AMENDED ITEM

Item No: 3.2

Title: DA 54122/2018 - 34-36 Brisbane Water Drive, Koolewong - Residential Flat Building and Commercial Premises

Department: Environment and Planning

Central Coast Local Planning Panel

9 July 2020 Local Planning Panel Meeting

Reference: F2020/00812 - D14051752
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Summary

An application has been received to demolish the existing dwelling houses and construct a shop and 15 residential apartments.

The application has been examined having regard to the matters for consideration detailed in section 4.15 of the *Environmental Planning and Assessment Act 1979* and other statutory requirements with the issues requiring attention and consideration being addressed in the report.

The application is required to be reported to the Local Planning Panel for determination due to:

- the height variation - the proposed development results a variation to the maximum height of buildings applicable to the site under the provisions of the *Gosford Local Environmental Plan 2014* (GLEP 2014) by more than 10%; and

- The number of submissions - The proposed development has been notified on two occasions. During the first notification period (19 April 2018 until 4 May 2018), 28 submissions were received. Amended plans were provided which were re-notified (8 August 2019 until 5 September 2019 - late submissions were also accepted) 45 submissions were received.

Property Lot and DP	LOT: 16 DP: 14946 LOT: 17 DP: 14946
Property Address	34 – 36 Brisbane Water Drive KOOLEWONG NSW 2256
Site Area	847 m^2 689 m^2
Zoning	B1 Neighbourhood Centre

Proposal	Commercial Premises and 15 units in a Residential Flat Building.
Application Type	Development Application - Local
Application Lodged	05/04/2018
Applicant	DFK Holdings Pty Ltd
Estimated Cost of Works	$ 5,825,958
Advertised and Notified	First Exhibition -19 April 2018 to 4 May 2018 Second Exhibition - 8 August 2019 until 5 September 2019
Submissions	First exhibition-28 submissions. Second exhibition-45 submissions.

Recommendation

1 That the Central Coast Local Planning Panel assume the concurrence of the Secretary of Planning for the use of Clause 4.6 to vary the height and floor space ratio development standards of Clauses 4.3 and 4.4 of Gosford Local Environmental Plan 2014 to permit the proposed development.

2 That the Central Coast Local Planning Panel Council grant consent subject to the conditions detailed in the schedule attached to the report and having regard to the matters for consideration detailed in Section 4.15 of the Environmental Planning and Assessment Act 1979 and other relevant issues.

3 That the Central Coast Local Planning Panel advise those who made written submissions of its decision.

Precis:

Proposed Development	Demolition existing dwelling houses and construct a shop and 15 residential apartments.
Permissibility and Zoning	B1 Neighbourhood Business zone
Relevant Legislation	• *Environmental Planning and Assessment Act 1979 – s. 4.15 (EP&A Act)* • *State Environmental Planning Policy No 55 - Remediation of Land (SEPP 55)* • *State Environmental Planning Policy No 65 - Design Quality of Residential Apartment Development (SEPP 65)* • *Gosford Local Environmental Plan 2014 (GLEP 2014)* • *Draft Central Coast Local Environmental Plan 2018 (Draft CCLEP 2018)*

	• Gosford Development Control Plan 2013 (GDCP 2013) • *Apartment Design Guide. Tools for improving the design of residential apartment development (ADG)* • *Gosford City Council Climate Change Policy*.
Current Use	Dwelling houses
Integrated Development	No

Variations to Policies

Policy	Clause / Description	Variation
Gosford Local Environmental Plan 2014	Clause 4.3(2) (Height of Buildings) Clause 4.4(2) FSR	Maximum permitted building height: 8.5m. Proposed 9.81m. Variation 1.31m or 15.4% (lift overrun) Maximum 0.75:1 Proposed 0.82:1. Variation 0.07:1 or 9.3%
Gosford Development Control Plan 2013	Clause 3.3.3.1 Maximum height 8.5m. Proposed height 6.37m-9.81m Maximum number storeys-2. Proposed 2-3 storeys. External wall height maximum 7.5m. Proposed height 6m-9m. Clause 3.3.3.2 Building setbacks. Deep soil side setback-2m. Proposed 0m-3m. Deep soil setback front and rear-6m. Proposed 0m-6m. Side setbacks- 3.5m minimum, average	 Nil-15.4% Nil-33% Nil-20% Nil-100% Nil-100% Nil-57%

Policy	Clause / Description	Variation
	4m. Proposed 1.5m-5.354m. Front and rear setback-6m. Proposed 1.179m-6.04m. 3rd storey additional 2.5m side setback. Clause 3.3.3.4 Maximum building depth/width-25m Clause 3.3.4.1 Housing Choice Mix maximum 33%	Nil-80% 100% 23% 40%
State Environmental planning Policy No 65	Part 2F ADG 12m separation (6m setback up to 4 storeys	3m (or 50%) variation

Background

Council has received a Development Application for the construction of a mixed-use development consisting of a shop and a residential flat building containing 15 residential apartments. The application was initially received by Council on 5 April 2018 and public notification (first notification period) was undertaken from 19 April 2018 until 4 May 2018. 28 submissions were received during this notification period.

As a result of issues raised in public submissions and by Council's assessment staff to the original proposed development, the applicant submitted amended plans and supporting documentation on 1 August 2019. The amended plans did not result in a loss of units from the originally submitted proposal, but relocated the units removed from the centre of the site to the front and rear of the site. Amended plans re-notified (second notification period) from 8 August 2019 until 5 September 2019 (late submissions were also accepted) 45 submissions were received.

The changes essentially result in a reduction in floor area by 113.16m^2 and a reduction in height of about one storey or 4m. This is a significant improvement to the initially proposed development.

Compared to the previous proposed development, the amended plans altered the following

aspects of the design:

- The basement entry driveway amended to be on southern side of site to accommodate potential road widening of Brisbane Water Drive.

- The commercial entry driveway and commercial car parking spaces were relocated to be on the northern side of the site to accommodate potential road widening of Brisbane Water Drive.

- The upper level of the residential flat building in the centre of the site has been removed, and the building footprint reduced to provide additional setback on both sides and to Brisbane Water Drive. This reduces the number of units in this part of the development from 15 to 6 units.

- The floor space removed from the centre of the site has been relocated to an additional two 2-storey units at the rear of the site, and the addition of 7 new 2-storey maisonette units located on the Brisbane Water Drive frontage of the site above the proposed shop.

- The basement car parking layout has been amended to delete the tandem spaces and provide 25 spaces including 2 accessible spaces.

The applicant submitted additional details and minor amendments on 24 April 2020. These additional details were minor and were not re-notified. As provided by Clause 7.3.2.10 of the *Gosford Development Control Plan 2013* which does not require re-notification of minor amendments, stating:

> *'…if in the opinion of Council or staff with the appropriate delegated authority the amendments are minor, or will result in no additional impacts, the amendments will not require re-advertisement or re-notification.'*

The amended plans and details submitted on 1 August 2019 and 24 April 2020 are the subject of this assessment report.

The following figure 1 illustrates the difference between the initial and current proposed development.

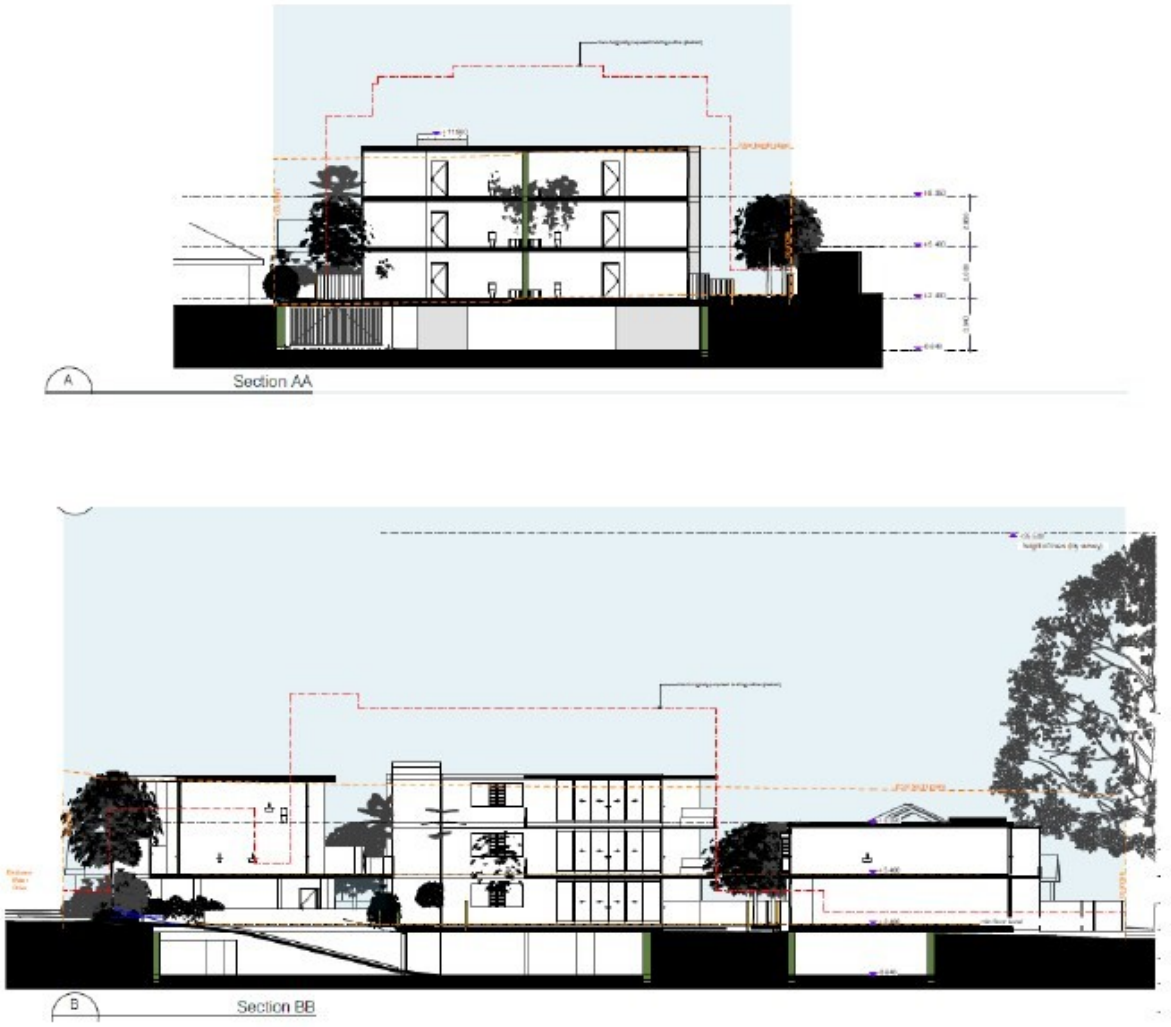

Figure 1 – Comparison between original and revised plans **W+D Architects**

The Site

The subject site is commonly known as No's 34 – 36 Brisbane Water Drive, Koolewong and is legally described as Lot 16 and 17 DP 14946.The site has a frontage of 31.3m to Brisbane Water Drive, and the rear of No.34 has a frontage of 13m to Couche Park, and Brisbane Water beyond. The combined site area is approximately 1,536m^2.

The site falls gently from the front north-west corner to the rear south-east corner, with a slope of approximately 1.9%

There is one small tree on the boundary between No's 34 and 36, and this is proposed to be removed as part of the development. There are no other trees nor vegetation of significance. The site has views of Brisbane Water and areas beyond to the north-east and south-east, and direct views to the east are screened by existing trees in Couche Park at the rear.

The site contains existing dwelling houses on both properties, with a two-storey brick dwelling house on No. 36, with a rear garage and swimming pool, and a single storey brick dwelling house on No.34 located towards the rear of the property and Couche Park.

The subject site has also been identified as being partially flood prone in the 1% Annual Exceedance Probability (AEP) flood event.

The subject land, and those properties to the immediate north and south are zoned *B1 Neighbourhood Centre*, and aim to provide for neighbourhood business purposes with the following existing adjoining uses:

- The adjoining land to the north (No. 38 Brisbane Water Drive) contains a coffee roasting and café business, with a dwelling at the rear.
- The adjoining land to the south (No. 32 Brisbane Water Drive) contains a vacant commercial business and dwelling to the rear.
- Located to the rear of No. 32 Brisbane Water Drive is a separate lot with a two-storey dwelling house, known as No. 32A Brisbane Water Drive. This lot has a battle axe vehicular access and adjoining that is a pedestrian path that connects Brisbane Water Drive to Couche Park.
- Land adjoining the site to the immediate east is Couche Park, which is a public open space reserve adjoining Brisbane Water, and contains a number of mature trees (up to approximately 25m in height), a children's playground, amenities block and jetty.
- To the immediate west of the site, on the opposite side of Brisbane Water Drive, is Koolewong Railway Station, the Sydney to Newcastle rail line and associated facilities (including a commuter car park with access off Brisbane Water Drive).

Figure 2-Locality Plan

Figure 3 – Locality Plan

Figure 4 – Zoning Map

The Proposed Development

A development application has been lodged for a 'Mixed Use Development' which consists of a building of 2 to 3 storeys in height containing a shop at ground level and 15 residential units. The proposed development includes:

- Proposed shop (approx. 60m^2);
- 15 residential units (7 x1 bedroom units and 8 x3 bedroom units);
- Partially underground carparking with access from Brisbane Water Drive for 25 cars, (including 2 accessible car spaces),
- 2 car parking spaces at ground level with separate access from Brisbane Water Drive (for the proposed shop);
- Ancillary/supporting elements (communal garden/open space, bin storage, landscaping and the like).

The proposed commercial component (shop) is located facing Brisbane Water Drive, located centrally on the street frontage, and has a gross floor area of 60m^2. The building has a 3m setback to Brisbane Water Drive, a setback of 12m to the northern side boundary, and 9m to the southern side boundary.

The building has a double height ceiling, and the building height is between 6.4m and 6.9m. Two car parking spaces are provided behind the commercial premises, with access via a driveway from Brisbane Water Drive.

Figure 5: Photomontage of proposal looking south along Brisbane Water Drive

Assessment

This application has been assessed using the heads of consideration specified under section 4.15 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), and relevant Council policies. The assessment has identified the following key issues, which are elaborated upon for the Panel's information.

s. 4.15 (1)(a)(i) of the EP&A Act: Provisions of any environmental planning instruments/Plans/Policies

State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004

The application is supported by a BASIX certificate which confirms the proposal will meet the NSW government's requirements for sustainability, if built in accordance with the commitments in the certificate.

The proposal is considered to be consistent with the requirements of State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004.

State Environmental Planning Policy (Coastal Management) 2018

The provisions of State Environmental Planning Policy (Coastal Management) 2018 require Council consider the aims and objectives of the SEPP when determining an application within the Coastal Management Areas. The Coastal Management Areas are areas defined on maps issued by the NSW Department of Planning and Environment and the subject property falls within the mapped coastal management areas.

The provisions of *State Environmental Planning Policy (Coastal Management) 2018* requires Council consider the aims and objectives of the SEPP when determining an application within the Coastal Management Area. The Coastal Management Area is an area defined on maps issued by the NSW Department of Planning Industry and Environment and the subject property falls within this zone (see figure 6).

Figure 6 – Coastal Management Area

Division 3 'Coastal environment area' of *State Environmental Planning Policy (Coastal Management) 2018* states:

> *'13 Development on land within the coastal environment area*
>
> *(1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following:*
>
> *(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,*
> *(b) coastal environmental values and natural coastal processes,*
> *(c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,*
> *(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,*
> *(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,*
> *(f) Aboriginal cultural heritage, practices and places,*
> *(g) the use of the surf zone.*

(2) *Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:*

(a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or
(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

(3) *This clause does not apply to land within the Foreshores and Waterways Area within the meaning of Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005.'.*

Assessment: The proposed development does not cause an adverse impact on the matters required to be considered under Clause 13 (1) (a) – (g) or Clause 13 (2) (a) – (c) of *SEPP (Coastal Management) 2018*, as follows:

- The proposed development has no adverse impact on the integrity or resilience of the biophysical, hydrological or ecological environment;
- The proposed development has no adverse impact upon coastal environmental values or natural coastal processes;
- The proposed development has no adverse impact on the water quality of the marine estate;
- The proposed development has no adverse impact on marine vegetation; native vegetation/fauna and their habitats; undeveloped headlands; or rock platforms;
- The proposed development has no adverse impact on the public amenity of any existing public open space or public access to the coastal foreshore;
- The proposed development has no adverse impact on any known Aboriginal cultural heritage, practices or places;
- The proposed development is far removed from the "surf zone" and does not adversely impact its use by the public; and
- Drainage, nutrient and erosion control measures will be installed to protect the adjoining reserve and water way.

Division 4 'Coastal use area' of *State Environmental Planning Policy (Coastal Management) 2018* states:

'14 Development on land within the coastal use area

(1) Development consent must not be granted to development on land that is within the coastal use area unless the consent authority—

(a) has considered whether the proposed development is likely to cause an adverse impact on the following—

(i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,
(ii) overshadowing, wind funnelling and the loss of views from public places to foreshores,
(iii) the visual amenity and scenic qualities of the coast, including coastal headlands,
(iv) Aboriginal cultural heritage, practices and places,
(v) cultural and built environment heritage, and

(b) is satisfied that—
(i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or
(ii) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
(iii) if that impact cannot be minimised—the development will be managed to mitigate that impact, and

(c) has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development.

(2) This clause does not apply to land within the Foreshores and Waterways Area within the meaning of Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005.'

Assessment: The proposed development does not cause adverse impact on the matters required to be considered under Clause 14 (1) (a) – (b) or clause 2 of *SEPP (Coastal Management) 2018*, as follows:

- The proposed development will not cause an adverse impact to access along the foreshore and public reserve;
- The proposed development will not cause overshadowing, wind funneling or loss of view from a public place;
- The proposal has been designed and located to minimize visual amenity and scenic qualities to the most maximum extent possible; and
- The proposal will not cause an adverse impact to and known Aboriginal cultural heritage or cultural and built environment heritage

The following provisions of Division 5 of SEPP (Coastal Management) 2018 apply to the consent authority's consideration of a development application on the subject land:

'15 Development in coastal zone generally—development not to increase risk of coastal hazards

Development consent must not be granted to development on land within the coastal zone unless the consent authority is satisfied that the proposed development is not likely to cause increased risk of coastal hazards on that land or other land.'

And:

'16 Development in coastal zone generally—coastal management programs to be considered

Development consent must not be granted to development on land within the coastal zone unless the consent authority has taken into consideration the relevant provisions of any certified coastal management program that applies to the land.'

Assessment: Due to its location which is not in close proximity to the coastal foreshore, the subject land is not subject to increased risk of coastal hazards and is not subject to any certified coastal management program. The proposed development will not therefore cause increased risk of coastal erosion.

The relevant matters have been considered in the assessment of this application. The application is considered consistent with the stated aims and objectives.

State Environmental Planning Policy No 65 - Design Quality of Residential Apartment Development.

The development application has been lodged for a 'mixed use development' consisting of a separate commercial building and residential flat building. The application due to the number of floors of the residential component must be assessed against SEPP 65 as the proposed development is 3 storeys and more than 4 residential units.

The Residential Flat Building component of Gosford DCP 2013 also applies (as it applies to buildings up to 4 storeys).

SEPP 65 applies to the residential component and is the planning instrument that will be used along with the Gosford LEP 2014 height and floor space provisions to assess the residential component of the application.

Council's Architect has assessed the application against SEPP 65 and provides the following comments:

The proposal is subject to SEPP 65 and has been assessed against the nine Design Quality Principles in the SEPP and the Apartment Design Guide (ADG).

Context

The site is located on Brisbane Waters Drive and is zoned B1 Neighbourhood Centre. A medium density commercial and residential development is appropriate in this main road location opposite the station. Adjoining sites to the north and south are commercial uses and are likely to redeveloped in the future.

The amended application includes a small commercial space at the front of the site (60m2 or 4.9% of the total floor area) but there is concern that while the commercial space occupies 26% of the frontage, driveways and garbage collection area occupy 38% of the street frontage.

Built Form and Scale

The ADG requires 6 metre side setbacks to habitable rooms including balconies for buildings up to 12 metres or 4 storeys in height and 12 metres separation between habitable rooms and balconies within a development and lists the following as objectives of building separation and setbacks.

- *ensure that new development is scaled to support the desired future character with appropriate massing and spaces between buildings*
- *assist in providing residential amenity including visual and acoustic privacy, natural ventilation, sunlight and daylight access and outlook*
- *provide suitable areas for communal open spaces, deep soil zones and landscaping.*

The application proposes 3 metre setbacks or 50% non-compliance on the north and south boundaries

It is expected that the adjoining sites to the north and south will be redeveloped in a similar manner and non-complying building separation will reduce the development potential for both these. Detrimental impacts on adjoining sites resulting from non-compliance are not supported.

The problems resulting from non-complying setbacks are exacerbated by the location of the underground carpark on the southern boundary which restricts the area of deep soil and significant landscaping necessary to provide screening to and from adjoining sites.

The application also proposes 4 metres separation or 66% non-compliance between the balconies of G.02 and 1.02 and the units directly to the east.

The amended application exceeds the 8.5 metre height control by approximately

800mm on the east. This is considered minor and does not have any detrimental impacts on adjoining sites.

Density

The density is non-compliant by 9.3%. When combined with non-complying setbacks and building separation it indicates the application is an overdevelopment of the site.

Sustainability

NatHERS certificate supplied indicating compliance with mandatory energy efficiency standards. The use of solar hot water and photovoltaic cells or other energy saving options should also be considered.

Landscape

Because of the location of the underground carpark there is inadequate deep soil and landscaping to screen the non-complying side setbacks to and from adjoining sites to the south. The location of the sewer line on the eastern boundary further reduces the opportunity for significant planting.

It is doubtful that the proposed planting will survive under the 4m overhang of the front units. In other respects the landscaping is acceptable.

Amenity

Non-complying setbacks and building separation result in privacy impacts between units and with future developments on adjoining sites.

Apart from this amenity within the development is generally acceptable with all units achieving acceptable solar access, being well planned and with living areas opening directly to terraces or outdoor areas.

Safety

Balconies and windows overlook the street and common areas to provide surveillance.

Housing Diversity and Social Interaction

The application provides 1 and 3 bedroom units to cater for a variety of occupants.

Aesthetics
The aesthetics are generally acceptable. The building is articulated and uses variations in material to disguise bulk and scale.

Recommendations
The amended application has significantly reduced the extent of non-compliance but there continues to be non-compliance with setbacks, internal building separation, FSR and deep soil zones.

The application is not supported but it is considered that if internal separation non-compliance was significantly reduced the approval could be considered.'

Planning Comment: Despite the objection raised by Councils architect, the proposed development is worth of support for the following reasons:

The side setbacks on the northern side to the middle units is 3.245m to the edge of balconies, and 5.35m/5.493m to the walls of the building above ground level. Balconies are provided on both the northern and eastern sides of the middle units in a "L" shape.

Similarly, on the southern side boundary, the middle units are setback 3m to the edge of the balconies, and 5.351m to the walls of the middle units.

The application proposes to provide privacy screens along the length of the side balconies to preserve amenity and privacy of the adjoining sites. Such side balconies may be deleted as they are not essential for the units. The adjoining sites are also zoned B1 and may be developed in a similar manner in the future, albeit they would require consolidation of two or more lots to achieve a similar development.

Gosford Local Environmental Plan 2014 - Permissibility

The subject sites (Lots 16 and 17 DP 14946) are zoned B1 Neighbourhood Centre, under the provisions of the *Gosford Local Environmental Plan 2014* (Gosford LEP 2014).

The proposed development is best defined as a *mixed-use development* comprising:

- neighbourhood shop; and
- residential flat building.

The Gosford LEP 2014 defines these uses as follows:

*'**neighbourhood shop** means premises used for the purposes of selling general merchandise such as foodstuffs, personal care products, newspapers and the like to provide for the day-to-day needs of people who live or work in the local area, and may include ancillary services such as a post office, bank or dry cleaning, but does not include neighbourhood supermarkets or restricted premises'.*

And:

> ***'residential flat building*** *means a building containing 3 or more dwellings, but does not include an attached dwelling or multi dwelling housing.'*

Both a 'neighbourhood shop' and 'residential flat building' permitted with development consent within the current B1 Neighbourhood Centre zone.

Gosford Local Environmental Plan 2014 – Clause 5.4 (7)

It is noted that Clause 5.4 (7) provides that

> *'If development for the purposes of a neighbourhood shop is permitted under this Plan, the retail floor area must not exceed 100 square metres.'*

The proposed development includes a neighbourhood shop with a gross floor area of 60 sq metres, and so complies with this standard.

Gosford Local Environmental Plan 2014 – Zone Objectives

The objectives of the B1 zone are:

- To provide a range of small-scale retail, business and community uses that serve the needs of people who live or work in the surrounding neighbourhood.
- To allow for an increased residential population in neighbourhood centres where land is not required to serve local needs.
- To ensure that development is compatible with the desired future character of the zone. To promote ecologically, socially and economically sustainable development.
- To ensure that local nodes and neighbourhood centres are recognised as small-scale centres that provide a range of services and facilities commensurate with their local population catchments and that development is of a scale that is appropriate to meet local needs.
- To encourage residential development as either stand alone development or as part of mixed use development in local nodes and neighbourhood centres, while retaining opportunities for retail and service activities to serve the population in the immediate locality.

The proposed development complies with the objectives of the B1 zone as it:

- Contains a small shop to serve the local needs of residents and users of the public reserve.
- Increases the residential population in a location with good public access and transport which will support the local shops.

- Is not high rise and in character with desired future character with the higher parts of the development located in the centre of the site to mitigate impacts on adjoining sites and the public reserve.

In this instance, it is considered that the proposed development is consistent with the stated objectives of the zone.

Gosford Local Environmental Plan 2014 – Non Compliances and 4.6 Submission

The proposed development contains non-compliances to development standards contained within the Gosford LEP 2014 (height and floor space ration) as set out below:

Development Standard	Required	Proposed	Compliance with Controls	Variation %	Compliance with Objectives
4.3 - Height of buildings	8.5m	9.81m	No - see comments below	Max 15.4%	Yes- see comments below
4.4 - Floor space ratio	0.75:1	0.82:1	No - see comments below	9.3%	Yes- see comments below

Gosford Local Environmental Plan 2014 – Clause 4.3: Height of buildings

The objectives of clause 4.3 are:

(a) to establish maximum height limits for buildings,
(b) to permit building heights that encourage high quality urban form,
(c) to ensure that buildings and public areas continue to receive satisfactory exposure to sky and sunlight,
(d) to nominate heights that will provide an appropriate transition in built form and land use intensity,
(e) to ensure that taller buildings are located appropriately in relation to view corridors and view impacts and in a manner that is complementary to the natural topography of the area,
(f) to protect public open space from excessive overshadowing and to allow views to identify natural topographical features.

The amended plans have reduced the height about 4m. The variation to height is now 1.31m at the lift overrun, 0.52m for the RFB at the front of the site, and 0.89m for the central RFB. The rear units facing the reserve have a height of up to 6.59m and are below the 8.5m height limit.

The applicant has provided the following diagram showing the non-compliances (refer to Figure 7) and the following table which shows in more detail the extent of variation over the proposed development.

Figure 7: Render indicating height non-compliances

The proposed building heights and extent of variations are:

Building element	LEP Standard	Max Height	% Variation
Front RFB (Maisonette) Units	8.5m	8.25m-9.02m	Nil-0.52m or 6.1%
Central RFB units	8.5m	8.55m-9.39m	0.05m-0.89m 0r 0.59%-10.47%
Central Lift Overrun	8.5m	9.76m-9.81m	1.26m-1.31m or 14.8%- 15.4%
Rear RFB units	8.5m	6.37m-6.59m	Nil

Gosford Local Environmental Plan 2014 – Clause 4.4: Floor Space Ratio

The objectives of clause 4.4 are:

(a) to establish standards for the maximum development density and intensity of land use,
(b) to control building density and bulk in relation to site area in order to achieve the desired future character for different locations,
(c) to minimise adverse environmental effects on the use or enjoyment of adjoining properties and the public domain,
(d) to maintain an appropriate visual relationship between new development and the existing character of areas or locations that are not undergoing, and are not likely to undergo, a substantial transformation,
(e) to provide an appropriate correlation between the size of a site and the extent of any development on that site,
(f) to facilitate design excellence by ensuring the extent of floor space in building envelopes leaves generous space for the articulation and modulation of design,

(g) to ensure that the floor space ratio of buildings on land in Zone R1 General Residential reflects Council's desired building envelope,
(h) to encourage lot amalgamation and new development forms in Zone R1 General Residential with car parking below ground level.

The development application involves a total floor space of 1,275.91 m^2. The resultant floor space ratio will be 0.82:1.

The *Gosford Local Environmental Plan 2014* (GLEP 2014) provides that the maximum floor space ratio for this land is 0.75:1. The variation to the development standard is 9.3%.

A proposed communal open space area is located on the northern side of the central residential units with an area of 69.5m^2. and will be extensively landscaped.

GLEP 2014 contains a hierarchy of business centre development controls. The FSR proposed for the residential component of the proposal is compatible with the *B1 Neighbourhood Business zone*.

Submission under Gosford Local Environmental Plan 2014 - Clause 4.6

The applicant has provided justification for the development. The justification contains the following elements.

> *The application seeks a variation to building height as a design response to the site, in order to locate the residential units centrally within the site, and maximise the setbacks to both Brisbane Water Drive and Couche Park. By consolidating building height within the proposed building footprint, the proposal is able to maintain the rear of the site adjoining Couche Park as large open space rather than maintaining a lower height overall and also building on the rear part of the site as could occur under Council's planning controls.*
>
> *Maintaining the rear open space area as proposed will provide a quality transition between the proposed units and Couche Park and will also improve the outlook and cross views from adjoining properties to the side over the rear of the site towards Couche Park and Brisbane Water compared to a scenario where the rear of the site was developed.*
>
> *The site survey submitted with the application identifies that the trees to the rear of the site in Couche Park are between 18.5m and 24m tall, which is over 10m higher than the proposed development, and these trees provide an effective screening of the site from Brisbane Water, and frame the height of the development as viewed from Brisbane Water Drive and areas beyond, with development sitting below the height of the trees behind.*

The building has variable setbacks, and in particular, the penthouse level has increased setbacks on all sides compared to the levels below so as to provide articulation to the building and to minimise visual impacts of the top-most level

The proposal also seeks a variation to floor space ratio on the basis of the high level of accessibility of the site to public transport services, both train and bus, which provides opportunity for a slightly increased density of development that takes advantage of the site's location, and provides additional housing and housing choice, and alternative transport

It is a well-established planning approach to allow for increased densities around public transport facilities, particularly railway stations, and this principle extends to regional planning documents such as the Central Coast Regional Plan 2036, which encourages growth in and around local centres with access to transport services.

The proposed additional floor area is able to be accommodated by an increase in the height of the building rather than requiring an expanded footprint or site coverage, and without compromising landscape or open space areas.

The planning controls for B1 zoned land also encourage a higher scale and density of development compared to surrounding residential zoned land, and it is likely that similar development will occur on other adjoining commercial zoned land due to the proximity of the land to Brisbane Water and foreshore areas and the high level of accessibility of the area to public transport.

In relation to the height non-compliance, the applicants submission under Clause 4.6 of the GLEP 2014 contends that adherence to the development standard is unnecessary or unreasonable for the following reasons:

- The variation to height is largely located in the centre of the site, with the variation along the street frontage very minor or below the height limit. The variation is not perceptible when viewed from Brisbane Water Drive or Couche Park.
- The additional height is in response to the minimum floor level required due to flooding and the degree of accessibility due to the close proximity to public transport.
- The variation in height provides a transition from the front, rear and sides to the centre of the site, without significant impacts of view loss or overshadowing on adjoining or surrounding developments.
- The development has been orientated to the front and rear so as to minimise privacy impacts on adjoining developments.
- The proposal exhibits a high standard of architectural design.
- The variation to the height compies with the zone and development standard objectives.

Council's Architect has stated that:

> *"the amended application exceeds the 8.5m height control by approximately 800mm on the east. This is considered minor and does not have any detrimental impacts on adjoining sites*".

In relation to the Floor Space Ratio non-compliance, the applicants justification for the proposed non-compliance states that the proposal provides a high standard of architectural design and has capacity to absorb the additional floor space without causing external impacts, considering the location of the site adjoining other commercial zoned and its accessibility to public transport facilities.

The site is located in an area with a high level of access to public transport, being on a bus route and within about 80m from Koolewong railway station. The variation to height and FSR is minor and does not significantly impact adjoining sites or their development potential. The variation is supported.

Consideration of the Submission under Clause 4.6 of the Gosford Local Environmental Plan 2014 - Exceptions to Development Standards

Clause 4.6 of Gosford LEP 2014 requires consideration of the following:

1 *Has the applicant submitted a written request that seeks to justify the contravention of the development standards by demonstrating:*

   a *that compliance with the development standard is unreasonable or unnecessary in the circumstances of the case, and*
   b *that there are sufficient environmental planning grounds to justify contravening the development standard?*

Comment - The applicant has submitted a written request to vary the height and FSR development standards. The applicant submission contends that the development standards should be varied for the following reasons;

- The variations are minor and can be accommodated within the consolidated site without any significant additional impacts on amenity or overshadowing of adjoining developments.
- The development is of a high standard of architectural design and quality finishes.
- The proposal is consistent with the objectives of the B1 zone to provide such development in close proximity to public transport and to encourage lot consolidation.
- The variation to height is only over part of the development and mostly located within the centre of the site which reduces visual impact or appearance of bulk and scale from the public areas of Brisbane Water Drive

and the rear park.
- The proposed development does not result in any significant loss of views or overshadowing of adjoining land.
- The development is orientated to the east and west, (Brisbane Water Drive or Couche Park) to mitigate the privacy and amenity impacts on adjoining residential developments.

The applicant's written request has adequately justified that compliance with the development standards is unreasonable and unnecessary in this instance and there are sufficient environmental Planning grounds to justify contravening the development standard.

2 Is the proposed development in the public interest because it is consistent with the objectives of the particular standard and the objectives for development within the zone in which the development is proposed to be carried out?

Comment - The proposed development is considered to be in the public interest. It provides for a small neighbourhood shop supported by residential units in close proximity to public transport including both bus and rail transport. The proposed development has been designed having regard to the streetscape and visual impact from the adjoining Couche Park and Brisbane Waters.

The development will not have unreasonable impacts on the adjoining residents or character of the area and is consistent with the objectives of the development standards and objectives of the B1 Zone.

3 Has the concurrence of the Secretary been obtained?

Comment - *Planning Circular PS 18-003* issued 21 February 2018 states that Council may assume the concurrence of the Secretary when considering exceptions to development standards under clause 4.6. The Council is therefore empowered to approve the application.

The requests for variation has been assessed with consideration of relevant principles set out in various judgements applying to variations to development standards, including;

- Wehbe v Pittwater Council [2007] NSWLEC 827;
- Four2Five Pty Ltd v Ashfield Council [2015] NSWLEC 90;
- Four2Five Pty Ltd v Ashfield Council [2015] NSWCA 248;
- Randwick City Council v Micaul Holdings Pty Ltd [2016] NSWLEC 7;
-Initial Action Pty Ltd v Woollahra Municipal Council [2018] NSWLEC 118.

