

# ACOUSTIC ASSESSMENT

**1A Leonay Parade, Leonay NSW 2750**

PREPARED FOR: PreTech Pty Ltd

OUR REFERENCE: REP-18-7068-A

ISSUE DATE: 11<sup>th</sup> December 2018



CONTROLLED DOCUMENT

**DISTRIBUTION & REVISION REGISTER**

<b><u>DISTRIBUTION LIST</u></b>		
<u>Copy No.</u>	<u>Custodian</u>	<u>Location</u>
1. Original	Daniel Mathew	ENVIROTECH PTY. LTD (Filed)
2 Soft Copy (PDF, emailed)	PreTech Pty Ltd	svlangos@pretech.com.au

Note: This register identifies the current custodians of controlled copies of the subject document.

<b><u>DOCUMENT HISTORY</u></b>		
<u>Document No.</u>	<u>Revision No.</u>	<u>Issue Date</u>
REP-18-7068	A	11/12/2018

<b><u>AUTHOR</u></b>	<b><u>TECHNICAL REVIEWER</u></b>
	
Simon Doberer BS(Env) Environmental Scientist – Team Leader	Daniel Mathew Environmental Engineer / Managing Director B.Eng. (ENV.)(Hons.)

**COPYRIGHT © 2018 ENVIROTECH PTY. LTD.**

The report is protected by copyright law and may only be reproduced, in electronic or hard copy format, if it copied and distributed in full with the prior written permission of EnviroTech Pty. Ltd.

**TABLE OF CONTENTS**

**1. INTRODUCTION ..... 4**

**2. NOISE ASSESSMENT CRITERIA ..... 7**

**3. BACKGROUND & AMBIENT NOISE MEASUREMENTS ..... 12**

**4. NOISE GOALS ..... 13**

**5. NOISE SOURCE MODELS ..... 17**

**6. NOISE ASSESSMENT ..... 22**

**7. RECOMMENDATIONS..... 25**

**8. CONCLUSION ..... 27**

**9. GRAPHED DATA ..... 28**

.....

## 1. INTRODUCTION

EnviroTech has been requested by PreTech Pty Ltd to undertake an acoustic assessment of the proposed torrens title subdivision and construction of 8 single storey senior housing dwellings, at 1A Leonay Parade, LEONAY 2750 (hereafter referred to as the site).

The purpose of this assessment is to accurately predict potential noise levels generated by the proposal and to assess the impact of these noise levels on the nearest receptors, in accordance with the NSW Government's relevant noise criteria. The noise assessment will also include the discussion of the development and the potential impacts during the construction stage of the residential buildings.

This assessment has been prepared in accordance with:

- NSW Protection of the Environment Operations Act 1997 (POEO Act)
- Environmental Planning and Assessment Act (1979)
- The Noise Policy for Industry NSW EPA (2017)
- The Noise Guide for Local Government (DECCW, 2009)
- NSW Department of Planning "Development near rail corridors and busy roads" 2008
- Assessing Vibration: a technical guideline (DECC 2006)
- State Environmental Planning Policy (Infrastructure) 2007
- Building Code of Australia

### Proposal

The site to be developed is located at 1A Leonay Parade, LEONAY (LOT 1101 DP 1217686) (Figure 1), and covers a total area of approximately 2,202m<sup>2</sup>. A site layout is provided in Figure 2 showing the proposed development and the closest residential receivers from the proposal. The proposed development is for a torrens title subdivision consisting of 2 lots and the construction of 8 single storey seniors housing dwellings. The location of the site is on the outskirts of the Leonay Golf Course and near the golf maintenance shed.

In accordance with the EPAs Industrial Noise Policy (INP), the surrounding noise amenity of the site is classified as Suburban.

The hours of operation of the golf course and maintenance shed is provided in Table 1 below:

**Table 1:** Hours of operation

	<i>Hours of operation</i>
Golf Course	9:00 am – 1:00 am
Golf Maintenance Shed	5:30 am – 3:00 pm



**Figure 1:** Aerial photograph of the site. Red star indicates logger placement.

**Surrounding Closest Residential/School Classroom/Active Recreational Area Noise Receptors Potentially Impacted by the Proposed Development and the Construction Phase of the Proposed Development.**

There are a number of residential properties located within the vicinity of the site on all aspects, and the closest boundaries of these properties on the differing aspects of the site are:

- 3A Leonay Parade, Leonay. Single storey residential house located to the south/south west of subject site. 7m from site boundary.
- 12 / 12A Leonay Parade, Leonay. Single storey residence located to the north east of subject site. 23m from site boundary.
- 10 Leonay Parade, Leonay. Single storey residential house located to the north east of subject site. 30m from site boundary.

Other buildings located within the vicinity of the site that may be potentially impacted by the proposed development include:

- Leonay Public School Playground. School playground located to the south east of subject site. 20m from site boundary.
- Leonay Public School Classrooms. Internal learning areas of the school located to the south east of subject site. 150m from site boundary.



**Figure 2:** Proposed subdivision/development and potential noise receptors from the proposed.



**Figure 3:** Logger Location

## 2. NOISE ASSESSMENT CRITERIA

This section reviews the NSW Government criteria for other noise sources and developments. These may be used as a basis for realistic noise goals from meeting halls to residential receivers.

### NSW Government Criteria

The NSW Government, via the Office of Environment & Heritage provides guidelines for many industrial, commercial and domestic types of noise sources. The primary aim of environmental noise control is to minimise the occurrence of offensive noise in the community.

Offensive noise is defined in the NSW Protection of the Environment Operations Act 1997 (POEO Act) as being noise:

- a) *That, by reason is of its level, nature, character or quality, or the time at which it is made, or other circumstances:*
  - i. *is harmful to (or is likely to be harmful to) a person who is outside the premises 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.*

The NSW Government also state that social surveys have indicated that noise from any particular source will be audible to many people in the community when that noise exceeds the background level by more than 5 decibels (dB). The noise may have characteristics which are pleasant or unpleasant to the listener.

Technically the background is found from the noise level that is present for 90% of the time of the measurement periods (usually 15 minutes each) and this is known as the LA90, 15 minute.

The source noise is found from the 'equivalent continuous A-weighted sound pressure level' (again usually 15 minutes samples), which is known as the LAeq, 15 minute.

### The Noise Guide for Local Government

The Noise Guide for Local Government published by the NSW Department of Environment, Climate Change and Water (2004 updated 2009) states:- '*A noise source is generally considered to be intrusive if noise from the source, when measured over a 15 minute period exceeds the background noise by more than 5 dB*'. It is assessed at the most affected point on or within the neighbouring residential property (unless that residence is more than 30 metres from the boundary). Intrusive noise can represent offensive noise. However, it is stated in the Noise Guide for Local Government that this is not always the case and it can depend upon the source of the noise, noise characteristics and cumulative noise levels.

### Noise Policy for Industry (INP)

The Noise Policy for Industry (INP; DECC) is used to assess noise from industrial noise sources, scheduled under the Protection of the Environment Operations Act 1997. This is a statutory document referred to by consultants when attempting to control short-term intrusive impacts upon sensitive receptors (i.e. nearby residents), and when attempting to maintain noise level amenities for particular land uses.

In accordance with the INP, there are two criteria which need to be considered when assessing industrial noise. These are:

- 1) Intrusive Noise Criterion
- 2) Noise Amenity Criteria.

Both of these criteria need to be satisfied under the INP. In this situation the cumulative impact over the day and evening periods would be significantly less than the peak periods which would cover continuous activity over any one 15 minute period. Therefore, the Noise Amenity Criterion would be the most stringent of the two noise criteria.

#### **Intrusive Noise Criterion**

The NSW Government in their Noise Policy for Industry NSW EPA (2017), 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 LAeq 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.'* Thus, when considering the environmental consequence of noise from a specific source, any increase above the background sound pressure level, which exceeds 5 dB, may be offensive. Again, it is assessed at the most affected point on or within the neighbouring residential property (unless that residence is more than 30 metres from the boundary).

The NSW Government state that where the existing background noise level at the receptor is less than 30 dBA, as may occur in a quiet suburban or rural area, then 30 dBA should be assumed to be the existing background noise level.

The intrusiveness criterion is primarily used to limit short term noise impacts, and is summarized as follows:

$$L_{Aeq, 15 \text{ minutes}} \leq \text{rating background noise level} + 5dB$$

The intrusiveness of an industrial noise source is generally considered acceptable if the equivalent continuous (A weighted) noise level  $L_{Aeq, 15 \text{ minutes}}$  does not exceed the rated background noise level by more than 5dB(A).



## Noise Amenity Criteria

The Noise Amenity Criteria is used to limit the potential of noise annoyance over longer periods, which may occur as a result of continual increases in background noise.

The Noise Policy for Industry states that *‘To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1.’*

TABLE 2 – RECOMMENDED NOISE LEVELS FROM INDUSTRIAL NOISE SOURCES.

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended LAeq Noise Level (dBA)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/Industrial Interface – for existing situations only	Day	65	70
Evening		55	60	
Night		50	55	
School Classroom - Internal	All	Noisiest 1-hour period when in use	35	40
Active Recreation Area (e.g. playground)	All	When in use	55	60
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

### Notes:

- Daytime is defined as between 07:00 hours and 18:00 hours
- Evening time is defined as between 18:00 hours and 22:00 hours
- Night time is defined as between 22:00 hours and 07:00 hours

## NSW Government Criteria for Domestic Air Conditioners.

The Protection of the Environment Operations (Noise Control) Regulation 2008 Part 4 - Miscellaneous articles, Division 2 - Use of Articles, Subdivision 1 – Time limits on the use of certain articles. Paragraph 52 - Air conditioners (1) states:

*'A person must not cause or permit an air conditioner or heat pump water heater to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of whether any door or window to that room is open).*

- a) *Before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or*
- b) *Before 7 am or after 10 pm on any other day.*

### Interim Construction Noise Guideline (ICNG)

The NSW Environment Protection Authority published the Interim Construction Noise Guideline in July 2009. While some noise from construction sites is inevitable, the aim of the Guideline is to protect the majority of residences and other sensitive land uses from noise pollution most of the time.

Construction noise is one of the major environmental noise issues in NSW – not only from building works but also from demolition, remediation, renewal and maintenance. Construction can generate high noise levels that can adversely affect:

- sleep
- concentration, and thus learning performance
- mental and physical health

This guideline provides noise goals that assist in assessing the impact of construction noise.

The main objectives of the Guideline are to:

- promote a clear understanding of ways to identify and minimise noise from construction works
- focus on applying all 'feasible' and 'reasonable' work practices to minimise construction noise impacts
- encourage construction to be undertaken only during the recommended standard hours (Table 1), unless approval is given for works that cannot be undertaken during these hours
- streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage
- provide flexibility in selecting site-specific feasible and reasonable work practices in order to minimise noise impacts.

For residences, the basic daytime construction noise goal is that the LAeq, 15min noise management level should not exceed the background noise by more than 10dBA. This is for standard hours: Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm. Outside the standard hours,

where construction is justified, the noise management level would be background + 5dBA. Table 3 details the ICNG noise management levels.

TABLE 3 – Construction noise at residences using quantitative assessment.

Time of day	Management level $L_{Aeq}$ (15 min) *	How to apply
<b>Recommended standard hours:</b> Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. <ul style="list-style-type: none"> <li>Where the predicted or measured <math>L_{Aeq}</math> (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</li> </ul>
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. <ul style="list-style-type: none"> <li>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:               <ol style="list-style-type: none"> <li>times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences)</li> <li>if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ol> </li> </ul>
<b>Outside recommended standard hours</b>	Noise affected RBL + 5 dB	<ul style="list-style-type: none"> <li>A strong justification would typically be required for works outside the recommended standard hours.</li> <li>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.</li> <li>For guidance on negotiating agreements see section 7.2.2.</li> </ul>

Construction noise at offices, retail outlets: external  $L_{Aeq}$  (15 min) 70 dB(A).

### **3. BACKGROUND & AMBIENT NOISE MEASUREMENTS**

1. Determination Method: Long-term continuous sampling
2. Noise Logger Location: See Site Plan, Figure 1
3. Survey Period: 19<sup>th</sup> November (10:40am) – 27<sup>th</sup> November (4:10pm)
4. Assessment Time Period: All Hours
5. Monitoring Conditions:

Heavy winds were recorded for the 22<sup>nd</sup> of November (up to 69km/h) and on the 23<sup>rd</sup> of November (up to 72km/h), resulting in the data being withdrawn for those dates.

