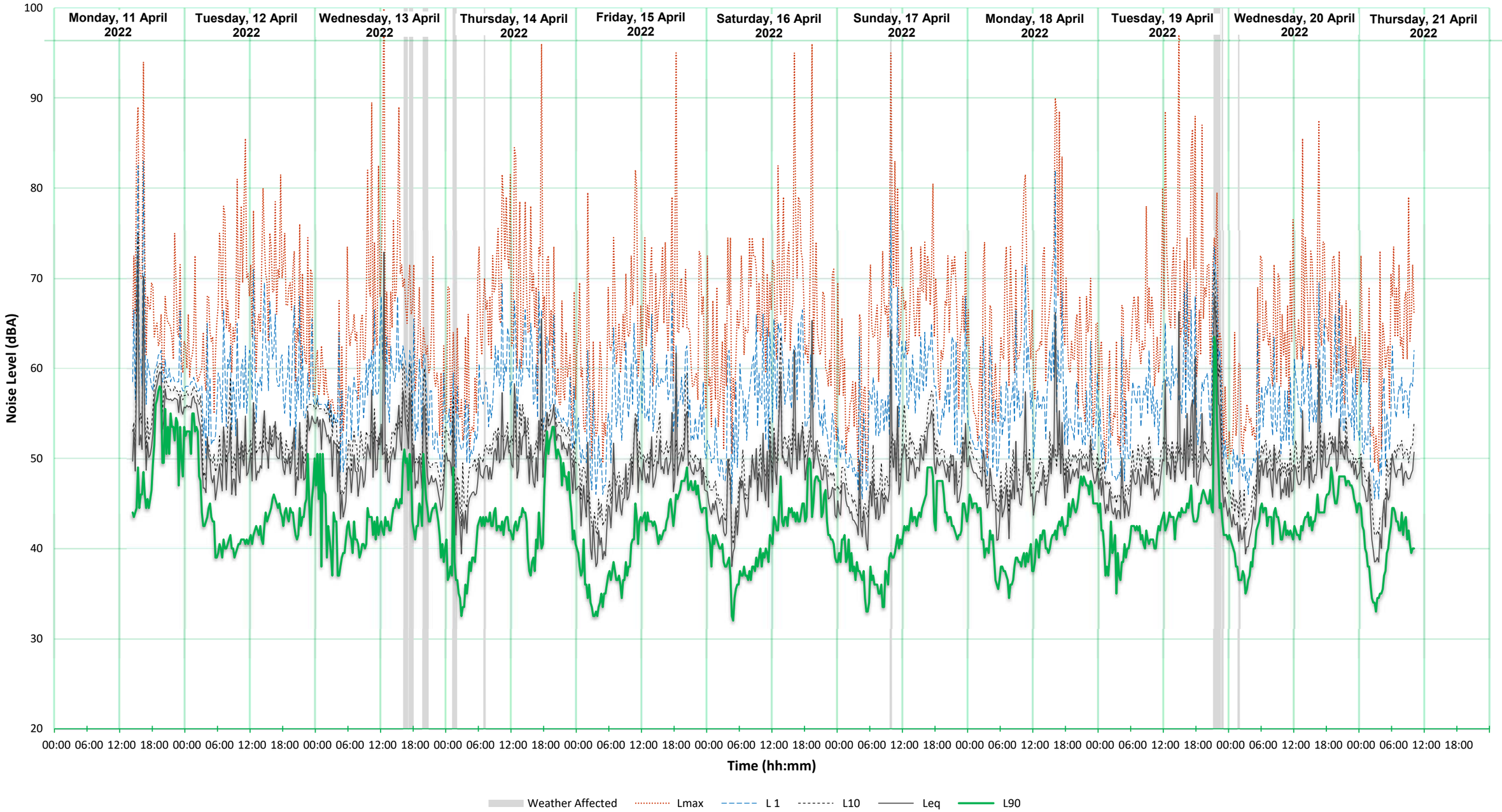
Table A1 Noise Survey Instrumentation

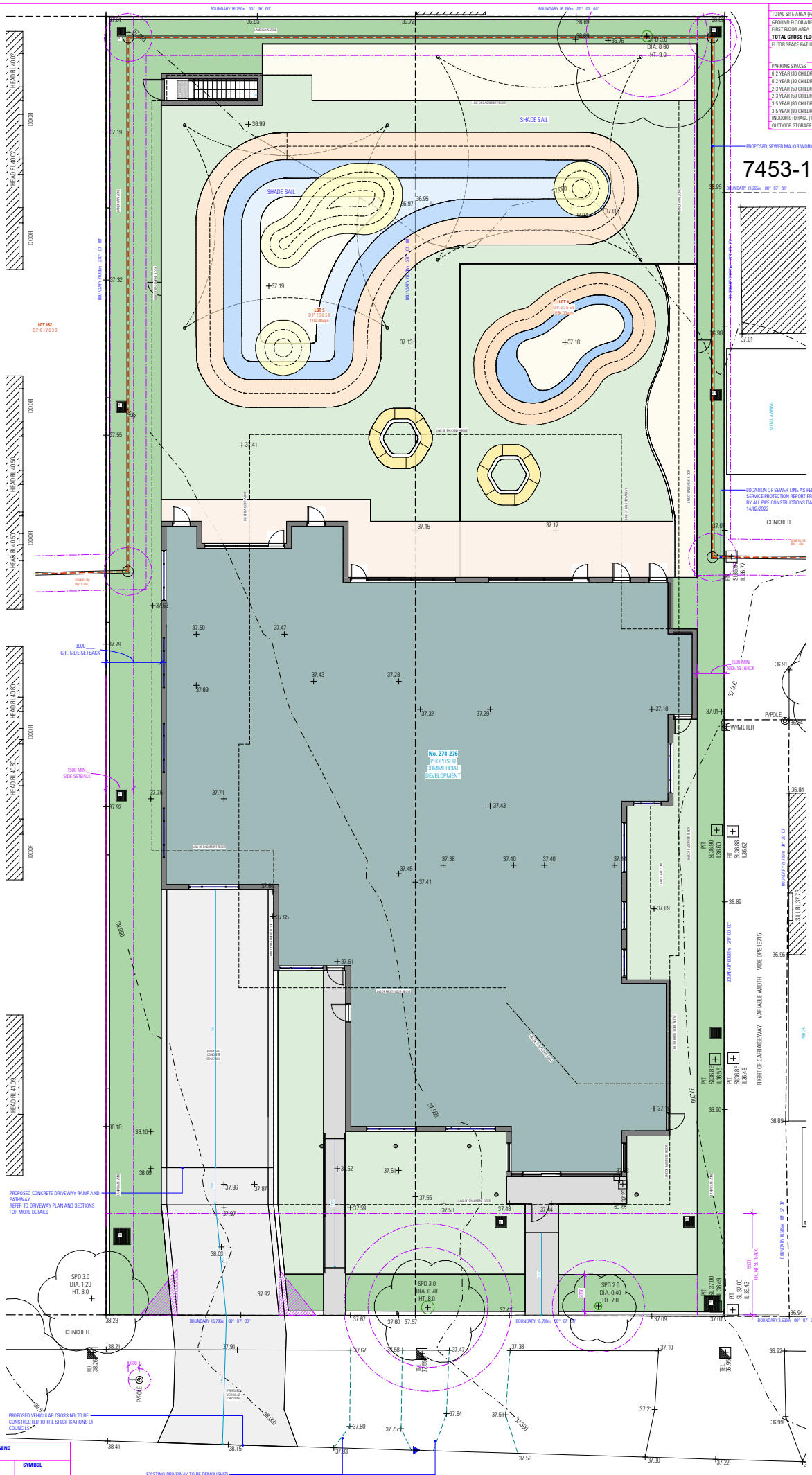
Description	Model No	Serial No
Infobyte Noise Logger (Type 2)	iM4	105
Condenser Microphone 0.5" diameter	MK 250	7112
Acoustical Calibrator	B&K 4231	2095415

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 Monitors iM4 #105 is a Type 1 precision environmental noise monitors meeting all the applicable requirements of AS1259 for an integrating-averaging sound level meter.

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 unattended measurements. No adjustments for instrument drift during the measurement period were warranted.

Located at Rear Yard, 276 Hector Street, Bass Hill, NSW





SITE CALCULATIONS	
TOTAL SITE AREA (PARENT LOT)	2367 sqm
GROUND FLOOR AREA	691.9f. sqm
FIRST FLOOR AREA	244.9f. sqm
TOTAL GROSS FLOOR AREA	**936.85sqm**
