Willoughby City Council

ORDINARY COUNCIL

ATTACHMENT BOOKLET 3

(Part 1)

on 3 November 2021

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DETAILED ASSESSMENT

Background

This attachment provides a summary of the proposal and a detailed analysis of the proposal against strategic planning considerations, including relevant State and local planning strategies and legislative requirements.

The Site and Locality

The site is located within the Castlecrag local centre, on the corner of Edinburgh Road and Eastern Valley Way. The site is a prominent entry point to the Castlecrag suburb and adjoins the Griffin Heritage Conservation Area. The Quadrangle shopping centre currently occupies the site.

Summary of Proposal

The existing LEP zone is B1 Neighbourhood Centre, with a strip at the rear of the site zoned RE1 Public Recreation. · The Planning Proposal is seeking the following LEP amendments to allow a mixed use development on the site:

- Include an additional permitted land use of "residential flat building" on the site, specifying that land uses facing Edinburgh Road should be non-residential and that a minimum of 18% of total floorspace should be non-residential uses.

- Proposed FSR of 1.8:1, which includes a maximum of FSR of 1.6:1 for the development above Edinburgh Road.
- Heights increased across the site from the current 9m maximum to a site specific clause. The site specific clause proposes a maximum building height not greater than AHD 97.49 which equates to 11m above Edinburgh Road level and 15.8 m above southern boundary.
- Additional height is to be permitted for various specified roof top facilities including a lift tower being a maximum 4.5m above the roof finished floor level.

Site specific DCP provisions are included with the proposal as follows:

- Site planning, including building height, public open space, setbacks, landscape and tree preservation.

- Development controls, including public and communal open space, private open space, building materials and colours, setbacks and visual privacy.

The concept proposal is for a mixed-use development comprising retail/commercial uses and housing units. The essential characteristics of the proposal are:

- Total site area of 5,168 m2 in single ownership.
- Two storey pavilions above a ground level base storey, equating to a three storey development on Edinburgh Road and four storey development at the rear.
- Total GFA of 9,300m2 comprising 1,740m2 retail and commercial space, 6,260m2 of residential apartments and the balance including corridor areas.
- 53 apartments with a mix of 4% one bedroom, 55% two bedroom, and 42% three-bedroom units.

- Half of all units are capable of meeting the adaptable housing standard.
- Public and communal open space of 2,220m2, including approximately 750m2 of landscaped plaza along the northern boundary of the site adjoining Edinburgh Road.

DISCUSSION

Consideration of planning aspects of the proposal and the major impacts are outlined below. The primary Council planning strategy relevant to the proposal is the *Willoughby Local Centres Strategy*. The proposal is considered further below in relation to the *Strategy*.

Willoughby Local Centres Strategy

As noted in the *Willoughby Local Centres Strategy*, the subdivision and layout of Castlecrag was designed by Walter Burley Griffin and the south eastern side of the centre is within the Griffin Conservation Area. The local centre sits on a ridgeline with wide views across the district.

The Griffin Conservation Area includes part of the local centre on the southern side of Edinburgh Road (adjacent to the Quadrangle site). The centre has a predominantly one to two storey built form character with a fine grain street frontage. The built form of the conservation area has a strong heritage character, referencing the original vision for Castlecrag. The centre offers north-facing cafes and associated outdoor dining, complemented by retractable awnings on the southern side of the street and consistent fixed awnings to the north.

The centre has been recently improved with new large unit Urban Stone paving, planting and street furniture. Generally, improvements include additional street trees and planting on the southern side of Edinburgh Road.

There is a strong desire within the community to retain the integrity of the design philosophy of Walter Burley Griffin for Castlecrag.

The vision for Castlecrag as stated in the *Local Centres Strategy* is as follows:

"*The Castlecrag local centre is a thriving historic shopping village in an attractive landscaped setting and offers a range of outdoor spaces for dining and gathering along Edinburgh Road. New development has enhanced the existing scale and pleasant public domain and has reinforced the character of the Conservation Area and strengthened the Walter Burley Griffin legacy*."

The *Local Centres Strategy* envisaged that some additional height could be considered in relation to The Quadrangle site. General recommendations for the centre include:

- Retain the existing B1 Neighbourhood Centre and R3 Medium Density Residential zones for the centre.
- Introduce a minimum non-residential FSR control in the B1 zone.
- Introduce an active ground floor frontage control in the B1 zone.
- Concentrate increased height to the south of Edinburgh Road to minimise solar access and amenity impacts.Minimum 3m upper level setback (2nd storey) for shop top housing.
- Provide a new publicly accessible open space within the Quadrangle site relating to the Edinburgh Road frontage and achieving good solar access. This may be

achieved by providing a setback in the order of 3.5 - 4m along the frontage of the site.

- Increase heights up to 4 storeys on Eastern Valley Way and up to 3 storeys above Edinburgh Road with an FSR up to 1.6:1 on the Quadrangle site.

- An FSR could be considered to 1.8:1 with an additional storey below the Edinburgh Road frontage to utilise the topography of the site without adversely impacting the streetscape and scale of the centre.

  For The Quadrangle site, the site specific clause in the Planning Proposal proposes a maximum building height not greater than AHD 97.49 which equates to 11m above Edinburgh Road level and 15.8 m above southern boundary. The proposed FSR is 1.8:1 with an FSR of not more than 1.6:1 above Edinburgh Road.

  In respect to FSR and building height the proposed development is consistent with the *Local Centres Strategy*. Further information in relation to building height and setbacks was requested, and is addressed in the section below.

  In relation to the issue of modelling the cumulative impact of the increase in floor space projected under the *Local Centres Strategy* (LCS), it is noted that this concept proposal will be less than the total projected additional residential floor space (6,665sqm) noted under the LCS for the Castlecrag centre, as this proposal is for an additional 6,260 sqm of residential floor space.

  The concept proposal will result in a net loss of floor space – the existing Quadrangle Centre is 2,552sm^2 in area, while this proposal will have a total of 1,740m2 retail. The study by SGS prepared for the LCS forecasts an additional 1,527sqm of non-residential floor space in the Castlecrag centre. This additional floor space may be provided by the redevelopment of other sites elsewhere within the centre, such as part of the shops on the northern side of Edinburgh Road.

Urban Design, Height and Built Form Massing

In response to the requirements of the *Local Centres Strategy*, justification for the proposed variations with the Strategy was requested to be provided in relation to the height of the building at the rear and the upper storey building setbacks. A copy of the additional information provided by the applicant is contained at **Attachment 4**. Part of the information provided is outlined below:

- The concept proposal includes an intention to provide a public right-of-way of an average width of 8m along Edinburgh Road, beyond the public footway.

- The concept proposal states that there is additional overshadowing impact on the rear of the adjoining buildings to the south. Sunlight does penetrate between the two wings to the backyards of adjoining dwellings for a limited time at midwinter's day. However, the additional overshadowing is a consequence of any redevelopment of the site in accordance with the Strategy. It is also noted that the trees on the southern boundary (to be largely retained) already have an overshadowing impact on buildings to the south. Therefore the proponents have stated that the additional overshadowing from the concept proposal will be minor.

- the proposal states that all but two living trees, one of which is failing, on the southern boundary and all the trees on the frontages to Eastern Valley Way and Edinburgh Road will be retained.

As this is a Planning Proposal, building form, detail and character will not be considered

in detail, however consideration has been given to the building setting, scale, mass and proposed base articulation and configuration.

It is considered that adequate justification for consistency with the Strategy has been provided in relation to height, bulk and scale and building setbacks. In particular the following matters have been adequately addressed:

- in relation to rear building height of 15.8m, this is determined (in part) by floor to underside of structure in basement of 4.5m to accommodate garbage trucks plus retail floor to ceiling height of 3.6m

- the applicant's drawings show that the rear boundary setbacks are from 6.0m near the south west site corner to 9.5m at the south western corner of the western pavilion. For the eastern pavilion, the setback varies 6.0m to 7.5m, measured from the rear boundary of the houses to the south. On average, the setbacks meet the WDCP.

- demonstration of minimal additional overshadowing impact to private properties to the south has been provided. The applicant has stated that any additional upper storey rear setback is not required in the LCS and any benefit will be minor.

It is considered that the proposal demonstrates adequate consistency with the *Willoughby Local Centres Strategy*. It is also noted the extensive community engagement undertaken and support that was obtained by Council in developing and finalising the Strategy.

The concept proposal has demonstrated general consistency or potential consistency with the provisions of Willoughby DCP and the criteria of SEPP 65 and the Apartment Design Guidelines (ADG). Additional information has been provided at **Attachment 4** on this issue.

It is recognised that this site will have a prominent visual impact on the context of the Castlecrag suburb, and its busy Eastern Valley Way frontage. It is not unreasonable to consider that any development, of prominent scale, will visibly and clearly define a western edge and entry to Castlecrag. A Visual Impact Assessment has been provided with the proposal at **Attachment 3**.

As the site is a prominent entry point to Castlecrag and the Griffin Heritage Conservation Area it is also important that it is developed in a way that aligns with the scale and nature of materials associated with the architecture of Walter Burley Griffin and Marion Mahoney. This issue is addressed in the draft DCP at **Attachment 5**.

Landscape and Vegetation management

The design rationale provided is comprehensive and addresses important landscape integration principles that have guided the design.

The planning proposal indicates that the majority of mature trees will be retained. The concept plan for the building has been located so as to provide adequate protection to the existing trees. The arborist report states that measures will be put in place to ensure that existing trees will be protected. Existing street trees on Edinburgh Road and mature trees to the southern boundary are proposed to be, protected, managed and maintained. A total of four dead (or dying) trees are proposed to be removed. An additional tree is proposed to be removed as a result of the new development. This tree will be replaced in the landscape plans.

Controls for the protection of existing trees and their root zones have also been included in the draft DCP (refer Fig. 5 Tree Preservation Plan)

The revised Arborist's report (Attachment 4) states that the proposed development will retain all of the street trees located along Edinburgh Road, Eastern Valley Way and all but one healthy tree on the southern boundary of the site. It also concludes the following:

"Three of the four trees identified to be removed are dead, with the other trees are 90% dead - also recommended for removal,(sic).

The trees located on the southern boundary are all located at the bottom of an existing retaining wall and will not be impacted from demolition works for the proposed development. The retention of these trees is possible as the proposed plans have been developed with arboriculturist input. Suitable replacement trees are included in the landscape plans.

The area's streetscape amenity will not be altered it and will be enhanced from the new building. Suitable replacement tree plantings in the landscape plan provide further amenity in the area. The trees impacted by the proposed development were planted when the site was developed, and the majority of the trees are not endemic to the area. The retention of as many trees as is possible is important to the community and has been achieved by these plans".

Wind Impact Assessment

At the request of Council a preliminary Wind Impact Assessment has been undertaken relating to the concept plan to address prevailing winds and relevant controls included in the draft DCP for this proposal.

This report presents an overview on the likely impact of the proposed Quadrangle development located at 100 Edinburgh Road, Castlecrag on the local wind environment at the critical outdoor areas within and around the subject site. The effect of wind activity has been examined for the three predominant wind directions for the region, namely the north-easterly, southerly, and westerly winds. The analysis of the wind effects relating to the proposed development have been carried out in the context of the local wind climate, building morphology and land topography.

No wind tunnel testing has been undertaken for the subject development, and hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection of the architectural drawings provided (received 17 September 2020 and 24 September 2020). Any recommendations in this report are made only in-principle and are based on experience in the study of wind environment effects.

The results of this assessment indicate that the development has incorporated several design features and wind mitigating strategies and is expected to be suitable for the intended use for the majority of the outdoor trafficable areas. However, there are some areas that are exposed to the prevailing winds. It is expected that the wind effects identified in the report can be ameliorated with the consideration of the following treatment strategies into the design of the development:

Ground Level Trafficable Areas

- Retention of the existing and proposed trees and landscaping along Edinburgh

Road.

- Retention of the proposed support columns along the northern façade of the development.
- Retention of the existing trees at the south of the site.
- Retention of the existing trees along Eastern Valley Way.

Level 3 Communal Rooftop Terrace

- Retention of perimeter landscaping.
- Private Balconies and Terraces
- Inclusion of 1.5-2m staggered planters on the Level 2 western balcony.
- Retention of standard height impermeable balustrades on corner balconies.

The assessment notes that for the landscaping to be effective in wind mitigation throughout the year, plant species are to be of a densely foliating evergreen species.

With the inclusion of the above recommendations in the final design, it is expected that wind conditions for the various trafficable outdoor areas within and around the development will be suitable for their intended uses and their applicable criteria.

Acoustic assessment

It is noted that an acoustic assessment will be required at development application stage given the proposed development includes residential units adjoining a major road (Eastern Valley Way) as triggered by *SEPP Infrastructure*.

Heritage impact

The subject site adjoins the Griffin Heritage Conservation Area along its eastern and part southern boundary and is in the vicinity of three (3) heritage items being, 10 The Postern (Community Centre - I48), 136 Edinburgh Road (House - I13) and 140 Edinburgh Road (House - I15). All three (3) heritage items are important for the Griffin area and are listed as having "local significance" in the Willoughby LEP 2012.

In support of the Planning Proposal, the applicant has submitted a Heritage Impact Statement, prepared by Weir Phillips, Heritage and Planning, with a supplementary report on Walter Burley Griffin's Legacy prepared by Heritage21.

The proposed concept development for the mixed use development is considered to be generally acceptable from a heritage point of view, subject to the existing trees being retained. The retention of the trees around the site will provide adequate screening to the adjoining properties and the heritage conservation area as is appropriate.

The proposed development is unlikely to have any adverse impact on the listed heritage items in the vicinity, due to the distance from the subject site and/or topography of the land. The retention of the majority of the trees will also assist to manage any visual impact of the proposed development on the nearby heritage conservation area.

The trees are essential from a heritage point of view to protect and continue the landscape character of the adjoining heritage conservation area. The subject site is the

entry point to the conservation area and requires to be treated as such.

The materials and colours of the proposed development are also very important and should be considered carefully in the development. Materials and colours must blend inconspicuously with the predominant colours of the local bushland. Locally indigenous vegetation is to be used for the landscaped areas, including private open spaces. These issues have been given due consideration in the draft DCP and will be considered in any subsequent development applications following the Planning Proposal.

Transport and Traffic Impact Assessment

It is noted that the site is located adjacent to a number of public transport (bus) stops, with good access to North Sydney Station and Chatswood Station (and Metro). The development proposal is located in an accessible and highly walkable location.

Overall, the concept proposal is unlikely to have significant impact on the surrounding road network. Traffic generation from the commercial component of the proposal will not significantly differ from the existing, similar-sized Quadrangle shopping centre.

Transport for NSW was previously consulted on the planning proposal submitted in 2020. It is anticipated that Transport for NSW will be consulted again at public exhibition stage. At the request of Council and Transport for NSW, a more detailed traffic and transport report was provided to support the earlier planning proposal and inform the draft DCP and any future development application. A copy of the previous Transport for NSW (TfNSW) response is at **Attachment 7.**

The updated traffic report has been provided with the Planning Proposal and it addresses the following:

- Cumulative traffic effects (both residential and retail uses)

- Site access

- Car Park and Loading Dock Design to Comply with Australian Standards.

The additional traffic impact will be from the residential component of the proposal. The traffic assessment forecasts an additional 10 vehicles per hour (two-way) in the weekday morning and 8 additional movements in the afternoon peak periods due to the new residential component. This would have a minimal impact on the Level of Service (LoS) of the Eastern Valley Way / Edinburgh Road intersection.

The revised traffic report has (in part) stated the following:

The planning proposal for the Quadrangle site envisages some 53 residential units and a decrease of some 772m2 in retail area. Applying the same generation rates as used in the TTP, the 53 residential units would generate an additional 10 vehicles per hour (two way) in the AM peak hour and an additional 8 vehicles per hour in the PM peak hour. Setting aside the decrease in retail area, the additional AM/PM peak hour traffic generated by the planning proposal (10 and 8 vehicles per hour, two way) is less than that assumed for the Quadrangle site in the TTP report for Castlecrag (17 and 25 vehicles per hour, two way). Thus the cumulative traffic effects of the planning proposal with other future development in Castlecrag have been considered in the TTP report. With regards to queuing on Edinburgh Road at the site access, the minor increase in traffic entering the site in the AM/PM peak hours (4 and 7 vehicles per hour in the AM/PM peak hours respectively) would have a negligible impact".

Generally, it is concluded by the applicant that the parking demand of the proposal is met on site and that the traffic generated will have only a minor impact upon the local traffic system and the intersection of Eastern Valley Way and Edinburgh Road.

Further traffic matters to note on the proposal include:

- The additional traffic generation will be relatively small and it will have a negligible impact on the Eastern Valley Way/Edinburgh Rd intersection. Although the intersection is already at a poor Level of Service (LoS), this development will only make it slightly worse.
- The largest vehicle that will access the site is proposed to be a 8.8m long medium rigid vehicle (MRV). It is noted that the design of the car park/access is proposed to only cater for such a vehicle. Given it will be a moderately sized supermarket similar to the existing, this approach seems reasonable.
- Compliance with relevant Australian Standards for car park/access design can be confirmed on plans with any future DA.
- Further design details for the carpark and access design can be considered at DA stage, such as a small raised kerb at the driveway entry to separate the entry and exit paths.
- **Car parking**: It is noted 157 car spaces are proposed to be provided in the development. According to the traffic review, a minimum of 147 car parking spaces are required for the proposed development using existing parking rates from Willoughby Development Control Plan (WDCP). According to Council calculations, a minimum of 156 spaces are required
- **Motorcycle parking**: Parking for motorcycles is proposed at Council's DCP rate of 1 motorcycle space per 25 car parking spaces, which would result in 6 motorcycle spaces required. This is supported and can be confirmed at DA stage including on the revised plans.
- **Bicycle parking and end-of-trip facilities (EOTF) and Green Travel Plan**: Indicative calculations for bicycle parking based on Council's existing WDCP rates are given in point 8 of the traffic review. Conversion of some parking spaces to storage cages (which could double as bike storage) may be suggested. The provisional Green Travel Plan provided in the Planning Proposal report is a welcome addition and can be further detailed at DA stage.
- **Access to Eastern Valley Way**: Willoughby Local Centres Strategy includes an indicative master plan for Castlecrag that includes item 14: "Potential for a new left-out (or service) access from the Quadrangle". Point 12 of the traffic review states this is not supported by TfNSW. Council supports this position, given the sight distances and potential for conflict with the driveway to the multi-dwelling residential property to the south (99 Eastern Valley Way).
- **Access / loading arrangements**: Access is proposed to be retained from Edinburgh Road and this is supported. The use of a turntable for a MRV is not a preferred solution, particularly given the plans appear to show adequate space is available for physical truck movements in this location. If a turntable is demonstrated to be the most feasible and practical option, greater justification will be required at DA stage and will need to address any potential safety issues that may arise between vehicle, cyclist and pedestrian movements. A management plan would also be required for the use of the turntable at DA stage. The smaller loading dock for a SRV (e.g. removalist trucks) for residential use is also supported, noting no turntable is required for this bay.
- **Electric vehicles (EVs):** Spaces and charging points for EVs should be given proper consideration and shown on revised plans as part of any future DA. The proponent would be aware that the draft WDCP will include controls relating to this matter.

Contamination assessment

A Preliminary Site Contamination Investigation has been undertaken for the planning proposal being reported to Council.

This report has considered the prior use of the land, including the use as a service station, together with the likelihood of the presence of fill material on the site and the risk that this fill might be contaminated, and the presence of asbestos and other hazardous materials. A preliminary site investigation report has been prepared. Having regard to site history, there is an assessed moderate risk of contamination which will need to be the subject of a detail site investigation.

If the proposal is supported, it is recommended that a detailed site contamination assessment be undertaken prior to public exhibition of the planning proposal.

Management of Stormwater

Stormwater drainage management plans, incorporating water quality systems and on-site detention systems complying with part C.5 of the Willoughby DCP including Technical Standards No. 1 will be required to be submitted with any future DA for the site.

The applicants have stated (**Attachment 4**) that a detailed stormwater management design will be an essential part of the development application. The applicants have also noted that there will be little change to the area of stormwater collection from that existing and that the site has the benefit of connection to the street system by gravity.

Management and zoning of public open space

There is an existing public access way zoned RE1 Public Recreation along the southern boundary of the site and linking through to The Postern. The plans show that this is proposed to be extended with a “public right-of-way” and landscaped area linking through the site to Edinburgh Road.

Further information was requested regarding the future intended ownership and management of this “public open space” as identified on sheet 6007 (public open space area of 1150m2 including approximately 750m2 of landscaped plaza along the northern boundary of the site adjoining Edinburgh Road). This included whether there is any proposed change to the existing RE1 Public Recreation zone link to the site (existing public pathway).

The following matters are also noted by Council officers for consideration in the development of the concept proposal and the draft DCP as well as subsequent development applications:

- Edinburgh Road frontage has limited footpath width between the existing street furniture/vegetation and the current boundary. Pedestrians currently use both the current public footpath and the private land in the vicinity as the existing buildings are set back from the boundary. If the development were to restrict public access to the public roadway only, as currently landscaped, there would not be the width required for a footpath. A footpath width available for use that is 2.4m or wider as determined by the pedestrian load of the area and that generated by the development will be required. This may require a public right of way into private land. Any potential outdoor eating areas should be clear of this footway area. Appropriate DCP provisions have been provided addressing this.

- Reconstruction of the streetscape should occur. A public domain landscape plan should be included as a DCP requirement for review by Council. The bus stop in front of the development needs to be a Disability Standards for Accessible Public Transport 2002 (DSAPT) compliant bus stop.

- Any public right of way over private land should be for the public to use but is to be maintained and renewed, insured etc. by the private land holder. Council should not have any responsibilities or liabilities on the private land. This public right of way should be compliant for disabled access and give consideration to Safer By Design principles and guidelines.

- The rear pathway from The Postern (between No.3 and No.5) should be upgraded to a minimum width of 1.5m with a desirable width of 1.8m (for passing wheelchairs). At the moment there are makeshift stairs on private land that provide access to the site from this pathway. This access should be upgraded to allow for disabled access.

The proponents have stated that the public outdoor eating area is contiguous with the public right of way but not part of it. Construction and maintenance of the public right of way over the site is to be the responsibility of the applicant and subject to a publicly accessible area management plan to be agreed with Council. No change to the existing RE1 Public Recreation zone is proposed.

Reconstruction of the footway and the making accessible of the bus stop are part of the public domain works which can be detailed in the DA and, where appropriate, negotiated through the Voluntary Planning Agreement (VPA). Upgrade of the rear pathway will also be considered further as part of the VPA.

Draft Development Control Plan (DCP)

A draft DCP has been submitted for Council consideration to apply to the site (see **Attachment 5**).

The draft DCP has provided objectives and controls for the proposed development on the site, including for the following:

- Masterplan
- Building form and height,
- Open space subject to a public right-of-way
- Building setbacks
- Landscaping and tree preservation
- Communal open space
- Private open space
- Solar access
- Visual privacy
- Materials and colours,

It is recommended that the reference to the nominated architect and design competition in the DCP should be excluded from the DCP, as the choice of architect is a matter for the developer not Council. Further, the project will be subject to Council's *Design Excellence Policy*. It is also noted that where matters are not covered by site specific provisions, the remainder of the *Willoughby Development Control Plan* will apply to the site. Specific recommendations in relation to management of the public open space on private land are also proposed in the draft DCP.

Design excellence

It is acknowledged that there are a number of aspects of the proposal that have design merit, noting that the proposed concept design provided with the Planning Proposal is the outcome of a proponent initiated design competition and community consultation. However it is intended that should the Planning Proposal be supported, it is is proposed that the *Willoughby LEP 2012 Design Excellence Clause* will apply to the site, with implementation undertaken in accordance with the *Willoughby City Council Design Excellence Policy (Guidelines*).

The proponent has indicated that they support the site being subject to the *Design Excellence Clause*, noting the fact that the proponents have had their own design excellence competition.

Proposed Voluntary Planning Agreement (VPA)

There are some items that may be considered in relation to a future VPA, including:

- public domain improvements in the Castlecrag local centre,
- streetscape, including rear access to the site,
- open space on site,
- public end of trip facilities
- public art contribution
- on-site public parking contribution (8 spaces)

Further information has been provided in the form of a draft VPA. This will enable for the matter of public benefit to be considered fully by Council and enable exhibition of the draft VPA in conjunction with the draft Planning Proposal and DCP. The draft VPA is the subject of a separate report to Council.

Department of Planning Requirements

The Planning Proposal is generally consistent with accordance with the requirements under Clause 33.3 of the Environmental Planning and Assessment Act 1979 and the Department of Planning's requirements set out in "*A guide to preparing planning proposals*" (October 2012). This document establishes six parts for consideration of a Planning Proposal which are addressed below:

PART 1 – OBJECTIVES OR INTENDED OUTCOMES

The objective of this planning proposal is to facilitate the development of a mixed-use development in the Castlecrag neighbourhood centre. The development will include commercial and residential uses with associated public domain improvements and additional car parking.

PART 2 – EXPLANATION OF PROVISIONS

The outcome proposed in the Planning Proposal will be achieved by preparing an amendment to WLEP2012, which will include:

- Increase to 1.8:1 FSR from the current 1:1, with a maximum FSR of 1.6:1 for the building above the Edinburgh Road level.

- Heights increased across the site from the current 9m maximum to a site specific clause. The site specific clause proposes a maximum building height not greater than AHD 97.49 which equates to 11m above Edinburgh Road level and 15.8 m above southern boundary of the site.

- Include an additional permitted land use of "residential flat building" on the site, specifying that land uses facing Edinburgh Road should be non-residential and that a minimum of 18% of total floorspace should be non-residential uses.

PART 3 – JUSTIFICATION

Section A- Need for the Planning Proposal

1) Is the Planning Proposal a result of any strategic study or report?

The Planning Proposal did not result from a strategic study or report.

2) Is the Planning Proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

The planning proposal facilitates the use of the subject site for mixed use development for an increased building height and floor space ratio than is currently permitted within the B1 Neighbourhood Centre zone.

Section B- Relationship to strategic planning framework

3) Is the planning proposal consistent with the objectives and actions of the applicable regional or sub-regional strategy (including the Sydney Metropolitan Strategy and exhibited draft strategies)?

The planning proposal as submitted is generally consistent with the applicable metropolitan strategies. The strategic planning context of the subject site is established by various State planning documents.

The *North District Plan* includes the following statement and priorities that are relevant for the proposal:

A place-based and collaborative approach is required to maintain and enhance the liveability of the North District. This can be achieved by the following Planning Priorities:

N3. Providing services and social infrastructure to meet people's changing needs

N4. Fostering healthy, creative, culturally rich and socially connected communities

N5. Providing housing supply, choice and affordability, with access to jobs, services and public transport

N6. Creating and renewing great places and local centres, and respecting the District's heritage.

The submitted planning proposal also states that the proposal is also consistent with relevant productivity and sustainability priorities. It is however noted that the proposal will reduce the commercial space available on the site from the existing 2,552m2 to 1,740m2.

4) Is the proposal consistent with a council's local strategy or other local strategic plan?

The proposal for mixed-use development for this site is consistent with the Willoughby *Local Centres Strategy* in respect to building heights and FSR propo*sed*. Further discussion on consistency of the proposal with the *Strategy* is outlined earlier in this report.

It is also consistent with the *Willoughby Community Strategic Plan 2028* and the *Willoughby Local Strategic Planning Statement.* (see **Attachment 3**).

The proposal intends to provide 53 new residential housing units, which includes an apartment mix of 1 bedroom, 2 bedroom and 3 bedroom apartments (including 2 affordable housing units). This is consistent with the *Willoughby Housing Strategy*, which intends to provide additional housing in local centres including Castlecrag, in addition to achieving increased housing yields in the Chatswood CBD and existing medium and high density zoned areas which are in close proximity to centres and with good public transport links.

The *Housing Strategy* recommends that increased development yields in the Castlecrag local centre could result in an additional 90 dwellings (apartments).
:

5) Is the proposal consistent with applicable State Environmental Planning Policies?

The applicant has provided a Table highlighting consistency with relevant SEPPs that can be viewed at **Attachment 3**. The report notes that the proposal is consistent with the following SEPPs:

SEPP 19 Bushland in Urban Areas
SEPP 55 Remediation of Land
SEPP 65 Design quality of Residential Apartment Development
SEPP 70 Affordable Housing (Revised schemes)
SEPP (Building Sustainability Index: BASIX) 2004
SEPP (Housing for Seniors or People with a Disability) 2004
SEPP (Infrastructure) 2007
SEPP (Vegetation in Non-Rural Areas) 2017
SREP (Sydney Harbour Catchment) 2005

The main SEPP which requires addressing at this stage is *SEPP 55 - Remediation of Contaminated Lands*. The applicant has submitted a Preliminary site investigation which

identified a number of sources of potential contamination. Should a planning proposal be supported for the site, the applicant would be requested to submit a Phase 1 Contamination Assessment prior to the exhibition of the Planning Proposal.

In relation to *SEPP 65*, the applicants have stated that the proposed concept scheme will comply with controls prescribed in the *Apartment Design Guide*. This can be verified at development application stage. The planning proposal application has noted that the shadows due to the proposal largely sit within the existing dense tree shadows at 21 June.

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

The Ministerial Directions issued to councils under s.9.1 of the EP&A Act 1979 require that a planning proposal does not conflict with the Directions. The following is a summary of the planning proposal against the relevant Section 9.1 Directions.

1. EMPLOYMENT AND RESOURCES

1.1 Business and Industrial Zones
The planning proposal will support continued employment generation and will support the viability of the identified local centre of Castlecrag as the proposal would allow a mixed-use development in the centre including commercial and residential uses. While the proponents state that employment levels will be maintained, the proposal intends to reduce the commercial space available from the existing 2,552m2 to 1,740m2. As there is no change to the existing B1 Neighbourhood Centre zone however, the proposal is therefore consistent with this direction.

2. ENVIRONMENT AND HERITAGE

2.3 Heritage Conservation
The planning proposal will not impact adversely on items of heritage conservation and the adjoining Griffin heritage conservation area, provided the majority of existing trees are retained on the site and on adjoining streets.

2.6 Remediation of Contaminated Land
The proposal is considered to be potentially consistent with this direction. Further information on contamination issues is addressed under *SEPP 55* assessment.

3. HOUSING, INFRASTRUCTURE AND URBAN DEVELOPMENT

3.1 Residential Zones
The proposal will provide for residential development as part of mixed-use development in a B1 Neighbourhood Centre zone and is therefore consistent with this direction.

3.4 Integrating Land Use and Transport
The site is well located close to public transport linkages and is therefore consistent with this direction. It is noted that some of the additional uses proposed, including residential uses may encourage additional car-related trips rather than by public transport.

4. HAZARD AND RISK

4.1 Acid Sulfate Soils
The subject site is identified as Class 5 on the Acid Sulfate Soils Map of WLEP 2012 and is consistent with this direction.

5. REGIONAL PLANNING

5.10 Implementation of Regional Plans
It is considered that the Planning Proposal is generally consistent with *A Plan for Growing Sydney* and the *North District Plan* with the proposal for mixed uses including retail and residential uses in the Local Centre zone at Castlecrag.

6. LOCAL PLAN MAKING

6.1 Approval and Referral Requirements
The planning proposal is consistent as it does not contain any provisions which require concurrence, consultation or referral to the Minister.

6.3 Site specific provisions
The planning proposal intends to include a specific clause to permit changes to the building height and FSR provisions that apply to the site. A site-specific clause to allow residential flat buildings on the site is also proposed, while incorporating a minimum proportion of non-residential uses in the development and the retention of active uses on the ground floor for parts of the development fronting Edinburgh Road. It is also proposed that Council's LEP clauses *6.8 Affordable Housing* and 6.23 *Design Excellence* will apply to the site.

7. METROPOLITAN PLANNING

7.1 Implementation of *A Plan for Growing Sydney*
The planning proposal is consistent with *A Plan for Growing Sydney* as outlined in the report above.

Section C- Environmental, social and economic impact

Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?
The subject site and adjoining lands have not been identified as containing any areas of critical habitat or threatened species, populations or ecological communities or habitats. The proposal intends to retain the majority of existing trees on the site.

8 Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?
The following environmental impacts of the proposal and their proposed management are discussed in this report in the relevant sections above:

- Urban design including bulk and scale.
- Traffic and transport
- Heritage
- Contamination
- Stormwater and drainage
- Landscape and tree protection.
- Public domain management
- Wind impact assessment

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

The Planning Proposal has adequately addressed social effects of the provision of a mixed use development on the site. It is considered that the proposal will result in economic and social benefits through the revitalisation of a key site in the Castlecrag neighbourhood centre for both commercial and residential uses. Impacts of increased building heights and FSRs on the site on adjoining uses can be managed effectively at the development application stage.

10 Is there adequate public infrastructure for the planning proposal?
The subject site is located within an established commercial area serviced by existing utilities infrastructure and public transport within the Castlecrag local centre.

The proponent has prepared a draft VPA offer showing an intention to enter into a Planning Agreement and any necessary supporting information required by Council's policy, as part of the Gateway Planning Proposal process.

Detailed consideration of the draft VPA is being undertaken and will be the subject of a separate report to Council.

11 What are the views of State and Commonwealth public authorities consulted in *accordance with the Gateway determination?*
Transport for NSW has been consulted on a previous version of the Planning Proposal and has provided a response which is addressed under Traffic and Transport section above.

PART 4 – MAPPING
Should it be supported, this Planning Proposal involves amending the Special Provisions Area map. Land use, height of building and the Floor Space Ratio provisions will be the subject of site specific clauses applying to the site. The height of building and floor space ratio maps will be amended to not apply to this site.

Part 5 - Community Notification

As is normal Council practice, no formal public community consultation has been undertaken by Council to date with regard to this Planning Proposal. The community will be consulted as part of the formal notification period following Gateway Determination by the Department of Planning, Industry and Environment.

PART 6 – PROJECT TIMELINE

Planning Proposal Presented to Council	November 2021
Planning Proposal submitted to Gateway	December 2021
Gateway Determination received by Council	April 2022
Community Consultation (28 days)	June 2022
Outcomes of Community Consultation presented to Council	September 2022
Planning Proposal submitted to Department requesting notification on Government website	October 2022

Conclusion

The Planning Proposal is considered to be generally consistent with the strategic objectives of the *Greater Sydney Region Plan* and the *North District Plan*. The Planning Proposal is also consistent with Council's *Local Centres Strategy* and therefore is supported in its current form.

It is considered that adequate justification has been provided for the proposed building height and floor space ratio controls that are generally consistent with those indicated in the *Strategy*. It is also noted the extensive community engagement and support that was undertaken and obtained by Council in developing and finalizing the *Strategy*.

Based on the above, it is recommended that this Planning Proposal should be forwarded to the Department of Planning, Industry and Environment, for a Gateway Determination under Section 3.34 of the *Environmental Planning and Assessment Act 1979*.

INCORPORATING NEUSTEIN URBAN

CITY PLANNING WORKS

URBAN PLANNING & DESIGN

Willoughby Local Government Area

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Planning Proposal for The Quadrangle Shopping Village Renewal

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Document Control

Version	Date	Issue details	Author	Checked	Authorised
1	25/08/2021	For Project Manager review	ED and MN	MN	MN
2	03/09/2021	For review by client	ED and MN	MN	MN
9	06 /09/2021	Lodgement	ED and MN	MN	MN

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Executive Summary

I. Introduction

This Planning Proposal has been prepared on behalf of Greencliff Castlecrag Pty Ltd and outlines redevelopment and revitalisation of The Quadrangle shopping village in Castlecrag.

Responding to the future housing and community needs of the area, the Planning Proposal is for activation of the site via a $63.9 million redevelopment for a high-quality local centre with ample public and communal open space, a supermarket, local shops and 53 shop top apartments. The proposal responds to the expected growth in Castlecrag population requiring 90 new dwellings by 2036.

The provision of flexible and diverse housing options is a suitable response to changes in household types as stated in the Willoughby LSPS:

> *couple families with children is expected to remain the biggest household type in the population, however, couple families without children and lone person households will also grow gradually as a share of total households.*[1]

The Planning Proposal is in line with the strategies of the NSW Government, the Greater Sydney Commission and Willoughby City Council, as outlined below.

The Planning Proposal has been formulated to implement the design of FJMT Studio as shown to and discussed with representatives of community groups and individual members of the community.

II. Site and locality

Located within the Willoughby LGA, the subject site has a street address of 100 Edinburgh Road, Castlecrag. The site has a legal description of lot 11 in DP 611594 and lot 1 in DP 43691 with a total site area of 5168m^2.

The site is located approximately 6.5km from Sydney CBD and 3km from Chatswood commercial centre and train station. Surrounding the site are the residential suburbs of Northbridge and Willoughby East. Castlecrag suburb was developed by a company controlled, for a time, by Walter Burley Griffin and Marion Mahony Griffin, husband and wife designers of the nation's capital, Canberra. The suburb still displays much evidence of the Griffins' legacy in its winding roads, its natural environment where rock outcrops are revealed and its architecture including many Griffin buildings.

[1] Willoughby LSPS, 2020, p. 16.

The site is currently zoned B1 (Neighbourhood Centre) with a small strip of 70sqm on the southern boundary RE1 (Public Recreation) under Willoughby Local Environmental Plan (WLEP) 2012.

The site is identified as being a part of the Castlecrag Centre in the *Willoughby Local Centres Strategy to 2036* (2019) and as a focus centre in the *Willoughby City Local Strategic Planning Statement* (LSPS) (2020).

An opportunity for this site is presented by the distinct, Griffin inspired, heritage character of the local area It is the gateway location of Castlecrag and its existing commercial precinct along Edinburgh Road. The centre offers an opportunity to meet the future commercial and residential demands expected of the suburb.

Castlecrag's population increased in recent years, growing by 4.5% between the census years of 2006 and 2016[2] compared with an overall increase of 20.4% for the Willoughby LGA.[3] The population of Castlecrag will age significantly in the next 16 years and provision needs to be made for the changing needs of older residents.

As the proposal locates 53 apartments over a local shopping village adjoining significant bus routes (203 and 275) serving Chatswood regional centre and the North Sydney CBD, the proposal aligns with the Metropolitan Strategy's objective of encouraging a shift from private to public transport. The proposal will not remove the need for residents of the suburb or the project itself to use cars. However, it will reduce the need for many shopping trips or shorten local shopping trips.

III. Proposal

The Planning Proposal seeks an amendment to the Willoughby LEP 2012 to facilitate the development of the subject site for a three-storey high (above Edinburgh Road) mixed-use development with a total GFA of 9,300m^2, an FSR of 1.8:1, to a design by FJMT Studio following a design competition. The development includes:

- 53 new shop top housing units, with an apartment mix of 4% one-bedroom, 55% two-bedroom and 42% three-bedroom units,
- 1740m^2 of retail/commercial floor space for a variety of uses including a supermarket, restaurants, cafes, shops and local services,
- A total of 157 parking spaces located at lower ground and basement levels,
- 1,150m^2 of publicly accessible open space adjoining Edinburgh Road and the neighbourhood shopping village.

[2] ABS Community Profiles: Castlecrag 2008 and 2017.

[3] ABS National Regional Profile: Willoughby 2008 and 2017.

The proposed development will positively contribute to the delivery of the estimated housing demand of 1,500 new dwellings in Willoughby's local centres by year 2036.[4] 90 additional dwellings are planned for Castlecrag.
The subject site due to its generally suitable zoning, prominent location and single ownership has the potential to deliver the majority of these dwellings.[5]

To facilitate the proposed development, the following amendments to Willoughby LEP 2012 are required:

- Addition of the site to the **Schedule 1 Additional permitted uses** to allow residential flat buildings because the definition of the permitted shop top housing does not exactly fit the proposal.
- Amendment of the Floor Space Ratio control map to allow an overall FSR of 1.8:1 for the subject site (FSR of 1.55:1 above Edinburgh Road and 0.25:1 below).
- Addition of a proposed clause 6.24 to increase the maximum permissible building height on site to no greater than an AHD of 97.49 as defined within the clause and not including roof top services and access to the communal open space. This will require a related change to the Special Areas Map.

IV. Compliance with strategic planning policies

The Planning Proposal is consistent with the following strategic plans and policies applicable to the site:

- ***The Greater Sydney Region Plan, A Metropolis of Three Cities***, is a plan that aims to achieve a '30 minute city' in which residents can live "within 30 minutes of their jobs, education and health facilities, services and great places".[6] The plan outlines 10 directions for Greater Sydney that establish the goals for the region. These directions are to be achieved over the next 40 years and they inform other strategic and more local documents to achieve these ambitions.

- ***The Future Transport Strategy 2056*** is supported by plans for regional NSW and for Greater Sydney[7] and delineates a 40-year strategy to address health, environmental and congestion issues, through better and safer active travel and public transport. The Quadrangle shopping village's proximity to the two bus routes that service Castlecrag ensures that the Planning Proposal enhances the community's access to viable transport options in relation to the local centre.

[4] Willoughby LSPS, 2020, p. 41.

[5] Willoughby Council Draft Housing Strategy to 2036, 2019, p. 51.

[6] The Greater Sydney Region Plan, A Metropolis of Three Cities, 2018, p. 6.

[7] The Future Transport Strategy 2056, 2018, p. 2.

- ***The North District Plan*** is a guide for achieving the goals of *A Metropolis of Three Cities* in a 20-year timeframe, at a district level. The plan is a bridge to regional and local planning[8] and informs a range of local policies. The plan reflects the local values and aspirations of communities to facilitate the growth and change of the LGAs in the North District. In particular, the plan requires urban renewal to accommodate the demand for additional dwellings and employment over the next 20 years[9]. The Planning Proposal for The Quadrangle assists in the achievement of these aims.

- ***Willoughby Economic Development Study*** is a review of Willoughby Council's economic development policies and land use planning strategies in order to ensure key employment in concentrated areas such as: commercial, retail and industrial precincts in the Willoughby LGA, and to manage the future growth and economic sustainability of employment hubs.[10] The study focuses on retaining existing employment services, achieving growth targets identified in regional strategies and catering for global and local trends as well as land use requirements.[11] The study has informed this Planning Proposal as it identifies The Quadrangle as a small village centre that provides opportunities for revitalisation that should be considered.[12]

- ***Our Future Willoughby 2028, Community Strategic Plan,*** is the Council's community strategic plan, produced through a community engagement process. The plan is based on five outcomes; A City that is green; A City that is connected and inclusive; A City that is liveable; A City that is prosperous and vibrant; A City that is effective and accountable.

- ***Draft Willoughby Housing Strategy To 2036***, is a 20-year plan that guides the future housing in Willoughby LGA. The draft Strategy considers the expected growth of the City and implements housing targets in order to accommodate for both current and future housing needs.[13] The Strategy has analysed residential development factors and conducted community engagement in order to provide an all-encompassing plan. The strategy identifies The Quadrangle as a local centre in Castlecrag having 'future economic and dwelling potential'[14]. It recommends shop top housing of up to five storeys above Edinburgh Road.

- ***Willoughby Local Centres Strategy To 2036***, (draft and adopted versions) which aims to promote a network of thriving, attractive and distinctive village centres. The strategy provides a framework for future planning controls and public domain improvements for eight local centres in the Willoughby LGA. The final, adopted version, with respect to Castlecrag, reduced the

[8] The North District Plan, 2018, p. 1.

[9] Ibid, p. 8.

[10] Willoughby Economic Development Study, 2016, p. 1.

[11] Ibid, p. 1.

[12] Ibid, p. 71.

[13] Draft Willoughby Housing Strategy to 2036, 2018, p. 5.

[14] Ibid, p. 41.

recommended height of the building from five to three storeys above Edinburgh Road apparently based on feedback received from limited public consultation. It preserved the recommendation for an FSR of 1.8:1 with 1.6:1 at or above the Edinburgh Road level.

- ***Willoughby City Local Strategic Planning Statement (LSPS)***, sets a 20-year vision for the LGA by focusing on the economic and social needs of the community. The LSPS answers the questions of what is to remain the same or needs to be changed for Willoughby's housing, centres and environment in response to local, metropolitan, national and global challenges and trends.

To respond to the forecast population growth for the area, a comprehensive approach to new community development is required. Such an approach must respond to social, economic, and environmental challenges. With its location on the Eastern Valley Way transport corridor, and via the bus route its proximity to the Chatswood CBD and train station, Castlecrag is identified as a Focus Area[15]. The site offers an exceptional opportunity to address these challenges through a renewed shopping village, with a focus on facilitating greater housing diversity, sustainable development and protection of the Griffin character of the area.

The proposed revitalisation of the Castlecrag urban village will assist Willoughby City Council and the NSW Government by providing a more diverse housing mix in the area, to meet the changing needs of current and future residents. The project will deliver high quality dwellings in proximity to local shops, services, open space and transport routes.

V. Anticipated impacts

a) Ecological

Previous construction on the subject site for the erection of the existing shopping village 40 years ago was carried out on 100% of the site. A site survey by the arborist has shown that there are no remnant forest species on the site.

b) Site Suitability - contamination and hazardous materials

The site development history is as follows:

- 1920s - 1949 shops
- 1949 – 1978 service station
- 1979 to date – shopping centre with excavated basement for parking.

[15] Willoughby LSPS, 2020.

The geotechnical report notes that rock is exposed on the northern side of the existing basement to a height of between 0.5m and 1.6m, sloping downwards to the east.[16] This suggests that about half of the site depth of 57m (north to south) has been excavated.

The service station on the site would have had underground service tanks (USTs) under its northern apron, close to the road for ease of tanker refuelling. Excavation of the site for the shopping centre appears to have removed the USTs, normally a cause of hydrocarbon pollution of the underlying material. The existing basement is approximately 3m to 4.8m below Edinburgh Road level.

Under the proposal, the basement parking will extend a further 3.8m below the existing basement, requiring further excavation of the rock. If any remnant of the USTs or hydrocarbon pollution is present, it will be excavated and removed with the basement material. Normal testing of the material to be removed is required under DECCW regulations before disposal to appropriate sites or re-use on this site.

c) Archaeology

It is anticipated that the Planning Proposal will not have any impact on potential Aboriginal archaeological remains as 100% of the site area was excavated and levelled 40 years ago. The site is not listed as having archaeological potential[17].

d) Infrastructure

The findings of the *Building Services* report advise the following upgrades to the capacity of the existing site and local infrastructure are necessary to capture the small increase in the future loads:

- Power: A 1,000KVA kiosk substation needs to be installed.
- Drinking water: A new domestic water services supply, connected to the Sydney Water main on Eastern Valley Way, will need to be provided.
- Natural gas services: The existing gas main located on Edinburgh Road has sufficient capacity to provide the proposed development with natural gas.
- Telecommunications: NBN is available at the site and the new development can be connected to NBN upon completion.[18]
- The sewer main connected to the site has sufficient capacity for the additional load generated by the future uses of the site.

In addition to the above recommendations, the installation of solar panels on the roof of the east and west wing buildings and the recycling of rainwater for the irrigation purposes will contribute to the efficient and sustainable use of resources and energy on site. Any proposal will also be subject to a

[16] Report on Preliminary Geotechnical Assessment, by Douglas Partners, June 2018 p. 2.

[17] Heritage Impact Statement Weir Philips Heritage and Planning, 2021, p 10.

[18] Building services concept report by Meinhardt: August 2021.

combination of SEPP BASIX and Section J considerations under the National Construction Code (formerly known as the BCA).

e) Traffic and transport

The traffic and parking study shows the proposed mixed-use development will generate about 20 vehicles per hour (two-way) in the weekday morning and afternoon peak periods. This would be a minor increase (1 to 3 seconds) in average delay per vehicle through the intersection of Eastern Valley Way/Edinburgh Road in the AM/PM peak hours and is considered an insignificant impact on the operation of the road network. [19]

New on-site parking and loading facilities, in accordance with Council's DCP, will minimise impact on street parking. Access to the site will be from the existing driveway location on the eastern boundary. No egress to Eastern Valley Way can be provided following refusal of such a proposal when previously discussed with RMS.

A green travel plan (appended) has been prepared at the suggestion of Council. Provision will be made for end of trip facilities including bicycle racks and lockers to encourage residents and shoppers to use bikes. The proximity of the site to two bus stops on Eastern Valley Way and Edinburgh Road that are regularly serviced by buses to Chatswood and the North Sydney CBD provides residents and visitors with a viable and regular alternative to private vehicle use.

f) Solid Waste

Solid waste is proposed to be stored at collecting points on site for either private or Council-managed collection. To the extent possible, sorting of recycling materials will be managed on site. As all storage of waste and its removal will be undertaken on the lower ground level, height clearance for garbage trucks is required for that level.

g) Urban design

The proposal has been designed to respond to the Griffin legacy and to minimise its environmental footprint:

- Orient the east wing and west wing sections in a radial arrangement to mirror the Griffin subdivision
- Create a gateway development for Castlecrag in keeping with the design principles of the Griffins
- Create a separation between the wings to allow sunshine through the development and to the neighbouring properties to the south.
- Restrict the height of the proposal to three storeys above Edinburgh Road to minimise the visual impact and reduce shadowing impact on the low-medium density housing to the south of the site.

[19] Planning Proposal – traffic review by Colston Budd Rogers & Kafes Pty Ltd: September 2021.

- Restrict the proposed excavation and level changes to minimise impacts as reasonably possible upon the mature trees along the southern boundary whilst maintaining all existing street trees to Edinburgh Road and Eastern Valley Way.
- Provide extensive landscaping plus green roofs to reduce heat island effects.
- Create a landscape setting using endemic species.
- Generate onsite power through the installation of photovoltaic panels on the roof.
- Encourage social interaction through providing public open space at ground level adjoining Edinburgh Road and café spaces on site
- Provide an inviting spatial quality to encourage active movement through the site.

The FJMT design of the proposal, incorporating the objectives above, will result in a sustainable building with a minimal environmental footprint in the footsteps of the Griffins.

h) Visual impact

The prime streetscape characteristics of Castlecrag are tree lined streets and front gardens with often substantial foliage. As noted above, the street pattern, topography and street trees limit distant views of the proposed development to the point that the building's striking architecture will only be apparent from very close up. The use of natural materials will serve to reduce the visual impact of the proposal, setting it into its background. Whilst the building has been designed as a gateway to the Griffin suburb, it will not be a dominant building except when seen very close up. Its visual impact will be very limited. (Refer to Annexure 12)

i) Social impact

- Public engagement – The Planning Proposal has been developed in response to an extensive voluntary stakeholder and community engagement process. Ongoing consultation with key stakeholders provided further insight into the desired community facilities for the site and the locality, the ideal location for such facilities, and means for encouraging and optimising use. Engagement with stakeholders has taken place up to the submission of this proposal.

- Renewal - The closing of The Quadrangle shopping village in the near future is inevitable considering the need for commercial renewal after over 40 years.

- Housing – There is increasing demand from the local residents for suitable residential options for downsizing.

- Local centre - Access to quality retail and local services in close proximity to the residential areas of Castlecrag is important to and necessary for the community. The creation of a community hub is also an important community need and the proposal will provide such a hub with outdoor café/dining areas and a publicly accessible open space on Edinburgh Road.

j) Economic impact

- Surrounding centres – It is unlikely that the nearest centre, Northbridge Plaza, will suffer any discernible impact as the gross floor area in that centre is approximately ten times greater than the whole Castlecrag local centre. Castlecrag serves a small demographic which extends along the Edinburgh Road spine to the east.

- Employment – It is estimated that the development, upon completion, will provide 90 jobs[20], in retail and plus up to 18 service contractors associated with the residential part of the development. There will be an economic benefit due to the expenditure of $63.9 million on renewal of The Quadrangle Shopping Village and the construction of housing above.

VI. Conclusions

The Planning Proposal outlines a sustainable transformation of an underutilised local centre into a medium-density mixed-use local centre designed for the 21st century.

Responding to the housing and community needs of the area, the Planning Proposal will meet the future needs of the community by providing housing, public and communal open space, and associated retail facilities. It addresses the strategic planning needs of the region, the Willoughby LGA and the suburb of Castlecrag.

Its strategic location along Eastern Valley Way, a major transport corridor[21], justifies amendment of the existing planning controls to achieve higher density housing and associated facilities, in line with Council and NSW Government's strategic vision for the area, as demonstrated by the adopted FJMT design.

[20] PERS COMM, Quadrangle Centre Management, May 2020.

[21] Willoughby LSPS, 2020, p. 46.

1 Existing context

1.1 The site and its context



Figure 1 – Subject site coloured yellow. Image courtesy of Nearmap.

Located within the Willoughby LGA the subject site is at 100 Edinburgh Road, Castlecrag, with a legal description of lot 11 in DP 611594 and lot 1 in DP 43691 with a total area of 5168m^2. It currently accommodates a shopping village and one level of basement parking built in late 1970s.

The site falls between 5.1m and 5.8m north to south and is almost flat east to west long the northern boundary with a 2m fall along the southern boundary of the site.

The irregular shaped site has two street frontages. To the north is Edinburgh Road and to the west is Eastern Valley Way. The eastern side boundary is shared with another commercial property. To the south are a number of residential properties on lots zoned R2 (Low Density Residential) and E4 (Environmental Living).



Figure 2 – The Quadrangle shopping centre viewed from the north west corner of the Eastern Valley Way and Edinburgh Road junction. Image courtesy of Google Maps.



Figure 3 – Rear, south west corner of the site. Image courtesy of Google Maps.



Figure 4 – Main entry to the shopping centre from Edinburgh Road. Image courtesy of Google Maps.



Figure 5 – Vehicular entry to the basement parking level from Edinburgh Road. Commercial properties adjoining the site to the east are to the left. Image courtesy of Google Maps.

The site boundaries have approximate lengths as follows.

- Northern boundary, along Edinburgh Road, 101m
- Western boundary, along Eastern Valley Way, 60m
- Southern boundary, shared with a number of residential lots, 108m
- Eastern boundary, shared with No.116 Edinburgh Road, 47m

Located immediately west of the Castlecrag Conservation Area, the shopping village is not a heritage item though it is integral to the character of the area. The proposal acknowledges that any redevelopment must pay homage to the Walter Burley Griffin legacy of the suburb and retain the "village feel".

The site is located approximately 6.5km from Sydney CBD, 4.4km from North Sydney station and 3km from Chatswood commercial centre and train station, both accessible via frequent bus services. Surrounding the site are the residential suburbs of Northbridge and Willoughby East. The site and its immediate and larger context are shown on the following map.

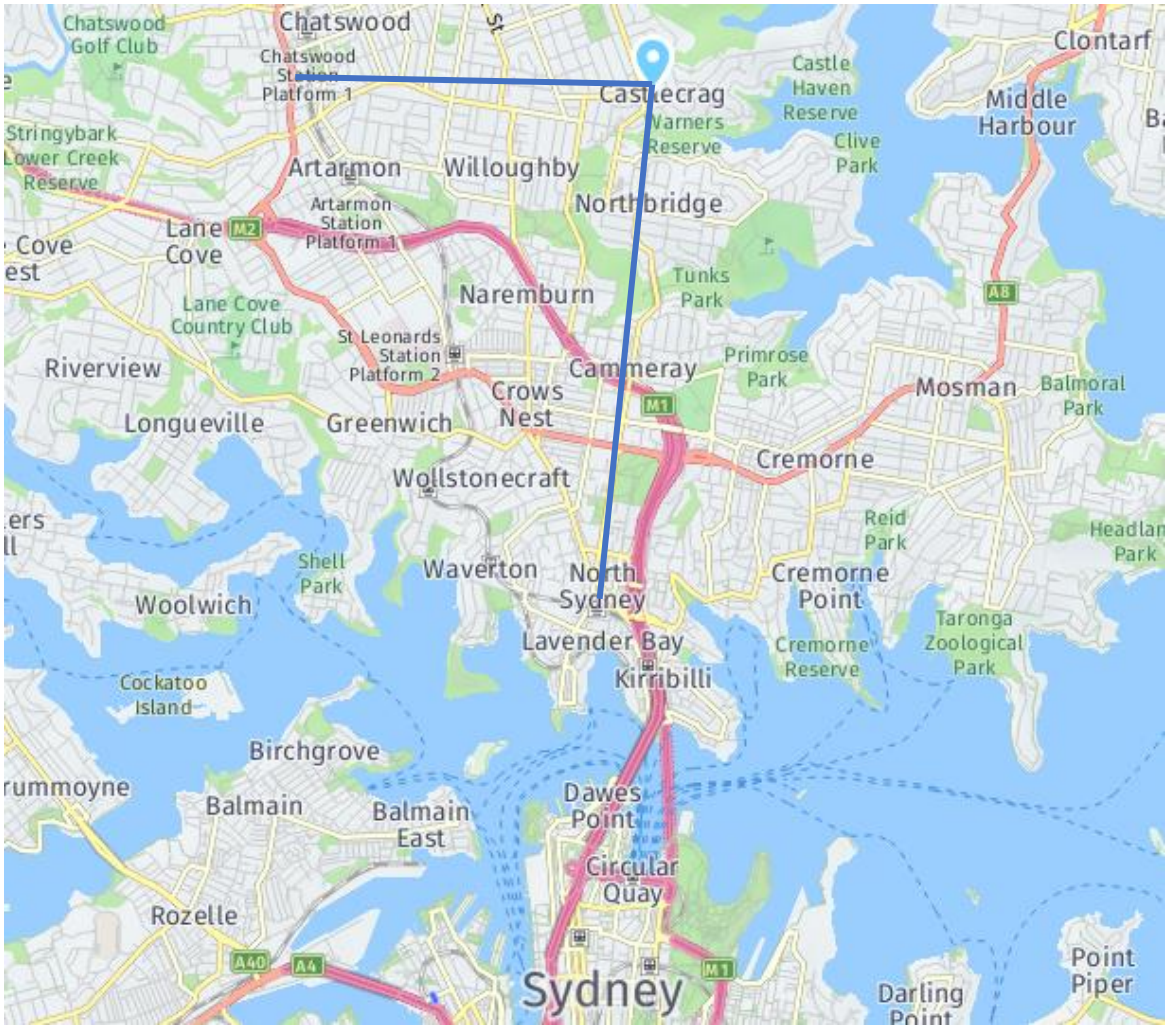


Figure 6 – Site's location in relation to the surrounding suburbs and the distances from the North Sydney CBD and Chatswood train station. Image courtesy of Nearmap.

The site is serviced by bus route numbers 203 and 275, to the North Sydney CBD and Chatswood.



Figure 7 – Castlecrag services by the 203 and 275 bus routes.[22]

The site is currently zoned B1 (Neighbourhood Centre) 5,096m^2 and RE1 (Public Recreation) 70m^2 under Willoughby Council Local Environmental Plan (WLEP) 2012.

As it can be seen from the street views above and as also shown on the architectural drawings, there street trees along the western and northern boundaries of the site. These trees are considered by the community as important factors defining the character of the suburb and the site. These trees will be preserved.

1.2 The locality

The site is located on the corner of Eastern Valley Way, a busy arterial road, and Edinburgh Road, the main local road servicing Castlecrag. Castlecrag suburb extends from the intersection at which the site stands along the spine of Edinburgh Road to the east. 96% of the dwellings in Castlecrag are detached houses[23].

[22] Ibid, p. 68.

[23] Elton Consulting, Community Engagement Report, 2020, p 31.

Eastern Valley Way forms a barrier between Castlecrag and Willoughby East, a barrier which extends to the Castlecrag's self-image as expressed by its residents.

Castlecrag suburb was developed by a company controlled, for a time, by Walter Burley Griffin and Marion Mahony Griffin, husband and wife designers of the nation's capital, Canberra.

The suburb still displays much evidence of the Griffins' legacy in its winding roads, its natural environment where the rock outcrops are revealed and its architecture including many Griffin houses. "To Griffin, architecture, the site planning, town planning and landscape design were inseparable. Any structure had to fit into the overall landscape of the area - being harmonious rather than obtrusive. He achieved this integration through his design philosophy - narrow winding roads following contours, linked open space networks, lack of fences, unobtrusive houses, retention of bushland in the reserves, walkways, nature strips and road islands."[24].

Surrounding the site are the residential suburbs of Willoughby East to the west and Northbridge to the south. The density of these suburbs is increasing from low density to medium density around commercial centres and transport hubs.

The population of Castlecrag experienced very little change between the 2006 and 2016 census when the population grew by 5% compared with 17% for the whole Willoughby LGA.

1.3 Site history and background

> *In 1920 Walter Burley and Marion Mahony Griffin designed the Castlecrag Estate, as it became known, in sympathy with the natural environment, creating bushland reserves that preserved the major landforms and rock outcrops, foreshore reserves, a delightful network of public walkways and roads that followed the contours and respected the landforms.*[25]

Aerial mapping from 1943 shows the site and much of the surrounding area were largely undeveloped. The site had three small buildings, two of which were shops built in 1926 and related to Radio Station2RC. The other building was likely a shed for a dairy business operated from the remainder of the site. This image also shows the street pattern laid out for the residential area to the east of the site, clear evidence of the master plan designed and laid out by Walter Burley Griffin and his wife. Specifically, the residential streets follow the contours of the peninsula highlighting the natural features of the area and the views available.

[24] Heritage Impact Statement Weir Philips Heritage and Planning, 2020, p. 18 & 19.

[25] Willoughby LSPS, 2020, p. 10.



Figure 8 - The site and surrounds in 1943. Image courtesy of SIX Maps

Due to previous works, the site has been cleared and extensively excavated or filled. The existing shopping centre, opened in 1979, covers about 85% of the site. Much of the landscape strip on the southern side of the site is on fill, probably the result of the 1979 development. The trees in that landscape are more recent plantings and are not part of the indigenous forest evident to the east.

1.4 Previous applications

Past development consents and previous uses of the site include:

- An Esso Service Station, built in 1952 to replace the shops,
- An Ampol Petrol Station, built in 1956 to replace the dairy business,
- The Quadrangle shopping village, built in 1979 to replace the petrol station,

The use of the site has not changed since.

An online search for previously approved DAs, involving the subject site on Council online application/ property tracking portal shows the following alterations have been carried out on the subject site:

- DA - 2017/436 - Change of use of shops 23 to 26 to licensed restaurant, internal fit out, modifications to shopfront and outdoor dining.

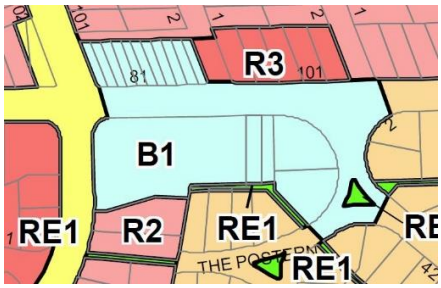
- CD – 2015/116 - Change of use - shop fit out and associated works.
- CD - 2015/116/A - Change of use - shop fit out for liquor store and associated works.

In 2020, an application was lodged for a Planning Proposal, generally along the lines of the then proposed Local centres Study for Castlecrag. The proposal was for an FSR of 2.2:1 in place of the 1.8:1 of the LCS and a part three and part four storey building. The Planning Proposal was ultimately refused by the Sydney North Planning Panel on the basis of its failure to meet the strategic requirements of the Council expressed in its LCS. The Panel did note the high architectural quality of the proposal.

1.5 Willoughby LEP 2012

The proposal is for a complete redevelopment of The Quadrangle shopping village for a medium density mixed-use local centre including residential units, retail tenancies and community open space. The LEP controls that apply to the site are below.

The site is zoned in a B1 Neighbourhood Centre and RE1 Public Recreation area.



Within a B1 zone, the following uses are permitted:

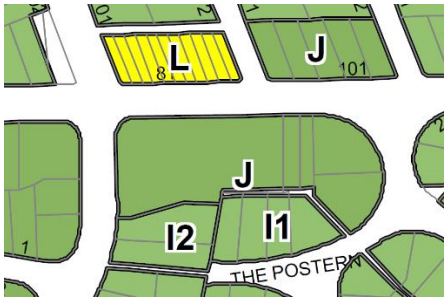
Boarding houses; Building identification signs; Business identification signs; Business premises; Centre-based child care facilities; Community facilities; Medical centres; Neighbourhood shops; Neighbourhood supermarkets; Oyster aquaculture; Respite day care centres; Restaurants or cafes; Roads; Shop top housing; Shops; Take away food and drink premises; Tank-based aquaculture; Any other development not specified in item 2 or 4.

Council has drawn the applicant's attention to the fact that the proposal may not meet the definition of shop top housing which is defined as:

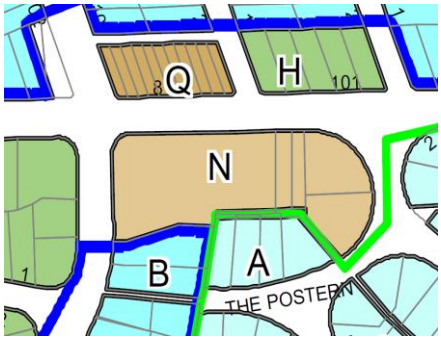
shop top housing means one or more dwellings located above ground floor retail premises or business premises.

As the proposal is for apartments at ground level and also at lower ground level, the additional use of *residential flat building* on the site needs to be added to **Schedule 1 Additional permitted uses**.

The maximum permissible height of building is 9m.



The maximum permissible floor space ratio for the site is 1:1



2 The proposal

"The architects of the proposal (FJMT Studio) have taken note of the abrupt termination of Griffin's subdivision pattern on the eastern side of the subject site. The proposal seeks to better integrate the site with the underlaying subdivision pattern of the Conservation Area by extending the fluid geometry of Griffin's subdivision pattern- both the street and lot pattern- into the site. Accordingly, the proposal is orientated to reflect the adjacent curve of both The Parapet and The Rampart, giving the proposal a more organic form than the existing building on the site. Given that the site is the gateway into the Conservation Area, a better integration with the underlying subdivision pattern will have a positive impact."[26]

2.1 Urban form

Described by the proposed masterplan, the urban form of the development has been shaped by key urban design concerns including:

- Response to Griffin legacy and principles,

[26] Heritage Impact Statement Weir Philips Heritage and Planning, 2021, p. 33.

- "Create a unique development through the integration of architecture and landscape,
- Pay homage to the vision of Marion and Walter Burley Griffin who perceived Castlecrag's bushland flora as the cleanest most delicate and varied native indigenous perpetually blooming flora extent,
- Create a landscape that is an integral part of the built form,
- Reconnect with the surrounding natural landscape qualities,
- Extend natural heritage landscape of Castlecrag into the precinct,
- Strengthen the distinctive Castlecrag community identity,
- Provide a strong sense of place and community pride,
- Develop a contemporary landscape, with references and respect to the historical sentiments and character of the historical Castlecrag landscape.
- Provide a sophisticated bushland environment through considered simplicity of design, while responding to the integrity of the architecture,
- Provide spatial opportunity, through the provision of communal open space, for a variety of recreational activities that cater to both residents and visitors of different age groups,
- Replace removed trees with endemic species in similar numbers"[27],
- Compliance with building separation and solar access requirements of the Apartment Design Guide referenced by SEPP 65,
- Consideration of the nine principles for urban residential development required by SEPP 65,
- Minimise adverse impacts on adjoining development.

2.2 The essential characteristics of the proposed development

The proposal is for a shopping village with shop top housing units. The essential characteristics of the proposal are:

- Total site area of 5,168 m^2 in single ownership.
- Two storey pavilions above a ground level base storey, with a maximum building height not greater than AHD 97.49 which equates to 11m above Edinburgh Road level and 15.8 m above southern boundary.
- Proposed FSR of 1.8:1, which includes an FSR of 0.25:1 for the section below Edinburgh Road level and an FSR of 1.55:1 for the building above the Edinburgh Road level.
- Total GFA of 9,300m^2 comprising 1,740m^2 retail and commercial space and 6,260m^2 of residential apartments.
- 53 apartments with a mix of 4% one bedroom, 55% two bedroom, and 42% three-bedroom units.
- Half of all units are capable of meeting the adaptable housing standard.
- Public and communal open space - 2,220m^2, including approximately 750m^2 of landscaped plaza along the northern boundary of the site adjoining Edinburgh Road.
- CIV of $63.9million.

[27] FJMT Planning Proposal Architectural and Landscape Design Report, 2021, p. 35.

3 Previous Planning Proposal

The previous planning proposal (PP-2020/5) was prepared on behalf of Greencliff Castlecrag Pty Ltd for the redevelopment and revitalisation of The Quadrangle shopping village in Castlecrag. The proposal was lodged on the 26 June 2020 and sought an amendment to the Willoughby LEP 2012 to facilitate the development of the subject site for a part three and part four storey high (above Edinburgh Road) mixed-use development. The proposal details included:

- A total GFA of 10,332m^2
- An FSR of 2.2:1
- A maximum permissible building height on site to variously 18.5m, 20.5m, 21m and 22.5m defined strictly in accordance with the LEP definition which took as a base, the excavated level of the car park
- 67 new shop top housing units, with an apartment mix of 21% one-bedroom, 45% two-bedroom, 33% three-bedroom and 1% four-bedroom units,
- 1942m^2 of retail/commercial floor space for a variety of uses including a supermarket, restaurants, cafes, shops and local services,
- A total of 166 parking spaces located at lower ground and basement levels,
- 1,350m^2 of publicly accessible open space.

The planning proposal was referred to the Willoughby Local Planning Panel by Council on 24 November 2020. The Panel formed the view that the proposal did not pass the Strategic Merit test. The record of advice states it was deemed not consistent with the relevant local strategy that had been endorsed by the Department of Planning Industry and Environment with regard to the Willoughby LSPS 2020.

On 8 February 2021 an Ordinary Council Meeting was held to determine Council's view of the planning proposal even though it was no longer the consent authority due to delay. Council did not support the planning proposal and advised that a reduced scheme in line with the Willoughby Local Centres Strategy could be supported.

On 14 April 2021 the rezoning review of the proposal was conducted by the Sydney North Planning Panel. The Panel determined the proposal should not be submitted for a Gateway determination because the proposal had not demonstrated strategic merit. The reason for the decision is as follows:

> *The Panel concurred with Council that the Planning Proposal is inconsistent with the **building heights, bulk and scale** proposed in Willoughby's Local Centres Strategy for the site and therefore fails the strategic test. The Panel is of the view that a Planning Proposal should be compliant with such a recently approved Local Centres Strategy.*
>
> *While the Panel felt the indicative design concept had merit for such a key site, the Panel's focus is necessarily on changes to FSR and Height. In both cases, the Planning Proposal sought significant variations to Willoughby's LEP 2012. The proposal sought heights of 18.5m to 22.5m as opposed to the*

current maximum 9m under the LEP and sought to increase the FSR to 2.2:1 from the existing 1:1 in the LEP.

Since the refused rezoning Greencliff Castlecrag Pty Ltd has revised the original proposal to address the matters raised by Council, the Willoughby Local Planning Panel and the Sydney North Planning Panel. A Pre-PP meeting was held on the 4 August 2021 with Willoughby Council planners to discuss the revised planning proposal and its key issues. The main changes to the current planning proposal are the reduction in height and FSR. The changes are fully consistent with the desired building heights, bulk and scale of the adopted Willoughby Local Centres Strategy and ensure the proposal is effective in achieving a desired community outcome. A comparison of the previous and proposed planning proposals is below:

Planning issues	**Previous planning proposal**	**Revised planning proposal**
FSR	2.2:1	1.8:1
Storey height	Part three and part four above Edinburgh Road	Three above Edinburgh Road
Height of building	Variously 18.5m, 20.5m, 21m and 22.5m	Height limited to an AHD of 97.49 other than roof top services
Publicly accessible open space	1,350m^2	1,150m^2
Apartments with solar access greater than 2 hours/day	70.1%	74% (39 of 53)
Deep soil	760m^2	750m^2
Apartments with cross or natural ventilation	65.7%	60% (32 of 53)
Number of apartments	67	53

Since the previous PP was refused, Council has initiated amendments to the Willoughby LEP to implement the LCS. The current PP should therefore be assessed against the nascent amended LEP with an FSR of 1.8:1 for the site and not the current LEP which permits only 1.0:1.

4 Objectives and intended outcomes of the Planning Proposal

4.1 Objectives of the planning proposal

The principal objective of this planning proposal is to amend the Willoughby Local Environmental Plan 2012 to enable the redevelopment of 100 Edinburgh Road, Castlecrag, for a mixed-use, medium-density apartment building above a neighbourhood shopping village. This can only be achieved through:

- Addition of the use *residential flat* building to Schedule 1 of the LEP
- The revision of the Building Height and associated control maps applicable to the site under clause 4.3 - Height of Building making the height subject to a new clause 6.24 of the LEP

- The revision of the Floor Space Ratio development standard and the associated control maps applicable to the site under clause 4.4 - Floor Space Ratio.

The proposed objectives of the planning proposal are a combination of the applicable zone objectives under the WLEP 2012 and the proposed objectives by the applicant to emphasise the requirements for the achieving the planned goals of the planning proposal. The relevant objectives of the current land use zones:

Zone B1 – Neighbourhood Centres (5096m^2 of the total site area):

To provide a range of small-scale retail, business and community uses that serve the needs of people who live or work in the surrounding neighbourhood.

To minimise the effect of business uses on the amenity of adjacent areas having regard to building design, operation and activities, traffic generation and the car parking capacity of local roads

Zone RE1 – Public Recreation (70m^2 of the total site area):

To enable land to be used for public open space or recreational purposes.

To maintain and provide visual open space links to a diversity of public and private spaces and facilities as an integral part of the open space system.

To provide adequate open space areas to meet the existing and future needs of the residents of Willoughby

The objectives proposed by the applicant are:

To provide new housing opportunities and greater choice for Castlecrag's ageing demography, including affordable housing - the proposal incorporates apartments to allow residents of Castlecrag to downsize.

To create a community-centred urban development which provides social and economic benefits and health services to its residents and the residents of surrounding suburbs

To encourage walking and cycling - cycling is encouraged by providing end-of-journey facilities. Walking is encouraged by linking the centre to a pedestrian network that stretches into The Postern.

To connect communal and public open spaces with The Postern.

To place the residential development in a landscaped garden setting in accordance with the Griffin design legacy,

To maximise the sustainable use of water on the site through water sensitive urban design strategies such as rainwater recycling for irrigation purposes.

To maximise the on-site energy generation through the installation of PV panels on the roof areas,

To foster design excellence in architecture, landscape design and infrastructure provision - design excellence in architecture achieved through the design competition process. The landscape and infrastructure provision are addressed by the expert reports and drawings accompanying this application.

To involve the Castlecrag community in the design and implementation of the proposal throughout the process.

4.2 Intended outcomes of the proposed development

The general outcome sought by this Planning Proposal is the renewal of The Quadrangle shopping village as a mixed-use project, as designed by FJMT Studio, which is economically viable and sustainable whilst adhering to the principles established for Castlecrag by the Griffins.

5 Justification and process for the implementation of the proposed amendments and outcomes

Though Willoughby LGA is expected to grow rapidly over the next 20 years[28], Castlecrag is expected to see only a small increase in population[29]. The Quadrangle shopping village site provides 5,168m^2 of land suitable for a medium-density mixed use local centre, immediately adjacent to Eastern Valley Way the major north south arterial road east of the Pacific Highway connecting North Sydney to Roseville and Forestville. Eastern Valley Way also forms a division between the Griffin estate of Castlecrag and the suburb of Willoughby East on the western side of the road. The subject site is the gateway to Castlecrag and is an important symbolic introduction to the Griffin designed suburb.

Built 40 years ago, The Quadrangle has not been the subject of major renewal and is showing signs of obsolescence with declining tenancies, closures, temporary uses and discounted rents. The current state of the centre provides an opportunity to upgrade the retail offering and to provide much needed accommodation for an ageing population. Castlecrag is 96% detached housing[30] with almost no

[28] Willoughby LSPS, 2020, p. 14.

[29] Elton Consulting, Community Engagement Report, 2020, p. 31.

[30] Ibid, p 31.

opportunity for existing residents to leave houses on the suburb's steep slopes for an apartment with modern facilities and essentially step free and slope free access.

The opportunity to re-develop a site of this area, the largest in commercial use in Castlecrag, through a community informed planning process is a once-in-a-lifetime opportunity for the residents of Castlecrag and the Willoughby LGA.

The community, when asked, made clear its preference for the creation of a significant open space on the northern side of the site, adjoining Edinburgh Road. Through the process of a design excellence competition, the applicant has made possible a design which simultaneously relates to the strong, and strongly defended, Griffin legacy as well as meeting community expectations for open space, an enhanced local centre and medium density housing.

Section A – Need for the planning proposal

5.1 Is the planning proposal a result of any strategic study or report?

This planning proposal is informed by the following state and local strategic plans, and by the obvious opportunity of providing a quality shopping village/local centre with new residential units in an already established location.

- ***The Greater Sydney Region Plan, A Metropolis of Three Cities,*** March 2018, the Greater Sydney Commission. The plan envisions a 30-minute city in which communities live with easy access to employment opportunities, housing, community facilities, amenities and public transport. This planning proposal addresses these visions and objectives as discussed in section 4.3.1.

- ***The Future Transport Strategy 2056,*** March 2018, The NSW Government – Transport for NSW. The focus of this plan is on how integrated land use and transport planning can work to create liveable places and spaces. How this planning proposal addresses the objectives of this strategy is discussed in section 4.3.2.

- ***The North District plan***, March 2018, The Greater Sydney Commission. This is the sub-regional plan, which also includes Willoughby LGA. The Plan is a guide for implementing the *A Metropolis of Three Cities – Greater Sydney Region Plan* at a district level and is a bridge between regional and local planning. The objectives and actions of this plan are addressed in section 4.3.3.

- ***Willoughby Economic Development Study***, May 2016, SGS Economics and Planning. Reference to *A Plan for Growing Sydney* strategies have been made in this report. The main focus of the plan is on the revitalisation of retail centres by focusing on the aggregated demand for retail floor space, public transport accessibility issues and an analysis on the capacity-demand gap. The findings of this report are discussed in section 4.4.1.

- ***Our Future Willoughby 2028, Community Strategic Plan****,* June 2018, Willoughby City Council. The Community Strategic Plan provides an overview of the Willoughby Council resident's vision for the area, a larger group than those considered for the Castlecrag proposal. Therefore, this plan is used as a reference when understanding the potential value of the proposal to the wider community, discussed in detail in section 4.4.2.

- ***Draft Willoughby Housing Strategy To 2036***, February 2019, Willoughby City Council. The Strategy provides final scenario's proposed for Willoughby local centres, including Castlecrag, in order to accommodate for the future projected population growth in the Willoughby LGA. This Strategy therefore outlines Council's recommendation for changes to existing local centres. Details of key features for the Quadrangle site is discussed in section 4.4.3.

- ***Draft Willoughby Local Centres Strategy to 2036,*** February 2019 which was exhibited from 05 February 2019 to 30 April 2019. This local strategic plan was prepared to guide the future planning controls and public domain improvements for eight local centres, including Castlecrag. Prepared by Architectus for Council, the draft strategy envisaged a scenario of a five storeys above Edinburgh Road development of FSR 1.8:1 on the subject site. Refer to section 4.4.4 below.

- ***(Adopted) Willoughby Local Centres Strategy To 2036***, December 2019, Willoughby City Council. The height of building proposed for the subject site was reduced from five storeys above Edinburgh Road to three, in response only to the objections of a small section of the community. The proposal responds to the adopted, but lower, scenario proposed refer to 4.4.5.

- ***Willoughby City Local Strategic Planning Statement (LSPS)****,* March 2020, Willoughby City Council. The LSPS sets a strategic landuse plan for the coming 20 years in Willoughby considering the environmental, economic and social needs of Willoughby. The proposal aims to facilitate the Willoughby vision for 2036. This is discussed in section 4.4.6.

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

As discussed in the previous section of the report, with an expected population growth of 14,000 in Willoughby LGA by 2036[31], there is a need to provide additional housing that is compatible with accessible and adaptable housing standards. Also, these new housing options have to be serviced with modern community facilities and amenities within the easy reach of local residents.

[31] Willoughby LSPS, 2020, p. 14.

Based on the urban design analyses carried out by Council prior to this proposal, the subject site has the capacity to accommodate a large proportion of the population growth planned for Castlecrag[32], by providing new housing, employment opportunities and community facilities such as the large sun filled public plaza along the northern boundary of the site.

To accommodate the growth within the Northern District, including Castlecrag, *A Metropolis of Three Cities - Greater Sydney Region Plan* (GSC Plan) specifies 40 objectives, focusing on four aspects: *Infrastructure & collaboration, Liveability, Productivity* and *Sustainability*.

Due to its size and location, The Quadrangle site offers Castlecrag local centre the major possibility to realise a model where the focus will be on all four aspects of the GSC plan.

At present, opportunities for the site to improve its viability through a new development are limited by the restrictive FSR and height of building controls. To achieve the *Objectives of the Planning Proposal* as set out under section 3.1 of this report, the development yield of the site needs to be increased to allow for the realisation of the planned development, as recognised in the Local Centres Strategy.

The objectives defined by the applicant, in addition to the zone objectives, are based on the aspiration of the State Planning Policies for future growth and development of Sydney. The proposed objectives are formed to achieve an outcome that is aligned with the hierarchy of current strategic plans.

The design and consultancy team worked closely to implement the objectives listed under section 2.2 of the Local Centres Strategy, through the proposed scheme for the redevelopment of the Castlecrag shopping village. The Planning Proposal is the best means of achieving the objectives and intended outcomes for the site.

Section B – Relationship to strategic planning framework

5.3 Is the planning proposal consistent with the objectives and actions of the applicable regional, sub-regional or district plan or strategy (including any exhibited draft plans or strategies)?

This planning proposal is consistent with the relevant objectives and actions contained within

- ***The Greater Sydney Region Plan, A Metropolis of Three Cities,*** March 2018, the Greater Sydney Commission.
- ***The Future Transport Strategy 2056,*** March 2018, The NSW Government – Transport for NSW.
- ***The North District plan***, March 2018, The Greater Sydney Commission.

These strategies and relevant objectives and actions are outlined below.

[32] Ibid, p. 28.

5.3.1 The Greater Sydney Region Plan, A Metropolis of Three Cities

In the plan, published in 2018, Castlecrag is not mentioned though the regional centre of Chatswood is mentioned specifically in terms of the Economic Corridor and investment and business. Castlecrag is a small local centre of approximately 6,500sqm, not comparable with centres like Chatswood or even the nearby Northbridge Plaza. However, some general objectives in the plan can be used to assess the strategic contribution of the proposal to meeting the plan.

> *Development will need to better capitalise on air rights rather than making space by expanding the urban footprint. This will not only require good quality apartment buildings and commercial towers but mixed-use buildings including schools, roof top gardens, vertical farms and innovative energy sources.* [33]

It is hard to conceive a better fit between objective and proposal than that described in this quote from the plan. It is a mixed-use building, utilising the air space above the existing local shopping centre. It also happens to be within 30 minutes travel of two major centres, Chatswood and North Sydney, another objective of the plan.

Of the benefits of mixed-use development, the plan notes:

> *Mixed-use neighbourhoods close to centres and public transport improve the opportunity for people to walk and cycle to schools, local shops and services. Enhancing the safety, convenience and accessibility of walking and cycling trips has many benefits including healthier people, more successful businesses and centres and reduced traffic congestion.* [34]

The plan also described ideal growth management in terms of community engagement:

> *Managing growth and change requires meaningful engagement with local communities. Understanding and building on a community's strengths, networks and potential are critical. Infrastructure and services for socially connected communities include:*
>
> - *playgrounds, libraries, education facilities and active street life*
> - *farmers' markets, eat streets, street verges and community gardens*
> - *creative arts centres, theatres, live music and co-working spaces …* [35]

The process undertaken thus far to develop the project design coincides with the ideal process noted by the authors of the plan – refer to the report on the community engagement undertaken by the proponent thus far.

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[33] https://www.greater.sydney/metropolis-of-three-cities/past-present-and-future

[34] https://www.greater.sydney/metropolis-of-three-cities/liveability/city-people/communities-are-healthy-resilient-and-socially

[35] https://www.greater.sydney/metropolis-of-three-cities/liveability/city-people/communities-are-healthy-resilient-and-socially

To the considerable extent that the proposal meets the objectives of the plan, it is strategically aligned with the plan for the Greater Sydney Region.

5.3.2 The Future Transport Strategy 2056

The Future Transport Strategy 2056 covers a long-term strategy for the whole of the State. No specific provisions apply to the Willoughby LGA. However, some general objectives are relevant to a development of the scale of the proposal.

> *Our approach to technology-enabled mobility is underpinned by the Future Transport Technology Roadmap, delivered in 2016, which set out five strategies: …*
>
> *2. Transform the mass transit network: …and attract customers from private car use* [36]

The strategy is focussed on technological solutions to transform public and private transport and notes

> *Future directions to investigate*
>
> *The NSW Government has an objective to achieve net-zero emissions by 2050.*
>
> - *Encourage a shift from private car use to public transport* [37]

To the extent that the proposal locates 53 apartments over a local shopping village adjoining significant bus routes (203 and 275) serving Chatswood regional centre and the North Sydney CBD, the proposal can be seen to align with the Strategy's objective of encouraging a shift from private to public transport. The proposal will not remove the need for residents of the suburb or the project itself to use cars. However, it will reduce the need for many shopping trips or shorten local shopping trips.

5.3.3 North District Plan (2018)

The *North District Plan* provides a 20-year plan to manage growth and achieve the 40-year vision, while it aims to enhance Greater Sydney's liveability, productivity and sustainability into the future. The district plan has been prepared to give effect to *A Metropolis of Three Cities – Greater Sydney Region Plan* at a district level through focus on the four areas outlined below.

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[36] Future Transport Strategy, 2056, 2018, p. 9.

[37] Ibid, p. 142.

Consistency with North District Plan (2018)		
Priority	**Objective**	**Consistency**
Infrastructure and Collaboration		
A city supported by infrastructure N1. Planning for a city supported by infrastructure.	O2. Infrastructure aligns with forecast growth… O3. Infrastructure adapts to meet future needs. O4. Infrastructure use is optimised.	The site is serviced by all the necessary civic infrastructure that can support the additional demand generated by the proposed development. The 'assessment of civic services' and the traffic assessment reports that accompany this application show the additional demand can be captured by the current capacity of the system.
A collaborative city N2. Working through collaboration.	O5. Benefits of growth realised by collaboration of government, community and business.	The current proposal is the result of an extensive and long community consultation process that included Willoughby Council officials.
Liveability		
A city for people N3. Providing services and social infrastructure to meet people's changing needs.	O6. Services and infrastructure meet communities' changing needs.	Considering the majority of local residents and future users of the centre are or will be seniors, the design and planning of the proposal have been directed towards responding to their needs. These strategies include accessible sun oriented outdoor spaces, provision of on-site parking, and the possibility of making half of all units adaptable.
N4. Fostering healthy, creative, culturally rich and socially connected communities.	O7. Communities are healthy, resilient and socially connected. O8. Greater Sydney's communities are culturally rich with diverse neighbourhoods. O9 Greater Sydney celebrates the arts and supports creative industries and innovation.	To the extent that the renewed centre acts as a social hub for residents of Castlecrag, its impact on the cultural life of the suburb will be significant. The project will create a new public open space on Edinburgh Road which is big enough to stage community events such as a school fair or art show, etc.
Housing the city	O10. Greater housing supply.	The proposed 53 new units including 50% capable of being adaptable and 2 affordable

Consistency with North District Plan (2018)		
Priority	**Objective**	**Consistency**
N5. Providing housing supply, choice and affordability with access to jobs, services and public transport.	O11. Housing is more diverse and affordable.	housing units, will assist the planned housing supply for the suburb.
A city of great places N6. Creating and renewing great places and local centres and respecting the District's heritage.	O12. Great places that bring people together. O13. Environmental heritage is identified, conserved and enhanced.	Social and cultural aspects of the proposal include the public plaza along the front boundary of the site that can accommodate community activity are discussed above. The proposal acknowledges and respects Walter Burley Griffin's legacy for the Castlecrag suburb by prioritising landscaping and applying his approach to the design of the building.
Productivity		
A well-connected city N12. Delivering integrated land use and transport planning and a 30-minute city.	O14. A Metropolis of Three Cities – integrated land use and transport creates walkable and 30-minute cities.	The site is serviced by two bus stops, one at its northern frontage and the other less than 30m north along Eastern Valley Way. Residents and visitors can access frequent bus services to Chatswood and the City from these two stops.
N14. Leveraging inter-regional transport connections.	O16. Freight and logistics network is competitive and efficient. O17. Regional connectivity is enhanced.	Not relevant.
Jobs and skills for the city N7. Growing a stronger and more competitive Harbour CBD	O18. Harbour CBD is stronger and more competitive.	Not relevant.
N8. Eastern Economic Corridor is better connected and more competitive	O15. The Eastern, GPOP and Western economic corridor are better connected and more competitive.	Not relevant.

Consistency with North District Plan (2018)		
Priority	**Objective**	**Consistency**
N10. Growing investment, business opportunities and jobs in strategic centres	O22. Investment and business activity in centres.	The site is not a strategic centre, but a local centre. The proposal will maintain job opportunities on site as discussed under section 4.9 of this report.
N13. Supporting growth of targeted industry sectors.	O24. Economic sectors are targeted for success.	Not relevant to the scale of the proposal or its location.
Sustainability		
A city its landscape N15. Protecting and improving the health and enjoyment of Sydney Harbour and the District's waterways	O25. The coast and waterways are protected and healthier.	Separated by 200m from Sailors Bay Creek by residential development, the proposal is not likely to affect the waterway. Rainwater recycling and natural stormwater filtration through landscaping are part of the proposal.
N16. Protecting and enhancing bushland and biodiversity	O27. Biodiversity is protected, urban bushland and remnant vegetation is enhanced.	In 1978 the whole site was cleared and no bushland or native vegetation remains.
N17. Protecting and enhancing scenic and cultural landscapes	O28. Scenic and cultural landscapes are protected.	The Griffin legacy cultural landscape is preserved by the materials chosen for the proposal as well as the landscape design.
N19. Increasing urban tree canopy cover and delivering Green Grid connections	O30. Urban tree canopy cover is increased. O32. The Green Grid links parks, open spaces, bushland and walking and cycling paths.	The area of landscaped open space at ground, lower ground will be significantly increased by the proposed scheme and will provide greater opportunities for walking through site. The site has been designed to reduce the urban heat island effect by extensive landscaping.
N20. Delivering high quality open space	O31. Public open space is accessible. Protected and enhanced.	To cater for the aging population of Castlecrag, accessibility of the significantly expanded open space area has been prioritised. The open space areas located within the site will be well lit and monitored.

Consistency with North District Plan (2018)		
Priority	**Objective**	**Consistency**
An efficient city N21. Reducing carbon emissions and managing energy, water and waste efficiently	O33. A low-carbon city contributes to net-zero emissions by 2050 and mitigates climate change. O34. Energy and water flows are captured, used and re-used. O35. More waste is re-used and recycled to support the development of a circular economy.	The proposal satisfies the sustainability benchmarks through the use of renewable energy sources (solar panels on the roof) and implementation of rainwater recycling system for irrigation purposes. Waste generation and transfer from the site will be managed and monitored through compliance with the waste management regulations and policies established by Council.
A resilient city N22. Adapting to the impacts of urban and natural hazards and climate change.	O36. People and places adapt to climate change and future shocks and stresses. O37. Exposure to natural and urban hazards is reduced. O38. Heatwaves and extreme heat are managed.	The site is not nominated as bushfire prone land and is not affected by flooding. However, the extensive landscaping and greenery proposed for the site will reduce the potential urban heat effect.

5.4 Is the planning proposal consistent with the council's local strategy or other local strategic plan?

This planning proposal is consistent with the relevant objectives of the following plans:

- ***Willoughby Economic Development Study***, May 2016, SGS Economics and Planning
- ***Our Future Willoughby 2028, Community Strategic Plan,*** June 2018, Willoughby Council
- ***Draft Willoughby Housing Strategy To 2036,*** February 2019, Willoughby City Council
- ***Willoughby Draft Local Centres Strategy to 2036,*** February 2019, Willoughby City Council
- ***Adopted Willoughby Local Centres Strategy to 2036,*** December 2019, Willoughby City Council
- ***Willoughby City Local Strategic Planning Statement*** **(LSPS)**, March 2020, Willoughby City Council

These plans and relevant objectives are further discussed in the following sections.

5.4.1 Willoughby Economic Development Study

The Willoughby Economic Development Study, published in 2016, was prepared for Council to report on the commercial, retail and industrial precincts in the LGA. The report noted Castlecrag's small village

centre and examined the current floorspace profile, floorspace projections and included an analysis of the potential capacity and calculated a demand gap in employment floor space for the centre.

In general, the objectives of the study are supportive of the proposal.

One study objective was to *provide new opportunities for retail and employment floorspace in the smaller retail centres*[38], and the following options were suggested:

1. *Ensure employment floorspace within current FSR envelope.*
2. *Increase overall FSR and quarantine a share for employment.*
3. *Expand footprint and quarantine a share for employment.*
4. *Establish new or expand existing centres (particularly where options 1, 2 and 3 are not possible in any centre where employment floorspace is required).*[39]

The Quadrangle site was purchased in 2017 by the proponent which has found itself owning a declining centre requiring rent discounts to maintain a reasonable level of occupancy. While the study recommended an additional 1,073 sqm of retail floorspace within Castlecrag to 2031"[40], the proponent does not believe that such additional floorspace is viable.

The proposal reduces commercial space from 2,552m^2 to 1,740m^2, with employment is estimated to be about 90 persons plus daily contractors which may increase the total to 15 to service the apartments above. Options 1-3 above are not viable leaving Option 4 to redirect additional employment floorspace elsewhere, possibly Northbridge Plaza which is about ten times the size of the Castlecrag local centre.

The Strategy reiterates the importance of the Small Village Centres in terms of accommodating for the local centres' changing needs:

> *The Village and Small Village centres highlighted (Northbridge, Artarmon, Castlecrag, Victoria Ave/ Penshurst St, Penshurst St/Mowbray Rd) should be a particular focus though the highlighted neighbourhood centres are also likely to provide opportunities for 'overflow' or revitalisation and should also be considered.*[41]

The proposal conforms with the recommended changes to the existing local centres for accommodating the future needs of the Willoughby LGA. Maximum retail employment in the Castlecrag centre post 2018 was 102 with 12 additional employed daily contractors such as cleaners. Due to deteriorating conditions within the centre and the open knowledge that redevelopment was being sought, only 39 employees worked in businesses paying a full market rent. 63 employees worked in businesses that were

[38] Willoughby Economic Development Study, 2016, p. 103.

[39] Ibid, p. 103.

[40] Ibid, p. 135.

[41] Ibid, p. 71.

supported to some degree by the centre's owners. Renewal of the centre, but not expansion of retail floorspace, is the only path to maintain viable retail uses on the site.

5.4.2 Our Future Willoughby 2028 – Community Strategic Plan

The Community Strategic Plan (CSP) represents the highest level of strategic planning undertaken by Council under the integrated planning and reporting framework. It is the key document that expresses the main priorities and aspirations of the community and sets out clear strategies to achieve this vision of the future over a 10-year period and beyond. The Our Future Willoughby 2028 CSP outlines five key strategic outcomes and *priority areas for the next 10 years in order to achieve the community's vision of a "diverse, liveable and prosperous City"*[42]:

Consistency with Our Future Willoughby 2028 - Community Strategic Plan	
Community Priorities	**Consistency**
Outcome 1 – A City that is green	
1.1 Create and enhance green spaces.	Design of the proposal increases green spaces by creating a 750sqm plaza on Edinburgh Road and providing a through-site link to The Postern which gives views to the surrounding landscape suburb.
1.2 Promote sustainable lifestyles and practices.	Sustainable lifestyle is encouraged through: 01. minimising the time of travel for future residents and locals by providing supermarket, shops and other local services on site, 02. producing renewable energy by installing solar panels on the roof, 03. recycling rainwater for irrigation purposes.
1.3 Enhance, protect and respect waterways, bushland, nature, wildlife and ecological systems.	To the extent possible on a fully disturbed site, the proposal follows the Griffin legacy of integration with the bushland of Castlecrag through a carefully designed landscape design highlighting natural plantings and the use of materials compatible with the architecture of the Griffins. By containing all environmental impacts to the site, no impacts beyond the site are expected.
1.4 Reduce energy, water and resource waste and encourage reuse and recycling.	The use of water and energy will be controlled and enhanced through compliance with the requirements of SEPP BASIX and the Section J of the NCC for the residential and commercial sections of the development. Use of renewable energy and rainwater harvesting are noted above. Waste generation and transfer from the site will be managed and monitored through compliance with the waste management regulations established by Council.

[42] Willoughby LSPS, 2020, p. 24.

Consistency with Our Future Willoughby 2028 - Community Strategic Plan	
Community Priorities	**Consistency**
1.5 Reduce carbon and greenhouse gas emissions.	The use of new building materials, better thermal insulation methods and provision of natural cross ventilation and access to sunlight will reduce emissions caused by excessive use of energy for thermal comfort. Generating clean energy through installation of solar panels on the roof will further reduce emissions.
Outcome 2 – A City that is connected and inclusive	
2.1 Enhance transport choices and connections throughout the City.	The site is serviced by a major bus service along the Eastern Valley Way that connects the site to Chatswood and North Sydney. The site provides a walking path through the middle of the site connecting north and south, also allows for cycling within and through the site.
2.2 Respect and celebrate our history and heritage sites.	"The site forms a small but vital shopping precinct for residents of the Castlecrag Peninsula and also acts as a social hub. The latter is an important function that ties back into the Griffins' ideals of community. It is generally considered that Castlecrag starts at the eastern side of the intersection of the Eastern Valley Way and Edinburgh Road. As such the site is integral to Castlecrag and the heritage significance ascribed to it"[43] "It clearly recognises the design principles of preservation and conservation of landscape and the integration of built form and the landscape in the work of the Griffins in Castlecrag. The existing trees to the street are retained. Densely planted landscape terraces and colonnades integrate landscape and built form and soften the boundary between public and private space in line with the Griffin's vision for the area"[44].
2.3 Celebrate and encourage our diversity.	The provision of a variety of housing choices, a new public plaza and the modern community facilities on site will encourage a larger group of visitors.
2.4 Reduce parking and traffic congestion.	Considering the ageing local population and the hilly nature of the area use of personal vehicles will remain the main means of travel in the area. The proposed on-site parking satisfies the Council minimum requirements and the traffic generation due to the proposed new residential units and retail spaces will be insignificant. Refer to the traffic report submitted with the proposal.

[43] Heritage Impact Statement Weir Philips Heritage and Planning, 2021, p. 29.

[44] Ibid, p. 35.

Consistency with Our Future Willoughby 2028 - Community Strategic Plan	
Community Priorities	**Consistency**
2.5 Create family friendly neighbourhoods that connect people.	One of the aims of the project is to encourage social interaction by means of the proposed new open space areas that are publicly accessible and which include outdoor café/restaurant seating. The north-south through site pedestrian connection invites neighbouring residents to visit the village for shopping.
2.6 Improve access to digital services in public places.	Will be considered at the later stages of the project (DA and CC).
2.7 Promote accessible services for the community.	Accessibility has been considered in the design which is capable of disabled access throughout but not including the cross-site pathway to The Postern. 50% of the units are designed to be capable of conversion to accessible housing units.
Outcome 3 – A City that is liveable	
3.1 Foster feelings of safety, security and cleanliness.	The design of the proposal maximises passive surveillance of the site boundaries as follows: • Along the north boundary, all the retail tenancies incorporate full height glass facades • Positioning the public plaza to the north opens up the development • The through site link turns the middle of the site into a public place that people to walk there The site will be managed by a future body corporate which will ensure security and cleanliness.
3.2 Create recreation spaces for all.	The proposal maximises the chances of social interaction by delivering larger open space areas, new connections and amenities surrounding the main plaza. The communal open space areas on the roof provide a facility for residents to meet and use for recreational purposes. The level of amenities provided for recreational purposes matches the size and scale of the proposed development.
3.3 Promote an active and healthy lifestyle.	Provision of extensive open space areas at different levels of the development and a cross site connection to The Postern encourage residents to use outdoor areas.
3.4 Create desirable places to be and enjoy.	As above.

Consistency with Our Future Willoughby 2028 - Community Strategic Plan	
Community Priorities	**Consistency**
3.6 Activate local spaces in creative ways.	Discussed above and throughout report. See architectural drawings for more details.
Outcome 4 – A City that is prosperous and vibrant	
4.1 Facilitate the development of all businesses.	Retail businesses such as a local supermarket, shops, cafes, restaurants and similar uses that benefit residents and the local community and fit the scale and size of the proposal are part of the new development. Business development is the key driver of the proposal overall.
4.2 Build and support a night-time economy.	The variety of cafes and restaurants located along the northern boundary of the site, facing Edinburgh Road and the public plaza will revitalise the night-time economy.
4.3 Create memorable food destinations.	As above.
4.4 Attract visitors and promote local, destination-based tourism.	Castlecrag is a residential suburb with heritage significance due to Griffin design legacy. However, the suburb is not a tourist destination and the proposal does not aim to change the character of the area by turning the site into a tourist destination. Willoughby has plenty of locations that can contribute to this purpose.
4.5 Diversify our economy including creative and innovative industries.	The proposal provides 1,740 sqm of retail area, a reduction from the current but not viable 2,500 sqm. Employment in the centre is expected to be about 90 plus service contractors who will increase to about 15 to cater for the 53 apartments above.
4.6 Facilitate the viability and vibrancy of our village centres.	Addressed in the above sections of this table and section 4.4.1 Willoughby LSPS.
Outcome 5 – A City that is effective and accountable	
5.1 Be honest, transparent and accountable in all that we do.	The planning proposal is the result of an extensive, three year long, voluntary public consultation process. The whole process from initial design development to design excellence competition stage and finalisation of the proposal have been presented to, and negotiated with, the local community and Council. The feedback provided by different local community groups has been incorporated in the design of the project.

Consistency with Our Future Willoughby 2028 - Community Strategic Plan	
Community Priorities	**Consistency**
5.2 Demonstrate leadership and advocacy for local priorities.	Local priorities are reflected in the design of the proposal through an iterative design, presentation, modification process. The architectural scheme submitted with this proposal is the result of extensive reviews, amendments and improvements in accordance with the feedback received from the local residents and local organisations. The details of the community consultation processes are recorded and submitted with this application[45].
5.3 Balance the creation of new public assets with the upgrade of existing public assets.	Public assets are not involved though the proposal provides new and extensive public access to a private asset.
5.4 Anticipate and respond to changing community and customer needs.	Provision of 50% adaptable units, accessible paths within the open space areas of the site, amenities such as shops and a supermarket are planned to accommodate the needs of the community.
5.5 Make it easy for citizens to participate in decision making.	As above, the community have been involved in all stages of design and planning of the proposal.

5.4.3 Draft Willoughby Housing Strategy to 2036

The Draft Willoughby Housing Strategy to 2036, published in February 2019, presents the "dialogue between residents, businesses and Council"[46]. In doing so, Council has recognised the needs of the community and utilised this information to forecast the future housing demands in the area. The Strategy investigates the capacity of the existing land use zones for delivering expected housing demand and the potential rezoning of local centres to contribute to this purpose. The Strategy forecasts a population growth, in the Willoughby LGA of between 6,000- 6,700 people by 2036[47], translating to the need for 90 additional dwellings in Castlecrag[48].

[45] Elton Consulting, Community Engagement Report, 2020. p 49.

[46] Draft Willoughby Housing Strategy to 2036, 2019, p. 64.

[47] Ibid, p. 51.

[48] Ibid, p. 51.

The Strategy incorporates community feedback collected during the consultation process. The feedback indicates a demand for units/separate dwellings in order to accommodate the demands of both local aging population, who plan to downsize, and the young couples without dependants.[49] The forecast for household types indicates the greatest increases in different demographic groups between years 2016 and 2036 will be couples without dependants (+2,234) followed by lone person families (+2,351).
The forecast also indicates an increase of couples with families (+1,156)[50], further demonstrating the need for an increase in all housing types:

> *Medium density housing (townhouses and low rise apartments) should be planned in accessible locations close to transport and walkable to services and amenities including open space. Local centres are considered appropriate for this scale of development.*[51]

The proposal is located along a transport corridor serviced by two bus routes along Edinburgh Road and Eastern Valley Way. The development provides considerable open space and ensures good accessibility. The draft housing strategy supports up to five storey high mixed-use buildings, including shop top housing, at The Quadrangle site[52].

5.4.4 Draft Willoughby Local Centres Strategy to 2036

The draft Willoughby Local Centres Strategy aims to promote a network of thriving, attractive and distinctive village centres throughout the Council area. When finalised in the form of LEP amendments, it will provide future planning controls and public domain improvements for eight local centres.[53]

It is informed by: The Directions and Objectives set out in the Greater Sydney Region Plan, North District Plan, the Willoughby Community Strategic Plan and Willoughby Local Centres and Housing Position Statements[54];

Strengths[55]

- Distinct heritage character
- Range of dining venues
- Undercover protection through street awnings
- Amenity provided by the small supermarket located within the Quadrangle
- Streetscape is attractive with a landscape character

[49] Ibid, p. 31.
[50] Ibid, p. 31.
[51] Ibid, p. 31.
[52] Ibid, p. 47.
[53] Ibid, p. 3.
[54] Ibid, p. 3.
[55] Ibid, p. 20.

- Retail amenity
- Fine grain built form of existing shopfronts on Edinburgh Rd
- Mature trees within and around the centre contribute to the visual aesthetics of the centre
- Parking both on street and off street supports the activity of the centre
- Potential views to the south of the centre

Feedback on scenarios[56]

The main issues identified from community feedback are summarised as follows:

- Griffin shops subdivision and the retention of the fabric of Griffin Centre is important
- There are traffic constraints into and out of the Castlecrag peninsula
- Concern regarding a proposal by the owner of Quadrangle Shopping Centre
- Concern that growth could destroy the unique "feel" of the centre
- More public open space is needed
- Careful traffic management is required

Directions[57]

Key suggestions

The following ideas were developed by the consultants in relation to built form, open space, public domain, and movement. These ideas established strategic principles for how the Centre could grow.

- Consider the redevelopment of the Quadrangle
- Retain existing mature tree canopy
- Investigate potential to redevelop residential properties on Chandler Lane
- Improve pedestrian and cycling conditions
- Consider the redevelopment potential of the Griffin Centre and the office block at 3 The Postern
- Consider future development of adjacent residential properties on Edinburgh Rd

This fourth scenario was developed based on public, stakeholder and Council feedback on three earlier scenarios previously exhibited (see page 9), and was offered for further discussion. General recommendations included the following[58]:

- Retain existing B1 neighbourhood Centre and R3 Medium Density residential for the centre.
- Introduce a minimum non-residential FSR control in the B1 zone.
- Introduce an active ground floor frontage control in the B1 zone.
- Concentrate increased height to the south of Edinburgh Rd to minimise solar access and amenity impacts.

[56] Ibid, p. 21.

[57] Ibid, p. 21.

[58] Ibid, p. 22.

Key Recommendations (LEP)[59]
(Numbering below refers to the above preferred scenario diagram)

1. Increase heights up to 5 storeys with an FSR up to 1.6:1 on The Quadrangle site. An FSR of 1.8:1 could be considered if more economically feasible and allow a future development to utilise the topography of The Quadrangle site without adversely impacting the streetscape and scale of the centre.

Key Recommendations (DCP)[60]

7. Minimum 3m upper level setback (2nd storey) for shop top housing.
8. Provide a new publicly accessible plaza within the Quadrangle site with a minimum width of 18m and clear views to the south.
9. Maintain direct pedestrian through site links from the Quadrangle site to The Postern.
10. Maintain full sun access along the length of the footpath on the southern side of Edinburgh Rd between 9am and 3pm during the winter solstice.
11. Any redevelopment of the Quadrangle site is to retain the mature trees at the rear of the site.

[59] Ibid, p. 22.

[60] Ibid, p. 22 & 23.

Indicative Master Plan for Castlecrag



Key features

1. Retention of the Griffin Centre and ground floor facade, roof line and active frontage. Additional shop top housing above.
2. A new park/green space
3. Extension of the curved facade of the Griffin Centre to reinforce The Postern.
4. Pedestrian links through to the Quadrangle site.
5. Mature boundary trees retained
6. A new plaza as part of the Quadrangle development with good solar access and views south through the tree tops.
7. Up to 5 storeys with shop top housing at the Quadrangle site
8. Up to 3 storeys with shop top housing whilst maintaining small scale shop fronts to Edinburgh Road.
9. Retain surface car parking
10. Accommodate RMS intersection improvements
11. Opportunity for kerb blisters to improve mid-block crossing amenity
12. Threshold and kerb blister treatments to improve pedestrian amenity
13. Potential for terrace/row housing with laneway access
14. Potential access to Quadrangle basement
15. Potential for a new left-out (or service) access from the Quadrangle.

Figure 9 – Indicative Master Plan for Castlecrag[61]

[61] Draft Willoughby Local Centres Strategy to 2036, 2019, p. 23.

Yield Analysis The study by SGS projected that the Castlecrag centre would require an additional 1,973sqm of employment space by 2041. A yield of an additional 2,139sqm of non-residential floor space and 8,120sqm of residential floor space or approximately 90 dwellings was envisaged for Castlecrag.[62]

The proponent indicated to Council general support for Scenario 4 of the draft study due to the closeness of study proposed height and FSR with those figures then sought for the economic viability of the proposed redevelopment. The current proposal is meets the FSR and building height in the adopted strategy.

	Storey height above Edinburgh Road	FSR
Draft strategy	5	1.8:1
Proponent at the time	5	2.2:1
Current proposal	3	1.8:1

However, the declining retail situation of the centre, with below market value rents, has meant that the retail floorspace needs to be reduced.

5.4.5 Adopted Willoughby Local Centres Strategy 2036

This final Local Centres Strategy allegedly took into consideration the feedback received with respect to the Preferred Scenario and Masterplan for each of the eight Local Centres.[63] In spite of detailed representations by the proponent, the height of The Quadrangle shown on the indicative urban design drawings was reduced from five storeys above Edinburgh Road to three.

[62] Ibid, p. 24.

[63] Adopted Willoughby Local Centres Strategy to 2036, 2019, p. 13.

INDICATIVE SCALE FOR CASTLECRAG GROWTH



Shadows shown at 12pm on 21st June

Floor space summary

Building Use	Existing GFA (sqm)	Potential GFA (sqm)	Increase GFA (sqm)	Increase GFA (%)
Residential	3,593	10,248	6,654	185%
Non-Residential	4,760	6,287	1,527	32%
Total	8,353	16,535	8,181	98%



Key Recommendations (LEP)

(Numbering below refers to the above scenario diagram)

1. Increase heights up to 4 storeys on Eastern Valley Way and up to 3 storeys above Edinburgh Road with an FSR up to 1.6:1 on the Quadrangle site. An FSR could be considered to 1.8:1 with an additional storey below the Edinburgh Road frontage to utilise the topography of the site without adversely impacting the streetscape and scale of the centre.
2. Retain existing controls for the Griffin Centre and identify as a heritage item.
3. Retain heights up to 3 storeys, with an FSR of 1.6:1 in the B1 zone north of Edinburgh Road.
4. Retain B1 zoning for The Postern, with a height limit of up 3 storeys with an FSR of 1.1:1.
5. Retain R3 zoning and FSR of 0.7:1 for properties in Edinburgh Road (95-103) and allow amalgamation for 2 developed lots.
6. Rezone the Council owned car park adjacent to the Griffin Centre to RE1 Public Open Space.

Key Recommendations (DCP)

7. Minimum 3m upper level setback (2nd storey) for shop top housing.
   Provide a new publicly accessible open space within the Quadrangle site relating to the Edinburgh Rd frontage and achieving good solar access. This may be achieved by providing a setback in the order of 3.5 - 4m along the frontage of the site.
8. Maintain direct pedestrian through site links from the Quadrangle site to the The Postern
9. Maintain full sun access along the length of the footpath on the southern side of Edinburgh Road between 9am and 3pm during the winter solstice.
10. Any redevelopment of the Quadrangle site is to retain the mature trees at the front and rear of the site.
11. Green entry point.
12. Rooftop garden.

Figure 10 – Indicative scale for Castlecrag growth[64]

[64] Ibid, p. 27.

INDICATIVE MASTER PLAN FOR CASTLECRAG

This indicative Master Plan for Castlecrag details the key features for growth and shows how development might be achieved alongside other opportunities for public domain improvements in the centre.



