Strategic & Corporate Committee

Monday, 17 February 2025
6:00 PM

Agenda

Strategic & Corporate Committee (S&C)

Woollahra Council will be holding Committee meetings (i.e. Environmental Planning (EP), Finance, Community & Services (FC&S) and Strategic & Corporate (S&C) with The Mayor, Councillors and staff will be participating in person. Members of the public are invited to attend the Committee meeting in person or watch and/or listen to meetings live (via Council's website).

Members of the public may also submit late correspondence. Instructions on how to do this are provided below:

- **To watch and/or listen to the meeting live (from 6.30pm)**
  Details on how to watch and listen to the meeting live will be available at Council Agendas, Audio Recordings and Minutes.

- **To request to address the Committee (pre-register by 10.00am on the day of the meeting)**
  Pre-register to address the Committee by 10.00am on the day of the meeting by using the relevant registration form on Council's website – http://www.woollahra.nsw.gov.au/

- **To submit late written correspondence (submit by 10.00am on the day of the meeting)**
  Members of the public may submit late written correspondence on an agenda item being considered at the Committee meeting. If you wish to make a written submission on an item on the agenda, please email your submission to records@woollahra.nsw.gov.au by 10.00am on the day of the meeting

Once registered you will be forwarded information on how to join the meeting via email.

The audio recording and late correspondence considered at the meeting will be uploaded to Council's website by 5.00pm on the next business day.

Outline of Meeting Protocol & Procedure:

- The Chairperson will call the Meeting to order and ask the Committee Members and/or Staff to present apologies and/or late correspondence.
- The Chairperson will commence the Order of Business as shown in the Index to the Agenda.
- At the beginning of each item the Chairperson will invite member(s) of the public who registered to speak to address the Committee.
- Members of the public who have registered to address the Committee, will be allowed four (4) minutes in which to address the Committee. One (1) warning bell will be rung at the conclusion of three (3) minutes and two (2) warning bells rung at the conclusion of four (4) minutes. Please direct comments to the issues at hand.
- If there are persons representing both sides of a matter (e.g. applicant/objector), the person(s) against the recommendation speak first.
- At the conclusion of the allocated four (4) minutes, the speaker will take no further part in the debate unless specifically called to do so by the Chairperson.
- If there is more than one (1) person wishing to address the Committee from the same side of the debate, the Chairperson will request that where possible a spokesperson be nominated to represent the parties.
- The Chairperson has the discretion whether to continue to accept speakers from the floor
- After considering any submissions the Committee will debate the matter (if necessary), and arrive at a recommendation (R items which proceed to Full Council).

Disclaimer:

By using conferencing technology or by teleconference, listening and/or speaking at Council or Committee Meeting members of the public consent to their voice and personal information (including name and address) being recorded and publicly available on Council's website. Councillors, staff and members of the public are advised that meeting are being lived streamed, accessible via a link from Council's website.

By addressing and/or listening to a Council or Committee meeting, members of the public consent to their voice and personal information (including name and address) being recorded and publicly available on Council's website.

Accordingly, please ensure your address to Council is respectful and that you use appropriate language and refrain from making any defamatory statements or discriminatory comments. Woollahra Council does not accept any liability for statements, comments or actions taken by individuals during a Council or Committee meeting.

Any part of the meeting that is held in closed session will not be recorded.

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The audio recording of each meeting will be retained on Council's website for a minimum period of 6 months. After that period has passed, recordings of meetings may be disposed of in accordance with the *State Records Act 1998*.

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Recommendation only to the Full Council ("R" Items):

Note: This Committee to function on the basis of referral with considerations to encompass functions and responsibilities from any other Committee.

Principal Considerations:

Municipal Strategy

- Objectives Setting
- Policies and Code Development
- Corporate Management
- Corporate Planning
- Woollahra Planning
- Community Services

Delegated Authority to be determined at Committee level ("D" Items):

Nil

Strategic & Corporate Committee Membership: All Councillors

Quorum: The quorum for Committee meeting is 8 Councillors

Woollahra Municipal Council

Notice of Meeting

11 February 2025

To: Her Worship the Mayor, Councillor Sarah Swan ex-officio

Councillors
Sarah Swan (Mayor)
Sean Carmichael (Deputy Mayor)
Alexander Andruska
James Ardouin
Mary-Lou Jarvis
Jeanette Mitchell
Julian Parmegiani
Harriet Price
Lucinda Regan
Matthew Robertson
Mark Silcocks
Torsten
Merrill Witt
Hugh Woodgate
Toni Zeltzer

Dear Councillors,

Strategic & Corporate Committee – 17 February 2025

In accordance with the provisions of the Local Government Act 1993, I request your attendance at Council's **Strategic & Corporate Committee** meeting to be held in the **Council Chambers, 536 New South Head Road, Double Bay, on Monday, 17 February 2025 at 6:00 PM.**

Members of the Public may:

- Register to address the meeting (via Zoom or in Person) by completing the relevant form available on Council's website: https://www.woollahra.nsw.gov.au/files/assets/public/v/1/forms/code-of-meeting-practice-comp-public-forum-registration-form-items-not-on-the-agenda-2023-2024.pdf and email the completed form to records@woollahra.nsw.gov.au **by 10.00am on the day of the meeting.**

- Submit late correspondence for consideration by Councillors by emailing records@woollahra.nsw.gov.au by **10.00am on the day of the meeting.**

Watch and listen to the meeting live via Council's website: https://www.woollahra.nsw.gov.au/council/meetings_and_committees/council_meetings/council_agendas_and_minutes.

An audio recording of the meeting will be uploaded to Council's website following the meeting by 5.00pm on the next business day.

If you have any difficulties accessing the meeting please contact (02) 9391 7001.

Regards,

Craig Swift-McNair
General Manager

Strategic & Corporate Committee

Agenda

1. Opening
2. Acknowledgement of Country (Gadigal People and Birrabirragal People)
3. Acknowledgement of the Sovereign of the Day (King Charles III)
4. Leave of Absence and Apologies
5. Disclosures of Interest

Items to be Submitted to the Council for Decision with Recommendations from this Committee

6.1 Planning Proposal for the Edgecliff Commercial Centre

6.2 Cross Street Car Park Redevelopment Project - Next Steps

6.3 Wilberforce Car Park Development

7. Conclusion of the Meeting

Item No: 6.1
Subject: **PLANNING PROPOSAL FOR THE EDGECLIFF COMMERCIAL CENTRE**
Author: Lyle Tamlyn, Acting Team Leader Strategic Planning
Approver: Anne White, Manager Strategic Planning & Place
Scott Pedder, Director Planning & Place

Purpose of the Report:

To seek a resolution of Council to proceed with the Edgecliff Commercial Centre planning proposal to establish new controls for the centre, including increased height and floor space ratios, and an affordable housing contributions scheme.

Alignment to Delivery Program:

4.1 Encourage and plan for sustainable, high quality planning and urban design outcomes.

Recommendation:

THAT Council:

A. Note the advice provided by the Woollahra Local Planning Panel on 19 December 2024 regarding the planning proposal to amend the controls for the Edgecliff Commercial Centre.

B. Resolves to support the planning proposal as contained at Attachment 1 of the report to the Strategic and Corporate Committee of 19 February 2025 to revise controls for the Edgecliff Commercial Centre.

C. Forwards the planning proposal to the Department of Planning, Housing and Infrastructure seeking a Gateway determination to allow public exhibition.

D. Requests the Minister for Planning and Public Spaces (or delegate) to authorise Council as the local plan-making authority to make the local environmental plan under section 3.36 of the *Environmental Planning and Assessment Act 1979*.

E. Request staff to prepare a planning proposal to establish design excellence provisions for the whole Woollahra Local Government Area, and refer this to the Woollahra Local Planning Panel for advice.

Executive Summary:

This report seeks a resolution of Council to endorse the planning proposal to revise the controls for the Edgecliff Commercial Centre (ECC), and forward this to the Department of Planning, Housing and Infrastructure (DPHI) with a request for a Gateway determination to allow public exhibition.

The proposed controls address building height and floor space ratio (FSR) standards, active frontages, dwelling mix and the public domain. The controls also propose the implementation of an *Affordable Housing Contributions Scheme* (AHCS), and a restriction on other envelope control bonuses applying. In the case of the ECC, these are currently the affordable housing bonuses available under *State Environmental Planning Policy (Housing) 2021* (Housing SEPP).

The proposed changes to the controls implement the recommendations of Council's endorsed *Edgecliff Commercial Centre Planning and Urban Design Strategy* (ECC Strategy).

Discussion:

Background- ECC Strategy

The ECC has been the subject of a number of proponent-led planning proposals, which are seeking uplift beyond that of the current planning controls. This has resulted in uncoordinated built form outcomes, which do not centre growth in the most appropriate areas.

Council has undertaken a strategic review of the planning controls for the ECC in order to provide a clear and coordinated approach to planning that will prevent ad-hoc development. Furthermore, Council has identified the ECC as a suitable area to facilitate controlled uplift to meet our housing target of 1900 dwellings between 2024-2029.

The planning proposal is an outcome of the comprehensive strategic planning process that resulted in the adopted ECC Strategy, which seeks to deliver this controlled growth.

The ECC Strategy was accompanied by the *Edgecliff Commercial Centre Public Domain Plan* (Public Domain Plan) and the *Edgecliff Commercial Centre Transport Study* (Transport Study) prepared by SCT Consulting in April 2024. These documents can be viewed at https://yoursay.woollahra.nsw.gov.au/edgecliff.

On 29 April 2024, Council resolved to endorse the ECC Strategy, as follows:

THAT Council:

A. *Receives and notes the submissions received in response to the Draft Edgecliff Commercial Centre Planning and Urban Design Strategy.*
B. *Receives and notes the post exhibition report on the Draft Edgecliff Commercial Centre Planning and Urban Design Strategy and supporting documents.*
C. *Endorses the updated Edgecliff Commercial Centre Planning and Urban Design Strategy as provided at Attachment 1 of the report to the Strategic and Corporate Committee meeting of 24 April 2024, and requests staff to prepare a planning proposal to enact the updated Edgecliff Commercial Centre Planning and Urban Design Strategy and report the planning proposal to a future meeting of the Woollahra Local Planning Panel for advice subject to the following:*
    i. *Amend Figure 26 on Page 29 to show a separated cycleway in front of the Edgecliff Centre Site and the Edgecliff Station.*
    ii. *Amend Figure 19 on Page 22 to remove western crossing across New South Head Road and show existing crossings only.*
    iii. *Make no changes to the current controls or zone to the site at 81-83 New South Head Road Edgecliff.*
D. *Requests staff to prepare an Affordable Housing Contributions Scheme to enable affordable housing contributions to be required in conjunction with uplift, which is progressed concurrently with the planning proposal.*
E. *Requests staff to prepare a draft development control plan for the Edgecliff Commercial Centre to complement the provisions in the planning proposal.*
F. *Endorses the updated Edgecliff Commercial Centre Public Domain Plan provided at Attachment 2 of the report to the Strategic and Corporate Committee meeting of 24 April 2024 subject to the following:*
    i. *Amend Figure 8 on Page 15 to add pedestrians in the footway section to clarify it is a shared pedestrian and cycleway.*
    ii. *Amend Figure 29 on Page 32 to show a separated cycleway in front of the Edgecliff Centre Site and the Edgecliff Station.*
    iii. *Amend Figure 30 on Page 33 to add a cycleway line around into Ocean Street.*
G. *Requests staff to identify how the public domain improvements will be funded including reviewing opportunities to use Section 7.11, Section 7.12 and Voluntary Planning agreements.*

In response to Parts C and D, staff have prepared the subject planning proposal to enact the approved strategy. It directly implements all recommendations of the ECC Strategy that are appropriate for inclusion in the *Woollahra Local Environmental Plan 2014* (Woollahra LEP 2014), as opposed to a development control plan (DCP).

Consistent with Part E of the resolution, a Draft DCP is being prepared by staff to implement elements of the adopted ECC Strategy that are not contained within this planning proposal. The Draft DCP will be reported to a future meeting of Council's Environmental Planning Committee (EPC) in 2025.

Staff envisage that the amendments proposed in the Draft DCP will include:
- Character statements for precincts within the ECC;
- Street wall heights and setbacks;
- Public domain requirements, including paving, awnings, active frontages and through site links;
- Parking and access requirements;
- Heritage considerations; and
- Public and private amenity controls.

Context– Low and mid-rise housing

This Council-led planning proposal is being progressed in the context of the NSW Government's low and mid-rise housing reforms. These propose (amongst other measures) significant residential density increases within 800m walking distance of the Edgecliff Station. However, we understand that the reforms will not apply to the ECC itself. Originally intended to commence in mid-2024, these reforms are still being considered by the DPHI, and Council has not been advised if or when they will commence. Council's comprehensive submission to the DPHI outlining the unsuitability of the reforms across the Woollahra LGA can be found at:
https://yoursay.woollahra.nsw.gov.au/download_file/3089

Staff recommend progressing this planning proposal as it represents best practice planning approach, strongly informed by community consultation and is consistent with the NSW Strategic Planning Framework. If implemented, this planning proposal will assist in delivering a significant portion of our 1900 dwelling target, and will deliver a renewed, high quality urban environment for our community. Note: In the event that the reforms commence during the progression of this planning proposal, staff will prepare a report to a meeting of Council, for Council to determine an appropriate course of action depending on the final scope and implications of the reforms.

Overview of planning proposal

A planning proposal is the legal mechanism through which a local environmental plan is amended. After Council resolves to prepare a planning proposal (as they did on 29 April 2024), staff then prepare the document and take it to the Woollahra Local Planning Panel (LPP) for independent advice. Following this, Council consider the planning proposal and determine whether it should endorse the planning proposal. If endorsed, the planning proposal will be submitted to the DPHI requesting a Gateway determination. If the DPHI issues a Gateway determination, the planning proposal will progress to public exhibition.

As discussed above, this planning proposal seeks to implement the controls contained in the ECC Strategy and applies to the ECC, which is predominately zoned E1 Local Centre and MU1 Mixed use under the Woollahra LEP 2014. **Figure 1** identifies the extent of the ECC.

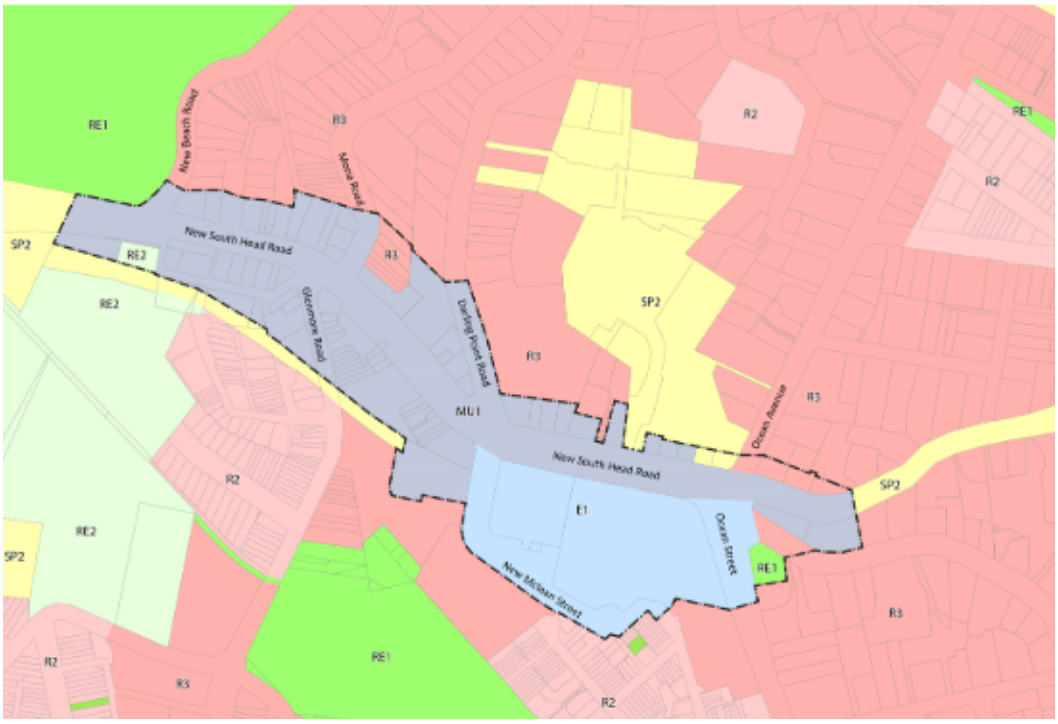

Figure 1: *Extent of ECC on Woollahra LEP 2014 land zone map, with the boundary identified with dotted line.*

Most significantly, the proposed controls in the planning proposal will allow applicants to access increased building heights and FSRs for certain sites in the ECC, where site amalgamation requirements are met. If these requirements are not met, owners of the specified sites may still develop, utilising existing height and FSR controls under the current Woollahra LEP 2014.

The planning proposal also recommends general controls for active frontages, dwelling mix and public domain treatments across the ECC.

Importantly, the planning proposal also proposes the implementation of an AHCS to capture land value increases from the uplift in height and FSR controls, and direct this money to the provision of affordable housing.

Intent of planning proposal

Consistent with the ECC Strategy that informed its preparation, the objectives of this planning proposal are to:

- Grow the ECC by facilitating uplift on appropriate sites, and protect the local character of land surrounding the centre.
- Encourage a mix of uses including retail, employment residential and community space, with non-residential uses on lower levels and residential above, with integrated community infrastructure.
- Accentuate the core, with the tallest buildings on the hill around the Edgecliff Station.
- Protect the environmental amenity of existing development and the public domain.
- Conserve environmental heritage in and around the ECC.
- Protect diverse housing in the ECC and promote the development of new affordable housing.
- Improve the public domain via improvements including new public spaces, urban greening, street furniture and lighting, pedestrian paths, cycleways and public art.
- Mitigate traffic impacts through upgraded infrastructure and the reduction of private vehicle reliance.
- Provide for the implementation of an AHCS to facilitate affordable housing provision in the area.

The objectives of this planning proposal will be achieved by amendments to the Woollahra LEP 2014, including:

- Increased building height and FSR controls on certain sites, where site amalgamation requirements are met and no other bonuses apply (such as those under the Housing SEPP);
- An AHCS applying to the proposed sites that have increased building height and FSR controls;
- A range of non-residential FSRs, which will mandate that part of new buildings must be used for uses other than residential (e.g. ground floor retail and office space); and
- Controls for active frontages, dwelling mix and public domain treatments.

Proposed increased envelope controls

The planning proposal recommends uplift on certain sites at the top of the ridge, closest to the Edgecliff Station. This uplift would be facilitated over seven amalgamated sites. The sites are shown in **Figure 2** below.



Figure 2: *Sites subject to uplift in the ECC (showing E and F, which have controls already gazetted).*

Sites E and F have already been subject to site specific planning proposals initiated by their respective owners, and consequently the controls illustrated in the ECC Strategy are already in force. However, they have been included above and in the planning proposal itself for completeness. Amalgamation criteria do not apply to either Sites E and F, as this issue was already addressed in their respective planning proposals.

Under this planning proposal, each of the remaining seven sites would receive an alternative maximum building height and FSR if lot amalgamation criteria are met.

Site H would be an exception to the above amalgamation requirement. This site includes 203-233 New South Head Road (the Edgecliff Centre) and part of the Council-owned road reserve behind. It would be unreasonable to impose a control that requires Council to agree to the amalgamation of its land to access increased building height and FSR controls. Accordingly, the proposed controls will not require Council land and private land on Site H to amalgamate.

A non-residential FSR range would also apply. The key envelope controls proposed for each site are summarised in **Table 1** below. They would be implemented using changes to the Key Sites Map, which would identify the spatial extent of land that would benefit from the revised controls.

Table 1: *Summary of proposed controls for uplift sites.*

Site	Address	Existing height / storeys	Proposed alternative height / storeys	Existing FSR	Proposed alternative FSR	Proposed non-residential FSR
A	135-155 New South Head Rd	14.5m / 4 storeys	34.5m / 10 storeys	1.5:1	2.6:1	0.7:1 – 1.2:1
AB	157-159 New South Head Rd	14.5m / 4 storeys	34m / 10 storeys	1.5:1	4.5:1	2:1 – 2.9:1
B	161 New South Head Rd	14.5m / 4 storeys	35m / 10 storeys	2:1	4.6:1	1.6:1 – 2.5:1
C	179-191 New South Head Rd	14.5m / 4 storeys	35m / 10 storeys	2.5:1	5.1:1	2:1 – 3.1
D	1 New McLean St	14.5m / 4 storeys	34.5m / 10 storeys	2.5:1	5.1:1	2.2:1 – 3.2:1
G	110-130 New South Head Rd (also partly known as 2A-2B Darling Point Rd	20.5m / 6 storeys	39m / 11 storeys	2:1	4.7:1	0.4:1 – 1.4:1
H	203-233 New South Head Rd and road reserve	6-26m / 7 storeys	86m / 26 storeys	2.5:1	7.5:1	3:1 – 4.5:1

The proposed provisions contained in the planning proposal are also intended to prevent the 30% building height or FSR bonuses under the Housing SEPP applying to the above uplift sites. This will ensure building scale does not exceed the carefully assessed envelopes tested in preparing the controls, which may result in adverse solar access, overlooking and visual bulk impacts. Staff note there is precedent for limiting the application of the Housing SEPP, such as in clause 1.9 (Application of SEPPs) of the *Sydney Local Environmental Plan 2012.* This clause prevents parts of the Housing SEPP applying to certain land in the Sydney LGA. However, this approach would require the approval of the DPHI.

Note: Council staff are currently assessing and will provide a submission to, a proposal in the ECC, which despite careful and nuanced controls being established last year, has utilised the Housing SEPP provisions for a development that exceeds the recently gazetted Woollahra LEP 2014 height by 20 metres.

Proposed affordable housing component

This planning proposal also recommends the introduction of an AHCS for the ECC. This will apply to all the uplift sites and the previously upzoned Site F (as development is yet to be carried out, and there is an opportunity to capture a mandatory contribution).

SGS Economics and Planning were commissioned by staff to carry out feasibility testing on the sites and recommend appropriate rates for the provision of affordable housing. Essentially, this means determining how much we can require in contributions while not affecting construction feasibility and hindering development.

The testing found that a 3% affordable housing rate, rising to a 5% rate after three years, would allow an AHCS to apply in the ECC without hampering economic viability. These rates mean that if a new development is approved, 3 or 5% of the residential floor area must be dedicated to affordable housing. This can be the dedication of affordable dwellings in perpetuity on the site, or payment of an affordable housing contribution to Council, via a condition of development consent. Any monetary contributions would be pooled and then used to invest in affordable housing assets, made available to lower income workers who meet pre-established criteria. This approach is consistent with the *Woollahra Affordable Housing Policy 2021.*

The *Woollahra Affordable Housing Contributions Scheme* is included at **Attachment 2**. The scheme has been prepared using DPHI's *Guideline for Developing an Affordable Housing Contribution Scheme*, which sets out NSW requirements for such schemes. It has also been informed by guidance from SGS Economics and Planning, and similar schemes from Waverley Council and the City of Sydney.

The *Affordable Housing Contribution Scheme Report* prepared by SGS Economics and Planning is provided at **Attachment 3**. This contains the necessary supporting information on feasibility analysis. This information is very important, as all AHCSs need to be substantiated by a robust evidence base that directly supports the sought contribution rates

Proposed provisions for the whole ECC

The increased height and FSR controls and AHCS only apply to the seven uplift sites. However, the planning proposal also recommends provisions that would apply to any development for new buildings or significant additions in the ECC. The extent of the ECC will be shown in a new Woollahra LEP 2014 map, known as the 'Locality Identification Map'. These provisions would address active frontages, the public domain and dwelling size mix.

The provisions for active frontages will require new buildings to activate areas of the ground floor adjoining public space, to promote vibrancy in the ECC and allow passive surveillance for safety. Public domain provisions will allow Council to require development to enhance the quality of surrounding spaces, through both design and physical upgrades directly adjoining the site.

The dwelling mix controls will require development with over nine dwellings to have at least 30% of them as self-contained studio or one bedroom apartments, or both. This is intended to provide for a range of dwelling sizes that cater to the area's demographics, as further detailed in the planning proposal. There is precedent for these types of controls in the Hills, Canada Bay and Inner West LEPs.

Merit of planning proposal

This planning proposal will enact the ECC Strategy, and facilitate a coordinated renewal of the ECC. It will improve the quality of the built form, and assist Council in facilitating sufficient housing supply for our community.

The planning proposal (at **Attachment 1**) demonstrates strategic and site-specific merit. It has been prepared in accordance with section 3.33 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Local Environmental Plan Making Guideline* (August 2023).

The planning proposal is consistent with the relevant objectives of the *Greater Sydney Region Plan: A Metropolis of Three Cities* and the relevant planning priorities and actions of the *Eastern City District Plan* (refer Part 6 of the planning proposal).

The planning proposal also aligns with the *Woollahra Local Strategic Planning Statement, Woollahra Local Housing Strategy* and Council's Community Strategic Plan *Woollahra 2032*.

The planning proposal is supported by a detailed transport study undertaken by SCT Consulting, to analyse the existing and the future transport capacity within the ECC. This study considers the impact of the proposed uplift on the wider work network, including intersection performance and traffic movements. With the implementation of recommendations, the study finds that the ECC can accommodate the projected growth in demand.

The AHCS is also supported by detailed feasibility testing carried out by SGS Economics and Planning, which demonstrates that contributions can be captured from the uplift without unreasonably hampering development feasibility.

Local planning panel advice

This planning proposal was referred to the Woollahra LPP on 19 December 2024. The panel were supportive of the proposed amendments and recommended that Council proceed. The Woollahra LPP's advice is provided below:

Part A. THAT the Woollahra Local Planning Panel advises Council that it supports the planning proposal (as provided at Attachment 1 of the Panel Agenda), as it demonstrates site-specific and strategic merit for following reasons:

i. *The planning proposal is consistent with the relevant objectives of the Greater Sydney Region Plan: A Metropolis of Three Cities and the relevant planning priorities and actions of the Eastern City District Plan.*
ii. *The planning proposal aligns with the Woollahra Local Strategic Planning Statement, Woollahra Local Housing Strategy and Council's Community Strategic Plan Woollahra 2032.*
iii. *The planning proposal is supported by a detailed transport study undertaken by SCT Consulting, to analyse the existing and the future transport capacity within the ECC.*

Part B. The Woollahra Local Planning Panel advises Council that it supports the planning proposal (as provided at Attachment 1) to amend the Woollahra Local Environmental Plan 2014 which seeks to achieve the following:

i. *Provide increased building heights and floor space ratios for areas identified on the Key Sites Map, subject to amalgamation requirements being met.*
ii. *Restrict bonuses from other environmental planning instruments applying where the increased building heights and floor space ratios are taken up.*
iii. *Specify minimum and maximum non-residential floor space ratios for the areas identified on the Key Sites Map.*
iv. *Insert local provisions for all development in the Edgecliff Commercial Centre, addressing dwelling mix, active frontages and the public domain.*
v. *Insert a clause that requires affordable housing contributions for areas identified on the Key Sites Map, consistent with the Woollahra Affordable Housing Contributions Scheme at Attachment 2.*

Part C. The Woollahra Local Planning Panel advises Council to ensure there are local provisions to facilitate design excellence in the Edgecliff Commercial Centre.

Part D. The Woollahra Local Planning Panel notes that the Edgecliff Commercial Centre Local Heritage Listing planning proposal to implement the Edgecliff Heritage Study has been lodged with the Department of Planning, Housing and Infrastructure for Gateway determination and this planning proposal should be considered separately.

Part E. The Woollahra Local Planning Panel notes the many public submissions made to the meeting of 19 December 2024 made comments on the three proponent-initiated planning proposals that are beyond the remit of this local planning panel and are being administered by the Sydney Eastern City Planning Panel.

Part F. The Woollahra Local Planning Panel encourages staff to monitor the evolving outcomes from various planning proposals in Edgecliff and state-led planning reforms for their implications in relation to this planning proposal.

In summary, the Woollahra LPP support the current planning proposal and recommend submitting it to the DPHI with a request for a Gateway determination to allow public exhibition.

Consideration of advice

Council staff support the recommendations of the Woollahra LPP.

In relation to Part C, staff agree that design excellence provisions are essential to ensuring high quality architectural outcomes in the ECC. Staff are separately preparing a planning proposal to establish design excellence provisions that capture development across the whole of the Woollahra LGA. This will help ensure the achievement of high quality architectural outcomes irrespective of whether development is in a key centre, and will avoid the duplication of controls for different areas (such as in a future planning proposal for the Double Bay Centre). Notwithstanding it being already underway, the actioning of this separate planning proposal has been added to the report recommendations for completeness.

Parts D, E and F are noted by staff. We will ensure that the evolving outcomes of other planning proposals in Edgecliff, as well as the NSW Government reforms, are closely monitored and appropriately acted on where necessary.

Staff therefore recommended that the planning proposal be submitted to Gateway without any further amendments, with one exception. This is detailed under the heading below.

Minor amendment to the planning proposal

Following the meeting of the Woollahra LPP, SGS Economics and Planning advised staff about an opportunity to increase the affordable housing dollar rate for in-lieu contributions from $21,118 to $23,800 per square metre. This came from a shift in industry best practice, which was not adopted by SGS when drafting the original report for this AHCS.

The original figure was developed using the median strata price from the last 12 months. The new figure is still informed by this, but also acknowledges trends shown in new sales evidence gathered by SGS. In summary, the new dollar amount is more tailored to our local market, and ensures that the impact of the scheme as a percent of development costs remains proportional.

This new figure will be indexed the same way as the original one, and will not be subject to further changes (except routine indexation).

Staff support this approach as it will increase revenue from the scheme, and is the recommended approach by our independent expert consultants. This approach has also recently been adopted by the City of Sydney, and is current best practice.

This approach constitutes a very minor change in the draft AHCS, and accordingly does not require re-referral to the Woollahra LPP. All attachments have been updated by staff to reflect this change.

Mechanisms to fund public domain treatments – 7.11 and 7.12 contributions

When endorsing the ECC Strategy, on 29 April 2024, Council resolved (in part):

H. Requests staff to identify how the public domain improvements will be funded including reviewing opportunities to use Section 7.11, Section 7.12 and Voluntary Planning agreements.

Council staff recognise the importance of ensuring funding is available for public domain improvements, and are progressing this matter in accordance with the resolution.

Section 7.11 of the EP&A Act authorises Council to impose a contribution in the form of a monetary contribution, land dedication, works in kind (or a combination of these) for the provision or augmentation of public amenities and services. This contribution can only be applied where there is a clear nexus between the development being charged and the demand for the infrastructure being funded. Under this type of contribution, a council must apportion costs so that the development is only paying for the demand it creates. Accordingly, section 7.11 contributions are generally most suitable for greenfield sites or areas with widespread infill growth, where the rate of development is predictable.

Having regard to the type of development characteristic of the Woollahra LGA, the rigorous plan making requirements and the cost apportionment required, staff determined that this is currently unsuitable for the Woollahra LGA.

In contrast, section 7.12 contributions can be more flexibly applied. This contribution is a fixed levy based on a percentage of the cost of works. Although a general relationship between the development and the demand for infrastructure is required, the direct nexus and apportionment does not have to be established as it does for section 7.11 contributions. A section 7.12 plan is an efficient way of collecting monetary contributions from infill development, and requires less administration.

Section 7.12 plans are generally used in established urban areas where development is mainly infill development (such as the Woollahra LGA), and it is difficult to determine the rate at which development will occur. Council already has adopted and implemented the *Woollahra Section 7.12 Development Contributions Plan 2022*. Under this plan, we require an applicant to pay a maximum levy of 1% of the cost of works. In the 2023-24 financial year this plan yielded $4,504,000 in revenue to Council.

However, there is scope to increase this amount. Councils can request the NSW Government to consider a change in the existing levy amount. Their staff assess the merit of a request, and then make recommendations to the Minister. If successful, an amendment to the Environmental Planning and Assessment Regulation 2021 (Regulation) is prepared to increase the levy. In assessing council requests, the NSW Government consider individual geographical, socioeconomic, and development contexts. In some circumstances, a percentage of 2-3% can be sought using the criteria here: https://www.planning.nsw.gov.au/sites/default/files/2023-03/epaa-local-infrastructure-contributions-amendment-direction-2021.pdf

Staff consider that an updated section 7.12 plan, with an increased levy, could be appropriate for the ECC and are currently investigating its potential application. The planned uplift would align with the above criteria, and could be used to justify an increase in the levy rate. Other councils, such as Penrith, Willoughby and Burwood have already successfully increased section 7.12 rates, so a precedent exists. However, there is no guarantee of an increase being granted. The DPHI have a strict process, and the council request needs to be compelling.

Staff recommend that this is not formally progressed until we receive a Gateway determination to insert affordable housing provisions into the Woollahra LEP 2014. This is because the introduction of an increased levy will change current feasibility data necessary to support an AHCS. Accordingly, we recommend the AHCS is first reviewed by DPHI at Gateway, in the absence of any other contributions changes that could affect their assessment. Then, at a later stage, staff would pursue an increased 7.12 rate. This would be subject to its own testing, having regard to the AHCS and any other contributions that are being charged.

Mechanisms to fund public domain treatments – VPAs and conditions of consent

Voluntary Planning Agreements, or VPAs, are agreements that are entered into between Council and developers when sites are redeveloped (typically at rezoning stage). Examples of their use are facilitating the dedication of land, or the payment of monies to Council to facilitate affordable housing. VPAs have been used by Council as a primary method of capturing value from new development, such as at 136-148 New South Head Road. They are not mandatory for developers to enter into, and are resource intensive to negotiate.

VPAs are likely to be used less into the future on the uplift sites in the ECC. This is because affordable housing contributions will be collected via the AHCS for the ECC, and there is limited ability for VPAs to capture the completion of infrastructure works outside a subject site. VPAs are likely to be used to ensure the delivery of public benefits on a site, such a community spaces or pedestrian links.

Staff note there are opportunities to require public domain upgrades as conditions of consent, provided they are adjacent to a development site. For example, when a developer restores a footpath outside a site, as required by conditions, they could be required to provide specific paving or advanced tree plantings. This could be instituted by draft conditions of consent after the proposed controls are in force.

In the broader space of contributions, staff are also preparing a broad base AHCS to cover new residential development throughout the LGA. This will capture value from future uplift sites outside the nominated ECC Strategy sites. The feasibility information is currently being prepared, and this will be reported to a future meeting of Council when complete.

Options:

As a consequence of this report, the Strategic and Corporate Committee may:
- Recommend to Council to proceed with the planning proposal;
- Request staff make amendments to the planning proposal before proceeding; or
- Recommend to Council to not proceed with the planning proposal.

Community Engagement and / or Internal Consultation:

Council exhibited the ECC Strategy from 31 May 2021 to 30 September 2021. This included posting 9000 letters to surrounding property owners and/or residents. In response, Council received 153 submissions and 123 online survey responses. The ECC Strategy was significantly amended using guidance from the issues raised in submissions.

In translating the adopted ECC Strategy to a planning proposal, staff from Council's Strategic Planning and Place department liaised closely with Development Control, Community and Culture, and Heritage staff.

When this planning proposal was tabled at the Woollahra LPP, all previous submitters to the ECC Strategy were notified. This resulted in five speakers addressing the panel and 25 pieces of late correspondence being tabled, which can be viewed here: https://www.woollahra.nsw.gov.au/Council/Meetings-and-committees/Agendas-and-Minutes

The same submitters were also notified of this report going before the Strategic and Corporate Committee.

If the planning proposal receives a Gateway determination, the landowners and wider community would be notified via the exhibition process. All those that previously made a submission will also be notified.

Public exhibition of the planning proposal will be undertaken in accordance with the requirements of the Act, the Regulation, the *Woollahra Community Participation Plan* and any conditions of the Gateway determination.

Policy Implications:

Should Council resolve to progress a planning proposal (having considered the advice of the Woollahra LPP), and should the planning proposal progress to finalisation, there would be policy implications as controls for the subject properties will change under the Woollahra LEP 2014.

Financial Implications:

Should Council resolve to progress the planning proposal, financial resources will be associated with the public exhibition process.

If the AHCS is implemented, it will generate significant revenue for Council to use for the provision of affordable housing.

Resourcing Implications:

Should Council resolve to progress a planning proposal, staff resources would be associated with progressing the matter including managing the public exhibition process and preparing a post exhibition report to a meeting of Council.

The implementation of an AHCS will reduce the amount of resources dedicated to negotiating VPAs.

Conclusion:

This report provides the advice of the Woollahra LPP on a planning proposal to amend the planning controls for the ECC under the Woollahra LEP 2014, including height and FSR, and the introduction of an AHCS. The proposed changes to the controls align with the recommendations of Council's recently endorsed ECC Strategy. Staff recommend that the amended planning proposal proceed to a Gateway determination.

Attachments:

1. Planning Proposal - February 2025
2. Woollahra Affordable Housing Contributions Scheme - February 2025
3. Affordable Housing Contributions Scheme Final SGS Report - January 2025

Planning Proposal

Edgecliff Commercial Centre Planning Controls



Version Date:	December 2024
Division/Department:	Planning and Place / Strategic Planning
Responsible Officers:	Lyle Tamlyn and Chinmayi Holla
HPE CM Record Number:	24/195451

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Acknowledgement of Country

Woollahra Council acknowledges that we are on the land of the Gadigal and Birrabirragal people, the Traditional Custodians of the land. We pay our respects to Elders past, present and emerging.

1. Introduction

This planning proposal seeks amendments to the *Woollahra Local Environmental Plan 2014* (Woollahra LEP 2014) to implement the vision and built form framework of the *Edgecliff Commercial Centre Planning and Urban Design Strategy* (ECC Strategy).

It aims to facilitate development in the Edgecliff Commercial Centre (ECC) that occurs in a planned and coordinated manner. It would achieve this by creating opportunities for renewal, while also protecting the environmental amenity of the ECC and surrounding residential land.

Specifically, the planning proposal seeks to establish alternative building heights and floor space ratios (FSRs) for select properties within the ECC, as well as new local provisions to encourage high quality outcomes across the centre. It also proposes an affordable housing contributions scheme (AHCS), which would capture affordable housing contributions from the uplift envisaged.

Council staff are separately preparing a draft development control plan (DCP) to amend *Chapter D4 Edgecliff Centre* of the *Woollahra Development Control Plan 2015* (Woollahra DCP 2015). This will include complementary controls on built form outcomes and public domain treatments.

This planning proposal has been prepared in accordance with section 3.33 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Local Environmental Plan Making Guideline.*

This planning proposal applies to the ECC, which is shown in **Figure 1** below.

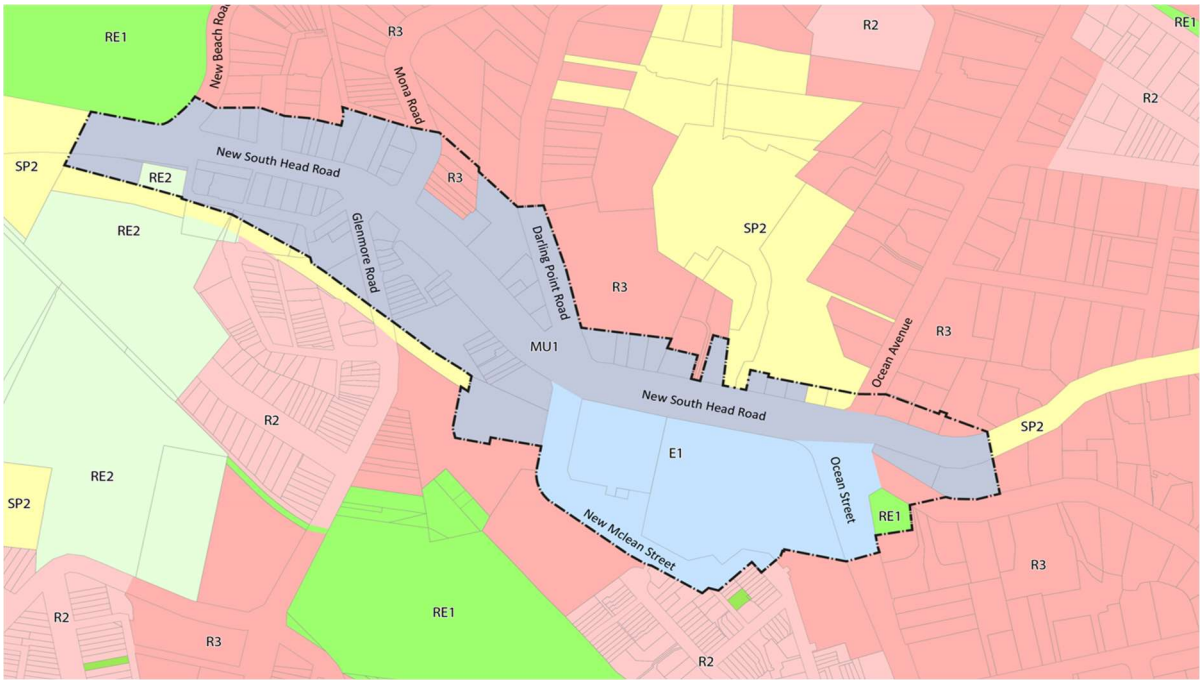


Figure 1: Map showing area subject to planning proposal (dotted line).

This document is principally guided by the adopted ECC Strategy and the *Edgecliff Commercial Centre: Heritage Assessment Report* by GML Heritage (Edgecliff Heritage Study). Relevant information regarding both these documents is outlined below.

1.1. Edgecliff Commercial Centre Planning and Urban Design Strategy

The ECC has been the subject of a number of proponent-led planning proposals, which are seeking uplift beyond that of the current planning controls. This has resulted in uncoordinated built form outcomes, which do not centre growth in the most appropriate areas.

Council has undertaken a strategic review of the planning controls for the ECC in order to provide a clear and coordinated approach to planning that will prevent ad-hoc development. Furthermore, Council has identified the ECC as a suitable area to facilitate controlled uplift to help meet our housing target of 1900 dwellings between 2024-2029.

The planning proposal is the outcome of the comprehensive strategic planning process that resulted in the adopted ECC Strategy, which seeks to deliver this controlled growth. After being publicly exhibited and refined in response to the feedback provided, the ECC Strategy was endorsed by Council on 29 April 2024 as follows:

THAT Council:

- *A. Receives and notes the submissions received in response to the Draft Edgecliff Commercial Centre Planning and Urban Design Strategy.*
- *B. Receives and notes the post exhibition report on the Draft Edgecliff Commercial Centre Planning and Urban Design Strategy and supporting documents.*
- *C. Endorses the updated Edgecliff Commercial Centre Planning and Urban Design Strategy as provided at Attachment 1 of the report to the Strategic and Corporate Committee meeting of 24 April 2024, and requests staff to prepare a planning proposal to enact the updated Edgecliff Commercial Centre Planning and Urban Design Strategy and report the planning proposal to a future meeting of the Woollahra Local Planning Panel for advice subject to the following:*
  - *i. Amend Figure 26 on Page 29 to show a separated cycleway in front of the Edgecliff Centre Site and the Edgecliff Station.*
  - *ii. Amend Figure 19 on Page 22 to remove western crossing across New South Head Road and show existing crossings only.*
  - *iii. Make no changes to the current controls or zone to the site at 81-83 New South Head Road Edgecliff.*
- *D. Requests staff to prepare an Affordable Housing Contributions Scheme to enable affordable housing contributions to be required in conjunction with uplift, which is progressed concurrently with the planning proposal.*
- *E. Requests staff to prepare a draft development control plan for the Edgecliff Commercial Centre to complement the provisions in the planning proposal.ma*
- *F. Endorses the updated Edgecliff Commercial Centre Public Domain Plan provided at Attachment 2 of the report to the Strategic and Corporate Committee meeting of 24 April 2024 subject to the following:*
  - *i. Amend Figure 8 on Page 15 to add pedestrians in the footway section to clarify it is a shared pedestrian and cycleway.*
  - *ii. Amend Figure 29 on Page 32 to show a separated cycleway in front of the Edgecliff Centre Site and the Edgecliff Station.*
  - *iii. Amend Figure 30 on Page 33 to add a cycleway line around into Ocean Street.*

G. *Requests staff to identify how the public domain improvements will be funded including reviewing opportunities to use Section 7.11, Section 7.12 and Voluntary Planning agreements.*

The ECC Strategy was accompanied by the *Edgecliff Commercial Centre Public Domain Plan* (Public Domain Plan) and the *Edgecliff Commercial Centre Transport Study* (Transport Study) prepared by SCT Consulting in April 2024. These documents may be viewed here: https://yoursay.woollahra.nsw.gov.au/edgecliff.

The ECC Strategy has been updated by Council staff, reflective of the changes in the resolution, and is now an endorsed document. This planning proposal and the accompanying AHCS action Parts C and D of the above resolution.

In accordance with the ECC Strategy, the planning proposal seeks to enact the following:

- Alternative building height and FSR controls on certain sites, where site amalgamation requirements are met, and sites are not subject to any additional bonuses;
- An AHCS applying to the uplift sites.
- A range for non-residential FSRs; and
- Controls for active frontages, dwelling mix and the public domain.

The remaining matters identified in the ECC Strategy will be addressed in the draft DCP, including but not limited to, character statements, street wall heights, setbacks, awnings, overshadowing, public domain upgrades and open space provision.

An excerpt of the ECC Strategy's recommended built form outcome is provided in **Figure 2** below.

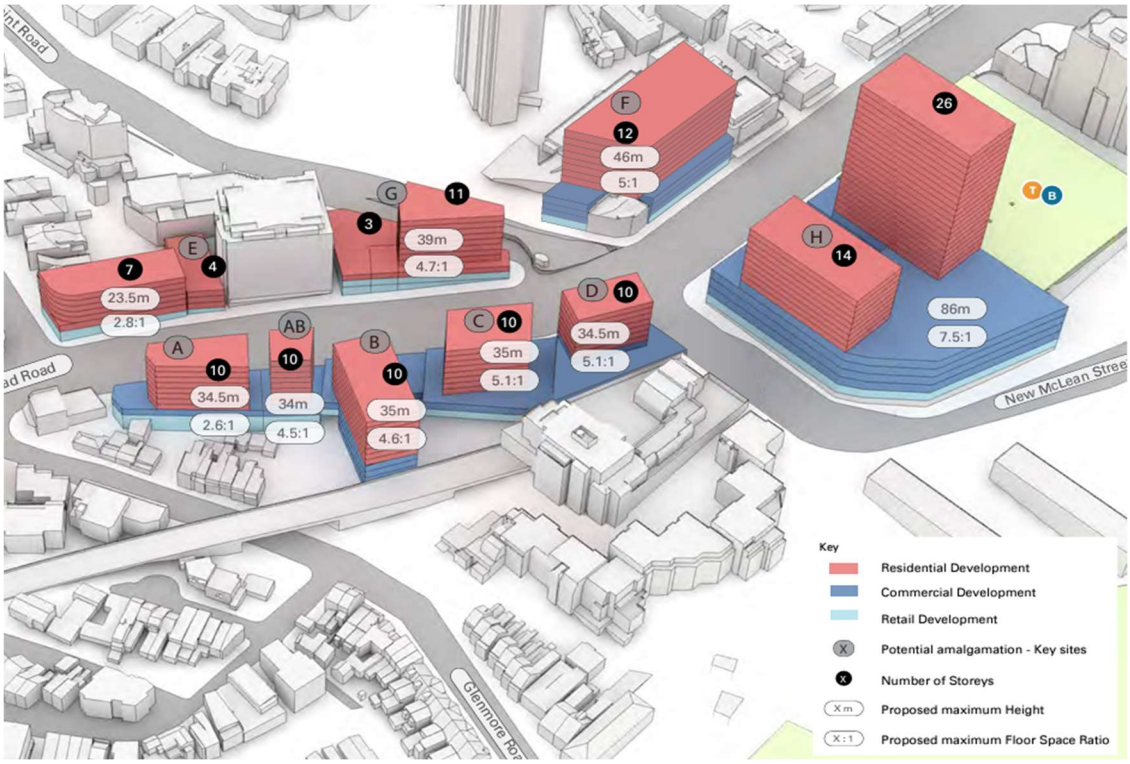


Figure 2: Built form outcome from endorsed ECC Strategy.

1.2. Edgecliff Heritage Study

In 2022, Council engaged GML Heritage to undertake a study of the ECC.

The Edgecliff Heritage Study originally recommended that Council prepare a planning proposal to list six local items and one heritage conservation area (HCA). The report was presented to the Woollahra Local Planning Panel (LPP) in October 2023 and following their feedback, the report was revised to include an additional two buildings recommended for heritage listing. After being supported by Council, the planning proposal was lodged for Gateway in June 2024. No Gateway determination has been issued as of 6 February 2025.

The final list of eight items and one HCA being recommended for heritage listing is presented below in **Table 1**. These recommended listings have been considered in the preparation of this planning proposal.

Table 1: Properties for proposed heritage listing in the Centre.

Item Name	Address	Lot
'Gruzman House', including interiors	6–8 Oswald Street, Darling Point	Lot 12, DP 3893 and Lot 3, DP 1197166
'Winston House', including interiors	20 New South Head Road, Edgecliff	SP 20728 SP 31826
'Portland Hall', including interiors and gardens	48 New South Head Road, Edgecliff	Lot 1, DP 82089 Lot 1, DP 1107185 Lot 1, DP 921798
'Cobham', including interiors and gardens	166 New South Head Road, Edgecliff	SP 90371
'Brantwood Court' including interiors and gardens	168 New South Head Road, Edgecliff	SP 11580
'Brantwood Hall' including interiors and gardens	170 New South Head Road, Edgecliff	SP 86720
Victorian Georgian terrace group – three cottages	543–547 Glenmore Road, Edgecliff	Lots 34, 35 and 36, DP 255233
Phoenix Palms at Oswald Street Reserve, Darling Point	Oswald Street, Darling Point	Road reserve
Brantwood Heritage Conservation Area	164 New South Head Rd 166 New South Head Rd 168 New South Head Rd 170 New South Head Rd 172-180 New South Head Rd	SP 16897 SP 90371 SP 11580 SP 86720 SP 10535

1.3. Edgecliff Centre site planning proposal

We note that the site at 203-233 New South Head Road (Area H in the ECC Strategy) is subject to a separate proponent-led planning proposal that seeks greater uplift than that envisaged in the ECC Strategy. Should this planning proposal be finalised, staff will remove this site from this planning proposal. As at 6 February 2025, it is at the pre-Gateway stage.

1.4. Local Planning Panel advice

This planning proposal was referred to the Woollahra LPP on 19 December 2024. The panel were supportive of the proposed amendments and recommended that Council proceed. The Woollahra LPP's advice is provided below.

Part A. THAT the Woollahra Local Planning Panel advises Council that it supports the planning proposal (as provided at Attachment 1 of the Panel Agenda), as it demonstrates site-specific and strategic merit for following reasons:

i. *The planning proposal is consistent with the relevant objectives of the Greater Sydney Region Plan: A Metropolis of Three Cities and the relevant planning priorities and actions of the Eastern City District Plan.*
ii. *The planning proposal aligns with the Woollahra Local Strategic Planning Statement, Woollahra Local Housing Strategy and Council's Community Strategic Plan Woollahra 2032.*
iii. *The planning proposal is supported by a detailed transport study undertaken by SCT Consulting, to analyse the existing and the future transport capacity within the ECC.*

Part B. The Woollahra Local Planning Panel advises Council that it supports the planning proposal (as provided at Attachment 1) to amend the Woollahra Local Environmental Plan 2014 which seeks to achieve the following:

i. *Provide increased building heights and floor space ratios for areas identified on the Key Sites Map, subject to amalgamation requirements being met.*
ii. *Restrict bonuses from other environmental planning instruments applying where the increased building heights and floor space ratios are taken up.*
iii. *Specify minimum and maximum non-residential floor space ratios for the areas identified on the Key Sites Map.*
iv. *Insert local provisions for all development in the Edgecliff Commercial Centre, addressing dwelling mix, active frontages and the public domain.*
v. *Insert a clause that requires affordable housing contributions for areas identified on the Key Sites Map, consistent with the Woollahra Affordable Housing Contributions Scheme at Attachment 2.*

Part C. The Woollahra Local Planning Panel advises Council to ensure there are local provisions to facilitate design excellence in the Edgecliff Commercial Centre.

Part D. The Woollahra Local Planning Panel notes that the Edgecliff Commercial Centre Local Heritage Listing planning proposal to implement the Edgecliff Heritage Study has been lodged with the Department of Planning, Housing and Infrastructure for Gateway determination and this planning proposal should be considered separately.

Part E. The Woollahra Local Planning Panel notes the many public submissions made to the meeting of 19 December 2024 made comments on the three proponent-initiated planning proposals that are beyond the remit of this local planning panel and are being administered by the Sydney Eastern City Planning Panel.

Part F. The Woollahra Local Planning Panel encourages staff to monitor the evolving outcomes from various planning proposals in Edgecliff and state-led planning reforms for their implications in relation to this planning proposal.

In relation to Part C, Council agree that design excellence provisions are essential to ensuring high quality architectural outcomes in the ECC. Staff are separately preparing a planning proposal to establish design excellence provisions that capture development across the whole Woollahra LGA. This will help ensure the achievement of high quality architectural outcomes irrespective of whether development is in a key centre, and will avoid the duplication of controls for different areas (such as in a future planning proposal for the Double Bay Centre).

Parts D, E and F are noted by Council staff. We will ensure that the evolving outcomes of other planning proposals in Edgecliff, as well as the NSW Government reforms, are closely monitored and appropriately acted on where necessary.

2. Existing context

2.1. Subject area

The ECC runs along both sides of New South Head Road, from its intersection with New Beach Road in the west to its intersection with Ocean Avenue in the east.

The ECC contains a mix of dwellings, shops, offices, and other services. A commercial hub at Edgecliff Station includes Eastpoint Food Fair (235-285 New South Head Road, above the station) and the Edgecliff Centre (203-233 New South Head Road, adjacent to the station). Each has a supermarket, specialty shops, cafes, parking, and pedestrian access through to Edgecliff Station and bus interchange.

There are nearby public open spaces including Rushcutters Bay Park, Trumper Park and Trumper Oval providing a range of recreational facilities.

Several schools are located within walking distance of the ECC. These include the private schools (primary and secondary) of Ascham, Sydney Grammar and Edgecliff Preparatory School, and Double Bay Public School.

The ECC has access to other nearby precincts that offer shopping and entertainment, including Bondi Junction, Kings Cross, Oxford Street and Darlinghurst, Double Bay and Surry Hills.

2.2. Building types and uses

The eclectic style and character of the built form in the ECC reflects the varied land uses present. Building age varies, generally from the early to late twentieth century. Building height ranges from one to 16 storeys. The three to four storey-built forms along New South Head Road are punctuated by several taller buildings that are generally of later construction.

The suburb of Edgecliff has a high percentage of apartments in medium and high-rise buildings – 70% of dwelling stock (ABS, 2021). Consequently, a significant number of properties within and surrounding the ECC have been strata subdivided.

Some of these older apartment buildings contain smaller units, have no parking or on-site facilities and are a type of housing that is unlikely to be facilitated in today's market. These buildings make an important contribution to housing diversity in the ECC.

2.3. Existing movement network and accessibility

The ECC is primarily accessed from New South Head Road. It is serviced by frequent public transport services including bus routes and trains at Edgecliff Station, being on the Eastern

Suburbs line. These transport services provide access to surrounding centres such as the Sydney CBD, Kings Cross and Bondi Junction. The ECC also has pedestrian links to Paddington and the Sydney CBD, providing opportunities for active transportation.

Within the ECC, there are moderate traffic volumes outside peak periods, with all intersections providing acceptable levels of service. However, on New South Head Road, worsened congestion and high traffic volumes have been identified during the morning and evening peak periods.

3. Existing planning controls

The existing planning controls applying to the ECC are summarised under the headings below.

3.1. Land use zone

The ECC is predominately zoned E1 Local Centre and MU1 Mixed use. In terms of permissible uses, both zones allow for commercial premises, which facilitates the introduction of a wide variety of businesses, including retail outlets, office space and consumer services. They also permit the construction of shop top housing, but not residential flat buildings. This ensures a wide distribution of commercial uses and encourages active site frontages.

3.2. Height of buildings

The maximum building height for the land within the ECC ranges from 5m to 34m. The distribution of the maximum heights generally follows the topography. The largest heights are focused on Edgecliff Station (a high point on the ridgeline) and then transition down the hills towards Rushcutters Bay and Double Bay. Some development around the ECC that has a greater height than is currently permitted, was built before the introduction of the Woollahra LEP 2014.

3.3. Floor space ratio

The maximum FSR for land within the ECC ranges from 0.5:1 to 4:1. Like building heights, the FSRs are highest around Edgecliff Station and follow the topography.

3.4. Heritage

Local heritage items within the ECC (on New South Head Road) include a masonry wall within Darling Point Road, the former bank building at 136, Ascham School at 188, the former Post Office at 287–289 New South Head Road. Rushcutters Bay Park (adjoining the ECC to the north-west) and the Fenton residential building at 8 Albert Street (to the south-east) are listed as state heritage items.

The Paddington HCA and Mona Road HCA adjoin the ECC (both having a small number of properties inside the centre as well), and the Woollahra HCA is to the south-east. Edgecliff Station and the Edgecliff (Rushcutters Bay) Viaduct are heritage items under Section 170 of the *Heritage Act 1977.*

As previously outlined, a current planning proposal also recommends the listing of eight local heritage items and one HCA in the ECC.

4. Objectives of planning proposal

The objectives of this planning proposal are to:

- Grow the ECC by facilitating uplift on appropriate sites, and protect the local character of land surrounding the centre.
- Encourage a mix of uses including retail, employment residential and community space, with non-residential uses on lower levels and residential above, with integrated community infrastructure.
- Accentuate the core, with the tallest buildings on the hill around the Edgecliff Station.
- Protect the environmental amenity of existing development and the public domain.
- Conserve environmental heritage in and around the ECC.
- Protect diverse housing in the ECC and promote the development of new affordable housing.
- Improve the public domain via improvements including new public spaces, urban greening, street furniture and lighting, pedestrian paths, cycleways and public art.
- Mitigate traffic impacts through upgraded infrastructure and the reduction of private vehicle reliance.
- Provide for the implementation of an AHCS to facilitate affordable housing provision in the area.

5. Explanation of provisions

The objectives of this planning proposal will be achieved by amendments to the Woollahra LEP 2014, including:

- Alternative building height and FSR controls on certain sites, where site amalgamation requirements are met, and sites are not subject to any additional bonuses;
- An AHCS applying to the uplift sites;
- A range for non-residential FSRs; and
- Controls for active frontages, dwelling mix and the public domain.

These amendments are consistent with those recommended in the adopted ECC Strategy. This section separately discusses controls concerning built form outcomes and affordable housing contributions under the headings below.

5.1. Basis for built form controls

The ECC Strategy recommends built form outcomes using a precinct-based approach. These precincts are shown in **Figure 3** below.

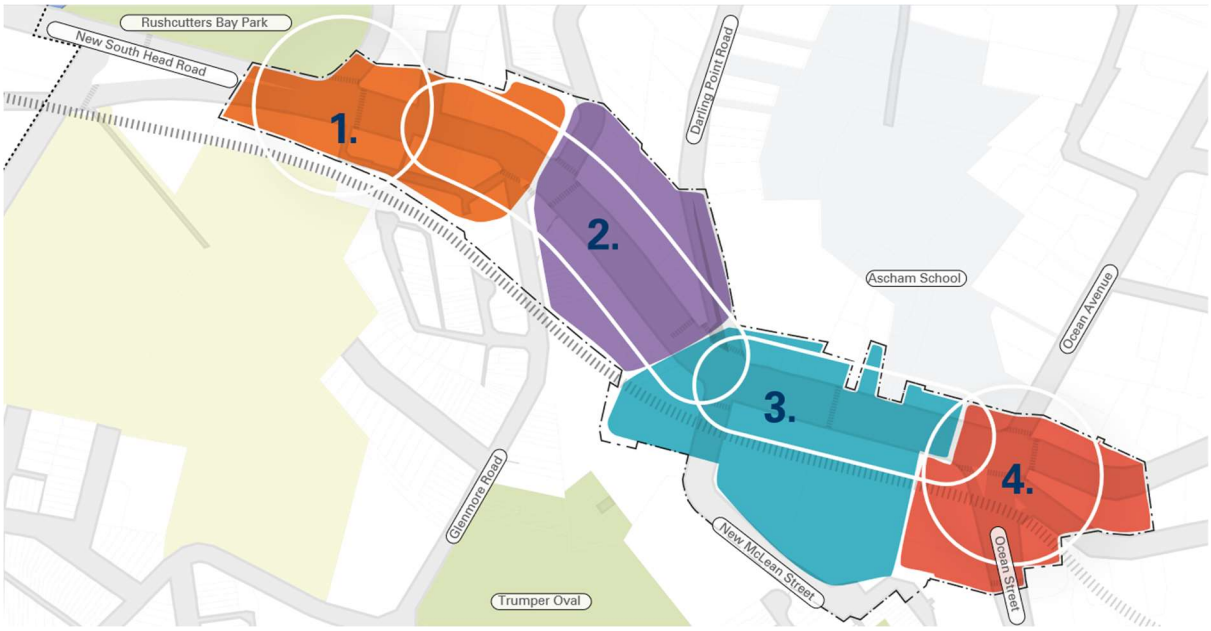


Figure 3: Precincts identified in the ECC Strategy.

The four precincts, listed in order of the numbers in **Figure 3**, are further described below.

5.1.1. Western Basin

The Western Basin (Precinct 1) is one of the main entrances to the Woollahra LGA and is the western entrance to the ECC. Some of the most diverse housing in the ECC is located in this precinct. It contains a large amount of older apartment stock, with smaller studio and one-bedroom dwellings that are more affordable to rent or buy. If these buildings were redeveloped, local market conditions would likely result in these dwellings being replaced by higher cost housing that does not cater to the same demographics.

It also has Moreton Bay Figs along the side of New South Head Road and in a landscaped median, which are fundamental to the precinct's character. Landscaping frames views into the ECC and building height responds to the height of the trees. The visual and physical relationship across the precinct, between the Paddington slopes and Rushcutters Bay, is retained.

No uplift is recommended for this precinct. This will assist in the retention of smaller, low-cost apartments, while also protecting the visual catchment across the basin and ensuring the LGA's entrance is framed by landscaped features. There are also a number of heritage items being separately proposed in this precinct. Gruzman House, Winston House and the Phoenix Palms previously described make development around Oswald Street unsuitable.

Public domain upgrades will be sought through the accompanying draft DCP. Unit mix controls being proposed will also promote housing diversity throughout the ECC.

5.1.2. Mixed Use Corridor

The Mixed Use Corridor (2) contains a mix of retail, services, and residential uses. Retail activates the New South Head Road frontages and continuous awnings provide pedestrian amenity. Articulated facades and upper storey setbacks reduce the apparent bulk and scale of buildings. Built form in this precinct is varied, contributing to an interesting streetscape, and frames the landmark development on the Edgecliff Centre site.

This planning proposal recommends uplift that would increase dwelling density and retail floor space in this precinct, providing for more housing and local services. However, this has been balanced against a need to respect places of heritage significance and allow an appropriate built form transition from the Local Commercial Core to the lower scale Western Basin. A height range of 7-11 storeys is proposed within this precinct. These heights are based on individual site merit, urban design testing, and context.

5.1.3. Local Commercial Core

The Local Commercial Core (3) serves as a community hub, being a focus for employment, shopping and mass transportation. It sits at the top of the ridgeline, resulting in its economic importance being underscored by its visual prominence.

This planning proposal seeks to further reinforce these characteristics by making provision for the growth of residential and commercial floor space. Subsequent redevelopment would also allow for the upgrading of prominent public spaces, and connections to important transport infrastructure. Importantly, the proposal also endeavours to concentrate bulk in areas that respect New McLean Street as a transition zone to the Paddington HCA and Trumper Park and have regard to the proposed Brantwood HCA.

This proposal will also capitalise on an opportunity to create an urban marker to strengthen the identity of the ECC. It recommends a landmark tower of 26 storeys on the Edgecliff Centre site. This is based on unique feasibility, urban design, environmental considerations and amenity outcomes.

5.1.4. Eastern Edge

The Eastern Edge (4) is the primary connection to the adjoining Double Bay Centre. No uplift is recommended in this area, as relevant sites are either used for education purposes or already developed to an appropriate density. Any further development would compromise the transition of bulk down the hill towards Double Bay. However, similar to the Western Basin, public domain upgrades will be set out in the accompanying draft DCP.

5.2. Details of built form controls

The planning proposal recommends uplift on certain sites at the top of the ridge, closest to the Edgecliff Station. This uplift would be facilitated over seven amalgamated sites. The sites are shown in **Figure 4**.



Figure 4: Seven consolidated subject sites (showing E and F, which have controls already gazetted).

Sites E and F have already been subject to site specific planning proposals initiated by their respective owners, and consequently the controls illustrated in the ECC Strategy are already in force. Site E has an adopted building height and FSR of 23.5m and 2.9:1 respectively. Site F has 46m and 5:1. They have been included in relevant maps and their site identifiers (e.g. Site E) have been retained as is, to maintain alignment with the adopted ECC Strategy. Amalgamation criteria do not apply to either Sites E and F, as this issue was already addressed in their respective planning proposals.

To align with drafting conventions in the Woollahra LEP 2014, we have had to convert the sites to ‘areas’ for inclusion in the Key Sites Map. These are shown in **Table 2** below.

Table 2: Summary of proposed controls for uplift sites*

ECC Strategy Site Identifier	Address	Key Sites Map Area
A	135-155 New South Head Rd	Area 2
AB	157-159 New South Head Rd	Area 3
B	161 New South Head Rd	Area 4
C	179-191 New South Head Rd	Area 5
D	1 New McLean St	Area 6
G	110-130 New South Head Rd (also partly known as 2A-2B Darling Point Rd	Area 7
H	203-233 New South Head Rd and road reserve	Area 8

*Note exclusion of Sites E and F as already gazetted. Site E is already Area 1 on the Key Sites Map.

Under this planning proposal, each of the remaining seven sites would receive an alternative maximum building height and FSR if lot amalgamation criteria are met. A non-residential FSR range would also apply. The key envelope controls proposed for each site are summarised in **Table 3** below.

This planning proposal also recommends a provision that prevents any uplift site receiving additional building height or floor space. This would be done by restricting bonuses from any other environmental planning instrument.

Table 3: Summary of proposed controls for uplift sites

Site	Address	Lots	Existing height / storeys	Proposed height / storeys	Existing FSR	Proposed FSR	Proposed non-residential FSR
A	135-155 New South Head Rd	• Lot 1 in DP 793936 • Lot 2 in DP 793936	14.5m / 4 storeys	34.5m / 10 storeys	1.5:1	2.6:1	0.7:1 -1.2:1
AB	157-159 New South Head Rd	• Lot 101 in DP 854375 • SP 51202	14.5m / 4 storeys	34m / 10 storeys	1.5:1	4.5:1	2:1 – 2.9:1
B	161 New South Head Rd	N/A, already consolid.	14.5m / 4 storeys	35m / 10 storeys	2:1	4.6:1	1.6:1 – 2.5:1
C	179-191 New South Head Rd	• Lots 14, 15, 16, 17, 18, 19 20 in DP 255233	14.5m / 4 storeys	35m / 10 storeys	2.5:1	5.1:1	2:1 – 3.1

Site	Address	Lots	Existing height / storeys	Proposed height / storeys	Existing FSR	Proposed FSR	Proposed non-residential FSR
D	1 New McLean St	N/A, already consolid.	14.5m / 4 storeys	34.5m / 10 storeys	2.5:1	5.1:1	2.2:1 – 3.2:1
G	110-130 New South Head Rd (also partly known as 2A-2B Darling Point Rd	• Lot A in DP 176247 • Lot C in DP 180913 • SP 3819 • SP 42657	20.5m / 6 storeys	39m / 11 storeys	2:1	4.7:1	0.4:1 – 1.4:1
H	203-233 New South Head Rd and road reserve	N/A	6-26m / 7 storeys	86m / 26 storeys	2.5:1	7.5:1	3:1 – 4.5:1

This planning proposal also recommends provisions that would apply to any development for new buildings or significant additions anywhere in the ECC (as shown on a new Locality Identification Map to be inserted into the Woollahra LEP 2014). These address active frontages, the enhancement of the public domain and dwelling size mix.

5.3. Built form controls draft clause

The following text is indicative of what would be included in the Woollahra LEP 2014 as a new local provision. It should be noted that the draft clause is indicative only and would be subject to drafting by the Parliamentary Counsel's Office, should the proposal progress to finalisation.

6.12 Development on land in the Edgecliff Commercial Centre

(1) The objectives of this clause are as follows—

(a) to provide additional building height and floor space to specified land,

(b) to encourage the consolidation of lots to promote high quality urban design outcomes and the efficient use of land,

(c) to ensure new development responds to the desired future character of the Edgecliff Commercial Centre,

(d) to protect the environmental amenity of surrounding land uses and the public domain,

(e) to enhance the public domain through improved community infrastructure and frontage activation,

(f) to encourage diversity in dwelling sizes.

(2) This clause applies to development in the Edgecliff Commercial Centre on the Locality Identification Map, involving-

(a) the erection of a new building,

(b) significant alterations and additions to an existing building.

(3) Despite Part 4, the building height and floor space ratio of development on land on the Key Sites Map to which this clause applies must be no more than -

(a) in respect to Area 2 – 34.5m and 2.6:1

(b) in respect to Area 3 – 34m and 4.5:1

(c) in respect to Area 4 – 35m and 4.6:1

(d) in respect to Area 5 – 35m and 5.1:1

(e) in respect to Area 6 – 34.5m and 5.1:1

(f) in respect to Area 7 – 39m and 4.7:1

(g) in respect to Area 8 – 86m and 7.5:1

*(4) Development subject to subclause (3) that exceeds development standards under Part 4 must have a **non-residential** floor space ratio between-*

(a) in respect to Area 2 – 0.7:1 and 1.2:1

(b) in respect to Area 3 – 2:1 and 2.9:1

(c) in respect to Area 4 – 1.6:1 and 2.5:1

(d) in respect to Area 5 – 2:1 and 3:1

(e) in respect to Area 6 – 2.2:1 and 3.2:1

(f) in respect to Area 7 – 0.4:1 and 1.4:1

(g) in respect to Area 8 – 3:1 and 4.5:1

(5) Consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that-

(a) all lots comprising an area on the Key Sites Map are consolidated into a single lot, with the exception of Area 8,

(b) active frontages will be provided,

(c) the development will improve the quality of the surrounding public domain.

(6) Development subject to subclause (3) that exceeds development standards under Part 4 must not use additional building height or floor space ratio provided under another environmental planning instrument.

(7) Development with over 9 dwellings must have at least 30% of the dwellings (to the nearest whole number) as self-contained studio or one bedroom dwellings, or both.

*(8) In this clause **non-residential** means used for purposes other than residential accommodation.*

5.4. Details of affordable housing component

This planning proposal recommends the introduction of affordable housing provisions for the ECC. SGS Economics and Planning were commissioned by Council staff to carry out feasibility testing on the suggested uplift sites and recommend appropriate rates for the provision of affordable housing.

The testing found that a 3% rate, rising to a 5% rate after three years, would allow an AHCS to apply in the ECC without hampering the economic viability of new development. Details of the testing, and the broader strategic justification for the AHCS, are provided in Part 6 of this planning proposal.

If implemented, amendments to the Woollahra LEP 2014 would require the dedication of affordable dwellings in perpetuity, or payment of an affordable housing contribution to Council (consistent with the AHCS), via a condition of development consent. Any monetary contributions would be pooled and then used to invest in affordable housing assets, made available to lower income workers who meet pre-established criteria.

While the structure of the proposed AHCS allows for both dedications and in lieu contributions, Council has received advice from SGS Economics and Planning and the Community Housing Industry Association that in lieu contributions are preferred. This preference emerges from the consideration of operational burdens, where scattered affordable dwellings present a higher operating expense burden on community housing providers (e.g., fixed and variable costs associated with site-to-site maintenance, management, travel, strata fees etc.).

We also note that section 7.12 development contributions, used to fund local infrastructure works, would be imposed concurrently with any affordable housing contribution.

Unlike the built form controls, Area 1 on the Key Sites Map (former Site F, or 136-148 New South Head Road) is included. While new envelope controls have been gazetted, no development application has been lodged as yet. Accordingly, the inclusion of this site allows Council to obtain an additional affordable housing contribution.

The *Woollahra Affordable Housing Contributions Scheme* itself and the *Woollahra Affordable Housing Contributions Scheme –Report* (AHCS Report), prepared by SGS Economics and Planning, are circulated with this document.

5.5. Affordable housing draft clause

The following text is indicative of what would be included in the Woollahra LEP 2014 to enact the AHCS. Similar to the built form controls, the draft clause would be subject to drafting by the Parliamentary Counsel's Office, should the proposal progress to finalisation.

6.13 Affordable housing in Edgecliff

(1) This clause applies to land identified as Areas 1 through to 8 on the Key Sites Map.

*(2) The consent authority may, when granting consent to the carrying out of development (other than development that is **excluded development**) impose a condition requiring a contribution equivalent to the "affordable housing contribution", being—*

- *a) for a development application lodged from [COMMENCEMENT DATE OF SCHEME] and up to and including [3 YEARS FROM COMMENCEMENT DATE] — 3% of the total floor area of the development that is intended to be used for residential purposes, and*
- *b) for a development application lodged after [3 YEARS FROM COMMENCEMENT DATE] — 5% of the total floor area of the development that is intended to be used for residential purposes.*

(3) The floor area of any excluded development is not to be included as part of the total floor area of a development for the purposes of calculating the applicable affordable housing contribution.

(4) A condition imposed under this clause must satisfy the affordable housing contribution-

- *a) by way of a dedication in favour of the Council of land comprising 1 or more dwellings (each having a total gross floor area of no less than 50 square metres) with any remainder being paid as a monetary contribution to the Council, or*
- *b) By way of a monetary contribution to the Council, but only for the purposes of affordable housing.*

(5) The rate at which monetary contribution is taken to be equivalent to floor area for the purposes of this clause is to be calculated in accordance with the Edgecliff Affordable Housing Contributions Scheme adopted by the Council on [DATE OF ADOPTION].

***Note:** The plan is made available by the Council on its website.*

(6) To avoid doubt—

- *a) it does not matter whether the floor area, to which a condition under this clause relates, was in existence before, or is created after, the commencement of this clause, or whether or not the floor area concerned replaces a previously existing area, and*
- *b) the demolition of a building, or a change in the use of the land, does not give rise to a claim for a refund of any contribution.*

(7) In this clause—

***"excluded development"** means development for the following purposes—*

- *a) development for the purposes of residential accommodation that will result in the creation of less than 100 square metres of total floor area,*

b) *development for the purposes of residential accommodation that involves a change of use of existing floor area from other than residential accommodation to residential accommodation that will result in a change of use affecting less than 100 square metres of total floor area,*

c) *development for the purposes of residential accommodation that is used to provide public or affordable housing in perpetuity.*

"total floor area" *means the total of the areas of each floor of a building within the outer face of the external enclosing walls and including balconies, but excluding the following—*

a) *columns, fins, sun control devices, awnings and other elements, projections or works outside the general lines of the outer face of the external walls,*

b) *any area of a balcony that is more than the minimum area required by the consent authority in respect of the balcony,*

c) *the maximum ancillary car parking permitted by the consent authority and any associated internal vehicular and pedestrian access to that car parking,*

d) *space for the loading and unloading of goods.*

6. Justification

This section establishes the need for a planning proposal, achieving the key outcomes and objectives. The set questions below address the strategic origins of the proposal and whether amending the Woollahra LEP 2014 is the best approach to achieve its aims.

6.1. Section A - Need for planning proposal

6.1.1. Is the planning proposal a result of an endorsed local strategic planning statement, strategic study or report?

The planning proposal is a result of the ECC Strategy, which was endorsed by Council on 29 April 2024. The built form outcomes from this strategy directly inform the scope of the Woollahra LEP 2014 amendments sought.

The AHCS Report prepared by SGS Economics and Planning forms the basis of the AHCS sought as part of this planning proposal. This component directly responds to affordable housing objectives in the ECC Strategy, as well as the *Woollahra Local Housing Strategy 2021* (Woollahra LHS 2021).

1. ECC Strategy foundation – Urban Design Study

The ECC Strategy is the guiding document that provides direction for the future growth of the ECC. The Edgecliff ECC establishes a vision for the ECC and provides recommendations on proposed planning controls, urban design outcomes, public domain improvements and transport enhancements to guide future development.

The *Edgecliff Commercial Centre Study* (the Urban Design Study) prepared by SJB informed the recommendations of the ECC Strategy. It contains the baseline research used to identify the preferred built form and urban design outcome for the ECC. It includes a detailed analysis of the study area, identification of opportunities and constraints, design principles, scenario testing, development of the preferred built form and recommendations to achieve the desired future character for the ECC.

The Urban Design Study tested three unique development scenarios in order to develop a preferred scenario for the ECC based on themes emerging from the site testing. The minimum and maximum range of built forms recommended in each scenario was informed by a market analysis commissioned by Council

A summary of the three scenarios is discussed below:

- Scenario 1: This scenario only considered existing or known proposed uplift. This consisted of three opportunity sites identified by Council in 2009, one approved development application and one approved planning proposal. The resulting built form was mixed use development with a height of four to 15 storeys, scattered across a limited number of sites.
- Scenario 2: This scenario considered a uniform increase in development potential across all sites in the ECC. It did not take into account the natural topography of the ECC, or the work of the Opportunity Sites. The resulting built form included commercial, retail and residential uses evenly distributed across the ECC with a height generally between six to eight storeys.

- Scenario 3: This scenario focused the maximum employment floor space around Edgecliff train station, and distributed retail and residential uses across the rest of the ECC. The resulting built form was the greatest with a height ranging from four to 26 storeys, which included a mix of commercial and residential towers.

Having taken into account the natural topography, heritage conservation, overshadowing, amenity and access, the preferred scenario combined elements from Scenarios 1, 2 and 3.

The preferred scenario, used to inform the ECC Strategy, also had regard to economic conditions and provided forecasts for future demand for retail, commercial and residential floor space in the ECC. Market analysis commissioned by Council identified strong potential for residential growth in the ECC in conjunction with retail and office uses.

2. ECC Strategy – overview

The exhibited version of the ECC Strategy was the result of the preferred scenario identified above. Its objective was to revitalise the ECC by creating a clear and coordinated framework to facilitate development that:

- Provides high quality transit oriented development with a suitable mix of uses;
- Displays design excellence;
- Upgrades the public domain and enhances active transport;
- Protects heritage;
- Provides affordable housing; and
- Contributes to the delivery of community infrastructure.

It was publicly exhibited from 31 May 2021 to 30 September 2021, where comment was sought from local residents, business, community groups and government bodies. This included posting 9000 letters to surrounding property owners and/or residents. In response, Council received 153 submissions and 123 online survey responses

3. ECC Strategy – post-exhibition amendments

Following public exhibition, as detailed in Chapter 4.2 of the ECC Strategy, Council staff amended the document to respond to issues raised in submissions.

The updates included the:

- Preservation of the entrance to the Woollahra LGA and ECC as the Western Basin;
- Amendment of the review sites to focus uplift around Edgecliff Station, with the updated ECC Strategy focusing additional height and floor space on sites that:
    - Are closer to Edgecliff Station;
    - Have a frontage to New South Head Road;
    - Have potential for higher housing yield;
    - Have no identified heritage or character value; and
    - Will not interrupt the view of the Paddington basin.
- Review of built form controls, through additional urban design testing, to ensure all adjusted building height and FSR controls align with one another;
- Inclusion of design principles for the Edgecliff Centre site (discussed more later);

- Adjustment of built form recommendations near potential heritage items, resulting from the Edgecliff Heritage Study; and
- Revision of amalgamation patterns for uplift sites to factor in all of the above.

The resulting final version of the ECC Strategy is therefore the result of a fine-grain, site-by-site review of the ECC and is informed by supporting urban design, traffic, economic, and heritage studies. There are no recommendations for blanket changes to planning provisions. It seeks to support the development of each site in accordance with the desired character of the area.

The adopted ECC Strategy is a clear reflection of the community and Council's position on the desired future character of the ECC. This planning proposal implements the key vision and recommendations set out in the ECC Strategy.

The recommended built form will generally follow the sloping topography of the ECC with the tallest buildings around Edgecliff Station. Current building heights within the Western Basin precinct will be preserved. This will enable retention of the apartment buildings that contribute to housing diversity.

New vehicle entries will be restricted to secondary streets, away from New South Head Road, to minimise congestion and improve public domain and street activation.

The proposed built form will ensure that solar access to Trumper Park and Oval, the Paddington HCA and existing dwellings is maintained. At a minimum, development will be required to allow two hours of direct sunlight between 10.00am and 2.00pm on 21 June. Narrow floorplates will be encouraged, wherever possible, to facilitate fast-moving shadows and minimise impacts on existing solar access.

4. ECC Strategy – Edgecliff Centre site

The existing Edgecliff Centre building (203-233 New South Head Road) is a key site in the ECC due to its size, its location next to the Edgecliff Station, and its location at the top of the ridge.

The proposed height provides for a landmark development at the ECC's core, marking the top of the hill and Edgecliff Station, while not overwhelming nearby residential areas and public spaces (**Figure 5**). The scale of the built form proposed is appropriate to its location and role in the strategic centre hierarchy. This proposal recommends a building height of 86 metres (26 storeys). A maximum FSR of 7.5:1 and a minimum non-residential FSR of 3:1 are also recommended to help retain and enhance the role of the Local Commercial Core.

A development measuring 26 storeys on the Edgecliff Centre site would result in the tallest building within the ECC. However, it will not produce any unreasonable environmental planning impacts. For instance, solar analysis indicates development on the Edgecliff Centre site would not produce excessive overshadowing. Trumper Oval would receive no additional shadowing after 10.00am in mid-winter. Dwellings south of the ECC will also be capable of receiving at least two hours of sunlight to their private open spaces.

This uplift site, unlike others identified in this planning proposal, also does not have any amalgamation requirements. Council owns the southern section of land comprising the area of the Key Sites Map. Accordingly, if an amalgamation requirement were imposed, it could have an influence on Council's negotiating power for the necessary sale of the land (to merge it with the privately held land). As such, the sites will be allowed to remain separated to avoid this issue.



Figure 5: Graph showing growth in dwelling sizes, 2011-2021 (SGS, 2024)

5. ECC Strategy – other local provisions

In addition to key building envelope controls, the ECC Strategy also makes recommendations on lot amalgamation, public domain treatments, active frontages and housing diversity. Other local provisions are proposed to capture these elements and ensure the delivery of high-quality planning outcomes in the ECC.

Uplift envisaged under the ECC Strategy assumes the amalgamation of fragmented lots in the ECC. This process allows for efficient floorplates, simpler vehicular access and enhanced opportunities to provide amenity. Accordingly, the draft clause requires all lots (except the Edgecliff Centre site, Area 8) within one area of the Key Sites Map to be amalgamated before increased building height and FSR can be accessed. The planning proposal suggests this approach for the draft clause instead of individually nominating lot numbers as the legal description of lots can change, and excessive text would make the clause less legible.

The ECC Strategy also places focus on the enhancement of the public domain. A specific vision for this is incorporated within the accompanying Public Domain Plan, and its implementation will be facilitated by new controls in the draft DCP. However, to ensure its delivery, it is appropriate to reference improvements to the quality of the public domain in the draft Woollahra LEP 2014 clause as well. This will ensure the DCP provisions are supported, and that high quality public domain outcomes (such as tree planting or the replacement of pavers) can be facilitated through development consents.

The activation of street frontages also underpins placemaking outcomes in the ECC Strategy. Accordingly, the draft clause also requires new development to provide active frontages. These will contribute to place identity, increase commercial vitality and allow passive surveillance of the streetscape.

Additionally, the ECC Strategy identifies the importance of diverse housing. Due to market factors, apartment delivery in the Woollahra LGA is biased towards larger dwellings aimed at families or residents downsizing from detached houses. While it is important that these demographics continue to be catered for, it is also essential that smaller, lower cost

dwellings are available for couples and singles. Only 12.5% of dwellings in the LGA are studios and one bedroom dwellings (ABS, 2021). This was the fastest growing typology across the Eastern Harbour City and Greater Sydney over the last decade, increasing by 38 percent and 43 percent, respectively. In contrast, Woollahra saw a one percent decline in one-bedroom and studio dwellings over the same timeframe. Larger dwellings saw positive growth in Woollahra, particularly four-bedroom homes which grew by 18 percent (see **Figure 6**).

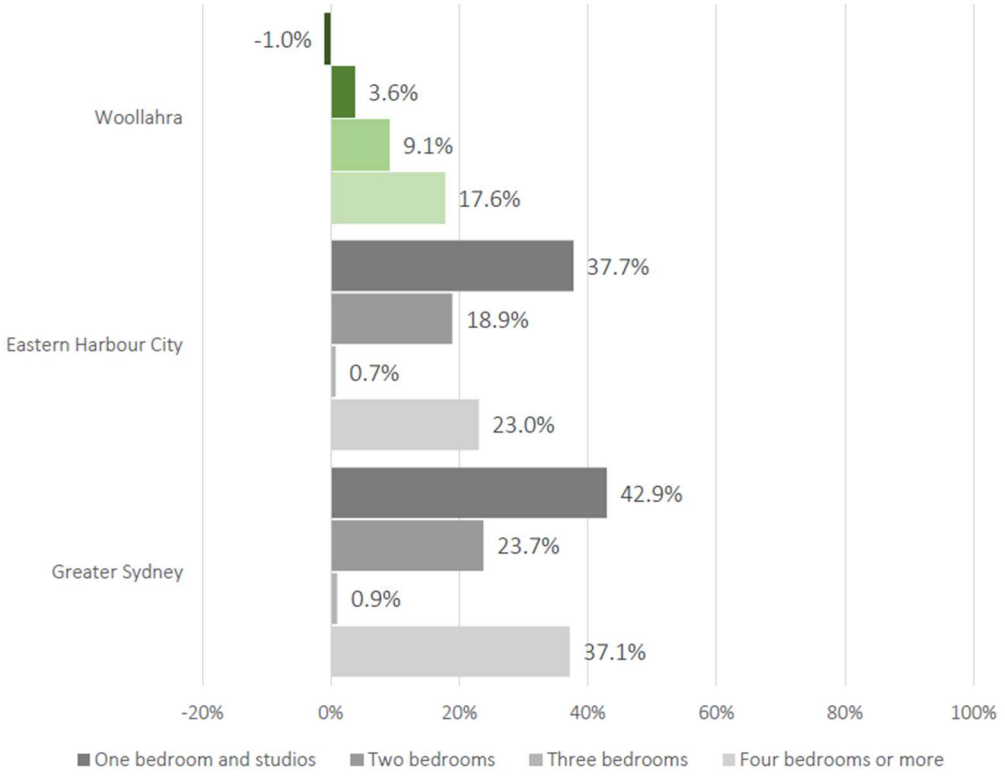


Figure 6: Graph showing growth in dwelling sizes, 2011-2021 (SGS, 2024)

Accordingly, the draft clause requires buildings with over nine dwellings to have at least 30% of them (to the nearest whole number) as self-contained studio or one-bedroom dwellings, or both. The nine dwelling figure is based on a staff investigation of the average dwelling yield of new development in the vicinity, and where it would be feasible to require a mix. The 30% share of total dwellings aligns with the 30% share of lone households in the LGA, and the similar 27% of households with couples without children. This approach is consistent with those of the *Canada Bay Local Environmental Plan 2013* and *Inner West Local Environmental 2022,* which both including dwelling mix provisions.

The drafting of the clause applies the public domain, active frontage and dwelling mix provisions to the whole of the ECC. While they are initially intended for the uplift sites, they will ensure that any future redevelopment not anticipated in the ECC Strategy will still provide high quality outcomes.

6. ECC Strategy – Non-residential floor space

The ECC Strategy also recommends minimum non-residential FSRs to ensure the provision of employment-generating floor space, which is important for the future vitality of the ECC. However, it does not recommend maximum non-residential FSRs. Nominating these at planning proposal stage is important as they will prevent the development of wholly

commercial buildings and assist with Council complying with its housing targets. As such, the draft clause recommends an FSR range for non-residential uses.

The maximum non-residential FSRs have been developed by adding 20% to the minimum FSRs, as a percentage of the total FSR for the site. For example, a minimum FSR that comprises 30% of the total allowable gross floor area would have a corresponding 50% maximum. The 20% figure was selected to provide appropriate flexibility in floorplate design, having regard to the unique characteristics of each included site.

7. ECC Strategy – Housing SEPP provisions

On 14 December 2023, the NSW Government implemented infill affordable housing reforms to encourage the provision of affordable housing. They include an FSR bonus of 20–30% and a height bonus of up to 30% for projects that include at least 10-15% of gross floor area as affordable housing. The affordable housing under this scheme must be provided for only 15 years.

While Council supports the incentivisation of affordable housing, the bonuses available under *State Environmental Planning Policy (Housing) 2021* (Housing SEPP) are not compatible with the provisions of this planning proposal. Uplift beyond the recommended controls would adversely affect the desired future character of the precincts and produce amenity outcomes not anticipated by Council staff. Accordingly, the draft provisions recommend that no bonuses from any other environmental planning instrument apply if the increased envelope controls are taken up.

8. SGS Affordable Housing Study 2024

In line with the adopted ECC Strategy, this planning proposal seeks the implementation of an AHCS in the ECC via the implantation of a new affordable housing clause in the Woollahra LEP 2014. The AHCS Report prepared by SGS Economics and Planning is circulated with this document and forms the primary evidence base and justification for the scheme. The accompanying *Edgecliff Affordable Housing Contributions Scheme*, which would facilitate the operation of the AHCS, is also enclosed with this document

The proposed AHCS is justified by the worsening housing affordability crisis across Greater Sydney, which is being felt acutely by residents of the Woollahra LGA. The Woollahra LHS 2021 identifies there is a significant shortfall in the supply of affordable housing when compared to demand. This creates an issue when one-third of all renter households are living in housing stress, meaning they spend more than 30% of their pre-tax income on rent (SGS, 2024). This is set to worsen with 3,367 renter households in housing stress by 2041, an increase of 722 households.

SGS Economics and Planning developed the basis for the AHCS in full compliance with the NSW Government's *Guideline for Development an Affordable Housing Contributions Scheme.* The AHCS Report was developed using the following methodology:

1. Review of legislative and policy framework - to ensure compliance with the EP&A Act and relevant Council strategies and plans.
2. Developing an affordable housing evidence base – detailed research on trends and conditions in the housing market, such as housing demand drivers (e.g., population and household growth and cohort shifts), housing sales and rent trend, household incomes, households by tenure and rental stress, housing supply conditions, dwelling stock by type and projections of need for social and affordable housing.

3. Nomination of areas for testing- to capture relevant areas of uplift and identify redevelopment typologies for testing.
4. Testing the viability of affordable housing contributions – to examine (using a residual land value, or RLV methodology[1]) redevelopment viability with the proposed uplift, with varying degrees of additional uplift, with varying potential contribution rates, and with projections of market conditions.

Based on the findings of the viability testing, the AHCS Report recommended the following:

- Council pursue a contribution rate of 5%, with analysis demonstrating that viability can be achieved across all sites with a 5% AHC (either in-kind or in-lieu contribution) within five to ten years.
- That a lower contribution rate of 3% be employed until 5% becomes viable, consistent with the approach of other councils with similar circumstances.

These rates are reflected in the draft clause in this planning proposal, and in the *Edgecliff Affordable Housing Contributions Scheme*. The dollar amount for the in-lieu contribution rate is based off the median strata sales price for the last 12 months, and is also grounded in current new dwelling sales data obtained from Council's consultant. This is consistent with industry best practice.

6.1.2. Is the planning proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

Yes. A planning proposal is the best means and most efficient way to amend the controls necessary to achieve the objectives outlined in this document. This planning proposal is underpinned by a comprehensive, evidence-based strategy informed by technical studies.

Built form in the ECC is undergoing a significant transition, with pressure from development applications that exceed the height and FSR limits contained in the current planning controls. In the absence of a comprehensive and up to date planning framework, development has been taking place in a fragmented and uncoordinated way. A single planning proposal that applies to the ECC is the most rational and orderly means to implement the recommendations and directions of the ECC Strategy to achieve the outcomes for employment, dwellings, and affordable housing. A planning proposal is also necessary to amend development standards within the Woollahra LEP 2014. This would not be possible with a draft DCP.

An alternative method, such as relying on individual site-specific and ad hoc planning, would be an inefficient means of achieving the objectives of the District Plan and the *Woollahra Local Strategic Planning Statement 2020* (Woollahra LSPS 2020). It will derogate from Council's ability to co-ordinate development and supporting infrastructure that achieves consistent and innovative place-based outcomes. Growth should be managed in a proactive and coordinated manner.

[1] RLV modelling seeks to determine the viability of redevelopment by determining the underlying value of a development site by subtracting all costs (construction, soft costs, finance costs, risk, etc.) from the gross realisable value of the proposed built form.

6.2. Section B - Relationship to strategic planning framework

6.2.1. Will the planning proposal give effect to the objectives and actions of the applicable regional or district plan or strategy (including exhibited draft plans or strategies)?

Yes. The planning proposal is consistent with the relevant objectives of the *Greater Sydney Region Plan: A Metropolis of Three Cities* (2018) and the relevant planning priorities and actions of the *Eastern City District Plan* (2018), as discussed below.

1. Greater Sydney Region Plan: A Metropolis of Three Cities

The planning proposal is consistent with the directions and objectives of *Greater Sydney Region Plan: A Metropolis of Three Cities* (Region Plan), as outlined in **Table 4.**

Table 4: Compliance with Region Plan.

Objectives	Planning proposal response
Objective 4: Infrastructure use is optimised	The planning proposal will facilitate an increase in housing density in an area well-serviced by public transport and other amenities, making more effective use of existing regional infrastructure (such as public transport, roads, schools and hospitals).
Objective 6: Services and infrastructure meet communities' changing needs. **Objective 7: Communities are healthy, resilient and socially connected**	Proposed changes to the Woollahra LEP 2014, including increases in height and FSR, as well as specific clauses to guide apartment unit mix will have implications on the urban fabric of the ECC. This residential uplift and the provision of a variety of apartment sizes will bring more varied demographics to the ECC, thereby addressing Objective 7 of the Region Plan to facilitate resilient, diverse communities. **Access to services and infrastructure** The ECC has relatively good access to community facilities, cultural precincts, health services and open spaces, which are all essential pieces of social infrastructure that enhance social opportunity in a centre. This adheres to Objective 6 and 7 of the Region Plan. The ECC Strategy and the Public Domain Plan underpinning this planning proposal outline a range of initiatives to help achieve a healthier urban environment in the ECC including: • Requirement for a public open space as a part of any redevelopment of the Edgecliff Centre Site (203- 233 New South Head Road); • Increasing urban greening in the ECC, enhancing the amenity of existing parks and providing better connections to open spaces; • Promoting active street life through human scale development, requiring ground floor active street frontages and substantial improvements to the public domain such as wider footpaths, outdoor dining, street trees and landscaping, street furniture and public art; and • Prioritising active transport through provision of new cycleways, and improvements to pedestrian access and safety through the public domain including through-site links, and new lighting, pedestrian crossings and wayfinding

Objectives	Planning proposal response
	All of these components together foster social opportunity, ensuring that the future community of Edgecliff have the facilities and services available to live and belong to the community. The planning proposal will also improve liveability within the ECC by contributing to the development of mixed-use neighbourhoods that improve opportunities for people to walk and cycle to schools, local shops and services.
Objective 10: **Greater housing supply** **Objective 11:** **Housing is more diverse and affordable**	The planning proposal creates more capacity for new housing in the right locations. This planning proposal supports Objective 10 and 11 of the Region Plan as it provides for greater housing supply, choice and diversity by: • Delivering between 490-615 additional dwellings through proposed changes to built form controls. • Requiring a mix of apartment sizes. The planning proposal also requires an affordable housing contribution for nominated development within the ECC to increase the provision of affordable housing. The proposed controls for studio and one bedroom apartments are expected to reduce the price point for entry into the Edgecliff housing or rental market and increase housing choice in a well-located and well-serviced centre. We anticipate that these housing opportunities will then attract younger demographics to live and work in the ECC.
Objective 12: **Great places that bring people together** **Objective 13:** **Environmental heritage is identified, conserved and enhanced**	The ECC Strategy was developed using a fine grain approach, to ensure that future building envelopes enabled by the controls result in appropriate heights, scale, setbacks and floorplates. The envelopes are designed to provide good internal amenity and compliance with the Housing SEPP and the *Apartment Design Guide* (ADG). The revision of the built form controls applying to the uplift sites will ensure an attractive and well-designed built environment for the ECC. The new controls will also require new development to appropriately relate to the surrounding neighbourhood. Increasing economic viability in the area will improve the quality of the built environment by encouraging the replacement of poor quality buildings with newer buildings. New development will generate increased income through development contributions which will be directed towards implementing public domain improvements to street lighting, wayfinding, laneway activation, and open spaces. These components will improve liveability throughout the ECC for both its residents and visitors, thereby addressing Objective 12 of the Region Plan. Consultation with the community during the exhibition of the ECC Strategy also enabled an understanding of the heritage values and how they contribute to the significance of the place. In response to issues raised during the public exhibition of the draft ECC Strategy, Council engaged GML Heritage in 2022 to undertake a study of buildings in the area. The purpose of the study was to consider and identify places with heritage value that meet the criteria for listing under

Objectives	Planning proposal response
	the Woollahra LEP 2014. The outcomes of the study informed significant amendments to the ECC Strategy. Therefore, the proposed built form controls of the planning proposal are influenced by a separate planning proposal (PP-2024-1101) to list eight new heritage items and one HCA within the ECC. The proposed controls ensure that any changes to height and FSR are sympathetic to the significance of the heritage items and HCA within the ECC and would deliver sensitive development outcomes. This gives effect to Objective 13 of the Region Plan.
Objective 14: **A Metropolis of Three Cities – integrated land use and transport creates walkable and 30-minute cities**	This planning proposal integrates land use and transport by concentrating housing and employment close to the Sydney CBD and public transport infrastructure. The planning proposal will increase the local community's capacity to live within 15 minutes of the Sydney CBD.
Objective 22: **Investment and business activity in centres**	The planning proposal supports the overall renewal of the ECC facilitating growth of retail, health services and hospitality.

Eastern City District Plan

The *Eastern City District Plan* (District Plan) identifies Edgecliff as a local centre located in close proximity to Bondi Junction (identified as a strategic centre).

The District Plan indicates opportunities should be taken to better align growth with infrastructure by considering the capacity of existing infrastructure and includes the following objective:

> *"Aligning growth with infrastructure, including transport, social and green infrastructure, and delivering sustainable, smart and adaptable solutions".*

The District Plan has also identified the ECC for potential housing, retail and commercial growth opportunities within a 400m walking catchment of its public transport nodes. As outlined in the previous section, this planning proposal implements this vision by enabling development at a higher density and creating wider public benefits via modern employment and residential floor space.

In particular, the planning proposal directly aligns with the following planning priorities in **Table 5.**

Table 5: Compliance with District Plan.

Priorities	Planning proposal response
Planning Priority E5 **Providing housing supply, choice and affordability, with access to jobs, services and public transport**	The ECC is primely positioned in the Eastern City District to facilitate a highly liveable centre with increased and sustainable housing, jobs and services. This planning proposal provides an opportunity for the ECC to contribute to the future growth of the District by creating additional housing and infrastructure such as services and accommodation. The District Plan identifies the ECC as a local centre, capable of accommodating moderate growth to meet the needs of the local community. The scale of built form facilitated through the planning

Priorities	Planning proposal response
	provisions are appropriate, and reinforce the role of the ECC as a local centre. The ECC has, and will continue to have, a moderate amount of retail and employment space. It is not a major employment hub, nor does it have the extensive range of retail, commercial, and services that are characteristic of most strategic centres. The proposed amendments to FSR and height of building provisions will provide additional capacity for approximately 490-615 dwellings which would significantly contribute to the Eastern City District Plan's dwelling target. In May 2024, the Department of Planning, Housing and Infrastructure (DPHI) identified a new five year housing completion target of 1,900 dwellings for the Woollahra LGA. The outcomes of the ECC Strategy will also contribute to these targets. Additionally, the District Plan proposes affordable housing targets that build on *A Plan for Growing Sydney*. It recommends a range of 5 – 10% of new floor space on land that has been re-zoned where a need for affordable housing has been identified. This planning proposal is consistent with that direction.
Planning Priority E6 **Creating and renewing great places and local centres, and respecting the District's heritage**	The planning proposal will assist with renewing the ECC by facilitating urban renewal and development at the select sites. It will do this by increasing feasibility for underutilised sites. Centre-wide DCP controls will be introduced that enable active frontages, pedestrianised streets, new plazas/civic spaces and urban greening. These controls will aim to enhance the vibrancy of the ECC and reinforce a human-scale public domain. The ECC Strategy seeks to protect the character of existing and proposed heritage items and HCAs through crafting sensitive built form solutions. The planning proposal's built form recommendations align with this approach.

6.2.2. Is the planning proposal consistent with a council LSPS that has been endorsed by the Planning Secretary or GSC, or another endorsed local strategy or strategic plan?

1. Woollahra Local Strategic Planning Statement

The proposed changes to the planning controls in the ECC are consistent with the Woollahra LSPS 2020, a plan which sets out a 20-year vision for the Woollahra LGA and its centres. Organised under four themes of Infrastructure & Collaboration, Liveability, Productivity and Sustainability, the Woollahra LSPS 2020 aims to:

- Manage future growth, new technology, and changing community needs;
- Conserve our heritage, villages, local character, and environment;
- Ensure resilience and sustainability despite challenges such as climate change;
- Identify areas for further detailed strategic planning; and
- Link our plans to the implementation of the NSW Government's strategic plans.

The ECC Strategy, that underpins this planning proposal, gives effect to the priorities and actions of the Woollahra LSPS 2020, which relies on the revitalisation of the ECC and promotes diverse housing choices in planned locations.

The Woollahra LSPS 2020 identifies the ECC as an important hub for local productivity. It also highlights the importance of protecting and enhancing employment space in our villages. The inclusion of a minimum non-residential FSR in this planning proposal reinforces this objective and would promote growth of jobs, businesses and services in a well- located area.

Revitalising the ECC through the implementation of the proposed controls, and effective placemaking strategies will enhance the role of the local centre, making it a place the community wants to work in, visit, stay and live.

2. Woollahra Local Housing Strategy

The Woollahra LHS 2021 establishes the long-term housing vision for our local area. The proposed amendments are consistent with the vision of the Woollahra LHS 2021 to facilitate new housing in well-planned locations that are close to villages, services and public transport hubs, such as the Edgecliff Centre. In particular, the Woollahra LHS 2021 outlines that housing growth and uplift should ideally:

> *"Be located within 400m easy walking distance of both an existing a local centre and high-frequency public transport service consistent with the vision for a 30-minute city."*

The Woollahra LHS 2021 identifies that Woollahra's housing targets will be primarily met in the ECC, it being the only area within the LGA that is capable of accommodating growth without NSW Government investment in major infrastructure and services. This planning proposal implements the housing targets identified in the Woollahra LHS.

The Woollahra LHS 2021 includes an aspirational target of 5% affordable housing. This planning proposal sets an affordable housing contribution (for uplift sites) at a variable rate of 3% for three years after the scheme's commencement, and then increased to 5% to ensure feasibility.

The planning proposal also gives effect to the recommended action of the Woollahra LHS 2021 to encourage a range of housing choices through the introduction of unit mix provisions. The planning proposal introduces a clause to include a minimum 30% requirement for studio dwellings or one-bedroom dwellings in new development within the ECC. By providing a mix of units the planning proposal aims to attract a wider range of social groups, particularly young workers.

3. Woollahra Community Strategic Plan

Adopted in 2022, Woollahra Community Strategic Plan *Woollahra 2032* characterises the community, sets out current and future social, environmental and economic challenges, while additionally guiding potential strategies to address these issues.

The planning proposal is consistent with the following goals:

- *Goal 4: Well-planned neighbourhoods;*
- *Goal 5: Liveable places; and*
- *Goal 9: Community focused economic development.*

Council values the community as a source of local expertise and actively seeks feedback to help shape decisions that affect residents and people who visit, work or go to school in Woollahra. This approach is consistent with the plan. The feedback obtained from the community on the exhibited ECC Strategy has been carefully considered with significant amendments made to the final ECC Strategy to address local issues.

6.2.3. Is the planning proposal consistent with any other applicable State and regional studies or strategies?

Yes. The planning proposal is consistent with the NSW Government's *Housing 2041* and *Future Transport Strategy*.

The planning proposal aligns with key ambitions of *Housing 2041* as follows:

- It will increase support for those in need, by establishing an AHCS intended to contribute to the supply of affordable housing;
- It will promote investment for diverse housing, through the unit mix clause recommended for the Woollahra LEP 2014; and
- Through concentrating growth around Edgecliff Station, it will improve the alignment of new housing with mass transit infrastructure.

The planning proposal is also consistent with the Future Transport Strategy, as it will promote transit-oriented development and contribute to the efficient use of public transport infrastructure in NSW.

6.2.4. Is the planning proposal consistent with applicable State Environmental Planning Policies?

Yes. The planning proposal is consistent with the *Standard Instrument – Principal Local Environmental Plan* and all other applicable State Environmental Planning Policies (refer to **Schedule 1**).

6.2.5. Is the planning proposal consistent with applicable Ministerial Directions (s.9.1 directions)?

Yes. The planning proposal is consistent with applicable section 9.1 directions (refer to **Schedule 2**).

6.3. Section C - Environmental, social and economic impact

6.3.1. Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected because of the proposal?

No. This planning proposal relates to an existing centre in an urbanised environment and seeks to increase densities within this footprint. There are no critical habitat areas, threatened species, populations or ecological communities or their habitats present on the subject land. Accordingly, the proposal will not have any impact in this regard.

6.3.2. Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?

No. There are no likely environmental effects that would arise as a result of the planning proposal. Other environmental effects that might arise through the redevelopment of the

sites would be identified through the development application process. Good design and conditions of consent will limit these effects.

Any other environmental effects will be managed through updates to Woollahra DCP 2015- *Chapter D4 Edgecliff Commercial Centre*. These will include best practice sustainability standards and environmental mitigation measures to ensure minimal ecological impacts to Trumper Park.

6.3.3. Has the planning proposal adequately addressed any social and economic effects?

1. Economic Impacts

The proposed amendments will stimulate economic activity in the ECC, firstly through construction-related jobs and secondly through increased opportunities for commercial services. The retail and commercial floor space delivered through this proposal will support employment generation and encourage spending within the local centre.

The proposed FSRs have also been subject to economic viability testing by SGS Economics and Planning to provide greater certainty that the development potential provided will justify the redevelopment of existing assets.

2. Social Impacts

The planning proposal is seeking to facilitate redevelopment, whilst ensuring local amenity and character is preserved. The planning proposal will deliver positive social effects including:

- Enabling housing and employment growth in a desirable area that has good access to community facilities, cultural precincts, health services and open spaces, which are all essential pieces of social infrastructure and will enhance social opportunity in the ECC;
- The uplift proposed will facilitate the delivery of public benefits such as an affordable housing contribution, an enhanced public domain, retention of employment and retail space, and significant residential yield.
- The proposed controls for residential unit mix would increase housing choice and supply in a well-located centre.

6.4. Section D - Infrastructure (Local, State and Commonwealth)

6.4.1. Is there adequate public infrastructure for the planning proposal?

Yes. The ECC is serviced by existing public infrastructure, including regular and frequent public transport services, education, public open space, and community and health facilities. The subject properties are connected to water, sewer, electricity, and telephone services.

In terms of water and sewage services, Sydney Water have provided confirmation that the water and wastewater system has adequate capacity to service the proposed development anticipated by the planning proposal.

The Transport Study was undertaken by SCT Consulting in 2024 to analyse existing and future transport capacity within the ECC. It notes the proposed scope of development supports best practice transit-oriented development principles, by providing increased residential and employment density close to mass transit infrastructure.

Based on the adopted trip generation rates of the respective land uses, the Transport Study notes the proposed increase in development yield in the ECC will generate a total of 117

additional vehicular trips during the weekday AM peak hour and 55 additional vehicular trips during the weekday PM peak hour.

Road network analysis shows that performance of the local network will continue to operate at acceptable levels with the trips generated by the potential development. In the AM peak hour, the greatest impact on the road network performance is forecast to be at the New South Head Road / Ocean Street / Ocean Avenue and the New South Head Road / Darling Point Road / New McLean Streets intersections, which will operate with a Level of Service (LoS) C and B, compared to LoS B and LoS A in the existing scenario.

Overall, the New South Head Road / New Beach Road and the New South Head Road / Glenmore Road / Mona Road intersections will continue to perform satisfactorily for all time periods, with the added trips in peak hours.

The study recommends several strategies to help ensure a successful outcome for potential development. These include methods to reduce trip generation (such as limiting additional parking), introducing green travel plan programs and car share schemes, and further improving active transport infrastructure. Parking restrictions would be accommodated in a complementary amendment to the Woollahra DCP 2015.

Infrastructure improvements suggested include the introduction of new signalised pedestrian crossings, optimisation of signal phasing, and pedestrian crossing improvements.

In a submission to the ECC Strategy, Schools Infrastructure NSW noted that local schools are expected to experience growth in their intake areas, which may require asset intervention to meet demand. Based on population projection data, the uplift may result in increased demand for one additional primary teaching space and up to one additional secondary teaching space. They considered that a combination of asset improvement and non-asset solutions across these schools could be required to accommodate the projected enrolment demand.

Notwithstanding the above, Council will consult with public utility and service providers during the public exhibition when required, including Transport for NSW and Schools Infrastructure NSW.

6.5. State and Commonwealth Interests

6.5.1. What are the views of State and Commonwealth public authorities consulted in accordance with the Gateway determination?

This section will be completed following consultation with public authorities identified in the Gateway determination. Public authorities, including but not limited to, will be notified:

- Sydney Water;
- School Infrastructure NSW;
- Transport for NSW; and
- Heritage NSW.

Any other authorities identified by the DPHI will be consulted during the public exhibition of the planning proposal.

7. Mapping

The planning proposal seeks to amend the Key Sites Map (Sheet KYS_003) under the existing Woollahra LEP 2014 maps to identify areas of uplift and create a new Local Identification Map (Sheet CL1_003) that outlines the extent of the ECC.

Areas within the ECC have been identified on the Key Sites Map that will refer to the proposed exceptions subclause under *6.12 Development on land in the Edgecliff Commercial Centre.* The alternative building height and FSR standards are subject to the sites achieving specific criteria.

Extracts of the existing and proposed maps are provided in the figures on the following pages.

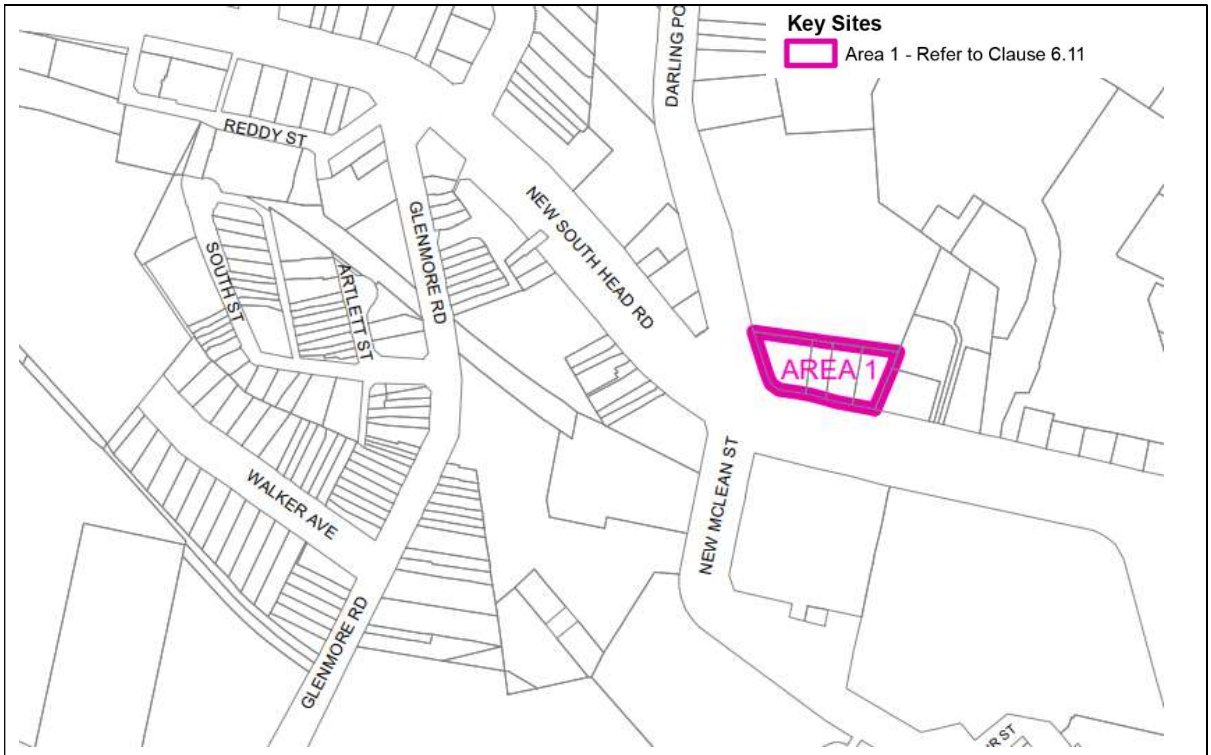


Figure 7: Extract from existing Woollahra LEP 2014 Key Sites Map (Sheet KYS_003)

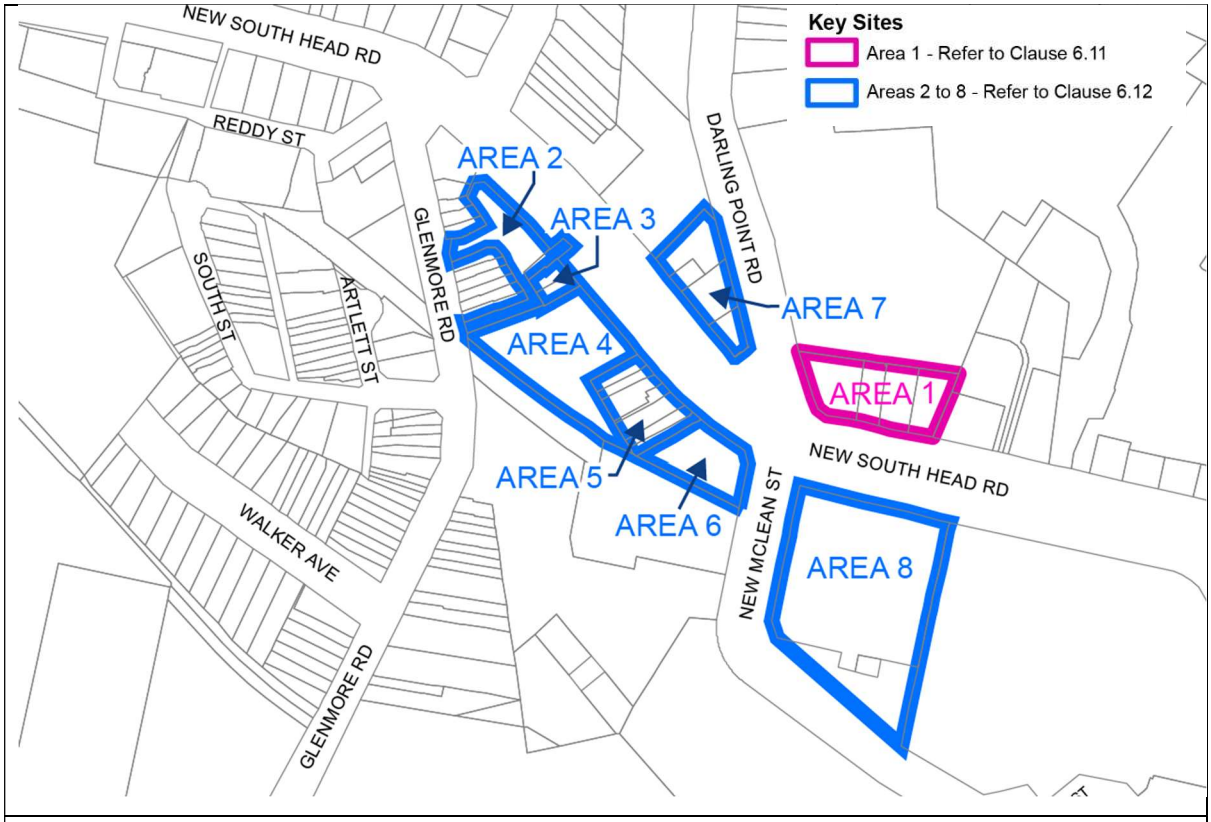


Figure 8: Extract from proposed Woollahra LEP 2014 Key Sites Map (Sheet KYS_003)

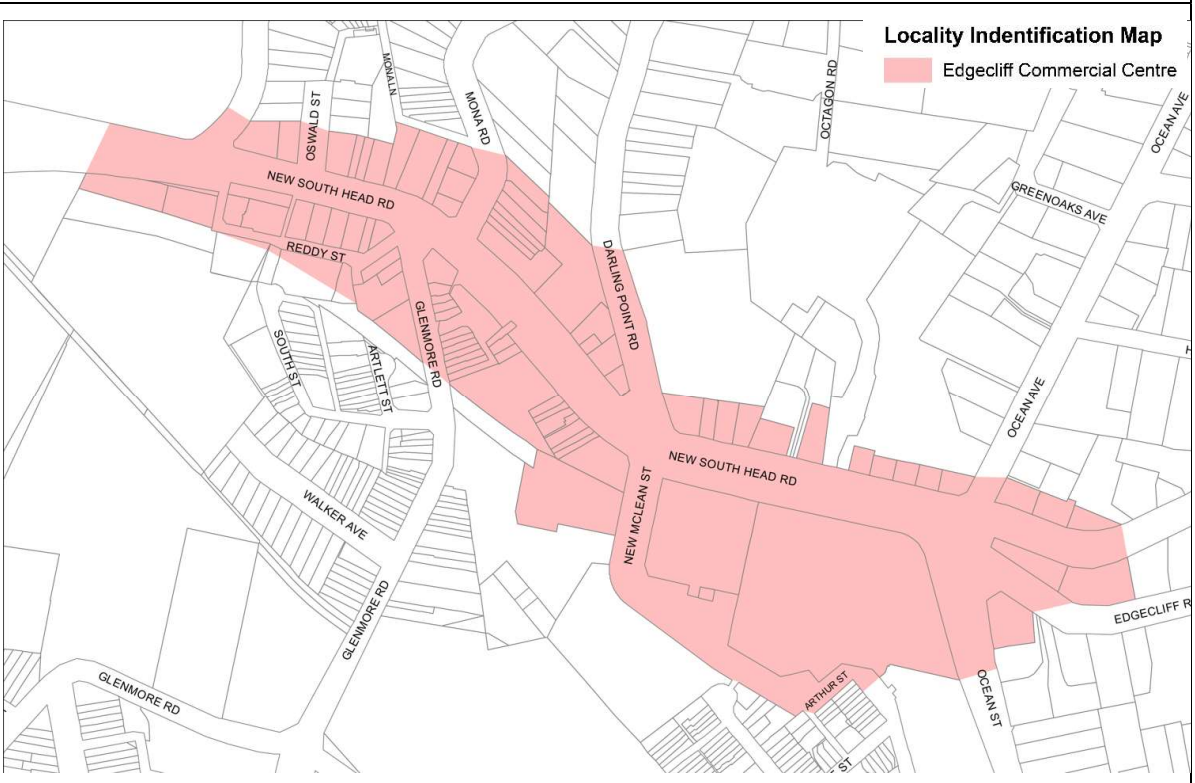


Figure 8: Extract from proposed Woollahra LEP 2014 Local Identification Map (Sheet CL1_003)

8. Community consultation

Public exhibition will be undertaken in accordance with the requirements of the Act and the *Environmental Planning and Assessment Regulation 2021*. It will also have regard to the *Local Environmental Plan Making Guideline* and any conditions of the Gateway determination.

The planning proposal will be exhibited for a minimum of 28 days.

Public notification of the exhibition will comprise:

- Weekly notice in the local newspaper (the Wentworth Courier) for the duration of the exhibition period, when a hardcopy version of that newspaper is being published.
- A notice on Council's website.
- A letter to land owners in the vicinity of each site, which will include every landowner in the ECC.
- Notice to local community, resident and business groups.

During the exhibition period the following material will be available on Council's website and in the customer service area at Woollahra Council offices:

- The planning proposal, in the form approved by the Gateway determination.
- The Gateway determination.
- Information relied upon by the planning proposal (such as relevant Council reports).
- Woollahra LEP 2014.
- Section 9.1 Directions.

The planning proposal is consequential to the ECC Strategy, which was supported by community consultation. The ECC Strategy was on public exhibition from 31 May 2021 to 30 September 2021, to which Council received 134 submissions. The ECC Strategy was amended in response to the community feedback received, with additional studies and information considered by Council.

9. Project timeline

As Council is authorised to exercise the functions of the Minister for Planning under section 3.36 of the EP&A Act 1979, the proposed timeline for completion is as follows:

Plan-making step	Estimated completion
Council Committee consideration	February 2025
Council resolution	February 2025
Gateway determination	June 2025
Government agency consultation	August 2025
Public exhibition period	August 2025
Council assessment of planning proposal post exhibition	October 2025
Council decision to make the LEP amendment	December 2025
Council to liaise with Parliamentary Counsel to prepare LEP amendment	December 2025
Forwarding of LEP amendment to Greater Sydney Commission and Department of Planning, Housing and Infrastructure for notification	December 2025
Notification of the approved LEP	January 2026

Council staff consider the planning proposal to be classed as ‘complex’ under the *Local Environmental Plan Making Guideline.*

Schedules

Schedule 1 – Consistency with State Environmental Planning Policies (SEPPs)

State environmental planning policy	Comment on consistency
SEPP (Biodiversity and Conservation) 2021	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the operation of this policy.
SEPP (Exempt and Complying Development Codes) 2008	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the operation of this policy.
SEPP (Housing) 2021	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the operation of this policy. The proposed built form controls were modelled and tested against the standards and requirements of the Housing SEPP and the ADG including building separation, building depth and solar access requirements. The proposed built form will ensure that solar access to Trumper Park and Oval, the Paddington HCA and existing dwellings is maintained. At a minimum, development will be required to allow two hours of direct sunlight between 10.00am and 2.00pm on 21 June. Solar analysis indicates that a 26-storey development on the Edgecliff Centre site would not produce excessive overshadowing. Trumper Oval would receive no additional shadowing after 10am in mid-winter. The draft clause for the built form controls contains a provision that prevents bonuses from other environmental planning instruments applying if the site-specific uplift in this document is taken up. This will not permit developers to also utilise affordable housing bonuses under the Housing SEPP. This approach is necessary as the use of both bonuses would create poorer urban design

	outcomes, which would unreasonably affect the amenity of the ECC.
SEPP (Industry and Employment) 2021	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the operation of this policy.
SEPP (Planning Systems) 2021	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the operation of this policy.
SEPP (Precincts – Eastern Harbour City) 2021	Applicable. There are currently no identified state significant precincts located in the Woollahra LGA.
SEPP (Precincts – Central River City) 2021	Not applicable.
SEPP (Precincts – Regional) 2021	Not applicable.
SEPP (Precincts – Western Parkland City) 2021	Not applicable.
SEPP (Primary Production) 2021	Not applicable.
SEPP (Resilience and Hazards) 2021	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the operation of this policy.
SEPP (Resources and Energy) 2021	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the operation of this policy.
SEPP (Sustainable Buildings) 2022	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the operation of this policy.
SEPP (Transport and Infrastructure) 2021	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the operation of this policy.

Schedule 2 – Compliance with section 9.1 directions

Planning proposal – Compliance with section 9.1 directions		
Direction		**Applicable/comment**
1	**Planning systems**	
1.1	Implementation of Regional Plans	Applicable. The planning proposal is consistent with the objectives of the *Greater Sydney Regional Plan: A Metropolis of Three Cities (2018)*, and the relevant priorities and actions of the *Eastern City District Plan (2018)* as discussed herein.
1.2	Development of Aboriginal Land Council land	Not applicable. This planning proposal does not affect Aboriginal Land Council Land.
1.3	Approval and referral requirements	Any additional approval or referral requirements can be met by this planning proposal in accordance with this direction.
1.4	Site specific provisions	Applicable and consistent. The planning proposal does not contain any unnecessarily restrictive site specific planning controls. A site-specific clause is proposed that enables additional height and floor space, subject to meeting specified amalgamation requirements. The criteria reflects the FSR and height achievable under the recommended amalgamation pattern under the ECC Strategy and is not considered restrictive. The requirement for amalgamation of properties ensures the creation of more efficient, functional and flexible floor plates for future retail, commercial and residential development within the ECC.
1.4A	Exclusion of development standards from Variation	Applicable and consistent. The planning proposal does not contain any provision which is contrary to this direction.
1.5 – 1.22	Implementation Plans	Not applicable. These plans do not apply to the Woollahra LGA.
2	**Design and place**	
	[This Focus Area was blank when the Directions were made]	

Planning proposal – Compliance with section 9.1 directions		
Direction		**Applicable/comment**
3	**Biodiversity and conservation**	
3.1	Conservation zones	Applicable and consistent. The planning proposal will not affect the conservation standards of any environmentally sensitive land.
3.2	Heritage conservation	Applicable and consistent. The planning proposal will not change existing heritage provisions. The proposed changes in built form controls will not have any adverse environmental heritage outcomes, as previously discussed in this document.
3.3	Sydney drinking water catchments	Not applicable. This direction does not apply to the Woollahra LGA.
3.4	Application of C2 and C3 zones and environmental overlays in Far North Coast LEPs	Not applicable. This direction does not apply to the Woollahra LGA.
3.5	Recreation vehicle areas	Not applicable. The planning proposal does not apply to sensitive land or land with significant conservation values. It will not allow land to be developed for a recreation vehicle area.
3.6	Strategic Conservation Planning	Not applicable. The planning proposal does not apply to avoided land or land in a strategic conservation area.
3.7	Public Bushland	Not applicable. This planning proposal will not affect any public bushland.
3.8	Willandra Lakes Region	Not applicable. This direction does not apply to the Woollahra LGA.
3.9	Sydney Harbour Foreshores and Waterways Area	Not applicable. The planning proposal does not apply to land identified within Foreshores and Waterways Area under the *State Environmental Planning Policy (Biodiversity and Conservation) 2021*.
3.10	Water catchment protection	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the objective of this direction.

Planning proposal – Compliance with section 9.1 directions		
Direction		**Applicable/comment**
4	**Resilience and hazards**	
4.1	Flooding	Applicable and consistent. Some of the sites identified for uplift are identified as being flood prone in the Woollahra LEP 2014. Council's flood engineer has identified that the flood issues can be mitigated through additional flood protection measures. The needed measures are likely to include a combination of terrain modification, raised thresholds, flood barriers and local drainage augmentation. These issues will be assessed further at development application stage.
4.2	Coastal management	Not applicable. The planning proposal will not affect land in a coastal zone.
4.3	Planning for bushfire protection	Not applicable. The planning proposal will not affect bushfire prone land.
4.4	Remediation of contaminated land	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the objective of this direction.
4.5	Acid sulfate soils	Applicable and consistent. Existing acid sulfate soils provisions will not be altered by the planning proposal.
4.6	Mine subsidence and unstable land	Not applicable. The planning proposal does not apply to land within a proclaimed Mine Subsidence District or to land identified as unstable.
5	**Transport and infrastructure**	
5.1	Integrating land use and transport	Applicable and consistent. The planning proposal does not contain a provision which is contrary to the aims, objectives and principles of: • Improving Transport Choice – Guidelines for planning and development (DUAP 2001), and • The Right Place for Business and Services – Planning Policy (DUAP 2001).

Planning proposal – Compliance with section 9.1 directions		
Direction		**Applicable/comment**
5.2	Reserving land for public purposes	The planning proposal does not amend reservations of land for public purposes. The planning proposal is consistent with the direction.
5.3	Development near regulated airport and defence airfields	Applicable and consistent. The planning proposal does not contain a provision which is contrary to this direction.
5.4	Shooting ranges	Not applicable. The planning proposal does not apply to land adjacent to or adjoining an existing shooting range.
6	**Housing**	
6.1	Residential zones	Not applicable. The planning proposal does not apply to land in a residential zone.
6.2	Caravan parks and manufactured home estates	Not applicable. The planning proposal will not affect any caravan parks or manufactured housing estates.
7	**Industry and employment**	
7.1	Employment zones	Applicable and consistent. The planning proposal does not remove or alter a business zone and does not reduce the achievable employment floor space in the existing E1 Local Centre zone that applies to subject site. The intended outcome is maintenance or increase in employment floor space on the land the planning proposal applies to.
7.2	Reduction in non-hosted short-term rental accommodation period	Not applicable. This direction does not apply to the Woollahra LGA.
7.3	Commercial and retail development along the Pacific Highway, North Coast	Not applicable. This direction does not apply to the Woollahra LGA.
8	**Resources and energy**	
8.1	Mining, petroleum production and extractive industries	Not applicable. This planning proposal will not affect any of the nominated activities.
9	**Primary production**	

Planning proposal – Compliance with section 9.1 directions		
Direction		**Applicable/comment**
9.1	Rural zones	Not applicable. This planning proposal will not affect any rural zones.
9.2	Rural lands	Not applicable. This planning proposal will not affect any rural lands.
9.3	Oyster aquaculture	Not applicable. This planning proposal will not affect any Priority Oyster Aquaculture Areas.
9.4	Farmland of state and regional significance on the NSW Far North Coast	Not applicable. This direction does not apply to the Woollahra LGA.

Supporting documents (circulated separately)

1. Woollahra Affordable Housing Contributions Scheme – November 2024
2. Woollahra Affordable Housing Contributions Scheme – Report (SGS Economics and Planning) – October 2024

Woollahra Affordable Housing Contributions Scheme

Note: This document is a draft only, and may be subject to administrative changes to comply with the *Guideline for Developing an Affordable Housing Contribution Scheme.*

Adoption Date:	TBC by Council Resolution
Version Date:	February 2025
HPE Number	21/210892

1 Strategic Context and Background

1.1 Definitions and terminology

TABLE 1: DEFINITIONS

Term	Definition	Statutory source (if applicable)
Affordable housing	Affordable housing means housing for very low income households, low income households or moderate income households, being such households as are prescribed by the regulations or as are provided for in an environmental planning instrument.	*Environmental Planning and Assessment Act 1979*
AHCS	Affordable housing contribution scheme – this document	
Very low income, low income, and moderate income households	1) a household is taken to be a very low income household, low income household or moderate income household if— a) the household— (i) has a gross income within the following ranges of percentages of the median household income for Greater Sydney or the Rest of NSW— (A) very low income household—less than 50%, (B) low income household—50–less than 80%, (C) moderate income household—80–120%, and (ii) pays no more than 30% of the gross income in rent, or b) the household— (i) is eligible to occupy rental accommodation under the National Rental Affordability Scheme, and (ii) pays no more rent than the rent that would be charged if the household were to occupy rental accommodation under the Scheme.	*State Environmental Planning Policy (Housing) 2021*
The EP&A Act	*Environmental Planning and Assessment Act 1979*	
Housing SEPP	*State Environmental Planning Policy (Housing) 2021*	
CHP	Community Housing Provider (as registered under the National Regulatory System for Community Housing)	
LGA	Local government area	

1.2 Objectives of the affordable housing contribution scheme

The objectives of the Woollahra Affordable Housing Contribution Scheme are:

- To recognise affordable housing as critical infrastructure necessary to support sustainable and diverse communities and long term economic growth in the LGA;
- To recognise that renewal and redevelopment will increase the need for affordable housing in the LGA;
- To contribute to meeting the housing needs of very low to moderate income households who live or work in the LGA; and
- To facilitate opportunities for government and community housing providers (CHP) to supply affordable housing within the LGA.

1.3 Where does the scheme apply?

The AHCS applies to land identified in Part 6 of the *Woollahra Local Environmental Plan 2014.*

1.4 What types of development does the scheme apply to?

This AHCS applies to all types of residential development (including residential components of mixed use development), except:

- Exempted developed (as outlined in this AHCS).

1.5 Overview of affordable housing need in Woollahra LGA

The *Woollahra Local Housing Strategy 2021* (LHS) identifies a lack of social and affordable housing within the LGA. Compared to the Greater Sydney average, housing affordability in the LGA is poor, with nearly all low-income households in rental or mortgage stress.

The *Woollahra Affordable Housing Policy 2021* (Affordable Housing Policy) details Council's objectives relating to affordable housing, including that the supply of affordable rental housing for key workers be increased, that planning controls facilitate the supply of new affordable housing, and that affordable housing assets and programs are effectively managed.

As of 2021, there were an estimated 2,645 households living in social housing or in moderate to severe rental stress. Most of these (49 percent) are one parent families.

By 2041, an estimated 3,367 Woollahra households will be living in social housing or in moderate to severe rental stress, representing a growth of 722 households from 2021 that will be in need of affordable housing.

1.6 Legislative basis for the affordable housing contributions

Council is obliged to "promote the delivery and maintenance of affordable housing" under Object 1.3(d) of the EP&A Act. Affordable housing contributions are authorised under Division 7.2 of the EP&A Act.

Section 7.32 of the EP&A Act allows Council to levy contributions for affordable housing provided a State Environmental Planning Policy (SEPP) identifies a need for affordable housing in the LGA.

Clause 14 of the Housing SEPP identifies that there is a need for affordable housing in Woollahra LGA.

Section 7.32(3) of the EP&A Act states that a condition may be imposed on a development consent requiring a reasonable dedication or contribution for affordable housing provided the condition is authorised by a Local Environmental Plan (LEP) and is in accordance with an affordable housing contribution scheme for dedications or contributions set out in, or adopted by, the LEP.

Part 6 of the *Woollahra Local Environmental Plan 2014* gives effect to this affordable housing contribution scheme.

1.7 Relationship with any other affordable housing provisions in the LGA

The Affordable Housing Policy details Council's objectives relating to affordable housing, as discussed under Section 1.5 of this document.

The purpose of this AHCS is to provide the primary framework for applying affordable housing contributions in the Woollahra LGA. It contains overarching requirements, such as contribution rates, indexing methods and dedication standards.

This AHCS is to be read in conjunction with the Affordable Housing Policy. The Affordable Housing Policy may contain detailed procedures for any dealings with applicants, NSW Government agencies or CHPs in relation to affordable housing contributions, or any other matters regarding the operation of this AHCS.

1.8 Identification of affordable housing principles

The following identified affordable housing principles are consistent with Clause 15 of the Housing SEPP. Clause 15 must be considered by a consent authority before imposing a condition of consent for the purpose of affordable housing.

Council's guiding affordable housing principles are:

- Affordable housing must be provided and managed so that a socially diverse residential population, representative of all income groups, is developed and maintained.
- Affordable housing is to be made available to a mix of households on very low to moderate incomes, which result in rents at no more than 30% of their gross household income.

- Dwellings provided for affordable housing must be professionally managed so as to maintain their continued use for affordable housing.

These are consistent with Clause 15 of the Housing SEPP and the Affordable Housing Policy.

2 Affordable Housing Contributions

2.1 Identification of contribution rates

The contribution rates are defined in **Table 3.**

TABLE 3: CONTRIBUTION RATES

Contribution Rate	Equivalent Monetary Contribution
3% or 5% of total gross floor area used for residential accommodation as specified under Clause 4.4 and 4.5 of the *Woollahra Local Environmental Plan 2014.*	$23,800 per square metre, or otherwise as determined by Council, using considerations from Section 2.3.

Affordable housing contributions are in addition to other infrastructure contributions required under relevant environmental planning instruments. Contributions may be made as a dedication of dwellings (in-kind), or as a monetary contribution (in-lieu), or both.

The requirement for an affordable housing contribution must be via a condition of development consent. In all instances, the Council will require evidence, via a legal agreement, that the condition of development consent relating to affordable housing has been satisfied prior to the granting of any construction certificate.

2.2 Dedication of dwellings

Dwellings dedicated under this AHCS must meet the following requirements:

- Dwellings must be provided in perpetuity, and dedicated to Council or a CHP, at Council's discretion.
- Dwellings dedicated in-kind must be constructed to a standard that, in the opinion of the consent authority, is consistent with other dwellings within the development, especially in terms of internal fittings and finishes, solar access and privacy.
- Where multiple affordable dwellings are provided in a development, the amenity benchmarks established by the *Apartment Design Guide* (or a subsequent design standard as applicable) are to be generally achieved.
- Dwellings must comprise a diverse range of sizes.
- All rent received from the dwellings after the deduction of management and maintenance costs must only be used for the purpose of improving, replacing, maintaining or providing additional affordable housing. This includes the investment of monies to meet cyclical maintenance costs, and all rates and taxes payable.

- Dwellings are to be rented to very low, low and moderate income households for a maximum of 30 per cent of gross household income.
- Any additional requirements of the Affordable Housing Policy for Council-owned rental stock.

Additionally, where only part of a contribution is satisfied by the dedication of dwellings, the remaining floor area must be paid as an equivalent monetary contribution.

A worked example of dwelling dedication is provided in **Figure 1** below.

FIGURE 1: WORKED EXAMPLE OF DEDICATED DWELLING FLOOR SPACE

Example:

Council receives a development application within 'Edgecliff Commercial Centre' for a development comprising 5,000m2 in gross floor area for residential use. The affordable housing contribution is calculated as:

(5% x 5,000m2) = 250m2 (gross floor area) dedicated as affordable housing dwellings.

2.3 Monetary contributions

- An affordable housing contribution may be satisfied by the payment of a monetary (or in-lieu) contribution.
- The monetary contribution is expressed as a dollar per square metre value to be multiplied by the required dedication of floor space (in square metres).
- The monetary contribution amount is specified in **Table 3** above.
- The monetary contribution amount is intended to reflect the market value of residential floor space.
- The contribution amount is to be updated in the first week of March annually to reflect changes in residential dwelling value over time. The update will be based on the NSW Government Rent and Sales Report, *Table: Sales Price – Greater Metropolitan Region – Strata for the Woollahra LGA*.

A worked example of a monetary contribution is provided in **Figure 2** below.

FIGURE 2: WORKED EXAMPLE OF MONETARY CONTRIBUTION

Example:

Council receives a development application within 'Edgecliff Commercial Centre' for a development comprising 5,000m2 in gross floor area for residential use. The affordable housing contribution is calculated as:

(5% x 5,000m2) = 250m2 (gross floor area) X $23,800 per square m2 = $5,950,000 as an equivalent monetary contribution.

2.4 Exempted development

The consent authority may exempt a development from the requirement to make an affordable housing contribution if the development application is for one or more of the following:

- Development solely for the purposes of social or affordable housing in perpetuity;
- Where the cost of construction is below $100,000; and
- Development that only includes non-residential floor space.

2.5 Conditions of consent

For development that is required to make a contribution under this AHCS, a condition will be placed on the consent and must detail (but is not limited to):

- The floor area of dwellings to be dedicated, or the total monetary contribution required;
- The relevant contribution rate(s);
- The indexation period at time of determination;
- A requirement to demonstrate that the title of any dwellings will be transferred to a CHP or Council (whichever is relevant);
- A requirement to make any monetary payment at a specified time or stage in the development application process, or a requirement that any dwellings that will be dedicated are shown on approved plans in the same development application.
- A requirement that evidence be provided of such a condition has been satisfied prior to the granting of any construction certificate.

3 Administration and Implementation

3.1 How to make a contribution

The dedication of any dwellings is to be free of charge to Council.

Payment must be made by unendorsed bank cheque, electronic transfer or an alternative method accepted by Council prior to issue of any construction certificate.

In circumstances where no construction certificate is required, payment is required prior to the commencement of use/occupation. The procedure for making payment is provided in the condition of consent.

If a development requires multiple construction certificates, Council will require payment prior to the release of the first construction certificate relating to the development consent on which the contributions were levied.

3.2 Adjustment of monetary contribution amounts

Monetary contribution amounts per square metre are adjusted on an annual basis, being the first day of March, with reference to movements in the median strata dwelling price in the Woollahra LGA as detailed in *NSW Government Rent and Sales Report, Table: Sales Price – Greater Metropolitan Region – Strata.*

The Rent and Sales Report is available on the NSW Government, Department of Communities and Justice website.

The formula for the adjustment of the monetary contribution amount per square metre is:

> **[New monetary contribution amount per square metre] = [current monetary contribution amount per square metre] x ([median strata dwelling price in current year] / [median strata dwelling price in prior year])**

For example, if the prior year median strata dwelling price was $1.7 million and the current year median strata dwelling price was $1.9 million, the new monetary contribution amount per square metre would be:

> New monetary contribution amount per square metre = $23,800 x ($1.9 million / $1.7 million) = $26,600

Note: The current contribution amount per square metre will be displayed on Council's website.

3.3 Adjustment of monetary contributions in a condition of consent

Where a monetary contribution is imposed as a condition of development consent, the total monetary contribution payable must be adjusted to reflect the relevant passage of time between the time of consent and the time at which the contribution is payable.

The formula for adjustment of the total monetary contribution payable is:

Total monetary contribution payable = [Total contribution amount in condition of consent] x ([Contribution amount per square metre at time of payment] / [Contribution amount per square metre at time of consent])

For example, if a total monetary contribution at time of consent had been $1,000,000, and the monetary contribution amount per square metre at time of consent was $23,800, and the new monetary contribution amount per square metre is now $26,600, the total monetary contribution payable would be:

Total monetary contribution payable = $1,000,000 x ($26,600 / $23,800) = $1,117,647.06

3.4 Process for the distribution and management of funds

In-kind contributions of affordable housing dwellings are to be given/dedicated, free of cost, to a CHP or Council, or as otherwise provided for in any policy adopted by Council. In circumstances where no CHP is willing to accept the in-kind contribution, then it may be managed by Council. In-kind contributions are to remain affordable housing in perpetuity and to be owned and managed in accordance with this AHCS.

Monetary contributions are to be held by Council or an authorised NSW Government department. They may be used by Council to purchase dwellings, provided to a CHP or used in partnership with a CHP to provide affordable housing.

3.5 Process for dedicating dwellings

Where the dwellings proposed for dedication are supported, a condition of consent requiring dedication of the affordable housing dwelling(s) will be imposed by the consent authority.

Prior to transferring the affordable housing dwellings to any CHP, Council will register on the title a covenant ensuring the affordable housing dwellings are:

- Owned and managed by a CHP in accordance with this AHCS, and
- Rented to very low to moderate income earners for no more than 30% of gross household income.

3.6 Registered community housing providers and delivery program

Any CHPs involved with the management of in-kind contributions or the use of monetary in-lieu contributions must be endorsed by a resolution of Council. Once endorsed, a CHP may continue to be involved in the operation of this AHCS, unless otherwise directed by a resolution of Council.

In endorsing a CHP, Council may specify financial reporting arrangements to be met during the term of the endorsement. Under this AHCS, Council will only conduct dealings with not for profit CHPs.

3.7 Proponent-led planning proposals

Any planning proposal that allows residential development and is considered by Council as likely to result in a significant value uplift must:

- Include a proposal to amend this scheme and *Woollahra Local Environmental Plan 2014* to include the planning proposal site or part of the planning proposal site to specify an affordable housing contribution rate that is supported by feasibility testing; or

- Be supported by a planning agreement that includes affordable housing provisions consistent with this scheme.

Council reserves the right to obtain an independent feasibility assessment of any proposed affordable housing contribution.

3.8 Monitoring and review of scheme

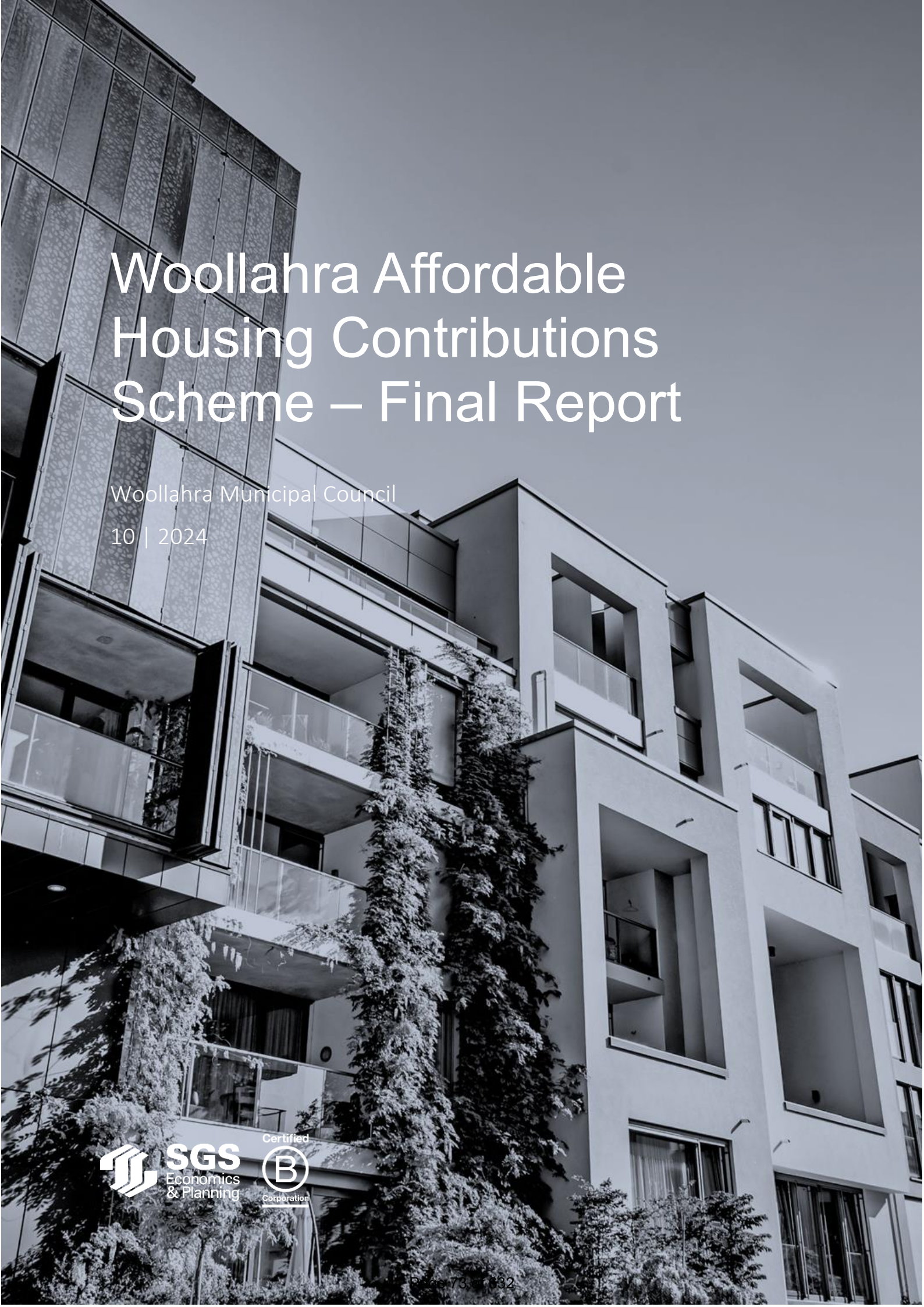
Council will regularly review this AHCS and the manner in which it operates. As necessary, amendments and other changes may be required to ensure it operates in the way that Council intends.

Amendments, unless purely administrative in nature, will be exhibited in accordance with the *Woollahra Community Participation Plan.*

Woollahra Affordable Housing Contributions Scheme – Final Report

Woollahra Municipal Council

10 | 2024



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SGS Economics and Planning Pty Ltd
ACN 007 437 729
www.sgsep.com.au

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Executive summary

This work represents evidence base documenting the continued and growing need for social and affordable housing and analysis of the supportability of an affordable housing contribution scheme for the Edgecliff Commercial Centre.

1.1 Background

The Edgecliff Commercial Centre (ECC) is one of Woollahra's key community hubs, well-located for transport access, and the gateway from the LGA to the CBD and the eastern suburbs. Council is in the process of developing the Edgecliff Commercial Centre Planning and Urban Design Strategy (the Strategy), which is currently in its draft phase. As part of the Strategy, it is likely that planning controls will be introduced to allow for increased building heights and uplift for selected sites within the ECC.

The need to facilitate more affordable housing in the LGA has become increasingly acute as housing affordability has worsened across Sydney. Council's Local Housing Strategy in 2021 identified that while the demand for social and affordable housing in Woollahra was lower than the Sydney average, there was a significant shortfall in supply of this housing compared to demand. At the time, almost all low-income households in the LGA were in in rental stress. While ABS Census estimates for 2021 have been included in this work, it is likely that the pandemic and ensuing housing market challenges have exacerbated housing stress.

1.2 Objectives

In response to these conditions and expanding affordable housing shortfall, Woollahra Municipal Council wishes to capture broader community benefits in the form of the delivery of affordable housing through the uplift envisaged as part of the Urban Design Strategy. To do this, Council commissioned SGS Economics & Planning (SGS) to test the supportability of an Affordable Housing Contribution Scheme (AHCS) for the ECC. In support of Council's preparation of a planning proposal to the Department, and in line with the Department's Guideline for Developing an AHCS (2019), this study provides:

- Evidence base of need for social and affordable housing
- Identify areas to be upzoned and representatives sites to test
- Use industry standard financial modelling supported with market-relevant inputs and assumptions
- Test the supportability of a variety of affordable housing contribution rates
- Document and provide considerations for progressing an appropriate rate in a scheme
- Draft LEP clauses to be inserted into a Planning Proposal

1.3 Approach

As noted above, SGS adhered to the NSW Government's Guideline for Developing an Affordable Housing Contribution Scheme (2019), which outlines the components and process for local governments to follow in preparing a planning proposal. Some technical elements SGS has provided exceed those that are required by the Department. Accordingly, the key components of this study include:

- Legislative and Policy Framework: an overview of the regulatory framework (i.e., authorising legislation from the EP&A Act, 1979), NSW Government guidance, as well as the statutory and strategic planning context for Woollahra Municipal Council (i.e., LEP, LHS, etc.).
- Affordable Housing Need Evidence Base: this section documents trends and conditions in the housing market, such as housing demand drivers (e.g., population and household growth and cohort shifts), housing sales and rent trend, household incomes, households by tenure and rental stress, housing supply conditions, dwelling stock by type and existing conditions and projections of need for social and affordable housing.
- Identification of Areas for Uplift: this section illustrates the areas of proposed uplift, the extent of the Council-led proposed uplift and the prototype sites and redevelopment typologies to test.
- Testing the Viability of Affordable Housing Contributions: in accordance with the Government's guidance on testing the viability of an AHCS, this section examines (using a residual land value methodology) redevelopment viability with the proposed uplift, with varying degrees of additional uplift, with varying potential contribution rates, and with projections of market conditions (realisable values and development costs)

1.4 Findings and Recommendations

Broadly, the analysis of trends and conditions found the following (which constitute a part of the evidence base for the progression of Council's planning proposal):

- The last decade's population growth has been fuelled by older age groups, 65 years and older. Younger populations (every cohort under 65) were declining.
- Households well above the area median household income account for approximately 60% of all households.
- Two- and three-bedroom dwellings accounting for most of the LGA's housing stock (66%). Over the past decade, however, it has seen a net decline in the number of studio and one-bedroom dwellings.
- Only approximately 10% of the rental supply (measured by rental bonds data) is affordable to households earning 80% of the area median income or less.
- Approximately one-third of all renter households are living in housing stress, meaning they spend more than 30% of their pre-tax income on rent.
- Using projections of population, household and affordability patterns, SGS estimates that there will be 3,367 renter households in housing stress by 2041, an increase of 722 households.

Based on the findings of the viability testing, SGS recommends the following with regard to an AHCS in the ECC:

- **Council pursue a contribution rate of 5%.** Analysis demonstrates that viability can be achieved across all sites (except E) with a 5% AHC (either in-kind or in-lieu contribution) within five (5) to ten (10) years.
- **Council could introduce the contribution incrementally**. Pursuing a 5% contribution upfront could be seen by the Department as an aggressive starting position. The Department has previously advised other councils to stage the introduction of (relatively high, e.g., rates greater than 3%) contributions to manage potential negative impacts.[1] For example, a 2% or 3% contribution is introduced first, followed by the 5% contribution taking effect one or two years later.

In consideration of the type of contribution, SGS observes the following:

- **In-lieu (monetary) affordable housing contributions are more viable than in-kind contributions**. developers will generally opt for payment of a monetary contribution, given that it is often substantially less costly than providing an in-kind contribution. This is particularly the case in Woollahra's market.
- **In-lieu contributions are also preferred by CHPs**. While SGS has not specifically engaged with any CHPs in this project, previous consultation with CHPs have indicated that they prefer that Councils to collect monetary contributions that can later be pooled (i.e., over time) and used as capital in either a purpose-built affordable housing development or the acquisition of existing dwellings. This preference seems to emerge from a consideration of operational burdens, where scattered affordable dwellings across an LGA in multiple buildings present a higher opex burden on CHPs (e.g., fixed and variable costs associated with site-to-site maintenance, management and travel, etc.).

Further considerations include issues of the broader market, including:

- **Current market conditions make redevelopment challenging.** Today's market conditions are characterised by a convergence of headwinds across multiple fronts: escalation in construction costs, increased cost of borrowing, diminished consumer purchasing power, as well as unrelenting expectations of land value. Construction costs since the pandemic have increased substantially (as discussed on page 52) due to, amongst other factors, major supply-chain disruptions and increased labour costs. Interest rate increases from central banks, in efforts to tame inflation, have resulted in higher borrowing costs for developers and producers. Higher interest rates have translated to higher cost of debt for borrowers, resulting in diminished consumer purchasing power. Compounding these difficulties are expectations of land value by landholders, which despite lower willingness to pay by either developers or purchasers, generally have not budged. Land values are often characterised as "sticky" or slow to move, reflective of land holders reticence to compromise perceived value based on previous market highs. Taken together, such conditions have created a set of significant challenges not only for the development industry by also for decision-makers (such as local and state government) engaged in longer-term, strategic efforts such as these. As such, this report provides also a view to viability using projections of market conditions to illustrate

[1] Randwick's approved AHCS for K2K was implemented initially at 3%, increasing to 5% 2 years later.

when if not now might viability of a strategic effort such as the establishment of an AHCS be supportable.

- Housing SEPP reforms are likely to be adopted by proponents. Under Part 2 of the Housing SEPP, a development may increase FSR and height by up to 30%, if 15% of the total development is provided as affordable housing for 15 years. It should be noted that the Housing SEPP provision is sought in addition to any AHCS under a Council's LEP. As examined by SGS's (see Appendix A), the AHCS implies a contribution made in perpetuity, which means that the RLV is negatively impacted. By contrast, the Housing SEPP, which only requires floorspace to be affordable for 15 years, means that developers account for such floorspace differently in their RLV estimate. Because floorspace can be sold back into the market following the 15-year term, the present value of a future sales can be capitalised into the RLV (increasing it). As such, analysis confirms that developers are likely to take advantage of the Housing SEPP provision to achieve greater density, even when accounting for the resulting increase to contributions under Council's AHCS.
- Housing SEPP poses additional challenges. Other challenges for strategic planning emerge, however, whereby Councils' ability to appropriately plan for, fund and maintain local and community infrastructure, including roads, libraries, parks, etc is likely to be impacted. In general, Council should be careful to structure local pathways to providing affordable housing contributions that fall in line with broader strategic planning and public infrastructure funding and financing targets.

Appendix A contains additional work Council requested of SGS to evaluate the implications of the NSW Government's recently-introduced Housing SEPP.

Glossary

TABLE 1: GLOSSARY

Term	Definition
AHCS	Affordable housing contribution scheme
The Guideline	The Guideline for Developing an Affordable Housing Contribution Scheme
EP&A Act	Environmental Planning and Assessment Act (1979)
Housing SEPP	State Environmental Planning Policy (Housing) 2021

1. Introduction and background

This chapter contextualises the work of developing an AHCS under the NSW legislative framework.

1.1 Background

The Edgecliff Commercial Centre (ECC) is one of Woollahra's key community hubs, well-located for transport access, and the gateway from the LGA to the CBD and the eastern suburbs. Council is in the process of developing the Edgecliff Commercial Centre Planning and Urban Design Strategy (the Strategy), which is currently in its draft phase. As part of the Strategy, it is likely that planning controls will be introduced to allow for increased building heights and uplift for selected sites within the ECC.

The need to facilitate more affordable housing in the LGA has become increasingly acute as housing affordability has worsened across Sydney. Council's Local Housing Strategy in 2021 identified that while the demand for social and affordable housing in Woollahra was lower than the Sydney average, there was a significant shortfall in supply of this housing compared to demand. At the time, almost all low-income households in the LGA were in in rental stress. While ABS Census estimates for 2021 have been included in this work, it is likely that the pandemic and ensuing housing market challenges have exacerbated housing stress.

This chapter considers the current process and mechanism to develop and adopt an AHCS under the NSW legislative framework.

1.2 Other nearby Affordable Housing Contribution Schemes

Affordable housing policy in NSW is guided both by legislation, and though the regulatory Guideline. These are discussed in detail within the following section. Under the Guideline, introduced in 2019, there have been a limited number of AHCSs implemented in NSW. However, there are examples of schemes (both introduced prior to the Guideline, and after) in the vicinity of the Woollahra LGA:

- **Randwick (2020[2]):** as part of the Kensington and Kingsford town centre rezonings precipitated through the opening of the CBD and South East Light Rail, a contribution of 3% was introduced for residential floorspace, which rose to 5% two years later.

[2] Randwick City Council, 2024, Affordable housing contributions, via https://www.randwick.nsw.gov.au/planning-and-building/planning/affordable-housing-contributions

- Waverley (2023[3]): Introduced a contribution of 1% for all new independent living units, multi dwelling housing, residential flat buildings, and shop-top housing developments. This proposal was not consistent with the Guideline but was granted Gateway determination and implemented.
- City of Sydney (1996[4]): The City of Sydney introduced an affordable housing scheme in Ultimo-Pyrmont in the 1990s through the rezoning and major redevelopment of previous industrial land. This was the first AHCs in NSW and the City has now developed a modest stock of affordable rental housing. Contributions were later required for the Southern Employment Lands and Green Square, with all new residential development in the City now falling under the AHCS at a rate of 3% for residential development and 1% for non-residential development. Higher contributions are required for land which is granted uplift under a Planning Proposal.

These Schemes which have been implemented in LGAs near Woollahra demonstrate that nearby councils have also identified a need for affordable housing.

1.3 Affordable Housing Contribution Schemes in NSW Legislative Context

The following provides the legislative context for the definition of affordable housing, and the creation of Affordable Housing Contribution Schemes in NSW.

The discussion of the legislative framework includes 1) an overview of the authorising legislation under the EP&A Act 1979, 2) the Housing SEPP, and 3) the Guidelines for Development of an Affordable Housing Contribution Scheme (2019).

Defining Affordable Housing

The definition of affordable housing is provided through the legislative framework in NSW as outlined below. The legislative framework is then discussed further in later sections.

Under the EP&A Act, affordable housing is defined as follows:

> affordable housing means housing for very low income households, low income households or moderate income households, being such households as are prescribed by the regulations or as are provided for in an environmental planning instrument.

The Housing SEPP further defines households of various income categories as follows:

13 Affordable housing—the Act, s 1.4(1)

(1) In this Policy, a household is taken to be a very low income household, low income household or moderate income household if—

(a) the household—

[3] Waverley Council, 2023, Waverley Council Affordable Housing Contributions Scheme, https://hdp-au-prod-app-waverley-yoursay-files.s3.ap-southeast-2.amazonaws.com/9016/9888/3535/Planning_Proposal_-_Exhibition_-_AHCS_PP.pdf

[4] City of Sydney, 2023, City of Sydney Affordable housing program, via https://www.cityofsydney.nsw.gov.au/affordable-housing-contributions/city-of-sydney-affordable-housing-program

(i) has a gross income within the following ranges of percentages of the median household income for Greater Sydney or the Rest of NSW—
(A) very low income household—less than 50%,
(B) low income household—50–less than 80%,
(C) moderate income household—80–120%, and
(ii) pays no more than 30% of the gross income in rent, or

(b) the household—
(i) is eligible to occupy rental accommodation under the National Rental Affordability Scheme, and
(ii) pays no more rent than the rent that would be charged if the household were to occupy rental accommodation under the Scheme.

(2) In this section—

Greater Sydney means the area that the Australian Bureau of Statistics determines from time to time to be the Greater Sydney—Greater Capital City Statistical Area.

National Rental Affordability Scheme has the same meaning as in the National Rental Affordability Scheme Act 2008 of the Commonwealth.

Rest of NSW means the area that the Australian Bureau of Statistics determines from time to time to be the Rest of NSW—Greater Capital City Statistical Area.

These definitions have accordingly been used for the development of the evidence base throughout this work.

EP&A Act 1979

Council is obliged to "promote the delivery and maintenance of affordable housing" under Object 1.3(d) of the Environmental Planning and Assessment Act (The EP&A Act). Affordable housing contributions are authorised under Division 7.2 of the EP&A Act, which falls under Part 7 covering infrastructure contributions and financing. The Act provides that these contributions can be included as a condition of consent of a development and can be either monetary contributions, or a direct dedication of land or dwellings. Under 7.32 (2) a condition for affordable housing can require dedication of the affordable housing/ land or monetary contribution (or both).

They must further be authorised under a clause within a Local Environmental Plan (LEP), which means that to implement or amend an AHCS, councils need to go through the process of altering their LEP (requiring approval by DPE). Section 7.32 (1) establishes the general requirements for affordable housing contributions – this includes that a SEPP has identified the need for affordable housing, and:

(a) the consent authority is satisfied that the proposed development will or is likely to reduce the availability of affordable housing within the area, or
(b) the consent authority is satisfied that the proposed development will create a need for affordable housing within the area, or
(c) **the proposed development is allowed only because of the initial zoning of a site, or the rezoning of a site, or**
(d) the regulations provide for this section to apply to the application.

Section 7.32(1)(c) is accordingly the mechanism under which an AHCS is established under the current policy paradigm.

Housing SEPP

The Housing SEPP establishes the need for affordable housing in all LGAs (satisfying the above-mentioned requirement of the EP&A Act). It further provides requirements that need to be met to allow a condition to be imposed, which guide councils in their management of contributions raised under an AHCS.

Reforms to the Housing SEPP were implemented in December 2023. The reforms provide an additional 20-30% FSR and height to a proposal, over existing EPI controls, to proposals which provide 10-15% of the gross floor area as affordable housing for a term of 15 years.

Guideline for Developing an Affordable Housing Contribution Scheme (2019)

The Guideline for Developing an Affordable Housing Contribution Scheme[5] (the Guideline) is the policy which outlines requirements for the development of an AHCS under 7.32(1)(c). The Guideline requires that councils complete the following process:

- Gather an evidence base for affordable housing need in their LGA (similar to the evidence base used for councils' Local Housing Strategies)
- Identify the areas of uplift to which an affordable housing contribution scheme will apply
- Determine a viable affordable housing contribution rate using a residual land value (RLV) method
- Produce an AHCS using the Department template
- Submit a Planning Proposal to amend their LEP to reference the AHCS

The AHCS is then assessed by the Department, exhibited, and implemented if the Department is satisfied.