FLOOR SPACE RATIO	0.395:1.0

CHILDCARE CALCULATIONS		
ITEM	REQUIREMENT	PROPOSED
PARKING SPACES	40 SPACES	43 SPACES
0-2 YEAR (30 CHILDREN) UNENCUMBERED INDOOR SPACE	97.50 sqm	98.48 sqm
0-2 YEAR (30 CHILDREN) UNENCUMBERED OUTDOOR SPACE	210.00 sqm	216.46 sqm
2-3 YEAR (50 CHILDREN) UNENCUMBERED INDOOR SPACE	162.50 sqm	170.04 sqm
2-3 YEAR (50 CHILDREN) UNENCUMBERED OUTDOOR SPACE	350.00 sqm	352.34 sqm
3-5 YEAR (80 CHILDREN)UNENCUMBERED INDOOR SPACE	260.00 sqm	262.83 sqm
3-5 YEAR (80 CHILDREN) UNENCUMBERED OUTDOOR SPACE	560.00 sqm	575.54 sqm
INDOOR STORAGE (160 CHILDREN)	32.00 m²	54.02 m²
OUTDOOR STORAGE (160 CHILDREN)	48.00 m²	53.96 m²

7453-1 Rev A Appendix C

SITE LEGEND	
ITEM	SYMBOL
GROUND FLOOR AREA	
LINE OF FIRST FLOOR	
SITE BOUNDARY	

PROPOSED SITE PLAN

ACOUSTIC NOTE
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DESIGN MICHEL TOUBIA
DRAFTED KATERINA NIKOVSKA
MANNDEEP ARIAS