Key features

1. Retention of the Griffin Centre and ground floor facade, roof line and active frontage. Identify as a heritage item.
2. A new park/green space
3. Extension of the curved facade of the Griffin Centre to reinforce The Postern, maximum height of 3 storeys.
4. Pedestrian links through to the Quadrangle site.
5. Mature boundary trees retained
6. A new plaza as part of the Quadrangle development with good solar access.
7. Shop top housing on the Quadrangle site, 4 storeys on Eastern Valley Way and up to 3 storeys above Edinburgh Road.
8. Up to 3 storeys with shop top housing whilst maintaining small scale shop fronts to Edinburgh Road.
9. Retain surface car parking
10. Opportunity for kerb blisters to improve mid-block crossing amenity
11. Threshold and kerb blister treatments to improve pedestrian amenity
12. Rooftop garden
13. Potential access to Quadrangle basement
14. Potential for a new left-out (or service) access from the Quadrangle.
15. Create a green entry point at the intersection of Eastern Valley Way and Edinburgh Road.

Figure 11 – Indicative master plan for Castlecrag[65]

The study by SGS projected that the Castlecrag centre would require an additional 1,973sqm of employment space by 2041. The projection was based on a Castlecrag share of multi-centre economic forecast. That may still be possible in the future but the current retail situation of The Quadrangle shopping centre does not support an increase in commercial floorspace.

[65] Ibid, p. 28.

In response to the adopted strategy, which followed by the design excellence competition for the site by three months, the proponent commissioned the competition winning firm, FJMT, to meet the reduced FSR and storey height. The current proposal, for a building of three storey height above Edinburgh Road and FSR 1.8:1 is the response to the strategy:

	Storey height above Edinburgh Road	FSR
Adopted strategy	3	1.8:1
Current proposal	3	1.8:1

5.4.6 Willoughby City Local Strategic Planning Statement (LSPS)

The Willoughby LSPS 2020 outlines a 20-year vision for actions and priorities that need to be implemented through the land use planning regime within the LGA. The plan addresses the current and future socio-economic demands of the community and the environmental values of Willoughby that need to be acknowledged and maintained within a defined timeframe. The LSPS establishes the key directions for the proper management of the changes that are necessary to satisfy regional, metropolitan and local strategies and deliver balanced outcomes for the community and the environment.

The proposal is in keeping with the aims and objectives of the statement, one of which is *We recognise the past while creating new liveable places, strong communities and homes for the future.*[66]

The following tables contain assessments of the Planning Proposal against the directions, targets, priorities and actions set by the Willoughby LSPS 2020.

Consistency of the proposal with Willoughby Local Strategic Planning Statement (LSPS) 2020			
Key Directions and Priorities	**Indicator**	**Baseline and Target**	**Consistency**
A LIVEABLE CITY			
Housing the city 1. Increasing housing diversity to cater to families, the aging population, diverse household types and key workers	Housing completions overall	Baseline: 29,993 existing dwellings (2016). Target: Up to 6,700 new dwellings by 2036 to be established in line with the Draft Housing Strategy	The proposed development provides a total of 53 new dwellings containing a mix of 1, 2, and 3-bedroom apartments. The proposal contributes to the provision of 6,700 new dwellings through the development of a mixed-use local centre in Castlecrag that has been identified as a (minor) focus area.[67] The proposal is consistent with the expected outcome for *Focus*

[66] Willoughby LSPS, 2020, p. 13.

[67] Ibid, p. 41.

Consistency of the proposal with Willoughby Local Strategic Planning Statement (LSPS) 2020			
Key Directions and Priorities	**Indicator**	**Baseline and Target**	**Consistency**
			area 3 under the LSPS that encourages the delivery of 1500 shop top housing units within the nominated local centres, including Castlecrag, through amendment of the existing planning controls.[68] The proposal contains a medium density residential component in the form of shop top housing. The proposed mix of 1, 2- and 3-bedroom units responds to the estimated reduction in the number of persons per household from 2.65 to 2.53 between 2016-2036.[69] The Planning Proposal provides modern housing choices above a modern shopping village that provides easy and quick access to local services and retail tenancies for families and ageing population.
	Medium density housing increased as a component to provide appropriate housing for ageing residents and for new families.	Baseline: 4,210 of total dwellings in 2016 medium density. Target: Increase number of medium density dwellings as component of WCC housing by 2036.	
2. Increase the supply of affordable housing.	Increase the number of affordable housing (AH) units provided	Baseline: AH 4% of GFA with housing uplift. Target: AH 7-10% GFA with new housing uplift by 2036.	The site is not nominated as a Special Provisions Area under Cl.6.8 of the WLEP. Provision of affordable housing units on site is not required by Council. However, the proposal provides two of 53 (3.8%) dwellings as affordable housing.

[68] Ibid, p. 41.

[69] Ibid, p. 39.

Consistency of the proposal with Willoughby Local Strategic Planning Statement (LSPS) 2020			
Key Directions and Priorities	**Indicator**	**Baseline and Target**	**Consistency**
A city for people 3. Enhancing walking and cycling connections, Willoughby's urban areas, local centres and landscape features.	Increase in number of resident journeys to work that do not use a car.	Baseline: 49% in 2016 of residents Target: More than 50% by 2021 and 55% by 2036.	The site is well served by existing bus routes which make use of public transport as convenient as possible. Location of essential convenience shops and social hub facilities such as cafes and restaurants, below 53 new dwellings, further contributes to an incentive to avoid or reduce car dependency for the local centre. Creation of a well-managed and secure cross site link to The Postern should also encourage walking rather than car use.
	Extend network of walking and cycling paths and links.	Baseline: to be established. Target: to be established.	
4. Ensuring that social infrastructure caters to the population's changing needs and improve the public domain to foster healthy and connected communities.	Planning for local infrastructure is up to date; provision is as per the relevant Local Infrastructure Plan and Open Space Review currently underway.	Baseline: Northern Sydney Social Infrastructure Strategy to be applied. Target: Plan reviewed every five years; Additional provision of social infrastructure having regard to work being undertaken on needs across the northern Sydney region.	The proposed development provides the necessary social infrastructure suitable for its size and the needs of the community including a local supermarket that provides fresh food produce, cafes and restaurants for social interaction. In relation to the improvement of the public domain, the proposed new landscaped plaza along the northern boundary of the site, through site link that enables pedestrian access to The Postern and extensive landscaping significantly improve the quality of the existing publicly accessible domain.
5. Respect and celebrate our history, heritage sites and attractions of Willoughby City, including more	Maintain heritage protection through regular heritage reviews.	Baseline: Undertake regular heritage reviews. Target: Complete a heritage review every 4 years.	The Quadrangle shopping village underpins the strong heritage character of the area by celebrating the visual connection of Griffin's vision for Castlecrag, which was to share access to the landscape and communal space with gentle privacy transitions to

Consistency of the proposal with Willoughby Local Strategic Planning Statement (LSPS) 2020			
Key Directions and Priorities	**Indicator**	**Baseline and Target**	**Consistency**
dwellings close to open space.	Proportion of residential lots in close proximity to open space.	Baseline: Proportion of dwellings in walkable distance to open space to be established. Target: Increase proportion.	create a true community.[70] While the site is not a heritage item, it adjoins a heritage conservation area to the east. The design of the proposed development, therefore, echoes the design principles of Griffin's works. The development reflects Griffin's design philosophy by incorporating nature and the unique landscape throughout the development, increasing the proportion of communal open space to enhance the amenity of dwellings and compatibility of the development with Castlecrag in general.[71]
6. Facilitate the viability and vibrancy of our strategic and local centres.	Increased retail spending captured in strategic and local centres.	Baseline and target to be established in line with the Local Centres Strategy.	The rental income generated from the current retail tenancies has fallen behind comparable centres and many of the tenancies have been subsidised by discounted rents due to lesser numbers of customers. The proposed new retail tenancies will benefit from the sun filled and landscaped plaza along the front boundary that will attract not only the residents but the general community of Castlecrag. The high quality of design and variety of retail and services delivered by the new shopping village will make up in attractiveness and convenience what it lacks in scale. Castlecrag cannot be a competitor to Northbridge Plaza which is ten times larger.

[70] FJMT Competition Scheme, 2019, p. 15.

[71] Heritage 21, Walter Burley Griffin's Legacy, 2019, p. 41.

Consistency of the proposal with Willoughby Local Strategic Planning Statement (LSPS) 2020			
Key Directions and Priorities	**Indicator**	**Baseline and Target**	**Consistency**
A PRODUCTIVE CITY			
A well-connected city 7. Developing Chatswood's role as a true transport hub for Willoughby City and the North Shore.	Increase in people living and working in Willoughby City LGA.	Baseline: 27% in 2016 Target: 30% in 2026 and 2036 to be set.	Does not apply to Castlecrag.
	Increase in bus and train passengers utilising Chatswood	Baseline: to be set in consultation with TfNSW. Target: to be discussed with TfNSW.	
Facilitate the viability and…			Addressed above.
Jobs and skills for the city 9. Developing Chatswood as …			Does not apply to Castlecrag.
10. Protecting the role of Willoughby's industrial lands as urban service hubs…	Retain share of urban services employment in North District… No loss of industrial zoned land in Artarmon and…		Does not apply to Castlecrag.
11. Supporting St Leonards …	St Leonards high end targets…		Does not apply to Castlecrag.
A SUSTAINABLE CITY			
A city in its landscape 12. Enhancing the health of Willoughby's waterways.	No net decline in the Local Waterway Health Report Card	Baseline: As reported on 2017-2018 Local Waterway Health Report Card results.	The site is separated from the nearest waterway, Sailors Bay Creek, by residential development. The stormwater management plan includes rainwater treatment

Consistency of the proposal with Willoughby Local Strategic Planning Statement (LSPS) 2020			
Key Directions and Priorities	**Indicator**	**Baseline and Target**	**Consistency**
		Target: No decline in the Local Waterway Health Report Card results by 2036.	mechanisms which will ensure that impact on the locality is not increased.
13. Protecting Willoughby's bushland and biodiversity.	No net decline in Willoughby's bushland and biodiversity	Baseline: 330 ha of bushland in 2018 Community Strategic Plan. Target: No net decline across the local bushland by 2036.	As discussed in the earlier sections of this report and shown on the aerial image from 1943, the site was cleared of all vegetation decades ago to allow for the construction of a service station. Proposed plantings will provide for endemic species to restore the former natural character of the site[72].
14. Increasing Willoughby's tree canopy coverage.	Increase in tree canopy coverage in Willoughby LGA	Baseline: 36% in 2016. Target**:** 40% canopy in line with the *North District Plan* by 2036.	Street tree numbers will be augmented by planting small trees on the northern edge of the green plaza adjoining Edinburgh Road. Compensatory planting of endemic species will be provided on the southern boundary where two trees will be lost to construction and four dead trees removed. With the landscaped plaza, balcony plantings, partial roof planting and green walls, the site will be greener overall and less susceptible to the urban heat island effect.
An efficient city 15. Improving the efficiency of Willoughby's built environment.	Amount of waste diverted from landfill per year	Baseline: Annual average 2017/18, 49% of waste diverted from landfill. Target: Greater than 70% of waste diverted	In order to minimise the volume of waste that will be generated on site during construction and ongoing use of the development, suitable waste management plans in accordance with Council regulations and guidelines will

[72] FJMT Planning Proposal Architectural and Landscape Design Report, 2021, p. 47.

Consistency of the proposal with Willoughby Local Strategic Planning Statement (LSPS) 2020			
Key Directions and Priorities	**Indicator**	**Baseline and Target**	**Consistency**
		from landfill per annum by 2021/22.	be prepared and submitted to for the DA and CC. The use of new building materials, better thermal insulation methods and provision of natural cross ventilation and access to sunlight will reduce emissions caused by excessive use of energy for thermal comfort. Generating clean energy through the installation of solar panels on the roof will further reduce emission.
	Reduction in greenhouse gas emissions by the Willoughby City community	Baseline: 1,046,097 tonnes CO2 2016/17. Target: 30% reduction on 2008/09 emissions by Willoughby City community by 2028 with possible further reductions of 38% by 2036.	
A resilient city 16. Increasing resilience to climate change, extreme weather and other shocks and stresses.	Implementation of Resilient Sydney in Willoughby City LGA.	Baseline: and targets to be determined through resilience planning.	Greening the facade and the roof of the development, introducing ample landscaping and maintaining the existing trees will reduce the urban heat effect on site.
A CITY THAT ALIGNS INFRASTRUCTURE WITH GROWTH			
A city supported by infrastructure 17. Augmenting local infrastructure and using existing infrastructure more efficiently to accommodate planned sporting and community demand.	Increased use of public resources such as open space and community facilities.	Baseline: and targets to be established in line with the Regional Sports Plan.	Not relevant to the proposal.

Consistency of the proposal with Willoughby Local Strategic Planning Statement (LSPS) 2020			
Key Directions and Priorities	**Indicator**	**Baseline and Target**	**Consistency**
18. Leveraging major infrastructure investments and projects to support growth.	Local infrastructure contributions fund a greater share of the cost of infrastructure for planned growth.	Baseline: 25% anticipated in Local Contributions Plan. Target: 25% or more.	Not relevant to the proposal
A collaborative city 19. Working with other organisations to provide required infrastructure.	Increase in shared infrastructure provision.	Baseline: Current number of joint use agreements. Target: Increase in number of active joint use agreements.	Not relevant to the proposal.
20. Co-ordinating economic development for Chatswood and St Leonards	High end job targets from District Plan.	Baselines and targets: under priorities 9 and 11 above.	Not relevant to the proposal.

Consistency with LSPS Actions and Priorities	
Actions	**Consistency**
PRIORITY 1: INCREASING HOUSING DIVERSITY TO CATER TO FAMILIES, THE AGING POPULATION, DIVERSE HOUSEHOLD TYPES AND KEY WORKERS	
1.2 Review planning controls in the Chatswood CBD and in local centres to facilitate delivery of an increased number of medium and high-density dwellings, increasing dwelling diversity in the LGA.	The main objective of the planning proposal is to deliver greater housing choice for the community at Castlecrag local centre through a medium density shop top housing development. The review of the height of building and FSR development standards applicable to the site is necessary to facilitate the delivery of an increased number of dwellings as required by this action.
1.3 Generally protect existing low-density areas from development as they provide	The subject site is suitable for the proposed additional housing units, due to its unique location, large size and suitable zoning. The provision of 53 new units on the

Consistency with LSPS Actions and Priorities	
Actions	**Consistency**
diversity and are not needed to ensure sufficient dwelling supply.	subject site will deliver a big proportion of the 90 new housing units planned for Castlecrag and will protect the lower density lots, which are part of the heritage conservation area, from future development for the purpose of high or medium density residential.
1.4 Assess any proposals for increased housing density against the Willoughby Housing Strategy.	An assessment of the proposal against the Draft Willoughby Housing Strategy is provided.
1.5 Ensure that planning controls create dwellings of universal design that are suitable for the changing needs of the community, including smaller and accessible dwellings for the aging population and family-friendly medium and high-density dwellings for new families moving to the area.	The proposal contains a mix of one-, two- and three-bedroom units, including 50% of the total number of units capable of conversion to accessible dwellings to allow aging in place for Castlecrag residents who would like to downsize but remain in the same locality.
1.6 Ensure higher sustainability and resilience targets for all new dwellings in Willoughby City in order to lower life cycle costs for new residents.	The proposed development satisfies the sustainability benchmarks through the use of renewable energy sources (solar panels), rainwater recycling, compliance with the applicable building standards and planning policies such as SEPP BASIX at DA stage.
PRIORITY 2: INCREASING THE SUPPLY OF AFFORDABLE HOUSING	
2.1 Undertake the required feasibility testing to increase the proportion of total floorspace to be delivered as affordable housing in new developments.	Two (3.8%) of the proposed 53 units will be provided as affordable housing.
2.2 Seek opportunities to deliver increased public benefit through affordable housing when increases in density are sought in major proposals.	As above.
2.5 Focus affordable housing delivery along potential eastern public transport routes and the Metro and North Shore Railway Line.	As above.

Consistency with LSPS Actions and Priorities	
Actions	**Consistency**
PRIORITY 4: ENSURING THAT SOCIAL INFRASTRUCTURE CATERS TO THE POPULATION'S CHANGING NEEDS AND IS ACCESSIBLE TO FOSTER HEALTHY AND CONNECTED COMMUNITIES.	
4.4 Pursue opportunities in new developments to increase public open space areas.	The proposal increases the area, variety and quality of publicly accessible open space on site. The main feature of the master planned new local centre is the sun filled public plaza along Edinburgh Road.
PRIORITY 5: RESPECTING AND ENHANCING HERITAGE AND LOCAL SUBURBAN CHARACTER	
5.1 Generally protect the existing character of low-density suburbs in the LGA.	The unique location of the subject site as the gateway to Castlecrag, its current zoning and large size justifies the proposed medium density mixed-use development to address the housing target of 90 dwellings set for Castlecrag. Provision of 53 new units on site will assist meeting the need for additional housing within the Castlecrag local centre.
PRIORITY 6: PLANNING FOR LOCAL CENTRES WHICH ARE VIBRANT PLACES THAT MEET THE EVERYDAY NEEDS OF THE POPULATION	
6.4 Limit retail development outside of local centres.	The proposal is for the redevelopment of The Quadrangle which is within the Castlecrag local centre.
PRIORITY 12: ENHANCING THE HEALTH OF WILLOUGHBY'S WATERWAYS	
12.2 Embed elements of water sensitive urban design in development to improve waterway health.	Although the site is located 200m away from the nearby Sailors Bay Creek and the proposed development will have no material impact on the quality of the waterway. Rainwater recycling and natural stormwater filtration through landscaping have been considered for the proposal.
PRIORITY 14: INCREASING WILLOUGHBY'S TREE CANOPY COVERAGE	
14.3 Protect existing trees in the LGA through planning controls and require large developments to retain existing trees and plant mature trees where appropriate.	The proposal maintains all existing mature street trees to the west and north of the site as well as nearly all of the existing mature trees on the southern boundary. The proposed new landscaping includes the planting of new endemic trees where appropriate to the south.

Consistency with LSPS Actions and Priorities	
Actions	**Consistency**
14.4 Encourage green roofs or green nature walls and green buildings, particularly in the Chatswood CBD and St Leonards.	1,010m^2 of green roof, landscaping at different levels of the building and the extensive open space areas at ground level are proposed for the development to emphasise the Griffin legacy of prioritising nature over building.
PRIORITY 15: IMPROVING THE EFFICIENCY OF WILLOUGHBY'S BUILT ENVIRONMENT	
15.4 Manage street and off-street parking to encourage public transport use and car sharing and limit growth in travel by private vehicles.	The proposed number of on-site parking is in accordance with the minimum parking rates required by the Council DCP. The site is in close proximity to two bus routes, on both Eastern Valley Way and Edinburgh Road, providing frequent services to Chatswood and North Sydney.
15.6 Advocate for increased energy and water efficiency standards for new buildings including Green Star Certification and the BASIX standards.	The proposal can satisfy the applicable BASIX and section J requirements at the DA stage.
15.7 Encourage the use of cool building materials in any new development to reduce the urban heat island effect, and where appropriate integrate water features both natural and man-made into urban design.	Extensive landscaping including tree planting and green roofs, use of building materials of light colours are proposed to minimise the urban heat effect as is now required following changes to Section J of the NCC. Further design details and possible use of water features will be explored at the DA stage of the project.
15.10 Require increased energy and water efficiency in major development proposals where increases in density or yield are sought.	As above. The proposed solar panels and reuse of rainwater for irrigation purposes contribute to the efficient use of water and energy and exceed Council requirements.
PRIORITY 17: AUGMENTING LOCAL INFRASTRUCTURE AND USING EXISTING INFRASTRUCTURE MORE INTENSIVELY AND EFFICIENTLY TO ACCOMMODATE PLANNED GROWTH	
17.4 Require major development to share any value uplift from changes in development rights to deliver a community benefit through improved local infrastructure.	The addition of the new publicly accessible plaza along Edinburgh Road, the north-south pedestrian access to The Postern and the high-quality local shops are community benefits that the proposal delivers.
17.5 Focus future development and density in places where infrastructure is available,	The site is located adjacent to the Eastern Valley Way corridor, which is considered a major road and tertiary freight corridor as it is a key corridor between Roseville

Consistency with LSPS Actions and Priorities	
Actions	**Consistency**
which is expected to be along the major public transport corridors.	Chase and Northbridge.[73] The road has been identified as such in 'Sydney's Bus Future' as a suburban bus route.[74]

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

The following table contains a list of all the State Environmental Planning Policies and an assessment of the proposal against the aims and objectives of the ones that are relevant to the nature of the proposed development or are applicable to the site.

The proposal does not seek approval to amend any SEPPs. It can satisfy the requirements of applicable SEPPs as detailed in the accompanying consultant reports.

State Environmental Planning Policies (SEPPs)	Relevant aims and objectives of the SEPP	Consistency of the proposal with the SEPP
SEPP No. 19—Bushland in Urban Areas	(1) The general aim of this Policy is to protect and preserve bushland within the urban areas… (2) The specific aims of this policy are: … (h) to protect significant geological features, (i) to protect existing landforms, such as natural drainage lines, watercourses and foreshores,	The whole site area had been cleared previously to allow for the construction of the service stations and the shopping centre. No bushland or significant native flora and fauna remained on site. However, the proposal is consistent with the relevant objectives of the policy through minimising the potential adverse impacts of the development on the natural features of the locality as discussed above.
SEPP No. 21—Caravan Parks		Not relevant
SEPP No. 33—Hazardous and Offensive Development		Not relevant

[73] HAVE YOUR SAY, Proposed new and extended clearways on Eastern Valley Way/Clive Street, between Roseville Chase and Northbridge, June 2017, RMS.

[74] Sydney's Bus Future, 2013.

SEPP No. 36—Manufactured Home Estates		Not relevant
SEPP No. 47—Moore Park Showground		Not relevant
SEPP No. 50—Canal Estate Development		Not relevant
SEPP No. 55—Remediation of Land	(2) In particular, this Policy aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment: (a) by specifying when consent is required, and when it is not required, for a remediation work, and (b) by specifying certain considerations that are relevant in rezoning land and in determining development applications in general and development applications for consent to carry out a remediation work in particular, and (c) by requiring that a remediation work meet certain standards and notification requirements.	The site development history is as follows: 1920s - 1949 shops 1949 – 1978 service station 1979 to date – shopping centre with excavated basement for parking. The geotechnical report notes that rock is exposed on the northern side of the existing basement to a height of between 0.5m and 1.6m, sloping downwards to the east . This suggests that about half of the site depth of 57m (north to south) has been excavated. The service station on the site would have had underground service tanks (USTs) under its northern apron, close to the road for ease of tanker refuelling. Excavation of the site for the shopping centre appears to have removed the USTs, normally a cause of hydrocarbon pollution of the underlying material. The existing basement is approximately 3m to 4.8m below Edinburgh Road level. Under the proposal, the basement parking will be a further 3.8m below the existing basement, requiring excavation of the rock. If any remnant of the USTs or hydrocarbon pollution is present, it will be excavated and removed with the

		basement material. Normal testing of the material to be removed is required under DECCW regulations before disposal to appropriate sites or re-use on this site.
SEPP No. 64—Advertising and Signage		Not relevant at this stage.
SEPP No. 65—Design Quality of Residential Apartment Development	(1) This Policy aims to improve the design quality of residential apartment development in New South Wales. (2) This Policy recognises that the design quality of residential apartment development is of significance for environmental planning for the State due to the economic, environmental, cultural and social benefits of high quality design. (3) Improving the design quality of residential apartment development aims (a) to ensure that it contributes to the sustainable development of New South Wales: (i) by providing sustainable housing in social and environmental terms, and (ii) by being a long-term asset to its neighbourhood, and (iii) by achieving the urban planning policies for its regional and local contexts, and …	The proposed urban design scheme for the site has been prepared having regard to the requirements of SEPP 65 and its associated guidelines under the Apartment Design Guide (ADG). Building separation distances; orientation to maximise solar access; natural cross ventilation and many other environmental and design parameters were considered in preparing this scheme to satisfy the requirements of SEPP 65 and the ADG from early stages of this project. To show how the proposal satisfies the aims of the SEPP through compliance with the SEPP 65 and ADG guidelines, a compliance table is attached to this report. The compliance of the proposal with the different local and state policies and strategies is discussed in the relevant sections of this report. Social, economic and environmental benefits of the scheme for the future residents and the general public, the Castlecrag community in particular, are elaborated throughout report.
SEPP No. 70—Affordable Housing (revised scheme)		Aims of the policy do not necessarily relate to the subject of the proposed development. However, as affordable housing is proposed as

		part of this application, it will satisfy the requirements of the SEPP.
SEPP (Aboriginal Land) 2019		Not relevant
SEPP (Affordable Rental Housing) 2009		See comments against SEPP No. 70 above.
SEPP (Building Sustainability Index: BASIX) 2004	(1) Regulations under the Act have established a scheme to encourage sustainable residential development (the BASIX scheme) under which: (a) an application for a development consent…in relation to certain kinds of residential development must be accompanied by a list of commitments by the applicant as to the manner in which the development will be carried out, and (b) the carrying out of residential development pursuant to the resulting development consent…will be subject to a condition requiring such commitments to be fulfilled.	The design and specifications of the residential section of the proposed development will satisfy the requirements of the SEPP at the DA stage.
SEPP (Coastal Management) 2018		Not relevant
SEPP (Concurrences and Consents) 2018		The policy may apply to the proposal if the conditions explained in the SEPP occur post submission.
SEPP (Educational Establishments and Child Care Facilities) 2017		Not relevant – educational or childcare centres not proposed as part of the development.
SEPP (Exempt and Complying Development Codes) 2008		Not relevant at this stage.

SEPP (Gosford City Centre) 2018		Not relevant
SEPP (Housing for Seniors or People with a Disability) 2004	(1) This Policy aims to encourage the provision of housing (including residential care facilities) that will: (a) increase the supply and diversity of residences that meet the needs of seniors or people with a disability, and (b) make efficient use of existing infrastructure and services, and (c) be of good design.	Although the proposal is not for senior housing, it satisfies the aims of this policy by providing housing choices suitable for the aging population of Castlecrag through good design that considers the applicable adaptable and accessible housing standards. Due to the proximity of the site to a major bus service the development maximises the use of existing infrastructure by introducing new housing options in this location.
SEPP (Infrastructure) 2007	The aim of this Policy is to facilitate the effective delivery of infrastructure across the State by: (e) identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure development, and	Not relevant to the intent of the proposal, as it does not seek approval for any changes to or construction of new infrastructure. However, the site is located adjacent to Eastern Valley Way that is a major arterial road that connects Castlecrag to the rest of Sydney. This is an important factor justifying the development of the site for the proposed mixed-use shopping village.
SEPP (Koala Habitat Protection) 2019		Not relevant
SEPP (Kosciuszko National Park – Alpine Resorts) 2007		Not relevant
SEPP (Kurnell Peninsula) 1989		Not relevant

SEPP (Mining, Petroleum Production and Extractive Industries) 2007		Not relevant
SEPP (Penrith Lakes Scheme) 1989		Not relevant
SEPP (Primary Production and Rural Development) 2019		Not relevant
SEPP (State and Regional Development) 2011		Not relevant. The applicant does not seek to declare the proposal as a state significant development.
SEPP (State Significant Precincts) 2005		Not relevant
SEPP (Sydney Drinking Water Catchment) 2011		Not relevant
SEPP (Sydney Region Growth Centres) 2006		Not relevant
SEPP (Three Ports) 2013		Not relevant
SEPP (Urban Renewal) 2010		Not relevant. The applicant does not seek to declare the proposal as an urban renewal precinct.
SEPP (Vegetation in Non-Rural Areas) 2017	(a) to protect the biodiversity values of trees and other vegetation in non-rural areas of the State, and (b) to preserve the amenity of non-rural areas of the State through the preservation of trees and other vegetation.	The whole site area had been cleared previously to allow for the construction of the service stations and the shopping centre. The existing trees were planted after the construction of the existing shopping centre. The proposal maintains all street trees and nearly all site trees. The project arborist has confirmed the need for the removal of four dead trees on the southern boundary. Two trees will be

		removed due to construction. There will be a small overall increase in tree canopy at the site.
SEPP (Western Sydney Employment Area) 2009		Not relevant
SEPP (Western Sydney Parklands) 2009		Not relevant

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

The planning proposal is consistent with the following applicable Ministerial Directions. Considering the majority of the directions do not apply to the site, either due to the nature of the proposal or the specific and location based requirements of the subject directions, they are excluded from the table.

Direction	Relevant Objectives	Proposal
1. Employment and Resources		
1.1 Business and Industrial Zones	(a) encourage employment growth in suitable locations, (b) protect employment land in business and industrial zones, and (c) support the viability of identified centres.	The proposal retains most of the current on-site workforce the current employment rate at the shopping village through the provision of 1,740m^2 of retail space, including a local supermarket. Although the retail GFA proposed is less than the existing, the variety of retail tenancies will deliver services sought by residents with a more stable employment of about 90 persons plus contractors servicing a modern and efficient building. The mixed-use development maintains the business use of the subject property. The provision of cafes and restaurants facing the new landscaped plaza along the northern site boundary will provide significantly improved viability for the shopping village.
2. Environment and Heritage		
2.3 Heritage Conservation	(1) The objective of this direction is to conserve items, areas, objects and places of environmental	This Planning Proposal pays tribute to Walter Burley Griffin's legacy in Castlecrag by acknowledging the design elements and concepts used in establishing the neighbourhood and construction of the significant

	heritage significance and indigenous heritage significance.	buildings designed by Griffin's studio. This approach is extensively discussed in this report and elaborated by the design team in the architectural report submitted with this application.
2.6 Remediation of Contaminated Land	(1) The objective of this direction is to reduce the risk of harm to human health and the environment by ensuring that contamination and remediation are considered by planning proposal authorities.	Contamination of the site is not expected to be encountered due to the extensive excavation of the site prior to 1979. Further excavation to a depth of about 3.8m will be subject to checking as required by DECCW.
3. Housing Infrastructure and Urban Development		
3.1 Residential Zones	(a) to encourage a variety and choice of housing types to provide for existing and future housing needs. (b) to make efficient use of existing infrastructure and services and ensure that new housing has appropriate access to infrastructure and services, and (c) to minimise the impact of residential development on the environment and resource lands.	Zoned for neighbourhood centre with shop top housing a permitted use, residential use is part of the proposal. The proposal satisfies the relevant objectives as follows: (a) The proposed residential section of the development incorporates a mix of one, two and three bedroom units with 50% of the units capable of conversion to accessible housing standards. (b) The site is serviced with the necessary infrastructure. The civil services report accompanying this application confirms the proposed development can be serviced by the existing infrastructure. (c) The potential environmental impacts of the development on its surroundings have been discussed in the relevant sections of this report and found acceptable.
3.4 Integrating Land Use and Transport	The objective of this direction is to ensure that urban structures, building forms, land use locations, development designs, subdivision and street layouts achieve the following planning objectives:	The site is serviced by two bus routes along Eastern Valley Way that connect the site to Chatswood and North Sydney. As well, the proposal opens up/reinforces a cross site link to The Postern to encourage walking access to the centre from the south and east. A green travel plan is annexed to this report. End of trip facilities will be provided.

	(a) improving access to housing, jobs and services by walking, cycling and public transport, and (b) increasing the choice of available transport and reducing dependence on cars, and (c) reducing travel demand including the number of trips generated by development and the distances travelled, especially by car, and (d) supporting the efficient and viable operation of public transport services, and (e) providing for the efficient movement of freight.	
4. Hazard and Risk		
The site is not affected by any of the environmental hazards and risks listed in the document.		
5. Regional Planning		
An assessment of the planning proposal against the objectives, priorities and actions of *Greater Sydney Region Plan, A Metropolis of Three Cities* is provided under section 4.3.1 of this report.		
6. Local Plan Making		
The requirements of this direction apply to the consent authorities and do not have any relevance to the subject planning proposal.		
7. Metropolitan Planning		
7.1 Implementation of A Plan for Growing Sydney	The objective of this direction is to give legal effect to the planning principles; directions; and priorities for subregions, strategic centres and transport gateways contained in A Plan for Growing Sydney.	*A Plan for Growing Sydney* as referenced in this direction was published in 2014 and has been replaced by the *Greater Sydney Region Plan, A Metropolis of Three Cities.* An assessment of the planning proposal against the objectives, priorities and actions of the regional plan is provided under section 4.3.1 of this report.

Section C – Environmental, social and economic impacts

5.7 Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

There is no evidence that the site is a critical habitat or ecological community. It was cleared of native vegetation prior to 1943 (see Figure 8 above) and was thereafter a service station site. In 1979, the existing shopping centre opened on the site following excavation over about 85% of the site and some filling on the southern boundary. Much of the landscape strip on the southern side of the site is on fill, the result of the 1979 development. The trees in that area of landscape are recent plantings, post 1979, and are not part of an indigenous forest (refer Arborist report – Appendix 4).

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

5.8.1 Trees

Four dead trees on the southern side of the site will be removed together with two trees which cannot be saved due to proximity to the construction. Trees on the south boundary, not endemic to the area, have nevertheless reached their genetic potential and will be retained where possible.

The architect addresses the proposed landscaping on site to align with Griffin's legacy - a building that complements the landscape. Removal of trees to the south will be compensated by planting native garden and indigenous trees, to accentuate the natural bushland qualities of the area[75]. The proposal incorporates new trees and landscaping to the north (more than 750m^2), greening a large portion of the site. The green roofs to the residential pavilions promote "long term sustainability of the building"[76] and act to reduce the heat island effect.

5.8.2 Overshadowing

The conclusions to be drawn from the extensive graphical analysis provided by the architect is that:

- Shadows due to the dense band of evergreen trees on the southern boundary of the site, which are to be retained as per the report of the arborist, must be considered in any analysis
- Shadows due to the trees extend beyond the shadows due to the existing building on the subject site at 21 June
- Shadows due to the proposal, and also the comparative LCS scheme, largely sit within the dense tree shadows at 21 June

[75] FJMT Planning Proposal Architectural and Landscape Design Report, 2021, pg.37.

[76] Ibid, p. 39.

- The additional shading impact of the proposed building will be relatively minor at 21 June, the winter solstice
- There will be little overshadowing due to the proposal (or the trees) at the equinox, 21 March or 21 September.

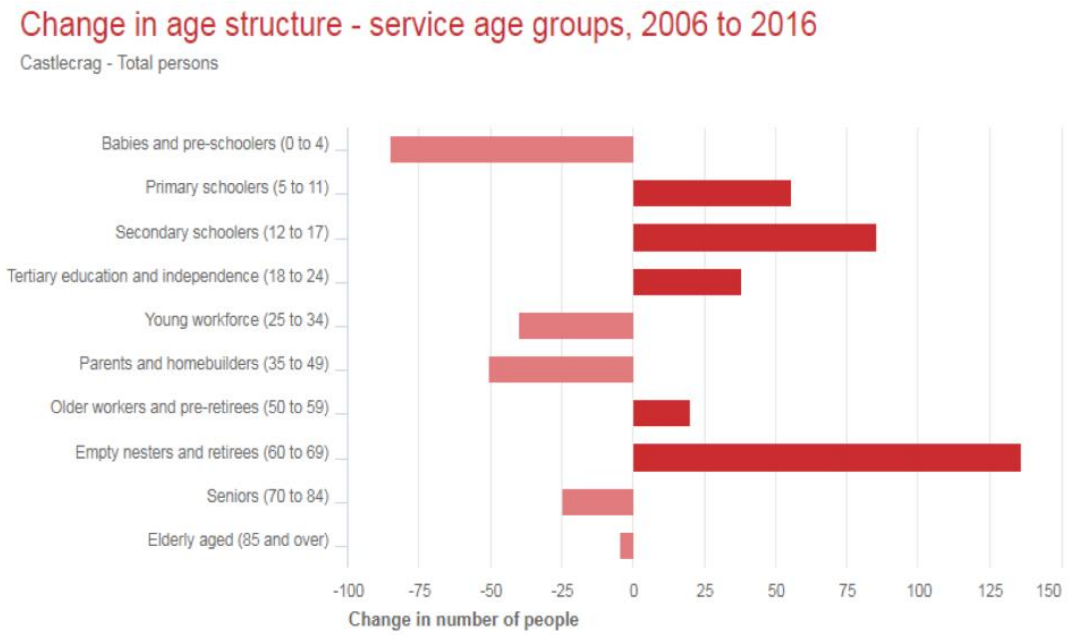
5.8.3 Visual impact

The conclusion of the Visual Impact assessment of the proposal is that it will have only a very limited visibility due to the heavily treed nature of the wider locality of the site. Sight distances from which the proposal can be seen are less than 140m on the main approach roads. In all views, the building sits within the tree canopy height and its impact will be very small.

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

Social impact

A key characteristic of the proposal will be the renewal of the existing shopping and the development above it of 53 apartments. As noted in the Elton Consulting report, the key characteristics of the suburb of Castlecrag are:



Source: Australian Bureau of Statistics, Census of Population and Housing, 2006 and 2016 (Usual residence data). Compiled and presented in profile.id by .id, the population experts.

As can be seen from the bar chart above, the retiree age population has grown significantly over the decade 2006-2016. The table below notes that there are very few apartments in Castlecrag to which retirees may choose to go if they cannot easily access their houses due to increasing mobility issues.

Population/suburb characteristic	Statistic	Commentary
Total population 2006	2,798	
Total population 2016	2,938	Increase of 140 in 10 years
Forecast population 2036	3,029	Increase of 91 over next 20 years forecast
Detached dwellings - Castlecrag	96% of all dwellings	
Medium density or other dwelling - Castlecrag	4%	
Medium or high density -Willoughby LGA	50%	Demonstrates how different Castlecrag is within Willoughby LGA
Own or paying off mortgage	83% of households	

As the suburb is characterised by steep hill sides falling to the north and south from the Edinburgh Road ridge, accessibility is an issue for most houses. The ageing population will require accessible housing if it is to allow residents to age in their suburb if not specifically in their detached house.

The proposed project will have a very positive social impact by providing 53 apartments that are sorely needed in a suburb virtually devoid of apartments. During the course of the project to date, some 35 members of the community have placed their names on a contact list to be offered apartments. Acting in the general interest of the Castlecrag community, the Castlecrag Progress Association has received a promise from the applicant that residents of Castlecrag will be offered preferential access to the apartments when they go on sale.

Renewal of the shopping centre, and the shops within it, will provide necessary services for residents of the suburb. The existing supermarket, pharmacy and post office are essential neighbourhood convenience shops and the café and restaurant have the additional social function of a community hub. Their importance to the community may be gauged from the positive community reaction to their renewal as part of the project.

Cultural impact

To the extent that the renewed centre acts as a social hub for residents of Castlecrag, its impact on the cultural life of the suburb could be significant. The project will create a new public open space on

Edinburgh Road which is big enough to stage community events such as a school fair or art show, etc. However, the key community cultural focus will remain The Haven, the Walter Burley Griffin and Marion Mahoney amphitheatre which first hosted performances between 1932 and 1934.

Economic impact
The CIV for the project of $63.9 million is estimated on developed design drawings. (We understand that construction job numbers are estimated by the Department of Planning using a Landcom model.)

Maximum retail employment in the centre post 2018 was 102 with 12 additional employed daily contractors such as cleaners. Due to deteriorating conditions within the centre and the open knowledge that redevelopment was being sought, only 39 employees worked in businesses paying a full market rent. 63 employees worked in businesses that were supported to some degree by the centre's owners. Renewal of the centre is the only path to maintain viable retail and commercial uses on the site.

Whilst commercial space will be reduced from 2,552m^2 to 1,740m^2, retail employment is estimated to reduce slightly to 90 and daily contractors may increase by possibly 6 to 18 to service the apartments above.

Impact on the surrounding centres studied in the Local Centres Strategic Plan is unlikely to be measurable due to the loss of gross floor space of The Quadrangle. The nearest centre is that at Northbridge Plaza which has a gross floor area of about 56,635m^2 compared with The Quadrangle (2,140m^2) and Castlecrag as a whole (8,353m^2).

Section D – State and Commonwealth interests

5.10 Is there adequate public infrastructure for the planning proposal?

Traffic and transport
"The site is located on the south eastern corner of the intersection of Eastern Valley Way and Edinburgh Road. This intersection is traffic signal controlled with all movements permitted … Observations of the operation of the intersection found that long delays and queues can occur on Edinburgh Road (westbound approach) in peak periods when traffic turning right into Eastern Valley Way is delayed and blocks through traffic" [77]

"Based on RMS Guidelines the proposed development…would generate some 20 vehicles per hour (two-way) in the weekday morning and afternoon peak periods. This additional traffic has been assigned to the road network and the impact on the operation of the intersection of Eastern Valley Way/Edinburgh Road has been analysed using SIDRA. The analysis found that with development traffic in place, there would be a minor increase in average delay per vehicle through the intersection of some one to three seconds in the AM/PM peak hours. There was no change in the LOS and minor increases in queue lengths. Thus, in

[77] Ibid, p. 3&5.

summary the proposed development would have minimal impact on the operation of the intersection of Eastern Valley Way and Edinburgh Road."[78]

Infrastructure and utility services

5.10.1 Potable water

"The existing cold water is provided by 50mm diameter water supply, from the 100mm Sydney Water main in Eastern Valley Way, via 50mm cold water meter located at ground level".[79]

It is proposed that a new domestic water service supply be connected to Sydney Water's 150mm water main located on the east side of Eastern Valley Way, subject to Sydney Water's approval.[80]

5.10.2 Natural Gas Services

The existing 75mm Natural Gas main is being supplied from Edinburgh Road and has a working pressure of 210Kpa. The existing gas main will be extended to the proposed site building with a "new regulator to reduce the pressure to 2.75Kpa"[81].

The existing main has the capacity to provide the proposed development with natural gas. "Natural gas services will be provided with Safety shut off valve (System III) and connected to Fire indicator panel"[82].

5.10.3 Power

The building services concept report submitted with the application states "The existing building is serviced by a three-phase supply from Ausgrid to an on-site kiosk substation (5062) located on the west side of the building, on Eastern Valley Way via an underground feed into the adjacent Main Switch Board."[83]

An initial maximum demand calculation to determine the required power infrastructure of the development was undertaken for the proposed 53 units, lower ground and ground floor supermarkets, retail and carpark. It was concluded that the maximum demand of the proposed development will be 930A including 10% future growth. Ausgrid will propose a new kiosk substation to facilitate the maximum power demand required for the development.[84]

[78] Planning Proposal – traffic review by Colston Budd Rogers & Kafes Pty Ltd: June 2020 p. 5 & 6.

[79] Building services concept report by Meinhardt: August 2021 p. 17.

[80] Ibid p. 17.

[81] Ibid, p. 20.

[82] Ibid, p. 20.

[83] Ibid, p. 11.

[84] Ibid, p. 12.

5.10.4 Wastewater

The site is connected to the civic sewerage system. The proposed development will be connected to the existing service. The building services concept report states:

"There is a 150mm sewer Sydney Water main on south boundary of the site, the main sewer has been repaired by Sydney water… Application / advice from Sydney Water coordinator regarding the requirements to connect and protect Sydney Water assets will be required"[85].

The main sewer system enters the site from Edinburgh Road. "Subject to Sydney Water's Section 73 requirements, the sewer connection will be from the existing 150mm sewer main. Sanitary drainage will be provided from sewer drainage and connecting all the stack work together and discharging thereafter to 'Sydney Water's sewer system via a boundary trap.

Sanitary drainage will be provided from sewer drainage and connecting all the stack work together and discharging thereafter to 'Sydney Water's sewer system via a boundary trap."[86]

5.10.5 Solid Waste

Solid waste will be stored in the waste storage areas in the basement where garbage trucks collect and transfer the waste to external treatment facilities.

5.10.6 Drainage

The *Stormwater management memorandum* submitted with the application concludes that "The proposed development presents a general improvement of site catchment characteristics, increasing pervious areas and reducing urbanisation".[87]

In addition, the building services reports states: "Rainwater downpipes will be connected to stormwater system, and rainwater from roof downpipes will be used for rainwater harvesting system including filtration system."[88]

5.10.7 Telecommunications

As stated in the building services report the development upon completion will replace the existing telecommunications system with NBN to allow for up-to-date telecommunication services on site. "NBN rollout map shows the NBN is available at the site and the property is ready to connect."[89]

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[85] Ibid, p. 20.

[86] Ibid, p. 20.

[87] Stormwater Management Memorandum by Meinhardt: June 2020. p. 3.

[88] Building services concept report by Meinhardt: June 2020 p. 19.

[89] Ibid, p. 16.

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

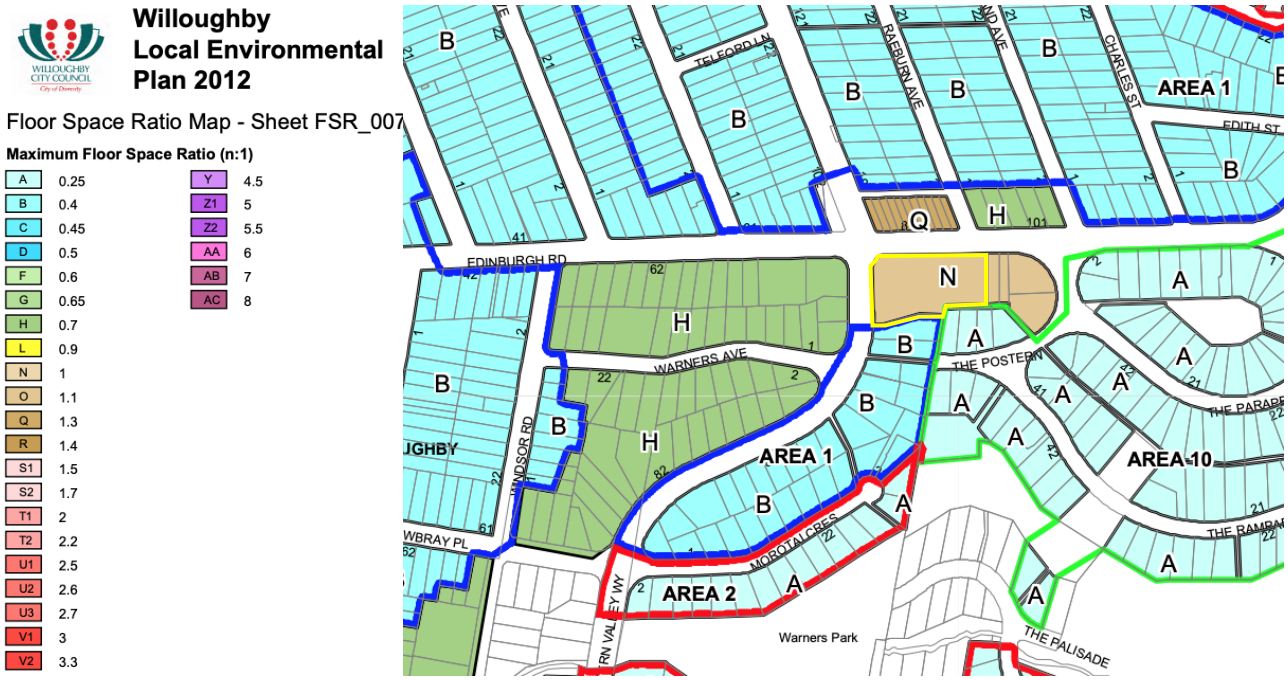
The State and Commonwealth are unlikely to have an interest in this proposal other than as a possible recovery project from the current COVID-19 crisis. No public authorities have yet been formally consulted.

6 Draft amended environmental planning instrument maps for proposed statutory changes

6.1 LEP

Current control maps

6.1.1 Maximum Floor Space Ratio



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

(a) to limit the intensity of development to which the controls apply so that it will be carried out in accordance with the environmental capacity of the land and the zone objectives for the land,

(b) to limit traffic generation as a result of that development,

(c) to minimise the impacts of new development on adjoining or nearby properties from disruption of views, loss of privacy, overshadowing or visual intrusion,

(d) to manage the bulk and scale of that development to suit the land use purpose and objectives of the zone,

(e) to permit higher density development at transport nodal points,

(f) to allow growth for a mix of retail, business and commercial purposes consistent with Chatswood's sub-regional retail and business service, employment, entertainment and cultural roles while conserving the compactness of the city centre of Chatswood,

(g) to reinforce the primary character and land use of the city centre of Chatswood with the area west of the North Shore Rail Line, being the commercial office core of Chatswood, and the area east of the North Shore Rail Line, being the retail shopping core of Chatswood,

(h) to provide functional and accessible open spaces with good sunlight access during key usage times and provide for passive and active enjoyment by workers, residents and visitors to the city centre of Chatswood,
(i) to achieve transitions in building scale and density from the higher intensity business and retail centres to surrounding residential areas,
(j) to encourage the consolidation of certain land for redevelopment,
(k) to encourage the provision of community facilities and affordable housing and the conservation of heritage items by permitting additional gross floor area for these land uses.

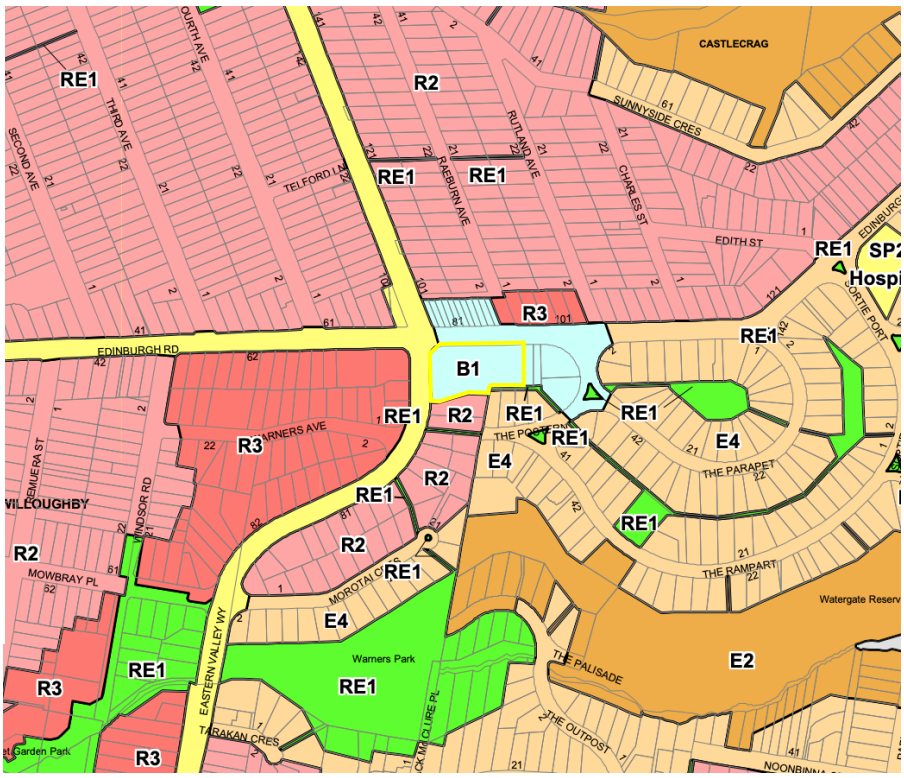
6.1.2 Zoning

Willoughby Local Environmental Plan 2012

Land Zoning Map - Sheet LZN_007

Zone

B1	Neighbourhood Centre
B2	Local Centre
B3	Commercial Core
B4	Mixed Use
B5	Business Development
B7	Business Park
E1	National Parks and Nature Reserves
E2	Environmental Conservation
E4	Environmental Living
IN1	General Industrial
IN2	Light Industrial
R2	Low Density Residential
R3	Medium Density Residential
R4	High Density Residential
RE1	Public Recreation
RE2	Private Recreation
SP1	Special Activities
SP2	Infrastructure



RE1 zone objectives

Objectives of zone

- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.
- To protect and enhance areas of ecological, scientific, cultural or aesthetic value.
- To maintain and provide visual open space links to a diversity of public and private spaces and facilities as an integral part of the open space system.
- To provide adequate open space areas to meet the existing and future needs of the residents of Willoughby.

Prohibited: any development not specified in 2 or 3

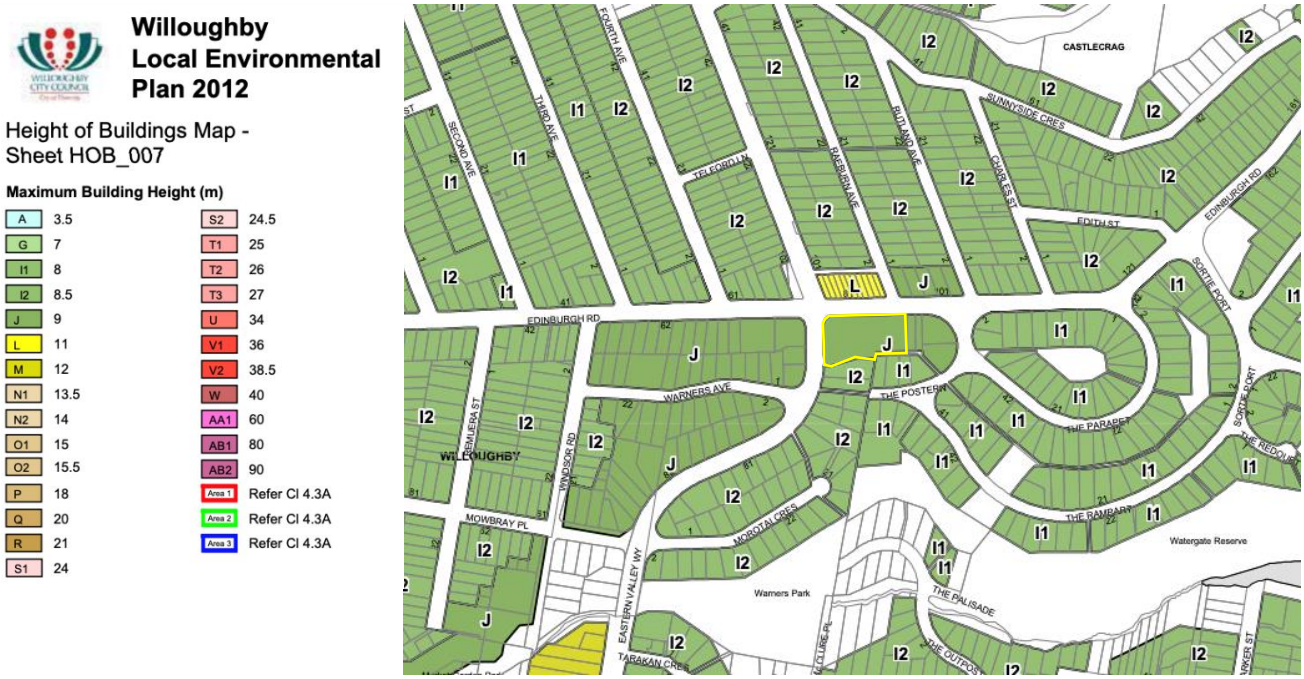
B1 objectives

Objectives of zone

- To provide a range of small-scale retail, business and community uses that serve the needs of people who live or work in the surrounding neighbourhood.
- To minimise the effect of business uses on the amenity of adjacent areas having regard to building design, operation and activities, traffic generation and the car parking capacity of local roads.

Permitted with consent: Shop top housing

6.1.3 Height of Building



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

(a) to ensure that new development is in harmony with the bulk and scale of surrounding buildings and the streetscape,

(b) to minimise the impacts of new development on adjoining or nearby properties from disruption of views, loss of privacy, overshadowing or visual intrusion,

(c) to ensure a high visual quality of the development when viewed from adjoining properties, the street, waterways, public reserves or foreshores,

(d) to minimise disruption to existing views or to achieve reasonable view sharing from adjacent developments or from public open spaces with the height and bulk of the development,

(e) to set upper limits for the height of buildings that are consistent with the redevelopment potential of the relevant land given other development restrictions, such as floor space and landscaping,

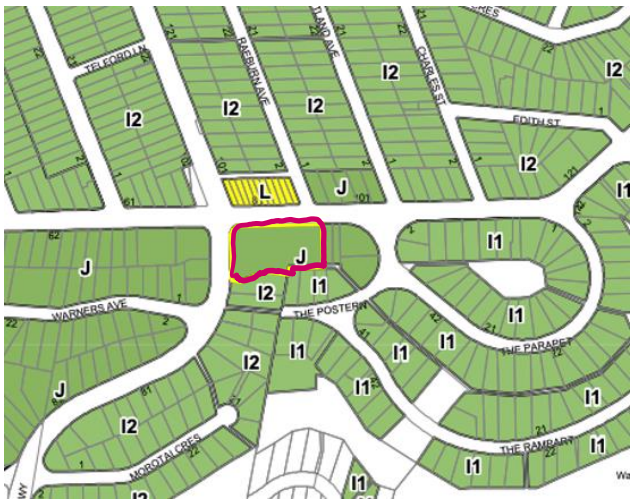
(f) to use maximum height limits to assist in responding to the current and desired future character of the locality,

(g) to reinforce the primary character and land use of the city centre of Chatswood with the area west of the North Shore Rail Line, being the commercial office core of Chatswood, and the area east of the North Shore Rail Line, being the retail shopping core of Chatswood,

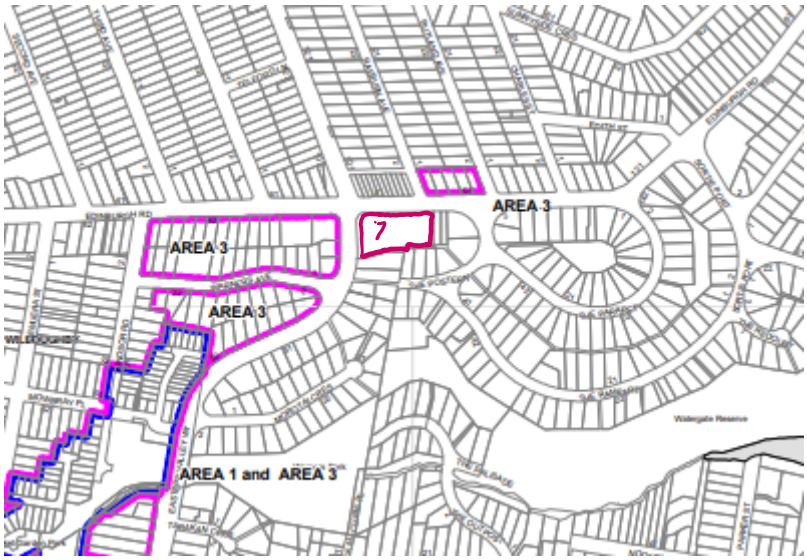
(h) to achieve transitions in building scale from higher intensity business and retail centres to surrounding residential areas.

Proposed control maps

The control maps that need to be changed due to the proposed rezoning are the FSR and Height of Building maps. The proposed LEP maps will be finalised at the Gateway Stage of the proposal.



Height of Building map change proposed – site marked in plum colour and labelled “refer to clause 6.24”.



Special Provisions Area Map – site outlined in plum and labelled “AREA 7”



Floor Space Ratio map change proposed.

Amendment of Willoughby LEP by adding following sections

6.24 Development of a mixed use project consisting or retail uses and a residential flat building at 100 Edinburgh Road, Castlecrag

(1) This clause applies to the following land at Castlecrag:
(a) Lot 11, DP 611594,
(b) Lot 1, DP 43691,
Identified as "Area X" on the *Special Provisions Area Map*.

(2) Despite clause 4.3, the height of any building on the land to which this clause applies shall not exceed AHD 97.490.

(3) For the purposes of this clause, height of building does not include the following elements:
(a) any balustrade which is less than 1.2m height,
(b) any lift tower allowing disabled access to communal areas on the building roof and access to the lift, not to exceed 4.5m above the roof finished floor level,
(c) any stair enclosure allowing access to the roof, not to exceed 3.5m above the roof finished floor level,

(d) any services installations which are less than 2m in height including but not limited to air conditioning, solar panels, skylights,
(e) any communal facilities such as barbeques, seating and tables, planter boxes,
(f) disabled facilities such as toilets, not to exceed 3.5m above the roof finished floor level.

(4) Despite clause 4.4, the floor space ratio of any building on the land to which this clause applies shall not exceed 1.8:1 of which not more than 1.6:1 shall be above the level of Edinburgh Road.

Schedule 1 Additional permitted uses

75 Use of certain land at 100 Edinburgh Road, Castlecrag

(1) This clause applies to land at 100 Edinburgh Road, Castlecrag, being Lot 11, DP 611594 and Lot 1, DP 43691.

(2) Development for the purpose of a residential flat building is permitted with development consent.

7 Completed community consultation, including with any relevant government agencies

7.1 Agencies that were, or are to be, consulted

From late 2018 to mid 2020, the project team consulted Willoughby City Council in direct meetings, by participating in Council engagement meetings convened as part of the preparation of the Local Centres Strategy and by informal discussions with Council officers. No other government agencies have been consulted as the project is not of State significance or even of a regionally significant scale.

However, the proposal will need the involvement of RMS as Eastern Valley Way is a State Road over which RMS has jurisdiction. No vehicular access is proposed to or from Eastern Valley Way.

7.2 Completed community consultations

From late 2018 to mid 2020, Elton Consulting was engaged to manage community consultation:

The Quadrangle Castlecrag project team identified and engaged directly with the following stakeholder groups over the course of two years of community engagement:

- *» Castlecrag residents*
- *» Castlecrag businesspeople*
- *» Quadrangle Liaison Committee (QLC) – a grouping of residents which included CPA members and residents with useful expertise*
- *» Castlecrag Progress Association (CPA)*

» *Walter Burley Griffin Society (WBGS)*
» *Friends of the Haven Amphitheatre (FoTHA)*
» *Glenaeon Rudolf Steiner School*
» *Willoughby City Council – Sailors Bay Ward councillors*
» *Castlecrag Conservation Society*
» *Willoughby Environmental Protection Association*

Greencliff and Elton Consulting used several methodologies to engage with stakeholders, tightly focusing on Castlecrag inhabitants:

» *Meetings with stakeholder groups*
» *Meetings with neighbours*
» *Attendance at community group meetings*
» *A letter to residents*
» *A dedicated website.* [90]

Many of these groups were consulted on multiple occasions and sometimes in groups.

*Throughout the two-year engagement process, there were **five persistent themes to community feedback**:*

» ***Transport:** concern for increased traffic congestion and the preservation of existing centre parking*
» ***Community:** Castlecrag residents stressed the importance of preserving the suburb's unique 'village feel'*
» ***Design democracy:** strong support for the Design Excellence Competition process and community participation in it*
» ***Design heritage:** the ultimate design should be sympathetic to the architectural principles of Walter Burley Griffin and Marion Mahoney Griffin*
» ***Nature & landscape:** stakeholders desired the retention of all living trees on the site*

While initially the community rejected any proposal for development over three storeys, as engagement progressed and issues of scale versus public space and amenity were addressed, concerns then became focused on floor space ratios (FSR) and feasibilities. At the end of the community engagement process, stakeholders became more comfortable with a structure over three storeys if open community space at ground level could be guaranteed.

*Ultimately, despite very vocal opposition from a very small minority of residents, support for the redevelopment of the Quadrangle Castlecrag can be demonstrated by exit polling at the final community engagement event, a series of on-site pop-ups held in February and March 2020, at which a total of **77.2% of stakeholders indicated they were positively disposed to the scheme and redevelopment of the site.***[91]

[90] Elton Consulting, Community Engagement Report, 2020, p. 3.

[91] Elton Consulting, Community Engagement Report, 2020, p. 3.

7.3 How feedback impacted design

When the project was commenced some three years ago, the brief from Greencliff (the proponent) was for a building of up to six storeys above Edinburgh Road with a FSR of 2.2:1. The proponent was aware of a proposal some ten years previously of possibly eight to ten storeys which had been rejected by Council and the community. After preliminary designs were prepared by Bruce Swalwell Architects, the designs were discussed with the CPA which made clear its opposition to a scheme greater than three storeys above Edinburgh Road.

During this time, Council consultants Architectus prepared a draft Urban Design Study of the Castlecrag Centre as part of a wider study of all local centres in Willoughby LGA. The draft urban design study, placed on exhibition November 2017 to January 2018, postulated a building of up to five storeys above Edinburgh Road on The Quadrangle site with a FSR of 1.8:1. Concurrently, the proponent carried out a detailed financial feasibility for the proposal which concluded that a building of four to five storeys and FSR 2.2:1 would be viable. The degree of coincidence between the draft urban design study and the proponent's feasibility encouraged the proponent to continue its community and Council engagement.

In February 2019, at a meeting of the CPA and WBGS, the proponent committed to holding its previously announced design excellence competition ahead of any planning proposal. Three prominent and award-winning architectural firms and four jurors, all nominated by the WBGS and CPA, were invited to contest/judge the competition which was held in October /November 2019. The brief for the competition was for two schemes, one at four storeys and one at five. The FSR was set at 2.2:1 with 1.8:1 above Edinburgh Road.

Francis Jones Morehen Thorp Architects (FJMT) was declared winner in December 2019, only after all schemes were presented to a general meeting of the CPA. At the meeting, the community made clear its preference for a lower, four storey or even three storey, scheme. However, community support for the scheme had increased markedly.

Following the CPA meeting, the proponent requested FJMT to investigate a lower scheme after Council made clear its preference for a three-storey scheme with FSR 1.6:1 at or above Edinburgh Road level. A partly three and partly four storey scheme, FSR 2.2:1, was prepared by the architects and a further financial feasibility conducted.

In December 2019 Council adopted the Local Centres Strategy with The Quadrangle site designated for three storeys and FSR 1.8:1 with 1.6:1 at or above Edinburgh Road. Council's decision was based only on feedback it received in response to its exhibition of the draft urban design study. This was despite proponent submissions as to feasibility and the quality of the final scheme resulting from the design excellence competition. Community engagement data at this time showed an increasing acceptance of the proponent's proposals.

Throughout the whole, lengthy process, the proponent has worked assiduously to find a balance between community views, Council planning studies and financial sustainability. Community engagement has been seriously undertaken and the final scheme, FSR 1.8:1 and three storeys, now has the open support of representatives of the Castlecrag Progress Association, the Walter Burley Griffin Society and the Friends of the Haven. These groups, along with members of a supportive Facebook group with some 440 members, were briefed immediately prior to completion of this PP.

8 Voluntary Planning Agreement

A Voluntary Planning Agreement has been drafted and is appended. The VPA covers the following items:

- Public domain improvements along Edinburgh Road and Eastern Valley Way
- Creation of publicly accessible area totalling 1,150m^2 on site fronting Edinburgh Road
- Landscaping of pathway along southern boundary to link with Council pathway to The Postern
- Public end-of-trip facilities
- Additional eight car spaces to allow relocation of Council parking from proposed park/garden on the corner of Edinburgh Road and The Postern
- Public art contribution.

9 Draft Part I.13 of Willoughby Development Control Plan

9.1 Introduction

Land to which this part applies

These special provisions apply to the land edged in yellow in Fig 1 with the legal description of lot 11 in DP 611594 and lot 1 in DP 43691.



Figure 1: Site area indicating boundaries, in yellow, of the site.

9.2 Application of this Part

This part is to be read in conjunction with:

- State Environmental Planning Policy 65 - Design Quality of Residential Apartment Development
- Willoughby Local Environmental Plan 2012

Relationship to the Apartment Design Guide

The Apartment Design Guide (ADG, 2015) is the primary document for guiding the design of the residential development at the site. Where there is an inconsistency between the ADG and controls within this part, the provisions of the ADG prevail.

Relationship to Planning Proposal design

This DCP governs the architectural design, prepared by FJMT Studio, lodged with the Planning Proposal for the site, subject to any changes adopted with the Planning Proposal. In accordance with the provisions of the Planning Proposal, the design architect is to be FJMT Studio. No alternative architect may be substituted without the agreement of Council.

Relationship to WDCP 2012

This part is to be read in addition to the parts listed above. Where there is an inconsistency between this Part and any other Part of the DCP in force, the provisions of WDCP prevail the extent necessary to achieve a design in accordance with that lodged as a Planning Proposal for the subject site.

9.3 Site planning

Site master plan

Development of the site is to be carried out in accordance with the master plan scheme prepared by FJMT Studio specifically:

- siting and orientation of the buildings
- provision of site facilities
- vehicular and pedestrian access

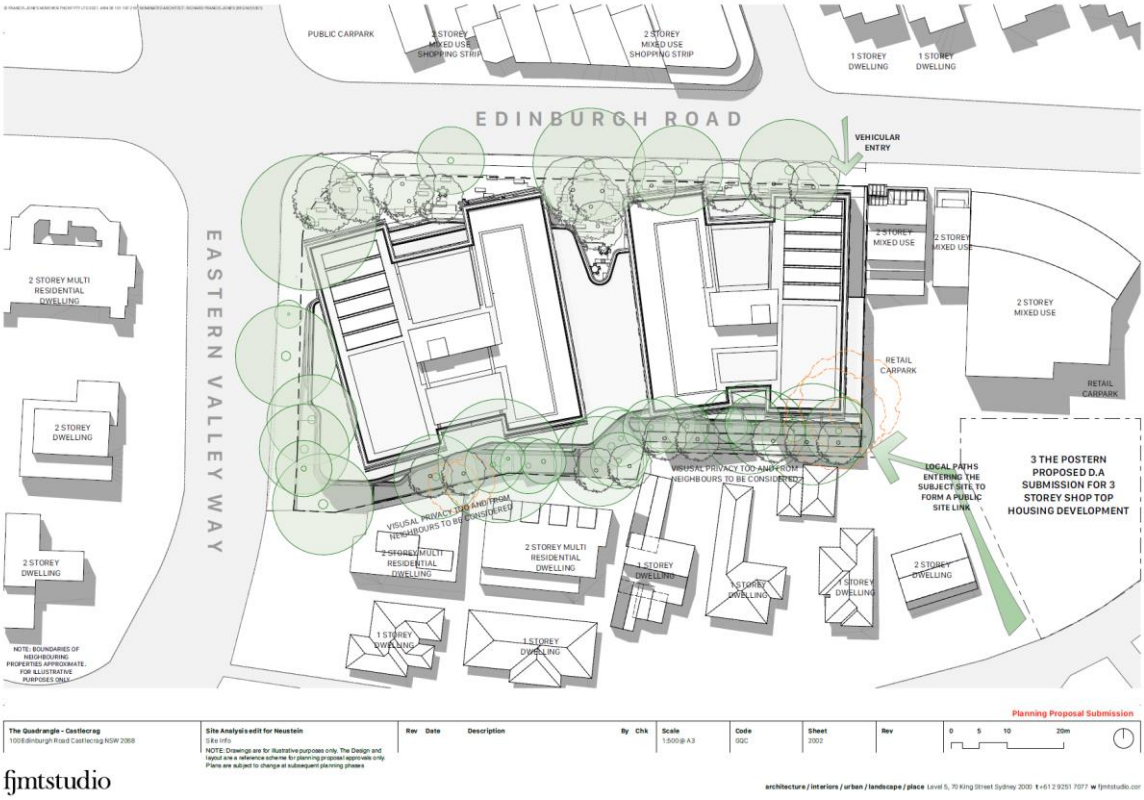


Figure 2: Site masterplan.

Building height

Development of the site is to be carried out in accordance with clause 6.24 of the Willoughby LEP.

Publicly accessible open space
Publicly accessible open space on site is to be provided as shown below:

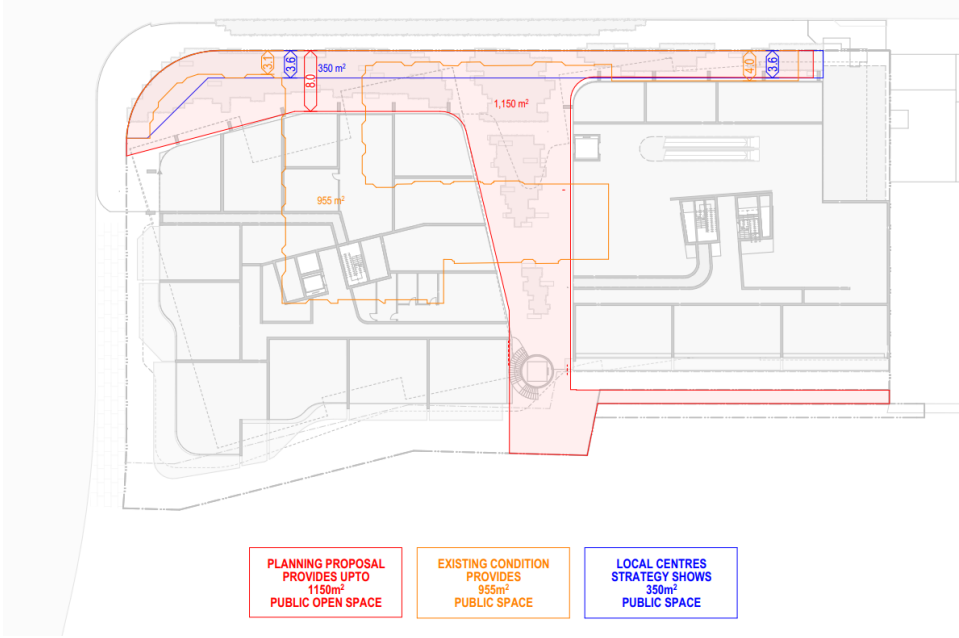


Figure 3: Publicly accessible open space on site.

Setbacks
Setbacks are to comply with the site setback plans below:

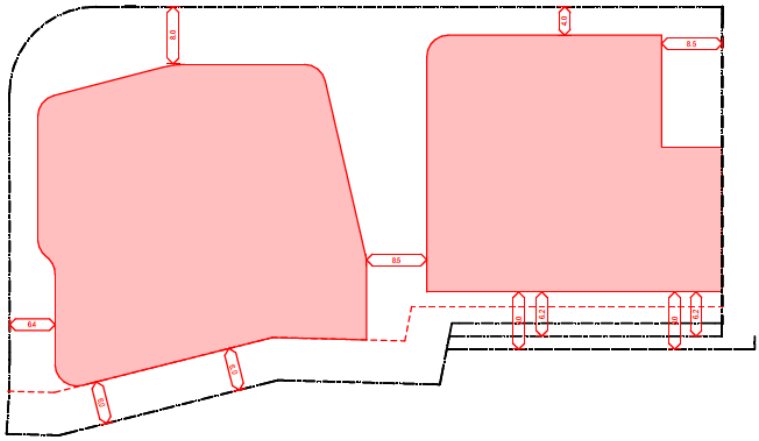


Fig 4a: Setback plan at ground level

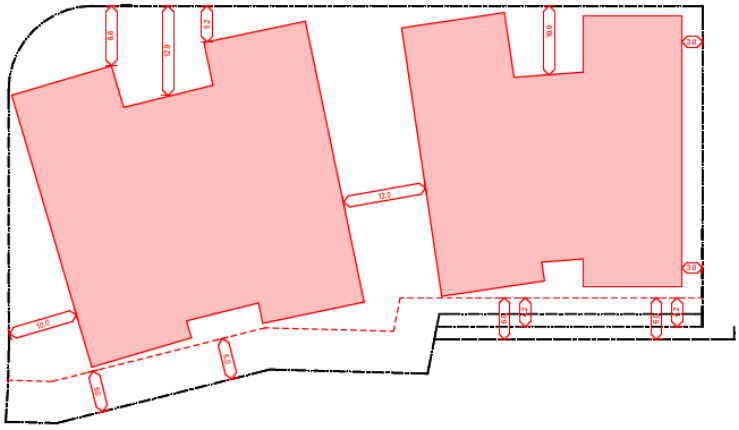


Fig 4b: Setback plan at Level 1 and 2. Note setbacks are to building faces and not to balconies.

Landscaping and tree preservation

Objectives

(a) To maintain the existing healthy trees on site and those adjoining the site on Edinburgh Road and Eastern Valley Way.

(b) To maximise landscaped area on site commensurate with Height of Building and FSR controls.

(c) To enhance the amenity of the site by planting additional trees where possible

Controls

(a) Landscaping is to be provided as per the site Masterplan.

(b) Street trees adjoining the site on Eastern Valley Way and Edinburgh Road are to be retained.

(c) Trees on the southern boundary, other than trees specified in the report of the arborist for removal, are to be retained. Trees subject to pruning are to be re-assessed at DA stage.

(d) Additional trees are to be planted where shown on the landscape plan lodged with the Planning Proposal.

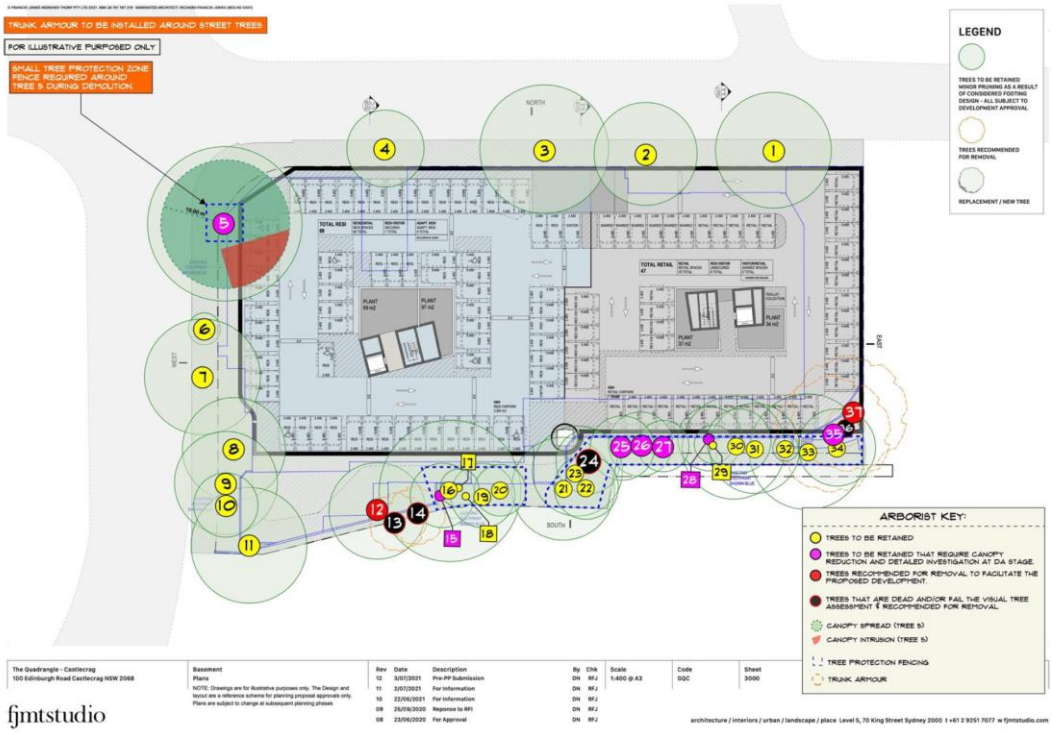


Figure 5: Tree preservation plan

9.4 Development controls

Public open space

Objectives

(a) Provide an open landscaped plaza, as shown on the public open space plan

(b) Provide opportunities for café and public seating within the plaza

(c) Allow for access to shops and cafes, etc fronting Edinburgh Road

(d) Provide a cross site through link to the walkway to The Postern

Control

(a) Provide public access to the approximately 1,150 sqm of designated area defined in Fig 3.

Communal open space

Objectives

(a) Provide outdoor recreation and relaxation opportunities for residents.

(b) Maximise solar access to communal open space, both for the amenity of the residents and viability of landscaping.

(c) Provide opportunities for residents to meet informally.

(d) Provide landscaped communal open space on the roof of the pavilions generally as shown in Fig 6:



Figure 6: Indicative communal open space on the pavilion roofs.

Control

(a) The area, extent and location of communal open space is generally as per Fig 6.

(b) A report on the wind effects of any design for the site is to be lodged with the Development Application detailing how adverse wind impacts through and around the building are to be mitigated.

Private open space

Objective

(a) Design private open space in a way that contributes to the building design and the privacy of ground floor apartments.

Control

(b) Private open space should achieve, to the extent possible having regard to Building Height and FSR permissible, the design criteria of section 4E- 1 of the Apartment Design Guide (ADG).

Solar access

Objective

(a) Maximise the amenity possible for all dwellings within a high density environment.

Control

(c) Solar access should achieve, to the extent possible having regard to Building Height and FSR permissible, the design criteria of section 4A- 1 of the Apartment Design Guide (ADG).

Visual privacy

Objective

(a) Provide separation between windows and balconies to ensure visual privacy is achieved.

Control

(b) Visual privacy should achieve, to the extent possible having regard to Building Height and FSR permissible, the design criteria of section 3F-1 of the Apartment Design Guide (ADG).

Colours and materials

Objective

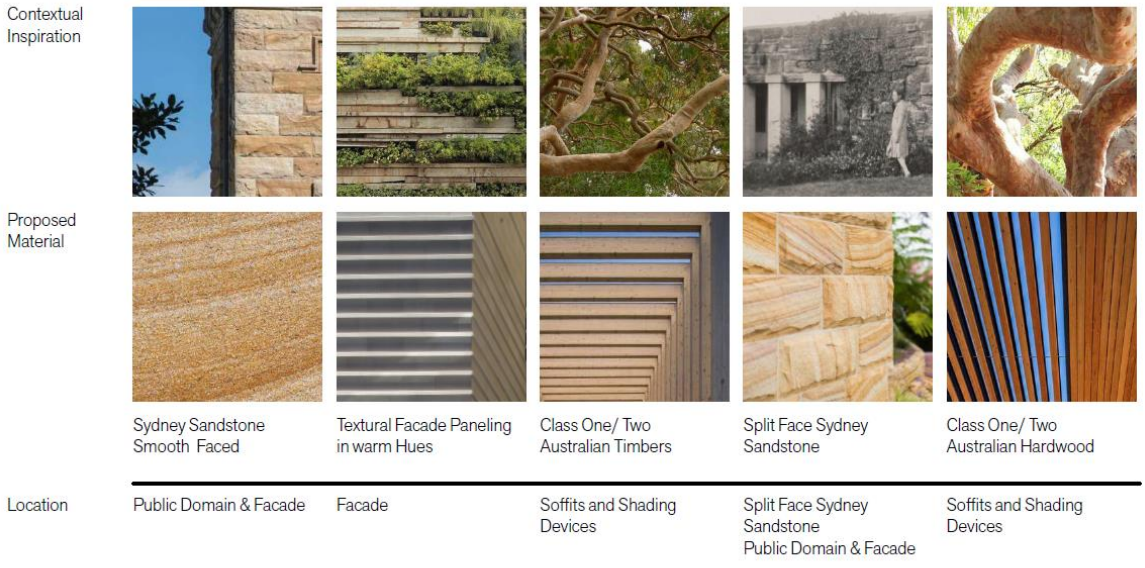
(a) To achieve a materials and colours architectural design sympathetic to the Griffin Legacy

(b) To use materials and colours that complement the adjoining Heritage Conservation Area.

Controls

(c) Use the following indicative but not exhaustive range of materials and to achieve the objectives above:

Indicative Material Palette



10 Assessment of the apartments against the design principles of SEPP 65 and the ADG

An assessment against the design quality principles of SEPP 65 and the design criteria and guidelines of the ADG is provided below.

Design quality principles	Compliance
Principle 1: Context and neighbourhood character	
Good design responds and contributes to its context. Context is the key natural and built features of an area, their relationship and the character they create when combined. It also includes social, economic, health and environmental conditions.	The context is mainly defined by the design legacy of Walter Burley Griffin for Castlecrag that incorporates the natural form of the land in the subdivision pattern of the allotments and curvilinear street patterns. In the Griffin design philosophy, landscaping is prioritised over building. The site is located at the gateway to Castlecrag where development consists of one and two storey buildings with retail at ground level. Located immediately west of the Castlecrag Conservation Area, the shopping village is an integral part of the neighbourhood in defining its character. The proposal acknowledges the heritage of the area and celebrates Walter Burley Griffin's legacy by delivering a shopping village in a landscaped setting to retain the "village feel" of the site, the natural bushland and rock escarpments.
Responding to context involves identifying the desirable elements of an area's existing or future character. Well designed buildings respond to and enhance the qualities and identity of the area including the adjacent sites, streetscape and neighbourhood.	The proposal delivers a three storey above Edinburgh Road development, which has been highlighted in the *Adopted Willoughby Local Centre Strategy to 2036* as a desirable element for the future character of the local centre. The proposal enhances the streetscape by replacing the existing centre with a well-designed modern building that is an outcome of a design excellence competition. The benefits of the proposal for the neighbourhood in relation to its contribution to the economic, social and environmental factors are extensively discussed in the report. The design approach employed by FJMT in developing the proposal incorporates concepts used by Griffin in defining the unique identity of Castlecrag.
Consideration of local context is important for all sites, including sites in established areas, those	The proposal enhances the established character of the locality, a retail strip at ground level. It improves this character by providing large open space areas and through site links that are publicly

Design quality principles	Compliance
undergoing change or identified for change.	available. It creates the mixed-use nature of a local centre through the provision of new housing units above and around the ground level.
Principle 2: Built form and scale	
Good design achieves a scale, bulk and height appropriate to the existing or desired future character of the street and surrounding buildings.	The proposed density and height for the proposal is the result of social, economic and feasibility studies carried out by both Council, i.e. *Willoughby Local Centre Strategy,* and the applicant. An extensive community consultation phase and a design excellence competition further contributed to the proposal. The architectural drawings and report demonstrate how the height, bulk and the scale of the proposed scheme fits well into its context.
Good design also achieves an appropriate built form for a site and the building's purpose in terms of building alignments, proportions, building type, articulation and the manipulation of building elements.	The proposed site plan positions the sandstone pavilions, the east and the west wing buildings on top of the podium, in a radial arrangement to align with the fluid geometry established by Griffins' master plan for Castlecrag that abruptly stopped at this western corner of the suburb. As stated in the architecture report, the utilisation of the following design details, materials and patterns provide articulation of the proposed facades: *… Sandstone and concrete are used to give depth, weight and connection to the ground of the site. Deep colonnades, openings and reveals will give depth and shade. Timber and concrete pergolas and awning shades integrate with landscape to give further shade and depth.*
Appropriate built form defines the public domain, contributes to the character of streetscapes and parks, including their views and vistas, and provides internal amenity and outlook.	The north facing open public plaza along Edinburgh Road is bordered by sandstone colonnades and landscaping which delivers a well-defined public domain that will be a meeting and gathering place for local residents. The opening at the centre of the site connects the public plaza to The Postern through a landscaped path and opens views and outlooks towards the south.
Principle 3: Density	
Good design achieves a high level of amenity for residents and each apartment, resulting in a density	A high level of amenity for residents and visitors will be delivered through the building and site design qualities discussed above.

Design quality principles	Compliance
appropriate to the site and its context.	The proposed density has been endorsed through Council's strategic studies for the centre and has been tested through the design development process, as discussed in the planning proposal report, to ensure the development is appropriate for the rejuvenation of Castlecrag.
Appropriate densities are consistent with the area's existing or projected population. Appropriate densities can be sustained by existing or proposed infrastructure, public transport, access to jobs, community facilities and the environment.	The proposal responds to the expected need for 90 new dwellings by the year 2036 in Castlecrag through the provision of 53 new housing units. The proposed density and height are necessary to deliver a development outcome that can: 01. satisfy living standard requirements for residential units under the ADG, 02. provide sufficient separation between building elements to enhance views, vistas, internal and external amenity of the future residents, 03. respect Griffins' legacy through provision of extensive landscaping and quality public domain. 04. maintain neighbourhood retail facilities on site and deliver modern community facilities. The additional density and the subsequent demand for local infrastructure has been assessed by the relevant experts and is found suitable.
Principle 4: Sustainability	
Good design combines positive environmental, social and economic outcomes.	The positive environmental, social and economic outcomes of the proposal are discussed in the report and supported by the expert reports submitted with this application.
Good sustainable design includes use of natural cross ventilation and sunlight for the amenity and liveability of residents and passive thermal design for ventilation, heating and cooling reducing reliance on technology and operation costs. Other elements include recycling and reuse of materials and waste, use of sustainable materials and deep soil	The development incorporates new building materials that will provide good thermal insulation. The number of units that have access to natural and/or cross ventilation and sunlight satisfies the ADG requirements. The liveability standards will be improved by reducing reliance on technology for providing thermal comfort. The proposed solar panels and the reuse of rainwater for irrigation purposes contribute to the efficient use of water and energy

Design quality principles	Compliance
zones for groundwater recharge and vegetation.	The proposal exceeds the required provision of 7% of site area as deep soil under the ADG by providing deep soil planting that equates to 15% of the site area. Overall, the proposal is designed and will be constructed by incorporating sustainable resource management techniques in accordance with relevant standards.
Principle 5: Landscape	
Good design recognises that together landscape and buildings operate as an integrated and sustainable system, resulting in attractive developments with good amenity. A positive image and contextual fit of well designed developments is achieved by contributing to the landscape character of the streetscape and neighbourhood.	Castlecrag's design is an integration of landscape and architecture in order to demonstrate how to live closer to nature in the bushland setting[92]. The redesign of The Quadrangle evidences this image by providing 42% of the site area as communal/public open space. This is 17% more than the minimum requirement of the ADG. The design qualities of the proposal and its suitability for its context through the provision of ample landscaping is discussed in this report and the landscape concept report provided by FJMT studio.
Good landscape design enhances the development's environmental performance by retaining positive natural features which contribute to the local context, co-ordinating water and soil management, solar access, micro-climate, tree canopy, habitat values and preserving green networks.	The aim of the proposal is to maximise landscaping area at different levels, provide a deep soil zone to maximise tree planting, reuse and harvest rainwater for irrigation purposes and connect the proposed new open space areas on site with the surrounding locality. In order to deliver these qualities, the proposed development is sited to minimise impact on street trees and the trees along the southern boundary of the site and to maximise solar access to public, communal and private open space areas. The environmental performance of the development will be improved through the provision of a contemporary landscape that references the bushland character of Castlecrag.
Good landscape design optimises useability, privacy and opportunities for social interaction, equitable access, respect for neighbours' amenity and provides	The proposed landscaped public plaza to the front of the site that is surrounded by cafes, restaurants and shops maximises the opportunities for social interaction between the visitors and the residents.

[92] FJMT Design Competition Scheme 2019

Design quality principles	Compliance
for practical establishment and long term management.	Considering the aging population of the neighbourhood, provision of accessible pathways through the site and between the open space areas has been prioritised in the design of the centre. By maintaining the ownership of the publicly accessible open space areas, the management of the centre will ensure the long-term maintenance of these assets.
Principle 6: Amenity	
Good design positively influences internal and external amenity for residents and neighbours. Achieving good amenity contributes to positive living environments and resident well being. Good amenity combines appropriate room dimensions and shapes, access to sunlight, natural ventilation, outlook, visual and acoustic privacy, storage, indoor and outdoor space, efficient layouts and service areas and ease of access for all age groups and degrees of mobility.	39 (74%) of units have access to sunlight for 2 hours or more in winter as per the ADG requirements. The rest of the units still receive ample daylight and mostly enjoy the views and outlook towards the south. 32 of 53 (60%) of units will be naturally ventilated. This exceeds ADG criteria of providing 60% of units with natural cross ventilation. To ensure visual privacy between the buildings on site and the neighbouring buildings, privacy screens will be incorporated to the openings where potential loss of privacy was expected. A detailed analysis will be provided at the DA stage to ensure privacy of future residents and neighbours can be satisfied through design. Compliance with the numerical requirements of the ADG in relation to internal and external amenity of the residents is assessed in a separate table and provided under Appendix 2 of the report.
Principle 7: Safety	
Good design optimises safety and security within the development and the public domain. It provides for quality public and private spaces that are clearly defined and fit for the intended purpose. Opportunities to maximise passive surveillance of public and communal areas promote safety.	The design of the proposal maximises passive surveillance of the site boundaries by incorporating the following design strategies: • Along the north boundary, all the retail tenancies have full height glass facades looking to the street. • The through site link turns the middle of the site into a publicly accessible area. • Windows and open space areas of upper floors face site boundaries. • CCTV system will be employed to monitor blind spots. In addition, the development will be managed by a future body corporate which will ensure security and cleanliness.

Design quality principles	Compliance
A positive relationship between public and private spaces is achieved through clearly defined secure access points and well lit and visible areas that are easily maintained and appropriate to the location and purpose.	The main pedestrian entry to the site, from Edinburgh Road (north), follows through to the communal/public open space that is visible to residents and visitors. The pedestrian access form The Postern, along the southern boundary, will be passively supervised by the residential units facing the route. The residential and retail premises are oriented towards different site boundaries to establish a secure relationship between private and public spaces. Sufficient but not intrusive lighting will be considered at later stages of design.
Principle 8: Housing diversity and social interaction	
Good design achieves a mix of apartment sizes, providing housing choice for different demographics, living needs and household budgets.	The proposed development provides an appropriate mix of housing typologies to accommodate for the future residential needs of Castlecrag. The development consists of one, two, three- and four-bedroom apartments. 50% of units are designed to satisfy adaptable unit standards to take account of the ageing population. Also, the provision of 3.8% (two by number) affordable housing units will cater for different demographics including residents with lower incomes.
Well designed apartment developments respond to social context by providing housing and facilities to suit the existing and future social mix.	The ageing population of Castlecrag needs apartments to replace their often topographically challenging dwelling houses. The project delivers 53 dwellings above a potentially vibrant community hub services by neighbourhood retail. The development will bring life and vitality to the site and provide a place where the community can meet – a social hub.
Good design involves practical and flexible features, including different types of communal spaces for a broad range of people and providing opportunities for social interaction among residents.	The development incorporates different types of communal/public open spaces at both ground level and the rooftop terraces.
Principle 9: Aesthetics	
Good design achieves a built form that has good proportions and a balanced composition of elements, reflecting the internal layout and structure. Good design uses a	The design achieves appropriate proportions and balanced compositions of elements by: 01. prioritising the nature (landscaping) over building and delivering green facades, naturally landscaped pathways and

Design quality principles	Compliance
variety of materials, colours and textures.	platforms to celebrate the dominant bushland character of the area. 02. utilising locally available natural materials, i.e. sandstone, on the façade of the building and other materials with earthy and light colours to maintain the relationship between the building and its context. 03. breaking up the overall development into smaller sections to maintain a good proportion between the site and its surrounds.
The visual appearance of a well designed apartment development responds to the existing or future local context, particularly desirable elements and repetitions of the streetscape.	This project pays tribute to Walter Burley Griffin's legacy in Castlecrag by acknowledging the design elements and concepts used in establishing the neighbourhood and construction of the significant buildings designed by Griffin's studio. Proposing a large public plaza surrounded by sandstone colonnades, natural planting and cafes and restaurants sits well within the existing streetscape.

Part 3 – Siting the development		
Design Criteria and Design Guidelines	**PROPOSED**	**COMPLIES**
3D Communal and public open space		
1. Communal open space has a minimum area equal to 25% of the site (see figure 3D.3)	43% (2,220m^2) of the site is proposed for communal/ public open space.	**Yes**
2. Developments achieve a minimum of 50% direct sunlight to the principal usable part of the communal open space for a minimum of 2 hours between 9 am and 3 pm on 21 June (mid winter)	The development achieves a minimum of 50% of direct sunlight to the principal usable parts of the communal open space for a minimum of 2 hours between 9 am and 3 pm on 21 June (mid winter).	**Yes**
3E Deep soil zones		
1. Deep soil zones are to meet the following minimum requirements:	The development provides 14.5% of the site (750m^2) as deep soil. More than 7% of the site area is provided as deep soil zone with a minimum dimension of 6m along the southern and western boundaries.	**Yes**

<table><tr><th>Site area</th><th>Minimum dimensions</th><th>Deep soil zone (% of site area)</th></tr><tr><td>less than 650m²</td><td>-</td><td rowspan="4">7%</td></tr><tr><td>650m² - 1,500m²</td><td>3m</td></tr><tr><td>greater than 1,500m²</td><td>6m</td></tr><tr><td>greater than 1,500m² with significant existing tree cover</td><td>6m</td></tr></table>		
3F Visual privacy		
1. Separation between windows and balconies is provided to ensure visual privacy is achieved. Minimum required separation distances from buildings to the side and rear boundaries are as follows: <table><tr><th>Building height</th><th>Habitable rooms and balconies</th><th>Non-habitable rooms</th></tr><tr><td>up to 12m (4 storeys)</td><td>6m</td><td>3m</td></tr><tr><td>up to 25m (5-8 storeys)</td><td>9m</td><td>4.5m</td></tr><tr><td>over 25m (9+ storeys)</td><td>12m</td><td>6m</td></tr></table>	The proposed buildings on the site are located on a higher ground compared to the residential buildings to the south and will not have a direct sight of line into their windows to cause any concerns with potential loss of privacy. Where the separation distances are less than the required figures under this controls, visual privacy measures such as screens, louvres and angled or highlight windows will be incorporated into the design at the DA.	

Part 4 – Designing the building		
Design Criteria and Design Guidelines	**PROPOSED**	**COMPLIES**
4A Solar and daylight access		
1. Living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 2 hours direct sunlight between 9 am and 3 pm at mid winter in the Sydney Metropolitan Area and…	74% (39) of the units receive a minimum of 2 hours of direct sunlight into their living areas and private open spaces between 9am and 3pm at mid-winter.	**Yes**
3. A maximum of 15% of apartments in a building receive no direct sunlight between 9 am and 3 pm at mid winter	26% (14 of 53) of units receive no direct sunlight between 9 am and 3 pm at mid-winter. Apartments that receive no direct sunlight have access to ample private open space to improve the amenity of the units. Some of these units that are located at ground level are split into two levels to maximise access to daylight.	**No, but justified.**

<table>
<tr><td colspan="3">Part 4 – Designing the building</td></tr>
<tr><td>Design Criteria and Design Guidelines</td><td>PROPOSED</td><td>COMPLIES</td></tr>
<tr><td></td><td>It should be noted that the sweeping views of surrounding bushland and Sydney CBD are towards the south. The lack of access to direct sunlight is compensated for by providing prominent views to the living areas and private open spaces of these units.</td><td></td></tr>
<tr><td colspan="3">4B Natural ventilation</td></tr>
<tr><td>1. At least 60% of apartments are naturally cross ventilated in the first nine storeys of the building. Apartments at ten storeys or greater are deemed to be cross ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and cannot be fully enclosed.</td><td>60% (32 of 53) of units are naturally cross ventilated.</td><td>Yes</td></tr>
<tr><td>2. Overall depth of a cross-over or cross-through apartment does not exceed 18m, measured glass line to glass line.</td><td>No cross-through units proposed as part of the mix. None of the units has an overall depth of 18m or more.</td><td>N/A</td></tr>
<tr><td colspan="3">4C Ceiling Heights</td></tr>
<tr><td>1. Measured from finished floor level to finished ceiling level, minimum ceiling heights are:
<table><tr><th colspan="2">Minimum ceiling height
for apartment and mixed use buildings</th></tr><tr><td>Habitable rooms</td><td>2.7m</td></tr><tr><td>Non-habitable</td><td>2.4m</td></tr><tr><td>For 2 storey apartments</td><td>2.7m for main living area floor
2.4m for second floor, where its area does not exceed 50% of the apartment area</td></tr><tr><td>Attic spaces</td><td>1.8m at edge of room with a 30 degree minimum ceiling slope</td></tr><tr><td>If located in mixed used areas</td><td>3.3m for ground and first floor to promote future flexibility of use</td></tr></table>The minimums do not preclude higher ceilings if desired.</td><td>The floor to ceiling height for all the habitable and non-habitable spaces within the proposed units satisfy the minimum dimensions required by this guideline.</td><td>Yes</td></tr>
</table>

<table>
<tr><td colspan="3">Part 4 – Designing the building</td></tr>
<tr><td>Design Criteria and Design Guidelines</td><td>PROPOSED</td><td>COMPLIES</td></tr>
<tr><td colspan="3">4D Apartment size and layout</td></tr>
<tr><td colspan="3">Objective 4D-1</td></tr>
<tr><td>1. Apartments are required to have the following minimum internal areas:
<table><tr><th>Apartment type</th><th>Minimum internal area</th></tr><tr><td>Studio</td><td>35m²</td></tr><tr><td>1 bedroom</td><td>50m²</td></tr><tr><td>2 bedroom</td><td>70m²</td></tr><tr><td>3 bedroom</td><td>90m²</td></tr></table>The minimum internal areas include only one bathroom. Additional bathrooms increase the minimum internal area by 5m2 each.
A fourth bedroom and further additional bedrooms increase the minimum internal area by 12m2 each.</td><td>All the proposed units are capable of satisfying the minimum area requirements as per this design guideline.</td><td>Yes</td></tr>
<tr><td>2. Every habitable room must have a window in an
external wall with a total minimum glass area of not
less than 10% of the floor area of the room. Daylight
and air may not be borrowed from other rooms.</td><td>The proposal can satisfy the numerical requirement of this guideline at the DA stage. Considering the architectural scheme is prepared for the purpose of a Planning Proposal provision of this level of detail on the plans is not necessary at this stage.</td><td>Yes</td></tr>
<tr><td colspan="3">Objective 4D-2</td></tr>
<tr><td>1. Habitable room depths are limited to a maximum of 2.5 x the ceiling height.</td><td>As above.</td><td>Yes</td></tr>
<tr><td>2. In open plan layouts (where the living, dining and kitchen are combined) the maximum habitable room
depth is 8m from a window.</td><td>As above.</td><td>Yes</td></tr>
<tr><td colspan="3">Objective 4D-3</td></tr>
<tr><td>1. Master bedrooms have a minimum area of 10m2 and other bedrooms 9m2 (excluding wardrobe space).</td><td>As above.</td><td>Yes</td></tr>
</table>

<table>
<tr><td colspan="3">Part 4 – Designing the building</td></tr>
<tr><td>Design Criteria and Design Guidelines</td><td>PROPOSED</td><td>COMPLIES</td></tr>
<tr><td>2. Bedrooms have a minimum dimension of 3m (excluding wardrobe space).</td><td>As above.</td><td>Yes</td></tr>
<tr><td>3. Living rooms or combined living/dining rooms have a minimum width of:
• 3.6m for studio and 1 bedroom apartments
• 4m for 2 and 3 bedroom apartments</td><td>As above.</td><td>Yes</td></tr>
<tr><td>4. The width of cross-over or cross-through apartments are at least 4m internally to avoid deep narrow apartment layouts.</td><td>As above.</td><td>Yes</td></tr>
<tr><td colspan="3">4E Private open space and balconies</td></tr>
<tr><td colspan="3">Objective 4E-1</td></tr>
<tr><td>1. All apartments are required to have primary balconies as follows:
<table><tr><th>Dwelling type</th><th>Minimum area</th><th>Minimum depth</th></tr><tr><td>Studio apartments</td><td>4m²</td><td>-</td></tr><tr><td>1 bedroom apartments</td><td>8m²</td><td>2m</td></tr><tr><td>2 bedroom apartments</td><td>10m²</td><td>2m</td></tr><tr><td>3+ bedroom apartments</td><td>12m²</td><td>2.4m</td></tr></table>The minimum balcony depth to be counted as contributing to the balcony area is 1m.</td><td>The proposal satisfies the numerical requirement of this guideline.</td><td>Yes</td></tr>
<tr><td>2. For apartments at ground level or on a podium or similar structure, a private open space is provided instead of a balcony. It must have a minimum area of 15m2 and a minimum depth of 3m</td><td>As above.</td><td>Yes</td></tr>
<tr><td colspan="3">4F Common circulation and spaces</td></tr>
<tr><td>1. The maximum number of apartments off a circulation core on a single level is eight.</td><td>A maximum of 10 units will be serviced off a circulation core in each building. This results from the division of the building into two pavilions to minimise its bulk and scale to fit into its context.</td><td>No but justified</td></tr>
</table>

<table>
<tr><td colspan="3">Part 4 – Designing the building</td></tr>
<tr><td>Design Criteria and Design Guidelines</td><td>PROPOSED</td><td>COMPLIES</td></tr>
<tr><td colspan="3">4G Storage</td></tr>
<tr><td>1. In addition to storage in kitchens, bathrooms and bedrooms, the following storage is provided:
<table><tr><th>Dwelling type</th><th>Storage size volume</th></tr><tr><td>Studio apartments</td><td>4m³</td></tr><tr><td>1 bedroom apartments</td><td>6m³</td></tr><tr><td>2 bedroom apartments</td><td>8m³</td></tr><tr><td>3+ bedroom apartments</td><td>10m³</td></tr></table>At least 50% of the required storage is to be located within the apartment.</td><td>The proposal is capable of providing sufficient storage as per the requirements of this guideline.</td><td>Yes</td></tr>
</table>

Appendix – Landscape and Architectural Report
In separate file.

Appendix – Geotechnical Assessment Report
In separate file.

Appendix – Traffic and Transport Study
In separate file.

Appendix – Arborist Report
In separate file.

Appendix – Building Services Concept Report
In separate file.

Appendix – Stormwater Management Memorandum
In separate file.

Appendix – Community Engagement Report
In separate file.

Appendix – Heritage Impact Statement
In separate file.

Appendix – Capital Investment Value
In separate file.

Appendix – Contamination Report
In separate file.

Appendix 1 – Overshadowing Analysis

Built on the southern edge of the Castlecrag ridge, the site sits above the houses in the cul-de-sac part of The Postern. These houses are south and downslope of the development and the impact of the proposal on solar access to their rear yards needs to be considered. The solar impact of the proposal is the subject of 18 sheets of the 53 sheet PP set – drawings 6201 to 6218.

Sheets 6201 to 6206 show shadows in plan for the winter solstice, 21 June. Three aspects of the development are illustrated – existing shadows, the scheme shown in the adopted LCS and the subject proposal. Sheets 6201 to 6203 are conventional diagrams without trees while 6204 to 6206 show the impact of trees particularly those on the southern boundary. Demonstrating the impact of the trees allows comparison with the aerial photography from Nearmap, particularly important as the trees are evergreens and the subject of extensive commentary from Council and the community. Shadows are shown from 8am to 4pm to capture fully the day.

Sheets 6207 to 6218 also provide an analysis of the overshadowing impact of the three situations, existing, LCS scheme and the proposal, but taken from a “sun eye view”. Use of the sun eye view allows for a more extensive understanding of the impact of one building and trees on others. It also allows assessment of solar access to the proposal itself. In any sun eye view, those windows and balconies which can be seen are in sunlight. Conversely, windows and balconies not visible are in shade. Sheets 6207 to 6212 cover 21 June, with and without trees. Sheets 6213 to 6218 cover 21 March, the equinox, again with and without trees.

These drawings can be related to the two photographs below. The photos are approximations of times illustrated in the solar analysis prepared using a standard drawing system. Figure 11 can be compared with the plan view of the existing situation at noon on sheet 6205. The degree of correspondence is high. This verifies the accuracy of illustrating the tree impact on overshadowing in the diagrams prepared to illustrate the degree of overshadowing due to the proposal.



Figure 11 – Shadows existing at approximately noon, three weeks from winter solstice – courtesy Nearmap



Figure 12 – Extract from sheet 6205 of the architectural drawings

A similarly comparative aerial photo for approximately 11am at the equinox is below together with a sun eye view of the corresponding time.



Figure 13 – Shadows existing at approximately 11am, five days from equinox – courtesy Nearmap

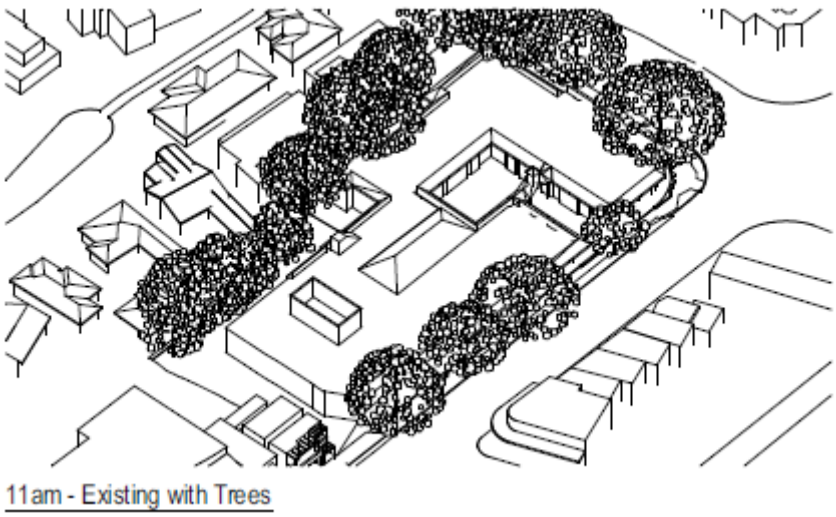


Figure 14 – Sun eye view corresponding with Fig 13. Note the extent of the rear yards visible in the diagram corresponds with the sunlit portions of the rear yards of the houses in The Postern.

The conclusions to be drawn from the extensive graphical information provided by the architect is that:

- Shadows due to the dense band of evergreen trees on the southern boundary of the site, which are to be retained as per the report of the arborist, must be considered in any analysis
- Shadows due to the trees extend well beyond the shadows due to the existing building on the subject site at 21 June

- Shadows due to the proposal, and also the comparative LCS scheme, largely sit within the dense tree shadows at 21 June
- The additional shading impact of the proposed building will be relatively minor at 21 June, the winter solstice
- There will be little overshadowing due to the proposal (or the trees) at the equinox, 21 March or 21 September.

Appendix 2 – Visual analysis

Visual catchment

Inspite of the prominent location of the proposed redevelopment of The Quadrangle at 100 Edinburgh Road, Castlecrag, the visual catchment for a building of mostly 11m height above the Edinburgh Road pavement is very limited. The proposal is within the canopy height of many of the street trees in its immediate and close locality and is thus partly obscured from many possible view positions. Further view limitations result from the tree lined streets around the subject site, the topography and also from the curves or angles in the nearby roads which allow street trees to limit views, not only of the site but also along the streets.

Analysis of the immediate streets around the site allows an accurate estimation of the sight distances along the streets and, from that an assessment of the visual impact of the proposal. The distances from which the subject site is visible, always partly hidden by the tree canopies, is as shown in Photo 1 and Table 1:



Photo 1 – Aerial view of site and surrounds with sight distances shown – courtesy Near Maps

Table 1 – Sight distances

Street	View Direction	Sight distance (rounded)
Edinburgh Road, east of site	West	80m to NE site corner
Eastern Valley Way north of site	South	100 to NW site corner
Edinburgh Road west of site	East	120m to NW site corner
Eastern Valley Way south of site	North	135m to SW corner

Edinburgh Road, east of site

Most of the street trees obscure a clear view of the site. As the proposal sits within the canopy height of the larger tress, it will be a two storey above existing ground level mass behind the trees. The architect's choice of natural materials, in keeping with the Griffin legacy and philosophy, will further merge the building form with the trees in front – refer Photo 2.



Photo 2 - From corner of Rutland Street looking west (courtesy of Google Streetview)

Photos 3 and 4, approaching the site, show that even from in front of the Griffin Centre the street trees still partly hide the mass of the proposal. The grey building on the eastern boundary of the site, No.98 will obscure the first floor of the proposal leaving only the top floor and its services visible against the sky, behind the street trees.



Photo 3 - Photo from outside NE corner of the Griffin Centre (courtesy of Google Streetview)



Photo 4 - From outside Griffin centre in Edinburgh Road looking west (courtesy of Google Streetview)

Eastern Valley Way north of site

The view from Eastern Valley Way north of the site is, like the other views, constrained by the combination of street trees and front yard foliage of houses lining the road. As one approaches the main intersection, it is apparent that the proposal will fill in the sky view to the east of the tree on the street corner immediately adjacent to the subject site, below the top of the tree canopy (refer Photos 5 and 6).



Photo 5 - From outside 106 Eastern Valley Way looking south (courtesy of Google Streetview)



Photo 6 - From outside 102 Eastern Valley Way looking south (courtesy of Google Streetview)

Edinburgh Road west of site

As for the other cardinal viewpoints, the site is framed by street trees as seen in Photos 7 and 8. The proposed design, by FJMT Studio, will fill in a small section of sky behind the street trees and within the height of their canopies. The proposed development is two storeys higher than that existing on the site.



