Environmental Noise Assessment

Hub68 Centre of Excellence – Aging & Wellness

At 58-68 Delancey Street, Ormiston

On behalf of The Hub Precinct Pty Ltd.

22BRA0115 R01_2

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Acoustics Data Traffic Waste

Revision Record

No.	Author	Reviewed/Approved	Description	Date
A.	A. Ashworth	S. Yorke	Draft – client review	09/11/2022
0.	A. Ashworth		Client Issue	25/11/2022
1	A. Ashworth		Updated Plans	27/04/2023
2	A. Ashworth		Updated Plans	15/05/2023

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Executive Summary

TTM conducted an environmental noise assessment for Hub68 Centre of Excellence – Aging & Wellness development located at 58-68 Delancey Street, Ormiston.

Noise measurements were undertaken to establish the existing road traffic and ambient noise levels.

Road traffic noise levels from the State-controlled transport noise corridor were predicted at the hospital facades, and façade requirements as outlined in Section 6.3 were recommended for compliance with the SDAP V3.0 internal noise level criteria.

Noise generated by the proposed development impacting nearby offsite and onsite noise sensitive receivers was assessed and recommendations, including an acoustic barrier, as outlined in Section 8 are required for compliance with the EPP 2008 noise criteria.

Compliance with the criteria outlined in Section 5 (SDAP V3.0 and EPP 2008) is predicted to be achieved based on the implementation of the recommendations outlined in Section 8 of this report.

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1 Introduction

1.1 Background

TTM was engaged by The Hub Precinct Pty Ltd to undertake an environmental noise assessment of Hub68 Centre of Excellence – Aging & Wellness development located at 58-68 Delancey Street, Ormiston.

1.2 References

The assessment is based on the following:

- State Development Assessment Provisions (SDAP) State Code 1, v3.0
- City Plan 2018, Redland Planning Scheme, Version 9
- Environmental Protection (Noise) Policy 2008
- Development plans as shown in Appendix A
- Earthworks design contours as shown in Appendix E
- Site inspection, noise measurements, analysis and calculations conducted by TTM.

1.3 Scope

The assessment includes the following:

- Description of the site and proposal;
- Measurement of existing road traffic and ambient noise levels;
- Statement of assessment criteria relating to road traffic noise intrusion and environmental noise emissions;
- Prediction of road traffic noise impacts on the development;
- Assessment of noise generated by the development onto noise sensitive receivers;
- Details of noise control recommendations to be incorporated to achieve predicted compliance.

2 Site Description

2.1 Site Location

The site is described by the following:

- 58-68 Delancey Street, Ormiston

The site locality is shown in Figure 1.

Figure 1: Site Locality

2.2 Description of Surrounding Area

The site is bound by residential properties to the north, Delancey Street to the east, Finucane Road to the south and conservation zoned land to the west. The current acoustic environment at the site is primarily comprised of road traffic noise on Finucane Road.

3 Proposed Development

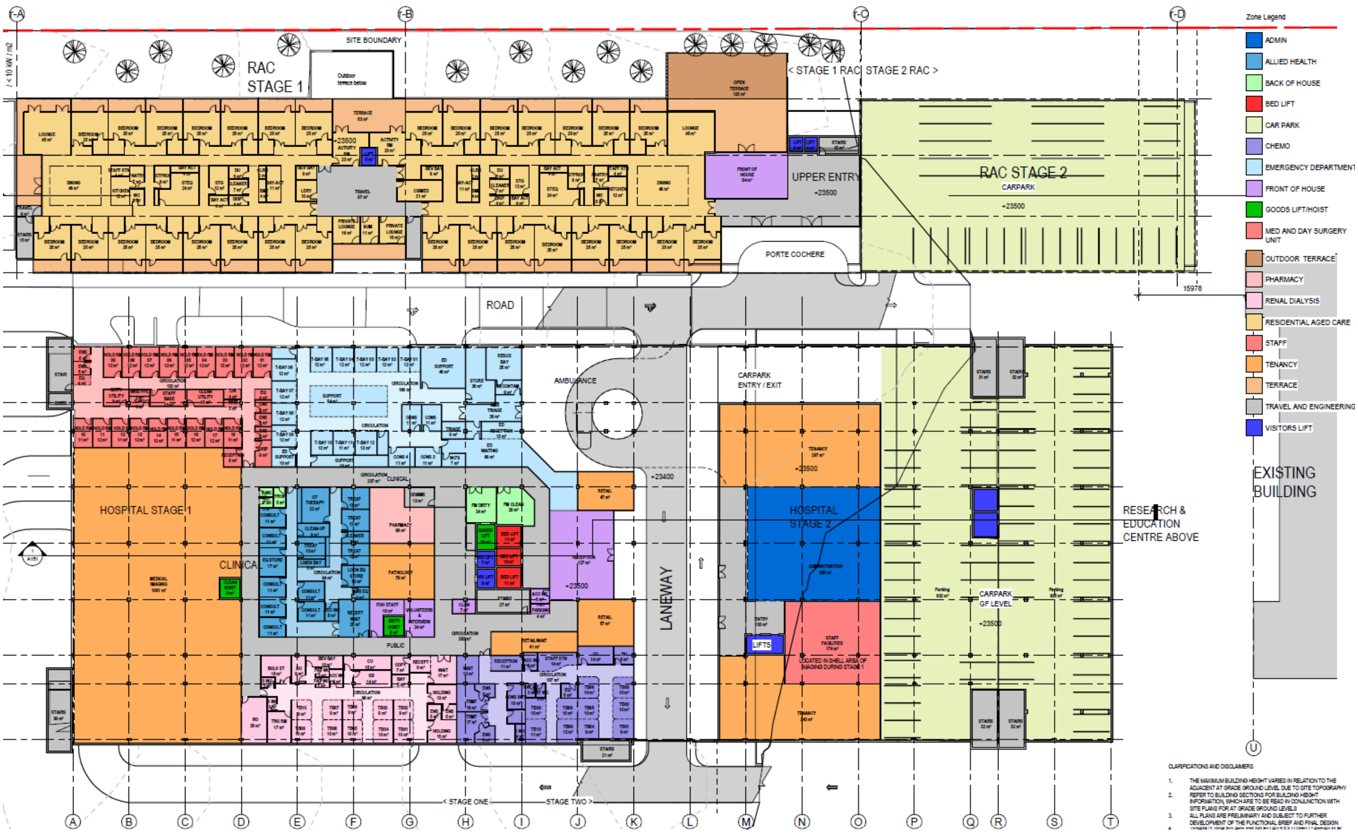
3.1 Development Description

The proposal is to develop a hospital and retirement accommodation. Access to the site is proposed via Finucane Road and Delancey Street.

- The proposed hours of operation for the hospital and residential aged care facilities are 24 hours, 7 days a week.

The assessment is based on the development plans shown in Appendix A. The ground floor plan of the proposed development is shown in Figure 2.

Figure 2: Proposed Ground Floor Plan



4 Noise Measurements

4.1 Equipment

The following equipment was used to measure existing road traffic and ambient noise levels:

- Norsonic 140 environmental noise monitor (Serial number: 1406504)
- ARL EL315 environmental noise monitor (Serial number: 15-302-489)
- Rion NC-73 Calibrator (Serial number: 10697023)
- Norsonic Nor131 sound level meter (Serial number: 1313158)

All equipment was calibrated by a National Association of Testing Authorities (NATA) accredited laboratory. The equipment was calibrated before and after the measurement session. No significant drift from the reference signal was recorded.

4.2 Unattended Noise Monitoring

Unattended noise monitoring was conducted to establish the existing road traffic noise and ambient levels between Friday 26th August and Monday 5th September 2022. The noise monitoring locations are shown in Figure 3.

The road traffic noise monitor was located approximately 9m from the nearest lane of Finucane Road with an unobstructed line of sight to the road. The microphone was in a free-field location and 1.5m above ground level. The noise monitor was set to measure statistical noise levels in 'A'-weighting, 'Fast' response, over 1-hour intervals. Road traffic noise levels were measured in accordance with Australian Standard AS2702[1].

The ambient noise monitor was located towards the north of the site in a position considered representative of noise levels experienced at the nearest noise sensitive receivers, with consideration to access and security requirements. The microphone was in a free-field location and 1.5m above ground level. The noise monitor was set to measure statistical noise levels in 'A'-weighting, 'Fast' response, over 15-minute intervals. Ambient noise levels were measured in accordance with Australian Standard *AS1055*[2].

Weather during the noise monitoring period was generally mixed with rainfall affected data excluded from the analysis. The temperature range was between 7-25°C (source: Bureau of Meteorology, Redland weather station).

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[1] Australian Standard *AS2702:1984 Acoustics – Methods for the Measurement of Road Traffic Noise*

[2] Australian Standard *AS1055:2018 Acoustics – Description and Measurement of Environmental Noise*

Figure 3: Noise Monitoring Locations

4.3 Results of Measurements

4.3.1 Road Traffic Noise Levels

Table 1 presents the measured road traffic noise levels from Finucane Road.

Table 1: Measured Road Traffic Noise Levels (Finucane Road)

Day and Date	Road Traffic Noise Descriptor	Time Period	Measured Level, dB(A)
Average of weekday measurement days	$L_{A10,18\ hour}$	6am to midnight	73.7
	$L_{A10,12\ hour}$	6am to 6pm	74.8
	$L_{A10,1\ hour}$ (Maximum during opening hours)	8am to 9am	76.0
	$L_{Aeq,1\ hour}$ (Noisiest daytime hour)	7am to 8am	73.0
	$L_{Aeq,1\ hour}$ (Noisiest night-time hour)	10pm to 11pm	70.4

Graphical presentation of the measured levels is shown in Appendix B.

4.3.2 Ambient Noise Levels

Table 2 presents the measured ambient noise levels from the unattended noise monitoring, determined in accordance with the Redland City Council *Planning Scheme Policy 6 – Environmental Emissions*. The Rating Background Level (RBL) is a 10th percentile average of all non-weather affected periods Graphical presentation of the measured levels is shown in Appendix B.

Table 2: Measured Ambient Noise Levels

Time Period	Measured Noise Levels, dB(A)	
	RBL L_{90}	L_{eq}
Daytime (7am – 6pm)	49	58
Evening (6pm – 10pm)	46	55
Night (10pm – 7am)	31	52

The data presented above has been used to determine the assessment criteria for the development.

5 Noise Criteria

5.1 Road Traffic Noise

The site is located within the State government transport noise corridor of Finucane Road. To ensure a satisfactory level of acoustic amenity is provided for the development, an assessment was conducted to achieve compliance with the requirements of the State Development Assessment Provisions (SDAP).

5.1.1 State Development Assessment Provisions (SDAP)

The road traffic noise criteria for a medical development near a state-controlled road are contained in State Code 1 (v3.0) of the State Development Assessment Provisions. The criteria are reproduced in Table 3.

Table 3: SDAP State Code 1 – Road Traffic Noise Criteria for Medical Developments

Performance Outcomes	Acceptable Outcomes
Ground floor level requirements (hospital) adjacent to a state-controlled road	
PO46 Development involving: 1. indoor education areas and indoor play areas; or 2. sleeping rooms in a childcare centre; or 3. patient care areas in a hospital achieves the maximum internal acoustic level in reference table 3 (items 3.2-3.4).	No acceptable outcome is provided.
Above ground floor level requirements (hospital) adjacent to a state-controlled road	
PO48 Development including: 1. indoor education areas and indoor play areas in a childcare centre or educational establishment; or 2. sleeping rooms in a childcare centre; or 3. patient care areas in a hospital located above ground level, is designed and constructed to achieve the maximum internal acoustic level in reference table 3 (items 3.2-3.4).	No acceptable outcome is provided.

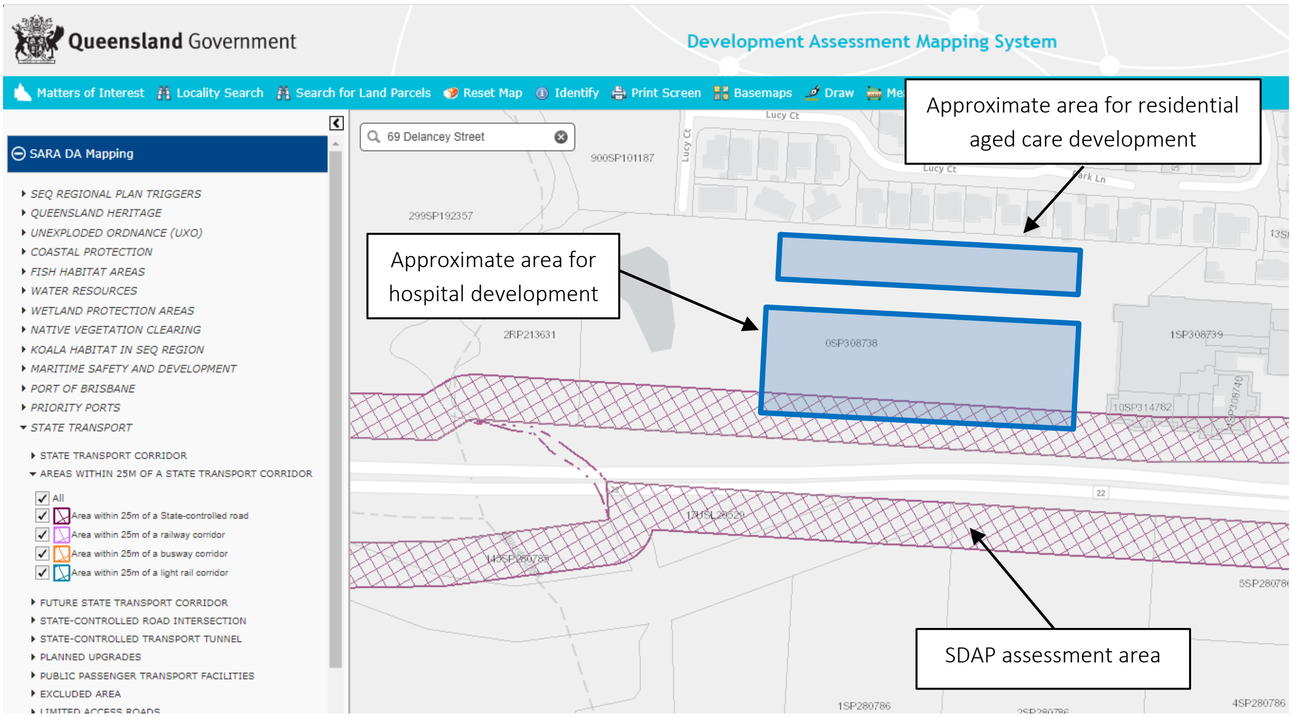
Table 3 of State Code 1: Maximum internal acoustic levels	
3.4: Patient care areas in a hospital	≤35 dB(A) $L_{eq\ (1\ hour)}$ (maximum hour over 24 hours)

Note, Hospital means the use of premises for:

1. the medical or surgical care or treatment of patients, whether or not the care or treatment requires overnight accommodation; or
2. providing accommodation for patients; or
3. providing accommodation for employees, or any other use, if the use is ancillary to the use in paragraphs 1 or 2.

As the residential aged care development is approximately 100m from the state road, and the hospital shields the residential aged care development from road traffic noise, the residential aged care component of the development has not been assessed against the SDAP criteria. The location of the residential aged care development relative to the SDAP assessment 25m corridor can be seen in Figure 4.

Figure 4: SARA DA Mapping



5.2 Environmental Noise

The Redland City Plan references the *Environmental Protection (Noise) Policy 2008* (EPP) for assessing noise emissions to a noise sensitive receiver. The criteria of the EPP are summarised below.

5.2.1 Acoustic Quality Objectives (EPP 2008)

Table 4 presents the acoustic quality objectives at noise sensitive receivers as detailed in Schedule 1 of the EPP2008.

Table 4: Acoustic Quality Objectives at Noise Sensitive Receivers (EPP2008)

Sensitive Receiver	Time of Day	Acoustic Quality Objectives, dB(A)		
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$
Dwelling (Outdoors)	Day and Evening (7am – 10pm)	50	55	65
Dwelling (Indoors)	Day and Evening (7am – 10pm)	35	40	45
	Night (10pm – 7am)	30	35	40

5.2.2 Background Creep (EPP 2008)

This criterion is to prevent background noise progressively increasing or creeping higher over time with the establishment of new developments in a locality. EPP2008 states that:

2. *To the extent that it is reasonable to do so, noise from an activity must not be—*
   - *for noise that is continuous noise measured by $L_{A90,T}$—more than nil dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$; or*
   - *for noise that varies over time measured by $L_{Aeq,adj,T}$—more than 5dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$.*

In accordance with the Environmental Protection Regulation 2008, the time period (T) is considered to be a time interval of at least 15 minutes.

The Background Creep criteria for steady-state and transient noise sources are stated in Table 5.

Table 5: Background Creep Noise Limits at Noise Sensitive Properties (EPP2008)

Time Period	Steady-State Noise Emission Criteria, dB(A)	Time Varying Noise Emission Criteria, dB(A)
	$L_{A90,T}$	$L_{Aeq,T}$
Daytime (7am – 6pm)	49	54
Evening (6pm – 10pm)	46	51
Night (10pm – 7am)	31	36

6 Road Traffic Noise Assessment

An assessment of road traffic noise from the State-controlled Finucane Road was conducted to determine the acoustic treatment requirements for predicted compliance with the relevant criteria.

6.1 Traffic Volumes

Table 6 presents the traffic volumes for Finucane Road which were used in the noise assessment. Traffic volumes and growth rates were based on advice by TTM traffic engineers and data obtained from the Department of Transport and Main Roads (DTMR) traffic census data 2019 and 2021 (Site 135781 - Finucane Road near Delancey Street).