No further unusual circumstances or activities
6. Instrumentation: 'ARL' - Type 2 Environmental Noise Logger (Rion NL-42) (Serial number 873126), This instrument conforms to Australian Standard 1259 "Acoustics - Sound Level Meters", (1990) and has an accuracy suitable for both field and laboratory use. The logger was set for the 'A' frequency weighting and 'fast' time weighting.
7. Calibration: The environmental noise logger and calibrator have been checked, adjusted and aligned before and after the measurement period, to conform to the Bruel and Kjrer or RTA factory specifications. Both have been issued with conformance certificates within the last 24 months as required by the regulations. The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O., Lindfield, NSW, Australia. No significant system drift occurred over the measurement periods. Current calibration certificate in appendix

## 8. Results:

The recorded LA90 levels determine the Rating Background Level (RBL). The RBL is defined as the median value of the tenth percentile value for the recorded LA90 levels for the complete monitoring period. The tenth percentile is also referred to as the Assessment Background Level (ABL).

The resultant RBL (LA90) and ambient (LAeq) levels for each period are summarised below in Table 4. Section 9 of the report contains a geographical presentation of the background noise levels generated from the monitoring period.

TABLE 4 – Summary of existing noise levels

<i>Time of Day</i>	<i>Rating Background Noise Level (L90) dBA</i>	<i>Log Average Existing Ambient Noise Levels (LAeq) dBA</i>
<b>Day (7am – 6pm)</b>	42.63	51.70
<b>Evening (6pm – 10pm)</b>	41.69	53.97
<b>Night (10pm – 7am)</b>	37.75	47.48

## 4. NOISE GOALS

As discussed above the assessment procedure given in the Noise Policy for Industry NSW EPA (2017) has two components: Controlling intrusive noise impacts and maintaining noise level amenity. Based on existing ambient noise levels, site specific noise goals from the proposal should not exceed a LAeq level of 47.63 dBA (42.63 + 5 – intrusive noise criterion) for the daytime. Site specific noise goals from this proposal should not exceed a LAeq levels of 45 dBA for the evening and 40 dBA for the night. These are shown in the table below:

TABLE 5 – Noise goal for the proposed senior housing dwellings on neighboring receivers

<i>Time Of Day</i>	<i>Intrusiveness Criterion</i>	<i>Amenity Criteria</i>
Day Time	<b>47.63dBA</b> (LAeq,15min)	55 dBA LAeq,
Evening	46.69dBA (LAeq,15min)	<b>45 dBA</b> LAeq,
Night	42.75dBA (LAeq,15min)	<b>40 dBA</b> LAeq,

*Notes:*

- The criteria in **BOLD** apply being the lower of either the Intrusiveness Criterion or the Amenity Criterion.

TABLE 6 – School Classroom (Internal) Noise Goals

<i>Time Of Day</i>	<i>Noise Goal</i>
Day Time	<b>35dBA</b> (LAeq,15min)

TABLE 7– Active Recreational Area (Playground) Noise Goals

<i>Time Of Day</i>	<i>Noise Goal</i>
Day Time	<b>55dBA</b> (LAeq,15min)

### Construction Noise

For residences, the basic daytime construction noise goal is that the LAeq, 15min noise management level should not exceed the background noise by more than 10dBA. This is for standard hours: Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm.

<i>Time Of Day</i>	<i>Allowable Criterion</i>
Day Time (7am – 6pm)	<b>Residence 52.63 dBA</b> (LAeq,15min)

### Vibration Construction

#### Human Comfort

Criteria for assessment of the effects of vibration on human comfort are set out in British Standard 6472-1992. Methods and criteria in that Standard are used to set “preferred” and “maximum” vibration levels in the document “Assessing Vibration: A Technical Guideline” (2006) produced by the NSW EPA.

Acceptable values of human exposure to continuous vibration, such as that associated with drilling, are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred values for continuous vibration is set out below in Table 8.

Table 8: Acceptable vibration dose values for intermittent vibration ( $m/s^{1.75}$ )Table 2.4 Acceptable vibration dose values for intermittent vibration ( $m/s^{1.75}$ )

Location	Daytime <sup>1</sup>		Night-time <sup>1</sup>	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas <sup>2</sup>	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

<sup>1</sup> Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.

## Criteria for building structures

When assessing potential vibration impacts on building structures, the velocity and direction of the movement is measured. The measurement is referred to as the Peak Particle Velocity (PPV), presented in mm/s.

Vibration from construction activities, with regard to building damage, is assessed using the German standard DIN 4150: Part 3 – 1999 *Effects of Vibration on Structures* (DIN Guideline). The DIN Guideline values for PPV measured at the foundation of various structures are summarised in Table 9 below.

Table 9: Guideline Values of vibration velocity for evaluating the effects of short term vibration.

Type of structure	Guideline values for velocity, $v_i$ (mm/s)			
	Vibration at the foundation at a frequency of:			Vibration at horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz*	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (eg heritage structures / buildings that are under a preservation order)	3	8 to 10	8 to 10	8

\* For frequencies above 100Hz, at least the values specified in this column shall be applied

From the guidelines outlined above, the following vibration criteria have been determined for the Project.

Type of structure	Guideline values for velocity, $v_i$ (mm/s)			
	Vibration at the foundation at a frequency of:			Vibration at horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz*	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40

**Recommend design Levels and reverberation times for building interiors.**

Sound Insulation rating of floors: A floor in a Class 2 or 3 building must have a  $R_w + C_{tr}$  (airborne) not less than 50 and an  $L_{n,w}$  (impact) not more than 62.

Sound Insulation rating of walls: A wall in a Class 2 or 3 building must—

- (i) have a  $R_w + C_{tr}$  (airborne) not less than 50, if it separates sole-occupancy units; and
- (ii) have a  $R_w$  (airborne) not less than 50, if it separates a sole-occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification; a

Sound Insulation rating of soil and waste pipes:

If a duct, soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one sole-occupancy unit, the duct or pipe must be separated from the rooms of any sole-occupancy unit by construction with an  $R_w + C_{tr}$  (airborne) not less than— (i) 40 if the adjacent room is a habitable room (other than a kitchen); or (ii) 25 if the adjacent room is a kitchen or non-habitable room.



## 5. NOISE SOURCE MODELS

This section provides details of the calculations used for predicting noise levels and the resulting noise levels at the potentially affected residential receptors

### Predicted Ongoing Noise Levels

#### Golf Cart

The below calculation was determined on the scenario of 2 electric golf carts and 4 people talking at a standardised level near the proposed senior housing development.

<b>Total 15 minute average</b>	<b>75.8 dBA</b>
--------------------------------	-----------------

Two electric golf carts and 4 people were modelled as it will be extremely unlikely and infrequent situation that more than 2 golf carts and 4 people will be in the one area at the same time.

#### Mechanical Plant (Air-Conditioners)

Electrical, mechanical, hydraulic and air conditioning equipment is to be housed so that it does not create an 'offensive noise' as defined in the Protection of the Environment Operations Act 1997, either within or at the boundaries of any property at any time of the day.

The below calculation was determined by the noise produced by a typical air-conditioner condenser.

<b>Total 15 minute average</b>	<b>54 dBA</b>
--------------------------------	---------------

#### Maintenance Shed

The below calculation is of a worst case scenario if all noise generating sources from the maintenance shed of the golf course are emitting noise at the one time. Whilst this maybe highly unlikely it is best practice to calculate and model this scenario to show noise compliance at neighboring receivers whilst the proposed is at full noise capacity.

The major internal noise sources for the proposed are listed below.

Toro Reelmaster 3100.D Reel Trim Mower – 83 dBA  
 Sand Pro 3040 Grooming Maintenance Machine – 87 dBA  
 Agrimetal Leaf Blower – 87 dBA  
 John Deere 1200a Bunker Rake – 78 dBA  
 John Deere 7200A Precision Cut Mower – 83 dBA  
 Greensmaster 3150-Q Riding Greensmower – 84 dBA  
 Kubota L3300 Tractor – 80 dBA

The below calculation was determined on a worst case scenario of all the mowers/tractors being turned on at any one time at the maintenance shed.

<b>Total 15 minute average - Daytime</b>	<b>92.5 dBA</b>
--	-----------------

The calculated maximum internal noise level of the proposed is 92.5 dBA.

### Predicted External Noise Levels

The source noise has been modelled using the International Standard ISO 9613-2 (1996(E)) 'Acoustic - Attenuation of sound during propagation outdoors Part 2 General method of calculation'. This Standard specifies methods for the description of noise outdoors in community environments. The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources, and covers the major mechanism of attenuation. The method allows for downwind propagation conditions namely:

- Wind direction within an angle of  $\pm 45^\circ$  of the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver,
- Wind speed between approximately 1 m/s and 5 m/s measured at a height of 3 m to 11 m above the ground.

### Basic Noise Modelling Equations

The equivalent continuous downwind sound pressure level ( $L_{Aeq}$ ) at each receiver point has been calculated using the equation below:-

$$L_{Aeq} = (L_{Aeq, int} + 10 \log_{10} S - R) - 14 + D_c - A$$

Where:

- $L_{Aeq, int}$  is the reverberant noise level within the building;
- $S$  is the area of the building envelope radiating noise;
- $R$  is the sound reduction index of the building envelope component;
- $D_c$  is directivity correction; and
- $A$  is the attenuation that occurs during the propagation from source to receiver.

The attenuation term  $A$  in the equation above is given by:-

$$A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

Where:

- $A_{div}$  is the attenuation due to geometric divergence;
- $A_{atm}$  is the attenuation due to atmospheric absorption;
- $A_{gr}$  is the attenuation due to the ground effects;
- $A_{bar}$  is the attenuation due to a barrier; and
- $A_{misc}$  is the attenuation due to miscellaneous other effects.

### Predicted Construction Noise Levels

The calculation of noise emission to the environment considers the surface area of the development radiating noise, the sound reduction index of the structural component and distance to the receiver location.

### **Construction Noise**

Sound Power Levels (SWLs) for typical construction plant are identified below in Table 10.

<b>Plant</b>	<b>Sound Power Level</b>
Concrete Truck	109
Angle Grinder	109
Concrete Pump – 120 mm diameter / 50 bar	112
Concrete Saw	116
Mobile Crane	98
Dump Truck	108
Compressor	100
Bobcat	103
Hand Tools	90
Excavator	108
Crawler Cranes	98
Tower Crane	104
Front End Loader	112
Excavator	107
Hammer Hydraulic	122
Bored Pile Rig	112

Table 10: Typical construction plant noise.

Assessment of possible construction noise at surrounding receivers has been undertaken for the proposed construction works. Modelling has been conducted for a number of construction scenarios with plant located across the construction site.

Scenario A – Excavation Stage

Scenario B – Building Construction

The construction noise modelling assumes a “typical worst-case” scenario whereby all plant, is running continuously. As such, the modelling represents likely noise levels that would occur during intensive periods of construction. Therefore, the presented noise levels can be considered in the upper range of noise levels that can be expected at surrounding receivers when the various construction scenarios occur.

Once noise sources have been applied to the model, the resultant noise levels at identified surrounding receivers are predicted. These results are then compared with established site-specific noise criteria.

The results of construction noise modelling for each scenario are presented in Table below.

Table 11: Predicted construction noise data on residential receivers

Residential Receiver	Predicted Noise Level (Dba)	NML (Dba)	Exceedance (Dba)
<b>Scenario A – Bulk Excavation</b>			
A – 3A Leonay Parade	63.10	52.63	10.47
B – 12/12A Leonay Parade	52.77	52.63	0.14
C – 10 Leonay Parade	50.46	52.63	NIL
<b>Scenario B – Building Construction</b>			
A – 3A Leonay Parade	55.10	52.63	2.47
B – 12/12A Leonay Parade	44.77	52.63	NIL
C – 10 Leonay Parade	42.46	52.63	NIL

Exceedances of noise management levels of up to 10.47 dBA at neighboring residence boundaries to the south and east of the site may be expected during the excavation period when major equipment is located on site. This magnitude of exceedance is consistent with similar sites where residences overlook development sites.

Table 12: Predicted construction noise data on school

School	Predicted Noise Level (Dba)	NML (Dba)	Exceedance (Dba)
<b>Scenario A – Bulk Excavation</b>			
A – Classroom	36.48	35	1.48
B – Playground	53.98	55	NIL
<b>Scenario B – Building Construction</b>			
A – Classroom	28.48	35	NIL
B – Playground	45.98	55	NIL

Exceedances of noise management levels of up to 1.48 dBA at the nearest school classroom to the east of the site may be expected during the excavation period when major equipment is located on site. This attenuation will be provided by the walls, roof, windows and door of the classroom.

During the construction stages the magnitude of exceedance will reduce due to the nature of construction activities. Based on these findings the adoption of reasonable and feasible noise management and mitigation will be required. These measures should be determined in detail when a contractor, with defined construction techniques, has been engaged on the project. However, “in-principle” mitigation measures are detailed in the following sections.