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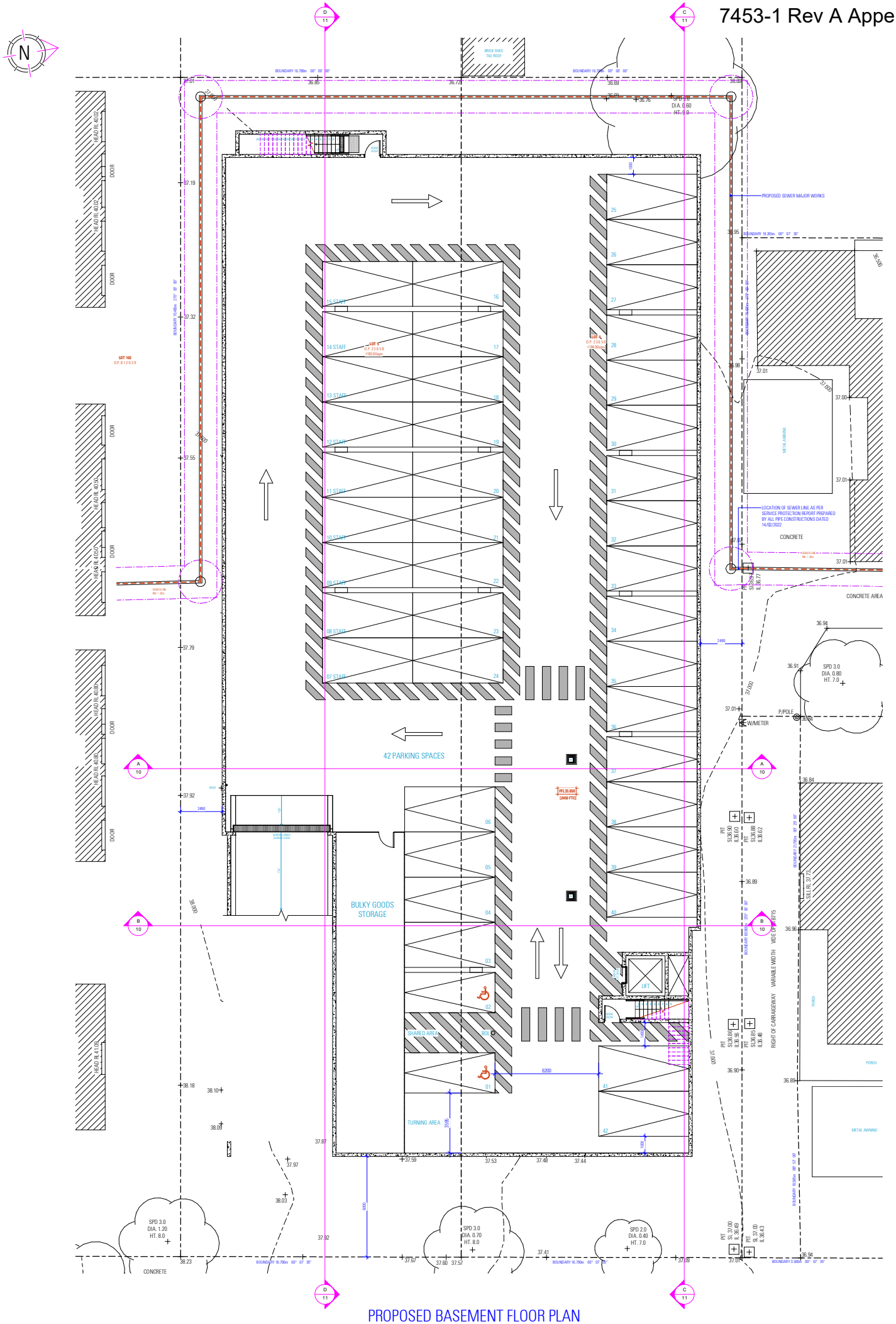