- The 2022 traffic volume prediction was based on 2021 census data and a 1.0% growth rate.
- The 2033 traffic volume prediction was based on 2019 census data and a 1.0% growth rate.
- A heavy vehicle percentage of 5.8% was used.

Table 6: Traffic Volumes used in the Assessment

Road		Traffic Volumes (AADT)			Heavy Vehicles (%)
	2019	2021	2022	2033	
Finucane Road	33,116	33,134	33,465	38,066	5.8%

The 18 hour traffic volumes used in the noise model are taken to be 95% of the AADT (Annual Average Daily Traffic).

6.2 Noise Model

6.2.1 Noise Modelling Parameters

Road traffic noise predictions were conducted using 'SoundPLAN v8.2', a CoRTN based modelling program. The basis of the 'SoundPLAN' model is presented in Table 7.

Table 7: Road Traffic Noise Modelling Parameters

Description	Value
Noise modelling standard	CoRTN (UK)
Grid spacing (noise maps)	2m
Road surface type	Dense Graded Asphalt (+0dB in accordance with Table 4.3.4.1 of TMR Code of Practice)
CoRTN correction for QLD roads (Except Pacific Motorway, Logan Motorway to Nerang)	-0.7dB(A) (free-field) -1.7dB(A) (1m in front of building facade)
Ground contours	Obtained from Mortons Urban Solutions • Earthworks Contours: Site Works Preliminary Overall No.37801-PS1, as shown in Appendix E.

Description	Value
	• Lidar data of surrounding natural contours from ELVIS.
Finucane Road Speed limit	80 km/h to 70 km/h
Noise source height above grade	0.5m
Floor heights	Hospital: 4.2m to 4.8m Building RLs shown in Development plans as shown in Appendix A
Façade receiver heights	1.8m above pad level
Façade correction	+2.5dB(A)

6.2.2 Noise Model Verification

To verify the road traffic noise model, the $L_{A10,\ 18hour}$ noise levels were modelled and compared to the measured levels as presented in Table 8. As the noise monitor was in a free-field location, the predicted noise level is also shown as free-field.

Table 8: Comparison of Measured and Predicted Road Traffic Noise Levels

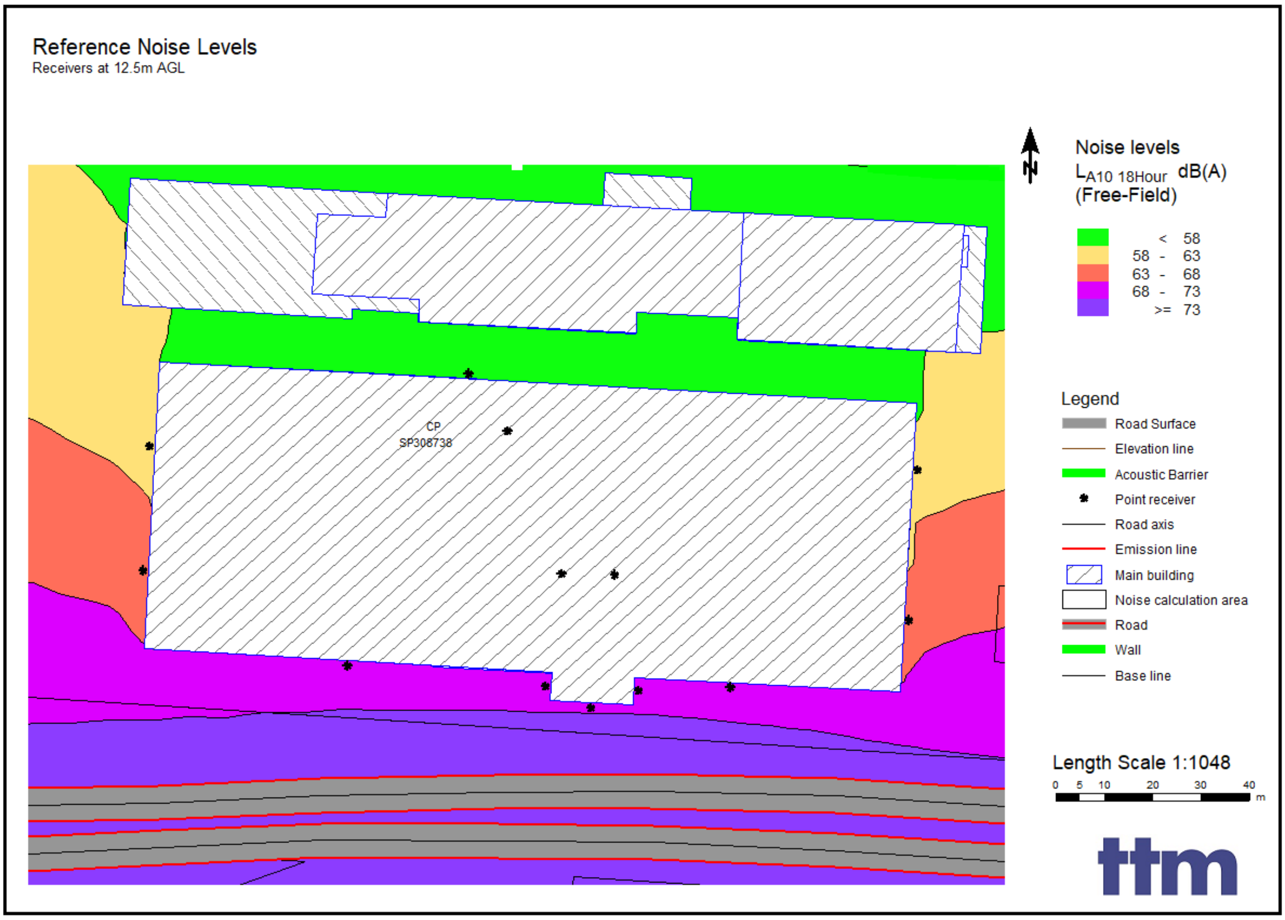
Logger Location	Measured $L_{A10,\ 18\ hour}$	Predicted $L_{A10,\ 18\ hour}$	Required Correction
9m from Finucane Road	73.7	74.1	0

As the modelled levels are within the allowable tolerance of 2dB(A) of the measured level, no correction is required to the model.

6.3 Predicted Road Traffic Noise Levels

Modelling was conducted to determine the road traffic noise levels at the development in the 10-year planning horizon to 2033. Figure 5 presents the indicative predicted road traffic noise levels at the facades of the hospital development. Note the noise contours shown are above ground level and due to ground level variation are not representative of any one specific floor and should be considered indicative only. SoundPLAN receiver point results are included in Table 9.

Figure 5: Predicted Road Traffic Noise Levels – $L_{A10\ 18hr}$



Additional acoustic façade treatment is required to attenuate road traffic noise for the eastern, southern, and western facades for the hospital. Table 9 presents the required façade attenuation to comply with the internal noise criteria as summarised in Table 3. A conversion factor of -0.7 dB was applied to convert from $L_{10,\ 18\ hour}$ dB(A) to $L_{eq,1hour}$ dB(A) (maximum hour over 24 hours), as determined from the noise monitoring results. SoundPLAN single point results included in Appendix C.

Table 9: Predicted Road Traffic Noise Levels - Hospital

Direction	Receiver	Floor	$L_{eq,1hour}$ dB(A) Free Field	Internal Criteria $L_{eq,1hour}$ dB(A)	Required Façade Attenuation dB
North	R1	Ground	35.2	35	<20
		Level 1	36.7	35	<20
		Level 2	39.8	35	<20
		Level 3	42.8	35	<20
East	R2	Level 1	54.9	35	20
		Level 2	58.5	35	24
		Level 3	60.6	35	26
	R3	Level 1	62.2	35	27
		Level 2	64.2	35	29
		Level 3	65.0	35	30
South	R4	Ground	67.1	35	32
		Level 1	70.5	35	36
		Level 2	71.1	35	36
		Level 3	70.9	35	36
East	R5	Level 2	69.4	35	34
		Level 3	69.5	35	35
		Level 4	69.2	35	34
South	R6	Level 2	72.4	35	37
		Level 3	72.2	35	37
		Level 4	71.7	35	37
West	R7	Level 2	69.4	35	34
		Level 3	69.3	35	34
		Level 4	68.9	35	34
South	R8	Ground	69.9	35	35
		Level 1	70.7	35	36
		Level 2	70.6	35	36
		Level 3	70.3	35	35
West	R9	Ground	64.0	35	29
		Level 1	64.5	35	30
		Level 2	64.6	35	30
		Level 3	64.5	35	30
	R10	Ground	60.5	35	26
		Level 1	61.0	35	26
		Level 2	61.6	35	27
		Level 3	62.0	35	27
Setdown Area	R11	Ground	47.5	35	<20
	R12	Ground	60.0	35	25
	R13	Ground	59.7	35	25

* <20dB noise reduction can be achieved with standard façade construction.

The receiver points in Table 9 correspond to the locations as shown in Figure 6 and Figure 7.

Figure 6: Receiver Locations (Hospital Ground Shown)

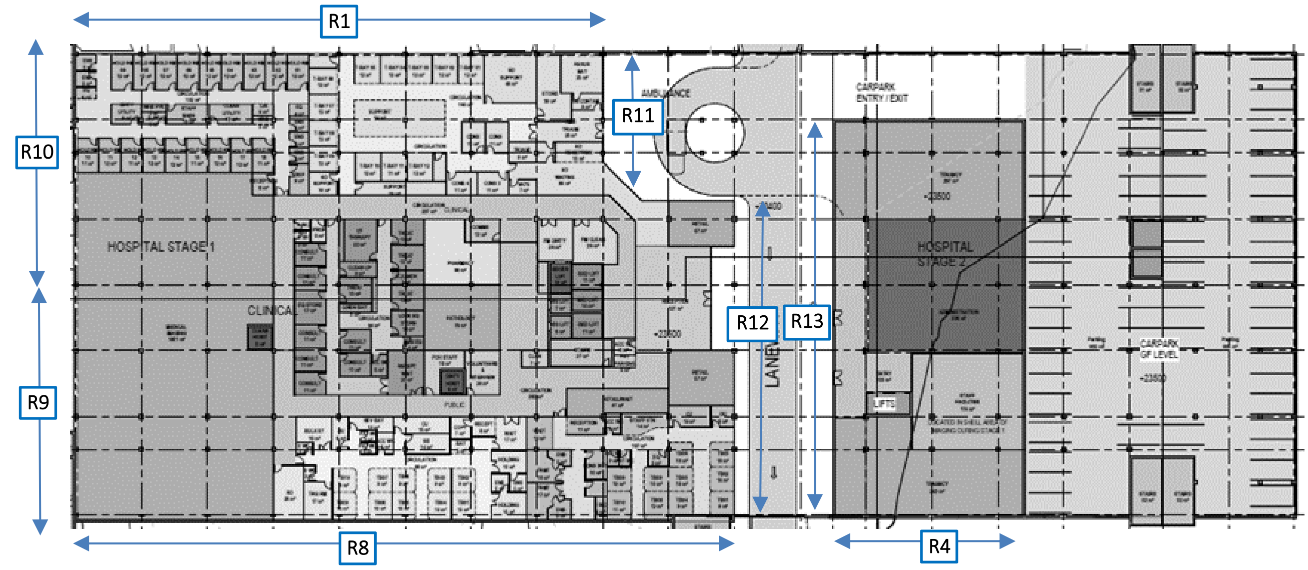
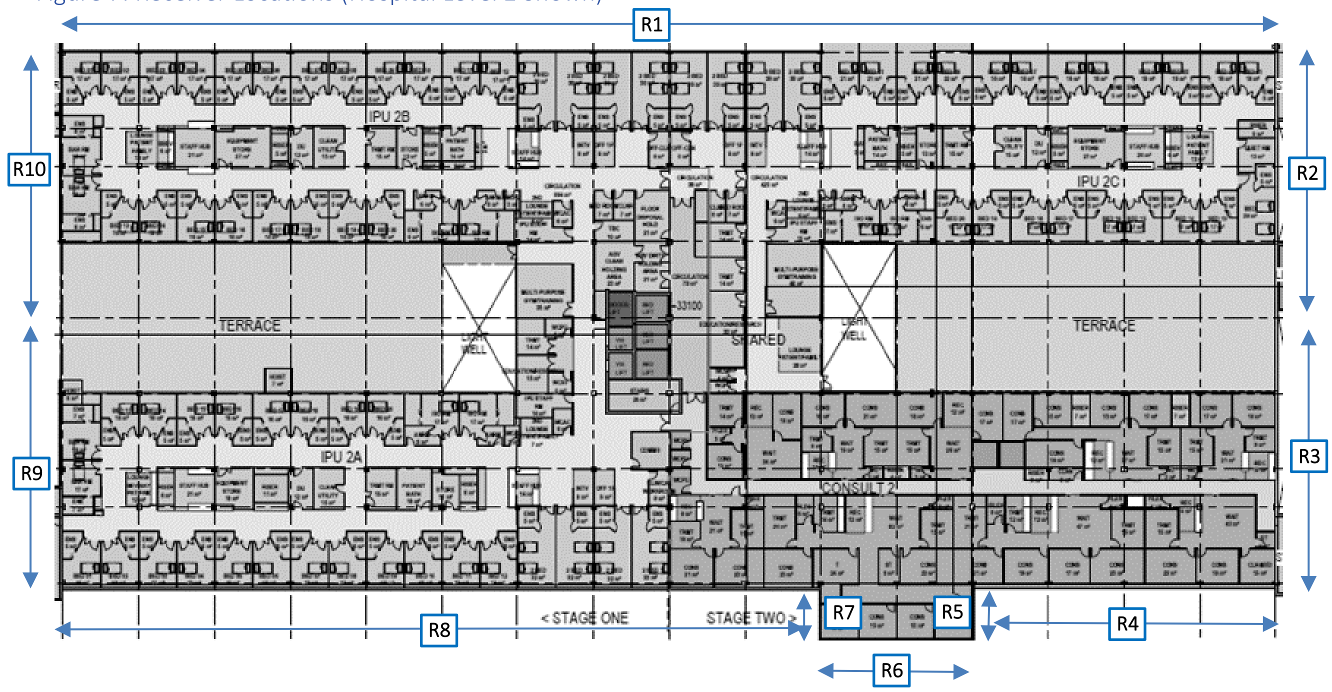


Figure 7: Receiver Locations (Hospital Level 2 Shown)



Façade construction is required to achieve up to 37dB noise reduction for the eastern, southern and western facades for the hospital.

Masonry wall construction is recommended for the wall materials. It is recommended that detailed design for glazing is conducted once window and patient care room dimensions are finalised, to determine the required glazing sound reduction rating (R_W). Double glazing window systems may be required, particularly for larger windows on exposed facades.

7 Assessment of Onsite Noise Emissions

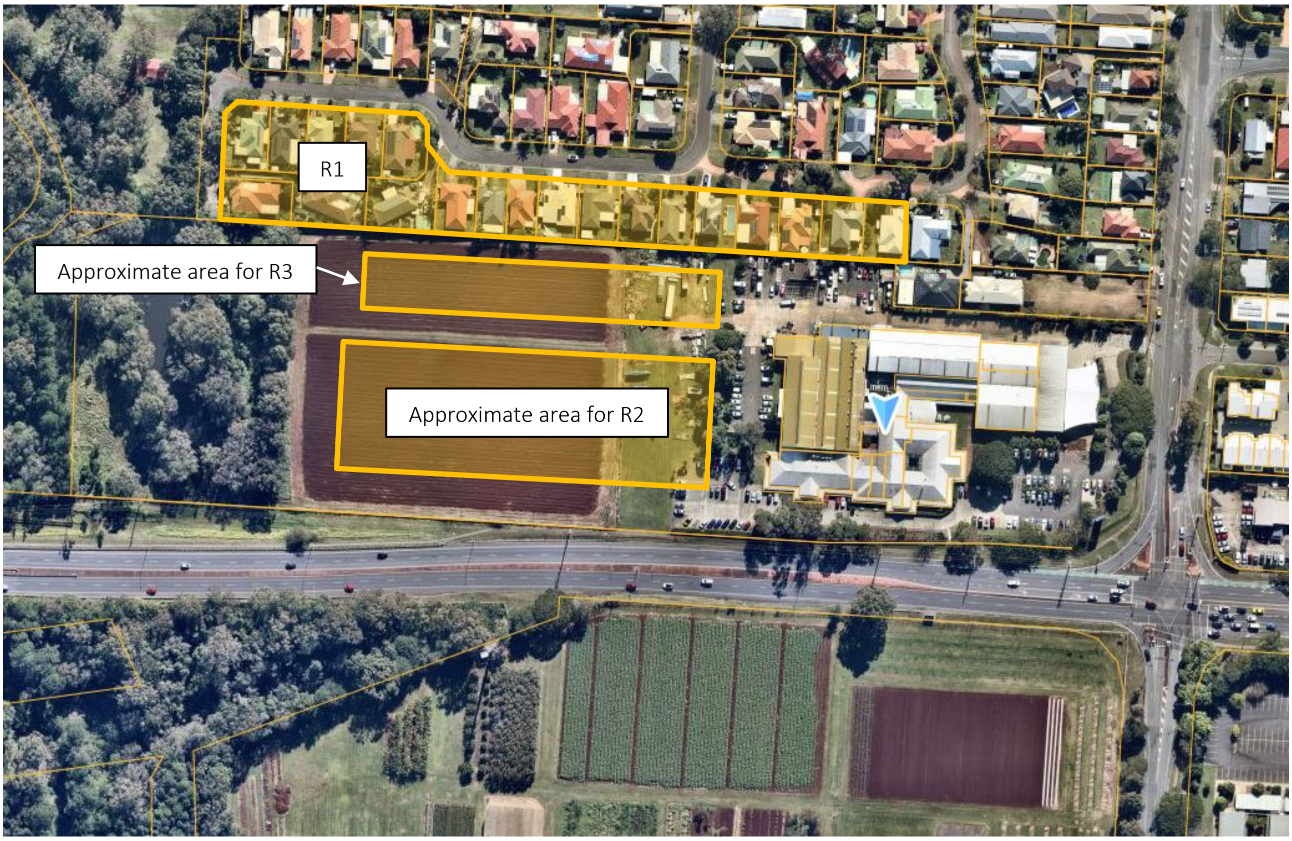
An assessment of activities associated with the proposed development was conducted to determine potential impacts at the nearest noise sensitive receivers.