### Construction Vibration

Operation of rock breakers and the like generate ground vibration that has the potential to transmit to nearby buildings. Table below sets out the typical ground vibration levels at various distances for safe working distances.

Table 13: Recommended Safe Working Distances for Vibration-Intensive Plant

Item	Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Small Hydraulic Hammer	(300 kg – 5 to 12t excavator)	2m	7m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7m	23m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22m	73m
Vibratory Pile Driver	Sheet piles	2m to 20m	20m
Pile Boring	≤ 800 mm	2m (nominal)	N/A
Jackhammer	Hand held	1m (nominal)	Avoid contact with structure

The highest vibration levels will occur when construction equipment is located on the northern, eastern and southern side of the site near neighboring residences. A review of the site plant and surrounding receivers indicates that the minimum distance between the vibration generating activities and surrounding buildings will be in the order of 1-2m. Therefore, the use of medium to large rock breakers if used onsite should be carefully managed.

Structural damage vibration criteria in residential buildings are much higher than human comfort criteria, and predicted vibration levels are within these criteria under most circumstances.

## 6. NOISE ASSESSMENT

The calculation of noise emission to the environment considers the surface area of the development radiating noise, the sound reduction index of the structural component and distance to the receiver location. Surface areas and the construction of the walls, roof, windows and doors are determined from the initial site inspection. The distance is measured from the proposed noise sources to the nearest residential receivers.

With the recommendations correctly implemented, as specified in Section 7 below and discussion of existing building materials below, the activities from within the proposal **are** predicted to generate sound pressure levels which are compliant at neighboring receivers.

The noise emission dBA to the nearest residential receptors were calculated as follows:

### **Golf Cart**

The nearest sensitive receptor property boundary can be located roughly 10m from the potential golf cart route.

$$75.8 - 20 \text{ LOG } (10 / 1) = \mathbf{55.8 \text{ dBA}}$$

Therefore, the minimum required 'Weighted Sound Reduction Index (Rw) from the golf cart route to the nearest proposed residential receptor property boundaries are **8.17 dBA** for the daytime, **10.8 dBA** for the evening and **15.8 dBA** for the night.

This attenuation that is required can be achieved via the construction materials of the senior housing dwellings. The minimum building code requirements for the roof, walls, windows and door will be sufficient to meet the noise goals of 15.8 dBA that is required.

### **Mechanical Plant (Air-conditioners) .**

The nearest sensitive receptor property boundary can be located roughly 1m from the potential mechanical plant at any proposed residency.

$$54 - 20 \text{ LOG } (2 / 1) = \mathbf{47.98 \text{ dBA}}$$

Therefore, the minimum required 'Weighted Sound Reduction Index (Rw) from the air conditioner condensers for the proposal to the nearest residential receptor property boundaries are **0.35 dBA** for the daytime, **2.98 dBA** for the evening and **7.98 dBA** for the night .

This attenuation that is required can be achieved via the construction materials of the senior housing dwellings. The minimum building code requirements for the roof, walls, windows and door will be sufficient to meet the noise goals of 7.98 dBA that is required.

## Maintenance Shed

The proposed construction of the senior housing development is located 100m to the north east of the golf maintenance shed.

$$92.5 - 20 \text{ LOG } (100 / 1) = \mathbf{52.5 \text{ dBA}}$$

Therefore, the minimum required 'Weighted Sound Reduction Index (Rw) from the proposed senior housing development to the golf maintenance shed is **4.87 dBA** for the daytime, **7.5 dBA** for the evening and **12.5 dBA** for the night.

Considering the loudest machinery that may be used on the golf course (Sand Pro 3040 Grooming Maintenance Machine) is in operation 6m from the proposed senior housing development:

$$87 - 20 \text{ LOG } (6 / 1) = \mathbf{71.44 \text{ dBA}}$$

Therefore, the minimum required 'Weighted Sound Reduction Index (Rw) from the proposed senior housing development to the golf maintenance shed is **23.81 dBA** for the daytime, **26.44 dBA** for the evening and **31.44 dBA** for the night.

The following constructions details are indicative of the type of construction required to achieve the noise goals as previously recommended.

### Roof Construction

The roof construction proposed that is selected is colorbond roof sheeting with sarking (Roof pitch at 22°). R 3.0 insulation or better is recommend over a 10mm plasterboard ceiling. When correctly constructed roof componentry will achieve a weighted reduction value of 40 – 45 dBA, far greater than the required 31.44 dBA.

### Wall Construction

Design plans of the proposed senior housing development indicate the external walls of the structures are to be comprised of selected weather board planking, painted fresh. Sarking, minimum density insulation and 10mm plasterboard will achieve a weighted reduction value of 45-55 dBA. This is far above the required noise reduction required of 31.44 dBA.

### Window Construction

The below recommendations are for the western and southern aspects of the proposed senior housing development only.

The windows that are proposed for this senior housing development are selected pre-painted windows in aluminium frames. All externally exposed windows are to be as a minimum consisting of laminated 6.38mm glass, with full perimeter acoustic type seals. If double glazing is proposed the following configurating as a minimum is needed, 5mm/100mm gap/5mm. Both above

configurations will provide attenuations of 32-43 dBA. Further attenuation of the transmitted noise may achieved via:

- Use of laminated glass of greater thickness
- Double glazing of greater varied configuration (cavity and glass depth)

### **Door Construction**

If timber doors are to be used externally, a 45mm single leaf solid core door within a steel frame with proprietary acoustic seals is required. This would give the overall door a rating of 33 Rw.

If glass doors are used two options are recommended. A double-glazed wide gap configuration is required; 4mm glass within non-sealed frames will provide a 35 dBA reduction or an 8.5mm thick laminated glass door which will provide a 32 dBA reduction. Further improvement upon the noise reduction is achievable via the implementation of various acoustically designed proprietary products.

Provided these proposed construction recommendations are adhered to the proposed senior housing development will be acoustically sufficient for construction in the proposed area.



## **7. RECOMMENDATIONS**

### **Mechanical Plant (Air Conditioners)**

Maximum noise emission levels for mechanical plant noise is to not exceed 56 dBA. Plant equipment with a higher dBA can be used in a sound booth which has the capacity to lower Rw by desired dBA.

Electrical, mechanical, hydraulic and air conditioning equipment is to be housed so that it does not create an 'offensive noise' as defined in the Protection of the Environment Operations Act 1997, either within or at the boundaries of any neighboring property at any time of the day.

Differing models of air conditioners will provide differing noise emitting values. Acoustic Enclosures typically achieve performance between 15dB (A) to 25dB (A) with higher performance systems readily available.

It is recommended for the proposed building that external air conditioning units emit a noise level of 70 dBA or less. Providing an acoustic enclosure on a unit with a noise level of 70 dBA with a 25 dBA reduction, relevant noise goals at the relevant property boundaries will be achieved.

### **Construction Noise & Vibration Mitigation Measures**

Noise levels from construction activities have been predicted to exceed the noise management levels nominated in the guidelines at some surrounding receivers. Therefore, noise control measures are recommended to ensure that noise is reduced where feasible.

The following project-specific mitigation measures are recommended:

- Selection of quietest feasible construction equipment;
- Localised treatment, such as barriers, shrouds and the like around fixed plant, such as pumps, generators and concrete pumps;
- Provision of respite periods, particularly on Saturdays;
- Limit noisy work to daylight or less sensitive hours where possible;
- Select low noise options for plant and equipment. Ensure equipment mufflers operate in a proper and efficient manner;
- Where possible, use quieter construction methods;
- Only have necessary equipment on-site and turn off when not in use;
- Ensure all plant and equipment is well maintained and where possible, fitted with silencing devices;
- Plan traffic flow, parking and loading/unloading areas to minimise reversing movements;

- Plant Noise Audit – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service;
- Operator Instruction – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission;
- Equipment Selection – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with EPA guidelines;
- Site Noise Planning – Where practical, the layout and positioning of noise-producing plant and activities on each work site should be optimised to minimise noise emission levels;
- An effective community relations program should be put in place to keep the community that has been identified as being potentially affected apprised of progress of the works, and to forewarn potentially affected groups (e.g. by letterbox drop, meetings with surrounding owners / tenants, etc.) of any anticipated changes in noise and vibration emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms;
- Close liaison should be maintained between the communities overlooking work sites and the parties associated with the construction works to provide effective feedback in regard to perceived noise emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighboring communities, and to ensure prompt response to complaints, should they occur;
- Identification of a site contact person to follow up any complaints, should they occur;

The adoption of the above measures is aimed at working towards achieving the construction noise management levels established at surrounding receivers.

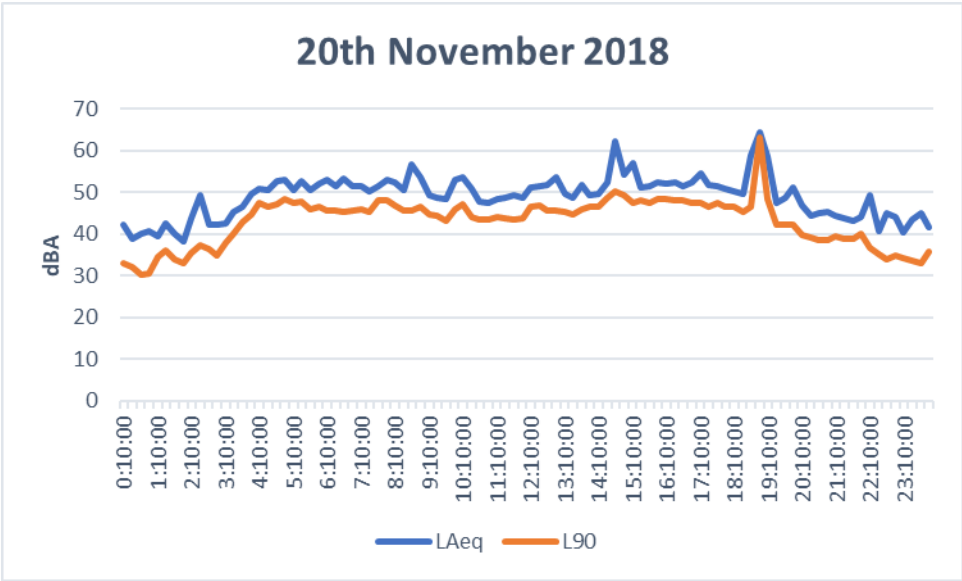
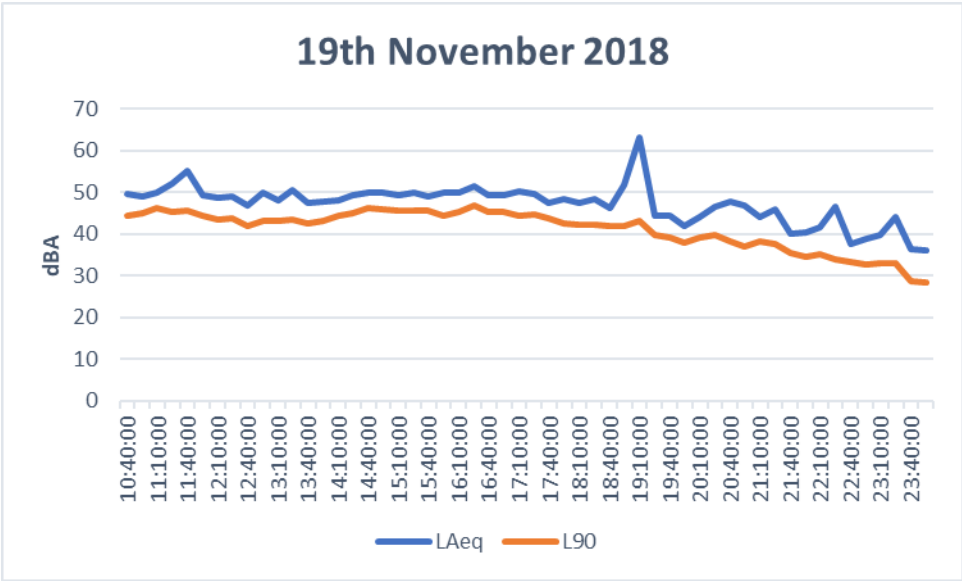
## **8. CONCLUSION**

