



PLANS AND DOCUMENTS
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Mirvac Pty Ltd

AIR AND NOISE ASSESSMENT - 19 HERCULES STREET, HAMILTON

November 2010

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1 INTRODUCTION

1.1 SCOPE OF STUDY

Air Noise Environment was commissioned by Mirvac Pty Ltd to complete an air quality and noise assessment for a proposed mixed use development at 19 Hercules Street, Hamilton. The proposed development site is located in an area that is under the planning jurisdiction of the Urban Land Development Authority (ULDA). Therefore, the assessment has been completed in accordance with the requirements of the Urban Land Development Authority (ULDA) Act 2007, and the guidance provided by the ULDA.

The proposed development site is located within the Northshore Hamilton Urban Development Area (UDA) that was declared on 28 March 2008. The Northshore Hamilton UDA includes land between Kingsford Smith Drive and the Brisbane River, extending from Bretts Wharf to the west and the Gateway Motorway to the east.

Applications to develop land within the UDA are considered by the ULDA in the context of the Northshore Hamilton UDA Development Scheme (July 2009). With respect to the potential amenity and environmental impacts of remnant industry within the UDA on land designated for mixed uses, the Development Scheme comments that:

'the redevelopment of the UDA presents a number of challenges, in particular the effective transition of the area while having regard to the on-going port and industrial activities, and the future amenity of new residents.'

This part of the UDA contains a mix of development and is in a transitional state of urban renewal from light industry and port activities to development for higher density residential living with retail and office uses supporting an emerging community.

Specific noise and air quality criteria are not defined by the ULDA, hence in order to address their Development Scheme requirements, reference is made in this assessment to the Queensland State legislation as defined in the Environmental Protection (Air) Policy 2008 and the Environmental Protection (Noise) Policy 2008.

1.2 THE PROPOSED DEVELOPMENT

The proposed development site is located at 19 Hercules Street, Hamilton described as Lot 3 on SP172658, as shown on Figure 1. A mixed use development comprising four buildings (with heights of 2, 8, 18, and 23-storeys) is proposed to be constructed comprising of a retail component at ground podium level and residential units to upper levels. A total of 582 units are proposed. Car parking is provided in a three-level basement with 610 car spaces for retail users, residents, and visitors.

The area surrounding the site is characterised by residential, commercial and industrial developments. The following developments are located adjacent to the proposed site:

- north – Thrifty Car Rental (including a Caltex refuelling depot), and Hamilton Recreation Reserve public car park;
- east – Portside retail, temporary carparking and restaurants;
- south – Portside Wharf incorporating the Brisbane Cruise Ship Terminal; and



- west – “Samies Girl” Seafood Market.

The Hamilton area in which the development site is located is characterised by rapid urban renewal, with remnant industry located predominantly to the east of the site along Macarthur Avenue and Curtin Avenue. Port related activities also remain in the area, including wharf activities to the south of the site which also extend along the frontage of sections of the existing Portside commercial and residential developments. Figure 1 identifies the site location and surrounding area. Proposed layouts for the development are presented in Appendix B. Further discussion of the potential impacts of the remnant industry and port activities is presented in the air quality and noise assessment sections of this report.



Figure 1: Site Location



2 ASSESSMENT CRITERIA

2.1 OVERVIEW

The proposed site is within the Hamilton Northshore Urban Development Area (UDA). Hence, the assessment of potential environmental impacts comes under the authority of the Urban Land Development Act 1997, Environmental Protection (Air) Policy 2008 and Environmental Protection (Noise) Policy 2008. As discussed in Section 1, the ULDA do not define specific assessment criteria hence reference is made to the goals and criteria defined in state legislation in this assessment.

2.2 AIR QUALITY CRITERIA

In Queensland, air quality goals are defined in the Queensland Environmental Protection (Air) Policy 2008 (EPP(Air)). Where appropriate criteria are not provided in local or state legislation, it is normal to refer to standards presented in other guidance such as the comprehensive list of air quality goals as detailed in the Victorian State Environment Protection Policy (Air Quality Management) 2001 (SEPP(AQM)).

Tables 2.1 and 2.2 below present a summary of the air quality goals relevant to the assessment of the expected air quality environment at the proposed development site.

TABLE 2.1: EPP(AIR) AIR QUALITY GOALS

Column 1	Column 2	Column 3	Column 4
Indicator	Environmental value	Air quality objectives $\mu\text{g}/\text{m}^3$ at 0 degrees Celsius (except where noted)	Period
Carbon monoxide	health and wellbeing	11 mg/m^3	8 hours
Hydrogen sulfide	health and wellbeing	54	24 hours
	protecting aesthetic environment	110	30 minutes
Nitrogen dioxide	health and wellbeing	250	1 hour
		62	1 year
PM_{10}	health and wellbeing	50	24 hours
Sulphur dioxide ^a	Health and wellbeing	570	1 hour
		230	1 day
		57	1 year
Toluene	health and wellbeing	4.1 mg/m^3	24 hours
		410	1 year
	protecting aesthetic environment	1.1 mg/m^3	30 minutes
Xylenes (as a total of ortho, meta and	health and wellbeing	1.2 mg/m^3	24 hours



Column 1	Column 2	Column 3	Column 4
Indicator	Environmental value	Air quality objectives µg/m ³ at 0 degrees Celsius (except where noted)	Period
para isomers)		950	1 year

^a For the purposes of the assessment, sulphur trioxide emissions are converted to sulphur dioxide to provide combined total sulphur dioxide emissions for comparison to this air quality goal.

TABLE 2.2: OTHER AIR QUALITY GOALS (mg/m³)

Substance	Reason for Classification	Design Criteria mg/m ³	Averaging Time	Source
Ethyl-benzene	Health	14.5	3 minute	VIC EPA
n-Butanol	Odour Health	0.9 5.1	3 minute 3 minute	VIC EPA VIC EPA

2.3 NOISE CRITERIA

The revised Environmental Protection (Noise) Policy 2008, subordinate legislation under the Queensland Environmental Protection Act 1995, provides overall acoustic quality objectives for different noise environments. The relevant acoustic quality objectives for the proposed development are presented in Table 2.3.

TABLE 2.3: ACOUSTIC QUALITY OBJECTIVES FOR HEALTH AND WELL BEING

Sensitive Receptor	Time of Day	L _{Aeq,adj,1hr}	L _{A10,adj,1hr}	L _{A1,adj,1hr}
Dwelling (outdoors)	Daytime and evening	50	55	65
Dwelling (indoors)	Daytime and evening	35	40	45
	Night time	30	35	40
Commercial and retail activity (for indoors)	When the activity is open for business	45	-	-

The impacts from existing local industrial sources in the locality are considered in the context of the criteria defined in Table 2.3 for the proposed development.

In addition the Environmental Protection Act 1994 indicates the following noise requirements for pool pumps and air conditioning equipment:

440T Pumps (including swimming pool pump and spa blower)

(2) An occupier of the premises must not use, or permit the use of, the pump on any day-

(a) before 7 a.m., if it makes an audible noise; or

(b) from 7 a.m. To 7 p.m., if it makes a noise of more than 5 dB(A) above the background level; or



- (c) from 7 p.m. To 10 p.m., if it makes a noise of more than 3 dB(A) above the background level;*
- or*
- (d) after 10 p.m., if it makes an audible noise.*

440U Airconditioning equipment

(2) An occupier of the premises must not use, or permit the use of, the equipment on any day-

- (a) before 7 a.m., if it makes noise of more than 3 dB(A) above the background level; or*
- (b) from 7 a.m. to 10 p.m., if it makes a noise of more than 5 dB(A) above the background level; or*
- (d) after 10 p.m., if it makes noise of more than 3 dB(A) above the background level.*



3 AIR QUALITY ASSESSMENT

3.1 POTENTIAL AIR EMISSION SOURCES

Air quality monitoring is no longer carried out in the Hamilton area, although data is available for a representative industry monitoring station at Pinkenba (refer to Section 3.4.1). Given the absence of monitoring data representative of the proposed development site, the methodology adopted in the air quality assessment is to consider the remaining sources of emissions in the locality and predict the contribution from those sources at the development site.

Site inspections of the local area were completed in order to determine the emissions sources that have potential to influence the air quality at the proposed development site. Table 3.1 presents a summary of the nearest potential air emission sources identified during the site inspections and the relevant separation distances from the proposed development site.

TABLE 3.1: POTENTIAL AIR EMISSION SOURCES

Business	Address	Industry Type	Separation Distance (m)
BCC Eagle Farm Asphalt Plant	260 Curtin Avenue West	Asphalt Manufacturing	1,400
Boral Whinstains	208 Curtin Avenue West	Asphalt Manufacturing	1,200
Langford Metal Industries	44 Curtin Avenue	Metal fabrication and powder coating	380
Colonial Restoration Supplies	20 Curtin Avenue West	Timber Product Manufacturer	340
P&O Shipping Wharf	Macarthur Avenue	Live animal export activities	450 - 850
P&O Wet Bulk Stores	147 Macarthur Avenue	Storage, shipping, unloading of bulk wet materials (including live animal exports, acid tanks and grain)	850 – 1000

It should be noted that the existing Caltex refuelling depot to the north of the development site has been excluded from consideration. Discussions with the site manager indicate that the facility would cease operations from December 2011, which would coincide with the proposed opening of the mixed use development at 19 Hercules Street.

3.2 MODELLED AIR EMISSION SOURCES

In order to determine which of the local emissions sources identified in Table 3.1 should be included in the air dispersion modelling, the following approaches have been adopted:

- review of recommended minimum industry separation distance guidelines from sensitive uses;



- inspections of specific operations; and
- guidance from the ULDA.

Given the significant separation distance between the development site and a number of the identified sources, consideration has been given to the guidelines regarding appropriate separation distances for the types of industry identified in Table 3.1. The Queensland Department of Environment and Resource Management (DERM) does not provide specific guidance on appropriate separation distances for industries from sensitive uses such as residential. However, guidance is provided by a range of authorities in other states including Victoria¹, Western Australia² and South Australia³. Table 3.2 presents the minimum separation distances recommended for the industries identified in Table 3.1.