The request for a variation under Clause 4.6 is considered to be well founded and is recommended for support.

Gosford Local Environmental Plan 2014 – Clause 7.1 Acid Sulfate Soils

This land has been identified as being affected by the Acid Sulfate Soils Map and the matters contained in Clause 7.1 of Gosford Local Environmental Plan 2014 have been considered. The site contains Class 2 Acid Sulfate Soils. In this instance, the proposed works are considered to impact on Acid Sulfate Soils. A geotechnical report and acid sulphate soil management plan has been submitted.

Gosford Local Environmental Plan 2014 – Clause 7.2 Flood Planning

This land has been classified as being under a "*flood planning level*" and subject to the imposition of a minimum floor level. The development is considered satisfactory in respect to Clause 7.2 of Gosford Local Environmental Plan 2014. Appropriate conditions of consent have been applied with respect to flooding, in particular requirement for the basement to be designed in order to prevent entry of flood waters of up to RL 2.4m AHD (See recommended condition 2.10).

Draft Central Coast Local Environmental Plan

The application has been assessed under the provisions of the draft *Central Coast Local Environment Plan 2018* (draft CCLEP) publicly exhibited from 6 December 2018 to 28 February 2019 with respect to zoning, development standards and special provisions.

Under the draft CCLEP the proposal is to be located on land zoned B1 Neighbourhood Centre with a maximum building height of 8.5m and maximum FSR of 0.75:1.

The assessment concluded the proposal is consistent with the draft *Central Coast Local Environment Plan*.

Gosford Development Control Plan 2013

The following table provides an assessment against numerical standards contained within the Gosford Development Control Plan 2013:

Development Standard	Description	Required	Proposed	Compliance with Controls	Compliance with Objectives
3.3.2 - Desired Character				Yes	Yes- see comments below
3.3.3.1 - Height	Building height maximum	8.5m	6.37m - 9.81m	No - see comments below	Yes- see comments below
	Number of storeys maximum	2	3	No - see comments below	Yes- see comments below
	Height of exterior wall maximum	7.5m	6m - 9m	No - see comments below	Yes- see comments below

Development Standard	Description	Required	Proposed	Compliance with Controls	Compliance with Objectives
	Floor height of lowest occupied storey maximum	1m	0.1m	Yes	Yes
	Ceiling height of habitable rooms minimum	2.7m	2.7m	Yes	Yes
	Ceiling height non-habitable rooms minimum	2.2m	2.4m	Yes	Yes
	Excavated depth habitable room on sloping site maximum	1.5m		n/a	
3.3.3.2 - Setbacks	Deep soil along side boundaries minimum	2m	0 -3m	No - see comments below	Yes- see comments below
	Deep soil planting along front and rear boundaries minimum	6m	0 - 6m	No - see comments below	Yes- see comments below
	Side setback (up to 2 storeys) minimum	3.5m	1.5m - 5.354m	No - see comments below	Yes- see comments below
	Front setback (up to 2 storeys) minimum	6m	1.179m - 3.79m	No - see comments below	Yes- see comments below
	Rear setback (up to 2 storeys) minimum	6m	4.412mm - 6.04mm	No - see comments below	Yes- see comments below
	Additional setback for third storey or mezzanine minimum	2.5m	0m	No - see comments below	Yes- see comments below
3.3.3.3 - Car Parking	Number of resident car parking spaces minimum	15	20	Yes	Yes
	Min number of visitor car parking spaces required	5	5	Yes	Yes
	Width of driveway minimum	5.5m	5.5m	Yes	Yes
3.3.3.4 - Articulation	Width and depth of building maximum	25m	30.8m	No - see comments below	Yes- see comments below
	"Unarticulated length" of any exterior wall maximum	8m	8m	Yes	Yes
3.3.3.5.2 - Sunlight and Overshadowing	Sunlight to be received by each dwelling minimum	3 hours	3 hours	Yes	Yes
	Sunlight to existing neighbours minimum	3 hours	3 hours	Yes- see comments below	Yes- see comments below
3.3.3.5.3 - Site Planning				Yes- see comments below	Yes- see comments below
3.3.3.5.4 - Natural Cross- ventilation	Percentage of dwellings having suitable natural cross-ventilation floor	70%	100%	Yes	Yes
3.3.3.5.5 - Private Open Space	Open space minimum	8 sqm - 16 sqm	>8 sqm	Yes	Yes

Development Standard	Description	Required	Proposed	Compliance with Controls	Compliance with Objectives
3.3.3.5.6 - Communal Open Space				Yes	Yes- see comments below
3.3.4.1 - Housing Choice				No - see comments below	Yes- see comments below
3.3.4.2 - Residential Address	Height of front fencing maximum			n/a	n/a
3.3.4.3 - Facades				Yes- see comments below	Yes- see comments below
3.3.4.4 - Landscaped Areas				Yes	Yes
3.3.4.5 - Building Services	Dimensions of garbage bin enclosure minimum			Yes	Yes
	Storage provided for each dwelling minimum			Yes	Yes

Gosford Development Control Plan 2013 – Scenic Quality and Character

The subject land lies within the *Koolewong 2: Open Parkland Foreshores* character area as set out in the Gosford DCP 2014. The following is the desired future character statement for the subject land. The statement does not specifically refer to the B1 Neighbourhood Business zone. It is the difficult to apply the character statement to the development application:

Desired Character

These should remain low-density residential foreshores where the informal open but leafy character of prominent backdrops to Gosford City's coastal waterways are enhanced by new dwellings that are surrounded by shady gardens.

Ensure that new structures do not dominate these foreshore settings or disrupt development patterns that are evident upon their surrounding properties. Avoid disturbing natural slopes and on properties that are floodprone, use low-impact construction such as suspended floors and decks rather than extensive landfilling to elevate habitable floors. Ensure a leafy character for these prominent backdrops by conserving any existing trees that are visually-prominent foreshore features, as well as planting gardens with low hedges and trees that are predominantly indigenous, arranged in clusters to maintain existing panoramic views. Maintain the informal character of existing wide street verges that are dotted with shady street trees.

Facing waterfronts in particular, avoid retaining walls, tall fences or extensive terraces that would visibly compromise the desired leafy character. Use fences that are low or see-through, or plant low hedges to maintain glimpses of the waterfront from street frontages. For properties with a direct waterfrontage, ensure that new boatsheds are modestly-scaled and reflect the architectural features of traditional timber-framed sheds. New jetties should be compatible with the style and visual impact of traditional timber piers.

Avoid the appearance of a continuous wall of foreshore development by surrounding buildings with leafy gardens that maintain waterfront and street setbacks similar to the surrounding properties. Provide at least one wide side setback or step the shape of front and rear facades.

Minimise the scale and bulk of new buildings or additions to existing dwellings by reflecting elements of traditional foreshore bungalows. Use irregular floorplans to create well-articulated forms, such as linked pavilions that are separated by courtyards and capped by individual roofs. All roofs should be gently-pitched to minimise the height of ridges, flanked by wide eaves and verandahs to disguise the scale of exterior walls. Facing the waterfront, disguise the visual impact of upper storeys by a combination of extra setbacks from the ground floor plus shady balconies and verandahs.

Reflect traditional coastal architecture and minimise the scale of prominent facades by using extensive windows and lightly-framed verandahs plus a variety of materials and finishes rather than expanses of plain masonry. All dwellings should display a "street address" with verandahs or decks, and living rooms or front doors that are visible from the roadway. Avoid wide garages that would visually-dominate any front façade or block views between the dwelling and the street.

Locate and screen all balconies or decks to maintain existing levels of privacy and amenity that are enjoyed by neighbouring dwellings.

The desired future character statement is mainly concerned with the appearance from the foreshore or eastern side of the site. The proposed development appears as a 3 storey development over the Brisbane Water Drive or western frontage of the site. This is not consistent with the traditional coastal architecture the scale of the façade or traditional housing designs that would be expected with a residential zone.

However, from the rear and water view of the proposed development is 2 storey and more in keeping with a low density residential development envisaged in the desired future character statement, albeit with a flat roof

The street address and pedestrian access from Brisbane Water Drive to the residential units is located between the proposed shop and the southern driveway access to the basement car parking area.

Such a development is one that would be expected on a site within a business or commercial area rather than on an isolated business zone surrounded by residences and residential zone.

The statement does not specifically refer to the B1 Neighbourhood Business zone and it is difficult to apply the scenic quality guidelines to the development application.

Desired Character

New developments shall be consistent with the statement of desired character that is specified for their surrounding area by Chapter 2.1 - Character in this development control plan:

a *Scenic settings shall be protected and enhanced.*
b *Existing natural features shall be conserved and enhanced.*
c *Siting of buildings and surrounding garden areas shall be consistent with predominant patterns across the surrounding neighbourhood.*
d *Height, size and scale of new buildings shall be compatible with the predominant pattern across the surrounding neighbourhood.*
e *Architectural form and design details shall be appropriate to existing scenic quality and streetscape character.*
f *Garden design and details shall be compatible with scenic quality and streetscape character.*
g *Street verges shall conserve visually-prominent landscape features.*

The proposed development is appropriate for the site being zoned B1 Neighbourhood Centre. Development on a business zone cannot be expected to have the same character as a residential zone.

The proposed design does not reduce the existing scenic quality or streetscape character and does not have excessive bulk or scale. The proposal is essentially a small-scale mix of business and residential on a main road frontage which conserves the visual appearance of surrounding development when viewed from the street or from Couche Park and Brisbane Water at the rear of the site.

Gosford Development Control Plan 2013 – 3.3.3.2 Setbacks

The proposed development has provided variable setbacks which contribute to the articulation of the building. This combined with the separation of the development into 3 separate components reduces the impact on the adjoining sites. The middle 3 storey units are located in the centre of the site which further reduces the impact on adjoining sites.

Gosford Development Control Plan 2013 – 3.3.3.3 and 7.1 Car Parking

The proposed development complies with the car parking required, including the provision of 2 accessible car parking spaces in the basement car parking area. In addition 3 bicycle spaces are provided.

Summary of parking is set out in the table below:

Development Type	Description	Required	Proposed	Compliance with Controls
RFB	Min car spaces	15	20	Yes
	Min visitor parking	3	5	Yes
Shops	Min car spaces	2	2	Yes

Gosford Development Control Plan 2013 – 3.3.3.4 Articulation

The maximum building depth of the front maisonette units exceeds the maximum 25m depth/width. The maisonette units are cantilevered over the ground level commercial premises which creates an architectural feature as well as a stepped building alignment. This provides an open area under the units as well as all maisonette units having cross ventilation.

The side elevations are articulated and broken up by recessed elements and different building materials.

Gosford Development Control Plan 2013 – 3.3.3.5 Sunlight and Overshadowing

The proposed development has been designed essentially into 3 components. The front 3 storey maisonette units, the middle 3 storey and the rear 2 storey residential units. Due to the east-west orientation of the lots and dwellings in this location, the shadow impacts are essentially on the southern side. The southern adjoining sites are impacted by their own shadow s to a degree in the morning and in the afternoon.

No 32A Brisbane Water Drive will have sunlight to the park frontage of the site in the morning. The shadow impact from the adjoining proposed two storey units will mostly impact the side wall of the dwelling, as the units are of a lower height than the building on 32A. Of particular concern from

No 32A Brisbane Water Drive was the shadow impact on the roof of the building as it is intended in the future to place solar panels on the northern side roof area. The shadow diagrams submitted show the roof area of No 32A Brisbane Water Drive will have adequate sunlight to the roof area in the winter time.

Gosford Development Control Plan 2013 – 3.3.3.5 Site Planning

The proposed development and units have been orientated in an east-west direction to take advantage of the views to Brisbane Water and to mitigate the privacy and amenity impacts on the adjoining sites. For the middle units, privacy screens are proposed on the north and south balconies above ground level.

Gosford Development Control Plan 2013 – 3.3.3.5 Natural Cross Ventilation

The orientation of the units and separation into 3 components significantly improves natural cross ventilation. This combined with all living areas being located within 8m of large windows improves the internal amenity.

Gosford Development Control Plan 2013 – 3.3.3.5 Private Open Space

The proposed private open space in excess of the minimum required.

Gosford Development Control Plan 2013 – 3.3.3.5 Communal Open Space

The proposed development provides 69.45 sqm on the northern side of the site. This combined with access from all units to Couche Park provides good internal and external amenity for residents.

Gosford Development Control Plan 2013 – 3.3.4 Housing Choice

The provision of 7 one bedroom units or 47% of all units exceeds the desirable no greater than 33% of the same type of units. However, this is compensated for by the remainder being 3 bedroom units. This provides a reasonable mix of units in this location close to both public transport and recreational facilities.

Gosford Development Control Plan 2013 – 3.3.4 Facades

The proposal provides a varying front setback, with changes in building materials.

Gosford Development Control Plan 2013 – 6.3 Erosion Sediment Control

Appropriate siltation control to be conditioned.

Gosford Development Control Plan 2013 – 6.4 Geotechnical Requirements

A geotechnical report has been submitted with the application. The land is not steep but has a high- water table. The report identifies temporary or permanent retaining walls will be required to ensure the stability of the adjoining land during excavation for the basement car parking.

Gosford Development Control Plan 2013 –6.6 Tree and Vegetation Management

Only one tree is to be removed or affected by the proposed development. This is compensated for by the proposed landscaping of the site.

Gosford Development Control Plan 2013 – 6.7 Water Cycle Management

A water cycle management plan has been submitted and assessed by Council's Engineer as satisfactory.

Referrals

The following referrals have been undertaken during the assessment of the application:

Internal Referral Body	**Comments**
Architect	Not supported
Engineering	Supported, subject to conditions
Engineering Traffic/Transport	Supported, subject to conditions
Environment	Supported, subject to conditions
Recreation Passive Parks	Supported, subject to conditions
Waste Service (Garbage)	Supported, subject to conditions
Water and Sewer Assessment	Supported, subject to conditions
External Referral Body	**Comments**
Roads and Maritime Services - State and Regional Roads	Supported, subject to conditions

s. 4.15 (1)(d) of the EP&A Act: Any Submission Made in Accordance with this Act or Regulations

Section 4.15 (1)(d) of the EP&A Act requires consideration of any submissions received during notification of the proposal.

Public Submissions

The application has undergone notified in accordance with Chapter 7.3 of *Gosford Development Control Plan 2013* (GDCP 2013). There were two notification periods, as follows:

The application was initially received by Council on 5 April 2018 and public notification (first notification period) was undertaken from 19 April 2018 until 4 May 2018. 28 submissions were received during this notification period.

Amended plans and supporting documentation was submitted by the applicant on 1 August 2019. These amended details were re-notified (second notification period) from 8 August 2019 until 5 September 2019 (late submissions were also accepted) 45 submissions were received.

The applicant submitted additional details and minor amendments on 24 April 2020. These additional details were minor and were not re-notified. As provided by Clause 7.3.2.10 of the *Gosford Development Control Plan 2013* which does not require re-notification of minor amendments, stating:

'...if in the opinion of Council or staff with the appropriate delegated authority the amendments are minor, or will result in no additional impacts, the amendments will not require re-advertisement or re-notification.'

The issues raised in the submissions are detailed below.

Submission: *The development is an overdevelopment of the site.*

Council Comment: The development does not comply with the height and floor space ratio provisions for the B1 zone. The variation to FSR is 0.07:1 or 9.3%. The variation to height is up to 1.31m or 15.4% for the lift overrun which is only over 0.5% of the site area. As assessed under the relevant controls the variations do not result in any significant additional impacts on adjoining sites or the environment.

Submission: *The development will create traffic congestion and increase traffic problems and reduce safety.*

Council Comment: The Development Application was referred to the TfNSW (formerly RMS) and Council's Traffic Engineer and neither has identified that the development will result in a level of additional traffic congestion on Brisbane Water Drive that would not preclude the development from taking place.

Submission: *Concern as to safety issues (i.e. sight lines) associated with the turning of vehicles into and out of the development.*

Council Comment: This matter has been addressed by Council's Traffic Engineer who has recommended conditions of consent. TfNSW has not raised any issues in this regard. The proposal provides adequate sight distance for vehicles exiting the driveways.

Submission: *There will be overshadowing of southerly properties associated with the development.*

Council Comment: The southern adjoining properties will be impacted by overshadowing by the proposed development to a minor extent in March/September and greater in June each year. While the dwelling house at No 32A Brisbane Water Drive will have its northern side wall impacted by shadow in the winter time, the roof of the house with still receive sunlight as it is at a level above the proposed adjoining 2 storey building. This is not an unreasonable shadow impact for part of the year.

A similar situation exists for No. 32 Brisbane Water Drive, although the proposed development adjoining No 32 has a minor variation to height, the additional overshadowing is not significant.

Overshadowing of Couche Park is minor in the late afternoon and therefore unlikely to occur at critical times of the day as the park is located to the east and north of the

subject land (ie the directions from which the sun is located for most of the day)

Submission: *The development application is not in accordance with desired character/scenic quality components of Council's GDCP 2013.*

Council Comment: The character statements in the GDCP 2013 do not address the business zoned land and mainly relate to impact on the foreshore or eastern side of the site. Of concern is the extend of the 3 storey building along the Brisbane Water Drive frontage of the site and the façade and street address treatment proposed. However, Brisbane Water Drive in this location is a mix of small scale businesses and existing residential dwellings in transition to new and larger developments

Submission: *The proposal will impact upon the views of Brisbane Water from properties in Glenrock Parade.*

Council Comment: Properties in Glenrock Parade are located on sites well above the subject site. This combined with the reduction in height of the proposed development does not result in any significant view loss from properties on the opposite side of the railway line and Glenrock Parade. Such a claim has no merit.

Submission: *The 3 storey development in nearby Couche Cres should not be used as a precedent for development on this site as the Couche Cres. development was achieved as a result of a unique existing use rights.*

Council Comment: The applicant has indicated that the finished RL of the development in Couche Cres is greater than that proposed on the subject site. The circumstances of the Couche Cres development are considered not readily comparable to that being proposed on the subject site as the Couche Crescent development was approved using existing use rights provisions and does not sit within the planning provisions created under GLEP 2014.

Submission: *The use of large trees in Couche Park as a reference point to justify the height of the residential component is inappropriate.*

Council Comment: The applicant has used the large trees in Couche Park as a reference point for the height of the building point to point out that the trees are much taller than the building.

Submission: *Only the 8.5m height laid down in community agreed LEP should be used.*

Council Comment: Council's GLEP 2014 provided for a hierarchy of business zoned land. This hierarchy is reflected in the increasing height and floor space ratios that apply to the business zoned land. The B1 zone has the lowest height and floor space potential of all business zoned land. The proposal involves a height of 6.37m to 9.81m and a floor space ratio of 0.82:1. The proposed heights and floor space ratio variations are not

significant. The greatest variation to height is due to the lift overrun which is only over a small part of the site and the development.
Submission: *The area is low lying and it is not explained where stormwater is disposed of to. It is assumed it will be disposed of to the community open space along the foreshore.*

Council Comment: The applicant has submitted a water cycle management plan which has been assessed by Council's engineers. Stormwater will be disposed of to Council's drainage system.

Submission: *The B1 zone is inappropriate for this site. Previous businesses have failed.*

Council Comment: The commercial viability of a business is not a relevant matter for consideration in assessment of an application. The site is zoned B1 and a shop and residential units are a permissible use with consent.

Submission: *Couche Park is located nearby and contains native birds.*

Council Comment: The proposed development does not adversely impact the park or birdlife.

Submission: *The proposed development overshadows the adjoining eastern property.*

Council Comment: The adjoining eastern property is not significantly affected by overshadowing.

Submission: *Inadequate on-site car parking due to the up to 40 people may be housed, and the number of shop parking spaces*

Council Comment: The number of car parking spaces meets the DCP requirements. It is unreasonable to assume 40 people will have 40 cars, as car sharing within families is common and not all residents have a car. The shop parking complies with the number of spaces required and the shop will also serve people within walking distance from the site.

Submission: *Two separate driveways pose a traffic hazard, particularly with the pedestrian/cycle path along the eastern side of Brisbane Water Drive.*

Council Comment: The driveway to the shop parking will have very minor traffic movements and both driveways must provide adequate sight distance for vehicles crossing the pathway before entering the road. TfNSW and Council's engineers have considered the impacts and have not objected to the proposal.

18. Submission: *The potential flooding of the underground car park. The 1% flood underestimates the effects of climate change and tidal surges.*

Council Comment: The entry to the basement car park must be at a level above the 1% flood to prevent water entering the basement level. The 1% AEP floor level for the site is RL 1.9m AHD. Therefore, the minimum floor level is RL 2.4m AHD. The development complies with the minimum floor level required.

Submission: *If the units are used for short term accommodation, traffic and road congestion will be greater.*

Council Comment: The proposal is not for short term accommodation.

Submission: *The proposal will impact housing values and the appeal of the area.*

Council Comment: No evidence has been submitted to justify this claim. A number of factors affect housing values, including the location and interest rates.

Submission: *The existing pedestrian refuge in Brisbane Water Drive opposite the Koolewong railway station is unsafe as it is too small. The proposed development will add to the vehicular and pedestrian traffic and increase accident potential.*

Council Comment: The increase in traffic and pedestrian movements generated by the development compared to the existing traffic is minor and does not generate a requirement for the refuge to be upgraded, particularly if it requires upgrading based on existing traffic movements.

Submission: *The increased pressure on Council infrastructure including water, sewer, garbage collection.*

Council Comment: The infrastructure can cater with the additional demand which is minor, and contributions are application for increased demand on water and sewer.

Submission: *Koolewong is not an area for 1 bedroom units. Two or more bedrooms are required for families.*

Council Comment: The close proximity of the railway station to the site will make 1 bedroom units suitable for singles or couples. The size of units is subject to market demand. Council supports a range in size of units to provide a range of accommodation types. Not all units are 1 bedroom, the remaining 8 units are 3 bedroom units.

Submission: *No details have been provided for the type of shop.*

Council Comment: This is not required at this stage and may be subject to a future development application. The proposal meets the requirements of a neighbourhood shop, being less than 100 sq metres, as set out in the *Gosford LEP 2014*.

Submission: *Driveway location is located at the bottom of a crest with poor visibility.*

Council Comment: Council and TfNSW have assessed the location and found it meets traffic standards.

Submission: *There will be a loss of privacy at Couche Park.*

Council Comment; Privacy for park users is not a requirement for such development and is not in the public interest. Natural surveillance from surrounding development promotes security and discourages anti-social behaviour.

Submission: *The excessive number of garbage bins that will be placed on the footpath for collection.*

Council Comment: The size of the shop and number of residential units is not excessive in terms of waste collection. Waste collection will be picked up from the kerb side the same as other dwellings along Brisbane Water Drive which is permitted under the DCP 2013. The proposal is supported by Council's Waste Officer and is consistent with the requirements of Councils current waste collection contract arrangements.

Submission: *The construction of the development will create problems due to inadequate parking in the area.*

Council Comment: The applicant will be required to prepare a construction management plan to control worker parking, delivery of materials, storage, noise and other construction impacts. While construction may cause some nuisances, it is over a short time span.

Submission: *The proposed development wholly overshadows the adjoining property at No. 32A Brisbane Water Drive in June, including front and rear decks, living room and kitchen. It is proposed to install solar panels on the roof which is now on hold pending the determination of this DA. The impact on No. 32A Brisbane Water Drive has not been addressed in the SEE and is not in with the decision in The Benevolent Society v Waverly Council [2010] NSWLEC 1082 as the adjoining dwelling will experience significant overshadowing of their principal living areas.*

Council Comment: In *The Benevolent Society* case the Court consolidated and revised the planning principle on solar access in the following terms;

- The ease with which sunlight can be protected is inversely proportional to the density of development. At low densities there is a reasonable expectation that a dwelling and some of its open space will retain its existing sunlight, however even at low densities there are sites and buildings highly vulnerable to being overshadowed. At higher densities the sunlight is harder to protect and the claim to retain it is not as strong.
- The amount of sunlight lost should be taken into account, as well as the amount

of sunlight retained. Overshadowing arising out of poor design is not acceptable, even if it complies with numerical guidelines.

- For a window, door or glass wall to be assessed as being in sunlight, regard should be had not only to the proportion of the glazed area in sunlight but also to the size of the glazed area.
- For private open space, regard should be had to the size of the open space and the amount of it receiving sunlight. The smaller the open space, the greater the proportion that should receive adequate sunlight.
- In areas undergoing change, the impact on what is likely to be built on adjoining sites should be considered as well as the existing development.
- Having consideration of the above principles;
- The proposed development is a medium density adjoining an existing low density dwelling house. The proposed development is 2 storey adjoining No32A and well below the 8.5m height standard. It is unreasonable to expect no overshadowing on the southern adjoining site.
- The shadow impact is not as a result of poor design as the development proposed beside No32A is 2 storey and well below the height limit.

Submission*: Noise from garbage collection trucks early of a morning will affect Nos 30,32, 32A, 38 and 40 Brisbane Water Drive.*

Council Comment: The waste collection will be carried out at the same time as other residential dwellings along Brisbane Water Drive. Collection is done within a very short period of time, is unavoidable and not a reason to refuse an application. Waste collection is a health requirement and in the public interest.

Submission*: Loss of privacy by residents of the central and rear building overlooking the adjoining sites.*

Council Comment: Privacy to the sides can be preserved by the addition of privacy screens on the north and south side of balconies on the first and second floor levels of the central building. Rooms on the first floor level of the rear building are bedrooms only, with living areas located on the ground floor, which does not impact adjoining privacy.

Submission*: The proposed changes do not properly address view loss from No. 32A Brisbane Water Drive. The rear 2 storey building projects forward of No. 32A Brisbane Water Drive and will impact views, even though it is acknowledged that views to the east and south from No. 32A are retained.*

Council Comment: In accordance with the planning principle established in *Tenacity Consulting Pty Limited v Warringah Council* [2004] NSWLEC 140, a view loss assessment concludes that the view loss from No 32A is minor and not unreasonable. This is based on the existing views from No 32A to the east are about 180 degrees water views from the front of No 32A. The erection of the proposed 2 storey building beside and slightly in front of No 32A will reduce the views to the north east to about 120 degrees. That is

substantial views are still retained generally easterly. As stated in the submission, it is acknowledged that views to the east and south are retained. This is in accordance with the principle of view sharing.

s. 4.15(1)(b) of the EP&A Act: Likely Impacts of the Development

Section 4.15 (1)(b) of the EP&A Act requires consideration of the likely impacts of the development including environmental impacts on both the natural and built environments, and social and economic impacts in the locality. The likely impacts of the development are addressed below:

a) Built Environment

The subject site is zoned B1 Neighbourhood Centre under GLEP 2014 and adjoins residential developments to the north, east and south, public reserve to the east, and a main road and railway line/commuter parking to the west.
The proposed development is not considered to have adverse amenity impacts to adjoining development from overshadowing, privacy, noise generating activities and views.
A thorough assessment of the impacts of the proposed development on the built environment has been undertaken in terms of the GLEP 2014 and GDCP 2013 compliance. The potential impacts are considered reasonable.

b) Natural Environment

The proposed development is not considered to have any adverse impacts on scenic quality or the streetscape of Brisbane Water Drive.
The redevelopment of the site will result in a development consistent with a local neighbourhood centre. There is no significant tree removal and the proposed development does not impact the natural environment of the adjoining public reserve.
The submitted SWMP, Water Cycle Management Plan and Landscape Design Report provides an overall concept which will stabilise and manage the entire site.

There will be no significant impact upon the natural environment as a result of the proposal.

b) Economic Impacts

The proposed development will have beneficial economic impacts. The proposal is considered to meet the aims of the *Central Coast Structure Plan 2036* and facilitates economic development that will lead to more local employment opportunities on the Central Coast and reduce the percentage of employed persons who travel outside the region each day for work. The proposed development will provide a local shop serving local residents as well as users of the public reserve.

d) Social Impacts

The proposed development will have beneficial social impacts as it will provide a local shop/services in accordance with the objectives of the B1 zone.
The provision of medium density residential development in close proximity to public transport also reduces dependence on car ownership and travel.

s. 4.15 (1)(c) of the EP&A Act: Suitability of the Site for the Development

The site is considered to be suitable for the proposed development as follows:

- The site is zoned B1 Neighbourhood Centre under GLEP 2014. Commercial premises and residential flat buildings are permissible under the GLEP 2014 and the scale of the proposed development is consistent with the objectives of the zone.
- There are no environmental hazards which would prevent development of the site.
- Utility services are available to the site.
- The site is located on and near public transport facilities as well as public recreation/community facilities.

s. 4.15 (1)(e) of the EP&A Act: The Public Interest

The approval of the application is considered to be in the public interest as follows:

- The proposal will generate social and economic benefits for the community by providing additional commercial and residential accommodation near public transport;
- The proposal is consistent with the relevant objectives of the applicable environmental planning framework, including the GLEP 2014 and GDCP 2013.
- The proposal does not result in any unreasonable environmental impacts and will not unreasonably impact the amenity of neighbouring properties.

Ecologically Sustainable Principles

The proposal has been assessed having regard to ecologically sustainable development principles and is considered to be consistent with the principles.
The proposed development is consistent with the relevant development objectives as it will not result in unreasonable environmental impacts. The proposed building footprint is located wholly within the B1 Neighbourhood Business zone. The proposal will provide opportunities for employment/local shop combined with medium density residential accommodation close to public transport.

The proposed development is considered to incorporate satisfactory stormwater, drainage and erosion control and the retention of vegetation where possible and is unlikely to have any significant adverse impacts on the environment and will not decrease environmental quality for future generations. The proposed development is unlikely to significantly affect fluvial environments.

Climate Change

The potential impacts of climate change on the proposed development have been considered by Council as part of the assessment of the application.
This assessment has included consideration of such matters as potential rise in sea level; potential for more intense and/or frequent extreme weather conditions including storm events, bushfires, drought, flood and coastal erosion; as well as how the proposed development may cope, combat, withstand these potential impacts. The proposed development is considered satisfactory in relation to climate change

Planning Agreements

The proposed development is not subject to a planning agreement / draft planning agreement.

Development Contribution Plan

The site is not subject to the provisions of any section 7.11 development contribution plan. Therefore, no contributions are applicable.

Political Donations

During assessment of the application there were no political donations were declared by the Applicant, Applicant's consultant, owner, objectors and/or residents.

Other Matters for Consideration

Hierarchy of Business Zones

Council seeks to provide a hierarchy of business zoned centres through Gosford LEP 2014. GLEP 2014 contained a cascading range of height and floor space depending on the business centre's role within the Local Government Area in the provision of retail and commercial services and other factors such as level of transport provision.

These roles had been established through the directions provided by the (then) *Central Coast Regional Strategy* (2006). The strategy identified a range of business centre roles from Regional City to Neighbourhood Centres. The strategy provided the basis for the creation of the hierarchy of development controls reflective of the business areas desired role and other matters such as level of transport provision. The existing Business zoned land in Koolewong subject of the application was assessed as being a Neighbourhood Centre.
The proposed development contains a shop of 60.1m^2 which is consistent with that of a neighbourhood shop.

Development at Zone Interface

Part of the rear boundary of the site adjoins land zoned R2 Low Density Residential. This site contains a dwelling house and also adjoins Couche Park.

The proposed development does not restrict the development potential on the adjoining residential zoned land, and it is expected that development on B1 zoned land will be of a different character and design to that on residential zoned land.

CONCLUSION

This application has been assessed against the heads of consideration of Section 4.15 of the Environmental Planning & Assessment Act 1979 and all relevant instruments and policies. The potential constraints of the site have been assessed and it is considered that the site is suitable for the proposed development. Subject to the imposition of appropriate conditions, the proposed development is not expected to have an adverse social or economic impact. It is considered that the proposed development will complement the locality and meet the desired future character of the area.
Accordingly, the application is recommended for **approval** pursuant to Section 4.16 of the Environmental Planning and Assessment Act.

REASONS FOR THE DECISION

The reasons for the decision as recommended under the assessment of this application are as follows:

1. The proposal is satisfactory having regard for the relevant environmental planning instruments, plans and policies.
2. The proposal has been considered against the provisions of Gosford Local Environmental Plan 2014 and has been found to be satisfactory.
3. There are no significant issues or impacts identified with the proposal under s.4.15 of the Environmental Planning and Assessment Act 1979.

Attachments

1	Placeholder Updated D900 Shadow Diagrams Mar_Sept 21 D13941157	D13941157
2	Updated D901 Shadow Diagrams Jun 22	D13941155
3	Updated Architectural Plans 34 Brisbane Water Drive, KOOLEWONG DA54122 Part 1 D13941158	D13941158
4	DRAFT Conditions 34 Brisbane Water Drive, KOOLEWONG DA54122 Part 1 D14030370	D14030370
5	Revised Basix Certificate DA54122 L16 DP14946 H34 Brisbane Water Drive KOOLEWONG Part 1	ECMD25148730

6	Revised Waste Management Plan DA54122 L16 DP14946 H34 Brisbane Water Drive KOOLEWONG Part 1	ECMD25148739
7	Revised Traffic Report DA54122 L16 DP14946 H34 Brisbane Water Drive KOOLEWONG Part 1	ECMD25148740
8	Addendum to Statement of Environmental Effects DA54122 L16 DP14946 H34 Brisbane Water Drive KOOLEWONG Part 1 ECMD25148738	ECMD25148738
9	Revised Traffic Report DA54122 L16 DP14946 H34 Brisbane Water Drive KOOLEWONG Part 1	ECMD23961194
10	DA54122 Photomontages	ECMD25341990
11	Revised Concept Stormwater Management Report DA54122 L16 DP14946 H34 Brisbane Water Drive KOOLEWONG Part 1	ECMD25148733

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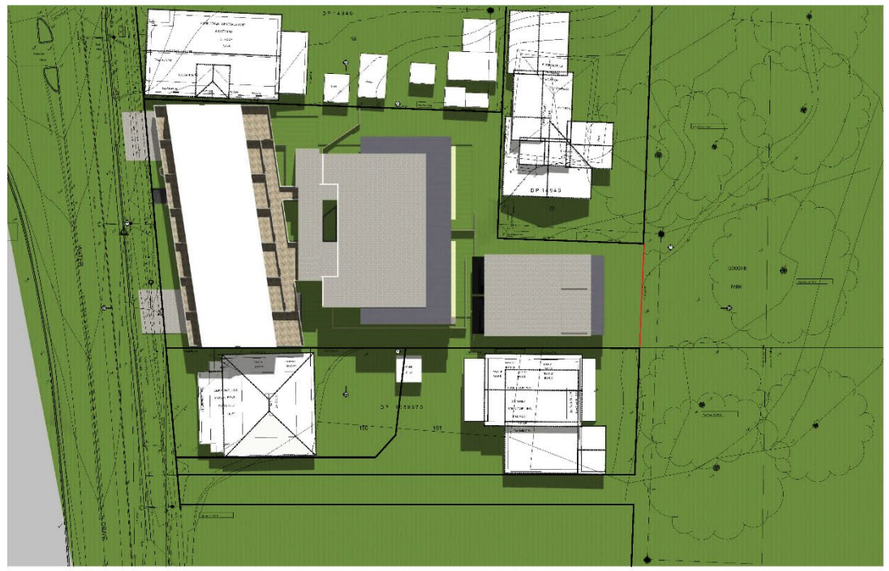
Mar 21 9am



Mar 21 12pm

Mar 21 3pm

MGA - Map Grid NSW (by survey)
TN - True (Solar) North

White + Dickson Architects.