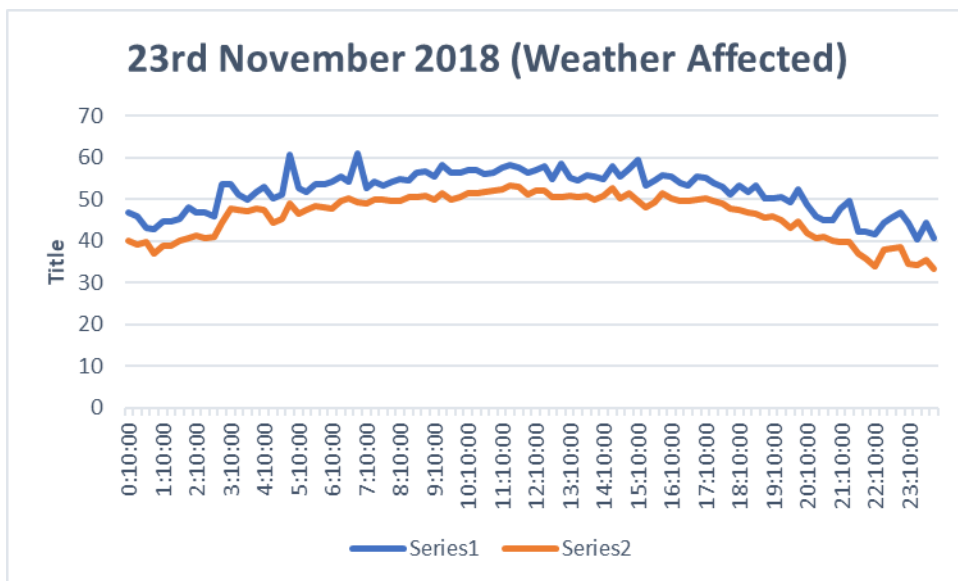
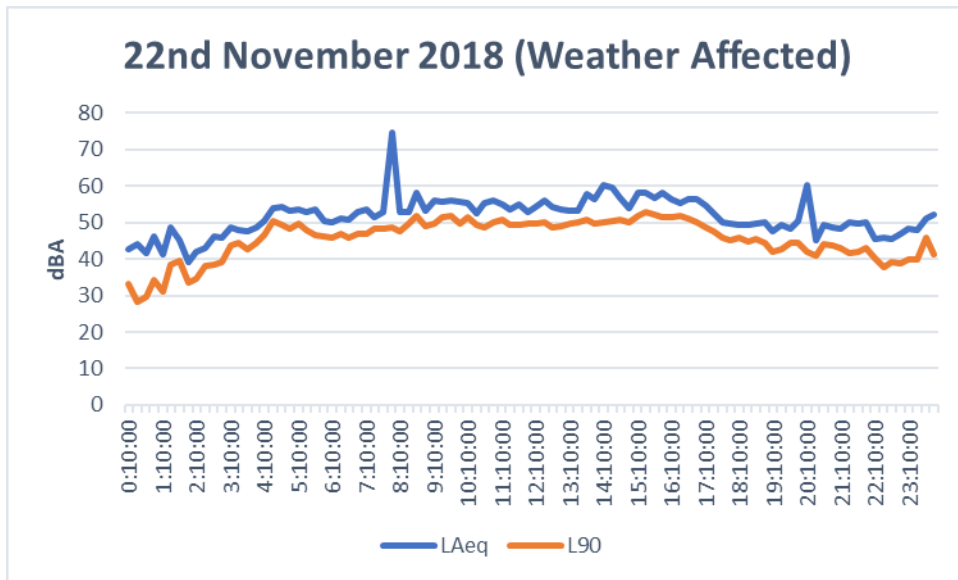
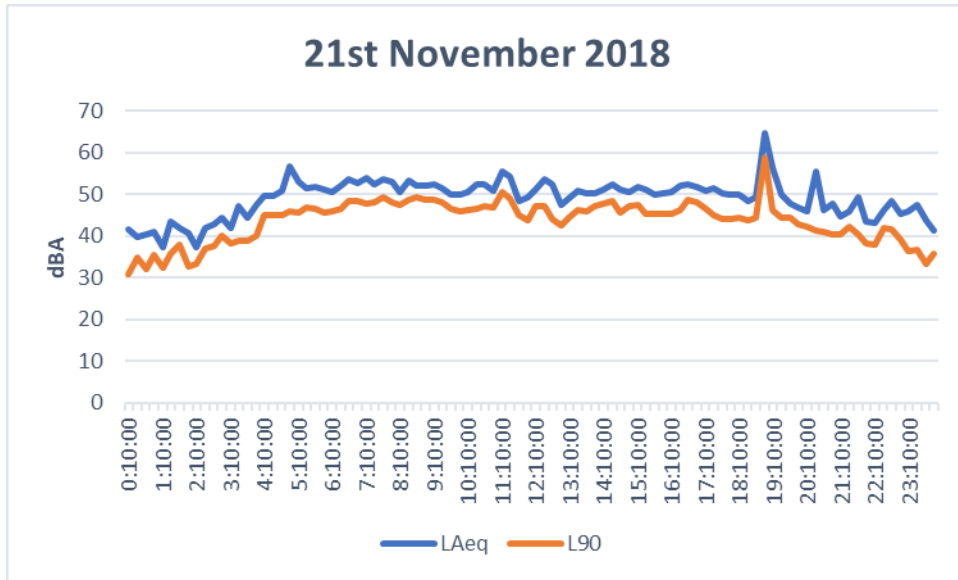
The acoustic assessment the proposed torrens title subdivision and senior housing development, at 1A Leonay Parade, LEONAY 2750 has determined that the noise generated from the proposal will be negligible once attenuation recommendations are put into place to the closest residential receivers.

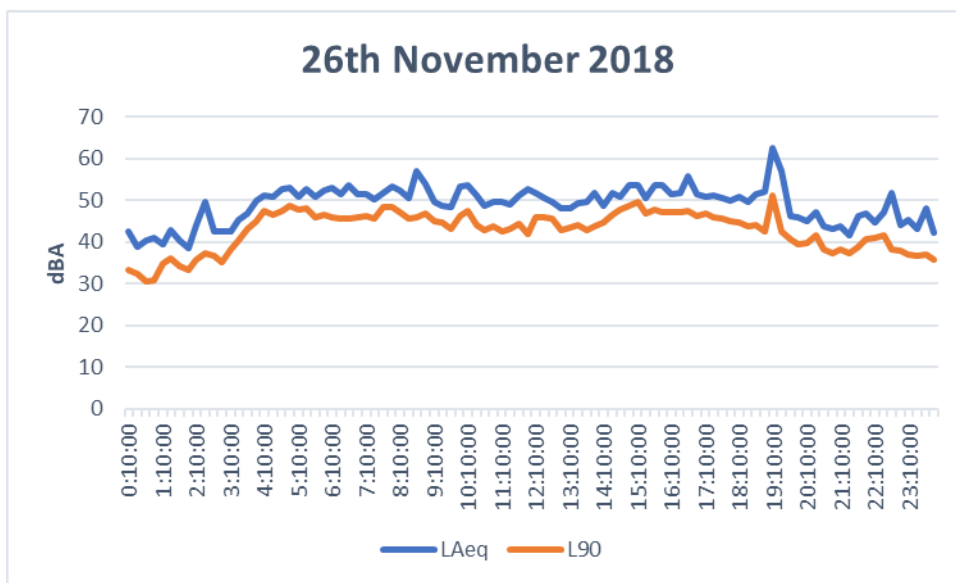
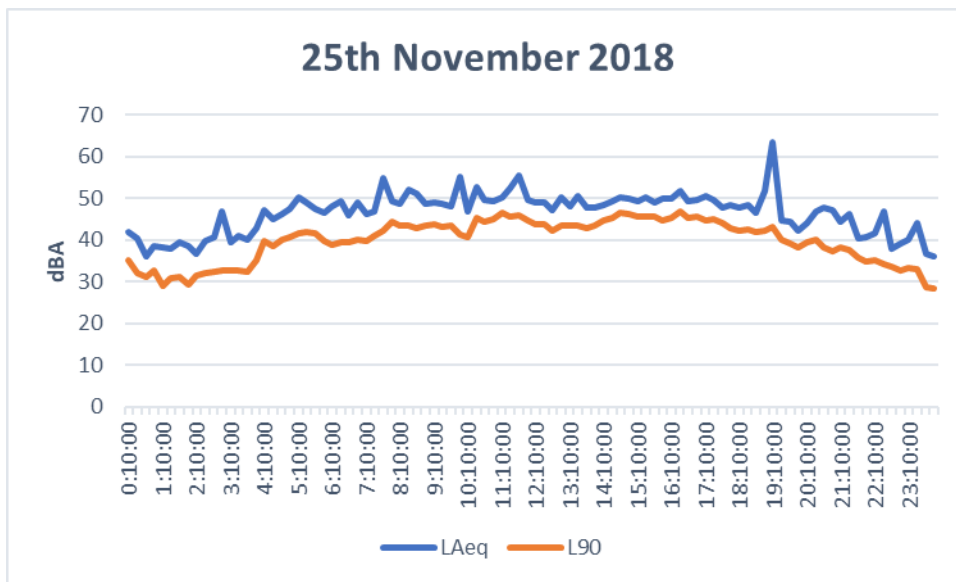
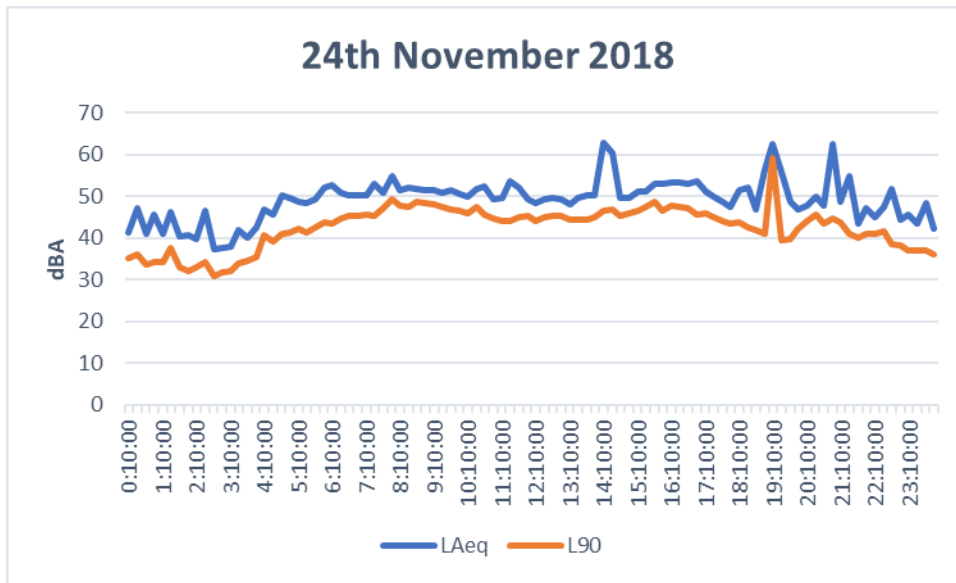
It is concluded that the proposed development is predicted to comply with the relevant noise goals providing the recommendations provided in Section 6 and 7 above are adhered to.

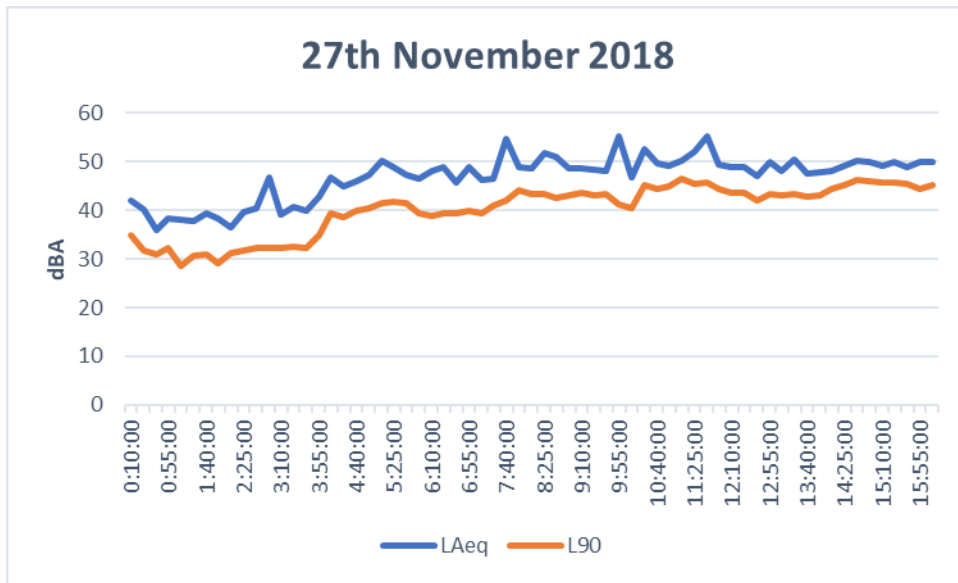
### 9. GRAPHED DATA

Measured noise levels.