TABLE 3.2: RECOMMENDED MINIMUM SEPARATION DISTANCES

Business	Address	Industry Type	Separation Distance (m)	Recommended Minimum Separation Distance (m)
BCC Eagle Farm Asphalt Plant	260 Curtin Avenue West	Asphalt Manufacturing	1,400	1,000
Boral Whinstains	208 Curtin Avenue West	Asphalt Manufacturing	1,200	1,000
Langford Metal Industries	44 Curtin Avenue	Metal fabrication and powder coating	380	500
Colonial Restoration Supplies	20 Curtin Avenue West	Timber Product Manufacturer	340	100 - 300
P&O Shipping Wharf	Macarthur Avenue	Live animal export activities	450 - 850	500 – 1000 (depending on size)
P&O Wet Bulk Stores	147 Macarthur Avenue	Storage, shipping, unloading of bulk wet materials (including acid tanks and grain)	850 – 1000	500 – 1000 (depending on size)

Based on the minimum separation guidelines, it is concluded that the following industries may require consideration in the air dispersion modelling analysis:

¹ *Recommended Buffer Distances for Industrial Residual Air Emissions, Environmental Protection Authority Victoria, July 1990.*

² *Separation Distances between Industrial and Sensitive Land Uses, Environmental Protection Authority Western Australia, June 2005.*

³ *Guidelines for Separation Distances, South Australian Environmental Protection Authority South Australia, December 2007.*



- Langford Metal Industries;
- Colonial Restoration Supplies;
- P&O Live Animal Exports.
- P&O Wet Bulk Stores.

Inspection of Langford Metal Industries has identified that the activities carried out at the site include a range of metal working activities including cutting, grinding, welding and powder coating. While there are two powder coating booths provided at the site, during a site inspection it was confirmed that only a single booth is operated at any given time. The powder coating booths emit via a stack, and have been included in the modelling. All other sources of emissions at this premises occur within the building and are emitted as fugitive sources. Given the separation distance and the fugitive nature of the other sources, only the powder coating emissions have been included in the air dispersion modelling.

Previous inspection of Colonial Restoration Supplies by Air Noise Environment Pty Ltd personnel has confirmed that the operation is relatively small and primarily involves timber cutting and dry finishing. All particulate emissions are captured within a ventilation system that is emitted via a dust baghouse. No visible emissions were observed during the site inspection. Varnishes and paints were not identified during the site inspection and the operator advised that finishing of timber products is not carried out on the site. On this basis, only particulate emissions have been included in the modelling assessment for this industrial operation.

For the P&O Wet Bulk Stores, discussions with the operator has confirmed that the majority of activities have limited potential for air emissions. Some acid storage occurs at the eastern end of the site, at a separation distance of 850 m. This is greater than the recommended minimum for port operations (500 m) hence the potential for adverse air quality impacts from the acid tanks to affect the proposed development site is minimal and has not been considered further in the assessment.

In the case of the live animal exports, there is potential for odour impacts to arise during delivery and loading of animals to export boats moored to the east of the P&O cruise ship terminal wharf. Discussions with the operator confirm that the transport and loading of animals is an infrequent occurrence, and would typically occur on average no more than once per month for a period of 24 hours. It is noted that the proposed development site is significantly more remote from the live animal export activities than existing residential development at Portside. In view of the greater separation distance from the potentially odorous activity than existing receptors, and the infrequent occurrence of live animal export, this source has not been included in the modelling. However, as a precaution, it is recommended that all potential purchasers of residential units at the development are advised of the potential for detectable odours to occur during live animal export activities, particularly under adverse meteorological conditions (such as direct source to receptor winds).

Discussions with the ULDA have indicated that the potential impacts of the asphalt operations are also of interest despite the significant separation distance. Therefore, these operations have been included in the dispersion modelling assessment completed for the proposed development.

In summary, the following industrial operations have been included in the air dispersion modelling:

- Langford Metal Industries: powder coating booth emissions;
- Colonial Restoration Supplies: particulate emissions from baghouse;
- Boral Whinstains: asphalt operations;
- Brisbane City Council Asphalt Plant: asphalt operations.



3.3 EMISSION DATA

To estimate potential emission rates from the sources identified for inclusion in the air dispersion modelling, reference has been made to various available documentation including environmental license limits, the National Pollution Inventory (NPI) reporting database and NPI emission rate techniques.

A summary of the stack parameters and emission data utilised for the potential air emission sources identified in Table 3.2 and Table 3.3. It should be noted that NO₂ has been predicted based on a conversion rate of 60% NO_x. This is considered to be a conservative assumption and may lead to over predictions in the modelling. Additionally the total suspended particulate emissions have been modelled as PM₁₀.

Figure 2 presents the modelled stack locations, and their location relative to the development site. Also identified are the P&O shipping and storage areas.



Figure 2: Modelled Air Emissions Sources, Stack Locations

TABLE 3.2: MODELLED STACK PARAMETERS

Industrial Operator	Stacks/ Sources	Height above ground (m)	Height above roof (m)	Diameter (m)	Velocity (m/s)	Temperature (°C)	Data Source
BCC Eagle Farm Asphalt Plant	1	34	-	1.34	14	50	Site observations and license limits
Boral Whinstains	1 (Asphalt)	34	-	1.34	14	50	Site observations and BCC Eagle Farm license limits
Langford Metal Industries	1	11	4	0.5	10	25	Site observations and license limits of similar operation
Colonial Restoration Supplies	1	10	4	0.6	10	25	Site observations and license limits of similar operation



TABLE 3.3: MODELLED STACK EMISSION RATES (g/s)

Industrial Operator	Stacks/ Sources	Ethyl-benzene	n-Butanol	Toluene	Xylene	Carbon Monoxide	SO ₃	H ₂ S	NO _x	Particulates (as PM ₁₀)	Data Source
BCC Eagle Farm Asphalt Plant	1	-	-	-	-	19.74	1.97	0.10	1.18	0.99	License Emission Limits and NPI ^a
Boral Whinstains	1	-	-	-	-	19.74	1.97	0.10	1.18	0.99	BCC Eagle Farm License Emission Limits and NPI ^a
Langford Metal Industries	1	0.0008	0.0018	0.0061	0.0032	-	-	-	-	-	Monitored Levels similar operation
Colonial Restoration Supplies	1	-	-	-	-	-	-	-	-	0.14	Monitored Levels similar operation

^a National Pollutant Inventory, Results – Individual Facility Detail, 2008/2009 report for Brisbane City Council, Eagle Farm Asphalt Plant – Eagle Farm, QLD.





3.4 EXISTING ENVIRONMENT

3.4.1 Ambient Air Quality Monitoring Network

Table 3.4 presents a summary of ambient air quality monitoring data collected in the area surrounding the proposed development site. For the purposes of the assessment, monitoring data collected at the Pinkenba monitoring station has been utilised to allow assessment of the potential cumulative impacts on the proposed development site. The Pinkenba monitoring station is located within an industrial area, and is considered suitable to represent existing air quality at a mixed use, remnant industrial area such as the proposed development. Where data is available for the Pinkenba monitoring site, this has been adopted as most representative of the development site.

For xylene and toluene, the only available monitoring data has been collected by the Queensland Department of Environment and Resource Management (DERM, formerly EPA) at the Springwood monitoring station.

TABLE 3.4: EXISTING AMBIENT AIR QUALITY (2009)

Pollutant	Unit	Measuring Period	Pinkenba	Springwood
Carbon monoxide (CO)	mg/m ³	8 hour maximum*	1489.3	-
Nitrogen dioxide (NO ₂)	µg/m ³	Annual mean	18.8	15.1
	µg/m ³	1 hour maximum	94.1	71.5
Particulate matter less than 10 µm (PM ₁₀)	µg/m ³	24 hour maximum **	84.3	77.3
		Annual mean	-	-
Sulphur dioxide	µg/m ³	24 hour maximum	26.2	10.5
		1 hour maximum	186	36.7
		annual mean	2.6	2.6
Toluene	µg/m ³	24 hour maximum	-	8.7
		annual mean	-	3.4
Xylene	µg/m ³	24 hour maximum	-	7
		annual mean	-	3

* One day per year maximum allowable exceedence;

** Five days per year allowable exceedence, not including exceedence in ambient goals due to external events (e.g. dust storms, fires, major construction works)

It is noted from Table 3.4 that, with the exception of particulates, the existing ambient air quality complies with the relevant EPP(Air) goals. For particulates, there are already occasional exceedences of the PM₁₀ air quality goal of 50 µg/m³ as a 24-hour average in Brisbane.

For particulates, the World Health Organisation (WHO)⁴ identifies that a 10 µg/m³ increase in

⁴ WHO 2003, *Health Aspects of Air Pollution with Particulate Matter, Ozone and Nitrogen Dioxide, Report on a WHO*



concentrations can result in adverse health impacts. Therefore, this is adopted as a guide to assessing the potential impacts associated with the additional contribution of emissions from the remnant industries on the proposed development site.

3.4.2 Local Meteorological Data

Review of the windrose data prepared for the modelling (presented in Figure 3) indicate that winds are predominately light and from the south-west, however a significant portion of winds are also noted from the north-east, and south-east with a higher frequency of moderate to high speed.

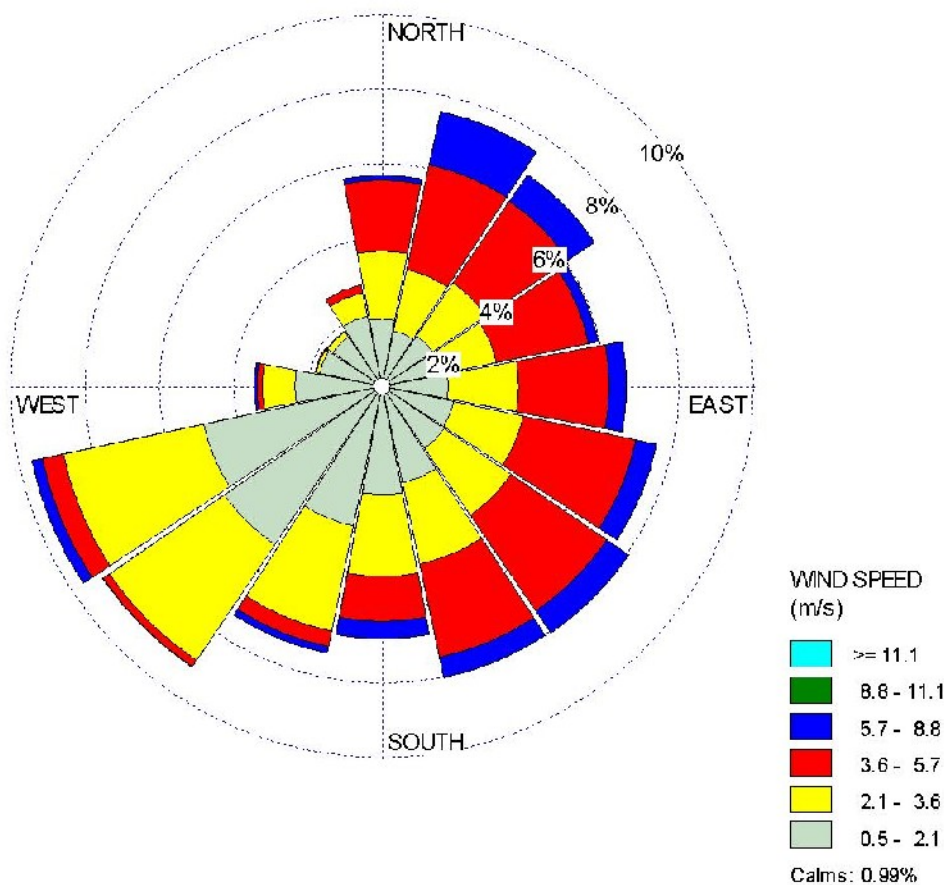


Figure 3: Annual Windrose

3.5 DISPERSION MODELLING METHODOLOGY

3.5.1 CALPUFF Dispersion Modelling

For the purposes of the assessment, the CALPUFF dispersion model has been utilised to assess the potential impacts of emissions from remnant industries in the surrounding area identified as

Working Group, Bonn, Germany, 13-15 January 2003.



having a potential to impact on the proposed development site. CALPUFF is a non-steady state Lagrangian Gaussian puff model able to incorporate effects dispersion effects associated with complex terrain, over-water transport, coastal interaction effects and building downwash.