PO Box 4371 East Gosford NSW 2250
Tel: +61 2 4324 3632
Nominated Architect: Andrew Dickson RAIA (Arch Registration No.7657)

Koolewong Residences

Shop and Residential Flat Building

34-36 Brisbane Water Drive Koolewong NSW Australia

Lots 16 + 17 in DP 14946

Shadow Diagrams Mar/Sept 21

Scale @ A3 1:400, 1:680.39 Project: 1708	Apr 2019	Issue: E
	Plot Date: 21/4/20	D900

Rev	Description	Date
A	Preliminary DA Issue	27/3/18
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June 22 9am

June 22 12pm

June 22 3pm

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Shadow Diagrams Jun 22

Scale @ A3 1:400, 1:680.39	Apr 2019	Issue: E
Project: 1708	Plot Date: 21/4/20	D901

Rev.	Description	Date
A	Preliminary DA issue	27/3/18
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Koolewong Residences

PROPOSED MIXED USE DEVELOPMENT

For: DFK Holdings Pty Ltd

34-36 Brisbane Water Drive Koolewong NSW Australia
Lots 16 + 17 in DP 14946

Sheet Index

Basix Building Fabric Requirements: 34-36 Brisbane Water Drive, Koolewong

Element	Material Type	Detail
External walls	Metal Clading + R2.0 Insulation + PB Concrete + R2.0 Insulation + PB	Medium colour
Internal walls	Plasterboard on studs	Intra-tenancy walls
	Hebel Powepanel	Inter-tenancy walls
Windows	ALM-002-04 A Aluminium B SG Low Solar Gain Low-E	NFRC Glazing System values: ⇒ U ≤ 5.60 and SHGC = 0.41 (± 5%)
Skylights	N/A	
Downlights		Sealed
Floor	Concrete slab	Tile (wet, kitchen & living) Carpet (bedrooms)
Ceiling + Roof	Plasterboard + R3.0 Insulation Concrete	Medium colour

6.2 Average star rating
NATIONWIDE HOUSE ENERGY RATING SCHEME
www.nathers.gov.au

Certificate no.: 0003753340
Assessor Name: Hamidul islam
Accreditation no.: 100982
Certificate date: 05 April 2019
Dwelling Address:
34-36 Brisbane Water Drive
Koolewong, NSW
2256

www.nathers.gov.au

Area Calculations

Site Area = 1,546.9m²

Site Coverage = 35.0% (540.95m²)

Deep Soil Planting = 23.0% (355.76m²) at 3m min width
= 18.9% (292.16m²) at 6m min width

Floor Areas

Shop FS Area	- 60.01m²	
Apt. G.01 FS Area	- 105.88m²	(+181.4m² POS)
Apt. G.02 FS Area	- 105.88m²	(+84.92m² POS)
Twnh. G.03 FS Area	- 115.23m²	(+62.36m² POS)
Twnh. G.04 FS Area	- 115.23m²	(+58.28m² POS)
Apt. 1.01 FS Area	- 105.88m²	(+49.06m² POS)
Apt. 1.02 FS Area	- 105.88m²	(+49.06m² POS)
Apt. 1.03 FS Area	- 50.01m²	(+27.12m² POS)
Apt. 1.04 FS Area	- 50.01m²	(+20.33m² POS)
Apt. 1.05 FS Area	- 50.01m²	(+20.33m² POS)
Apt. 1.06 FS Area	- 50.01m²	(+20.33m² POS)
Apt. 1.07 FS Area	- 50.01m²	(+20.33m² POS)
Apt. 1.08 FS Area	- 50.01m²	(+20.33m² POS)
Apt. 1.09 FS Area	- 50.01m²	(+27.12m² POS)
Apt. 2.01 FS Area	- 105.88m²	(+49.06m² POS)
Apt. 2.02 FS Area	- 105.88m²	(+49.06m² POS)

Floor Space Ratio = 0.82:1 (1,275.82m² FSA)
= 9.97% over 0.75:1 FSR

Schedule of Materials
refer to image on this page

1. Core and slab edges - off form natural concrete
2. Panel Cladding - prefinished panels with 10mm expresssed joints
3. Apartment wall cladding - vertical smooth profile prefinished anodised aluminium panels
4. Shop walls - anodised aluminium framed glazing with horizontal prefinished anodised aluminium boards and prefinished off white panels above
5. Murobond Bridge paint to metalwork
6. FC vertical louvre blades + screens
7. Frameless glass balustrades
8. Hardwood timber decking to balconies
9. Refer landscape plan for paving to common areas (non slip)
10. Satin dark bronze aluminium framing to glazing suites
11. Concrete roof and slab soffits to balconies and terraces
12. Colorbond rainwater goods and garage door - Night Sky

White + Dickson Architects.
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Nominated Architect: Andrew Dickson RAIA (Arch Registration No.7657)

Koolewong Residences

Shop and Residential Flat Building

34-36 Brisbane Water Drive Koolewong NSW Australia

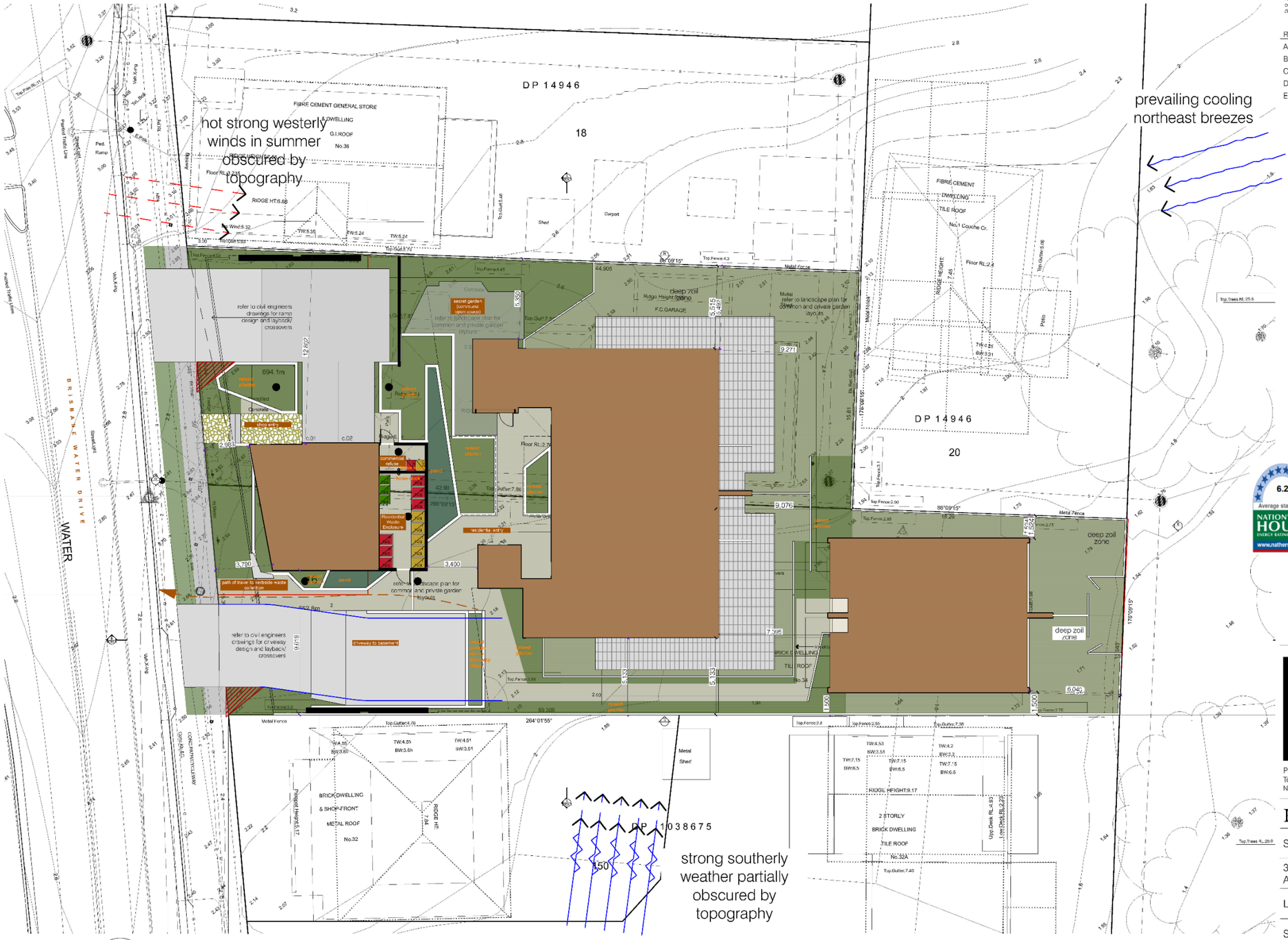
Lots 16 + 17 in DP 14946

Cover Sheet

Scale @ A3 1:1, 1:1.67, 1:347.22 Project: 1708	Apr 2019 Plot Date: 21/4/20	Issue: E D000

This drawing is issued as a preliminary concept design and must not be used for construction, cost estimation or any purpose other than for preliminary design purposes. Do not scale off this drawing, use figured dimensions where provided.

Rev.	Description	Date
A	Preliminary DA issue	27/3/18
B	Revised DA issue	4/5/18
C	Revised DA Issue C	2/4/19
D	Revised DA Issue 'd'	19/3/20
E	Revised DA Issue 'e'	21/4/20



D100 Site Plan 1:250

6.2 Average star rating
NATIONWIDE HOUSE ENERGY RATING SCHEME www.nathers.gov.au

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MGA - Map Grid NSW (by survey)
TN - True (Solar) North

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Koolewong Residences

Shop and Residential Flat Building

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Lots 16 + 17 in DP 14946

Site Plan + Site Analysis Plan

Scale @ A3 1:250	Apr 2019	Issue: E
Project: 1708	Plot Date: 21/4/20	D100

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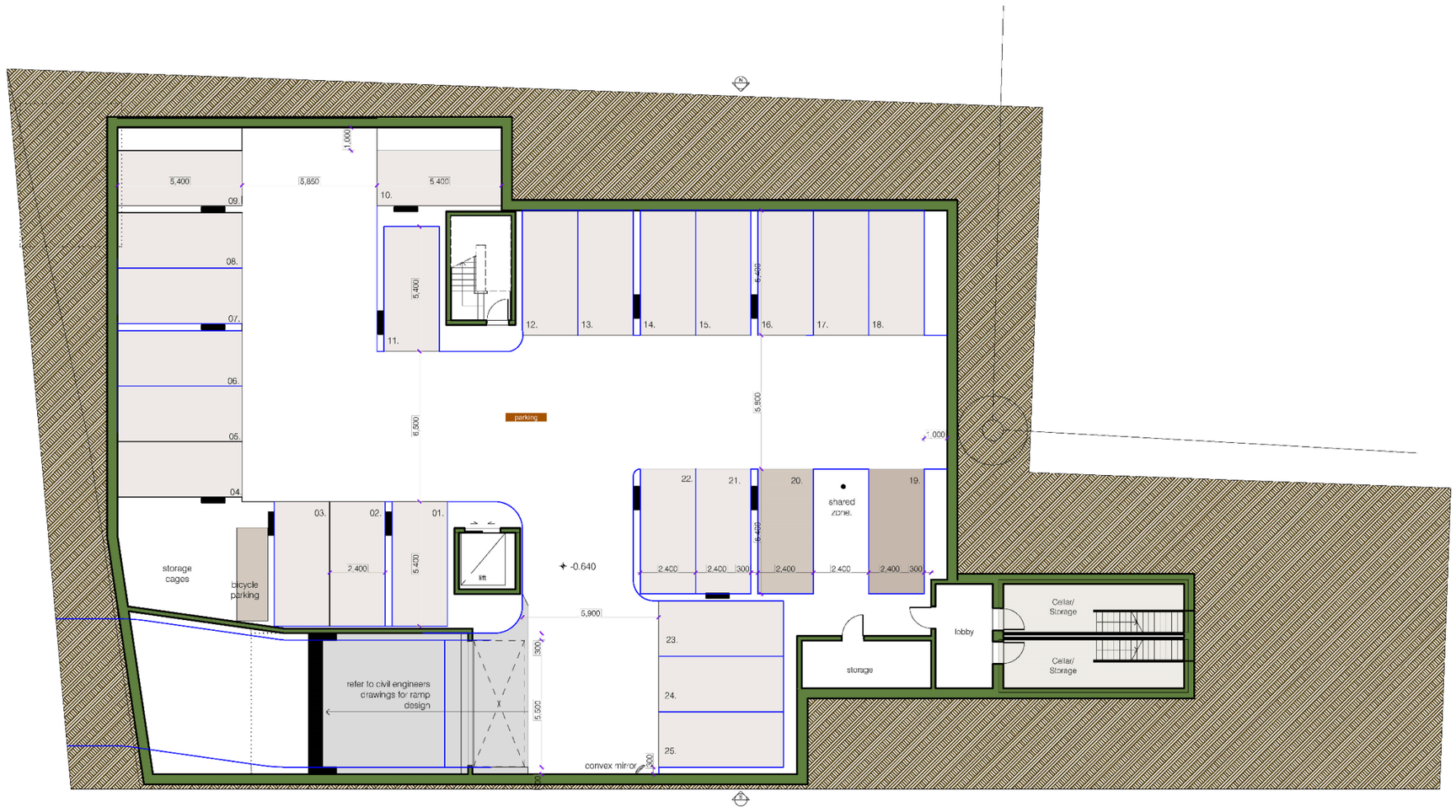

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Koolewong Residences

Shop and Residential Flat Building

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Lots 16 + 17 in DP 14946

Basement Floor Plan

Scale @ A3 1:200	Apr 2019	Issue: E
Project: 1708	Plot Date: 21/4/20	D200

Rev.	Description	Date
A	Preliminary DA issue	27/3/18
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Koolewong Residences

Shop and Residential Flat Building

34-36 Brisbane Water Drive Koolewong NSW Australia

Lots 16 + 17 in DP 14946

Ground Floor plan

Scale @ A3 1:200	Apr 2019	Issue: E
Project: 1708	Plot Date: 21/4/20	D201

6.2 Average star rating
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First Floor Plan 1:200

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TN - True (Solar) North

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Koolewong Residences

Shop and Residential Flat Building

34-36 Brisbane Water Drive Koolewong NSW Australia

Lots 16 + 17 in DP 14946

First Floor plan

Scale @ A3 1:200	Apr 2019	Issue: E
Project: 1708	Plot Date: 21/4/20	D202

Rev.	Description	Date
A	Preliminary DA issue	27/3/18
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Second Floor Plan 1:200

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Koolewong Residences

Shop and Residential Flat Building

34-36 Brisbane Water Drive Koolewong NSW Australia

Lots 16 + 17 in DP 14946

Second Floor plan

Scale @ A3 1:200	Apr 2019	Issue: E
Project: 1708	Plot Date: 21/4/20	D203

6.2 Average star rating
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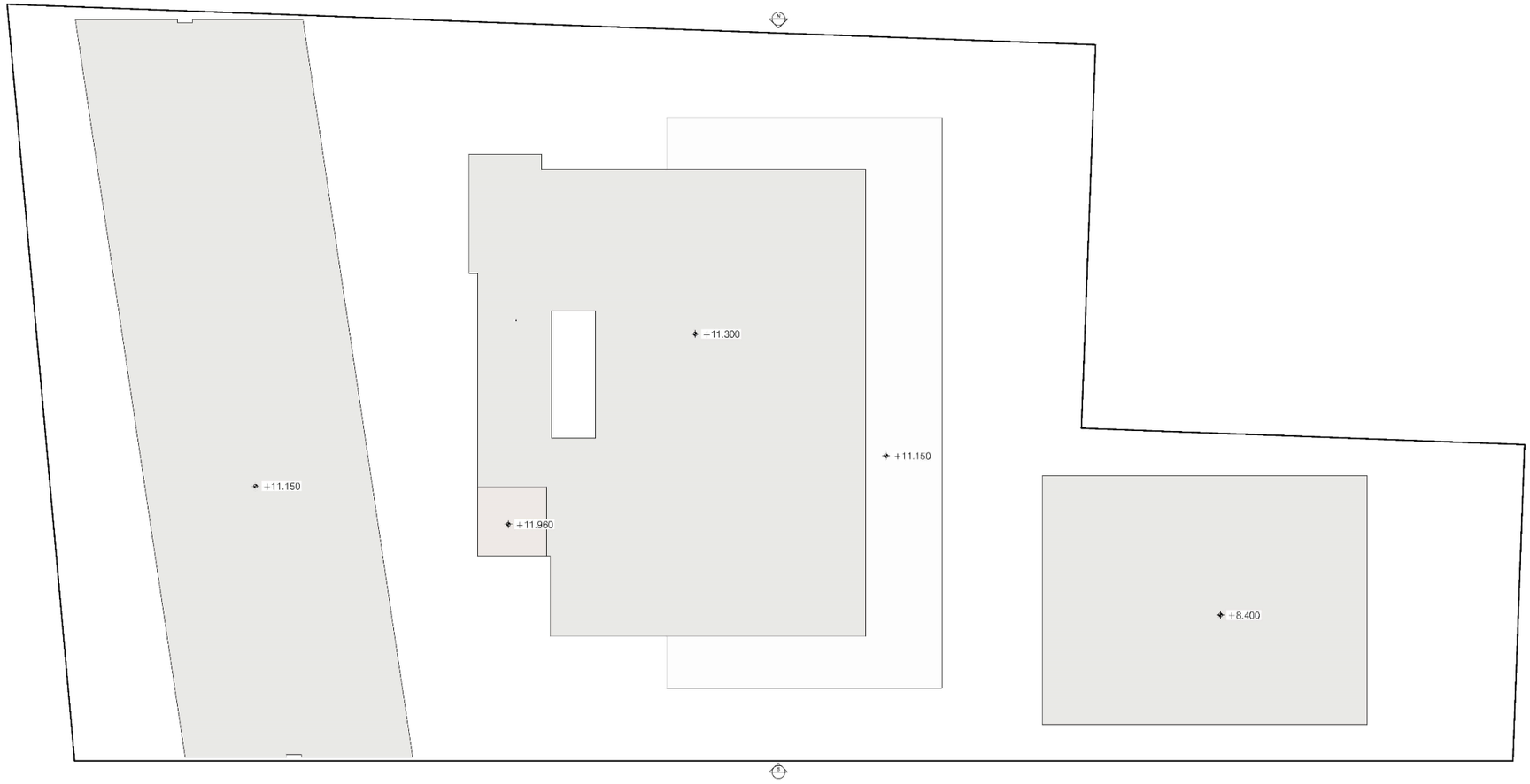
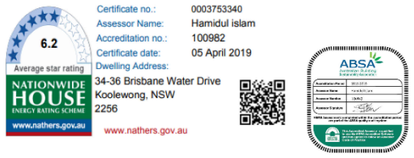


Roof Plan 1:200



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Koolewong Residences

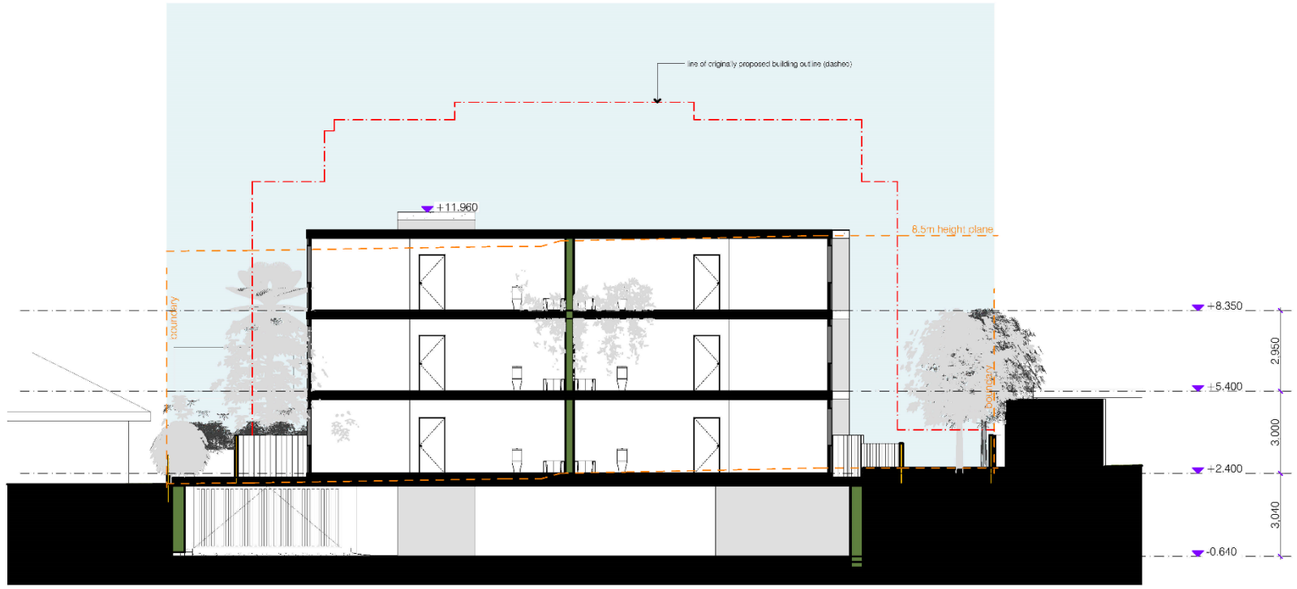
Shop and Residential Flat Building

34-36 Brisbane Water Drive Koolewong NSW Australia

Lots 16 + 17 in DP 14946

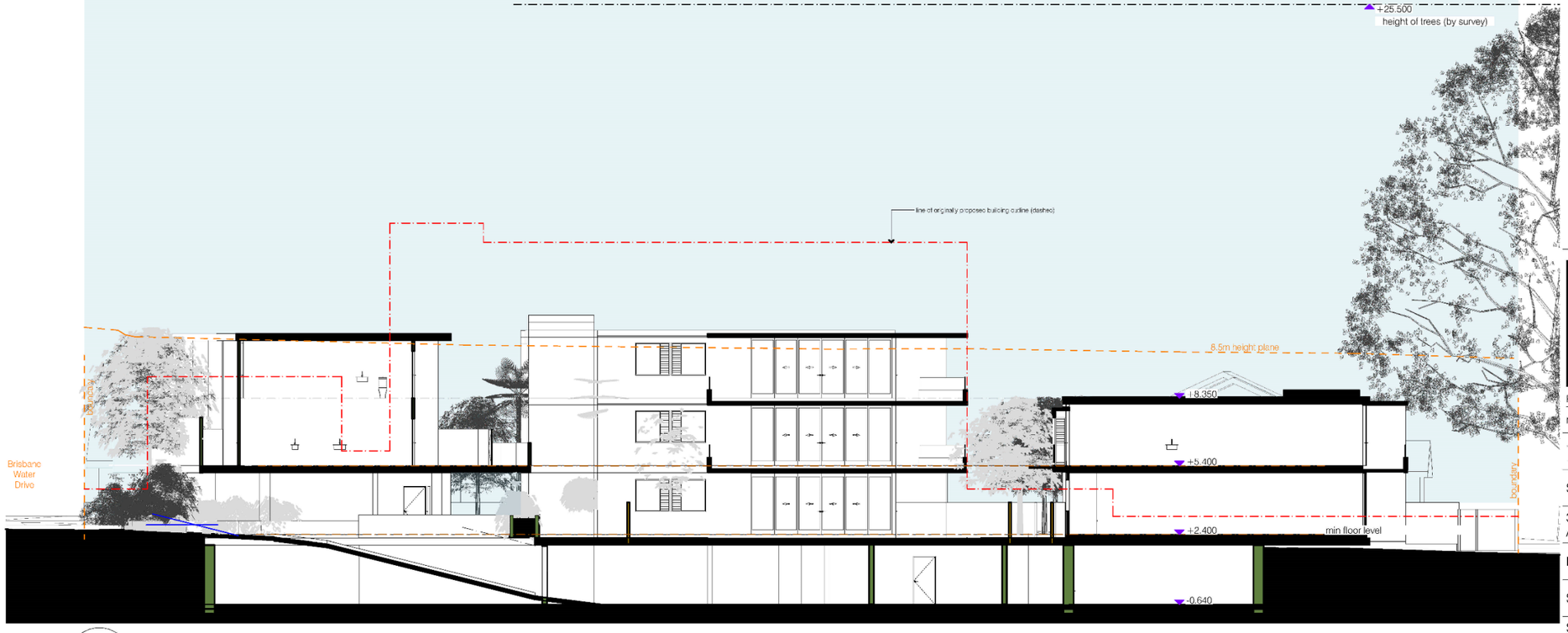
Roof plan

Scale @ A3 1:200	Apr 2019	Issue: E
Project: 1708	Plot Date: 21/4/20	D204



A

Section AA
1:200



B

Section BB
1:200

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6.2 Average star rating
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Koolewong, NSW
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ABSA

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Koolewong Residences

Shop and Residential Flat Building

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Lots 16 + 17 in DP 14946

Sections

Scale @ A3 1:200	Apr 2019	Issue: E
Project: 1708	Plot Date: 21/4/20	D300

BASIX® Certificate

Building Sustainability Index www.basix.nsw.gov.au

Multi Dwelling

Certificate number: 899635M_02

This certificate confirms that the proposed development will meet the NSW government's requirements for sustainability, if it is built in accordance with the commitments set out below. Terms used in this certificate, or in the commitments, have the meaning given by the document entitled "BASIX Definitions" dated 06/10/2017 published by the Department. This document is available at www.basix.nsw.gov.au

This certificate is a revision of certificate number 899635M lodged with the consent authority or certifier on 05 April 2018 with application DA54122.

It is the responsibility of the applicant to verify with the consent authority that the original, or any revised certificate, complies with the requirements of Schedule 1 Clause 2A, 4A or 6A of the Environmental Planning and Assessment Regulation 2000

Secretary
Date of issue: Friday, 05 April 2019
To be valid, this certificate must be lodged within 3 months of the date of issue.

NSW GOVERNMENT Planning & Environment

Project summary		
Project name	34-36 Brisbane Water Drive, Koolewong_02	
Street address	34-36 Brisbane Water Drive Koolewong 2256	
Local Government Area	Central Coast Council	
Plan type and plan number	deposited 14946	
Lot no.	17	
Section no.	-	
No. of residential flat buildings	1	
No. of units in residential flat buildings	15	
No. of multi-dwelling houses	0	
No. of single dwelling houses	0	
Project score		
Water	✔ 51	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 46	Target 30

Certificate Prepared by
Name / Company Name: SLR Consulting Pty Ltd
ABN (if applicable): 29001584612

Description of project

Project address	
Project name	34-36 Brisbane Water Drive, Koolewong_02
Street address	34-36 Brisbane Water Drive Koolewong 2256
Local Government Area	Central Coast Council
Plan type and plan number	deposited 14946
Lot no.	17
Section no.	-
Project type	
No. of residential flat buildings	1
No. of units in residential flat buildings	15
No. of multi-dwelling houses	0
No. of single dwelling houses	0
Site details	
Site area (m²)	1546
Roof area (m²)	369
Non-residential floor area (m²)	59.56
Residential car spaces	22
Non-residential car spaces	-

Common area landscape		
Common area lawn (m²)	50.0	
Common area garden (m²)	50.0	
Area of indigenous or low water use species (m²)	50.0	
Assessor details		
Assessor number	100982	
Certificate number	0003753340	
Climate zone	15	
Project score		
Water	✔ 51	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 46	Target 30

Description of project

The tables below describe the dwellings and common areas within the project

Residential flat buildings - Building1, 15 dwellings, 4 storeys above ground

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
1.01	3	115.6	0.0	0.0	0.0
1.05	1	63.1	0.0	0.0	0.0
1.09	1	63.1	0.0	0.0	0.0
G.02	3	115.6	0.0	0.0	0.0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
1.02	3	115.6	0.0	0.0	0.0
1.06	1	56.8	0.0	0.0	0.0
2.01	3	115.6	0.0	0.0	0.0
G.03	3	120.4	0.0	0.0	0.0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
1.03	1	56.8	0.0	0.0	0.0
1.07	1	63.1	0.0	0.0	0.0
2.02	3	115.6	0.0	0.0	0.0
G.04	3	120.4	0.0	0.0	0.0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
1.04	1	56.8	0.0	0.0	0.0
1.08	1	56.8	0.0	0.0	0.0
G.01	3	115.6	0.0	0.0	0.0

Description of project

The tables below describe the dwellings and common areas within the project

Common areas of unit building - Building1

Common area	Floor area (m²)
Car park area (No. 1)	798.0
Hallway/lobby type (No. 1)	79.0

Common area	Floor area (m²)
Garbage room (No. 1)	19.0

Common area	Floor area (m²)
Ground floor lobby type (No. 1)	61.0

Schedule of BASIX commitments

1. Commitments for Residential flat buildings - Building1
    (a) Dwellings
        (i) Water
        (ii) Energy
        (iii) Thermal Comfort
    (b) Common areas and central systems/facilities
        (i) Water
        (ii) Energy

2. Commitments for multi-dwelling houses

3. Commitments for single dwelling houses

4. Commitments for common areas and central systems/facilities for the development (non-building specific)
        (i) Water
        (ii) Energy

Schedule of BASIX commitments

The commitments set out below regulate how the proposed development is to be carried out. It is a condition of any development consent granted, or complying development certificate issued, for the proposed development, that BASIX commitments be complied with.

1. Commitments for Residential flat buildings - Building1

(a) Dwellings

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must plant indigenous or low water use species of vegetation throughout the area of land specified for the dwelling in the "Indigenous species" column of the table below, as private landscaping for that dwelling. (This area of indigenous vegetation is to be contained within the "Area of garden and lawn" for the dwelling specified in the "Description of Project" table).	✔	✔	
(c) If a rating is specified in the table below for a fixture or appliance to be installed in the dwelling, the applicant must ensure that each such fixture and appliance meets the rating specified for it.		✔	✔
(d) The applicant must install an on demand hot water recirculation system which regulates all hot water use throughout the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below.		✔	✔
(e) The applicant must install: (aa) a hot water diversion system to all showers, kitchen sinks and all basins in the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below; and (bb) a separate diversion tank (or tanks) connected to the hot water diversion systems of at least 100 litres. The applicant must connect the hot water diversion tank to all toilets in the dwelling.		✔ ✔	✔ ✔
(e) The applicant must not install a private swimming pool or spa for the dwelling, with a volume exceeding that specified for it in the table below.	✔	✔	
(f) If specified in the table, that pool or spa (or both) must have a pool cover or shading (or both).		✔	
(g) The pool or spa must be located as specified in the table.	✔	✔	
(h) The applicant must install, for the dwelling, each alternative water supply system, with the specified size, listed for that dwelling in the table below. Each system must be configured to collect run-off from the areas specified (excluding any area which supplies any other alternative water supply system), and to divert overflow as specified. Each system must be connected as specified.	✔	✔	✔

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
All dwellings	4 star (> 4.5 but <= 6 L/min)	4 star	4 star	4 star	no	4 star	4 star	-	-	-	-	-	-	-

	Alternative water source							
Dwelling no.	Alternative water supply systems	Size	Configuration	Landscape connection	Toilet connection (s)	Laundry connection	Pool top-up	Spa top-up
All dwellings	central water tank (no. 1)	See central systems	See central systems	yes	no	no	no	no
None	-	-	-	-	-	-	-	-

(ii) Energy	**Show on DA plans**	**Show on CC/CDC plans & specs**	**Certifier check**
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must install each hot water system specified for the dwelling in the table below, so that the dwelling's hot water is supplied by that system. If the table specifies a central hot water system for the dwelling, then the applicant must connect that central system to the dwelling, so that the dwelling's hot water is supplied by that central system.	✔	✔	✔
(c) The applicant must install, in each bathroom, kitchen and laundry of the dwelling, the ventilation system specified for that room in the table below. Each such ventilation system must have the operation control specified for it in the table.		✔	✔
(d) The applicant must install the cooling and heating system/s specified for the dwelling under the "Living areas" and "Bedroom areas" headings of the "Cooling" and "Heating" columns in the table below, in/for at least 1 living/bedroom area of the dwelling. If no cooling or heating system is specified in the table for "Living areas" or "Bedroom areas", then no systems may be installed in any such areas. If the term "zoned" is specified beside an air conditioning system, then the system must provide for day/night zoning between living areas and bedrooms.		✔	✔
(e) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Artificial lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that the "primary type of artificial lighting" for each such room in the dwelling is fluorescent lighting or light emitting diode (LED) lighting. If the term "dedicated" is specified for a particular room or area, then the light fittings in that room or area must only be capable of being used for fluorescent lighting or light emitting diode (LED) lighting.		✔	✔

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(f) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Natural lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that each such room or area is fitted with a window and/or skylight.	✔	✔	✔
(g) This commitment applies if the applicant installs a water heating system for the dwelling's pool or spa. The applicant must: (aa) install the system specified for the pool in the "Individual Pool" column of the table below (or alternatively must not install any system for the pool). If specified, the applicant must install a timer, to control the pool's pump; and (bb) install the system specified for the spa in the "Individual Spa" column of the table below (or alternatively must not install any system for the spa). If specified, the applicant must install a timer to control the spa's pump.		✔ ✔	
(h) The applicant must install in the dwelling: (aa) the kitchen cook-top and oven specified for that dwelling in the "Appliances & other efficiency measures" column of the table below; (bb) each appliance for which a rating is specified for that dwelling in the "Appliances & other efficiency measures" column of the table, and ensure that the appliance has that minimum rating; and (cc) any clothes drying line specified for the dwelling in the "Appliances & other efficiency measures" column of the table.		✔ ✔ ✔	✔
(i) If specified in the table, the applicant must carry out the development so that each refrigerator space in the dwelling is "well ventilated".		✔	

	Hot water	Bathroom ventilation system		Kitchen ventilation system		Laundry ventilation system	
Dwelling no.	Hot water system	Each bathroom	Operation control	Each kitchen	Operation control	Each laundry	Operation control
All dwellings	gas instantaneous 4 star	individual fan, ducted to façade or roof	interlocked to light	individual fan, ducted to façade or roof	manual switch on/off	individual fan, ducted to façade or roof	interlocked to light

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.09	ceiling fans + 3-phase airconditioning EER > 4.0 (zoned)	ceiling fans + 3-phase airconditioning EER > 4.0 (zoned)	3-phase airconditioning EER > 4.0 (zoned)	3-phase airconditioning EER > 4.0 (zoned)	0 (dedicated)	1 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no
All other dwellings	ceiling fans + 3-phase airconditioning EER > 4.0 (zoned)	ceiling fans + 3-phase airconditioning EER > 4.0 (zoned)	3-phase airconditioning EER > 4.0 (zoned)	3-phase airconditioning EER > 4.0 (zoned)	3 (dedicated)	1 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no

	Individual pool		Individual spa		Appliances & other efficiency measures							
Dwelling no.	Pool heating system	Timer	Spa heating system	Timer	Kitchen cooktop/oven	Refrigerator	Well ventilated fridge space	Dishwasher	Clothes washer	Clothes dryer	Indoor or sheltered clothes drying line	Private outdoor or unsheltered clothes drying line
All dwellings	-	-	-	-	gas cooktop & electric oven	4 star (new rating)	yes	4 star	4 star	2.5 star	no	no

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must attach the certificate referred to under "Assessor details" on the front page of this BASIX certificate (the "Assessor Certificate") to the development application and construction certificate application for the proposed development (or, if the applicant is applying for a complying development certificate for the proposed development, to that application). The applicant must also attach the Assessor Certificate to the application for a final occupation certificate for the proposed development.			
(b) The Assessor Certificate must have been issued by an Accredited Assessor in accordance with the Thermal Comfort Protocol.			