PROPOSED BASEMENT FLOOR PLAN

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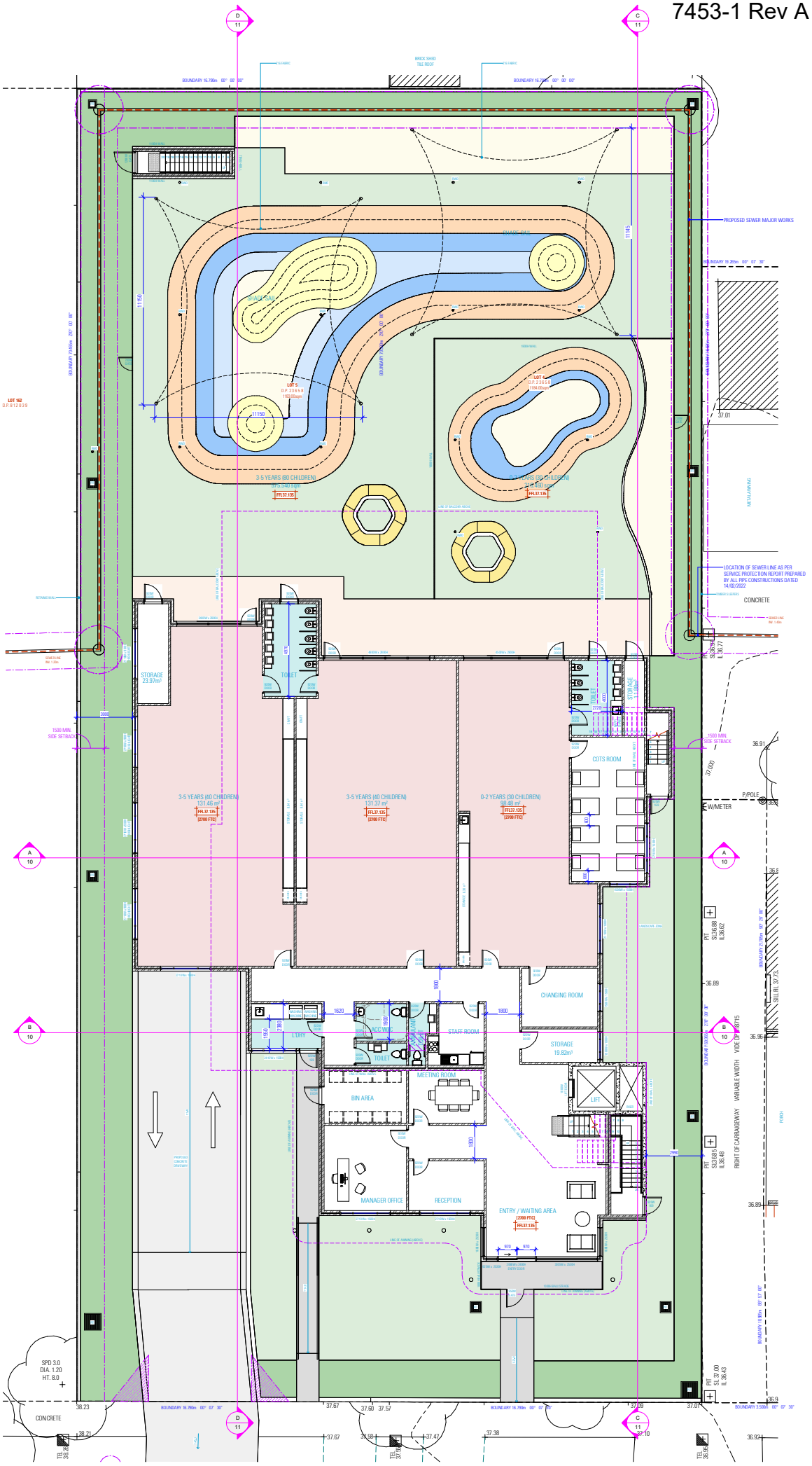

PROPOSED GROUND FLOOR PLAN

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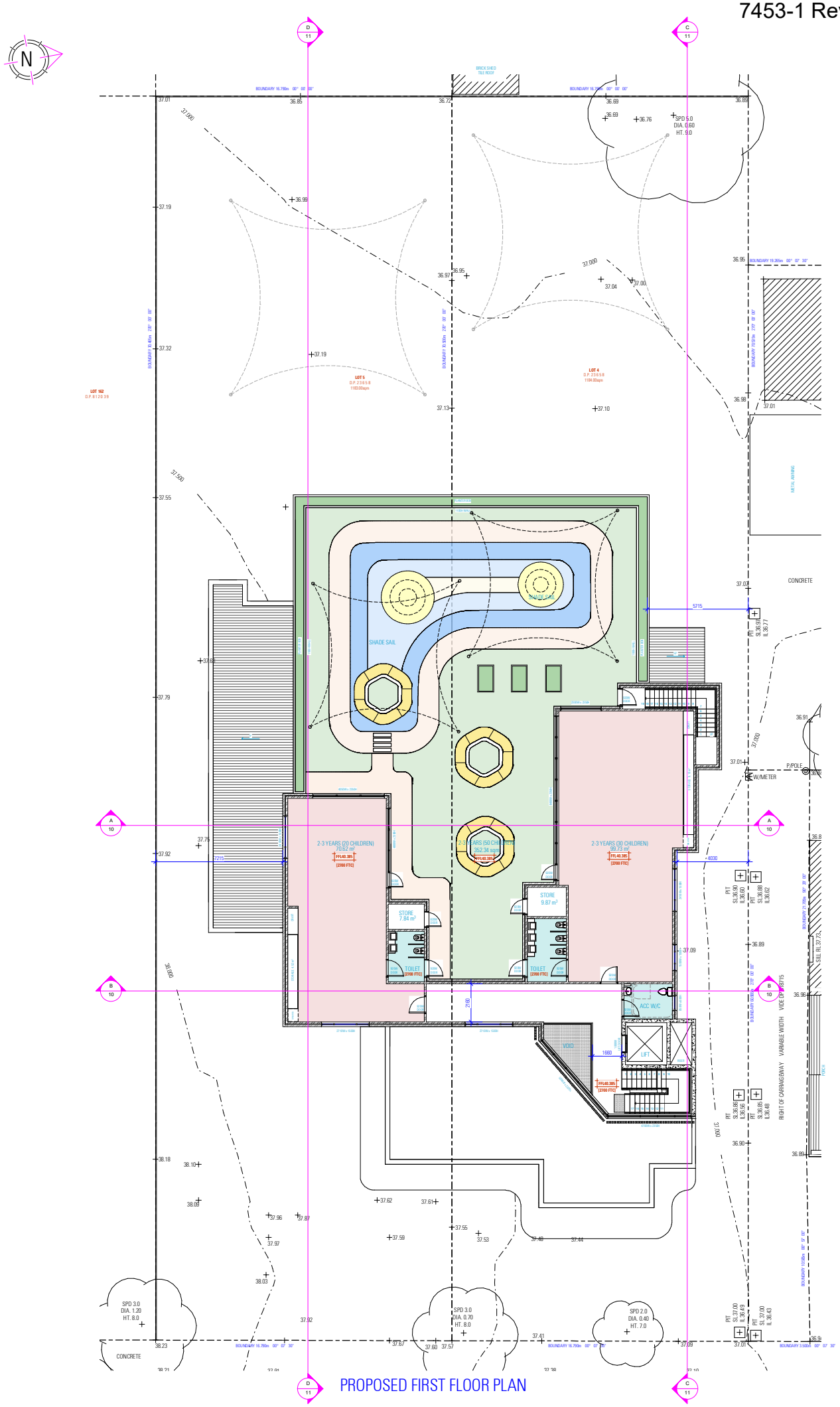