The CALPUFF modelling system treats emissions as a series of puffs. These puffs are then dispersed throughout the modelling area and allowed to grow and bend with spatial variations in meteorology. In doing so, the model is able to retain a memory of the plume's movement throughout a single hour and from one hour to the next while continuing to better approximate the effects of the complex air flows noted in the project area.

CALPUFF utilises the meteorological processing and prediction model CALMET to provide three dimensional wind field predictions for the area of interest. The final wind field developed by the model (for consideration by CALPUFF) includes an approximation of the effects of local topography, the effects of varying surface temperatures (as is observed in land and sea bodies) and surface roughness (resulting from varied land uses and vegetation cover in an area). The CALPUFF model is able to resolve complex terrain influences on local wind fields including consideration of katabatic flows and terrain blocking along with sea breeze recirculation effects associated with the region.

Post processing of modelled emissions is undertaken using the CALPOST package. This allows the rigorous analysis of pollutant predictions generated by the CALPUFF system. CALPOST is able to provide an analysis of predicted pollutant concentrations for a range of averaging periods from 1 hour to 1 year.

The industrial emissions sources identified for modelling in Section 3.2 have been input to the model as point emission sources (stacks) with operating parameters and emissions as identified in Tables 3.2 and 3.3.

The modelling has considered the influences that building wake effects have on the dispersion of emitted plumes from stack sources at Langford Metal Industries and Colonial Restoration Supplies in the modelling. The PRIME building downwash algorithm is then used in association with the BPIP program to incorporate the likely plume downwash effects attributed to tall structures in the vicinity of the stacks.

Gridded receptors across the development site at ground level have been modelled with a spacing of 20 m. In addition discrete receptors, representative of each floor level of the proposed buildings, have been included in the modelling to predict the potential for higher concentrations at elevated positions.

3.5.2 CALMET Meteorological Modelling

CALMET has been utilised for the purposes of preparing a suitable meteorological file for use in the CALPUFF modelling. CALMET is a meteorological model which includes a diagnostic wind field generator containing objective analysis and parameterised treatments of slope flows, kinematic terrain effects, terrain blocking effects and a divergence minimisation procedure, and micro meteorological model for overland and over-water boundary layers. The terrain handling effects included within the CALMET meteorological processor are able to resolve complex terrain influences on local wind fields including consideration of katabatic flows.

A number of meteorological monitoring stations are located in the Greater Brisbane area, and these include stations operated by the Bureau of Meteorology (BoM) and the Queensland Department of Environment and Resource Management (DERM) (formerly the Environmental Protection Agency).



Details of the meteorological monitoring stations included in the CALMET modelling are summarised in Table 3.5.

TABLE 3.5: METEOROLOGICAL STATIONS

Station Name/Location	Easting (km)	Northing (km)	Operated By
Brisbane Airport	512.820	6970.203	BoM
Brisbane CBD	503.832	6960.309	BoM
Inner Marker (Moreton Bay)	523.906	6984.327	BoM
Redcliffe	508.963	6989.244	BoM

For the purposes of the modelling, CALMET was initialised with a total of 12 vertical layers with layer boundaries at 20 m, 30 m, 50 m, 80 m, 160 m, 250 m, 500 m, 1,000 m, 1,500 m, 2,000 m, 3,000 m and 4,000 m respectively.

For the purposes of the project, minimum mixing heights were set to 50 m and maximum mixing heights to 3,000m. These mixing heights are the recommended values for use in the model, and are representative of the range of mixing heights that have been established as typical for Queensland⁵.

Digital terrain height data for a grid at 200 m resolution was included in the meteorological modelling. The data utilised was obtained from the NASA Shuttle Terrain Database. This database has a grid resolution of approximately 0.09 km. The land-use data was sourced from the USGS (United States Geological Survey) and the coastline information was obtained from the United States National Geophysical Data Centre.

3.6 CALPUFF MODELLING RESULTS

The results of the Calpuff modelling for the industrial landuses identified as potentially impacting on the proposed development are presented in Table 3.6 and discussed below.

Nitrogen oxides (NO_x) are reactive pollutants and, when sufficient ozone is available in the atmosphere, nitrogen oxide (NO_x) converts to nitrogen dioxide (NO₂). Nitrogen dioxide is a criteria pollutant for the purposes of this assessment. For the purposes of the screening assessment a conversion ratio of 60 % of NO_x to NO₂ has been adopted. This is considered to be appropriate given the separation distance involved between the industry and proposed site location.

Review of the predicted modelling results indicate that under worst case emissions for the surrounding operators including ambient background levels for the area, the PM₁₀ is in excess of the criteria. However, the contribution from the modelled emissions sources is noted to be marginal, and the exceedance is attributable to the ambient background levels and significantly lower than the 10 µg/m³ increase identified by the World Health Organisation. All other compounds considered are predicted to comply with the adopted air quality criteria.

Review of the predicted concentrations at the discrete receptors indicate that the maximums occur at the highest discrete receptors position (representative of the top floor of construction). Further

⁵ HLA-EnviroSciences, *Queensland Meteorological Data Files for Air Quality Planning, June 1995, prepared for the Queensland Department of Environment and Heritage.*



review indicates that the ground level predictions are significantly lower than those for upper floors.

TABLE 3.6: SUMMARY OF MAXIMUM PREDICTED CONCENTRATIONS AT DISCRETE RECEPTORS POSITIONS ($\mu\text{g}/\text{m}^3$)

Compound	Averaging Time	Predicted Max Discrete Receptor	Background	Cumulative	Criteria
		$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
CO	8 hour	199.13	1489.3	1688.43	11000
H ₂ S	24 hour	0.37	-	0.37	54
H ₂ S	30 minutes	4.52	-	4.52	110
NO ₂	1 hour	27.75 ^a	94.1	121.85	250
NO ₂	Annual	0.19 ^a	18.8	18.99	62
SO ₂	1 hour	77.52	186	263.52	570
SO ₂	24 hour	7.30	26.2	33.50	230
SO ₂	Annual	0.53	2.6	3.13	57
Toluene	24 hour	0.09	8.7	8.79	4100
Toluene	Annual	0.01	3.4	3.41	410
Toluene	30 minutes	0.95	8.7	9.65	1100
PM ₁₀	24 hour	3.78	84.3	88.08	50
Xylene	24 hour	0.05	7	7.05	1200
Xylene	Annual	0.01	3	3.01	950
Ethyl-Benzene	3 minutes	0.20	-	0.20	14500
n-Butanol	3 minutes	0.27	-	0.27	900

^a Assuming 60% NO_x to NO₂ conversion rate



4 NOISE ASSESSMENT

4.1 OVERVIEW

The following sections present an assessment of noise impacts associated with noise immission and emissions. Existing and predicted noise levels have been assessed against the acoustic quality objectives outlined in the Environmental Protection (Noise) Policy 2008.

4.2 EXISTING NOISE CLIMATE

4.2.1 Noise Monitoring Methodology

Noise monitoring was undertaken at two locations (refer to Figure 4) utilising two Acoustic Research Laboratories (ARL) noise loggers.



Figure 4: Noise Monitoring Positions

An averaging time of 15 minutes was adopted and measurements were made over seven days (10/9/2010 – 17/09/2010) which included a weekend period. Half-hourly data from the Bureau of Meteorology for the Brisbane Airport indicated that the weather was fine and calm for the majority of the monitoring period. Noise data collected for the hours when it rained or wind speeds exceeded 5 m.s^{-1} were excluded from the assessment to prevent weather-related bias. A total of 6 hours of monitoring data was excluded from the datasets as a result of wind or rain. The Bureau of Meteorology weather data for the monitoring period is presented in Appendix C.

Appendix D presents the results of the background noise monitoring and Tables 4.1 and 4.2 present a summary of the average levels recorded for each period.



TABLE 4.1: AVERAGE MEASURED BACKGROUND NOISE LEVELS (POSITION 1) (dB(A))

Date	Period	L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}	MinL _{A90,1hr}
10/09/10	Day	60.8	80.6	62.8	53.3	51.5
10/09/10	Evening	55.7	74.4	57.3	49.5	48.9
11/09/10	Night	53.8	72.7	54.2	44.9	38.6
11/09/10	Day	58.7	76.3	60	51.1	50.0
11/09/10	Evening	55	73.2	56.2	48.3	46.4
12/09/10	Night	49.9	66.8	50.1	42.6	39.6
12/09/10	Day	55.9	71.9	57.7	49.9	46.2
12/09/10	Evening	56.3	73.5	57.3	49.8	47.6
13/09/10	Night	53.2	70.1	52	42.7	37.4
13/09/10	Day	59.7	78.7	61.7	51.6	49.4
13/09/10	Evening	55	72.4	56.4	49	47.1
14/09/10	Night	55.5	70.6	54.3	43.6	38.8
14/09/10	Day	60.6	77.9	63.1	52.3	49.1
14/09/10	Evening	56.4	72.8	58.4	49.9	48.0
15/09/10	Night	54.9	71.6	54.6	44.7	40.4
15/09/10	Day	56.9	75.2	59.3	49	50.1
15/09/10	Evening	53.5	71.2	56.3	46.1	45.2
16/09/10	Night	54.5	71	53.7	43.6	39.1
16/09/10	Day	59.3	76.8	61.8	50	49.5
16/09/10	Evening	54.1	73.2	56.1	46.5	45.8
17/09/10	Night	53.1	69.5	51.7	40.9	37.1
17/09/10	Day	59.9	77.5	62.9	49.7	48.2