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(c) The details of the proposed development on the Assessor Certificate must be consistent with the details shown in this BASIX Certificate, including the details shown in the "Thermal Loads" table below.			
(d) The applicant must show on the plans accompanying the development application for the proposed development, all matters which the Thermal Comfort Protocol requires to be shown on those plans. Those plans must bear a stamp of endorsement from the Accredited Assessor, to certify that this is the case.	✔		
(e) The applicant must show on the plans accompanying the application for a construction certificate (or complying development certificate, if applicable), all thermal performance specifications set out in the Assessor Certificate, and all aspects of the proposed development which were used to calculate those specifications.		✔	
(f) The applicant must construct the development in accordance with all thermal performance specifications set out in the Assessor Certificate, and in accordance with those aspects of the development application or application for a complying development certificate which were used to calculate those specifications.		✔	✔
(g) Where there is an in-slab heating or cooling system, the applicant must: (aa) Install insulation with an R-value of not less than 1.0 around the vertical edges of the perimeter of the slab; or (bb) On a suspended floor, install insulation with an R-value of not less than 1.0 underneath the slab and around the vertical edges of the perimeter of the slab.	✔	✔	✔
(h) The applicant must construct the floors and walls of the development in accordance with the specifications listed in the table below.	✔	✔	✔

	Thermal loads	
Dwelling no.	Area adjusted heating load (in mJ/m²/yr)	Area adjusted cooling load (in mJ/m²/yr)
1.01	21.0	18.1
1.02	46.9	16.0
1.03	58.0	35.5
1.09	33.1	29.5
2.01	32.1	23.3
2.02	57.3	20.5
G.01	23.4	15.7
G.02	50.9	14.7
G.03	22.6	27.2

	Thermal loads	
Dwelling no.	Area adjusted heating load (in mJ/m²/yr)	Area adjusted cooling load (in mJ/m²/yr)
G.04	33.8	25.1
1.05, 1.07	29.8	30.2
All other dwellings	48.2	35.5

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	no common facility	no common facility	no common laundry facility

Central systems	Size	Configuration	Connection (to allow for...)
Central water tank - rainwater or stormwater (No. 1)	5000.0	To collect run-off from at least: - 368.0 square metres of roof area of buildings in the development - 0.0 square metres of impervious area in the development - 0.0 square metres of garden/lawn area in the development - 0.0 square metres of planter box area in the development (excluding, in each case, any area which drains to, or supplies, any other alternative water supply system).	- irrigation of 100.0 square metres of common landscaped area on the site - car washing in 0 car washing bays on the site
Fire sprinkler system (No. 1)	-	So that fire sprinkler test water is contained within the fire sprinkler system for re-use, rather than disposed.	-

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

	Common area ventilation system		Common area lighting		
Common area	Ventilation system type	Ventilation efficiency measure	Primary type of artificial lighting	Lighting efficiency measure	Lighting control system/BMS
Car park area (No. 1)	no mechanical ventilation	-	light-emitting diode	motion sensors	Yes
Garbage room (No. 1)	no mechanical ventilation	-	light-emitting diode	motion sensors	Yes
Ground floor lobby type (No. 1)	no mechanical ventilation	-	light-emitting diode	motion sensors	Yes
Hallway/lobby type (No. 1)	no mechanical ventilation	-	light-emitting diode	motion sensors	Yes

4. Commitments for common areas and central systems/facilities for the development (non-building specific)

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	no common facility	no common facility	no common laundry facility

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

Notes

1. In these commitments, "applicant" means the person carrying out the development.
2. The applicant must identify each dwelling, building and common area listed in this certificate, on the plans accompanying any development application, and on the plans and specifications accompanying the application for a construction certificate / complying development certificate, for the proposed development, using the same identifying letter or reference as is given to that dwelling, building or common area in this certificate.
3. This note applies if the proposed development involves the erection of a building for both residential and non-residential purposes (or the change of use of a building for both residential and non-residential purposes). Commitments in this certificate which are specified to apply to a "common area" of a building or the development, apply only to that part of the building or development to be used for residential purposes.
4. If this certificate lists a central system as a commitment for a dwelling or building, and that system will also service any other dwelling or building within the development, then that system need only be installed once (even if it is separately listed as a commitment for that other dwelling or building).
5. If a star or other rating is specified in a commitment, this is a minimum rating.
6. All alternative water systems to be installed under these commitments (if any), must be installed in accordance with the requirements of all applicable regulatory authorities. NOTE: NSW Health does not recommend that stormwater, recycled water or private dam water be used to irrigate edible plants which are consumed raw, or that rainwater be used for human consumption in areas with potable water supply.

Legend

1. Commitments identified with a "✔" in the "Show on DA plans" column must be shown on the plans accompanying the development application for the proposed development (if a development application is to be lodged for the proposed development).
2. Commitments identified with a "✔" in the "Show on CC/CDC plans and specs" column must be shown in the plans and specifications accompanying the application for a construction certificate / complying development certificate for the proposed development.
3. Commitments identified with a "✔" in the "Certifier check" column must be certified by a certifying authority as having been fulfilled. (Note: a certifying authority must not issue an occupation certificate (either interim or final) for a building listed in this certificate, or for any part of such a building, unless it is satisfied that each of the commitments whose fulfilment it is required to monitor in relation to the building or part, has been fulfilled).

Michael Leavey Consulting
Planning & Development Services

REVISED WASTE MANAGEMENT PLAN

PROJECT DETAILS	
Address of Development	34 & 36 Brisbane Water Drive, Koolewong
Existing buildings and other structures currently on site	2 x dwelling houses, garage, swimming pool
Description of Proposed Development	Mixed Use Development (retail premises and residential flat building)
This development achieves the waste objectives set out in the DCP. The details on this form are the provisions and intentions for minimising waste relating to this project. All records demonstrating lawful disposal of waste will be retained and kept readily accessible for inspection by regulatory authorities such as Council, OEH or Workcover NSW	
Prepared By	Michael Leavey Consulting
Date	28 March 2019

DEMOLITION

Type of waste generated	Reuse	Recycle	Disposal	Comment
	Estimated volume	Estimated volume	Estimated volume	Method of onsite reuse, recycling outlet and/or waste depot to be used
Excavation Material		N/A		Excavation will be carried out at the construction stage
Timber		15m^3		Transfer to Material Recovery Facility
Concrete		8m^3	2m^3	Transfer to Material Recovery Facility/ Council Waste Facility
Bricks/Pavers		180m^3		Transfer to Material Recovery Facility
Tiles (roof)		20m^3		Transfer to Material Recovery Facility
Metal (Misc)		6m^3		Transfer to Material Recovery Facility
Gyprock		6m^3		Transfer to Material Recovery Facility
Glass -		4m^3		Transfer to Material Recovery Facility
Furniture		N/A		Will be removed by tenants
Fixtures & Fittings	2m^3	2m^3	2m^3	Reuse/ Transfer to Material Recovery Facility/ Council Waste Facility
Floor Coverings		4m^3		Transfer to Material Recovery Facility
Packaging (used pallets, pallet wrap)		N/A		
Garden Organics		4m^3		Transfer to Material Recovery Facility
Containers (Cans, plastic, glass)		N/A		
Residual Waste			6m^3	Transfer to Council Waste Facility
Asbestos (potential)			6m^3	Transfer to approved waste facility in accordance with legislative requirements

Note: if any other hazardous or special waste is found during demolition, measures will be put in place to ensure they are removed in accordance with relevant legislative requirements.

CONSTRUCTION

Type of waste generated	Reuse	Recycle	Disposal	Comment
	Estimated volume	Estimated volume	Estimated volume	Method of onsite reuse, recycling outlet and/or waste depot to be used
Excavation Material		2,000m^3		Transfer to Material Recovery Facility (and treatment in accordance with ASS Management Plan)
Timber		4m^3		Transfer to Material Recovery Facility
Concrete		6m^3	1.5m^3	Transfer to Material Recovery Facility/ Council Waste Facility
Bricks/Pavers		3m^3		Transfer to Material Recovery Facility
Tiles (bathroom)		2m^3		Transfer to Material Recovery Facility
Metal - Roofing, Guttering, Framing		4m^3		Transfer to Material Recovery Facility
Gyprock		4m^3		Transfer to Material Recovery Facility
Glass - Windows		2m^3		Transfer to Material Recovery Facility
Furniture		N/A		
Fixtures & Fittings		N/A		Will be made to order
Floor Coverings		2m^3		Transfer to Material Recovery Facility
Packaging (used pallets, pallet wrap)	4m^3	2m^3		For reuse and transfer to Material Recovery Facility
Garden Organics		2m^3		Transfer to Material Recovery Facility/ reuse for landscaping
Containers (Cans, plastic, glass)		3m^3		Transfer to Material Recovery Facility
Residual Waste			6m^3	Transfer to Council Waste Facility
Hazardous/special waste eg. Asbestos (specify)		N/A		No hazardous materials proposed
Other (specify)		N/A		

ONGOING OPERATION

Commercial (as 'shop' < 100m² as per Council's DCP)

	Recyclables		Residual Waste	Compostable
	Paper/ cardboard/	Metal/ plastic/ glass		
Amount generated (L per day)	25L x (60m²/100m²) = 15L		50L x (60m²/100m²) = 30L	
Amount generated (L per development per week @ 6 days)	90L		180L	
Any reduction due to compaction equipment	Nil		Nil	
Frequency of collections (per week)	Weekly		Weekly	
Number and size of storage bins required	1 x 240L		1 x 240L	
Floor area required for storage bins (m²)	0.5m²		0.5m²	
Floor area required for manoeuvrability (m²)	All bins are able to be manoeuvred within the garbage storage area			
Height required for manoeuvrability (m)	Height exceeds 2m			

Note: green waste will be disposed of by the landscape maintenance contractor.

ONGOING OPERATION

Residential

	Recyclables		Residual Waste	Compostable
	Paper/ cardboard/	Metal/ plastic/ glass		
Amount generated (L per day				
Amount generated (L per development per week)	15 x 120L = 1,800L		15 x 140L = 2,100L	
Any reduction due to compaction equipment	Nil		Nil	
Frequency of collections (per week)	Weekly		Weekly	Fortnightly
Number and size of storage bins required	5 x 360L		6 x 360L	3 x 240L*
Floor area required for storage bins (m^2)	$3m^2$		$4m^2$	$1.5m^2$
Floor area required for manoeuvrability (m^2)	All bins are able to be manoeuvred within the garbage storage area			
Height required for manoeuvrability (m)	Height exceeds 2m			

** green waste will be disposed of by the landscape maintenance contractor, and 3 green waste bins are provided for the use of residents.*

CONSTRUCTION DESIGN

Outline how measures for waste avoidance have been incorporated into the design, material purchasing and construction techniques of the development (refer to section 7.2.14 of the DCP)
Materials Careful bill of quantities by builder to ensure that building materials are used or returned to the supplier for refund. Arrange for delivery of all materials to ensure that materials are used in an as needed basis. Any excess material will be recycled or reused in accordance with Part 3 of this Plan.
Lifecycle Selection of materials which will minimise replacement of substandard products in years to come. Selection of quality paints and finishes will reduce the need to re-apply and minimise maintenance to the proposed structure.
Detail the appropriate needs for the ongoing use of waste facilities including the transfer of waste between the residents or tenancy units, the servicing of waste location and frequent of waste transfer and collection. If truck access is required then engineering details are required.
Residents will transfer waste to bins located in the waste enclosure area, which has easy access from the residential lobby and foyer area. Bins will be transported to the roadside by the Building Manager for collection by the Council contracted waste service on a weekly basis. The path of travel is via the residential entry pathway to the south of the commercial premises. Upon collection the Building Manager will return bins to the waste enclosure area, as soon as practical following collection of the bins. Commercial tenants will transfer waste to bins located in a separate commercial waste enclosure area, located adjacent to the commercial parking spaces, and with easy access to the commercial premises. Bins will be collected on a weekly basis, or as otherwise required, by separate private contract arrangements. The path of travel to the roadside is via the sealed access driveway to the commercial parking spaces

PLANS & DRAWINGS

The following checklists are designed to help ensure WMP are accompanied by sufficient information to allow assessment of the application.

Drawings are to be submitted to scale, clearly indicating the location of and provisions for the storage and collection of waste and recyclable during:

- Demolition – to be provided at Construction Certificate stage
- Construction – to be provided at Construction Certificate stage
- Ongoing operation.

DEMOLITION *Refer to Section 7.2.13 of the chapter for specific objectives and measures.* Do the site plans detail/indicate:	**Y/N**
Size & location of waste storage areas	Detail at CC stage
Access for waste collection vehicles	Detail at CC stage
Areas to be excavated	Detail at CC stage
Types and numbers of storage bins likely to be required	Detail at CC stage
Signage required to facilitate correct use of storage facilities	Detail at CC stage

CONSTRUCTION *Refer to Section 7.2.15 – 7.2.19 of the chapter for specific objectives and measures.* Do the site plans detail/indicate:	**Y/N**
Size & location of waste storage areas	Detail at CC stage
Access for waste collection vehicles	Detail at CC stage
Areas to be excavated	Detail at CC stage
Types and numbers of storage bins likely to be required	Detail at CC stage
Signage required to facilitate correct use of storage facilities	Detail at CC stage

ONGOING OPERATION

	Comment
SPACE	
Size and location of waste storage areas	Shown on plans
Recycling bins placed next to residual waste bins	Shown on plans
Space provided for access to and the manoeuvring of bins/equipment	Adequate access and manoeuvring area is provided
Any additional facilities	Nil
ACCESS	
Access route to deposit waste in storage room/area	Suitable internal access route is available
Access route to collect waste from storage room/area	
Bin carting grade not to exceed 10% and travel distance not greater than 100m in length	N/A
Clearance, geometric design and strength of internal access driveways and roads	N/A – road side collection
Direction of traffic flow for internal access driveway and roads	
AMENITY	
Aesthetic design of waste storage areas, including being compatible with the main buildings and adequately screened and visually unobtrusive from the street	Storage areas are enclosed and screened, and are setback from the street
Signage type and location	Detail at CC stage as required
Construction details of storage rooms/areas (including floor, walls, doors, ceiling design, sewer connection, lighting, ventilation, security, wash down provisions, cross and longitudinal section showing clear internal dimensions between engaged pier and other obstructions etc	

NOTES REGARDING ASBESTOS

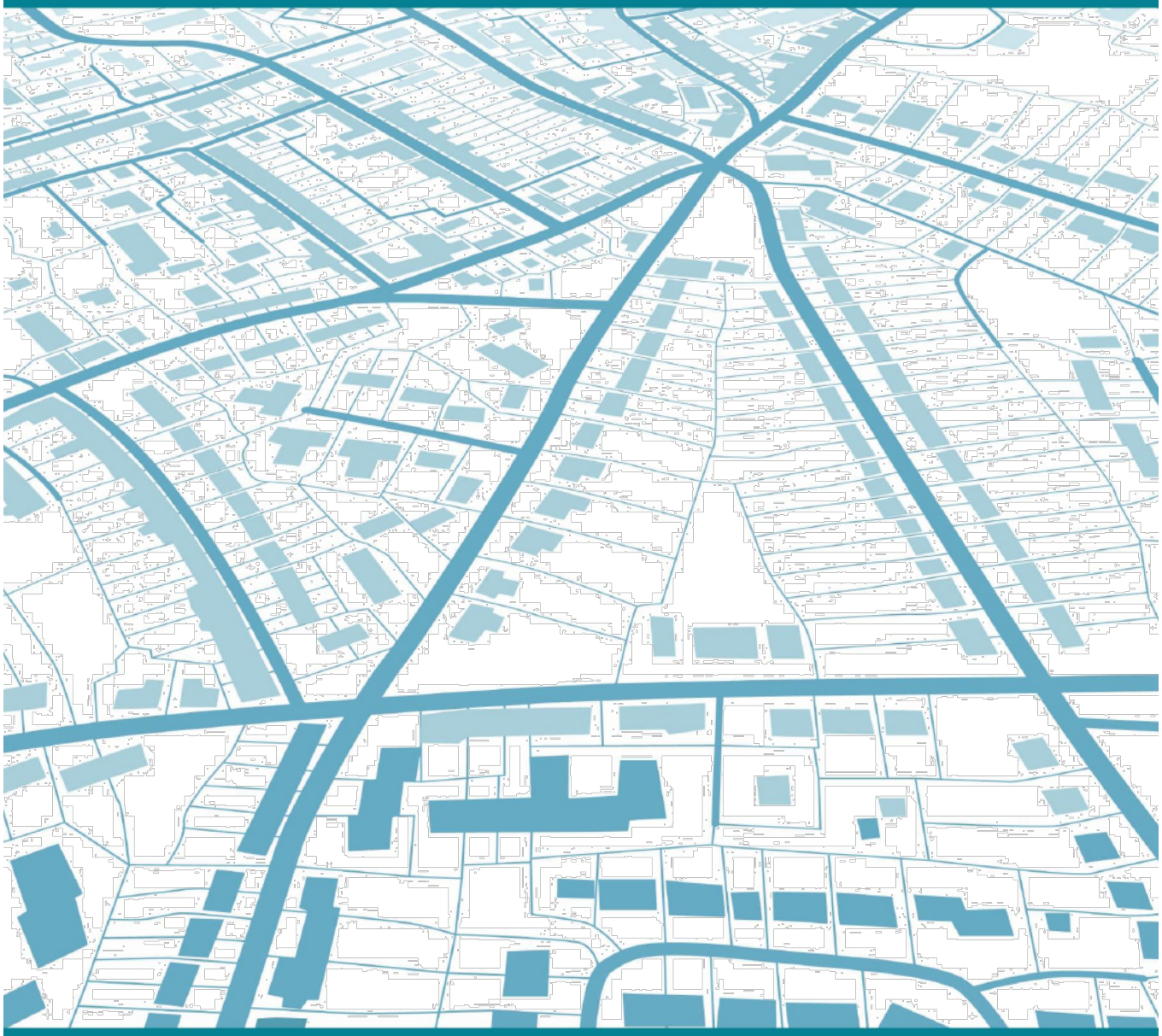
Buildings built before 1988 may contain asbestos in the form of flat or corrugated sheets ('fibro') used for walls, ceilings and roofing, or in products such as pipes, electrical conduit and eaves.

To prevent access to the area which may contain asbestos the site should be securely fenced. The site will need to be continually damped down so as not to cause runoff or sprayed with PVA to ensure that the asbestos cannot become airborne. This needs to continue until the site is cleaned up.

If asbestos is discovered during demolition, all work is to cease until the extent is determined and a suitably qualified and approved contractor is used to appropriately remove and dispose of all material.

ttpa TRANSPORT AND TRAFFIC PLANNING ASSOCIATES
Established 1994

Suite 502, Level 5, 282 Victoria Avenue
Chatswood NSW 2067
T (02) 9411 5660 | F (02) 9904 6622
E info@ttpa.com.au | ttpa.com.au



34 – 26 Brisbane Water Drive, Koolewong

Mixed Use Development

Traffic and Parking Impact Assessment

Ref: 17215
Date: April 2019
Issue: E

Transport and Traffic Planning Associates

Table of Contents

List of Figures

List of Appendices

1.0 Introduction

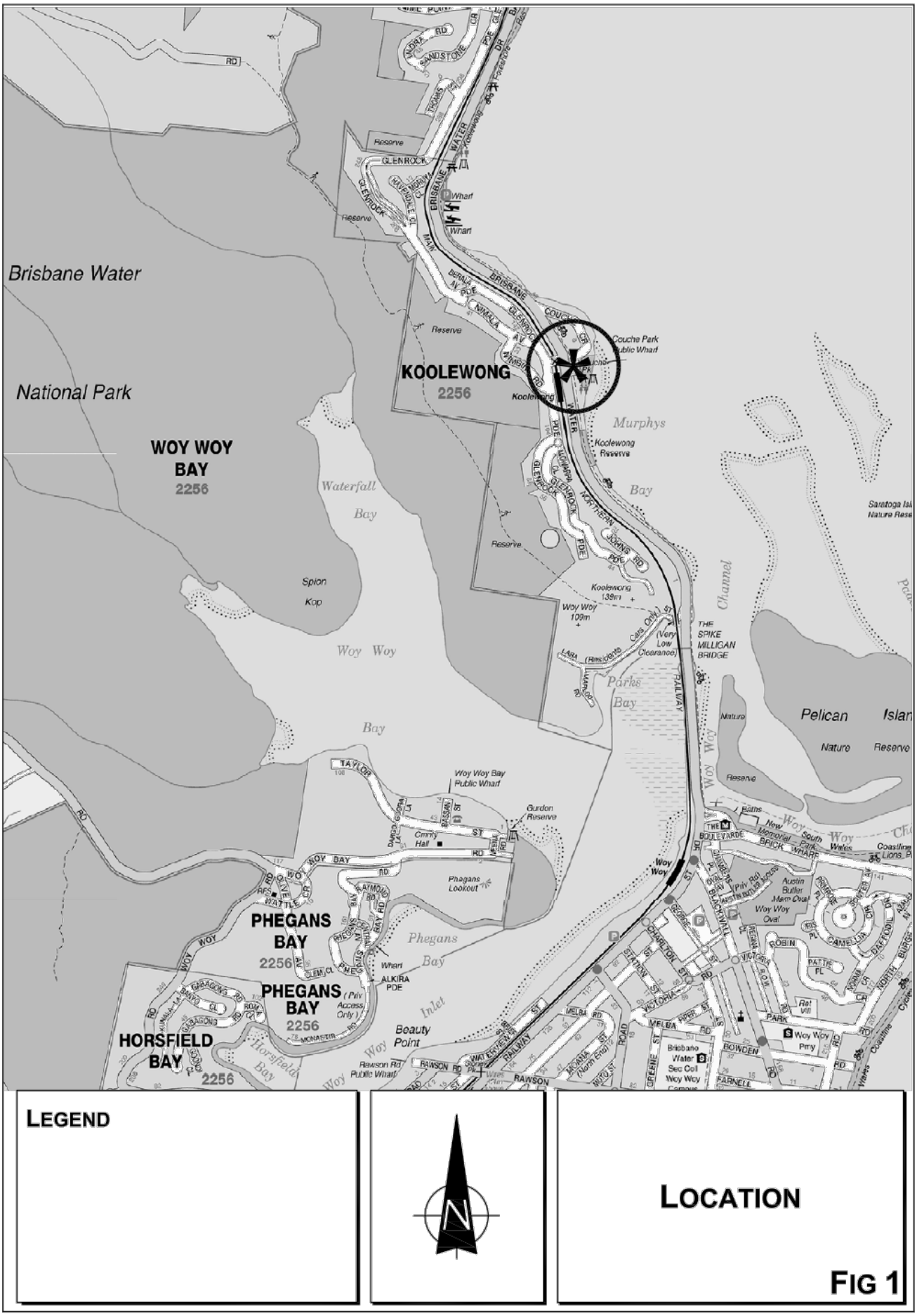
This report has been prepared to accompany a Development Application to Central Coast Council for a proposed mixed use development at 34 – 36 Brisbane Water Drive, Koolewong (Figure 1).

The development site adjoins the Couche Park waterfront reserve on the shore of Murphys Bay providing a scenic outlook over Brisbane Water. These scenic attributes together with the convenient access to railway station have acted to generate recent new residential apartment in the area and the proposed development scheme comprises:

- 14 residential apartments
- Retail unit (60m^2)
- Basement parking

The purpose of this report is to:

- describe the site, its context and the proposed development
- describe the road network serving the site and the traffic circumstances
- assess the proposed vehicle access and traffic implications
- assess the adequacy of the proposed parking provision
- assess the suitability of the proposed internal circulation and servicing arrangements


Brisbane Water
National Park
KOOLEWONG
2256
WOY WOY
BAY
2256
PHEGANS
BAY
2256
PHEGANS
BAY
2256
HORSFIELD
BAY
2256
Waterfall
Bay
Woy Woy
Bay
Murphys
Bay
Parks
Bay
Phegans
Bay
Beauty
Point
Inlet
Horsfield
Bay
Spion
Kop
Pelican
Island
Nature
Reserve
Channel
Couche Park
Public Wharf
Koolewong
Reserve
Woy Woy Bay
Public Wharf
Gurdon
Reserve
Phegans
Lookout
Rawson Rd
Public Wharf
Koolewong
139m
Woy Woy
109m
THE
SPIKE
MILLIGAN
BRIDGE
(Very
Low
Clearance)
Woy Woy
Oval
Brisbane
Water
Sec Col
Woy Woy
Campus
Woy Woy
Pmy
LEGEND
N
LOCATION
FIG 1

2.0 Proposed Development Scheme

2.1 Site, Context and Existing Use

The site (Figure 2) is a consolidation of Lots 16 and 17 in DP 14946 occupying an irregular shaped area of some 1,546.9m^2, located to the north of the Woy Woy town centre. The site has a frontage of some 31.3 metres to the eastern side of Brisbane Water Drive.

The surrounding uses include:

- the general store and residential dwelling which adjoin to the north
- the takeaway fast food and residential dwelling which adjoin to the south
- Couche Park which adjoins to the east
- the mixed residential uses in the Koolewong "enclave" including a new apartment complex on Couche Crescent

The existing uses on the site comprise an older style residential dwelling on the southern part and a modern 2-level dwelling on the northern part.

2.2 Proposed Development

It is proposed to demolish the existing buildings and excavate the site to provide for basement parking and a level building platform. A new 4-level building will be constructed comprising:

Residential Apartments	**Retail Unit**
5 x one-bedroom	60m^2
6 x two-bedroom	
4 x three-bedroom	
Total – 15 apartments	


SITE
LEGEND
N
SITE
FIG 2

A total of 27 parking spaces will be provided in a basement and a small at-grade carpark accessed via 2 driveways on the Brisbane Water Drive frontage.

Details of the proposed development scheme are provided on the plans prepared by White Dickson Architects, which accompany the Development Application and are reproduced in part in Appendix A.

3.0 Existing Road Network and Traffic Conditions

3.1 Road Network

The road network serving the site (Figure 3) comprises:

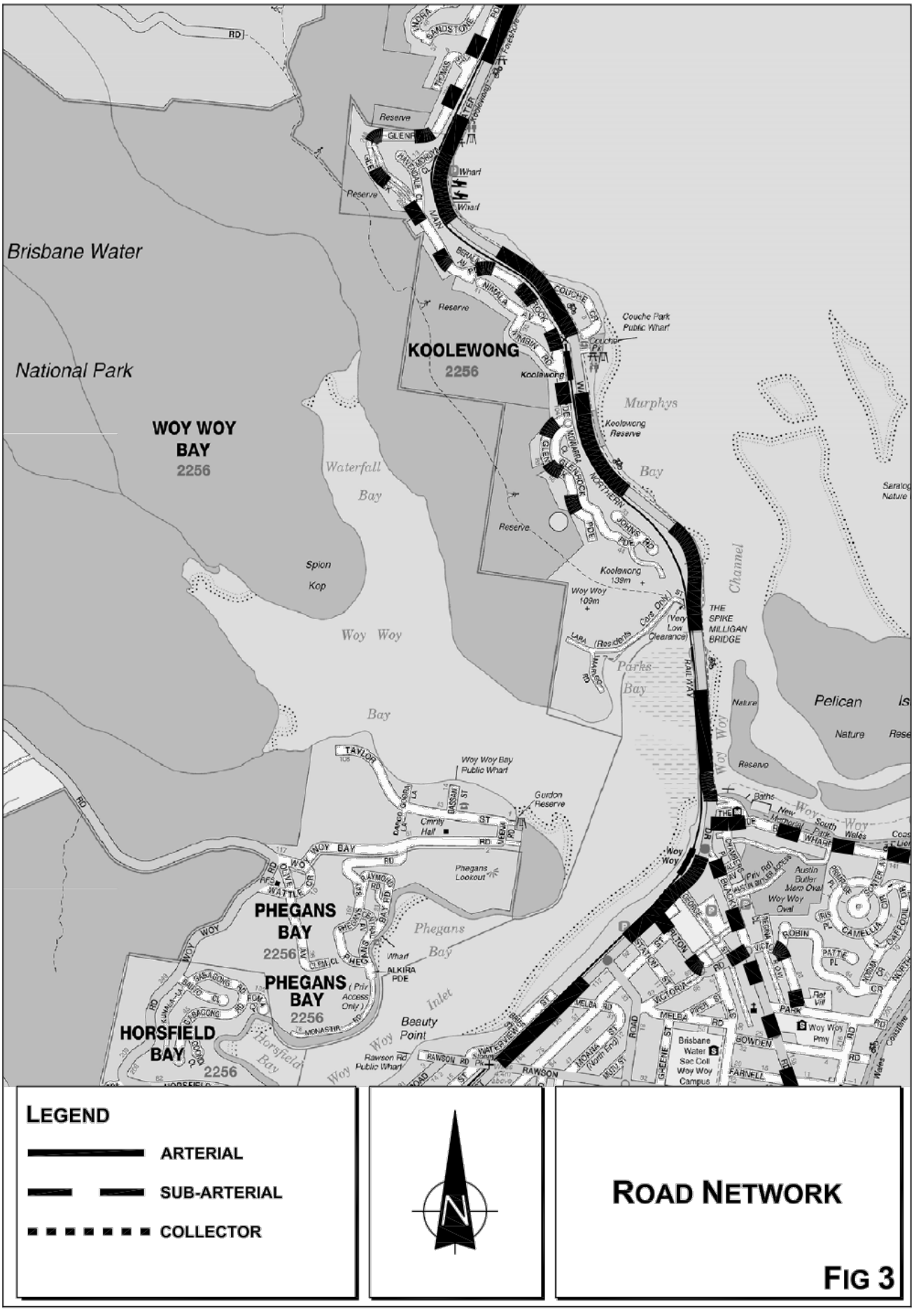
- *Brisbane Water Drive / Railway Street* – a State Road and sub-arterial route connecting between Gosford and Woy Woy
- *Glenrock Parade* – a collector route running parallel to Brisbane Water Drive connecting between Point Clare and Koolewong
- *Blackwell Road* – a collector road connecting southwards from Woy Woy

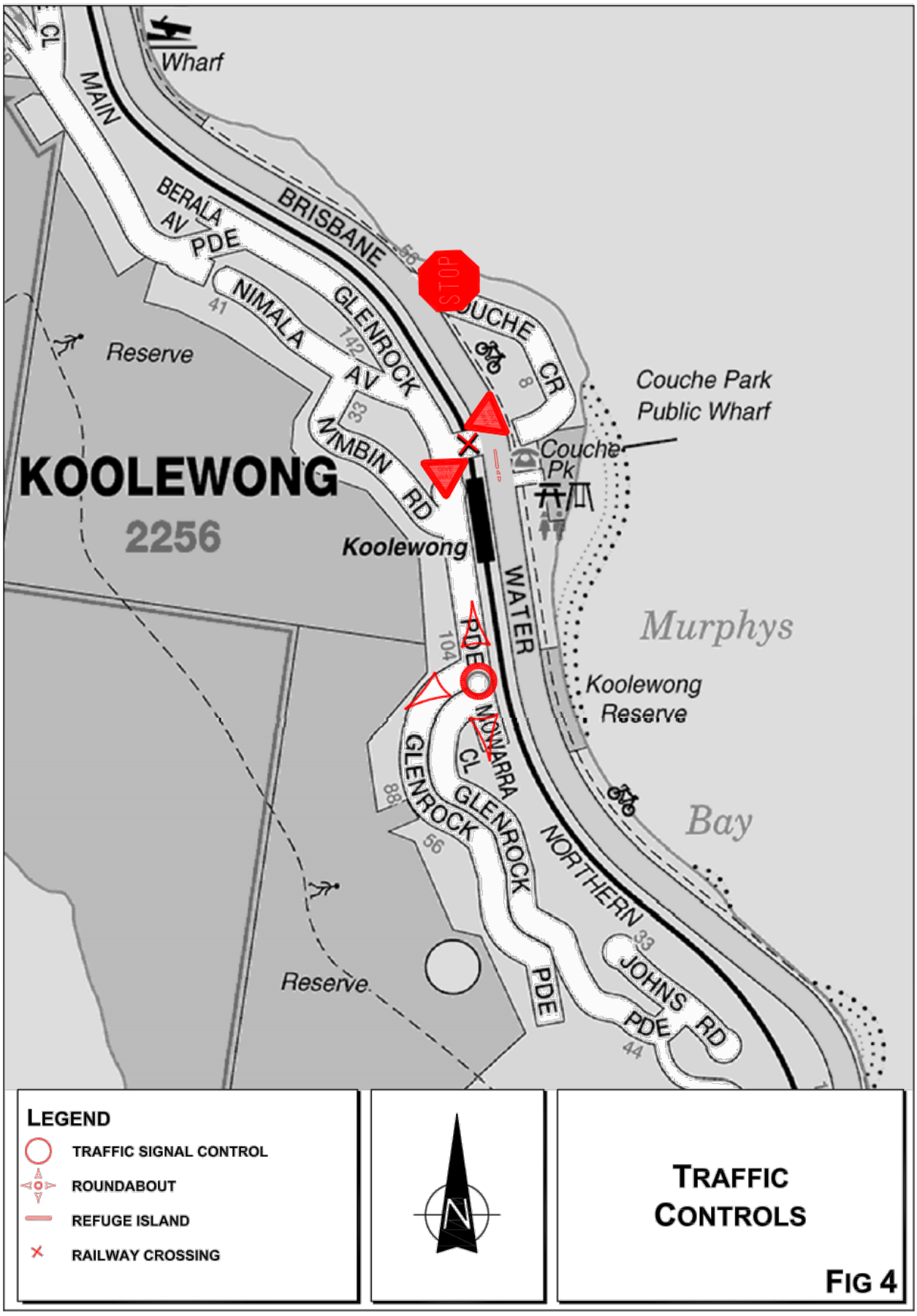
Brisbane Water Drive in the vicinity of the site has one lane in each direction with supplementary turning lanes at the level crossing intersection (which has a "seagull" arrangement) and a parking lane along the eastern side.

