ATTACHMENTS

Special Council Meeting

16 February 2016

ATTACHMENTS TO AGENDA ITEMS

Special Council - 16 February 2016

Contents

Government of **Western Australia**
Development Assessment Panels

Form 1 - Responsible Authority Report

(Regulation 12)

Property Location:	Lots 156, 157 & 158 (Nos. 26 & 28A) Charles Street, South Perth
Application Details:	Mixed Development within a Nine-Storey Building
DAP Name:	Metro Central JDAP
Applicant:	McDonald Jones Architects
Owner:	Charles Street Apartments Pty Ltd ATF Charles St Apartments Trust
LG Reference:	11.2015.540.1
Responsible Authority:	City of South Perth
Authorising Officer:	Cameron Howell, Senior Statutory Planning Officer
Department of Planning File No:	DAP/15/00933
Report Date:	12 February 2016
Application Receipt Date:	30 October 2015
Application Process Days:	90 Days
Attachment(s):	1. Development Plans. 2. Applicant's supporting reports / letters. 3. Photographs of the subject site. 4. Public consultation submissions. 5. Comments from the City's Engineering Infrastructure Services. 6. Comments from the City's Environmental Health Services. 7. Comments from the Department of Parks and Wildlife, Rivers and Estuaries Division.

Officer Recommendation:

That the Metro Central JDAP resolves to:

Approve DAP Application reference DAP/15/00933 and accompanying plans 15030 DA1.00 Rev. E (Site Plan), 15030 DA1.01 Rev. C (Site Survey), 15030 DA1.02 Rev. C (Overshadowing Diagram), 15030 DA1.03 Rev. E (Ground Floor Plan), 15030 DA1.04 Rev. E (First Floor Plan Carpark), 15030 DA1.05 Rev. D (Second Floor Plan Commercial), 15030 DA1.06 Rev. D (Third Floor Plan Commercial), 15030 DA1.07 Rev. D (Fourth Floor Plan Commercial), 15030 DA1.08 Rev. D (Fifth Floor Plan Residential), 15030 DA1.09 Rev. D (Sixth Floor Plan Residential), 15030 DA1.10 Rev. D (Seventh Floor Plan Residential), 15030 DA1.11 Rev. D (Eighth Floor Plan Residential), 15030 DA1.12 Rev. C (Roof Plan), 15030 DA1.13 Rev. D (Design Section AA), DA1.14 Rev. D (Design Section BB), DA1.15 Rev. C (North Elevation Charles Street), DA1.16 Rev. C (East Elevation), DA1.17 Rev. B (South Elevation), DA1.18 Rev. C (West Elevation), in accordance with Clause 7.9 of the City of South Perth Town Planning Scheme No. 6 and Schedule 2 Part 9 of the Planning and Development (Local Planning Schemes) Regulations, subject to the following conditions:

Conditions

1. At or prior to the submission of a building permit, Lots 156, 157 and 158 comprising the subject site shall be amalgamated on a compiled Diagram of Survey and application for a new Certificate of Title shall be lodged with the Land Titles Office. The building permit may not be issued until the new Certificate of Title is issued.

   Alternatively, a legal agreement is to be prepared to ensure that these Lots cannot be sold or developed separately. The legal agreement is to be executed prior to the issue of a building permit to the satisfaction of the City of South Perth. The legal agreement is to be prepared at the owner's expense.

2. At or prior to the submission of a building permit, a copy of documentation from the Green Building Council of Australia certifying that the development achieves a Green Star rating of at least 4 Stars or another rating tool that achieves equivalent or greater performance standards than required by Green Star, shall be submitted to the City. All sustainable design features proposed in the development shall be implemented.

3. At or prior to the submission of a building permit, a Waste Management Plan shall be prepared to the satisfaction of the City. The approved plan shall be implemented, unless otherwise approved by the City.

4. At or prior to the submission of a building permit, the owner is to provide to the City a detailed construction management plan. The management plan shall include details on noise, vehicle movements, dust suppression, traffic management, contractor parking, waste disposal, pedestrian safety, site security and any other construction management issues. The approved plan shall be implemented, unless otherwise approved by the City.

5. The proposed driveway gradient exceeds that which will normally be accepted by the City. The driveway gradient is acceptable if:

   (a) a letter is received from the property owner, at or prior to the submission of a building permit, which acknowledges responsibility for any access difficulties that may arise, without any future recourse to the City of South Perth; and

   (b) certification is received from a consulting traffic engineer or architect, at or prior to the submission of a building permit, confirming that the vehicle ramps comply with Australian Standard AS2890.

6. Prior to the construction of the approved development, a public art concept for the subject development, with a minimum value of $155,000, 1% of the cost of construction shall be submitted to the City. The approved public art concept shall be to the satisfaction of the City.

7. The approved public art concept or contribution shall be thereafter implemented and the artwork constructed prior to occupation of the development, and maintained for the life of the development to the satisfaction of the City.

8. For the surface of the boundary walls not visible from the street, on the southern, western and eastern sides of the lot, the applicant is to obtain the

adjoining owner's agreement as to the surface finish of the wall. If the adjoining owner's agreement is not obtained, the surface finish is to be compatible with the external walls of the neighbour's main building. Details in this respect are to be included on the plans submitted with a building permit application. (Refer also to the associated Advice Note)

9. Prior to demolition of the buildings on the development site, the applicant shall provide the City with a detailed electronic photographic record, for inclusion in the City's local heritage archive, of the following:

   (a) the exterior of the buildings, with emphasis on the street frontage and those parts of the building visible from the street;

   (b) any internal features of architectural or historic interest; and

   (c) contextual images of the buildings showing adjoining buildings in the same street.

10. Prior to the occupation of the building, a detailed landscaping plan shall be prepared to the satisfaction of the City. The approved plan shall be implemented and subsequently maintained to a high standard, unless otherwise approved by the City.

11. Prior to the occupation of the building, the owner is to provide to the City a detailed car parking management plan. The management plan shall include details on accessibility to and use of the non-residential occupier and residential parking bays, reciprocal parking arrangements, as well as other general parking considerations. The approved plan shall be implemented, unless otherwise approved by the City.

12. The designated visitor parking bays shall be clearly identified on site by means of a sign bearing the words "Visitors' Parking Only" in accordance with the requirements of clause 6.3(11) of Town Planning Scheme No. 6.

13. The car parking bays situated in car stackers shall be restricted to staff use and clearly identified on site by means of a sign bearing the words "Staff Parking Only".

14. The car stackers shall be of no lesser weight bearing capacity and no lesser internal dimensions than the Wöhr Parklift Comfort Type 411/5-195.

15. A Section 70A notification shall be placed on the strata title of each affected lot to state that the car stacker in this development is the Wöhr Parklift Comfort Type 411/5-195 which can accommodate vehicles up to 2000kg and a maximum height of 1.9 metres on the lower level and 1.5 metres on the upper level".

16. The allocation of car bays on the site and the approved strata plan (if car bays are allocated to specific commercial tenancies and residential apartments) shall be:

   (a) One Bedroom Dwellings- At least 6 bays;

   (b) Two and Three Bedroom Dwellings- At least 20 bays;

(c) Visitor Parking- At least 9 bays; and

(d) Non-Residential- At least 55 bays (excluding bays for the exclusive use of visitors).

The necessary alterations to the internal car parking layout, including any additional car stackers, to the satisfaction of the City, shall be incorporated into the plans submitted as part of a building permit application and the constructed development.

17. End of trip facilities for cyclists shall be provided for the use of staff. The design and location of those facilities shall be to the satisfaction of the City and the facilities shall be provided at the following ratios:

    (a) Number of secure clothes lockers- At least thirteen; and

    (b) Number of showers- As shown on the approved plans.

18. The approved land use of the commercial tenancies is Office. Any subsequent change to an approved land use requires the planning approval of the City.

19. The applicant shall construct crossovers between the road and the property boundary. The crossovers shall be constructed in accordance with the approved drawings, associated conditions and the requirements contained within Management Practice M353, which is available at the City's website. The existing verge levels at the front property boundary shall not be altered.

20. The height of any letterbox, electricity installation, bin enclosure, or other structure, fence, wall or hedge within 1.5 metres of any vehicle driveway where it meets a street alignment shall not exceed 0.75 metres, in accordance with clause 6.3(6) of Town Planning Scheme No. 6.

21. The existing crossovers shall be removed and the verge and kerbing shall be reinstated to the satisfaction of the City.

22. External clothes drying facilities shall be screened from view from the street or any other public place.

23. The development shall provide lighting to the City's satisfaction to pathways, communal areas and car parking areas.

24. Any required filling or excavation of the site shall be retained by embankments or walls, details of which are to be incorporated in the working drawings submitted in support of a building permit application.

25. Any required retaining walls along lot boundaries shall be constructed immediately after excavation or filling has been carried out.

26. Stormwater drainage shall be contained on site, or connected to the local stormwater drainage system, to the satisfaction of the City.

27. The applicant/developer and the owners are to comply with the requirements set out in Council Policy P352 'Final Clearance Requirements for Completed

Buildings'. Policy P352 requires the applicant to engage a licensed land surveyor, to undertake survey measurements on a floor-by-floor basis. The surveyor is to submit progressive reports to the City regarding compliance with the planning approval documents. The City will not issue final clearance certificates until satisfied that the completed building is consistent with the planning approval documents and the requirements of other relevant statutes.

28. The property shall not be used for the uses hereby granted until an inspection has been carried out by a Council Officer and the City is satisfied that the conditions of planning approval have been complied with.

29. The validity of this approval shall cease if construction is not substantially commenced within 24 months of the date of planning approval.

Advice Notes

1. This planning approval is not an authorisation to commence construction. A building permit must be obtained from Council's Building Services department prior to commencing any work of a structural nature.

2. Prior to lodging a building permit, the owner is required to satisfactorily address the outstanding planning matters identified in the Conditions of approval. Therefore, to avoid delays in obtaining a building permit and a certificate of occupancy, it is important for the owner to commence the related processes at the earliest.

3. In relation to the Public Art Conditions, the City will be required to give final consent for the proposed public art, including any cash-in-lieu arrangement. Full details and specifications should be submitted at the earliest opportunity to ensure that the finalisation of the public art does not delay the progression of the development.

4. As identified in the Boundary Wall Surface Finish Condition, prior to finishing the surface of the boundary wall, the applicant is required to obtain written agreement of the adjoining property owner with regards to the preferred finish. A copy of this agreement should be forwarded to the City prior to lodging a building permit application. If the adjoining property owner does not provide the applicant with a written response within 14 days, the applicant would provide sufficient evidence to the City that written correspondence from the applicant was not responded to. Therefore, to avoid delays in obtaining a building permit, it is important for the applicant to commence the related processes at the earliest.

5. The car parking bays shall be marked on site as indicated on the approved site plan, in order to comply with the requirements of clause 6.3(10)(c) of Town Planning Scheme No. 6 and such marking shall be subsequently maintained so that the delineation of parking bays remains clearly visible at all times.

6. Hard standing areas approved for the purpose of car parking or vehicle access shall be maintained in good condition at all times, free of potholes and dust and shall be adequately drained in accordance with the requirements of clause 6.3(10) of Town Planning Scheme No. 6.

7. The car park ventilation is to be designed to ensure that the carbon monoxide build up in the parking area does not exceed 50 ppm per hour in accordance with the *Health Act (Carbon Monoxide) Regulations 1975*.

8. All mechanical ventilation services, motors and pumps, such as air conditioners, are to be located in a position so as not to create a noise nuisance as determined by the *Environmental Protection Act 1986* and *Environmental Protection (Noise) Regulations 1997*.

9. Planning Approval or the subsequent issuing of a Building Permit by the City is not consent for the construction of a crossing. As described in Management Practice M353 a 'Crossing Application' form must be formally submitted to the City (Engineering Infrastructure Services) for approval prior to any works being undertaken within the road reserve.

10. The owner should consider the advice provided by the Department of Parks and Wildlife, Rivers and Estuaries Division in developing the dewatering management plan should excavation be proposed.

    All plans required to be submitted to the approval of the Department of Parks and Wildlife, Rivers and Estuaries Division should be submitted at least 30 days prior to the submission of a building permit application to the City.

11. This planning approval does not permit the display of any signage on the building or on the site. A new application for planning approval will be required if signage is proposed to be displayed.

12. Where minor variations are sought at the Building Permit stage from an approved set of plans, a formal request for a variation to the planning approval is to be sought by the Applicant, in accordance with Council Policy P689.

    If supported, the variations may be granted subject to all the previous terms and conditions, or possibly with new terms and conditions. If not supported, either the Building Plans must be amended for a Building Permit to be issued, or a new application for planning approval must be lodged for consideration by Council.

13. If an applicant or owner is aggrieved by this determination there is a right of review by the State Administrative Tribunal in accordance with the *Planning and Development Act 2005* Part 14. An application must be made within 28 days of the determination.

    There are no rights of appeal in relation to aspects of the decision where the City / Council or Development Assessment Panel cannot exercise discretion.

Alternate Recommendation:

No Alternative Recommendation has been prepared.

Background:

Insert Property Address:	Lots 156, 157 & 158 (Nos. 26 & 28A) Charles

	Street, South Perth
Insert Zoning MRS:	Urban
TPS:	Special Control Area 1 – South Perth Station Precinct
Insert Use Class:	Mixed Development - Preferred Multiple Dwelling - Preferred Office - Preferred
Insert Strategy Policy:	Not Applicable
Insert Development Scheme:	City of South Perth Town Planning Scheme No. 6
Insert Lot Size:	1517m^2 total: 323m^2 (Lot 156), 597m^2 each (Lots 157 & 158)
Insert Existing Land Use:	Office
Value of Development:	$15.5 million

The development site comprises three lots. A single-storey office building is located on both Lot 157 and 158, whilst Lot 156 is vacant land associated with Lot 157.

The site has a frontage to Charles Street to the north and is located between a four-storey Multiple Dwelling to the west, single-storey office building to the east and a three-storey office building to the south. The majority of development opposite the site comprises of single storey office buildings.

Pre-lodgement plans were submitted to the City in September 2015, for preliminary advice. The advice given at the time was based on the gazetted Scheme and the previously advertised version of Amendment No. 46 to the City's Town Planning Scheme. The planning application was subsequently received in October 2015.

In response to the City's assessment of the plans and relevant DAC comments, revised plans were submitted in November and December 2015 and February 2016.

Details: outline of development application

The applicant's proposal includes the following works:

- Construction of a 9-storey Mixed Development building, incorporating commercial tenancies and car parking in the three level podium and commercial tenancies and Multiple Dwellings in the tower element.
- Demolition of the existing buildings.
- Offices provided on the ground floor and second, third and fourth floor levels.
- 28 residential apartments consisting of 1, 2 & 3 bedrooms provided on the fifth to eight floor levels.
- 92 on-site car parking bays (5 visitor & 87 secure parking) contained on the ground and first floor levels.
- Bicycle parking provided on the ground floor and the first floor levels.
- Residential storerooms provided on the basement floor level or within the balconies of the residential apartments
- Bin stores and common service areas are mostly provided on the ground floor.

The plans of the proposal are contained in **Attachment 1**. The applicant's supporting reports, contained in **Attachment 2** describe the proposal in more detail. The site photographs, contained in **Attachment 3**, show the relationship of the site with the surrounding built environment.

Legislation & policy:

Legislation
Planning and Development Act 2005.
Planning and Development (Local Planning Schemes) Regulations 2015, specifically Schedule 2. [Regulations]
City of South Perth Town Planning Scheme No. 6, specifically Parts VII and IX, Schedules 1 and 9 and proposed Schedule 9A^. [TPS6]

^ *Proposed Schedule 9A (Amendment 46) was adopted by Council for public advertising on 27 October 2015, which commenced on 4 November 2015.*

State Government Policies
State Planning Policy 2.10 'Swan-Canning River System' (2006).
State Planning Policy 3.1 'Residential Design Codes' (2013), specifically Part 6 and Appendix 1. [R-Codes]

Local Policies

The following local planning policies are relevant to this application:
Council Policy P316 'Developer Contribution for Public Art'
Council Policy P350.01 'Environmentally Sustainable Building Design'
Council Policy P350.03 'Car Parking Access, Siting, and Design'
Council Policy P350.09 'Significant Views'
South Perth Station Precinct Plan (WAPC, January 2011)

Further comment on compliance with policy requirements is provided in the Planning assessment section.

Consultation:

Public Consultation
Public consultation has been undertaken for this proposal to the extent and in the manner required by City Policy P301 'Consultation for Planning Proposals'. Under the "Area 1" consultation method, individual property owners and occupiers were invited to inspect the plans and to submit comments during a minimum 14-day period.

A total of 43 consultation notices were sent, with 3 submissions received, all objecting to the proposal. Further details of the submissions are contained in **Attachment 4**.

Consultation with other Agencies or Consultants

Design Advisory Consultants

The proposal was referred to the Design Advisory Consultants (DAC) in November 2015.

Presentation

- *The applicants delivered a presentation of the proposed development, its site context and design concept. While presenting the associated slides and explaining the drawings, comprising floor plans, side & street elevations and perspective views, the applicants responded to enquiries from the Design Advisory Consultants.*

Advisory Consultants' Comments

- *The Advisory Consultants considered the amended proposal in light of the notes from September 2015 [pre-lodgement], and provided the following comments.*
    - *The overall built form and design of the building was observed to be of a quality that will enhance the desired character in the Station Precinct.*
    - *Provision of two lifts and separate lobbies for residential and non-residential components of the proposed development will enhance the amenity of the users of this development and provide greater sense of security for the residents. Associated modifications were recommended.*
    - *Additional glazing should be considered for non-residential floor space.*
    - *The Advisory Consultants considered that the band of perforated metal artwork, placed vertically above the awning will not be visible from the footpath level. It was suggested that a perspective drawing to be provided from the 1.5 metre eye level to see the actual view instead of a bird's eye view.*
    - *Additionally, extended the vertical perforated metal artwork horizontally along the bottom face of the awning, only over the main entrance to the building will assist in directing the visitors to the entry foyer.*
    - *Increasing the resultant ceiling height of the awning, located above the footpath, by half a metre will improve the quality of the pedestrian walkway.*
    - *Greater clarity is required with regards to the vertical band of storerooms that are visible in the perspective drawings. Consistent external colour and materials on all floors will assist in correct representation on the drawing. The Advisory Consultants recommended the use of timber slats.*

In response to these comments, the applicant has revised their proposal to incorporate some of these elements into the building and supporting documentation. The applicant's responses to the DAC comments are contained in **Attachment 2**.

While the applicant has not incorporated all elements suggested by the DAC members into their proposal, the City is satisfied that the design of the proposed building meets the relevant planning provisions.

Engineering Infrastructure Department

The application was referred to the City's Engineering Infrastructure department for comment. This department provided comments in relation to sewer easement, car parking, access, traffic, stormwater, waste management, dewatering management, construction management and crossovers.

This department's comments are contained in **Attachment 5**.

The matters raised by the department can be resolved through the implementation of appropriate conditions. Accordingly, relevant conditions are recommended to respond to this department's comments.

Environmental Health Services Department
The application was referred to the City's Environmental Health Services department for comment. This department provided comments in relation to car park ventilation, waste management, the bin enclosure and noise.

This department's comments are contained in **Attachment 6**.

The matters raised by the department can be resolved through the implementation of appropriate conditions. Accordingly, relevant conditions are recommended to respond to this department's comments.

Department of Parks and Wildlife, Rivers and Estuaries Division (on behalf of the Swan River Trust)
The application was referred to the Department of Parks and Wildlife, Rivers and Estuaries Division, as the proposal may affect the Swan River Trust Management Area, noting the site's close proximity to the Swan River and potential ground water impacts from the proposed construction. The Department of Parks and Wildlife, Rivers and Estuaries Division, on behalf of the Swan River Trust, has provided comments on stormwater, construction methods and dewatering. The supplied comments do not object to the proposal.

The Department of Parks and Wildlife, Rivers and Estuaries Division comments are contained in **Attachment 7**.

The City has no objection to implementing conditions and advice notes in line with the Department of Parks and Wildlife, Rivers and Estuaries Division's recommendation.

Planning assessment:

The proposed development is considered to be generally compliant with the provisions of the 'Deemed Provisions' of the Regulations, Town Planning Scheme No. 6 (TPS6), the Residential Design Codes (R-Codes) and Council policies where applicable. The following planning aspects have been assessed, and were found to be compliant with the relevant provisions:

- Plot Ratio and Land Use Proportions: TPS6 Schedule 9 Table A 3.1, 3.2 & 3.4 [proposed 1.50 Residential Plot Ratio & 1.87 Non-Residential Plot Ratio].
- Dwelling Size: TPS6 Schedule 9 Table A 3.5 and R-Codes cl. 6.4.3.
- Essential Facilities: TPS6 Schedule 9 Table A 3.6 and R-Codes cl. 6.4.6.
- Podium Height: TPS6 Schedule 9 Table A 4.
- Building Height: TPS6 Schedule 9 Table A 5.1 and cl. 6.1A (25 metres maximum permitted, measured to highest floor level).
- Vehicular Crossovers: TPS6 Schedule 9 Table A 10, R-Codes cl. 6.2.3 and Policy P350.07.
- Landscape and Outdoor Living Areas: TPS6 Schedule 9 Table A 11 and R-Codes cl. 6.3.1.
- Heritage: TPS6 Schedule 9 Table A 12
- Designing Out Crime: TPS6 Schedule 9 Table A 14.

- Road and Rail Transport Noise: TPS6 Schedule 9 Table A 15
- Stormwater Management: TPS6 cl. 6.8(2).
- Minimum Floor Levels: TPS6 cl. 6.9(2) and (3).
- Maximum Ground and Floor Levels: TPS6 cl. 6.10(1) and (3).
- Developer Contribution for Public Art: Policy P316.
- Sustainable Design: Policy P350.01.
- Design and Development - Swan River Context: Swan-Canning River System.

The following matters, which require the exercise of discretion, are considered acceptable subject to the conditions should the development be approved and are discussed further below:

- Land Use and Ground Floor Uses: TPS6 Schedule 9 Table A 1-2.
- Relationship to the Street: TPS6 Schedule 9 Table A 6.1-6.6.
- Side and Rear Setbacks: TPS6 Schedule 9 Table A 7.1 and R-Codes Table 5
- Parking: TPS6 Schedule 9 Table A 8.
- Dimensions of Car Parking Bays and Accessways: TPS6 cl. 6.3(8).
- Driveway Gradient: TPS6 cl. 6.10(2).

Applicable Scheme Provisions within Special Control Area 1

TPS6 Schedule 9 was gazetted on 18 January 2013, applicable to any comprehensive new developments within Special Control Area 1, including the development site. Schedule 2 clause 67(b) of the Regulations requires the local government and DAP to have due regard to any proposed local planning scheme or amendment that has been advertised under the Regulations or any other proposed planning instrument that the local government is seriously considering adopting or approving.

Amendment No. 46 to TPS6 proposed to rectify anomalies and ambiguities in Schedule 9 by replacing the current provisions with proposed Schedule 9A. Amendment No. 46 was first endorsed by Council for public advertising on 28 October 2014, with advertising undertaken in early 2015. In response to submissions and recent planning approvals, Council sought to further modify proposed Schedule 9A. The modified Amendment No. 46 included major changes and so was endorsed by Council for further public advertising on 27 October 2015, with the amendment advertised and the public submission period commencing on 4 November 2015 and concluding on 5 February 2016.

The City considers that as the 27 October 2015 version of Amendment No. 46 has been advertised, it constitutes a seriously entertained proposal. Hence, the DAP is required to have due regard to this Scheme Amendment in considering this planning application. However, variations to the gazetted Schedule 9 can only be considered where discretion is currently available in Schedule 9.

The City has obtained legal advice in relation to having due regard to proposed Amendment No. 46. In summary, this advice provided the following guidance:

(a) The extent to which the application is consistent with the planning objective or planning approach reflected in the scheme amendment.
(b) The weight to be given to point (a):
    (1) The degree to which the amendment addresses the specific development application.

(2) The degree to which the amendment is based on sound town planning principles.
(3) The degree to which its ultimate approval could be regarded as "certain".
(4) The degree to which its ultimate approval could be regarded as "imminent".

Compliant Elements

The City has identified that the proposal is compliant without the exercise of discretion for some of the planning provisions. Proposed Amendment No. 46 does not propose any substantial modifications to these provisions. Accordingly, the assessments of these provisions are not discussed further, though conditions would be recommended, should the DAP approve the application to ensure compliance.

Land Use

TPS6 Schedule 9 Table A clauses 1 and 2 specifies 'Preferred', 'Discretionary' and 'Prohibited' land uses for each of the sub-precincts. The development proposes the land use of Mixed Development, incorporating Offices and Multiple Dwellings.

The proposed land uses are 'Preferred' land uses for the Scott-Richardson Sub-Precinct in TPS6 Schedule 9 and proposed Schedule 9A. The City considers that all of the proposed land uses are consistent with the relevant Guidance Statements.

Relationship to the Street

TPS6 Schedule 9 Table A clause 6 specifies required street setbacks and the design of the ground floor facades of the building. Proposed Schedule 9A, renumbered to clause 7, proposed to increase the podium street setback requirement but otherwise maintains a similar intent as the gazetted provisions.

In relation to the gazetted provisions, the proposed development is seeking variations to the:

- maximum 5.0 metre ground floor wall length without openings; and
- minimum 4.0 metres above podium setback (projections within setback).

The variations can be permitted where the development is consistent with / meets the intent of the relevant Guidance Statements.

The car park screening portion of the building on the ground floor level does not meet the maximum wall length requirements. However, to reduce the detrimental visual amenity impacts, the portion of the wall is finished with timber screening, with vegetation planted in front, in a manner to compliment the remainder of the building.

The tower element of the building does not fully meet the 4.0 metre street setback requirement, as architectural features of the building encroach into this setback area, as parts of the Multiple Dwelling balconies and planter boxes are setback 3.5 metres from the street boundary. However, the City considers that these encroachments are minor, they are seen to pose no significant visual impact, rather they contribute to the overall design quality of the building and they do not conflict with the additional street setback provisions in Amendment No. 46, which would permit a minimum 3.0 metre setback for cantilevered balconies and decorative features.

The nil podium street setback is compliant with the gazetted Schedule 9 requirement; however it would not meet the proposed minimum 4.0 metres podium street setback contained in Amendment No. 46. In relation to having due regard to this amendment, the City notes the following:

(a) The relevant Guidance Statement in the Scheme Amendment lists the potential reasons for the increased street setback being related to the larger street setbacks of existing buildings (approved prior to the creation of the Special Control Area) in the same street, a narrow street and/or significant street trees. Charles Street currently has two developments approved under Schedule 9 with nil podium setbacks, being No. 30-34 (Pinnacle building, under construction) and No. 12 (originally Nos. 12-16, no building permit application received); otherwise the existing buildings are setback from the street boundary. The narrow street and street tree provisions are not seen to be applicable to Charles Street.

(b)(1) The increase to the minimum podium street setback impacts this application.

(b)(2) The proposed minimum 4.0 metre podium street setback could be seen to contradict with some objectives of the precinct, particularly those relating to an active and pedestrian friendly environment.

(b)(3) The gazettal of a minimum 4.0 metres street setback is uncertain, as the Council has not yet considered submissions and the WAPC recommendation and Minister's final decision is unknown.

(b)(4) The gazettal of Amendment No. 46 is not imminent, as its final approval is months away.

The street setback requirement proposed in the most recently advertised version of Amendment No. 46 is going a different direction to the gazetted Scheme. In this instance, noting the nil podium setbacks already approved in this street for comprehensive new developments and the uncertainty of the proposed 4.0 metre podium setback requirement being later implemented, the City is recommending that the nil setback requirement be applied. In the event that DAP wished to apply the 4.0 metre podium setback requirement, due to the substantial redesign required, the application would need to be deferred, to allow the applicants to modify their proposal accordingly, or refused.

Side and Rear Setbacks

TPS6 Schedule 9 Table A clause 7.2 specifies a zero side and rear setback for the podium element of the building. The development is mostly compliant, though on the second floor level, portions of the building are setback from the side lot boundaries and the whole building is setback from the rear boundary.

The portion of the building above the podium is compliant with the minimum 4.0 metres setback requirement. Terrace screens on the second floor level are located within 4.0 metres of the rear boundary. This screen is observed to not form part of the definition of 'building' in the Residential Design Codes and accordingly is not subject to the setback requirements.

The proposed podium setbacks can be approved, if the proposal is considered to be consistent with the relevant associated Guidance Statement.

The proposed wall setbacks are observed to provide additional natural light into the office tenancies and break up the visual building bulk impact as viewed from the adjoining properties. The proposed side and rear setbacks are observed by City officers not to conflict with the Guidance Statement.

In relation to the surface finishes, a condition would be recommended requiring the applicant to contact the adjoining landowners regarding their preferred surface finish, in accordance with Council Policy P350.02.

Parking – Car Parking
The proposed building is calculated by City officers to require 93 car bays, based upon the ratios listed in TPS6 Schedule 9 Table A clause 8.1. The same ratios apply to this development in proposed Schedule 9A. The proposed development provides 100 car bays on site, a surplus of 8 bays. The allocation of bays identified on the plans results in a 5 bay shortfall of visitor car bays, a 5 bay surplus of non-residential occupier car bays and an 8 bay surplus of residential car bays. The tables below list further details of the car parking requirements.

Floor	Non-Residential Gross Floor Area
Ground	168m^2
Second	1287m^2
Third	811m^2
Fourth	675m^2
Proportional Share of Shared Spaces	141m^2
Subtotal	**3082m^2**

Car Parking Calculation (TPS6 Schedule 9 Table A clause 8.1)				
Use	**Value**	**Rate**	**Required**	**Proposed**
1 Bedroom Dwellings	8 dwellings	0.75 per dwelling	6 (6.00)	8
Other Dwellings	20 dwellings	1 per dwelling	20 (20.00)	25
Residential Visitors	28 dwellings	1 per 6 dwellings	5 (4.67)	0
Non-Residential	3082m^2 GFA	1 per 50m^2 GFA - 10% marked for visitors	62 (61.64) - 7 marked for visitors	60 0
Other	-	-	0	7 visitor (shared)
Total			**93 bays**	**100 bays**

In addition, the development is compliant with the minimum requirement for the provision of at least 13 non-residential and 10 residential bicycle bays.

The use of discretion is limited to the extent specified in TPS6 Schedule 9 Table A clauses 8.2 and 8.3. Accordingly, a lesser number of car bays can be approved on the basis of reciprocal parking between non-residential uses, or due to existing off-street parking being under-utilised, where the development is consistent with the associated guidance statement. In proposed Amendment No. 46, Schedule 9A Table A clause 9.2 limits the exercise of discretion to developments with two or more non-residential uses – a lesser number of non-residential car bays can be approved where it is demonstrated that the proposed number or bays is sufficient, having regard to different periods of peak parking demand for the proposed non-residential land uses. Hence, a car parking reduction would not be permitted in the proposed circumstance should the advertised Amendment No. 46 be implemented.

In relation to the visitor car parking shortfall, the gazetted Scheme can consider a potential use of reciprocal parking between residential visitors and Office visitors, as a result of differing expected usage patterns. Accordingly, less than 12 visitor bays (as per Table A clause 8.1) could be provided on site to cater for the likely peak parking demand.

The applicant's comments relating to reduced parking demand as a result of the availability of alternative forms of transport and public car parks are not relevant, as the minimum parking ratios prescribed for comprehensive new developments in the South Perth Station Precinct already accommodate these factors.

If more visitor parking was considered to be required than currently proposed, the internal security doors and walls to separate the visitor and non-residential occupier would either need to be shifted to include bays currently allocated for non-residential occupiers, or an electronic communication system would be required for visitors to communicate with occupiers of the building, to gain access to the secured portion of the car park.

Considering the current proposal, the number of car bays available is seen to be insufficient for visitors to the non-residential tenancies (Offices), as 7 bays are required and some of these bays could be being used by residential visitors during operating hours, depending on residential parking demand at the time.

In the currently proposed form, the car parking shortfall to non-residential car parking and visitor car parking is not supported. However, a reallocation of car bays would adequately address this matter.

Minimum Dimensions of Car Parking Bays and Accessways
TPS6 cl. 6.3(8), which refers to the Australian Standard AS2890.1, specifies minimum dimensions for car parking bays and accessways. The proposed car parks are compliant with the minimum dimensions for the land uses proposed (User Class 1A), based upon these land uses' low turnover of car bays.

The development proposes 20 Wöhr Comfort type Parklift 411/5-195 car stackers for 40 of the non-residential car bays. The section drawing and technical specifications identifies a total of 3.6 metres headroom. The Australian Standard advises that the height of all passenger cars and station wagons is below 1.5 metres. The local planning framework does not specify requirements for car stackers, though the Wöhr Comfort type Parklift 411-190 car stacker system has previously been accepted by the Metro Central JDAP for employee parking (3 & 5 Barker Avenue, Como – DAP/14/00581), subject to a notification on the title. The 411/5-195 system has the same maximum 2,000kg platform load for the upper level as the 411-190 system, though the 411/5-195 system has a reduced headroom height of 1.5 metres for the upper level as opposed to 1.9 metres.

The City has no objection to the use of the proposed car stacker system.

Driveway Gradient
TPS6 clause 6.10(2) specifies a maximum driveway gradient of 1:12 within 3.6 metres of the street alignment and 1:8 for the remainder of the driveway. The vehicle accessways and car bays mostly have a constant finished floor level specified. The ramp between the ground and first floor levels is noted to propose gradients as steep as 1:4.

The 1:4 gradient can be accepted, subject to meeting the requirements of Council Policy P350.03 clause 7(b). To indemnify the Council from any future access difficulties from the future occupants of the building, a condition is recommended requiring the landowner to submit documentation confirming compliance with the Australian Standard and a letter accepting any access difficulties that may arise, without any future recourse to the City of South Perth, in accordance with Council Policy P350.03.

Options/Alternatives
The alternative options available are to refuse the application or defer the application. However the City is satisfied that the proposed development is capable of approval, subject to the recommended conditions.

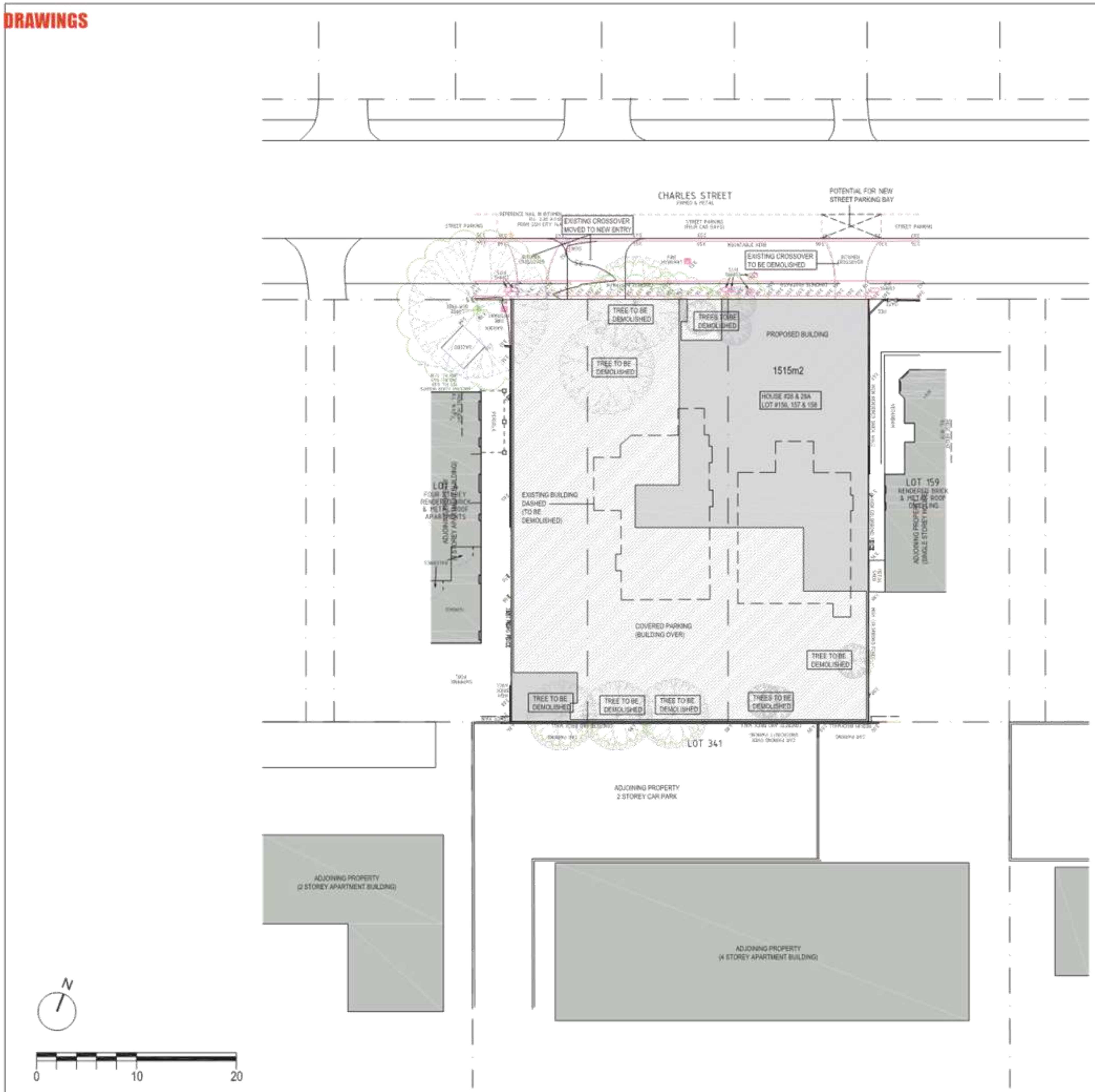
Council Recommendation:

The Council of the City of South Perth had not provided comments on this application at the time this Responsible Authority Report was lodged.

Conclusion:

The proposed development satisfies most of the town planning provisions applicable to this site. The City officers have identified a few planning matters, however these are dealt with by the recommended conditions. Accordingly, it is recommended by City officers that the proposed development should be conditionally approved.

DRAWINGS



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B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	24.11.15	COMMERCIAL LIFT ADDED	D.
E.	12.02.16	PARKING & PLOT RATIO REVISED	E.