PROPOSED FIRST FLOOR PLAN

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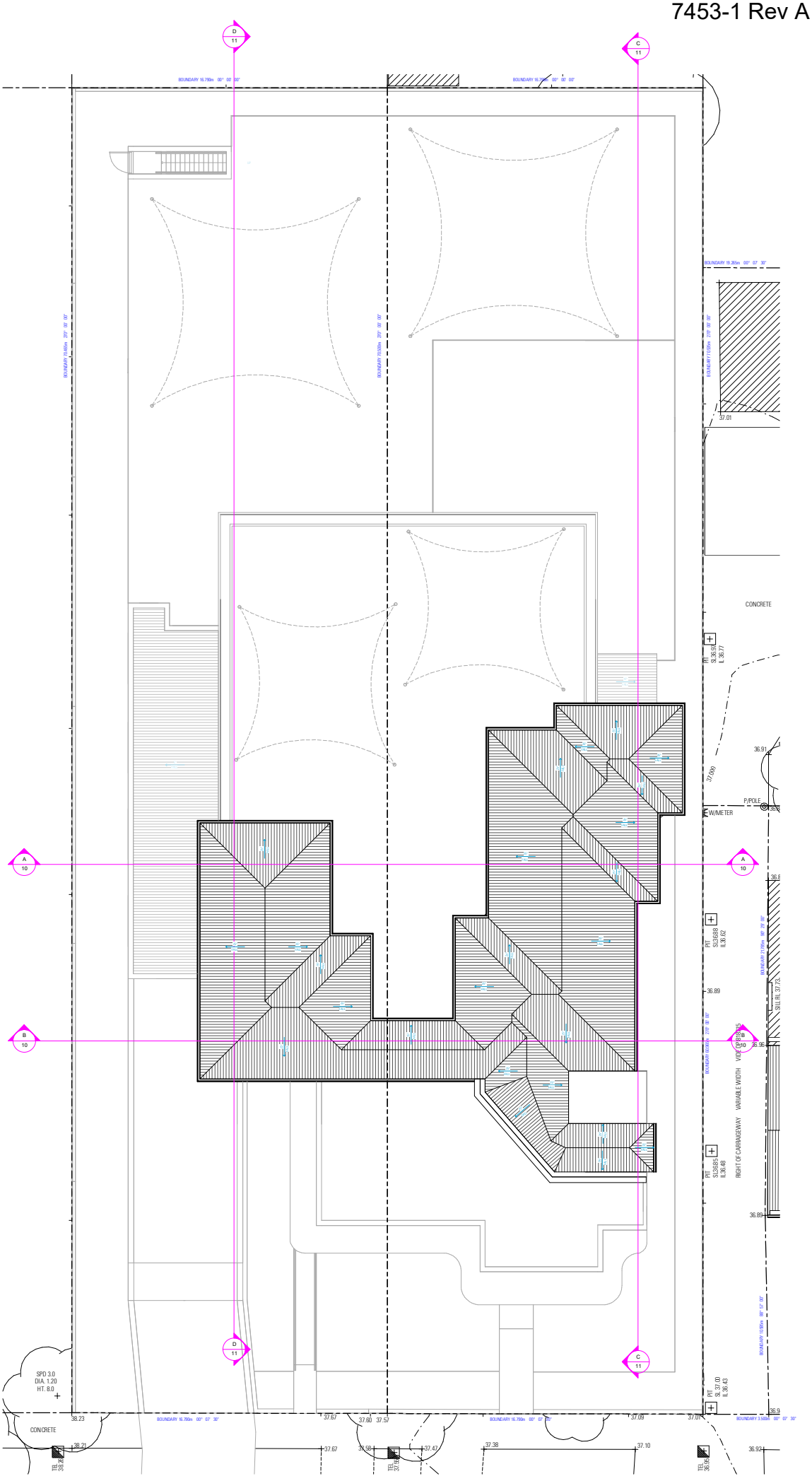