TABLE 4.2: AVERAGE MEASURED BACKGROUND NOISE LEVELS (POSITION 2) (dB(A))

Date	Period	L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}	MinL _{A90,1hr}
10/09/10	Day	57.8	70.6	58.4	55.9	54.5
10/09/10	Evening	53.9	70.1	52.8	49.5	48.6
11/09/10	Night	50.3	59.9	50.8	44.6	39.2
11/09/10	Day	56.5	72.3	56.2	51.9	49.9
11/09/10	Evening	53.4	64.6	51.1	48	47.6
12/09/10	Night	47.3	58.8	47.7	40.5	37.5
12/09/10	Day	53.8	71.2	52	46.8	43.9



Date	Period	L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}	MinL _{A90,1hr}
12/09/10	Evening	55.5	72.4	51.1	48.2	47.8
13/09/10	Night	48.7	57.1	47.1	41	37.4
13/09/10	Day	55.9	71.5	56.3	50.5	48.8
13/09/10	Evening	53.8	67.6	50.8	47.3	45.0
14/09/10	Night	48.3	57.5	47.6	40.9	37.9
14/09/10	Day	56.7	71.8	56.5	50.3	49.1
14/09/10	Evening	53.8	68.3	52	48.3	47.0
15/09/10	Night	49	58.7	49.1	43.2	40.0
15/09/10	Day	54.2	68.7	56.2	51.2	50.1
15/09/10	Evening	50.5	64	51.4	47.6	46.6
16/09/10	Night	48	58.7	47.3	41.4	38.9
16/09/10	Day	54.7	68.8	56.7	51.3	49.9
16/09/10	Evening	50.5	66.3	51.8	47.8	47.6
17/09/10	Night	48.4	59.9	48.6	41.8	39.2
17/09/10	Day	54.6	69.2	56.4	50.8	48.6

4.2.2 Attended Monitoring Results

Attended noise monitoring was completed at the monitoring positions identified in Figure 4 during afternoon, evening, and night periods to identify the sources contributing to the existing noise in the area. Table 4.3 presents the results of the monitoring and the noise sources identified during the monitoring exercises.

TABLE 4.3: ATTENDED NOISE MONITORING RESULTS DB(A)

Position	Date	Time	L _{Aeq}	L _{A1}	L _{A10}	L _{A90}	L _{Amax}	Description
<i>Evening Period (6 pm to 10 pm)</i>								
1	16/09/10	21:10	53.8	65.2	55.0	45.8	74.0	Traffic from Kingford-Smith Drive and Hercules Street provide constant background levels. Noise from commercial business at Portside just audible. Cars hitting speed bump exiting Portside car park at approximately 53 dB(A).
2	16/09/10	21:26	50.6	56.7	52.3	47.3	71.7	Constant hum from generator or air conditioning unit at Portside audible. Bell ringing at Portside occasionally. Aeroplanes, wind. Traffic from Kingsford-Smith Drive and Hercules Street just audible.
<i>Night Period (10 pm to 7 am)</i>								
1	16/09/10	22:02	52.2	62	54.8	45.1	74.8	Less traffic exiting Portside, still constant background noise from traffic on Kingsford-Smith Drive. Truck leaving service station approximately 68 dB(A). Aeroplanes, wind.



Position	Date	Time	L _{Aeq}	L _{A1}	L _{A10}	L _{A90}	L _{Amax}	Description
2	16/09/10	22:17	48.7	55.5	49.4	45.0	74.4	Constant hum from generator or air conditioning unit at Portside audible. Traffic from Kingsford-Smith Drive and Hercules Street just audible. Revving motorbike causes maximum.
<i>Day Period (7 am to 6 pm)</i>								
1	17/09/10	13:54	59.9	70.2	62.5	53.9	77.0	Traffic on Kingsford-Smith Drive dominant noise source. Cars going over speed bump at Portside cause maximum. Birds, wind, pedestrians other noise sources.
2	17/09/10	14:10	52.7	57.0	54.0	50.4	72.1	Constant hum and commercial noises from Portside dominant as well as cars leaving car park. Traffic from Kingsford-Smith Drive and Hercules Street clearly audible.

4.3 ASSESSMENT OF POTENTIAL NOISE IMPACTS

4.3.1 Noise Immissions

4.3.1.1 Overview

Noise immission sources that were identified during site visits include road traffic noise (Hercules Street and Kingsford-Smith Drive), docked cruise ship noise and nearby retail/commercial activity (e.g. Portside Wharf).

Review of the Australian Noise Exposure Forecast (ANEF) for Brisbane Airport indicate the proposed site is outside the ANEF 20 noise contour (see Figure 5). Hence, aircraft noise impacts has not been considered further in the assessment.





4.3.1.2 Analysis of Background Noise Monitoring

In order to assess the potential for noise impacts on proposed residential units at the development, existing background noise levels have been compared with the acoustic quality objectives outlined in the Environmental Protection (Noise) Policy 2008. Table 4.4 presents a comparison of noise levels.

TABLE 4.4: COMPARISON OF EXISTING NOISE LEVELS TO ACOUSTIC OBJECTIVES FOR DWELLINGS

Period / Noise Parameter ¹	Monitoring Position 1 Noise Levels dB(A)	Monitoring Position 2 Noise Levels dB(A)	EPP Objective dB(A)
<u>Day</u>			
L _{Aeq,1-hour}	61	57	50 external 35 internal
L _{A10,1-hour}	63	58	55 external 40 internal
L _{A1,1-hour}	72	67	65 external 45 internal
<u>Evening</u>			
L _{Aeq,1-hour}	57	57	50 external 35 internal
L _{A10,1-hour}	59	54	55 external 40 internal
L _{A1,1-hour}	67	67	65 external 45 internal
<u>Night</u>			
L _{Aeq,1-hour}	59	53	30 internal
L _{A10,1-hour}	52	58	35 internal
L _{A1,1-hour}	71	61	40 internal

¹ Median of the maximum 1-hour values for each monitoring period

The measured noise levels for the L_{Aeq,1-hour}, L_{A10,1-hour} and L_{A1,1-hour} noise parameters exceed both internal and external EPP acoustic quality objectives. For Monitoring Position 1 and 2, an exceedence of 29 dB and 23 dB was measured for the L_{Aeq,1-hour} parameter, respectively.

Based on these estimated noise reductions, construction materials should have a minimum Sound Transmission Class (STC) of 35 (Monitoring Position 1) and 30 (Monitoring Position 2). STC is a commonly referenced descriptor of the effectiveness of a material to reduce the noise energy transmitted through that material. Where traffic noise is the dominant source (as is the case for the proposed development), the noise reduction must be adjusted by a plus 6 dB correction to give the STC.

Monitoring Position 2 is representative of residential units located at the rear of the site, facing towards the Brisbane River (away from road traffic noise). Monitoring Position 1 is representative of residential units located towards the front of the site closest to road traffic noise.



Air conditioning units and/or mechanical ventilation should also be provided to residential units to allow windows to remain closed, while achieving the required internal noise levels. Table 4.5 presents potential construction materials for achieving the estimated STCs.

TABLE 4.5: TYPICAL STC RANGES FOR CONSTRUCTION TYPES

Component	STC Range	Examples of Construction
External Walls	40	Timber stud-framed walls at 600 mm, clad externally with 7.5 mm CSR Fibre Cement Texture Base Sheet and 13 mm Gyprock Fyrcheck MR plasterboard, and internally with 10 mm Gyprock Plasterboard CD (CSR) ¹
Sliding Door	35	12.5 mm Vlam ^a single glazing.
	30	6.38 mm laminated, single glazing, awning style.
Windows	35	12.38 mm laminated, single glazing, awning style.
	30	6.38 mm laminated, single glazing, awning style.

^a Vlam consists of two or more sheets of glass bonded together by heat and pressure with an interlayer of either PVB, EVA or a specialist high strength ionoplast interlayer.

Before any construction material is chosen for the affected receptors, STC information should be sought from the suppliers to ensure that the minimum STCs are achievable. In order to achieve design STC ratings it is essential that the acoustically treated areas be constructed in a manner conducive to maximising sound attenuation. For example there must be no air gaps around windows or at the eaves, which could act as noise pathways.

Recommendations for minimising potential noise impacts and achieving the EPP internal noise goals include the following:

- for residential units in a direct line of sight with Hercules Street (as identified in figure 6), construction materials should achieve a minimum STC of 35;
- for residential units located towards the rear of the sight, facing Brisbane River (as identified in figure 6), construction materials should achieve a minimum STC of 30;
- mechanical ventilation should be provided to residential units to allow windows to remain closed;
- construction methods adopted should be conducive to maximising sound attenuation. For example there must be no air gaps around windows or at the eaves, which could act as noise pathways.

A more detailed acoustic assessment of the traffic noise and construction requirements of each facade may identify less stringent facade construction requirements to some units.



Figure 6: Facade Treatment Recommendations

4.3.2 Noise Emissions

4.3.2.1 Overview

Potential noise sources associated with the proposed development include:



- fixed plant for residential units at upper levels and retail areas at ground level;
- car movement;
- service vehicles (ie. rubbish trucks, delivery vehicles); and
- retail areas (e.g. potential restaurant noise).

The proposed development is not expected to introduce new noise source types to the surrounding area, given the presence of surrounding road traffic and commercial developments.

4.3.2.2 Fixed Plant Noise

Fixed plant is considered to be the main continuous noise source associated with the proposed development. Proposed designs and locations for air-conditioning units and other fixed plant have not been confirmed at the current stage of the design phase.

The air conditioning (A/C) units adopted for the units would be similar to those of typical residential developments (whether split system or ducted).

The proposed retail buildings (located on the lower levels) are expected to require larger air-conditioning units and hence, source noise levels are expected to be more significant than typical residential A/C units. Noise impacts from air-conditioning units do not typically present a major issue for proposed developments. Minimising noise is commonly achieved through the selection of appropriate locations, unit types and/or the provision of shielding (e.g. acoustic barriers).

The nearest sensitive landuses to the proposed buildings are as follows:

- Residential building 50m to the south;
- Residential building 60 m to the south-west;
- Residential building 80 m to the east;
- Proposed adjacent residential towers (within 13m).

The lowest monitored background level of 37.1 dB(A) $\text{min}L_{A90,1\text{-hour}}$ has been utilised in consideration of the EPA criteria, defining a limit of 40.1 dB(A) to be achieved for the design of air-conditioning plant decks within the development.

Table 4.6 presents maximum allowable sound power levels for the air conditioning and fixed plant at the site based on the above separation distances and noise criteria specified by the EPP, and EPA. A 10 dB facade attenuation has also been assumed for off-site receptors.