NEW SCHEME

SITE AREA 1515m²

PLOT RATIO
COMMERCIAL = NO LIMIT
RESIDENTIAL = 1.5
28 APARTMENTS

	COMM	PR RESI	STRATA
G	160		
1			
2	1268		
3	799		
4	596		
5		568.8	525
6		568.8	525
7		568.8	525
8		568.8	525
	2823	2275.2	2100

COMMERCIAL PLOT RATIO 1.86
RESIDENTIAL PLOT RATIO 1.50
TOTAL PLOT RATIO 3.36

28 Apartments

	A	B	C	D	E	
	3 BED x 2 BATH	2 BED x 2 BATH	2 BED x 2 BATH	2 BED x 1 BATH	1 BED + 1 BATH	TOTAL
	121	86	89	65	50	
G						
1						
2						
3						
4						
5	1	1	1	2	2	7
6	1	1	1	2	2	7
7	1	1	1	2	2	7
8	1	1	1	2	2	7
TOTAL	4	4	4	8	8	28
	484	344	356	520	400	2100

RESIDENTIAL	
REQUIRED RESIDENTIAL CAR BAYS	32
PROVIDED RESIDENTIAL CAR BAYS	34
REQUIRED VISITOR CAR BAYS	4.6
PROVIDED VISITOR CAR BAYS	5
REQUIRED RESIDENTIAL BIKE BAYS	9.3
PROVIDED RESIDENTIAL BIKE BAYS	10

TOTAL RESIDENTIAL CAR BAYS 34
TOTAL RESIDENTIAL BIKE BAYS 10
REQUIRED VISITOR BIKES 2.8

COMMERCIAL	
REQUIRED COMMERCIAL CAR BAYS	59
PROVIDED COMMERCIAL CAR BAYS	60
REQUIRED VISITOR CAR BAYS	5.9
PROVIDED VISITOR CAR BAYS	7
REQUIRED COMMERCIAL BIKE BAYS	13
PROVIDED COMMERCIAL BIKE BAYS	13

TOTAL COMMERCIAL CAR BAYS 60
TOTAL COMMERCIAL BIKE BAYS 11

TOTAL CAR BAYS REQUIRED 93
TOTAL CAR BAYS PROVIDED 94
TOTAL VISITOR BAYS 7
(RECIPROCAL VISITORS)

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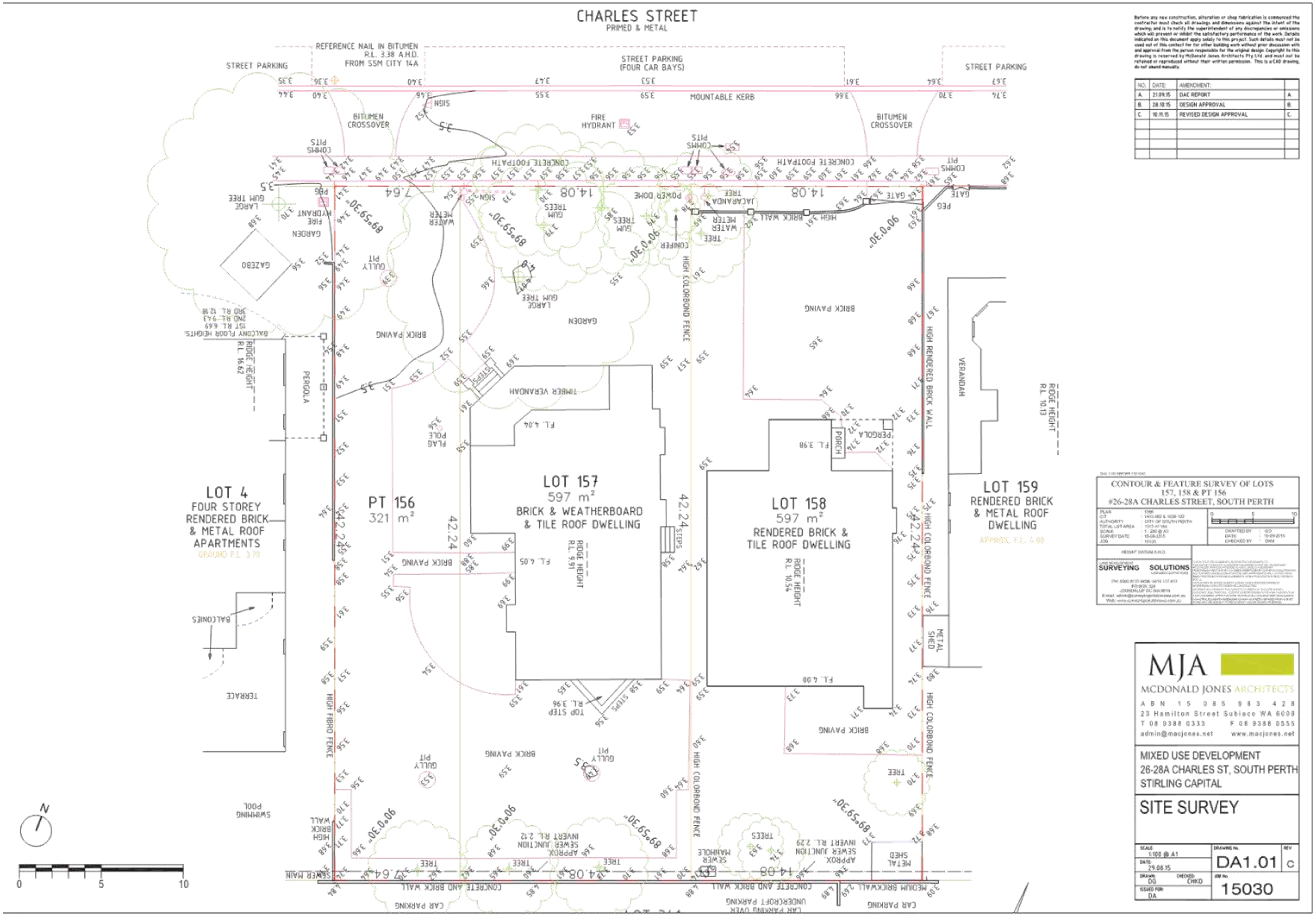
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

SITE PLAN

SCALE: 1:200 @ A1	DRAWING No. DA1.00 — REV E
DATE: 29.08.15	
DRAWN: DG CHECKED: CHKD	JOB No. 15030
ISSUED FOR: DA	


CHARLES STREET
PRIMED & METAL
REFERENCE NAIL IN BITUMEN
R.L. 3.38 A.H.D.
FROM SSM CITY 14A
STREET PARKING
STREET PARKING
(FOUR CAR BAYS)
STREET PARKING
MOUNTABLE KERB
BITUMEN CROSSOVER
FIRE HYDRANT
BITUMEN CROSSOVER
COMMS PITS
CONCRETE FOOTPATH
14.08
14.08
LOT 4
FOUR STOREY
RENDERED BRICK
& METAL ROOF
APARTMENTS
GROUND F.L. 3.78
PT 156
321 m²
42.24
LOT 157
597 m²
BRICK & WEATHERBOARD
& TILE ROOF DWELLING
42.24
STEPS
LOT 158
597 m²
RENDERED BRICK &
TILE ROOF DWELLING
42.24
LOT 159
RENDERED BRICK
& METAL ROOF
DWELLING
APPROX. F.L. 4.00
VERANDAH
RIDGE HEIGHT
R.L. 10.13
HIGH RENDERED BRICK WALL
HIGH COLORBOND FENCE
HIGH FIBRO FENCE
N
0 5 10
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B. 28.10.15 DESIGN APPROVAL B.
C. 10.11.15 REVISED DESIGN APPROVAL C.
CONTOUR & FEATURE SURVEY OF LOTS
157, 158 & PT 156
#26-28A CHARLES STREET, SOUTH PERTH
SURVEYING SOLUTIONS
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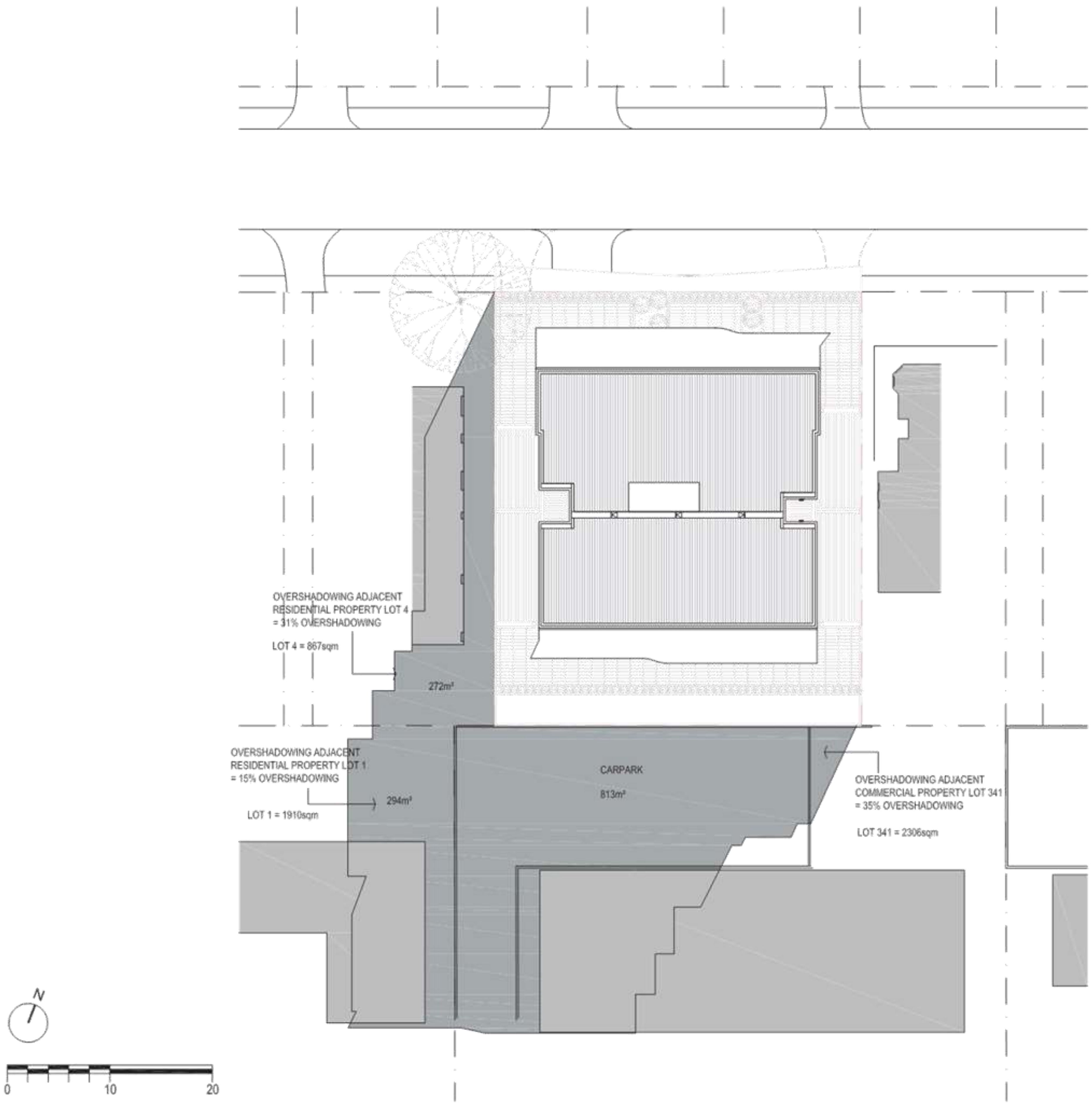
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
SITE SURVEY
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG
CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.01
REV C
JOB No. 15030



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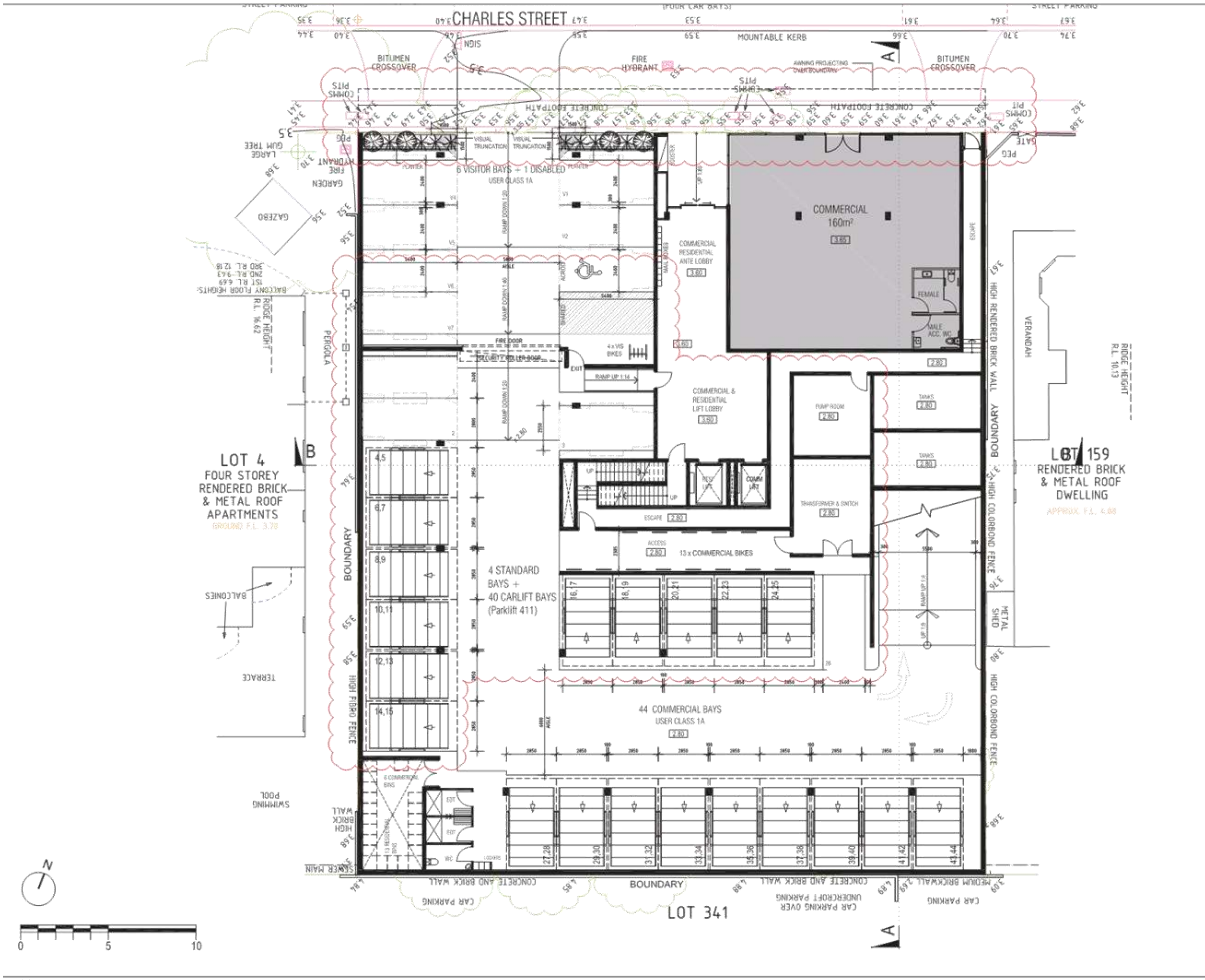
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

OVERSHADOWING DIAGRAM

SCALE: 1:200 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.02 REV C
JOB No. 15030



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C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	24.11.15	COMMERCIAL LIFT ADDED	D.
E.	12.02.16	PARKING & PLOT RATIO & AWNING REVISED	E.

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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

GROUND FLOOR PLAN

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.03 REV E
JOB No. 15030

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E.	12.02.16	PARKING & PLOT RATIO & AWNING REVISED	E.

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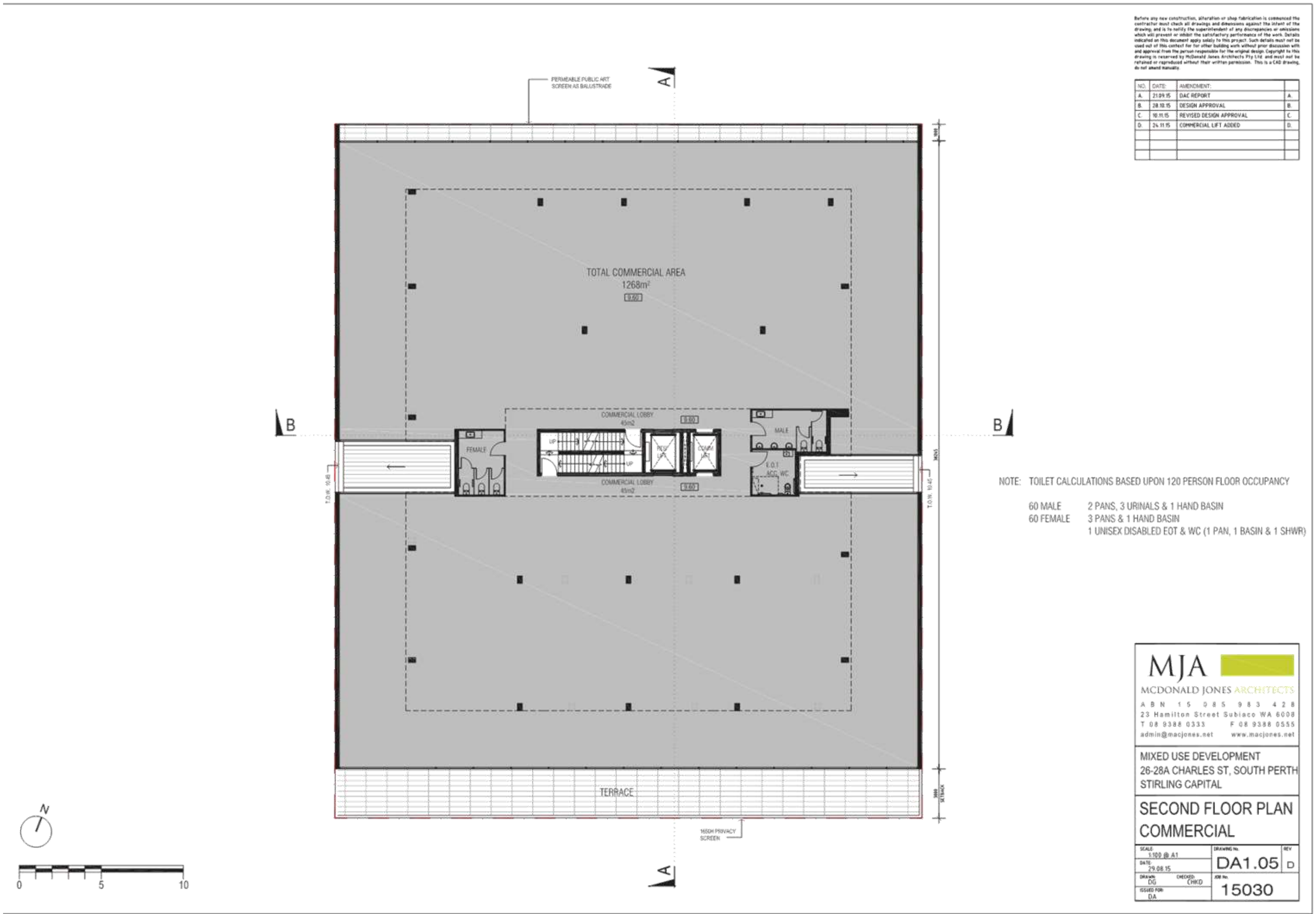
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

FIRST FLOOR PLAN
CARPARK

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.04
REV E
JOB No. 15030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B. 28.10.15 DESIGN APPROVAL B.
C. 10.11.15 REVISED DESIGN APPROVAL C.
D. 24.11.15 COMMERCIAL LIFT ADDED D.
PERMEABLE PUBLIC ART SCREEN AS BALUSTRADE
TOTAL COMMERCIAL AREA
1268m²
COMMERCIAL LOBBY 45m2
COMMERCIAL LOBBY 45m2
FEMALE
MALE
TERRACE
1650H PRIVACY SCREEN
NOTE: TOILET CALCULATIONS BASED UPON 120 PERSON FLOOR OCCUPANCY
60 MALE 2 PANS, 3 URINALS & 1 HAND BASIN
60 FEMALE 3 PANS & 1 HAND BASIN
1 UNISEX DISABLED EOT & WC (1 PAN, 1 BASIN & 1 SHWR)
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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
SECOND FLOOR PLAN
COMMERCIAL
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.05 REV D
JOB No. 15030
0 5 10

NO.	DATE:	AMENDMENT:	
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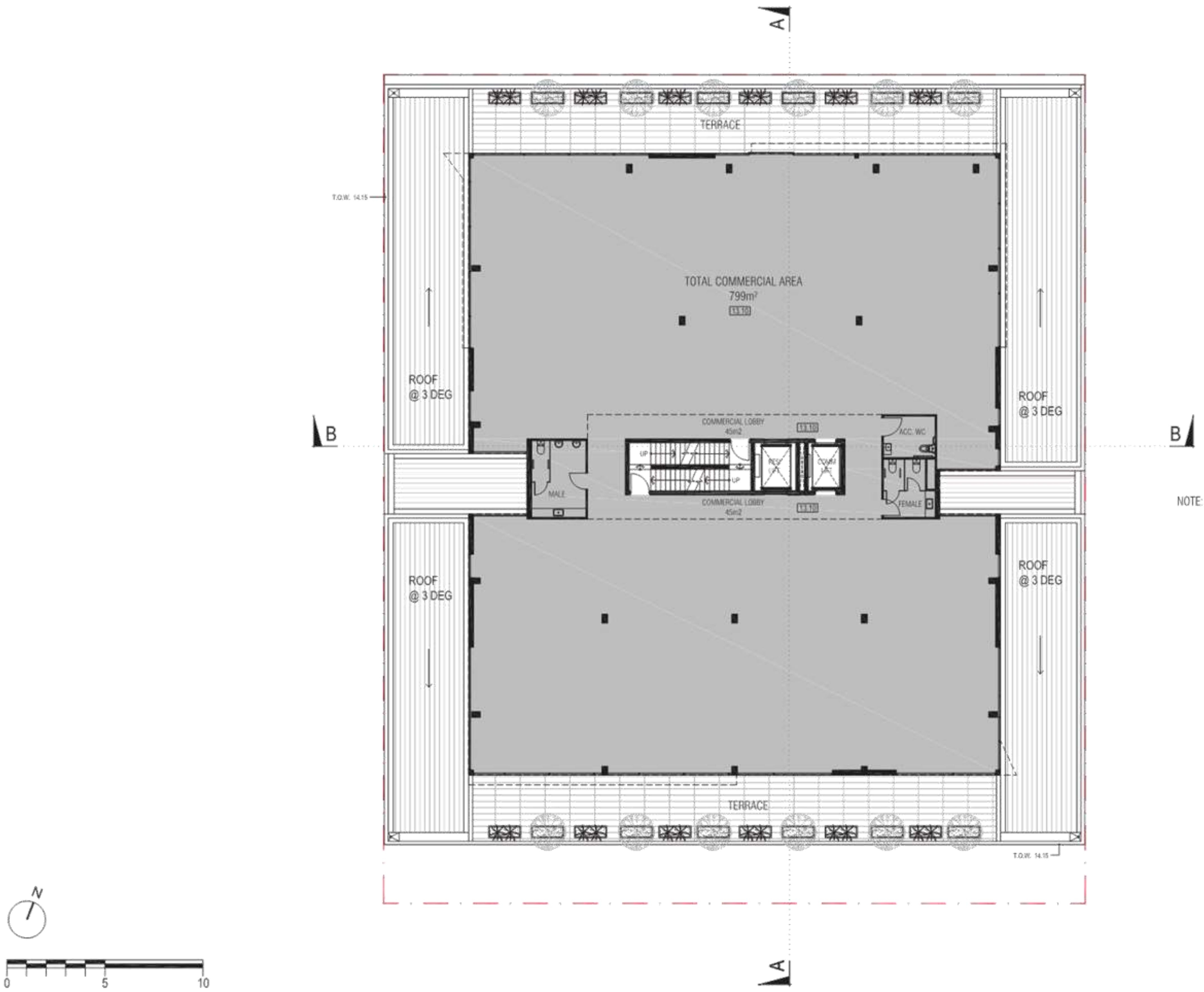
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	24.11.15	COMMERCIAL LIFT ADDED	D.



NOTE: TOILET CALCULATIONS BASED UPON 74 PERSON FLOOR OCCUPANCY

37 MALE	1 PAN, 2 URINALS & 1 HAND BASIN
37 FEMALE	2 PAN & 1 HAND BASIN
	1 UNISEX DISABLED WC (1 PAN & 1 BASIN)

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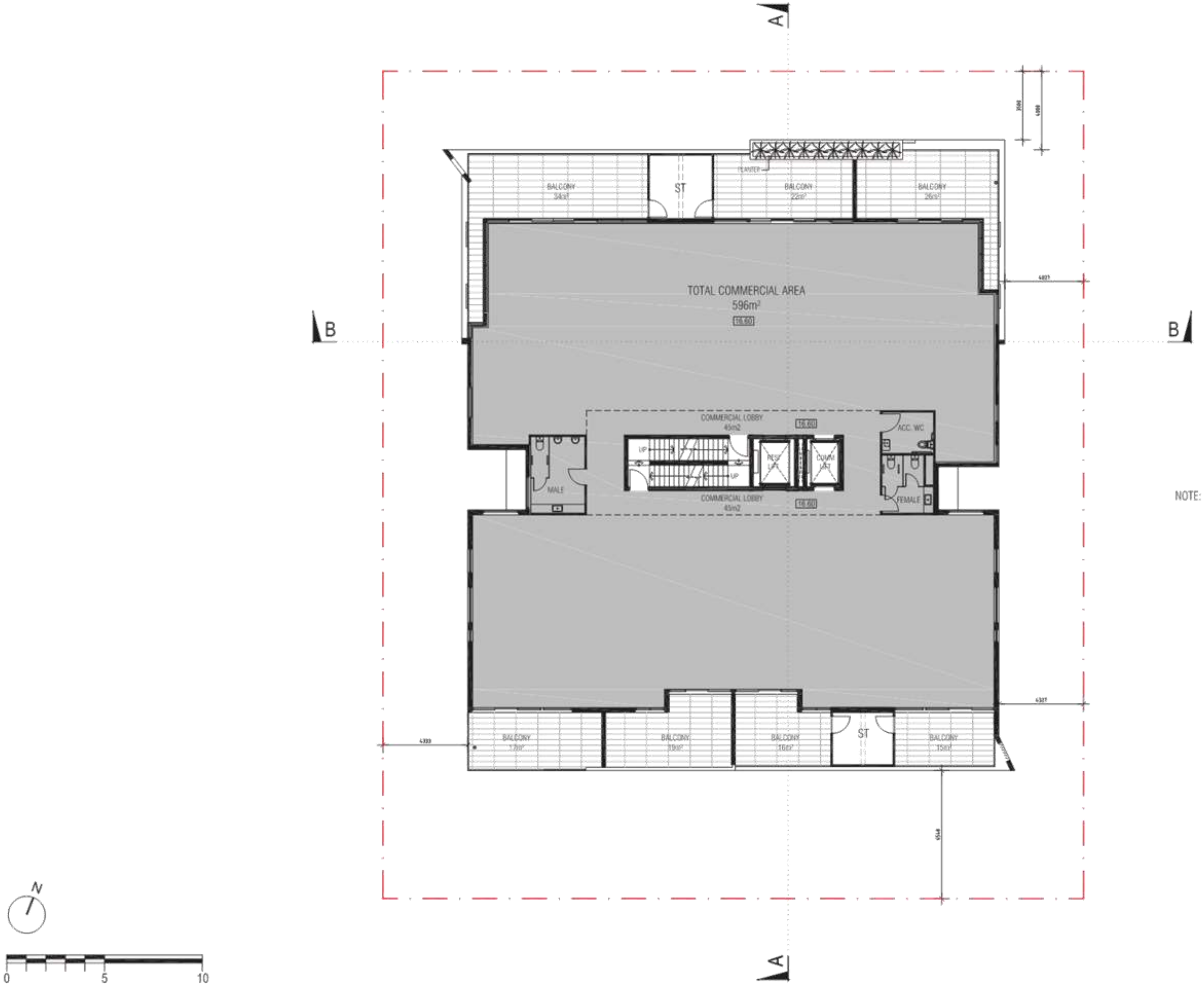
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

THIRD FLOOR PLAN
COMMERCIAL

SCALE: 1:100 @ A1	DRAWING No. DA1.06	REV D
DATE: 29.08.15		
DRAWN: DG CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: DA		



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C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	24.11.15	COMMERCIAL LIFT ADDED	D.

NOTE: TOILET CALCULATIONS BASED UPON 54 PERSON FLOOR OCCUPANCY

24 MALE 1 PAN, 2 URINALS & 1 HAND BASIN
24 FEMALE 2 PAN & 1 HAND BASIN
1 UNISEX DISABLED WC (1 PAN & 1 BASIN)

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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
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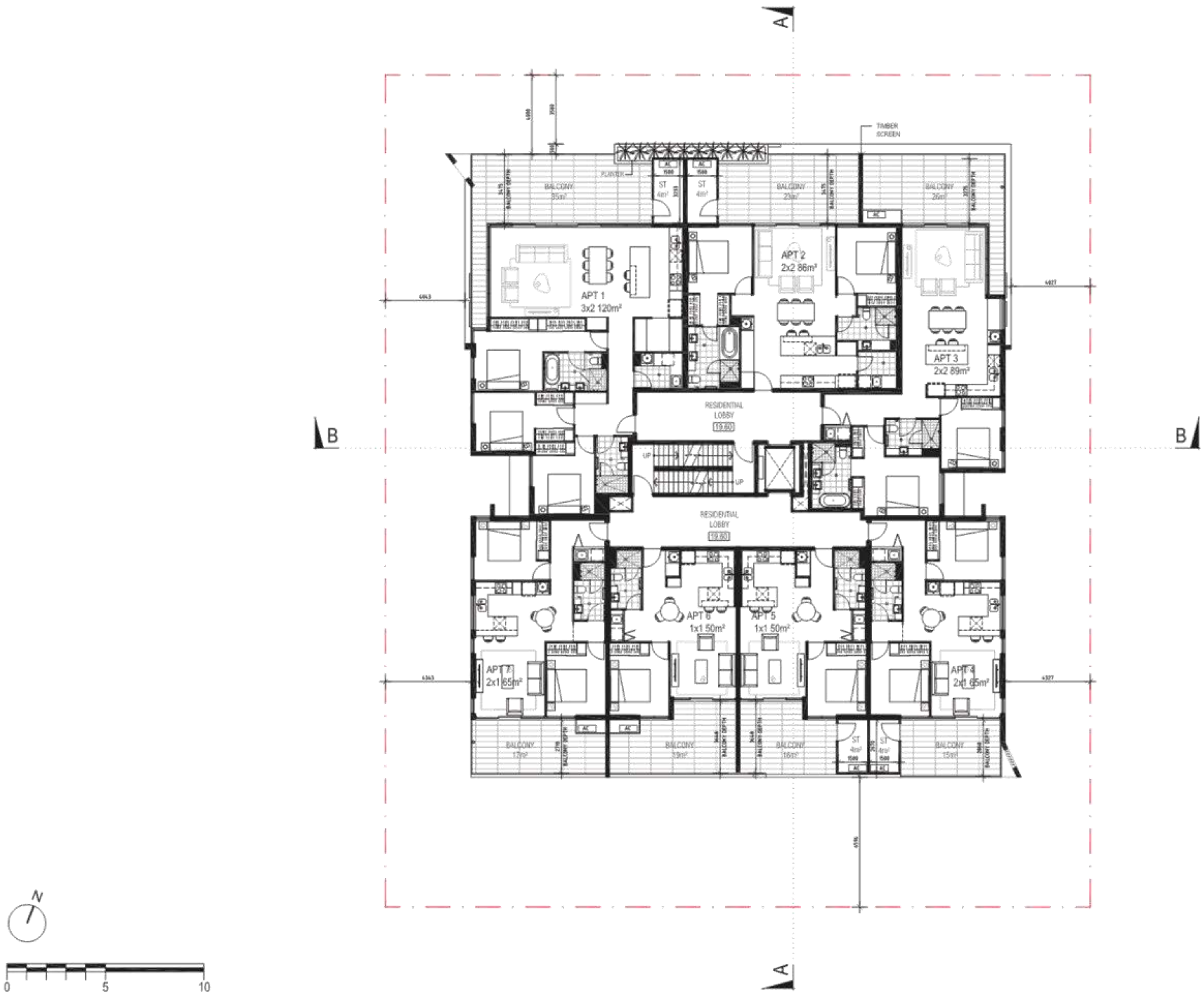
FOURTH FLOOR PLAN COMMERCIAL

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.07 REV D
JOB No. 15030



NO.	DATE:	AMENDMENT:	
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B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	02.12.15	WINDOWS ADDED TO WEST BED / LIVING	D.

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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

FIFTH FLOOR PLAN
RESIDENTIAL

SCALE: 1:100 @ A1	DRAWING No. DA1.08	REV D
DATE: 29.08.15		
DRAWN: DG CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: DA		

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D.	02.12.15	WINDOWS ADDED TO WEST BED / LIVING	D.

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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

SIXTH FLOOR PLAN
RESIDENTIAL

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.09 REV D
JOB No. 15030

NO.	DATE:	AMENDMENT:	
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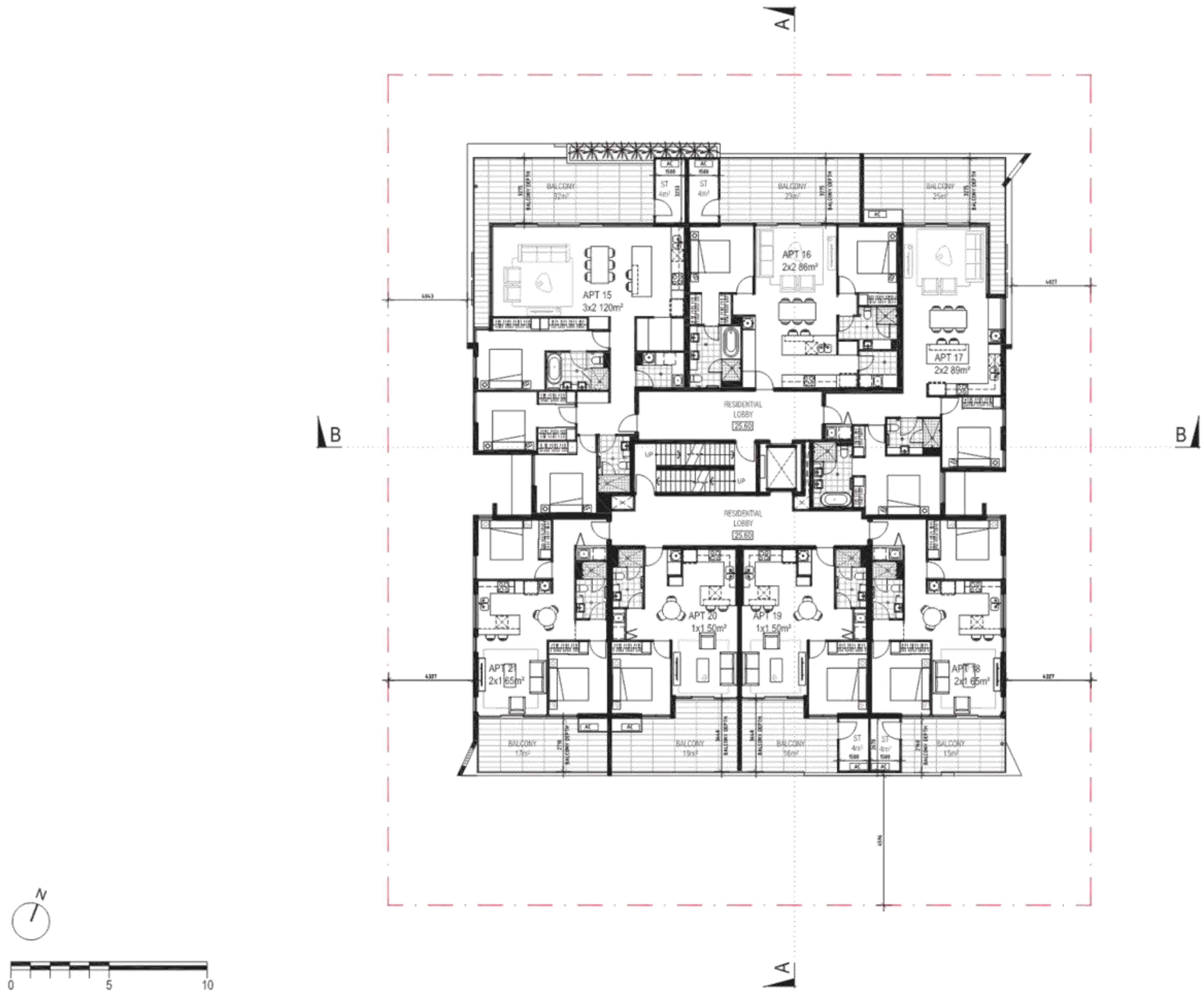
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	02.12.15	WINDOWS ADDED TO WEST BED / LIVING	D.



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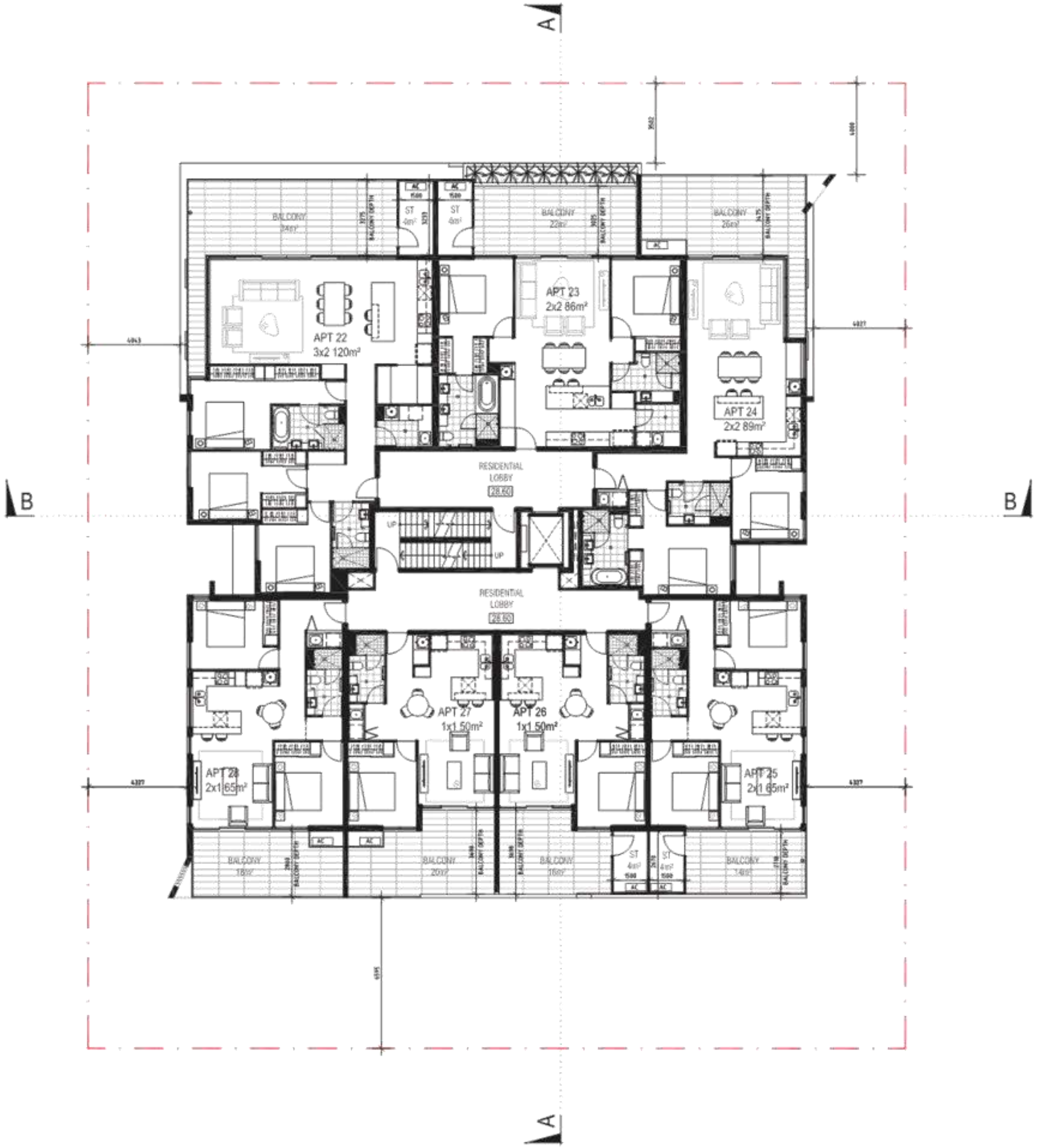
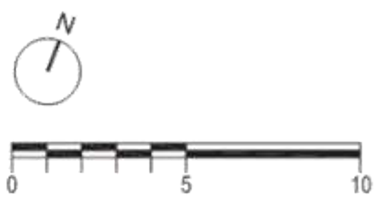
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

SEVENTH FLOOR PLAN RESIDENTIAL

SCALE: 1:100 @ A1	DRAWING No. DA1.10	REV D
DATE: 29.08.15		
DRAWN: DG	CHECKED: CHKD	JOB No. 15030
ISSUED FOR: DA		





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C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	02.12.15	WINDOWS ADDED TO WEST BED / LIVING	D.