The Guideline requires that AHCS be levied from upzoning, which "ensures contributions are drawn from the increase in land value generated by the rezoning and are consistent with the affordable housing targets established in the Greater Sydney Commission's District Plans". The Guidelines suggest that a percentage of floorspace (and equivalent monetary contribution) should be identified as the 'contribution rate'.

Objective 11 of the Greater Sydney Region Plan (2018), 'Housing is more diverse and affordable' did not directly set affordable housing targets but stated that affordable rental housing targets would be "applied in defined precincts prior to rezoning", and that "within Greater Sydney, targets generally in the range of 5–10 per cent of new residential floor space are viable".

[5] NSW Department of Environment and Planning 2019 *Guideline for Developing and Affordable Housing Contribution Scheme,* Sydney

2. Policy and document review

This chapter seeks to and understand how Woollahra is seen in the NSW strategic planning framework, and what issues have been identified in relation to its affordable housing needs. This forms the context for the evidence base in the next chapter, which quantitatively analyses the issues raised in this chapter.

2.1 State or regional strategies and policies

A Metropolis of Three Cities - Greater Sydney Region Plan (2018)

Under the Greater Sydney Region Plan 'A Metropolis of Three Cities'[6], Woollahra is identified as being located within the Eastern City.

The liveability section of the Plan includes the chapter 'Housing the city' which relates to the housing needs of the area. Objective 10 'Greater housing supply' speaks to the need to provide housing for a growing population, across a broad range of built form typologies. The plan references the role good strategic planning will play in locating this housing close to services and infrastructure, and notes the challenges faced by inner metro councils in providing for housing giving existing urban constraints. For these Councils, of which Woollahra is one, the plan identifies urban infill development as being the most appropriate form of development to pursue. This includes the delivery of housing that is close to existing or proposed infrastructure and transport corridors, with good access to public facilities, open space and jobs.

Whilst not being identified within a future growth area, Woollahra Council contains several 'Local' Centres', which fit the urban infill development profile of being able to support additional housing.

The Plan sets a housing target for the Eastern City of:

- an additional 46,550 between 2016–2021, with 157,500 set to be delivered between 2016-2036.

Stemming from Objective 10 are Actions 3 and 4 which prompt Councils to prepare housing strategies and develop 6-10 year housing targets.

Objective 11 'Housing is more diverse and affordable' of the Plan identifies a range of measures to address housing affordability, including the direct provision of housing by government, the implementation of affordable housing schemes that incentivise the provision of affordable housing by developers and community housing providers and the delivery of market housing stock to ensure supply keeps up with demand.

Action 5 proposes the implementation of Affordable Rental Housing Targets, which will include finalising a consistent viability test for the Affordable Rental Housing Targets to support councils and

[6] Greater Sydney Commission 2018 *A Metropolis of Three Cities – Greater Sydney Region Plan*, New South Wales Government, Sydney

relevant planning authorities and ensuring that housing strategies include a sufficient affordable housing needs analysis and strategy to identify preferred affordable housing locations in each local government area.

Whilst not specifically mentioning Woollahra, these actions are relevant to the LGA in that they feed into the District Plan and provide Council with the direction to make steps to address these issues.

Eastern City District Plan (2018)

The Eastern City District Plan[7] is a guide for implementing the Greater Sydney Region Plan at a district level and is a bridge between regional and local planning. Woollahra is located strategically within the Eastern City District.

Planning Priority E5 'Providing housing supply, choice and affordability, with access to jobs, services and public transport' of the Plan gives effect to Objectives 10 and 11 of the Metropolis of three cities Plan in the context of the Eastern Harbour City.

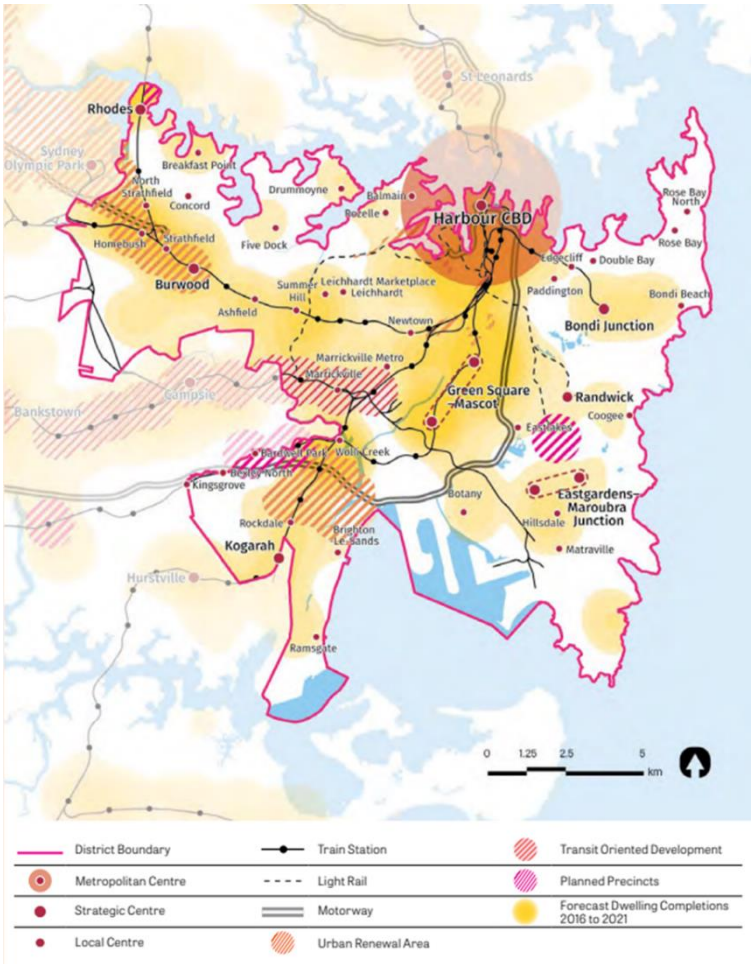
The Plan identifies the different housing markets that operate within the district, with Woollahra residing within the 'City and Harbourside' housing market. The Plan makes reference to the fact that providing supply in one market demand area may not satisfy demand in another. This information is relevant when considering the potential effectiveness and limitations of various policy and land use planning interventions available to Council to address the supply and affordability of housing.

Woollahra LGA itself is not identified as being subject to any current initiatives or having any specific opportunities for growth. Notwithstanding this, the LGA includes multiple local centres located along transport corridors that are close to public amenities and jobs and thus has an obligation to deliver additional housing stock.

Woollahra was identified as having a housing supply target of 300 dwellings between 2016-2021, which is modest in comparison to the overall district total of 46,550.

[7] Greater Sydney Commission 2018 Eastern City District Plan, New South Wales Government, Sydney

FIGURE 1: EASTERN CITY DISTRICT FUTURE HOUSING SUPPLY



Source: Eastern City District Plan, March 2018, Greater Cities Commission.

The Six Cities Region: Discussion Paper (2022)

The 'Six Cities Region: Discussion Paper'[8], released in September 2022, seeks to build upon the 2018 Region Plan and District Plans and March 2020 assurances by providing additional direction that will allow for faster delivery on the ground, particularly relating to housing and local infrastructure, with measurable and timebound targets that reflect what matters to people in the Six Cities Region.

Woollahra is located within the newly identified Eastern Harbour City, which is an expansion on the previously identified Eastern City. A Draft Region Plan for the six cities region and a City Plans for the Eastern Harbour City is due to be released by the end of 2023.

The discussion paper builds upon the issues mentioned in the previous Plan and emphasises the urgency at needing to address the escalating housing affordability crisis playing out in the region.

[8] Greater Sydney Commission 2022 *Six Cities Region: Discussion Paper*, New South Wales Government, Sydney

The paper recommends that housing diversity and affordability be improved by:

- Increasing the proportion of multi-unit and higher density housing in accessible locations that are supported by infrastructure.
- Ensuring existing and new freestanding homes and medium density housing are connected to quality amenity, essential services and transport infrastructure.
- Continuing to work with councils through their local housing strategies.

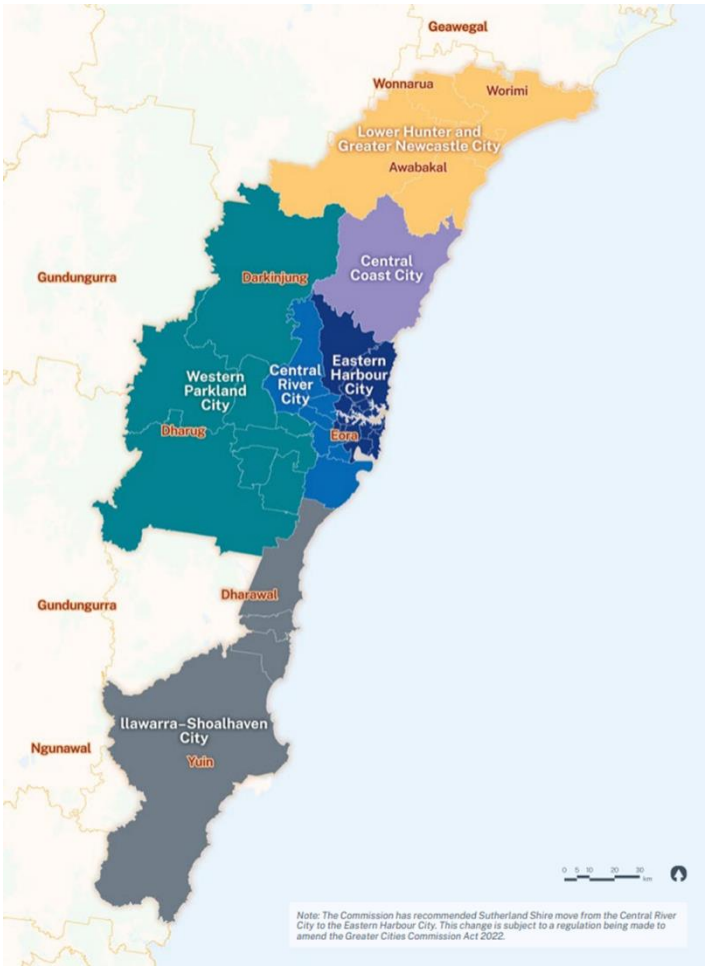
It is expected that the soon to be released Eastern Harbour City Plan will include stronger housing targets and will have a focus on housing affordability and ways in which this can be achieved.

Whilst making no specific mention of the eastern harbour city or Woollahra LGA, it is likely that these will feature as prominent concerns for the area given its central location within the six cities region.

The Plans make reference to the challenges and limitations faced by established inner metro Councils in providing affordable housing, which include the cost of land, difficulty in undertaking infill development and the tight housing markets which these solutions must operate within.

The plans also identify strengths of areas which include multiple local centres located along transport corridors that are close to public amenities and jobs. Woollahra falls within this category and is in a good position to deliver additional affordable housing, noting the above constraints will provide limitations on where this may occur.

FIGURE 2: THE SIX CITIES REGION



Source: Six Cities Region Discussion Paper, 2022, Greater Cities Commission.

2.2 Local strategies and policies

This section seeks to understand Woollahra's current policies and frameworks, specifically in relation to housing, and affordable housing.

Local Strategic Planning Statement (2020)

The Woollahra Local Strategic Planning Statement[9] (LSPS) highlights the importance of planning for future housing that meets the needs and characteristics of the local community. This includes ensuring that new housing developments are able to meet the diverse and changing needs of the community, including those associated with an aging population and greater demand for affordable housing in accessible locations.

[9] Woollahra Municipal Council 2020 *Woollahra Local Strategic Planning Statement,* Sydney

In support of this goal, the LSPS includes actions to develop a local housing strategy that measures the need for affordable housing and explores opportunities for Council to advocate for the delivery of affordable housing stock (see Local Housing Strategy below). Council also committed to work with the Greater Sydney Commission, government agencies, and neighbouring councils to develop affordable housing options.

Local Strategic Planning Assurance (2020)

In March of 2020, as part of the Local Strategic Planning assurance, Woollahra's Local Strategic Planning Statement was given support by the Commission[10].

The letter of support indicated that Woollahra was on track to deliver its housing targets, however also provided updated housing delivery targets to Council of an additional Council is to show how it can meet an indicative draft range for 6-10 year housing targets for 2021/22 to 2025/26 of 500 - 600 dwellings as part of its Local Housing Strategy.

Local Housing Strategy and DPE Letter of Approval (2021)

The Woollahra Local Housing Strategy (LHS)[11] identified a lack of social and affordable housing within the LGA. Compared to the Sydney average, housing affordability in Woollahra is poor, with nearly all low-income households in rental or mortgage stress.

Currently, the primary mechanism for affordable housing contributions is SEPP 70 (now the Housing SEPP) which applies to uplift precincts. In accordance with this, the LHS included a commitment to develop an AHCS for areas experiencing development uplift, including for the Edgecliff Commercial Centre. In approving the LHS[12], the Department of Planning and Environment required that Council develop an AHCS, in consultation with neighbouring councils and community housing providers. This report is the outcome of that requirement.

For LGAs such as Woollahra, which do not have large uplift precincts but are increasingly unaffordable for key workers (especially teachers, carers, nurses, and support workers), broad-based affordable contribution schemes are also an important area of reform. The LHS additionally included measures to improve access to affordable housing by working with the NSW Government and neighbouring Waverley and Randwick Councils to develop affordable housing contribution schemes for new apartment developments.

Affordable Housing Policy (2021)

Woollahra's Affordable Housing Policy[13] details Council's objectives relating to affordable housing, including that the supply of affordable rental housing for key workers be increased, that planning controls facilitate the supply of new affordable housing, and that Council's affordable housing assets

[10] Greater Sydney Commission 2020 *Letter of Support: Woollahra Council draft Local Strategic Planning Statement*, New South Wales Government, Sydney.
[11] Woollahra Municipal Council 2021 *Woollahra Local Housing Strategy,* Sydney
[12] Department of Planning and Environment 2022 *Woollahra Local Housing Strategy 2021,* Sydney
[13] Woollahra Municipal Council 2021 *Woollahra Affordable Housing Policy,* Sydney

and programs are effectively managed. In support of these objectives, the Policy outlines actions and timeframes for completion. Short-to-medium-term actions include:

- investigating the potential to introduce unit mix planning provisions to ensure a diverse range of housing sizes are delivered in new developments;
- investigating the suitability of introducing planning controls to facilitate appropriate and high-quality co-living and/or micro-housing types in areas close to hospitals and tertiary education facilities; and
- advocating for contributions reform to permit the preparation of affordable housing contributions scheme for all new apartment developments.

Longer-term and ongoing actions include working with the NSW Government and neighbouring councils to develop affordable housing options and advocating for increased investment in public housing stock.

The Policy is to be reviewed every two years or in accordance with legislative requirements.

3. Evidence base

The evidence base has been developed to align with the NSW Government's 2019 Guideline for the Development of an Affordable Housing Contribution Scheme (AHCS), comprising of a demographic analysis, assessment of housing supply and demand and the identification of gaps.

The Guideline recommends that the evidence base considers the housing market as a whole, with affordable housing being a subset of it. It responds to the requirements of the 2019 Guideline through three analytical lenses:

- Demand for housing (incorporating the demographic analysis referred to in the Guideline) is illustrated by growth in population and households. Household income and the change of households by income over time, as well as changes in the characteristics of those households, such as by size, are also demand indicators. Projected demographic changes should also be examined.
- Supply of housing is indicated by the change in dwellings over time, considering the size and type of dwellings. While the scale or increase in supply of housing generally aligns with the needs of the household growth, gaps often emerge when examining the distribution of that supply across categories of household size, dwelling size, supply by tenure, and especially affordability levels.
- The affordability of housing, as illustrated in trends in housing sales prices, rental rates, and vacancies. Trends and distribution of housing by affordability level are contrasted against households by income to identify gaps in the affordability of housing. Incidence of rental stress, and change over time, also helps to characterise how many households, and to what extent, are not being provided for by the market. Trends are projected to understand how these conditions could change in the future.

3.1 Demand for housing

Demographic analysis is a key component of demand for housing. While affordability and household preferences play a large part in driving housing choice (such as where to live, in what type of dwelling and in what type of surroundings), there are several key metrics that characterise housing demand:

- Population growth is the overall metric of the net change in underlying conditions, such as births, deaths, in- and out-migration.
- The population by age analysis provides additional insight to population growth. Analysis of household sentiment and housing choices often reveals demand for different preferences sets (housing types, settings, etc.) across key age groups, such as under 35s, family and working age (35 to 64) and empty-nesters or retirees (65 and older). A market with more population growth at the younger end of the spectrum implies housing demand of a different type than more population growth at the older end of the spectrum.

- **Households by size**: This metric indicates how the population growth is distributed specific sizes of households, such as one-, two-, three-person households, etc. A population growing more strongly in smaller households, for example, will often have more demand for rental housing and smaller dwelling sizes.
- **Tenure split** shows whether people are renting or if they own their own home (outright, or with a mortgage). Change in this indicator over time can show reduced affordability of dwellings for purchase.
- **Households by Income**: changes in household income and the distribution of households by income characterise one of the more important aspects of housing affordability analysis. This metric and changes in this metric and the distribution of households by income are central to understanding the affordability of a market for its residents.

Population growth

Across Greater Sydney, the older age brackets of 60 years and above experienced the greatest increase in population between 2011 and 2021. However, this skew towards older age brackets was particularly pronounced in Woollahra, where there was strong growth among those aged 60-79 but minimal or negative growth in younger age brackets (those aged 39 years and less).

Net increases in the 0-19 age group were negligible, while the 20-39 age group decreased by over 1,500 people in Woollahra. The total net population increase across the LGA was just over 1,300, driven mainly by a 21 percent growth in the 60-79 age bracket and 19 percent growth in the 80+ bracket. Across the rest of Eastern Harbour City and Greater Sydney, population growth was more balanced within age brackets, although this trend of strong growth among the older population was apparent.

TABLE 2: POPULATION BY AGE, 2021

Geography	<34	35-64	65+	Total
Woollahra	21,952	20,377	11,180	53,496
Eastern Harbour City	943,620	841,494	340,542	2,125,638
Greater Sydney	2,412,316	2,024,084	794,688	5,231,052

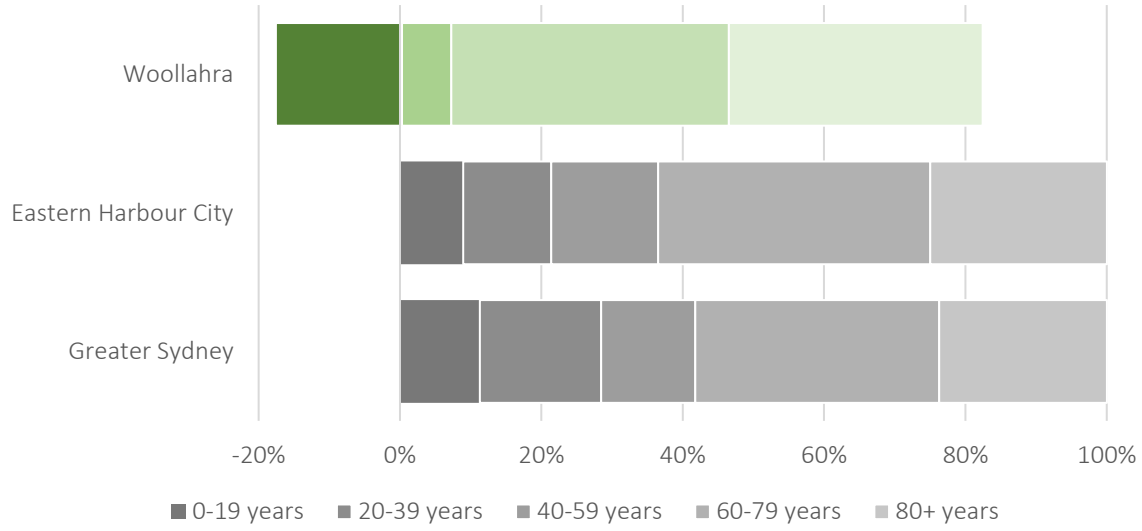
Source: ABS Census 2021

TABLE 3: POPULATION CHANGE (%) BY AGE, 2011-2021

Geography	<34	35-64	65+	Total
Woollahra	-5.0%	-0.9%	31.6%	2.6%
Eastern Harbour City	8.1%	11.8%	32.1%	12.8%
Greater Sydney	14.7%	17.4%	40.8%	19.1%

Source: ABS Census 2011, 2021; SGS Economics & Planning, 2023

FIGURE 3: POPULATION CHANGE (%) BY AGE (2011-2021)



Source: ABS Census 2011, 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

Household growth

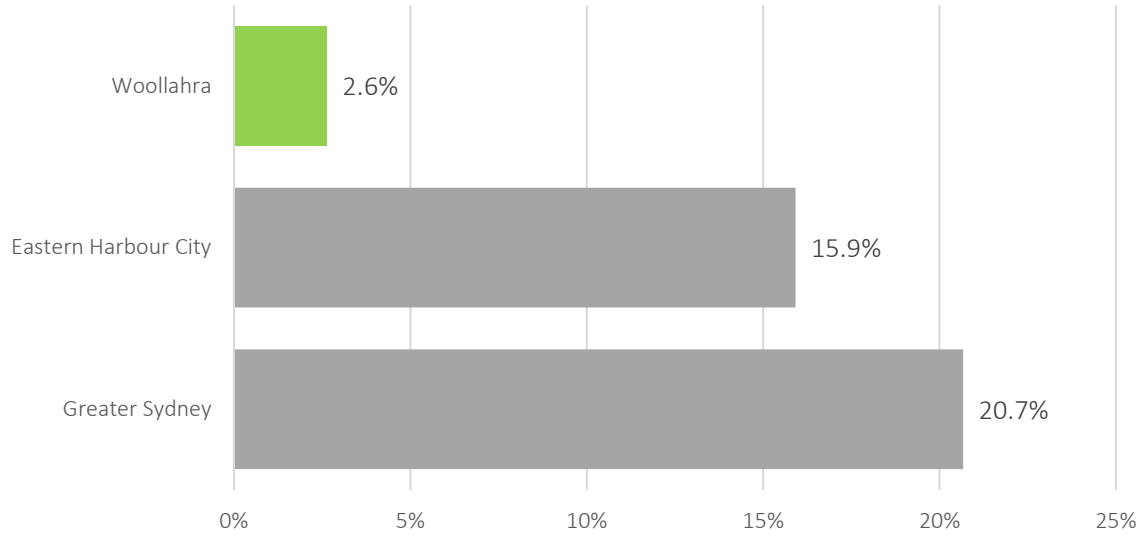
Woollahra grew from a total of 20,457 households in 2011 to 21,916 households in 2021. As shown in **Figure 4**, the overall net household growth in Woollahra between 2011 and 2021 was 2.6 per cent, significantly below the rate seen across the rest of Eastern Harbour City and Greater Sydney.

TABLE 4: HOUSEHOLDS BY TYPE, 2021

Geography	Family households	Lone person households	Group households	Total
Woollahra	13,617	6,946	1,353	21,916
Eastern Harbour City	547,770	220,488	45,428	813,686
Greater Sydney	1,327,549	424,734	76,564	1,828,847

Source: ABS Census 2021

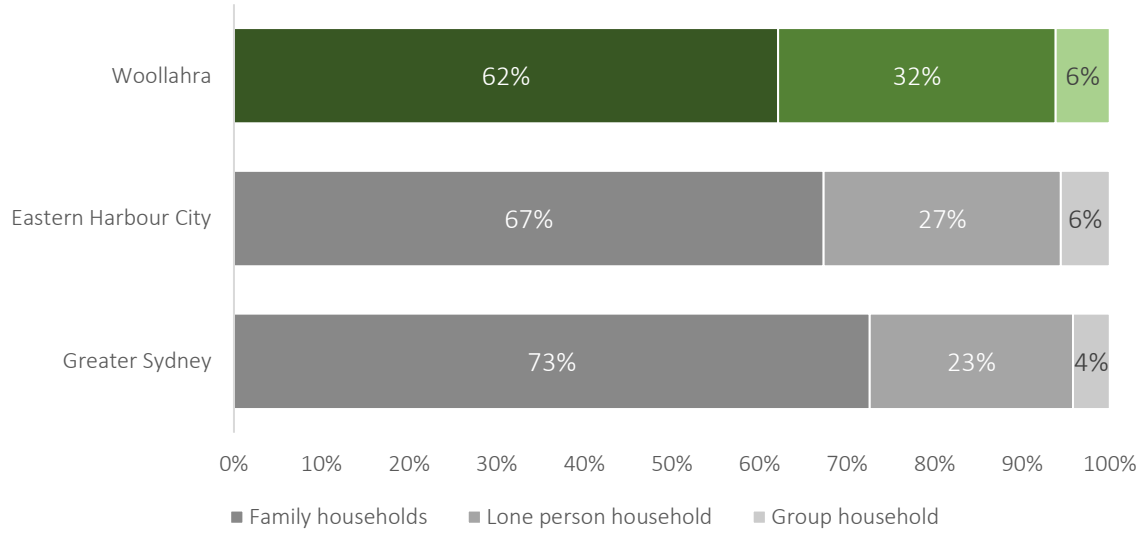
FIGURE 4: OVERALL HOUSEHOLD GROWTH, 2011-2021



Source: ABS Census 2011, 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

Illustrated in **Figure 5,** household type distributions for 2021 show that Woollahra has a slightly higher proportion of group and lone person households than Eastern Harbour City and Greater Sydney. However, family households still account for the majority in the LGA (62%).

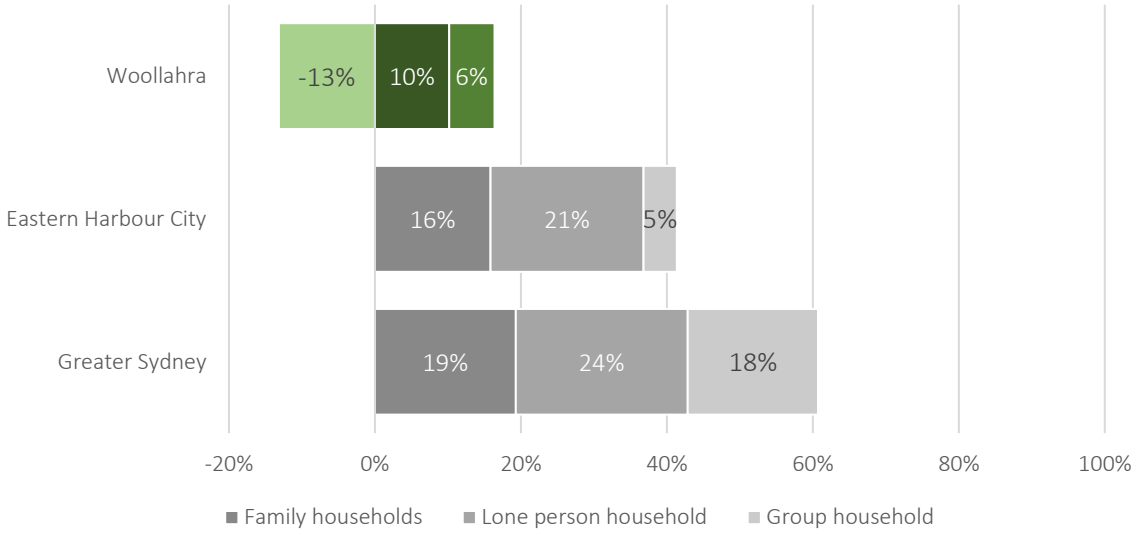
FIGURE 5: DISTRIBUTION OF HOUSEHOLDS BY TYPE (2021)



Source: ABS Census 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

As shown in **Figure 6**, family households saw the fastest growth between 2011 and 2021 (up 10%). Group households declined in the same period (down 13%), while lone person households increased (up 6%). This likely reflects in part the COVID-induced shift away from shared housing and towards lone person households.

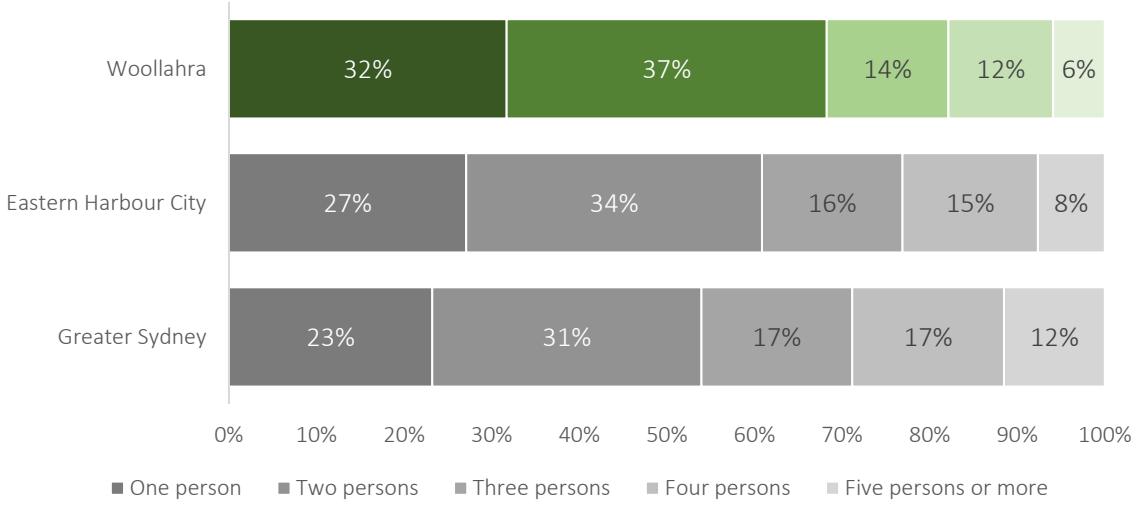
FIGURE 6: CHANGE IN HOUSEHOLDS BY TYPE, 2011-2021



Source: ABS Census 2011, 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

Figure 7 shows the distribution of households by size in 2021. Across all areas, one and two person households represent a majority of all households, however this is most pronounced in Woollahra.

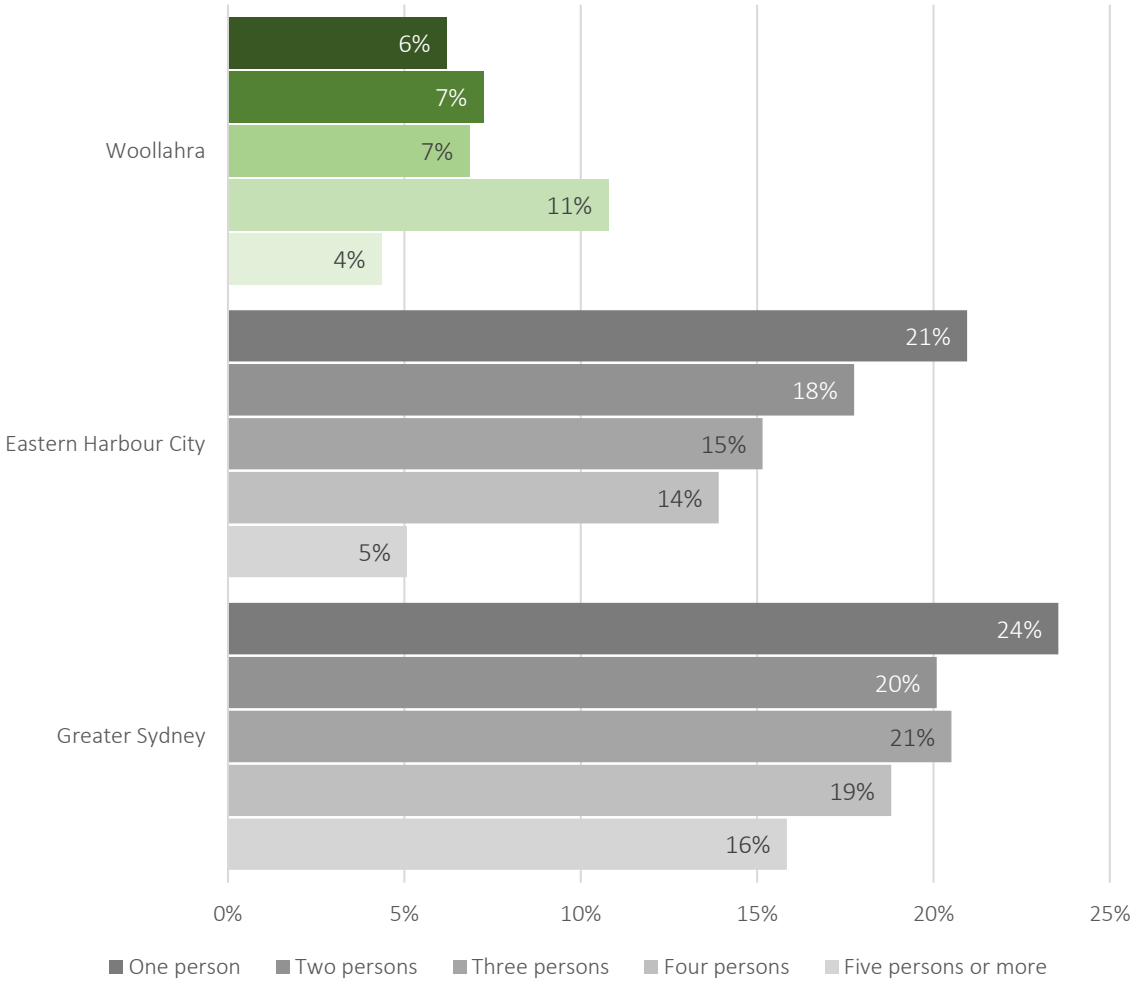
FIGURE 7: DISTRIBUTION OF HOUSEHOLDS BY SIZE (2021)



Source: ABS Census 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

Considering the change from 2011 to 2021, as illustrated in **Figure 8**, Woollahra is an outlier in having lower growth than Eastern Harbour City and Greater Sydney, and in that one person households were not the fastest-growing household size within the LGA. In Woollahra, four person households demonstrated the largest growth.

FIGURE 8: GROWTH OF HOUSEHOLDS BY SIZE, 2011-2021



Source: ABS Census 2011, 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

Households by income brackets

In alignment with the definition of household income levels under the EP&A Act, the analysis of household incomes has been completed in relation to the relevant Greater Sydney median household income, as measured at the 2011 and 2021 censuses.

Table 5 compares the proportions of household incomes with those of Greater Sydney in 2021. This shows that Woollahra has a greater proportion of high-income earners, with 67 percent of households earning above the Greater Sydney AMI.

TABLE 5: GREATER SYDNEY AND WOOLLAHRA INCOME DISTRIBUTION, 2021

AMI Category	Greater Sydney (%)	Woollahra LGA (%)
Less than 30% AMI	12%	7%
30% to 50% AMI	12%	7%
50% to 60% AMI	5%	4%
60% to 80% AMI	11%	7%
80% to 100% AMI	10%	8%
100% to 120% AMI	10%	9%
Greater than 120% AMI	41%	58%

Source: ABS Census 2021; SGS Economics & Planning, 2023

Table 6 presents the analysis of Woollahra households by income. Between 2011 and 2021, the total number of households in Woollahra grew by 12 percent (from approximately 17,900 to 20,200), with most of this increase (61 percent) coming from households earning an income greater than the AMI. Figure 9 illustrates this change by AMI.

TABLE 6: HOUSEHOLDS BY AREA MEDIAN INCOME, 2011 AND 2021

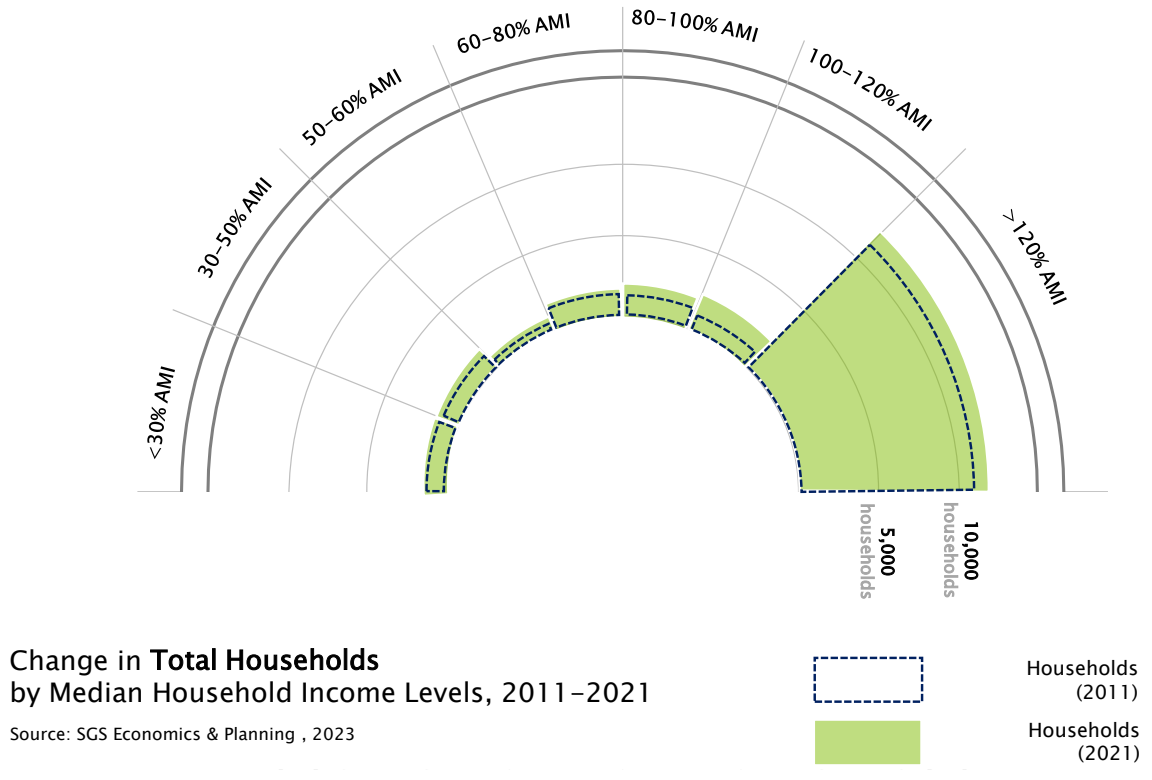
			Change (2011-2021)		
AMI Category	2011	2021	Total	Annual	% CAGR
Less than 30% AMI	1,259	1,424	165	16	1.2%
30% to 50% AMI	1,250	1,448	198	20	1.5%
50% to 60% AMI	661	712	51	5	0.7%
60% to 80% AMI	1,362	1,486	124	12	0.9%
80% to 100% AMI	1,287	1,606	319	32	2.2%
100% to 120% AMI	1,104	1,802	698	70	5.0%
Greater than 120% AMI	11,017	11,685	668	67	0.6%
Total	**17,941**	**20,164**	**2,223**	**222**	**1.2%**

Source: ABS Census 2021; SGS Economics & Planning, 2023

The following discusses a few of the highlights of the analysis by AMI.

- **Less than 30% AMI**: this segment of Woollahra households remained relatively constant from 2011 to 2021, increasing 13 percent overall.
- **30% to 80% AMI**: the increase in number of households within these three segments was also relatively minimal, growing by 11 percent overall.
- **80% to 100% AMI**: this segment of the population grew faster than the overall number of households, increasing a total of 25 percent between 2011 and 2021, at an average 2.2 percent per annum. This cohort is often representative of the community workforce, key worker cohorts and those that would benefit from subsidised homeownership solutions, such as shared equity or shared ownership models.
- **100% to 120% AMI**: this income cohort saw the largest growth, increasing a total of 63 percent between 2011 and 2021, at an average 5 percent per annum. This segment is inclusive of those in community workforce and key worker designations.
- **120% AMI or higher**: overall, this cohort grew by 6 percent between 2011 and 2021. From the perspective of affordable housing policy development, this cohort is largely unimportant as the supply of available housing often meets the needs of this cohort.

FIGURE 9: CHANGE IN TOTAL HOUSEHOLDS BY AMI (2011-2021), WOOLLAHRA

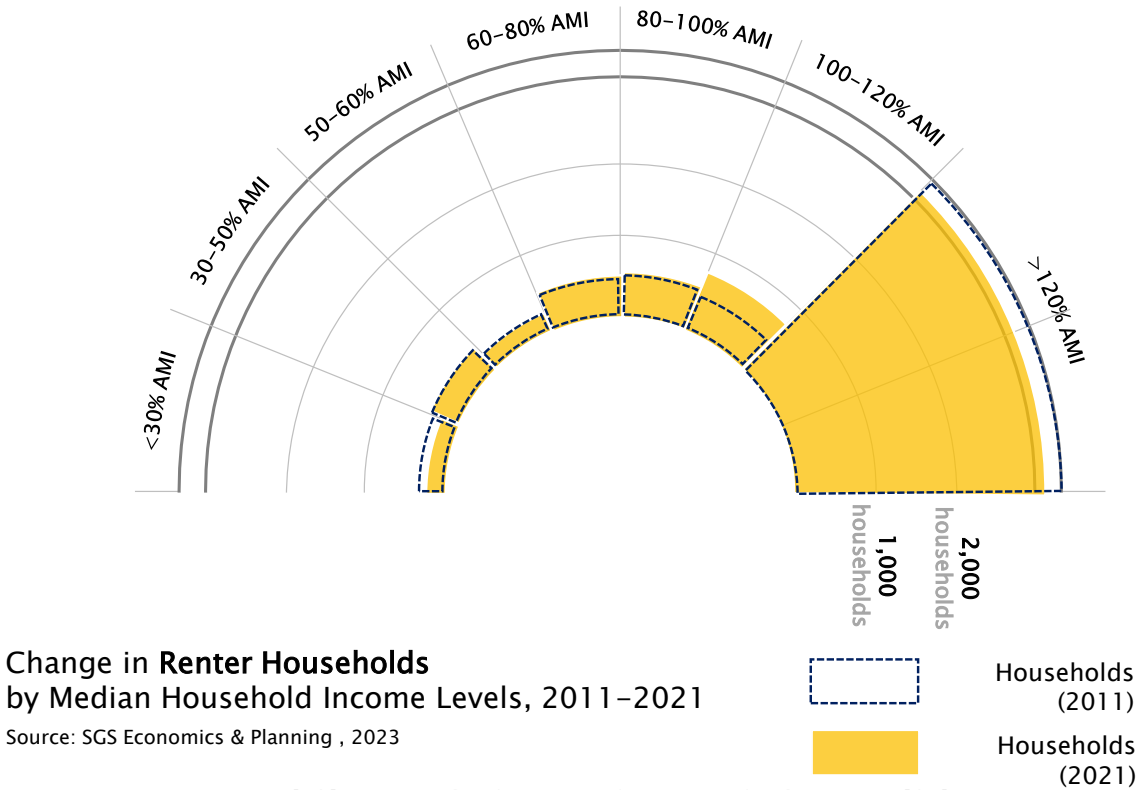


Source: ABS Census 2021; SGS Economics & Planning, 2023

Renter Households

Between 2011 and 2021, the total number of renter households in Woollahra grew by 5 percent (from approximately 5,560 to 5,840). **Figure 10** shows the change in distribution of renter households by Greater Sydney AMI. Households in the lowest income cohort (less than 30% AMI) decreased by 19 percent, while those in the highest income segment (>120% AMI) decreased 6 percent. Renter households in the 101%-120% AMI cohort accounted for most growth, increasing by 78 percent.

FIGURE 10: CHANGE IN RENTER HOUSEHOLDS BY AMI (2011-2021), WOOLLAHRA

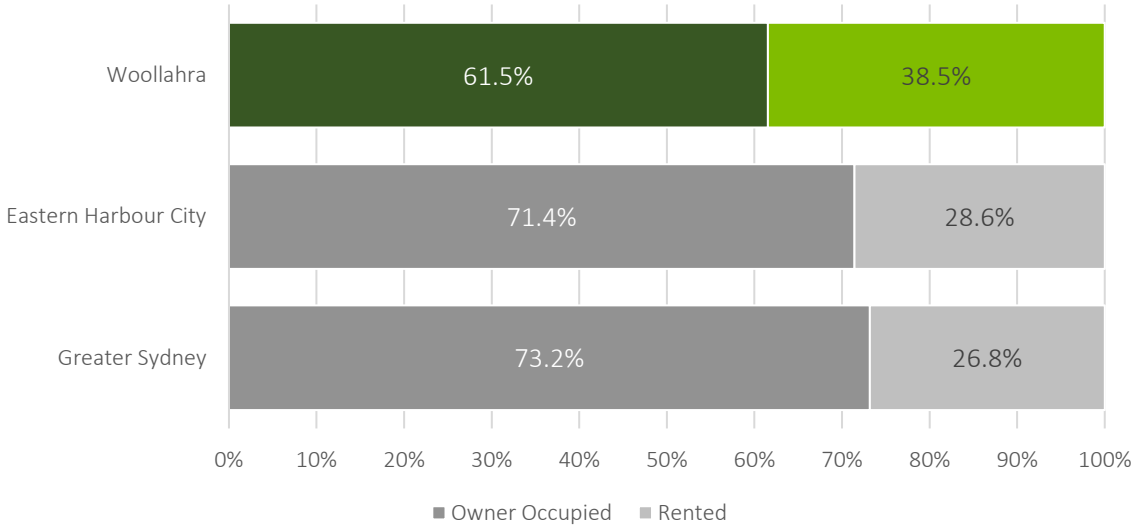


Source: ABS Census 2021; SGS Economics & Planning, 2023

Tenure split

Figure 11 shows the split between owner-occupier and rented dwellings in 2021 (other tenure types having been excluded for the purposes of this analysis). While owner-occupied dwellings account for a majority of households across all areas, Woollahra has comparatively more renters than Eastern Harbour City and Greater Sydney, at 38.5 per cent compared to 28.6 per cent and 26.8 per cent, respectively.

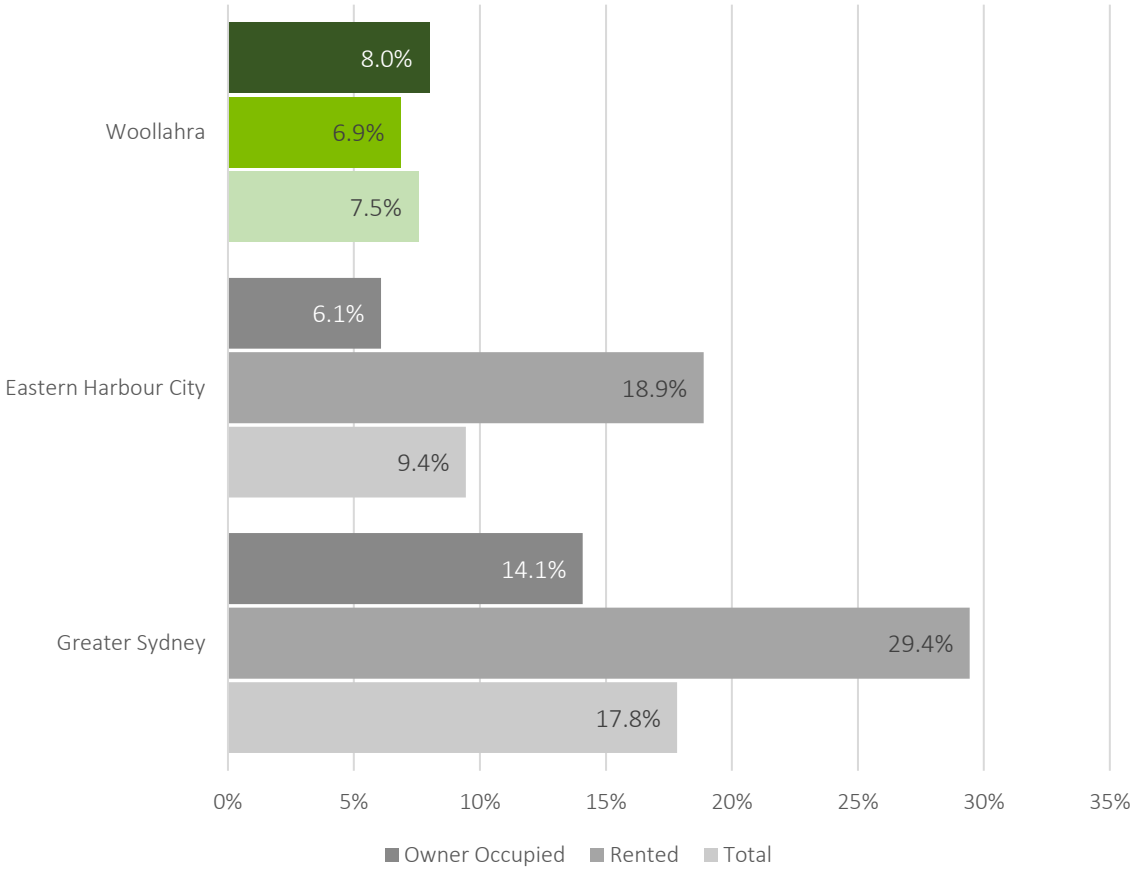
FIGURE 11: TENURE TYPE DISTRIBUTION, 2021



Source: ABS Census 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

Considering the growth in households by tenure type between 2011 and 2021, as shown in **Figure 12**, Woollahra saw significantly lower growth in renter households, compared to the rest of Eastern Harbour City and Greater Sydney. In contrast to these other areas, Woollahra's growth in owner-occupied households outpaced growth in rentals, albeit marginally.

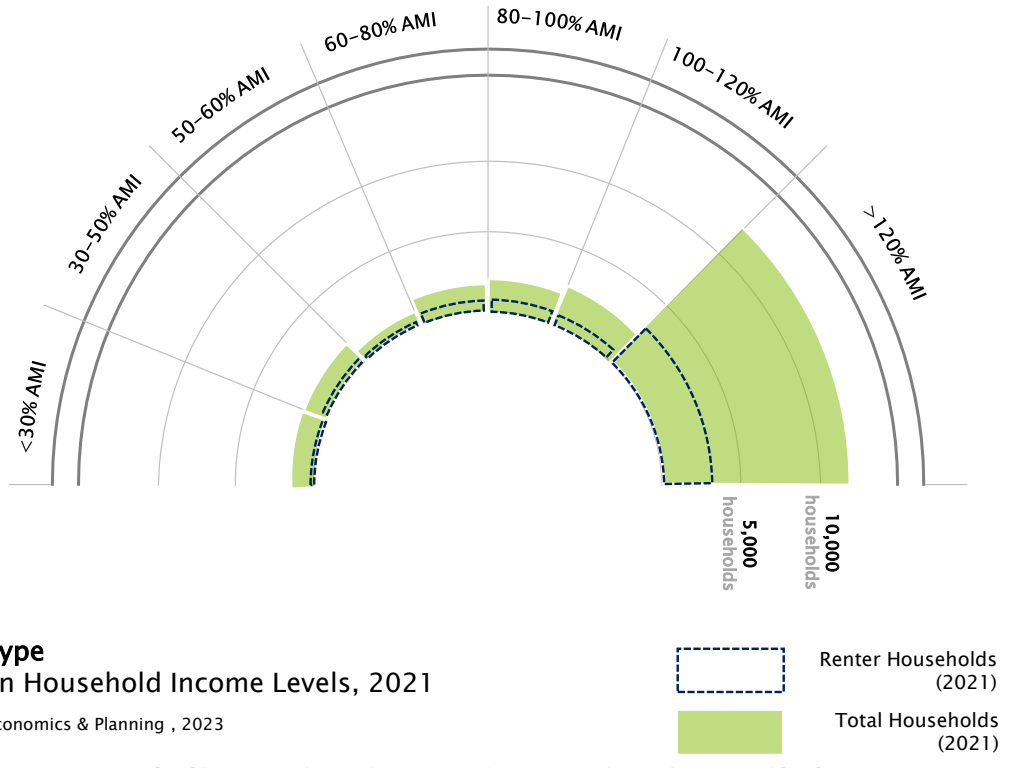
FIGURE 12: TENURE TYPE GROWTH, 2011-2021



Source: ABS Census 2011, 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

Figure 13 illustrates the distribution of renter households by AMI in 2021. Although renter households account for the smaller portion of housing stock in Woollahra, they follow a broadly similar distribution across income cohorts as total households.

FIGURE 13: TENURE TYPE BY AMI, 2021

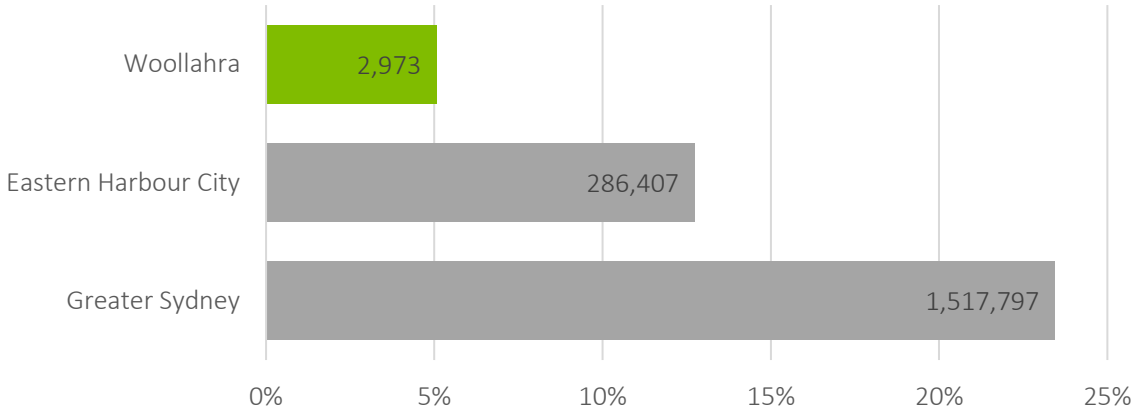


Source: ABS Census 2021; SGS Economics & Planning, 2023

Population projections

Figure 14 illustrates projected population growth in Woollahra, Eastern Harbour City, and Greater Sydney from 2021 to 2041. Woollahra is expected to experience only moderate growth over this period, increasing just 5.1 per cent over the 20 years. In comparison, Eastern Harbour City and Greater Sydney will see 12.7 and 23.4 per cent growth, respectively.

FIGURE 14: PROJECTED POPULATION GROWTH, 2021-2041



Source: SGS Economics & Planning, 2022

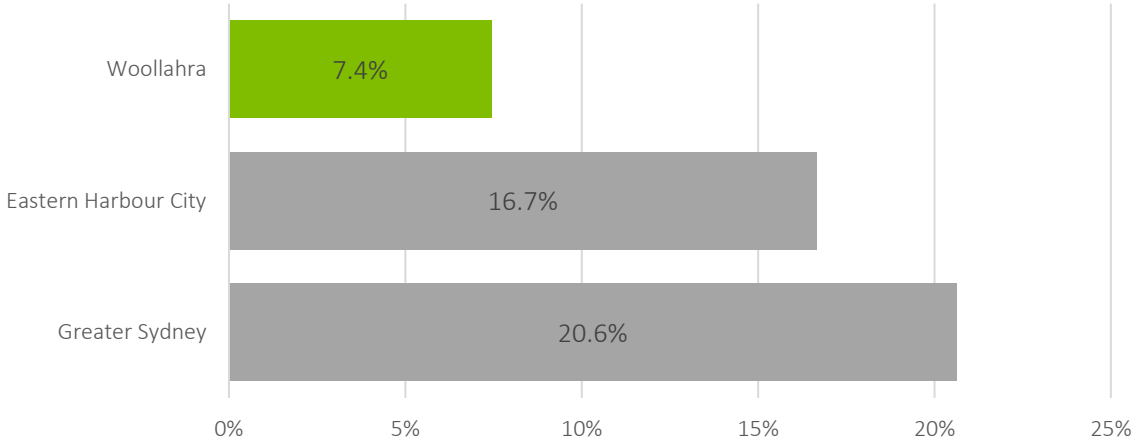
3.2 Supply of housing

Housing Supply discusses overall growth in the supply, as well as the change in the distribution of supply by dwelling size. This section indicates how the market has responded to demand. This begins to highlight where gaps by size, tenure, and type may have emerged.

Growth in total dwellings

Woollahra had a lower proportion of overall dwelling growth between 2011 and 2021 than Eastern Harbour City or Greater Sydney, as shown in Figure 15. Woollahra grew from a total of 20,419 dwellings in 2011 to 21,938 dwellings in 2021, which is an overall growth of 7.4 per cent – contrasted with an overall household growth of only 2.6 per cent.

FIGURE 15: CHANGE IN TOTAL DWELLINGS AS PERCENTAGE, 2011-2021

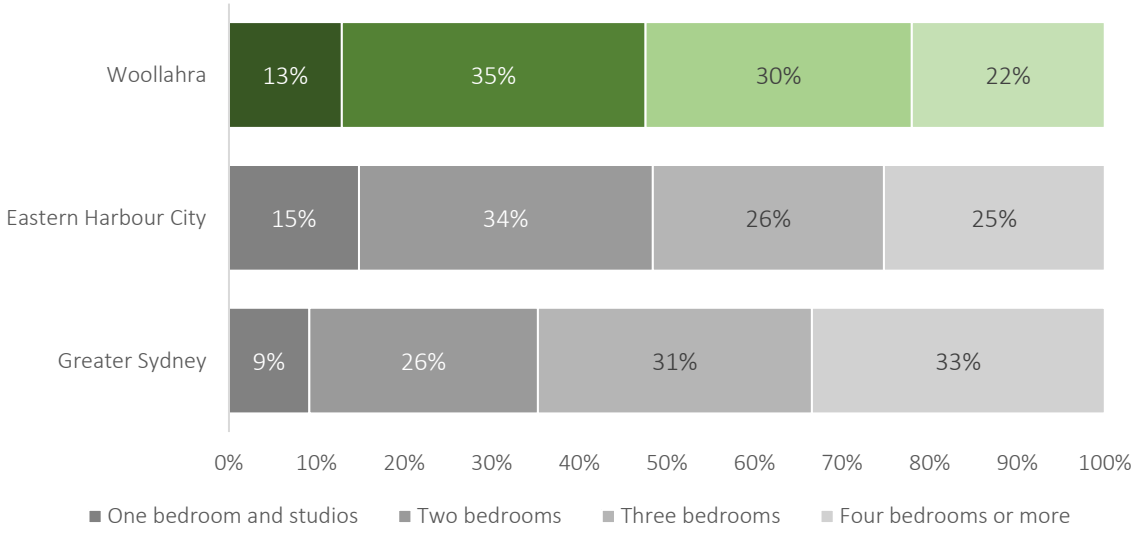


Source: ABS Census 2011, 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

Growth in dwellings by size

As illustrated in **Figure 16**, Woollahra's dwelling stock is broadly in line with the rest of Greater Sydney, with two- and three-bedroom dwellings accounting for most housing stock (66%). Compared to Greater Sydney, Woollahra has a greater proportion of single bedroom or studio dwellings, and fewer four-bedroom dwellings.

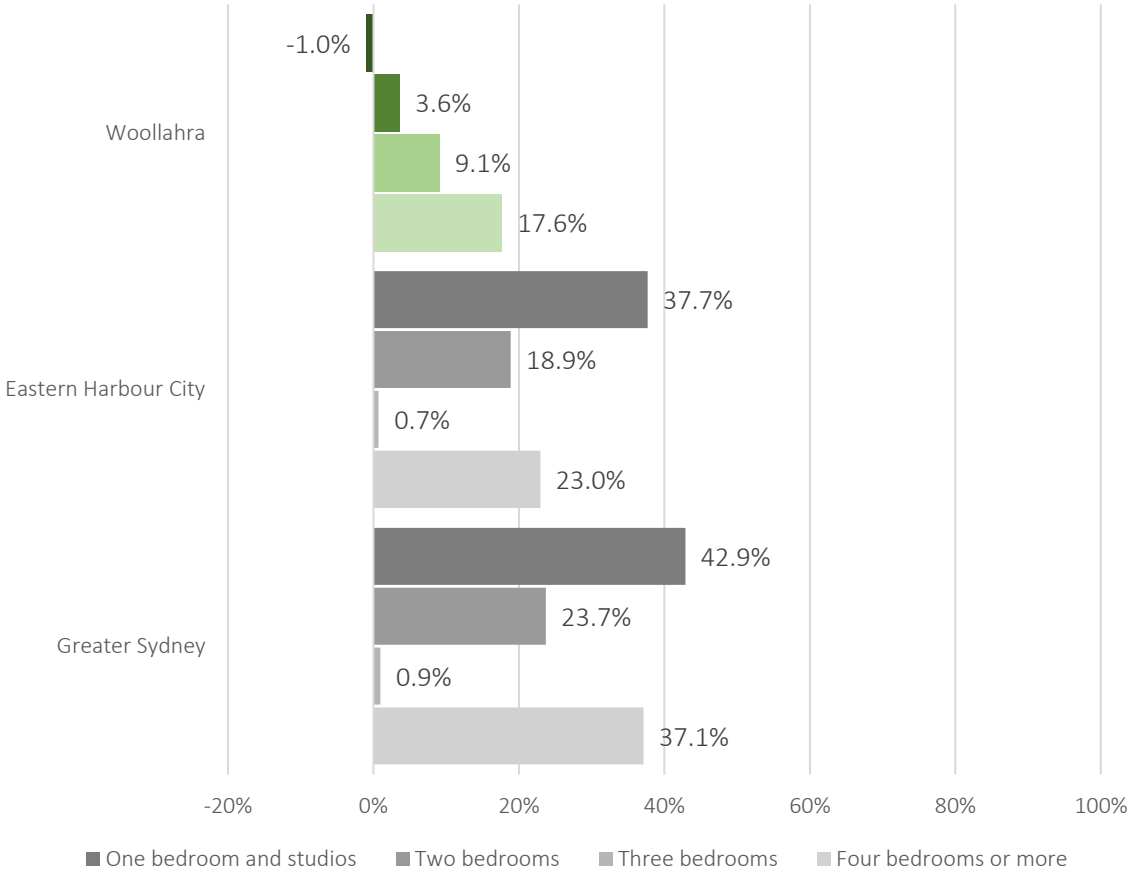
FIGURE 16: DISTRIBUTION OF DWELLINGS BY SIZE (2021)



Source: ABS Census 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

Considering the growth in dwellings by size between 2011 and 2021, as shown in **Figure 17**, Woollahra was an outlier is experiencing a decline in the number of one bedroom and studio dwellings. This was the fastest growing typology across Eastern Harbour City and Greater Sydney, increasing by 38 percent and 43 percent, respectively. In contrast, Woollahra saw a 1 percent decline in one-bedroom and studio dwellings over the past decade. Larger dwellings saw positive growth in Woollahra, particularly four-bedroom homes which grew by 18 percent.

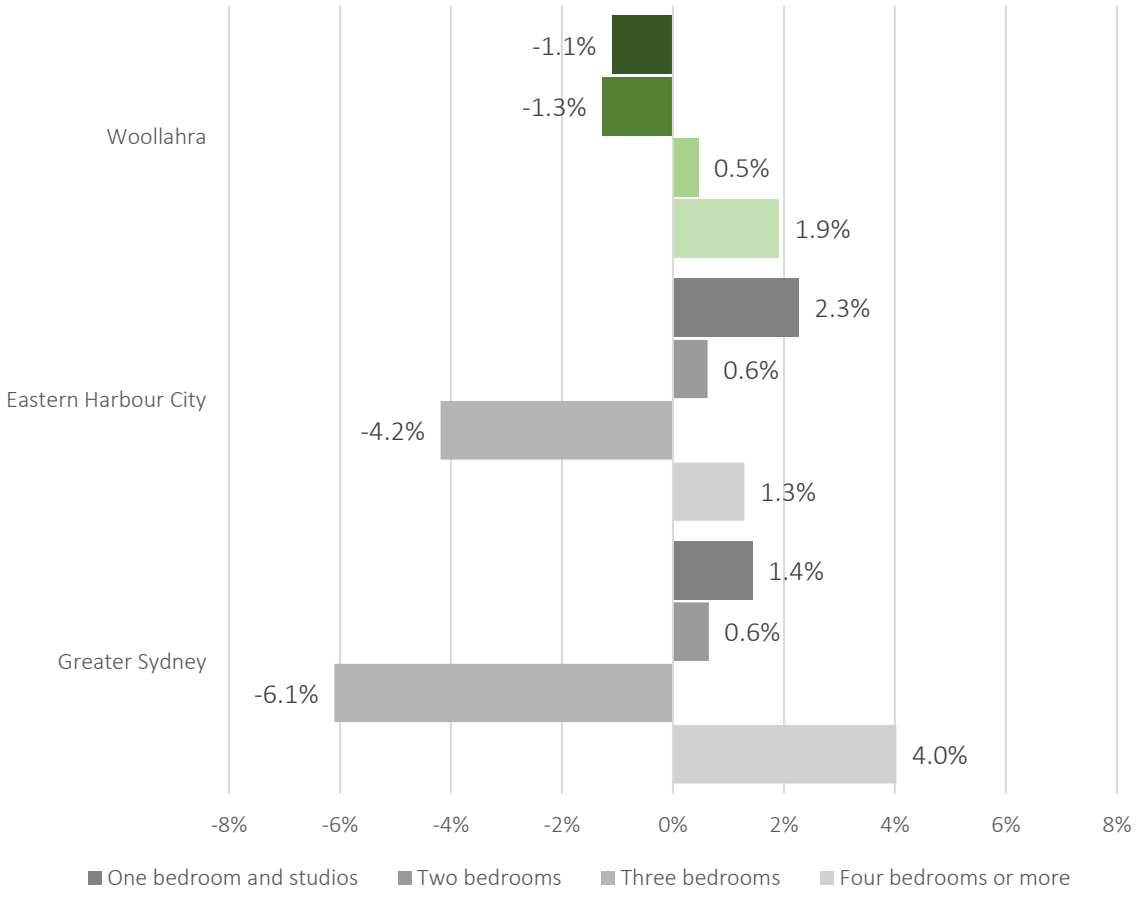
FIGURE 17: GROWTH IN DWELLINGS BY SIZE, 2011-2021



Source: ABS Census 2011, 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

As shown in Figure 18, the growth in three- and four-bedroom dwellings from 2011 to 2021 has increased the total proportion of these dwelling sizes within Woollahra by 1.9 and 0.5 percentage points, respectively. In contrast, one- and two-bedroom dwellings have decreased as a proportion of total housing stock. This differs from the rest of Eastern Harbour City and Greater Sydney, where one- and two-bedroom dwellings accounted for larger proportions of housing in 2021 than 2011.

FIGURE 18: CHANGE IN PROPORTION OF DWELLINGS BY SIZE, 2011-2021

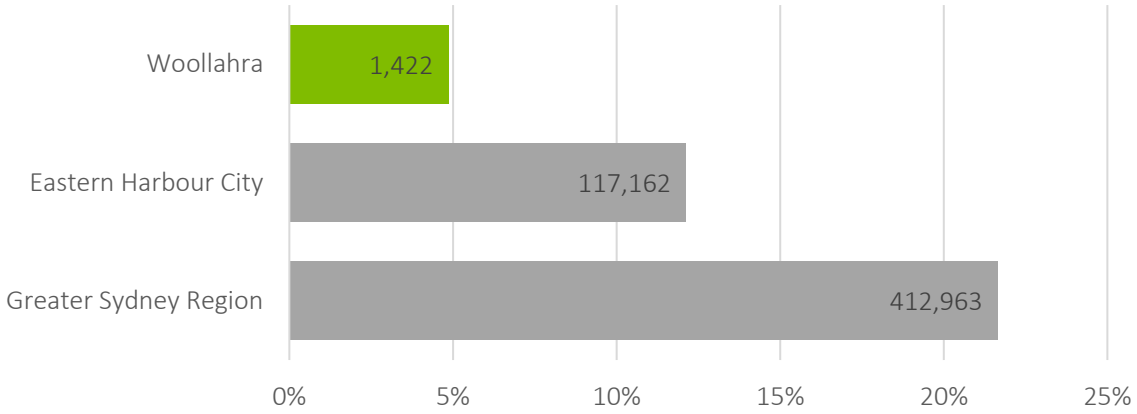


Source: ABS Census 2011, 2021; SGS Economics & Planning, 2023
Note: Woollahra LGA statistics highlighted in shades of green to distinguish results from comparative geographies.

Dwelling projections

As shown in Figure 19, growth in Woollahra's dwelling stock is expected to be moderate over the next 20 years. The number of occupied private dwellings (OPD) is projected to increase by 1,422, or 4.9 per cent, from 2021 to 2041. This aligns with population projections, which show Woollahra growing by 5.2 per cent over the same period.

FIGURE 19: GROWTH IN PROJECTED OCCUPIED PRIVATE DWELLINGS (OPD), 2021-2041



Source: SGS Economics & Planning, 2022

3.3 Affordability of housing

This section discusses how to define affordability of housing and an assessment of the affordability of housing within the Woollahra LGA. This section demonstrates the lack of affordable housing in Woollahra and amounts to a substantial finding with regard to an evidence base for the need for affordable housing.

This section includes an analysis of the distribution of sales in the for-sale market, distribution of rentals in the rental market, and a discussion of the implied gaps that it leaves when considering growth in households in the Woollahra LGA.

- Sales prices of dwellings in terms of the affordability to existing households by income.
- Rental prices of dwellings in terms of the affordability to existing households by income.
- Rental vacancy rates provide an indication of further supply-side constraints in the rental market. A market at equilibrium typically has a vacancy rate of 3.4% to account for turnover in inventory, whereas lower vacancy rates are a strong indicator of rental stress pressures.
- Rental stress, showing where households are paying more than 30% of their income in rent. This can show if specific income cohorts are more likely to be experiencing stress, and whether this has changed over time.

Affordability concepts

Affordability of dwellings is the result of interactions between the demand and supply of housing, as well as external factors on the market. The affordability of housing in the LGA has been analysed as a consideration of the acceptable level of spending on housing, at the household level.

The consensus in the practice of housing affordability analysis is to identify thresholds of income spent on housing beyond which a household is considered unaffordable, placing them in housing or rental stress. Housing is considered affordable when a household spends no more than 30% of its gross

income on housing or rent. A household spending more than 30% (but less than 50%) of its income on housing experiences moderate housing stress, whereas a household spending 50% or more of its income on housing experiences severe housing stress.

This section accordingly provides detail with available data that characterises the relative affordability of the housing market in the same terms as used to define and categorise the change in households in Section 3.1. As discussed previously, affordable housing under the NSW legislative context provides that affordable housing be targeted towards households at the following income levels:

- Very low income households: Less than 50% of median income
- Low income households: 50% to 80% of median income
- Moderate income households: 80% to 120% of median income

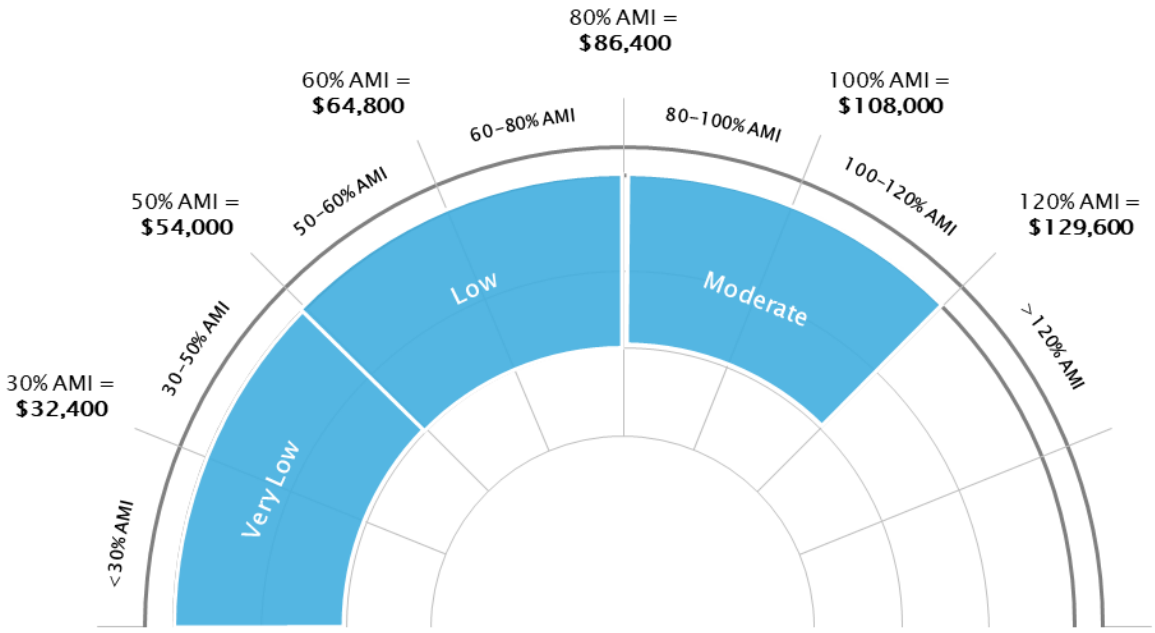
Where the median income (or AMI, for Area Median Income) is that of the Greater Sydney region.

However, as illustrated in Figure 20 below, greater granularity of household incomes has been analysed. This framework of housing affordability analysis reflects the need for policy-makers to understand the alignments or linkages between income levels and broad categories of intervention or response types.

- Supportive Services (under 30% AMI): At the lowest end and generally below the 30% AMI mark is where interventions and policy responses commonly result in investment around crisis accommodation, transitional housing or permanent-supportive or service-enriched housing (terminology can vary by organisation or practitioner). This end of the population is characterised by the presence of a variety of different populations, including: the working poor, retired and/or households on fixed incomes, and those at risk of homelessness. This end of the housing affordability spectrum is generally the focus of homelessness studies and social services.
- Affordable Rental Housing (30% to 80% AMI): the second category is associated with different variants on affordable rental housing (subsidised rentals). Most of contemporary Australian housing policy interventions have been targeted to the middle and upper end of this range, such as the construction of social housing, households benefitting from CRA, housing projects leveraging NRAS or the provision of local affordable housing contributions that translate into affordable rental housing managed or owned by CHPs. This part of the spectrum is arguably the most diverse. From 30% to 50% or 60% AMI is the low end of the service worker economy and represents households in great need for subsidised or affordable rentals, but they are generally not the households needing supportive services. Between 50% or 60% and 80% AMI, however, is a vastly different set of circumstances. These households are representative of the broader community workforce, such as what have recently been characterised as frontline workers or key workers. These are households that can neither afford a home nor often qualify for a mortgage), but also struggle with moderate and severe housing stress when left to the open housing market. For them, policy-makers are often challenged in providing proper interventions or delivery formats because of local housing market dynamics (i.e., the distribution of rents in the private rental housing market often overlaps at this 60% to 80% AMI range).
- Affordable Ownership or Rental Housing (80% to 120% AMI): the third category is particularly challenging from the perspective of scale. Households in this income range can often afford to purchase a home and can be qualified by a lender, but struggle in the private market where housing prices have escalated as much as they have in the Australian context. This is the category

where attention is often given to solutions such as shared equity or shared ownership models or the community land trust (CLT) model in which land is held in common ownership and the homes are made available for purchase as deed-restricted below-market prices. Notwithstanding, households at this income level, particularly in areas with high costs of housing, can also be served by affordable rental schemes, as is envisaged under the NSW legislative context.

FIGURE 20: AFFORDABILITY SPECTRUM WITH BROAD CATEGORIES



Source: ABS Census 2021; SGS Economics & Planning, 2023

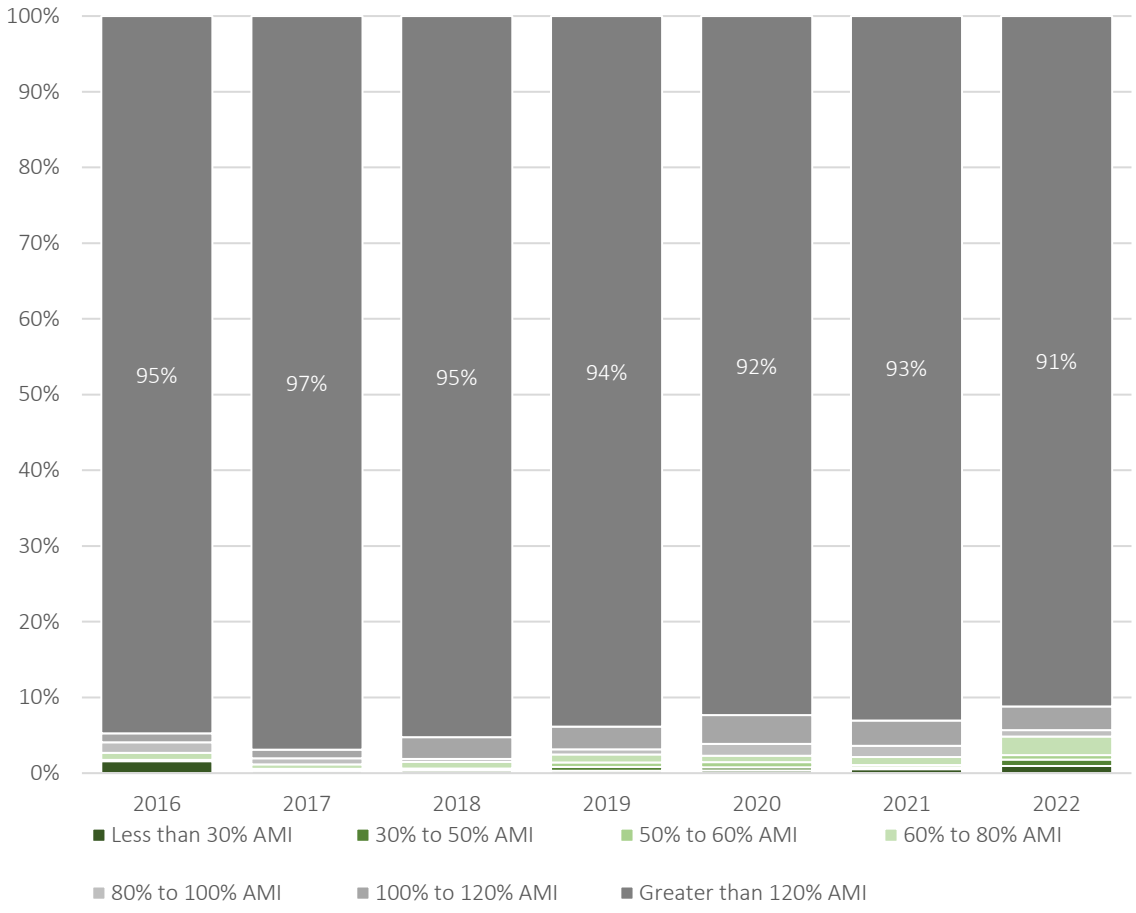
Sales trends and affordability

This section examines existing home and apartment sales evidence data. The analysis, completed and shown in **Figure 21**, examines the distribution of existing dwelling sales applying the following inputs and assumptions:

- Thirty (30) percent of a household's gross income is available for servicing mortgage debt.
- Mortgage borrowing rates from the RBA are used for respective years of data analysis, assuming standard variable rate loan.
- 30-year loan term.
- 20 percent deposit on purchase price.

In general, the analysis reveals a pattern not uncommon for a housing market experiencing affordability challenges, i.e., one in which sales are affordable mainly for the upper income categories. The analysis reveals that the vast majority of home and apartment sales during any given time are generally affordable only to households with incomes above 120% AMI.

FIGURE 21: DISTRIBUTION OF HOUSING SALES BY AMI LEVEL IN WOOLLAHRA (2016-2022)



Source: ABS Census 2021; Valuer General of NSW 2023, SGS Economics & Planning, 2023
Note: Shades of green used to distinguish sales of dwellings affordable to 80% of the median income or below.

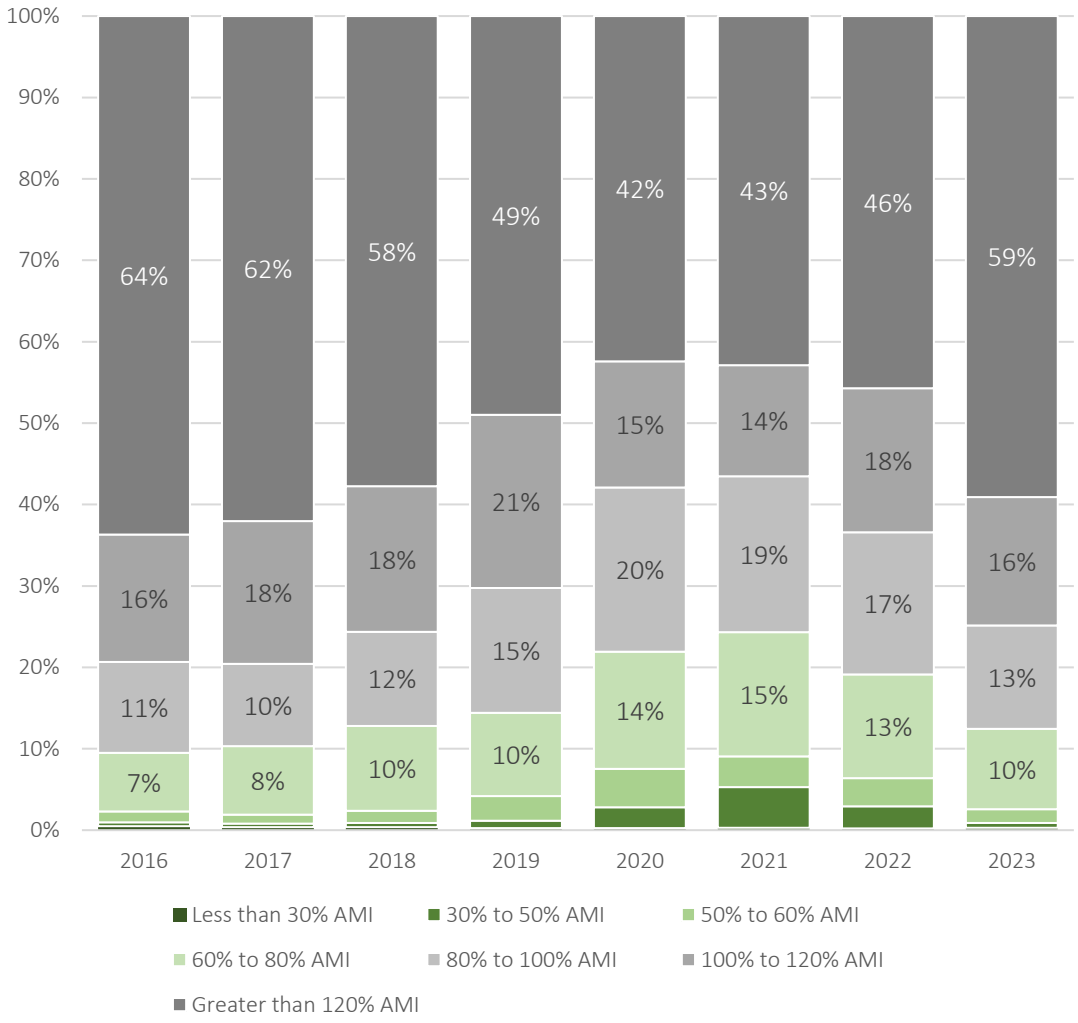
Rental trends and affordability

This section examines the distribution of rental properties through analysis of the distribution of rentals by rental rate converted to an associated AMI level. The analysis, completed and shown in **Figure 22**, illustrates these distributions of rentals applying the following inputs and assumptions:

- Thirty (30) percent of a household's gross income is available for rental payments

In general, the analysis reveals a pattern not uncommon for a housing market experiencing affordability challenges, i.e., one in which rentals are mainly affordable at income levels generally associated with the open rental market, greater than 80% AMI with some rental availability between 60% and 80% AMI. The analysis also illustrates that, for a brief period leading up to and during the COVID-19 pandemic, more rentals (as a percent of overall rentals turning over in the market) were available at more affordable levels.

FIGURE 22: RENTAL BOND BY AMI DISTRIBUTION IN WOOLLAHRA POSTCODES, 2016-2023

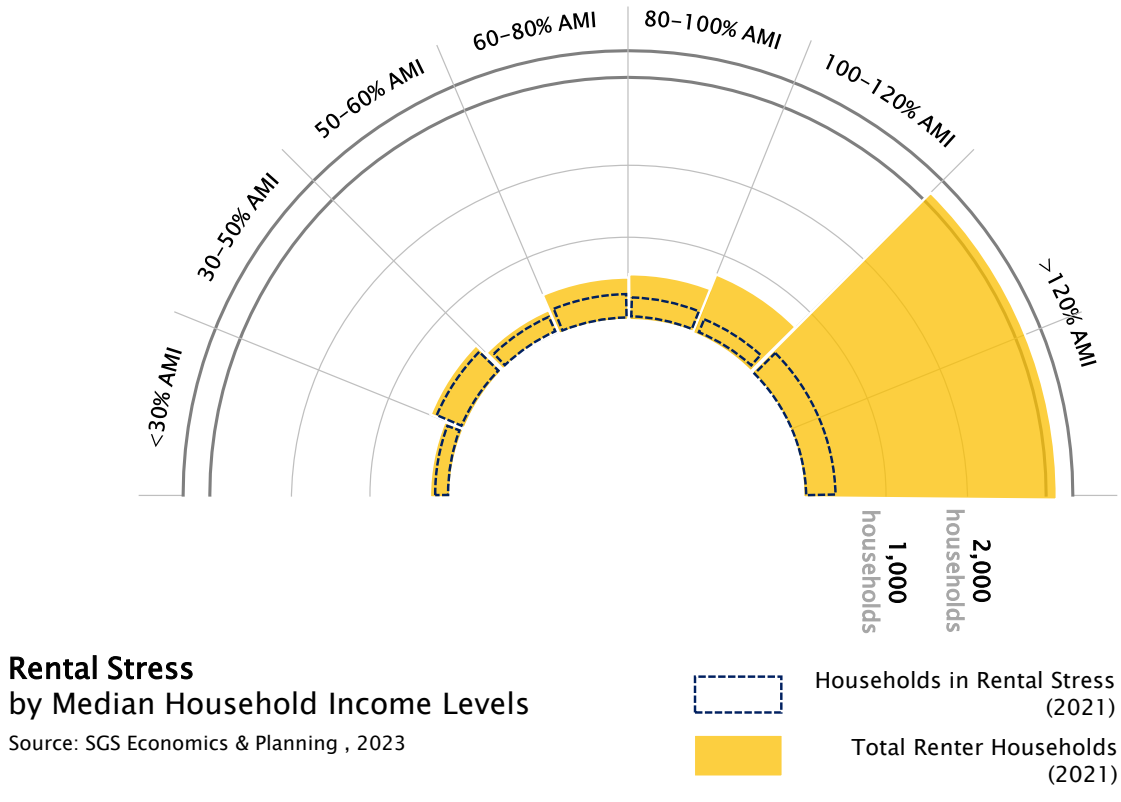


Source: ABS Census 2021; SGS Economics & Planning, 2023
Note: Shades of green used to distinguish sales of dwellings affordable to 80% of the median income or below.

Rental stress

Analysis of ABS data indicate that in 2021, there were approximately 2,000 households in rental stress in Woollahra, representing 34 percent of all renter households. **Figure 23** shows the distribution of renter households in Woollahra by AMI. While most rental households are within the >120% of AMI income band, households in the lower income bands are much more likely to be in rental stress. Households with income less than 60% of the AMI, are nearly all in rental stress.

FIGURE 23: RENTER HOUSEHOLDS AND HOUSEHOLDS IN RENTAL STRESS, WOOLLAHRA, 2021



Rental Stress
by Median Household Income Levels

Source: SGS Economics & Planning , 2023

3.4 Projections of social and affordable housing demand

Methodology

The SGS Housing Assistance Demand Model measures the number of households who currently need affordable housing, segmented by demographic and spatial variables, and forecasts the evolution of this need subject to factors such as expected population growth, demographic shifts, changes in household incomes, and the changes of rental rates. For the purposes of this analysis, the model is used to estimate housing unaffordability through ***rental stress***.

The model uses the following key datasets:

- ABS Census 2021: including weekly rent, weekly household income, household type, tenure type and weekly equivalised income
- 2021 ABS estimation of homelessness (cat 2049.0)
- Forecasts of household by type (NSW Travel Zone Projections)

As shown in Table 7, there are an estimated 2,645 Woollahra households living in social housing or in moderate to severe rental stress. Most of these (49 percent) are one parent families.

TABLE 7: DEMAND FOR SOCIAL AND AFFORDABLE HOUSING, WOOLLAHRA, 2021

Household Type	Living in social housing	Severe rental stress	Moderate rental stress	Total demand for SAH
Couple family with children	1	65	124	189
Couple family with no children	7	171	261	439
Group household	11	159	119	289
Lone person household	0	43	60	102
One parent family	88	716	501	1,305
Other family	5	112	204	321
Total	**112**	**1,266**	**1,267**	**2,645**

Source: SGS Economics & Planning, 2023

Table 8 shows the expected change in demand for social and affordable housing from 2021 to 2041. By 2041, a total estimated 3,367 Woollahra households will be living in social housing or in moderate to severe rental stress, representing growth of 722 households (27 percent) from the 2021 level.

TABLE 8: CHANGE IN DEMAND FOR SOCIAL AND AFFORDABLE HOUSING, WOOLLAHRA, 2021-2041

	Living in social housing		Severe rental stress		Moderate rental stress		Total demand for SAH	
Year	2021	2041	2021	2041	2021	2041	2021	2041
Very low income	93	93	703	855	115	90	911	1,039
Low income	14	14	403	628	409	351	827	994
Moderate income	4	4	160	388	743	941	907	1,334
Total	**112**	**112**	**1,266**	**1,872**	**1,267**	**1,383**	**2,645**	**3,367**

Source: SGS Economics & Planning, 2023

4. Viability Methodology

This chapter outlines the inputs and assumptions required to complete the viability analysis to determine an appropriate affordable housing contribution rate.

4.1 Introduction

The NSW Guideline on Developing an Affordable Housing Contribution Scheme outlines the process and methodologies Councils should follow in identifying an appropriate contribution rate. Specifically, the NSW Guideline states that the "residual land value approach to valuing land for redevelopment is the preferred method to determine a viable affordable housing contribution rate", which is calculated by "estimating the anticipated revenue from a development, then deducting all the development costs and allowance for a reasonable developer profit."

As such, this chapter provides detailed discussions of SGS's RLV modelling framework, and how we developed our inputs and assumptions for Redevelopment Prototypes across a range of Proposed Areas of Uplift. Specifically, this chapter contains the following structure:

- Methodology and Terminology – what steps are taken to conduct the modelling and some key terms.
- Key inputs and assumptions – what inputs and assumptions were required and made for the analysis.
- Scenarios and outputs – How the analysis provides outputs which can be used for strategic decision-making.

4.2 Methodology and Terminology

In accordance with the NSW Guideline, this study applies the preferred RLV methodology to redevelopment typologies across Proposed Areas of Uplift. To further illuminate the sensitivity of the contribution rate to the amount of FSR uplift, scenarios displaying the impacts to RLV of incremental uplift are also provided.

Overview of Residual Land Value Modelling

Two common forms of real estate development feasibility evaluation are static (RLV) and discounted cash flow (DCF) modelling. In analysis, the appropriate methodology is the one that reflects the degree to which credible information and assumptions can be made. For example, DCF modelling is appropriate for 'actual' projects when a detailed development program is available, such that inputs and assumptions on costs, revenues, and timing are known. In the case of identifying supportable contribution rates for strategic planning purposes (and not specific site development purposes), the preferred RLV methodology of a static model is more suitable for such analyses.

RLV modelling seeks to determine the viability of redevelopment by determining the underlying value of a development site by subtracting all development costs (construction, soft costs, finance costs, risk, etc) from the gross realisable value (GRV) of the proposed built form. The residual (i.e., the R in the RLV) is considered to be the maximum that a rational developer would purchase the site for. Where the RLV is greater than the existing value of the site, the site could be purchased for and undergo redevelopment.

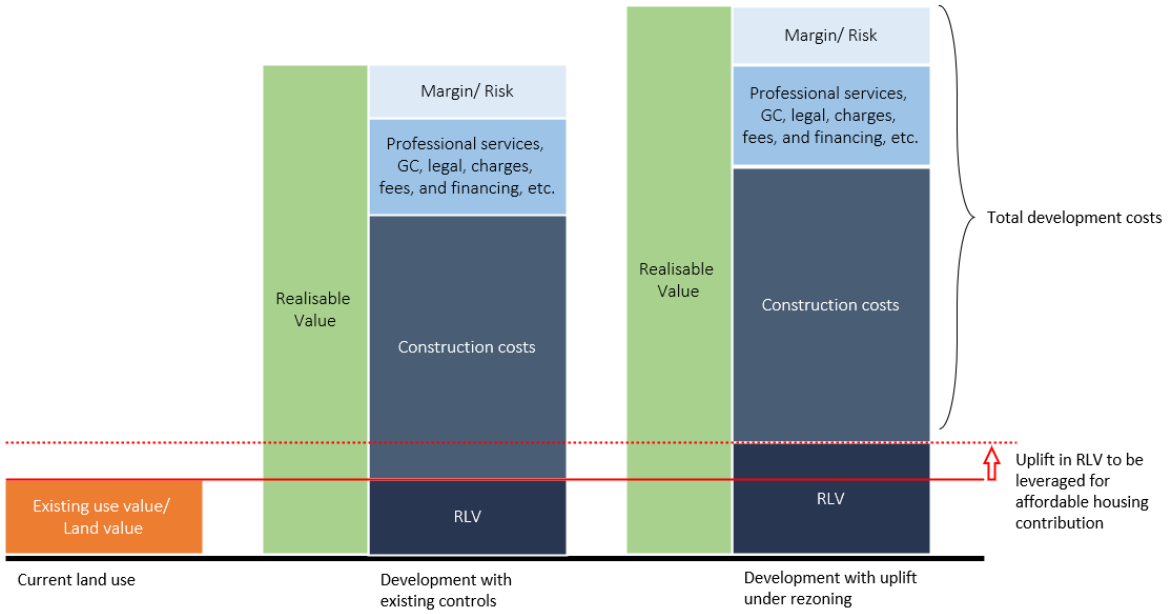
This requires the following key inputs, which are expanded on within section 4.3 below:

- **Site characteristics** – built form outcomes of proposed development typologies and potential required works to support the site.
- **Development costs** – including hard costs (e.g., building), soft costs (e.g., professional fees, legal, financing, contingency, etc.), planning fees and charges (e.g., stamp duty, GST, SSDA fees), infrastructure contribution charges (e.g., Section 7.11/7.12, housing and productivity contribution, etc). The Affordable Housing Contribution will form a part of these fees and charges.
- **Development margin and risk** – an estimate of the minimum margin a developer would seek in developing such a project that is adjusted for the various risks associated with such development (e.g., timing, land cost, construction cost, market, environment, etc.).
- **Realisable values** – a method to derive the end value of the proposed development, considering rental and a suitable capitalisation rate.

SGS's modelling methodology applies these inputs as reflected by the graphic representation in **Figure 24** below, in which the two (2) NSW Guideline-required scenarios are compared:

- **Existing Use Value (EUV)** – representative of existing built form, or the RLV of the current built form controls (where these are different, the higher value is used). This is the 'base development value', as referred to in the NSW Guideline.
- **Redevelopment RLV** – representative of the RLV if developed to the proposed level of built form controls, referred to in the NSW Guideline as the 'upzoning' RLV.

FIGURE 24: RESIDUAL LAND VALUE APPROACH TO ANALYSIS



Source: SGS Economics and Planning, 2023

For clarification, a few terms used throughout the following chapters relate to the modelling results and findings.

- *Feasibility* refers to a condition in which a development project's revenues exceed its development costs by a sufficient margin, such that it can be developed with sufficient risk-adjusted investment returns.
- *Viability* on the other hand, refers to a condition in which a developer's willingness to pay for land in a feasible redevelopment exceeds the existing use value of the parcel land to be redeveloped. The development is considered **viable** because the underlying land transaction may proceed.

In summary, feasibility characterises the relationship between a development's total revenues and costs, while viability occurs when a developer's willingness to pay for land in redevelopment is greater than the landowners' expectation of existing use value. As such, the analysis undertaken in the following sections accordingly considers the *viability* of development in relation to a proposed AHCS.

Application of affordable housing contributions in the modelling

In-kind contributions

In-kind contributions are where floorspace is provided directly from the development to either the Council, or a Community Housing Provider (CHP). In the modelling, this is calculated as a reduction in the total sales value, or realisable value, of the residential component of the development. Ie, for a 5% contribution, the realisable value would be reduced by 5%, which models the impact of that percentage of residential floor area being contributed for affordable housing purposes.

In-lieu or monetary contributions

The requirements of an Affordable Housing Contribution Scheme can also be satisfied through the payment of an in-lieu or monetary contribution to Council. Revenues generated by such monetary contributions are typically used as subsidy for either construction of new affordable dwellings or the acquisition of existing dwellings for the purpose of providing them as affordable. In practice, these funds are often deployed through collaborations with Community Housing Providers (CHP).

A monetary contribution is calculated as the per-square metre dollar amount multiplied by the AHCS percentage of residential GFA. For example, if the AHCS rate were 5%, and the residential GFA of a development were 1,000 square metres, a monetary contribution would be payable for 50 sqm of floorspace (multiplied by the per-square metre dollar value).

As has been common practice for contribution schemes in place, the dollar value of the contribution is benchmarked against the median strata sales price for the prior 12 month period. Recently, however, a couple Councils have raised concerns about the appropriateness of such benchmarks to generate adequate funds for acquisition or construction. Specifically, the City of Sydney recently proposed not only updating its monetary contributions on a precinct-by-precinct basis but also grounding the dollar amount in sales evidence of new stock[14]. Waverley also calibrated their in-lieu contributions to market prices by suburb when implementing its AHCS in 2023 [15].

In light of such context, SGS has modelled monetary contributions in line with the adopted realisable value assumptions.

Methodology for projecting market conditions

SGS also considers the viability of development in the future. The RLV modelling tests each site's development program under the assumption that costs and realisable values escalate over time, where realisable values typically escalate faster than costs. As such, the outputs illustrate *when* a proposed development may become viable (in number of years). Specifically, the modelling estimates when the RLV exceeds or is at least equal to the EUV, i.e., the point at which the modelled development becomes

[14] City of Sydney, *Affordable housing revamp set to boost numbers*, December 2024, via https://news.cityofsydney.nsw.gov.au/media-releases/affordable-housing-revamp-set-to-boost-numbers
[15] Waverley Council, *Waverley Affordable Housing Contribution Scheme 2023 – Monetary Contribution Calculation Rates,* September 2024, via https://www.waverley.nsw.gov.au/__data/assets/pdf_file/0009/10206/Affordable_Housing_Contribution_Scheme_Calculation_Rates.pdf

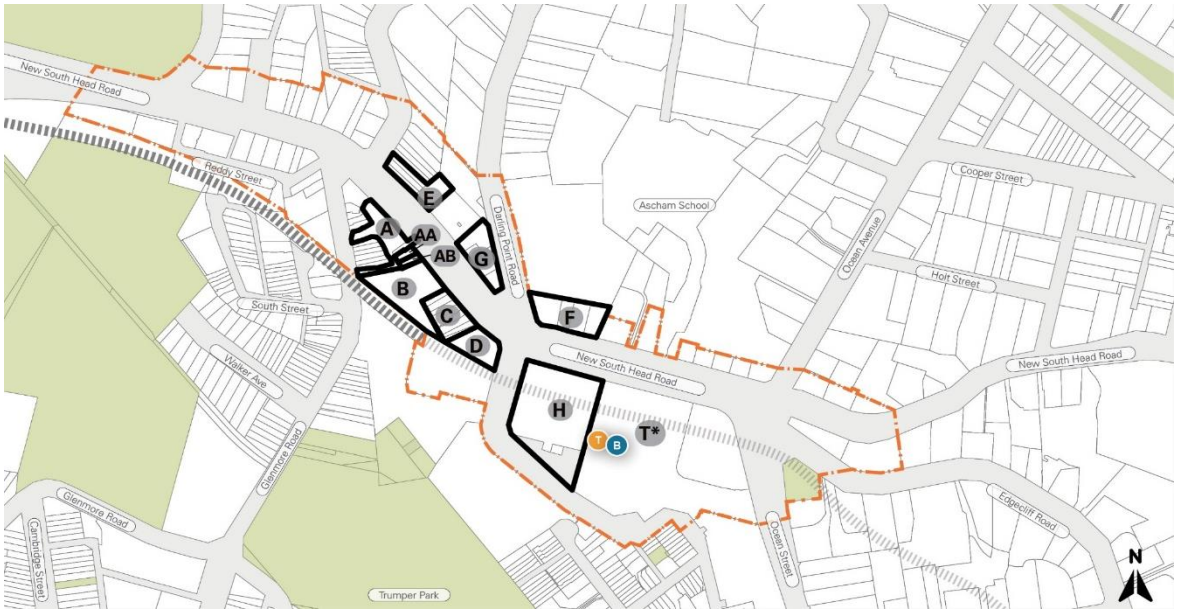
viable. In this modelling, SGS specifically tested realisable values increasing at a rate 2% higher per annum than costs.

4.3 Inputs to the viability model

Development prototype characteristics

Under the Guideline, the testing must be representative of the areas of uplift proposed. Accordingly, this testing has been done for nine (9) sites proposed to be rezoned under the Edgecliff Centre Strategy. These are illustrated in Figure 25.

FIGURE 25: SITES TESTED UNDER THE EDGECLIFF COMMERCIAL CENTRE STRATEGY



Source: Woollahra Municipal Council, 2024

As noted in NSW Guideline, the contribution rate may differentiate between residential and non-residential land uses, and in line with the viability assessment, there may be unique contribution rates for each development prototype. The outputs of the viability modelling are used to identify a recommended affordable housing contribution.

TABLE 9: DEVELOPMENT PROTOTYPES USED IN THE MODELLING - OVERVIEW

Site ID	Area (Sqm)	Current LEP FSR	Current built form FSR	Current built form residential FSR	Proposed FSR tested	Proposed Residential FSR Tested	Proposed height in storeys tested
A	1,206	1.50	2.13	0.00	2.60	1.90	10
AA, AB	260	1.50	1.52	0.00	4.50	2.50	10
B	2,508	2.00	2.19	1.86	4.60	3.00	10
C	1,135	2.50	3.41	0.00	5.10	3.10	10
D	1,023	2.50	2.06	0.00	5.10	2.90	10
E	1,064	2.90	2.11	0.70	2.80	2.30	7
F	1,746	1.50	0.89	0.25	5.00	3.50	12
G	1,227	2.00	2.31	1.60	4.70	4.30	11
H	5,856	2.50	2.31	0.00	7.50	4.50	26

Source: SGS Economics and Planning, 2024

TABLE 10: BUILT FORM CHARACTERISTICS OF PROTOTYPES USED IN THE MODELLING

Site ID	Area (Sqm)	Proposed FSR tested	Total GFA	Residential GFA	Retail GFA	Commercial GFA
A	1,206	2.60	3,136	2,292	725	119
AA, AB	260	4.50	1,170	650	198	322
B	2,508	4.60	11,535	7,523	412	3,600
C	1,135	5.10	5,789	3,519	782	1,488
D	1,023	5.10	5,216	2,966	623	1,627
E	1,064	2.80	3,014	2,703	311	
F	1,746	5.00	8,730	5,872	327	2,542
G	1,227	4.70	5,765	5,275	491	
H	5,856	7.50	43,919	26,351	2,893	14,675

Source: SGS Economics and Planning, 2024

TABLE 11: RESIDENTIAL PARKING RATES USED IN THE MODELLING

Unit size	Distribution of units by size	No. of carparks per unit
1 bedroom	30%	0.5 spaces
2 bedrooms	30%	1.0 spaces
3 bedrooms	40%	1.5 spaces
Visitors		0.2 spaces

Source: Woollahra DCP 2015

TABLE 12: NON-RESIDENTIAL PARKING RATES USED IN MODELLING

Type	Spaces per 100sqm	Spaces per 100sqm (including 0.6 multiplier)	1 space per x sqm
Commercial	2.5 per 100 sqm	1.5 per 100 sqm	1 space per 67 sqm
Retail	3.3 per 100 sqm	2 per 100 sqm	1 space per 51 sqm

Source: Woollahra DCP 2015

Revenue and existing use values

Revenue

The following are revenue assumptions used in the viability modelling to quantify realisable values in redevelopment for the redevelopment prototypes. These assumptions were developed using sales evidence provided from M3 Property, consultation with M3 Property valuers, and reviewed with Council.

Several key assumptions underpin the revenue assumptions:

- Retail and office products are anticipated to be leased to the market at completion of the project and sold at stabilisation as a going concern.
- The residential sales price has been calibrated according to the unit split identified in market research and in consultation with M3 Property. Additionally, parking spaces were assumed at a gross realisable value of $100,000 each per space allocated to residential (non-visitor) parking.
- Sites with higher floors are assumed to attract a view premium, resulting in an additional 5% in realisable value.

TABLE 13: REVENUE ASSUMPTIONS USED FOR RESIDENTIAL PRODUCT TYPES

Unit type	Unit size	Price range	Unit Split	Average $/ sqm excluding parking
1 bedroom	60 sqm	$1.6m - $1.7m	30%	$25,833
2 bedrooms	90 sqm	$2.5m - $2.6m	30%	$27,222
3 bedrooms	150 sqm	$4.5m - $5.0m	40%	$30,333
Average	105 sqm			$28,050

Source: SGS Economics and Planning, 2023.

TABLE 14: RETAIL AND COMMERCIAL REVENUE ASSUMPTIONS USED IN MODELLING

Typology	Net Face Rent ($/sqm/annum)	Vacancy rate assumption	Yield	Realisable value ($/sqm)
Retail	$900	5.0%	5.75%	$14,870
Commercial	$800	5.0%	5.75%	$13,217

Source: SGS Economics and Planning, 2023.

Existing Use Value (EUV)

The following are assumptions central to the estimation of the Existing Use Value (EUV), against which the Redevelopment RLV is compared to ascertain viability. The 'base development value', as it is referred to in the NSW Guideline, is the EUV of a site "if it were developed to its full potential", including information on:

- Existing development controls;
- Highest-and-best use; and
- How much can be paid for a site.

The approach and assumptions discussed in this section identify how the EUVs were calibrated using the above-required information and land sales evidence provided by M3 Property, further consultation with M3 Property valuers, as well as review with Council.

As noted previously in the discussion of SGS's methodology, the modelling in this study estimates both 1) the feasibility of the redevelopment and 2) the viability of a land sales transaction between landowner and developer necessary to progress a redevelopment. As indicated above, for viability to exist, the following must be satisfied:

> The residual land value (RLV) estimated for redevelopment must be greater than the existing use value (EUV), plus an amalgamation premium where applicable.

The EUV is accordingly juxtaposed against the RLV in the modelling to determine viability of redevelopment. Considering the development prototypes selected and the context of the Edgecliff Commercial Centre, the EUV assumptions were calibrated assuming that the current built form of each prototype represents the highest-and-best use of the site, and no further development is anticipated by the market under current controls. These sites are valued through the comparison to sales of similar properties, or through a rent and yield comparison (for commercial properties), on a per square metre basis, as indicated in Table 15 below.

Table 16 below indicates the adopted EUVs for each development prototype. This illustrates how the proportions of uses and intensity of existing use influence the underlying land value. These existing values on a per square metre rate were calibrated to sales and leasing evidence provided by M3 Property.

TABLE 15: EXISTING USE VALUE ASSUMPTIONS USED IN MODELLING

Use	Price per sqm
Residential	$19,000
Retail	$13,000
Commercial	$10,000

Source: SGS Economics and Planning, 2023

TABLE 16: EXISTING USE VALUE INPUTS FOR MODELLING

Site ID	Lot size	Existing FSR	Total sqm	Current residential proportion	Current retail proportion	Current office proportion	Total EUV ($m)	Per sqm ($)
A	1,206	2.13	2,574	0%	23%	77%	$27,549,495	$10,703
AA, AB	260	1.52	396	0%	33%	67%	$4,350,000	$10,985
B	2,508	2.19	5,487	85%	15%	0%	$99,387,000	$18,113
C	1,135	3.41	3,876	0%	15%	85%	$40,462,650	$10,439
D	1,023	2.50	2,557	0%	20%	80%	$27,104,200	$10,600
E	1,064	2.90	3,086	33%	17%	50%	$41,642,827	$13,496
F	1,746	1.50	2,619	28%	33%	38%	$35,497,862	$13,554
G	1,227	2.31	2,830	70%	22%	9%	$47,852,050	$16,909
H	5,856	2.50	14,640	0%	20%	80%	$155,180,820	$10,600

Source: SGS Economics and Planning, 2023

Costs

Hard Costs

The following hard cost assumptions have been sourced from industry publications and updated to reflect recent market trajectories in the cost of materials and labour, in consultation with our valuation partners at M3 Property. The key hard cost assumptions that have been used in the feasibility testing are outlined in Table 17 below. All dollar values are expressed on a per-square metre basis.

TABLE 17: HARD COST ASSUMPTIONS USED IN MODELLING

Costs	Value	Metric	Source
Demolition – Commercial up to 2 floors	$130	Per square metre of building area	Rawlinsons Australia Construction Handbook 2023
Demolition – Commercial 3 to 6 floors	$142	Per square metre of building area	
High density residential construction – Prestige quality	$4,209	Per square metre of building area	Rawlinsons Australia Construction Handbook 2023
Residential construction	$6,563	Per square metre of building area	Napier & Blakeley (July 2023)
Residential balcony construction	$1,095	Per square metre of building area	Rawlinsons Australia Construction Handbook 2023
Underground parking construction	$100,000	Per space, gross	Napier & Blakeley (July 2023)

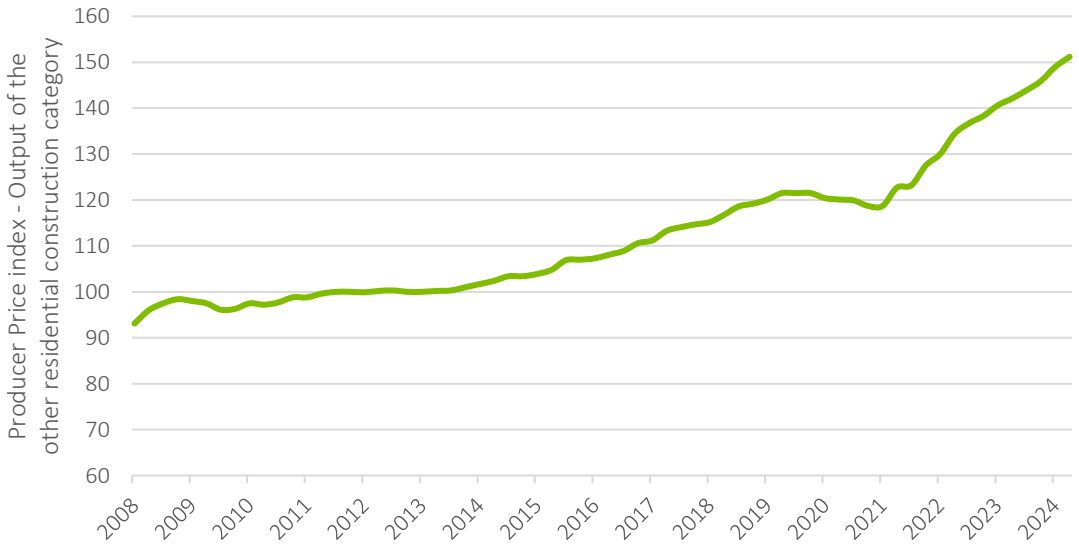
Costs	Value	Metric	Source
Commercial construction – under 8 floors	$3,386	Per square metre of building area	Napier & Blakeley (July 2023)
Commercial construction – 8 to 20 floors	$4,463	Per square metre of building area	Napier & Blakeley (July 2023)
Commercial construction – over 20 floors	$6,799	Per square metre of building area	Napier & Blakeley (July 2023)
Retail construction	$3,192	Per square metre of building area	Napier & Blakeley (July 2023)

Source: SGS Economics and Planning, 2023

Residential building costs for units and apartments have escalated significantly since the onset of the COVID-19 pandemic. **Figure 26** illustrates the change in the Producer Price Index for other residential construction (i.e., excludes houses) since 2008. Between 2008 (the trough of the GFC) and 2020 (onset of the pandemic), building costs escalated at a rate of approximately 1.8 per cent per annum.

Since 2020, however, annual escalation in building costs for apartments has risen by an average of 6.0 per cent per annum (approximately 25 per cent in total). By contrast, this rate of cost escalation exceeded the market price of apartments, leading to a severe deterioration of development viability, a set of circumstances that has not yet corrected.

FIGURE 26: PRODUCER PRICE INDEX - OUTPUTS FOR OTHER RESIDENTIAL CONSTRUCTION, 2008 TO 2024



Source: Australian Bureau of Statistics, Producer Price Indexes, Australia. Table 17, Series ID A2333676X (2024)

Soft Costs

Adopted soft costs are summarised in **Table 18** below. Within the viability modelling conducted, these result in the soft costs being around 40 to 45 per cent of hard costs, which is considered a conservative assessment.

TABLE 18: SOFT COST ASSUMPTIONS USED IN MODELLING

Costs	Value/ metric	Source
Professional fees and project management	5% of hard costs (HC)	Industry standard
Marketing and advertising	1.0% of gross realisable value	Industry standard
Legal fees	$2,000 per residential unit	Industry standard
Contingency	7.5% of HC and some soft costs	Industry standard
Land Acquisition costs (e.g., title fees, valuer study)	0.5% of estimated RLV	Industry standard
Cost of financing (assumes financing on 80% of total development costs + estimated RLV)	Ranges between 5.0% and 11.0% of HC Formula, depending on assumed length of project (circa 24 months) and interest rates (currently assumed at 8% borrowing rates)	Formula-based

Source: SGS Economics and Planning, 2024

Fees and charges

Adopted fees and charges are outlined in **Table 19** below.

TABLE 19: FEES AND CHARGES USED IN VIABILITY MODELLING

Costs	Value/ metric	Source
Council fees including Section 7.12, and development application fees	Varies – calculated on individual type of application by value	Woollahra Municipal Council
Stamp duty	Calculated per formula	Revenue NSW
Housing and Productivity Contribution	$10,000 per new strata dwelling $30 per square metre of new commercial GFA	NSW Department of Planning and Environment

Source: SGS Economics and Planning, 2024

Margin

A development margin was assumed at 20%. The development margin accounts for: a standard business premium, land cost, construction cost, market, timing, environmental and approvals risks. Each risk is assigned a premium, generally between 0.5% and approximately 4.5%. These premiums account for the possible risks of, for example, unforeseen increases in construction costs, land acquisition costs, slower market absorption (i.e., sales) of residential dwellings or lease-up of non-residential space.

4.4 Scenarios and outputs

This section outlines the core modelling scenarios used in SGS's viability testing. For all modelling, results are expressed on a per square metre of site basis, which enables the prototypes to be compared at the same basis. The RLV of each prototype is modelled to consider the *feasibility* of the development. The EUV is then subtracted from the RLV, which provides *viability* of scenarios.

Outputs are provided across the following key modelling constructions:

- Proposed development viability, at proposed FSR controls and with uplift – the proposed FSR controls are modelled to understand current feasibility and viability. Further modelling then incrementally increases the FSR to model additional gross floor area. The primary assumption in modelling uplift is that additional floor area beyond the proposed built form control (baseline) is residential. This allows for the impact of higher density to be illustrated.
- Development viability with affordable housing contributions – applying the affordable housing contributions, from 1% to 10%, which illustrates how higher contributions affect viability, both at the proposed FSR and with uplift modelled. This is presented on a site by site basis.
- Projecting market conditions – a preferred affordable housing contribution rate is identified, and for these, analysis is carried out with a projection of market conditions. Where the proposed rates are not viable under current market conditions, the assumptions applied identify a time at which viability may be achieved.
- Development viability with the inclusion of the Housing SEPP in-fill affordable housing reforms - The reforms to the Housing SEPP provide an additional 20-30% FSR and height to a proposal, over existing EPI controls, to proposals which provide 10-15% of the gross floor area as affordable housing for a term of 15 years. Full details of the assumptions used for this modelling are provided in Appendix A. An overview of the findings of this modelling, with affordable housing contributions, is provided in the outputs under section 5.3.

5. Viability testing outputs and considerations

The results in this chapter are intended to assist Council in weighing the trade-offs between the (positive) impact that upzoning has on the viability of development and the (negative) impact that affordable housing contributions have on the viability of development.

The chapter is organised around the following series of findings:

- Viability of tested sites with proposed uplift **without** affordable housing contribution
- Viability of tested sites with proposed uplift **with** 1% to 10% affordable housing contribution
- Viability of selected affordable housing contribution rates

Generally, the results are presented on the basis of a value per square metre of land area of each prototype. Results are colour coded throughout this section, where a value of $0 is white, positive values are green (with the highest value being darkest green), and negative values are red (with the most negative value being darkest red).

5.1 Viability without an Affordable Housing Contribution

Results of the modelling – without an affordable housing contribution – are presented below. Absent the consideration of existing use value (EUV), **Table 20** illustrates the residual land value (RLV) on a per square metre of land basis for the redevelopment itself.

TABLE 20: REDEVELOPMENT SCENARIOS WITH UPLIFT – FEASIBILITY RESULTS ($/SQM OF SITE AREA)

	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
A	$15,743	$17,766	$19,789	$21,944	$23,890	$25,776
AA, AB	$21,290	$22,727	$24,721	$26,558	$28,395	$30,403
B	$21,477	$23,499	$25,475	$27,497	$29,474	$31,495
C	$23,735	$25,671	$27,707	$29,644	$31,623	$33,660
D	$23,029	$25,051	$26,968	$28,864	$30,615	$32,410
E	$18,210	$20,206	$22,350	$24,345	$26,489	$28,485
F	$27,964	$29,982	$32,001	$34,020	$36,038	$38,057
G	$35,569	$37,757	$39,954	$41,966	$43,979	$46,076
H	$35,473	$37,364	$31,748	$33,621	$35,512	$37,402

Source: SGS Economics and Planning, 2024

Viability is determined by subtracting the EUV from the RLV, as shown in **Table 21.** Here, findings indicate varying degrees of viability for the baseline redevelopment (i.e., without an affordable housing contribution).

- At proposed levels of FSR (shown in the left-most column), three (3) of the sites tested are viable – that is, sites AA/AB, F and H.
- With minor levels additional FSR (i.e., with an additional 0.5), two (2) more sites become viable – that is, D and G.
- For site A to be viable, an additional 1.0 FSR would be necessary
- For the remaining B, C and E, viability would not be achievable without considerable additional uplift.

TABLE 21: REDEVELOPMENT SCENARIOS WITH UPLIFT – VIABILITY RESULTS ($/SQM OF SITE AREA)

	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
A	-$7,095	-$5,071	-$3,048	-$894	$1,053	$2,939
AA, AB	$4,559	$5,996	$7,990	$9,827	$11,665	$13,673
B	-$18,157	-$16,136	-$14,159	-$12,137	-$10,161	-$8,139
C	-$11,912	-$9,976	-$7,939	-$6,003	-$4,023	-$1,987
D	-$3,471	-$1,449	$468	$2,364	$4,115	$5,910
E	-$20,928	-$18,932	-$16,788	-$14,793	-$12,649	-$10,653
F	$7,633	$9,651	$11,670	$13,689	$15,707	$17,726
G	-$3,439	-$1,252	$945	$2,958	$4,970	$7,067
H	$8,973	$10,864	$5,248	$7,121	$9,012	$10,902

Source: SGS Economics and Planning, 2024

5.2 Viability with Range of Affordable Housing Contribution Rates

Following are results of the modelling of redevelopment with an affordable housing contribution. The modelling results are presented for both scenarios of an in-kind (i.e., onsite provision of affordable dwellings) and in-lieu (i.e., monetary) contribution.

For the reader, this section is presented in the following format:

- Subsections are provided delineating the results of each site being tested
- Individual tables present dollar ($) values that represent the RLV less the EUV, to illustrate viability.
- Each table also displays the variability of viability when trading off incremental amounts of FSR uplift and the in-kind or in-lieu contribution. The purpose is to facilitate decision-making with regard to tipping points that occur on a site by site basis.

For reference, SGS has applied an in-lieu (monetary contribution) in line with the approach taken by other comparable councils. In practice, councils (with adopted schemes) have used the Department of Communities and Justice quarterly sales report[16], which provides the median strata sale price for each LGA. As an example, with an LGA-wide average apartment size of 85sqm and a median strata sales price for that apartment of $1.58 million (in March 2023), the adopted in-lieu contribution would be calibrated as $18,550 per sqm ($1.58 million ÷ 85 sqm). [17]

[16] NSW Government, Department of Communities and Justice Sales Report, 2023, via https://public.tableau.com/app/profile/dcj.statistics/viz/Rentandsales_16849924917120/Rent?publish=yes

[17] This method in practice results in a lower overall cost to compliance with the AHCS for the developer, as the price point represented by the median strata sales will likely be significantly lower than the price point adopted for market-rate dwellings used in the modelling. As discussed in SGS's considerations in Section 5.5, this approach clearly creates an incentive to developers to provide monetary contributions, rather than in-kind dwellings.

Site A

Modelling outputs for Site A in **Table 22** and **Table 23** show that the proposed development is not viable with an affordable housing contribution, either in-kind or in-lieu. Modelling of higher FSR controls does improve viability, but not to the extent of supporting a 5% contribution under in-kind contributions. As shown in **Table 23,** a 5% in-lieu contribution does become viable with an additional 1.25:1 FSR.

TABLE 22: SITE A IN-KIND AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$7,095	-$5,071	-$3,048	-$894	$1,053	$2,939
In-kind at 1%	-$7,555	-$5,592	-$3,629	-$1,535	$398	$2,228
In-kind at 2%	-$8,015	-$6,113	-$4,210	-$2,177	-$275	$1,517
In-kind at 3%	-$8,475	-$6,633	-$4,791	-$2,819	-$977	$806
In-kind at 4%	-$8,935	-$7,154	-$5,372	-$3,460	-$1,679	$95
In-kind at 5%	-$9,395	-$7,674	-$5,954	-$4,102	-$2,381	-$661
In-kind at 6%	-$9,855	-$8,195	-$6,535	-$4,744	-$3,084	-$1,423
In-kind at 7%	-$10,315	-$8,715	-$7,116	-$5,385	-$3,786	-$2,186
In-kind at 8%	-$10,775	-$9,236	-$7,697	-$6,027	-$4,488	-$2,949
In-kind at 9%	-$11,235	-$9,757	-$8,278	-$6,669	-$5,190	-$3,712
In-kind at 10%	-$11,695	-$10,277	-$8,859	-$7,311	-$5,892	-$4,474

Source: SGS Economics and Planning, 2024

TABLE 23: SITE A IN-LIEU AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$7,095	-$5,071	-$3,048	-$894	$1,053	$2,939
In-lieu at 1%	-$7,527	-$5,561	-$3,594	-$1,497	$438	$2,270
In-lieu at 2%	-$7,960	-$6,050	-$4,141	-$2,100	-$191	$1,602
In-lieu at 3%	-$8,392	-$6,540	-$4,687	-$2,704	-$851	$934
In-lieu at 4%	-$8,825	-$7,029	-$5,233	-$3,307	-$1,511	$265
In-lieu at 5%	-$9,258	-$7,519	-$5,780	-$3,910	-$2,171	-$433
In-lieu at 6%	-$9,690	-$8,008	-$6,326	-$4,514	-$2,832	-$1,150
In-lieu at 7%	-$10,123	-$8,498	-$6,873	-$5,117	-$3,492	-$1,867
In-lieu at 8%	-$10,555	-$8,987	-$7,419	-$5,720	-$4,152	-$2,584
In-lieu at 9%	-$10,988	-$9,477	-$7,965	-$6,324	-$4,812	-$3,301
In-lieu at 10%	-$11,420	-$9,966	-$8,512	-$6,927	-$5,473	-$4,018

Source: SGS Economics and Planning, 2024

Site AA, AB

Modelling outputs for Site AA, BB in **Table 24** and **Table 25** show that the proposed development is viable, including with a 5% affordable housing contribution, both in-kind and in-lieu.

TABLE 24: SITE AA, AB IN-KIND AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	$4,559	$5,996	$7,990	$9,827	$11,665	$13,673
In-kind at 1%	$3,994	$5,375	$7,312	$9,093	$10,874	$12,825
In-kind at 2%	$3,429	$4,753	$6,634	$8,359	$10,083	$11,978
In-kind at 3%	$2,864	$4,132	$5,956	$7,624	$9,292	$11,130
In-kind at 4%	$2,299	$3,510	$5,278	$6,890	$8,501	$10,283
In-kind at 5%	$1,734	$2,889	$4,600	$6,155	$7,710	$9,435
In-kind at 6%	$1,169	$2,268	$3,922	$5,421	$6,920	$8,588
In-kind at 7%	$604	$1,646	$3,244	$4,686	$6,129	$7,740
In-kind at 8%	$39	$1,025	$2,566	$3,952	$5,338	$6,893
In-kind at 9%	-$572	$403	$1,888	$3,218	$4,547	$6,045
In-kind at 10%	-$1,186	-$237	$1,210	$2,483	$3,756	$5,198

Source: SGS Economics and Planning, 2024

TABLE 25: SITE AA, AB IN-LIEU AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	$4,559	$5,996	$7,990	$9,827	$11,665	$13,673
In-lieu at 1%	$4,028	$5,412	$7,353	$9,137	$10,921	$12,876
In-lieu at 2%	$3,496	$4,827	$6,715	$8,446	$10,177	$12,079
In-lieu at 3%	$2,965	$4,243	$6,078	$7,756	$9,434	$11,282
In-lieu at 4%	$2,434	$3,659	$5,440	$7,065	$8,690	$10,485
In-lieu at 5%	$1,903	$3,075	$4,803	$6,374	$7,946	$9,688
In-lieu at 6%	$1,371	$2,490	$4,165	$5,684	$7,203	$8,891
In-lieu at 7%	$840	$1,906	$3,527	$4,993	$6,459	$8,094
In-lieu at 8%	$309	$1,322	$2,890	$4,303	$5,716	$7,297
In-lieu at 9%	-$242	$737	$2,252	$3,612	$4,972	$6,501
In-lieu at 10%	-$819	$153	$1,615	$2,921	$4,228	$5,704

Source: SGS Economics and Planning, 2024

Site B

Modelling outputs for Site B in **Table 26** and **Table 27** show that the proposed development is not viable with an affordable housing contribution, either in-kind or in-lieu. Modelling of higher FSR controls does not result in viability. This is related to the high existing use value of the site, as there is a significant proportion of existing residential uses on the site. The land use mix of the proposed redevelopment also acts as a depressing factor on realisable values, with high proportions of non-residential.

TABLE 26: SITE B IN-KIND AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$18,157	-$16,136	-$14,159	-$12,137	-$10,161	-$8,139
In-kind at 1%	-$18,894	-$16,934	-$15,019	-$13,058	-$11,143	-$9,183
In-kind at 2%	-$19,631	-$17,732	-$15,878	-$13,979	-$12,125	-$10,226
In-kind at 3%	-$20,368	-$18,530	-$16,738	-$14,900	-$13,108	-$11,270
In-kind at 4%	-$21,104	-$19,328	-$17,597	-$15,821	-$14,090	-$12,314
In-kind at 5%	-$21,841	-$20,126	-$18,457	-$16,742	-$15,072	-$13,358
In-kind at 6%	-$22,578	-$20,925	-$19,316	-$17,663	-$16,055	-$14,401
In-kind at 7%	-$23,315	-$21,723	-$20,176	-$18,584	-$17,037	-$15,445
In-kind at 8%	-$24,051	-$22,521	-$21,035	-$19,505	-$18,019	-$16,489
In-kind at 9%	-$24,788	-$23,319	-$21,895	-$20,426	-$19,002	-$17,532
In-kind at 10%	-$25,525	-$24,117	-$22,754	-$21,347	-$19,984	-$18,576

Source: SGS Economics and Planning, 2024

TABLE 27: SITE B IN-LIEU AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$18,157	-$16,136	-$14,159	-$12,137	-$10,161	-$8,139
In-lieu at 1%	-$18,850	-$16,886	-$14,967	-$13,003	-$11,084	-$9,120
In-lieu at 2%	-$19,543	-$17,637	-$15,775	-$13,869	-$12,008	-$10,102
In-lieu at 3%	-$20,236	-$18,387	-$16,584	-$14,735	-$12,932	-$11,083
In-lieu at 4%	-$20,928	-$19,138	-$17,392	-$15,601	-$13,855	-$12,065
In-lieu at 5%	-$21,621	-$19,888	-$18,200	-$16,467	-$14,779	-$13,046
In-lieu at 6%	-$22,314	-$20,639	-$19,008	-$17,333	-$15,703	-$14,028
In-lieu at 7%	-$23,007	-$21,389	-$19,817	-$18,199	-$16,627	-$15,009
In-lieu at 8%	-$23,700	-$22,140	-$20,625	-$19,065	-$17,550	-$15,990
In-lieu at 9%	-$24,392	-$22,890	-$21,433	-$19,931	-$18,474	-$16,972
In-lieu at 10%	-$25,085	-$23,641	-$22,241	-$20,797	-$19,398	-$17,953

Source: SGS Economics and Planning, 2024

Site C

Modelling outputs for Site C in **Table 28** and **Table 29** show that the proposed development is not viable with an affordable housing contribution, either in-kind or in-lieu. Modelling of higher FSR controls does not result in viability. This is due to the high existing use values (with the built form FSR currently at 3.41:1).

TABLE 28: SITE C IN-KIND AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$11,912	-$9,976	-$7,939	-$6,003	-$4,023	-$1,987
In-kind at 1%	-$12,677	-$10,802	-$8,828	-$6,953	-$5,035	-$3,060
In-kind at 2%	-$13,442	-$11,629	-$9,716	-$7,903	-$6,047	-$4,134
In-kind at 3%	-$14,207	-$12,455	-$10,604	-$8,853	-$7,058	-$5,207
In-kind at 4%	-$14,972	-$13,282	-$11,492	-$9,803	-$8,070	-$6,280
In-kind at 5%	-$15,737	-$14,109	-$12,381	-$10,753	-$9,082	-$7,354
In-kind at 6%	-$16,502	-$14,935	-$13,269	-$11,702	-$10,093	-$8,427
In-kind at 7%	-$17,267	-$15,762	-$14,157	-$12,652	-$11,105	-$9,500
In-kind at 8%	-$18,032	-$16,588	-$15,045	-$13,602	-$12,117	-$10,574
In-kind at 9%	-$18,796	-$17,415	-$15,934	-$14,552	-$13,128	-$11,647
In-kind at 10%	-$19,561	-$18,242	-$16,822	-$15,502	-$14,140	-$12,720

Source: SGS Economics and Planning, 2024

TABLE 29: SITE C IN-LIEU AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$11,912	-$9,976	-$7,939	-$6,003	-$4,023	-$1,987
In-lieu at 1%	-$12,631	-$10,753	-$8,775	-$6,896	-$4,975	-$2,996
In-lieu at 2%	-$13,351	-$11,530	-$9,610	-$7,789	-$5,926	-$4,006
In-lieu at 3%	-$14,070	-$12,307	-$10,445	-$8,683	-$6,877	-$5,015
In-lieu at 4%	-$14,789	-$13,085	-$11,280	-$9,576	-$7,829	-$6,024
In-lieu at 5%	-$15,509	-$13,862	-$12,116	-$10,469	-$8,780	-$7,033
In-lieu at 6%	-$16,228	-$14,639	-$12,951	-$11,362	-$9,731	-$8,043
In-lieu at 7%	-$16,947	-$15,417	-$13,786	-$12,256	-$10,682	-$9,052
In-lieu at 8%	-$17,666	-$16,194	-$14,621	-$13,149	-$11,634	-$10,061
In-lieu at 9%	-$18,386	-$16,971	-$15,457	-$14,042	-$12,585	-$11,071
In-lieu at 10%	-$19,105	-$17,748	-$16,292	-$14,935	-$13,536	-$12,080

Source: SGS Economics and Planning, 2024

Site D

Modelling outputs for Site D in **Table 30** and **Table 31** show that the proposed development is not viable with an affordable housing contribution, either in-kind or in-lieu. Modelling of higher FSR controls does improve viability: if an additional 1.25:1 FSR were permitted, a 5% in-kind contribution would be viable. As shown in **Table 31,** a 5% in-lieu contribution does become viable with an additional 1.00:1 FSR.

TABLE 30: SITE D IN-KIND AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$3,471	-$1,449	$468	$2,364	$4,115	$5,910
In-kind at 1%	-$4,186	-$2,226	-$328	$1,539	$3,234	$4,972
In-kind at 2%	-$4,902	-$3,003	-$1,167	$714	$2,352	$4,034
In-kind at 3%	-$5,617	-$3,780	-$2,006	-$122	$1,470	$3,096
In-kind at 4%	-$6,333	-$4,558	-$2,845	-$1,022	$589	$2,158
In-kind at 5%	-$7,049	-$5,335	-$3,684	-$1,923	-$320	$1,219
In-kind at 6%	-$7,764	-$6,112	-$4,523	-$2,823	-$1,282	$281
In-kind at 7%	-$8,480	-$6,889	-$5,362	-$3,724	-$2,244	-$717
In-kind at 8%	-$9,195	-$7,666	-$6,201	-$4,625	-$3,207	-$1,741
In-kind at 9%	-$9,911	-$8,444	-$7,040	-$5,525	-$4,169	-$2,765
In-kind at 10%	-$10,626	-$9,221	-$7,879	-$6,426	-$5,131	-$3,789

Source: SGS Economics and Planning, 2024

TABLE 31: SITE D IN-LIEU AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$3,471	-$1,449	$468	$2,364	$4,115	$5,910
In-lieu at 1%	-$4,144	-$2,179	-$278	$1,588	$3,286	$5,028
In-lieu at 2%	-$4,817	-$2,910	-$1,067	$812	$2,457	$4,146
In-lieu at 3%	-$5,489	-$3,641	-$1,856	$36	$1,628	$3,264
In-lieu at 4%	-$6,162	-$4,372	-$2,645	-$807	$799	$2,381
In-lieu at 5%	-$6,835	-$5,103	-$3,434	-$1,654	-$33	$1,499
In-lieu at 6%	-$7,508	-$5,834	-$4,223	-$2,501	-$938	$617
In-lieu at 7%	-$8,181	-$6,565	-$5,012	-$3,348	-$1,842	-$290
In-lieu at 8%	-$8,854	-$7,295	-$5,801	-$4,195	-$2,747	-$1,253
In-lieu at 9%	-$9,527	-$8,026	-$6,589	-$5,042	-$3,652	-$2,215
In-lieu at 10%	-$10,200	-$8,757	-$7,378	-$5,889	-$4,557	-$3,178

Source: SGS Economics and Planning, 2024

Site E

Modelling outputs for Site E in **Table 32** and **Table 33** show that the proposed development is not viable with an affordable housing contribution, either in-kind or in-lieu. Modelling of higher FSR controls does not result in viability. This is due to the high existing use values with existing residential uses on the site, and an overall lack of sufficient uplift.

TABLE 32: SITE E IN-KIND AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$20,928	-$18,932	-$16,788	-$14,793	-$12,649	-$10,653
In-kind at 1%	-$21,535	-$19,600	-$17,516	-$15,581	-$13,498	-$11,563
In-kind at 2%	-$22,142	-$20,268	-$18,245	-$16,370	-$14,347	-$12,473
In-kind at 3%	-$22,749	-$20,935	-$18,973	-$17,159	-$15,197	-$13,383
In-kind at 4%	-$23,357	-$21,603	-$19,701	-$17,948	-$16,046	-$14,293
In-kind at 5%	-$23,964	-$22,271	-$20,430	-$18,737	-$16,896	-$15,202
In-kind at 6%	-$24,571	-$22,939	-$21,158	-$19,526	-$17,745	-$16,112
In-kind at 7%	-$25,178	-$23,606	-$21,886	-$20,314	-$18,594	-$17,022
In-kind at 8%	-$25,786	-$24,274	-$22,615	-$21,103	-$19,444	-$17,932
In-kind at 9%	-$26,393	-$24,942	-$23,343	-$21,892	-$20,293	-$18,842
In-kind at 10%	-$27,000	-$25,610	-$24,071	-$22,681	-$21,142	-$19,752

Source: SGS Economics and Planning, 2024

TABLE 33: SITE E IN-LIEU AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$20,928	-$18,932	-$16,788	-$14,793	-$12,649	-$10,653
In-lieu at 1%	-$21,499	-$19,560	-$17,473	-$15,534	-$13,447	-$11,509
In-lieu at 2%	-$22,070	-$20,188	-$18,158	-$16,276	-$14,246	-$12,364
In-lieu at 3%	-$22,641	-$20,816	-$18,843	-$17,018	-$15,044	-$13,220
In-lieu at 4%	-$23,212	-$21,444	-$19,527	-$17,759	-$15,843	-$14,075
In-lieu at 5%	-$23,782	-$22,071	-$20,212	-$18,501	-$16,642	-$14,931
In-lieu at 6%	-$24,353	-$22,699	-$20,897	-$19,243	-$17,440	-$15,786
In-lieu at 7%	-$24,924	-$23,327	-$21,582	-$19,984	-$18,239	-$16,642
In-lieu at 8%	-$25,495	-$23,955	-$22,266	-$20,726	-$19,038	-$17,497
In-lieu at 9%	-$26,066	-$24,583	-$22,951	-$21,468	-$19,836	-$18,353
In-lieu at 10%	-$26,637	-$25,211	-$23,636	-$22,209	-$20,635	-$19,208

Source: SGS Economics and Planning, 2024

Site F

Modelling outputs for Site F in **Table 34** and **Table 35** show that the proposed development is viable, including with a 5% affordable housing contribution, both in-kind and in-lieu.

TABLE 34: SITE F IN-KIND AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	$7,633	$9,651	$11,670	$13,689	$15,707	$17,726
In-kind at 1%	$6,836	$8,795	$10,754	$12,714	$14,673	$16,632
In-kind at 2%	$6,039	$7,939	$9,839	$11,739	$13,639	$15,539
In-kind at 3%	$5,242	$7,082	$8,923	$10,764	$12,604	$14,445
In-kind at 4%	$4,445	$6,226	$8,007	$9,789	$11,570	$13,351
In-kind at 5%	$3,648	$5,370	$7,092	$8,814	$10,536	$12,258
In-kind at 6%	$2,851	$4,514	$6,176	$7,839	$9,501	$11,164
In-kind at 7%	$2,054	$3,657	$5,261	$6,864	$8,467	$10,070
In-kind at 8%	$1,257	$2,801	$4,345	$5,889	$7,433	$8,976
In-kind at 9%	$460	$1,945	$3,429	$4,914	$6,398	$7,883
In-kind at 10%	-$368	$1,088	$2,514	$3,939	$5,364	$6,789

Source: SGS Economics and Planning, 2024

TABLE 35: SITE F IN-LIEU AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	$7,633	$9,651	$11,670	$13,689	$15,707	$17,726
In-lieu at 1%	$6,922	$8,887	$10,853	$12,819	$14,785	$16,751
In-lieu at 2%	$6,211	$8,124	$10,036	$11,949	$13,862	$15,775
In-lieu at 3%	$5,500	$7,360	$9,220	$11,079	$12,939	$14,799
In-lieu at 4%	$4,789	$6,596	$8,403	$10,210	$12,017	$13,824
In-lieu at 5%	$4,078	$5,832	$7,586	$9,340	$11,094	$12,848
In-lieu at 6%	$3,367	$5,068	$6,769	$8,470	$10,171	$11,872
In-lieu at 7%	$2,656	$4,304	$5,952	$7,600	$9,248	$10,897
In-lieu at 8%	$1,945	$3,540	$5,136	$6,731	$8,326	$9,921
In-lieu at 9%	$1,234	$2,777	$4,319	$5,861	$7,403	$8,945
In-lieu at 10%	$524	$2,013	$3,502	$4,991	$6,480	$7,970

Source: SGS Economics and Planning, 2024

Site G

Modelling outputs for Site G in **Table 36** and **Table 37** show that the proposed development is not viable with an affordable housing contribution, either in-kind or in-lieu. Modelling of higher FSR controls does improve viability: if an additional 1.25:1 FSR were permitted, a 5% in-kind contribution would be viable. If an additional 1.00:1 FSR were permitted, a 5% in-lieu contribution would be viable.

TABLE 36: SITE G IN-KIND AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$3,439	-$1,252	$945	$2,958	$4,970	$7,067
In-kind at 1%	-$4,548	-$2,425	-$211	$1,759	$3,713	$5,751
In-kind at 2%	-$5,657	-$3,599	-$1,449	$561	$2,455	$4,434
In-kind at 3%	-$6,766	-$4,772	-$2,686	-$693	$1,197	$3,117
In-kind at 4%	-$7,875	-$5,945	-$3,924	-$1,995	-$66	$1,800
In-kind at 5%	-$8,984	-$7,119	-$5,162	-$3,297	-$1,432	$483
In-kind at 6%	-$10,093	-$8,292	-$6,400	-$4,599	-$2,799	-$907
In-kind at 7%	-$11,201	-$9,465	-$7,638	-$5,902	-$4,166	-$2,338
In-kind at 8%	-$12,310	-$10,639	-$8,875	-$7,204	-$5,533	-$3,769
In-kind at 9%	-$13,419	-$11,812	-$10,113	-$8,506	-$6,899	-$5,200
In-kind at 10%	-$14,528	-$12,985	-$11,351	-$9,808	-$8,266	-$6,632

Source: SGS Economics and Planning, 2024

TABLE 37: SITE G IN-LIEU AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	-$3,439	-$1,252	$945	$2,958	$4,970	$7,067
In-lieu at 1%	-$4,428	-$2,299	-$77	$1,889	$3,848	$5,893
In-lieu at 2%	-$5,418	-$3,345	-$1,181	$820	$2,727	$4,718
In-lieu at 3%	-$6,407	-$4,392	-$2,285	-$271	$1,605	$3,543
In-lieu at 4%	-$7,396	-$5,439	-$3,390	-$1,432	$483	$2,368
In-lieu at 5%	-$8,385	-$6,485	-$4,494	-$2,594	-$694	$1,194
In-lieu at 6%	-$9,374	-$7,532	-$5,598	-$3,756	-$1,914	$19
In-lieu at 7%	-$10,363	-$8,579	-$6,702	-$4,917	-$3,133	-$1,256
In-lieu at 8%	-$11,352	-$9,625	-$7,806	-$6,079	-$4,352	-$2,533
In-lieu at 9%	-$12,341	-$10,672	-$8,910	-$7,241	-$5,571	-$3,809
In-lieu at 10%	-$13,331	-$11,718	-$10,014	-$8,402	-$6,790	-$5,086

Source: SGS Economics and Planning, 2024

Site H

Modelling outputs for Site H in **Table 38** and **Table 39** show that the proposed development is viable, including with a 5% affordable housing contribution, both in-kind and in-lieu. It should be noted that the results display a set of results in which an additional 0.5:1 FSR yield diminished viability. The redevelopment prototype at the proposed FSR is 19 floors. When 0.5:1 FSR are added to the prototype, the resulting building reaches 21 floors, which results in a higher per-sqm construction cost. As such, viability generally improves only when marginal increases in FSR do not yield significant increases to per-sqm construction costs.

TABLE 38: SITE H IN-KIND AHC VIABILITY RESULTS

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	$8,973	$10,864	$5,248	$7,121	$9,012	$10,902
In-kind at 1%	$7,903	$9,734	$4,058	$5,872	$7,703	$9,534
In-kind at 2%	$6,832	$8,604	$2,869	$4,623	$6,394	$8,166
In-kind at 3%	$5,761	$7,473	$1,679	$3,374	$5,086	$6,798
In-kind at 4%	$4,690	$6,343	$489	$2,124	$3,777	$5,430
In-kind at 5%	$3,620	$5,213	-$781	$875	$2,469	$4,062
In-kind at 6%	$2,549	$4,083	-$2,108	-$417	$1,160	$2,694
In-kind at 7%	$1,478	$2,953	-$3,435	-$1,810	-$166	$1,326
In-kind at 8%	$408	$1,823	-$4,762	-$3,204	-$1,625	-$47
In-kind at 9%	-$739	$692	-$6,089	-$4,597	-$3,085	-$1,573
In-kind at 10%	-$1,934	-$488	-$7,416	-$5,990	-$4,545	-$3,099

Source: SGS Economics and Planning, 2024

TABLE 39: SITE H IN-LIEU AHC VIABILITY RESULTS (RLV / SQM

Affordable housing contribution	Proposed FSR (RLV)	Proposed + 0.25 FSR (RLV)	Proposed + 0.5 FSR (RLV)	Proposed + 0.75 FSR (RLV)	Proposed + 1 FSR (RLV)	Proposed + 1.25 FSR (RLV)
Baseline 0%	$8,973	$10,864	$5,248	$7,121	$9,012	$10,902
In-lieu at 1%	$8,018	$9,855	$4,186	$6,006	$7,844	$9,682
In-lieu at 2%	$7,062	$8,847	$3,125	$4,892	$6,676	$8,461
In-lieu at 3%	$6,107	$7,839	$2,063	$3,777	$5,509	$7,240
In-lieu at 4%	$5,152	$6,830	$1,002	$2,663	$4,341	$6,019
In-lieu at 5%	$4,196	$5,822	-$66	$1,548	$3,173	$4,799
In-lieu at 6%	$3,241	$4,813	-$1,251	$433	$2,006	$3,578
In-lieu at 7%	$2,286	$3,805	-$2,435	-$760	$838	$2,357
In-lieu at 8%	$1,330	$2,796	-$3,619	-$2,003	-$368	$1,136
In-lieu at 9%	$375	$1,788	-$4,803	-$3,246	-$1,670	-$94
In-lieu at 10%	-$647	$780	-$5,987	-$4,490	-$2,973	-$1,456

Source: SGS Economics and Planning, 2024

5.3 Summary of Viability with Selected Contribution Rates

This section summarises results for:

- **Supportability of selected contribution rates**: at 3%, 5% and 10% and with the proposed FSR. This is provided for the purpose of compiling the viability results with a few potential contribution rates.
- **Supportability of 5% AHC and the Housing SEPP**: with distinction between the impact that an in-kind versus an in-lieu (monetary) contribution have on viability. This is provided for the purpose of appreciating the impact on viability of: 1) the Housing SEPP and 2) the monetary contribution.

Findings of Viability at Selected Contribution Rates

As in the section above, **Table 40** presents the difference between the RLV and EUV, where:

- Positive values indicate viability
- Negative values indicate inviability

The table also presents for reference:

- FSR of the current Woollahra LEP
- Existing use FSR (some sites have non-conforming FSRs)
- Proposed FSR for testing

In general, the findings below can be summarised as:

- A 5% affordable housing contribution Highest viability occurs on sites with the most proposed uplift. This is the case for AA/AB, F, and H.
- Low viability occurs when the existing use (as measured by FSR) is dominated by residential. This is the case for B and G.

TABLE 40: SUPPORTABILITY OF KEY CONTRIBUTIONS RATES, COMPARED WITH UPLIFT PROPOSED

					Affordable Housing Contribution (In-Kind)			
Site	Current LEP (FSR)	Existing Use FSR	Existing Res. FSR	Tested FSR	0%	3%	5%	10%
A	1.50	2.13	0.00	2.60	-$7,095	-$8,475	-$9,395	-$11,695
AA, AB	1.50	1.52	0.00	4.50	$4,559	$2,864	$1,734	-$1,186
B	2.00	2.19	1.86	4.60	-$18,157	-$20,368	-$21,841	-$25,525
C	2.50	3.41	0.00	5.10	-$11,912	-$14,207	-$15,737	-$19,561
D	2.50	2.06	0.00	5.10	-$3,471	-$5,617	-$7,049	-$10,626
E	2.90	2.11	0.70	2.80	-$20,928	-$22,749	-$23,964	-$27,000
F	1.50	0.89	0.25	5.00	$7,633	$5,242	$3,648	-$368
G	2.00	2.31	1.60	4.70	-$3,439	-$6,766	-$8,984	-$14,528
H	2.50	2.31	0.00	7.50	$8,973	$5,761	$3,620	-$1,934

Source: SGS Economics and Planning, 2024

Findings of Viability with a 5% and Housing SEPP

The following scenarios are summarised to present the impact that 1) the Housing SEPP and 2) the application of an in-kind vs. monetary contribution have on viability.

Because discussion leading to this point in SGS's work with Council began to narrow in on the potential to pursue a 5% affordable housing contribution, the following results only display the RLV less EUV of a 5% AHC (in perpetuity) with and without the Housing SEPP. (Full outputs of SGS's modelling of the Housing SEPP reform are provided in Appendix A).[18]

The findings in **Table 41** seem to confirm many of the findings from SGS's analysis above:

- Application of the Housing SEPP results in higher viability than either in-kind or in-lieu contributions without the Housing SEPP – the exception is Site H, for which the additional density tips the development prototype into higher construction costs, which reduces the RLV.
- In-lieu contributions are more viable than in-kind contributions, both with and without the Housing SEPP.

TABLE 41: COMPARISON OF A 5% CONTRIBUTIONS WITH AND WITHOUT THE HOUSING SEPP

	Excluding Housing SEPP		Including Housing SEPP	
Site	5% In-kind contribution	5% monetary contribution	5% In-kind contribution	5% monetary contribution
A	-$9,395	-$9,258	-$8,282	-$8,088
AA, AB	$1,734	$1,903	$4,451	$4,711
B	-$21,841	-$21,621	-$19,598	-$19,277
C	-$15,737	-$15,509	-$12,923	-$12,582
D	-$7,049	-$6,835	-$3,872	-$3,546
E	-$23,964	-$23,782	-$23,529	-$23,287
F	$3,648	$4,078	$6,445	$7,068
G	-$8,984	-$8,385	-$8,005	-$7,210
H	$3,620	$4,196	$273	$1,137

Source: SGS Economics and Planning, 2024

[18] The Housing SEPP reform allows for an additional 30% density on a site, with 15% of the GFA provided as affordable housing for a term of 15 years (after which it reverts to market housing).

5.4 Projection of market conditions modelling outputs

Further narrowing in on the viability implications of a preferred scenario, this section presents the results for a specified affordable housing contribution (in-kind) of 5% with escalations to costs and realisable values over time. The purpose being to demonstrate (shown in Table 42 and Table 43) *when* a proposed redevelopment with an AHC may become viable (in number of years).

- Redevelopment without a 5% AHC: as shown in Table 42, while A, B, C and E are currently not viable, with escalation of both cost and revenue factors, viability is likely achieved withing the five (5) to ten (10) year range.
- Redevelopment with a 5% in-kind AHC: as shown in Table 43, the inclusion of an in-kind/in-lieu contribution delays viability by approximately one (1) to three (3) years approximately. Generally, though, redevelopment with an AHC is viable for most sites within a reasonable strategic planning horizon.

It should be noted that this analysis does not include an assessment of land holding costs for the portion of developers or proponents that may have land-banked sites. It also presumes that landholders will be willing to accept an acquisition price equal to today's EUV at some point in the future when the RLV is equal to or greater than the current EUV.

TABLE 42: PROJECTION OF MARKET CONDITIONS MODELLING OUTPUTS FOR DEVELOPMENT WITHOUT AN AHC

	A	AA, AB	B	C	D	E	F	G	H
EUV	$27,549,495	$4,350,000	$99,387,000	$40,462,650	$27,104,200	$41,642,827	$35,497,862	$47,852,050	$155,180,820
1 year	$23,082,209	$6,762,481	$67,596,774	$33,719,574	$29,283,555	$23,586,964	$58,929,378	$51,910,516	$254,415,858
2 years	$24,862,470	$7,281,173	$73,415,328	$36,588,093	$31,568,478	$25,433,249	$63,269,027	$55,430,085	$274,118,477
3 years	$26,749,325	$7,828,176	$79,590,581	$39,632,553	$33,994,282	$27,389,366	$67,871,484	$59,157,064	$295,032,523
4 years	$28,667,125	$8,412,402	$86,142,340	$42,661,689	$36,568,809	$29,461,332	$72,751,263	$63,102,767	$317,225,358
5 years	$30,641,091	$9,032,110	$93,091,464	$45,800,880	$39,300,318	$31,655,480	$77,923,647	$67,279,102	$340,767,913
6 years	$32,731,662	$9,689,264	$100,374,279	$49,129,585	$42,197,506	$33,978,478	$83,404,723	$71,698,601	$365,734,876
7 years	$34,945,204	$10,385,929	$107,561,753	$52,658,254	$45,269,532	$36,437,342	$89,211,430	$76,374,451	$392,204,886
8 years	$37,288,418	$11,124,281	$115,178,762	$56,397,893	$48,526,034	$39,039,456	$95,361,595	$81,320,532	$420,260,737
9 years	$39,768,360	$11,906,610	$123,248,886	$60,360,087	$51,977,165	$41,782,414	$101,873,986	$86,551,449	$449,989,590
10 years	$42,392,451	$12,735,325	$131,796,951	$64,557,029	$55,633,609	$44,496,799	$108,768,355	$92,082,570	$481,483,203
Years for RLV to exceed EUV	3.0 years	Viable at year 0	5.2 years	2.9 years	0.3 years	8.4 years	Viable at year 0	0.1 years	Viable at year 0

Source: SGS Economics and Planning, 2024

TABLE 43: PROJECTION OF MARKET CONDITIONS MODELLING OUTPUTS FOR DEVELOPMENT WITH A 5% IN-KIND AHC

	A	AA, AB	B	C	D	E	F	G	H
EUV	$27,549,495	$4,350,000	$99,387,000	$40,462,650	$27,104,200	$41,642,827	$35,497,862	$47,852,050	$155,180,820
1 year	$20,022,158	$5,952,527	$57,410,172	$28,932,072	$25,447,312	$20,024,488	$51,257,327	$44,762,506	$219,846,072
2 years	$21,649,051	$6,430,629	$62,718,221	$31,560,672	$27,685,724	$21,692,233	$55,212,527	$48,182,834	$237,816,531
3 years	$23,374,869	$6,935,015	$68,357,444	$34,353,216	$29,916,966	$23,460,884	$59,411,312	$51,546,690	$256,911,810
4 years	$25,205,087	$7,474,491	$74,346,373	$37,318,877	$32,287,203	$25,336,010	$63,867,235	$55,111,114	$277,194,939
5 years	$27,145,468	$8,047,212	$80,704,524	$40,466,926	$34,804,208	$27,323,477	$68,594,570	$58,887,105	$298,732,303
6 years	$29,089,752	$8,655,030	$87,452,452	$43,528,433	$37,476,168	$29,429,459	$73,608,346	$62,886,242	$321,593,815
7 years	$31,120,857	$9,299,892	$94,611,803	$46,776,546	$40,311,703	$31,660,457	$78,924,386	$67,120,714	$345,853,102
8 years	$33,272,514	$9,983,851	$101,980,421	$50,221,600	$43,319,890	$34,023,312	$84,559,352	$71,603,347	$371,587,694
9 years	$35,551,319	$10,709,066	$109,389,548	$53,874,479	$46,510,290	$36,525,226	$90,530,783	$76,347,644	$398,879,225
10 years	$37,964,218	$11,477,813	$117,243,565	$57,746,642	$49,892,966	$39,173,781	$96,857,144	$81,367,813	$427,813,649
Years for RLV to exceed EUV	4.6 years	Viable at year 0	7.0 years	4.4 years	1.6 years	10.6 years	Viable at year 0	1.7 years	Viable at year 0

Source: SGS Economics and Planning, 2024

5.5 Recommendations and considerations

Based on the preceding analysis and findings, SGS recommends the following with regard to an affordable housing contribution scheme in the ECC:

- **Council pursue a contribution rate of 5%.** Analysis demonstrates that viability can be achieved across all sites (except E) with a 5% AHC (either in-kind or in-lieu contribution) within five (5) to ten (10) years.
- **Council could introduce the contribution incrementally**. Pursuing a 5% contribution upfront could be seen by the Department as an aggressive starting position. The Department has previously advised other councils to stage the introduction of (relatively high, e.g., rates greater than 3%) contributions to manage potential negative impacts.[19] For example, a 2% or 3% contribution is introduced first, followed by the 5% contribution taking effect one or two years later.
- **Council should calibrate the monetary contribution to $23,800 per square-metre of GFA to be dedicated as affordable.** This dollar amount reflects SGS's adopted realisable value assumptions, which are grounded in M3 Property's sales evidence. These dollar amounts are furthermore tailored to the market to which they will apply, ensuring that their impact as a per cent of development costs remains proportional.

In consideration of the type of contribution, SGS observes the following:

- **In-lieu (monetary) affordable housing contributions are more viable than in-kind contributions**. developers will generally opt for payment of a monetary contribution, given that it is often less costly than providing an in-kind contribution. This is particularly the case in Woollahra's market.
- **In-lieu contributions are also preferred by CHPs**. While SGS has not specifically engaged with any CHPs in this project, previous consultation with CHPs have indicated that they prefer that Councils to collect monetary contributions that can later be pooled (i.e., over time) and used as capital in either a purpose-built affordable housing development or the acquisition of existing dwellings. This preference seems to emerge from a consideration of operational burdens, where scattered affordable dwellings across an LGA in multiple buildings present a higher opex burden on CHPs (e.g., fixed and variable costs associated with site-to-site maintenance, management and travel, etc.).

Further considerations include issues of the broader market, including:

- **Current market conditions make redevelopment challenging.** Today's market conditions are characterised by a convergence of headwinds across multiple fronts: escalation in construction costs, increased cost of borrowing, diminished consumer purchasing power, as well as unrelenting expectations of land value. Construction costs since the pandemic have increased substantially (as discussed on page 52) due to, amongst other factors, major supply-chain disruptions and increased labour costs. Interest rate increases from central banks, in efforts to tame inflation, have resulted in higher borrowing costs for developers and producers. Higher interest rates have translated to higher cost of debt for borrowers, resulting in diminished consumer purchasing power. Compounding these difficulties are expectations of land value by landholders, which despite lower

[19] Randwick's approved AHCS for K2K was implemented initially at 3%, increasing to 5% 2 years later.

willingness to pay by either developers or purchasers, generally have not budged. Land values are often characterised as "sticky" or slow to move, reflective of land holders reticence to compromise perceived value based on previous market highs. Taken together, such conditions have created a set of significant challenges not only for the development industry by also for decision-makers (such as local and state government) engaged in longer-term, strategic efforts such as these. As such, this report provides also a view to viability using projections of market conditions to illustrate when if not now might viability of a strategic effort such as the establishment of an AHCS be supportable.

- Housing SEPP reforms are likely to be adopted by proponents. Under Part 2 of the Housing SEPP, a development may increase FSR and height by up to 30%, if 15% of the total development is provided as affordable housing for 15 years. It should be noted that the Housing SEPP provision is sought in addition to any AHCS under a Council's LEP. As examined by SGS's (see Appendix A), the AHCS implies a contribution made in perpetuity, which means that the RLV is negatively impacted. By contrast, the Housing SEPP, which only requires floorspace to be affordable for 15 years, means that developers account for such floorspace differently in their RLV estimate. Because floorspace can be sold back into the market following the 15-year term, the present value of a future sales can be capitalised into the RLV (increasing it). As such, analysis confirms that developers are likely to take advantage of the Housing SEPP provision to achieve greater density, even when accounting for the resulting increase to contributions under Council's AHCS.
- Housing SEPP poses additional challenges. Other challenges for strategic planning emerge, however, whereby Councils' ability to appropriately plan for, fund and maintain local and community infrastructure, including roads, libraries, parks, etc is likely to be impacted. In general, Council should be careful to structure local pathways to providing affordable housing contributions that fall in line with broader strategic planning and public infrastructure funding and financing targets.

Disclaimer: The modelling in this study has been undertaken to test viability of supportable affordable housing contribution rates at varying degrees of the contribution rate and with varying degrees of uplift, as guided by the required methodologies, inputs and assumptions in NSW Guideline for Developing an Affordable Housing Contribution Scheme.

Inputs and assumptions relevant to costs and revenues for each development program, such as site dimensions, specific floor area, unit sizes and mixes, demolition costs, hard and soft construction costs, as well as sales price points and lease rates, have been applied to redevelopment sites representative of the selected areas of uplift.

Sites that are developed in future, including the identification of a site-specific development program, construction costs, lease rates or sales prices, as well as specific EUVs, for example, may result in findings different from those modelled for this study.

Appendix A: Housing SEPP Reform Testing

As a variation to the original contract, SGS Economics and Planning was commissioned by Woollahra Municipal Council to conduct analysis for the Edgecliff Commercial Centre of the supportability of an Affordable Housing Contribution Scheme as well as the provisions of the Housing SEPP reforms introduced in December 2023. The following provides background, methodology, use of inputs and assumptions to the analysis, as well as the findings and implications.

Introduction

Objectives

SGS Economics and Planning (SGS) was commissioned by Woollahra Municipal Council (Council) to provide analysis for the potential implementation of an Affordable Housing Contribution Scheme (AHCS) in the Edgecliff Commercial Centre, under the current NSW Guideline for Developing an Affordable Housing Contribution Scheme.

SGS undertook further analysis considering the impact of the in-fill affordable housing reforms which were implemented in December 2023[20]. The reforms to the Housing SEPP provide an additional 20-30% FSR and height to a proposal, over existing EPI controls, to proposals which provide 10-15% of the gross floor area as affordable housing for a term of 15 years. As such, Council requested that SGS test further the viability implications of this bonus provision in the Edgecliff Commercial Centre.

Nine sites which are proposed to undergo rezoning in the Edgecliff Commercial Centre were modelled, as shown in Figure 27 and Table 44 overleaf.

Structure of this memo

This memo comprises four parts:

- This introduction
- An overview of the methodology of analyses undertaken and key assumptions made
- Full details of the results of the analyses
- A conclusion and summary of findings

[20] In-fill affordable housing, NSW Government, 2023, via https://www.planning.nsw.gov.au/policy-and-legislation/housing/housing-sepp/in-fill-affordable-housing

FIGURE 27: EDGECLIFF COMMERCIAL CENTRE SITES ANALYSED



Source: Woollahra Municipal Council (2024)

TABLE 44: SITES ANALYSED

Site name	Area (Sqm)	Current LEP FSR	Current built form FSR	Proposed FSR tested
A	1,206	1.50	2.13	2.60
AA, AB	260	1.50	1.52	4.50
B	2,508	2.00	2.19	4.60
C	1,135	2.50	3.41	5.10
D	1,023	2.50	2.06	5.10
E	1,064	2.90	2.11	2.80
F	1,746	1.50	0.89	5.00
G	1,227	2.00	2.31	4.70
H	5,856	2.50	2.31	7.50

Source: SGS Economics and Planning via Woollahra Municipal Council (2024)

Methodology

Several analyses were undertaken to achieve the objectives of the modelling. These were all forms of residual land value (RLV) modelling. Details of the method and assumptions are provided in this section.

RLV Methodology

RLV modelling seeks to determine the viability of redevelopment by determining the underlying value of a development site by subtracting all development costs from the gross realisable value (GRV) of the proposed built form. The residual is considered to be the maximum that a developer would pay to acquire the site. Where the RLV is greater than the existing value of the site, the site could be purchased for and undergo redevelopment. The analysis required the following key inputs:

- Site characteristics – built form outcomes of proposed development typologies. These were provided by Council.
- Development costs – including hard costs (e.g., building), soft costs (e.g., professional fees, legal, financing, contingency, etc.), and fees and charges (e.g., stamp duty, GST, SSDA fees, 7.11/12 fees, etc.). These were taken from relevant sources including Rawlinsons Construction Cost Guide, Council, and State Government agencies.