Photo 7 - From corner Fourth Avenue and Edinburgh Road looking east (courtesy of Google Streetview)

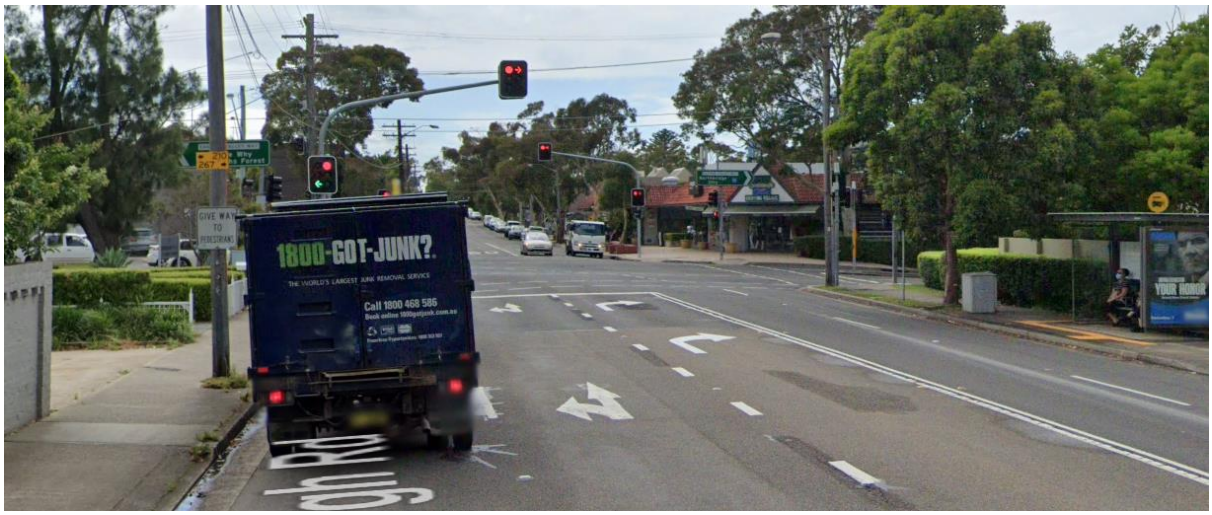


Photo 8 - Opposite 80 Edinburgh Road looking east (courtesy of Google Streetview)

Eastern Valley Way south of the site

The edge of the proposal may be seen from Eastern Valley Way about 135m south of the SW corner, possibly from the viewpoint of Photo 9. As one approaches, the building will be largely screened by the trees along the south boundary of the site (Photo 10) but it is unlikely to be visible on the skyline.
Even from much closer (Photo 11) the building will be screened by trees. About 20m from the SW corner, the new building will be visible through the tree screen.

Any other viewpoints

The building is virtually hidden by street trees and houses from all other viewpoints, including from Northbridge shopping Centre. Some limited close up views will be available between the three houses to the immediate south of the site in the cul-de-sac portion of The Postern.

Assessment of visual impact

The prime streetscape characteristics of Castlecrag, and also Northbridge, are tree lined streets and front gardens with often substantial foliage. As noted above, the street pattern, topography and street trees limit distant views of the proposed development to the point that the building's striking architecture will only be apparent from very close up. The use of natural materials will serve to reduce the visual impact of the proposal, setting it into its background. Whilst the building has been designed as a gateway to the Griffin suburb, it will not be an overwhelming or dominant building except when seen very close up. Its visual impact will be very limited.



Photo 9 - Outside 94 Eastern Valley Way looking north (courtesy of Google Streetview)



Photo 10 - Outside 92 Eastern Valley Way looking north (courtesy of Google Streetview)



Photo 11 - Corner of Warners Avenue and Eastern Valley Way looking north (courtesy of Google Streetview)



Photo 12 - Outside 97 Eastern Valley Way looking north (courtesy of Google Streetview)

Appendix 3 – Green Travel Plan

This Green Travel Plan (GTP) outlines the actions which can be implemented to ensure an integrated transport access concept is achieved for the proposal.

12.1 Existing Transport Provisions

Staff and visitors currently have access to the following transport options:

- Bus services
- Pedestrian and bicycle linkages

12.1.1 Bus

The site is serviced by bus route numbers 203 and 275, to the North Sydney CBD and Chatswood, refer to Figure 7.



Figure 7 – Castlecrag services by the 203 and 275 bus routes.[93]

12.1.2 Pedestrian Infrastructure

The site is largely visible from the major traffic route to the east, Eastern Valley Way, and Edinburgh Road as it sits at the gateway to Castlecrag. Topographically the site is somewhat difficult to navigate on foot. Nevertheless, a majority of walking trips to the site will be undertaken by Castlecrag residents who will not need special signage.

[93] Ibid, p. 68.

12.1.3 Cycling Infrastructure

Castlecrag is serviced by a marked on-road bicycle route that starts at the end of Edinburgh Road and leads to a range of bike routes ending in Chatswood CBD, Lane Cove North and Chatswood West - refer to Figure A below.

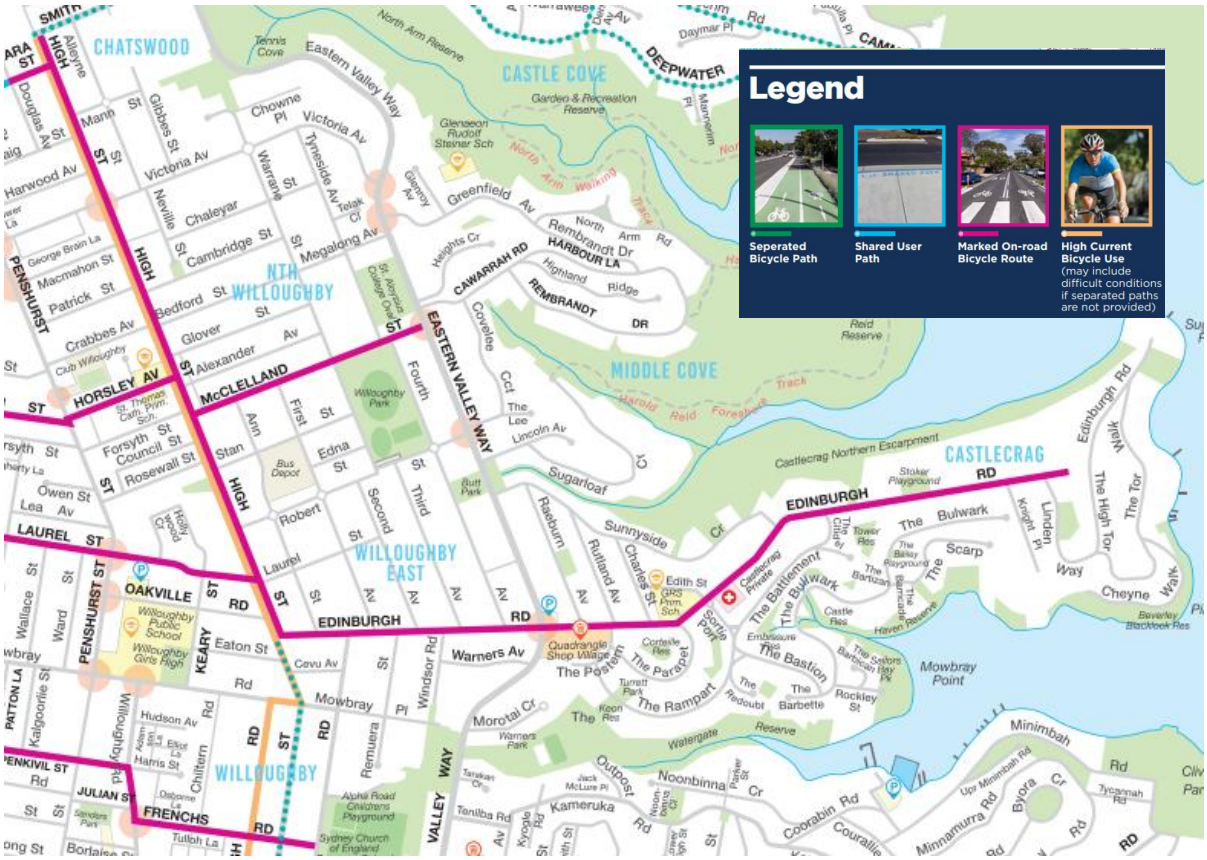


Figure 8– Castlecrag marked on road cycle route.[94]

12.2 Actions

The proposed development incorporates the following actions into the design of the site to ensure equitable access to and from the site is achieved.

Walking

- Provide wayfinding signage to public facilities on site and cross site link to The Postern.

Cycling

- Ensure bicycle parking is clearly sign posted

[94] https://www.willoughby.nsw.gov.au/Residents/Parking-and-transport/Cycling

- Have secure bicycle parking in an easily accessible location
- Provide bicycle parking to meet community needs
- Provide bicycle parking for visitors
- Provide secure bicycle lockers
  Provide end of trip facilities.

Public transport (buses)

- Provide bus timetables in a prominent location on site.

Car Parking

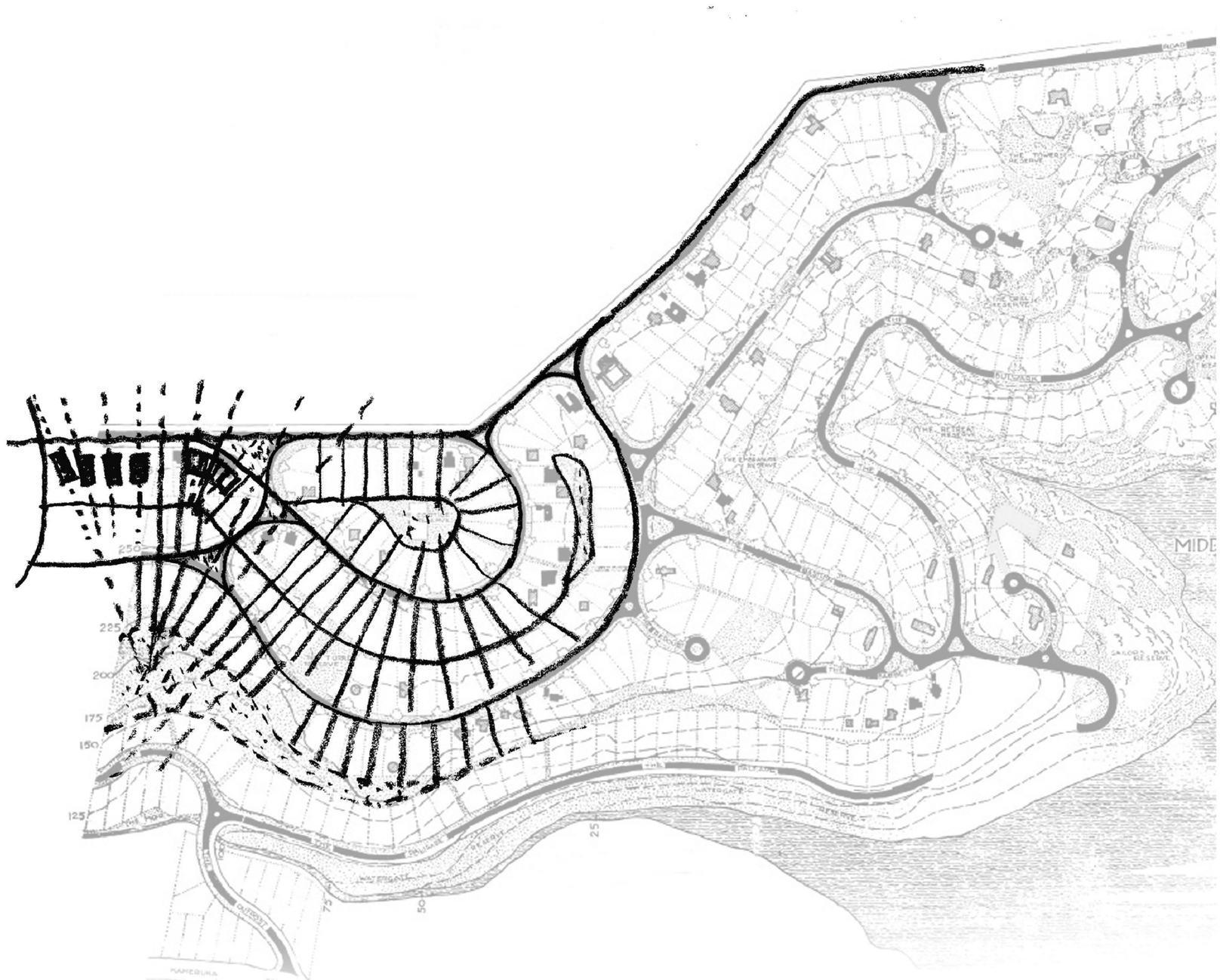
- The application will provide the required number of parking spaces to service the community, its residents and visitors
- Ensure underground visitor parking is clearly sign posted.

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Planning Proposal

100 EDINBURGH ROAD , CASTLECRAG, NSW, 2068
LOT 11 (DP611594) & LOT 1(43691)

DRAWING SCHEDULE			
	Layout ID	Layout Name	Rev
0000 Sheet Info			
	0000	Drawing Schedule	12
2000 Site Info			
	2000	Location Plan	12
	2001	Site Analysis	12
	2002	Survey Copy	12
3000 Plans			
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	3001	Lower Ground	14
	3002	Ground Floor	14
	3003	Level 1	14
	3004	Level 2	14
	3005	Roof Plan	14
4000 Sections			
	4000	Section A-A	12
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	4002	Section C-C	12
	4003	Section - Diagramatic	01
5000 Elevations			
	5000	Edinburgh Road Elevation	10
	5001	Eastern Valley Way Elevation	10
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6000 Diagrams			
	6000	Solar Access	12
	6001	Cross Ventilation	12
	6002	Apartment Mix	12
	6003	Retail Areas	12
	6004	Gross Floor Area	12
	6005	Communal Open Space	12
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	6007	Public Open Space	12
	6008	Average Setbacks	05
	6009	Height Zones	04
	6010	Envelope Diagrams	04
6200 Solar Analysis			
	6200	Solar Analysis	12
	6201	Shadow Diagrams - June 21 - Sheet 1	09
	6202	Shadow Diagrams - June 21 - Sheet 2	04
	6203	Shadow Diagrams - June 21 - Sheet 3	04
	6204	Shadow Diagrams With Trees - June 21 -Sheet 1	02
	6205	Shadow Diagrams With Trees - June 21 -Sheet 2	02
	6206	Shadow Diagrams With Trees - June 21 -Sheet 3	02
	6207	Eye of the Sun - June 21 - Sheet 1	04
	6208	Eye of the Sun - June 21 - Sheet 2	04
	6209	Eye of the Sun - June 21 - Sheet 3	04
	6210	Eye of the Sun with Trees - June 21 - Sheet 1	02
	6211	Eye of the Sun with Trees - June 21 - Sheet 2	02
	6212	Eye of the Sun with Trees - June 21 -Sheet 3	02
	6213	Eye of the Sun - March 21 - Sheet 1	01
	6214	Eye of the Sun - March 21 - Sheet 2	01
	6215	Eye of the Sun - March 21 - Sheet 3	01
	6216	Eye of the Sun - March 21 With Trees - Sheet 1	01
	6217	Eye of the Sun - March 21 With Trees - Sheet 2	01
	6218	Eye of the Sun - March 21 With Trees - Sheet 3	01
9000 Development			
	9000	Development Summary	11



Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Drawing Schedule
Sheet Info

NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

Rev	Date	Description	By	Chk
12	27/08/2021	Submission	DN	RFJ
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The 1921 Griffin plan for Castlecrag closely follows and interprets the natural contours of the site. The masterplan for Castlecrag works with the natural landscape, not against it. The streets and pedestrian pathways follow these lines of topography with the lot lines a corresponding radial division.
The eastern boundary of their plan is an abrupt stop to this beautiful fluid geometry. Our site plan imagines a possible continuity of the Griffin master plan. And suggest what may have been an unrealised continuation of their plan
A gentle continuation of he radial geometry extending to the line of 'The Parapet' and'The Rampart' to Eastern Valley way and the natural threshold of Castlecrag.

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Location Plan
Site Info

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08	22/06/2021	For Information	DN	RFJ

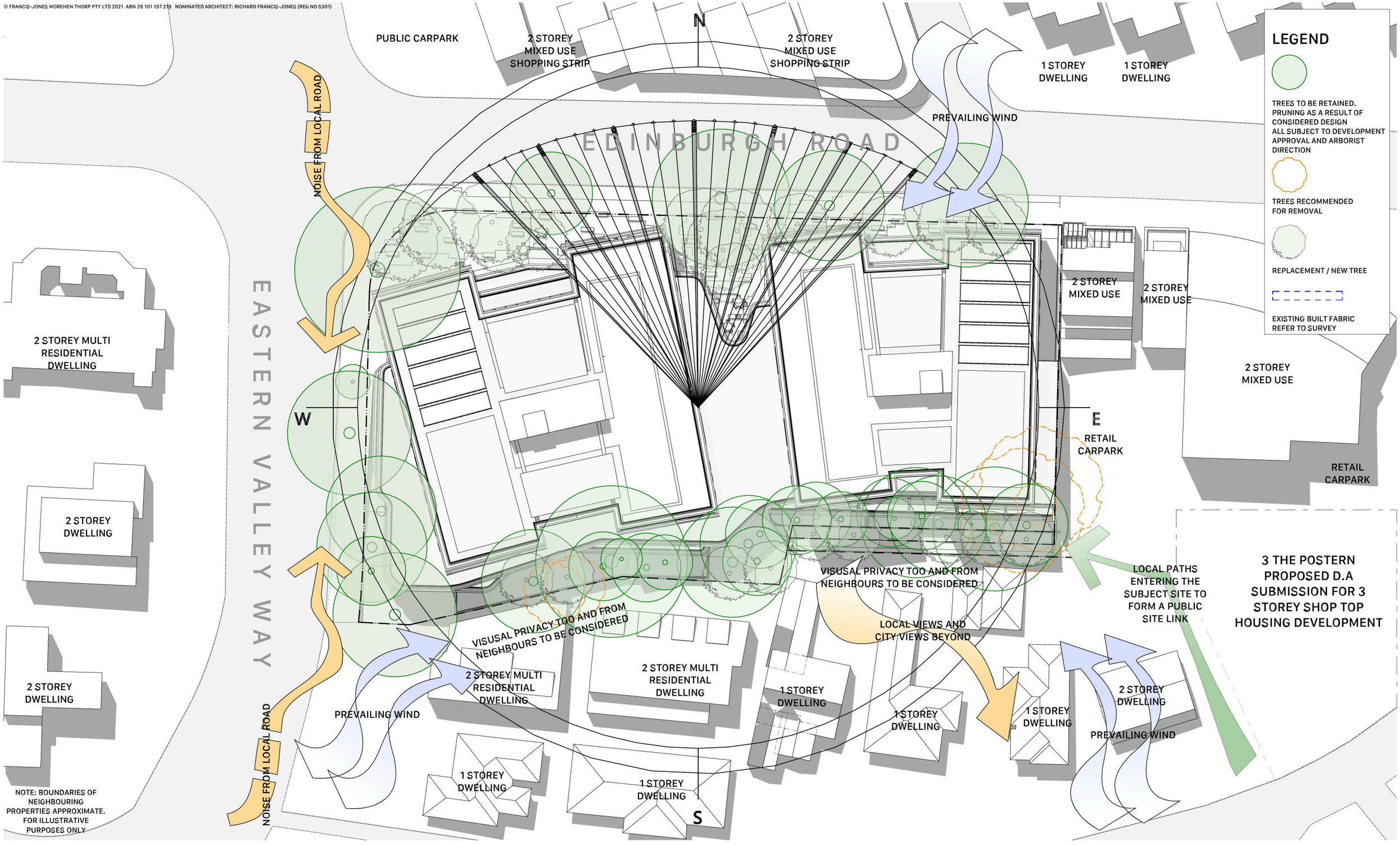
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The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Site Analysis
Site Info

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FOR INFORMATION ONLY
REFER TO ORIGINAL SURVEY

1

2

3

4

EDINBURGH ROAD

EASTERN VALLEY WAY

No 130 QUADRANGLE SHOPPING CENTRE

LOT 11 DP 617994

No 83 ONE STOREY BRICK SHOP METAL ROOF

No 85 ONE STOREY BRICK SHOP METAL ROOF

No 87-91 ONE STOREY BRICK SHOP METAL ROOF

No 89-89A TWO STOREY BRICK SHOP METAL ROOF

No 91-93 TWO STOREY BRICK SHOP AND OFFICES METAL ROOF

No 95 RESIDENCE

No 99 TWO STOREY METAL CLADDING TOWNHOUSES METAL ROOF

No 115 ONE STORE BRICK RESIDENCE TILE ROOF

No 113 ONE STORE RENDERED SHOP AND RESIDENCE FLAT ROOF

No 115 ONE STORE RENDERED SHOP AND RESIDENCE FLAT ROOF

No 11 ONE STORE BRICK RESIDENCE TILE ROOF

No 9 ONE STORE BRICK RESIDENCE TILE ROOF

LOT 3 DP 715154

LOT 4 DP 715154

LOT 10 DP 17416

LOT A DP 380076

LOT B DP 380076

LOT 7 DP 17416

LOT 1 DP 1045583

LOT 1 DP 236900

LOT 1 DP 123693

SP 86100

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The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Survey Copy Site Info NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	

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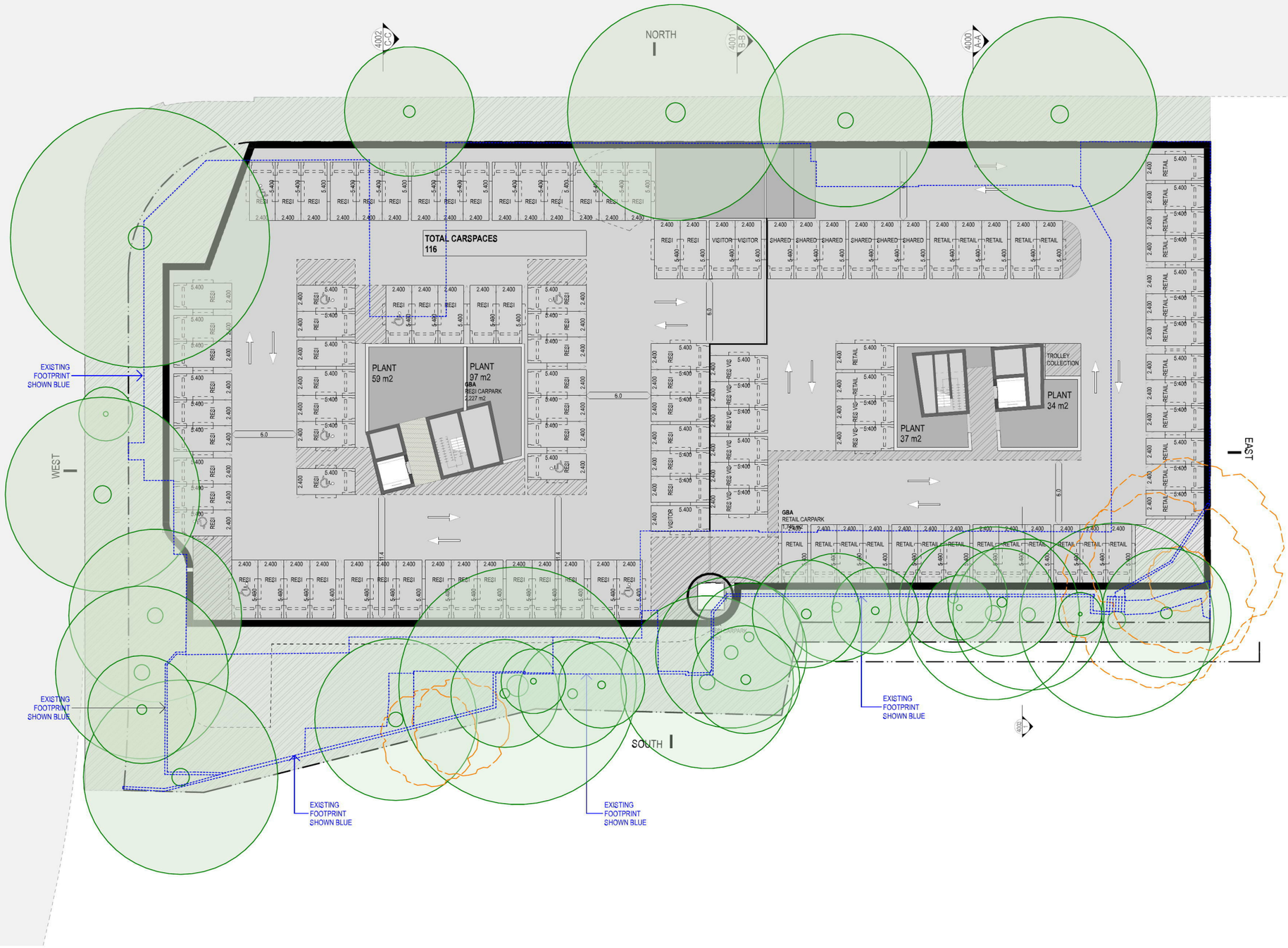
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LEGEND

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TREES RECOMMENDED FOR REMOVAL

REPLACEMENT / NEW TREE

EXISTING BUILT FABRIC REFER TO SURVEY

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Basement
Plans

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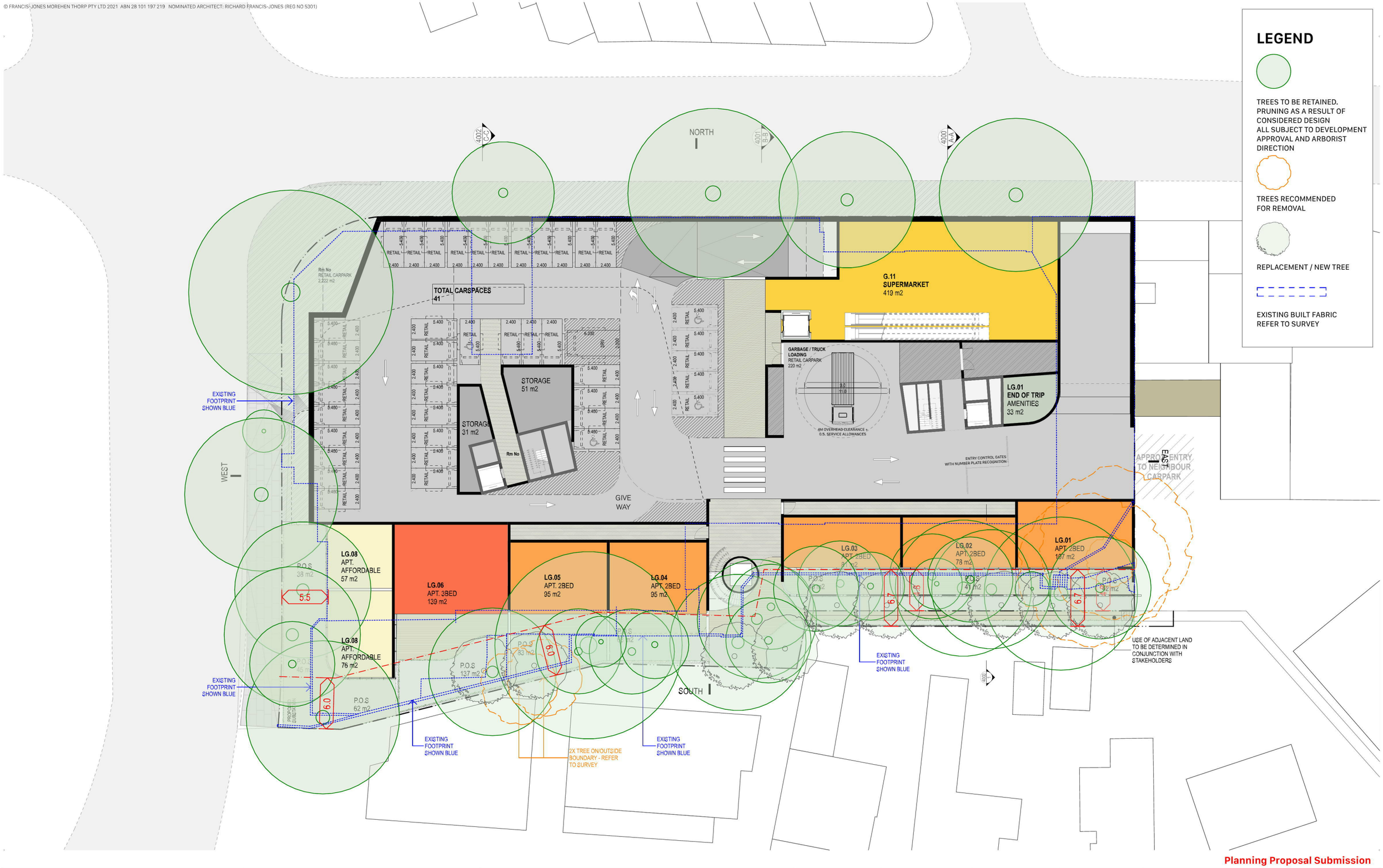
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TREES RECOMMENDED FOR REMOVAL

REPLACEMENT / NEW TREE

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Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Lower Ground
Plans

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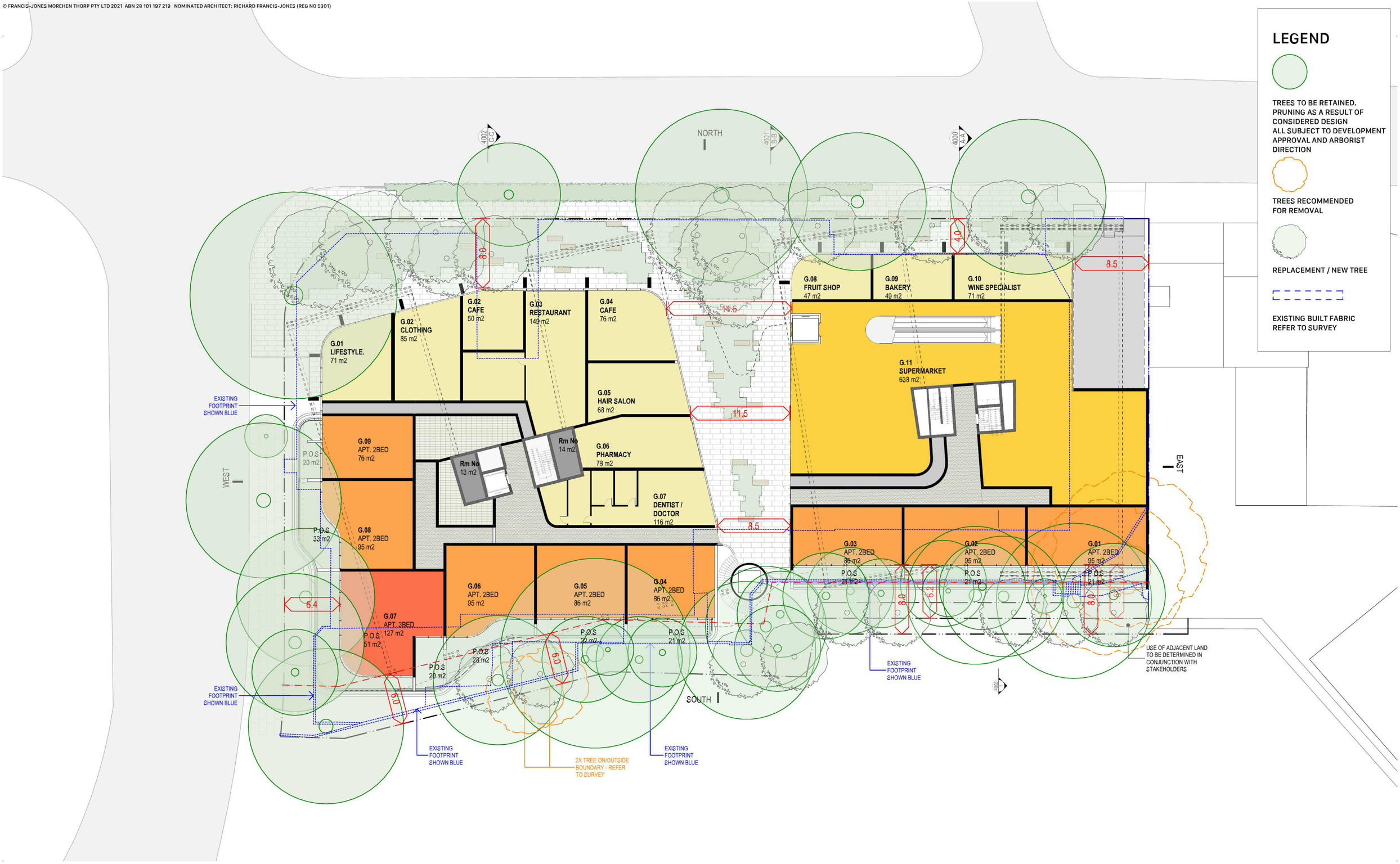
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REPLACEMENT / NEW TREE

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Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Ground Floor
Plans

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TREES RECOMMENDED FOR REMOVAL

REPLACEMENT / NEW TREE

EXISTING BUILT FABRIC REFER TO SURVEY

Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Level 1 Plans NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

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Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Level 2
Plans

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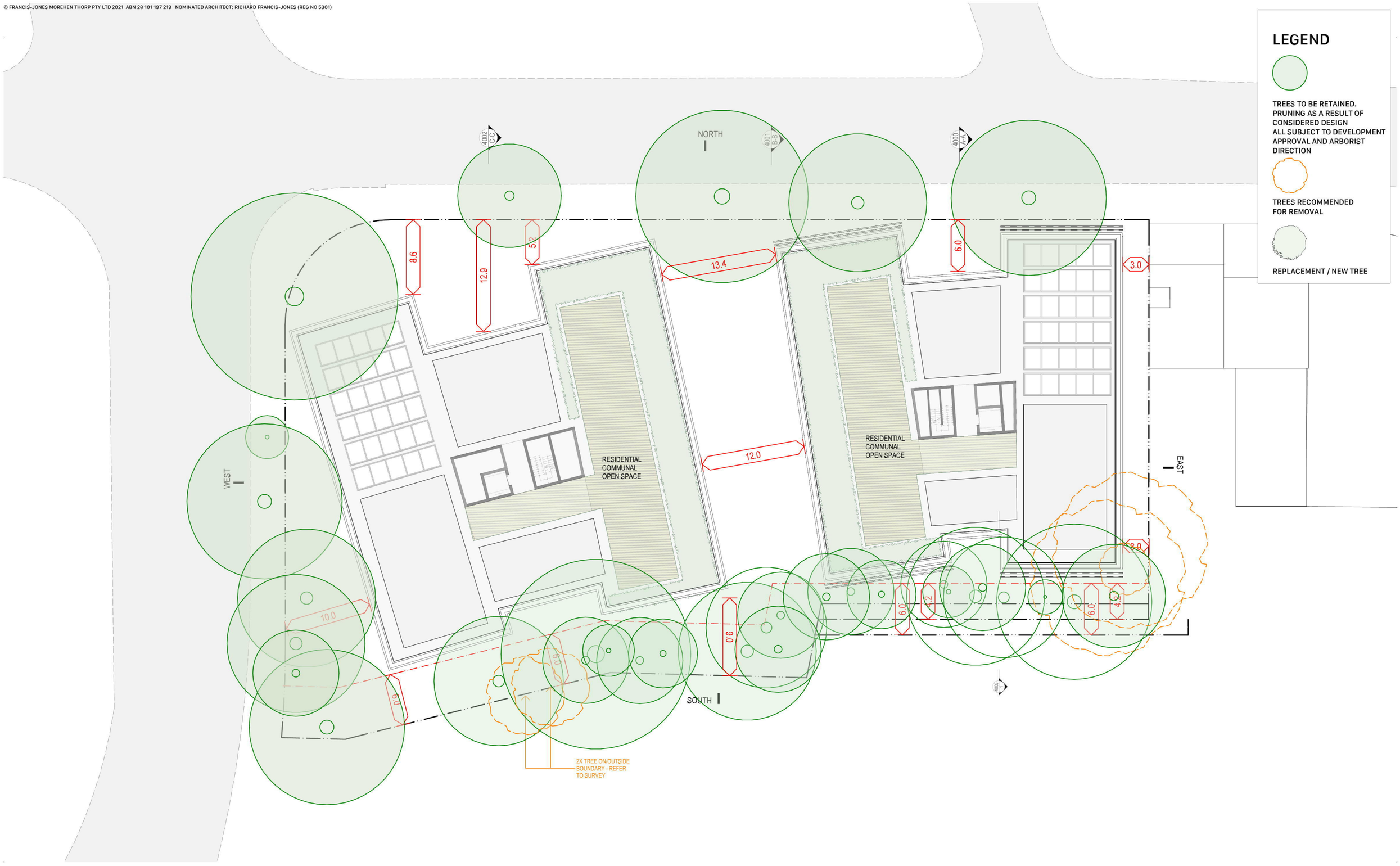
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REPLACEMENT / NEW TREE

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Roof Plan
Plans

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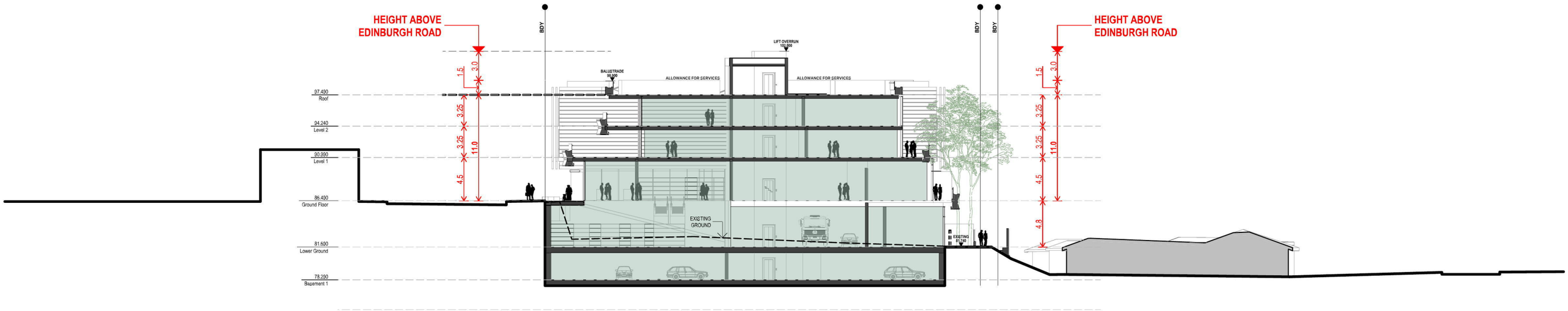
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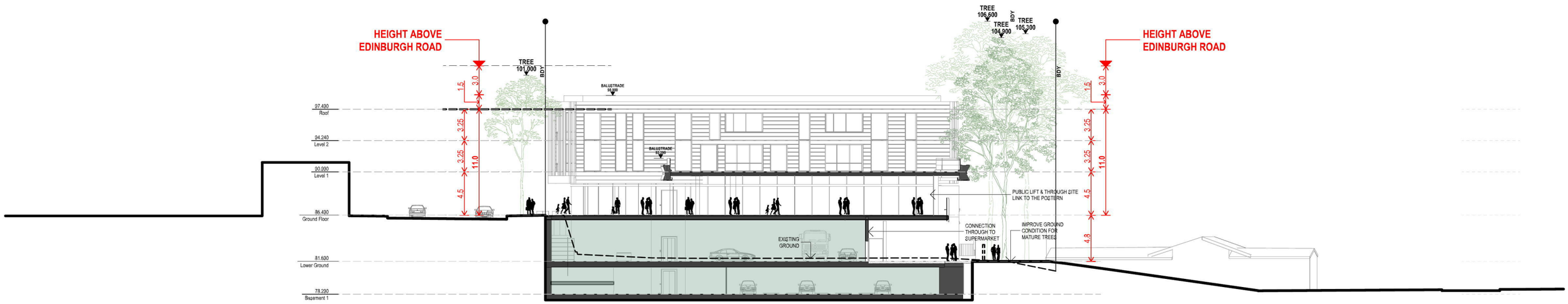
Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Section A-A Sections NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev	Date	Description	By	Chk	Scale 1:400 @ A3	Code GQC	Sheet 4000	Rev 12	0 4 10 20m
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The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Section B-B
Sections

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09	2/07/2021	For Information	DN	RFJ
08	22/06/2021	For Information	DN	RFJ

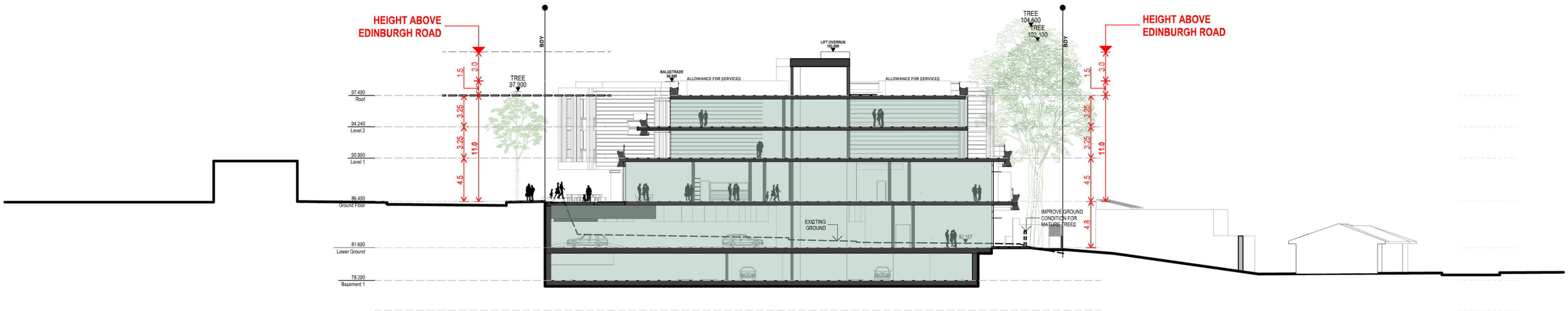
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0 4 10 20m

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Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Section C-C
Sections

NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

Rev	Date	Description	By	Chk
12	27/08/2021	Submission	DN	RFJ
11	18/08/2021	For Information	DN	RFJ
10	3/07/2021	Pre-PP Submission	DN	RFJ
09	2/07/2021	For Information	DN	RFJ
08	22/06/2021	For Information	DN	RFJ

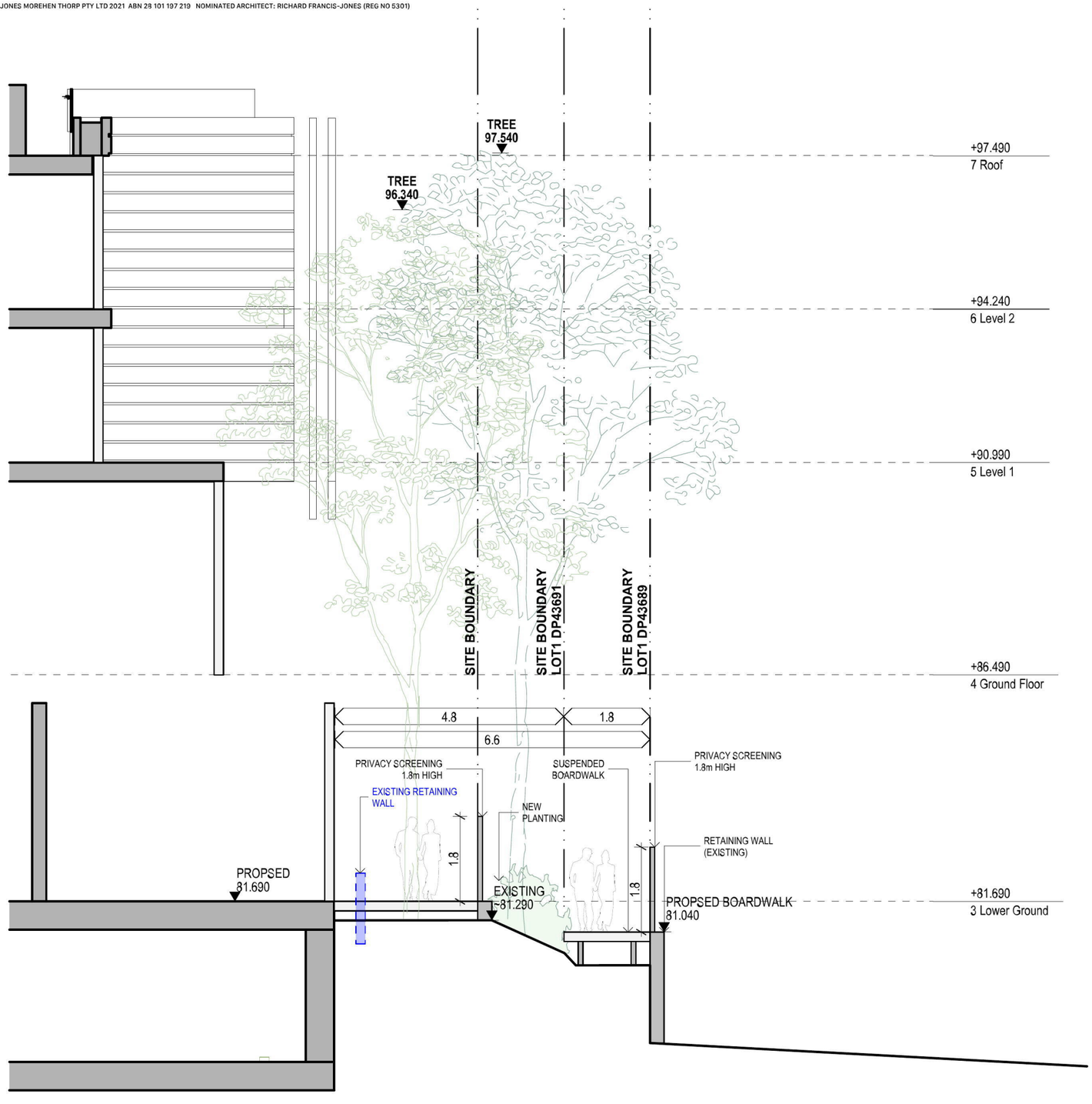
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DIAGRAMATIC SECTION ONLY
SUBJECT TO FUTURE APPROVALS

Section 01

Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Section - Diagramatic Sections NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev Date Description By Chk	Scale 1:400 @ A3	Code GQC	Sheet 4003	Rev 01	0 4 10 20m		

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North

Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Edinburgh Road Elevation Elevations NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	fjmtstudio

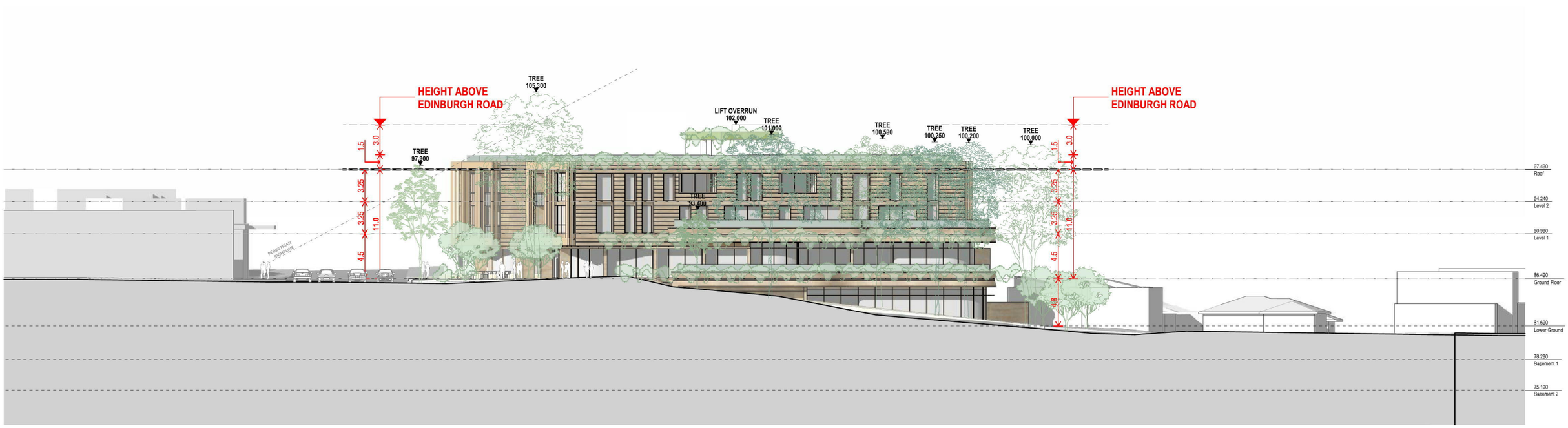
Rev	Date	Description	By	Chk
10	27/08/2021	Submission	DN	RFJ
09	18/08/2021	For Information	DN	RFJ
08	3/07/2021	Pre-PP Submission	DN	RFJ
07	2/07/2021	For Information	DN	RFJ
06	22/06/2021	For Information	DN	RFJ

Scale	Code	Sheet	Rev
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West

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Eastern Valley Way Elevation
Elevations

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Rev	Date	Description	By	Chk
10	27/08/2021	Submission	DN	RFJ
09	18/08/2021	For Information	DN	RFJ
08	3/07/2021	Pre-PP Submission	DN	RFJ
07	2/07/2021	For Information	DN	RFJ
06	22/06/2021	For Information	DN	RFJ

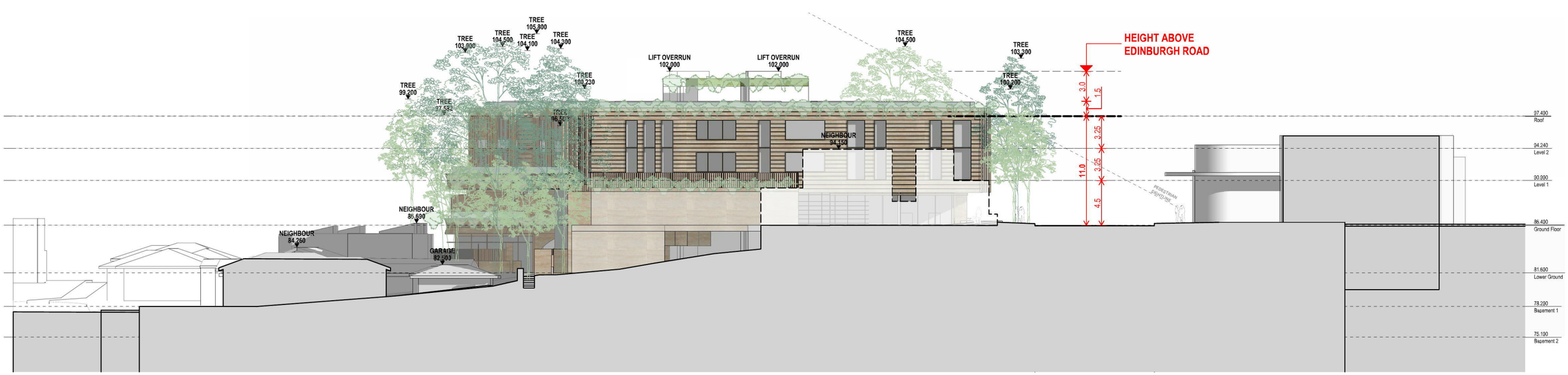
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Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eastern Elevation Elevations NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev 02	Date 27/08/2021	Description Submission	By DN	Chk RFJ	Scale 1:400 @ A3	Code GQC	Sheet 5002	Rev 02	0 4 10 20m

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Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Southern Elevation Elevations NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev 02 / Date 27/08/2021 / Description Submission	By DN / Chk RFJ	Scale 1:400 @ A3	Code GQC	Sheet 5003	Rev 02	0 4 10 20m	

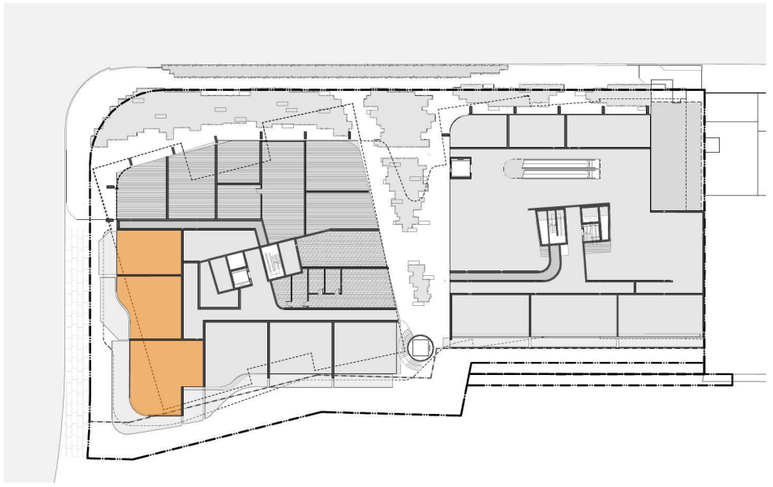
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Lower Ground



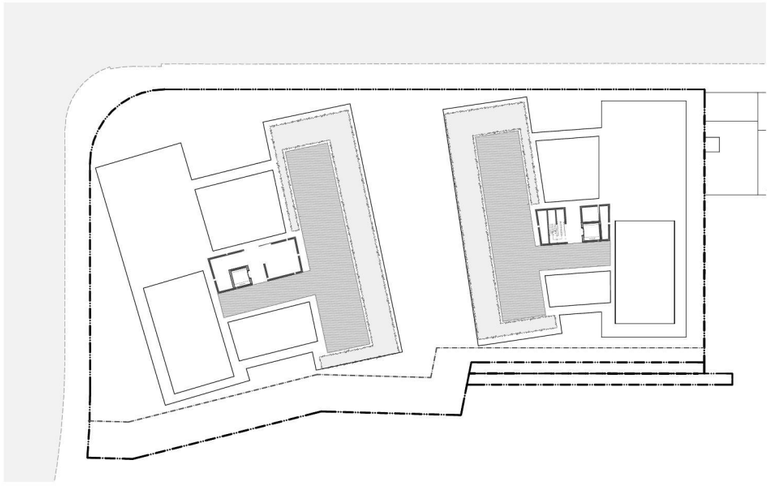
Ground Floor



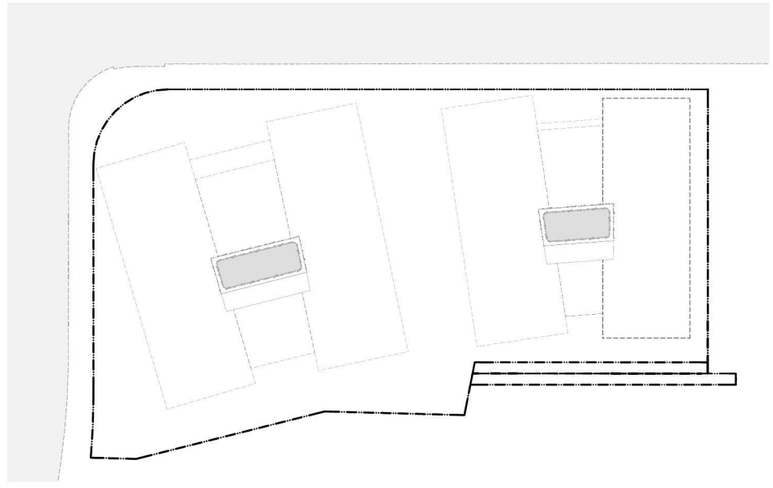
Level 1



Level 2



Roof



2 HOURS SOLAR ACCESS

COMPLIANCE IS ACHIEVED BETWEEN 9am and 3pm

TOTAL 39/53
74%
COMPLIES

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Solar Access
Diagrams

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09	2/07/2021	For Information	DN	RFJ
08	22/06/2021	For Information	DN	RFJ

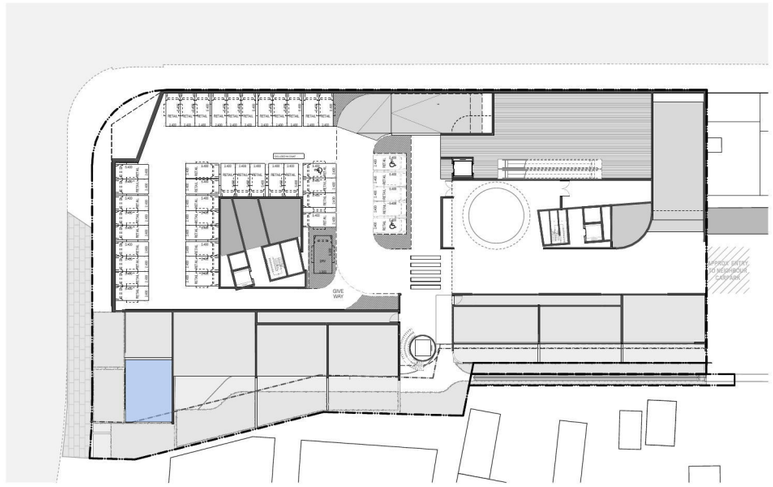
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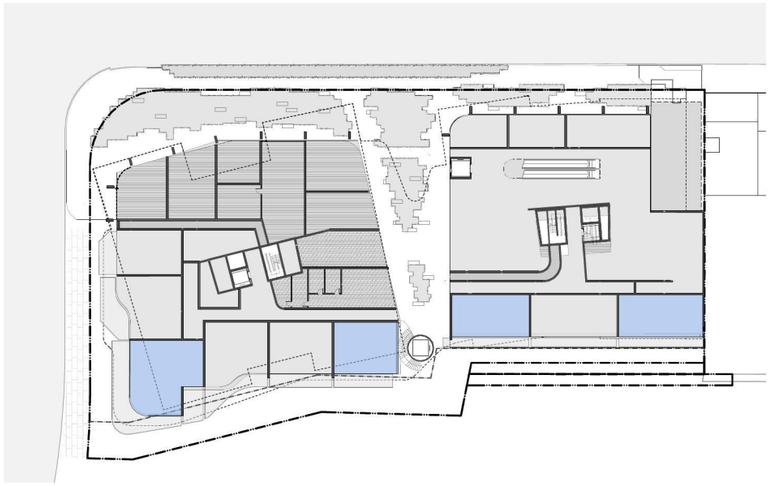
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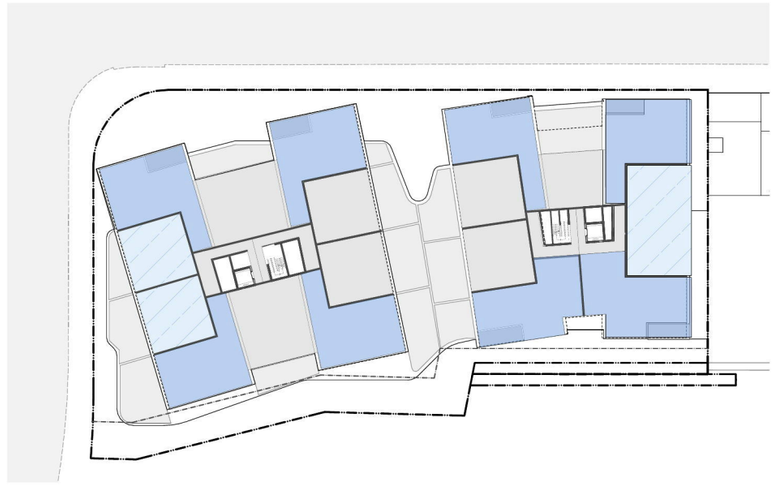
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Lower Ground



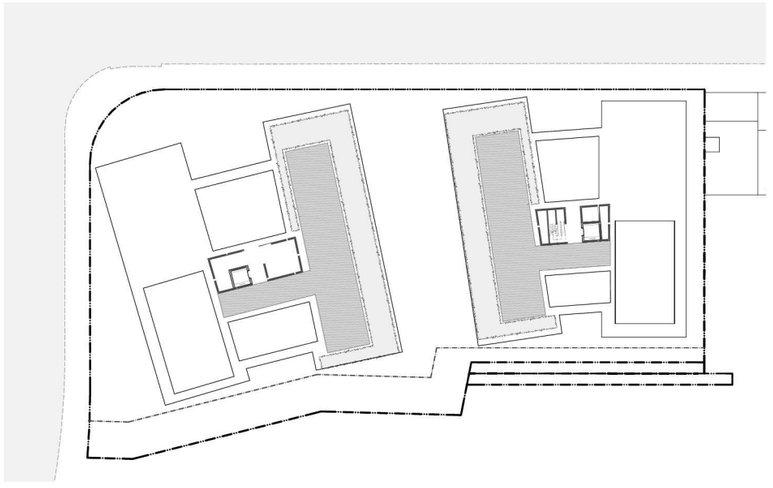
Ground Floor



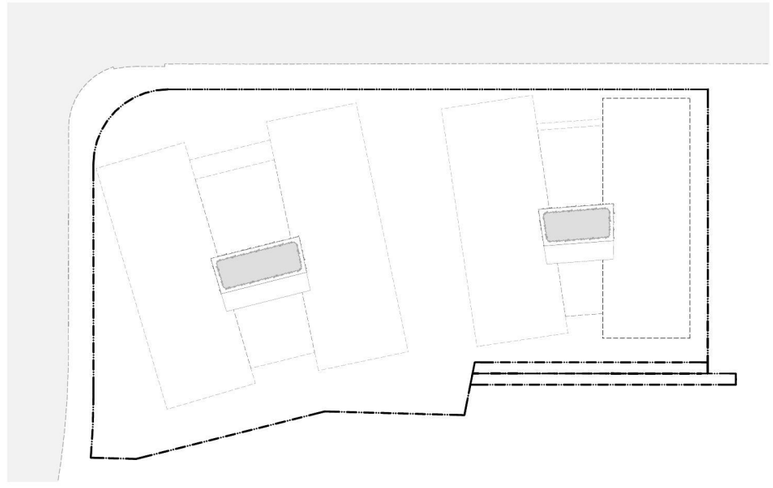
Level 1



Level 2



Roof



ACHIEVING NATURAL CROSS VENTILATION ADHERING TO APARTMENT DESIGN GUIDE DEFINITION

NATURAL VENTILATION ACROSS SINGLE SIDED APARTMENT UTILISING PREVAILING WIND (REFER TO WIND REPORT)

TOTAL 34/53
POTENTIAL COMPLIANCE 64%
COMPLIES

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Cross Ventilation Diagrams

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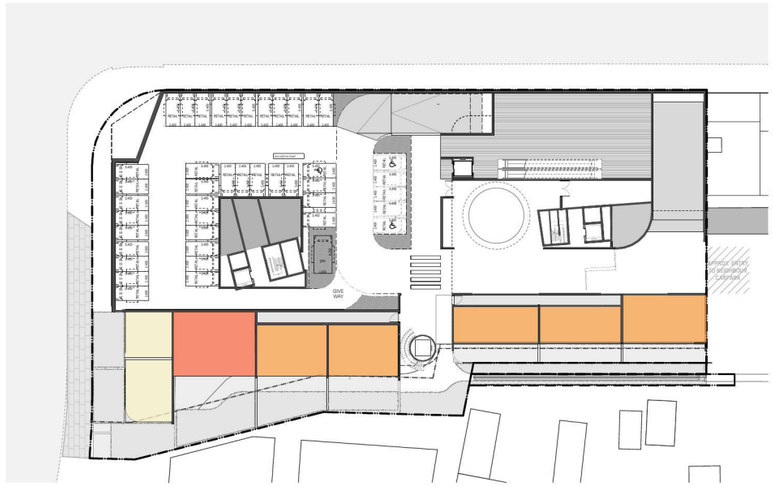
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Sheet 6001
Rev 12

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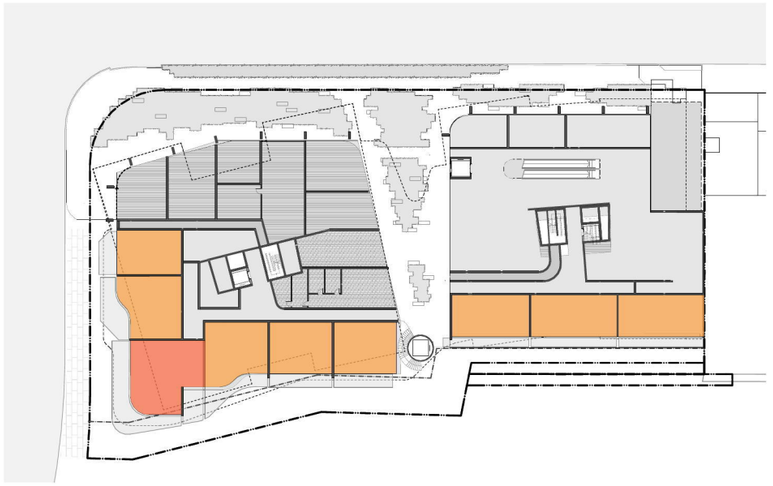
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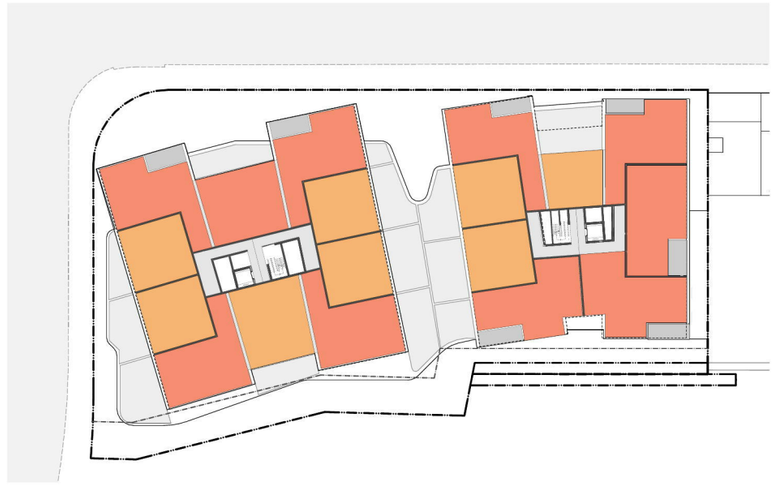
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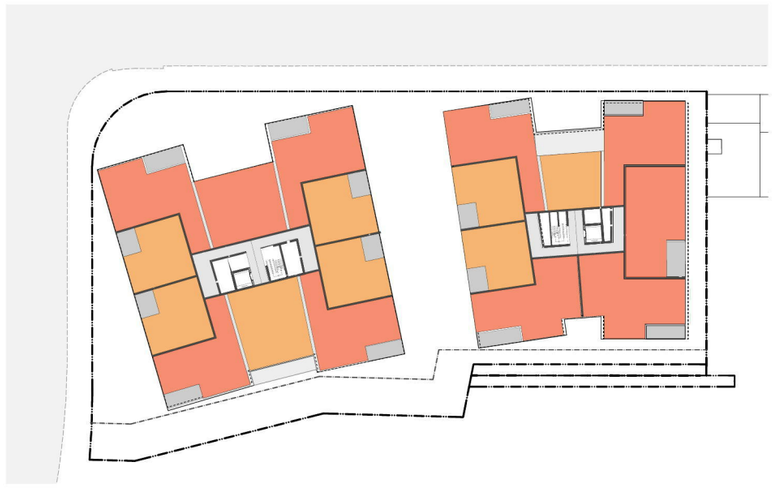
Lower Ground



Ground Floor



Level 1



Level 2



Roof



1 BEDROOM
2 BEDROOM
3 BEDROOM
4 BEDROOM
COMMUNAL FACILITIES

1BED	2 BED	3 BED	4BED	TOTAL
2	5	1		**8**
0	8	1		**9**
0	8	10		**18**
0	8	10		**18**
2	**29**	**22**	**0**	
4%	55%	42%	0%	
Total				**53**

Mix of Apartments Meets Willoughby DCP objectives

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Apartment Mix
Diagrams

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10	3/07/2021	Pre-PP Submission	DN	RFJ
09	2/07/2021	For Information	DN	RFJ
08	22/06/2021	For Information	DN	RFJ

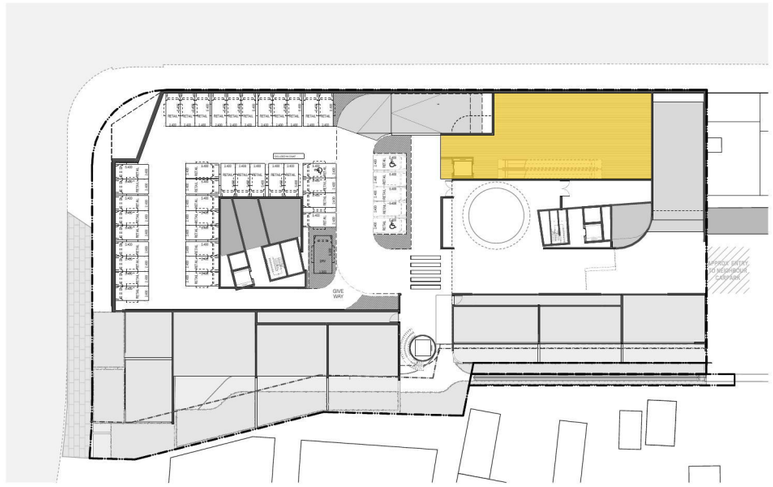
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Sheet 6002
Rev 12

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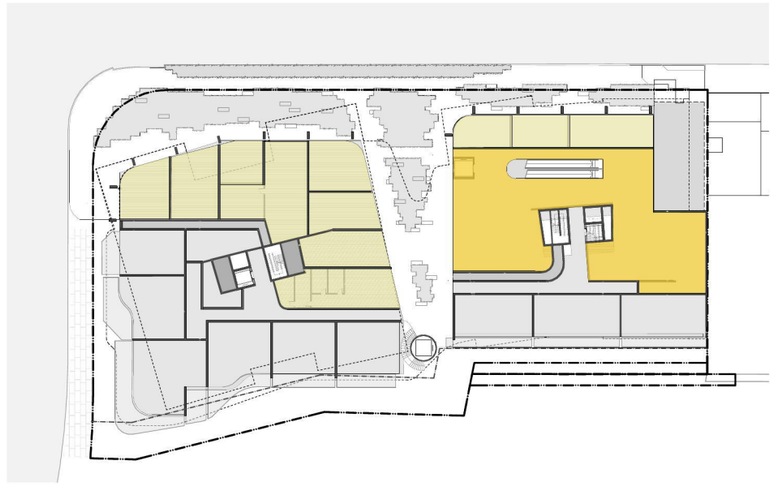
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Lower Ground



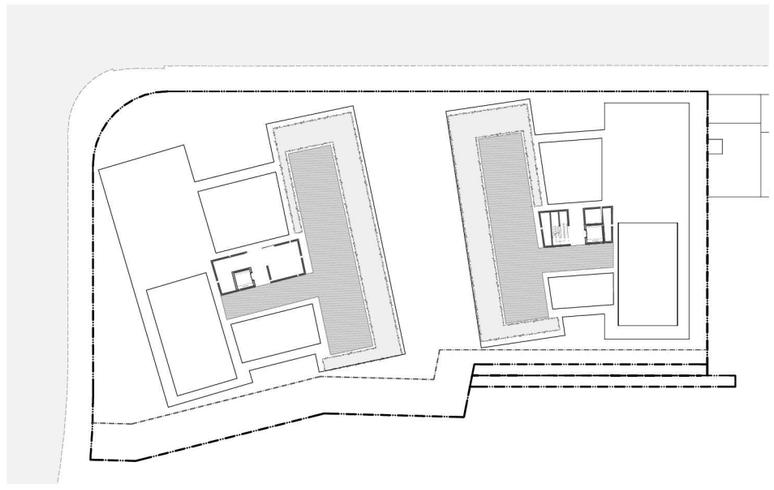
Ground Floor



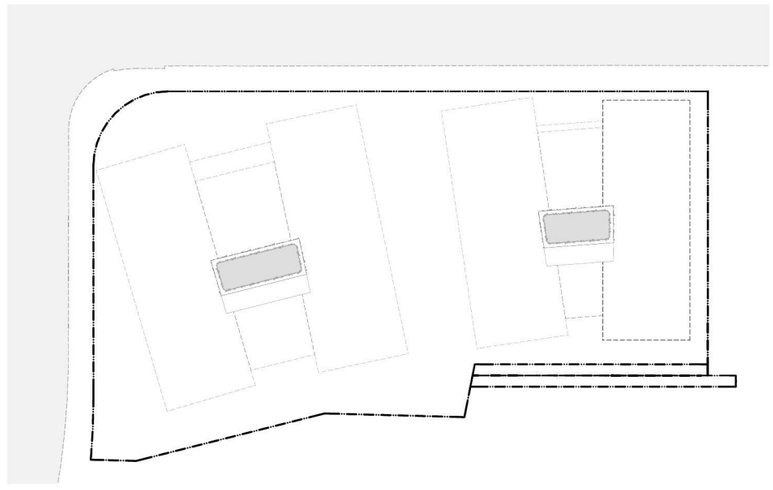
Level 1



Level 2



Roof



RETAIL

SUPERMARKET

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Retail Areas
Diagrams

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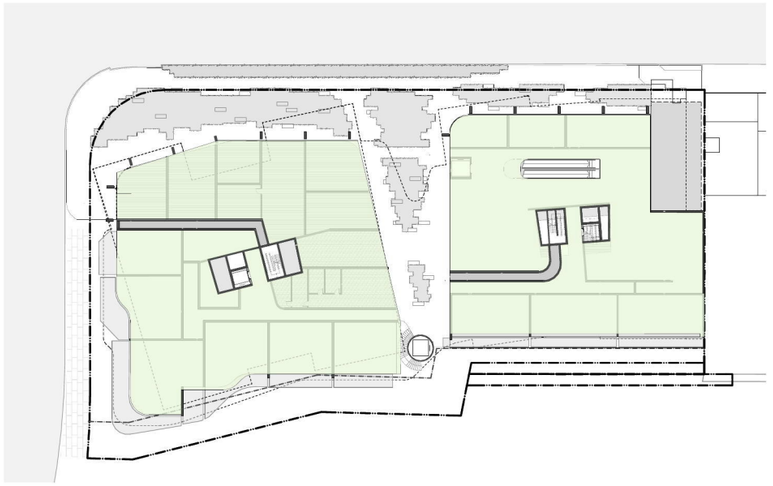
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Lower Ground



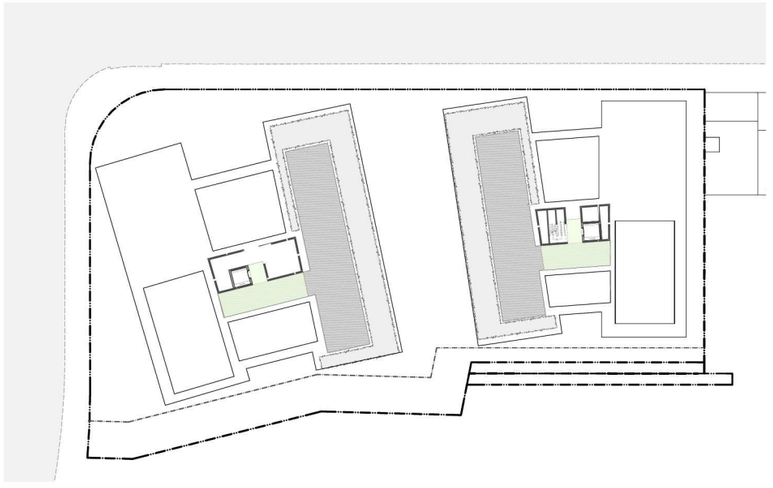
Ground Floor



Level 1



Level 2



Roof



GROSS FLOOR AREA

Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Gross Floor Area Diagrams NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	fjmtstudio

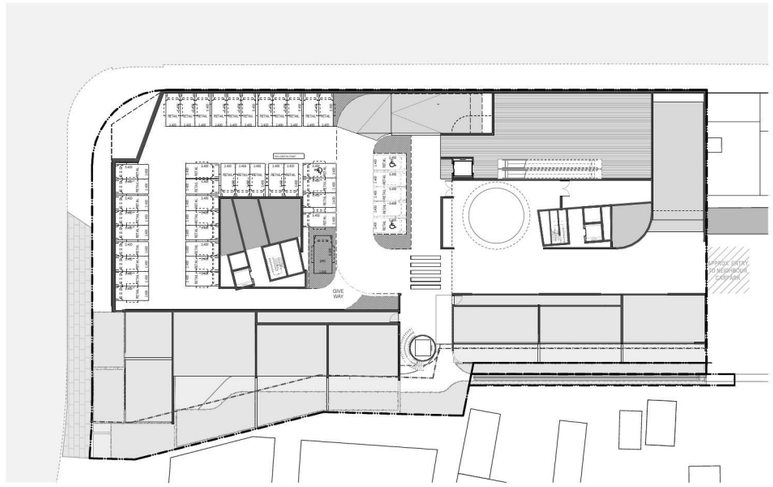
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12	27/08/2021	Submission	DN	RFJ
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10	3/07/2021	Pre-PP Submission	DN	RFJ
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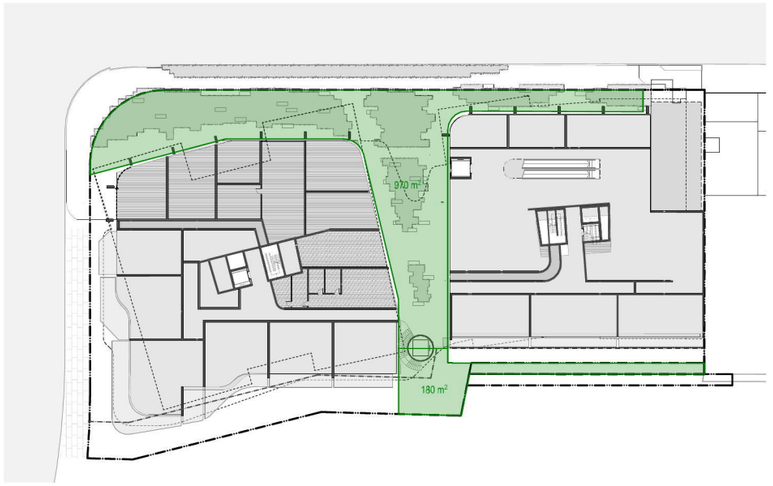
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Lower Ground



Ground Floor



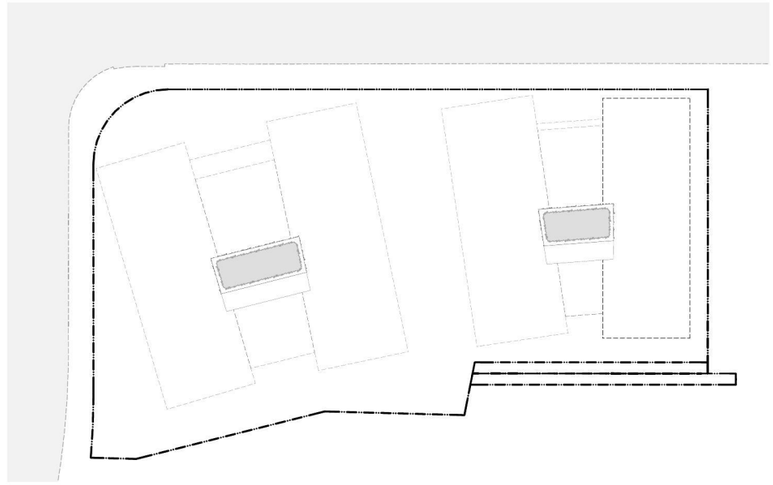
Level 1



Level 2



Roof



RESIDENTIAL ONLY COMMUNAL OPEN SPACE

SHARED, PUBLICLY ACCESSIBLE COMMUNAL OPEN SPACE

APARTMENT DESIGN GUIDE DEFINITION
Outdoor space located within the site at ground level or on a structure that is within common ownership and for the recreational use of residents of the development. Communal open space may be accessible to residents only, or to the public

REQUIRED: 25% SITE = 1,379m²

PROVIDED: 42% SITE = 2,160m²

COMPLIES

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Communal Open Space
Diagrams

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08	22/06/2021	For Information	DN	RFJ

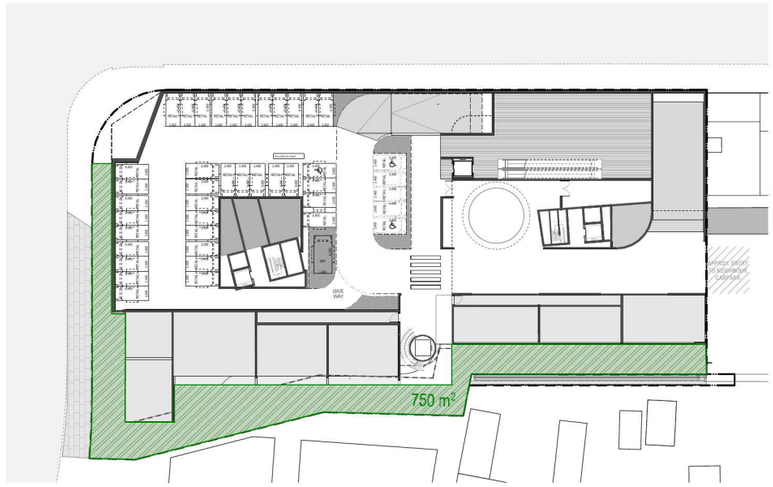
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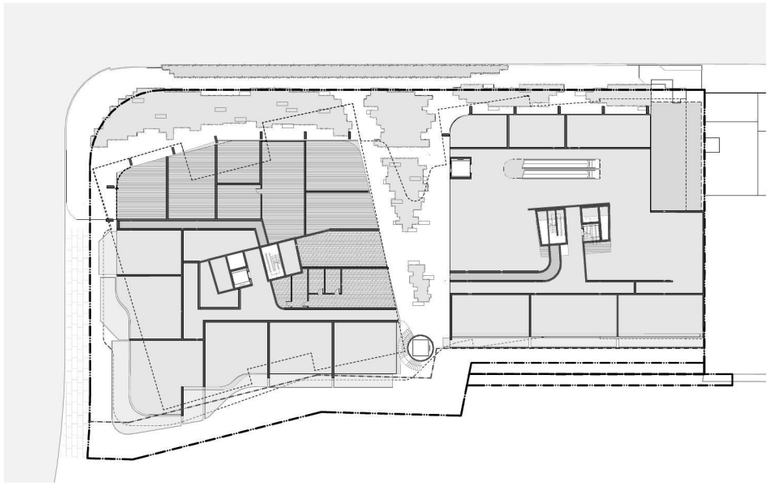
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Lower Ground



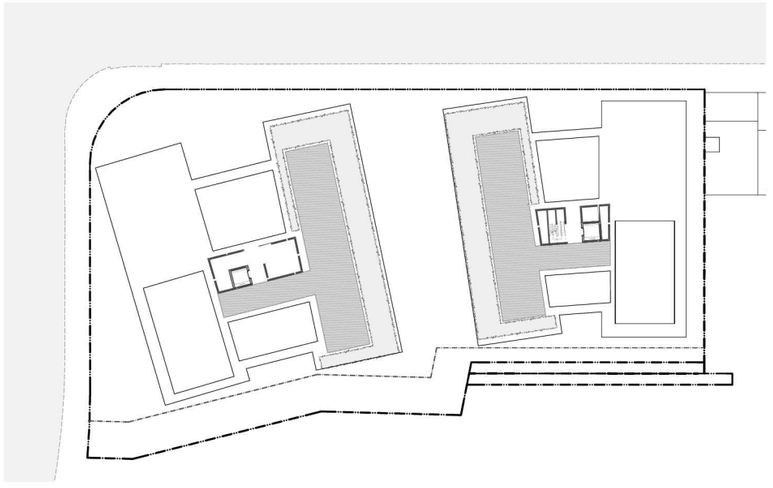
Ground Floor



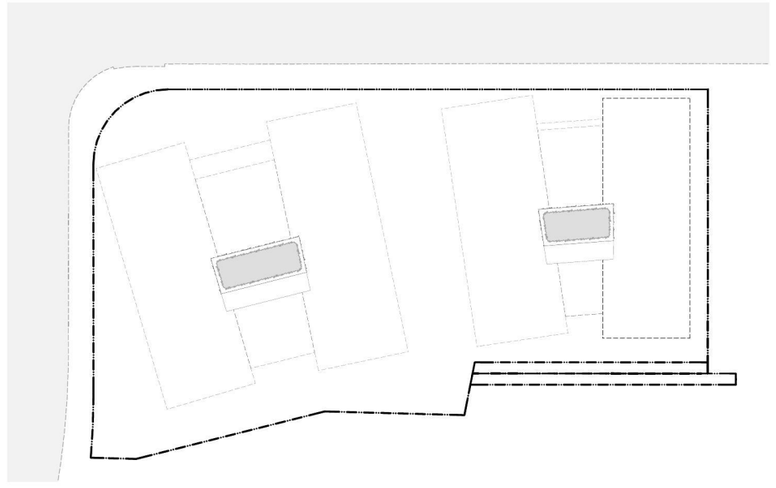
Level 1



Level 2



Roof



DEEP SOIL ZONES

REQUIRED: 7% SITE = 362m²

PROVIDED: 15% SITE = 750m²

COMPLIES

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Deep Soil
Diagrams

NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

Rev	Date	Description	By	Chk
12	27/08/2021	Submission	DN	RFJ
11	18/08/2021	For Information	DN	RFJ
10	3/07/2021	Pre-PP Submission	DN	RFJ
09	2/07/2021	For Information	DN	RFJ
08	22/06/2021	For Information	DN	RFJ

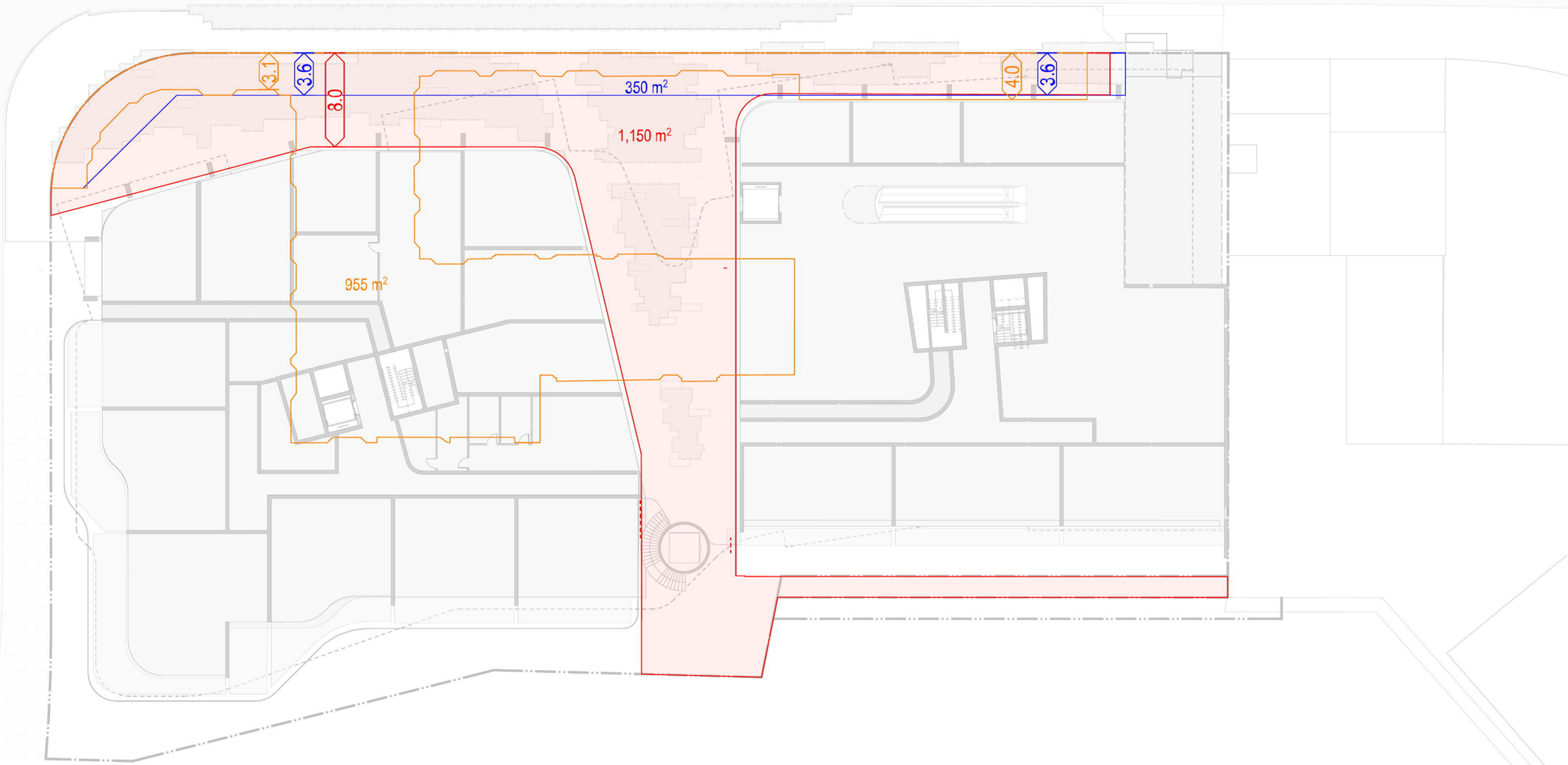
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EXISTING CONDITION
PROVIDES
955m²
PUBLIC SPACE

POTENTIAL SCHEME
UTILISING WLCS2036
350m²
PUBLIC SPACE

PLANNING PROPOSAL
PROVIDES UPTO
1150m²
PUBLIC OPEN SPACE

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Public Open Space
Diagrams

NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

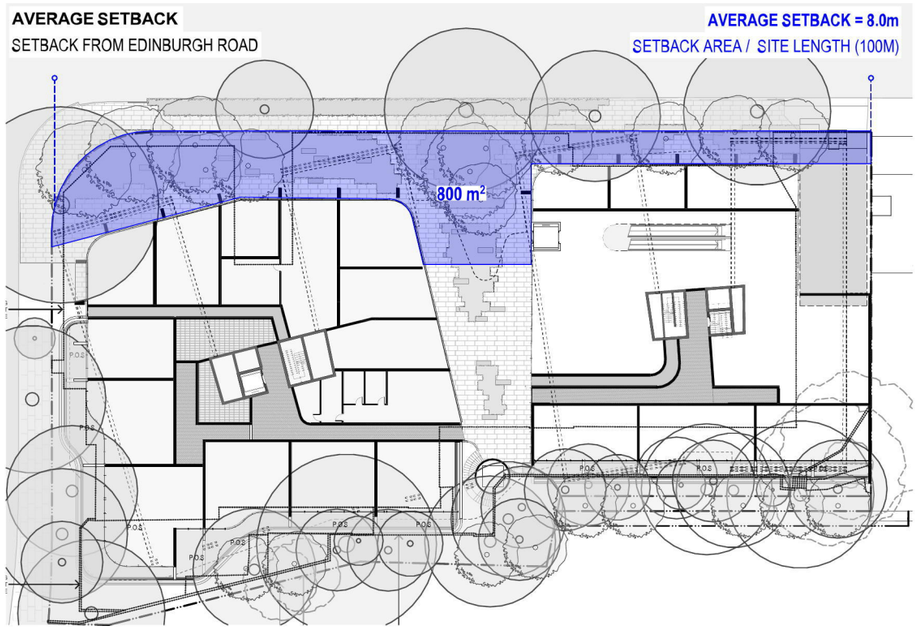
Rev	Date	Description	By	Chk
12	27/08/2021	Submission	DN	RFJ
11	18/08/2021	For Information	DN	RFJ
10	3/07/2021	Pre-PP Submission	DN	RFJ
09	2/07/2021	For Information	DN	RFJ
08	22/06/2021	For Information	DN	RFJ

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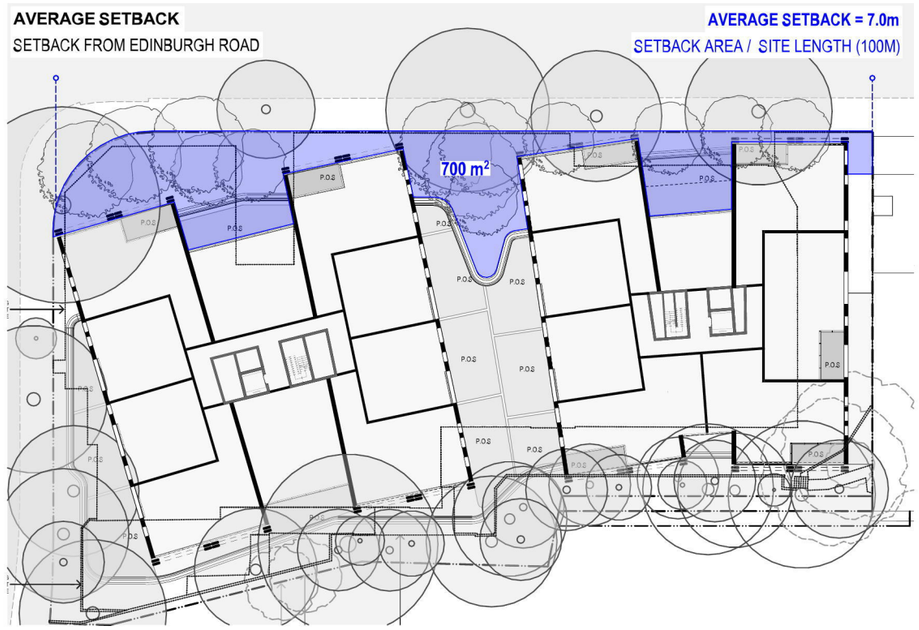
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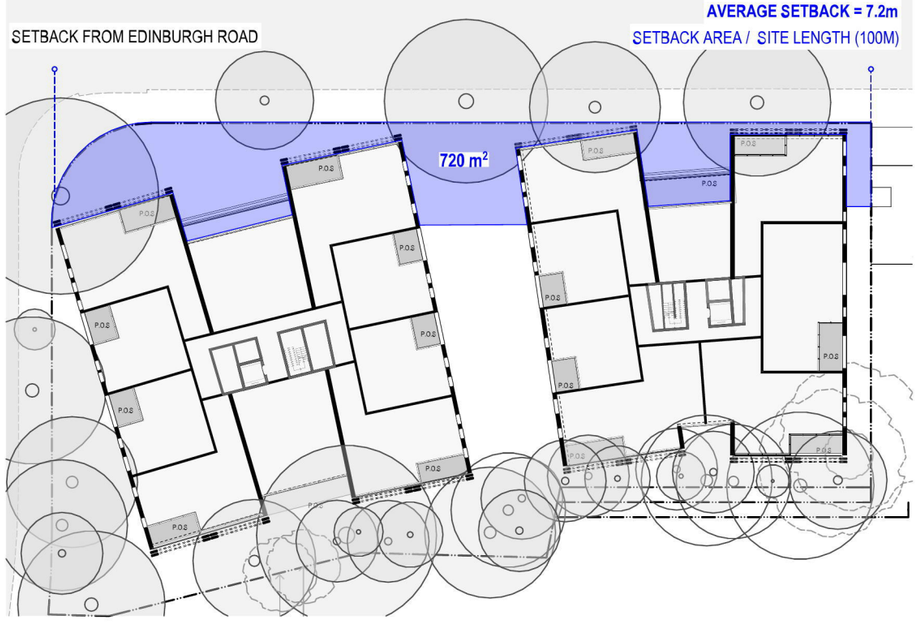
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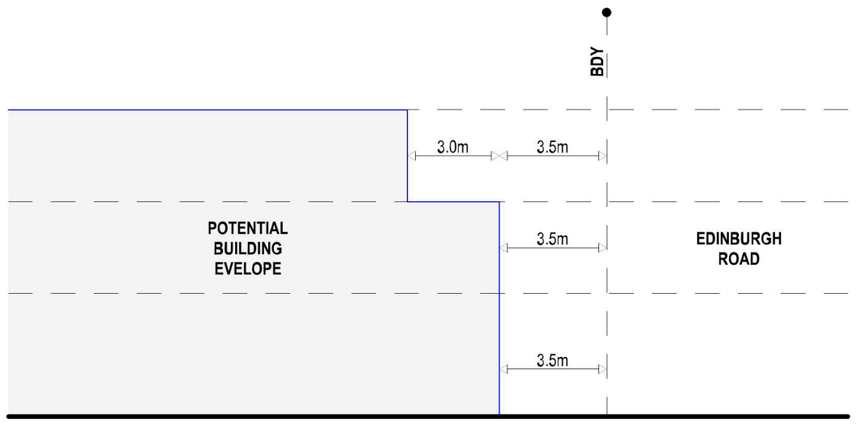
1 PLAN Front Setback Base - Ground Floor
1:750
AVERAGE SETBACK



3 PLAN Front Setback Base - Level 1
1:750



4 PLAN Front Setback Base - Level 2
1:750



Willoughby Local Centres Scheme
Prescribed Setbacks (Section)

Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Average Setbacks Diagrams NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	

Rev	Date	Description	By	Chk
05	27/08/2021	Submission	DN	RFJ
04	18/08/2021	For Information	DN	RFJ
03	3/07/2021	Pre-PP Submission	DN	RFJ
02	2/07/2021	For Information	DN	RFJ
01	22/06/2021	For Information	DN	RFJ

Scale	Code	Sheet	Rev
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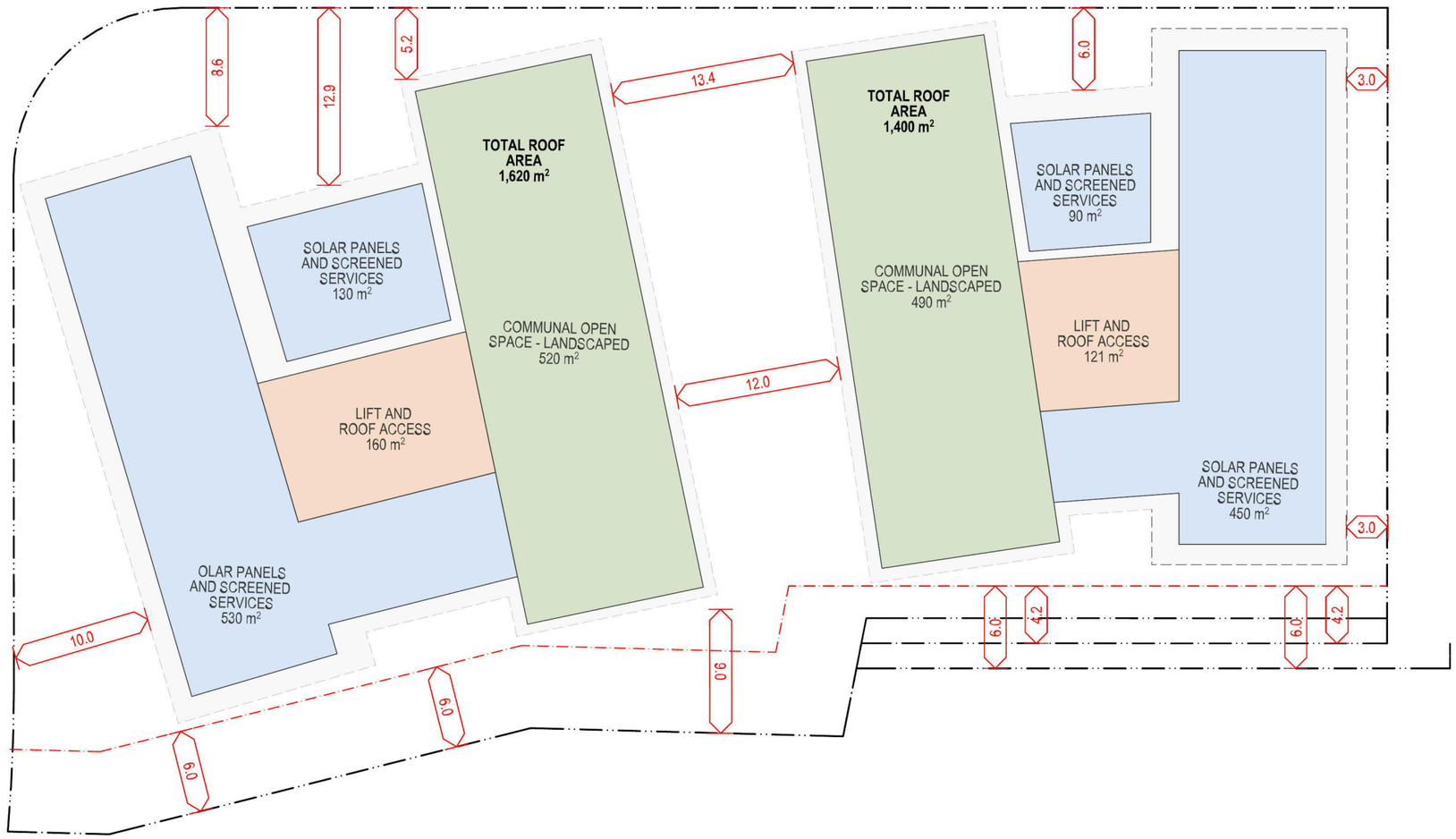
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LEGEND

30% — COMMUNAL OPEN SPACE
LOW LEVEL DECK AND SOFT LANSCAPE, HARD SURFACES
NOM. LESS THAN 1.5M AFFL

<10% — LIFT OVER RUN AND RESIDENT ACCESS TO ROOFTOP GARDENS
NOM. 4.5M AFFL

30% — SOLAR PANELS & PLANT SERVICES TO BE SCREENED FROM PUBLIC DOMAIN VIEWING
NOM. 2M AFFL



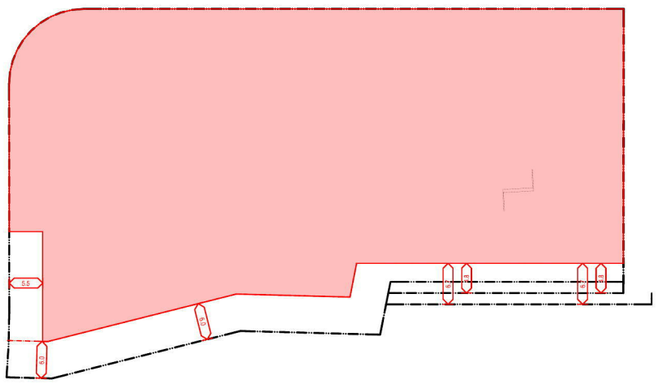
Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Height Zones Diagrams NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev 04 03 02	Date 27/08/2021 18/08/2021 3/07/2021	Description Submission For Information Pre-PP Submission	By Chk DN RFJ DN RFJ DN RFJ	Scale 1:400 @ A3	Code GQC	Sheet 6009	Rev 04	0 4 10 20m

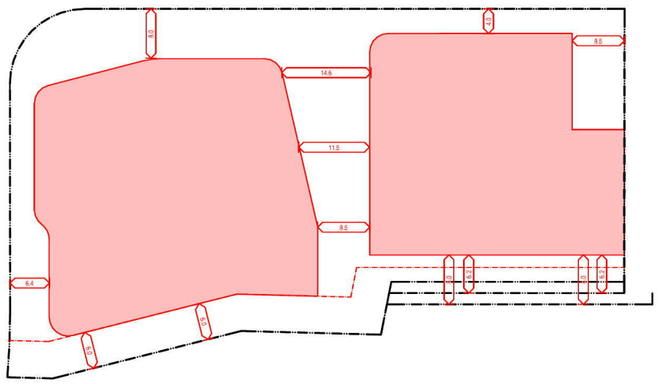
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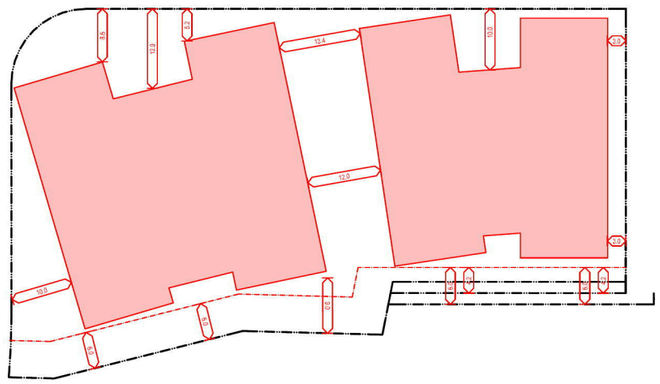
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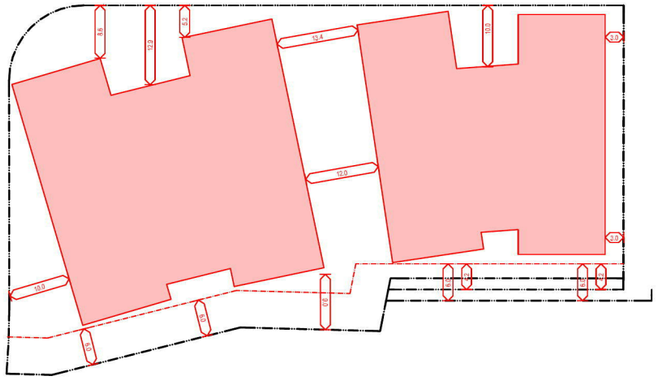
Lower Ground



Ground Floor



Level 1



Level 2



Roof

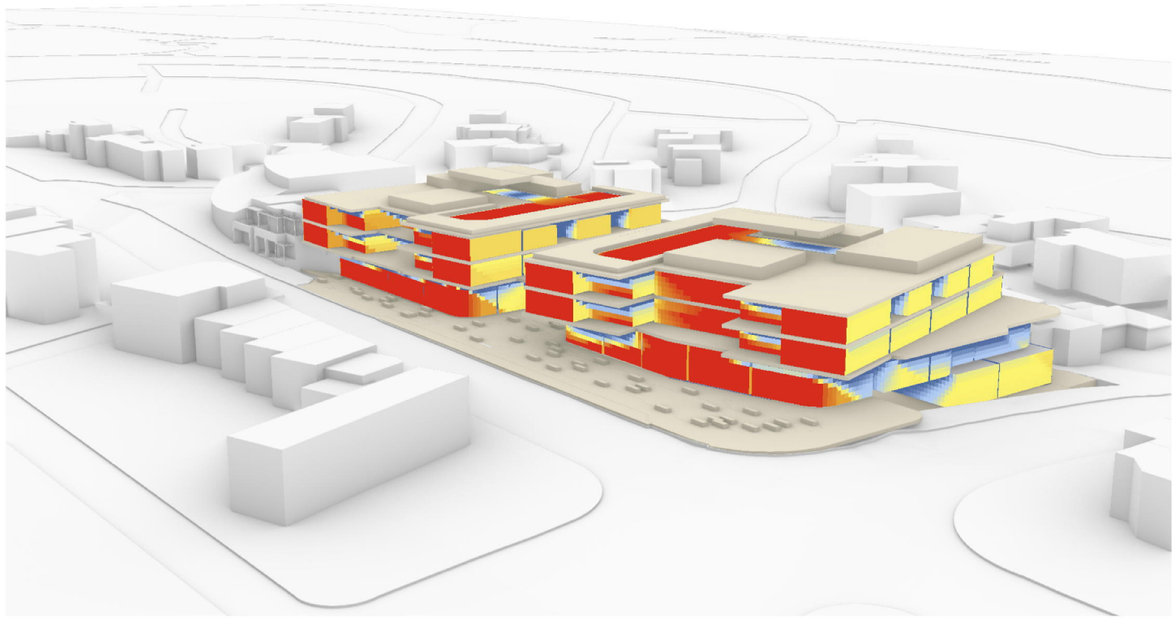
Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Envelope Diagrams Diagrams NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev 04 / 03 / 02 Date 27/08/2021 / 18/08/2021 / 3/07/2021 Description Submission / For Information / Pre-PP Submission By DN / DN / DN Chk RFJ / RFJ / RFJ	Scale 1:400 @ A3	Code GQC	Sheet 6010	Rev 04	0 4 10 20m	

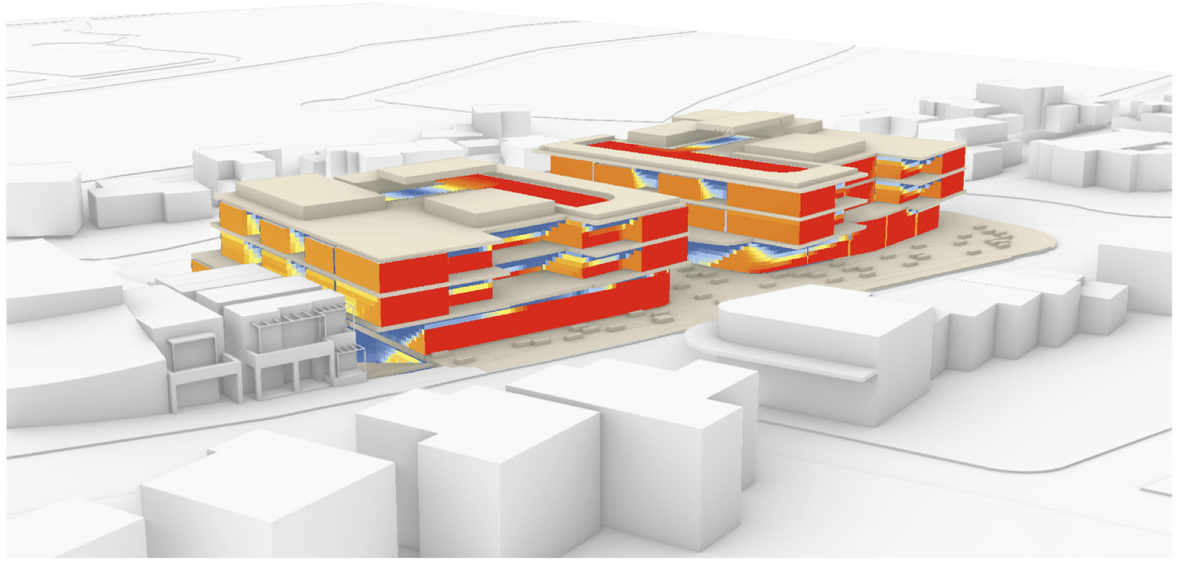
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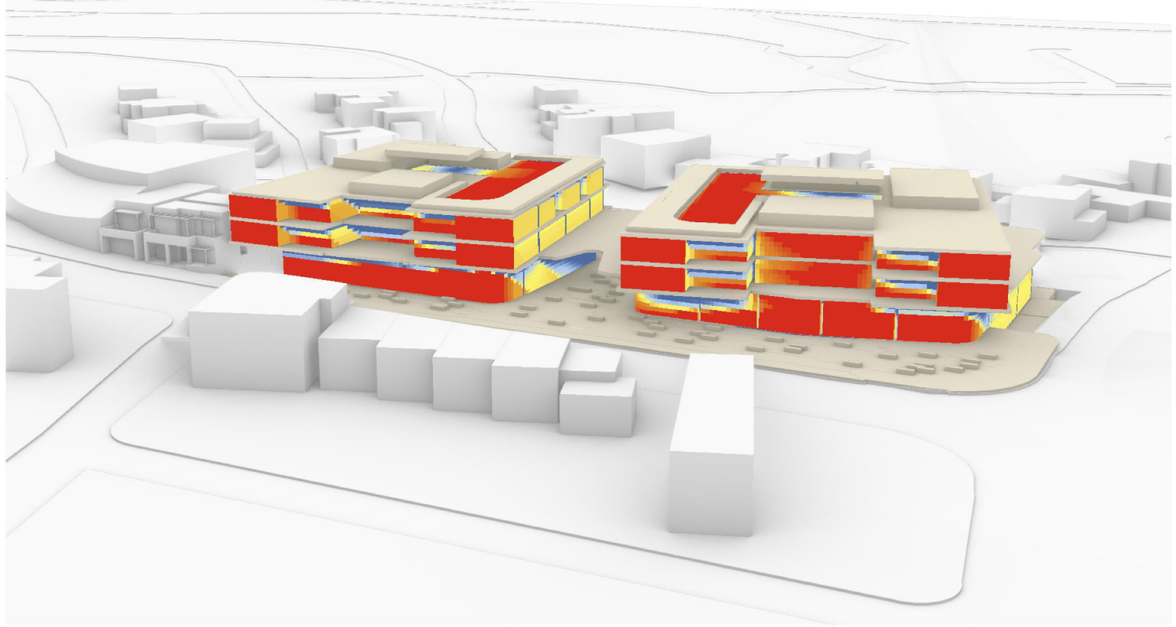
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June 21 - Solar Heatmap (View1)



June 21 - Solar Heatmap (View2)



June 21 - Solar Heatmap (View3)



21 June - Heatmap Legend

COMPLIANCE IS ACHIEVED BETWEEN 9am and 3pm (AS ILLUSTRATED)

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Solar Analysis
Solar Analysis

NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

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09	2/07/2021	For Information	DN	RFJ
08	22/06/2021	For Information	DN	RFJ

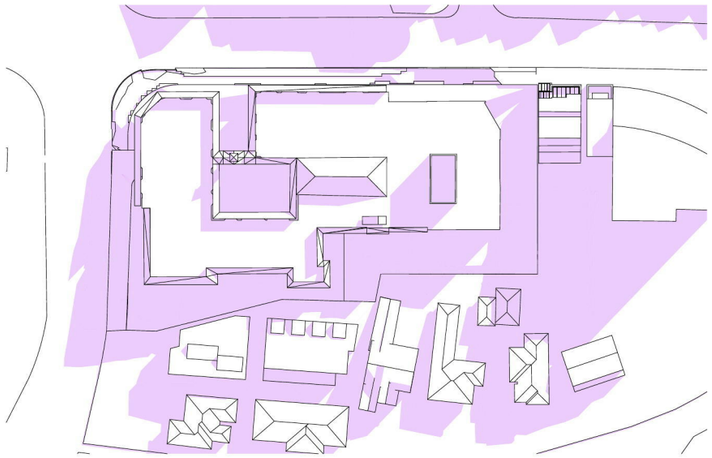
Scale	Code	Sheet	Rev
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0 4 10 20m