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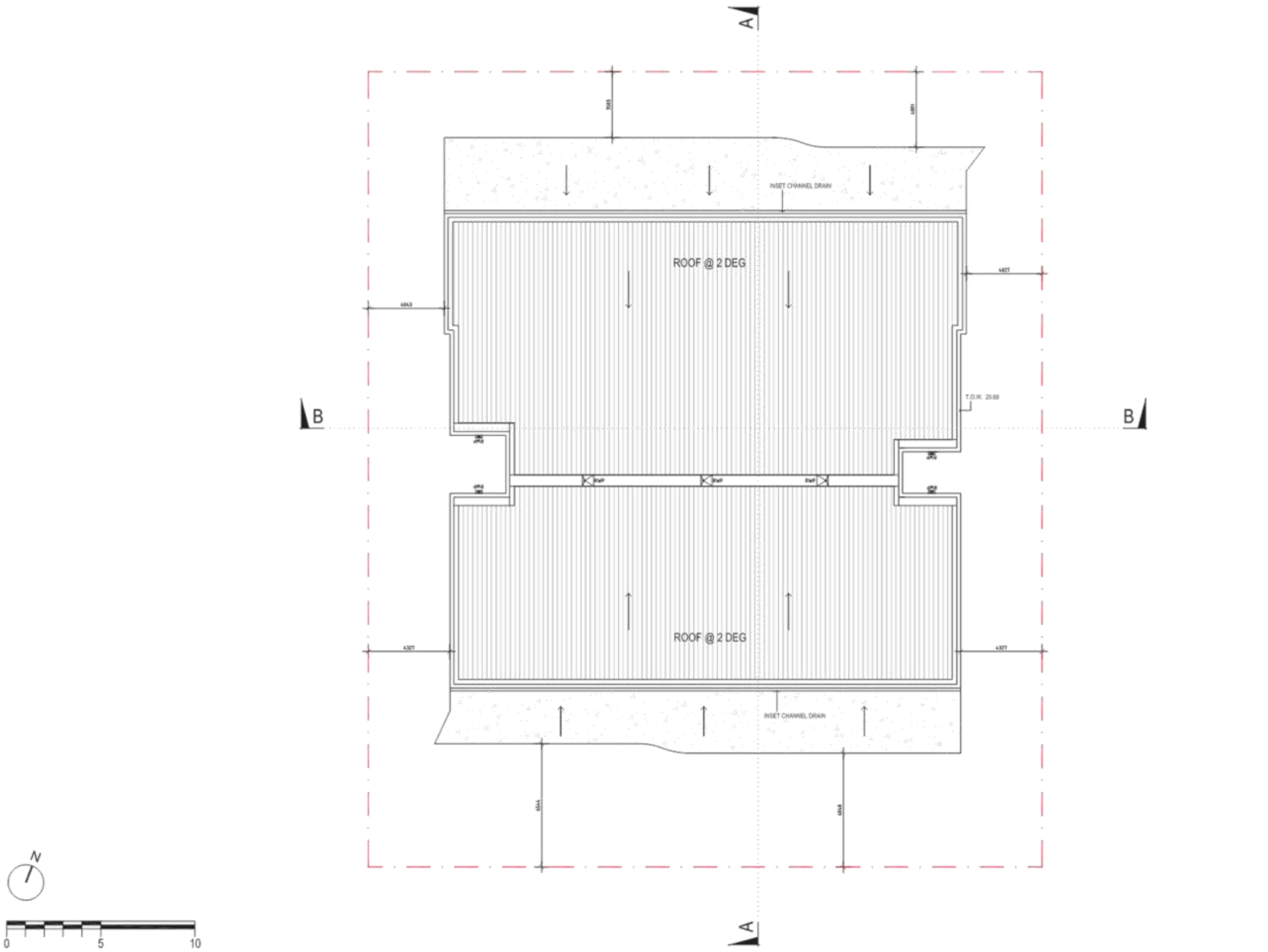
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

EIGHTH FLOOR PLAN
RESIDENTIAL

SCALE: 1:100 @ A1	DRAWING No. DA1.11
DATE: 29.08.15	REV D
DRAWN: DG CHECKED: CHKD	JOB No. 15030
ISSUED FOR: DA	



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A.	21.09.15	DAC REPORT	A.
B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.

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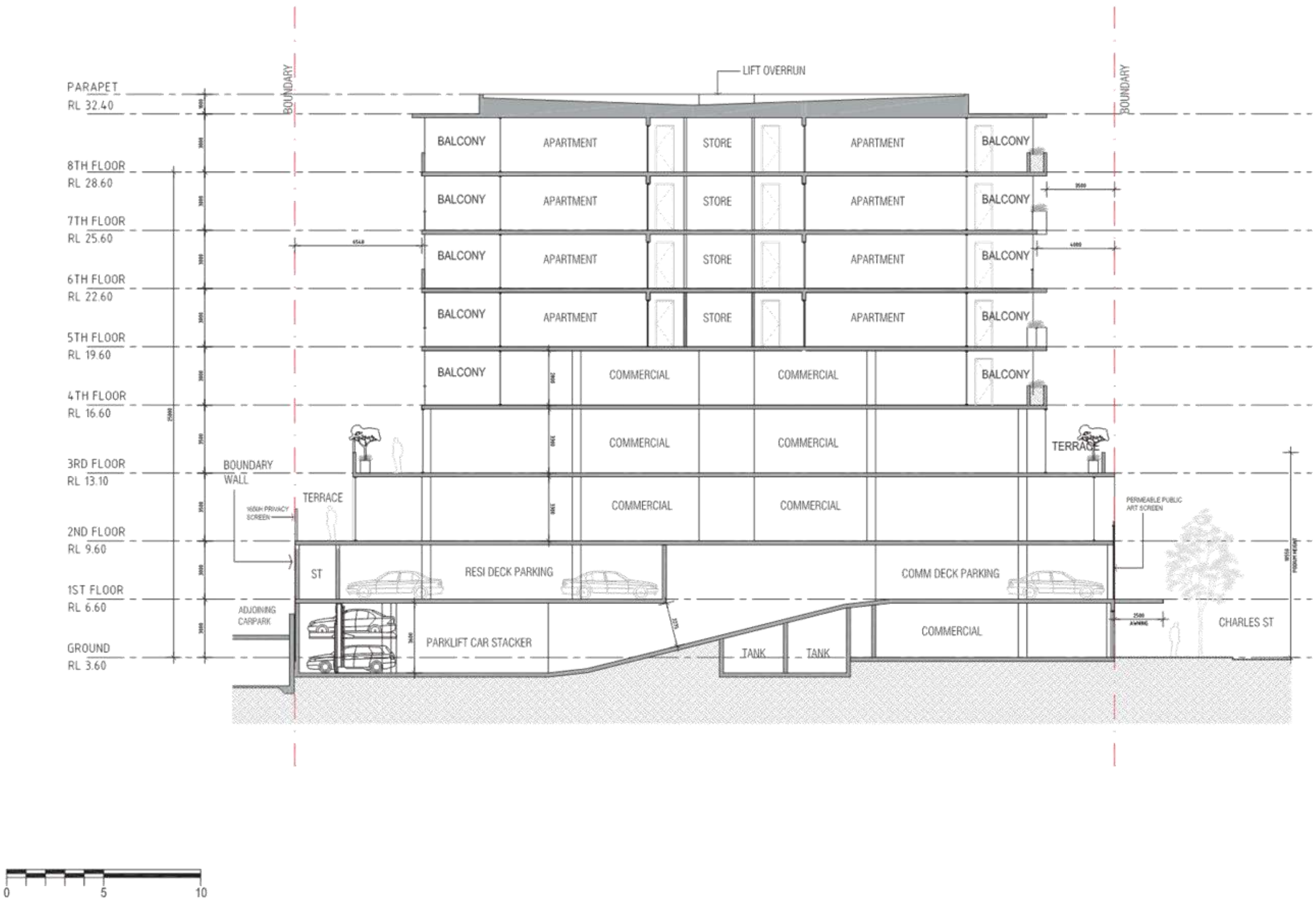
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

ROOF PLAN

SCALE: 1:100 @ A1	DRAWING No. DA1.12 — REV C
DATE: 29.08.15	
DRAWN: DG CHECKED: CHKD	JOB No. 15030
ISSUED FOR: DA	

NO.	DATE:	AMENDMENT:	
A.	21.09.15	DAC REPORT	A.
B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	12.02.16	AWNING UPDATED	D.



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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

DESIGN SECTION AA

SCALE: 1:100 @ A1	DRAWING No. DA1.13	REV D
DATE: 29.08.15		
DRAWN: DG CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: DA		

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NO.	DATE:	AMENDMENT:	
A.	21.09.15	DAC REPORT	A.
B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	24.11.15	COMMERCIAL LIFT ADDED	D.

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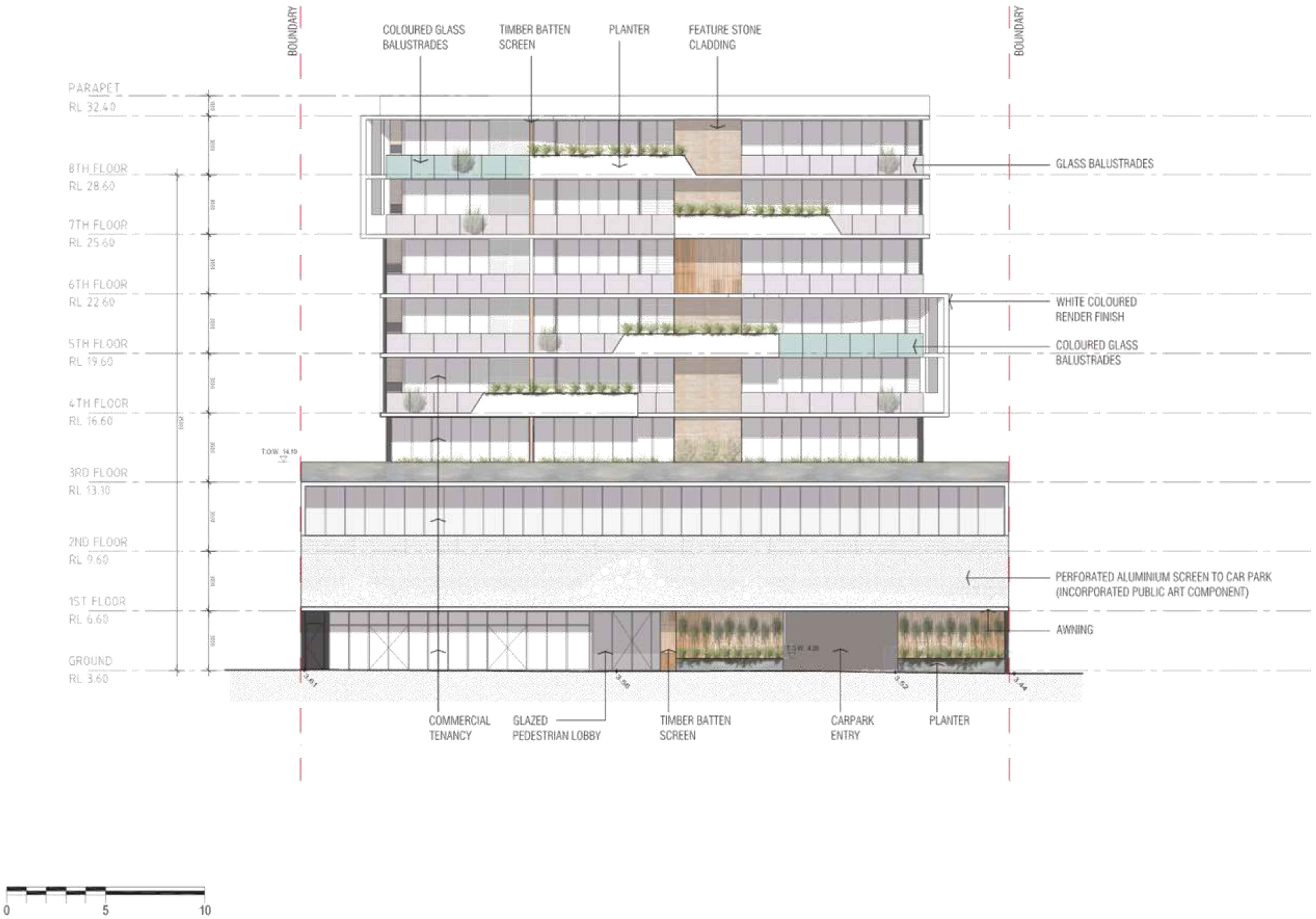
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

DESIGN SECTION BB

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.14
REV D
JOB No. 15030

NO.	DATE:	AMENDMENT:	
A.	27.09.15	DAC REPORT	A.
B.	28.10.15	DESIGN APPROVAL	B.
C.	16.11.15	REVISED DESIGN APPROVAL	C.



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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

NORTH ELEVATION
CHARLES STREET

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DS CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.15 REV C
JOB No. 15030


NO. DATE: AMENDMENT:
A. 21.09.15 DAC REPORT A.
B. 28.10.15 DESIGN APPROVAL B.
C. 13.11.15 REVISED DESIGN APPROVAL C.
BOUNDARY
GLASS BALUSTRADES
WHITE COLOURED RENDER FINISH
COLOURED GLASS
WHITE COLOURED RENDER FINISH
FEATURE STONE CLADDING
GLASS BALUSTRADES
BOUNDARY
PARAPET RL 32.40
8TH FLOOR RL 28.60
7TH FLOOR RL 25.60
6TH FLOOR RL 22.60
5TH FLOOR RL 19.60
4TH FLOOR RL 16.60
3RD FLOOR RL 13.10
2ND FLOOR RL 9.60
1ST FLOOR RL 6.60
GROUND RL 3.60
T.O.W. 14.10
T.O.W. 10.6
WHITE COLOURED POWDERCOATED ALUMINIUM SLIDING SCREEN
CHARLES ST
PRIVACY SCREEN
SCREEN
COMMERCIAL TENANCY
COLOUR BACK SPANDREL
CHARCOAL COLOURED RENDER FINISH
WHITE COLOURED RENDER FINISH
AWNING
0 5 10
MJA
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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
EAST ELEVATION
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: JG
CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.16
REV C
JOB No. 15030

NO.	DATE:	AMENDMENT:	
A.	28.10.15	DESIGN APPROVAL	A.
B.	16.12.15	REVISED DESIGN APPROVAL	B.

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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

SOUTH ELEVATION

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DS CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.17 REV B
JOB No. 15030

NO.	DATE:	AMENDMENT:	
A.	26.10.15	DESIGN APPROVAL	A.
B.	12.11.15	REVISED DESIGN APPROVAL	B.
C.	02.12.15	WINDOWS ADDED TO BED / LIVING	C.

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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

WEST ELEVATION

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: SG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.18 REV C
JOB No. 15030

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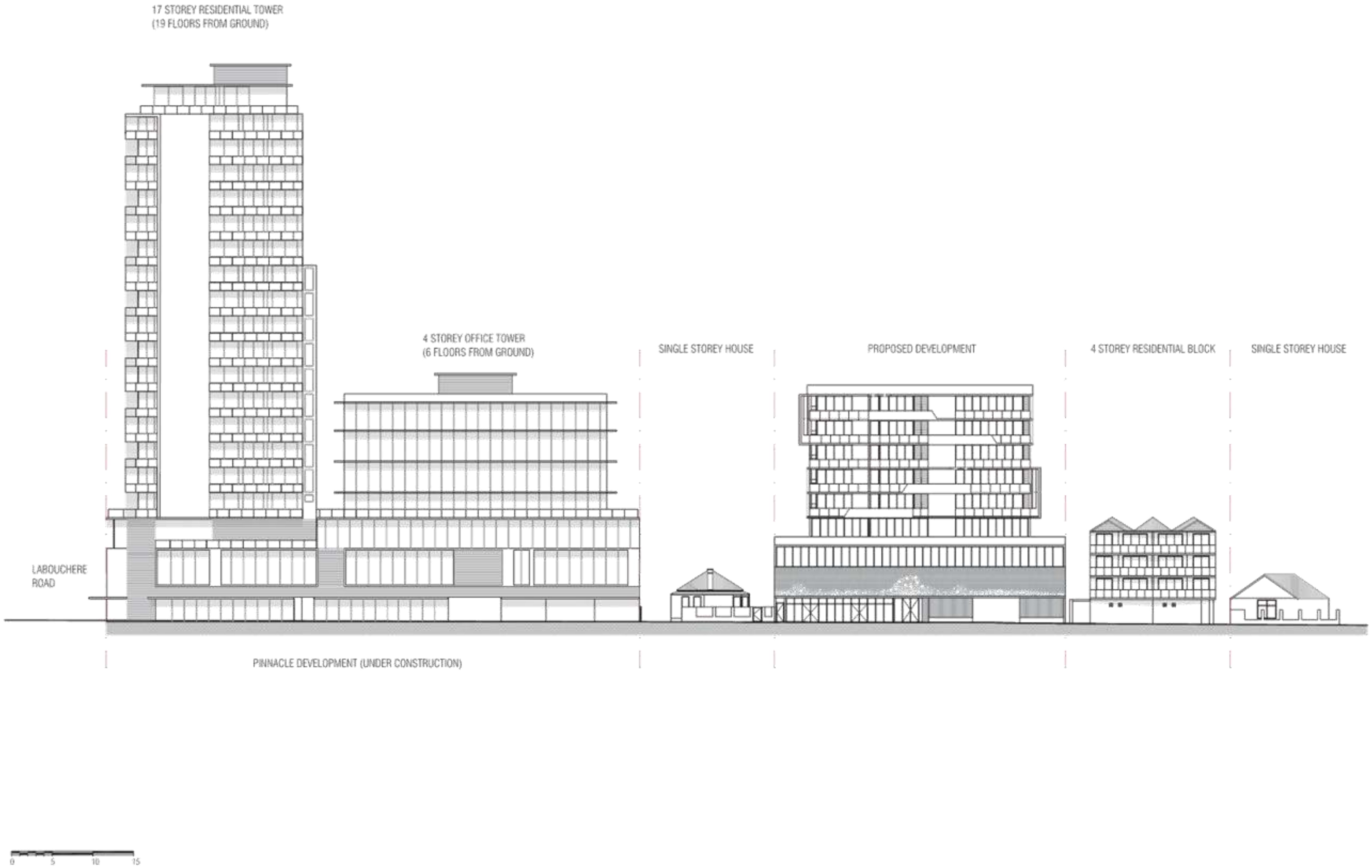
B.	10.11.15	REVISED DESIGN APPROVAL	B.



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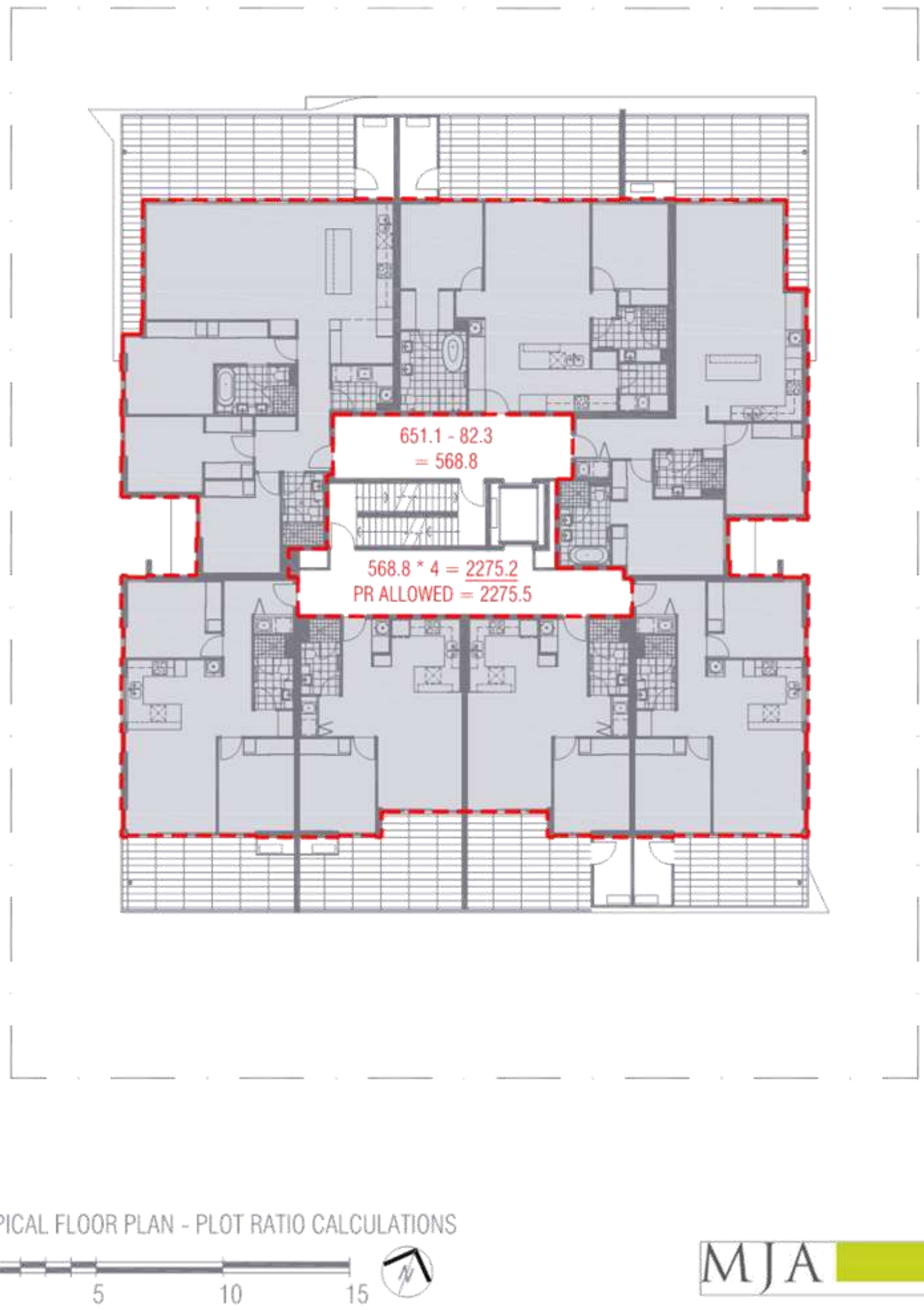
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

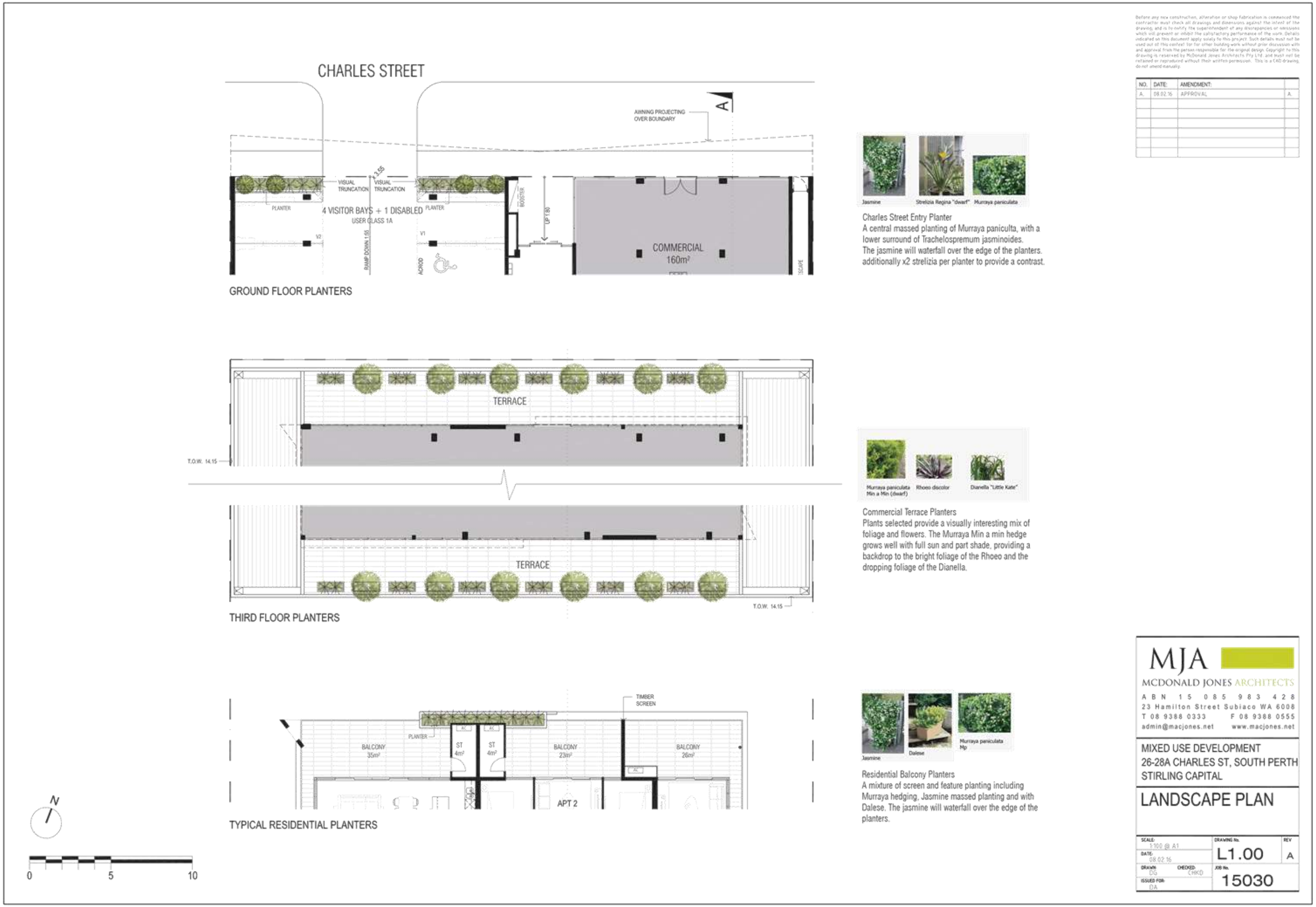
STREET SCAPE
CHARLES STREET

SCALE: 1:250 @ A1		DRAWING No. DA1.19	REV B
DATE: 29.08.15			
DRAWN: DG	CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: DA			



TYPICAL FLOOR PLAN - PLOT RATIO CALCULATIONS

MJA


CHARLES STREET
AWNING PROJECTING OVER BOUNDARY
VISUAL TRUNCATION
VISUAL TRUNCATION
PLANTER
4 VISITOR BAYS + 1 DISABLED
USER CLASS 1A
PLANTER
COMMERCIAL
160m²
GROUND FLOOR PLANTERS
TERRACE
T.O.W. 14.15
TERRACE
T.O.W. 14.15
THIRD FLOOR PLANTERS
TIMBER SCREEN
PLANTER
BALCONY 35m²
ST 4m²
ST 4m²
BALCONY 23m²
BALCONY 26m²
APT 2
TYPICAL RESIDENTIAL PLANTERS
N
0
5
10
Jasmine
Strelizia Regina "dwarf"
Murraya paniculata
Charles Street Entry Planter
A central massed planting of Murraya paniculta, with a lower surround of Trachelospremum jasminoides.
The jasmine will waterfall over the edge of the planters.
additionally x2 strelizia per planter to provide a contrast.
Murraya paniculata Min a Min (dwarf)
Rhoeo discolor
Dianella "Little Kate"
Commercial Terrace Planters
Plants selected provide a visually interesting mix of foliage and flowers. The Murraya Min a min hedge grows well with full sun and part shade, providing a backdrop to the bright foliage of the Rhoeo and the dropping foliage of the Dianella.
Jasmine
Dalese
Murraya paniculata Mp
Residential Balcony Planters
A mixture of screen and feature planting including Murraya hedging, Jasmine massed planting and with Dalese. The jasmine will waterfall over the edge of the planters.
NO. DATE: AMENDMENT:
A. 08.02.16 APPROVAL A.
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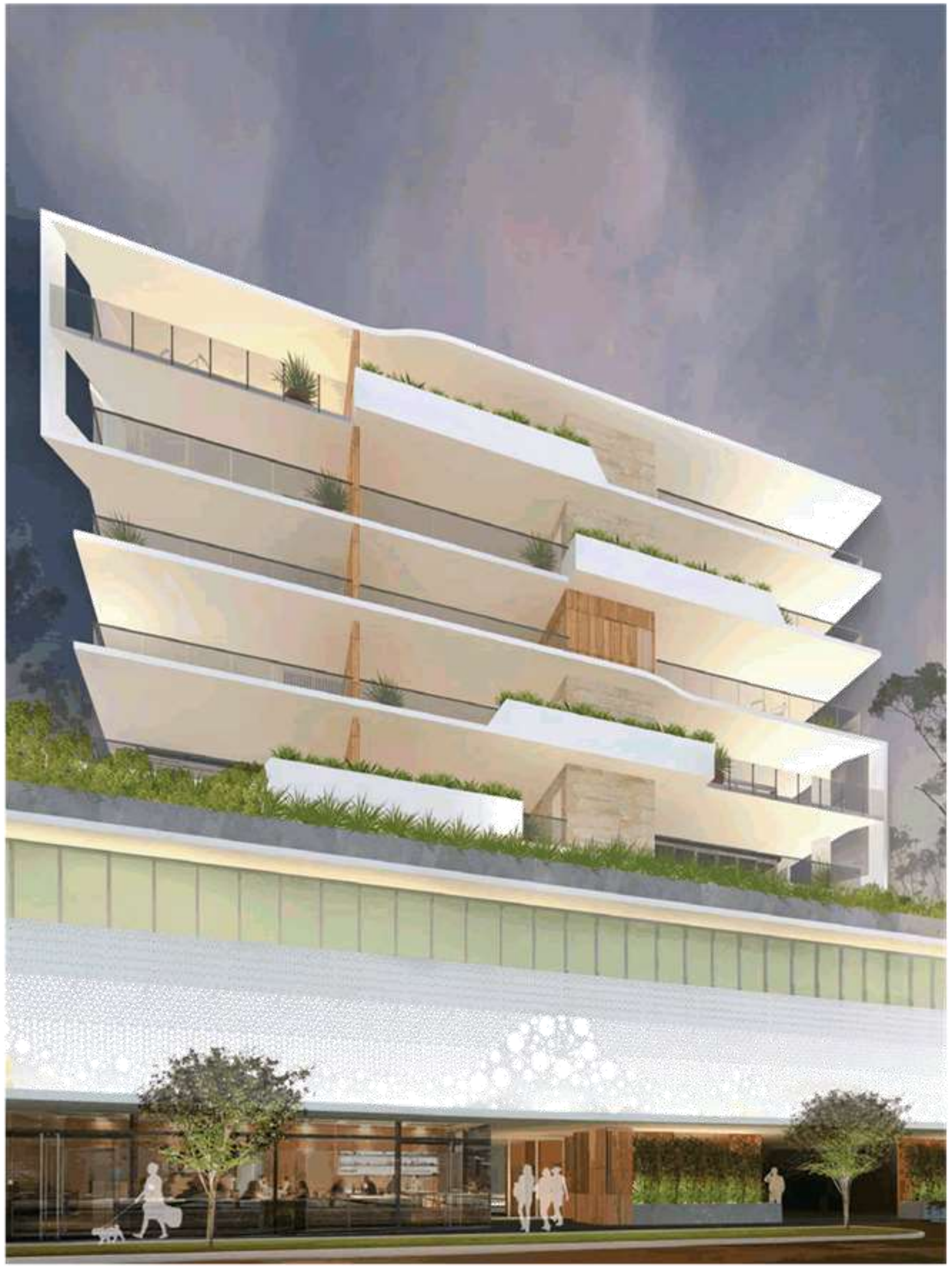
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
LANDSCAPE PLAN
SCALE: 1:100 @ A1
DATE: 08.02.16
DRAWN: DG
CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. L1.00
REV A
JOB No. 15030



MIXED-USE DEVELOPMENT

SUBMISSION FOR DEVELOPMENT APPLICATION

FEBRUARY 2016

MJA studio

STIRLING

26 - 28A CHARLES STREET
SOUTH PERTH
WESTERN AUSTRALIA

MJA

PLANNING FRAMEWORK

26 - 28A CHARLES STREET, SOUTH PERTH

PROPOSAL FOR 28 RESIDENTIAL APARTMENTS + 4 COMMERCIAL TENANCY

Metropolitan Region Scheme (MRS)
The MRS provides statutory framework within which all development is progressed in the Metropolitan Region.

SOUTH PERTH
Town Planning Scheme No. 6

The subject site is within the MIXED USE zone of the South Perth Planning Scheme (Town Planning Scheme No. 6) with an applicable density of R60/R80. It is located in the 'South Perth Station' Precinct which is also a 'Special Control Area' (SCA 1). The subject site falls within the 'Scott-Richardson' Sub-Precinct and is NOT part of the 'Special Design Area'.

The Scott-Richardson Sub-Precinct comprises of a mixed scale of residential and commercial uses which are compatible with, and largely serve, the surrounding residential uses. The design of the proposed building is attuned with the scale, character, materiality and site layout of the future buildings within the precinct. Car parking is located within the ground and first level of the property with a single crossover on Charles Street.

Development of 26 - 28A Charles Street is to be in accordance with the provisions of the TPS no.6, the Residential Design Code of Western Australia and the City of South Perth Local Planning Policies.

The proposed development lot is currently three separate lots (156, 157 and 158). The lots will be amalgamated following Development Application and prior to submission for Building Permit.

The total site area of amalgamated lots is 1515m² with a street frontage to Charles Street of 35.8m and a side boundary of 42.2m.

There are currently two single storey dwellings on the site which will be demolished. The land has a minor natural rise of 150mm from West to East along Charles street.

The proposed mixed use development will consist of;

28 x Residential Apartments (a mix between 1,2 & 3 bedroom)
4 x Commercial Tenancy (2823m²)

100 x car parking bays within the site (7 visitor & 93 secure parking)
13x dedicated Commercial bicycle parking
10x dedicated Residential bicycle parking
4x dedicated Visitor bicycle parking

01

Town Planning Scheme No. 6- Precinct 15 Zoning Map - partial view showing site

MIXED USE ZONE

26 - 28A CHARLES STREET
SOUTH PERTH
WESTERN AUSTRALIA

THE SITE

The subject site is located centrally to the South Perth Station Precinct, within the inner-urban suburb of South Perth. South Perth Station Precinct is envisioned as a hub of activity- the centre for a large range of restaurants, bars, cafes, retail spaces, offices and an array of residential varieties (apartment, terrace and single homes).

Charles Street is near a number of high frequency bus routes with frequent service between Fremantle and Perth City. The subject site is located adjacent from Perth Zoo and has direct access to a number of major arterial roads linking the subject site to the wider metropolitan region. The subject site is located approximately 600 meters south of the Kwinana Freeway interchange. The site is also in close proximity to the proposed south Perth train station.

The subject site is bound by Mixed Use zoning along the length of Charles Street.

The locality is characterised by a significant variety of building character, building height and bulk, including single-storey single houses, and two and three storey dwellings. More recent development approvals consist of mixed use multiple and grouped dwelling developments. It is evident that there are strategic sites in the neighbourhood that are appropriate for multi-residential projects- MJA believe this site (26-28A Charles Street) is a prime opportunity for the amalgamation of lots and for a mixed use development of high quality design and architectural standard.

The local area is characterised by a diverse range of dwelling types, of varying age and quality. It is anticipated that some of the existing buildings (without heritage value), will be redeveloped in the short-medium term future, in accordance with the zoning and policy framework applicable to the locality. There are a number of higher density proposals currently under construction within the local area.

The proposed development aims to honour the site's prime location by providing a model for mixed-use projects that is appropriate now and relevant for the future within the Scott-Richardson Sub-Precinct.

04

Street Scape view from adjacent property

02

Aerial View of site location

03

Street Scape view from adjacent property

MJA

LEGISLATION AND PLANNING FRAMEWORK

05

The proposed development has been subject to preliminary assessment against the following State and Local Planning Policies;

- City of South Perth - Town Planning Scheme No. 6.
- State Planning Policy 3.1 - Residential Design Codes
- All other relevant local planning policies

Clause 3.1 in Schedule 9 of the TPS states that .... *there is no maximum plot ratio within the precinct.*
Clause 3.4 in Schedule 9 of the TPS states that .... *where the total plot ratio exceeds 3.0, the residential plot ratio is not to exceed 1.5*

Therefore, the City's Special Control Area prescribes a maximum residential plot ratio of 1.5 with no maximum commercial plot ratio.
This application proposes a residential component with a plot ratio of 1.5 and a commercial plot ratio of 1.86.

Street Scape view looking east - Night time lantern effect

26 - 28A CHARLES STREET
SOUTH PERTH
WESTERN AUSTRALIA

Scale

Building Height

City of South Perth - Town Planning Scheme No. 6.
Schedule 9 - Special Control Area SCA1 - South Perth Station Precinct - Plan 3 Building Heights
The maximum height of any development within the Scott-Richardson sub-precinct and not part of the special design area is 25 meters (measured to the finished floor level of the upper-most storey).

The proposed development has a podium height of 10.55 meters (3 floors) with an additional 6 floors above. The proposal has a total of 9 storeys with the finished floor level of the upper-most storey at 25 meters.

The buildings facade has been designed to reduce the perception of height through the break up of materials, expansive windows and manipulation of scale. Avoiding a typical 'pancake stack' of Apartments.

Setbacks

The following is referring to Schedule 9 of the Town Planning Scheme No.6, City of South Perth:

- The podium is to be constructed with a nil setback to the street.
- Zero side and rear setbacks will be permitted for the podium/lower levels.
- For storeys above the podium, the minimum setback to the street shall be 4 meters.
- Side and rear setbacks above the podium shall be 3 meters minimum for non-residential and 4 meter minimum for residential in accordance with Table 5 of the Residential Design Codes.
- Where a building abuts the street boundary, a canopy with a minimum projection depth of 2.5 meters shall be provided over the street footpath.

The proposed development has a nil street, side and rear setback for the podium.
At the rear of the development, the non-residential component has a setback of 3 meters.
Above the podium the residential component has a setback of 4 meters along the street and side, whilst at the rear of the property, the residential component is setback 6.5 meters from the boundary.

We believe the proposed approach to height and setbacks create an appropriate varied scale on this site and work to mitigate the effect of overall bulk and responds appropriately to the site context and the future context of the street.

Residential Plot Ratio

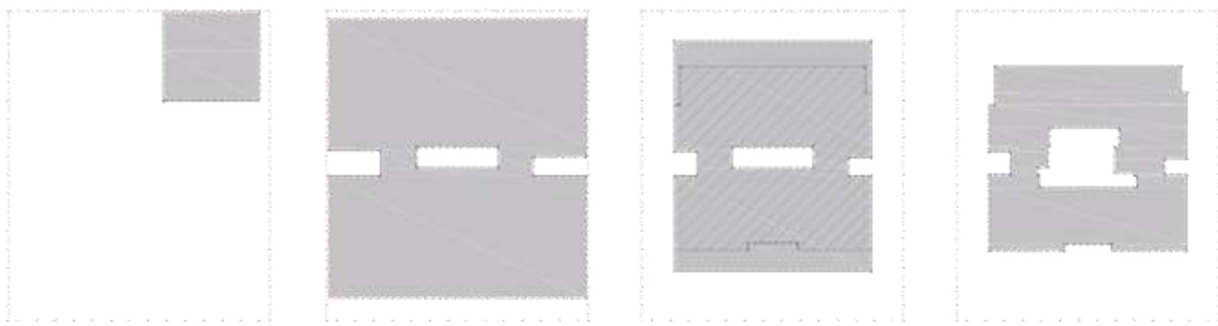
Defined by Statement of Planning Policy No. 3.1: Residential Design Codes, means the ratio of the gross total of the areas of all floors of buildings on a site to the area of land within the site boundaries.

For this purpose, such areas shall include the area of any internal and external walls but not include the areas of lift shafts, stairs or stair landings common to two or more dwellings, machinery, air conditioning and equipment rooms, non-habitable space that is wholly below natural ground level, areas used exclusively for the parking of wheeled vehicles at or below natural ground level, storerooms, lobbies, bin storage areas and passageways to bin storage areas or amenities areas common to more than one dwelling, or balconies or verandahs, courtyards and roof terraces.

As per City of South Perth TPS there is no maximum plot ratio for the subject site. However, the residential component shall not exceed a plot ratio of 1.5

Site area is 1517m², maximum residential plot area	=	2275.5m²	=	1:1.5
TOTAL COMMERCIAL PLOT RATIO AREA	=	2823m²	=	1:1.86
TOTAL RESIDENTIAL PLOT RATIO AREA	=	2275.2m²	=	1:1.5
TOTAL PLOT RATIO	=	5098m²	=	1:3.36

06



GROUND LEVEL- 160m² Commercial Tenancy excl. walls

SECOND LEVEL- 1268m² Commercial Tenancy excl. walls

THIRD LEVEL + FOURTH - 799m² + 596m² Commercial Tenancy excl. walls

TYPICAL APT LEVEL (4 Floors)- 568.8m² per floor = 2275.2m² Residential incl. walls

Diagram per floor showing calculable Plot Ratio areas

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07

AMENITY & PARKING

A high level of amenity will be provided for this residential proposal. The following outlines the qualities contributing to this:

- 4 of the 7 Apartments on each floor plate can be crossvented
- Dedicated and distinct vehicular and pedestrian entries
- Universal lift access to every apartment,
- Secure residential car bay for every apartment (see below for further information),
- Bike storage opportunities for visitors, outside the building and for residents and workers with secure bike rooms with lockers and end of trip facilities,
- North facing outdoor areas and windows where possible to permit winter sun penetration,
- Apartments facing Charles Street will have city and precinct views, the rear will have a opportunity for canning river views
- Recesses and blades on the façade capture breezes and channel any air movement through the apartments,
- Soft landscaping at street level is designed to increase amenity and reduce heat loads near pedestrian entry points,
- Deep covered balconies ensure highly functional outdoor living spaces for residents in all weather,
- Functional layouts to every apartment,
- External storage areas on balconies also conceal AC condensers to maintain visual amenity,
- Public art integrated into the Charles street facade, providing a clear and legible entry point,
- Commercial and Residential balconies provide passive surveillance to Charles St

The proposed development is made up of 28 apartments and 4 commercial tenancies.