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PROPOSED ROOF PLAN

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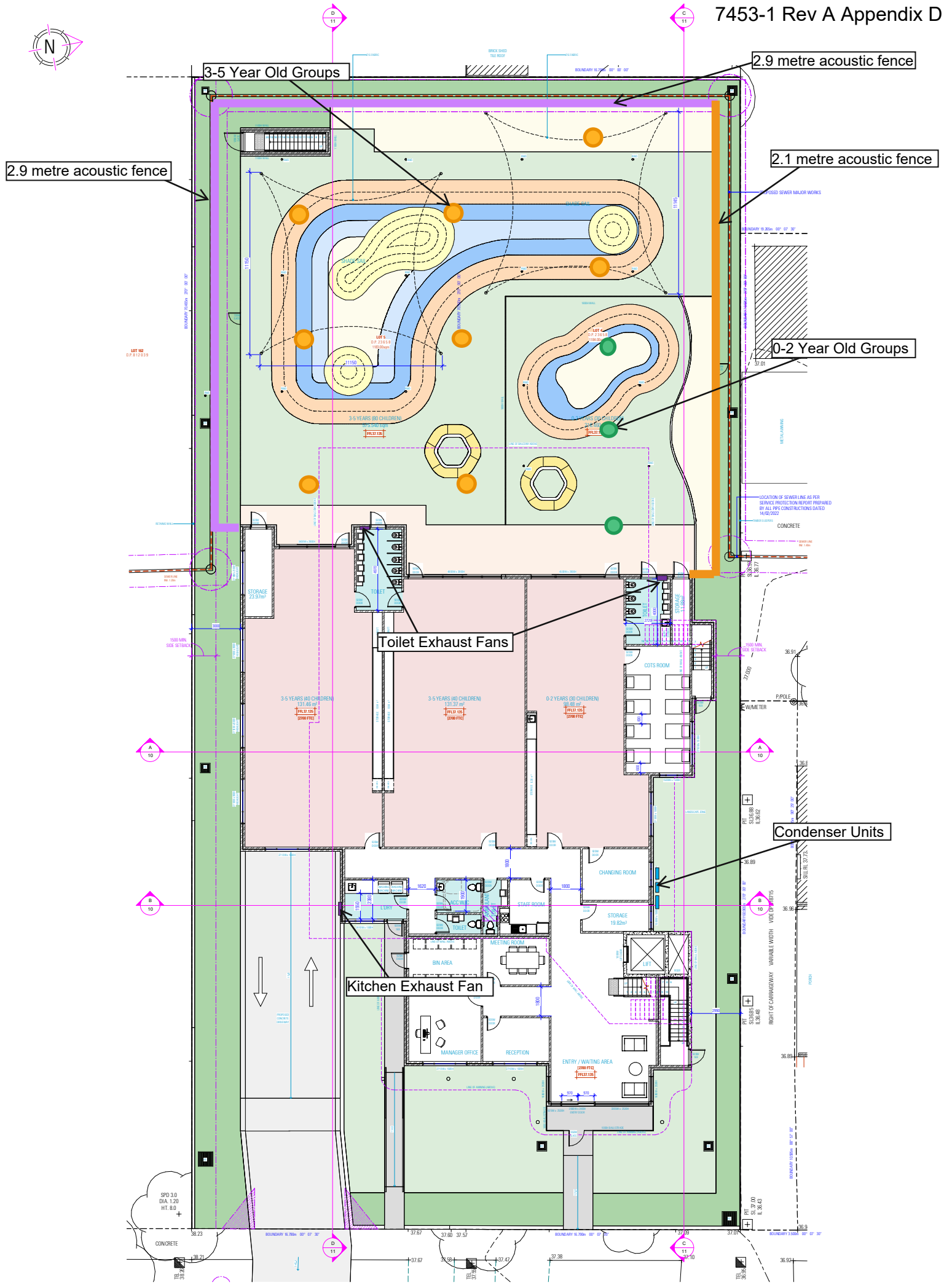