  Affordable housing contributions are a form of fee on development, and are included in this item.
- Development margin and risk – an estimate of the minimum margin a developer would seek in developing such a project that is adjusted for the various risks associated with such development (e.g., timing, land cost, construction cost, market, environment, etc.).
- Realisable values – a method to derive the end value of the proposed development. These were developed from sales evidence provided by M3 Property.
- Existing use value – a method to derive the current market value of a site, considering the existing built form and statutory controls. These were developed from sales evidence provided by M3 Property.

Modelling Affordable Housing Contributions

There are two forms of affordable housing contributions modelled. A few of SGS's critical assumptions are provided in this section, particularly relevant to the unique model of the recent Housing SEPP reforms introduced.

AHCS under the existing Guideline

Under the current provisions of an AHCS, either dwellings can be provided (in-kind) by the developer or a monetary contribution can be made. In-kind contributions are made in perpetuity, with the required units to be titled over to the Council, or a nominated community housing provider. Such dwellings provide no revenue to a developer, and are modelled as such. Alternatively, an in-lieu payment (monetary contribution) can be made. Standard practice for implementing such a form of the AHCS, as evidenced by Willoughby, Randwick, and Sydney, the monetary contribution is benchmarked to the median strata sales price per square metre, as reported by the Department of Communities and Justice using Valuer General NSW data. For Councils considering such options, it is important to recognise that the median strata sales price is often significantly lower than the monetary value of a new dwelling being sold in a development.[21] As such, developers seeking to comply with the provisions of a local AHCS are incentivised to provide monetary contributions because they do not impact the development's economics as substantially.

Contributions under the Housing SEPP reforms

Under the provisions of the recent Housing SEPP reforms, affordable housing contributions made are only required to be "affordable", as defined by statutory provisions, for a period of 15 years, after which they may be sold or rented as market-rate housing. In modelling this unique affordable housing model, SGS applied the following key assumptions: 1) 30% bonus density; 2) a discount rate of 7% was used across the period of 15 years; 7% is an approximation of the standard business return and it is also the standard discount rate applied to government capital investment as evaluated in a Strategic Business Case, for example; 3) SGS did not escalate sales prices over the 15 years, as the dwellings at that point in time would no longer be regarded as new or off-the-plan, warranting premium price points. Furthermore, SGS considered the operational structures of typical affordable housing models, and decided to exclude rental revenues from the viability modelling. Affordable housing operates with insufficient rental revenues to cover all operational expenditures, which include management and maintenance as well as debt service on project financing. In a typical operational model, availability payments (such as the HAFF) from either the state or federal government would be needed to bring a project into viability.

[21] The median strata price is typically used because it is a readily available rate which does not require the individual valuation of developments.

Time series modelling

SGS also considered the supportability of affordable housing contributions in the future. The RLV modelling tests each site's development program under the assumption that costs and realisable values escalate over time, where realisable values typically escalate faster than costs. As such, the outputs illustrate *when* an affordable housing contribution may become viable (in number of years). Specifically, the modelling estimates when the RLV exceeds or is at least equal to the EUV, i.e., the point at which the contribution(s) become viable. In this modelling, SGS specifically tested realisable values increasing at a rate 2% higher per annum than costs.

Overview of outputs

Outputs are expressed for various metrics which provide important context for the viability environment of the Edgecliff Commercial Centre under various scenarios and a changing regulatory setting. Accordingly, the outputs of the modelling provide representations of a comparison between the existing use value (EUV) and the RLV of the proposed built form, with affordable housing contributions of up to 10%, as well as with additional FSR uplift of up to 1.25:1.

Four scenarios are modelled:

1. In-kind contributions, no Housing SEPP
2. Monetary contribution, no Housing SEPP
3. In-kind contributions, with Housing SEPP
4. Monetary contributions, with Housing SEPP

Furthermore, as noted in the previous section regarding time-series modelling, SGS modelled the supportability of Scenario 1 over time (not all scenarios).

Details of findings

All findings are shown in a tabular format, as the result of RLV, less the existing use value (EUV), on a per square metre of site basis. This indicates the *viability* of redevelopment. The colour ramp moves from red (where values are negative) to green (where values are positive).

Baseline development viability

The following results illustrate the difference between the EUV and RLV of baseline redevelopment for each site. The purpose of estimating viability for baseline redevelopment without an affordable housing contribution is to illustrate that with current market characteristics, not all of the sites are viable. Specifically, Table 45 illustrates the difference between RLV and EUV for the nominated sites without an affordable housing contribution. The results are presented with additional FSR uplift (in increments of 0.25:1, up to an additional 1.25:1 of FSR) to illustrate whether and at what point of uplift sites do become viable in baseline redevelopment.

For example, for Site A, the proposed development would be viable, if an additional 1:1 FSR were applied to the site. There are also points in the modelling which illustrate a change in costs – as taller

buildings cost more to construct, where a building tips into a higher construction bracket, viability is negatively affected – as illustrated in Site H, where the change from an additional 0.25:1 of FSR to 0.5:1 FSR results in a lower RLV than under the proposed FSR (without uplift).

TABLE 45: BASELINE (NO AHCS) VIABILITY RESULTS WITH ADDITIONAL UPLIFT

Site	Proposed FSR	Proposed + 0.25 FSR	Proposed + 0.5 FSR	Proposed + 0.75 FSR	Proposed + 1 FSR	Proposed + 1.25 FSR
A	-$7,095	-$5,071	-$3,048	-$894	$1,053	$2,939
AA, AB	$4,559	$5,996	$7,990	$9,827	$11,665	$13,673
B	-$18,157	-$16,136	-$14,159	-$12,137	-$10,161	-$8,139
C	-$11,912	-$9,976	-$7,939	-$6,003	-$4,023	-$1,987
D	-$3,471	-$1,449	$468	$2,364	$4,115	$5,910
E	-$20,928	-$18,932	-$16,788	-$14,793	-$12,649	-$10,653
F	$7,633	$9,651	$11,670	$13,689	$15,707	$17,726
G	-$3,439	-$1,252	$945	$2,958	$4,970	$7,067
H	$8,973	$10,864	$5,248	$7,121	$9,012	$10,902

Source: SGS Economics and Planning (2024)

In-kind contribution, no Housing SEPP reform

Table 46 shows viability results for each site with a 3%, 5%, and 10% affordable housing contribution. Sites showing positive values (highlighted in a shade of green) are those for which an affordable housing contribution is viable. Sites showing negative values (highlighted in a shade of red) are those for which an affordable housing contribution is not viable. The results presented here also indicate (if relevant at all) whether and what extent of additional uplift would be required for viability to be achieved.[22] The results demonstrate two things:

1. Where sites are viable at the baseline, they are *also* viable with a 5% contribution. This reflects the fact that such sites are proposed to be granted significant uplift.
2. Where sites are not viable at the baseline, they require progressively more uplift to also provide contributions. This is because they are closer to the so-called 'tipping point' of viability.

TABLE 46: VIABILITY RESULTS WITH AN IN-KIND CONTRIBUTION AND NO HOUSING SEPP REFORM

Site	Baseline FSR, no AHC	Uplift req'd for viability	3% AHC	Uplift req'd for viability	5% AHC	Uplift req'd for viability	10% AHC	Uplift req'd for viability
A	-$7,095	+ 1 FSR	-$8,475	+ 1.25 FSR	-$9,395	Not viable	-$11,695	Not viable
AA, AB	$4,559		$2,864		$1,734		-$1,186	+ 0.5 FSR
B	-$18,157	Not viable	-$20,368	Not viable	-$21,841	Not viable	-$25,525	Not viable
C	-$11,912	Not viable	-$14,207	Not viable	-$15,737	Not viable	-$19,561	Not viable
D	-$3,471	+ 0.5 FSR	-$5,617	+ 1 FSR	-$7,049	+ 1.25 FSR	-$10,626	Not viable
E	-$20,928	Not viable	-$22,749	Not viable	-$23,964	Not viable	-$27,000	Not viable
F	$7,633		$5,242		$3,648		-$368	+ 0.25 FSR
G	-$3,439	+ 0.5 FSR	-$6,766	+ 1 FSR	-$8,984	+ 1.25 FSR	-$14,528	Not viable
H	$8,973		$5,761		$3,620		-$1,934	Not viable

Source: SGS Economics and Planning (2024)

[22] If the uplift required to achieve viability exceeds 1.25 FSR above the proposed FSR, SGS does not report the finding.

In-lieu contribution, no Housing SEPP reform

Table 47 illustrates the viability results for each site with the monetary affordable housing contributions. As for the reported results above, sites showing positive values (highlighted in a shade of green) are those for which a monetary contribution is viable, whereas sites showing negative values (highlighted in a shade of red) are those for which a monetary contribution is not viable.

The results of the analysis indicate that the monetary affordable housing contributions are more viable than the in-kind contributions. For instance, a 10% contribution for Site AA, AB, Site F, and Site H is viable as a monetary contribution, but not as an in-kind contribution (as shown in section 0). Further, the uplift required for viability is less for a monetary contribution than an in-kind contribution – this is shown best in the outputs for Site D and Site G.

Note that the baseline outputs for the monetary contribution are identical to the in-kind contributions, as the baseline does not include a contribution.

TABLE 47: VIABILITY RESULTS WITH AN IN-LIEU CONTRIBUTION AND NO HOUSING SEPP REFORM

Site	Baseline FSR, no AHC	Uplift req'd for viability	3% AHC	Uplift req'd for viability	5% AHC	Uplift req'd for viability	10% AHC	Uplift req'd for viability
A	-$7,095	+ 1 FSR	-$8,392	+ 1.25 FSR	-$9,258	Not viable	-$11,420	Not viable
AA, AB	$4,559		$2,965		$1,903		-$819	
B	-$18,157	Not viable	-$20,236	Not viable	-$21,621	Not viable	-$25,085	Not viable
C	-$11,912	Not viable	-$14,070	Not viable	-$15,509	Not viable	-$19,105	Not viable
D	-$3,471	+ 0.5 FSR	-$5,489	+ 0.75 FSR	-$6,835	+ 1.25 FSR	-$10,200	Not viable
E	-$20,928	Not viable	-$22,641	Not viable	-$23,782	Not viable	-$26,637	Not viable
F	$7,633		$5,500		$4,078		$524	
G	-$3,439	+ 0.5 FSR	-$6,407	+ 1 FSR	-$8,385	+ 1.25 FSR	-$13,331	Not viable
H	$8,973		$6,107		$4,196		-$647	+ 0.25 FSR

Source: SGS Economics and Planning (2024)

In-kind contribution, with Housing SEPP reform

Table 48 illustrates the viability results for modelling of a supportable affordable housing contribution, as well as the provisions of the reforms to the Housing SEPP. As described earlier, SGS modelled the provisions of the Housing SEPP reform to include a 30% increase in FSR, 15% of the GFA provided as affordable housing for 15 years.

The findings suggest overall that viability is, overall, more positive in terms of the difference between the EUV and RLV across the tested sites. It should be noted that the bonus density for Site H, for example, pushes the height into a typology of building with higher construction costs – as such, the difference between EUV and RLV declines.

TABLE 48: VIABILITY RESULTS WITH AN IN-KIND CONTRIBUTION AND HOUSING SEPP REFORM

Site	Baseline FSR, no AHC	Uplift req'd for viability	3% AHC	Uplift req'd for viability	5% AHC	Uplift req'd for viability	10% AHC	Uplift req'd for viability
A	-$5,000	+ 0.75 FSR	-$6,969	+ 1 FSR	-$8,282	+ 1.25 FSR	-$11,563	Not viable
AA, AB	$8,850		$6,210		$4,451		$52	
B	-$14,160	Not viable	-$17,423	Not viable	-$19,598	Not viable	-$25,036	Not viable
C	-$7,147	+ 1 FSR	-$10,613	Not viable	-$12,923	Not viable	-$18,698	Not viable
D	$1,516		-$1,661	+ 0.25 FSR	-$3,872	+ 0.75 FSR	-$9,398	Not viable
E	-$19,430	Not viable	-$21,890	Not viable	-$23,529	Not viable	-$27,628	Not viable
F	$12,275		$8,777		$6,445		$616	
G	-$561	+ 0.25 FSR	-$5,027	+ 0.75 FSR	-$8,005	+ 1.25 FSR	-$15,449	Not viable
H	$8,389		$3,519		$273		-$8,749	Not viable

Source: SGS Economics and Planning (2024)

In-lieu contribution, with Housing SEPP reform

Table 49 illustrates the viability results for modelling of an affordable housing monetary contribution, as well as the provisions of the reforms to the Housing SEPP As with the findings discussed previously, the in-lieu contribution with the Housing SEPP reform improves viability by comparison to the results of modelling the in-kind contributions.

TABLE 49: VIABILITY RESULTS WITH AN IN-LIEU CONTRIBUTION AND HOUSING SEPP REFORM

Site	Baseline FSR, no AHC	Uplift req'd for viability	3% AHC	Uplift req'd for viability	5% AHC	Uplift req'd for viability	10% AHC	Uplift req'd for viability
A	-$5,000	+ 0.75 FSR	-$6,853	+ 1 FSR	-$8,088	+ 1.25 FSR	-$11,175	Not viable
AA, AB	$8,850		$6,366		$4,711		$572	
B	-$14,160	Not viable	-$17,230	Not viable	-$19,277	Not viable	-$24,394	Not viable
C	-$7,147	+ 1 FSR	-$10,408	Not viable	-$12,582	Not viable	-$18,017	Not viable
D	$1,516		-$1,466	+ 0.25 FSR	-$3,546	+ 0.75 FSR	-$8,745	Not viable
E	-$19,430	Not viable	-$21,744	Not viable	-$23,287	Not viable	-$27,144	Not viable
F	$12,275		$9,150		$7,068		$1,861	
G	-$561	+ 0.25 FSR	-$4,550	+ 0.75 FSR	-$7,210	+ 1 FSR	-$13,859	Not viable
H	$8,389		$4,038		$1,137		-$6,820	+ 1.25 FSR

Source: SGS Economics and Planning (2024)

Timing considerations

Table 50 illustrates the results of modelling a redevelopment scenario including only the supportable affordable housing contribution, but not including the provisions of the Housing SEPP reforms. As discussed previously, this modelling assumes that realisable values escalate 2% faster than construction costs over time and examines at what point (in number of years) the RLV is equal to or greater than the EUV – the point at which the affordable housing contribution becomes viable.

This type of modelling is important for strategic work and especially in the context of current market conditions, in which even baseline redevelopment is not viable given high construction costs. As such, for strategic planning purposes, the model findings provide some guidance as to whether the sites selected are viable within the realm of a reasonable timeframe (such as 10 years) for build-out of the sites within the Edgecliff Commercial Centre. The modelling shows that:

- Viable redevelopment with a 3% in-kind contribution within 10 years: all sites
- Viable redevelopment with a 5% in-kind contribution within 10 years: all sites except Site E
- Viable redevelopment with a 10% in-kind contribution within 10 years: all sites except Site E

TABLE 50: VIABILITY TIMING ANALYSIS RESULTS

Site	Baseline Redevelopment	w/ 3% AHC	w/ 5% AHC	w/ 10% AHC
A	3.0 years	3.9 years	4.6 years	6.4 years
AA, AB	-	-	-	< 1 year
B	5.2 years	6.3 years	7.0 years	9.1 years
C	2.9 years	3.8 years	4.4 years	6.2 years
D	< 1 year	1.0 years	1.6 years	3.1 years
E	8.4 years	9.7 years	10.6 years	13.4 years
F	-	-	-	< 1 year
G	0.1 years	1.0 years	1.7 years	3.7 years
H	-	-	-	< 1 year

Source: SGS Economics and Planning (2024)

Conclusions

A summary of the findings of the analysis is shown in Table 51, Table 52, and Table 53 below and overleaf, which summarise the analysis of 3%, 5%, and 10% contributions for each scenario of in-kind or in-lieu, and with and without the Housing SEPP reforms. These summaries show that:

- Generally, in-lieu or monetary contributions are more viable than in-kind contributions. This is due to the calculation method applied to determine those contributions. Changes to this method could be explored in future.
- The Housing SEPP reforms, which add a 15% affordable housing requirement for 15 years, also result in increased viability. This indicates that this is likely to be taken up by proponents. A further implication of this finding is that, as this requirement is in addition to any AHCS in place, the adoption of these reforms into development proposals would increase the contributions under the AHCS by 30%.
- Considering individual sites analysed, two sites exhibit significant unviability and are considered unlikely to be developed under the current proposed FSRs in the current market. However, there are three sites which are indicatively viable with a 5% contribution, and the viability timing analysis in the previous section indicated that four further sites would be viable within 5 years with a 5% contribution.

TABLE 51: 3% CONTRIBUTION COMPARISON

Site	BASELINE IN KIND	BASELINE IN LIEU	HOUSING SEPP REFORM IN KIND	HOUSING SEPP REFORM IN LIEU
A	-$8,475	-$8,392	-$6,969	-$6,853
AA, AB	$2,864	$2,965	$6,210	$6,366
B	-$20,368	-$20,236	-$17,423	-$17,230
C	-$14,207	-$14,070	-$10,613	-$10,408
D	-$5,617	-$5,489	-$1,661	-$1,466
E	-$22,749	-$22,641	-$21,890	-$21,744
F	$5,242	$5,500	$8,777	$9,150
G	-$6,766	-$6,407	-$5,027	-$4,550
H	$5,761	$6,107	$3,519	$4,038

Source: SGS Economics and Planning (2024)

TABLE 52: 5% CONTRIBUTION COMPARISON

Site	BASELINE IN KIND	BASELINE IN LIEU	HOUSING SEPP REFORM IN KIND	HOUSING SEPP REFORM IN LIEU
A	-$9,395	-$9,258	-$8,282	-$8,088
AA, AB	$1,734	$1,903	$4,451	$4,711
B	-$21,841	-$21,621	-$19,598	-$19,277
C	-$15,737	-$15,509	-$12,923	-$12,582
D	-$7,049	-$6,835	-$3,872	-$3,546
E	-$23,964	-$23,782	-$23,529	-$23,287
F	$3,648	$4,078	$6,445	$7,068
G	-$8,984	-$8,385	-$8,005	-$7,210
H	$3,620	$4,196	$273	$1,137

Source: SGS Economics and Planning (2024)

TABLE 53: 10% CONTRIBUTION COMPARISON

Site	BASELINE IN KIND	BASELINE IN LIEU	HOUSING SEPP REFORM IN KIND	HOUSING SEPP REFORM IN LIEU
A	-$11,695	-$11,420	-$11,563	-$11,175
AA, AB	-$1,186	-$819	$52	$572
B	-$25,525	-$25,085	-$25,036	-$24,394
C	-$19,561	-$19,105	-$18,698	-$18,017
D	-$10,626	-$10,200	-$9,398	-$8,745
E	-$27,000	-$26,637	-$27,628	-$27,144
F	-$368	$524	$616	$1,861
G	-$14,528	-$13,331	-$15,449	-$13,859
H	-$1,934	-$647	-$8,749	-$6,820

Source: SGS Economics and Planning (2024)

CANBERRA / NGAMBRI / NGUNNAWAL / NGARIGO

Level 2, 28-36 Ainslie Avenue
Canberra ACT 2601
+61 2 6257 4525
sgsact@sgsep.com.au

HOBART / NIPALUNA

PO Box 123
Franklin TAS 7113
+61 421 372 940
sgstas@sgsep.com.au

MELBOURNE / NAARM

Level 14, 222 Exhibition Street
Melbourne VIC 3000
+61 3 8616 0331
sgsvic@sgsep.com.au

SYDNEY / WARRANG

Suite 2.01/50 Holt Street
Surry Hills NSW 2010
+61 2 8307 0121
sgsnsw@sgsep.com.au

SGS Economics & Planning

Certified B Corporation

Item No: 6.2
Subject: **CROSS STREET CAR PARK REDEVELOPMENT PROJECT - NEXT STEPS**
Author: Richard Pearson, Development Manager
Tom O'Hanlon, Director Infrastructure & Sustainability
Approver: Tom O'Hanlon, Director Infrastructure & Sustainability
Sue Meekin, Director, Corporate Performance

Purpose of the Report:

The report responds to a Council resolution of 29 April 2024 and proposes a way forward for the redevelopment of the Cross Street Carpark site in Double Bay.

Alignment to Delivery Program:

9.1 Collaborating to achieve positive outcomes in our local centres which are hubs for jobs, shopping, dining and entertainment.

Recommendation:

THAT:

A. Note that the Woollahra Council owned Cross Street Car Park in Double Bay (constructed in the 1970s), is now reaching the end of its useful asset life, noting the previously commissioned independent engineering advice from Altus Group (January 2022) confirming this.
B. Note the report titled Cross Street Car Park Planning and Development Feasibility Study December 2024 by HillPDA (as commissioned by Council), included at Confidential Attachment 1 to this report.
C. Note the advice from Douglas Partners at Attachment 3 to this report regarding the feasibility of complying with Council's planning controls regarding groundwater drawdown from basement car park construction.
D. Note that Options 1 (Affordable High) & 5 (Council Do it Yourself) in the HillPDA report referred to in Part B above, are not considered feasible, nor is a 'retention' scenario and therefore, Options 1, 5 and a 'retention' scenario will not be subject to community engagement as referred to in Part E below.
E. Adopt, for the purpose of community engagement, Options 2A (Market Residential Max), 2B (Market Residential Max – no cinema), 3 (Market Residential) & 4 (SEPP Bonus/SSDA) as included in the HillPDA report referred to in Part B above, with the following steps then to be undertaken;

    1. Following community engagement on the endorsed development options, a further report will be tabled at a future Council meeting, detailing community feedback on the exhibited options and recommending one or more options for inclusion in an EOI process.
    2. Further to a Council resolution on preferred options (as per E.1), staff will make a submission to the NSW Office of Local Government (OLG) seeking endorsement to proceed to call for Expressions of Interest to enter into a Private Public Partnership (PPP) to redevelop the site.

F. Endorse the community consultation process for this project as included in this report.

Executive Summary:

This report summarises the outcomes of independent feasibility analysis commissioned in response to the potential redevelopment of the Cross Street car park site in Double Bay.

The advice concludes that a number of options for redevelopment of the site are feasible at a height of 7-8 storeys and consistent with the site's FSR control of 2.5:1, together with five basement levels of car parking. Redevelopment will deliver public benefits of a new 406 space public car park, new Early Childhood Health Centre (ECHC), affordable housing units and new cinema, along with substantial Development Rights Payment (DRP) Council.

Advice has also been commissioned on the ability of a five-level basement to comply with Council's groundwater planning controls, which concludes that this is feasible subject to appropriate engineering advice and construction methodology.

It is recommended that Council conduct a new EOI process and that the HillPDA report be used to guide that process.

It is recommended that the HillPDA report (redacted) and Douglas Partners report be included in the community information/comment.

The report includes an indicative timeline for delivery of the project and notes that, following community consultation and a new EOI process, a contract could be signed in November 2026, with the first tranche of a DRP to be received at that time.

Discussion:

The Cross Street car park in Double Bay was constructed in the 1970s and is now at the end of its useful life. Council has previously commissioned independent engineering advice which confirms this and that expenditure of in excess of $46M (escalated to 2028) would be required to prolong the life of the car park for an additional period of 25 years.

The report prepared by Altus Group in January 2022, is included as Attachment 4 to this report and which has been publicly available via Council's website since April 2022, makes the following observation (see Executive Summary at p3).

The report looked at the existing condition and remaining service life assessment of the carpark and was completed based on specialist consultant input and investigations. As advised by Taylor Thompson Whitting (TTW) the future expectancy of the carpark could potentially be extended however this would require significant major upgrade works to the building structure, facade, compliance upgrade, ongoing remediation, overloading provision for future vehicles and the implementation of an ongoing maintenance regime and monitoring of structure. As reported by TTW in its remedial repair strategies dated 7 December 2021, a maximum 25 years for the future use expectancy of the carpark was discussed with Council. However, it is also anticipated that the ongoing remediation works to maintain the carpark over a 25-year period would be significantly costly and higher than a new carpark.

The report includes a detailed cost breakdown for required works (see pages 8 & 257). The cost estimate at January 2022 was between $31 and $33m. Noting significant cost escalation on other construction projects in recent years, staff asked the Altus Group to provide an updated estimate. The estimated cost as at November 2024 was $40m. With further escalation to a likely construction time in 2028, the cost would be in the order of $46-47m. This is not considered a prudent use of Council's limited finances and this option cannot reasonably be recommended.

Council has on two previous occasions conducted expressions of interest to redevelop the site with a private sector partner, however on both occasions the redevelopment proposal ultimately did not proceed.

As a result of this, Council on 29 April 2024 resolved that a report be prepared for Council which includes but not limited to consideration of:

i. *The most appropriate and feasible redevelopment options for the site, having regard to Council's strategic planning and recent and emerging changes to the NSW planning system, particularly relating to the provision of affordable housing and how affordable housing may be funded.*
ii. *The merits of undertaking a Council-led site-specific planning proposal.*
iii. *A future community consultation process.*

This report responds to Council's resolution. Independent advice was also commissioned regarding the ability to comply with Council's planning controls for groundwater drawdown from basement.

Redevelopment Feasibility

In commissioning feasibility advice, Council staff specified a number of requirements based on Council's previous approach to any redevelopment of the site. These were:

Land ownership
- Council is to retain ownership of the site and all Council assets (car park, Early Childhood Health Centre, cinema). Note that following discussion with HillPDA it was agreed that Council would not need to own the cinema, with a 20 year leasehold basis being the most optimal delivery option.
- All other components (residential, retail, commercial) are likely to be subject to 99-year leasehold stratums.

Land uses
- Replacement of existing car park (in full) and new modern Early Childhood Health Centre.
- Additional DCP-compliant car parking for other proposed uses.
- Council has historically sought to include a cinema in any redevelopment. The viability of any cinema use is to be specifically addressed.
- Substantial affordable housing component to be included.
- High quality on-site public domain, including opportunity for through-site east-west link.
- Minimisation of impacts on water table consistent with Council's DCP controls to be addressed.

Town planning
- Height and density should have regard to the substantial public benefits proposed to be included as above.
- Merits of Council-led site specific Planning Proposal to be addressed.
- Advice to be provided regarding what could be achieved under Housing SEPP affordable housing bonus provisions without the need for a planning proposal and its feasibility.

Financial offer
- Council is seeking to redevelop the site at no cost or with Development Rights payment to Council for use of the site.

Council appointed HillPDA to provide feasibility advice and this is contained in the report at Confidential Attachment 1. The full report has been included as Confidential having regard to the Local Government Act 1993 *Section 10A(2)(c) The report contains information that would, if disclosed, confer a commercial advantage on a person with whom the council is conducting (or proposes to conduct) business.* However, a redacted version of this report to remove the commercial information has been included as Attachment 2.

The HillPDA report reviewed six potential redevelopment options for the site as summarised in Table 1 below.

Description	Option 1: High Affordable Mix	Option 2a: Market Residential Max	Option 2b: Market Residential Max – no cinema	Option 3: Market Residential	Option 4: SEPP Bonus/SSDA	Option 5: Council DIY
Levels	9 Levels	8 Levels	8 Levels	7 Levels	7 Levels	6 Levels
FSR	2.64:1	2.48:1	2.48:1	2.36:1	2.36:1	4.64:1
Total GFA	9,965sqm	9,331sqm	9,331sqm	8,902sqm	8,902sqm	4,146sqm
Residential Market GFA	4,277sqm (60%)	6,484sqm (90%)	6,484sqm (90%)	6,099sqm (90%)	5,760sqm (85%)	0sqm (0%)
Residential Affordable GFA	2,743sqm (40%)	720sqm (10%)	720sqm (10%)	678sqm (10%)	1,016sqm (15%)	0sqm (0%)
ECHC GFA	219sqm	219sqm	219sqm	219sqm	219sqm	219sqm
Commercial GFA	600sqm	0sqm	0sqm	0sqm	0sqm	652sqm
Cinema GFA	1,341sqm	1,341sqm	0sqm	1,341sqm	1,341sqm	2,404sqm
Retail GFA	785sqm	566sqm	1,907sqm	566sqm	566sqm	871sqm
Total Council Car Parking Reinstated	**406**	**406**	**406**	**406**	**406**	**406**

Table 1 – Redevelopment options analysed

All options analysed would deliver Council a new 406 space public car park, a new early childhood health centre and (with the exception of Option 2b) a new cinema. All options except the Council DIY option would also deliver affordable housing units to Council in perpetuity.

With regard to each of the options, the HillPDA report concludes:

- Option 2b is the most financially viable option, delivering a substantial Develop Rights Payment (DRP) to Council. Note this option does not include a cinema and was included on the basis that another developer in Double Bay is considering the inclusion of a cinema. **Note that in the interests of Council achieving the best possible return in a future EOI process, the estimate of DRP of this option will not be publicly disclosed. The relationship between the DRP of this option and other options will be disclosed to inform community discussion.**
- Option 2a is financially viable and would deliver a substantial DRP to Council, albeit at approximately $19m less than that estimated for a DRP under on 2b.
- Option 3 is financially viable and would deliver a DRP to Council, albeit approximately $31M less than Option 2b.
- Option 4 is financially viable but would deliver a DRP to Council of approximately $40M less than Option 2b. The main advantage of this option is that it would not require a Planning Proposal as it could be implemented through the Housing SEPP affordable housing bonus provisions, saving considerable upfront planning time.
- Option 1 is not financially viable as it would deliver a negative Internal Rate of Return and no DRP to Council.

The Council DIY option (Option 5) would require Council to fund construction costs of $108M, a substantial undertaking that is not considered to be feasible.

Feasibility Implications

The work completed by HillPDA enables Council to be more confident that redevelopment of the

site is feasible – and that it can deliver important Council assets on the site, as well as substantial funds to commit to other Council projects. It will also be very useful in interrogating bids submitted through a new EOI process. Council may also be able to issue a more prescriptive EOI tender document, including the following requirements:

- Project to deliver new 406 space basement public car park and new ECHC.
- Car parking for other uses to be DCP-compliant and/or planning justification for any variations.
- Height to be limited to 7-8 storeys and any variation to current FSR of 2.5:1 to be minimised.
- New cinema to be provided on 20 year leasehold basis.
- All other non-Council assets to be subject to 99 year leasehold status.
- Minimum 10% affordable housing to be provided and granted to Council in perpetuity.
- Substantial Development Rights Payment to Council.
- New east-west pedestrian link to be provided on the site.
- Basement construction to ensure compliance with Council's DCP in relation to groundwater drawdown.

Planning Pathway

Council's resolution also required consideration of whether Council should undertake a Planning Proposal itself for the site, rather than leaving this responsibility with the successful bidder. It is understood the basis for this was to deliver a more certain planning environment for the EOI process.

It is clear that any successful redevelopment of the site will require an increase in height from the current 5 storeys permitted, given the substantial public benefits which need to be delivered, including a 406 space public car park, ECHC, affordable housing and new cinema.

The advice from HillPDA notes that Council could itself undertake the task of changing the planning controls for the site, however a future developer may seek to make further changes to the statutory planning environment, the substantial number of studies and cost involved, as well as the time that would be required to put new planning controls in place are factors against Council doing the work proactively. The Housing SEPP also provides scope to redevelop the site without need for a Planning Proposal and this was the basis of Option 4 considered by HillPDA. It should be noted, however, that while this was the most efficient option from a planning pathway perspective, it delivered the smallest financial return to Council of the feasible options.

On balance, it is not considered necessary for Council to undertake a Planning Proposal for the site itself, rather to indicate a preparedness to support a height of 7-8 storeys in the EOI prospectus.

Basement Construction

A critical issue for redevelopment of the site is the depth of basement construction required and the need to comply with Council's planning controls to limit groundwater drawdown during construction and potential impacts on adjacent properties. All feasible options modelled by HillPDA require a five-level basement or alternatively basement levels would need to be relocated above ground, resulting in additional building height, potentially up to 12-13 storeys if all car parking was located above ground.

Advice has been commissioned from Douglas Partners (Attachment 3) regarding the ability of a five-level basement to comply with Council's DCP control which requires a maximum temporary drawdown of groundwater level during construction of 0.2 metres. The advice confirms that this standard is indeed feasible for a five-level basement through the use of low-permeability shoring walls. The standard is more difficult to meet on the parts of the site which have bedrock located closer to the surface, however modelling by Douglas Partners indicates that even on these parts of the site the 0.2 m maximum drawdown standard can be met through decreasing the permeability of the shoring wall. Interestingly, the Douglas Partners report notes (page 13) reducing the number of

basement levels to say three has no beneficial effect on the level of groundwater drawdown which occurs compared to a five-level basement.

Community Engagement

Council's resolution of 29 April 2024 also requires consideration of a community consultation program for the Cross Street project.

On 16 December 2024, Council adopted a revised Community Engagement Strategy. As detailed in the Strategy, Council engages with the community to ensure that the decision-making process of Council reflects the whole community and in turn, this increases community confidence and trust in Council.

While noting that statutory consultation will occur as part of any future development approval process (e.g. Planning Proposal, Development Assessment), it is also proposed to undertake a community consultation process on development options prior prior to commencement of an EOI process. it is stressed however that any community consultation prior to embarking on a new EOI process needs to be very clear on what is and what is not negotiable. For example, there are a number of options in the HillPDA report which are not feasible, and nor is the option of retaining the existing car park. Community consultation will be limited to those options which are feasible.

It is recommended that both the HillPDA report (redacted version, noting earlier comments regarding confidentiality of DRP estimates) and the Douglas Partners report be included in the community comment/information, together with a brief Information Paper which outlines:

- The issues with the current Cross Street car park site/building.
- Potential benefits which may arise from redeveloping the site, such as revitalisation of the precinct, new public facilities and funds for Council to undertake other worthwhile community projects.
- Trade-offs to enable this to occur, including increased building height.
- A precis of feasible redevelopment options from the HillPDA report, including potentially the opportunity to nominate a preferred redevelopment option.
- An outline of a future EOI process, including ongoing information updates and further community consultation at statutory planning phases.

Indicative Development Timeline

The table below outlines an indicative timeline for development of the site, informed by programs developed for previous iterations of the scheme. It also indicates the likely timing of payment of tranches of development rights payments (DRP), again based on programs provided for previous iterations of the scheme.

Task	Duration	Period
Community engagement and further report	3 months	Mar - June 2025
OLG pre-EOI process for PPP	2 months	July - Aug 2025
EOI process and shortlist for Council approval	3 months	Sep - Dec 2025
Request for detailed proposal process and Council approval of development partner *	3 months (excl. January)	Feb - April 2026
Contract negotiation and preparation	5 months	May - Sep 2026
OLG pre-contract process and Council resolution to enter contract	2 months	**November 2026 (1st DRP)**
Planning Proposal Preparation and Assessment	18 months	May 2026 - **Nov 2027 (2nd DRP)**
Development Assessment Preparation and Assessment	24 months	May 2026 - April 2028

Construction	36 months	**June 2028** - May 2031 **(Final DRP)**

**EOI and RFDP process may be combined, if Council requirements for development are well defined*

Options:

Should Council not proceed with a new EOI process, it will need to undertake unfunded remedial work on the car park or else seek funds to undertake the DIY option.

Community Engagement and / or Internal Consultation:

No community engagement has been undertaken in compiling this report. A future community engagement program prior to a new EOI process is recommended in this report.

Policy Implications:

There are no policy implications as a result of this report.

Financial Implications:

Commercial and urban design advice will need to be sought through the EOI process at an estimated cost of $50,000.

Additional funding of $30,000 will be required to conduct the community engagement program.

Broader commentary on the financial implications of various development options are included under the heading Discussion above.

Resourcing Implications:

A dedicated internal resource will be allocated to ensure the smooth running of the community engagement and EOI processes and implementation of the outcome.

Conclusion:

In response to Council's resolution of 29 April 2024, independent advice has been commissioned on the feasibility of redeveloping the Cross Street car park site.

The advice concludes that a number of options for redevelopment of the site are feasible at a height of 7-8 storeys and consistent with the site's FSR control of 2.5:1, together with five basement levels of car parking. Redevelopment will deliver public benefits of a new 406 space public car park, new ECHC, affordable housing units and new cinema, along with substantial Development Rights Payment to Council.

On this basis, it is recommended Council move forward with a new EOI process for the site. Prior to this, it is recommended that community engagement occur to ensure that there is a shared understanding of the need to redevelop the site, as well as the feasible options.

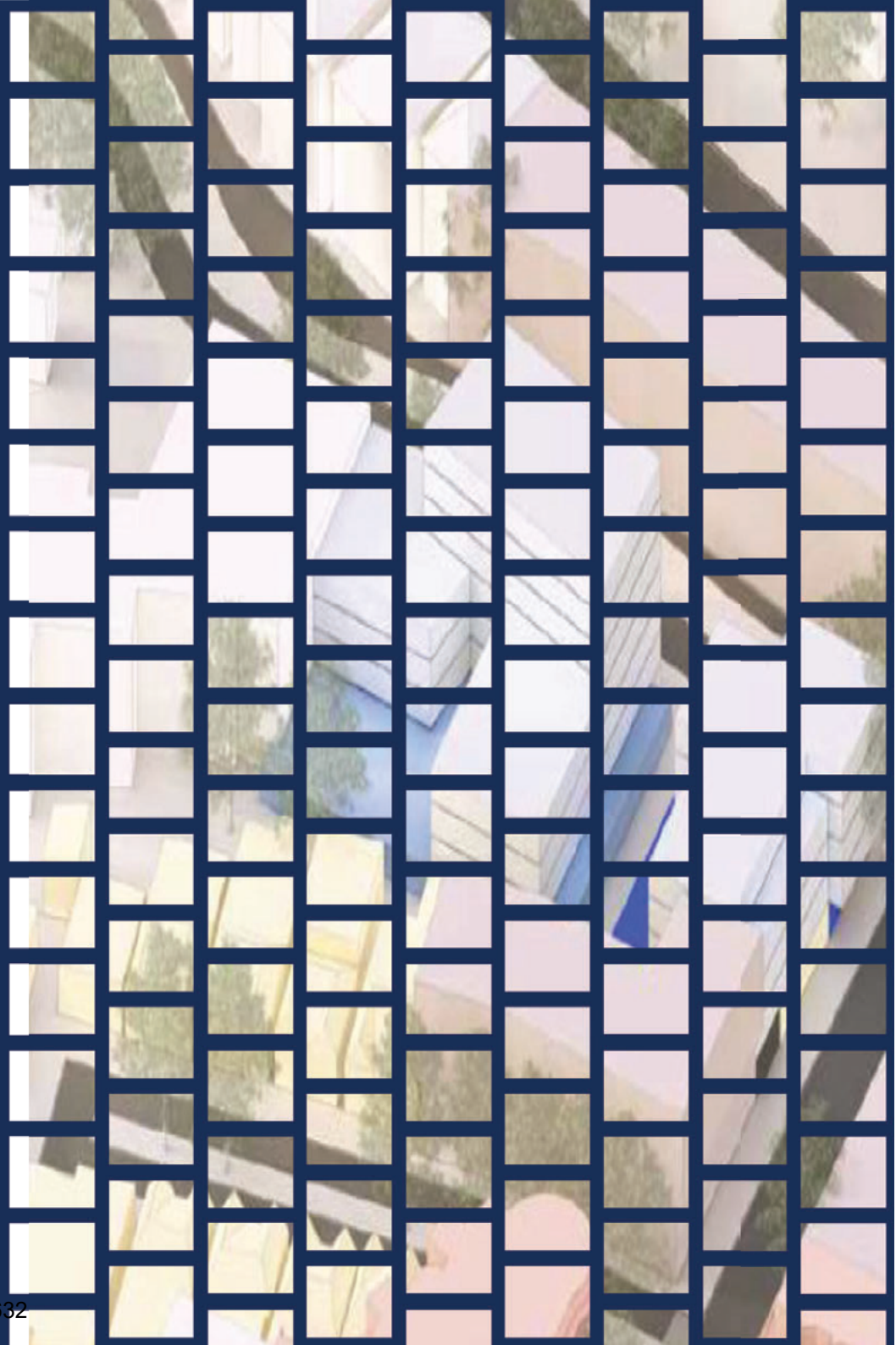
Attachments:

1. Woollahra Council Car Park Cross Street Updated Options - Final Report - prepared by HillPDA - January 2025 CONFIDENTIAL
2. Woollahra Council Car Park Cross Street Updated Options - Final Report - prepared by HillPDA REDACTED
3. Woollahra Council Car Park Cross Street - Preliminary Groundwater Drawdown Assessment - Douglas Partners REDACTED
4. Cross Street Car Park Redevelopment - Altus Condition and Remediation Report Version 2.3 - 31 January 2022 REDACTED

Cross Street Car Park

Planning and Development Feasibility Study

Prepared for Woollahra Council
December 2024



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Quality Assurance

Report contacts

Jenny Rudolph

Principal

B BSC Town and Regional Planning (University of Witwatersrand, South Africa),
Diploma in Project Management, Damelin College, South Africa,
Graduate of Australian Institute of Company Directors, Certificate (Distinction)
Executive Leadership Oxford University UK, RPIA, and Certificate in Engagement Essentials IAP2.

Jenny.Rudolph@hillpda.com

Virginia Phillips

Associate and Practice Manager

Adv Dip Val, Masters Property Development (UTS),VAL015544

Virginia.Phillips@hillpda.com

Supervisor

Martin Hill

Director

M.Real Estate (UNSW), M.Property Development (UTS), BSc (Hons), Certified Practicing Valuer (Unrestricted), FAPI, MRICS

Martin.Hill@hillpda.com

Quality control

This document is for discussion purposes only unless signed and dated by a Principal of HillPDA.

Reviewer

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Date issued	January 2025

EXECUTIVE SUMMARY

The current structure of the Cross Street car park is nearing the end of its useful life and will require substantial repairs and upgrades. The Woollahra Council has reviewed the potential redevelopment of the multi-storey Cross Street public car park site in Double Bay. To assist with this process, Woollahra Council has engaged HillPDA to collaborate with a project team on a strategic review of the site. The objective of this study was to provide Council with:

1. The most appropriate and feasible redevelopment option for the site; and
2. The merits of pursuing a site-specific planning proposal led by the Council.

The development options should include a mixed-use project that reinstates 406 parking spaces, the Early Child Health Centre (ECHC), cinema and affordable housing units. The commercial floor area is optional. Additionally, it should be noted that one development option excludes a cinema, given the awareness that a developer in Double Bay is considering a cinema in their development.

The design and proposed development options

The project team commissioned E8Urban to develop five design concepts for the car park that could be financially assessed. Each option included different floor space ratios, gross floor areas, land use, and building outcomes for the site. The five options are shown in Figure 1. As the project progressed, Option 2 was divided into Option 2a, which included a mix of uses, including a cinema, and Option 2b, which excluded the cinema.

Altus Group and Traffix provided input on the design's costs and parking requirements. HillPDA undertook market research, assessed the financial costs and benefits, and outlined the statutory planning pathways for each option.

Financial assessment

To undertake the feasibility modelling for the proposed five development options described above, HillPDA used the proprietary software EstateMaster, an industry benchmark used by developers, financiers, and property valuers. The method calculates the residual land value by subtracting the anticipated net sales revenue from the anticipated development costs plus a profit and risk margin. HillPDA has adopted a 20% target Development Margin (DM) and an 18% target Project Internal Rate of Return (IRR) for the feasibility testing.

To calculate the development rights payment to the Council for each option, HillPDA adopted the industry benchmark IRR of 18%, which represents a viable project. This benchmark has allowed HillPDA to determine the amount a developer can contribute to the council for development rights.

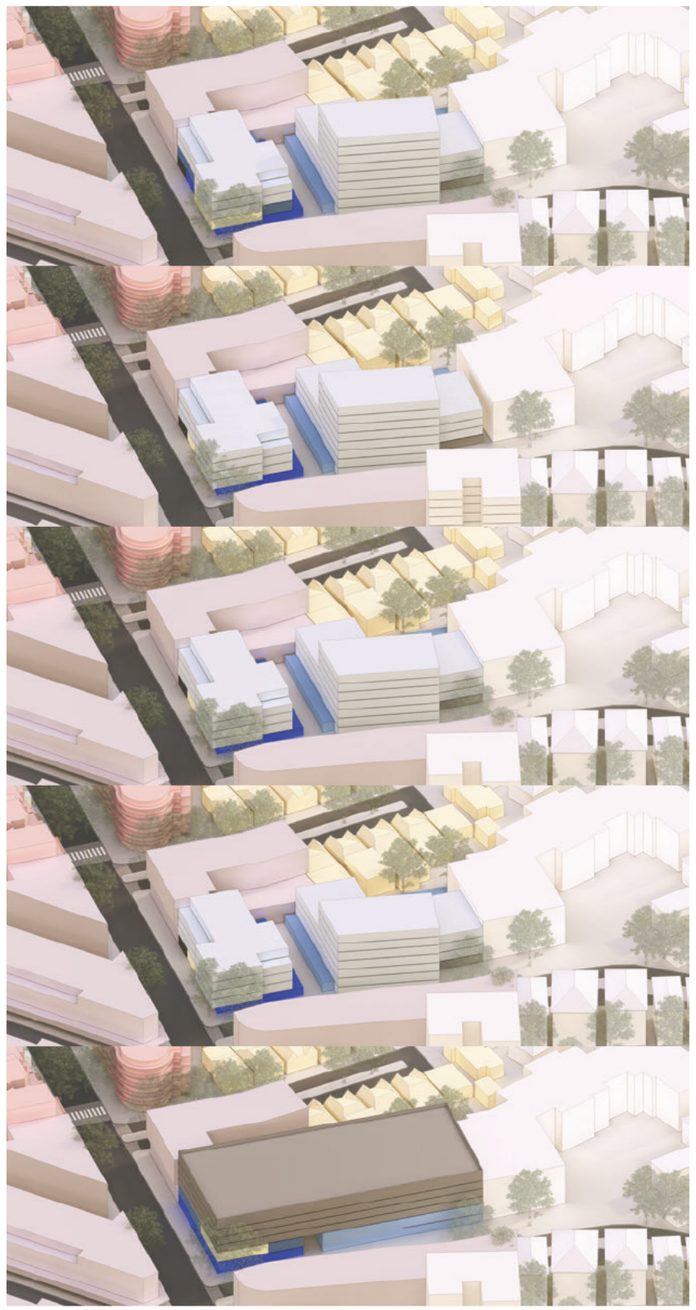
The results of each option are as follows:

Figure 1: Massing options summary

The design team have developed four massing options.

The following pages of the report highlight the four options and provide diagrams and metrics that allow an assessment of the following:

- Over-all built form composition
- Balance of land uses
- Parking rates
- Public domain interfaces and structure
- Massing, scale and overall height of the development
- Impacts on solar access to adjoining properties
- Potential impacts on views from properties with existing harbour views



Option 1: High Affordable Mix

- 60%/40% market to affordable units (81 units)
- Residential tower
- 9 levels
- Retail/commercial frontage
- Cinema at rear

Option 2: Market Residential Maximum

- 90%/10% market to affordable units (71 units)
- Residential tower
- 8 levels
- Retail ground floor frontage
- Cinema at rear

Option 3: Market Residential

- 90%/10% market to affordable units (66 units)
- Residential tower
- 7 levels
- Retail ground floor frontage
- Cinema at rear

Option 4: SEPP Bonus

- 85%/15% market to affordable units (68 units)
- Compliant with SEPP affordable housing height bonus (30%)
- 7 levels
- Retail ground floor frontage
- Cinema at rear

Option 5: Council DIY

- No Residential
- 7 levels (within HOB envelope)
- 5 levels above ground parking
- Retail ground floor frontage
- Double height cinema at rear

Table 1: Summary of development options gross floor areas and results

Description	Option 1: High Affordable Mix	Option 2a: Market Residential Max	Option 2b: Market Residential Max – no cinema	Option 3: Market Residential	Option 4: SEPP Bonus/SSDA	Option 5: Council DIY
Levels	9 Levels	8 Levels	8 Levels	7 Levels	7 Levels	6 Levels
FSR	2.64:1	2.48:1	2.48:1	2.36:1	2.36:1	1:10:1 (or 4.64 if including car parking above ground)
GFA	9,965sqm	9,331sqm	9,331sqm	8,902sqm	8,902sqm	4,146sqm
Residential Market	4,277sqm (60%)	6,484sqm (90%)	6,484sqm (90%)	6,099sqm (90%)	5,760sqm (85%)	0sqm (0%)
Residential Affordable	2,743sqm (40%)	720sqm (10%)	720sqm (10%)	678sqm (10%)	1,016sqm (15%)	0sqm
ECHC	219sqm	219sqm	219sqm	219sqm	219sqm	219sqm
Commercial	600sqm	0sqm	0sqm	0sqm	0sqm	652sqm
Cinema	1,341sqm	1,341sqm	0sqm	1,341sqm	1,341sqm	2,404sqm
Retail	785sqm	566sqm	1,907sqm	566qm	566sqm	871sqm
Development rights payment to the Council based on a target IRR of 18% Project IRR	[redacted]					

[redacted]

Works in-kind contribution to Council

Table 2 provides a breakdown of the proposed works-in-kind contributions a developer would provide to the Council in each option.

Table 2: Works In-Kind Contribution to Council

Description	Option 1: High Affordable Mix	Option 2a: Market Residential Max	Option 2b: Market Residential Max – no cinema	Option 3: Market Residential	Option 4: SEPP Bonus/SSDA	Option 5: Council DIY
406 Public Car Parking Cost	[redacted]					
Early Childcare Health Care (ECHC) Total GFA						
Affordable Housing Units Costs Total Number of Affordable Housing Units						
Development Rights payment to Council for use of the site						
Total Works In-Kind Contribution to Council						
Total Costs to Council						
Public Car park Net Annual Income						

*We note the costs above are only the hard costs for each of the assets retained by Council. The costs exclude GST, Professional Fees, Contingency and any other costs.

[redacted]

Planning pathway merits

Each feasibility and design option are slightly different, meaning planning considerations were assessed for each option to determine the appropriate planning pathway. The assessment determined that the predominant planning pathway is either (a) a planning proposal pathway or (b) a state-significant development application. Specific technical studies will be required to provide detailed justification for the merit of any of the planning applications. The following table summarises the planning pathway for each of the options:

Table 3: Overview of the planning assessment

Description	Option 1: High Affordable Mix	Option 2 (Option 2a and 2b): Market Residential Max and Market Residential Max – no cinema	Option 3: Market Residential Max	Option 4: SEPP Bonus/SSDA	Option 5: Council DIY
Planning assessment	The floor space ratio falls within the Housing SEPP infill affordable housing bonus; however, the proposed height exceeds the permissible height under the Housing SEPP bonus.	In both Options, the proposed floor space ratio complies with the current FSR and falls within the Housing SEPP infill affordable housing bonus; however, the height exceeds the permissible controls under the Housing SEPP bonus.	The floor space ratio complies with the current FSR and falls within the Housing SEPP infill affordable housing bonus; however, the proposed height exceeds the permissible height under the Housing SEPP bonus.	The proposed floor space ratio and height fall within the current FSR of 2.5:1 and complies with Housing SEPP infill affordable housing FSR and height bonus.	The proposed height complies with the permissible height however the proposal will exceed the current FSR of 2.5:1, as car parking above ground is required (by the definition in the LEP) to be included as FSR.
Planning Merits	A planning proposal for this option will have strategic merit as it: • Is consistent with the Council's LSPS and priorities • Can achieve the objectives of the Double Bay Local Centre DCP • Consistent with the Greater Sydney Eastern District Plan objectives • Strategically retains the council car park and provides community benefit • Provides 40% affordable housing in perpetuity with minimal site impacts The site-specific merit would be justified based on detailed technical reports to be undertaken with the planning proposal	A planning proposal for Option 2 will have strategic merit as it: • Is consistent with the Council's LSPS and priorities • Can achieve the objectives of the Double Bay Local Centre DCP • Consistent with the Greater Sydney Eastern District Plan objectives • Strategically retains the council car park and community benefit • Provides 10% affordable housing in perpetuity with minimal site impacts The site-specific merit would be justified based on detailed technical reports to be undertaken with the planning proposal.	A planning proposal for Option 3 will have strategic merit as it: • Is consistent with the Council's LSPS and priorities • Can achieve the objectives of the Double Bay Local Centre DCP • Consistent with the Greater Sydney Eastern District Plan objectives • Strategically retains the council car park and community benefit • Provides 10% affordable housing in perpetuity with minimal site impacts The site-specific merit would be justified based on detailed technical reports to be undertaken with the planning proposal.	A development application under Part 4 of the Environmental and Assessment Act, 1979 (EP&A Act) (based on State Environmental Planning Policy (Housing) 2021 – Part 2 Division 1), which will use the infill housing 30% bonus as 15% affordable housing, will be provided on-site. Upon broad analysis, it is indicated that: • The design can fulfil the objectives of the Double Bay DCP by activating the ground level, placing car parking in basements, creating a public realm, and avoiding overshadowing or visual impacts. • This will result in a faster planning process, likely taking 9-12 months instead of two years.	The public car park floor area is to be included within the floor space ratio (FSR) meaning that the proposed development will exceed the current permissible FSR. A planning proposal for this option will be required. The site-specific merit would be justified based on detailed technical reports to be undertaken with the planning proposal.
Key Findings	As the height exceeds the planning controls, a Planning Proposal is required.	Planning proposal required	Planning proposal required	The estimated construction value is likely over $75m, resulting in the planning pathway being a state-significant development application (SSDA) planning pathways.	Planning proposal required

Key Insights: The planning pathway that provides the most merit for the Council is Option 4.

Key conclusion and recommendation

After reviewing the financial assessment and considering the works-in-kind contribution to the council, Option 2b is the most financially viable option and has significant benefits. To achieve Option 2b, the planning pathway will be a planning proposal under Part 3 of the Environmental and Assessment Planning Act, 1979 (EP&A Act).

The proposed mixed-use development for Option 2b includes a Floor Space Ratio (FSR) of 2.48:1, a height of 25.7m (8 storeys), and 10% affordable housing. The proposed height would exceed the Infill Affordable Housing bonus outlined in the State Environmental Planning Policy Housing (SEPP 2021). The planning proposal requires approval by the state government.

Option 2b enables the Council to retain the following assets with a combined construction and revenue value of [redacted]:

- 406 public car spaces
- Development Rights payment to Council for the use of the site: [redacted]
- 10% affordable housing units, equating to 11 units in perpetuity
- 219sqm GFA Early Childcare Health Centre.

Option 4 is also feasible for the council [redacted] payment to council) and can result in similar planning and community benefits, with 15% affordable housing and a cinema. It takes half the time to obtain planning approval as a state-significant development application (using the Infill Housing Bonus under the Housing SEPP), but it receives fewer financial benefits. Option 4 provides Council with: -

- 406 x public car spaces
- Development rights payment of [redacted]
- 15% affordable housing units, equating to 15 units in perpetuity
- 219sqm GFA Early Childcare Health Centre

Option 2a and 3 are feasible options for Council and provide development rights payments of [redacted] respectively. They also offer a similar early child health centre, public car parking, cinema, retail, and similar affordable housing in perpetuity.

Based on feasibility, Option 1 does not support a cash payment to the Council, has a low internal rate of return (0.43%), and has a similar mix of uses.

Option 5 assumes the Council is the developer. The Council must contribute substantial equity and borrowings to achieve the mix of uses (excluding affordable housing).

Options 1, 2, 3, and Option 5 require a planning proposal to secure the development. The council can benefit from undertaking and leading the planning proposal; however, it may be relatively expensive and time-consuming, with many technical reports required.

STUDY BACKGROUND AND SITE PARTICULARS

1.0 STUDY BACKGROUND AND OBJECTIVES

1.1 Study background

The Woollahra Council has reviewed the potential redevelopment of the multi-storey public car park site in Cross Street, Double Bay. The car park structure is nearing the end of its practical life and would necessitate significant repairs and upgrades.
The resolution from Council's meeting of 29 April 2024 is that a report be prepared for the Council, which includes but is not limited to consideration of:

1. The most appropriate and feasible redevelopment options for the site, regarding the Council's strategic planning and recent and emerging changes to the NSW planning system, particularly relating to the provision of affordable housing and how affordable housing may be funded.
2. The merits of undertaking a Council-led site-specific planning proposal.
3. A future community consultation process.

1.2 The study objective

As a result of the outcome of the Council meeting, Woollahra Council engaged HillPDA to carry out a strategic review of the site. The review will provide advice on the following:

1. The most appropriate and feasible redevelopment options for the site.
2. The advantages of pursuing a site-specific planning proposal led by the Council.

Part of the brief was to ensure that the proposed development options included a mixed-use development that provided the following:

1.2.1 Land ownership

- The council will retain ownership of the site and all Council assets (i.e car park, Early Childhood Health Centre).
- All other components (residential, retail, commercial) will likely be subject to 99-year leasehold stratums.

1.2.2 Land uses

- Replacement of existing car park (406 car spaces) and new modern Early Childhood Health Centre.
- Additional DCP-compliant car parking for other proposed uses unless planning arguments to justify a reduction.
- Council has historically sought to include a cinema in any redevelopment. The viability of any cinema use is to be specifically addressed.
- Substantial affordable housing component to be included.
- High-quality on-site public domain, including the opportunity for a through-site east-west link.
- Minimisation of impacts on water table consistent with Council's DCP controls to be addressed.

1.2.3 Town planning

- Height and density should be considered in the substantial public benefits proposed to be included above.
- Merits of Council-led site-specific Planning Proposals to be addressed.
- Advice is to be provided regarding what could be achieved under Housing SEPP's affordable housing bonus provisions without needing a planning proposal and its feasibility.

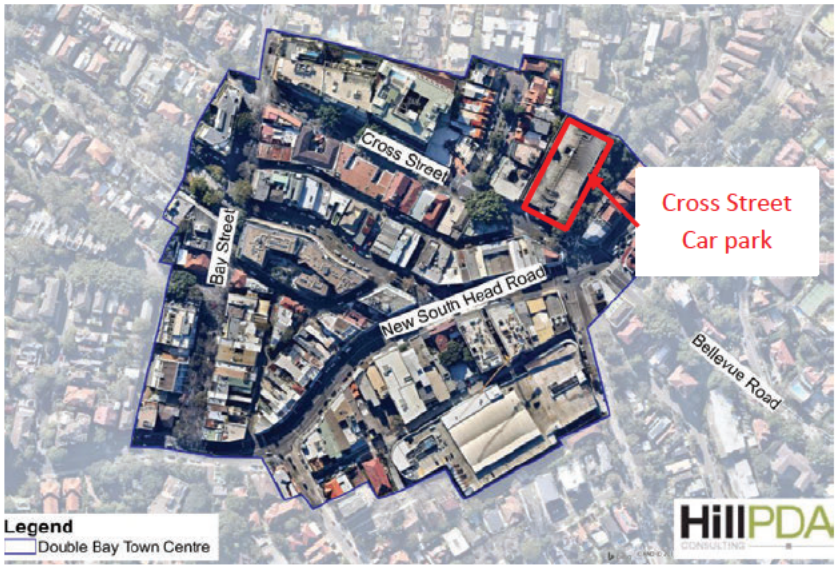
1.2.4 Financial offer

- Council is seeking to redevelop the site at no cost or with Development Rights payment to Council for use of the site.

2.0 THE SITE

The site is located in the Double Bay Town Centre at 1-13 Cross Street, Double Bay, in the Lot 2 in DP 220530. Double Bay is approximately 5 kilometres from the Sydney Central Business District (CBD) and 1 kilometre from Edgecliff Railway Station.

Figure 2: Site location



Double Bay is well served by bus and ferry public transport. The major arterial road, New South Head Road, runs directly through the Centre.

2.1 Site particulars and existing improvements

The site has a multi-level 406-space public car park, an early childhood health centre, community space, and amenities. It is rectangular, with a frontage to Cross Street of approximately 42.51m and a depth of around 85.11m along the western boundary.

The allotment's Jamberoo Lane/eastern alignment is irregularly shaped and measures approximately 86.83m. The northern boundary spans approximately 47.66m.

Figure 3: Existing improvements



2.2 Surrounding developments

Over the last decade, the area has transformed from a culture of street-side cafes and restaurants to include several licensed bars, enhancing its appeal and drawing a range of demographics, particularly the downsizer market.

The Centre's built form is primarily defined by a relatively fine-grain lot layout, with more significant sites already accommodating larger-format land uses such as mixed-use developments up to five storeys, commercial offices, supermarkets, and hotel premises. The remaining built form in the Centre is of a lower scale, generally two to three storeys, with ground-floor retail and commercial uses on the upper floors.

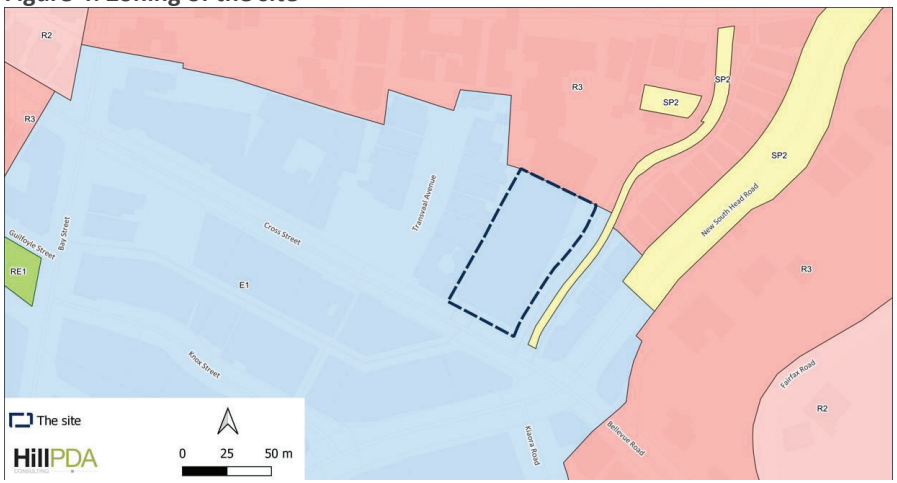
3.0 PLANNING CONTEXT

Local planning context

The Double Bay local centre is the unique heart of the Woollahra community. The Woollahra Council Local Strategic Planning Statement (LSPS) identifies, in *Planning Priority 6 and Priority 8,* that the Council intends to collaborate to achieve excellent placemaking outcomes in the local centre, with a hub for jobs, shopping, dining and community activities. *Planning Priority 4* of the LSPS outlines the desire and direction for housing diversity, including providing affordable housing. All of these attributes can be achieved in the Double Bay local centre. The LSPS also mentions reviewing the broader planning framework for Double Bay and investigating the redevelopment of the car park site (Action 13). The Council car park site will play a critical role in the placemaking and vibrancy of the local centre.

The Cross Street car park, located at 1-13 Cross Street, is zoned under the Woollahra Local Environmental Plan (LEP) 2014 as E1 Local Centre. The planning controls include a maximum building height of 18.1 metres and a maximum floor space ratio (FSR) of 2.5:1. Further LEP details are provided in Annexure B

Figure 4: Zoning of the site



The E1 zone permits land uses with consent, including the following:

- Centre-based childcare facilities
- Commercial premises [includes retail premises]
- Community facilities
- Entertainment facilities
- Serviced apartments
- Shop top housing.

The site is affected by several provisions under the Woollahra Development Control Plan (DCP) 2015, particularly Chapter D5 – Double Bay Centre - with a summary of the applicable provisions included in Annexure B.

The Double Bay Cross Street planning controls under the Woollahra LEP provide the basis for the feasibility study. Other local planning strategies influencing the study are the Woollahra Housing Strategy 2021, Affordable Housing Policy 2021, Double Bay Place Plan 2019-2023, and Double Bay Public Domain Strategy 2016.

State planning context

Numerous statutory and strategic planning frameworks provide the context for the site's redevelopment at the state planning level. However, the recent NSW State planning reforms provide the main planning context for this study.

The State Environmental Planning Policy (Housing) 2021 (Housing SEPP) is relevant to the site. Part 2 - Infill affordable housing of the Housing SEPP proposes a bonus of 30% of gross floor area and height in response to a provision of a minimum of 10% affordable housing, where a site is located within an accessible location. The site falls within 800m of the Edgecliff railway station and bus stops between 130m to 350m from the site. The site is, therefore, *accessible* in terms of the Housing SEPP. This planning context formed a major part of the planning pathway considered for the options.

The second planning framework applicable to the site is a planning proposal, or LEP Amendment, under Part 3 of the Environmental Planning and Assessment Act, 1979,

should the land use or development standards/controls for the site need to change. In August 2023, the updated Local Environmental Plan Making Guideline outlined steps and guidance for planning proposals. A copy of the Guideline can be found here: https://www.planning.nsw.gov.au/sites/default/files/2023-03/lep-making-guideline.pdf.

For a planning proposal to proceed through Gateway determination, the Minister (or delegate) must be satisfied that the proposal has strategic and site-specific merit and that identified potential impacts can be readily addressed during the subsequent LEP-making stages. Strategic merit means a proposal aligns with the NSW strategic planning framework and government priorities.

The planning context has been considered to provide the merit and best planning pathway to achieve the Council's outcome for the Cross Street car park.

DEVELOPMENT OPTIONS AND FEASIBILITY

4.0 DEVELOPMENT OPTIONS AND FEASIBILITY ASSESSMENT

Following the market research five development options, in collaboration with the council, formed the basis of the feasibility testing. They are as follows:

Table 4: Summary of the five development options (gross floor areas)

Description	Option 1: High Affordable Mix	Option 2a: Market Residential Max	Option 2b: Market Residential Max – no cinema	Option 3: Market Residential	Option 4: SEPP Bonus/SSDA	Option 5: Council DIY
Levels	9 Levels	8 Levels	8 Levels	7 Levels	7 Levels	6 Levels
FSR	2.64:1	2.48:1	2.48:1	2.36:1	2.36:1	4.64:1
Total GFA	9,965sqm	9,331sqm	9,331sqm	8,902sqm	8,902sqm	4,146sqm
Residential Market GFA	4,277sqm (60%)	6,484sqm (90%)	6,484sqm (90%)	6,099sqm (90%)	5,760sqm (85%)	0sqm (0%)
Residential Affordable GFA	2,743sqm (40%)	720sqm (10%)	720sqm (10%)	678sqm (10%)	1,016sqm (15%)	0sqm (0%)
ECHC GFA	219sqm	219sqm	219sqm	219sqm	219sqm	219sqm
Commercial GFA	600sqm	0sqm	0sqm	0sqm	0sqm	652sqm
Cinema GFA	1,341sqm	1,341sqm	0sqm	1,341sqm	1,341sqm	2,404sqm
Retail GFA	785sqm	566sqm	1,907sqm	566sqm	566sqm	871sqm
Total Council Car Parking Reinstated	**406**	**406**	**406**	**406**	**406**	**406**

4.1 Development options

As outlined in the table above, five urban design concepts were developed, considering the site's location, current and future surrounding uses, built form, access, and the current planning framework. More detailed urban design work was then undertaken, particularly regarding providing market and affordable housing and car parking within a maximum of five basement levels. In all options, the Council required the current public car parking of 406 parking spaces to be accommodated on-site.

To support the development options, a high-level parking and traffic assessment was undertaken by Traffix—Traffic and Transport Planners. The assessment was commissioned to confirm that the options were practical and could be justified in future planning applications. The car parking analysis included parking for residential, affordable housing, retail, and commercial uses. The assessment was based on the Housing SEPP car parking rates and the Woollahra Development Control car parking rates. The building can include approximately 515 parking spaces located across five basement levels. A summary of the parking provision is outlined below:

Table 5: Required and proposed parking

Option	Provided parking	Required parking	Surplus parking
Option 1	512	497 Car Spaces	406 plus 91 car parking with a surplus of 15 spaces.
Option 2	512	489 Car Spaces	406 plus 83 car parking with a surplus of 23 spaces.
Option 3	512	483 Car Spaces	406 plus 77 car parking with a surplus of 29 spaces.
Option 4	512	484 Car Spaces	406 plus 78 car parking with a surplus of 28 spaces.
Option 5	424	421 Car Spaces	406 plus 15 car parking with a surplus of 3 spaces.

4.2 Basis of the feasibility

4.2.1 Residual land value methodology

To undertake the feasibility modelling for the proposed five development options described in Chapters 5 to 9, HillPDA used the proprietary software EstateMaster, an industry benchmark used by developers, financiers, and property valuers. This method calculates the residual land value by subtracting the anticipated net sales revenue from the anticipated development costs plus a profit and risk margin.

Any unpredicted change, such as a short-term increase in developer contributions or development costs, could notably affect development feasibility unless it can be absorbed by making allowances in the project contingency or increasing market sale values for the developed product.

To determine the feasibility of development, it was necessary to compare the current use value with the redevelopment value; if the redevelopment value is higher, the development is considered feasible.

A feasibility assessment is based on profit and risk factors. These two factors are subjective elements that determine the minimum level a developer is willing to purchase a site for, factoring in the risk associated with a proposed development.

HillPDA identified a residual land value (RLV) viable for development using the proposed five development options for feasibility testing. The RLV represents the maximum amount the prudent developer would pay for a site to achieve the required hurdle rate(s). Where the RLV of the site is greater than the 'as is' values, development is viable.



The maximum price a developer will pay for land is total costs and profit margin subtracted from total revenue from the proposed development.

Table 6: Feasibility viability scale

Viable	Marginal	Not Viable
Redevelopment is greater than the existing use value	The redevelopment value is equal to or slightly lower than the existing use value	The existing use value is greater than the redevelopment value

4.2.2 Hurdle rates

Hurdle rates are the required financial returns that make a project viable. Higher hurdle rates are needed for riskier projects. Risks in development include:

- planning risk (relating to obtaining planning consent and costs and further delays in obtaining consent)
- market risk (obtaining sufficient sales and pre-sales)
- procurement risk (obtaining labour and materials, cost overruns and delays in delivery)
- financial risk (obtaining finance and delays due to insufficient pre-sales and cost certainty).

The two most common hurdle rates in development are:

- The Development Margin (**DM**) is the net profit before tax that a developer receives from a development expressed as a percentage of the total cost, where cost includes interest on finance. For example, revenue of $1.2m and total costs of $1.0m would result in a development margin of 20%.
- The discount rate or target Project Internal Rate of Return (**IRR**) is the return of an investment on an annualised basis expressed as a percentage. The IRR is calculated using a discounted cash flow model that includes the time value of money. It can be compared to interest received on funds invested expressed as %/ann.

Based on HillPDA's previous consultation with the development and financing sector and industry norms, the IRR has been adopted as the preferred hurdle rate. DM has been used as a supplementary rate to support analysis where applicable and is sometimes the preferred hurdle rate for single-staged projects with short project life. For the feasibility testing, we have adopted the rates of **20% target development margin and 18% target IRR**.

A hypothetical project is deemed feasible when both hurdle rates are achieved. Where development return is marginal, a developer may undertake development if they have unique circumstances, such as a higher tolerance for risk, lower construction costs, or above-market financing.

4.2.3 Key RLV assumptions

The critical assumptions included:

4.2.3.1 Gross floor areas

E8Urban Pty Ltd provided the gross building area (GBA) and gross floor areas (GFA) per development per land use.

E8urban did not specify the number and size of units. However, our market research showed the demand for larger apartments, so we assumed a Net Saleable Area and average $/sqm per level.

4.2.3.2 Floor area efficiencies

Table 7 outlines the GBA to GFA and GFA to net lettable area (NSA)

Table 7: Efficiencies

	GBA to GFA	GFA to NSA
Residential	75%	85%
Retail/Commercial	90%	90%
Cinema	90%	
Early Child Health Care	90%	90%

4.2.4 Construction costs

Project costs are sourced from Altus Group, the quantity surveyor for this study. Appendix B of this report lists cost assumptions in the feasibility models. A summary of costs are as follows:

Table 8: Construction costs

Land use	Cost
Car Parking Basement	$125,000 to $133,000 [er car space
Residential Market Housing	$7,500/sqm
Residential Affordable Housing	$6,000/sqm
Retail	$4,000/sqm
Cinema	$5,200/sqm
Early Child Health Care	$5,800/sqm
Commercial	$4,500/sqm

4.2.5 Revenue and rents

HillPDA researched and spoke to selling agents in the Double Bay area (see Annexure A). We included the NSA in our financial model and analysed sale revenue in $/sq. A summary of costs is as follows:

Table 9: Revenue and rents for land uses

Land Use	Revenue ($/sqm) Options 1,2, 3and 4	Rents ($/sqm) Option 5 only
Residential Market Housing	$45,000 to $65,000	
Residential Affordable Housing	Gifted to Council in perpetuity	Gifted to Council in perpetuity
Retail	$25,000/sqm	$2,000/sqm
Cinema	$7,890/sqm	$550/sqm
Early Child Health Care	$18,000/sqm	$750/sqm
Commercial	$16,000/sqm	$900/sqm
Car Parking		$1.8 million / annum

4.2.6 Land Use Uses Retained by Council

In liaison with the Council, the following formed part of the assumptions: -

- All affordable housing is to be gifted to the Council
- All affordable housing will be in perpetuity
- The Early childhood Health Centre is to be gifted to the Council
- In each options all 406 current public car parking spaces will be reinstated and provided to the Council

Chapters 5 to 9, outline the proposed development options and the financial results.

OPTION 1:
HIGH AFFORDABLE MIX

5.0 OPTION 1: HIGH AFFORDABLE MIX FEASIBILITY ASSESSMENT

This chapter describes the proposed development option's land uses, gross floor area, construction costs, and the financial results

The proposal provides a mix of uses with an FSR of 2.64:1 and a height of nine stories (28.8m). The proposed development would exceed the permissible current FSR and height. The proposed option delivers 81 units with 39 market units and 42 affordable units.

Option 1 - High Affordable Mix

Massing and Summary

Key Points

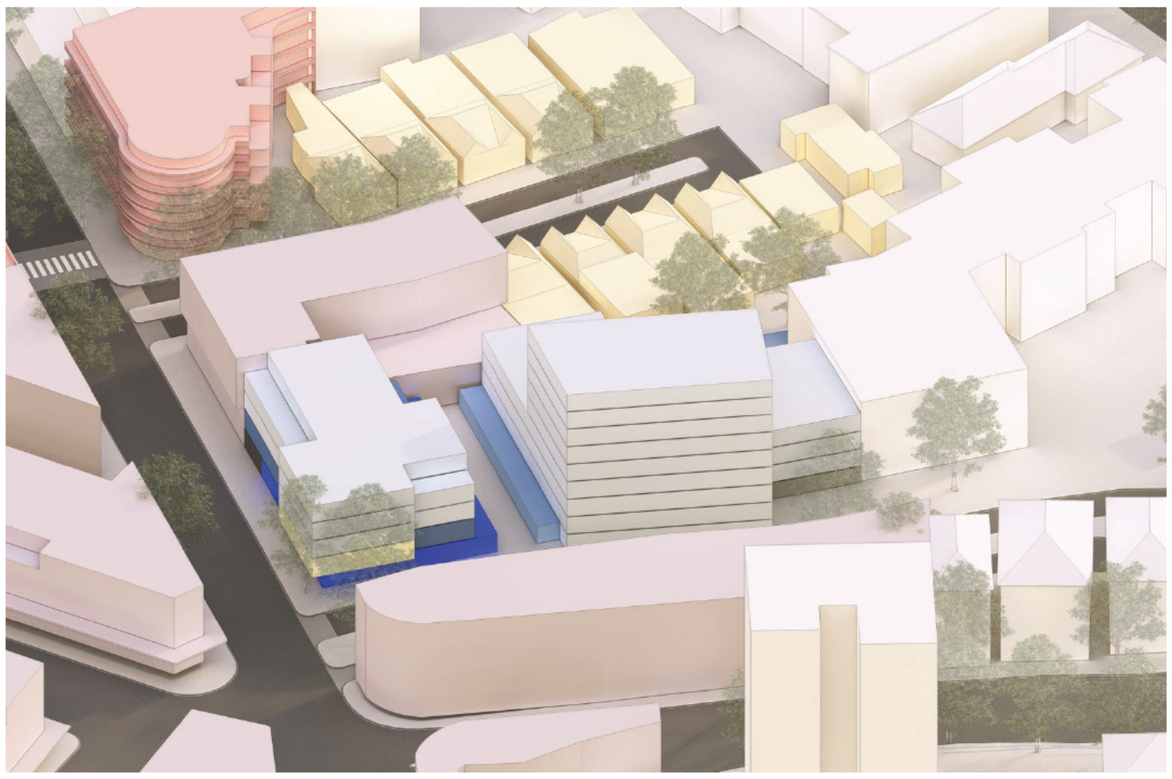
- 60%/40% market to affordable units
- Residential tower
- 9 levels
- Retail/commercial frontage

Legend

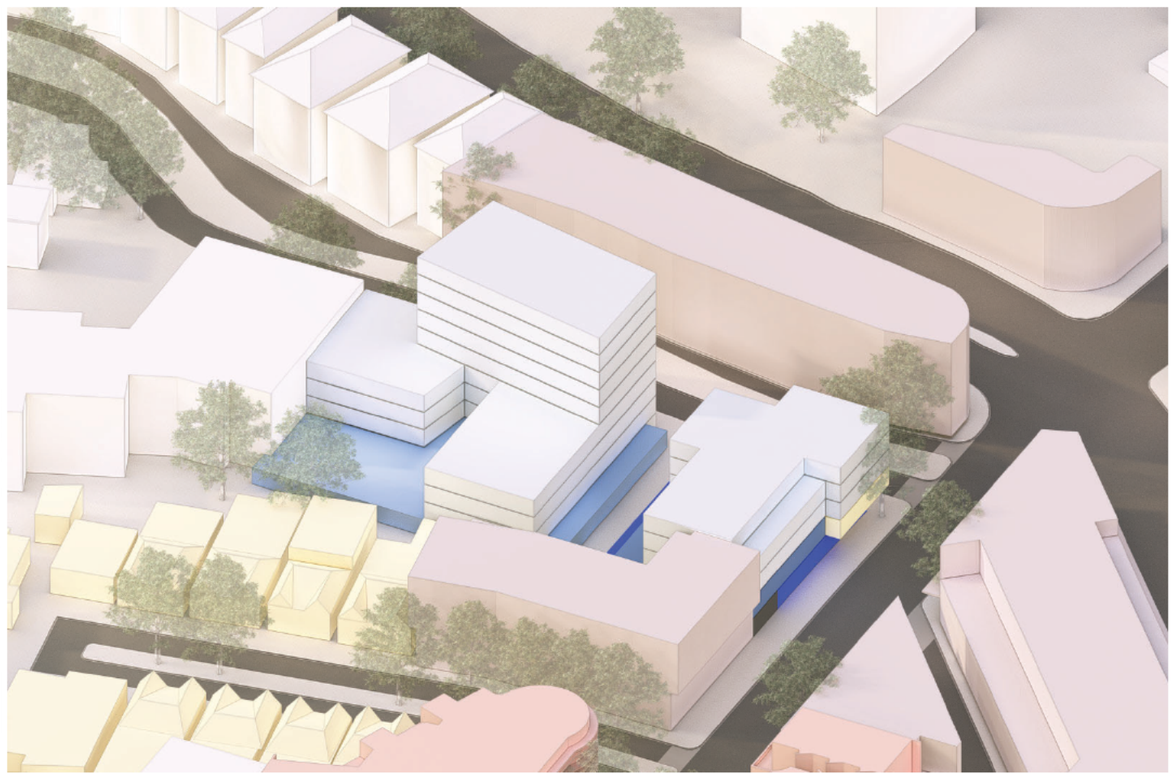
- Residential
- Commercial
- Retail
- Early Childhood Health Centre

Project Snapshot

	GFA	Units	Parking	No. Levels	FSR
Cinema	1,341 sqm				
ECHC	219 sqm				
Commercial	600 sqm				
Retail	785 sqm				
Residential	7,020 sqm				
Market		4277			
Affordable		2743			
Above ground			8		
Underground (5 levels)			504		
Total	9,965 sqm	81	512	9	2.64:1



View from South East



View from South West

Option 1 - High Affordable Mix

Metrics

Option 1 - High Affordable Mix	Floor to Floor Height (m)	Cumulative Height (m)	Parking Circulation/Ancillary (sqm)	Parking GBA (sqm)	Parking Spaces (No.)	Cinema GBA (sqm)	Cinema GFA (sqm)	ECHC GFA (sqm)	ECHC GFA (sqm)	Commercial GBA (sqm)	Commercial GFA (sqm)	Retail GBA (sqm)	Retail GFA (sqm)	Residential GBA (sqm)	Residential GFA (sqm)	Aff unit (No.)	Market Unit (No.)	Total Units (No.)	AH NSA (sqm)	MH NSA (sqm)
Level 11																				
Level 10																				
Level 09																				
Level 08	3.1 m	28.8 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 07	3.1 m	25.7 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 06	3.1 m	22.6 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 05	3.1 m	19.5 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 04	3.1 m	16.4 m												1,272 sqm	954 sqm		8.8	8.8	0	811
Level 03	3.1 m	13.3 m												2,145 sqm	1,609 sqm		14.8	14.8	0	1368
Level 02	3.1 m	10.2 m												2,145 sqm	1,609 sqm	24.8		24.8	1368	0
Level 01	3.1 m	7.1 m						243 sqm	219 sqm	666 sqm	600 sqm			1,328 sqm	996 sqm	15.3		15.3	847	0
Ground Floor	4.0 m	4.0 m		292.4	8	1,490 sqm	1,341 sqm					872 sqm	785 sqm	184 sqm	138 sqm	2.1		2.1	117	0
Basement Level 01				3,528 sqm	101															
Basement Level 02				3,528 sqm	101															
Basement Level 03				3,528 sqm	101															
Basement Level 04				3,528 sqm	101															
Basement Level 05				3,528 sqm	101															
Total	28.8 m	28.8 m	sqm	17,932 sqm	512	1,490 sqm	1,341 sqm	243 sqm	219 sqm	666 sqm	600 sqm	872 sqm	785 sqm	9,360 sqm	7,020 sqm	42.2	39.2	81.4	2331	3636

Total GFA	9,965 sqm
Total FSR	2.64:1
Target Resi Parking	95
Target Commercial Parking	6
Target Retail Parking	0
Target Council Parking	406
Target Parking Total	507

vs 512 provided

	Mix %	GFA	Units	Parking /Unit	Parking Spaces (No.)	NSA
Market	61%	4277	39	2.0	78	3636
Affordable	39.1%	2743	42	0.4	17	2331
Total	100%	7020	81		95	7020

Woollahra Municipal Council - Cross Street Carpark Site, Double Bay

Option 1 - High Affordable Mix

Order of Cost Estimate

Date: 30-Oct-24

Item	Description	Area	Unit	Rate	Total	Total Residential (Market)	Total Residential (Affordable)	Total Council Carpark	Total Cinema	Total ECHC	Total Commercial /Retail
	SUMMARY				[redacted]						
	60%/40% Market to Affordable Units (39 Market Units & 42 Affordable Units)										
1	Demolitions (existing slab structure approx. 14,500m2)										
	Basement										
2	Basement Carpark : 5 levels, GBA 17,640m2 and 504 parking spaces										
	Above Ground Parking										
3	Parking : GBA 293m2 and 8 car spaces										
	Cinema										
4	Cinema : GFA 1,341m2, GBA 1,490m2										
	Early Childhood Health Centre										
5	ECHC : GFA 219m2, GBA 243m2										
	Commercial										
6	Commercial : GFA 600m2, GBA 666m2										
	Retail										
7	Retail : GFA 785m2, GBA 872m2										
	Residential (9 levels, GFA 7,020m2, GBA 9,360m2 and 81 Apartments										
8	Residential (Market), GFA 4,277m2, GBA 5,616m2 and 39 Apartments										
9	Residential (Affordable), GFA 2,743m2, GBA 3,744m2 and 42 Apartments										
	Others										
10	External Services										
11	External and Landscape Works										
	OTHERS										
12	Budget allowance for soil remediation										
	TOTAL (EXCL CONSTRUCTION CONTINGENCIES)										
13	CONSTRUCTION CONTINGENCIES (10%)										
14	LOOSE FURNITURE AND EQUIPMENT										
	TOTAL (INCL CONSTRUCTION CONTINGENCIES BUT EXCL GST)										

Notes and Assumptions:

All the above costs are only indicative and are subject to review of Schematic Designs and design development information

GFA, nos of units and car parking spaces as per e8urban's provided massing plans and unit schedule dated 15/08/24, and updated NSA Split by Levels received on 22/10/24

Plant space assumed included in the overall GBA

Basement - mainly within water table

Assume EV charges provided to 5% of parking spaces

Assume only pavement replacement requirerd to Cross Street

Exclusions:

Land Costs

Finance and Interest

Legal Fees

Marketing Costs & Display Apartment

Design & Consultants Fees

Council and Authorities Fees

Section 7.11 or other Council Contributions

Section 73/Sydney Water Contribution

Building Bond

Car stackers

Flood barriers or similar measures

Removal of Ground Contamination and Wastes

Fitout to Retail (Shell & core allowed only)

Fitout to Commercial (Warm shell allowed only)

Fitout to Cinema (Shell & core allowed only)

Loose furniture, fittings and equipment; gym equipment

Home automation

Building Maintenance Unit

ESD / Sustainability Initiatives

Services diversions and amplification

Escalation from date of estimate to actual date of commencement of works

Material and labour cost escalation to be reviewed

GST

5.1 The financial results

The proposal provides a mix of uses with an FSR of 2.64:1 and a height of nine levels (28.8m). The proposed uses are permissible. However, the proposed height and floor area exceed the permissible controls under the Council's LEP and the Housing SEPP Infill bonus.

The proposed option plans to deliver 60% market and 40% affordable housing. This equates to 39 market units and 42 affordable units. The results revealed that the proposed option would not be viable in the current market.

Table 10: Option 1 results

Option 1	High Affordable Housing Option
Site Area	3,769sqm
Gross Floor Area	9,965sqm
Floor Space Ratio	2.64:1
Total Number of Residential Units	81 units
Market Housing Units	39 units (109sqm GFA)
Affordable Housing Units	42 units (65sqm GFA)
Performance Indicators	
Total Revenue after GST	$228,824,541
Development Rights Payment	$0
Total Construction Costs(including professional fees)	$240,097,755
Viability at 18% Project IRR	Not Viable at 0.43%

The following page provides the estate master development feasibility summary of the financial results.

ARGUS EstateMaster | Development Feasibility

SUMMARY OF PROJECT RETURNS

Cross Street Car Park Development Options

Option 1 - High Affordable Mix

Option 1 40% AH

HillPDA CONSULTING

Licensed to: Hill PDA Pty Ltd

Time Span:	Jan-25 to Aug-30 (67 Months)		
Type:	Mixed Use		
Status:	Under Review		
Site Area:	3,769 SqM		
#N/A	2.64:1	Equated GFA:	9,964.96 SqM
Project Size:	81.44 Units	1 per 46.27 SqM of Site Area	
	9,964.96 GFA	1 per 0.37 SqM of Site Area	

	Total AUD	AUD Per Unit	AUD Per GFA	% of Total Net Revenue	Total Exc GST
Revenues					
	Quantity	SqM	AUD/Quantity		
Gross Sales Revenue	-	6,420.09	-		
Market Housing Apartments	-	3,635.67	-		
Commerical Office	-	2,078.20	-		
Retail Shops	-	706.22	-		
Less Selling Costs					
Less Purchasers Costs					
NET SALES REVENUE					
	Quantity	SqM	AUD/SqM/annum		
Gross Rental Income	-	-	-		
Less Outgoings & Vacancies					
Less Letting Fees					
Less Incentives (Rent Free & Fitout Costs)					
Less Turnover Costs					
Less Other Leasing Costs					
NET RENTAL INCOME					
Interest Received					
Other Income					
TOTAL REVENUE (before GST paid)					
Less GST paid on all Revenue	Excludes 19,068,403 withheld by Purchasers				
TOTAL REVENUE (after GST paid)					
Costs					
Land Purchase Cost					
Land Acquisition Costs					
Construction Costs (inc. Contingency)					
Car Parking					
Built Form					
Other cOSTS					
Contingency					
Professional Fees					
Statutory Fees					
Marketing and Advertising					
Miscellaneous Costs 2					
Misc					
Project Contingency (Reserve)					
Land Holding Costs					
Pre-Sale Commissions					
Finance Charges (inc. Fees)					
Interest Expense					
TOTAL COSTS (before GST reclaimed)					
Less GST reclaimed					
Plus Corporate Tax					
TOTAL COSTS (after GST reclaimed)					

Performance Indicators

[1]	**Net Development Profit**	
[3]	**Development Margin (Profit/Risk Margin)**	Based on total costs (exc selling & leasing costs)
[4]	Residual Land Value	Based on Target Margin of 18% (Exclusive of GST)
[5]	**Net Present Value**	Based on Discount Rate of 18% p.a. Effective
[6]	Benefit Cost Ratio	
[7]	**Project Internal Rate of Return (IRR)**	Per annum Effective
[8]	Residual Land Value	Based on NPV (Exclusive of GST)
	Equity IRR	Per annum Effective
	Equity Contribution	
	Peak Debt Exposure	
	Equity to Debt Ratio	
[9]	Weighted Average Cost of Capital (WACC)	
[10]	Breakeven Date for Cumulative Cash Flow	
[11]	Yield on Cost	
[12]	Rent Cover	
[13]	Profit Erosion	

[redacted]

Footnotes:

1. Development Profit: is total revenue less total cost including interest paid and received
2. Note: No redistribution of Developer's Gross Profit
3. Development Margin: is profit divided by total costs (exc selling & leasing costs)
5. Net Present Value: is the project's cash flow stream discounted to present value. It includes financing costs but excludes interest and corp tax.
6. Benefit:Cost Ratio: is the ratio of discounted incomes to discounted costs and includes financing costs but excludes interest and corp tax.
7. Internal Rate of Return: is the discount rate where the NPV above equals Zero.
8. Residual Land Value (based on NPV): is the purchase price for the land to achieve a zero NPV.
9. The Weighted Average Cost of Capital (WACC) is the rate that a company is expected to pay to finance its assets.
10. Breakeven date for Cumulative Cash Flow: is the last date when total debt and equity is repaid (ie when profit is realised).
11. Yield on Cost is Current Net Annual Rent divided by Total Costs (before GST reclaimed), including all Selling Costs.
12. The total net development profit divided by the current net annual rental expressed as a number of years/months.
13. The period of time post practical completion that it can remain unsold (but leased out) until finance and land holding costs erodes the profit for the development to zero.

OPTION 2:
MARKET RESIDENTIAL MAX

6.0 OPTION 2: MARKET RESIDENTIAL MAX

This chapter describes the proposed development option's land uses, gross floor area, construction costs, and the financial results

As the project progressed, we added two scenarios to Option 2, namely:

- Option 2a: Proposed car parking, retail, cinema, early child centre, and residential with 10% affordable and 90% market housing.
- Option 2b: Proposed car parking, retail, early child centre, and residential with 10% affordable and 90% market housing. The Cinema was excluded from this option.

Both sub-options propose a floor space ratio of 2.48:1 (below the maximum FSR of 2.5:1) and a proposed height of 25.7m, or eight levels.

Option 2 - Market Residential Maximum

Massing

Key Points

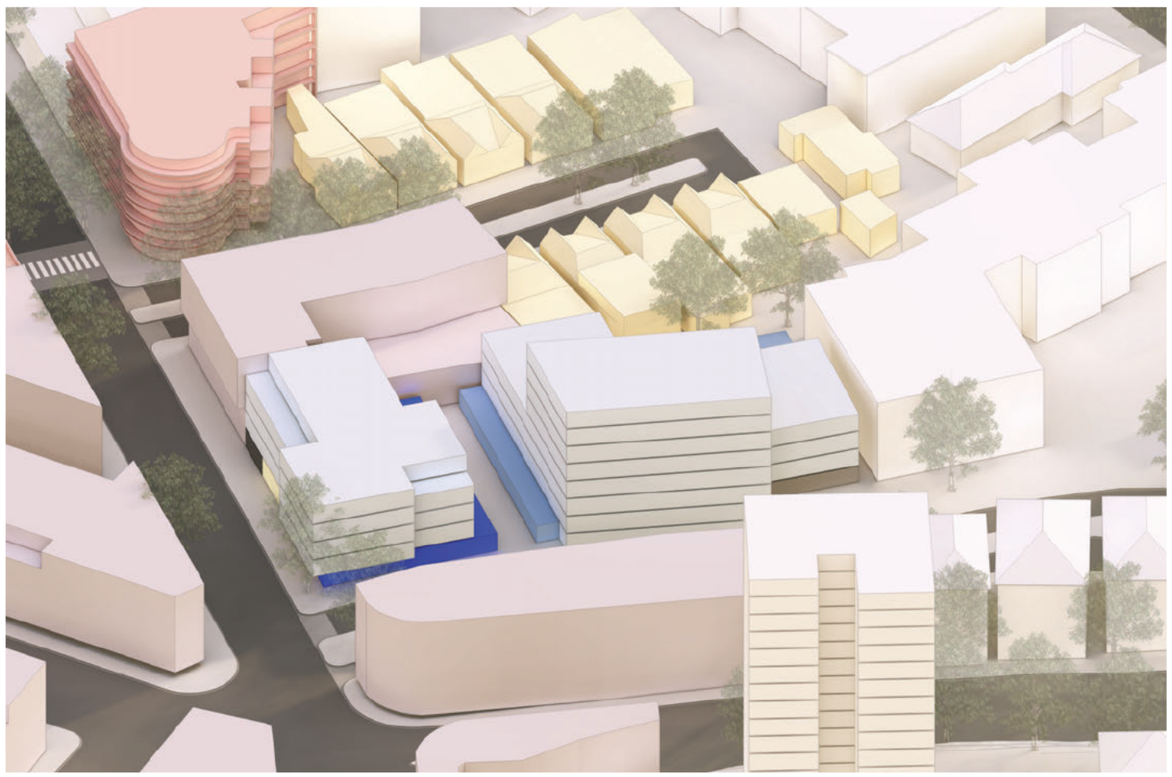
- 90%/10% market to affordable units
- Residential tower
- 8 levels
- Retail ground floor frontage

Legend

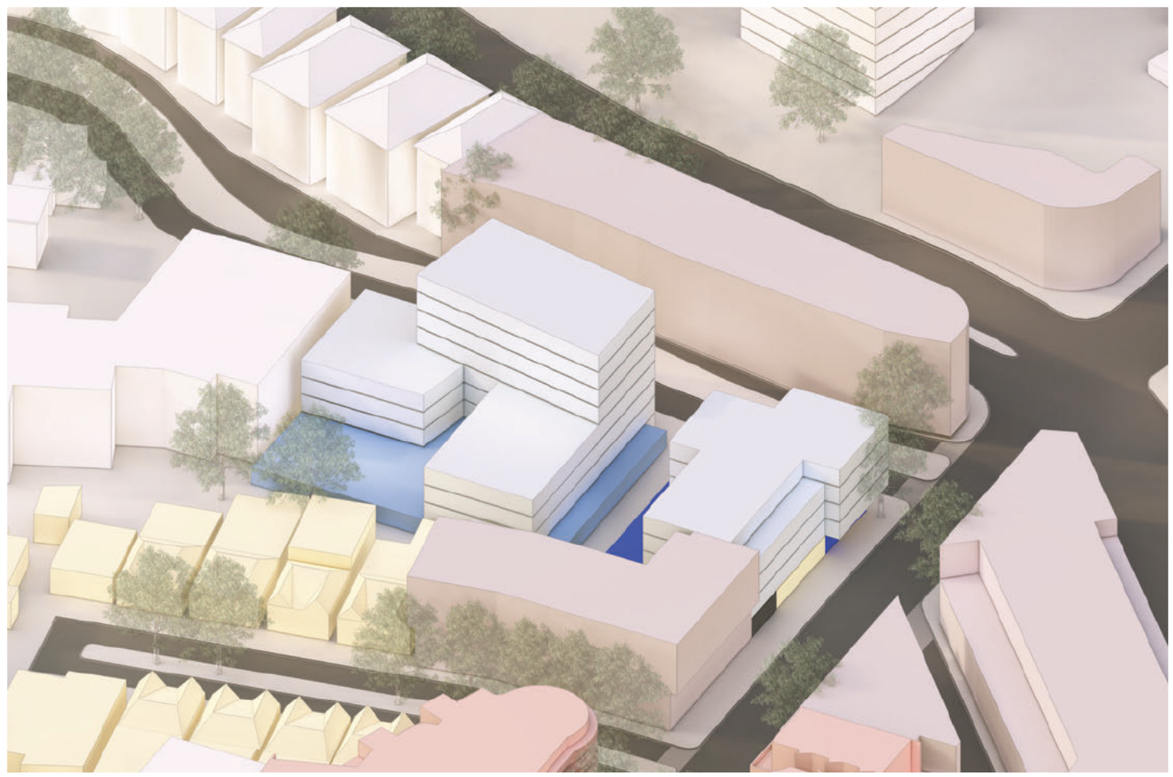
- Residential
- Commercial
- Retail
- Early Childhood Health Centre
- Cinema
- Parking

Project Snapshot

	GFA	Units	Parking	No. Levels	FSR
Cinema	1,341 sqm				
ECHC	219 sqm				
Commercial	sqm				
Retail	566 sqm				
Residential	7,205 sqm				
Market		6484			
Affordable		720			
Above ground			8		
Underground (5 levels)			504		
Total	9,331 sqm	71	512	8	2.48:1



View from South East



View from South West

Option 2 - Market Residential Maximum

Metrics

Option 2 - Market Resi Max

	Floor to Floor Height (m)	Cumulative Height (m)	Parking Circulation/Ancillary (sqm)	Parking GBA (sqm)	Parking Spaces (No.)	Cinema GBA (sqm)	Cinema GFA (sqm)	ECHC GFA (sqm)	ECHC GFA (sqm)	Commercial GBA (sqm)	Commercial GFA (sqm)	Retail GBA (sqm)	Retail/ GFA (sqm)	Residential GBA (sqm)	Residential GFA (sqm)	Aff unit (No.)	Market Unit (No.)	Total Units (No.)	AH NSA sqm	MH NSA sqm
Level 11																65.0	109.0			
Level 10																				
Level 09																				
Level 08																				
Level 07	3.1 m	25.7 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 06	3.1 m	22.6 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 05	3.1 m	19.5 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 04	3.1 m	16.4 m												1,272 sqm	954 sqm		8.8	8.8	0	811
Level 03	3.1 m	13.3 m												2,145 sqm	1,609 sqm		14.8	14.8	0	1368
Level 02	3.1 m	10.2 m												2,145 sqm	1,609 sqm		14.8	14.8	0	1368
Level 01	3.1 m	7.1 m												2,145 sqm	1,609 sqm	9.0	9.4	18.4	495	873
Ground Floor	4.0 m	4.0 m		292.4	8	1,490 sqm	1,341 sqm	243 sqm	219 sqm			629 sqm	566 sqm	184 sqm	138 sqm	2.1		2.1	117	0
Basement Level 01				3,528 sqm	101															
Basement Level 02				3,528 sqm	101															
Basement Level 03				3,528 sqm	101															
Basement Level 04				3,528 sqm	101															
Basement Level 05				3,528 sqm	101															
Total	25.7 m	25.7 m	sqm	17,932 sqm	512	1,490 sqm	1,341 sqm	243 sqm	219 sqm	sqm	sqm	629 sqm	566 sqm	9,606 sqm	7,205 sqm	11.1	59.5	70.6	612	5512

Total GFA	9,331 sqm
Total FSR	2.48:1
Target Resi Parking	124
Target Commercial Parking	0
Target Retail Parking	0
Target Council Parking	406
Target Parking Total	530

vs 512 provided

	Mix %	GFA	Units	Parking /Unit	Parking Spaces (No.)	NSA
Market	90%	6484	60	2.0	120	5512
Affordable	10%	720	11	0.4	4	612
Total	100%	7204.78	71		124	7205

Woollahra Municipal Council - Cross Street Carpark Site, Double Bay

Option 2 - Market Residential Maximum (FSR 2.48:1)

Order of Cost Estimate

Date: 30-Oct-24

Item	Description	Area	Unit	Rate	Total	Total Residential (Market)	Total Residential (Affordable)	Total Council Carpark	Total Cinema	Total ECHC	Total Commercial /Retail
	SUMMARY				[redacted]						
	90%/10% Market to Affordable Units (60 Market Units & 11 Affordable Units)										
1	Demolitions (existing slab structure approx. 14,500m2)										
	Basement										
2	Basement Carpark : 5 levels, GBA 17,640m2 and 504 parking spaces										
	Above Ground Parking										
3	Parking : GBA 293m2 and 8 car spaces										
	Cinema										
4	Cinema : GFA 1,341m2, GBA 1,490m2										
	Early Childhood Health Centre										
5	ECHC : GFA 219m2, GBA 243m2										
	Commercial										
6	Commercial : NIL										
	Retail										
7	Retail : GFA 566m2, GBA 629m2										
	Residential (8 levels, GFA 7,205m2, GBA 9,606m2 and 71 Apartments										
8	Residential (Market), GFA 6,484m2, GBA 8,645m2 and 60 Apartments										
9	Residential (Affordable), GFA 720m2, GBA 961m2 and 11 Apartments										
	Others										
10	External Services										
11	External and Landscape Works										
	OTHERS										
12	Budget allowance for soil remediation										
	TOTAL (EXCL CONSTRUCTION CONTINGENCIES)										
13	CONSTRUCTION CONTINGENCIES (10%)										
14	LOOSE FURNITURE AND EQUIPMENT										
	TOTAL (INCL CONSTRUCTION CONTINGENCIES BUT EXCL GST)										

Notes and Assumptions:

All the above costs are only indicative and are subject to review of Schematic Designs and design development information

GFA, nos of units and car parking spaces as per e8urban's provided massing plans and unit schedule dated 15/08/24, and updated NSA Split by Levels received on 22/10/24

Plant space assumed included in the overall GBA

Basement - mainly within water table

Assume EV charges provided to 5% of parking spaces

Assume only pavement replacement requirerd to Cross Street

Exclusions:

Land Costs

Finance and Interest

Legal Fees

Marketing Costs & Display Apartment

Design & Consultants Fees

Council and Authorities Fees

Section 7.11 or other Council Contributions

Section 73/Sydney Water Contribution

Building Bond

Car stackers

Flood barriers or similar measures

Removal of Ground Contamination and Wastes

Fitout to Retail (Shell & core allowed only)

Fitout to Commercial (Warm shell allowed only)

Fitout to Cinema (Shell & core allowed only)

Loose furniture, fittings and equipment; gym equipment

Home automation

Building Maintenance Unit

ESD / Sustainability Initiatives

Services diversions and amplification

Escalation from date of estimate to actual date of commencement of works

Material and labour cost escalation to be reviewed

GST

6.1 The financial results

The testing results indicated that Option 2a could achieve a viable IRR of 18% by paying the Council $30 million for development rights.

In contrast, Option 2b demonstrated that the Council could receive a payment of $49 million while maintaining viable development at the target IRR of 18%.

Table 11: Option 2a and 2b results

Option 2	Option 2a	Option 2b
Site Area	3,769sqm	3,769sqm
Gross Floor Area	9,331sqm	9,331sqm
Floor Space Ratio	2.48:1	2.48:1
Total Number of Residential Units	**71 units**	**71units**
Market Housing Units	60 units (109sqm)	60 units (109sqm)
Affordable Housing Units	11 units (65sqm)	11 units (65sqm)

[redacted]

ARGUS EstateMaster | Development Feasibility

SUMMARY OF PROJECT RETURNS

Cross Street Car Park Development Options

Option 2a Market Resi Max

Option 2a includes cinema

HillPDA CONSULTING

Licensed to: Hill PDA Pty Ltd

Time Span:	Jan-25 to Jun-30 (65 Months)		
Type:	Mixed Use		
Status:	Under Review		
Site Area:	3,769 SqM		
#N/A	2.48:1	Equated GFA:	9,330.71 SqM
Project Size:	71 Units	1 per 53.08 SqM of Site Area	
	9,330.71 GFA	1 per 0.4 SqM of Site Area	

	Total AUD	AUD Per Unit	AUD Per GFA	% of Total Net Revenue	Total Exc GST
Revenues					
	Quantity	SqM	AUD/Quantity		
Gross Sales Revenue	-	7,361.97	-		
Market Housing Apartments	-	5,511.66	-		
Commerical Office	-	1,341.23	-		
Retail Shops	-	509.09	-		
Less Selling Costs					
Less Purchasers Costs					
NET SALES REVENUE					
	Quantity	SqM	AUD/SqM/annum		
Gross Rental Income	-	-	-		
Less Outgoings & Vacancies					
Less Letting Fees					
Less Incentives (Rent Free & Fitout Costs)					
Less Turnover Costs					
Less Other Leasing Costs					
NET RENTAL INCOME					
Interest Received					
Other Income					
TOTAL REVENUE (before GST paid)					
Less GST paid on all Revenue	Excludes 30,628,807 withheld by Purchasers				
TOTAL REVENUE (after GST paid)					
Costs					
Land Purchase Cost					
Land Acquisition Costs					
Construction Costs (inc. Contingency)					
Car Parking					
Built Form					
Other cOSTS					
Contingency					
Professional Fees					
Statutory Fees					
Marketing and Advertising					
Strata Bond					
Development Rights (Paid to Council)					
Project Contingency (Reserve)					
Land Holding Costs					
Pre-Sale Commissions					
Finance Charges (inc. Fees)					
Interest Expense					
TOTAL COSTS (before GST reclaimed)					
Less GST reclaimed					
Plus Corporate Tax					
TOTAL COSTS (after GST reclaimed)					

[redacted]

Performance Indicators

[1]	**Net Development Profit**	
[3]	**Development Margin (Profit/Risk Margin)**	Based on total costs (exc selling & leasing costs)
[4]	Residual Land Value	Based on Target Margin of 18% (Exclusive of GST)
[5]	**Net Present Value**	Based on Discount Rate of 18% p.a. Effective
[6]	Benefit Cost Ratio	
[7]	**Project Internal Rate of Return (IRR)**	Per annum Effective
[8]	Residual Land Value	Based on NPV (Exclusive of GST)
	Equity IRR	Per annum Effective
	Equity Contribution	
	Peak Debt Exposure	
	Equity to Debt Ratio	
[9]	Weighted Average Cost of Capital (WACC)	
[10]	Breakeven Date for Cumulative Cash Flow	Month 61
[11]	Yield on Cost	
[12]	Rent Cover	
[13]	Profit Erosion	

Footnotes:

1. Development Profit: is total revenue less total cost including interest paid and received
2. Note: No redistribution of Developer's Gross Profit
3. Development Margin: is profit divided by total costs (exc selling & leasing costs)
5. Net Present Value: is the project's cash flow stream discounted to present value. It includes financing costs but excludes interest and corp tax.
6. Benefit:Cost Ratio: is the ratio of discounted incomes to discounted costs and includes financing costs but excludes interest and corp tax.
7. Internal Rate of Return: is the discount rate where the NPV above equals Zero.
8. Residual Land Value (based on NPV): is the purchase price for the land to achieve a zero NPV.
9. The Weighted Average Cost of Capital (WACC) is the rate that a company is expected to pay to finance its assets.
10. Breakeven date for Cumulative Cash Flow: is the last date when total debt and equity is repaid (ie when profit is realised).
11. Yield on Cost is Current Net Annual Rent divided by Total Costs (before GST reclaimed), including all Selling Costs.
12. The total net development profit divided by the current net annual rental expressed as a number of years/months.
13. The period of time post practical completion that it can remain unsold (but leased out) until finance and land holding costs erodes the profit for the development to zero.

SUMMARY OF PROJECT RETURNS

Cross Street Car Park Development Options

Option 2b cinema replaced by retail

Option 2b no cinema

HillPDA CONSULTING

Licensed to: Hill PDA Pty Ltd

Time Span:	Jan-25 to Jun-30 (65 Months)		
Type:	Mixed Use		
Status:	Under Review		
Site Area:	3,769 SqM		
#N/A	2.48:1	Equated GFA:	9,330.71 SqM
Project Size:	71 Units	1 per 53.08 SqM of Site Area	
	9,330.71 GFA	1 per 0.4 SqM of Site Area	

	Total AUD	AUD Per Unit	AUD Per GFA	% of Total Net Revenue	Total Exc GST
Revenues					
	Quantity	SqM	AUD/Quantity		
Gross Sales Revenue	-	7,424.99	-		
Market Housing Apartments	-	5,511.66	-		
Commerical Office	-	197.14	-		
Retail Shops	-	1,716.19	-		
Less Selling Costs					
Less Purchasers Costs					
NET SALES REVENUE					
	Quantity	SqM	AUD/SqM/annum		
Gross Rental Income	-	-	-		
Less Outgoings & Vacancies					
Less Letting Fees					
Less Incentives (Rent Free & Fitout Costs)					
Less Turnover Costs					
Less Other Leasing Costs					
NET RENTAL INCOME					
Interest Received					
Other Income					
TOTAL REVENUE (before GST paid)					
Less GST paid on all Revenue	Excludes 30 684 808 withheld by Purchasers				
TOTAL REVENUE (after GST paid)					
Costs					
Land Purchase Cost					
Land Acquisition Costs					
Construction Costs (inc. Contingency)					
Car Parking					
Built Form					
Other cOSTS					
Contingency					
Professional Fees					
Statutory Fees					
Marketing and Advertising					
Strata Bond					
Development Right (Paid to Council)					
Project Contingency (Reserve)					
Land Holding Costs					
Pre-Sale Commissions					
Finance Charges (inc. Fees)					
Interest Expense					
TOTAL COSTS (before GST reclaimed)					
Less GST reclaimed					
Plus Corporate Tax					
TOTAL COSTS (after GST reclaimed)					

[redacted]

Performance Indicators

[1]	**Net Development Profit**	
[3]	**Development Margin (Profit/Risk Margin)**	Based on total costs (exc selling & leasing costs)
[4]	Residual Land Value	Based on Target Margin of 18% (Exclusive of GST)
[5]	**Net Present Value**	Based on Discount Rate of 18% p.a. Effective
[6]	Benefit Cost Ratio	
[7]	**Project Internal Rate of Return (IRR)**	Per annum Effective
[8]	Residual Land Value	Based on NPV (Exclusive of GST)
	Equity IRR	Per annum Effective
	Equity Contribution	
	Peak Debt Exposure	
	Equity to Debt Ratio	
[9]	Weighted Average Cost of Capital (WACC)	
[10]	Breakeven Date for Cumulative Cash Flow	Month 61
[11]	Yield on Cost	
[12]	Rent Cover	
[13]	Profit Erosion	

Footnotes:

1. Development Profit: is total revenue less total cost including interest paid and received
2. Note: No redistribution of Developer's Gross Profit
3. Development Margin: is profit divided by total costs (exc selling & leasing costs)
5. Net Present Value: is the project's cash flow stream discounted to present value. It includes financing costs but excludes interest and corp tax.
6. Benefit:Cost Ratio: is the ratio of discounted incomes to discounted costs and includes financing costs but excludes interest and corp tax.
7. Internal Rate of Return: is the discount rate where the NPV above equals Zero.
8. Residual Land Value (based on NPV): is the purchase price for the land to achieve a zero NPV.
9. The Weighted Average Cost of Capital (WACC) is the rate that a company is expected to pay to finance its assets.
10. Breakeven date for Cumulative Cash Flow: is the last date when total debt and equity is repaid (ie when profit is realised).
11. Yield on Cost is Current Net Annual Rent divided by Total Costs (before GST reclaimed), including all Selling Costs.
12. The total net development profit divided by the current net annual rental expressed as a number of years/months.
13. The period of time post practical completion that it can remain unsold (but leased out) until finance and land holding costs erodes the profit for the development to zero.

OPTION 3:
MARKET RESIDENTIAL

7.0 OPTION 3: MARKET RESIDENTIAL

This chapter describes the proposed development option's land uses, gross floor area, construction costs, and the financial results.

The proposed development comprises market and affordable residential apartments, retail, commercial, and community space, and the Council's car parking, which will be over seven levels. The proposed mixed-use is permissible and will have a floor space ratio of 2.36:1, which is below the permissible current FSR.

Option 3 - Market Residential

Massing

Key Points

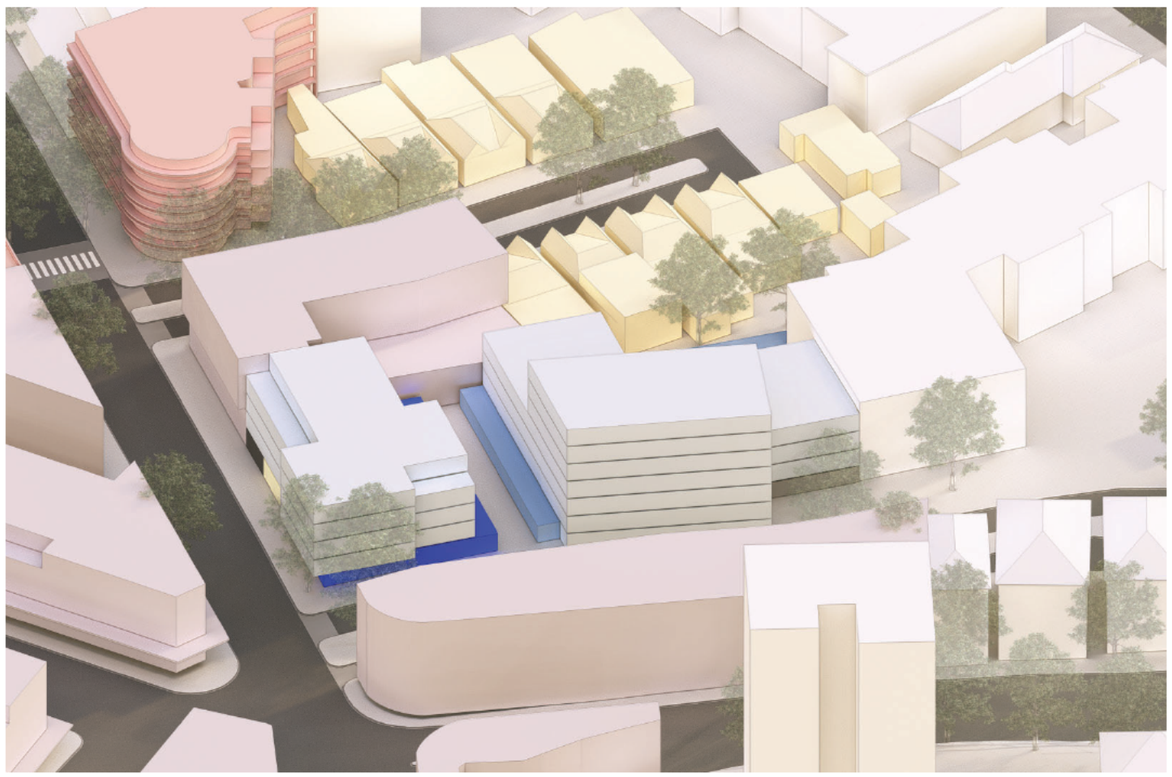
- 90%/10% market to affordable units
- Residential tower
- 7 levels
- Retail ground floor frontage

Legend

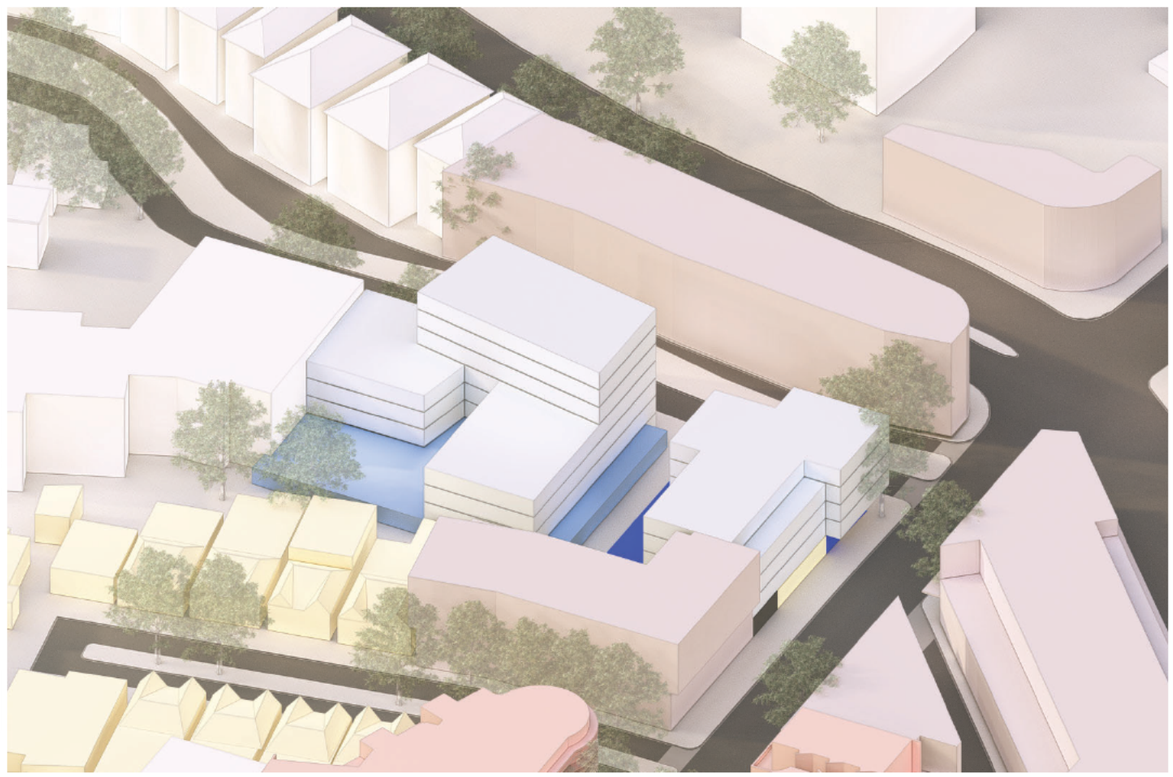
- Residential
- Commercial
- Retail
- Early Childhood Health Centre
- Cinema
- Parking

Project Snapshot

	GFA	Units	Parking	No. Levels	FSR
Cinema	1,341 sqm				
ECHC	219 sqm				
Commercial	sqm				
Retail	566 sqm				
Residential	6,776 sqm				
Market		6099			
Affordable		678			
Above ground			8		
Underground (5 levels)			504		
Total	8,902 sqm	66	512	7	2.36:1



View from South East



View from South West

Option 3 - Market Residential

Metrics

Option 3 - Market Residenstial

	Floor to Floor Height (m)	Cumulative Height (m)	Parking Circulation/Ancillary (sqm)	Parking GBA (sqm)	Parking Spaces (No.)	Cinema GBA (sqm)	Cinema GFA (sqm)	ECHC GFA (sqm)	ECHC GFA (sqm)	Commercial GBA (sqm)	Commercial GFA (sqm)	Retail GBA (sqm)	Retail/ GFA (sqm)	Residential GBA (sqm)	Residential GFA (sqm)	Aff unit (No.)	Market Unit (No.)	Total Units (No.)	AH NSA (sqm)	MH NSA (sqm)
Level 11																65.0	109.0			
Level 10																				
Level 09																				
Level 08																				
Level 07																	-			
Level 06	3.1 m	22.6 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 05	3.1 m	19.5 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 04	3.1 m	16.4 m												1,272 sqm	954 sqm		8.8	8.8	0	811
Level 03	3.1 m	13.3 m												2,145 sqm	1,609 sqm		14.8	14.8	0	1368
Level 02	3.1 m	10.2 m												2,145 sqm	1,609 sqm		14.8	14.8	0	1368
Level 01	3.1 m	7.1 m												2,145 sqm	1,609 sqm	8.3	9.8	18.1	459	909
Ground Floor	4.0 m	4.0 m		292.4	8	1,490 sqm	1,341 sqm	243 sqm	219 sqm			629 sqm	566 sqm	184 sqm	138 sqm	2.1		2.1	117	0
Basement Level 01				3,528 sqm	101															
Basement Level 02				3,528 sqm	101															
Basement Level 03				3,528 sqm	101															
Basement Level 04				3,528 sqm	101															
Basement Level 05				3,528 sqm	101															
Total	22.6 m	22.6 m	sqm	17,932 sqm	512	1,490 sqm	1,341 sqm	243 sqm	219 sqm	sqm	sqm	629 sqm	566 sqm	9,035 sqm	6,776 sqm	10.4	56.0	66.4	576	5184

Total GFA	8,902 sqm
Total FSR	2.36:1
Target Resi Parking	116
Target Commercial Parking	0
Target Retail Parking	0
Target Council Parking	406
Target Parking Total	522

vs 512 provided

	Mix %	GFA	Units	Parking /Unit	Parking Spaces (No.)	NSA
Market	90%	6099	56	2.0	112	5184
Affordable	10%	678	10	0.4	4	576
Total	100%	6776	66		116	6776

Woollahra Municipal Council - Cross Street Carpark Site, Double Bay

Option 3 - Market Residential Maximum (FSR 2.36:1)

Order of Cost Estimate

Date: 30-Oct-24

Item	Description	Area	Unit	Rate	Total	Total Residential (Market)	Total Residential (Affordable)	Total Council Carpark	Total Cinema	Total ECHC	Total Commercial /Retail
	SUMMARY				[redacted]						
	90%/10% Market to Affordable Units (56 Market Units & 10 Affordable Units)										
1	Demolitions (existing slab structure approx. 14,500m2)										
	Basement										
2	Basement Carpark : 5 levels, GBA 17,640m2 and 504 parking spaces										
	Above Ground Parking										
3	Parking : GBA 293m2 and 8 car spaces										
	Cinema										
4	Cinema : GFA 1,341m2, GBA 1,490m2										
	Early Childhood Health Centre										
5	ECHC : GFA 219m2, GBA 243m2										
	Commercial										
6	Commercial : NIL										
	Retail										
7	Retail : GFA 566m2, GBA 629m2										
	Residential (7 levels, GFA 6,776m2, GBA 9,035m2 and 66 Apartments										
8	Residential (Market), GFA 6,099m2, GBA 8,132m2 and 56 Apartments										
9	Residential (Affordable), GFA 678m2, GBA 904m2 and 10 Apartments										
	Others										
10	External Services										
11	External and Landscape Works										
	OTHERS										
12	Budget allowance for soil remediation										
	TOTAL (EXCL CONSTRUCTION CONTINGENCIES)										
13	CONSTRUCTION CONTINGENCIES (10%)										
14	LOOSE FURNITURE AND EQUIPMENT										
	TOTAL (INCL CONSTRUCTION CONTINGENCIES BUT EXCL GST)										

Notes and Assumptions:

All the above costs are only indicative and are subject to review of Schematic Designs and design development information

GFA, nos of units and car parking spaces as per e8urban's provided massing plans and unit schedule dated 15/08/24, and updated NSA Split by Levels received on 22/10/24

Plant space assumed included in the overall GBA

Basement - mainly within water table

Assume EV charges provided to 5% of parking spaces

Assume only pavement replacement requirerd to Cross Street

Exclusions:

Land Costs

Finance and Interest

Legal Fees

Marketing Costs & Display Apartment

Design & Consultants Fees

Council and Authorities Fees

Section 7.11 or other Council Contributions

Section 73/Sydney Water Contribution

Building Bond

Car stackers

Flood barriers or similar measures

Removal of Ground Contamination and Wastes

Fitout to Retail (Shell & core allowed only)

Fitout to Commercial (Warm shell allowed only)

Fitout to Cinema (Shell & core allowed only)

Loose furniture, fittings and equipment; gym equipment

Home automation

Building Maintenance Unit

ESD / Sustainability Initiatives

Services diversions and amplification

Escalation from date of estimate to actual date of commencement of works

Material and labour cost escalation to be reviewed

GST

7.1 The financial results

Option 3 demonstrated that the Council could receive a payment of $18 million while maintaining viable development at the target IRR of 18%.

Table 12: Option 3 results

Description	Option 3
Site Area	3,769sqm
Gross Floor Area	8,902sqm
Floor Space Ratio	2.36:1
Total Number of Residential Units	66 units
Market Housing Units	56 units (109sqm GFA)
Affordable Housing Units	10 units (65qm GFA)
[redacted]	

SUMMARY OF PROJECT RETURNS

Cross Street Car Park Development Options

Option 3 - Market Residental

Option 3

Licensed to: Hill PDA Pty Ltd

Time Span:	Jan-25 to Jun-30 (65 Months)		
Type:	Mixed Use		
Status:	Under Review		
Site Area:	3,769 SqM		
#N/A	2.36:1	Equated GFA:	8,902.21 SqM
Project Size:	66 Units	1 per 57.1 SqM of Site Area	
	8,902.21 GFA	1 per 0.42 SqM of Site Area	

	Total AUD	AUD Per Unit	AUD Per GFA	% of Total Net Revenue	Total Exc GST
Revenues					
	Quantity	SqM	AUD/Quantity		
Gross Sales Revenue	-	7,231.31	-		
Market Housing Apartments	-	5,183.86	-		
Commerical Office	-	1,538.37	-		
Retail Shops	-	509.09	-		
Less Selling Costs					
Less Purchasers Costs					
NET SALES REVENUE					
	Quantity	SqM	AUD/SqM/annum		
Gross Rental Income	-	-	-		
Less Outgoings & Vacancies					
Less Letting Fees					
Less Incentives (Rent Free & Fitout Costs)					
Less Turnover Costs					
Less Other Leasing Costs					
NET RENTAL INCOME					
Interest Received					
Other Income					
TOTAL REVENUE (before GST paid)					
Less GST paid on all Revenue	Excludes 28,098,310 withheld by Purchasers				
TOTAL REVENUE (after GST paid)					
Costs					
Land Purchase Cost					
Land Acquisition Costs					
Construction Costs (inc. Contingency)					
Car Parking					
Built Form					
Other cOSTS					
Contingency					
Professional Fees					
Statutory Fees					
Marketing and Advertising					
Strata Bond					
Development Rights (Paid to Council)					
Project Contingency (Reserve)					
Land Holding Costs					
Pre-Sale Commissions					
Finance Charges (inc. Fees)					
Interest Expense					
TOTAL COSTS (before GST reclaimed)					
Less GST reclaimed					
Plus Corporate Tax					
TOTAL COSTS (after GST reclaimed)					

[redacted]

Performance Indicators

[1] **Net Development Profit**		
[3] **Development Margin (Profit/Risk Margin)**	Based on total costs (exc selling & leasing costs)	
[4] Residual Land Value	Based on Target Margin of 18% (Exclusive of GST)	
[5] **Net Present Value**	Based on Discount Rate of 18% p.a. Effective	
[6] Benefit Cost Ratio		
[7] **Project Internal Rate of Return (IRR)**	Per annum Effective	
[8] Residual Land Value	Based on NPV (Exclusive of GST)	
Equity IRR	Per annum Effective	
Equity Contribution		
Peak Debt Exposure		
Equity to Debt Ratio		
[9] Weighted Average Cost of Capital (WACC)		
[10] Breakeven Date for Cumulative Cash Flow	Month 61	
[11] Yield on Cost		
[12] Rent Cover		
[13] Profit Erosion		

Footnotes:

1. Development Profit: is total revenue less total cost including interest paid and received
2. Note: No redistribution of Developer's Gross Profit
3. Development Margin: is profit divided by total costs (exc selling & leasing costs)
5. Net Present Value: is the project's cash flow stream discounted to present value. It includes financing costs but excludes interest and corp tax.
6. Benefit:Cost Ratio: is the ratio of discounted incomes to discounted costs and includes financing costs but excludes interest and corp tax.
7. Internal Rate of Return: is the discount rate where the NPV above equals Zero.
8. Residual Land Value (based on NPV): is the purchase price for the land to achieve a zero NPV.
9. The Weighted Average Cost of Capital (WACC) is the rate that a company is expected to pay to finance its assets.
10. Breakeven date for Cumulative Cash Flow: is the last date when total debt and equity is repaid (ie when profit is realised).
11. Yield on Cost is Current Net Annual Rent divided by Total Costs (before GST reclaimed), including all Selling Costs.
12. The total net development profit divided by the current net annual rental expressed as a number of years/months.
13. The period of time post practical completion that it can remain unsold (but leased out) until finance and land holding costs erodes the profit for the development to zero.

OPTION 4:
SEPP BONUS (SSDA)

8.0 OPTION 4: SEPP BONUS/SSDA

This chapter describes the proposed development option's land uses, gross floor area, construction costs, and the financial results.

The planning pathway for this option is a state significant development application (SSDA) under Part 4 of the EP&A Act (based on State Environmental Planning Policy (Housing) 2021 – Part 2 Division 1), as the 15% affordable housing can trigger the application of the 30% height bonus, meaning an allowable permissible height of 23.53m (an additional height of 5.43m).The proposal complies with the permissible current FSR.

Option 4 - SEPP Bonus

Massing

Key Points

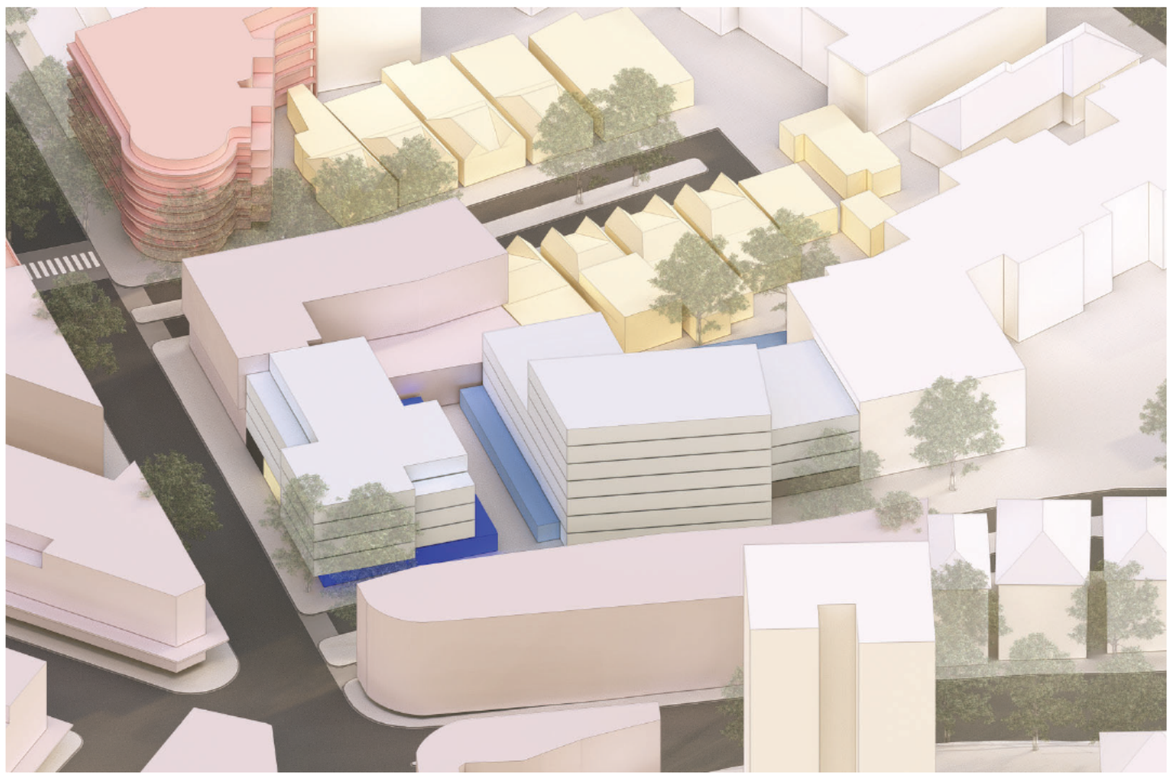
- 85%/15% market to affordable units
- Residential tower
- 7 levels
- Retail ground floor frontage

Legend

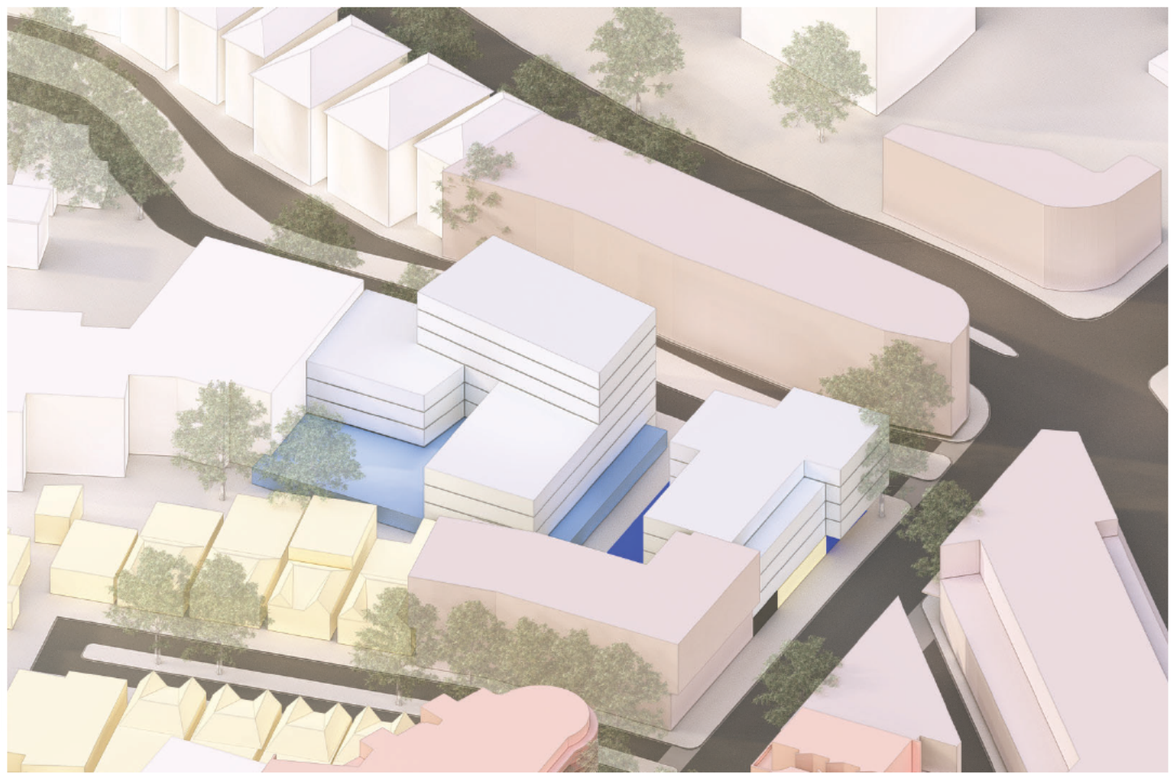
- Residential
- Commercial
- Retail
- Early Childhood Health Centre
- Cinema
- Parking

Project Snapshot

	GFA	Units	Parking	No. Levels	FSR
Cinema	1,341 sqm				
ECHC	219 sqm				
Commercial	sqm				
Retail	566 sqm				
Residential	6,776 sqm				
Market		5760			
Affordable		1016			
Above ground			8		
Underground (5 levels)			504		
Total	8,902 sqm	68	512	7	2.36:1



View from South East



View from South West

Option 4 - SEPP Bonus

Metrics

Option 4 - SEPP BONUS

	Floor to Floor Height (m)	Cumulative Height (m)	Parking Circulation/Ancillary (sqm)	Parking GBA (sqm)	Parking Spaces (No.)	Cinema GBA (sqm)	Cinema GFA (sqm)	ECHC GFA (sqm)	ECHC GFA (sqm)	Commercial GBA (sqm)	Commercial GFA (sqm)	Retail GBA (sqm)	Retail/ GFA (sqm)	Residential GBA (sqm)	Residential GFA (sqm)	Aff unit (No.)	Market Unit (No.)	Total Units (No.)	AH NSA (sqm)	MH NSA (sqm)
Level 11																65.0	109.0			
Level 10																				
Level 09																				
Level 08																				
Level 07																				
Level 06	3.1 m	22.6 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 05	3.1 m	19.5 m												571 sqm	428 sqm		3.9	3.9	0	364
Level 04	3.1 m	16.4 m												1,272 sqm	954 sqm		8.8	8.8	0	811
Level 03	3.1 m	13.3 m												2,145 sqm	1,609 sqm		14.8	14.8	0	1368
Level 02	3.1 m	10.2 m												2,145 sqm	1,609 sqm		14.8	14.8	0	1368
Level 01	3.1 m	7.1 m												2,145 sqm	1,609 sqm	13.5	6.7	20.2	747	621
Ground Floor	4.0 m	4.0 m		292.4	8	1,490 sqm	1,341 sqm	243 sqm	219 sqm			629 sqm	566 sqm	184 sqm	138 sqm	2.1		2.1	117	0
Basement Level 01				3,528 sqm	101															
Basement Level 02				3,528 sqm	101															
Basement Level 03				3,528 sqm	101															
Basement Level 04				3,528 sqm	101															
Basement Level 05				3,528 sqm	101															
Total	22.6 m	22.6 m	sqm	17,932 sqm	512	1,490 sqm	1,341 sqm	243 sqm	219 sqm	sqm	sqm	629 sqm	566 sqm	9,035 sqm	6,776 sqm	15.6	52.8	68.5	864	4896

Total GFA	8,902 sqm
Total FSR	2.36:1
Target Resi Parking	112
Target Commercial Parking	0
Target Retail Parking	0
Target Council Parking	406
Target Parking Total	518

vs 512 provided

	Mix %	GFA	Units	Parking /Unit	Parking Spaces (No.)	NSA
Market	85%	5760	53	2.0	106	4896
Affordable	15%	1016	15	0.4	6	864
Total	100%	6776	68		112	6776

Woollahra Municipal Council - Cross Street Carpark Site, Double Bay

Option 4 - SEPP Bonus

Order of Cost Estimate

Date: 30-Oct-24

Item	Description	Area	Unit	Rate	Total	Total Residential (Market)	Total Residential (Affordable)	Total Council Carpark	Total Cinema	Total ECHC	Total Commercial /Retail
	SUMMARY										
	85%/15% Market to Affordable Units (53 Market Units & 15 Affordable Units)										
1	Demolitions (existing slab structure approx. 14,500m2)										
	Basement										
2	Basement Carpark : 5 levels, GBA 17,640m2 and 504 parking spaces										
	Above Ground Parking										
3	Parking : GBA 293m2 and 8 car spaces										
	Cinema										
4	Cinema : GFA 1,341m2, GBA 1,490m2										
	Early Childhood Health Centre										
5	ECHC : GFA 219m2, GBA 243m2										
	Commercial										
6	Commercial : NIL										
	Retail										
7	Retail : GFA 566m2, GBA 629m2										
	Residential (7 levels, GFA 6,776m2, GBA 9,035m2 and 68 Apartments										
8	Residential (Market), GFA 5,760m2, GBA 7,680m2 and 53 Apartments										
9	Residential (Affordable), GFA 1,016m2, GBA 1,355m2 and 15 Apartments										
	Others										
10	External Services										
11	External and Landscape Works										
	OTHERS										
12	Budget allowance for soil remediation										
	TOTAL (EXCL CONSTRUCTION CONTINGENCIES)										
13	CONSTRUCTION CONTINGENCIES (10%)										
14	LOOSE FURNITURE AND EQUIPMENT										
	TOTAL (INCL CONSTRUCTION CONTINGENCIES BUT EXCL GST)										

Notes and Assumptions:

All the above costs are only indicative and are subject to review of Schematic Designs and design development information

GFA, nos of units and car parking spaces as per e8urban's provided massing plans and unit schedule dated 15/08/24, and updated NSA Split by Levels received on 22/10/24

Plant space assumed included in the overall GBA

Basement - mainly within water table

Assume EV charges provided to 5% of parking spaces

Assume only pavement replacement requirerd to Cross Street

Exclusions:

Land Costs

Finance and Interest

Legal Fees

Marketing Costs & Display Apartment

Design & Consultants Fees

Council and Authorities Fees

Section 7.11 or other Council Contributions

Section 73/Sydney Water Contribution

Building Bond

Car stackers

Flood barriers or similar measures

Removal of Ground Contamination and Wastes

Fitout to Retail (Shell & core allowed only)

Fitout to Commercial (Warm shell allowed only)

Fitout to Cinema (Shell & core allowed only)

Loose furniture, fittings and equipment; gym equipment

Home automation

Building Maintenance Unit

ESD / Sustainability Initiatives

Services diversions and amplification

Escalation from date of estimate to actual date of commencement of works

Material and labour cost escalation to be reviewed

GST

8.1 The financial results

Option 4 demonstrated that the Council could receive a payment of $9.6 million while maintaining viable development at the target IRR of 18%.

Table 13: Option 4 results

Description	Option 4
Site Area	3,769sqm
Gross Floor Area	8,902sqm
Floor Space Ratio	2.36:1
Total Number of Residential Units	**68 units**
Market Housing Units	53 units (109sqm GFA)
Affordable Housing Units	15 units (65sqm GFA)

[redacted]

SUMMARY OF PROJECT RETURNS

Cross Street Car Park Development Options

Option 4 - SEPP BONUS

Option 4

Licensed to: Hill PDA Pty Ltd

Time Span:	Jan-25 to Jun-30 (65 Months)		
Type:	Mixed Use		
Status:	Under Review		
Site Area:	3,769 SqM		
#N/A	2.36:1	Equated GFA:	8,902.21 SqM
Project Size:	68 Units	1 per 55.42 SqM of Site Area	
	8,902.21 GFA	1 per 0.42 SqM of Site Area	

	Total AUD	AUD Per Unit	AUD Per GFA	% of Total Net Revenue	Total Exc GST
Revenues					
	Quantity	SqM	AUD/Quantity		
Gross Sales Revenue	-	6,943.32	-		
Market Housing Apartments	-	4,895.86	-		
Commerical Office	-	1,538.37	-		
Retail Shops	-	509.09	-		
Less Selling Costs					
Less Purchasers Costs					
NET SALES REVENUE					
	Quantity	SqM	AUD/SqM/annum		
Gross Rental Income	-	-	-		
Less Outgoings & Vacancies					
Less Letting Fees					
Less Incentives (Rent Free & Fitout Costs)					
Less Turnover Costs					
Less Other Leasing Costs					
NET RENTAL INCOME					
Interest Received					
Other Income					
TOTAL REVENUE (before GST paid)					
Less GST paid on all Revenue	Excludes 26,860,517 withheld by Purchasers				
TOTAL REVENUE (after GST paid)					
Costs					
Land Purchase Cost					
Land Acquisition Costs					
Construction Costs (inc. Contingency)					
Car Parking					
Built Form					
Other cOSTS					
Contingency					
Professional Fees					
Statutory Fees					
Marketing and Advertising					
Strata Bond					
Development Rights (Paid to Council)					
Project Contingency (Reserve)					
Land Holding Costs					
Pre-Sale Commissions					
Finance Charges (inc. Fees)					
Interest Expense					
TOTAL COSTS (before GST reclaimed)					
Less GST reclaimed					
Plus Corporate Tax					
TOTAL COSTS (after GST reclaimed)					

[redacted]

Performance Indicators

[1]	**Net Development Profit**	
[3]	**Development Margin (Profit/Risk Margin)**	Based on total costs (exc selling & leasing costs)
[4]	Residual Land Value	Based on Target Margin of 18% (Exclusive of GST)
[5]	**Net Present Value**	Based on Discount Rate of 18% p.a. Effective
[6]	Benefit Cost Ratio	
[7]	**Project Internal Rate of Return (IRR)**	Per annum Effective
[8]	Residual Land Value	Based on NPV (Exclusive of GST)
	Equity IRR	Per annum Effective
	Equity Contribution	
	Peak Debt Exposure	
	Equity to Debt Ratio	
[9]	Weighted Average Cost of Capital (WACC)	
[10]	Breakeven Date for Cumulative Cash Flow	Month 61
[11]	Yield on Cost	
[12]	Rent Cover	
[13]	Profit Erosion	

Footnotes:

1. Development Profit: is total revenue less total cost including interest paid and received
2. Note: No redistribution of Developer's Gross Profit
3. Development Margin: is profit divided by total costs (exc selling & leasing costs)
5. Net Present Value: is the project's cash flow stream discounted to present value. It includes financing costs but excludes interest and corp tax.
6. Benefit:Cost Ratio: is the ratio of discounted incomes to discounted costs and includes financing costs but excludes interest and corp tax.
7. Internal Rate of Return: is the discount rate where the NPV above equals Zero.
8. Residual Land Value (based on NPV): is the purchase price for the land to achieve a zero NPV.
9. The Weighted Average Cost of Capital (WACC) is the rate that a company is expected to pay to finance its assets.
10. Breakeven date for Cumulative Cash Flow: is the last date when total debt and equity is repaid (ie when profit is realised).
11. Yield on Cost is Current Net Annual Rent divided by Total Costs (before GST reclaimed), including all Selling Costs.
12. The total net development profit divided by the current net annual rental expressed as a number of years/months.
13. The period of time post practical completion that it can remain unsold (but leased out) until finance and land holding costs erodes the profit for the development to zero.

OPTION 5: COUNCIL DIY

9.0 OPTION 5: COUNCIL DIY

This chapter describes the proposed development option's land uses, gross floor area, construction costs, and the financial results.

The proposed development will comprise retail, commercial, and community space, together with the Council's car parking. The proposed mixed-use is permissible and will have a floor space ratio of 4.64:1 with the council car park floor area included into FSR as it is above ground. This FSR exceeds the current FSR of 2.5:1. The proposed height is generally within the current permissible height of 18.1m.

Option 5 - Council DIY

Key Points

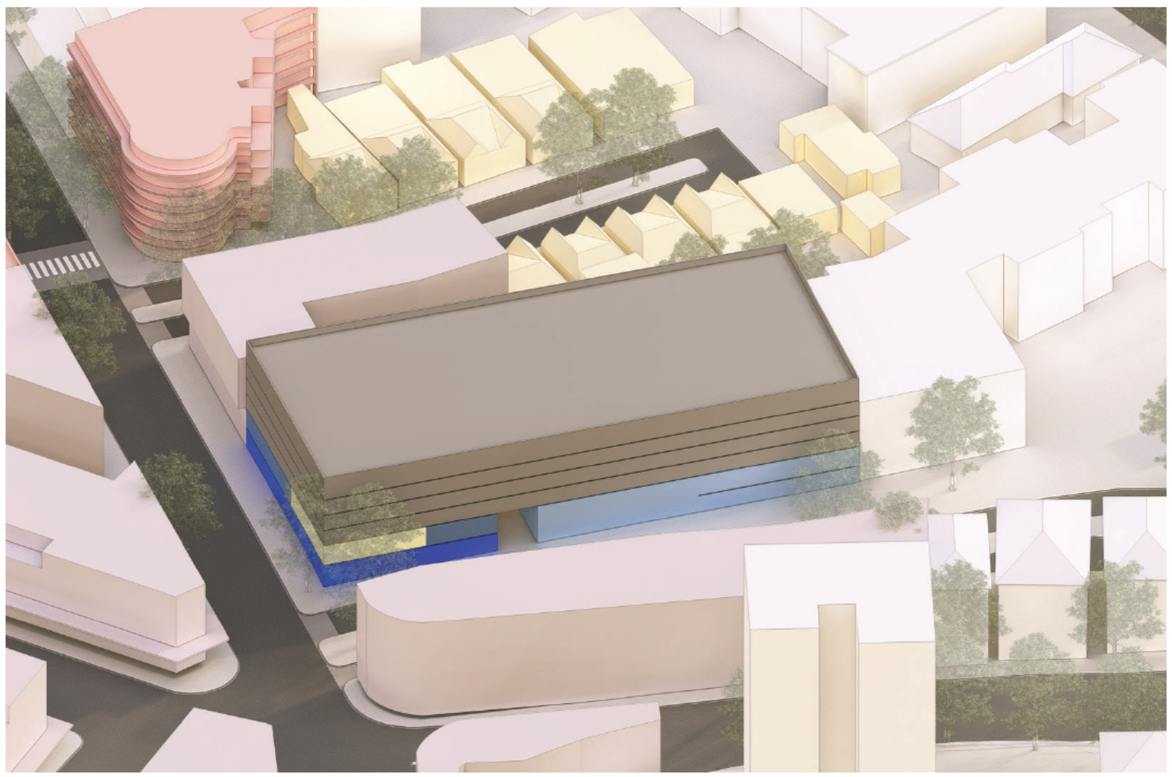
- No Residential
- 7 levels
- 5 levels above ground parking
- Retail ground floor frontage

Legend

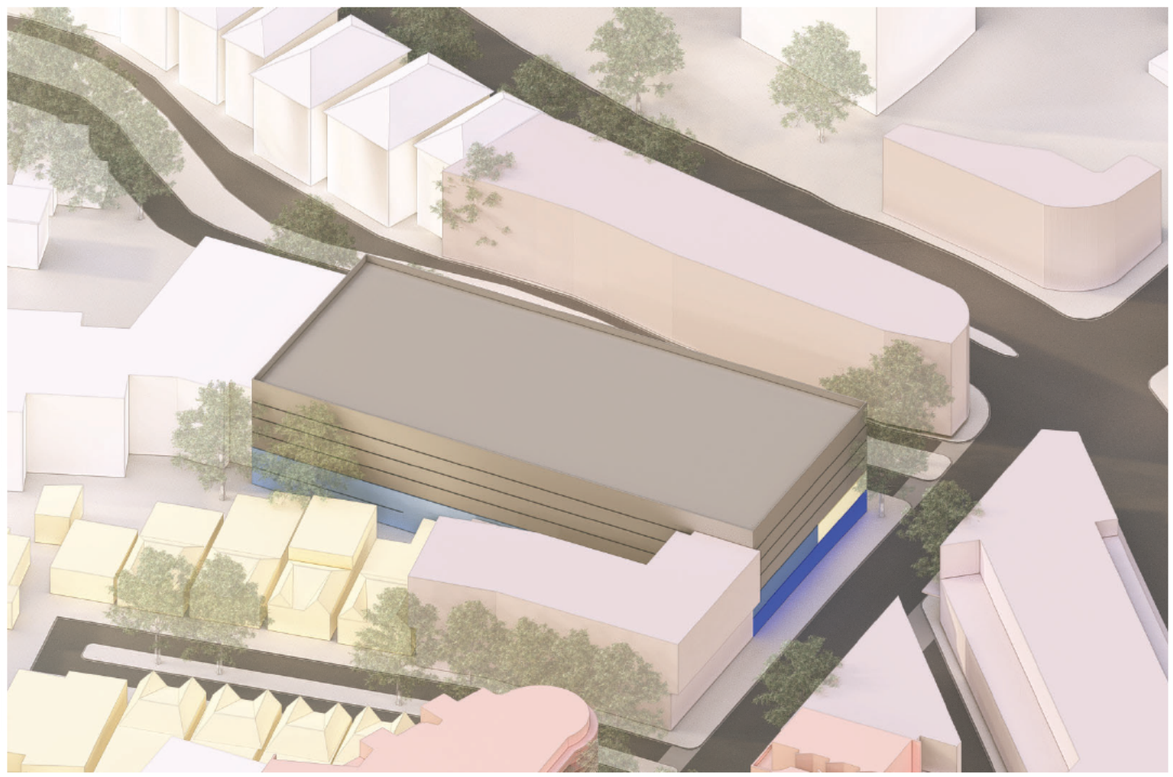
- Residential
- Commercial
- Retail
- Early Childhood Health Centre

Project Snapshot

	GFA	Units	Parking	No. Levels	FSR
Cinema	2,404 sqm				
ECHC	219 sqm				
Commercial	652 sqm				
Retail	871 sqm				
Residential					
Market		0			
Affordable		0			
Above ground (5 levels)			424		
Underground			0		
Total	4,146 sqm	0	424	7	1.10:1



View from South East



View from South West

Option 5 - Council DIY

Option 5 - Council DIY

	Floor to Floor Height (m)	Cumulative Height (m)	Parking Circulation/Ancillary (sqm)	Parking GBA (sqm)	Parking Spaces (No.)	Cinema GBA (sqm)	Cinema GFA (sqm)	ECHC GFA (sqm)	ECHC GFA (sqm)	Commercial GBA (sqm)	Commercial GFA (sqm)	Retail GBA (sqm)	Retail/ GFA (sqm)	Residential GBA (sqm)	Residential GFA (sqm)	Aff unit (No.)	Market Unit (No.)	Total Units (No.)	AH NSA (sqm)	MH NSA (sqm)
Level 11																				
Level 10																				
Level 09																				
Level 08																				
Level 07																				
Level 06				2968.3	85															
Level 05	2.7 m	18.3 m		2968.3	85															
Level 04	2.7 m	15.6 m		2968.3	85															
Level 03	2.7 m	12.9 m		2968.3	85															
Level 02	2.7 m	10.2 m		2968.3	85															
Level 01	3.5 m	7.5 m				888 sqm	799 sqm	243 sqm	219 sqm	725 sqm	652 sqm									
Ground Floor	4.0 m	4.0 m				1,783 sqm	1,604 sqm					968 sqm	871 sqm							
Basement Level 01																				
Basement Level 02																				
Basement Level 03																				
Basement Level 04																				
Basement Level 05																				
Total	18.3 m	18.3 m	sqm	14,841 sqm	424	2,671 sqm	2,404 sqm	243 sqm	219 sqm	725 sqm	652 sqm	968 sqm	871 sqm	sqm	sqm			0		

Total GFA	4,146 sqm		
Total FSR	1.10:1		
Target Resi Parking	0		
Target Commercial Parking	7		
Target Retail Parking	0		
Target Council Parking	406		
Target Parking Total	413	vs	424 provided

	Mix %	GFA	Units	Parking /Unit	Parking Spaces (No.)	NSA
Market	0%				0	
Affordable	0%				0	
Total	0%	0			0	

Woollahra Municipal Council - Cross Street Carpark Site, Double Bay

Option 5 - Council DIY

Order of Cost Estimate

Date: 30-Oct-24

Item	Description	Area	Unit	Rate	Total	Total Residential (Market)	Total Residential (Affordable)	Total Council Carpark	Total Cinema	Total ECHC	Total Commercial /Retail
	SUMMARY										
	Council DIY; No Residential										
1	Demolitions (existing slab structure approx. 14,500m2)				$4,785,000	$0	$0	$3,591,206	$657,175	$59,788	$476,831
	Basement										
2	Basement Carpark : Nil	0	m2	$3,800	$0	$0	$0	$0			
	Above Ground Parking										
3	5 Levels Above Ground Parking : GBA 14,841m2 and 424 car spaces	14,841	m2	$3,500	$51,943,500			$51,085,942			$857,558
	Cinema										
4	Cinema (GF & L1) : GFA 2,404m2, GBA 2,671m2	2,671	m2	$5,200	$13,889,200				$13,889,200		
	Early Childhood Health Centre										
5	ECHC : GFA 219m2, GBA 243m2	243	m2	$5,800	$1,409,400					$1,409,400	
	Commercial										
6	Commercial : GFA 652m2, GBA 725m2	725	m2	$4,500	$3,262,500						$3,262,500
	Retail										
7	Retail : GFA 871m2, GBA 968m2	968	m2	$4,000	$3,872,000						$3,872,000
	Residential										
8	Residential (Market) - NIL	0	m2	$7,500	$0	$0					
9	Residential (Affordable) - NIL	0	m2	$6,000	$0		$0				
	Others										
10	External Services				$1,000,000	$0	$0	$750,513	$137,341	$12,495	$99,651
11	External and Landscape Works				$1,800,000	$0	$0	$1,350,924	$247,213	$22,491	$179,372
	OTHERS										
12	Budget allowance for soil remediation				$2,000,000	$0	$0	$1,501,027	$274,681	$24,990	$199,302
	TOTAL (EXCL CONSTRUCTION CONTINGENCIES)	19,448	m2	$4,317	$83,961,600	$0	$0	$58,279,613	$15,205,610	$1,529,163	$8,947,215
13	CONSTRUCTION CONTINGENCIES (10%)				$8,396,160	$0	$0	$5,827,961	$1,520,561	$152,916	$894,721
14	LOOSE FURNITURE AND EQUIPMENT				Excluded	Excluded	Excluded	Excluded	Excluded	Excluded	Excluded
	TOTAL (INCL CONSTRUCTION CONTINGENCIES BUT EXCL GST)				$92,357,760	$0	$0	$64,107,574	$16,726,171	$1,682,080	$9,841,936

	Residential (Market)	Residential (Affordable)	Council Carpark	Cinema	ECHC	Commercial /Retail
GBA (m2)	0	0	14,596	2,671	243	1,938
No. of Units			417			
	$/m2	$/m3	$/m2	$/m2	$/m3	$/m2
Cost per GBA (excl Contingencies)			$3,993	$5,693	$6,293	$4,617
Cost per GBA (incl Contingencies)			$4,392	$6,262	$6,922	$5,078
Cost / Unit (excl Contingencies)			$139,759			
Cost / Unit (incl Contingencies)			$153,735			

Notes and Assumptions:

All the above costs are only indicative and are subject to review of Schematic Designs and design development information

GFA, nos of units and car parking spaces as per e8urban's provided massing plans and unit schedule dated 15/08/24, and updated NSA Split by Levels received on 22/10/24

Plant space assumed included in the overall GBA

Basement - mainly within water table

Assume EV charges provided to 5% of parking spaces

Assume only pavement replacement requirerd to Cross Street

Exclusions:

Land Costs

Finance and Interest

Legal Fees

Marketing Costs & Display Apartment

Design & Consultants Fees

Council and Authorities Fees

Section 7.11 or other Council Contributions

Section 73/Sydney Water Contribution

Building Bond

Car stackers

Flood barriers or similar measures

Removal of Ground Contamination and Wastes

Fitout to Retail (Shell & core allowed only)

Fitout to Commercial (Warm shell allowed only)

Fitout to Cinema (Shell & core allowed only)

Loose furniture, fittings and equipment; gym equipment

Home automation

Building Maintenance Unit

ESD / Sustainability Initiatives

Services diversions and amplification

Escalation from date of estimate to actual date of commencement of works

Material and labour cost escalation to be reviewed

GST

9.1 The financial results

This project would be led by the council and would encompass the following land uses:

- Commercial areas
- Retail spaces
- Early childhood facilities
- A cinema
- A public car park.

The feasibility study indicated that the council **retain the development and** generate an annual revenue of $4.85 million. **An** estimated total sale value of $85.6 million upon project completion, as detailed in Table 14 below.

Table 14: Option 5 results

Description	Option 4
Site Area	3,769sqm
Gross Floor Area	4,146sqm
Floor Space Ratio	4.64:1
Performance Indicators	
Current Net Annual Rent	$4,845,138
End Sale Value	$85,683,347
Total Construction Costs (including professional fees)	$108,381,139
Viability at 18% Project IRR	**Not applicable**

The following page provides the estate master development feasibility summary of the financial results.

SUMMARY OF PROJECT RETURNS

Cross Street Car Park Development Options

Option 5 - Council DIY

Option 5 Council DIY

Licensed to: Hill PDA Pty Ltd

Time Span:	Jan-25 to Apr-28 (39 Months)		
Type:	Residential		
Status:	Under Review		
Site Area:	3,769 SqM		
#N/A	1.1:1	Equated GFA:	4,145.98 SqM
Project Size:			
	4,145.98 GFA	1 per 0.9 SqM of Site Area	

	Quantity	SqM	AUD/Quantity	Total AUD	AUD Per Units	AUD Per GFA	% of Total Net Revenue	Total Exc GST
Revenues								
Gross Sales Revenue	1	3,993.66	85,683,347.22	85,683,347		20,667	100.5%	85,683,347
Less Selling Costs				-		-	0.0%	-
Less Purchasers Costs				-		-	0.0%	-
NET SALES REVENUE				85,683,347		20,667	100.5%	85,683,347
	Quantity	SqM	AUD/SqM/annum					
Gross Rental Income	1	3,993.66	1,347.76	-		-	0.0%	-
Less Outgoings & Vacancies				-		-	0.0%	-
Less Letting Fees				(394,077)		(95)	-0.5%	(394,077)
Less Incentives (Rent Free & Fitout Costs)				-		-	0.0%	-
Less Turnover Costs				-		-	0.0%	-
Less Other Leasing Costs				-		-	0.0%	-
NET RENTAL INCOME				(394,077)		(95)	-0.5%	(394,077)
Interest Received				-		-	0.0%	-
Other Income				-		-	0.0%	-
TOTAL REVENUE (before GST paid)				85,289,271		20,572	100.0%	85,289,271
Less GST paid on all Revenue				-		-	0.0%	
TOTAL REVENUE (after GST paid)				**85,289,271**		**20,572**	100.0%	85,289,271
Costs								
Land Purchase Cost				-		-	0.0%	-
Land Acquisition Costs				-		-	0.0%	0
Construction Costs (inc. Contingency)				98,072,055		23,655	115.0%	98,072,055
Car Parking				55,345,772		13,349	64.9%	55,345,772
Built Form				28,785,544		6,943	33.8%	28,785,544
Other cOSTS				5,025,098		1,212	5.9%	5,025,098
Contingency				8,915,641		2,150	10.5%	8,915,641
Professional Fees				10,170,885		2,453	11.9%	10,170,885
Statutory Fees				138,199		33	0.2%	138,199
Marketing and Advertising				-		-	0.0%	-
Miscellaneous Costs 2				-		-	0.0%	-
Other				-		-	0.0%	-
Project Contingency (Reserve)				-		-	0.0%	-
Land Holding Costs				-		-	0.0%	-
Pre-Sale Commissions				-		-	0.0%	-
Finance Charges (inc. Fees)				-		-	0.0%	-
Interest Expense				-		-	0.0%	-
TOTAL COSTS (before GST reclaimed)				108,381,139		26,141	127.1%	108,381,139
Less GST reclaimed				-		-	0.0%	
Plus Corporate Tax				-		-	0.0%	-
TOTAL COSTS (after GST reclaimed)				**108,381,139**		**26,141**	127.1%	108,381,139

Performance Indicators			Per Units	Per GFA	Total Exc GST
[1] **Net Development Profit**		**(23,091,869)**		(5,570)	
[3] **Development Margin (Profit/Risk Margin)**	Based on total costs (exc selling & leasing costs)	**-21.31%**			
[4] Residual Land Value	Based on Target Margin of 12% (Exclusive of GST)	(31,596,206)		(7,621)	(31,596,206)
[5] **Net Present Value**	Based on Discount Rate of 12% p.a. Effective	**(32,970,522)**			
[6] Benefit Cost Ratio		0.6416			
[7] **Project Internal Rate of Return (IRR)**	Per annum Effective	**-12.67%**			
[8] Residual Land Value	Based on NPV (Exclusive of GST)	(33,275,203)		(8,026)	(33,275,203)
Equity IRR	Per annum Effective	N.A.			
Equity Contribution		23,091,869			
Peak Debt Exposure		108,381,139			
Equity to Debt Ratio		21.31%			
[9] Weighted Average Cost of Capital (WACC)		0.88%			
[10] Breakeven Date for Cumulative Cash Flow		N.A. (No Profit)			
[11] Yield on Cost		4.47%			
[12] Rent Cover		0 Yrs, 0 Mths			
[13] Profit Erosion		N.A.			

Footnotes:

1. Development Profit: is total revenue less total cost including interest paid and received
2. Note: No redistribution of Developer's Gross Profit
3. Development Margin: is profit divided by total costs (exc selling & leasing costs)
5. Net Present Value: is the project's cash flow stream discounted to present value. It includes financing costs but excludes interest and corp tax.
6. Benefit:Cost Ratio: is the ratio of discounted incomes to discounted costs and includes financing costs but excludes interest and corp tax.
7. Internal Rate of Return: is the discount rate where the NPV above equals Zero.
8. Residual Land Value (based on NPV): is the purchase price for the land to achieve a zero NPV.
9. The Weighted Average Cost of Capital (WACC) is the rate that a company is expected to pay to finance its assets.
10. Breakeven date for Cumulative Cash Flow: is the last date when total debt and equity is repaid (ie when profit is realised).
11. Yield on Cost is Current Net Annual Rent divided by Total Costs (before GST reclaimed), including all Selling Costs.
12. The total net development profit divided by the current net annual rental expressed as a number of years/months.
13. The period of time post practical completion that it can remain unsold (but leased out) until finance and land holding costs erodes the profit for the development to zero.