7.1 Noise Sensitive Receivers

This assessment will focus on the nearest noise sensitive receivers as outlined below and shown in Figure 8. If compliance can be achieved at these nearest receivers, then all remaining noise sensitive locations are expected to comply.

- Receiver 1: Offsite residential dwellings to the north of the site.
- Receiver 2: Onsite hospital development
- Receiver 3: Onsite residential component of the aged care development.

Figure 8: Nearest Noise Sensitive Receivers



7.2 Noise Source Levels

Table 10 presents the typical noise sources generated by the development and the respective measured noise levels in $L_{Aeq,T}$, $L_{A10,T}$, and $L_{A1,T}$. The noise source levels were calculated to one metre and include corrections for tonality and impulsiveness as per *AS1055*. The number of events was estimated for a 'peak' one-hour time period providing a 'worst case scenario' applied to all time periods.

Table 10: Typical Onsite Transient Noise Source Levels

Noise Source Description	Noise Level at 1m, dB(A)			Measured Duration (sec)	Events per 'peak hour' / duration (All time periods)	
	$L_{Aeq,T}$	$L_{A10,T}$	$L_{A1,T}$		Hospital	Residential Aged Care
Car door closure	75*	77*	83*	2	1552	52
Car bypass @ 5km/h	69	75	75	6	776	26
Car engine ignition	72	74	74	3	776	26
Truck pass-by	80	82	83	20	30	6
Refrigerated Deliveries	85#	86#	86#	60	10	2
Waste collection	93*	94*	105*	40	5	1

*Includes 2dB(A) adjustment to account for impulsiveness characteristics in accordance with AS1055

Includes 5dB(A) adjustment to account for tonal noise characteristics in accordance with AS1055

7.3 Calculation Assumptions

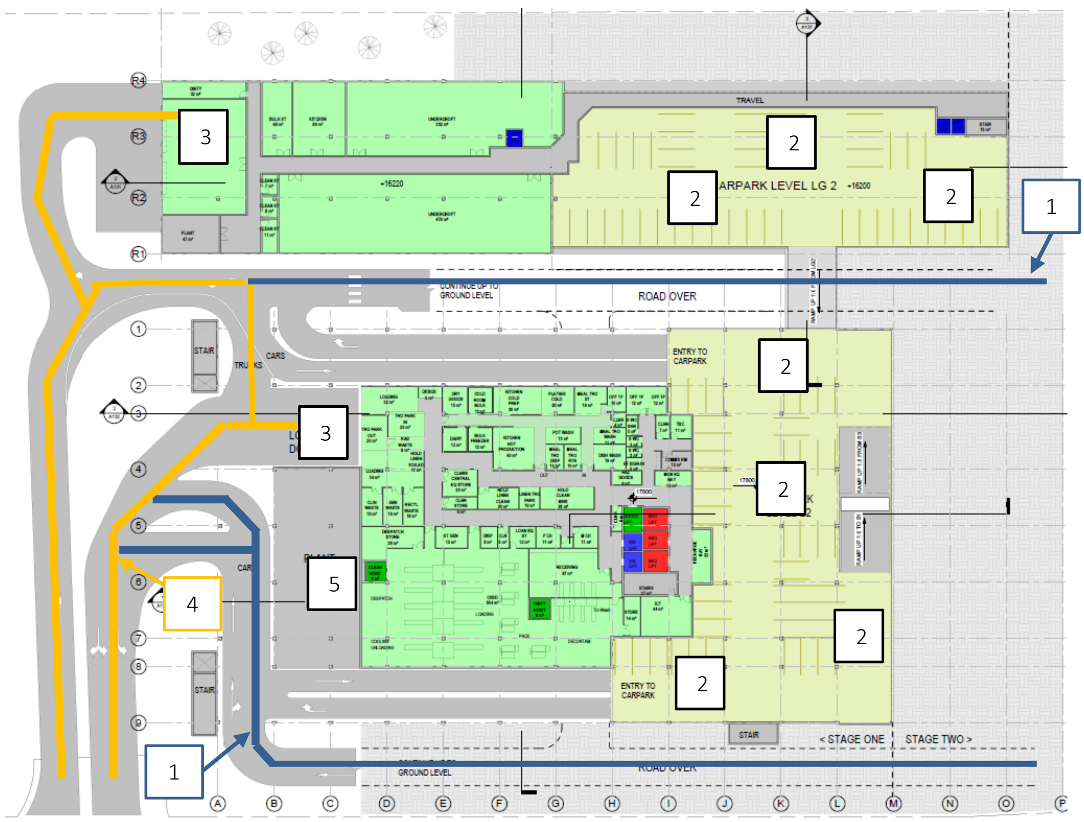
Noise predictive calculations in accordance with *Environmental Protection (Noise) Policy 2019* are based on the number of events occurring within a typical or worst-case period. The following assumptions have been made for noise calculations:

- Based on information from Hub68, site maximum traffic generation rates are 766 events per hour (in and out) for the hospital and 26 events per hour (in and out) for the residential aged care facility.
- Car movements were considered at the nearest car parking or driveway area to the receiver. Truck movements were predicted from the nearest driveway access and loading bays.
- Car door closures and engine starts were predicted from the centre of the nearest group of car parking spaces relative to the receiver. Where car parking is enclosed within the building. Attenuation is included from building screening.
- The method of predicting noise from the nearest single location is conservative as the noise sources would be spread out at varying distances from the receiver.
- Deliveries and waste collection are predicted from the loading docks for the hospital and residential aged care facility. Loading dock areas are both enclosed within the building. Attenuation is included from building screening.

- Deliveries and waste collection includes all activities associated with loading and unloading the vehicle.
- Noise attenuation of 7dB(A) through an open window at a receiver was applied for internal noise level predictions. It is noted that between 15 and 20dB could be expected to be achieved through a closed window with standard façade construction.
- Attenuation from the acoustic barriers as outlined in Section 8, is included in the analysis.
- Attenuation due to the shielding from onsite buildings was included in the analysis where applicable.
- A site plan of noise source locations is presented in Figures 7 and 8. Noise sources were located at the nearest operating locations to the sensitive receivers (worst-case locations relative to the receivers).

  1. Car pass-by
  2. Car pass-by, door closure and engine starts (Also occurs on G, B1 and B3 levels – not shown)
  3. Deliveries and waste collection
  4. Car and truck pass-by
  5. Mechanical Plant

Figure 9: Noise Source Locations – Hospital development – Basement 2 level shown (Approximate)



7.4 Predicted Onsite Noise Levels at Offsite Receivers

Predicted noise levels are based on the noise source levels presented in Table 10, calculation assumptions listed in Section 7.3, distance loss to the nearest receiver, and noise reduction from intervening structures and recommended acoustic barriers (Section 8.2.1) where applicable. Sample calculations are shown in Appendix D.

7.4.1 Acoustic Quality Objective Predictions

Table 11 presents the predicted acoustic quality objective noise levels. The criteria for day/evening periods is specified in the table heading, with the night time indoor criteria shown in brackets. Noise level exceedances are shown in bold and underline.

Table 11: Acoustic Quality Objective Onsite Noise Predictions – Hospital

Receiver	Noise Source (Hospital)	Predicted Noise Level, dB(A)					
		$L_{Aeq, 1hr}$		$L_{A10, 1 hr}$		$L_{A1, 1hr}$	
		Outdoors	Indoors	Outdoors	Indoors	Outdoors	Indoors
	Criteria	50	35 (30)	55	40 (35)	65	45 (40)
1	Car door closure	17	10	19	12	25	18
	Car bypass	23	16	29	22	29	22
	Car engine ignition	13	<10	15	<10	15	<10
	Truck pass-by	28	21	30	23	31	24
	Refrigerated Deliveries	19	12	20	13	20	13
	Waste collection	22	15	23	16	34	27

All noise sources are predicted to comply at the nearest sensitive receivers during all time periods.

Table 12: Acoustic Quality Objective Onsite Noise Predictions – Residential Aged Care

Receiver	Noise Source (Residential Aged Care)	Predicted Noise Level, dB(A)					
		$L_{Aeq, 1hr}$		$L_{A10, 1 hr}$		$L_{A1, 1hr}$	
		Outdoors	Indoors	Outdoors	Indoors	Outdoors	Indoors
	Criteria	50	35 (30)	55	40 (35)	65	45 (40)
1	Car door closure	<10	<10	10	<10	16	<10
	Car bypass	18	11	24	17	24	17
	Car engine ignition	10	<10	12	<10	12	<10
	Truck pass-by	32	25	34	27	35	28
	Refrigerated Deliveries	20	13	21	14	21	14
	Waste collection	23	16	24	17	35	28

All noise sources are predicted to comply at the nearest sensitive receivers during all time periods.

7.4.2 Background Creep Predictions

Table 13 presents the predicted background creep noise levels at the receivers.

Table 13: Background Creep Onsite Noise Predictions - Hospital

Receiver	Noise Source	Predicted External Noise Level, L_{eq} dB(A)	Complies with Criteria: (Yes/No)		
			Day 54 dB(A) 7am – 6pm	Evening 51 dB(A) 6pm – 10pm	Night 36 dB(A) 10pm – 7am
1	Car door closure	17	✓	✓	✓
	Car bypass	23	✓	✓	✓
	Car engine ignition	13	✓	✓	✓
	Truck pass-by	29	✓	✓	✓
	Refrigerated Deliveries	20	✓	✓	✓
	Waste collection	25	✓	✓	✓

Table 14: Background Creep Onsite Noise Predictions – Residential Aged Care

Receiver	Noise Source	Predicted External Noise Level, L_{eq} dB(A)	Complies with Criteria: (Yes/No)		
			Day 54 dB(A) 7am – 6pm	Evening 51 dB(A) 6pm – 10pm	Night 36 dB(A) 10pm – 7am
1	Car door closure	<10	✓	✓	✓
	Car bypass	17	✓	✓	✓
	Car engine ignition	<10	✓	✓	✓
	Truck pass-by	31	✓	✓	✓
	Refrigerated Deliveries	23	✓	✓	✓
	Waste collection	30	✓	✓	✓

All noise sources are predicted to comply at the nearest sensitive receivers during all time periods.

7.5 Predicted Onsite Noise Levels at Onsite Receivers

Predicted noise levels at residential onsite receivers are based on the noise source levels presented in Table 10, calculation assumptions listed in Section 7.3, distance loss to the nearest receiver, and noise reduction from intervening structures and/or recommended acoustic barriers (Section 8.2.1) where applicable. Calculations are shown in Appendix D. Residential onsite receivers have been assessed against the Acoustic Quality Objectives to achieve compliance with internal noise level criteria.

7.5.1 Acoustic Quality Objective Predictions

Table 11 presents the predicted acoustic quality objective noise levels. The criteria for day/evening periods is specified in the table heading, with the night time indoor criteria shown in brackets. Noise level exceedances are shown in bold and underline.

Table 15: Acoustic Quality Objective Onsite Noise Predictions – Hospital/RAC onto Hospital

Receiver	Noise Source (Hospital)	Predicted Noise Level, dB(A)					
		$L_{Aeq, 1hr}$		$L_{A10, 1 hr}$		$L_{A1, 1hr}$	
		Outdoors	Indoors	Outdoors	Indoors	Outdoors	Indoors
	Criteria	50	35 (30)	55	40 (35)	65	45 (40)
2	Car door closure	<10	<10	<10	<10	14	<10
	Car bypass	49	19	**64**	34	64	34
	Car engine ignition	30	<10	32	<10	32	<10
	Truck pass-by	**54**	24	**65**	35	66	36
	Refrigerated Deliveries	19	<10	20	<10	20	<10
	Waste collection	22	<10	23	<10	34	<10

Internal criteria can be achieved with a minimum noise reduction of 30dB at all façades of the Hospital building. Recommendations have been made in Section 8.

Table 16: Acoustic Quality Objective Onsite Noise Predictions – Hospital/RAC onto Residential Aged Care

Receiver	Noise Source (Residential Aged Care)	Predicted Noise Level, dB(A)					
		$L_{Aeq, 1hr}$		$L_{A10, 1 hr}$		$L_{A1, 1hr}$	
		Outdoors	Indoors	Outdoors	Indoors	Outdoors	Indoors
	Criteria	50	35 (30)	55	40 (35)	65	45 (40)
3	Car door closure	41	11	43	13	49	19
	Car bypass	49	19	**64**	34	64	34
	Car engine ignition	38	<10	40	10	40	10
	Truck pass-by	**54**	24	**65**	35	66	36
	Refrigerated Deliveries	42	12	43	13	43	13
	Waste collection	45	15	46	16	57	27

Internal criteria can be achieved with a minimum noise reduction of 30dB at the south, west and east façades of the residential aged care building. Recommendations have been made in Section 8.

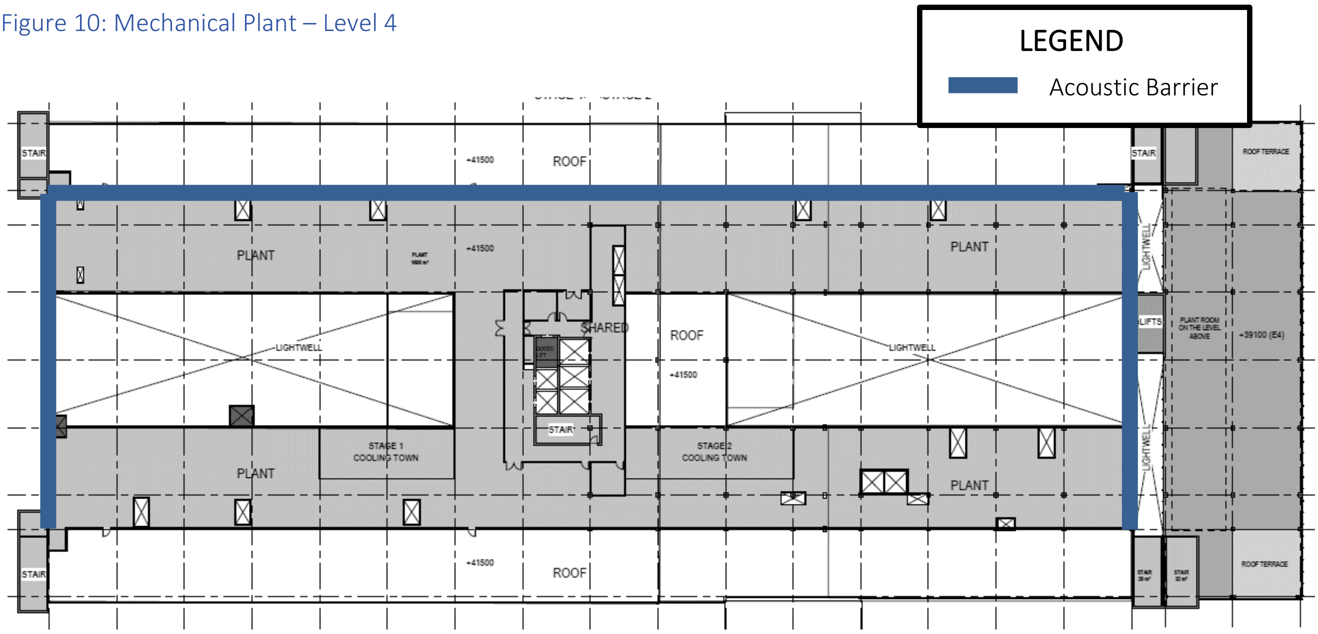
7.6 Preliminary Mechanical Plant Advice

7.6.1 Mechanical Plant Advice - Hospital

At this stage, plant equipment selections, location and noise emission data are not available. A noise assessment using a reverse calculation was conducted based on the following parameters:

- Mechanical plant assumed to be on rooftop of Level 4 with the recommended acoustic barriers as shown in Figure 10.
- The acoustic barrier should have a minimum height of at least 0.5m above the top of the mechanical plant equipment, be solid with no gaps, and have a minimum density of 12.5kg/m^2.

Figure 10: Mechanical Plant – Level 4



Based on the steady-state Background Creep criteria, barrier attenuation and distance attenuation from the nearest potential location to the nearest residential receiver, the allowable mechanical noise levels are presented in Table 17.

Table 17: Mechanical Plant Noise Limit for Compliance Without Acoustic Treatment

Plant location	Allowable noise level at 1m from the nearest piece of plant to receiver to achieve compliance, L_{eq} dB(A)		
	Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
Level 4 Rooftop	106	103	88

Further acoustic treatment to the plant may allow a higher noise limit. A mechanical plant noise assessment should be conducted by a suitably qualified acoustic consultant once plant selections are finalised.