1x1, 2x1, 2x2 & 3x2 apartments of different square meterage and solar aspect allows for a range of afford-ability within the development.

The proposed development includes;

93 secure car parking bays over 2 levels with 7 reciprocal visitor bays located at the enterance of the carpark.
Each apartment is to have an exclusive and secure allocated parking space with the 3x2 apartment occupying 2 exclusive bays.
The commercial tenancy is allocated 1 x car bay per 50m² which ads up to 59 bays (total GROSS commercial area is 2973m², which excludes shared residential lobby and carparking).
The visitor bays include 1 disabled bay .

There is also on-street carparking on Charles Street which can provide extra visitor bays.
When the seperate lots are amalgamated, one crossover will be relocated, whilst another removed which can be utalised by the council to provide an extra bay for on-street carparking.

13 secure commercial bicycle spaces.
10 secure residential bicycle spaces.
4 visitor bicycle spaces.

Street Scape view looking East - Public art incorporated into the podium's perforated screen

**26 - 28A CHARLES STREET
SOUTH PERTH
WESTERN AUSTRALIA**

RESOURCE AND ENERGY EFFICIENCY

Sustainable aspects of the proposal are achieved with a holistic approach which starts at first principle level of schematic design and then integrates technology to meet sustainability aspirations.

- 4 of the 7 Apartments on a floor-plate can be crossvented and get north light into south facing Apartments
- North facing outdoor areas and windows wherever possible to allow winter solar penetration.
- Contemporary lightweight pergola structure to 3rd floor terrace to maximise solar penetration in winter.
- Waterwise planting will be used where appropriate
- Motion and lux sensors combined with 3 minute timers to carpark & communal areas
- Addition of northern facing windows and skylights wherever possible to allow winter solar penetration
- Louvres and ventilation where possible
- Use of high efficiency rated hydraulic fixtures

Safety & Security

An optimum level of security is provided for the residential development and achieved through:

- Well defined and secure pedestrian entry points
- Well defined and secure vehicular entry points
- Extensive passive surveillance from balconies and terraces to Charles street frontage
- Appropriate lighting along circulation paths
- Secure, well lit under-croft parking
- Careful consideration of window placements and balcony semi-enclosure to ensure resident privacy

08

A dynamic street activation through the use of timber screens and landscaping

09

Street view of awning and public art

Street view of awning and public art

MJA studio

PUBLIC ART & AWNING

The City of South Perth- Planning Policy 316;

Under the planning policy stated above the council requires any development valued over $4 million to contribute towards public art.

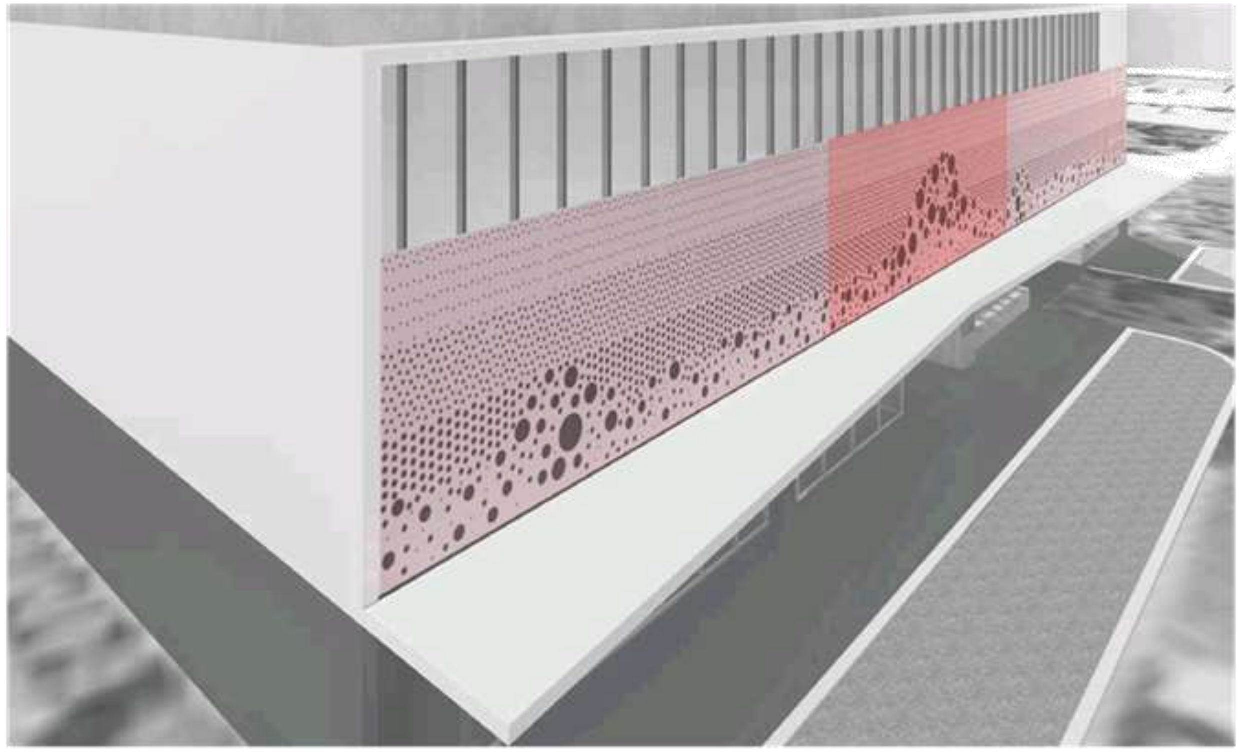
It is proposed that the public art will be integrated into the perforated aluminium screen fronting Charles Street. MJA will seek to work with a local art consultan t and artist to create a unique design. This proposal includes some conceptual imagery of the screen which is only indicative for locational purposes. The screen will be developed once an artist has been chosen. The inclusion of the public art screen will engage pedestrians, provide a local way-finding and place an emphasis on the entry point of the proposed development.

Image 10 is a diagram displaying the proposed screen and how it clearly defines the entrance of the development by acting as a focal point.

The designed awning illustrated in Images 09 & 11 works seamlessly in conjunction with the art screen. The tapered awning provides a clear indication to the building's entrance, while also allowing an unobstructed view of the art screen from the adjacent footpath.

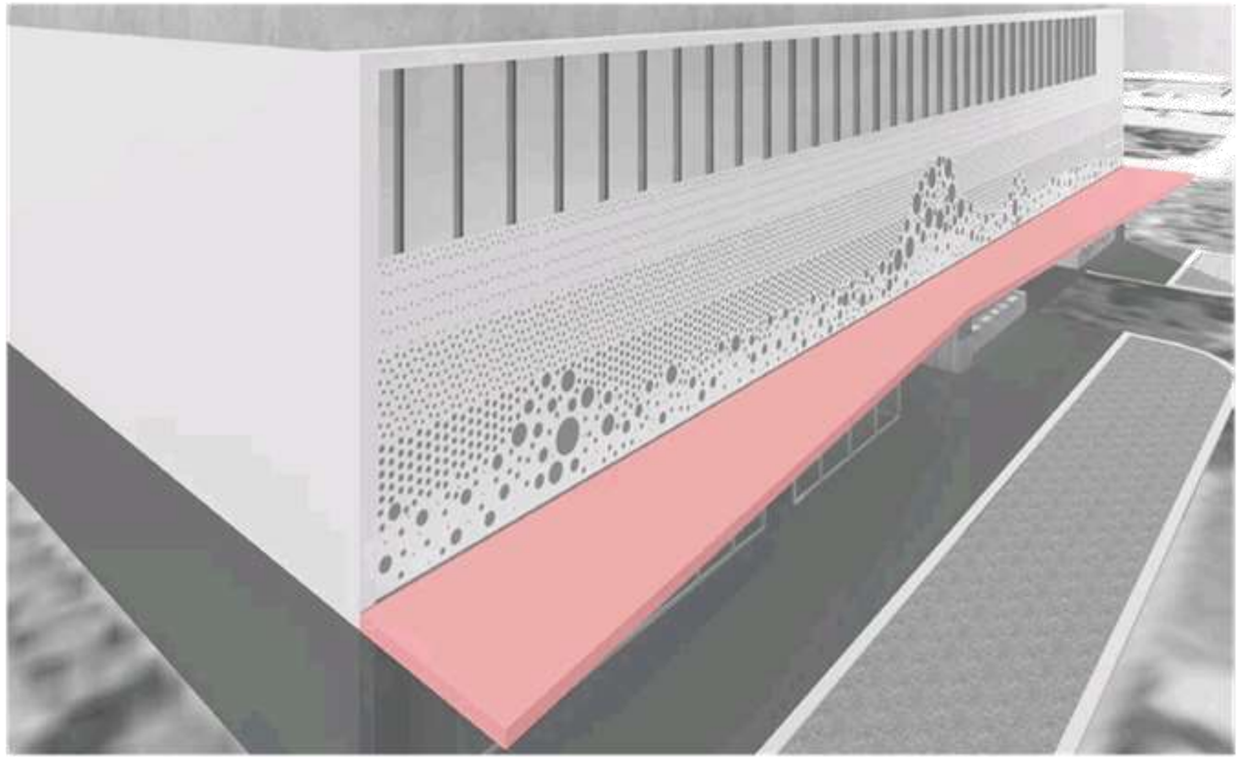
We believe that incorporating a public art element into the facade will create a positive and engaging environment whilst also providing a dynamic and interesting inclusion to the streetscape. The screen will also have a different character from day to night. At night it becomes backlit giving it the perception of a lantern and a focal point of the street.
This vibrant public art screen will be an efficacious statement to Charles Street and the developing South Perth Station Precinct.

10



Perforated aluminium screen - public art place holder

11



Tapered awning towards entry of development

26 - 28A CHARLES STREET
SOUTH PERTH
WESTERN AUSTRALIA

CONCLUSION- ITEMS THAT REQUIRE DISCRETION
AREAS OF NON- COMPLIANCE AND OUR JUSTIFICATION

The City of South Perth- Town Planning Scheme No. 6 Section 6.6.3;

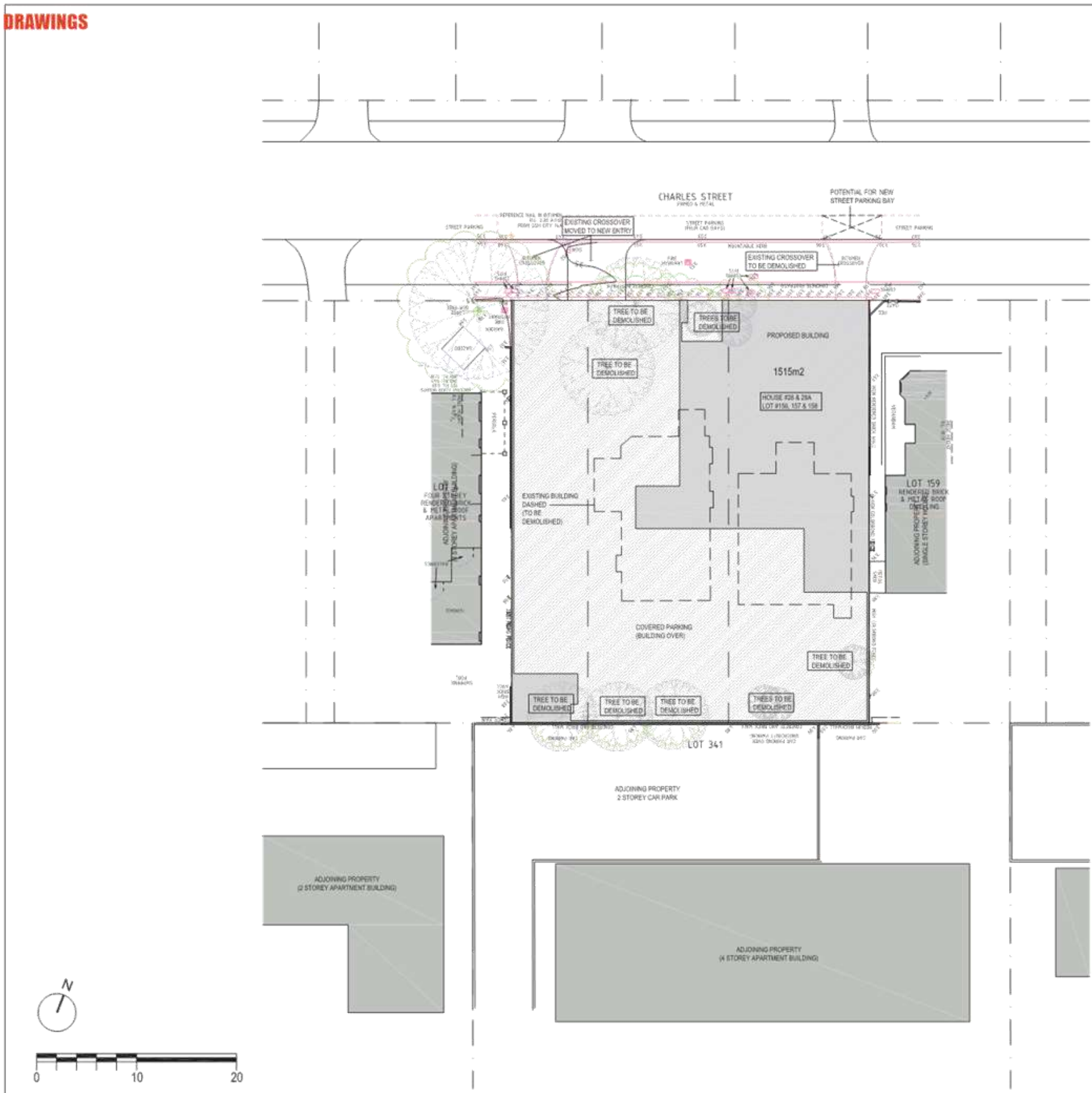
....minimum of 60% clear glass with a maximum sill height of 450mm above the floor level, and no obscure screening is permitted higher than 1.2 metres above the ground floor level;

Justification:

We wish to present a varied and tactile amenity to the ground level fronting Charles street.
The integrated landscaping and timber batten screens allow for a dynamic street activation and ensures there is no negative visual impact from Charles street. The screens and landscaping ensure that there are no blank walls facing Charles street.
The timber batten screens are visually permeable to allow for passive security into the visitor carpark. This in turn will also allow visitors a clear visual indication to the location and ease of access to the visitor parking.
The parking is also located close to the main entry allowing a lesser travel distance for visitor parking which includes a disabled access.

Street elevation from adjacent property

DRAWINGS



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NO.	DATE:	AMENDMENT:	
A.	21.09.15	DAC REPORT	A.
B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	24.11.15	COMMERCIAL LIFT ADDED	D.
E.	12.02.16	PARKING & PLOT RATIO REVISED	E.

NEW SCHEME

SITE AREA 1515m²

PLOT RATIO
COMMERCIAL = NO LIMIT
RESIDENTIAL = 1.5
28 APARTMENTS

	COMM	PR RESI	STRATA
G	160		
1			
2	1268		
3	799		
4	596		
5		568.8	525
6		568.8	525
7		568.8	525
8		568.8	525
	2823	2275.2	2100

COMMERCIAL PLOT RATIO 1.86
RESIDENTIAL PLOT RATIO 1.50
TOTAL PLOT RATIO 3.36

28 Apartments

	A	B	C	D	E	
	3 BED x 2 BATH	2 BED x 2 BATH	2 BED x 2 BATH	2 BED x 1 BATH	1 BED + 1 BATH	TOTAL
	121	86	89	65	50	
G						
1						
2						
3						
4						
5	1	1	1	2	2	7
6	1	1	1	2	2	7
7	1	1	1	2	2	7
8	1	1	1	2	2	7
TOTAL	4	4	4	8	8	28
	484	344	356	520	400	2100

RESIDENTIAL	
REQUIRED RESIDENTIAL CAR BAYS	32
PROVIDED RESIDENTIAL CAR BAYS	34
REQUIRED VISITOR CAR BAYS	4.5
PROVIDED VISITOR CAR BAYS	5
REQUIRED RESIDENTIAL BIKE BAYS	9.3
PROVIDED RESIDENTIAL BIKE BAYS	10

TOTAL RESIDENTIAL CAR BAYS 34
TOTAL RESIDENTIAL BIKE BAYS 10
REQUIRED VISITOR BIKES 2.8

COMMERCIAL	
REQUIRED COMMERCIAL CAR BAYS	59
PROVIDED COMMERCIAL CAR BAYS	60
REQUIRED VISITOR CAR BAYS	5.9
PROVIDED VISITOR CAR BAYS	7
REQUIRED COMMERCIAL BIKE BAYS	13
PROVIDED COMMERCIAL BIKE BAYS	13

TOTAL COMMERCIAL CAR BAYS 60
TOTAL COMMERCIAL BIKE BAYS 11

TOTAL CAR BAYS REQUIRED 93
TOTAL CAR BAYS PROVIDED 94
TOTAL VISITOR BAYS 7
(RECIPROCAL VISITORS)

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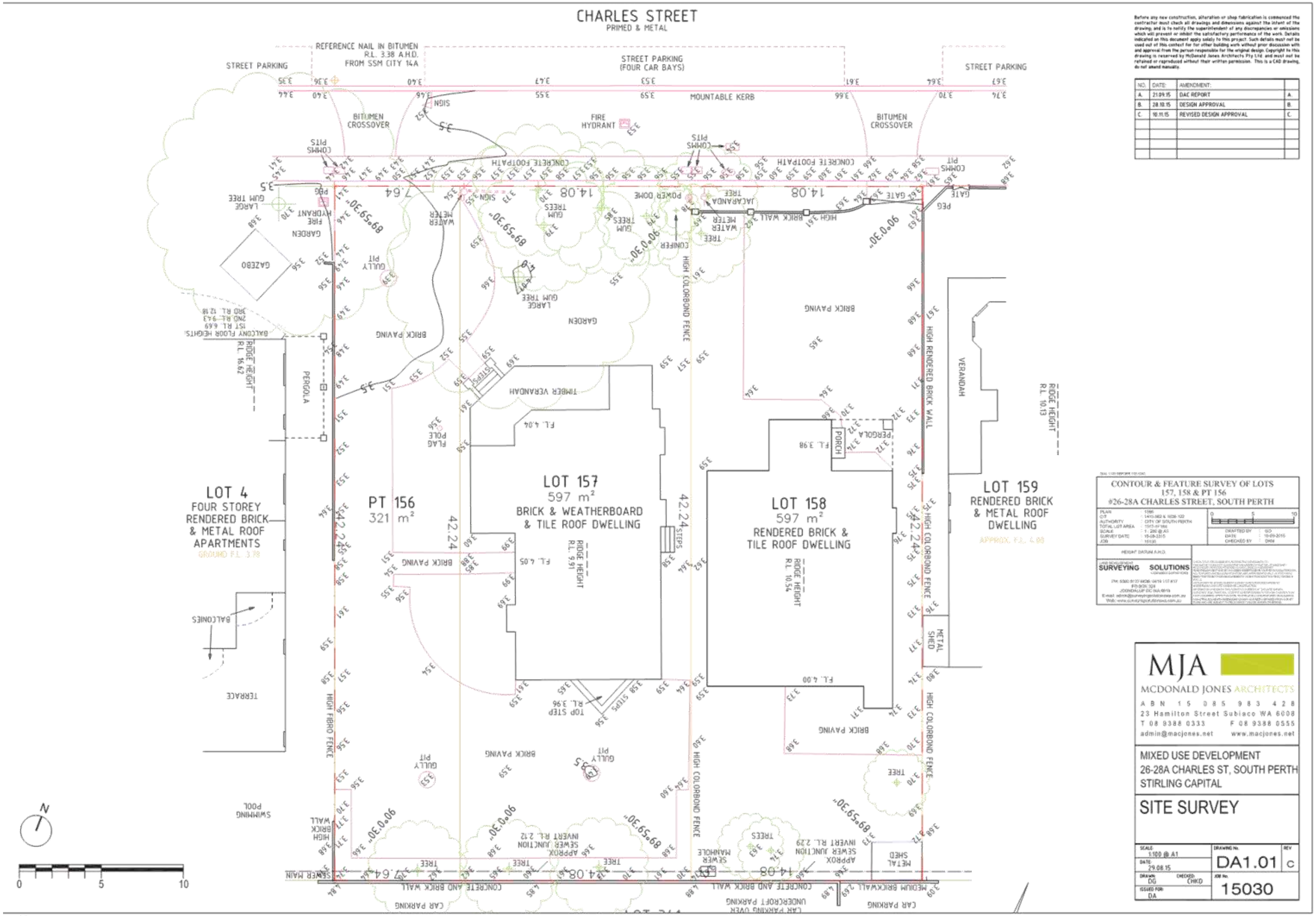
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

SITE PLAN

SCALE: 1:200 @ A1	DRAWING No. DA1.00	REV E
DATE: 29.08.15		
DRAWN: DG	CHECKED: CHKD	JOB No. 15030
ISSUED FOR: DA		


CHARLES STREET
PRIMED & METAL
REFERENCE NAIL IN BITUMEN R.L. 3.38 A.H.D. FROM SSM CITY 14A
STREET PARKING
STREET PARKING (FOUR CAR BAYS)
STREET PARKING
MOUNTABLE KERB
BITUMEN CROSSOVER
FIRE HYDRANT
BITUMEN CROSSOVER
LOT 4
FOUR STOREY RENDERED BRICK & METAL ROOF APARTMENTS
GROUND F.L. 3.78
PT 156
321 m²
LOT 157
597 m²
BRICK & WEATHERBOARD & TILE ROOF DWELLING
LOT 158
597 m²
RENDERED BRICK & TILE ROOF DWELLING
LOT 159
RENDERED BRICK & METAL ROOF DWELLING
APPROX. F.L. 4.00
HIGH COLORBOND FENCE
HIGH RENDERED BRICK WALL
HIGH FIBRO FENCE
VERANDAH
RIDGE HEIGHT R.L. 10.13
METAL SHED
PERGOLA
TERRACE
SWIMMING POOL
N
0 5 10
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NO. DATE: AMENDMENT:
A. 21.09.15 DAC REPORT A.
B. 28.10.15 DESIGN APPROVAL B.
C. 10.11.15 REVISED DESIGN APPROVAL C.
CONTOUR & FEATURE SURVEY OF LOTS 157, 158 & PT 156
#26-28A CHARLES STREET, SOUTH PERTH
SURVEYING SOLUTIONS
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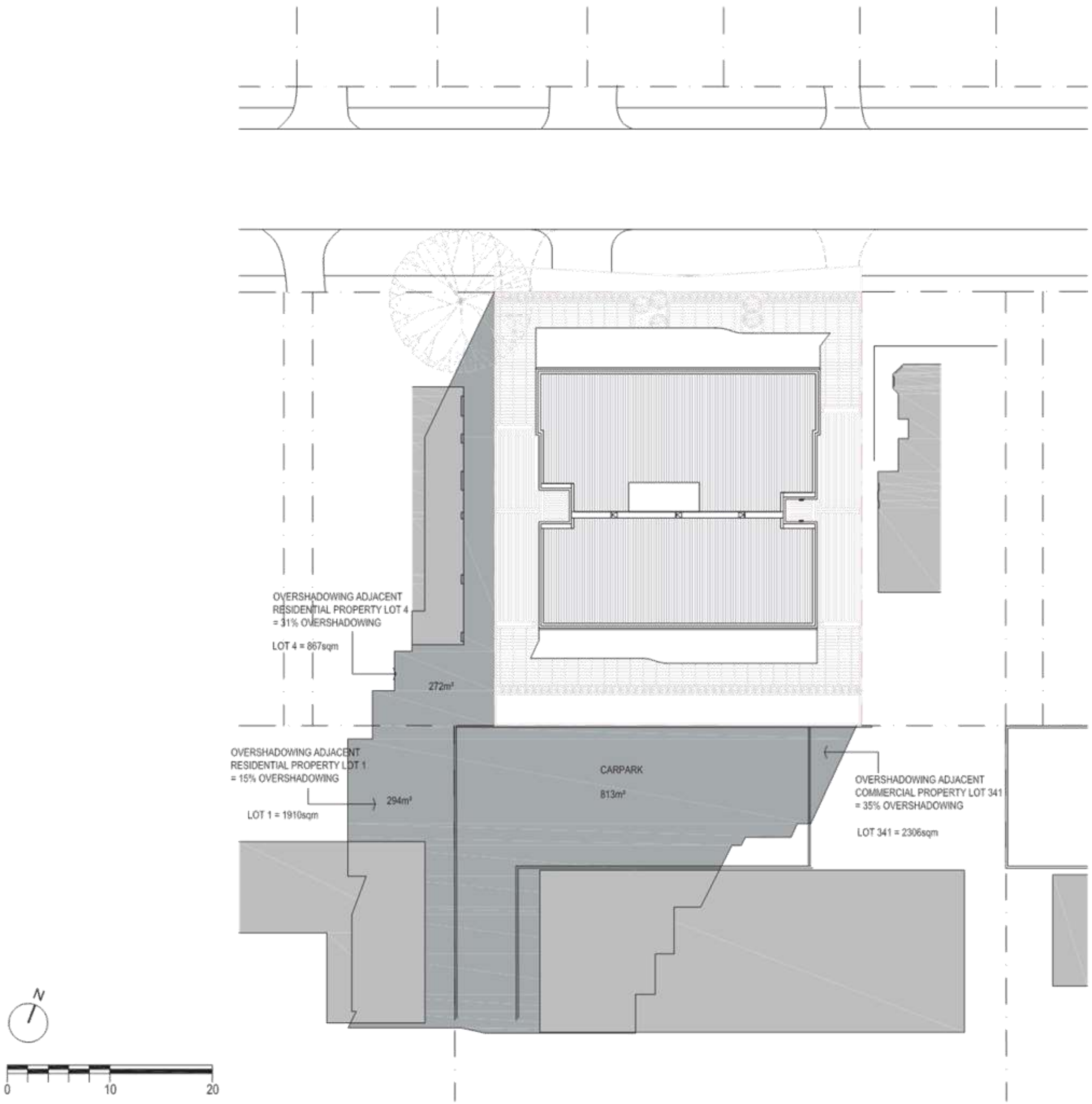
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
SITE SURVEY
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG
CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.01
REV C
JOB No. 15030



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C.	10.11.15	REVISED DESIGN APPROVAL	C.

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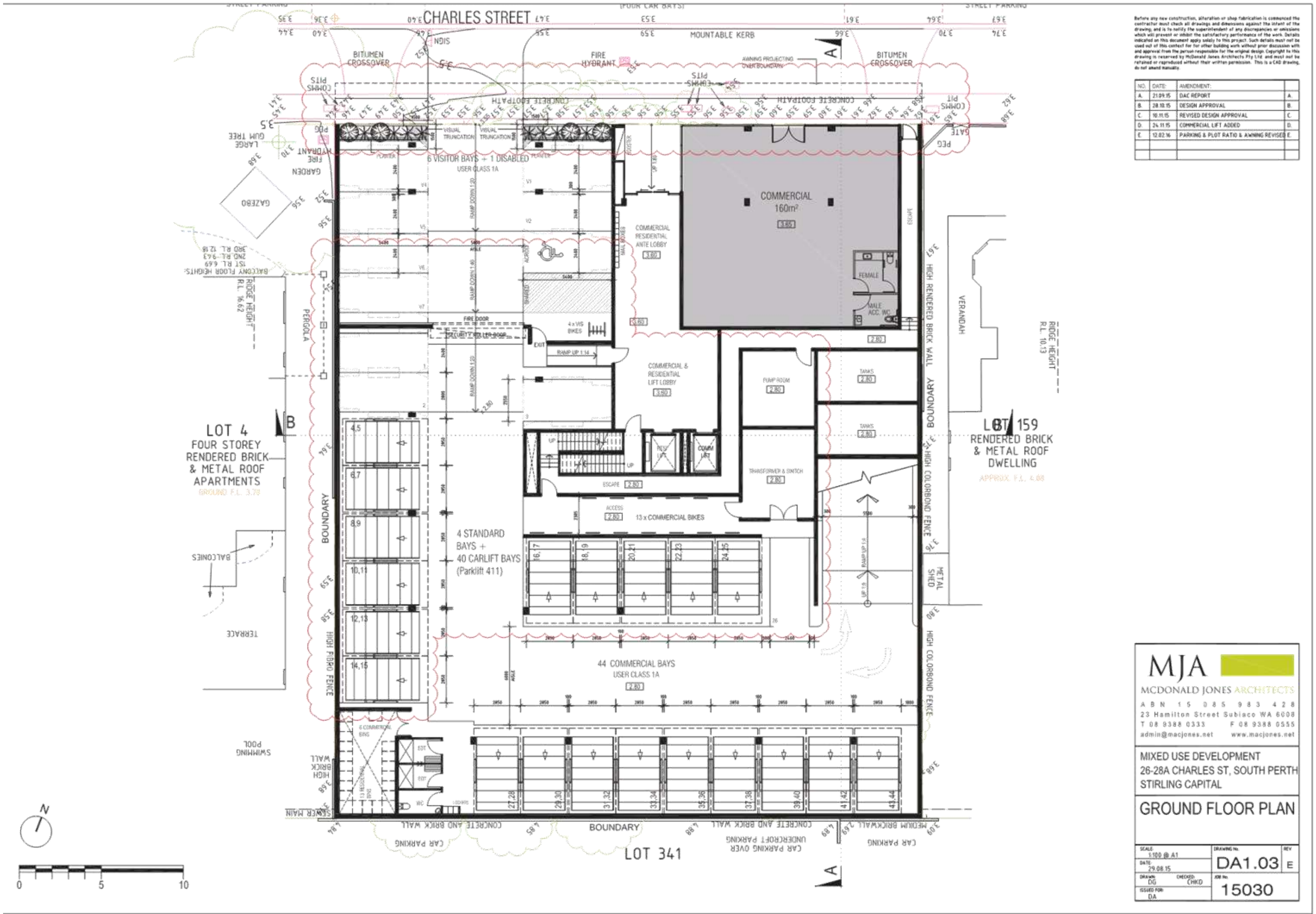
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

OVERSHADOWING DIAGRAM

SCALE: 1:200 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.02
REV C
JOB No. 15030


CHARLES STREET
MOUNTABLE KERB
BITUMEN CROSSOVER
FIRE HYDRANT
BITUMEN CROSSOVER
CONCRETE FOOTPATH
6 VISITOR BAYS + 1 DISABLED
USER CLASS 1A
COMMERCIAL
160m²
COMMERCIAL RESIDENTIAL ANTE LOBBY
FEMALE
MALE ACC. WC
COMMERCIAL & RESIDENTIAL LIFT LOBBY
PUMP ROOM
TANKS
TRANSFORMER & SWITCH
ESCAPE
ACCESS
13 x COMMERCIAL BIKES
4 STANDARD BAYS + 40 CARLIFT BAYS (Parklift 411)
44 COMMERCIAL BAYS
USER CLASS 1A
LOT 4
FOUR STOREY RENDERED BRICK & METAL ROOF APARTMENTS
BOUNDARY
HIGH FIBRO FENCE
PERGOLA
TERRACE
BALCONIES
LOT 159
RENDERED BRICK & METAL ROOF DWELLING
HIGH RENDERED BRICK WALL
HIGH COLORBOND FENCE
VERANDAH
METAL SHED
LOT 341
BOUNDARY
CONCRETE AND BRICK WALL
CAR PARKING
MEDIUM BRICKWALL
0 5 10
NO. DATE: AMENDMENT:
A. 21.09.15 DAC REPORT
B. 28.10.15 DESIGN APPROVAL
C. 10.11.15 REVISED DESIGN APPROVAL
D. 24.11.15 COMMERCIAL LIFT ADDED
E. 12.02.16 PARKING & PLOT RATIO & AWNING REVISED
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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
GROUND FLOOR PLAN
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG
CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.03
REV E
JOB No. 15030

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B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	24.11.15	COMMERCIAL LIFT ADDED	D.
E.	12.02.16	PARKING & PLOT RATIO & AWNING REVISED	E.

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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

FIRST FLOOR PLAN
CARPARK

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.04
REV E
JOB No. 15030

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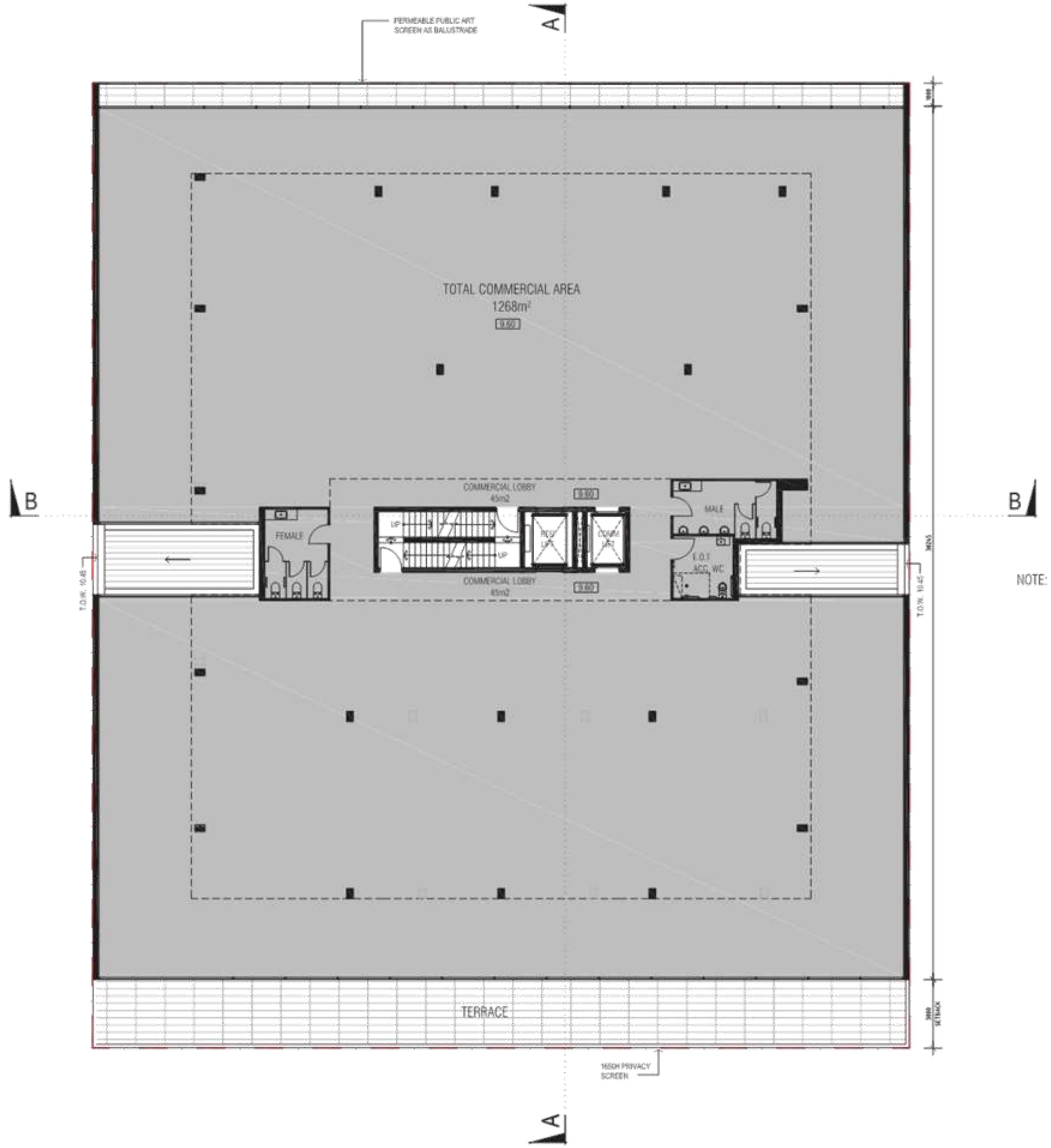
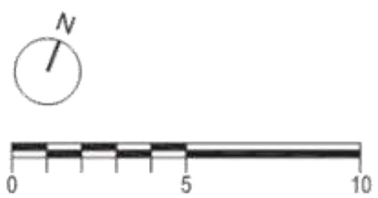
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	24.11.15	COMMERCIAL LIFT ADDED	D.



NOTE: TOILET CALCULATIONS BASED UPON 120 PERSON FLOOR OCCUPANCY

60 MALE 2 PANS, 3 URINALS & 1 HAND BASIN
60 FEMALE 3 PANS & 1 HAND BASIN
1 UNISEX DISABLED EOT & WC (1 PAN, 1 BASIN & 1 SHWR)



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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

SECOND FLOOR PLAN
COMMERCIAL

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.05 REV D
JOB No. 15030

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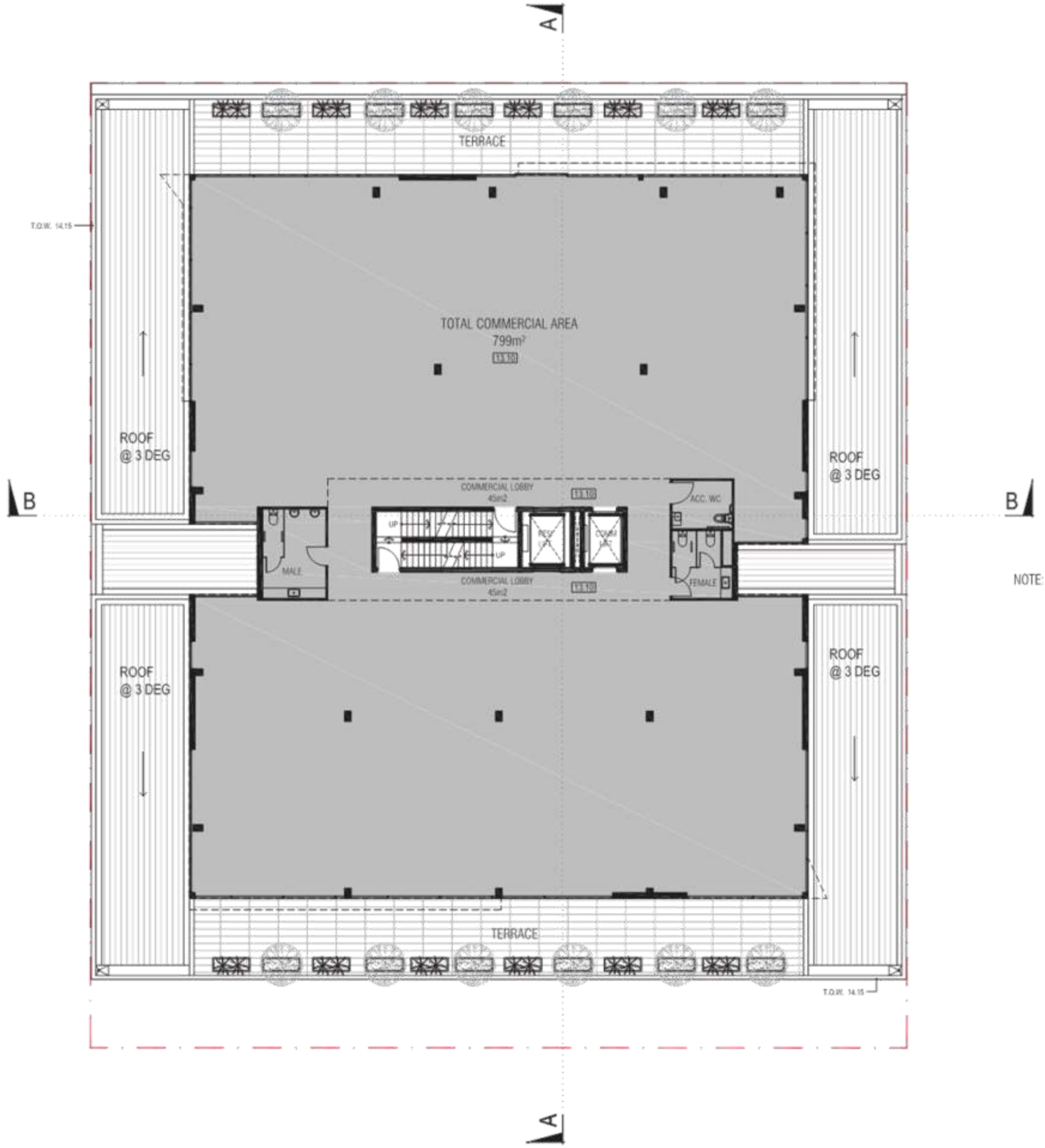
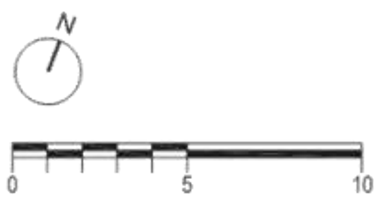
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	24.11.15	COMMERCIAL LIFT ADDED	D.