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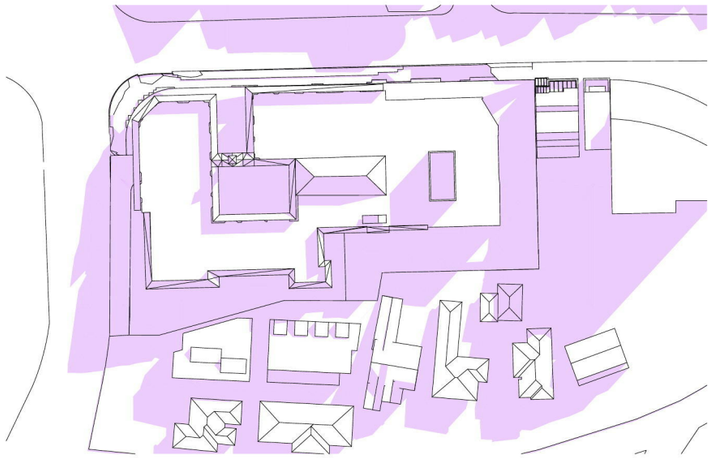
08:00am Existing



08:00am Potential Base Scheme



08:00am Proposed



09:00am Existing



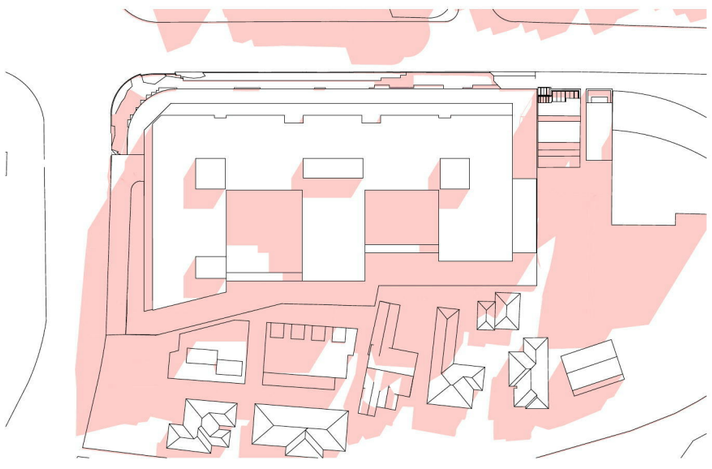
09:00am Potential Base Scheme



09:00am Proposed



10:00am Existing



10:00am Potential Base Scheme



10:00am Proposed

Solar Analysis Shadow Diagrams - June 21 - Sheet 1

EXISTING SHADOWS

WLCS2036 BASE SCHEME (POTENTIAL)

PROPOSED SHADOWS

SHADOWS TAKEN ON THE 21st JUNE

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Shadow Diagrams - June 21 - Sheet 1
Solar Analysis

NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

Rev	Date	Description	By	Chk
09	27/08/2021	Submission	DN	RFJ
08	18/08/2021	For Information	DN	RFJ
07	3/07/2021	Pre-PP Submission	DN	RFJ
06	2/07/2021	For Information	DN	RFJ
05	22/06/2021	For Information	DN	RFJ

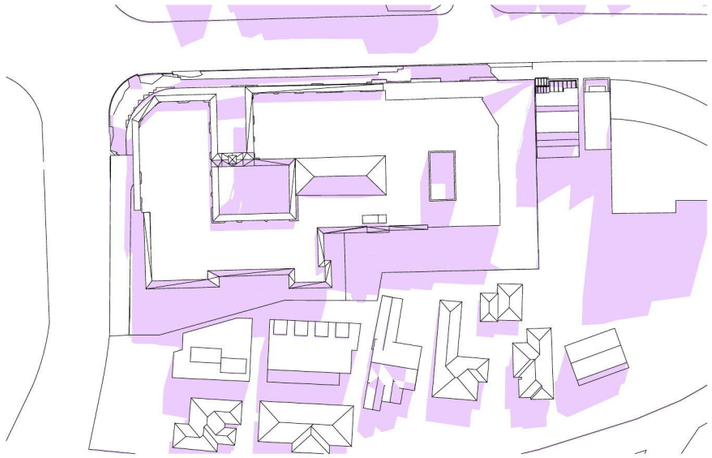
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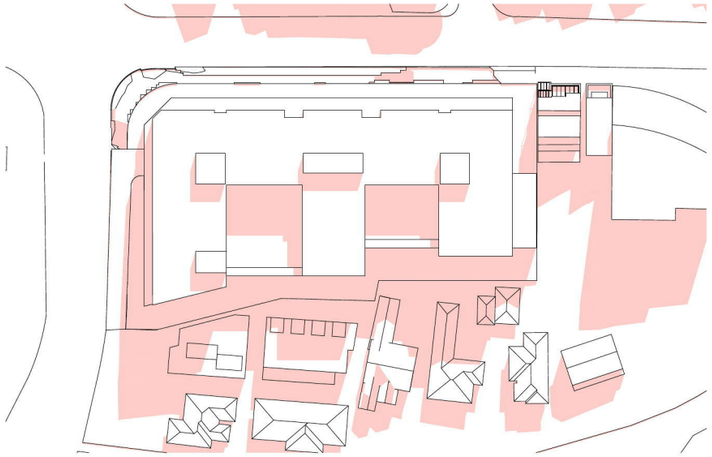
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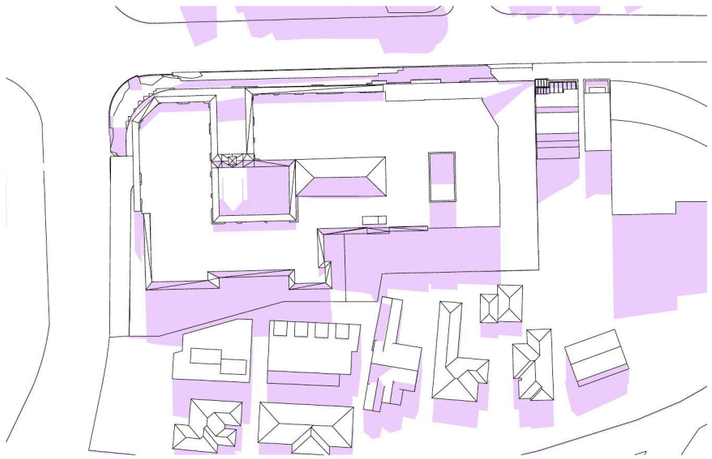
11:00am Existing



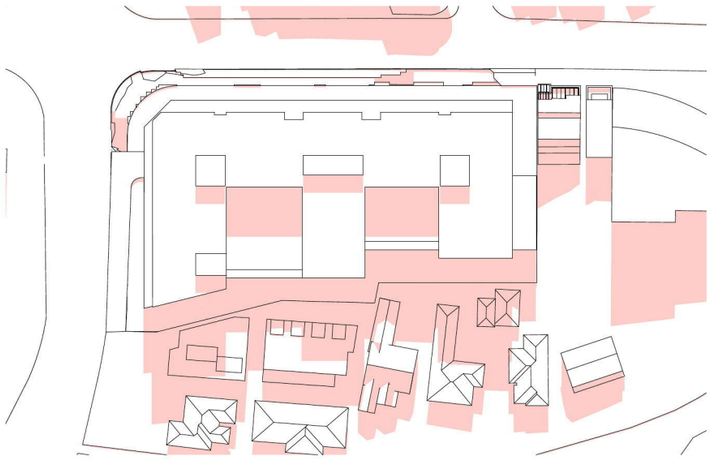
11:00am Potential Base Scheme



11:00am Proposed



12:00pm Existing



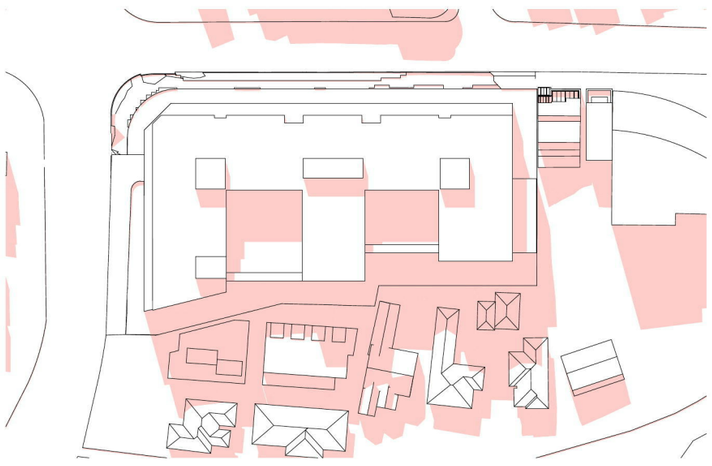
12:00pm Potential Base Scheme



12:00pm Proposed



13:00pm Existing



13:00pm Potential Base Scheme



13:00pm Proposed

Solar Analysis Shadow Diagrams - June 21 - Sheet 2

EXISTING SHADOWS

WLCS2036 BASE SCHEME (POTENTIAL)

PROPOSED SHADOWS

SHADOWS TAKEN ON THE 21st JUNE

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Shadow Diagrams - June 21 - Sheet 2
Solar Analysis

NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

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04	27/08/2021	Submission	DN	RFJ
03	18/08/2021	For Information	DN	RFJ
02	3/07/2021	Pre-PP Submission	DN	RFJ

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1:400 @ A3	GQC	6202	04

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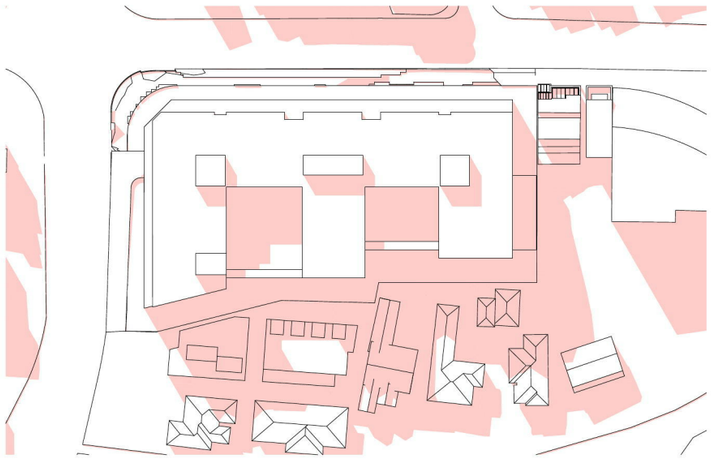
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14:00pm Existing



14:00pm Potential Base Scheme



14:00pm Proposed



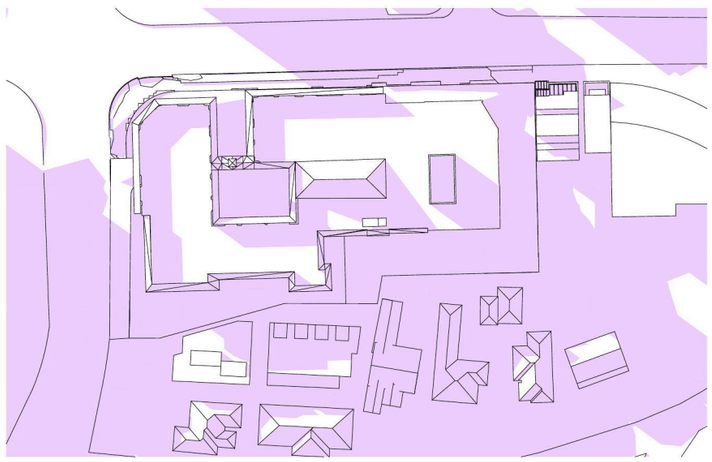
15:00pm Existing



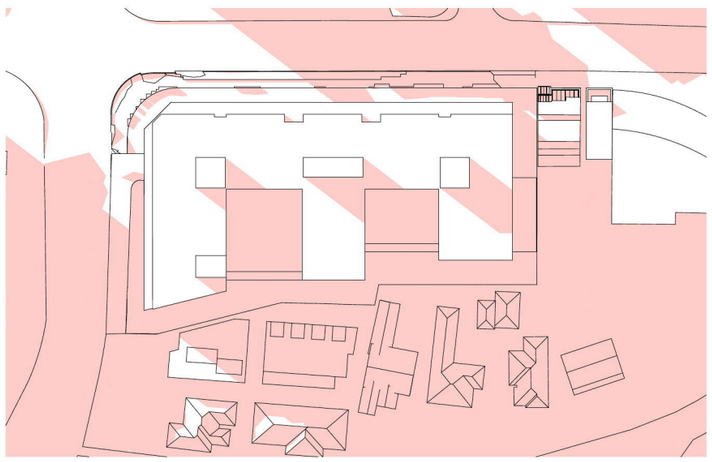
15:00pm Potential Base Scheme



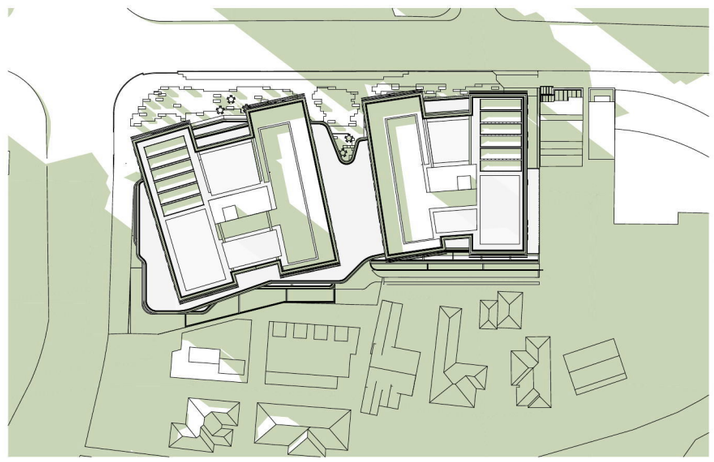
15:00pm Proposed



16:00pm Existing



16:00pm Potential Base Scheme



16:00pm Proposed

Solar Analysis
Shadow Diagrams -
June 21 - Sheet 3

EXISTING SHADOWS

WLCS2036 BASE SCHEME (POTENTIAL)

PROPOSED SHADOWS

SHADOWS TAKEN ON THE 21st JUNE

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Shadow Diagrams - June 21 - Sheet 3
Solar Analysis

NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

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04	27/08/2021	Submission	DN	RFJ
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02	3/07/2021	Pre-PP Submission	DN	RFJ

Scale	Code	Sheet	Rev
1:400 @ A3	GQC	6203	04

0 4 10 20m

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08:00am Existing with Trees



08:00am Potential Base Scheme with Trees



08:00am Proposed with Trees



09:00am Existing with Trees



09:00am Potential Base Scheme with Trees



09:00am Proposed with Trees



10:00am Existing with Trees



10:00am Potential Base Scheme with Trees



10:00am Proposed with Trees

Solar Analysis
Shadow Diagrams
With Trees - June 21 -
Sheet 1

EXISTING SHADOWS

WLCS2036 BASE SCHEME (POTENTIAL)

PROPOSED SHADOWS

SHADOWS TAKEN ON THE 21st JUNE

Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Shadow Diagrams With Trees - June 21 -Sheet 1 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev 02	Date 27/08/2021	Description Submission	By Chk DN RFJ	Scale 1:400 @ A3	Code GQC	Sheet 6204	Rev 02

0 4 10 20m

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11:00am Existing with Trees



11:00am Potential Base Scheme with Trees



11:00am Proposed with Trees



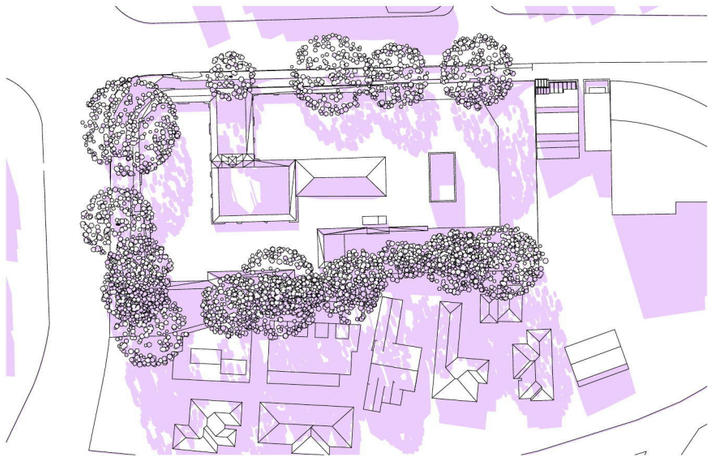
12:00pm Existing with Trees



12:00pm Potential Base Scheme with Trees



12:00pm Proposed with Trees



13:00pm Existing with Trees



13:00pm Potential Base Scheme with Trees



13:00pm Proposed with Trees

Solar Analysis
Shadow Diagrams
With Trees - June 21 -
Sheet 2

EXISTING SHADOWS

WLCS2036 BASE SCHEME (POTENTIAL)

PROPOSED SHADOWS

SHADOWS TAKEN ON THE 21st JUNE

Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Shadow Diagrams With Trees - June 21 -Sheet 2 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev 02	Date 27/08/2021	Description Submission	By DN	Chk RFJ	Scale 1:400 @ A3	Code GQC	Sheet 6205	Rev 02	0 4 10 20m

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14:00pm Existing with Trees



14:00pm Potential Base Scheme with Trees



14:00pm Proposed with Trees



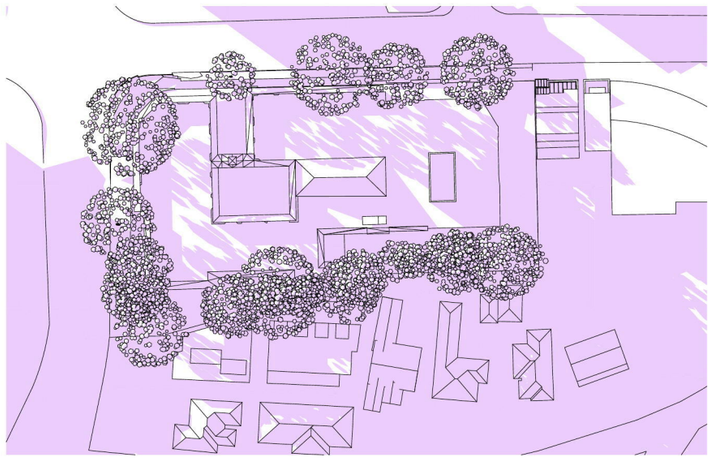
15:00pm Existing with Trees



15:00pm Potential Base Scheme with Trees



15:00pm Proposed with Trees



16:00pm Existing with Trees



16:00pm Potential Base Scheme with Trees



16:00pm Proposed with Trees

Solar Analysis
Shadow Diagrams
With Trees - June 21 -
Sheet 3

EXISTING SHADOWS

WLCS2036 BASE SCHEME (POTENTIAL)

PROPOSED SHADOWS

SHADOWS TAKEN ON THE 21st JUNE

Planning Proposal Submission

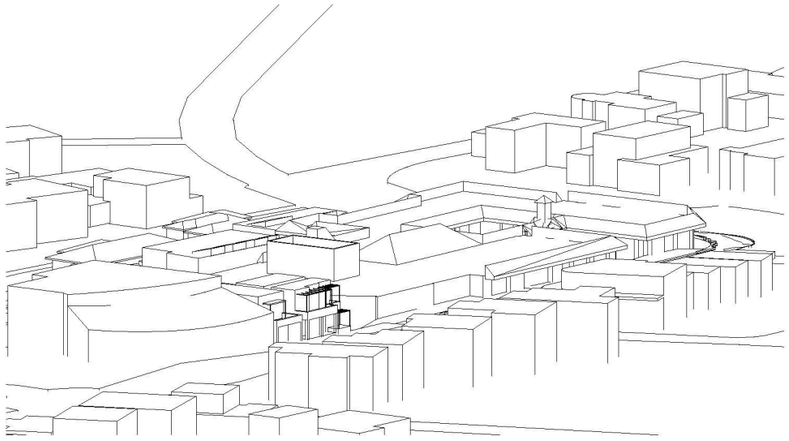
The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Shadow Diagrams With Trees - June 21 -Sheet 3 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev 02	Date 27/08/2021	Description Submission	By DN	Chk RFJ	Scale 1:400 @ A3	Code GQC	Sheet 6206	Rev 02

0 4 10 20m

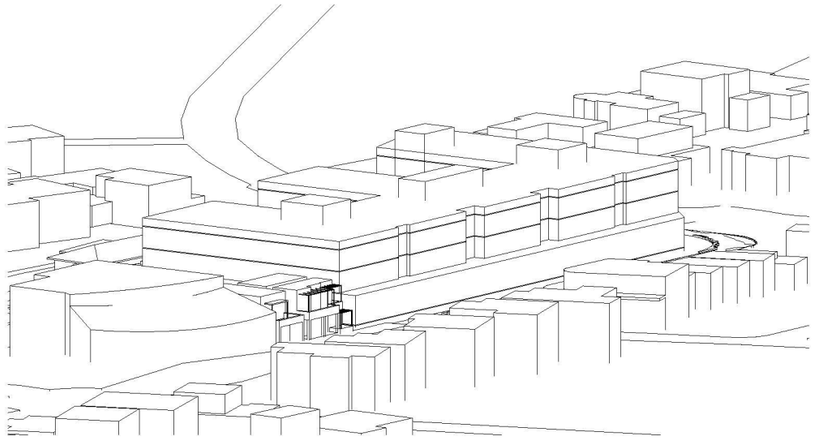
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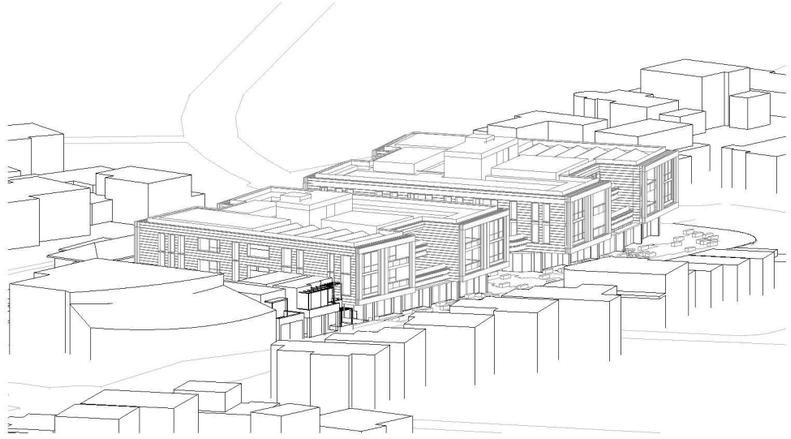
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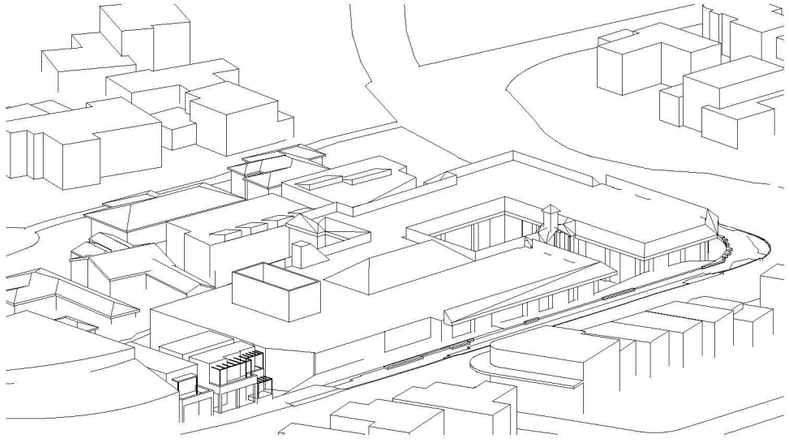
8am - Existing



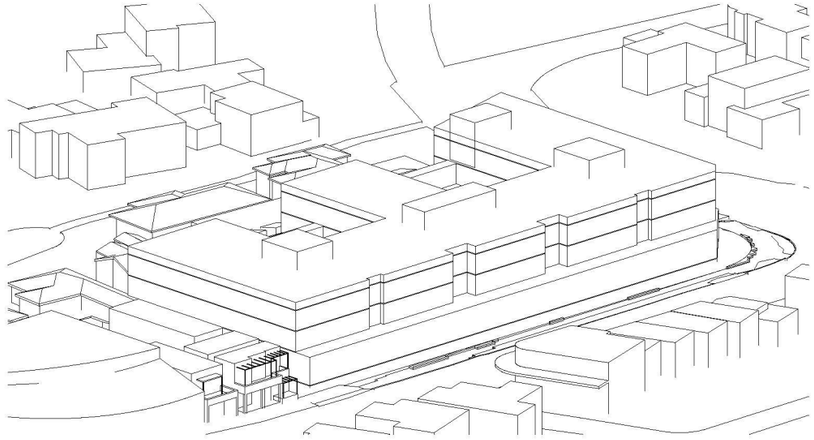
8am - WLCS2036 Base Scheme



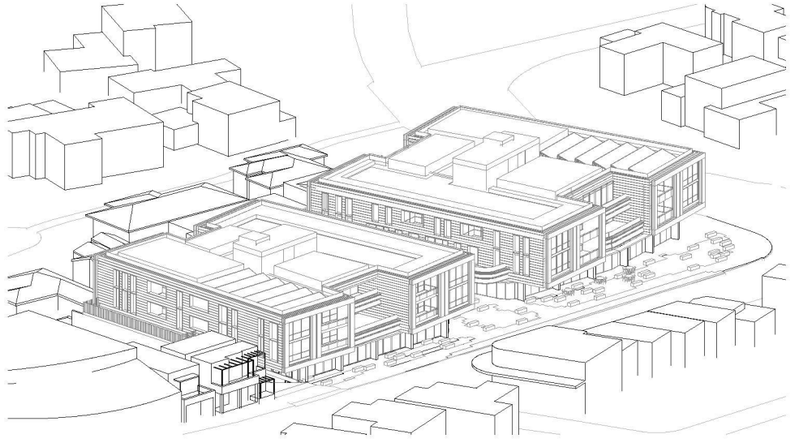
8am - Proposed



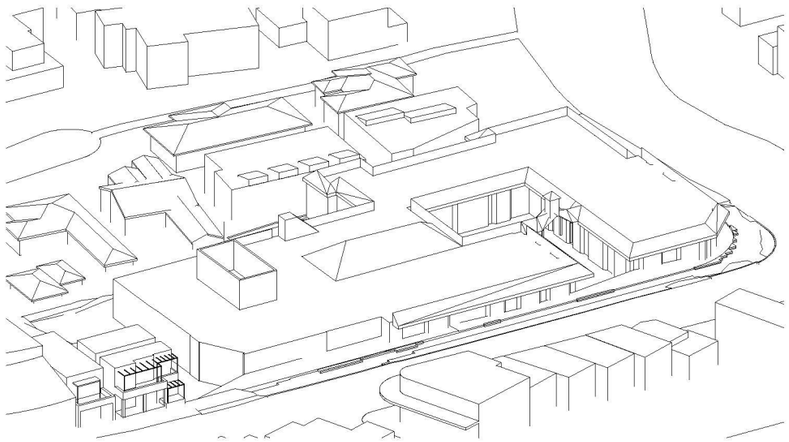
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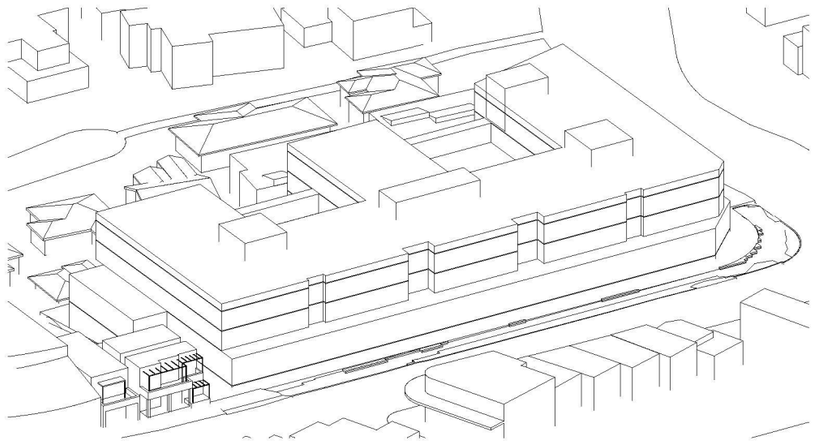
9am - WLCS2036 Base Scheme



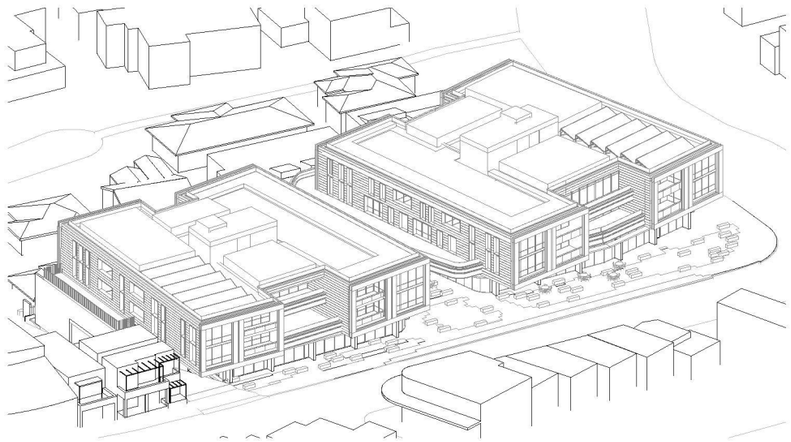
9am - Proposed



10am - Existing



10am - WLCS2036 Base Scheme



10am - Proposed

Solar Analysis - June 21

Solar Analysis - June 21

Solar Analysis - June 21

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Eye of the Sun - June 21 - Sheet 1
Solar Analysis

NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

Rev	Date	Description	By	Chk
04	27/08/2021	Submission	DN	RFJ
03	18/08/2021	For Information	DN	RFJ
02	3/07/2021	Pre-PP Submission	DN	RFJ

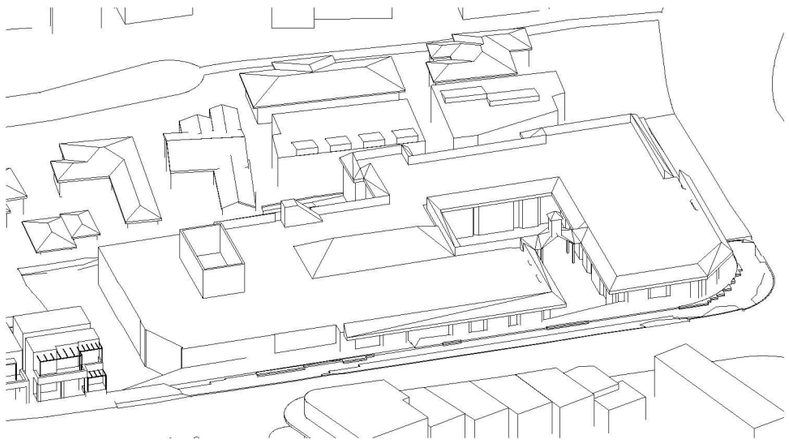
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0 4 10 20m

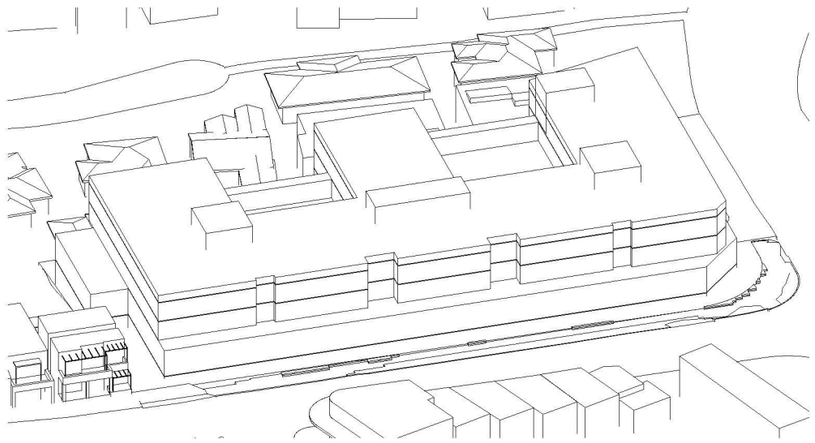
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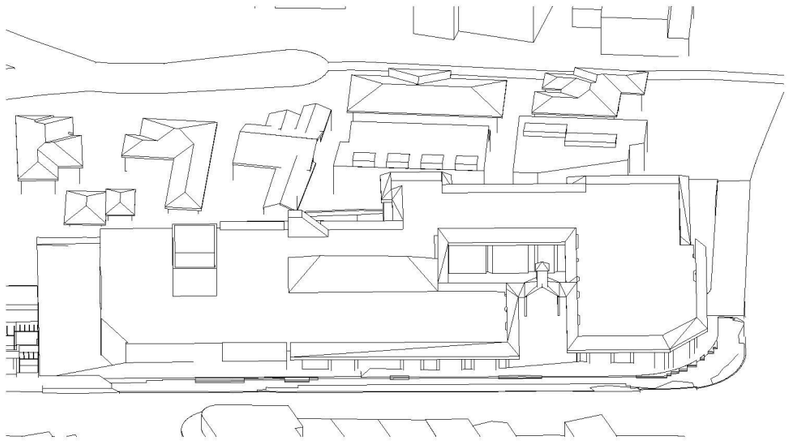
11am - Existing



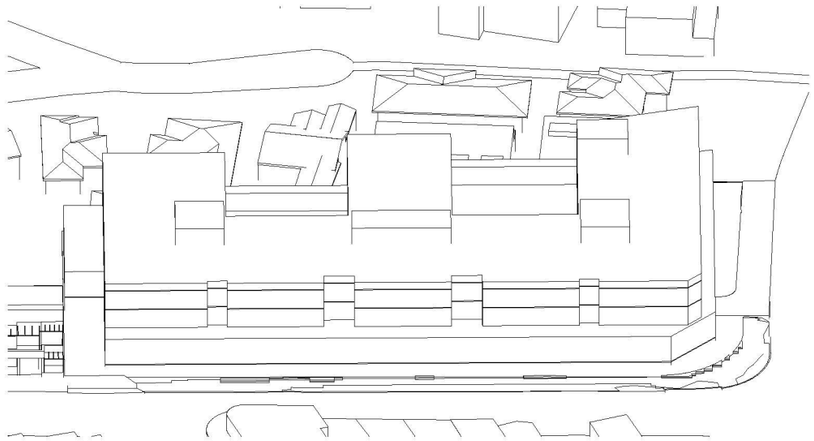
11am - WLCS2036 Base Scheme



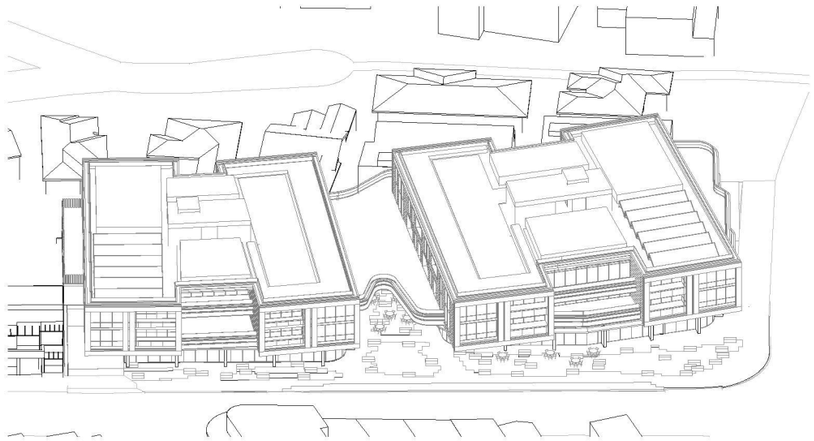
11am - Proposed



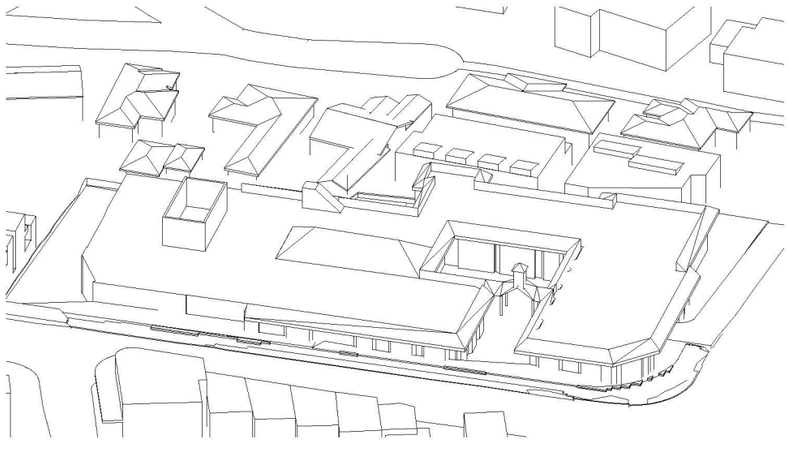
12am - Existing



12am - WLCS2036 Base Scheme

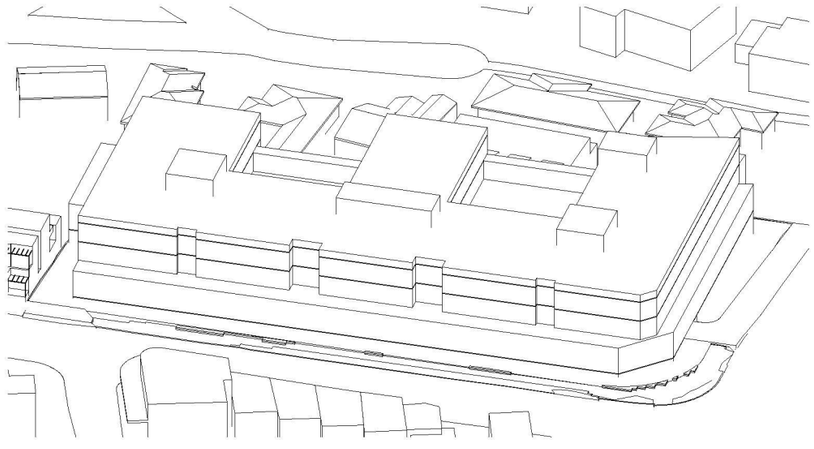


12am - Proposed



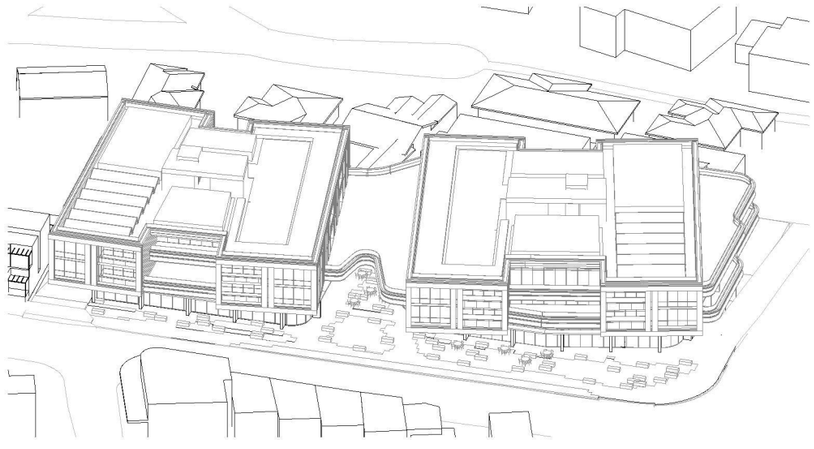
1pm - Existing

Solar Analysis - June 21



1pm - WLCS2036 Base Scheme

Solar Analysis - June 21



1pm - Proposed

Solar Analysis - June 21

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Eye of the Sun - June 21 - Sheet 2
Solar Analysis

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Rev	Date	Description	By	Chk
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03	18/08/2021	For Information	DN	RFJ
02	3/07/2021	Pre-PP Submission	DN	RFJ

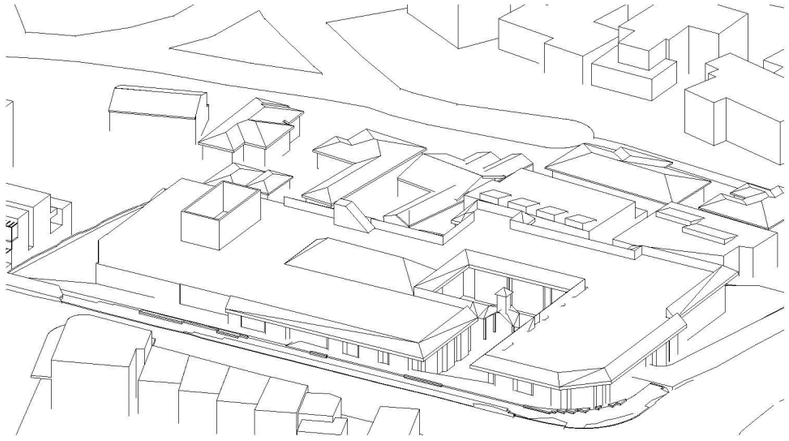
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0 4 10 20m

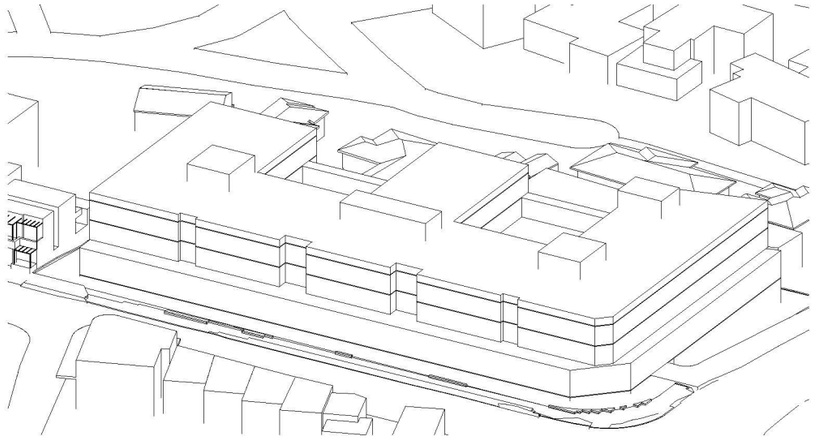
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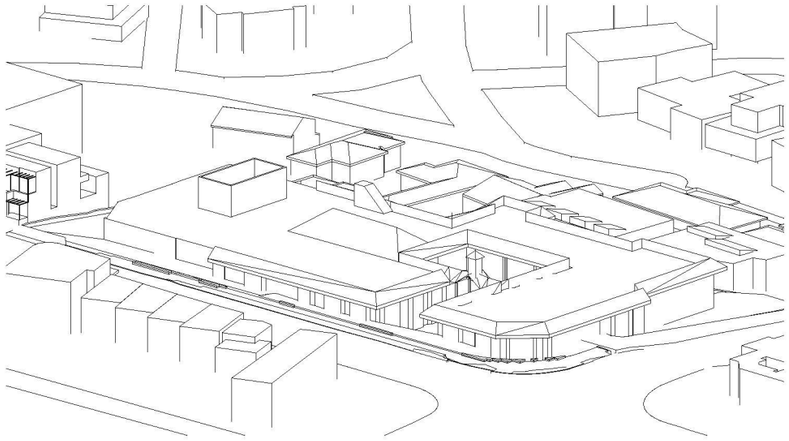
2pm - Existing



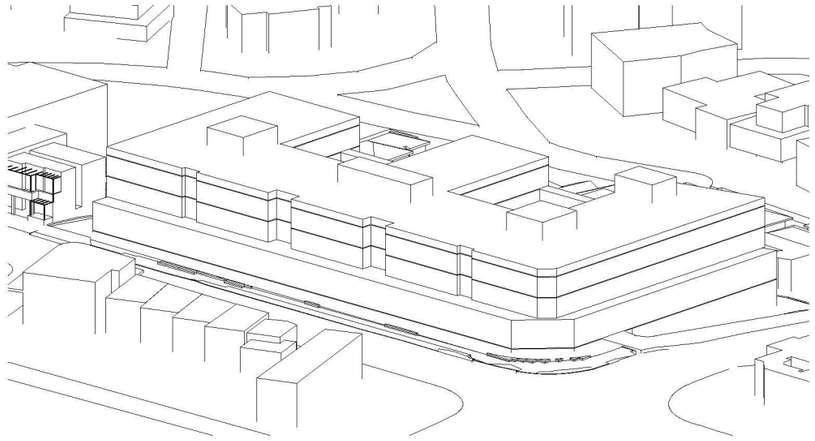
2pm - WLCS2036 Base Scheme



2pm - Proposed



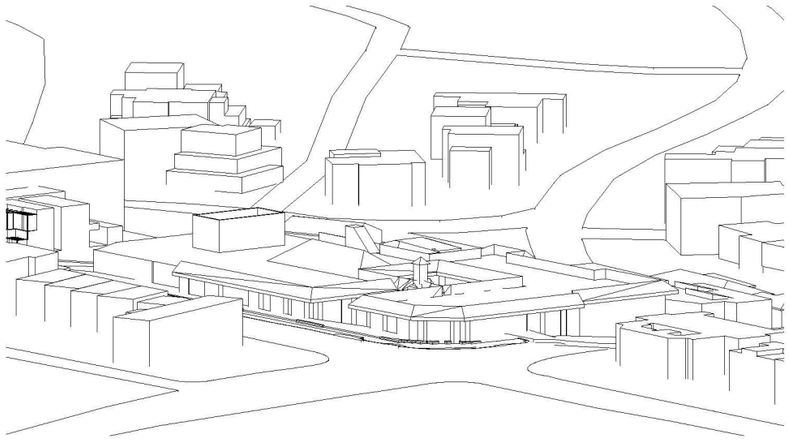
3pm - Existing



3pm - WLCS2036 Base Scheme

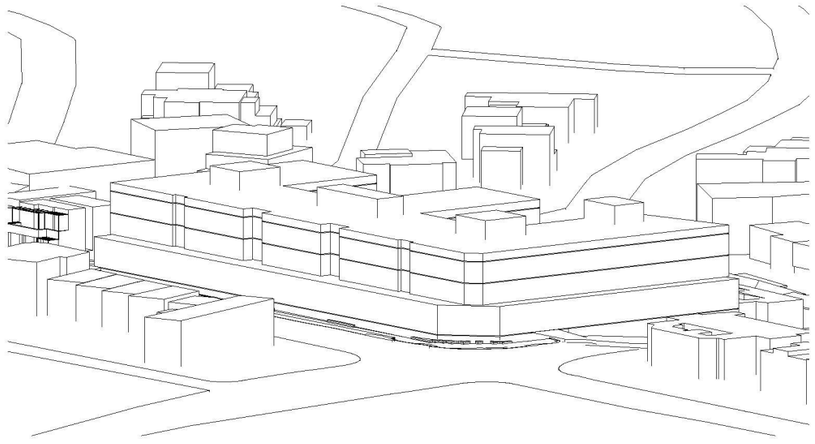


3pm - Proposed



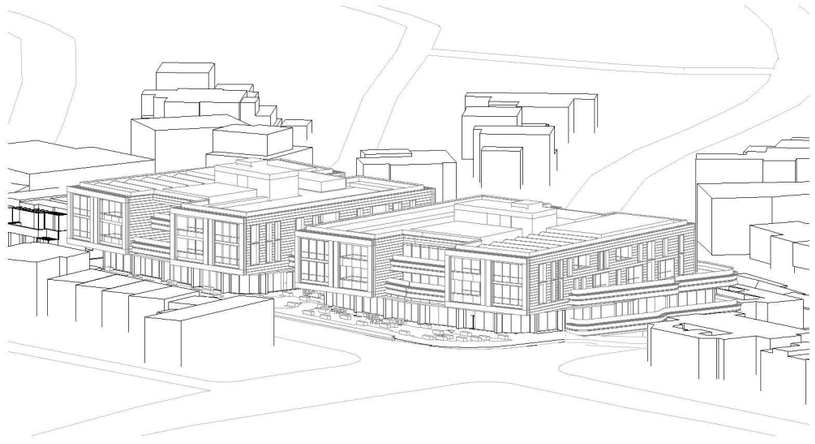
4pm - Existing

Solar Analysis - June 21



4pm - WLCS2036 Base Scheme

Solar Analysis - June 21



4pm - Proposed

Solar Analysis - June 21

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Eye of the Sun - June 21 - Sheet 3
Solar Analysis

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03	18/08/2021	For Information	DN	RFJ
02	3/07/2021	Pre-PP Submission	DN	RFJ

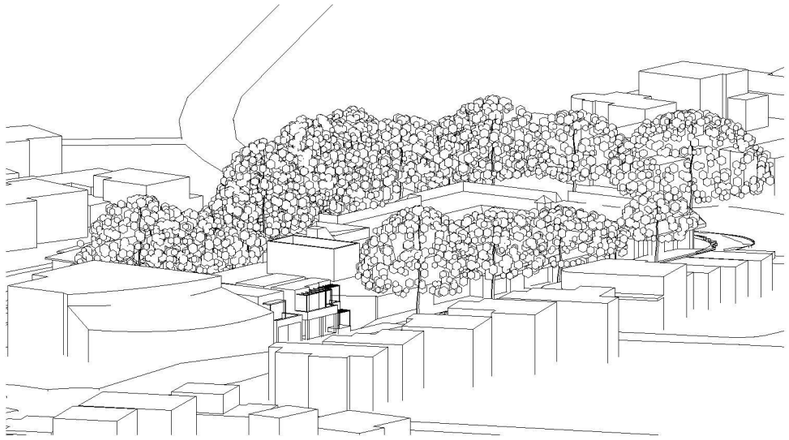
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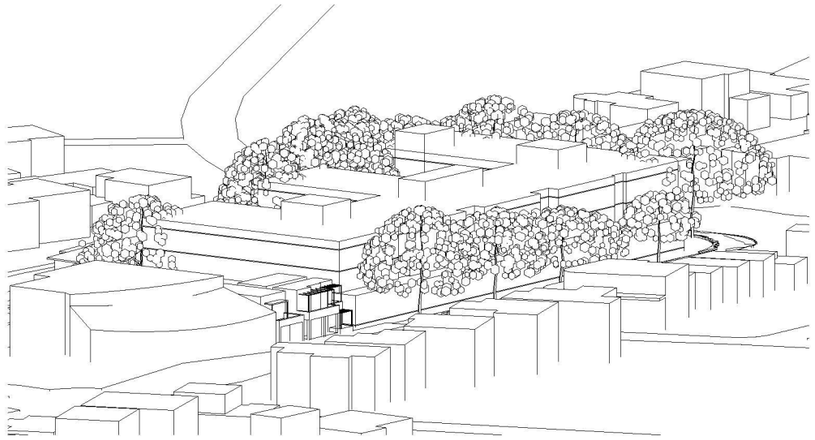
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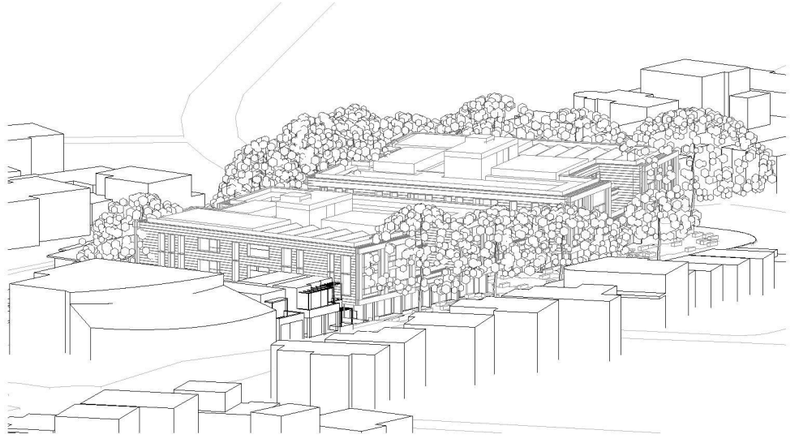
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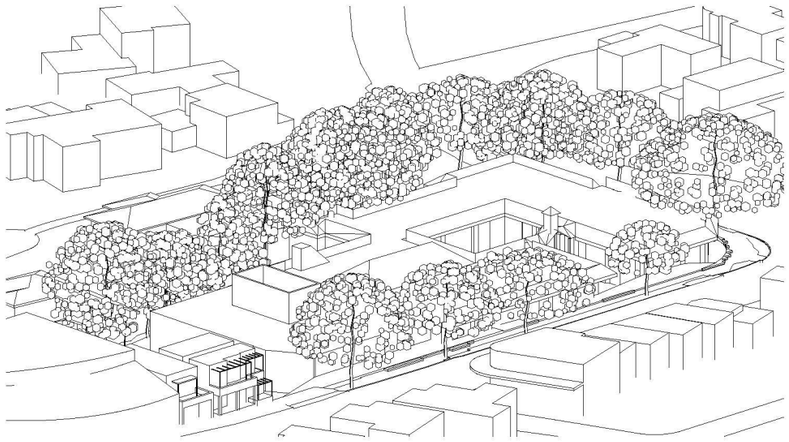
8am - Existing with Trees



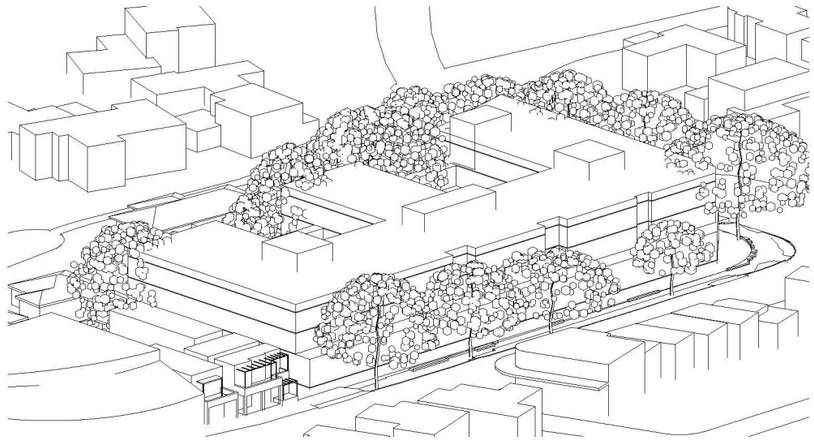
8am - WLCS2036 Potential Scheme With Trees



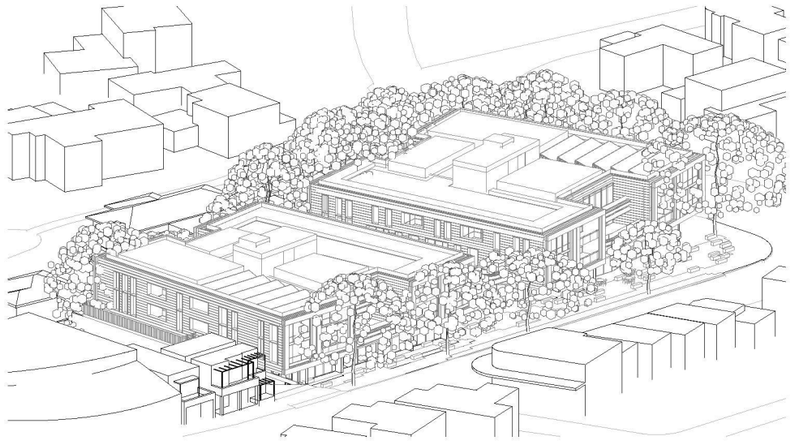
8am - Proposed with Trees



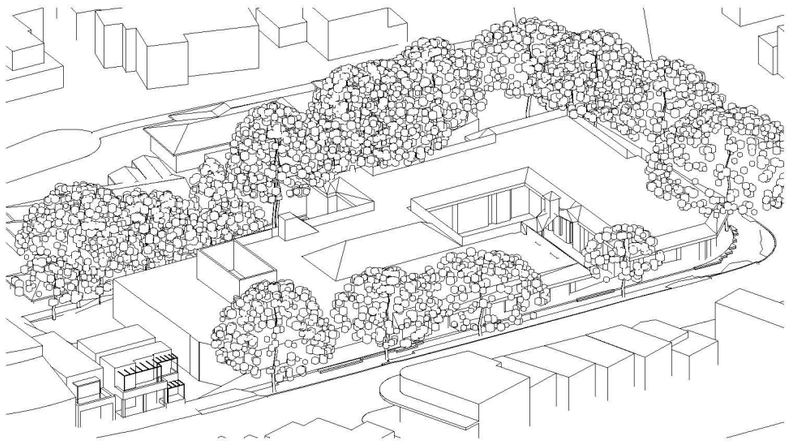
9am - Existing with Trees



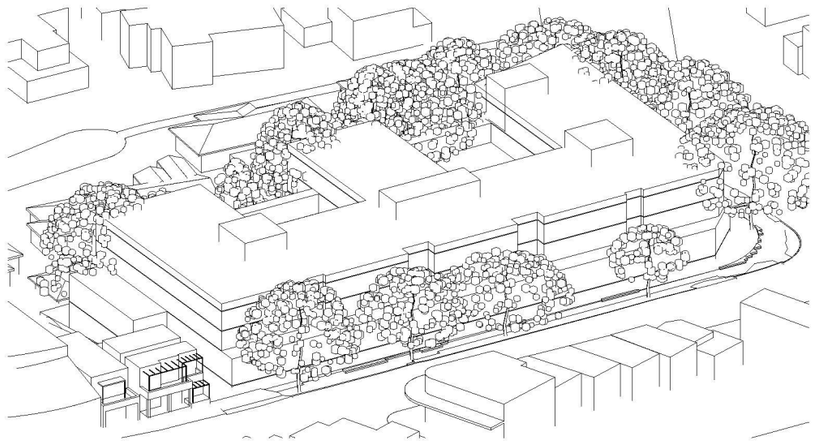
9am - WLCS2036 Potential Scheme With Trees



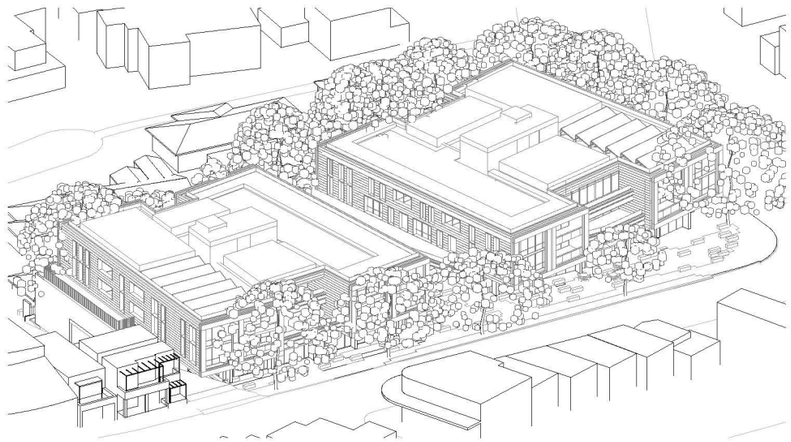
9am - Proposed with Trees



10am - Existing with Trees



10am - WLCS2036 Potential Scheme With Trees



10am - Proposed with Trees

Solar Analysis - June 21

Solar Analysis - June 21

Solar Analysis - June 21

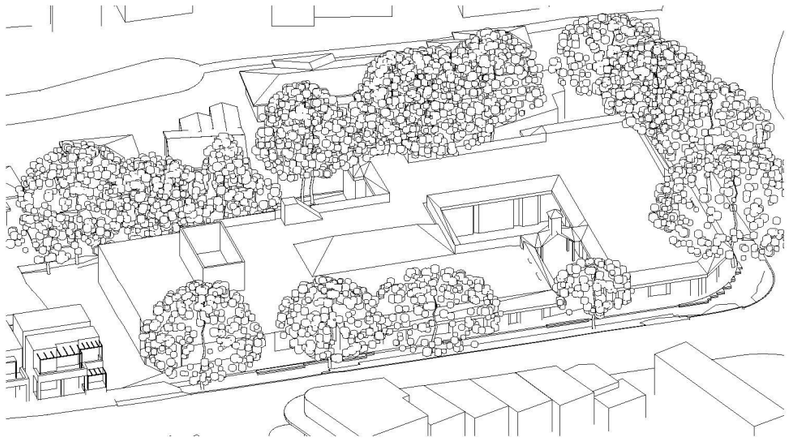
Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eye of the Sun with Trees - June 21 - Sheet 1 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev 02	Date 27/08/2021	Description Submission	By DN	Chk RFJ	Scale 1:400 @ A3	Code GQC	Sheet 6210	Rev 02	0 4 10 20m

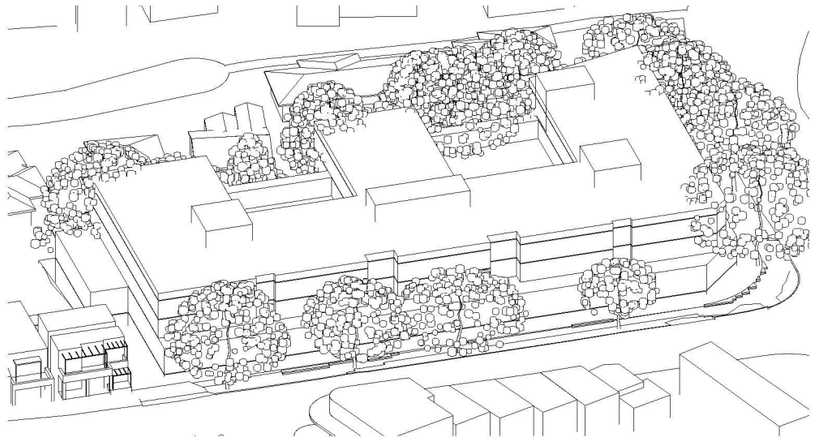
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11am - Existing with Trees



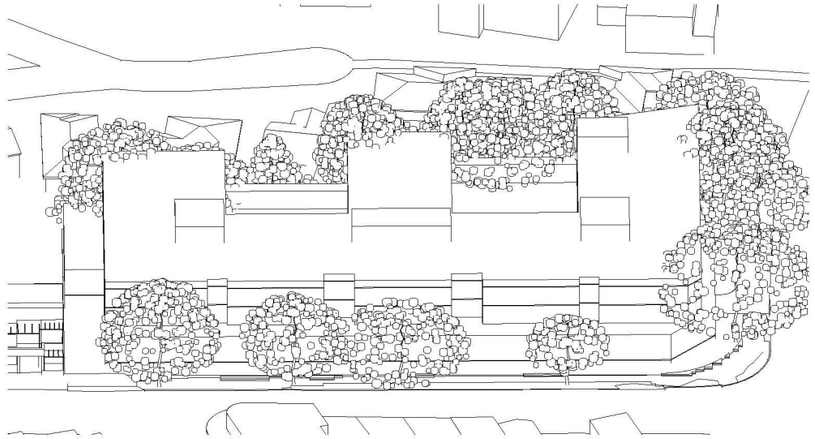
11am - WLCS2036 Potential Scheme With Trees



11am - Proposed with Trees



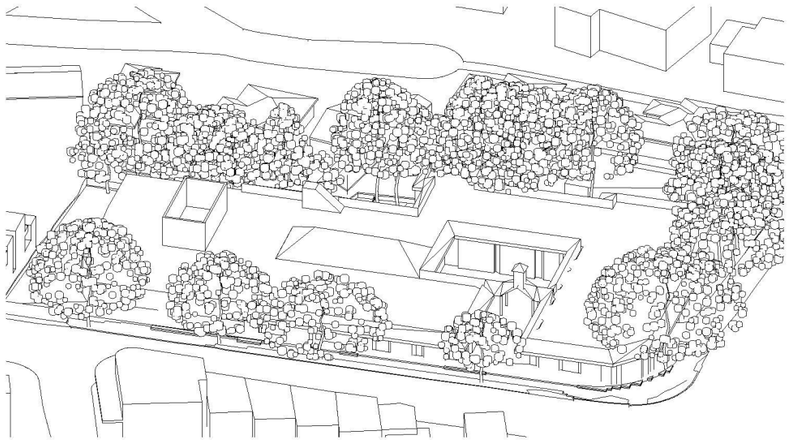
12am - Existing with Trees



12am - WLCS2036 Potential Scheme With Trees

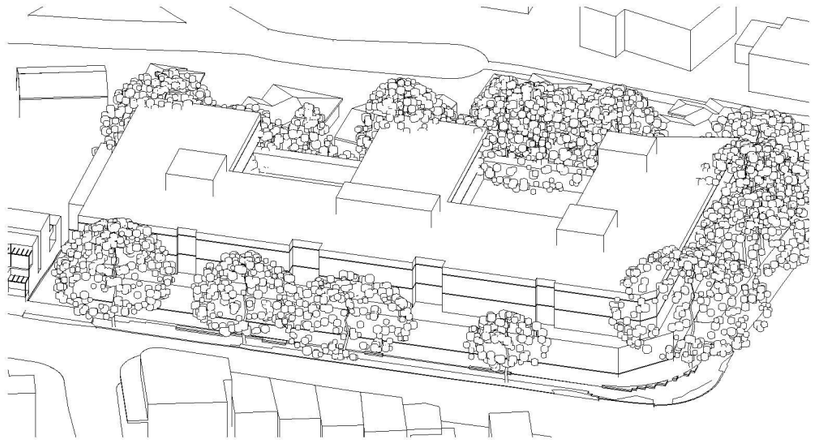


12am - Proposed with Trees



1pm - Existing with Trees

Solar Analysis - June 21



1pm - WLCS2036 Potential Scheme With Trees

Solar Analysis - June 21



1pm - Proposed with Trees

Solar Analysis - June 21

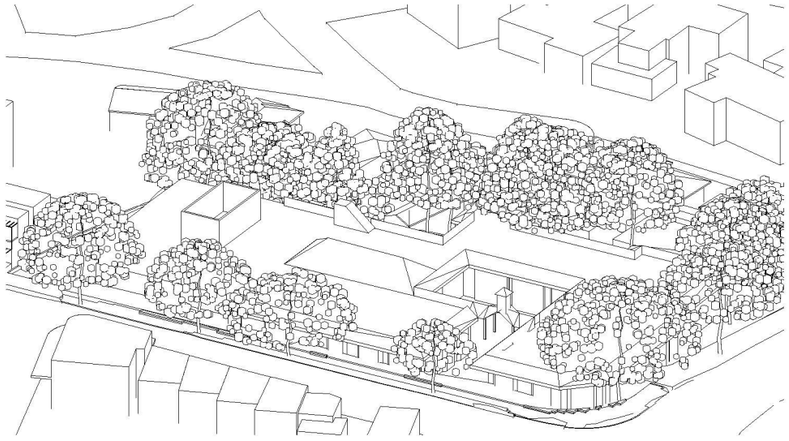
Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eye of the Sun with Trees - June 21 - Sheet 2 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev 02	Date 27/08/2021	Description Submission	By DN	Chk RFJ	Scale 1:400 @ A3	Code GQC	Sheet 6211	Rev 02	0 4 10 20m

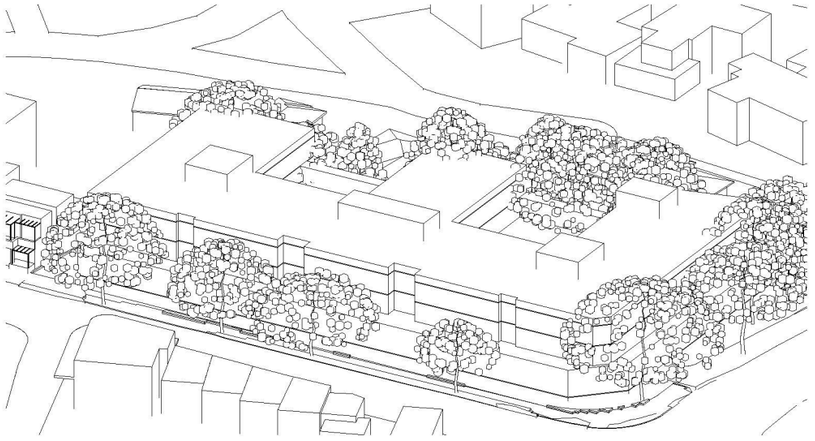
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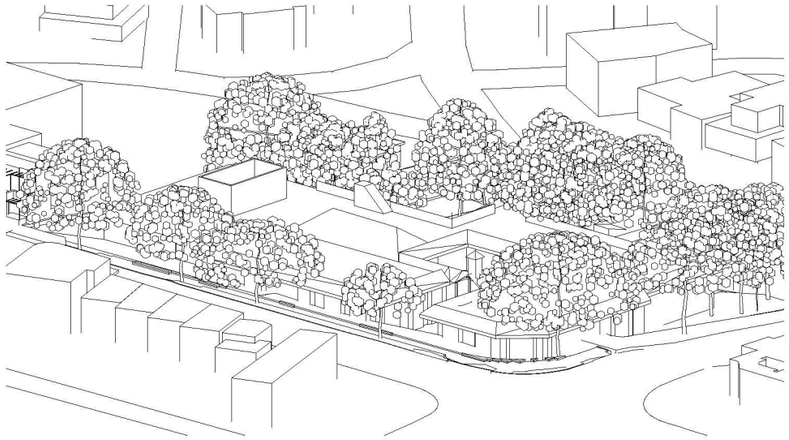
2pm - Existing with Trees



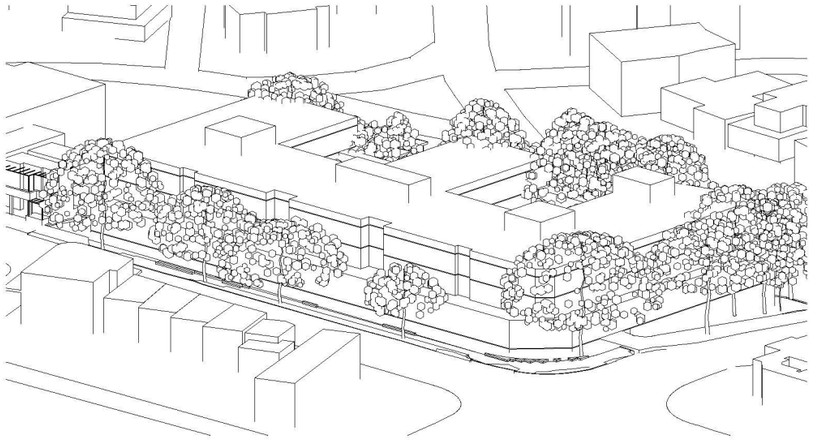
2pm - WLCS2036 Potential Scheme With Trees



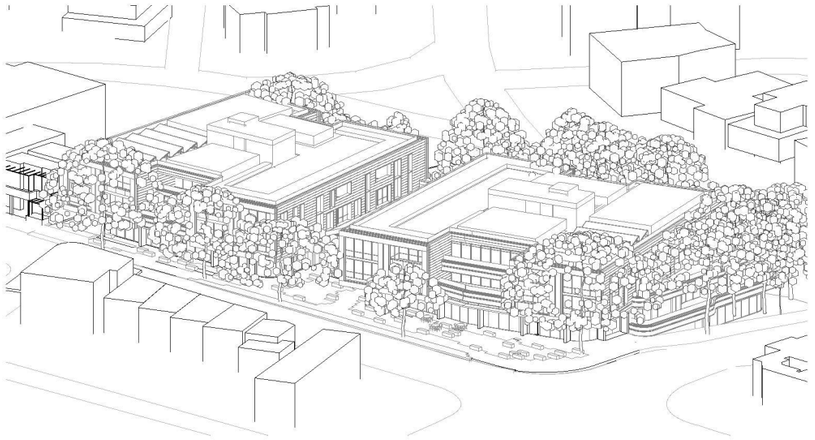
2pm - Proposed with Trees



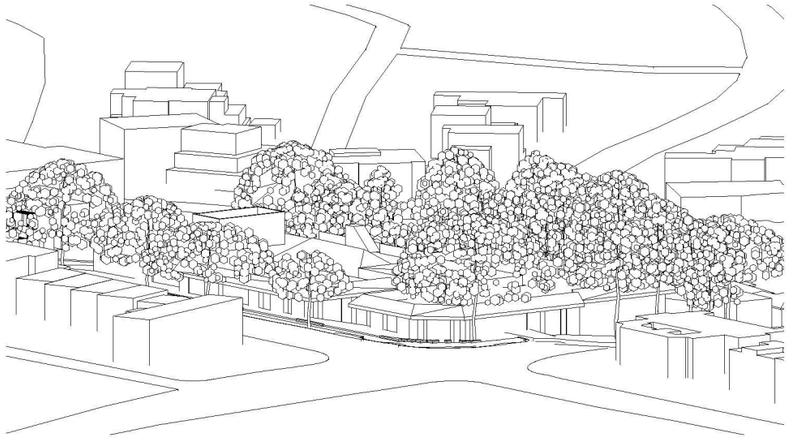
3pm - Existing with Trees



3pm - WLCS2036 Potential Scheme With Trees

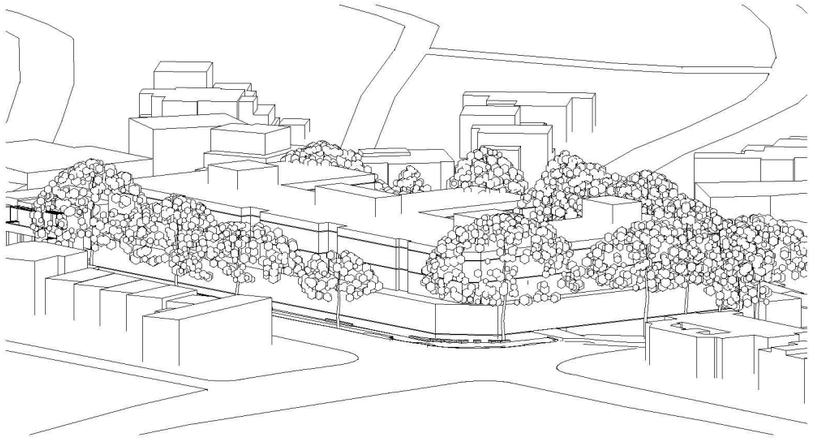


3pm - Proposed with Trees



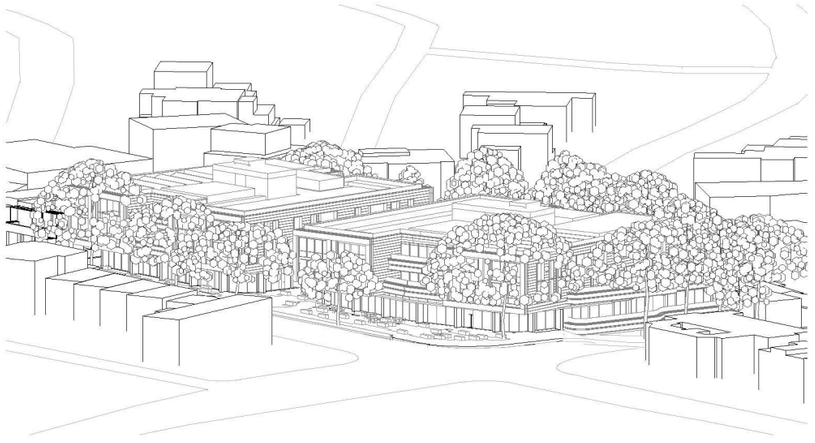
4pm - Existing with Trees

Solar Analysis - June 21



4pm - WLCS2036 Potential Scheme With Trees

Solar Analysis - June 21



4pm - Proposed with Trees

Solar Analysis - June 21

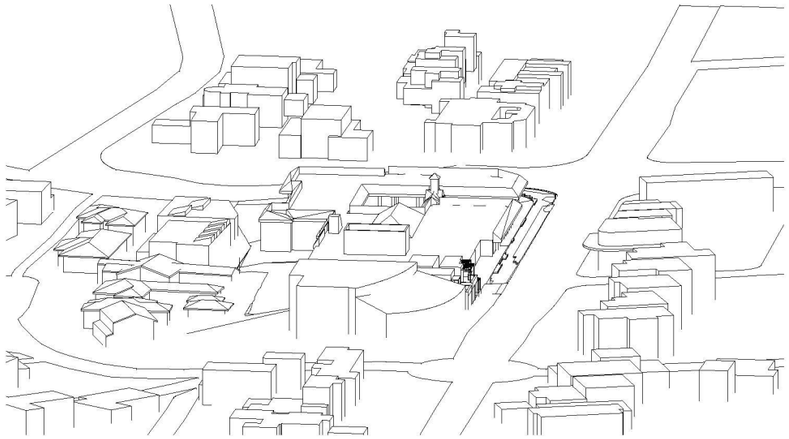
Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eye of the Sun with Trees - June 21 -Sheet 3 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev 02	Date 27/08/2021	Description Submission	By DN	Chk RFJ	Scale 1:400 @ A3	Code GQC	Sheet 6212	Rev 02	0 4 10 20m

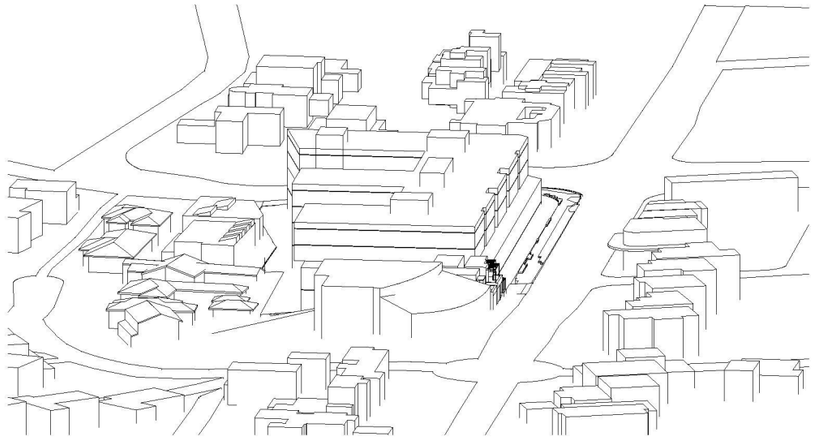
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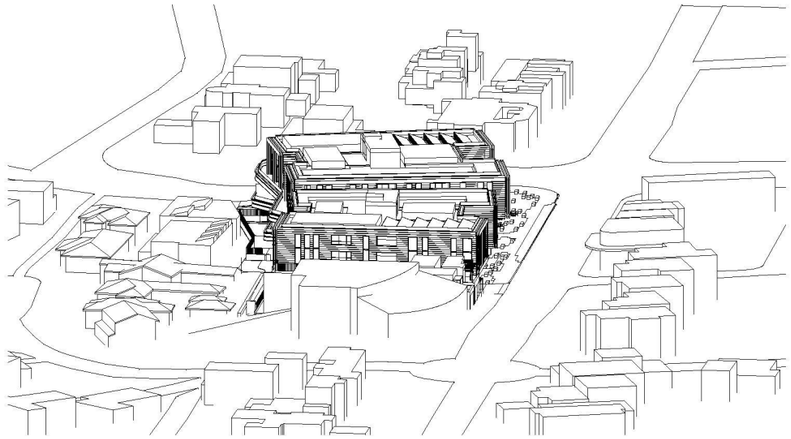
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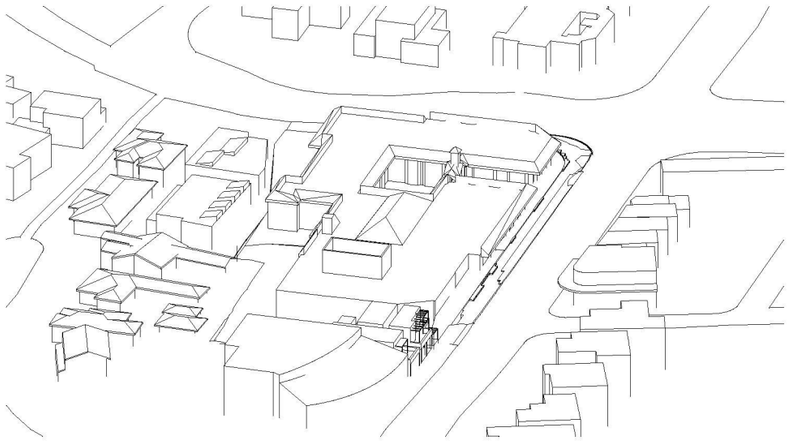
8am - Existing



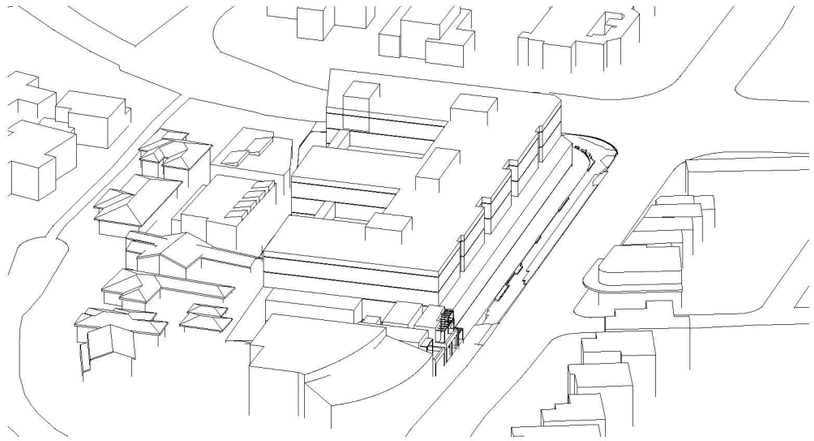
8am - WLCS2036 Potential Scheme



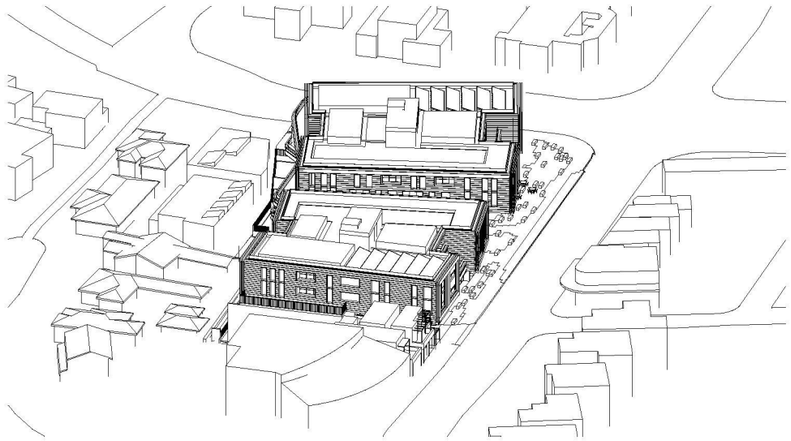
8am - Proposed



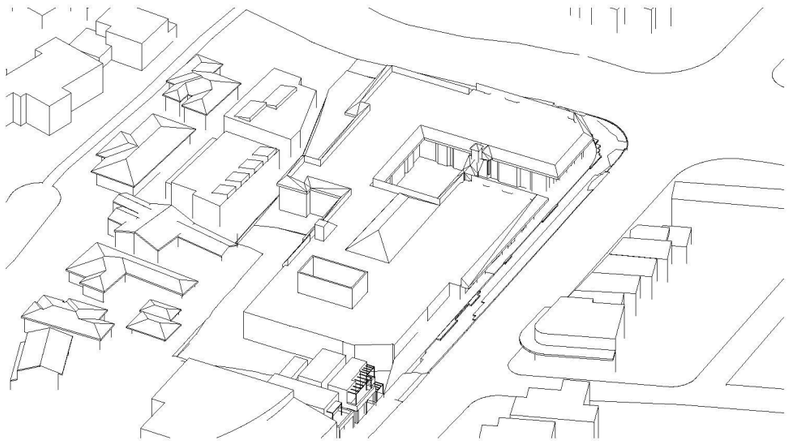
9am - Existing



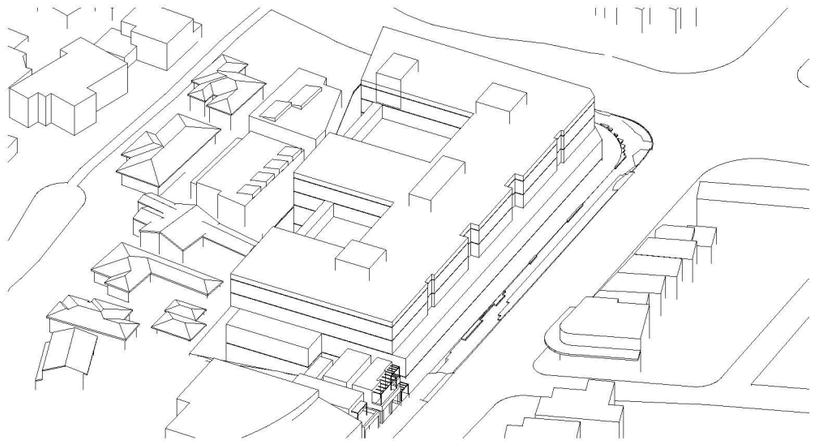
9am - WLCS2036 Potential Scheme



9am - Proposed



10am - Existing



10am -WLCS2036 Potential Scheme



10am - Proposed

Solar Analysis - March 21

Solar Analysis - March 21

Solar Analysis - March 21

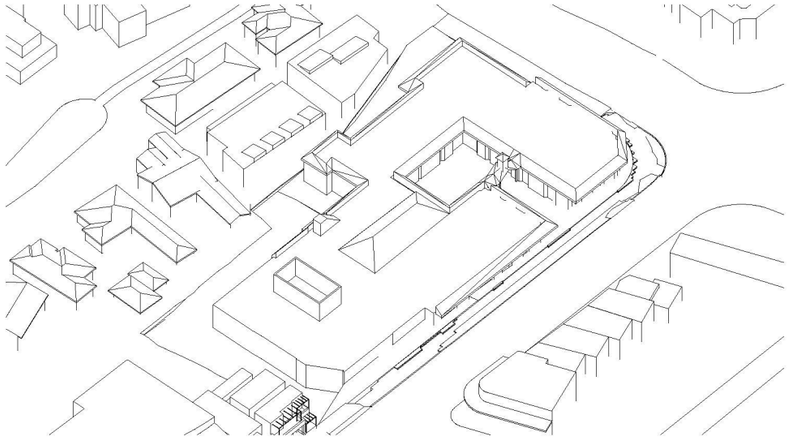
Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eye of the Sun - March 21 - Sheet 1 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev Date Description By Chk	Scale 1:400 @ A3	Code GQC	Sheet 6213	Rev 01	0 4 10 20m	

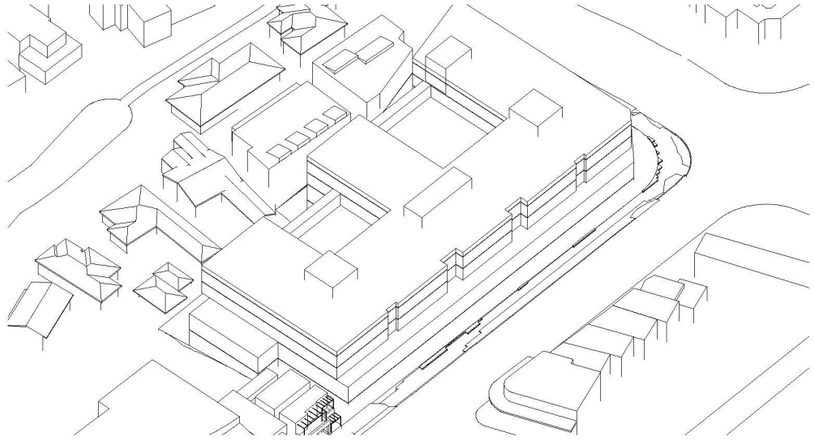
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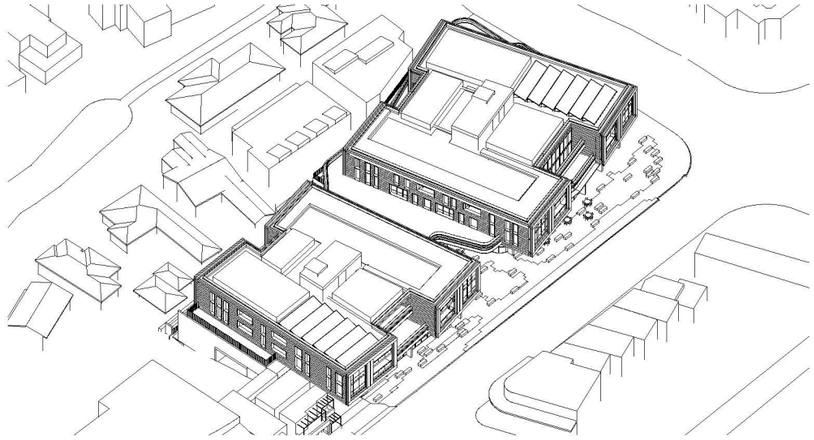
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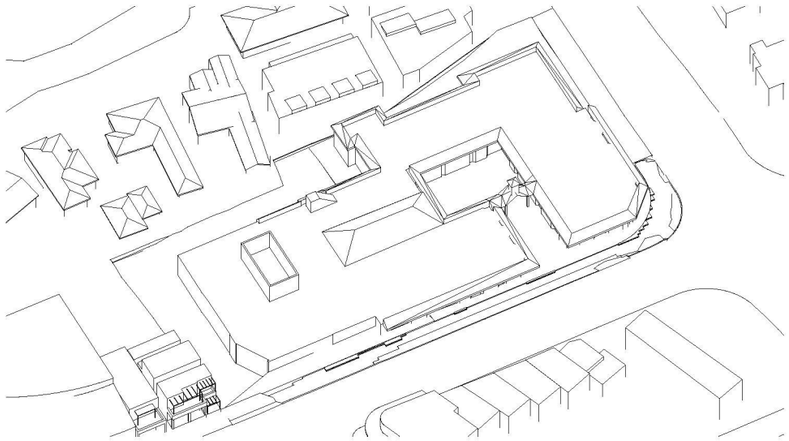
11am - Existing



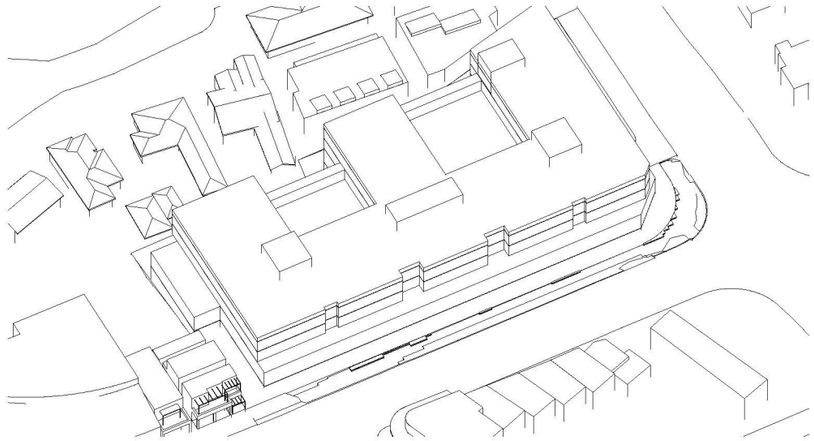
11am - WLCS2036 Potential Scheme



11am - Proposed



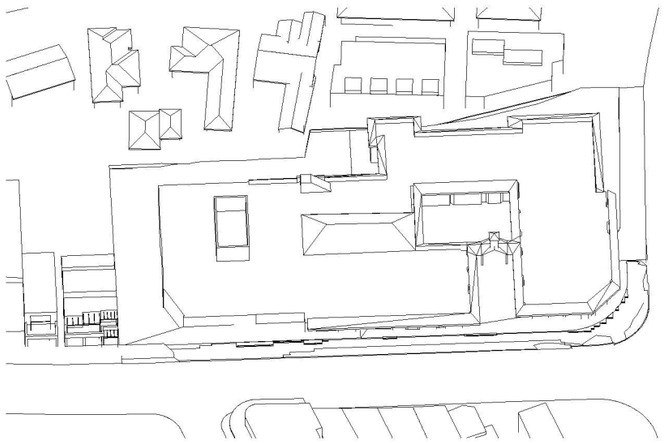
12am - Existing



12am - WLCS2036 Potential Scheme

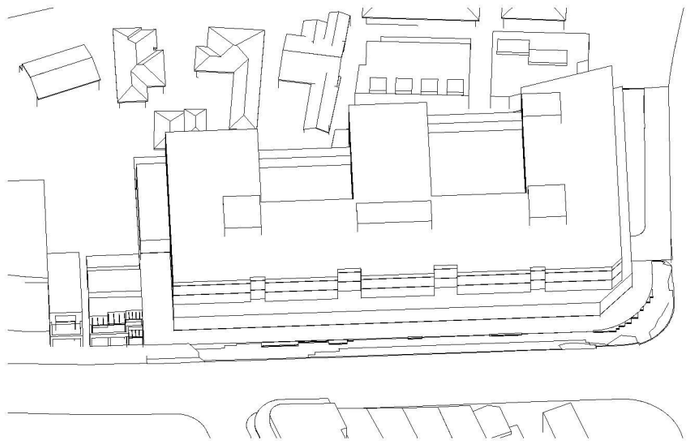


12am - Proposed



1pm - Existing

Solar Analysis - March 21



1pm - WLCS2036 Potential Scheme

Solar Analysis - March 21



1pm - Proposed

Solar Analysis - March 21

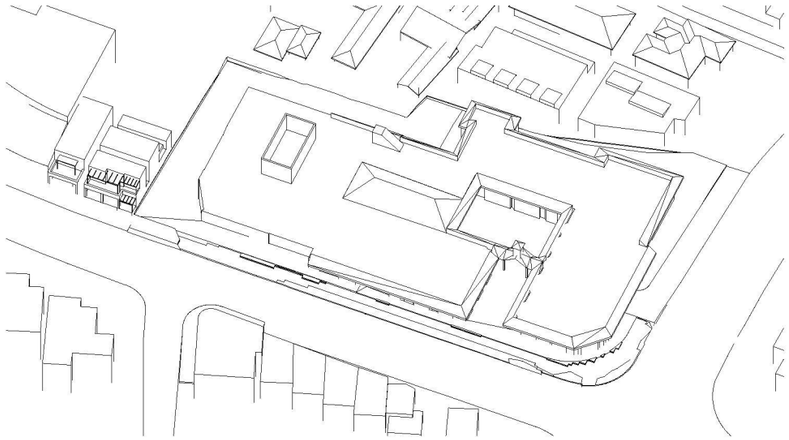
Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eye of the Sun - March 21 - Sheet 2 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev Date Description By Chk	Scale 1:400 @ A3	Code GQC	Sheet 6214	Rev 01	0 4 10 20m	

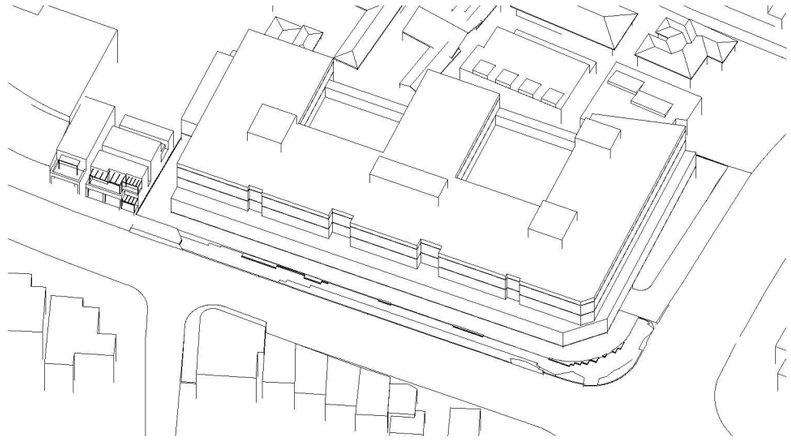
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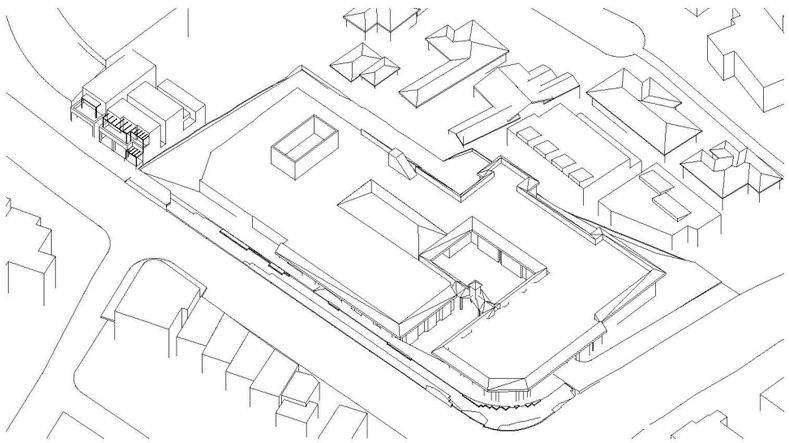
2pm - Existing



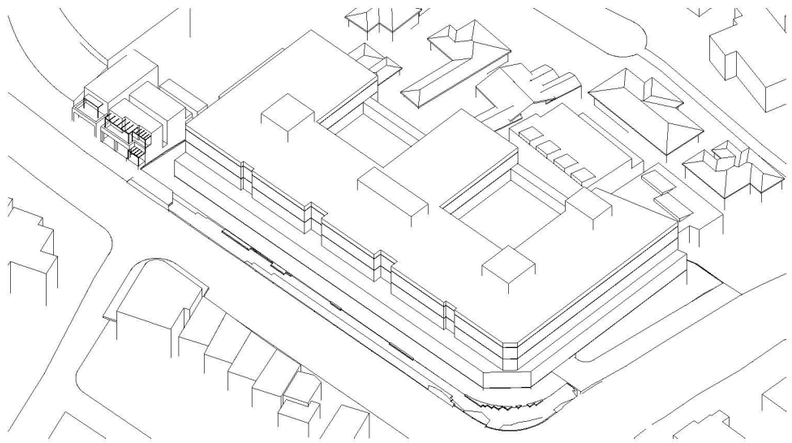
2pm - WLCS2036 Potential Scheme



2pm - Proposed



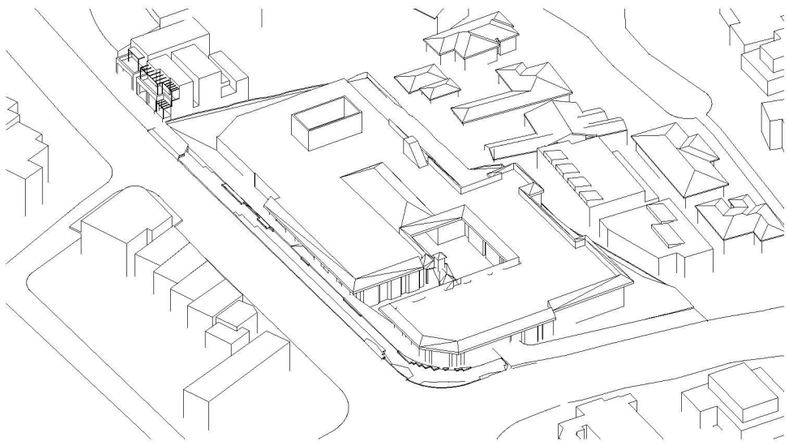
3pm - Existing



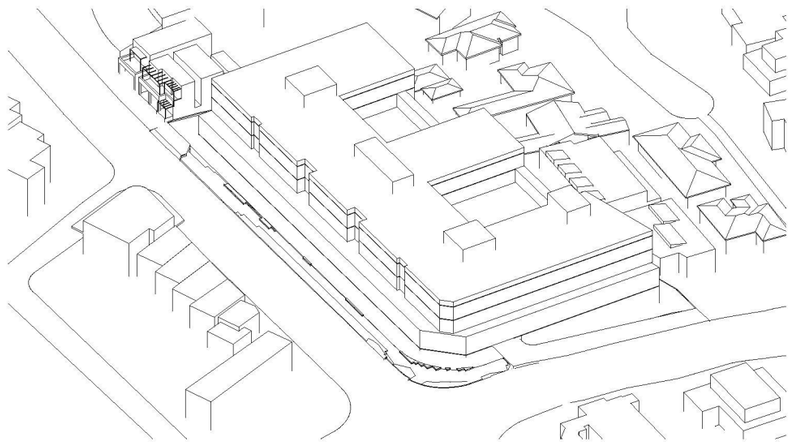
3pm - WLCS2036 Potential Scheme



3pm - Proposed



4pm - Existing



4pm - WLCS2036 Potential Schemed



4pm - Proposed

Solar Analysis - March 21

Solar Analysis - March 21

Solar Analysis - March 21

Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eye of the Sun - March 21 - Sheet 3 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev Date Description By Chk	Scale 1:400 @ A3	Code GQC	Sheet 6215	Rev 01	0 4 10 20m	

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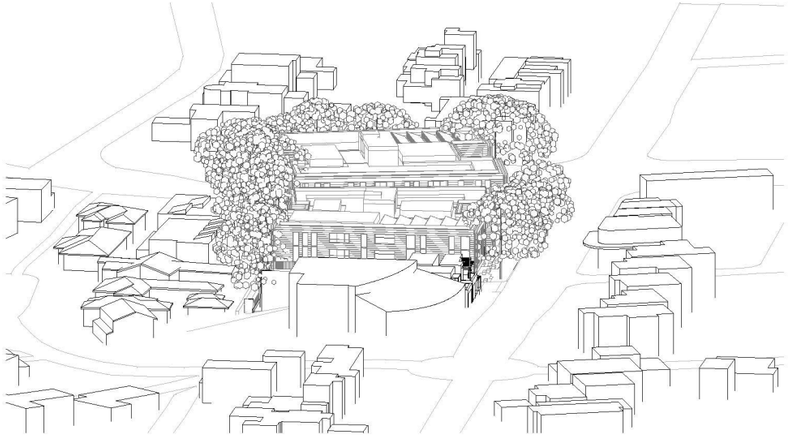
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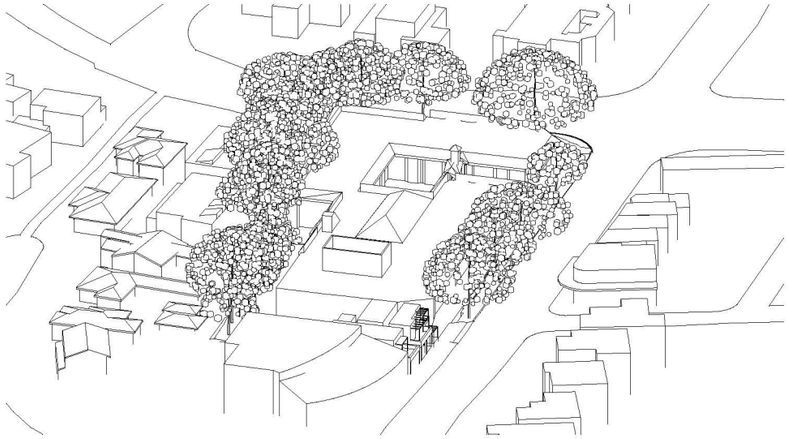
8am - Existing with Trees



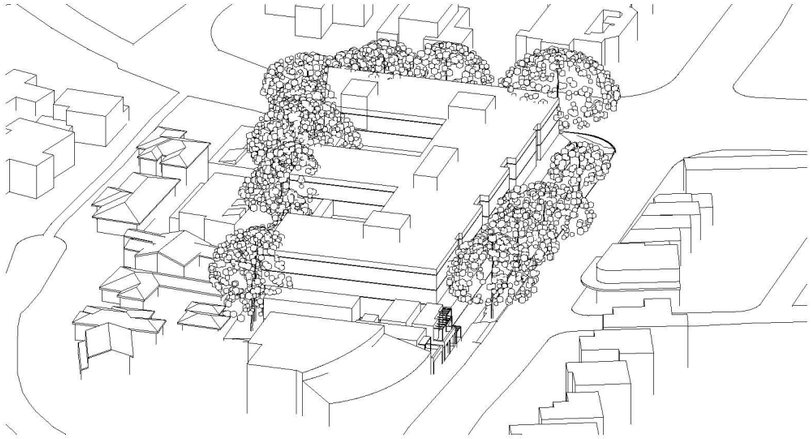
8am - WLCS2036 Potential Scheme with Trees



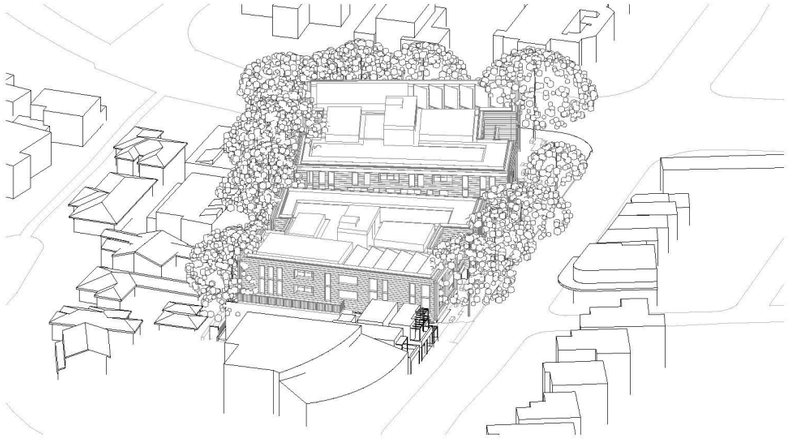
8am - Proposed with Trees



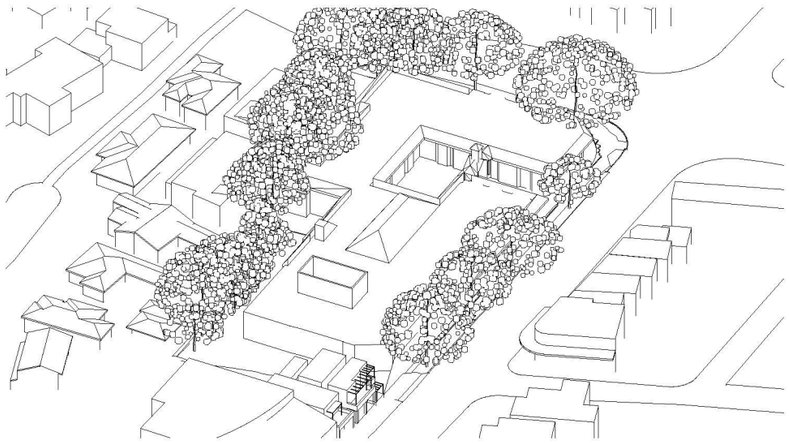
9am - Existing with Trees



9am - WLCS2036 Potential Scheme with Trees

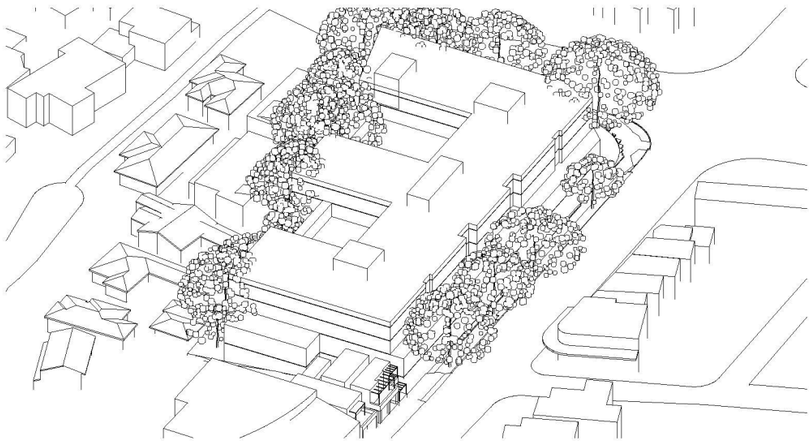


9am - Proposed with Trees



10am - Existing with Trees

Solar Analysis - March 21



10am -WLCS2036 Potential Scheme with Trees

Solar Analysis - March 21



10am - Proposed with Trees

Solar Analysis - March 21

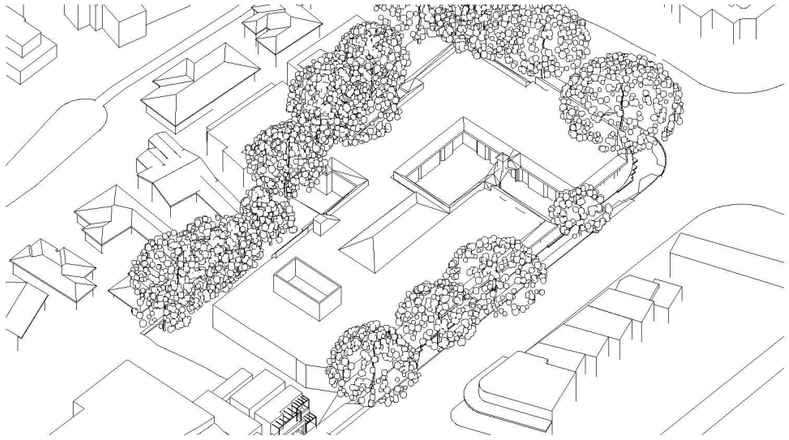
Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eye of the Sun - March 21 With Trees - Sheet 1 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev Date Description By Chk	Scale 1:400 @ A3	Code GQC	Sheet 6216	Rev 01	0 4 10 20m	

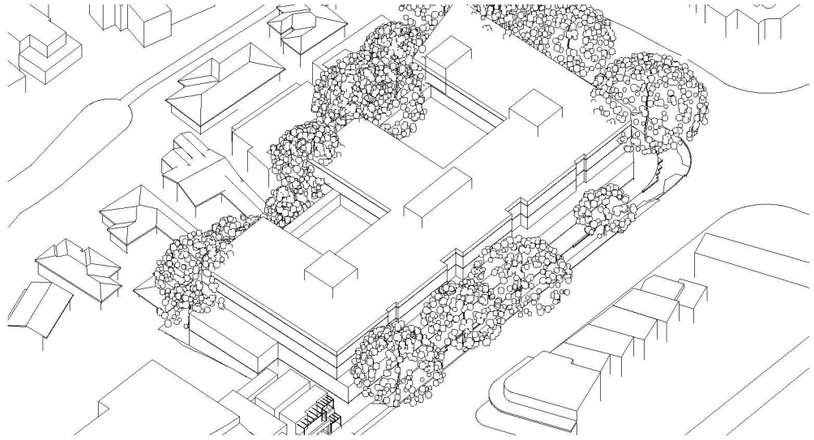
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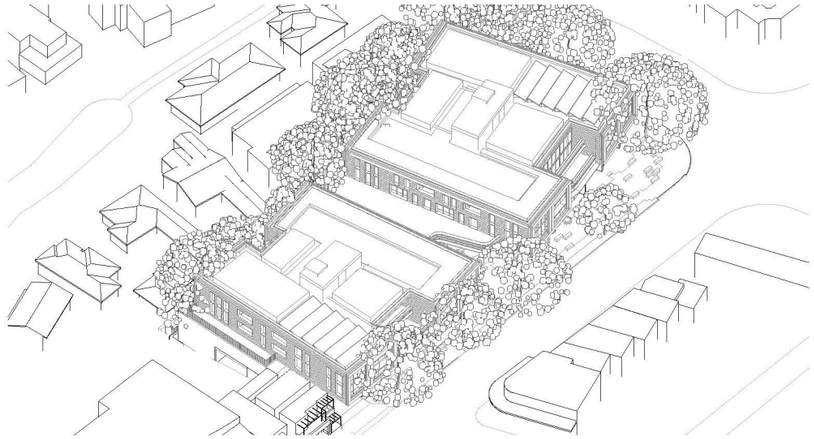
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11am - Existing with Trees



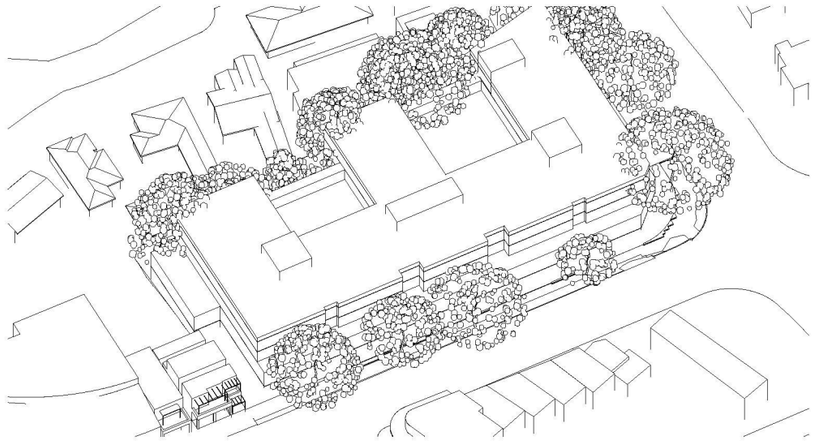
11am - WLCS2036 Potential Scheme with Trees



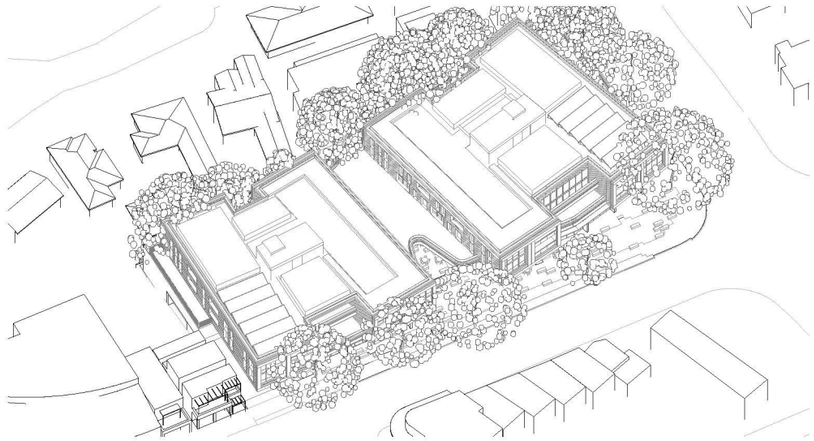
11am - Proposed with Trees



12am - Existing with Trees



12am - WLCS2036 Potential Scheme with Trees



12am - Proposed with Trees



1pm - Existing with Trees

Solar Analysis - March 21



1pm - WLCS2036 Potential Scheme with Trees

Solar Analysis - March 21



1pm - Proposed with Trees

Solar Analysis - March 21

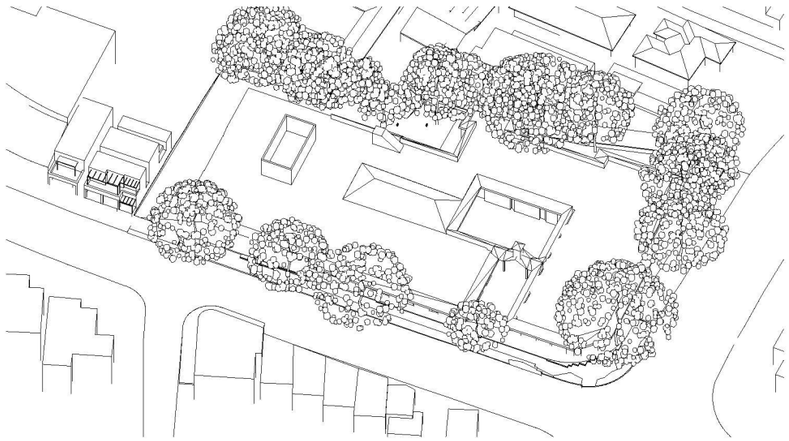
Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eye of the Sun - March 21 With Trees - Sheet 2 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev Date Description By Chk	Scale 1:400 @ A3	Code GQC	Sheet 6217	Rev 01	0 4 10 20m	

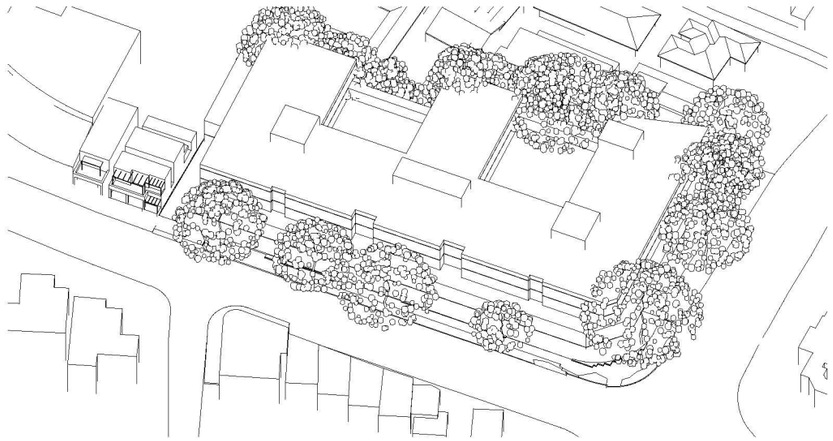
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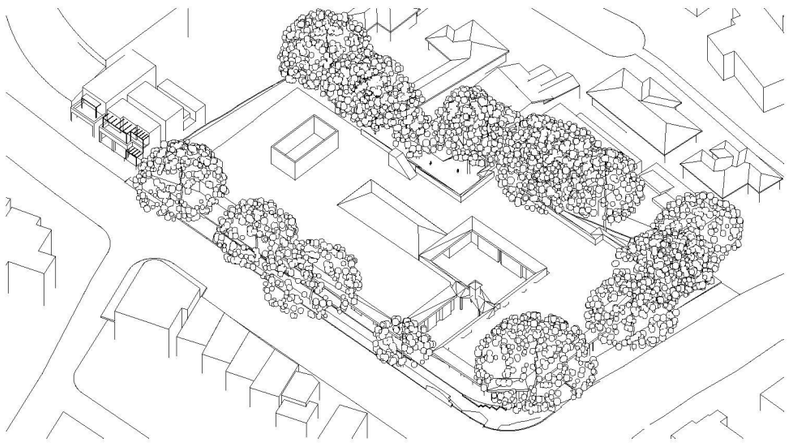
2pm - Existing with Trees



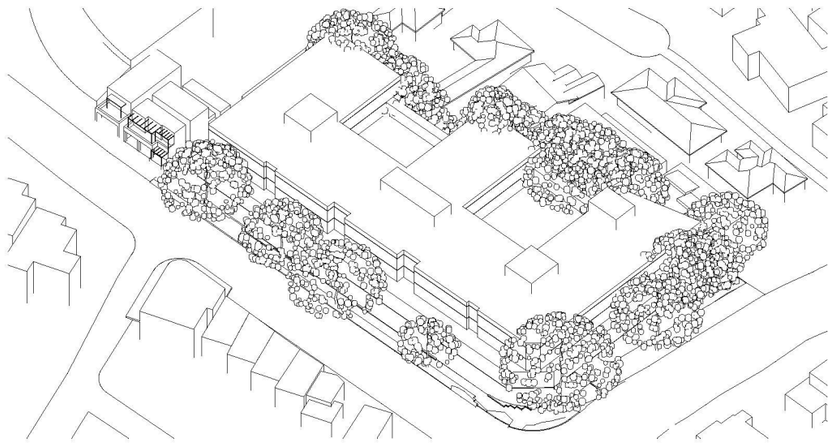
2pm - WLCS2036 Potential Scheme with Trees



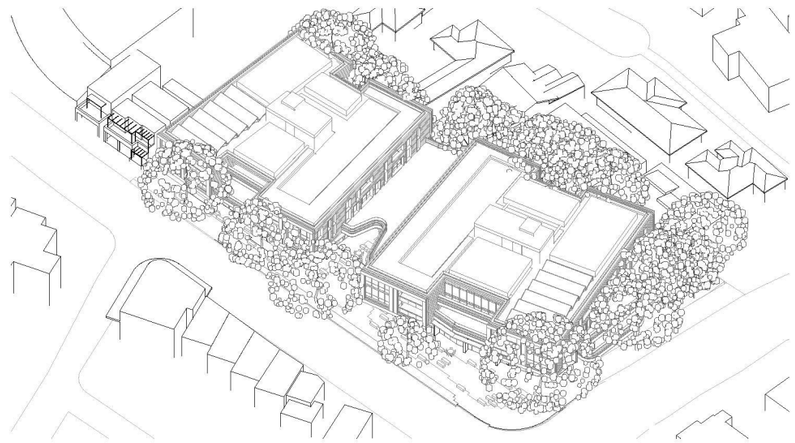
2pm - Proposed with Trees



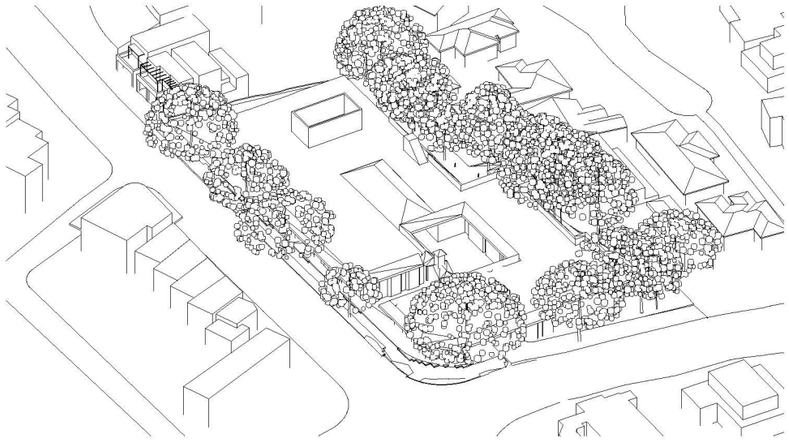
3pm - Existing with Trees



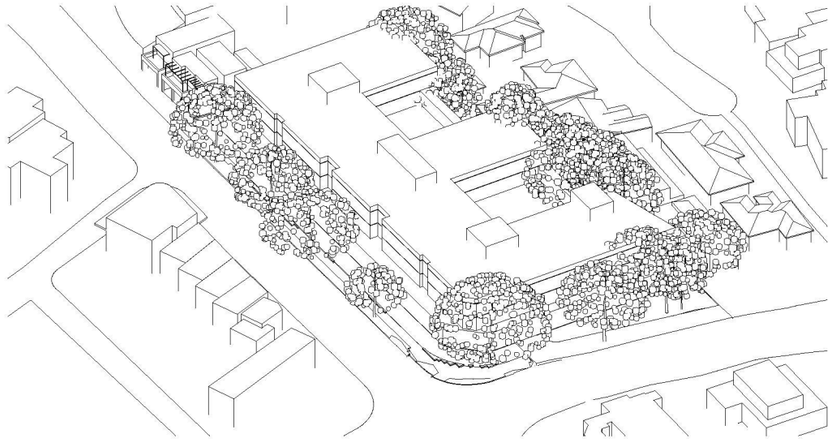
3pm - WLCS2036 Potential Scheme with Trees



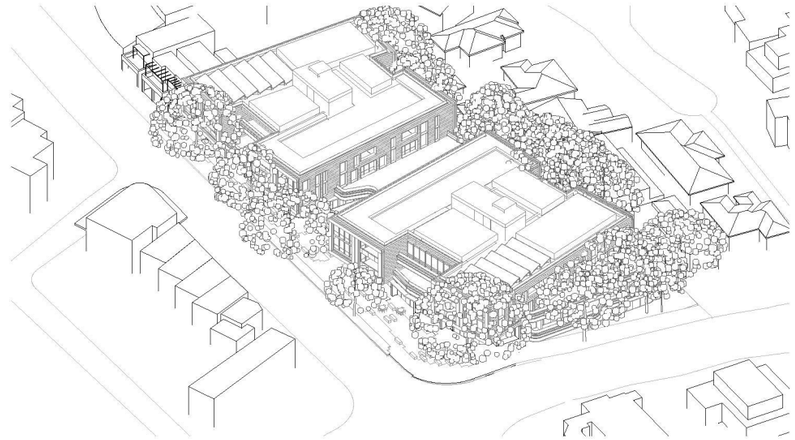
3pm - Proposed with Trees



4pm - Existing with Trees



4pm - WLCS2036 Potential Scheme with Trees



4pm - Proposed with Trees

Solar Analysis - March 21

Solar Analysis - March 21

Solar Analysis - March 21

Planning Proposal Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eye of the Sun - March 21 With Trees - Sheet 3 Solar Analysis NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev Date Description By Chk	Scale 1:400 @ A3	Code GQC	Sheet 6218	Rev 01	0 4 10 20m	

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Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Photomontage
Photomontage

NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

Rev	Date	Description	By	Chk
09	27/08/2021	Submission	DN	RFJ
08	18/08/2021	For Information	DN	RFJ
07	25/09/2020	Reponse to RFI	DN	RFJ
06	23/06/2020	For Approval	DN	RFJ
05	16/06/2020	For Approval	DN	RFJ

Scale	Code	Sheet	Rev
1:400 @ A3	GQC	8000	09

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Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Photomontage
Photomontage
NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases

Rev	Date	Description	By	Chk
09	27/08/2021	Submission	DN	RFJ
08	18/08/2021	For Information	DN	RFJ
07	25/09/2020	Reponse to RFI	DN	RFJ
06	23/06/2020	For Approval	DN	RFJ
05	16/06/2020	For Approval	DN	RFJ

Scale	Code	Sheet	Rev
1:400 @ A3	GQC	8001	09

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ARTISTS IMPRESSION ONLY

Planning Proposal Submission

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05	16/06/2020	For Approval	DN	RFJ

Scale	Code	Sheet	Rev
1:400 @ A3	GQC	8002	09

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Scale	Code	Sheet	Rev
1:400 @ A3	GQC	8003	09

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100 Edinburgh Road, Castlecrag, NSW - Plannning Proposal - Development Summary

27/08/2021

DEVELOPMENT AREAS

AREAS	RESIDENTIAL	RETAIL	
	GFA	**NSA**	**NLA**	
BASEMENT 2				
BASEMENT 1				
LOWER GROUND	1270	730	260	0.25 :1
GROUND	2740	840	1480	1.55 :1
LEVEL 1	2670	2390		
LEVEL 2	2500	2300		
ROOF	120			
TOTAL	**9300**	**6260**	**1740**	1.80 :1

EFFICIENCY	NLA+NSA/GFA	86.0%

3 STOREYS	
FSR 1.8	:1

Targets	m²	
Site area	5168 Refer to Survey	
Target GFA	9303	m2
Target FSR	1.8	:1

APARTMENT MIX

	1BED	2 BED	3 BED	4BED	TOTAL
	2	5	1		**8**
	0	8	1		**9**
	0	8	10		**18**
	0	8	10		**18**
	2	**29**	**22**	**0**	
	4%	55%	42%	0%	
	Total				**53**

Mix of Apartments Meets Willoughby DCP objectives

SEPP65 / ADG COMPLIANCE

	SOLAR >2 HOURS	CROSS VENT	NO SOLAR ACCESS	COMMUNAL SPACE	DEEP SOIL
LG	2	1	6		750
G	3	4	6	180	
L1	18	11	2	970	
L2	18	18	2	1010	
	39	**34**	**14**		
	74%	**64%**	**26%**	**2160**	**750**
Req.	Min 70%	Min 60%	Max 15%	25% Site = 1,292m²	7% Site = 362m²
	Complies	Complies	Refer Note1	Complies	Complies

1) Apartments receiving no solar access are afforded large private opens space areas and ceiling heights that exceed the ADG minimums. These same apartments are provided with sweeping views of both the local context and Sydney CBD beyond . These provisions assist on their single aspect

** Note: In the case of shop development proposals, where the shop selling areas are not precisely defined on the plans submitted to Council for development approval, determination of parking requirements will be based on a figure equivalent to 85 percent of the net lettable area.*

NOTE: WDCP C4.2 - Table: Schedule of Car parking Requirements - Carparking numbers are neither maximum nor minimum rates

Planning Proposal Submission

The Quadrangle - Castlecrag
100 Edinburgh Road Castlecrag NSW 2068

Development Summary
Development

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Rev	Date	Description	By	Chk
11	27/08/2021	Submission	DN	RFJ
10	18/08/2021	For Information	DN	RFJ
09	3/07/2021	Pre-PP Submission	DN	RFJ
08	2/07/2021	For Information	DN	RFJ
07	22/06/2021	For Information	DN	

Scale: 1:400 @ A3
Code: GQC
Sheet: 9000
Rev: 11

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3. No investigation has been made of underground services on or adjacent to this land.
4. Restriction on building may apply to this land.
5. Origin of levels PM 16737 adopted as RL 86.045 A.H.D.