3.2 Traffic Controls

The few existing traffic and parking controls in the vicinity of the site (Figure 4) comprise:

- the railway level crossing with boom gates
- the GIVE WAY sign controls at the intersections each side of the level crossing
- the pedestrian refuge island in Brisbane Water Drive
- the 60 kmph speed restriction on Brisbane Water Drive
- the shared pedestrian / bicycle pathway along the eastern side of Brisbane Water Drive
- the BUS ZONE and Bus Bay on Brisbane Water Drive just to the north of the site


Brisbane Water
National Park
KOOLEWONG
2256
WOY WOY
BAY
2256
PHEGANS
BAY
2256
PHEGANS
BAY
2256
HORSFIELD
BAY
2256
Waterfall
Bay
Woy Woy
Bay
Phegans
Bay
Beauty
Point
Parks
Bay
Murphys
Bay
Pelican
Channel
Couche Park
Public Wharf
Woy Woy Bay
Public Wharf
Rawson Rd
Public Wharf
Koolewong
Reserve
Gordon
Reserve
Phegans
Lookout
Spion
Kop
Koolewong
139m
Woy Woy
109m
THE
SPIKE
MILLIGAN
BRIDGE
Brisbane
Water
Sec Coll
Woy Woy
Campus
Woy Woy
Pmy
Austin
Butler
Mem Oval
Woy Woy
Oval
Civic
Hall
LEGEND
ARTERIAL
SUB-ARTERIAL
COLLECTOR
N
ROAD NETWORK
FIG 3


Wharf
MAIN
CL
BERALA AV
PDE
BRISBANE
STOP
NIMALA AV
GLENROCK
COUCHE CR
Reserve
Couche Park
Public Wharf
Couche Pk
KOOLEWONG
2256
VIMBIN RD
Koolewong
WATER
PDE
MONARRA CL
GLENROCK
NORTHERN
Murphys
Koolewong Reserve
Bay
Reserve
JOHNS PDE
RD
LEGEND
TRAFFIC SIGNAL CONTROL
ROUNDABOUT
REFUGE ISLAND
RAILWAY CROSSING
N
TRAFFIC CONTROLS
FIG 4

3.3 Traffic Conditions

The RMS counting station located on Brisbane Water Drive indicates an Average Annual Daily Traffic (AADT) flow of some 19,000 vpd in the vicinity of the site.

A 7-day tube count undertaken at the railway crossing just to the north of the site indicates an AADT of some 1,593 vpd.

The traffic movements in the surrounding road network are moderate during the peak periods and access movements to and from the Brisbane Water Drive frontage are facilitated by gaps provided by the traffic signals to the south (Blackwell Point Road) and the roundabout and traffic signals to the north.

3.4 Transport Services

Public transport services in the vicinity of the site are provided by the:

- the rail services at the adjacent Koolewong Railway Station (50 metres north)
- the Routes 51CN, 54CN, 55, and 70 bus services which operate along the Bus Stop just to the north of the site at Brisbane Water Drive between Ettalong Beach and Gosford via Woy Woy

It is apparent that the site is conveniently located in relation to public transport services.

4.0 Parking

Central Coast Council's DCP specifies the following parking criteria relative to the proposed development.

Residential Apartments (<400m of railway station)	1 space per dwelling
Visitor	1 space per 5 apartments
Retail	1 space per $30m^2$
Commercial	1 space per $40m^2$

Application of this criteria to the proposed development scheme elements would indicate the following:

Residential	
14 x apartments	14 spaces
Visitors (14 apartments)	3 spaces
Retail $60m^2$	2 spaces
Total	**19 spaces**

Accordingly, it is proposed to provide a total of 27 spaces in the development being composed of 25 in the basement and 2 retail spaces at-grade.

5.0 Traffic

The RMS Development Guidelines specify a traffic generation rate for medium density apartments of 0.4 to 0.65 vtph per apartment in the morning and afternoon peak periods. The criteria contained in the RMS Guidelines for retail use are not applicable to the subject circumstance because it is not a 'shopping centre' with supermarket and the traffic generation will solely reflect that of the 2 retail parking spaces provided plus some potential minor on-street movements.

Thus, the assessed traffic generation in the AM and PM peak periods is as follows:

		AM	**PM**
Apartments			
5 @ 0.4 vtph		2.0	2.0
6 @ .05 vtph		3.0	3.0
3 @ 0.65 vtph		2.0	2.0
Retail		2.0	4.0
	Total	**9 vtph**	**11 vtph**

The existing development on the site (i.e. 2 large dwellings would generate some 2 vtph in the peak periods. Thus, the additional peak traffic generation would be some 10 vtph or 1 vtph each 6 minutes which will spread over the 2 driveways and will be largely imperceptible.

Council requires that the development's potential traffic implication on the railway crossing just to the north west of the site is assessed. The surveyed AADT and peak hourly traffic volumes (Appendix B) at the crossing are summarised as follows:

AADT	1,593 vpd
AM Peak	107 vpd
PM Peak	138 vpd

The land uses on the enclave which is situated to the west of the crossing are primarily residential and there is no apparent employment or retail uses. As such, there is no "trip attractor "or "destination" venues which are traffic generators from Brisbane Water Drive westwards. For this reason, residents from the proposed development are unlikely to access the crossing during normal peak periods. Because there is a small retail component at the proposed development, a worst-case scenario would be the 2 retail employees living within this enclave and therefore use the crossing (and assuming they opt to drive the short distance) during the peak hours. This would equate up to 2 vtph (2 retail carpark only).

Based on the above, it is assessed that the proposal will have no adverse or undue traffic implications on the exiting road network and operations.

6.0 Access, Internal Circulation and Servicing

6.1 Access

The proposed vehicle access arrangements comprise:

- a 5.5m wide combined ingress/egress driveway located at the southern site boundary for the basement car park

- a 5.5m wide driveway located at the northern site boundary for retail access

The driveways are consistent with the design provisions of AS2890.1 and have particular regard for the frontage sightlines requirements.

6.2 Internal Circulation

The access, carpark and servicing arrangements will allow safe and efficient movement throughout the development with aisle width, column locations and parking space dimensions etc. in accordance with AS2890.1 and 6.

Details of turning path analyses indicating a satisfactory outcome are provided in Appendix C.

6.3 Servicing

Refuse will be collected from the street front by Councils service while small service vehicles (eg service personnel) will be able to use the visitor spaces. The small retail tenancy will only have very minor deliveries which can be made by small vehicles using the retail parking area or standing at the kerbside.

7.0 Conclusion

The proposal represents a valuable opportunity for a residential apartment based mixed use development replacing the residential dwellings in the small Koolewong "enclave" taking advantage of the scenic outlook and adjacent railway station. The traffic, transport and parking assessment provided in this report indicates that the development will:

- not present any unsatisfactory traffic capacity, safety or environmental related implications
- incorporate a suitable and appropriate parking provision for the use
- incorporate suitable vehicle access, internal circulation and servicing arrangements

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Appendix A

Development Plans

Rev	Description	Date
A	Preliminary DA issue	27/3/18
B	Revised DA issue	4/5/18
draft	draft issue	26/2/19

Second Floor Plan 1:200

MGA - Map Grid NSW (by survey)
TN - True (Solar) North

White + Dickson Architects.

PO Box 4371 East Gosford NSW 2250
Tel: +61 2 4324 3632
Nominated Architect: Andrew Dickson RAIA (Arch Registration No.7657)

Koolewong Residences

Shop and Residential Flat Building

34-36 Brisbane Water Drive Koolewong NSW Australia

Lots 16 + 17 in DP 14946

Second Floor plan

Scale @ A3 1:200	Feb 2019	Issue: draft
Project: 1708	Plot Date: 26/2/19	D203

Rev	Description	Date
A	Preliminary DA issue	27/3/18
B	Revised DA issue	4/5/18
draft	draft issue	26/2/19

First Floor Plan 1:200

MGA - Map Grid NSW (by survey)
TN - True (Solar) North

White + Dickson Architects.

PO Box 4371 East Gosford NSW 2250
Tel: +61 2 4324 3632
Nominated Architect: Andrew Dickson RAIA (Arch Registration No.7667)

Koolewong Residences

Shop and Residential Flat Building

34-36 Brisbane Water Drive Koolewong NSW Australia

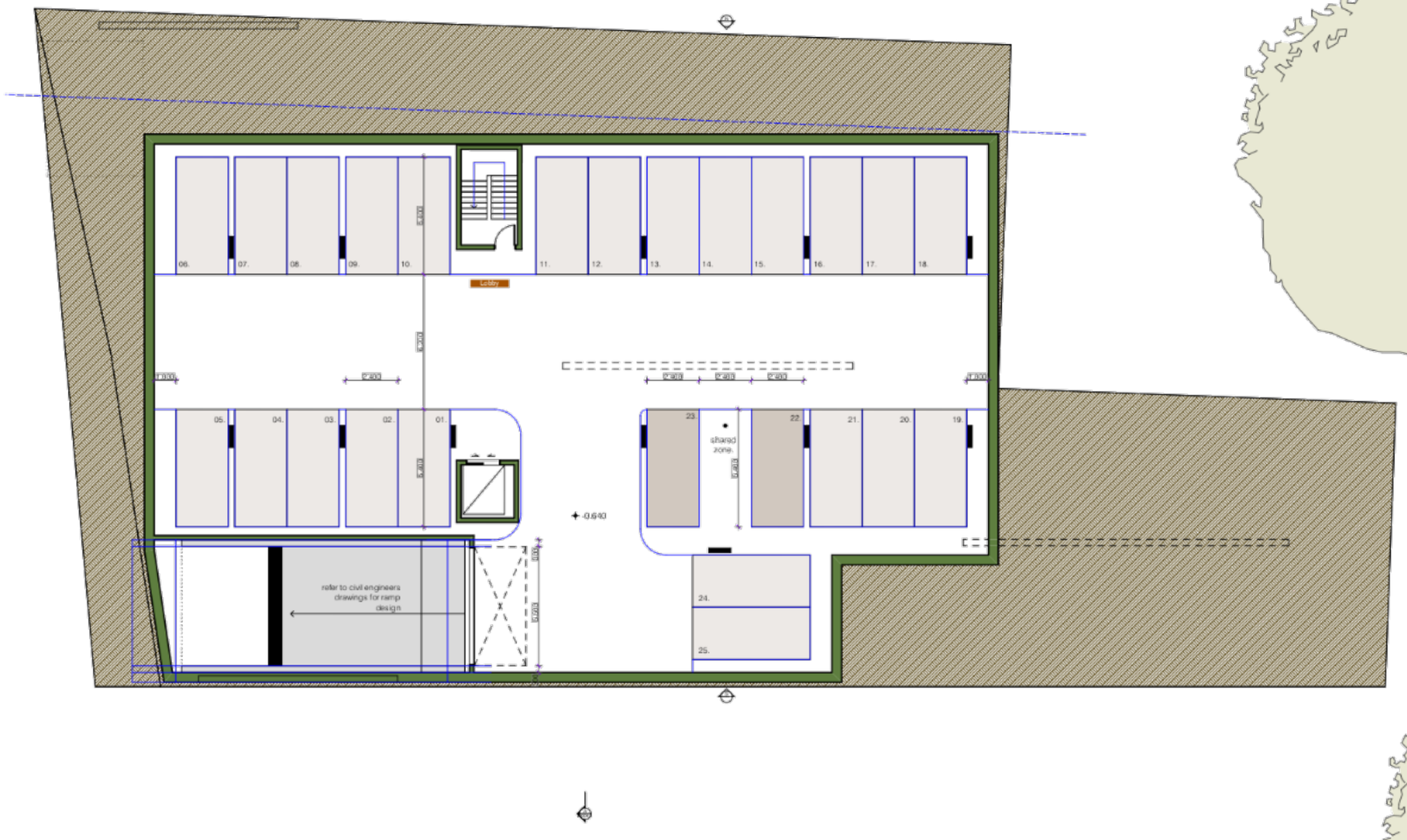
Lots 16 + 17 in DP 14946

First Floor plan

Scale @ A3 1:200	Feb 2019	Issue: draft
Project: 1708	Plot Date: 26/2/19	D202

This drawing is issued as a preliminary concept design and must not be used for construction, cost estimation or any purpose other than for preliminary design purposes. Do not scale off this drawing. use figured dimensions where provided.

Rev	Description	Date
A	Preliminary DA issue	27/3/18
B	Revised DA issue	4/5/18
draft	draft issue	26/2/19



MGA - Map Grid NSW (by survey)
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PO Box 4371 East Gosford NSW 2250
Tel: +61 2 4324 3632
Nominated Architect: Andrew Dickson RAIA (Arch Registration No.7667)

Koolewong Residences

Shop and Residential Flat Building

34-36 Brisbane Water Drive Koolewong NSW Australia

Lots 16 + 17 in DP 14946

Basement Floor Plan

Scale @ A3 1:200	Feb 2019	Issue: draft
Project: 1708	Plot Date: 26/2/19	D200

Rev.	Description	Date
A	Preliminary DA issue	27/3/18
B	Revised DA issue	4/5/18
draft	draft issue	26/2/19

MGA - Map Grid NSW (by survey)
TN - True (Solar) North

White + Dickson Architects.

PO Box 4371 East Gosford NSW 2250
Tel: +61 2 4324 3632
Nominated Architect: Andrew Dickson RAIA (Arch Registration No.3667)

Koolewong Residences

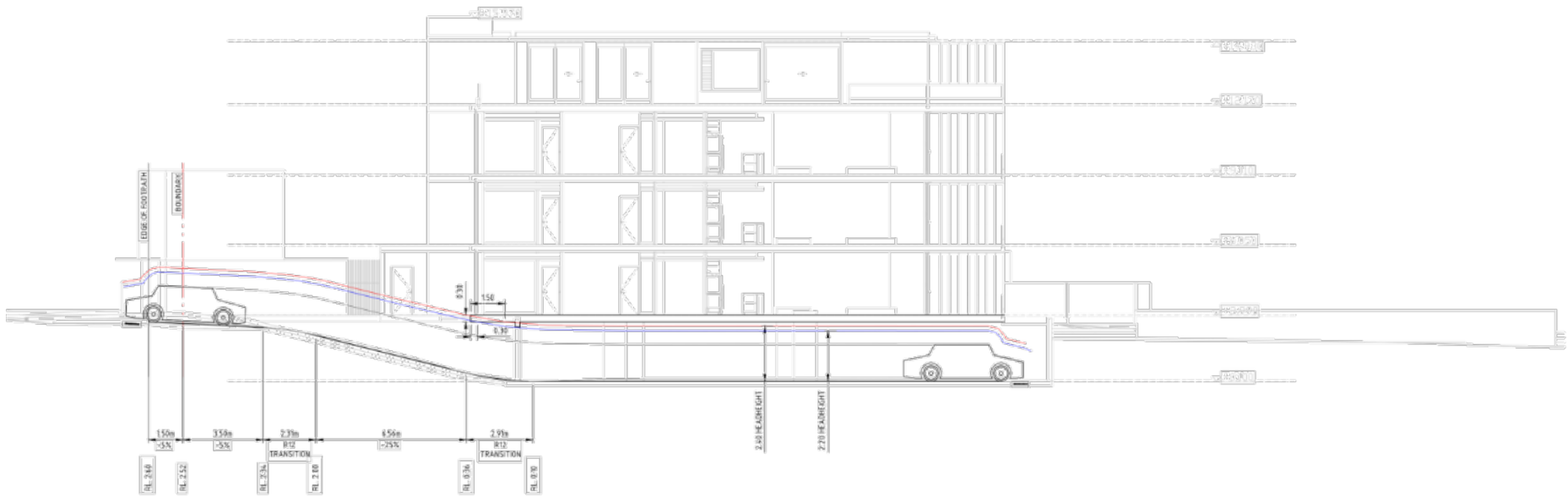
Shop and Residential Flat Building

34-36 Brisbane Water Drive Koolewong NSW Australia

Lots 16 + 17 in DP 14946

Ground Floor plan

Scale @ A3 1:200	Feb 2019	Issue: draft
Project: 1708	Plot Date: 26/2/19	D201



PROJECT:	34-36 BRISBANE WATER DRIVE, KOOLEWONG
JOB NUMBER:	NL172238
TITLE:	DRIVEWAY LONGSECTION
PAGE No:	1
DATE:	02/03/18
DRAWN:	ROBERT SUCKLING

NORTHROP
Central Coast
Suite 4, 257-259 Central Coast Hwy, Erina NSW 2250
Ph: (02) 4365 4648 Fax: (02) 4367 6565
Email: centralcoast@northrop.com.au ABN: 81 094 433 100

NOTES:
1. THE STRUCTURAL THICKNESS OF THE SLAB IS ASSUMED TO BE 300mm.

2. LONGSECTION IS BASED ON ADVICE PROVIDED BY TRAFFIC CONSULTANT & REQUIRED GROUND CLEARANCE

2. IT IS OUR RECOMENDATION TO ALLOW FOR 2.4m HEADHEIGHT CLEARANCE (SHOWN IN RED). THIS WILL REQUIRE THE SLAB EXTENTS TO BE REDUCED BY 15m.

3. THE MINIMUM CLEARANCE ALLOWED IS 2.2m (SHOWN IN BLUE). THE SLAB EXTENTS WILL NEED TO BE REDUCED BY 0.3m (OR HAVE A SLAB THICKNESS OF 250mm) TO PROVIDE ADEQUATE CLEARANCE. THIS WILL REQUIRE WARNING SIGNAGE FOR ALL AREAS THAT HAVE LESS THAN 2.3m CLEARANCE TO ANY OBSTRUCTION.

4. A SUITABLE LOCATION WILL NEED TO BE FOUND FOR THE ROLLER DOOR HOUSING TO ENSURE IT DOES ENCROACH ON THE HEADHEIGHT CLEARANCE.

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Appendix B

Tube Count Data

CfeIT bob.white@cfeit.com (02) 9740 8600

Traffic Count Summary Report

Count Number	6648	Ref : TTPA	Lat/Long : S33 27.963 / E151 19.090	GUBD 96 M-6
Street	KOOLEWONG RAILWAY CROSSING, TASCOTT : Between GLENROCK PARADE & BRISBANE WATER DRIVE (bidirectional) :			
Location	Combined Counts (6629,6630) immediately after railway racks on Keep Clear Sign			*Carriageway*

TOTAL COUNT MATRIX

Start Date	12-SEP-18
Start Time	100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	21
Weekly 85th Percentile Speed	28
Five Day AADT	1620
Seven Day AADT	1594

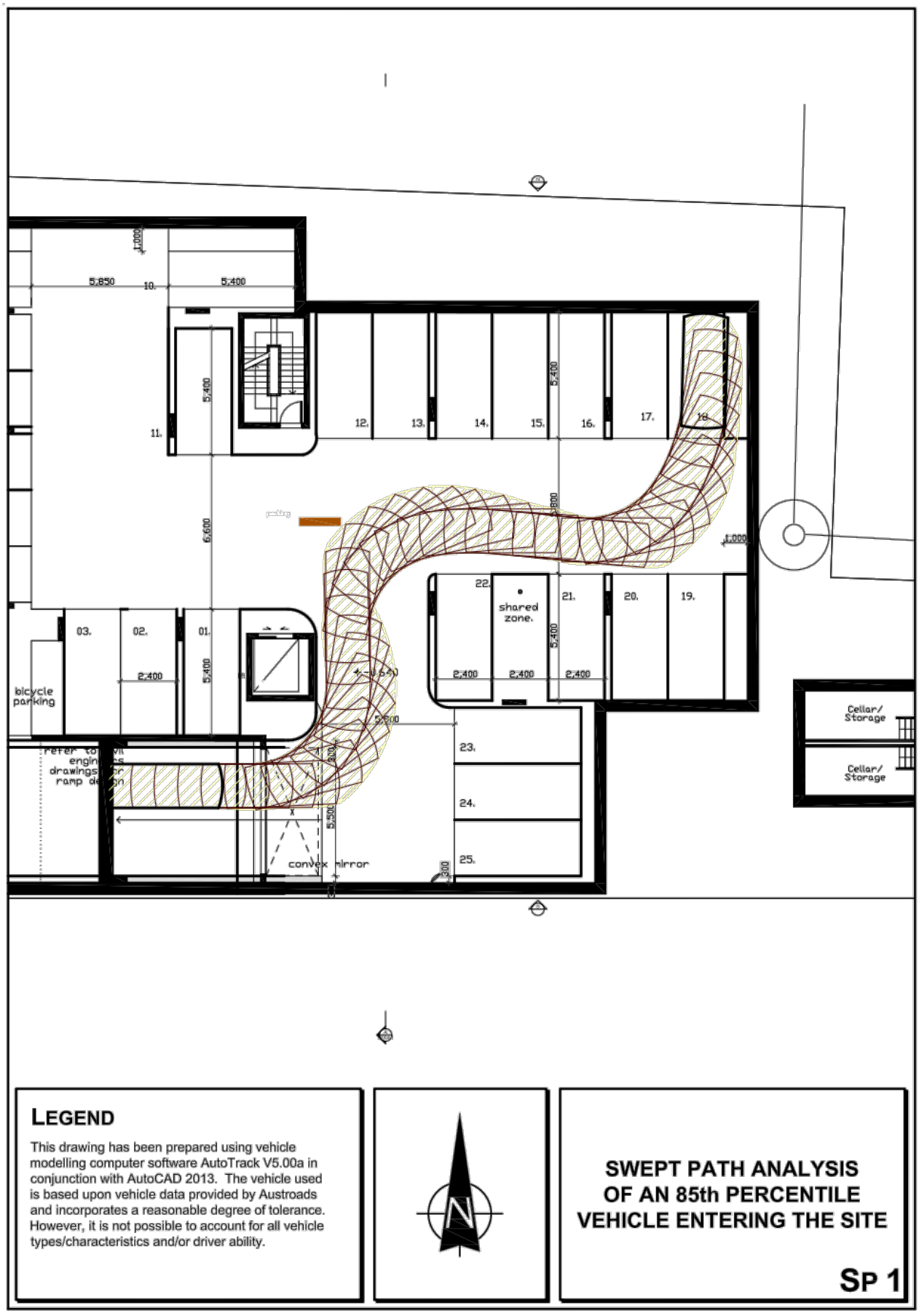
	MON 17TH	TUE 18TH	WED 12TH	THU 13TH	FRI 14TH	SAT 15TH	SUN 16TH	5 Dav Total	5 Dav Average	7 Dav Total	7 Dav Average
Midnight - 1am	2	3	1	1	1	8	11	8	2	27	4
1am - 2am	2	3	6	1	0	8	14	12	2	34	5
2am - 3am	1	2	3	1	1	9	5	8	2	22	3
3am - 4am	3	5	2	8	2	4	5	20	4	29	4
4am - 5am	8	12	8	7	11	5	2	46	9	53	8
5am - 6am	30	40	32	27	29	11	10	158	32	179	26
6am - 7am	50	55	58	55	58	26	18	276	55	320	46
7am - 8am	94	89	93	98	87	72	47	461	92	580	83
8am - 9am	109	102	106	125	110	123	76	552	110	751	107
9am - 10am	103	91	110	112	92	129	109	508	102	746	107
10am - 11am	103	84	84	87	97	136	113	455	91	704	101
11am - Midday	104	106	98	88	102	113	130	498	100	741	106
Midday - 1pm	104	93	126	85	99	151	121	507	101	779	111
1pm - 2pm	91	87	87	99	122	126	118	486	97	730	104
2pm - 3pm	132	89	98	96	114	117	104	529	106	750	107
3pm - 4pm	132	144	121	132	144	88	111	673	135	872	125
4pm - 5pm	137	160	150	140	159	118	101	746	149	965	138
5pm - 6pm	124	149	140	142	126	135	109	681	136	925	132
6pm - 7pm	121	106	122	114	111	110	69	574	115	753	108
7pm - 8pm	74	60	64	71	70	63	47	339	68	449	64
8pm - 9pm	40	40	61	50	58	37	30	249	50	316	45
9pm - 10pm	24	32	27	47	49	26	18	179	36	223	32
10pm - 11pm	10	14	25	23	31	26	9	103	21	138	20
11pm - Midnight	4	5	4	5	12	30	9	30	6	69	10
Total	1602	1571	1626	1614	1685	1671	1386	8098	1619	11155	1593

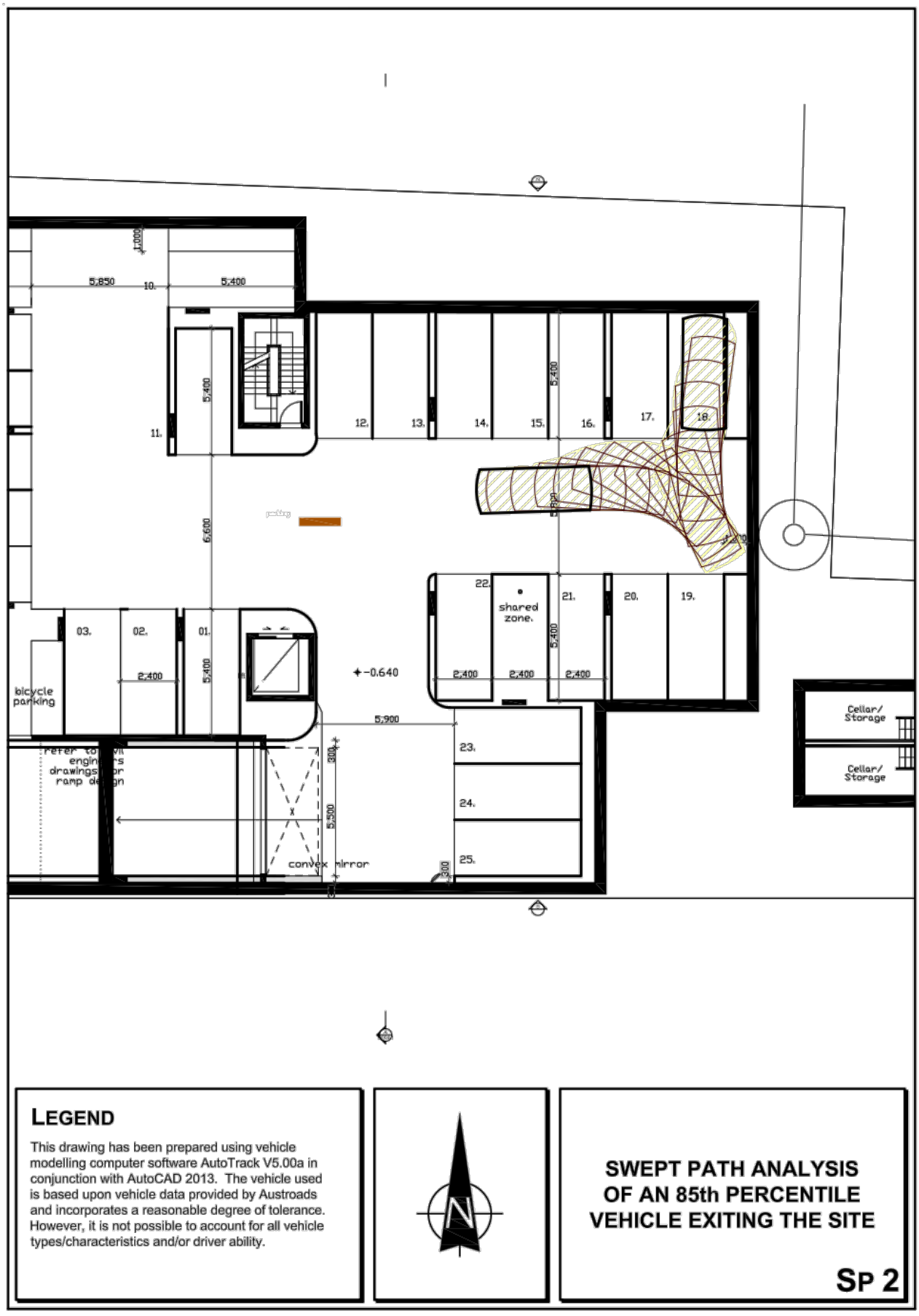
Data displayed has been compiled from pneumatic traffic count processes and is subject to the documented limitations

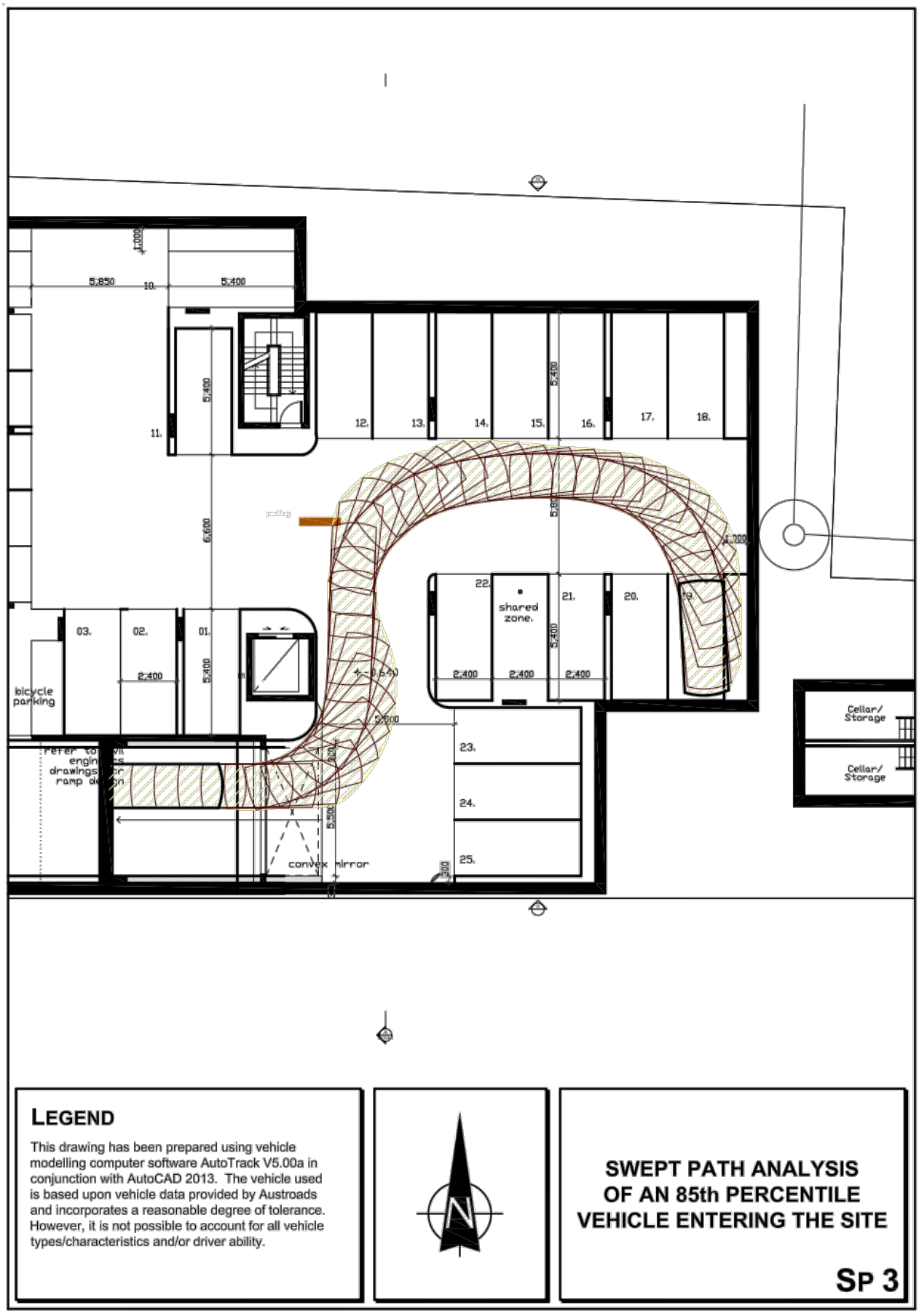
Transport and Traffic Planning Associates

Appendix C

Turning Path Assessment


5,850
10.
5,400
1,000
5,400
11.
12.
13.
14.
15.
16.
17.
18.
6,600
shared zone.
22.
21.
20.
19.
03.
02.
01.
2,400
5,400
bicycle parking
2,400
2,400
2,400
5,200
23.
24.
25.
5,500
convex mirror
Cellar/ Storage
Cellar/ Storage
LEGEND
This drawing has been prepared using vehicle modelling computer software AutoTrack V5.00a in conjunction with AutoCAD 2013. The vehicle used is based upon vehicle data provided by Austroads and incorporates a reasonable degree of tolerance. However, it is not possible to account for all vehicle types/characteristics and/or driver ability.
N
SWEPT PATH ANALYSIS OF AN 85th PERCENTILE VEHICLE ENTERING THE SITE
SP 1