PLANNING PATHWAY MERITS

10.0 PLANNING ASSESSMENT

10.1 Introduction

HillPDA undertook several planning pathway assessments related to the options for the site and ascertained that some pathways, such as under State Environmental Planning Policy (Exempt and Complying) 2021 or a Review of Environmental Factors under Part 5 of the EP&A Act, do not apply to the potential design and feasibility options for the site.

The most appropriate planning pathways that are applicable depending on the final design options for the site include the following:

1. A development application under Part 4 of the Environmental Planning and Assessment Act, 1979 (EP&A Act)
2. A development application or State Significant development application under Part 4 of the EP&A Act (based on State Environmental Planning Policy (Housing) 2021 – Part 2 Division 1) – will now be referred to as the Housing SEPP bonus.
3. A planning proposal under Part 3 of the Environmental Planning and Assessment Act, 1979 (EP&A Act)

In terms of 2. above, an assessment was undertaken to ascertain whether the "accessible" criteria outlined in Part 2, Division 1 of the State Environmental Planning Policy (Housing) 2021 (Housing SEPP) would apply. The assessment determined that the site would comply with the criteria of the Housing SEPP.

Section 10.2 below provides a summary of the planning assessment and pathway to achieve each option.

10.2 Planning assessment and pathways

An analysis of the planning options outlined in previous chapters was undertaken, and the resultant planning pathway determined. A summary is provided in the table below, with further details expanded in Annexure C.

Table 15: Planning assessment and pathway

Description	Option 1: High Affordable Mix	Option 2 (Option 2a and 2b): Market Residential Max and Market Residential Max – no cinema	Option 3: Market Residential Max	Option 4: SEPP Bonus/SSDA	Option 5: Council DIY
Planning assessment	The floor space ratio falls within the Housing SEPP infill affordable housing bonus; however, the proposed height exceeds the permissible height under the Housing SEPP bonus.	In both Options, the proposed floor space ratio complies with the current FSR and falls within the Housing SEPP infill affordable housing FSR bonus, however the height exceeds the permissible controls under the Housing SEPP bonus.	The floor space ratio complies with the current FSR and falls within the Housing SEPP infill affordable housing FSR bonus; however, the proposed height exceeds the permissible height under the Housing SEPP bonus.	Both the proposed floor space ratio and height fall within the Housing SEPP infill affordable housing bonus.	The proposed height complies with the permissible height however the proposal will exceed the current FSR of 2.5:1. The FSR is exceeded as the council car park floor area is above ground and is required to be included as FSR (due to the definition of FSR in the LEP).
Planning Merits	A planning proposal for this option will have strategic merit as it: • Is consistent with the Council's LSPS and priorities • Can achieve the objectives of the Double Bay Local Centre DCP	A planning proposal for Option 2 will have strategic merit as it: • Is consistent with the Council's LSPS and priorities • Can achieve the objectives of the Double Bay Local Centre DCP • Consistent with the Greater Sydney Eastern District Plan objectives	A planning proposal for Option 3 will have strategic merit as it: • Is consistent with the Council's LSPS and priorities • Can achieve the objectives of the Double Bay Local Centre DCP	A development application under Part 4 of the Environmental and Assessment Act, 1979 (EP&A Act) (based on State Environmental Planning Policy (Housing) 2021 – Part 2 Division 1), which will use the infill housing 30% bonus as 15% affordable housing, will be provided on-site.	A planning proposal for this option will be required. The public car park floor area is to be included within the floor space ratio (FSR) meaning that the proposed

Description	Option 1: High Affordable Mix	Option 2 (Option 2a and 2b): Market Residential Max and Market Residential Max – no cinema	Option 3: Market Residential Max	Option 4: SEPP Bonus/SSDA	Option 5: Council DIY
	• Consistent with the Greater Sydney Eastern District Plan objectives • Strategically retains the council car park and provides community benefit • Provides 40% affordable housing in perpetuity with minimal site impacts The site-specific merit would be justified based on detailed technical reports to be undertaken with the planning proposal	• Strategically retains the council car park and community benefit • Provides 10% affordable housing in perpetuity with minimal site impacts The site-specific merit would be justified based on detailed technical reports to be undertaken with the planning proposal.	• Consistent with the Greater Sydney Eastern District Plan objectives • Strategically retains the council car park and community benefit • Provides 10% affordable housing in perpetuity with minimal site impacts The site-specific merit would be justified based on detailed technical reports to be undertaken with the planning proposal.	Upon broad analysis, it is indicated that: • The design can fulfil the objectives of the Double Bay DCP by activating the ground level, placing car parking in basements, creating a public realm, and avoiding overshadowing or visual impacts. • This will result in a faster planning process, likely taking 9-12 months and would represent a significant time saving over a Planning Proposal and development application	development will exceed the current permissible FSR. *Note:* *It should be noted that if the council car park floor area is not included as floor area, then a regional significant DA (as per Schedule 6 of State Environmental Planning Policy (Planning Systems) 2021, would be the planning pathway.*
Key Findings	As the height exceeds the planning controls a Planning Proposal is required	Planning proposal required	Planning proposal required	The proposed estimated construction value is likely over $75m, resulting in the planning pathway being a state-significant development application (SSDA)	Planning proposal required.
Potential timeframe	14 months	14 months	14 months	9-12 months	14 months

10.3 Summary

From a planning perspective Option 4 using the Infill Housing SEPP height bonus under Part 4 of the EP&A Act is the preferred approach. However, from a financial and community benefits perspective, Option 2b could provide a more feasible outcome for Council.

10.4 Merit of Council undertaking a planning proposal itself

A planning proposal should follow the process as outlined in the NSW Government Local Plan Making Guidelines August 2023. HillPDA has outlined some of the key merits and issues with a site specific planning proposal led by Council.

Table 16: Planning pathway – Pros and Cons of Council undertaking a Planning Proposal itself

Pro's	Con's
Council can prepare the planning proposal and provide the technical scope requirements to all consultants to their satisfaction Council can take on the project management and control over the content, process and provide direction on the timeframe.	Council will prepare the planning proposal, however the developer who purchases the EOI/site in the future may need to make changes to achieve the viability.
Ensuring a transparent and clear process for council and the community, where the advantages of the proposed scheme can be assessed, comments received, and decisions made	Council will be required to undertake a significant number of studies which can be expensive.
The timeframe can be managed and directed by Council (at a pace suitable to council) and is likely to take between 18-24 months.	The Department of Planning Housing and Infrastructure are likely to be the Principal Planning Authority to make the decision/determination on the planning proposal; instead of Council making the decision of its own land, due to a conflict of interest.
Council can support and approve the planning proposal to be submitted to Gateway, and liaise with DPHI as a landowner and consent authority	
Active community consultation can be undertaken by council	
Council can understand the financial and viability issues, and in making any amendments can consider its council and community benefits.	

Conclusions and Recommendations

11.0 CONCLUSIONS AND RECOMMENDATIONS

To calculate the development rights payment to the Council for each option, we have adopted the industry benchmark IRR of 18%, which represents a viable project. This benchmark has allowed HillPDA to determine the amount a developer can contribute to the council for development rights.

Table 17: Description of the options - gross floor areas and results

Description	Option 1: High Affordable Mix	Option 2a: Market Residential Max	Option 2b: Market Residential Max – no cinema	Option 3: Market Residential	Option 4: SEPP Bonus	Option 5: Council DIY
Levels	9 Levels	8 Levels	8 Levels	7 Levels	7 Levels	6 Levels
FSR	2.64:1	2.48:1	2.48:1	2.36:1	2.36:1	4.64:1
GFA	9,965sqm	9,331sqm	9,331sqm	8,902sqm	8,902sqm	4,146sqm
Residential Market	4,277sqm (60%)	6,484sqm (90%)	6,484sqm (90%)	6,099sqm (90%)	5,760sqm (85%)	0sqm
Residential Affordable	2,743sqm (40%)	720sqm (10%)	720sqm (10%)	678sqm (10%)	1,016sqm (15%)	0sqm
ECHC	219sqm	219sqm	219sqm	219sqm	219sqm	219sqm
Commercial	600sqm	0sqm	0sqm	0sqm	0sqm	652sqm
Cinema	1,341sqm	1,341sqm	0sqm	1,341qm	1,341sqm	2,404sqm
Retail	785sqm	566sqm	1,907sqm	566sqm	566sqm	871sqm

[redacted]

Works in-kind contribution to Council

Table 18 provides a breakdown of the works-in-kind contributions a developer would provide to the Council in each option.

Table 18: Works In-Kind Contribution to Council

Description	Option 1: High Affordable Mix	Option 2a: Market Residential Max	Option 2b: Market Residential Max – no cinema	Option 3: Market Residential	Option 4: SEPP Bonus/SSDA	Option 5: Council DIY
406 Public Car Parking Cost	[redacted]					
ECHC						
Total GFA						
Affordable Housing Units Costs						
Total Number of Affordable Housing Units						
Development Rights payment to Council for use of the site						
Total Works In-Kind Contribution to Council						
Total Costs to Council						
Current Net Annual Income						

[redacted]

After reviewing the financial assessment and considering the works-in-kind contribution to the council, Option 2b is the most financially viable option and has significant benefits. To achieve Option 2b, the planning pathway will be a planning proposal under Part 3 of the Environmental and Assessment Planning Act, 1979 (EP&A Act).

The proposed mixed-use development for Option 2b includes a Floor Space Ratio (FSR) of 2.48:1, a height of 25.7m (8 storeys), and 10% affordable housing. The proposed height would exceed the Infill Affordable Housing bonus outlined in the State Environmental Planning Policy Housing (SEPP 2021). The planning proposal requires approval by the state government.

Option 2b enables the Council to retain the following assets with a combined construction and revenue value of [redacted]:

- 406 public car spaces
- Development Rights payment to Council for the use of the site: [redacted]
- 10% affordable housing units, equating to 11 units in perpetuity
- 219sqm GFA Early Childcare Health Centre is retained by Council.

Option 4 is also feasible for the council [redacted] payment to council) and can result in similar planning and community benefits, with 15% affordable housing and a cinema. It takes half the time to obtain planning approval as a state-significant development application (using the Infill Housing Bonus under the Housing SEPP), but it receives fewer financial benefits. Option 4 provides Council with: -

- 406 x public car spaces
- Development rights payment of [redacted]
- 15% affordable housing units, equating to 15 units in perpetuity
- 219sqm GFA Early Childcare Health Centre is retained by Council.

Option 2a and 3 are feasible options for Council and provide development rights payments of [redacted] respectively. They also offer a similar early child health centre, public car parking, cinema, retail, and similar affordable housing in perpetuity.

Based on feasibility, Option 1 does not support a cash payment to the Council, has a low internal rate of return (0.43%), and has a similar mix of uses.
Option 5 assumes the Council is the developer. The Council must contribute substantial equity and borrowings to achieve the mix of uses (excluding affordable housing).

Options 1, 2, 3, and Option 5 require a planning proposal to secure the development. The council can benefit from undertaking and leading the planning proposal; however, it may be relatively expensive and time-consuming, with many technical reports required.

APPENDIX A: MARKET RESEARCH

The following Chapter analyses trends and factors influencing the property market in the Centre and its surroundings. It also investigates various uses' sale and rental prices, including residential apartments, retail units and commercial office space. The research is based on detailed discussions with market and industry experts and a review of relevant property databases. These factors, in turn, inform the feasibility modelling discussed in Chapter 5.

Residential apartment market overview

Double Bay is located in one of Australia's most prestigious localities, which also benefits from good access to the Sydney CBD and Sydney Harbour. The suburb of Double Bay is characterised as a residential area with an affluent population.

In October 2024, the median sale value for a house (non-strata dwelling) within Woollahra was $6.6m. Regarding strata-titled dwellings, units, townhouses, terraces, and semi-detached dwellings were $1.7m.

The general construction of residential apartments tends to be mixed-use developments comprising ground-floor retail and shop-top housing. These buildings are usually three to four storeys in height and are located along Bay Street and Cross Street.

A recent example of a typical four-story mixed-use development is the Bay Residences, located at 16-22 Bay Street, Double Bay. This development was converted from the Sir Stamford Hotel to residential apartments. It comprises a mix of one-, two-, and three-bedroom apartments. Our discussions with selling agents indicated that young professionals were in high demand for the one—and two-bedroom apartments.

Many older-style residential apartment buildings are located on New South Head Road, Ocean Avenue, and along the harbour edge near the Double Bay ferry wharf.

Agents revealed demand for a mix of apartment sizes in the Centre. In particular, downsizers purchase two—to three-bedroom apartments, while one—and two-bedroom apartment sales are more attractive to young professionals and investors. The investor market consists of local investors and investors from across Sydney and overseas.

Despite this demand and smaller apartments of Bay Residences mixed-use development at 1788 Residences, Cross Street example, our research shows that most of the newer residential flats in the Centre comprise only three and four-bedroom apartments. The internal areas generally range from 150sqm to 200sqm. Furthermore, discussions with local agents indicated that this product attracted the downsizer market, predominantly from areas such as Point Piper and Vaucluse. Downsizers generally want to stay in the local area, close to amenities and seek low-maintenance accommodation.

Discussions with local selling agents indicated that new studio, one and two-bedroom apartments in the Centre could likely sell for the following:

- The buyer profile is an owner-occupier. The buyers who purchase properties in Double Bay include local downsizers, young professionals, and intestate buyers already established in the area. The two—to three-bedroom unit type is the most popular.
- A car space is required, and not providing one hinders the unit's marketability. They add $300-$400,000 onto a
- Purchases, particularly the downsizers, require the development to provide parking on the streets and in the building and is flat and within walking distance to the Woolworths.
- 315 and 321 New South Head Road development takes longer to sell, say 2 to 3 months, than a well-located and well-parking apartment.
- Achieved Sales Prices in the Centre: 19-27 Cross Street: Level 1: Average $40,000/sqm, Level 2: Average $50,000/sqm. Level 3 is $60,000/sqm, Level 4 is $66,000/sqm, and Level 5 is $92,000/sqm because two apartments per floor are located next to the hotel. The averages for Levels 3 to 5 have been discounted. If these were not, the averages range between $70,000 and $98,000/sqm.

Discussions with local agents revealed that only studio and one-bedroom apartments could be sold without car parking. However, larger apartments, such as two-, three---, and four-bedroom apartments, would need at least one car space per apartment. Otherwise, the buyers' market would be limited.

Our discussions with agents revealed that the Centre would be beautiful for the younger demographic because of its lifestyle attractions, including a vibrant day and nightlife within the Centre and its close proximity to the Sydney CBD. To activate the Centre, agents confirmed that a diverse range of products would need to be available to meet the affordability bracket for higher-earning young professionals.

The Centre has achieved a healthy vibe, with various restaurants, lounge bars, and nightclubs established to meet the demands of residents and visitors. This change in the Centre has made it a destination for people to socialise and live.

1.1 Non-residential overview

The Double Bay commercial and retail property market took a hit after the completion of Bondi Junction Westfield and the relocation of the old cinema; however, agents have indicated that retail and commercial office space has experienced substantial growth in both investment sales and tenants seeking retail and commercial space over recent years.

The agent mentioned that the recent development in the town centre has affected the supply of office space, increasing its demand. Retail tenants on Cross Street and Bay Street have been affected by the ongoing development in the area, which has ultimately impacted their businesses.

1.2 Commercial market evidence findings

- The Centre has traditionally been a retail centre with ancillary residential and commercial units. Commercial office space generally consists of ground-floor retail or commercial and first-floor commercial office space
- Research revealed that professional services and medical clinics dominate the commercial market with a typical floor plate of 50sqm to 150sqm. There is currently a limited amount of new stock on the market
- Agents revealed that tenants are requesting space that has good road exposure, pedestrian footfall and accessibility to car parking
- There is a moderate level of demand for commercial space now and in the immediate future; however, sale prices and rents need to be realistic for the buyer or tenant; otherwise, the space may remain vacant for some time
- Commercial office space will typically sell for $10,000/sqm to $18,000/sqm in a prime location (i.e., street exposure) and $9,000/sqm to $14,000/sqm in a secondary location (i.e., low pedestrian traffic or first floor).

1.3 Retail market evidence findings

- Double Bay has traditionally been considered an established retail Centre owing to the broader catchment of shoppers it has attracted to its specialty in high fashion, café, restaurant and lounge bar scene
- Agents indicated that retail premises located on Bay Street, Cross Street and Knox Street are the better-performing streets for retail due to high footfall and good exposure. Retail premises situated along New South Head Road have a slightly lower demand, which can make it difficult to lease or sell
- Retail space in a prime location will typically sell for $26,000- $30,000/sqm (Knox, Cross, and Bay Streets), and secondary retail along New Head South Road could achieve approximately $21,000/sqm.

1.4 Cinema market overview

The Australian film industry is one of the largest in the world in terms of revenue. Despite the challenges posed by the coronavirus pandemic and resulting lockdowns, social distancing, and closures, Australian cinemas have been slowly recovering. In 2023, the proportion of Australians attending the cinema at least once yearly was around 59 per cent. Historically, cinema attendance in Australia has been around the 70 per cent mark. In 2020 and 2021, the attendance rates dropped drastically due to mandatory closures of cinemas during the COVID-19 pandemic. However, they have started to recover in recent years. However, this growth has yet to restore attendance to pre-pandemic levels fully. This increase in attendance may be partially attributed to the average price of a cinema ticket, which slightly increased to just under 17 Australian dollars. The continued dominance of independently owned cinema screens across the country also played a role in maintaining attendance and keeping ticket prices down. In 2023, there were 660 cinema screens owned by independent parties in Australia, representing around 30% of the exhibitor market share.

The average number of cinema visits peaked in 2017, with an average of 8.6 visits over three months. Most cinema patrons were aged 50 and over, with only minor fluctuations

in recent years. Regarding gender distribution, the number of male and female visitors to the cinema remained consistent across all age groups.

The cinema industry has undergone significant changes over the past 44 years. The number of theatres has decreased by 35%, while the number of screens has nearly tripled. In 1980, the average number of screens per theatre was 1.2, but with the shift from single to multi-screens, this number has increased more than fourfold to 4.9 per theatre.

1.4.1 Double Bay and its surrounds

In 2004, The Greater Union Cinemas closed in Double Bya es from Double Bay, the Palace Chauvel Cinema at Oxford St in Paddington and Event Cinemas Bondi Junction. The Palace Chauvel Cinema has two screens with a total of 365 seats. Bondi junction has 11 screens.

The introduction of premium seating has led to a gradual decline in seats per screen. In 1980, the average number of seats per screen was 456. By 2023, this average had dropped to 164. Even though there are fewer theatres than in the 1980s, the significant increase in the number of screens per theatre and the shift to digital projection provide exhibitors.

APPENDIX B - PLANNING FRAMEWORK

A.1.1 Local Environmental Plan provisions

Under the Woollahra Local Environmental Plan (LEP) 2014, the site is zoned E1 Local Centre, with a maximum building height of 18.1 metres and a maximum floor space ratio (FSR) of 2.5:1.

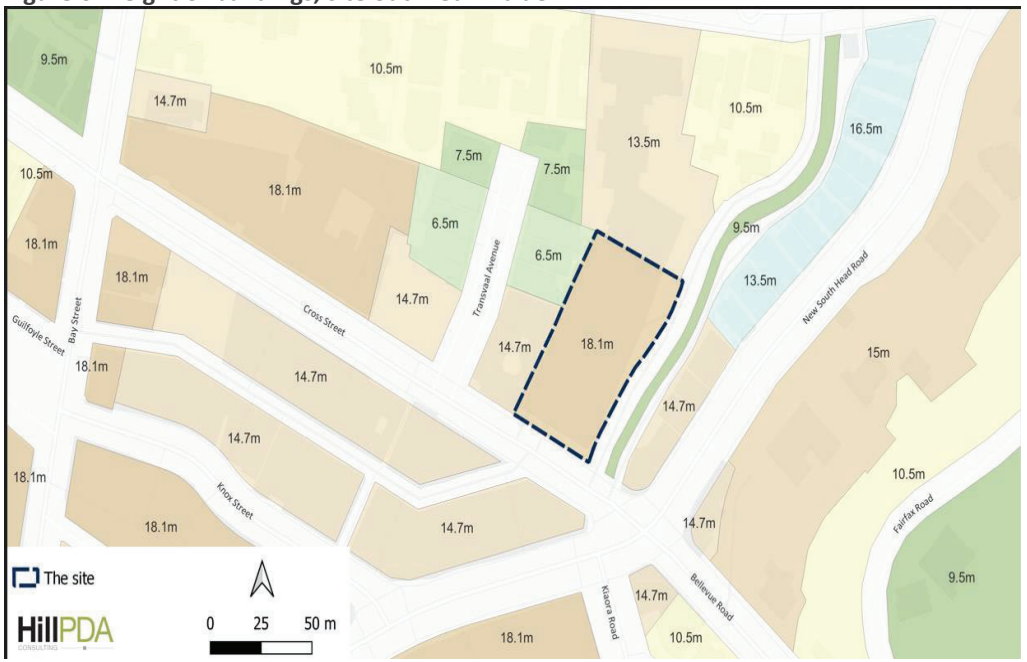
The following figures illustrate these provisions at the site and its immediate surroundings.

Figure 5: Zoning, site outlined in blue



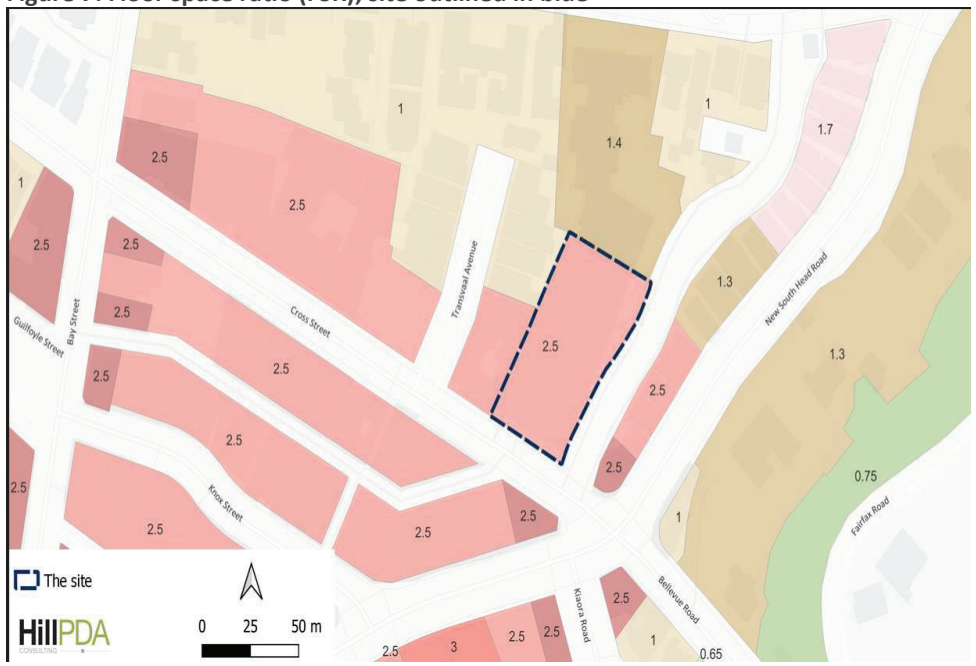
Source: NSW Department of Customer Service (2020), *NSW Planning Portal Spatial Viewer*

Figure 6: Height of buildings, site outlined in blue



Source: NSW Department of Customer Service (2020), *NSW Planning Portal Spatial Viewer*

Figure 7: Floor space ratio (FSR), site outlined in blue



Source: NSW Department of Customer Service (2020), *NSW Planning Portal Spatial Viewer*

Land uses

As shown above, the site is in an area zoned E1 Local Centre. This zone permits land uses with consent including the following:

- Centre-based childcare facilities
- Commercial premises [includes retail premises]
- Community facilities
- Entertainment facilities
- Serviced apartments.
- Shop top housing.

A.1.2 Development control plan provisions

The site is affected by several provisions under the Woollahra Development Control Plan (DCP) 2015. The following table summaries applicable provisions, listing the relevant sections, categories, and provisions under the DCP.

Table 19: Development control plan (DCP) provisions affecting the site

Section	Category	Provision
D5.4.7	Character [Cross Street]	• Desired future character – a) Unify the street on the north side by building to the street boundary – e) Strengthen built form on corner sites. • Continuous awning • Demountable enclosures for outdoor eating are permissible on this side of Cross Street.
D5.6.8	Parking and site facilities	*5.6.8.1 On-site parking* • C1 Parking provision must comply with Part E of this DCP, Chapter E1 Parking and Access, except where detailed below. • C2 Consolidated parking areas are preferred below ground level where possible and concentrated under building footprints to maximise the area for landscaping areas. • C3 Basement parking should be naturally ventilated if possible. *5.6.8.2 Vehicular access* • C1 Vehicular access to a building is only permitted via a rear land or rear right of way where possible. • C2 If loading facilities are provided, they must be in a rear lane or side street. • C3 Driveway widths should be kept to minimum dimensions. Driveway crossings should be 3m, however a maximum width of 6m may be considered depending on the site, the location of the access point, and the capacity of the car park. Wider driveways are permitted only when it is necessitated by compliance with Australian Standards • C4 Driveways to car parking above, below and at the ground floor level should be designed with minimal visual impact on the street, and maximum pedestrian safety. Pedestrian access to the development should be separate and clearly defined. • C6 Access ways to car parking should not be in direct proximity to doors or windows to habitable rooms. • C7 Devices such as car hoists and turntables may be incorporated to provide access to car parking above and below the ground floor. *5.6.8.4 Site facilities* • C1 Site facilities, particularly garage areas, are to be visually integrated with the development to minimise their visibility from the street. Preferably orientate service areas within the building envelope, perpendicular to lane frontage. Such facilities must be located away from operable windows to habitable rooms to avoid amenity problems associated with smell. They must be located close to rear lanes where access is available. • C2 Ensure service areas are unobtrusive and have minimal lane presence. Preferably orientate service areas within the building envelope, perpendicular to lane frontage • C5 Buildings are designed to accommodate venting from ground floor uses to avoid potential impacts from exhaust and odour such as cooking smells.
E1.4.2	Residential parking generation rates	Mixed use development (residential component) *Spaces based on number of bedrooms per dwelling.* • 1 bedroom or studio apartment: 0.5 space – The number of parking spaces for 1 bedroom and studio apartments in the Double Bay Centre should be multiplied by the parking multiplier for non-residential uses in the Double Bay E1 zone. • 2 bedrooms: 1 space • 3 or more bedrooms: 1.5 space • Visitors: 0.2 spaces.
E1.5.2	Non-residential parking generation rates	Retail premises: 3.3 spaces per 100m^2 • Entertainment facility: Parking rate to be determined on a site-specific basis. A traffic and parking report must be submitted with applications for this use.

Section	Category	Provision
		Childcare centre • Staff parking: 0.5 spaces per 100m^2 – This rate applies only to staff parking. Separate requirements for an on-site pick-up and drop-off area are set out in Part F of this DCP, Chapter F1 Child Care Centres.
E1.5.3	Parking multipliers	Centre: Double Bay Centre E1 Zone • Parking multiplier: 0.6.
E1.6.2	Bicycle parking rates	Residential accommodation • Residents: 1 per dwelling • Visitors: 1 per 10 dwellings. Entertainment facility • Customers: Greater of 1 per 15 seats or 1 per 40m^2 GFA. Childcare centre • Employees: 1 per 10 staff • Customers: 2 per centre.
E1.7.1	**Calculating required motorcycle parking**	• **C1 Developers shall provide a minimum of 1 motorcycle parking space per 10 car spaces for all types of development.** • **C2 Motorcycle parking spaces must have a minimum dimension of 1.2m x 2.5m** • **C3 Motorcycle parking areas shall be located close to the pedestrian access of the development.**
F1.3.2	Visual and acoustic impacts [childcare]	• C1 The childcare centre minimises disturbance to adjacent, nearby, and surrounding properties by suitable: – a) design and siting of the facility (including for example, the layout of building, maximising separation between active and open outdoor play areas and the façade of any neighbouring properties, soft close gates, noise barriers, fencing and the use of noise absorbing materials) • C4 The location and design of open spaces, playground areas and balconies, terraces, or the like, accessible to the children, minimise any direct views to or from neighbouring and surrounding properties.
F1.3.3	Traffic, parking, and access [childcare]	• C3 Development provides an on-site drop off and pick up area, which preferably: – a) is in the form of a one-way driveway – b) incorporates a passing bay – c) accommodates on-site the number of vehicles expected during the drop-off and pick up times based on the 98th percentile queue length.
F1.4.4	Design of childcare centre: internal layout and design	• C12 Where proposed in a multi-storey building, children's play areas are located on the ground level, unless it is demonstrated that adequate emergency access and egress is available. For example, a fire isolated safe haven area may be provided that opens directly onto a dedicated fire-isolated stair.

Source: Woollahra Municipal Council (2024), *Woollahra Development Control Plan 2015*

APPENDIX C- PLANNING ASSESSMENT AND INFILL HOUSING BONUS UNDER THE HOUSING SEPP

A planning assessment was undertaken for each of the Options. Below is a brief outline of the assessment

C.1 Planning assessment of options

Option 1 – High affordable mix

The planning pathway for this option is to submit a planning proposal under Part 3 of the EP&A Act.

The proposal provides for a mix of uses with an FSR of 2.64:1 and a height of 9 stories (28.8m). The proposed uses are permissible. The floor space ratio falls within the Housing SEPP affordable housing bonus; however, the proposed height exceeds the permissible height under the Housing SEPP bonus.

This option applies the 30% Housing SEPP Bonus relating to height and FSR bonus (as there is in excess of 30% affordable housing), meaning an allowable permissible height from 18m to 23.53m (an additional height of 5.43m) and FSR from 2.5:1 to 3.25:1. A table in Annexure C shows an overview of the calculation of the Housing SEPP bonus.

As the height exceeds the planning controls, the planning pathway for this option is to submit a planning proposal to Department of Planning Housing and Infrastructure.

11.1.1 Option 2 – Market residential max

The planning pathway for this option is a planning proposal under Part 3 of the EP&A Act.

Option 2 includes:-

- **Option 2a** – Proposed car parking, retail, cinema and early child centre and residential with 10% affordable housing and 90% market housing, or
- **Option 2b -** Proposed car parking, retail, early child centre and residential areas with 10% affordable and 90% market housing

Both sub-options will apply the Housing SEPP bonus of 20% for height and FSR, meaning an allowable permissible height of 21.72m and FSR of 3:1.

In both sub-options the proposed floor space ratio is 2.48:1, which is below the current maximum FSR of 2.5:1 in the LEP and below the FSR when the Housing SEPP bonus is applied. The proposed height for both options is 25.7m or 8 storeys, which is above the LEP height of 18m and the height when the Housing SEPP height bonus. The proposed uses are permissible. The proposed floor space ratio falls within the Housing SEPP affordable housing bonus however the height exceeds the permissible controls.

The planning pathway for this option is to submit a planning proposal to Department of Planning Housing and Infrastructure

11.1.2 Option 3 – Market residential

The planning pathway for this option is a planning proposal under Part 3 of the EP&A Act.

The proposal provides for a mix of uses with a FSR of 2.36:1 and a height of 7 stories (22.6m). The proposed uses are permissible.

This option will apply the Housing SEPP Bonus of 20% for height and FSR, as 10% of the GFA is provided for affordable housing. The bonus means an allowable permissible height of 21.72m and FSR of 3:1.

The floor space ratio will comply within the Housing SEPP affordable housing bonus; however, the height exceeds the permissible height control.

The planning pathway for the options is a planning proposal under Part 3 of the EP&A Act, as the height would exceed the permissible height, using the 20% bonus under Part 4 of the EP&A Act (based on State Environmental Planning Policy (Housing) 2021 – Part 2 Division 1)

11.1.3 Option 4 – SEPP bonus/SSDA

The planning pathway for this option is a state significant development application under Part 4 of the EP&A Act (based on State Environmental Planning Policy (Housing) 2021 – Part 2 Division 1). The application will apply the 30% Infill Housing Bonus incentives.

The proposal provides for a mix of uses, including housing, retail, cinema, and community, with an FSR of 2.36:1 and a height of 7 stories (22.6m). The proposed uses are permissible. Both the proposed floor space ratio and height fall within the Housing SEPP infill affordable housing bonus.

This option will apply the 30% housing bonus for height and FSR, as 15% of the GFA is provided for affordable housing. The bonus enables an allowable permissible height of 23.53m and an FSR of 3.25:1.

The proposed estimated construction value is likely over [redacted], resulting in the planning pathway being a state-significant development application (SSDA) submitted to the Department of Planning Housing and Infrastructure. The SSDA could be compiled and submitted by Council, or a joint venture party and it would be required to follow the SSDA pathway as indicated in this link: https://www.planning.nsw.gov.au/assess-and-regulate/development-assessment/planning-approval-pathways/state-significant-development. A SSDA application could take up to 12 months to be determined, however would represent a significant time saving over a planning proposal and development application.

11.1.4 Option 5 – Council DIY

This option's planning pathway is a proposal under Part 3 of the EP&A Act.

The proposed development will comprise retail, commercial, cinema, community space and council car parking.

The proposed mixed-use is permissible and proposes a floor space ratio of 1.10:1 (excluding the council's car park floor area in the calculation of GFA). Alternatively, if the council's car park floor area is included in the floor space ratio because the floor area is above ground (and only 15 car parking bays are needed for the proposed uses), the FSR will be 4.64:1. The proposed height is 18.1m and would be within the height limit.

There could be two planning pathways for this option: -

- Pathway 1 – If the public car park floor area is included within the FSR, the proposed development will exceed the permissible GFA, and a planning proposal must be submitted.
- Pathway 2 - If the consent authority agrees that the council car park does constitute parking to meet the car parking requirements of the development, then the planning pathway is a development application to the consent authority under Part 4 of the EP&A Act. Depending on the final estimate of construction costs, if it is more than $5m, the development application will be classified as a regional significant development (as per Schedule 6 of State Environmental Planning Policy (Planning Systems) 2021, as the development is council-related development. The consent authority will be the regional Planning Panel.

Pathway 1 was adopted for this Option 5.

The primary reason for the difference in pathway is due to the definition of gross floor area, which is as follows:

Gross floor area means the sum of the floor area of each floor of a building measured from the internal face of external walls or from the internal face of walls separating the building from any other building, measured at a height of 1.4 metres above the floor, and includes—

a. the area of a mezzanine and
b. habitable rooms in a basement or an attic, and
c. any shop, auditorium, cinema, and the like, in a basement or attic,

*but **excludes—***

d. any area for common vertical circulation, such as lifts and stairs, and
e. any basement—
f. storage, and
g. vehicular access, loading areas, garbage and services, and
h. plant rooms, lift towers and other areas used exclusively for mechanical services or ducting, and
i. **car parking to meet any requirements of the consent authority (including access to that car parking), and**

j. any space used for the loading or unloading of goods (including access to it) and

k. terraces and balconies with outer walls less than 1.4 metres high, and

l. voids above a floor at the level of a storey or storey above.

Subclause (g), highlighted in bold, excludes the car parking floor area from the calculation to meet the Council's requirements. The car parking is made up of non-council car parking GFA for commercial and community uses, equating to around 15 car parking spaces. However, the current 406 public car parking spaces need to be replaced, and currently, this parking is used for other businesses, users, and residents within Double Bay. It could be argued that both parking floor areas are needed for the development, or a second opinion is that the 406 car parking spaces are required for Double Bay, not only for this development. For this reason, car parking can be excluded from the FSR.

There are no clauses in the DCP that indicates public car parking must be included in FSR; however, under the definition, the Council can decide whether the parking meets the land's requirements.

As the planning interpretation is critical, for this study a risk-based approach was taken, and the recommended planning pathway if a planning proposal.

C.2 Summary of Housing SEPP Infill Housing bonus

A summary of the calculations is included in the table below.

Table 20: Housing SEPP infill bonus calculations

Summary								
	Current FSR	Current height	Proposed % of affordable housing	Allowable Bonus - Total FSR	Allowable Bonus - Total Height	Proposed FSR	Proposed height	Pathway
Option 1	2.5:1	18.1m	40%	3.25	23.53	2.64	28.8	PP
Option 2a	2.5:1	18.1m	10%	3	21.72	2.48	25.7	PP
Option 2b	2.5:1	18.1m	10%	3	21.72	2.48	25.7	PP
Option 3	2.5:1	18.1m	10%	3	21.72	2.36	22.6	PP
Option 4	2.5:1	18.1m	15%	3.25	23.53	2.36	22.6	SSDA
Option 5	2.5:1	18.1m	0%	0	0	4.64	18.3	PP

* Option 5 - includes car parking above ground as FSR

C.3 Reports required for the planning application

The following reports will be required to justify the proposal. The level of detail can be adjusted depending on the planning pathway.

Table 21: Reports required

Plan/Document
Planning report
Estimated Development Cost
Urban design report
Architectural report, built form and Plans
Traffic and Parking report
Economic and retail report
Acoustic/ Noise report
Visual impact
Waste Management Plan
Landscaping report and plan, including public domain
ESD and BASIXs
Ground and water conditions
Stormwater and services report
Contamination and remediation
Social impact assessment
Engagement report - outcomes
Contributions and public benefit
Construction, operation and staging
Site survey

The above reports will be the minimum reports required.

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HillPDA Pty Ltd
Level 3
234-242 George Street
Sydney, NSW 2000

86127.04
31 January 2025
R.001.Rev2
JH

Attention: Jenny Rudolph
Email: jenny.rudolph@hillpda.com

Report on Preliminary Groundwater Drawdown Assessment Cross Street Car Park 1-13 Cross Street, Double Bay NSW

Executive Summary

This report presents the findings of a preliminary groundwater drawdown assessment conducted for the proposed redevelopment of the Cross Street Car Park at 1-13 Cross Street, Double Bay, NSW. The proposed redevelopment is currently envisaged to include the excavation of a five-level basement.

The primary objective of this assessment was to evaluate the feasibility of achieving the maximum groundwater drawdown threshold as stipulated in the recent amendment to the Woollahra Development Control Plan 2015.

Previous geotechnical investigations undertaken on the site indicate that the subsurface profile comprises man-made fill over alluvial sediment underlain by Hawkesbury Sandstone bedrock. Groundwater levels have been generally observed between 1.0 m to 2.0 m (RL1.1 mAHD to RL0.5 mAHD).

Based on the information provided for the proposed development (five-level basement), it was assumed the bulk excavation level for the basement will be at RL-15 mAHD. It was assumed that a 450 mm thick (effective) secant pile wall socketed into the underlying sandstone (2 m embedment below bulk excavation) will be used for shoring of the basement excavation.

Simplified (2D) groundwater modelling was undertaken to predict the groundwater drawdown due to dewatering during basement excavation and construction for the proposed development. The results suggest that the groundwater drawdown induced by construction dewatering in the area of deep sand is likely close to the acceptable limit of 0.2 m, whereas that in the area with a shallow sand profile is likely to exceed this limit.

The results of the parametric study indicate that:

- Decreasing shoring wall permeability is most effective in reducing groundwater drawdown around the site. An equivalent wall permeability of 5×10^{-9} m/s or less will reduce groundwater drawdown to below the acceptable limit of 0.2 m. It should be noted that wall permeability is influenced not only by the permeability of the concrete, but also by construction methods, techniques, and workmanship.
- Increasing the effective shoring wall thickness can also reduce the groundwater drawdown around the site, however to a lesser extent. In order to sufficiently reduce the drawdown to less than 0.2 m, the required effective wall thickness is likely to be greater than 0.8 m.
- The groundwater drawdown is largely unaffected by the increase of cut-off depths once beyond 2 m below the BEL at RL-15 mAHD.
- The reduction in the basement levels (ie. by 2 levels, 6 m excavation depth) is also ineffective in reducing the groundwater drawdown.

The assessment concludes that with appropriate design, construction, management and monitoring, the proposed redevelopment can proceed without significant adverse impacts on the groundwater regime and is able to satisfy the current Woollahra Council DCP.

1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of a preliminary groundwater drawdown assessment undertaken for the proposed redevelopment of the "cross street car park" at 1-13 Cross Street, Double Bay NSW (the site). The assessment was commissioned by email instructing to proceed dated 17 December 2024 from Jenny Rudolph of HillPDA Pty Ltd and was undertaken in accordance with Douglas' proposal 86127.04.P.001.Rev1 dated 13 December 2024.

It is understood that HillPDA were commissioned by Woollahra Municipal Council (Council) to develop some massing options and to undertake feasibility studies of those options for the redevelopment of the existing Council carpark. Based on the information provided, these options are likely to require excavation of a 5 level basement below the existing ground surface. The site is shown on Drawing 1 attached.

It is understood that there is a recent amendment to the Woollahra Development Control Plan 2015 (DCP), dated 2 December 2024. The amended Clause E2.2.10 "*Groundwater (hydrogeology) and geotechnical impacts*" now enforces more strict groundwater fluctuation limits during temporary (construction) dewatering. The objective of this assessment is to assess whether this maximum drawdown threshold can be feasibly achieved.

This preliminary drawdown assessment is based on previous investigations carried out by Douglas and Environmental Investigation Australia (EI Australia) (refer Section 4) on the site.

Preliminary numerical modelling with multiple parameters of the proposed excavation for the development was undertaken to assess their effects on potential drawdown of groundwater levels around the site. Details of the numerical modelling are given in this report, with comments relevant to the Woollahra Municipal Council drawdown requirements.

This report must be read in conjunction with all attachments including the notes provided.

2. Site Description

The site is located at 1-13 Cross Street, Double Bay NSW. The site is rectangular in shape and covers an area of approximately 2,300 m^2, with a 40 m long southern frontage to Cross Street and an 80 m long eastern frontage to Jamberoo Lane. A stormwater channel/culvert runs along the eastern side of Jamberoo Lane.

The site is located towards the base of a west facing slope. Surface levels on the site generally fall to the west from about RL3.5 m to RL1.9 m (relative to Australian Height Datum, AHD). Double Bay within Sydney Harbour is located about 250 m north of the site. An aerial image of the site overlain with 10 m surface contours is shown in Figure 21.



Figure 1: Aerial image of the site overlain by 10 m surface contours to AHD

It is understood that the site is occupied by a four-storey carpark that extends up to all four site boundaries. On the adjacent property to the north there is a four-storey unit block that extends up to the common boundary. This building appears to have basement carparking however the depth and extent of the basement has not been confirmed by Douglas. Several one to three storey residential and commercial buildings exist to the west of the site that are in close proximity to the common boundary.

3. Published Data

3.1 Geology

The Sydney 1:100 000 Geological Series Sheet suggests that the site is underlain by man-placed filling overlying alluvial and estuarine sediments which generally comprise silty to peaty quartz sand, silt and clay with common shell layers. The areas to the east and west of the site are mapped as Quaternary sediments (transgressive dunes) comprising medium to fine grained sand. Hawkesbury sandstone is mapped in the area upslope, approximately 110 m south-east, and generally comprises medium to coarse grained quartz sandstone with minor shale and laminite lenses.

An extract of the geology map is shown in Figure 2.



Figure 2: Extract of Sydney 1:100 000 Geological Series map

3.2 Hydrogeology

A search of the NSW Office of Water groundwater database revealed that 29 registered groundwater bores are located within 500 m of the site. A review of the work summaries for the three registered bores closest to the site (GW106048, GW106047 and GW107680, approximately 70 m north of the site) did not reveal any recorded standing water levels.

Based on Douglas' experience in the area a shallow unconfined aquifer exists beneath the site within the soil profile. Groundwater typically occurs at approximately 1 m to 2 m depth below the lower lying surface levels and is expected to flow towards Double Bay which is located about 250 m to the north of the site. The groundwater levels will be affected (fluctuate) by seasonal or climatic conditions and to a lesser extent by tides.

4. Background and Previous Investigations

A number of geotechnical and environmental investigations have been undertaken by Douglas and EI Australia on the site. Selected previous test locations are shown on Drawing 1 attached and selected previous borehole logs are also attached.

4.1 Douglas Project 5001B (1975) and Douglas Project 5390 (1976), Geotechnical Investigation

Douglas carried out investigations on the site in 1975 (Douglas Ref. 5001B) and 1976 (Douglas Ref. 5390) for the existing carpark. The investigations included the drilling of eight boreholes across the site. The boreholes were drilled to practical refusal on sandstone bedrock and Bore 3 was extended 3 m into the sandstone to obtain core samples. The boreholes typically encountered sandy filling to depths of 0.5 m to 1.5 m over mostly loose grading to medium dense sand to depths of 4.0 m to 15.3 m over sandstone bedrock. The sandstone generally comprised up to 1 m of very low strength rock over medium strength rock. Groundwater was encountered within the boreholes at depths of between 1.4 m to 1.8 m.

4.2 EI Australia Project E23054 (2016)

EI Australia carried out the following assessments on the site:

- *Geotechnical Assessment Report* (Report E23054, dated 14 September 2016); and
- *Acid Sulphate Soils Assessment and Management Plan* (Report E23054 AA-Rev0, dated 4 August 2016).

The EI geotechnical assessment included the drilling of two rock cored boreholes (BH1 and BH2) to depths of 21.1 m and 18.4 m, respectively.

The EI acid sulphate soils assessment included laboratory testing (field screening and sPOCAS) on 14 soil samples collected from the two geotechnical boreholes. The report indicated that potential acid sulphate soils were present on the site.

4.3 Douglas Project 86127.00 (2017), Geotechnical and Hydrogeological Investigation

Douglas carried out an investigation on the site in 2017 (Douglas Ref. 86127.00). The investigation included:

- Drilling of four rock cored boreholes (BH101 to BH104) to depths of between 27.2 m and 29.1 m;
- Drilling of three auger/rotary boreholes to the top of rock (BH105 to BH107) at depths of between 8.6 m and 13.0 m;
- Two packer tests within the sandstone bedrock in BH101 and BH102;
- Installation of three groundwater monitoring wells (BH101, BH104 and BH105) for sampling of groundwater and measurement of water levels;
- Rising head permeability tests within the monitoring wells in boreholes BH104 and BH105;
- Laboratory testing on selected soil samples to assess aggressivity and the potential for acid sulphate soils; and
- Laboratory testing of groundwater samples for a range of common contaminants.

The results of groundwater measurements within the wells are summarised in Table 1. The groundwater measurements indicate a groundwater table at depths of about 1.0 m to 2.0 m (RL1.1 m to RL0.5 mAHD) with the groundwater surface falling to the north-west.

Table 1: Summary of measured groundwater levels

Borehole	Surface RL (mAHD)	Measured depth to groundwater (m) [Groundwater level (mAHD)]		
		9 - 13 October 2017	18 October 2017	16 March 2018
BH101	3.1	2.1 [1.0]	2.0 [1.1]	2.0 [1.1]
BH104	2.1	1.6 [0.5]	1.4 [0.7]	-
BH105	1.9	1.0 [0.9]	1.2 [0.7]	1.2 [0.7]

"Packer" hydraulic conductivity tests were carried out in boreholes BH101 and BH102. The testing involved pumping fresh-water into a section of the borehole (within rock) which was sealed off using a single hydraulic packer system. The results of the packer tests are summarised in Table 2.

Table 2: Summary of packer test results

Borehole	Depth (m)	Rock Description	Estimated Lugeon Value (L/m/min at 1000 kPa)
BH101	7.0 – 16.4	Slightly fractured sandstone but fractured and slightly fractured between 11.3 - 15.5 m	15 – 20
BH101	16.0 – 25.4	Slightly fractured and unbroken sandstone	2.5 – 3.5
BH102	13.0 – 21.85	Slightly fractured and unbroken sandstone	1.0 - 1.5
BH102	21.0 – 29.06	Slightly fractured and unbroken sandstone	3.0 – 3.5

Rising head permeability tests were carried out within the monitoring wells in boreholes BH104 and BH105. The test was undertaken by pumping groundwater out of the well to lower the groundwater level within the well. Pumping was then stopped, and the groundwater level recovery was monitored with time. The results of the rising head permeability tests are summarised in Table 3.

Table 3: Summary of rising head permeability test results

Borehole	Screened interval (m) [Screened material]	Estimated hydraulic conductivity k (m/s)	Estimated hydraulic conductivity k (m/day)
BH104	3.0 – 6.0 [sand]	6×10^{-5}	5
BH105	1.0 – 7.5 [sand]	1.8×10^{-5}	1.5

The k values in Table 3 are relatively low and more consistent with silty/clayey sand. Douglas' experience on other sites in Double Bay is that a k value of 10-20 m/day is more typical for the general sandy profile.

5. Hydrogeological Model

Based on the results of previous investigations, the site subsurface profile appears to comprise fill to varying depths underlain by Alluvial sands. Sandstone bedrock was encountered at depths of between 4.0 m (RL-1.0 mAHD) and 14.9 m (RL-12.7 mAHD). The top of bedrock generally appears to fall towards the north-west.

The groundwater measurements indicate a groundwater table at depths of about 1.0 m to 2.0 m (RL1.1 mAHD to RL0.5 mAHD) with the groundwater surface falling to the north-west. It should be noted that groundwater levels will fluctuate with climatic conditions, and to a lesser extent tidal influences, and may temporarily rise by at least 1 m following rainfall. Ongoing monitoring of water levels should be carried out to assess likely fluctuations, if such information is required.

It is expected that water inputs to the ground profile beneath the site include:

- Rainfall infiltration on the site and surrounds, including water flowing downslope laterally through the natural soils from areas of higher topography;
- Tidal influence from Double Bay; and
- Possible anthropogenic recharge from seepage from nearby leaking water mains and / or stormwater pipes, garden irrigation etc.

Water outputs or losses from the ground beneath the site include:

- Evapotranspiration from the vegetation across the surface;
- Tidal influence from Double Bay; and
- Nearby dewatering projects or drained basements, if applicable.

6. Groundwater Modelling

6.1 Methodology

Modelling was undertaken to assess the induced groundwater level changes adjacent to the proposed development (excavation) during construction.

A 2-dimensional (2D) numerical groundwater model was developed. The modelling was carried out using the 2D finite element hydrogeological software (SEEP/W, a component of GeoStudio) developed by GEOSLOPE International Ltd. The transient conditions during construction dewatering were modelled in the analysis. Long-term 'steady-state' flow analysis was not undertaken due to the 'water-tight' tanked basement proposed.

6.2 Model

6.2.1 Model layers

The aquifer surrounding the proposed development was simulated as a two-layer numerical model to represent the subsurface conditions beneath the site and to allow simulation of the vertical flow components. The two hydrogeological units modelled comprised a combined fill and alluvial sediment layer and a sandstone bedrock layer. Adopted hydraulic properties (base case) are presented in Table 4.

Table 4: Model layers and adopted hydraulic conductivity

Material	Saturated k_h (m/s)	Saturated k_h (m/d)	Anisotropy Ratio (k_v/k_h)	Saturated Volumetric Water Content	Material Model Adopted
Fill and alluvial sediment	1×10^{-4}	8.64	1	0.4	Saturated / unsaturated
Sandstone	5×10^{-7}	4.32×10^{-2}	0.33	0.2	Saturated / unsaturated
Concrete/shoring	1×10^{-8}	8.64×10^{-4}	Not applicable		Saturated

Notes: k_v is vertical hydraulic conductivity
K_h is horizontal hydraulic conductivity

Parameters were selected based on the results of the hydraulic conductivity testing (Section 4.3), ranges of values documented in available literature for similar lithologies (e.g., Fetter 1994 and Hoek & Bray 1981) and previous experience with similar materials. The parameters selected for concrete assume the basement cut-off walls are adequately constructed (i.e., no defects allowing seepage through the wall).

6.2.2 Initial groundwater elevation and boundary conditions

As the proposed development is located within a residential setting a net infiltration percentage of 5% was assigned. Based on historical data from the Bureau of Meteorology Rose Bay station

(station number 66098), an annual rainfall of 1.2 m was adopted. This equates to a rainfall influx of 1.9 x 10^{-9} $m^3/sec/m^2$ over the ground surface.

A constant head boundary at RL1.0 mAHD (1.5 m depth) was adopted on both boundaries of the model. The model boundaries were extended about 100 m beyond the proposed site boundaries.

6.2.3 Basement design and dewatering

Based on the information provided (5 level basement), it was assumed that the bulk excavation level for the basement will be at RL-15 mAHD. It was assumed that a 450 mm thick (effective) cut-off wall (eg. secant piles or similar) socketed into the underlying sandstone (2 m embedment below bulk excavation) will be used for temporary and permanent shoring of the basement excavation. The excavation faces (shoring wall) and base were simulated as "Seepage" and "Drainage" boundary conditions in SEEP/W with zero hydraulic pressure head along the full length.

It was assumed that dewatering will be undertaken to 0.5 m below bulk excavation level to facilitate construction works within the excavation (i.e., footings, trenching excavations, etc.).

It has been assumed that the construction dewatering will be required for one year for the proposed basement.

6.2.4 Simulation

To simulate the temporary dewatering during construction, transient flow conditions were modelled in the analysis. For the purpose of the analysis, excavation was undertaken in a single stage (i.e. instantaneously) and the subsequent temporary dewatering period was assumed to be one year for the basement excavation, subdivided into multiple time intervals.

7. Groundwater Modelling Results

7.1 Groundwater fluctuation requirements

It is understood that there is a recent amendment to the Woollahra Development Control Plan 2015 (DCP), dated 2 December 2024. The amended Clause E2.2.10 "*Groundwater (hydrogeology) and geotechnical impacts*" now stipulates that temporary changes to the groundwater level due to developments within the "Double Bay settlement area" must not exceed 0.2 m from the average monitored pre-construction groundwater level.

7.2 Initial model scenarios

Two initial model sections were produced to capture the variability in the geological profile (top of bedrock) across the site. The depth to bedrock was set as 4.5 m and 15 m in the respective model sections as shown in Figure 3 and Figure 4.

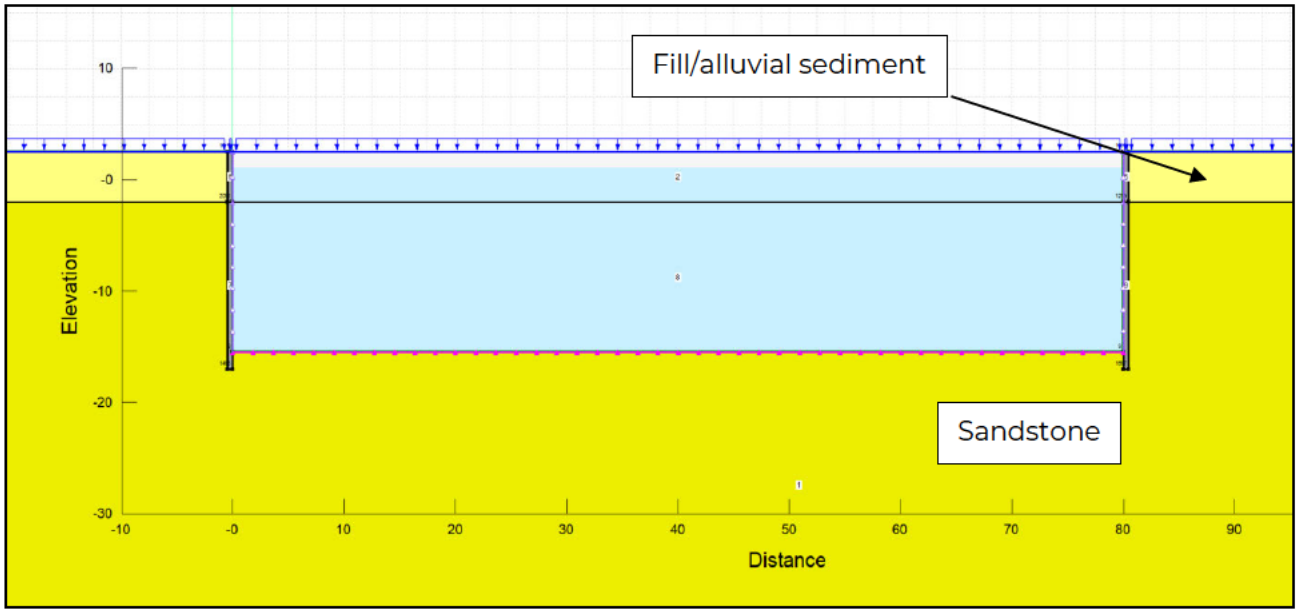

Figure 3: Model section (top of rock at 4.5 m depth)

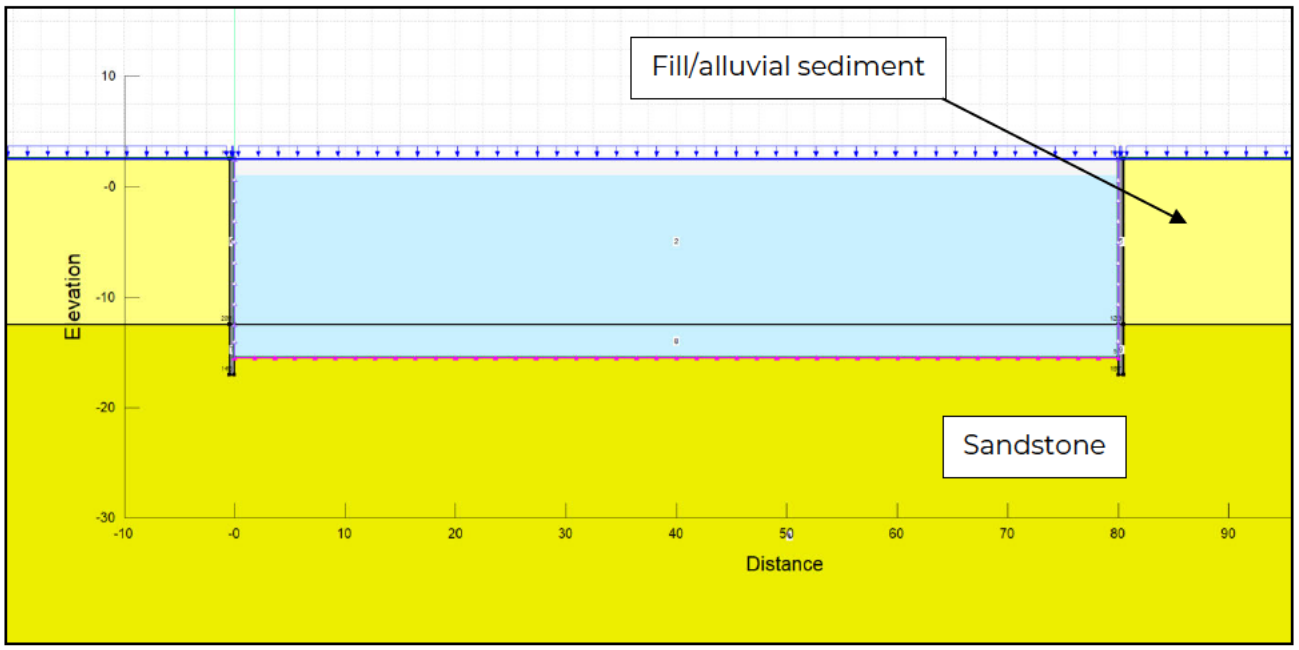

Figure 4: Model section (top of rock at 15 m depth)

The induced groundwater drawdown results from these sections are shown in Table 5.

Table 5: Summary of initial groundwater drawdown results

Model Scenario	Max. Drawdown Left (m)[1]	Max. Drawdown Right (m)[1]
Top of rock at 4.5 m depth	0.4	0.4
Top of rock at 15 m depth	0.2	0.2

Notes: 1 – refers to the drawdown immediately adjacent to the shoring pile wall on the left or the right side of the model

The results of the modelling of the deeper soil profile (top of rock at 15 m depth) suggest that under the simplified conditions modelled, the groundwater drawdown due to the temporary construction dewatering is close to the acceptable limit of 0.2 m. The results indicate that the drawdown within the model of the shallow bedrock profile (top of rock at 4.5 m depth) exceeds the acceptable limit of 0.2 m and suggests this geology profile (ie. thinner sand layer) is the more critical case regarding the drawdown requirements for the site.

7.3 Subsequent model scenarios

Subsequently, further modelling (parametric study) of the 'shallow rock' section (ie. depth to bedrock at 4.5 m) was undertaken. The following scenarios were simulated:

- Decrease the shoring wall permeability to 5 x 10^{-9}, 1 x 10^{-9}, and 1 x 10^{-10} m/s;
- Increase the effective shoring wall thickness to 0.75 m;
- Increase the cut-off depth of the shoring wall to 12 m below bulk excavation level; and
- Reduce basement to 3-4 levels with the new BEL at RL -9.0 mAHD and the toe of wall at RL-11.0 mAHD .

All other aspects of the model remained unchanged from the initial model simulated in Section 7.1. The drawdown results from these sections are shown in Table 6.

Table 6: Summary of subsequent model drawdown results – top of rock at 4.5 m depth

Model Scenario	Max. Drawdown Left (m)[1]	Max. Drawdown Right (m)[1]
Baseline case	0.4	0.4
Shoring wall permeability 5 x 10^{-9} m/s	0.2	0.2
Shoring wall permeability 1 x 10^{-9} m/s	0.0	0.0
Shoring wall permeability 1 x 10^{-10} m/s	-0.03[2]	-0.05[2]
Shoring wall thickness 0.75 m	0.2	0.3
Cut-off depth 12 m below bulk excavation level	0.4	0.4
Reducing to 3-4 basement level with BEL at RL-9.0 Toe of cut-off wall at RL-11.0	0.4	0.4

Notes: 1 – refers to the drawdown immediately adjacent to the shoring pile wall on the left or the right side of the model
2 – negative value indicates mounding of groundwater

The results of the above parametric study suggest that decreasing the shoring wall permeability is most effective in reducing the groundwater drawdown around the site and that an equivalent wall permeability of 5 x 10^{-9} m/s or less will reduce groundwater drawdown to below the acceptable limit of 0.2 m. While this shoring wall permeability is expected to be achievable for most commonly used retaining wall types such as secant pile wall or diaphragm wall, it is important to point out that wall permeability is not only dependent on the permeability of the concrete itself but also on the construction methods, techniques and workmanship. High inflow usually occurs due to leakage through the gaps/joints between piles or panels, rather than direct permeation through the concrete. Therefore, it is important to consult with and seek advice from the specialist contractors who install these walls.

The results of the modelling also suggest that increasing the effective shoring wall thickness will reduce the groundwater drawdown around the site, however the 0.75 m thick wall modelled did not reduce the drawdown to below the acceptable limits of 0.2 m. It should be noted that the effective shoring wall thickness accounts for the geometry of the shoring wall, and 750 mm diameter piles do not necessarily equate to an effective shoring wall thickness of 0.75 m.

The results suggest that under conditions modelled (i.e. bulk excavation within sandstone bedrock) the groundwater drawdown around the proposed excavation is largely unaffected by the cut-off depths (once beyond 2 m cut-off below the BEL of -15 m) of the shoring wall into the sandstone bedrock.

The reduction in the basement levels (ie. basement excavation depth) and correspondingly the toe depth of the cut-off wall is also ineffective in reducing the groundwater drawdown. This is probably because the reduction in the cut-off depth shortens the flow paths between the sand aquifer and the base of the excavation, compared to those with a deeper cut-off wall.

It is noted that the purpose of this preliminary drawdown assessment was to indicate at a "high-level" whether the Council drawdown requirements can be satisfied. The precision to which the results are presented does not represent the accuracy of the predictions. The level of precision is provided to allow comparison of scenarios and in reality, the accuracy will be lower because of the inherent variability in key parameters such as hydraulic conductivity and recharge.

It is also noted that the requirement to limit drawdown to 0.2 m below the average measured baseline water level is very conservative, particularly where the soil profile does not include very loose sand or soft to firm peaty/clayey layers. In most cases it would be expected that historical water levels would have been lower than the nominated 0.2 m drawdown and therefore the settlement has likely already occurred. If there is scope to assess drawdown and potential settlement on a case by case basis then possibly slightly higher drawdowns of say 0.4 m could be justified, or at the very least used a redundancy.

It should also be noted that the results of previous 3D analysis (Douglas ref. 86127.04.R.001.Rev0, dated 12 April 2018) suggest mounding may occur along the southern and eastern boundaries (where rock is shallower), likely due to groundwater flow towards Double Bay. The 2D modelling undertaken is a simplified concept of the broader site subsurface profile and does not account for 3D flow interaction. Hence, further detailed (3D) analysis should be undertaken once the development options are decided, to more accurately predict the groundwater fluctuations due to dewatering of the excavation for the proposed development.

8. Conclusion

In summary, it is technically feasible to construct the basement and to comply with the 0.2 m drawdown taking into account the above comments. These predictions are estimates based on the information available; actual drawdown may vary from these and will only be known once the excavation is complete and drawdown can be measured.

Further detailed (3D) analysis should be undertaken to more accurately predict the groundwater fluctuations due to dewatering of the excavation for the proposed development. A dewatering management plan (DMP) should also be produced to outline the monitoring and reporting procedures during the construction dewatering, together with the groundwater treatment and disposal requirements.

9. References

Woollahra Municipal Council, (2015), Woollahra Development Control Plan

Douglas Partners Pty Ltd, (1975), Geotechnical Investigation, report reference 5001B

Douglas Partners Pty Ltd, (1976), Geotechnical Investigation, report reference 5390

Douglas Partners Pty Ltd, (2017), Geotechnical and Hydrogeological Investigation, report reference 86127.00.R.001.Rev2

Douglas Partners Pty Ltd, (2018), Groundwater Assessment and Dewatering Management Plan, report reference 86127.01.R.001.Rev0

Environmental Investigations Australia Pty Ltd, (2016), Geotechnical Assessment Report, report reference E23054

10. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 1-13 Cross Street, Double Bay NSW in line with Douglas' proposal dated 13 December 2024 and acceptance received from Jenny Rudolph of HillPDA Pty Ltd dated 17 December 2024. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of HillPDA 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 Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas 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 Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during previous investigations. The accuracy of the advice provided by Douglas 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 assessment of atypical safety hazards arising from this advice is restricted to the geotechnical / groundwater components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

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. Douglas 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 Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Please contact the undersigned if you have any questions on this matter.

Yours faithfully
Douglas Partners Pty Ltd

[redacted]

Lachlan Straney
Geotechnical Engineer

[redacted]

Joel Huang
Senior Associate

Reviewed by

[redacted]

Scott Easton
Principal

Attachments: About this Report
Drawing 1: Test Location Plan
Selected borehole Logs

About this Report

November 2023

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

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

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.

continued next page

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.

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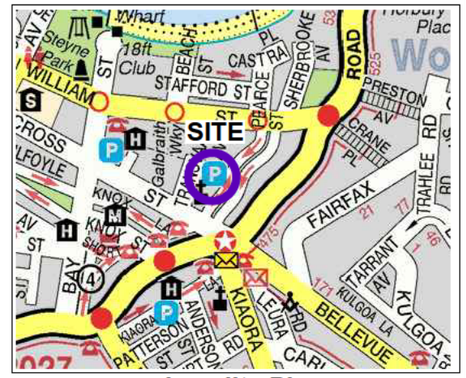


Locality Plan

NOTE:
1: Base image from Nearmap.com (Dated 22.8.2017)
2: Test locations are approximate only and were located using hand held GPS (outside) and Nearmap (inside).

0 5 10 15 20 30 40 60m
1:600 @ A3

LEGEND

- Current DP borehole location
- EI Australia borehole location (14.9.2016)
- A A' Geotechnical cross section (Dwg 2 to 4)
- 4.0 (RL-1.0) Depth (RL) to top of weathered rock

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Built (NSW) Pty Ltd		TITLE: **Locations of Boreholes**	PROJECT No: 86127.00
OFFICE: Sydney	DRAWN BY: PSCH	**Council Carpark Redevlopment**	DRAWING No: 1
SCALE: 1:600 @ A3	DATE: 27.10.2017	**1-13 Cross Street, DOUBLE BAY**	REVISION: 0

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

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.

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

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

Graphic Symbols for Soil and Rock

General


Asphalt


Road base


Concrete

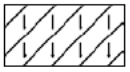

Filling

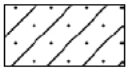
Soils


Topsoil

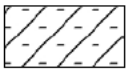

Peat

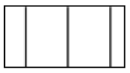

Clay

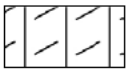

Silty clay

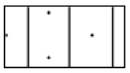

Sandy clay

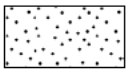

Gravelly clay

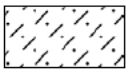

Shaly clay

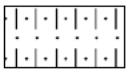

Silt


Clayey silt

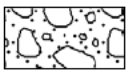

Sandy silt

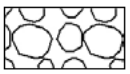

Sand

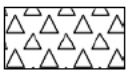

Clayey sand


Silty sand


Gravel

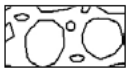

Sandy gravel


Cobbles, boulders

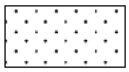

Talus

Sedimentary Rocks

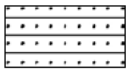

Boulder conglomerate

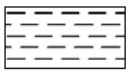

Conglomerate


Conglomeratic sandstone

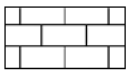

Sandstone


Siltstone

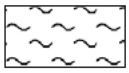

Laminite

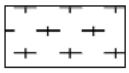

Mudstone, claystone, shale

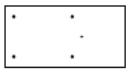

Coal


Limestone

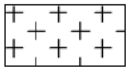
Metamorphic Rocks

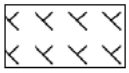

Slate, phyllite, schist

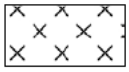

Gneiss

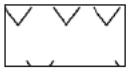

Quartzite

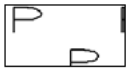
Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 3.1 AHD
EASTING: 337651
NORTHING: 6250122
DIP/AZIMUTH: 90°/--

BORE No: 101
PROJECT No: 86127.00
DATE: 12/10/2017
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.1	FILLING - brown and grey silty clay filling with some bark, garden mulch, concrete rubble and igneous rock gravel, humid							E			
	0.8	FILLING - brown sand filling with some igneous rock and sandstone gravel and cobbles, humid							E*			
	1.0											
	1.18	FILLING - grey sandstone filling (possible boulder)										
	1.5	CONCRETE										
		FILLING - brown to red-brown silty clay filling with some ironstone gravel and glass fragments										
		FILLING - grey medium sand filling with some igneous rock gravel							S/E			5,8,5 N = 13
		- with some glass and tile fragments from 1.5m to 2.5m										
	3.5	SAND - loose, grey medium sand, wet							S/E			2,2,2 N = 4
								Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			1,3,4 N = 7
	4.7	SANDSTONE - extremely low strength, extremely weathered, grey and brown sandstone										
	5.06	SANDSTONE - medium strength, slightly weathered, slightly fractured and unbroken, light grey-brown, medium grained sandstone						5.5m: B5°, cly co, 1mm	C	100	100	PL(A) = 0.6
								6.72m: B0°, fe				PL(A) = 0.63
								7.64m: B10°, cly co, 2mm	C	100	99	PL(A) = 0.38
	7.85	SANDSTONE - high strength, fresh, slightly fractured and unbroken, pale grey, medium grained sandstone						8.55m: B5°, fe 8.6m: J25°, pl, ro, fe 8.87m: B5°, cly, sm				PL(A) = 1.14
								9.2m: B20°, cly vn, ti	C	100	98	PL(A) = 1.27

RIG: Bobcat **DRILLER:** GM/SS **LOGGED:** JS/SI **CASING:** HW to 5.0m; HQ to 5.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m; Rotary to 5.06m; NMLC-Coring to 28.85m

WATER OBSERVATIONS: No free groundwater observed (water added from 1.0m for coring concrete)

REMARKS: *BD2 taken at 0.5m. Packer test between 7.0m to 16.4m and 16.0m to 2.4m. Standpipe installed to 28.85m (screen 6-28.9m; blank to 6m; gravel to 5.2m; bentonite 4.1-5.2m; backfill to 0m; finish with gatic cover)

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_x	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

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PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 3.1 AHD
EASTING: 337651
NORTHING: 6250122
DIP/AZIMUTH: 90°/--

BORE No: 101
PROJECT No: 86127.00
DATE: 12/10/2017
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-7	10.2	SANDSTONE - medium strength, fresh, unbroken, light grey, fine to medium grained sandstone	EW HW MW SW FS FR		Ex Low Very Low Low Medium High Very High Ex High		0.01 0.05 0.10 0.50 1.00	10.2-10.22m: Cs	C	100	98	PL(A) = 0.96
-8	11											
	11.32	SANDSTONE - medium and high strength, highly to moderately then slightly weathered, fractured and slightly fractured, medium to coarse grained sandstone with some quartz gravel and fragmented, very low strength carbonaceous bands						11.31m: B10°, cly vn, fe 11.41m: J, sv, pl, ro, fe 11.49m: B0°, fe 11.69-11.75m: J80°, un, ro, fe 11.76m: J25°, pl, ro, fe 11.86-11.88m: Ds 11.94m: J0°- 45°, cu, ro, cly inf, 5mm 12.02-12.12m: B's 5°-15°, fe, he 12.12m: J, sv, un, ro, fe 12.14m: J45°, pl, ro, fe 12.32-12.42m: B (x2) 0°-5°, fe 12.5m: J35°, pl, ro, fe 12.55m: siltstone clast 12.56-12.64m: fg, cbs band 13.64m: B10°, cbs, 10mm 13.72-13.82m: fg, cbs bands	C	100	77	PL(A) = 0.75 PL(A) = 0.93
-9	12											
-10	13											
-11	14											PL(A) = 1.49
-12	15							14.6m: J45° & 85°, st, ro, fe 14.75-14.85m: J (x2) 30°, pl/un, ro, fe	C	100	95	PL(A) = 0.92
	15.52	SANDSTONE - high strength, fresh, slightly fractured and unbroken, light grey, medium to coarse grained sandstone with some quartz gravel						15.5-15.52m: Ds, fe				PL(A) = 1.75
-13	16											
-14	17							17m: B0°, cly, 5mm				PL(A) = 1.85
-15	18							17.73m: B10°, un, ro, cly vn 18.42m: B0°, cly vn, ti	C	100	100	PL(A) = 1.93 PL(A) = 1.94
-16	19							18.99m: B10°, fe				
									C	100	99	PL(A) = 2.08

RIG: Bobcat **DRILLER:** GM/SS **LOGGED:** JS/SI **CASING:** HW to 5.0m; HQ to 5.0m

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SAMPLING & IN SITU TESTING LEGEND

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B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	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

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LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 3.1 AHD
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BORE No: 101
PROJECT No: 86127.00
DATE: 12/10/2017
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-17												
	20.35	SANDSTONE - medium to high strength, fresh, slightly fractured, light grey to grey, fine grained sandstone with approximately 15-20% siltstone laminations						20.34m: B5°, cly co, 2mm				PL(A) = 0.95
-18	21											PL(A) = 1.83
	21.12	SANDSTONE - high strength, fresh, unbroken, light grey, medium to coarse grained sandstone						21.12m: B5°, quartz gravel	C	100	99	
-19	22											PL(A) = 1.96
-20	23											PL(A) = 2.04
	23.5	SANDSTONE - medium strength, moderately and slightly weathered, slightly fractured, light grey medium to coarse grained sandstone with some quartz gravel										PL(A) = 0.45
-21	24							23.98-24.0m: Ds 24.06, 24.42, 24.85m: B (x3) 5°- 15°, cly co, 1-5mm	C	100	98	
	24.8	SANDSTONE - medium then high strength, moderately weathered, slightly fractured, brown, medium to coarse grained sandstone with some quartz gravel										PL(A) = 0.9
-22	25											PL(A) = 0.24
								25.38m: J85°, pl, ro, cln				PL(A) = 0.54
-23	26							25.86m: J50°, he 26m: J70°, pl, ro, cln				
								26.26m: J80°, un, ro, ti 23.36-26.6m: J85°, pl, ro, cln				PL(A) = 1.85
-24	27	27.0 SANDSTONE - high strength, slightly weathered then fresh, slightly fractured and unbroken, light grey, medium to coarse grained sandstone						26.9m: J30°, un, ro, cln 27m: J90°, un, ro, cln	C	100	98	
-25	28											PL(A) = 2.59
												PL(A) = 1.95
	28.85							28.7m: B20°, cly vn, ti 28.75m: J25°, pl, ro, ti				
-26	29	Bore discontinued at 28.85m										

RIG: Bobcat **DRILLER:** GM/SS **LOGGED:** JS/SI **CASING:** HW to 5.0m; HQ to 5.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m; Rotary to 5.06m; NMLC-Coring to 28.85m

WATER OBSERVATIONS: No free groundwater observed (water added from 1.0m for coring concrete)

REMARKS: *BD2 taken at 0.5m. Packer test between 7.0m to 16.4m and 16.0m to 2.4m. Standpipe installed to 28.85m (screen 6-28.9m; blank to 6m; gravel to 5.2m; bentonite 4.1-5.2m; backfill to 0m; finish with gatic cover)

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$_x$	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


BORE: 101 PROJECT: DOUBLE BAY OCTOBER 2017
Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 86127.00
BH ID: BH101
Depth: 5.06-9.0m
Core Box No.: 1 of 5
86127 DOUBLE BAY 12.10.17 BH101 START CORING 5.06m
5.06m
6m
7m
8m
5.06- 9.0m


BORE: 101 PROJECT: DOUBLE BAY OCTOBER 2017
Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 86127.00
BH ID: BH101
Depth: 9.0-14.0m
Core Box No.: 2 of 5
9
10
11
12
13
9.0 – 14.0m


BORE: 101 PROJECT: DOUBLE BAY OCTOBER 2017
Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 86127.00
BH ID: BH101
Depth: 14.0-19.0m
Core Box No.: 3 of 5
14
15
16
17
18
14.0 – 19.0m


BORE: 101 PROJECT: DOUBLE BAY OCTOBER 2017
Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 86127.00
BH ID: BH101
Depth: 19.0-24.0m
Core Box No.: 4 of 5
19
20
21
22
23
19.0 – 24.0m


BORE: 101
PROJECT: DOUBLE BAY
OCTOBER 2017
Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 86127.00
BH ID: BH101
Depth: 24.0 - 28.84
Core Box No.: 5055
24
25
26
27
28
24.0 – 28.85m

BOREHOLE LOG

CLIENT: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 3.5 AHD
EASTING: 337679
NORTHING: 6250179
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 86127.00
DATE: 9/10/2017
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.12	FILLING - brown medium grained sand (topsoil) filling with some rootlets, humid							E			
		FILLING - light brown medium grained sand filling with a trace of sandstone gravel, humid							E			
	1	- with some shells from 0.7m							E			
									S			2,3,7 N = 10
	1.5	FILLING - brown medium grained sand filling with some igneous rock gravel and tree roots							E			
									S			6,8,5 N = 13
	3.2	SAND - very loose to loose, brown medium grained sand										
									S			2,2,1 N = 3
		- becoming grey at 4.0m										
									S			2,3,3 N = 6
	5.0	SAND - medium dense, light grey, medium grained sand, wet										
									S			2,4,6 N = 10
									S			5,6,7 N = 13
									S			8,9,8 N = 17
									S			5,5,5 N = 10
									S			7,6,6 N = 12

RIG: Bobcat **DRILLER:** GM **LOGGED:** JS/SI **CASING:** HW to 11.7m; HQ to 12.8m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; Rotary to 11.73m; NMLC-Coring to 29.06m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Continued collapse of hole when augering cannot do 2.0m SPT

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_x	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: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 3.5 AHD
EASTING: 337679
NORTHING: 6250179
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 86127.00
DATE: 9/10/2017
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-7		SAND - medium dense, light grey, medium grained sand, wet *(continued)*										
	11							Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			11,10,15 N = 25
-8	11.5	SANDSTONE - extremely low strength, extremely weathered sandstone							S			20/100mm refusal
	11.73	SANDSTONE - medium strength, moderately and slightly weathered, slightly fractured, light grey and brown, medium grained thinly bedded sandstone with some extremely low and very low strength bands							C	100	99	PL(A) = 0.37
	12							12.55m: B0°, fe, cly, 5mm				PL(A) = 0.55
-9												
	13							13.12m: B5°, fe, Ds, 30mm				PL(A) = 0.44
-10								13.66-13.72m: J, sv, un, ro, Ds, 60mm				
	13.91							13.82m: B5°, fe, cly co, 5mm				
	14	SANDSTONE - high strength, moderately weathered then fresh, slightly fractured and unbroken, medium grained sandstone with indistinct irregular cross bedding at 0°- 15°						13.88-13.91m: Ds, 30mm	C	100	95	PL(A) = 1.23
-11								14.43, 14.8, 15.85m: B (x3) 5°- 20°, fe, cly vn, ti				
	15											PL(A) = 1.65
-12		- with trace siltstone clast at 15.7m										
	16							16.32m: B10°, cly vn				PL(A) = 1.32
-13												
	17	- with trace carbonaceous laminae from 16.9m							C	97	97	
-14												PL(A) = 1.41
	18							17.8m: B5°, cly vn				
-15	18.44							18.44m: CORE LOSS: 60mm				
	18.5	SANDSTONE - high and medium to high strength, slightly weathered and fresh, slightly fractured and unbroken, pale grey-brown and pale grey, medium to coarse grained sandstone										PL(A) = 2.65
	18.52	- with some siltstone and quartz gravel 18.55-19.65m										
	19								C	100	97	
-16								19.75m: B15°, cly, 5mm				PL(A) = 2.25

RIG: Bobcat **DRILLER:** GM **LOGGED:** JS/SI **CASING:** HW to 11.7m; HQ to 12.8m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; Rotary to 11.73m; NMLC-Coring to 29.06m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Continued collapse of hole when augering cannot do 2.0m SPT

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$_x$	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: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 3.5 AHD
EASTING: 337679
NORTHING: 6250179
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 86127.00
DATE: 9/10/2017
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
-17		SANDSTONE - high and medium to high strength, slightly weathered and fresh, slightly fractured and unbroken, pale grey-brown and pale grey, medium to coarse grained sandstone *(continued)*						20.47m: B0°, cly vn 20.56m: B10°, cly vn				PL(A) = 1.19
-18	21	20.55m: quartz gravel band						21.58-21.61m: Ds	C	100	97	PL(A) = 1.4
-19	22											PL(A) = 2.52
-20	23								C	100	100	PL(A) = 2.03
-21	24							23.8m: J45°, pl, ro, cln 24.3 & 24.68m: B (x2) 5°- 10°, cly co, 5mm				PL(A) = 1.4
-22	25											PL(A) = 0.73
-23	26								C	100	100	PL(A) = 1.7
-24	27							26.82m: B10°, cly co, 5mm				PL(A) = 1.64
-25	28								C	100	96	PL(A) = 2.3
-26	29 29.06							28.7-28.75m: J45°, pl, ro, Ds, 50mm				
		Bore discontinued at 29.06m - limit of investigation										

RIG: Bobcat **DRILLER:** GM **LOGGED:** JS/SI **CASING:** HW to 11.7m; HQ to 12.8m
TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; Rotary to 11.73m; NMLC-Coring to 29.06m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Continued collapse of hole when augering cannot do 2.0m SPT

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_x	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
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BORE: 102 PROJECT: DOUBLE BAY OCTOBER 2017
Douglas Partners
Geotechnics / Environment / Groundwater
Project No: 86127.00
BH ID: BH102
Depth: 11.73-16.0m
Core Box No.: 1 of 4
86127 DOUBLE BAY BH102 09.10.17 START CORING 11.73m
12
13
14
15
11.73 – 16.0m


BORE: 102 PROJECT: DOUBLE BAY OCTOBER 2017
Douglas Partners
Geotechnics / Environment / Groundwater
Project No: 86127.00
BH ID: BH102
Depth: 16.0-21.0m
Core Box No.: 2 of 4
16
17
18
19
20
16.0 – 21.0m


BORE: 102 PROJECT: DOUBLE BAY OCTOBER 2017
Douglas Partners
Geotechnics / Environment / Groundwater
Project No: 86127.00
BH ID: BH102
Depth: 21.0 - 26.0m
Core Box No.: 3 of 4
21
22
23
24
25
21.0 – 26.0m


BORE: 102 PROJECT: DOUBLE BAY OCTOBER 2017
Douglas Partners
Geotechnics / Environment / Groundwater
Project No: 86127.00
BH ID: BH102
Depth: 26.0 - 29.0m
Core Box No.: 4 of 4
26
27
28
29
EOH 29.06m
26.0 – 29.06m

BOREHOLE LOG

CLIENT: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 2.1 AHD
EASTING: 337640
NORTHING: 6250175
DIP/AZIMUTH: 90°/--

BORE No: 103
PROJECT No: 86127.00
DATE: 11 - 12/10/2017
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.1	ASPHALTIC CONCRETE							A/E			
	0.2	FILLING - dark grey roadbase gravel filling, damp							A/E*			
		FILLING - grey-brown medium grained sand filling with some fine to medium gravel, damp										
	1.2	SAND - loose, brown, medium sand, moist becoming wet, strong sulphur dioxide odour				▼			S/E			2,3,5 N = 8
									S/E			1,2,3 N = 5
									S/E			1,2,3 N = 5
	4.5	SAND - loose, grey, medium sand, wet										
									S/E			2,2,2 N = 4
		7.0m: becoming very loose							S			0,0,0 N = 0
	8.5	SAND - medium dense, light grey medium sand, wet							S			4,9,10 N = 19

RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** JN/SI **CASING:** HQ to 11.5m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; Rotary (mud) to 12.55m; NMLC-Coring to 27.2m

WATER OBSERVATIONS: Free groundwater observed at 1.6m whilst augering

REMARKS: *BD1/2017101101 taken at 0.4m to 0.5m

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_x	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: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 2.1 AHD
EASTING: 337640
NORTHING: 6250175
DIP/AZIMUTH: 90°/--

BORE No: 103
PROJECT No: 86127.00
DATE: 11 - 12/10/2017
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-8		SAND - medium dense, light grey medium sand, wet *(continued)*							S			7,8,11 N = 19
-9	11											
-10	11.93 12	SANDSTONE - extremely low strength, extremely weathered, light grey-brown sandstone						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			8,16,18/130mm refusal
-11	12.55 13	SANDSTONE - medium strength, moderately then slightly weathered, slightly fractured, brown then pale grey, medium grained sandstone with some extremely low to very low strength bands						12.9m: B10°, pl, ro, cly 13.03m: B5°, fe, cly, 5mm	C	100	95	PL(A) = 0.34
-12	14							13.65-13.7m: Ds 13.93m: B5°, pl, ro, cly, 5mm	C	100	92	PL(A) = 0.89 PL(A) = 0.86
-13	15							14.85, 14.9m: B10°, pl, ro, cly, 3mm	C	100	94	PL(A) = 0.67
-14	15.7 16	SANDSTONE - high strength, fresh, slightly fractured, grey-brown, medium to coarse grained sandstone						15.55-15.58m: Cs 16.6m: B15°, pl, ro, cly	C	100	89	PL(A) = 1.13
-15	17							17.15m: B30°, pl, ro, cln 17.25-17.27m: Ds	C	100	97	PL(A) = 1.5
-16	18											
-17	18.49 19	SANDSTONE - medium then high strength, slightly weathered, slightly fractured and unbroken, medium to coarse grained sandstone						18.42m: J35°, pl, sm, cly 18.42m: siltstone clast 18.45-18.48m: Cs 19.16m: B0°- 10°, un, ro, cbs stn	C	100	100	PL(A) = 0.62
		19.9-23.0m: some quartz gravel						19.9m: B0°- 10°, un, ro, cln with qtz gravel				PL(A) = 2.1

RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** JN/SI **CASING:** HQ to 11.5m
TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; Rotary (mud) to 12.55m; NMLC-Coring to 27.2m
WATER OBSERVATIONS: Free groundwater observed at 1.6m whilst augering
REMARKS: *BD1/2017101101 taken at 0.4m to 0.5m

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_x	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: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 2.1 AHD
EASTING: 337640
NORTHING: 6250175
DIP/AZIMUTH: 90°/--

BORE No: 103
PROJECT No: 86127.00
DATE: 11 - 12/10/2017
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-18	21	SANDSTONE - medium then high strength, slightly weathered, slightly fractured and unbroken, medium to coarse grained sandstone *(continued)*							C	100	100	PL(A) = 1.59
-19								21.2, 21.32m: B0°, pl, ro, cly, 5mm 21.58m: B0°- 10°, un, ro, cln				
-20	22								C	100	98	PL(A) = 1.85
												PL(A) = 2.19
-21	23	23.2-24.0m: some carbonaceous laminations						23.48m: J20°, pl, ro, cln	C	100	99	PL(A) = 2.79
-22	24							24.52m: B0°, cly co				
-23	25								C	100	99	PL(A) = 2.24
-24	26							26.2m: B10°, cbs co, 2mm	C	100	100	PL(A) = 2.72
-25	27											PL(A) = 2.34
	27.2	Bore discontinued at 27.2m										
-26	28											
-27	29											

RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** JN/SI **CASING:** HQ to 11.5m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; Rotary (mud) to 12.55m; NMLC-Coring to 27.2m

WATER OBSERVATIONS: Free groundwater observed at 1.6m whilst augering

REMARKS: *BD1/2017101101 taken at 0.4m to 0.5m

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_x	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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BORE: 103 PROJECT: DOUBLE BAY OCTOBER 2017



12.55 – 17.0m

BORE: 103 PROJECT: DOUBLE BAY OCTOBER 2017



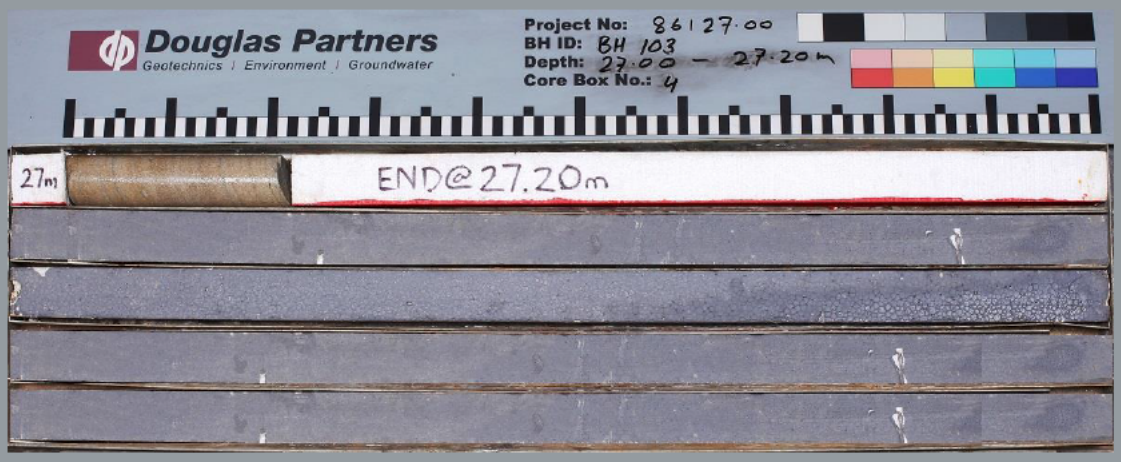
17.0 – 22.0m

BORE: 103 PROJECT: DOUBLE BAY OCTOBER 2017



22.0 – 27.0m

BORE: 103 PROJECT: DOUBLE BAY OCTOBER 2017



27.0 – 27.2m

BOREHOLE LOG

CLIENT: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 2.1 AHD
EASTING: 337650
NORTHING: 6250197
DIP/AZIMUTH: 90°/--

BORE No: 104
PROJECT No: 86127.00
DATE: 9 - 10/10/2017
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
2	0.1	ASPHALTIC CONCRETE							A/E			
	0.2	FILLING - dark grey roadbase gravel filling, damp							A/E			
	0.8	FILLING - grey-brown medium sand filling, damp										
1		SAND - very loose to loose, brown medium sand, moist							A//E			
									S/E			2,1,2 N = 3
		1.6m: becoming wet				▼						
0	2											
									S/E			2,2,2 N = 4
-1	3											
-2	4.0	SAND - medium dense, grey, medium sand, wet							S			6,6,6 N = 12
-3	5											
	5.9	SAND - very loose, dark grey silty sand, wet							S			1,6,7 N = 13
-4	6											
-5	7								S			0,0,0 N = 0
-6	8											
	8.8	SAND - medium dense, light grey, medium sand, wet							S			4,8,13 N = 21
-7	9											
	10.0											

RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** JN/SI **CASING:** HQ to 15.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 4.0m; Rotary (mud) to 15.5m; NMLC-Coring to 27.4m

WATER OBSERVATIONS: Free groundwater observed at 1.6m whilst augering

REMARKS: Standpipe installed to 6.0m (screen 6.0-3.0m; blank 0m-3.0m; gravel to 2.4m; bentonite to 2.0m; backfill to 0.0m; finished with gatic cover and concrete)

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_x	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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BOREHOLE LOG

CLIENT: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 2.1 AHD
EASTING: 337650
NORTHING: 6250197
DIP/AZIMUTH: 90°/--

BORE No: 104
PROJECT No: 86127.00
DATE: 9 - 10/10/2017
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
-8		SAND - very dense, light grey, medium sand, wet							S			14,17,18 N = 35
-9	11											
-10	12								S			14,25/140mm refusal
-11	13 13.0	SAND - medium dense, light brown medium sand with some clay, wet							S			4,4,10 N = 14
-12	14	14.6m: some fine siltstone flecks						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	S			7,12,12/80mm refusal bouncing
-13	14.8 15	SANDSTONE - extremely low strength, light grey-brown, medium grained sandstone										
-14	15.5 16	SANDSTONE - medium strength, moderately weathered, fractured, pale grey-brown medium grained sandstone with some extremely low strength bands						15.5m: B0°, fe 15.88m: J30°, un, ro, cly 15.9-16.05m: Cs	C	100	78	PL(A) = 0.41
-15	17 17.15	SANDSTONE - high strength, slightly weathered, moderately to slightly weathered and unbroken, pale grey-brown medium to coarse grained sandstone						17.07m: J20°, pl, ro, fe 17.15m: B0°, cly & J85°, un, ro, fe 17.3-18.3m: J70°- 90°, un, ro, cln 17.45m: J35°, un, ro, cln	C	100	96	PL(A) = 0.91 PL(A) = 2.31
-16	18							18.48m: B10°, cly vn 18.6m: B20°, pl, ro, cln	C	100	99	PL(A) = 2.22
-17	19							19.4m: J35°, pl, ro, siltstone 19.6m: B0°, cly, 5mm	C	100	99	PL(A) = 2.51

RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** JN/SI **CASING:** HQ to 15.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 4.0m; Rotary (mud) to 15.5m; NMLC-Coring to 27.4m

WATER OBSERVATIONS: Free groundwater observed at 1.6m whilst augering

REMARKS: Standpipe installed to 6.0m (screen 6.0-3.0m; blank 0m-3.0m; gravel to 2.4m; bentonite to 2.0m; backfill to 0.0m; finished with gatic cover and concrete)

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_x	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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BOREHOLE LOG

CLIENT: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 2.1 AHD
EASTING: 337650
NORTHING: 6250197
DIP/AZIMUTH: 90°/--

BORE No: 104
PROJECT No: 86127.00
DATE: 9 - 10/10/2017
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-18		SANDSTONE - high strength, slightly weathered, moderately to slightly weathered and unbroken, pale grey-brown medium to coarse grained sandstone *(continued)*						20.7m: B5°, cly, 10mm	C	100	99	PL(A) = 1.97
-19	21							21.48m: B0°, fe, cly, 10mm	C	100	99	PL(A) = 2.1
-20	22							22.5m: B5°, fe				PL(A) = 2.23
-21	23							23.62m: J30°, he, cbs co, 2mm	C	100	100	PL(A) = 1.79
-22	24											PL(A) = 2.24
-23	25											PL(A) = 2.9
-24	26 26.0	SANDSTONE - high to very high strength, moderately to slightly weathered then fresh, slightly fractured, medium to coarse grained sandstone						26.06m: B10°, cly co, 5mm	C	100	99	PL(A) = 3.56
-25	27							26.9m: B0°, fe				PL(A) = 2.5
	27.4	Bore discontinued at 27.4m										
-26	28											
-27	29											

RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** JN/SI **CASING:** HQ to 15.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 4.0m; Rotary (mud) to 15.5m; NMLC-Coring to 27.4m

WATER OBSERVATIONS: Free groundwater observed at 1.6m whilst augering

REMARKS: Standpipe installed to 6.0m (screen 6.0-3.0m; blank 0m-3.0m; gravel to 2.4m; bentonite to 2.0m; backfill to 0.0m; finished with gatic cover and concrete)

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_x	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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BORE: 104 PROJECT: DOUBLE BAY OCTOBER 2017



15.5 – 20.0m

BORE: 104 PROJECT: DOUBLE BAY OCTOBER 2017



20.0 – 25.0m

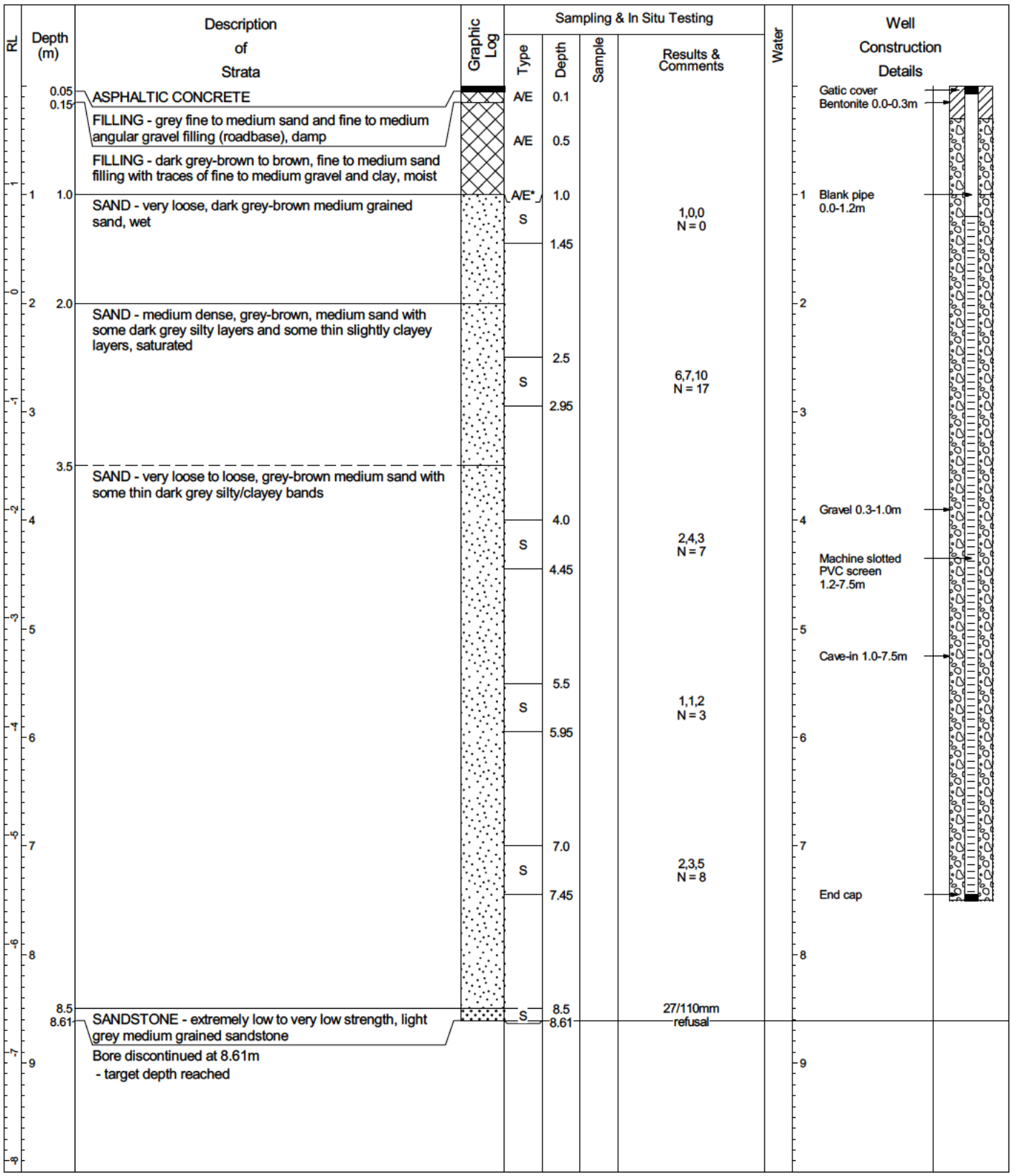

BORE: 104
PROJECT: DOUBLE BAY
OCTOBER 2017
Douglas Partners
Geotechnics | Environment | Groundwater
Project No: 86127.00
BH ID: BH 104
Depth: 25.00 – 27.40m
Core Box No.: 3
25m
26m
27m
END@27.40m
25.0 – 27.4m

BOREHOLE LOG

CLIENT: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 1.9 AHD
EASTING: 337632
NORTHING: 6250142
DIP/AZIMUTH: 90°/--

BORE No: 105
PROJECT No: 86127.00
DATE: 14/10/2017
SHEET 1 OF 1



RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** RMM **CASING:** HQ to 5.5m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; Rotary to 8.61m

WATER OBSERVATIONS: Free groundwater observed at approximately 1.0m

REMARKS: *BD/14102297 taken at 1.0m

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_x	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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BOREHOLE LOG

CLIENT: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 3.3 AHD
EASTING: 337653
NORTHING: 6250163
DIP/AZIMUTH: 90°/--

BORE No: 106
PROJECT No: 86127.00
DATE: 13/10/2017
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.03	ASPHALTIC CONCRETE		E	0.1				
	0.15	FILLING - grey sandy gravel (roadbase) filling, humid							
		FILLING - brown medium sand filling with some sandstone and igneous rock gravel, humid		E	0.5				
				S/E*	1.0		4,4,4 N = 8		
					1.45				
				S/E	2.5		3,2,2 N = 4		
	3.0	FILLING - brown medium grained sand filling with a trace of ironstone gravel and brick fragments, wet			2.95				
				S	4.0		1,0,4 N = 4		
					4.45				
	5.0	SAND - very loose to loose, grey medium sand, wet			5.5				
				S/E	3,4,4 N = 8				
					5.95				
				S	7.0		1,0,0 N = 0		
					7.45				
	8.0	SAND - medium dense to dense, grey and light brown, medium grained sand, wet			8.5				
				S	6,12,16 N = 28				
					8.95				

RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** JS **CASING:** HQ to 4.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 4.0m; Rotary to 11.52m

WATER OBSERVATIONS: Free groundwater observed at approximately 3.0m

REMARKS: *BD3 taken at 1.0m to 1.45m

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_x	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: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 3.3 AHD
EASTING: 337653
NORTHING: 6250163
DIP/AZIMUTH: 90°/--

BORE No: 106
PROJECT No: 86127.00
DATE: 13/10/2017
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
-7		SAND - medium dense to dense, grey and light brown, medium grained sand, wet *(continued)*		S	10.0 10.45		8,16,14 N = 30		
-8	10.8 11	SANDSTONE - extremely low strength, extremely weathered, grey sandstone							
	11.52	Bore discontinued at 11.52m - limit of investigation		S	11.5 11.52		15/20mm refusal		
-9	12								
-10	13								
-11	14								
-12	15								
-13	16								
-14	17								
-15	18								
-16	19								

RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** JS **CASING:** HQ to 4.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 4.0m; Rotary to 11.52m

WATER OBSERVATIONS: Free groundwater observed at approximately 3.0m

REMARKS: *BD3 taken at 1.0m to 1.45m

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_x	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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BOREHOLE LOG

CLIENT: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 1.9 AHD
EASTING: 337654
NORTHING: 6250183
DIP/AZIMUTH: 90°/--

BORE No: 107
PROJECT No: 86127.00
DATE: 16/10/2017
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.03	ASPHALTIC CONCRETE		E	0.1				
	0.2	FILLING - grey sand and igneous rock gravel (roadbase) filling, damp		E	0.5				
		FILLING - brown medium grained sand filling (possibly natural), damp							
	1.0	SAND - loose, brown medium grained sand, damp		S/E*	1.0		2,3,3 N = 6		
					1.45				
	2.0	SAND - very loose to loose, brown medium grained sand, wet							
				S	2.5		1,0,1 N = 1		
					2.95				
				S	4.0		4,4,4 N = 8		
					4.45				
		- becoming grey at 5.0m							
				S	5.5		1,0,0 N = 0		
					5.95				
				S	7.0		1,2,3 N = 5		
					7.45				
	8.0	SAND - dense, grey medium grained sand, wet							
				S	8.5		7,13,19 N = 32		
					8.95				

RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** JS **CASING:** HQ to 3.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; Rotary to 13.02m

WATER OBSERVATIONS: Free groundwater observed at 2.5m

REMARKS: *BD4 taken at 1.0m to 1.45m

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_x	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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BOREHOLE LOG

CLIENT: Built (NSW) Pty Ltd
PROJECT: Council Carpark Redevelopment
LOCATION: 1-13 Cross Street, Double Bay

SURFACE LEVEL: 1.9 AHD
EASTING: 337654
NORTHING: 6250183
DIP/AZIMUTH: 90°/--

BORE No: 107
PROJECT No: 86127.00
DATE: 16/10/2017
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
-9	11	SAND - dense, grey medium grained sand, wet *(continued)*		S	10.0		13,17,21 N = 38		11
					10.45				
-10	12			S	11.5		15,27,20 N = 47		12
					11.95				
	12.5	SANDSTONE - extremely low strength, extremely weathered, grey sandstone							
-11	13 13.02	Bore discontinued at 13.02m - limit of investigation		S	13.0 13.02		15/20mm refusal No sample recovery		13
-12	14								14
-13	15								15
-14	16								16
-15	17								17
-16	18								18
-17	19								19
-18									

RIG: Trailer-mounted rig **DRILLER:** BG Drilling **LOGGED:** JS **CASING:** HQ to 3.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.5m; Rotary to 13.02m

WATER OBSERVATIONS: Free groundwater observed at 2.5m

REMARKS: *BD4 taken at 1.0m to 1.45m

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_x	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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Permeability Testing - Rising or Falling Head Test Report

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Test Location

		Test No.	
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]

Details of Well Installation

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]			

Test Results

[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
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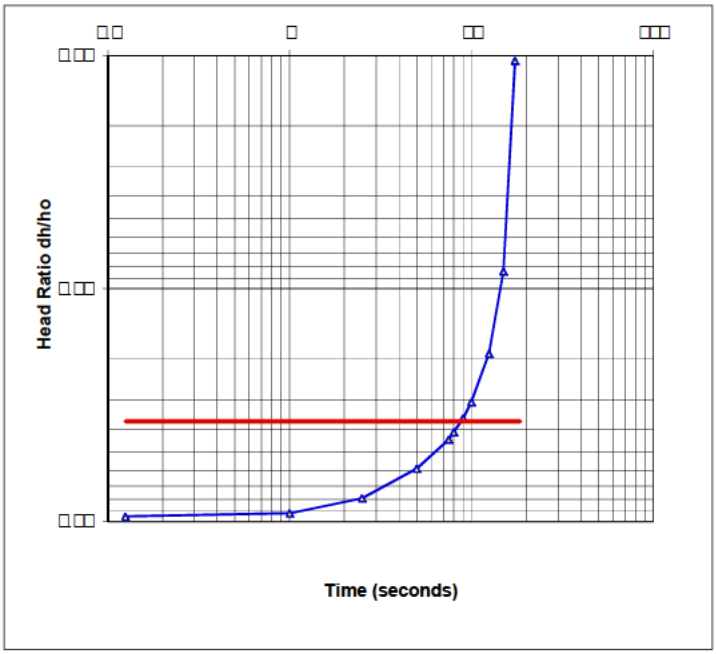


[illegible]

Theory: [illegible]

Hydraulic Conductivity k = 6.0E-05 [illegible]
= 21.592 [illegible]

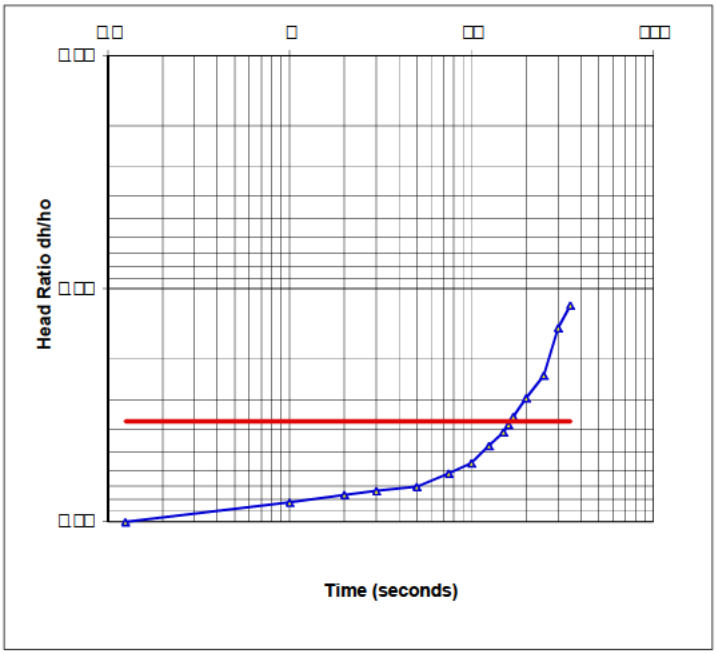
Permeability Testing - Rising or Falling Head Test Report

Test Location

Test No.

Details of Well Installation

Test Results



Theory:

Hydraulic Conductivity	**k =**	**1.8E-05**
	=	**6.601**

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WATER PRESSURE TEST RESULTS

Client : □□□□□□□ □□ □P□□□□□d
Project : □□□□□□□□□ □rp□r□□R□d□□□□□p□ □□□
Location : □□□□□□r□□□□□□r□□□□□D□□□□□□□□ □□

Field input sheet only

Project No. : □□□□□□
Bore : □□ □□□□□
Test section : □□□ □□□□□ □□□

Test Details

D□□□	□□□□ □□□□	□□□□□ □□□p□□□□r□□□ □□	□ □	□□□□□□□□□pr□□□□r□□□□□□□□□□□ □□	□ □
□□r□d□□□ □□□r□□□ □ □ □□	□□	□□r□d□p□□□□ □□	□□ □	□□r□□□□D□p□□□□□□□r□□□d□□□r□□□ □□	□ □
□□r□□□□□□□□□□□d□□□□	□□	□□□□□□□□□□□□□□□ □□	□ □	□r□d□p□□□□□□□□□□□□□□p□□□□r□	

Dr□□ □□r□□□□□ □□

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Hg = gauge pressure, Hl = head loss in rods and packer, Hw = (gauge height + groundwater depth)x 9.81, Total = Hg+Hw-Hl

PRESSURE Hg □□P□□	Hl □□P□□	Total □□P□□	Test Duration □□ □□□	FLOW RATES Flowmeter □□□□□ □□□□□□	Flowmeter □□□□□ □□□□□□	Flowmeter □□□□□ □□□□□□	Drum readings □□□□□ □□ □ □	Drum readings □□□□□ □□ □ □	Drum readings □□□□□□□□□□ □□□	Leakage □□□□□□	Assigned Flow □□□□□□	Water Loss □□□ □□ □□□	Lugeons □□□ □□ □□□□□ □□□□□□P□□	Approx Permeability □□ □□□□□
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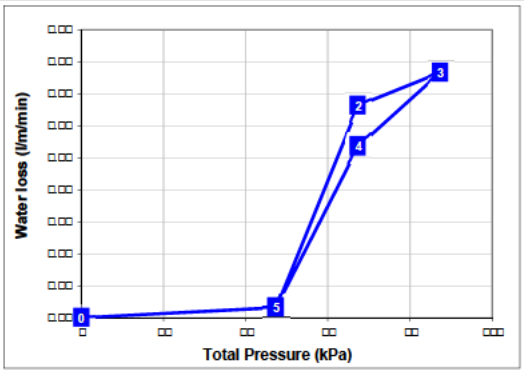

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WATER PRESSURE TEST RESULTS

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Hg = gauge pressure, Hl = head loss in rods and packer, Hw = (gauge height + groundwater depth)x 9.81, Total = Hg+Hw-Hl

PRESSURE Hg □□P□□	Hl □□P□□	Total □□P□□	Test Duration □□ □□□	FLOW RATES Flowmeter □□□□□ □□□□□□	Flowmeter □□□□□ □□□□□□	Flowmeter □□□□□ □□□□□□	Drum readings □□□□□ □□ □ □	Drum readings □□□□□ □□ □ □	Drum readings □□□□□□□□□□ □□□	Leakage □□□□□□	Assigned Flow □□□□□□	Water Loss □□□ □□ □□□	Lugeons □□□ □□ □□□□ □□□□□□P□□	Approx Permeability □□ □□□□□
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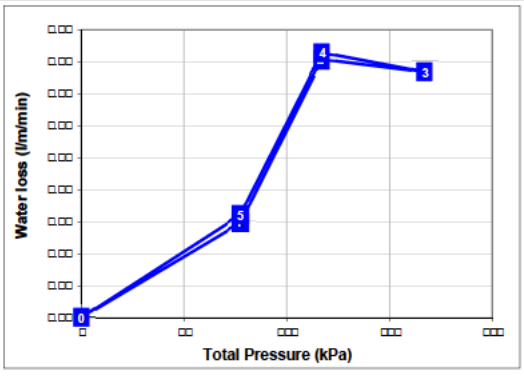

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WATER PRESSURE TEST RESULTS

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Test Details

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Hg = gauge pressure, Hl = head loss in rods and packer, Hw = (gauge height + groundwater depth)x 9.81, Total = Hg+Hw-Hl

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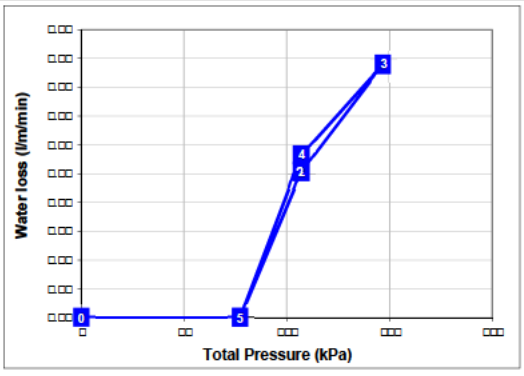

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WATER PRESSURE TEST RESULTS

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Project : □□□□□□□□□ □rp□r□IR□d□□□□□p□ □□□
Location : □□□□□□r□□□□□□r□□□□D□□□□□□□□

Field input sheet only

Project No. : □□□□□
Bore : □□ □□□□
Test section : □□□□ □□□□ □□□□

Test Details

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Hg = gauge pressure, Hl = head loss in rods and packer, Hw = (gauge height + groundwater depth)x 9.81, Total = Hg+Hw-Hl

PRESSURE Hg □□P□□	Hl □□P□□	Total □□P□□	Test Duration □□ □□□	FLOW RATES Flowmeter □□□□□ □□□□□	Flowmeter □□□□□ □□□□□	Flowmeter □□□□□ □□□□□	Drum readings □□□□□ □□ □ □	Drum readings □□□□□ □□ □ □	Drum readings □□□□□□□□□□ □□□	Leakage □□□□□□□	Assigned Flow □□□□□□□	Water Loss □□□ □□ □□□	Lugeons □□□ □□ □□□□□ □□□□□□□P□□	Approx Permeability □□ □□□□□□
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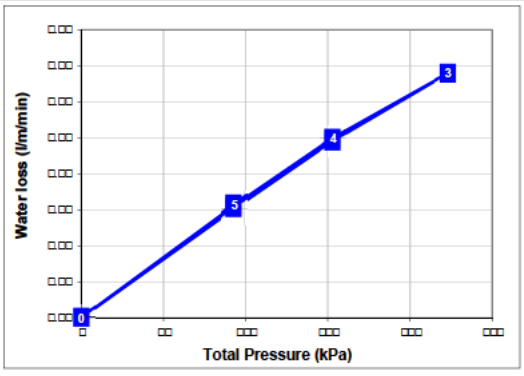
Notes



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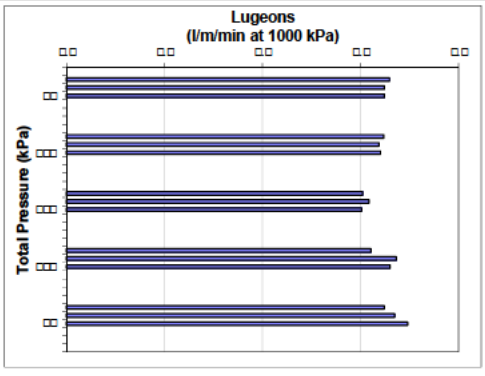

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TEST BORE REPORT

BORE No. 1

CLIENT WOOLLAHRA NUNICIPAL COUNCIL

SITE CROSS STREET

LOCATION DOUBLE BAY

DATE 21st April, 1975.

CONTRACT No. SS1/1-5001B

SURFACE LEVEL

Description of Strata	Depth	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
	S.L.				%
FILLING - Road pavement and road base.	0.35				
FILLING - Very loose brown slightly silty sand with occasional rock fragments.		S	1.00 - 1.45	1	
	1.50				
			2.00 - 2.45	7	
SAND - Loose light grey brown medium grained sand occasional medium dense zones.		S	3.00 - 3.45	9	
		S	4.50 - 4.95	16	
		S	6.00 - 6.45	8	
	7.00				
		S	8.00 - 8.45	0	
SAND - Very loose grey silty fine to medium grained sand.		S	8.50 - 8.95	6	
		S	10.00 - 10.45	6	
	11.00				
SAND - Medium dense light grey brown medium grained sand.		S	12.00 - 12.45	19	
*12.70 - 12.90 - dark grey silty sand.	12.90				
SANDSTONE - Weak to medium strong sandstone.					
	14.40				
BORE DISCONTINUED AT 14.40 METRES					

RIG Pioneer DRILLER Simpson CASING NX to 4.5

TYPE OF BORING Flight auger to 3m, then rotary mud drilling

WATER LEVEL OBSERVATIONS Free water at 1.4

REMARKS

TYPE

A — auger sample
S — standard penetration test sample
U — inch diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

'N' VALUE

blows of a 140lb hammer falling 30" to drive a standard 2"O.D. split pentrometer for the last 12" of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

GROUND TEST PTY. LIMITED

TEST BORE REPORT

BORE No. 2

CLIENT WOOLLAHRA MUNICIPAL COUNCIL

SITE CROSS STREET

LOCATION DOUBLE BAY

DATE 22nd April, 1975.

CONTRACT No. SS1/1-5001B

SURFACE LEVEL

Description of Strata	Depth	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
	S.L.				%
FILLING - Road pavement and road base.					
	0.50				
FILLING - Silty sand with brick fragments.					
	0.80				
SAND - Loose dark grey brown fine to medium grained silty sand.		S	1.00 - 1.45	7	
	1.50				
		S	2.00 - 2.45	9	
SAND - Loose light grey brown medium grained sand.		S	3.00 - 3.45	9	
		S	4.50 - 4.95	11	
	5.90				
SANDSTONE - Weak to medium strong sandstone.					
		S	6.00 -	7	
		REFUSAL IN FIRST 150mm			
	6.40				
BORE DISCONTINUED AT 6.40 METRES					

RIG Pioneer DRILLER Simpson CASING NX to 4.5

TYPE OF BORING Flight auger to 3m, then rotary mud drilling

WATER LEVEL OBSERVATIONS Free water at 1.4 m.

REMARKS

TYPE

A — auger sample
S — standard penetration test sample
U — inch diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

'N' VALUE

blows of a 140lb hammer falling 30" to drive a standard 2"O.D. split pentrometer for the last 12" of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

GROUND TEST PTY. LIMITED

TEST BORE REPORT

BORE No. 3

CLIENT WOOLLAHRA MUNICIPAL COUNCIL

SITE CROSS STREET

LOCATION DOUBLE BAY

DATE 23rd April, 1975.

CONTRACT No. SS1/1-5001B

SURFACE LEVEL

Description of Strata	Depth	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
	S.L.				%
FILLING - Road pavement and road base.	0.50				
SAND - Dark brown peaty sand.	0.70				
SAND - Loose grey medium grained sand.		S	1.00 - 1.45	9	
	1.50				
SAND - Loose dark brown slightly peaty medium grained sand.		S	2.00 - 2.45	10	
		S	3.00 - 3.45	8	
	3.50				
SAND - Medium dense grey and brown slightly silty medium grained sand.		S	4.50 - 4.95	14	
		S	6.00 - 6.45	14	
	7.50				
SAND - Very loose grey silty sand.		S	8.00 - 8.45	0	
	9.00				
SAND - Medium dense light grey and brown medium grained sand.		S	10.00 - 10.45	38	
		S	12.00 - 12.45	22	
		S	14.00 - 14.45	19	
	14.30				
SANDY CLAY - Very stiff grey and brown sandy clay grading to clayey sand in part and with fragments of weak sandstone. (decomposed sandstone)					
	15.30				
SANDSTONE - Medium strong thinly bedded grey and brown medium grained sandstone.		S	16.00 - REFUSAL IN FIRST 150mm	8	
*16.62 - 16.70 weak sandstone.		C	16.10 - 16.70		100
*16.87 - 70mm zone hard sandy clay.		C	16.70 - 18.20		100
	18.20				
BORE DISCONTINUED AT 18.20 METRES					

RIG Pioneer DRILLER Simpson. CASING NX to 16m

TYPE OF BORING Flight auger to 3m rotary mud drilling to 16.1m then diamond core drilling.

WATER LEVEL OBSERVATIONS Free water at 1.6m

REMARKS

TYPE

A — auger sample
S — standard penetration test sample
U — inch diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

'N' VALUE

blows of a 140lb hammer falling 30" to drive a standard 2"O.D. split pentrometer for the last 12" of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

GROUND TEST PTY. LIMITED

TEST BORE REPORT

BORE No. 4

CLIENT WOOLLAHRA MUNICIPAL COUNCIL

SITE CROSS STREET

LOCATION DOUBLE BAY

DATE 23 April, 1975.

CONTRACT No. SS1/1-5001B

SURFACE LEVEL

Description of Strata	Depth	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
	S.L.				%
FILLING - Road pavement and road base.	0.50				
FILLING - Very loose dark grey and brown silty sand with occasional rock fragments.		S	1.00 - 1.45	0	
		S	2.00 - 2.45	2	
		S	3.00 - 3.45	3	
	4.00				
SAND - Light brown and grey sand.					
	10.00				
SANDSTONE - Very weak to medium strong brown and grey sandstone.					
	10.60				
PIONEER AUGER REFUSAL AT 10.60 METRES					

RIG Pioneer DRILLER Simpson CASING

TYPE OF BORING Flight auger

WATER LEVEL OBSERVATIONS Free water at 1.7 m.

REMARKS

TYPE

A — auger sample
S — standard penetration test sample
U — inch diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

'N' VALUE

blows of a 140lb hammer falling 30" to drive a standard 2"O.D. split pentrometer for the last 12" of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

GROUND TEST PTY. LIMITED

TEST BORE REPORT

BORE No. 5 & 6

CLIENT PAK-POY & ASSOCIATES

DATE 10th December, 1976

SITE PARKING STATION

CONTRACT No. SSI/1-5390

LOCATION CROSS STREET, DOUBLE BAY

SURFACE LEVEL

Description of Strata	Depth	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
BORE 5	S.L.				%
BITUMEN AND ROADBASE	0.30				
FILLING - brown silty sand with rock fragments	1.00				
SAND - light brown sand, slightly silty	7.90				
SANDSTONE					
PIONEER AUGER REFUSAL AT 7.90 METRES					
BORE 6	S.L.				
BITUMEN AND ROADBASE	0.50				
SAND - dark brown silty sand	0.70				
SAND - light brown sand, slightly silty	12.50				
SANDSTONE					
PIONEER AUGER REFUSAL AT 12.50 METRES					

RIG Pioneer DRILLER Simpson CASING

TYPE OF BORING Flight auger

WATER LEVEL OBSERVATIONS Free ground water noted at 1.40 m in Bore 5 & 1.50 m in Bore 6

REMARKS Driller's log only, no samples taken.

TYPE

A — auger sample
S — standard penetration test sample
U — inch diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

'N' VALUE

blows of a 140lb hammer falling 30" to drive a standard 2"O.D. split pentrometer for the last 12" of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

GROUND TEST PTY. LIMITED

TEST BORE REPORT

BORE No. 7 & 8

CLIENT PAK-POY & ASSOCIATES

DATE 10th December, 1976

SITE PARKING STATION

CONTRACT No. SSI/1-5390

LOCATION CROSS STREET, DOUBLE BAY

SURFACE LEVEL

Description of Strata	Depth	Sampling and in-situ Testing			
		Type	Depth	'N' value	Core recovery
BORE 7	S.L.				%
BITUMEN AND ROADBASE	0.40				
SAND - dark brown silty sand	1.30				
SAND - light brown sand, slightly silty	4.00				
SANDSTONE					
PIONEER AUGER REFUSAL AT 4.00 METRES					
BORE 8	S.L.				
BITUMEN AND ROADBASE	0.30				
FILLING - dark brown silty sand with rock fragments	1.20				
SAND - light brown sand, slightly silty	10.90				
SANDSTONE					
PIONEER AUGER REFUSAL AT 10.90 METRES					

RIG Pioneer DRILLER Simpson CASING

TYPE OF BORING Flight auger

WATER LEVEL OBSERVATIONS Free ground water noted at 1.40 m in Bore 7 & 1.80 m in Bore 8

REMARKS

Driller's log only, no samples taken.

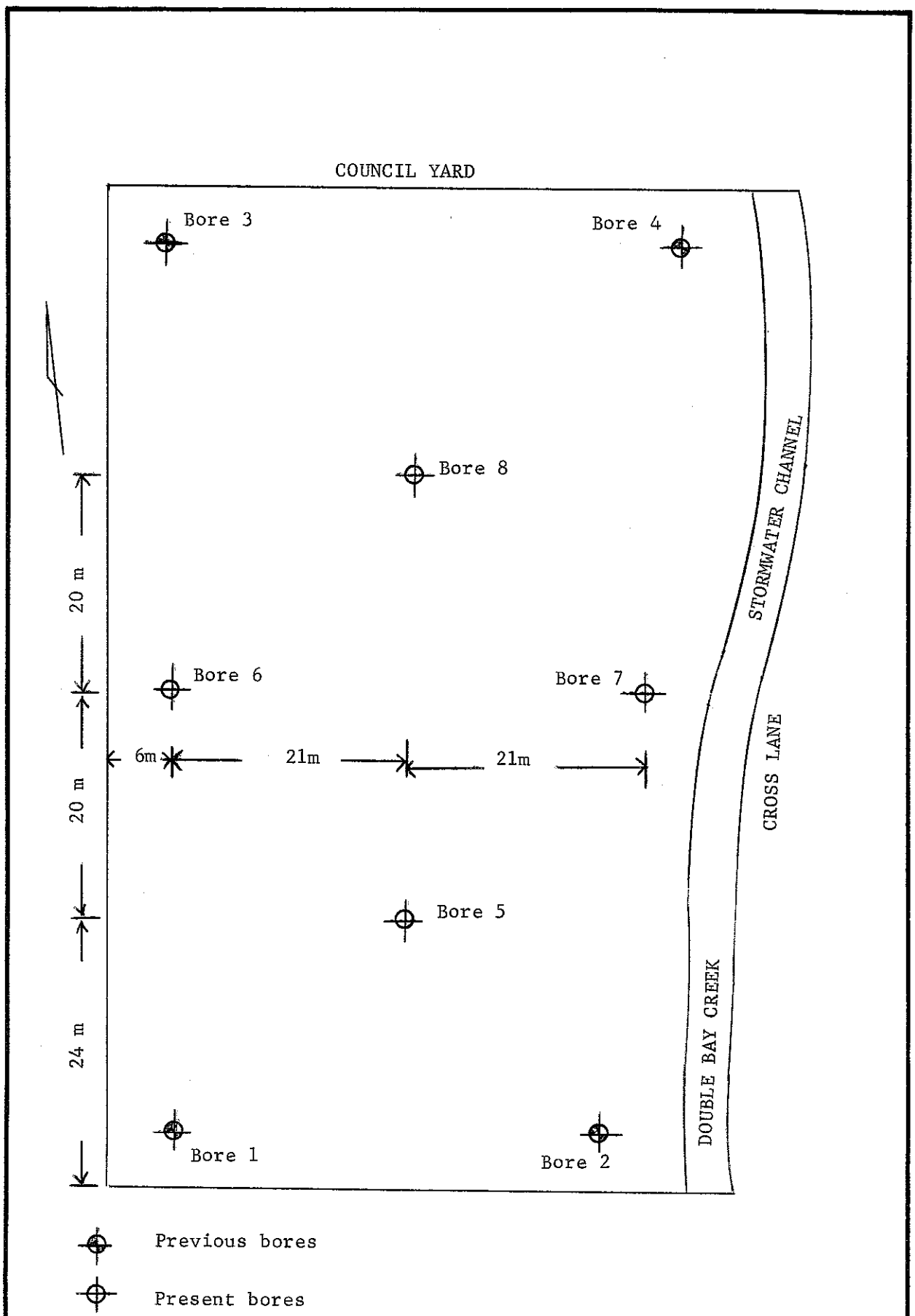
TYPE

A — auger sample
S — standard penetration test sample
U — inch diameter undisturbed sample
C — continuous diamond core
V — field vane shear test

'N' VALUE

blows of a 140lb hammer falling 30" to drive a standard 2"O.D. split pentrometer for the last 12" of test (where thin walled undisturbed sample tubes are driven in the same manner, the values are shown bracketed).

GROUND TEST PTY. LIMITED



LOCATION OF TEST BORES,

COUNCIL PARKING STATION, DOUBLE BAY

Scale 1:500

GROUND TEST PTY. LIMITED

BOREHOLE: BH1

eiaustralia
Contamination | Remediation | Geotechnical

Project	Proposed Mixed-Use Development	East	337616.2 m		
Location	Cross Street Carpark, Double Bay, NSW	North	6250124.3 m MGA94 Zone 56	Sheet	1 OF 4
Position	Refer to Figure 2	Surface RL	2.20 m AHD	Date Started	7/7/16
Job No.	E23054	Contractor	BG Drilling Pty Ltd	Date Completed	7/7/16
Client	Woollahra Municipal Council	Drill Rig	Hanjin DB8	Logged BY	Date: 7/7/16
		Inclination	-90°	Checked SK	Date: 14/9/16

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	E	▽	0	2.15				-	ASPHALT: 50mm thick.	-	-	ROAD SURFACE
				0.50				-	FILL: SAND; fine to medium grained, dark grey/black/brown mottled pale brown, with trace fines and trace of fine to medium, orange, subrounded gravel.			FILL
				1.70	BH1_0.4-0.5 ES 0.40-0.50 m SPT 0.50-0.95 m 0,0,0 N=0				From 0.5m, brown/pale brown mottled pale brown.	M	-	
			1	1.00								
				1.20	BH1_0.5-0.95			SP	SAND; fine to medium grained, pale brown.			ALLUVIUM
					BH1_1.4-1.5 ES 1.40-1.50 m SPT 1.50-1.95 m 1,1,2 N=3					M		
			2		BH1_1.5-1.95							
			3		BH1_2.9-3.0 ES 2.90-3.00 m SPT 3.00-3.45 m 0,0,1 N=1						VL	
					BH1_3.0-3.45							
			4									
					BH1_4.4-4.5 ES 4.40-4.50 m SPT 4.50-4.95 m 1,1,3 N=4							
			5		BH1_4.5-4.95							
			6		BH1_5.9-6.0 ES 5.90-6.00 m SPT 6.00-6.45 m 2,2,6 N=8					W		
				6.50								
				-4.30	BH1_6.0-6.45				From 6.5m, pale brown-grey.			
			7								L	
					BH1_7.4-7.5 ES 7.40-7.50 m SPT 7.50-7.95 m 1,2,2 N=4							
			8		BH1_7.5-7.95							
			9		BH1_8.9-9.0 ES 8.90-9.00 m							
			10	10.00								

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

EIA LIB 1.03.GLB | Log: IS AU BOREHOLE 3 E23054 BOREHOLE LOGS.GPJ <<DrawingFile>> 14/09/2016 16:35 8.30.004 Datgel Lab and In Situ Tool - DGD | Lib: EIA 1.03 2014-07-05 Prj: EIA 1.03 2014-07-05

BOREHOLE: BH1

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Contamination | Remediation | Geotechnical

Project	Proposed Mixed-Use Development	East	337616.2 m		
Location	Cross Street Carpark, Double Bay, NSW	North	6250124.3 m MGA94 Zone 56	Sheet	2 OF 4
Position	Refer to Figure 2	Surface RL	2.20 m AHD	Date Started	7/7/16
Job No.	E23054	Contractor	BG Drilling Pty Ltd	Date Completed	7/7/16
Client	Woollahra Municipal Council	Drill Rig	Hanjin DB8	Logged BY	Date: 7/7/16
		Inclination	-90°	Checked SK	Date: 14/9/16

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T	E		10	-7.80				SP	SAND; fine to medium grained, pale grey.			
					BH1_10.4-10.5 ES 10.40-10.50 m							
			11									
			12		BH1_11.9-12.0 ES 11.90-12.00 m SPT 12.00-12.45 m 7,4,5 N=9 BH1_12.0-12.45					W	L	
			13									
			14									
			15	14.95	BH1_14.9-15.0			-	SANDSTONE; fine to medium grained, pale grey, extremely weathered, extremely low strength Continued as Cored Borehole	-	-	WEATHERED ROCK
			16									
			17									
			18									
			19									
			20									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

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BOREHOLE: BH1

eiaustralia
Contamination | Remediation | Geotechnical

Project	Proposed Mixed-Use Development	East	337616.2 m		
Location	Cross Street Carpark, Double Bay, NSW	North	6250124.3 m MGA94 Zone 56	Sheet	3 OF 4
Position	Refer to Figure 2	Surface RL	2.20 m AHD	Date Started	7/7/16
Job No.	E23054	Contractor	BG Drilling Pty Ltd	Date Completed	7/7/16
Client	Woollahra Municipal Council	Drill Rig	Hanjin DB8	Logged BY	Date: 7/7/16
		Inclination	-90°	Checked SK	Date: 14/9/16

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				10							
				11							
				12							
				13							
				14							
				15			Continuation from non-cored borehole				
NMLC	70-80% RETURN	100	89 (92)		-12.80 / -12.86		SANDSTONE; fine to medium grained, bedding dipping 0-10°, <1-2mm thick, average spacing = <1-90mm, orange-brown/yellow -brown. From 15.06m, pale grey with dark grey laminations.	DW / FR		15.07: BP 0° PR RF CN 15.15-15.16: JT 0 - 10° IR RF Clay VNR 15.21-15.23: DS 20mm, Low Plasticity Clay 15.56-15.68: BPx2 5 - 10° PR RF CN 16.20: HB 16.41-16.70: BPx2 5 - 10° PR RF CN 17.04: JT 0° PR RF 2mm, Low Plasticity Clay 17.32-17.33: BP 10° PR RF CN 17.35-17.40: JT 70 - 80° IR VRF CN 17.72-17.76: JT 20 - 30° IR VRF CN 17.83: HB 17.97: DL 18.09: HB 18.48: BP 0° PR RF CN 18.59-18.60: JT 0 - 50° IR VRF CN 18.89: BP 0° PR VRF SN 19.18-19.25: DS 70mm, Extremely Weathered 19.19-19.20: JT 15° PR VRF Silt VNR 19.20-19.23: JT 0° PR VRF Silt VNR 19.60: BP 0° PR SM CN	
				16							
				17				DW			
		100	98 (97)	18	17.97 / -15.77		From 17.97-18.4m, fine to coarse grained, pale grey/yellow-brown.				
				19	19.05 / -16.85		From 19.05, fine to coarse grained, bedding dipping 0-10°, pale grey with dark grey laminations, <1-3mm thick, average spacing = <1-2mm.				
					19.42 / -17.22		SANDSTONE; fine to medium grained, bedding dipping 0-2°, grey with dark grey laminations, <1-2mm thick, average spacing = <1-10mm.	FR			
				20							

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BOREHOLE: BH1

eiaustralia
Contamination | Remediation | Geotechnical

Project	Proposed Mixed-Use Development	East	337616.2 m		
Location	Cross Street Carpark, Double Bay, NSW	North	6250124.3 m MGA94 Zone 56	Sheet	4 OF 4
Position	Refer to Figure 2	Surface RL	2.20 m AHD	Date Started	7/7/16
Job No.	E23054	Contractor	BG Drilling Pty Ltd	Date Completed	7/7/16
Client	Woollahra Municipal Council	Drill Rig	Hanjin DB8	Logged BY	Date: 7/7/16
		Inclination	-90°	Checked SK	Date: 14/9/16

Drilling						Field Material Description			Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	70-80% RETURN	100	98 (97)	20	20.10			FR			
					-17.90		SANDSTONE; fine to medium grained, bedding dipping 5-15°, pale grey with grey laminations, 1-4mm thick, average spacing = 1-15mm.			20.00-20.01: DS 10mm, Low Plasticity Clay	
					20.72						
					-18.52					20.72-20.73: DS 10mm, Low Plasticity Clay	
					20.93		SANDSTONE; fine to medium grained, bedding dipping 0-2°, grey with dark grey laminations, <1-2mm thick, avergae spacing = <1-10mm.			20.93: BP 0° PR RF CN	
				21	21.05						
					-18.85		SANDSTONE; fine to medium grained, bedding dipping 5-15°, pale grey with grey laminations, 1-4mm thick, average spacing = 1-15mm.				
							Hole Terminated at 21.05 m				
				22							
				23							
				24							
				25							
				26							
				27							
				28							
				29							
				30							

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CORE PHOTOGRAPH OF BOREHOLE: BH1

Project:	Proposed Mixed-Use Development	East:	337616.2 m	Depth Range:	15.00 m to 21.05 m
Location:	Cross Street Carpark, Double Bay, NSW	North:	6250124.3 m MGA94 Zone 56	Contractor:	BG Drilling Pty Ltd
Position:	Refer to Figure 2	Surface RL:	2.20 m AHD	Drill Rig:	Hanjin DB8
Job No. :	E23054	Inclination:	-90°	LOGGED: BY	DATE: 7/7/16
Client:	Woollahra Municipal Council	Box:	1 - 2 of 2	CHECKED: SK	DATE: 14/9/16
		Hole Depth:	21.05 m		



BOREHOLE: BH2

eiaustralia
Contamination | Remediation | Geotechnical

Project	Proposed Mixed-Use Development	East	337669.7 m		
Location	Cross Street Carpark, Double Bay, NSW	North	6250150.5 m MGA94 Zone 56	Sheet	1 OF 3
Position	Refer to Figure 2	Surface RL	3.00 m AHD	Date Started	6/7/16
Job No.	E23054	Contractor	BG Drilling Pty Ltd	Date Completed	6/7/16
Client	Woollahra Municipal Council	Drill Rig	Hanjin DB8	Logged BY	Date: 6/7/16
		Inclination	-90°	Checked SK	Date: 14/9/16

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
AD/T			0	3.00				-	FILL/TOPSOIL: Gravelly SAND; fine to medium grained, brown-grey with fine to medium, subangular to subrounded gravels and fines.	M	-	FILL/ TOPSOIL
				0.50								
				2.50	BH2_0.4-0.5 ES 0.40-0.50 m BH2_0.5-0.95			SP	SAND; fine to medium grained, brown-grey.			ALLUVIUM
			1							M		
					BH2_1.4-1.5 ES 1.40-1.50 m SPT 1.50-1.95 m 6,7,5 N=12 BH2_1.5-1.95							
	E		2								VL - L	
			3		BH2_2.9-3.0 ES 2.90-3.00 m SPT 3.00-3.45 m 0,0,1 N=1 BH2_3.0-3.45					W		
				4.00								
	F		4	-1.00				-	SANDSTONE; fine to medium grained, pale grey/orange-brown, extremely weathered, extremely low strength.	-	-	WEATHERED ROCK
				4.30					Continued as Cored Borehole			
			5									
			6									
			7									
			8									
			9									
			10									

This borehole log should be read in conjunction with EI Australia's accompanying standard notes.

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BOREHOLE: BH2

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Contamination | Remediation | Geotechnical

Project	Proposed Mixed-Use Development	East	337669.7 m		
Location	Cross Street Carpark, Double Bay, NSW	North	6250150.5 m MGA94 Zone 56	Sheet	2 OF 3
Position	Refer to Figure 2	Surface RL	3.00 m AHD	Date Started	6/7/16
Job No.	E23054	Contractor	BG Drilling Pty Ltd	Date Completed	6/7/16
Client	Woollahra Municipal Council	Drill Rig	Hanjin DB8	Logged BY	Date: 6/7/16
		Inclination	-90°	Checked SK	Date: 14/9/16

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
				0							
				1							
				2							
				3							
				4	4.30		Continuation from non-cored borehole				
NMLC	70-80% RETURN	100	95 (97)	5	-1.30		SANDSTONE; fine to medium grained, bedding dipping 0-20°, pale grey/grey/orange-brown, with brown/dark grey laminations, <1-3mm thick, average spacing = <1-5mm.	DW - SW		4.77: JT 5° PR RF Fe SN 4.88: HB 5.05-5.06: BP 15° PR RF CN 5.20: JT 0° PR RF VNR	
				6	5.45 -2.45		From 5.45m, bedding dipping 0-40°, pale grey with red/orange/pink laminations, <1-10mm thick, avergae spacing = <1-2mm.			5.39-5.40: BP 5° PR RF CN 6.17: JT 15° PR RF VNR	
				7	6.37 -3.37		From 6.37m, bedding dipping 0-30°, pale grey with grey laminations, <1-2mm thick, avergae spacing = 1-20mm.			6.48: BP 5° PR RF CN 6.48-6.65: DZ 170mm, Extremely Weathered 6.55-6.60: JT 60° PR VRF CN 6.64-6.65: DS 10mm, medium plasticity Sandy CLAY	
					7.27 -4.27		From 7.27m, bedding dipping 0-30°, pale grey with orange/red/brown laminations/mottling, <1-10mm thick, average spacing <1-15mm.			7.13: BP 0° PR VRF CN 7.28-7.33: DS 50mm, Extremely Weathered 7.33: DL 7.33-7.53: DZ 200mm, medium to high plasticity, brown Silty CLAY 7.54: BP 0° PR RF CN 7.72: BP 5° IR VRF CN 7.91-8.03: HBx3 8.08: BP 0° PR RF CN	
		100	72 (72)	8						8.25: JT 0° PR RF Clay VNR	
				9						8.60-8.61: JT 5° PR VRF CN 8.65-8.70: DS 50mm, Extremely Weathered 8.78-8.87: HBx2 9.05: BP 0° PR RF CN 9.23-9.28: JT 0 - 5° IR VRF CN 9.30-9.60: DZ 300mm, Extremely Weathered	
		100	100 (98)	10						9.70: DL	

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BOREHOLE: BH2

eiaustralia
Contamination | Remediation | Geotechnical

Project	Proposed Mixed-Use Development	East	337669.7 m		
Location	Cross Street Carpark, Double Bay, NSW	North	6250150.5 m MGA94 Zone 56	Sheet	3 OF 3
Position	Refer to Figure 2	Surface RL	3.00 m AHD	Date Started	6/7/16
Job No.	E23054	Contractor	BG Drilling Pty Ltd	Date Completed	6/7/16
Client	Woollahra Municipal Council	Drill Rig	Hanjin DB8	Logged BY	Date: 6/7/16
		Inclination	-90°	Checked SK	Date: 14/9/16

Drilling						Field Material Description				Defect Information	
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $Is_{(50)}$ MPa (EL 0.03, VL 0.1, L 0.3, M 1, H 3, VH 10, EH)	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm) (10, 30, 100, 300, 1000, 3000)
NMLC	70-80% RETURN	100	100 (98)	10			SANDSTONE; fine to medium grained, bedding dipping 0-20°, pale grey/grey/orange-brown, with brown/dark grey laminations, <1-3mm thick, average spacing = <1-5mm.	DW - SW		10.00: BP 0° PR RF CN 10.06-10.08: DS 20mm, Extremely Weathered	
				11						10.64-10.68: JT 0 - 10° CU RF <1-10mm, CLAY INFILL 11.05: HB	
				12						11.60: JT 0° PR RF CN 12.10: JT 0° PR RF CN	
					12.52 -9.52					12.52: DL	
		100	95 (94)	13			From 12.52m, bedding dipping 0-10°, pale grey with dark grey laminations, <1-2mm thick, average spacing <1-15mm.			13.09: JT 0° IR VRF CN 13.27-13.28: JT 0 - 10° IR VRF 0-4mm CLAY INFILL 13.36-13.38: JT 15° PR RF CN 13.50-13.51: DS 10mm, Low Plasticity Clay 13.56-13.59: DS 30mm, Low Plasticity Clay 13.70: BP 10° PR RF CN	
				14				FR		14.73-14.76: DS 30mm, Low Plasticity Clay 14.89-14.90: JT 10° PR CLOSED	
				15						15.19-15.50: BPx2 0° PR RF CN	
					15.63 -12.63					15.50-15.51: JT 15° PR RF CN 15.50-15.63: DZ 130mm	
		100	97 (97)	16			From 15.63m, bedding dipping 0-30°, pale grey with dark grey laminations, <1-2mm thick, average spacing 1-150mm.			15.58: DB 15.62: DL 15.77: BP 0° PR RF CN 15.93-15.96: DS 30mm, Extremely Weathered 16.00-16.01: DS 10mm, Extremely Weathered	
				17						16.62-17.19: HBx3	
				18							
					18.43 -15.43		Hole Terminated at 18.43 m			18.43: DL	
				19							
				20							

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CORE PHOTOGRAPH OF BOREHOLE: BH2

Project:	Proposed Mixed-Use Development	East:	337669.7 m	Depth Range:	4.30 m to 14.00 m
Location:	Cross Street Carpark, Double Bay, NSW	North:	6250150.5 m MGA94 Zone 56	Contractor:	BG Drilling Pty Ltd
Position:	Refer to Figure 2	Surface RL:	3.00 m AHD	Drill Rig:	Hanjin DB8
Job No. :	E23054	Inclination:	-90°	LOGGED: BY	DATE: 6/7/16
Client:	Woollahra Municipal Council	Box:	1-2 of 3	CHECKED: SK	DATE: 14/9/16
		Hole Depth:	18.43 m		



CORE PHOTOGRAPH OF BOREHOLE: BH2

Project:	Proposed Mixed-Use Development	East:	337669.7 m	Depth Range:	14.00 m to 18.43 m
Location:	Cross Street Carpark, Double Bay, NSW	North:	6250150.5 m MGA94 Zone 56	Contractor:	BG Drilling Pty Ltd
Position:	Refer to Figure 2	Surface RL:	3.00 m AHD	Drill Rig:	Hanjin DB8
Job No. :	E23054	Inclination:	-90°	LOGGED: BY	DATE: 6/7/16
Client:	Woollahra Municipal Council	Box:	3 of 3	CHECKED: SK	DATE: 14/9/16
		Hole Depth:	18.43 m		



Cross Street Carpark

1-13 Cross Street, Double Bay NSW 2028

Condition Report and Remediation Strategies with Costings

Issued to:

Woollahra Municipal Council

536 New South Head Road, Double Bay
NSW 2028

Prepared by:

Altus Group Consulting Pty Ltd

Report Reference.:

1-13 Cross Street, Double Bay - Conditions Report and Remediation Strategies V2.3 (NM).doc

Date:

31 January 2022

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Disclaimer

This report has been prepared to give a review of the subject property based on a review of the available documentation as listed in this report. Whilst all care and attention has been taken in preparing this report, Altus Group (AG) does not accept any contractual, tortuous or other form of liability for any consequences, loss or damage which may arise as a result of any other persons acting upon or using this report. This report is intended only for the addressee and may contain privileged or confidential information. Any unauthorized disclosure is strictly prohibited and any third parties should not rely upon the contents of this report.

Terms of Inspection

This report is not an all-encompassing and is based on a visual inspection only limited to those internal areas as approved that are fully accessible and visible to the inspectors on the date of inspection.

The inspector did not break apart, dismantle, remove or move objects including but not limited to, foliage, moldings, access on roof insulation/insulation, floor or wall coverings, sidings, ceilings, floors, furnishings, appliances or personal possessions.

The inspector cannot see inside walls, between floors, inside roofing, behind stored goods in cupboards, risers or other areas that are concealed or obstructed. The inspector did not dig, gouge, force or perform any other invasive procedures.

This report does not and cannot make comment upon: defects that may have been concealed: the assessment or detection of defects (including rising damp and leaks) which may be subject to the prevailing weather conditions; the presence or absence of timber pests, gas-fittings, common property areas, environmental concerns; health and safety issues; heritage concerns; security concerns; fire protection; site drainage; detection and identification of illegal building work; detection and identification of illegal plumbing work; durability of exposed finishes; document analysis; electrical installation; any matters that are solely regulated by statute; any area(s) or item(s) that could not be inspected by consultant.

1. Introduction

Altus Group (AG) was commissioned by the Client on 17 March 2021 to carry out a detailed review on the existing carpark located at 1 -13 Cross Street, Double Bay.

This report has been prepared for the benefit of the Client.

1.1 Assumptions

1. This Report has been prepared on the following assumptions:
    a. that all documents provided to us and reviewed by us were true and complete;
    b. that all information and documentation supplied to us or reviewed by us in connection with the preparation of this Report was and remains true and complete and is not misleading;
    c. that all opinions and views expressed by the appointed consultants, *contractors,* employees or agents are based on reasonable assumptions and all statements of fact by any of those persons are true and not misleading;
    d. we have not verified the accuracy of facts or the basis of opinions supplied to us. Where facts and opinions were supplied orally we have, as stated above, relied on this without documentary verification for the purposes of the Report;
    e. that Client will undertake its own due diligence reviews with respect to the following matters:
        i. legal;
        ii. insurance;
        iii. environmental;
        iv. planning;
        v. surveying and titling; and
        vi. Deed and Leasing Agreement
2. This Report is to be treated as confidential and must not be copied, provided to or relied on by any party other than the Client without the prior written consent of Altus Group.
3. The Report relies on the Consultant investigations and professional expertise.

1.2 Documentation

Preparation of this report was based on the existing documentation provided by Woollahra Municipal Council in Appendix H followed by on-site inspections consisting of Council and the specialist consultant team on at various times. The outcome of this has been documented by the consultant team in a report and included in the Appendices. An observation report is provided in Appendix G.

Please note the scope of inspections are limited to items witnessed during the site inspection and no intrusive investigations (unless noted otherwise) were carried out during the site walk. For some items if upgrade works are proposed than it is highly likely that the further removal of existing finishes, tap testing or intrusive investigations may be required.

2. Property Description

A summary of the subject property is as follows:

Address	Lot/DP	Building Classification^	Land Zoning
1 – 13 Cross Street, Double Bay	Lot 2 DP220530	Type A Construction - and is primarily a class 7a carpark with class 5 office components at part ground and part level 1.	The site is zoned as B2 – Local Centre

^ Information from the PCA

The existing main car parking building entry is located on Cross Street and in proximity to the New South Head Rd and Cross St Road intersection. An early childhood health centre is attached to this building on the south-eastern side and it does not form part of the scope of this report.

The building is a 5-storey split deck carpark which is wholly located within Lot 2 DP220530 and constructed around 1977-1978 and it is therefore 43 to 44 years old.

Based on specialist consultant reporting, significant structural and upgrade works would be required to extend the life of the carpark and to bring the building up to current building standards.

There are four levels of undercover parking plus one exposed roof top carpark. The pedestrian access to each building level is accessible from internal staircases, one lift and internal ramp for vehicles.

This report provides a detailed review based on existing as built documentation, specialist consultant investigations, testing and reporting and other key issues as summarised below:

- Current condition of existing carparking building structure and issues
- Current NCC (BCA) non-compliances as reviewed by the PCA and Consultants
- Proposed upgrade works to achieve NCC compliance
- Proposed upgrade works to improve the ongoing usage of the building and its safety
- Current structural, durability and building services investigations
- Proposed sustainability initiatives as part of the upgrade works
- A cost estimate (2 options) for the proposed upgrade is provided
- Proposed initial programme and staging options

3. Executive Summary

On behalf of Woollahra Municipal Council a condition report and remediation strategies with costings was prepared for the existing carpark at 1-13 Cross Street, Double Bay.

The report looked at the existing condition and remaining service life assessment of the carpark and was completed based on specialist consultant input and investigations. As advised by Taylor Thompson Whitting (TTW) the future expectancy of the carpark could potentially be extended however this would require significant major upgrade works to the building structure, facade, compliance upgrade, ongoing remediation, overloading provision for future vehicles and the implementation of an ongoing maintenance regime and monitoring of structure.

As reported by TTW in its remedial repair strategies dated 7 December 2021, a maximum 25 years for the future use expectancy of the carpark was discussed with Council. However, it is also anticipated that the ongoing remediation works to maintain the carpark over a 25-year period would be significantly costly and higher than a new carpark.

A summary of key upgrade works is provided under Section 4 including an initial estimated cost and programme under Section 5.

The consultant team and their investigations included:

- Altus Group – Initial Staging, Programme and Cost Advise
- BCA Logic – Private Certifying Authority Review
- Building and Construction Research and Consulting Pty Ltd (BCRC) – Durability Consultants
- Taylor Thomson Whitting (TTW) – Structural Engineer
- Floth – Building Services, Vertical Transport and ESD

The preparation of the report was also informed by existing documentation which was provided to the team during the investigations under Appendix H:

- Ashby Doyle – Existing Structural Assessment Report
- Douglas Partners - Geotechnical Report and Preliminary In-situ Waste Classification
- EI Australia – Acid Sulfate Soil Assessment and Management Plan, Geotech Assessment Report
- P.G. PAK-POY and Associates Pty Ltd – Existing Structural, Hydraulic and Mechanical Plans
- Denny Linker & Company – Existing Site Survey

The report is intended to provide Council with a detailed assessment of the existing carpark condition, remediation strategies, initial works staging, costing and programme options.

A summary of the key items and recommendations for Council consideration is provided in the next section and detailed further in the consultant reports.

4. Key Items

A summary of the Key Items for Council's consideration are noted as follows. For further details on each point and recommendations please refer to the individual reports under the Appendices.

Item	Commentary of Key Items
Private Certifying Authority (BCA Logic)	**Primary Items as Raised by the Specialist Consultant** - The current carpark does not meet the open deck provisions of BCA2019. It would need to be fully sprinkler protected in accordance with AS2118.1-2017. - The existing open deck carpark to the northern and eastern elevations of the carpark are non-compliant as they are less than 3m from the boundary. This would require a fire engineered solution which includes the use of a special screen treatment to address C3.2 and C3.4 of the BCA. - The upgrade of entire carpark exhaust system in accordance with AS1668.2-2012 including duct head height issues. - The existing fire hydrant system updated to a current AS2419.1-1982 standard system with the hydrants relocated into the fire isolated stairs at each level. - The upgrade of fire isolated and non-fire isolated stairways is necessary to meet compliances under AS1428.1-2009 including doors. - The existing fire hose reels are not compliant with AS2441-2005 and therefore a complete upgrade is required. - Upgrade of balustrade heights to be increased to D2.16 of the BCA2019 as they are currently at non-compliant heights. **Secondary Items as Raised by the Specialist Consultant** - The existing accessible car spaces are non-compliant and would need to be provisioned to the dimensions set-out in AS2890.6. - The existing toilet facilities to be upgraded to include an ambulant male and female WC as per AS1429.1-2009. - The existing pedestrian access upgraded to satisfy AS1428.1-2009 for wheelchair and disabled access. - Upgrade to existing exit signage and lighting to satisfy AS2293.1-2018. - Braille 'Exit' signage to be installed to the latch side of the fire doors leading into fire isolated stairs to D3.6 of BCA2019. - Fire rating of gaps between external precast panels including its fixings at northern elevation in accordance with C3.2 and C3.4 of the BCA.

Item	Commentary of Key Items
	Head Height Issues - Based on observation's the existing carparking headroom height is 2.0m high and non-compliant. - Under AS2890 Parking facilities - Off-street car parking this is required to be no less than 2.2m high. The implications of this are outlined below. - Existing clear head height = 5.08-2.38 = 2.7m. Less 700mm for beam = 2.0m clear head height - On the Ground Floor entry, (the area where accessible car spaces are to be located, the above head height non-compliance issues could be resolved during the lower ground floor rectifications works. In general terms, the existing bitumen surface would be removed and a new slab on ground provided with extra excavation. The additional excavation would provision for the required 2.2m clear height requirements provided no structural modification is required. The provision for this is included in the cost report.
Structural Services (TTW) & (BCRC)	**Primary Item as Raised by the Specialist Consultant** The existing split-deck carpark was built in 1977 - 1978 and is therefore 43-44 years old. Based on Council advice, observations and consultant input the carpark is requiring significant structural and NCC upgrade works to improve and extend the life of the building by another 25 or 40 years. This would also improve the overall safety of the building. **Urgent trial remediations to the T-beam edge cracking on Level 4 – 5 and spalling repair rectification works to the upper L5 carpark area is programmed to commence 4 February 2022.** Through this investigation period, specialist consultants BCRC were engaged by Council to undertake some invasive testing. The results from; - the invasive testing, reporting and recommendations by the specialist durability consultant (BCRC) are included in Appendix B. - the H-Pile testing reporting and recommendations by the specialist durability consultant (BCRC) are included in Appendix B. - Western wall precast panels and carbonation of concrete reporting and recommendation for remediation are provided by BCRC and TTW under Appendix B. **A list of identified building defects by the Structural Engineer:** - Complete blanking plate rectification which has corroded in all locations where it was exposed (refer drawing). - Joints in the topping slab were overgrown with moss and deteriorated. Localised patch repairs with grey sealant were

Item	Commentary of Key Items
	noted. - Water streaks and staining emanating from existing joints and from slab edges was noted throughout all levels. In many instances, algae growth was also visible. - Drip trays were installed along some of the joints possibly concealing some of the damage. - Cracks and spalls to concrete were mostly present at supports. These were marked green. - Exposed and corroding reinforcement was identified in several locations on the soffits, as well as on the walls. These were marked blue on the plans. - Existing penetrations in the slabs are marked on the plan as cyan circles. Majority of the pipework was severely corroded.
Mechanical Services (Floth)	**Primary Items as Raised by the Specialist Consultant** The mechanical ventilation system is non-operational and requires complete replacement. The following listed works but not limited to the list below are considered necessary for continued operation of the carpark: - The replacement of the entire existing car park supply, exhaust fans and associated attenuators with new monitoring sensors located throughout the car park level. - Provision of new smoke detector at the fan inlet side as per AS1668.2 Clause 5 to shut down the fan upon the detection of smoke in the supply air system. - Car park exhaust discharge to be extended further up to be more than 2m above the upper roof car park. - New weatherproofing and air tightening of the Carpark supply, exhaust air fan room. - The replacement of all the existing air filters at carpark supply air fan room with new. - New supply air fan, complete system and signage. - Installation of new energy efficient fan and attenuators. - The replacement of all existing carpark supply air fan control panel with new. - Acoustic impact of fan room to be assessed by a qualified acoustic engineer.
Electrical Services (Floth)	**Primary Items as Raised by the Specialist Consultant** - The following works are requiring attention for the continued use of the carpark. - Service protection device (SPD) to comply with AS3000. - Upgrade work to circuit boards to comply with AS3000 requirements.

Item	Commentary of Key Items
	- Malfunctioning light fittings and emergency exit lights need to be replaced. - LED pole lights in the roof carparking space may need to be adjusted to comply with AS 4282. - In certain areas, water dripping on the electrical fittings may lead to potential electrical hazards.
Hydraulic and Fire Services (Floth)	**Primary Items as Raised by the Specialist Consultant** - The hydraulic system requires major repair especially to the stormwater collection and disposal system. The pipework is substantially degraded and requires replacement. - The hydrant and hose reel system are operational however it does not comply with current statutory requirements. The system should be replaced to meet current codes and regulations. - The building does not have a sprinkler system. The BCA consultant has identified that a sprinkler system will be required because the carpark does not satisfy the requirements of an open deck carpark. - Floth have proposed new sprinkler system distribution mains proposed to run above the car bays at the split level (Along gridline C of existing drawings) and ranges then run between the precast beams. If this option is advanced than further investigation on the buildability of this would be required. - A typical preliminary sprinkler arrangement plan was prepared by Floth to cover the carparking levels and included under Appendix C.
Vertical Transportation Services (Floth)	**Primary Items as Raised by the Specialist Consultant** - The lift is found to be operating in a reasonable condition and it is expected to operate with the similar reliability for the next 12 months period with proper ongoing maintenance. - The performance of the existing lift is likely to decline as the equipment ages and it is recommended the full replacement of the lift should be considered. The cost for this is included. - The cost to install a complete new lift is provisioned in the cost estimate report. - A further detailed list of items requiring attention is listed in Appendix C

As described above the existing carpark building does not meet the NCC (BCA) requirements and even if the upgrade works were to be completed it will require a comprehensive fire engineered solution, a management procedure for disabled access and future structural overloading requirements which is very cost intensive and difficult to achieve. The installation of a new additional lift will result in a loss of approximately 20 car parking bays. As advised in the TTW structural reports the carpark building has significant structural issues e.g., spalling, corrosion cracking etc. which will be reoccurring in future and require costly ongoing maintenance. A regular monitoring and maintenance regime would need to be set-up for the proposed lifecycle. It is anticipated the above costs projected over a 25-year life expectancy would be major and exceed the cost of a new carpark. The carpark structure would require regular monitoring to minimise potential risks to its users.

5. Estimated Cost and Time

5.1 Estimated Cost Summary

The detailed cost estimate reports in Appendix D consider the items raised for upgrade and rectification based on Council and specialised consultant input.

The report provides the estimated construction costs and potential additional construction costs subject to further investigations and other invasive testing.

A summary of the costs for Council's consideration are noted as follows:

Item	Option 1 Full Shutdown of carpark (Ex GST)	Option 2 Staged Closure of carpark (Ex GST)
Construction Cost Estimate	23,434,100	23,434,100
Construction Contingency	2,343,410	2,343,410
Design Contingency	2,343,410	2,343,410
Escalation	EXCL	EXCL
Consultant Fees	2,343,410	2,343,410
Authority Fees	468,682	468,682
Staging Costs	EXCL	880,000
Anticipated Programme	35 months	39 months
Project Cost Total*	**$30,933,012**	**$31,813,012**

A detailed breakdown of the cost estimate report (Options 1 and 2) is provided under Appendix D – Cost Estimate Report.

*The above estimate excludes any ongoing carpark maintenance, structural monitoring, vehicle overloading capacity provision or remediation costs for a future 25-year life expectancy of the building. It is anticipated these costs would be significant and exceed the cost of a new carpark.

5.2 Indicative Overall Programme & Remediation Timeframes

The indicative programmes in Appendix F consider the items raised for upgrade and rectification requirements. The table below provided a breakdown of the overall programme for both options.

Option 1 – Full Shutdown

Indicative Overall Construction Staging and Programme breakdown for Option 1 – Full Shutdown.