SHEETS LAYOUT

1	2
3	4
5	6

EASEMENTS:
(A) EASEMENT FOR SUPPORT VARIABLE WIDTH TSFR No. J924648)
(B) INCLINED RIGHT OF CARRIAGEWAY 8. 8.5, 11.5 AND VARIABLE WIDTH (VIDE DP 609560)
(C) EASEMENT FOR ELECTRICITY PURPOSES SHOWN IN PLAN S695227.

LEGEND:
SV - STOP VALVE
HY - HYDRANT
SI - TRAFFIC SIGN
RTA - TRAFFIC COMM PIT
WM - WATER METER

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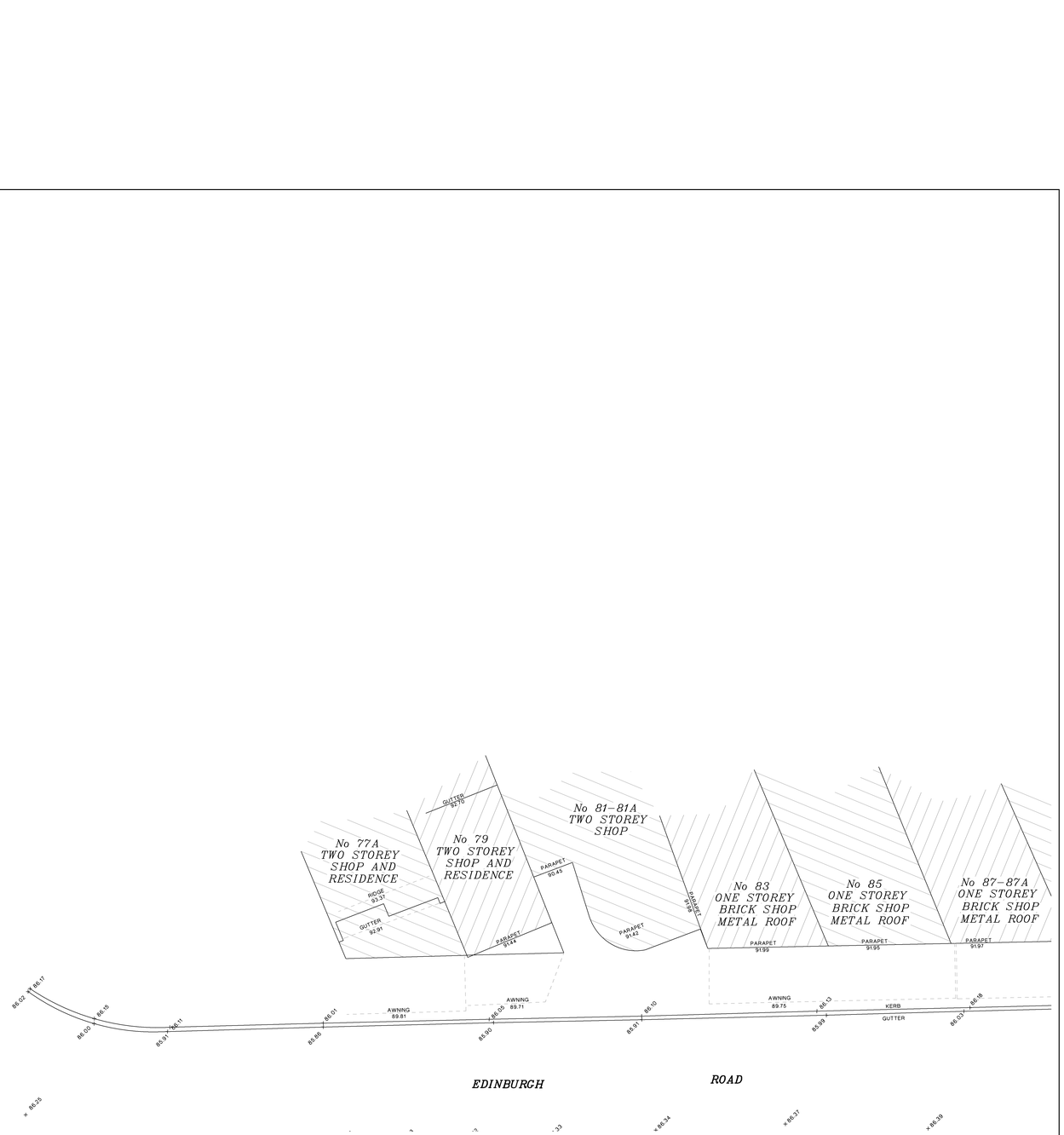
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PLAN SHOWING RELATIVE HEIGHTS AND FEATURES OF PART OF LOT 11 DP 611594 AND LOT 1 DP 436691 BEING LAND AT CASTLECRAG IN THE LGA OF WILLOUGHBY

Drawn RS	Surveyor	RS	Datum	AHD	Date 23.02.2017
Reduction Ratio	Size	A1	Drawing Name		Sheet of
1:250			3321G-02		



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M.G.A.

SHEETS LAYOUT

1	2
3	4
5	6

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(B) INCLINED RIGHT OF CARRIAGEWAY 8, 8.5, 11.5 AND VARIABLE WIDTH (VIDE DP 609580)
(C) EASEMENT FOR ELECTRICITY PURPOSES SHOWN IN PLAN S695227.

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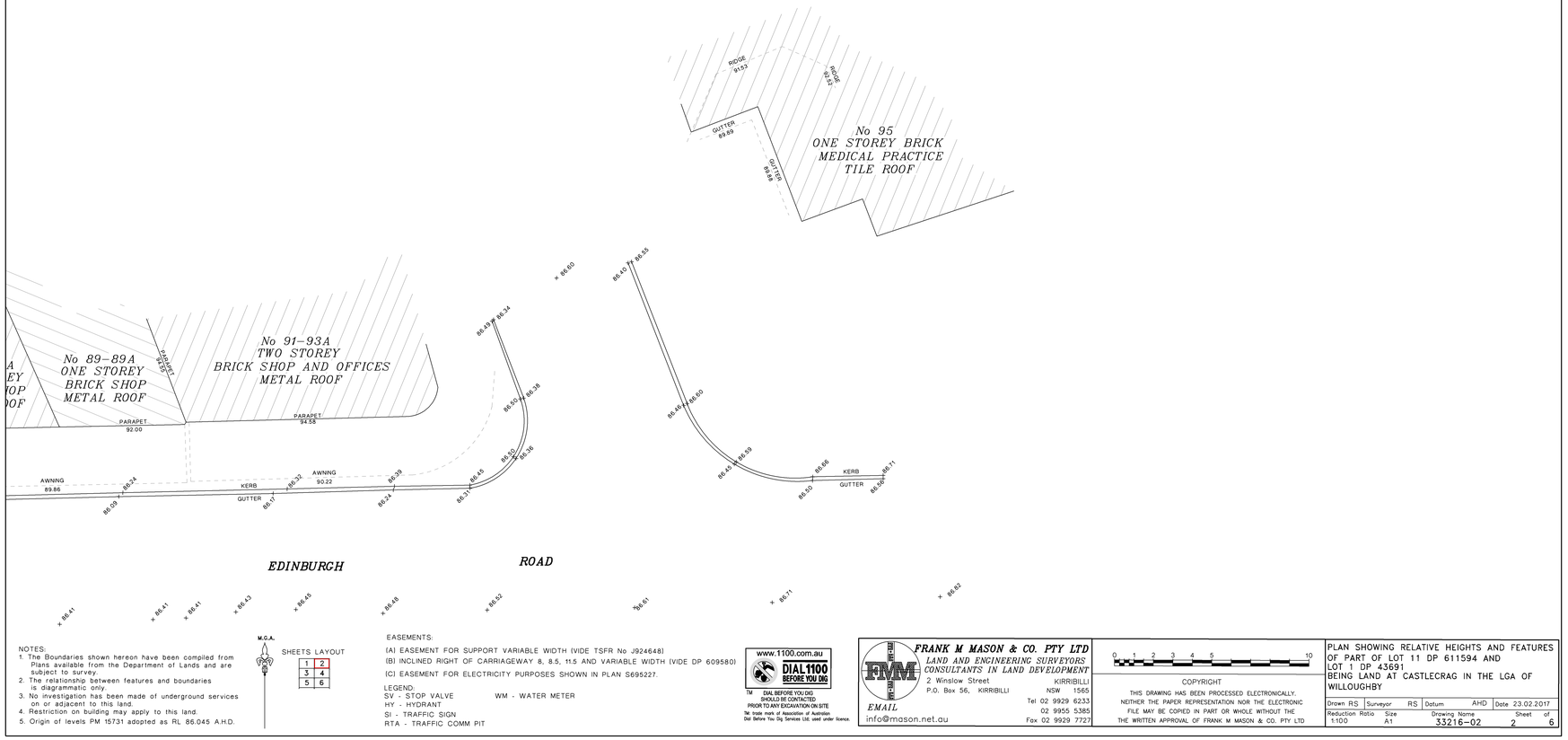
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Drawn RS	Surveyor	RS	Datum	AHD	Date 23.02.2017
Reduction Ratio 1:100	Size A1	Drawing Name 33216–02		Sheet 1	of 6



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M.G.A.

SHEETS LAYOUT

1	2
3	4
5	6

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(B) INCLINED RIGHT OF CARRIAGEWAY 8, 8.5, 11.5 AND VARIABLE WIDTH (VIDE DP 609580)
(C) EASEMENT FOR ELECTRICITY PURPOSES SHOWN IN PLAN S695227.

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PLAN SHOWING RELATIVE HEIGHTS AND FEATURES OF PART OF LOT 11 DP 611594 AND LOT 1 DP 43691
BEING LAND AT CASTLECRAG IN THE LGA OF WILLOUGHBY

Drawn	Surveyor	Datum	Date
RS	RS	AHD	23.02.2017

Reduction Ratio	Size	Drawing Name	Sheet of
1:100	A1	33216-02	2 6

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SHEETS LAYOUT

1	2
3	4
5	6

M.G.A.

EASEMENTS
(A) EASEMENT FOR SUPPORT VARIABLE WIDTH (VIDE TSFR No. J924664B)
(B) INCLINED RIGHT OF CARRIAGEWAY 8, 8.5, 11.5 AND VARIABLE WIDTH (VIDE DP 609360)
(C) EASEMENT FOR ELECTRICITY PURPOSES SHOWN IN PLAN S693227.

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PLAN SHOWING RELATIVE HEIGHTS AND FEATURES OF PART OF LOT 11 DP 611594 AND LOT 1 DP 43591 BEING LAND AT CASTLECRAG IN THE LGA OF WILLOUGHBY

Drawn RS	Surveyor	RS	Datum	AHD	Date	23.02.2017
Reduction Ratio 1100	Size A1	Drawing Norma		3	Sheet of	6

3321G-02

EASTERN VALLEY WAY

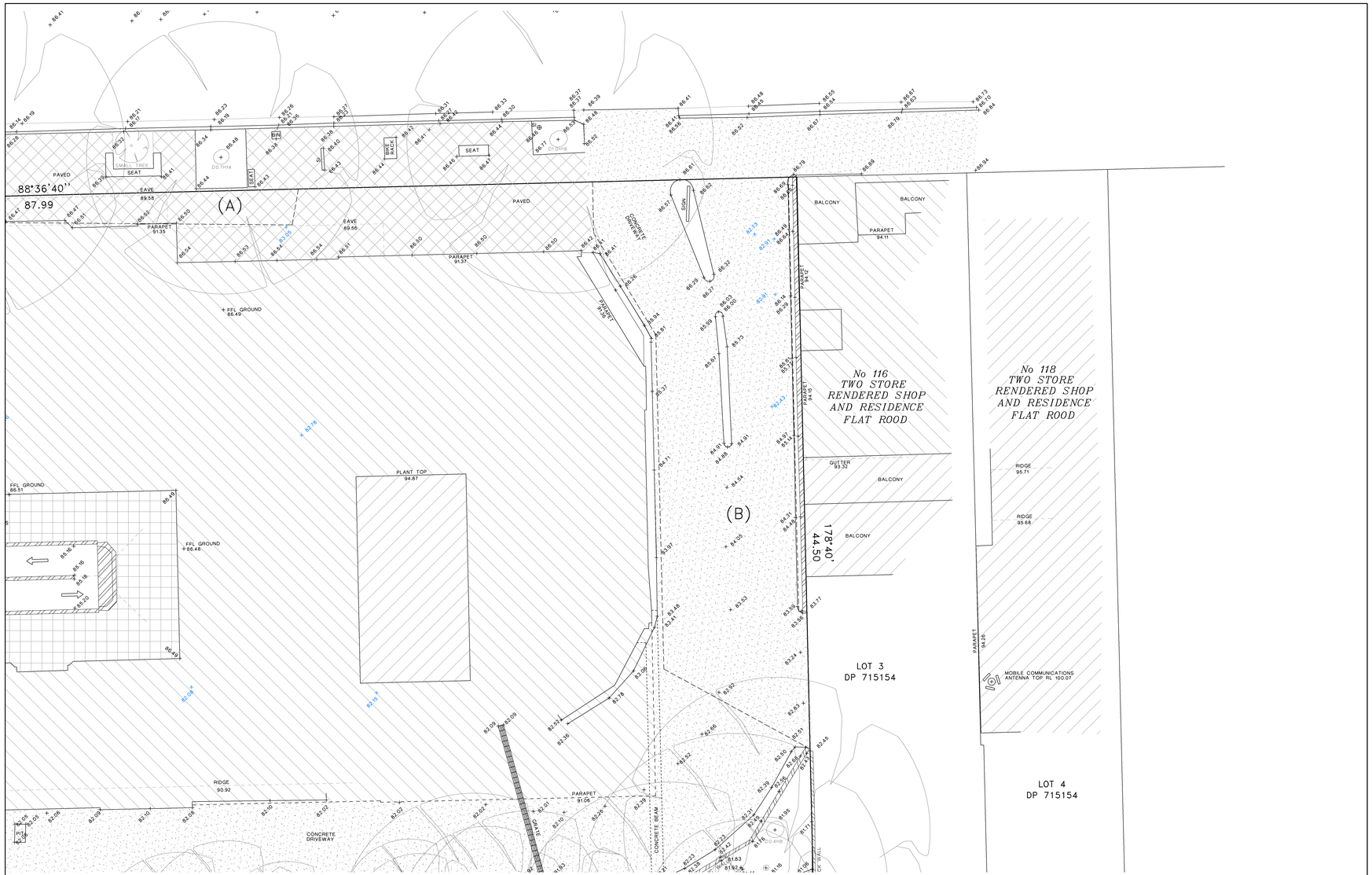
358°34'20" 37.41

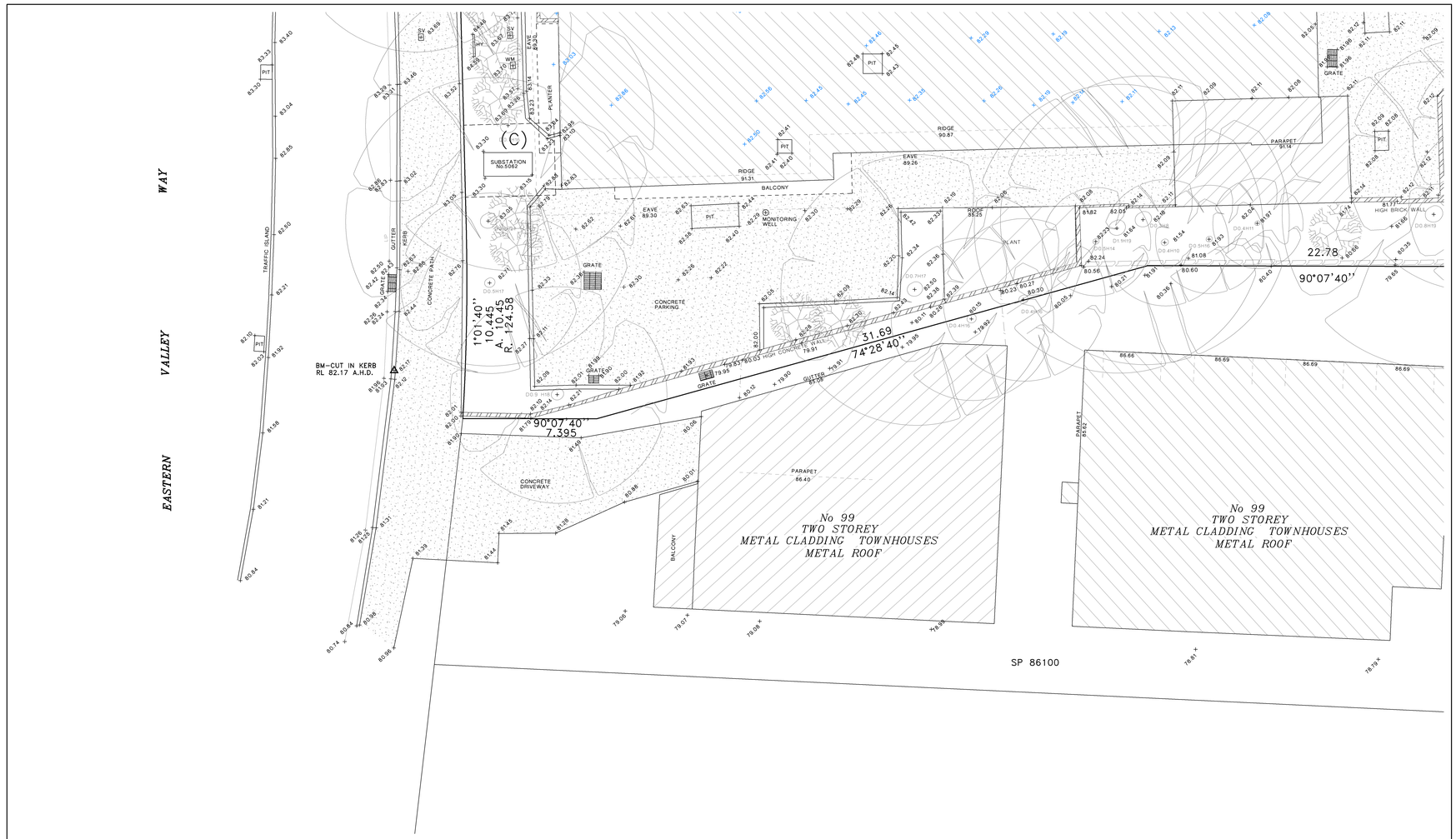
LOT 11 DP 611594

QUADRANGLE SHOPPING CENTRE NO 100

RL 86.045 A.H.D. BM PM 15737

43°55'58" 17.249 19.16 A.R. 12.2


88°36'40"
87.99
(A)
(B)
178°40'
44.50
PAVED
EAVE
89.58
PARAPET
91.35
PARAPET
91.37
EAVE
89.56
SEAT
SEAT
SEAT
SEAT
BBQ
SIGN
BRICK WALL
DRAIN
DRAIN
DRAIN



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M.G.A.

SHEETS LAYOUT

1	2
3	4
5	6

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(C) EASEMENT FOR ELECTRICITY PURPOSES SHOWN IN PLAN S695227.

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PLAN SHOWING RELATIVE HEIGHTS AND FEATURES OF PART OF LOT 11 DP 611594 AND LOT 1 DP 43691
BEING LAND AT CASTLECRAG IN THE LGA OF WILLOUGHBY

Drawn RS	Surveyor	RS	Datum	AHD	Date 23.02.2017
Reduction Ratio 1:100	Size A1		Drawing Name 33216-02		Sheet 5 of 6

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M.A.

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EASEMENTS:
(B) NOLNED RIGHT OF CARRIAGEWAY 8.85 11.5 AND VARIABLE WIDTH (VIDE DP 609580)
(A) EASEMENT FOR SUPPORT VARIABLE WIDTH (VIDE TSP# No. J924648)
(C) EASEMENT FOR ELECTRICITY PURPOSES SHOWN IN PLAN 5693227.

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Drawn RS	Surveyor	RS	Datum	AHD	Date 23.2.2017
Reduction Ratio 1:100	Size A1	Drawing Name 3321G-02		Sheet 6	of 6

SWIMMING POOL APPROX POSITION
GARAGE
GARAGE
LOT 7 DP 17416
LOT B DP 380076
LOT A DP 380076
LOT 10 DP 17416
No 11 ONE STORE BRICK RESIDENCE TILE ROOF
No 9 ONE STORE BRICK RESIDENCE TILE ROOF
No 7 ONE STORE BRICK RESIDENCE TILE ROOF
No 5 TWO STORE BRICK RESIDENCE TILE ROOF
THE POSTERN
LOT 1 DP 43690
LOT 1 DP 43689
LOT 1 DP 43688
LOT 1 DP 43691
268°38'
268°38'
38.325
37.97
1.83
178°40'
8.785
189°42'40"
HIGH BRICK WALL
LOW BLOCK WALL
GATE
GATE

Colston Budd Rogers & Kafes Pty Ltd
as Trustee for C & B Unit Trust
ABN 27 623 918 759

Our Ref: TR/11554/jj

1 September, 2021

Transport Planning
Traffic Studies
Parking Studies

Greencliff Castlecrag Pty Ltd

Attention: Michael Goldrick
Email: mg@greencliff.com.au

Dear Sir,

RE: QUADRANGLE SHOPPING CENTRE,
AMENDED PLANNING PROPOSAL - TRAFFIC REVIEW

1. As requested, we have undertaken a review of the traffic and parking aspects of the proposed amended planning proposal for the redevelopment of Quadrangle shopping centre, Castlecrag. The amended planning proposal has been prepared in response to matters raised by Council with regards to a previous planning proposal and involves replacement of the existing shopping centre with a mixed use development (retail/residential). The findings of our review are set out through the following sections:

- site location;
- proposed development;
- parking;
- access and parking layout;
- servicing;
- traffic effects;
- response to traffic matters raised by Council in pre-planning advice; and
- summary

Site Location

2. The site is located on the south eastern corner of Edinburgh Road and Eastern Valley Way, Castlecrag. The site currently is occupied by a shopping centre (some 2,552m^2 NLA comprising a small supermarket (920m^2) and specialty shops). There is a basement car park (117 spaces) with access from Edinburgh Road (at the eastern end of the site).

Proposed Development

3. The concept plans prepared by FJMT are for a mixed use development comprising:

Suite 1801/Tower A, Zenith Centre, 821 Pacific Highway, Chatswood NSW 2067
P.O. Box 5186 West Chatswood NSW 1515 Tel: (02) 9411 2411 Fax: (02) 9411 2422
Directors - Geoff Budd - Stan Kafes - Tim Rogers - Joshua Hollis ACN 002 334 296
EMAIL: cbrk@cbrk.com.au

- retail – (some 1,740m^2 NLA, comprising a 1,057m^2 supermarket, 549m^2 specialty shops and 134m^2 restaurants);
- 53 residential units (2x1 bed, 29x2 bed, 22x3 bed);
- 2 levels of basement parking (with 157 parking spaces); and
- access from Edinburgh Road (via the existing driveway).

Parking

4. Section C.4 of WDCP sets out parking requirements for new development. The rates relevant to the proposed development are set out below:

- supermarkets – 6 spaces per 100m^2 of selling area;
- shops – 1 space per 25m^2 of selling area;
- restaurants (located on a major transport corridor) – 1 space per 75m^2; and
- residential (located on major transport corridor) – 1 space per 1 and 2 bed unit, 1.25 spaces per 3 bed unit plus 1 visitor space per 4 units.

5. In calculating selling area, WDCP suggests applying 85% of net lettable area.

6. Applying the above rates to the proposed development results in a requirement for 147 spaces comprising:

- 75 retail/restaurant spaces;
- 59 residential spaces; and
- 13 visitor spaces.

7. The concept plans prepared by FJMT show 157 spaces which satisfies the WDCP requirements.

8. WDCP requires 1 motorcycle space per 25 spaces, 1 bicycle locker per 10 units and 450m^2 of retail and 1 bicycle rack per 12 units and 150m^2 of retail Applying these rates, the proposed development will provide 7 motor cycle spaces, 10 bicycle lockers (6 residential and 4 retail) and racks/rails for 16 bicycles (4 residential and 12 retail).

Access and Parking Layout

9. Access to the site will be maintained from Edinburgh Road at the location of the existing driveway (eastern boundary). The existing driveway also provides access to the property to the east of the site. This access will be maintained in the proposed development.

10. Parking will be provided in two levels of basement parking, with retail/visitor parking on the upper and lower levels and resident parking on the lower level. Access between parking levels will be provided via ramps on the northern part of the site. All parking areas will be designed to comply with requirements of AS2890.1-2004 and AS2890.6-2009 with respect parking bay dimensions, aisle

widths, ramp grades and height clearances. This will be an improvement over the existing car park which is non-compliant with AS2890.1-2004.

11. Access to the site will be managed through a ticketless parking system with boom gates located on site, between the loading dock and ramp to Edinburgh Road. Based on the expected traffic flows, 98th percentile queue at the boom gates would be two vehicles. Queuing for two vehicles is provided.

12. Access to the site from Eastern Valley Way was investigated and was not supported by TfNSW. Eastern Valley Way is classified road and as such TfNSW concurrence for access is required under the provision of SEPP Infrastructure. TfNSW advised that as the site has practical access from Edinburgh Road it would not provide its concurrence for access from Eastern Valley Way.

Servicing

13. Servicing of the site will occur from on the upper car park level at two locations:

- a separate loading dock for the supermarket and waste collection (for all components) on the eastern part of site. This dock will be designed to accommodate a 8.8 metre long medium rigid truck with a turntable to allow entry and exit to the dock in a forward direction and all manoeuvring to occur separate to the car park access' and
- adjacent to the western lift core loading bays for a 6.4 metre long small rigid truck and a van. This would provide for deliveries to the residential and specialty shops/restaurants and removals for the residential component.

14. As the docks will be shared between the various components of the development, as part of a development application, a loading dock management plan would be prepared setting out, hours of operation of docks, size of trucks and management of the use of docks for each component.

15. Vehicle turning paths are provided in Attachment A. The loading docks and access to/from the dock will be designed to comply with the requirements of AS2890.2-2018.

Traffic Effects

16. The site is located on the south eastern corner of the intersection of Eastern Valley Way and Edinburgh Road. This intersection is traffic signal controlled with all movements permitted. Eastern Valley Way is located to the west of the site and forms part of an arterial road link between Miller Street (North Sydney) and Boundary Street (Roseville). It provides a four lane undivided carriageway, with separate right turn bays at the intersection with Edinburgh Road. Clearway restrictions apply in the direction of peak traffic flow in the weekday morning and afternoon peak periods. Bus stops are located on Eastern Valley Way immediately north of Edinburgh Road (with indented bus bays).

17. Edinburgh Road is located north of the site and provides access to residential development located within Castlecrag (east of Eastern Valley Way). It provides a traffic lane and parking lane in each direction (clear of intersections). Bus stops are located on Edinburgh Road along the frontage of the site. West of Eastern Valley Way, Edinburgh Road forms part of an alternative connection to the Warringah Freeway (via Alpha Road).

18. Traffic counts were undertaken at the intersection of Eastern Valley Way and Edinburgh Road during the weekday morning and afternoon peak periods in the last week of July 2019.

19. The results of the surveys are summarised in Table 1.

Table 1 : Existing Two Way Peak Hour Traffic Flows (Vehicles Per Hour)

Location	**Morning**	**Afternoon**
Eastern Valley Way – north of Edinburgh Road – south of Edinburgh Road	 3130 1715	 3150 1695
Edinburgh Road – east of Eastern Valley Way – west of Eastern Valley Way	 700 2055	 635 2010

20. Examination of Table 1 reveals that:

- Eastern Valley Way carried traffic flows of some 1,700 to 3,150 vehicles per hour (two way) in the peak periods. Traffic flows were highest north of Edinburgh Road; and
- Edinburgh Road carried traffic flows of some 635 to 2,055 vehicles per hour (two way) in the peak periods. Traffic flows were highest west of Eastern Valley Way.

21. The capacity of the road network is generally determined by the capacity of its intersections to cater for peak period traffic flows. The intersection of Eastern Valley and Edinburgh Road has been analysed using the SIDRA program using the 2019 traffic flows. SIDRA is designed to analyse signal controlled intersections, roundabouts and priority intersections

22. Based on average delay per vehicle, SIDRA estimates the following levels of service (LOS):-

    - For traffic signals, the average delay per vehicle in seconds is calculated as delay/(all vehicles), for roundabouts the average delay per vehicle in

seconds is selected for the movement with the highest average delay per vehicle, equivalent to the following LOS:-

0 to 14	=	"A"	Good
15 to 28	=	"B"	Good with minimal delays and spare capacity
29 to 42	=	"C"	Satisfactory with spare capacity
43 to 56	=	"D"	Satisfactory but operating near capacity
57 to 70	=	"E"	At capacity and incidents will cause excessive delays. Roundabouts require other control mode.
>70	=	"F"	Unsatisfactory and requires additional capacity

23. The SIDRA analysis found that the intersection of Eastern Valley Way and Edinburgh Road operates with average delays per vehicle of some 65 seconds during the morning peak period. This represents level of service (LOS) E, at capacity. In the afternoon peak period the intersection operates with average delays of some 66 seconds per vehicle. This represents level of service (LOS) E, at capacity.

24. Observations of the operation of the intersection found that long delays and queues can occur on Edinburgh Road (westbound approach) in peak periods when traffic turning right into Eastern Valley Way is delayed and blocks through traffic. This can be exacerbated when the pedestrian movement across Eastern Valley Way (south) holds left turning traffic, effectively blocking through traffic (as only one traffic lane is provided on this approach for these two movements).

25. Based on TfNSW Guidelines the proposed development (additional 53 dwellings and setting aside the decrease of some 772m^2 in retail area) would generate some additional 20 vehicles per hour (two-way) in the weekday morning and afternoon peak periods. This additional traffic has been assigned to the road network and the impact on the operation of the intersection of Eastern Valley Way/Edinburgh Road has been analysed using SIDRA. The analysis found that with development traffic in place, there would be a minor increase in average delay per vehicle through the intersection of some one to three seconds in the AM/PM peak hours. There was no change in the LOS and minor increases in queue lengths. Thus in summary the proposed development would have minimal impact on the operation of the intersection of Eastern Valley Way and Edinburgh Road.

26. With respect to cumulative traffic impacts, we have reviewed the Traffic and Transport Plan (TTP) report for Willoughby Local Centres (Cardno – 17 January 2020) and note the following scale of additional development was assessed for the Castlecrag local centre:

- 6,665m^2 of additional residential floor space (101 units); and
- 1,527m^2 GFA of additional non-residential floor space;

27. The TTP report estimated the following additional traffic generation for the increase floor space:

- residential - 19 vehicles per hour (two way) in the weekday AM peak hour and 15 vehicles per hour (two way) in the PM peak hour.
- non-residential - 15 vehicles per hour (two way) in the weekday AM peak hour and 34 vehicles per hour (two way) in the PM peak hour

28. We are informed by City Planning Works that the Quadrangle site represents some 50% of the development potential within the Castlecrag local centre. Thus its development potential would be some 3,330m^2 of residential floor space (50 units) and some 760m^2 of additional non-residential floor space. Based on the traffic generation rates used in the TTP report, the additional traffic generated by the Quadrangle site (based on this scale of development) would be some 17 vehicles per hour (two way) in the AM peak hour and some 25 vehicles per hour (two way) in the PM peak hour.

29. The planning proposal for the Quadrangle site envisages some 53 residential units and a decrease of some 772m^2 in retail area. Applying the same generation rates as used in the TTP, the 53 residential units would generate an additional 10 vehicles per hour (two way) in the AM peak hour and an additional 8 vehicles per hour in the PM peak hour. Setting aside the decrease in retail area, the additional AM/PM peak hour traffic generated by the planning proposal (10 and 8 vehicles per hour, two way) is less than that assumed for the Quadrangle site in the TTP report for Castlecrag (17 and 25 vehicles per hour, two way). Thus the cumulative traffic effects of the planning proposal with other future development in Castlecrag have been considered in the TTP report.

Response to Traffic Matters

30. Council raised a number of traffic matters in its pre-planning proposal advice dated 4 August 2021. It is noted that Council acknowledges that the planning proposal is unlikely to have a significant adverse impact on the surrounding road network compared to the existing Quadrangle development. The matters raised and our response is set out below.

Parking Assessment under Draft WDCP

31. As requested, an assessment of parking requirements under Part F of Draft WDCP is set out below. For the planning proposal the following rates are relevant:

- retail – 1 space per 33m^2;
- restaurants – 1 space per 33m^2; and
- residential (located on major transport corridor) – 1 space per 2 bed unit, 1 space per 3 bed unit plus 1 visitor space per 7 units.

32. Applying these rates the planning proposal (1,740m^2 retail/restaurants and 53 x 2 and 3 bed units) would require 114 parking spaces (53 retail/restaurant spaces, 53 residential spaces and 8 residential visitor spaces).

Assessment of the Traffic Effects of the Planning Proposal

33. This report assesses the traffic effects of the planning proposal.

Queueing on Edinburgh Road at the Site Access

34. With regards to queuing on Edinburgh Road at the site access, the minor increase in traffic entering the site in the AM/PM peak hours (3 and 6 vehicles per hour in the AM/PM peak hours respectively) would have negligible impact and not extend back to Eastern Valley Way.

Relocation of Council Car Park (8 spaces)

35. Council has suggested relocation of the 8 spaces located in the Council car park on the corner of Edinburgh Road and The Postern to the subject site. The proposed parking provision provides a surplus of 10 spaces (based on WDCP) and 38 spaces (Based on Draft WDCP) and thus could accommodate the relocation of the Council car park (8 spaces).

Site Access

36. As noted in Paragraph 9, the existing site access on Edinburgh Road will be retained to provide access to the site. As per the existing situation this will provide access to the car park and loading docks. The swept paths provided in Attachment A, show that a car and 8.8 metre long medium rigid truck (MRV) can pass each other at the site access.

Servicing and Truck Size

37. As noted in Paragraphs 13 to 15, servicing of the site will occur from the upper car park level at two locations:

- a separate loading dock for the supermarket and waste collection (for all components) on the eastern part of site. This dock will be designed to accommodate a 8.8 metre long medium rigid truck with a turntable to allow entry and exit to the dock in a forward direction and all manoeuvring to occur separate to the car park access, and
- adjacent to the western lift core loading bays for a 6.4 metre long small rigid truck and a van. This would provide for deliveries to the residential and specialty shops/restaurants and removals for the residential component.

38. The largest vehicle that will access the site is a 8.8 metre long MRV. Supermarkets can be serviced by trucks as small as 6.4 metre long single unit trucks to 20 metre long articulated trucks. The size of truck used depends on the size of the

supermarket and the site constraints. The proposed supermarket in the planning proposal is a small supermarket located in a constrained site. As such deliveries by a 8.8 metre long MRV are considered appropriate.

39. As the docks will be shared between the various components of the development, as part of a development application, a loading dock management plan would be prepared (as part of a DA) setting out, hours of operation of docks, size of trucks and management of the use of docks for each component.

Car Park and Loading Dock Design to Comply with Australian Standards

40. As noted in Paragraphs 10 and 11, access between parking levels will be provided via ramps on the northern part of the site. All parking areas will be designed to comply with requirements of AS2890.1-2004 and AS2890.6-2009 with respect parking bay dimensions, aisle widths, ramp grades and height clearances (including truck access to the loading docks). This will be an improvement over the existing car park which is non-compliant with AS2890.1-2004.

41. As noted in Paragraph 15, the loading docks and access to/from the dock will be designed to comply with the requirements of AS2890.2-2018.

Vehicles to Enter/Depart Site in a Forward Direction

42. The swept paths provided in Attachment A, show that all vehicles enter and depart the site in forward direction. With regards to the use of a turntable for access to/from the main loading dock, it is considered appropriate and it is used to provide access by large rigid trucks to supermarkets at Beecroft and Manly.

Matters Raised by TfNSW

43. In response to the previous planning proposal, TfNSW requested that a cumulative traffic assessment be undertaken that takes into account the local centres strategy. Consideration of the cumulative traffic effects of the amended planning proposal (that takes into account the local centres strategy) is set out in Paragraphs 26 to 29.

Summary

44. Our review of the traffic and parking effects of the amended planning proposal for the redevelopment of the Quadrangle shopping centre at Castlecrag for a mixed use development has found that:

- parking provision is considered appropriate and will be provided in accordance with the requirements of WDCP;
- access and parking will be designed to comply with AS2890.1-2004 and AS2890.6-2009;
- loading docks will be designed to comply with AS2890.2-2018;

- the proposed development would have minimal impact on the operation of the intersection of Eastern Valley Way and Edinburgh Road;
- the cumulative traffic effects of the amended planning proposal (that takes into account the local centres strategy) have been considered; and
- the traffic matters raised by Council in its pre-planning proposal advice have been addressed.

45. We trust the above provides the information you require. Finally, if you should have any queries, please do not hesitate to contact us.

Yours faithfully,
COLSTON BUDD ROGERS & KAFES PTY LTD



T. Rogers
Director

ATTACHMENT A

VEHICLE TURN PATHS



NOTE:
SKETCH PLAN ONLY. PROPERTY BOUNDARIES, UTILITIES, KERBLINES & DIMENSIONS ARE SUBJECT TO SURVEY AND FINAL DESIGN. TRAFFIC MEASURES PROPOSED IN THIS PLAN ARE CONCEPT ONLY AND ARE SUBJECT TO FINAL DESIGN BY CIVIL ENGINEERS.

Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

B99 VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 11554 30 AUGUST 2021



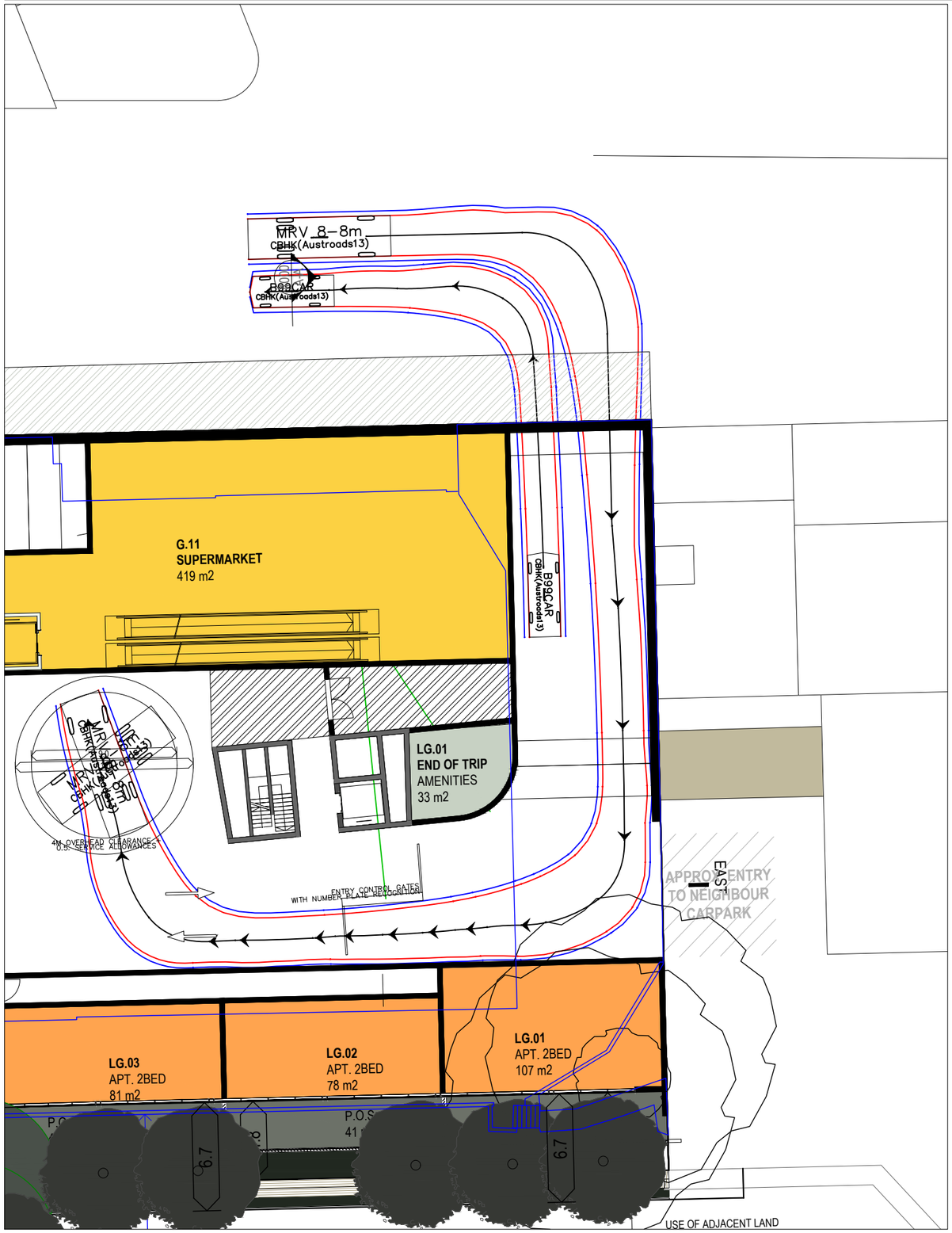
NOTE:
SKETCH PLAN ONLY. PROPERTY BOUNDARIES, UTILITIES, KERBLINES & DIMENSIONS ARE SUBJECT TO SURVEY AND FINAL DESIGN. TRAFFIC MEASURES PROPOSED IN THIS PLAN ARE CONCEPT ONLY AND ARE SUBJECT TO FINAL DESIGN BY CIVIL ENGINEERS.

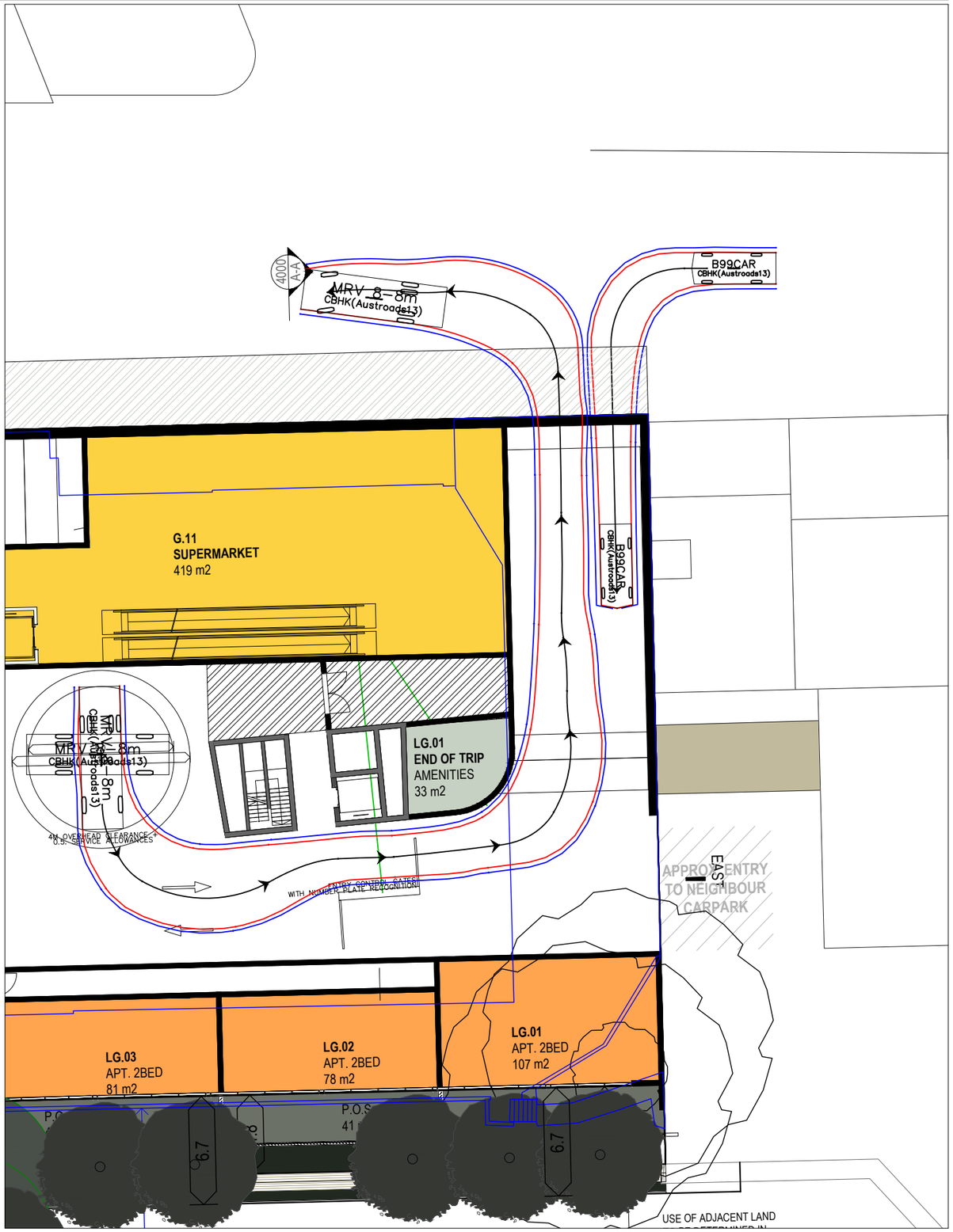
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

6.4m SMALL RIGID VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 11554 30 AUGUST 2021

2





NOTE:
SKETCH PLAN ONLY. PROPERTY BOUNDARIES, UTILITIES, KERBLINES & DIMENSIONS ARE SUBJECT TO SURVEY AND FINAL DESIGN. TRAFFIC MEASURES PROPOSED IN THIS PLAN ARE CONCEPT ONLY AND ARE SUBJECT TO FINAL DESIGN BY CIVIL ENGINEERS.

Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

B99 & 8.8m MEDIUM RIGID VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 11554 30 AUGUST 2021

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ARBORICULTURAL IMPACT ASSESSMENT

Quadrangle Shopping Village
100 Edinburgh Road
CASTLECRAG NSW 2068

[REPORT UPDATE - SEPTEMBER 2021]

requested by

Greencliff Castlecrag Pty Ltd

prepared by

Russell Kingdom
Qualified AQF5 Arboriculturist

03/09/2021

Principal: Russell Kingdom
Fully insured: Public Liability $20M, Professional Indemnity $5M.
Advanced Treescape Consulting is committed to providing a safe working environment for its employees in accordance with the Work Health and Safety Act 2011.

INSTITUTE OF AUSTRALIAN CONSULTING ARBORICULTURISTS
IACA
ACCREDITED MEMBER™

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1.0 Proposal

Greencliff Castlecrag Pty Ltd has commissioned Advanced Treescape Consulting to prepare an Arboricultural Impact Assessment at Quadrangle Shopping Village, Edinburgh Road, Castlecrag.

It is proposed to build a new shopping village and residential dwellings.

The subject site was inspected on 17/07/2018, 30/07/2018 and 03/06/2020. The plans supplied are from:

- FJMT Studio
    - Drawing No. 3000, 3001 & 3005, Revision 12, dated 03/07/2021
    - Drawing No. 4000, 4001 & 4002, Revision 10, dated 03/07/2021
    - Drawing No. 5000 & 5001, Revision 08, dated 03/07/2021
- Frank M Mason & Co Pty Ltd, drawing No. 33216-03, dated 27/02/2017.

The site plan in Appendix 1 illustrates the location of all surveyed trees.

This assessment has been carried out by Russell Kingdom: Diploma in Arboriculture (AQF5), Graduate Diploma of Horticulture (AQF8) - Australian Qualification Framework (AQF) (Department of Education and Training, Australian Government) (see Appendix 11).

2.0 Scope of Report

- Assess the existing trees on site.
- Assess the impact of the proposed development on the existing trees.
- Identify existing trees to be retained and those that require removal to facilitate the proposed development plans as well as those already dead or almost dead - being four of.
- Make recommendations to ensure the impact on the retained existing trees is acceptable and complies with AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009).

3.0 Site Inspection

The property faces north and is a retail shopping centre. The land slopes gently from north to south.

All of the trees on the site were planted when the site was originally developed. Many of the trees are mature and prominent in the streetscape of Edinburgh Road and Eastern Valley Way.

The trees on the southern rear boundary are planted at the bottom of a retaining wall that is 2 to 3m in height. These trees will have restricted root plates due to the large foundations for the retaining walls. The canopies of the smaller trees are impacted by the existing structure, but the large trees have large crowns to the north of the existing building. These trees will require crown reduction to accommodate the new plans.

The soil texture was observed to be clay-based Blacktown soils (Chapman, et al., 2002).

Blacktown soil limitations are moderately reactive highly plastic subsoil and low soil fertility.

Drainage characteristics are considered to be good.

3.1 Site Assessment

- The microclimate is considered good as all existing trees appear to have reached their genetic potential.
- There are no re-reflected heat load issues.
- There are no sunlight level issues.
- There is no irrigation visible on the site.
- The site is exposed to all winds.

4.0 Method of Assessment

An objective visual inspection was made from the ground of the health and condition of the trees based on the Levels of Visual Assessment method (Appendix 4a) – 'Level 2: Basic Assessment Process' (Dunster, et al., 2013) as well as the *Visual Tree Assessment* (VTA) technique described by Mattheck and Breloer (Mattheck, et al., 1994) (Appendix 4b). The Tree Schedule (provided in '5.0 Assessment of VTA, Recommendations of Impact & Tree Protection Measures required by Proposed Plans') was based upon:

- Estimation of tree heights by Silva Clino Master/Heightmeter™ plus visual estimates of canopy spreads.
- Distances of trees, etc. are measured using a Leica Disto™ D2 Laser Distance Meter.
- All photographs that appear in this report are unaltered originals which were taken during site inspection (see Appendix 2).
- Hazard ratings for all trees (see Tree Schedule in clause 5.0 'Assessment of VTA, Impact & Tree Protection Measures') refer to Failure Potential, Size of Defective Part & Target Rating = Hazard Rating is out of 12.
- Significance Rating.
- Calculation of Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) using AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) (see Appendix 5 and 6).
- Any additions, mark-ups and/or calculations to plans included in this report have been made using Bluebeam® Revu® (http://www.bluebeam.com).
- The application of TPZs and SRZs using AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) (see Appendix 7 and 8).
- Glossary (see Appendix 10).

It should be noted that this objective assessment and related VTA assessments are based upon health and condition that were observed at the time of inspection.

The recommendations of this report regarding retention, works or removal are based upon Safe & Useful Life Expectancy (SULE – see Appendix 9) and hazard ratings being applied.

This information has guided the conclusions in this report.

5.0 Assessment of VTA, Impact & Tree Protection Measures required by Proposed Plans

Accepted tree management practices recommend removal of trees where SULE ratings are 3 (or listed as dead), and/or where hazard ratings are high [where ratings adapted from Matheny and Clark range from low=3 to dangerous=12] (Matheny, et al., 1994). A detailed explanation of SULE ratings is provided in Appendix 9. Height/Diameter Ratio should not exceed 1:30 (Mattheck, et al., 1994).

The trees contained within the Tree Schedule (see below) range from having short to long SULEs. These trees also have a broad range of hazard ratings which limits the retention of such trees within development sites. Appendix 3 provides explanations of abbreviations and assessment criteria.

Tree Protection Zones for each of the trees that are assessed to be retained and protected are highlighted in yellow in the Tree Schedule below. It should be noted that distance stated is a radius, not a diameter. AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) states that an intrusion of the TPZ of less than 10% is considered minor. No above-ground intrusion into the TPZ is to exceed 20% of total TPZ area (e.g., cantilevered building, balcony etc.).

Tree Schedule

ABBREVIATIONS: **m**-metres, **mm**-millimetres, **DBH**-trunk diameter @ 1.4m, **DGL**-trunk diameter at ground level, **VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good, **CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-quad-dominant trunk, **Multi**-5+ trunks/leaders, **J**-juvenile, **YM**-young mature, **SM**-semi mature, **M**-mature, **OM**-over mature, **REC**-recommendation, **S**-save, **R**-remove, **T**-transplant, **C**-council determination, **W**-work needed to be carried out, **mon**-monitor, **VTA**-visual tree assessment, **Hazard Rating**-**3**=low hazard ~ **12**=dangerous, **N/A**-not applicable, **SULE**-safe & useful life expectancy, **STARS**-Significance of a Tree, Assessment Rating System.

TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (m) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SIGNIFICANCE RATING	SULE	STARS	(1) COMMENT ON TREE ASSESSMENT (2) ASSESSMENT OF IMPACT (3) TREE PROTECTION MEASURES	REC
1	*Eucalyptus scoparia* (Wallangarra White Gum)	20	820	1100	9.8	3.4	F	G	10 10 10 8	M	Pass	6	High	2B	High	1. This street tree passes the VTA and is suitable to be considered for retention. It has some small deadwood present, epicormic shoots and tip dieback. This tree is NOT damaging the hard landscaping. Its crown is over the shops. This tree is a designed constraint. 2. There will be an acceptable impact on this tree from the proposed development. Retain and protect. 3. Trunk armour is required as per Appendix 7.	S
2	*E. scoparia* (Wallangarra White Gum)	18	440	650	5.3	2.8	F	G	8 8 4 6	M	Pass	6	High	2B	High	1. This street tree passes the VTA and is suitable to be considered for retention. It has some small deadwood present, epicormic shoots and tip dieback. This tree is NOT damaging the hard landscaping. It has a northern trunk lean of 10°. This tree is a designed constraint. 2. There will be an acceptable impact on this tree from the proposed development. Retain and protect. 3. Trunk armour is required as per Appendix 7.	S

ABBREVIATIONS: **m**-metres, **mm**-millimetres, **DBH**-trunk diameter @ 1.4m, **DGL**-trunk diameter at ground level, **VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good, **CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-quad-dominant trunk, **Multi**-5+ trunks/leaders, **J**-juvenile, **YM**-young mature, **SM**-semi mature, **M**-mature, **OM**-over mature, **REC**-recommendation, **S**-save, **R**-remove, **T**-transplant, **C**-council determination, **W**-work needed to be carried out, **mon**-monitor, **VTA**-visual tree assessment, **Hazard Rating**-**3**=low hazard ~ **12**=dangerous, **N/A**-not applicable, **SULE**-safe & useful life expectancy, **STARS**-Significance of a Tree, Assessment Rating System.

TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (m) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SIGNIFICANCE RATING	SULE	STARS	(1) COMMENT ON TREE ASSESSMENT (2) ASSESSMENT OF IMPACT (3) TREE PROTECTION MEASURES	REC
3	*E. scoparia* (Wallangarra White Gum)	16	660	960	7.9	3.3	F	F	8 8 10 8	M	Pass	5	High	2B	High	1. This street tree passes the VTA and is suitable to be considered for retention. It has some small deadwood present, epicormic shoots, tip dieback, canker in the trunk and surface roots. This tree is NOT damaging the hard landscaping. Its crown is over the shops. This tree is a designed constraint. 2. There will be an acceptable impact on this tree from the proposed development. Retain and protect. 3. Trunk armour is required as per Appendix 7.	S
4	*Corymbia maculata* (Spotted Gum)	16	380	450	4.6	2.4	G	G	4 radial	YM	Pass	5	High	2B	High	1. This street tree passes the VTA and is suitable to be considered for retention. It is NOT damaging the hard landscaping. This tree is a designed constraint. 2. There will be an acceptable impact on this tree from the proposed development. Retain and protect. 3. Trunk armour is required as per Appendix 7.	S
5	*C. maculata* (Spotted Gum)	22	750	1000	9.0	3.3	G	G	10 radial	M	Pass	5	High	2B	High	1. This prominent street tree is less than 100mm to the building. The building is cantilevered over the root plate. This tree is 2.1m to an existing retaining wall from the edge of its trunk and is damaging hard landscaping - footpath. This tree is a design constraint. 2. This tree has a full canopy spread of 10mr (314.16m^2). There will be a 16.66% intrusion (52.34m^2) of the canopy. This will be an acceptable impact. See Appendix 1 & 1a for more information. Retain and protect. 3. TPZ fencing *and* Trunk armour is required as per Appendix 7.	S
6	*C. maculata* (Spotted Gum)	10	130	200	2.0	1.7	G	G	2 radial	J	Pass	4	Medium	2B	Medium	1. This street tree passes the VTA and is suitable to be considered for retention. It has surface roots damaging the hard landscaping. 2. There will be an acceptable impact on this tree from the proposed development. Retain and protect. 3. Trunk armour is required as per Appendix 7.	S
7	*E. scoparia* (Wallangarra White Gum)	18	CD 2x350 (490)	520	5.9	2.5	F	F	6 radial	M	Pass	5	High	2B	High	1. This street tree has an inclusive main fork union, tip dieback and epicormic shoots. This tree is damaging the hard landscaping. 2. There will be an acceptable impact on this tree from the proposed development. Retain and protect. 3. Trunk armour is required as per Appendix 7.	S

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TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (m) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SIGNIFICANCE RATING	SULE	STARS	(1) COMMENT ON TREE ASSESSMENT (2) ASSESSMENT OF IMPACT (3) TREE PROTECTION MEASURES	REC
8	*C. maculata* (Spotted Gum)	20	CD 440 460 (640)	750	7.7	2.9	G	G	6 6 6 4	M	Pass	5	High	2B	High	1. This street tree has a restricted root plate, and the power sub-station is in the structural root zone. It is <1m to the car park and 4m to the building. 2. There will be an acceptable impact on this tree from the proposed development. Retain and protect. 3. Trunk armour is required as per Appendix 7.	S
9	*E. scoparia* (Wallangarra White Gum)	20	510	760	6.1	3.0	G	G	6 8 10 12	M	Pass	6	High	2B	High	1. This street tree has the power sub-station is in the structural root zone. The car park is 1.8m east and the footpath 1m west. It has a 5° trunk lean to north, epicormic shoots and some small deadwood present. 2. There will be an acceptable impact on this tree from the proposed development. Retain and protect. 3. Trunk armour is required as per Appendix 7.	S
10	*E. scoparia* (Wallangarra White Gum)	18	440	520	5.3	2.5	F	G	6 radial	M	Pass	5	High	2B	High	1. This street tree is 2m from carpark and footpath 1m to the west. There are bark splits and some small deadwood present. 2. There will be an acceptable impact on this tree from the proposed development. Retain and protect. 3. Trunk armour is required as per Appendix 7.	S
11	*Eucalyptus microcorys* (Tallow-wood)	20	560	820	6.7	3.0	G	G	10 radial	M	Pass	6	High	2B	High	1. This is a street tree. The storm water is 5m to north and the carpark is at the trunk. The drive is 1.5m to the south and a 500mm existing retaining wall is 300mm to the south, damaging the car park. 2. There will be an acceptable impact on this tree from the proposed development. Retain and protect. 3. Trunk armour is required as per Appendix 7.	S
12	*Eucalyptus saligna* (Sydney Blue Gum)	24	520	790	6.2	3.0	F	G	8 radial	M	Pass	7	Medium	3D	Low	1. This tree has epicormic shoots, tip dieback and some small deadwood present. This tree is growing in the rear carpark. The carpark is 500mm to the west and a 3m existing retaining wall to ground level is 500mm to the south. It has a raised root plate. 2. This tree will be removed when the existing building is demolished. 3. N/A.	R

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TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (m) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SIGNIFICANCE RATING	SULE	STARS	(1) COMMENT ON TREE ASSESSMENT (2) ASSESSMENT OF IMPACT (3) TREE PROTECTION MEASURES	REC
13	*Eucalyptus* sp. (Gum)	16	320	460	3.8	2.4	Dead	F	- 6 4 2	M	Fail	10	Low	4	**Priority for Removal**	1. This tree fails the VTA. It is not suitable to be considered for retention. This tree is within the site, below the existing retaining wall and is dead. 2. N/A. 3. N/A.	R
14	*Eucalyptus* sp. (Gum)	14	300	400	3.6	2.3	Dead	F	3 radial	M	Fail	8	Low	4	**Priority for Removal**	1. This tree fails the VTA. It is not suitable to be considered for retention. This tree is within the site, below the existing retaining wall and is dead. 2. N/A. 3. N/A.	R
15	*E. microcorys* (Tallow-wood)	18	400	620	4.8	2.7	F	G	4 radial	M	Pass	5	Medium	2B	Medium	1. This tree is within the site, below the existing retaining wall and is 1.9m to a brick wall on the boundary. 2. The below ground intrusion from the proposed plans improves the growing conditions for this tree as there will be less intrusion. There appears to be an above ground conflict with the proposed building. The Level 1 and above plans need to be closely reviewed in conjunction with the current tree and canopy to ensure that it can be retained. The tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
16	*E. saligna* (Sydney Blue Gum)	25	840	1100	10.1	3.4	F	F	10 radial	M	Pass	7	Medium	2D	Medium	1. This tree is within the site, below the existing retaining wall and is 1.2m from the centre of the trunk to a brick wall on the boundary. It has a trunk wound at 8m on the southeast side and there is some large deadwood. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
17	*E. microcorys* (Tallowwood)	16	240	380	2.9	2.2	F	G	4 3 3 3	YM	Pass	5	Medium	2B	Medium	1. This tree is within the site, below the existing retaining wall and is 700mm from the centre of the trunk to a brick wall on the boundary. It has a trunk wound at 8m on the southeast side and there is some large deadwood. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S

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TREE NO.	SPECIES	HEIGHT (m)	DBH (mm)	DGL (mm)	RADIUS OF FULL TPZ (m)	RADIUS OF FULL SRZ (m)	HEALTH/VIGOUR	STRUCTURAL CONDITION	CANOPY SPREAD (m) N S E W	AGE CLASS	VTA	HAZARD RATING (3 - 12)	SIGNIFICANCE RATING	SULE	STARS	(1) COMMENT ON TREE ASSESSMENT (2) ASSESSMENT OF IMPACT (3) TREE PROTECTION MEASURES	REC
18	*E. microcorys* (Tallow-wood)	18	300	420	3.6	2.3	F	F	1 6 3 3	YM	Pass	5	Medium	2B	Medium	1. This tree is within the site, below the existing retaining wall and is 1.9m from the centre of the trunk to a brick wall on the boundary. The crown is suppressed by Tree 16, and it has tip dieback. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
19	*E. microcorys* (Tallow-wood)	20	400	580	4.8	2.6	G	G	6 4 6 2	M	Pass	6	Medium	2B	Medium	1. This tree is within the site, below the existing retaining wall and is 1.7m from the centre of the trunk to a brick wall on the boundary. It has epicormic shoots, tip dieback and some small deadwood. There are previous failure sites. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
20	*E. microcorys* (Tallow-wood)	22	350	520	4.5	2.5	G	G	6 6 6 2	M	Pass	5	Medium	2B	Medium	1. This tree is within the site, below the existing retaining wall and is 1m from the centre of the trunk to a brick wall on the boundary. It has epicormic shoots, tip dieback and some small deadwood. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
21	*E. microcorys* (Tallow-wood)	22	620	750	7.4	2.9	G	G	4 8 8 8	M	Pass	5	Medium	2B	Medium	1. This tree is within the site below the existing retaining wall, is 200mm to the brick wall, east of the trunk and >500mm below carpark level. It has an inclusive main fork union and is co-dominant at 1.8m. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
22	*E. microcorys* (Tallow-wood)	22	460	700	2.4	2.0	G	G	2 6 6 6	M	Pass	5	Medium	2B	Medium	1. This tree is within the site below the existing retaining wall, is 3m to the brick wall, east of the trunk and >500mm below carpark level. It has some small deadwood. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S

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23	*E. microcorys* (Tallow-wood)	24	460	690	5.5	2.8	F	G	12 - - 8	M	Pass	6	Medium	2D	Medium	1. This tree is within the site below the existing retaining wall, is 1.6m to the brick wall, east of the trunk and >500mm below carpark level. The crown is over the existing building and is unbalanced. It has some large deadwood and tropism to the north. 2. This tree will require crown reduction to accommodate Level 1 of the proposed plans. The proposed building is 4m from the trunk. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
24	*E. microcorys* (Tallow-wood)	20	390	520	4.7	2.5	VP	G	6 3 3 3	M	Fail	9	Low	3B	**Priority for Removal**	1. This tree is within the site below the existing retaining wall, is 3.1 & 3.7m to the brick wall, east of the trunk and >500mm below carpark level. It is 90% dead and is dangerous. Removal is recommended as a priority. 2. N/A. 3. N/A.	R
25	*E. microcorys* (Tallow-wood)	24	450	720	5.4	2.9	G	G	10 8 6 6	M	Pass	5	Medium	2B	Medium	1. This tree is within the site below the existing retaining wall, is 1.5m to the brick wall, east of the trunk and >500mm below carpark level. 2. The below ground intrusion from the proposed plans improves the growing conditions for this tree as there will be less intrusion. There appears to be an above ground conflict with the proposed building. The Level 1 and above plans need to be closely reviewed in conjunction with the current tree and canopy to ensure that it can be retained. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S

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26	*E. microcorys* (Tallow-wood)	24	720	960	8.6	3.3	G	G	8 radial	M	Pass	5	Medium	2B	Medium	1. This tree is within the site below the existing retaining wall, is 1.2m to the brick wall, east of the trunk and >500mm below carpark level. 2. The below ground intrusion from the proposed plans improves the growing conditions for this tree as there will be less intrusion. There appears to be an above ground conflict with the proposed building. The Level 1 and above plans need to be closely reviewed in conjunction with the current tree and canopy to ensure that it can be retained. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
27	*Eucalyptus botryoides* (Bangalay)	20	320	400	3.8	2.3	G	G	2 8 6 2	M	Pass	5	Medium	2B	Medium	1. This tree is within the site below the existing retaining wall, is 1.2m to the brick wall, east of the trunk and >500mm below carpark level. 2. The below ground intrusion from the proposed plans improves the growing conditions for this tree as there will be less intrusion. There appears to be an above ground conflict with the proposed building. The Level 1 and above plans need to be closely reviewed in conjunction with the current tree and canopy to ensure that it can be retained. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
28	*Angophora costata* (Sydney Red Gum)	22	CD 250 300 (390)	550	4.7	2.6	G	G	6 6 2 8	M	Pass	5	Medium	2B	Medium	1. This tree is within the site below the existing retaining wall, is on the brick wall, east of the trunk and >500mm below carpark level. 2. The below ground intrusion from the proposed plans improves the growing conditions for this tree as there will be less intrusion. There appears to be an above ground conflict with the proposed building. The Level 1 and above plans need to be closely reviewed in conjunction with the current tree and canopy to ensure that it can be retained. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S

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29	*Syncarpia glomulifera* (Turpentine)	12	160	280	2.0	1.9	F	G	1 radial	YM	Pass	4	Medium	2B	Medium	1. This tree is within the site below the existing retaining wall, is 800mm to the brick wall, east of the trunk and >500mm below carpark level. The crown is suppressed by Tree 28. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
30	*A. costata* (Sydney Red Gum)	18	350	520	4.2	2.5	G	G	4 8 8 -	M	Pass	5	Medium	2B	Medium	1. This tree is within the site below the existing retaining wall, is 300mm to the brick wall, east of the trunk and >500mm below carpark level. It has tropism to the east. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
31	*E. microcorys* (Tallow-wood)	20	350	4.6	4.2	2.4	G	G	6 radial	M	Pass	5	Medium	2B	Medium	1. This tree is in the adjacent site and there is some small deadwood present. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
32	*S. glomulifera* (Turpentine)	12	TD 3x100 (170)	300	2.0	2.0	F	F	2 radial	YM	Pass	5	Medium	2B	Medium	1. This tree is in the adjacent site, and it is 1.5m to the brick wall. There is some small deadwood present, and it has been coppiced. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
33	*E. microcorys* (Tallow-wood)	24	520	650	6.2	2.8	G	G	2 8 6 6	M	Pass	9	Medium	3B	Medium	1. It is <200mm to the stairs and has 2 retaining walls at the base. It has tropism to the southeast and 3 residences are in the target zone. It has an inclusive main fork union, epicormic shoots and some small deadwood present. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
34	*Lophostemon confertus* (Brushbox)	16	220	350	2.6	2.1	G	G	3 radial	YM	Pass	4	Medium	2B	Medium	1. It is 100mm to the path and is a good young tree. 2. This tree is to be retained and protected. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S

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35	*E. microcorys* (Tallow-wood)	26	760	1100	9.1	3.4	G	G	15 8 10 10	M	Pass	6	Medium	2B	Medium	1. This prominent tree passes the VTA and is suitable to be considered for retention. It is on the path edge and 1.8m to the existing retaining wall. It has epicormic shoots and some small deadwood present. 2. The below ground intrusion from the proposed plans improves the growing conditions for this tree as there will be less intrusion. There appears to be an above ground conflict with the proposed building. The Level 1 and above plans need to be closely reviewed in conjunction with the current tree and canopy to ensure that it can be retained. 3. TPZ fencing is required as per Appendix 8 if retained. The size of the TPZ is shown in this table (radius of full TPZ).	S
36	*S. glomulifera* (Turpentine)	8	CD 80 100 (130)	240	2.0	1.8	Dead	G	1 radial	J	Fail	5	Low	4	**Priority for Removal**	1. This tree fails the VTA. It is not suitable to be considered for retention. This tree is dead. 2. N/A. 3. N/A.	R
37	*S. glomulifera* (Turpentine)	10	CD 2x200 (280)	520	3.4	2.5	F	F	4 1 4 2	YM	Pass	5	Medium	2B	Medium	1. This tree has an inclusive main fork union, and the crown is suppressed by Tree 35. It has tip dieback, and some small deadwood is present. It is 500mm to the existing retaining wall. 2. This tree is located within the proposed building footprint. Removal is required to facilitate the proposed development plans. 3. N/A.	R

5.1 Discussion

STREET TREES THAT PASS THE VTA & ARE TO BE RETAINED: .....1 - 7.

TREES THAT PASS THE VTA (ONSITE) & ARE TO BE RETAINED: .....8 - 11, 15 - 23 & 25 - 35.

TREES THAT ARE DEAD AND/OR FAIL THE VISUAL TREE ASSESSMENT AND ARE RECOMMENDED FOR REMOVAL: .....13, 14, 24 & 36.

TREES THAT REQUIRE REMOVAL TO FACILITATE THE CURRENT PROPOSED DEVELOPMENT PLANS:..... ..... 12 & 37.

TREES LOCATED IN THE ADJACENT SITE(S): ..... None.

The proposed development will retain all street trees numbered 1 through to 11. These trees are all located on either Edinburgh Road or Eastern Valley Way. These trees are prominent in the streetscape.

The proposed building will impact Tree 5. It has been calculated that there will be a 16.66% intrusion into the canopy of this tree. There are no intrusions in the root plate from the proposed development. The intrusion into the canopy will need to be pruned. The required works is reduction pruning [AS 4373:2007 Pruning of amenity trees (Australian Standard®, 2007), section 7.3.2 refers]. All reduction pruning should be to suitable growth points if available. If not, the reduction may be required to be to the branch collar. Reduction pruning will be required in two stages:

1. Initial pruning - To allow for construction
2. Final pruning - When building is completed.

All reduction pruning must be supervised by the project arborist (AQF5) and conducted by an AQF3 arborist.

Trees Located on the Southern Boundary
These trees are all located at the bottom of an existing retaining wall and will not be impacted from demolition works for the proposed development. The retention of these trees is possible as the proposed plans have been developed with arboriculturist input.

Section AA shows the built form reducing in size the higher it gets. This will allow canopy growth and increased light levels within the crown. There will be an improvement for the long-term viability of all trees located on the southern boundary.

There will also be a small amount of fill soil to reduce the angle of the batter at the rear of the site. This will aid tree viability by reducing the angle of the soil which will allow for better water absorption by soil. It will also increase soil volume which will also benefit the viability of surrounding trees.

The amount of fill soil is small, but beneficial. If fill soils are to be imported, they should be suitable for Australian native trees. The soils must not be enriched. 'Australian Native Landscapes' supply suitable soils which can be used with confidence.

Tree 11, 15 - 23 & 25 - 34 will all have reduced inground intrusions into their TPZs from the revised plans. The removal of the existing concrete walls and footings must be supervised by the project arborist. This will ensure the least possible impact on the retained trees which will also ensure their long-term viability is enhanced.

Tree 13, 14 and 36 are dead and are recommended for removal. Tree 36 is recommended for removal as a priority.

Tree 24 fails the visual tree assessment. It is 90% dead and is dangerous. Removal is recommended as a priority.

Tree 12 is the only tree that is located on the upper level. This is around the RL81.69. This tree will be removed when the existing structure is demolished. It will be replaced in the landscape plans.

Tree 37 is located in a small area that currently has a path running through it. This tree is within the proposed building footprint and removal will be required to facilitate the proposed plan.

Crown Management/Reduction will be required for Tree 5, 15, 25 - 28 & 35.

There will be the need for crown management to allow for the new built form and scaffolding for construction. The crown reduction works should be only conducted when there is obvious conflict with built forms (building and scaffolding). The project arborist should meet with the certifying authority to ensure that the works are necessary and will comply with the guidelines specified in AS 4373:2007 Pruning of amenity trees (Australian Standard®, 2007). With the desired retention of Tree 25, 26, 27, 28 and 35 a study needs to be undertaken during the Development Application phase of the built form and possible conflict with the trees in question. Where necessary some building mass may need to be amended to minimise the impact upon these trees to ensure their long-term viability.

The reduction pruning works will not be significant and will not reduce any tree's viability, The most important element of crown reduction/management is the tree's root plate which drives the canopy growth. There will be improved soil conditions which will benefit all trees

- Subject trees are young-mature and still growing vigorously. If there is some impact, they will be able to regenerate canopy and roots to ensure viability of the tree.

- Constant management of the trees, by the project arborist, is the most important element in maintaining the trees during demolition and construction.

- The Project Arborist shall monitor all trees (existing and new) for a period of two (2) years Post Occupation to ensure their continued viability.

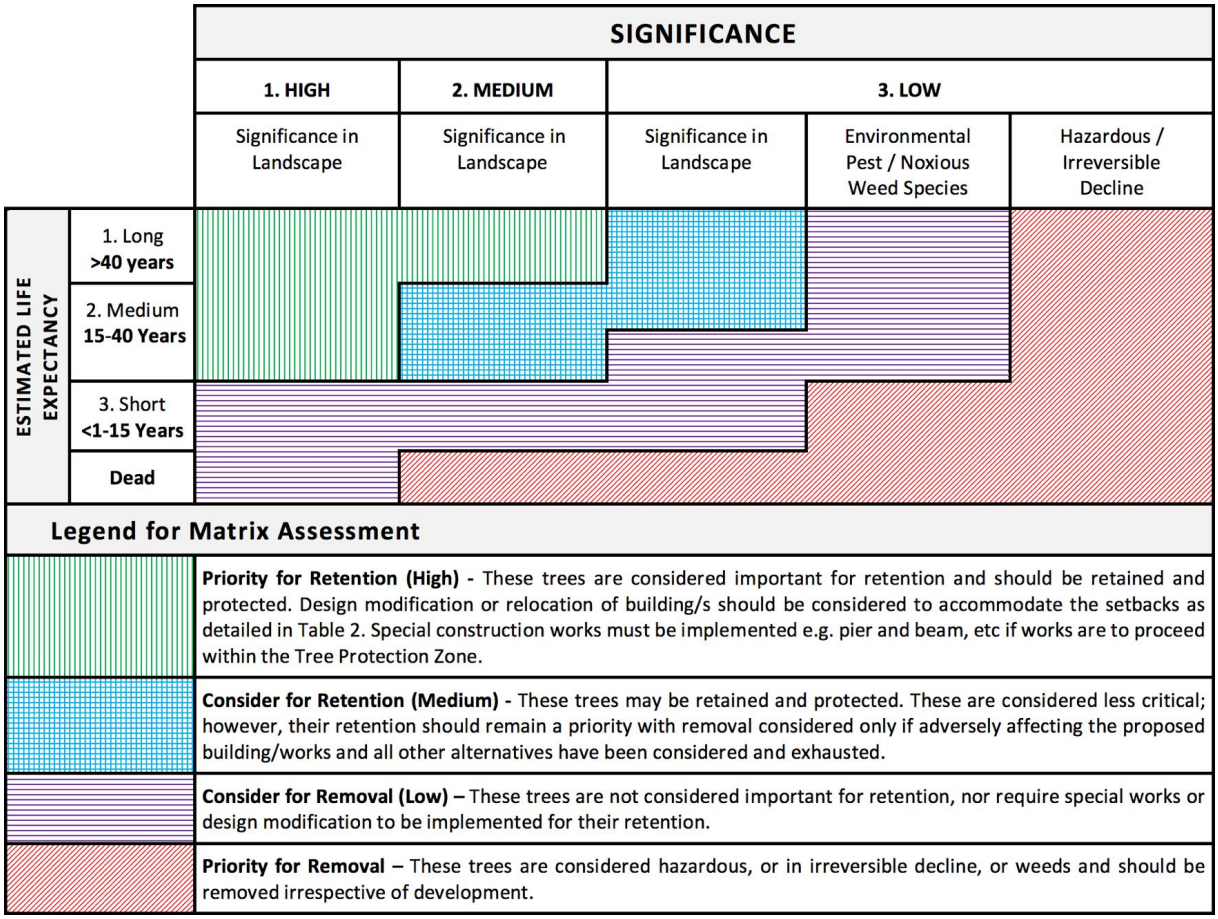
The trees surrounding the proposed development were planted when the site was developed, and most of the trees are not endemic to the area. The successful retention of all trees shall be paramount in the interest of the Community, Heritage and Client objectives.

5.2 Tree Significance (Appendix 4)

- Tree 1, 2, 3, 4, 5, 7, 8, 9, 10 & 11 listed in this report are of **high** significance.
- Tree 6, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 & 37 listed in this report are of **medium** significance.
- Tree 12, 13, 14, 24, & 36 listed in this report are of **low** significance.

5.3 Significance of a Tree, Assessment Rating System (STARS)

TABLE 1.0 TREE RETENTION VALUE - PRIORITY MATRIX.



SUMMARY OF TREES & STARS RECOMMENDATIONS

- Tree 1, 2, 3, 4, 5, 7, 8, 9, 10 & 11 listed in this report have a **High** STARS rating (Priority for Retention).
- Tree 6, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 & 37 listed in this report have a **Medium** STARS rating (Consider for Retention).
- Tree 12 listed in this report has have a **Low** STARS rating (Consider for Removal).
- Tree 13, 14, 24 & 36 listed in this report are a **Priority for Removal**.

5.4 Gradient of Impacts[1]

0% of TPZ impacted – no impact of significance
0 to 10% of TPZ impacted – low level of impact
10 to 15% of TPZ impacted – low to moderate level of impact
15 to 20% of TPZ impacted – moderate level of impact - Tree 5 (16.66% - Above Ground)
20 to 25% of TPZ impacted – moderate to high level of impact
25 to 35% of TPZ impacted – high level of impact - Tree 15, 25, 26, 27, 28 & 35 (Above Ground Level 1)
>35% of TPZ impacted – significant level of impact

[1] Used with permission of Landscape Matrix.

6.0 Tree Protection Plan

for 100 Edinburgh Road, CASTLECRAG NSW 2068

a) Project Arborist (AQF5)

A project arborist (AQF5) is to be engaged to supervise implementation of works for the duration of construction.

b) Induction for Tree Protection

All workers entering the site involved in construction must be advised of the tree protection measures and specifications outlined within this report during the site induction. This is to be verbally acknowledged and signed off before the commencement of works.

c) Identify Further Potential Impacts on Trees by Proposed Plans

1. No fill soils be used in any TPZ unless approved by the Project Arborist.
2. Soil cuts are not permitted in any TPZ unless approved by the Project Arborist.
3. Services should not be in or run through any TPZ unless approved by the Project Arborist.
4. Site Office/Toilet, etc., are not to be located within any TPZ unless approved by the Project Arborist.
5. All materials must not be stored in any TPZ unless approved by the Project Arborist.
6. Aeration of the soil is managed by the TPZ fencing. Refer to AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009).
7. An area is to be set aside for tradespeople to wash down equipment away from any TPZ. The location of the wash down point should be approved by the project arborist unless approved by the Project Arborist.

d) Tree Protection Zones using AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009)

DBH – Diameter at Breast Height (1.4 metres)
DGL – Diameter at Ground Level
TPZ = DBH (stem) x 12 (radius)
SRZ radius = $(D \times 50)^{0.42} \times 0.64$

See Appendix 5 and Appendix 6
Refer to the Tree Schedule in clause 5.0 'Assessment of VTA, Impact & Tree Protection Measures' required by Proposed Plans' for TPZ and SRZ details

* Minimum TPZ is 2 metres – Maximum TPZ is 15 metres | # Minimum SRZ is 1.5 metres

e) Tree Protection Works

1. Trunk armour is to be installed around the retained trees (Tree 1, 2, 3, 4, 6, 7, 8, 9, 10 & 11) before construction commences (see Appendix 7).
2. TPZ fencing is to be erected around the retained trees (Tree 5, 16 - 23 & 25 to 35 before construction commences (see Appendix 8).
3. The distance from the tree trunk to the TPZ fence is specified in Tree Schedule in clause 5.0 'Assessment of VTA, Impact & Tree Protection Measures' and highlighted. N.B: This is a radius, not diameter.
4. The TPZ fence is to be constructed of two (2) metres high temporary chain wire fencing. This is preferable to star pickets as it would require them to be hammered into the ground which could damage roots. This action will greatly reduce the stress on the trees. The TPZ fence should be left in place until the landscaping phase of construction begins.
5. TPZ signage as per Appendix 7 to be attached to TPZ fencing.

f) Tree Works

- All tree work is to be carried out by a suitably qualified and insured Arborist (AQF3).
- Any crown reduction/management works required must comply with AS 4373-2007 Pruning of amenity trees (Australian Standard®, 2007).

g) Tree Protection Schedule

1. Mark all trees on site for removal or retention - certification letter required.
2. Inspect site after tree removal and certify trees identified for retention are still there - certification letter required.
3. Inspect tree protection fencing/trunk armour. Ensure that all requirements of approved development application (DA) have been complied with - certification letter required.
4. After the initial certification inspection and arboriculturist appointment letter, the site will be regularly inspected at monthly intervals unless otherwise specified in approved DA.
5. Supervision of in-ground works as specified in the DA e.g., root cutting trenching, pipe installation etc. - certification letter required.
6. At the completion of works all tree protection measures are to be inspected and when appropriate, authorised to be removed - certification letter required.
7. Supervision of landscaping in-ground works within the TPZs of retained trees - certification of correct planting and landscaping procedures required.
8. Certification of correct planting methods for replacement trees as specified in an approved landscape plan - certification for planting of replacement trees required.

7.0 Tree Protection Stages

a) Works Prior to Demolition

- All trees within the site are to be marked for Removal or Protection (retention).
- Trunk armour and TPZ fencing to be erected around retained trees as per Appendix 8 prior to any works commencing.
- Trunk armour and TPZ fencing is to be inspected by the Project Arborist (AQF5) and a letter certifying compliance is to be sent to the Principal Certifying Authority.

b) Works During Demolition

- Tree removal works can be carried out during demolition by a suitably qualified and insured Arborist (AQF3).
- All trunk armour and TPZ fencing is to be retained during works.

c) Excavation/Earthworks

- There will be earthworks to level the site. Any tree roots encountered within the works area need to be correctly terminated by the Project Arborist (AQF5), which is cut by a hand saw and not smashed off with an excavator bucket. Correctly terminating a root will ensure that the tree roots do not suffer from decay.
- The Project Arborist is to establish a likely root zone which excavation works within such will be undertaken under the supervision of the Project Arborist to minimise any potential damage to the existing tree roots.

d) Construction Works

- TPZ fencing to remain in place during construction and regularly inspected by the project arborist.
- Trunk/branch armour to remain in place during construction and regularly inspected by the project arborist.

e) Landscaping Phase

- The TPZ fencing may be removed during the Landscaping Phase.
- All trees removed should, where practicable, be replaced at the landscaping phase as part of the proposed Development Application (DA).
- At the landscaping phase, the retained trees must only have tube stock plants planted with the structural root zone (SRZ). No additional (fill) soil is to be added within the TPZ of any retained tree.
- The Project Arborist (AQF5) should supervise planting with TPZ areas of retained trees.

8.0 Conclusions

The proposed development will retain all the street trees located along Edinburgh Road, Eastern Valley Way and all but one healthy tree on the southern boundary of the site.

Three of the trees identified to be removed area dead, with another 90% dead - also recommended for removal. Tree 12 is growing in a garden bed in the carpark area. When the existing building is demolished, this tree will have to be removed. This tree will be replaced in the landscape plans.

The trees located on the southern boundary are all located at the bottom of an existing retaining wall and will have an acceptable impact from demolition works for the proposed development. All demolition works in TPZs are to be supervised by the project arborist. The retention of these trees is possible as the proposed plans have been developed with arboriculturist input. Suitable replacement trees are included in the landscape plans. The project arborist must supervise all demolition and construction works in the TPZs of retained trees.

Crown Management/Reduction will be required for Tree 5, 15, 25 - 28 & 35.

Tree 25 - 28 & 35 will require further assessment of the impacts from the proposed development.

The area's streetscape amenity will not be altered and will be enhanced from the new building. Suitable replacement tree plantings in the landscape plan provide further amenity in the area.

The trees impacted by the proposed development were planted when the site was developed, and the majority of the trees are not endemic to the area. The retention of as many trees as is possible is important to the community and has been achieved by these plans.

9.0 Recommendations

Implement all recommendations contained in Clauses 5.0, 5.1, 6.0 & 7.0.

Reason: These recommendations have been developed in accordance with AS 4970-2009 (Australian Standard®, 2009) to reduce the impact of the proposed development on the retained trees.

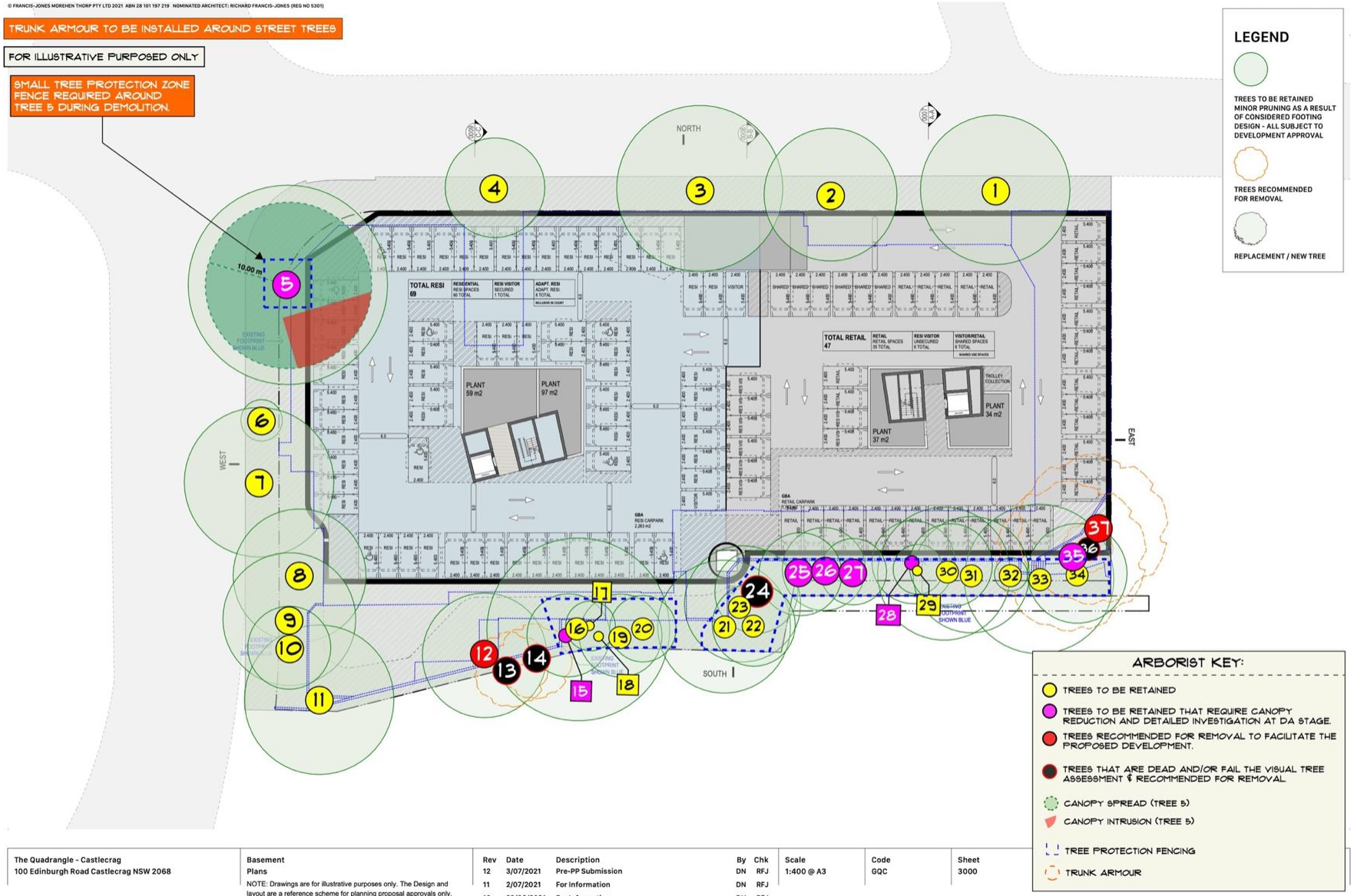
The trees to be removed have been assessed as being unsuitable to be considered for retention or they have an unacceptable impact from the proposed development.