7.6.2 Mechanical Plant Advice - Residential Aged Care

At this stage, plant equipment selections, location and noise emission data are not available. Mechanical plant equipment would be expected to be individual condenser units on balconies or rooftop plant however at this stage there are no details, therefore, a mechanical plant noise assessment should be conducted by a suitably qualified acoustic consultant once plant selections are finalised. Mechanical plant is to be assessed against the steady-state Background Creep criteria.

8 TTM Recommendations

The recommended acoustic treatments are presented in the sections below to achieve predicted compliance with the relevant assessment criteria.

8.1 Façade Attenuation

8.1.1 Road Traffic Noise

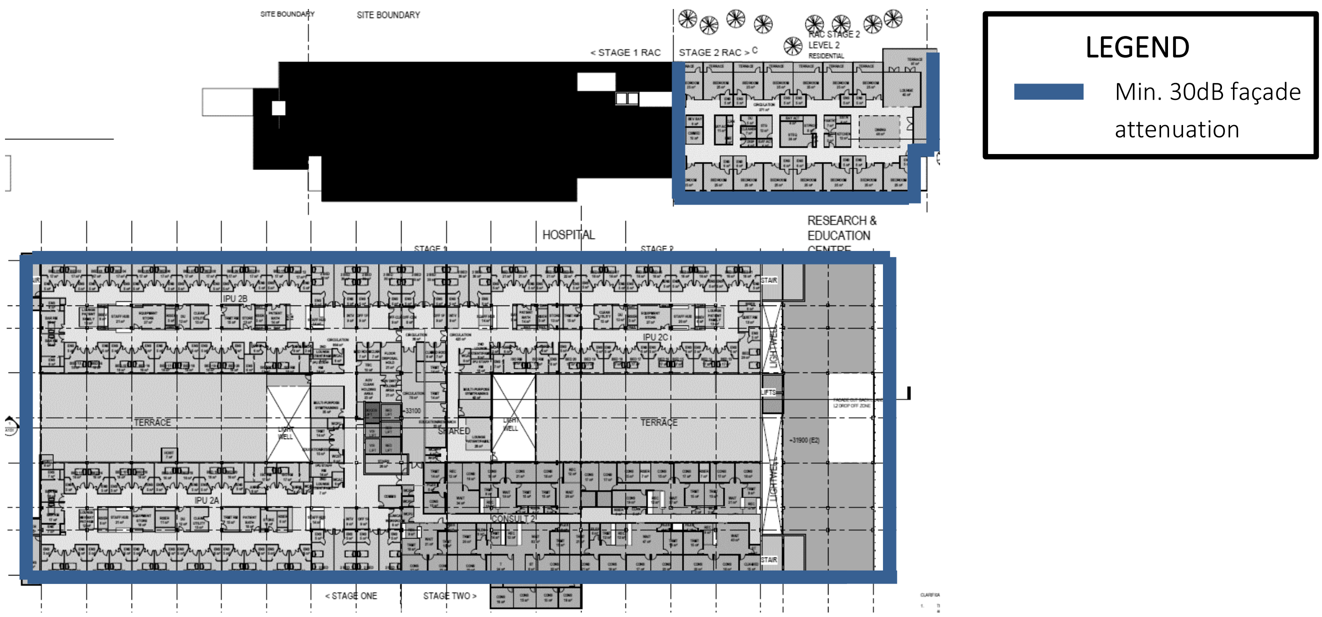
Façade construction for road traffic noise intrusion for the hospital is required to achieve up to 37dB noise reduction for the eastern, southern and western facades as shown in Table 9. Masonry wall construction is recommended for the wall materials. It is recommended that detailed design for glazing is conducted once window and patient care room dimensions are finalised during design development stage, to determine the required glazing sound reduction ratings (R_W). Double glazing window systems may be required, particularly for larger windows on exposed facades.

8.1.2 Onsite Noise

Façade construction for onsite noise intrusion for the hospital (all facades directions) and residential aged care dwellings (East, South and West facades) is required to achieve 30dB noise reduction. This is required for all floors for sensitive receivers (patient care areas and residential dwellings).

Masonry wall construction is recommended for the wall materials. It is recommended that detailed design for glazing is conducted once window dimensions are finalised during design development stage. An example level is shown in Figure 11.

Figure 11: Façade Attenuation – Onsite Noise (only Level 2 shown)



8.1.3 Hospital - Combined Façade Attenuation (road traffic and onsite noise)

Hospital façade construction requirements for both road traffic noise and onsite noise is shown in Table 18. Receivers in Table 18 correspond to the locations shown in Figure 6 and Figure 7 in Section 6.3.

Table 18: Predicted Road Traffic Noise Levels - Hospital

Direction	Receiver	Floor	Required Façade Attenuation dB
North	R1	Ground	30*
		Level 1	30*
		Level 2	30*
		Level 3	30*
East	R2	Level 1	30*
		Level 2	30*
		Level 3	30*
	R3	Level 1	30*
		Level 2	30*
		Level 3	30
South	R4	Ground	32
		Level 1	36
		Level 2	36
		Level 3	36
East	R5	Level 2	34
		Level 3	35
		Level 4	34
South	R6	Level 2	37
		Level 3	37
		Level 4	37
West	R7	Level 2	34
		Level 3	34
		Level 4	34
South	R8	Ground	35
		Level 1	36
		Level 2	36
		Level 3	35
West	R9	Ground	30*
		Level 1	30
		Level 2	30
		Level 3	30
	R10	Ground	30*
		Level 1	30*
		Level 2	30*
		Level 3	30*
Setdown Area	R11	Ground	30*
	R12	Ground	30*
	R13	Ground	30*

* 30dB minimum noise reduction for onsite noise.

8.2 Onsite Noise

8.2.1 Acoustic Barriers

The following acoustic barriers along the northern boundary of the site are required to reduce noise levels from the development onto noise sensitive receivers.

Barrier recommendations are as follows:

a. The existing section of the acoustic barriers is to be maintained, as shown in Figure 12.

b. The acoustic barrier must extend along the entire northern boundary of the site.

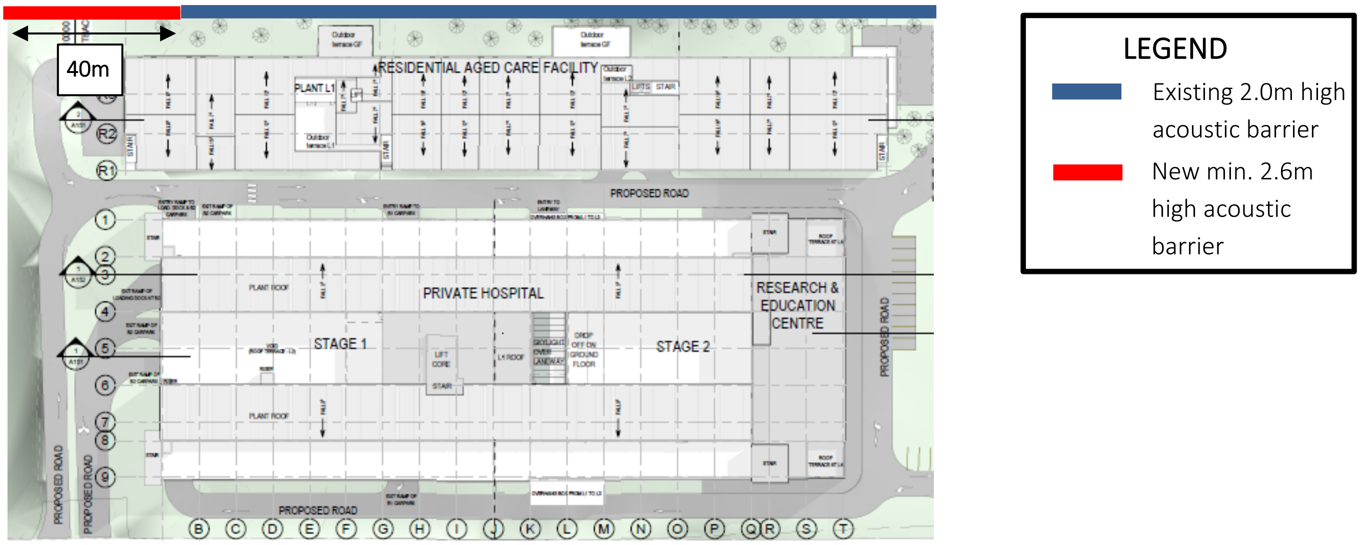
c. The acoustic barrier must be the minimum height above ground level as shown in Figure 12.

d. The acoustic barrier must have no gaps or holes should be evident in the barrier construction including at the base.

e. The acoustic barrier must be constructed of a material with a surface mass not less than 12.5kg/m2.

f. Suitable materials may include lapped timber, earth mound, steel panels, fibre cement sheeting, plywood, glass, masonry, or a combination of materials.

Figure 12: Acoustic Barriers



8.2.2 Noise Management Strategies

The following management strategies are recommended to minimise noise annoyance:

a. All heavy vehicles are recommended to access the site via Finucane Road.

b. Any speed humps should be bitumen, concrete (as part of the slab) or rubber, not metal.

c. Any grates or other protective covers in the handstand and access driveway must be rigidly fixed in position to eliminate clanging, and be maintained.

8.2.3 Mechanical Plant Noise

As detailed plant selections are not available at this stage, it is not possible to carry out a detailed examination of the noise control measures that may be required to achieve the noise targets for mechanical plant.

A preliminary assessment of allowable plant noise for the hospital rooftop plant to achieve compliance was conducted in Section 7.6.

It is recommended mechanical plant is screened from the northern receivers with acoustic barriers and/or building structures, the mechanical plant may need to be further acoustically treated to achieve the criteria detailed in Section 0 to prevent noise emissions from adversely impacting the surrounding properties. This may include selecting the quietest plant possible, or treating the plant equipment with enclosures, duct lining and silencers, etc.

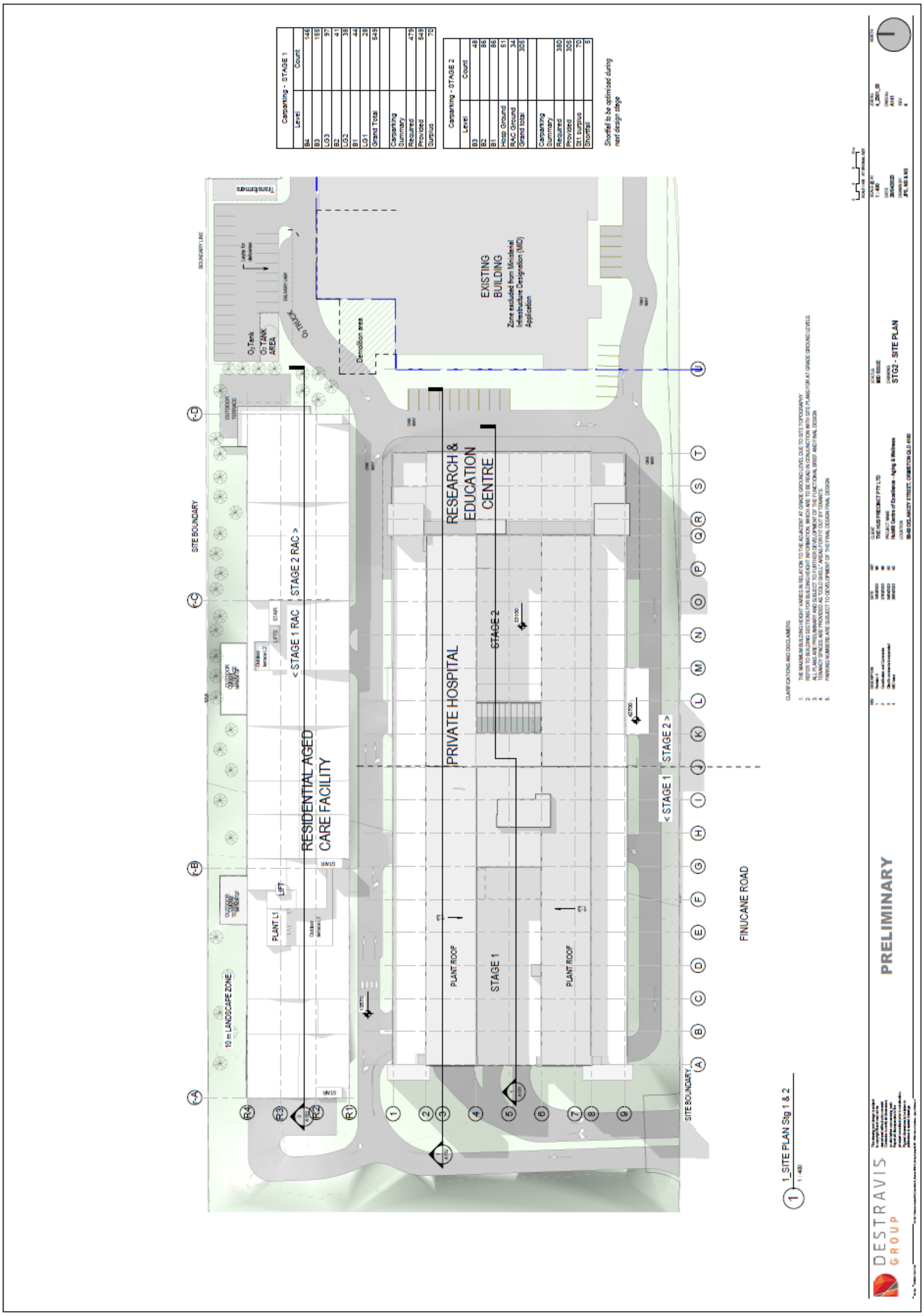
A full mechanical plant noise assessment should be conducted by a suitably qualified acoustic consultant once plant selections are finalised.

9 Conclusion

An environmental noise assessment was undertaken of the proposed hospital development located at 58-68 Delancey Street, Ormiston.

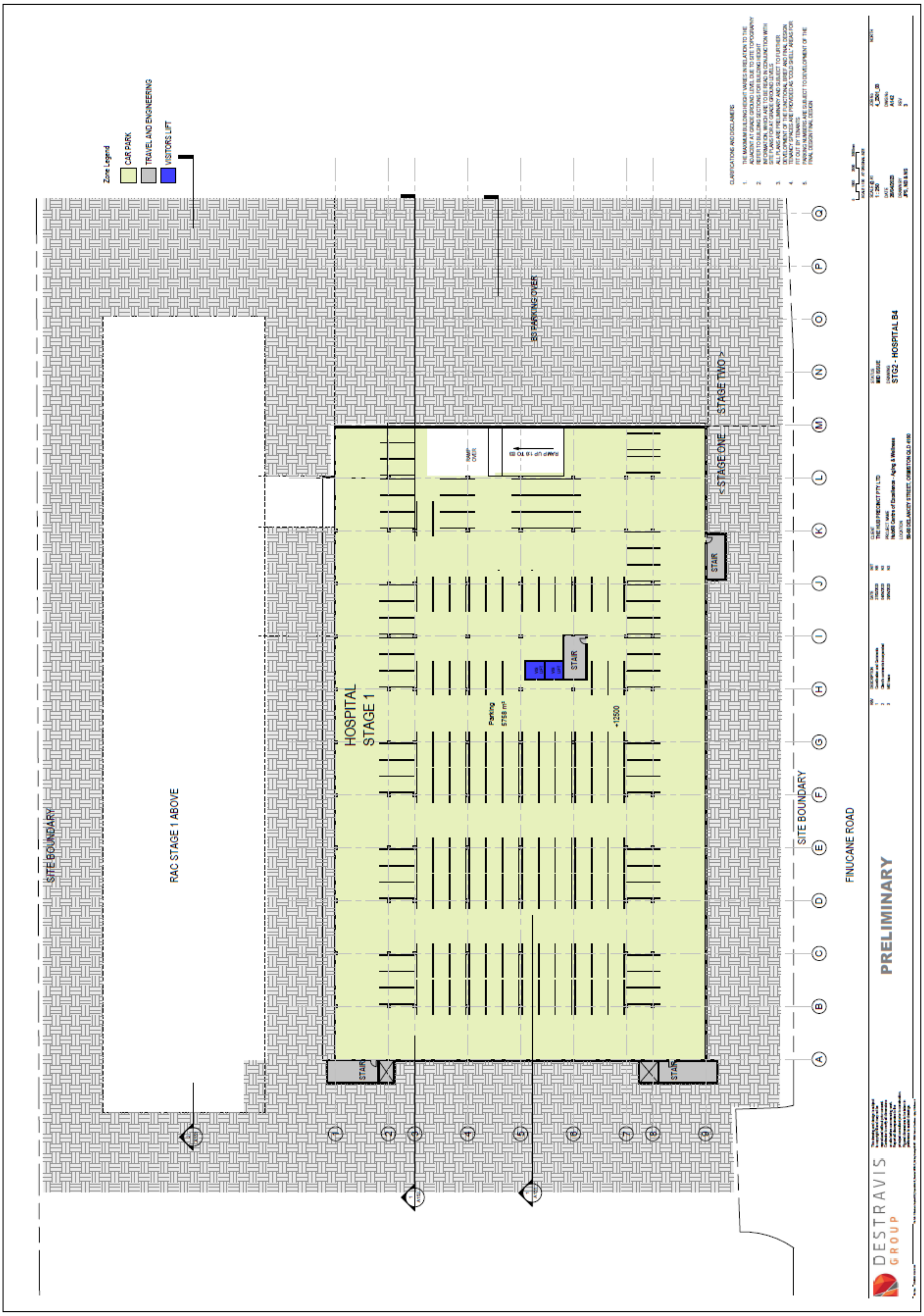
Compliance with the Environmental Protection (Noise) Policy and SDAP criteria outlined in Section 5 is predicted to be achieved based on the implementation of the recommendations outlined in Section 8 of this report.