Project Phase	Estimated Duration	Estimated No. of Carspaces available for use
Design/Approval/Procurement	15 months	396*
Construction	17 months	0
Construction Contingency	3 months	0
TOTAL	**35 months**	

Option 2 – Staged Closure

Indicative Overall Construction Staging and Programme breakdown for Option 2 – Staged Closure.

Project Phase	Estimated Duration	Estimated No. of Carspaces available for use
Design/Approval/Procurement	15 months	396*
Construction (Upper Floors)	15 months	228 – 232^
Construction (LG Floors/ Entrances)	6 months	0 – 228^
Construction Contingency	3 months	228 – 232^
TOTAL	**39 months**	

*Total no. of car bays are based quantities provided.

^ Carspaces are anticipated to be shut on a floor-by-floor basis during construction starting from the top floor and descending downwards floor by floor. This proposed methodology allows lower level carspaces to be operational whilst works to upper levels are completed.

During the construction stage, the number of carspaces available will vary depending on the staged approach to carrying out works to the floors and externally.

It is anticipated that the works on the LG Floors and Entrances will need the carpark to be closed in entirety while excavation and remedial works are undertaken for a period. It is anticipated that alternative traffic management may be possible to allow access. The works on upper GF would include interruptions to the carwash.

The programmes are without the inclusion of any allowance for major delays for such things as COVID-19 pandemic delays, latent conditions and the like.

Appendix A - PCA Review

BCA Logic

PCA Review - BCA Logic - 1-13 Cross Street Carpark, Double Bay NSW

From: Stuart Boyce [redacted]
Sent: Thursday, 6 May 2021 2:38 PM
To: Sagar Mansukh
Cc: Nick Marston
Subject: RE: Carpark Project - Double Bay

[External Sender: [redacted]

Sagar,

Further to your email this morning – refer below corrected email version.

Thanks for the As Built information.

I have now had a chance to review the documentation and the issues to be discussed at our meeting this afternoon include:

The base building has a rise in storeys of 4 thus is required to be f Type Construction– and is primarily a class 7a carpark with class 5 office components at part ground and part l el 1

Current BCA non-compliances when compared against BCA2019:

It is noted that if any substantial upgrade were proposed o the d elopmen – the following items would need to be addressed as part of the works. If no works are prop ed to he b lding - it can remain in its current form.

- All fire isolated stairs currently discharg i to the gro nd flo r portion and not direct to open space as per D1.7 of BCA2019 (Note if the bu ding we sprinkler p cted – the current discharge of fire stairs would be acceptable.
- The fire isolated stairs are not ovid with co rast stair nosings as per AS1428.1-2009.
- The non fire isolated stairs a acent to th lift are not provided with contrast stair nosings, Tactile ground surface indicators or complia handrails as er AS1428.1-2009.
- Ther current onsite hydrant sys m – whi t suitable coverage is achieved, the hydrants are not located inside the fire isolated stairs, the bo ter assembly would not comply with current stanadards and is infact an AS2419.1-1982 standard system. This hydrant system would need to be updated to a current AS2419.1-2005 standard system with the hydrants relocated into the fire isolated stairs at each level.
- The building along the northern and eastern elevatiosn contains openings in an external wall that are less than 3.0m to a side or rear boundary and have not been suitably protected in accordance with C3.2 and C3.4 of BCA2019. As such these openinsg need to be addressed in some way – one option could be the use of radiant heat attenuation screens as part of a possible Fire Engineering Assessment. The issue with this is that by addressing this protection of openings issue directly affects the Open Deck carpark provisions of the carpark.
- The carpark as currently constructed onsite would not achieve the open deck carpark provisions of BCA2019 that requires the below: It would appear that the eastern and western ends have been used as the “open” ends which is in accordance with the below definition fo being not less than 1/6th of the longer side. The openings – although not measured in detail could achieve compliance (by being open for at least 50%) from level 2 and above (at ground and level 1 the office component blocks the available open area). However with the treatment of the openings to the northern and eastern elevations to address C3.2 and C3.4 of the BCA the open deck carpark definition will not be met – thus the carpark would need to be fully sprinkler protected in accordance with AS2118.1-2017.

Open-deck carpark means a carpark in which all parts of the parking *storeys* are cross-ve unobstructed openings in not fewer than 2 opposite or approximately opposite sides, and—
(a) each side that provides ventilation is not less than $^1/_6$ of the area of any other side; and
(b) the openings are not less than ½ of the wall area of the side concerned.

- As the carpark is no longer deemed to be an open deck carpark a carpark exhaust system in accordabnce with AS1668.2-2012 would need to be installed throughout the carpark – maintaining compliant clear head heights beneath ductwork.
- The accessible carspaces have not been provided dimensioanlly as per AS2890.6 being a 2.4m wide carspace with a 2.4m wide shared zone between – as well as the fact that the clear head height over the accessible carspace is less than the required 2.5m.
- Currently there is a mixture of new and old "Exit" signs and there appears to be a lack of emergency lighting throughout the building. The exit and emergency lighting is to be upgraded to satisfy AS2293.1-2018 with a central test switch provided and the "running man" symbol to the exit signs.
- The current mechanical ductwork along the northern side of the carpark over the front of the carspaces is down as low as 1750mm that would not satisfy F3.1 of BCA2019 nor AS2890.6.
- Along the northern elevation, there are gaps between the external pre cast panels that need to be fire sealed in accordance with C3.2 and C3.4 – as well as the fact that these pre cast panel fixing points have not been fire rated. Such fixing points are to be fire sprayed to achieve a 60/60/60 FRL.
- The offence signage located on the fire stair doors needs to be relocated to be on the wall adjacent to the latchside of the doors entering the fire stairs at each level.
- The fire doors and frames leading into the fire stairs at each level are in many instances missing their fire door tags – such tags to be reinstated as per AS1905.1-2015 or if not the door leaf to be replaced with a -/60/30 fire door leaf.
- Braille "Exit" signage is to be installed on the wall adjacent to the latchside of the fire doors leading into the fire isolated stairs at each level as per D3.6 of BCA 019.
- Currently the balustrades are climbable – i.e. th have cl bable element located between 150-760mm above floor level – such climbable elements nee to b addre d so they are not deemed climbable as per D2.16 of BCA2019.
- The balustrades to the top of t fire iso ed stairs a evel are less than 1.0m in height thus need to be increased in height to satisfy D2.1 of BCA2 19.
- Some fire stair widths are less th m on cl r width - however with the low transient populations to the carpark, such slightly reduced widths wo ld be justifiable under a fire engineering assessment to retain as existing onsite.
- The fire hose reels existing ons e being ci ca 1978 hose reels would not satisfy AS2441-2005 thus require upgrading.
- The toilet facilities provided for onsite do not contain an ambulant male and ambulant female WC as per AS1429.1-2009 and the unisex accessible WC provided would also not be dimensionally compliant with AS1428.1-2009.
- The pedestrian access to the office component and carpark component would not satisfy AS14289.1-2009 for wheelchair and disabled access thus require upgarding to the access ramps as per AS1428.1-2009.

Just a few high level items for discussion this afternoon.

If you have any queries or require any further information, please do not hesitate to contact me.

Stuart Boyce | Director

d [redacted] **m** [redacted]

Appendix B - Structural Report

- 220128 - 211124 Cross St Carpark Remedial Strategies ltr. PC - R2
- BCRC- Condition assessment of Cross St Carpark, Double Bay_final
- Corrosion assessment of H piles - Cross St Carpark Double bay
- TTW H-Pile Construction Method
- TTW T-Beam Investigation PC

28 January 2022 211124 SAAA – R2

Altus Group
Level 12, 1 Market Street
Sydney NSW 2000

Attention: Sagar Mansukh

Email: [redacted]

CROSS STREET CARPARK, DOUBLE BAY

Remedial Repair Strategies

Dear Sagar,

Further to our joint Teams meeting with Council and BCRC on 17 November, and our phone call with you on 14 December 2021, we advise on the additional remedial repair strategies, for which Altus Group are preparing cost estimates. The future use expectancy for the carpark being discussed is a maximum of 25 years, with ongoing maintenance.

Western Wall Precast Panels

Issues

Carbonation of Concrete

BCRC's condition assessment report, dated 29 October 2021, assesses that the concrete carbonation front of the western wall panels as having reached 34% of the steel reinforcement. BCRC predicts that after a further 36 years all steel reinforcement will be within carbonated concrete, and therefore no longer protected against corrosion by the alkalinity of the concrete.

BCRC's report recommends cathodic protection (CP). However, given the access requirements for CP (high degree of breaking into concrete required) and very high cost, replacing panels or other means of treating and protecting the existing panels from ongoing carbonation may be more viable options.

NCC Requirements[1]

The western wall of the carpark is within 1.5m of the site boundary, i.e. within 1.5m of a *fire-source feature*. Assessing the carpark as a non-open-deck carpark[2] it is our understanding that the western wall precast panels (non-loadbearing), at this proximity to the boundary, require an FRL of not less than --/120/120

[1] TTW are not NCC/BCA consultants and therefore the information provided is our understanding of the NCC but should not be relied upon as statement of fact. If an NCC/BCA assessment is required, we recommend that you consult a BCA Consultant.

[2] To be open-deck all parts of the parking storeys would need to be cross-ventilated by permanent unobstructed openings in not fewer than two opposite sides. The precast panels to the western side prevent this and, in our opinion, the proximity of the building to the north may also limit cross-ventilation. If an NCC/BCA assessment is required, we recommend that you consult a BCA Consultant or Fire Engineering Consulting.

(integrity and insulation). If the carpark can be considered open-deck, or if a protective sprinkler system were installed, the external wall FRL requirement (non-loadbearing) would reduce to --/60/60.

In addition, concrete external wall panels that could collapse as a complete panel (e.g. precast concrete) must be designed so that in the event of a fire within the building the likelihood of outwards collapse is avoided. In the case of the carpark, this would require the steel brackets holding the panels to the concrete frame to be fire-protected to the same minimum level as the panels. Presently, the steel brackets holding the panels are not fire-protected.

Options and Solutions

Option 1 – Remove and Replace the Panels

From a buildability perspective, replacement of the western boundary precast panels is problematic. To remove the panels whole heavy lifting equipment would be required. However, the panels are along the boundary with other buildings and the site is effectively landlocked along the western side. Heavy lifting equipment would therefore need to stand in Cross Street (which impracticable because of how busy the road is), or be brought into the carpark building, which is unviable because the carpark would not support the loads and does not have the required height clearance.

Alternatively, a scaffold would need to be erected along the west elevation and the wall demolished in pieces into the carpark and removed. The west wall is very tight to the site boundary line – in places less than 1m – and therefore erecting a scaffold (without entering neighbouring land) is also impractical. Also, to remove the demolished wall pieces the carpark would likely need to be closed for a period.

Option 2 – Over-cladding the Panels

At our meeting over-cladding the panels was proposed by BCRC. The purpose of the over-cladding would be to capture future concrete spalling that may resulting from reinforcement corrosion and expansion.

- For costing purposed, for wall cladding that may last 25 years, allow for Colorbond metal cladding (such as Spandek) on galvanized steel top-hats. Assume that this well be required internally (between floors) and externally, to the full area of the wall. Allow for installation externally by workers working from a narrow, tube-fitting scaffold.
    - To install from a scaffold the metal cladding sheets will need to be lowered from the top, working between scaffold tie-backs to the building (scaffold tie-backs are typically required every 3 metres). Installation of final sheets, to close the gaps, will likely need to take place as the scaffold is struck, working from the top down.
    - Catch netting and overhead protective hoardings will be required to protect carpark users accessing and leaving the carpark, and to protect neighbouring properties.
- The wall will require a new Colorbond capping at its head, to exclude rainwater.
- The top deck of the carpark is not presently flashed to the wall panels, to prevent rain entering. We would recommend an upstand flashing from the top deck to the wall face, to reduce the amount or rainwater running between the internal cladding and wall face (however, this will not reduce smaller amounts of water entering at lower floors, where cars bring rainwater in).
- Soffit trim, capping off the underside of the cladding will be required to contain any spalled pieces concrete, and to protect carpark users and neighbouring property owners.
- Each metal bracket holding the precast panels to the carpark structure requires to be fire-protected (intumescent paint, for example). The cladding system must not interfere with the correct operation of the protection (expansion of intumescent paint under heat).

- Intumescent paint protecting brackets must be suitable for external use. For costing purposes assume the use of Nullifire SC902, to give 120 minutes fire protection to brackets.

The disadvantages of over-cladding are as follows:

- Over-cladding will not slow the rate of concrete carbonation and therefore reinforcement will still be susceptible to corrosion. The over-cladding acting as a rainscreen externally may reduce the moisture exposure of the panels, and thereby reinforcement corrosion, however condensation and humidity between the over-cladding and concrete panels may inadvertently reduce the water-excluding benefits of the rainscreen. Ventilation between the over-cladding and concrete panels should assist.

- The over-cladding will prevent future inspection of the concrete panels (without removing sections of cladding). Therefore, any future deterioration of the concrete panels may go unnoticed.

We would recommend reinspection by an engineer at 1 year after the installation of cladding (end of defects liability), and then every 5 years.

Option 3 – Concrete Patch Repair and Anti-carbonation Coating

As an alternative to over-cladding, we would propose localized concrete patch repair, where reinforcement has corroded, and overpainting the panels internally and externally with a high-performance anti-carbonation coating.

- For concrete patch repair costs purposed, assume excavation, square cutting edges and treatment of reinforcement with Fosroc Nitoprime Zincrich. Allow to prime repair area with Nitobond HAR primer, and concrete patch repair using Renderoc HB.

- For anti-carbonation coating, assume to use a two-part process, using hydrophobic impregnants as a primer and a highly elastomeric anti carbonation protective coating as a top coat, such as Fosroc Nitoprime DG hydrophobic impregnation followed by Dekguard Elastic film-forming protective coating.

- The wall will require a new Colorbond capping at its head, to exclude rainwater.

- The top deck of the carpark is not presently flashed to the wall panels, to prevent rain entering. We would recommend an upstand flashing from the top deck to the wall face, to reduce the amount or rainwater running between the internal cladding and wall face. This will not reduce smaller amounts of water entering at lower floors, where cars bring rainwater in.

- Each metal bracket holding the precast panels to the carpark structure requires to be fire-protected (intumescent paint, for example). The anti-carbonation coating must not interfere with the correct operation of the protection, i.e. expansion of intumescent paint under heat, and the intumescent paint must be suitable for external use. For costing purposes assume the use of Nullifire SC902, to give 120 minutes fire protection to brackets.

The advantages of using concrete patch repair and anti-carbonation coating are that the concrete can be inspected in future.

We would recommend reinspection at 1 year after protective coating (end of defects liability), and then every 5 years.

Overhead Protection Above Western Side Entrance and Pedestrian Laneway

Concerns have been raised regarding the possibility of spalled concrete pieces detaching and falling on pedestrians using the western side entrance, connecting to Transvaal Avenue, and pedestrian laneway

connecting Cross Street. In our opinion there should only be of concern if concrete to the outside faces of precast wall units is found to be drummy (loose), and this was not tested for by BCRC.

We would therefore recommend that remedial repair rope technicians tap-test the length of precast wall above these pedestrian areas[3] for drummy concrete. If drummy concrete is found a hazard reduction could be conducted, removing patches of drummy concrete so that pieces do not fall unintentionally – this being the normal hazard reduction treatment of concrete buildings where drummy concrete is found. Reinspection by remedial repair rope technicians should then be undertaken every two years, say, to detect and remove any further loose concrete.

If hazard reduction is undertaken, then we consider that overhead protective hoardings should not be required. However, if concern over the possibility of spalled and loose concrete persists, and hazard reduction is not done, overhead protective hoardings would require to be designed and installed to B Class standard – to a minimum strength of 10kPa – as per Council and SafeWork NSW Standards. This would include weather protection and lighting beneath the hoarding etc.

All three repair options above (Options 1, 2 or 3) would negate the need for hazard reductions or overhead protective hoardings once done.

Tap-testing and hazard reduction should only be undertaken by experienced remedial rope technicians, as the sound hollow core planks make may sound slightly drummy, because they are hollow. Typically, the sound that spalled concrete makes is slightly duller.

Repair or T-Beam Bearings

This section should be read in conjunction with our letter of report on concrete cracking at T-beams bearings, dated 15 October 2021.

Issues

T-beam ends have spalled, particularly where bearing lengths are short, along the central spine of the building (gridline C). The occurrence of spalling is worst at Level 5 (roof level) and it is therefore considered that rainwater penetrating has also played a part. Along gridline C, 81% of bearings at the Level 5 upper deck and 48% at the Level 5 lower deck have spalled.

High bearing stresses in precast T-beam construction are not uncommon and many carparks constructed in this way in the 1970s seem to have this design issue. From our inspection, there appears to be no imminent risk of a beam ends failing, however we have recommended further detailed inspection. To this end, Council has sought prices for trial repair of two bearings.

Additionally, to bearing soffits along gridline A (west elevation) and gridline E (east elevation) there is evidence that the T-beam top reinforcement is corroding at some beam end locations. Also, there are many locations where rainwater is likely entering, which may lead to corrosion of reinforcement. Again, in our opinion there is no imminent risk of a beam ends failing, although we do recommend further detailed inspection and repair treatment as necessary, to slow the deterioration.

If T beam ends are not treated (particularly to the underside bearing) their condition will deteriorate with time. Until concrete repair is undertaken, we would recommend annual inspection by a structural engineer, to monitor their condition, followed a full structural condition review and report at 3 to 5 years.

[3] Tap-testing could be extended to the wall lengths facing neighbouring properties if these too are concerned of concern.

Options for Repair

Access to repair T-beam ends is very restricted. Among options to increasing the bearing areas would be to pour flowable, non-shrink grout around the beam ends and trapezoidal sides, where beam ends sit in pockets (not all beam ends sit into pockets). Alternatively, structural steel brackets or beams could be used to augment the existing bearings.

Council has sought prices for trial repair of 2 bearings. We understand the cost for 2 bearings to be in the order of $11,000 plus GST. From our inspection we counted 55 bearings at Levels 5, 4, 3, and 2 that require repair. We would therefore recommend a budget of $300,000 plus GST for repairs at present numbers, plus 15% contingency.

At our inspection we counted 70 top-of beam locations that may require concrete repair. Refer to our report and appended plans dated 15 October 2021.

Reinspection

If T beam ends are not treated, we would recommend annual inspection by a structural engineer, to monitor their condition, followed a full structural condition review and report at 3 to 5 years. It is advised however that concrete repairs will be necessary at some point in time, and the costs for concrete repairs will increase with time.

Once concrete repairs have been undertaken, we would recommend reinspection at 1 year after repair (end of defects liability), and then every 5 years thereafter. However, to achieve 25 years ongoing services life for the carpark it is likely that ongoing maintenance and one or two further rounds of concrete repairs may be required – say at 10 years and 20 years from now – as carbonation and rain ingress deteriorates the concrete further, resulting in reinforcement corrosion and spalling. Electric vehicles (EVs) presently being manufactured weigh considerably more than a comparable petrol-powered vehicle. Whether this will change in the future, and batteries and car bodies be manufactured from lighter materials, is unknown. However, the present move towards EVs seems likely to increase the imposed load (floor action) for carparks. Presently, carparks are designed for light vehicles not exceeding 2,500kg, and several EV models manufactured presently weigh more than this. It may be that the imposed floor action loads for carparks will need to increased (and charging stations installed0 as the switch to EVs is made.

Repairing the T-beam end bearings at Level 5 could provide a further 20 years usable life to the carpark, however during this period it is likely that repair of further latent concrete defects and cracking will be required. In our opinion, the cracking to T-beam end bearings at Level 5 is so prevalent – resulting from (a) a short bearing length and (b) the ingress of water – that other similar cracking will manifest with time and will require repair.

New Wearing Surface for Slabs

BCRC has recommended applying a concrete topping to slabs, to repair abraded surfaces and to restore concrete cover to reinforcement. The issue with concrete toppings is that they have thickness between 10mm (minimum) and 50mm and would add load to the slabs. Also, thin concrete toppings of this thickness tend to crack and break-up with use, particularly under vehicle breaking and turning forces. Edge detailing around carpark barrier posts, concrete fin cleat fixings and at lift and stair thresholds etc. would be difficult and expensive to achieve. It would also likely lead to water palling at barrier post bases and cleat fixings, leading to corrosion of these items and their anchor bolts.

As an alternative, for costing purposes consider using Fosroc Cemtop HD30 (total DFT 2-4mm) or Sika MultiFlex PB-32UV (DFT 3-5mm) – note that some components of these systems have long lead times.

Fosroc Cemtop HD30

Fosroc Cemtop HD30 is mid grey in colour and produces a cementitious, waterproof, abrasion resistant, highly trafficable wearing surface. Being cementitious and mid grey it likely won't change the appearance of the existing surface by much. It doesn't claim to increase corrosion resistance over the reinforcement but being waterproof it likely does. The existing surface should be prepared and primed first with Nitoprime 330 (water-based styrene-acrylate copolymer emulsion). Cemtop HD30 gives P4 slipe resistance.

Sika MultiFlex PB-32UV

Sika MultiFlex PB-32UV is a hard-wearing, slip resistant polyurethane flooring system that is applied in 4 layers. It can be tinted and is suitable for carparks.

Expansion Joints

The carpark slabs have an expansion joint running east-west, mid-way along the carpark. These require redoing. For costing purposes assume Sika Floor Joint PB-30 PDRS, or similar.

Carpark Ramps

The carpark ramps have a rough tamped finish, for grip, and neither of the above systems would be suitable over these rougher surfaces. Scabbling and a new concrete topping at ramps will be required.

Ground Floor

At present the ground floor it is very uneven, eroded and patched in multiple places, presenting multiple trip hazards. A new tarmac pavement is recommended throughout ground floor.

Additional Items

The following dot-point items are copied from our email dated 6 May 2021, in case they are relevant for cost planning and/or refurbishment purposes. These dot-points are not covered above, in our other letters of report, and may not have been covered by other consultants.

Roofs

- All roof membranes have perished and require replacement.
- Existing membranes look to be Malthoid, which in 1976 contained Asbestos.

Barriers

- The retrofitted barriers would likely comply with AS1170.1 Structural design actions - Permanent, imposed and other actions.
- Original infills do not meet climbability compliance (NCC, vol. 1, AS1657 Fixed platforms, walkways, stairways and ladders – Design, construction and installation) or strength (AS1170.1 Structural design actions - Permanent, imposed and other actions; test for impact force of 30kN) and require replacement.
- Where cars can reverse in, sight indicators are required to be 1.3m high (AS2890 Parking facilities - Off-street car parking).
- Armco-type barriers are not compulsory however they would assist at ramps, etc.
- Wheel stops are not compulsory.

Pre-cast Concrete Wall units Opposite bottoms of Ramps

- The wall units and their fixings should be checked for impact loading (AS1170.1 Structural design actions - Permanent, imposed and other actions; impact force of 30kN), however we doubt that the fixings will meet this. Alternatively, new Armco-type barriers could be installed in front.

Sprinkler System

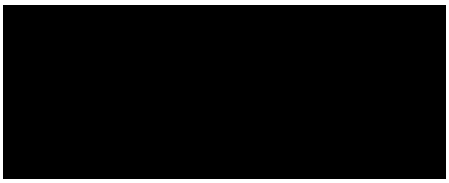
- It is not clear to us whether the carpark can be considered open-deck or not, and we recommend that a BCA Consultant advise.
- If not open-deck, a sprinkler system may be required throughout to meet BCA compliance. Moreover, the Planning and Assessment Act should trigger compliance requirements whenever any upgrade works are done.

Head Clearance

Currently the head clearance is noted at the entrance as 2.0m. AS2890, Parking facilities – Off-street car parking, requires not less than 2.2m. If the carpark is to be upgraded, we would recommend that a BCA Consultant advise.

We trust that the above and attached plans meet your present requirements. However, should you require anything further please contact the undersigned.

Yours faithfully,
TAYLOR THOMSON WHITTING (NSW) PTY LTD
in its capacity as trustee for the
TAYLOR THOMSON WHITTING NSW TRUST



PAUL CONNETT
Technical Director

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BCRC Durability Consultants

Building and Construction Research and Consulting Pty Ltd
ABN 91 116 565 265
Unit 7, 9-11 Chaplin Drive
Lane Cove West NSW 2066
Tel: +61 2 9131 8018
[redacted] | www.bcrc.com.au

REPORT TITLE:	**Cross St Double bay Carpark condition assessment**		
CLIENT:	Woollahra Municipal Council		
REPORT AUTHOR:	G. Ijaz	**REVIEWED:**	I.Khan
REPORT DATE:	29 October 2021	**FILE REF:**	BCRCN10222

EXECUTIVE SUMMARY

A condition and remaining service life assessment were required as concerns were raised by council and local residence, signs of distress such as corrosion including spalling were noted all over the structure. The building was constructed in the late 1970's and is over 40 years old.

BCRC undertook a detailed inspection including a visual survey, drummy testing, scanning works, half-cell potential testing as well as sampling for durability from all concrete elements. The following results were obtained from our investigation.

Similar defects were noted across the site, these include concrete spalls due at low cover location, failed movement joints, cracks and exposed reinforcement along the edges of the T beams. Water staining was observed across all levels of the carpark.

Based on a statistical analysis of carbonation depth and cover distribution, it was estimated that around 7.5% of the reinforcement in the beams currently lies in carbonated concrete and our modelling of future carbonation indicated that in another 50 years i.e. in year 2071, approximately 26 % of reinforcement would be in the carbonated concrete.

For the concrete columns, the carbonation front has reached 2% we predict this will be 12% in 50 years. For the soffits, it was estimated that around 1.2% now and approximately 7.4 % in 50 years. For the wing, the carbonation depth at all test locations was measured as 0 mm. For the precast walls as the cover to reinforcement was extremely low, the carbonation front has reached 34% the reinforcement. After 36 years our carbonation modelling predicts that by then all of reinforcement will be in the carbonated concrete.

For the soffit, columns and wings test location, the chloride levels are below the lower bound activation level at the depth of the reinforcement. The precast wall the diffusion of chlorides occurs from both the front and back face was well as through the voids running along the eight of the walls. The low cover along with the high carbonation depth and chloride ingress make the risk of corrosion these walls extremely high and it can be seen from the visual inspection that a number of locations have started to spall.

From a statistical probability analysis of potential test data collected, it could be seen that about 67% of the half-cell potential survey area had a 10% or less chance of active steel corrosion, and about 1% of the half-cell potential survey area had a 90% chance of active steel corrosion. This finding can reasonably be taken to be representative for the whole structure.

BCRC recommend that a combination of crack injection, patch repair, joint sealing are required to extend the low maintenance service life of the car park structure for a further 25+ years. All defects identified in the visual inspection presented in appendix A need to be repaired in accordance with the latest standards and guidelines.

Once the repairs have been completed, given the main cause of the corrosion noted across the structure is due to a combination of carbonation ingress, low concrete cover and moisture

	ingress. It is recommended that all exposed concrete members be painted with a high-quality anti-carbonation and waterproof coating. This will prevent further ingress of carbonation and chlorides as well as prevent further corrosion activity. The floor of the requires a abrasion resistant topping layer to be installed to restore the concrete cover to the reinforcement in the slab. For the precast wall, due to the voids running though the walls and the chloride levels we recommended these will need cathodic protection. Given the access requirement and current condition council may feel it is more reasonable to replace these walls.
KEY WORDS:	Carbonation, Chlorides, Corrosion, Concrete, Testing, Repair

REVISION SHEET

Revision Number	Description of Revision	Prepared By	Checked/ Reviewed By	Approved	Issued to Client
A	First Draft	G. Ijaz	I.Khan	I.Khan	27/10/32

Disclaimer:

This report and the results shown and the recommendations made herein are based upon the information, drawings, samples and tests referred to. BCRC, its consultants and agents accepts no liability for any damages, charges, costs or expenses in respect of or in relation to injury to or death of any person or damage to any property or of other loss whatsoever arising either directly or indirectly from the use of this report, the carrying out of any recommendations contained herein or the use of any goods or materials referred to.

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1. INTRODUCTION

BCRC were engaged by Altus Group to assess the condition of the public carpark located at 1 Cross St Double Bay. A condition and remaining service life assessment were required as concern were raised by council and local residence, signs of distress such as corrosion including spalling were noted all over the structure. The building was constructed in the late 1970's and is over 40 years old.

BCRC undertook a detailed inspection including a visual survey, drummy testing, scanning works, half-cell potential testing as well as sampling for durability from all concrete elements. All BCRC field investigations were carried out on 9th – 16th of September. The weather was clear on most days, on one of the day toward the end of our investigation it was raining which highlights the area where rain water was entering the building.

Figure 1 below shows the location of the investigated structure.

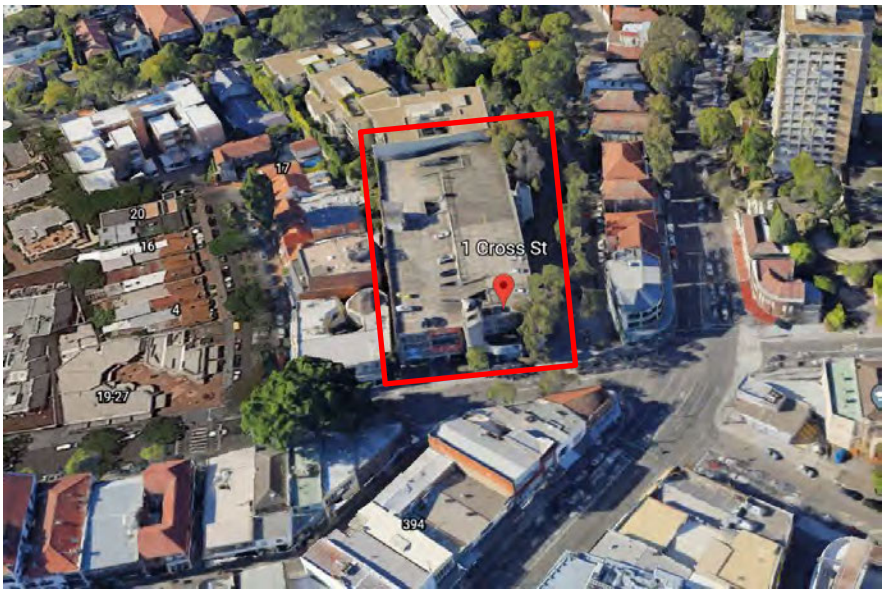


Figure 1: Aerial view of the carpark at 1 Cross St Double Bay

2. INVESTIGATION METHODOLOGY

2.1 VISUAL INSPECTION

BCRC undertook a detailed visual assessment of the beams, columns wings, walls and floor across all levels of the carpark. Drummy testing was also conducted around delaminated areas to evaluate and map the areas. The. The visual inspection of these members was undertaken to better locate the cores, identify areas of concern and assist in developing and detailed repair specification.

2.2 COVER SURVEY

A Proceq Live ground penetrating radar (GPR) was used to scan concrete surfaces to locate reinforcement and determine concrete cover depth. To calibrate GPR scans, some spot checks of cover depth were completed where cover was physically measured directly over the reinforcement exposed through coring.

GPR is an electromagnetic wave technique that measures the dielectric properties of different materials below the subsurface. The dielectric value and changes can be used to locate steel reinforcement within concrete. An example of the GPR output is provided in the image below.

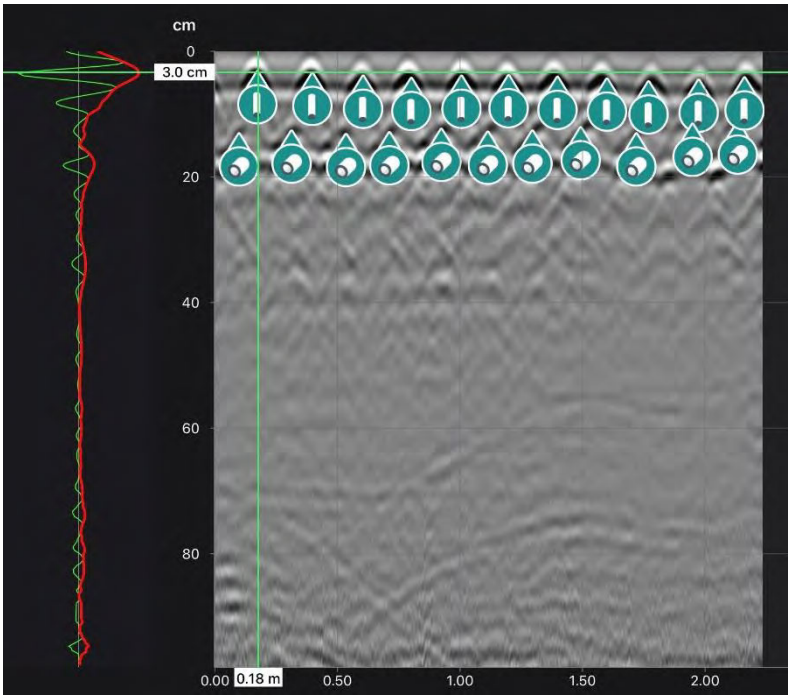


Figure 2: GPR image showing the location of the top and Bottom internal reinforcement

2.3 CEMENT CONTENT DETERMINATION

Cement content determination was performed on 17 core samples, one from each member at each level. Testing was undertaken at a NATA accredited laboratory. GP (Portland) cement content was determined in accordance with an in-house method developed by Watertest.

2.4 CHEMICAL TESTING

Concrete carbonation and chloride ingress content was assessed on core samples from the structure. The testing was completed at a NATA accredited test laboratory in accordance with the methods described below. Laboratory test results are provided in Appendix B.

2.4.1 Carbonation testing

Carbonation testing was performed on site by BCRC as well as by a NATA accredited material testing laboratory. BCRC sprayed a 0.1% phenolphthalein solution of the surface of the extracted cores. All of the extracted cores were also tested for carbonation by the laboratory which involves splitting sampled cores longitudinally using a hammer and bolster to expose a fresh fracture face and spraying that face with a 0.1% phenolphthalein solution. A colour change to red/purple indicates the boundary of un-carbonated concrete. Concrete that does not change colour is known to be carbonated. The mean depth to the colour change boundary was measured and reported as the depth of carbonation.

2.4.2 Chloride testing

Chloride ion ingress was determined by testing the remaining half of the core samples, typically by taking 3 or 4 slices at discrete depths according to AS 1012.20. The activation threshold at which mild steel reinforcement corrosion commences in un-carbonated GP cement concrete is conservatively taken as 0.4% chloride ions by weight of cement. In practice this corrosion threshold concentration has been found to range from 0.2 % to >1.0 % by wt. cement. This threshold is known to decrease as the alkalinity of concrete is reduced and can be as low as 0.1% by weight of cement or less in carbonated concrete.

2.5 HALF-CELL POTENTIAL AND LINEAR POLARIZATION SURVEY

BCRC used Corromap equipment, a rapid, non-destructive technique, to measuring the half-cell potentials (HCP) and corrosion rates on one test per floor, the test areas covered, beams columns, wings and walls.

The Corromap uses the galvanostatic pulse principle to establish the corrosion current and thereby the corrosion rate of reinforcing steel. The equipment works by inducing a short-duration anodic current pulse into the reinforcement galvanostatically from a counter electrode placed on the concrete surface together with a reference electrode. By utilising the ohmic resistance (electrical resistance), the DC polarisation resistance over time, and the applied current, the corrosion current can be estimated with the Stern Geary equation. Figure 3 shows the diagram of electrode and system connections.

To locate the reinforcement, a Proceq GPR Live was used to scan the concrete surfaces. Locating steel reinforcement enabled the reinforcement grid to be marked on the structure, and test points to be located appropriately. An electrical connection to the exposed steel reinforcements was made, which enables the checking of the electrical continuity of reinforcement and to the Corromap testing.

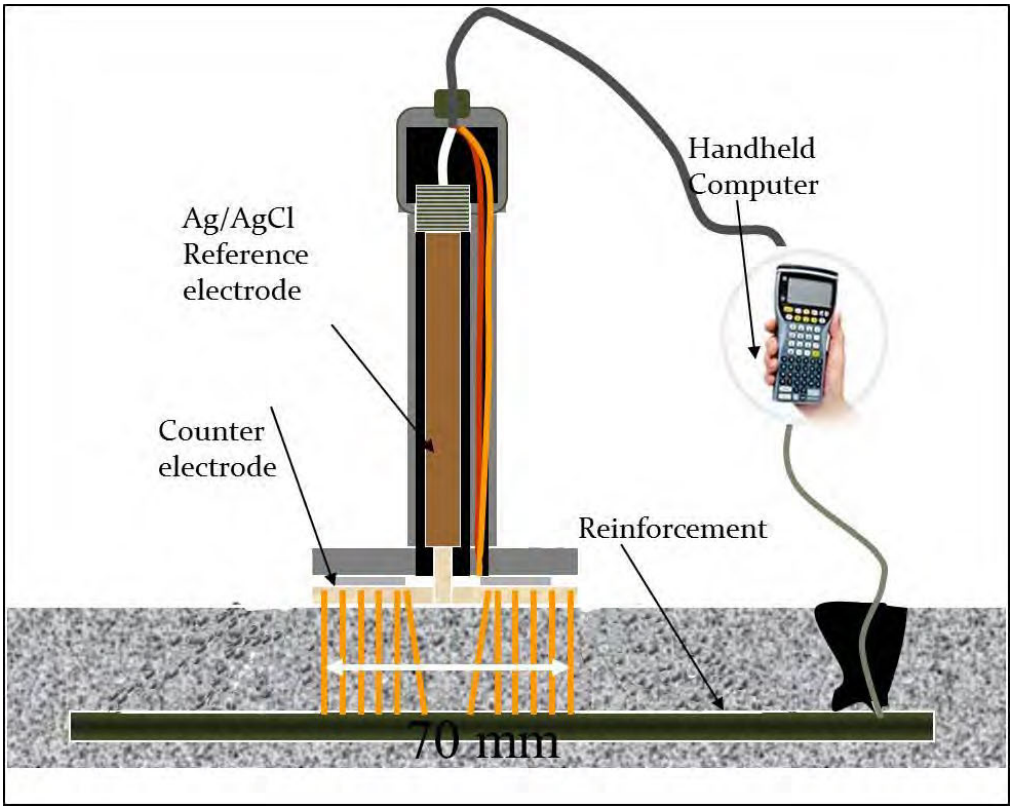


Figure 3: Electrode and system connections of Corromap equipment

2.5.1 Surface resistivity testing

Concrete resistivity measurements were performed using a Proceq Resipod that employs the Wenner 4-probe technique on the same face as the extracted core, in accordance with RILEM TC 154-EMC. Reinforcement was marked and avoided when performing the test to ensure the results were not affected.

2.5.2 Assessment of H piles

A detailed desktop top study of the geotechnical report, current standards, available drawings were used to assess to model the remaining life and predict section loss over time. BCRC also exposed the top of one H pile to measure the section loss. Due to the presence of ground water we were not able to visually assess the level of corrosion but we were able to use the measurement to confirm the rate of section loss.

The H pile assessment has been provided in a separate report , please refer to ‘N10222 -1 Corrosion assessment of H piles - Cross St Carpark Double bay’.

3. RESULTS

3.1 VISUAL INSPECTION

The full result from the visual inspection is provided in Appendix A. The type and location of the defects were similar and consistent throughout the structure, the figures show a few of the common types of defects we identified across the site. BCRC conducted a drummy survey around the defect to confirm the full extent of the spalling and delamination.



Low cover and spalling especially around edges



Low cover and small spalls along precast walls



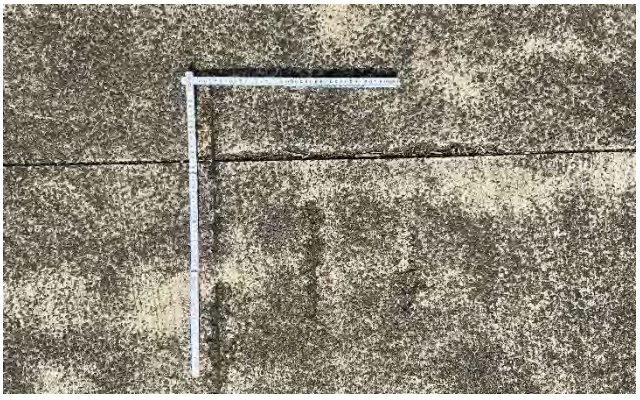
Cracking and spalling at edge of precast beams



Signs of water ingress and poor drainage across all floors



Low cover and edge spalls toward end of beams

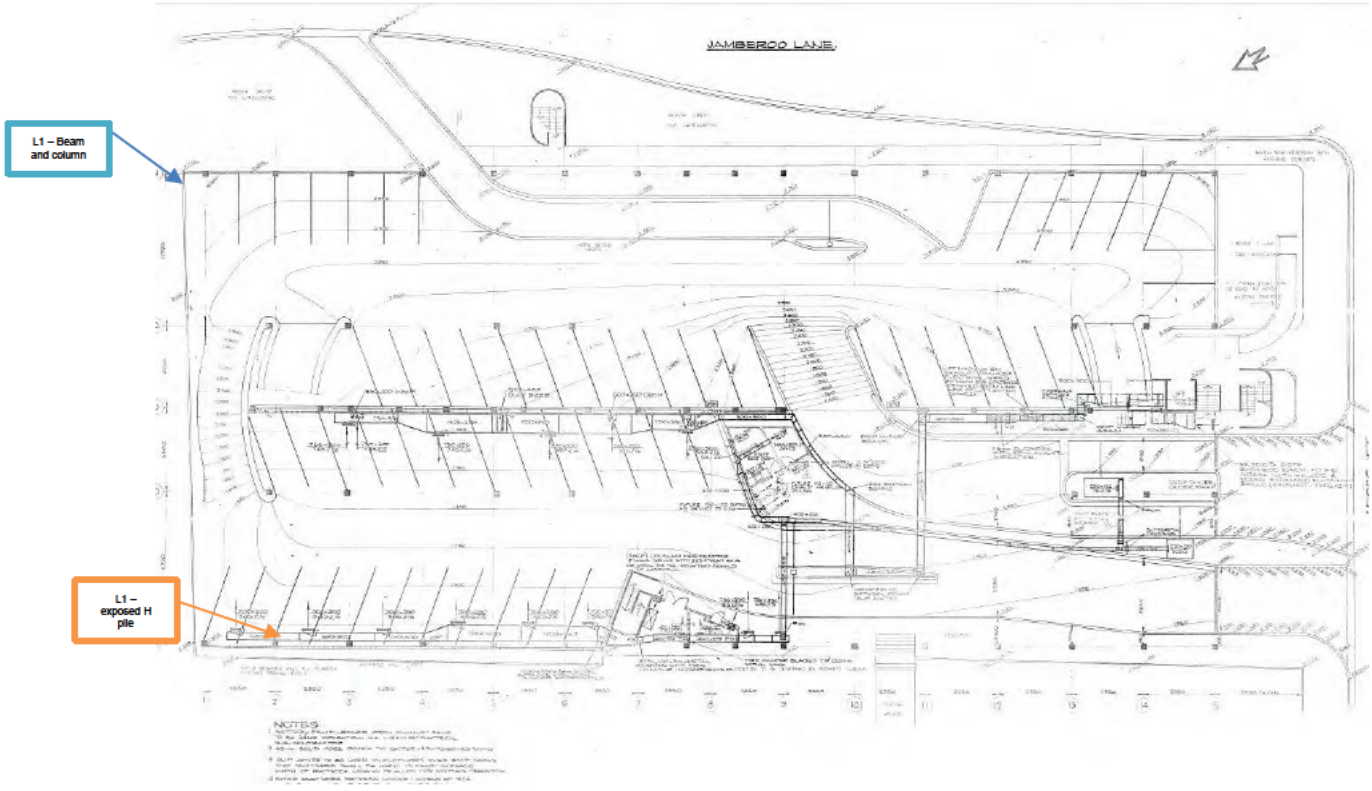


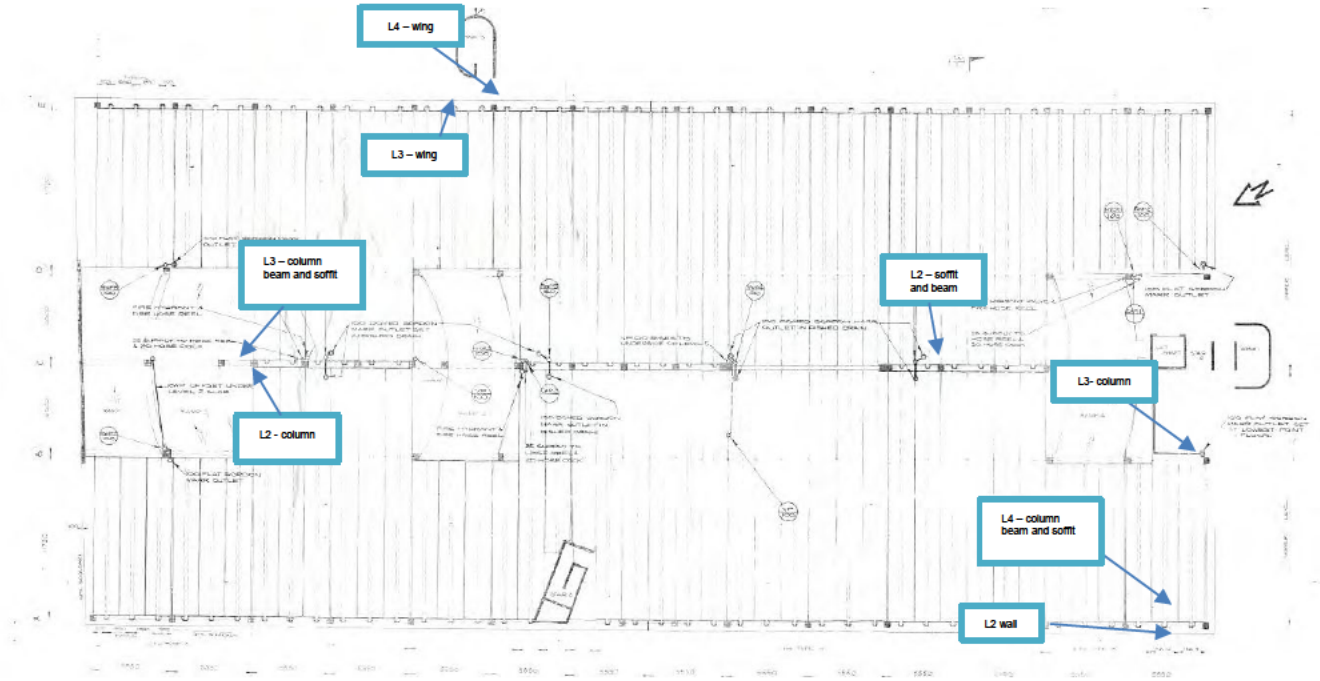
Low cover and abrasion of floor slabs

Figure 4: Approximate core locations

3.2 TEST LOCATIONS

Figure 5 shows the approximate coring locations at all floor levels. At each test area a core was taken from a beam and column, depending on the location a core was also taken from the soffit of the prestressed beam, the wing or the precast wall. Cores locations were selected to try and cover all exposure zones and spread out as much as possible. All cores were taken in sound locations, with a few taken adjacent to spalled concrete





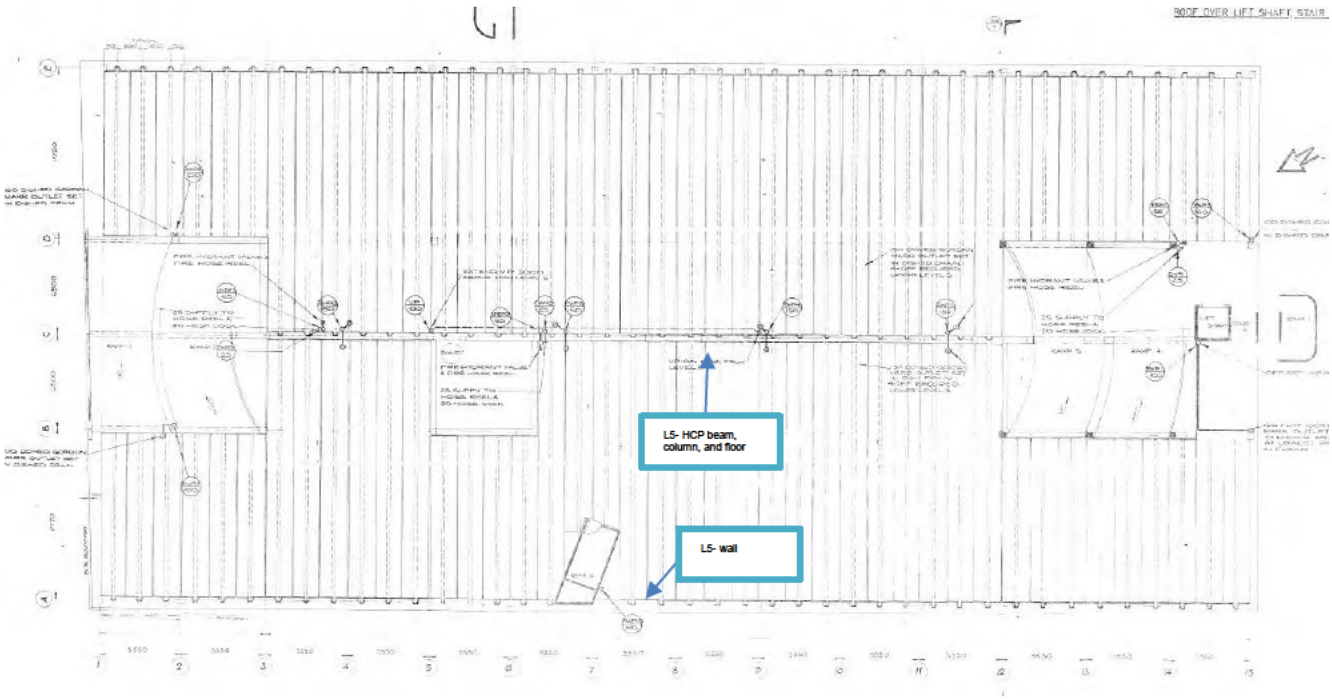


Figure 5: Approximate core locations

3.3 COVER DATA

Cover surveys were conducted using GPR. The dielectric constant for the concrete in GPR imaging was calibrated using the physical cover depth measurements from coring.

Table 1 gives the average cover, minimum and maximum cover and the lower 95% confidence interval concrete cover result. The confidence limit, hereby referred to as the 'characteristic cover' was calculated by statistical analysis based on the distribution type and level of skewness of the data. The value represents the cover depth at which 95% of reinforcing bars from the population assessed have equal or greater cover. In certain cases where the characteristic cover calculated was unrealistically low, we adjusted the statistical data used to determine the characteristic value using our engineering judgement and mathematical knowledge.

Table 1: Top cover survey results

Level	Test location	Mean cover (mm)	Minimum cover (mm)	Maximum cover (mm)	Characteristic cover (mm)
1	Column	66	62	70	62
	Beam	50	46	55	46
2	Column	60	45	76	45
	Beam	48	33	63	33
	Wall	8	7	9	7
	Soffit	33	10	52	15
3	Column	58	45	73	45
	Beam	44	28	70	28
	Wing	30	28	33	28
	Soffit	33	29	38	29
4	Column	65	58	70	58
	Beam	42	37	44	38
	Wall	30	28	32	28
	Soffit	41	32	49	32
5	Column	77	60	95	60
	Beam	54	30	78	31

	Floor	66	50	74	52
	wall	9	7	11	7

3.4 CONCRETE SAMPLING

A total of 38 cores were taken, 17 for chloride, carbonation and cement testing and 16 over reo to visually assess the condition of the bar and calibrate the GPR data . A summary of core properties is presented in Table 2. Figure 6 displays photos of the cores showing aggregate type and void ratio.

Table 2: Summary of core properties

Level	Test location	Voids	Aggregate type	Tests performed
Level 1	Column	0.5%	Breccia	Cl^- profile, cement & carbonation
	Beam	0.5%	Breccia	Cl- profile, cement & carbonation
Level 2	Column	0.5%	Breccia	Cl- profile, cement & carbonation
	Beam	0.5%	Breccia	Cl- profile, cement & carbonation
	Wall	0.5%	River gravel	Cl- profile, cement & carbonation
	Soffit	0.5%	Breccia	Cl- profile, cement & carbonation
Level 3	Column	0.5%	Breccia	Cl- profile, cement & carbonation
	Beam	0.5%	Breccia	Cl- profile, cement & carbonation
	Wing	0.5%	River gravel	Cl- profile, cement & carbonation
	Soffit	0.5%	Breccia	Cl- profile, cement & carbonation
Level 4	Column	0.5%	Breccia	Cl- profile, cement & carbonation
	Beam	0.5%	Breccia	Cl- profile, cement & carbonation
	Wing	0.5%	River gravel	Cl- profile, cement & carbonation
	Soffit	0.5%	Breccia	Cl- profile, cement & carbonation
Level 5	Column	0.5%	Breccia	Cl- profile, cement & carbonation
	Beam	0.5%	Breccia	Cl- profile, cement & carbonation
	Floor	0.5%	Breccia	Cl- profile, cement & carbonation
	wall	0.5%	River gravel	Cl- profile, cement & carbonation



Figure 6: Photos of core samples

3.5 VISUAL ASSESSMENT OF REINFORCEMENT

As mentioned above, BCRC took cores over reinforcement at all test location, this was to physically measure the cover in order to calibrate the GPR data as well as to visually inspect the steel reinforcement. The photos below show the condition of the reinforcement. The reinforcement in most the location was found to be sound with no section loss. At some of the locations surface corrosion can be seen on the bars which suggest corrosion initiation as occurred at these locations.

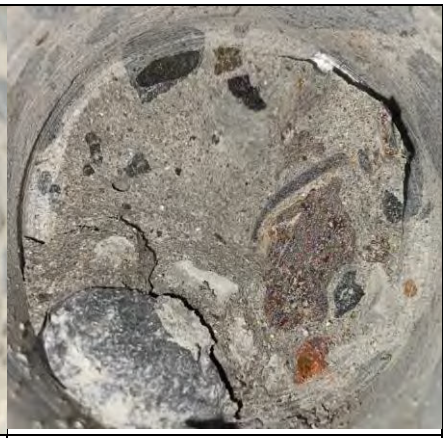
		
Level 1 – columns ties	Level 1 – beam horizontal bar	Level1 beam vertical bar
		
Level 2 – Wall strands	Level 2 – column vertical bar	Level 2 – prestressed beam soffit
		
Level 2 – column ties	Level 3- wing	Level 3 – vertical bars
		
Level 3 – column vertical ties	Level 4 - column ties	Level 4- soffit



Figure 7: Photos of exposed reinforcement

3.6 CEMENT CONTENT

Cement content was measured on 16 core samples at a NATA-accredited material testing laboratory (Watertest) using an in-house method developed by Watertest. The results of cement content testing are summarised in Table 3.

Table 3: Cement content of concrete

level	Test location	Cement content (%)	GP Cement content (kg/m^3)	Average cement content (kg/m^3)
Level 1	Column	18.9	444	450
	Beam	19.4	456	
Level 2	Column	16.4	385	447
	Beam	16	376	
	Wall	22	517	
	Soffit	21.6	508	
Level 3	Column	16.6	390	433
	Beam	15.2	357	
	Soffit	20.8	489	
	Wing	21.1	496	
Level 4	Column	17.5	411	415
	Beam	15	353	
	Soffit	20.9	491	
	Wing	17.2	404	
	Beam	15.2	357	379

Level 5	Column	14.9	350	
	Floor	16.7	392	
	Wall	17.7	416	

3.7 RESULTS OF CHEMICAL TESTING

The results of carbonation depth and chloride profile are discussed in separate subsections below and then evaluated in light of the observed cover results to give an indication of the remaining service life of the structure.

3.7.1 Carbonation depth

Carbonation depth testing was carried out according to the procedure described in Section 2.4.1. Phenolphthalein testing results for cores are summarised in Table 4.

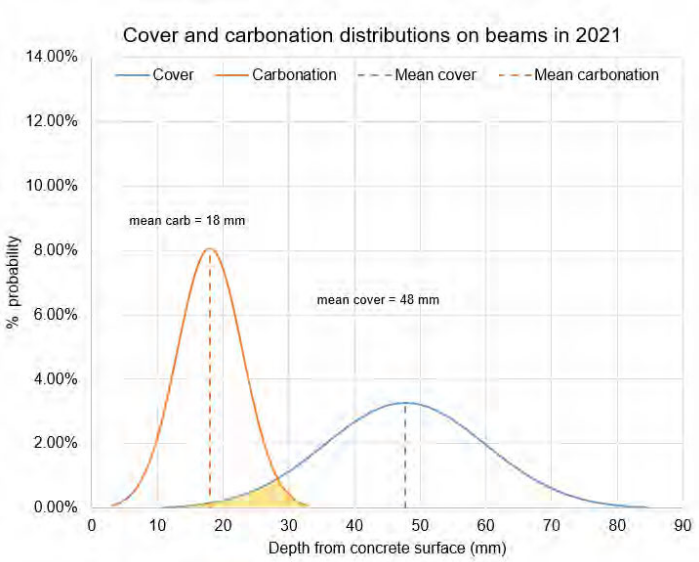
Table 4: Carbonation test results summary

Level	Test location	Carbonation depth (mm) durability cores	Carbonation depth (mm) Over reo cores	Minimum cover (mm)	Characteristic cover (mm)
Level 1	Column	15		62	62
	Beam	20	8	46	46
Level 2	Column	30	30	45	45
	Beam	25	18	33	33
	Wall	7	5	7	7
	Soffit	0	0	10	15
Level 3	Column	25	24	45	45
	Beam	25	18	28	28
	Soffit	7	0	29	29
	Wing	0	0	28	28
Level 4	Column	20	17	58	58
	Beam	18		37	38
	Soffit	14	0	32	32
	Wing	0	0	28	28
Level 5	Beam	15	15	30	31
	Column	10	10	60	60
	Floor	0	10	50	52
	Wall	0		7	7

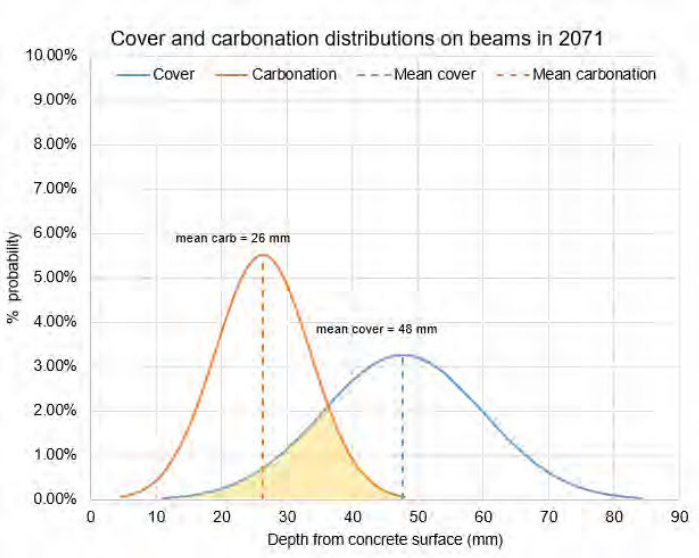
It can be seen from Table 4 that in the test location that all tested elements except the wings have some level of carbonation ingress. A statistical analysis of carbonation depth and cover distribution has been performed for the combined test locations for each type of member.

Figure 8 shows the results of statistical analysis of carbonation depth and cover distribution for all members. From the statistical analysis, it can be estimated that at the time of investigation in 2021, the carbonation front has reached a certain percentage of the steel reinforcement in the tested area. After a further 50 years our carbonation modelling predicts that by then what percentage of reinforcement lies in carbonated concrete.

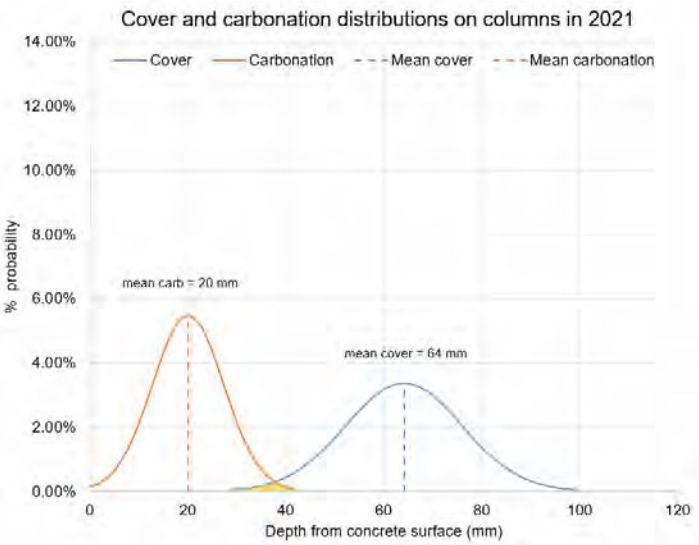
For the precast walls as the cover to reinforcement was extremely low, the carbonation front has reached 34% the reinforcement. After 36 years our carbonation modelling predicts that by then all of reinforcement will be in the carbonated concrete.



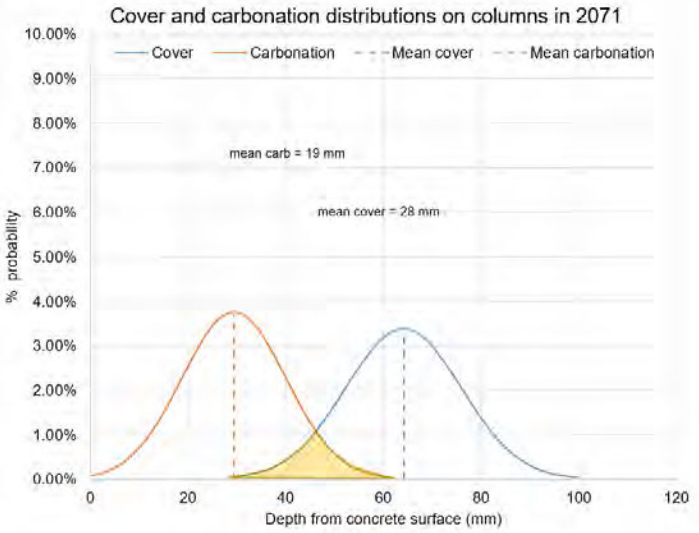
Currently carbonation front has reached 7.5% of the steel reinforcement



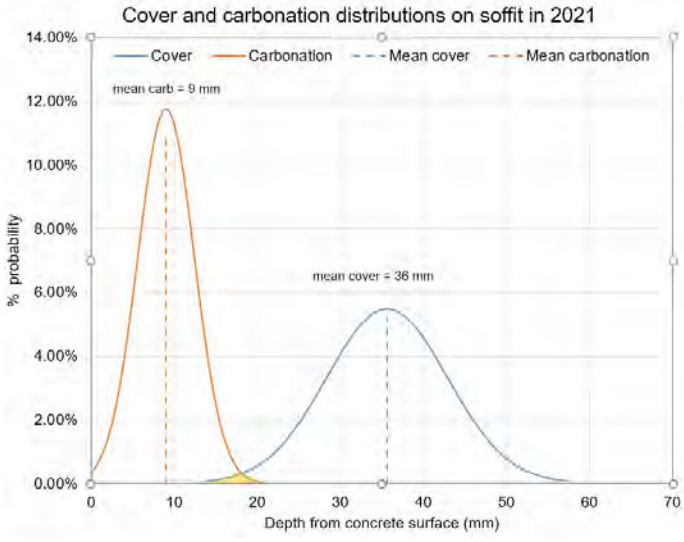
In 50 years, carbonation front will reach 26% of the reinforcement

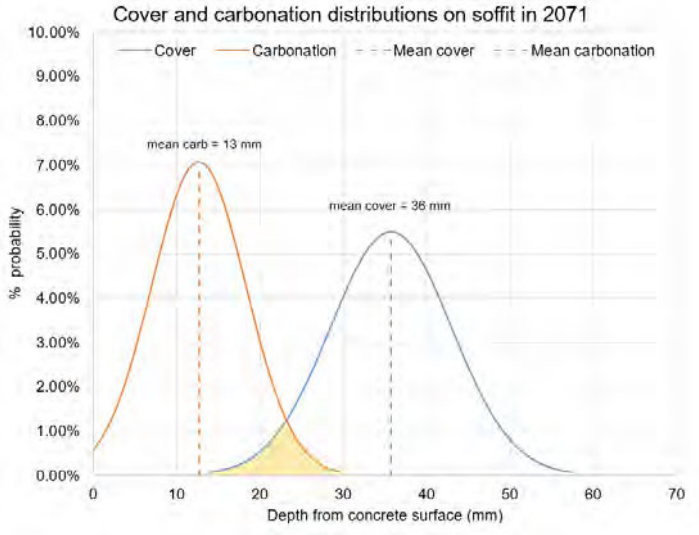


Currently carbonation front has reached 2% of the steel reinforcement



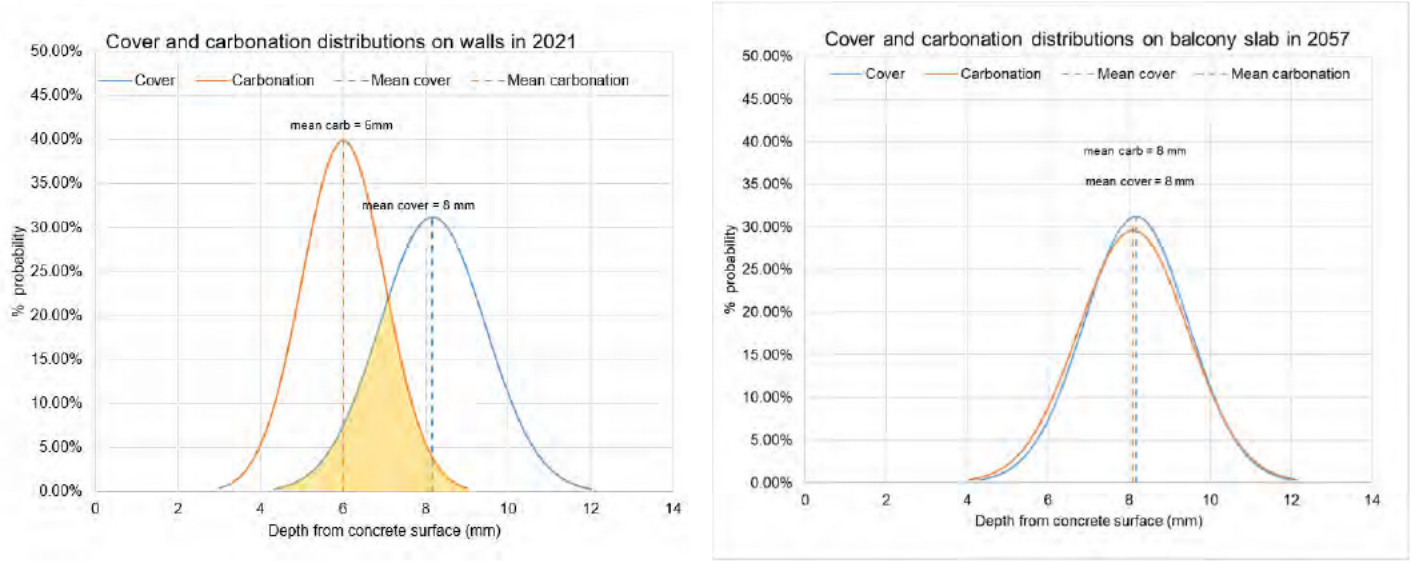
In 50 years, carbonation front will reach 12% of the reinforcement





Currently carbonation front has reached 1.2% of the steel reinforcement

In 50 years, carbonation front will reach 7.4% of the reinforcement



Currently carbonation front has reached 34% of the steel reinforcement

In 36 years, the carbonation front will reach 100% of the reinforcement

Figure 8: Cover and carbonation distributions at time of investigation (in 2021) and in 50 years later (in 2071)

3.7.2 Chloride ion ingress

The concentration of chloride ions in each core sample was determined at 4 depth slices by a NATA-accredited material test laboratory (Watertest) according to AS 1012.20. The laboratory test report is presented in Appendix B. Results are presented in terms of percentage by mass of concrete (as reported by Watertest). The cement content of the concrete was used to calculate the percentage concentration by mass of cement for all the samples.

As explained earlier, the commonly accepted initiation threshold for chloride induced corrosion is 0.4% by mass of cement. While this value is conservative, it is used to ensure that the risk of corrosion is unlikely. However, in the literature, it is reported that the actual threshold value at which corrosion commences can be both higher and lower depending on a wide range of local factors.

The chloride levels of all the samples are presented in Table 5. In accordance with Fib Bulletin 34 – Model Code for Service Life Design (2006), the lower bound activation level is 0.20 wt.-%/cement, and the mean activation level is 0.60 wt.-%/cement.

Table 5: Chloride test results summary

Columns				Beams			
Test location	Depth slice from top surface (mm)	Chloride concentration by mass of concrete (%)	Chloride concentration by mass of cement (%)	Test location	Depth slice from top surface (mm)	Chloride concentration by mass of concrete (%)	Chloride concentration by mass of cement (%)
Level 1	5-15	0.027	0.143	Level 1	5-15	0.053	0.27295
	15-25	0.024	0.127		15-25	0.027	0.13905
	35-45	0.019	0.101		35-45	0.011	0.05665
	55-65	0.016	0.085		55-65	0.013	0.06695
Level 2	5-15	0.056	0.342	Level 2	5-15	0.021	0.131
	15-25	0.037	0.226		15-25	0.025	0.165
	35-45	0.071	0.433		35-45	0.02	0.133
	55-65	0.014	0.085		55-65	0.02	0.132
Level 3	5-15	0.022	0.132	Level 3	5-15	0.017	0.11186
	15-25	0.017	0.102		15-25	0.04	0.2632

	35-45	0.018	0.108
	55-65	0.018	0.108
Level 4	5-15	0.022	0.125
	15-25	0.016	0.091
	35-45	0.015	0.086
	55-65	0.019	0.108
Level 5	5-15	0.049	0.328
	15-25	0.032	0.214
	35-45	0.023	0.154
	55-65	0.017	0.114

	35-45	0.02	0.1316
	55-65	0.015	0.0987
Level 4	5-15	0.091	0.60606
	15-25	0.023	0.15318
	35-45	0.017	0.11322
	55-65	0.019	0.12654
Level 5	5-15	0.046	0.30268
	15-25	0.031	0.20398
	35-45	0.017	0.11186
	55-65	0.016	0.10528

Soffit/floor			
Test location	Depth slice from top surface (mm)	Chloride concentration by mass of concrete (%)	Chloride concentration by mass of cement (%)
Level 2	5-15	0.001	0.00
	15-25	0.004	0.02
	35-45	0.001	0.00
	55-65	0.001	0.00
Level 3	5-15	0.003	0.01
	15-25	0.001	0.00
	35-45	0.003	0.02
	55-65	0.003	0.02
Level 4	5-15	0.004	0.02
	15-25	0.003	0.02
	35-45	0.002	0.01
	55-65	0.002	0.01
Level 5	5-15	0.038	0.23
	15-25	0.022	0.13
	35-45	0.015	0.09
	55-65	0.016	0.10

Wings and walls			
Test location	Depth slice from top surface (mm)	Chloride concentration by mass of concrete (%)	Chloride concentration by mass of cement (%)
Level 2	5-15	0.056	0.252
	15-25	0.037	0.167
	35-45	0.071	0.320
	55-65	0.014	0.063
Level 3	5-15	0.0119	0.056
	15-25	0.005	0.024
	35-45	0.001	0.005
	55-65	0.02	0.095
Level 4	5-15	0.028	0.162
	15-25	0.014	0.081
	35-45	0.006	0.035
	55-65	0.023	0.133
Level 5	5-15	0.001	0.006
	15-25	0.006	0.034
	35-45	0.039	0.218
	55-65	0.03	0.168

Chloride ion distribution profiles modelled based on Fick's second law of diffusion for all the samples from the carpark are presented in Figure 10. It can be seen that the chloride concentration at the 5% characteristic cover depth is below the lower bound chloride corrosion threshold limit for all types of members except the precast walls indicating there is a low level of risk that corrosion initiation due to chloride ions ingress.

For the precast wall the diffusion of chlorides occurs from both the front and back face as well as through the voids running along the height of the walls. The low cover along with the high carbonation depth and chloride ingress make the risk of corrosion in these walls extremely high and it can be seen from the visual inspection that a number of locations have started to spall.

For the soffit test location, the chloride levels are very low, as the cores were taken from mostly sheltered and dry locations. The graphs show little to no chloride ingress which mean the risk of carrion due to chlorides is low for the soffit.

For the columns and the beams, the graphs show some diffusion of chlorides, however the concrete cover for these locations is quite high which mean the risk of corrosion due to chloride ingress is low for these members.

For the precast wings, diffusion can be seen to occur from both faces, however the chloride level are below the lower bound activation level which mean the risk of chloride induced corrosion is low.

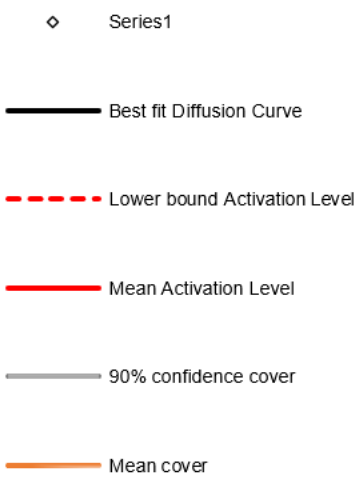
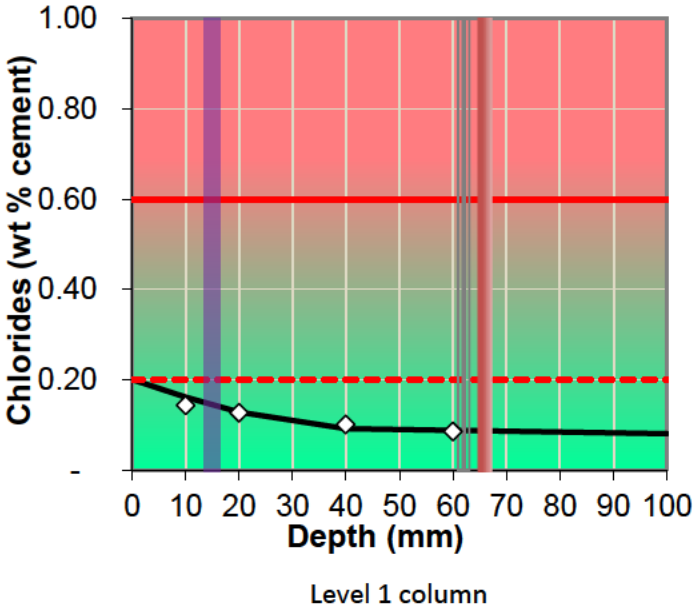


Figure 9: Legend for graphs below



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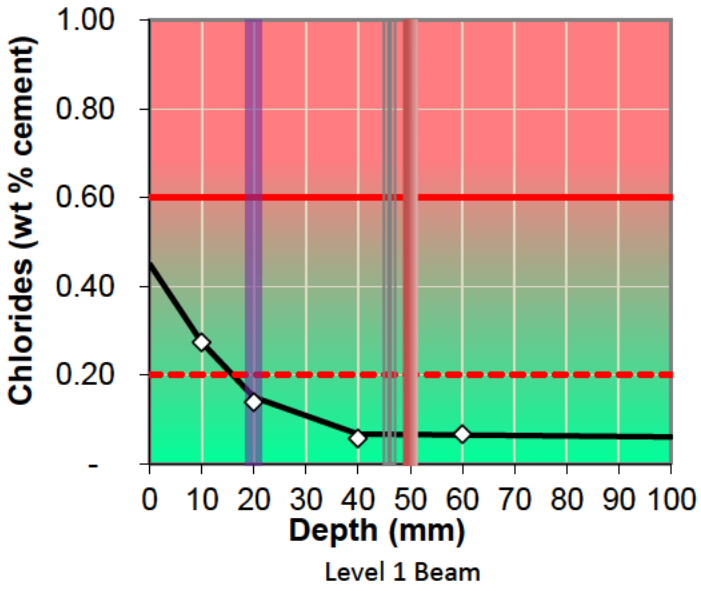
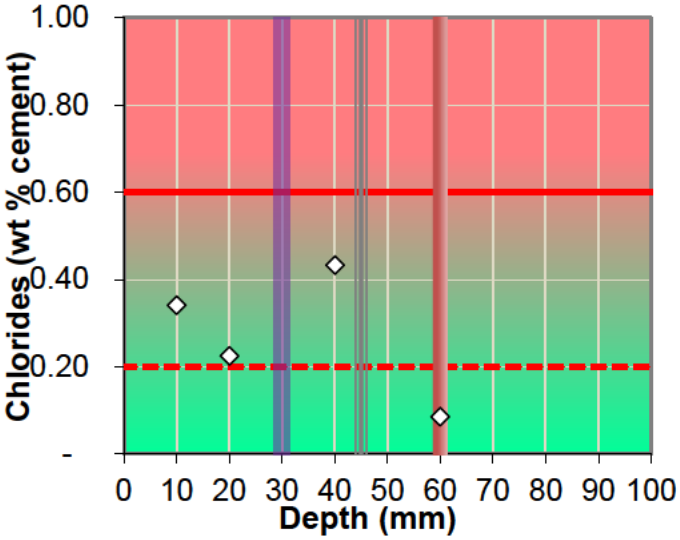
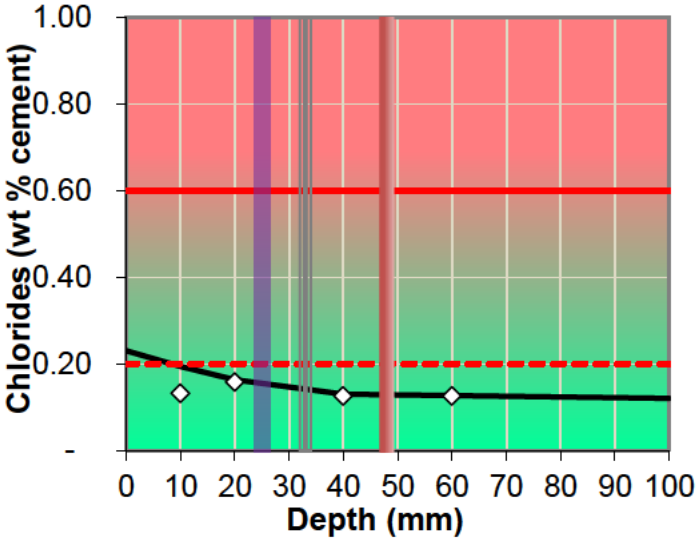


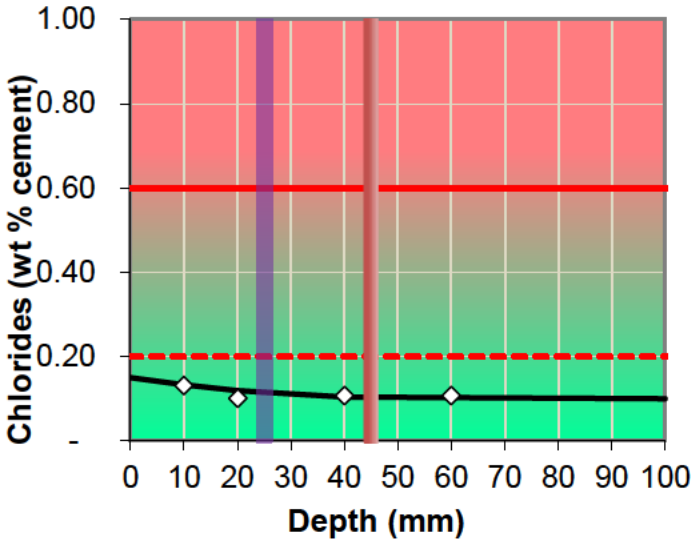
Level 1 Beam



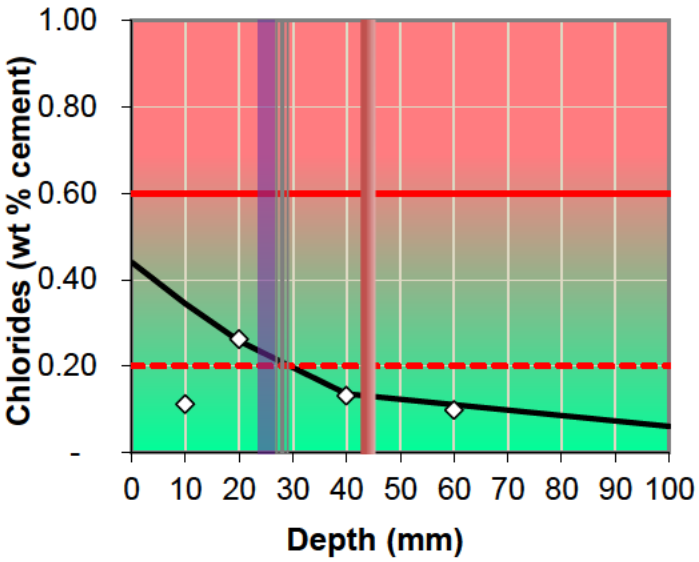
Level 2 column



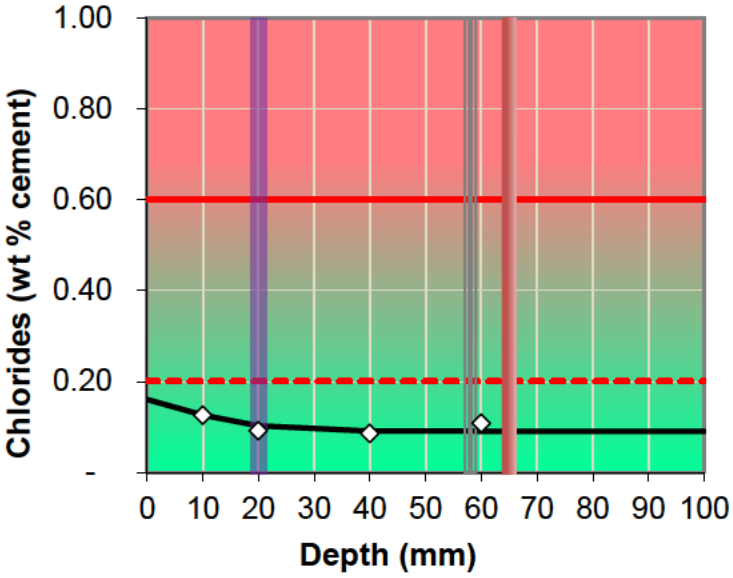
Level 2 Beam



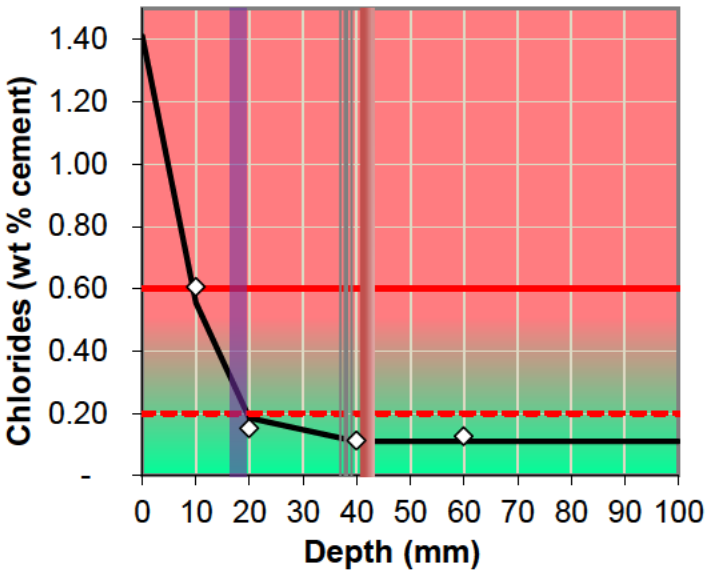
Level 3 column



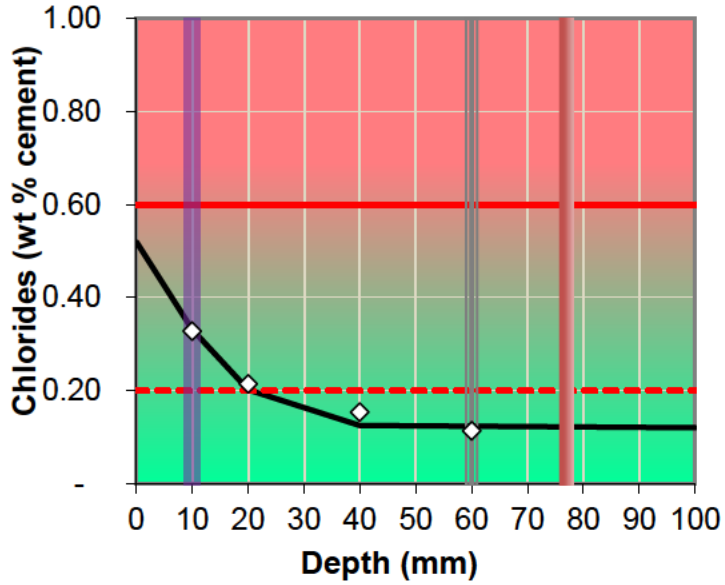
Level 3 Beam



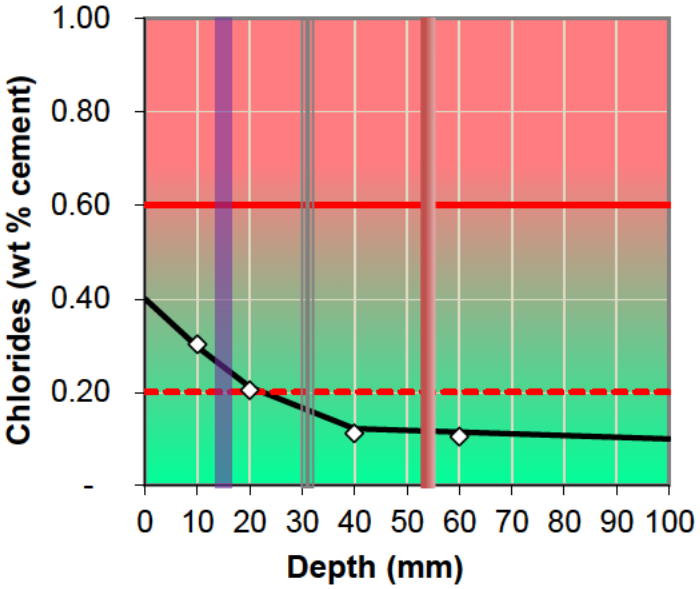
Level 4 column



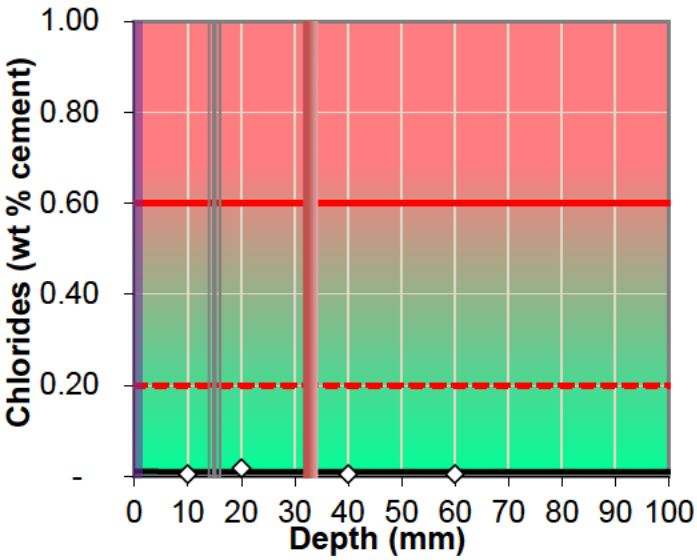
Level 4 Beam



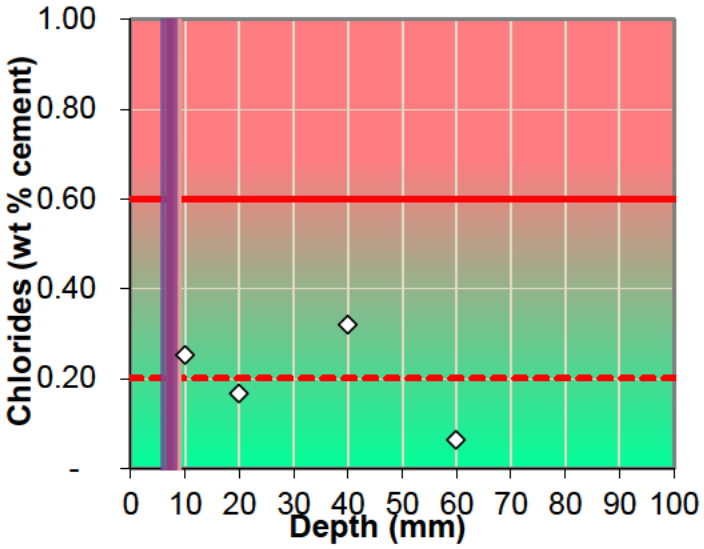
Level 5 column



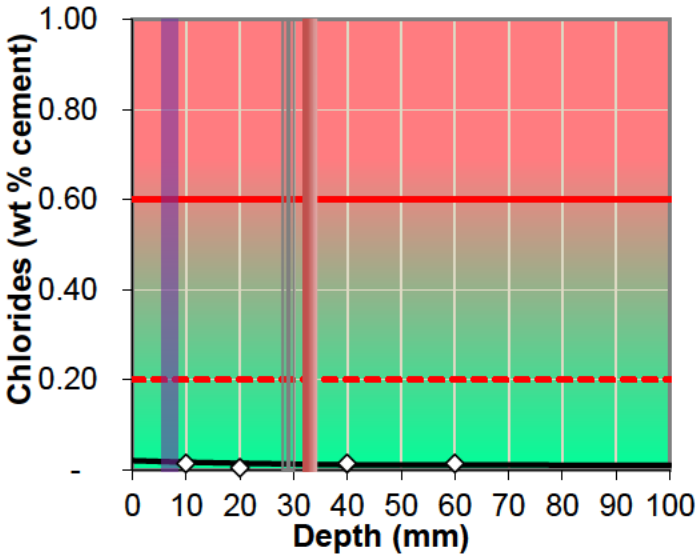
Level 5 Beam



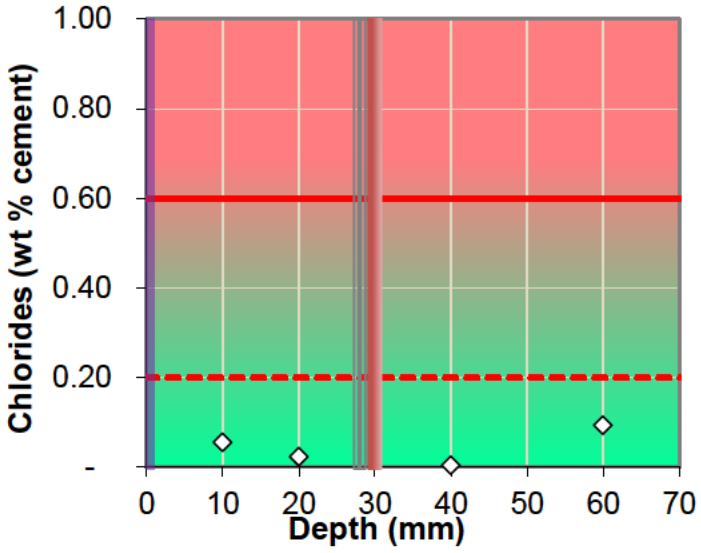
Level 2 soffit



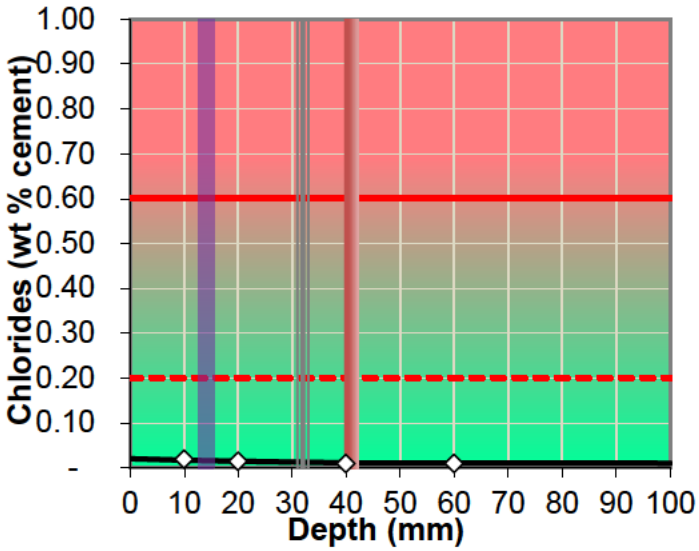
Level 2 wall



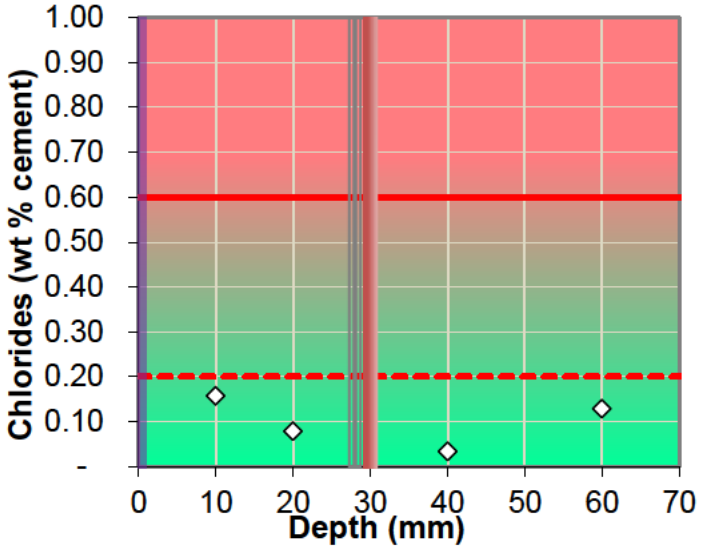
Level 3 soffit



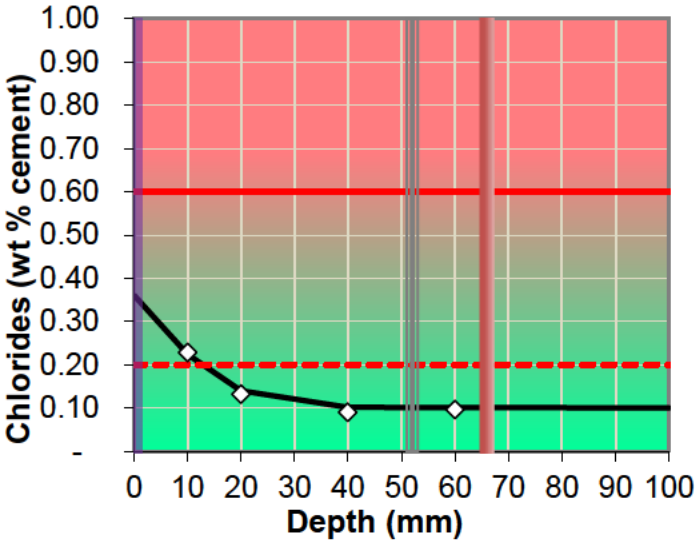
Level 3 wing



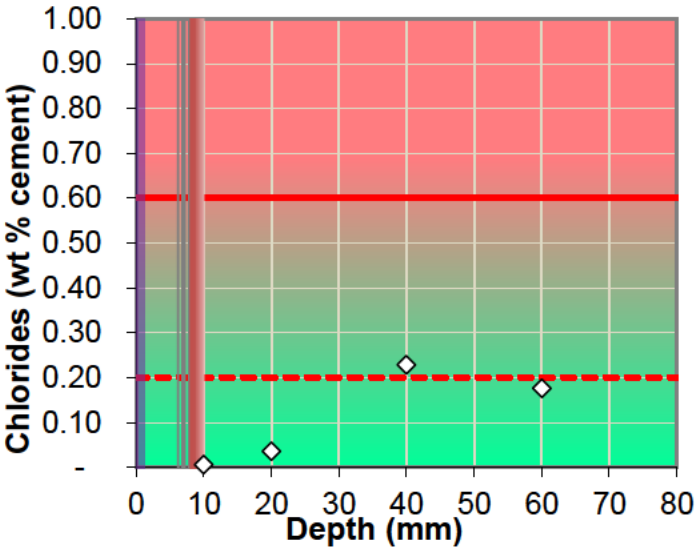
Level 4 soffit



Level 4 wing



Level 5 floor



Level 5 wall

Figure 10: Chloride diffusion profiles

3.8 SURFACE RESISTIVITY

Surface resistivity reading were taken across each test face. Around 10 readings were measured in each of the same areas as the half-cell potential survey. The readings were taken prior to and after the surface was wetted, this was done to get the resistivity for the concrete is the dry state when the test was taken and also to simulate wet conditions e.g. after and during a rain event

The reading of resistivity measurements can be used to estimate the risk of corrosion. When the electrical resistivity of concrete is low, the risk and rate of corrosion is higher. When the resistivity is high, the risk and rate of corrosion is lower. Empirical tests have arrived at the following threshold values (shown in Table 6) which can be used to determine the likelihood of corrosion, as recommended by RILEM (Polder, 2001).

Table 6: Indicative risk of corrosion corresponding to concrete resistivity (Polder, 2001)

Concrete resistivity (kΩ cm)	Risk of corrosion
⩾ 100	Negligible risk of corrosion
= 50 to 100	Low risk of corrosion
= 10 to 50	Moderate risk of corrosion
⩽ 10	High risk of corrosion

The reading of resistivity measurements can also be used as an additional information to evaluate the rate of corrosion in the tested areas. The following interpretation (shown in Table 7) of resistivity measurements from the Wenner four-probe system has been cited when referring to depassivated steel.

Table 7: Indicative corrosion rate corresponding to concrete resistivity (Langford and Broomfield, 1987)

Concrete resistivity (kΩ cm)	Corrosion rate
> 20	Low corrosion rate
= 10-20	Low to moderate corrosion rate
= 5-10	High corrosion rate
< 5	Very high corrosion rate

Table 8 shows the minimum, maximum and mean values of the measured surface resistivity for each test location after being wetted. For all test location surface resistivity of dry concrete was above the measurable limit of the Proceq Resipod. The risk of corrosion and rate of corrosion in Table 3 was determined based on the minimum resistivity.

Table 8: Concrete resistivity results

Test location	Minimum resistivity (kΩ cm)	Maximum resistivity (kΩ cm)	Likelihood of corrosion	Rate of corrosion
Level 1 upper	150	339	Negligible	Low
Level 2 lower	210	1920	Negligible	Low
Level 2 upper	209	1320	Negligible	Low
Level 3 lower	180	900	Negligible	Low
Level 3 upper	98	328	low	Low
Level 4 lower	156	599	Negligible	Low
Level 4 upper	150	800	Negligible	Low
Level 5 lower	230	960	Negligible	Low

HALF-CELL POTENTIAL SURVEY

BCRC conducted half-cell potential survey in the test locations across the site using Corromap equipment as explained in Section 2.5. The Corromap uses a silver/silver chloride (Ag/AgCl) as reference electrode (RE) instead of a copper/copper sulphate (Cu/CuSO4) electrode. The ASTM C876 standard test method for half-cell potentials testing of concrete provides standard guidelines to assess the probability of corrosion using half-cell potential values.

Table 9 provides the summary of these guidelines. As explained earlier, half-cell potential values depend on various factors e.g. concrete cover, humidity, oxygen supply, and therefore ASTM C876 guidelines should be referenced with care when interpreting the half-cell potential results.

Table 9: Half-cell potentials and probability of corrosion according to ASTM C876

R.E. Cu/CuSo4	R.E. Ag/AgCl	Probability of corrosion
-350 mV or less	-246 mV or less	90 % chance of active steel corrosion
-200 mV to -350 mV	-96 mV to -246 mV	50 % chance of active steel corrosion
Greater than -200 mV	Greater than -96 mV	10 % chance of active steel corrosion

In order to assess the probability of active (corroding) and passive steel in a structure, ASTM C876 potential criteria are often used. According to RILEM recommendations (Elsener, 2003), ASTM C876 criteria should not be employed as absolute criteria to determine whether the reinforcement is active or passive. In structures, the half-cell potential measurements taken from the concrete surface are not only influenced by the corrosion state of the rebars (active or passive) but also by the concrete cover, concrete resistivity, presence of chloride ions and

presence of carbonated concrete. This leads to differing potential values equating to a low, medium or high risk of steel corrosion in different concrete elements and even at different locations of the same concrete element.

Given the above, Gulikers and Elsener (2009) expanded on statistical analysis of potential mapping results, producing a method for obtaining the potential boundary between active and passive steel.

Therefore, all the tested areas in this investigation were analysed collectively. Statistical analysis of 161 test points (from all the test locations) where corrosion potentials were measured was performed as described in the reference by Gulikers and Elsener (2009). The frequency density histogram of measured equivalent potentials is presented in Figure 11.

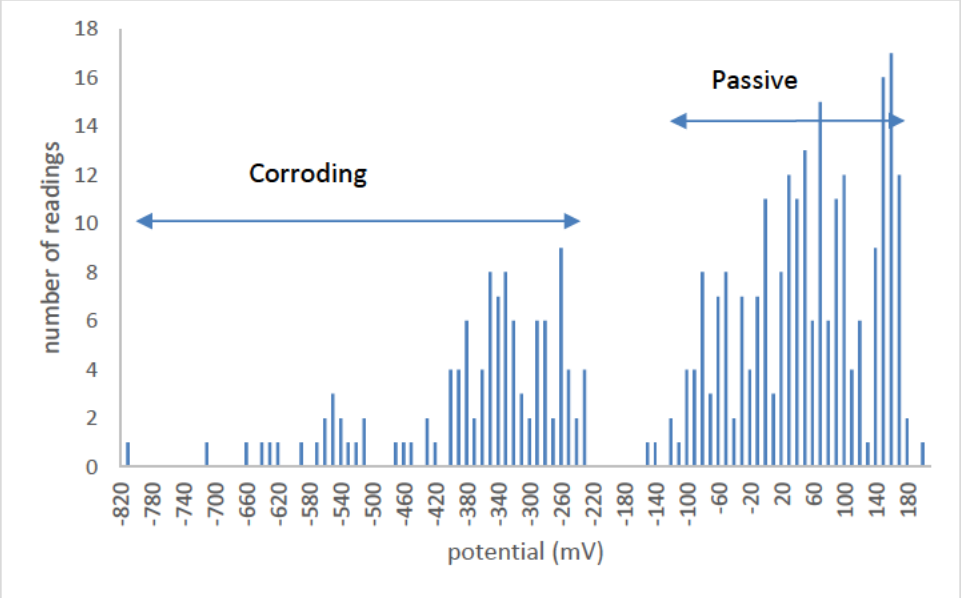


Figure 11: Frequency density histogram of measured equivalent potentials based on class width of 10 mV

From the probability density distribution, the potential criteria for any probability level of identifying corroding steel was derived and is presented in Figure 12. At locations characterised by a potential of -190 mV, there would be an equal probability of 50% of finding active or passive steel. For example, at a location with a potential of -245 mV, there would be a 90% probability that steel at this location is actively corroding.

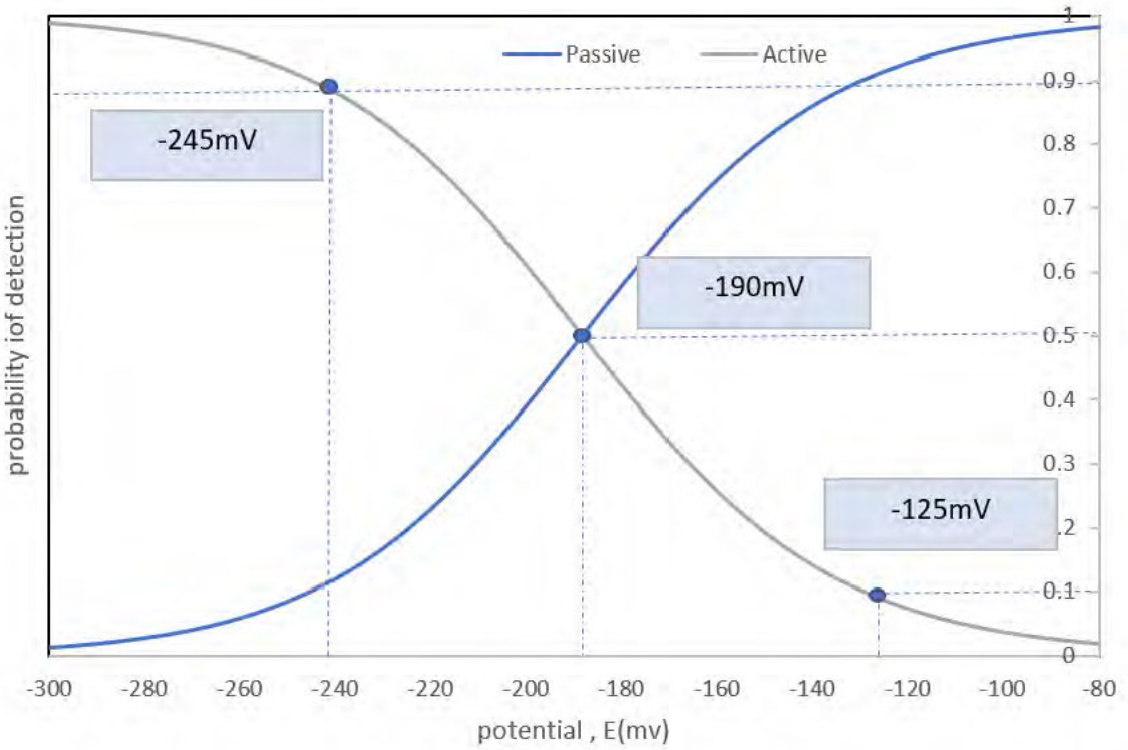


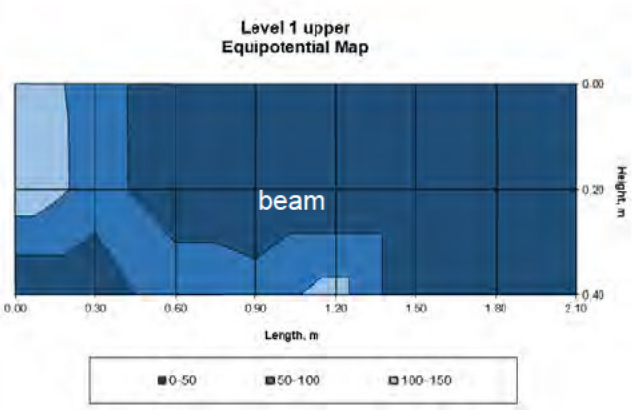
Figure 12: Probability of detecting corroding and passive steel as a function of equivalent potential

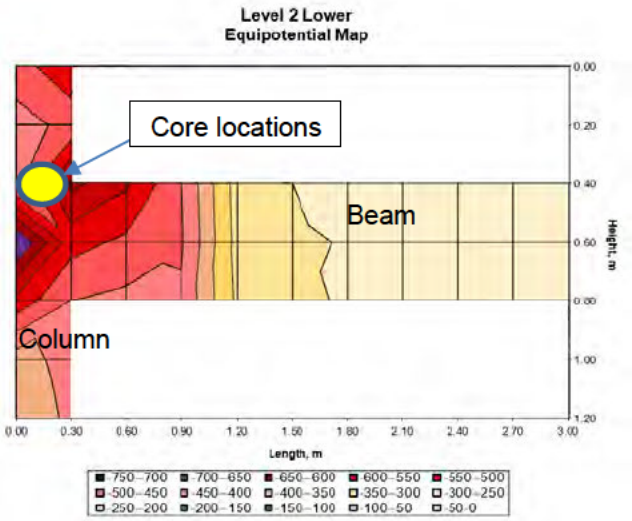
Based on the above analysis, the following criteria shown in Table 10 was derived to determine the probability of active corrosion at all test locations.

Table 10: Half-cell potentials and probability of corrosion according to statistical analysis

Equivalent potential (vs. $Cu/CuSO_4$ RE)	Measured potential (vs. Ag/AgCl RE)	Probability of corrosion
-245 mV or less	-141 mV or less	90 % chance of active steel corrosion
-190mV	-86 mV	50 % chance of active steel corrosion
Greater than -125mV	Greater than -21 mV	10 % chance of active steel corrosion

The half-cell potential values for all the test locations are presented as a contour map in Figure 13.


Level 1 upper
Equipotential Map
beam
Length, m
Height, m
0-50
50-100
100-150


Level 2 Lower
Equipotential Map
Core locations
Beam
Column
Length, m
Height, m
750-700
700-650
650-600
600-550
550-500
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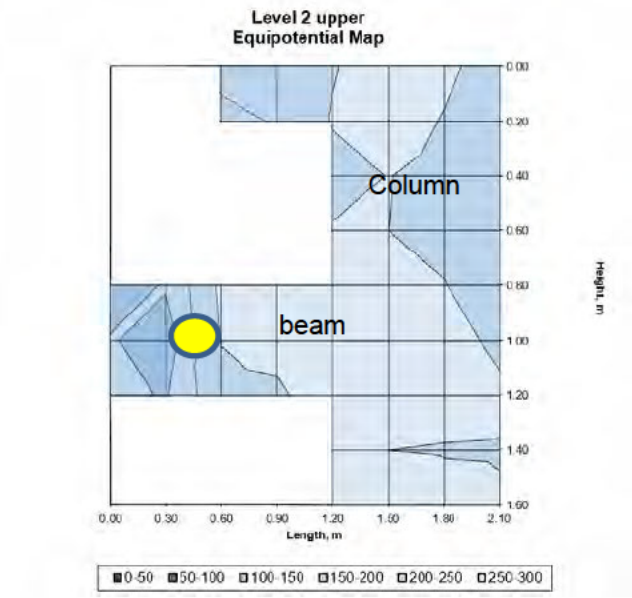
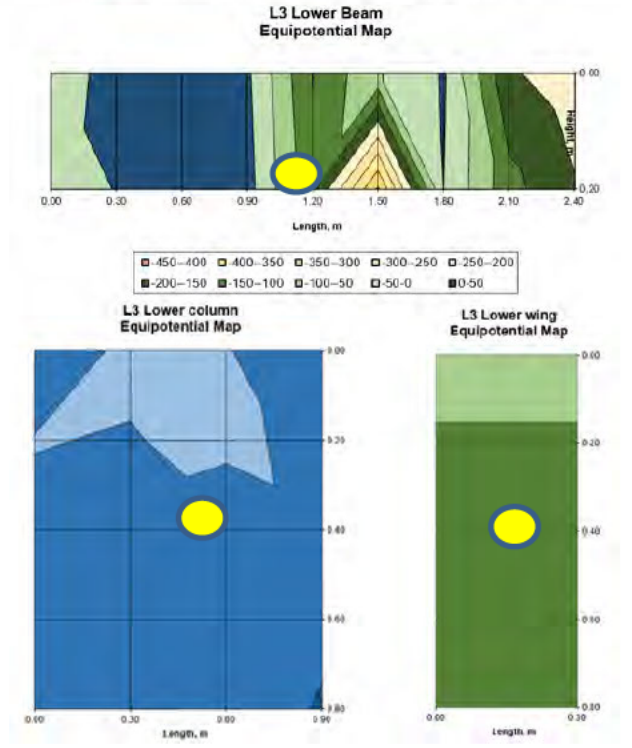
200-150
150-100
100-50
50-0


Level 2 upper
Equipotential Map
Column
beam
Length, m
Height, m
0-50
50-100
100-150
150-200
200-250
250-300


L3 Lower Beam
Equipotential Map
Length, m
450-400
400-350
350-300
300-250
250-200
200-150
150-100
100-50
50-0
0-50
L3 Lower column
Equipotential Map
L3 Lower wing
Equipotential Map

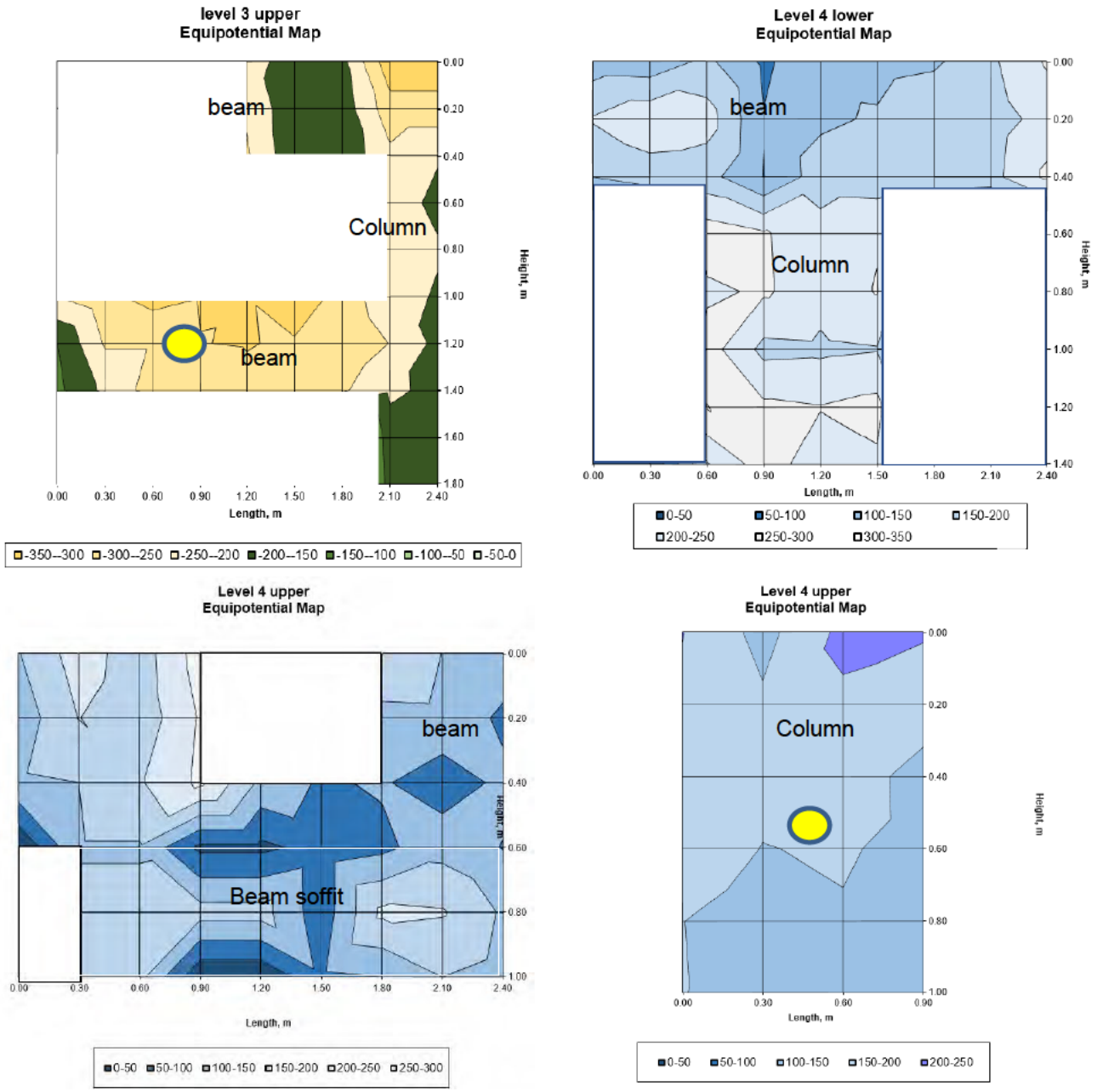


Figure 13: Half-cell potential contour maps (measured vs. Ag/AgCl RE)

4. CONCLUSIONS

4.1 VISUAL INSPECTION

A detailed visual inspection including drummy testing was carried out across all accessible of the park. A number of typical types of defects were observed across all levels. These defects were across each type of concrete member.

For the precast walls, the concrete cover to reinforcement was extremely low which has resulted in spalling along the length of the walls across all levels.

The precast prestressed T beams gave some cause for concern when cracking, edge spalled and exposed strands were observed, it is likely due to low concrete cover at the ends of these beams, combined with carbonation and water ingress. TTW were engaged separately by Altus to assess the risk of imminent failure , please refer to their report for more detailed information but it was determined low risk of imminent failure and the beams do not require temporary propping/ support however repairs would be required and beams would need to be propped during the repair.

The in-situ beams were observed to be mostly sound, a few locations had spalls and exposed corroding bars, these were isolated and likely due to low cover and availability of moisture.

The columns were found to be sound with no issues observed issues. From GPR it was found the concrete cover was high.

The precast wings were also noted to be mostly sound; a few surface stains were noted which are likely to be ties and stray metallic objects corroding over time. These were not drummy which suggest metallic objects were on the surface. The connects form the slab to the wings were found to be mostly sound with only one locations noted to have loss of section due to water pooling. It is recommended the coating for this connection be replaced to extend their life.

The carpark floors, especially on level 5 and around the ramps had exposed reinforcement. The cover to the reinforcement was noted to be very low with abrasion from vehicle traffic the likely cause of the exposed reinforcement. Surface corrosion was noted on the bars which is to be expected however the concrete around the bars was not drummy which again suggest abrasion as the main cause.

The movement joints across all levels of the carpark have failed and passed their service life. The expansive material was noted to be brittle and cracked along a number of joints. The failed joints also with poor drainage has led to rain water flowing through to all levels.

Majority of the bolted connection were in sound condition with no significant loss of section. The coatings have deteriorated and would need to be replaced to extend the life of the connections. A few of the connections showed some section loss and one on level 5, adjacent to a down pipe which required urgent remediation as pooled water has caused almost complete loss of section.

4.2 CARBONATION

Concrete carbonation is usually one of the main causes of reinforcement corrosion in concrete. Carbonation is the reaction of the cement hydration products dissolved in the pore water with carbon dioxide in the air which reduces concrete pore solution’s alkalinity from approx. pH 13 to less than pH 9. This breaks down the passive oxide film on the surface of the embedded steel and allows the corrosion of reinforcing steel to occur whenever sufficient moisture and oxygen are available. Subsequent accumulation of corrosion product causes concrete cover to spall and crack due to expansive stresses that are developed.

Based on a statistical analysis of carbonation depth and cover distribution, it was estimated that around 7.5% of the reinforcement in the beams currently lies in carbonated concrete and our modelling of future carbonation indicated that in another 50 years i.e. in year 2071, approximately 26 % of reinforcement would be in the carbonated concrete.

For the concrete columns as the cover to reinforcement is quite high, the carbonation front has reached 2% reinforcement and our carbonation modelling predicted that in 50 years approximately 12% of reinforcement would be in the carbonated concrete.

For the soffit it was estimated that around 1.2% of the reinforcement in the beams currently lies in carbonated concrete and our modelling of future carbonation indicated that in another 50 years i.e. in year 2071, approximately 7.4 % of reinforcement would be in the carbonated concrete.

For the wing the carbonation depth at all test locations was measured as 0mm, none of the reinforcement lies in carbonated concrete and this is unlikely to change in 50 years.

For the precast walls as the cover to reinforcement was extremely low, the carbonation front has reached 34% the reinforcement. After 36 years our carbonation modelling predicts that by then all of reinforcement will be in the carbonated concrete.

At all the locations where carbonation front has reached the level of reinforcement, it is highly likely that corrosion has already commenced at these locations and is in propagation stage. If no protective measures are taken, there will be further spalling of concrete due to corrosion in the areas where carbonation front has already reached the reinforcement level.

4.3 CHLORIDE ION DIFFUSION

Chloride attack is often the other main cause of corrosion of steel in concrete. The commonly accepted initiation threshold for chloride induced corrosion is 0.4% by mass of cement. While this value is conservative, it is used to ensure that the risk of corrosion is unlikely. However, in the literature, it is reported that the actual threshold value at which corrosion commences can be both higher and lower depending on a wide range of local factors. In accordance with Fib Bulletin 34 – Model Code for Service Life Design (2006), the lower bound activation level is 0.20 wt.-%/cement, and the mean activation level is 0.60 wt.-%/cement.

For the precast wall the diffusion of chlorides occurs from both the front and back face as well as through the voids running along the height of the walls. The low cover along with the high carbonation depth and chloride ingress make the risk of corrosion in these walls extremely high and it can be seen from the visual inspection that a number of locations have started to spall.

For the soffit test location, the chloride levels are very low, as the cores were taken from mostly sheltered and dry locations. The graphs show little to no chloride ingress which mean the risk of carrion due to chlorides is low for the soffit.

For the columns and the beams, the graphs show some diffusion of chlorides, however the concrete cover for these locations is quite high which mean the risk of corrosion due to chloride ingress is low for these members

For the precast wings, diffusion can be seen to occur from both faces, however the chloride level are below the lower bound activation level which mean the risk of chloride induced carrion is low.

4.4 HALF-CELL POTENTIAL AND CORROSION RATE

From a statistical probability analysis of potential test data collected, it could be seen that about 67% of the half-cell potential survey area had a 10% or less chance of active steel corrosion, and about 31% of the half-cell potential survey area had a 90% chance of active steel corrosion. This finding can reasonably be taken to be representative for the whole structure.

4.5 REPAIR RECOMMENDATIONS

BCRC recommend that a combination of crack injection, patch repair, joint sealing is required to extend the low maintenance service life of the car park structure for a further 25+ years. All defects identified in the visual inspection presented in appendix A need to be repaired in accordance with the latest standards and guidelines. At areas the bars are exposed, it is recommended if the section loss is more than 10% the bars will need to be replaced, advice from a structural engineer may be required when remediation these areas.

A detailed drummy survey should be conducted prior to preparing the scope of work for the repair in order to quantify and highlight area which would need to be patched repaired.

Once the repairs have been completed, given the main cause of the corrosion noted across the structure is due to a combination of carbonation ingress, low concrete cover and moisture ingress. It is recommended that all exposed concrete members be painted with a high-quality anti-carbonation and waterproof coating. This will prevent further ingress of carbonation and chlorides as well as prevent further corrosion activity.

The floor of the carpark requires an abrasion resistant topping layer to be installed to restore the concrete cover to the reinforcement in the slab.

For the precast wall, due to the voids running though the walls and the chloride levels we recommended these will need cathodic protection. Given the access requirement and current condition council may feel it is more reasonable to replace these walls.

The bolted connections coating needs to be recoated with some with the ones highlighted in the visual inspection to have section loss replaced

Th overall drainage needs to be improved, pipes and pits to be cleaned out and/ or replaced, as required. The floor levels to be to be adjusted to assist with drainage and prevent water pooling around connections and critical points.

5. REFERENCES

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Crevello, G. L., Matteini I., & Noyce P. A. (2016). Understanding the rates of corrosion in concrete structures. *Structure Magazine, April 2016, 17-20.*

Elsener, B., Andrade, C., Gulikers, J., Polder, R., & Raupach, M. (2003). Half-cell potential measurements—Potential mapping on reinforced concrete structures. *Materials and Structures*, *36*(7), 461-471.

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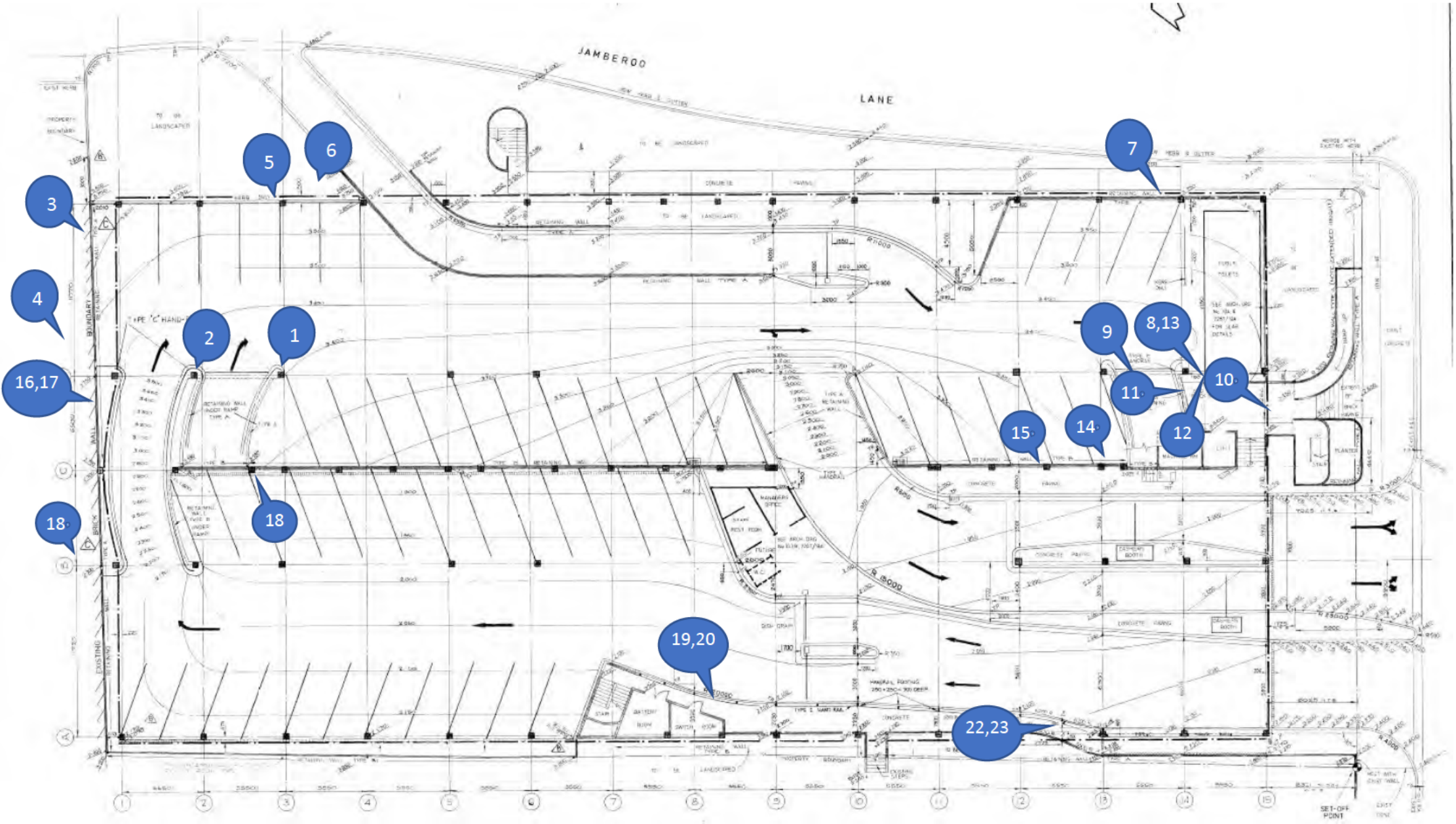
APPENDIX A – VISUAL INVESTIGATION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SET-OFF POINT

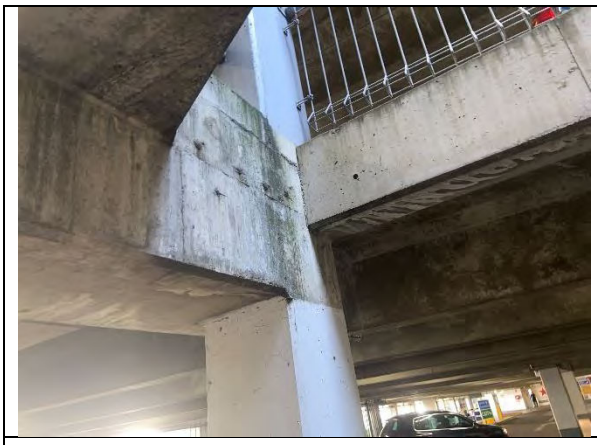


Photo 1 - Level 1 exposed end of reinforcement and ties- corrosion staining and surface corrosion observed	Photo 2 - Level 1 -signs of water ingress, corrosion of old pipe noted.

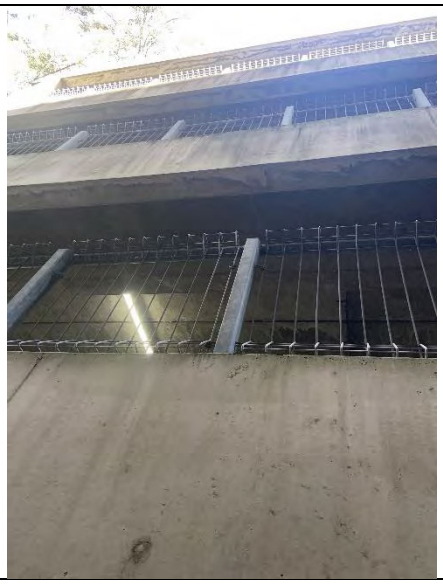
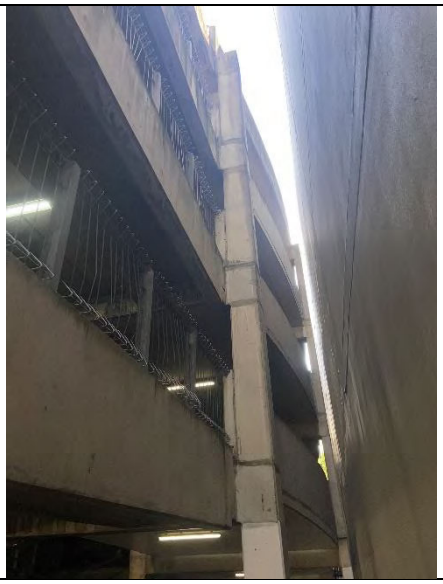

	

Photo 3 - Level 1 - external overview from north side – generally sound	Photo 4 – Level 1- external overview from north side
	
Photo 5 - Level 1- precast beam condition generally sound on this floor	Photo 6 - Level 1 – column, condition found to be generally sound on this level

	
Photo 7 - Level 1 – beams in generally sound condition, some signs of water ingress noted	Photo 8 - Level 1 – water staining, efflorescence noted

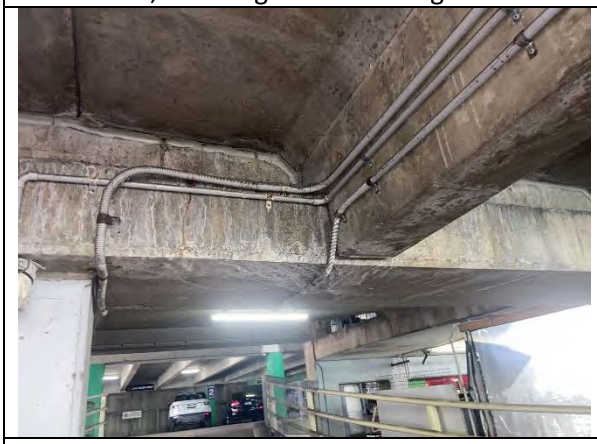
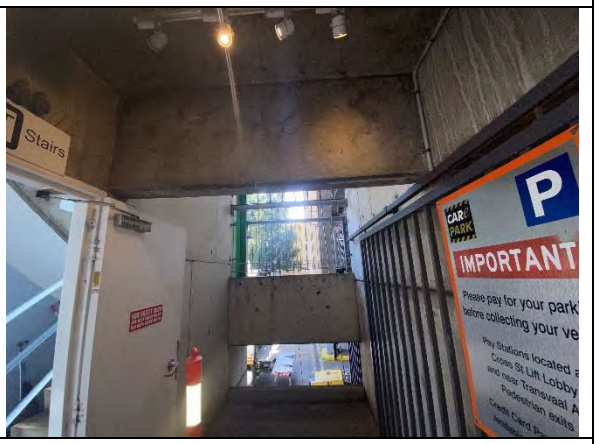

	

Photo 9 - Level 1 – water staining, corrosion of fixings	Photo 10 - Level 1- generally sound dry condition
	
Photo 11 - Level 1 – water staining, corrosion staining of exposed ties	Photo 12 - Level 1- water and corrosion staining noted with suspected previous repair patch



Photo 13 - Level 1 – overview of water staining



Photo 14 - Level 1 – overview of beams



Photo 15 - Level 1- overview of more water staining



Photo 16 - Level 1 – north end, generally sound condition



Photo 17 - Level 1 – north end overview



Photo 18 - Level 1 – impact damage of top of beam



Photo 19 - Level 1 lower - painted surfaces, generally good condition

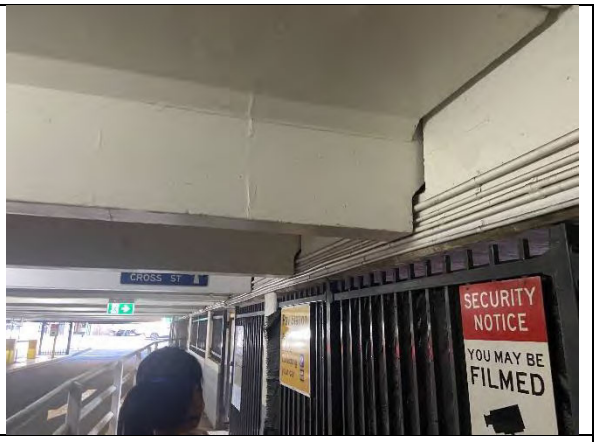


Photo 20 - Level 1- painted surfaces, generally good condition



Photo 21 - Level 1-painted surfaces, generally good condition

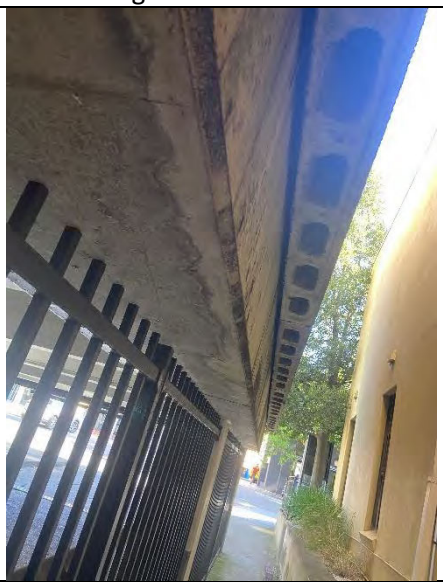
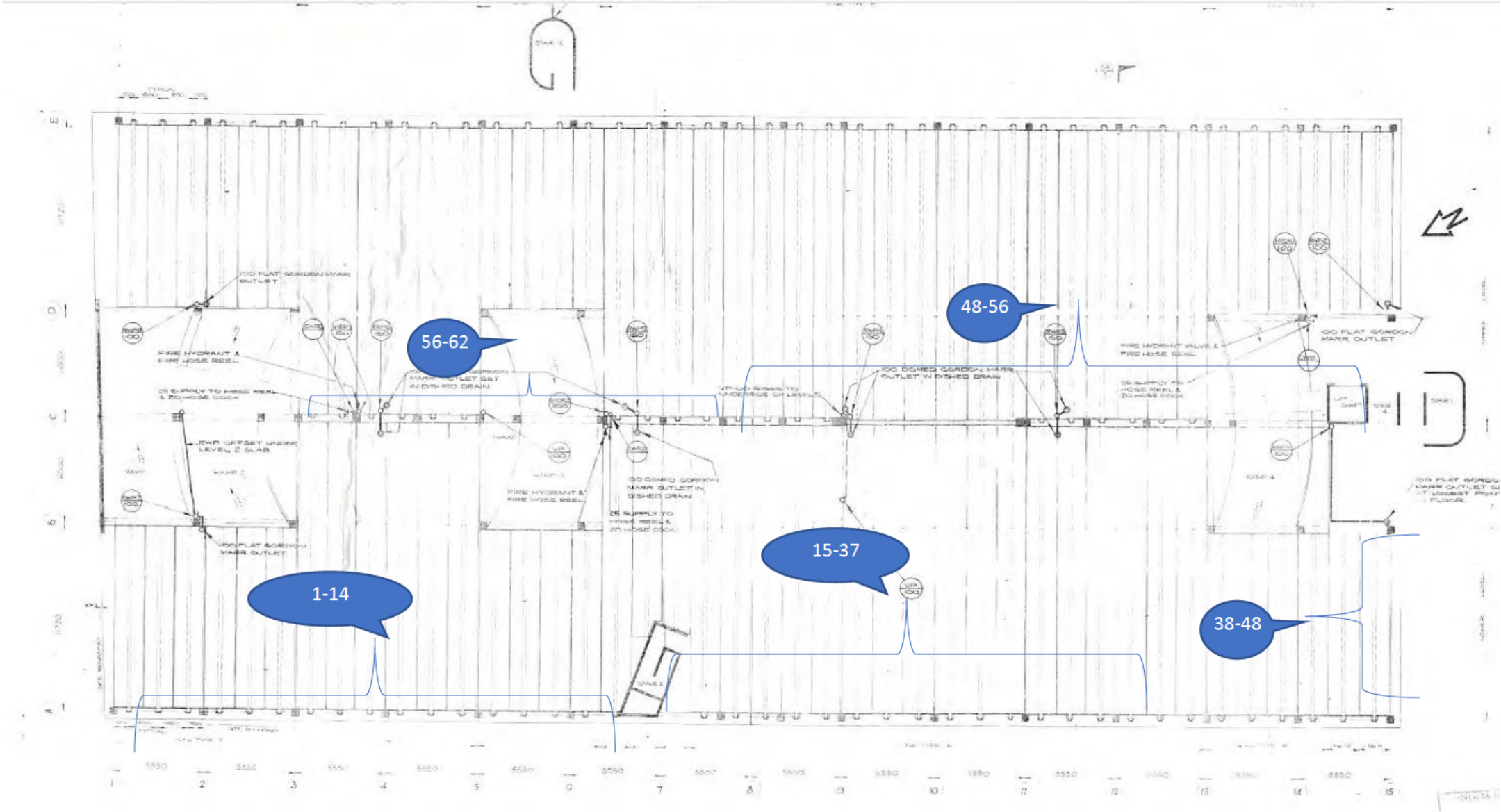


Photo 22 – east end, showing water staining along edge of beam



Photo 23 – east end, precast wall,


56-62
48-56
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38-48

	
Photo 1 - Level 3- generally sound condition with signs of water staining	Photo 2 - Level 3 - generally sound condition of connections to walls
	
Photo 3 - Level 3 – overview of connection from wall to soffit	Photo 4 – Level 3- magnified view bolted connection joint, which appeared to be in good condition, coating has deteriorated

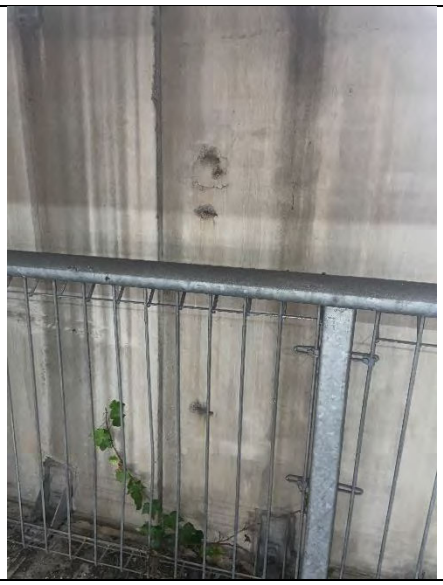



Photo 5 - Level 3- localised spalling damage with corrosion scales on the exposed reinforcement	Photo 6 - Level 3 – localised spalling damage with signs of corrosion scales on the exposed reinforcement

	
Photo 7 - Level 3 – spalling and cracks on the wall surface, with signs of corrosion on the exposed reinforcement. No significant defect was on the rest of the wall	Photo 8 - Level 3 – minor surface carrion of bolted connection, coating to be replaced

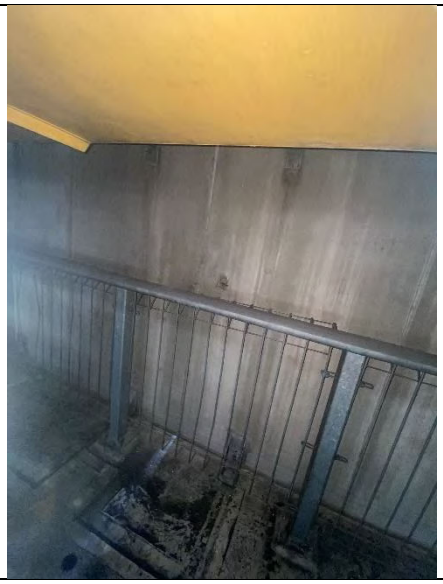



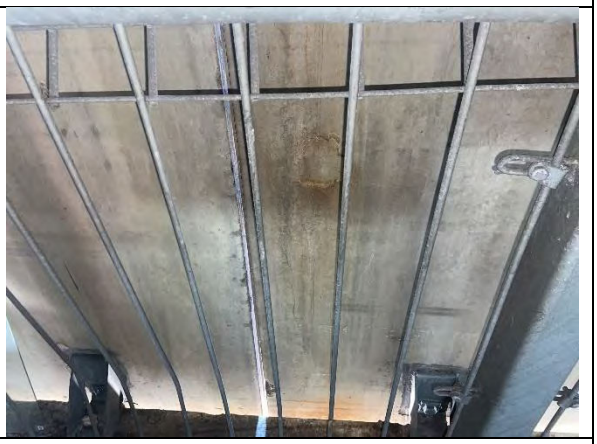
Photo 9 - Level 3 – generally sound condition of colts, localised spalling and exposed reinforcement along wall	Photo 10 - Level 3- magnified view of photo 9, connection
	
Photo 11 - Level 3 – magnified view of photo 9 at spalling damage, exposed reinforcement observed.	Photo 12 - Level 3- corrosion staining on the wall. Generally sound condition

	
Photo 13 - Level 3 – honey combing and loss of fines during construction	Photo 14 - Level 3 – close up honey combing and loss of fines during construction

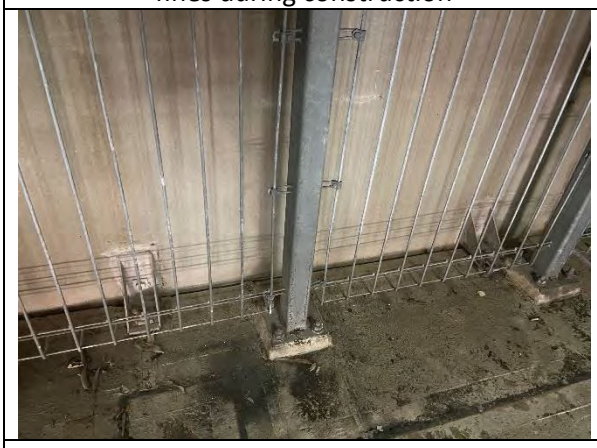
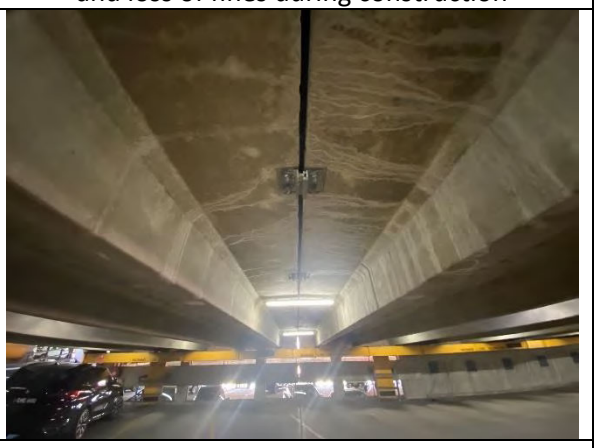

	

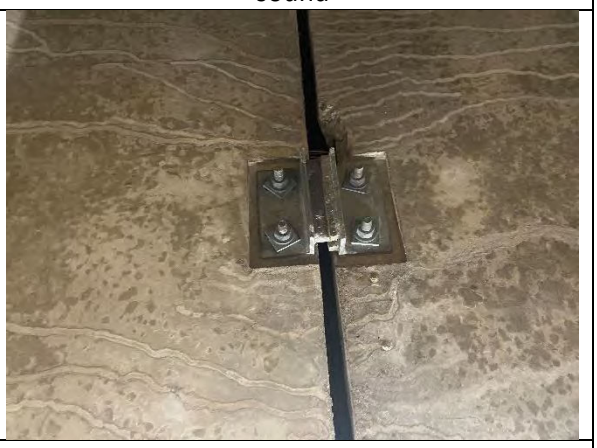
Photo 15 - Level 3- generally sound condition of connections	Photo 16 - Level 3 – significant amount of water staining. Connection along joint observed to be sound
	
Photo 17 - Level 3 – magnified view showing of condition of connections	Photo 18 - Level 3 – more connections, sound condition



Photo 19 - Level 3 - more connections, sound condition



Photo 20 - Level 3- more connections, sound condition



Photo 21 - Level 3- presence of spalling, delamination and crack in a 100cm^2 area, with exposed reinforcement observed in spalled region.



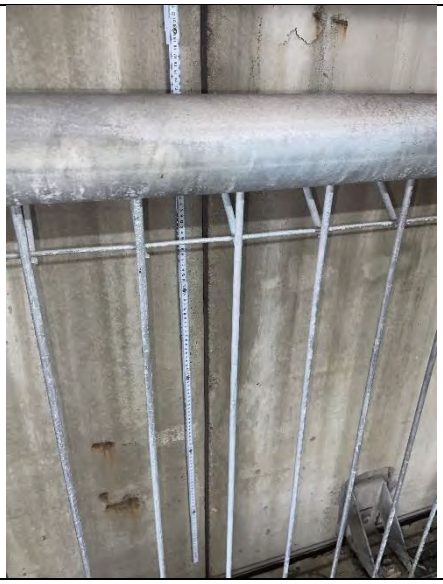
Photo 22 – surface corrosion of connection at the joint on the wall edge, coating to be reinstated



Photo 23 – spalling damage and corrosion of exposed reinforcement observed.



Photo 24 – generally in sound condition

	
Photo 25 – spalling damage and corrosion of exposed reinforcement observed.	Photo 26 – spalling damage and corrosion of exposed reinforcement observed.

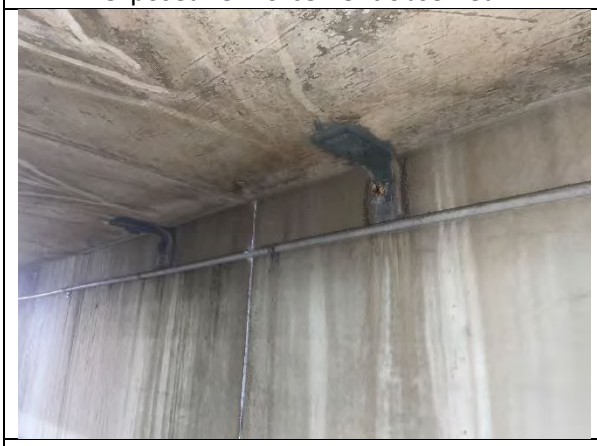



Photo 27 – water and corrosion staining. Localised corrosion of one bolt on the joint	Photo 28 – overview of water and corrosion staining, with exposed reinforcement subject to corrosion
	
Photo 29 – spalling damage and corrosion of exposed reinforcement observed.	Photo 30 – spalling damage and corrosion of exposed reinforcement observed.

	
Photo 31 - Level 3- overview, generally in sound condition	Photo 32 - Level 3- overview, generally in sound condition
	
Photo 33 - Level 3- exposed reinforcement in two regions, subject to corrosion noted.	Photo 34 - Level 3- exposed reinforcement in two regions, corrosion noted.

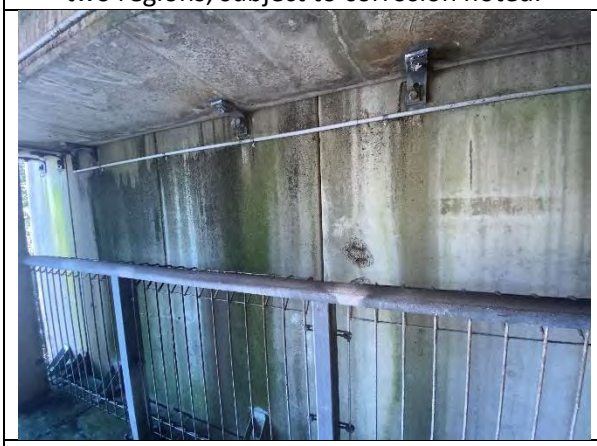



Photo 35 - Level 3- water ingress and corrosion staining, Exposed reinforcement with presence of corrosion observed	Photo 36 - Level 3- magnified view of exposed reinforcement in photo 35

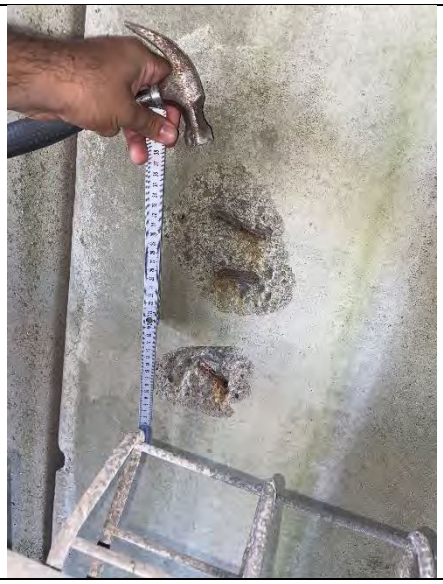


Photo 37 - Level 3- exposed reinforcements in two regions with presence of corrosion



Photo 38 - Level 3- exposed reinforcements in two regions with presence of corrosion

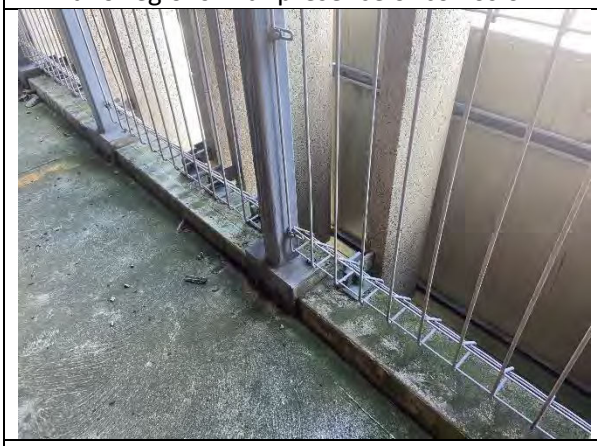


Photo 39 - Level 3- overview of general condition



Photo 40 - Level 3- spalled concrete from soffit, believed to be from edge of beam above



Photo 41 - Level 3- source of concrete from photo 40, corroding bar running along edge of beam with low cover believed to be the cause

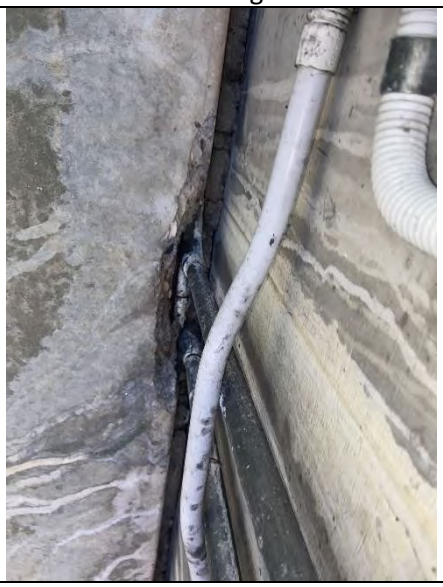


Photo 42 - Level 3- water ingress and localised spalling at the corner area

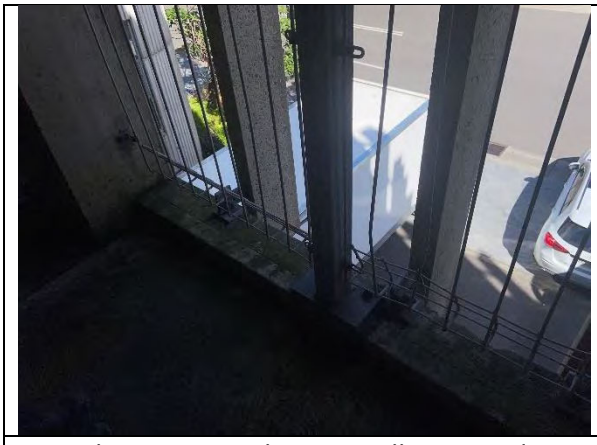


Photo 43 - Level 3- generally in sound condition,	Photo 44 - Level 3- magnified view of connection, sound condition
	
Photo 45 - Level 3- localised spalling d with significant corrosion on the exposed reinforcement. Carbonation , Low cover and moisture availability is the cause	Photo 46 - Level 3- generally sound condition (of connection to the soffit

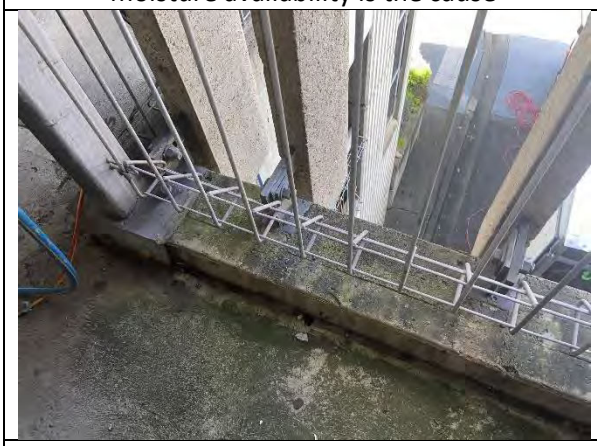



Photo 47 - Level 3- overview generally sound condition,	Photo 48 - Level 3- low cover and exposed reinforcement noted on floor



Photo 49 - Level 3- magnified view exposed reinforcement, low cover and abrasion likely cause



Photo 50 - Level 3- water and corrosion staining and overview of beam condition



Photo 51 - Level 3- surface delamination due to corrosion of reinforcement



Photo 52 - Level 3- Magnified view of photo 51



Photo 53 - Level 3- water ingress and corrosion staining of bar running along edge of T beam



Photo 54 - Level 3- edge spall, water ingress, and efflorescence, with exposed reinforcement

	
Photo 55 - Level 3- magnified view of the spalled region showing the exposed reinforcement	Photo 56 - Level 3- signs of water ingress
	
Photo 57 - Level 3- magnified view of photo 56 at the location of imperfections	Photo 58 - Level 3- water ingress staining,
	
Photo 59 - Level 3- localised corrosion along the beam edge with presence of water staining observed	Photo 60 - Level 3- magnified view of the corrosion shown in photo 59

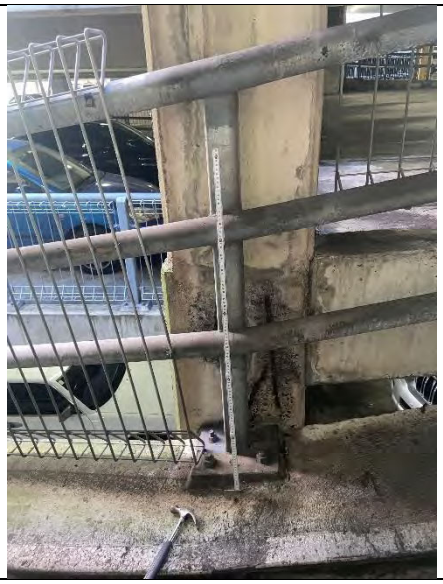
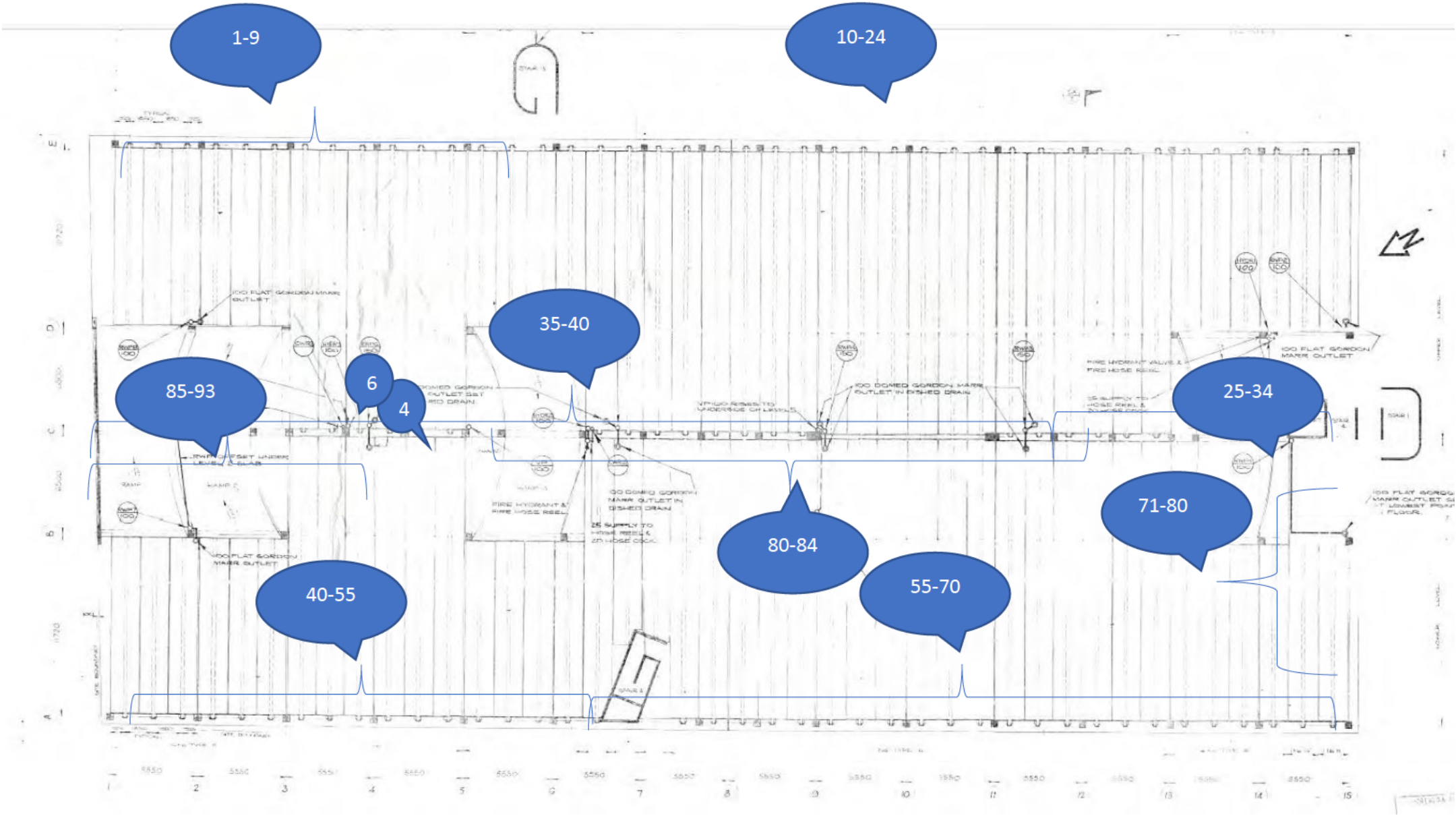


Photo 61 - Level 3- significant spalling with exposed reinforcement at the spalled region	Photo 62 - Level 3- magnified view of spalled region shown in photo 61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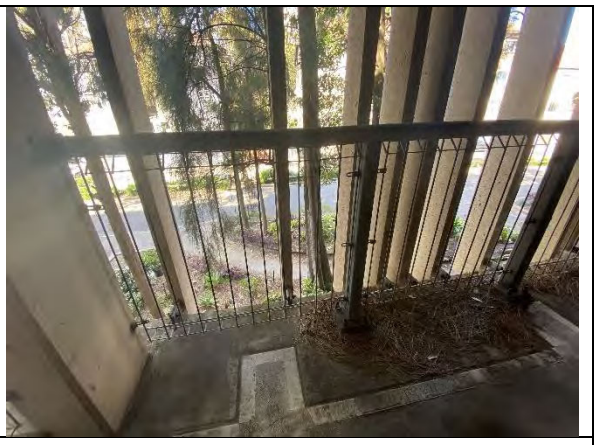
	
Photo 1 - Level 2- presence of water staining, but generally in sound condition	Photo 2 - Level 2 - generally overview of connections to wings

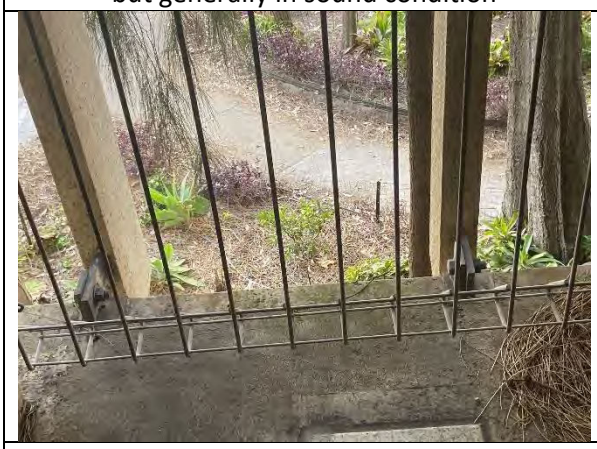



Photo 3 - Level 2 – magnified view of photo 2 – generally sound condition. Some wings appear to be missing, reason unknown	Photo 4 – Level 2- connection to soffit, generally sound, coating to be replaced for extended life

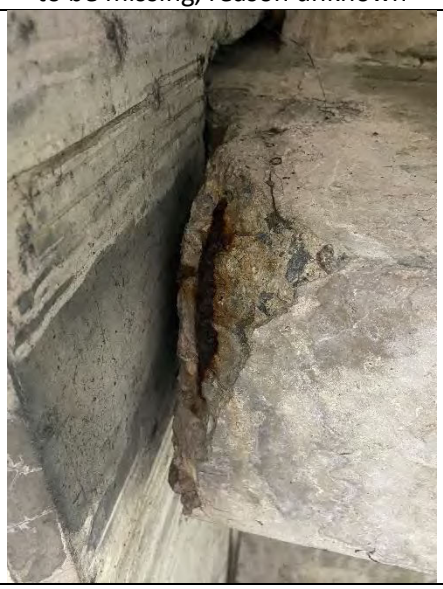



Photo 5 - Level 2- concrete spall at end of beam with signs of corrosion of exposed reinforcements, low cove and water staining noted.	Photo 6 - Level 2 – cracks and spalling within the edge of beam end.



Photo 7 - Level 2 – wings and connected bolts in generally sound condition, some surface corrosion noted



Photo 8 - Level 2 – close of connection to soffit, coating deterioration noted otherwise sound

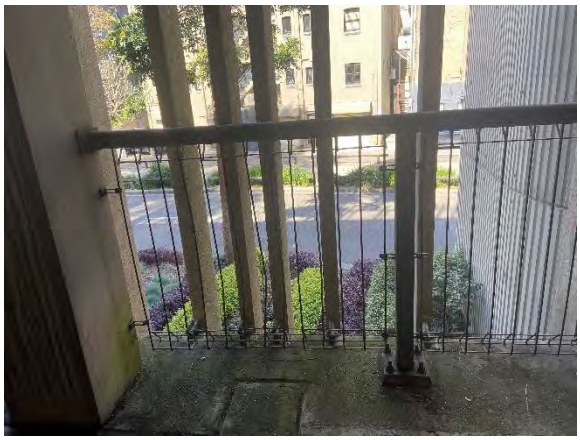


Photo 9 - Level 2 – Overview of connections generally sound condition



Photo 10 - Level 2- magnified coating deterioration noted otherwise sound field view of photo 9



Photo 11 - Level 2 – generally in sound condition with signs of water ingress observed.