TABLE 4.6: FIXED PLANT NOISE SPECIFICATIONS

Location of Fixed Plant	Nearest Receptors	Sound Power Level dB(A)
Near Western Boundary	60 m to the South-West	84 ¹
Near Southern Boundary	50 m to the South	82 ¹
Near Eastern Boundary	80 m to the East	86 ¹



Location of Fixed Plant	Nearest Receptors	Sound Power Level dB(A)
Building 1 (15 condensers per level)	13 m to the West, On-site	48 ²
Building 2 (13 condensers per level)	16 m to the South, On-site	50 ²
Building 3 (15 condensers per level split across two decks)	8 m to the West (South deck) 20 m to the West (North deck)	49 ² 58 ²

¹ Maximum Allowable Sound Power Level = 30 dB(A) internal criteria + 20 x log(separation distance) + 10 dB facade attenuation + 8

² Maximum Allowable Sound Power Level = 40.1 dB(A) EPA criteria

If the plant noise sources are shielded from the nearest receptors a sound power level 10 dB(A) or more higher may be acceptable depending on the height of the sources relative to the type of structure involved.

3D noise modelling of the proposed plant decks and air conditioning units suitable to service each apartment of the development have been undertaken to estimate the noise levels at sensitive receptors (both within the development, and off-site).

Based on preliminary review of the proposed A/C plant, it is expected that each plant deck requires a reduction of up to 20 dB(A), and is proposed to be achieved through the use of acoustic louvres. Due to plant decks being proposed on each level of the multi-storey buildings, it is advised that the acoustic louvres would be required to extend from floor to ceiling around each plant deck up to floor level 19. Above floor 19 a composite arrangement with shielding adjacent to the plant and absorptive walls/ceiling could be utilised, reducing noise levels radiating down to adjacent receptors.

A detailed assessment of the proposed air conditioning plant and locations is recommended to identify the specific attenuation requirements for each plant deck.

4.3.2.3 Vehicle and Loading Dock Noise

Potential areas for rubbish collection and delivery vehicles are located near the eastern and western boundaries of the proposed site (behind retail tenancies). For rubbish collection, the L_{A10} noise parameter has been referenced which is appropriate for short-term noise impacts. For delivery vehicles, it is appropriate to reference the L_{A90} noise parameter which describes continuous noise sources.

Table 4.7 presents predicted noise levels associated with refrigerated delivery vehicles and rubbish collection.



TABLE 4.7: PREDICTED NOISE LEVELS FOR SERVICE VEHICLES

Noise Source	Rubbish Collection	Refrigerated Truck
Noise Level at 1 metre	L_{A10} 97 dB(A)	L_{Aeq} 79 dB(A)
Nearest Sensitive Receptor	80 m to the East	80 m
Predicted Noise Level	59 dB(A)	41 dB(A)
Day/Evening Criteria	$L_{A10,1-hr}$ 55 external $L_{A10,1-hr}$ 40 internal	$L_{Aeq,1-hr}$ 50 external $L_{Aeq,1-hr}$ 35 internal
Night Criteria	$L_{A10,1-hr}$ 35 internal	$L_{Aeq,1-hr}$ 30 internal

For rubbish collection, exceedences of the EPP noise goals are predicted by up to 24 dB and 18 dB for the internal night-time and day/evening criteria, respectively. An 18 dB to 24 dB reduction is likely to be achieved for standard construction and with windows closed, as is applicable for the nearest residential apartments. Actual $L_{A10,1-hour}$ noise levels are likely to be lower given the short-term nature of rubbish collection noise.

For delivery vehicles, an exceedence of the night-time and day/evening noise criteria is predicted by up to 11 dB and 6 dB, respectively. It is noted that predicted noise levels are equal to or below existing night-time L_{A90} background noise levels measured at Position 2 (41 dB(A) to 45 dB(A)). Hence, potential impacts associated with delivery vehicles are likely to be minimal.

As a best management approach, it is recommended that the operation of service vehicles on-site be limited to between 7 am and 10 pm.

4.3.2.4 Pool Plant Room

The Environmental Protection Act 1994 indicates that for pool pumps/plant, an occupier of the premises must not use, or permit the use of, the equipment on any day must not exceed the background level by more than 5 dB(A) from 7 am – 7 pm, 3 dB(A) from 7 pm – 10 pm, and must not be audible from 10 pm – 7 am.

The lowest monitored background level of 37.1 dB(A) $\min L_{A90,1-hour}$ has been utilised in consideration of the 24 hour criteria, and 45.0 dB(A) $\min L_{A90,1-hour}$ has been utilised in consideration of the 7 am – 7 pm, and 7 pm – 10 pm criteria when assessing the potential for pool pump noise within the development. Inaudibility has been assessed as background minus 10 dB(A).

Based on the currently proposed pool location (between buildings 1 and 2 on level 3) the combined total sound power level (L_w) from all pool pump and filter equipment plant noise sources installed in the proposed plant enclosure must not exceed 82 dB(A) (7 am – 7 pm), or 80 dB(A) (7 pm – 10 pm), or 60 dB(A) where all pool pump and filter equipment is required to run 24 hours.

It should be noted that this sound power level defines the noise emitted to the surrounding environment. Therefore if the design of the enclosure results in the reduction of noise breakout, the allowable source sound power levels of plant within the room will be proportionally increased.

In addition it is noted that the pool plant room shares a wall or ceiling with any residential units. Therefore, it is recommended that the pool plant room is of a concrete slab construction, and care is taken in selection of equipment and mounting such that noise is not transmitted through vibration to the adjoining residential units.



4.3.2.5 Communal Pool and Barbecue area

To reduce noise amenity to both on and off-site sensitive receptors, it is recommended that the use of external areas (pool and barbecue areas) is managed to ensure they are not used during the hours of 10 pm – 7 am. It is recommended that these areas be signed to instruct patrons of these restrictions.

If outdoor activities (patronage/amplified music) were proposed during the hours of 10 pm – 7 am, a detailed acoustic assessment would be required to ensure that compliance with the relative criteria can be achieved, at the nearest sensitive receptors.

4.3.2.6 Retail/Restaurants

Details of the proposed retail tenancies at ground level have not been confirmed (possibly utilised as restaurants/café). For proposed retail tenancies, noise associated with restaurants/café are expected to have the most potential for impacts. The main noise sources included patron noise and amplified music. The potential for impacts are dependent on the following:

- location of any outdoor dining areas in relation to the nearest sensitive receptors;
- the use of amplified entertainment/PA systems; and
- facade design and construction materials of the restaurants.

Where possible, outdoor dining areas should be located towards the centre of the development, utilising proposed site buildings for shielding noise emissions. In addition, if an external amplified system is installed, a liquor license assessment should be completed to determine appropriate speaker source noise levels.

The following recommendations should be adopted to achieve predicted compliance with the adopted noise criteria at the existing sensitive receptors:

- music from the restaurants/café will not exceed 75 dB(C) @ 3m from a speaker, at any time, without a full liquor licence assessment being completed and approved by the Liquor Licensing Division;
- no outdoor retail/dining activities to occur without a full acoustic liquor license assessment; and
- it is recommended that after 10 pm, the commercial tenancies do not operate amplified music, and all doors are closed during the hours of 10 pm – 7 am.

If outdoor activities (patronage/amplified music) were proposed during the hours of 10 pm – 7 am, a detailed acoustic assessment would be required to ensure that compliance with the relative criteria can be achieved, at the nearest sensitive receptors.

To cater for the possibility of amplified entertainment noise at the commercial tenancies, it is recommended that the body corporate or lease manager for the proposed development ensure that prior to commencement of the use of any amplified sound systems or live music from the commercial tenancies a full acoustic liquor licence assessment is completed.



It is recommended that a more detailed assessment of restaurant noise (if applicable) be completed at the detailed design phase of the project.



5 CONCLUSION

5.1 AIR QUALITY ASSESSMENT

An air quality assessment has been undertaken to predict the impact of emissions from the industrial operators surrounding the proposed mixed use development at 19 Hercules Street, Hamilton.

Review of the industrial operators and potential sources of emission in the area were identified based on site inspections and previous assessment in the area. In addition ULDA requested that the two asphalt plants to the east be considered (despite their significant separation distances).

Calpuff dispersion modelling was undertaken for the following sources based on site inspections and recommendations from ULDA.

- Langford Metal Industries: powder coating booth emissions;
- Colonial Restoration Supplies: particulate emissions from baghouse;
- Boral Whinstains: asphalt operations;
- Brisbane City Council Asphalt Plant: asphalt operations.

Review of the predicted modelling results indicate that under worst case emissions for the surrounding operators including ambient background levels for the area, the PM₁₀ is in excess of the criteria. However, the contribution from the remnant industry emissions sources is noted to be marginal, and the exceedance is attributable to the ambient background levels. All other compounds are predicted to comply with the adopted air quality criteria.

A potential for odour impacts to arise during delivery and loading of animals to export boats moored at the northern end of the P&O wharf (occurring approximately once a month for a period of 24 hours) has also been identified. Although the proposed development site is significantly more remote from the live animal export activities than existing residential development at Portside, it is recommended that disclosure to prospective residents within the development cover the potential odour impacts from existing landuses.

5.2 NOISE ASSESSMENT

An assessment of noise immission and emission impacts has been undertaken for the proposed development.

Noise immission sources with a potential to impact the proposed development include surrounding commercial activity and road traffic noise. In order to assess potential noise immission impacts, an analysis of the background noise monitoring data has been completed. Based on the background noise monitoring, the noise levels currently exceed the acoustic quality objectives outlined in the Environmental Protection (Noise) Policy 2008. Recommendations for minimising potential noise impacts and achieving the EPP internal noise goals include the following:

- for residential units in a direct line of sight with Hercules Street (as identified in figure 6), construction materials should achieve a minimum STC of 35;
- for residential units located towards the rear of the site, facing Brisbane River (as identified in figure 6), construction materials should achieve a minimum STC of 30;



- mechanical ventilation should be provided to residential units to allow windows and doors to remain closed;
- construction methods adopted should be conducive to maximising sound attenuation. For example there must be no air gaps around windows or at the eaves, which could act as noise pathways.

A more detailed acoustic assessment of the traffic noise and construction requirements of each facade may identify less stringent facade construction requirements to some units.