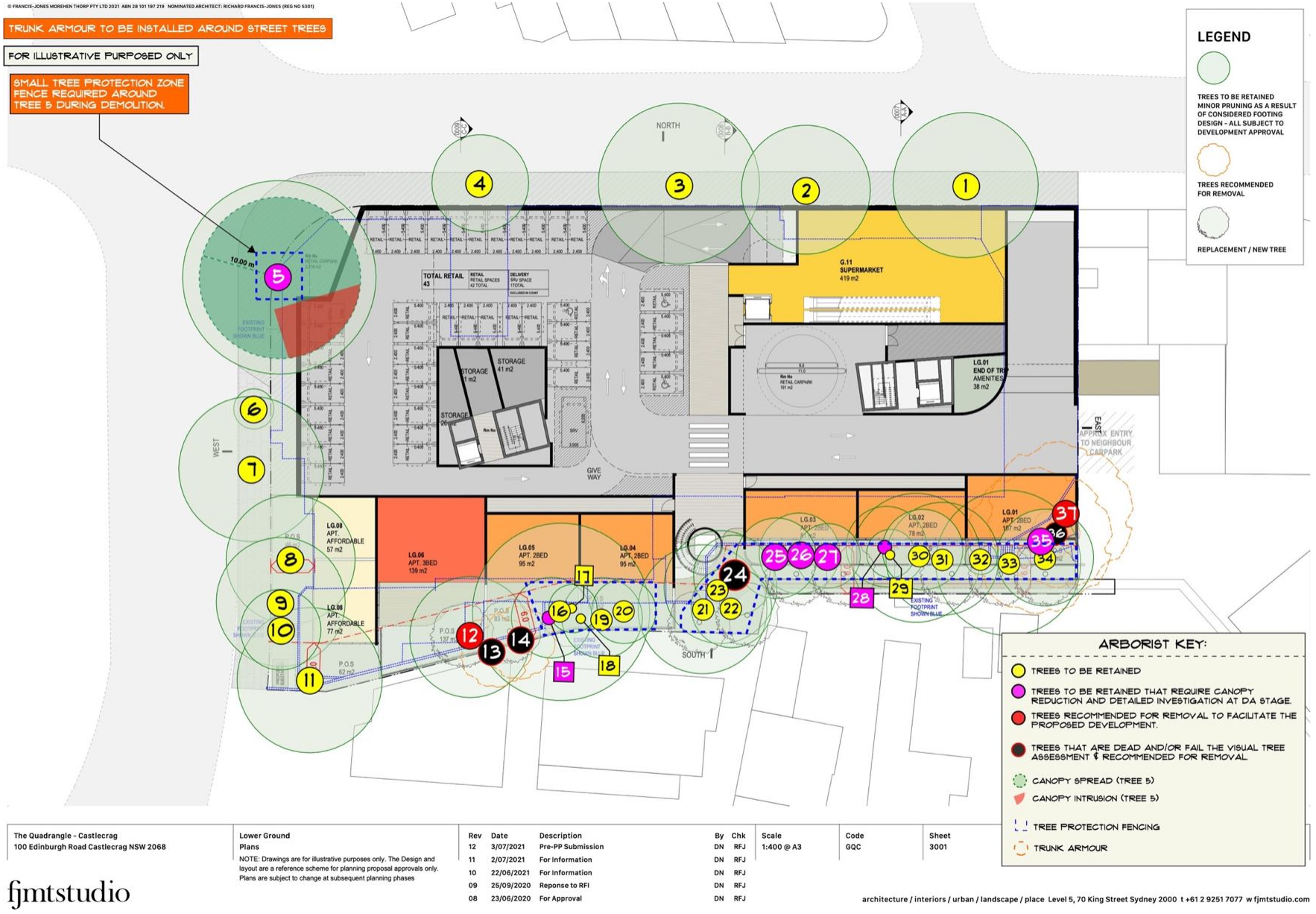
Russell Kingdom
Arboriculturist & Horticulturist

MIACA MAIH MAA
Diploma of Arboriculture (AQF5) | Graduate Diploma of Horticulture (AQF8)

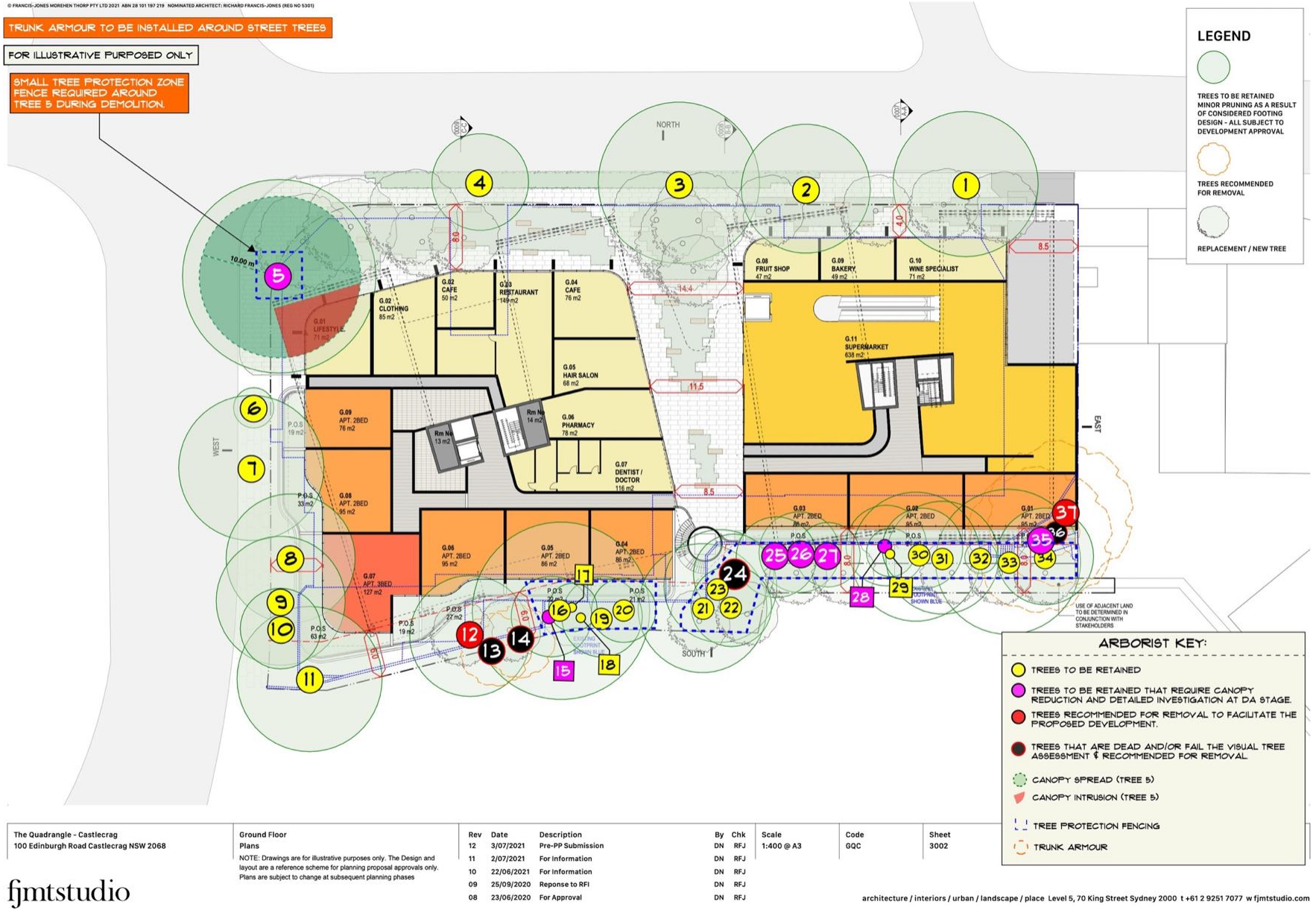
Appendix 1: Site Plan with Trees and Proposed Development (Basement)



Appendix 1b: Site Plan with Trees and Proposed Development (Lower Ground)

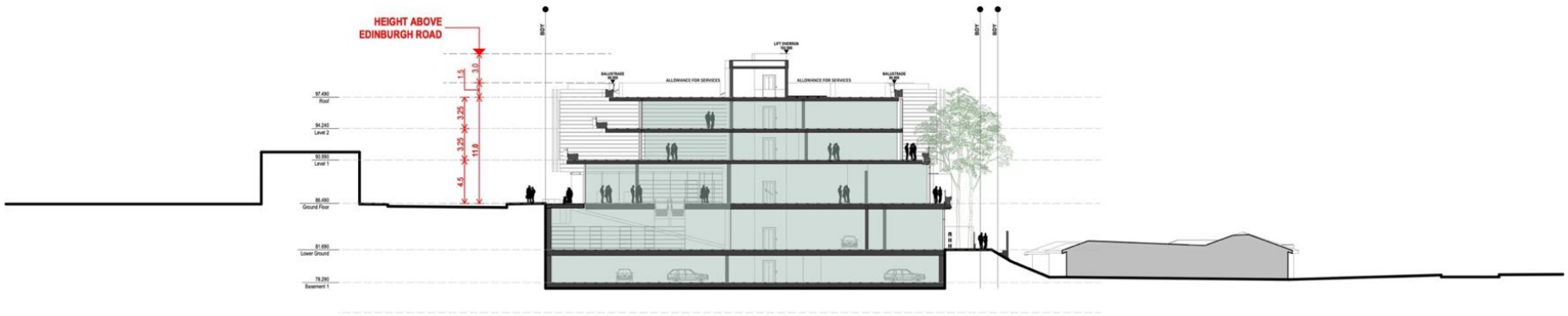


Appendix 1b: Site Plan with Trees and Proposed Development (Level 1)



Appendix 1c: Site Plan (Section A-A)

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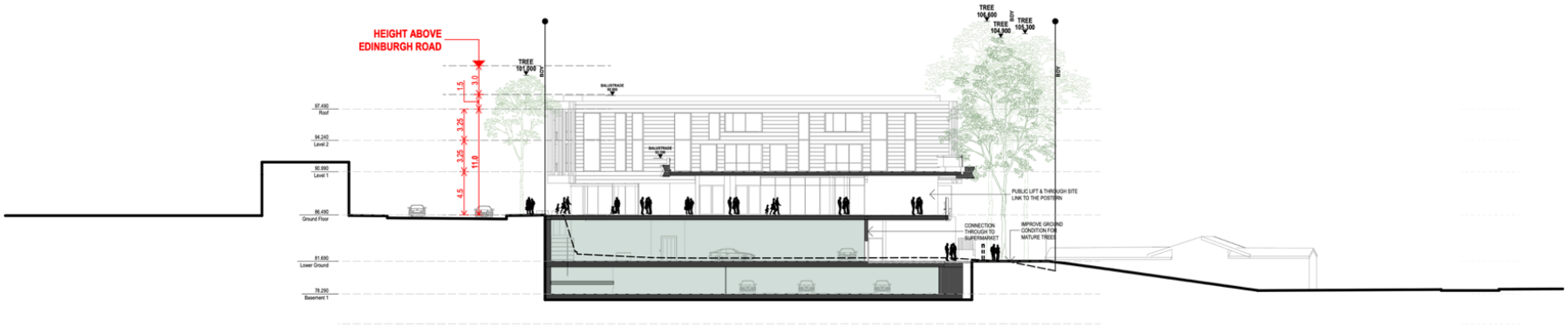
The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Section A-A Sections NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev	Date	Description	By	Chk	Scale	Code	Sheet	Rev	0 4 10 20m
		10	3/07/2021	Pre-PP Submission	DN	RFJ	1:400 @ A3	GQC	4000	10	
		09	2/07/2021	For Information	DN	RFJ					
		08	22/06/2021	For Information	DN	RFJ					
		07	25/09/2020	Reponse to RFI	DN	RFJ					
		06	23/06/2020	For Approval	DN	RFJ					

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Appendix 1d: Site Plan (Section B-B)

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The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Section B-B Sections NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev	Date	Description	By	Chk	Scale 1:400 @ A3	Code GQC	Sheet 4001	Rev 10
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		09	2/07/2021	For Information	DN	RFJ				
		08	22/06/2021	For Information	DN	RFJ				
		07	25/09/2020	Reponse to RFI	DN	RFJ				
		06	23/06/2020	For Approval	DN	RFJ				

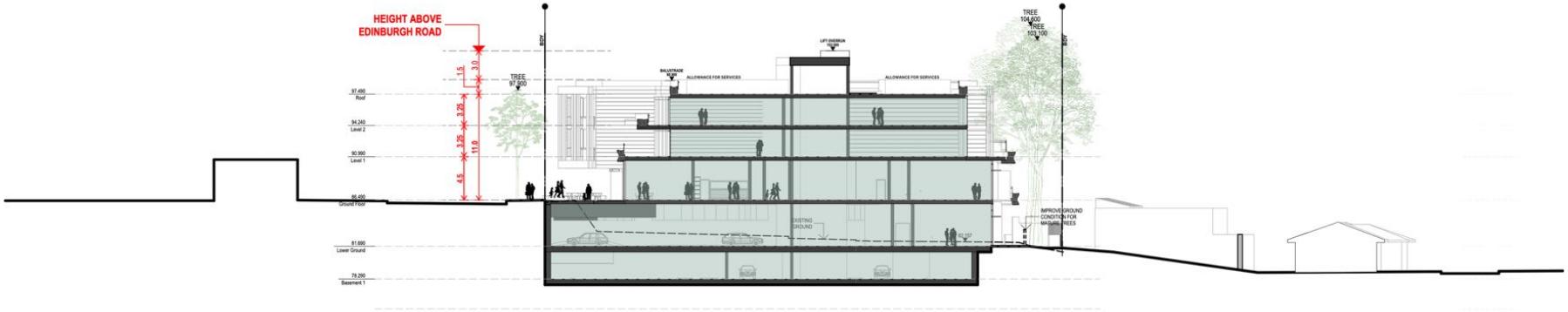
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Appendix 1e: Site Plan (Section C-C)

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The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Section C-C Sections NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev	Date	Description	By	Chk	Scale	Code	Sheet	Rev	0 4 10 20m
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		08	22/06/2021	For Information	DN	RFJ					
		07	25/09/2020	Reponse to RFI	DN	RFJ					
		06	23/06/2020	For Approval	DN	RFJ					

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Appendix 1f: Site Plan (Edinburgh Road Elevation)

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North

Pre-PP Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Edinburgh Road Elevation Elevations NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev	Date	Description	By	Chk	Scale	Code	Sheet	Rev	0 4 10 20m
		08	3/07/2021	Pre-PP Submission	DN	RFJ	1:400 @ A3	GQC	5000	08	
		07	2/07/2021	For Information	DN	RFJ					
		06	22/06/2021	For Information	DN	RFJ					
		05	25/09/2020	Reponse to RFI	DN	RFJ					
		04	23/06/2020	For Approval	DN	RFJ					

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Appendix 1g: Site Plan (Eastern Valley Way Elevation)

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West

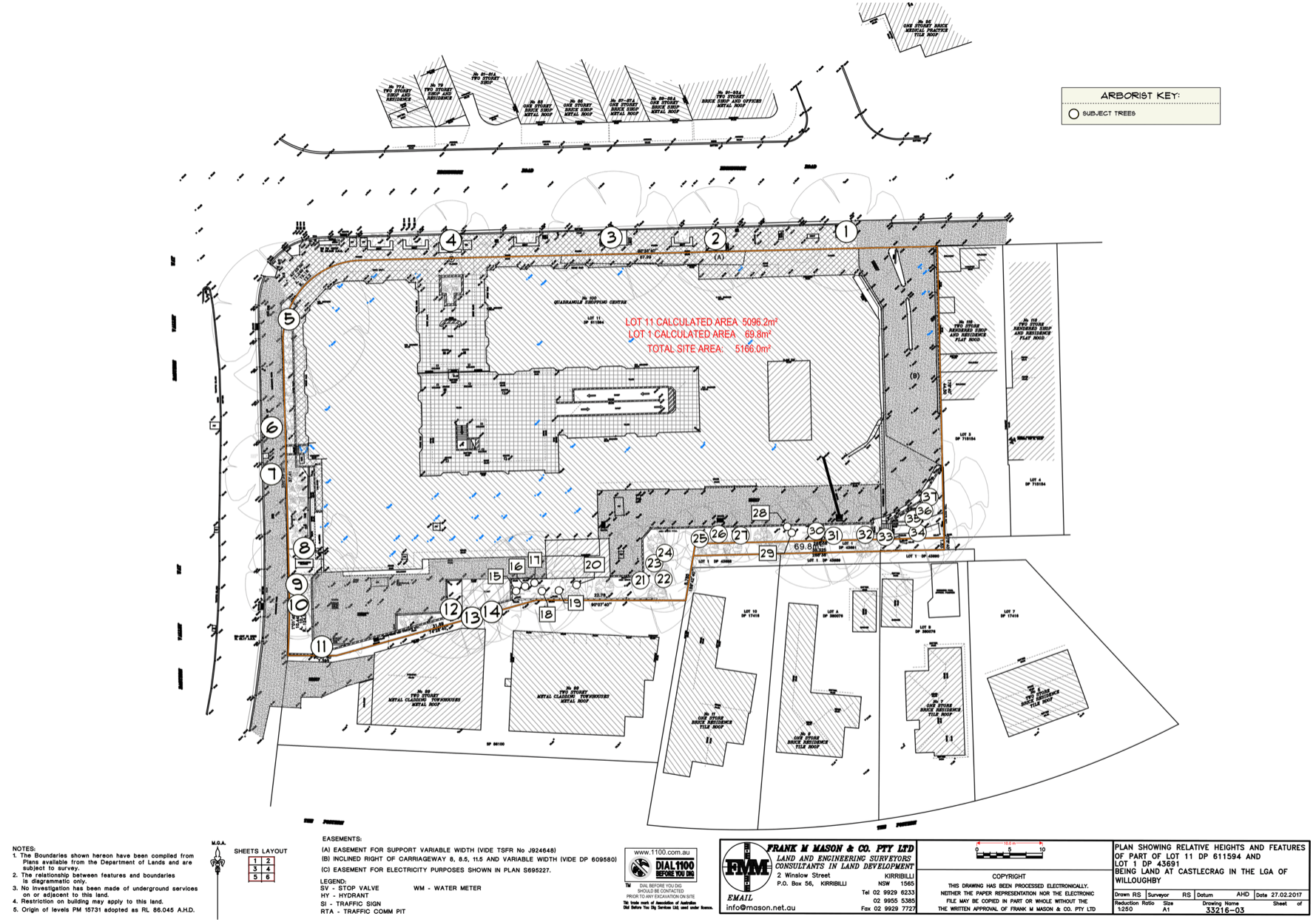
Pre-PP Submission

The Quadrangle - Castlecrag 100 Edinburgh Road Castlecrag NSW 2068	Eastern Valley Way Elevation Elevations NOTE: Drawings are for illustrative purposes only. The Design and layout are a reference scheme for planning proposal approvals only. Plans are subject to change at subsequent planning phases	Rev	Date	Description	By	Chk	Scale	Code	Sheet	Rev	0 4 10 20m
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		06	22/06/2021	For Information	DN	RFJ					
		05	25/09/2020	Reponse to RFI	DN	RFJ					
		04	23/06/2020	For Approval	DN	RFJ					

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Appendix 1h: Site Plan with Trees and Existing Development (Survey)



Appendix 2: Photographs

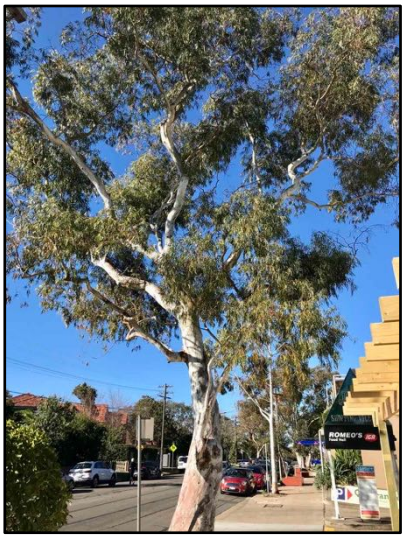


Figure 1: Tree 4 to 1.



Figure 2: Tree 2.

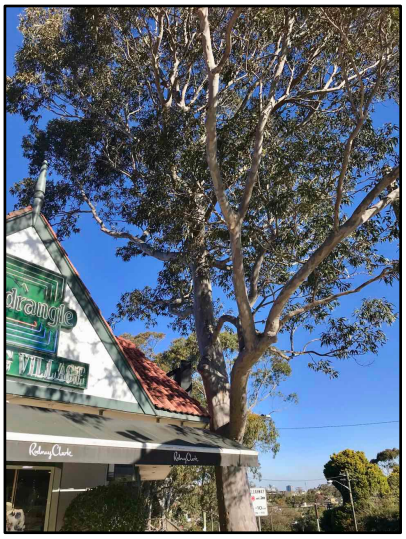


Figure 3: Tree 5.



Figure 4: Tree 5.



Figure 5: Tree 6 & 7 to 10.



Figure 6: Tree 12 is growing in a planter at carpark level. When the building is demolished, the tree will be removed and replaced in the landscape plans.

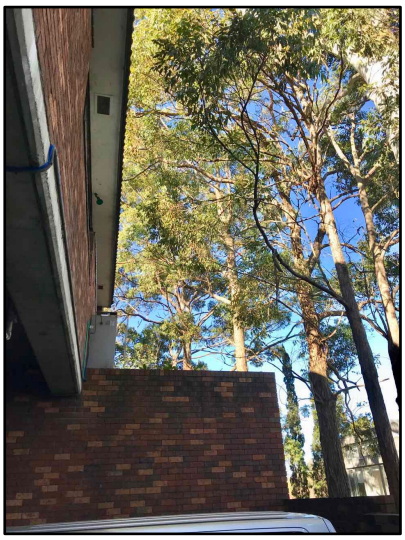


Figure 7: Trees on southern boundary. Tree 21 to 29.

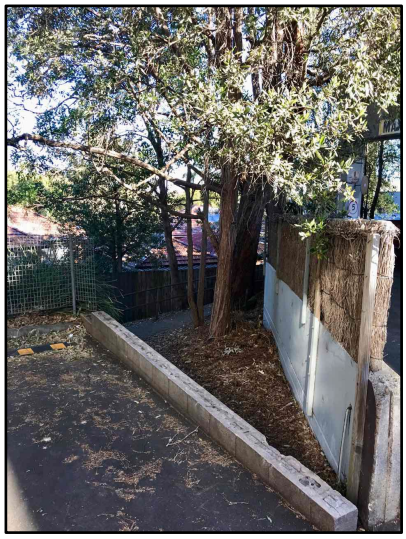


Figure 8: Tree 12.



Figure 9: Tree 4.



Figure 10: Tree 8, 9 & 10.



Figure 11: Tree 9 & 10.

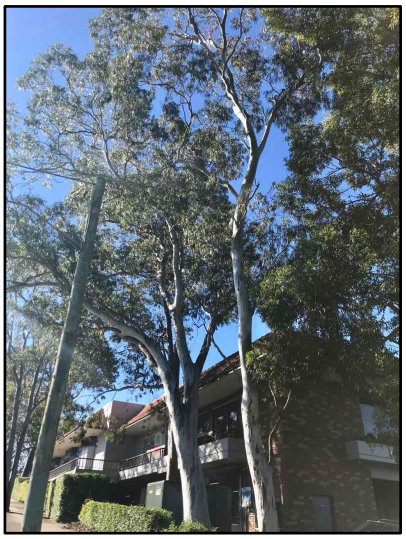


Figure 12: Tree 6 & 7.



Figure 13: Tree 30 to 33.



Figure 14: Tree 26 to 33.

Appendix 3: Notes on Tree Assessment

Key	Criteria	Comments
Tree No	Must relate to the number on your site diagram	
Species	Botanical name and common name of Tree	
Diameter of trunk	DBH Diameter at Breast Height (1.4 metres) DGL Diameter at Ground Level	
Height	In metres	
Spread	Average diameter of canopy in metres	
Crown Condition	Overall vigour and vitality 0 Dead 1 Severe decline (<20% canopy; major dead wood) 2 Declining (20-60% canopy density; twig and branch dieback) 3 Average/low vigour (60-90% canopy density; twig dieback) 4 Good (90-100% crown cover; little or no dieback or other problems) 5 Excellent (100% crown cover, no deadwood, or other problems)	This requires knowledge of species.
Age class	Y Young = recently planted SM Semi-mature (< 20% of life expectancy) M Mature (20-80% of life expectancy) OM Over-mature (> 80% of life expectancy)	
Special Significance	A Aboriginal C Commemorative Ha Habitat Hi Historic M Memorial R Rare U Unique form O Other	This may require specialist knowledge.
Services/adjacent structures	Bs Bus stop Bu Building within 3m HVo High voltage open-wire construction HVb High Voltage bundled (ABC) LVo Low Voltage open-wire construction LVb Low Voltage bundled (ABC) Na No services above Nb No services below ground Si Signage Sl Street light T Transmission lines (>33KV) U Underground services O Other	More than one of these may apply.
Defects	B Borers C Cavity D Decay dw Deadwood E Epicormics FA Forest Architecture H/D Height/Diameter ratio I Inclusions L Lopped LDCMP Leaf damage by chewing mouthpiece insects M Mistletoe/Parasites MBA Multiple Branch Attachments PD Parrot Damage PFS Previous Failure Sites S Splits/cracks T Termites TL Trunk Lean TW Trunk Wound O Other	More than one of these may apply. H/D if ratio is higher than 50:1 then tree is defective (Mattheck, et al., 1994).

Key	Criteria	Comments
Root zone	C Compaction D Damaged/wounded roots (e.g., by mowers) E Exposed roots Ga Tree in garden bed Gi Girdled roots Gr Grass Kb Kerb close to tree L+ Raised soil level L- Lowered soil level M Mulched Pa Paving/concrete/bitumen Pr Roots pruned O Other	More than one of these may apply.
Failure Potential	Identifies the most likely failure and rates the likelihood that the structural defect(s) will result in failure within the inspection period. 1. Low – defects are minor (e.g., dieback of twigs, small wounds with good wound wood development) 2. Medium – defects are present and obvious (e.g., cavity encompassing 10-25% of the circumference of the trunk) 3. High – numerous and or significant defects present (e.g., cavity encompassing 30-50% of the circumference of the trunk, major bark inclusions) 4. Severe – defects are very severe (e.g., heart rot fruiting bodies, cavity encompassing more than 50% of the trunk)	This requires specialist knowledge.
Size of defective part	Rates the size of the part most likely to fail. The larger the part that fails, the greater the potential for damage. 1. Most likely failure less than 150mm in diameter 2. Most likely failure 150-450mm in diameter 3. Most likely failure 450-750mm in diameter 4. Most likely failure more than 750mm in diameter	
Target Rating*	Rates the use and occupancy of the area that would be struck by the defective part. 1. Occasional use (e.g., jogging/cycle track) 2. Intermittent use (e.g., picnic area, day use parking) 3. Frequent use, secondary structure (e.g., seasonal camping area, storage facilities) 4. Constant use, structures (e.g., year-round use for a number of hours each day, residences)	
Hazard rating*	Failure potential + size of part + target rating Add each of the above sections for a number out of 12	The final number identifies the degree of risk. The next step is to determine a management strategy. A rating in this column does not condemn a tree but may indicate the need for more investigation and a risk management strategy.

Appendix 4: Significance of a Tree, Assessment Rating System (STARS) (IACA)

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is, therefore, necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the Tree Significance - Assessment Criteria and Tree Retention Value - Priority Matrix, are taken from the IACA 'Dictionary for Managing Trees in Urban Environments' (Draper, et al., 2009).

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of High, Medium, and Low significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined.

TREE SIGNIFICANCE - ASSESSMENT CRITERIA

1. **High Significance in landscape**
   - The tree is in good condition, or normal vigour and form typical of the species,
   - The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of grand age.
   - The tree is listed as a Heritage Item, Threatened Species or part of a Threatened Community or listed on council's significant tree register.
   - The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape by bulk and scale and makes a positive contribution to the local amenity.
   - The tree has been influenced by historic figures, events, or part of the heritage development of the place.
   - The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group, or has commemorative values. (ICOMOS)
   - The growing environment supports the tree to its full dimensions above and below ground without conflict or constraint.

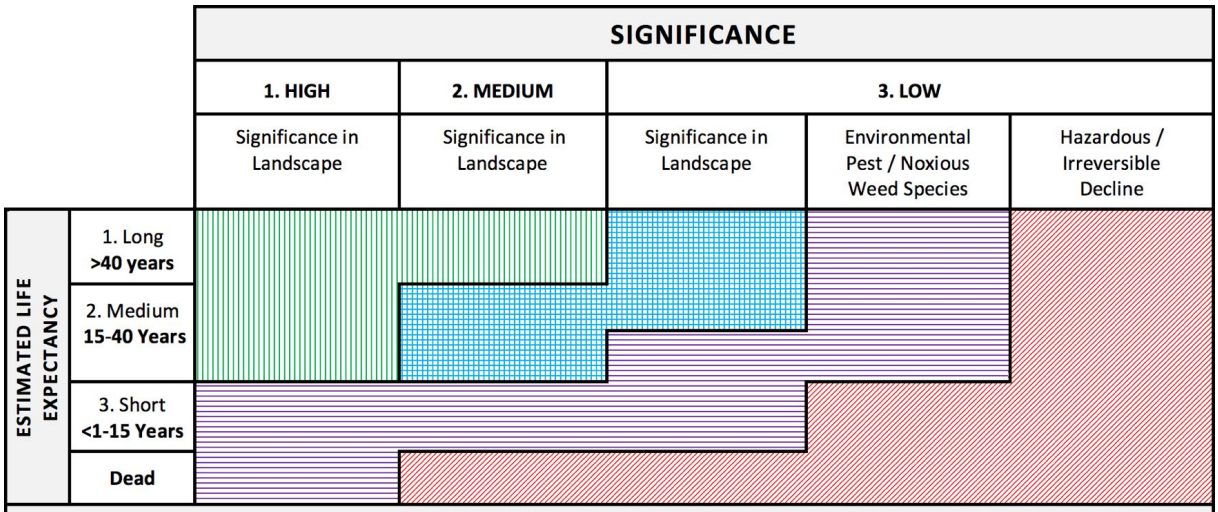
2. **Medium Significance in landscape**
   - The tree is in fair-good condition, or normal or low vigour and form typical or atypical of the species.
   - The tree is a planted locally indigenous or a common species with its taxa readily planted in the local area.
   - The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street.
   - The tree provides a fair contribution to the visual character and amenity of the area.
   - The tree is moderately constrained by above or below ground influences of the built environment to reach full dimensions.

3. **Low Significance in landscape**
   - The tree is in fair-poor condition, or normal or low vigour and form typical or atypical of the species,
   - The tree is not visible or is partly from surrounding properties as obstructed by other vegetation or buildings.
   - The tree provides a minor contribution or has a negative impact on the visual character and amenity of the area.
   - The tree is severely constrained by above or below ground by influences of the built environment and therefore will not reach full dimensions; the tree is inappropriate to the site conditions.
   - The tree is listed as exempt under the provisions of the local Council Tree Preservation Order.
   - The tree has a wound or defect that has the potential to become structurally unsound.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g., hedge.

TABLE 1.0 TREE RETENTION VALUE - PRIORITY MATRIX.



Legend for Matrix Assessment

	Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or relocation of building/s should be considered to accommodate the setbacks as detailed in Table 2. Special construction works must be implemented e.g. pier and beam, etc if works are to proceed within the Tree Protection Zone.
	Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however, their retention should remain a priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for Removal (Low) – These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for Removal – These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

Appendix 4a: Levels of Visual Assessment

The following Visual Assessment information is from 'Tree Risk Assessment Manual', published by International Society of Arboriculture (Dunster, et al., 2013).

The level of assessment used in this report is specified in '4.0 Method of Assessment' (Page 4).

LEVEL I: LIMITED VISUAL ASSESSMENT PROCESS

- Identify the location and/or selection criteria of trees to be assessed.
- Determine the most efficient route for assessing large populations of trees and documenting the route taken.
- Assess the tree(s) of concern from the defined perspective (for example, walk-by, drive-by).
- Record information about the tree as specified in the scope of work (for example, significant defects or other conditions of concern), and identify locations of trees that need a higher level of assessment and/or prompt action.
- Evaluate the risk of trees that meet the selection criteria (a risk rating is optional).
- Submit a report indicating risk level and mitigation options and/or recommendations.

LEVEL 2: BASIC ASSESSMENT PROCESS

- Locate and identify the tree or trees to be assessed.
- Determine the targets and target zone for the tree or branches of concern.
- Review site history, conditions, and species failure profile.
- Assess potential loads on the tree and its parts.
- Assess general tree health.
- Inspect the tree visually using binoculars, mallet, probes, or shovels, as desired by the arborist or as specified in the scope of work.
- Record observations of site conditions, defects, and outward signs of possible internal defects and response growth.
- If necessary, recommend an advanced assessment.
- Analyse data to determine the likelihood and consequences of failure in order to evaluate the degree of risk.
- Develop mitigation options and estimate residual risk for each option.
- Develop and submit the report/documentation, including, when appropriate, advice on reinspection intervals.

LEVEL 3: ADVANCED TECHNIQUES

There are many techniques that can be considered for advanced risk assessment. *Some situations may be assessed with several techniques. Advanced assessment techniques include the following:

- Aerial inspection and evaluation of structural defects in branches
  - Visual inspection; Decay testing; Load testing.
- Detailed target analysis
- Detailed site evaluation
- Decay testing
  - Increment boring; Drilling with small-diameter bit; Resistance-recording drilling; Single-path sonic (stress) wave; Sonic tomography; Electrical impedance tomography; Radiation (radar, X-ray, and gamma ray)
- Health evaluation
  - Tree ring analysis (in temperate trees); Shoot length measurement; Detailed health/vigour analysis; Starch assessment
- Storm/wind load analysis
  - Detailed assessment of tree exposure and protection; Computer-based estimations according to engineering standards; Wind reaction monitoring over a defined interval
- Measuring and assessing the change in trunk lean
- Load testing
  - Hand pull; Measured static pull

*Inclusion of specific techniques in this list should not be considered an endorsement of the use of that technique.

Appendix 4b: Visual Tree Assessment

The Visual Tree Assessment (VTA) methods as described in 'The Body Language of Trees. A Handbook for Failure Analysis. Research for Amenity Trees' by Mattheck and Breloer (Mattheck, et al., 1994) is used in association with the International Society of Arboriculture's guidelines in this report.

196 THE BODY LANGUAGE OF TREES

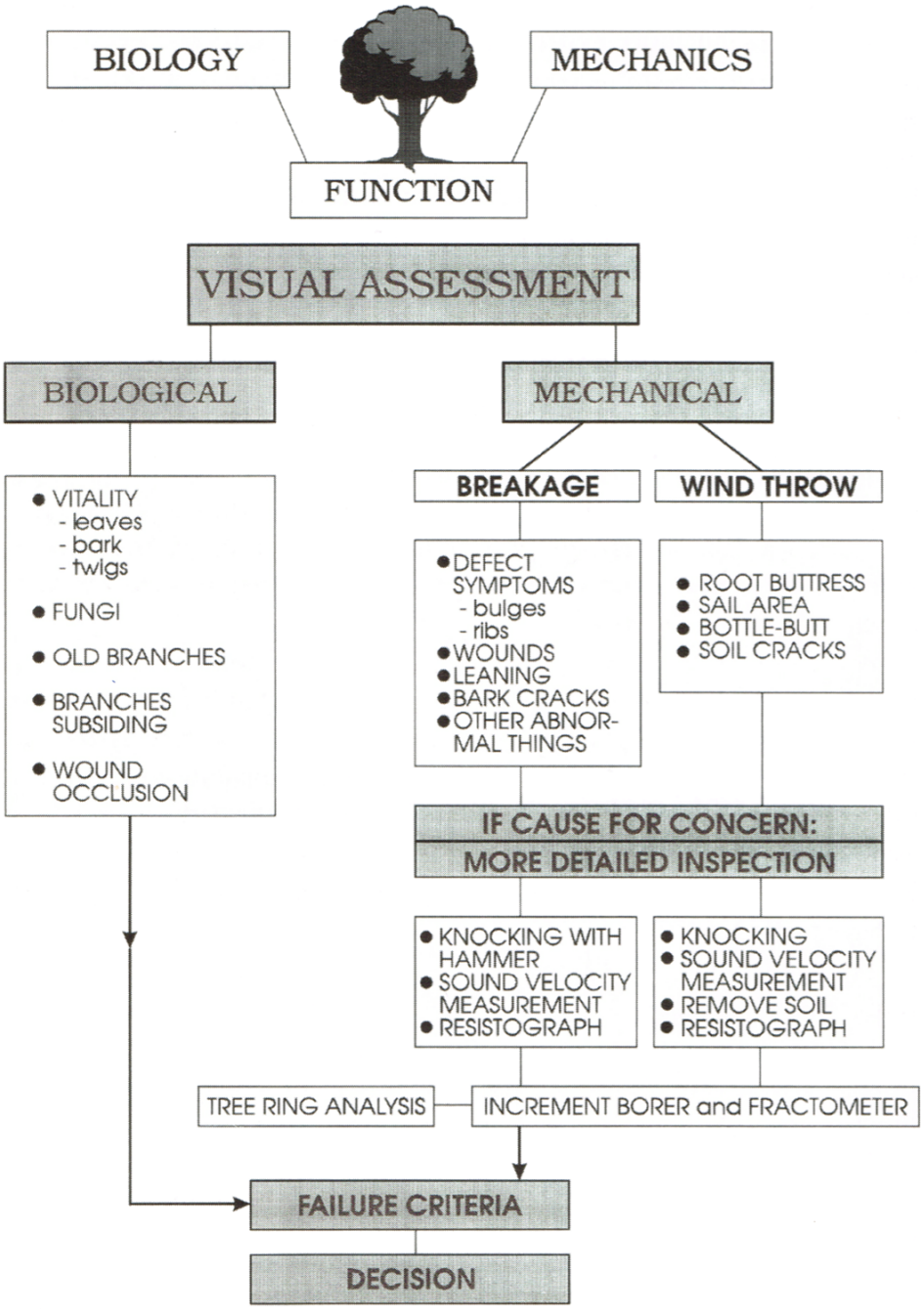


Fig 120. The Visual Tree Assessment (VTA) procedure for assessing trees. As the suspicion increases that defects are present, the examination becomes more thorough and searching.

Appendix 5: Extract from AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 3: Determining the Tree Protection Zones of the Selected Trees, 3.1 Tree Protection Zone (TPZ)

3.1 TREE PROTECTION ZONE (TPZ)

"The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance so that the tree remains viable.

The TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5)."

3.2 DETERMINING THE TPZ

TPZ for Single Trunked Trees

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

TPZ = DBH x 12

TPZ for Multiple Trunked Trees

The radius of the TPZ for multiple-trunked trees is calculated using the following formula:

$\sqrt{(DBH_1)^2+(DBH_2)^2+(DBH_3)^2}$ = total DBH x 12

DBH = trunk diameter measured at 1.4 metres above ground.

Radius is measured from the centre of the stem at ground level.

A TPZ should not be less than 2 metres nor greater than 15 metres (except where crown protection is required).

The TPZ of palms, other monocots, cycads, and tree ferns should not be less than 1 metre outside the crown projection.

AS 4970-2009

Refer to page 14 "FIGURE 2 INDICATIVE TREE PROTECTION ZONE" & page 24 "Appendix A – DIAMETER AT BREAST HEIGHT (DBH) (Informative)" in AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) **for more information.**

Appendix 6: Extract from AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 3: Determining the Protection Zones of the Selected Trees, 3.3.5 Structural Root Zone (SRZ)

3.3.5 Structural root zone (SRZ)

"The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree.

The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed.

There are many factors that affect the size of the SRZ (e.g., tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks and footings. An indicative SRZ radius can be determined from the trunk diameter measured immediately above the root buttress using the following formula. Root investigation may provide more information on the extent of these roots.

SRZ radius = $(D \times 50)^{0.42} \times 0.64$

where

D = trunk diameter, in m, measured above the root buttress.

NOTE: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m."

AS 4970-2009

Refer to page 13 "FIGURE 1 STRUCTURAL ROOT ZONE CALCULATION" in AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) **for more information.**

TABLE 2.0 TPZ AND SRZ TABLE

DBH for TPZ (mm)	DGL for SRZ (mm)	TPZ (m)	SRZ (m)
100	100	2.0	1.5
110	110	2.0	1.5
120	120	2.0	1.5
130	130	2.0	1.5
140	140	2.0	1.5
150	150	2.0	1.5
160	160	2.0	1.5
170	170	2.0	1.6
180	180	2.2	1.6
190	190	2.3	1.7
200	200	2.4	1.7
210	210	2.5	1.7
220	220	2.6	1.8
230	230	2.8	1.8
240	240	2.9	1.8
250	250	3.0	1.9
260	260	3.1	1.9
270	270	3.2	1.9
280	280	3.4	1.9
290	290	3.5	2.0
300	300	3.6	2.0
310	310	3.7	2.0
320	320	3.8	2.1
330	330	4.0	2.1
340	340	4.1	2.1
350	350	4.2	2.1
360	360	4.3	2.1
370	370	4.4	2.2
380	380	4.6	2.2
390	390	4.7	2.2
400	400	4.8	2.3
410	410	4.9	2.3
420	420	5.0	2.3
430	430	5.2	2.3
440	440	5.3	2.3
450	450	5.4	2.4
460	460	5.5	2.4
470	470	5.6	2.4
480	480	5.8	2.4
490	490	5.9	2.5

DBH for TPZ (mm)	DGL for SRZ (mm)	TPZ (m)	SRZ (m)
500	500	6.0	2.5
510	510	6.1	2.5
520	520	6.2	2.5
530	530	6.4	2.5
540	540	6.5	2.6
550	550	6.6	2.6
560	560	6.7	2.6
570	570	6.8	2.6
580	580	7.0	2.6
590	590	7.1	2.7
600	600	7.2	2.7
610	610	7.3	2.7
620	620	7.4	2.7
630	630	7.6	2.7
640	640	7.7	2.7
650	650	7.8	2.8
660	660	7.9	2.8
670	670	8.0	2.8
680	680	8.2	2.8
690	690	8.3	2.8
700	700	8.4	2.9
710	710	8.5	2.9
720	720	8.6	2.9
730	730	8.8	2.9
740	740	8.9	2.9
750	750	9.0	2.9
760	760	9.1	3.0
770	770	9.2	3.0
780	780	9.4	3.0
790	790	9.5	3.0
800	800	9.6	3.0
810	810	9.7	3.0
820	820	9.8	3.0
830	830	10.0	3.1
840	840	10.1	3.1
850	850	10.2	3.1
860	860	10.3	3.1
870	870	10.4	3.1
880	880	10.6	3.1
890	890	10.7	3.2

DBH for TPZ (mm)	DGL for SRZ (mm)	TPZ (m)	SRZ (m)
900	900	10.8	3.2
910	910	10.9	3.2
920	920	11.0	3.2
930	930	11.2	3.2
940	940	11.3	3.2
950	950	11.4	3.2
960	960	11.5	3.3
970	970	11.6	3.3
980	980	11.8	3.3
990	990	11.9	3.3
1000	1000	12.0	3.3
1010	1010	12.1	3.3
1020	1020	12.2	3.3
1030	1030	12.4	3.4
1040	1040	12.5	3.4
1050	1050	12.6	3.4
1060	1060	12.7	3.4
1070	1070	12.8	3.4
1080	1080	13.0	3.4
1090	1090	13.1	3.4
1100	1100	13.2	3.4
1110	1110	13.3	3.5
1120	1120	13.4	3.5
1130	1130	13.6	3.5
1140	1140	13.7	3.5
1150	1150	13.8	3.5
1160	1160	13.9	3.5
1170	1170	14.0	3.5
1180	1180	14.2	3.6
1190	1190	14.3	3.6
1200	1200	14.4	3.6
1210	1210	14.5	3.6
1220	1220	14.6	3.6
1230	1230	14.8	3.6
1240	1240	14.9	3.6
1250	1250	15.0	3.6

Appendix 7: Tree Protection Zones – Standard Procedure

1.0 TREE PROTECTION ZONES - STANDARD PROCEDURE

1.1 The Protective fencing where required may delineate the ***TPZ*** and should be located as determined by the project Arborist either in accordance with the specific Council's guidelines or if no guidelines are given by the Council then using AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 4, 4.3. *"Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the project arborist. The TPZ must be secured to restrict access. AS 4687 Temporary fencing and hoardings specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter, and liquids into the protected area. Fence posts and supports should have a diameter greater than 20mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing."*

Figure 03 Protective fencing shows examples of such fencing.

1.2 AS 4970-2009 Protection of trees on development sites Section 4, Tree protection measures, 4.2 Activities restricted within the TPZ

"Activities generally excluded from the TPZ included but are not limited to-

(a) Machine excavation including trenching;
(b) Excavation for silt fencing;
(c) Cultivation;
(d) Storage;
(e) Preparation of chemicals, including preparation of cement products;
(f) Parking of vehicles and plant;
(g) Refuelling;
(h) Dumping of waste;
(i) Wash down and cleaning of equipment;
(j) Placement of fill;
(k) Lighting of fires;
(l) Soil level changes;
(m) Temporary or permanent installation of utilities and signs, and
(n) Physical damage to the tree."

AS 4970-2009

Refer to page 15 "4.3 PROTECTIVE FENCING" & page 16 "FIGURE 3 PROTECTIVE FENCING" in AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) **for more information.**

1.3 Tree Protection signage is to be attached to each ***Tree Protection Zone*** and displayed from within the development site in accordance with AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 4.4 – see example below.



Example of Tree Protection Zone signage

1.4 Where a tree is to be retained and a ***Tree Protection Zone*** cannot be adequately established due to restricted access e.g. tree located alongside an access way, the trunk and branches in the lower crown will be protected by wrapping 2 layers of hessian or carpet underfelt around the trunk and branches for a minimum of 2 m or as lower branches permit, then wire or rope secures 90x50x2000mm hardwood battens together around the trunk (do not nail or screw to the trunk or branches). The number of battens to be used is as required to encircle the trunk and the planks are to extend to the base of the tree [AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009)]– see example below.



Example of Trunk Armour

1.5 If a tree is growing downslope from an excavation, a silt fence located along the contours of the site in the area immediately above the ***Tree Protection Zone*** fencing may need to be installed and regularly maintained to prevent burial and asphyxiation of the roots of the tree. To allow for the maintenance of both fences, the silt fence must be constructed separately to the tree protection fence and the 2 fences must be constructed independently of each other and standalone. To reduce competition with the tree the area within the ***Tree Protection Zone*** is to be kept free of weeds. These are best removed by the application of foliar herbicide with Glyphosate as the active constituent. This is the preferred method rather than removal by the cultivation of the soil within the dripline, to minimise root disturbance to the tree. The removal of woody weeds such as Privet should use the cut and paint method of herbicide application. Weeds are to be controlled within the ***Tree Protection Zone***, for the duration of the project.

1.6 The area of the Tree Protection Zone to be mulched to a depth of 50mm with the organic material being 75% leaf litter and 25% wood, and this being composted material. The depth of mulch and type as indicated, to be maintained for the duration of the project. Where deep excavation will expose the soil profile to drying out the root plate is to be protected by pegging jute matting across the ground surface 2 m back from the edge of the profile and 2 m down the face of the profile and is to be in one continuous sheet or layers up to 5mm thick and overlapped 300mm and pegged. Pegs are to be a minimum length of 200mm and spaced at 500mm increments in a grid pattern. Once installed mulch is to be placed on top of the jute matting previously described.

1.7 No services either temporary or permanent are to be located within the ***Tree Protection Zone***. If services are to be located within the ***Tree Protection Zone***, special details will need to be provided by a qualified Consulting Arboriculturist for the protection of the tree regarding the location of the service/s. Works within the TPZ should be hand dug or tunnelled.

1.8 A tree will not be fertilised during its protection within the ***Tree Protection Zone***, as this may hasten its decline if it were to decline. If a tree is to be fertilised this should be in consultation with a qualified Consulting Arboriculturist.

1.9 In the event of prolonged dry periods, or where a tree has been transplanted, or where excavation nearby, especially up slope, leads to drying out of a soil profile, or modification to ground water flow, or flows across an existing ground surface to the tree and its growing environment; deep root watering thoroughly at least twice a week is to be undertaken to irrigate the tree. The need for such watering is determined readily by observing the dryness of the soil surface within the dripline of the tree by scraping back some mulch. Mulch is to be reinstated afterwards. In the event of disrupted ground or surface water flows to the tree due to excavation, filling or construction, a reticulated irrigation system may be required to be installed within the ***Tree Protection Zone***. If an irrigation system is to be installed, consideration must be given to volume, frequency, and drainage of water delivered, and this should be in consultation with a qualified Consulting Arboriculturist.

AS 4970-2009
Refer to page 17 "4.5.2 Trunk and branch protection", "4.5.3 Ground protection" & "FIGURE 4 EXAMPLES OF TRUNK, BRANCH AND GROUND PROTECTION" in AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) **for more information.**

Appendix 8: Tree Protection on Construction Sites

1.0 TREE PROTECTION ON CONSTRUCTION SITES

Note: Individual protection measures to be applied where stated as applicable.

1.1.0 General notes
1.2.0 Cautionary notes for the protection of retained trees
1.3.0 Demolition of built structures - precautions to protect trees
1.4.0 Excavation and construction close to Tree Protection Zones

1.1.0 **General notes**

1.1.1 The application of any measures for the Protection of trees on development sites is determined by the species characteristics of the subject tree, and the existing physical constraints of the growing environment on site both above and below ground.

1.1.2 This report considers where applicable, AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009).

1.1.3 This report applies the ***Tree Protection Zone - Standard Procedure*** However, this does not restrict the author from applying additional or alternative conditions where it is deemed appropriate by the author for the Protection of trees on development sites. Such additional or alternative conditions may be founded upon professional judgement based on:

- the experience of the Consulting Arboriculturist
- scientific research
- new technology
- industry best practice
- consideration of the individual tree species and its relative tolerance to development impacts
- the individual or cumulative factors present or proposed to impact upon the growing environment essential for the trees' survival.

1.1.4 Where this report makes reference to the retention of subject trees it is for their incorporation into the landscaping works for the site, and they are to be documented on a Landscape Plan for the site.

1.2.0 **Cautionary notes for the protection of retained trees**

1.2.1 **Installing underground services within TPZ**

If an underground utility service is to be located within the area of the TPZ, AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 4, 4.5.5 Installing underground services within TPZ provides the following:

"All services should be routed outside the TPZ. If underground services must be routed within the TPZ, they should be installed by directional drilling or in manually excavated trenches.

The directional drilling bore should be at least 600mm deep. The project Arborist should assess the likely impacts of boring and bore pits on retained trees.

For manual excavation trenches, the project Arborist should advise on roots to be retained and should monitor the works. Manual excavation may include the use of pneumatic and hydraulic tools. Refer Clause 4.5.3."

1.2.1.1 **Location of services Option B** (Driveway Construction)

If a service is to be located within the area of the dripline of a protected tree or within the Tree Protection Zone, and site conditions such as shallow bedrock or if mass rooting has occurred from multiple trees growing in close proximity to each other, the service trench is to be elevated and positioned above natural ground level within the new driveway structure. The existing driveway surface is to be scabbled and a reinforced concrete topping is to be provided with downturned thickened edges constructed under the kerb edging to prevent lateral movement. A suitable subgrade material to manufacturers' recommendations is to be utilised if and where appropriate. Construction is to occur in a manner so as not to cause damage to the subject tree's root system. All works to be in accordance with engineers' details.

1.2.2 **Precautions in Respect of Temporary Work**

For Precautions in respect of temporary work, AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009), Section 4, Tree protection measures, 4.5 Other tree protection measures, provides the following:

"4.5.3 Ground protection

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards as per Figure 4. These measures may be applied to root zones beyond the TPZ."

4.5.6 Scaffolding

Where scaffolding is required, it should be erected outside the TPZ. Where it is essential for scaffolding to be erected within the TPZ, branch removal should be minimised. This can be achieved by designing scaffolding to avoid branches or tying back branches. The ground below the scaffolding should be protected by boarding (e.g., scaffolding board or plywood sheeting) as shown in Figure 5. Where access is required, a boardwalk or other surface material should be installed to minimise soil compaction. Boarding should be placed over a layer of mulch and impervious sheeting to prevent soil contamination. The boarding should be left in place until the scaffolding is removed."

"Notes:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed, or screwed.

2 Rumble boards should be a suitable thickness to prevent soil compaction and root damage."

AS 4970-2009

Refer to page 19 "FIGURE 5 INDICATIVE SCAFFOLDING WITHIN A TPZ" in AS 4970-2009 Protection of trees on development sites (Australian Standard®, 2009) **for more information.**

1.3.0 **Demolition of Built Structures - Precautions to Protect Trees**

1.3.1 **Demolition of Existing Buildings**

The demolition of the buildings should be undertaken with access restricted to the driveway and the building platform for each of the existing buildings, or to areas of the land where no trees are growing within 6m of any tree to be retained. Where access or space for a safe working environment is restricted, or where the area of the 6m setback must be compromised, a 100mm layer of Eucalyptus wood mulch must be laid over the area of encroachment. Where vehicular access is required across the mulch layer further root protection should be provided by laying a temporary pathway over the mulch. The temporary pathway should be constructed of a grated steel material capable of supporting the vehicles used during demolition e.g., similar to ramps used to load vehicles onto the backs of trucks. Trunks of trees are to be protected from vehicular damage as per section 1.2.2 above.

1.3.2 **Demolition of Landscape Structures**

The demolition of walls, driveways retaining walls, paths, and pools etc. within 6 m of a tree to be retained should be undertaken manually using hand tools. Where a driveway is to be demolished being of concrete strip or slab type construction, it should be undertaken by working from the end of the driveway closest to the building back towards the street by utilising the driveway as a stable platform to prevent soil compaction. Where a concrete slab driveway passes less than 1 m from the base of a tree and the area beneath the driveway is to be undisturbed and incorporated into the landscape works for the site, the volume of space previously occupied by the driveway must be replaced with local top soil from the site or otherwise a loamy sand, to replace the mass of the concrete on the root plate which may be critical to the ballast and centre of mass for the stability of the tree. If the tree becomes unstable immediately contact the Consultant Arboriculturist.

1.3.3 **Removal of Existing Trees near Trees to be Retained**

Removal of a tree within 6 m of a tree to be retained should be undertaken only by cutting down such a tree without damaging the trees to be retained, and by grinding out its stump. Where possible the structural roots of 20mm diameter or greater of the tree to be cut down should not be removed, minimise soil disturbance and reduce the impact on the roots of any tree to be retained nearby. Where structural roots are to be removed this should be undertaken manually by the use of non-motorized hand tools after the stump has been ground out when such roots are often easier to locate from the site of the stump from which they have been severed.

1.4.0 **Excavation and Construction close to Tree Protection Zones**

1.4.0.1 Where structural woody roots with a diameter of 20mm or greater are to be pruned outside the area of the Tree Protection Zone, they are to be excavated manually first by using hand tools to determine their location. A Water knife or Airknife can be used as a mechanised alternative to locate such structural woody roots. Once located those roots to be severed are to be cut cleanly with a final cut to undamaged woody tissue and this will prevent tearing damage to the roots from excavation equipment which can extend beyond the point of excavation back towards the tree.

1.4.0.2 Where a large vigorous tree is to be retained near to a built structure, and dependent upon its taxa, age class and propensity for its roots system to regenerate, it may be prudent to install a root barrier immediately adjacent to the footing of the new building, or to deepen and strengthen the footings themselves to act as a root barrier, but for such structural advice an appropriately qualified chartered structural engineer should be consulted.

1.4.1 **Root Location and Protection where Structures are to be Positioned near a Retained Tree**

1.4.1.1 If walls or a driveway or other structures are to be constructed near a protected tree, careful excavation is to be undertaken manually by using non-motorized hand tools to determine the location of first order and lower order structural roots with a diameter of 20mm (*structural woody roots*) or greater, without damaging them. Boundary walls or fences should use columns or posts within fill panels, or a wall to be constructed with suspended sections 100mm clear above or beside any structural woody root or further as required, or any new wall to be built only to the depth of that existing. Structural woody roots to be further protected by utilising the construction techniques of pier or bridge footings, or screw piles between or over them with a minimum clearance above or beside of 100mm, or further as required to allow for future and on-going growth.

1.4.1.2 Where a driveway or footpath is to pass by the tree a suspended slab is to be constructed or approved similar, to protect the roots that may be encountered at, near, or above ground, and may be constructed on gap graded fill. Where such a driveway or footpath is to be constructed the edge of the structure closest to the tree is to terminate no closer than 0.5 m from the closest edge of trunk, or further depending on the species and its likely further growth to allow for future development and expansion of the trunk, buttresses, and first order and lower order roots as may be advised by a Consultant Arboriculturist. The side of the driveway closest to a tree is to be edged with a concrete kerb of minimum dimensions of 150 x 150mm, to prevent vehicular collision with the trunk. Here a *Water knife* or an *Airknife* can be used as a mechanised alternative to locate first order and lower order structural woody roots.

1.4.1.3 Alternatively a footpath or driveway may be constructed at ground level without any excavation, removing turf by raking, having sprayed with herbicide first if time permits. Here the path or driveway section is to extend for a distance past the tree equivalent to the lateral spread of the crown of that tree alongside the footpath, or driveway.

1.4.1.4 Watering / Gaseous exchange vents are to be installed in the area of the driveway that passes within the dripline of the tree or the prescribed ***Tree Protection Zone*** area and the number and location are to be determined by a Consultant Arboriculturist and the driveway design approved by a Certified Engineer. Exposed edges of the path are to be concealed with the finished level beside the path equivalent to the top of the path by minimal filling with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation, or other landscape treatments as appropriate. (See image below)

1.4.2 **Root Protection where a Driveway close to a Tree is to be Demolished and a New Driveway Constructed in a Similar Location to a Previous Driveway.**

After demolition of an existing driveway as per 1.3.2, the level of the base for the new driveway should be located at the same existing level as that of the base of the previous driveway and should extend for a distance past the tree equivalent to the lateral spread of the crown of that tree alongside the driveway. To prevent excavation from damaging the existing roots which may be located at, near or above the surface of the soil beneath the base of the previous driveway, the new driveway may need to be raised by constructing it on pier or bridge footings between or over them (see 1.4.2 for minimum clearances), or based on a gap graded fill and the driveway constructed with any exposed edges concealed to the top of the driveway by minimal filling with a sandy soil and turf, or mulch, or a garden bed with

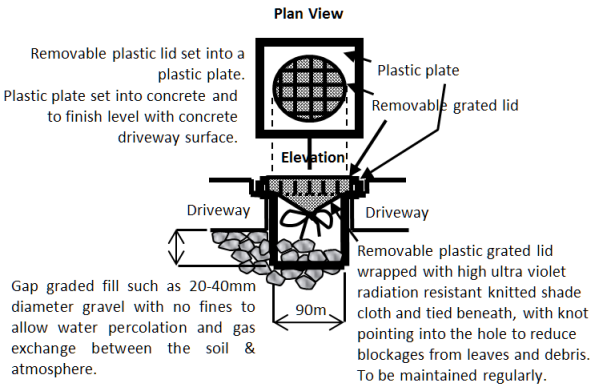
minimal cultivation, or other landscape treatments as appropriate. Where roots have grown to occupy the soil between the concrete strips of a concrete, stone, or brick strip driveway, they and the soil may be excavated to the level of the base of the concrete strips, but where such roots have a diameter of 20mm or greater, a Consulting Arboriculturist should be contacted prior to such works being undertaken. Where roots are to be severed, they are to be cut cleanly with a final cut to undamaged woody tissue.

1.4.3 **Root Protection where a Footpath is to be Constructed close to a Tree.**

1.4.3.1 A footpath may be constructed at ground level without any excavation, by first killing with herbicide the plants to be removed from the pathway area, and then removing that plant material by cutting the trunks of woody shrubs to ground level and by raking all other plant material to expose the topsoil surface without organic matter. This will remove the need for physically disturbing the soil and the roots of the tree. The path section is to extend for a distance past each tree equivalent to the lateral spread of the crown of that tree where it extends alongside the footpath.

1.4.3.2 To prevent excavation from damaging the existing roots which may be located at, near, or above the surface of the soil, a gap graded fill as a fill material of a media as appropriate to a depth of 100mm above the soil surface, or above the top of the root of any tree to be retained, or above the soil surface may be utilised as a base treatment to construct the footpath. Any exposed edges to be concealed to the top of the edges of the footpath and tapering back to the base of the trunk of each tree by minimal filling at each trunk of no greater than 100mm with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation with ground covers, or other landscape treatments as appropriate. A Consultant Arboriculturist should be contacted prior to such works being undertaken or if any structural roots are considered appropriate to be severed being those roots of 20mm diameter or greater.

Irrigation / Gaseous Exchange Vent



NOTE: Such vents can be installed in a grid pattern at 1 per 1 m^2 and their planning and construction utilised in consultation with an appropriate structural or civil engineer.

1.4.4 **Structural Soil to Accommodate Load Bearing Conditions**

A structural soil should only be considered as a new media into which the trees could be planted if the planting was into a new area where the area surrounding was to be load bearing such as a footpath, driveway, or road.

1.4.5 **Gap Graded Fill to Accommodate Compacted Sub Grade and Root Growth**

To further protect woody roots with a diameter of 20mm or greater, a gap graded fill with no fines such as gravel 40mm diameter should only be considered as a fill media above existing grade when soil levels are to be increased near existing trees and the roots can utilise the new media to develop on-going and future root growth and provide for gaseous exchange between the soil and the atmosphere.

Appendix 9: SULE (Safe & Useful Life Expectancy)

There are a number of SULE categories that indicate the safe useful life anticipated for each tree. Factors such as the location, age, condition, and health of the tree are significant to determining this rating. Other influences such as the tree's effect on better specimens and the economics of managing the tree successfully in its location are also relevant to SULE (Barrell, 1993 - 2009).

SULE Categories and Subgroups

1 = Long SULE OF > 40 years

A	**B**	**C**
Structurally sound trees located in positions that can accommodate future growth.	Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery.	Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.

2 = Medium SULE of 15-40 years

A	**B**	**C**	**D**
Trees that may only live between 15 and 40 more years.	Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals.	Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons.	Storm damaged or defective trees that can be made suitable for retention in the medium term by remedial work.

3 = Short SULE of 1-15 years

A	**B**	**C**	**D**
Trees that may only live between 1 and 15 more years.	Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals.	Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons.	Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.

(4) Dead (and Dying)

A	**B**	**C**	**D**	**E**	**F**
Dead trees.	Dying or suppressed and declining trees through disease or inhospitable conditions.	Dangerous trees through instability or recent loss of adjacent trees.	Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form.	Damaged trees that are considered unsafe to retain.	Trees that will become dangerous after removal of other trees for the reasons given in (a) to (e).

The SULE rating given to any tree in this report assumes that reasonable maintenance will be provided by a qualified Arboriculturist (AQF3) using the correct and acknowledged techniques. Retained trees are to be protected from root damage. Incorrect tree work practices can significantly accelerate tree decline and increase hazard potential.

Appendix 10: Glossary

All Glossary items adapted from Dictionary for Managing Trees in Urban Environments, Institute of Australian Consulting Arboriculturists (IACA) 2009. (Draper, et al., 2009), unless otherwise cited.

AGE OF TREES

Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as Young, Mature and Over-mature (British Standard®, 1991) p.13 & (Harris, et al. 2004) p.262.

Young Tree aged less than <20% of life expectancy, in situ.

Mature Tree aged 20-80% of life expectancy, in situ.

Over-mature Tree aged greater than >80% of life expectancy, in situ, or senescent with or without reduced vigour, and declining gradually or rapidly but irreversibly to death.

CONDITION OF TREES

A tree's *crown form* and growth habit, as modified by its *environment* (aspect, suppression by other trees, soils), the *stability* and *viability* of the *root plate*, trunk, and structural branches (first [1st] and possibly second [2nd] order branches), including structural defects such as wounds, cavities or hollows, *crooked* trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with *vigour,* and it is possible for a tree to be of *normal vigour* but in *poor condition*. The condition can be categorised as *Good Condition*, *Fair Condition*, *Poor Condition* and *Dead*.

Good Condition Tree is of good habit, with crown form not severely restricted for space and light, physically free from the adverse effects of predation by pests and diseases, obvious instability, or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent of or contributed to by vigour.

Fair Condition Tree is of good habit or misshapen, a form not severely restricted for space and light, has some physical indication of decline due to the early effects of predation by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the environment essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent of or contributed to by vigour.

Poor Condition Tree is of good habit or misshapen, a form that may be severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal, or bacterial infestation, major die-back in the branch and foliage crown, structural deterioration from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local environment that would normally be sufficient to provide for its basic survival if in good to fair condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and predation by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent of or contributed to by vigour.

Senescent / Moribund The advanced state of decline, dying or nearly dead.

Dead Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms;

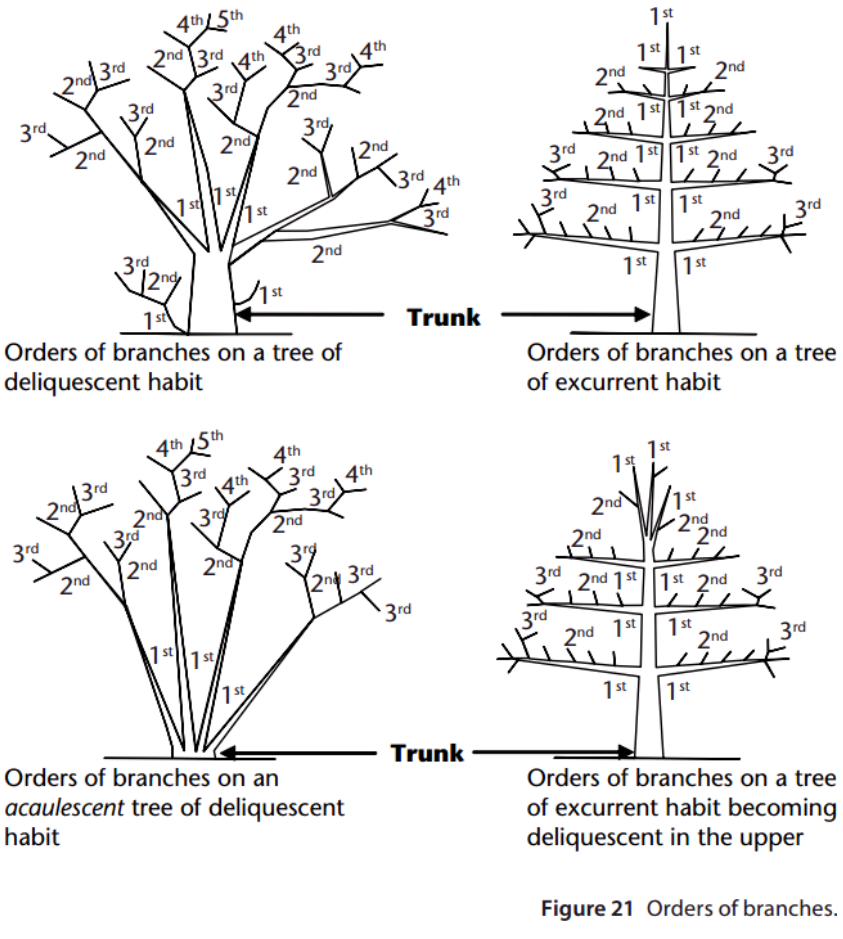
Processes Photosynthesis via its foliage crown (as indicated by the presence of moist, green, or other coloured leaves); Osmosis (the ability of the root system to take up water); Turgidity (the ability of the plant to sustain moisture pressure in its cells); Epicormic shoots or epicormic strands in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a lignotuber);

Symptoms Permanent leaf loss; Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots); Abscission of the epidermis (bark desiccates and peels off to the beginning of the sapwood).

Removed No longer present, or tree not able to be located or having been cut down and retained on a site or having been taken away from a site prior to site inspection.

BRANCH

An elongated woody structure arising initially from the trunk to support leaves, flowers, fruit, and the development of other branches. A branch may itself fork and continue to divide many times as successive orders of branches with the length and taper decreasing incrementally to the outer extremity of the crown. These may develop initially as a gradually tapering continuation of the trunk with minimal division as in a young tree or a tree of excurrent habit, or in a sapling, or may arise where the trunk terminates at or some distance from the root crown, dividing into first order branches to form and support the foliage crown. In an acaulescent tree, branches arise at or near the root crown. Similarly, branches may arise from a sprout mass from damaged roots, branches, or trunk.



Orders of branches on a tree of deliquescent habit

Orders of branches on a tree of excurrent habit

Orders of branches on an *acaulescent* tree of deliquescent habit

Orders of branches on a tree of excurrent habit becoming deliquescent in the upper

Figure 21 Orders of branches.

Orders of Branches The marked divisions between successively smaller branches (James, 2003) p. 168, commencing at the initial division where the trunk terminates on a deliquescent tree or from lateral branches on an excurrent tree. Successive branching is generally characterised by a gradual reduction in branch diameters at each division, and each gradation from the trunk can be categorised numerically, e.g., first order, second order, third order etc. (See Figure 21.)

Branch tear out Dislodging of a branch from its point of attachment where it is torn away from the branch collar snapping the branch tail causing a laceration, usually to the underside of the branch union of the branch or trunk to which it was attached forming a tear out wound.

Sudden branch drop The failure and collapse of live, usually horizontal branches, seemingly without any noticeable cause in calm hot, dry weather conditions generally after rain. Theorised to be caused by altered moisture content in the branch disturbing the longitudinal pre-stressing of the wood that normally helps support the load as formed by reaction wood in branches tending to horizontal (Lonsdale, 1999) p. 30, or incipient failure from the lengthening of existing internal cracks as the wood cools (Shigo, 1986) p. 248, or influenced by branch creep under its own weight and by wind (Mattheck, et al., 1994) p. 126, or fractures to vascular rays if pulled at right angles to their longitudinal orientation forming from subsidence cracks (Mattheck, et al., 1994) p. 169, or a combination of these factors. Such branch breakages usually occur at some distance from the branch collar leaving a stub. See also *Branch tear out*.

Canopy

1. Of multiple trees, the convergence, or merging in full or part, of the crowns of two or more trees due to their proximity, or where competition for light and space available in a forest environment is limited as each tree develops forming a continuous layer of foliage.
2. Used as a plural for the crown.
3. Sometimes synonymously used for the crown (USA).

Crown Of an individual tree all the parts arising above the trunk where it terminates by its division forming branches, e.g., the branches, leaves, flowers, and fruit; or the total amount of foliage supported by the branches. The crown of any tree can be divided vertically into three sections and can be categorised as lower crown, mid crown, and upper crown (Figure 8). For a leaning tree these can be divided evenly into crown sections of one-third from the base to apex. The volume of a crown can be categorised as the inner crown, outer crown, and outer extremity of the crown.

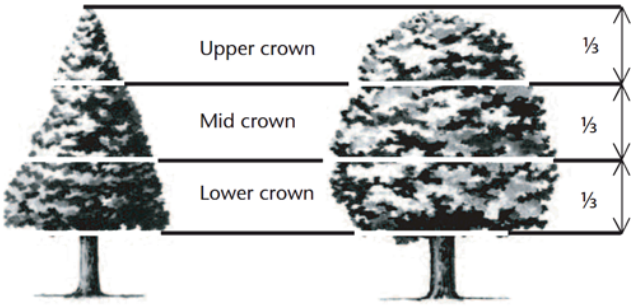


Figure 8 Crown sections.

Lower Crown The proximal or lowest section of a crown when divided vertically into one-third (⅓) increments.

Mid Crown The middle section of a crown when divided vertically into one-third (⅓) increments.

Upper Crown The distal or highest section of a crown when divided vertically into one-third (½) increments.

Crown Projection (CP) Area within the dripline or beneath the lateral extent of the crown (Geiger, 2004) p.2.

Dripline A line formed around the edge of a tree by the lateral extent of the crown. Such a line may be evident on the ground with some trees when exposed soil is displaced by rain shed from the crown.

CROWN FORM OF TREES

The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment. Crown Form may be determined for tree shape and habit generally as Dominant, Codominant, Intermediate, Emergent, Forest and Suppressed. The habit and shape of a crown may also be considered qualitatively and can be categorised as Good Form or Poor Form.

Good Form Tree of typical crown shape and habit with proportions representative of the taxa considering constraints such as origin e.g., indigenous, or exotic but does not appear to have been adversely influenced in its development by environmental factors in situ such as soil water availability, prevailing wind, or cultural practices such as lopping and competition for space and light.

Poor Form Tree of atypical crown shape and habit with proportions not representative of the species considering constraints and appears to have been adversely influenced in its development by environmental factors in situ such as soil water availability, prevailing wind, cultural practices such as lopping and competition for space and light; causing it to be misshapen or disfigured by disease or vandalism.

Crown Form Codominant Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g., constrained by another tree/s or a building.

Crown Form Dominant Crowns of trees generally not restricted for space and light receiving light from above and all sides.

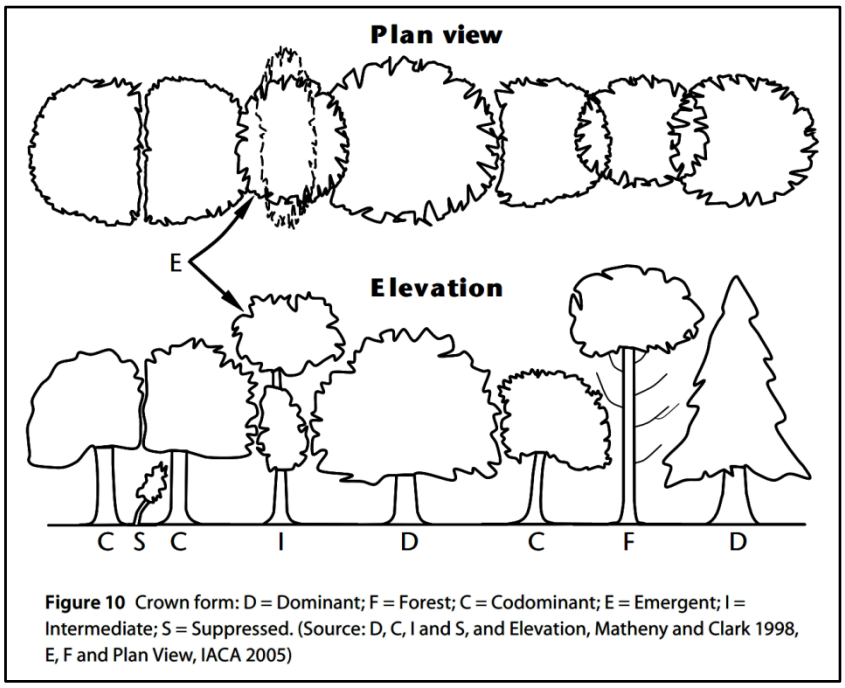


Figure 10 Crown form: D = Dominant; F = Forest; C = Codominant; E = Emergent; I = Intermediate; S = Suppressed. (Source: D, C, I and S, and Elevation, Matheny and Clark 1998, E, F and Plan View, IACA 2005)

Crown Form Emergent Crowns of trees restricted for space on most sides receiving most light from above until the upper crown grows to protrude above the canopy in a stand or forest environment. Such trees may be crown form dominant or transitional from crown form intermediate to crown form forest asserting both apical dominance and axillary dominance once free of constraints for space and light.

Crown Form Forest Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight, and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point other first order branches arising radially with each inferior and usually temporary, divergent, and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the lower crown.

Crown Form Intermediate Crowns of trees restricted for space on most sides with light primarily from above and on some sides only.

Crown Form Suppressed Crowns of trees generally not restricted for space but restricted for light by being overtopped by other trees and occupying an understorey position in the canopy and growing slowly.

DEADWOOD

Dead branches within a tree's crown and considered quantitatively as separate to crown cover and can be categorised as Small Deadwood and Large Deadwood according to diameter, length, and subsequent risk potential. The amount of dead branches on a tree can be categorised as Low Volume Deadwood, Medium Volume Deadwood and High-Volume Deadwood. See also Dieback.

Deadwooding Removing of dead branches by pruning. Such pruning may assist in the prevention of the spread of decay from dieback or for reasons of safety near an identifiable target.

Small Deadwood - dw A dead branch up to 10mm diameter and usually <2 metres long, generally considered of low-risk potential.

Large Deadwood - DW A dead branch >10mm diameter and usually >2 metres long, generally considered of high-risk potential.

DIEBACK

The death of some areas of the crown. Symptoms are leaf drop, bare twigs, dead branches, and tree death, respectively. This can be caused by root damage, root disease, bacterial or fungal canker, severe bark damage, intensive grazing by insects, abrupt changes in growth conditions, drought, water-logging or over-maturity. Dieback often implies reduced resistance, stress or decline which may be temporary. Dieback can be categorised as Low Volume Dieback, Medium Volume Dieback and
High Volume Dieback.

High Volume Dieback Where >50% of the crown cover has died.

Medium Volume Dieback Where 10-50% of the crown cover has died.

Low Volume Dieback Where <10% of the crown cover has died. See also Dieback, High Volume Dieback and Medium Volume Dieback.

EPICORMIC SHOOTS

Juvenile shoots produced at branches or trunk from epicormic strands in some Eucalypts (Burrows, 2002) pp. 111-131, or sprouts produced from dormant or latent buds concealed beneath the bark in some trees. Production can be triggered by fire, pruning, wounding, or root damage but may also be as a result of stress or decline. Epicormic shoots can be categorised as Low Volume Epicormic Shoots, Medium Volume Epicormic Shoots and High Volume Epicormic Shoots.

High Volume Epicormic Shoots Where >50% of the crown cover is comprised of live epicormic shoots.

Medium Volume Epicormic Shoots Where 10-50% of the crown cover is comprised of live epicormic shoots.

Low Volume Epicormic Shoots Where <10% of the crown cover is comprised of live epicormic shoots.

GENERAL TERMS

Cavity A usually shallow void often localised initiated by a wound and subsequent decay within the trunk, branches, or roots, or beneath bark, and may be enclosed or have one or more opening.

Decay The process of degradation of wood by microorganisms (Australian Standard®, 2007) p. 6, and fungus.

Hazard The threat of danger to people or property from a tree or tree part resulting from changes in the physical condition, growing environment, or existing physical attributes of the tree, e.g., included bark, soil erosion, or thorns or poisonous parts, respectively.

Included Bark The bark on the inner side of the branch union or is within a concave crotch that is unable to be lost from the tree and accumulates or is trapped by acutely divergent branches forming a compression fork. The growth of bark at the interface of two or more branches on the inner side of a branch union or in the crotch where each branch forms a branch collar, and the collars roll past one another without forming a graft where no one collar is able to subsume the other. The risk of failure is worsened in some taxa where branching is acutely divergent or acutely convergent and ascending or erect.

Hollow A large void initiated by a wound forming a cavity in the trunk, branches or roots and usually increased over time by decay or other contributing factors, e.g., fire, or fauna such as birds or insects e.g., ants or termites. A hollow can be categorised as an Ascending Hollow or a Descending Hollow.

Kino The extractive polyphenols (tannins) formed in veins in the cambial zone as a defence in response to wounding in eucalypts. Often visible as an exudate when the kino veins rupture or are injured (Boland, et al., 2006) p. 691.

Occupancy Rating The frequency of use of a likely target and possibility that people will be present when tree failure or collapse occurs.

Risk The random or potentially foreseeable possibility of an episode causing harm or damage.

Significant Important, weighty, or more than ordinary.

Significant Tree A tree considered important, weighty, or more than ordinary. Example: due to prominence of location, or in situ, or contribution as a component of the overall landscape for amenity or aesthetic qualities, or curtilage to structures, or importance due to uniqueness of taxa for species, subspecies, variety, crown form, or as an historical or cultural planting, or for age, or substantial dimensions, or habit, or as remnant vegetation, or habitat potential, or a rare or threatened species, or uncommon in cultivation, or of aboriginal cultural importance, or is a commemorative planting.

Structural Root Zone (SRZ) The minimum radial distance around the base of a tree and its root plate required for its stability in the ground against windthrow and applied only to trees with a circular root plate (Mattheck, et al., 1994) pp. 77-87.

Stag-headed Protruding dead branches above the live foliage of the crown as a result of dieback.

Substantial A tree with large dimensions or proportions in relation to its place in the landscape.

Sustainable Retention Index Value (SRIV) A visual tree assessment method to determine a qualitative and numerical rating for the viability of urban trees for development sites and management purposes, based on general tree and landscape assessment criteria using classes of age, condition and vigour. SRIV is for the professional manager of urban trees to consider the tree in situ with an assumed knowledge of the taxon and its growing environment. It is based on the physical attributes of the tree and its response to its environment considering its position in a matrix for age class, vigour class, condition class and its sustainable retention with regard to the safety of people or damage to property. This also factors the ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement. SRIV is supplementary to the decision made by a tree management professional as to whether a tree is retained or removed (IACA).

Target People or property likely to be harmed or damaged, respectively, by being struck by a failed or collapsed tree in full or part.

Tree Protection Zone (TPZ) A combination of the root protection zone (RPZ) and crown protection zone (CPZ) as an area around a tree set aside for the protection of a tree and a sufficient proportion of its growing environment above and below ground established prior to demolition or construction and maintained until the completion of works to allow for its viable retention including stability.

Visual Tree Assessment (VTA) A visual inspection of a tree from the ground based on the principle that, when a tree exhibits apparently superfluous material in its shape, this represents repair structures to rectify defects or to reinforce weak areas in accordance with the Axiom of Uniform Stress (Mattheck, et al., 1994) pp. 12-13, 145). Such assessments should only be undertaken by suitably competent practitioners.

LEANING TREES

A tree where the trunk grows or moves away from upright. A lean may occur anywhere along the trunk influenced by a number of contributing factors e.g., genetically predetermined characteristics, competition for space or light, prevailing winds, aspect, slope, or other factors. A leaning tree may maintain a static lean or display an increasingly progressive lean over time and may be hazardous and prone to failure and collapse. The degrees of leaning can be categorised as Slightly Leaning, Moderately Leaning, Severely Leaning and Critically Leaning.

Slightly Leaning A leaning tree where the trunk is growing at an angle within 0°-15° from upright. - Low Risk.

Moderately Leaning A leaning tree where the trunk is growing at an angle within 15°-30° from upright. - Medium Risk.

Severely Leaning A leaning tree where the trunk is growing at an angle within 30°-45° from upright. - High Risk.

Critically Leaning A leaning tree where the trunk is growing at an angle greater than >45° from upright. - Very High Risk.

Progressively Leaning A tree where the degree of leaning appears to be increasing over time. - Lodging.

Static Leaning A leaning tree whose lean appears to have stabilised over time.

SYMMETRY

Balance within a crown, or root plate, above or below the axis of the trunk of branch and foliage, and root distribution respectively and can be categorised as Asymmetrical and Symmetrical.

Asymmetrical Imbalance within a crown, where there is an uneven distribution of branches and the foliage crown or root plate around the vertical axis of the trunk. This may be due to Crown Form Codominant or Crown Form Suppressed as a result of natural restrictions e.g., from buildings, or from competition for space and light with other trees, or from exposure to the wind, or artificially caused by pruning for clearance of roads, buildings or power lines. An example of an expression of this may be, crown asymmetrical, bias to the west.

Symmetrical Balance within a crown, where there is an even distribution of branches and the foliage crown around the vertical axis of the trunk. This usually applies to trees of Crown Form Dominant or Crown Form Forest. An example of an expression of this may be crown symmetrical.

ROOTS

First Order Roots (FOR) Initial woody roots arising from the root crown at the base of the trunk, or as an adventitious root mass for structural support and stability. Woody roots may be buttressed and divided as a marked gradation, gradually tapering and continuous or tapering rapidly at a short distance from the root crown. Depending on soil type these roots may descend initially and not be evident at the root crown or become buried by changes in soil levels. Trees may develop 4-11 (Perry, 1982) pp. 197- 221, or more first order roots which may radiate from the trunk with a relatively even distribution, or be prominent on a particular aspect, dependent upon physical characteristics e.g., leaning trunk, asymmetrical crown, and constraints within the growing environment from topography e.g., slope, soil depth, rocky outcrops, exposure to predominant wind, soil moisture, depth of water table etc.

Orders of Roots The marked divisions between woody roots, commencing at the initial division from the base of the trunk, at the root crown where successive branching is generally characterised by a gradual reduction in root diameters and each gradation from the trunk and can be categorized numerically, e.g., first order roots, second order roots, third order roots etc. Roots may not always be evident at the root crown, and this may be dependent on species, age class and the growing environment. Palms at maturity may form an adventitious root mass.

Root Plate The entire root system of a tree generally occupying the top 300-600mm of soil including roots at or above ground and may extend laterally for distances exceeding twice the height of the tree (Perry, 1982) pp. 197-221. Development and extent is dependent on water availability, soil type, soil depth and the physical characteristics of the surrounding landscape.

Root Crown Roots arising at the base of a trunk.

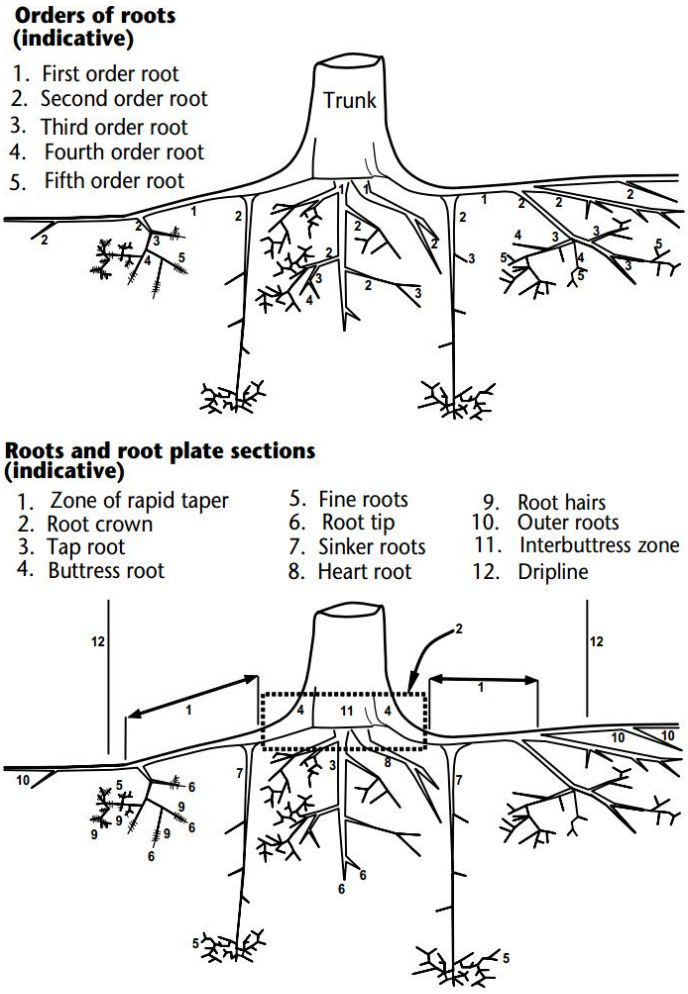


Figure 22 Orders of roots.

Zone of Rapid Taper The area in the root plate where the diameter of structural roots reduces substantially over a short distance from the trunk. Considered to be the minimum radial distance to provide structural support and root plate stability. See also Structural Root Zone (SRZ).

Structural Roots Roots supporting the infrastructure of the root plate providing strength and stability to the tree. Such roots may taper rapidly at short distances from the root crown or become large and woody as with gymnosperms and dicotyledonous angiosperms and are usually 1st and 2nd order roots form an adventitious root mass in monocotyledonous angiosperms (palms). Such roots may be crossed and grafted and are usually contained within the area of crown projection or extend just beyond the dripline.

TRUNK

A single stem extending from the root crown to support or elevate the crown, terminating where it divides into separate stems forming first order branches. A trunk may be evident at or near the ground or be absent in acaulescent trees of deliquescent habit or may be continuous in trees of excurrent habit. The trunk of any caulescent tree can be divided vertically into three (3) sections and can be categorised as Lower Trunk, Mid Trunk and Upper Trunk. For a leaning tree, these may be divided evenly into sections of one-third along the trunk (Figure 28).

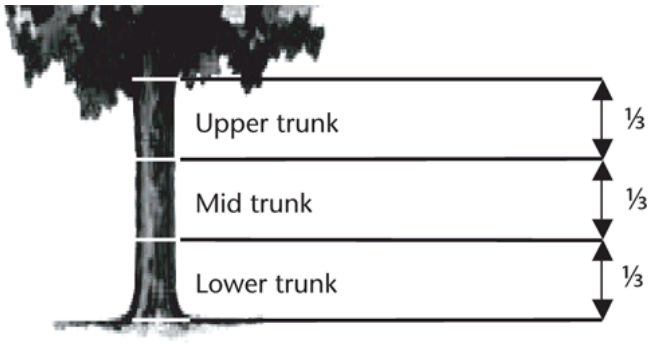


Figure 28 Trunk sections.

Co-Dominant Equal in size and relative importance, usually associated with either trunk/stems or scaffold limbs/branches in the crown; in the context of crown class, trees whose crowns form the bulk of the upper layer of the canopy but which are crowded by adjacent trees (Matheny, et al., 1994).

Diameter at Breast Height (DBH) Measurement of trunk width calculated at a given distance above ground from the base of the tree often measured at 1.4 m. The trunk of a tree is usually not a circle when viewed in cross section, due to the presence of reaction wood or adaptive wood, therefore an average diameter is determined with a diameter tape or by recording the trunk along its narrowest and widest axis, adding the two dimensions together and dividing them by 2 to record an average and allowing the orientation of the longest axis of the trunk to also be recorded. Where a tree is growing on a lean the distance along the top of the trunk is measured to 1.4m and the diameter then recorded from that point perpendicular to the edge of the trunk. Where a leaning trunk is crooked a vertical distance of 1.4m is measured from the ground. Where a tree branches from a trunk that is less than 1.4m above ground, the trunk diameter is recorded perpendicular to the length of the trunk from the point immediately below the base of the flange of the branch collar extending the furthest down the trunk, and the distance of this point above ground recorded as trunk length. Where a tree is located on sloping ground the DBH should be measured at halfway along the side of the tree to average out the angle of slope. Where a tree is acaulescent or trunkless branching at or near ground an average diameter is determined by recording the radial extent of the trunk at or near the ground and noting where the measurement was recorded e.g., at ground.

Dominant One of four types of crown class; tree whose crown extends above the height of nearby trees in the stand, receiving light from above and he side

Leader The topmost portion of the tree trunk (stem) that is able to grow more than the laterals below. (Harris, et al. 2004).

VIGOUR

The ability of a tree to sustain its life processes. This is independent of the condition of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g., dormant, deciduous, or semi-deciduous trees. Vigour can be categorised as Normal Vigour, High Vigour, Low Vigour and Dormant Tree Vigour.

Normal Vigour The ability of a tree to maintain and sustain its life processes. This may be evident by the typical growth of leaves, crown cover and crown density, branches, roots and trunk and resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

High Vigour Accelerated growth of a tree due to incidental or deliberate artificial changes to its growing environment that are seemingly beneficial, but may result in premature aging or failure if the favourable conditions cease, or promote prolonged senescence if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feedlot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous pollarding practices over the life of the tree.

Low Vigour Reduced ability of a tree to sustain its life processes. This may be evident by the atypical growth of leaves, reduced crown cover and reduced crown density, branches, roots and trunk, and a deterioration of their functions with reduced resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

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Appendix 11: Curriculum Vitae

U W S (Hawkesbury)	Graduate Diploma in Horticulture (AQF8) Diploma in Horticulture (AQF5)
Hortus Australia	Diploma of Arboriculture (AQF5) (RTF50203-6522-6/12/2005)
Ryde School of Horticulture	Tree Surgery Arboriculture Techniques
Central Coast Community College	Excel Module 1 and 2 Excel – Advanced
Workcover	OHS General Induction for Construction Work in NSW (CGI00871464SEQ1) St Johns Ambulance First Aid Certificate

CONFERENCE ATTENDANCE & TRAINING

2016	IACA Root Mapping Seminar - Ryde TAFE IACA Report Writing Seminar - Ryde TAFE IML Resistograph® Users Course - Belmont TAFE
2015	Quantified Tree Risk Assessment System - Estimating Probability of Failure Aboriginal Scar Trees: Significance Conservation and Management of Veteran Eucalypts in the Landscape - Griffith University
2012	Australian Institute of Horticulture Inc. - 'Don Burke Field Day' Professional Development Workshop
2011	Institute of Australian Consulting Arboriculturists (IACA) AS 4970 Forum Ecological Consultants Association of NSW - Impacts of Invasive Species
2010	Root Barrier Field Day
2009	Matheny & Clark: Arboriculture
2008	Quantified Tree Risk Assessment System - Principals and Application
2007	Quantified Tree Risk Assessment System - Principals and Application Quantified Tree Risk Assessment System - A Practitioners Guide to Visual Tree Assessment
2006	Barrell Tree A-Z 2 Day Workshop IML Resistograph® F500S Training Course
2005	Urban Tree Forum – Sydney City Council Urban Tree Risk Management – Treelogic DA Workshop Preparing Development Applications for Local Council –AIH Urban Forest – The New Imperative – Parks and Leisure Australia
2004	Visual Tree Assessment Workshop – Professor Doctor Claus Mattheck
2003	Urban Trees - Our Urban Urgency – Parks and Leisure Australia
1999	Tree Hazard Assessment – Parramatta Park – NAAA
1990	Aero Advanced Climbers Seminar NSW

INDUSTRY BACKGROUND

20th June 2001 to present	*Proprietor* **Advanced Treescape Consulting** (Formerly known as RJK Consulting)
2002 - 2005	*Part Time Horticulturist* **Acorn/Bushlands Nursery/Aquarium Centre, Erina Heights**
1997 to present	*Consultant* **Horticulturist**
1997 to present	*Public Speaker* **Horticulturist/Arboriculturist Topics**
1997 - 2001	*Part Time Horticulturist* **Flower Power, Glenhaven**
1991 - 1995	*Proprietor* **KAC Peninsula Firewood** Assembled team to clear backlog of firewood
1990 - 1996	*Proprietor/Climber* **Kingdom's Arbor Care** (until its sale)
1986 - 1990	*Tree Worker* **Arbor 2000 Pro-Climb, Sydney**
1972 to present	*Bonsai enthusiast*

BUSINESS ACHIEVEMENT

Finalist in Central Coast Advocate Community Business Awards 2005 for Specialised Business category.

MEMBERSHIPS

- Institute of Australian Consulting Arboriculturists
- Australian Institute of Horticulture
- Arboriculture Australia
- Gosford City Council Tree Protection Committee - Committee Member - August 1998 to June 2004.

Disclaimer

The author and Advanced Treescape Consulting take no responsibility for actions taken and their consequence if contrary to those expert and professional instructions are given as recommendations pertaining to safety. The conclusions and recommendations contained in this report refer to the tree(s) condition on the inspection day. All care has been taken using the most up to date Arboricultural information in the preparation of this report. The report is based on a visual inspection only. Tree health and environmental conditions can change irreversibly at any time due to unforeseen circumstances or events. Due to *Myrtaceae* family hybridisation, some tree species are difficult to accurately identify. Unless trees are in full flower identification is only probable.

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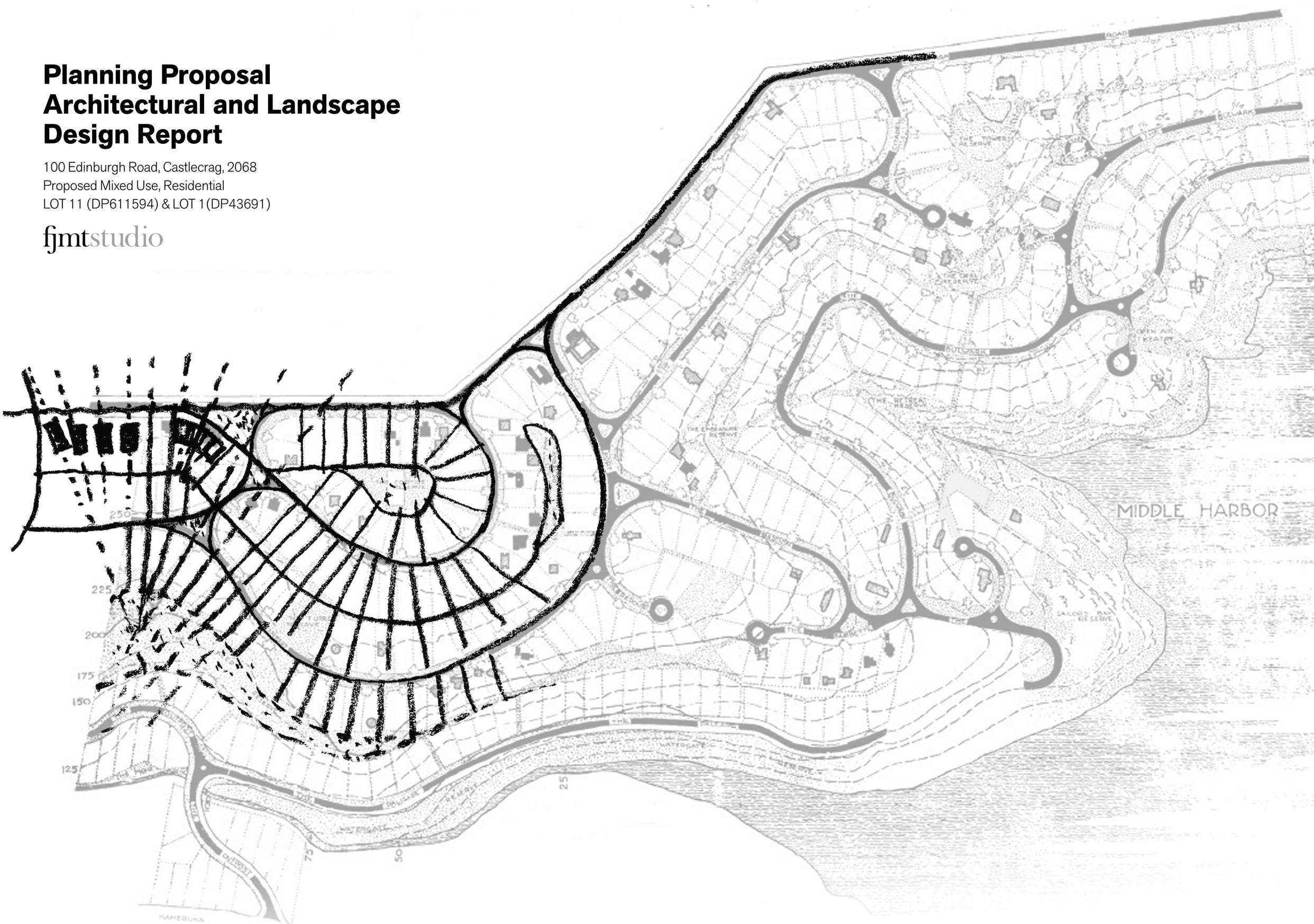
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Planning Proposal
Architectural and Landscape Design Report

100 Edinburgh Road, Castlecrag, 2068
Proposed Mixed Use, Residential
LOT 11 (DP611594) & LOT 1(DP43691)

fjmtstudio



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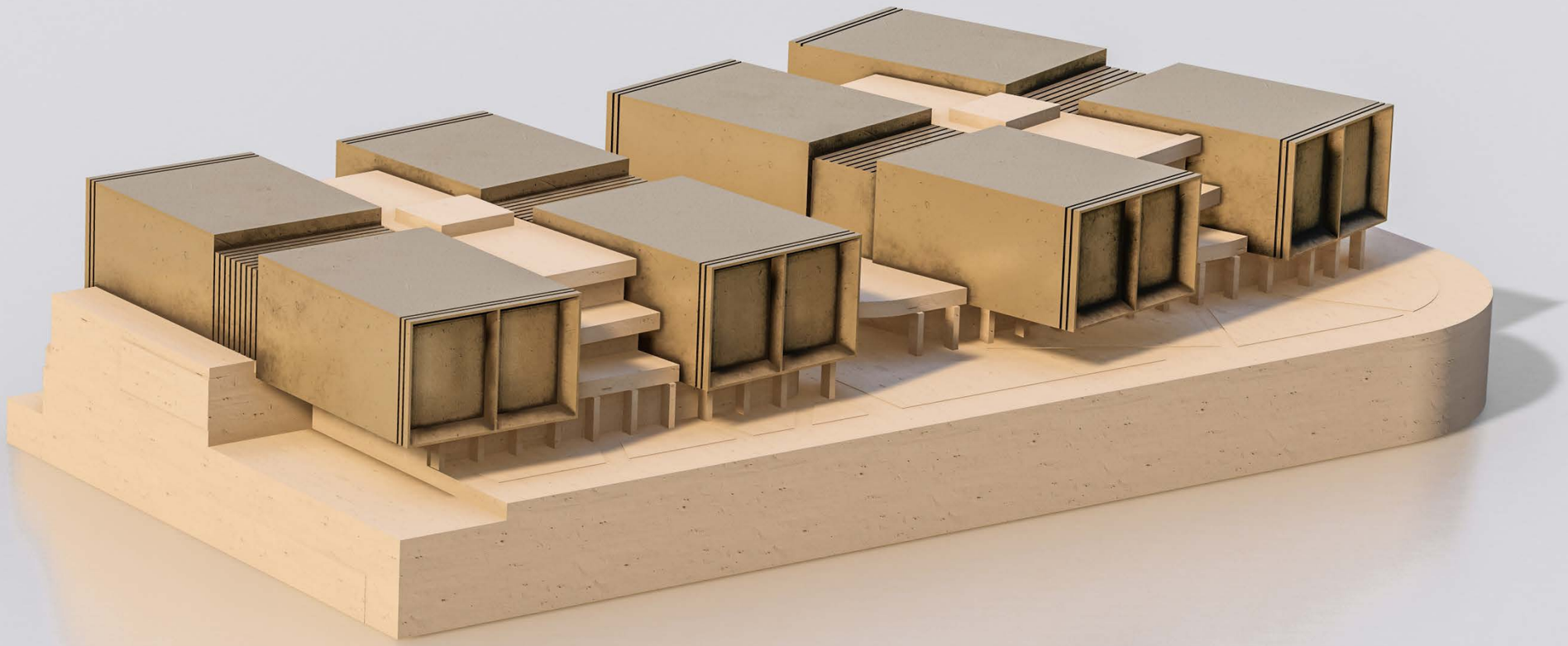
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Project Name	100 Edinburgh Road, Castlecrag - Residential | Mixed Use		
Project Code	GQC		
Document Name	Planning Proposal : Architectural and Landscape Design Statement		
Document ID	200625_100 Edinburgh Road _ Architectural +Landscape Design Report		
	Date	Comment	Approved
1	21/08/21	For Client Approval	DN
2	26/08/21	Submission	DN
3			
4			



Executive Summary

This report has been prepared by FJMT on behalf of the proponents; Greencliff Castlecrag Pty Ltd - for No 100 Edinburgh Road, Castlecrag. The aim of this report, and the planning proposal it supports, is to give reason to the proposed increase in density for the site.

The current controls of the Willoughby Local Environmental Plan 2012 (WLEP2012) allows for a development complying with The following:
Land Zoning: B1 - Neighbourhood Centre
Floor space ratio of -1.0:1
Height of building - 9.0m

In late 2019, Willoughby council released a draft strategy for eight (8) local centres across their local government area. *"The draft Willoughby Local Centres Strategy aims to promote a network of thriving, attractive and distinctive neighbourhoods throughout the Council Area.*

It provides the framework for future planning controls and public domain improvements for 8 local centres, with Willoughby South which was added to the original 7 centres as a result of community feedback, to prepare them for growth and renewal over the next 20 years."

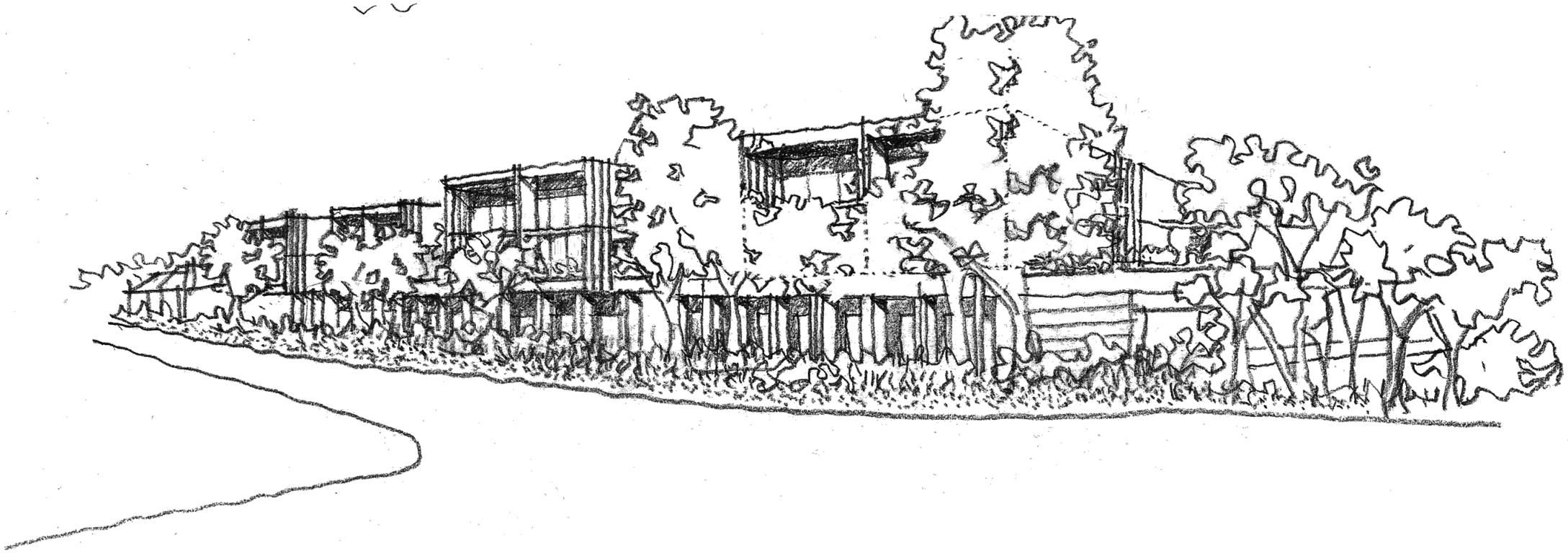
The WLCS2036 sought to provide greater density, whilst engaging in community consultation. The resultant draft saw an uplift in density on the subject site. The uplift however has not yet been developed as a Draft Local Environment Plan, or Development Control Plans and can therefore not be drawn upon as an assessment document.

This report aims to present a case for a marginal uplift in density from the current LEP provisions and aligns with the intet of the the Draft WLCS2036 to support an urban renewal project with the community at the core of its response.

The proposed amendments to planning controls will enable the redevelopment of the site. This will in-turn provide a diversity of housing types and sizes with improved efficient urban forms appropriately scaled to the local town centre.

The proposal is deeply imedded in the history of the immediate context and acknowledges the important history of the Walter Burley Griffin and Marion Mahony Grifiin.

The proposal presents clear public benefits. The delivery of a north facing public open space is at the core of the proposal. The space is supplement by publicly accessible pedestrian linkages, and will rejuvenate a local shopping village that has come to the end of its commercially viable life.



Previous Submissions

In June 2020 the proponents, Greencliff Castlecrag Pty Ltd - for No 100 Edinburgh Road, Castlecrag submitted a planning proposal that sought to increase the Willoughby Local Environment Plan (WLEP2012) that would only allow a development complying with The following:
Land Zoning: B1 - Neighbourhood Centre
Floor space ratio of -1.0:1
Height of building - 9.0m

The proposal also sought an increase to the recently exhibited Willoughby Local Centres Strategy 2036 (WLCS2036)

The general provisions of the WLCS2036 outlined below:

- *Increase heights up to 4 storeys on Eastern Valley Way and up to 3 storeys above Edinburgh Road*
- *An FSR up to 1.6:1 on the Quadrangle site. An FSR could be considered to 1.8:1 with an additional storey below*
- *the Edinburgh Road frontage to utilise the topography of the site without adversely impacting the streetscape and scale of the centre.*
- *Provide a new publicly accessible open space within the Quadrangle site relating to the Edinburgh Rd frontage and achieving good solar access.*

The previous planning proposal sought approval for a part 3/ part 4 storey building comprising and FSR of 2.0:1 - a deviation from the Local Centres Strategy.

The proposal was referred to Sydney North Planning Panel for Gateway determination as the council failed to indicate its support 90 days after the proponent submitted the application

The proposal was subsequently refused as it was deemed to fall outside of the strategic merit test. The determination ultimately determined that the building heights, bulk and scale of the building should be consistent with the local centers strategy.





Previous Proposal Key Figures	
Storeys	3 & 4 Storeys above Edinburgh Road
FSR	2.0:1
Apartments	67
Gross Floor Area	10332m^2
Public Open Space	1350m^2

Current Proposal

The proponents for the site submission, Greencliff Castlecrag Pty Ltd have heavily engaged with both WIlloughby Council, aswell as the community to appease some of the concerns raised in regards to the previous submission.

The proponents have conceded their initial vision for the site in order to accommodate and respect the setting in which they wish to deliver a quility, site specific response.

The current proposal draws upon the architectural inspiration which underpins design excellence competition winning scheme, but ultimately ensures that the current proposal is aligned with the Willoughby Local centres strategy 2036 (WLCS2036)

The current proposal is:

- *3 storeys above Edinburgh Road*
- *A total FSR of 1.8:1*
- *Mixed use, with residential apartments, retail, and a supermarket that caters for the wider community*
- *Carparking for the retail offering, private car spaces as well as 8 car-parks dedicated via VPA*
- *Delivers a north-facing publicly accessible open space of up to 1150m2 fronting Edinburgh Road*
- *A direct pedestrian through site links from the Quadrangle site to the The Postern*
- *Retention of the mature trees at the front and rear of the site.*





Current Proposal Key Figures	
Storeys	3 Storeys above Edinburgh Road - 11m as per WLCS2036
FSR	1:8:1 - comprising less than 1.6:1 above Edinburgh Road
Apartments	53
Gross Floor Area	9300m^2
Public Open Space	1150m^2

Character and Place

A Draft Local Centres Strategy 2036 was released by Willoughby council in 2019. The strategy documents characterise Castlecrag as a shopping village with a unique character, having a strong reference to the original subdivision penned by Walter Burley Griffin and Marion Mahony Griffin.

The Draft WLC2036 summarises the character and place of the Castlecrag Study are as follows:

" The subdivision and layout of Castlecrag was designed by Walter Burley Griffin and the south eastern side-of the center is within the Griffin Conservation Area. The centre sits on a ridge-line with views to the south.
Castlecrag has a predominantly one to two storey built form character with a fine grain street frontage. The built form has a strong heritage character, referencing the original vision for Castlecrag and the existing Griffin Conservation area.

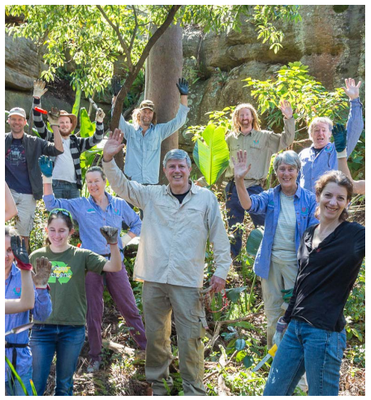
The centre offers north-facing cafes and associated outdoor dining, complemented by retractable awnings on the southern side of the street and consistent fixed awnings to the north."



Source: Draft WLCS2036

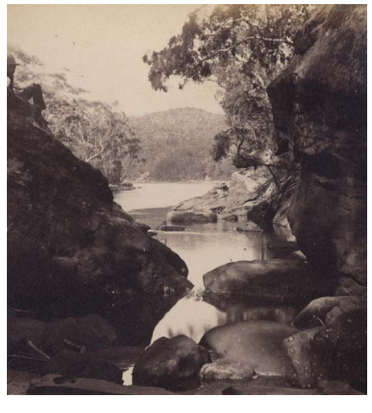














The Site

The proposed development is located within the Northern Sydney city of Willoughby, approximately 8.5km North of the Sydney CBD. Willoughby falls under the governance of the Willoughby City Council. The majority of the Municipality is Residential with the subject site within close proximity to the busy centres of St Leonards, Chatswood and North Sydney CBD.

One of the council's immediate strategic direction is an increase in housing, to meet the growing population demand in an area close to public transport corridors and facilities and major urban centres.

The draft Willoughby Local Centres Strategy 2036 aims to promote a network of thriving, attractive and distinctive village centres throughout the Council area. When finalised it will provide the framework for future planning controls and public domain improvements

The site falls within the study area for Castlecrag (dashed red) and is in an ideal location for higher density to meet the anticipated urban strategy targets of the state and Willoughby City Council.

The site is not listed as a heritage item or located within a Conservation Area identified by the WLEP 2012. The site, however, adjoins the Griffin Heritage Conservation Area as it is defined by The WLEP 2012 and lies within the vicinity of the Community Centre, No. 10 The Postern, Castlecrag, listed by Schedule 5 Part 1 of this plan. *(refer to Heritage Impact Statement prepared by Weir Phillips Heritage and Planning)*



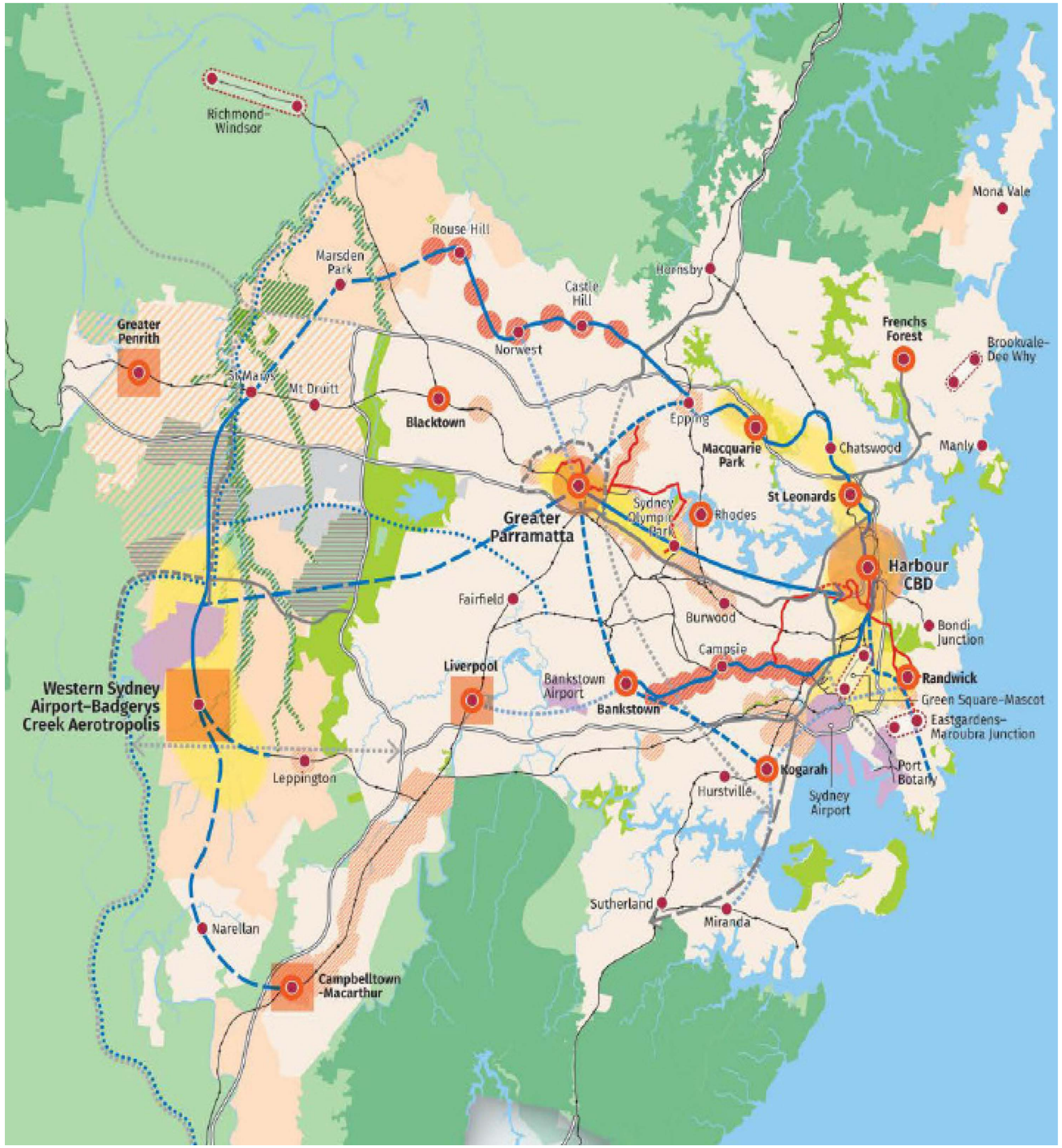
The Greater Sydney Region Plan

The Greater Sydney Region Plan reveals a vision of three cities where most residents live within 30 minutes of their jobs, education and health facilities, services and great places.

This is consistent with the 10 Directions in Directions for a Greater Sydney which establish the aspirations for the region over the next 40 years and are a core component of the vision and a measure of the Plan's performance.

Particularly, the plan outlines the expected demands for housing and employment in relation to population growth . And, in turn, identifies over arching development strategies to support the above projections.

According to the plan, by 2056 there will be an additional 1.5 million people across Sydney metropolitan area, with a requirement for "725,00 new homes and 817,00 new jobs."



Northern District Plan

This North District Plan is a 20-year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year vision for Greater Sydney. It is a guide for implementing the Greater Sydney Region Plan, A Metropolis of Three Cities, at a district level and is a bridge between regional and local planning.

The District Plan informs local strategic planning statements and local environmental plans, the assessment of planning proposals as well as community strategic plans and policies.

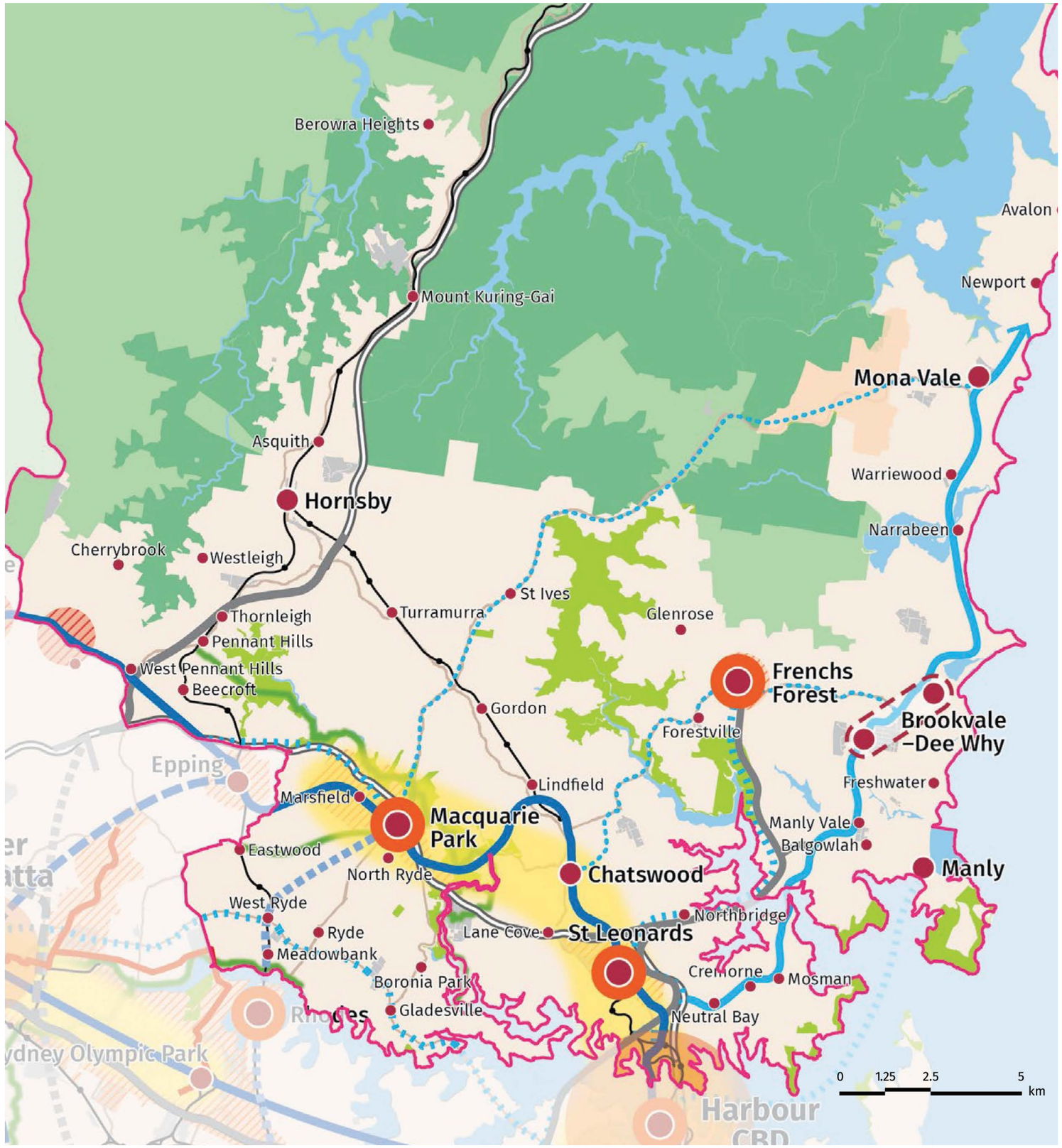
The District Plan also assists councils to plan for and support growth and change, and align their local planning strategies to place-based outcomes. It guides the decisions of State agencies and informs the private sector and the wider community of approaches to manage growth and change.