Appendix A Development Plans

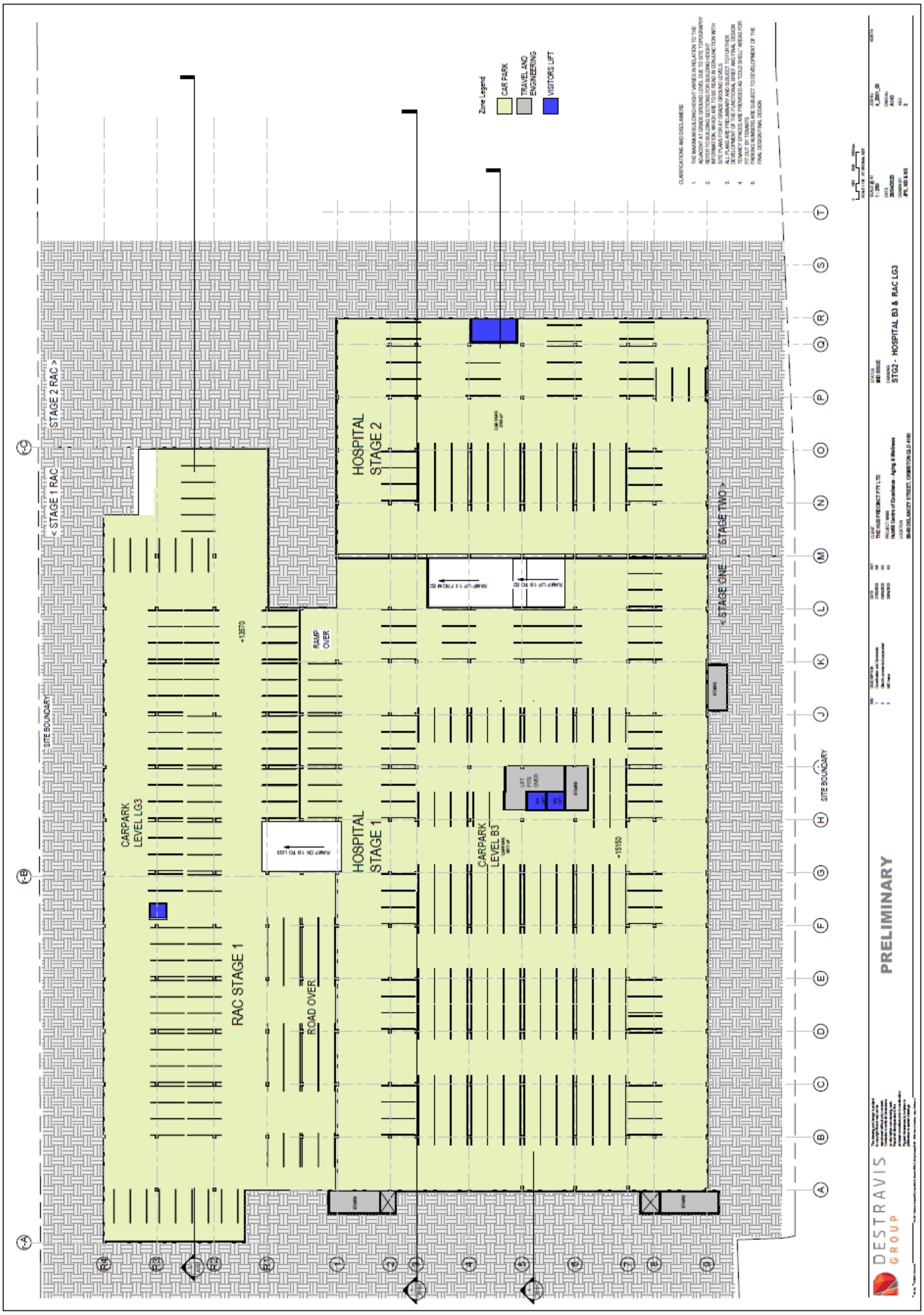


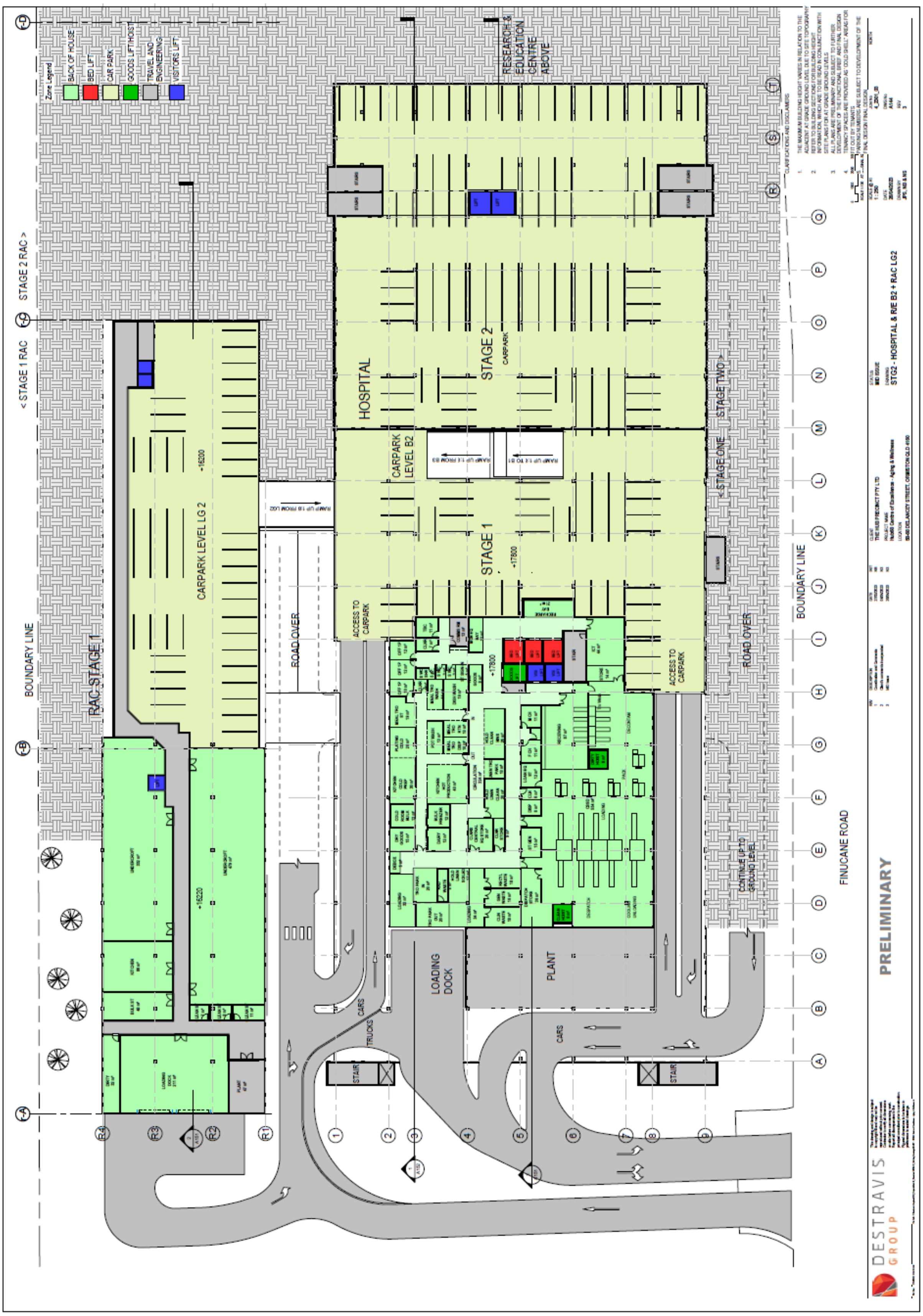
Carparking - STAGE 1	
Level	Count
B4	146
B3	155
LG3	97
B2	41
LG2	38
B1	44
LG1	28
Grand Total	549
Carparking Summary	
Required	479
Provided	549
Surplus	70

Carparking - STAGE 2	
Level	Count
B3	48
B2	86
B1	86
Hosp Ground	51
RAC Ground	34
Grand total	305
Carparking Summary	
Required	380
Provided	305
St1 surplus	70
Shortfall	5


Zone Legend
CAR PARK
TRAVEL AND ENGINEERING
VISITORS LIFT
SITE BOUNDARY
RAC STAGE 1 ABOVE
HOSPITAL
STAGE 1
B3 PARKING OVER
STAGE TWO >
< STAGE ONE
STAIR
SITE BOUNDARY
FINUCANE ROAD
STG2 - HOSPITAL B4
PRELIMINARY
DESTRAVIS
GROUP

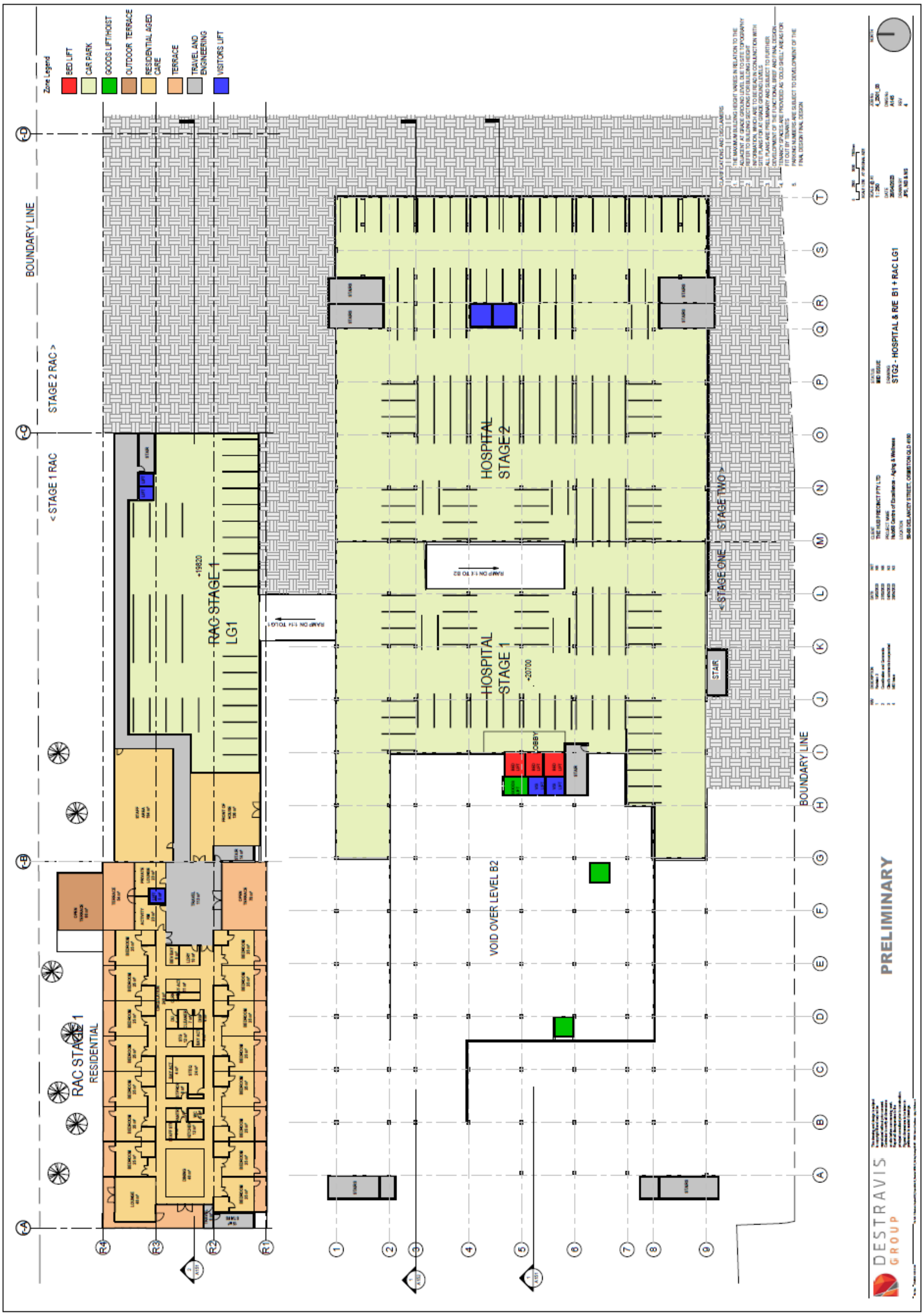
ttm


HOSPITAL STAGE 2
HOSPITAL STAGE 1
RAC STAGE 1
CARPARK LEVEL LG3
CARPARK LEVEL B3
ROAD OVER
RAMP OVER
STAGE 1 RAC
STAGE 2 RAC
STAGE ONE
STAGE TWO
SITE BOUNDARY
Zone Legend
CAR PARK
TRAVEL AND ENGINEERING
VISITORS LIFT
STG2 - HOSPITAL B3 & RAC LG3
PRELIMINARY
DESTRAVIS GROUP



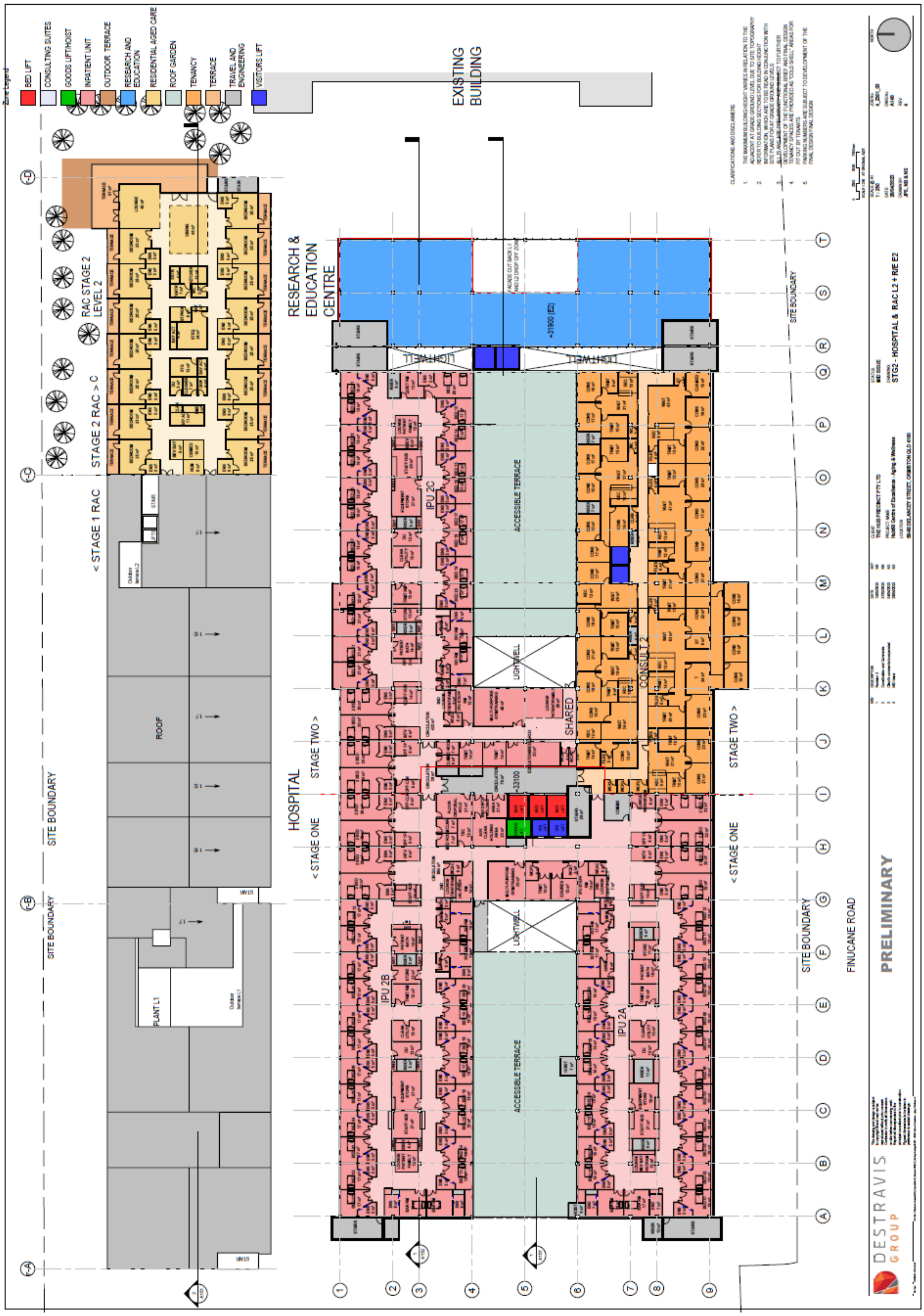
PRELIMINARY
DESTRAVIS GROUP
Zone Legend
BACK OF HOUSE
BED LIFT
CAR PARK
GOODS LIFT/HOIST
TRAVEL AND ENGINEERING
VISITORS LIFT
STAGE 2 RAC >
< STAGE 1 RAC
BOUNDARY LINE
RAC STAGE 1
CARPARK LEVEL LG 2
+16200
+16220
ROAD OVER
ACCESS TO CARPARK
HOSPITAL
STAGE 2
CARPARK
CARPARK LEVEL B2
STAGE 1
+17800
RESEARCH & EDUCATION CENTRE ABOVE
< STAGE ONE
STAGE TWO >
LOADING DOCK
PLANT
CARS
TRUCKS
STAIR
CONTINUE UP TO GROUND LEVEL
FINUCANE ROAD
STG2 - HOSPITAL & R/E B2 + RAC LG2