NOTE: TOILET CALCULATIONS BASED UPON 74 PERSON FLOOR OCCUPANCY

37 MALE 1 PAN, 2 URINALS & 1 HAND BASIN
37 FEMALE 2 PAN & 1 HAND BASIN
1 UNISEX DISABLED WC (1 PAN & 1 BASIN)



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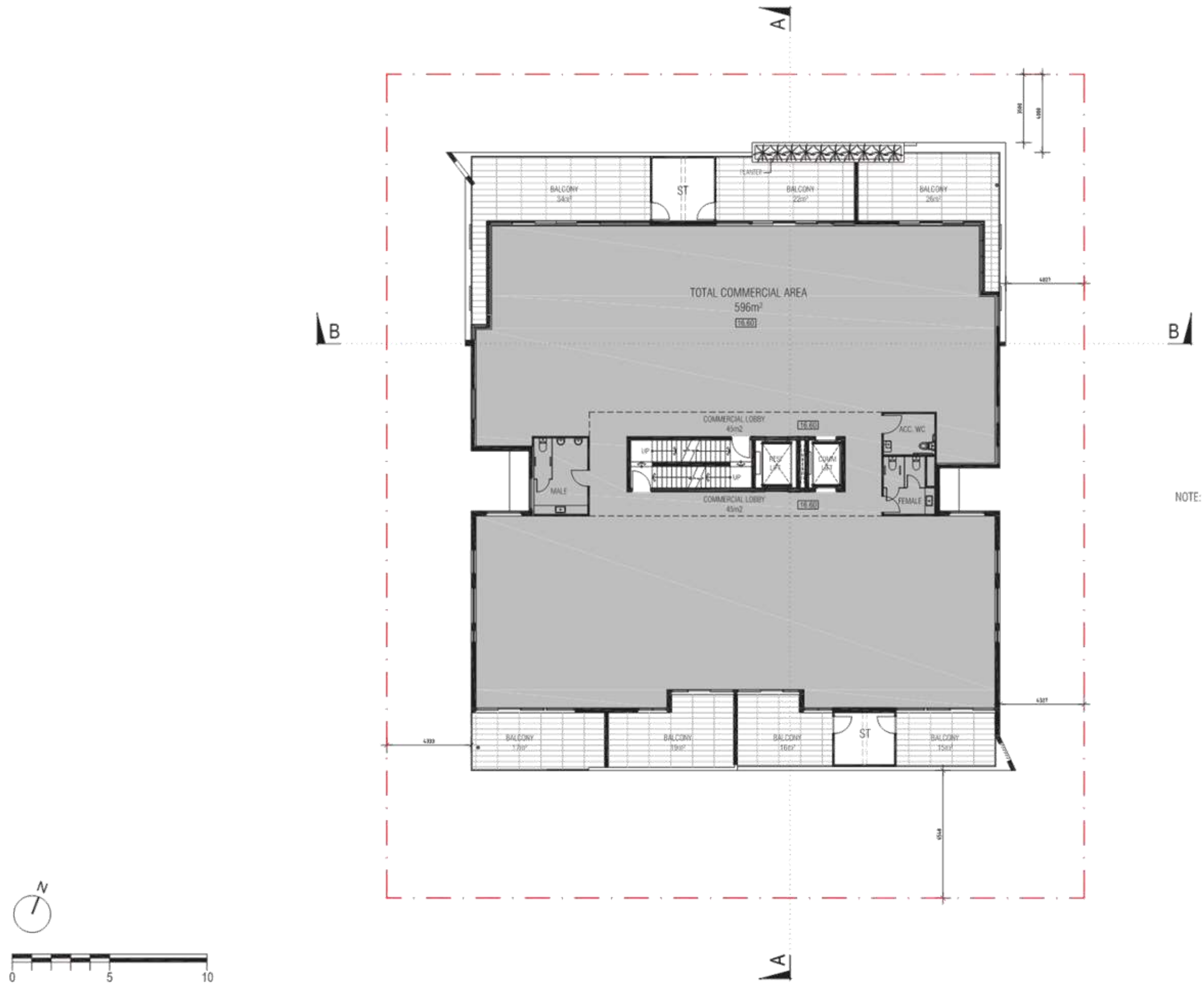
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

THIRD FLOOR PLAN
COMMERCIAL

SCALE: 1:100 @ A1	DRAWING No. DA1.06	REV D
DATE: 29.08.15		
DRAWN: DG CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: DA		



NOTE: TOILET CALCULATIONS BASED UPON 54 PERSON FLOOR OCCUPANCY

24 MALE 1 PAN, 2 URINALS & 1 HAND BASIN
24 FEMALE 2 PAN & 1 HAND BASIN
1 UNISEX DISABLED WC (1 PAN & 1 BASIN)

NO.	DATE:	AMENDMENT:	
A.	21.09.15	DAC REPORT	A.
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C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	24.11.15	COMMERCIAL LIFT ADDED	D.

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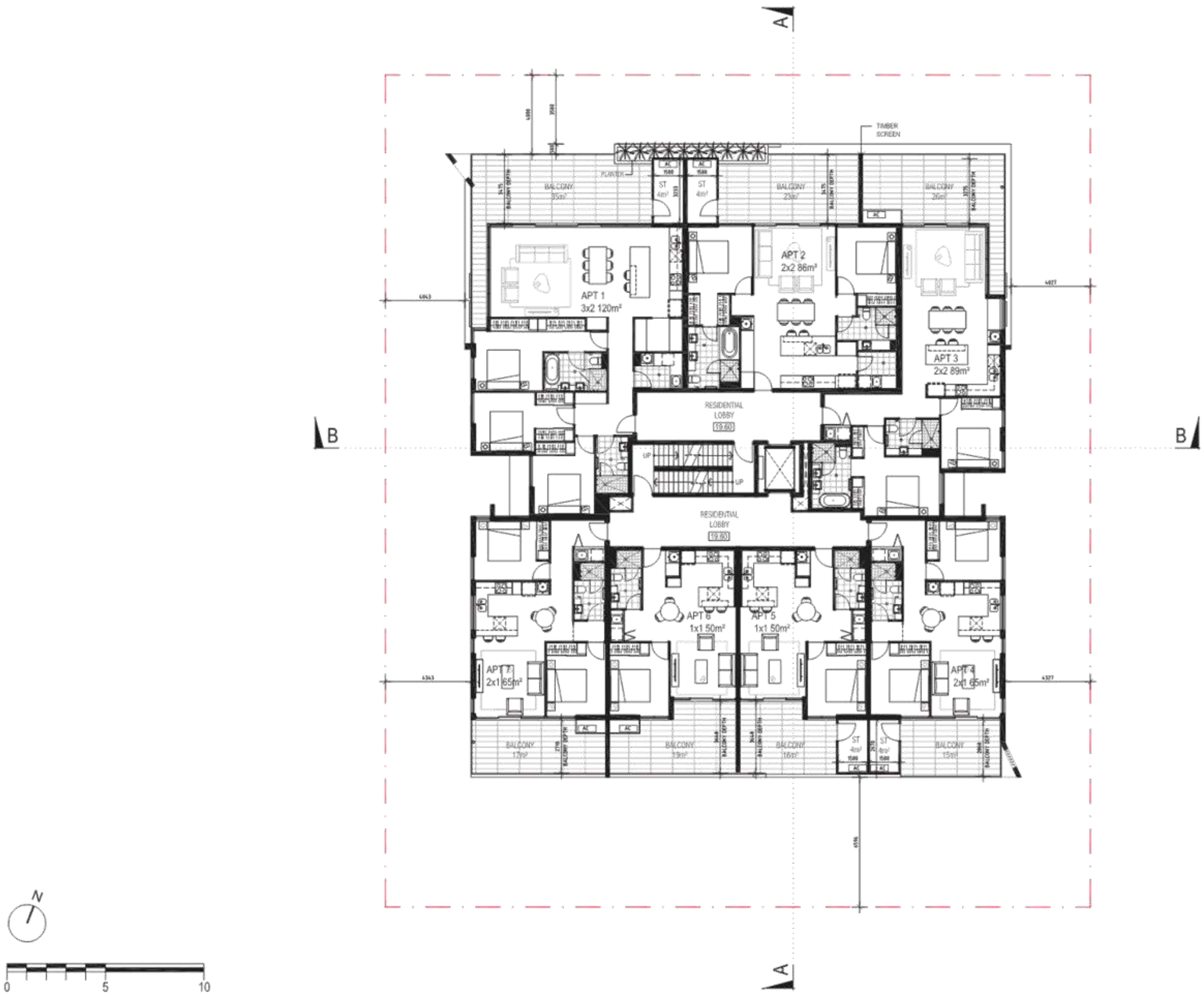
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

FOURTH FLOOR PLAN
COMMERCIAL

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.07 REV D
JOB No. 15030



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B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	02.12.15	WINDOWS ADDED TO WEST BED / LIVING	D.

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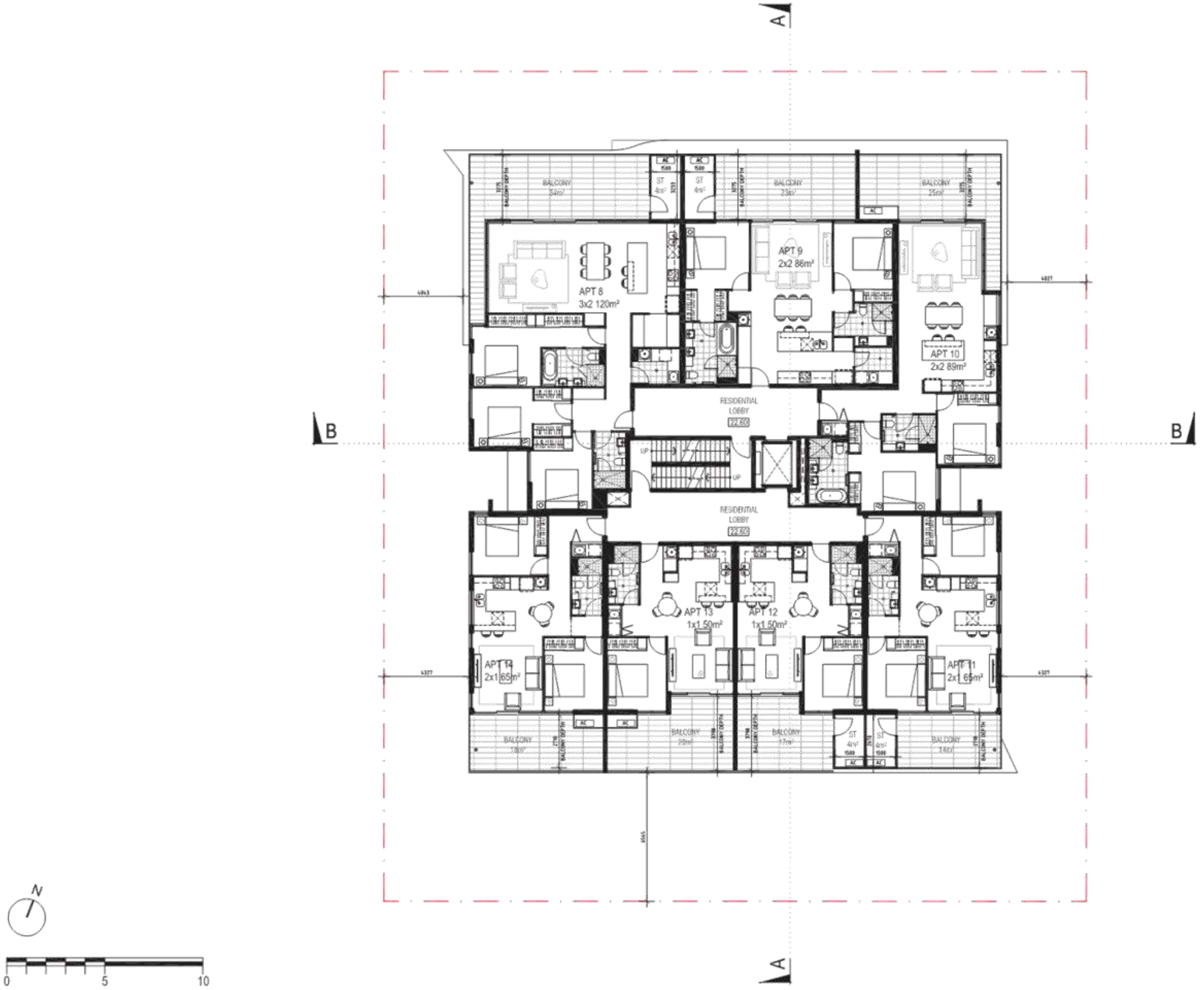
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

FIFTH FLOOR PLAN RESIDENTIAL

SCALE: 1:100 @ A1	DRAWING No. DA1.08	REV D
DATE: 29.08.15		
DRAWN: DG CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: DA		



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A.	21.09.15	DAC REPORT	A.
B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	02.12.15	WINDOWS ADDED TO WEST BED / LIVING	D.

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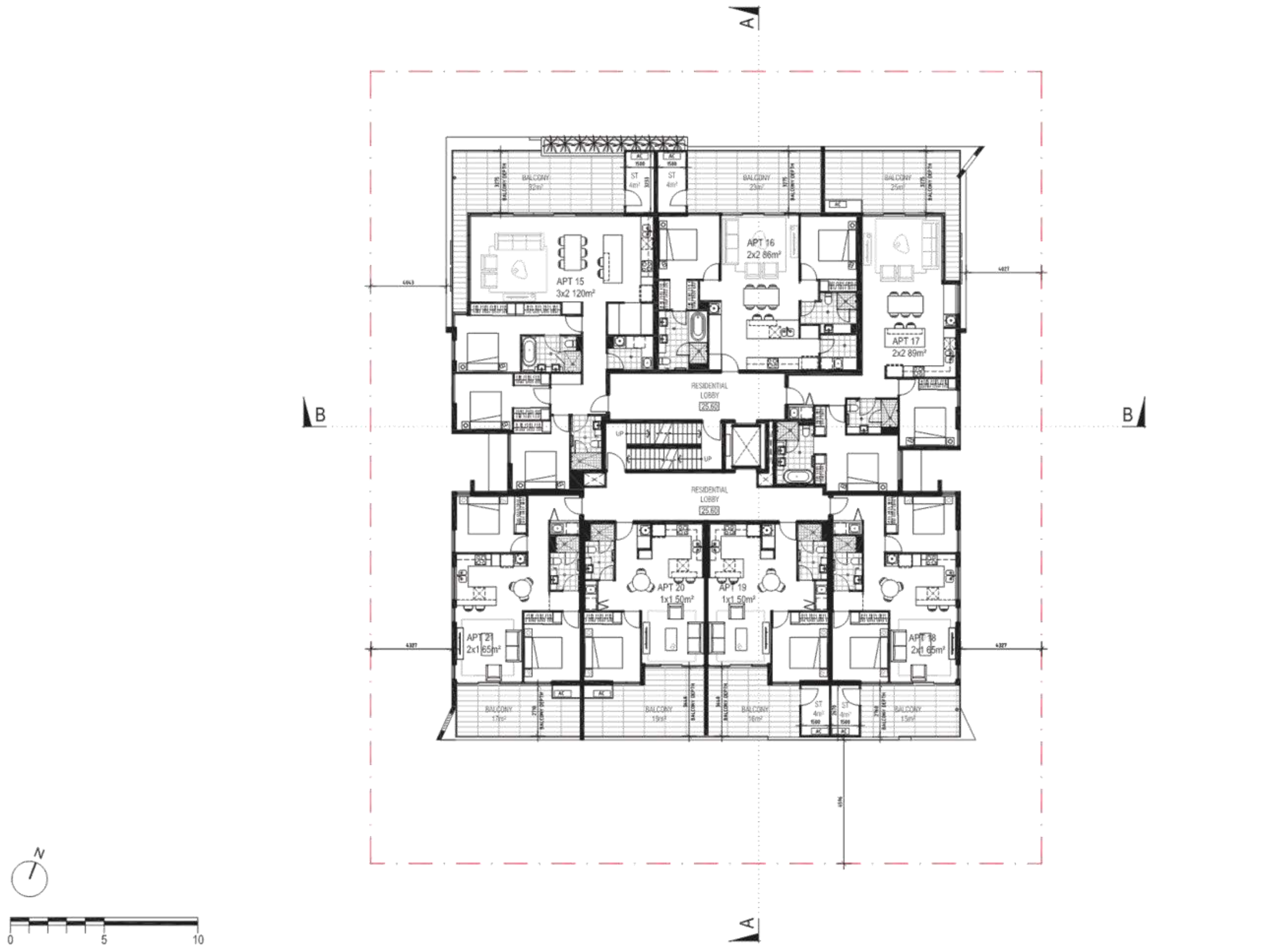
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

SIXTH FLOOR PLAN RESIDENTIAL

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.09 REV D
JOB No. 15030



NO.	DATE:	AMENDMENT:	
A.	21.09.15	DAC REPORT	A.
B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	02.12.15	WINDOWS ADDED TO WEST BED / LIVING	D.

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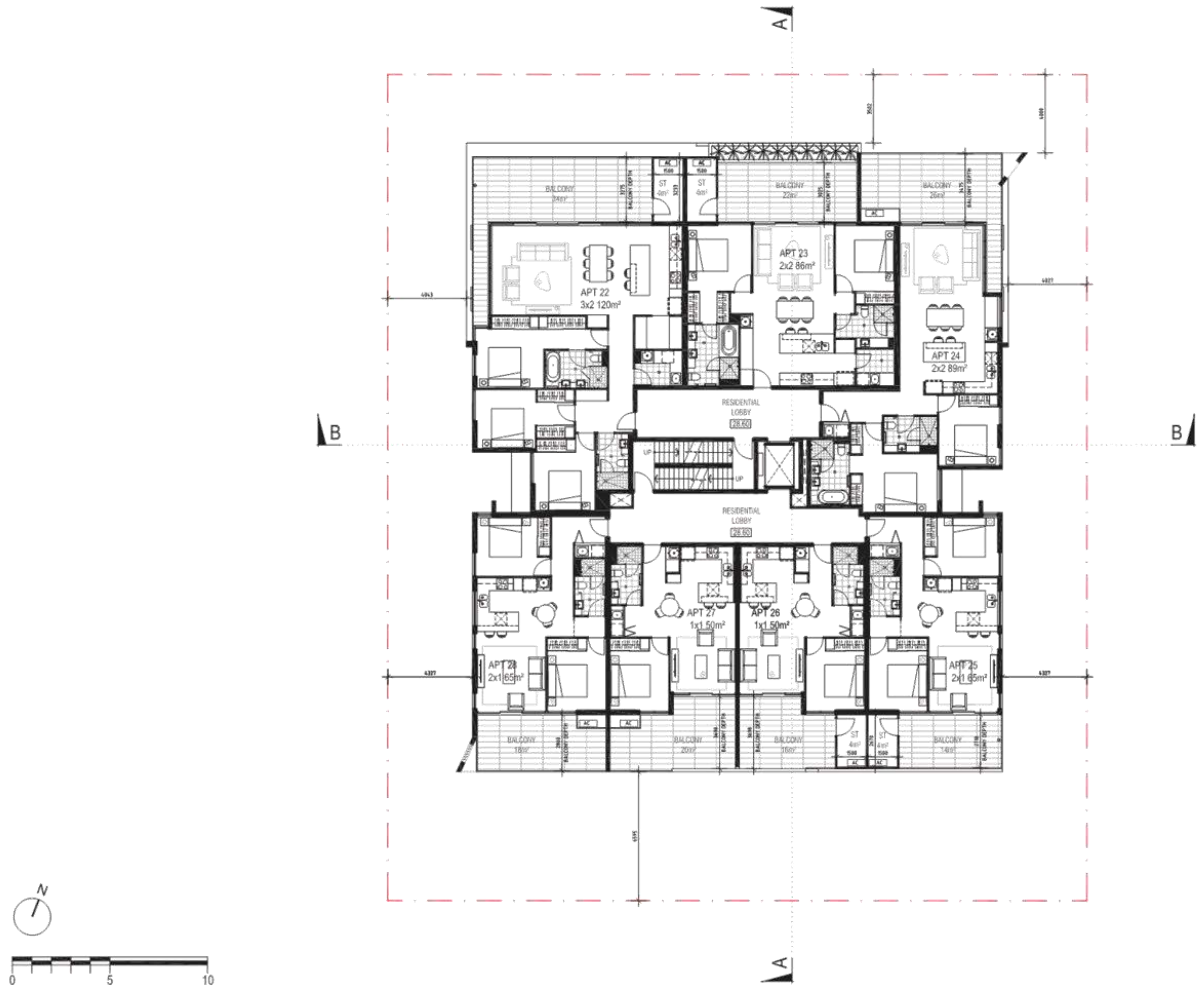
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

SEVENTH FLOOR PLAN RESIDENTIAL

SCALE: 1:100 @ A1	DRAWING No. DA1.10	REV D
DATE: 29.08.15		
DRAWN: DG CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: DA		



NO.	DATE:	AMENDMENT:	
A.	21.09.15	DAC REPORT	A.
B.	28.10.15	DESIGN APPROVAL	B.
C.	10.11.15	REVISED DESIGN APPROVAL	C.
D.	02.12.15	WINDOWS ADDED TO WEST BED / LIVING	D.

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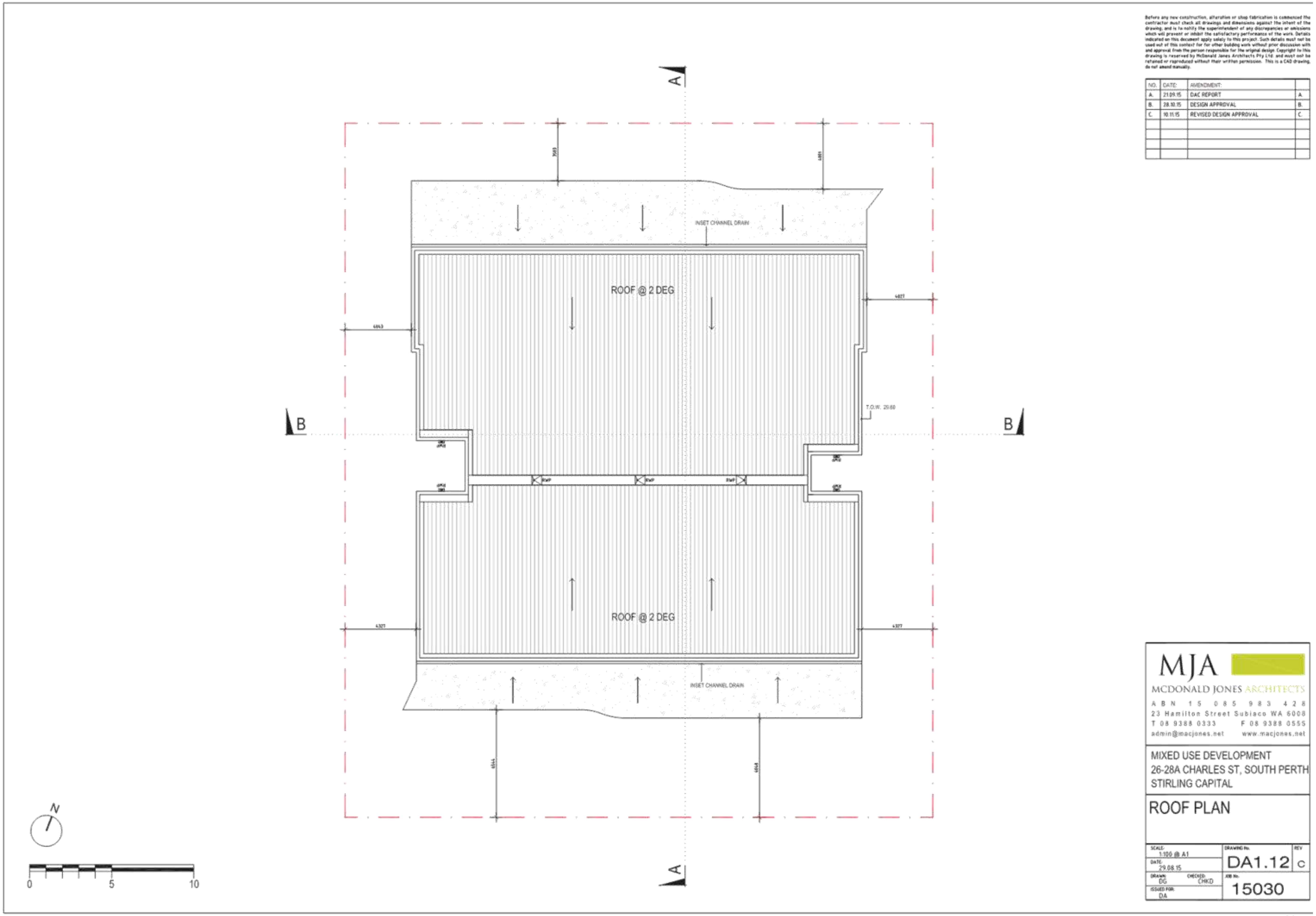
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

EIGHTH FLOOR PLAN RESIDENTIAL

SCALE: 1:100 @ A1	DRAWING No. DA1.11	REV D
DATE: 29.08.15		
DRAWN: DG CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: DA		


A
B
B
A
INSET CHANNEL DRAIN
ROOF @ 2 DEG
T.O.W. 25.60
RWP
ROOF @ 2 DEG
INSET CHANNEL DRAIN
N
0
5
10
Before any new construction, alteration or shop fabrication is commenced the contractor must check all drawings and dimensions against the intent of the drawing, and is to notify the superintendent of any discrepancies or omissions which will prevent or inhibit the satisfactory performance of the work. Details indicated on this document apply solely to this project. Such details must not be used out of this context for for other building work without prior discussion with and approval from the person responsible for the original design. Copyright to this drawing is reserved by McDonald Jones Architects Pty Ltd. and must not be retained or reproduced without their written permission. This is a CAD drawing, do not amend manually.
NO. DATE: AMENDMENT:
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B. 28.10.15 DESIGN APPROVAL B.
C. 10.11.15 REVISED DESIGN APPROVAL C.
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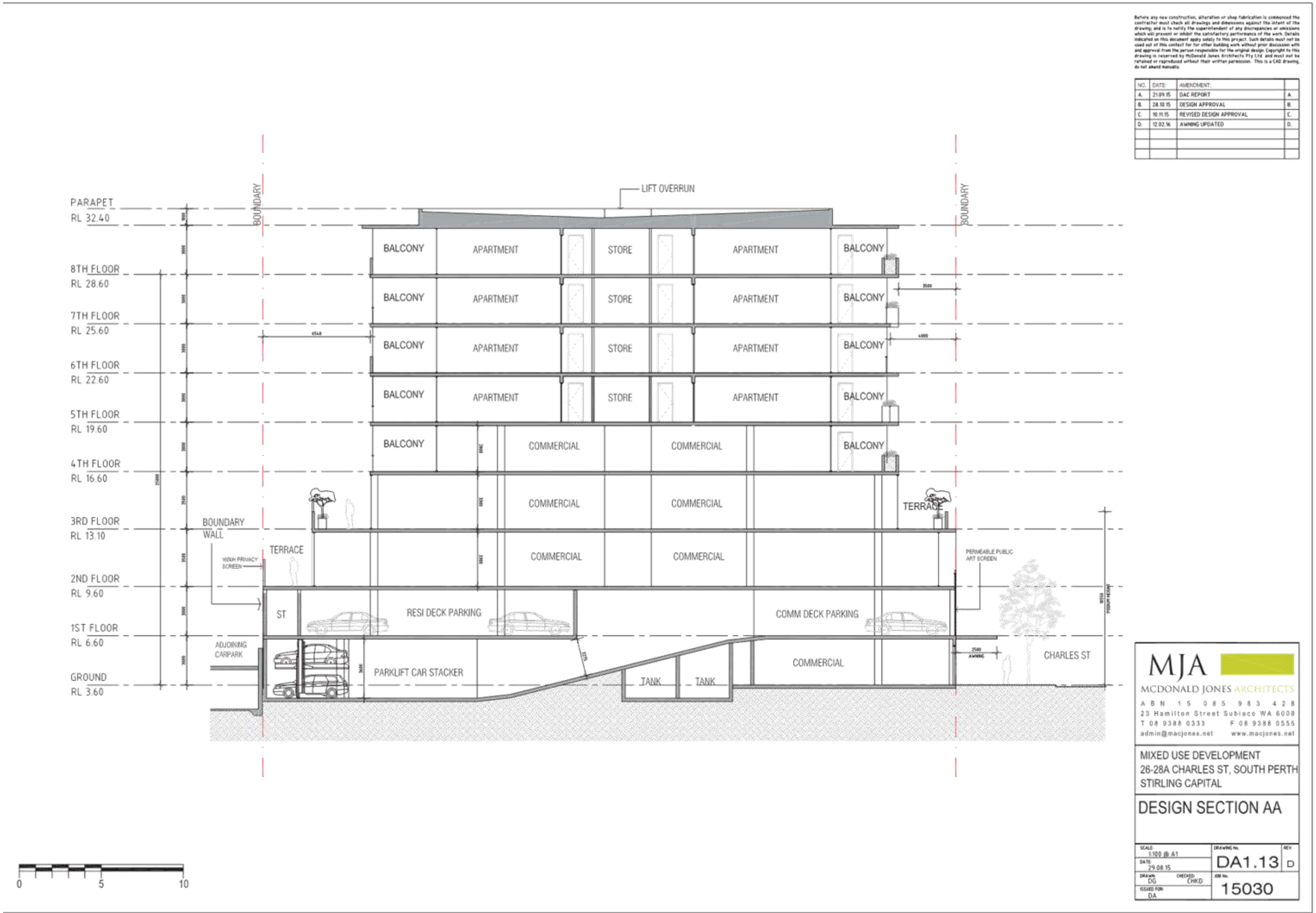
admin@macjones.net www.macjones.net
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
ROOF PLAN
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG
CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.12
REV C
JOB No. 15030


PARAPET
RL 32.40
8TH FLOOR
RL 28.60
7TH FLOOR
RL 25.60
6TH FLOOR
RL 22.60
5TH FLOOR
RL 19.60
4TH FLOOR
RL 16.60
3RD FLOOR
RL 13.10
2ND FLOOR
RL 9.60
1ST FLOOR
RL 6.60
GROUND
RL 3.60
BOUNDARY
LIFT OVERRUN
BALCONY
APARTMENT
STORE
COMMERCIAL
TERRACE
BOUNDARY WALL
ST
RESI DECK PARKING
COMM DECK PARKING
ADJOINING CARPARK
PARKLIFT CAR STACKER
TANK
CHARLES ST
PERMEABLE PUBLIC ART SCREEN
0
5
10
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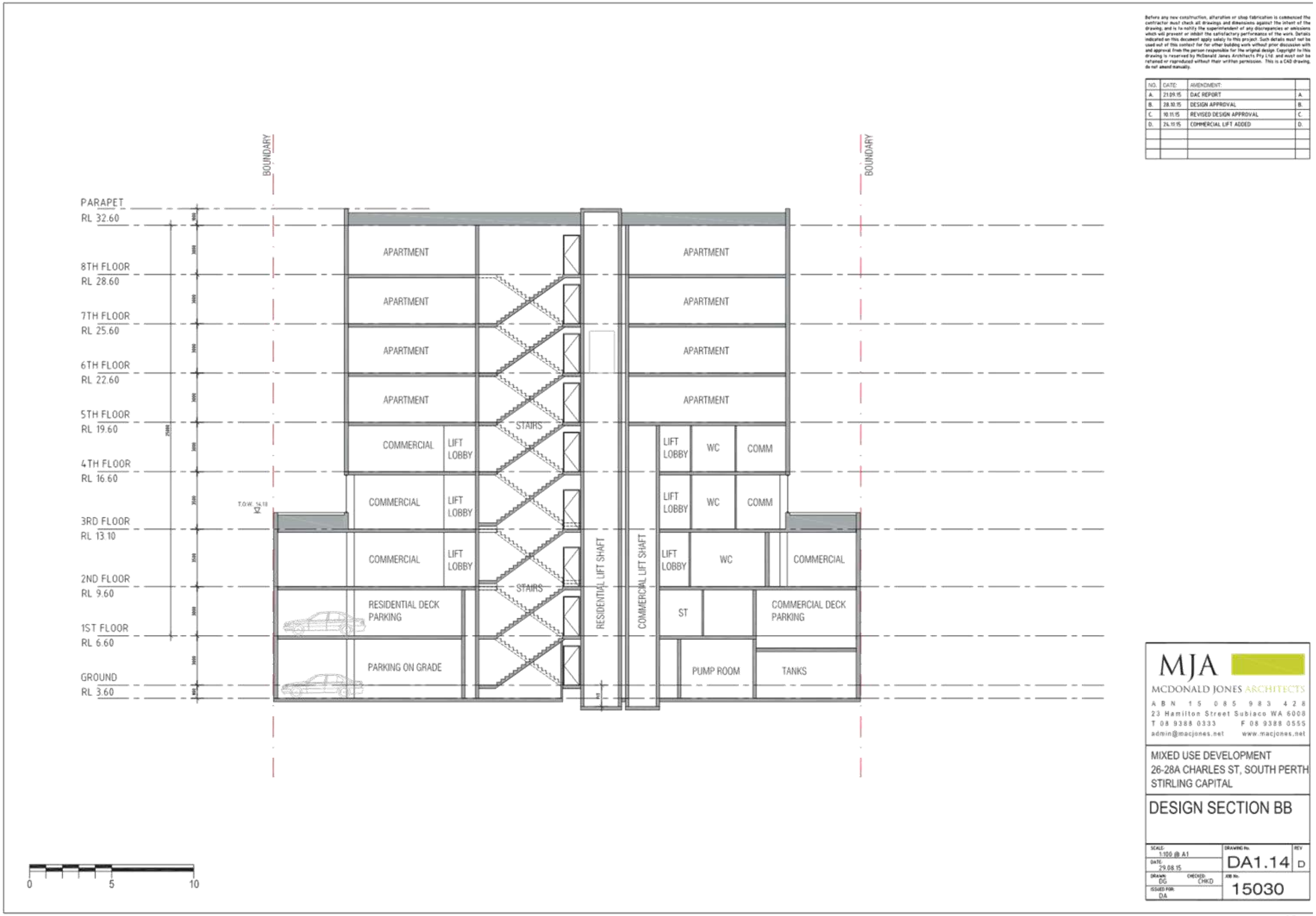
NO. DATE: AMENDMENT:
A. 21.09.15 DAC REPORT A.
B. 28.10.15 DESIGN APPROVAL B.
C. 10.11.15 REVISED DESIGN APPROVAL C.
D. 12.02.16 AWNING UPDATED D.
MJA
MCDONALD JONES ARCHITECTS
A B N 15 085 983 428
23 Hamilton Street Subiaco WA 6008
T 08 9388 0333 F 08 9388 0555
admin@macjones.net www.macjones.net
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
DESIGN SECTION AA
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG
CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.13
REV D
JOB No. 15030


Before any new construction, alteration or shop fabrication is commenced the contractor must check all drawings and dimensions against the intent of the drawing, and is to notify the superintendent of any discrepancies or omissions which will prevent or inhibit the satisfactory performance of the work. Details indicated on this document apply solely to this project. Such details must not be used out of this context for for other building work without prior discussion with and approval from the person responsible for the original design. Copyright to this drawing is reserved by McDonald Jones Architects Pty Ltd. and must not be retained or reproduced without their written permission. This is a CAD drawing, do not amend manually.
NO. DATE: AMENDMENT:
A. 21.09.15 DAC REPORT A.
B. 28.10.15 DESIGN APPROVAL B.
C. 10.11.15 REVISED DESIGN APPROVAL C.
D. 24.11.15 COMMERCIAL LIFT ADDED D.
BOUNDARY
BOUNDARY
PARAPET RL 32.60
8TH FLOOR RL 28.60
7TH FLOOR RL 25.60
6TH FLOOR RL 22.60
5TH FLOOR RL 19.60
4TH FLOOR RL 16.60
3RD FLOOR RL 13.10
2ND FLOOR RL 9.60
1ST FLOOR RL 6.60
GROUND RL 3.60
APARTMENT
APARTMENT
APARTMENT
APARTMENT
COMMERCIAL
LIFT LOBBY
STAIRS
RESIDENTIAL DECK PARKING
PARKING ON GRADE
RESIDENTIAL LIFT SHAFT
COMMERCIAL LIFT SHAFT
WC
COMM
ST
COMMERCIAL DECK PARKING
PUMP ROOM
TANKS
0 5 10
MJA
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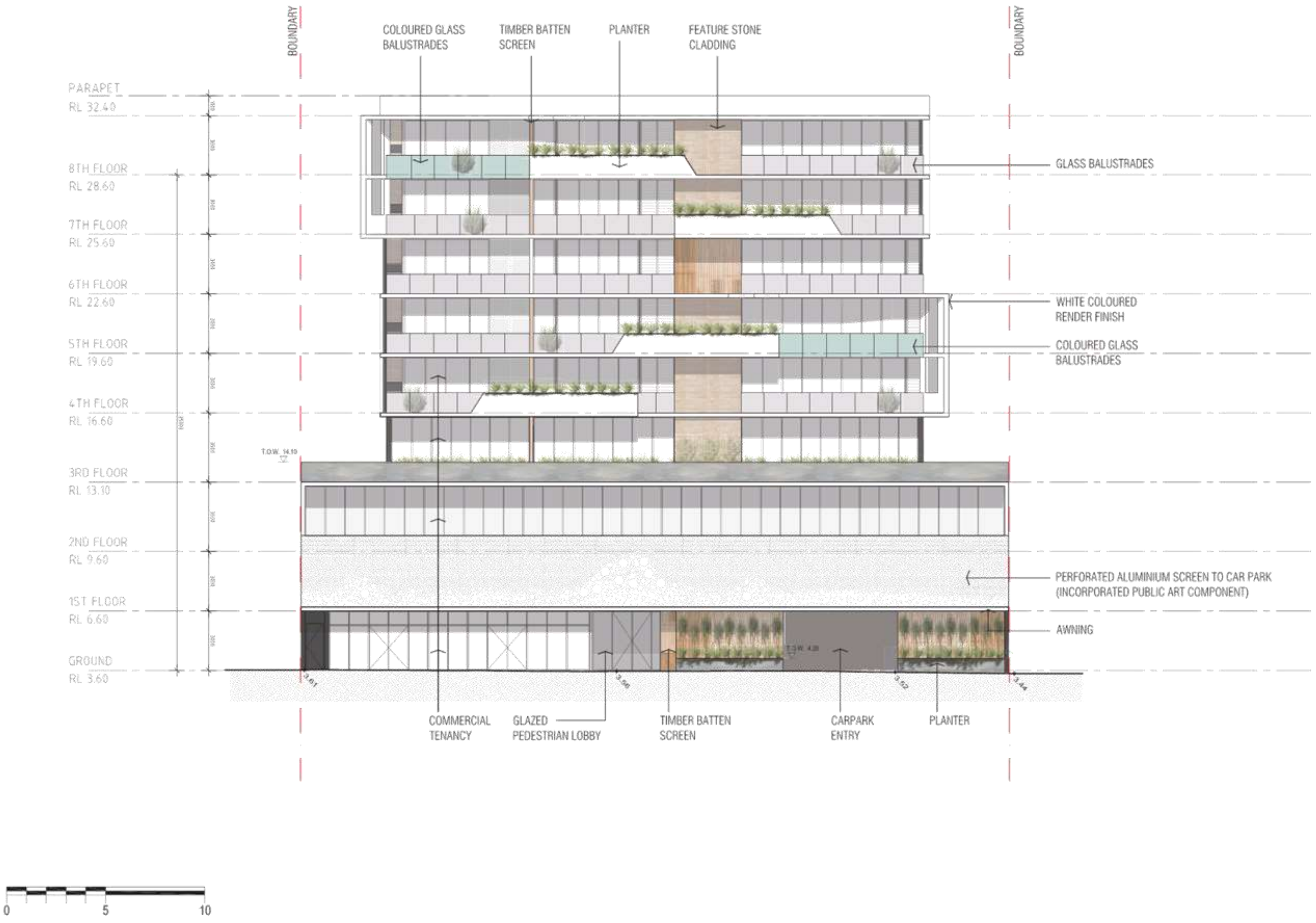
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
DESIGN SECTION BB
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.14
REV D
JOB No. 15030



NO.	DATE:	AMENDMENT:	
A	27.09.15	DAC REPORT	A
B	28.10.15	DESIGN APPROVAL	B
C	16.11.15	REVISED DESIGN APPROVAL	C

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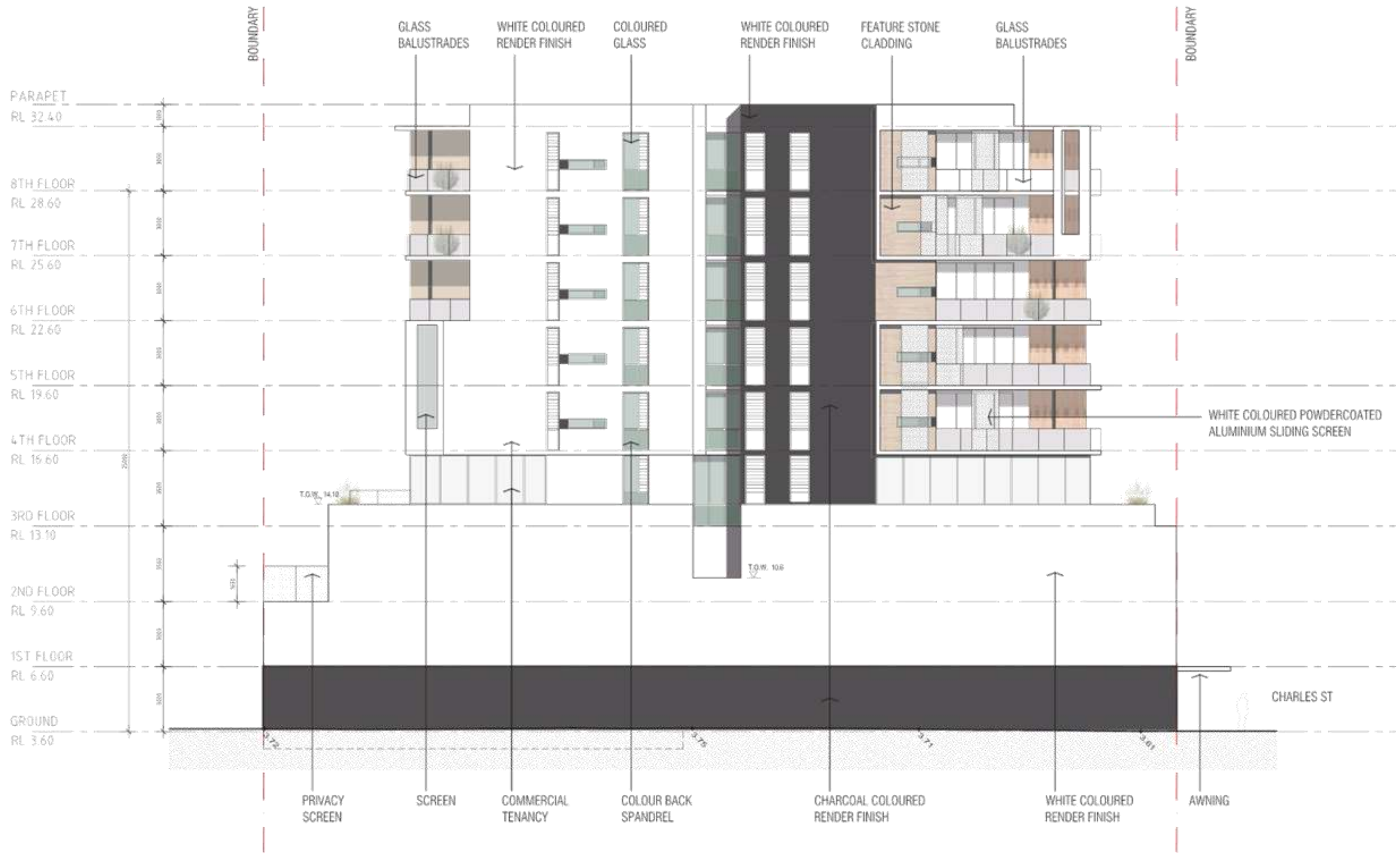
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

NORTH ELEVATION
CHARLES STREET

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DS CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.15 REV C
JOB No. 15030



NO.	DATE:	AMENDMENT:	
A.	21.09.15	DAC REPORT	A.
B.	28.10.15	DESIGN APPROVAL	B.
C.	12.11.15	REVISED DESIGN APPROVAL	C.