5,850
10.
5,400
1,000
5,400
11.
12.
13.
14.
15.
16.
17.
18.
5,400
6,600
22.
shared zone.
21.
20.
19.
03.
02.
01.
2,400
5,400
+-0.640
2,400
2,400
2,400
5,400
bicycle parking
5,900
Cellar/ Storage
Cellar/ Storage
23.
24.
25.
300
5,500
convex mirror
300
LEGEND
This drawing has been prepared using vehicle modelling computer software AutoTrack V5.00a in conjunction with AutoCAD 2013. The vehicle used is based upon vehicle data provided by Austroads and incorporates a reasonable degree of tolerance. However, it is not possible to account for all vehicle types/characteristics and/or driver ability.
N
SWEPT PATH ANALYSIS OF AN 85th PERCENTILE VEHICLE EXITING THE SITE
SP 2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This drawing has been prepared using vehicle modelling computer software AutoTrack V5.00a in conjunction with AutoCAD 2013. The vehicle used is based upon vehicle data provided by Austroads and incorporates a reasonable degree of tolerance. However, it is not possible to account for all vehicle types/characteristics and/or driver ability.
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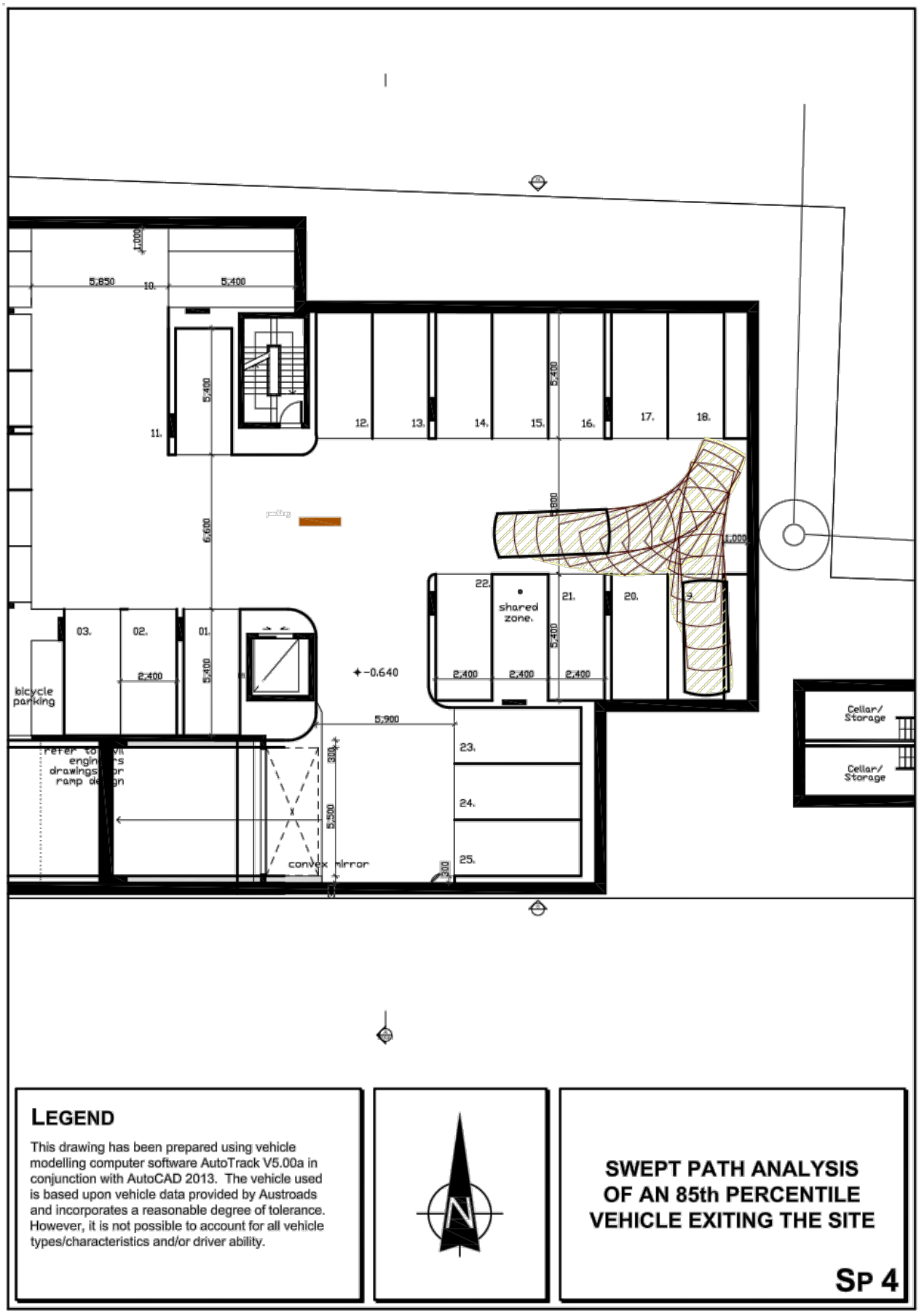
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SWEPT PATH ANALYSIS OF AN 85th PERCENTILE VEHICLE EXITING THE SITE
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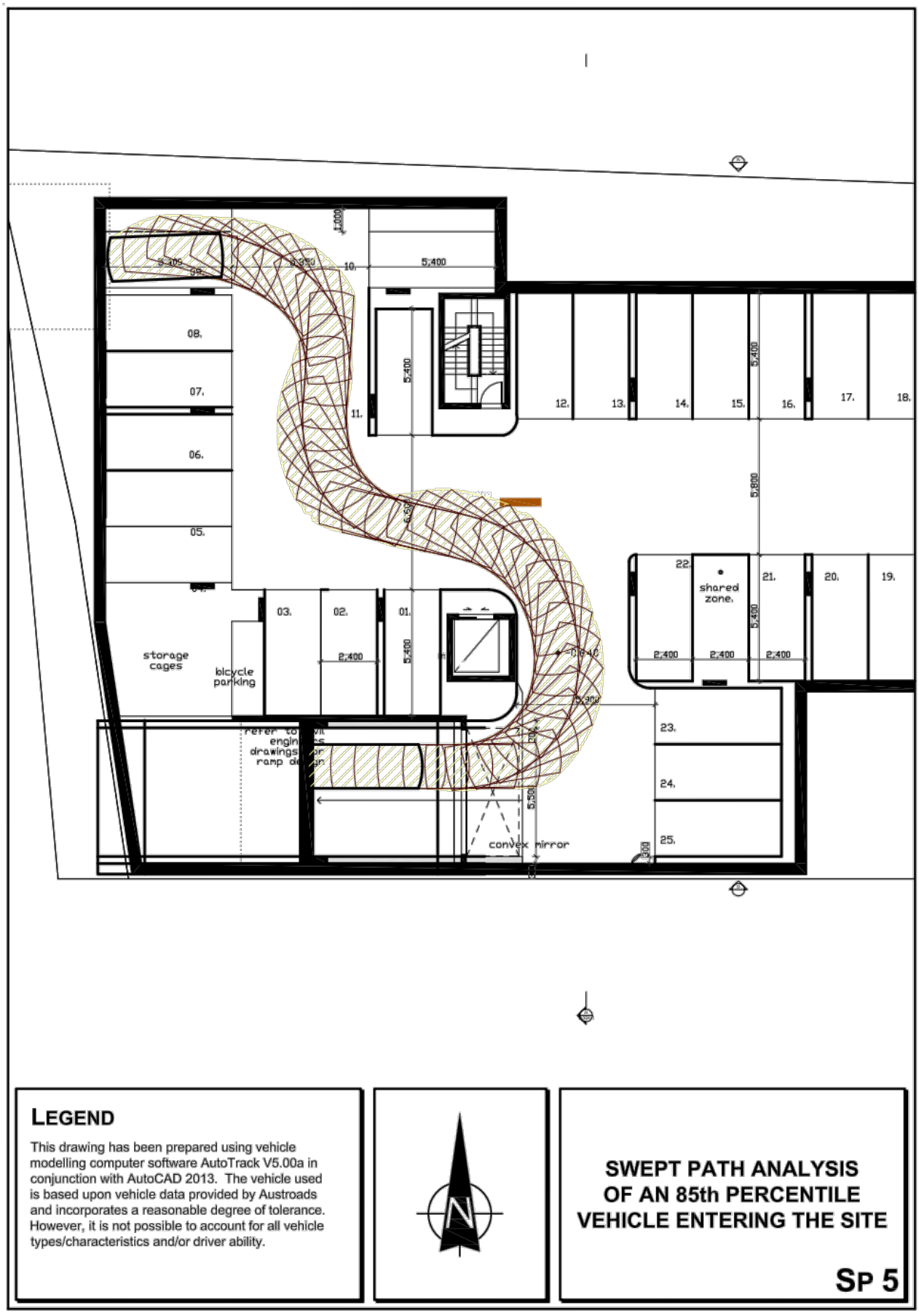
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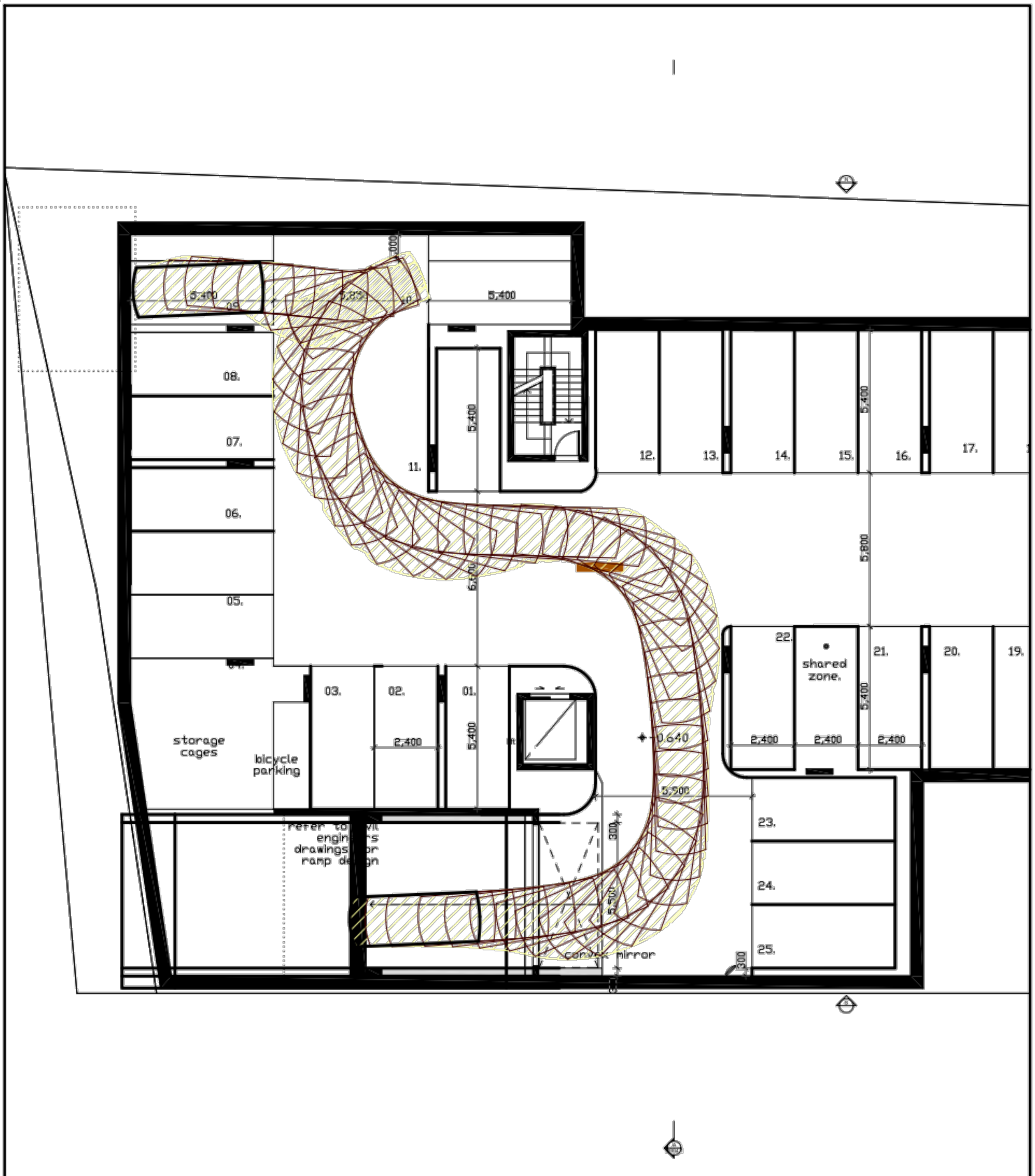

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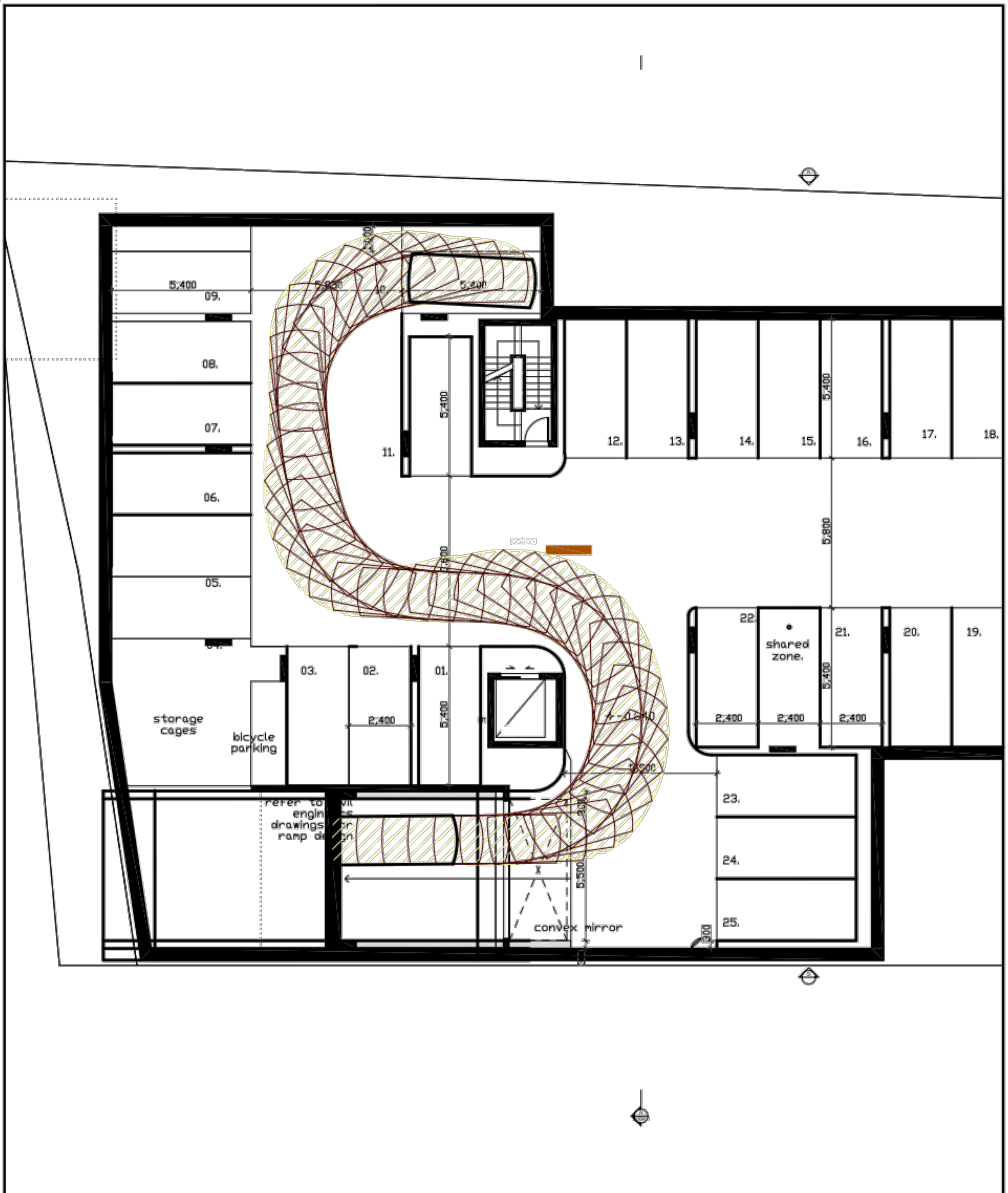
SWEPT PATH ANALYSIS OF AN 85th PERCENTILE VEHICLE EXITING THE SITE

SP 6



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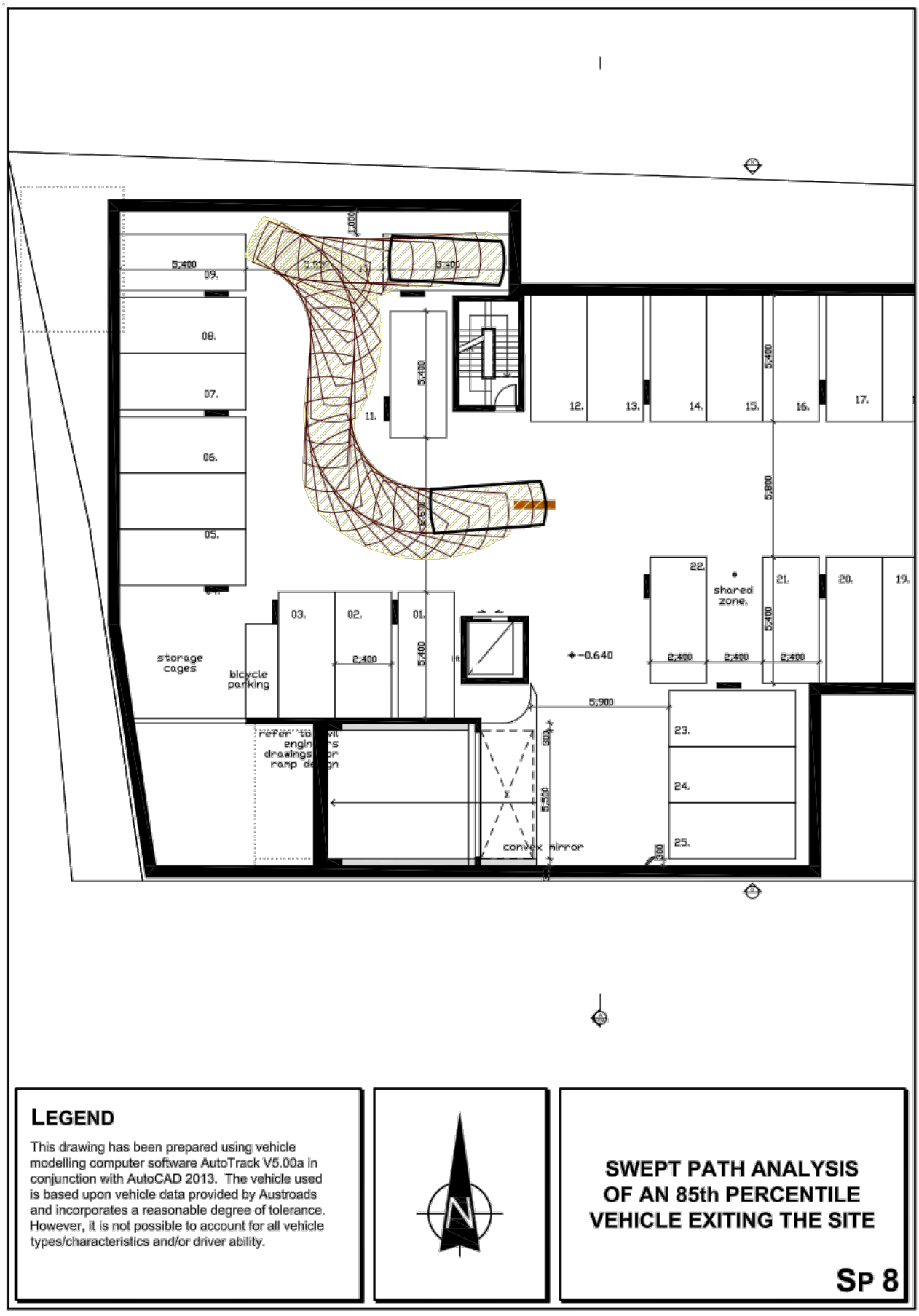
SWEPT PATH ANALYSIS OF AN 85th PERCENTILE VEHICLE ENTERING THE SITE

SP 7



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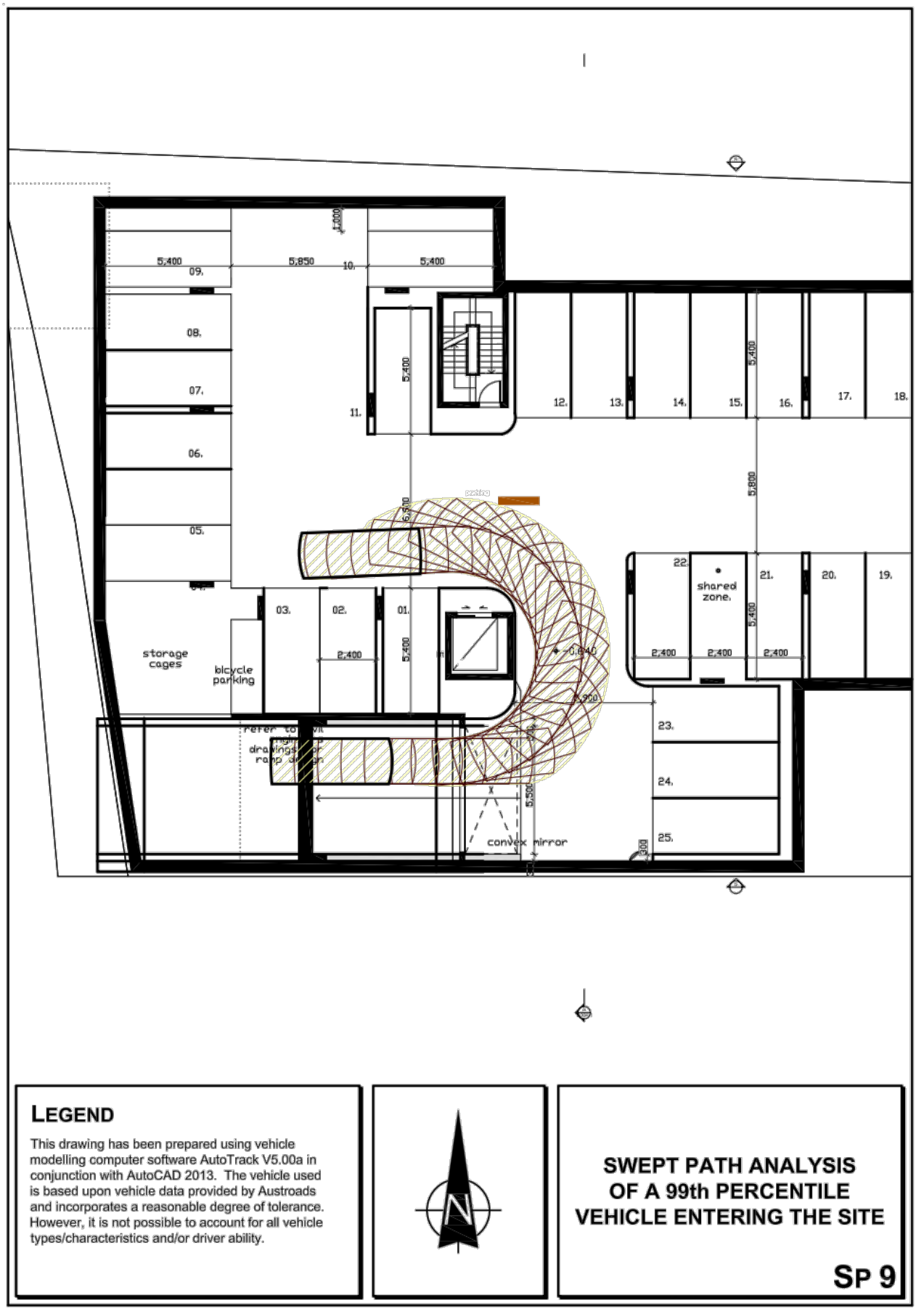
SWEPT PATH ANALYSIS OF AN 85th PERCENTILE VEHICLE EXITING THE SITE

SP 8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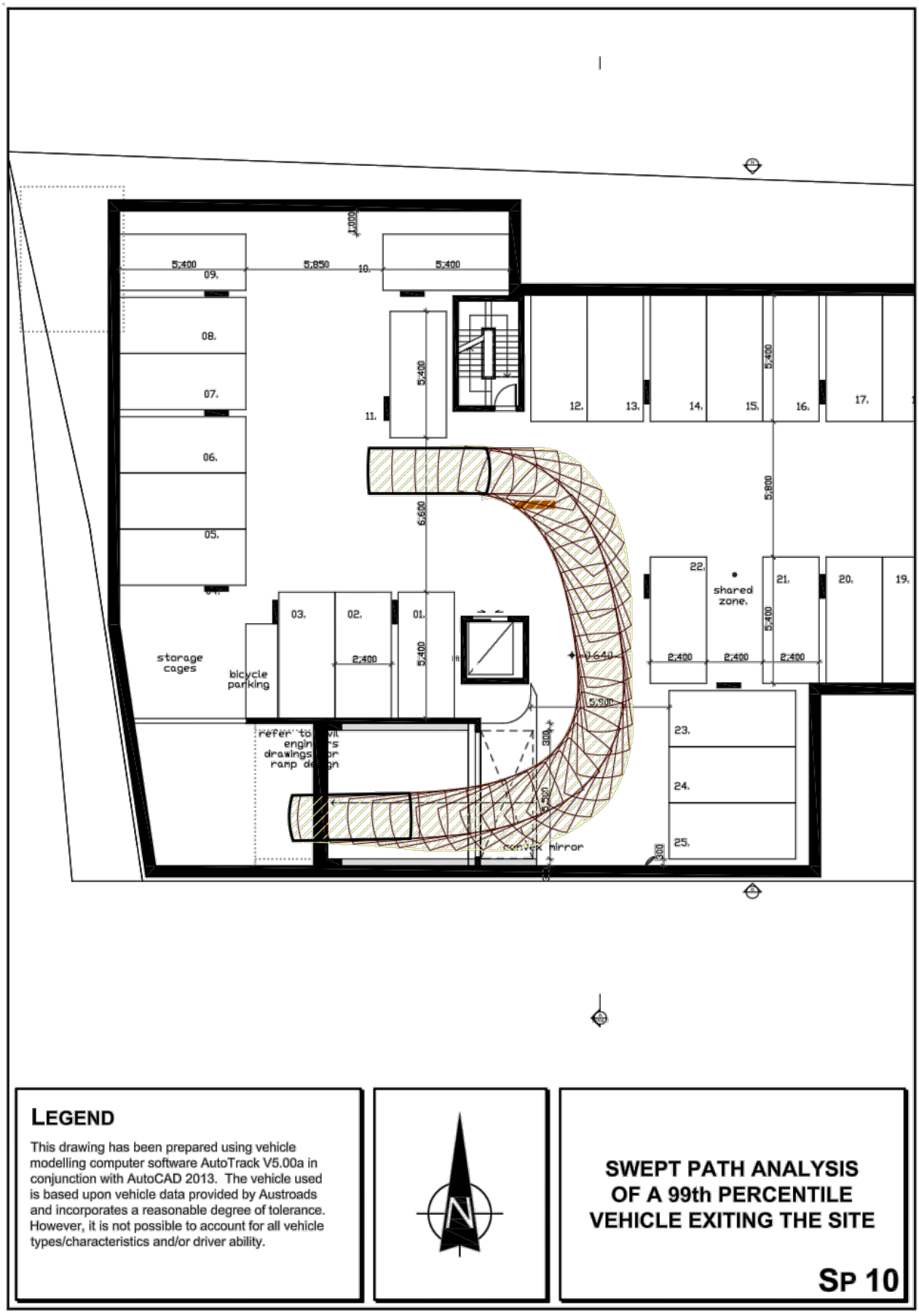
SWEPT PATH ANALYSIS OF A 99th PERCENTILE VEHICLE ENTERING THE SITE
SP 9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SWEPT PATH ANALYSIS OF A 99th PERCENTILE VEHICLE EXITING THE SITE
SP 10

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Integrated Practical Solutions

Report on
Geotechnical Investigation and Acid Sulfate Soil Assessment

Proposed Mixed Use Development
34-36 Brisbane Water Drive, Koolewong

Prepared for
Harman Project Engineering Management Pty Ltd

Project 83242.00
October 2017

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

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Report prepared for	Harman Project Engineering Management Pty Ltd		
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Document status and review

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Revision 0	1	1	DP Archive

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		18 October 2017
Reviewer	for John Harvey	18 October 2017

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Report on Geotechnical Investigation and Acid Sulfate Soil Assessment
Proposed Mixed Use Development
34-36 Brisbane Water Drive, Koolewong

1. Introduction

This report presents the results of a geotechnical investigation and acid sulfate soil assessment undertaken for a proposed mixed use development at 34-36 Brisbane Water Drive, Koolewong. The investigation was commissioned in an email dated 8 September 2017 by Lin Xu of Harman Project Engineering Management Pty Ltd and was undertaken in accordance with Douglas Partners Pty Ltd (DP) proposal WYG170146 dated 14 June 2017.

From the information provided, it is understood that development of the site will include demolishing existing buildings and proposed construction of residential dwellings and a commercial building located on the frontage of Brisbane Water Drive. A basement is proposed to be located in the central part of the site, along with internal access roads/carparks.

The aim of the investigation was to provide comment on:

- Subsurface conditions and groundwater observations at test locations;
- Site classification in accordance with AS2870-2011: Residential Slabs and Footings;
- Geotechnical parameters for the design of footings;
- Safe batter slopes;
- Retaining wall design parameters;
- Recommendations on site preparation and earthworks; and
- Presence of acid sulfate soils (ASS).

The investigation included the drilling of four boreholes with in-situ testing, collection of representative soil samples and subsequent laboratory testing. The details of the field work are presented in this report, together with comments and recommendations on the issues outlined above.

2. Site Description

The site is located at 34-36 Brisbane Water Drive, Koolewong and is identified as Lots 16 and 17 in DP 19496. It is bounded to the north and south by previously developed residential lots, to the east by an undeveloped residential lot and to the west by Brisbane Water Drive. Lots 16 and 17 have a total surface area of approximately 1,500 m^2.

At the time of the investigation Lot 16 (southern lot) contained an existing dwelling surrounded by grassed lawns. Lot 17 (northern lot) also contained an existing dwelling surrounded by grassed lawns,

with a detached garage/shed and swimming pool located towards the eastern boundary of the lot. A photograph showing the site is presented in Figure 1.

Figure 1: View of the site looking from Brisbane Water Drive to the east

Figure 2 shows an aerial image of the site and location of the proposed development.

Figure 2: Aerial image of the site showing the location of the proposed development

(Image sourced from Nearmap PhotoMaps, dated 13 November 2016)

Based on survey information provided, it is understood surface levels in Lot 16 fall from approximately 2.6 m AHD in the north-western corner of the lot to approximately 1.6 m AHD to the south-eastern corner, whilst surface levels in Lot 17 fall from approximately 2.8 m AHD in the north-western corner to

approximately 2 m AHD in the south-eastern corner of the lot. The topography at the site is relatively level with surface gradients of less than 1° falling from north-west to south-east towards Brisbane Water estuary.

3. Regional Geology and Acid Sulfate Soil Mapping

With reference to the 1:100,000 scale Gosford-Lake Macquarie Geology Sheet, the site is primarily underlain by Quaternary Alluvium comprising gravels, sands, silts, and clays. Underlying the Quaternary Alluvium and on the western side of the lots, fronting onto Brisbane Water Drive, is the Terrigal Formation belonging to the Narrabeen Group. The Terrigal Formation typically comprises interbedded shale and sandstone.

Reference to the Soil Conservation Service of NSW Acid Sulfate Soil Risk Map for Gosford indicates that the site is mapped as a sandplain with ground surface levels about 1 m to 2 m AHD. The risk map indicates that the site is not mapped as having acid sulfate soils, however directly adjacent to the east and south lot boundaries of the site there is a high probability of occurrence of acid sulfate soils occurring within 1 m of the ground surface.

4. Field Work Methods

Field work for the investigation was undertaken on 13 September 2017 and included the drilling of four boreholes (Bore 1 to Bore 4) to depths of between 2.0 m and 3.8 m. The boreholes were drilled using a utility-mounted push tube rig fitted with 60 mm diameter sampling tubes. Dynamic cone penetrometer tests (DCPs) were carried out adjacent to the boreholes, to provide information on the relative strength or density of the near-surface soil.

Borehole locations were set out with reference to the site plan of the proposed development and are therefore approximate. The locations of the boreholes are shown on Drawing 1, included in Appendix B.

Engineering logs of the subsurface conditions encountered in the boreholes were prepared by a geotechnical officer who also collected representative samples for identification purposes and subsequent laboratory testing. Details of the conditions encountered in the boreholes are given in the log sheets which are presented in Appendix C. These logs should be read in conjunction with the explanatory notes, which define the descriptive terms and classification methods.

5. Field Work Results

The subsurface conditions encountered during the investigation are broadly summarised as alluvial / estuarine deposits consisting of a layer of topsoil to a depth of between 0.1 m and 0.5 m, overlying alluvial soils comprising mainly loose to medium dense sand and silty sand. Some thin layers of dense and very dense sand were encountered in Bore 1 and Bore 4 at depths of 1.5 m and 1.8 m respectively. A layer of soft to firm clayey silt was encountered between 0.9 m and 1.4 m in Bore 2. In

Bore 1, filling comprising red mottled brown sand with a trace of fine grained gravel was encountered to a depth of 0.5 m, overlying the alluvial sands. A layer of dense to very dense/very stiff to hard clayey sand/sandy clay was also encountered at a depth of 1.9 m in Bore 1.

Groundwater was observed at depths of between 1.3 m and 1.6 m in Bores 1 to 3, at the time of investigation. Standing groundwater level was not observed in Bore 4; however, groundwater seepage was encountered at 1.9 m depth. Boreholes were backfilled on completion of logging and sampling which precluded long term monitoring of groundwater levels. It should be noted that groundwater levels are variable and can be affected by factors such as soil permeability and recent climatic conditions, and can vary with time.

6. Laboratory Testing

To assess for the presence/absence of acid sulfate soils, samples collected from the boreholes were tested in Douglas Partners' laboratory using a calibrated pH meter for measurement of pH in water (pH_F) and pH following oxidation in hydrogen peroxide (pH_{FOX}) in accordance with the ASSMAC Guidelines (Ref 7). The following samples were tested:

- Nine (9) samples from Bore 1;
- Five (5) samples from Bore 2;
- Seven (7) samples from Bore 3; and
- Eight (8) samples from Bore 4.

Based on the results of the screening tests, four samples were selected and forwarded to Envirolab Services Pty Ltd to undergo Chromium reducible sulfur (S_{Cr}) testing. The results of these tests are summarised in Table 1, with the laboratory testing certificate provided in Appendix D.

Table 1: Results of Acid Sulfate Soils Screening and Laboratory Testing

Bore	Sample Depth [a] (m)	Sample Description	Soil Textural Classification	Screening Test Results				Laboratory Results				
				pH			Strength of Reaction[b]	pH_{KCL}	S_{cr} (%S)	Titratable Actual Acidity (TAA) [%sulfur]	Acid Neutralising Capacity (ANC) [%sulfur]	Net Acidity (%sulfur)
				pH_F	pH_{FOX}	pH_F - pH_{FOX}						
1	0.20	Light grey SAND	Coarse	6.3	4.3	**2.0**	F	-	-	-	-	-
1	0.40	Red brown SAND	Coarse	6.4	5.8	0.6	1	-	-	-	-	-
1	0.60	Light grey SAND	Coarse	6.5	5.6	0.9	1	-	-	-	-	-
1	1.00	Dark grey and brown SLIGHTLY SANDY SILT	Coarse	6.6	5.7	0.9	1	-	-	-	-	-
1	1.50	Light grey SAND	Coarse	6.6	5.9	0.7	1	-	-	-	-	-
1	2.00	Light grey and light brown CLAYEY SAND/SANDY CLAY	Coarse	6.5	5.4	**1.1**	1	-	-	-	-	-
1	2.50	Light grey and light brown CLAYEY SAND/SANDY CLAY	Coarse	5.7	5.2	0.5	4	-	-	-	-	-
1	3.00	Light grey and light brown CLAYEY SAND/SANDY CLAY	Coarse	5.7	5.2	0.5	2	-	-	-	-	-
1	3.80	Light grey and light brown CLAYEY SAND/SANDY CLAY	Coarse	5.4	4.9	0.5	4	-	-	-	-	-
2	0.05	Dark brown SILTY SAND	Coarse	5.9	5.0	0.9	F	-	-	-	-	-
2	0.30	Dark brown SAND	Coarse	6.1	5.2	0.9	1	-	-	-	-	-
2	0.70	Light brown SAND	Coarse	6.2	5.1	**1.1**	1	-	-	-	-	-
2	1.00	Dark brown SILTY CLAY/CLAYEY SILT	Coarse	6.2	**2.9**	**3.3**	2	4.3	0.05	0.1	<0.005	**0.20**
2	1.80	Light brown SAND	Coarse	5.7	**3.4**	**2.3**	1	-	-	-	-	-
3	0.10	Dark grey SILTY SAND	Coarse	5.9	3.5	**2.4**	F	-	-	-	-	-
3	0.50	Dark brown SILTY SAND	Coarse	6.3	**3.4**	**2.9**	1	5.4	<0.005	0.11	<0.005	**0.12**
3	1.00	Light brown SAND	Coarse	6.4	4.0	**2.4**	1	-	-	-	-	-
3	1.30	Dark brown SAND	Coarse	6.4	**3.3**	**3.1**	1	-	-	-	-	-
3	2.20	Dark brown SILTY SAND	Coarse	6.1	**2.4**	**3.7**	4	-	-	-	-	-

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Bore	Sample Depth [a] (m)	Sample Description	Soil Textural Classification	Screening Test Results				Laboratory Results				
				pH			Strength of Reaction[b]	pH_{KCL}	S_{cr} (%S)	Titratable Actual Acidity (TAA) [%sulfur]	Acid Neutralising Capacity (ANC) [%sulfur]	Net Acidity (%sulfur)
				pH_F	pH_{FOX}	pH_F - pH_{FOX}						
3	3.00	Light brown SAND	Coarse	6.2	**2.2**	**4.0**	4	4.8	0.04	0.01	<0.005	**0.056**
3	3.80	Light brown SAND	Coarse	6.2	**2.4**	**3.8**	4	-	-	-	-	-
4	0.30	Light brown SAND	Coarse	6.3	4.6	**1.7**	F	-	-	-	-	-
4	0.60	Light grey SAND	Coarse	6.5	5.3	**1.2**	1	-	-	-	-	-
4	1.00	Light grey SAND	Coarse	6.6	4.2	**2.4**	1	-	-	-	-	-
4	1.50	Grey CLAYEY SILTY SAND	Coarse	5.6	**3.0**	**2.6**	2	4.5	<0.005	0.04	<0.005	**0.042**
4	2.00	Light grey SAND	Coarse	5.8	5.1	0.7	1	-	-	-	-	-
4	2.70	Light brown SILTY SAND	Coarse	5.9	**3.1**	**2.8**	1	-	-	-	-	-
4	3.00	Light grey SAND	Coarse	6.2	**2.9**	**3.3**	1	-	-	-	-	-
4	3.70	Dark brown SILTY SAND	Coarse	5.7	**2.0**	**3.7**	1	4.0	1.4	0.12	<0.005	**1.5**
ASSMAC Indicators		Coarse Texture: 'Sands to loamy sands'		**<4**	**<3.5**	**>1**	-	-	-	-	-	**0.03**
		Medium Texture: 'Sandy loams to light clays'										**0.06**
		Fine Texture: 'Medium to heavy clays'										**0.1**

Notes:

a Depth below ground surface

b Strength of Reaction

1: denotes no or slight reaction

2: denotes moderate reaction

3: denotes violent reaction

4: denotes "volcano" i.e. Very rigorous effervescence, gas evolution and heat

F after number indicates a bubbling/frothy reaction (organics)

- not tested

Bold notates exceedance of net acidity action criteria or ASSMAC indicator

7. Proposed Development

It is understood that development of the site will include the following:

- Demolishing existing dwellings;
- Construction of approximately 14 residential dwellings. From the conceptual plan provided it appears as though the dwelling are two-storey;
- Construction of a commercial building, located on the frontage of Brisbane Water Drive;
- Construction of a basement, located in the centre of the site, with a footprint of approximately 600 m^2; and
- Internal pavements for vehicular access.