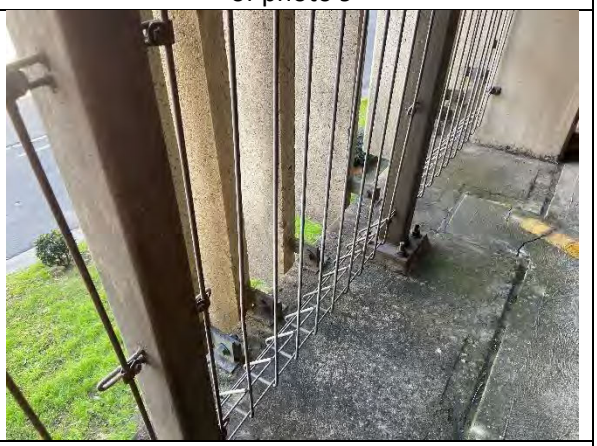
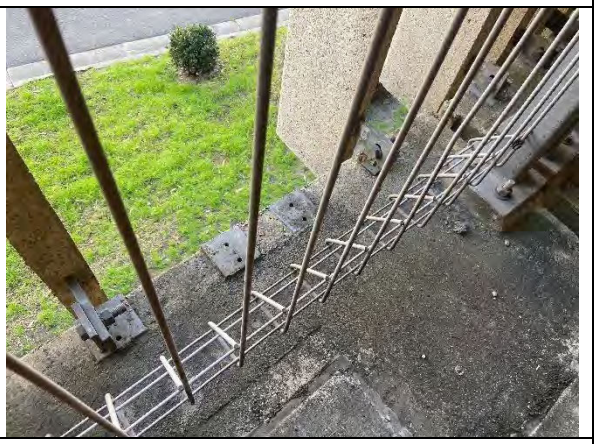


Photo 12 - Level 2- presence of a continuous overview of connection and edge of T Beam below, cracking noted along edge

	
Photo 13 - Level 2 – close up view of crack across edge of T beam shown in photo 12	Photo 14 - Level 2 – close up of photo 13
	
Photo 15 - Level 2- close up view of bolt connection, coating deterioration noted otherwise sound	Photo 16 - Level 2 – removed wings, connections are sound, unknown reason for removal

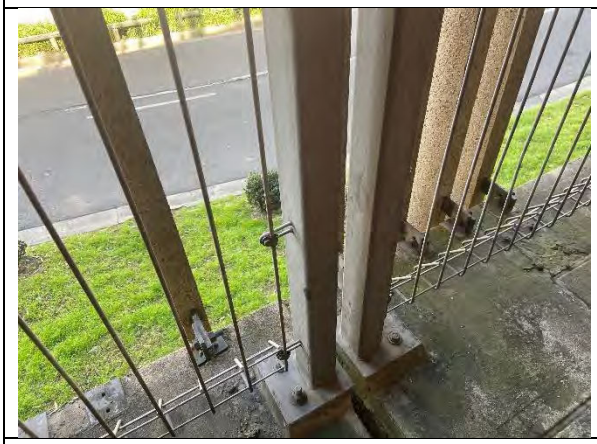
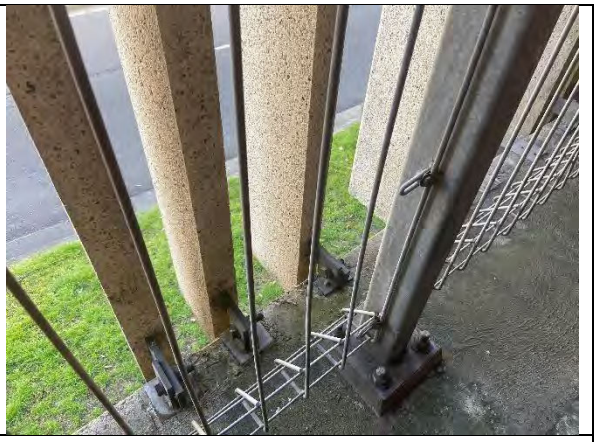



Photo 17 - Level 2 — generally in sound condition of connections	Photo 18 - Level 2 –Signs of water along the movement joint above

	
Photo 19 - Level 2 – same as photo 16 - deleted	Photo 20 - Level 2-– generally sound condition

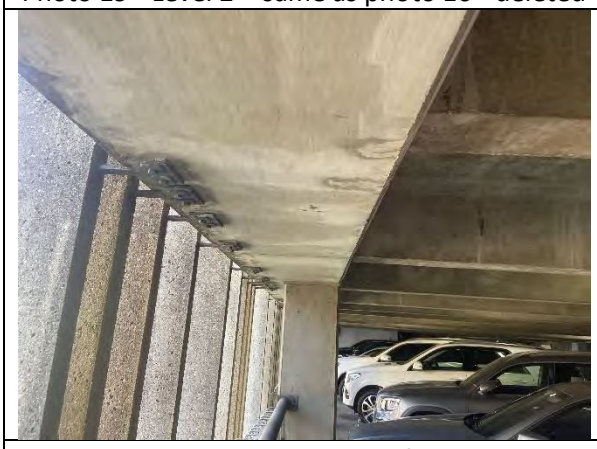



Photo 21 - Level 2- presence of minor water ingress. Generally, in sound condition	Photo 22 – removed wings, reason unknown. Connections appear to be fine

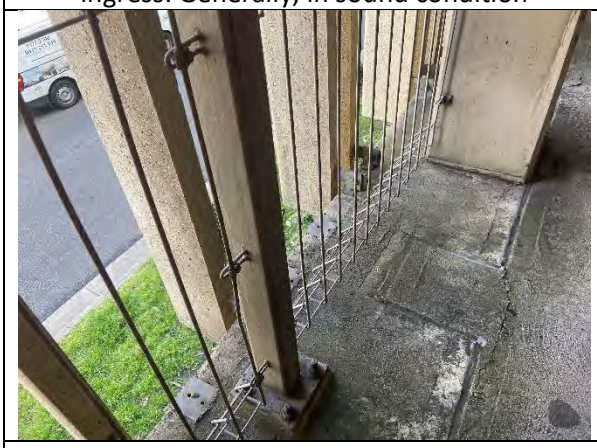
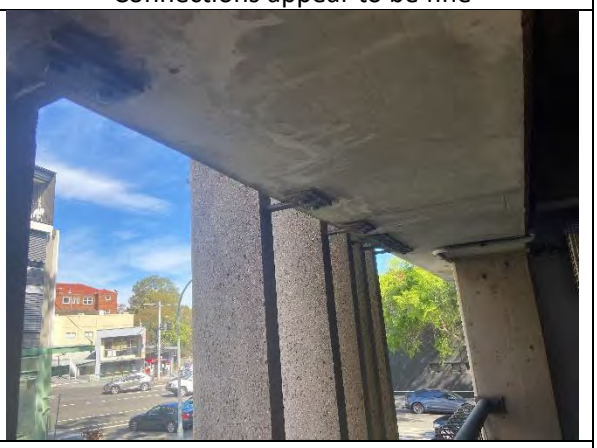

	

Photo 23 – crack observed across edge of T beam	Photo 24 – overview, generally in sound condition

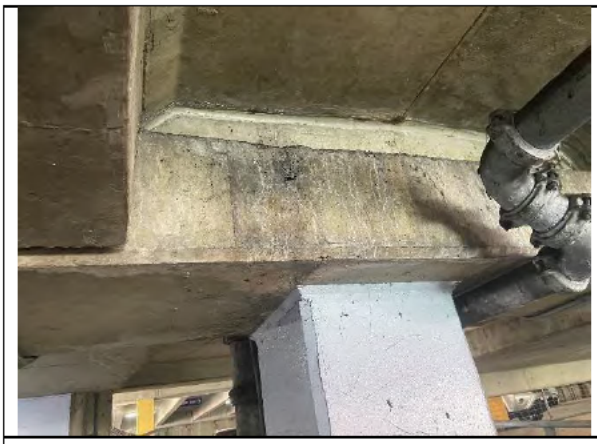


Photo 25 – overview of beam, water staining observed



Photo 26 – generally in sound condition



Photo 27 – water ingress below ramps



Photo 28 – overview, water ingress otherwise sound



Photo 29 – water staining, a small isolated spalling



Photo 30 – water staining. Painted column generally in the good condition



Photo 31 - Level 2- of bolted connection along joint, generally sound

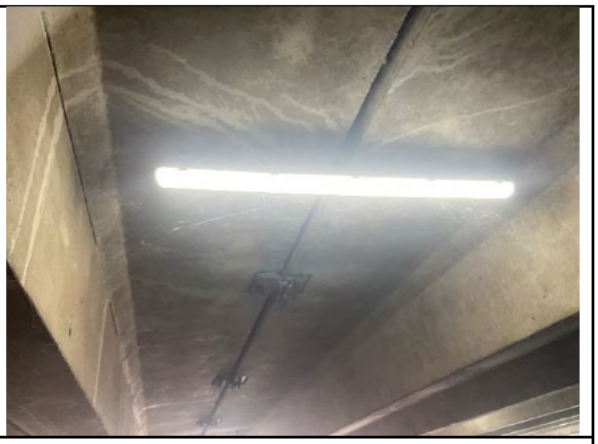


Photo 32 - Level 2- overview of water staining and bolted connections along joint

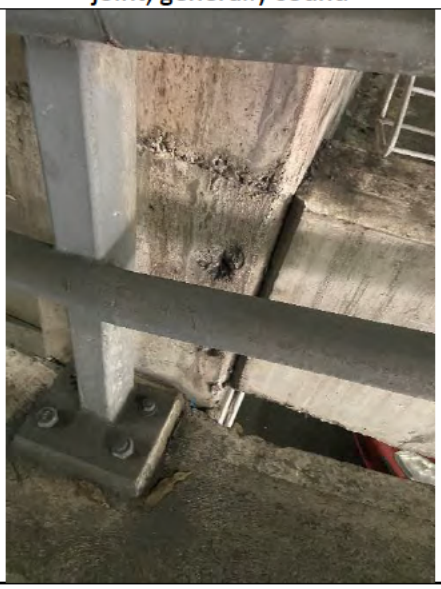


Photo 33 - Level 2- overview of water staining with evidence of spalling due to low cover



Photo 34 - Level 2- overview of water staining with evidence of spalling due to old embedded pipes and connections



Photo 35 - Level 2- water ingress, corrosion staining, and spalling observed



Photo 36 - Level 2- water staining, generally sound



Photo 37 - Level 2- beams in generally sound condition, signs of water ingress noted



Photo 38 - Level 2- localised spalling along edge of



Photo 39 - Level 2- impact damage and exposed reinforcement with surface corrosions



Photo 40 - Level 2- close up of photo 39

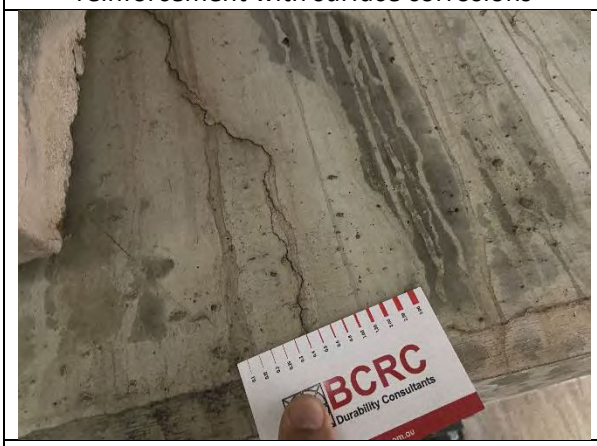


Photo 41 - Level 2- vertical crack along beam between 0.4mm wide

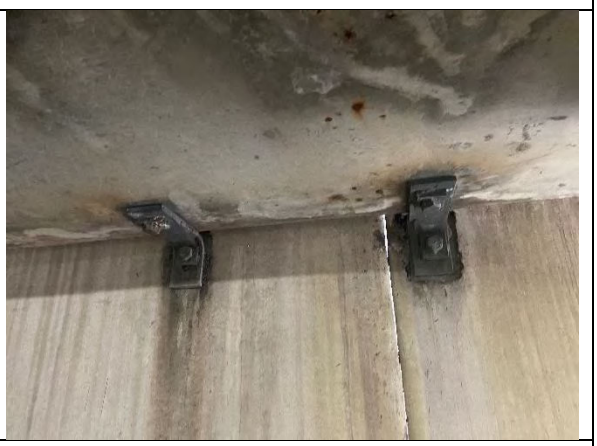


Photo 42 - Level 2- connection from precast walls to slab, coating deterioration noted otherwise sound .

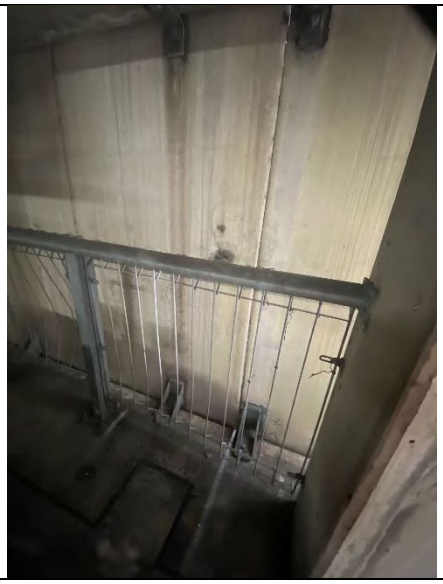


Photo 43 - Level 2- overview of wall and connections

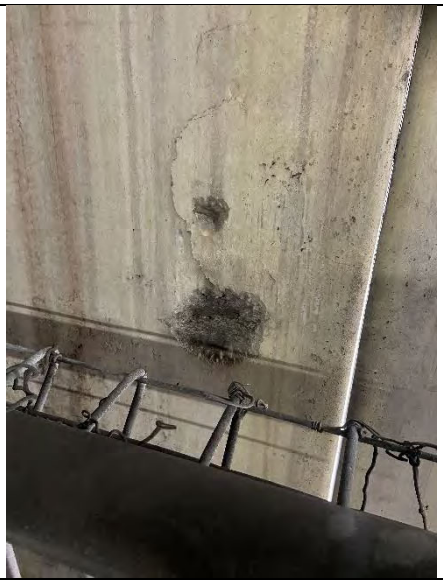


Photo 44 - Level 2- close up view spalled concrete along wall



Photo 45 - Level 2- localised spalling along precast wall



Photo 46 - Level 2- cracks and spalling with evidence of corrosion on the exposed reinforcement



Photo 47 - Level 2- localised spalling and exposed corroding reinforcement



Photo 48 - Level 2- water and corrosion staining, but generally in good condition, coating to be repalced

	
Photo 49 - Level 2- spalling damage in two regions with presence of corrosion on the exposed reinforcement	Photo 50 - Level 2- spalling and presence of corrosion staining
	
Photo 51 - Level 2- water ingress at the wall, coating deterioration noted otherwise sound	Photo 52 - Level 2- spalling damage with presence of corrosion on the exposed reinforcement
	
Photo 53 - Level 2- corrosion and staining on two localised regions on the wall	Photo 54 - Level 2- unknown reason for voids through wall and staining of embedded metallic

	
Photo 55 - Level 2- close up of photo 54	Photo 56 - Level 2- corrosion of exposed reinforcement at the top corner
	
Photo 57 - Level 2- close up of corrosion of exposed reinforcement	Photo 58 - Level 2- overview of connections, generally good condition
	
Photo 59 - Level 2- localised corrosion staining observed	Photo 60 - Level 2- long crack within the wall

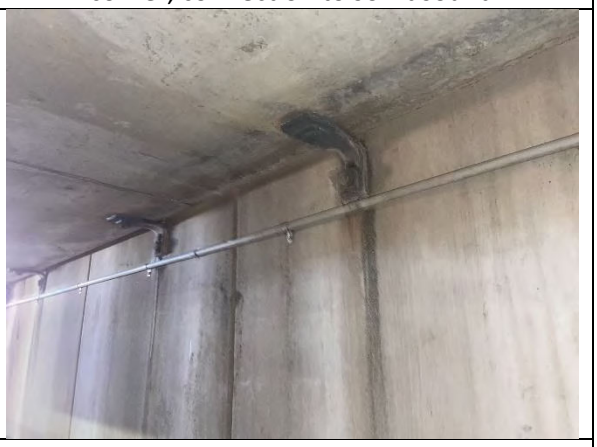
	
Photo 61 - Level 2- close of of connections generally sound condition	Photo 62 - Level 2- water ingress along the wall corner
	
Photo 63 - Level 2- water ingress along the wall corner, generally sound	Photo 64 - Level 2- water ingress along the wall corner, connection to soffit sound
	
Photo 65 - Level 2- generally sound condition o connections	Photo 66 - Level 2- vernally sound connection to soffit

	
Photo 67 - Level 2- spalling damage in two regions with presence of corrosion staining	Photo 68 - Level 2- localised spalling damage and exposed reinforcement
	
Photo 69 - Level 2- localised spalling damage with minor corrosion staining	Photo 70 - Level 2- same as 67 - deleted

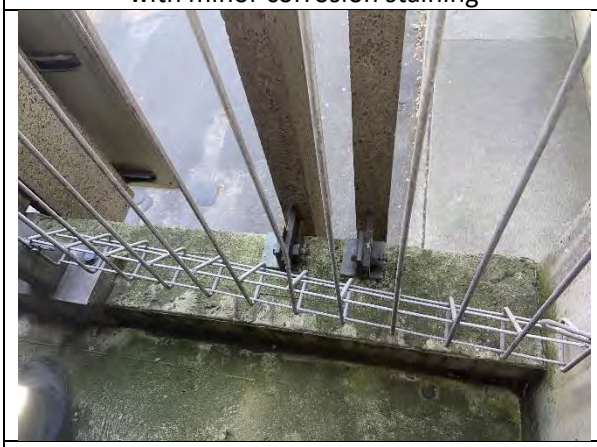



Photo 71 - Level 2- connection to wings, generally sound	Photo 72 - Level 2- connection to soffit, generally sound

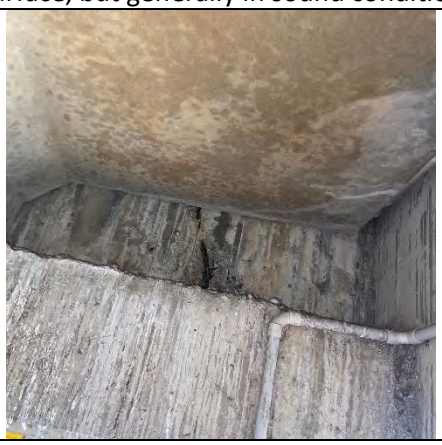
	
Photo 73 - Level 2- water staining	Photo 74 - Level 2- green deposits on the surface, but generally in sound condition
	
Photo 75 - Level 2- connections to beam soffit generally sound	Photo 76 - Level 2- spalling, exposed reinforcement, with presence of water and corrosion staining on the beam
	
Photo 77 - Level 2- exposed corroding reinforcement will low concrete cover	Photo 78 - Level 2- surface cracking and presence of water staining

	
Photo 79 - Level 2- abrasion of floor with exposed reinforcements, low concrete cover	Photo 80 - Level 2- generally sound condition edge of ramp

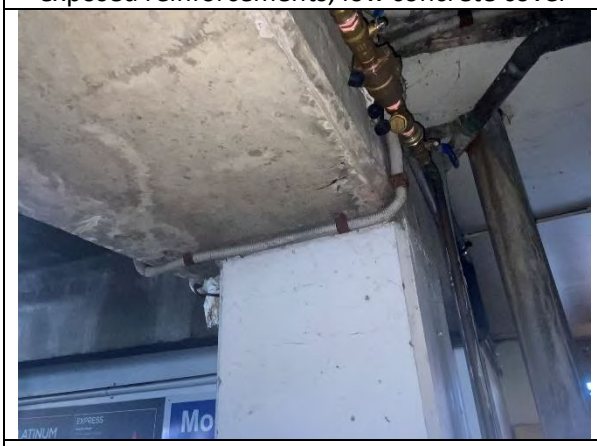



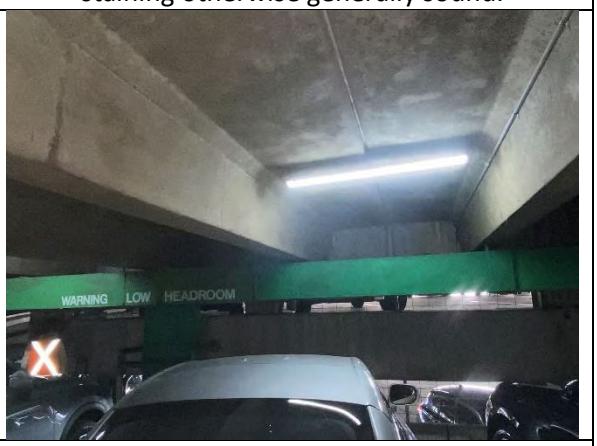
Photo 81 - Level 2- generally sound concrete	Photo 82 - Level 2- overview of beams, water staining otherwise generally sound.
	
Photo 83 - Level 2- crack with efflorescence noted	Photo 84 - Level 2- generally sound dry condition

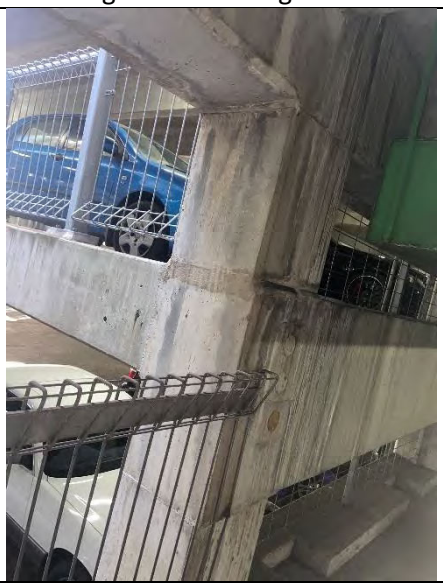
	
Photo 85 - Level 2- generally sound dry condition	Photo 86 - Level 2- generally sound dry condition
	
Photo 87 - Level 2- generally sound condition with signs of water staining	Photo 88 - Level 2- generally sound condition with signs of water ingress noted
	
Photo 89 - Level 2- spalling damage and cracking in one edge of the wall, with sign of water ingress.	Photo 90 - Level 2- generally sound condition with signs of water ingress

	
Photo 91 - Level 2- spalling and water ingress noted	Photo 92 - Level 2- close up view of the spalling on the wall shown in photo 91
	
Photo 93 - Level 2- spalling with signs of water ingress.	Photo 94 - Level 2- example of poor drainage noted across the site

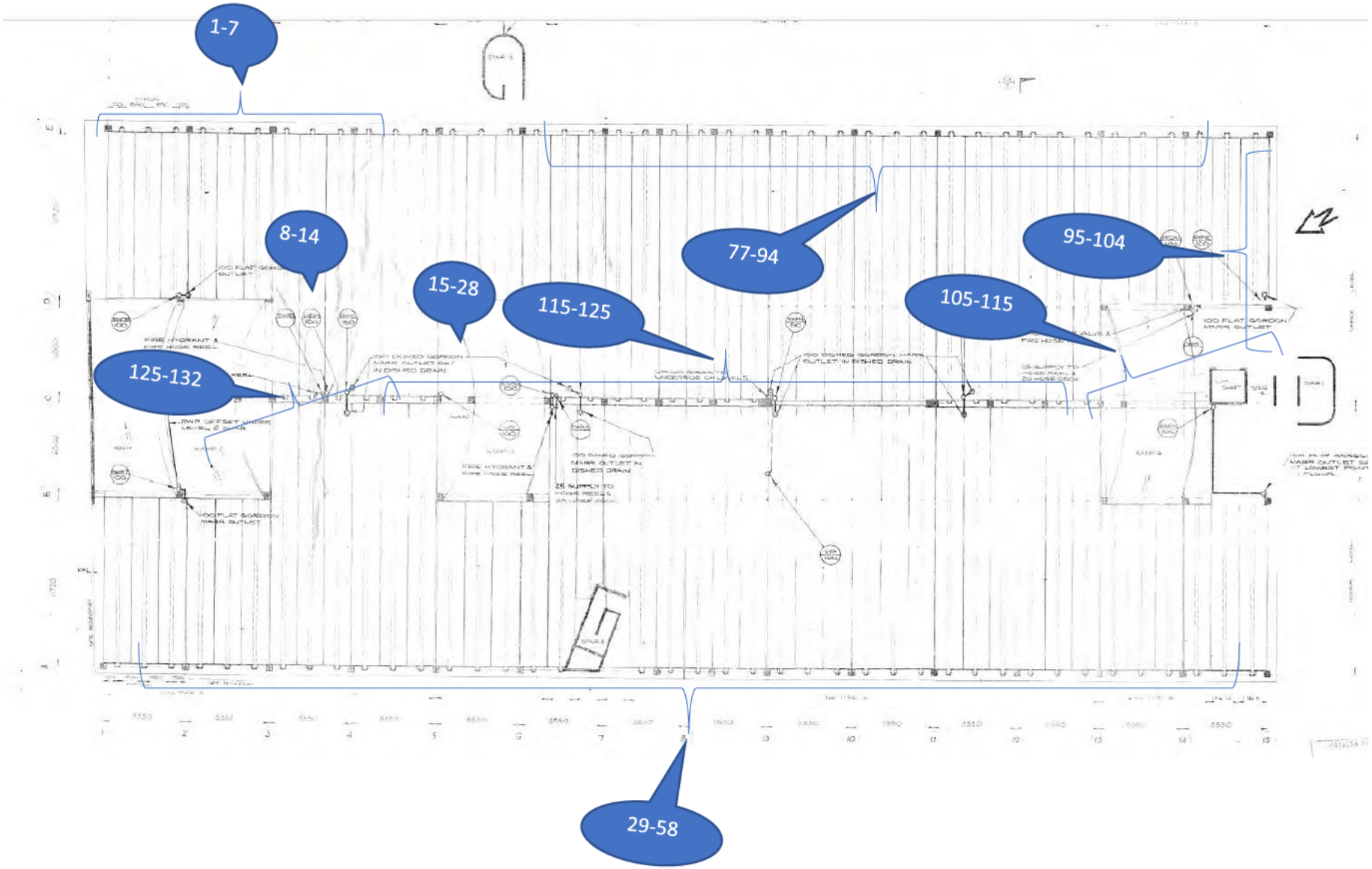

1-7
8-14
15-28
115-125
77-94
95-104
105-115
125-132
29-58

	
Photo 1 - Level 4- generally sound condition	Photo 2 - Level 4 - generally sound condition
	
Photo 3 - Level 4 water ingress	Photo 4 – Level 4- another view of the ceiling with water ingress shown in photo 3.

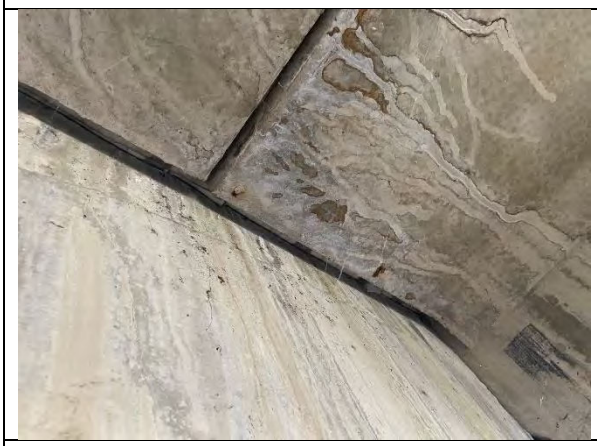
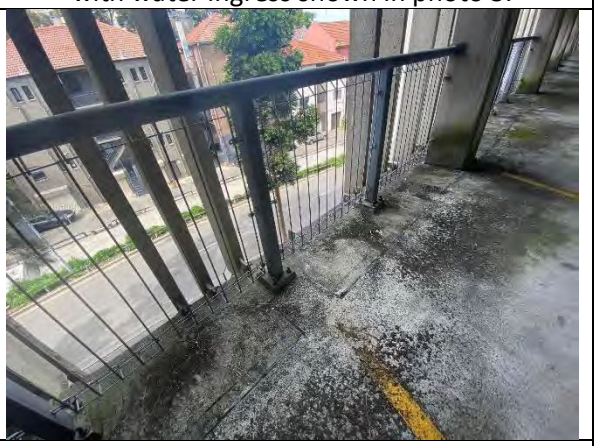

	

Photo 5 - Level 4- Magnified view of the edge of ceiling shown in photo 4, where the water ingress initiated.	Photo 6 - Level 4 – generally sound condition,

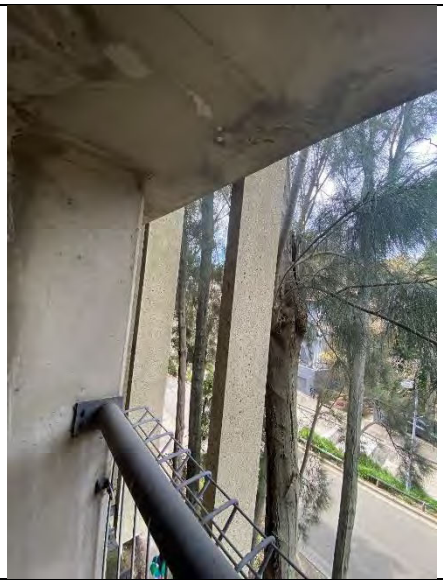


Photo 7 - Level 4 – generally in sound condition	Photo 8 - Level 4 – Presence of water ingress and signs of corrosion might be from reinforcement
	
Photo 9 - Level 4 – localised and exposed corroded reinforcement	Photo 10 - Level 4- magnified view of photo 9
	
Photo 11 - Level 4 – water ingress and signs of efflorescence	Photo 12 - Level 4-close up of photo spalling evident on the edge of ceiling

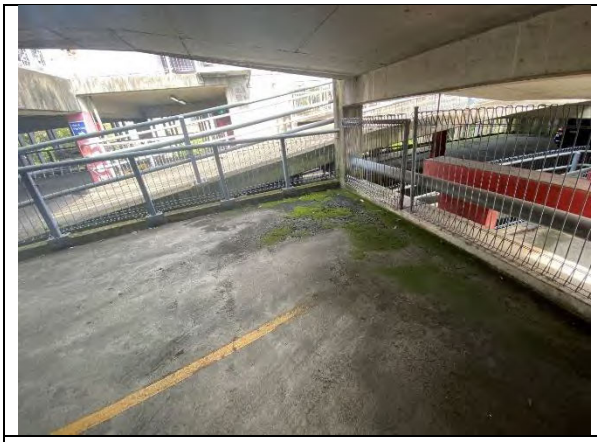


Photo 13 - Level 4 – overview showing evidence pooling of water, poor falls and drainage of water



Photo 14 - Level 4 – generally in sound condition, with evidence of slight water ingress



Photo 15 - Level 4- underside view of location shown in photo 14.



Photo 16 - Level 4 – presence of cracking. Crack width was measured to be less than 0.4mm (

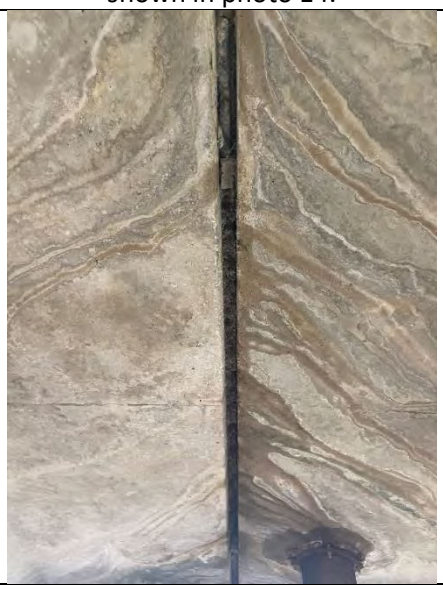


Photo 17 - Level 4 –water ingress region on the ceiling



Photo 18 - Level 4 – water ingress region on the ceiling

	
Photo 19 - Level 4 – exposed delaminated area corroded reinforcement on the surface	Photo 20 - Level 4- magnified view of corroded
	
Photo 21 - Level 4- drainage of joint with no down pipe	Photo 22 – magnified view of photo 21 at the location of cracking
	
Photo 23 – Water ingress	Photo 24 – Spalling at the ceiling edge, water and corrosion staining

	
Photo 25 –spalling damage and corrosion of exposed reinforcement and significant deterioration of beam edge	Photo 26 – Water ingress and spalling noted
	
Photo 27 – spalling damage and corroded exposed reinforcement	Photo 28 – spalled edge of beam
	

Photo 29 – generally in sound condition	Photo 30 – spalling damage and corrosion of exposed reinforcement observed along edge f beam

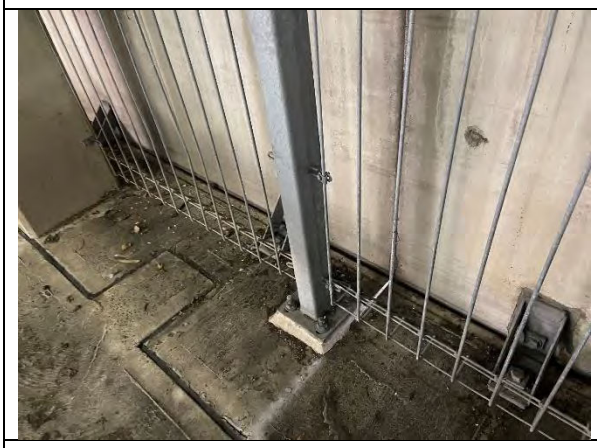



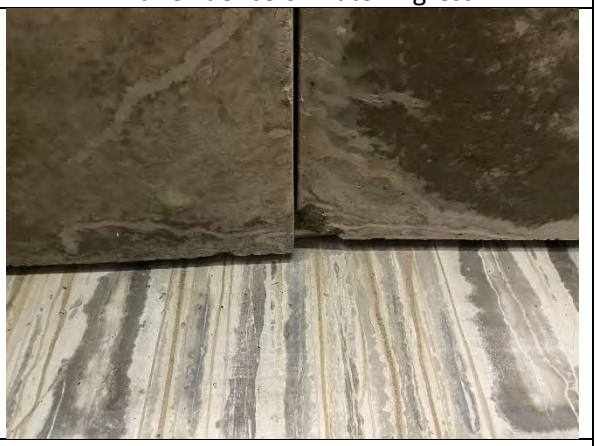
Photo 31 - Level 4- localised spalling on the side wall. Generally, in sound condition	Photo 32 - Level 4- spalling on the edge of slab, with evidence of water ingress
	
Photo 33 - Level 4- water ingress, with a small localised spalling area on the ceiling joint edge	Photo 34 - Level 4- magnified view of photo 33 at the spalled region.
	
Photo 35 - Level 4- water ingress and corrosion staining, with presence of spalled region (8719)	Photo 36 - Level 4- magnified view of spalled region in photo 35

	
Photo 37 - Level 4- exposed reinforcements noted alonf edge of T beam	Photo 38 - Level 4- close up
	
Photo 39 - Level 4- exposed reinforcements noted along edge of beam	Photo 40 - Level 4- Exposed reinforcement with significant corrosion (8729)
	
Photo 41 - Level 4- water ingress and corrosion staining	Photo 42 - Level 4- water ingress and corrosion staining initiated from corroded reinforcement

	
Photo 43 - Level 4- spalling and exposed reinforcement observed	Photo 44 - Level 4- spalling damage on the surface
	
Photo 45 - Level 4- generally in sound condition, with only a small, spalled region	Photo 46 - Level 4- magnified view of spalled region in photo 45

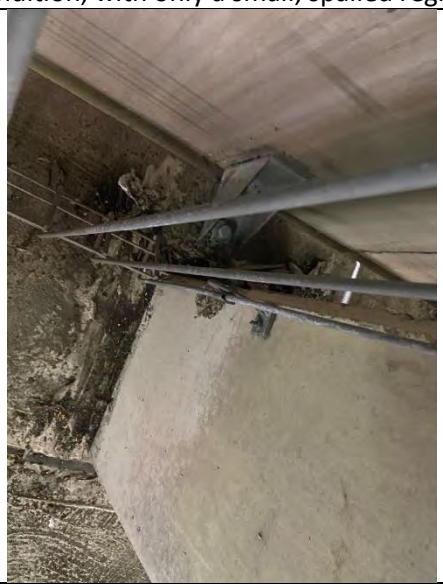
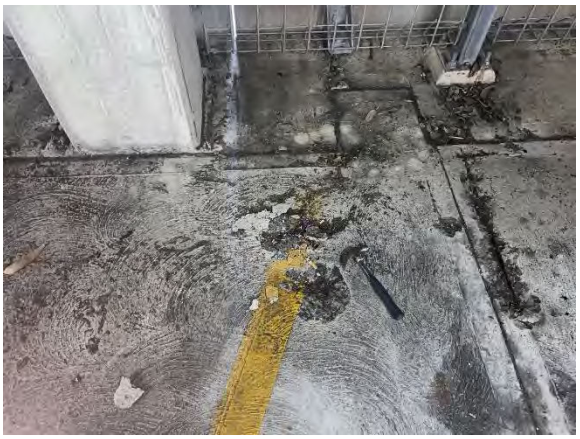

	

Photo 47 - Level 4- connection generally sound condition (	Photo 48 - Level 4- Surface spalled region, but generally in good condition

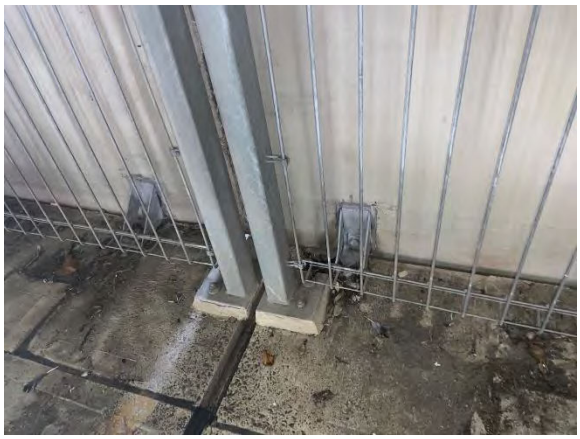


Photo 49 - Level 4- generally sound condition	Photo 50 - Level 4- spalling and exposed corroded reinforcement observed (8750)

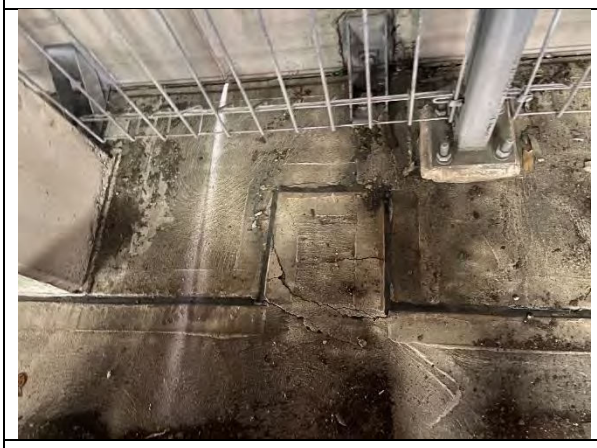
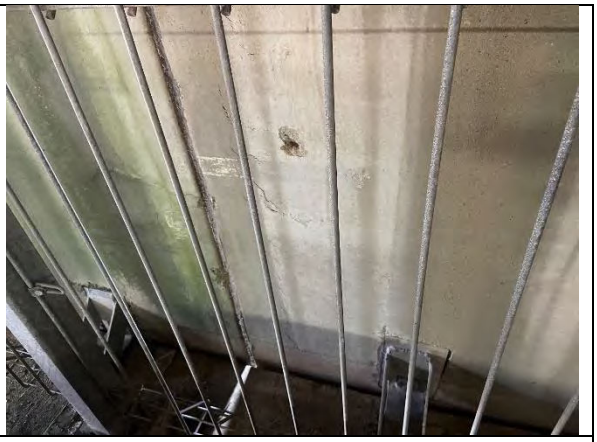



Photo 51 - Level 4- cracked egde of T beam below	Photo 52 - Level 4- water ingress and longitudinal cracking on the ceiling with effloresce
	
Photo 53 - Level 4- water ingress and corrosion staining with evidence of cracking on ceiling	Photo 54 - Level 4- generally sound condition (8758)

	
Photo 55 - Level 4- small spalled, but generally sound condition	Photo 56 - Level 4- small localised spalling with exposed corroded reinforcement (8761)

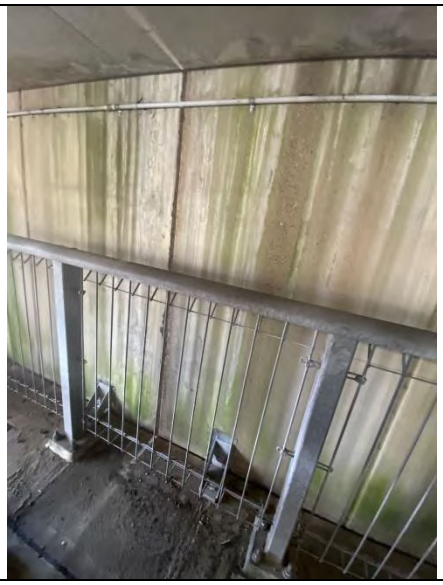
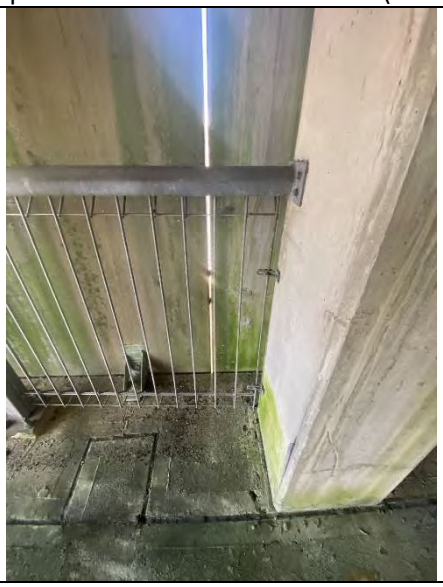

	

Photo 57 - Level 4- sound condition of connections	Photo 58 - Level 4- generally sound condition,

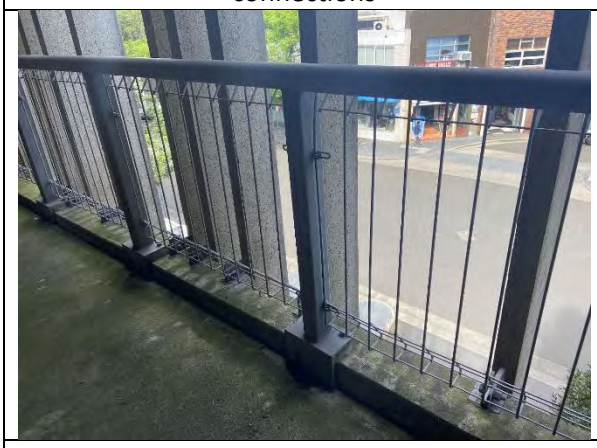



Photo 59 - Level 4- generally sound condition	Photo 60 - Level 4- presence of a longitudinal cracking at the edge of slabs on ceiling

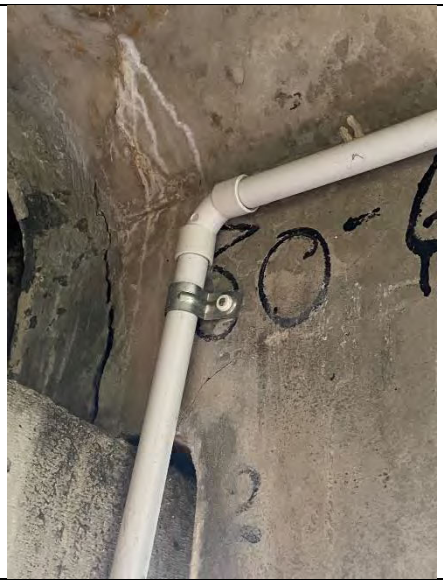
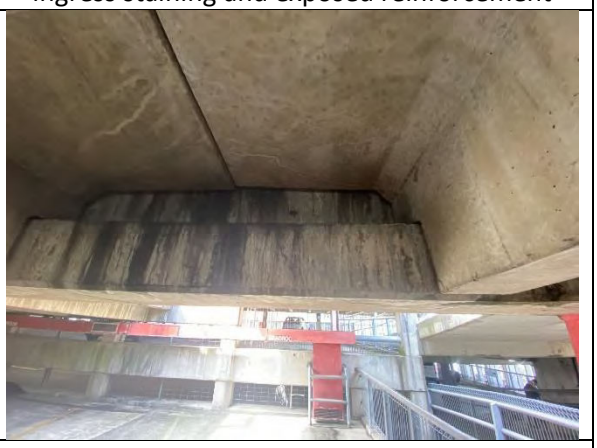


Photo 61 - Level 4- significant cracking on the edge of beam due to corroding reinforcement	Photo 62 - Level 4- water ingress and corrosion staining
	
Photo 63 - Level 4- water ingress	Photo 64 - Level 4- magnified view of water ingress staining and exposed reinforcement
	
Photo 65 - Level 4- water ingress and corrosion staining with some efflorescence	Photo 66 - Level 4- water ingress and corrosion staining with slight efflorescence

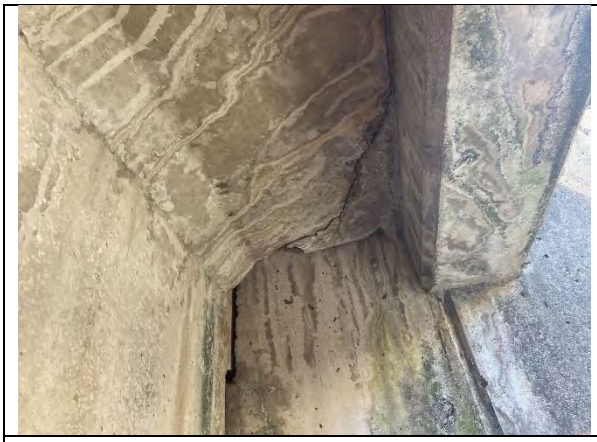


Photo 67 - Level 4- significant spalling along edg of beam	Photo 68 - Level 4- water ingress and corrosion staining with efflorescence (8797)
	
Photo 69 - Level 4- significant spalling, with exposed reinforcement in the corroded condition at the spalled region	Photo 70 - Level 4- water ingress
	
Photo 71 - Level 4- Presence of exposed reinforcement in corroded condition at the location of water staining and efflorescence	Photo 72 - Level 4- Exposed corroded reinforcement, with evidence of water ingress

	
Photo 73 - Level 4- Magnified view poor quality voided concrete	Photo 74 - Level 4- Spalled region with exposed corroded reinforcement (8816)
	
Photo 75 - Level 4- magnified view of spalled region and corroded reinforcement shown in photo 74	Photo 76 - Level 4- Spalled region with exposed corroded reinforcement (

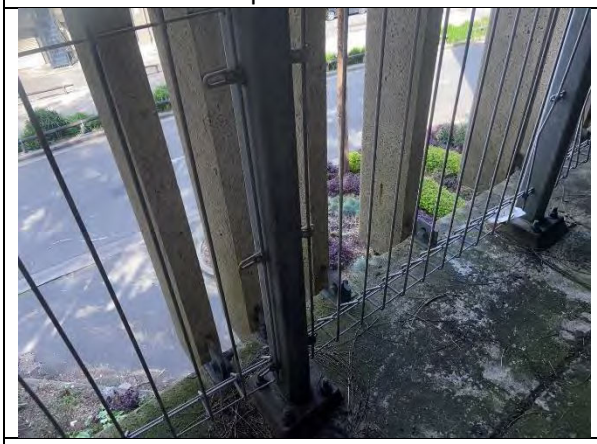



Photo 77 - Level 4- generally sound condition (8823)	Photo 78 - Level 4- Small spalled region

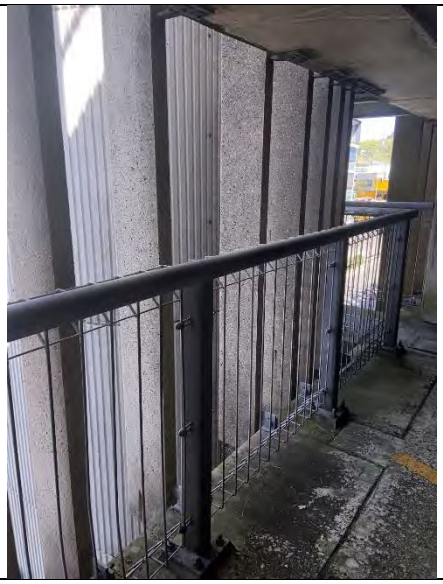


Photo 79 - Level 4- generally sound condition	Photo 80 - Level 4- magnified view of photo 79 showing no evidence of significant damage at the edge
	
Photo 81 - Level 4- showing cracking with presence of spalling at the region inspected	Photo 82 - Level 4- magnified view of spalled region shown in photo 81

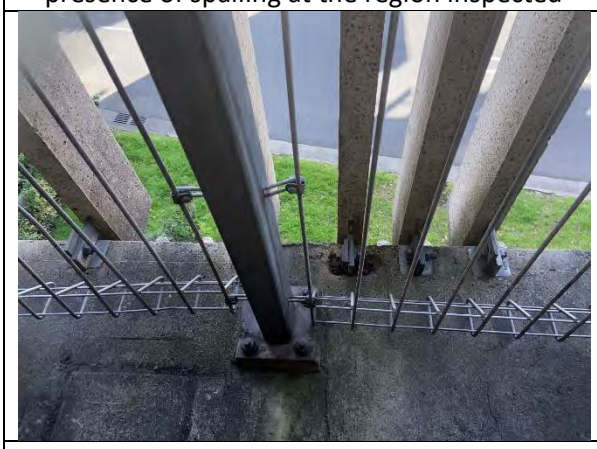



Photo 83 - Level 4-overview of bolts one out of yhe four has loss of section	Photo 84 - Level 4- magnified view of exposed connection with section loss, should be repaired soon, highlight in email

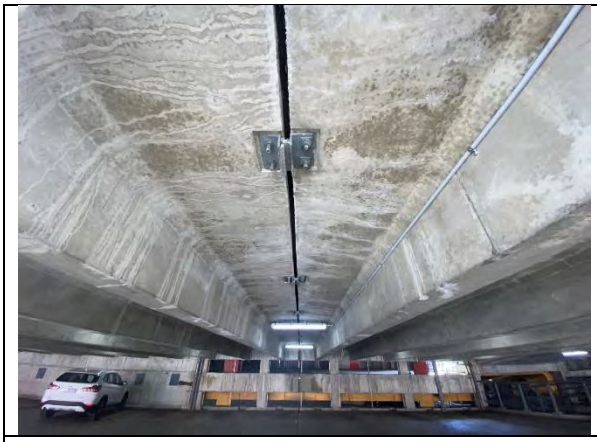


Photo 85 - Level 4- general sound condition of bolted connections across joint,



Photo 86 - Level 4- magnified view of water ingress and efflorescence at joint connection

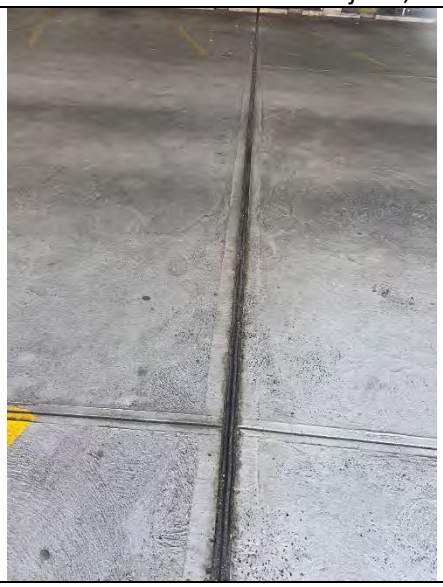


Photo 87 - Level 4- no significant damage within the slab joints



Photo 88 - Level 4- generally sound condition



Photo 89 - Level 4- missing wings and exposed reinforcement



Photo 90 - Level 4- magnified view of exposed reinforcement shown in photo 89

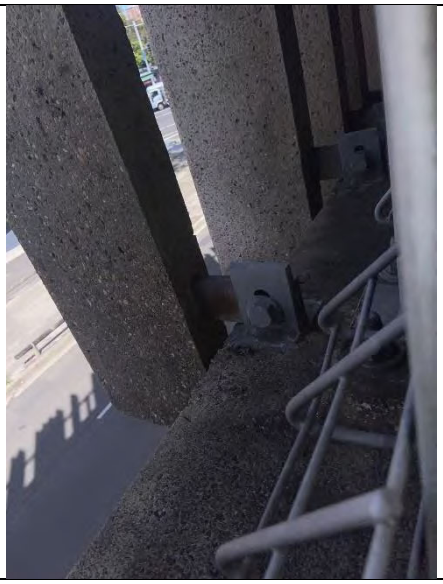
	
Photo 91 - Level 4- surface corrosion of bolt at the connection	Photo 92 - Level 4- generally sound condition some surface staining
	
Photo 93 - Level 4- spalling damage noted	Photo 94 - Level 4- magnified view of spalled region shown in photo 93



Photo 95 - Level 4- exposed reinforcement at due to low cover and abrasion

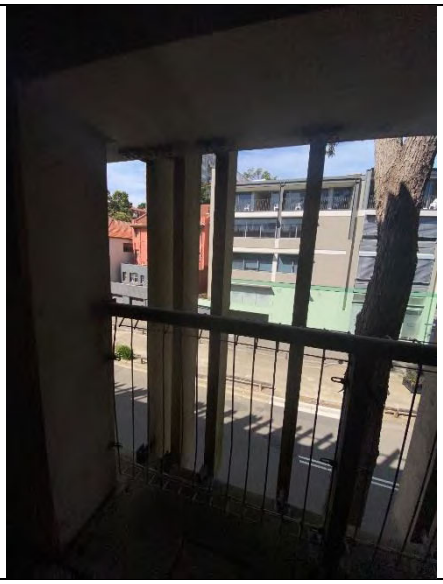


Photo 96 - Level 4- overview



Photo 97 - Level 4- view of surface corrosion of connection of sign



Photo 98 - Level 4- edge spall region present at the outer surface of wing, not due to carrion but not due to corrosion



Photo 99 - Level 4- corrosion staining at the exposed reinforcement with presence of water ingress



Photo 100 - Level 4- water staining and surface corroded bolt connection observed



Photo 101 - Level 4- generally sound condition



Photo 102 - Level 4- water ingress and corrosion staining, with presence of exposed reinforcement at the tube connection

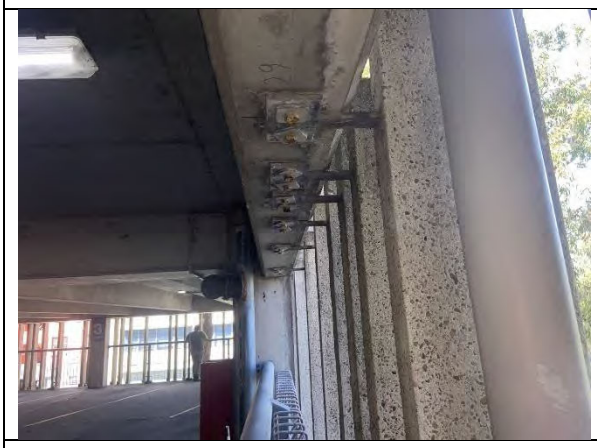


Photo 103 - Level 4- general corrosion on the bolt connection, surface corrosion



Photo 104 - Level 4- exposed reinforcement with corrosion staining adjacent to the rebar, with presence of efflorescence



Photo 105 - Level 4- general condition

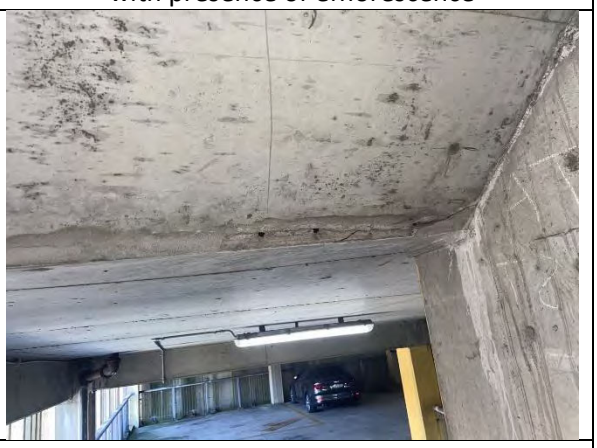
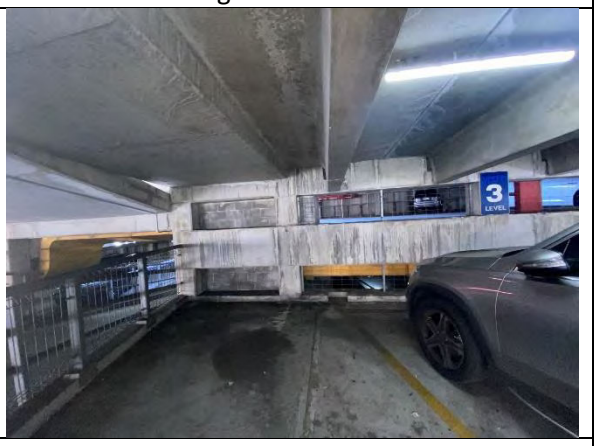


Photo 106 - Level 4- previous repair along edge

	
Photo 107 - Level 4- exposed corroded reinforcement	Photo 108 - Level 4- exposed corroded reinforcement observed
	
Photo 109 - Level 4- two long exposed reinforcement with corrosion through the slab, with presence of water ingress	Photo 110 - Level 4- water ingress and corrosion staining
	
Photo 111 - Level 4- spalling damage at the edge of slab observed	Photo 112 - Level 4- exposed corroded reinforcement observed

	
Photo 113 - Level 4- exposed reinforcement at the spalled region observed with presence of water ingress	Photo 114 - Level 4- magnified view of spalled region with two exposed corroded enforcement shown in photo 113
	
Photo 115 - Level 4- spalling damage, with exposed corroded reinforcement at the spalled region	Photo 116 - Level 4- magnified view of exposed corroded reinforcement
	

Photo 117 - Level 4- exposed corroded service at the boundary of repaired region	Photo 118 - Level 4- water ingress but generally in good condition
	
Photo 119 - Level 4- exposed reinforcement along edge of beam	Photo 120 - Level 4- water ingress, but generally sound condition

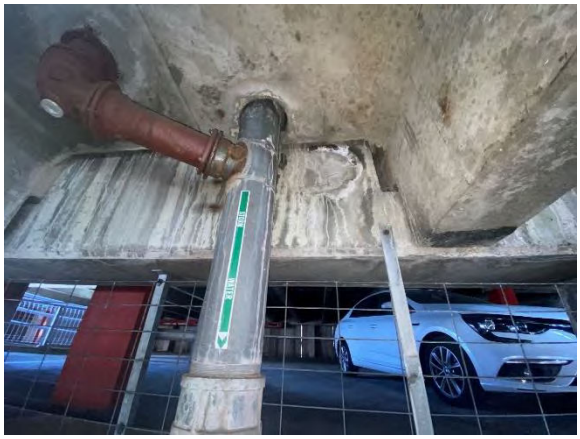
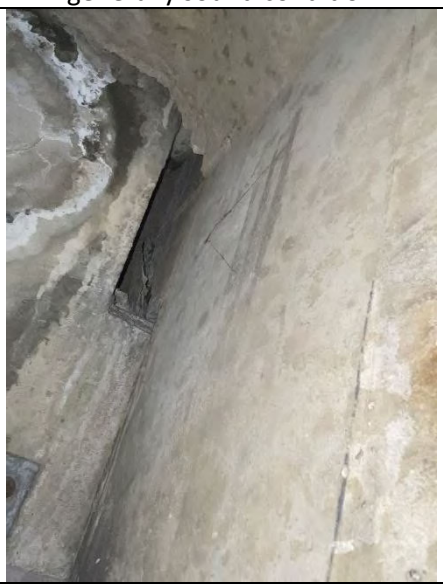

	

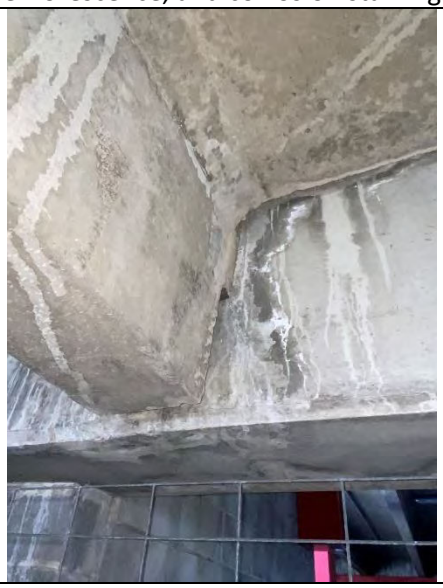
Photo 121 - Level 4- water ingress, efflorescence, and corrosion staining	Photo 122 - Level 4- Efflorescence and water staining
	

Photo 123 - Level 4- water staining and efflorescence observed	Photo 124 - Level 4- spalling damage at the edge of slab
	
Photo 125 - Level 4- magnified view of spalled region	Photo 126 - Level 4- water staining with slight spalling
	
Photo 127 - Level 4- water ingress	Photo 128 - Level 4- water ingress

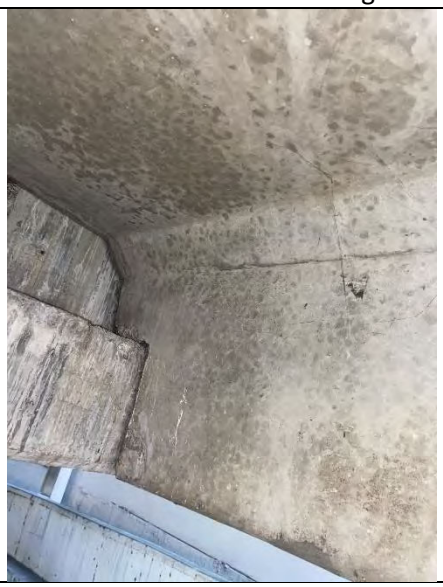
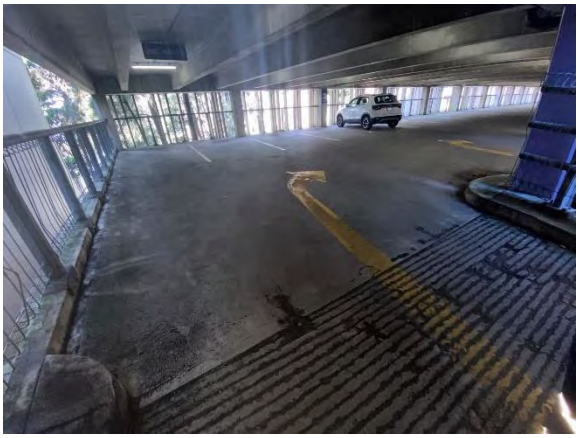
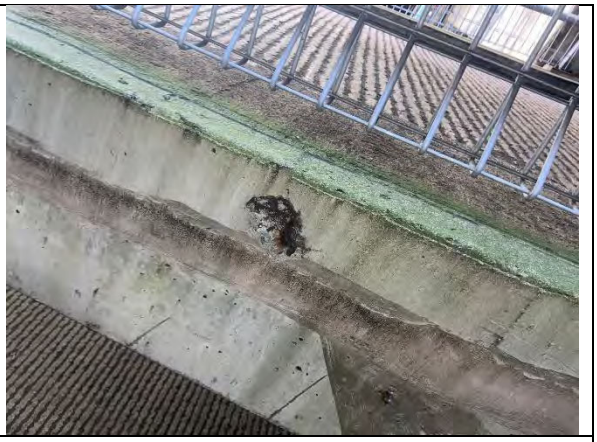
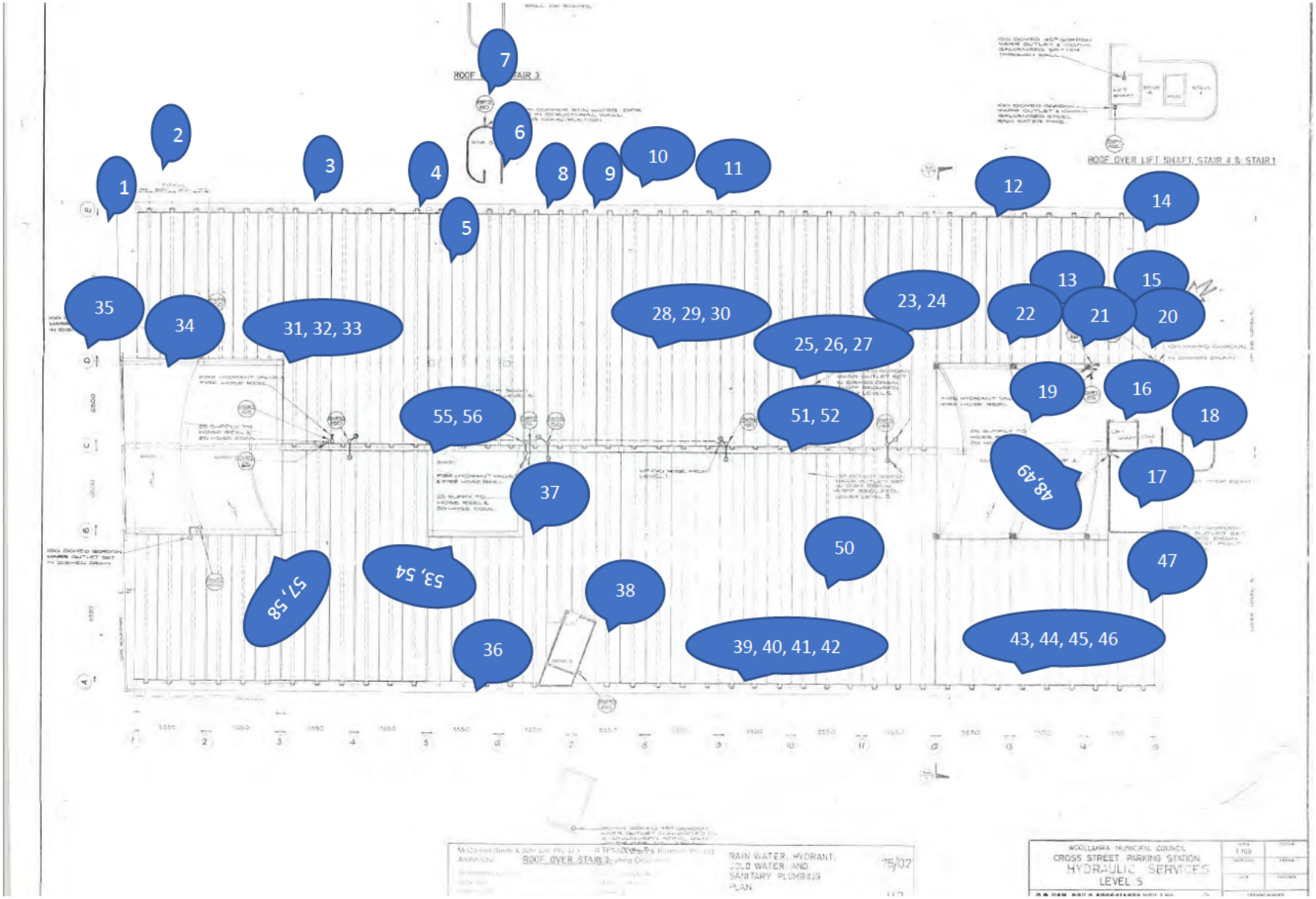

	

Photo 129 - Level 4- generally sound	Photo 130 - Level 4- generally sound condition (8947)

	
Photo 131 - Level 4- small, spalled region with exposed corroded reinforcement	Photo 132 - Level 4- magnified view of spalled region shown in photo 131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57, 58
ROOF OVER LIFT SHAFT, STAIR 4 & STAIR 1
ROOF OVER STAIR 3
RAIN WATER, HYDRANT, COLD WATER AND SANITARY PLUMBING PLAN
WOOLLAHRA MUNICIPAL COUNCIL
CROSS STREET PARKING STATION
HYDRAULIC SERVICES
LEVEL 5

	
Photo 1 - Level 5- overview	Photo 2 - Level 5 – surface corrosion of bolts
	
Photo 3 - Level 5 – slabs generally appeared to be in sound condition	Photo 4 – Level 5- corrosion underneath the plate connection
	
Photo 5 - Level 5- Corrosion of galvanised nut and the plate connection (loc.1 dwg) p.8275	Photo 6 - Level 5 – Corrosion of galvanised nut and the plate connection

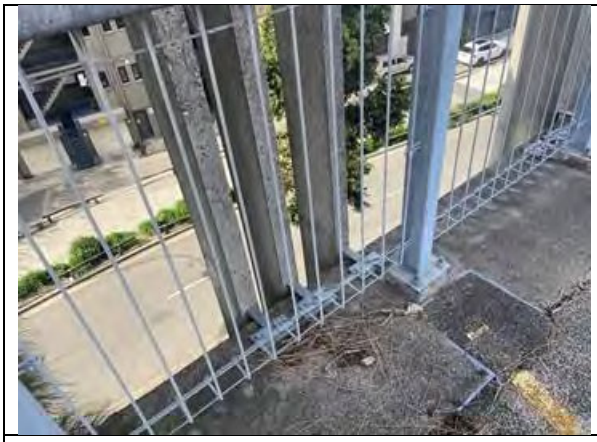


Photo 7 - Level 5 – presence of cracking and spalling on the slab near the columns (location 3) p.8282



Photo 8 - Level 5 – Corrosion of galvanised nut and the underneath plate connection



Photo 9 - Level 5 – Corrosion of galvanised nut and the underneath plate connection



Photo 10 - Level 5- significant corrosion, loss of bolt and corroded washer (loc.4 dwg)



Photo 11 - Level 5 – magnified view of phot 10 significant corrosion, loss of bolt and corroded washer.

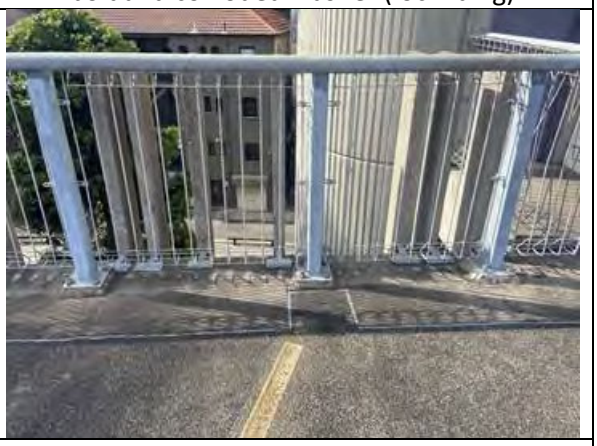
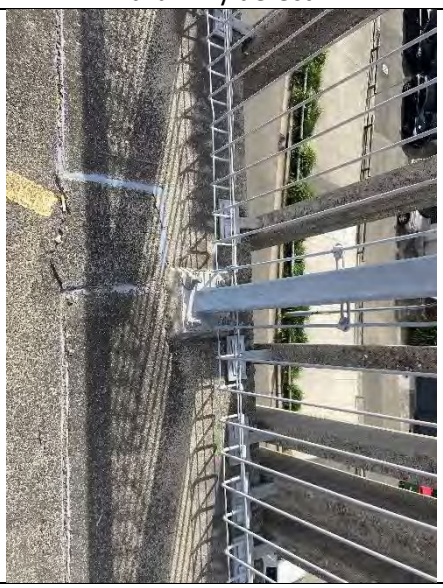


Photo 12 - Level 5- deformation issue on guardrail (loc.5 dwg)

	
Photo 13 - Level 5 – close up of connection, generally sound	Photo 14 - Level 5 – generally sound path to exit
	
Photo 15 - Level 5- 1mm crack width at the drummy location	Photo 16 - Level 5 – generally sound
	
Photo 17 - Level 5 – sound	Photo 18 - Level 5 – cracking width over 3mm at the drummy location on the slab, edge of Tbeam below

	
Photo 19 - Level 5 – generally sound condition (loc.9 dwg) (8321)	Photo 20 - Level 5- corrosion staining at one location due to stray metal
	
Photo 21 - Level 5- presence of spalling at the drummy region along edge of beam below	Photo 22 – magnified view of spalled region within drummy region

	
Photo 23 – drummy region noted (loc.11 dwg) 8329	Photo 24 – loss of joint with presence of drummy defect
	
Photo 25 – Cracking and drummy defect on the slab noted. (loc.12 dwg)	Photo 26 – cracking observed, the width was measured to be over 3mm. (loc.13 dwg)

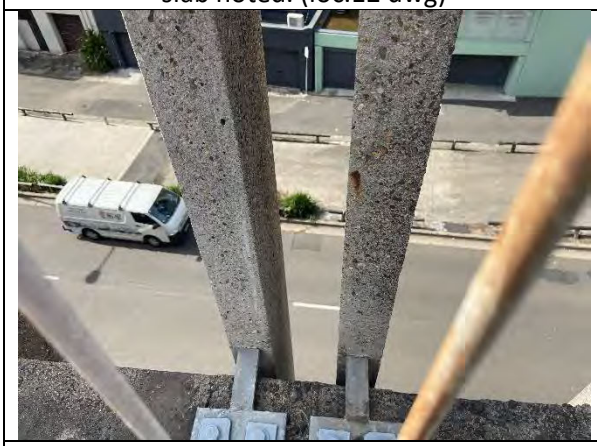
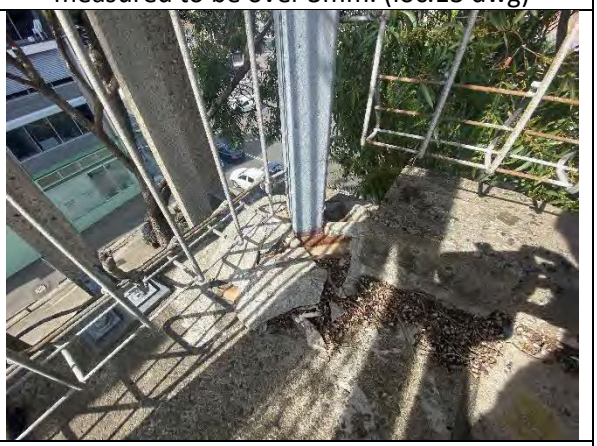

	

Photo 27 –generally in good condition (loc.14 dwg)	Photo 28 – spalling and significant corrosion at the spalled region (loc.15 dwg)



Photo 29 – spalling damage, significant corrosion on plate, at the drummy region(loc.16 dwg)



Photo 30 – magnified view of corroded plate underneath the spalled region shown in p.29.



Photo 31 - Level 5- connection issue in the corner, but generally in sound condition



Photo 32 - Level 5- presence of small spalled region



Photo 33 - Level 5- magnified view of spalled region



Photo 34 - Level 5- non homogeneity of slab due to old repair patch (loc.18 dwg)

	
Photo 35 - Level 5- water staining and efflorescence observed	Photo 36 - Level 5- exposed reinforcement and presence of water ingress at the location of corrosion

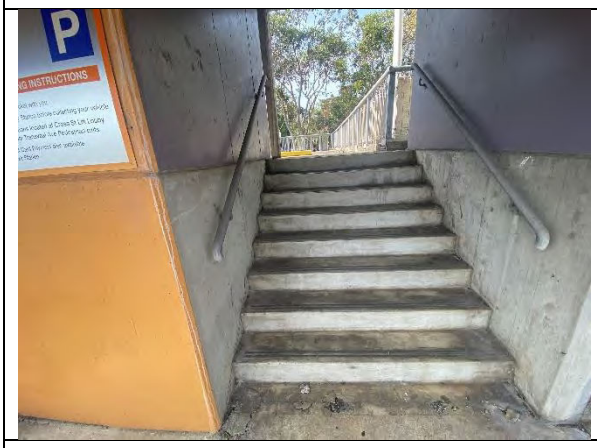
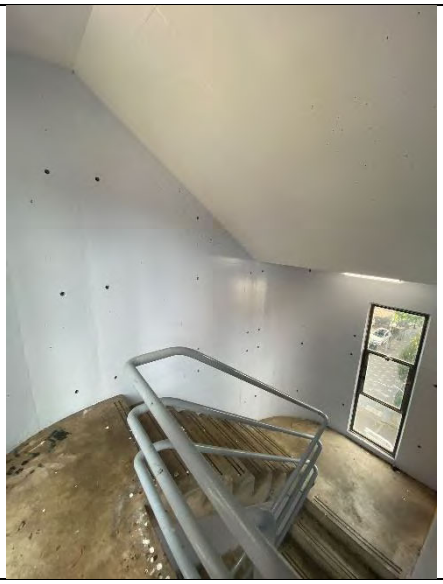



Photo 37 - Level 5- spalling damage on the lower floor of stairs (loc.19 dwg)	Photo 38 - Level 5- spalled region within drummy region shown
	
Photo 39 - Level 5- continuous transverse cracking over the whole cross section of wall	Photo 40 - Level 5- width of cracking was measured to be less than 0.3mm

	
Photo 41 - Level 5- spalling and longitudinal cracking on the ceiling	Photo 42 - Level 5- generally sound (loc.20 dwg)
	
Photo 43 - Level 5- exposed reinforcement with presence of corrosion (loc.21 dwg)	Photo 44 - Level 5- exposed reinforcement with presence of corrosion

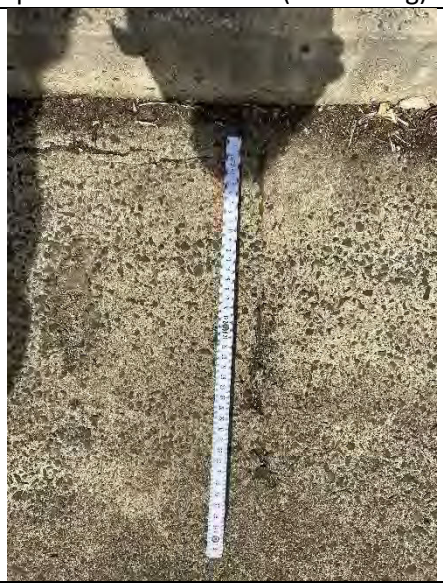



Photo 45 - Level 5- exposed reinforcement with presence of corrosion noted. measured to be approximately 500mm (loc.22 dwg)	Photo 46 - Level 5- exposed reinforcement with presence of corrosion (loc.23 dwg)

	
Photo 47 - Level 5- exposed reinforcement due to abrasion and low cover with presence of corrosion noted. The length was measured to be approximately 500mm	Photo 48 - Level 5- presence of cracking on the slab (loc.24 dwg)
	
Photo 49 - Level 5- magnified view of cracking on the slab	Photo 50 - Level 5- crack width was up to 0.8mm

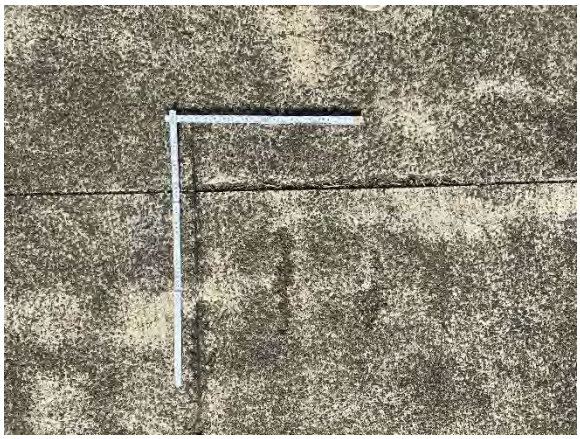


Photo 51 - Level 5- exposed reinforcement on within slab joints noted (loc.25 dwg)	Photo 52 - Level 5- Magnified view of p.51 showing exposed reinforcement (loc.26 dwg)
	
Photo 53 - Level 5- four exposed reinforcement bars were observed on the slab noted (loc.27 dwg)	Photo 54 - Level 5- exposed reinforcement bar (approximately 300mm) observed on the slab (loc.28 dwg)

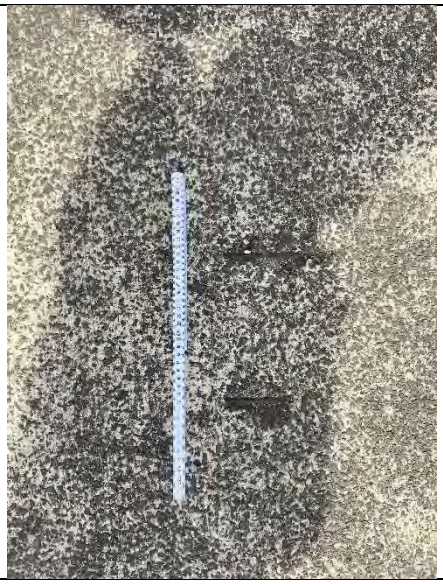
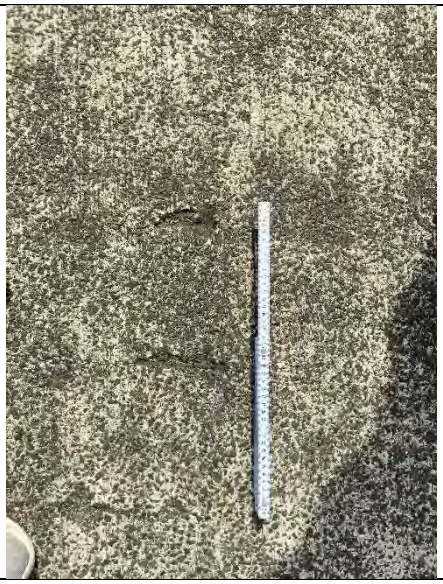
	

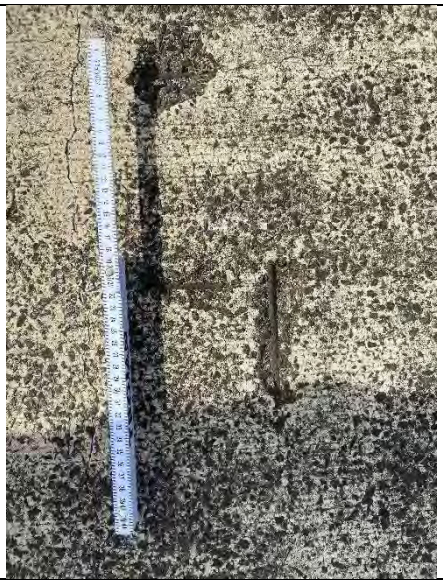
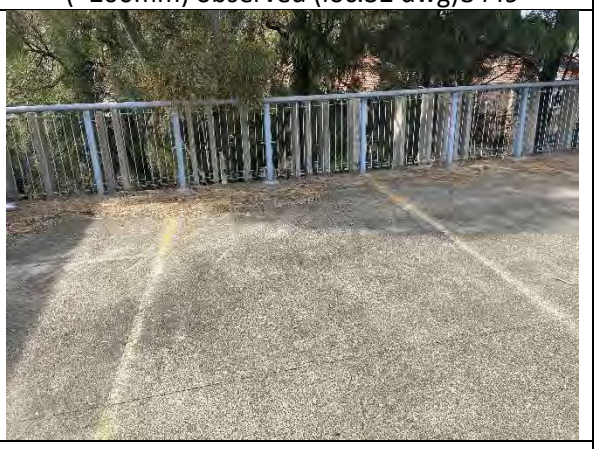
Photo 55 - Level 5- two exposed reinforcement bars were observed on the slab noted (loc.29 dwg)8443	Photo 56 - Level 5- exposed reinforcement bars observed (loc.30 dwg) (8445)
	
Photo 57 - Level 5- exposed reinforcement bar (~200mm) observed (loc.31 dwg)8447	Photo 58 - Level 5- exposed reinforcement bar (~200mm) observed (loc.32 dwg)8449
	
Photo 59 - Level 5- spalling and slab joint issue at the drummy region observed (loc.33 dwg) (	Photo 60 - Level 5- overview of the area inspected (loc.34 dwg)

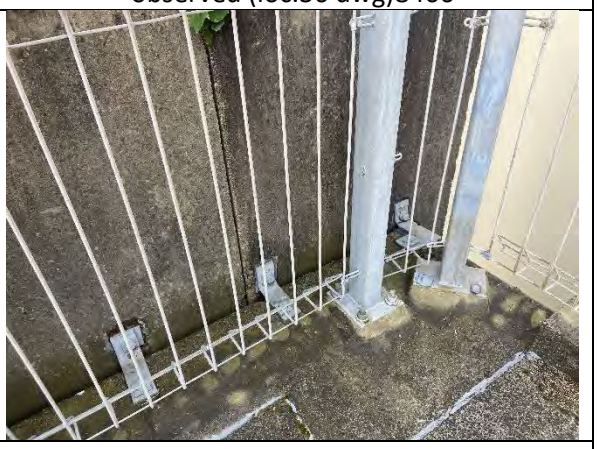
	
Photo 61 - Level 5- slab joint issue noted	Photo 62 - Level 5- exposed reinforcement bar observed (loc.35 dwg)
	
Photo 63 - Level 5- slab joint issue noted	Photo 64 - Level 5- - exposed reinforcement bar observed (loc.36 dwg)8466
	
Photo 65 - Level 5- exposed reinforcement bar observed	Photo 66 - Level 5- overview of the location inspected at the lower floor west side (loc.37 dwg)



Photo 67 - Level 5- corrosion underneath the connection plate noted, otherwise sound

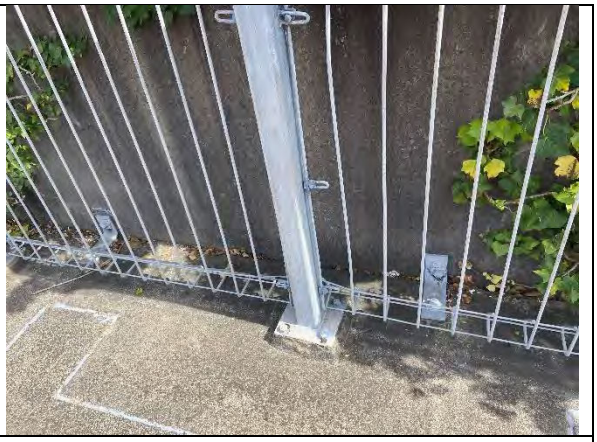


Photo 68 - Level 5- overview of the location inspected with similar issue for coating of plate connection (loc.38 dwg)

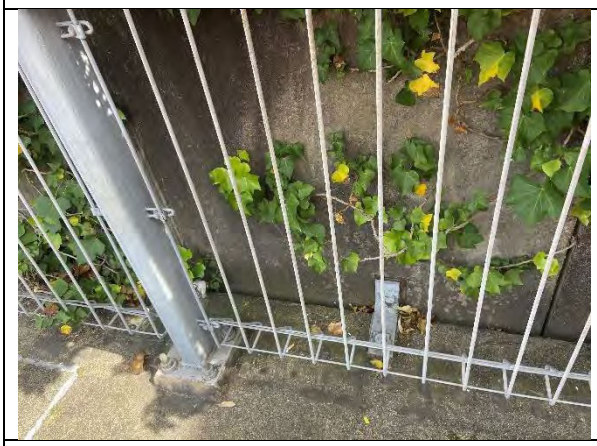


Photo 69 - Level 5- overview of the location inspected

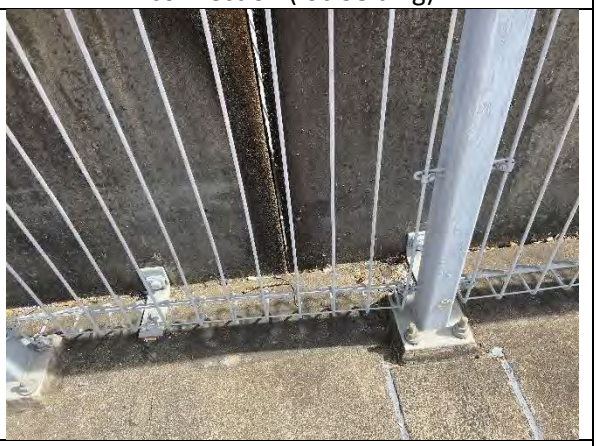


Photo 70 - Level 5- overview of the location inspected with presence of concrete joint issue (loc.39 dwg)



Photo 71 - Level 5- overview



Photo 72 - Level 5- overview



Photo 73 - Level 5- exposed reinforcement with significant corrosion at the spalled region



Photo 74 - Level 5- magnified view of exposed corroded reinforcement shown in p.73

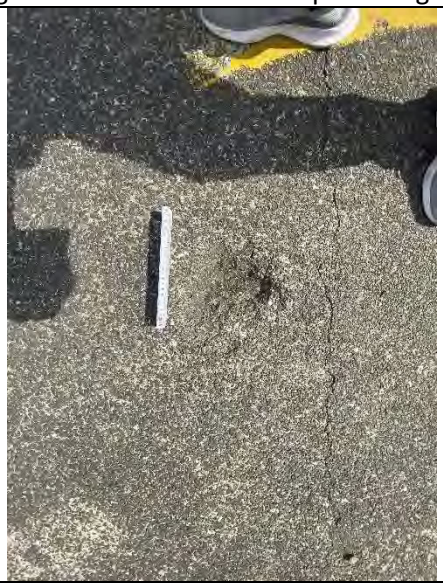


Photo 75 - Level 5- longitudinal continuous cracking and small region of spall (loc.42 dwg) (8490)

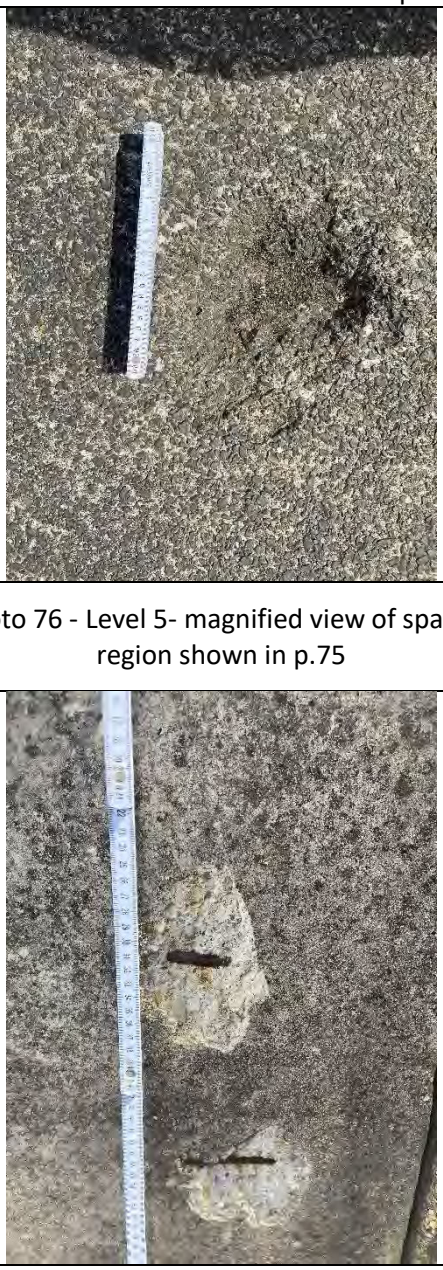


Photo 76 - Level 5- magnified view of spalled region shown in p.75



Photo 77 - Level 5- spalling damage, with exposed reinforcement at the spalled region (loc.43 dwg)	Photo 78 - Level 5- magnified view of exposed corroded reinforcement shown in p.77

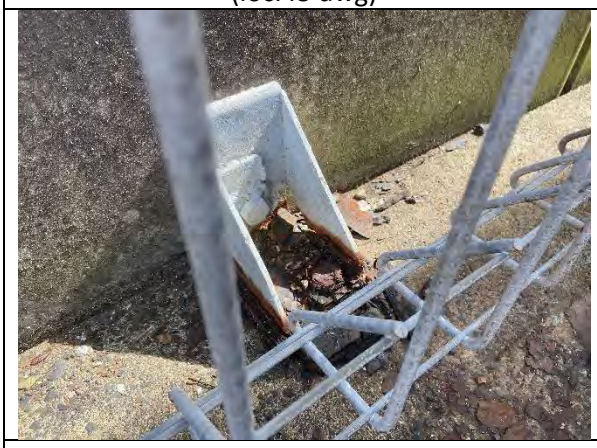



Photo 79 - Level 5- significant, complete loss of section, corrosion on the bolt and plate connection, advice council to fix while onsite	Photo 80 - Level 5- overview of area inspected (loc.44)
	
Photo 81 - Level 5- spalling damage, with exposed reinforcement at the spalled region	Photo 82 - Level 5- magnified view of exposed corrode reinforcement shown in p.81



Photo 83 - Level 5- overview of the inspected area with presence of cracking at edge of T beam below (loc.45 dwg)

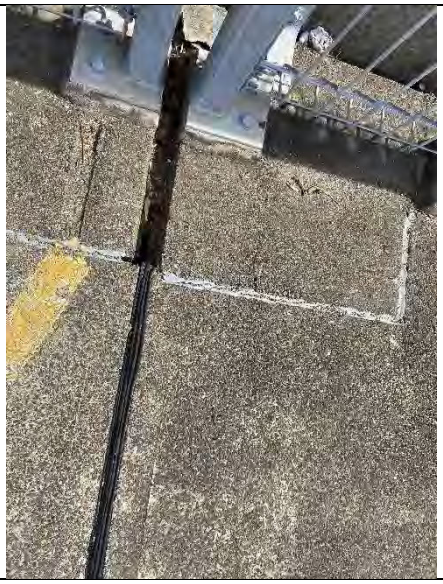


Photo 84 - Level 5- magnified view of slab joint



Photo 85 - Level 5- close up view of the slab joint

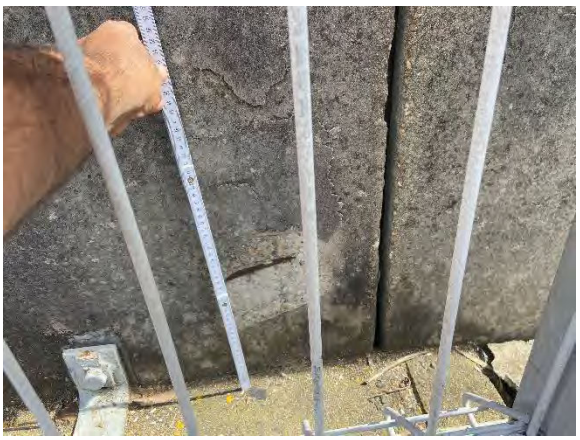


Photo 86 - Level 5- presence of exposed reinforcement at the area inspected.



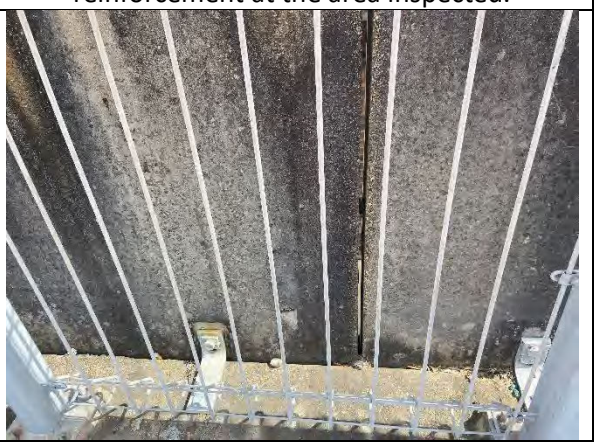
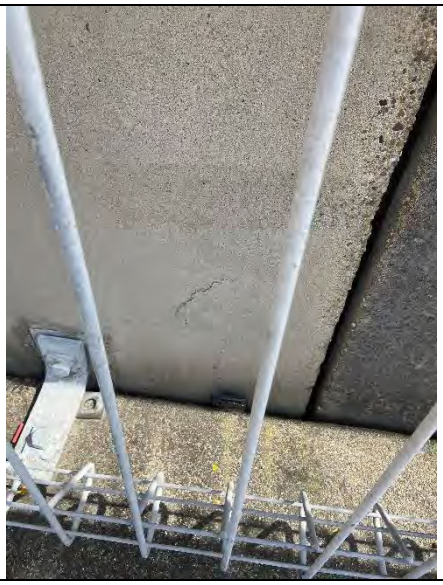
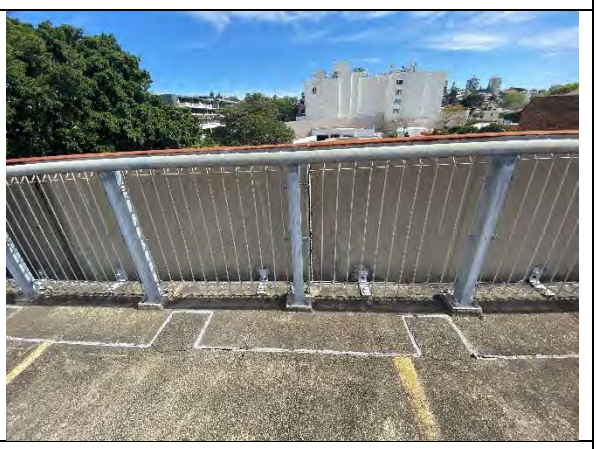
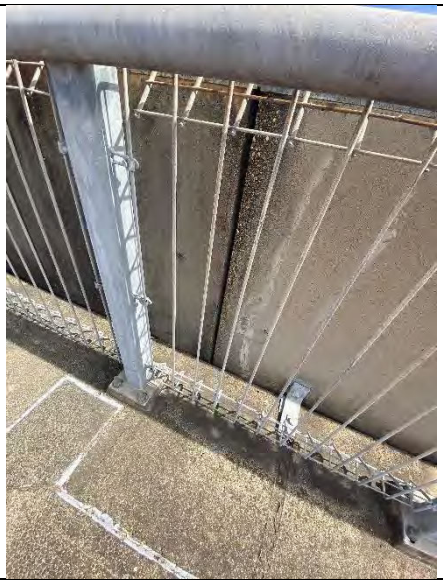


Photo 87 - Level 5- presence of cracking and spalling damage at the inspected area (loc.46 dwg) (8520)	Photo 88 - Level 5- wall joint issue noted
	
Photo 89 - Level 5- presence of exposed reinforcement at the area inspected. (loc.47 dwg)	Photo 90 - Level 5- presence of cracking at the area inspected. (loc.48 dwg)
	
Photo 91 - Level 5- overview of area inspected (loc.49 dwg)	Photo 92 - Level 5- overview of area inspected with presence of cracking (loc.50 dwg)

	
Photo 93 - Level 5- spalling damage, with exposed reinforcement at the spalled region	Photo 94 - Level 5- wall joint issue noted (loc.51 dwg) 8541

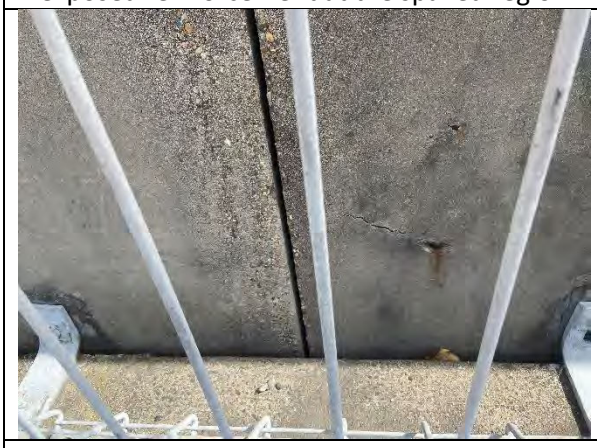
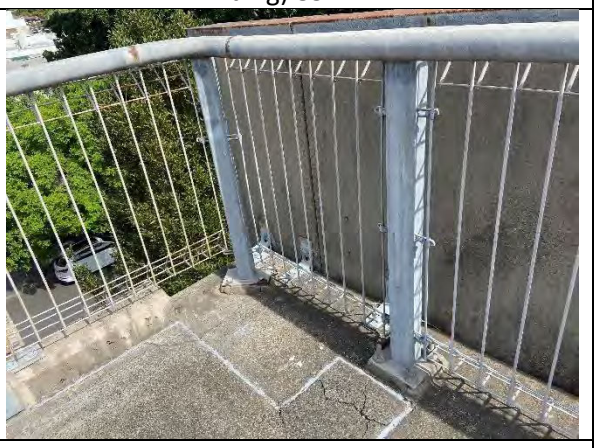

	

Photo 95 - Level 5- cracking and exposed reinforcement observed	Photo 96 - Level 5- cracking on the slab noted (loc.52 dwg)

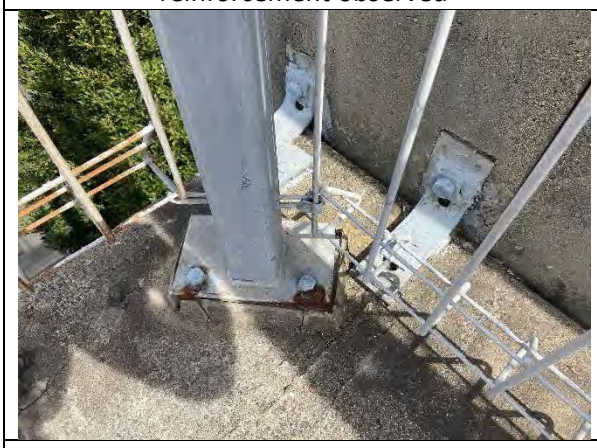
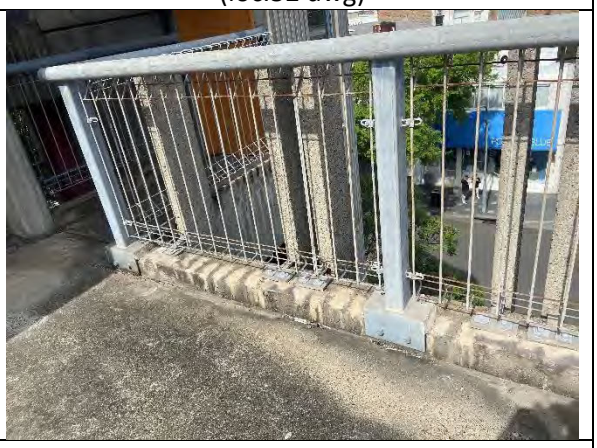

	

Photo 97 - Level 5- surface corrosion on the bolt and underneath plate connection	Photo 98 - Level 5- overview of the area inspected with presence of corrosion on the plate connection (loc.53 dwg)

	
Photo 99 - Level 5- corrosion on plate connection	Photo 100 - Level 5- significant spalled region with corrosion staining on the exposed reinforcement (loc.54 dwg)
	
Photo 101 - Level 5- overview of the area inspected, in general sound condition (loc.55 dwg)	Photo 102 - Level 5- overview of the area inspected, appeared in general sound condition
	
Photo 103 - Level 5- exposed reinforcement within the area inspected (loc.56 dwg) (	Photo 104 - Level 5- exposed reinforcement within the area inspected



Photo 105 - Level 5- overview of the area inspected, appeared in general sound condition (loc.57 dwg)



Photo 106 - Level 5- magnified view of spalled region in one of the holes underneath the slab



Photo 107 - Level 5- overview of the area inspected, plates covering beam ends



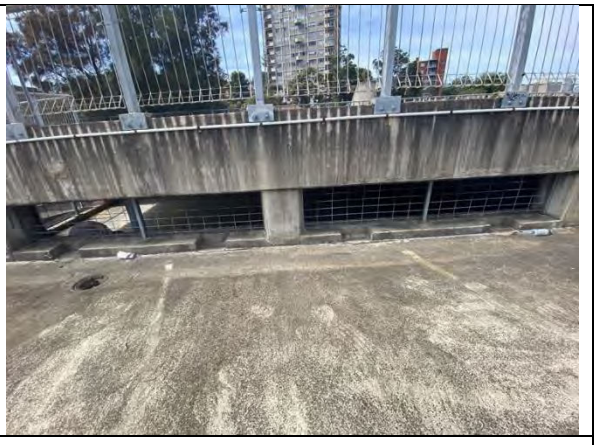
Photo 108 - Level 5- magnified view of spalled region in one of the holes underneath the slab



Photo 109 - Level 5- overview of the area inspected (loc.59 dwg)



Photo 110 - Level 5- presence of small cracking with loss of bolt and nuts

	
Photo 111 - Level 5- overview of the area inspected with evidence of bolt corrosion (loc.57 dwg)	Photo 112 - Level 5- overview of the area inspected
	
Photo 113 - Level 5- cracking and small spalling damage, at the inspected area noted	Photo 114 - Level 5- cracking and small spalling damage, at the area inspected 8591

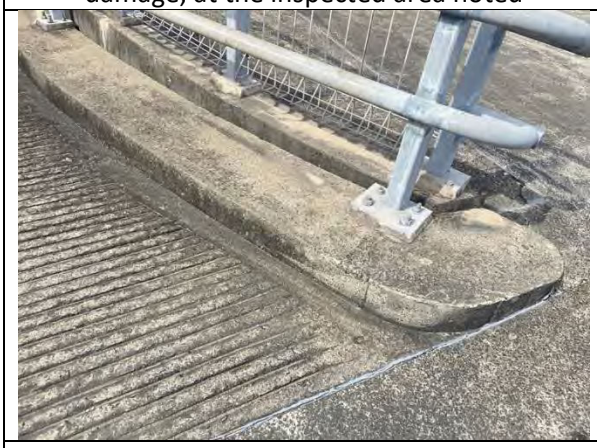



Photo 115 - Level 5- overview of the area inspected, appeared in general sound condition (loc.58 dwg) (	Photo 116 - Level 5- presence of small exposed reinforcement bar on the slab joint

	
Photo 117 - Level 5- magnified view of the exposed reinforcement bar	

APPENDIX B – CHEMICAL TESTING LABORATORY REPORT

Office:
PO BOX 591
SEVEN HILLS NSW 2147

Laboratory:
1/4 ABBOTT ROAD
SEVEN HILLS NSW 2147
Telephone: (02) 9838 8294
Fax: (02) 9838 8919
A.C.N. 098 982 140
A.B.N. 76 098 982 140
NATA No: 1884

ANALYTICAL REPORT for:

BCRC PTY LTD

PO BOX 471
BELROSE WEST 2085

ATTN: GULRAIZ IJAZ

JOB NO: WG1128

CLIENT ORDER: BCRCN10222

DATE RECEIVED: 22/09/21

DATE COMPLETED: 06/10/21

TYPE OF SAMPLES: CONCRETE

NO OF SAMPLES: 105

NATA Accredited for compliance with ISO/IEC 17025 Testing

[redacted]

Issued on 06/10/21
Sue Wyman
(Laboratory Supervisor)

ANALYTICAL REPORT

JOB NO: WG1128
CLIENT ORDER: BCRCN10222

	SAMPLES	Cl- %	*L.Carb mm	*CaO %	*Cement %
	LONG CORES				
1	L5 BEAM 5-15	0.046			
2	L5 BEAM 15-25	0.031			
3	L5 BEAM 35-45	0.017			
4	L5 BEAM 55-65	0.016			
5	L5 COL 5-15	0.049			
6	L5 COL 15-25	0.032			
7	L5 COL 35-45	0.023			
8	L5 COL 55-65	0.017			
9	L5 FLOOR 5-15	0.038			
10	L5 FLOOR 15-25	0.022			
11	L5 FLOOR 35-45	0.015			
12	L5 FLOOR 55-65	0.016			
13	L5 WING 5-15	0.001			
14	L5 WING 15-25	0.006			
15	L5 WING 35-45	0.039			
16	L5 WING 55-65	0.030			
17	L4 COL 5-15	0.022			
18	L4 COL 15-25	0.016			
19	L4 COL 35-45	0.015			
20	L4 COL 55-65	0.019			
21	L4 BEAM 5-15	0.091			
22	L4 BEAM 15-25	0.023			
23	L4 BEAM 35-45	0.017			
24	L4 BEAM 55-65	0.019			
25	L4 SOFF 5-15	0.004			
26	L4 SOFF 15-25	0.003			
27	L4 SOFF 35-45	0.002			
28	L4 SOFF 55-65	0.002			
29	L4 WING 5-15	0.028			
30	L4 WING 15-25	0.014			
31	L4 WING 35-45	0.006			
32	L4 WING 55-65	0.023			
MDL		0.001	1	0.1	0.1
Method Code		10.13	10.80	C17	10.12
Preparation		P5	P1	P5	

ANALYTICAL REPORT

JOB NO: WG1128
CLIENT ORDER: BCRCN10222

	SAMPLES	Cl- %	*L.Carb mm	*CaO %	*Cement %
33	L3 COL 5-15	0.022			
34	L3 COL 15-25	0.017			
35	L3 COL 35-45	0.018			
36	L3 COL 55-65	0.018			
37	L3 BEAM 5-15	0.017			
38	L3 BEAM 15-25	0.040			
39	L3 BEAM 35-45	0.020			
40	L3 BEAM 55-65	0.015			
41	L3 SOFF 5-15	0.003			
42	L3 SOFF 15-25	0.001			
43	L3 SOFF 35-45	0.003			
44	L3 SOFF 55-65	0.003			
45	L3 WING 5-15	0.019			
46	L3 WING 15-25	0.005			
47	L3 WING 35-45	<0.001			
48	L3 WING 55-65	0.020			
49	L2 COL 5-15	0.056			
50	L2 COL 15-25	0.037			
51	L2 COL 35-45	0.071			
52	L2 COL 55-65	0.014			
53	L2 BEAM 5-15	0.021			
54	L2 BEAM 15-25	0.025			
55	L2 BEAM 35-45	0.020			
56	L2 BEAM 55-65	0.020			
57	L2 SOFF 5-15	<0.001			
58	L2 SOFF 15-25	0.004			
59	L2 SOFF 35-45	<0.001			
60	L2 SOFF 55-65	<0.001			
61	L2 WALL 5-15	0.009			
62	L2 WALL 15-25	0.006			
63	L2 WALL 35-45	0.004			
64	L2 WALL 55-65	0.003			
MDL		0.001	1	0.1	0.1
Method Code		10.13	10.80	C17	10.12
Preparation		P5	P1	P5	

ANALYTICAL REPORT

JOB NO: WG1128
CLIENT ORDER: BCRCN10222

	SAMPLES	Cl- %	*L.Carb mm	*CaO %	*Cement %
65	L1 COL 5-15	0.027			
66	L1 COL 15-25	0.024			
67	L1 COL 35-45	0.019			
68	L1 COL 55-65	0.016			
69	L1 BEAM 5-15	0.053			
70	L1 BEAM 15-25	0.027			
71	L1 BEAM 35-45	0.011			
72	L1 BEAM 55-65	0.013			
73	L5 BEAM		15	9.8	15.2
74	L5 COLUMN		10	9.6	14.9
75	L5 FLOOR		0	10.8	16.7
76	L5 WING/WALL		25	11.4	17.7
77	L4 COLUMN		20	11.3	17.5
78	L4 BEAM		18	9.7	15.0
79	L4 SOFFIT		14	13.5	20.9
80	L4 WING		0	11.1	17.2
81	L3 COLUMN		25	10.7	16.6
82	L3 BEAM		25	9.8	15.2
83	L3 SOFFIT		7	13.4	20.8
84	L3 WING		0	13.6	21.1
85	L2 COLUMN		30	10.6	16.4
86	L2 BEAM		25	10.3	16.0
87	L2 SOFFIT		3	14.2	22.0
88	L2 WALL		4	13.9	21.6
89	L1 COLUMN		15	12.2	18.9
90	L1 BEAM		20	12.5	19.4
	SHORT CORES				
91	L5 BEAM		15		
92	L5 COLUMN		10		
93	L5 FLOOR		10		
94	L4 COLUMN		17		
MDL		0.001	1	0.1	0.1
Method Code		10.13	10.80	C17	10.12
Preparation		P5	P1	P5	

ANALYTICAL REPORT

JOB NO: WG1128
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	SAMPLES	Cl- %	*L.Carb mm	*CaO %	*Cement %
95	L4 SOFFIT		0		
96	L4 WING		0		
97	L3 COLUMN		24		
98	L3 BEAM		18		
99	L3 SOFFIT		0		
100	L3 WING		0		
101	L2 COLUMN		30		
102	L2 BEAM		18		
103	L2 SOFFIT		0		
104	L2 WALL		5		
105	L1 BEAM		8		
MDL		0.001	1	0.1	0.1
Method Code		10.13	10.80	C17	10.12
Preparation		P5	P1	P5	

Cement assumed to contain 64.5% CaO.

ANALYTICAL REPORT

JOB NO: WG1128
CLIENT ORDER: BCRCN10222

METHODS OF PREPARATION AND ANALYSIS

The tests contained in this report have been carried out on the samples as received by the laboratory. In the case where an analyte or group of analytes are received outside of recommended holding times, the analysis will proceed and the report annotated. Analysis is carried out within analyte holding times where possible.

P5	Sample dried, split and crushed to -150um
P1	Analysis performed on sample as received
10.13	Chloride in Concrete - AS1012.20.1 Determined by Potentiometric Titration
*10.80	L.ofCO3 - Level of Carbonation (phenolphthalein) Depth in Millimetres.
*C17	Calcium Oxide - Acid Soluble Determined by APHA 3120B
*10.12	Cement Content - Determined by Calculation

*The laboratory's NATA accreditation does not cover performance of this test

BCRC Durability Consultants

Building and Construction Research and Consulting Pty Ltd
ABN 91 116 565 265
Unit 7, 9-11 Chaplin Drive
Lane Cove West NSW 2066
Tel: +61 2 9131 8018
[redacted] | www.bcrc.com.au

REPORT TITLE:	**Corrosion assessment of H piles at the carpark locate don 1 Cross St Double bay**		
CLIENT:	Altus Group		
REPORT AUTHOR:	I. Khan	**REVIEWED BY:**	F. Papworth
REPORT DATE:	27 October 2021	**FILE REF:**	BCRCN10222

BCRC were engaged by Altus Group to assess the condition of the public carpark located at 1 Cross St Double Bay. A condition and remaining service life assessment were required as concern were raised by council and local residence, signs of distress such as corrosion including spalling were noted all over the structure. The building was constructed in the late 1970's and is over 40 years old.

As a part of condition assessment, BCRC were also engaged to assess the corrosion rates of the steel H piles to predict the remaining life these piles.

The current age of the piles is approx. 44 years. From the soil and groundwater aggressivity data, the piles are in "non-aggressive" exposure environment as per AS2159. Considering a uniform corrosion allowance of 0.01 mm/year as recommended in AS2159, the expected uniform thickness loss at current stage is 0.44 mm. For a future 40 years life, a total thickness loss 0.84 mm is expected over the entire life of the structure i.e. 84 years.

Considering the effect of differential aeration corrosion, the predicted corrosion rate is 0.04 mm/year. This equates to a thickness loss of 1.76 mm at present and a total thickness, considering a future life of 40 years, 3.36 mm.

Based on the values of sulphates and chlorides present in the soil and groundwater, the risk of localised corrosion and MIC is minimal.

KEY WORDS: Exposure, Steel, Piles, Corrosion rate

REVISION SHEET

Revision Number	Description of Revision	Prepared By	Checked/ Reviewed By	Approved	Issued to Client
A	Draft report	I. Khan	F. Papworth	F. Papworth	11/10/21

Disclaimer:

This report and the results shown, and the recommendations made herein are based upon the information, drawings, samples and tests referred to. BCRC, its consultants and agents accept no liability for any damages, charges, costs or expenses in respect of or in relation to injury to or death of any person or damage to any property or of other loss whatsoever arising either directly or indirectly from the use of this report, the carrying out of any recommendations contained herein or the use of any goods or materials referred to.

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1. INTRODUCTION

BCRC were engaged by Altus Group to assess the condition of the public carpark located at 1 Cross St Double Bay. A condition and remaining service life assessment were required as concern were raised by council and local residence, signs of distress such as corrosion including spalling were noted all over the structure. The building was constructed in the late 1970's and is over 40 years old.

As a part of condition assessment, BCRC were also engaged to assess the corrosion rates of the steel H piles to predict the remaining life these piles. All BCRC field investigations were carried out on 9th – 16th of September. The weather was clear on most days, on one of the days toward the end of our investigation it was raining which highlights the area were rain water was entering the building.

Figure 1 below shows the location of the investigated structure.

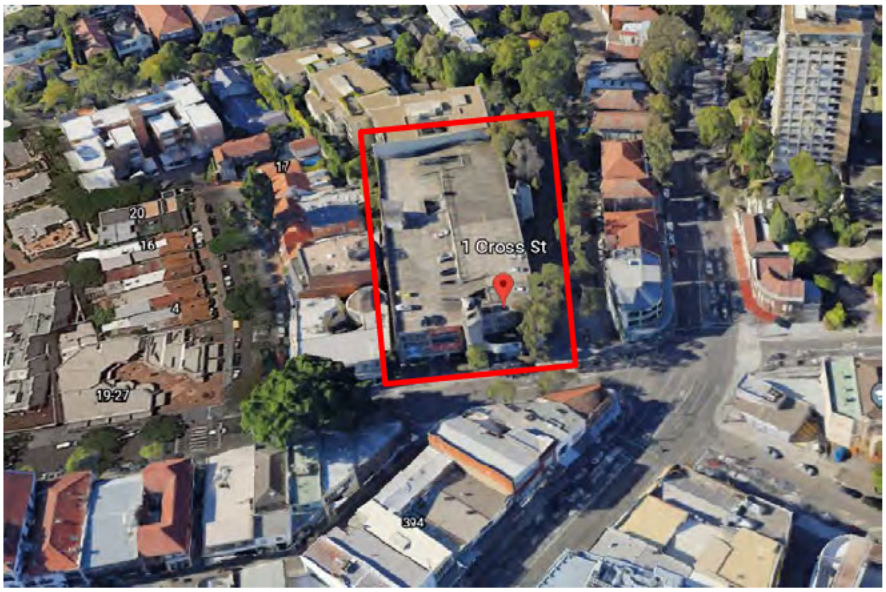


Figure 1: Aerial view of the carpark at 1 Cross St Double Bay

2. EXPOSURE ENVIRONMENT

2.1 SOIL AGGRESSIVITY

The soil aggressivity data was included in the geotechnical investigation report (20171127_Geotechnical Report_DP Australia) which was provided to BCRC. A summary of the chemical test results for soil is presented in Table 1.

Table 1 : Summary of Chemical Test Results (Soil)

Sampl/depth (m)	pH Value	Chloride Content in soil (mg/kg)	Sulphate (SO_4) Content (mg/kg)	Ec (µS/cm)	Soil resisivity (ohm-cm)*	Material description
102/3.5	7.3	<10	<10	16	62500	Sand
102/5.5	7.2	10	<10	20	50000	Sand
102/3.5	7.0	10	<10	19	52631	Sand

Sampl/depth (m)	pH Value	Chloride Content in soil (mg/kg)	Sulphate (SO_4) Content (mg/kg)	Ec (µS/cm)	Soil resisivity (ohm-cm)*	Material description
105/2.5	7.3	10	<10	17	58823	Sand
105/5.5	7.1	20	44	77	12987	Sand

The soil chemical testing data indicates that the chlorides and sulphates in all the test locations are minimal. The soil resistivities are also higher than 5000 ohm-cm (obtained from conversion of conductivity to resistivity). Therefore, based on the soil testing data in the boreholes, the exposure classification for the H-piles in contact with ground assessed as per AS 2159 Table 6.5.2 (C) is considered as "Non-aggressive".

Table 2: AS 2159 exposure classification for H piles

Resistivity (ohm-cm)*	pH	Chlorides in soil (ppm)	Exposure Classification	
			Soil conditions A	Soil conditions B
>5000	>5	<5000	Non-aggressive	Non-aggressive

Soil condition A denotes high permeability soils such as sands and gravels that are in groundwater.
Soil condition B denotes low permeability soils such as silts and clays or all soils above groundwater.

It is to be noted that soil aggressivity data is available up to a depth of 5.5 m. Further testing may be advisable to confirm the assessed exposure classification at depths greater than 5.5 m and at other locations. The necessity for this may be determined from borehole logs showing changing soil strata. In this report, all the assessment and conclusions are made based on existing soil data.

2.2 GROUNDWATER AGGRESSIVITY

The groundwater measurements indicated a groundwater table at depths of about 1.0 m to 2.0 m. The groundwater was also encountered during the excavation to expose one of the H piles. The water sample was collected from the site and sent to a NATA accredited laboratory for testing. The test results are summarised in Table 3.

Table 3 : Summary of Chemical Test Results for groundwater

pH Value	Chloride Content in soil (mg/L)	Sulphate (SO_4) Content (mg/L)
6.5	23	52

The groundwater chemical testing data indicates that the chlorides and sulphates are minimal. Based on the groundwater testing data collected at the pile location, the exposure classification for the H-piles in contact with groundwater assessed as per AS 2159 Table 6.5.2 (C) is considered as "Non-aggressive".

3. CORROSION ALLOWANCES IN AUSTRALIAN STANDARDS

3.1 CORROSION ALLOWANCE AS PER AS2159

Based on "Non-aggressive" exposure classification, the recommended corrosion allowance as per AS2159 table 6.5.3 is less than 0.01 mm/year. Note that the corrosion allowances in AS 2159 and supporting documentation assume that corrosion is essentially uniform, and corrosion allowances are predicated on that assumption.

3.2 CORROSION ALLOWANCE AS PER AS5100.3

Similarly, For uncoated steel elements, the element shall be designed to include a sacrificial layer that is not included in the assessment of structural capacity but is included as an imposed load. The allowance, as defined in AS5100.3-2017 Section 4.4 shall be:

- 1.5 mm total for the life of the structure for each face in contact with soil, above and below groundwater, provided the soil is undisturbed or comprises compacted, well-graded, chemically neutral, structural fill.
- 0.025 mm per year for each face in contact with open-graded or rubble fill, or sands and gravels that have moving groundwater.

It is to be noted that the above values are related to a 100-year design life.

4. CORROSION RATE PREDICTIONS

4.1 UNIFORM CORROSION

Uniform corrosion is very rare in soils due to variability in soil moisture along the depth of the pile presence of ground water etc. However, in some acidic and high resistivity soils, the uniform corrosion can also occur. In the presence of oxygen, the maximum uniform corrosion rate is given by the following equation (Pedeferri):

$$i_{rate}=12.2^{[(T-25)/25]}.[O_2]$$

where i_{rate} is expressed in μm/year, $[O_2]$ is the oxygen content in mg/L and T is the temperature (°C).

The mean ambient annual temperature at the nearest weather station (Sydney Harbour) is 18.5°C. The ground temperatures are assumed to be similar to ambient air temperatures. Assuming an average oxygen concentration of 0.9 mg/l in the soil, the calculated corrosion rate is expected to be 0.009 mm/year.

4.2 DIFFERENTIAL AERATION CORROSION

Differential aeration corrosion takes place in all those conditions where a non-homogeneous oxygen distribution exists. The typical situations where the piles are in saturated soils are shown in Figure 2. The pile is close to a ground surface such that there is a layer of dry soil with higher oxygen content near the surface and this layer will act as a cathode. On the other hand, the pile area which in contact with saturated soil, which is not permeable to oxygen, becomes anodic and metal dissolution takes place. The corrosion rates in this case are highly dependent on the anode to cathode area ratio.

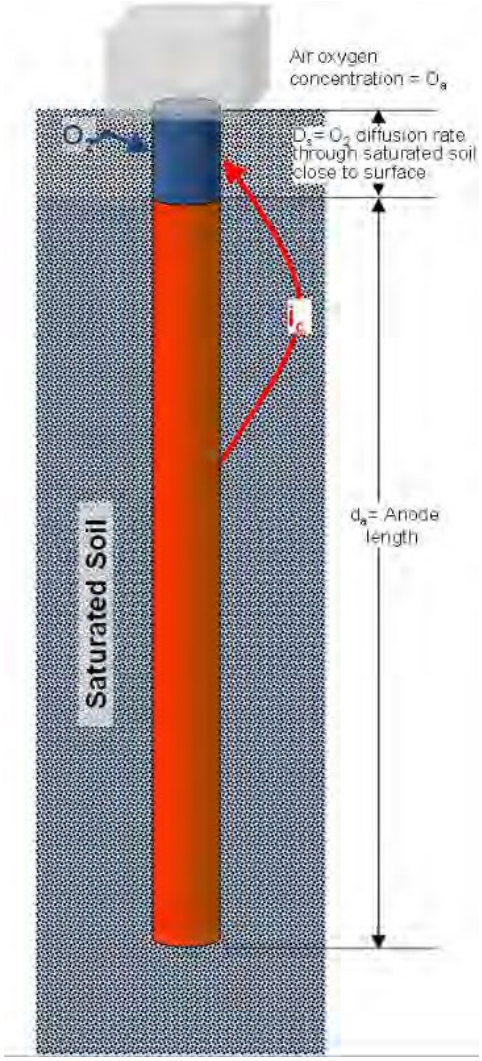


Figure 2 : Differential aeration corrosion mechanisms of Pile

There are no published general solutions to this situation and hence the modelling is based on the research and published information on oxygen availability. The general corrosion situation can be calculated in a series of stages, i.e.:

The Pedeferri's empirical formula is derived from Fick's law ;

$$i_c = 4FDC1/\delta$$

Where:

D is diffusion coefficient, F is Faraday constant, C1 is oxygen concentration in the bulk and δ is diffusion layer thickness.

The anodic current can be calculated from

$$i_a = i_c/r$$

Where

r = anode: cathode area

The corrosion over the target design life calculated by multiplying the corrosion rate by the target design life.

The mean depth of the groundwater table is 1.5 m. The length of the steel pile close to the ground interface will act as a cathode to the pile length in saturated soil. The length of pile that acts as cathode is severely restricted due to the high resistance of the semi-dry soil. Conversely the resistance in the saturated soil is low and the whole of the length of pile in saturated soil will act as the anode.

We are unaware of the total pile length. Assuming a pile length of 10 m with top 1.5 m length buried in semi-dry soil and remaining 8.5 m in saturated soil. An Anode: Cathode ratio of 5.6 is considered. However, it will depend on the total length of the pile.

The value for oxygen diffusion coefficient of soil was taken from the available literature as shown in Figure 3.

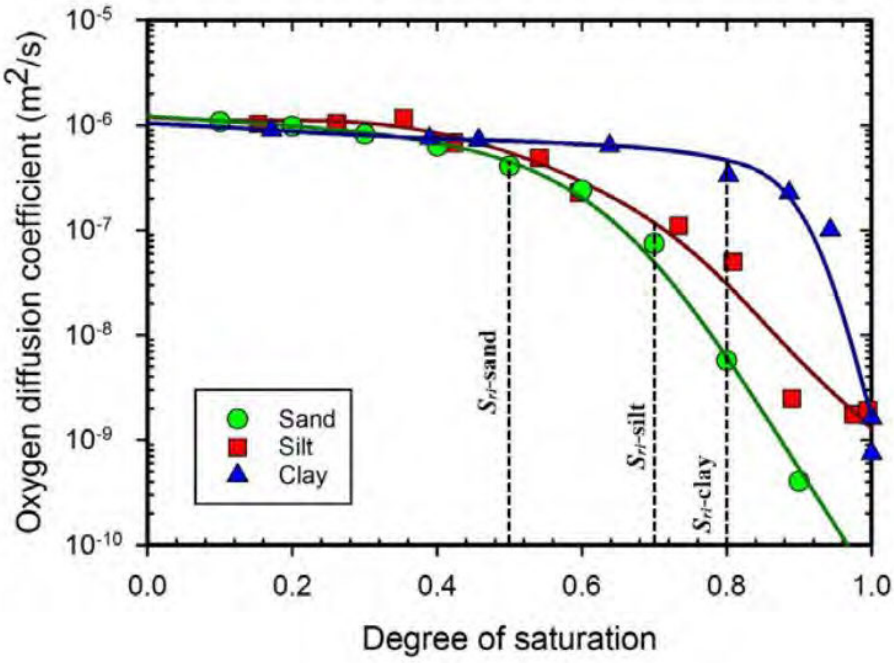


Figure 3 : Oxygen diffusion coefficient vs degree of saturation (Azoor et al. 2019)

Considering an oxygen diffusion coefficient of $1x10^{-9}$ m^2/s for saturated soil (sand), a corrosion rate 0.04 mm/year is expected. This equates to a total thickness loss 1.6 mm over the future 40 years.

The prediction of corrosion rates can be improved when the parameter such as oxygen diffusion coefficient, oxygen concentration in soil is obtained from actual site conditions.

4.3 LOCALISED CORROSION

The presence of a high content of chloride and sulphate ions influences the corrosion rate and promotes conditions for localized corrosion attacks.

According to laboratory data and extensive field experimentation data available in the literature, the corrosion rate becomes high when threshold values of 200 ppm of chlorides and 1000 ppm of sulphates are exceeded. The soil aggressivity data provided in the geotechnical investigation report indicates that maximum values of sulphates and chlorides encountered in the soil are 44 ppm and 20 ppm respectively indicating a very low or negligible risk of localised corrosion.

4.4 MICROBIAL INFLUENCED CORROSION

In tidal and splash zones the presence of high levels of oxygen may contribute to localised corrosion, usually shallow pitting (Oshaki, 1982), but in driven piles the lack of available oxygen means uniform corrosion is the

operative mechanism. It is important to note that microbiologically influenced corrosion (MIC) is not a separate form of corrosion, but a mechanism where a reduced metal surface pH caused by bacteria activity exacerbates the normal uniform or localised forms of corrosion. In driven piles with no cathodic oxygen available, MIC does not operate, and corrosion rates remain low (Metals Handbook, 1987).

4.5 CURRENT CONDITION OF THE PILE

During the site investigations, one of the piles was excavated to measure the remaining thickness of the pile. The carpark was constructed in 1977-1978 and is therefore the age of the pile is expected to be 43 to 44 years old. The groundwater was encountered during the soil excavation. Due to presence of groundwater, it was difficult to accurately measure the thickness of the beam. The measured thickness of the beam flange varied between 22 mm to 25 mm. As per information provided to BCRC, the investigated pile can be either of the three sections, 310 UC 118, 310 UBP 79 and 310 UC 137. Section 310 UC 137 flange thickness is 21.7 mm which is closest to what was measured on site.

Though the thickness of flange measured on site does not indicate any thickness loss, however, this measurement was made only at one location. The thickness loss due to corrosion may have occurred at other locations of the pile.

5. CONCLUSIONS

The current age of the piles is approx. 44 years. From the soil and groundwater aggressivity data, the piles are in “non-aggressive” exposure environment as per AS2159. Considering a uniform corrosion allowance of 0.01 mm/year as recommended in AS2159, the expected uniform thickness loss at current stage is 0.44 mm. For a future 40 years life, a total thickness loss 0.84 mm is expected over the entire life of the structure i.e. 84 years.

Considering the effect of differential aeration corrosion, the predicted corrosion rate is 0.04 mm/year. This equates to a thickness loss of 1.76 mm at present and a total thickness, considering a future life of 40 years, 3.36 mm.

Based on the values of sulphates and chlorides present in the soil and groundwater, the risk of localised corrosion and MIC is minimal.

1 June 2021 211124 SAAA

Altus Group
Level 12, 1 Market Street
Sydney NSW 2000

Attention: Sagar Mansukh

Email: [redacted]

CROSS STREET CARPARK, DOUBLE BAY

Steel H Piles in Acid Sulfate Soils

Dear Sagar,

We provide revised advice on the potential for corrosion of steel H piles in potential acid sulfate soils (PASS) at the above site and how this may be managed.

This revised advice is provided having read EI Australia's report titled Acid Sulfate Soils Assessment and Management Plan, Reference E23054 AA Rev. 0, dated 4 August 2016. We have also re-read Douglas Partners' report titled Preliminary In-Situ Waste Classification (prepared for Built), dated 15 November 2017. Our advice of this letter is based on the finding of these two reports.

Background

The split-deck carpark was constructed in 1977-1978 and is therefore 43 to 44 years old. Woollahra Municipal Council has asked what structural repairs and upgrades would be required to extend the life of the carpark by a further 25 or 40 years. The site is in a low-lying, flood prone area of Double Bay.



Figure 1 - Extract from EPA Act 1979, Woollahra Local Environmental Plan 1995 (Amendment No.39) Acid Sulfate Soils Planning Map – published in Government Gazette of 11 March 2005.

Site Classification

Woollahra Local Environmental Plan 1995 (Amendment No.39), Acid Sulfate Soils Planning Map (Figure 1 above) indicates that the site lies within a Class 2 acid sulfate soils area. As such, Council consent is required before commencing any works more than 1m below ground level or works by which the water table is likely to be lowered. Acid sulfate soils when exposed to oxygen oxidise and become more acidic. Disturbing the ground or lowering the water table will expose the soils to oxygen, hence the EPA Act requirement.

Assessment of Acid Sulfate Soils

Acid sulfate soils are assessed in accordance with the published guidelines set out by NSW Acid Sulfate Soils Management Advisory Committee (ASSMAC) 1998.

In basis terms, the criteria for assessing sites with course textured soils and where more than 1,000 tonnes of materials are to be disturbed[1] are as follows:

- Laboratory results on non-oxidised (pH_{KCl}) soil samples with values > pH 4 indicate the general absence of actual acid sulfate soils (AASS).
    - It follows that laboratory results on non-oxidised (pH_{KCl}) soil samples with values < pH 4 indicate the general presence of AASS.

- Laboratory results on oxidised (pH_{Ox}) soil samples with values < pH 3.5 indicate the likelihood of potential acid sulfate soils (PASS).

Effects of Acid Sulfate Soils on Embedded Steel Piles

The acidity of acid sulfate soils can increase the risk and rate of corrosion of buried steelwork. The carpark is founded on steel H piles and therefore assessment of potential acid sulfate soils is required to assess whether the life of the carpark can be extended.

The effects of acid sulfate soils on embedded steel depends on several factors. Acid sulphate soils can vary in acidity, but the upper non-oxidised bound is pH 4 and upper oxidised bound is pH 3.5 (refer to assessment of acid sulfate soils above). Generally, greater acidity (lower pH) would lead to an increased risk and rate of corrosion. The risk and rate of corrosion is very dependent on the availability of oxygen for the soil to oxidise and become more acidic.

Geotechnical Report Findings

We have reviewed the following geotechnical reports advising on acid sulfate soils for the site.

- EI Australia's report titled Acid Sulfate Soils Assessment and Management Plan, Reference E23054 AA Rev. 0, dated 4 August 2016, for Woollahra Municipal Council.

- Douglas Partners' report, Preliminary In-Situ Waste Classification, dated 15 November 2017, for Built.

[1] Both Douglas Partners' report and EI Australia's report consider mass excavation of the site for the construction of a multi-storey mixed-use building over a five-level basement carpark.

EI Australia Report Findings

EI Australia reported samples from two boreholes, one outside the building at the S-W corner, left of the Cross Street entrance, and one outside the building along Jamberoo Lane, near the east stair.

Borehole logs were not provided; however, sandstone bedrock was encountered at 15m below ground level at the S-W corner (Cross Street) and at 4.3m below ground level near the east stair (Jamberoo Lane). We would anticipate that the steel H piles were driven to bedrock.

Ground water seepage as detected at about 2m below ground.

The soils observed during drilling comprised gravelly sand fill (or topsoil) overlaying sand with trace gravels and trace fines. Visual indicators of actual acid sulfate soils (AASS) – i.e., soils containing pale yellow deposits / coatings of jarosite – were not observed. However, indicators of potential acid sulfate soils (PASS), including waterlogged and estuarine sands (fines and grey colouring), were present.

Suspended Peroxide Oxidation Combined Acidity and Sulfate Testing (sPOCAS)

EI Australia undertook 14 tests on samples, to test for acid sulfate soils: ten (10) at varying depths from the Cross Street borehole and four (4) from the shallower Jamberoo Lane borehole.

All samples tested pre-oxidisation (pH_{KCl}) returned results > pH 4, indicate the general absence of actual acid sulfate soils (AASS).

When samples were tested post-oxidisation (pH_{Ox}) the risk of acid generation form un-oxidised sulfur compounds was considered likely in the following samples:

- Cross Street borehole at 2.9 to 3.0m depth – pH 3.5. This is at the threshold of indicating the likelihood of potential acid sulfate soils (PASS).
- Cross Street borehole at depths between 5.9 and 12.0m – pH 3.4 to 2.5, indicating the likelihood of potential acid sulfate soils (PASS).
- Jamberoo Lane borehole at 4.4 to 4.5m depth – pH 3.3 indicating the likelihood of potential acid sulfate soils (PASS). This is at top of bedrock level.

Peroxide oxidisable sulfar exceeding 0.03%w/w was present at 0.4m below ground level at Cross Street (0.034%w/w) and then again at depths exceeding 4.4m.

Conclusion

EI Australia concluded that potential acid sulfate soils (PASS) are present onsite from at least 0.4m below ground level to 15m below ground level, associated with the alluvial sand and estuarine sedimentary units underlying the site. EI Australia's report was prepared with excavation in mind.

Douglas Partners Report

Douglas Partners report was also prepared with excavation in mind, for five storeys of basement carpark. Not all of their 108 page report has been read in detail.

Douglas Partners undertook a further seven (7) boreholes, both along Jamberoo Lane and inside the carpark. They also reference the two boreholes undertaken by EI Australia. Top of weathered sandstone bedrock was found at between 4.7m and 14.8m below ground level. The top of bedrock slopes down from the South-East corner of the site (where it is at RL -1.0m to RL -1.6m) to the West and North-West, where top of bedrock is at RL12.7m. We would anticipate that the steel H piles were driven to bedrock.

Free ground water was observed at 1.6m below ground level at the N-W corner of the site, at between 1m and 3m in the centre of the site. This compares to EI Australia's finding of ground water seepage detected at about 2m below ground level.

Pages 6 and 7 of Douglas Partners' report give screening results for the possible presence of AASS and PASS based on the guidance indicators specified in the ASSMAC Guidelines. As per EI Australia's findings, all samples tested pre-oxidisation returned results > pH 4, indicate the general absence of actual acid sulfate soils (AASS).

When samples were tested post-oxidisation, potential acid sulfate soils (PASS) were found to be present at 1.0m to 1.45m depth below ground level at boreholes 105 and 107 (entrance barriers and N-W corner of the site) – change in pH reaction described as moderate to slight – and then below 4m at other areas of the site. That said, most Douglas Partners' test samples were taken from depths greater than 2.5m.

Conclusion

We would interpret Douglas Partners AASS (not present) and PASS findings as being similar to EI Australia's findings.

Recommended Investigations for Acid Sulfate Soils and Corrosion of H Piles

Both EI Australia's and Douglas Partners' reports conclude that that there is a general absence of actual acid sulfate soils (AASS) – no results with pH_{KCl} < pH 4.

EI Australia's assessment of potential acid sulfate soils (PASS) at shallow depth were based on one test where peroxide oxidisable Sulfar (0.034%w/w) exceeded the threshold level of 0.03%w/w.

Our assessment form Douglas Partners' results of potential acid sulfate soils (PASS) at shallow depth is based on two samples, from 1.0m to 1.45m depth below ground, where the change in pH from natural (un-oxidised) to oxidised is described as slight to moderate.

In no post-oxidisation tests on samples taken form above 2.5m below ground level was pH_{Ox} < pH 3.5. i.e., there were no post-oxidisation tests that would indicate the likelihood presence of potential acid sulfate soils (PASS) above 2.5m to 2.95m depth below ground level (Douglas Partners' borehole No.107).

The tops of steel H piles are typically 1.35m to 1.9m below carpark pavement level. Therefore, as no AASS soils were found, and PASS soils were only conclusively found below 2.5m to 2.95m, excavating to investigate tops of piles is unlikely to reveal acid sulfate soil related corrosion of piles.

The influence of PASS soils on embedded steel to corrode is very dependent on the ability of the soils to oxidise and become more acidic. Both reports advise that ground water was found at 1m to 3m below ground level, and provided the PASS soils are not disturbed, or the water table lowered, it would generally be considered that the soils should not oxidise.

Recommendation for Peer Review

Our knowledge of soils is far less than that of a geotechnical engineer and therefore we would recommend that a geotechnical engineer review our conclusions. This would ideally be Douglas Partners or EI Australia, as authors of the reports.

Inspections, Should Inspections be Advised by the Geotechnical Engineer

Specialist durability consultants, such as BCRC, are most experienced to advise on the effects on durability of acid sulfate soils, working in conjunction with a geotechnical engineer. What has been undertaken

elsewhere on buildings of similar age with steel piles is to exposes the top 1m or so of some piles, to inspect what the rate of corrosion has been and make an assessment from that.

Attached in Appendix A are plans marked with the most suitable locations for investigations, based on depth of pile cap beneath ground – and therefore depth of excavation that would be required – and avoiding the more public areas and areas where more expensive reinstatement of finishes would be required.

Based on our interpretation of Douglas Partners findings, potentially a worst-case area to investigate would be at one of the pile caps at Location A.

We trust that the above and attached plans meet your present requirements. However, should you require anything further please contact the undersigned.

Yours faithfully,
TAYLOR THOMSON WHITTING (NSW) PTY LTD
in its capacity as trustee for the
TAYLOR THOMSON WHITTING NSW TRUST

[redacted]

PAUL CONNETT
Technical Director

P:\2021\2111\211124\Reports\TTW\210602 - 211124 Cross St Carpark Pile Investigation ltr. PC - R1.docx

Appendix A

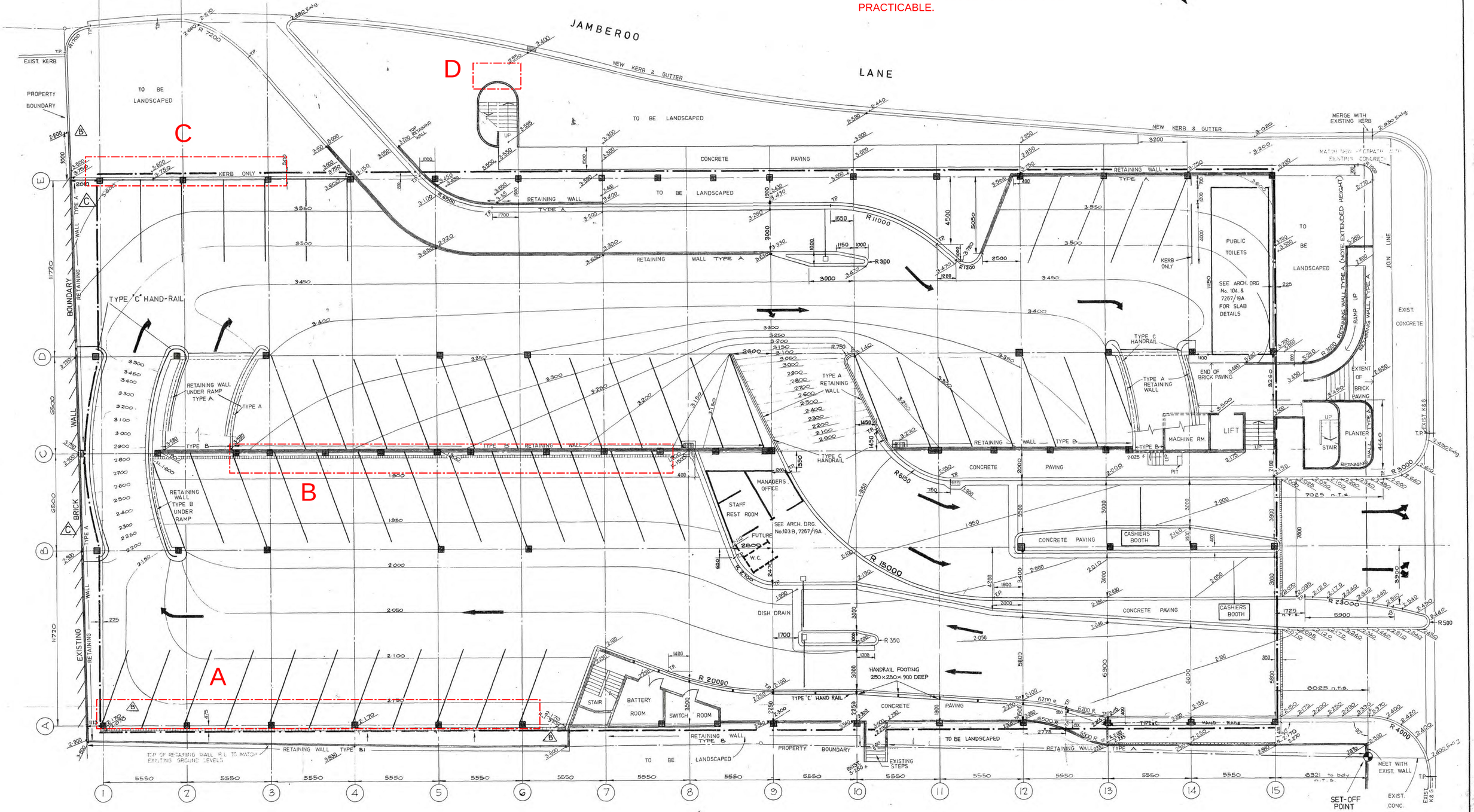
Potential Locations at which to Investigate H Piles

LOCATION A
ASPHALT CONCRETE CARPARK PAVEMENT
U/S PILE CAPS APPROX. RL 0.82,
i.e.1.35m BELOW CARPARK PAVEMENT.
THEREFORE, EXCAVATION WOULD NEED TO BE **2.35m** DEEP TO EXPOSE 1m HEIGHT OF PILE TO INSPECT FOR CORROSION.
LIMITED HEADROOM UNDER DUCT.

LOCATION B
ASPHALT CONCRETE CARPARK PAVEMENT
U/S PILE CAPS APPROX. RL 0.55,
i.e.1.35m BELOW CARPARK PAVEMENT.
THEREFORE, EXCAVATION WOULD NEED TO BE **2.35m** DEEP TO EXPOSE 1m HEIGHT OF PILE TO INSPECT FOR CORROSION.
LIMITED HEADROOM UNDER DUCT.

LOCATION C
GARDEN BED
U/S PILE CAPS APPROX. RL 1.7,
i.e.1.9m BELOW GROUND LEVEL.
THEREFORE, EXCAVATION WOULD NEED TO BE **2.9m** DEEP TO EXPOSE 1m HEIGHT OF PILE TO INSPECT FOR CORROSION.

LOCATION D
GARDEN BED
U/S PILE CAPS APPROX. RL 1.7,
i.e.1.18m BELOW GROUND LEVEL.
THEREFORE, EXCAVATION WOULD NEED TO BE **2.18m** DEEP TO EXPOSE 1m HEIGHT OF PILE TO INSPECT FOR CORROSION.
CONSIDED TOO CLOSE TO ROAD TO BE PRACTICABLE.



LEGEND

GRATING SHOWN THUS

LEVEL TOP OF WALL 5.800

LINE OF BUILDING OVER

FOR RETAINING WALL, KERB & GRATING DETAILS REFER DWG. Nº 7267/19

FOR HAND-RAIL DETAILS REFER DWG. Nº 7267/21

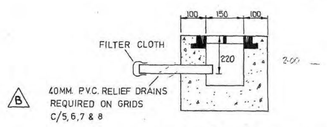
FOR DETAILS OF BATTERY RM., SWITCH RM., STAFF, REST & AMMENITIES REFER ARCHITECTURAL DRWG. Nos 102 & 103

LANDSCAPED AREAS TO HAVE 300mm.OF GARDEN LOAM BELOW FINISHED LEVELS

(B) RETAINING WALL SHOWN

KERB SHOWN

POTENTIAL LOCATIONS AT WHICH TO INVESTIGATE H PILES IN ACID SULFATE SOILS



TRENCH GRATING CROSS SECTION

SHT. 01

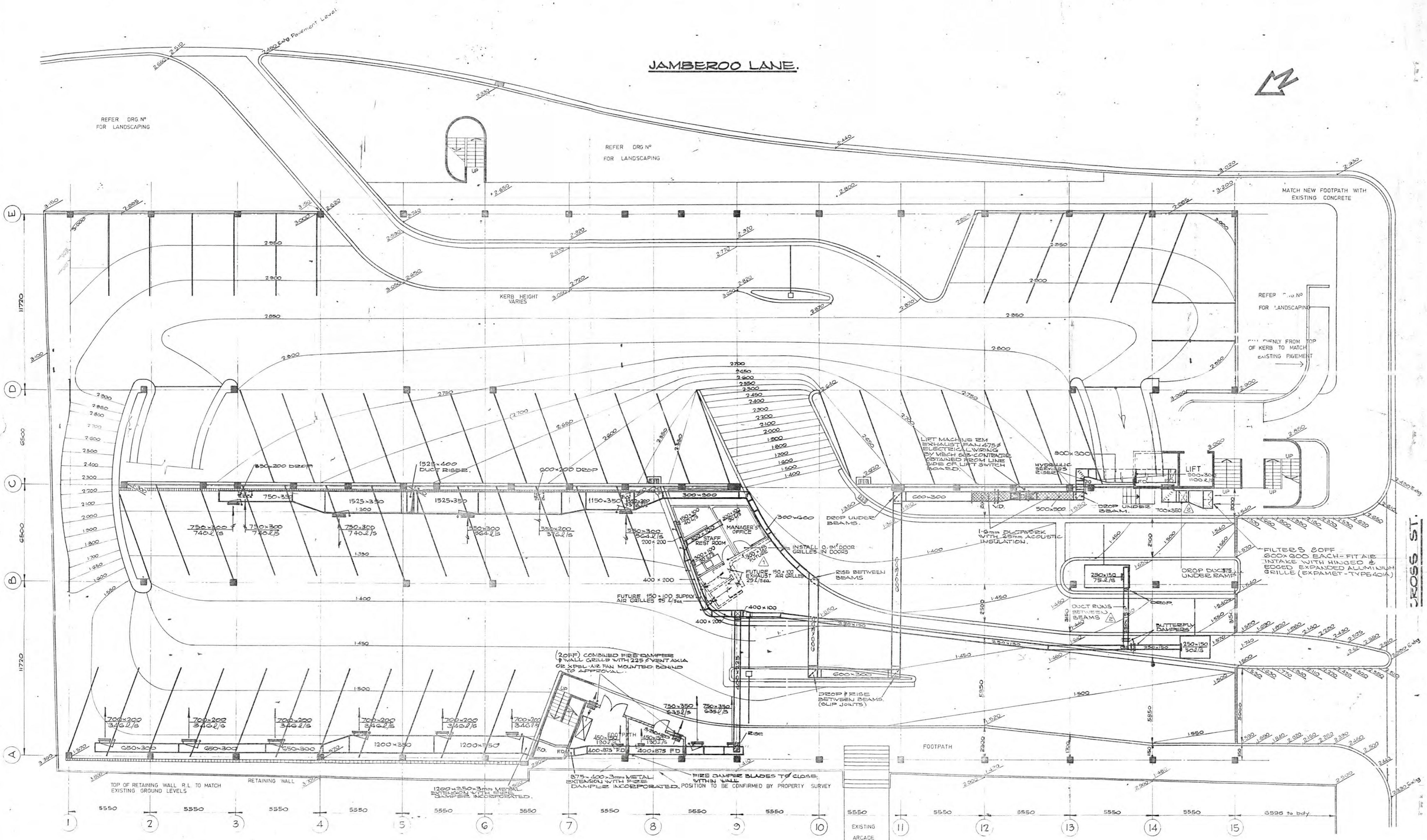
No.	AMENDMENTS	DATE
A	REVISION TO GRID LINE A BETWEEN 8 & 15.	15-7-77
B	REVISION TO RETAINING WALLS & TRENCH DRAIN EXTENT OF LANDSCAPING REVISED	22-7-77
C	RETAINING WALL CHANGED FROM B1. TO TYPE A.	8-9-77

WOOLLAHRA MUNICIPAL COUNCIL
CROSS ST. PARKING STATION
GENERAL ARRANGEMENT, GRADING & LINEMARKING LEVEL 1

P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS
REGENT HOUSE, 37-43 ALEXANDER STREET, CROWS NEST, N.S.W. 2065

SCALE	DESIGN
1:100	R.G.H.
APPROVED	DRAWN
	L.J.B.
DATE	CHECKED

DRAWING NUMBER 7267/3 C



NOTES.

1. BATTERY & SWITCHBOARD ROOM EXHAUST FANS TO BE 24HR OPERATION. ALL WIRING BY ELECTRICAL SUB-CONTRACTOR
2. 45mm SOLID CORE DOORS TO BATTERY & SWITCHBOARD ROOMS.
3. SLIP JOINTS TO BE USED ON DUCTWORK OVER RAMP AREAS AND DUCTWORK SHALL BE HARD TO SLAB - INCREASE WIDTH OF DUCTWORK LOCALLY TO ALLOW FOR COMPLEX TRANSITION.
4. RISER DUCTWORK BETWEEN LOWER LEVELS OF 3 & 4 AND RUN OUT DUCT EITHER SIDE OF RISERS (EXHAUST & SUPPLY AIR) FOR TWO LEVELS BELOW PLANT ROOMS FOR A HORIZONTAL DISTANCE OF 5m TO BE 1·6mm SHEET METAL.
5. ALL SUB-MAINS TO BE TERMINATED AND CONNECTED BY MECHANICAL SUB-CONTRACTOR.

DUCTWORK LOCATIONS -
RESTRICTED HEADROOM BENEATH

SHT. 02

DATE	RECIPIENT	Nº OFF
4/11/77	WOOLLAHRA MUNICIPAL COUNCIL PAK-POY & ASSOCIATES	1 1
21/3/77	PAK-POY & ASSOCIATES McCONNEL SMITH & JOHNSON	1 1

DRAWING ISSUES

McConnel Smith & Johnson Pty Ltd
Architects
35 Richards Avenue
Surry Hills
Sydney 2010
Telephone 33 4301

R H Tewksbury & Partners Pty Ltd
Consulting Engineers
First Floor Univac Building
754 Pacific Highway
Chatswood
Telephone 412 4322

Title: DUCTWORK LAYOUT

Drawing No. M 2/2
Job No. 75/02
Date 8·3·77 | Drawn G.W. | Checked RH 19·4·77 | Scale

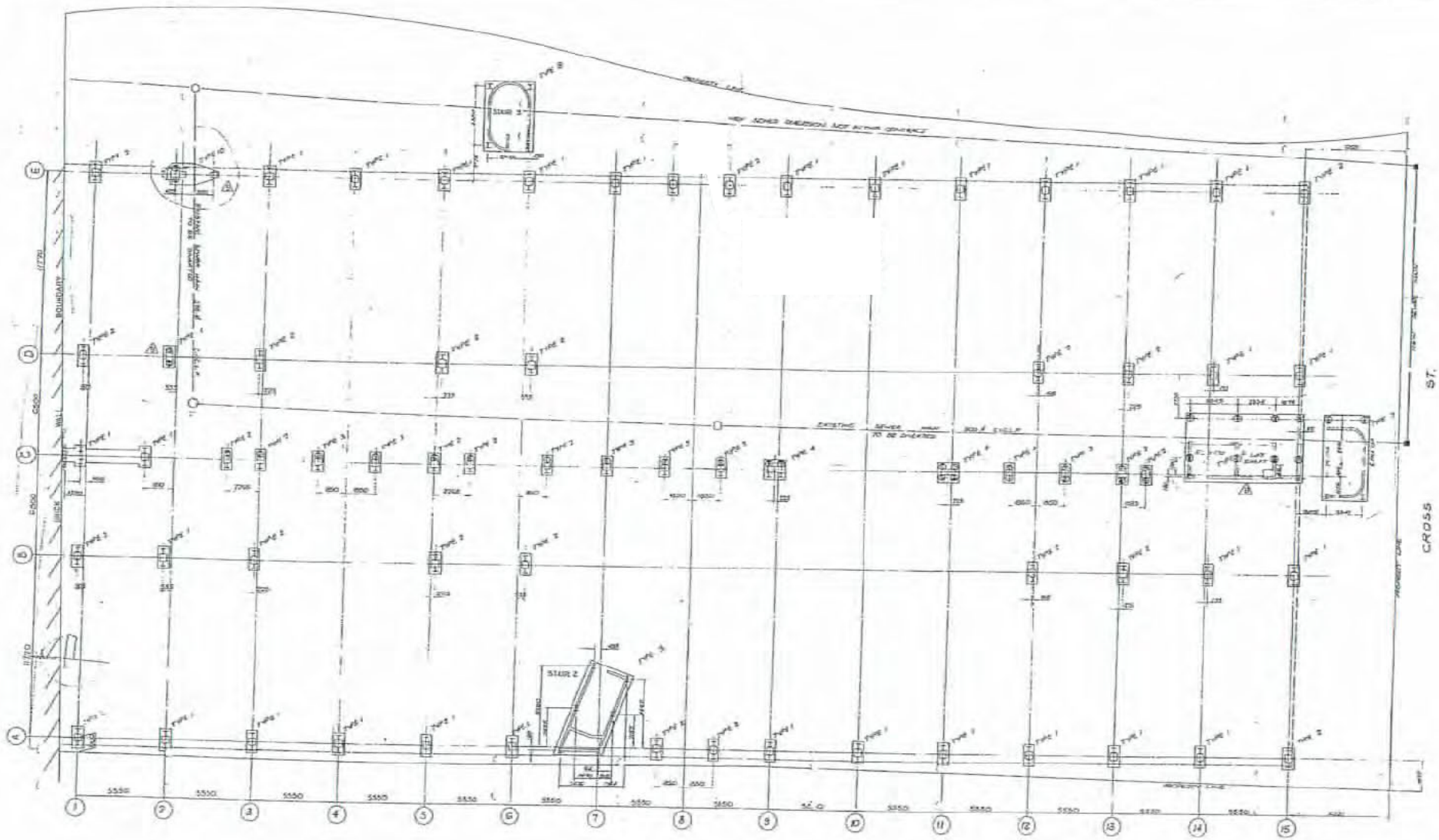
No.	AMENDMENTS	DATE
2	REVISE EA DUCT TO LIFT MOTOR ROOM & DUCT TAKEOFF TO BOOTH	4/11/77
1	S.A & EA DUCTWORK TO STAFF REST & TOILETS REVISED	2/11/77
A	SUPPLY AIR DUCTWORK TO TOLL BOOTHS REVISED	4/4/77

WOOLLAHRA MUNICIPAL COUNCIL
CROSS ST. PARKING STATION
MECHANICAL SERVICES
LEVEL 1

P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS

SCALE	DESIGN
1:100	R.G.H.
APPROVED	DRAWN
-	L.J.B.
DATE	CHECKED

DRAWING NUMBER



FOOTING PLAN - PILE LOCATIONS

SHT. 03

NOT FOR CONSTRUCTION

Rev.	Amendment or reason for issue	Date	Drawn	Designed	Verified	Authorised (*)

Project

Drawing Title

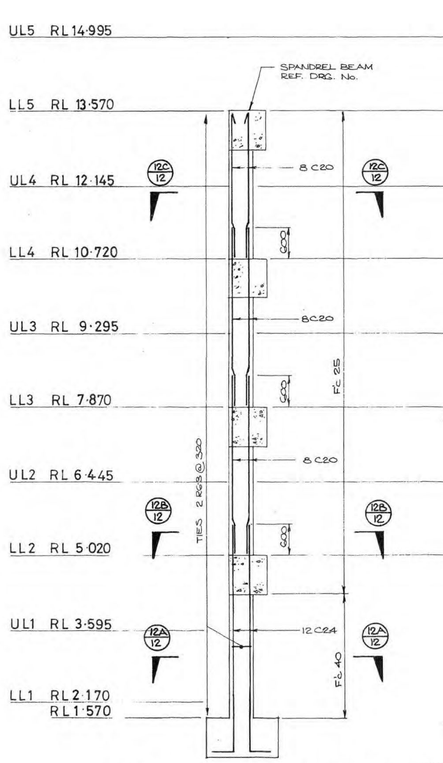
6/55/2 - 04

Of

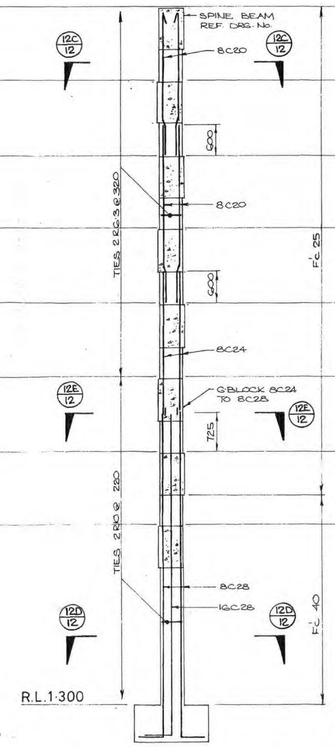
(*) Unless there is an authorised Hughes Trueman signature at *, this drawing is not authorised for issue. / Copyright: This drawing remains the property of Hughes Trueman Pty. Ltd. It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagement for that commission. Unauthorised use of this drawing is prohibited.