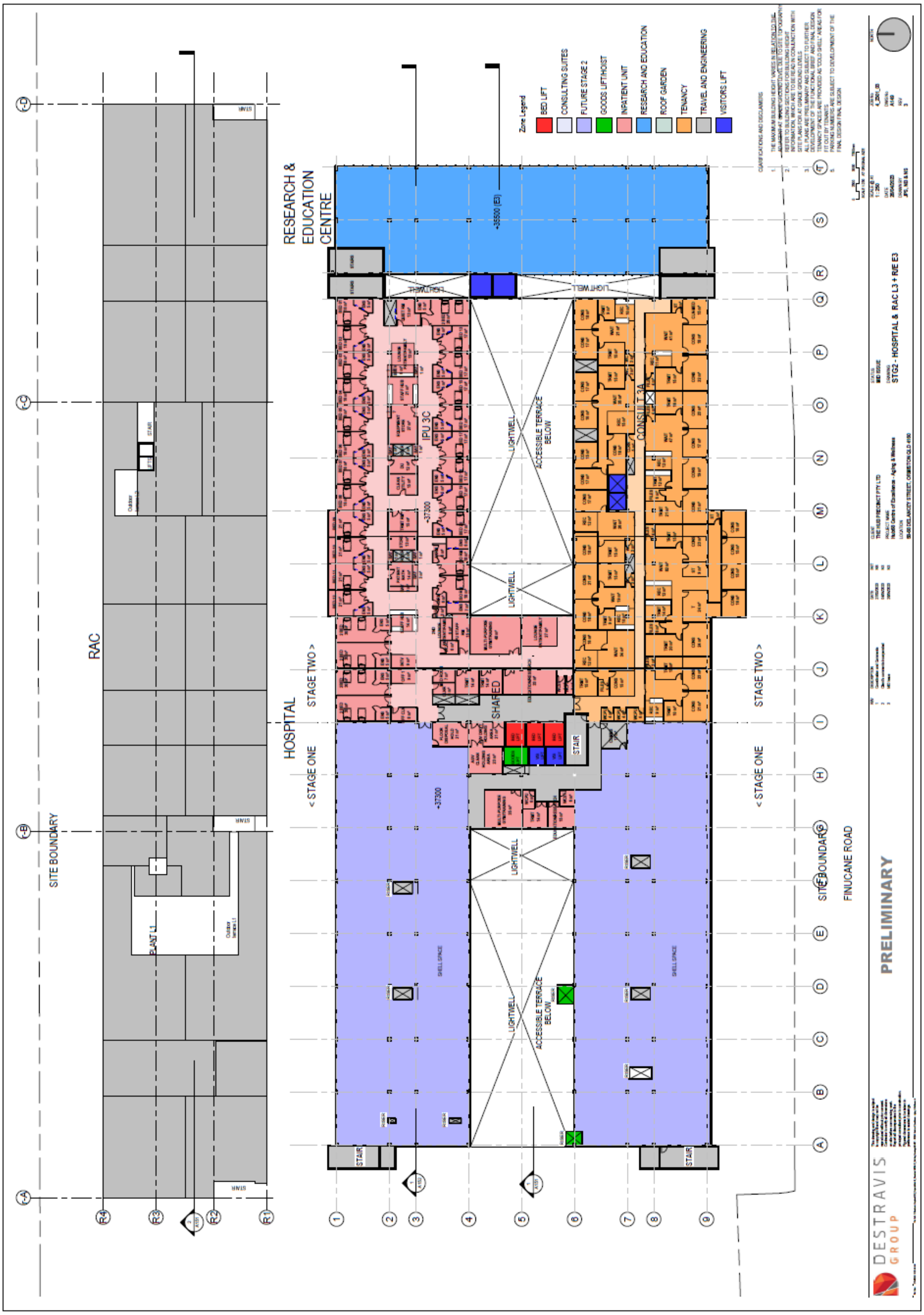
ttm


Zone Legend
BED LIFT
CAR PARK
GOODS LIFT/HOIST
OUTDOOR TERRACE
RESIDENTIAL AGED CARE
TERRACE
TRAVEL AND ENGINEERING
VISITORS LIFT
BOUNDARY LINE
STAGE 2 RAC >
< STAGE 1 RAC
RAC STAGE 1 LG1
HOSPITAL STAGE 2
HOSPITAL STAGE 1
< STAGE ONE
STAGE TWO >
VOID OVER LEVEL B2
RAC STAGE 1 RESIDENTIAL
BOUNDARY LINE
PRELIMINARY
DESTRAVIS GROUP


Zone Legend
ADMIN
ALLIED HEALTH
BACK OF HOUSE
BED LIFT
CAR PARK
CHEMO
EMERGENCY DEPARTMENT
FRONT OF HOUSE
GOODS LIFT/HOIST
MED AND DAY SURGERY UNIT
OUTDOOR TERRACE
PHARMACY
RENAL DIALYSIS
RESIDENTIAL AGED CARE
STAFF
TENANCY
TERRACE
TRAVEL AND ENGINEERING
VISITORS LIFT
EXISTING BUILDING
RAC STAGE 2
CARPARK
< STAGE 1 RAC STAGE 2 RAC >
UPPER ENTRY
PORTE COCHERE
CARPARK ENTRY / EXIT
RESEARCH & EDUCATION CENTRE ABOVE
CARPARK GF LEVEL
HOSPITAL STAGE 2
LANEWAY
AMBULANCE
CLINICAL
RAC STAGE 1
SITE BOUNDARY
HOSPITAL STAGE 1
ENTRY RAMP TO LOAD. DOCK & B2 CARPARK
EXIT RAMP OF B2 CARPARK
EXIT RAMP OF LOADING DOCK AT B2
< STAGE ONE
STAGE TWO >
FINUCANE ROAD
PRELIMINARY
STG2 - HOSPITAL, R/E & RAC GF
DESTRAVIS GROUP

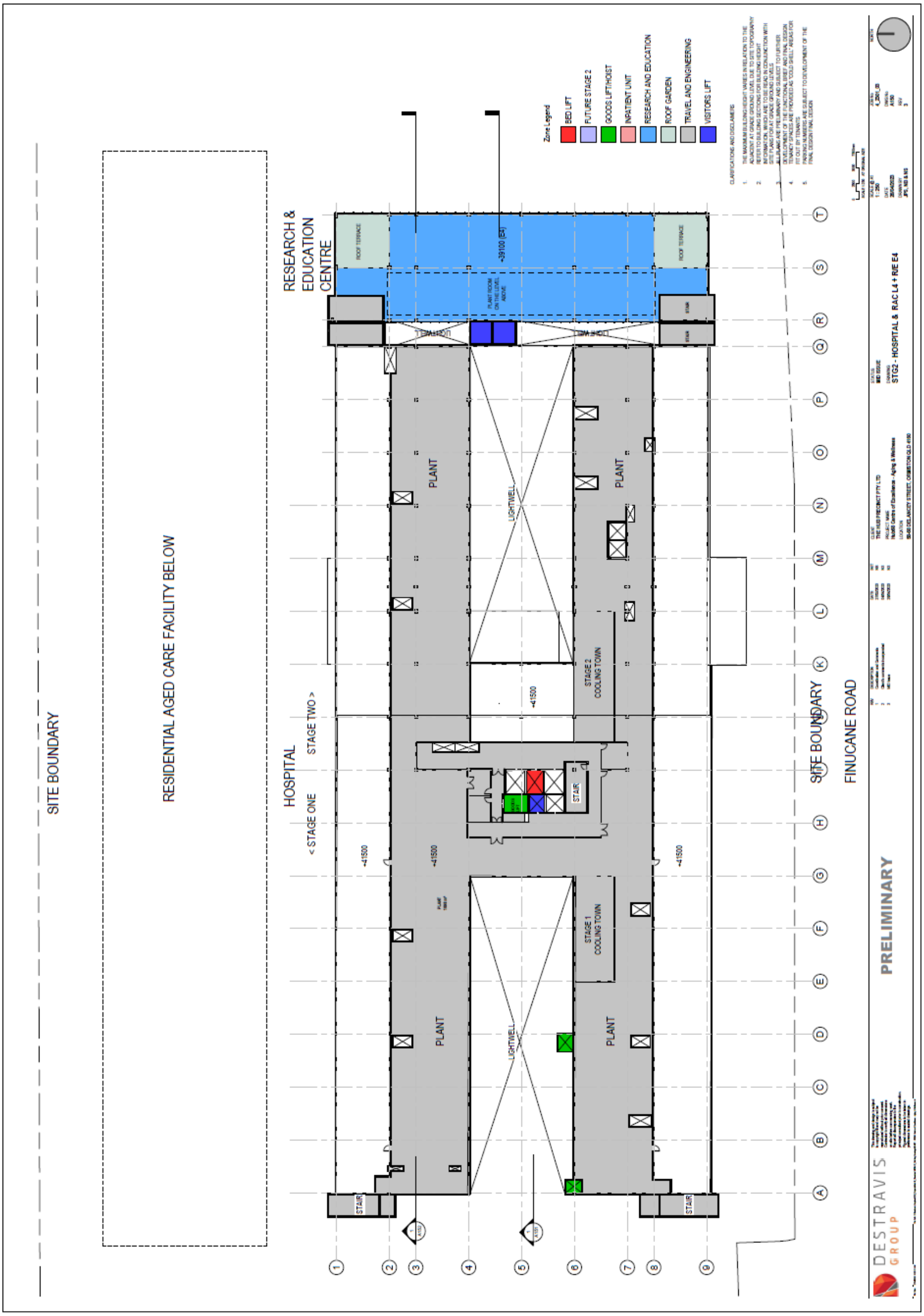
Zone Legend
BED LIFT
CHEMO
GOODS LIFT/HOIST
OUTDOOR TERRACE
PERIOPERATIVE
RESEARCH AND EDUCATION
RESIDENTIAL AGED CARE
STAFF
TENANCY
TERRACE
TRAVEL AND ENGINEERING
VISITORS LIFT
EXISTING BUILDING
RESEARCH & EDUCATION CENTRE LEVEL 1
RAC STAGE 2 LEVEL 1
RAC STAGE 1 LEVEL 1
HOSPITAL STAGE 2 LEVEL 1
HOSPITAL STAGE 1 LEVEL 1
CONSULT SUITE
LIGHTWELL
SITE BOUNDARY
FINUCANE ROAD
PRELIMINARY
STG2 - HOSPITAL & RAC L1 + R/E E1
DESTRAVIS GROUP


EXISTING BUILDING
RESEARCH & EDUCATION CENTRE
RAC STAGE 2 LEVEL 2
STAGE 2 RAC > C
< STAGE 1 RAC
ROOF
SITE BOUNDARY
HOSPITAL
STAGE TWO >
< STAGE ONE
IPU 2C
IPU 2B
IPU 2A
ACCESSIBLE TERRACE
LIGHTWELL
CONSULT 2
SHARED
FINUCANE ROAD
PRELIMINARY
DESTRAVIS GROUP

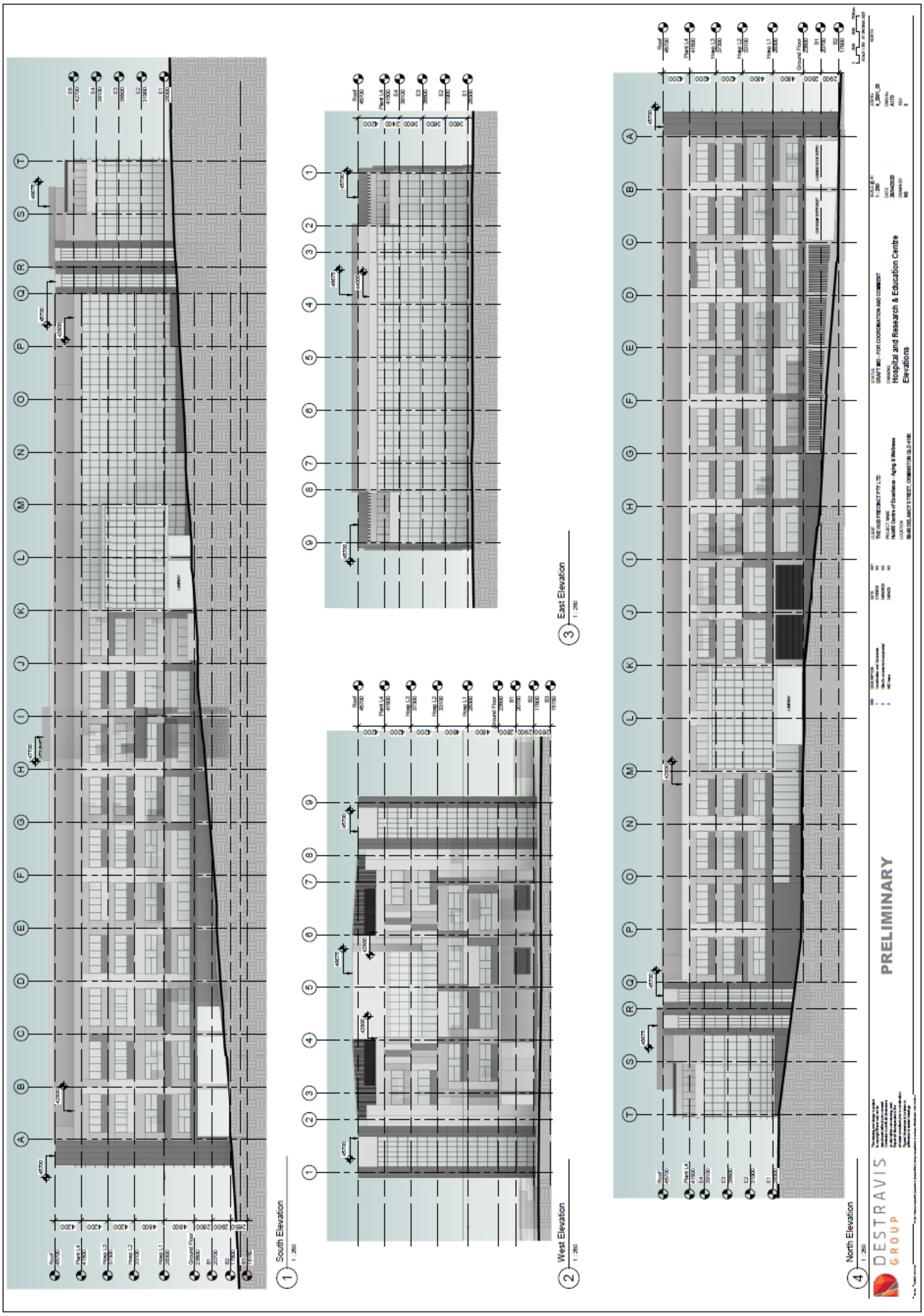


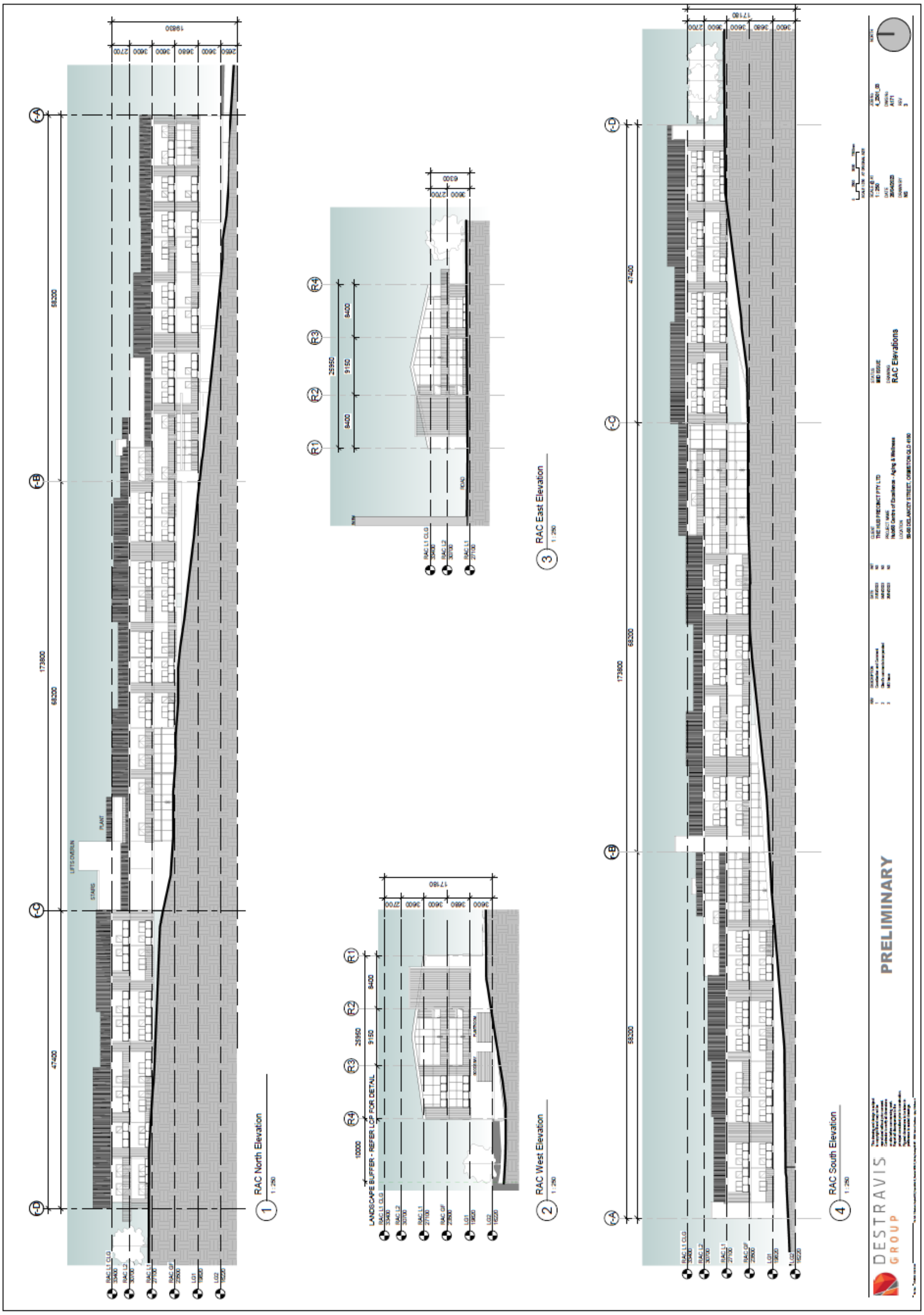
RESEARCH & EDUCATION CENTRE
HOSPITAL
RAC
SITE BOUNDARY
< STAGE ONE
STAGE TWO >
IPU 3C
CONSULT 3A
SHARED
LIGHTWELL
ACCESSIBLE TERRACE BELOW
SHELL SPACE
STAIR
FINUCANE ROAD
PRELIMINARY
DESTRAVIS GROUP
Zone Legend
BED LIFT
CONSULTING SUITES
FUTURE STAGE 2
GOODS LIFT/HOIST
INPATIENT UNIT
RESEARCH AND EDUCATION
ROOF GARDEN
TENANCY
TRAVEL AND ENGINEERING
VISITORS LIFT

ttm



SITE BOUNDARY
RESIDENTIAL AGED CARE FACILITY BELOW
HOSPITAL
< STAGE ONE
STAGE TWO >
RESEARCH & EDUCATION CENTRE
ROOF TERRACE
PLANT
LIGHTWELL
STAGE 2 COOLING TOWN
STAGE 1 COOLING TOWN
STAIR
+41500
SITE BOUNDARY
FINUCANE ROAD
Zone Legend
BED LIFT
FUTURE STAGE 2
GOODS LIFT/HOIST
INPATIENT UNIT
RESEARCH AND EDUCATION
ROOF GARDEN
TRAVEL AND ENGINEERING
VISITORS LIFT
STG2 - HOSPITAL & RAC L4 + R&E E4
PRELIMINARY
DESTRAVIS GROUP