## **Appendix I – Site Photos**





**Figure A1:** Toro Reelmaster 3100.D Reel Trim Mower



**Figure A2:** Sand Pro 3040 Grooming Maintenance Machine



Figure A3: Agrimetal Leaf Blower



Figure A4: John Deere 1200a Bunker Rake



**Figure A5:** John Deere 7200A Precision Cut Mower



**Figure A6:** Greensmaster 3150-Q Riding Greensmower



Figure A7: Kubota L3300 Tractor

## **Appendix II – Site Plans**

Client:

Leonay Links Pty Limited

ARCHITECTURAL CONSULTANTS  
DEVELOPMENT CONSULTANTS

# Proposed SEPP Housing for Seniors or People with a Disability 2004

Part of Lot 110 in DP1135581, (Leonay Golf Course) Leonay Parade, LEONAY

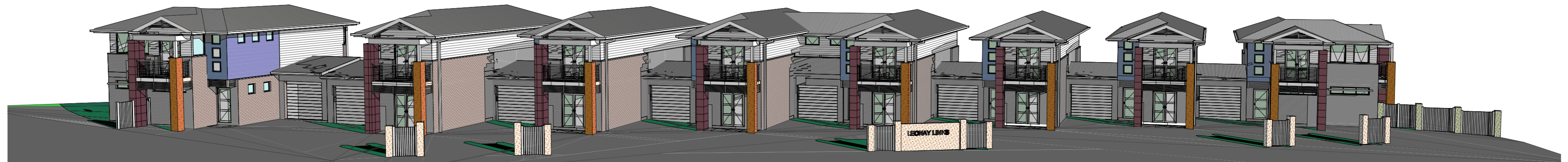
Development Application - Revised October 2015



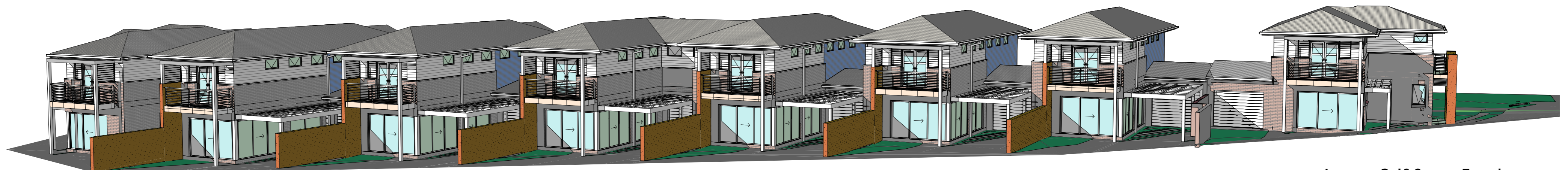
PreTech Pty Ltd - Architects  
John Hepworth Nominated Architect Reg. No 5036  
Level 1, Suite 2/86 Henry Street  
Penrith NSW 2750 Australia  
PO Box 301 Penrith NSW 2751  
T - (02) 4732 5100  
E - admin@pretech.com.au

## ARCHITECTURAL DRAWING SCHEDULE

SITE PLAN, GROUND FLOOR PLANS, SENIOR LIVING 2004 SPECIFICATION & DEVELOPMENT CALCULATIONS	1 : 250	A 01
FIRST FLOOR PLANS & SENIOR LIVING 2004 SPECIFICATION	1 : 250	A 02
ELEVATIONS	1 : 200	A 03
ELEVATIONS, SECTION & THERMAL PERFORMANCE SPECIFICATION	1 : 200	A 04
SITE ANALYSIS PLAN	1 : 350	A 05
SHADOW ANALYSIS (June 22, 9.0am, 12.0 & 3.0pm)	1 : 400	A 06



Leonay Parade Facade



Leonay Golf Course Facade

**SURVEY LEGEND & NOTES**  
 wt - DENOTES WINDOW TOP  
 wb - DENOTES WINDOW BOTTOM  
 DENOTES OVERHEAD ELECTRICITY  
 DENOTES SEWERMAIN (approx. position only)

1/k DENOTES TOP OF KERB  
 NOTE: SPREAD OF TREES IS APPROXIMATE ONLY

**DEVELOPMENT CALCULATIONS**  
**1. SITE AREA = 2,202.0m<sup>2</sup>**  
**2. PARKING REQUIREMENTS**  
 2.0 space per every  
 3 bed unit (x8 units),  
 plus 2 visitor.  
 Total provided = 18.0 Spaces

**3. LANDSCAPED OPEN AREA**  
 Min. required 30.0% = 660.60m<sup>2</sup>  
 Actual Area 38.96% = 858.23m<sup>2</sup>

**4. UNIT FLOOR AREAS**  
**UNIT 1**  
 Living Area = 132.60m<sup>2</sup>  
 Garage = 23.09m<sup>2</sup>  
 Veranda = 8.75m<sup>2</sup>  
 Balcony = 8.75m<sup>2</sup>  
 Total Area = 173.19m<sup>2</sup>

**UNIT 2-4&6-7**  
 Living Area = 134.66m<sup>2</sup>  
 Garage = 22.61m<sup>2</sup>  
 Veranda = 8.56m<sup>2</sup>  
 Balcony = 8.56m<sup>2</sup>  
 Total Area = 174.39m<sup>2</sup>

**UNIT 5**  
 Living Area = 151.49m<sup>2</sup>  
 Garage = 22.61m<sup>2</sup>  
 Veranda = 8.56m<sup>2</sup>  
 Balcony = 8.56m<sup>2</sup>  
 Total Area = 191.22m<sup>2</sup>

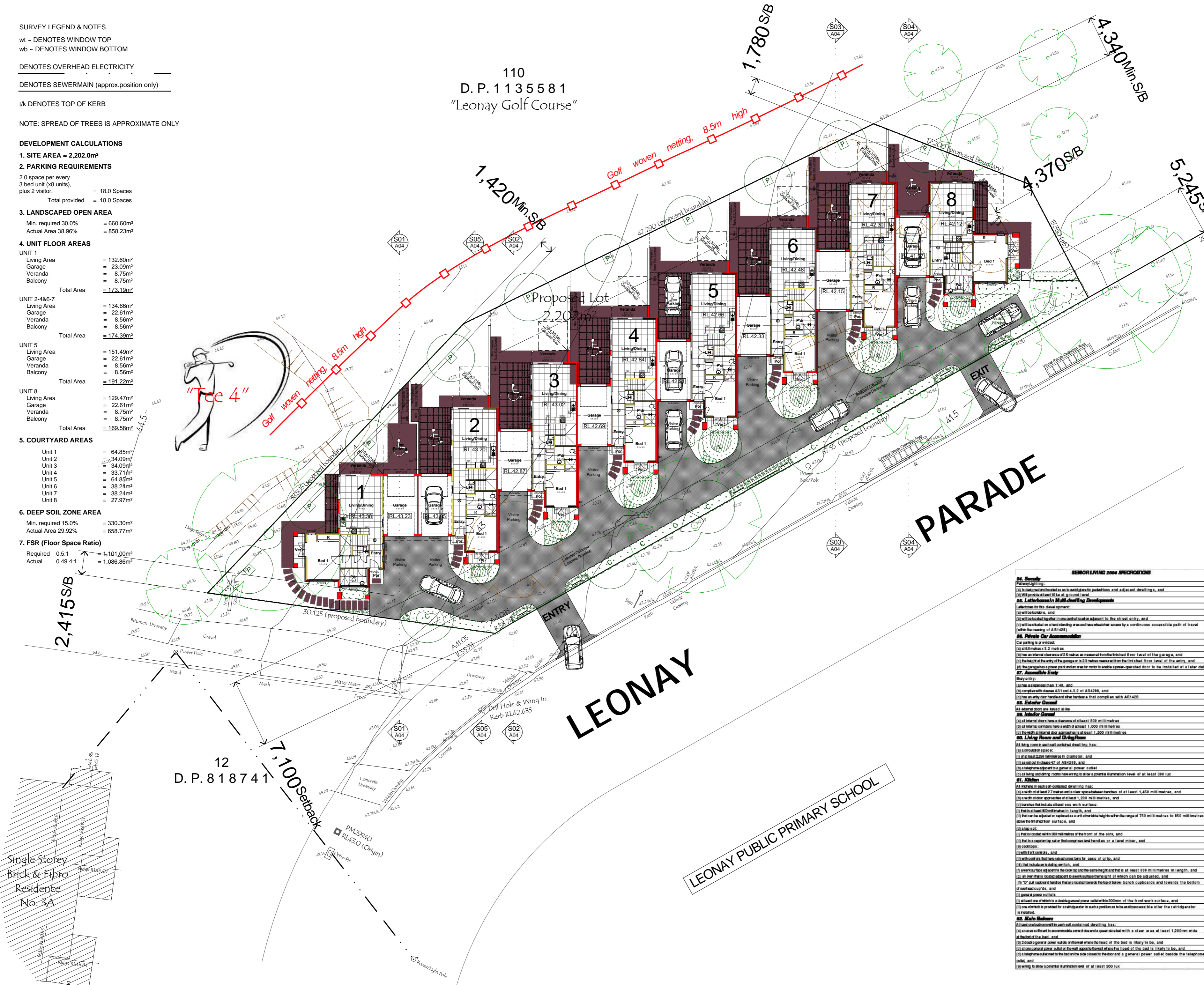
**UNIT 8**  
 Living Area = 129.47m<sup>2</sup>  
 Garage = 22.61m<sup>2</sup>  
 Veranda = 8.75m<sup>2</sup>  
 Balcony = 8.75m<sup>2</sup>  
 Total Area = 169.58m<sup>2</sup>

**5. COURTYARD AREAS**  
 Unit 1 = 64.85m<sup>2</sup>  
 Unit 2 = 34.09m<sup>2</sup>  
 Unit 3 = 34.09m<sup>2</sup>  
 Unit 4 = 33.71m<sup>2</sup>  
 Unit 5 = 64.85m<sup>2</sup>  
 Unit 6 = 38.24m<sup>2</sup>  
 Unit 7 = 38.24m<sup>2</sup>  
 Unit 8 = 27.97m<sup>2</sup>

**6. DEEP SOIL ZONE AREA**  
 Min. required 15.0% = 330.30m<sup>2</sup>  
 Actual Area 29.92% = 658.77m<sup>2</sup>

**7. FSR (Floor Space Ratio)**  
 Required 0.5:1 = 1,101.00m<sup>2</sup>  
 Actual 0.49:1 = 1,086.86m<sup>2</sup>

110  
 D. P. 1 1 3 5 5 8 1  
 "Leonay Golf Course"



NOTE: THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION, THE STRUCTURAL ENGINEER'S DETAILS AND ANY OTHER DOCUMENT THAT MAY BE ISSUED DURING THE COURSE OF CONSTRUCTION.  
 ALL DIMENSIONS SHOWN ARE IN MILLIMETRES, NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS.  
 ALL DIMENSIONS SHALL BE VERIFIED BY THE BUILDER ON SITE. ANY DISCREPANCY SHALL BE REFERRED TO THE DESIGNER BEFORE ANY CONSTRUCTION OR FABRICATION IS COMMENCED.