Figure 3 shows a concept plan for the proposed development.

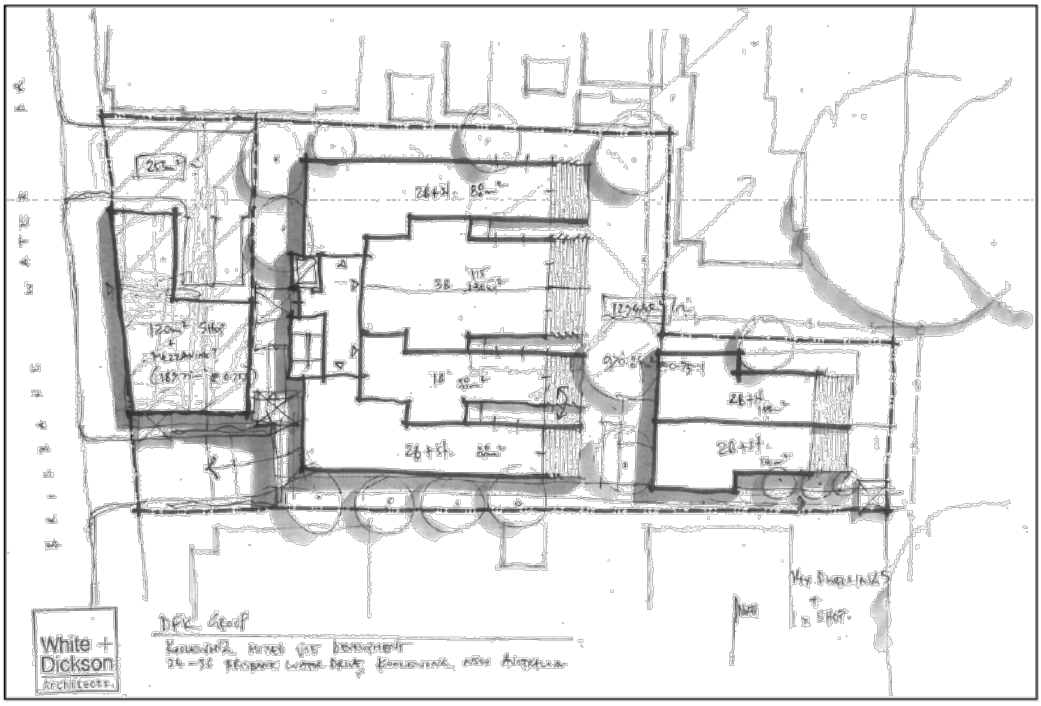


Figure 3: Concept plan show the proposed development

(Adapted from drawing provided by White + Dickson Architects)

8. Comments

8.1 Site Classification

Site classification of residential sites, as described in AS 2870 – 2011: *Residential Slabs and Footings* (Ref 1), is partly based on ground movement limits, which are defined by the characteristic surface movement (y_s), applicable to sites containing cohesive (clay) soils. Site classification also has to consider other factors such as the presence of uncontrolled filling, or weak soils.

Based on the presence of up to approximately 1.5 m of loose sand/silty sand, as identified in Bores 1 to 4, the site is classified as 'Class P' in accordance with AS 2870-2011 (Ref 1).

Residential footings for a 'Class P' site would need to be specifically designed according to the engineering principles detailed in AS2870-2011 (Ref 1) and in this report.

If footings for the proposed development are supported beneath the loose sand/silty sand and founded within medium dense sand (water-charged) or better, a 'Class A' classification could be considered appropriate for foundation design.

It should be noted that the site classification is also dependent on proper site maintenance, which should be carried out in accordance with AS 2870 – 2011 and with the CSIRO Building Technology File 18: Foundation Maintenance and Footing Performance – A Homeowner's Guide, which is attached.

8.2 Footings

At this stage, DP does not have any information on the proposed excavation depths and structural loads for the proposed buildings. Due to the presence of loose sand/silty sand to a depth of approximately 1.5 m below existing surface levels and groundwater at between 1.3 m and 1.6 m depth, shallow footings are not considered to be an appropriate footing system. It is envisaged that piled footings may be the most appropriate footing system.

8.2.1 Piled Footings

Piled footings taken to found within at least medium dense sand below 1.5 m depth, may be considered appropriate.

Based on the subsurface conditions encountered, steel screw piles or continuous flight auger (CFA) piles are considered to be appropriate pile types for the proposed development. Concrete bored piles were considered, however, given the presence of free groundwater at between 1.3 m and 1.6 m depth and saturated sandy soils which are prone to collapse, concrete bored piles are not recommended. Timber driven piles were considered, however not considered suitable due to the proximity of surrounding buildings and the vibrations that would be induced during pile installation.

The design, installation and testing of piles should be undertaken with reference to the piling code AS 2159–2009 (Ref 2). The design geotechnical strength of a pile ($R_{d,g}$) is the ultimate geotechnical strength ($R_{d,ug}$) multiplied by the geotechnical strength reduction factor (ϕ_g), such that:

$$R_{d,g} = \phi_g \cdot R_{d,ug}$$

The calculated value $R_{d,g}$ must equal or exceed the structural design action effect E_d. Selection of the geotechnical strength reduction factor (ϕ_g) is based on a series of individual risk ratings (IRR) which are weighted and lead to an average risk rating (ARR). A geotechnical strength reduction factor ϕ_g of 0.48 is considered appropriate for the design of piles for this project but it should be reduced to 0.4 if pile testing is not proposed.

Steel Screw Piles

In the event that screw piles are considered, it is suggested that specialist installers be consulted in relation to the suitability of ground conditions and the most suitable screw pile for the site.

Steel screw piles are a proprietary pile type and are relatively quick to install. They rely on the soil underlying the helix to resist vertical loads without undergoing excessive settlement. It is usual practice to ignore skin friction in determining the vertical capacity of screw piles.

Steel screw piles are not suitable for support of the proposed basement excavation because they have negligible lateral load-carrying capacity.

It is suggested that the ratio of the pile helix outstand to the helix plate thickness be less than 10, otherwise considerable elastic flexing or plastic deformation of the helix plate will occur and conventional pile settlement predictions could be exceeded. For example, for a 16 mm thick helix plate, the outstand width should be less than or equal to 200 mm. Where a 160 mm diameter pile shaft and 16 mm thick helix plate is used, the total helix diameter should be less than or equal to 480 mm.

Steel screw piles should be founded at a depth of at least 2.0 m and extend into medium dense (or better) sand. The ultimate end bearing pressure of piles in sand is a function of depth and soil strength. Table 2 shows preliminary design values and capacities for steel screw piles of selected diameter and founding depth.

Table 2: Steel Screw Pile – Preliminary Design Values and Capacities

Founding Depth (m)	Helix Diameter (mm)	Ultimate End-Bearing Pressure (kPa)	Ultimate Geotechnical Strength $R_{d,ug}$ (kN)	Design Geotechnical Strength $R_{d,g}$ (1) (kN)
2.0	350	1,500	140	65
2.0	500	1,500	290	135
2.0	700	1,500	570	270

Notes:

1 Design geotechnical strength based on $\phi g = 0.48$

Notwithstanding the above estimates, the piling contractor should confirm the pile capacities achieved taking into account the equipment used, installation monitoring (such as torque measurements), site conditions and experience. Design of steel screw piles should also take into account the durability requirements of the ground conditions.

Continuous Flight Auger Piles

Continuous Flight Auger piles (also referred to as grout injected piles) should be founded at a depth of at least 2.0 m and extend into medium dense (or better) sand. The ultimate end bearing pressure of piles in sand is a function of depth and soil strength. Table 3, below, provides preliminary design values and capacities for 450 mm and 600 mm diameter CFA piles.

Table 3: Geotechnical Strengths for CFA Piles

Founding Depth (m)	Pile Diameter (mm)	Ultimate End-Bearing Pressure (kPa)	Ultimate Geotechnical Strength $R_{d,ug}$ (kN)	Design Geotechnical Strength $R_{d,g}$ (1) (kN)
2.0	450	1,500	230	110
2.0	600	1,500	420	200

Notes:
1 Design geotechnical strength based on $\phi g = 0.48$

8.3 Excavation Support

In the area of the proposed basement, due to the proximity of site boundaries and existing structures, the presence of loose sand/silty sand to a depth of 1.5m, and the presence of groundwater at depths of between 1.3 m to 1.6 m, it is anticipated that retaining walls (either permanent or temporary) will be required for the support of excavations.

8.3.1 Retaining Wall Design Parameters

For the design of retaining walls or temporary shoring, a triangular earth pressure distribution can be adopted to calculate earth pressures. The earth pressure coefficients apply for well drained retained materials. Separate account should be made in the design for additional surcharge loads, during or after construction. Design of retaining walls should be based on the parameters given in Table 4.

Table 4: Retaining Wall Design Parameters - Unfactored

Material	Bulk Unit Weight (kN/m^3)	Submerged Bulk Unit Weight (kN/m^3)	Active Earth Pressure Coefficient, K_a	At Rest Earth Pressure Coefficient, K_o	Passive Earth Pressure Coefficient, K_p
Sand / Silty Sand (Loose)	18	8	0.35	0.55	2.6
Sand / Silty Sand (Medium Dense)	18	8	0.30	0.45	3.2
Sand / Silty Sand (Dense or better)	18	8	0.25	0.40	4.0

It should be noted that the parameters provided in Table 4 are ultimate values and a suitable factor of safety should be applied to design.

Where retaining walls are not able to tolerate deflections, then they should be designed based on 'at rest' conditions rather than 'active' conditions. The design of the retaining walls should also account for any surcharge loads, such as from vehicles or from any proposed structures located behind the wall. Braced retaining walls should be designed for 'at rest' conditions as described above.

The earth pressure design parameters given above are based on the assumption that full drainage will be provided behind the retaining walls. All retaining walls, regardless of height, should be provided with geotextile encapsulated free draining backfill (such as 10 mm single size aggregate) with a slotted drainage pipe at the base of the wall for the relief of hydrostatic pressures. Water collected by the drainage system should be discharged to a formal stormwater drainage system. If drainage is not provided behind retaining walls, then the walls should be designed to withstand hydrostatic pressures over the full height of the walls, with the submerged bulk unit weight values provided in Table 4. This is necessary even for retaining walls that are supporting sand soils.

8.4 Site and Subgrade Preparation

Site preparation for the proposed development should be carried out in general accordance with the following methodology:

- Strip existing vegetation and any organic topsoils and stockpile for later use in landscaping (if required);
- Where required, excavate to design level;
- Proof roll the exposed surface accompanied by careful visual inspection by an experienced geotechnical consultant to allow detection and treatment of any soft or compressible zones. Unsuitable materials should be over-excavated and replaced with suitable filling. Based on the presence of loose soils identified up to about 1.5 m depth, a provisional rate for over-excavation and replacement of soft or compressible zones should also be allowed for in the budget estimates;
- Within the building pad, the exposed surface should be compacted to a density ratio of at least 98% Standard Compaction in areas proposed for filling.

- Filling should be placed in near horizontal layers no thicker than 300 mm (loose thickness) and be compacted to the density ratio indicated above. Moisture contents of the subgrade and additional filling should be maintained within -3% to +1% of the optimum moisture content for Standard compaction. Filling should comprise relatively homogeneous materials (such as site won natural materials) with a maximum particle size of not greater than 100 mm and be free from organic and other deleterious matter; and
- Protect the area after subgrade preparation to maintain moisture content close to the equilibrium as far as practicable. The placement of subbase gravel, or concrete slab (within building footprint) would normally provide adequate protection.

Earthworks testing and inspections for filling should be carried out, within the building area and at least 1 m beyond, to Level 1 conditions, as defined in AS 3798-2007: *Guidelines on Earthworks for Commercial and Residential Developments* (Ref 3).

NSW EPA Guidelines require that all material removed from site should be subjected to a Waste Classification Assessment.

8.5 Pavement Design

It is considered that a flexible pavement would be suitable for on-grade access roads and carparks. If a carpark pavement design is required for the basement, it is recommended that, due to subsurface soil conditions and groundwater levels, a concrete pavement be adopted.

8.5.1 Design Traffic Loading

Traffic loadings have not been advised for the project; however, it is considered that a design traffic loading of 6×10^4 Equivalent Standard Axle (ESA) repetitions over a 30 year design period would be appropriate for the proposed on-grade car park. This traffic loading is equivalent to a 'Shareway' road class as per Table 6.1 of Central Coast Council's *Gosford Civil Works Specification Volume 1 - Design* (Ref 4).

8.5.2 Design CBR

Based on the results of the investigation, the subgrade in the area of the proposed internal access roads and car parking areas generally comprise loose to medium dense sand/silty sand.
Based on the results of the boreholes, DCPs and experience with similar soils in the local area, a design subgrade CBR value of 7% has been adopted for the pavement thickness design.

8.5.3 Pavement Thickness Design

Table 5 shows the minimum layer thicknesses for the proposed new flexible pavement. This design is based on procedures contained in Central Coast Council's *Gosford Civil Works Specification Volume 1 – Design* (Ref 4), and Austroads *Guide to Pavement Technology – Part 2: Pavement*

Structural Design (Ref 6). It also requires that subgrade preparation will be carried out in accordance with Section 8.5.4 of this report.

Table 5: Minimum Flexible Pavement Design– Internal Access Roads and On-grade Carpark

Pavement	Road Class	Design Traffic Load (ESA)	Subgrade CBR (%)	Total Pavement Thickness (mm)	Layer Component		
					Wearing Course (mm)	Basecourse (mm)	Subbase Course (mm)
Internal Access / Carpark	Shareway	6×10^4	7	310*	40mm* AC14 and primer seal	150*	120*

Notes: * As per minimum council requirements

Note that placement and compaction of relatively thin pavement layers, such as 120 mm of subbase, on sand can prove difficult. Alternatives include increasing the subbase thickness sufficiently (say, 150 mm) or placing the whole granular pavement as 270 mm of basecourse.

It is recommended that, due to subsurface soil conditions and groundwater levels, a concrete pavement is adopted for the basement carpark.

8.5.4 Subgrade Preparation

Subgrade preparation for the proposed internal access roads and carpark pavement should be carried out in general accordance with the following methodology:

- Strip all vegetation and topsoils, topsoil can be expected to a depth of up to about 0.5 m;
- Where required, excavate to design subgrade level within the area of proposed pavement construction;
- Proof roll the exposed subgrade with smooth drum vibrating roller having a static weight of at least 8 tonnes. At least six passes of the roller would be required. A final pass should be carried out in the presence of an experienced geotechnical engineer in order to check for any soft or compressible zones which may require over-excavation and replacement with suitable filling;
- Subgrade materials should be compacted to at least 100% Standard compaction or 80% density index, with moisture contents within ± 2% of the optimum moisture content (OMC);
- Additional subgrade filling, if required, should comprise material having a soaked CBR value of 10%. The filling should be well graded and have a maximum particle size of not greater than 50 mm. This material should be placed in layers not exceeding 250 mm loose thickness, with each layer compacted to at least 100% Standard compaction;
- Protect the area after subgrade preparation to maintain moisture content close to the equilibrium as far as practicable and prevent further disturbance. The placement of subbase gravel would normally provide adequate protection; and
- Place subsequent layers of suitable pavement materials in layers not thicker than 250 mm loose thickness and compact in accordance with details given in Section 8.5.5 of this report.

In accordance with Central Coast Council's (CCC) requirements, individual pavement layers (subgrade, subbase and basecourse) must be presented for testing immediately after placement and compaction. The results of such testing would need to be reported to CCC for final approval.

8.5.5 Material Properties

The material quality and compaction requirements for pavement layers are presented in Table 6.

Table 6: Material Quality and Compaction Requirements

Layer	Material Quality	Compaction
Wearing Course	Conform to RMS Spec. R116	RMS Spec R116
Base Course	Conform to RMS Spec. 3051; DGB20 with minimum soaked CBR 80%	Minimum 98% Modified Compaction
Subbase Course	Conform to RMS Spec. 3051; DGS20 with minimum soaked CBR 40%	Minimum 95% Modified Compaction
Select Material	Conform to *Gosford Civil Works Specification Volume 2 – Construction* (Ref 5)	Minimum 100% Standard Compaction
Subgrade	Minimum Soaked CBR 7%	Minimum 100% Standard Compaction / 80% Density Index

8.5.6 Drainage

The vehicular pavement thickness design provided above depends on the provision of adequate surface and subsoil drainage to maintain the subgrade as close to the optimum moisture content as possible and to ensure that the pavement layers do not become saturated.

Preparation of subgrade surfaces should normally be such that adequate crossfalls for surface drainage are achieved across the final pavement.

8.6 Acid Sulfate Soils

The results of the screening tests for pH in H_2O (pH_F) were in the range of 5.4 to 6.6 pH units. The ASSMAC guidelines (Ref 7) suggest that actual acid sulfate soils (AASS) may be present if the pH_F is less than 4 pH units when measured in dry seasonal conditions. This condition did not occur in any of the 29 samples screened.

The results of the initial screening tests for pH following addition of H_2O_2 (pH_{FOX}) were in the range of 2.0 to 5.9 pH units. The ASSMAC guidelines suggest that potential acid sulfate soil (PASS) conditions may be present where pH in H_2O_2 (pH_{FOX}) is less than 3.5 pH units. This condition occurred in 11 of the 29 samples screened.

The ASSMAC guidelines also suggest that potential acid sulfate soil conditions may be present where the difference between pH in H_2O (pH_F) and pH in H_2O_2 (pH_{FOX}) is greater than 1 pH unit. This occurred in 19 of the 29 samples screened.

The screening tests are generally considered as indicative only and can be affected by the presence of organic material. Definitive and quantitative results are obtained from laboratory testing by either Suspension Peroxide Oxidation Combined Acidity and Sulfate (SPOCAS) or Chromium reducible sulfur (S_{Cr}) methods. Chromium reducible sulfur testing was carried out on five samples that exceeded the above indicators of acid sulfate soils. The results of these tests are presented in Table 1, Section 6.

As outlined in *The Soil Management Guidelines* (Ref 8) the action criteria which define the requirement for management of acid sulfate soils vary depending on the amount of soil disturbed and textural classification of the soil.

The method for determining net acidity has been derived from the Soil Management Guidelines (Ref 8) and the Laboratory Methods Guidelines (Ref 9) and can be summarised as follows:

- When $4.5 \leq pH_{KCl} < 5.5$ Net acidity = S_{Cr} + $_S$-TAA; and
- When $pH_{KCl} < 4.5$ Net acidity = S_{Cr} + $_S$-TAA + $_S$-S_{NAS}.

Where: *pH_{KCl} = Potassium chloride suspension pH*
S_{Cr} = Chromium Reducible Sulfur
FF = Fineness Factor (at least 1.5)
$_S$-TAA = Titratable Actual Acidity

Due to the proposed basement, it is expected that more than 1,000 tonnes of soil will be disturbed during construction of the proposed development.

Therefore based on the results of the screening and detailed laboratory testing, DP has made the following interpretation in relation to ASS conditions at the site:

- The light brown, light grey and dark brown sands between 0.5 m and 2.2 m depth in Bores 2 to 4 are considered to be moderately potential acid sulfate soils (PASS);
- The light brown sand and dark brown silty sand below 2.2 m depth in Bores 2 to 4 are considered to be highly potential acid sulfate soils (PASS);
- The brown to grey sand/silty sand with organics to a depth of 0.5 m are not considered to be acid sulfate soils. The soils may be considered to be slightly acidic; and
- The light grey sand (0.0 - 1.9 m) and light grey/light brown clayey sand/sandy clay (1.9 - 3.8 m) in Bore 1 are not considered to be acid sulfate soils;

Excavation of PASS should be undertaken with reference to an Acid Sulfate Soil Management Plan as outlined in Section 9.

9. Acid Sulfate Soil Management Plan (ASSMP)

9.1 Proposed Management Options

Based on the results of the screening and laboratory testing and DP's understanding of the project, excavation of the identified PASS (refer to Section 8.6) will occur. The following options for the excavated PASS have been considered:

- Following treatment/neutralisation, the neutralised soils would be suitable for re-use on site below a non-permeable surface such as pavement or at least 0.3 m of non-acid sulfate soil, such as topsoil; and
- Following treatment/neutralisation, the neutralised soils may be disposed to a licensed landfill. In the event that any spoil is to be disposed of from site, the generator of the waste is obliged to chemically assess the soil in accordance with *Waste Classification Guidelines, Part 1: Classifying Waste* (Ref 10). DP's investigations did not include a waste classification assessment.

9.2 Proposed Excavation Procedure

The following excavation procedure is recommended during the proposed works:

- Excavation of the identified PASS and stockpile on site for treatment/neutralisation prior to on-site reuse or off-site disposal; and
- Excavation of soils identified in Section 8.6 as non PASS should be stockpiled on-site separately from PASS for re-use on-site or removal from site as required.

Stockpiles of acid sulfate soils should be kept separate to other materials and should include:

- Bunding, preferably constructed of low permeability soil (i.e. clay) or hay bales covered with impermeable plastic, of at least 0.3 m in height around the entire treatment area;
- An impervious pad on which to place the stockpile. Where an impervious pad cannot be provided, a guard layer of lime should be placed across the temporary stockpiling and treatment area. A rate of approximately 1 kg/m^2 per vertical metre of fill with Grade 1 Agricultural Lime is suggested to counteract the generation of acidic leachate due to the soils being exposed to air;
- Measures to minimise the surface area exposed to oxidisation; and
- Incorporation of a leachate collection and treatment system.

Stockpiles of PASS should be kept moist to minimise oxidation, prior to lime treatment. They should be covered to prevent rainfall leaching through the stockpile and possibly creating acidic runoff and be located as far away as possible from any sensitive receptors (e.g. waterways).

9.3 Soil Treatment

Excavated acid sulfate soils should be treated with lime in accordance with the liming rate outlined below. Following lime treatment the soils will require validation testing (soil screening and laboratory testing) to confirm that the appropriate quantities of lime have been added and the soils have been appropriately mixed/blended.

The required dosing rate for lime treatment should be calculated from the following formula, which includes a factor of safety of 1.5.

$$\textit{Alkali Material Required (kg) per tonne of soil} = \left(\text{Net Acidity\%S} \times 30.59 \times 1.02\right) \times \frac{100}{\text{ENV (\%)}} \times \text{FOS}$$

Where: *30.59 = conversion factor to H_2SO_4;*
1.02 = conversion factor to $CaCO_3$/t;
1.5 = safety factor (FOS);
ENV = Effective Neutralising Value (e.g. 80% for Grade 1 Agricultural lime).

Note: *The ENV is calculated based on the molecular weight, particle size and purity of the neutralising agent and should be assessed for proposed materials in accordance with The Soil Management Guidelines* (Ref 8).

It is recommended that Grade 1 agricultural lime is used for the neutralisation of acid sulfate soils. Advice is given against the use of other more reactive types of lime (such as hydrated lime) as they would pose a much greater risk to the environment than would be posed by the use of agricultural lime.

Based on the results of the laboratory testing carried out during the investigation, the following initial liming rates are recommended:

- Acid Sulfate Soils
  - Light brown/light grey/dark brown sand (0.5 - 2.2 m) 12 kg lime / tonne of soil; and
  - Light brown sand/dark brown silty sand (> 2.2 m) 90 kg lime / tonne of soil.

The neutralising agent should be thoroughly mixed into the soils using the bucket of an excavator or skid-steer loader. The actual liming rate may need to change due to the natural variations in the pyritic components in the soil. The actual liming will therefore be appropriately adjusted on the basis of monitoring results obtained during the treatment process. Additional lime will be required if monitoring results indicate that appropriate neutralisation has not been achieved.

Following initial liming, screening and laboratory testing will be required to determine whether the acid sulfate soil have been appropriately neutralised.

Further treatment of the acid sulfate soil will be required if monitoring of the material reveals any of the following properties:

- If soil pH is less than 6; and
- If soil pH after forced oxidation is less than 5 or greater than 9; and
- Net Acidity greater than zero following treatment.

9.4 Placement of a Guard Layer

Following completion of excavation activities, the newly exposed PASS within the excavation should be dosed at a rate of approximately 1 kg/m^2 with Grade 1 Agricultural Lime to counteract the generation of acidic leachate due to the soils being exposed to air.

9.5 Dewatering

Groundwater was measured at 1.3 m to 1.6 m depth during the investigation. Provisions for dewatering and treatment of leachate should therefore be included in the methodology and budget estimates for the proposed works.

The following procedure is recommended in order to minimise potential adverse impacts resulting from excavation and dewatering of PASS during construction:

- minimise the dewatering depth required for excavation;
- minimise the time and volume of exposed PASS (i.e. staged dewatering and excavation over relatively short durations);
- extracted groundwater should be discharged to a bunded area (i.e. evaporation/infiltration area or storage tanks) away from the dewatering site or discharged to stormwater/sewer, subject to regulatory approval; and
- the pH and turbidity of the extracted water should be monitored prior to discharge. Neutralisation should be undertaken if discharge water pH falls below natural groundwater levels or regulatory requirements.

The amount of neutraliser required to be added to the leachate or discharged groundwater can be calculated from the equation below:

$$\text{Alkali Material Required (kg)} = \frac{M_{Alkali} \times 10^{-pH\ initial}}{2 \times 10^{3}} \times V$$

Where: *pH initial = initial pH of leachate*
V = volume of leachate or collected water (litres)
M_{Alkali} = molecular weight of alkali material (g/mole)

Note: *molecular weight of hydrated lime = 74 g/mole.*

The alkali should be added to the leachate/discharged groundwater water as a slurry. Mixing of the slurry is best achieved using an agitator.

Whilst agricultural lime is well suited to the treatment of acid sulfate soils, it does not dissolve readily in water; hence it should not be used for adjusting the pH of water. Hydrated lime ($Ca(OH)_2$) is more soluble than agricultural lime making it more suited to treating water, but it has a high pH value (pH ~ 12). Therefore, if hydrated lime is to be used to treat water, it should be added incrementally with care and thoroughly mixed to prevent overshooting the desired pH.

As a guide, the approximate quantities of hydrated lime would be required to neutralise acidic water to pH 7 are provided in Table 7.

Table 7: Recommended Dosing Rates for Water using Hydrated Lime (in kg of $Ca(OH)_2$)

Water pH	Dosing Rate (kg of $Ca(OH)_2$)		
	2 m^3 #	5 m^3 #	10 m^3 #
2	0.74	1.85	3.7
3	0.074	0.185	0.37
4	0.0074	0.0185	0.037
5	0.00074	0.00185	0.0037
6	0.000074	0.000185	0.00037

Notes: # volume of extracted water

It should be recognised that portable holding and treatment tanks will be required to allow on site neutralisation of water generated by dewatering activities prior to disposal.

Notwithstanding any additional regulatory requirements placed on water disposal by Central Coast Council (CCC), formerly Gosford City Council, it is recommended that CCC's Gosford *Policy for the Discharge of Liquid Trade Waste and Septic Waste to the Gosford City Council Sewage System* (Ref 11) be met before discharging any water, leachate or groundwater to the sewerage system.

Table 8: CCC's Gosford Liquid Trade Waste General Acceptance Limits

Indicator	Sewerage System
pH	7.0 – 9.0
Total Suspended Solids[1]	300 mg/L (600 mg/L)[2]

Notes:

1 – Field measurement of Turbidity may be substituted for TSS subject to regulatory approval. Correlation of Turbidity to TSS is dependant of site specific factors and it is recommended that if turbidity is to be monitored then the relationship should be establish at the commencement of the monitoring programme. Notwithstanding, an initial approximate correlation of turbidity to TSS would be 0.5 NTU approximates 1 mg/L TSS.

2 – It is understood that of Discharge limit of 600 mg/L maybe be accepted by CCC for some sites.

Depending on the results of testing, additional lime may need to be applied to adequately neutralise the soil.

9.6 Reporting

A record of treatment of acidic and acid sulfate soils should be maintained by the contractor and should include the following details:

- date;
- location/area;
- time of excavation;
- neutralisation process undertaken;
- lime rate utilised;
- results of monitoring;
- disposal location; and
- tonnages and landfill dockets (if applicable).

A record should also be maintained confirming contingency measures and additional treatment if undertaken. A final report should be issued upon completion of the works presenting the monitoring regime and results, and confirming that adverse environmental impact has not occurred during the works.

10. References

1. Australian Standard, AS 2870-2011: *Residential Slabs and Footings*, Standards Australia, January 2011
2. Australian Standard, AS 2159-2009: *Piling Design and Installation*, Standards Australia, November 2009
3. Australian Standard, AS 3798-2007: *Guidelines on Earthworks for Commercial and Residential Developments*, Standards Australia, March 2007
4. Central Coast Council, *Gosford Civil Works Specification, Volume 1 – Design*, Central Coast Council Publication, Revision date July 2017
5. Central Coast Council, *Gosford Civil Works Specification, Volume 2 – Construction*, Central Coast Council Publication, Revision date July 2017
6. Austroads, *Guide to Pavement Technology Part 2: Pavement Structural Design*, Austroads Publication No. AGPT02-12, 2012
7. NSW Acid Sulfate Soil Management Advisory Committee, *Acid Sulfate Soil Manual*, August 1998.
8. Dear SW, Ahern CR, O'Brien LE, Dobos SK, McElnea AE, Moore NG and Watling KM, *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines*, Department of Science, Information, Technology, Innovation and the Arts, Queensland Government, Version 4.0, 2014
9. Ahern CR, McElnea AE and Sullivan LA, *Acid Sulfate Soils Laboratory Methods Guidelines*, Department of Natural Resources, Mines and Energy, Indooroopilly, June 2004

10. NSW Environment Protection Authority (EPA), *Waste Classification Guidelines, Part 1: Classifying Waste*, November 2014.
11. Central Coast Council, formerly Gosford City Council, *Policy for the Discharge of Liquid Trade Waste and Septic Waste to the Gosford City Council Sewage System*

11. Limitations

Douglas Partners (DP) has prepared this report for this project at 34-36 Brisbane Water Drive, Koolewong in accordance with DP's proposal dated 14 June 2017 and acceptance received from Kejia Liu dated 8 September 2017. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Harman Project Engineering Management Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current

scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical / environmental components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

July 2010

About this Report

Site Anomalies
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

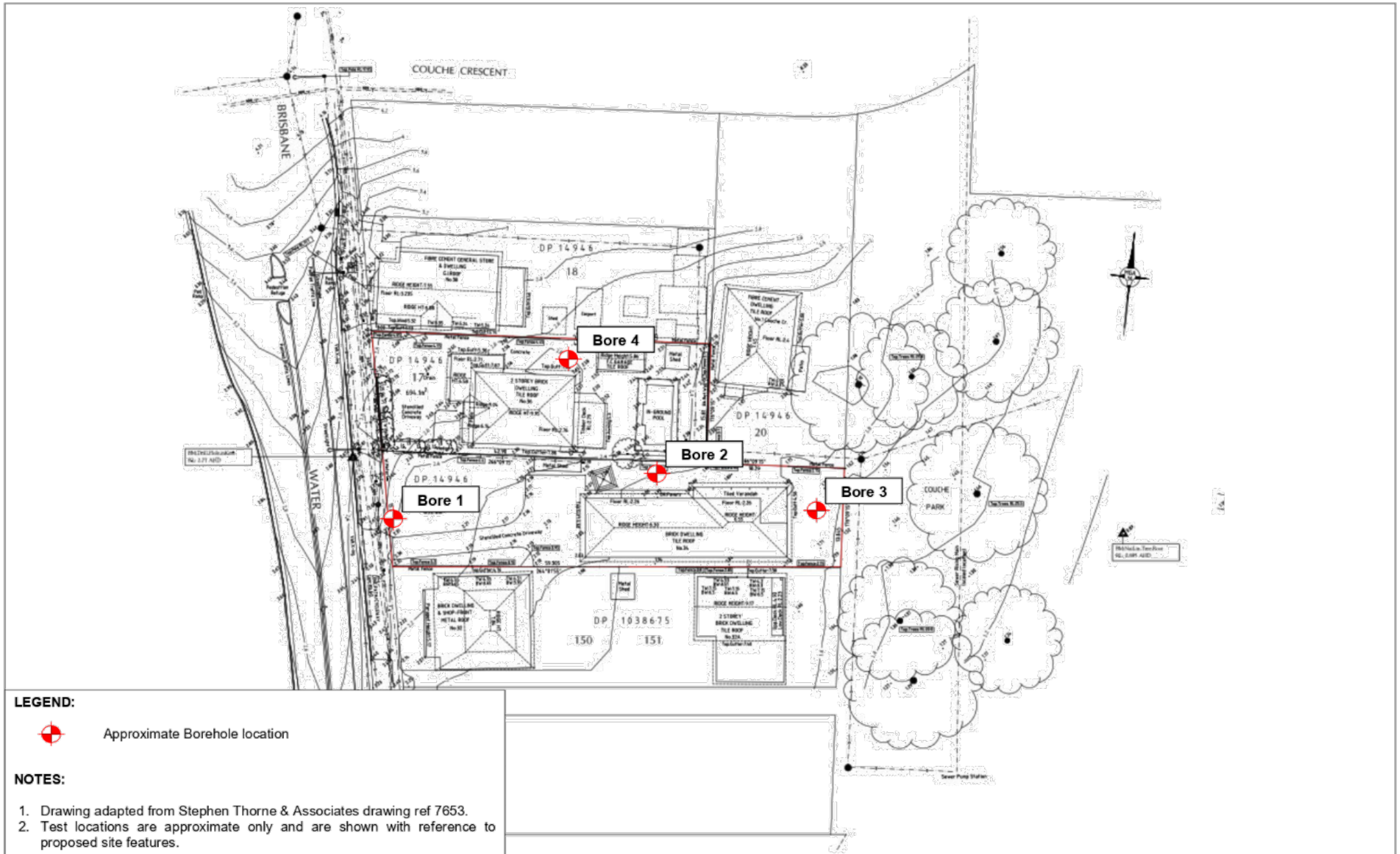
Information for Contractual Purposes
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection
The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

July 2010

Appendix B

Drawings



LEGEND:

Approximate Borehole location

NOTES:

1. Drawing adapted from Stephen Thorne & Associates drawing ref 7653.
2. Test locations are approximate only and are shown with reference to proposed site features.