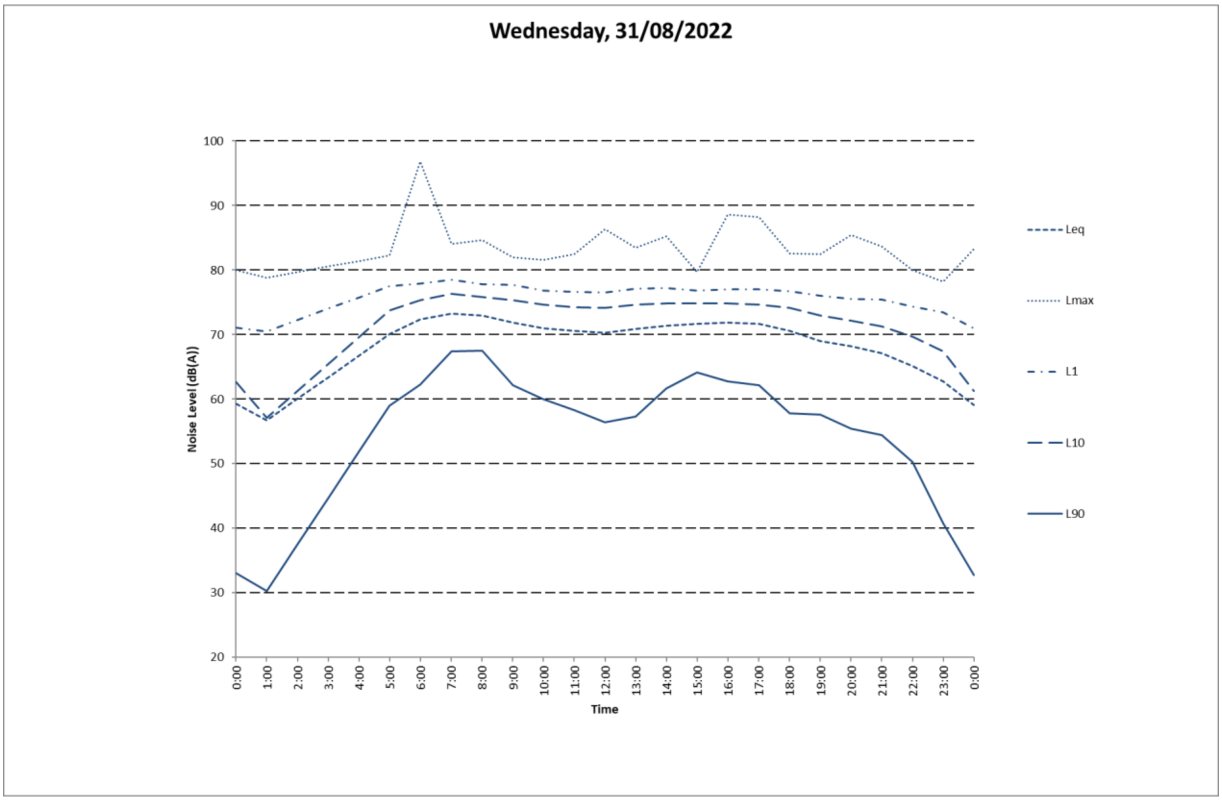

South Elevation
1 : 250
East Elevation
1 : 250
West Elevation
1 : 250
North Elevation
1 : 250
PRELIMINARY
Hospital and Research & Education Centre
Elevations
DESTRAVIS
GROUP

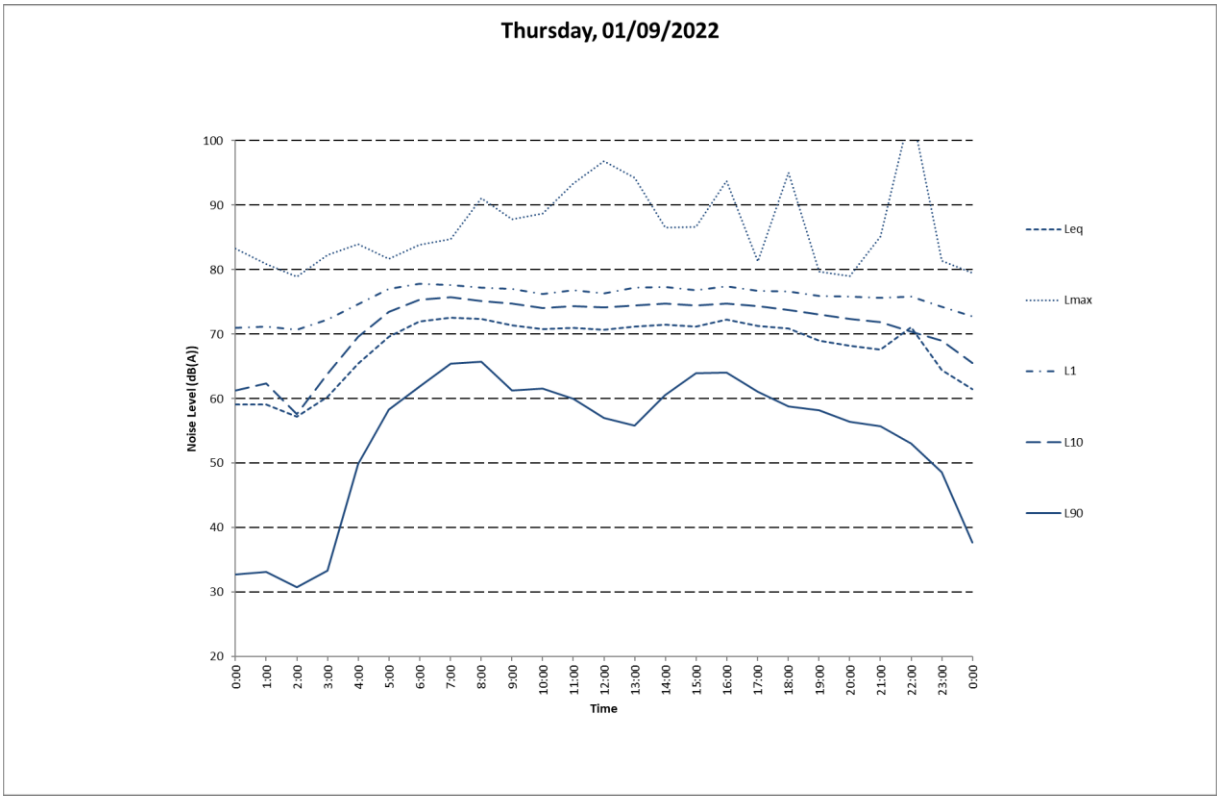


RAC North Elevation
RAC East Elevation
RAC West Elevation
RAC South Elevation
LANDSCAPE BUFFER - REFER LCP FOR DETAIL
RAC Elevations
PRELIMINARY
DESTRAVIS GROUP

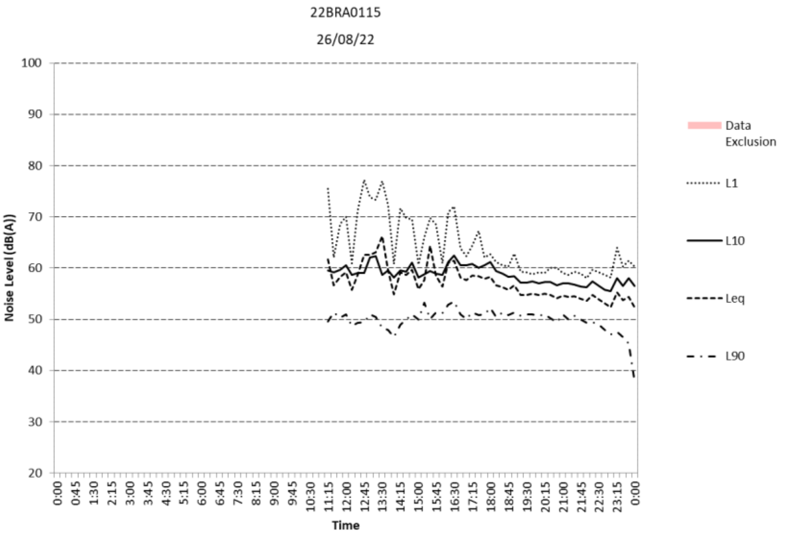
Appendix B Unattended Noise Monitoring Graphs