Community engagement on the District Plan has contributed to a plan for growth that reflects local values and aspirations, in a way that balances regional and local considerations

North District housing targets by LGA
0–5 year housing supply target: 2016–2021

Hornsby 4,350
Hunter's Hill 150
Ku-ring-gai 4,000
Lane Cove1,900
Mosman 300
North Sydney 3,000
Northern Beaches 3,400
Ryde 7,600
Willoughby 1,250
North District Total 25,950

The proposal will positively add to both the private and affordable housing stock in line with targets outlines above



WLCS2036 Vision

A Vision for Castlecrag

"The Castlecrag local centre is a thriving historic shopping village in an attractive landscaped setting and offers a range of outdoor spaces for dining and gathering along Edinburgh Rd. New development has enhanced the existing scale and pleasant public domain and has reinforced the character of the Conservation Area and strengthened the Walter Burley Griffin legacy."

- Strengths of Existing Character
- Distinct heritage character
- Range of dining venues
- Undercover protection through street awnings
- Amenity provided by the small supermarket located within the Quadrangle
- Streetscape is attractive with a landscape character
- Retail amenity
- Fine grain built form of existing shop on Edinburgh Rd
- Mature trees within and around the centre contribute to the visual aesthetics of the centre
- Parking both on street and off street supports

Source:
Willoughby Council Draft Local Centres Strategy to 2036

The vision for our proposal is to transform the ageing Quadrangle Shopping Village into a mixed-use neighborhood center that can better serve the community of Castlecrag

The proposal which was won through a competitive design excellence competition, will offer a large village space with amenity that is inclusive of the wider community.

It is a project aimed at rejuvenating an old, tired shopping village that has come to the end of its commercially viable life, and providing the community with a higher level of amenity



Design Excellence

In November 2019, the proponent of this proposal engaged three of Australia's most prominent architectural firms to compete in a design excellence competition for the rights to develop their scheme further.

In late 2019, FJMT were announced the winners of the competition by an independent Jury. An excerpt of the jury's report below:

The proposal is underpinned by the belief that the boundaries between landscape and architecture are artificial and that Castlecrag's character is defined by its relationship with the beautiful indigenous bush escarpment landscape.

At the gateway to Castlecrag, this natural landscape bush rock escarpment is announced and celebrated.
The concept is a composition of two primary architectural and landscape forms: a platform or podium stepping down with the natural contours of the site and a series of pavilions positioned on this platform in a gentle radial pattern as a continuation of the Griffin /Mahoney subdivisional geometry.

This strategy offers an approach that can successfully resolve scale relationships, maintain permeable vistas to sky and tree canopy to the south, and minimise shade to the properties to the south boundary.
The public realm is planned as an extension of the network of Castlecrag's pathways, passes and shaded lanes... The residential units in the pavilions are well planned whilst those in the podium require further development and more detailed consideration of the private, public and communal use of landscape spaces.

The Jury believed that this conceptual approach and the design principles that underpin it offers an approach that can successfully deal with human scale, building mass and density. It has flexibility to respond to detailed recommendations whilst maintaining and improving the strength of the scheme's core conceptual ideas

The Quadrangle, CastlecragDesign Excellence Competition Report 26thNovember 2019

Independent Jury:
Richard Johnson (Chair) - Diane Jones
Angelo Candalepas - Elizabeth Farrelly



Image1: Competition - Artists Impression

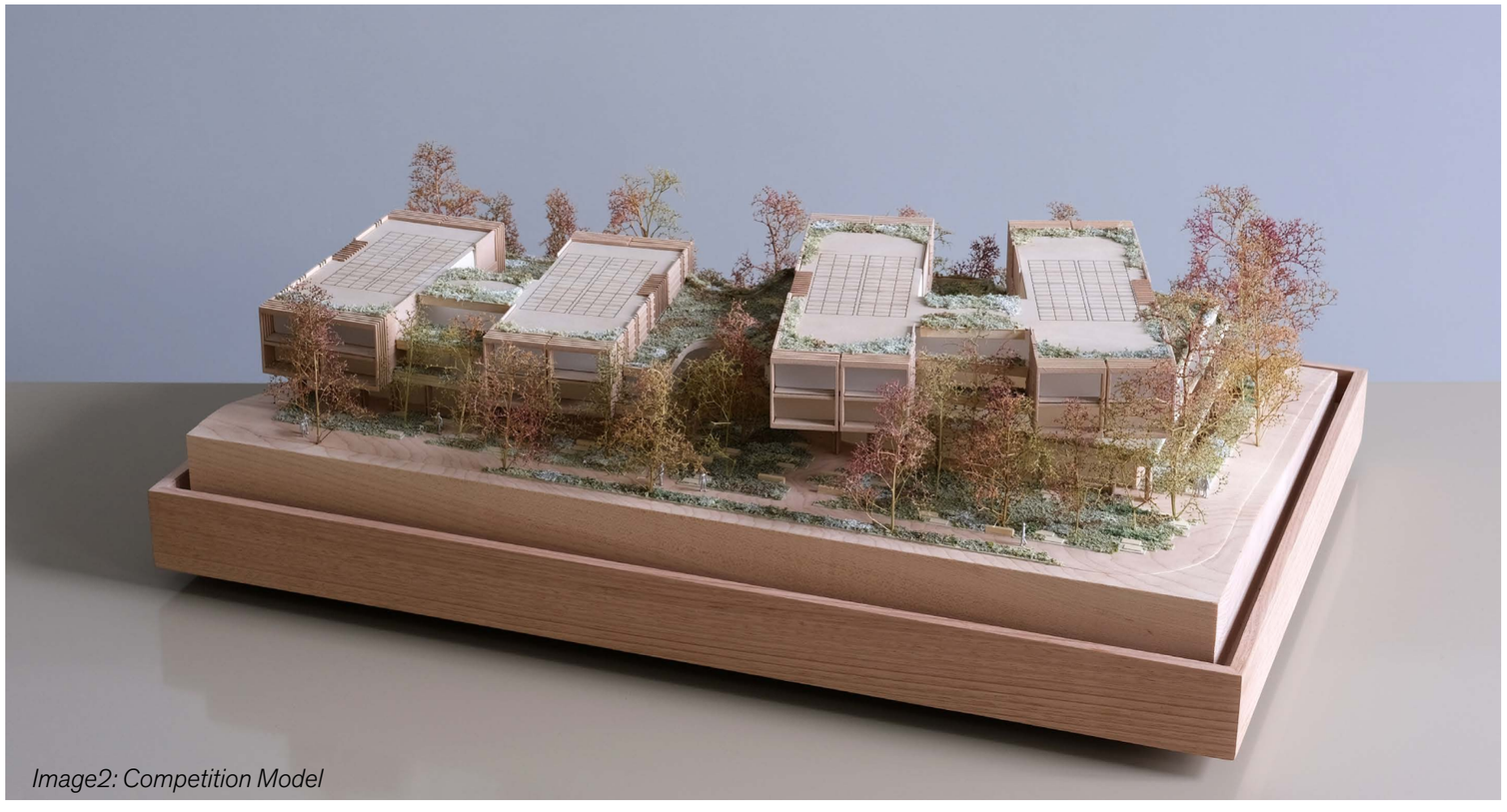


Image2: Competition Model

Site Analysis and Description

The site is located at 100 Edinburgh Road and is comprised of two lots, Lot 11 DP 611594 and Lot 1 DP 43691, totaling 5,166sqm.

Lot 11 defines the major part of the site and Lot 1 comprises of a small strip of land, approx 70sqm on the eastern end of the southern boundary.

Lot 11 is zoned for Neighbourhood Business B1 and Lot 1 is zoned Public Recreation RE1. The proposal utilities Lot 1 where the proposed works are permitted. It is imagined that the adjacent land (not forming part of this submission) zoned RE1 could be remediated with agreement from the appropriate stakeholders.

The Site is located on a prominent ridge line, which Edinburgh road follows. The Site slopes towards the south and has a fall of approx 12-8% from north to south.

The site is afforded good solar access to the north where the current site utilities the forecourt with activated retail frontages. The orientation of the site lends itself for both public and private uses where solar access is readily available.

To the south of the site, an existing public site link is formed, currently in a state of disrepair. The site link currently ends at a driveway where access is unsafe and impeded by the flow of traffic. There is an abundance of opportunity to make this a safe and legible site link.

The existing trees on the site were planted when the previous development was built. They are not of local old growth forests and are not endemic to the context. These trees are candidates for removal / replacement. The existing street trees along Edinburgh Road and Eastern Valley way add a sense of place and are to be retained.

The existing building has no heritage merit and is not listed under state or local registers as a building of heritage significance. Demolition of all built works on the site is considered acceptable with appropriate approvals.



Site Constraints and Opportunities

Existing Site:
The existing building is a tired, old shopping village that has come to the end of its commercially viable life. The site is an ideal candidate for redevelopment

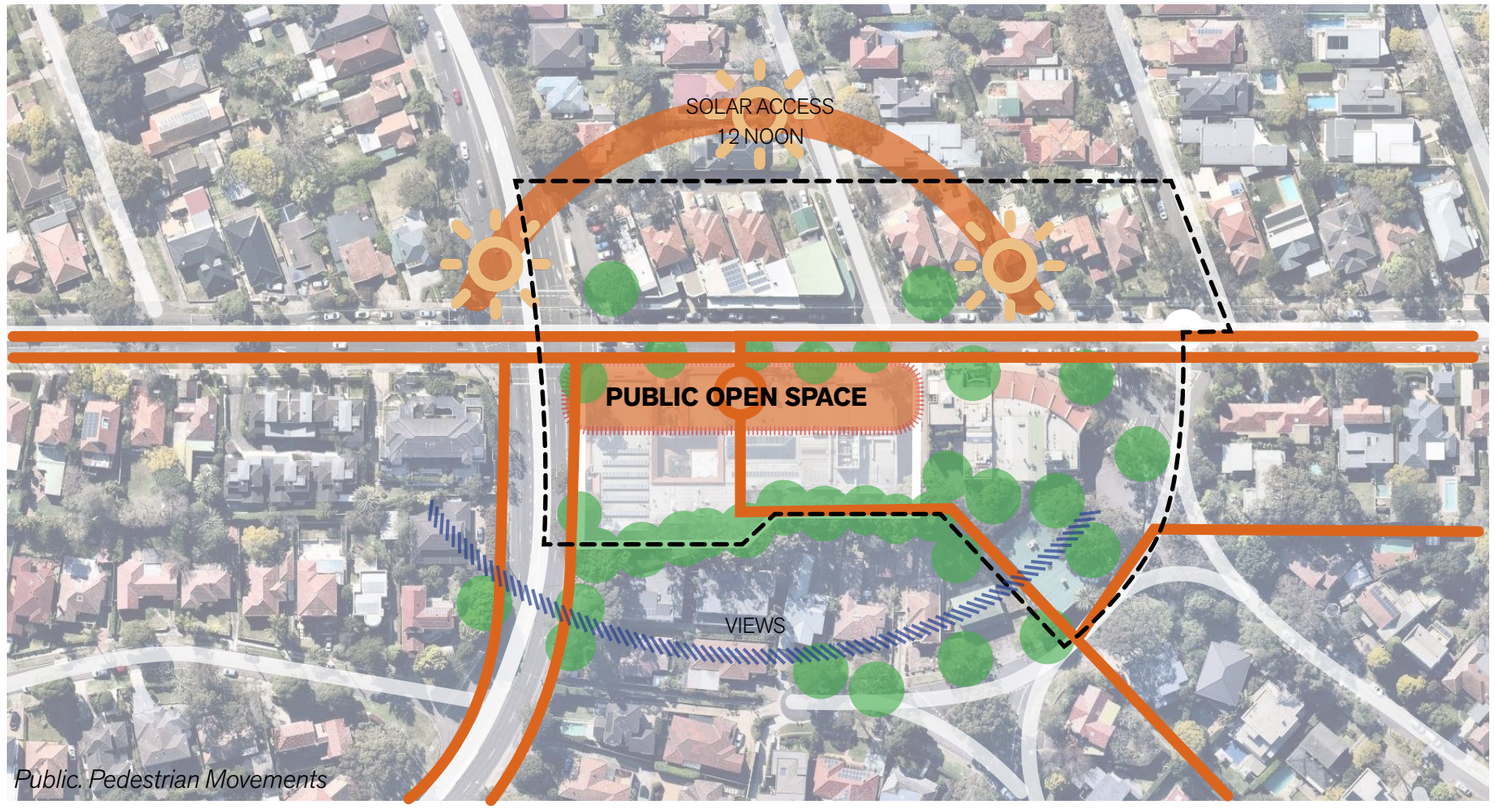
Traffic:
The site current holds 119 car spaces, a proposed the marginal increase in traffic will not place an unreasonable burden on the local streets, or the intersection at Edinburgh Road and Eastern Valley Way. The existing traffic generates noise at close proximity to the site. Residential amenity can be dealt with at later planning and development stages

Trees
The trees currently found on site were planted as part of the previous development. The majority of the trees are not endemic to the area. These trees are suitable for removal or replacement. Refer to arborist report for further information

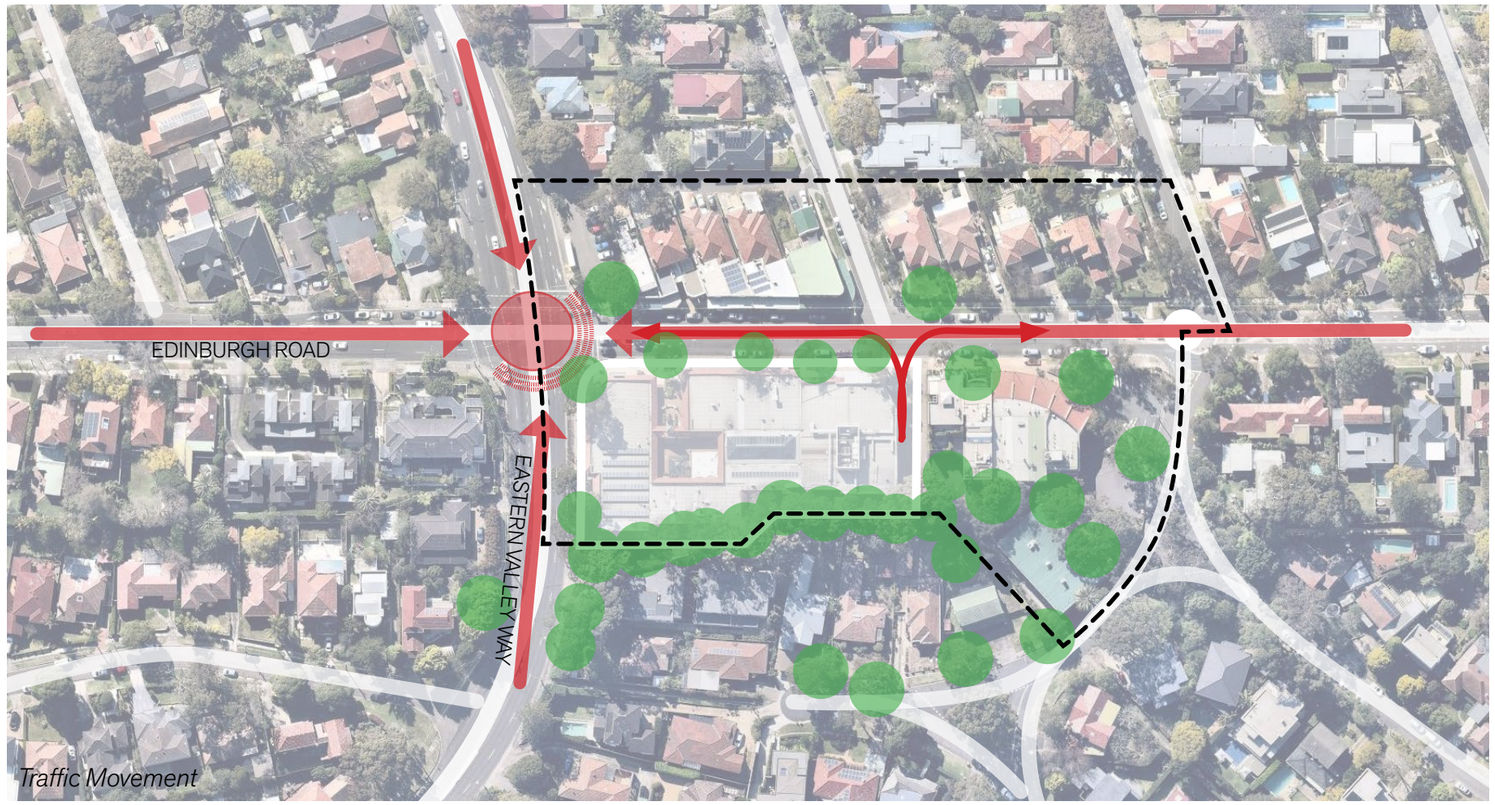
Public Space:
The existing public space is narrow and relies on council land to be activated in an appropriate manner. A substantial increase in size would benefit the immediate site and the community at its wider context.

Public Benefit.
The site is ideally located to become a new, vibrant and inclusive mixed use offering. A primary opportunity of the site is to provide public benefit in the form of an public open space. This space will be supplemented with an accessible site link that promotes pedestrian movement from the wider local path networks that wind through Castlecrag. There is ample opportunity for artworks and heritage interpretation to be considered at later stages.

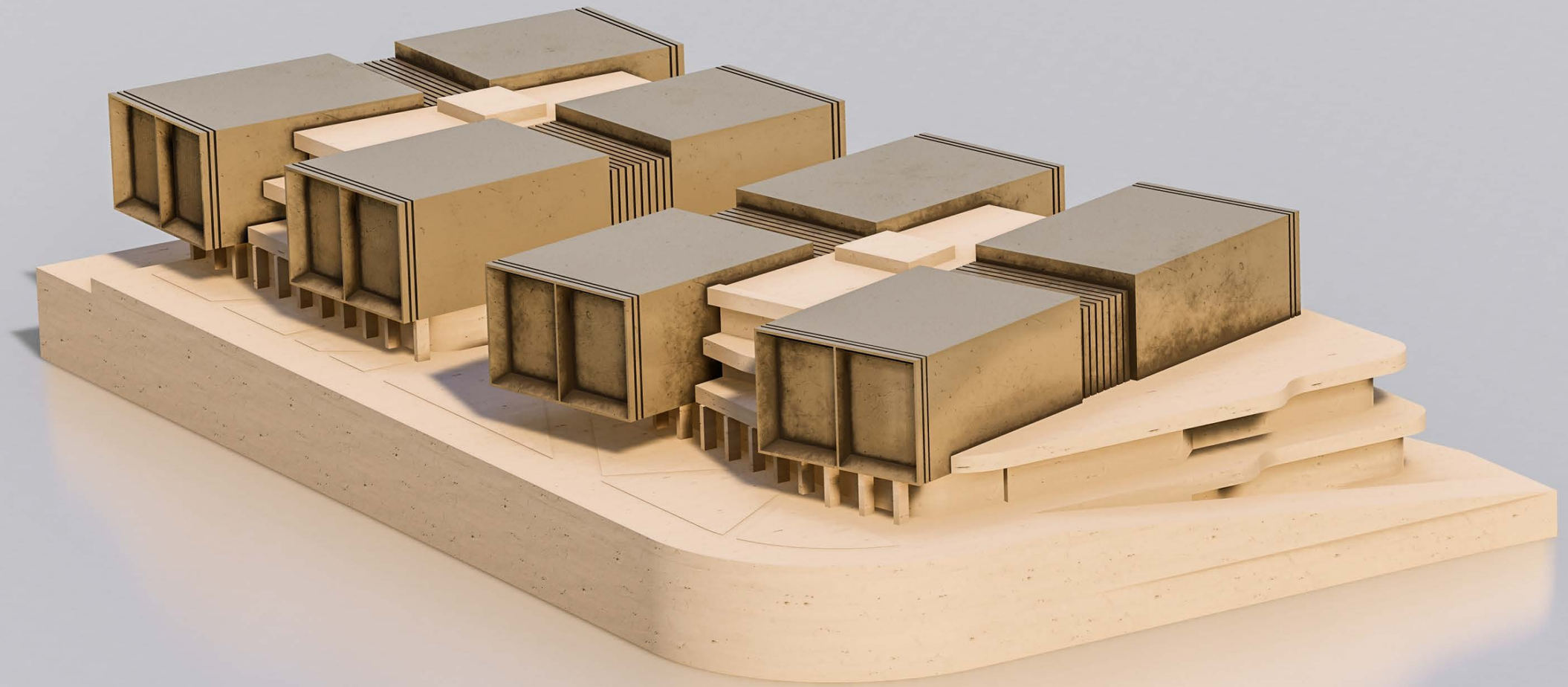
Views.
As the site is located on a ridge, there are both near and distant views toward the south. The views will be benefited by both the public and its residents.



Public. Pedestrian Movements



Traffic Movement



Architectural Response

A Vision for Castlecrag

1 Landscape and Architecture
2 Nature and Landscape
3 Topography and Alignment
4 Cove to Ridge Layers
5 Rock Escarpment Cove and Bushland
6 Pavilion and Platform
7 Public Space Community and Pathways
8 Stone and Depth
9 Nature and Sustainability
10 A Communal Landscape

“Beauty is where nature is allowed to work itself out”

Walter Burley Griffin, 191345

1
Landscape and Architecture

"The power of a conscientious consideration of all the elements of a problem was brought home to me when I saw the revolution in methods and results that took place when landscape was made a part of architecture"

Marion Mahony Griffin (The Magic of America, Section III, 175

The Quadrangle is an integrated work of landscape and architecture, where the design is inspired by a vision of how to live our lives closer to nature in a bushland setting.

Underpinning our work and concept for this site is a belief that the boundaries between landscape and architecture is artificial.

Our approach and design methodology begins with a understanding and interpretation of the landscape of the Castlecrag.

Souhami, Manfred, Walter Burley Griffin Society Inc. 1922, Panorama looking west of Lookout Reserve and 3 of the 4 Griffin houses in The Parapet, Castlecrag, Castlecrag, Sydney, New South Wales

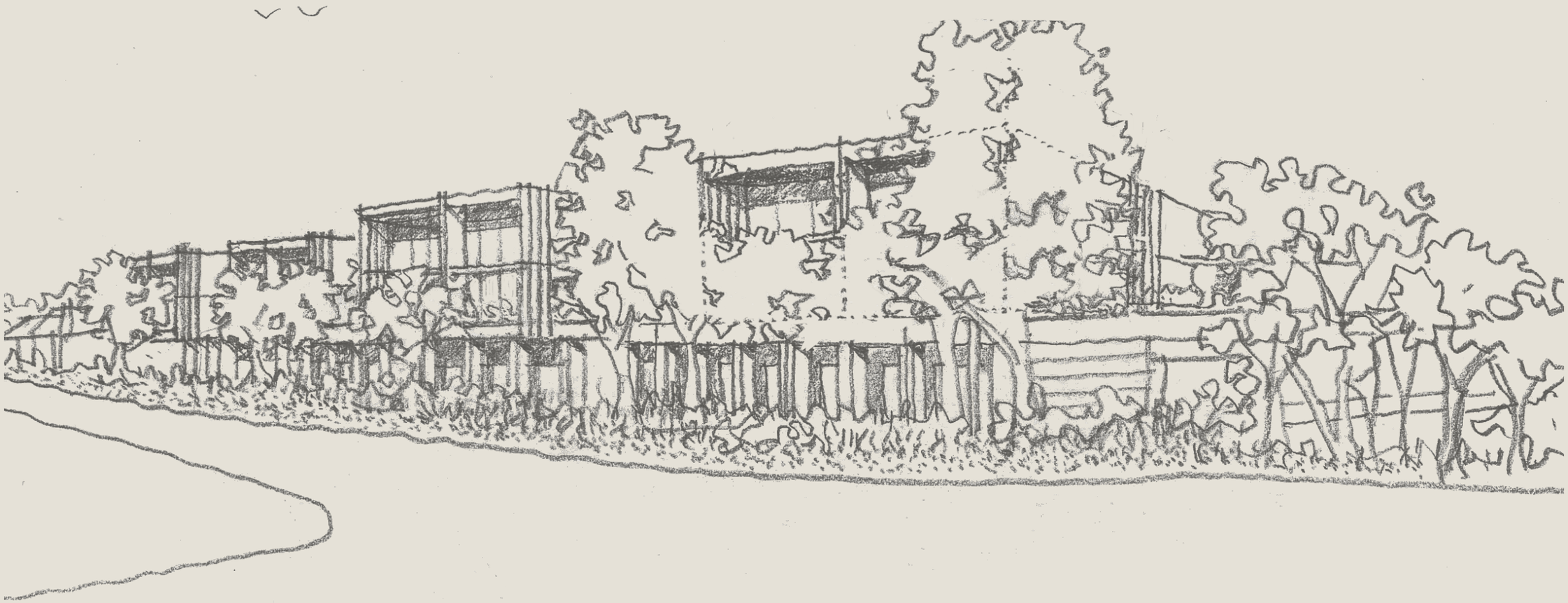
Griffin, Marion Mahony & Griffin, Walter Burley, National Library of Australia, 1925, Presentation drawing Lot 218, The Palisade, Castlecrag, Castlecrag, Sydney, New South Wales

2
Nature and Landscape

"Land planning or site arrangement is therefore concerned in understanding the features and processes of the Earth itself, The relationships of the configuration, the vegetation, the rocks, the soils,the waters, the very winds; and conservation to the maximum of their effectiveness and their irreplaceable perfection and beauty"

Marion Mahony Griffin (The Magic of America, Section III, 26)

The unique life of Castlecrag is a life close to nature, an appreciation and sensitivity to the beautiful Indigenous bush escarpment landscape. At the gateway to Castlecrag this natural bushland and rock escarpment should be announced and experienced.

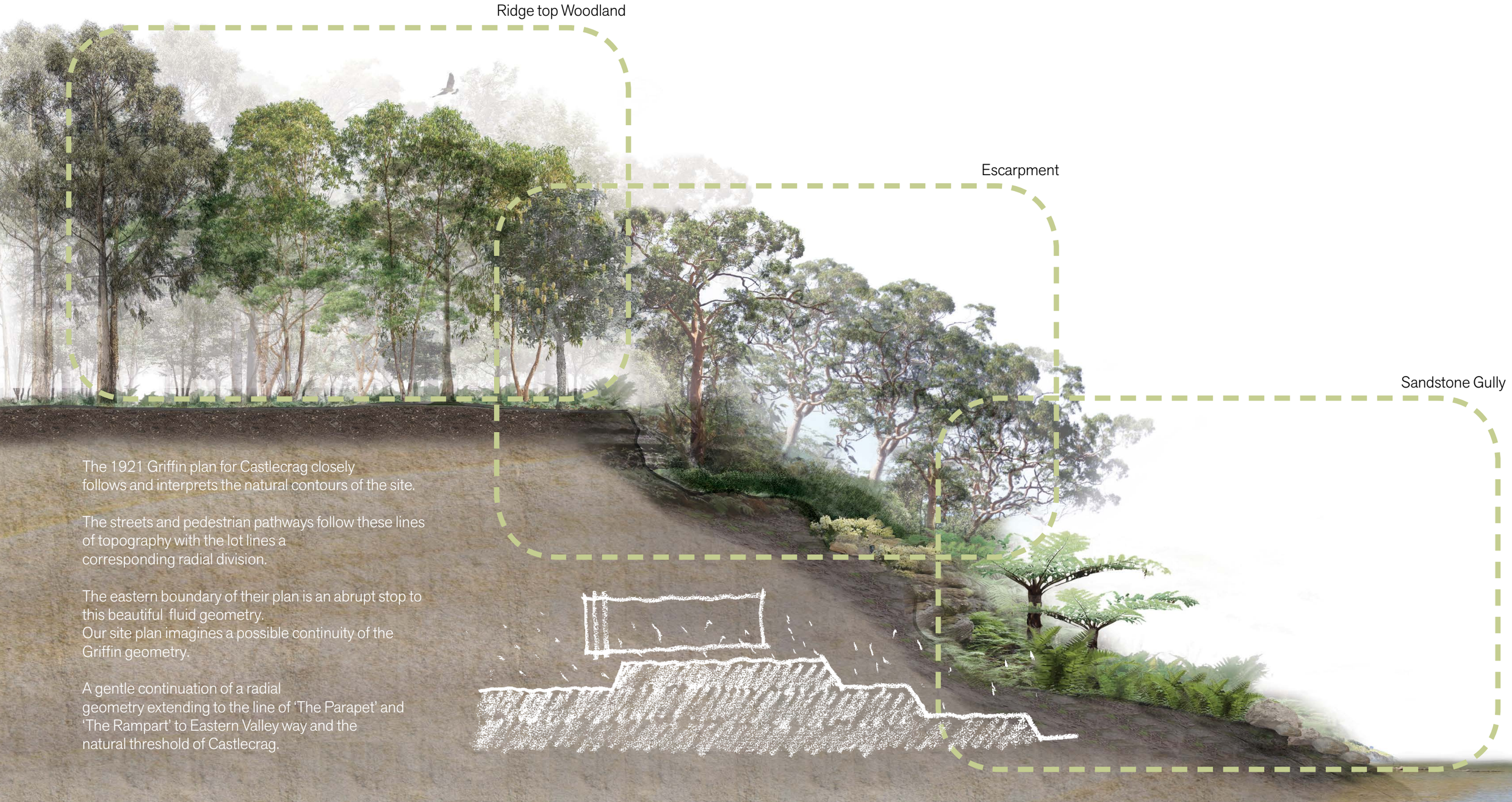


3
Cove to Ridge Layers of Landscape Typologies

"Castlecrag is an effort toward Land Planning in the fundamental sense of arranging for that use to which the terrain is most suitable.

Land in this sense is accorded the respect...not to be exterminated nor treated as dead material, nor as a mere section of the map"

The Magic of America, Section III, 156



The 1921 Griffin plan for Castlecrag closely follows and interprets the natural contours of the site.

The streets and pedestrian pathways follow these lines of topography with the lot lines a corresponding radial division.

The eastern boundary of their plan is an abrupt stop to this beautiful fluid geometry.
Our site plan imagines a possible continuity of the Griffin geometry.

A gentle continuation of a radial geometry extending to the line of 'The Parapet' and 'The Rampart' to Eastern Valley way and the natural threshold of Castlecrag.

4
Topography and Alignment

"But if you love nature she yields herself to you,
and these terraces in the end, after the roads have been built,
seem to have been created for the very purpose of ideal human habitation"

The Magic of America, Section III, 275

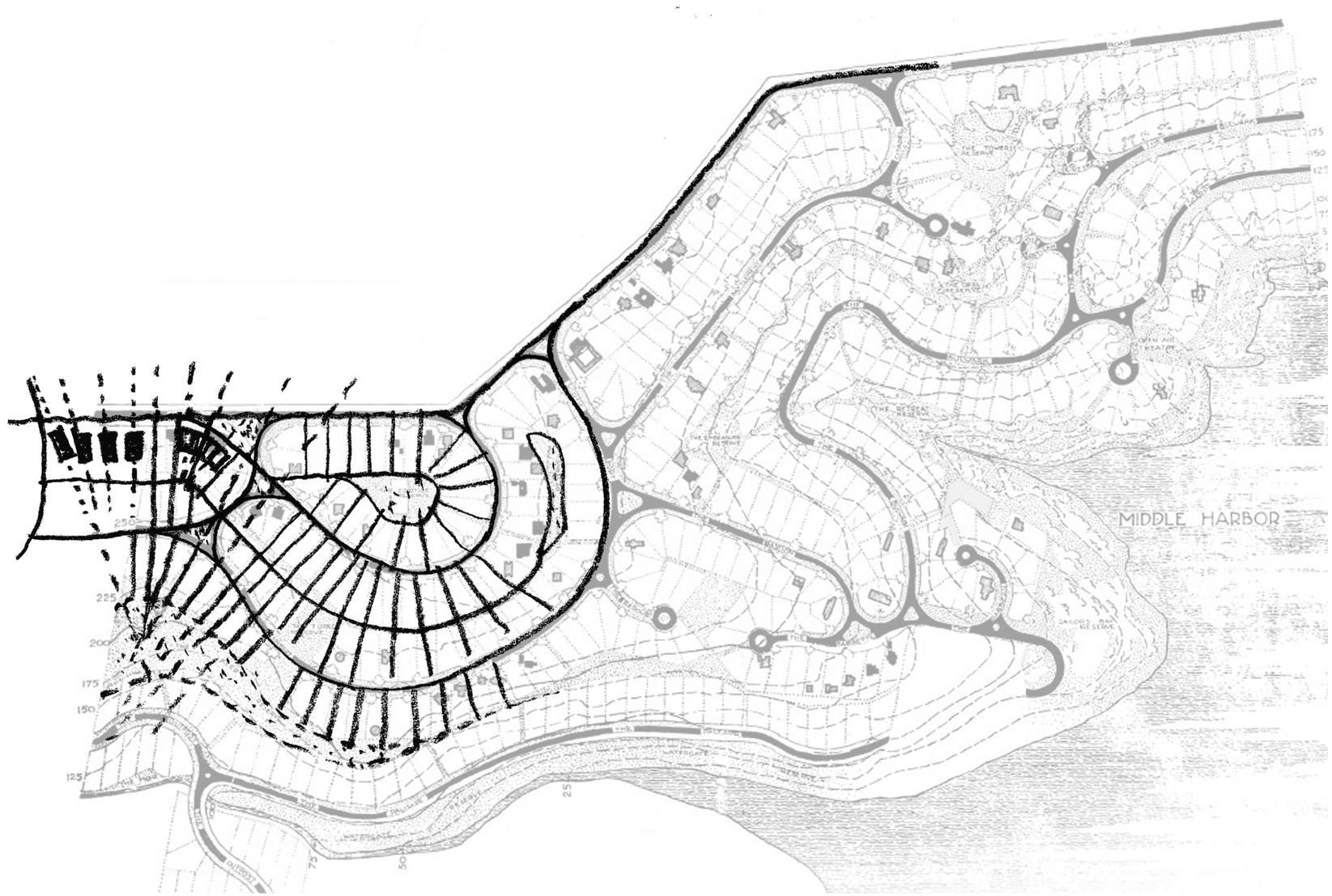
The 1921 Griffin plan for Castlecrag closely follows and interprets the natural contours of the site. The masterplan for Castlecrag works with the natural landscape, not against it.

The streets and pedestrian pathways follow these lines of topography with the lot lines a corresponding radial division.

The eastern boundary of their plan is an abrupt stop to this beautiful fluid geometry.

Our site plan imagines a possible continuity of the Griffin master plan. And suggest what may have been an unrealised continuation of their plan

A gentle continuation of he radial geometry extending to the line of 'The Parapet' and 'The Rampart' to Eastern Valley way and the natural threshold of Castlecrag.



Griffin's 1932 Castlecrag Plan, Walter Burley Griffin Society Inc

5
Rock Escarpment Cove and Bushland

"... Under great overhanging rocks beautifully carved by water and wind, and such...tracery of branch and foliage, rich and varied in its colors, and still, Oh so still!"

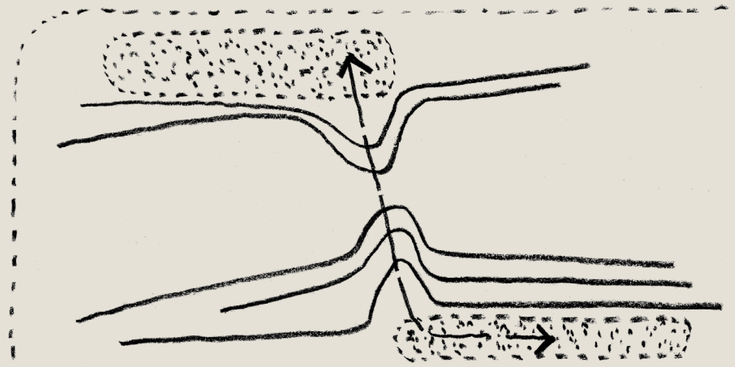
Marion Mahony Griffin (The Magic of America, Section III, 112

The inspiration for our architectural form has come from the landscape forms of Castlecrag. The emblematic landscape elements of Castlecrag have been re-interpreted in the architecture:

Gully Ravine: The central profiling of the podium stepping down to the gully
Terracing Topography: The profiled landscape podium terraces

Sandstone Outcrop and Promontory: The cantilevered sandstone block-like forms on the ridge



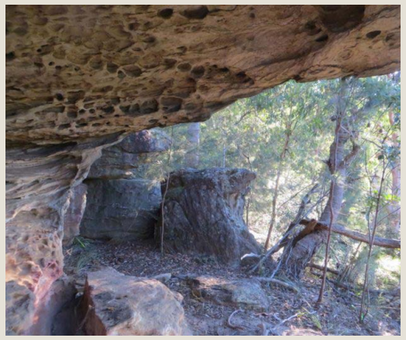


Gully Ravine





Terracing Topography





Sandstone Outcrop and Promontory

6
Pavilion and Platform

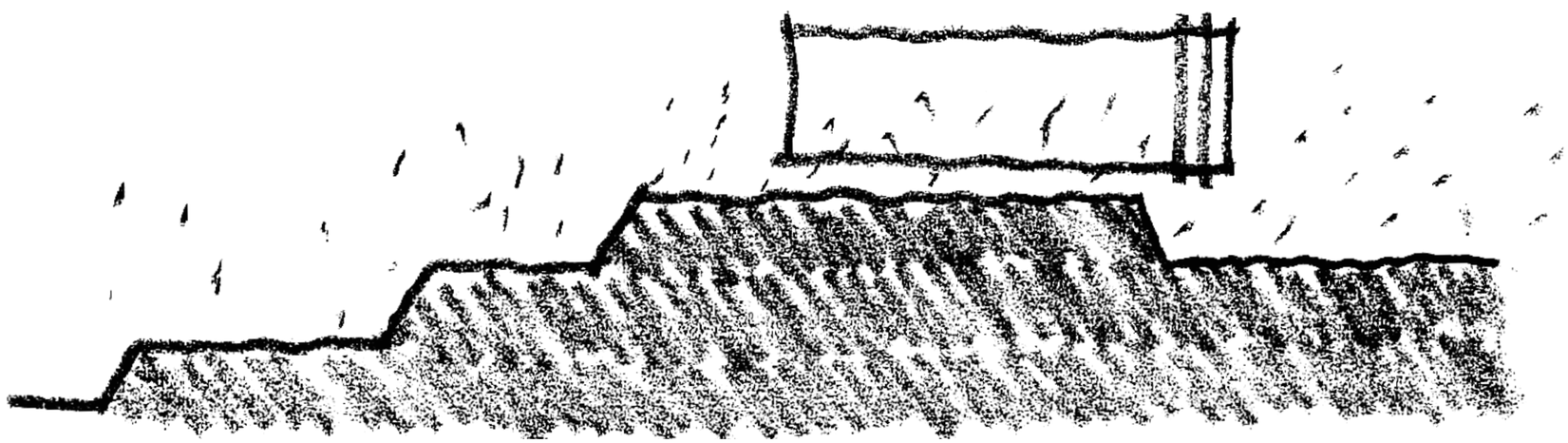
"Twice as high as the Sydney observatory and the heights of the South shore of our Harbor, these narrow headlands rise above the mists and possess the bright easterly seaward aspect sheltered from the bleak winds. Their conformation in ledges is the ideal for successive tiers of stately homes, and the sandstone substructure of these ledges affords the most elegant of all building materials"

The Magic of America, Section III, 184

The concept is a composition of two primary and essential architectural and landscape forms:

A platform of landscaped terraces stepping down in relation to the natural contours of the site

A series of sandstone pavilions carefully positioned on this platform in a gentle radial pattern





Milton Nichols, Eric, National Library of Australia, 1924, Castlecrag panorama, Castlecrag, Sydney, New South Wales

7
Public Space, Community and Pathways

"All the recreation reserves form a single system and are connected throughout by a network of pathways, passes and shaded lanes. They are designed to perpetuate the delightful rambles which were a feature of Castlecrag before its development".

Marion Mahony Griffin (The Magic of America, Section III, 192)

The creation of a north facing public/ communal space is at the centre of the concept.

This is to be a bushland-ridge gathering space, sheltered from the street through dense landscape planting, edged with deep sandstone colonnades and connecting with the bushland pathways and contoured geometry of Castlecrag.

It is to be a meeting and gathering place for the community and visitors to Castlecrag, with a subtle sense of theatre for performance, recalling Marion Mahony's passion for theatre.

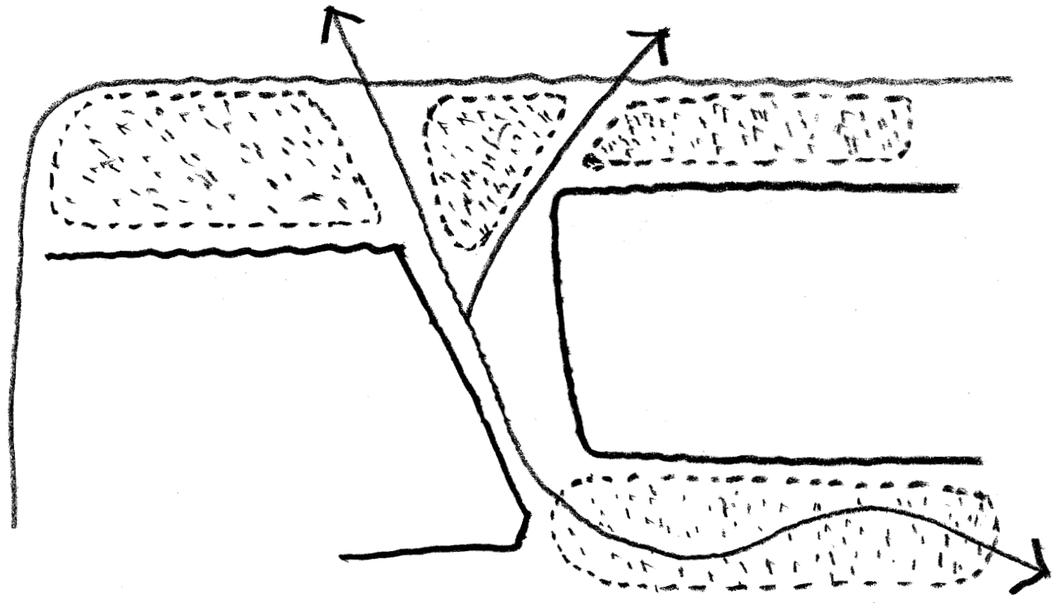
The public open space is an ongoing acknowledgment and the Griffins and the unique heritage of Castlecrag.



Milton Nicholls, Eric, National Library of Australia. 1922, Cutting through rocks, Castlecrag, Sydney, New South Wales



Hilder, Bill, Walter Burley Griffin Society Inc. 1936, Seats of the Haven Amphitheatre at Castlecrag, Castlecrag, Sydney, New South Wales



8
Stone and Depth

Natural materials and the bush landscape will characterise the material experience of the new buildings.

True to the Griffin's vision for Castlecrag, Sandstone and concrete are used to give depth, weight and connection to the ground of the site.

Deep colonnades, openings and reveals will give depth and shade. Timber and concrete pergolas and awning shades integrate with landscape to give further shade and depth.

"The buildings throughout Castlecrag are of the native stone, rough hewn generally, and random set in massive walls, with windows in batteries protected with overhanging trellises and climbing plants. Most of the houses have flat concrete roofs which best suit the tiers of cliffs and provide flower terraces of creepers for the prospects from the successive levels above them"

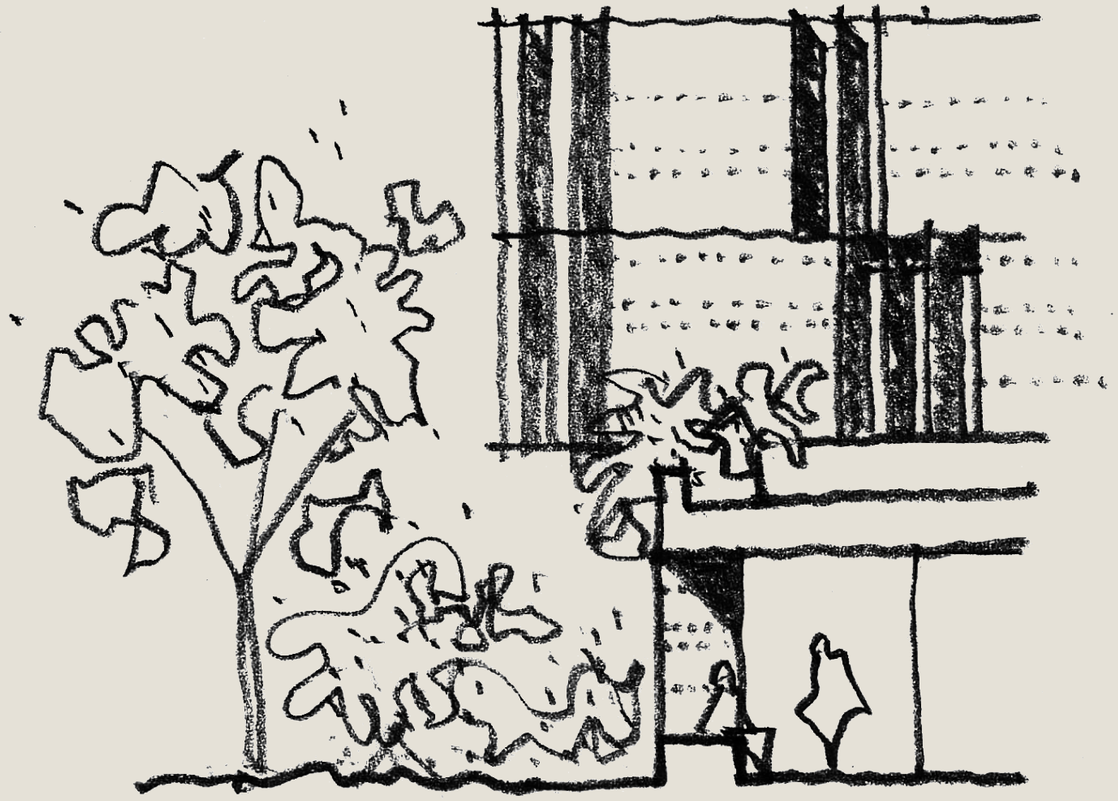
The Magic of America, Section III, 166



Milton Nicholls, Eric, National Library of Australia. 1929, T.H.R. Wilson House, 2 The Barbette, Lot 197, Castlecrag, Sydney, New South Wales



Pohjanpalo, Jorma, National Library of Australia. 1930, Marion Mahony Griffin at Castlecrag, Castlecrag, Sydney, New South Wales



9
Nature and Sustainability

"Griffin was the greatest conservationist of his time for he did not merely set aside these beautiful districts but showed how they could be occupied without destroying their natural beauty"

Marion Mahony Griffin (The Magic of America, Section III, 192)

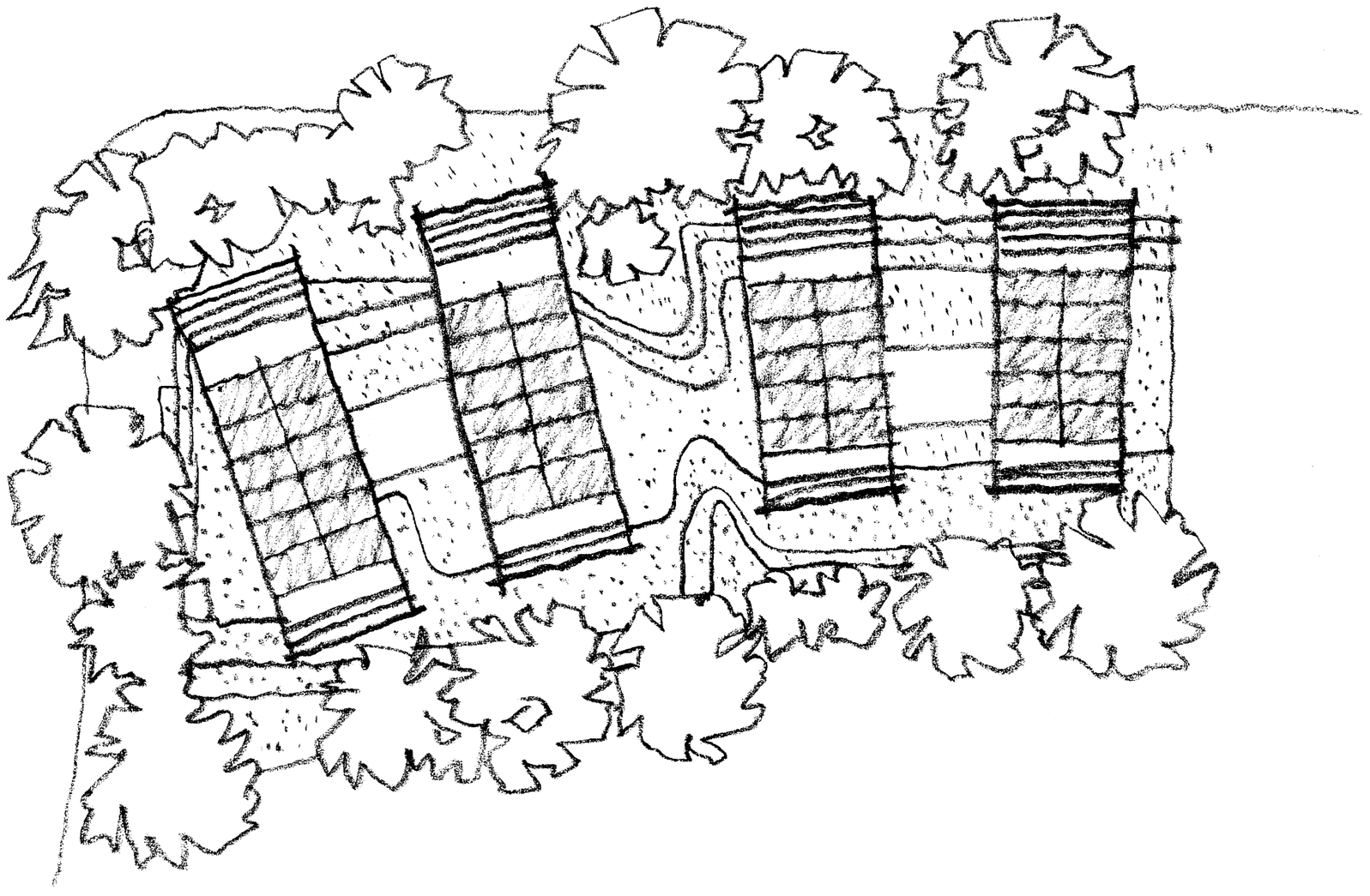
Walter Burley Griffin and Marion Mahony Griffin were environmentalists at heart. Their vision for castlecrag was to live and love amongst the natural setting of the untamed bushland.

In keeping with their ethos of reducing the human input, the proposed redevelopment will reduce embodied energy, and promote the use of renewable and sustainable energy consumption.

The project proponent is deeply passionate about delivering a sustainable offering, and will continue to develop these ideas as the project moves forward.



Climate Strike 2019 - Collage



10
A Communal Landscape

"The dwellings staggered so that you look into the neighboring gardens and feel them as part of your own, unconscious of the buildings or boundaries".

The Magic of America, Section III, 166

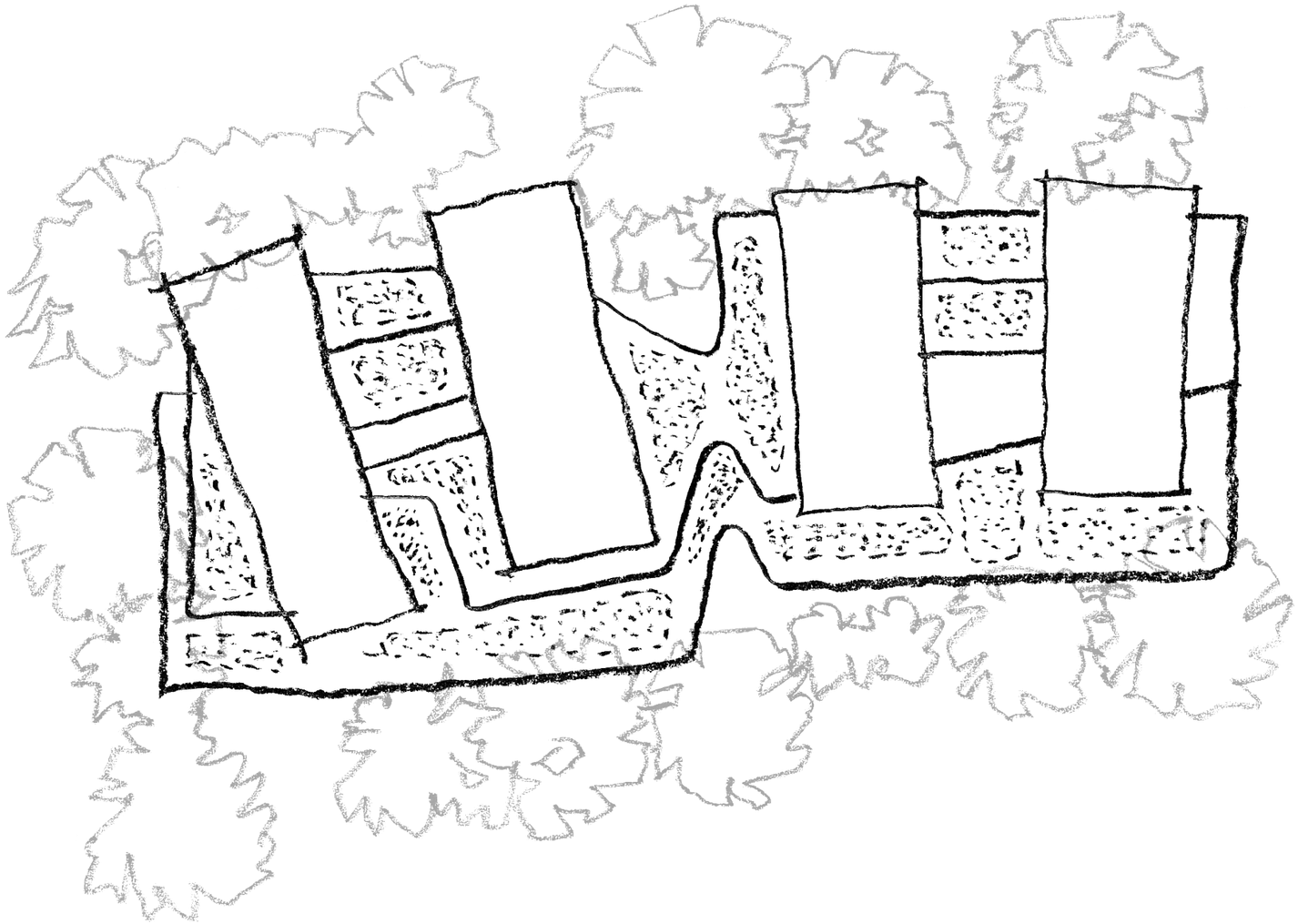
In keeping with the Griffin vision of the residence of Castlecrag being a true community, sharing access to the landscape and communal space, 'no boundaries, no fences', we are proposing a series of generous landscaped terraces with gentle privacy transitions and a shared communal landscape.

These landscaped garden areas are zoned into those managed by the residence to 'common' zones maintained by the body corporate.

In this way a unified bushland-inspired landscape characterises the project and is maintained.
We would like to promote this living close to nature as a character and value of this project, in line with the vision of the Griffins.



Milton Nicholls, Eric, National Library of Australia. 1922, Walter Burley Griffin with a group of people in backyard, Castlecrag, Sydney, New South Wales





View from Edinburgh Road Looking South East - Indicative Facade Articulation



View from Edinburgh Road Looking South East - Indicative Facade Articulation



View from Edinburgh Road Looking West - Indicative Facade Articulation



View from Edinburgh Road Looking South West - Indicative Facade Articulation

Landscape Response

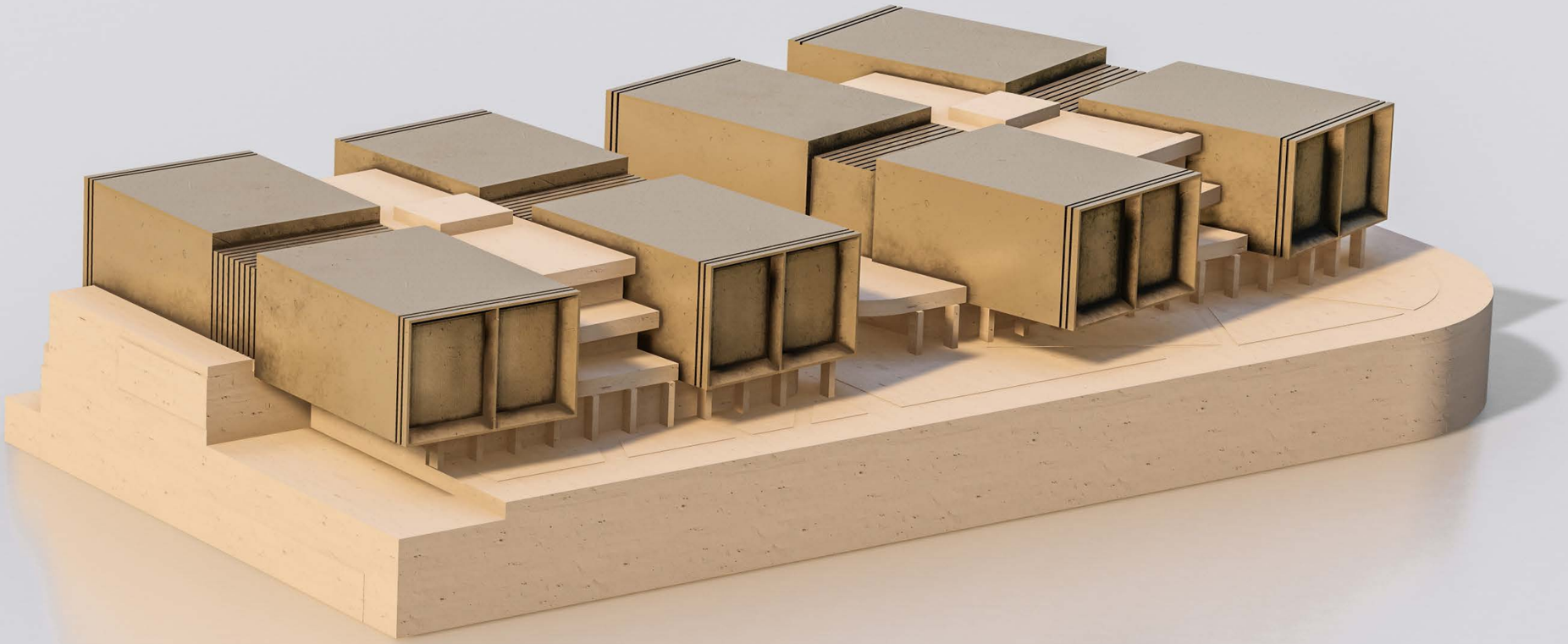
An Urban Bush Setting

- Introduction
- Landscape Concept
- A contextual landscape response
- Ridge top community space
- Through site link - “Gully Walk”
- Landscape terraces & communal garden
- Environmentally sustainable design
- Materials
- Landscape planting

“I want Castlecrag to be built so that each individual can feel that the whole of the landscape is (theirs).

No fences, no boundaries, no red roofs to spoil the Australian landscape; these are some of the features that will distinguish Castlecrag”.

Walter Burley Griffin’s vision for Castlecrag, 192135



Introduction

Background

This landscape report have been prepared to supplement they Planning proposal submitted to the Willoughby Council

The work builds upon the FJMT, winning competition scheme.

This Landscape report has been prepared having regard to Willoughby council's requirements for the project. The following documents are referenced:

Willoughby Local Environmental Plan 2012

NSW Apartment Design Guidelines

Willoughby DCP 2006

Landscape Zones

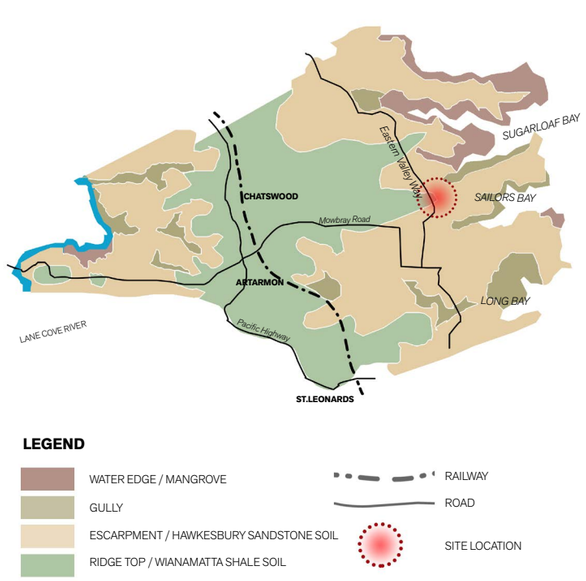
This landscape section of the planning proposal supports the building envelope is broadly defined by the following areas:

- Integrated Landscape through site link that connects the existing pedestrian path to The Postern
- Public Domain and community space with Intergrated retail areas to Edinburgh Road
- Landscaped private communal Garden including; seating, garden areas, outdoor dinning.



Landscape Concept







Objectives

The Landscape design approach can be defined as incorporating the following key objectives:

- Create a unique development through the integration of architecture and landscape
- Pay homage to the vision of Marion and Walter Burley Griffin who perceived the Castlecrag's bushland flora as " the cleanest most delicate and varied native indigenous perpetually blooming flora extent".
- Create a landscape that is an integral part of the built form
- Reconnect with the surrounding natural landscape qualities.
- Extend natural heritage landscape of Castlecrag into the precinct.
- Strengthen the distinctive Castlecrag community identity
- Provide a strong sense of place and community pride.
- Develop a contemporary landscape, with references and respect to the historical sentiments and character of the historical Castlecrag landscape
- Provide a sophisticated bushland environment through considered simplicity of design, while responding to the integrity of the architecture.
- Provide spatial opportunity for a variety of recreational activities that cater to both residents and visitors of different age groups.
- Replace removed trees with endemic species in similar numbers.

The landscape design draws upon the geology that was formed by distant rivers eroding inland mountains that began to deliver huge amounts of sand, silt, and clay that filled the Sydney Basin. The sediments were fused together and cemented into sandstone and the finer silts to shale these unique layers are the Narabeen group, Hawkesbury (Sydney) Sandstone and uppermost Wianamatta shale the correlation between the geology and the vegetation that is celebrated and abstracted within the design.

This unique bushland of Castlecrag displays a vibrant, invigorating, diverse and yet calming natural bushland. It is that essence of the natural bushland that is integrated into the project, respecting and reflecting the unique quality of the natural landscape.

A contextual landscape response



One of the predominant communities associated with the unique Castlecrag natural setting is the **Ridge top Woodland** which is set on the top of the Sydney Sandstone found along plateaus, ridges and exposed slopes. with species such as the narrow-leafed Apple, Scribbly Gum, Sydney Peppermint, Stringybark and banksias.



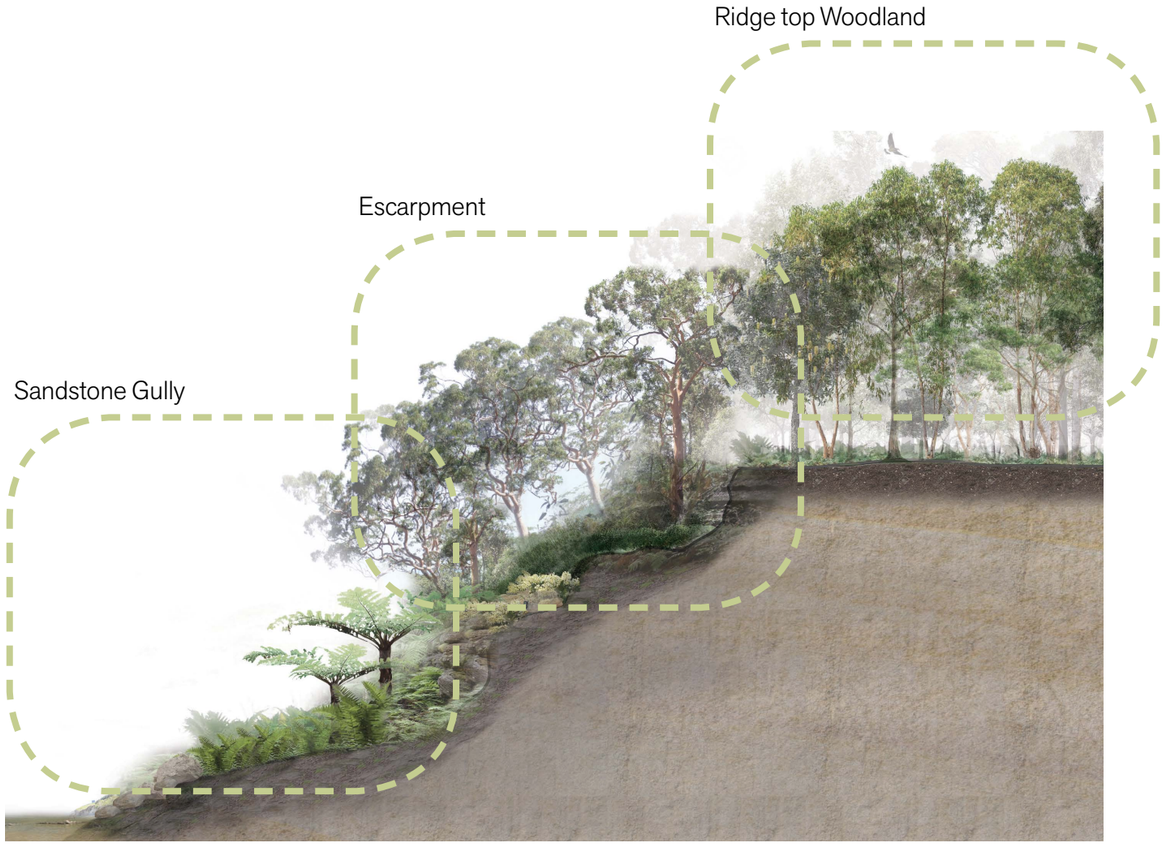
The upper **escarpments** are reminiscent of the exposed sandstone ridges, with eroded rock outcrops and with gnarled vegetation reaching out for the sun with close ground hugging plants & sparser planting. The pockets of richer soil and diversity means that a large variety of stunning native plants, with vibrant colours and textures There are fragrant boronias, soft furry petalled flannel flowers abundant in spring, sculptural ancient macrozamias, grass trees.



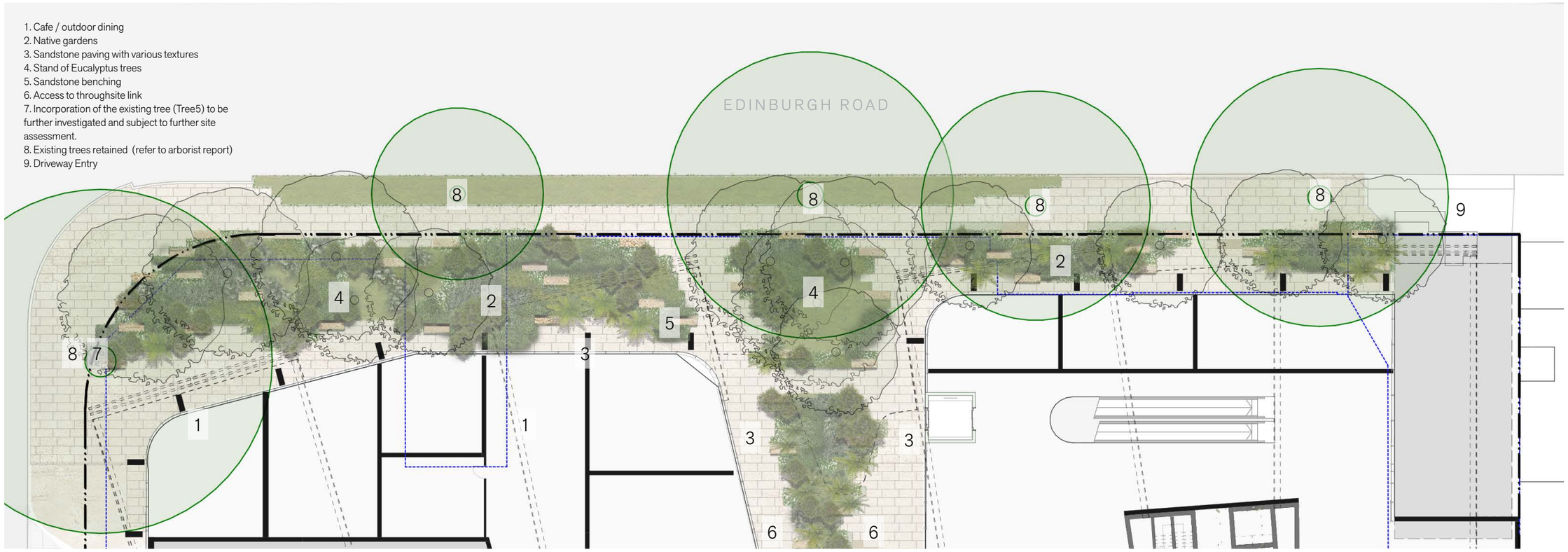
Sydney **Sandstone gully** thrives on the geology of Hawkesbury Sandstone.
With many secret glades and gullies, with deep clear pools, and mossy caverns, and soft overhanging ferns are part of this typology. The bedrock with spectacular sandstone monoliths pitted and wind eroded form honeycomb sculptures that detached from the Escarpment.

Existing Trees
Response to Arborist Report
As outlined the arborist report, the existing trees on the site are not part of old growth forests and are generally not endemic to the area. As such, they are prime candidates for removal and / or replacement where new plantings will be of a more considered nature.

The arborist draws attention to "***Tree 5***"- All through the root ball remains intact, there is a potential need for canopy trimming. As architectural and landscape designs progress, the impacts on this tree will be monitored to ensure its ongoing survival. There is no current desire to remove this tree and retention of all street trees will be given the highest priority (refer to plan next page)



Ridge top public open space



The communal space showcases the geometry of the built form within the extended building setback, with lush planting accentuating the natural bushland qualities.

A variety of mixed mode gatherings from contemplative spaces for outdoor dinning / seating to open areas for small performances and events are provided. The design has an emphasis on the landscape integration between the street and surrounding neighbours. Mass planting with minimal paving to bring the natural landscape into development.



Native garden integrated with sandstone groundplane and seating



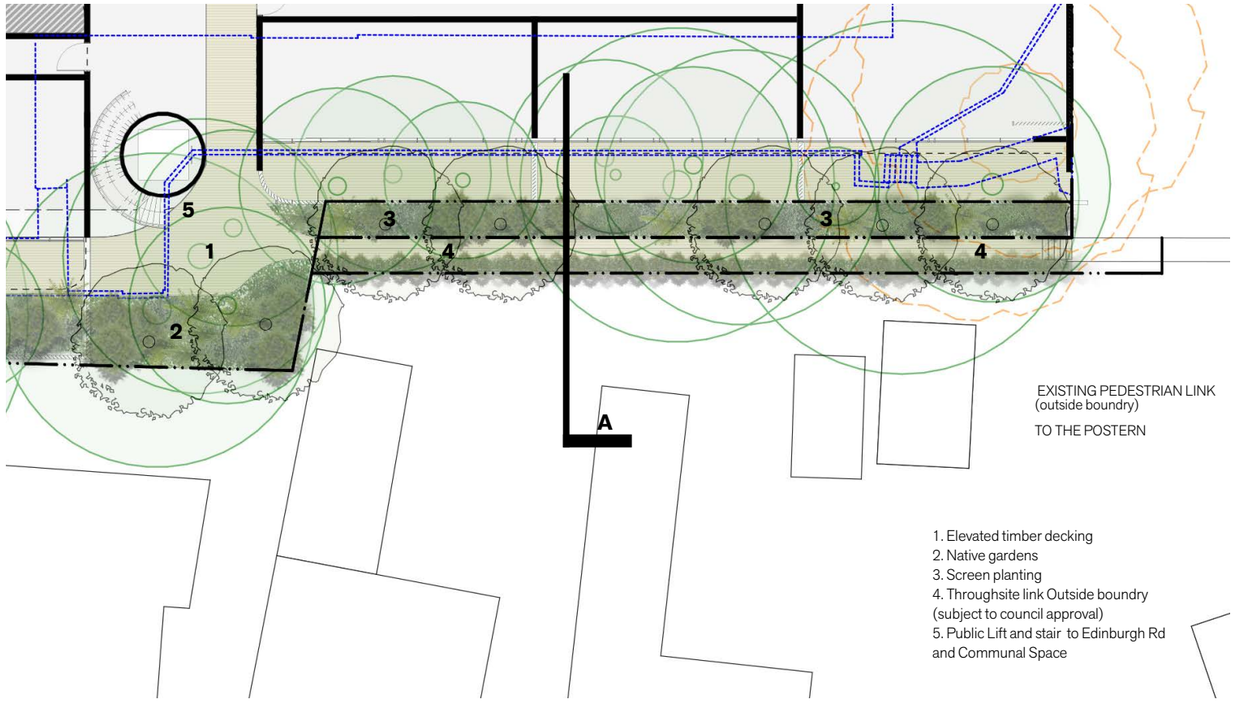


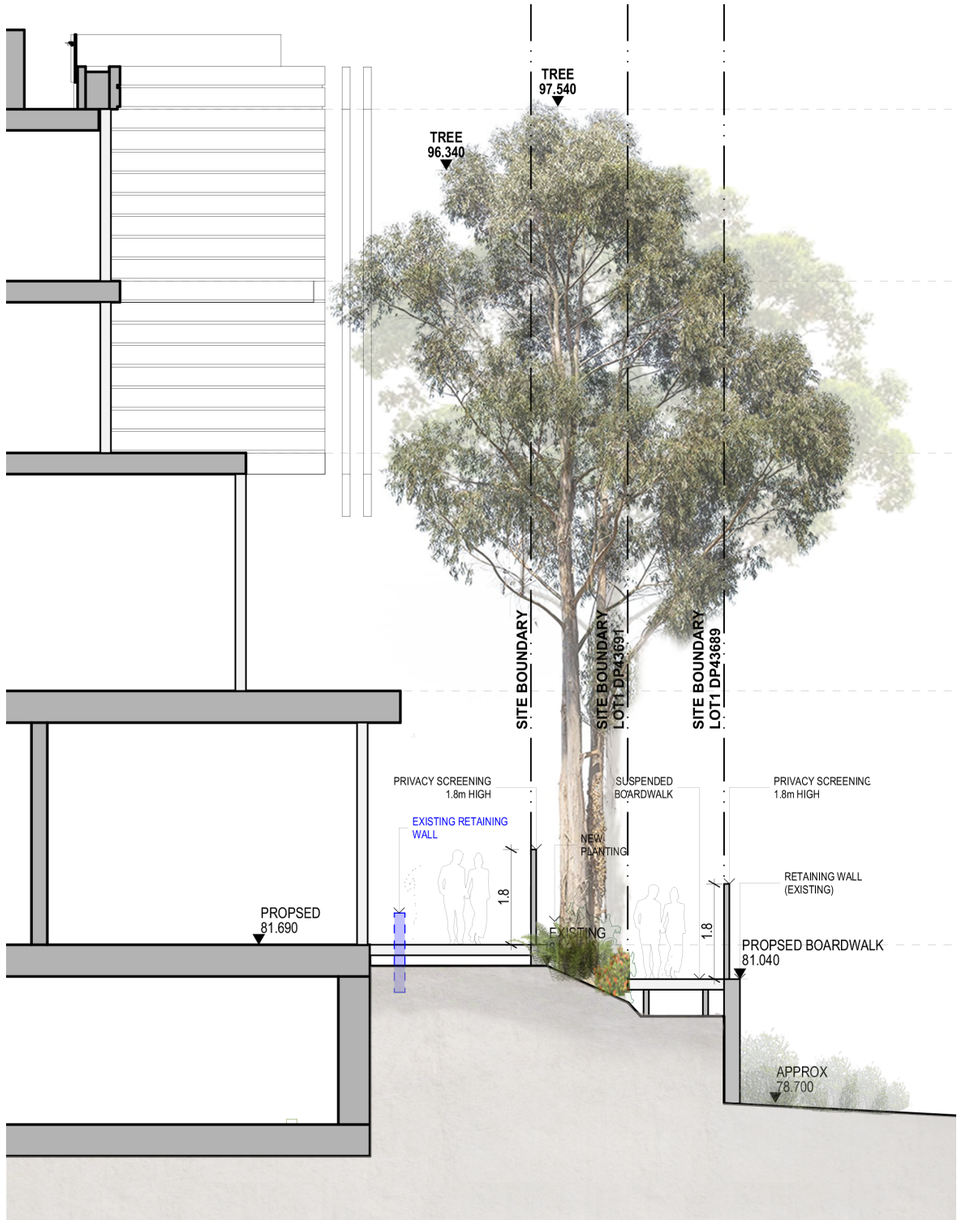
Minimise hard paving use of sandstone as the ground-plane



Stands of Eucalyptus trees scattered through-out the forecourt

Through site link - “gully walk”





A quiet glade sunken garden & gully walk provides a landscape setting and connections to the pedestrian network to The Postern and the Castlecrag pathway network beyond.

The lush gully planting typology is showcased in this unique space, providing a deep setback from adjoining residents with dense screen planting and appropriate density of tree planting to replace the trees to be removed.
The new offering of trees will be more considered and appropriate for the sites' micro-climate (refer to arborist report)


Sandstone retaining walls step down the topography with cascading planting


Native planting and screen planting

Landscape terraces & communal garden



Where possible the extensive areas of planting are designed to promote a variety of vegetation and long term sustainability of the building, including green roofs and native visual gardens.

The green roofs will be provided with access for maintenance of the building facade and the roof top planting water sourced from on site.

The swathes of planting characterise the rooftop garden and provide a patterned visual interest when viewed from above and from surrounding residents. The planting design seeks to create a visual link between the layered landscape and provide bio-diversity.

The communal terrace to level 3 provides a rooftop experience set within the tree tops maximising views with open deck areas perimeter planting with shade structures.



PRIVATE TERRACES



ROOFTOP COMMUNAL TERRACES

Environmentally Sustainable Design & Materials

Ethos

The material selected provide a balance between hard paved surfaces and soft landscape areas suitable for intended users. Whilst hard paved surfaces are necessary and appropriate for an urban space maximise green open space and planting zones is

Public Domain

The public domain paving consisting of predominately lighter sandstone tonal coloured granite
Longer bands of sandstone of darker granite to link the planter boxes orientation and the established grid The block seats solid / clad sandstone. This combination combined with the strong paving bands that unify and stitch the ground plane together.

Communal Terrace

The Communal terrace materials consist of predomiantly planted areas with stepping stones and some areas of hardwood decking to create gathering areas.

Maintenance

Whilst regular maintenance of the hard and soft landscape is expected, the design considers ways to lessen the burden of maintenance. Areas of mass planting are proposed to provide visual impact without requiring high-frequency attention. Materials selection will also contribute to reduced maintenance and resistance from vandalism. Surfaces that age gracefully, wear well and require minimal upkeep are being considered, such as natural stone.

Sustainability

The intention is that sustainable ecological principles are integrated into the landscape design with the primary focus on water. Principles such as sustainable Drainage Systems, a thorough plant selection process and site microclimatic analysis inform the layout, materials selection and environmental response. Initiatives such as rainwater harvesting and reuse, consideration of the extent of embodied energy within landscape materials, durability of material selection and resource requirements of new planting are all considerations and is summarised below.
The primary landscape sustainability initiatives include:

- The capture of rainwater and reuse for irrigation via a water storage tank
- Design falls in paving levels to facilitate surface water recharge to mass planting beds and thereby reduce potable water usage.
- Appropriate provision of planting to improve air quality and reduce the urban heat island effect
- Selection of hardy, low water use, indigenous plant species suited to the urban environment
- The selection of a range of plant species to support biodiversity

Water Sensitive Urban design

Where possible, stormwater runoff will be collected and treated in local bio-retention systems incorporated into the podium planting zones . Appropriate species and best practise will be utilised in order to locate and design the stormwater treatment areas.
Capture stormwater runoff and convey treated runoff from the rain gardens. Seating elements and raised platforms are options that can be used to mitigate the set downs required to pond and treat the stormwater and to maintain public safety.

Conclusions

Resolution of the various aspects of the proposed landscape design will continue. This refinement of the proposed works will be based on the descriptions, options and performance objectives detailed above and guided by the development application and council objectives. An acknowledgment of sustainable principles, the provision of aesthetic and functional spaces via exciting design solutions will continue to guide the resolution of the landscape design.



Planting

The planting strategy is to create a cohesive design through the use of carefully selected species that demonstrate a connection to the concept of place making and link to the three landscape commmunity types, Risge, Escarpment Gully.

The preference is for endemic plants to the Sydney area however the selection will also address the following:

Suitable for the existing micro climatic conditions (wind, access to sunlight); Low water use plant species; Maintenance requirements (such as watering regime, fertilising and pruning replacement); Wind breaks to mitigate microclimate conditions; Crime prevention through design; Privacy and screening

Selected plants provide visual interest through form, texture and variations in seasonal colour. A diverse planting scheme comprising mass planting of native plant species and a selection of drought tolerant species is proposed for the podium terrace.

The plant palette takes into account the potential impact of wind that may affect the plants at upper levels. The use of diverse shrubs and understory layer in various forms helps creates spaces, achieve accents to the various gardens that are experienced by the tenants and guests.

Ridge Top Community space



Basket Grass
Oplismenus spp.



Blueberry Ash
Elaeocarpus reticulatus



Christmas Bush
Ceratopetalum gummiferum



Coastal Banksia
Banksia integrifolia



Common Rush
Juncus usitatus



Sydney Peppermint
Eucalyptus piperita



Flannel Flower
Actinotus helianthi



Grey Gum
Eucalyptus punctata



Kangaroo Grass
Themeda triandra australis



Mat Rush
Lomandra longifolia



Native Fuschia
Epacris longiflora



Old Man Banksia
Banksia serrata



Pinnate Boronia
Boronia pinnata



Weeping Grass
Microlaena stipoides

Escarpment stair and amphitheater



Kidney Weed
Dichondra repens



Rasp Fern
Doodia aspera



Sydney Red Gum
Angophora costata



Sydney Rock Orchid
Dendrobium Speciosum

Gully Walk



Bird's Nest Fern
Asplenium australasicum



False Bracken Fern
Calochlaena dubia



Gristle Fern
Blechnum cartalagineum



Rough Treefern
Cyathea australis

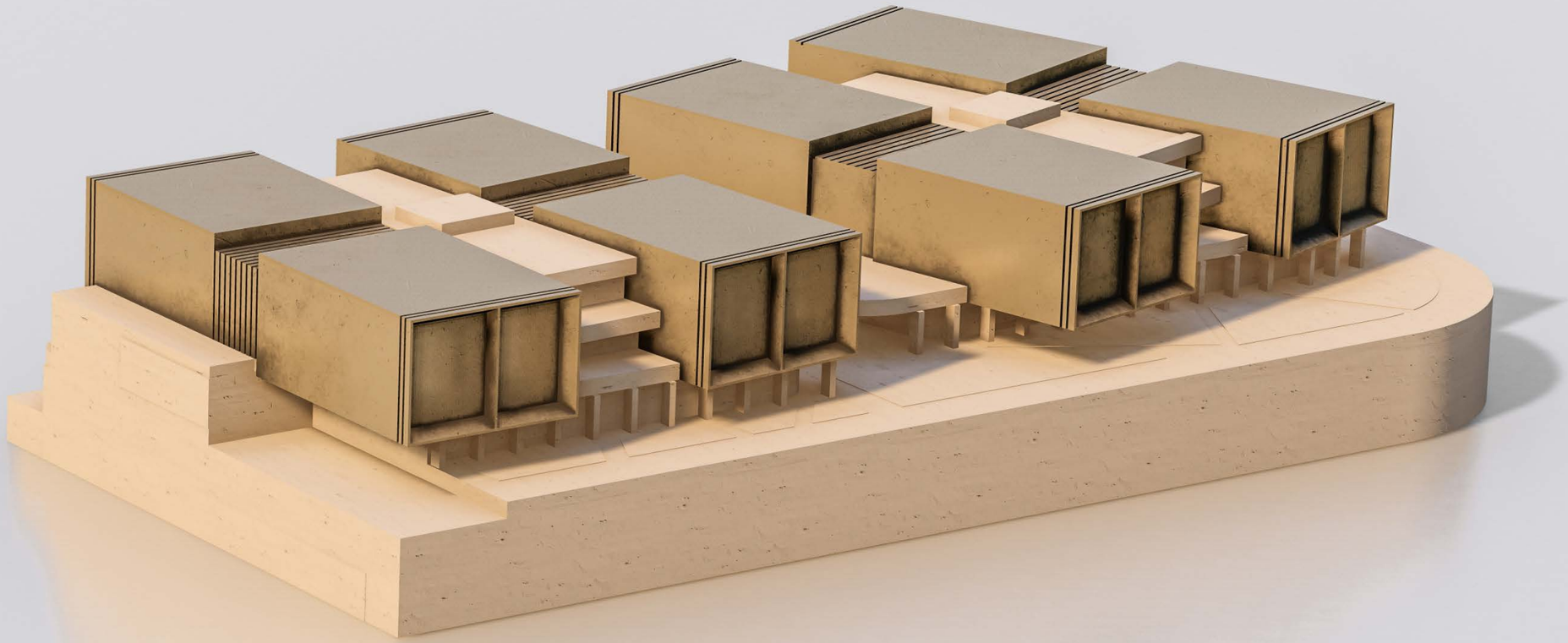
Technical

- Indicative Material Palette
- Indicative Facade Materiality
- Sustainability Benchmarking

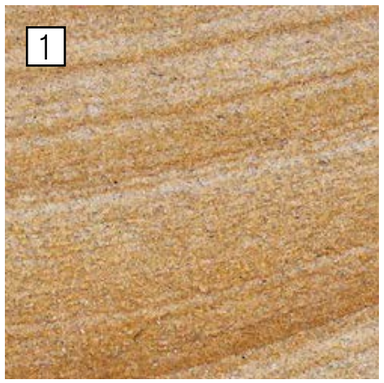
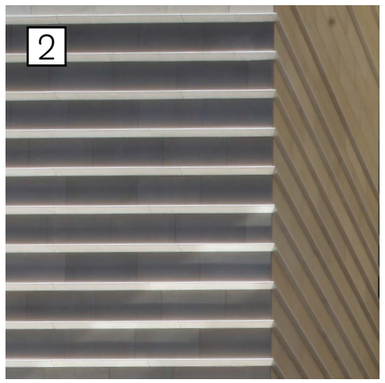
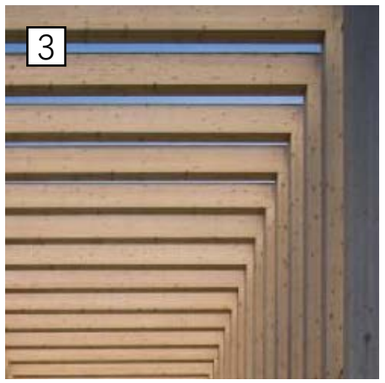
"Castlecrag ... are the picked portions of that mighty amphitheatre which stretches down to the rocky shores, wooded coves and charming inlets of Sydney's finest reach of water.

Designed to preserve all the remarkable natural features - outlooks, cliffs, waterfalls, fern valleys, foreshores, birds and animals ..."

The Magic of America, Section III, 192



Indicative Material Palette

Contextual Inspiration					
Proposed Material					
	Sydney Sandstone Smooth Faced or GRC	Textural Facade Paneling in warm Hues	Class One/ Two Australian Timbers	Split Face Sydney Sandstone	Class One/ Two Australian Hardwood
Location	Public Domain & Facade	Facade	Soffits and Shading Devices	Split Face Sydney Sandstone Public Domain & Facade	Soffits and Shading Devices

All Materials Indicative and Subject to Future Approvals

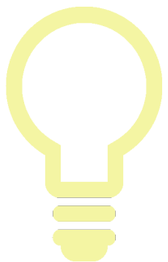
Indicative Materials Pallete - Borrowed from the landscape, of the local setting

Indicative Facade Materiality



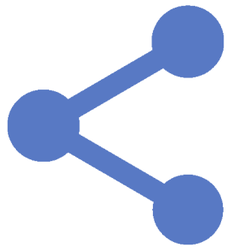
Indicative Facade Articulation

Sustainability Benchmarking



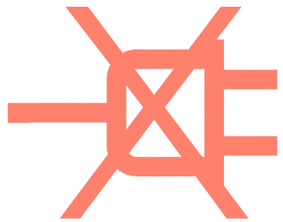
Photovoltaic Arrays

A Solar PV array will be installed on the rooftop and oriented north to generate electricity for community spaces and public lighting. Low-energy lighting will be specified throughout the building. Solar hot water and a packaged heat pump boost will also be installed on the rooftop of the development. With further development, the project aims to be a benchmark of the locality, and is deeply embedded in its environmental ethos.



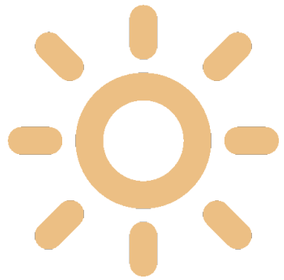
Integrated Building Systems

Integrated building systems such as heating, cooling, and hot water will be designed to respond to the environmental conditions of the site. Internet and communications infrastructure will also be realised through centralised networks. The consolidation of these building-wide systems will minimise environmental impacts, installation costs, and significantly reduce ongoing running costs for residents.



Minimise Fossil Fuel Reliance

The proposal is for a zero fossil fuel design, using solar hot water, electric appliances, and passive design strategies to achieve practical and comfortable living conditions. When electricity is required as a back-up, power providers will be chosen based on their ability to deliver renewable power generation certificates.



Passive Solar Design

North-facing apartments are recessed behind balconies to minimize summer solar heat gain and shield apartments from harsh summer sun. Winter daylight will penetrate deep into the interior of the floor plates by way of balconies and internal light courts. Openings to the East and West draw in cooling breezes



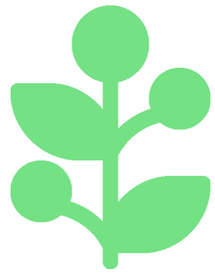
Green Transport Initiatives

The site is ideally located to make use of existing public transport infrastructure. Residents will be encourages to utilise this public transport network which is highly accessible from the site. The site is located immediately adjacent to several bus routes that further link close by train stations. Existing public transport routes will allow accessible travel to and from the Northern Sydney and Chatswood CBDs.



Rainwater Collection

Rainwater will be captured and stored in water tanks located below ground. These water tanks will be plumbed to garden taps and landscape irrigation to support public and private gardens throughout the development. It is imagined that no additional town water will be required to facilitate the vast planting areas.



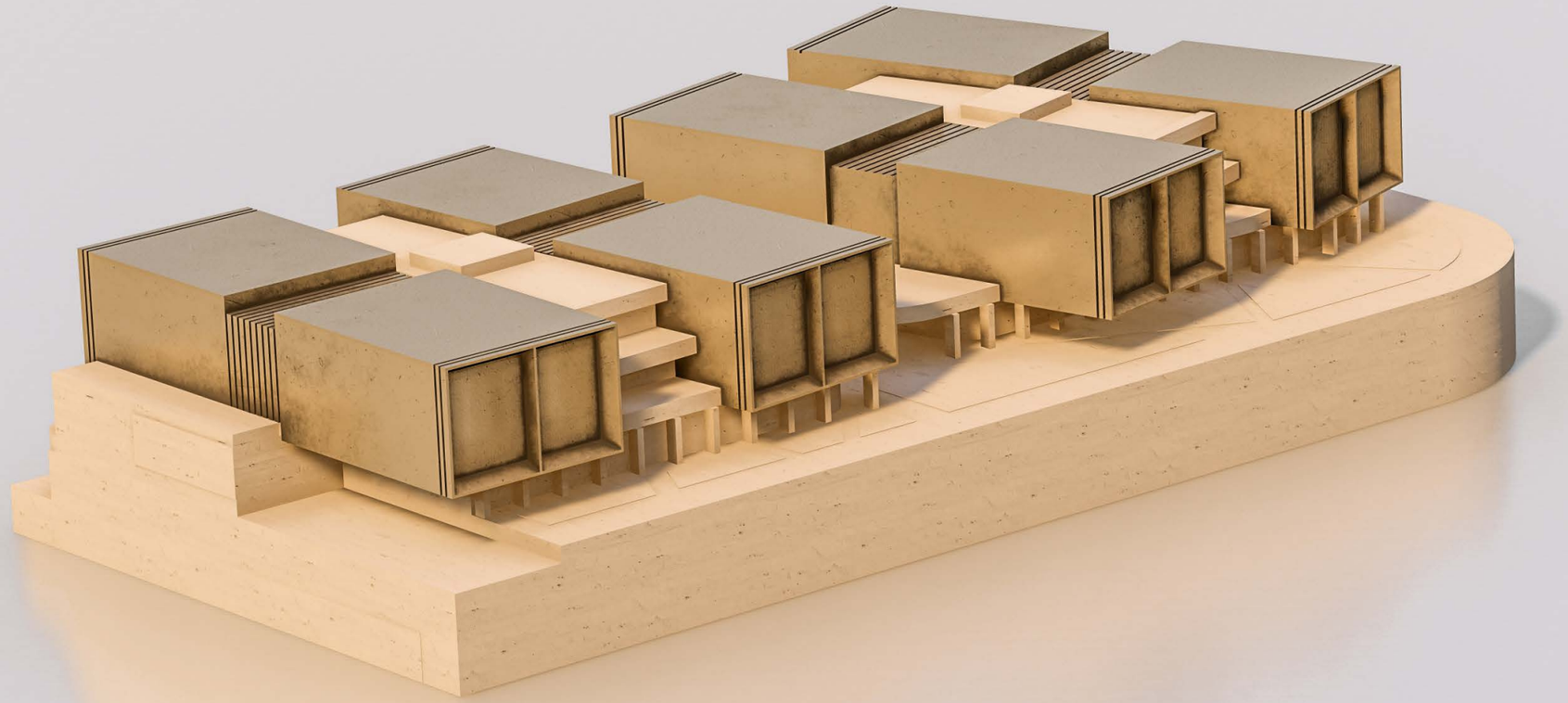
Native Plant Selection

Plant selection will draw inspiration from the immediate context. The Griffins sought a means to live harmoniously amongst the bush. Our proposal is an embodiment of their beliefs. Landscaping includes low-maintenance and local indigenous plants will minimize water use and create a robust native landscape. Only native species endemic to the area will be considered for inclusion to the project.



BASIX / Section J Targets

The proposal aims to achieve a target of (a) A BASIX energy score of at least 5 points above the minimum compliance requirement; and (b) A BASIX water score of at least 5 points above the minimum compliance requirement. Additionally, the proposal will use water saving fixtures and fittings as well as energy efficient lighting, air conditioning, lifts, and appliances to minimize water and energy loads.
Carefully considered passive design solutions contribute to thermal comfort, minimizing the need for mechanical heating and cooling. Native, existing, mature trees provide shading to the north and harsh western sun.
The refuse of the existing building will be collected, sorted and recycled appropriately. The project will endeavour to reuse and recycle the demolition, excavation and construction materials where possible. Appropriate BASIX and Section J compliance will be resolved at later development phases



fjmtstudio

Compliance Tables

Table 1_**Proposed Modifications to Local Environment Plans**

Zoning	**Draft Willoughby Local Centres Strategy 2018 (client preferred scenario)**	**Note:**
Clause 2.2 B1 Neighbourhood Centre & RE1 Public Recreation	B1 Zoning (LOT 11 (DP611594) RE1 Public Recreation (LOT 1(DP43691)	No Change
Clause 4.3 Height of building– maximum permissible height on site: 9m	A maximum of 3 Storeys is proposed above Edinburgh Road Refer to Planning Report prepared by CPW	Proposed Modification
Clause 7.7 Floor space ratio – maximum permissible floor space ratio: 1:1	FSR 1.8:1	Proposed Modification

Table 2_**Key Provisions of WDCP 2006 - Part C**

	Summary of Provision	**Comment**
C.4.2 Car Parking Requirements Table	Shop Top Housing Studio - 0.5 space 1 space / dwelling (other than studios) Visitor spaces - 1 per 4 dwellings Retail Shop* 1 space / 25m2	Complies: *The indicative scheme illustrates compliance will be achievable at later phases* Refer to Traffic report for further information
C.4.3 Other Parking Issues	Bicycle Parking Bicycle lockers Residential: 1 per 10 units Retail/Restaurant: 1 per 450m2 Bicycle rail/ racks Residential: PLUS 1 per 12 units Retail/Restaurant: PLUS 1 per 150m2	Complies: *The indicative scheme illustrates compliance will be achievable at later phases*
C.6.2.2 Accessible Car Parking	1 accessible visitors' space in parking area with more than 50 spaces. All adaptable housing dwellings must be allocated a car space. A proportion of the adaptable housing dwellings are to have adaptable car parking spaces provided as follows: Number of adaptable housing dwellings Number of adaptable car space 1-4 1 5-9 2 10-14 3 15-19 4 20-24 5 25-29 6 30-34 7 35-39 8 The adaptable car spaces should comply with the following design requirements: be located as close as practicable to and be linked to an accessible entrance to the building or to a wheelchair accessible lift by a continuous accessible path of travel; have a firm surface, with a fall not exceeding 1 in 40 in any direction; and have a minimum length of 5.5m, a minimum width of 3.2m and a minimum height of 2.5m	Complies: *The indicative scheme illustrates compliance will be achievable at later phases*
C.6.3 Adaptable Housing	Shop top housing: If lift access is to be provided, 50% of all dwellings to be adaptable.	Complies Our proposal has the ability to meet the requirements of the DCP and further, the liveable housing guide to a silver level standard.

	Summary of Provision	Comment
E.1.2 Density, Use and Height	1) Ground floor minimum – 3.5m floor to floor height Level 1 and above (residential) minimum 3m floor to floor height 2) To maintain the commercial character and retain activity at street level, the ground floor or any level addressing the primary street is to predominantly comprise retail and shops, food and drink premises or business premises. 3) No more than 30% of the street frontage is to be used for vehicular and pedestrian access to lower and upper levels. A minimum of 60% gross floor space at street level is to be used for retail or business premises.	Complies: Complies Complies *The indicative scheme illustrates compliance can be achievable at later phases*
E.1.4 Setbacks Front / street setback	1) Where the existing streetscape is characterised by ribbon development immediately on the boundary to the street frontage, the ground floor (and where existing two storey building façades prevail, the first floor) of the new development should maintain the existing streetscape character by incorporating a zero front setback. 2) First and second floor levels should be setback a minimum of an additional two metres from the street frontage (from that of the ground floor level below). Balconies, other than use of the podium level, shall not encroach into this setback. 3) Third Floor and above: 5m for the third floor of the building with an increase of 1.2m for each storey of the building above the third floor (setback = 5m + 1.2m/storey above the third floor). The total required setback is to apply to all floors from the 3rd floor up (see diagram 3). Balconies are not to encroach into the required setback of the level below (see Diagram 1). 4) Splay corners are to be provided to all street corners at street level.	Complies The proposal provides significant front setbacks when taken as a weighted average. The proposal provides shelter and addresses the street in a manner that is sympathetic to the surrounding context.
E.1.4 Setbacks Side Setbacks	Minimum setback from side boundaries: Ground Floor: Zero setback; First and Second Floor: Zero setback for maximum of 50% of the length of the side boundary and located within the front half of the site; Side boundary setbacks for first and second floors for the remainder of the building are to comply with the building envelope determined by a line projected horizontally at 300 from the side boundary from half way along the boundary towards the rear of the site (where side boundaries step the projected envelope shall also step accordingly)- see Diagram below; and Third Floor and Above: 3m for the third floor of the building with an increase of 1.2m for each storey of the building above the third floor (i.e. setback = 3m + 1.2m/storey above the third floor). The total required setback is to be applied to all floors from the third floor up. The DRAFT Willoughby Local Centres Strategy 2018 (preferred scenario) proposes minimum 3m upper level setback (2nd storey) for shop top housing.	Complies Setbacks to the side boundaries are consistent with current planning controls and are delivered in a manner that protects and conserves the existing mature trees.

Reference	Summary of Provision	Comment
E.1.4 Setbacks Rear Setbacks	*Minimum setback from rear boundaries:* *Ground floor adjoining a residential boundary: minimum 3m* *For land adjoining R2 or R3 (height limit of 9m) zoned Land at the rear whether or not the land is separated by a lane way. Upper Floors (all floors above ground floor): a minimum of 6 metres from the line of the ground floor rear wall below for the first floor, with an increase of 1.2m for the second level, 3m for the third level, 1.2m for the fourth level and 3m for the fifth level. The site adjoins R2 and RE1.*	Setbacks to the rear have been provided to ensure that amenity to neighbours is considered.
E.1.4 Setbacks General	Balconies and Verandahs Balconies and verandahs other than rear balconies may encroach upon the prescribed side and rear setbacks providing that the encroachment: produces no adverse effect on the amenity (privacy, solar access etc.) of the adjoining properties; The encroaching balcony or verandah must not be enclosed, except by balustrades or any dividing wall; and does not encroach upon the required side setback so as to be closer than two metres to the side boundary. Rear balconies or planter boxes may not project beyond the line of the required setback of the level below.	Complies
E.1.6 Landscaping Requirements	1. A three metre wide landscaped setback area is to be provided along a rear boundary adjoining residentially zoned land 2. A minimum one metre wide planter box planted with dense screen planting is to be provided along the edge of any balcony or terrace at first floor level facing a low density residential area. (Residential R2 or R3 (land with a 9m height limit). 3. All other balconies (other than to the street frontage) facing a low density residential area should incorporate planter boxes facing these boundaries with a minimum internal width of 400mm. 4. A minimum of 20% of podium and a minimum of 20% of rooftop open space is to be provided as vegetated area (turf, gardens and planters) 5. Landscaping should be provided on site in the following locations: within rear boundary setback areas and any side boundary setbacks at upper level; - where a driveway is provided along a side boundary, provide a continuous planting strip of minimum 1m along that side boundary;	Complies Complies Complies Complies Complies
E.1.7 Open Space Requirements for Shop Top Housing Developments	Communal Open Space: 1. Communal open space for shop top housing for development in excess of 15 dwellings must be provided as follows: 16 dwellings + : 30m2 for the first 15 dwellings plus 10m2 per additional dwelling Minimum area: 30m2 Minimum dimension: 5m Maximum proportion of the communal open space that can be used as an adjoining internal room: 20%	Our proposal invests significantly in the public domain and delivers a highly usable space for the residents and wider community to enjoy. The areas dedicated as communal spaces significantly exceed the minimum ADG and DCP requirements

Compliance Tables

Table 3_**Provisions of the ADG**

Objective	Design Guidance/Criteria	Comment on Proposed Scheme	Complies?
PART 3: Siting the Development			
3B Orientation			
Objective 3B-2 Overshadowing of neighbouring properties is minimised during mid winter	Living areas, private open space and communal open space should receive solar access. Solar access to living rooms, balconies and private open spaces of neighbours should be considered. Where an adjoining property does not currently receive the required hours of solar access, the proposed building ensures solar access to neighbouring properties is not reduced by more than 20%. Overshadowing should be minimised to the south or down hill by increased upper level setbacks.	Our proposal is deeply embedded in site analysis of the surrounding context. By orienting the buildings north, shadows to neighbouring buildings are minimised. Neighbouring properties are afforded solar amenity to that of the existing state. *The indicative scheme illustrates compliance will be achievable at later phases*	Complies
3D Communal and Public Open Space			
Objective 3D-1 An adequate area of communal open space is provided to enhance residential amenity and to provide opportunities for landscaping	**Design Criteria** Communal open space has a minimum area equal to 25% of the site. Developments achieve a minimum of 50% direct sunlight to the principal usable part of the communal open space for a minimum of 2 hours between 9 am and 3 pm on 21 June (mid winter). **Design Criteria** Communal open space should be consolidated into a well designed, easily identified and usable area. Communal open space should have a minimum dimension of 3m.	Our proposal invests significantly in the public domain and delivers a highly usable space for the residents to enjoy. The areas dedicated as communal spaces significantly exceed the minimum ADG and DCP requirements *The indicative scheme illustrates compliance will be achievable at later phases*	Complies
3F Visual Privacy			
Objective 3F-1 Adequate building separation distances are shared equitably between neighbouring sites, to achieve reasonable levels of external and internal visual privacy Note: Separation distances between buildings on the same site should combine required building separations depending on the type of room	**Design Criteria** Separation between windows and balconies is provided to ensure visual privacy is achieved. Minimum required separation distances from habitable rooms and balconies to the side and rear boundaries are as follows: Up to 12m/4 storeys: 6m Up to 25m/5-8 storeys: 9m Over 25m (9+storeys): 12m Separation distances between buildings on the same site should combine required building separations depending on the type of room (see Figure 3F.2 in the ADG).	Apartments are afforded visual separation exceeding the minimum requirements. Visual privacy is highly considered and habitable rooms are highly private. *The indicative scheme illustrates compliance will be achievable at later phases*	Complies
Part 4 – Designing the Building			

Objective	Design Guidance/Criteria	Comment on Proposed Scheme	Complies?
4A Solar and Daylight Access			
Objective 4A-1 To optimise the number of apartments receiving sunlight to habitable rooms, primary windows and private open space	**Design Criteria** Living rooms and private open spaces of at least 70% of apartments in a building receive a minimum of 2 hours direct sunlight between 9 am and 3 pm at mid winter.	Solar amenity to the future residents was considered from the outset. The development delivers apartments with a high level of solar amenity. Where direct solar access cannot be obtained. Residents will be able to utilise the communal open space which is afforded a northerly solar aspect	Complies
	A maximum of 15% of apartments in a building receive no direct sunlight between 9 am and 3 pm at mid winter.	Whilst every effort has been made to reduce the number of apartments receiving no solar access, the longest side of the site is north facing. This has resulted in a number of apartments receiving no solar access. Where apartments receive no solar access, they are generally afforded larger private open spaces, larger ceiling heights, and are provided with views of the local context and the CBD beyond. Whilst they receive little to no solar access, they are still provided a high level of amenity.	Non Compliant
Objective 4A-3 Design incorporates shading and glare control, particularly for warmer months.		*The indicative scheme illustrates compliance will be achievable at later phases*	Complies
4B Natural Ventilation			
Objective 4B-1 All habitable rooms are naturally ventilated		*The indicative scheme illustrates compliance will be achievable at later phases*	
Objective 4B-3 The number of apartments with natural cross ventilation is maximised to create a comfortable indoor environment for residents	**Design Criteria** At least 60% of apartments are naturally cross ventilated in the first nine storeys of the building.	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies
	Overall depth of a cross-over or cross-through apartment does not exceed 18m, measured glass line to glass line	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies
4C Ceiling Heights			
Objective 4C-1 Ceiling height achieves sufficient natural ventilation and daylight access	**Design Criteria** Measured from finished floor level to finished ceiling level, minimum ceiling heights are: Habitable: 2.7m Non habitable: 2.4m Ground/First Floors: 3.3m **Note:** As per Figure 4C.5 a floor to ceiling height of 2.7m requires a minimum floor to floor height of 3.1m.	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies

Objective	Design Guidance/Criteria	Comment on Proposed Scheme	Complies?
4D Apartment Size and Layout			
Objective 4D-1 The layout of rooms within an apartment is functional, well organised and provides a high standard of amenity	**Design Criteria** Apartments are required to have the following minimum internal areas: Studio: 35sqm 1 bed: 50sqm 2 bed: 70sqm 3 bed: 90sqm The minimum internal areas include only one bathroom. Additional bathrooms increase the minimum internal area by 5sqm each. A fourth bedroom and further additional bedrooms increase the minimum internal area by 12sqm each.	Complies and exceeds the minimum requirements in order to deliver a high quality development that is appropriate for the demographic of the area. Providing large apartments also ensures that at-least 50% of the apartments will be able to meet adaptable and accessible requirements	Complies
	Every habitable room must have a window in an external wall with a total minimum glass area of not less than 10% of the floor area of the room. Daylight and air may not be borrowed from other rooms	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies
Objective 4D-2 Environmental performance of the apartment is maximised	**Design Criteria** Habitable room depths are limited to a maximum of 2.5 x the ceiling height	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies
	In open plan layouts (where the living, dining and kitchen are combined) the maximum habitable room depth is 8m from a window	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies
Objective 4D-3 Apartment layouts are designed to accommodate a variety of household activities and needs	**Design Criteria** Master bedrooms have a minimum area of 10sqm and other bedrooms 9sqm (excluding wardrobe space)	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies
	Bedrooms have a minimum dimension of 3m (excluding wardrobe space)	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies
	Living rooms or combined living/ dining rooms have a minimum width of: 3.6m for studio and 1 bedroom apartments 4m for 2 and 3 bedroom apartments	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies
	The width of cross-over or cross-through apartments are at least 4m internally to avoid deep narrow apartment layouts	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies

Objective	Design Guidance/Criteria	Comment on Proposed Scheme	Complies?
4E Private Open Space and Balconies			
Objective 4E-1 Apartments provide appropriately sized private open space and balconies to enhance residential amenity	**Design Criteria** All apartments are required to have primary balconies as follows: Minimum area: Studio: 4sqm 1 bed: 8sqm 2 bed: 10sqm 3 bed: 12sqm Minimum depth: Studio: - 1 bed: 2m 2 bed: 2m 3 bed: 2.4m The minimum balcony depth to be counted as contributing to the balcony area is 1m	All private open spaces will meet the minimum requirements	Complies
	For apartments at ground level or on a podium or similar structure, a private open space is provided instead of a balcony. It must have a minimum area of 15sqm and a minimum depth of 3m.	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies
4F Common Circulation and Spaces			
Objective 4F-1 Common circulation spaces achieve good amenity and properly service the number of apartments	**Design Criteria** The maximum number of apartments off a circulation core on a single level is eight.	Podium level circulation areas are afforded a high level of communal amenity through delivering natural ventilation, and contains areas for the residents to encounter chance meetings. sit and intermingle.	Complies
	For buildings of 10 storeys and over, the maximum number of apartments sharing a single lift is 40.	*The indicative scheme illustrates compliance will be achievable at later phases*	N/A
4G Storage			
Objective 4G-1 Adequate, well designed storage is provided in each apartment	**Design Criteria** In addition to storage in kitchens, bathrooms and bedrooms, the following storage is provided: Studio: 4m3 1 bed: 6m3 2 bed: 8m3 3 bed: 10m3 At least 50% of the required storage is to be located within the apartment.	*The indicative scheme illustrates compliance will be achievable at later phases*	Complies

CONCEPT REPORT

Castlecrag Shopping Centre with Apartments

Building Services

Project Reference # 122058

Revision B
June 2020

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REV	DATE	WRITTEN BY	REVIEWED BY	APPROVED BY
A	05/06/20	AM	SH	AS
B	15/06/20	AM, DR, BP	SH	AS

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1 General

1.1 Project Overview

We understand the project to comprise the following:

Castlecrag Shopping centre and residential living

- Basement carpark and plant space
- Lower ground, Supermarket, storage and residential living
- Ground floor supermarket, retail, commercial space and residential living
- Podium floor, residential living, Gym and storage
- Level 2 Residential living
- Level 3 Residential living and plant space
- Roof, residential plant space and retail plant space

1.2 Project Description

FJMT architecture has designed an affordable living arrangement on top of various retail outlets in the shopping centre, ample parking and space will be paramount in this design, plant space in the basement and on the rooftop will house all plant equipment and several risers throughout the building will house all pipework running up and down the building.

This report presents the Buildings Services Discipline for the Proposal.