PROPOSED GROUND FLOOR PLAN

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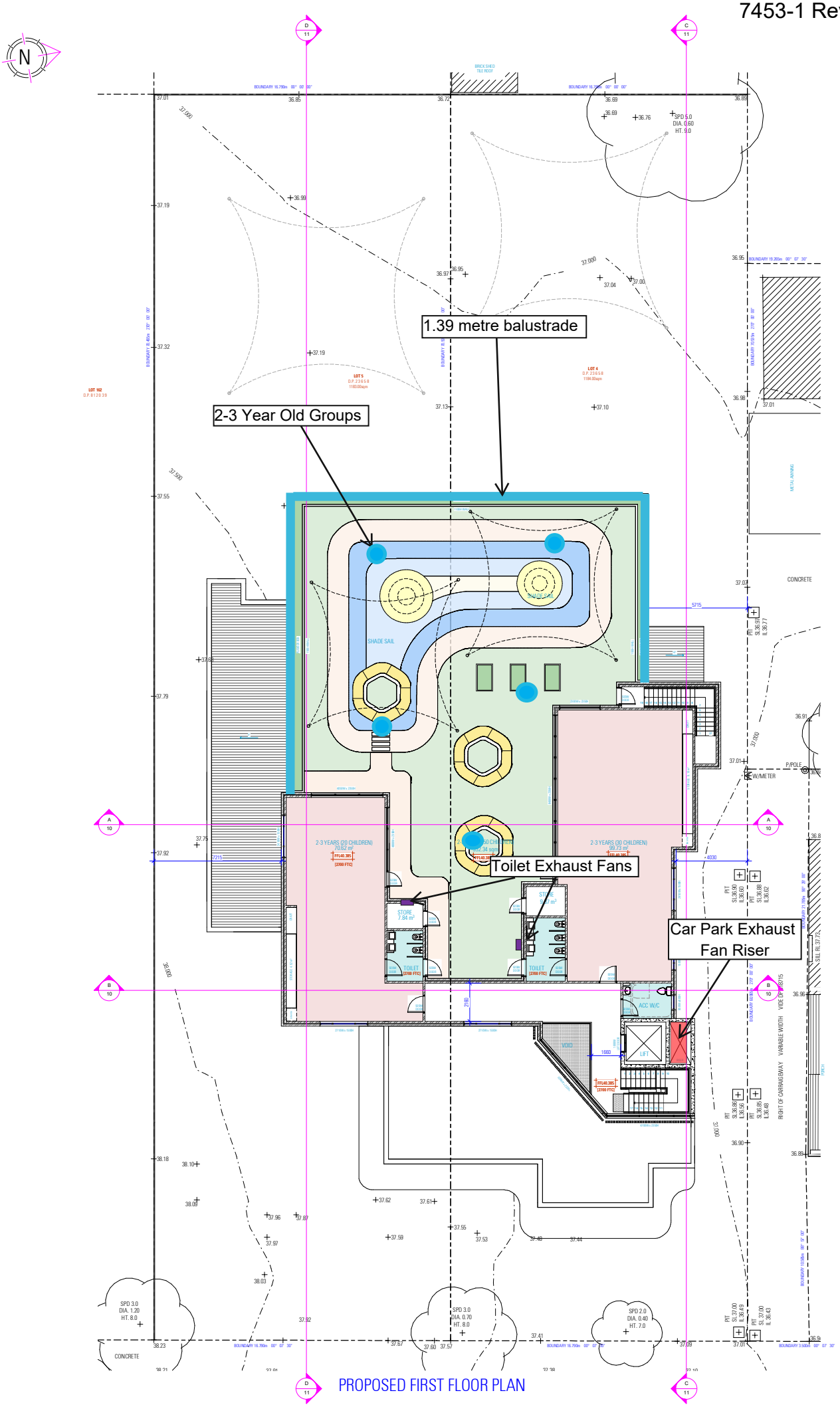

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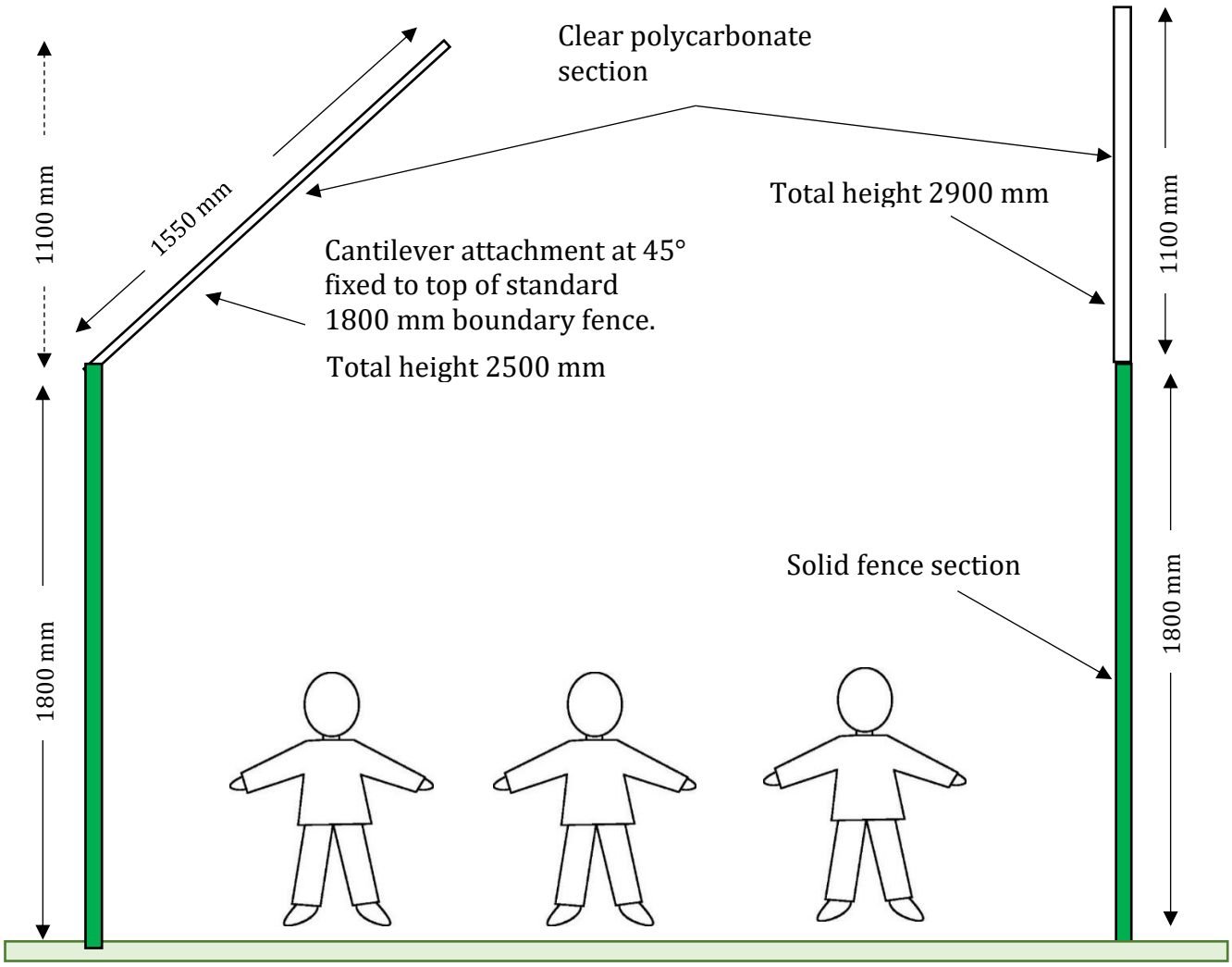
OUTDOOR PLAY AREA