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT:	Harman Project Engineering Management Pty Ltd		TITLE:	**Site Investigation Location Plan**	PROJECT No: 83242.00
OFFICE:	Central Coast	DRAWN BY: JBR		**Proposed Mixed Use Development**	DRAWING No: 1
SCALE:	NTS	DATE: 28/09/2017		**34-36 Brisbane Water Drive, Koolewong**	REVISION: 0

Appendix C

Sampling Methods
Soil Descriptions
Symbols and Abbreviations
Borehole logs

Sampling Methods

Douglas Partners

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

July 2010

Sampling Methods

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

Douglas Partners

Description and Classification Methods
The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types
Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils
Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils
Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

May 2017

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

May 2017

Symbols & Abbreviations

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Introduction
These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock
The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation
The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

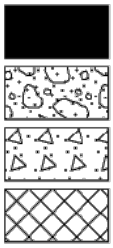
fg	fragmented
bnd	band
qtz	quartz

May 2017

Symbols & Abbreviations

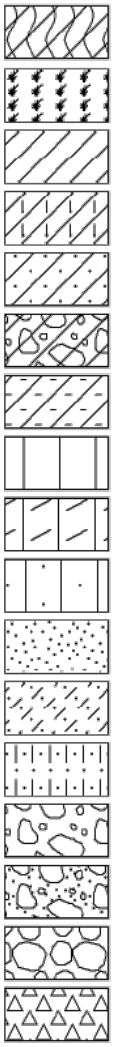
Graphic Symbols for Soil and Rock

General



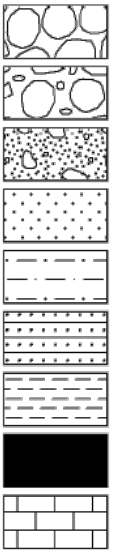
Asphalt
Road base
Concrete
Filling

Soils



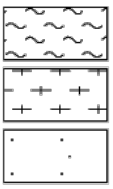
Topsoil
Peat
Clay
Silty clay
Sandy clay
Gravelly clay
Shaly clay
Silt
Clayey silt
Sandy silt
Sand
Clayey sand
Silty sand
Gravel
Sandy gravel
Cobbles, boulders
Talus

Sedimentary Rocks



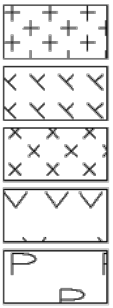
Boulder conglomerate
Conglomerate
Conglomeratic sandstone
Sandstone
Siltstone
Laminite
Mudstone, claystone, shale
Coal
Limestone

Metamorphic Rocks



Slate, phyllite, schist
Gneiss
Quartzite

Igneous Rocks



Granite
Dolerite, basalt, andesite
Dacite, epidote
Tuff, breccia
Porphyry

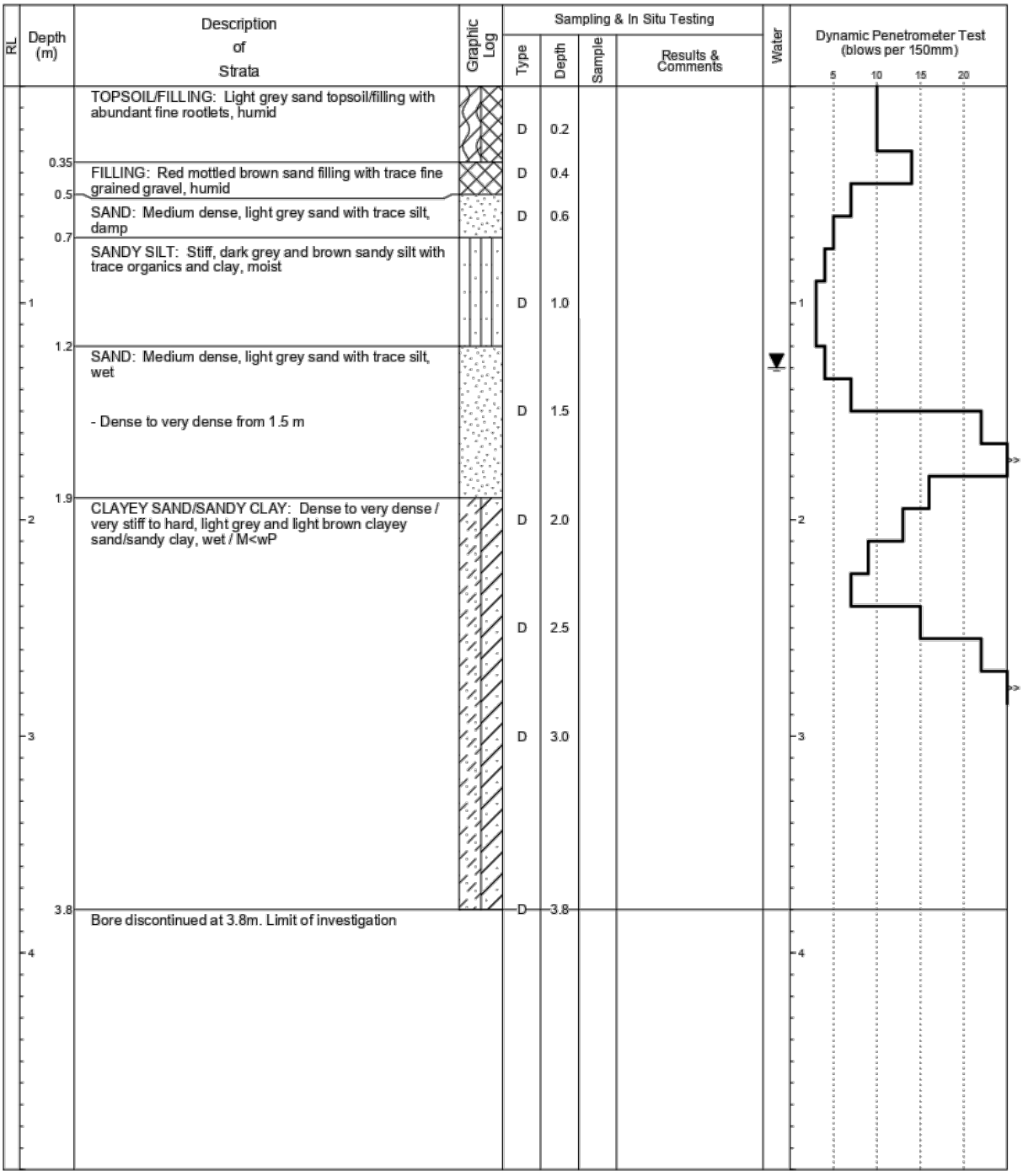
May 2017

BOREHOLE LOG

CLIENT: Harman Project Engineering Management Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 34-36 Brisbane Water Drive, Koolewong

SURFACE LEVEL: –
EASTING: 343789
NORTHING: 6295724
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 83242.00
DATE: 13/9/2017
SHEET 1 OF 1



RIG: Toyota 4WD **DRILLER:** M Harrison **LOGGED:** M Harrison **CASING:**
TYPE OF BORING: Dynamic Push Tube (continuous sample)
WATER OBSERVATIONS: Free Groundwater Observed at 1.3m
REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

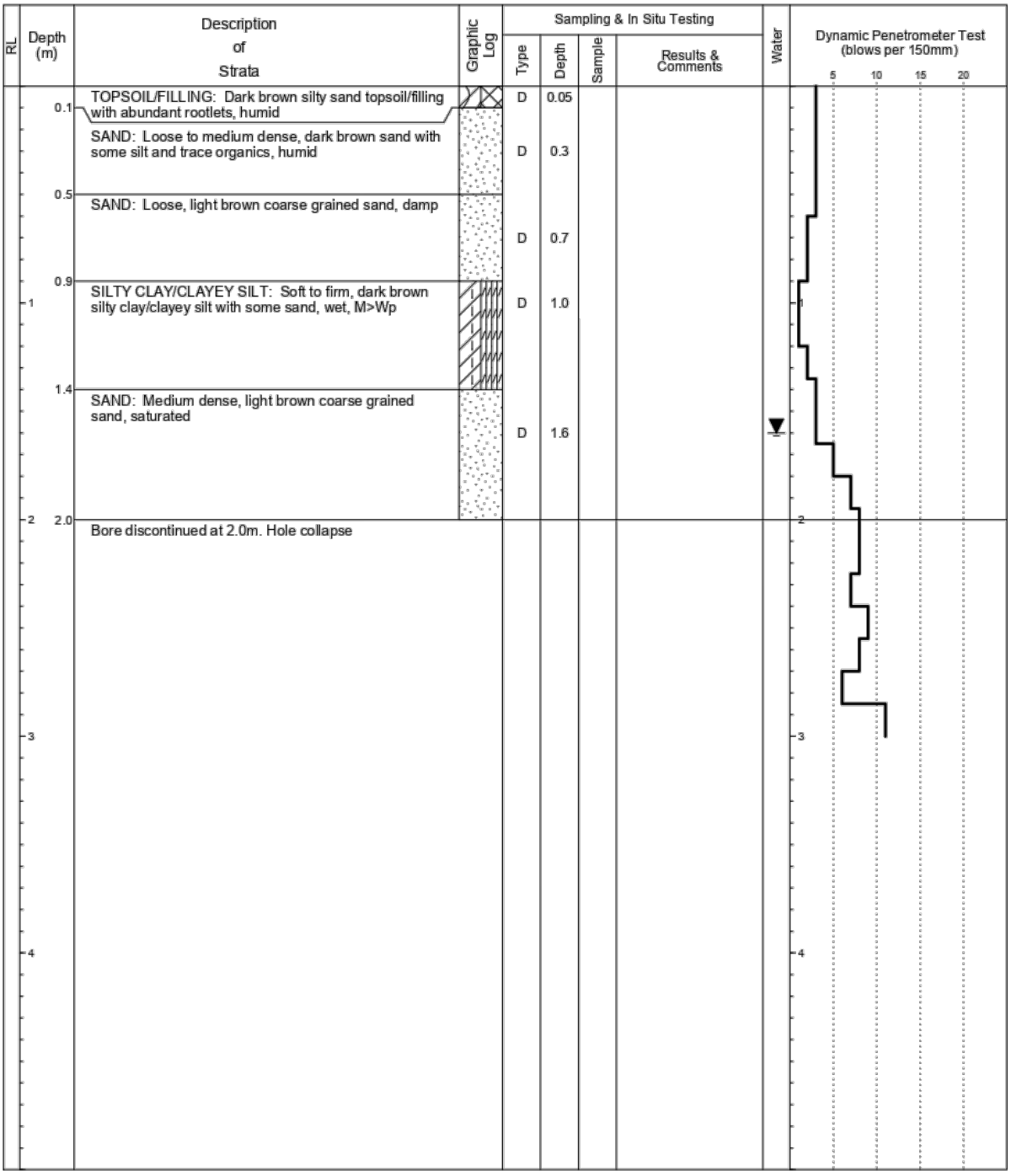
SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Harman Project Engineering Management Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 34-36 Brisbane Water Drive, Koolewong
SURFACE LEVEL: –
EASTING: 343824
NORTHING: 6295734
DIP/AZIMUTH: 90°/--
BORE No: 2
PROJECT No: 83242.00
DATE: 13/9/2017
SHEET 1 OF 1



RIG: Hand Tools **DRILLER:** M Harrison **LOGGED:** M Harrison **CASING:**
TYPE OF BORING: 70mm ϕ Hand Auger
WATER OBSERVATIONS: Free Groundwater Observed at 1.6m
REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

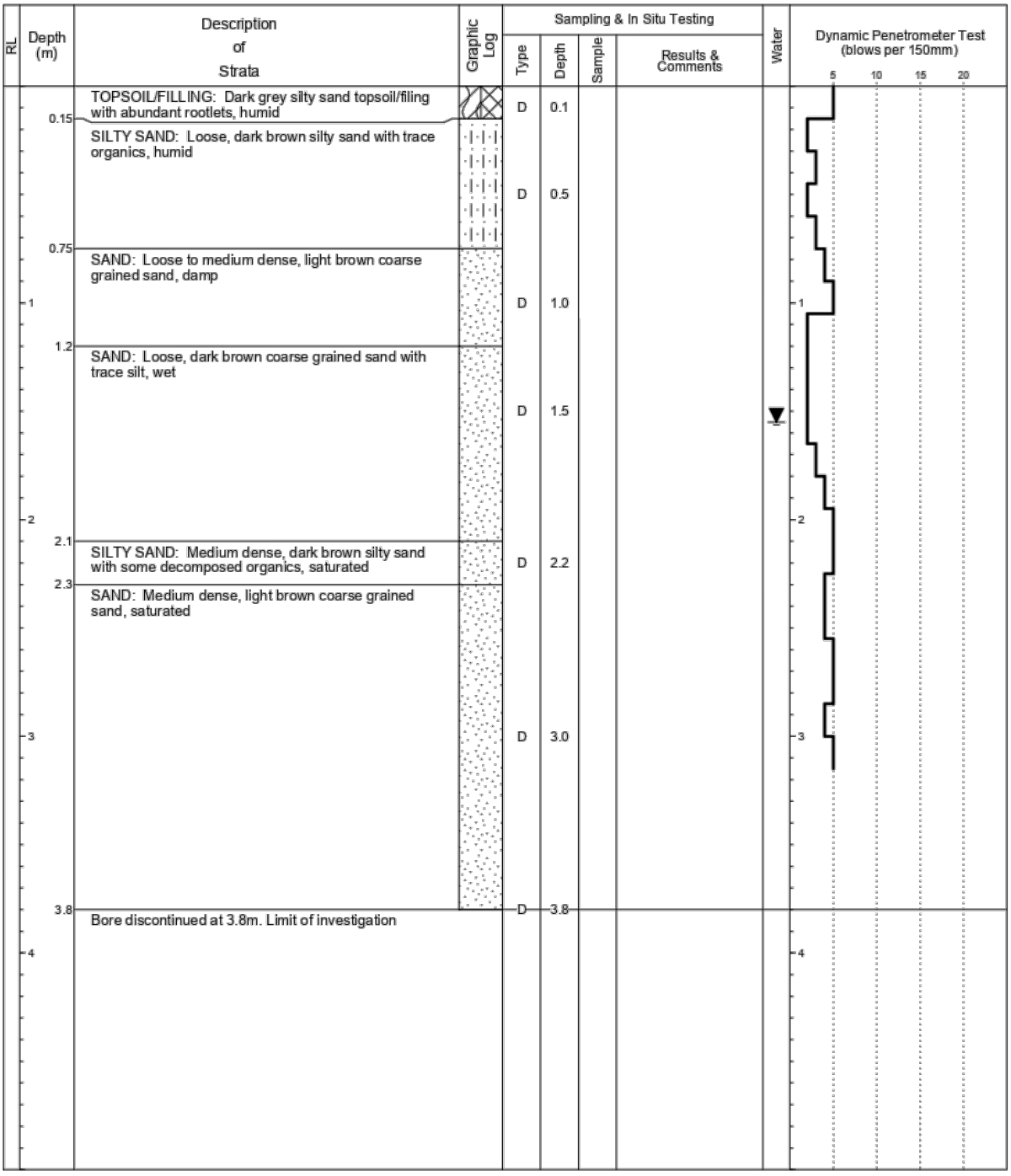
SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Harman Project Engineering Management Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 34-36 Brisbane Water Drive, Koolewong
SURFACE LEVEL: –
EASTING: 343846
NORTHING: 6295732
DIP/AZIMUTH: 90°/--
BORE No: 3
PROJECT No: 83242.00
DATE: 13/9/2017
SHEET 1 OF 1



RIG: Toyota 4WD **DRILLER:** M Harrison **LOGGED:** M Harrison **CASING:**
TYPE OF BORING: Dynamic Push Tube (continuous sample)
WATER OBSERVATIONS: Free Groundwater Observed at 1.55m
REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

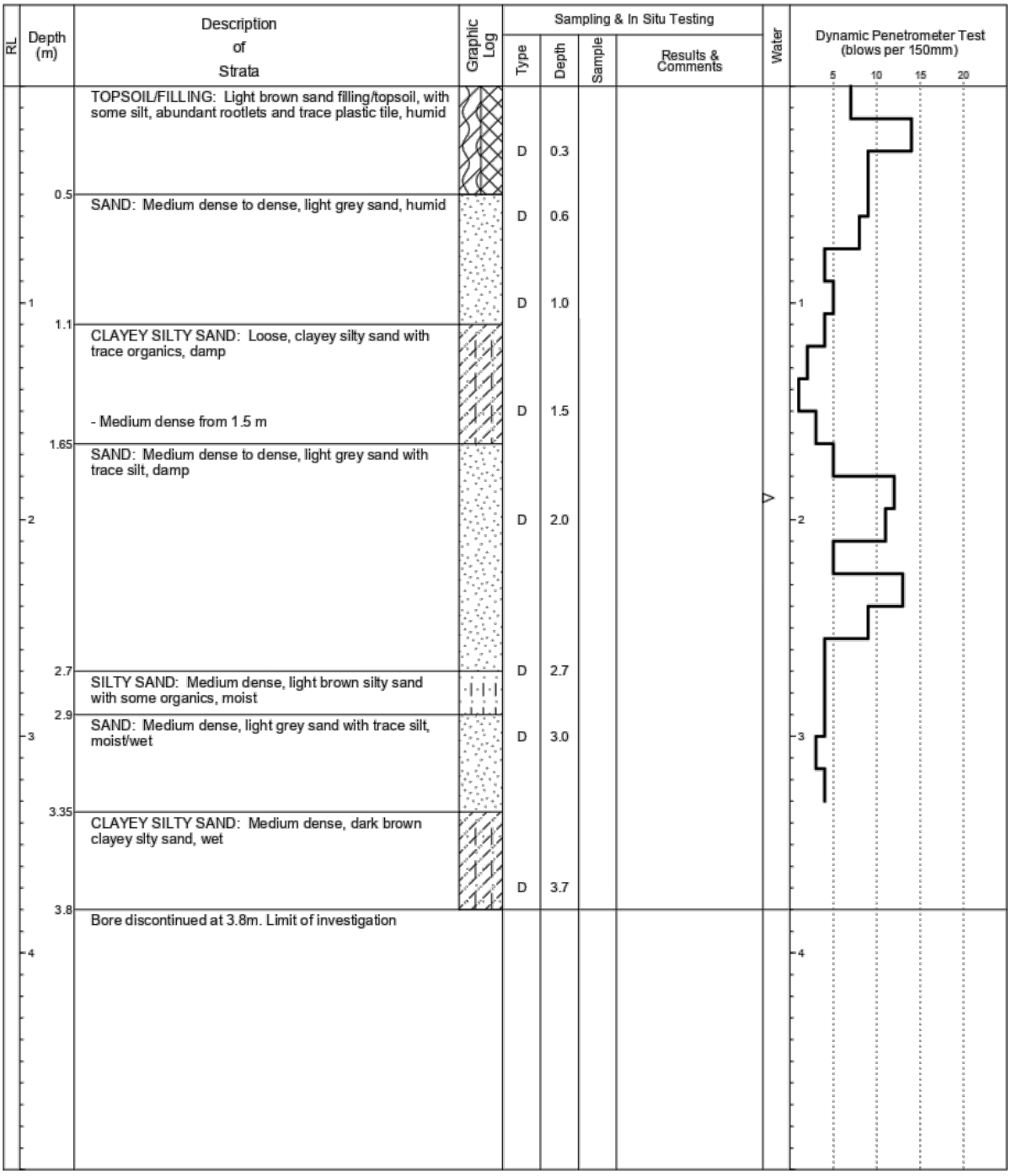
Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Harman Project Engineering Management Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 34-36 Brisbane Water Drive, Koolewong

SURFACE LEVEL: –
EASTING: 343811
NORTHING: 6295747
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 83242.00
DATE: 13/9/2017
SHEET 1 OF 1



RIG: Toyota 4WD **DRILLER:** M Harrison **LOGGED:** M Harrison **CASING:**
TYPE OF BORING: Dynamic Push Tube (continuous sample)
WATER OBSERVATIONS: Water Seepage Observed at 1.9m
REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

Appendix D

Laboratory Test Reports

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 175934

Client Details	
Client	Douglas Partners Tuggerah
Attention	Joel Cowan
Address	Unit 5, 3 Teamster Close, Tuggerah, NSW, 2259

Sample Details	
Your Reference	**83242.00, Koolewong**
Number of Samples	5 soil
Date samples received	19/09/2017
Date completed instructions received	19/09/2017

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details	
Date results requested by	26/09/2017
Date of Issue	25/09/2017

Results Approved By
Nick Sarlamis, Inorganics Supervisor

Authorised By
David Springer, General Manager

Client Reference: 83242.00, Koolewong

Chromium Suite						
Our Reference		175934-1	175934-2	175934-3	175934-4	175934-5
Your Reference	UNITS	2	3	3	4	4
Depth		1.0	0.5	3.0	1.5	3.7
Date Sampled		13/09/2017	13/09/2017	13/09/2017	13/09/2017	13/09/2017
Type of sample		soil	soil	soil	soil	soil
Date prepared	-	21/09/2017	21/09/2017	21/09/2017	21/09/2017	21/09/2017
Date analysed	-	21/09/2017	21/09/2017	21/09/2017	21/09/2017	21/09/2017
pH $_{kcl}$	pH units	4.3	5.4	4.8	4.5	4.0
s-TAA pH 6.5	%w/w S	0.1	0.11	0.01	0.04	0.12
TAA pH 6.5	moles H^+ /t	61	71	9	26	75
Chromium Reducible Sulfur	%w/w	0.05	<0.005	0.04	<0.005	1.4
a-Chromium Reducible Sulfur	moles H^+ /t	30	<3	26	<3	860
S_{HCl}	%w/w S	0.006	<0.005	<0.005	<0.005	0.077
S_{KCl}	%w/w S	<0.005	<0.005	0.006	<0.005	0.093
S_{NAS}	%w/w S	<0.005	<0.005	<0.005	<0.005	<0.005
ANC_{BT}	% $CaCO_3$	<0.05	<0.05	<0.05	<0.05	<0.05
s-ANC_{BT}	%w/w S	<0.05	<0.05	<0.05	<0.05	<0.05
s-Net Acidity	%w/w S	0.20	0.12	0.056	0.042	1.5
a-Net Acidity	moles H^+ /t	91	74	35	26	930
Liming rate	kg $CaCO_3$ /t	6.8	5.6	2.6	2.0	70
a-Net Acidity without ANCE	moles H^+ /t	91	74	35	26	930
Liming rate without ANCE	kg $CaCO_3$ /t	6.8	5.6	2.6	2.0	70
s-Net Acidity without ANCE	%w/w S	0.15	0.12	0.056	0.042	1.5

Client Reference: 83242.00, Koolewong

Method ID	Methodology Summary
Inorg-068	Chromium Reducible Sulfur - Hydrogen Sulfide is quantified by iodometric titration after distillation to determine potential acidity. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.

Client Reference: 83242.00, Koolewong

QUALITY CONTROL: Chromium Suite					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			21/09/2017	1	21/09/2017	21/09/2017		21/09/2017	[NT]
Date analysed	-			21/09/2017	1	21/09/2017	21/09/2017		21/09/2017	[NT]
pH $_{kcl}$	pH units		Inorg-068	[NT]	1	4.3	4.3	0	99	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-068	<0.01	1	0.1	0.1	0	[NT]	[NT]
TAA pH 6.5	moles H^+/t	5	Inorg-068	<5	1	61	61	0	95	[NT]
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	<0.005	1	0.05	0.04	22	105	[NT]
a-Chromium Reducible Sulfur	moles H^+/t	3	Inorg-068	<3	1	30	27	11	[NT]	[NT]
S_{HCl}	%w/w S	0.005	Inorg-068	<0.005	1	0.006	0.006	0	[NT]	[NT]
S_{KCl}	%w/w S	0.005	Inorg-068	<0.005	1	<0.005	<0.005	0	[NT]	[NT]
S_{NAS}	%w/w S	0.005	Inorg-068	<0.005	1	<0.005	<0.005	0	[NT]	[NT]
ANC_{BT}	% $CaCO_3$	0.05	Inorg-068	<0.05	1	<0.05	<0.05	0	[NT]	[NT]
s-ANC_{BT}	%w/w S	0.05	Inorg-068	<0.05	1	<0.05	<0.05	0	[NT]	[NT]
s-Net Acidity	%w/w S	0.005	Inorg-068	<0.005	1	0.20	0.15	29	[NT]	[NT]
a-Net Acidity	moles H^+/t	5	Inorg-068	<5	1	91	88	3	[NT]	[NT]
Liming rate	kg $CaCO_3$/t	0.75	Inorg-068	<0.75	1	6.8	6.6	3	[NT]	[NT]
a-Net Acidity without ANCE	moles H^+/t	5	Inorg-068	<5	1	91	88	3	[NT]	[NT]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	Inorg-068	<0.75	1	6.8	6.6	3	[NT]	[NT]
s-Net Acidity without ANCE	%w/w S	0.005	Inorg-068	<0.005	1	0.15	0.14	7	[NT]	[NT]

Client Reference: 83242.00, Koolewong

Result Definitions	
NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions	
Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	

Client Reference: 83242.00, Koolewong

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	83242.00	**Suburb:**	Koolewong	**To:**	Envirolabs
Project Name:	Acid Sulfate Soils and Geotech	**Order Number**			
Project Manager:	Joel Cowan	**Sampler:**	MJH	**Attn:**	Aileen
Emails:	joel.cowan@douglaspartners.com.au			**Phone:**	
Date Required:	Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard ☐			**Email:**	
Prior Storage:	☐ Esky ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	Yes ☐ No ☐	(If YES, then handle, transport and store in accordance with FPM HAZID)	

Sample ID	Lab ID	Date Sampled	Sample Type: S - soil, W - water	Container Type: G - glass, P - plastic	Analytes: Heavy Metals	OCP/OPP PCB	TRH and BTEX	PAH	Total Phenols	Asbestos 500 ml	Scr Suite			Notes/preservation
2/1.0	1	13/09/17	S	P							X			
3/0.5	2	13/09/17	S	P							X			
3/3.0	3	13/09/17	S	P							X			
4/1.5	4	13/09/17	S	P							X			
4/3.7	5	13/09/17	S	P							X			

ENVIROLAB GROUP
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 175734
Date Received: 19/9
Time Received: 12:30
Received by: F
Temp: Cool/Ambient 15.9
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL (S) mg/kg			**ANZECC PQLs req'd for all water analytes** ☐
PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit			**Lab Report/Reference No:**
Metals to Analyse: 8HM unless specified here:			
Total number of samples in container: 5	**Relinquished by:** MJH	**Transported to laboratory by:**	
Send Results to: Douglas Partners Pty Ltd	**Address**	**Phone:**	**Fax:**
Signed:	**Received by:**	**Date & Time:**	


DOUBTFIRE BRISBANE WATER DRIVE PRELIMINARY
osmosis


DOUBTFIRE BRISBANE WATER DRIVE PRELIMINARY
osmosis


DOUBTFIRE WHARF PRELIMINARY
osmosis


DOUBTFIRE WHARF PRELIMINARY
osmosis

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CONCEPT STORMWATER MANAGEMENT REPORT

for

Proposed Mix Use Development

at

34 – 36 Brisbane Water Drive, Koolewong

Job No: NL172238
Revision: B
Date: 26.03.19

	BY	DATE
Prepared	RS	26.03.19
Checked	DH	26.03.1
Admin	LE	28.03.19

1. INTRODUCTION

Northrop Consulting Engineers Pty Ltd has been engaged to undertake the conceptual stormwater management design for the proposed development located at 34 – 36 Brisbane Water Drive, Koolewong (Lot 16 & 17 in DP 14946).

The purpose of this report is to summarise the proposed design solutions for the stormwater management for the Development Application submission to Council. The proposed design has been considered with regard to Central Coast Council's DCP 2013, in particular Chapter 6.7 – Water Cycle Management as well as industry best practice.

We note the information contained in this report is not intended to present detailed design solutions but rather provide solutions commensurate with a conceptual design suitable for Development Application assessment.

2. SITE DESCRIPTION

The subject site is bound by Brisbane Water Drive to the West, residential development to the North and South and Couche Park in the East. Figure 1 below shows the development extent as well as the locality of the site.

Figure 1: Aerial Image

The lots are currently comprised of a residential development & retail shop front. In its current state the site is estimated to have an impervious fraction of 60%. The topography displays a dominant slope falling from North-West to the South-East with surface levels that range between 1.60m to 2.80m AHD.

Based on previous geotechnical investigations performed for nearby developments, the soil profile is believed to consist of a layer topsoil/fill material over a sandy substrate.

3. PROPOSED DEVELOPMENT

The proposed redevelopment comprises a multi-storey residential building with under croft garage parking with vehicle access from Brisbane Water Drive. The development also contains retail shop front with separate vehicle access from Brisbane Water Drive.

The layout of the proposed development has been illustrated in the Concept Stormwater Management Plan appended to the rear of this report.

4. PROPOSED STORMWATER MANAGEMENT STRATEGY

4.1 GENERAL STRATEGY

The proposed development will incorporate a number of devices and measures aimed at providing adequate and responsible management of stormwater runoff and flooding.

In line with Chapter 6.7 of CCC DCP 2013 the conceptual stormwater management strategy has considered the following items which will be discussed in the following sections of this report:

- Water conservation;
- Retention;
- Stormwater Quality;
- Onsite Detention;
- Local Overland Drainage;
- Flooding.

4.2 WATER CONSERVATION

The water conservation objective for the proposed development is to reduce potable water demand by 40%. It is proposed that the redevelopment will incorporate the following water saving measures:

- Using AAA+ efficient taps, hoses and fittings and undertaking regular maintenance of these fixtures;
- The use of 4.5/3 duel flush toilet cisterns;
- Providing water efficient washing machines and dishwashers;
- Landscaping with plant species that require minimal watering and irrigation with appropriate systems to minimise water loss and evaporation. This includes native plant species, using mulch around garden beds, avoiding watering when it's windy, watering during the coolest parts of the day and using drip irrigation;
- Harvested rainwater from the roof of the new building is proposed to be collected and reused for irrigation of landscaping areas and car washing.

It is our opinion that the measures outlined above will provide adequate reduction in potable demand to meet the intent of the water conservation target. The development will also be subject to satisfy BASIX commitments to meet water conservation targets.

4.3 RETENTION

The intent of water retention targets is to mimic the natural catchment hydrology from all development sites, in terms of:

- Quantity - the annual volume of stormwater reaching natural creeks and waterways;
- Rate - the peak flow rates leaving the site; and
- Response - the time it takes for rain to runoff the site.

Runoff from the roof will be captured and harvested in the reuse tank located below ground in landscaping area. This process involves the collection, storage and re-use of rainwater from the roof areas of the development for internal and external uses. For the development, harvested rainwater will be used for irrigation of landscaped areas and car washing.

The stormwater retention volume (SRV) has been determined in accordance with Section 6.7.7.2.4 of Chapter 6.7 of CCC DCP 2013. The SRV calculation is shown below:

$$SRV = 0.01 \times A \times (0.02 \times F)^2$$

where: SRV = stormwater retention volume (m^3)

A = site area (m^2)

F = fraction impervious (%)

$$= 0.01 \times 1550 \times (0.02 \times 62)^2$$

$$= 23.5m^3$$

The entire retention volume will be provided by a single 23.5kL rainwater tank. Adequate draw down will be provided with the proposed reuse scheme as noted above. High level overflow from the rainwater tank will be directed to the stormwater system via the use of a 225mm diameter overflow pipe.

Runoff from the driveway areas will be directed to a floor sump and pump out pit and will be pumped to the stormwater system. A one-way flow back valve will be installed in the rising main to prevent overflow from flooding the basement.

4.4 STORMWATER QUALITY

In general, treatment devices on site have been incorporated within the stormwater system such that they treat stormwater runoff prior to reuse or discharge off site. Individual stormwater quality devices and mechanisms incorporated within the development will treat runoff for different pollutant types and sizes. The treatment devices designed within the development is outlined below:

- Runoff from roofs (containing small amounts of phosphorus and dust particles) will be treated by proprietary first flush devices. By capturing the first portion of runoff from roofs the first flush devices will effectively remove dead insects, bird & animal droppings and concentrated tannic acids from the stormwater system. Runoff captured by first flush devices will, in accordance with common practice, be emptied from the device straight onto the site at a rate of approximately 1l/hr. The solid material captured in the first flush holding device accumulates over time and is periodically removed offsite thereby reducing potential pollution export to the downstream receiving system.

- It is proposed that leaves & gross pollutants will be filtered from runoff by meshed filters fitted to downpipe orifices.

- Runoff collected from roofs will be directed to the reuse tank. The tank will allow for settling of fine sediments and nutrients which will collect in the tank sump and be periodically removed from site.

- The retention of rainwater itself provides a reduction in pollutant export from the site. By reducing the volume of stormwater discharging from the site there is an associated reduction in pollutant export.

- Surface runoff that is not directed into the rainwater tank is proposed to be conveyed over landscaped/grassed areas. These buffer areas will act to remove pollutants by filtering stormwater runoff prior to runoff connecting to the street drainage system.

- For surface runoff from impermeable areas that are not managed by any stormwater source control was assessed using the Site Discharge Index (SID). The SID for the site was determined to be 0.02, which is deemed to comply.

It is our opinion that the treatment devices outlined above and shown in the drawings will adequately treat runoff for pollutants prior to it being reused or discharged into the Council stormwater system.

4.5 ONSITE DETENTION

Onsite detention is not required for this development due to the sites proximity to Brisbane Water and has as not been included.

4.6 LOCAL OVERLAND DRAINAGE

An overland flow path has been provided for the site via the northern and eastern boundaries. This flow path will direct surface flows around the building and towards the proposed level spreader.

The level spreader will convey runoff generated onsite through Couche Park and towards the water frontage. The proposed level spreader has been designed to limit surface flows to below 1m/s to prevent soil erosion and scour.

4.7 FLOODING

Review of Councils online flood mapping system indicates the site is not impacted by flooding. As such, flooding has not been considered in the stormwater management for the proposed development.

5. CONCLUSION

The proposed stormwater management design presented above has been prepared to comply with Central Coast Council's DCP as well as industry best practice. The design philosophy is based on the principle of at source treatment, to reduce conveyance infrastructure and manage water quantity and quality aspects.

At a concept level the system has been designed to cater for frequent and infrequent storm events.

Based on the above, our investigation and concept designs indicate the proposed development can adequately manage and address all items surrounding stormwater runoff. Should you have any queries, please feel free to contact the undersigned on (02) 4365 1668.

Robert Suckling

Civil Engineer

Daniel Holland

Civil Engineer

REFERENCES:

Central Coast Council, Development Control Plan 2013, February 2014

Central Coast Council, Civil Works Specification – Volume 1, November 2018

LIMITATION STATEMENT:

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by the client. The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

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APPENDIX A – SUPPLEMENTARY INFORMATION

- Concept Stormwater Management Plan