**LEGEND**

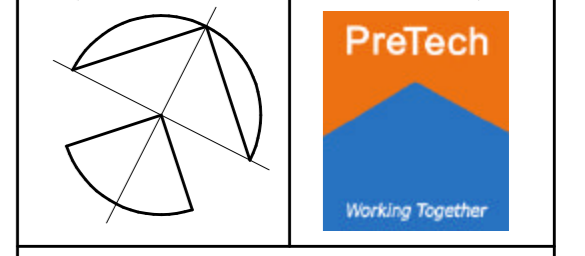
- Existing Surveyors Spot Level
- Proposed Related Level
- WT 2,000L
- WT 2,000L
- IG-WT 2,000L
- Smoke Detector
- Roof Access
- Electric Hot Water System
- Skytube
- Exhaust Fan/Light
- Gas Hot water
- Grasscrete
- Selected Brick Paver
- Retain Trees
- Remove Trees

Masonry Retaining Wall Notes:  
 (a) generally should be no taller than 500mm  
 (b) should not cut through roots of any tree  
 (c) should be separated from any associated fence by a planter-bed at least 500mm wide, minimising the apparent height of fencing  
 (d) should provide drainage for any associated planterbed  
 (e) should be separated from any driveway by a landscaped verge at least 500mm wide, to prevent impact damage from vehicles

**SEMPOR LIVING 2004 SPECIFICATIONS**

<b>44. Security</b>	Pathway Lighting	(a) be designed and installed so as to avoid glare for pedestrians and adjacent dwellings, and	(b) W8 provide at least 10 lux at ground level
<b>45. Letterboxes in Multi-dwelling Developments</b>	Letterboxes for the development	(a) be lockable, and	(b) be located together in one central location adjacent to the street entry, and
<b>46. Vehicle Car Accommodation</b>	Car parking is provided:	(a) at 6.0 metres x 3.2 metres	(b) has an internal clearance of 2.5 metres as measured from the finished floor level of the garage, and
<b>47. Accessible Entry</b>	Every entry:	(a) has a slope less than 1:49, and	(b) complies with clause 4.3.1 and 4.3.2 of AS4299, and
<b>48. External Doors</b>	All external doors are keyed alike	(a) have a minimum clear width of at least 800 millimetres	(b) have an internal clear width of at least 1,000 millimetres
<b>49. Living Room and Dining Room</b>	All living room in each self-contained dwelling has:	(a) a minimum clear width of at least 2,000 millimetres in diameter, and	(b) a minimum clear height of at least 2,000 millimetres
<b>50. Kitchen</b>	All kitchens in each self-contained dwelling has:	(a) a width of at least 2,7 metres and a clear space between benches of at least 1,450 millimetres, and	(b) a width of clear approach of at least 1,200 millimetres, and
<b>51. Bathrooms</b>	All bathrooms in each self-contained dwelling has:	(a) a minimum clear width of at least 800 millimetres in length, and	(b) a minimum clear height of at least 2,000 millimetres
<b>52. Main Bedroom</b>	At least one bedroom in each self-contained dwelling has:	(a) an area sufficient to accommodate a bed and a queen size bed with a clear area of at least 1,200mm wide	(b) a clear space of at least 1,200mm wide

E	Development Application Revised	01.10.15
D	Development Application Revised	14.09.15
C	Development Application Revised	05.03.15
B	Development Application	20.12.14
A	Client Presentation	20.10.14
Issue	Amendment	Date



**PreTech Pty Ltd - Architects**  
 John Hepworth Nominated Architect Reg. No 5036  
 Level 1, Suite 2-86 Henry Street  
 Penrith, NSW 2750  
 Telephone: (02) 4732 5100 Email: admin@pretech.com.au

Project  
**Proposed SEPP 2004 Housing**  
 Leonay Golf Course, Leonay Parade, LEONAY

Client: Leonay Links Pty Limited  
 Job No. 00311  
 Scale 1:250  
 Author S.Vlangos  
 Drawn S.Vlangos  
 Date Oct 2014

Site, Ground Floor Plan & Development Calculations

No. in Set	Dwg. No.	Issue
06	A01	E

**SURVEY LEGEND & NOTES**  
 wt - DENOTES WINDOW TOP  
 wb - DENOTES WINDOW BOTTOM  
 DENOTES OVERHEAD ELECTRICITY  
 DENOTES SEWERMAIN (approx. position only)

1/k DENOTES TOP OF KERB  
 NOTE: SPREAD OF TREES IS APPROXIMATE ONLY

**DEVELOPMENT CALCULATIONS**  
**1. SITE AREA = 2,202.0m<sup>2</sup>**  
**2. PARKING REQUIREMENTS**  
 2.0 space per every  
 3 bed unit (x8 units),  
 plus 2 visitor.  
 = 18.0 Spaces  
 Total provided = 18.0 Spaces

**3. LANDSCAPED OPEN AREA**  
 Min. required 30.0% = 660.60m<sup>2</sup>  
 Actual Area 38.96% = 858.23m<sup>2</sup>

**4. UNIT FLOOR AREAS**  
**UNIT 1**  
 Living Area = 132.60m<sup>2</sup>  
 Garage = 23.09m<sup>2</sup>  
 Veranda = 8.75m<sup>2</sup>  
 Balcony = 8.75m<sup>2</sup>  
 Total Area = 173.19m<sup>2</sup>

**UNIT 2-4&6-7**  
 Living Area = 134.66m<sup>2</sup>  
 Garage = 22.61m<sup>2</sup>  
 Veranda = 8.56m<sup>2</sup>  
 Balcony = 8.56m<sup>2</sup>  
 Total Area = 174.39m<sup>2</sup>

**UNIT 5**  
 Living Area = 151.49m<sup>2</sup>  
 Garage = 22.61m<sup>2</sup>  
 Veranda = 8.56m<sup>2</sup>  
 Balcony = 8.56m<sup>2</sup>  
 Total Area = 191.22m<sup>2</sup>

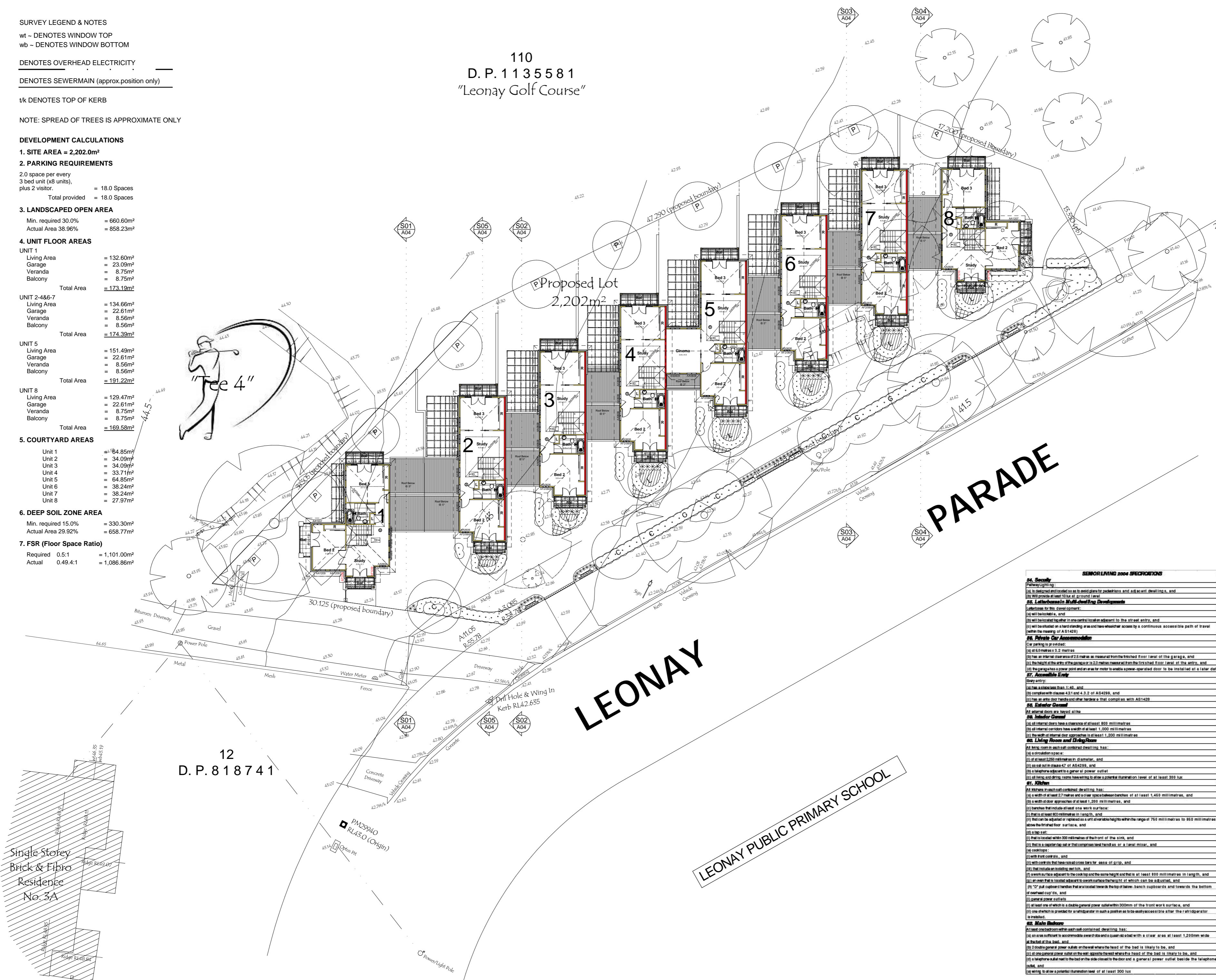
**UNIT 8**  
 Living Area = 129.47m<sup>2</sup>  
 Garage = 22.61m<sup>2</sup>  
 Veranda = 8.75m<sup>2</sup>  
 Balcony = 8.75m<sup>2</sup>  
 Total Area = 169.58m<sup>2</sup>

**5. COURTYARD AREAS**  
 Unit 1 = 64.85m<sup>2</sup>  
 Unit 2 = 34.09m<sup>2</sup>  
 Unit 3 = 34.09m<sup>2</sup>  
 Unit 4 = 33.71m<sup>2</sup>  
 Unit 5 = 64.85m<sup>2</sup>  
 Unit 6 = 38.24m<sup>2</sup>  
 Unit 7 = 38.24m<sup>2</sup>  
 Unit 8 = 27.97m<sup>2</sup>

**6. DEEP SOIL ZONE AREA**  
 Min. required 15.0% = 330.30m<sup>2</sup>  
 Actual Area 29.92% = 658.77m<sup>2</sup>

**7. FSR (Floor Space Ratio)**  
 Required 0.5:1 = 1,101.00m<sup>2</sup>  
 Actual 0.49:1 = 1,086.86m<sup>2</sup>

110  
 D. P. 1 1 3 5 8 1  
 "Leonay Golf Course"



NOTE:  
 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION, THE STRUCTURAL ENGINEER'S DETAILS AND ANY OTHER DOCUMENT THAT MAY BE ISSUED DURING THE COURSE OF CONSTRUCTION.  
 ALL DIMENSIONS SHOWN ARE IN MILLIMETRES, NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS.  
 ALL DIMENSIONS SHALL BE VERIFIED BY THE BUILDER ON SITE.  
 ANY DISCREPANCY SHALL BE REFERRED TO THE DESIGNER BEFORE ANY CONSTRUCTION OR FABRICATION IS COMMENCED.

**LEGEND**

- Existing Surveyors Spot Level
- Proposed Related Level
- WT-2,000L
- WT-2,000L
- IG-WT-2,000L
- Aboveground pre-fabricated water tank (WT) and Inground (IG) 2,000L-620W x 2,000L x 2,190H" or equal and 2,000L-1,200D x 2,190H" or equal
- Smoke Detector
- Roof Access
- Electric Hot Water System
- Skytube
- Exhaust Fan/Light
- Gas Hot water
- Grasscrete
- Selected Brick Paver
- Retain Trees
- Remove Trees

Masonry Retaining Wall Notes:  
 (a) generally should be no taller than 500mm  
 (b) should not cut through roots of any tree  
 (c) should be separated from any associated fence by a planter-bed at least 500mm wide, minimising the apparent overall height of fencing  
 (d) should provide drainage for any associated planterbed  
 (e) should be separated from any driveway by a landscaped verge at least 500mm wide, to prevent impact damage from vehicles

**SEWORLDING 2004 SPECIFICATIONS**

**44. Security**  
 Pathway Lighting:  
 (a) be designed and installed so as to avoid glare for pedestrians and adjacent dwellings, and  
 (b) W8 provide at least 10 lux at ground level

**45. Letterboxes in Multi-dwelling Developments**  
 Letterboxes for the development:  
 (a) will be lockable, and  
 (b) will be located together in one central location adjacent to the street entry, and  
 (c) will be situated on a hard standing area and have wheelchair access by a continuous accessible path of travel (within the meaning of A 61401)

**46. Vehicle Car Accommodation**  
 Car parking is provided:  
 (a) at 6.0 metres x 3.2 metres  
 (b) has an internal clearance of 2.5 metres as measured from the finished floor level of the garage, and  
 (c) the height of the entry of the passage or to 2.5 metres measured from the finished floor level of the entry, and  
 (d) the garage has a power point and an area to enable a power-operated door to be installed at a later date

**47. Accessible Entry**  
 Every entry:  
 (a) has a slope less than 1:49, and  
 (b) complies with clause 4.3.1 and 4.3.2 of AS4299, and  
 (c) has an entry door handle not other hardware that complies with AS1428

**48. External Doors**  
 All external doors are keyed alike

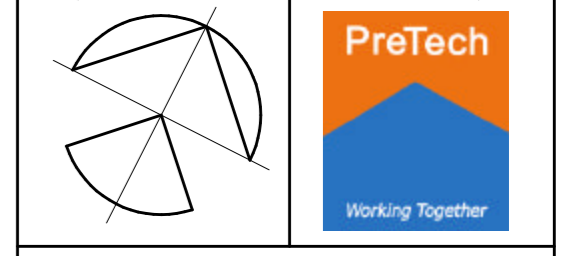
**49. Internal Doors**  
 All internal doors have a clearance of at least 800 millimetres  
 (b) all internal corridors have a width of at least 1,000 millimetres  
 (c) the width of internal door approaches is at least 1,000 millimetres