The proposed development is not expected to introduce new noise source types to the surrounding area, given the presence of surrounding road traffic and existing commercial developments. Recommendations for minimising noise emission impacts include the following:

- limit operation of service vehicles on-site to between 7 am and 10 pm (e.g. delivery trucks and rubbish collection trucks);
- pool pumps/plant should be installed to achieve a sound power level of 80 dB(A) during the hours of 7 am – 10 pm, or 60 dB(A) during the hours of 10 pm – 7 am (although it is recommended that plant is not operated during this period);
- communal pool and barbecue areas are not to be used during the hours of 10 pm – 7 am;
- acoustic louvres should be installed around the air conditioning plant decks, the louvres should be chosen to achieve a reduction of at least 20 dB(A);
- the combined sound power level of fixed plant for the retail tenancies should not exceed noise levels specified in Table 4.6 in Section 4.3.2. It is noted that fixed plant locations have not been finalised and the maximum noise levels are based on worst-case locations. Higher noise level specifications may be appropriate for different locations or if additional shielding is provided;
- if restaurants or cafes are proposed at ground floor, it is recommended that a more detailed assessment of noise impacts be completed at the detailed design phase of the project.

If outdoor activities (patronage/amplified music) were proposed during the hours of 10 pm – 7 am, a detailed acoustic assessment would be required to ensure that compliance with the relative criteria can be achieved, at the nearest sensitive receptors.

To reduce noise amenity to both on and off-site sensitive receptors, it is recommended that the use of external areas (pool and barbecue areas) is managed to ensure they are not used during the hours of 10 pm – 7 am. It is recommended that these areas be signed to instruct patrons of these restrictions.

A detailed assessment of the proposed air conditioning plant and locations is recommended to identify the specific attenuation requirements for each plant deck.

To cater for the possibility of amplified entertainment noise at the retail tenancies, it is recommended that the body corporate or lease manager for the proposed development ensure that prior to commencement of the use of any amplified sound systems or live music from the commercial tenancies a full acoustic liquor licence assessment is completed.



APPENDIX A

GLOSSARY



APPENDIX A1: GLOSSARY OF ACOUSTIC TERMINOLOGY

A-Weighting	A response provided by an electronic circuit which modifies sound in such a way that the resulting level is similar to that perceived by the human ear.
dB (decibel)	This is the scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and the reference pressure (0.00002N/m ²).
dB(A)	This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Facade Noise Level	Refers to a sound pressure level determined at a point close to an acoustically reflective surface (in addition to the ground). Typically a distance of 1 metre is used.
Free Field	Refers to a sound pressure level determined at a point away from reflective surfaces other than the ground with no significant contribution due to sound from other reflective surfaces; generally as measured outside and away from buildings.
Hertz (Hz)	A measure of the frequency of sound. It measures the number of pressure peaks per second passing a point when a pure tone is present.
L_{Aeq} Equivalent Continuous Sound Level	This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over the given period. For a steady sound with small fluctuations, its value is close to the average sound pressure level.
L_{A90,T}	This is the dB(A) level exceeded 90% of the time, T.
L_{A10,T}	This is the dB(A) level exceeded 10% of the time, T.
L_{A50,T}	This is the dB(A) level exceeded 50% of the time, T.
L_{WA}	The A-weighted sound power level in dB.
STC (Sound Transmission Class)	A rating of how well a construction material or building partition attenuates airborne sound.



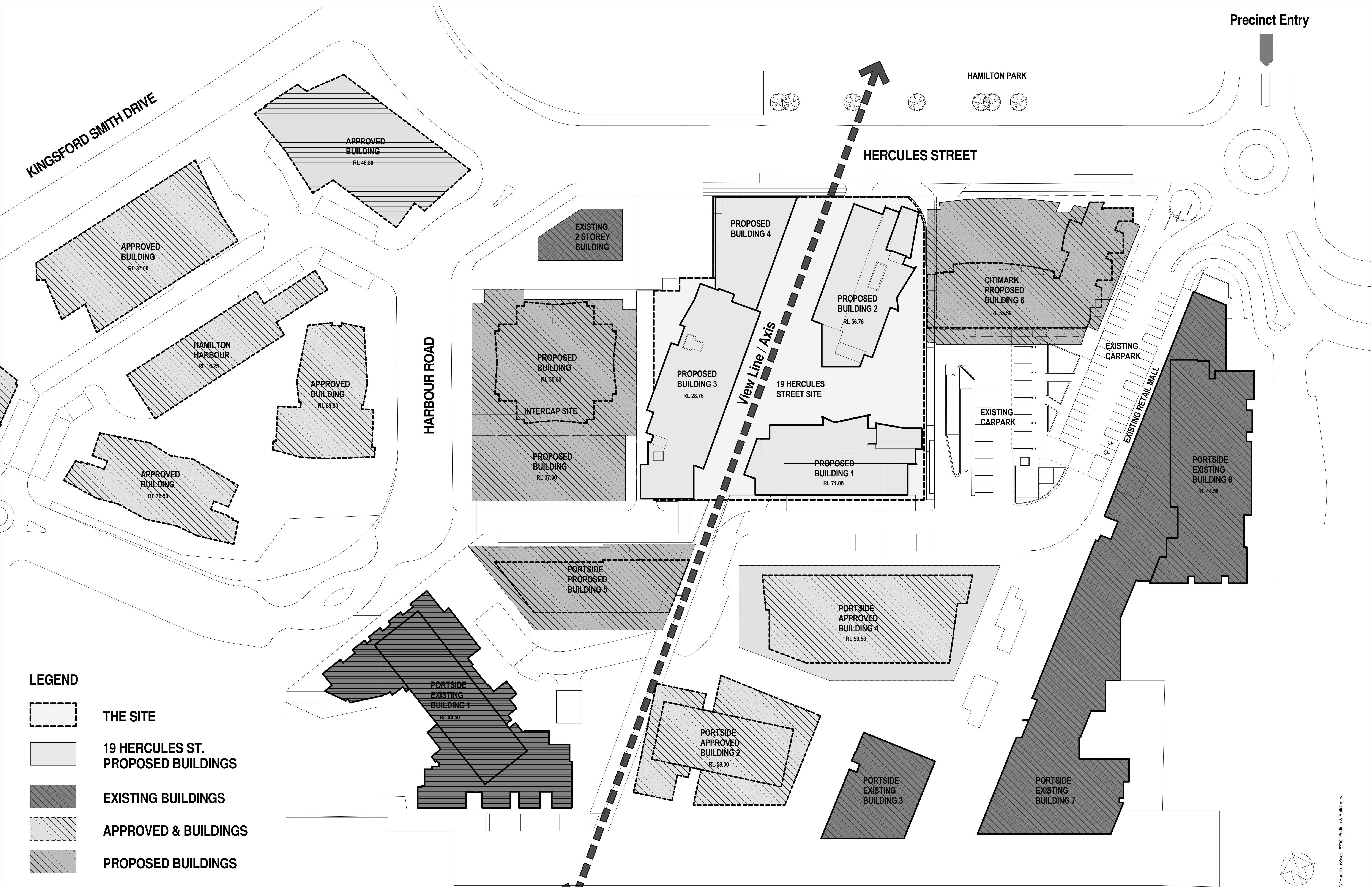
APPENDIX A2: GLOSSARY OF AIR QUALITY TERMINOLOGY

Term	Definition
Conversion of ppm to mg/m^3	Where R is the ideal gas constant; T, the temperature in kelvin ($273.16 + T^{\circ}\text{C}$); and P, the pressure in mm Hg, the conversion is as follows: $\mu\text{g m}^{-3} = (P/RT) \times \text{Molecular weight} \times (\text{concentration in ppm})$ $= \frac{P \times \text{Molecular weight} \times (\text{concentration in ppm})}{62.4 \times (273.2 + T^{\circ}\text{C})}$ For the purposes of the air quality assessment all conversions were made at 25°C.
g/s	grams per second
mg/m^3	milligrams (10^{-3}) per cubic metre. Conversions from mg/m^3 to parts per volume concentrations (ie, ppm) are calculated at 25 degrees Celsius as required by the SEPP(AQM).
$\mu\text{g/m}^3$	micrograms (10^{-6}) per cubic metre. Conversions from $\mu\text{g/m}^3$ to parts per volume concentrations (ie, ppb) are calculated at 25 degrees Celsius.
ppb	parts per billion.
ppm	parts per million.
VOC	Volatile Organic Compounds. These compounds can be both toxic and odorous.
PM_{10} , $\text{PM}_{2.5}$, PM_1	Fine particulate matter with an equivalent aerodynamic diameter of less than 10, 2.5 or 1 micrometres respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments.
50th percentile	The value exceeded for 50 % of the time.
NO_x	Oxides of nitrogen – a suite of gaseous contaminants that are emitted from road vehicles and other sources. Some of the compounds can react in the atmosphere and, in the presence of other contaminants, convert to different compounds (eg, NO to NO_2).
NO_2	Nitrogen dioxide – one of the group of NO_x compounds that can form through chemical interactions in the atmosphere following emission from the source.