2 Mechanical Services

2.1 Scope

General Objectives

- The mechanical services capital cost is to achieve value for money
- The mechanical services need to be energy efficient

Air Conditioning (Comfort Cooling)

- Accommodation
- Common areas
- Retail and commercial spaces

Ventilation

- Outdoor air throughout
- Toilet exhaust in all amenities
- Car Park Exhaust and Make Up Air systems
- Dedicated roof space for the plant
- Garbage exhaust systems
- Fire Pump Room Exhaust
- Storeroom exhaust
- Electrical for the mechanical
- Building management and control systems
- BASIX and ESD Report requirements if required

No allowance has been made for the following:

- Specialist refrigeration, including cold rooms
- Precision controlled environmental rooms
- Compressed air and suction systems

2.2 Performance Standards

2.2.1 Code Compliance

New mechanical works shall be in accordance with the following current Australian Building Code and Standards.

- Comply to client's requirements including industry best practice
- Comply to the current Australia Standards
- Building Code of Australia (BCA) or otherwise known as the National Construction Code (NCC) Series
- Fire Engineering Reports
- AS/NZS 1668.1 The Use of Mechanical Ventilation and Air Conditioning in Buildings Part 1
- AS/NZS 1668.2 The Use of Mechanical Ventilation and Air Conditioning in Buildings Part 2
- AS 1324 – Air Filters for use in air conditioning and general ventilation (Parts 1 & 2)
- AS 1682 – Fire Dampers
- AS 1674 – Cutting and Welding
- AS1530 – Fire Hazard Tests
- AS 3666 – Microbial Control in Air-conditioning
- AS 4254 – Ductwork for Air-handling Systems in Buildings
- AS 1851 - Maintenance of Fire Protection Systems
- AS 3000 - SAA Wiring Rules
- AS 3013 - Electrical installations, wiring systems for specific applications.
- AS 3666 Series
- AS 4254 Series - Ductwork and Solid Ductwork – Fire resistance & Sealing.

- AS 2107 - Acoustics
- NSW Fire Brigade
- Safe Work requirements

2.2.2 Outdoor temperature

- Summer 32o C dry bulb, 23 o C wet bulb, Full Solar Load
- Winter 5.4o C

2.2.3 Room Temperature

Summer

- All Areas, except reticulation space 23 o C +- 1.0K, no humidity control
- Reticulation space 23 o C +- 2.0K, no humidity control

Winter

- All Areas, except reticulation space 21 o C +- 1.0K, no humidity control
- Reticulation space 21 o C +- 2.0K, no humidity control

Although called up in the Green Star report we do not recommend to Humidity controls not required.

We also suggest that Camel is used to calculate the building heat loads.

2.2.4 Glazing and Building Fabric:

Heating and cooling load calculations will be based in the information provided by ESD in the BASIX report which requires inputs from the Building Services, Architectural Features and Building Fabric

The below will be used for preliminary calculations these values are confirmed.

Glazing U-value (whole system) [K. m²/W]	**Glazing SHGC (whole system)**	**Wall Total R-value** [K. m²/W]	**Roof Total R-value** [K. m²/W]
4.8	0.51 or 0.59 (Slider)	TBA	TBA

These figures above are assumed and are subject to change.

2.2.5 Outside Air Content

Generally, as per AS1668.2

2.2.6 Exhaust air flow rates

Substation	To meet energy supplier requirements if it is required.
Switchroom	to meet Electrical Consultants requirements.
Carpark	To meet AS1668.1-2015, AS1668.2-2012 requirements
Occupancy units	to meet AS 1668.2-2012 requirements
Other areas	to meet AS1668.2-2012 requirements
Gas meter room	to meet AS1668.2-2012 & AS 5601.1.2013 requirements
Garbage / waste rooms	to meet AS1668.2-2012 requirements

2.2.7 Accommodation

Toilet Exhaust	10 l/s/m2 in common area, 35 - 40 l/s for private toilets which allows for a maintenance factor.
Kitchen Exhaust	120l/s (Recommended) dependent on final range hood selection.

2.3 General - Air conditioning and ventilation

Each sole occupancy unit shall be provided with VRV DX air conditioning which is fed by roof top package plant. This air cooled plant will service the entire building. Heating will be provided by virtue of the fact that the equipment is heat recovery reverse cycle.

Outdoor air will be ducted in via the face of the building to serve the units and also the roof top if required. This will allow the residents to bring in outdoor air from time to time without the need to run the air conditioning system. This will also allow the windows to remain closed in the event external winds, noise or other factors are unsuitable. The filters will be installed in a convenient location to allow for maintenance to be carried out safely.

The range hood exhaust will also be directed towards the façade via small openings. An in-duct fan will be used to assist with the discharge. Motorised dampers shall be installed to prevent air coming back into the building through the weatherproof louvres.

The exhaust system is installed to facilitate exhaust of the bathroom odours to the external weatherproof louvre, typically provided in the façade of the building as approved by the architect. The exhaust ductwork can be shallow to allow to work with the ceiling space allowance.

A GPO will be supplied c/w run on timer, current sensor and controls above the ceiling for toilet/laundry exhaust fan. Residential toilet exhaust systems are to be interlocked with lighting.

This kitchen exhaust will consist of a domestic style range hoods with filters that recirculate the exhaust air by removing grease particles and ducted to discharge louvre via facade.

2.3.1 Indoor Air Conditioning Units

Low profile DX fan coil units are proposed for the accommodation spaces as per the picture below.

Typical Fan Coil unit



Each indoor unit will be equipped with a wired remote-control panel for individual control. The control panel will provide control for on/off switch, temperature display, temperature reset, mode selector, fan speed selector, time clock as minimum. The control panel will be similar to the unit presented below.



Typical Local Control Panel

2.4 Ventilation and Air Conditioning Systems

Each apartment shall be naturally ventilated via operable doors and windows to outside. Typically, this requires an opening free area of 5% of the floor area of the zone to be ventilated.

Mechanical exhaust will be provided to all bathrooms, ensuites, WC's etc within each unit in accordance with AS 1668.2. Each unit will have a dedicated mechanical exhaust system that can be operated by turning on a dedicated switch. Exhaust systems will be designed in excess of that stipulated in the standards to ensure that over the lifetime of the plant minimum air flow rates are achieved.

All fans will be powered from local distribution board.

Corridors and apartments will be provided with natural ventilation via operable windows

Retail – provision of 350 W per square metre for cooling, and 120 W per square metre for heating allowances.

An economy cycle will be provided in the corridors and general circulation spaces where possible and will also have provision to heat and cool as required.

2.4.1 Range Hood Exhaust

The range hoods will have booster fans depending on the length of ductwork runs. The system is complete with discharge ductwork connection to range hoods via flexible ductwork and discharge louvre from façade. The range hoods will be by others.



Typical Fan

2.4.2 Carpark Ventilation

A mechanical ventilation system will be provided in accordance with AS 1668.2 to the carpark.

The system will include make-up (supply) to the basement through intakes at the entrance/exit of the carpark and or the roof as required. The carpark exhaust will be ducted to the roof level.

The exhaust system will be controlled via a carbon monoxide (CO) monitoring system which will ensure that operation of the fans will occur in accordance with AS1668.2. The fans will also be controllable from the Fire Fan Controls (located in the Fire Indication Panel) in accordance with AS 1668.1.

Fans will be powered from the Mechanical Services Switchboard.

The car park basement levels will be ventilated in compliance with AS 1668.2.2012 or a fire engineered solution based on CO Modelling

Dedicated fans room will be provided for supply and exhaust systems. The car park exhaust system will be discharged at roof level via a discharge louvre

CFD modelling may be beneficial to reduce the extent ductwork required and reduce the air flow requirements for the supply and exhaust air systems.

Car park supply, and exhaust reticulation path will be via inbuilt plenums at each car park level

2.4.3 Retail tenancies Kitchen Exhaust

The fresh air intake for the retail tenancies will be provided via a continuous louvre band in the overhang at high level on the ground level. The future retail tenants may be required to provide their own duct connection to the outside air plenum above the retail ceiling level.

- Retail Typical Exhaust rates are as follows 3000 L/s
- Exhaust air rates will be subject to change depending on cooking process

2.4.4 Garbage/ Waste Rooms

Garbage / waste rooms will be mechanically exhausted via exhaust risers and discharge on the roof levels. The system is complete with roof mounted fans and cowls.

2.4.5 Bicycle storeroom (Where provided):

Bicycle storerooms will be provided with mechanical supply air system in compliance with AS 1668.2.2012. The system is complete with fan, supply air ductwork, intake louvre and filter.

2.4.6 Switch room:

The room will be provided with mechanical fresh air system in compliance with AS 1668.2.2012 and the room heat load requirements. The system is complete with fan, supply air ductwork, intake louvre and filter.

2.4.7 Gas meter room:

The space will be provided with mechanical exhaust system in compliance with AS 1668.2.2012 and AS 5601.1

2.4.8 Power supply:

Essential and non-essential mechanical switchboard will be provided for the building.

2.5 Control/ BMCS:

Automatic control of the mechanical plant shall be provided by a Direct Digital Control (DDC) system. The DDC shall be an integral component of the Building Automation System. A distributed processing arrangement shall be utilised that will allow plant components to continue to operate in the event of a failure of the system head end or failure of the control system serving a specific plant component.

The BMS will only control the mechanical plant at this point in time. It may be expanded to suit the client requirements.

2.6 Noise and vibration:

All mechanical equipment and /or plant areas will be required to be assessed by an Acoustician to ensure noise levels do not exceed the requirements of AS2107, and Local Council requirements.

2.7 Energy Meters

Electrical Energy meters are to be provided within the mechanical switchboards to measure the energy usage from the major plant. The meters are to be connected to the BMS.

2.8 WORK BY OTHERS

The following equipment and work will be supplied and/or carried out by other Trades/Authorities as follows:

Work by Mechanical Installer....	Work By ....
In Connection with Electrical Services	**Electrical Services Installer**
• Supply and installation of mechanical services switchboard (MSSB) and advise whether boards are non-essential or fire essential. • Power and control wiring from MSSB to mechanical plant. • Connection of power from local isolators adjacent to mechanical plant. • Power and control wiring from Apartment distribution board to exhaust fans.	• Provision and termination of power supplies to mechanical services switchboards and FFCP. • Provision of power and local isolators to Unit exhaust fans. • Provision of power and local isolators to Unit Outdoor air fans.
In Connection with Hydraulic Services	**Hydraulic Services Installer**
• Condensate drainage to tundishes.	▪ Provision of tundishes
In Connection with Fire Services	**Fire Services Installer**
• Final termination of fire alarm signal cable at equipment fire trip interface where required. • Provision of fire fan control panel (FFCP) OR Coordination with Fire Services Installer for integration of FFCP into the FDCIE. • Access panels, drilling and sealing of ductwork for mounting of detectors • Installation of Fire dampers	• Provision of fire alarm signal cable to equipment fire trip interface where required. • Provision and installation of smoke detector on the supply ventilation systems required to run during Fire Mode.

In Connection with Building Works	Builder's Works
Fire Rated Building Elements Seal all penetrations using a system to AS4072.1.	Fire Rated Building Elements Undertake all coring, cutting and making good.
Non-Fire Rated Building Elements ▪ Seal penetrations around conduits, ducts and sleeves. Seal around cables within sleeves. If the building element is acoustic rated, maintain the rating.	**Non-Fire Rated Building Elements** ▪ Undertake all coring, cutting and making good.
Ceilings ▪ Co-ordination of penetrations. ▪ Locate all ceiling penetrations. ▪ Set out all required penetrations in ceilings for access and maintenance of Mechanical Services. ▪ Installation of access panels in ductwork	**Ceilings** ▪ Cut outs and trimming of openings for diffusers and grilles provided as part of Mechanical Services Works. ▪ Removal and replacement of ceiling panels ▪ Openings in plasterboard ceilings and ceiling tiles. Access panels in plasterboard ceilings for the maintenance and servicing of new and existing mechanical services. Locations to be confirmed on site by mechanical contractor and agreed with the Architect prior to installation of services.

3 Electrical Services

3.1 Scope

- Main switchboard, consumers' mains and metering as required.
- Submains to electrical DB's and other services.
- General lighting, interior and exterior.
- Exit & emergency lighting to NCC and AS2293.
- General purpose & special purpose power.
- Electrical supply for A/C to apartment units.
- Power supply to equipment & plants by other trades.
- Communication cabling and reticulation.
- NBN conduit provisions
- Retail/Commercial Electrical services (base build)
- Smoke Alarms
- MATV
- Access Control and Intruder Detection
- CCTV

No allowance has been made for the following:

- Level 3 design
- Standby and Emergency Power Generator systems
- Fit-out and retail design
- Lightning Protection
- Council street lighting

3.2 Incoming supply

3.2.1 Existing power supply

The existing building is serviced by a three-phase supply from Ausgrid on-site kiosk substation (5062) located at the west side of the building, on Eastern Valley Way via an underground feed into the adjacent Main Switch Board.

Further investigation is required to understand the current rating of the incoming supply from the on-site kiosk substation and the available spare capacity of the existing system. The current maximum demand of the existing building is also required to work out the spare capacity of the existing substation.

The kiosk substation that positioned within 10m from the fire boosters and fire hydrant pumps do not comply with current Code and Regulations.

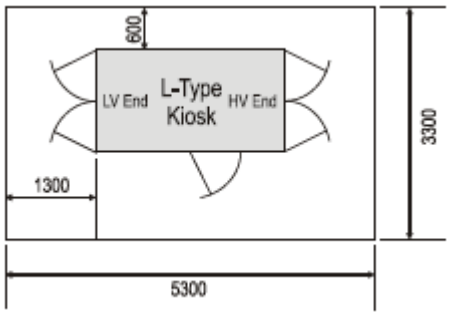


3.2.2 Proposed power supply

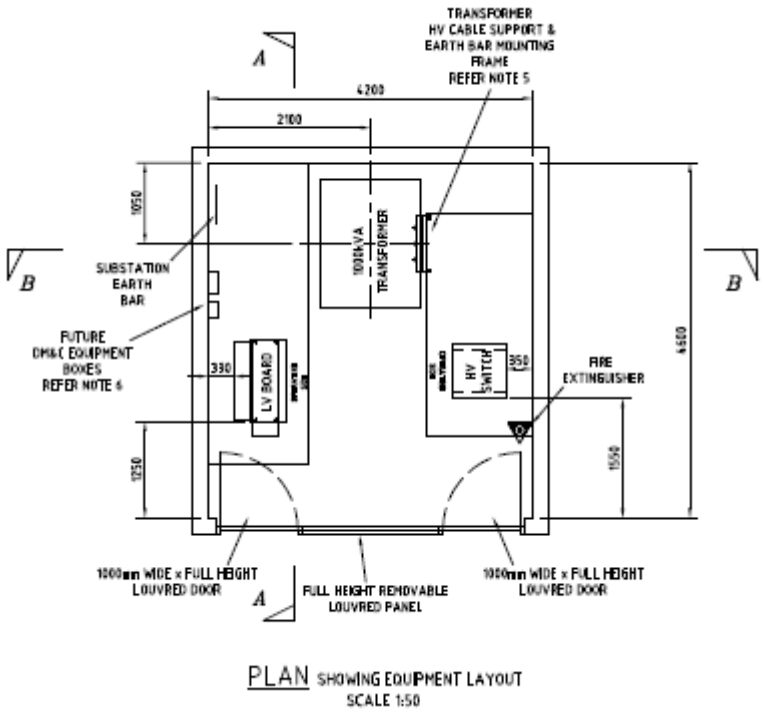
An initial maximum demand calculation was done to work out required power infrastructure of the development. Taking 67 units, lower ground and ground floor supermarkets, retail and carpark into account the maximum demand of the proposed development will be 930A including 10% future growth. The exact capacity and location of required substation will be defined in Level 3 design and is subject to Ausgrid approval however based on calculated maximum demand probably an 800 KVA kiosk substation will be proposed by Ausgrid.

Generally, kiosk substations are located at street levels. In our spatial drawing the substation has been indicated at lower ground floor to follow architect's layout. To locate the kiosk at lower ground floor, specific approval needs to be obtained from Ausgrid prior to proceeding with the design. The level at the top of the kiosk base must be not more than two metres above or below the access roadway level or street footpath level adjacent to the kiosk site.

The minimum site requirements for the kiosk would be 5.3m x 3.3m as per the layout below:



Another option is to install a surface chamber substation. This substation will be located within the property with 24/7 access for utilities.



PLAN SHOWING EQUIPMENT LAYOUT
SCALE 1:50

To enable us to determine if a new kiosk can cater for the load requirements of the proposed development as well as supply the load of the existing kiosk, the following information needs to be reviewed:

1) MD of the existing site. (needs to be investigated from site. MDI reading or electricity bills)
2) MD of the proposed development. (calculated at 930A)
3) Load on the existing kiosk (needs to be investigated from Ausgrid)

An application for connection alteration will be submitted to Ausgrid for proposed development power requirements. After submitting the application Ausgrid will provide a letter of offer normally within two weeks notifying how the proposed site will be supplied.

3.3 Performance Standards

3.3.1 Code Compliance

The electricity supply Authority Ausgrid, is the utility provider for the site. All works involving Ausgrid will be in accordance with their standards and specifications.

New electrical works will be in accordance with the following current Australian Building Code and Standards and Client Briefs.

- AS 1158 Lighting for Roads and Public Spaces
- AS 1428 General requirements for access – New building works
- AS 1680 Interior lighting and the visual environment
- AS 1768 Lightning Protection
- AS 2201 Intruder Alarm Systems
- AS/NZS 2293.1 Emergency evacuation lighting in buildings, system design, installation and operation
- AS/NZS 3000 Australian/New Zealand Wiring Rules
- AS/NZS 3008 Electrical Installations – Selection of Cables
- AS/NZS 3080 Integrated telecommunications cabling systems for commercial premises
- AS 4282 Control of the obtrusive effects of outdoor lighting
- TS 009 Installation Requirements for Customer Cabling (Wiring Rules)
- National Construction Code, including Section J6 and J8
- Local Supply Authority Services and Installation Rules
- Relevant Australian Standards
- The requirements of other relevant regulatory authorities

3.3.2 Electrical Main Switchboard & Metering

The Main Switchboard will to be located within a 2 hours fire rated Main Switch Room complete with 2 outward opening egress doors.

The Main Switch Room shall be located close to the substation.

The main switchboard will be front or back connected, floor mounted, bottom and top cable entry, Form 3B construction, minimum to IP42 rate, and with fault level of 35kA for 1 sec.

The fire rated consumer mains will be reticulated from the substation to the main switchboard supported on ladder tray or underground rigid conduits.

Submain protection will be by circuit breakers with suitable fault rating capacity to withstand the expected fault current. Circuit breakers will be selected for full discriminations.

The main switchboard will consist of 3 sections:

- Essential section (safety services) – for safety equipment identified by NCC
- Metered section – serve public area and house services
- Un-metered section – apartments and retail/commercial tenancies

Each section of the MSB will have minimum 20% spare modules for future circuit breakers.

3.3.3 Authorities Metering

Authority Metering will be provided in accordance with Ausgrid requirements.

We understand that each of the tenancies and each of the accommodation apartments will require a separate Authority meter.

Authority meter will be located on selected floors of the building within the electrical riser as well as in the Main Switchboard room.

Private energy metering will also be provided to comply with NCC Section J requirements, covering

- Vertical transportation,
- Mechanical services,
- Fire services,
- hydraulic services,
- House lighting
- House power.

These meters will be located within the Main Switch Room and within the House Distribution Boards.

3.3.4 Distribution Boards/ Load Centre

House electrical distribution boards serving general lighting and power will be of 3-phase supply complete with split chassis – for lighting and power. They will be of Form 1 construction and IP42 rated. The House Distribution Board will have 20% spare space.

Single phase load centres will be provided to each apartment for electricity distribution within the apartment. The location of the apartment load centres will be coordinated with the Architect at detail design stage.

It is proposed that each retail tenancy will be provided with

- General Retail/Café: Single phase 63 Amp supply to a 36-pole distribution board.
- Specialist Food Tenancy. Three phase 80 Amp supply to a 60-pole distribution board.
- Commercial Tenancy. Three phase 80 Amp supply to a 60-pole distribution board.

3.3.5 Submains

Submains will originate from the Main Switchboard and will be reticulated to:

- The Meter Panels serving the apartments, retail and commercial spaces.
- House light and power switchboard.
- Mechanical Services Switchboards.
- Hydraulic control panels.
- Fire services control panels.
- Lifts.
- Fire Panel.

Submains cabling will be reticulated throughout the building from the main switch board to the respective electrical distribution boards and load centres.

Submains cabling will be run on a system of ladder trays.

Submains cabling for fire and life safety related services will be of fire rated cables with copper conductors. Submains cabling for other services will be by XLPE/PVC stranded copper cables.

The cable type and size will be selected to comply with AS3008 and AS/NZS 3000 requirements.

3.3.6 General Power

General Power Outlets (GPOs) will be provided to each apartment.

GPOs and cleaner outlets will be provided to public area.

Dedicated power supply will be provided to mechanical services, hydraulic services, vertical transportation and fire services.

Dedicated GPO will be provided at selected parking bay for electric car charging if required.

The location of power outlets to each of the apartments will be determined in conjunction with the Architect and the Client

3.3.7 Lighting and Lighting Control System

Design of interior and exterior lighting is generally carried out based on the recommendations AS/NZS 1680, 1158 and the mandatory requirements of NCC Section J. All luminaires will be of LED type light fittings and will be controlled as follows:

- Basement carpark light fittings will be provided with motion detectors. At main car park entry – luminaires setting to be controlled by timer and PE cell controls.
- Exterior lighting will be controlled by photo electric (PE) cell and timer.
- Corridor lighting will be controlled by motion detector and timer.

24-hour security lights will be provided throughout the building at selected strategic locations.

Apartment lighting will be controlled by a local light switch.

Lighting will be provided to all areas within the building that are part of this project.

Lighting will be designed in accordance with the BCA, the project BASIX report and AS 1680.

The exact details of fitting locations and types will be determined in conjunction with the Architect and Client.

3.3.8 Exit and Emergency Lights

Emergency lighting and exit signs will be provided in accordance with mandatory requirements to AS/NZS 2293.

Exit and emergency lighting will be self-contained single point units. Emergency and Exit lights will be of LED type.

3.3.9 Digital Master Antenna Television (MATV)

A digital free-to-air Master Antenna Television will be provided, the system will comprise of the following:

- VHF/UHF high-gain antenna, suitable for digital TV.
- Individual channel amplifiers.
- Tap and Splitter for horizontal cabling.
- Horizontal cabling and MATV outlets as required.

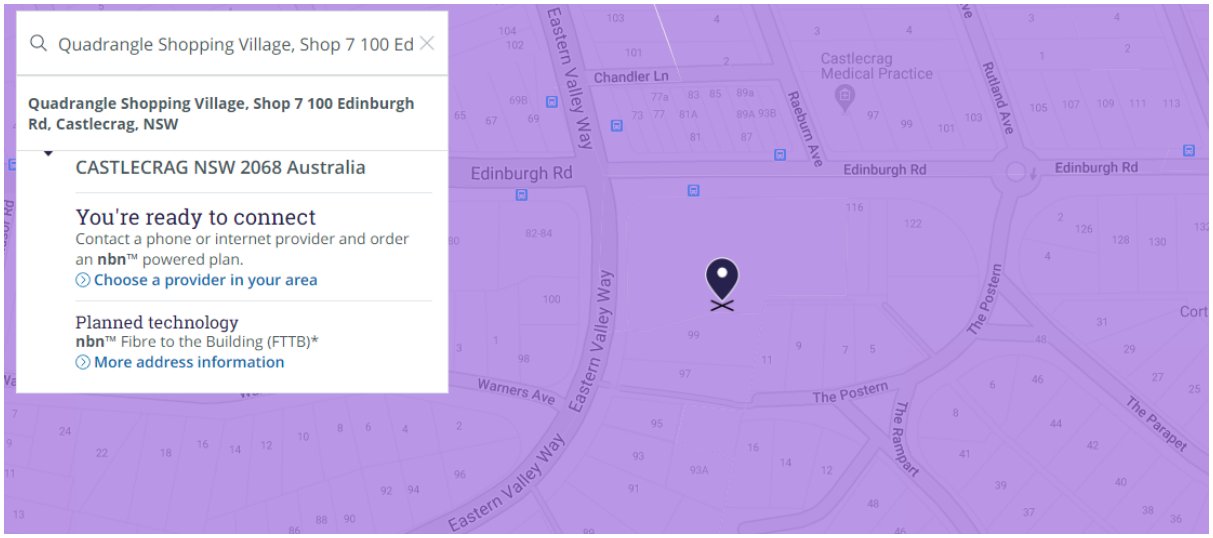
MATV outlets will be provide to each Apartment

3.3.10 COMMUNICATIONS

The exiting Centre MDF is located next to G/F electrical riser, outside of the Centre Management Office. Copper telephone cabling are installed.



NBN rollout map shows the NBN is available at the site and the property is ready to connect:



A dedicated communication room is required in the new development to accommodate NBN/MDF equipment.

A connection application will be submitted to NBN to allow for site future communications requirements.

The NBN works will comprise:

- Inground white communications lead-in conduits from property boundary to the Main Communications Room.
- Main Communication Room to accommodate Premises Distribution Hub and Network Termination Device.
- Communication riser cupboard on all floors for NBN backbone cables.
- Provision of communication cable trays and conduits reticulation throughout the facilities starting from Main Communications room to Communications riser cupboard to apartment Network Terminal Device (NTD).
- Provision of access along the public corridors.
- Provision of NTD enclosure in each apartment.
- Provision of 240V power supply as required.

RJ 45 outlets for both telecommunication and broadband network will be provided to each apartment. The outlet will be located next to the Apartment Network Terminal Device, unless instructed otherwise.

Each retail/commercial will be provided with 1no NBN Network Device (NTD) to cater for telecommunication network.

3.3.11 Smoke Alarms

Stand-alone smoke alarms will be provided in accordance with AS3786 within each apartment, powered from the resident's distribution board.

3.3.12 WORK BY OTHERS

The following equipment and work will be supplied and/or carried out by other Trades/Authorities as follows:

Work by Electrical Installer....	Work By ....
in Connection with the Supply Authority	**Supply Authority/Energy Retailer**
▪ Application for connection ▪ Application for meters	▪ Provision of Supply Authority/Energy Retailer meter.
in Connection with the NBN Co	**NBN Co**
▪ All drawings required by NBN Co. ▪ Cable supports/conduits as required by NBN Co	▪ Incoming cabling and backbone cabling ▪ Apartment NBN equipment ▪ Building NBN equipment

in Connection with Mechanical Services	Mechanical Services Installer
▪ Supply and installation of sub-mains to the Mechanical Services Switchboards	▪ Supply and installation of Mechanical Services Switchboards, complete with suitable lugs, gland plates, connectors, isolators.
▪ Supply and installation of sub-mains to air conditioning plant for the business, retail and apartment areas, including provision of isolator and final connection	▪ Supply and installation of air conditioning equipment.
▪ All cables to be dressed, prepared and terminated.	
in Connection with Lift Services	**Lit Services Installer**
▪ Provide supply to the lift services switchboards.	▪ Supply and installation of lift switchboards and panels complete with suitable lugs, gland plates, connectors, isolators etc.
▪ Dress and prepare all cables for termination and terminated as indicated on the drawings.	▪ Final connection of power supplies to the lift switchboards.
▪ Provide telephone cabling to Local Distributor box adjacent to the Lift Motor panels and terminate the cables at each end.	▪ Connection to telephone Local Distributor panel from the lift machine control panels.
in Connection with Hydraulic Services	**Hydraulic Services Installer**
▪ Provide supply to hydraulic services equipment.	▪ Supply and installation of hydraulic services equipment complete with suitable lugs, gland plates, connectors, isolators etc.
▪ All cables to be dressed, prepared and terminated.	
in Connection with Civil Engineering	**Civil Engineering Installer**
▪ Provide supply to civil engineering panel.	▪ Supply and installation of civil engineering equipment complete with suitable lugs, gland plates, connectors, isolators etc.
▪ All cables to be dressed, prepared and terminated.	
in Connection with the Ceilings	**Ceiling Installer**
▪ Set out all required penetrations in ceilings for Electrical Services (lights, exit and emergency lights etc.).	▪ Cutouts and trimming of openings for light fittings. ▪ Removal and replacement of ceiling tiles. ▪ Openings in plasterboard ceilings and ceiling tiles. ▪ Co-ordination of penetrations.
in Connection with Building Works	**Builders Works**
▪ Seal all fire rated penetrations using a system to AS4072.1. ▪ Seal all non-fire rated penetrations around conduits and sleeves. Seal around cables within sleeves. If the building element is acoustic rated, maintain the rating. ▪ Undertake all coring, cutting and making good, subject to approval from the Structural Engineer. ▪ Undertake all placing, casting in and protection of conduct sleeves and conduits.	▪ Services trenches; excavation and backfilling. ▪ All chasing, coring, cutting and making good. ▪ Access doors and hatches for maintenance. ▪ Bases and plinths for equipment.

4 Hydraulic Services

4.1 Scope

The scope of the hydraulic services will comprise the following:

- Cold Water Service
- Hot Water Flow and return Service
- Rainwater harvest
- Natural Gas Services
- Sanitary Plumbing and Drainage Systems
- Fire Hose reel Service
- Rainwater Drainage (Gutters & Downpipes Only)
- Trade waste drainage

No allowance has been made for the following:

- LP gas services or other
- Stormwater drainage (including Civil and Ground drainage)
- Water / Sewerage Treatment services (Filtration / Black Water / Grey Water)
- Roof design
- Irrigation systems
- Authority Infrastructure upgrades

4.2 Performance Standards

The hydraulic services will be designed to comply with.

- Australian Standard AS3500 parts 1, 2, 3, &4
- Australian Standard AS2419
- Australian Standard AS2441
- Australian Standard AS5061
- Water and Gas Supply Authorities
- Council Regulations
- Nation Construction Code – Plumbing Code of Australia

4.3 Incoming Services

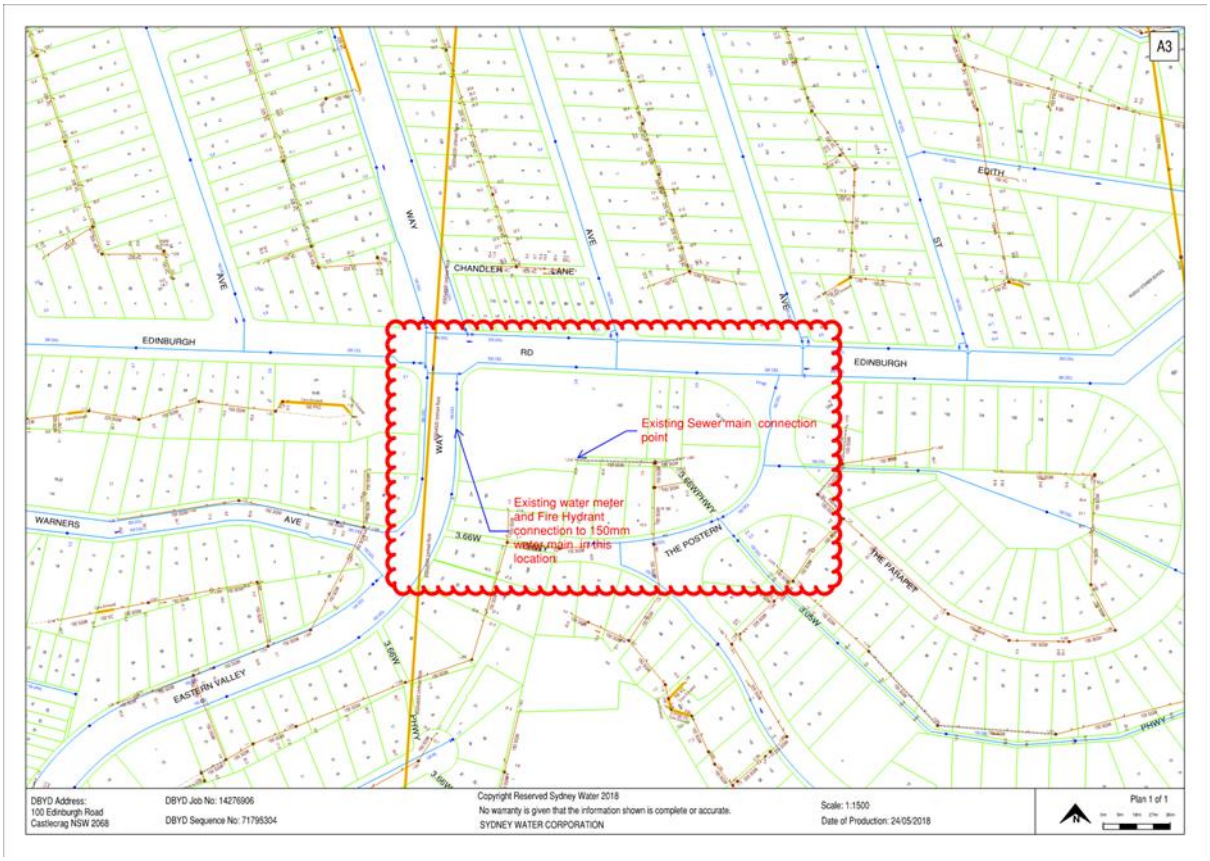
Incoming services will be designed to suit site-specific requirements and existing services conditions will be confirmed onsite.

4.4 Domestic Water Supply

The existing cold water is provided by 50mm diameter water supply, from the 150mm Sydney Water main in Eastern Valley Way,



For the new retail / residential building with estimated total probable simultaneous demand (PSD) (67 dwellings 5.73 L/s + retails 4.5L/s + Fire hose reel and irrigation 3.2 L/= **13.43L/s**). It is proposed that a new Domestic water services supply connected to 150mm Sydney Water's water main located in east side of Eastern Valley Way be incorporated. (Subject to Sydney Water notice of requirements and Section 73 Sydney Water approval, Sydney Water will determine the connection point and amplifying of existing water main pipe to 200mm).



Master Water meter sets for the building will be located in the site boundary, including testable RPZD to each meter (Backflow prevention Device and pressure limiting Valves). The Water meter will be at a maximum distance of 3 meters from building boundary.

Domestic potable pump in basement:
A domestic potable water pump will be required in the basement to supply water to the roof of the building, estimated 9 l/s is required, the supermarket is to advise us on their water usage requirements.

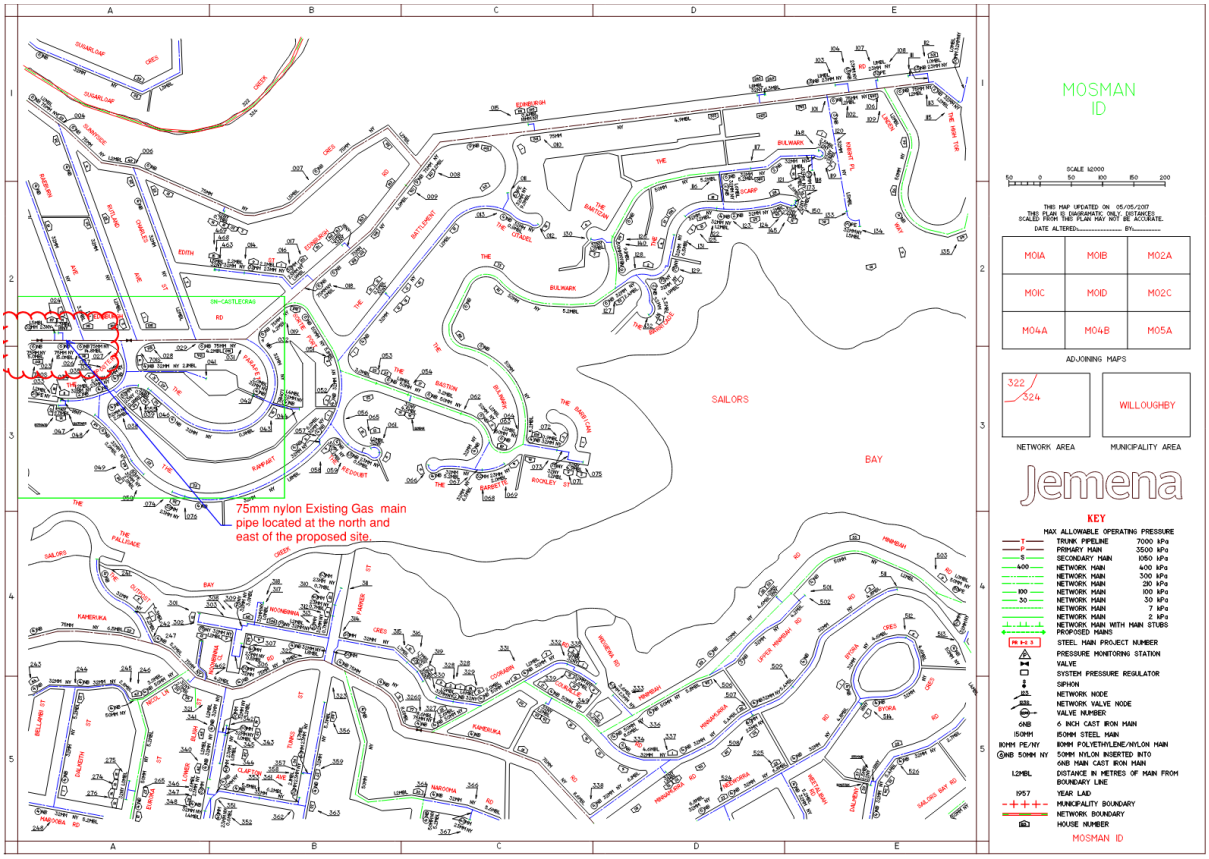
New branch lines from the water supply main, to groups of fixtures or other user groups, including take-offs for WC flushing system, will all be provided with stop valves for easy shut off and maintenance.

Rainwater downpipes will be connected to stormwater system, and rainwater from roof downpipes with be used rainwater harvesting system including filtration system.

4.5 Natural Gas Service

Existing 75mm Natural Gas main having working pressure of 210Kpa, is located in Edinburgh in accordance with the authorities. The gas main will be extended to the proposed site building with new regulator to reduce the pressure to 2.75Kpa.

For the new retail / residential building with estimated gas load (Retail 3,500Mj/hr + Residential 1,910Mj/hr=**5,410Mj/hr** total Gas consumption). The Existing main have the capacity to provide the new proposed development with natural gas



Application to be submitted to the Gas authority for approval for the required load.

Natural gas services will be provided with Safety shut off valve (System III) and connected to Fire indicator panel.

Gas will be reticulated throughout the building to serve central hot water main kitchen within new proposed building.

All flues and safety measures to be provided as per the Gas Company's requirements and relevant standards.

4.6 Sewer Drainage and Connection to Sydney Water Mains

There is a 150mm sewer Sydney Water main on south boundary of the site, the main sewer has been repaired by Sydney water as the Sydney water map above indicate that the existing sewer main SGW (Salt Glazed Ware) has been rehabilitation(lining) . Application / advice from Sydney Water coordinator regarding the requirements to connect and protect Sydney Water assets will be required.

Subject to Sydney Water's Section 73, the sewer connection will be from the existing 150mm sewer main.

Sanitary drainage will be provided from sewer drainage and connecting all the stack work together and discharging thereafter to 'Sydney Water's sewer system via a boundary trap.

4.7 Sanitary Plumbing

Sanitary plumbing will be provided with a fully vented modified system of stacks and relief vents for all wet areas. Vents which will be terminate above the roof to atmosphere.

4.8 Sanitary ware and Tapware

Sanitary ware will generally be vitreous china in accordance with Architect Specification. Tapware will generally be chrome plated brass with loose jumper valves. Sanitary ware and tap ware will be scheduled by the Architect and to comply with regulations, Basix, and star rating.

4.9 Sanitary Drainage

Sanitary drainage is provided from the underside of the ground floor, connecting all the stack work together, and discharging to the street sewer system.

4.10 Hot and Cold Water Services

A hot and cold-water reticulation is provided with the cold-water system having a connection to the street water mains, via a water meter assembly and RPZD to supply water to the building. Subject to Sydney Water Section 73,

Hot water system for the building will be provided via two new flow and return central hot water systems (one for each side of the building) The retail stores will have a separate hot water system separate to the residential hot water system complete with a gas booster which will be provide warm water. The hot water system will be designed complete with circulation for each unit including valve control.

Isolation valves will be provided to each dwelling for easy shut off and maintenance.

4.11 Water Heating Plant

The following water heating plant is proposed:

1. Water Heating Plant

The proposed residential hot water plants are separated into 2 sides, the east side which has 3 storeys and the west side which has 4 storeys;
Zone 1 (east side) will consist of 26 apartments

1 x Rheem Tankpak series 2 model TPI02N*D/1340 (internal) inclusive of:

- 2 x Rheem 6.1 Star 205MJ commercial continuous flow internal water heaters factory manifolded inline on galvanised frame
- 1 x 610340 commercial storage cylinder with high flow 50mm fittings.
- 1 x Grundfos CM 3-2 primary circulator factory mounted on frame.
- 1 x digital controller with temperature display factory mounted on frame.
- 1 x circulating pump will be required

Providing up to 3,615 litres of hot water raised 50°C over the 2 hour peak period

Weight and plant space required

Weight in operation: 519kg

3500mm x 2000mm is the required space in the plant room.

1000mm x 1000mm space will be required for the circulation pump

Gas and electrical consumption

- Gas consumption is 410 MJ/H
- Maximum running current 4.0 Amps

Flue requirements

- This internal Tankpak model will require 2 x Rheem co-axial room sealed flue terminations to suit the project.
- A 160mm flue will be required for the hot water unit, it will penetrate through the roof vertically and terminate.

Zone 2 (West side) will consist of 41 apartments

1 x Rheem Tankpak series 2 model TPI04N*D/1340 (internal) inclusive of:

- 4 x Rheem 6.1 Star 205MJ commercial continuous flow internal water heaters factory manifolded inline on galvanised frame
- 1 x 610340 commercial storage cylinder with high flow 50mm fittings.
- 1 x Grundfos CM 3-2 primary circulator factory mounted on frame.
- 1 x digital controller with temperature display factory mounted on frame.
- 1 x circulating pump will be required

Providing up to 3,615 litres of hot water raised 50°C over the 1 hour peak period

Top down heating for faster hot water delivery and better redundancy

Weight and plant space required

Weight in operation: 677kg

4000mm x 2000mm is the required space in the plant room.

1000mm x 1000mm space will be required for the circulation pump

Gas and electrical consumption

- Gas consumption is 820 MJ/H
- Maximum running current 5.5 Amps

Flue requirements

- This internal Tankpak model will require 4 x Rheem co-axial room sealed flue terminations to suit the project.
- A 160mm flue will be required for the hot water unit, it will penetrate through the roof vertically and terminate.

Circulation hot water Pumps to be provided to each hot water plant to provide continues flow and return to all levels

This will Include with by-pass, include mounting brackets and pump control panel. Panel to incorporate relays, contractors, etc and BMS labelled terminal strip for remote monitoring of pump status.
All as supplied by Kelair Pumps Australia
all necessary pipework, valves, supports, safe tray, circulating pumps etc to form a complete working installation.
Reticulate pipework to all wet areas via a recirculation loop system s

4.12 Fire Hose Reel

A fire hose reel system will be installed to provide enough coverage to all parts of the development for initial response by the building occupants in the event of a fire.

Fire hose reels will be installed within four meters of designated exits; or fire stairs and in other areas to provide supplementary coverage. (Non-class 2 areas only)

The fire hose reel system will be fed from the domestic service and is to be installed in accordance with AS2441.

4.13 WORK BY OTHERS

The following equipment and work will be supplied and/or carried out by other Trades/Authorities as follows:

Work by Hydraulic Installer....	Work By ....
in Connection with the Mechanical Services	**Mechanical Services Installer**
▪ Provide AC tundish drains for AC condensate drainage	▪ Connect condensate pipework to tundishes
in Connection with the Electrical Services	**Electrical Services Installer**
▪ Provide access to electrical components from manufacturer products.	▪ Supply and install electrical services to the required hydraulic items
in Connection with the Supply Authority	**Supply Authority/Energy Retailer**
▪ Application for all connections ▪ Application for meters	▪ Provision of supply from Authority.

in Connection with Civil Engineering	Civil Engineering Installer
▪ Discharge above ground stormwater system to inground civil system.	▪ Allow discharge points for hydraulic services to discharge to civil inground system

5 Fire Protection Services

5.1 Scope of Design

ITEM #	Essential Fire Safety Measures	Standard of Performance NCC 2019 (DtS) (including all amendments) & EP&A Regs 2000 Clauses:
1	Alternative/Performance Solutions	BCA CL. A0.3
2	Automatic door fail-safe devices	D2.21, D2.22, AS1670.1:2018
3	Automatic Fire Sprinkler Systems	E1.5, Spec E1.5, AS 2118.1:2017 and AS 2118.6:2012.
4	Automatic Fire Detection and Alarm Systems	Spec E2.2A(Cl.5), AS 1670.1:2018, AS 1668.1:2015, AS 3786:2014.
5	Brigade connection (system monitoring)	AS 1670.3-2018, Spec E2.2A (CL. 8).
6	Emergency warning and intercommunication systems	E4.9, AS 1670.4:2018, AS 7240.24:2018, AS 7240.23:2014, G3.8, Spec G3.8 (CL.5)
7	Fire extinguishers & blankets	E1.6, AS 2444: 2001
8	Fire hydrants and sprinkler mains	E1.3, AS 2419.1:2005, AS 2118.6:2012.
9	Fire Pumps and Pump Rooms	C2.12, C2.13, F5.7, G3.8(6), AS 2941:2013 AS2118.1:2017, AS2419.1:2017
10	Kitchen hood fire suppression system (Range Guard)	AS 3772:2008, Range Guard Design Guidelines, UL300, NFPA 17A, NFPA 96
11	Static water storage (hydrants &/or sprinklers)	E1.3, AS 2419.1:2017, AS 2304:2019. E1.5, Spec E1.5 (CL. 7), AS 2118.1:2017, AS 1657:2018, AS 3500.1:2018
12	Fire sprinkler risk – back of house storage areas	OH3 – K_M :8.00 – DD:5.0 mm/min – 18 off heads
13	Fire sprinkler risk – carpark	OH2 – K_M :8.00 – DD:5.0 mm/min – 12 off heads
14	Fire sprinkler risk – ceiling space	LH Skeleton – K_M :8.00 – DD:1.59 mm/min – 6 off heads
15	Fire sprinkler risk – lift motor room	OH1 – K_M :8.00 – DD:5.0 mm/min – 6 off heads
16	Fire sprinkler risk – offices below ceiling	LH – K_M :8.00 – DD:3.19 mm/min – 6 off heads
17	Fire sprinkler risk – plant room	OH1 – K_M :8.00 – DD:5.0 mm/min – 6 off heads
18	Fire sprinkler risk – residential	LH – K_M :8.35 – DD:4.1 mm/min – 4 off heads
19	Fire sprinkler risk – restaurants & cafes	OH2 – K_M :8.00 – DD:5.0 mm/min – 12 off heads
20	Fire sprinkler risk – retail areas	OH3 – K_M :8.00 – DD:5.0 mm/min – 18 off heads
21	Fire sprinkler risk – switch room	Nil Sprinklers. All walls and doors are required to maintain an FRL of 120/120/120.

5.2 WORK BY OTHERS

The following equipment and work will be supplied and/or carried out by other Trades/Authorities as follows:

Work by Fire Installer....	Work By ....
in Connection with Mechanical Services	**Mechanical Services Installer**
▪ Supply and installation of cabling between the FIP and other input output to mechanical switchboard.	▪ Supply and installation of Mechanical Services Switchboards, complete with suitable interface relays suitable for connection to FIP. ▪ Connection, testing and commissioning of smoke hazard management. ▪ Providing access and installation for supply duct air detectors.
in Connection with Electrical Services	**Electrical Services Installer**
	▪ Provision of power supply to FIPs and other remote part of the Control and Indication Equipment (CIE).
in Connection with Hydraulic Services	
Provision of stop valves and double check valves for sprinkler system	▪ Provision of domestic water riser and branch for sprinkler connection. ▪ Provision of domestic pump capable to supply domestic and sprinkler system.

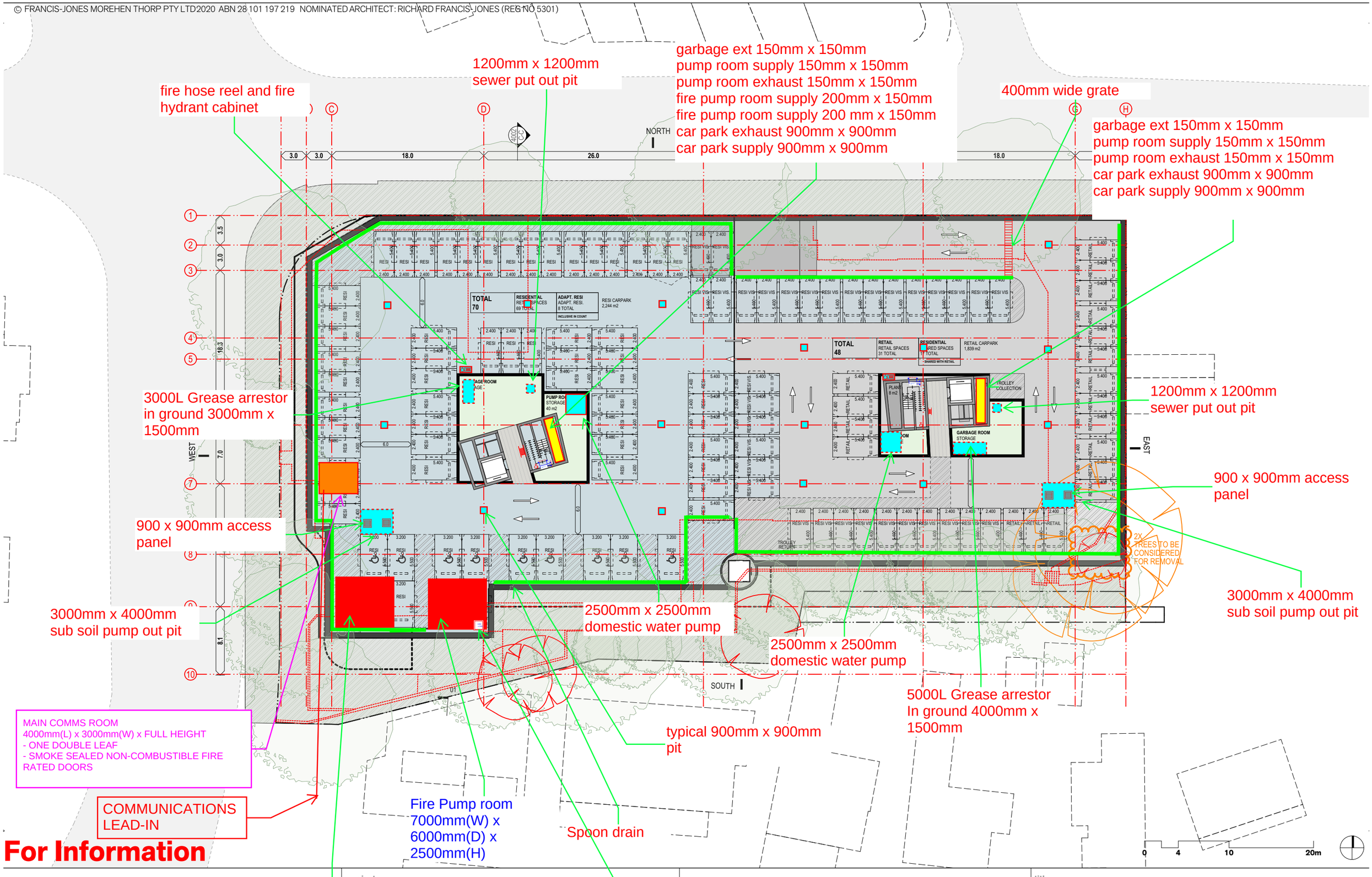
6 Building Services Spatial Requirements

Electrical System	Location	Preferred Aspect and Size Etc.	System Requirements and Considerations
Chamber Substation	Ground Level	Refer to Level 3 designer	Refer to Level 3 ASP designer
Alternative: Pad mounted substation	N/A	Refer to Level 3 designer	Refer to Level 3 ASP designer
Main Switchboard and Meter Panel Room	Basement	5800mm x 2800mm x 2600mm	In close proximity to substation. Two doors on opposite side of room. Doors must open outwards. Column free. Meter panel located in MSB for House services and commercial tenancies.
Electrical Riser	Typical floors - Vertically aligned	3200 mm wide x 400 mm deep	Meter panels located in riser cupboards for apartments.
Main Communications Rooms	Basement	2400 mm wide x 1700 mm deep	Room to also contain security head end panel and intercom head end panel, and data loggers for gas supplies.
Communications Riser	Typical floors	1200 wide x 400 mm deep	Vertically aligned
NBN Riser	Typical floors	900 wide x 400 mm deep	Vertically aligned
Mechanical System	**Location**	**Preferred Aspect and Size Etc.**	**System Requirements and Considerations**
Stair Pressurisation	Adjacent Fire Stairs	3200mm x 600mm or as shown on the drawings	1200mm dia fan located on the roof top, pressure sensors, VSD
Car Park Exhaust and Supply	Carpark	900mm x 1100mm each system	Duct work opposite walls at high level
Storeroom Exhausts	Throughout	125mm x 150mm	Small Exhaust Fan
Toilet Exhausts	Throughout	400mm x 500mm	Roof top exhaust fan
Garbage Rooms	Ground floor	150mm x 150mm	Roof top exhaust fan
Lobby Ventilation	2 opposite sides	800mm x 700mm	Fan and grilles
Kitchen Exhaust	Ground Level	800mm x 900mm	Roof top exhaust fan
Kitchen Supply	Ground Level	800mm x 800mm	Grilles and fan at Ground Level
Potable Cold-Water Pump Room	Basement	100mm x 200mm	Grilles and fan
Laundry Room	Basement	125mm x 125mm	Grilles and Fan
Fire Pump Room exhaust and supply	Basement	250mm x 200mm	Fan and grilles
Basement Showers	Basement	125mm x 125mm	Fan and grilles
Outside Air Ducts	apartments and retail spaces	150mm x 150mm	Fan and grilles
Floor and Return Chilled Water	Risers	800mm x 300mm	Chilled Water Pipework
Lobby Ventilation	Lobbies	200mm x 125mm	Ducts and grilles
Hydraulic System	**Location**	**Preferred Aspect and Size Etc.**	**System Requirements and Considerations**
Roof Down Pipes	Internal	250mm x 250mm	Location and numbers to be confirmed
Hydraulic risers	1 or 2 per Apartment	600mm x 300mm Internal Clear	Caters for 100mm Sewer Stack and 100mm Relief Vent as well as water and gas risers.
Master Gas Meter and Regulator	Ground Floor at boundary	1500mm X 1000mm	If in room will need to be 3m x 2m and accessed straight from the street. Mains extension required.
Subsoil pump pit	Basement carpark	4000mmx 5000mm	To be located in ground.

Grease arrestor	Basement carpark	4500mm x 4500mm	To be located in ground.
Sewers pump out pit	Basement carpark	1200mm x 1200mm	Any sewer that cannot be gravity fed to the main is to go in this pit.
Drain Sump	Fire Pump Room	1200mm x 1200mm x 900mm	Be able to withstand the testing of the fire pump
Master Water Meter and RPZD	External at Front Boundary	2200mm x 1000mm	Must be located within 1m of front boundary unless special approval given by Municipal Water Authority with backflow device.
Roof pump room	Roof	2000mm x 2000mm	Adequate ventilation required.
Hot Water Plant 1 (gas system)	Open Roof Plant	6000mm X 2500mm	Adequate ventilation required.
Hot Water Plant 2 (gas system)	Open Roof Plant	6500mm x 2500mm	Adequate ventilation required.
Cold Water Pump Room	Internal (Basement Level)	3500mm x 4500mm	Potable cold-water pump room.
Fire System	**Location**	**Preferred Aspect and Size Etc.**	**System Requirements and Considerations**
Combined Fire Hydrant and Sprinkler System Booster	Adjacent to Main Site Entry and Dominant Towns Mains - External	5250mm (W) x 1500mm (D) x 2975mm (H)	Located within building facade. Fire rating of 90/90/90 for 2m each side and 3m above cupboard. To be located within sight of the main entry to the building and within 8m of a hardstand that can cater a fire brigade pumping appliance (truck).
Combined Fire Hydrant and Sprinkler Tank	Basement - Internal	Tank Volume = 153m^3 (Effective Capacity = 113kL)	At least 1000mm vertical clearance above the access hatch.
Fire Control Room	Street Level - Internal	4000mm (W) x 3000mm (D) x 2500mm (H)	Door must open into the room. Two paths of egress (One directly to the road or open space & the other via the front entry of the building) Fire rating of 120/120/120 Minimum width 2.5m as per NCC Containing the following as per NCC requirements; - master emergency control panel - Fire Indicator Panel - White board - Pin board - Racked plan table
Fire Pump Room	Basement - Internal	7000mm (W) x 6000mm (D) x 2500mm (H)	Opening directly onto a public road or open space or fire isolated egress. (basement fire stairs) - Fire Rating; 120/120/120 - 2 x Diesel Fire pumps - 1 x Diesel Fire relay pump - Sprinkler control valve assemblies - Testing drainage sump (1200 x 1200 x 900) raised of slab. Draining to stormwater pumpout tank.
2 x Dry Fire Riser	Typical floors - Vertically aligned in separate cupboards	1200mm (W) x 400mm (D)	Vertically aligned.
2 x Wet Fire Risers	Typical floors - Vertically aligned in each fire stair	990mm (W) x 270mm (D)	Vertically aligned.

7 Building Services Spatial Drawings

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rev	date	reason	by	chk
3	20/05/2020	For Information	DN	
2	14/05/2020	For Information	DN	RFJ
01	13/05/2020	For Information	DN	RFJ

title
PLANS
Basement 1 Floor Plan

scale	code	sheet no.	rev
1:400 @ A3	GQC	3000	03

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garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
fire pump room supply 200mm x 150mm
fire pump room supply 200 mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
switchboard room exhaust 125mm x 125mm

gas and water meter
for supermarket
1000mm x 600mm x 2

garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
Outside air duct 200mm x 200mm

400mm wide grate

2x cabinet 1000mm x 600mm for gas and water sub meter for units

Typical every unit needs an individual hydraulic riser 600mm x 300mm to house all drainage pipes, water pipe, gas pipes and any internal storm water pipework

MAIN SWITCHROOM
7000mm(L) x 5000mm(W) x FULL HEIGHT
- TWO DOORS ONE SINGLE LEAF AND ONE DOUBLE LEAF
- SMOKE SEALED NON-COMBUSTIBLE FIRE RATED DOORS

Gas and Water sub meter cupboard 1000mm x 350mm for units

crust hump to be provided in front of truck turning circle

INDICATIVE LOCATION OF KIOSK SUBSTATION. TO BE VERIFIED BY LEVEL 3 DESIGNER SUBJECT TO AUSGRID APPROVAL.

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rev	date	reason	by	chk
03	20/05/2020	For Information	DN	
02	14/05/2020	For Information	DN	RFJ
01	13/05/2020	For Information	DN	RFJ

title
PLANS
Lower Ground

scale 1:400 @ A3 | code **GQC** | sheet no. **3001** | rev **03**

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garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
fire pump room supply 200mm x 150mm
fire pump room supply 200 mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
switchboard room exhaust 125mm x 125mm
restaurant exhaust 200mm x 200mm
cafe exhaust 200mm x 200mm
cafe exhaust 200mm x 200mm
pharmacy shop 200mm x 200mm

Fire Booster Assembly
- Internal Dimensions
5250(L) x 1500(D) x
2975(H)

water and gas master meter rooms
3200mm(D) x
1000mm(D) x
1500mm(H) each

restaurant and cafe future gas meter

garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
Outside air duct 200mm x 200mm
outside air duct 200mm x 200mm

2x cabinet 1000mm x 600mm for gas and water sub meter for units

ELECTRICAL RISER CUPBOARD
(W)1600 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOUBLE DOORS

COMMS RISER CUPBOARD
(W)1200 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOORS

COMMS RISER CUPBOARD
(W)1200 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
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ELECTRICAL RISER CUPBOARD
(W)1600 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOUBLE DOORS

1500mm x 350mm cabinets
1x for retail water sub meter
1x for residential gas sub meter
1x hot/cold residential water sub meter

Fire control room
10m^2

Every unit needs an individual hydraulic riser 600mm x 300mm to house all drainage pipes, water pipe, gas pipes and any internal storm water pipework

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03	20/05/2020	For Information	DN	
02	14/05/2020	For Information	DN	RFJ
01	13/05/2020	For Information	DN	RFJ

title
PLANS
Ground Floor Plan

scale	code	sheet no.	rev
1:400 @ A3	GQC	3002	03

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garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
fire pump room supply 200mm x 150mm
fire pump room supply 200 mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
switchboard room exhaust 125mm x 125mm
restaurant exhaust 200mm x 200mm
cafe exhaust 200mm x 200mm
cafe exhaust 200mm x 200mm
pharmacy shop 200mm x 200mm

garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
Outside air duct 200mm x 200mm
outside air duct 200mm x 200mm

COMMS RISER CUPBOARD
(W)1200 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOORS

ELECTRICAL RISER CUPBOARD
(W)1600 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOUBLE DOORS

2x cabinet 1000mm x 600mm for gas and water sub meter for units

Every unit needs an individual hydraulic riser 600mm x 300mm to house all drainage pipes, water pipe, gas pipes and any internal storm water pipework

1500mm x 350mm cabinets
1x for residential gas sub meter
1x hot/cold residential water sub meter

ELECTRICAL RISER CUPBOARD
(W)1600 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOUBLE DOORS

Every unit needs an individual hydraulic riser 600mm x 300mm to house all drainage pipes, water pipe, gas pipes and any internal storm water pipework

COMMS RISER CUPBOARD
(W)1200 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOORS

2X TREES TO BE CONSIDERED FOR REMOVAL

WEST
EAST
SOUTH

0 4 10 20m

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rev	date	reason	by	chk
03	20/05/2020	For Information	DN	
02	14/05/2020	For Information	DN	RFJ
01	13/05/2020	For Information	DN	RFJ

title
PLANS
Podium Floor Plan

scale 1:400 @ A3 | code **GQC** | sheet no. **3003** | rev **03**

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garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
fire pump room supply 200mm x 150mm
fire pump room supply 200 mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
switchboard room exhaust 125mm x 125mm
restaurant exhaust 200mm x 200mm
cafe exhaust 200mm x 200mm
cafe exhaust 200mm x 200mm
pharmacy shop 200mm x 200mm

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garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
Outside air duct 200mm x 200mm
outside air duct 200mm x 200mm

COMMS RISER CUPBOARD
(W)1200 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOORS

ELECTRICAL RISER CUPBOARD
(W)1600 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOUBLE DOORS

1500mm x 350mm cabinets
1x for residential gas sub meter
1x hot/cold residential water sub meter

Every unit needs an individual hydraulic riser 600mm x 300mm to house all drainage pipes, water pipe, gas pipes and any internal storm water pipework

Every unit needs an individual hydraulic riser 600mm x 300mm to house all drainage pipes, water pipe, gas pipes and any internal storm water pipework

2X TREES TO BE CONSIDERED FOR REMOVAL

COMMS RISER CUPBOARD
(W)1200 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOORS

ELECTRICAL RISER CUPBOARD
(W)1600 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOUBLE DOORS

For Information

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project
The Quadrangle - Castlecrag
100 Edinburgh Road
Castlecrag NSW 2068

rev	date	reason	by	chk
03	20/05/2020	For Information	DN	
02	14/05/2020	For Information	DN	RFJ
01	13/05/2020	For Information	DN	RFJ

title
PLANS
Level 2 Floor Plan

scale 1:400 @ A3 | code **GQC** | sheet no. **3004** | rev **03**

© FRANCIS-JONES MOREHEN THORP PTY LTD 2020 ABN 28 101 197 219 NOMINATED ARCHITECT: RICHARD FRANCIS-JONES (REG NO 5301)

garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
fire pump room supply 200mm x 150mm
fire pump room supply 200 mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
switchboard room exhaust 125mm x 125mm
restaurant exhaust 200mm x 200mm
cafe exhaust 200mm x 200mm
cafe exhaust 200mm x 200mm
pharmacy shop 200mm x 200mm

COMMS RISER CUPBOARD
(W)1200 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOORS

ELECTRICAL RISER CUPBOARD
(W)1600 x (D)600mm
- ALIGNED WITH THE RISER CUPBOARD ABOVE AND BELOW
- SMOKE SEALED NON-COMBUSTIBLE DOUBLE DOORS

East side hot water plant 4500mm x 2000mm including circulation pump

garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
Outside air duct 200mm x 200mm
outside air duct 200mm x 200mm

discharging to roof

residential central hot water plant 5000mm x 2000mm including circulation pump

1500mm x 350mm cabinets
1x for residential gas sub meter
1x hot/cold residential water sub meter

Every unit needs an individual hydraulic riser 600mm x 300mm to house all drainage pipes, water pipe, gas pipes and any internal storm water pipework

2X TREES TO BE CONSIDERED FOR REMOVAL

WEST
EAST
SOUTH

0 4 10 20m

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rev	date	reason	by	chk
03	20/05/2020	For Information	DN	
02	14/05/2020	For Information	DN	RFJ
01	13/05/2020	For Information	DN	RFJ

title
PLANS
Level 3 Floor Plan

scale 1:400 @ A3 | code **GQC** | sheet no. **3005** | rev **03**

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garbage ext 150mm x 150mm
pump room supply 150mm x 150mm
pump room exhaust 150mm x 150mm
fire pump room supply 200mm x 150mm
fire pump room supply 200 mm x 150mm
car park exhaust 900mm x 900mm
car park supply 900mm x 900mm
switchboard room exhaust 125mm x 125mm
restaurant exhaust 200mm x 200mm
cafe exhaust 200mm x 200mm
cafe exhaust 200mm x 200mm
pharmacy shop 200mm x 200mm

residential central hot water plant 5000mm x 2000mm including circulation pump

discharging to the roof

PV PANELS
PV PANELS
RESIDENTIAL PLANT
RESIDENTIAL PLANT
RETAIL PLANT
RESIDENTIAL PLANT
RESIDENTIAL PLANT
RETAIL PLANT

2X TREES TO BE CONSIDERED FOR REMOVAL

2000mm x 1000mm for common area hot water system

WEST
EAST
SOUTH

0 4 10 20m

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rev	date	reason	by	chk
03	20/05/2020	For Information	DN	
02	14/05/2020	For Information	DN	RFJ
01	13/05/2020	For Information	DN	RFJ

title
PLANS
Roof Plan

scale 1:400 @ A3
code **GQC**
sheet no. **3006**
rev **03**

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FJMT Scheme -Friday 22nd May 2020

DEVELOPMENT AREAS

AREAS	RESIDENTIAL	RETAIL

	GFA	NSA	NLA	
BASEMENT 2				
BASEMENT 1				
LOWER GROUND	1551	770	647	0.3 :1
GROUND	2720	904	1440	1.7 :1
PODIUM	2585	2236		
LEVEL 2	2383	2150		
LEVEL 3	1173	1062		
TOTAL	**10412**	**7122**	**2087**	

EFFICIENCY	GFA / NLA+NSA	88%

3 STOREYS (EAST) & 4 STOREYS (WEST)
FSR 2.0 :1

Targets	m²	
Site area	5166	
Target GFA	10332	m2
Target FSR	2.0	:1

APARTMENT MIX

1BED	2 BED	3 BED	4BED
3	8	1	0
2	5	0	0
4	4	9	1
6	6	8	0
1	5	4	0
16	**28**	**22**	**1**
24%	42%	33%	1%
Total			**67**

CARPARKING REQUIREMENTS

RESIDENTIAL			
Studio Apartments	0.5 per 1 apartment	0.5	N/A
Apartments	1 per / 1 dwelling	1	67
Visitor Spaces	1 per 4 apartments	0.25	17
Accessible Resi	Refer WDCP 6.2.2.2	50% Apartments Adapt	8 (Inclusive)
		TOTAL	**84**
RETAIL			
Retail (Shop)	1 per 25m2 (@85%)	25	70.958
Accessible Shop	3% of parking spaces	3%	2.1
		TOTAL	**73**

BICYCLE PARKING

BICYCLE LOCKERS			
Apartments	1 per 10apartments	0.1	6.7
Retail / Restaurant	1 per 450m2	450	5
		TOTAL	**11**
RAILS/RACKS			
Apartments	1 per 10 units	10	6.7
Retail / Restaurant	1 per 150m2	150	13.9
		TOTAL	**21**

** Note: In the case of shop development proposals, where the shop selling areas are not precisely defined on the plans submitted to Council for development approval, determination of parking requirements will be based on a figure equivalent to 85 percent of the net lettable area .*

WDCP C4.2 - Table: Schedule of Car parking Requirements
Carparking numbers are neither maximum nor minimum rates

SEPP65 / ADG COMPLIANCE

SOLAR >2 HOURS	CROSS VENT	NO SOLAR ACCESS	COMMUNAL SPACE	DEEP SOIL
3	6	9	100	638
4	3	3	1200	602
13	11	5		
18	14	2		
9	10	1	800	
47	**44**	**20**		
70%	**66%**	**30%**	**2100**	**1240**
Min 70%	Min 60%	Max 15%	25% Site = 1,292m²	7% Site = 362m²

PROVIDED CARPARK

BASEMENT 2		
Residential Carpark		70
Resi Visitor		17
Residential Accessible (inclusive)		8
	Total Resi	**87**
Retail Carpark		30
Retail Accessible (Included in above count)		0
	Total	**30**
	Complies?	

BASEMENT 1		
Retail Carpark		39
Retail Accessible (Included in above count)		2 (inclusive)
	Total	**39**
Residential Visitor Bike Rack		TBC
Bicyle / Store Lockers		*TBC*
	Total Bicycles	**0**

Totals			
		Residential	**87**
		Retail	**69**

17 visitors to be shared with Retail

FOR CO-ORDINATION ONLY

For Information

0 4 10 20m

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rev	date	reason	by	chk
02	14/05/2020	For Information	DN	RFJ
01	13/05/2020	For Information	DN	RFJ

title
DEVELOPMENT
Development Summary

scale	code	sheet no.	rev
1:400 @ A3	**GQC**	**9000**	**02**

Capital Investment Value (CIV) Report

Quadrangle Redevelopment



PROJECT NO.:	103527
REVIEWED BY:	BMB
DOCUMENT TITLE:	Quadrangle Redevelopment Capital Investment Value Report
ISSUE DATE:	2nd September 2021

Quality Information

Document: Capital Investment Value Report

Project No.: 103527

Ref: Quadrangle Redevelopment

Prepared By: MT

Reviewed By: BMB

Issue Register

Version	Issue Date	Details	Authorised	
			Name (Position)	Signature
1	02/09/2021	Capital Investment Value Report	Director	

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1. Introduction

Altus Group has been requested by to prepare a Capital Investment Value (CIV) report for the proposed Quadrangle Redevelopment Project.

In summary, works at the Quadrangle Site includes the following project scope:

- Basement car-parking along with a lower ground, and ground and 2-story residential levels above.

2. Capital Investment Value

Capital Investment Value (CIV) is defined by the Environmental Planning and Assessment Regulation 2000 – Rev 3, as required by the State Environmental Planning Policy Amendment (Capital Investment Value) 2010 to be:

"Capital Investment Value of a development or project includes all costs necessary to establish and operate the project, including the design and construction of buildings, structures, associated infrastructure and fixed or mobile plant and equipment, other than the following costs:

a) amounts payable, or the cost of land dedicated or any other benefit provided, under a condition imposed under Division 6 or 6A of Part 4 of the Act or a planning agreement under that Division,

b) costs relating to any part of the development or project that is the subject of a separate development consent or project approval,

c) land costs (including any costs of marketing and selling land),

d) GST (within the meaning of A New Tax System (Goods and Services Tax) Act 1999 of the Commonwealth)."

Calculation of CIV

Altus Group has based costs on similar previous projects and forms the basis of the estimated total Capital Investment Value of **$63,932,406 ex GST**, broken down as follows:

Cost Centre	$ Cost
Demolition & Alteration	939,912
Parking including Early Works	8,984,909
Retails (incl. supermarket)	4,685,466
Residential	39,863,454
External Works & Services & Community Areas	4,722,931
G.C.C. excl contingencies (excl. GST)	**59,196,672**
Professional Fees (8%)	4,735,734
G.C.C. excl contingencies (excl. GST)	**63,932,406**

2.1 Information Used

Concept designs were available at the time of preparing this report. Costs have been prepared using the following information:

1. **201610 Updated Drawings**
2. **210610 Updated Plans to Greencliff**

3. Development Notes

3.1 Statutory Fees

We note Statutory Fees are excluded from the calculation in accordance with the amended definition.

3.2 Professional Fees

We have allowed 8% in the Professional Fees.

3.3 Development Management Fees

All Development Management Fees have been excluded from this calculation.

3.4 Contingencies

No contingencies have been included within this calculation.

3.5 Escalation

No allowance has been included for escalation beyond the commencement date.

3.6 Finance Costs

Finance costs are excluded from the calculation.

3.7 Exclusions

- Land acquisition and holding cost
- Agent and Legal Fees
- Local Authority Fees and Charges
- Latent site conditions, including in-ground contamination, etc.
- GST
- Planning, Design and Construction Contingency
- Executive / Client Contingency

4. Report Parameters

Please note this report is provided for the purposes of the named party only and must not be used by any third party for any other purpose whatsoever without the prior written consent of Altus Group.

This report has been prepared from documentation and/or information provided to Altus Group by third parties in circumstances where Altus Group:

a) Has not performed our own independent investigations in order to ascertain the veracity and/or accuracy of the documentation and/or information so provided; and
b) Do not, in any way, warrant the veracity and/or accuracy of the said documentation and/or information; and
c) Do not, in any way, adopt the said documentation and information as our own.

Altus Group note this report is an expression of opinion based upon the documentation and/or information provided by third parties and Altus Group expressly disclaims any liability to the named party and any third parties where the documentation and/or information is found to be untrue and/or inaccurate in any way.

The Quadrangle Castlecrag Shopping Centre

Community Engagement Report

Client: Greencliff Castlecrag Pty Ltd
Date: 24 June 2020

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Version	01

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1 Introduction

1.1 Background

Greencliff Castlecrag Pty Ltd (Greencliff) purchased The Quadrangle Shopping Centre – on the corner of Edinburgh Rd and Eastern Valley Way, Castlecrag - in September 2016. In late 2017 the new owner commenced a series of technical studies to explore options for the redevelopment of the centre. Some preliminary engagement was undertaken with stakeholders, the community and Willoughby Council to understand the opportunities and constraints of the site.

From the project's inception, Greencliff was aware of the social, cultural and heritage significance of the suburb. It was understood the legacy of Walter Burley Griffin and Marion Mahony Griffin extends beyond physical structures such as the 15 houses built in Griffin's designs, the Haven open-air amphitheatre and the numerous foreshore reserves and walkways of Castlecrag. Further, it was understood by all working on The Quadrangle project that the Griffins' legacy must be respected, and the project should provide a community benefit.

In May 2018 Elton Consulting was engaged by Greencliff to undertake community engagement for the proposed redevelopment of the Quadrangle Shopping Village at Castlecrag (The Quadrangle).

This report is the result of that engagement.

1.2 Executive summary

The Quadrangle Castlecrag project team identified and engaged directly with the following stakeholder groups over the course of two years of community engagement:

» Castlecrag residents

» Castlecrag businesspeople

» Quadrangle Liaison Committee (QLC) – a grouping of residents which included CPA members and residents with useful expertise

» Castlecrag Progress Association (CPA)

» Walter Burley Griffin Society (WBGS)

» Friends of the Haven Amphitheatre (FoTHA)

» Glenaeon Rudolf Steiner School

» Willoughby City Council – Sailors Bay Ward councillors

» Castlecrag Conservation Society

» Willoughby Environmental Protection Association

Greencliff and Elton Consulting used several methodologies to engage with stakeholders, tightly focusing on Castlecrag inhabitants:

» Meetings with stakeholder groups

» Meetings with neighbours

» Attendance at community group meetings

» A letter to residents

» A dedicated website

The timeline of engagement activities was:

Timing	Engagement activity
March 2018	» CPA public meeting
April 2018	» Establishment of Quadrangle Liaison Committee (QLC)
June 2018	» Meetings with community groups
July 2018	» Community workshop 1
August 2018	» Meeting of the Quadrangle Liaison Committee (QLC) » Meeting with Willoughby City Council » Community workshop 2
October 2018	» Meeting with QLC & WBGS » Presentation to the Castlecrag Progress Association
October-November 2018	» Meetings with immediate neighbours
December 2018	» Meeting with Willoughby City Council » Meeting of the QLC
February 2019	» Project team meeting with the QLC & WBGS
May 2019	» Meetings with community groups: CPA, WBGS, FoTH

Timing	Engagement activity
August 2019	» Meeting with community groups: CPA, WBGS, FoTH, WEPA
October 2019	» Letter to Castlecrag residents
November 2019	» On-site community information sessions
November 2019	» CPA meeting
February-March 2020	» On-site pop-up engagements

Throughout the two-year engagement process, there were **five persistent themes to community feedback**:

» **Transport:** concern for increased traffic congestion and the preservation of existing centre parking

» **Community:** Castlecrag residents stressed the importance of preserving the suburb's unique 'village feel'

» **Design democracy:** strong support for the Design Excellence Competition process and community participation in it

» **Design heritage:** the ultimate design should be sympathetic to the architectural principles of Walter Burley Griffin and Marion Mahoney Griffin

» **Nature & landscape:** stakeholders desired the retention of all living trees on the site

While initially the community rejected any proposal for development over three storeys, as engagement progressed and issues of scale versus public space and amenity were addressed, concerns then became focused on floor space ratios (FSR) and feasibilities. At the end of the community engagement process, stakeholders became more comfortable with a structure over three storeys if open community space at ground level could be guaranteed.

Ultimately, despite very vocal opposition from a very small minority of residents, support for the redevelopment of the Quadrangle Castlecrag can be demonstrated by exit polling at the final community engagement event, a series of on-site pop-ups held in February and March 2020, at which a total of **77.2% of stakeholders indicated they were positively disposed to the scheme and redevelopment of the site.**

2 Engagement overview

It is important to understand the considerable effort and length of time spent engaging with the community for the Quadrangle Castlecrag project.

Engagement began officially with a presentation to the Castlecrag Progress Association (CPA) in March 2018, and concluded with a series of pop-up engagements with the community in March 2020. In that time, the sentiment of the Castlecrag community changed significantly, as *2.3 Timeline of Engagement* will demonstrate.

2.1 Stakeholders identified

In addition to the residents and businesspeople of Castlecrag the project team identified, and engaged directly with, the following stakeholder groups:

- Quadrangle Liaison Committee (QLC) – a grouping of residents which included CPA members and residents with useful expertise
- Castlecrag Progress Association (CPA)
- Walter Burley Griffin Society (WBGS)
- Friends of the Haven Amphitheatre (FoTHA)
- Glenaeon Rudolf Steiner School
- Willoughby City Council – Sailors Bay Ward councillors
- Castlecrag Conservation Society
- Willoughby Environmental Protection Association

2.2 Engagement methodology

Greencliff and Elton Consulting employed a number of different methods, direct and indirect, to engage with stakeholders associated with the Quadrangle project.

Early in the engagement process, the Quadrangle Liaison Committee (QLC) was formed. The purpose of this group was to interact with and challenge The Quadrangle project team on various issues. Members of the QLC brought a range of appropriate skills to the process.

In addition, the following methodologies were used to engage with stakeholders:

- Meetings with stakeholder groups
- Meetings with neighbours
- Attendance at community group meetings
- A dedicated website, which was regularly updated
- A letter to residents

These techniques allowed the project team to both update stakeholders and gather important feedback as the project progressed. This feedback influenced the engagement process, the dissemination and content of engagement materials, and also the ultimate design outcome.

Importantly, aside from the website, engagement methods were tightly focused on Castlecrag residents, ensuring the views of these constituents were not diluted by engagement with those living outside the suburb.

2.3 Timeline of engagement

Over a two-year period, Greencliff and Elton Consulting engaged with stakeholders, predominantly Castlecrag residents and their representative community groups, a total of 19 times.

Table 1 Timeline of engagement

Timing	Engagement activity	Notes
March 2018	CPA public meeting	» The Quadrangle project team presented at the CPA public meeting » Topics covered included: > How the development would serve the ageing demographic of Castlecrag by providing much-needed medium-density housing > The results of early engagement: concerns regarding traffic, parking, design, heritage, and shadowing, and a design to enable residents to downsize > Design principles to be used by the project team > Opportunities for the project team and community to work together, including future engagement opportunities
April 2018	Establishment of Quadrangle Liaison Committee (QLC)	» The QLC was intended to be a voice for the community throughout the engagement period » The QLC would: > access plans > communicate with residents > reflect community views > facilitate a mutually satisfactory outcome » Members of the QLC included representatives from the CPA and residents with particular expertise in architecture, finance, law and economics
June 2018	Meetings with community groups	» Meetings were held with leaders of the Water Burley Griffin (WBGS) Society and the Friends of the Haven Amphitheatre (FoTH) » Topics covered included: > Design principles for the proposed redevelopment, including embodying the Griffin design principles into the design of the project and ensuring height and density for the project were excessive > The site's future, including planning pathway > Traffic and parking > Understanding the vision for Castlecrag as a suburb > An acknowledgement that an apartment project was required to address the needs of Castlecrag's ageing population
July 2018	Community workshop 1	» The first of two workshops held by the project team » Attendees included representatives of the QLC, CPA, WBGS, FoTHA, Glenaeon Rudolf Steiner School, and the Willoughby Environmental Protection Agency » Meeting purpose: > Inform the community about the project > Advise about the planning process

Timing	Engagement activity	Notes
		> Explain the site context > Gather feedback about the Griffin legacy > Discuss conservation issues > Consider opportunities and constraints > Gather feedback on design principles > Agree to next steps » Workshop outcomes included: > A useful discussion about the emerging vision for the site > Greater understanding of community aspirations and views about potential redevelopment > A thorough discussion and agreement for the next steps of consultation
August 2018	Meeting of the Quadrangle Liaison Committee (QLC)	» The project team presented on progress of the project, including: > An update on actions taken since the first community workshop > The results of the tree survey and the meeting with Willoughby City Council > Options for tree and building heights, solar access. The community expressed a desire to minimise project height within commercial constraints
	Meeting with Willoughby City Council	» The project team met with Willoughby City Council representatives to discuss the voluntary consultation process, and address several suggestions regarding parking, the library and a community centre
	Community workshop 2	» The second of two workshops held by the project team » Attendees included representatives of the QLC, CPA, WBGS, FoTHA, Glenaeon Rudolf Steiner School, and the Willoughby Environmental Protection Agency » Meeting purpose: > Recap the outcomes of the first workshop and update the group on subsequent progress > Discuss community preferences for the site and its input into the design framework > Outline emerging scenarios for the planning and design process » Topics covered included: > Outcomes of a meeting with Willoughby City Council > The results of a tree survey > The potential to relocate the Water Burley Griffin Puppets to the site > Traffic planning > The potential for a Design Excellence Competition for the project
October 2018	Meeting with QLC & WBGS	» The project updated community groups on progress of the project. Topics of discussion included: > Feedback on the latest design concept, including concerns regarding the scale of the building versus public space and amenity

Timing	Engagement activity	Notes
		> Traffic, parking and access, particularly the intersection of Edinburgh Rd & Eastern Valley Way > A desire to retain Castlecrag's 'village feel' > Feasibility, including a recognition from the community that financial feasibility was an essential component for the project to proceed. The community acknowledged the requirement to build to a FSR of 2.2:1 in order to deliver a reasonable financial return > The potential for the CPA and WBGS to participate in the creation of a design brief > Economic feasibility of the project > The planning pathway
	Presentation to the Castlecrag Progress Association	» The Quadrangle project team presented to the community at the CPA meeting. The presentation covered: > The expectations of Willoughby City Council's planning department > An arborists report regarding trees on the site > Recognition of the importance of the Griffins' legacy > In-principle agreement to hold a Design Excellence Competition > Project timing and the planning pathway
October-November 2018	Meetings with immediate neighbours	» Meetings were held with the immediate neighbours of The Quadrangle to understand the potential impacts of development and obtain a greater understanding of their position » Issues discussed with stakeholders included light access to neighbouring properties, vehicular movement, proposed height and density of the project
December 2018	Meeting with Willoughby City Council	» The project team met with Willoughby City Council (WCC) representatives, including WCC's CEO, to provide an update on community consultation undertaken since the last meeting, and to discuss alternate avenues reaching a decision regarding the development sooner » At the meeting the project team explored the planning process and the possibility of lodging a Development Application (DA) instead of a Planning Proposal (PP). Council's CEO advised that Council had agreed to the DA process for another site when the design was consistent with a planning strategy for the site
	Meeting of the QLC	» The Quadrangle project team met with the QLC to update the group on progress and the outcomes of the meeting with Willoughby City Council (WCC) » Topics covered were: > Discussion regarding the desired FSR expressed by WCC and the FSR proposed by Greencliff > The current poor financial performance of The Quadrangle shopping centre > Community concerns regarding traffic management, and Greencliff's commitment to commission a traffic report

Timing	Engagement activity	Notes
		> Greencliff's desire for the community to participate in the Design Excellence Competition to establish the ultimate design of the project > Next steps for the planning and design processes
February 2019	Project team meeting with the QLC & WBGS	» The Quadrangle project team met with the QLC and WBGS to update the community on progress and to table the Design Excellence Competition process and traffic report » Topics covered included: > An outline of the proposed Design Excellence Process, including methodology, timing, jury selection and potential participating architects. It was noted the process was established on the basis of community feedback received previously. A draft of the proposed process was provided to the CPA and WBGS for their feedback > Traffic consultant Tim Rogers (of CBRK) outlined the process undertaken for the Traffic Report. Attendees were assured parking would be in compliance with the DCP from Willoughby City Council. CBRK's primary finding was that the redevelopment as proposed would not noticeably impact traffic flow. If proposed RMS alterations were implemented, the intersection of Edinburgh Rd and Eastern Valley Way would be safer but queueing times would be longer > Greencliff resolved to proceed with the Design Excellence Competition ahead of lodging a Planning Proposal
May 2019	Meetings with community groups: CPA, WBGS, FoTH	» In May 2019 the project team met with the leadership of the three primary community representative groups within Castlecrag » Key topics addressed were: > The importance of a collaborative approach with the community in order to build something of value for Castlecrag residents > The poor financial performance of the existing Quadrangle shopping centre > Options of varying heights and designs in order to meet the need for open community space, an appropriate mix of retail and apartment space, and community expectations around height and mass > Greencliff's commitment to work with the community on the future of the project, and also to holding a Design Excellence Competition involving the community, with a two-scheme competition agreed as the best course of action. The CPA and WBGS were invited to suggest architect participants for the Competition
August 2019	Meeting with community groups: CPA, WBGS, FoTH, WEPA	» In August 2019 the project team met with the leadership of several community groups » Key topics covered were: > The key challenges to transforming the Quadrangle shopping centre were recognised: traffic; the interaction of commercial viability and design excellence; design challenges and the Design Excellence Competition

Timing	Engagement activity	Notes
		> The architects participating in the Design Excellence Competition – fjmt, Tzannes and Tonkin Zulaikha Greer - were noted by all parties. Further, the Competition methodology was outlined
October 2019	Letter to Castlecrag residents	» On 30/10/19 Greencliff distributed a letter to Castlecrag residential properties. » Key points made in the letter included: > An outline of the community engagement conducted, to date > The announcement that the Design Excellence Process was underway, participants had been inducted and jurors appointed > An invitation to view the dedicated project website, and also to attend on-site community information sessions, to be held on 16/11/20 and 17/11/20 > A statement addressing rumours re: design principles for the project and the site's value
November 2019	On-site community information sessions	» On Saturday, 16/11/20 and Sunday, 17/11/19, Elton Consulting and Greencliff held community information sessions at the Quadrangle shopping centre » The purpose of the sessions was to engage Castlecrag residents and provide background information about the proposed redevelopment of the centre, and allow residents to view the proposed schemes submitted by the participants in the Design Excellence competition: fjmt, Tonkin Zulaikha Greer and Tzannes » Between 150 and 200 people attended the sessions, with Elton Consulting speaking to 52 attendees directly
November 2019	CPA meeting	» The architects participating in the Design Excellence Competition addressed the CPA meeting held at the Willoughby Park Bowling Club » Key points noted were: > A group of four Castlecrag residents made a motion for the CPA membership to endorse their vision for the Quadrangle site, including setting limitations to height and mass > The CPA leadership stressed several times during the meeting that any vote moved and taken would be informal and simple a view of sentiment from those assembled » In the week following the meeting, the results of the Design Excellence Competition were announced on the project website
February-March 2020	On-site pop-up engagements	» Between Friday, 28/2/20 and Sunday, 1/3/20, Elton Consulting and Greencliff staff conducted a series of pop-up engagements at the Quadrangle Shopping Centre at Castlecrag. » The purpose of the engagements was to: > Update Castlecrag residents about the revised scheme produced by architects fjmt > Allow residents to review the revised scheme in detail, and ask questions about the amended design and the project's future > Determine the sentiment of Castlecrag residents towards the revised scheme

Timing	Engagement activity	Notes
		» Over the course of three days, a total of 291 people attended pop-ups. Elton Consulting conducted exit polling, capturing the views of 79 attendees (27% of attendees)

(More detail on these engagements – including presentations and meeting minutes – can be found in the Appendices)

2.4 Images: face-to-face engagement



(L) July 2018 – project architect Bruce Swalwell presents at the community workshop





November 2019 – Castlecrag attend community information sessions held at the Quadrangle shopping centre to view results of the Design Excellence Process





November 2019 – (L) Castlecrag residents view display boards while waiting for the CPA meeting to commence; (R) Dr Tim Greer of Tonkin Zulaikha Greer addresses attendees on his firm's submission to the Design Excellence Competition



(L) March 2020 – Castlecrag residents view the winning design for the Design Excellence Competition, by architecture firm fjmt

3 What we heard

3.1 Key themes of the engagement

Throughout the two-year engagement process, there were five persistent themes to feedback gathered from the community:

» **Transport:** residents expressed concern about the potential for the development to increase traffic congestion, particularly waiting times at the intersection of Edinburgh Rd and Eastern Valley Way. Further, the preservation of existing parking spots at the centre was considered essential

» **Community:** Castlecrag residents stressed the importance of preserving the suburb's unique 'village feel'

» **Design democracy:** there was strong support for the Design Excellence Competition process and community participation in it, via the Castlecrag Progress Association and the Walter Burley Griffin Society

» **Design heritage:** residents felt it was crucial the ultimate design of the Quadrangle Castlecrag be sympathetic to the architectural principles of Walter Burley Griffin and Marion Mahoney Griffin

» **Nature & landscape:** stakeholders desired the retention of all living trees on the site

Initially, the community rejected any proposal for development over three storeys, with particular concerns regarding overshadowing and solar access. As engagement progressed and the community saw effort from Greencliff to address issues of scale versus public space and amenity, concerns then became focused on floor space ratios (FSR) and feasibilities. This issue of 'community versus commercial' was directly addressed at every opportunity, and the messaging was clear: a three-storey design was possible, but would not provide the desired public open space, and this was an outcome Greencliff would not consider. A FSR of 2.2:1 was required in order to be feasible.

Towards the end of the community engagement process, stakeholders became more comfortable with a structure over three storeys if open community space at ground level could be guaranteed.

Ultimately, despite very vocal opposition from a very small small minority of residents, support for the redevelopment of the Quadrangle Castlecrag can be demonstrated by exit polling at the final community engagement event, a series of on-site pop-ups held in February and March 2020, at which:

» **A total of 77.2% of attendees were positively disposed to the scheme and redevelopment of the site**

» Only 7.5% of attendees were negatively disposed to the scheme and redevelopment of the site

» 15.1% were neutral

3.2 Feedback in detail

The following table outlines key feedback points over the course of the two-year community engagement exercise.

Table 2 The evolution of feedback

Timing	Engagement activity	Primary feedback received from the community
March 2018	CPA public meeting	» Residents would not support development over three storeys » There is concern regarding the potential for a development to overshadow neighbouring properties, and for traffic congestion to increase at the corner of Edinburgh Rd and Eastern Valley Way

Timing	Engagement activity	Primary feedback received from the community
		» Some residents supported the development as a means to downsize within the suburb
April 2018	Establishment of Quadrangle Liaison Committee (QLC)	» There is concern for the health of existing trees on the Quadrangle site » Residents were curious about the FSR for the development. It was pointed out building height could be reduced but would result in less open community space
June 2018	Meetings with community groups	» Community groups were happy to participate in workshops to inform the design and planning process » There were concerns regarding overshadowing, solar access and the availability of carparking in the redeveloped centre » Residents queried the intended planning pathway » There was an acknowledgement that redevelopment of the site must be commercially feasible
July 2018	Community workshop 1	» Any redevelopment of the Quadrangle site should be sympathetic to the flora of Castlecrag, and landscaping and the greening of buildings/terraces was desired » Pedestrian access is vital and should be linked with the public domain » The ultimate design for the site should avoid creating wind tunnels » Consideration should be given to using part of the Quadrangle site to alleviate traffic congestion through the intersection of Edinburgh Rd and Eastern Valley Way » Understanding the Griffin legacy was key to a successful redevelopment of the Quadrangle site » Layering of buildings and open public space were important traits » There was underlying demand for smaller dwellings in Castlecrag, which currently was dominated by single-family dwellings. Ideally, the local community would have first preference for purchase of apartments in the new property » Residents encouraged Greencliff to test 2.2:1 FSR, with as much floor space as possible below ground level to minimise height
August 2018	Meeting of the Quadrangle Liaison Committee (QLC)	» Trees frame the entry point to The Quadrangle and should be preserved » The community queried the options for height, setbacks and FSR for the development. It was again pointed out building height could be reduced but would result in less open community space » Residents expressed an interest in placing the Bim Sculptures on the site
	Community workshop 2	» Residents suggested placing the Bim Sculptures on the site » The current number of on-street parking spots should be retained » Attendees were opposed to an option on the basis of height, saying it would affect the 'village feel' of Castlecrag. Instead,

Timing	Engagement activity	Primary feedback received from the community
		residents preferred an option for a three-storey structure above Edinburgh Rd » Community members clearly preferred one of the three initial design concepts put to the meeting, although there was concern about height and a preference to reduce FSR below 2.2:1
October 2018	Meeting with QLC & WBGS	» Residents expressed concern that the health of existing trees on site be preserved » Community representatives expressed a desire to know more about cost, assumptions and the anticipated return on investment » Castlecrag residents were likely to react negatively if 80 apartments were proposed for the site
	Presentation to the Castlecrag Progress Association	» Concern was expressed that the redevelopment would lead to increased density, traffic and parking issues » Some members of the community conducted their own, independent financial study and concluded that Greencliff's own feasibility studies were reliable
December 2018	Meeting of the QLC	» Transport and traffic were the most important topics to the community at the time. Community representatives were keen for Greencliff to fast-track the traffic report » It was important for Griffin design principles to be followed in the design » Residents appreciated the community engagement undertaken, to date
February 2019	Project team meeting with the QLC & WBGS	» Community groups agreed that the indicated Design Excellence Process was sound » The issue of 'community versus commercial' was raised by residents, and this was addressed by the project team: a three-storey design was possible, but would not provide the desired public open space, and this was an outcome Greencliff would not consider. A FSR of 2.2:1 was required in order to be feasible
May 2019	Meetings with community groups: CPA, WBGS, FoTH	» The community has mixed feelings about the redevelopment: some acknowledge demand for residential apartments, others are opposed to the development. In summary, the overall feeling was that the majority agreed that development must occur on the site and are not opposed to residential apartments, but would oppose a building considered to be too high or bulky. Further, there is acknowledgement that a residential component is required to make the redevelopment viable » Residents acknowledged the existing Quadrangle shopping centre did not meet the needs of the community, and was also struggling financially. Further, community sentiment had shifted over the consultation period: it was felt the majority view in the community was that redevelopment must ultimately occur, and most saw the need for apartment living, but residents were opposed to excessive height and bulk

Timing	Engagement activity	Primary feedback received from the community
		» There was support for a two-scheme Design Excellence Competition amongst community groups
August 2019	Meeting with community groups: CPA, WBGS, FoTH, WEPA	» The process for the Design Excellence Competition was agreed by the community groups. Further, community groups were invited to indicate their preferences for participating architects and jurors » Residents supported the placement of a Post Office and pharmacy in the redeveloped centre, but were opposed to large supermarket chains » The WBGS provided a set of Griffin-sympathetic design guidelines, and the project team committed to review these and incorporate them into the Design Excellence Competition brief for architects, where appropriate » Community members congratulated Greencliff on the standard of community engagement for the project, to date
November 2019	On-site community information sessions	» Between 150 and 200 people attended the sessions. Elton Consulting polled 52 attendees, with the following results: > 63.4% were positively disposed to a redevelopment > 25% were neutral towards a redevelopment > 11.5% were negatively disposed to a redevelopment » Elton Consulting noted the following themes amongst residents who volunteered general comments about the site's redevelopment: > Concerns about traffic impacts, parking, structural height and over-shadowing. Typically, residents expressed a desire for 3- or 4-storey schemes, or simply indicated "keep it as low as possible" > Residents feel the existing centre is tired and in need of refreshing, and accept the inevitability of its redevelopment > Several people who indicated they were positively disposed to a redevelopment indicated they wanted to buy an apartment if the redevelopment proceeded, and volunteered their email addresses to receive updates and/or an offer (For more detailed feedback from this community engagement session, please see *Appendices*)
February-March 2020	On-site pop-up engagements	» A total of 291 people attended the pop-ups. Elton Consulting conducted exit polling, capturing the views of 79 attendees (27% of attendees). Of these: > A total of 77.2% of attendees were positively disposed to the scheme and redevelopment of the site > Only 7.5% of attendees were negatively disposed to the scheme and redevelopment of the site > 15.1% were neutral » The results represent a significant shift from the previous engagement conducted in November 2019 » The pop-up engagements demonstrated Castlecrag residents were now more positively disposed to redevelopment of the

Timing	Engagement activity	Primary feedback received from the community
		Quadrangle shopping centre site with the revised fjmt scheme » Following these engagements, Greencliff emailed stakeholders to thank them for their attendance and update them on the level of support for the project. Recipients were advised that Greencliff was evaluating its options for a planning pathway, and encouraged them to contact Willoughby City Council to share their feedback

3.3 Digital engagement

In mid-2019 a dedicated website for the Quadrangle Castlecrag project was created - https://quadranglecastlecrag.com.au/

While principally a means to engage and update the Castlecrag community, the website included a contact page that allowed users to leave a message for the project team.

Between 20/11/19 and 2/3/20, 40 users left comments on the Quadrangle Castlecrag website. Of these,

» 31 comments were positive about the redevelopment for the Quadrangle site

» 3 comments were neutral

» 6 comments were negative

Text comments left by users are listed below, where

» Green text = positive sentiment

» Grey text = neutral sentiment

» Red text = negative sentiment

Table 3 Website user comments

Comments (anonymised, in order of receipt)
I am a local Castlecrag resident who will support a well-designed and a well-considered re-development of the quadrangle. I look forward to seeing the progress. Thankyou
Hi I would be interested in an apartment upon completion and would be willing to commit to an off the plan sale but only if the total height above ground level is 3 stories. To facilitate an informed judgement about the visual appearance it would be great if the existing trees shown on your home page were not grossly misrepresented ie they have been substantially increased in height as well as bulk.
We would be interested in potential purchase of a 3 bedroom apt
THANK YOU so very much for going the distance with this project. I am thrilled that we will all have the complete privilege of conducting our shopping and planned and unplanned meetings with friends and family in a building of very great contextual sensibility and quiet grace. I suspect that at times you have all felt that the extraordinariness of your commitment to thoughtful architecture was not being understood and that any number of business cases would not allow for the very considerable costs of the competition and its time, quite apart from the cost differences in a build of this quality. But, thank goodness you must have had your own personal meaningful connection to public architecture. We have not done well by future generations in a great number of matters of immense significance so it will be wonderful to have the pleasure of this building knowing that it will

Comments (anonymised, in order of receipt)
be a positive contribution to the future of Castlecrag and the residents. Truly, thank you for giving us a deep and beautiful articulation of the history and the ideas that constitute Castlecrag.
The latest scheme seems ideal for the site subject to retention of existing parking spaces and crucially, egress for cars direct to Eastern Valley Way without having to first enter Edinburgh Road. The existing traffic congestion at the Quadrangle during busy times is already unacceptably bad without any solution. If the scheme has no solution for potential traffic congestion and reduction of street parking, the scheme should be rejected and the architects dismissed.
As a resident of Castlecrag I fully support the 3/4 level design. It encompasses the key community values of the suburb and the sympathetic design to acknowledge the natural landscape. I would be mortified if the block 3 level design was recommended. Please Willoughby council do not miss this unique opportunity to be leaders in great design for great suburbs such as Castlecrag.
The concept and proposed design look a beautiful attribute to the Castlecrag environs.
Ok. Better than we feared and happy with what is proposed.
I am a new resident of Castlecrag, I strongly support the scheme proposed by Greencliff. The design by FJMT would be great addition to the streetscape and provides public space and amenity. I urge the Willoughby City Council to amend its controls to allow this scheme to proceed. The height of the development is not what is important on this site, it is the public outcomes, which are clearly superior in the development proposed by Greencliff.
Love the finishes & style of the new proposed development. Would be proud to have this in Castlecrag.
Thank goodness! Get it done. It has been too long.
The winning design by fjmt will be a magnificent and artistic gateway to Castlecrag. All the residents of Castlecrag and the wider Willoughby community will be proud to have such a proposed wonderful asset that will benefit all the community into the future. Thank you to Dr Quek and his team for their patience in persisting with such an inspiring vision.
Sensible proposed alternative. Love the character of the new development. Aligns well with Castlecrag.
I consider the design to be very appealing and sits well with the environment of Castlecrag. I strongly support the final design and b liver it will enhance the suburb and stimulate an even stronger community here. I appeal to Willoughby council to approve the design as proposed.
Love the concept design
I would like to support the latest plans to renew the Castlecrag Quadrangle. This development is to be the gateway to Castlecrag which is a unique architectural suburb that has many outstanding architecturally designed homes. Many of these homes have been designed by some of Australia 's leading architects following on from the founding architect Walter Burley Griffin. In this regard it is important to have another leading architect head this very special and significant development.
Prefer proposed alternative
What is given in a slight height approval in the alternative design is more than made up in the functional and aesthetic values it provides. The current draft scheme seems like a cement block and somewhat similar to cameras square - not aligned to the architectural qualities of Willoughby council's Castlecrag.
I like the new design
I saw the photomontages for the revised 3- and 4- storey proposal last night. I am so pleased that Greencliff has proposed such a beautiful development using a world class award winning architect/firm (fjmt) for Castlecrag's gateway. I love the proposed design and wish to thank Greencliff, Dr Quek and all architects who participated in the design competition. I think we are so lucky that Greencliff bought the Quadrangle, consulted so widely and for so long, listened to the community and produced this beautiful design. I can't wait to see it finished and look forward especially to enjoying more open space for eating and drinking than at present and shopping in the

Comments (anonymised, in order of receipt)
most beautiful surroundings. We may even live there! Congratulations and THANK YOU to all involved. I do hope it doesn't take too long from now until completion.
It is a pity that such a creditable presentation should be unnecessarily let down by making the comparison between the high quality design proposal and an extreme interpretation of Council's draft strategy. The illustrated interpretation of Council's strategy is such as would be interpreted by a bad designer forcing the extremes of the envelope and this could have the effect of eliciting favourable comments based on an unrealistic comparison. It would have been much better if the design could have been presented solely on its own merits rather than by making this comparison that seems to me to be ethically questionable. Perhaps this is the result of strategic advice given by others?
Hi, I'm very interested in purchasing a 2 bedroom unit in the future, if Dr Quek is the owner. So please let me know once things get to that stage. Thanks!
I fully support the new development of the quadrangle with the Scheme proposed by Greencliff and architects fjmt rather than the proposal that would be done in consideration of Willoughby council rules. The design by Greencliff is imaginative, in keeping with the natural environment surrounding it, and would be a huge asset.
Dear Mayor, Councillors, CEO, and Planning Officers, I strongly support the new 'Compromise Design' for the Castlecrag Quadrangle Redevelopment which was exhibited to the public this weekend by Dr Quek. This is an outstanding FJMT 'compromise design' commissioned by Dr Quek. I respectfully submit that it is aesthetically very suitable for Castlecrag, and would be a wonderful community asset and create an attractive and appropriate gateway for Castlecrag. I note that, to my understanding, not one of the three architectural firms or five independent judges raised any query re aesthetics, bulk or scale to the earlier proposed FSR of 2.2 : 1 or the set back partial fourth floor on which the 3 concept designs were submitted. That is EIGHT expert opinions who felt that with a sensitive moulding of the structures to the ridgetop topography, these two elements were satisfactory. It is a sorry situation for Council to effectively force design and construction of a commercially feasible design which complied with Council's LCS 3 storey and FSR<=1.8 restrictions to be a bland unimaginative box without open space. Willoughby Council aspires to being a world class local government authority. Here is an opportunity to show vision and leadership by recognising the exceptional design and appraisal process that Dr Quek has initiated (and at considerable expense), and resulted in a design that has the support not only of the CPA, but also WBGS and the many architects and planners who reside in Willoughby, and especially Castlecrag.
Not in consideration for larger accommodation for families. One bedroom only is not in the best interest of growing community. As population dies younger families are looking for homes the design looks like blocks stuck together ugly. Public area and space is too small. This district is beautiful and green with an old world class blocks stuck together loses that feel.
We have viewed the visuals and model of the proposal for the Quadrangle at Castlecrag and support the alternative plans being proposed , ie the 4 story plans. Really like the staggered facade and greater public space and better design. Thanks
I would strongly support the quadrangle proposal. The set back, open space and community amenity is much better than what could be built given the councils current draft strategy.
We visited the new plan today at the shop in the Castlecrag Quadrangle. We believe it us a great initiative for Castlecrag. The design is a a clear indication that Dr Quek cares about sustainability, the community feelings, the environment and creating a village atmosphere with a viable compromise between development and liveability. We met Dr Quek and was impressed with his forward thinking and his continual community engagement. Shops in the village should include super market, butcher, High St type baker, chemist, cafes and selection of restaurants and professional services offices. We also hope the apartments are appropriate for the area - mostly 2 & 3 bedroom up market residences that would be attractive to down sizers - something sadly lacking in the area. Congratulations to Dr Quek and we urge Willoughby Council to approve this quality development which is clearly the desire of the vast majority of the Castlecrag community.
Like the proposed design but as a resident of Raeburn Avenue I do have serious concerns about the implications on traffic at the top of our street (which is already gridlocked every morning) both during and after the construction phase and would like to request that this gets serious and careful consideration please.

Comments (anonymised, in order of receipt)
Castlecrag is a heritage site and an important mark in our state's architectural heritage. This design concept ignore this heritages. It ignores public amenity, space, liveability and the enjoyment of citizens. It's intrusive, ugly, brutalist. It loook less like a community space and more like an institutional one. And if there is consideration for apeartmrnt living (and why.,) then space that accommodates contemporary living requirements is the minimal requirement. This is community. The council and its design team should know better. Back to the drawing board, please.
I am very impressed by the outstanding FJMT 'compromise design' commissioned by Dr Quek. I believe it is a world class design, aesthetically very suitable for Castlecrag, and would be a wonderful community asset. By comparison any commercially feasible design which complied with Council's LCS 3 storey and FSR<=1.8 restrictions would be an 'ugly, unimaginative box' with no open space: it would definitely not create an inviting entrance to the Castlecrag peninsula. I sincerely hope that Dr Quek will proceed with his exciting concept and that Council will see the wisdom of his proposal. Castlecrag is ready - we want and need the vision of Dr Quek to reinvigorate our local shopping centre.
We love what you are proposing. We wouldn't want to deal with other Builders. Good choice of architect!
A beautiful design that fits in with the character of Castlecrag. This project would invigorate the suburb and help keep it a lovely place to live.
Please,Please proceed with this development. It is a great design for a failed shopping centre. If the Council officers are reticent please go to the next phase quickly with application to the planning pannel. We have many who love the concepts but are never going to put pen to paper. There is still the gang of four who may not approve? 4 out of say 3000. It will form a wonderfull gate way to our suburb. Please proceed.
I am supportive of the scheme proposed by Greencliff and fjmt. I feel it is well designed for the location and landscape. The tiered approach of 4 storeys at the corner reducing to 3 storeys further along Edinburgh Rd is appropriate. The design is pleasing with appropriate breaks to lessen the visual impact, as opposed to the council block style approach which appears heavy and dense in nature. I am also favourable to the linkages to the rear track and public spaces provided with the Greencliff scheme.
As a long term resident in Castlecrag, I believe that the "proposed alternative" design is very nice and fits with the spirit of Castlecrag. I hope that it will be chosen. Thanks in advance for your consideration.
I think that the proposed development is imaginative, unlike most development that we see nowadays that tend to be just concrete boxes. The facades are well articulated such that the bulk of the building is reduced, the materials are varied makeig the overall development quite pleasing to the eye. The new public areas will ensure that the Quadrangle stays as a centre for the community and the shops will ensure that local trade is nurtured. I support this proposal as I really think that it satisfies the needs of the Castlecrag community as well as satisfying commercial requirements.
I definitely prefer Greencliff's design to Council's however I still think 3-4 storeys is too high and will detract from the Griffen estate. The established trees in these photos will take many years to grow and until this time, the buildings will not be softened with greenery. I don't think Castlecrag can handle the population surge that these residences would bring and furthermore, I think it brings too much of a commercial space to Castlecrag. It is far too dense, boxy and heavy for Castlecrag. I think a redevelopment can be done without being so large in size and scale
I love the new proposal from Dr Quek. I hope council supports.
When the project is built you would have to consider the effects of the built conserning the local shops and the local resident because the building is going to effect traffic and they will not be happy with the change. You will also need to consider the new parking restrictions and parking below IGA

4 How feedback impacted design

At the inception of the project three years ago, the brief from Greencliff Castlecrag Pty Ltd (the proponent) was for a building of up to six storeys above Edinburgh Road with a FSR of 2.2:1. The proponent was aware of a proposal some 10 years previously of possibly eight to 10 storeys which had been rejected by Willoughby City Council and the community. After preliminary designs were prepared by Bruce Swalwell Architects, the designs were discussed with the CPA, which made clear its opposition to a scheme greater than three storeys above Edinburgh Road.

During this time, Council consultants Architectus prepared a draft Urban Design Study of the Castlecrag Centre as part of a wider study of all local centres in Willoughby LGA. The draft urban design study, placed on exhibition from November 2017 to January 2018, postulated a building of up to five storeys above Edinburgh Road on The Quadrangle site with a FSR of 1.8:1. Concurrently, the proponent carried out a detailed financial feasibility for the proposal which concluded that a building of four to five storeys and FSR 2.2:1 would be viable. The degree of coincidence between the draft urban design study and the proponent's feasibility encouraged the proponent to continue its community and Council engagement.

In February 2019, at a meeting of the CPA and WBGS, the proponent committed to holding its previously announced design excellence competition ahead of any planning proposal. Three prominent and award winning architectural firms, whose nominations were agreed to by the WBGS and CPA, were invited to contest the competition which was held in October/November 2019. The brief for the competition was for two schemes, one at four storeys and one at five. The FSR was set at 2.2:1 with 1.8:1 above Edinburgh Road.

Francis Jones Morehen Thorp Architects (fjmt) was declared the winner in December 2019, only after all schemes were presented to a general meeting of the CPA. At the meeting, the community made clear its preference for a lower, four storey or even three, scheme. However, community support for the scheme had increased markedly.

Following the CPA meeting, the proponent requested fjmt to investigate a lower scheme after Council made clear its preference for a three-storey scheme with FSR 1.6:1 at or above Edinburgh Road level. A partly three- and partly four-storey scheme, with FSR of 2.0:1, was prepared by the architects and a further financial feasibility conducted.

In December 2019 Council adopted the Local Centres Strategy with The Quadrangle site designated for three storeys and FSR 1.8:1, with 1.6:1 at or above Edinburgh Road. Council's decision was based only on feedback it received in response to its exhibition of the draft urban design study. This was despite proponent submissions as to feasibility and the quality of the final scheme resulting from the design excellence competition. Community engagement data at this time showed an increasing acceptance of the proponent's proposals.

Throughout the lengthy engagement and planning process the proponent has worked assiduously to find a balance between community views, Council planning studies and financial sustainability. Community engagement has been seriously considered and the final scheme, with FSR 2.0:1 and at three/four storeys, now has the open support of the CPA committee.