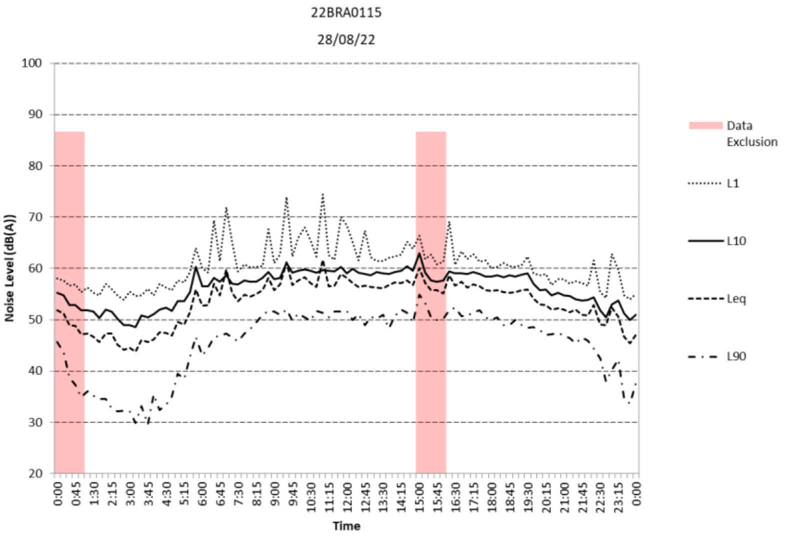
ROAD TRAFFIC NOISE

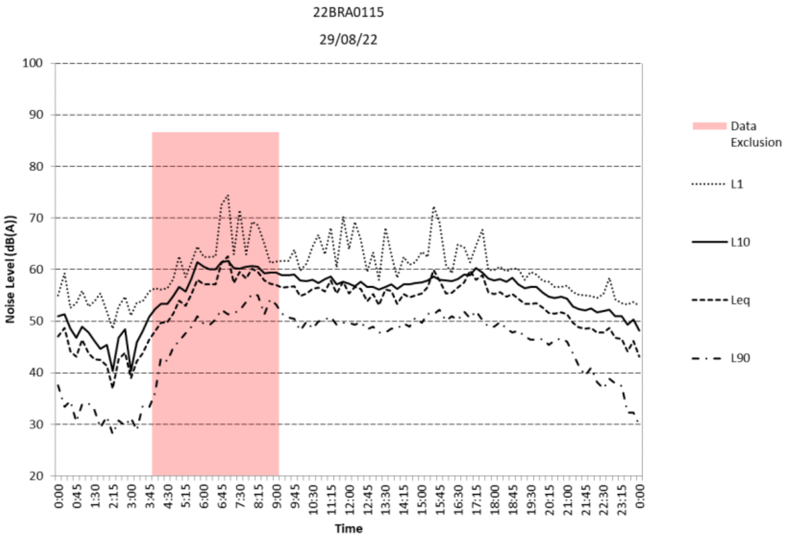


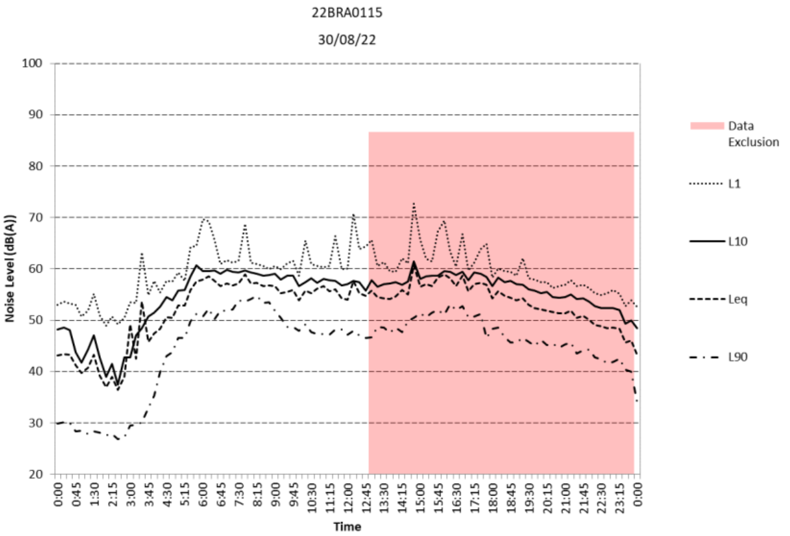


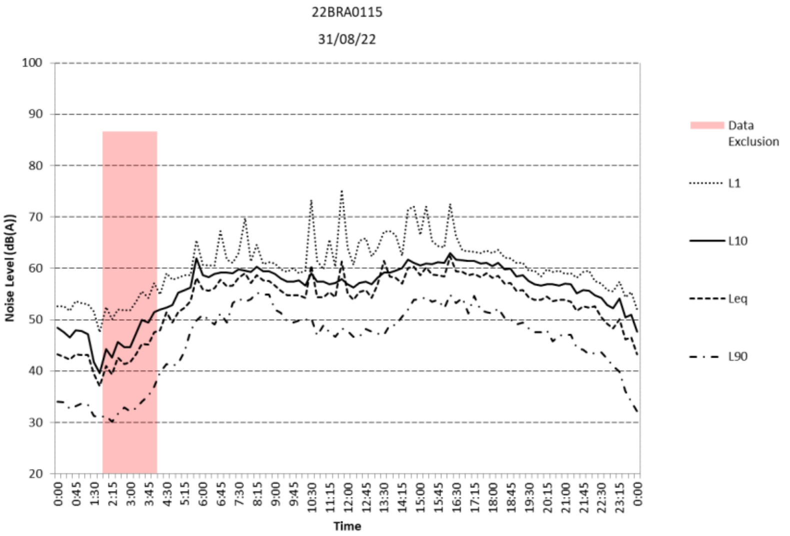
AMBIENT NOISE

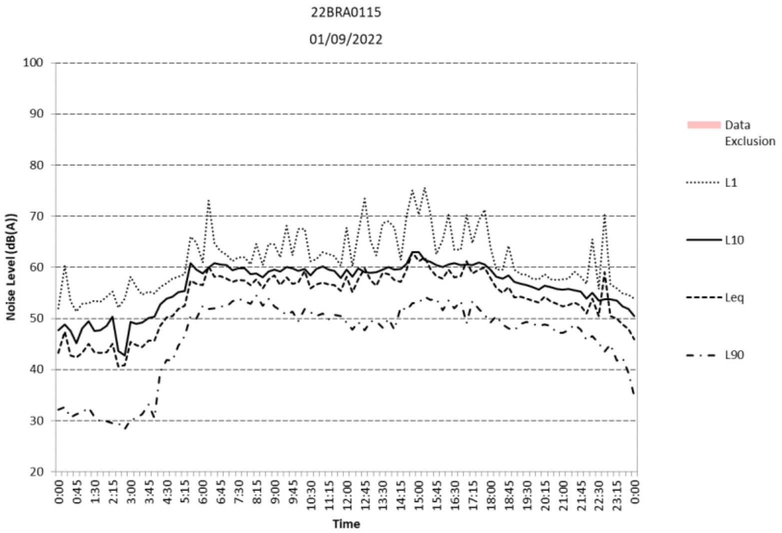



22BRA0115
28/08/22
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90

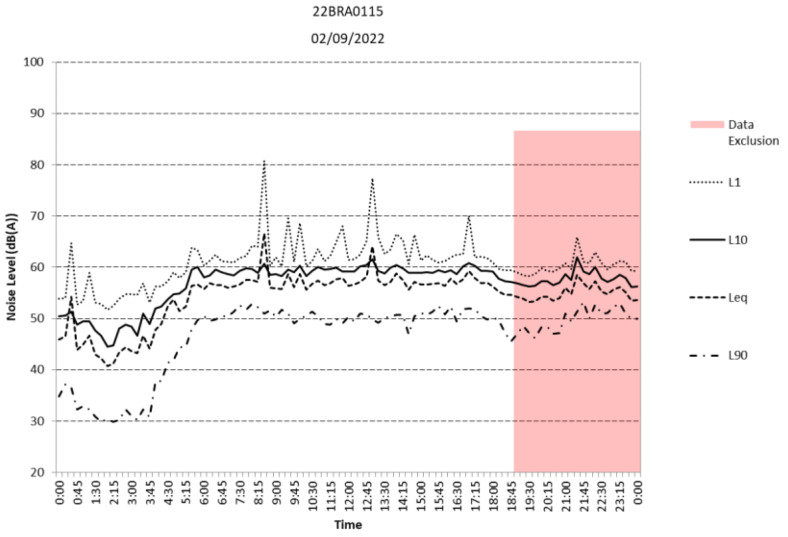

22BRA0115
29/08/22
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90


22BRA0115
30/08/22
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90

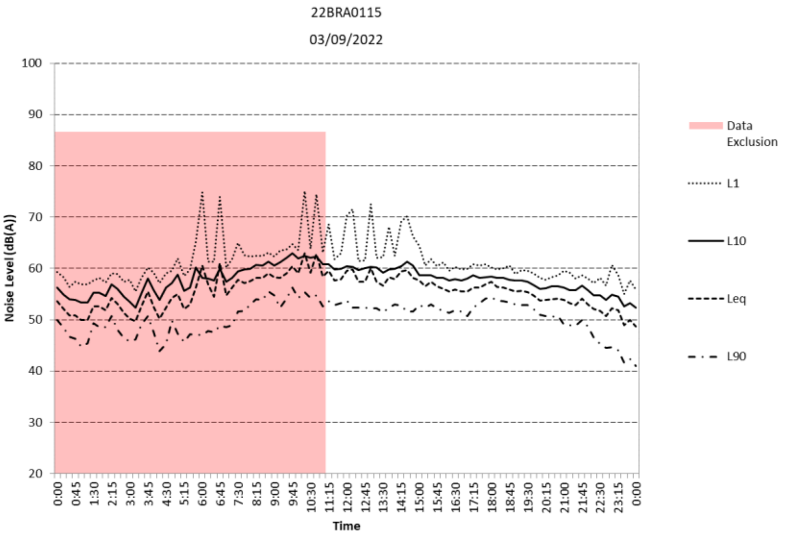

22BRA0115
31/08/22
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90

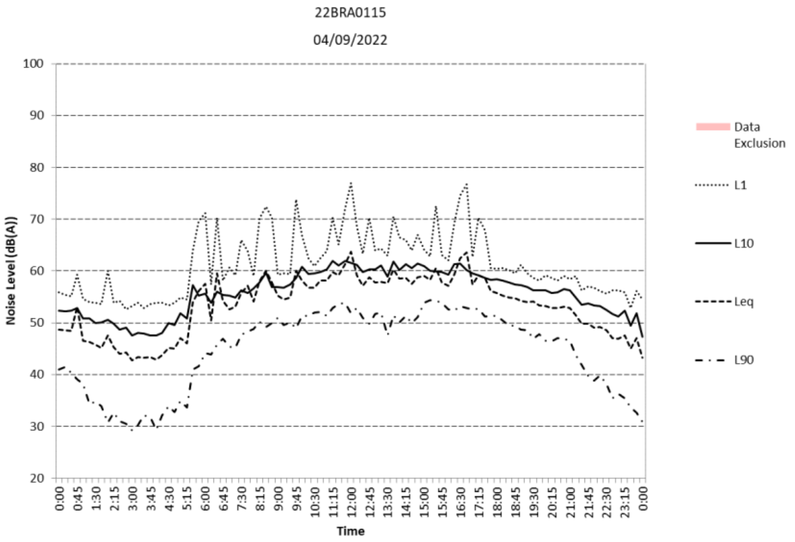


22BRA0115
01/09/2022
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90



22BRA0115
02/09/2022
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90


22BRA0115
03/09/2022
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90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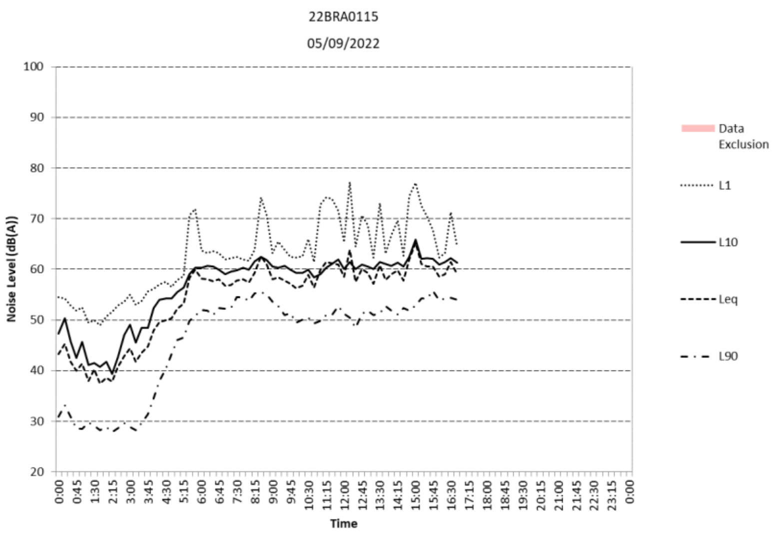
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90



22BRA0115
05/09/2022
Noise Level (dB(A))
Time
Data Exclusion
L1
L10
Leq
L90

Appendix C SoundPLAN Noise Model Outputs

Cleveland Private Hospital, 58-68 Delancey Street, Ormiston
Road Traffic Noise Assessment

Receiver	Direction	Floor	L10(18h) Facade Corrected dB(A)
Hospital - R1	N	GF	38.4
		F 1	39.9
		F 2	43.0
		F 3	46.0
Hospital - R2	E	F 1	58.1
		F 2	61.7
		F 3	63.8
Hospital - R3	E	F 1	65.4
		F 2	67.4
		F 3	68.2
Hospital - R4	S	GF	70.3
		F 1	73.7
		F 2	74.3
		F 3	74.1
Hospital - R5	E	F 1	72.6
		F 2	72.7
		F 3	72.4
Hospital - R6	S	F 1	75.6
		F 2	75.4
		F 3	74.9
Hospital - R7	W	F 1	72.6
		F 2	72.5
		F 3	72.1
Hospital - R8	S	GF	73.1
		F 1	73.9
		F 2	73.8
		F 3	73.5
Hospital - R9	W	GF	67.2
		F 1	67.7
		F 2	67.8
		F 3	67.7
Hospital - R10	W	GF	63.7
		F 1	64.2
		F 2	64.8
		F 3	65.2
Hospital - Setdown R11	E	GF	50.7
Hospital - Setdown R12	E	GF	63.2
Hospital Setdown - R13	W	GF	62.9

	TTM Consulting Pty Ltd	1

SoundPLAN 9.0

Cleveland Private Hospital, 58-68 Delancey Street, Ormiston
RTN Assessment
"Verification 2022.sit"

Receiver	Fl	L10(18h) Free-field dB(A)	
Logger (73.7dBA)	GF	74.1	

TTM Consulting Pty Ltd

1

SoundPLAN 8.2

Appendix D Sample Calculations

ONSITE NOISE CALCULATIONS – Hospital – Leq

Noise Source	Duration	Leq	Events	Leq period	Distance to Receivers R1	Hospital onsite	RAC onsite
				1 hour			
Car door closure	2	75	1552	74	57	N/A - internal	20
Car bypass	3	69	776	67	44	8	8
Car engine	3	72	776	70	55	N/A - internal	18
Truck passby	20	80	30	72	44	8	8
Deliveries	60	85	10	77	63	N/A - internal	25
Waste Collection	40	93	5	80	63	N/A - internal	25
Noise level after Distance loss							
Car door closure					39	#VALUE!	48
Car bypass					34	49	49
Car engine					35	#VALUE!	45
Truck passby					39	54	54
Deliveries					41	#VALUE!	49
Waste Collection					44	#VALUE!	52
Shielding losses (building, barrier etc)							
Car door closure					22	7	7
Car bypass					11	0	0
Car engine					22	7	7
Truck passby					11	0	0
Deliveries					22	7	7
Waste Collection					22	7	7
Noise Level at Receiver					**R1**	**Hospital onsite**	**RAC onsite**
Car door closure					17	#VALUE!	41
Car bypass					23	49	49
Car engine					13	#VALUE!	38
Truck passby					28	54	54
Deliveries					19	#VALUE!	42
Waste Collection					22	#VALUE!	45

ONSITE NOISE CALCULATIONS – Hospital - L1

Receiver	Duration	L1	Events	L1 period	R1	Hospital onsite	RAC onsite
				1 hour	0	0	
Car door closure	2	83	1552	82	57	N/A - internal	20
Car bypass	3	75	776	73	44	8	8
Car engine	3	74	776	72	55	N/A - internal	18
Truck passby	20	83	30	75	44	8	8
Deliveries	60	86	10	78	63	N/A - internal	25
Waste Collection	40	105	5	92	63	N/A - internal	25
Noise level after Distance loss							
Car door closure					47	#VALUE!	56
Car bypass					40	64	64
Car engine					37	#VALUE!	47
Truck passby					42	66	66
Deliveries					42	#VALUE!	50
Waste Collection					56	#VALUE!	64
Shielding losses (building, barrier etc)							
Car door closure					22	7	7
Car bypass					11	0	0
Car engine					22	7	7
Truck passby					11	0	0
Deliveries					22	7	7
Waste Collection					22	7	7
Noise Level at Receiver					**R1**	**Hospital onsite**	**R3**
Car door closure					25	#VALUE!	49
Car bypass					29	64	64
Car engine					15	#VALUE!	40
Truck passby					31	66	66
Deliveries					20	#VALUE!	43
Waste Collection					34	#VALUE!	57
0					0	0	0

ONSITE NOISE CALCULATIONS – Residential Aged Care – Leq

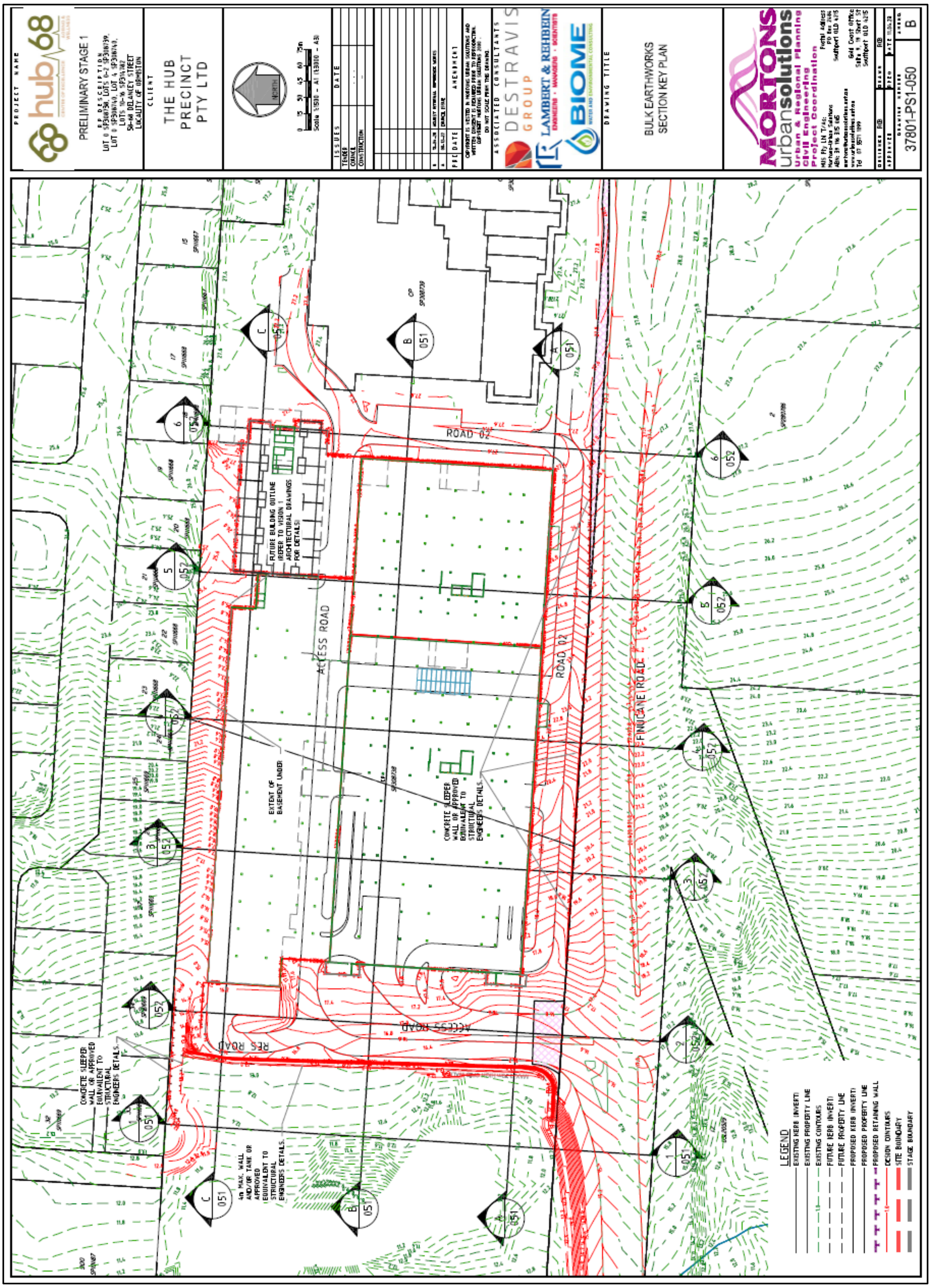
Noise Source	Duration	Leq	Events	Leq period	Distance to Receivers R1	Hospital onsite	RAC onsite
				1 hour			
Car door closure	2	75	12	53	15	18	N/A - internal
Car bypass	6	69	26	55	15	8	8
Car engine	3	72	26	55	15	18	N/A - internal
Truck passby	20	80	6	65	15	15	12
Deliveries	60	85	2	70	25	30	N/A - internal
Waste Collection	40	93	1	73	25	30	N/A - internal
Noise level after Distance loss							
Car door closure					30	28	#VALUE!
Car bypass					32	37	37
Car engine					32	30	#VALUE!
Truck passby					42	42	44
Deliveries					42	41	#VALUE!
Waste Collection					45	44	#VALUE!
Shielding losses (building, barrier etc)							
Car door closure					22	22	0
Car bypass					14	0	0
Car engine					22	0	0
Truck passby					10	0	0
Deliveries					22	22	0
Waste Collection					22	22	0
Noise Level at Receiver					**R1**	**Hospital onsite**	**RAC onsite**
Car door closure					8	6	#VALUE!
Car bypass					18	37	37
Car engine					10	30	#VALUE!
Truck passby					32	42	44
Deliveries					20	19	#VALUE!
Waste Collection					23	22	#VALUE!

ONSITE NOISE CALCULATIONS – Hospital - L10

Receiver	Duration	L10	Events	L10 period	R1	Hospital onsite	RAC onsite
				1 hour	0	0	
Car door closure	2	77	12	55	15	18	N/A - internal
Car bypass	6	75	26	61	15	8	8
Car engine	3	74	26	57	15	18	N/A - internal
Truck passby	20	82	6	67	15	15	12
Deliveries	60	86	2	71	25	30	N/A - internal
Waste Collection	40	94	1	74	25	30	N/A - internal
Noise level after Distance loss							
Car door closure					32	30	#VALUE!
Car bypass					38	52	52
Car engine					34	32	#VALUE!
Truck passby					44	55	56
Deliveries					43	42	#VALUE!
Waste Collection					46	45	#VALUE!
Shielding losses (building, barrier etc)							
Car door closure					22	22	0
Car bypass					14	0	0
Car engine					22	0	0
Truck passby					10	0	0
Deliveries					22	22	0
Waste Collection					22	22	0
Noise Level at Receiver					**R1**	**Hospital onsite**	**R3**
Car door closure					10	8	#VALUE!
Car bypass					24	52	52
Car engine					12	32	#VALUE!
Truck passby					34	55	56
Deliveries					21	20	#VALUE!
Waste Collection					24	23	#VALUE!

Appendix E Earthworks Design Contours

(Site Works Preliminary Overall
No.37801-PS1)


PRELIMINARY STAGE 1
THE HUB PRECINCT PTY LTD
BULK EARTHWORKS SECTION KEY PLAN
37801-PS1-050
ROAD 02
ACCESS ROAD
FINUCANE ROAD
RES ROAD
LEGEND