APPENDIX B

PROPOSED PLANS



LEGEND

- THE SITE
- 19 HERCULES ST. PROPOSED BUILDINGS
- EXISTING BUILDINGS
- APPROVED & BUILDINGS
- PROPOSED BUILDINGS

date	rev	amendment
18.10.10	B	UPDATED ISSUE FOR DEVELOPMENT REVIEW
22.10.10	C	

project: 19 Hercules Street Brisbane

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mirvac

title: LOCATION & SITE ANALYSIS PLAN

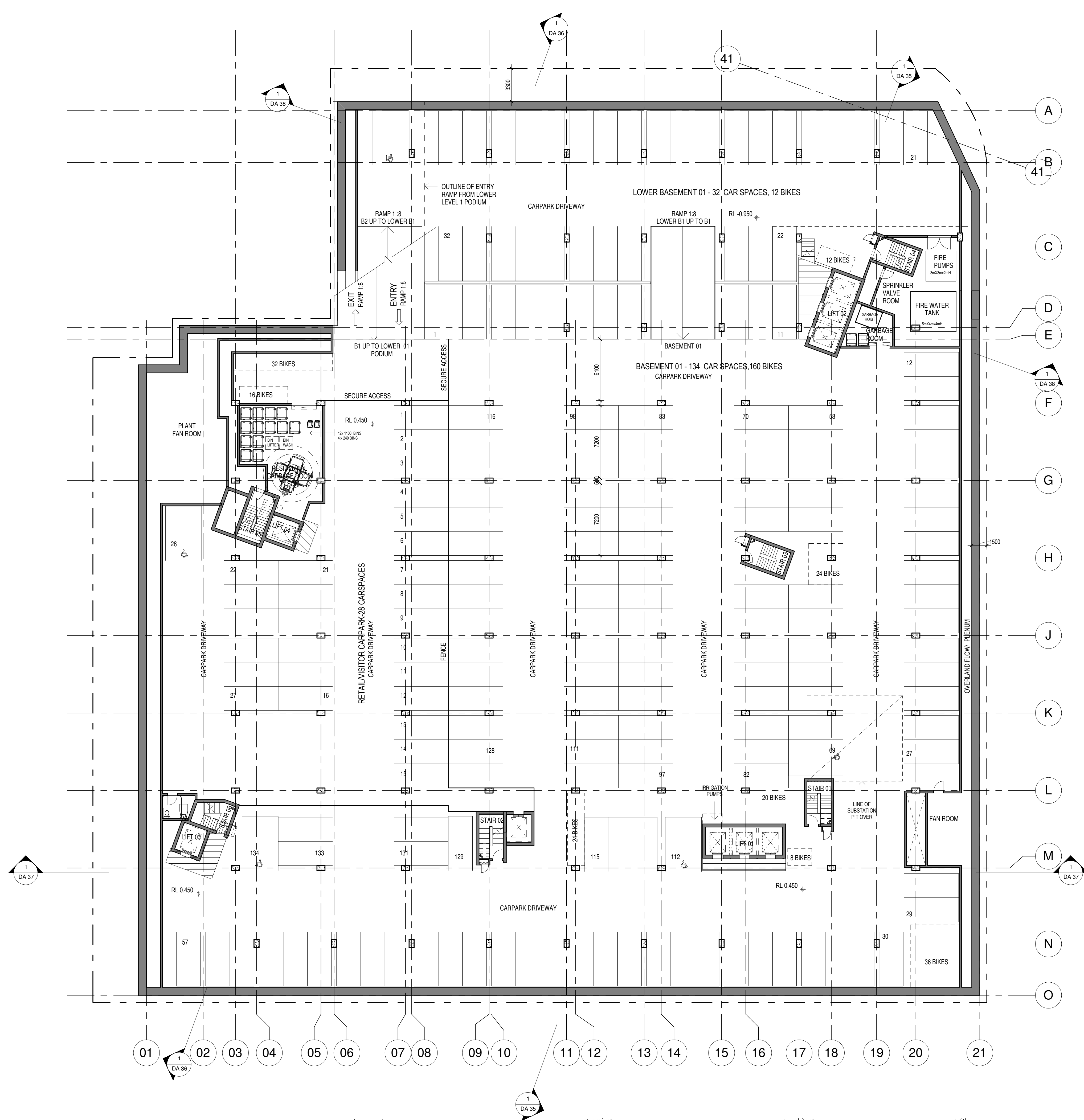
drawn: Author
approved: Approver

job no: 8700

date: Issue Date

scale @ A1: 1 : 500

lot no: drawing no: DA 01 rev: C



NOTES: DA

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SP colourback glass spandrell panel
L aluminium louvres
GL glass louvres
RS roller shutter

date	rev	amendment
18.10.10	B	UPDATED ISSUE
22.10.10	C	FOR DEVELOPMENT REVIEW
29.10.10	D	FINAL CONSULTANTS ISSUE
02.11.10	E	ISSUE FOR INFORMATION
03.11.10	F	CARPARK LAYOUT UPDATED

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title:

DEVELOPEMENT APPLICATION

BASEMENT 01 PLAN

drawn: Author
approved: Approver

job no: 8700

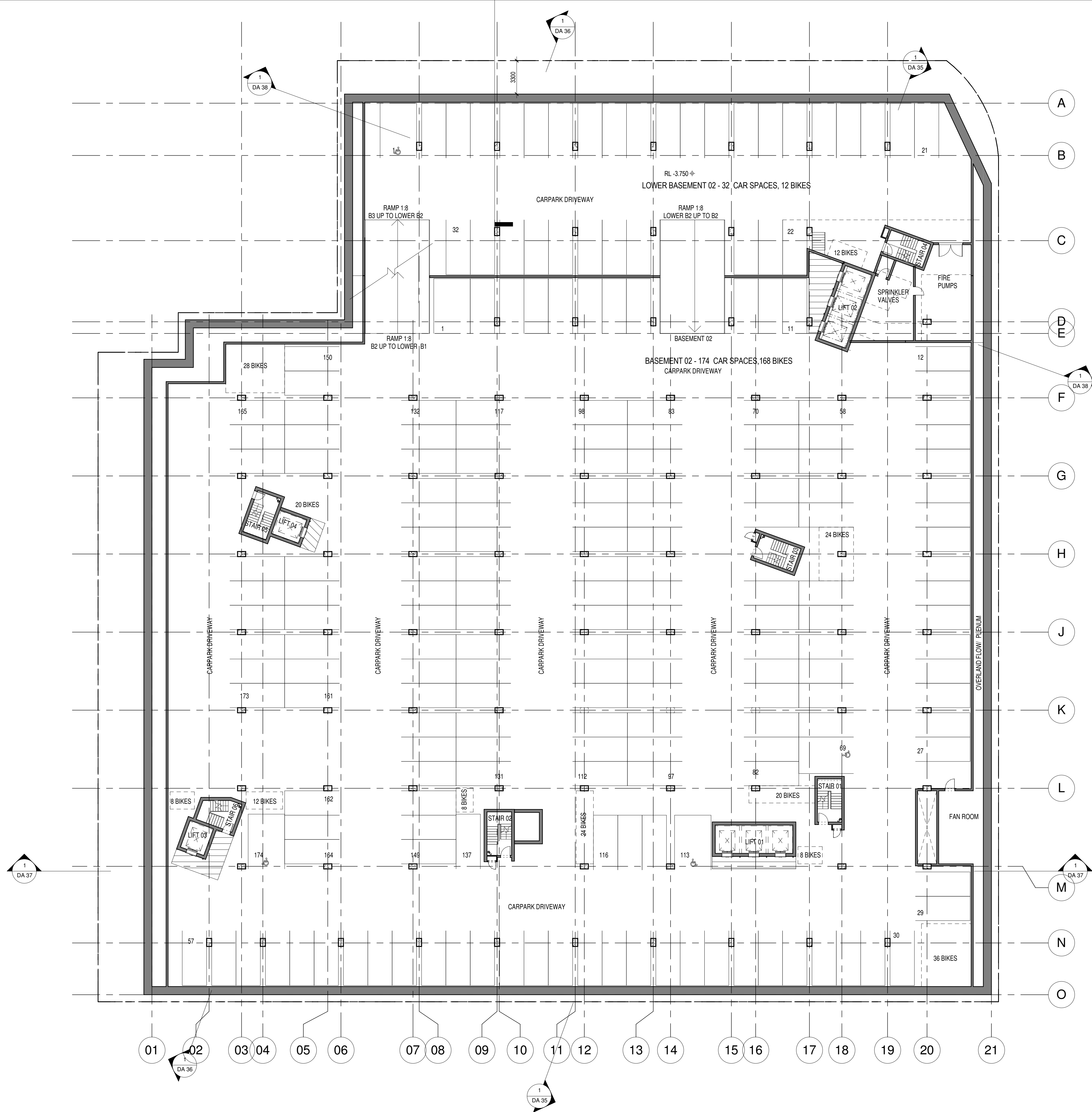
lot no:

date: Issue Date

drawing no: DA 04

scale @ A1: As indicated

rev: F



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22.10.10	C	FOR DEVELOPMENT REVIEW
29.10.10	D	FINAL CONSULTANTS ISSUE
02.11.10	E	ISSUE FOR INFORMATION
03.11.10	F	CARPARK LAYOUT UPDATED

project:

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title:

DEVELOPEMENT APPLICATION
BASEMENT 02 PLAN

drawn: Author
approved: Approver

job no 8700

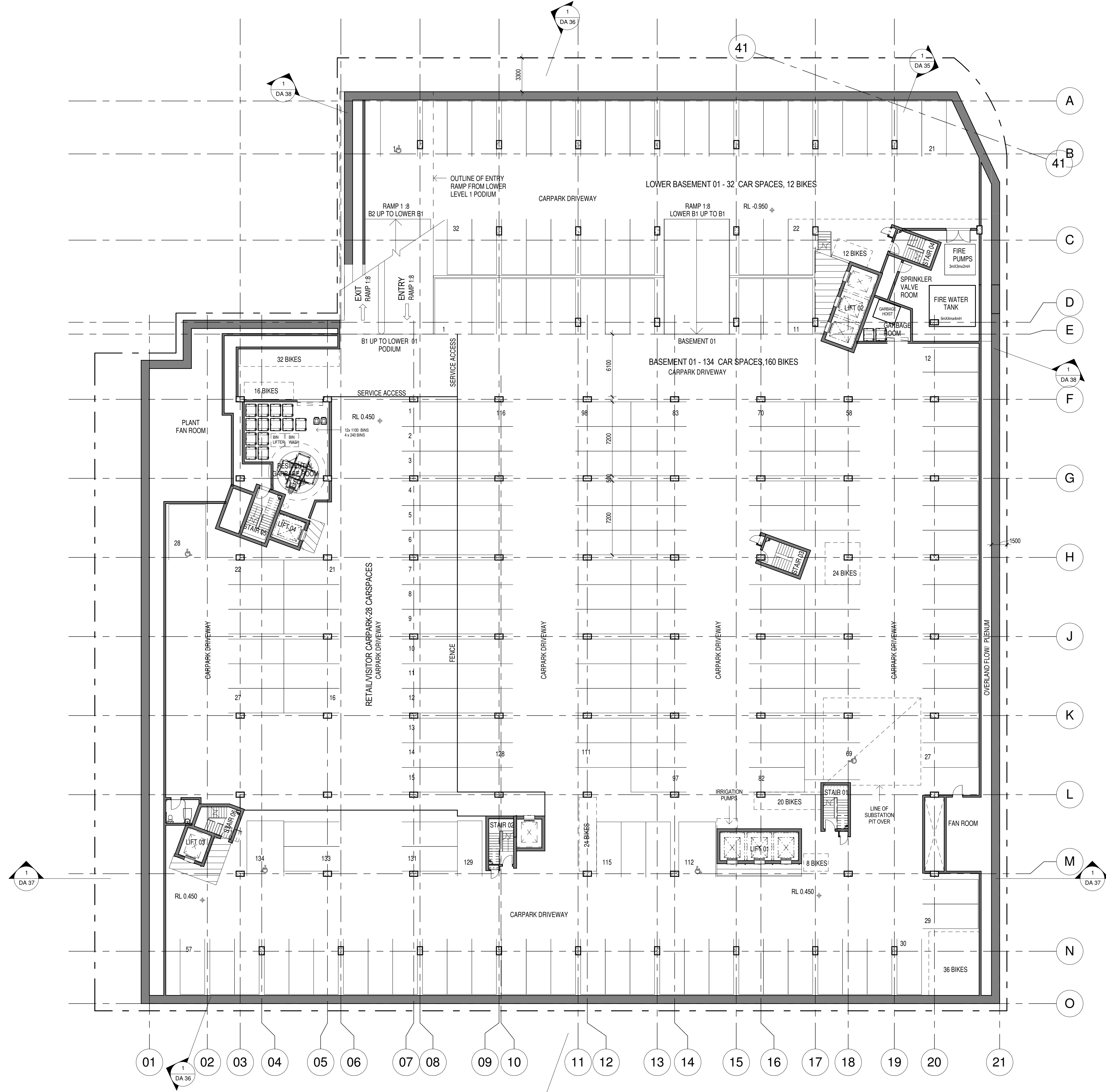
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date: Issue Date
scale @ A1:As indicated

drawing no: DA 03

rev: F



NOTES: DA

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SP	colourback glass spandrell panel
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RS	roller shutter

date	rev	amendment
18.10.10	B	UPDATED ISSUE
22.10.10	C	FOR DEVELOPMENT REVIEW
29.10.10	D	FINAL CONSULTANTS ISSUE
02.11.10	E	ISSUE FOR INFORMATION
03.11.10	F	CARPARK LAYOUT UPDATED