**50. Living Room and Dining Room**  
 All living room in each self-contained dwelling has:  
 (a) a circulation space:  
 (i) of at least 2,500 millimetres in diameter, and  
 (ii) as set out in clause 4.7 of AS4299, and  
 (b) a telephone adjacent to a general air power outlet  
 (c) all living and dining rooms have written to allow a potential illumination level of at least 300 lux

**51. Kitchens**  
 All kitchens in each self-contained dwelling has:  
 (a) a width of at least 2,7 metres and a clear space between benches of at least 1,450 millimetres, and  
 (b) a width of approach of at least 1,200 millimetres, and  
 (c) benches that include at least six work surface:  
 (i) that is at least 800 millimetres in length, and  
 (ii) that can be adjusted or replaced as a unit at various heights within the range of 750 millimetres to 850 millimetres above the finished floor surface, and  
 (d) a tap set:  
 (i) that is located within 300 millimetres of the front of the sink, and  
 (ii) that is a combination set or that comprises hand washers, or a level mirror, and  
 (e) cocktoops:  
 (i) with front controls, and  
 (ii) with controls that are recessed into the front of a grip, and  
 (f) that includes an existing wet tap, and  
 (g) a work surface adjacent to the cocktop and the same height and that is at least 800 millimetres in length, and  
 (h) an oven that is located adjacent to work surface the height of which can be adjusted, and  
 (i) 10" x 10" cupboards located below the work surface towards the top of the bench, bench cupboards and towards the bottom of overhead cupboards, and  
 (j) general air power outlets  
 (k) at least one of which is a double general power outlet within 300mm of the front work surface, and  
 (l) one of which is provided for a refrigerator in such a position as to be easily accessible after the refrigerator is installed

**52. Main Bedroom**  
 At least one bedroom within each self-contained dwelling has:  
 (a) an area sufficient to accommodate a wardrobe and a queen size bed with a clear area of at least 1,200mm wide at the foot of the bed, and  
 (b) 2 x double general power outlets installed where the head of the bed is likely to be, and  
 (c) a telephone power outlet on the wall opposite the head of the bed is likely to be, and  
 (d) a telephone outlet next to the bed on the side closest to the door and a general power outlet beside the telephone outlet, and  
 (e) wiring to allow a potential illumination level of at least 300 lux

E	Development Application Revised	01.10.15
D	Development Application Revised	14.09.15
C	Development Application Revised	05.03.15
B	Development Application	20.12.14
A	Client Presentation	20.10.14
Issue	Amendment	Date



**PreTech Pty Ltd - Architects**  
 John Hepworth Nominated Architect Reg. No 5036  
 Level 1, Suite 2-86 Henry Street  
 Penrith, NSW 2750  
 Telephone: (02) 4732 5100 Email: admin@pretech.com.au

© Copyright 2015 PreTech Pty Limited ACH 096 521 023  
 All intellectual property rights in this document are and remain the sole property of PreTech Pty Limited and may not be copied, reproduced or otherwise used in whole or in part without the written permission of PreTech Pty Limited. Without limitation, in no circumstances may these drawings be reduced for any purpose by any person, in whole or in part, without the written permission of PreTech Pty Limited.

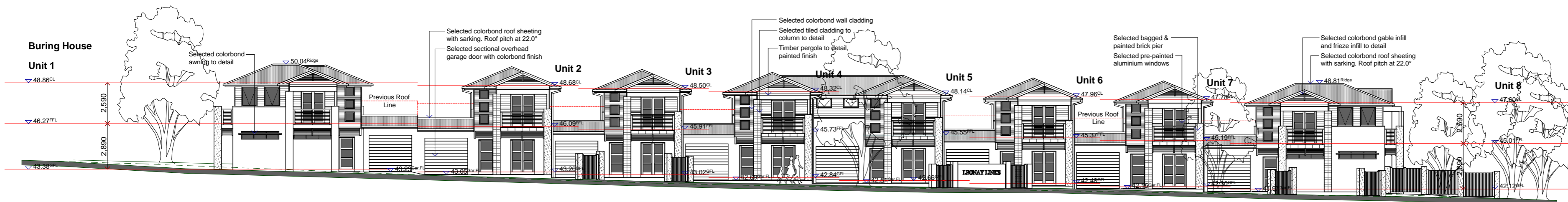
Project  
**Proposed SEPP 2004 Housing**  
 Leonay Golf Course, Leonay Parade, LEONAY  
 Client : Leonay Links Pty Limited  
 Job No. 00311 Scale 1:250  
 Author S.Vlangos Drawn S.Vlangos Date Oct 2014

Drawing  
**First Floor Plan & Development Calculations**

No. in Set	Dwg. No.	Issue
06	A02	E



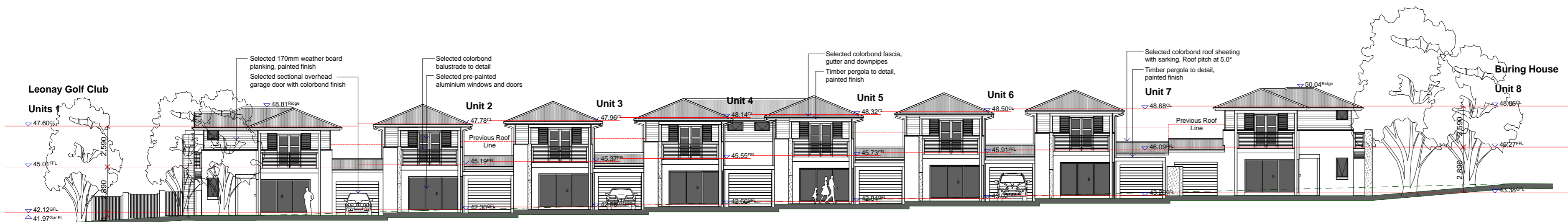
NOTE:  
THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION, THE STRUCTURAL ENGINEER'S DETAILS AND ANY OTHER DOCUMENT THAT MAY BE ISSUED DURING THE COURSE OF CONSTRUCTION.  
ALL DIMENSIONS SHOWN ARE IN MILLIMETRES, NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS.  
ALL DIMENSIONS SHALL BE VERIFIED BY THE BUILDER ON SITE. ANY DISCREPANCY SHALL BE REFERRED TO THE DESIGNER BEFORE ANY CONSTRUCTION OR FABRICATION IS COMMENCED.



South-East Elevation  
Leonay Parade

**External Colour Schedule**

- Colorbond roof sheeting  
Colour-Surfmist
- Colorbond fascia  
Colour-Surfmist
- Colorbond gutter & downpipes  
Colour-Jasper
- Colorbond wall cladding  
Colour-Deep Ocean
- Plank cladding  
Colour-Off White (Dulux)
- External face brickwork  
(Austral-Urban Fringe-Truffle)
- Feature Column-Tiled  
Iron stone-metallic colour
- Bagged brick pier  
Colour-Jasper 50% (Colorbond Colour)
- Aluminium windows and doors  
Colour-Surfmist (Colorbond Colour)
- Aluminium garage doors  
Colour-Surfmist (Colorbond Colour)
- External timber work  
Colour-Off White (Dulux)

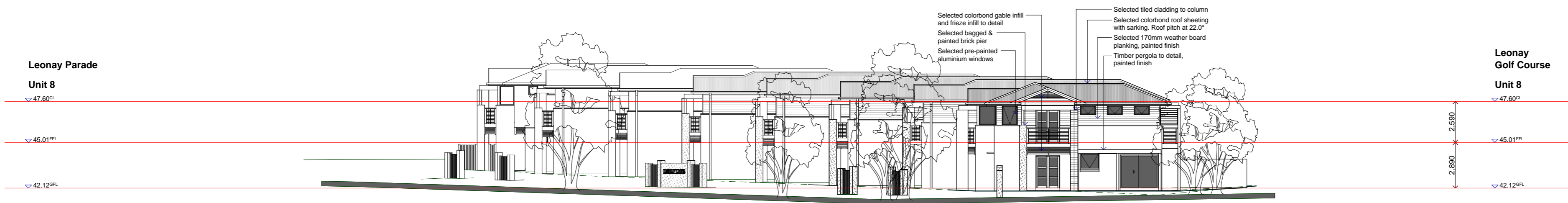


North-West Elevation  
Leonay Golf Course

**Retaining Wall Notes:**  
(a) generally should be no taller than 500mm  
(b) should not cut through roots of any tree  
(c) should be separated from any associated fence by a planter-bed at least 500mm wide, minimising the apparent overall height of fencing  
(d) should provide drainage for any associated planter-bed  
(e) should be separated from any driveway by a landscaped verge at least 500mm wide, to prevent impact damage from vehicles



South-West Elevation  
Buring House



South-East Elevation  
Leonay Parade

Issue	Amendment	Date
C	Development Application Revised	01.10.15
B	Development Application Revised	14.09.14
A	Development Application	20.12.14



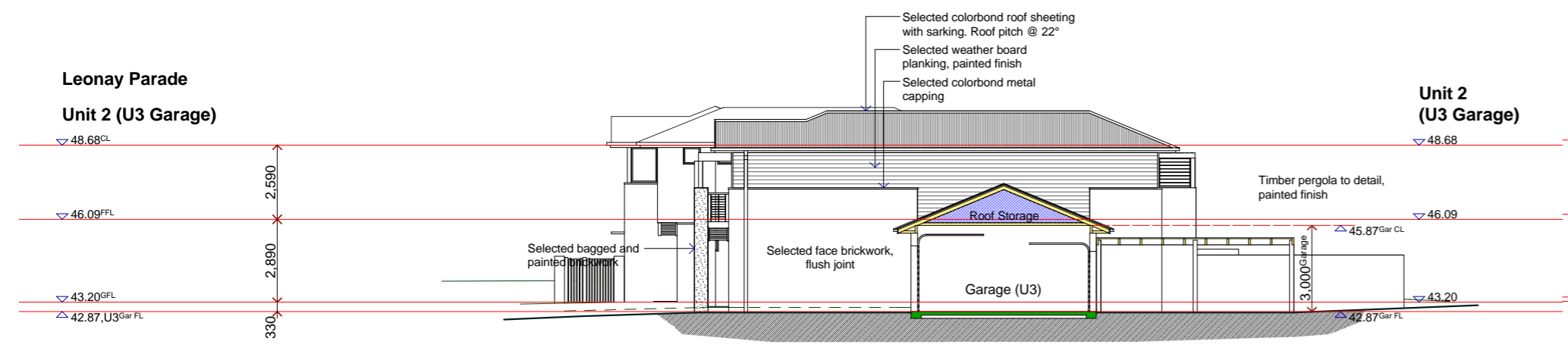
**PreTech Pty Ltd - Architects**  
John Hepworth Nominated Architect Reg. No 5036  
Level 1, Suite 2-86 Henry Street  
Penrith, NSW 2750  
Telephone: (02) 4732 5100 Email: admin@pretech.com.au

© Copyright 2015 PreTech Pty Limited ACH 096 521 023  
All intellectual property rights in this document are and remain the sole property of PreTech Pty Limited and may not be copied, reproduced or otherwise used in whole or in part without the written permission of PreTech Pty Limited. Without limitation, in no circumstances may these drawings be redrafted for any purpose by any person, in whole or in part, without the written permission of PreTech Pty Limited.