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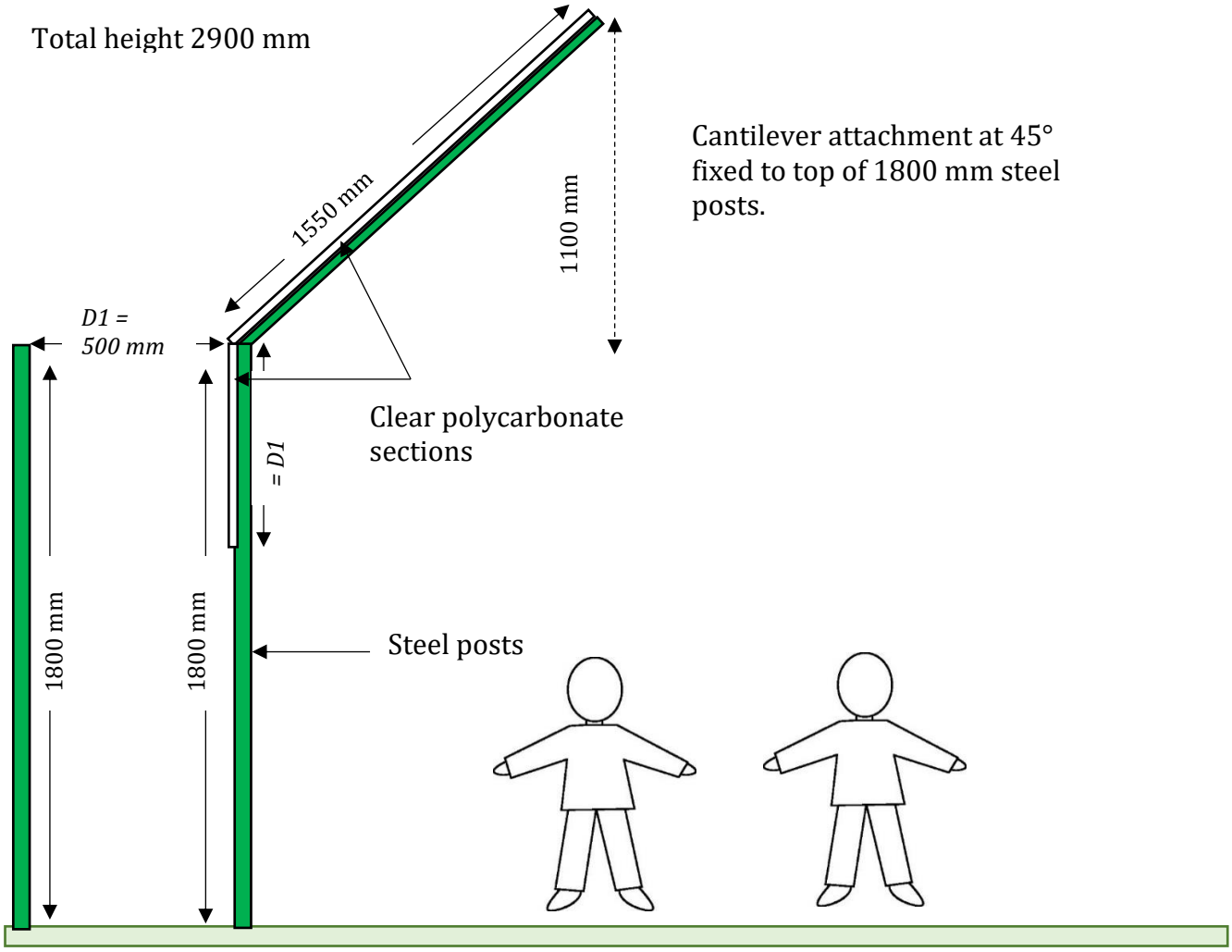
OUTDOOR PLAY AREA



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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.