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title:

DEVELOPEMENT APPLICATION

BASEMENT 01 PLAN

drawn: Author
approved: Approver

job no: 8700

lot no:

scale: 1:200

date: Issue Date

scale: @ A1:As indicated

drawing no: DA 04

rev: F



NOTES: DA

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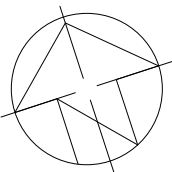
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PRELIMINARY



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title:
DEVELOPEMENT APPLICATION
LEVEL 01 PODIUM PLAN

drawn: Author
approved: Approved

job no: 8700

lot no:

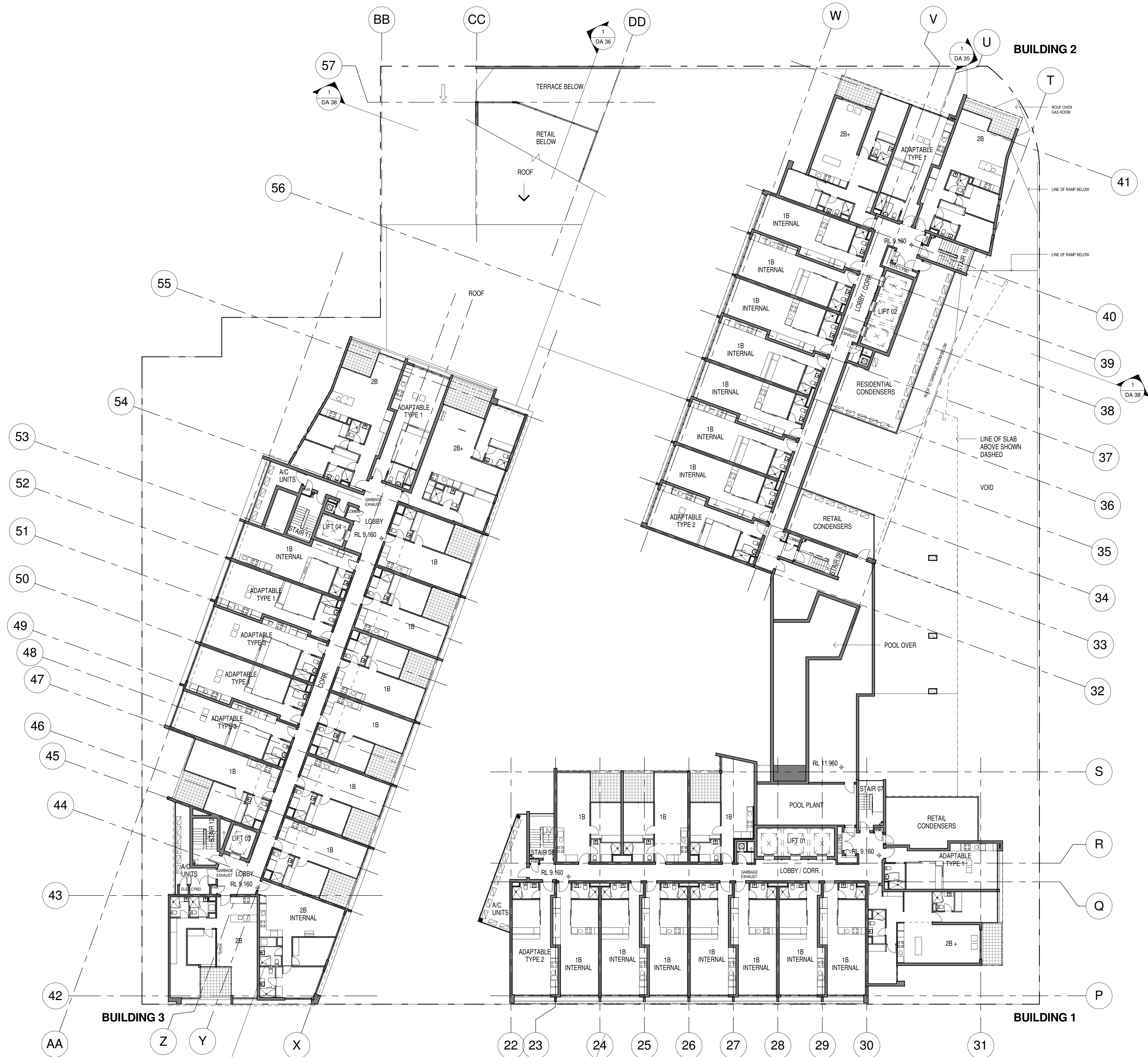
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scale: @ A1:As indicated

drawing no: **DA 05**

rev: **G**

date	rev	amendment
18.10.10	B	UPDATED ISSUE
22.10.10	C	FOR DEVELOPMENT REVIEW
26.10.10	D	PRELIM ULDA PACKAGE
29.10.10	E	FINAL CONSULTANTS ISSUE
02.11.10	F	ISSUE FOR INFORMATION
03.11.10	G	CARPARK LAYOUT UPDATED



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title:

DEVELOPEMENT APPLICATION

LEVEL 02 PLAN

drawn: Author
approved: Approver

job no: 8700

lot no:

Scale 1:200

date: Issue Date

drawing no: DA 06

scale @ A1: As indicated

rev: E



NOTES: DA

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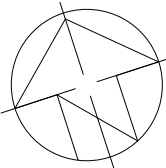
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PRELIMINARY



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title:

LEVEL 03 PLAN

drawn: Author
approved: Approver

job no: 8700

lot no:

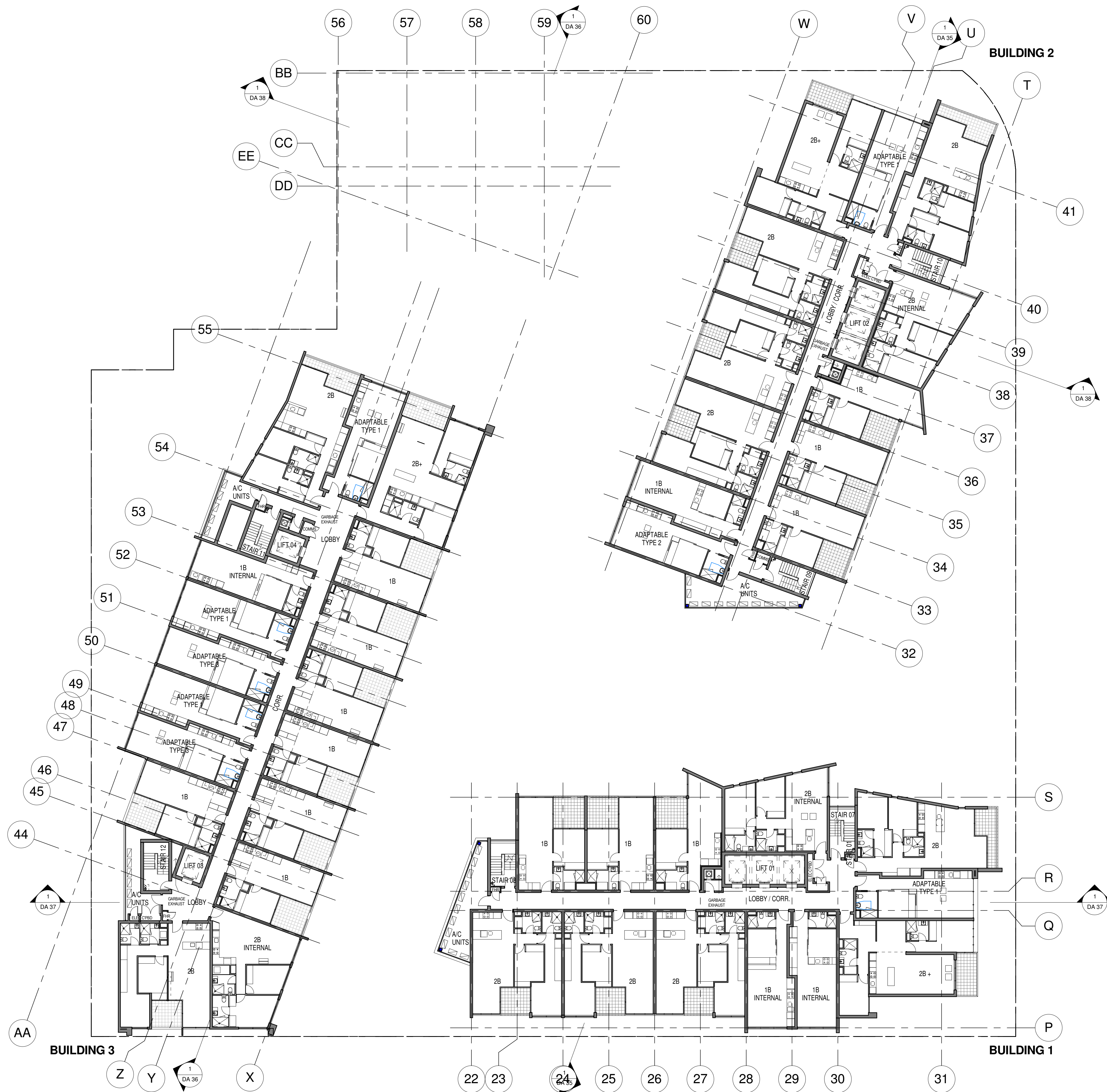
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date: Issue Date

scale: @ A1:As indicated

drawing no: DA 07

rev: E



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title:

LEVEL 06 PLAN

drawn: Author
approved: Approver
job no: 8700
lot no:
date: Issue Date
drawing no: DA 10
scale: @ A1: As indicated
rev: D