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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

EAST ELEVATION

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: JPG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.16 REV C
JOB No. 15030

NO.	DATE:	AMENDMENT:	
A.	28.10.15	DESIGN APPROVAL	A.
B.	14.12.15	REVISED DESIGN APPROVAL	B.

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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

SOUTH ELEVATION

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.17 REV B
JOB No. 15030


NO. DATE: AMENDMENT:
A. 26.10.15 DESIGN APPROVAL A.
B. 31.11.15 REVISED DESIGN APPROVAL B.
C. 22.12.15 WINDOWS ADDED TO BED / LIVING C.
BOUNDARY
WHITE COLOURED POWDERCOATED ALUMINIUM SLIDING SCREEN
WHITE COLOURED RENDER FINISH
COLOURED GLASS
WHITE COLOURED RENDER FINISH
SCREEN
BOUNDARY
PARAPET RL 32.40
8TH FLOOR RL 28.60
7TH FLOOR RL 25.60
GLASS BALUSTRADES
6TH FLOOR RL 22.60
5TH FLOOR RL 19.60
4TH FLOOR RL 15.60
3RD FLOOR RL 13.10
2ND FLOOR RL 9.60
1ST FLOOR RL 6.60
CHARLES ST
GROUND RL 3.60
AWNING
WHITE COLOURED RENDER FINISH
CHARCOAL COLOURED RENDER FINISH
COLOUR BACK SPANDREL
COMMERCIAL TENANCY
PRIVACY SCREEN
MJA
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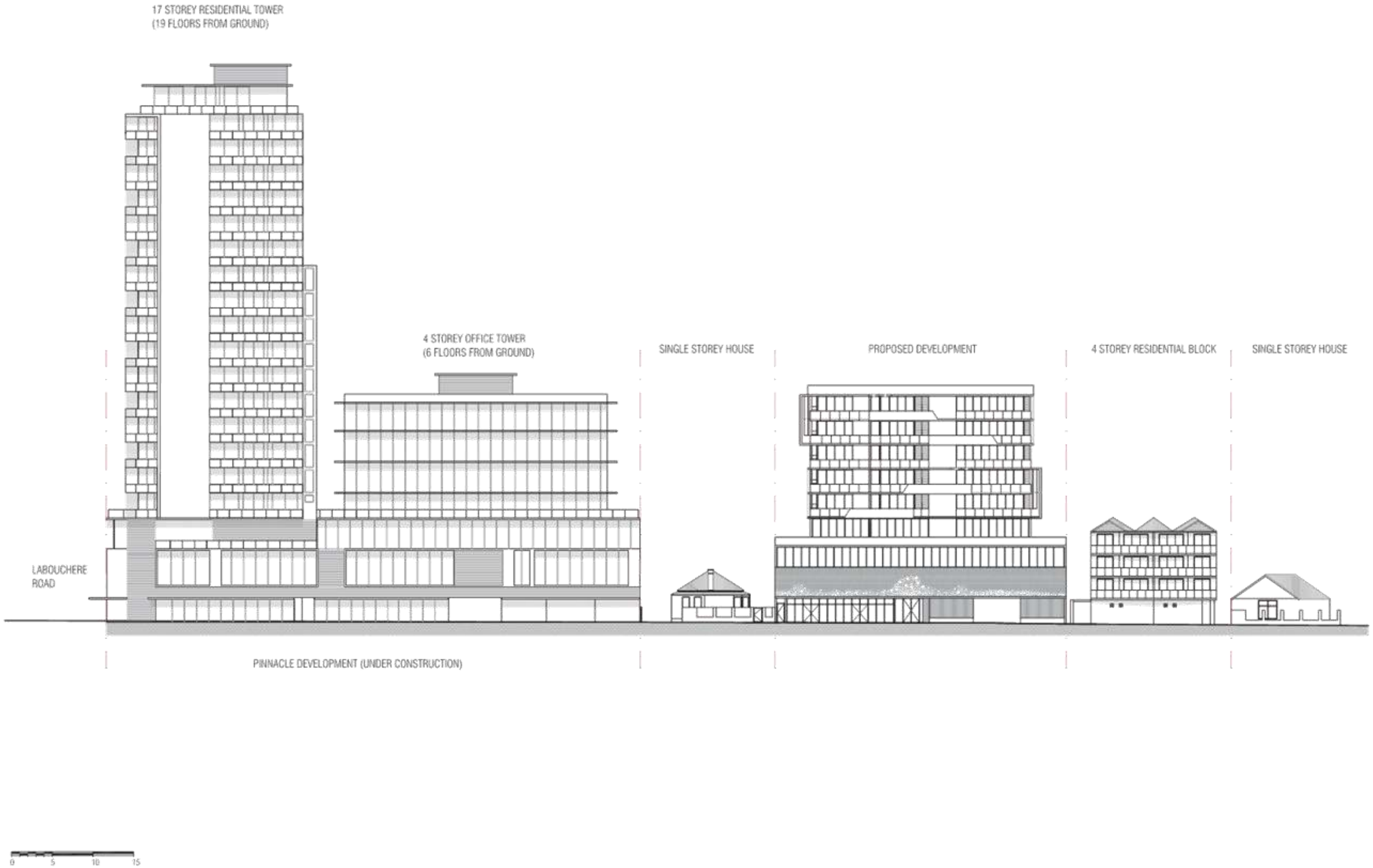
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
WEST ELEVATION
DA1.18 C
15030
0 5 10

MJA studio

NO.	DATE:	AMENDMENT:	
A.	28.10.15	DESIGN APPROVAL	A.
B.	10.11.15	REVISED DESIGN APPROVAL	B.



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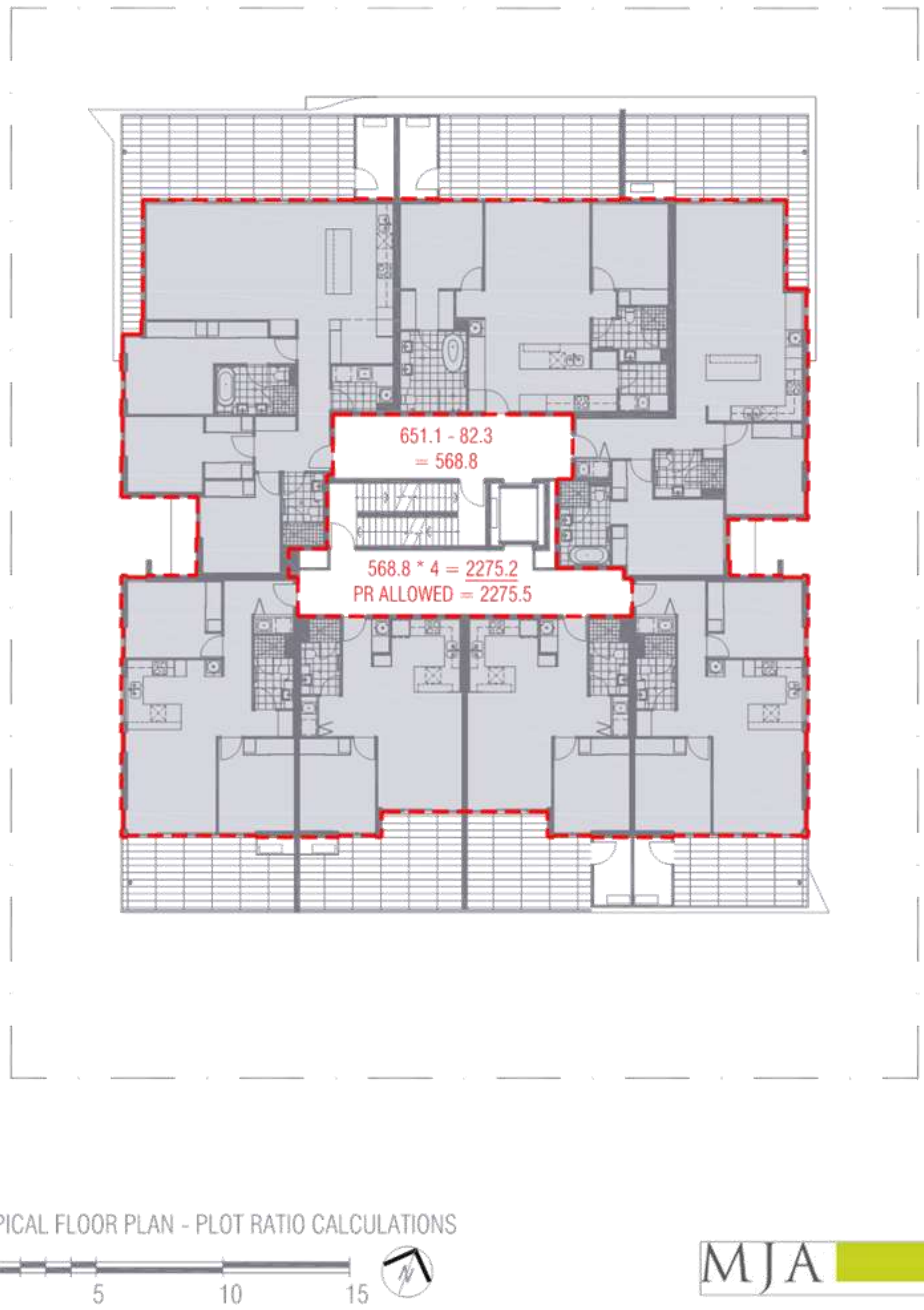
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

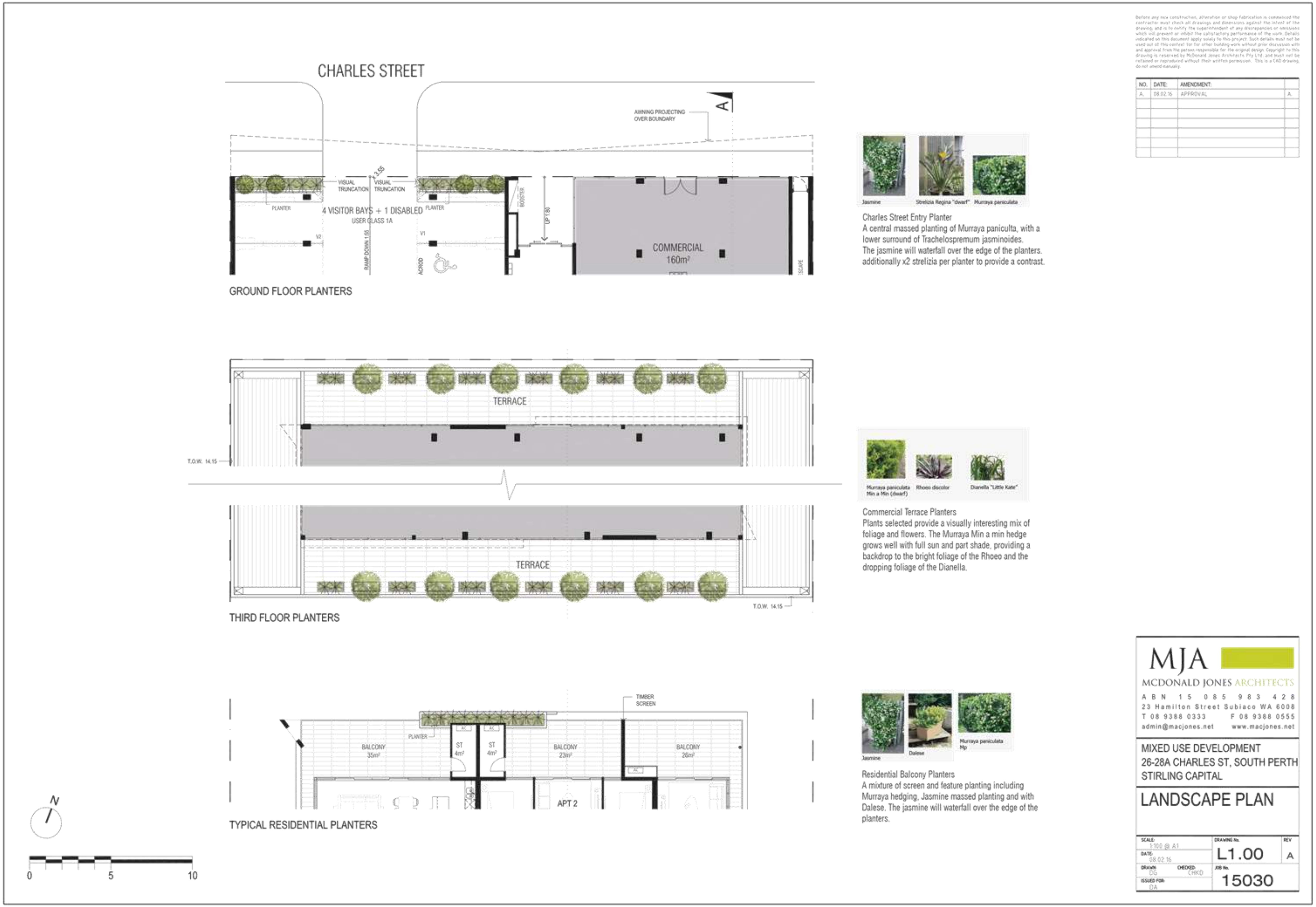
STREET SCAPE
CHARLES STREET

SCALE: 1:250 @ A1	DRAWING No. DA1.19	REV B
DATE: 29.08.15		
DRAWN: DG CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: DA		



TYPICAL FLOOR PLAN - PLOT RATIO CALCULATIONS

MJA


CHARLES STREET
AWNING PROJECTING OVER BOUNDARY
VISUAL TRUNCATION
PLANTER
4 VISITOR BAYS + 1 DISABLED
USER CLASS 1A
COMMERCIAL 160m²
GROUND FLOOR PLANTERS
Jasmine
Strelizia Regina "dwarf"
Murraya paniculata
Charles Street Entry Planter
A central massed planting of Murraya paniculta, with a lower surround of Trachelospremum jasminoides.
The jasmine will waterfall over the edge of the planters.
additionally x2 strelizia per planter to provide a contrast.
TERRACE
T.O.W. 14.15
THIRD FLOOR PLANTERS
Murraya paniculata Min a Min (dwarf)
Rhoeo discolor
Dianella "Little Kate"
Commercial Terrace Planters
Plants selected provide a visually interesting mix of foliage and flowers. The Murraya Min a min hedge grows well with full sun and part shade, providing a backdrop to the bright foliage of the Rhoeo and the dropping foliage of the Dianella.
TIMBER SCREEN
BALCONY 35m²
BALCONY 23m²
BALCONY 26m²
ST 4m²
APT 2
TYPICAL RESIDENTIAL PLANTERS
Jasmine
Dalese
Murraya paniculata Mp
Residential Balcony Planters
A mixture of screen and feature planting including Murraya hedging, Jasmine massed planting and with Dalese. The jasmine will waterfall over the edge of the planters.
N
0 5 10
NO. DATE: AMENDMENT:
A. 08.02.16 APPROVAL A.
MJA
MCDONALD JONES ARCHITECTS
ABN 15 085 983 428
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admin@macjones.net www.macjones.net
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
LANDSCAPE PLAN
SCALE: 1:100 @ A1
DATE: 08.02.16
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. L1.00
REV A
JOB No. 15030

Response to the DAC comments made Tuesday 24 November.

- Provision of two lifts and separate lobbies for residential and non-residential components of the proposed development will enhance the amenity of the users of this development and provide greater sense of security for the residents. Associated modifications were recommended:
  - The revised plans reveal a separate lift for residential and commercial users. This will enhance the amenity of both user classes and provide extra security for the residential. They will share one main lobby at ground floor. However commercial tenants will not be able to use the residential lifts and vice versa through the use of a secure swipe card which should be outlined in a building management plan.

- Additional glazing should be considered for non-residential floor space.
  - Additional glazing has been provided to the second floor commercial. This will increase the natural light entering and allow for opportunities for natural ventilation.

- The Advisory Consultants considered that the band of perforated metal artwork, placed vertically above the awning will not be visible from the footpath level. It was suggested that a perspective drawing to be provided from the 1.5 metre eye level to see the actual view instead of a bird's eye view.
  - An additional image of the awning has been provided. This reveals that the tapering awning will focus the pedestrians view toward the entry which is the peak of the taper.

- Additionally, extended the vertical perforated metal artwork horizontally along the bottom face of the awning, only over the main entrance to the building will assist in directing the visitors to the entry foyer.
  - We believe that the tapering awning is sufficient and will act as an indicator to the entry. It also ties in with the design of the building. The awning is at the same level as the first floor slab and can be read as the soffit of the first floor extending outward.

- Increasing the resultant ceiling height of the awning, located above the footpath, by half a metre will improve the quality of the pedestrian walkway.
  - This has been considered, however increasing the awning height will clash with the perforated aluminium public art screen. It will also impact the space below. The current height of 2.8m provides the pedestrian with a sense of 'human scale' and does not become an overpowering volume to pass underneath. The tapered awning will also direct focus towards the entry point.

- Greater clarity is required with regards to the vertical band of storerooms that are visible in the perspective drawings. Consistent external colour and materials on all floors will assist in correct representation on the drawing. The Advisory Consultants recommended the use of timber slats.
  - The change of the material on the vertical band is part of the architectural feature of the overall design. This change in material emphasises a break and acts as a datum for the residential building. This then creates juxtaposition between the vertical and horizontal elements.

Planning Department
City of South Perth
Cnr Sandgate St and South Tce
South Perth
WA 6151

Job No 15030
7th January 2016

Attention: Mina Thomas

COMMENTS & RESPONSE MADE WITH REGARD TO THE DA APPLICATION

LOT 156, 157 & 158 CHARLES STREET, South Perth

Dear Sir,

Please find attached our response to the comments made by a neighbouring property on Charles St.

If you require any further information please do not hesitate to contact the undersigned.

Appendix I: Response to comments
Appendix II: Response to comments_2

Yours sincerely,

Daniel Guggisberg
P.P. McDonald Jones Architects.

Response to comments made to COSP

- *The advertised version of Amendment 46, which was unanimously approved by Council, has direct relevance to the proposed development. One of the advertised changes was to re-instate some of the setbacks that were regrettably removed under Amendment 25. Council has acknowledged that this was a mistake and they intend to rectify this. It would be a travesty if this development application was given approval prior to the final decision being made on Amendment 46. The negative impact of a 3-4 story concrete podium wall, being built next to our property without setbacks, is substantial. I ask that approval be deferred until the process for Amendment 46 is completed. I've attached three photos which illustrate the scope of the problem. Current Street View shows the current street view of our property as viewed from the eastern boundary. Proposed Podium Wall shows the impact that the proposed 3-4 story podium wall will have. Example Podium Wall shows an actual example of how the podium wall will look, from the Pinnacles Development on the corner of Charles Street and Labouchere Road.*

- Amendment 46 has been advertised for public comment. It should not be interpreted that the Council's proposed changes to the scheme are final and absolute. A further decision from Council (after public advertising) is still required, followed by WAPC consideration and Ministerial approval. Until such time, the City must assess the proposal against the gazetted Town Planning Scheme.

- It would be unreasonable to defer a decision until after the amendment process is completed. This would be contrary to the assessment/determination timeframes under DAP regulations.

- The proposed development is fully compliant with the setback requirements of the current TPS 6. In particular, Clause 6.2 of Schedule 9 not only permits, but requires the podium to have a nil setback to the street.

- The nil setback is consistent with the **future** desired streetscape which should be a key consideration. To this end, there have been two approvals on this side of Charles Street (No. 12 and No.30-34 Charles Street) both of which provide a nil setback to the street for their entire frontage. Cumulatively, these developments have a frontage of approximately 106m, which equates to 35% of the length of the street. This application would therefore be consistent with the likely future streetscape.

- *The plans for the development have west facing terraces and balconies, all of which look down through my main bedroom windows, and onto my uncovered balcony. In the case of the terrace, it is only 3 metres away. The upper balconies have a slightly bigger setback, but because of their position, they all look backwards into my main bedroom window, and onto my uncovered balcony. They may as well sell tickets for what is going on at the front of my apartment. I thought there were provisions in the regulations that were supposed to stop this type of overlooking. All of the balconies and the terrace in front of my front bedroom window should be screened with opaque material, so that people don't get to 'enjoy the view'.*

- The proposed development is fully compliant with the boundary setback requirements of the TPS 6.

- *Our apartment is a relatively new apartment block, having only being built about 10 years ago. The majority of the owners are the original owners. It is highly unlikely that this building will be redeveloped for at least another 20 years. However, the positioning of the proposed podium wall on our eastern boundary will ensure that our windows on that side of the building will be starved of light for all of those 20 years. Natural light is important in apartments, and ours was designed based on regulations that allowed this. However,* *we will now be deprived of a substantial amount of natural light that currently enters through the windows on the eastern side of our building. There are no western facing windows in our eastern apartments, so the impact of overshadowing is effectively doubled when it comes to considering these apartments in isolation.*

- The proposed development is fully compliant with the boundary setback requirements of the TPS 6. This development, as well as the neighbour, has a predominantly north/south orientation. Therefore, the important winter noon sun will not be impacted by our development.

- *We currently have plants in the garden on the eastern side of our building, including vegetables. With the positioning of the podium, the garden will be almost permanently in the dark. It will lie at the bottom of a 3-4 story canyon that will only be 2.8 metres wide at the base. Many of the windows for the eastern apartments also lie in this canyon. It is unreasonable for us not to have direct sunlight for our plants - or residents (which a bigger podium setback would provide).*

- The proposed development is fully compliant with the boundary setback requirements of the TPS 6. This development, as well as the neighbour, has a predominantly north/south orientation. Therefore, the important winter noon sun will not be impacted by our development.

- *The proposed development calls for the demolition of a forest of native trees on the front part of the property. These trees are currently used by many native birds and animals, including cockatoos, kookaburras, magpies and possums. Removing them will deprive the fauna of their homes, and us of their beauty. Magpies are ground feeders, and use the strip of vegetation at the front of this property to feed. Their food sources are already dwindling with the current development under-way. This proposed development will eliminate another important food source (by virtue of the zero metre setback).*

- There is no requirement under the local planning framework to maintain existing vegetation on site.

- As outlined above, TPS6 requires the development to have a nil setback to the Charles Street boundary.

- *The large concrete foot print of the proposed development, and the elimination of all trees on the property will further increase the urban heat effect. There was an article in The West today (2/12/15) that talked about the importance of Councils retaining trees in areas where people live. This proposed development will have no trees.*

- The development is compliant with the boundary setback requirement of TPS6. In particular, TPS6 either encourages or requires the podium of the development to have a nil setback to both side, rear and front boundaries.

- Landscaping has been integrated into the design of this development. There are planters boxes with vegetation located on the ground floor as well as on a number of balconies throughout the development. The terraces and balconies are also large enough for individual occupants to landscape as they deem appropriate.

- *It is not clear from the plans where the air conditioning units and vents will go, which makes it difficult for me to determine the potential environmental effects of the noise and hot air outflow. The application should* *be delayed until it is clearly articulated where the air conditioning units will be placed, so the environmental impacts can be considered by residents.*

- The Apartment A/C units are clearly demonstrated on the floor plans. Please refer to the balconies for screened enclosure.

- The A/C units for the commercial tenancies will be screened from view and acoustically treated as per the Australian Standards.

- *It is not clear to me from the plans whether the car park wall is perforated, or whether it is solid concrete on our eastern boundary. This is important, because if it is not solid, there will be substantial noise emanating from cars driving on the ground and first floors. This is immediately adjacent to the main bedrooms on the eastern side of our building. The garage walls MUST be solid concrete to stop the noise from the cars. In the case of apartment 1 in our complex, the bed head and window would literally be 3 metres from the cars. Lots of cars.*

- The carpark & podium walls will be a solid concrete construction with adequate acoustic properties.

- *The developer has yet to approach us about their proposed development. They should be made to pay for a dilapidation report of our property, given the size of the footings that will be needed to construct this building. It is highly likely that cracking will occur in our apartments as a result of a very deep hole being dug up against the boundary fence. This should be a condition of any approval given for development.*

- Whilst we consider damage to the adjoining property is unlikely, the developer would be pleased to commission a dilapidation report, to be prepared by the builder before work commences on site.

Response to comments made to COSP_2

- *With zero setbacks on all sides of these properties, this proposal is obviously aimed at circumventing the expressed wishes of Council contained in Amendment No.46 that a street frontage setback of 4 metres is now preferred.*

- Amendment 46 has been advertised for public comment. It should not be interpreted that the Council's proposed changes to the scheme are final and absolute. A further decision from Council (after public advertising) is still required, followed by WAPC consideration and Ministerial approval. Until such time, the City must assess the proposal against the gazetted Town Planning Scheme.

- It would be unreasonable to defer a decision until after the amendment process is completed. This would be contrary to the assessment/determination timeframes under DAP regulations.

- The proposed development is fully compliant with the setback requirements of the current TPS 6. In particular, Clause 6.2 of Schedule 9 not only permits, but requires the podium to have a nil setback to the street.

- The nil setback is consistent with the **future** desired streetscape which should be a key consideration. To this end, there have been two approvals on this side of Charles Street (No. 12 and No.30-34 Charles Street) both of which provide a nil setback to the street for their entire frontage. Cumulatively, these developments have a frontage of approximately 106m, which equates to 35% of the length of the street. This application would therefore be consistent with the likely future streetscape.

- *Even if Amendment No.46 is ratified, zero setback at the western side of the proposed development will significantly impact our well-being and quality of life. Our eastern outlook will be a concrete wall with no morning sunlight.*

- The development is compliant with the boundary setback requirement of TPS6. In particular, TPS6 either encourages or requires the podium of the development to have a nil setback to both side, rear and front boundaries.

- *Charles Street is already severely impacted by current developments with chaotic traffic and parking as a result of the construction of the Pinnacle apartments. Further building work will worsen the situation.*

- There will be a traffic management plan in place during the construction of the development.

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Asset Management | Environmental Services | Spatial Intelligence | Waste Management

Waste Management Plan

28A Charles Street, South Perth

Prepared for Stirling Capital Pty Ltd

December 2015

Project Number TW15039

talis
delivering solutions

Talis Consultants Pty Ltd
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Leederville WA 6007
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DOCUMENT CONTROL

Version	Description	Date	Author	Reviewer
0a	Internal Review	16/10/15	RPC	SC
1a	Released to Client	16/10/15	RPC	Client
2a	Client Amendments	9/11/15	RPC	Client
2b	Client Amendments	13/11/15	RPC	Client
3a	City Amendments	16/12/15	RPC	Client

Approval for Release

Name	Position	File Reference
Ronan Cullen	Director	TW15039 – Waste Management Plan.3b

Signature

Ronan Cullen

Table of Contents

Tables

Figures

1 Introduction

Stirling Capital Pty Ltd (Stirling Capital) is currently seeking building approval for a mixed use development at 28A Charles Street, South Perth, Western Australia (WA) (the Proposal). Prior to lodging a building permit application and as a condition of the development approval, the City of South Perth (the City) requires the submission of a Waste Management Plan (WMP). The Proposal is bordered by Charles Street to the north and surrounded by residential properties to the east, south and west as shown in **Figure 1**. The number of apartments and commercial tenancies at the Proposal are:

- One Bedroom apartment – eight (8);
- Two bedroom apartment – sixteen(16);
- Three bedroom apartment – four (4);
- Office (2,613m^2).

As part of this process, the City requires the development of a WMP that identifies how waste is to be stored and collected from the Proposal. Stirling Capital has therefore engaged Talis Consultants Pty Ltd (Talis) to prepare this WMP to satisfy the City's requirements.

1.1 Objectives and Scope

The objective of this WMP is to outline the equipment and procedures that will be adopted to manage all waste (both refuse and recycling) at the Proposal. Specifically, the WMP demonstrates that the Proposal has been designed to:

- Adequately cater for the anticipated quantities of waste and recyclables to be generated;
- Provide a suitable bin storage area including appropriate receptacles; and
- Allow for efficient collection of receptacles by appropriate waste collection vehicles.

To achieve the objective, the scope of the WMP comprises:

- Section 2: Waste Generation;
- Section 3: Waste Storage;
- Section 4: Specialist Waste Streams;
- Section 5: Property Management Activities;
- Section 6: Waste Collection; and
- Section 7: Conclusion.

2 Waste Generation

The Proposal consists of residential apartments and commercial tenancy. The anticipated quantities of refuse and recyclables were estimated based on the number and size of apartments; and the floor space of the commercial tenancy.

Residential and commercial waste generation rates were obtained from the City of South Perth Waste Guidelines for New Developments. Consideration was also given to City of Sydney's *Policy for Waste Minimisation in New Developments* (2005), City of Melbourne's *Guidelines for Preparing a Waste Management Plan* (2014), Randwick City Council's *Waste Management Guidelines for Proposed Developments* (2004) and Western Australian Local Government Association's *Draft Multi Dwelling Development Waste Management Plan Guidelines* (2014). Where a range of values were provided for a particular waste source, a conservative approach was adopted and the largest value was taken to ensure that sufficient receptacle volume will be provided.

Waste generation is estimated by volume in Litres (L) as this is generally the influencing factor when considering receptacle size, numbers and storage space required. The waste generation volumes in Litres per week (L/week) of refuse and recyclables adopted for this study are shown in **Table 2-1**, **Table 2-2** and **Table 2-3**.

Table 2-1: Estimated Residential Waste Generation

Use	Number of Units	Generation Rate (L/week)	Waste Generation (L/week)
		Refuse	
Apartment (One Bed)	8	80	640
Apartment (Two Bed)	16	100	1,600
Apartment (Three Bed)	4	120	480
Total			**2,720**
		Recycling	
Apartment (One Bed)	8	80	640
Apartment (Two Bed)	16	120	1,920
Apartment (Three Bed)	4	120	480
Total			**3,040**

As shown in **Table 2-1**, it is anticipated that the Proposal will generate 2,720L of refuse and 3,040L of recyclables per week from the residential apartments.

Table 2-2: Estimated Commercial Waste Generation

Use	Floor Area (m^2)	Generation Rate (L/100m^2 per day)	Waste Generation (L/week)
		Refuse	
Office	2,613	10	1,307
Total			**1,307**
		Recycling	
Office	2,613	10	1,307
Total			**1,307**

As shown in **Table 2-2**, it is anticipated that the Proposal will generate 1,307L of refuse and recyclables per week from the commercial tenancies. These waste generation quantities are based on five days of operation per week for the office tenancy.

Table 2-3: Estimated Combined Waste Generation

Use	Waste Generation (L/week)
Refuse	
Apartments	2,720
Office	1,307
Total	**4,027**
Recycling	
Apartments	3,040
Office	1,307
Total	**4,347**

As shown in **Table 2-3**, it is anticipated that the Proposal will generate a combined total of 4,207L of refuse and 4,347L of recyclables per week.

3 Waste Storage

To ensure that waste is managed appropriately at the Proposal, it is important to allow for sufficient space to house the required receptacles within the designated Bin Storage Area. The procedure and receptacles to be used in this area are described in the proceeding sections.

3.1 Internal Receptacles

To promote positive recycling behaviour and maximise diversion from landfill, the Proposal will be required to have two receptacles for the disposal of refuse and recycling separately within each apartment unit. Waste from apartments will be placed in these receptacles and transferred by the Resident and/or their authorised representative to the Bin Storage Area for disposal.

The Proposal will have a minimum of two receptacles for the disposal of refuse and recycling within each commercial unit. In the future the Proposal may provide additional receptacles for waste streams such as paper and cardboard for source separation of waste. Waste from commercial units will be placed in these receptacles and transferred by the tenant and/or their authorised representative to the appropriate receptacle within the Bin Storage Area.

3.2 Bin Storage Area

3.2.1 Size

To ensure sufficient area is available for storage of the waste receptacles prior to collection, the quantity of receptacles required was modelled based on two collections per week and utilising a range of receptacle sizes from 240L to 1,100L as shown in **Table 3-1**and **Table 3-2**.

Table 3-1: Residential Receptacle Requirements

Waste Stream	Waste generation (L/week)	Number of Receptacles Required		
		240L	660L	1,100L
Refuse	2,720	6	3	2
Recycling	3,040	7	3	2

Table 3-2: Commercial Receptacle Requirements

Waste Stream	Waste generation (L/week)	Number of Receptacles Required		
		240L	660L	1,100L
Refuse	1,307	3	1	1
Recycling	1,307	3	1	1

Based on typical receptacle dimensions as per **Table 3-3**, the placement of the receptacles within the Bin Storage Area has been considered, as shown in **Figure 2**. This was based on two collections per week of refuse and recyclables utilising Private collection services.

The Bin Storage Area is designed to accommodate the following receptacles:

- Nine (9) 240L refuse receptacles; and
- Ten (10) 240L recycling receptacles.

.

Table 3-3: Typical Receptacle Dimensions

Receptacle Size (L)	Depth (m)	Width (m)	Area (m^2)
240	0.735	0.580	0.426
360	0.865	0.680	0.588
660	0.765	1.360	1.040
1,100	1.070	1.240	1.327

Reference: SULO Australia Bin Specification Data Sheets

3.2.2 Design

The Bin Storage Area is located at ground level of the Proposal. The Bin Storage Area will have an impervious floor draining to the sewer and a tap to facilitate washing of receptacles inside the store. Doors to the Bin Storage Area will be vermin proof. The Bin Storage Area will also be ventilated to a suitable standard. To reduce potential odours in the Bin Storage Area, the receptacles, floor and walls will be cleaned when required. Receptacles will be washed down in a designated area inside the bin compound.

It is worth noting that the number of receptacles and corresponding placement of receptacles as shown in **Figure 2** represents the maximum requirements assuming two collections per week for refuse and recyclables. More frequent collections would reduce both the number of receptacles and the storage space required.

Receptacle capacity and storage space within the Bin Storage Area will be monitored during the operation of the Proposal to ensure that the receptacles are sufficient.

4 Specialty Waste Streams

Adequate space has been allocated for the collection of the following Specialty Waste types:

- Batteries;
- Printer Cartridges;
- Fluorescent Globes; and
- Mobile Phones.

Specialty Wastes will be collected in a specially designed cabinet located in a communal area of the Development. The typical dimensions of a Specialty Waste cabinet are as follows:

- Height - 1.5 metres;
- Length – 2 metres; and
- Depth – 0.5 metres.

Once sufficient volume has been collected, the Specialty Wastes will be transported by the Property Manager to suitable collection locations for recycling.

5 Property Management Activities

A suitably qualified Property Manager will be engaged to complete the following tasks:

- Monitoring of the Bin Storage Areas;
- Transport collected Specialty Wastes to suitable collection locations for recycling or disposal as required;
- Education of residents regarding bulk waste disposal;
- Maintenance of receptacles and Bin Storage Areas; and
- Clean receptacles and Bin Storage Areas when required.

6 Waste Collection

A Private waste contractor will service the Proposal by providing 240L receptacles for refuse and recyclables which are to be collected by a rear lift waste collection vehicle. The receptacles will be serviced from within the Proposal. The Private waste contractor will reverse into the Proposal to an area adjacent to the Bin Storage Area to minimise the ferrying of receptacles to the waste collection vehicle. The collection vehicle will then exit the premise in forward gear. This servicing method will reduce the noise generated in the area during collection. In addition, it will remove the need for receptacles on the street, maintaining the amenity of the area and remove the requirement for a lay down area to temporary store receptacles on the verge before the collection vehicle arrives.

As described previously, there is sufficient space within the Bin Storage Area for the number of receptacles required for collections two times per week for refuse and recycling. However, increased collection frequency would reduce the number of receptacles required.

Specialty Waste will be taken to suitable collection locations for by the Property Manager for recycling or disposal as required.

6.1 Bulk Waste Collection

Given the streetscape adjacent to the Proposal, placement of bulk verge material on the verge is not considered desirable. Instead bulk waste material will be removed from the Proposal as it is generated. Removal of this material will be the responsibility of each person(s) residing at the Proposal.

Collier Park Transfer Station (Collier Park) is located approximately 4.6 kilometres from the Proposal and accepts self-hauled material from residential properties. Collier Park is open from 9:00am to 4:45pm, seven days per week excluding Good Friday, ANZAC Day, Christmas Day and New Year's Day. The City of South Perth provides three entry vouchers annually with Rate Notices.