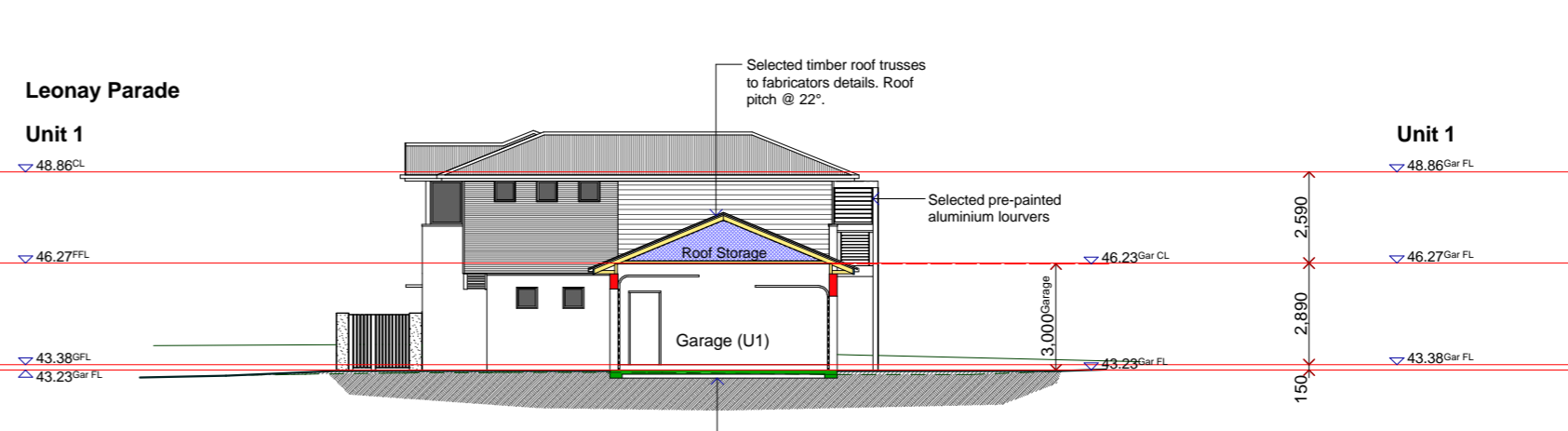
Project <b>Proposed SEPP 2004 Housing</b> Leonay Golf Course, Leonay Parade, LEONAY		
Client : Leonay Links Pty Limited		
Job No. 00311	Scale 1:200	Date Oct 2014
Author S.Vlangos	Drawn S.Vlangos	Date Oct 2014

Drawing <b>Elevations</b>		
No. in Set <b>06</b>	Dwg. No. <b>A03</b>	Issue <b>C</b>

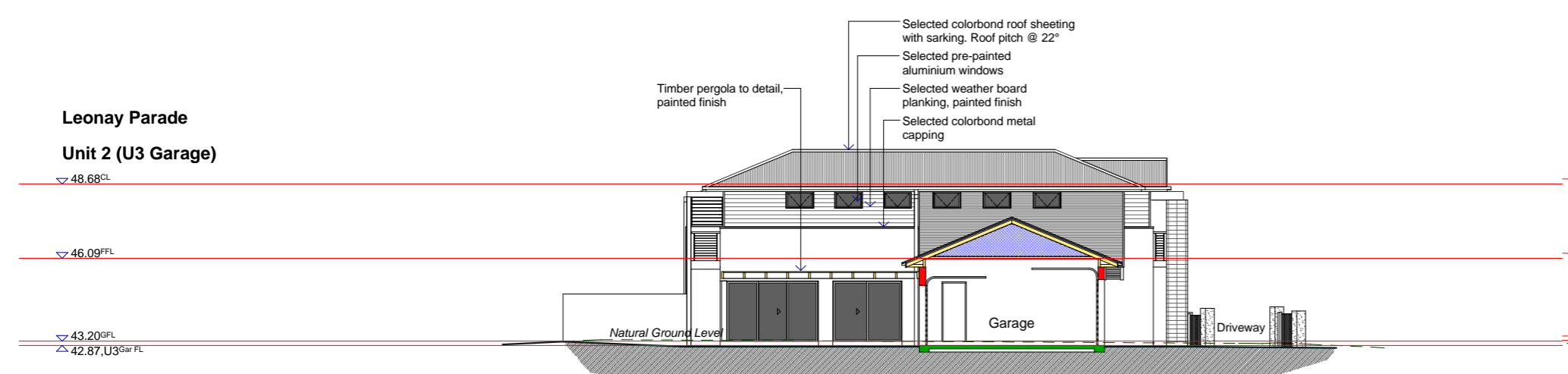
NOTE:  
THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION, THE STRUCTURAL ENGINEER'S DETAILS AND ANY OTHER DOCUMENT THAT MAY BE ISSUED DURING THE COURSE OF CONSTRUCTION.  
ALL DIMENSIONS SHOWN ARE IN MILLIMETRES, NO DIMENSIONS SHALL BE SCALED FROM THE DRAWINGS.  
ALL DIMENSIONS SHALL BE VERIFIED BY THE BUILDER ON SITE.  
ANY DISCREPANCY SHALL BE REFERRED TO THE DESIGNER BEFORE ANY CONSTRUCTION OR FABRICATION IS COMMENCED.



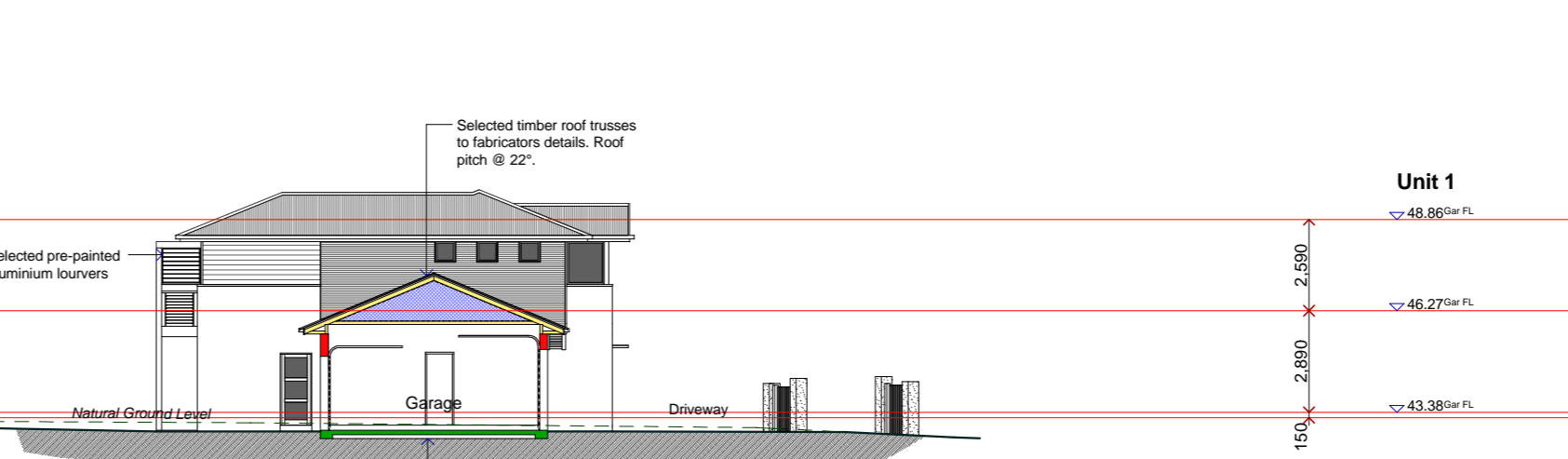
S01 Elevation-Section  
A01



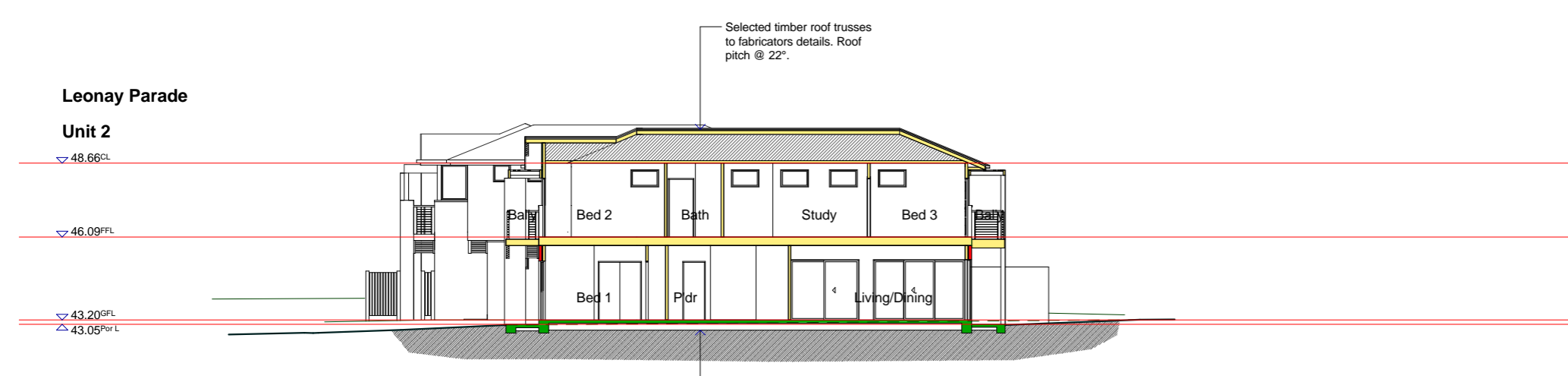
S02 Elevation-Section  
A01



S03 Elevation-Section  
A01



S04 Elevation-Section  
A01



S05 Section  
A01

**External Colour Schedule**

- Colorbond roof sheeting  
Colour-Surfmist
- Colorbond fascia  
Colour-Surfmist
- Colorbond gutter & downpipes  
Colour-Jasper
- Colorbond wall cladding  
Colour-Deep Ocean
- Plank cladding  
Colour-Off White (Dulux)
- External face brickwork  
(Austral-Urban Fringe-Truffle)
- Feature Column-Tiled  
Iron stone-metallic colour
- Bagged brick pier  
Colour-Jasper 50% (Colorbond Colour)
- Aluminium windows and doors  
Colour-Surfmist (Colorbond Colour)
- Aluminium garage doors  
Colour-Surfmist (Colorbond Colour)
- External timber work  
Colour-Off White (Dulux)

**Retaining Wall Notes:**  
(a) generally should be no taller than 500mm  
(b) should not cut through roots of any tree  
(c) should be separated from any associated fence by a planter-bed at least 500mm wide, minimising the apparent overall height of fencing  
(d) should provide drainage for any associated planterbed  
(e) should be separated from any driveway by a landscaped verge at least 500mm wide, to prevent impact damage from vehicles

B	Development Application-Revised	01.10.15
A	Development Application	20.12.14
Issue	Amendment	Date



**PreTech Pty Ltd - Architects**

John Hepworth Nominated Architect Reg. No 5036  
Level 1, Suite 2-86 Henry Street  
Penrith, NSW 2750  
Telephone: (02) 4732 5100 Email: admin@pretech.com.au

Project  
**Proposed SEPP 2004 Housing**  
Leonay Golf Course, Leonay Parade, LEONAY

Client : Leonay Links Pty Limited

Job No. 00311 Scale 1:200

Author S.Vlangos Drawn S.Vlangos Date Oct 2014

**Elevations, Sections & Thermal Specification**

No. in Set	Dwg. No.	Issue
06	A04	B

BASIX & NatHERS COMMITMENTS NOTES				
*REFER TO APPROVED BASIX REPORT*				
<b>WATER</b>				
Fixtures	All Shower Heads	All toilet flushing systems	All kitchen taps	All bathroom taps
	3 star (> 7.5 but <= 9 L/min)	4 star	4 star	5 star
Alternative water source	Individual water tank to collect run off from at least 50 m <sup>2</sup> of roof area - Tank size min 2000 litres			
	Landscape connection	Toilet connection	Laundry connection	Pool top up
	Yes	Yes	Yes	-
<b>ENERGY</b>	Hot water system: Gas instantaneous 5 star			
	Bathroom ventilation system: Individual fan, ducted to façade or roof manual switch on/off			
	Kitchen ventilation system: Individual fan, ducted to façade or roof manual switch on/off			
	Laundry: Individual fan, ducted to façade or roof manual switch on/off			
	Cooling system: 1 Phase air-conditioning EER 3.0-3.5 (zoned)			
	Heating system: 1 Phase air-conditioning EER 3.0-3.5 (zoned)			
	Natural lighting: As per BASIX			
	Artificial lighting: As per BASIX			
	Must install a fixed outdoor clothes drying line as part of the development.			
	Must install a fixed indoor or sheltered clothes drying line as part of the development.			

Building Elements	Material	Detail
External walls	Brick veneer Lightweight.	R2.0 Bulk insulation
	Cavity brick – as per plans	Foil sided bubble wrap (Aircell permica / Polyair Performa 4 or the like) total system R value Rt1.7
Internal walls	Plasterboard on studs	R2.0 bulk insulation between garage and living areas
Common walls between dwellings	Brick	-
Ceiling	Plasterboard	R3.0 bulk insulation to ceilings with roof above
Floors	Concrete Timber	Waffle pod -
Roof	Metal roof, Medium Colour	Foil (sialation) to underside of roof
Windows	Aluminium framed, single glazed low e or similar	U value 4.7 or less and a SHGC of 0.63 +/- 10% to units 1 and 8 only
	Aluminium framed, single glazed clear	U value 6.57 or less and a SHGC of 0.74 +/- 10% rest of units

**Lighting:** Dwellings have been rated without downlights.  
Self closing dampers to exhaust fans  
Note: Insulation specified must be installed in accordance with Part 3.12.1.1 of the BCA