DATE : 20-4-07 TIME : 10:58am PLOTTED BY : Jsathan FILENAME: P:\St_Leona.rds\2005\05s636\Docs\DisplacationCunit 1.dwg

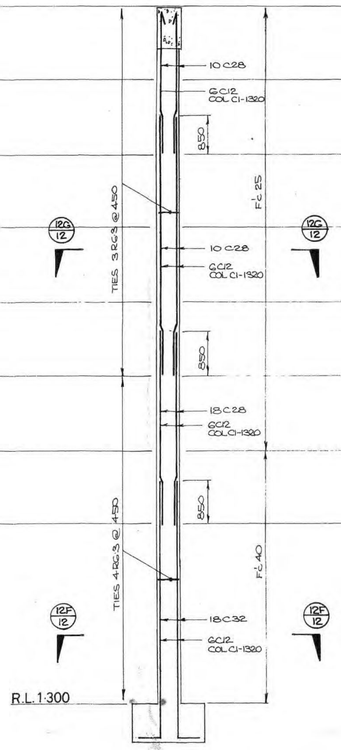
200mm A3 SHEET



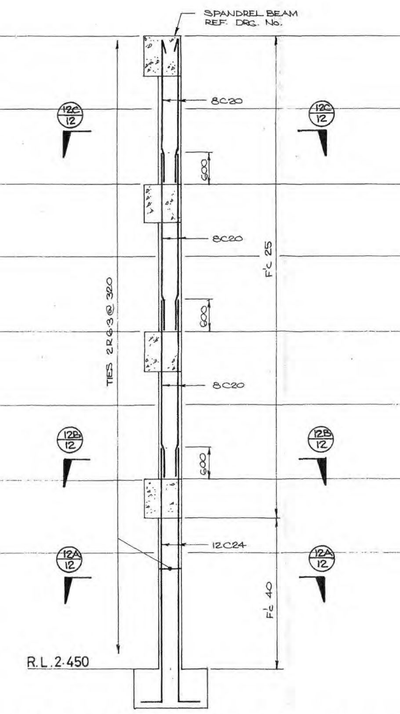
COLS. A1, A2, A3, A4, A5, A6, A7+3700, A8+1850, A9, A10, A11, A12, A13 A14, A15



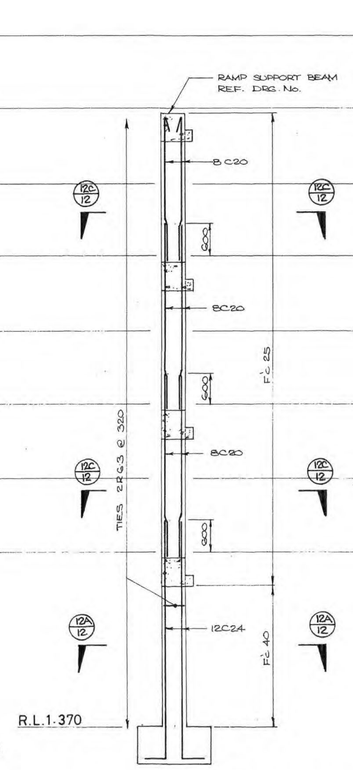
COLS. C1+3740, C2+3285, C3, C3+3700, C4+1850, C5, C5+2266, C6+1810, C7, C7+3700, C8+1850, C11+3700, C12+1850, C13, C13+1583



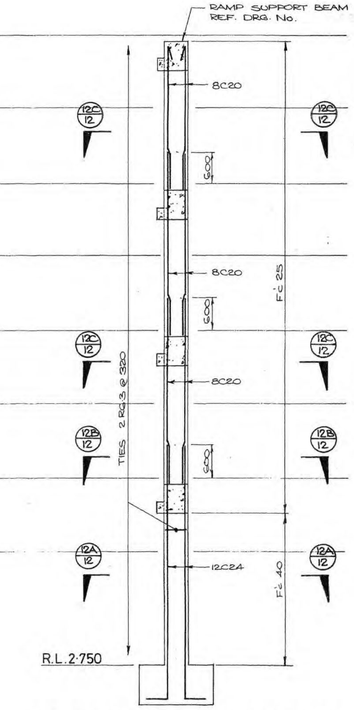
COLS C1-1320, C9, C11



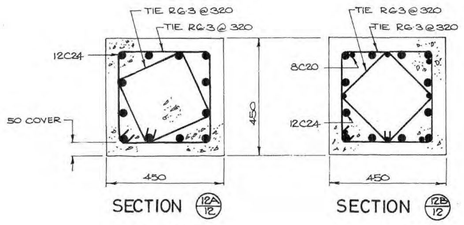
COLS. E1, E2, E3, E4, E5, E6, E7, E7+3700, E8+1850, E9, E10, E11, E12, E13, E14, E15

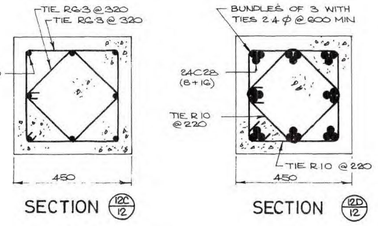


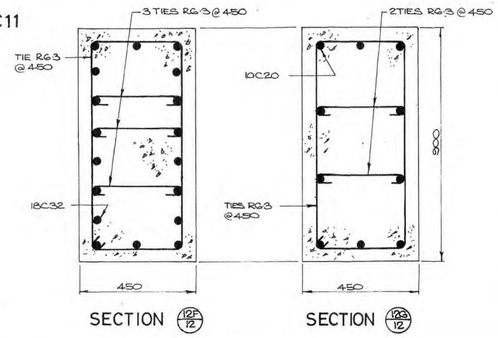
COLS B1-505, B1+4995, B2+5325, B5+225, B6+555, B13+225, B14+175, B15, B11+5445



COLS. D1-505, D1+5045, D2+5235 D5+225, D6+555, D13+225, D14+175, D15, D11+5445

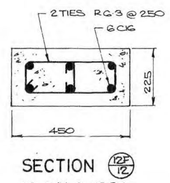




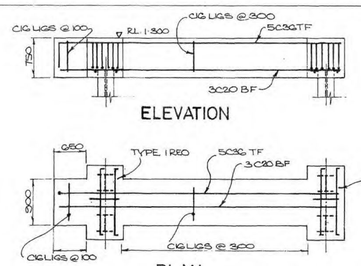


COLUMN SCHEDULE

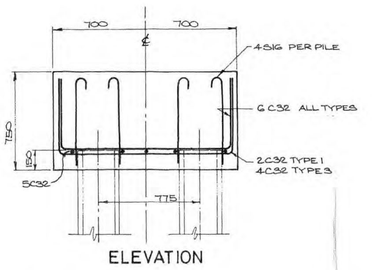
SCALES 1:- 1·50, 1·10

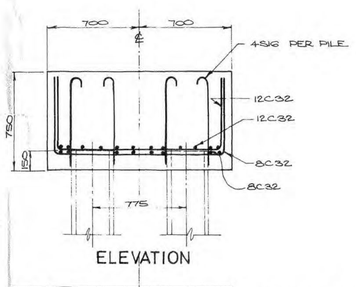


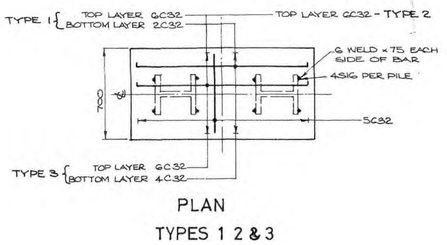
COLUMN C1-1320

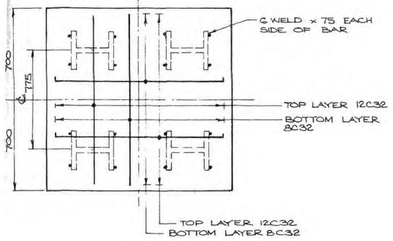


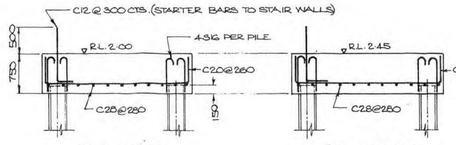
CANTILEVERED BEAM (UNDER COL. C1)

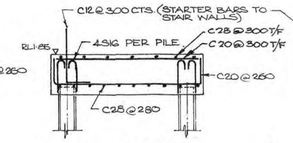


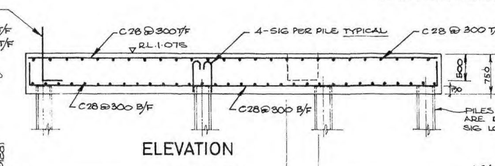




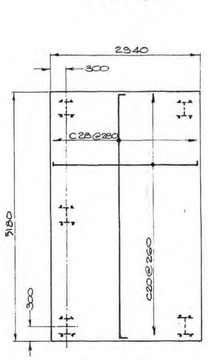


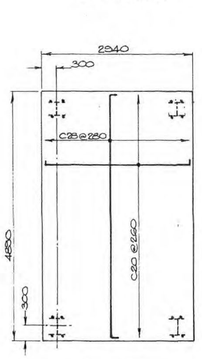


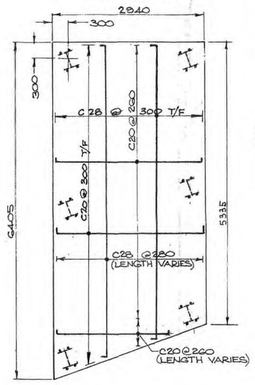


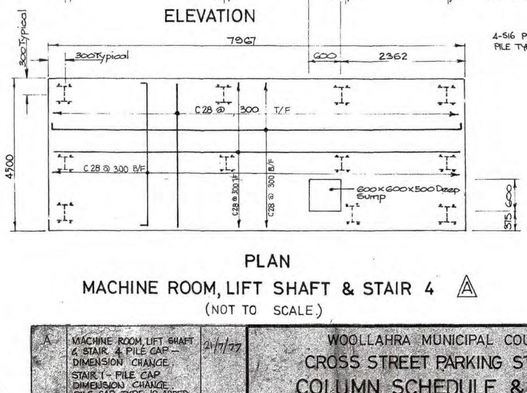


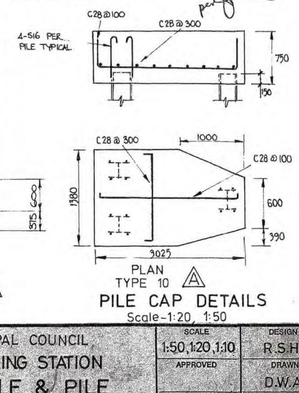
WOOLLAHRA MUNICIPAL COUNCIL
STRUCTURALLY CHECKED
pursuant to Part XI of the Local Government Act, relevant Ordinances, and S.A.A. Codes.
-8 NOV. 1977
BUILDING SURVEYOR











No.	AMENDMENTS	DATE
A	MACHINE ROOM, LIFT SHAFT & STAIR 4 PILE CAP — DIMENSION CHANGE. STAIR 1 - PILE CAP DIMENSION CHANGE. PILE CAP TYPE 10 ADDED.	21/7/77

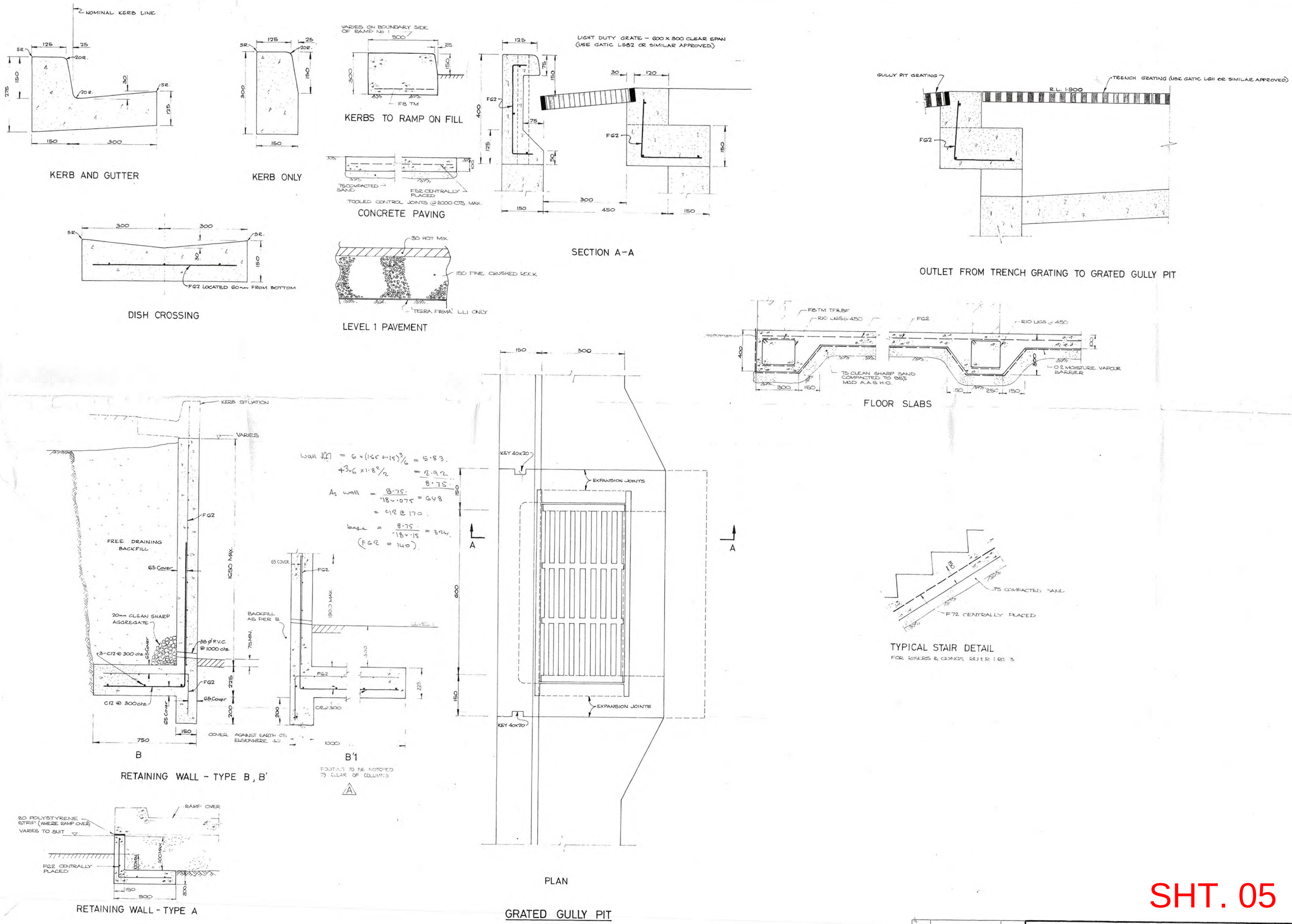
WOOLLAHRA MUNICIPAL COUNCIL
CROSS STREET PARKING STATION
COLUMN SCHEDULE & PILE CAP DETAILS

P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS
REGENT HOUSE, 37-43 ALEXANDER STREET, CROWS NEST, N.S.W. 2065

SCALE	DESIGN
1:50, 1:20, 1:10	R.S.H.
APPROVED	DRAWN
	D.W.A.
DATE	CHECKED
DRAWING NUMBER	
7267/12 A	

FOOTING DETAILS AND LEVELS

SHT. 04



CROSS ST CAR PARK STRUCTURAL DRAWINGS

SHT. 05

RETAINING WALL DETAILS - REFER TO SHT. 01 FOR LOCATIONS

No.	AMENDMENTS	DATE
A	RETAINING WALL 'B' REVISED	28-7-77

WOOLLAHRA MUNICIPAL COUNCIL
CROSS STREET PARKING STATION
STANDARD DETAILS
CONCRETE WORK LEVEL 1

P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS
REGENT HOUSE, 27-43 ALEXANDER STREET, CROWS NEST, N.S.W. 2065

SCALE	DESIGN
N.T.S.	R.G.H.
APPROVED	DRAWN
	L.J.B.
DATE	CHECKED

DRAWING NUMBER 7267/19 A

Send Attach Encrypt Discard ···

To Bcc

Cc

Fw: Cross Street Carpark Double Bay - H-Pile Footings Testing

Marini MRP-350 - Comp...
10 MB

From: Paul Connett <Paul.Connett@ttw.com.au>
Sent: Thursday, 24 June 2021 12:27 PM
To: Sagar Mansukh <Sagar.Mansukh@altusgroup.com>
Cc: Yoontae Jung <Yoontae.Jung@altusgroup.com>; yoontae83@gmail.com <yoontae83@gmail.com>
Subject: RE: Cross Street Carpark Double Bay - H-Pile Footings Testing

CAUTION: This email originated from outside this organization. Do not click links or open attachments unless you can confirm the sender and know the content is safe.

Hi Sagar,

Please find attached brochure from TerraQuip. Their MRO-350 is similar to the Tescar CF2.5A. they say it needs a minimum of 2.9m to operate in, so approx. 900mm excavation to create a working platform would be required, to operate below beams with 2.1m headroom. Depth that configuration can drill to is 12m, or 14m with extensions – likely just deep enough towards the N-W corner – top for rock then increases across the rest of the site. Travelling in seems to require 2.36m headroom, so groundworker would need to excavate a path say 200mm deep below top of asphalt to get the machine in. All adds work and cost, but not impossible.

Regards,
Paul

Paul Connett | Technical Director
+61 2 9439 7288 | +61 458 019 973
Level 6, No. 73 Miller Street, North Sydney NSW 2060
We have a new Sydney office, read about it here

Send Discard ···

[redacted]

[redacted]

Hi Sagar,

Ground floor height under beam to carpark pavement level is approximately 2.1m

1. MGI Piling Australia (Glendenning NSW) website advises that they have a Tescar CF2.5A (details attached) which with head modification can work within 2.5m headroom. Therefore, to use this rig as configured in the brochure it would be necessary to remove the carpark asphalt and excavate 400mm+ to give a machine platform. However, if the drilling head can be attached to a backhoe (similar to the below photograph) then the machine could stand away and likely the drilling head could work within 2.1m headroom, or the ground excavated at the pile cap to allow it to. http://www.mgipiling.com.au/equipment-dimensions.html



2. Another NSW hire company is TerraQuip https://terraquip.com.au/marini-drilling-equipment/marini-drilling-equipment-mr-p-line/ , whose website advises that they have a Marini MR-P Line, which looks maybe lower in height than the Tescar CF2.5A. No brochure available on their website. Drilling depth 18m.

Worldwide there are machines that will drill in 2.2m headroom (Techno Drill 308 attached as an example), possibly laboriously as they seem to need sections of drill length added until the hole is deep enough, and then removed each time the auger is removed. The timesaving feature of the Tescar CF2.5A, Marini MR-P Line, and others like them, is that they are telescopic (no adding or removing sections).

As advised by phone, and our report, from the two geotechnical reports provided we doubt that there is an acid sulfate / H pile issue. However, for budget cost purposes and if for any reason Council were to do this work in the future, the approach would normally be to tender to groundworkers who would then hire/source the necessary machinery, and if needs be mount it on a suitable backhoe, for example.

Regards,
Paul

Paul Connett | Technical Director

[redacted]

Level 6, No. 73 Miller Street, North Sydney NSW 2060

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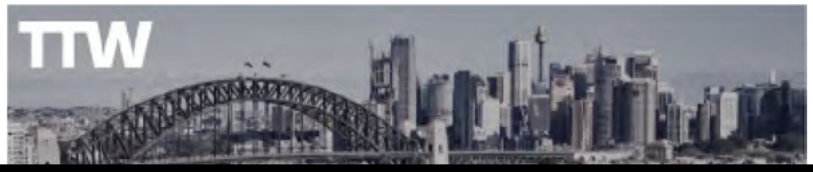


[redacted]

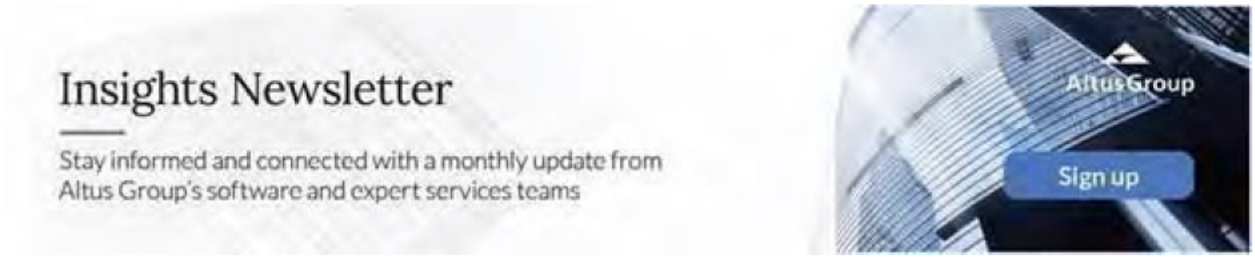
l so we can consider as part of our cost advise.
Appreciate if you could come back to us by tomorrow morning.

Regards,

Sagar Mansukh
Senior Project Manager, Project Management
Altus Expert Services, Altus Group
sagar.mansukh@altusgroup.com | www.altusgroup.com

T: +61 2 9263 1295 | M: [redacted]
Level 12, 1 Market Street
Sydney NSW 2000, Australia

Altus Group is a leading provider of commercial real estate advisory services, software and data solutions.



[redacted] wrote:

> Hi Sagar,
>
> Most existing column footing have two H piles with rectangular pile cap. As discussed, attached is a remedial footing detail for budget cost purposes only, in the theoretical event that a footing might settle. There is no visible evidence of footing settlement presently.

Regards,
Paul

Paul Connett | Technical Director

+61 2 9439 7288 | [redacted]

Level 6, No. 73 Miller Street, North Sydney NSW 2060

We have a new Sydney office, read about it here



From: Sagar Mansukh [redacted]
Sen [redacted]
To: [redacted]
Cc: [redacted]
Subject: RE: Cross Street Carpark Double Bay - H-Pile Footings Testing

Hi Paul,

Hope you are well.
I tried calling this morning and have left a message on your mobile.
Please call me back when you get a moment this morning.

Regards,
Sagar

PS: Apologies our company network and emails are down so I am emailing you from my temporary gmail account.

CF 2.5 A

Perforatrice Idraulica CF 2.5 A
CF 2.5 A *Hydraulic Drill*
***Foreuse Hydraulique* CF 2.5 A**
***Perforadora Hidráulica* CF 2.5 A**





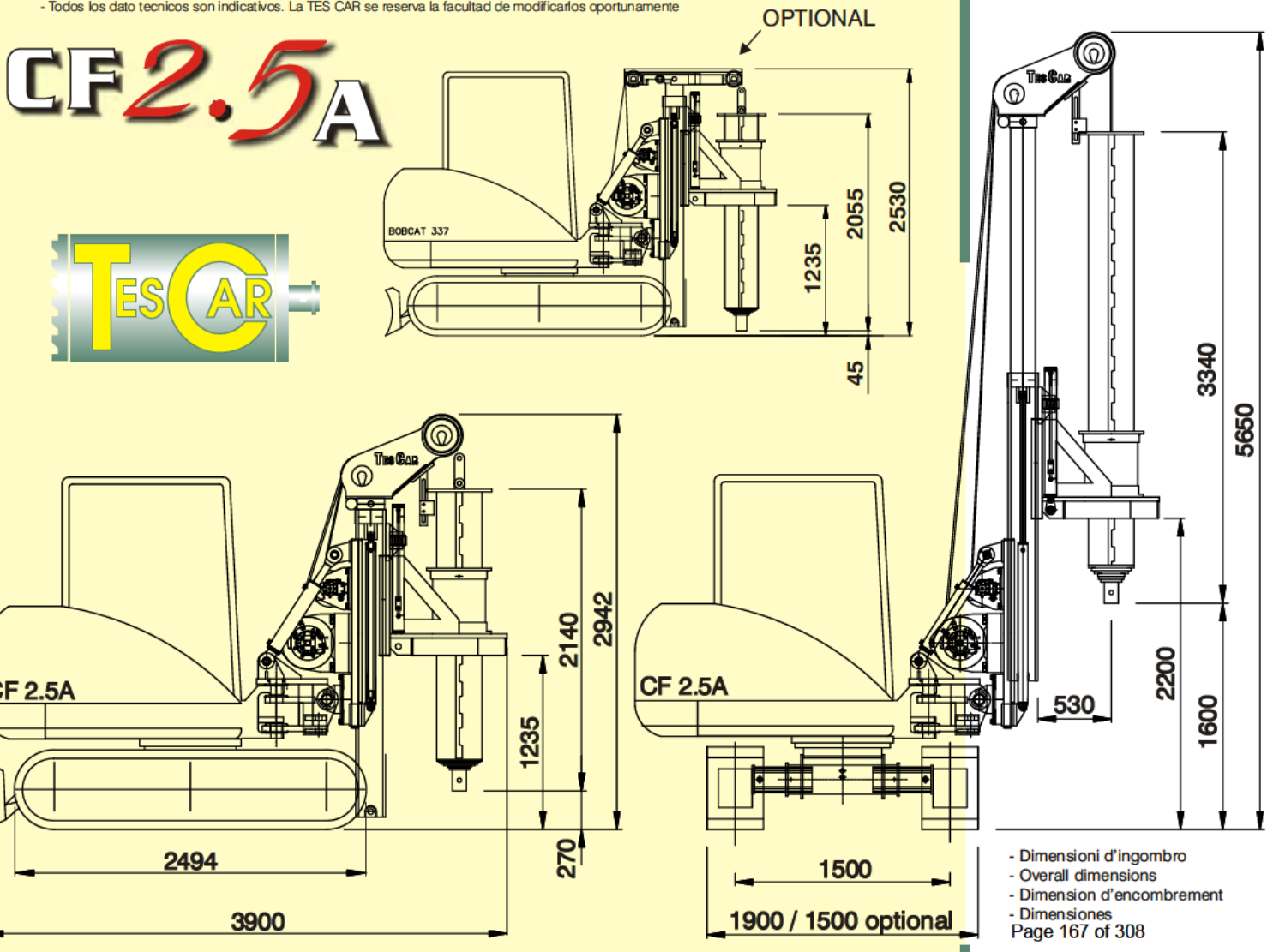


TES CAR SRL
Macchine da trivellazione
Hydraulic drilling rigs
Via Flaminia II, 18
60027 - Osimo (AN) - ITALIA
TEL. : 0039 - 071 72 31 883
0039 - 071 71 43 72
FAX : 0039 - 071 71 44 16
web-site: www.tescar.com
e-mail: info@tescar.com

Dati tecnici / Technical data / Données techniques / Datos técnicos

I	GB	F	E		
Motore diesel	**Diesel engine**	**Moteur diesel**	**Motor diesel**	**39.5 kW**	**52.9 HP**
Antenna telescopica	**Telescopic Mast**	**Mât téléscopique**	**Mástil telescòpico**	**2**	**2**
Altezza massima	Max. Height	Hauteur max.	Altura max.	**5650 mm**	**18.54 ft**
Altezza minima (mast chiuso)	Min. Height (closed mast)	Hauteur min. (Mât fermé)	Altura min. (Mástil cerrado)	**2950 mm**	**9.65 ft**
Asta telescopica	**Telescopic Kelly bar**	**Tige téléscopique**	**Kelly telescópico**		
Attacco quadro	Square connection	Attache carré	Connexión cuadra	**100 x 100 mm**	**3.94 x 3.94 in**
Profondità massima	Max. Depth	Profondeur max.	Profundidad max	**15 m**	**49.21 ft**
Argani idraulici	**Hydraulic winches**	**Treuils hydraulique**	**Cabrestantes hidráulicos**		
Argano principale	Main winch	Treuil principal	Cabrestante principal	**3000 kg**	**6600 lb**
Argano di servizio	Service winch	Treuil de service	Cabrestante auxiliar	**1000 kg**	**2200 lb**
Testa di rotazione idraulica	**Hydraulic rotary head**	**Tête de rotation hydraulique**	**Cabeza de rotacion hidráulica**		
Coppia	Torque	Couple	Par	**2500 kgm**	**18439.05 ftlb**
Velocità di perforazione	Drilling speed	Vitesse de perforation	Velocidad de perforación	**7 - 15 rpm**	**7 - 15 rpm**
Velocità di scarico	Spin-off speed	Vitesse de déchargement	Valocidad de descargo	**70 rpm**	**70 rpm**
Corsa	Stroke	Course	Carrera	**700 mm**	**27.56 in**
Diametri di perforazione	**Drilling diameters**	**Diamétres de perforation**	**Diámetros de perforación**		
Max.	Max.	Max.	Max.	**800 mm**	**31.6 in**
Min.	Min.	Min.	Min.	**350 mm**	**13.78 in**
Dimensioni per il trasporto	**Dimensions for transport**	**Dimensions pour le transport**	**Dimensiones para el transporte**		
Altezza	Height	Hauteur	Altura	**2940 mm**	**9.65 ft**
Lunghezza	Lenght	Longueur	Largo	**3900mm**	**12.79 ft**
Larghezza	Width	Largeur	Ancho	**1500 mm**	**4.92 ft**
Peso (senza utensile)	**Weight** (without tool)	**Poids** (sans outil)	**Peso** (sin herramienta)	**7950kg**	**17530 lb**

- Tutti i dati tecnici sono indicativi. La TES CAR si riserva il diritto di modificarli opportunamente.
- Technical data are indicative only. TES CAR reserves the right to introduce changes without prior notice.
- Les caractéristiques techniques sont indicatives. TES CAR se réserve le droit de les modifier sans préavis.
- Todos los dato tecnicos son indicativos. La TES CAR se reserva la facultad de modificarlos oportunamente



- Dimensioni d'ingombro
- Overall dimensions
- Dimension d'encombrement
- Dimensiones

MARINI®
QUARRIES GROUP



New product 2020 ... MR - P 350

PERFORATRICE IDRAULICA PER PALI
HYDRAULIC PILING DRILLING RIG
FOREUSE HYDRAULIQUE POUR PIEUX

MR
NEW ERA OF DRILLING MACHINES

MR - P Line

IT

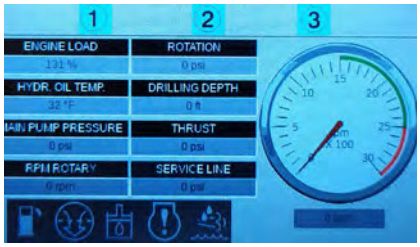
La nuova MR-P 350 introdotta da Marini, è una macchina da perforazione cingolata per l'esecuzione di pali trivellati con systema Kelly Bar. Le dimensioni compatte e la notevole potenza della MR-P 350 permettono di realizzare pali fino a 1200 mm (47.2 in) di diametro con profondità max. di 18 m (59 ft).
L'innovativa impiantistica idraulica ed elettronica sviluppata da Marini, incrementano sicurezza, performance, affidabilità e facilità d'uso grazie al nuovo radiocomando con display incorporato.
Adatta principalmente al lavoro in situazioni LHR (Low Head Room) grazie al mast telescopico che permette una maggiore flessibilità di posizionamento e alla centrale idraulica separabile fino a distanza di 30 m ne consente l'utilizzo in aree senza ricircolo d'aria.

ENG

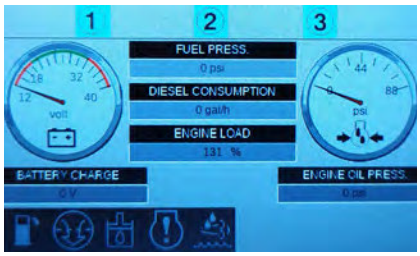
The new MR-P 350, introduced by Marini, is a crawler piling rig designed to perform bored piles with Kelly Bar system. The compact dimensions and the remarkable power of the MR-P 350 allow to realize piles up to 1200 mm (47.2 in) in diameter with max. depth of 18 m (59 ft).
The innovative hydraulic and electronic systems developed by Marini, have increased safety, performance, reliability and facility of use thanks to the new remote control with integrated display.
Mainly suitable to work in LHR (Low Head Room) conditions thanks to the telescopic mast system that allows flexible positioning options and to the hydraulic power pack unit which can be separated up to a distance of 30 m in areas without air circulation.

FR

La nouvelle MR-P 350 brevetée par Marini, est une unité de perforation à chenilles pour l'exécution de pieux forés Kelly Bar. Les dimensions compactes et la puissance remarquable de la MR-P 350 permettent de réaliser des pieux jusqu'à 1200 mm (47.2 in) de diamètre avec profondeur max de 18 m (59 ft).
Les systèmes hydrauliques et électroniques innovantifs développés par Marini augmentent la sécurité, les performances, la fiabilité et la facilité d'utilisation grâce à la nouvelle télécommande avec écran intégré.
Également adapté pour travailler dans des situations LHR (Low Head Room), le mât télescopique permet une plus grande flexibilité de positionnement et l'unité hydraulique peut être séparée jusqu'à une distance de 30 m en permettant sa utilisation dans des zones sans recirculation d'air.





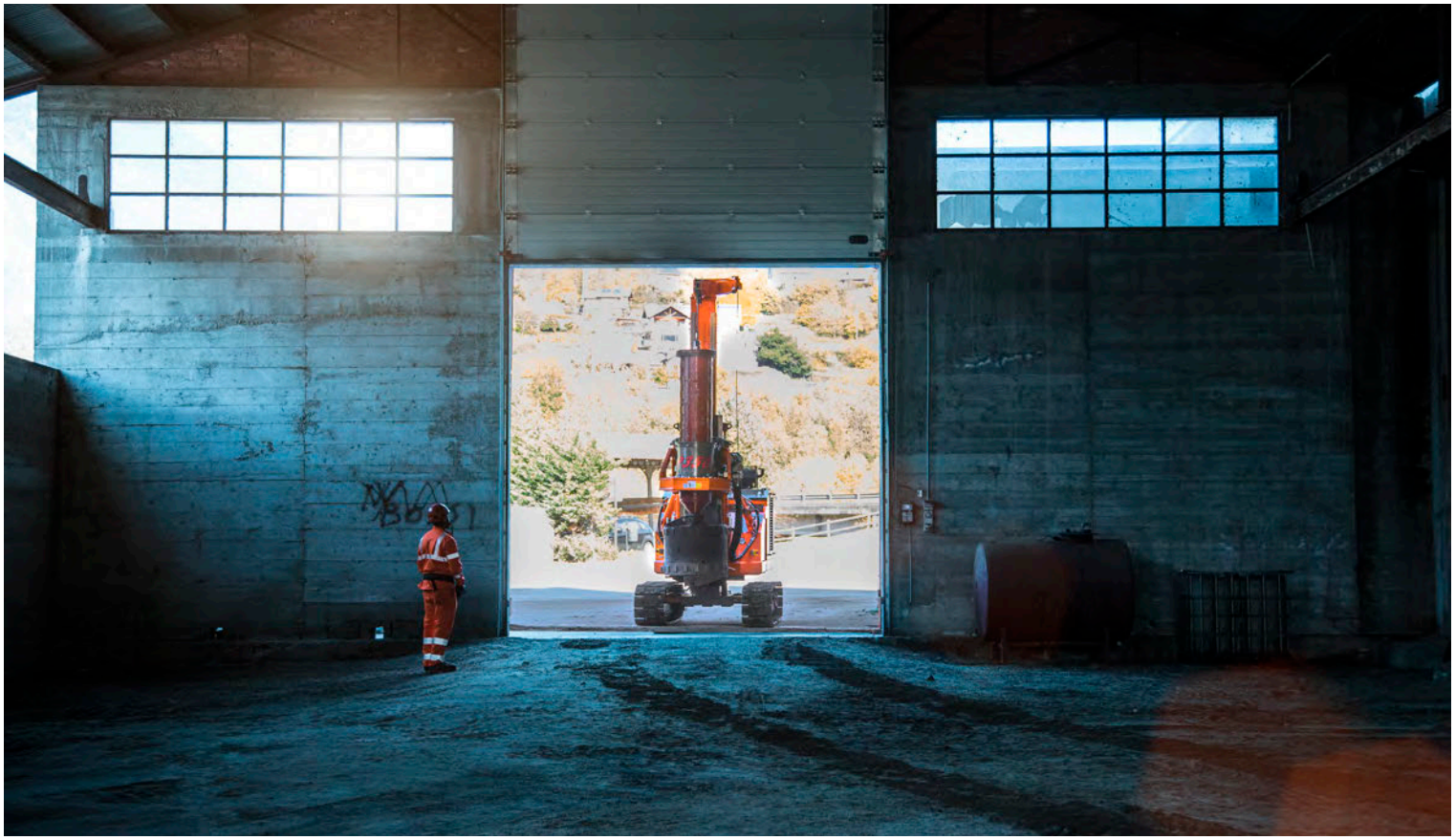




Nuovo radiocomando interattivo Marini tech - New interactive Marini remote control tech - Nouvelle télécommande radio interactive Marini tech

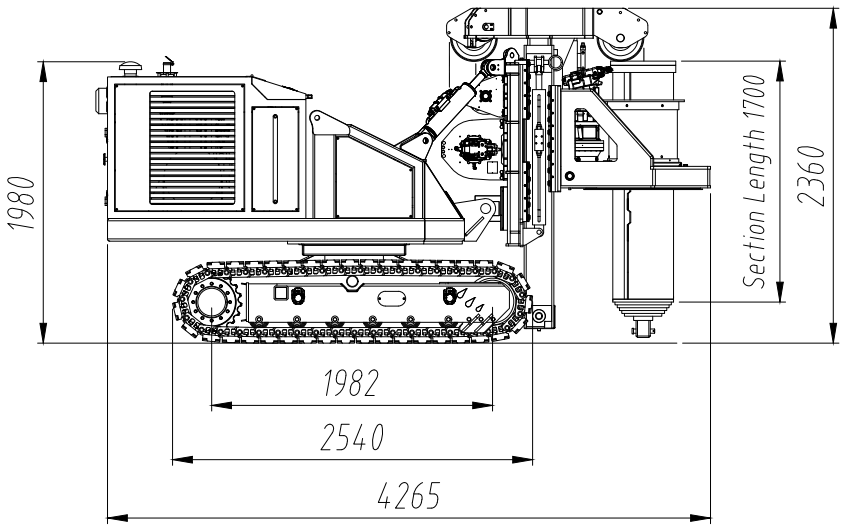
MR - P 350

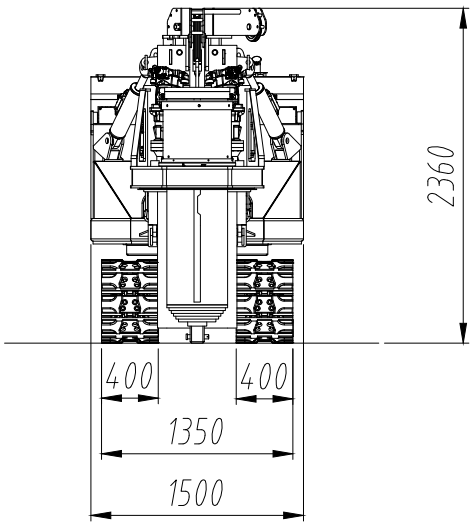




Dati Tecnici- Technical Data

Carro Cingolato Undercarriage	Chariot chenille Fahrwark		
Passo cingolo Wheel base	Enpattement Fahrwerk	1982 mm / 6.50 ft	
Careggiata variabile Variable track	Standbreite verstellbar Voie variabre	1350 - 1850 mm (4.43- 6.07 ft)	
Larghezza suole Pad width	Langeur patins Fussbreite	400 mm / 1.31 ft	
Pendenza max. Max. climbing ability	Pente max. Steigfähigkeit max.	80%	
Velocità max. Max. speed	Vitesse max. Fahrgeschwindigkeit	2.5 Km/h (15.5 mph)	
Velocità rotazione torretta Tower rotation speed	Vitesse de rotation de la tour Revolverdrehzahl	5 rpm	
Centrale idraulica Power Pack	Groupe Hydraulique Hydraulikaggregat		
Motore Diesel Diesel Engine	Moteur diesel Dieselmotor	KOHLER KDI 2504 TCR	
Potenza motore Engine Power	Puissance moteur Antriebsleische Leistung	55kW (75 Hp) @2600 rpm	
Pompa principale Main pump	Pompe principale Hydraulische Leistung	160 lpm @ 250 bar (42.3 gpm @3771 psi)	
Serbatoio olio Oil tank	Réservoir huile Oltank	200 Litri / 52.8 gal	
Serbatoio Gasolio Fuel Tank	Réservoir diesel Diesel tank	100 Litri /28 gal	
Consumo carburante Fuel consumption	Consommation de carburant Kraftstoffverbrauch	5 l/h (1.33 gal/h)	
Raffreddamento Cooling	Refroidissement Kühlung	Scambiatore aria olio separato - Separate oil air exchanger - Échangeur air-huile séparé - Separater Luft-Öl-Tauscher	
Argano idraulico Hydraulic winch	Treuil hydraulique Hydraulische Seilwinde	Principale / Main	Servizio / Service
Tiro max. Max. pull	Traction max. Max. Zugkraft	3000 daN / 6600 lb	1000 daN / 2200 lb
Radiocomando Remote control	Télécommande Fernbedienung		
Standard		Pulsantiera Standard / Standard control/ Panneau standard / Standard-Tastenfeld	
Tech (optional)		Pulsantiera con schermo dati / Control with data display / Panneau avec écran / Panel mit Datenbildschirm	



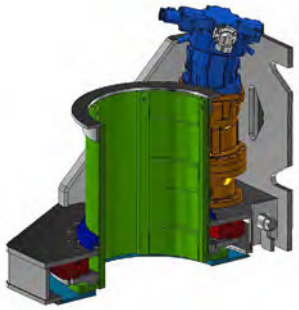


Peso totale unità / Machine total weight / Gesamtgewicht der Einheit / Poids total de l'unité ~9000 kg (19850 lbs)

Opzioni ed Accessori- Options and Accessories- Options et Accessoires- Optionen und Zubehör

Teste di rotazione Rotary head	Téte de rotation Drehkopf	R- 27	R- 35
Coppia max. Max. torque	Couple max. Drehmoment max.	2700 daNm (19915 lbft)	3500 daNm (25815 lbft)
Velocità di perforazione Drilling speed	Vitesse de forage Bohrgeschwindigkeit	0/30 rpm	0/45 rpm
Velocità di scarico Spin-off speed	Vitesse de déchargement Entladegeschwindigkeit	70 rpm	70 rpm
Corsa testa Rotary head stroke	Course de tête rotative Drehkopfhub	700 mm / 2.29 ft	700 mm / 2.29 ft
Forza di spinta max. Max. Feed force	Poussée max. Vorschubkraft	9000 daN / 20234 lbf	
Forza di tiro max. Max. Retract force	Traction max. Rückzugskraft	6000 daN / 13489 lbf	



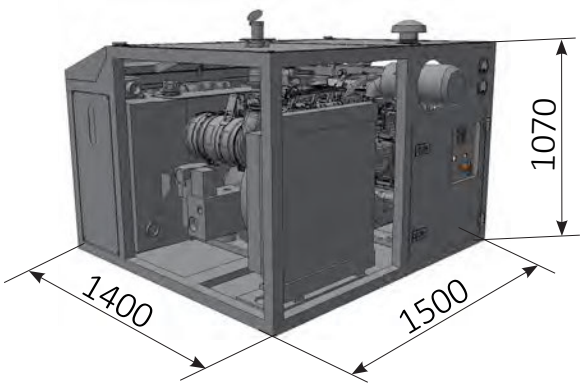


Parametri di perforazione / Drilling parameters / Paramètres de forage / Bohrparameter

Parametri di Perforazione Drilling parameters	Paramètres de forage Bohrparameter	
Diametro Max Max. diameter	Diamètre max Durchmesser max	1200 mm / 47.2 in
Diametro Min Min. diameter	Diamètre min Durchmesser min	500 mm / 19.6 in
Profondità Max Max. dept	Profondeur max Tiefe max	18 mt / 59 ft

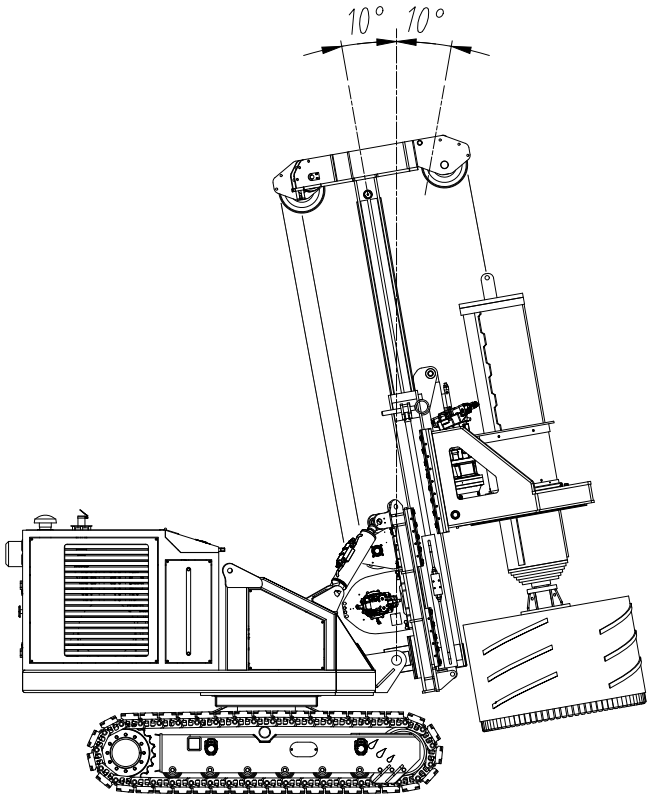
Centrale separabile / Separable power-pack / Central séparable / Zentral trennbar

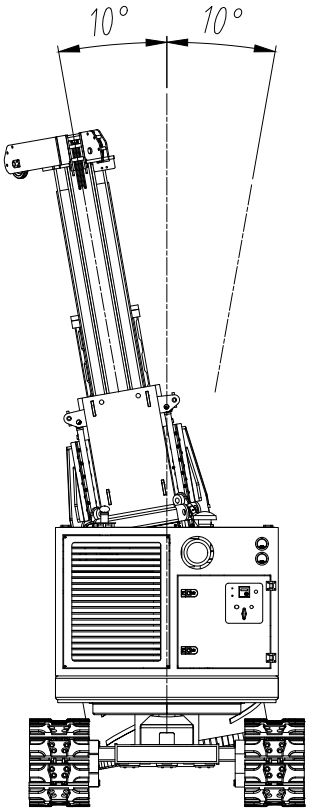
Centrale idraulica separabile Separable hydraulic Power-Pack	Central séparable Zentral trennbar	Optional
Rimozione Removal	Enlèvement Entfernung	Sollevamento / Lifting / Levage / Aufzug
Max. distanza Distance max.	Distance max. Entfernung max.	30 mt / 98.33 ft
Peso Weight	Poids Gewicht	1500 kg (3300 lbs)

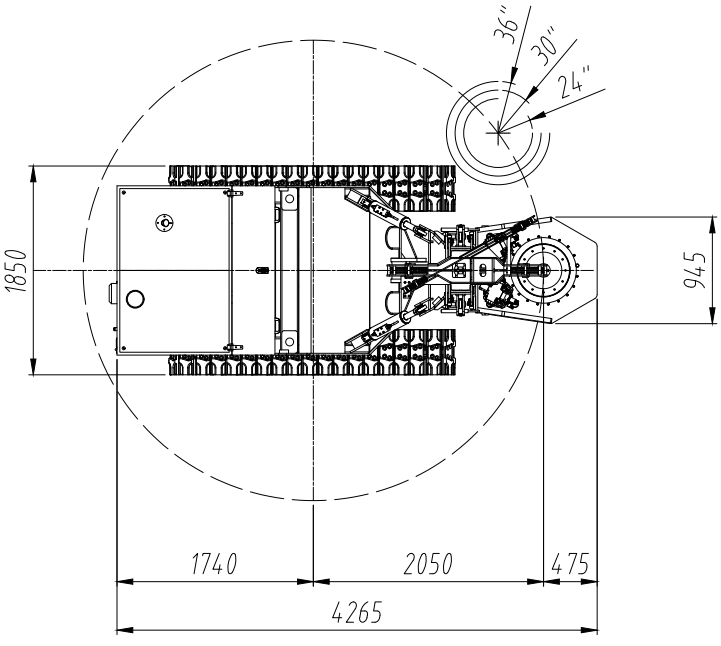


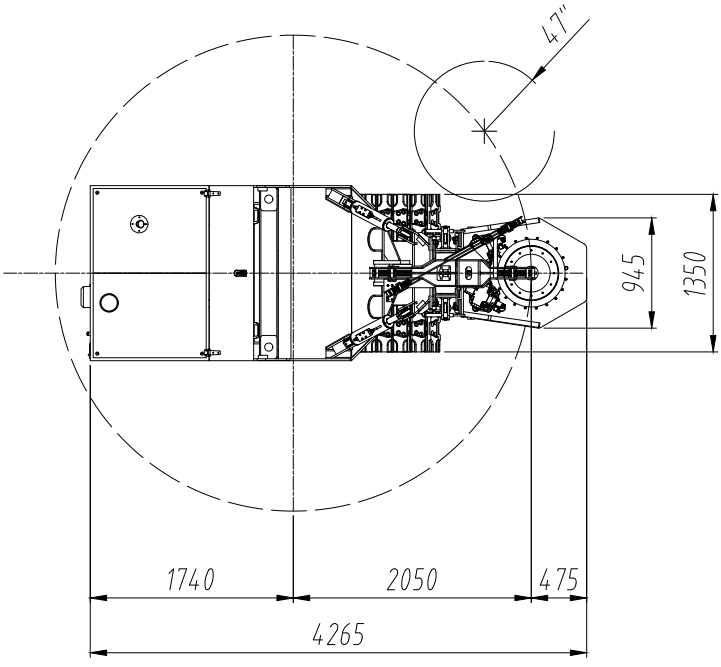
MR - P 350

Condizioni di lavoro - Working conditions - Conditions de travail - Arbeitsbedingungen









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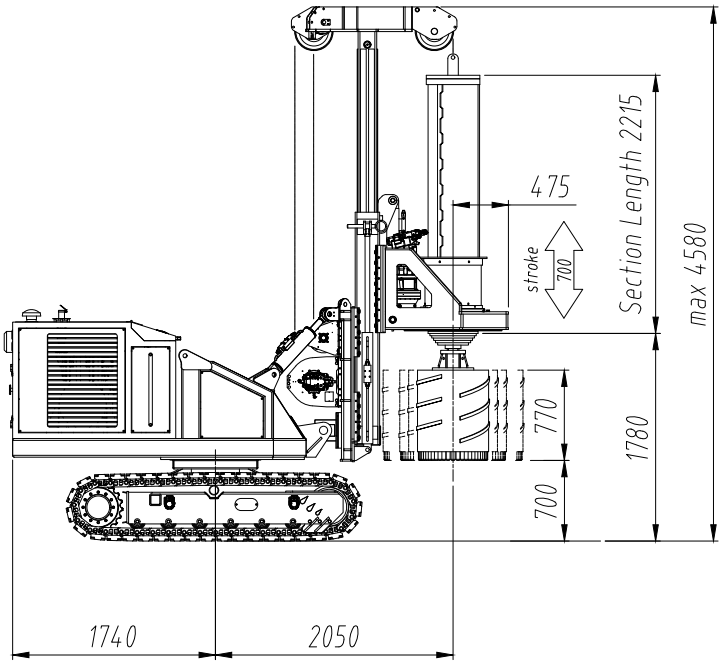

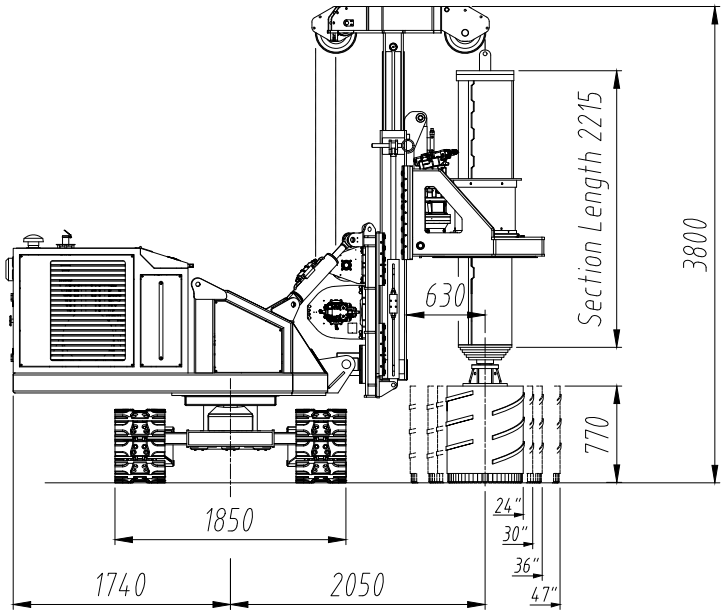

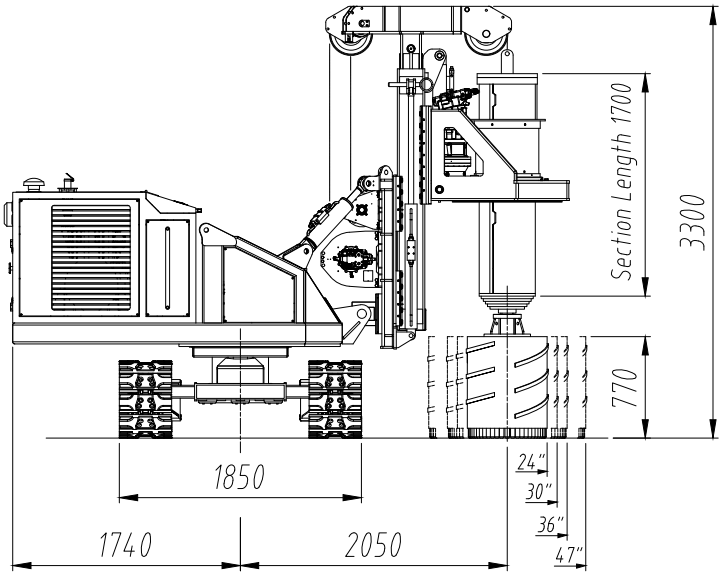

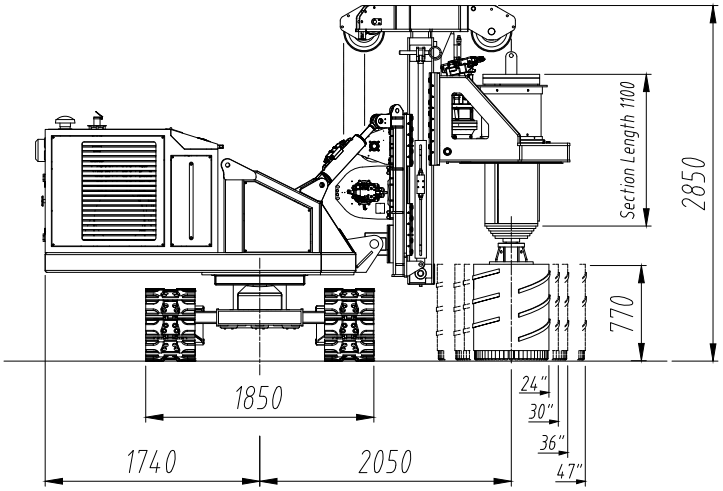

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MARINI QUARRIES GROUP S.R.L.
Via Beura 44-28844 Villadossola (VB)-ITALY
Tel.+39 0324 575106 Fax. +39 0324 54096
Web site www.mariniqg.it
email: mariniqg@mariniqg.it

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New product 2020 ... MR - P 350

PERFORATRICE IDRAULICA PER PALI
HYDRAULIC PILING DRILLING RIG
FOREUSE HYDRAULIQUE POUR PIEUX

MR
NEW ERA OF DRILLING MACHINES

MR - P Line

IT

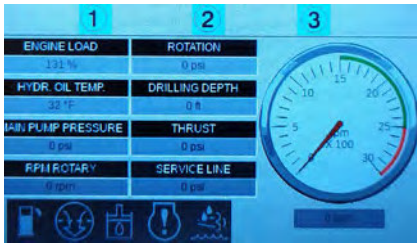
La nuova MR-P 350 introdotta da Marini, è una macchina da perforazione cingolata per l'esecuzione di pali trivellati con systema Kelly Bar. Le dimensioni compatte e la notevole potenza della MR-P 350 permettono di realizzare pali fino a 1200 mm (47.2 in) di diametro con profondità max. di 18 m (59 ft).
L'innovativa impiantistica idraulica ed elettronica sviluppata da Marini, incrementano sicurezza, performance, affidabilità e facilità d'uso grazie al nuovo radiocomando con display incorporato.
Adatta principalmente al lavoro in situazioni LHR (Low Head Room) grazie al mast telescopico che permette una maggiore flessibilità di posizionamento e alla centrale idraulica separabile fino a distanza di 30 m ne consente l'utilizzo in aree senza ricircolo d'aria.

ENG

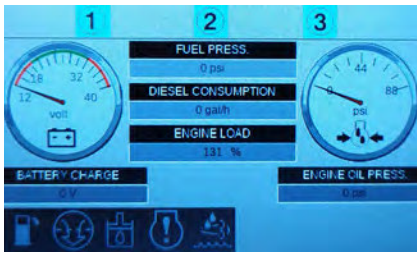
The new MR-P 350, introduced by Marini, is a crawler piling rig designed to perform bored piles with Kelly Bar system. The compact dimensions and the remarkable power of the MR-P 350 allow to realize piles up to 1200 mm (47.2 in) in diameter with max. depth of 18 m (59 ft).
The innovative hydraulic and electronic systems developed by Marini, have increased safety, performance, reliability and facility of use thanks to the new remote control with integrated display.
Mainly suitable to work in LHR (Low Head Room) conditions thanks to the telescopic mast system that allows flexible positioning options and to the hydraulic power pack unit which can be separated up to a distance of 30 m in areas without air circulation.

FR

La nouvelle MR-P 350 brevetée par Marini, est une unité de perforation à chenilles pour l'exécution de pieux forés Kelly Bar. Les dimensions compactes et la puissance remarquable de la MR-P 350 permettent de réaliser des pieux jusqu'à 1200 mm (47.2 in) de diamètre avec profondeur max de 18 m (59 ft).
Les systèmes hydrauliques et électroniques innovantifs développés par Marini augmentent la sécurité, les performances, la fiabilité et la facilité d'utilisation grâce à la nouvelle télécommande avec écran intégré.
Également adapté pour travailler dans des situations LHR (Low Head Room), le mât télescopique permet une plus grande flexibilité de positionnement et l'unité hydraulique peut être séparée jusqu'à une distance de 30 m en permettant sa utilisation dans des zones sans recirculation d'air.





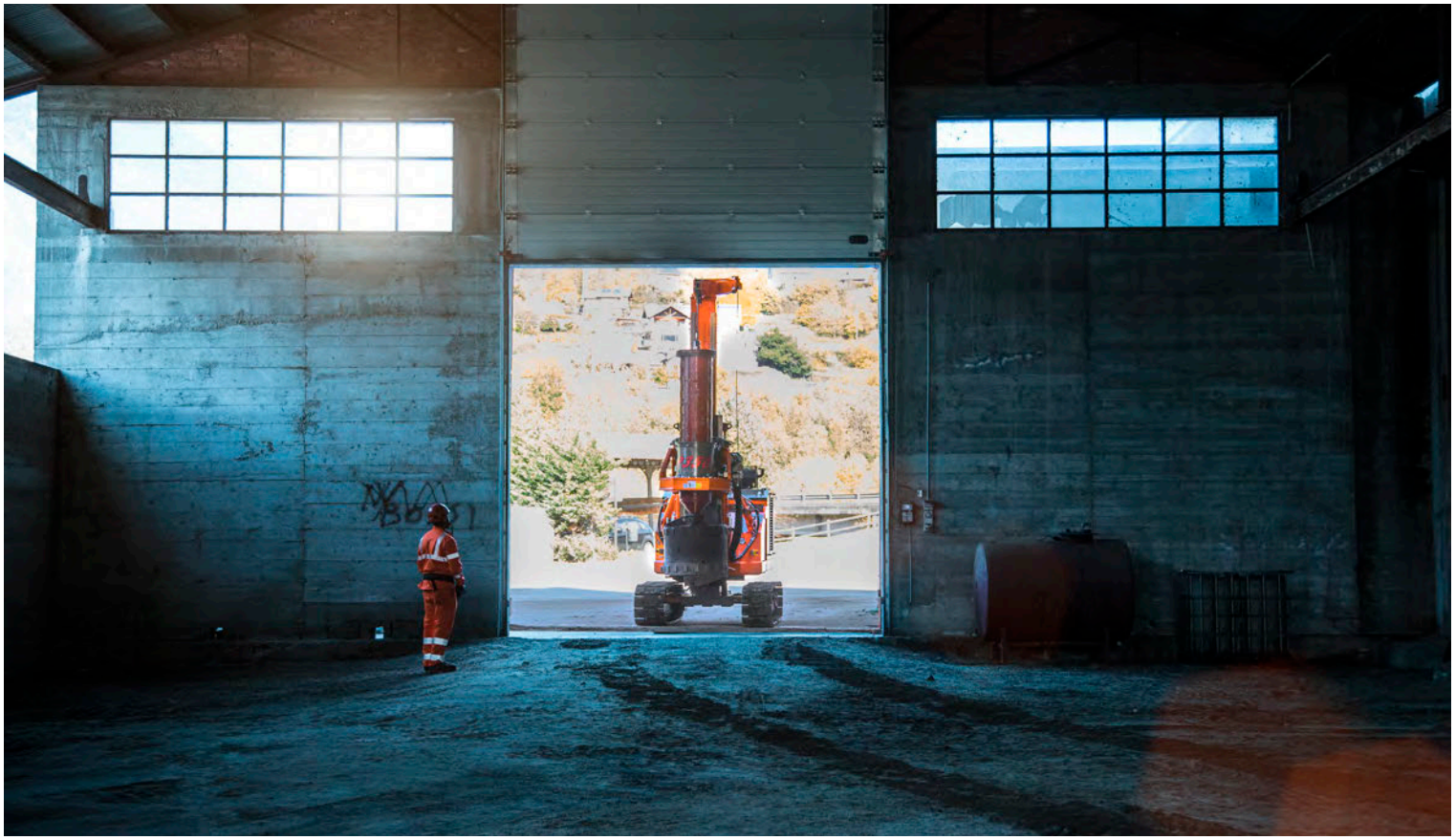




Nuovo radiocomando interattivo Marini tech - New interactive Marini remote control tech - Nouvelle télécommande radio interactive Marini tech

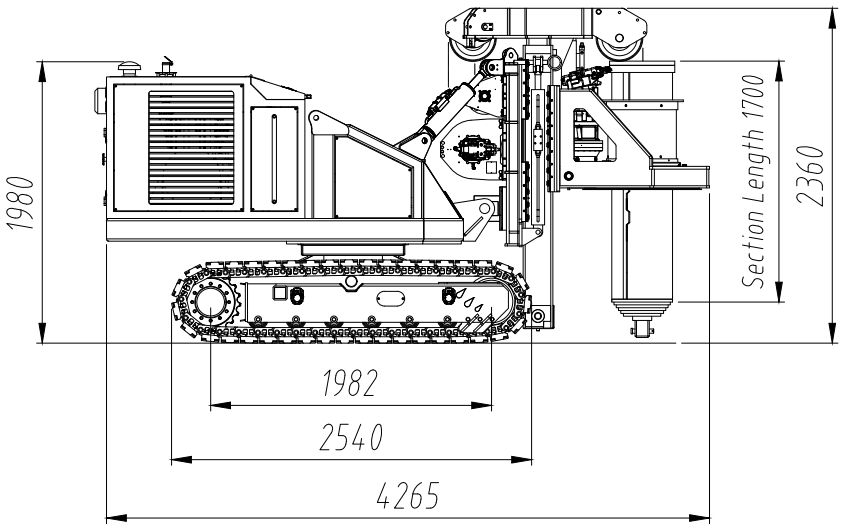
MR - P 350

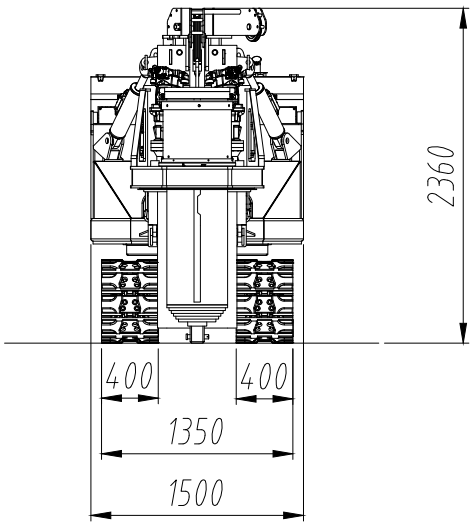




Dati Tecnici- Technical Data

Carro Cingolato Undercarriage	Chariot chenille Fahrwark		
Passo cingolo Wheel base	Enpattement Fahrwerk	1982 mm / 6.50 ft	
Careggiata variabile Variable track	Standbreite verstellbar Voie variabre	1350 - 1850 mm (4.43- 6.07 ft)	
Larghezza suole Pad width	Langeur patins Fussbreite	400 mm / 1.31 ft	
Pendenza max. Max. climbing ability	Pente max. Steigfähigkeit max.	80%	
Velocità max. Max. speed	Vitesse max. Fahrgeschwindigkeit	2.5 Km/h (15.5 mph)	
Velocità rotazione torretta Tower rotation speed	Vitesse de rotation de la tour Revolverdrehzahl	5 rpm	
Centrale idraulica Power Pack	Groupe Hydraulique Hydraulikaggregat		
Motore Diesel Diesel Engine	Moteur diesel Dieselmotor	KOHLER KDI 2504 TCR	
Potenza motore Engine Power	Puissance moteur Antriebsleische Leistung	55kW (75 Hp) @2600 rpm	
Pompa principale Main pump	Pompe principale Hydraulische Leistung	160 lpm @ 250 bar (42.3 gpm @3771 psi)	
Serbatoio olio Oil tank	Réservoir huile Oltank	200 Litri / 52.8 gal	
Serbatoio Gasolio Fuel Tank	Réservoir diesel Diesel tank	100 Litri /28 gal	
Consumo carburante Fuel consumption	Consommation de carburant Kraftstoffverbrauch	5 l/h (1.33 gal/h)	
Raffreddamento Cooling	Refroidissement Kühlung	Scambiatore aria olio separato - Separate oil air exchanger - Échangeur air-huile séparé - Separater Luft-Öl-Tauscher	
Argano idraulico Hydraulic winch	Treuil hydraulique Hydraulische Seilwinde	Principale / Main	Servizio / Service
Tiro max. Max. pull	Traction max. Max. Zugkraft	3000 daN / 6600 lb	1000 daN / 2200 lb
Radiocomando Remote control	Télécommande Fernbedienung		
Standard		Pulsantiera Standard / Standard control/ Panneau standard / Standard-Tastenfeld	
Tech (optional)		Pulsantiera con schermo dati / Control with data display / Panneau avec écran / Panel mit Datenbildschirm	



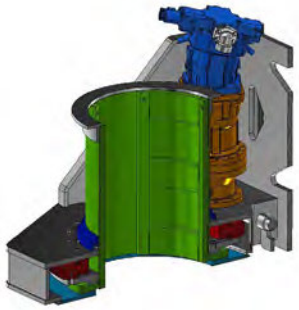


Peso totale unità / Machine total weight / Gesamtgewicht der Einheit / Poids total de l'unité ~9000 kg (19850 lbs)

Opzioni ed Accessori- Options and Accessories- Options et Accessoires- Optionen und Zubehör

Teste di rotazione Rotary head	Téte de rotation Drehkopf	R- 27	R- 35
Coppia max. Max. torque	Couple max. Drehmoment max.	2700 daNm (19915 lbft)	3500 daNm (25815 lbft)
Velocità di perforazione Drilling speed	Vitesse de forage Bohrgeschwindigkeit	0/30 rpm	0/45 rpm
Velocità di scarico Spin-off speed	Vitesse de déchargement Entladegeschwindigkeit	70 rpm	70 rpm
Corsa testa Rotary head stroke	Course de tête rotative Drehkopfhub	700 mm / 2.29 ft	700 mm / 2.29 ft
Forza di spinta max. Max. Feed force	Poussée max. Vorschubkraft	9000 daN / 20234 lbf	
Forza di tiro max. Max. Retract force	Traction max. Rückzugskraft	6000 daN / 13489 lbf	



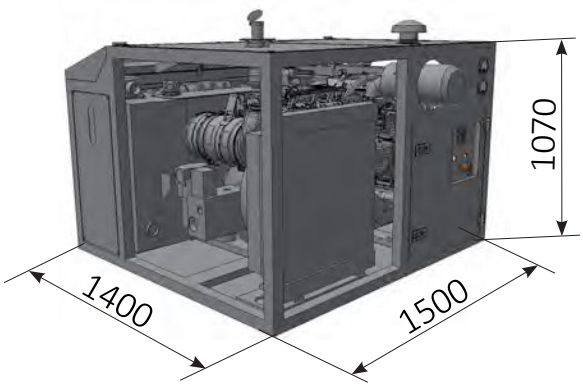


Parametri di perforazione / Drilling parameters / Paramètres de forage / Bohrparameter

Parametri di Perforazione Drilling parameters	Paramètres de forage Bohrparameter	
Diametro Max Max. diameter	Diamètre max Durchmesser max	1200 mm / 47.2 in
Diametro Min Min. diameter	Diamètre min Durchmesser min	500 mm / 19.6 in
Profondità Max Max. dept	Profondeur max Tiefe max	18 mt / 59 ft

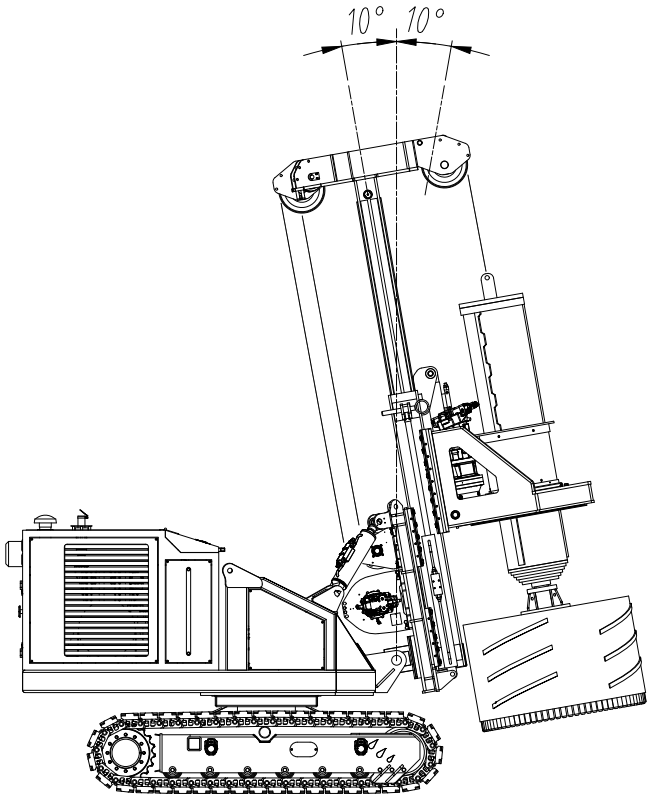
Centrale separabile / Separable power-pack / Central séparable / Zentral trennbar

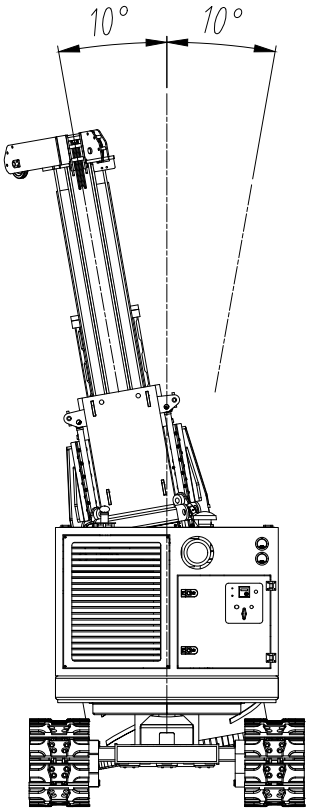
Centrale idraulica separabile Separable hydraulic Power-Pack	Central séparable Zentral trennbar	Optional
Rimozione Removal	Enlèvement Entfernung	Sollevamento / Lifting / Levage / Aufzug
Max. distanza Distance max.	Distance max. Entfernung max.	30 mt / 98.33 ft
Peso Weight	Poids Gewicht	1500 kg (3300 lbs)

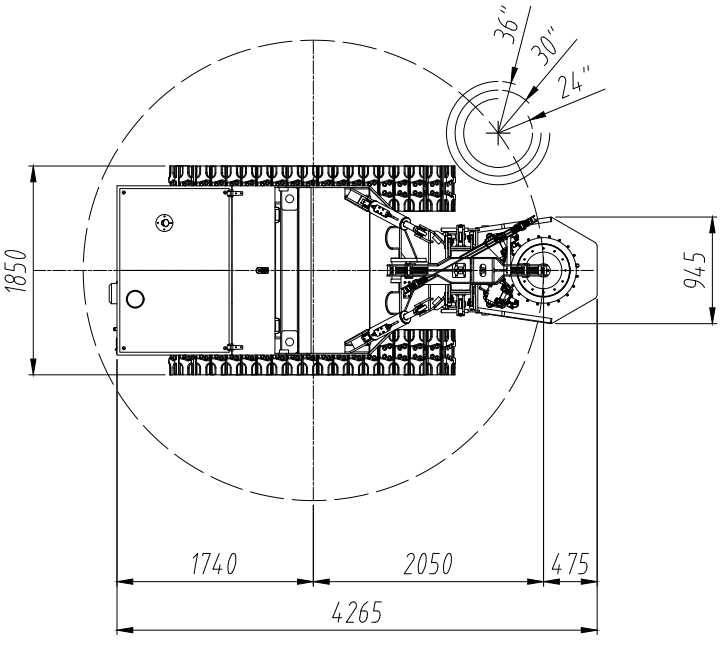


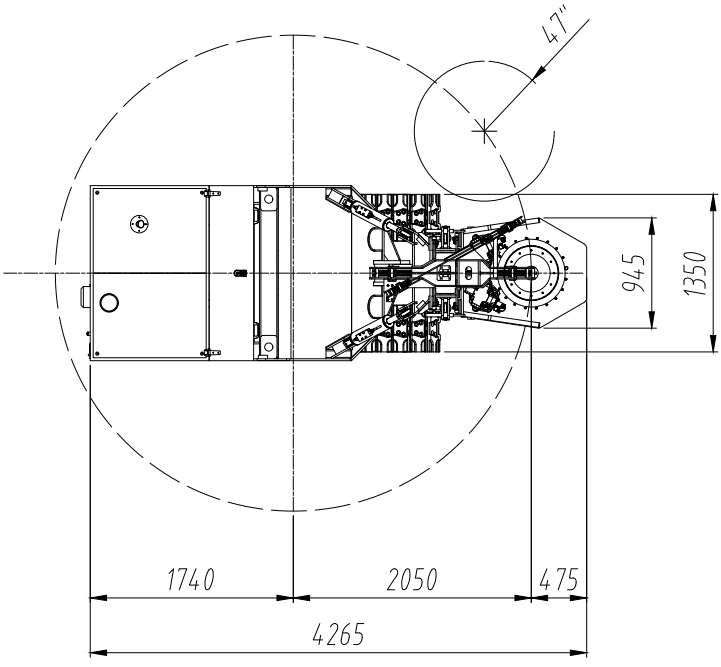
MR - P 350

Condizioni di lavoro - Working conditions - Conditions de travail - Arbeitsbedingungen









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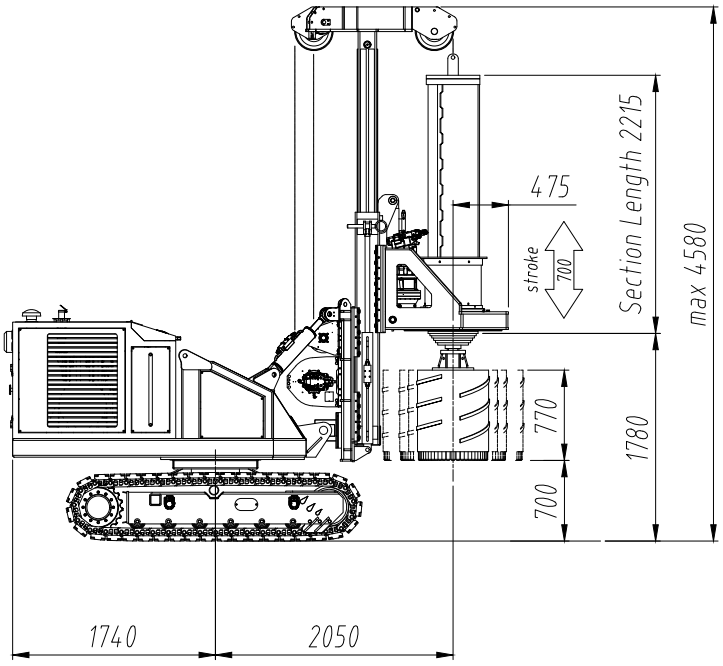

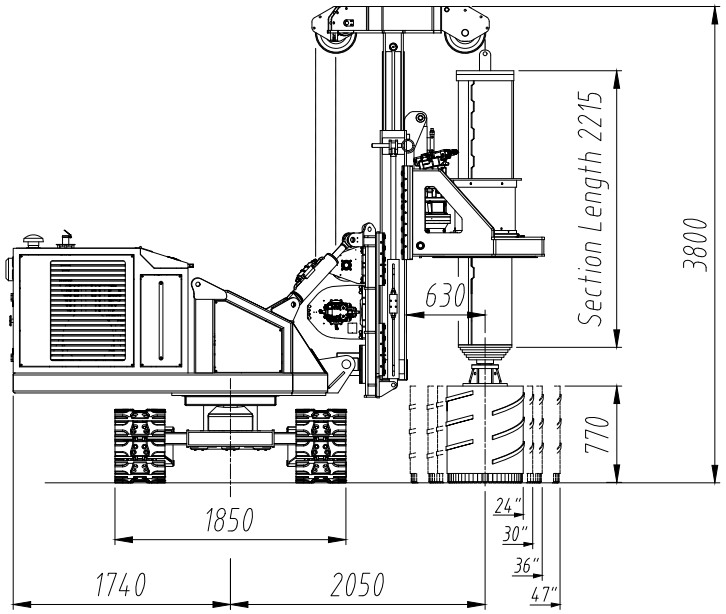

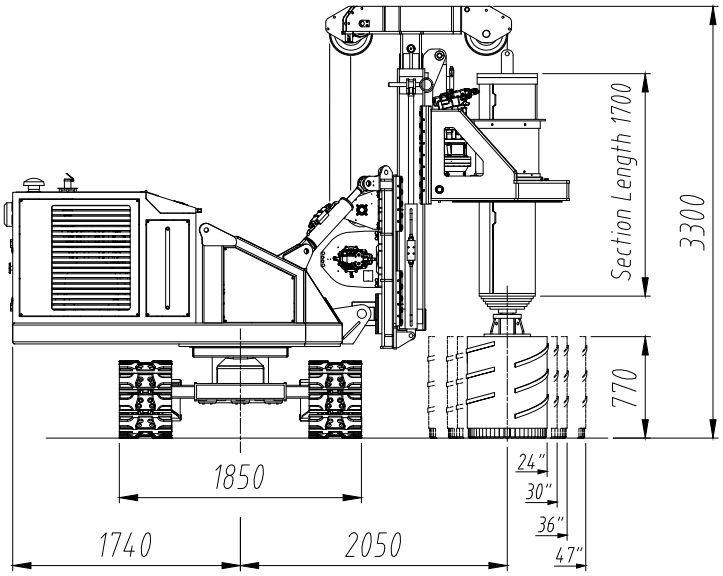

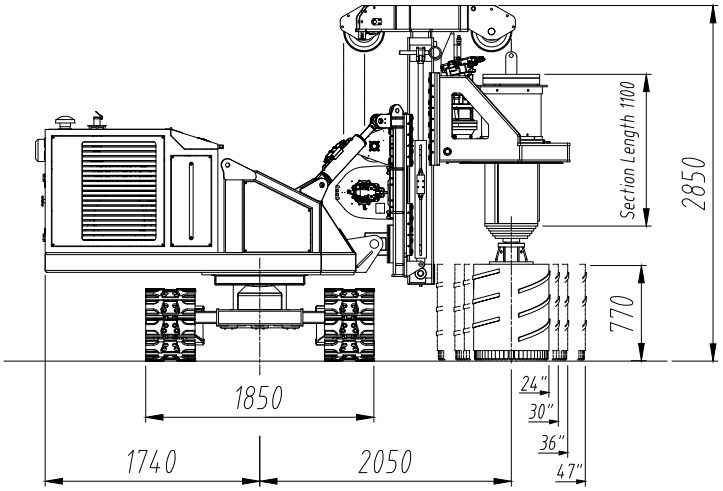

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Via Beura 44-28844 Villadossola (VB)-ITALY
Tel.+39 0324 575106 Fax. +39 0324 54096
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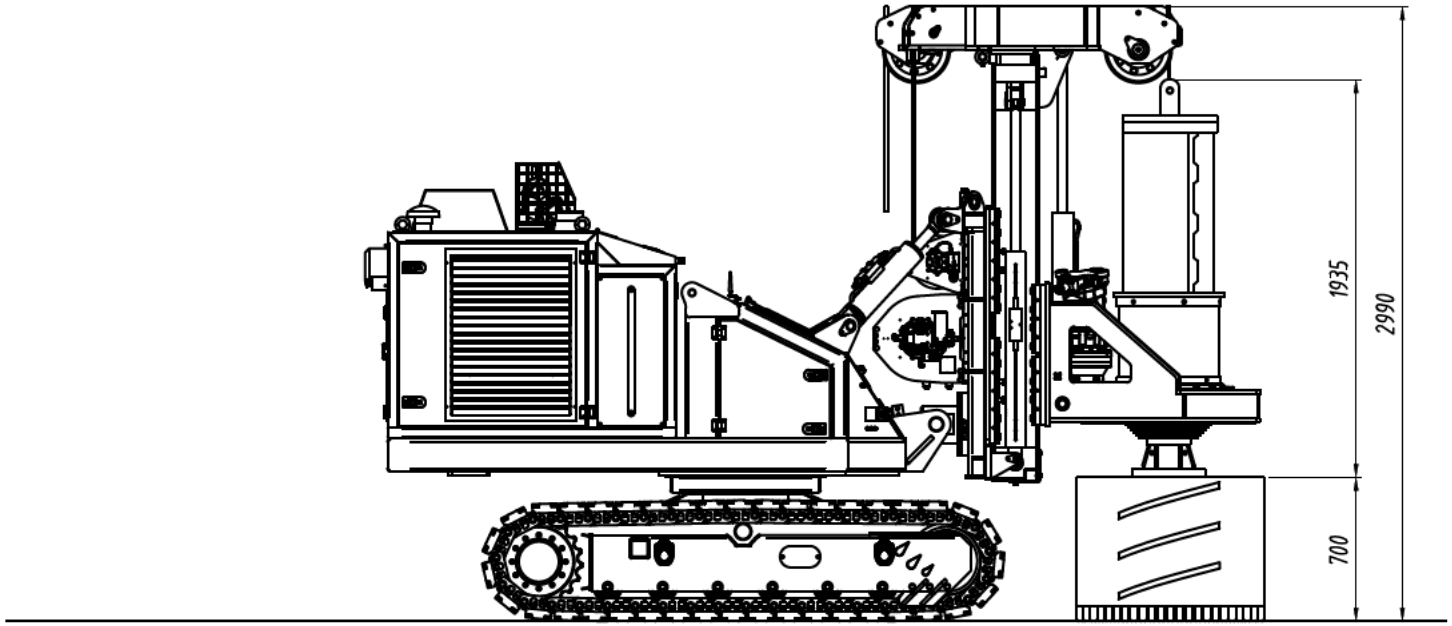

POS.	DENOMINAZIONE	N° PEZZI	MATERIALE	PESO	MODELLI	NOTE

SALDATURE *Preparazione dei lembi secondo UNI 11001*
Dove non altrimenti indicato A = 0.7 dello spessore minimo da collegare

SCOSTAMENTI PER QUOTE SENZA INDICAZIONE DI TOLLERANZA (in mm)

PER DIMENSIONI LINEARI NOMINALI

0,5..6	>6..30	>30..120	>120..315	>315..1000	>1000..2000	>2000..4000	>4000
	±1	±1,5	±2	±3	±4	±6	±8

SPIGOLI NON QUOTATI = 1x45°

0,5..3	>3..6	>6..30	>30..120	>120..315
±0,2	±0,5	±1	±2	±4

MODIFICHE

DESCRIZIONE	DATA

MARINI QUARRIES GROUP

DENOMINAZIONE

MR-P350
KELLY 9X1487 O.D.419
ALTEZZA CHIUSO 2990

N.DISEGNO: 00 00 00 CAD A

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SCALA	DISEGN.	CONTROLL.	DATA	SOST. IL DIS. N.	SOST. DAL DIS. N.
1:30	BETTEO		21/06/21		

15 October 2021 211124 SAAB

Woollahra Municipal Council
536 New South Head Road,
Double Bay NSW 2028

Attention: Zubin Marolia – Manager Property and Projects

Email: zubin.marolia@woollahra.nsw.gov.au

CROSS STREET CARPARK, DOUBLE BAY

Concrete Cracking at T-Beam Bearings

Dear Zubin,

We provide structural advice on the concrete spalling observed by BCRC[1] to floor beam bearings, at Level 5[2] gridline C/9-10 and at other spine wall locations.

Inspection

The author inspected site on 8 October 2021. Our visual inspection was limited to the floor T-beam bearings, primarily at Level 5, with a cursory inspection at other levels, as limited time allowed. Our structural advice is based on the findings of our visual inspection. A record of site findings is presented at Appendix A.

Background

The split-deck carpark was constructed in 1977-1978 and is therefore 43 to 44 years old. Woollahra Municipal Council has asked what structural repairs and upgrades would be required to extend the life of the carpark by a further 25 or 40 years.

Carpark Construction

The carpark has cast in-situ reinforced concrete columns and beams, and precast concrete T-beams floors, places side-by-side. The T-beams have a 65mm thick concrete topping that acts compositely to forming the carpark decks[3]. Reinforcement details and dimensions for the supporting beams (at gridlines A, C and E) and floor T-beams are provided at Appendix B. Floor plans, showing the set-out of floor beams, are at Appendix A.

[1] Reported by BCRC by email on 6 October 2021.

[2] The floor levels referred to in this report are the Levels used on c.1977 record drawings, where ground level is Level 1 and the rooftop parking level is Level 5.

[3] Calculation records from the original design suggest that the T-beams are 40MPa strength concrete and the in-situ structural topping is 25MPa strength concrete (although this has not been verified). The calculations advise that the T-beams and concrete topping are designed act compositely, and this is borne out by the reinforcement shear keys atop the beam detail

Inspection Findings

The floor T-beam bearings were visually inspected for concrete spalling, commencing at Level 5 (rooftop parking level) and working downwards. Our inspection at lower floors were more cursory, as fewer spalls were found. Our findings are presented at Appendix A.

T-Beam Bearing Concrete Spalls

T-beam bearing concrete spalls have predominantly occurred at bearings to the spine wall (Gridline C), where at Level 5 upper deck 22 out of 27 beam ends (81%) were observed to have spalled. At the Level 5 lower deck 11 out of 23 beam ends (48%) were observed to have spalled. Access to inspect is very restricted and there may be further beam ends that have cracks.

At gridline D/3 the T-Beam has settled and it is considered that end bearing to the ramp beam has likely crushed through bearing failure, although it is not considered that there is a risk of structural failure and collapse in the medium term. Bearing failure and settlement of T-beam ends also appears to have occurred at Level 5 gridline C/5, C/6 and A-B/7.



Figure 1 - T-Beam bearing failure at Level 5 upper deck grid C/10. The overall bearing length measured 160mm, but with an effective bearing length of maybe 100-120mm remaining.





Figure 2 – Tow further locations that illustrate reduced bearing length and width, due to bearing failure and concrete spalling (locations not recorded). This degree of concrete spalling is not untypical at underside of Level 5.

Along Gridline C, the bearing lengths on which the T-beams sit are shorter than at Gridlines A and E and we consider that it is this reduced bearing length that is a primary cause of the concrete spalling. Record drawings (at Appendix B) show 150mm x 60mm x 20mm thick steel bearing plates cast into the spine wall

and spandrel beam pockets[4] and ramp beam corbels, with comparably sized bearing plates cast into the T-beams, for steel-on-steel bearing. This provided a very small bearing area – particularly if plates do not quite align or are not level – with high bearing stresses to concrete. The short end distance from bearing plate to T-beam end may also exacerbate stresses and make spalling more probable. We consider that this is why T-beam spalling is so prevalent along gridline C and there is much less evidence of it along gridlines A and E, where bearing lengths are longer (although it is more difficult to observe bearings at gridlines A and E because the pockets are deeper).

There is less evidence of T-beam end spalling at lower floor levels along gridline C, leading us to consider that short end bearing at roof-level is not the only cause. It is likely that rainwater penetrating the slab has also played a part, causing reinforcement to corrode and expand; particularly where the concrete was already cracked because of high bearing stresses.

High bearing stresses in precast T-beam construction are not uncommon and many carparks constructed in this way in the 1970s seem to have this design flaw. From our inspection, there appears to be no imminent risk of a beam ends failing, however we would recommend further detailed inspection.



Figure 3 - Carpark Level 5 settlement at gridline D/3, where T-Beam end bearing to the ramp beam has likely crushed. through bearing failure (it is not considered that there is a risk of structural failure and collapse in the medium term). Bearing failure and settlement of T-beam ends appears also to have occurred at Level 5 gridline C/5, C/6 and A-B/7.

[4] The steel bearing plate photographed in Figure 1, at Level 5 grid C/10, appears larger than 150mm x 60mm x 20mm thick, although the comparable bearing plate to the T-beam end may be the design size (150mm x 60mm x 20mm thick), because the area to cast it in is smaller.

Level 5, Gridlines A and E

The T-beam ends were inspected from beneath and there is far less concrete spalling than at gridline C. No concerns with concrete bearing were seen.

Inspection from below, at one location, E/13, we consider that the top of the T-beam is delaminating, likely due to reinforcement corrosion and expansion at the beam end. Inspection from above, the concrete topping appears to have lifted upwards, and this again is an indication that there is likely steel corroding and expanding beneath. There are other examples of this, particularly towards the corners of the building and in front of Stair 3. We consider that it is likely that the T-beam reinforcement is corroding. The other steel present is a galvanised sheet used as permanent formwork however this is considered too thin to have cause this degree of uplift.



Figure 4 - Example of topping cracking likely due to reinforcement corrosion below (this example in front of Stair 3).

At 60% of all beams to Level 5 the topping has cracked where it reduces in section atop the T-beam bearing. This is likely due to the reduction in section however the cracks are probably allowing rainwater to enter, which may lead to corrosion of reinforcement in time.

Conclusions

Along gridline C the bearing lengths on which the T-beams sit are shorter we consider that it is this short bearing length that is a primary cause of the concrete spalling at T-beam bearing (81% of bearings at the Level 5 upper deck and 48% at the Level 5 lower deck). It is likely that rainwater penetrating the slab has

also played a part, causing reinforcement to corrode and expand; particularly where the concrete was already cracked because of high bearing stresses.

Along gridline A and E no concerns with concrete bearing spalling were seen. However, there is evidence the T-beam top reinforcement is likely corroding at some bearing locations. Also, there are many locations (60%) where rainwater likely enters, that may lead to corrosion.

Recommendations

Our inspection was visual only and we therefore recommend a more thorough, detailed investigation where T-beam bearing cracking appears worst, and where topping concrete is cracked and lifting. During these investigations we recommend that the beam ends being investigated be temporarily propped through two floor levels, for safety.

It is our opinion that there is no imminent risk of a beam ends failing, however the beam end bearings do required remediation, and it may be necessary to temporarily prop beam ends as remediation is undertake, particularly when removing spalled concrete.

A cautious approach would be to close the top deck of the carpark from use until repairs have been undertaken. This would reduce the load to beam ends by up to a third. If repairs are not actioned within a year, we would recommend a structural engineering inspection annually.

Among options to increasing the bearing areas would be to pour flowable, non-shrink grout around the beam ends and trapezoidal sides, where beam ends sit in pockets (not all beam ends sit into pockets). Alternatively, structural steel brackets or beams could be used to augment the existing bearings.

Repairing the T-beam end bearings at Level 5 could provide a further 20 years usable life to the carpark, however during this period it is likely that repair of further latent concrete defects and cracking will be required. In our opinion, the cracks to T-beam end bearings at Level 5 is so prevalent – and essentially a design flaw – that other similar cracking will manifest with time, and as more rainwater enters.

In our opinion, ongoing remedial works to extend the life of the carpark by 40 years would become increasingly involved (disrupting the use of the carpark periodically) and uneconomic.

We trust that the above and attached plans meet your present requirements. However, should you require anything further please contact the undersigned.

Yours faithfully,
TAYLOR THOMSON WHITTING (NSW) PTY LTD
in its capacity as trustee for the
TAYLOR THOMSON WHITTING NSW TRUST



PAUL CONNETT
Technical Director

P:\2021\2111\211124\Reports\TTW\211014 - 211124 Cross St Carpark T-Beam Investigation PC.docx

Appendix A

T-beam End Bearing Inspection Findings – 8 October 2021

TTW OBSERVATION LEGEND

Concrete Spalling to T-Beam at Bearing (Underside of Deck):

Concrete spalling at T-beam bearing, sitting to central spine beam and shear wall.

Settlement at bearing, or to T-beam, indicating that bearing may be failing (combined with concrete spalling at T-beam bearing).

Cracking to Concrete Topping above T-Beam Bearing (Top Surface of Deck):

Cracking to concrete topping locally to bearing without significant uplift (but allows rainwater to enter).

Cracking to concrete topping locally to bearing with significant uplift, indicating that T-beam end reinforcement may be corroding and expanding beneath, forcing the topping upwards.

SIGNIFICANT UPLIFT TO TOPPING.

SIGNIFICANT UPLIFT TO TOPPING.

T-BEAM HAS SETTLED (VIEWED FROM ABOVE) POSSIBLE BEARING FAILURE.

WATER PENETRATING AT BEARINGS IN THIS AREA.

POSSIBLE SETTLEMENT AT BEARING (ABOVE RAMP).

SPALLING BOTH SIDES.

MOVEMENT IN TOPPING SUGGESTS SETTLEMENT.

T-BEAM CORNER CRACKED.

SIGNIFICANT UPLIFT OF TOPPING SUGGESTS REINFORCEMENT CORROSION.

BEARINGS INSPECTED BY BCBC (CIRCLED).

T-BEAM HAS SETTLED (VIEWED FROM BELOW AND ABOVE). LIKELY BEARING FAILURE.

CORRODING REINFORCEMENT TO 2 T-BEAM ENDS - NOT STRUCTURALLY CRITICAL AT THIS STAGE.

SIGNIFICANT UPLIFT TO TOPPING, SUGGESTING T-BEAM REINFORCEMENT CORROSION.

SIGNIFICANT UPLIFT TO TOPPING.

JOINT DETAIL
APPLIES TO ALL LEVEL JOINTS EXCEPT LINE B - EXPANSION JOINT

WOOLLAHRA MUNICIPAL COUNCIL
STRUCTURALLY CHECKED
pursuant to Part XI of the Local Government Act, relevant Ordinances, and S.A.A. Codes.
-9 MAR 1977
[redacted]

No.	AMENDMENTS	DATE
A	F-92 FABRIC TO F72	13-9-77

WOOLLAHRA MUNICIPAL COUNCIL
CROSS STREET PARKING STATION
STRUCTURAL FRAMING PLAN
LEVEL 5

P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS
REGENT HOUSE, 37-43 ALEXANDER STREET, CROWS NEST, N.S.W. 2065

SCALE	DESIGN
1:100	RSH
APPROVED	DRAWN
	DWA
DATE	CHECKED
DRAWING NUMBER	
7267/6 A	

LEVEL 5. NEG

DISHED DRAIN DETAIL

SPINE BEAM
DRAIN
GRADE 1 IN 300
50 AT OUTLET
Q15 TOPPING

STAIR 3
REF STAIR DETAIL SUPER. DRG. 19
EXPANSION JOINT
TYPICAL
BEAM MARKS
MIDDLE T-BEAM SPALLING.
SPANDREL BEAMS (EDGE) SPALLED AT (4)
225 SLAB
REF STAIR DETAIL REFER DRG 18
STAIR 1
DISHED DRAIN
RAMP 1
RAMP 2
RAMP 3
RAMP 4
300 SLAB
225 SLAB
225 SLAB LOWER LEVEL 4 ONLY
LOWER LEVEL 4 ONLY
OPEN
EXISTING WALL
Q15 TOPPING WITH FIBRE REINFORC. OVER ALL PRECAST BEAMS
BEAM MARKS
LOWER LEVEL
EXPANSION JOINT
REF STAIR DETAIL REFER DRG 17
STAIR 2
100 SLAB
SPANDREL BEAM SPALLED AT (3)
SPALLING AT (2)
1720
6500
6500
1720
5550

WOOLLAHRA MUNICIPAL COUNCIL
STRUCTURALLY CHECKED
Pursuant to Part 33 of the Local Government Act, relevant Ordinances, and S.A.A. Codes
S. MP.

[redacted]

3000 CENTRES
240
40
120
150
300
G.F.W. ALL ROUND ALL EA
SECTION (5D/5)

WABO WA200 JOINT SEAL FIRE RATED
32 GAP AT INSTALLATION
OFF FORM STEEL FORM FINISH OR STEEL TROWEL FINISH
Q15 TOPPING
SHIMS
4 No 32 Φ SLEEVED HOLES
4 No 20 Φ BOLTS WITH WASHERS
2 No 20 x 20 MS PL
2 No 102 x 76 x 10 L x 200
50
40
EXPANSION JOINT DETAIL (5D/5)

NOTE:- REFER DRG. 6 FOR JOINT DETAIL BETWEEN T- BEAMS
FOR HYDRAULIC, ELECTRICAL & MECHANICAL PENETRATIONS REFER TO SERVICES DRAWINGS.

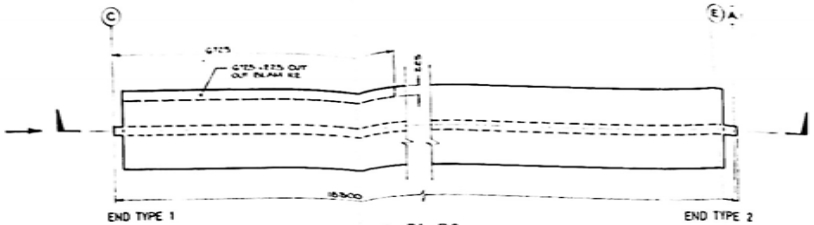
WOOLLAHRA MUNICIPAL COUNCIL CROSS STREET PARKING STATION STRUCTURAL FRAMING PLAN LEVELS 2,3 & 4	SCALE 1:100, 1:5	DESIGN R.S.H.
	APPROVED	DRAWN D.W.A
	DATE	CHECKED
P.G. PAK-POY & ASSOCIATES PTY. LTD. CONSULTING ENGINEERS and PLANNERS REGENT HOUSE 37-43 ALEXANDER STREET, CROWS NEST, N.S.W. 2065	DRAWING NUMBER 7267/5	

No. AMENDMENTS DATE

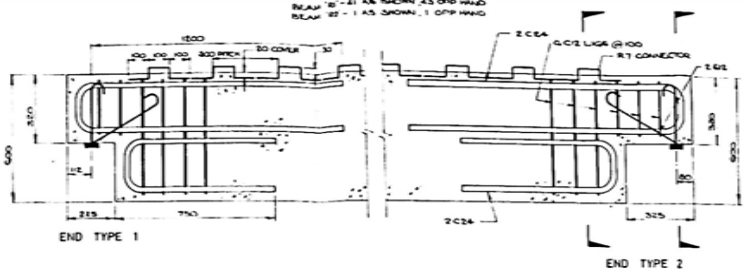
LEVELS 2, 3 AND 4 (AS NUMBERED).

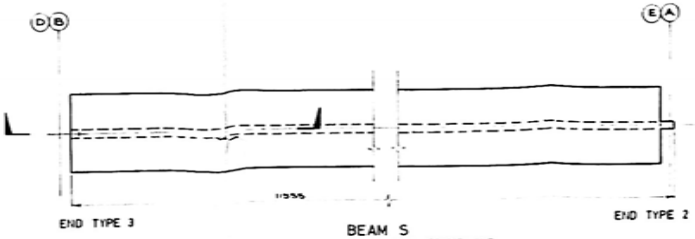
Appendix B

Record Drawings Showing T-Beam End Bearings

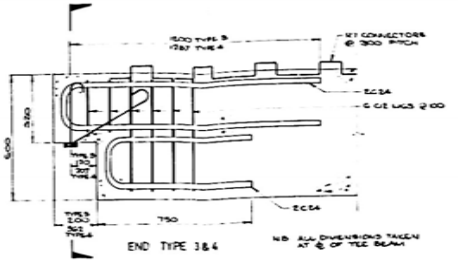


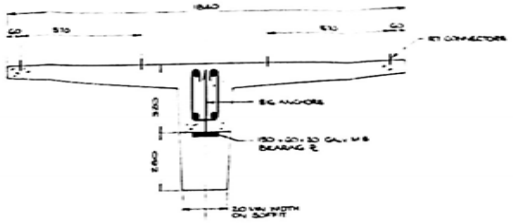
BEAM R, R1, R2

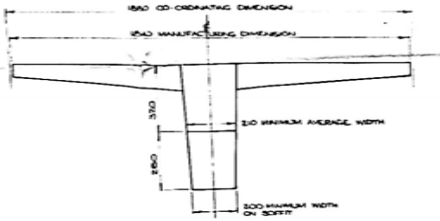


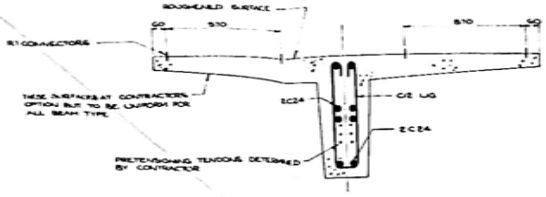


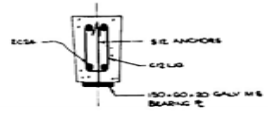
BEAM S

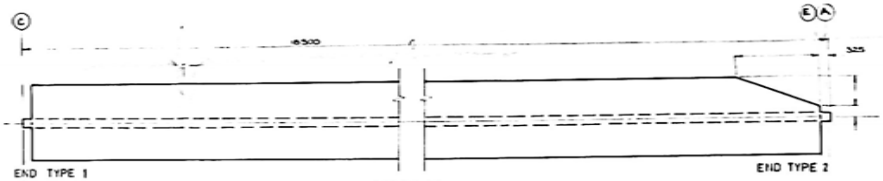








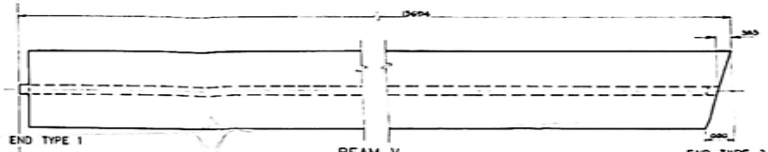




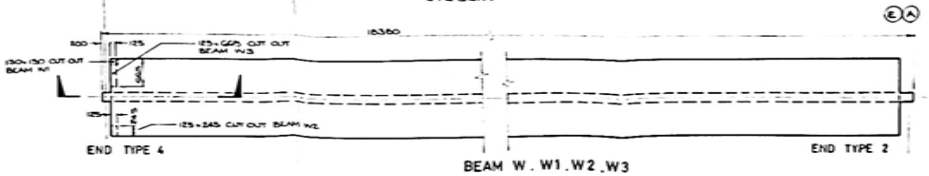
BEAM T



BEAM U



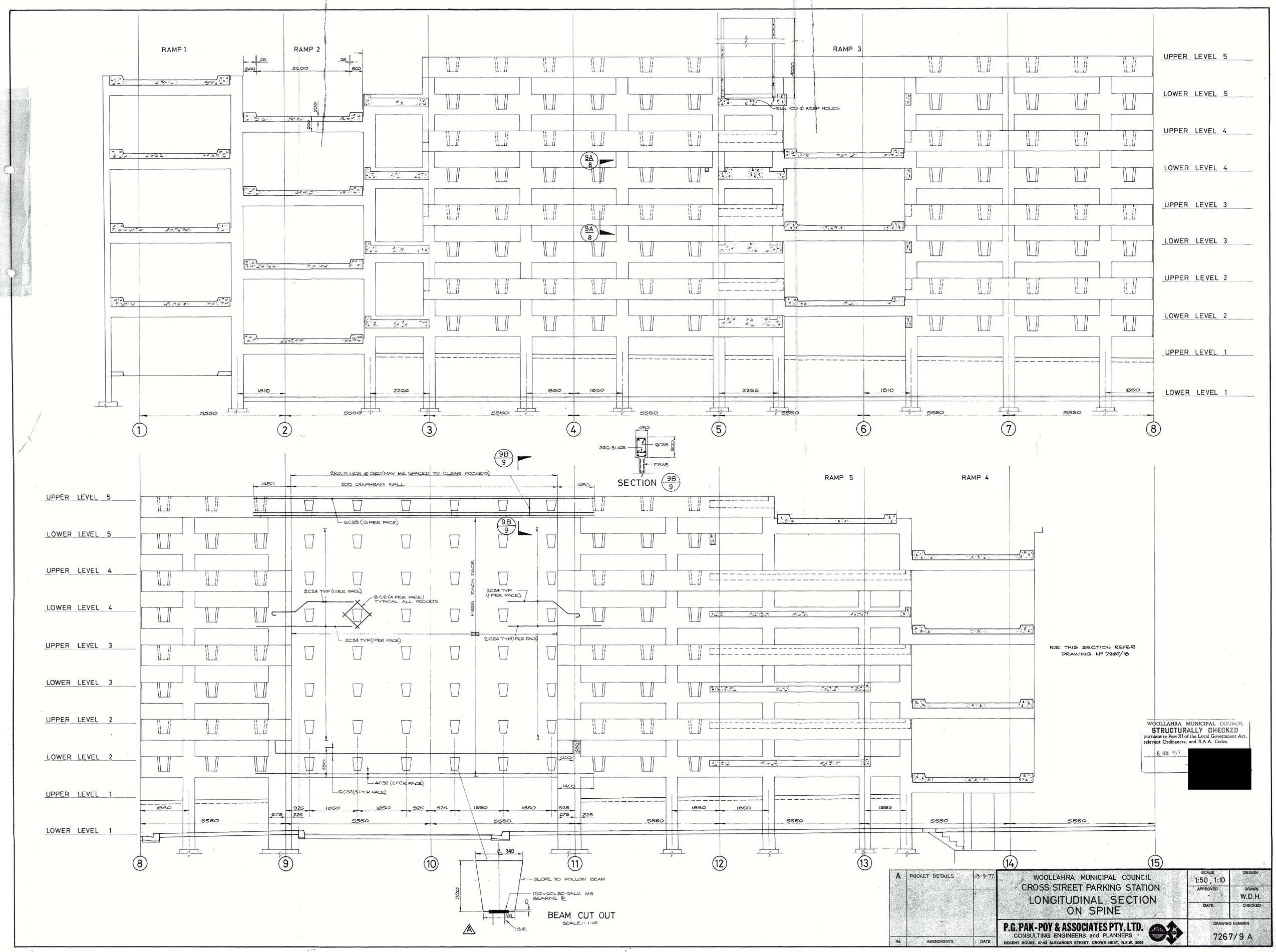
BEAM V

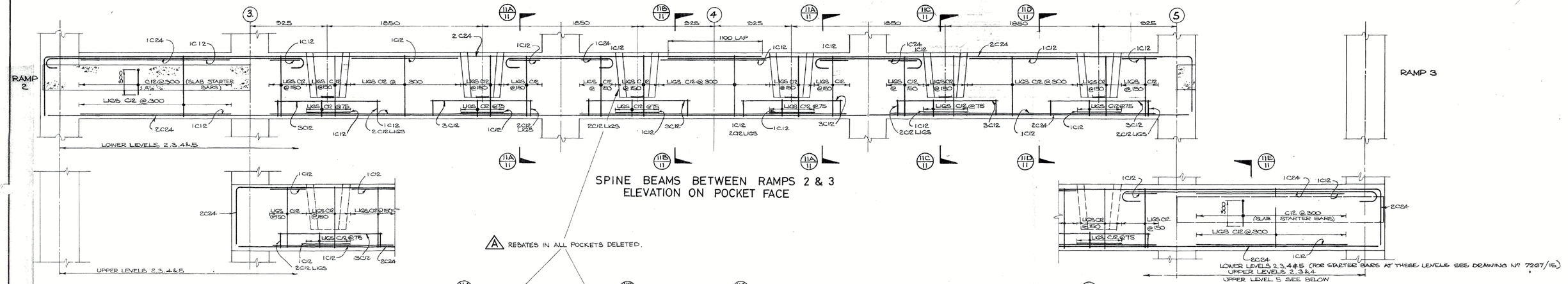


BEAM W, W1, W2, W3

GENERAL NOTES:-
1. ALL HARDWARE SHOWN HEALON TO BE INCLUDED
2. BEAMS TO BE ADEQUATE FOR THE FOLLOWING LOADS:-
- BEAM SELF WEIGHT
- 65mm TOPPING OF NORMAL WEIGHT CONCRETE
- 3.0 kPa LIVE LOAD U.D.L. OR 13 kN CONCENTRATED WHICHEVER IS THE MORE SEVERE.
3. BEAMS TO BE WITHIN DIMENSIONAL LIMITATIONS SHOWN AND NOT TO EXCEED 7000 kg IN MASS.
4. BEAMS SIMPLY SUPPORTED BETWEEN BEARING PADS AND COMPOSITE ACTION MAY ASSUME TO APPLY FOR 50 mm TOPPING OF 25 MPa CONCRETE.
5. BEAMS TO BE OF 32 MPa CONCRETE, STRENGTH NOT LESS THAN 40 MPa

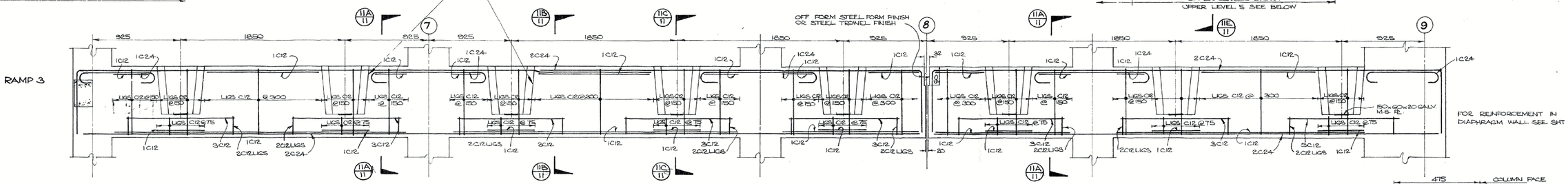
WOOLLAHRA MUNICIPAL COUNCIL		SCALE 1:10, 1:50	DESIGN
CROSS STREET PARKING STATION		APPROVED	DRAWN
PRECAST BEAMS		DATE	CHECKED
P.G. PAKAPOY & ASSOCIATES PTY. LTD. CONSULTING ENGINEERS and PLANNERS			DRAWING NUMBER 7267/13


RAMP 1
RAMP 2
RAMP 3
RAMP 4
RAMP 5
UPPER LEVEL 5
LOWER LEVEL 5
UPPER LEVEL 4
LOWER LEVEL 4
UPPER LEVEL 3
LOWER LEVEL 3
UPPER LEVEL 2
LOWER LEVEL 2
UPPER LEVEL 1
LOWER LEVEL 1
2 No. 100 ϕ WEEP HOLES
SECTION 9B/9
2RG3 UGS @ 320 (MAY BE SPACED TO CLEAR POCKETS)
200 DIAPHRAM WALL
6C28 (3 PER FACE)
2C24 TYP (1 PER FACE)
8C12 (4 PER FACE) TYPICAL ALL POCKETS
F828 EACH FACE
4C32 (2 PER FACE)
6C32 (3 PER FACE)
FOR THIS SECTION REFER DRAWING Nº 7267/18
SLOPE TO FOLLOW BEAM
150 x 60 x 20 GALV. MS BEARING PL
BEAM CUT OUT
SCALE:- 1:10
WOOLLAHRA MUNICIPAL COUNCIL
STRUCTURALLY CHECKED
pursuant to Part XI of the Local Government Act, relevant Ordinances, and S.A.A. Codes.
8 NOV. 1977
[redacted]
A POCKET DETAILS 13-9-77
No. AMENDMENTS DATE
WOOLLAHRA MUNICIPAL COUNCIL
CROSS STREET PARKING STATION
LONGITUDINAL SECTION ON SPINE
P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS
REGENT HOUSE, 37-43 ALEXANDER STREET, CROWS NEST, N.S.W. 2065
SCALE 1:50, 1:10
DESIGN
APPROVED
DRAWN W.D.H.
DATE
CHECKED
DRAWING NUMBER 7267/9 A



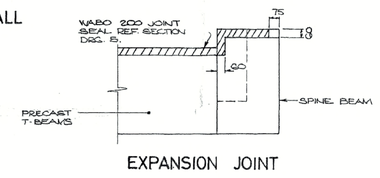
SPINE BEAMS BETWEEN RAMPS 2 & 3
ELEVATION ON POCKET FACE

A REBATES IN ALL POCKETS DELETED.

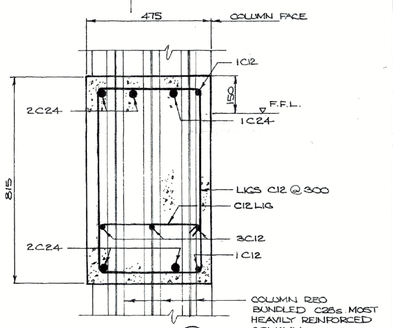


SPINE BEAMS BETWEEN RAMP 3 & DIAPHRAGM WALL
ELEVATION ON POCKET FACE

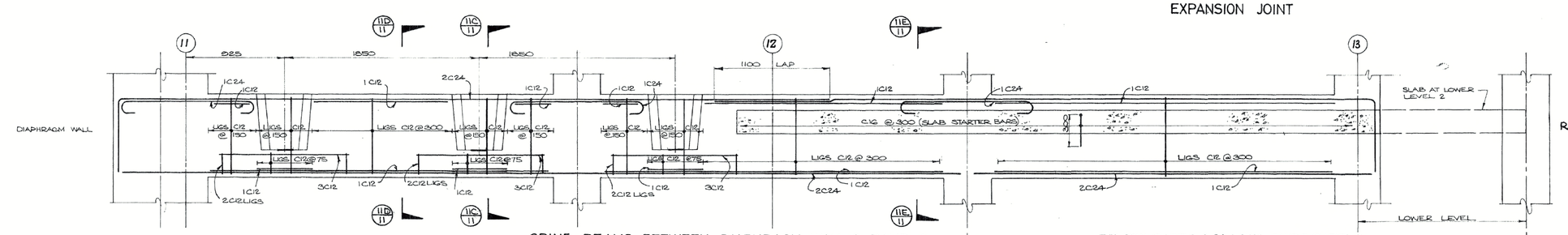
NOTE:- S12 HOOKS TO BEARING PLS. NOT SHOWN FOR CLARITY



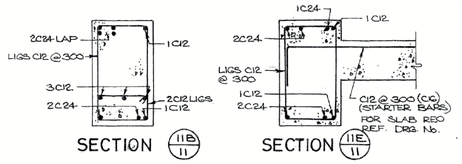
EXPANSION JOINT



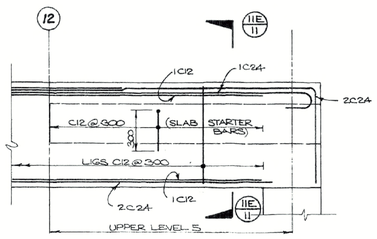
SECTION (11A/11)
SCALE:- 1:10



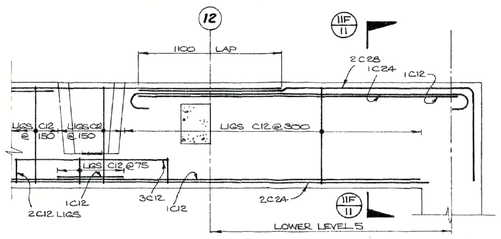
SPINE BEAMS BETWEEN DIAPHRAGM WALL & RAMP 4
ELEVATION ON POCKET FACE



SECTION (11B/11) SECTION (11E/11)

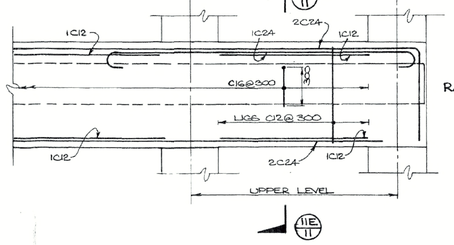


ELEVATION ON BACK FACE



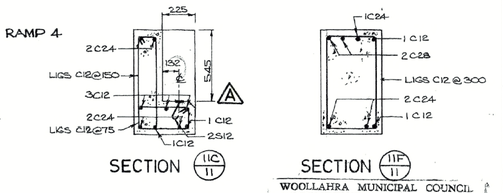
ELEVATION ON POCKET FACE

LEVEL 5 AT GRID LINE 12

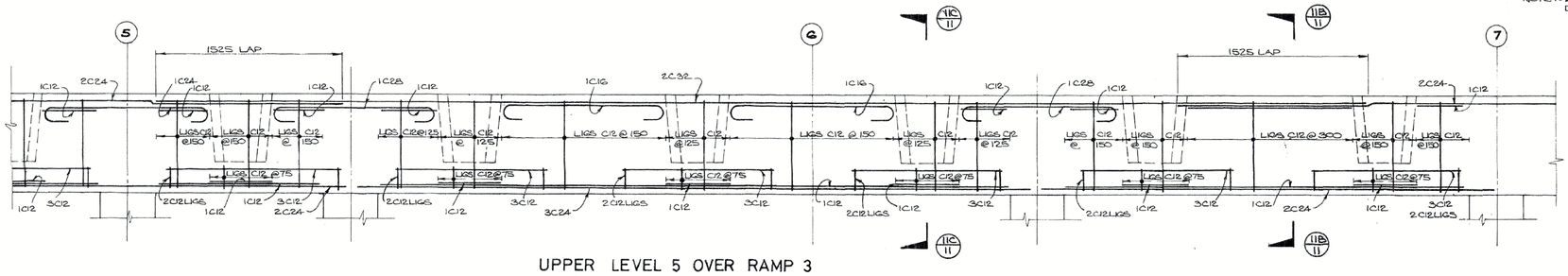


RAMP 5

NOTE:- REFER ELECTRICAL & HYDRAULIC SERVICES DRGS FOR CONDUITS



SECTION (11C/11) SECTION (11F/11)



UPPER LEVEL 5 OVER RAMP 3
ELEVATION ON BACK



SECTION (11D/11)

BEARING PL DETAIL
SCALE:- 1:10
TYPICAL ALL POCKETS

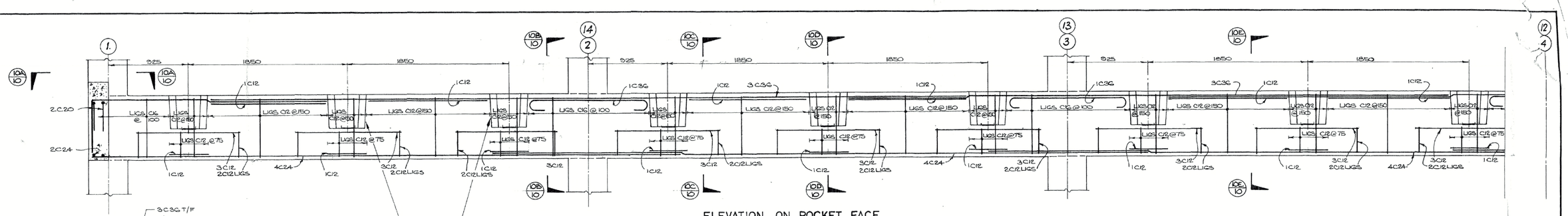
WOOLLAHRA MUNICIPAL COUNCIL
STRUCTURALLY CHECKED
pursuant to Part XI of the Local Government Act, relevant Ordinances, and S.A.A. Codes.
-8 NOV. 1977
[redacted]

No.	AMENDMENTS	DATE
A	POCKET DETAIL	11-9-77

WOOLLAHRA MUNICIPAL COUNCIL
CROSS STREET PARKING STATION
SPINE STRUCTURE DETAILS 1
BEAM REINFORCEMENT

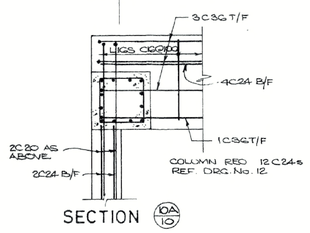
P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS
REGENT HOUSE, 37-43 ALEXANDER STREET, CROWS NEST, N.S.W. 2065

SCALE	DESIGN
1:10, 1:20	R.S.H.
APPROVED	DRAWN
	D.W.A.
DATE	CHECKED
DRAWING NUMBER	
7267/11 A	



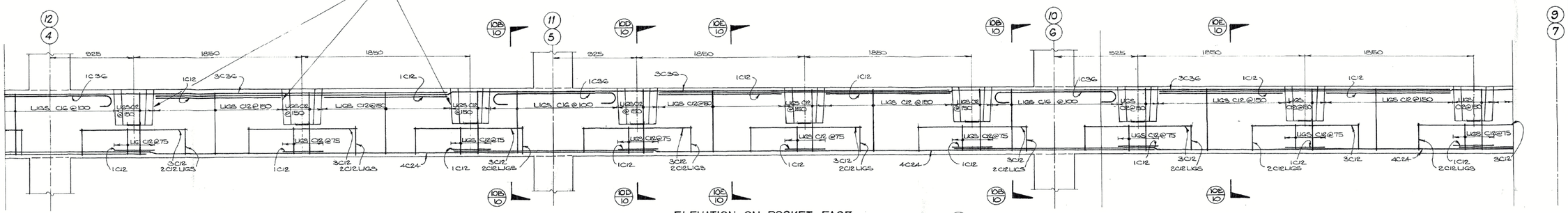
ELEVATION ON POCKET FACE

NOTE:- 5/12 HOOKS TO BEARING PLS. NOT SHOWN FOR CLARITY.

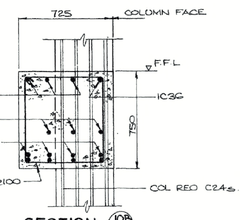


SECTION 10A/10

A REBATE IN ALL POCKETS DELETED.



ELEVATION ON POCKET FACE



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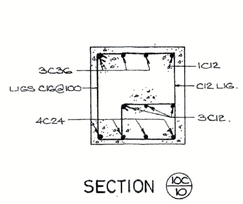
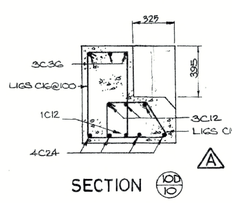


SECTION 10C/10



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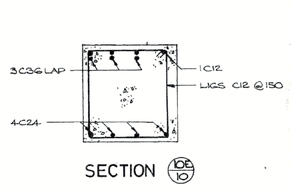
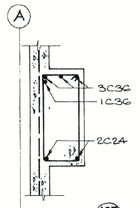


SECTION 10E/10



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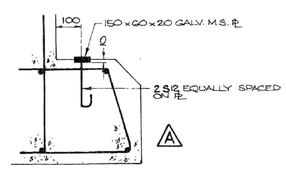

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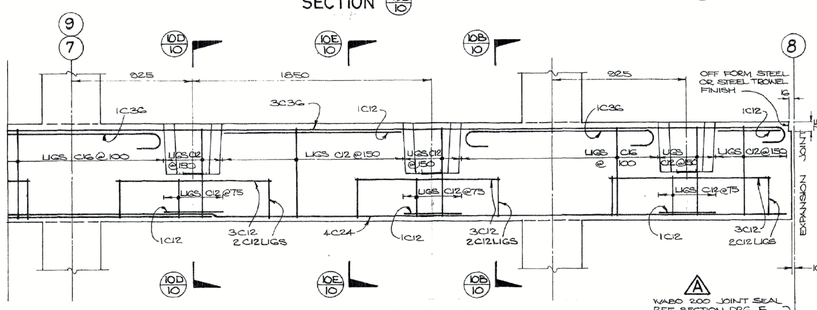
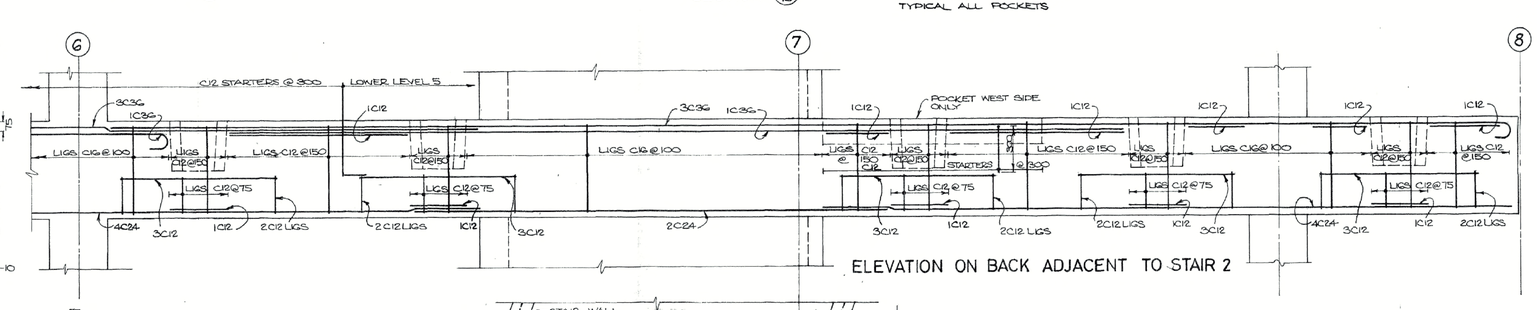
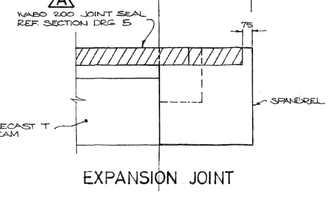


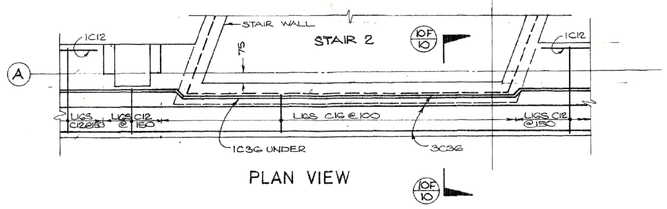
ELEVATION ON POCKET FACE



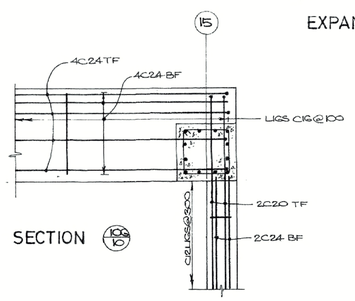
ELEVATION ON BACK ADJACENT TO STAIR 2



EXPANSION JOINT



PLAN VIEW



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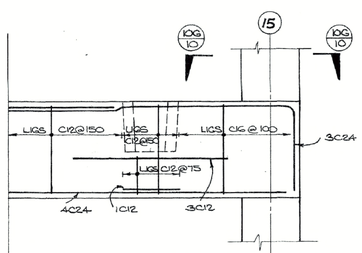

ELEVATION ON BACK ADJACENT TO 15

WOOLLAHRA MUNICIPAL COUNCIL
STRUCTURALLY CHECKED
pursuant to Part XI of the Local Government Act, relevant Ordinances, and S.A.A. Codes.
-8 NOV. 1977
[redacted]

No.	AMENDMENTS	DATE
A	POCKET DETAILS	1-9-77

WOOLLAHRA MUNICIPAL COUNCIL
CROSS STREET PARKING STATION
SPANDREL BEAM
REINFORCEMENT DETAILS

P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS
REGENT HOUSE, 37-43 ALEXANDER STREET, CROWS NEST, N.S.W. 2065

SCALE	DESIGN
1:20	R.S.H
APPROVED	DRAWN
	D.W.A
DATE	CHECKED

DRAWING NUMBER
7267/10 A

Appendix C - Building Services Report

Floth

Cross Street Carpark

Cross Street Double Bay

Building Services Report

PROJECT MANAGER

Altus Group



Amendment Register

Rev. No	Section & Page No.	Issue/Amendment	Author	Project Engineer	Checked	Date
01		Draft - For Client Review	BS / TC / VA / BH	VA		8/04/2021

EXECUTIVE SUMMARY

Mechanical Services

The mechanical ventilation system is non-operational and requires replacement. The following works are considered necessary for continued operation of the carpark:

- Replace existing car park supply and exhaust fans and associated attenuators with new. New fans of current market will have better efficiency and provide energy saving. Provide VSD drive to both fans. Fans shall be operated via CO monitoring sensors located throughout the car park level. Provide smoke detector at the fan inlet side as per AS 1668.2 Clause 5 to shut down the fan upon the detection of smoke in the supply air system.
- Car park exhaust discharge needs to be extended further up to be more than 2m above the upper roof car park.
- Weatherproof and air tight C/P S//A fan room.
- Replace all the existing air filters at C/P S/A fan room with new.
- Name plate of the car park S/A fan is illegible but appears the fan is at the end of service life and does not appear to be operating for some extended period. Fan and attenuators should be replaced with new. Fan in the current market is more efficient to run.
- Replace existing C/P S/A fan control panel with new.
- Weatherproof and air-tight the C/P exhaust fan room and replace the faulty room light.
- Acoustic impact of fan room to be assessed by a qualified acoustic engineer.

Electrical Services

The electrical services are generally in a serviceable condition. Some repair and maintenance works are required.

The following works are requires for continued use of the carpark.

- Service protection device (SPD) to comply with AS3000.
- All the non-RCBO final subcircuits circuit breakers in distribution board 1, 2 and 4 need to be replaced by RCBO type circuit breakers except for the subcircuits with a rating exceeding 32A. (to comply with AS3000)
- Malfunctioning light fittings and emergency exit lights need to be replaced.
- Led pole lights in the roof carparking space may need to be adjusted to comply with AS 4282.
- In certain areas, water dripping on the electrical fittings may lead to potential electrical hazards.

Hydraulic and Fire Services

The hydraulic system require major repair especially to the storwater collection and disposal system. The pipework is substantially degraded and requires replacement

The hydrant and hose reel system is operational however it does not comply with current statutory requirements. The system should be replaced to meet current codes and regulations.

The building does not have a sprinkler system. The BCA consultant has identified that a sprinkler system will be required because the carpark does not satisfy the requirements for an open deck carpark.

Vertical Transportation Services

- The lift is found to be operating in a reasonable condition and it is expected to operate with the similar reliability for the next 12 months period with proper ongoing maintenance.
- The performance of the lift is likely to decline as the equipment ages and replacement of the lift should be considered.
- A list of items that require attention is listed in the Vertical Transportation Services section.

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Appendix A – Level 1 Mechanical Recommended Works Mark Up

Section 01 – Introduction



1. INTRODUCTION

Floth have been engaged to undertake a inspection of the carpark services and prepare a report on the following:

1. Extent, condition and code compliance.
2. Requirements to bring to compliance (where possible).
3. Suggested additional works to allow continued carpark operation.

The Double Bay early childhood health centre is out of scope and is not included in this report.

2. EXISTING BUILDING & SITE LOCATION

The existing building is a five-storey split deck car park constructed in or around 1977. There are four levels of undercover parking plus one roof top car park. The lower deck of the car park is located on the western side of the building whilst the upper deck is located on the eastern side.



Site Location

Section 02 – Mechanical Services



2. EXISTING SYSTEMS DESCRIPTION, CONDITIONS & RECOMMENDATIONS

The existing building is a five-storey split deck car park constructed in or around 1977. There are four levels of undercover parking plus one roof top car park. The lower deck of the car park is located on the western side of the building whilst the upper deck is located on the eastern side.

The upper deck of each undercover parking level is naturally ventilated by evenly provided openings along the eastern façade. The lower deck of each undercover parking level is mechanically ventilated by overhead supply and exhaust sheetmetal ductwork connecting to a common car park supply and exhaust riser. Car park exhaust fan is housed in a dedicated fan room located at level 4 above the exhaust riser near the ramp. Exhaust is being discharged at high level at the roof top car park floor directly above the exhaust fan room. Supply air fan is housed in a fan room located at lower deck of roof top car park floor. Outside air is drawn to the fan room via louvres mounted on the plant room wall. Supply air dropper is located below the supply air fan room and behind the fire staircase at the western side.

There are several other mechanical systems installed servicing various building utility space, such as lift motor room, parking manager office, electrical switch room, battery room etc.

A plant room, which houses electrical meters and switchboards, is located at the northeaster corner of level 1 car park. This plant room is naturally ventilated via several wall mounted terracotta louvres. Two air-cooled A/C condenser units (of Mitsubishi Heavy Industries Brand) are mounted off the car park wall at southeaster corner on level 2 adjacent to community centre. There are additional two air cooled A/C condenser units (of Mitsubishi Electric Brand) mounted on the roof at southeaster corner above the community centre. These condensers appear to be serving the community centre. However the exact configuration of these A/C systems and associated serving area is subject to access to the community centre, which is not part of the scope.

At the time of this inspection, none of the mechanical systems appears to be operating.

Below are the observations of various mechanical installations based on a visual site inspection undertaken on 22nd March 2021.

2.1 Lower Level 1 and Upper level 1 Mechanical Services

2.1.1 System description

The Upper Level 1 car park is naturally ventilated by permanent openings along eastern façade.

The Lower Level 1 car park is ventilated by mechanical supply and exhaust system with overhead ductwork and risers to above. Several low-level droppers complete with exhaust intake grille are installed at the exhaust system.

A branch duct is extended from the car park supply air system to provide outside air to parking manager's office, staff rest room as well as two cashier booths near the Cross Street car park entry. Note that the cashier booths, which were shown on the original P.G.Pak-Poy & Associates design drawing—Drawing No. M2/2, have since been demolished, however the associated branch ductwork and supply air grilles have not been removed.

Lift motor room on this level is provided with mechanical exhaust system and appears it was originally connected to the car park exhaust system with a dedicated inline booster fan mounted horizontally outside of the lift motor room. At some stage, the system has been disconnected and blanked off from the car park exhaust system. However the original exhaust booster fans and redundant ductwork have not been removed. A new roof mounted type exhaust fan is installed and reconnected to original lift motor room exhaust system. Exhaust is discharged at high level at the void. Make up air for the room is provided by a short run sheetmetal duct with outside air intake at car park entry. There are Honeywell high and low temperature control thermostats installed inside of the room with a high temperature alarm installed outside of the lift motor room next to its entry. The alarm and thermostats appear very old with rusted surface. The thermostat wirings appear to be disconnected. It's unknow whether the alarm and thermostats are still functional or not.

Switch room and battery room on this level is each provided with a wall mounted exhaust fan with discharge louvre on the plant room wall. Make up air to each room is branched off from the car park supply air system.

The plant room housing various electrical meters /switchboards at the northeaster corner of the car park is naturally ventilated via several wall mounted terracotta louvres.

Refer PG.Pak-Poy & Associates design drawing in Appendix attached for further information.

P.G.Pak-Poy & Associates Mechanical Services Layout – Level 1.

2.1.2 Mechanical Services Condition and Recommendation

Mechanical installation is overall in poor condition and does not appear to be in operation for some extended period.

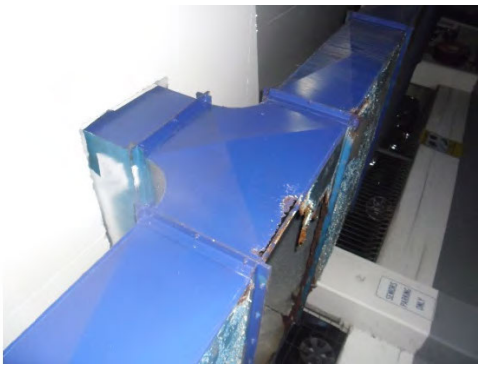
There are also various code compliance issues to be addressed.

Refer site photos below showing various installation conditions.

- Mechanical ductwork and fittings have evidence of significant damages caused by corrosions.







Section of C/P exhaust duct at the bottom of the riser corroded away.



Corrosion Evident at Lift Motor Room O/A intake with no filter fitted.



Damaged C/P S/A grille blade near switch room





No bollard protection for C/P exhaust dropper duct resulting damaged ductwork and grille

- Redundant supply air grille and ductwork near Cross Street Entry boom gates—one at each boom gate (2 off)



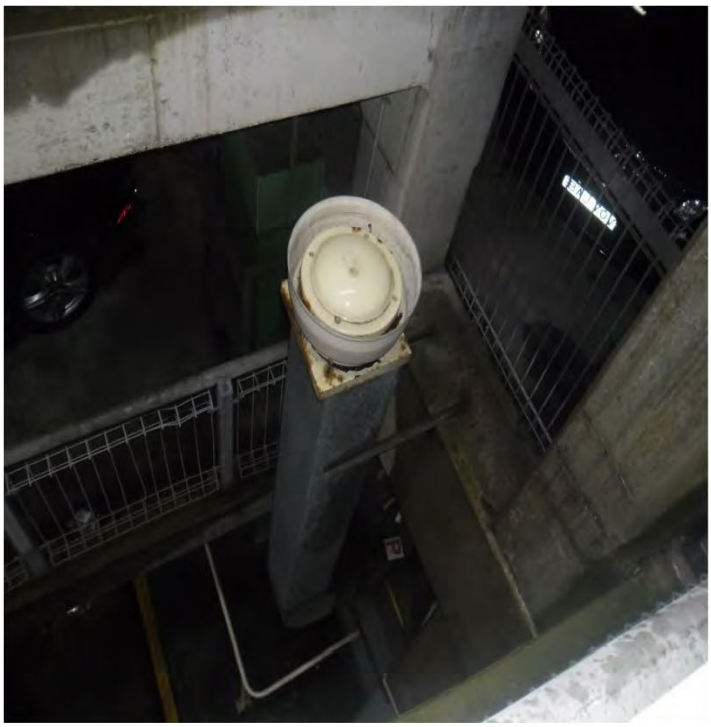
- Low head clearance underneath C/P S/A & Exhaust ductwork (with generally less than 2m less head room)



- Redundant old lift motor room inline exhaust fans and ductwork near lift motor room (Two fans installed in series configuration and are of G.W.Axial brand manufactured in 1977; These fans are well beyond their service life).



- Re-routed lift motor room exhaust is discharged within the building at the void; No provision for fan service/maintenance.



- Wiring for Lift motor room thermostats appear to be disconnected or dysfunctional; surface of the thermostats showing sign of corrosion.





- Lift motor room High temperature alarm bell surface corroded.



- No grilles provided for either lift motor room supply and exhaust system; exhaust ductwork damaged at the end with rust inside.





- Fire control panel located outside of the building. Interior of the panel not accessible for inspection.



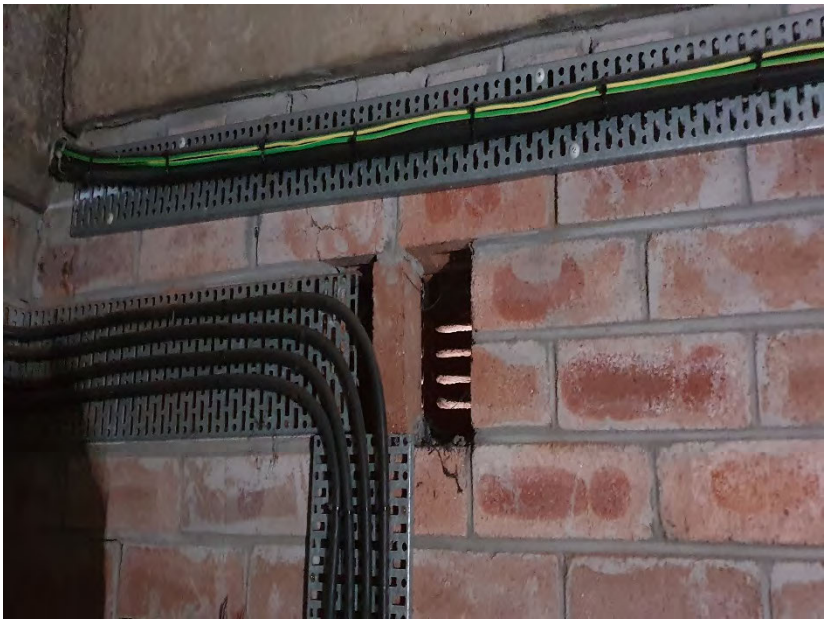
- Electrical switch room and battery room is provided with S/A grille off the car park S/A system; Fire damper is provided where the S/A duct passing thru wall penetrations.





- Natural ventilation openings for Electrical meter and switch room does not appear to be adequate and it is not weatherproof; part of the terracotta louvre is blocked by cable trays behind.





- Parking manager's office is provided with a wall mounted split type A/C unit (location of the CU not known; FCU is operating at the time of the inspection)



- Inadequate clearance between adjacent building and car park natural ventilation openings at southwestern façade to meet natural ventilation requirement for the undercover C/P entry from Cross Street. Refer to BCA consultant's report for more information on this issue.



We note the following Non-compliant issues,

- Cross Street car park entry area is approx. 30m from building entry and is an undercover driveway. It appears to be naturally ventilated by openings at its south entry and west façade. As indicated in the attached photo above, the clearance between the western façade openings and adjacent building is less than 6m. AS 1668.4 requires a minimum 6m clearance between building outside air opening and adjacent building. Therefore, only the first 18m of from the car park entry can be considered as naturally ventilated by openings at the entry. Remaining area needs to be mechanically ventilated by means of extending the existing car park supply and exhaust ductwork for additional coverage.

- No CO monitoring sensor or system evident in the car park area for the control/operation of the car park supply and exhaust fan as required by AS 1668.2. No VSD provided for car park exhaust or supply air fans as required by AS 1668.2. The car park exhaust fan is currently operated by a time switch yet at the time of this inspection (peak hour in the morning), the fan was not in operation.
- As per AS 1668.1 Clause 5.5.3, car park fans shall be provided with a control switch at the designated building entry point for fire fighting personnel in case of fire. Note there is a fire control panel located outside of the building but it is unknow if any control switch is provided for car park ventilated fans. If not, there will be code compliance issue.
- Lift motor room exhaust is discharged within the building through a void, not outside of the building. Exhaust shall be discharged to outside as per AS 1668.2 requirement. Nevertheless, access shall be provided for service and maintenance of the fan and the provision shall meet OH&S requirements.
- Main Switch room and battery room are both provided with S/A off the central C/P S/A system with a section of the C/P S/A duct passing thru these rooms. Fire dampers are provided in the duct penetrations at the plant room walls. As per AS 1668.2 section 5, car park supply ventilation system is required to operate at full ventilation rate in fire mode. But these fire dampers will close off the C/P S/A branch in fire mode and limit the S/A to the car park area.
- We note that there is a sign at car park entry stating a maximum clearance of 2m. However, the current installation clearance under the car park supply and exhaust ductwork is generally less than 2m. This does not comply with AS 2890.1 which stated that the clear headroom above parking spaces shall be a minimum of 2.2m and that the headroom above disabled parking space shall be 2.5m.

We also note that installation of local car park exhaust dropper with low-level exhaust intake grille were required by old version of AS 1668.2. However, this is no longer required by current AS 1668.2.

Our recommendation is as follows,

- Extend the car park supply and exhaust ductwork southward to cover additional under cover car park entry area as mentioned above.
- Provide CO monitoring system and VSD for car park supply and exhaust fans as per AS 1668.2. This will also provide benefits of energy saving on fan operation.
- Provide control switch at a designated building entry point as per AS 1668.1.
- Remove redundant lift motor room exhaust fans (of G.W.Axial brand) and associated ductwork and cap off its connection to car park exhaust ductwork behind manager's office.
- Extend the current lift motor room exhaust ductwork vertically to ensure exhaust discharge is above roof and outside of building. Provide safe access to the fan. Existing roof mounted type exhaust fan may be reused subject to verification of the fan condition. Replace with new if necessary.

- Verify the status of the existing lift motor room exhaust fan control thermostats and alarm bell. Recommendation is to replace them with new and modern thermostats and controls.
- Clean all the retained ductwork and fittings and apply additional rust inhibitor coating/painting to sections/parts, as necessary.
- Replace any damaged or heavily corroded ductwork, hanging strap, flanges, grilles with new and apply rust inhibitor coating/painting to the new ductwork and fittings with colour to match existing.
- Re-instate any missing grilles and dampers or duct mounted access panels.
- None of damper behind the grilles appears to be operable for air balancing or commissioning. Provide control mechanism such as control lever to each damper.
- Remove redundant cashier booth supply air system and cap off its connection to the car park supply air ductwork near parking manager's office.
- Provide mechanical ventilation to the electrical meter room or larger or additional weatherproof louvre if for natural ventilation.
- Due to different functionality, the supply air system to parking manager's office, battery room and switch room should not be combined with car park supply system as installed on site. Provide new and dedicated supply air system for these utility spaces and disconnect their current connection to car park supply air system. Existing wall mounted exhaust fan serving switch room and battery room may be retained subject to verification of fan condition. Replace with new fans if necessary.
- Provide air filters at the lift motor room outside air intake.
- Recommissioning and rebalancing the system after all the ratification works.

Recommendation for other miscellaneous equipment please refers to the mark-up sketches in attached Appendix.

2.2 Lower and Upper Level 2, 3 Mechanical Services

2.2.1 System description

Upper level 2 & 3 car parks are naturally ventilated by permanent openings along eastern façade.

Lower level 2 & 3 car parks are ventilated by overhead supply and exhaust system with riser connecting to level 1 and level 4 system. Several low-level droppers complete with exhaust intake grille are installed at the exhaust system side.

There are no mechanical As-built or original design drawing available for these levels.

2.2.2 Equipment Condition and Recommendation

Similar to level 1, the existing ductwork and associated fittings are in poor condition showing sign of corrosions. The system, which is part of central car park and exhaust ventilation system, does not appear to be in operation for some extended period.

Refer site photos below showing various installation conditions.

- Mechanical ductwork and fittings showing sign of corrosions.




- Faded painting at grille face and section of the ducts





- Ducted mounted access panel missing at C/P exhaust duct near the riser above ramp on level 2



We note the following Non-compliant issues,

- No CO monitoring sensor or system evident in the car park area for the control/operation of the car park supply and exhaust fan as required by AS 1668.2.
- The clearance under the car park supply and exhaust ductwork is generally less than 2m. This does not comply with AS 2890.1 which stated that the clear headroom above parking spaces shall be a minimum of 2.2m and that the headroom above disabled parking space shall be 2.5m.
- Fire dampers have been installed at car park supply and exhaust riser take-off on each floor. C/P ventilation system should be running in case of fire as per AS 1668.1. If fire damper is fitted, it will close off the branches serving respective level. This should not be the case.

  We note that installed car park exhaust dropper and low-level exhaust intake grille are no longer required by current AS 1668.2.

Our recommendation is as follows,

- Provide CO monitoring system for car park supply and exhaust fans as per AS 1668.2. This will also provide benefits of energy saving on fan operation.
- Clean all the retained ductwork and fittings and apply rust inhibitor coating/painting to sections/parts, as necessary.
- Replace any damaged or heavily corroded ductwork, hanging strap, flanges, grilles with new and apply rust inhibitor coating/painting to the new ductwork and fittings with colour to match existing.
- Re-instate any missing grilles and dampers or duct mounted access panels.

- None of damper behind the grilles appears to be operable for air balancing or commissioning. Provide control mechanism such as control lever to each damper.
- Recommissioning and rebalancing the system after all the ratification works.

2.3 Lower and Upper Level 4 Mechanical Services

2.3.1 System description

Upper level 4 car park is naturally ventilated by permanent openings along eastern façade.

Lower level 4 car park is ventilated by overhead supply and exhaust system with riser and dropper connecting to other levels. Several low-level droppers complete with exhaust intake grille are installed at the exhaust system side.

Car park exhaust fan is housed in a fan room located on this level with horizonal branch ductwork to serve this level and dropper to serve all the lower levels. Circular attenuator is fitted at the fan outlet before discharge. Exhaust is discharged at roof level above the fan room.

There are no mechanical As-built or original design drawing available for this levels.

2.3.2 Equipment Condition and Recommendation

Due to the exposure, the existing ductwork and associated fittings are in extremely poor condition with severe sign of corrosions. The system, which is part of central car park and exhaust ventilation system, does not appear to be in operation for some extended period.

Refer site photos below showing various installation conditions.

- Mechanical ductwork and fittings (including flange and hanging strap/rod) severely corroded away.





- Ducted mounted fire damper access panel missing at C/P exhaust duct near the riser at the north; Fire damper operating components corroded making the damper ineffective; no inspection testing label evident (Note this is typical for most of the fire dampers on other levels)

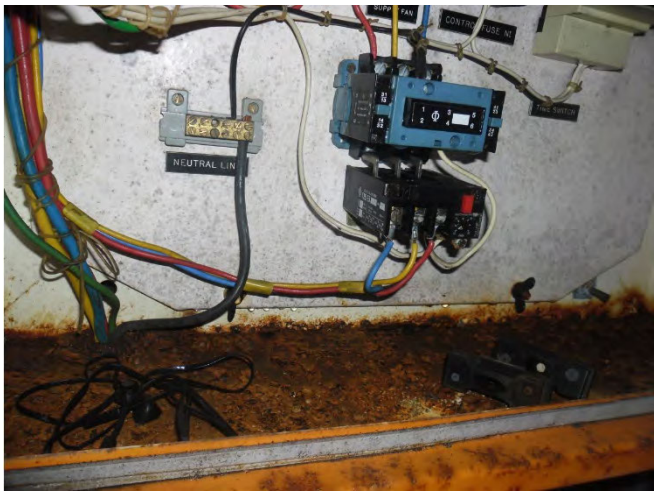




- C/P exhaust fan/attenuator casing, flanges, spring mounts and supporting structure showing significant sign of corrosions; fan room not air tight or weatherproof; Fan room floor flooded; room light not working; fan room door not securely locked for unauthorised entry.



- FC/P exhaust fan control panel severely corroded with sign of water ingress at the base.



We note the following Non-compliant issues,

- No CO monitoring sensor or system evident in the car park area for the control/operation of the car park supply and exhaust fan as required by AS 1668.2. No VSD provided for car park exhaust fan as required by AS 1668.2. The car park exhaust fan is currently operated by a time switch yet at the time of this inspection (peak hour in the morning), the fan was not in operation.
- The clearance under the car park supply and exhaust ductwork is generally less than 2m. This does not comply with AS 2890.1 which stated that the clear headroom above parking spaces shall be a minimum of 2.2m.
- Fire dampers have been installed at car park supply and exhaust riser take-off on each floor. C/P ventilation system should be running in case of fire as per AS 1668.1. If fire damper is fitted, it will close off the branches serving respective level. This should not be the case.

  We also note that installed car park exhaust dropper and low-level exhaust intake grille are no longer required by current AS 1668.2.

Our recommendation is as follows,

- Provide CO monitoring system and VSD for car park exhaust fans as per AS 1668.2. This will also provide benefits of energy saving on fan operation.
- Clean all the retained ductwork and fittings and apply rust inhibitor coating/painting to sections/parts, as necessary.
- Replace any damaged or heavily corroded ductwork, hanging strap, flanges, grilles with new and apply rust inhibitor coating/painting to the new ductwork and fittings with colour to match existing.
- Re-instate any missing grilles and dampers or duct mounted access panels.
- None of damper behind the grilles appears to be operable for air balancing or commissioning. Provide control mechanism such as control lever to each damper.

- Name plate of the car park exhaust fan is illegible but appears to be at the end of service life and does not appear to be operating for some extended period. Fan and attenuators should be replaced with new. Fan in the current market is more efficient to run.
- Replace existing exhaust fan control panel with new. New control panel shall be provided.
- Weatherproof and air-tight the C/P exhaust fan room and replace the faulty room light.
- Securely lock the fan room to prevent any unauthorised access.
- Recommissioning and rebalancing the system after all the ratification works.

2.4 Lower and Upper Roof Level Mechanical Services

2.4.1 System description

There is no mechanical system provided for the roof car park levels. Car park supply air fan room is located on lower deck roof level with outside air intake sourced from plant room wall mounted louvre. The fan is of centrifugal SWSI type fan with ducted connection to the dropper to serve all the lower levels of the building.

Car park exhaust discharge is at lower deck roof level.

There are two roof mounted A/C condensers (of Mitsubishi Electric brand) locate at southeaster corner of the roof outside of the car park. These units are in fair condition and appear to be serving the community centre directly below.

There are no mechanical As-built or original design drawing available for this levels.

2.4.2 Equipment Condition and Recommendation

Neither the car park supply nor exhaust fan was running at the time of the inspection and they do not appear to be in operation for some extended period. Fans and attenuators appear to be at the end of their service life.

Refer site photos below showing various installation conditions.

Refer site photos below showing various installation conditions.

- C/P S/A fan base spring mounts corroded and not mounted on a floor plinth; Fan room showing sign of vandalism; Flexible connector at the fan outlet is broken and leaking; fan room roof/wall/floor showing sign of water leakage

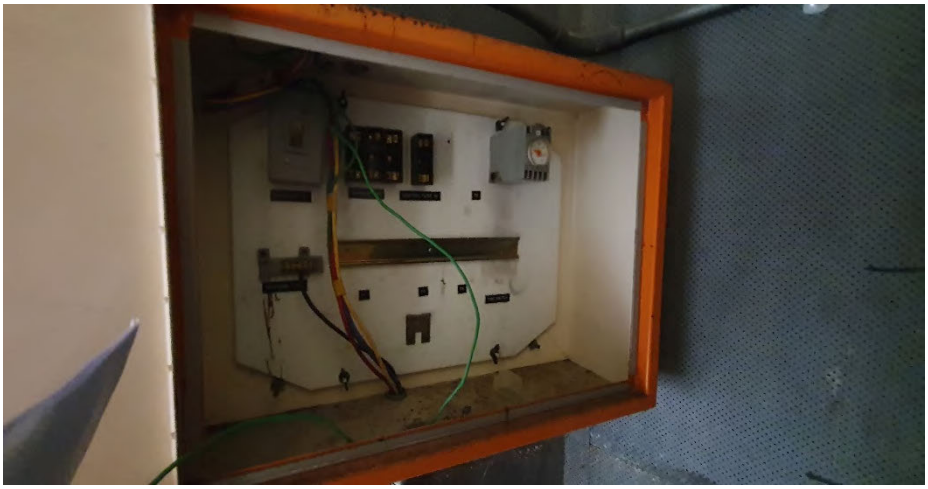





- Air bag filter cells (within the C/P S/A fan room) are damaged with holes; base of the filter bank showing sign of corrosion; no internal acoustic lining on the fan room entry side of the wall, including the door; debris on the floor near entry.



- C/P S/A Fan control panel showing sign of corrosion at the base; Time switch is installed within the panel but with no connections; No interlock wirings installed for C/P S/A & exhaust fan.




FL
FD
FS



- C/P S/A Fan room O/A intake louvre with missing blades in the centre.



- The casing of the car park exhaust fan and attenuator is showing sign of corrosions; base of the assembly is not adequately weatherproofed resulting in rain water ingress to the fan room below.



We note the following Non-compliant issues,

- No VSD provided for car park supply fan as required by AS 1668.2. No time switch wiring connection to the C/P S/A fan. The car park is not running at the time of this inspection (peak hour in the morning).
- Car park exhaust discharge point is approx. 3m above the lower deck of car park roof but less than 2m above the upper roof car park. As per AS 1668.2, discharge needs to be at least 2m above roof subject to regular traffic.

Our recommendation is as follows,

- Replace existing car park supply and exhaust fans and associated attenuators with new. New fans of current market will have better efficiency and provide energy saving. Provide VSD drive to both fans. Fans shall be operated via CO monitoring sensors located throughout the car park level. Provide smoke detector at the fan inlet side as per AS 1668.2 Clause 5 to shut down the fan upon the detection of smoke in the supply air system.
- Car park exhaust discharge needs to be extended further up to be more than 2m above the upper roof car park.
- Clean all the retained ductwork and fittings and apply rust inhibitor coating/painting to sections/parts, as necessary.
- Replace any damaged or heavily corroded ductwork, hanging strap, flanges, spring mounts with new and apply rust inhibitor coating/painting to the new ductwork.
- Weatherproof and air tight C/P S//A fan room.
- Replace all the existing air filters at C/P S/A fan room with new.

- Name plate of the car park S/A fan is illegible but appears the fan is at the end of service life and does not appear to be operating for some extended period. Fan and attenuators should be replaced with new. Fan in the current market is more efficient to run.
- Replace existing C/P S/A fan control panel with new.
- Weatherproof and air-tight the C/P exhaust fan room and replace the faulty room light.
- Acoustic impact of fan room to be assessed by a qualified acoustic engineer.
- Recommissioning and rebalancing the system after all the ratification works.

Section 03 – Electrical Services



3. EXISTING SYSTEMS DESCRIPTION

3.1 Power Supply

The incoming power supply enters the site form the north east corner of Jamberoo lane and terminates on the service fuse cabinet. The services fuses are rated at 200amps/phase.

Current arrangement does not comply with AS 3000 with respect to a service protection device.

The door to the room does no identify that it contains the site main switchboard.

The room has an accumulation of dust and debris.

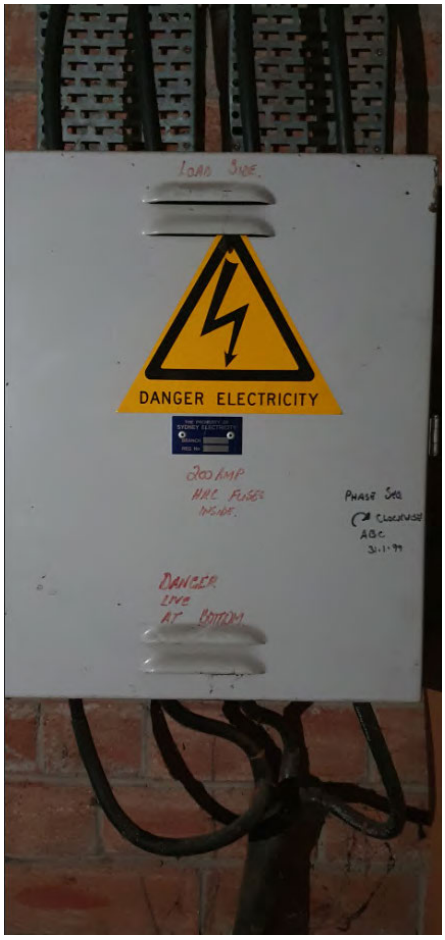


Figure 3.1 Service Fuse Cabinet



Figure 3.2 Main Switchboard

3.2 Main Distribution Board

Main distribution board switchboard (Figure 2.1) is located in a second main switch room.

This board contains the following:

- Submain controls for mechanical services
- Submain controls for upper level distribution boards
- Incorporates distribution board no. 1
- Incorporates lighting controls

DB1 does is not provided with RCD protection for outgoing circuits as required by AS3000.



Figure 2.1 Main Distribution Board



Figure 2.2 DB1

3.3 Distribution Boards

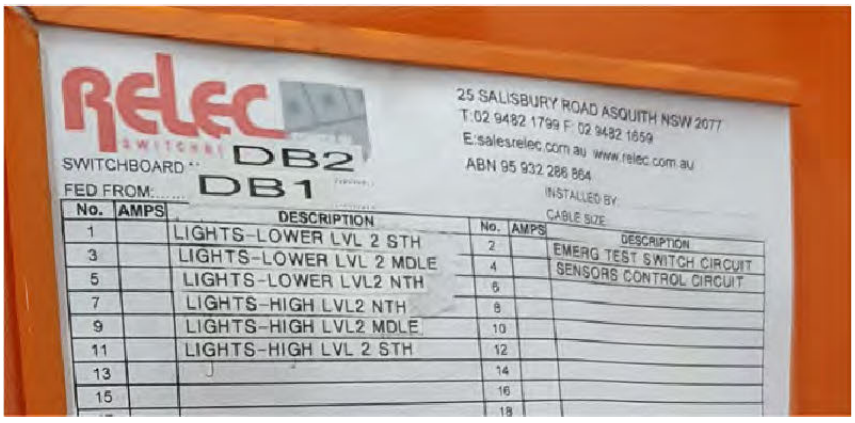
3.3.1 Distribution Board No. 2

The distribution board is satisfactory condition and should continue to provide reliable service. There 2 circuit breakers which are required to be replaced with RCBO (RCDs).







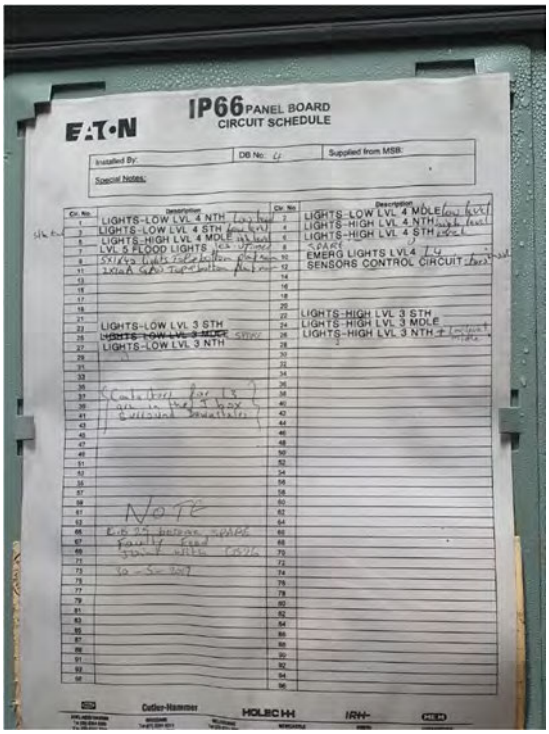


3.3.2 Distribution Board No. 4

The distribution board is satisfactory condition and should continue to provide reliable service. There 2 circuit breakers which are required to be replaced with RCBO (RCDs).







3.4 Lighting

Lighting throughout the carpark consist of LED type battens controlled by motion sensors at a number of locations. The fixture are in good condition and will provide satisfactory continued operation. It appears that little maintenance is provide as the fixtures need to be cleaned and some lights are malfunctioning (e.g. Figure 1).





Figure 5.1

In certain areas of the carpark, water is dripping on the Led light fittings and electrical conduits. This may lead to potential electrical hazards.





Roof level lighting is via LED pole mounted lights. The current arrangement does not provide adequate lighting and has poor control of light spill to adjacent properties..

New light fixtures should installed that would provide compliant lighting lives and compliance with AS 4282.



Arrangement of roof lighting

There a number of lights in plantrooms that are not working.

Recommend replacing existing malfunctioning light fittings with IP rated LED lights.



Roof top fan room



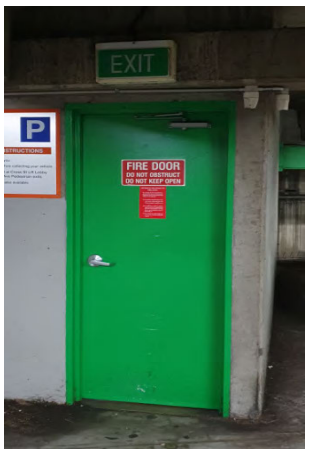
Site Main Switchroom -

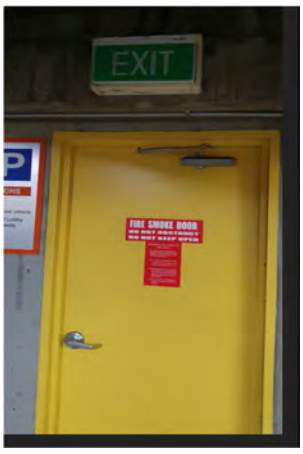
3.5 Emergency Lighting System

Emergency exit lights are installed throughout the carpark. Most of the emergency exit lights are in good condition. A few malfunctioning emergecny exit lights (Figure 6.1) need to be replaced to match existing.



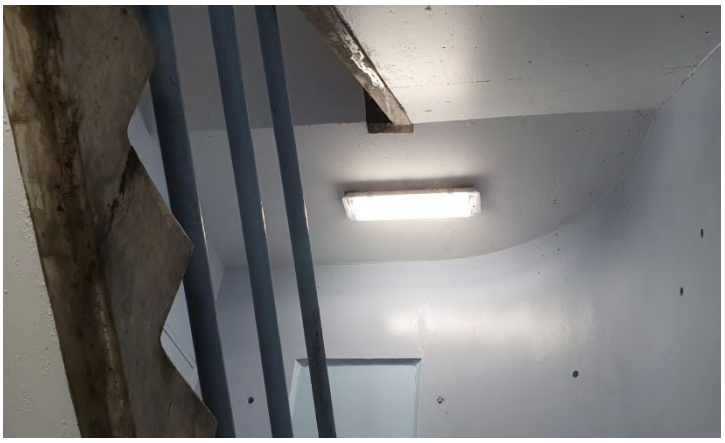






Lighting to fire isolated stairs consist of LED batten fittings with integrated emergency light. The lights are in good condition.





Light fittings with integrated emergency lights are installed throughout the circulation area of the carpark.



3.6 Communication System

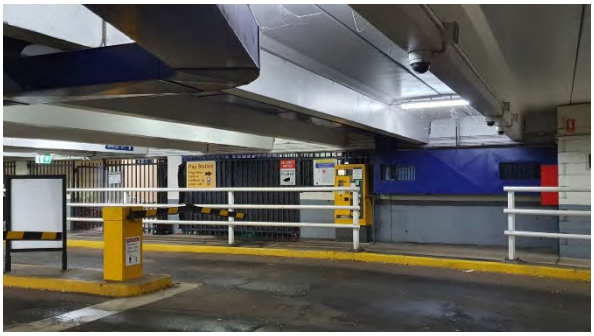
The building is provided with an NBN connection. The number of services supported by this connection was not investingated



NBN Tremination Box at Cross Street frontage in garden bed

3.7 Security Systems

Secuirty cameras are installed throughout the carpark (e.g. exit doors to external area, carpark entrances and exits and carpark ramps). Camera operation was not checked as access to the crpark office was not provided.