The above will be communicated to residents residing at the Proposal by the Property Manager and information sheets distributed to new owners.

7 Conclusion

As demonstrated within this WMP, the Proposal provides a sufficiently large Bin Storage Area for the storage of receptacles for both refuse and recyclables based on a configuration of suitable receptacles. This indicates that a satisfactorily designed Bin Storage Area has been provided and collection of both refuse and recycling receptacles can be completed from the Proposal.

The above is achieved using nine 240L refuse receptacles and ten 240L recycling receptacles collected two times per week. Servicing will be conducted from within Proposal, adjacent to the Bin Storage Area by a Private Contractor using a rear lift collection vehicle.

A suitably qualified Property Manager will be engaged to oversee relevant aspects of waste management at the Proposal.

Figures

Figure 1: Site Aerial and Locality Plan

Figure 2: Bin Storage Area

LEGEND

- Site Boundary
- Cadastral Boundary
- Road Network

SITE AERIAL

26-28A Charles Street, South Perth

0 5 10 20 30 metres

Coordinate System: GDA 1994 MGA Zone 50, Projection: Transverse Mercator, Datum: GDA 1994

Date: 9/10/2015	Revision: A
Scale @ A3:1:750	Project No: TW15039
Prepared: R P Cullen	Figure 01
Checked: P Gauci	
Reviewed: N King	

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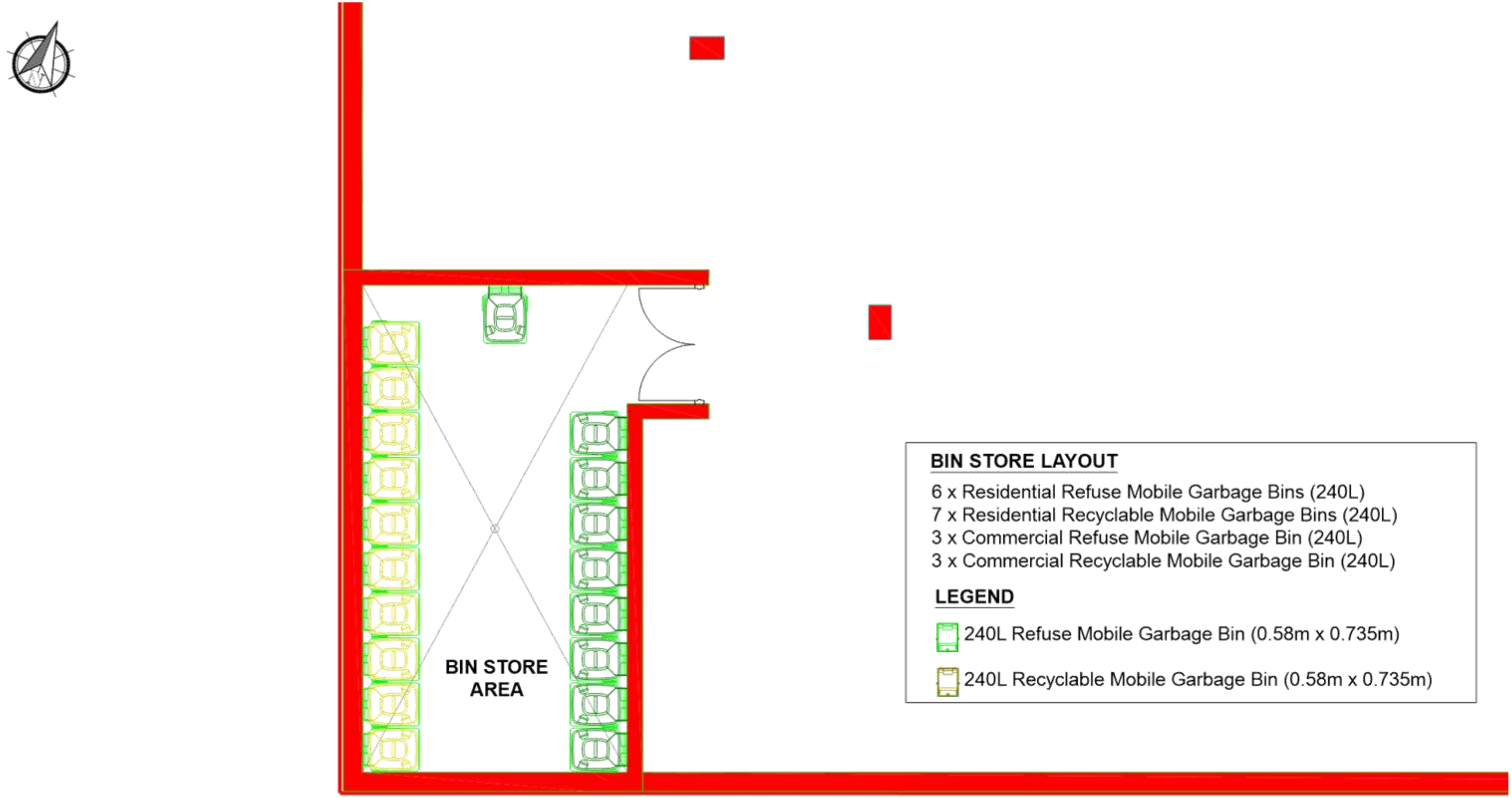

BIN STORE LAYOUT

6 x Residential Refuse Mobile Garbage Bins (240L)
7 x Residential Recyclable Mobile Garbage Bins (240L)
3 x Commercial Refuse Mobile Garbage Bin (240L)
3 x Commercial Recyclable Mobile Garbage Bin (240L)

LEGEND

240L Refuse Mobile Garbage Bin (0.58m x 0.735m)

240L Recyclable Mobile Garbage Bin (0.58m x 0.735m)

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ASSET MANAGEMENT
CIVIL ENGINEERING
ENVIRONMENTAL SERVICES
SPATIAL INTELLIGENCE
WASTE MANAGEMENT

8/663 Newcastle Street, Leederville WA 6007
PO Box 454, Leederville WA 6903

Client: McDonald Jones Architects

NOTES
1. This drawing is the property of Talis Consultants Pty Ltd. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels refer to Australian Height Datum.
3. DO NOT SCALE, use figured dimensions only, if in

C	9/11/15	AU RC	FINAL ISSUE	RC
B	28/10/15	PO RC	SECOND ISSUE	RC
A	13/10/15	PO RC	FIRST ISSUE	RC

Project: 28A Charles Street Waste Management Plan

Title: Bin Store Area

Drawn by:	AU	Job No:	TW15039
Checked by:	RC	File No:	TW15039DG
Approved by:	RC	Drg. No: 002	Rev: C
Scale: 1:50 @A3			

Sealhurst
Acoustic Design
& Engineering

Stirling Capital Pty Ltd

26 - 28A Charles St, SOUTH PERTH

Acoustic Design Report for DA

22 JAN 2016

Sealhurst Pty Ltd
PO Box 862 | CANNING BRIDGE | APPLECROSS | WA 6153
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ACN: 161 563 551

Sealhurst
Acoustic Design & Engineering

Stirling Capital Pty Ltd

26 - 28A Charles St, SOUTH PERTH

Acoustics - Report for Development Approval

JANUARY 2016

QA INFORMATION	
Project No	SEA-2016-001
Project Name	26 - 28A Charles St, SOUTH PERTH
Client	Stirling Capital Pty Ltd
Report Title	Acoustics - Report for Development Approval
Filename	SEA-2016-001 RPT001 [DA]
Revision	A
Reason For Issue	Development Approval
Authorised By	
Issue Date	22 JAN 2016

Sealhurst Pty Ltd
PO Box 862 | CANNING BRIDGE | APPLECROSS | WA 6153
ABN: 86 161 563 551
ACN: 161 563 551

PROJECT PARTNERS

Discipline	Entity	
Client	Stirling Capital Pty Ltd	STIRLING CAPITAL
Architectural Design	McDonald Jones Architects	MCDONALD JONES ARCHITECTS
Structural Design	TBC	
Mechanical Design	TBC	
Electrical Design	TBC	
Hydraulic Design	TBC	

EXECUTIVE SUMMARY

Sealhurst were appointed by Stirling Capital Pty Ltd to provide acoustic design, coordination and consultancy relating to the design for a new 9-storey multi-residential/commercial building, proposed as a redevelopment of the existing site(s) at 26-28A Charles Street in SOUTH PERTH, Western Australia.

This report presents our DA documentation design development review of the proposed project, and anticipated compliance status as compared to the applicable design criteria contained within a national design framework of applicable acoustic criteria encompassed by *AS2107:000, Section F5* of the *National Construction Code* (*NCC*, formerly the *BCA*), and *WA Environmental Protection (Noise) Regulations 1997* (incl. amendments).

A summary of our report findings is presented below:

ARCHITECTURAL REQUIREMENTS

BUILDING FACADE - NOISE INGRESS & BUILDING ENVELOPE (GLAZING)

Australian Standard *AS2107:2000* establishes internal room acoustic design criteria for assessment of anticipated internal noise levels in residential developments, based upon existing noise in the vicinity of the new development site. Sealhurst presented engineering staff to site to conduct an objective detailed external noise survey, to provide the basis upon which to demonstrate compliance with internal noise standard via calculations. The residential and commercial elements of the building are demonstrated to achieve internal levels defined in *AS 2107:2000* - the standard presents a range of acceptable performance criteria between ***"Satisfactory"*** and ***"Maximum Permissible"***.

Detailed assessment of the site and surrounding local acoustic environment informs the acoustic performance requirements of each building element, and the building façade composite, in terms of delivering suitable internal amenity from the active street. The general external daytime sound field averages between 40 dB(A) at night and 55 dB(A) during the day, with incidental periods of up to 61 dB(A) L_{Aeq} due to transient construction noise at an adjacent site.

The project is advised that external noise levels are generally "low", which implies minimal impact to façade design in terms of glazing acoustic (Rw) ratings for internal noise, specifically the need for specialist acoustic performance/glazing thereof. Our calculations predict the minimum glazing performance to meet internal noise level criteria set out in AS2107:2000 as rated Rw 32dB expected to be sufficient to attain internal design sound levels; This rating is considered equivalent to standard 6mm float glass In appropriate frame(s) with effective compressible seals at all operable jambs.

Example minimum glazing format and acoustic performance (Rw) details are provided, along with calculation methodology and implication advice on building façade design. Lower (quieter) internal levels can be obtained at the client's discretion, typically through the specification of higher acoustic (Rw) performance glazing (e.g. 10mm float or laminate equivalent) and acoustically treated ventilation openings.

SEPARATING CONSTRUCTION PERFORMANCE BETWEEN RESIDENTIAL APARTMENTS - WALLS

Section F5 of the *NCC* (formerly *BCA*) is the national reference standard in terms of minimum criteria for acoustic performance between residential apartments, and for shared building services concealment. Current understanding of preferred construction methodology for the building is for a reinforced concrete structure, with a mixture of pre-cast and in-situ concrete panels to be used for external/building envelope walls; Internal structure is understood to be formed from concrete panel or infill concrete (AFS or Ritek-type) panel system with plasterboard cladding over, forming the rated separating construction(s) between adjacent residential apartments.

Detailed mark ups are presented in Appendix B.1 which show where compliance criteria is applicable, notes on potential areas for additional consideration, and where practical at this stage, means to meet or exceed the standard for separating walls.

SEPARATING CONSTRUCTION PERFORMANCE BETWEEN RESIDENTIAL APARTMENTS - FLOORS

Vertical separation (floors) between adjacent residential apartments are understood to be provided by reinforced concrete slabs – a minimum thickness of 200mm is considered "Deemed-to-Satisfy" in terms of **airborne sound transmission**, hence should be adopted as a minimum (or greater) thickness to comply with NCC minimum criteria, pending structural design.

Separating floor coverings are an equally critical determinant for NCC compliance of floor construction in terms of meeting the minimum performance for **impact sound isolation** ratings, with alternative floor build ups required for soft and hard floor coverings. For separating floors between residential apartments, any areas with carpet on foam underlay installed over ≥200mm concrete floor slab will meet/exceed NCC *"Deemed-to-Satisfy"* provisions for both **airborne** and **impact** sound, therefore fully complies with the minimum performance requirements, without need for a suspended ceiling layer below.

Any areas utilising a tiled (hard) floor covering will require some form of resilient treatment to be installed to isolate the floor/ceiling components from undue transmission of impact sound between apartments. Two options are presented at this stage – an isolating matting to be installed between screed and slab, or, a suspended ceiling mounted on resilient hangers below the slab to the entre extent of the separating floor/ceiling area; Both present suitable minimum engineered solutions to enable tiled floors to meet the NCC minimum performance of 62dB LnT,w. Advice and recommended design options are presented in Section 5.4.2.

CONCEALED SERVICE DUCT WALLS

Formal advice is given for building services duct and concealment/isolation able to comply with the minimum services duct wall provisions of the NCC as applicable to residential apartments. Minimum construction types and advice is set out in Section 5.9, and applicable to all shared building services which run adjacent to apartment areas.

Additionally, all services penetrations through rated walls must be acoustically sealed – general detailing specification is provided, to be integrated with services and architectural specifications as design progresses.

SEPARATING PARTITIONS IN COMMERCIAL FLOORS

Separating partition types and acoustic performance(s) thereof in commercial space(s) are not subject to minimum performance criteria per se, as with residential partition components. Rather, partitions and respective acoustic performance(s), are determined practically as part of architectural fitout, based upon office room layout and adjacencies of noise-sensitive (or non-noise-sensitive) spaces.

Second (1268m^2), Third (799m^2) and Fourth (596m^2) commercial floor areas are currently being developed as open floor plan areas, pursuant to end-tenant fitout(s) pending lease arrangements to be made as is commercially appropriate for this stage of the development. As such, room layouts are yet to be determined and partition design advice is not yet appropriate. In lieu, a base palette of partition types has been presented which may be useful to development and potential fitout clients, as a means to assess potential costing versus acoustic performance.

Detailed partition advice can be provided during detailed design, to ensure client and developer performance requirements are delivered in the finished building.

BUILDING SERVICES - INTERNAL NOISE

MECHANICAL SERVICES

The development will require AC and several mechanical exhaust systems as part of the design. Residential AC is to be provided by split system internal FCU with balcony condenser units, located in ventilated enclosures. Appropriate CU unit selection(s) rated at sound pressure level emissions of 48 dB(A)@ 3m are anticipated to ensure full compliance with Regulation limits at the closest point.

Mechanical concepts for commercial floor areas are not yet fully determined, as is appropriate for this stage of design therefore concept advice is provided to allow the development to progress with acoustic amenity in mind.

Specific advice is offered regarding car park, bin stores and potential kitchen exhaust fan systems. Sealhurst recommend each mechanical system is designed in view of acoustics, and assessed during detailed design phase to ensure the building and its systems are able comply with requirements for noise levels during operation of mechanical services in all adjacent internal spaces.

HYDRAULIC SERVICES

In association with minimum constructions for services duct walls, hydraulic services pipe work in service ducts adjacent to residential apartment space(s) must be wrapped in a suitable loaded vinyl or mineral fibre wrap.

Additionally, all circulating pump equipment connections to hydraulic pipework must have flexible couplings, s a BCA compliance requirement.

ELECTRICAL SERVICES NOISE

Electrical services sockets must be installed with appropriate offsets when back-to-back in separating walls to comply with NCC minimum criteria for electrical services. Utilising a cavity masonry party wall construction, the appropriate offset is 100mm; Where lightweight infill walls are installed, minimum offset is 300 mm. Offsets can be vertical or horizontal.

ENVIRONMENTAL NOISE EMISSIONS COMPLIANCE

The *WA Environmental Protection (Noise) Regulations 1997* (inc amendments) stands as the applicable statutory legislation covering all noise emissions from the new development. The Assigned Noise Level (ANL) limits have been determined based upon an Influencing Factor of +9, and applied at the nearest noise-sensitive receiver location, (NSR), identified as a distance of 5m to the adjacent 4-storey multi-residential building at 24 Charles Street.

ANL limits were calculated on the basis of percentage commercial (C) land use and presence of local road transport infrastructure within 100m and 450m radii surrounding the nearest off-site noise sensitive receiver (NSR), and are applicable to all noise emissions emanating from the new development. Guidance for anticipated mechanical noise systems and ancillary noise sources as part of building operation are provided. Sealhurst recommend these systems and any other noise emissions sources be assessed in more detail as design progresses to ensure the building is able to comply with the limits.

CONSTRUCTION NOISE & VIBRATION

Finally, in anticipation of potential demolition and forward works on the site, Sealhurst have provided summary notes in Section 9.3.3 and Appendix F.1 regarding management of noise and vibration during construction phase, to serve as preliminary guidance in terms of noise emissions during these phases. Control strategies and potential mitigation are presented for project reference and as a basis for any construction noise and vibration management plan which Council may request as the project design matures to construction phase.

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1 INTRODUCTION

1.1 General Appreciation

Sealhurst were appointed by Stirling Capital Pty Ltd to provide acoustic design, coordination and consultancy relating to the design for a new 9-storey multi-residential/commercial building, proposed as a redevelopment of the existing site(s) at 26-28A Charles Street in SOUTH PERTH, Western Australia.

The proposed development will consist of a combination of 28 residential apartments, three floors of dedicated commercial office space, a mixed use Ground Floor of an individual commercial tenancy and car park spaces, and integrated car parking facility on Level 1. The building is composed over 9 identified Levels (Ground –Eighth Floor), around a central lift and stairwell core, with resident access at street level via shared commercial/residential lobby.

This formal report presents our design review and acoustic advice in response to City of South Perth request for acoustic input to the Development Approval application.

1.1.1 Acoustic Design Criteria

The project is seeking Development Approval, and requires demonstration of compliance against a range of statutory acoustic and noise control criteria which forms a framework of assessment against which the development must be shown to achieve in order to proceed.

The cumulative requirements contained within the acoustic design framework are drawn from an overarching and integrated set of existing Australian Standards and Legislation to provide residential accommodation and commercial space(s) able to attain minimum acoustic standards across the following design elements:

Internal separating construction between apartments, concealed building services and other types of adjacent spaces:

- The design and the as-constructed **MULTI-RESIDENTIAL** built form (separating walls and floors) must comply with the minimum performance *Provisions* of *Section F5* of the *National Code of Construction* (*NCC*, formerly *BCA*) regarding sound transmission and insulation;
- Building services which pass adjacent to the **MULTI-RESIDENTIAL** areas of the building must be treated in accordance with the minimum services isolation treatments defined in *Section F5* of the *National Code of Construction* (*NCC,* formerly *BCA*) regarding sound transmission and insulation;

Acoustic performance of the building envelope and of (internal) building services noise:

- All elements of the external building envelope(s) must provide sufficient resistance to the ingress of external noise to meet criteria for internal design sound levels prescribed in *AS2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors*;
- Building services noise levels must meet internal design sound levels prescribed in *AS2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors*;

And, control of any new sources of noise emission introduced by the development's construction:

- Any identified noise emissions introduced by the new development's construction to the surrounding area must comply with noise emissions limits as calculated under the *Environmental Protection (Noise) Regulations 1997 (inc amendments).*

The combined contained therein aims to guide the development and construction of urban environments to provide spaces that are functional and able to respond to the changing needs of the community, the economy, and the environment.

1.1.2 Report Aims

The primary aim of our report is to demonstrate the design is able to be compliant, or alternatively provide detail advice to achieve compliance with the relevant acoustic standards and criteria applicable to the proposed development.

Our report will achieve this by presenting a technical assessment of each applicable element of the project via detailed site appraisal and available concept design information. Each design element is identified against the applicable design requirement, and compliance (or guidance advice) is presented.

The format of the report is set out in sections which present the criteria and current design status of building elements' compliance.

It is intended that our report will comprise one part of a revised submission of cross-disciplinary documentation, pursuant to an application for Development Approval, such that the project is able to proceed to detailed design.

1.2 Project Inputs

1.2.1 Schedule of Architectural Drawings

The assessment has been carried out based upon the latest available architectural drawings supplied by McDonald Jones Architects.

Design compliance, and advice contained in this report to achieve compliance (where required) is based upon this set of documentation - a full list of these drawings are presented in Appendix A.1. Details are current at the date of this report (22 JAN 2016).

1.2.2 Schedule of Consultant Drawings

As the project progresses, the design must also necessarily consider Structural, Mechanical, Electrical and Hydraulic elements in order to demonstrate and thus achieve all elements of the identified acoustic criteria.

Design compliance and advice contained in this report to achieve compliance (where required) is based upon available documentation at the time of assessment. A schedule of the information and drawings used in this assessment are presented in Appendix **Error! Reference source not found.**. Details are current at the date of this report (22 JAN 2016).

2 PROJECT CONTEXT

2.1 Development Definition

2.1.1 Proposed Development Site: 28 – 28A Charles Street, SOUTH PERTH

The project seeks to amalgamate 3 adjacent Lots (156, 157 and 158) into a single site, allowing the development to proceed under a single Lot title. At the time of our site assessment, the proposed site(s) were occupied two separate brick and tile buildings, with landscaped areas to street frontage. The collective site(s) are located 80m from the Labouchere Road junction at the eastern extent of Charles St. Kwinana Freeway road reserve is located some 215m west of the site, beyond Melville Parade.

The new development is to present a residential/commercial mixed-use building, composed over 9 identified Levels (Ground to Eighth Floor) with uses split between premium residential apartments (Fifth to Eighth Floors), commercial office space (Second to Fourth Floors), an individual commercial Ground Floor space activating existing street frontage, and an integrated car parking facility on Ground and Level 1.

The project DA design render drawings (above-right), shows the proposed street frontage on Charles Street. Aerial maps show the location of the development relative to the Swan River and Perth CBD.

2.1.2 Site Location and Surrounds

The project site is located in the established suburb of South Perth, areas of which are currently undergoing significant redevelopment with a series of multi-residential and mixed use commercial/multi-residential buildings and amenities recently completed or under construction.

Central to the acoustic design will be the assessment of road traffic noise contributions from Labouchere Road to the east, and from Kwinana Freeway, as a primary State distributor route and major road, carrying in excess of 100,000 vehicles per day.

Elsewhere in the vicinity, the surrounding buildings and amenities are a mix of commercial uses, converted residential dwellings used as offices and consulting rooms, and small coffee/café operations. Perth Zoo is located immediately across Labouchere Road, and beyond this to the north-east lies the popular Mends Street café strip and Windsor Hotel.

With the current selection of new developments and associated amenities underway, the local environment will provide a vibrant mix of commercial, entertainment, and noise sensitive uses. These close relationships will allow provision of a high quality mixed use development project - through appropriate acoustic design of the building, façade, operations and the building's response to its environment.

3 EVALUATION OF LOCAL ENVIRONMENT

3.1 Existing Local Noise Climate

3.1.1 Summary of Relevant Noise Sources

An extended period of unattended noise monitoring was undertaken in order to comprehensively quantify the level and range of existing noise sources present at the Charles St location, at all times of the day, evening and night.

As is evident from images taken during periods of attended noise monitoring survey periods, adjacent blocks on Charles Street are currently undergoing development with various construction process' active during the monitoring period.

Road traffic composition on principal nearby roads at the east and west ends of Charles Street were observed as private vehicles, light commercial, trucks and HGV commercial vehicles, and public buses passing on both Labouchere Road and Kwinana Freeway. However, Contributions from Kwinana Freeway and Labouchere Road at ground level were present as residual noise level only, due to attenuation distances of 215m and 80m respectively, and significant screening from existing buildings. In the absence of construction noise, calculated road traffic noise levels have been assessed as ~55 – 57 dB(A) during day time hours despite both roads carriage of a high density of vehicular traffic.

Analysis of recorded noise levels show a consistent rise in noise levels around 5am daily, associated with birdsong, morning commencement of road traffic and local activities. During attended survey periods, peak noise sources (L_{AMAX}) were identified above the general level pertaining to incidental construction noise at the nearby Zone Q development site, street cleaning vehicles, police sirens, passing motorcycles and 8-cylinder vehicles, and incidental pedestrian activities.

Audio recordings were set to trigger when a sound pressure level of 65 dB(A) occurred – most audio recordings were from incidental construction noise, road traffic pass-bys and one instance of thunder, though with no accompanying precipitation .

Construction noise was the principal noise source, however the general ambient levels were below 60 dB(A) for the entire period. Truck deliveries and occasional impact sounds generated recorded L_{AMAX} levels of ~80 dB(A), with consequent short periods of L_{AEQ} over 60 dB(A) as an exception to the otherwise benign external noise environment.

A set of more detailed noise survey notes is presented in Section **Error! Reference source not found.**.

3.2 Existing Environmental Noise Assessment

3.2.1 Designing for Noise Ingress

To deliver a building design able to respond to an existing or future-defined acoustic environment, reliable sound level data is crucial information, particularly in relation to noise-sensitive building uses, whereby noise ingress is a design parameter. Reliable sound data allows informed decisions to be made regarding building facade materials which will influence both project cost, and ultimately the internal acoustics of the finished space as a result of external noise climate in which the finished development will inhabit.

In order to make acoustically-compliant and cost-effective design decisions to satisfy internal noise level criteria, the building façade, (specifically building envelope materials selections), must consider and ensure appropriate acoustic ratings for walls, glazing units and ventilation openings within the primary building envelope construction. These decisions allow the building to successfully engage with the identified local environmental noise sources whilst retaining the required internal noise amenity in residential apartments, Ground Floor commercial tenancy unit and 2nd to 4th Floor commercial office space(s) from external noise.

Our approach to satisfy *AS2107:2000* internal design sound level criteria is to use a detailed determination of reliable sound data, obtained during our detailed noise survey of the area. The process was undertaken specifically to address this requirement and to accurately assess the development in terms of external noise. Noise survey analysis offers a practical relevance to any building facade design options, and provides an objective baseline which can be very useful as a strategy to demonstrate the project has been responsibly designed.

Survey data can also provide useful project information in terms of noise emissions from the development (noise egress), for example plant room ventilation grilles and exhaust fan outlets to atmosphere, which serve the building. This is of particular importance in this instance, as background external noise levels are low, implying minimal impact upon building envelope, though potentially increased audibility of "new" noise sources (e.g. AC condensers, KEF systems). These findings are addressed in Sections 4.2.5 and 9.2 respectively.

3.2.2 Measurement Equipment Details

Attended and logged measurements were recorded using a Norsonic Nor140 Type 1 Sound Level Meter. The meter complies with all relevant specification standards for Type 1 integrating sound measurement equipment and was within a valid laboratory-calibration period at the time of survey. The meter also satisfies all relevant and applicable Australian Standards for acoustic measurement devices, including Schedule 4 clauses contained within the *Environmental Protection (Noise) Regulations 1997 (inc. amendments).*

The meter was field-calibrated before and after the measurement series, which consisted of continuous data logging with synchronised measurements stored in 5 minute intervals. All measurements were taken in accordance with the relevant guidance in *AS1055.1-1997: Acoustics – Description and Measurement of Environmental Noise, Part 1: General Procedures.*

Details of the measurement equipment are presented below:

Equipment Type/Model	Serial No.	Calibration Cert. No.	Last Calibration Date
Norsonic Nor140	1406036	473692023	2014-08-14
Norsonic Nor 1251	34172	CAL 022-2014-4735	2014-08-14

Calibration certificates of this equipment are included in Appendix E of this report.

3.2.3 Noise Survey Details

Sealhurst established a noise monitoring position at the development site from 18th – 21st January 2016 to undertake a baseline noise survey analysis via 24-hour continuous data logging. Sound pressure levels and detailed spectral and time resolution data were obtained for consecutive 5 minute periods, complete with audio recordings of significant noise events occurring during the survey period. Significant noise events were defined as attributable to incidental local sound pressure levels above 65 dB(A).

Collected data was then analysed to determine an objective design case data set for assessment of the building facade and hence proof the currently proposed building materials and glazing in terms of design compliance with *AS2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors.*

3.2.4 Noise Survey - Measurement Locations

The noise monitoring station was established at a height of approx. 1.5m above ground level on a landscaped area in front of the existing property at 26 Charles St. This location was deemed to be representative of noise level and character which will ultimately be incident upon the residential building façade on Charles Street – considered the most exposed façade in terms of existing noise.

Data was recorded over day, evening and night time periods as documented in this report. Noise measurement (locations are shown orange) in relation to the development site (red) plan below, with survey notes reported in Section 3.3.

3.3 Detailed Noise Survey Notes

3.3.1 Prevailing Meteorological Conditions

Meteorological conditions were stable throughout the week, with light (<10km/h) to moderate (10-20km/h) winds during day time measurements. One instance of thunder was recorded though with no accompanying precipitation. Night time conditions were relatively calm. No significant precipitation was recorded during the measurement interval.

3.3.2 Day Time Sources (0700 - 1900)

The general ambient noise climate at Charles Street can be described as benign – noise levels were typically between 55 – 60 dB(A) during day time, despite proximity to Major road transport infrastructure. The primary noise source observed and recorded during the site survey was incidental construction noise from the nearby Zone Q high rise development, at the junction of Charles St and Labouchere Road. Incidental peaks were recorded at 70 - 80 dB(A) – under post analysis of audio recordings, delivery trucks, truck manoeuvrings, impact hand tools were attributed.

A consistent fall in level occurs each day, after 18:00 hours through to evening hours, attributable to cessation of construction noise and receding of road traffic flow(s) – this is demonstrated in graphical analysis on the following pages. Other incidental sound energy received at ground level included one instance of thunder clap, and a passing police siren.

3.3.3 Evening Sources (1900 - 2200)

General noise levels consistently recede to approximately 50 dB(A) around 18:30pm daily, into evening periods and just prior to 2200 hours ambient noise levels were of the order of 45 dB(A) at the measurement location. Incidental bus, motorcycle and vehicle pass-bys were the most significant audible noise source during evening periods, with a single distant aircraft flyover event noted.

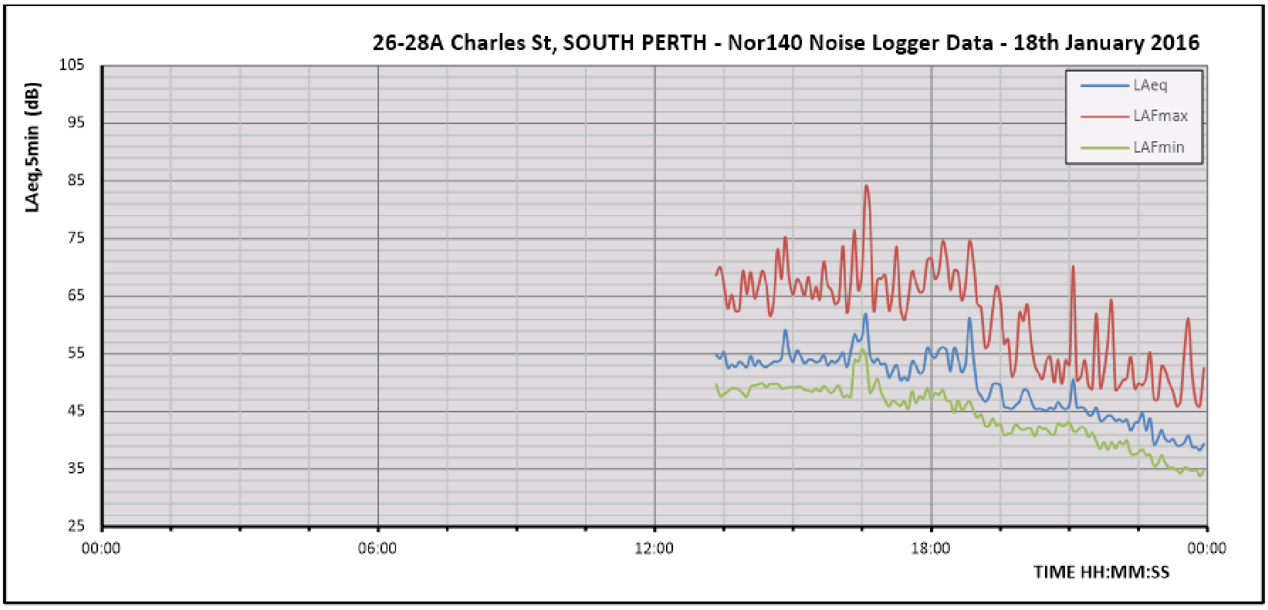
3.3.4 Night Time Sources (2200 - 0700)

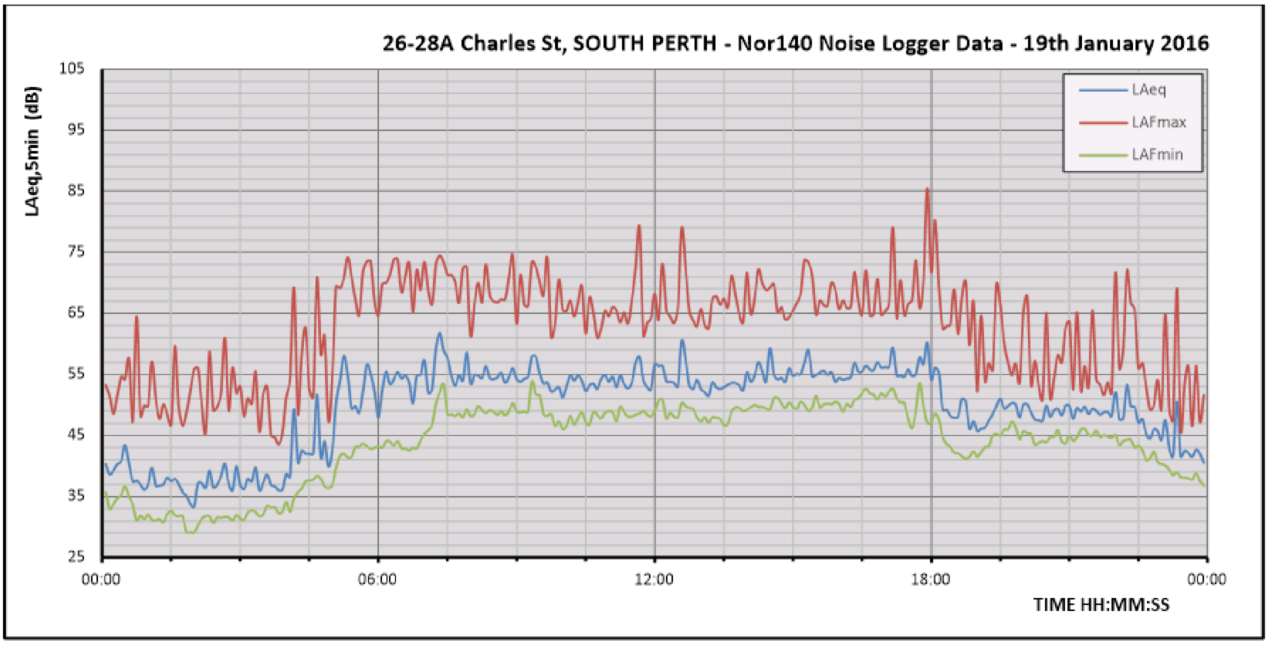
During the night time period noise levels ranged from as low as 35 dB(A) to 55 dB(A) at the commencement of daily activities at 5am, which falls into night time noise category. Sound levels were almost entirely due to environmental sound (wind noise) with infrequent vehicle pass-bys and birdsong identified attributed to identified incidental “peaks” in the graphical analysis.

3.4 Design Sound Level Data

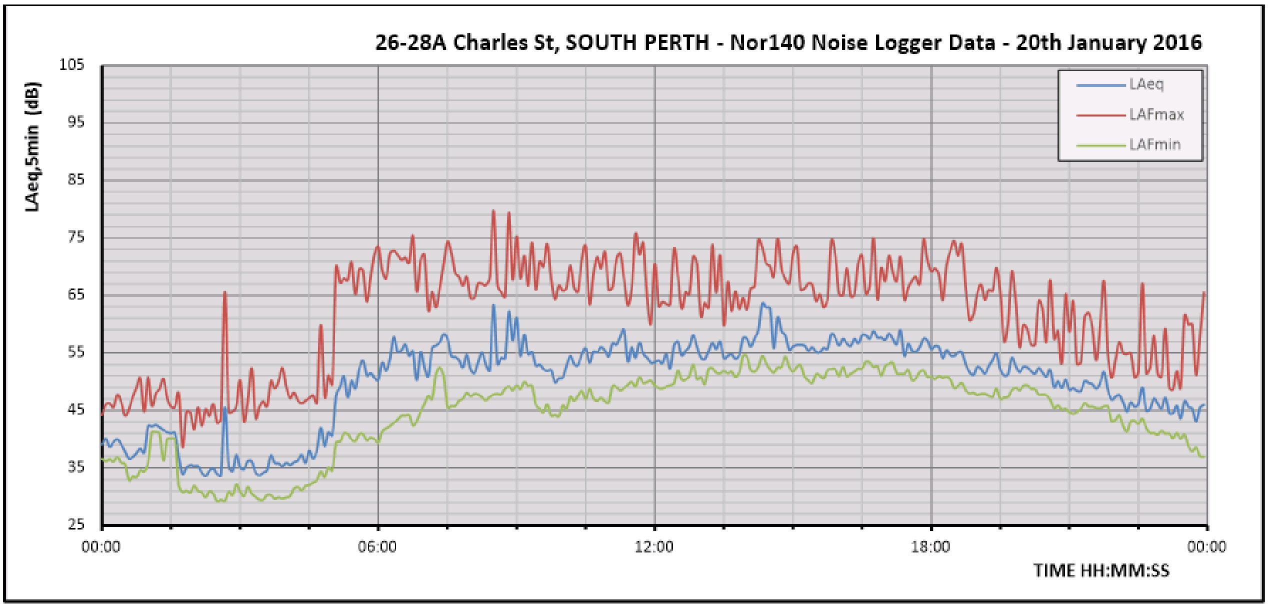
3.4.1 Logged Measurements

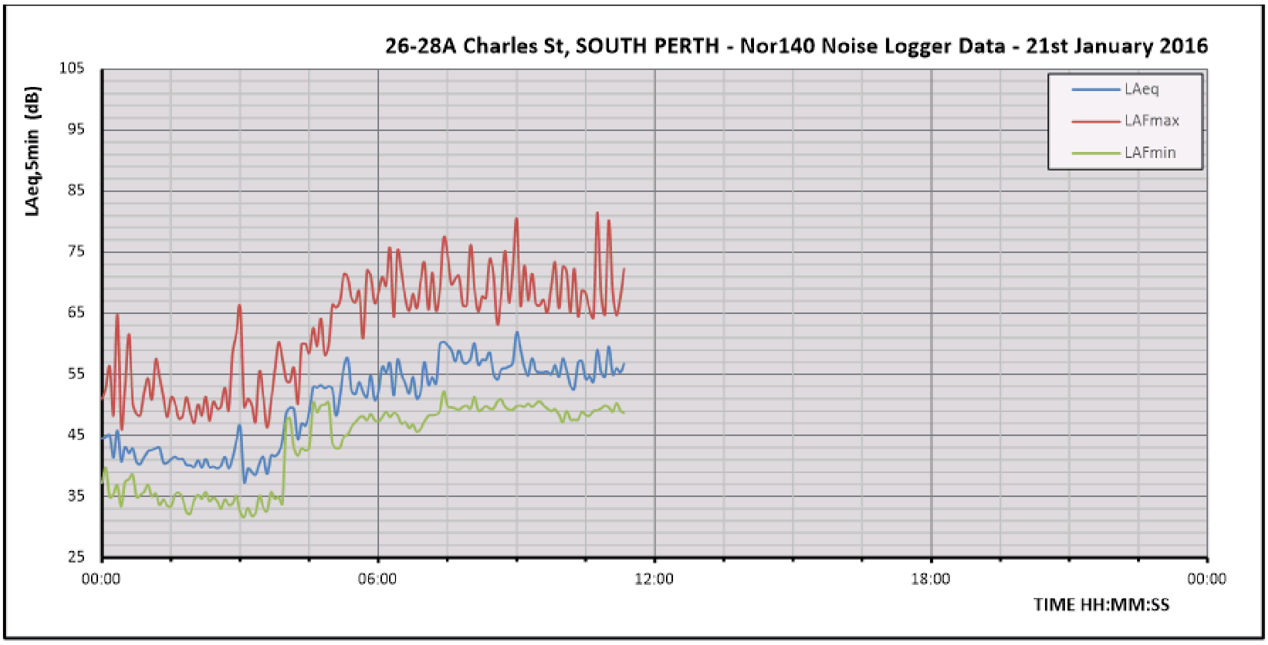
The consecutive logged data periods were recorded over the course of the week, to provide a representative noise climate for assessment of external noise ingress. The following graphical representation plots external L_{Aeq}, L_{AMAX} and L_{AMIN} noise levels, providing an overview of the existing noise environment at the proposed development site.