4. WORKS REQUIRED TO ALLOW CONTINUE USE OF THE BUILDING

4.1 Power supply

Install new services protection device to comply with the NSW Service and Installation Rules

4.2 Main switchboard

Main switchboard to be cleaned and internally inspected by a switchboard manufacturer to report on condition of internal components. Carry our thermal imaging to determine busbar/cable connection integrity.

4.3 Existing Consumer's Mains

4.4 Distribution Board 1, 2 and 4

Replace all non-RCD circuit breakers with RCBOs. Test and repair DB locks to keep out the general public.

4.5 Lighting

Led light fittings need to be cleaned and maintained in the carpark. IP rated replacement fittings are required to replace malfunctioning light fittings in the carpark circulation area and plant rooms (to comply with AS 1680).

In certain areas of the carpark, water is dripping on the Led light fittings and electrical conduits. This may lead to potential electrical hazards. Leaks are to be remediated or conduit/wiring /fixtures relocated.

Led pole lights in the roof carparking space need to be replaced to achieve with AS 4282 and AS1158.3.1.

4.6 Emergency Lighting System

A few malfunctioning emergency exit lights need to be replaced to match existing.

Additional emergency exit lights may require throughout the carpark.

Section 04 – Hydraulic and Fire Services



4. HYDRAULIC AND FIRE SERVICES

4.1 Existing Systems Description

The hydraulic services to this site include:

- Sanitary Drainage and Plumbing Systems
- Stormwater Drainage Systems
- Domestic Potable Cold-Water Systems

Sanitary Drainage and Plumbing Systems: -

The existing sanitary drainage serves the ground floor amenities and is installed underground. The condition of the pipework is unknown as it is underground and would need a CCTV inspection to determine its condition and remining service life.

Trade Waste Drainage Systems: -

No trade waste system was observed.

Stormwater Drainage Systems: -

The above ground stormwater system consists of galvanised steel downpipes collecting surface water from a series of surface outlets.

The condition of the below ground stormwater drainage is unknown and would require CCTV survey to determine its condition.

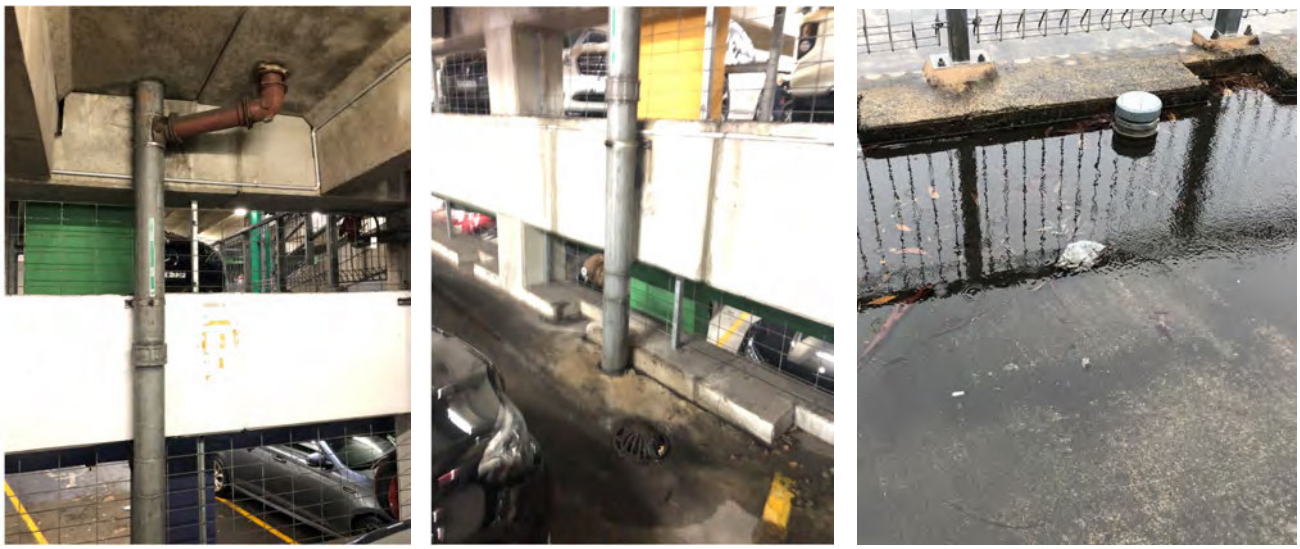


Fig 3.1 Typical downpipe and surface outlet arrangement and blocked outlet at roof level.

The existing downpipes and surface outlets are in a poor state of repair. Many of the downpipes have rust damage and many of the surface outlet are blocked and are not draining surface water effectively.

It was raining during the inspection and rainwater was observed dripping outside the downpipes and surface outlets.

The rainwater in ground floor entry/exit driveway is collected by kerb inlet pits and trench grates. These are in a poor state of repair and are not draining rainwater effectively. It appears that the underground pipework is partilly blocked.

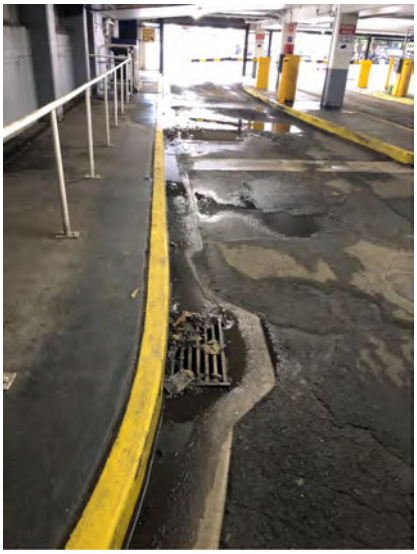



Fig 3.2 Drainage to entry/exit driveways showing water ponding

We recommend cleaning all stormwater pipe work as there are sign of blockages.

No drawing/documents have been provided.

Domestic Cold-Water: -

The existing potable cold-water system is supplied from Sydney Water pressurised street main in Cross St. A Sydney Water meter and backflow prevention device located at the front right side of the property adjacent to the main drive way entry.




Fig 3.3 Water meter with backflow device (meter is buried in leaf litter).

The existing potable cold-water pipework is in poor condition.

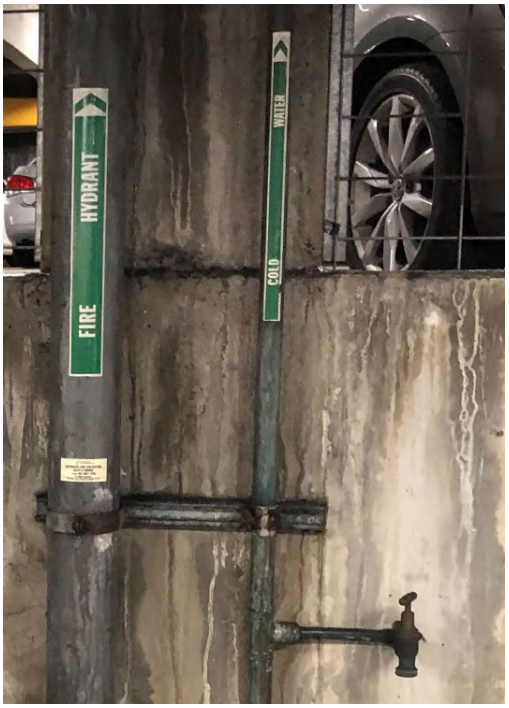


Fig 3.4 Cold water and hydrant pipework

Domestic Hot and Warm Water Systems:

No hot water systems were observed.

4.2 Documentation Review

Hydraulic services documentation was provided for the roof and levels 2 to 5. No ground floor documentation showing underground pipework was provided. The drawings generally are consistent with the observed installation with the exception of the health centre at the front of the site. No drawings were provided for the health centre.

4.3 Works Required for continued operation

To enable continued operation of the carpark the following works will be required to be undertaken.

Sanitary Drainage and Plumbing Systems: -

The existing sanitary drainage pipework will need to be further reviewed by CCTV inspection to determine its condition and suitability for ongoing usage.

Stormwater Drainage Systems: -

The above ground stormwater pipework should be replaced with PVC material as repair/replacement of existing steel pipework may be less cost effective.

The underground pipework appears to be partially blocked and will require further investigation via CCTV inspection to determine its condition.

Cleaning and clearing any blockages should be carried out as soon as possible to allow system to convey drainwater as intended.

4.4 Fire Sprinkler System

No fire sprinklers are provided in the building

4.5 Fire Hydrant System

A fire hydrant system is provided throughout the carpark. Hydrant outlets are located near the lift and adjacent to the northern exit ramp. The locations of the hydrant are not in accordance with the current National Construction Code (NCC2019). A number of the hydrant locations are located such that access is restricted by the head height and height of hydrant outlet is non-compliant.





Fig 4.1Typical Hydrant and hose reel arrangement and example of location with restricted access.

The hydrant outlets do not comply with current code requirements.

The booster connection is located at the front of the property and does not comply with current code requirements.



Fig 4.2 Hydrant Booster Arrangemnts

Other than the non-compliances listed above, the condition of the system is in satisfactory condition and should continue to operate to provide satisfactory service.

The adequacy of the existing fire water supply has not been checked. We have applied for a pressure enquiry to Sydney Water to determine its adequacy. The report will be updated once the information is received.

4.6 Fire Hose reel System

A fire hose reel system is provided throughout the building and are located adjacent to the hydrant outlets. The locations of the hosereels are not in accordance with the current National Construction Code (NCC2019).

4.7 Works Required for future operation

The following works would be required for continued operation of the carpark.

4.7.1 Fire Hydrant System

A new fire hydrant system in accordance with NCC 2019 and AS 2419.1-2017,.

4.7.2 Sprinkler System

The BCA consultant has identified the building is required to be sprinkler protected as it no longer meets to requirements for an open deck carpark.

The sprinkler installation include the following:

- New mains connection
- Sprinkler booster assembly at the Cross St frontage
- Sprinkler alarm valves
- Booster pumps if insufficient pressure in water mains
- Sprinkler tanks if insufficient water supply in water mains
- Distribution pipework
- Sprinkler ranges and heads.

The carpark structure will limit the locations where sprinkler mains can be installed. The most likely location would be to run distribution mains above the car bays at the level split (gridline C on existing drawings) and ranges then run between the precast beams.

4.7.3 Fire Hose Reels

The fire hose reels are to be tested ad retained.

Section 05 – Vertical Transportation Services



1. LIFT SITE OBSERVATIONS

We have inspected the lift motor room, lift landing lobby and inside the lift car. No inspection was conducted inside the lift shaft and lift car top.

The lift is rated at 750kg (11 persons lift car) serving five floors (Level 1 to level 5). This is a geared bottom traction machine lift.

The lift operation and safety features (emergency alarm button and car entrance door protection) were tested and found in satisfactory and functioning condition with the following remarks/ areas requiring attention:

1. Landing push button braille error on level L1 – L4.
2. Up direction landing push button on level L3 and L4 not functioning.
3. Landing door width measured 864mm (34 inches). AS1735.12-1999 minimum clear width of car door openings shall not be less than 900mm.
4. A liftwell access device to be permanently located in the machine room.
5. Sighted rust stain on stainless steel landing door panel, full depth frame and landing call panels.
6. Sighted water in lift spit.
7. Sighted water at lift machine room entrance door.

2. LIFT EQUIPMENT ASSESSMENT

Based on our site observation on the lift (without evaluating lift breakdown report), with proper periodic maintenance, we would be expecting the lift to be operating in its similar reliability level for the next 12 months period.

We noted that the lift controller and inverter has recently been upgraded. However, the performance of the lift is likely to decline as the other equipment ages further ie. lift traction machine, lift car operator and controller.

We would recommend upgrading the lift to a motor room-less lift (MRL) with the following consideration:

- Energy efficiency –A MRL lift is a gearless traction machine lift which have lesser energy consumption (up to 50% energy use reduction [1]) compared with the current geared machine lift due to lesser energy loss through friction and heat. The MRL lift is also an overhead machine design lift as opposed to the current bottom traction design lift. Both changes will overall provide an energy consumption benefit and saving on electricity bill on a longer run.
- Green Environment –MRL gearless machine do not require hydrocarbon lubricants and can be supplied with regenerative drive which will recover energy from operation.,
- The lift will be designed to incorporate the latest standards and safety requirement ie. auto releveling if accuracy between car and landing door outside the +/- 20mm range, unintended car movement with additional protection

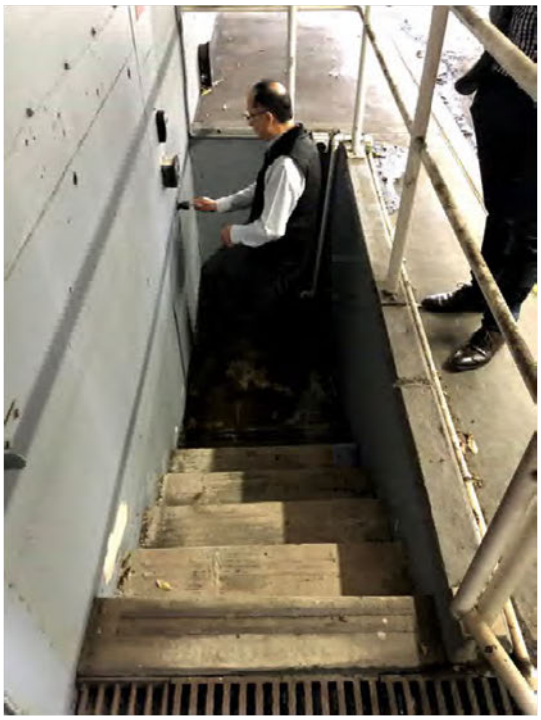
devices and sensors, minimum 900mm door width opening as per AS1735.12-1999 accessibility requirement, lift well access on all floors which allows rescue operation to be performed at intermediate levels and faster release of trapped passenger etc.

- Reduced maintenance and operating costs
- Readily available parts
- Reduce lift down time and improve reliability.
- Increased lift car capacity of 1000kg (1400mm width by 1600mm depth) in lieu of current 750kg. This lift car size accommodates one wheelchair user and a few other passengers. It also allows a wheelchair to be rotated within the car.
- Space efficiency – the existing lift motor room will no longer be required and can be used for other purposes.
- Appropriate materials for the coastal climate which will prevent further corrosion of lift doors and landing fixtures.

Reference: [1] National Elevator Industry, Inc. The Benefits of Machine Room Less Elevators, The Insider; NEII: New York, NY, USA, November 2015. Available online: http: //www.neii.org/insider/editions/20151112.pdf

3. OTHER CONSIDERATION

The Client would like to install an additional new lift to the North side of the carpark. The requirements for the new lift would be the same as the upgrade configuration noted above for the existing lift and would be subject to final location considerations.



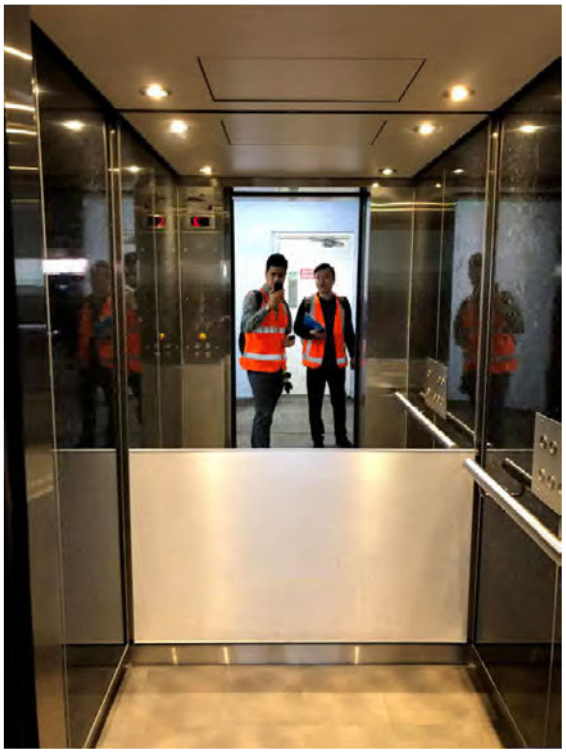
1. Lift motor room access



2. Lift motor room



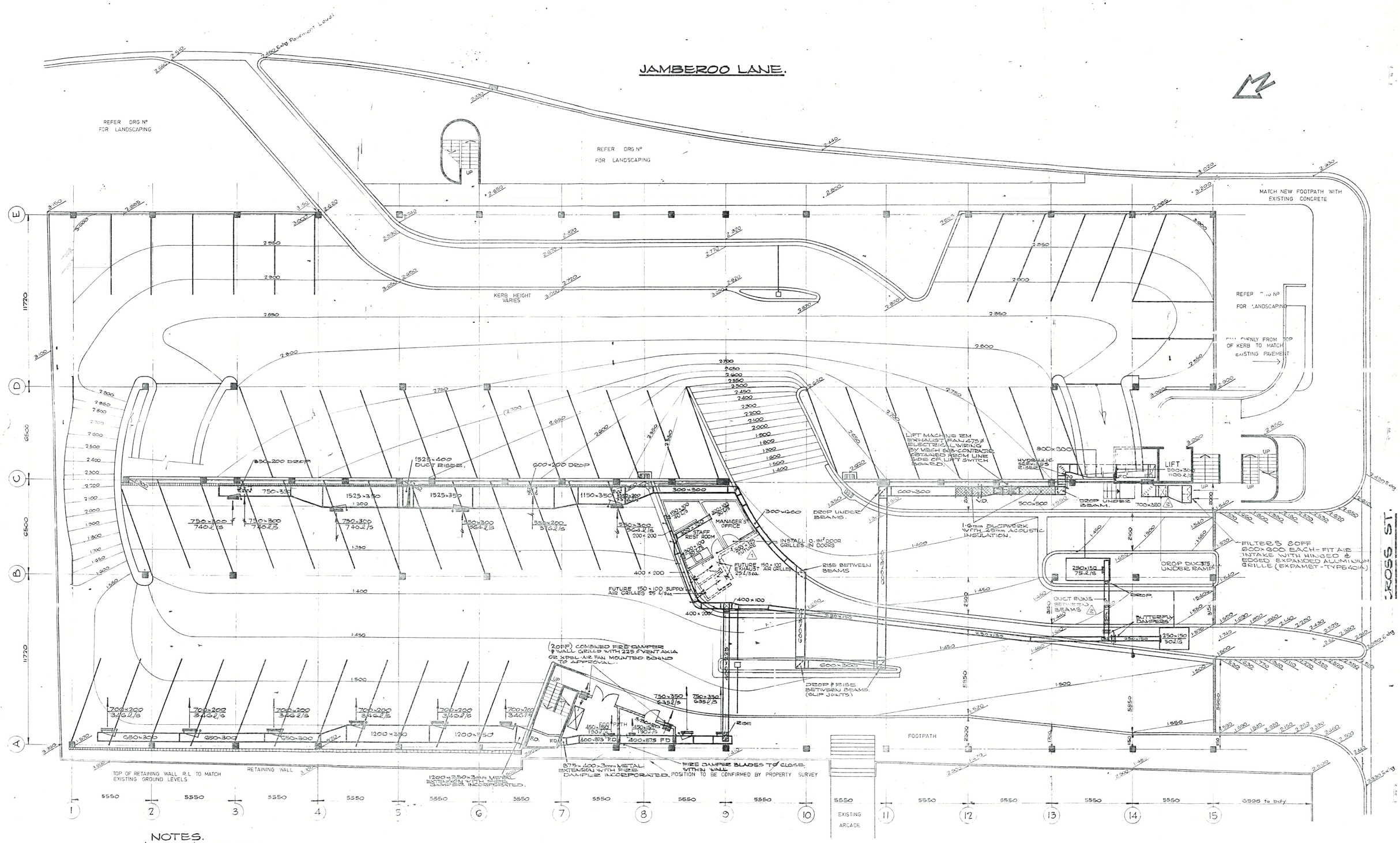
3. Typical landing



4. Lift Car

	
5. Landing button braille error	6. Rust stain on landing door and fixtures

Appendix A – Level 1 Mechanical Recommended Works Mark Up



NOTES.

1. BATTERY & SWITCHBOARD ROOM EXHAUST FANS TO BE 24HR OPERATION. ALL WIRING BY ELECTRICAL SUB-CONTRACTOR
2. 45mm SOLID CORE DOORS TO BATTERY & SWITCHBOARD ROOMS.
3. SLIP JOINTS TO BE USED ON DUCTWORK OVER RAMP AREAS AND DUCTWORK SHALL BE HARD TO SLAB - INCREASE WIDTH OF DUCTWORK LOCALLY TO ALLOW FOR COMPLEX TRANSITION.
4. RISER DUCTWORK BETWEEN LOWER LEVELS OF 3 & 4 AND RUN OUT DUCT EITHER SIDE OF RISERS (EXHAUST & SUPPLY AIR) FOR TWO LEVELS BELOW PLANT ROOMS FOR A HORIZONTAL DISTANCE OF 5m TO BE 1·6mm SHEET METAL.
5. ALL SUB-MAINS TO BE TERMINATED AND CONNECTED BY MECHANICAL SUB-CONTRACTOR.

DATE	RECIPIENT	Nº OFF
4/11/77	WOOLLAHRA MUNICIPAL COUNCIL PAK-POY & ASSOCIATES	1 1
21/3/77	PAK-POY & ASSOCIATES McCONNEL SMITH & JOHNSON	1 1

DRAWING ISSUES

McConnel Smith & Johnson Pty Ltd
Architects
35 Richards Avenue
Surry Hills
Sydney 2010
Telephone 33 4301

R H Tewksbury & Partners Pty Ltd
Consulting Engineers
First Floor Univac Building
754 Pacific Highway
Chatswood
Telephone 412 4322

Title: DUCTWORK LAYOUT

Drawing No: M 2/2

Job No: 75/02

Date: 8·3·77 | Drawn: G.W. | Checked: RHT 19·4·77 | Scale:

No.	AMENDMENTS	DATE
2	REVISE EA DUCT TO LIFT MOTOR ROOM & DUCT TAKEOFF TO BOOTH	4/11/77
1	S.A & E.A. DUCTWORK TO STAFF REST & TOILETS REVISED	2/11/77
A	SUPPLY AIR DUCTWORK TO TOLL BOOTHS REVISED	4/4/77

WOOLLAHRA MUNICIPAL COUNCIL
CROSS ST. PARKING STATION
MECHANICAL SERVICES
LEVEL 1

P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS

SCALE	DESIGN
1:100	R.G.H.
APPROVED	DRAWN
-	L.J.B.
DATE	CHECKED

DRAWING NUMBER

floth.com.au

BRISBANE
Level 2
69 Robertson St
Fortitude Valley QLD 4006
+61 7 3513 8000
bne@floth.com.au

SYDNEY
Level 8, Tower A
799 Pacific Hwy
Chatswood NSW 2067
+61 2 9406 4555
syd@floth.com.au

PERTH
Level 6
66 St Georges Tce
Perth WA 6000
+61 8 6162 2396
perth@floth.com.au

MELBOURNE
Suite 13.04, Level 13
470 Collins St
Melbourne VIC 3000
+61 3 9448 8755
mel@floth.com.au

JAKARTA
Wisma Kemang Level 2
JL Kemang Selatan Raya No. 1
Jakarta Selatan 12560, Indonesia
+62 21 781 9446
floth@flothindonesia.com

Appendix D - Cost Estimate Report

Altus Group

Preliminary Option 1 – Full Shutdown

Preliminary Option 2 – Staged Closure

Client : Woollahra Council
Project : Cross Street Parking Station, Double Bay
Report: Cost Estimate_06_Option 1 Full Shutdown
Date: 14 Jan 2022

Ref.	Description	Quantity	Unit	Rate	Total
	GFA	14,380	**m2**		
1	ASSUMPTION & EXCLUSION			NOTE	
2	DEMOLITION			95.40	1,371,828
3	SITE PREPARATION			3.78	54,420
4	SUBSTRUCTURE			51.55	741,250
5	COLUMNS			-	EXCL
6	UPPER FLOORS			46.20	664,285
7	STAIRCASES			12.71	182,730
8	ROOF			93.86	1,349,735
9	EXTERNAL WALLS			310.33	4,462,500
10	WINDOWS			2.66	38,250
11	EXTERNAL DOORS			4.26	61,200
12	INTERNAL WALLS			-	EXCL
13	INTERNAL SCREENS AND BORROWED LIGHTS			-	EXCL
14	INTERNAL DOORS			-	EXCL
15	WALL FINISHES			3.63	52,182
16	FLOOR FINISHES			111.33	1,600,985
17	CEILING FINISHES			20.54	295,382
18	FITMENTS			33.91	487,600
19	SPECIAL EQUIPMENTS			36.16	520,000
20	HYDRAULIC SERVICES			29.84	429,030
21	ELECTRICAL SERVICES			185.11	2,661,855
22	MECHANICAL SERVICES			50.61	727,713
23	FIRE SERVICES			99.79	1,435,035
24	LIFTS			12.05	173,250
25	LANDSCAPING			14.22	204,450
26	EXTERNAL WORKS			11.17	160,610
27	POTENTIAL ADDITIONAL CONSTRUCTION COSTS			73.78	1,061,000
	CONSTRUCTION COST SUBTOTAL			**1,302.87**	**18,735,290**
28	PRELIMINARIES (18%)	18	%		3,372,352
29	MARGIN (6%)	6	%		1,326,458
	CONSTRUCTION COST TOTAL			**1,629.63**	**23,434,100**
30	CONSTRUCTION CONTINGENCY (10%)	10	%		2,343,410
31	DESIGN CONTINGENCY (10%)	10	%		2,343,410
32	ESCALATION				EXCL
33	CONSULTANT FEES (10%)	10	%		2,343,410
34	AUTHORITY FEES (2%)	2	%		468,682
35	STAGING COSTS				EXCL
	PROJECT COST TOTAL				**30,933,012**

Ref.	Description	Quantity	Unit	Rate	Total
1	**ASSUMPTION & EXCLUSION**				
	DOCUMENTATION USED				
1.1	Building Services Report prepared by Floth dated 8 Apr 2021	Note			
1.2	Initial mark up comments and drawings prepared by TTW dated 25 Mar 2021	Note			
1.3	E-mail from BCA Logic dated 1 Apr 2021	Note			
1.4	E-mail from TTW dated 6 May 2021	Note			
1.5	Memo for ESD Initiative from Floth dated 22 June 2021	Note			
1.6	Draft Construction Staging and Programme Option 1 & 2 from Altus Group dated 7 June 2021	Note			
1.7	Remedial pile and cap sample drawing from TTW dated 18 June 2021	Note			
1.8	Corrosion assessment of H piles from BCRC dated 29 Oct 2021	Note			
1.9	Remedial Repair Strategies report from TTW dated 7 Dec 2021	Note			
	ASSUMPTION				
1.10	Assume Level 1 existing asphalt paving is required to demolish.	Note			
1.11	Assume 200mm thick excavation is required to have 2.2m clear height to level 1.	Note			
1.12	Assume new concrete topping to Level 5 is required.	Note			
1.13	Assume all existing stairs and stair shaft walls are required to demolish and build new stairs and stair shaft walls.	Note			
1.14	Assume stainless steel tactile indicators is required to all stair landings	Note			
1.15	Assume new metal roof and associated structure are required.	Note			
1.16	Assume existing precast pins are required to demolish.	Note			
1.17	Assume all fire stair doors are required to replace.	Note			
1.18	Assume a metal gate to main carpark entrance is required.	Note			
1.19	Assume paint finish to existing balustrades to building perimeter is not required.	Note			
1.20	Assume paint finish is required to columns, underside of slab, sides of beams and walls to western facade.	Note			
1.21	Assume metal cladding is required to external facing of existing precast walls on southern façade	Note			
1.22	Assume existing balustrades to carpark perimeter ato be retained.	Note			
1.23	Assume existing balustrades/barriers to ramp is required to be replaced to new safety barriers.	Note			
1.24	Assume ticket-less parking system and car parking guidance system are required.	Note			
1.25	Assume new floor finish and loose furniture are required to the office at Level 01.	Note			
1.26	Assume new windows, floor finishes and external paint finishes are required to the community centre.	Note			
1.27	Assume roof remediation to the community centre will be completed prior to the project as part of urgent rectification.	Note			
1.28	Assume new LED light fittings and fixtures to whole building are required.	Note			
1.29	Assume existing mechanical exhaust system is demolished and new mechanical exhaust system to whole carpark area is required.	Note			
1.30	Assume the existing lift car is retained.	Note			
1.31	Assume vertical green wall is required to stair 1&2, eastern & southern façade.	Note			
1.32	Assume new lift shaft walls and a lift car are required.	Note			
1.33	Assume 50% of existing piles and caps on Grid A & E require new piles and caps underside of existing pile caps.	Note			
1.34	Assume 50% of existing landscaping is required to reinstate due to piling works and new staircases.	Note			
1.35	Assume 30 bike racks are required as part of ESD initiatives	Note			
1.36	Assume 100Kw photovoltaic system is required on roof as part of ESD initiatives	Note			
1.37	Assume 20 EV charges are required as part of ESD initiatives	Note			
1.38	Assume new hydraulic fixtures are required as part of ESD initiatives	Note			
1.39	Assume 10KL RC rainwater tank in ground are required as part of ESD initiatives	Note			
1.40	Assume existing structure is in reasonable condition and allowed strucure strengthening, make good and rectification works only. Carbon fibre strips and/or demolition of whole structure are not included in this cost plan.	Note			
1.41	Assume new underground hydraulic services on L01 including demolition of existing pipes are required.	Note			
1.42	10% of construction and design contingency allowed respectively.	Note			

Ref.	Description	Quantity	Unit	Rate	Total
1.43	10% of consultant fees allowed.	Note			
1.44	2% of authority fees allowed.	Note			
	EXCLUSION				
1.45	GST	Note			
1.46	Escalation	Note			
1.47	Finance Costs	Note			
1.48	Works to internal wall finishes, ceiling and services to community centre	Note			
1.49	Staging Costs (not applicable for full Shutdown)	Note			
1.50	Out of hours work	Note			
1.51	Service amplification works if required	Note			
2	**DEMOLITION**				
2.1	**Substructure**				
2.2	Allowance for removal of existing asphalt paving to carpark and ramps (Level 1)	2,790	m2	45	125,550
2.3	Allowance for concrete/asphalt cutting to install new pile caps	96	m	50	4,800
2.4	**Upper Floor**				
2.5	Allowance for removal of existing concrete topping and blanking plates to upper floor (Level 2 to 4) - say 25% (assume not required)	2,829	m2		EXCL
2.6	Allowance for removal of existing movement joints (Level 2 to 4)	333	m	15	4,995
2.7	Allowance for demolition of existing RC slab to install new lift	25	m2	300	7,500
2.8	Allowance for removal of asbestos roof membrane - assume 100mm thick topping on entire roof is required to removed, 1m3 = 2.4t, $250/t	1	item	170,000	170,000
2.9	Provision for latent site conditions, removal and disposal of unknown hazardous materials	1	item	100,000	100,000
2.10	**Staircases**				
2.11	Allowance for demolition of existing fire stair 1, 2 & 3 (Level 1 to 5)	158	m2	350	55,300
2.12	Allowance for demolition of existing walls and windows to fire stair 1, 2 & 3 (Level 1 to 5)	698	m2	300	209,395
2.13	Allowance for demolition of existing roof to fire stair 1, 2 & 3 (Level 1 to 5)	40	m2	300	11,880
2.14	Allowance for removal of metal balustrade to stairs	64	m	25	1,600
2.15	**External Walls**				
2.16	Allowance for demolition of existing precast fins to eastern and southern façade (say 50% of eastern and southern façade area)	737	m2	300	221,205
2.17	**Windows**				
2.18	Allowance for demolition of existing windows and glazed door to community centre	45	m2	150	6,675
2.19	**External Doors**				
2.20	Allowance to strip and remove existing single leaf firestair doors	20	No	150	3,000
2.21	**Floor Finishes**				
2.22	Allowance for removal of floor finishes to office	18	m2	50	900
2.23	Allowance for removal of floor finishes to community centre	240	m2	25	6,000
2.24	**Fitments**				
2.25	Allowance for removal of existing boom gates	5	No	500	2,500
2.26	Allowance for removal of existing balustrades to ramps	434	m	30	13,020
2.27	Allowance for removal of general metalworks	1	item	5,000	5,000
2.28	Allowance for removal of ground stormwater drainage system incl. downpipes, grates etc.	11,551	m2	5	57,755
2.29	Allowance to strip and remove existing ambulant WC	2	No	2,000	4,000
2.30	Allowance for removal of loose furniture and fixtures to office	1	item	1,000	1,000
2.31	Allowance for removal and relocate loose furniture to community centre	1	item	3,000	3,000
2.32	**Hydraulic Services**				
	Allowance for removal of existing downpipes and drainage	11,551	m2	10	115,510
2.33	Allowance for removal of existing hydraulic fixtures (2 WCs)	1	item	1,500	1,500
2.34	**Electrical Services**				
2.35	Allowance for removal of existing exit signs, light fittings and fixtures	11,551	m2	10	115,510
2.36	**Mechanical Services**				
2.37	Allowance for removal of existing mechanical services	11,551	m2	8	86,633

Ref.	Description	Quantity	Unit	Rate	Total
2.38	**Fire Services**				
2.39	Allowance for removal of existing hydrant points and fire hose reels	1	item	15,000	15,000
2.40	**Lift**				
2.41	Allowance for demolition of existing lift push buttons and lift door panels	1	item	5,000	5,000
2.42	**External Works**				
2.43	Allowance for demolition of existing footpath	123	m2	45	5,535
2.44	Allowance for demolition of existing driveway	177	m2	45	7,965
2.45	Allowance for demolition of existing kerb and gutter	82	m	50	4,100
	DEMOLITION TOTAL				**1,371,828**
3	**SITE PREPARATION**				
3.1	Site Clearance & Leveling				
3.2	Allowance for general cleaning to carpark and plant rooms	14,380	m2	3	43,140
3.3	Allowance for removal of existing plants	314	m2	20	6,280
3.4	Allowance for tree removals	1	item	5,000	5,000
	SITE PREPARATION TOTAL				**54,420**
4	**SUBSTRUCTURE**				
4.1	**Piling**				
4.2	Note: According to the corrosion assessment of H piles provided by BCRC, existing piles are in good condition. AG assume no new piles are required.				
4.3	Provisional allowance for pile testing for existing H piles	1	item	100,000	100,000
4.4	Allowance for detail excavation and disposal for pile caps (assume 3.7m x 2.45 x 2.1m deep excavation) - assume not required	305	m3	350	EXCL
4.5	Allowance for temporary shoring to detail excavation - assume not required	413	m2	45	EXCL
4.6	Allowance for 700 x 1700 x 700mm deep RC pile caps to Grid A & E (say 50% of existing pile caps) - assume not required	16	No	1,500	EXCL
4.7	Allowance for 300mm dia piles to Eastern boundary, reinforcement ratio 370kg/m3 (assume 2.7m high) - assume not required	43	m	520	EXCL
4.8	Allowance for 300mm dia piles to Eastern boundary, reinforcement ratio 370kg/m3 (assume 12.8m high) - assume not required	205	m	520	EXCL
4.9	E/O for 1000mm socketing into rock - assume not required	32	No	400	EXCL
4.10	Allowance for trimming and testing - assume not required	32	No	1,000	EXCL
4.11	**Slab on Ground**				
4.12	Allowance for 400mm excavation to lower Level 1	460	m3	250	115,000
4.13	Allowance for disposal of excavated material - assume GSW	460	m3	350	161,000
4.14	Allowance for 75mm thick sand bedding to lower level 1	1,150	m2	10	11,500
4.15	Allowance for 125mm thick reinforced concrete slab on ground on sand bedding to carpark area (Level 1)	2,790	m2	125	348,750
4.16	Allowance for lift pit	1	item	5,000	5,000
	SUBSTRUCTURE TOTAL				**741,250**
6	**UPPER FLOORS**				
6.1	**Rectification Works**				
6.2	Allowance for make good and rectification works for cracks and spalls to suspended slabs and beams	55	No	5,000	275,000
6.3	Allowance for make good and rectification works for exposed corroding reinforcement to suspended slabs and beams	28	No	5,000	140,000
6.4	Allowance for make good movement joints	333	m	40	13,320
6.5	Allowance for make good slab edges	920	m	40	36,800
6.6	**Concrete Topping**				
6.7	Allowance for concrete topping to Level 2 to 4 carpark area and ramps - assume not required	2,131	m2		EXCL
6.8	Allowance for concrete topping to Level 5 carpark area and ramps	2,829	m2	60	169,740

Ref.	Description	Quantity	Unit	Rate	Total
6.9	Allowance for sealant to movement joints (Level 1 to 5)	555	m	35	19,425
6.10	**Others**				
6.11	Allowance for upgrade of pedestrian access ramps on Level 1 (no detail provided)	1	item	10,000	10,000
	UPPER FLOORS TOTAL				**664,285**
7	**STAIRCASES**				
7.1	**Stair Balustrades**				
7.2	Allowance for RC staircases (3 off, Level 1 to 5)	39	m	3,200	124,800
7.3	**Stair Nosing**				
7.4	Allowance for stair noising to firestairs	238	m	85	20,230
7.5	**Tactile**				
7.6	Allowance for stainless steel tactile surface indicators to stair landings - assume 1000x 600mm to each landing	29	m2	1,300	37,700
	STAIRCASES TOTAL				**182,730**
8	**ROOF**				
8.1	**Metal Roof**				
8.2	Allowance for metal roof with associated structure to roof carpark area	2,829	m2	400	1,131,600
8.3	Allowance for roof drainage to roof carpark area	2,829	m2	55	155,595
8.4	Concrete plinths for columns (assume 66 concrete plinths are required)	66	No.	500	33,000
8.5	**RC Roof**				
8.6	Roof remediation to community centre (early childhood centre) - PM advised that the works will be completed separate as part of the urgent rectification				Excl.
8.7	Allowance for 200mm thick RC concrete roofs to staircases	40	m2	400	16,000
8.8	Allowance for 200mm thick RC concrete roofs to new lift shaft	6	m2	400	2,500
8.9	Allowance for waterproofing	46	m2	90	4,140
8.10	Allowance for pebbles to roof for staircases and lift shaft	46	m2	50	2,300
8.11	Allowance for drainage	46	m2	100	4,600
	ROOF TOTAL				**1,349,735**
9	**EXTERNAL WALLS**				
9.1	**External Radiant Heat Attenuation Screens**				
9.2	Allowance for radiant heat attenuation screens to northern and eastern elevation as per email from BCA Logic dated 1 Apr 2021	1,489	m2	410	610,490
9.3	**External Metal Screen**				
9.4	**External Vertical Green Wall System**				
9.5	Provision of $1500/m2 for external vertical green wall system including support frame and drip tray to Eastern & southern façade to be confirmed (Level 1 to 4)	1,489	m2	1,500	2,233,500
9.6	Provision of $1500/m2 for external vertical green wall system including support frame and drip tray to new stair1 & 2 (assume size of stairs is same as existing stairs)	379	m2	1,500	568,800
9.7	Allowance for 12months maintenance for green walls	12	month	1,000	12,000
9.8	**RC Walls**				
9.9	Provision for temporary bracing	854	m2	50	42,699
9.10	Allowance for 200mm thick RC concrete staircase walls - assume size of staircases are same as existing staircases	698	m2	450	314,093
9.11	Allowance for 200mm thick RC concrete lift shaft walls	156	m2	450	70,200
9.12	Allowance for paint finish	854	m2	12	10,248
9.13	**Balustrades**				
9.14	Metal balustrades to perimeter of carpark (Level 1 to Roof) - assume no work required	1	item		Excl.
9.15	Allowance for make good existing balustrade to ramp adjacent to community centre	10	m	100	1,000
9.16	**Existing Precast Walls to Western Façade**				
9.17	Allowance for colorbond metal cladding including capping to external facing of exisitng precast walls to western façade	758	m2	350	265,300
9.18	Allowance for metal capping to edge of precast walls	486	m	100	48,570

Ref.	Description	Quantity	Unit	Rate	Total
9.19	E/O for scaffolding to western façade	968	m2	200	193,600
9.20	**Rectification Works**				
9.21	Allowance for make good and rectification works for exposed reinforcement to external walls (Level 1 to 4)	14	No	3,000	42,000
9.22	Allowance for fire seals to gaps between existing external precast panels along the northern elevation	1	item	25,000	25,000
9.23	Allowance for sprayed vermiculite to fixing points for existing precast panels along the northern elevation	1	item	25,000	25,000
	EXTERNAL WALLS TOTAL				**4,462,500**
10	**WINDOWS**				
10.1	**Windows to Community Centre**				
10.2	Allowance for single glazing aluminium framed windows to community centre	45	m2	750	33,750
10.3	E/O for single glazed entry door to community centre	1	item	4,500	4,500
	WINDOWS TOTAL				**38,250**
11	**EXTERNAL DOORS**				
11.1	**Fire Stair Doors**				
11.2	Single leaf fire stair doors	20	No	1,500	30,000
11.3	**Carpark Entry Doors**				
11.4	Allowance for gates to carpark entrance (approx. 16m length x 2m high)	1	item	30,000	30,000
11.5	**Other Doors**				
11.6	Allowance for paint finish to single leaf doors to plant ad office rooms	4	No	150	600
11.7	Allowance for paint finish to double leaf doors to plant ad office rooms - assume no work required	2	No	300	600
	EXTERNAL DOORS TOTAL				**61,200**
15	**WALL FINISHES**				
15.1	**Wall Finishes**				
15.2	Allowance for general cleaning and preparation of existing walls to receive paint finish	1,898	m2	8	15,184
15.3	Allowance for paint finish to inner face of precast walls to western facade	758	m2	15	11,370
15.4	Allowance for paint finish to columns	1,072	m2	15	16,080
15.5	Allowance for paint finish to office	67	m2	15	1,008
15.6	Allowance for make good external walls of community centre to receive new paint finish	214	m2	25	5,338
15.7	Allowance for paint finish to external walls of community centre	214	m2	15	3,203
	EXTERNAL DOORS TOTAL				**52,182**
16	**FLOOR FINISHES**				
16.1	**Floor Finishes**				
16.2	Allowance for preparation to receive Fosroc Cemtop HD30 or Sika MultiFlex PB-32UV	14,380	m2	25	359,500
16.3	Allowance for Fosroc Cemtop HD30 or Sika MultiFlex PB-32UV to carpark (Level 1 to 5)	14,143	m2	85	1,202,155
16.4	Allowance for epoxy floor finish to other areas	238	m2	50	11,900
16.5	Allowance for finish to staircases	1	item		Excl.
16.6	Allowance for preparation to receive carpet tile finish	18	m2	25	450
16.7	Allowance for vinyl floor finish to office	18	m2	80	1,440
16.8	Allowance for vinyl skirting to office	28	m2	55	1,540
16.8	Allowance for carpet to community centre	240	m2	100	24,000
	FLOOR FINISHES TOTAL				**1,600,985**
17	**CEILING FINISHES**				

Ref.	Description	Quantity	Unit	Rate	Total
17.1	**Ceiling Finishes**				
17.2	Allowance for cleaning underside of all slabs and sides of beams	17,362	m2	5	86,810
17.3	Allowance for paint finish to underside of concrete slabs (Level 1 to 4)	11,314	m2	12	135,768
17.4	Allowance for paint finish to sides of Beams (Level 1 to 4)	6,049	m2	12	72,588
17.5	Allowance for paint finish to existing ceiling to office	18	m2	12	216
	CEILING FINISHES TOTAL				**295,382**
18	**FITMENTS**				
18.1	**Signage**				
18.2	Allowance for statutory and directional signage	1	item	75,000	75,000
18.3	**Metalworks**				
18.4	Allowance for general metalworks	1	item	60,000	60,000
18.5	Allowance for bike racks	30	No	500	15,000
18.6	**Wheel Stops**				
18.7	Allowance for precast concrete wheel stops (396 parking bays)	396	item	250	99,000
18.8	**Bathroom Accessories**				
18.9	Allowance for bathroom accessories for ambulant toilet	2	item	5,000	10,000
18.10	**Lift Motor Room Fitout**				
18.11	Allowance for lift motor room fitout	1	item	5,000	5,000
18.12	**Line Marking**				
18.13	Allowance for line marking (396 parking bays)	1	item	20,000	20,000
18.14	Allowance for direction arrow, disabled parking insignia, hatch lines, pedestrian crossing lines and etc.	1	item	25,000	25,000
18.15	**Barriers**				
18.16	Allowance for safety barriers to ramps	434	m	400	173,600
18.17	**Loose Furniture**				
18.18	Provision of loose furniture to office	1	item	5,000	5,000
	FITMENTS TOTAL				**487,600**
19	**SPECIAL EQUIPMENTS**				
19.1	**Parking System**				
19.2	Allowance for ticket-less parking system	1	item	300,000	300,000
19.3	Allowance for car parking guidance system (396 parking bays)	1	item	220,000	220,000
	SPECIAL EQUIPMENTS TOTAL				**520,000**
20	**HYDRAULIC SERVICES**				
20.1	**Sanitary Drainage and Plumbing Systems**				
20.2	Sanitary drainage and plumbing systems are not investigated. Assume no work required.	Note			
20.3	Sanitary Drainage and Plumbing System	1	item		Excl.
20.4	**Trade Waste Drainage Systems**				
20.5	No trade waste system was observed according to the building services report by Floth. Assume no work required.	Note			
20.6	Trade waste drainage system	1	item		Excl.
20.7	**Stormwater Drainage Systems**				
20.8	The condition of the below ground stormwater drainage is unknown according to the building services report by Floth. assume no work required.	Note			
20.9	Assume existing grates to be retained.	1	item		Excl.
20.10	Underground stormwater drainage system	1	item		Excl.
20.11	Unblock underground pipework and drainage	1	item	20,000	20,000
20.12	Allow for stormwater drainage system with PVC pipes (Level 1 to 5)	14,380	m2	20	287,600

Ref.	Description	Quantity	Unit	Rate	Total
20.13	Allowance for 10KL RC rainwater tank in ground	1	item	80,000	80,000
20.14	**Hydraulic Fitments**				
20.15	Allowance for bathroom fixture	2	No	6,000	12,000
20.16	E/O for ambulant WC to male and female WC (Level 1)	2	No	4,500	9,000
20.17	**BWIC**				
20.18	Allowance of 5% for Builder's works in connections with Hydraulic Services Installation	5	%	408,600	20,430
	HYDRAULIC SERVICES TOTAL				**429,030**
21	**ELECTRICAL SERVICES**				
21.1	**Electrical Services**				
21.2	Allowance electrical service upgrade	1	item	100,000	100,000
21.3	Allowance for exit signs	20	No	400	8,000
21.4	Allowance for electrical services including light fittings and fixtures (Level 1 to 5)	14,380	m2	45	647,100
21.5	Allowance for services protection device	1	item		Incl.
21.6	Allowance for cleaning and inspection of main switchboard	1	item		Incl.
21.7	Allowance for replacement of non-RCD circuit breakers to distribution board No. 2 & 4	1	item		Incl.
21.8	Allowance for EV electrical charges (say 5% of the total number of parking bays)	20	No	20,000	400,000
21.9	**Photovoltaic System**				
21.10	provision for photovoltaic (PV) panels including framing on the roof (assume 100kw peak capacity)	1	item	1,300,000	1,300,000
21.11	**Communication Systems**				
21.12	NBN connection was not investigated according to the building services report by Floth	Note			
21.13	Communication systems - Assume no work required to existing NBN connection	1	item		Excl.
21.14	**Security Systems**				
21.15	CCTV was not investigated according to the building services report by Floth	Note			
21.16	Allowance for CCTV (assume 20 CCTVs)	1	item	80,000	80,000
21.17	**BWIC**				
21.18	Allowance of 5% of Builder's work in connection with Electrical Services installation	5	%	2,535,100	126,755
	ELECTRICAL SERVICES TOTAL				**2,661,855**
22	**MECHANICAL SERVICES**				
22.1	**Mechanical Services**				
22.2	Allowance for new carpark exhaust system to carpark from Level 1 to Level 4	11,551	m2	60	693,060
22.3	Allowance for new carpark exhaust system to Level 5 carpark - assume not required	2,829	m2		Excl.
22.4	**BWIC**				
22.5	Allowance of 5% of Builder's work in connection with Mechanical Services installation	5	%	693,060	34,653
	MECHANICAL SERVICES TOTAL				**727,713**
23	**FIRE SERVICES**				
23.1	**Wet Fire**				
23.2	Allowance for fire sprinkler system (Level 1 to 5)	14,380	m2	90	1,294,200
23.3	Fire hose reels (3 no. each level)	15	No	1,500	22,500
23.4	Fire hydrant system	1	item	30,000	30,000
23.5	Allowance for service connection	1	item	20,000	20,000
23.6	**BWIC**				
23.7	Allowance of 5% of Builder's work in connection with Fire Services installation	5	%	1,366,700	68,335
	FIRE SERVICES TOTAL				**1,435,035**
24	**LIFTS**				

Ref.	Description	Quantity	Unit	Rate	Total
24.1	**Passenger lift**				
24.2	The existing lift is in functioning condition according to the building services report by Floth dated 8th Apr 2021				
24.3	Allowance for alteration and make good existing lift including new landing push buttons and lift door panels	1	item	35,000	35,000
24.4	Allowance for new passenger lift (Level 1 to 5)	1	item	130,000	130,000
24.5	Allowance for feature finish to lifts	1	item		EXCL
24.6	**BWIC**				
24.7	Allowance of 5% of Builder's work in connection with Fire Services installation	5	%	165,000	8,250
	LIFTS TOTAL				**173,250**
25	**LANDSCAPING**				
25.1	Allowance for landscaping (say 100% of landscaping area)	314	m2	650	204,100
25.2	Allowance for make good existing planter box	14	m2	25	350
	LANDSCAPING TOTAL				**204,450**
26	**EXTERNAL WORKS**				
26.1	Allowance for asphalt driveway to entries	177	m2	150	26,550
26.2	Allowance for 80mm thick Concrete slab underside of stone paving	123	m2	120	14,760
26.3	Allowance for 1.5wide stone paving to footpath along with Jamberoo Lane	123	m2	350	43,050
26.4	Allowance for reinstatement of kerb and gutter (say 50%)	89	m	250	22,250
26.5	Allowance for reinstatement of roads including cutting exisitng road, joints and the like	1	item	10,000	10,000
26.6	Allowance for metal roof with associated structure to L1 footpath on western site boundary	55	m2	800	44,000
	EXTERNAL WORKS TOTAL				**160,610**
27	**POTENTIAL ADDITIONAL CONSTRUCTION COSTS**				
27.1	Allowance for H-Pile testing - included in Item 4.2.	1	item		Incl.
27.2	Allowance for additional geotechnical review of TTW conclusions (peer review)	1	item	4,000	4,000
27.3	Provisional allowance for special durability consultant fees (BCRC) regarding corrosion and invasive testing	1	item	50,000	50,000
27.4	Provisional allowance for make good and rectification works to existing structure based on corrosion and invasive testing (based on GFA: 14,280m2) - no allowance for demo and reconstruction of existing structure/ carbon fibre strips	1	item	714,000	714,000
27.5	Provisional allowance for hydraulic consultant fees in regards to underground pipeworks investigation via CCTV (say 4 off CCTVs are required)	1	item	18,000	18,000
27.6	Provisional allowance for underground hydraulic services with demolition of existing pipes based on further investigation (Based on L01 FECA: 2,829m2)	1	item	160,000	160,000
27.7	E/O potential additional cost for new lift in lieu of existing lift including removal of existing lift car - Floth have recommended the motor room-less lift (MRL) (Please refer page 45 in Floth's building services report)	1	item	115,000	115,000
27.8	ESD initiative items provided by Floth have been included in above elements (item 9.5, 9.6, 18.5, 20.13, 21.4, 21.8, 21.10 and 25.1)	1	item		Incl.
	POTENTIAL ADDITIONAL CONSTRUCTION COSTS TOTAL				**1,061,000**

Client : Woollahra Council
Project : Cross Street Parking Station, Double Bay
Report: Cost Estimate_06_Option 2 Staging
Date: 14 Jan 2022

Ref.	Description	Quantity	Unit	Rate	Total
	GFA	14,380	**m2**		
1	ASSUMPTION & EXCLUSION			NOTE	
2	DEMOLITION			95.40	1,371,828
3	SITE PREPARATION			3.78	54,420
4	SUBSTRUCTURE			51.55	741,250
5	COLUMNS			-	EXCL
6	UPPER FLOORS			46.20	664,285
7	STAIRCASES			12.71	182,730
8	ROOF			93.86	1,349,735
9	EXTERNAL WALLS			310.33	4,462,500
10	WINDOWS			2.66	38,250
11	EXTERNAL DOORS			4.26	61,200
12	INTERNAL WALLS			-	EXCL
13	INTERNAL SCREENS AND BORROWED LIGHTS			-	EXCL
14	INTERNAL DOORS			-	EXCL
15	WALL FINISHES			3.63	52,182
16	FLOOR FINISHES			111.33	1,600,985
17	CEILING FINISHES			20.54	295,382
18	FITMENTS			33.91	487,600
19	SPECIAL EQUIPMENTS			36.16	520,000
20	HYDRAULIC SERVICES			29.84	429,030
21	ELECTRICAL SERVICES			185.11	2,661,855
22	MECHANICAL SERVICES			50.61	727,713
23	FIRE SERVICES			99.79	1,435,035
24	LIFTS			12.05	173,250
25	LANDSCAPING			14.22	204,450
26	EXTERNAL WORKS			11.17	160,610
27	POTENTIAL ADDITIONAL CONSTRUCTION COSTS			73.78	1,061,000
	CONSTRUCTION COST SUBTOTAL			**1,302.87**	**18,735,290**
28	PRELIMINARIES (18%)	18	%		3,372,352
29	MARGIN (6%)	6	%		1,326,458
	CONSTRUCTION COST TOTAL			**1,629.63**	**23,434,100**
30	CONSTRUCTION CONTINGENCY (10%)	10	%		2,343,410
31	DESIGN CONTINGENCY (10%)	10	%		2,343,410
32	ESCALATION				EXCL
33	CONSULTANT FEES (10%)	10	%		2,343,410
34	AUTHORITY FEES (2%)	2	%		468,682
35	STAGING COSTS				880,000
	PROJECT COST TOTAL				**31,813,012**

Ref.	Description	Quantity	Unit	Rate	Total
	DOCUMENTATION USED				
1.1	Building Services Report prepared by Floth dated 8 Apr 2021	Note			
1.2	Initial mark up comments and drawings prepared by TTW dated 25 Mar 2021	Note			
1.3	E-mail from BCA Logic dated 1 Apr 2021	Note			
1.4	E-mail from TTW dated 6 May 2021	Note			
1.5	Memo for ESD Initiative from Floth dated 22 June 2021	Note			
1.6	Draft Construction Staging and Programme Option 1 & 2 from Altus Group dated 7 June 2021	Note			
1.7	Remedial pile and cap sample drawing from TTW dated 18 June 2021	Note			
1.8	Corrosion assessment of H piles from BCRC dated 29 Oct 2021	Note			
1.9	Remedial Repair Strategies report from TTW dated 7 Dec 2021	Note			
	ASSUMPTION				
1.10	Assume Level 1 existing asphalt paving is required to demolish.	Note			
1.11	Assume 200mm thick excavation is required to have 2.2m clear height to level 1.	Note			
1.12	Assume new concrete topping to Level 5 is required.	Note			
1.13	Assume all existing stairs and stair shaft walls are required to demolish and build new stairs and stair shaft walls.	Note			
1.14	Assume stainless steel tactile indicators is required to all stair landings	Note			
1.15	Assume new metal roof and associated structure are required.	Note			
1.16	Assume existing precast pins are required to demolish.	Note			
1.17	Assume all fire stair doors are required to replace.	Note			
1.18	Assume a metal gate to main carpark entrance is required.	Note			
1.19	Assume paint finish to existing balustrades to building perimeter is not required.	Note			
1.19	Assume paint finish is required to columns, underside of slab, sides of beams and walls to western facade.	Note			
1.20	Assume metal cladding is required to external facing of existing precast walls on southern façade	Note			
1.21	Assume existing balustrades to carpark perimeter ato be retained.	Note			
1.22	Assume existing balustrades/barriers to ramp is required to be replaced to new safety barriers.	Note			
1.23	Assume ticket-less parking system and car parking guidance system are required.	Note			
1.24	Assume new floor finish and loose furniture are required to the office at Level 01.	Note			
1.25	Assume new windows, floor finishes and external paint finishes are required to the community centre.	Note			
1.26	Assume roof remediation to the community centre will be completed prior to the project as part of urgent rectification.	Note			
1.27	Assume new LED light fittings and fixtures to whole building are required.	Note			
1.28	Assume existing mechanical exhaust system is demolished and new mechanical exhaust system to whole carpark area is required.	Note			
1.29	Assume the existing lift car is retained.	Note			
1.30	Assume vertical green wall is required to stair 1&2, eastern & southern façade.	Note			
1.31	Assume new lift shaft walls and a lift car are required.	Note			
1.32	Assume 50% of existing piles and caps on Grid A & E require new piles and caps underside of existing pile caps.	Note			
1.33	Assume 50% of existing landscaping is required to reinstate due to piling works and new staircases.	Note			
1.34	Assume 30 bike racks are required as part of ESD initiatives	Note			
1.35	Assume 100Kw photovoltaic system is required on roof as part of ESD initiatives	Note			
1.36	Assume 20 EV charges are required as part of ESD initiatives	Note			
1.37	Assume new hydraulic fixtures are required as part of ESD initiatives	Note			
1.38	Assume 10KL RC rainwater tank in ground are required as part of ESD initiatives	Note			
1.39	Assume existing structure is in reasonable condition and allowed strucure strengthening, make good and rectification works only. Carbon fibre strips and/or demolition of whole structure are not included in this cost plan.	Note			
1.40	Assume new underground hydraulic services on L01 including demolition of existing pipes are required.	Note			
1.41	10% of construction and design contingency allowed respectively.	Note			
1.42	10% of consultant fees allowed.	Note			
1.43	2% of authority fees allowed.	Note			

Ref.	Description	Quantity	Unit	Rate	Total
	EXCLUSION				
1.44	GST	Note			
1.45	Escalation	Note			
1.46	Finance Costs	Note			
1.47	Works to internal wall finishes, ceiling and services to community centre	Note			
1.48	Out of hours work	Note			
1.49	Service amplification works if required	Note			
2	**DEMOLITION**				
2.1	**Substructure**				
2.2	Allowance for removal of existing asphalt paving to carpark and ramps (Level 1)	2,790	m2	45	125,550
2.3	Allowance for concrete/asphalt cutting to install new pile caps	96	m	50	4,800
2.4	**Upper Floor**				
2.5	Allowance for removal of existing concrete topping and blanking plates to upper floor (Level 2 to 4) - say 25% (assume not required)	2,829	m2		EXCL
2.6	Allowance for removal of existing movement joints (Level 2 to 4)	333	m	15	4,995
2.7	Allowance for demolition of existing RC slab to install new lift	25	m2	300	7,500
2.8	Allowance for removal of asbestos roof membrane - assume 100mm thick topping on entire roof is required to removed, 1m3 = 2.4t, $250/t	1	item	170,000	170,000
2.9	Provision for latent site conditions, removal and disposal of unknown hazardous materials	1	item	100,000	100,000
2.10	**Staircases**				
2.11	Allowance for demolition of existing fire stair 1, 2 & 3 (Level 1 to 5)	158	m2	350	55,300
2.12	Allowance for demolition of existing walls and windows to fire stair 1, 2 & 3 (Level 1 to 5)	698	m2	300	209,395
2.13	Allowance for demolition of existing roof to fire stair 1, 2 & 3 (Level 1 to 5)	40	m2	300	11,880
2.14	Allowance for removal of metal balustrade to stairs	64	m	25	1,600
2.15	**External Walls**				
2.16	Allowance for demolition of existing precast fins to eastern and southern façade (say 50% of eastern and southern façade area)	737	m2	300	221,205
2.17	**Windows**				
2.18	Allowance for demolition of existing windows and glazed door to community centre	45	m2	150	6,675
2.19	**External Doors**				
2.20	Allowance to strip and remove existing single leaf firestair doors	20	No	150	3,000
2.21	**Floor Finishes**				
2.22	Allowance for removal of floor finishes to office	18	m2	50	900
2.23	Allowance for removal of floor finishes to community centre	240	m2	25	6,000
2.24	**Fitments**				
2.25	Allowance for removal of existing boom gates	5	No	500	2,500
2.26	Allowance for removal of existing balustrades to ramps	434	m	30	13,020
2.27	Allowance for removal of general metalworks	1	item	5,000	5,000
2.28	Allowance for removal of ground stormwater drainage system incl. downpipes, grates etc.	11,551	m2	5	57,755
2.29	Allowance to strip and remove existing ambulant WC	2	No	2,000	4,000
2.30	Allowance for removal of loose furniture and fixtures to office	1	item	1,000	1,000
2.31	Allowance for removal and relocate loose furniture to community centre	1	item	3,000	3,000
2.32	**Hydraulic Services**				
	Allowance for removal of existing downpipes and drainage	11,551	m2	10	115,510
2.33	Allowance for removal of existing hydraulic fixtures (2 WCs)	1	item	1,500	1,500
2.34	**Electrical Services**				
2.35	Allowance for removal of existing exit signs, light fittings and fixtures	11,551	m2	10	115,510
2.36	**Mechanical Services**				
2.37	Allowance for removal of existing mechanical services	11,551	m2	8	86,633
2.38	**Fire Services**				
2.39	Allowance for removal of existing hydrant points and fire hose reels	1	item	15,000	15,000
2.40	**Lift**				
2.41	Allowance for demolition of existing lift push buttons and lift door panels	1	item	5,000	5,000

Ref.	Description	Quantity	Unit	Rate	Total
2.42	**External Works**				
2.43	Allowance for demolition of existing footpath	123	m2	45	5,535
2.44	Allowance for demolition of existing driveway	177	m2	45	7,965
2.45	Allowance for demolition of existing kerb and gutter	82	m	50	4,100
	DEMOLITION TOTAL				**1,371,828**
3	**SITE PREPARATION**				
3.1	Site Clearance & Leveling				
3.2	Allowance for general cleaning to carpark and plant rooms	14,380	m2	3	43,140
3.3	Allowance for removal of existing plants	314	m2	20	6,280
3.4	Allowance for tree removals	1	item	5,000	5,000
	SITE PREPARATION TOTAL				**54,420**
4	**SUBSTRUCTURE**				
4.1	**Piling**				
4.2	Note: According to the corrosion assessment of H piles provided by BCRC, existing piles are in good condition. AG assume no new piles are required.				
4.3	Provisional allowance for pile testing for existing H piles	1	item	100,000	100,000
4.4	Allowance for detail excavation and disposal for pile caps (assume 3.7m x 2.45 x 2.1m deep excavation) - assume not required	305	m3	350	EXCL
4.5	Allowance for temporary shoring to detail excavation - assume not required	413	m2	45	EXCL
4.6	Allowance for 700 x 1700 x 700mm deep RC pile caps to Grid A & E (say 50% of existing pile caps) - assume not required	16	No	1,500	EXCL
4.7	Allowance for 300mm dia piles to Eastern boundary, reinforcement ratio 370kg/m3 (assume 2.7m high) - assume not required	43	m	520	EXCL
4.8	Allowance for 300mm dia piles to Eastern boundary, reinforcement ratio 370kg/m3 (assume 12.8m high) - assume not required	205	m	520	EXCL
4.9	E/O for 1000mm socketing into rock - assume not required	32	No	400	EXCL
4.10	Allowance for trimming and testing - assume not required	32	No	1,000	EXCL
4.11	**Slab on Ground**				
4.12	Allowance for 400mm excavation to lower Level 1	460	m3	250	115,000
4.13	Allowance for disposal of excavated material - assume GSW	460	m3	350	161,000
4.14	Allowance for 75mm thick sand bedding to lower level 1	1,150	m2	10	11,500
4.15	Allowance for 125mm thick reinforced concrete slab on ground on sand bedding to carpark area (Level 1)	2,790	m2	125	348,750
4.16	Allowance for lift pit	1	item	5,000	5,000
	SUBSTRUCTURE TOTAL				**741,250**
6	**UPPER FLOORS**				
6.1	**Rectification Works**				
6.2	Allowance for make good and rectification works for cracks and spalls to suspended slabs and beams	55	No	5,000	275,000
6.3	Allowance for make good and rectification works for exposed corroding reinforcement to suspended slabs and beams	28	No	5,000	140,000
6.4	Allowance for make good movement joints	333	m	40	13,320
6.5	Allowance for make good slab edges	920	m	40	36,800
6.6	**Concrete Topping**				
6.7	Allowance for concrete topping to Level 2 to 4 carpark area and ramps - assume not required	2,131	m2		EXCL
6.8	Allowance for concrete topping to Level 5 carpark area and ramps	2,829	m2	60	169,740
6.9	Allowance for sealant to movement joints (Level 1 to 5)	555	m	35	19,425
6.10	**Others**				
6.11	Allowance for upgrade of pedestrian access ramps on Level 1 (no detail provided)	1	item	10,000	10,000

Ref.	Description	Quantity	Unit	Rate	Total
	UPPER FLOORS TOTAL				**664,285**
7	**STAIRCASES**				
7.1	**Stair Balustrades**				
7.2	Allowance for RC staircases (3 off, Level 1 to 5)	39	m	3,200	124,800
7.3	**Stair Nosing**				
7.4	Allowance for stair noising to firestairs	238	m	85	20,230
7.5	**Tactile**				
7.6	Allowance for stainless steel tactile surface indicators to stair landings - assume 1000x 600mm to each landing	29	m2	1,300	37,700
	STAIRCASES TOTAL				**182,730**
8	**ROOF**				
8.1	**Metal Roof**				
8.2	Allowance for metal roof with associated structure to roof carpark area	2,829	m2	400	1,131,600
8.3	Allowance for roof drainage to roof carpark area	2,829	m2	55	155,595
8.4	Concrete plinths for columns (assume 66 concrete plinths are required)	66	No.	500	33,000
8.5	**RC Roof**				
8.6	Roof remediation to community centre (early childhood centre) - PM advised that the works will be completed separate as part of the urgent rectification				Excl.
8.7	Allowance for 200mm thick RC concrete roofs to staircases	40	m2	400	16,000
8.8	Allowance for 200mm thick RC concrete roofs to new lift shaft	6	m2	400	2,500
8.9	Allowance for waterproofing	46	m2	90	4,140
8.10	Allowance for pebbles to roof for staircases and lift shaft	46	m2	50	2,300
8.11	Allowance for drainage	46	m2	100	4,600
	ROOF TOTAL				**1,349,735**
9	**EXTERNAL WALLS**				
9.1	**External Radiant Heat Attenuation Screens**				
9.2	Allowance for radiant heat attenuation screens to northern and eastern elevation as per email from BCA Logic dated 1 Apr 2021	1,489	m2	410	610,490
9.3	**External Metal Screen**				
9.4	**External Vertical Green Wall System**				
9.5	Provision of $1500/m2 for external vertical green wall system including support frame and drip tray to Eastern & southern façade to be confirmed (Level 1 to 4)	1,489	m2	1,500	2,233,500
9.6	Provision of $1500/m2 for external vertical green wall system including support frame and drip tray to new stair1 & 2 (assume size of stairs is same as existing stairs)	379	m2	1,500	568,800
9.7	Allowance for 12months maintenance for green walls	12	month	1,000	12,000
9.8	**RC Walls**				
9.9	Provision for temporary bracing	854	m2	50	42,699
9.10	Allowance for 200mm thick RC concrete staircase walls - assume size of staircases are same as existing staircases	698	m2	450	314,093
9.11	Allowance for 200mm thick RC concrete lift shaft walls	156	m2	450	70,200
9.12	Allowance for paint finish	854	m2	12	10,248
9.13	**Balustrades**				
9.14	Metal balustrades to perimeter of carpark (Level 1 to Roof) - assume no work required	1	item		Excl.
9.15	Allowance for make good existing balustrade to ramp adjacent to community centre	10	m	100	1,000
9.16	**Existing Precast Walls to Western Façade**				
9.17	Allowance for colorbond metal cladding to external facing of exisitng precast walls to western façade	758	m2	350	265,300
9.18	Allowance for metal capping to edge of precast walls	486	m	100	48,570
9.19	E/O for scaffolding to western façade	968	m2	200	193,600
9.21	**Rectification Works**				
9.22	Allowance for make good and rectification works for exposed reinforcement to external walls (Level 1 to 4)	14	No	3,000	42,000

Ref.	Description	Quantity	Unit	Rate	Total
9.23	Allowance for fire seals to gaps between existing external precast panels along the northern elevation	1	item	25,000	25,000
9.24	Allowance for sprayed vermiculite to fixing points for existing precast panels along the northern elevation	1	item	25,000	25,000
	EXTERNAL WALLS TOTAL				**4,462,500**
10	**WINDOWS**				
10.1	**Windows to Community Centre**				
10.2	Allowance for single glazing aluminium framed windows to community centre	45	m2	750	33,750
10.3	E/O for single glazed entry door to community centre	1	item	4,500	4,500
	WINDOWS TOTAL				**38,250**
11	**EXTERNAL DOORS**				
11.1	**Fire Stair Doors**				
11.2	Single leaf fire stair doors	20	No	1,500	30,000
11.3	**Carpark Entry Doors**				
11.4	Allowance for gates to carpark entrance (approx. 16m length x 2m high)	1	item	30,000	30,000
11.5	**Other Doors**				
11.6	Allowance for paint finish to single leaf doors to plant ad office rooms	4	No	150	600
11.7	Allowance for paint finish to double leaf doors to plant ad office rooms - assume no work required	2	No	300	600
	EXTERNAL DOORS TOTAL				**61,200**
15	**WALL FINISHES**				
15.1	**Wall Finishes**				
15.2	Allowance for general cleaning and preparation of existing walls to receive paint finish	1,898	m2	8	15,184
15.3	Allowance for paint finish to inner face of precast walls to western facade	758	m2	15	11,370
15.4	Allowance for paint finish to columns	1,072	m2	15	16,080
15.5	Allowance for paint finish to office	67	m2	15	1,008
15.6	Allowance for make good external walls of community centre to receive new paint finish	214	m2	25	5,338
15.7	Allowance for paint finish to external walls of community centre	214	m2	15	3,203
	EXTERNAL DOORS TOTAL				**52,182**
16	**FLOOR FINISHES**				
16.1	**Floor Finishes**				
16.2	Allowance for preparation to receive Fosroc Cemtop HD30 or Sika MultiFlex PB-32UV	14,380	m2	25	359,500
16.3	Allowance for Fosroc Cemtop HD30 or Sika MultiFlex PB-32UV to carpark (Level 1 to 5)	14,143	m2	85	1,202,155
16.4	Allowance for epoxy floor finish to other areas	238	m2	50	11,900
16.5	Allowance for finish to staircases	1	item		Excl.
16.6	Allowance for preparation to receive carpet tile finish	18	m2	25	450
16.7	Allowance for vinyl floor finish to office	18	m2	80	1,440
16.8	Allowance for vinyl skirting to office	28	m2	55	1,540
16.8	Allowance for carpet to community centre	240	m2	100	24,000
	FLOOR FINISHES TOTAL				**1,600,985**
17	**CEILING FINISHES**				
17.1	**Ceiling Finishes**				
17.2	Allowance for cleaning underside of all slabs and sides of beams	17,362	m2	5	86,810
17.3	Allowance for paint finish to underside of concrete slabs (Level 1 to 4)	11,314	m2	12	135,768

Ref.	Description	Quantity	Unit	Rate	Total
17.4	Allowance for paint finish to sides of Beams (Level 1 to 4)	6,049	m2	12	72,588
17.5	Allowance for paint finish to existing ceiling to office	18	m2	12	216
	CEILING FINISHES TOTAL				**295,382**
18	**FITMENTS**				
18.1	**Signage**				
18.2	Allowance for statutory and directional signage	1	item	75,000	75,000
18.3	**Metalworks**				
18.4	Allowance for general metalworks	1	item	60,000	60,000
18.5	Allowance for bike racks	30	No	500	15,000
18.6	**Wheel Stops**				
18.7	Allowance for precast concrete wheel stops (396 parking bays)	396	item	250	99,000
18.8	**Bathroom Accessories**				
18.9	Allowance for bathroom accessories for ambulant toilet	2	item	5,000	10,000
18.10	**Lift Motor Room Fitout**				
18.11	Allowance for lift motor room fitout	1	item	5,000	5,000
18.12	**Line Marking**				
18.13	Allowance for line marking (396 parking bays)	1	item	20,000	20,000
18.14	Allowance for direction arrow, disabled parking insignia, hatch lines, pedestrian crossing lines and etc.	1	item	25,000	25,000
18.15	**Barriers**				
18.16	Allowance for safety barriers to ramps	434	m	400	173,600
18.17	**Loose Furniture**				
18.18	Provision of loose furniture to office	1	item	5,000	5,000
	FITMENTS TOTAL				**487,600**
19	**SPECIAL EQUIPMENTS**				
19.1	**Parking System**				
19.2	Allowance for ticket-less parking system	1	item	300,000	300,000
19.3	Allowance for car parking guidance system (396 parking bays)	1	item	220,000	220,000
	SPECIAL EQUIPMENTS TOTAL				**520,000**
20	**HYDRAULIC SERVICES**				
20.1	**Sanitary Drainage and Plumbing Systems**				
20.2	Sanitary drainage and plumbing systems are not investigated. Assume no work required.	Note			
20.3	Sanitary Drainage and Plumbing System	1	item		Excl.
20.4	**Trade Waste Drainage Systems**				
20.5	No trade waste system was observed according to the building services report by Floth. Assume no work required.	Note			
20.6	Trade waste drainage system	1	item		Excl.
20.7	**Stormwater Drainage Systems**				
20.8	The condition of the below ground stormwater drainage is unknown according to the building services report by Floth. assume no work required.	Note			
20.9	Assume existing grates to be retained.	1	item		Excl.
20.10	Underground stormwater drainage system	1	item		Excl.
20.11	Unblock underground pipework and drainage	1	item	20,000	20,000
20.12	Allow for stormwater drainage system with PVC pipes (Level 1 to 5)	14,380	m2	20	287,600
20.13	Allowance for 10KL RC rainwater tank in ground	1	item	80,000	80,000
20.14	**Hydraulic Fitments**				
20.15	Allowance for bathroom fixture	2	No	6,000	12,000

Ref.	Description	Quantity	Unit	Rate	Total
20.16	E/O for ambulant WC to male and female WC (Level 1)	2	No	4,500	9,000
20.17	**BWIC**				
20.18	Allowance of 5% for Builder's works in connections with Hydraulic Services Installation	5	%	408,600	20,430
	HYDRAULIC SERVICES TOTAL				**429,030**
21	**ELECTRICAL SERVICES**				
21.1	**Electrical Services**				
21.2	Allowance electrical service upgrade	1	item	100,000	100,000
21.3	Allowance for exit signs	20	No	400	8,000
21.4	Allowance for electrical services including light fittings and fixtures (Level 1 to 5)	14,380	m2	45	647,100
21.5	Allowance for services protection device	1	item		Incl.
21.6	Allowance for cleaning and inspection of main switchboard	1	item		Incl.
21.7	Allowance for replacement of non-RCD circuit breakers to distribution board No. 2 & 4	1	item		Incl.
21.8	Allowance for EV electrical charges (say 5% of the total number of parking bays)	20	No	20,000	400,000
21.9	**Photovoltaic System**				
21.10	provision for photovoltaic (PV) panels including framing on the roof (assume 100kw peak capacity)	1	item	1,300,000	1,300,000
21.11	**Communication Systems**				
21.12	NBN connection was not investigated according to the building services report by Floth	Note			
21.13	Communication systems - Assume no work required to existing NBN connection	1	item		Excl.
21.14	**Security Systems**				
21.15	CCTV was not investigated according to the building services report by Floth	Note			
21.16	Allowance for CCTV (assume 20 CCTVs)	1	item	80,000	80,000
21.17	**BWIC**				
21.18	Allowance of 5% of Builder's work in connection with Electrical Services installation	5	%	2,535,100	126,755
	ELECTRICAL SERVICES TOTAL				**2,661,855**
22	**MECHANICAL SERVICES**				
22.1	**Mechanical Services**				
22.2	Allowance for new carpark exhaust system to carpark from Level 1 to Level 4	11,551	m2	60	693,060
22.3	Allowance for new carpark exhaust system to Level 5 carpark - assume not required	2,829	m2		EXCL
22.4	**BWIC**				
22.5	Allowance of 5% of Builder's work in connection with Mechanical Services installation	5	%	693,060	34,653
	MECHANICAL SERVICES TOTAL				**727,713**
23	**FIRE SERVICES**				
23.1	**Wet Fire**				
23.2	Allowance for fire sprinkler system (Level 1 to 5)	14,380	m2	90	1,294,200
23.3	Fire hose reels (3 no. each level)	15	No	1,500	22,500
23.4	Fire hydrant system	1	item	30,000	30,000
23.5	Allowance for service connection	1	item	20,000	20,000
23.6	**BWIC**				
23.7	Allowance of 5% of Builder's work in connection with Fire Services installation	5	%	1,366,700	68,335
	FIRE SERVICES TOTAL				**1,435,035**
24	**LIFTS**				
24.1	**Passenger lift**				
24.2	The existing lift is in functioning condition according to the building services report by Floth dated 8th Apr 2021				

Ref.	Description	Quantity	Unit	Rate	Total
24.3	Allowance for alteration and make good existing lift including new landing push buttons and lift door panels	1	item	35,000	35,000
24.4	Allowance for new passenger lift (Level 1 to 5)	1	item	130,000	130,000
24.5	Allowance for feature finish to lifts	1	item		EXCL
24.6	**BWIC**				
24.7	Allowance of 5% of Builder's work in connection with Fire Services installation	5	%	165,000	8,250
	LIFTS TOTAL				**173,250**
25	**LANDSCAPING**				
25.1	Allowance for landscaping (say 100% of landscaping area)	314	m2	650	204,100
25.2	Allowance for make good existing planter box	14	m2	25	350
	LANDSCAPING TOTAL				**204,450**
26	**EXTERNAL WORKS**				
26.1	Allowance for asphalt driveway to entries	177	m2	150	26,550
26.2	Allowance for 80mm thick Concrete slab underside of stone paving	123	m2	120	14,760
26.3	Allowance for 1.5wide stone paving to footpath along with Jamberoo Lane	123	m2	350	43,050
26.4	Allowance for reinstatement of kerb and gutter (say 50%)	89	m	250	22,250
26.5	Allowance for reinstatement of roads including cutting exisitng road, joints and the like	1	item	10,000	10,000
26.6	Allowance for metal roof with associated structure to L1 footpath on western site boundary	55	m2	800	44,000
	EXTERNAL WORKS TOTAL				**160,610**
27	**POTENTIAL ADDITIONAL CONSTRUCTION COSTS**				
27.1	Allowance for H-Pile testing - included in Item 4.2.	1	item		Incl.
27.2	Allowance for additional geotechnical review of TTW conclusions (peer review)	1	item	4,000	4,000
27.3	Provisional allowance for special durability consultant fees (BCRC) regarding corrosion and invasive testing	1	item	50,000	50,000
27.4	Provisional allowance for make good and rectification works to existing structure based on corrosion and invasive testing (based on GFA: 14,280m2) - no allowance for demo and reconstruction of existing structure/ carbon fibre strips	1	item	714,000	714,000
27.5	Provisional allowance for hydraulic consultant fees in regards to underground pipeworks investigation via CCTV (say 4 off CCTVs are required)	1	item	18,000	18,000
27.6	Provisional allowance for underground hydraulic services with demolition of existing pipes based on further investigation (Based on L01 FECA: 2,829m2)	1	item	160,000	160,000
27.7	E/O potential additional cost for new lift in lieu of existing lift including removal of existing lift car - Floth have recommended the motor room-less lift (MRL) (Please refer page 45 in Floth's building services report)	1	item	115,000	115,000
27.8	ESD initiative items provided by Floth have been included in above elements (item 9.5, 9.6, 18.5, 20.13, 21.4, 21.8, 21.10 and 25.1)	1	item		Incl.
	POTENTIAL ADDITIONAL CONSTRUCTION COSTS TOTAL				**1,061,000**

Appendix E - Sustainability Initiatives

Floth

MEMO

Date:	22 June 2021
Revision:	A
Project No:	21106
Attention:	Sagar Mansukh
Company:	Altus Group
Re:	**Cross St Car Park, Double Bay – ESD Initiatives**

This memo has been prepared to provide some suggested ESD / Sustainability initiatives on the refurbishment / modernisation of Cross St Car Park, Double Bay.

The following sustainability initiatives are listed for the consideration in the refurbishment / upgrade project:

- Installation of photovoltaic (PV) panels on the roof, assuming 100 kW peak capacity can be installed, with a maximum of 150,000 kWh/pa energy generation possible.
- Upgrade of lighting to LED lighting with photo and motion sensors and lighting control system.
- Upgrade of hydraulic fixtures to current standards with high WELS rating.
- Installation of rainwater tank(s) and water treatment plant to harvest rainwater for reuse such as irrigation, toilet flushing, car washing; a separate water balance analysis is recommended to determine an optimal size for the rainwater tank.
- Refit some car park bays to Electric Vehicle (EV) only with EV charging infrastructure; this is to encourage use of electric vehicles which have no emissions in its operation.
- Allocate space for bike racks and end-of-trip facilities, and/or provide bike share service; this initiative encourages sustainable transport which is good for social sustainability, and community health, alleviate traffic congestion.
- Provision of car park bays for car share service providers, this is to encourage car sharing so as to reduce car ownership.
- Carry out computational fluid dynamics (CFD) modelling to minimise car park ventilation systems.
- Consider community garden, landscaping with native plants, bee hives, etc. Depending on the availability of space, a community garden may be set up and promote community interaction, also reduce waste by composting and also promote edible food.
- Consider specification and use of green concrete, recycled/remanufactured materials, etc. This is to reduce embodied carbon in the refurbishment.

Yours sincerely,

Ray Chung
Senior Sustainability Engineer

Appendix F - Indicative Construction Programme & Staging

Altus Group

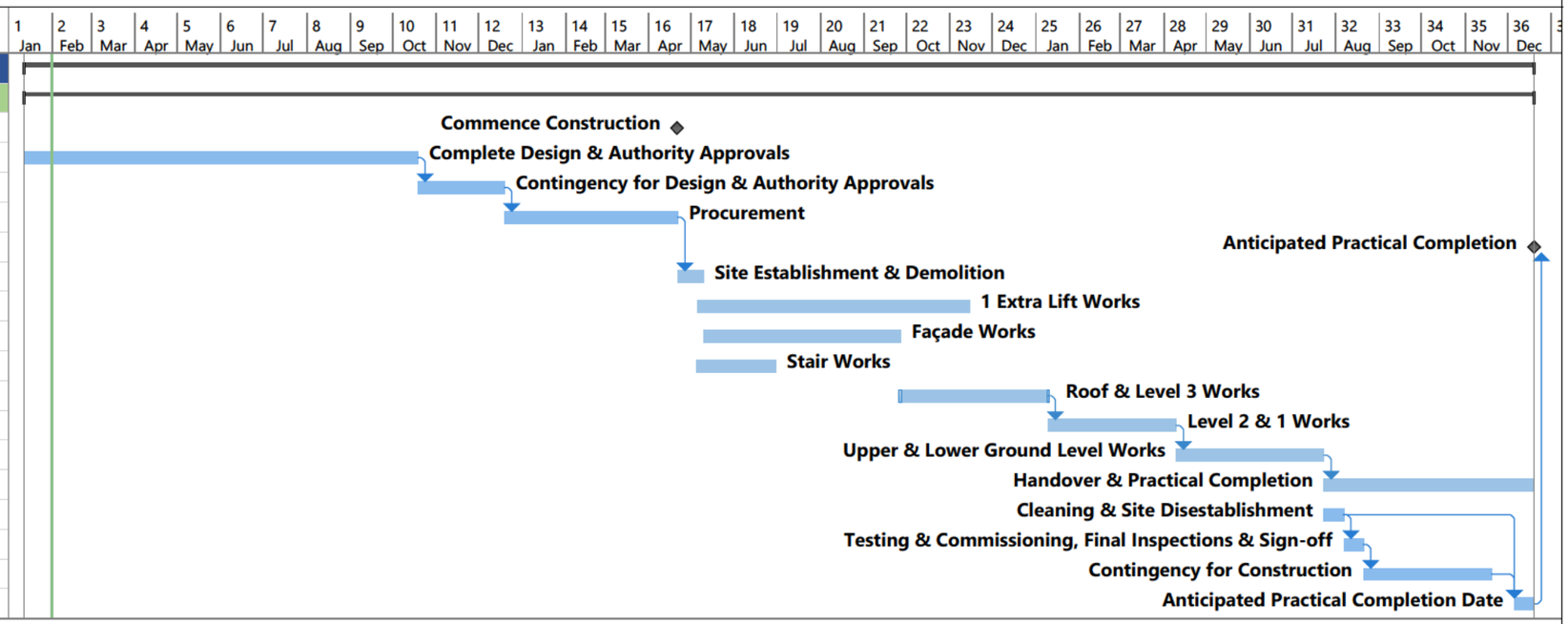
Indicative Construction Staging and Programme Option 1 – Full Shutdown

Indicative Construction Staging and Programme Option 2 – Staged Closure

1-13 Cross Street, Double Bay NSW 2028
Option 1 - Full Shutdown - Draft Staging Plan Programme

Altus Group

ID	Task Name
1	Draft High Level Construction Staging Plan - [Full Shutdown - Option 1]
2	**Key Project Activities & Milestone**
3	Commence Construction
4	Complete Design & Authority Approvals
5	Contingency for Design & Authority Approvals
6	Procurement
7	Anticipated Practical Completion
8	**Site Establishment & Demolition**
14	**1 Extra Lift Works**
19	**Façade Works**
22	**Stair Works**
24	**Roof & Level 3 Works**
30	**Level 2 & 1 Works**
35	**Upper & Lower Ground Level Works**
41	**Handover & Practical Completion**
42	Cleaning & Site Disestablishment
43	Testing & Commissioning, Final Inspections & Sign-off
44	Contingency for Construction
45	Anticipated Practical Completion Date



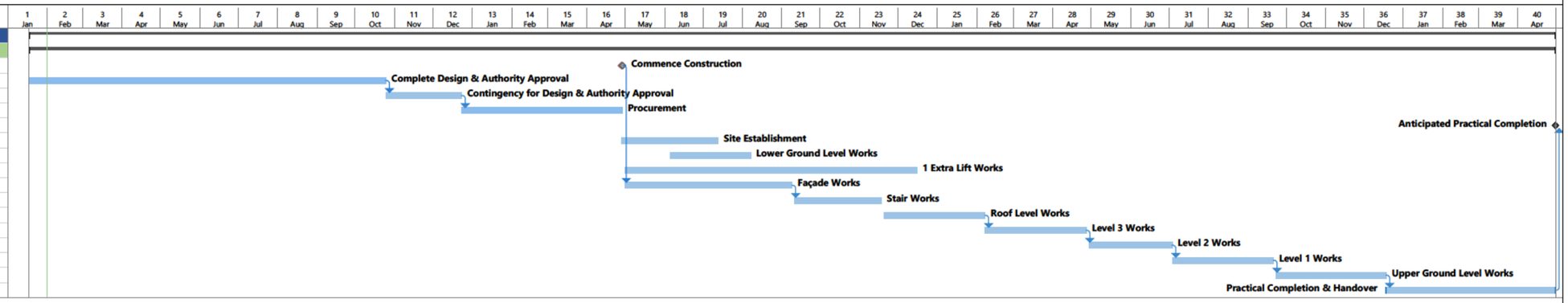
Project: [1-13 Cross Street, Double
Date: Tue 1/02/22

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

Page 1

1-13 Cross Street, Double Bay NSW 2028
Option 2 - Staged Closure - Draft Staging Plan Programme

ID	Task Name
1	**Draft High Level Construction Staging Plan - [Staged Closure Option 2]**
2	**Key Project Activities & Milestone**
3	Commence Construction
4	Complete Design & Authority Approval
5	Contingency for Design & Authority Approval
6	Procurement
7	Anticipated Practical Completion
8	**Site Establishment**
14	**Lower Ground Level Works**
19	**1 Extra Lift Works**
24	**Façade Works**
27	**Stair Works**
29	**Roof Level Works**
36	**Level 3 Works**
42	**Level 2 Works**
48	**Level 1 Works**
54	**Upper Ground Level Works**
61	**Practical Completion & Handover**



Project: [1-13 Cross Street, Double
Date: Tue 1/02/22

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

Page 1

TEMPORARY ENTRY DURING CONSTRUCTION

17. WORKS TO FINISH AT UPPER GROUND FLOOR – FULL SHUTDOWN REQUIRED

JAMBEROO LANE

17.

10.

TEMP EXIT DURING CONSTRUCTION

WORKS TO START AT LOWER GF. THAN MOVE TO UPPER FLOOR

CONSTRUCTION DRAFT STAGING PLAN.

STAGED OPT. 1.

LEGEND

GRATING SHOWN THUS

LEVEL TOP OF WALL

LINE OF BUILDING OVER

FOR RETAINING WALL, KERB & GRATING DETAILS REFER DWG Nº 7267/19

FOR HAND-RAIL DETAILS REFER DWG Nº 7267/21

FOR DETAILS OF BATTERY RM., SWITCH RM., STAFF REST & AMMENITIES REFER ARCHITECTURAL DRWG Nos 102 & 103

LANDSCAPED AREAS TO HAVE 300mm OF GARDEN LOAM BELOW FINISHED LEVELS

RETAINING WALL SHOWN

KERB SHOWN

TRENCH GRATING CROSS SECTION

No	AMENDMENTS	DATE
A	REVISION TO GRID LINE A BETWEEN 8 & 15.	17-7-77
B	REVISION TO RETAINING WALLS & TRENCH DRAIN. EXTENT OF LANDSCAPING REVISED	22-7-77
C	RETAINING WALL CHANGED FROM B1 TO TYPE A	8-9-77

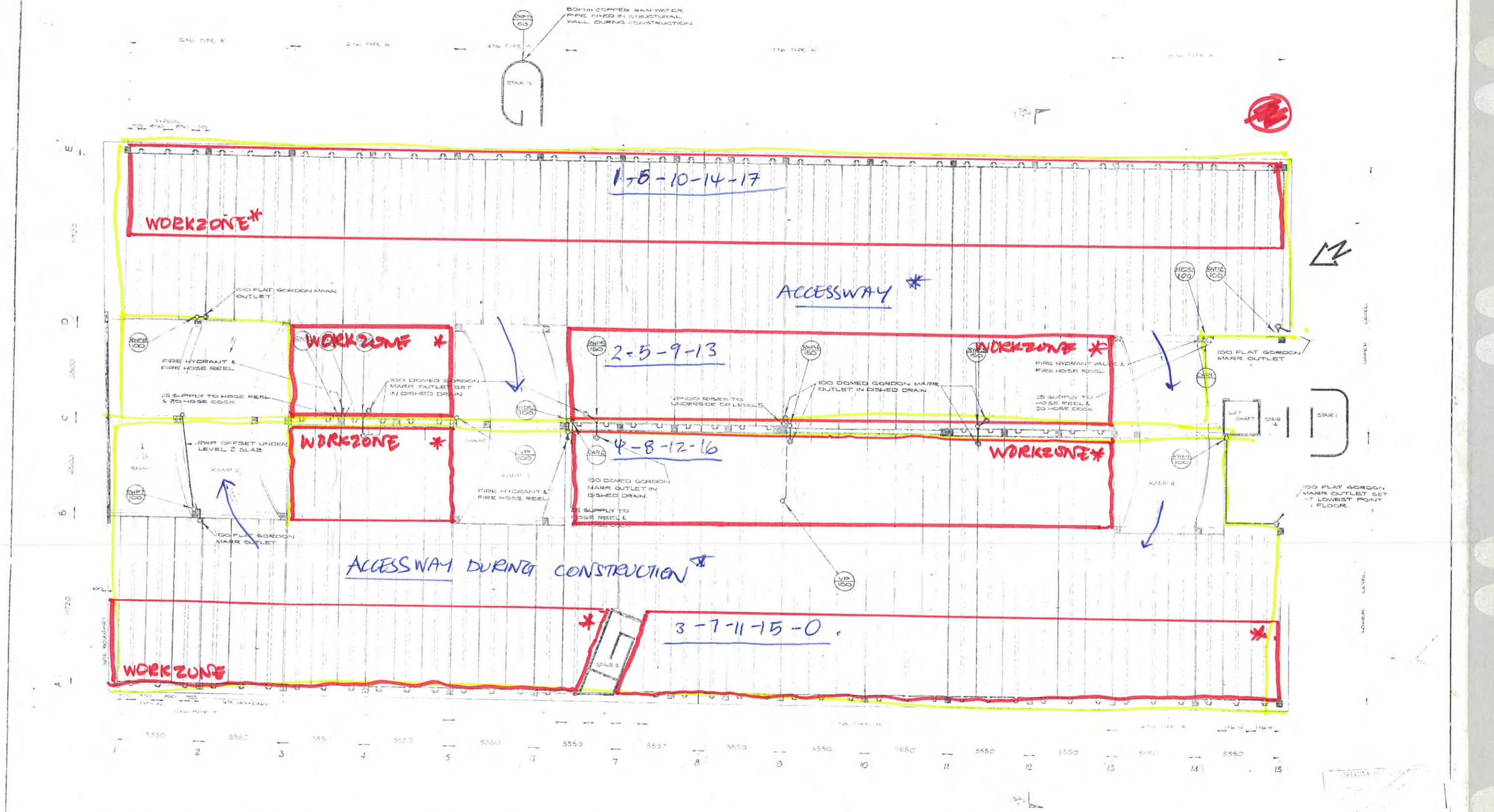
WOOLLAHRA MUNICIPAL COUNCIL
CROSS ST. PARKING STATION
GENERAL ARRANGEMENT, GRADING & LINEMARKING LEVEL 1

SCALE 1:100 | DESIGN R.G.H. | APPROVED | DRAWN L.J.B. | DATE | CHECKED

P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS
REGENT HOUSE, 37-43 ALEXANDER STREET, CROWS NEST, N.S.W. 2065

DRAWING NUMBER 7267/3 C

4/6/21



* TYPICAL FLOOR BY FLOOR WORKZONE.

Final floor by floor line-marking LEVELS 1-5

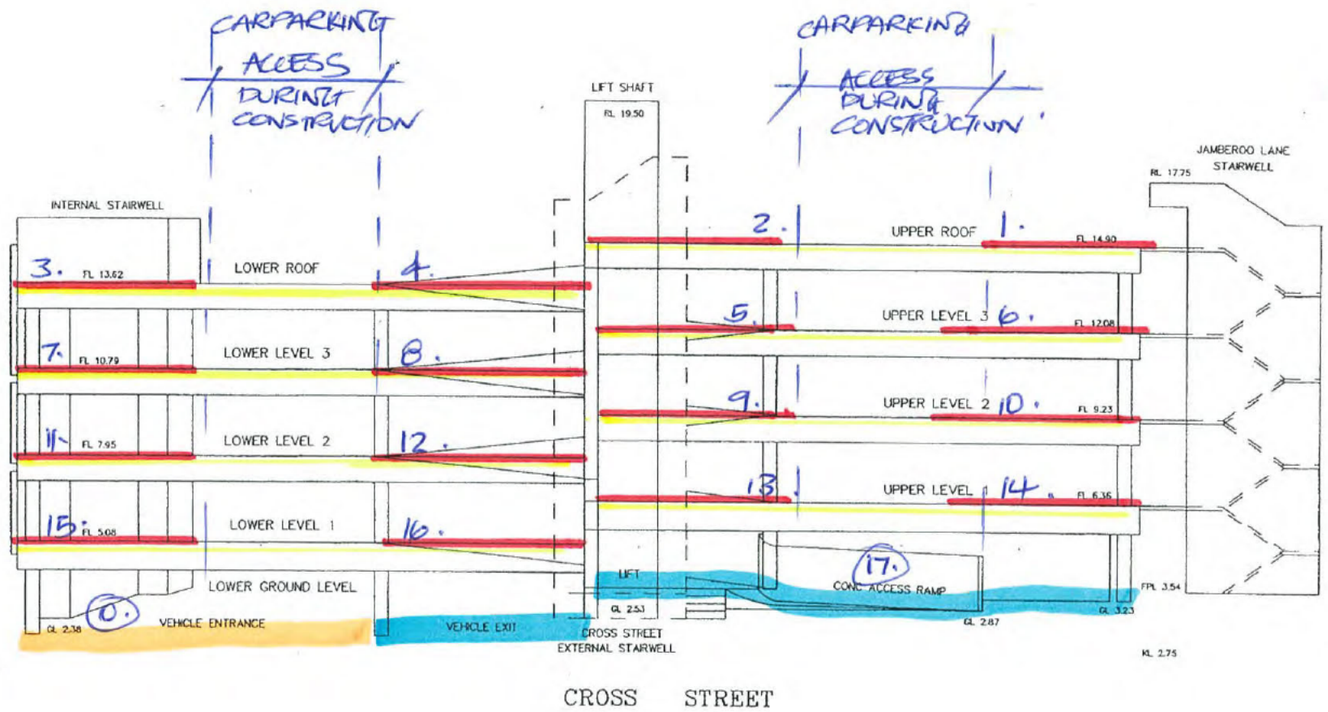
McCormick Smith & Johnson Pty. Ltd. Architects	B.H. Tewksbury & Partners Pty. Ltd. Consulting Engineers	RAINWATER, HYDRANT, COLD AND HOT WATER AND SANITARY PLUMBING - PLAN	75/02 H2
		18-3-77	

WOOLLAHRA MUNICIPAL COUNCIL
CROSS STREET PARKING STATION
HYDRAULIC SERVICES
LEVELS 2, 3 & 4

P.G. PAK-POY & ASSOCIATES PTY. LTD.
CONSULTING ENGINEERS and PLANNERS

DRAFT CONST. STAGING PLAN.

STAGED OPT. 1. AG 4/6/21



CONSTRUCTION SEQUENCE

START

0. – START LOWER GF

1.-2

3.-4

5-6

7-8

9-10

11-12

13-14

15-16

→ TYPICAL FLOORS STAGED WORKS TOP FLOOR TO BOTTOM.

17. FINAL UPPER GF WORKS.

JAMBEROO LANE

FINISH

DOUBLE BAY CAR PARK – ELEVATION VIEW

DRAFT STAGED CONSTRUCTION SEQUENCE

START GF ENTRY BAY WORK.

TYPICAL FLOORS (CAR BAY WORK ZONE).

FINAL FLOOR (FULL CARPARK SHUTDOWN) #

SCALE 1:100

STAGED OPT. 1 - 4/6/21.

NOTE
FOR BO[redacted]ONS & DETAILS
SEE BOUNDARY REPORT.
ORIGIN OF LEVELS SSM 54 R.L. 3.817

SHEET 3 OF 5 SHEETS

DATE	BY	REVISION	ISSUE

WOOLLAHRA COUNCIL DOUBLE BAY CARPARK & COUNCIL DEPOT
CROSS STREET & WILLIAM STREET, DOUBLE BAY
DOUBLE BAY CARPARK – ELEVATION

CONSULTING SURVEYORS
DENNY LINKER & CO.
GEOMATIC ENGINEERS
5th Floor 17 RANDLE STREET
SURRY HILLS N.S.W. 2010
PH. (02) 9212 4655 FAX (02) 9212 5254

RATIO 1: 100 | DATE 20/4/98
DATUM A.H.D. | ISSUE
DRAWN CAD/AW
REF. 970115

Appendix G - Observation Report

Altus Group

name:	SM Altus Group	report group:	1-13 Cross St
company:	Altus Group	title:	Double Bay
		created:	30/3/21, 8:22 am
		modified:	30/3/21, 9:27 am
		item count:	91

Double Bay Carpark inspect.
Council, AG, Floth and PCA

(1)



created:	30/3/21, 8:23 am
modified:	30/3/21, 8:25 am
taken by app:	Yes
description:	1-13 Cross Street, Double Bay

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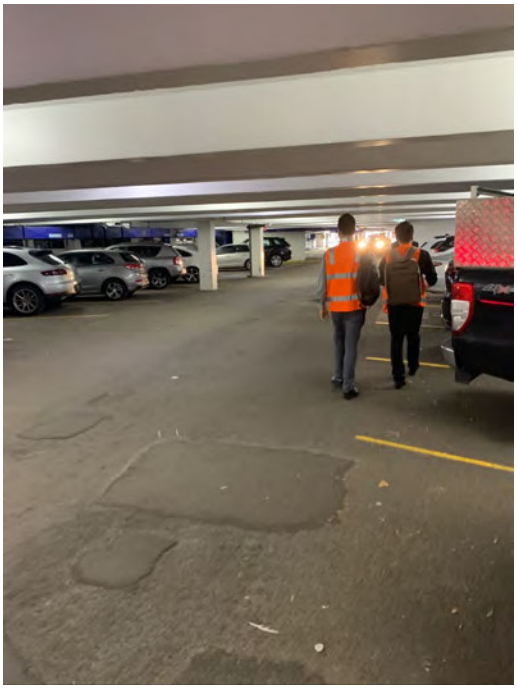

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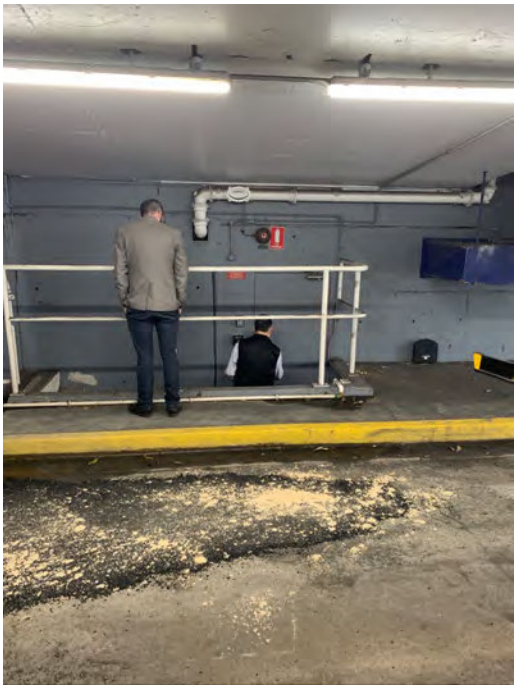

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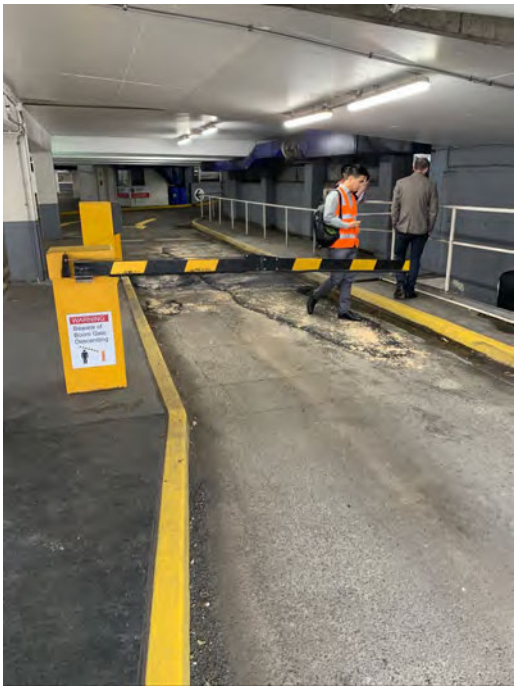

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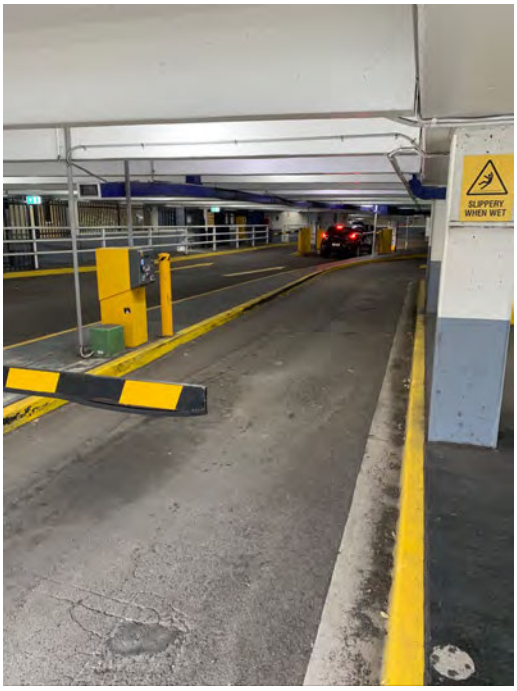

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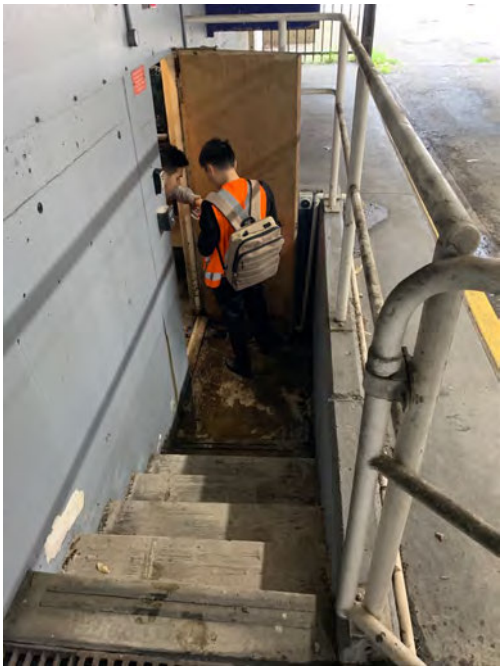

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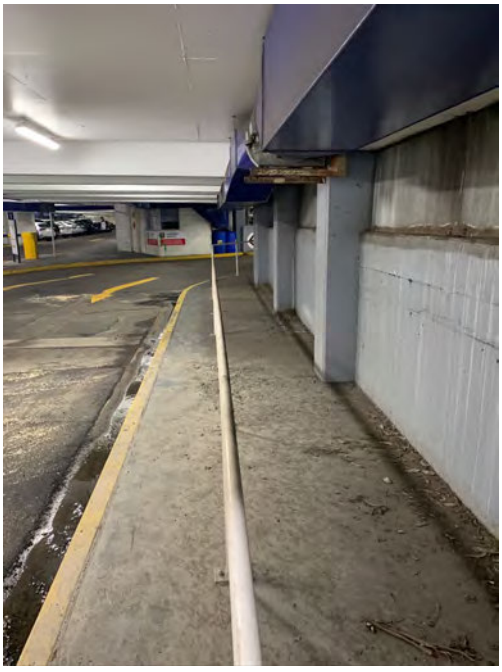

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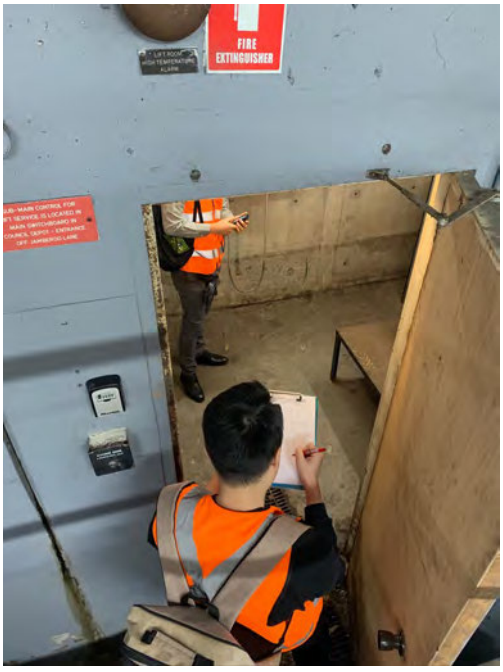

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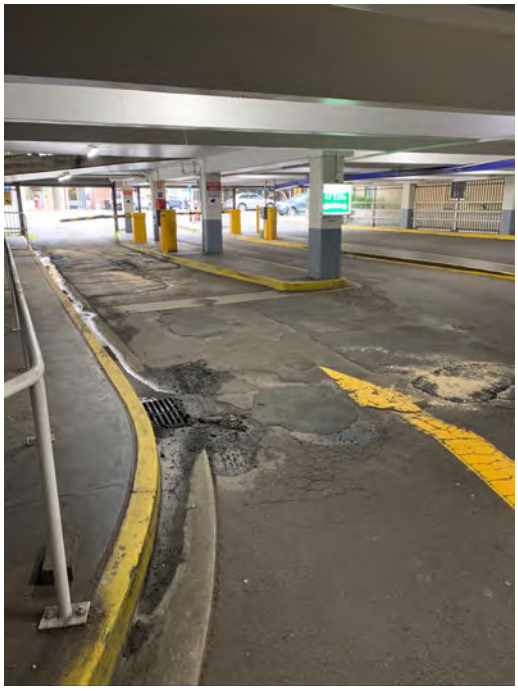

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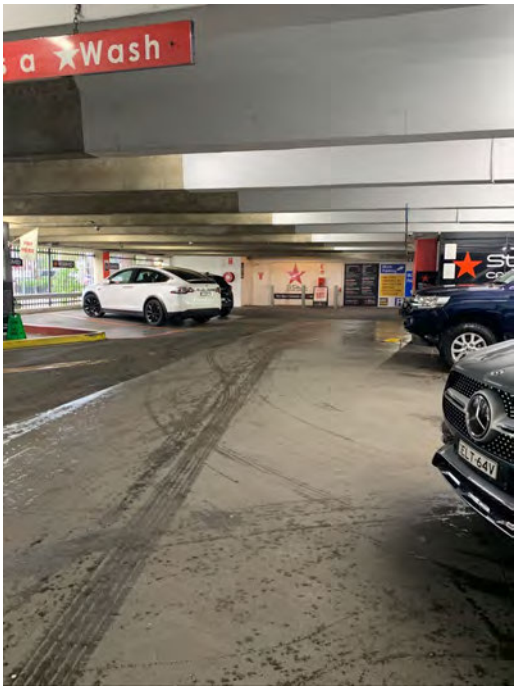

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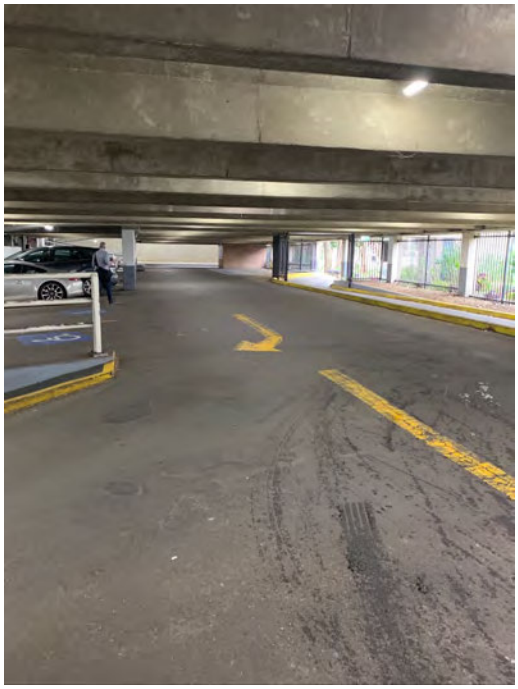

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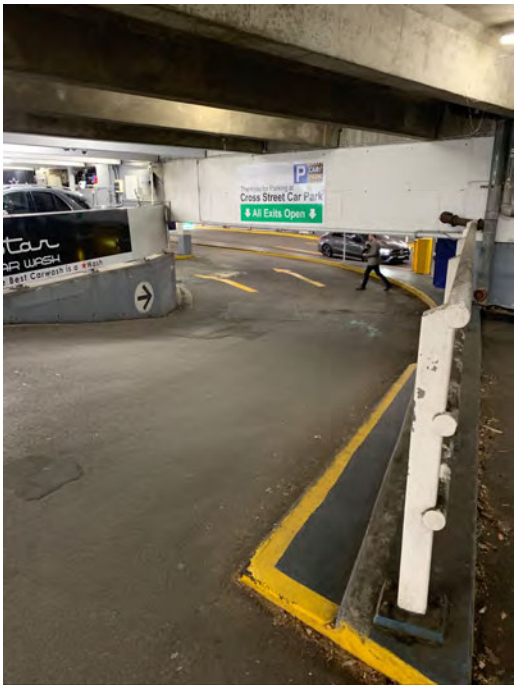

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company:	Altus Group	title:	Double Bay
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		modified:	30/3/21, 9:27 am
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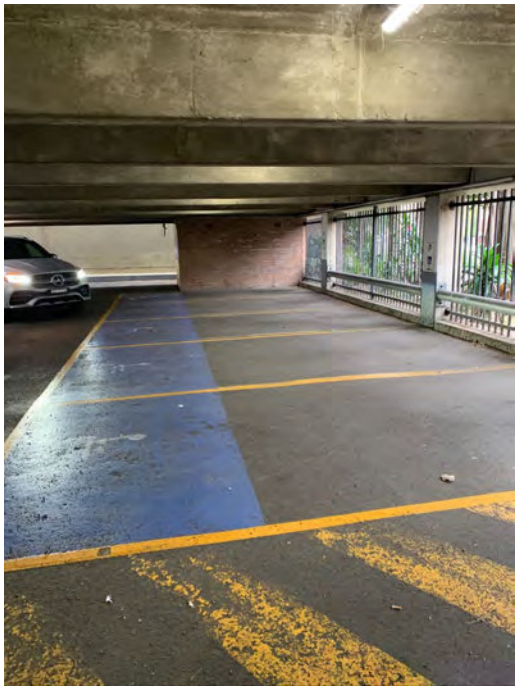

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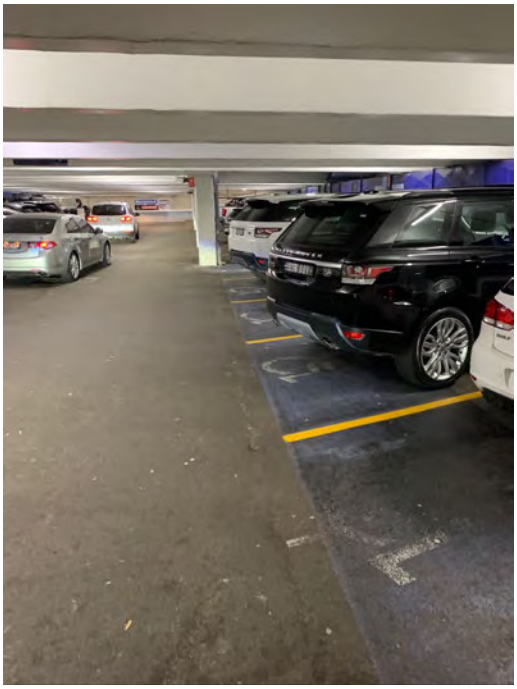

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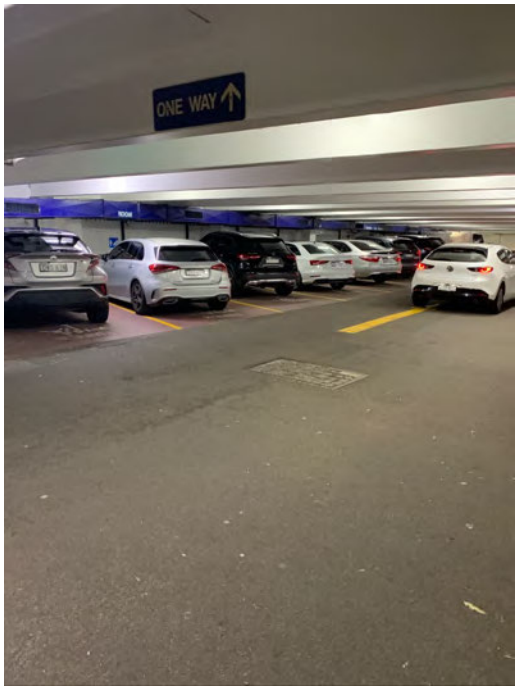

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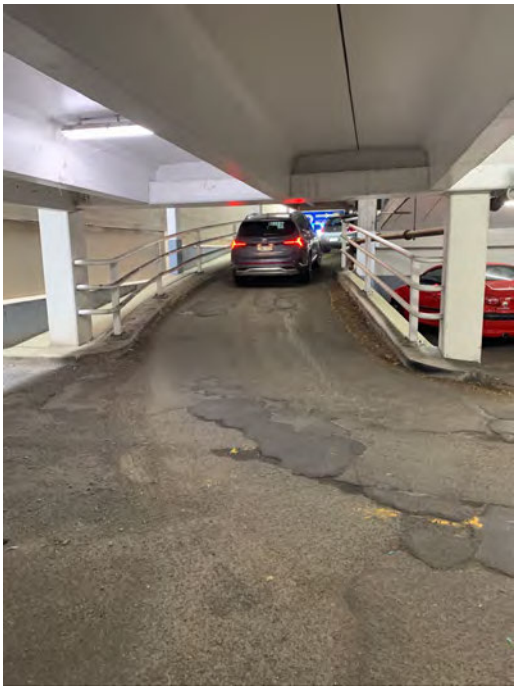

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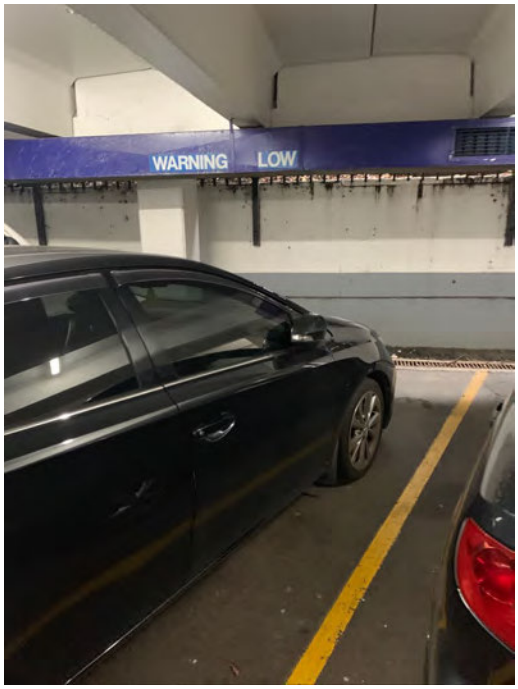

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company:	Altus Group	title:	Double Bay
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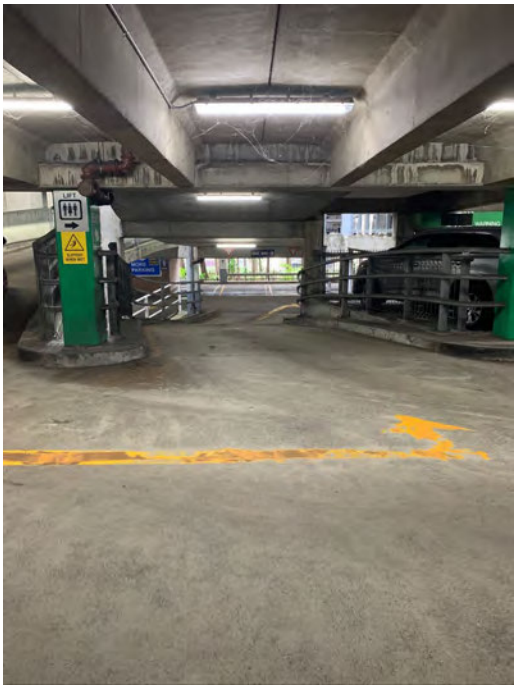

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taken by app: Yes

name:	SM Altus Group	report group:	1-13 Cross St
company:	Altus Group	title:	Double Bay
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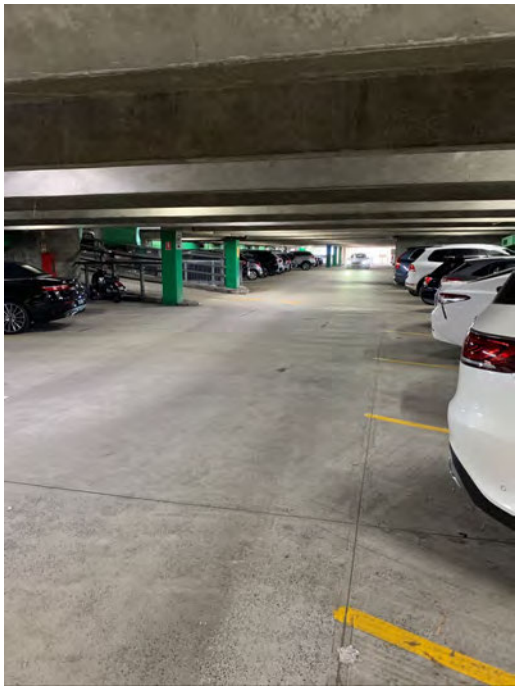
		modified:	30/3/21, 9:27 am
		item count:	91

(37)



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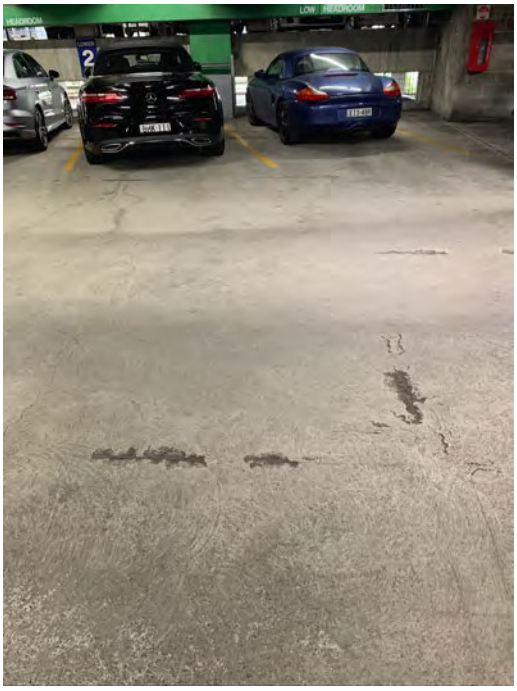

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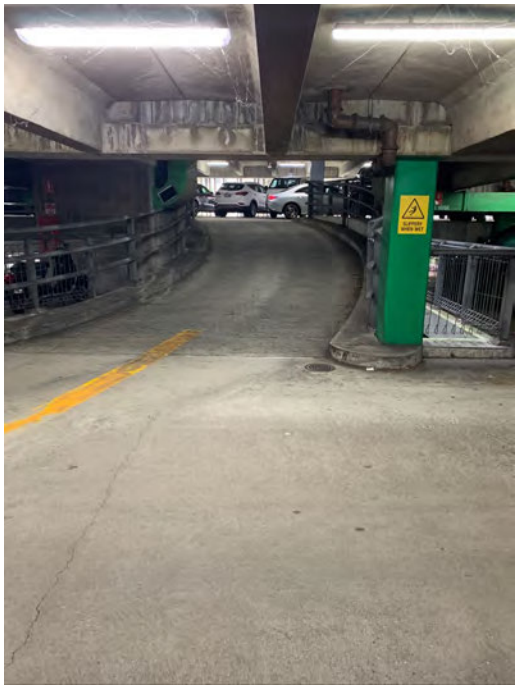

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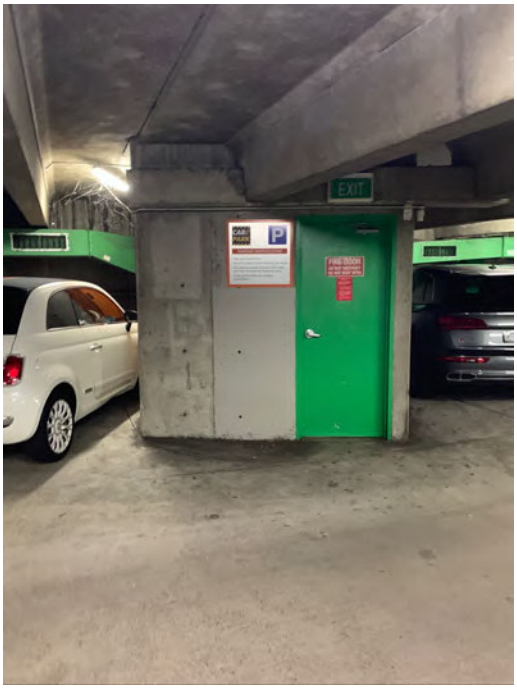

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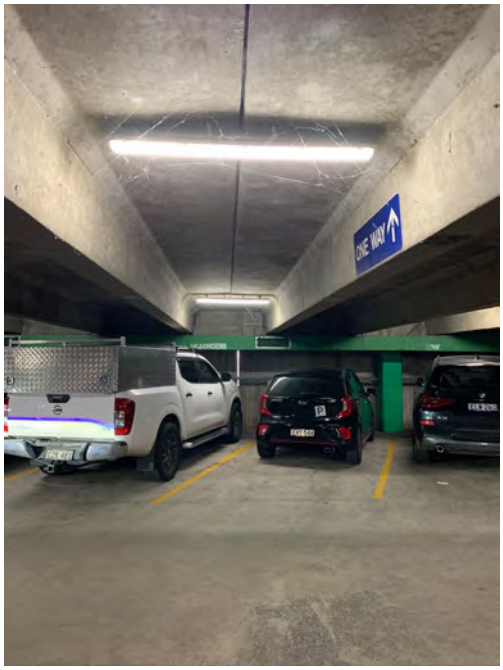

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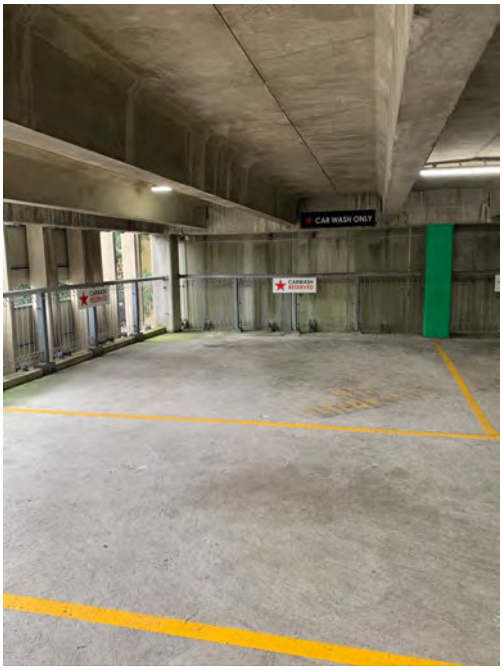

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taken by app: Yes

(43)



created: 30/3/21, 8:49 am
modified: 30/3/21, 8:49 am
taken by app: Yes

(44)



created: 30/3/21, 8:50 am
modified: 30/3/21, 8:50 am
taken by app: Yes
description: Water leakage

(45)



created: 30/3/21, 8:51 am
modified: 30/3/21, 8:51 am
taken by app: Yes
description: L2

(46)



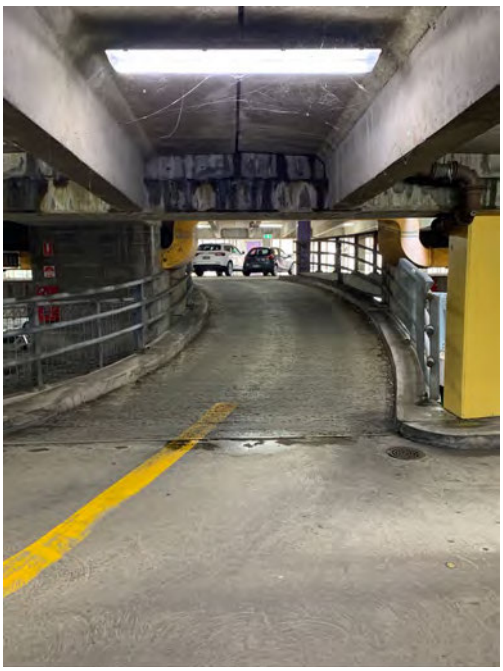
created: 30/3/21, 8:52 am
modified: 30/3/21, 8:52 am
taken by app: Yes
description: Dripping water from beam

(47)



created: 30/3/21, 8:52 am
modified: 30/3/21, 8:52 am
taken by app: Yes

(48)



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taken by app: Yes

(49)



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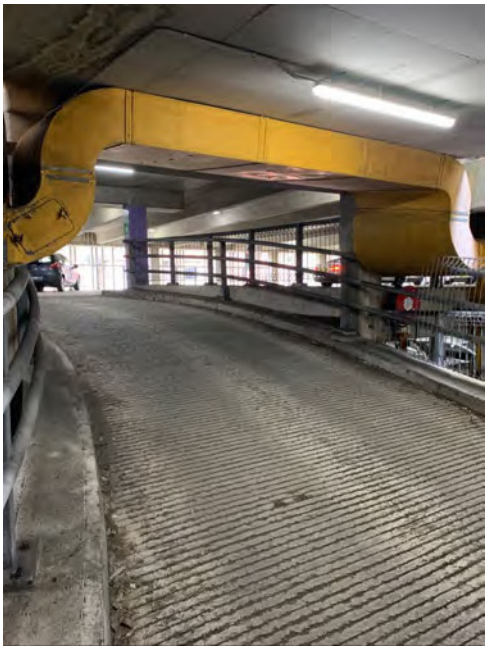
modified: 30/3/21, 8:54 am
taken by app: Yes
description: Water leakage

(50)



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taken by app: Yes

(51)



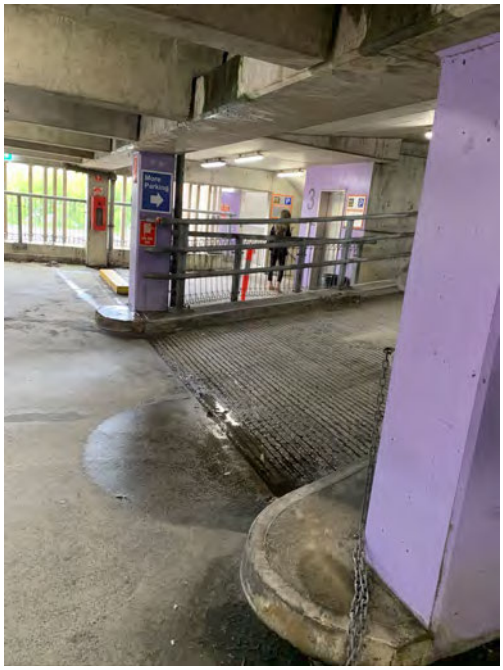
created: 30/3/21, 8:55 am
modified: 30/3/21, 8:55 am
taken by app: Yes
description: Damaged exit sign

(52)



created: 30/3/21, 8:55 am
modified: 30/3/21, 8:55 am
taken by app: Yes

(53)



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taken by app: Yes
description: Extensive leakage

(54)



created: 30/3/21, 8:56 am
modified: 30/3/21, 8:56 am
taken by app: Yes

(55)



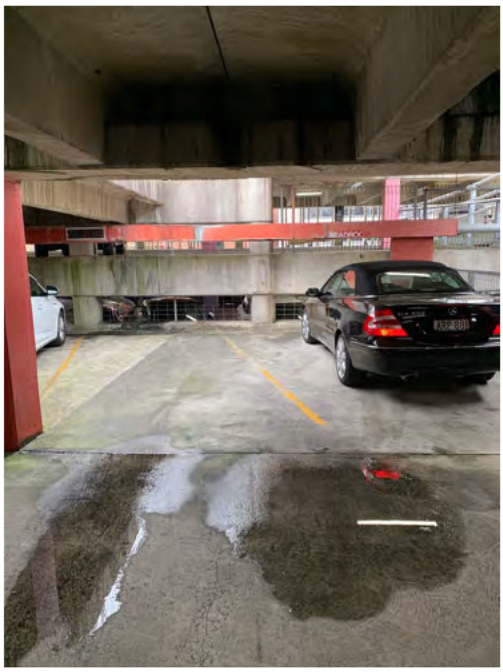
created: 30/3/21, 8:56 am
modified: 30/3/21, 8:56 am
taken by app: Yes

(56)



created: 30/3/21, 8:57 am
modified: 30/3/21, 8:57 am
taken by app: Yes

(57)



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taken by app: Yes

(58)



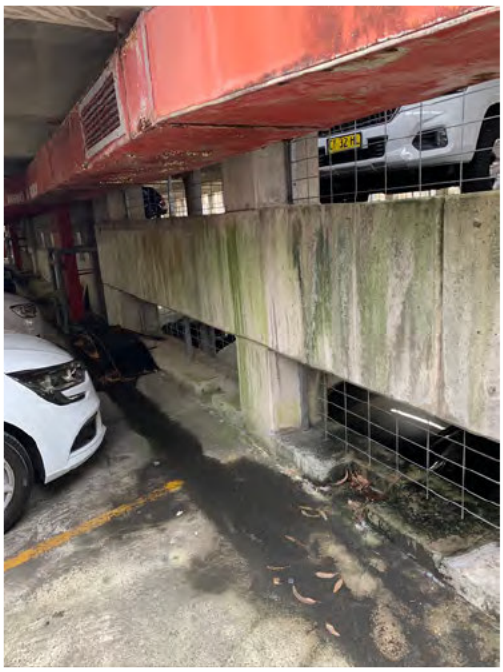
created: 30/3/21, 8:57 am
modified: 30/3/21, 8:58 am
taken by app: Yes
description: Source of leak from upper floor

(59)



created: 30/3/21, 8:58 am
modified: 30/3/21, 8:58 am
taken by app: Yes

(60)



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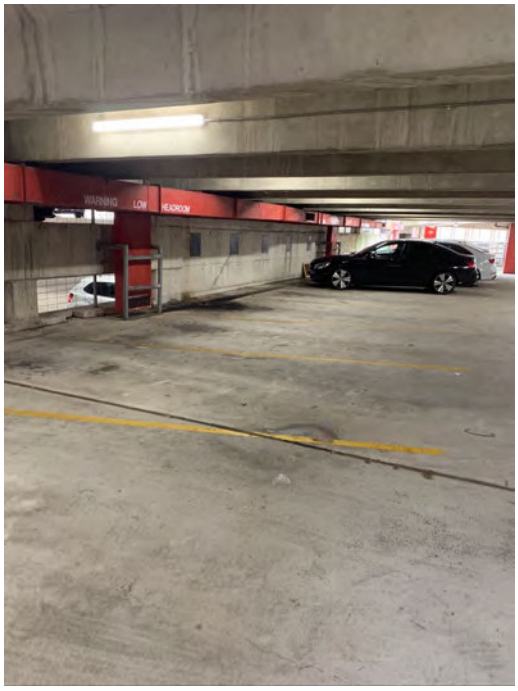
name:	SM Altus Group	report group:	1-13 Cross St
company:	Altus Group	title:	Double Bay
		created:	30/3/21, 8:22 am
		modified:	30/3/21, 9:27 am
		item count:	91

(61)



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taken by app:	Yes

(62)



created:	30/3/21, 8:59 am
modified:	30/3/21, 8:59 am
taken by app:	Yes

(63)



created:	30/3/21, 8:59 am
modified:	30/3/21, 8:59 am
taken by app:	Yes

(64)



created:	30/3/21, 8:59 am
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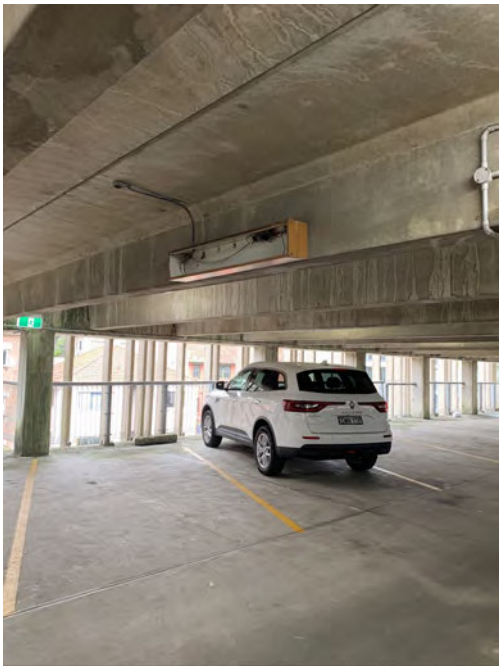
taken by app:	Yes

(65)



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modified: 30/3/21, 9:00 am
taken by app: Yes
description: Damaged exit sign

(66)



created: 30/3/21, 9:00 am
modified: 30/3/21, 9:00 am
taken by app: Yes

(67)



created: 30/3/21, 9:00 am
modified: 30/3/21, 9:00 am
taken by app: Yes

(68)



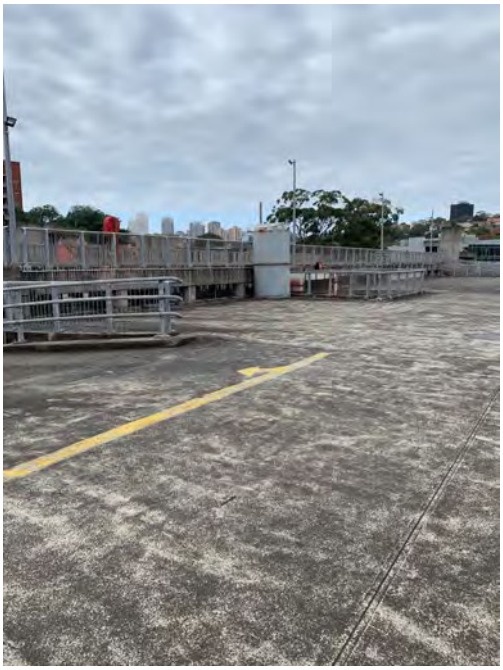
created: 30/3/21, 9:01 am
modified: 30/3/21, 9:01 am
taken by app: Yes

(69)



created: 30/3/21, 9:01 am
modified: 30/3/21, 9:01 am
taken by app: Yes

(70)



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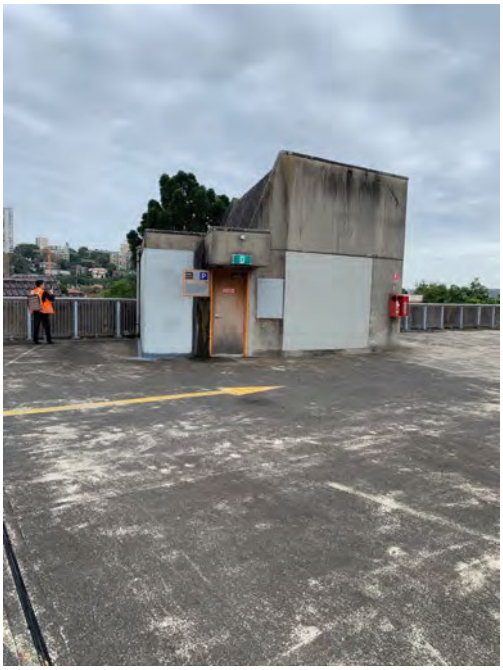
modified: 30/3/21, 9:01 am
taken by app: Yes

(71)



created: 30/3/21, 9:01 am
modified: 30/3/21, 9:01 am
taken by app: Yes

(72)



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modified: 30/3/21, 9:02 am
taken by app: Yes
description: Mech in supply

(73)



created: 30/3/21, 9:02 am
modified: 30/3/21, 9:02 am
taken by app: Yes

(74)



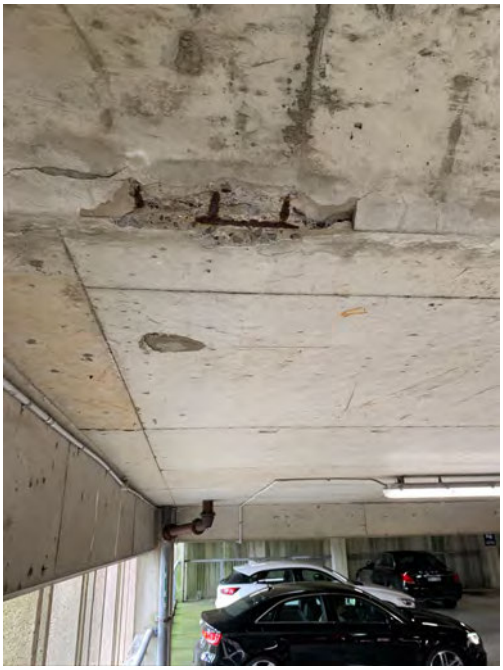
created: 30/3/21, 9:03 am
modified: 30/3/21, 9:03 am
taken by app: Yes

(75)



created: 30/3/21, 9:03 am
modified: 30/3/21, 9:03 am
taken by app: Yes

(76)



created: 30/3/21, 9:04 am
modified: 30/3/21, 9:04 am
taken by app: Yes
description: Exposed rio

name:	SM Altus Group	report group:	1-13 Cross St
company:	Altus Group	title:	Double Bay
		created:	30/3/21, 8:22 am
		modified:	30/3/21, 9:27 am
		item count:	91

(77)



created: 30/3/21, 9:04 am
modified: 30/3/21, 9:04 am
taken by app: Yes

(78)



created: 30/3/21, 9:08 am
modified: 30/3/21, 9:08 am
taken by app: Yes

(79)



created: 30/3/21, 9:09 am
modified: 30/3/21, 9:09 am
taken by app: Yes

(80)



created: 30/3/21, 9:10 am
modified: 30/3/21, 9:10 am
taken by app: Yes

(81)



created: 30/3/21, 9:11 am
modified: 30/3/21, 9:11 am
taken by app: Yes
description: L2 meeting room

(82)



created: 30/3/21, 9:11 am
modified: 30/3/21, 9:11 am
taken by app: Yes

(83)



created: 30/3/21, 9:14 am
modified: 30/3/21, 9:14 am
taken by app: Yes

(84)



created: 30/3/21, 9:14 am
modified: 30/3/21, 9:14 am
taken by app: Yes

(85)



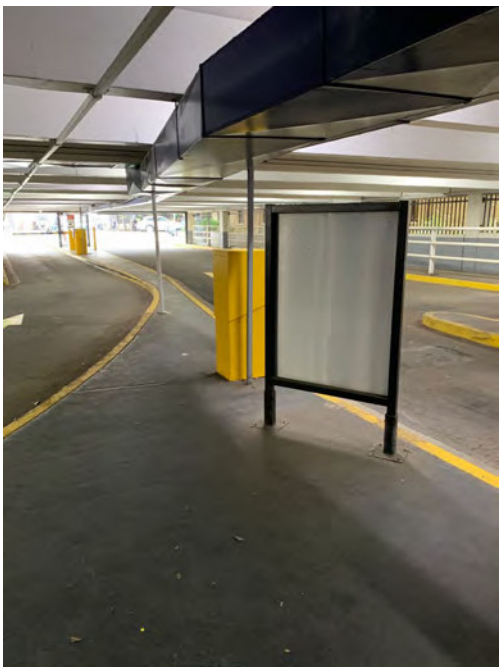
created: 30/3/21, 9:14 am
modified: 30/3/21, 9:14 am
taken by app: Yes

(86)



created: 30/3/21, 9:17 am
modified: 30/3/21, 9:17 am
taken by app: Yes
description: Carpark Mgr office

(87)



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taken by app: Yes

(88)



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taken by app: Yes

name:	SM Altus Group	report group:	1-13 Cross St
company:	Altus Group	title:	Double Bay
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		modified:	30/3/21, 9:27 am
		item count:	91

(89)



created: 30/3/21, 9:26 am
modified: 30/3/21, 9:26 am
taken by app: Yes

(90)



created: 30/3/21, 9:26 am
modified: 30/3/21, 9:26 am
taken by app: Yes

(91)



created: 30/3/21, 9:27 am
modified: 30/3/21, 9:27 am
taken by app: Yes
description: Early Childhood attached to Carpark

Appendix H - Existing Information

01 - Existing Survey

02 - Existing Structural, Mechanical & Hydraulic Plans

03 - Existing Structural Assessment Report by Ashby Doyle Sept 2020

04 - Geotechnical Report

Follow the link below to download the above listed documents.

https://altusgroup.box.com/s/726kk94wg57nf14maz0qup9t3bo1jrhd

Item No: 6.3
Subject: **WILBERFORCE CAR PARK DEVELOPMENT**
Author: Tom O'Hanlon, Director Infrastructure & Sustainability
Paul Ryan, Chief Financial Officer
Approver: Sue Meekin, Director, Corporate Performance

Purpose of the Report:

To respond to the Council resolution of 12 August 2024 and to recommend a way forward for the Wilberforce Carpark project.

Alignment to Delivery Program:

5.1 Enhance council provided community facilities to foster connections between people and place and enhance quality of life.

Recommendation:

THAT Council:

A. Notes the outcome of the negotiations and value re-engineering process undertaken with Growthbuilt Ltd for the construction phase of the Wilberforce Carpark project.

B. Notes the ongoing challenges with funding the project.

C. Resolves to conclude negotiations with Growthbuilt Ltd and not enter into a contract for construction of the carpark and community centre at this time.

D. Resolves to acknowledge the Growthbuilt team and thank them for their participation in the tender and subsequent work on the re-engineering process.

E. Undertakes a review of development options for the Wilberforce Avenue and Ian Street carpark sites with a further report to be tabled in July 2025.

F. Receives a report in the next two months on short term options to increase parking availability in the Rose Bay centre and improved turnover of existing spaces within the Ian Street and Wilberforce Avenue carparks.

Executive Summary:

This report responds to a Council resolution of 12 August 2024 relating to the outcome of the tender process for construction of a new community facility and multi-storey carpark on the site of the existing at-grade carpark at Wilberforce Avenue, Rose Bay. The report describes the outcome of negotiations with Growthbuilt Ltd, Council's preferred tenderer for the project, and a value engineering (VE) process conducted as part of those negotiations.

It is advised that, despite a relatively effective VE process that identified material cost savings and design changes that de-risk the project, the revised project cost still materially exceeds funding made available by the Special Rate Variation achieved in 2023. Detailed financial modelling of a number of options demonstrates that continuing with the project in it's current form will place very considerable pressure on Council's financial position over the long term.

The report considers a range of options to progress the project which include;

- seeking additional capital funding through asset sales or attainment of grant funding in order to continue with a variation on the currently approved design scheme
- exploring other development options for the Wilberforce Avenue and Ian Street car park sites, potentially through partnership with the private sector.

It is recommended that Council conclude negotiations with Growthbuilt and commence a detailed review of development options for the Wilberforce Avenue and Ian Street sites.

Discussion:

Background

On 12 August 2024, Council considered a report on the outcome of the tender process for the construction of a carpark and community centre at Wilberforce Avenue, Rose Bay. The report noted that the tender prices received were significantly higher than quantity surveyor estimates for the project and materially exceeded available funding.

After considering the report, Council resolved to confirm its commitment to the project but to reject all tenders and enter into negotiations with a preferred tenderer, Growthbuilt Ltd, with a view to achieving cost reductions through value engineering.

The resolution also noted that a further report on the outcome of the negotiations with Growthbuilt and a review of the funding strategy for the project would be brought to Council.

Tender Negotiations/Value Engineering Process

As noted at a meeting of the Property Assets Working Party on 28 November 2024, following the appointment of Growthbuilt as preferred contractor, a value engineering (VE) exercise was undertaken between August 2024 and October 2024.

The VE strategy focused on achieving substantial efficiencies and savings through collaborative design adjustments, while maintaining the integrity of the design, ensuring that the nominated area of the community centre and the extent of parking spaces were preserved.

The VE exercise has resulted in several key design adjustments that maintain the core intent of the project while achieving significant cost savings and reducing program and construction risks. Major changes include the removal of the lower basement, reduction of the basement footprint to within the site boundary, and optimisation of the structural and sewer design. To compensate for loss of parking from removal of the lower basement, a new split level was added, expanding the lift core and central fire stair above the approved DA approved maximum height of 19.3m to 21.65m and 20.35m respectively. The proposed design includes a total of 223 car spaces.

Growthbuilt has now submitted a revised tender price incorporating cost-saving adjustments of $4,606,044. The total forecast construction cost is now $49,433,742 which includes the renegotiated tender price, construction contingency, fitout of the the community centre and professional fees.

The design adjustments would require a S4.55 modification to the approved DA for the project. This process would be expected to add approximately six months to the project timeline.

Office of Local Government - Capital Expenditure Review.

Under the terms of S23A of the Local Government Act and the NSW Capital Expenditure Guidelines, Council was required to submit a detailed Capital Expenditure Review (CER) to the Office of Local Government (OLG) for the Wilberforce project. The initial CER was submitted in February 2023 and, as the project was to be funded through a special rate variation (SRV), a copy

of the CER was included in Council's SRV application to IPART. A specific requirement of the Capital Expenditure Guidelines is that the OLG be advised of any material variation to project costs. In September 2024, the Director Infrastructure and Sustainability wrote to the OLG advising of the outcome of the tender process and the resolution of Council to undertake a value engineering process with a preferred tenderer. In response, OLG requested a further update on the project prior to further reporting to Council. The requested update was to include information on the outcome of the value engineering process and funding strategy and a revised Business Case assessment. A revised Business Case was prepared with assistance from consultants Deloittes Ltd and provided to OLG in late December 2024.

On 22 January 2025, the OLG responded, simply noting the increased costings and requesting to be kept updated on Council decision making and the the impact on the Long Term Financial Plan. It is noted that under the terms of the Guidelines, there is no requirement for the OLG to approve a project, only that they ensure that Council follows the Guidelines. Staff are of the view that this obligation has been met.

Options:

In response to the continued difficulty with affordability of the project, staff have considered and modelled a number of options for progressing the project. These are outlined below.

Option 1 (Recommended)

Conclude negotiations with Growthbuilt Ltd and undertake a detailed review of development options for the Wilberforce Avenue and Ian Street sites, similar to the study recently completed for the Cross Street site. It is noted that Council has previously undertaken detailed studies of development opportunities for the sites, with work undertaken by consultants HillPDA in 2014 and Currie and Brown in 2018. While these studies would provide a useful basis for continued review, there has been very considerable movement in the development environment since these studies were undertaken. Most notably, there has been significant movement in construction cost, residential sale prices and DCP requirements affecting basement construction. It would therefore appear timely to undertake a further review prior to making a decision on a project of such significance.

Advantages
- The review would provide a more current understanding of the full development potential of the two sites.
- The review may demonstrate that Council's requirements in terms of a community centre, additional car parking and public facilities could be delivered at a lower net cost to ratepayers than is currently envisaged.
- The review would contribute very materially to meeting the requirements of the OLG in relation to any future PPP for the site. (See Option 4)

Disadvantages
- The currently negotiated position with Growthbuilt would be lost.
- The project would be further delayed.

Timeline
It is expected that a review of development options for the two sites would be completed within 4 months of a Council resolution to proceed, with a further report and recommendation to Council provided in July 2025.

Option 2

Conclude negotiations with Growthbuilt Ltd and put the project on hold until the procurement

processes for the Cross Street project are further advanced. As has been noted in a separate report which is also on the agenda for this Strategic and Corporate Committee meeting, a recently completed feasibility report for the Cross Street site suggests that there is a feasible prospect of Council developing the Cross Street site through a Private Public Partnership (PPP) and receiving a substantial development rights payment (DRP). The DRP could be used to fund the shortfall between the currently available SRV funding and the project cost. As noted in the Cross Street report, the position on the likely DRP payments available would become clearer at the conclusion of a new EOI/RFDP process for Cross Street, which is estimated to be in April 2026.

Advantages

- Council would have a much clearer view of its likely long term financial position prior to committing very significant funds to the Wilberforce project.
- There may be an opportunity to construct the Wilberforce project without the complication of involving a development partner or selling the Ian Street site (see Options 3 & 4).

Disadvantages

- The currently negotiated position with Growthbuilt would be lost.
- The project would be further delayed.

Option 3

Proceed to enter a construction contract with Growthbuilt Ltd and seek additional funds to address the funding gap. This Option would need to be subject to the final approval of borrowings. Staff have held discussions with several potential funders for the project, including banks and the New South Wales Treasury Corporation (TCorp). However, these are preliminary conversations, and no approvals have been granted.

The original funding strategy for the project, developed in 2022, was fully financed through loan borrowings, which resulted in an annual net operating cash deficit of approximately $1.4 million. This deficit was covered by Council's Special Rate Variation.

Since then, the project cost has increased to $49.4 million. The Business Case/Feasibility Study conducted by Deloitte for Council identified that the revised project would result in annual operating deficits of up to $4.8 million during construction, and between $2.4 million and $2.8 million until the loan principal and interest are fully repaid.

While the business case for an asset of this nature—being a public asset not intended for income generation but rather for public benefit—should not rely solely on financial analysis, it is important to assess its impact on the organisation's overall financial position, both in the short term and over the long term.

The significant increase in the operating deficit would require Council to use its cash reserves to service the additional borrowings. However, with limited unrestricted cash reserves available, Council is not in a position to service a loan of this magnitude. The following table (Scenario 1) outlines the impact on Council's projected annual Operating Position over a ten year outlook:

Scenario 1:	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
Fully fund $49.4 million project from loan borrowings. Cross Street redeveloped through a PPP.										
Forecast Surplus before Capital Grants & Contributions ('$000)	331	-668	-1,644	-1,096	-484	-1,222	21	-1,193	471	-2,581
Operating Performance ratio (Benchmark >0%)	0.79%	0.05%	-0.64%	-0.22%	0.22%	-0.27%	0.56%	-0.21%	0.84%	-1.01%
Cash & Investments ('$'000)	120,269	75,533	58,245	54,873	50,936	49,033	52,352	53,161	53,962	51,719

This shows that Council would have an operating deficit position in seven of the ten years with an annual Operating Performance Ratio below the Office of Local Government benchmark in five of the ten years (shown as red) with a further two years at a level just above benchmark. Further, Council's cash and investments reduce from $120million to $51million with negative unrestricted cash from 2027/28 and beyond. Unrestricted cash refers to funds that are not reserved or

earmarked for specific purposes. These funds can be used at council's discretion for any operational or capital expenses, providing flexibility to address unforeseen needs, new projects, or financial challenges. This means that under this scenario, from 2027/28 onwards Councils has minimal discretionary cash, limited ability for new operational or capital items and no flexibility to address unforeseen needs.

A funding strategy (Scenario 2) was also considered with the aim of reducing the level of borrowings to a more manageable amount. This would involve injecting around $17 million into the project, potentially through the sale of an asset or the acquisition of grant funding. While this approach improves the viability of the project on an individual basis, there remains a significant impact on Council's overall finances over a ten-year outlook. The following table outlines the impact on Council's projected annual Operating Position over a ten year outlook:

Scenario 2:	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
Cash Injection to the Project of $17million from sales of an asset or grant funding. Cross Street redeveloped through a PPP.										
Forecast Surplus before Capital Grants & Contributions ('$000)	330	-668	5,585	-562	32	-717	524	-681	986	-2,076
Operating Performance ratio (Benchmark >0%)	0.79%	0.05%	-0.59%	0.15%	0.57%	0.07%	0.89%	0.11%	1.15%	-0.71%
Cash & Investments ($'000)	120,269	75,533	75,132	72,291	68,684	67,461	71,279	72,594	73,904	72,161

This shows that Council would have an operating deficit position in five of the ten years with an annual Operating Performance Ratio below the Office of Local Government benchmark in two of the ten years (shown as red) with a further three years at a level just above benchmark. Further, Council's cash and investments reduce from $120million to $72million with negative unrestricted cash in years 2029/30 to 2031/32. As noted above reduced levels of cash, particularly negative unrestricted cash, leaves Council with no flexibility to address unforeseen needs.

Modelling was also conducted to assess the position should additional measures also be taken, such as postponing capital renewal expenditure for at least one year, reducing capital expenditure over multiple years, cutting operating costs, increasing revenue, and combinations of these measures. While these could further improve Council's financial position and its capacity to fund the project, each carries its own risks and requires specific actions to be effective, which would take time to implement and yield results.

Additionally, there is a risk that, if a Public-Private Partnership (PPP) is not established for the development of the Cross Street carpark, Council will be required to fund the major works around 2028 at an estimated cost of $46million for the carpark to remain functional. The table below outlines the impact on Council's projected annual operating position over a ten-year period if it is required to fund the renewal of the Cross Street carpark. Scenario 3 assumes that Council borrows the full amount of $49.4 million for the Wilberforce Carpark project, while Scenario 4 extends Scenario 2, incorporating a cash injection of $17 million into the Wilberforce carpark project.

Scenario 3:	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
Fully fund $49.4million project from loan borrowings and renew Cross Street carpark in 2028 at a cost of $46million										
Forecast Surplus before Capital Grants & Contributions ('$000)	331	-668	-5,302	-4,747	-4,751	-4,161	-2,961	-4,259	-2,632	-7,464
Operating Performance ratio (Benchmark >0%)	0.79%	0.05%	-3.33%	-2.79%	-2.73%	-2.24%	-1.39%	-2.17%	-1.09%	-3.99%
Cash & Investments ($'000)	120,269	75,533	84,218	60,409	36,886	30,112	28,911	25,023	20,992	12,960

Scenario 4:	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
Cash Injection to the Project of $17million from sales of an asset or grant funding and renew Cross Street carpark in 2028 at a cost of $46million.										
Forecast Surplus before Capital Grants & Contributions ('$000)	331	-668	1,927	-4,213	-4,234	-3,656	-2,450	-3,755	-2,117	-6,958
Operating Performance ratio (Benchmark >0%)	0.79%	0.05%	-3.28%	-2.41%	-2.36%	-1.89%	-1.05%	-1.84%	-0.77%	-3.67%
Cash & Investments ($'000)	120,269	75,533	101,106	77,826	54,815	48,542	47,847	44,459	40,938	33,137

Under both scenarios, Council is projected to be in deficit for most years and cash levels expected to decline significantly, eventually reaching a critical level. This would place Council in a difficult financial position.

Advantages:

- Council will deliver a long-term asset to the community within the next three years, providing car parking and community space in the Rose Bay town centre.

Disadvantages/Risks:

- There is a risk that Council may not be able to secure the additional $17 million required for the project.
- Proceeding with the project may restrict Council's ability to undertake future new projects or expand services over the next 10 years.
- Undertaking the project would limit flexibility within Council's budget, posing a significant risk to Council's ability to respond to unforeseen financial challenges or opportunities.
- Inability of Council to fund the required renewal of the Cross Street carpark should a PPP not be completed.

Option 4

Conclude negotiations with Growthbuilt Ltd and commence the processes required for entering into a partnership with a private sector partner for development of the site. Under the terms of the NSW OLG Public Private Partnership Guidelines 2022, the following must be provided to OLG prior to Council commencing an EOI;

1. Council Resolution to agree on outcomes and deliverables of the project
2. Council Resolution to proceed with the project as a PPP and submit to OLG for assessment
3. Clear statement of project relationship to IPR documents (community strategic plan, delivery program, operational plans)
4. Clear statement of outcomes and deliverables (as agreed by Council resolution – see required certification and council resolutions above)
5. Clear outline of the proposed management and governance structure for the PPP entity
6. Justification of PPP as delivery model
7. Estimated total project costs and sources of funding
8. Value of contributions
9. Risk Assessment and Risk Management Plan as per the relevant AS/ NZS
10. EOI documentation
11. Probity plan
12. Assessment plan

As noted above, significant elements of these mandatory requirements would be difficult to achieve without first undertaking the detailed review of development options as contemplated in Option 1.

For that reason, this option cannot be recommended by staff as the preferred option, but it is clear that commencing an EOI may follow from the review proposed in Option 1. The following information regarding advantages and disadvantages and timeline therefore relates to an EOI process that may arise from the detailed review of development options.

Advantages

- The EOI process will transparently demonstrate that Council has achieved the best available outcome both in terms of financial management and provision of community facilities
- The EOI process may elicit proposals from the private sector that are more beneficial to Council than the development as currently envisaged.

Disadvantages

- The currently negotiated position with Growthbuilt would be lost.
- The project would be further delayed.

Timeline

It is anticipated that an EOI process for the site could be completed and reported to Council within 6 months of a Council resolution to do so. This includes an allowance of 2 months for OLG

processes.

Commentary on direct negotiation with private sector proponents

As per previous advice to Council, it is noted that Council has over recent years been approached by an adjacent landholder regarding a potential unsolicited proposal for redevelopment of the Wilberforce Avenue site under a PPP arrangement.

In considering options for redevelopment of the site should Council resolve not to continue with the currently resolved development proposal, staff have reviewed the relevant legislation and applicable guidelines to determine the permissibility and merits of directly negotiating with a proponent without recourse to an EOI process.

In doing so, staff have reviewed the *OLG Public Private Partnership Guidelines (2022*) and the *NSW Unsolicited Proposals – Guide for Submission and Assessment (2022)*. Based on that review, it is advised that entering into a PPP with any party without first undertaking a broad Expression of Interest process is not consistent with the Guidelines (and therefore S23 of the Local Government Act which calls up the Guidelines).

The most relevant section of the PPP Guidelines is *11.2.7 Pre-expression of interest Phase Documents.* The following excerpt is explicit in regard to market testing;

The EOI process is a key element in ensuring that the community gets the best value for its investment in a project. A good EOI process will test the market to identify available competitive partners who have the capacity to deliver the project. All local government PPP proposals, regardless of whether they originate from within the council or from an external source, should be subjected to a formal EOI process to identify preferred partners for the project to ensure overall transaction costs are minimised. Many councils receive unsolicited proposals from the private sector. Such proposals can provide a great opportunity for council to bring forward developments that may otherwise not have been considered. However, unsolicited proposals still need to be market tested to ensure councils identify whether there are other market participants who can bid for the opportunity so as to enable council to achieve value for money.

In providing this advice, it is acknowledged that the adjacent land holder mentioned above does have a long standing interest in developing the site and, as they have significant adjacent holdings, are likely to be a significant respondent to any future EOI. However, there are other adjacent landholders who may have an interest in the project and there are potentially other parties who are not adjacent landholders who also may be able to bring additional benefit to the project.

Entering into direct negotiation with one party without first undertaking an EOI process would be inconsistent with applicable legislation and not in Council's best interests.

Car parking arrangements in the short term

Having regard to the ongoing concerns regarding parking congestion in the Rose Bay centre and noting that the recommended way forward will further delay the provision of additional parking, it is proposed to investigate options in the short term that will either increase available parking spaces in the vicinity of the Rose Bay centre or improve turnover of parking in the Ian Street and Wilberforce carparks. The focus of the investigation will be on;

- installation of 90 degree parking in Newcastle Street
- introduction of paid parking in the Ian Street and Wilberforce Avenue carparks
- increased enforcement of over stayers in the Ian Street and Wilberforce Avenue carparks

it is proposed that a further report on these matters be brought to Council in the next two months.

Community Engagement and / or Internal Consultation:

There has been no direct community engagement in the development of the recommendations of this report. It is noted that extensive community engagement has been undertaken previously regarding the resolved development scheme and the Special Rate Variation application that significantly funds the project.

Policy Implications:

There are no policy implications as a result of this report.

Financial Implications:

The specific financial implications arising from the recommendations of this report relate to the cost of engaging expert external consultants to undertake the review of the development options for the site. Based on recent experience with the Cross Street site, it is anticipated that costs would be in the order of $60K.

The broader financial implications of undertaking the project without recourse to a private sector partnership are detailed under the headings Discussion and Options above.

Resourcing Implications:

Procurement and management of the consultancy to undertake the recommended review of development options will be managed with existing staff resources.

Conclusion:

Following a detailed value engineering process conducted as part of negotiations with Growthbuilt Ltd, it has been determined that, despite the potential savings identified, it is not currently feasible to proceed to construction of the project as this would result in a significant negative impact to Council's long term financial position.

It is therefore recommended that Council conclude negotiations with Growthbuilt and procced to undertake a detailed review of development options for the Wilberforce Avenue and Ian Street sites.

Attachments:

None