3 EVALUATION OF LOCAL ENVIRONMENT





L_{Aeq} (dB) noise levels are used for assessment of internal design criteria, shown blue, representing the equivalent sound energy recorded in each successive period – the L_{Aeq} is a measure of general activity noise level recorded at the building façade location throughout the day. As mentioned in the above survey notes, the increase in traffic from the early morning is clearly evident on the graph.

L_{AMAX} (dB) noise levels report the loudest sound recorded during each consecutive 5 minute period. The L_{AMAX} trace is shown red, and peaks are attributable to sound pressure from the passing of incidental louder vehicles, sirens, occasional pedestrian activity and the like.

L_{AMIN} (dB) noise levels report the lowest noise levels recorded during each measurement period, hence between the three traces we can visualise the typical acoustic environment at the development site. The L_{AMIN} trace closely resembles the L_{Aeq} trace, indicating a consistent noise environment.

3.4.2 External Noise – Summary Average Design Sound Level Data

The table below presents continuous measurements taken over the course of the survey period as energy or statistically averaged single figure values (as appropriate) across day, evening and night time periods respectively, to generate reference levels for assessment of building facade and surrounding environment. Equivalent (L_{Aeq}), Maximum (L_{Amax}) and Minimum (L_{Amin}) and statistical noise indices L_{A1}, L_{A10} and L_{A90} sound level data is presented to offer an overview of the local acoustic environment.

A summary of this broadband design sound level data is presented below.

Measurement Location	Period	$L_{Aeq,T}$ (dB)	L_{A1} (dB)	L_{A10} (dB)	L_{A90} (dB)	L_{AFmax} (dB)
26 – 28A Charles St, SOUTH PERTH (Charles St Facade)	Day time (0700-1900 hrs)	55.9	63.8	56.6	51	85.5
	Evening Time (1900-2200 hrs)	49.4	54.5	49.9	46.2	71.7
	Night time (2200-0700 hrs)	48.6	50.9	45.4	39.4	55.8

NOTES:

$L_{Aeq,T}$ (dB) is the equivalent noise level that is the summation of noise events and integrated over the measurement period (T).
L_{AF1} (dB) is the statistical index that describes the sound pressure level which was exceeded for 1% of the overall measurement period,
L_{AF10} (dB) is the statistical index that describes the sound pressure level which was exceeded for 10% of the overall measurement period.
L_{AF90} (dB) is the statistical index that describes the sound pressure level which was exceeded for 90% of the overall measurement period, L_{A90} is also referred to as background or residual noise.
L_{AFMAX} (dB) is the maximum sound pressure level measured during the measurement period.

Measurements were recorded at a location representative of the eventual building façade, with frontage to Charles St. Spectral data pertaining to design sound levels for building interiors have not been adjusted for distance propagation, outside of corrections present in the noise ingress calculation methodology (Appendix C.1).

Subjectively, 26 – 28A Charles St presents a low noise site. The project is advised that noise levels were typically low, which implies:

(i) impact to façade design (and any specialist acoustic performance/glazing thereof) will be minimal in terms of glazing acoustic (Rw) ratings, with standard 6.38mm laminate or float glass expected to be sufficient to attain internal design sound levels; And,

(ii) the converse of quiet background noise levels is the sensitivity to "new" noise sources introduced as part of the development – as well as demonstrating statutory compliance with EPA *Regulations'* noise emissions limits (See Section 9.1.5), where possible, any new AC condenser units, kitchen exhaust fans (KEF) and/or related building plant should be selected to run at appropriate sound pressure levels, equal to or lower than that of recorded background noise where practicable.

4 ACOUSTIC DESIGN FOR EXTERNAL NOISE

4.1 Applicable Criteria

4.1.1 AS 2107:2000 Acoustics - Design Sound Levels [...] for Building Interiors

AS 2107:2000 presents the applicable Australian Standard for sound in building interiors, and defines internal noise levels which are deemed acceptable and suitable for a range of spaces within completed buildings. Compliance is derived by comparison of predicted internal sound levels against *AS 2107:2000* criteria. An allowance is made for building services noise within the predicted compliance ratings for contributions from both external noise ingress AND with building services systems operating.

Calculations are then optimised using known façade material properties to determine a result able to meet the *AS 2107:2000* standard for internal areas. Any improvement (i.e. upgrade to Rw rating) above the minimum specified façade material Rw performance(s) thereupon would equate to quieter internal noise levels within the subject internal area(s), and hence an improved (quieter) acoustic amenity for eventual occupants.

An extract from *AS 2107:2000* is presented below for residential criteria - two levels of internal noise are outlined for typical internal spaces, with bedrooms the most sensitive; A '*Satisfactory*' level represents the design target level, while the '*Maximum*', level represents the highest permissible internal noise level for design compliance. As the development site is located within 300m of Kwinan Freeway, design sound levels for apartments "near major roads" are applicable:

4.1.2 Residential Design Criteria – AS 2107:2000

Type of Occupancy	Recommended design sound level, LAeq, (dB(A))		Recommended reverberation time (T), s
	Satisfactory	Maximum	
RESIDENTIAL BUILDINGS			
Houses in areas with negligible transportation - Sleeping areas	25	30	-
Houses and apartments near minor roads -			
Living areas	30	40	-
Sleeping areas	30	35	-
Work areas	35	40	-
Apartment common areas (e.g. foyer, lift lobby)	45	55	See Note 3
Houses and apartments near major roads -			
Living areas	35	45	-
Sleeping areas	30	40	-
Work areas	35	45	-
Apartment common areas (e.g. foyer, lift lobby)	45	55	See Note 3

Particular note must be taken of *AS 2107:2000* regards bedrooms, which states that sleeping areas must be assessed (i.e. internal noise levels calculated) using noise data measured during the night time hours of 2200-0700.

4.1.3 Adopted Residential Criteria for 26 – 28A Charles St

Clause 5.2 of *AS2107:2000*, applicable to residential buildings states:

> *"The design sound levels given in the Residential Criteria Table are not necessarily appropriate in all circumstances. In particular, lower noise levels may be appropriate in quiet environments or where expectations of quality are high. For example, lower design sound levels than those given as "Satisfactory" may be preferred for luxury hotels and apartments."*

The design advice and recommendations presented in our report are calculated to meet the minimum acceptable criteria as the basis for demonstrating design compliance. It should be noted that achieving higher levels of external sound attenuation can incur additional costs WITHOUT an in-depth analysis of the overall design and how to optimise the prevailing circumstances, including building services.

Sealhurst's approach is to offer a balance of the most cost-effective solutions to attain the minimum required outcomes within the known constraints, and delivering an acoustical design able to retain its integrity in the finished space. Advice is provided on possible optimisations, and risks associated with material substitutions. The final selection of materials will therefore be an informed choice by the client, based upon a cost-versus-performance analysis of building facade materials.

4.2 Compliance Calculation Methodology

Having quantified the baseline external noise climate, the building facade performance may be calculated to respond to the particular noise sources which impinge upon the new building. This is achieved by matching appropriate sound-rated components to measured external noise level data (including spectral content), allowing the proposed facade construction(s) to be assessed against *AS2107:2000* design targets. Where capacity is identified, material selections can then be optimised to achieve the best cost outcome whilst preserving internal noise amenity.

4.2.1 Elemental Sound Reduction Index (R) Data

Sound reduction index data for individual building elements is available from a number of sources, most commonly from laboratory-measured data or technical product information direct from manufacturers and from reputable technical literature. Field-measured data can also be used.

Data is given in the form of a sound reduction index value "R_i" (dB) for each octave band centre frequency over the range 125Hz-4kHz, along with a weighted single-figure rating value R_w (dB). Sealhurst maintain a large volume of sound reduction index data for common and specialist building elements, construction types and finishes to allow the calculation and facade optimisation process.

It should be noted that all sound reduction index data quoted as R_w is referenced to standard test panel sizes, which are typically of a minimum of 10m^2 for wall constructions, and 2.4m^2 for glazing panels. Building façade elements with increasingly larger surface areas may suffer from a decrease in sound transmission loss performance, specifically at low frequency due to wave based phenomena, and therefore a higher specification may apply to achieve internal design sound levels.

4.2.2 Composite Sound Reduction Index

Design assessment is by means of a composite sound reduction index (SRI) calculation, which examines the building envelope at specific noise-sensitive points, for example a noise-receiving bedroom, and calculates sound transmission through the building envelope, bounded at the limits of the subject internal space.

The Sound Reduction Index (R_w) performance characteristics of each individual façade element (and any known penetrations) are summed together in octave bands (63Hz-4kHz), and mathematically weighted according to their relative 'elemental' façade area. The resultant figure is the composite sound reduction index (R_w) performance of the building façade and is typically dictated by the 'weakest' element of the construction, which in many cases can be glazing, ventilation louvers or other building penetrations.

Once the composite performance is calculated, representative noise spectra obtained during our site noise survey is applied to the composite building facade performance to optimise the building facade materials, identifying the minimum and/or best cost-versus-performance parameters to apply to the building in terms of the specification of the building facade's glazed elements.

A more complete description of the calculation and reference standards are included in Appendix C.1 of this report.

4.2.3 Sound Reduction Index Data of Proposed Building Façade Elements

Preferred construction methodology is understood to be of a primary reinforced concrete core structure and concrete panel/infill concrete (e.g. AFS/Ritek type system) envelope walls. Appropriately engineered concrete panel/infill concrete, lightweight infill, masonry or masonry veneer walls can offer significant acoustic resistance to sound ingress, therefore a number of structural and non-structural infill wall options are available, to be integrated with areas of glazed façade element which will form the building envelope.

Glazed elements in any building are an essential part of façade design, however glazing pane and frame combinations are typically less acoustically robust than typical surrounding building façade wall construction. Logically, the (acoustic) performance of the overall facade design and consequent internal noise amenity is therefore dependent upon the selection of appropriate glazing, frame and installation detailing.

In this project the specification of glazing acoustic performance and subsequent integration detailing between building façade walls and glazing frame and sub-frame elements will be critical in achieving the required resistance to the ingress of external noise to meet *AS2107:2000* internal sound level design criteria.

4.2.4 Implications of Measured Survey Data

There are obvious cost implications for the choice of glazing option, plus additional considerations regards coordinating an appropriate (acoustic) selection with energy/ESD and architectural preferences. The table below presents sound reduction index (Rw) data for potential façade glazing construction elements, which may be included in the building design to control noise ingress:

Glazed Element	Sound Reduction Index (R_i)						
	R_w (dB)	Octave Band Centre Frequency (Hz)					
		125	250	500	1000	2000	4000
Standard Glazing							
6mm standard float glass	**32**	20	24	31	35	29	36
Laminate Glazing							
6.38mm laminate glazing	**33**	20	24	31	35	33	38
8.38mm laminate glazing	**34**	23	27	32	34	35	43
10.38mm laminate glazing	**36**	26	27	33	36	38	46

Glazed Element	Sound Reduction Index (R_i)						
	R_w (dB)	Octave Band Centre Frequency (Hz)					
		125	250	500	1000	2000	4000
Specialist Acoustic Laminate Glazing							
6.5mm VLAM Hush acoustic laminate	**36**	23	27	32	37	39	39
8.5mm VLAM Hush acoustic laminate	**37**	24	30	34	39	40	42
10.5mm VLAM Hush acoustic laminate	**39**	27	31	36	40	40	47
Typical Double Glazed Units							
6mm/12mm/6mm double glazed unit	**32**	26	18	29	39	34	47
10mm/12mm/6mm double glazed unit	**36**	27	29	34	41	37	47

4.2.5 Recommended Minimum Glazing Performance (Rw) Specification

The project is advised that the consistently relatively low existing noise levels represent a low impact external noise environment. The resulting effect upon façade design for minimum glazing acoustic (Rw) performance is low – our calculations predict standard format single glazing, rated between 32 – 34 dB (considered equivalent to 6.38mm – 8.38mm laminate) will be sufficient to achieve internal design sound levels.

Lower (quieter) internal levels can be obtained at the client's discretion, typically through the specification of higher performance (Rw) rated glazing and acoustically treated ventilation openings.

4.3 Predicted Internal Noise Levels – Residential Spaces

4.3.1 Assessment of Recommended Glazing Specification – Predicted Internal Noise Levels

The following table details minimum R_w rating and example glazing formats REQUIRED to achieve *AS 2107:2000* design sound level compliance from existing external noise sources:

Internal Area	*AS2107:2000* Design Criteria		Glazing Format	
Apartment Unit	LAeq (dB(A))		Min. R_w (dB) (Equivalent System)	Predicted Internal Level
	Satisfactory	Maximum		
Apartment – BEDROOMS All Floors	30	40	Rw 32 (6 mm float)	**< 30.0 dB(A)**
APT 1 (3x2) – LIVING/KITCHEN/DINING All Floors	35	45	Rw 32 (6 mm float)	**41.2 dB(A)**
APT 4 (2x1) – LIVING/KITCHEN/DINING All Floors	35	45	Rw 32 (6 mm float)	**39.6 dB(A)**
APT 6 (1x1) – LIVING/KITCHEN/DINING All Floors	35	45	Rw 32 (6 mm float)	**36.4 dB(A)**

4.3.2 Glazing Specification Performance – Value/Cost Control Assessment

A series of cost-control versus performance design iterations have been investigated, to offer cost/value control decisions to the client/project. Based on results from our detailed noise survey, the minimum glazing performances to meet *AS2107/2000* internal noise criteria are 6mm float glass throughout.

This presents a cost-effective glazing solution to meet AS2107:2000 criteria, however by giving consideration that the glazing is full height and has operable elements, some degradation should be anticipated. Strategies key to minimising potential internal noise level "Creep" would be:

- ensuring effective compressible seals to all jambs and double brush seal to threshold are installed;
- upgrading to 8mm or 10mm glazing in 3 bed apartments with fully glazed facades.

The data within the table above is a representative selection of room types and locations.

Glazing specifications must be correlated with wind load, ESD/energy requirements and integrated into architectural window (and door) schedules during documentation to ensure a fully coordinated building design solution.

4.4 Predicted Internal Noise levels – Commercial Spaces

4.4.1 Commercial Design Criteria – AS 2107:2000

As with residential space(s), *AS2107:2000* prescribes internal design sound levels for commercial space. A selection of commercial spaces, likely to be applicable to this project are presented in the table below:

Type of Occupancy	Recommended design sound level, L_{AEQ}, (dB(A))		Recommended reverberation time (T), s
	Satisfactory	Maximum	
OFFICE BUILDINGS			
Board and conference rooms	30	30	0.6 - 0.8
Computer rooms	45	50	*See Note 3*
Corridors and lobbies	45	50	0.4 - 0.6
Design offices	40	45	0.4 - 0.6
Drafting offices	40	50	0.4 - 0.6
General office areas	40	45	0.4 - 0.6
Private offices	35	40	0.6 - 0.8
Public Spaces	40	50	0.5 - 1.0
Reception areas	40	45	*See Note 3*
Rest room and tea rooms	40	45	0.4 - 0.6
Toilets	50	55	-
Undercover car parks	55	65	-
PUBLIC BUILDINGS			
Restaurants and cafeterias -			
Cafeterias and food courts	45	55	*See Note 3*
Coffee bars	45	50	<1.0
Restaurants	45	50	<1.0

4.4.2 Internal Noise Levels from Existing External Noise Survey Levels

The following table details minimum R_w rating and example glazing format for the glazed façade wall and door set REQUIRED to achieve *AS2107:2000* design sound level compliance from existing external noise sources:

Internal Area	*AS2107:2000* Design Criteria		Glazing Format	
Commercial Unit	LAeq (dB(A)) Satisfactory	LAeq (dB(A)) Maximum	Min. R_w (dB) (Equivalent System)	Predicted Internal Level
Commercial Tenancy Floor (1268m^2) Carpet Floors and Ceiling Tiles	40	45	R_w32dB (6mm float glass)	**39.1dB**
Commercial Tenancy Floor (762m^2) Carpet Floors and Ceiling Tiles	40	45	R_w32dB (6mm float glass)	**39.4dB**
Commercial Tenancy (500m^2) Carpet Floors and Ceiling Tiles	40	45	R_w32dB (6mm float glass	**41.0dB**
Commercial Tenancy Unit (160m^2) Carpet Floor and Ceiling Tiles	40	45	R_w32dB (6mm float glass)	**38.8dB**

4.4.3 Glazing Specification Performance

The Ground Floor commercial unit has been assessed as "General Office" space under *AS2107:2000* classification, using internal finishes of 50% carpeted floor area and 50% tiled floor area. Internal noise level has been predicted during day time noise conditions, and with doors closed. Predicted internal noise levels have been calculated for both office grade carpeted finish and hard floor finishes, with mineral fibre tiles to ceilings.

On this basis, internal criteria may be met using R_w32dB glazing (equivalent to a 6mm float glazed pane). Public safety and security requirements may imply greater thickness of glazing to commercial tenancies, which would improve R_w and hence no detriment to acoustics would be incurred.

4.5 Building Envelope Design Considerations

4.5.1 Notes on Glazing Installation

The determination of laboratory data (R_w) for standard glazing elements includes the performance of the frame. For a large group of glazing elements, particularly domestic glazing and non-specialist applications with R_w ratings below 37dB, the sound transmission of the window frame can be considered as equal to that of the glazing panel, (assuming adequate seals) except in the case of sliding window arrangements, which exhibit significantly lower R_w performance ratings due to poor sealing around the sliding mechanism at the frame perimeter.

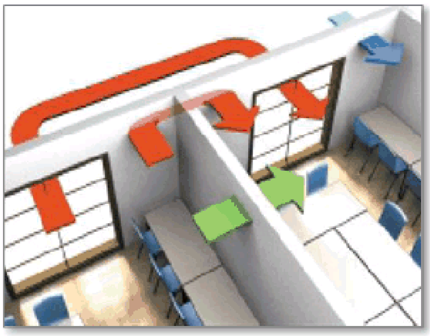
In order to maintain the predicted acoustic amenity, all operable windows must be fitted with good quality seals to minimize transmission of noise through the facade. Very small air gaps can be severely detrimental to the aggregate window/façade performance, resulting in non-compliant internal noise levels.

Special attention must be taken during installation of any sliding door set to ensure they are well fitted with a robust closing mechanism to avoid introducing acoustically weak transmission paths for noise to enter through the façade. Balcony door sets and frames must be supplemented with compressible neoprene seals at both jambs, and a continuous double brush seal at the threshold and head to minimise transmission of noise into living areas.

At the junction between the window sub-frame (cavity masonry aperture) and glazing frame proper, **ALL** voids must be fully sealed, or the full extent of the sound transmission performance will not be realised. Any voids between concrete and frame must be packed with fibreglass insulation and fully sealed with dense mastic.

4.5.2 Flanking Transmission

Certain types of construction such as architectural cladding systems, cavity block work and particular lightweight constructions are susceptible to the excess ingress of noise through poor junction detailing and voids between sound attenuating elements, known as **flanking transmission paths**.



The preferred building methodology for this project is understood to be composed of concrete and glazed wall elements in a composite system, and is considered to be able to provide robust resistance to the passage of sound when fully sealed and properly detailed during construction.

In order to ensure that this performance is not compromised at junctions with building penetrations, and at junctions with external cladding elements, the following measures must be taken:

- Junction detailing at window frames are stuffed with glass wool insulation off cuts and sealed with a dense mastic bead of minimum depth 10mm;
- ALL voids between building penetrations and wall systems must be packed/stuffed glass wool insulation off cuts and sealed with a dense mastic bead of minimum depth 10mm;
- Where external wall elements meet perpendicular internal and party walls, all voids/gaps must be packed/stuffed glass wool insulation off cuts and sealed with a dense mastic bead of minimum depth 10mm;
- Any structural movement joints are to be fully sealed with a flexible sealant.

It is anticipated that there will be no degradation of acoustic performance of the facade at wall/floor slab junctions.

4.5.3 Notes for Glazing Schedule and Drawings

Sealhurst recommend the project architect annotate building plans with the following notes regarding glazed elements installation notes to allow the builder to follow the necessary detailing.

Installing Contractor to Ensure:

1. Chosen glazing/frame combination can achieve minimum acoustic R_w rating(s);
2. All operable windows to be fitted with good quality seals, with no air gaps;
3. All glazed door sets be fitted with compressible neoprene seals at both jambs, and a continuous double brush seal at the threshold and head; and
4. All voids between cavity masonry and glazing sub-frame must be packed with dense fibreglass insulation and fully sealed with dense mastic.

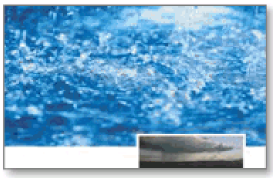
Failure to correctly install and seal glazed elements, in particular glazed sliding door sets is likely to weaken the building façade design sound resistance such that it cannot achieve the specified performance, and as a result *AS2107:2000* internal design sound levels may not be met in the completed building.

4.5.4 Ventilation Openings

In some instances, ventilation grilles exhausting air to atmosphere create paths for external noise to enter the building which can negate the engineered glazing/façade wall performance if not appropriately considered during design. Ventilation openings should be located away from sensitive spaces where practicable. Where ventilation openings enter bedrooms or living spaces, internal ductwork linings, acoustically absorptive baffles or attenuating louver grilles may be used to ensure the building faced retains its design resistance to noise ingress.

4.6 Roof Construction

4.6.1 Mitigation of Rain Noise



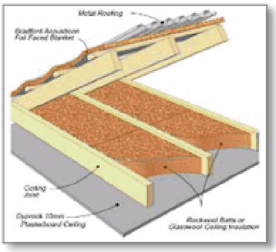
The roof and ceiling construction(s) are yet to be confirmed. A common issue with lightweight profile steel roof sheeting systems over framing is the acoustic response to excitation from falling rain.

Droplets of water impacting upon the sheet cause it to vibrate in a manner analogous to a drum membrane. Unconstrained membranic excitation of the roof sheeting can cause high levels of intrusive noise in top floor apartment units during downpours, causing nuisance/annoyance and a reduction in acoustic amenity and perceived quality.

Generally speaking, rain noise is excluded from any standard classifications for environmental noise and its transitory nature and difficulty in field testing implies no fixed criteria to be achieved. However, levels as high as 70 to 80 dB L_{Aeq} can be generated during downpours - to give some context, 80dB(A) is as high as roadside noise levels, measured from the Kwinana Freeway.

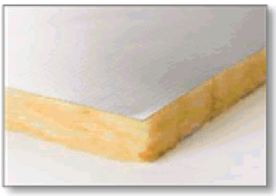
4.6.2 Mitigation of Rain Noise

Where lightweight roof sheeting is installed, the issue of rain noise can be mitigated at nominal additional cost by the appropriate consideration during design of the installation of acoustic and thermal insulation layers usually already present, between critically connected roof elements.



An acoustically absorptive quilt must be installed to be laid in the ceiling void as part of the Mechanical and Hydraulic services treatments detailed in Section 5.9.2 to absorb reverberant noise within roof cavities, therefore this insulation quilt is anticipated to be coordinated into the roof construction already, providing a quietening function assisting in rain noise mitigation.

As an additional measure, resilient hangers can be used to suspend the plasterboard ceiling layer for maximum rain noise attenuation in the detail shown.



The roof sheeting and steel I-beams must be installed such to incorporate any thermal and acoustic insulation to underside of roof sheet. It is assumed that a combination of insulation in the roof space will be installed to provide the required energy efficiency/thermal rating, typically around R2.5 - 3.0.

It should be noted that **thermal** R values do not consider sound insulation performance, however a denser insulating blanket should have a positive effect on the roof construction's ability to resist the passage of sound.

Pending final roof construction specification, appropriate detailing notes should be incorporated into the architectural Tender drawing set to ensure inclusion in both the documentation set and the pricing for Tender. During construction phase, this detailing should be subject to QA and inspection procedures to ensure the installed detail is able to perform in-situ.

4.7 Additional Notes on Predicted Internal Noise Amenity

4.7.1 Installation Detailing

It is important to note that at the time of completion, internal noise levels measured within the completed building spaces will be a combination of external noise sources, building services operation noise and noise from adjacent units. Internal ambient conditions will ultimately depend on the quality of workmanship during construction phase and adherence to the advice and specific detailing requirements at window frame, between window frame and facade concrete walls, and at junctions between external wall elements as set out in this report.

4.7.2 Design Review, Inspection and QA

Effective site inspections and QA/checking procedures on site during construction phase are critical in ensuring the design acoustic performances are not compromised by omissions, incomplete detailing, poorly sealed junctions and interstitial spaces in construction elements or other voids gaps introduced due to site tolerances and the like.

Sealhurst recommend early site inspections be carried out during construction phase to coincide with acoustically critical installations of separating walls, floor/ceiling construction installations, glazing and window frame installations and roof construction sealing to establish and advise site staff of the standard of detailing to seek in regular day-to-day QA checks.

5 INTERNAL SOUND TRANSMISSION & INSULATION - RESIDENTIAL

5.1 Applicable Criteria – Class 2 Residential Areas

5.1.1 Noise Isolation between Dwellings

As the principle standard for the design and construction of buildings in Australia, the *National Construction Code* (*NCC*, formerly the *BCA*) defines aspects of performance applicable to each type of classification of building, depending upon its use.

In areas of the development defined as Class 2 multi-residential apartment space(s), minimum acoustic separation is determined by the *NCC Section F5 - Sound Transmission and Insulation*, which regulates acoustic (separation) performance between adjacent apartments via the prescription of minimum standards for the design and construction of separating wall and floor constructions. The following general Performance (FP) clauses apply:

Clause FP5.1 - Floors separating-

(a) *sole-occupancy units*; Or,

(b) a *sole-occupancy units* [sic] from a plant room, lift *shaft*, stairway, *public corridor*, public lobby, or the like, or part of a different classification,

must provide insulation against the transmission of airborne and impact generated sound sufficient to prevent illness or loss of amenity to the occupants.

Clause FP5.2 - Walls separating sole occupancy units, or a *sole-occupancy unit* from a plant room, lift *shaft*, stairway, *public corridor*, public lobby, or the like, or part of a different classification, must provide insulation against the transmission of-

(a) airborne sound; and

(b) impact generated sound, if the wall is separating a bathroom, *sanitary compartment*, laundry or kitchen in one *sole-occupancy unit* from a *habitable room* (other than a kitchen) in an adjoining unit,

sufficient to prevent illness or loss of amenity to the occupants

Clause FP5.3 - The *required* sound insulation of a floor or a wall must not be compromised by-

(a) the incorporation or penetration of a pipe or other service element; or

(b) a door assembly.

In addition to general performance clauses FP5.1, FP5.2 and FP5.3, additional specific clauses applicable to Class 2 buildings are detailed under "*Deemed-to-Satisfy*" Provisions. Clauses **F5.4 (a) (i) and (ii),** for floor constructions, **F5.5 (e)** for full height walls, and **F5.6 (a) (i)** and **(ii)** for concealed service duct walls are also directly applicable.

5.1.2 Summary of Performance Criteria

The application of the above Clauses has been simplified and summarised in the Table below, and coordinated with the Performance criteria and *"Deemed-to-Satisfy" provisions* of the *NCC.* Detailed mark ups of the applicable criteria are presented in Appendix B.1, which shows minimum performance requirements for all separating constructions, and any additional notes pertinent to compliance.

Clause	Performance Requirement	Applicable To	Mark Up Annotation
FP5.2 (a)	**R_w+C_{tr}** of not less than **50dB** for a wall separating "like-spaces" in adjacent *sole-occupancy units*	Separating walls between like-spaces e.g. "habitable-to-habitable"	
FP5.2 (a)	**R_w** of not less than **50dB** for a wall separating a *sole-occupancy unit* from an adjoining part of a different classification the development	Separating walls between *sole-occupancy units* and parts of a different classification e.g. "public corridors, stairway etc."	
FP5.2 (b)	**R_w+C_{tr}** of not less than **50dB** AND incorporating a **discontinuous** construction between habitable (e.g. living room, bedroom) and wet area (e.g. bathroom, laundry, kitchen) adjacencies; OR between a *sole-occupancy unit* and a plant room or public corridor	Specific separating walls between *sole-occupancy units* and kitchen, bathroom, laundry, plant room or lift *shaft*	
F5.6 (a)(i)	**R_w+C_{tr}** of not less than **40dB** between habitable rooms and soil, waste and water supply pipes serving more than one *sole-occupancy unit*	Service duct walls passing adjacent to "habitable" areas	
F5.6 (a)(ii)	**R_w+C_{tr}** of not less than **25dB** between non-habitable rooms and soil, waste and water supply pipes serving more than one *sole-occupancy unit*	Service duct walls passing adjacent to "non-habitable" areas	
F5.5 (b)	A door may be incorporated in a wall in a Class 2 or 3 building that separates a sole-occupancy unit from a stairway, public corridor, public lobby or the like, provided the door assembly has an **R_w** not less than **30dB**	Doors separating sole-occupancy units from public areas	
FP5.1 / F5.4 (a)	**R_w+C_{tr}** of not less than **50dB** for a floor separating sole-occupancy units or separating a sole- occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby etc.	Separating floors between *sole-occupancy units* or between *sole-occupancy units* and a plant room, public corridor etc.	Floors (noted on Mark ups as required)
FP5.1 / F5.4 (a)	**$L_{n,w}$** (impact) of not more than **62dB** for a floor separating *sole-occupancy units* OR a sole-occupancy unit from a plant room, lift shaft, stairway or public corridor	Separating floors between sole-occupancy units or between sole-occupancy units and plant room, public corridors etc.	Floors (noted on Mark ups as required)
F5.5 (e)	Where a wall that is required to have a min. sound insulation performance has a floor or roof above, the wall must continue to the underside of the floor or roof or a ceiling that has the same sound insulation as the wall	Separating walls to underside of adjoining roof structure	Noted on Mark ups as required

5.1.3 Notes on Discontinuous Wall Construction Requirements

The application of **discontinuous** construction in addition to the minimum R_w+C_{tr} rating of 50dB is a requirement of the *NCC* which seeks to provide adequate resistance to impact-generated sound transmission. The rating is applied in specific circumstances determined by the nature and use of adjacent spaces, typically where non-habitable (wet) areas (e.g. bathrooms, kitchens, WC, laundry and the like) are adjacent to habitable areas (e.g. sleeping and living areas) in adjacent apartment units, OR where plant rooms or lift shafts are adjacent to any part of an apartment unit.

In this project, a **discontinuous** wall leaf may be formed from either:

(i) 1 x 13mm plasterboard on 64mm stud frame with 20mm clear air gap between stud frame and secondary wall leaf; Or,

(ii) 1 x 90mm skin of single brick work with minimum 20mm clear air gap between primary/secondary wall leaves.

5.1.4 Recommended Minimum Performance Wall Constructions

Current understanding of preferred construction methodology for the building is for a reinforced concrete structure, with a mixture of pre-cast and in-situ concrete panels to be used for external/building envelope walls; Internal structure is understood to be formed from concrete panel or infill concrete (AFS or Ritek-type) panel system with plasterboard cladding over, forming the rated separating construction(s) between adjacent residential apartments.

Separating wall types are required to meet a range of minimum performance and construction criteria – the table below summarises our recommended wall type options and details at this stage:

Min. Rating	Min. Recommended Construction Detail	Applicable To	Mark Up Annotation
≥Rw+Ctr 50 dB	150mm thick pre cast concrete panel, AFS 162, Ritek 165 XL; Or, Lightweight twin stud separated by clear 40mm air gap, clad with 1 x 13mm and 1 x 6mm CFC sheet to both sides – cavity filled with 2 x 75 mm Glasswool Partition (minimum density 11 kgm^{-3})	Separating walls between like-spaces e.g. "habitable-to-habitable"	
≥Rw 50 dB	150mm thick concrete panel, AFS150 or AFS162, Ritek 165 XL; Or Lightweight staggered stud on 92 mm track, clad with 2 x 13 mm plasterboard to apartment side, 1 x 13 mm plasterboard to public corridor side - cavity filled with 2 x 75 mm Glasswool Partition (minimum density 11 kgm-3)	Separating walls between *sole-occupancy units* and parts of a different classification e.g. "public corridors, stairway etc."	
≥Rw+Ctr 50 dB plus discontinuous	150mm thick pre cast concrete panel, AFS 162, Ritek 165 XL WITH 20mm clear air gap to one side to 64mm stud, clad with 1 x 13mm plasterboard; Or, Lightweight twin stud separated by clear 40mm air gap, clad with 1 x 13mm and 1 x 6mm CFC sheet to both sides – cavity filled with 2 x 75 mm Glasswool Partition (minimum density 11 kgm^{-3})	Specific separating walls between *sole-occupancy units* and kitchen, bathroom, laundry, plant room or lift *shaft*	
≥Rw+Ctr 40 dB	150mm thick concrete panel, AFS150 or AFS162, Ritek 165 XL; Or 64mm stud frame clad to one side with 2 x 13 mm plasterboard – recommend 50mm insulation quilt to be retained within service duct	Service duct walls passing adjacent to "habitable" areas	
≥Rw+Ctr 25 dB	64mm stud frame clad to one side with 1 x 13 mm plasterboard – recommend 50mm insulation quilt to be retained within service duct	Service duct walls passing adjacent to "non-habitable" areas	

5.1.5 Field Performance of Lightweight Separating Walls

Lightweight wall systems differ from monolithic mass construction systems in a number of critical areas – as such, lightweight systems are able to meet extremely high airborne sound separation performances when installed in situ. However, lightweight wall systems can also exhibit significant weaknesses under certain circumstances, and a greater level of care must be observed when designing for acoustically critical installations. It is therefore imperative the project be able to make informed decisions regarding installed system selection.

When seeking to demonstrate compliance with *NCC* minimum ratings using lightweight construction, lightweight systems represent a special case, relating to the physical and practical differences exhibited between laboratory tested systems in field circumstances. The matter becomes problematic for designers and specifiers alike, as shown under *NCC Part A2 – Acceptance of Design and Construction*:

Clause A2.2 Evidence of Suitability states:

(a) "Subject to A2.3 and A2.4, evidence to support the use of a material, form of construction or design meets a Performance Requirement or a Deemed-to-Satisfy Provision may be in the form of one of the following:

(i) A report issued by a Registered Testing Authority, showing that the material or form of construction has been submitted to the tests listed in the report, and setting out the results of those tests and any other relevant information that demonstrates its suitability for use in the building."

Hence, given laboratory ratings, (or manufacturer warranty of performance), it would seem sufficient to warrant the demonstration of compliance required of it under the *NCC*.

5.1.6 Laboratory versus Field Performance

As an example, the CSR 216 system has a published rating of R_w+C_{tr} 50dB, supported by a NATA-accredited laboratory test certificate (Ref: ATF Report 1740) which clearly shows the laboratory result meets the *NCC* minimum criteria.

The issue is that lightweight systems can present a non-compliance risk (i.e. do not meet the minimum performance criteria) when installed in field conditions not present under laboratory testing. To make this a clear and objective point, the principal element for field "under-performance" is flanking transmission, which is borne from the connection of an otherwise compliant-rated partition system to a non-idealised perimeter construction:

(i) Under laboratory test conditions (which generate an "Rw+Ctr" rating), sound transmission tests are undertaken whereby the subject partition is fixed to extremely high performance (idealised) perimeter constructions, allowing almost ZERO flanking sound to be received in the adjacent "receiver" space;

(ii) Where lightweight walls junction with other lightweight wall elements, each of which will be excited into vibration under field sound test conditions and radiate/transmit sound into the adjacent room. The nett result can amount to excess noise in the adjacent "receiver" room, generating a non-compliance issue - even though each lightweight partition may be rated as > Rw+Ctr 50dB on its own;

(iii) Though no specific inference is made here, site installation, workmanship, detailing, site tolerances/poor sealing, gaps/voids, bridging (of discontinuous elements) the incorporation of services and services penetrations and incorrect or substituted insulation products can also contribute to the potential drop in performance.

5.1.7 Field Performance of Separating Walls – Tolerances and Allowances

R_w+C_{tr} ratings are laboratory tested under stringent conditions regards the suppression of flanking sound transmission, which is the transmission of sound through connected structural elements and radiated into the adjacent space. The *BCA* (and wider international reference standards) allow for a slight deviation in the as-built construction by way of an equivalent field rating – referred as $D_{nT,w}+C_{tr}$ and ascribed a minimum performance rated at ≥45dB – which can be measured at the time of completion to proof *NCC* minimum performance design criterion have been met.

Whilst it is technically inaccurate to state these two ratings are simply 5dB apart, for the sake of this practical discussion and advice, a field "dip" or "tolerance" of 5dB is permitted, BELOW the R_w+C_{tr} laboratory rating, whereby a rating of $D_{nT,w}+C_{tr}$ 45dB or above is deemed to meet the minimum performance.

Based upon our knowledge and experience designing and testing the proposed separating wall constructions, we anticipate there to be a minor deviation (< 2-4 dB) in field results, using concrete wall types, and more significant deviation (5-9 dB) using lightweight systems, providing each system(s) are installed as per manufacturer instructions.

Unfortunately, there is no simple way to calculate or predict the above factors (i), (ii), and (iii) at design. The latent risk to the development can manifest in potential delay at completion, should testing/certification be requested by the approving Council, or post-completion, for an upheld complaint, with the added impact of potential remediation costs and associated issues falling to the developer to rectify.

Consequently, to allow for the above potential issues, Sealhurst recommend that any proposed lightweight wall constructions be conservatively specified with slightly higher performance than the required ratings.

Completion testing will typically be requested by the approving Council to verify that the *NCC* minimum performance ratings have been achieved in the finished building, prior to sign off and building occupancy.

5.1.8 Building Services Penetrations

R_w/R_w+C_{tr} values describe direct airborne sound transmission performance through a particular partition type when tested in laboratory conditions and under strictly controlled circumstances. A fully sealed, field-installed partition without penetrations may be expected to meet an equivalent field performance of separation. However, once separating walls are penetrated, the penetrations can severely undermine the design performances, and hence must be treated.

NCC Section F5 Clause FP5.6 of states:

> *"The required sound insulation of a floor or a wall must not be compromised by the incorporation or penetration of a pipe or other service element"*

Where building services penetrate acoustically-rated separating walls, each penetration should be subject to a "pack-and-seal" detail. All void space between the penetration aperture and building service must be packed with a mineral wool or glassfibre insulation batt off-cut, and sealed with a dense mastic bead of minimum depth 10mm, in all cases.

This standard acoustic detail should be documented as part of the Construction Drawings documentation set. Site QA during construction phase can then be referenced to the Standard Detail to ensure weaknesses that would negate the design performance of the separating wall are not introduced on site.

5.2 Construction *"Deemed-to-Satisfy"* for Separating Wall Elements

Section F5 of the referenced *BCA* states:

> *"Where masonry walls require wall ties, but are also required to be of **discontinuous construction**, the wall ties must be of resilient type".*

Regarding masonry and concrete slabs, *BCA Specification F5.2, Clause 2(a) Masonry* and *Clause 2(b) Concrete Slabs* states:

> *"(a) **Masonry** – Units are to be laid with all joints filled solid, including those between the masonry and any adjoining construction*
>
> *b) **Concrete slabs** – Joints between concrete slabs or panels and any adjoining construction must be filled solid"*

Regarding sheeting materials, *BCA Specification F5.2, Clause 2(c) Sheeting materials* states:

> *"(c) **Sheeting materials** –*
>
> *(i) if one layer is **required** on both sides of a wall, it must be fastened to the studs with joints staggered on opposite sides; and*
>
> *(ii) if two layers are **required**, the second layer must be fastened over the first layer so that the joints do not coincide with those of the first layer; and*
>
> *(iii) joints between sheets or between sheets and any adjoining construction must be taped and filled solid. "*

Regarding timber or steel-framed construction, *BCA Specification F5.2, Clause 2(d) Timber or steel-framed construction* states:

> *" (d) **Timber or steel-framed construction** – Perimeter framing members must be securely fixed to the adjoining structure and-*
>
> *(i) bedded in resilient compound*
>
> *(ii) the joints must be caulked so that there are no voids between the framing.*

5.2.1 Full Height Walls to Underside of Roof Construction

Clause F5.5 (f)(i) Section F5 of the *NCC* states:

> *"Where a wall that is required to have a min. sound insulation performance has a floor or roof above, the wall must continue to the underside of the floor or roof or a ceiling that has the same sound insulation as the wall".*

If separating wall constructions are not inherently sealed, for example in the case of poured concrete infill wall and the like, a sealing detail must be incorporated at the head of the wall to ensure flanking transmission over the wall apex is controlled. This can be achieved on site by packing any void space between partition and soffit, slab or roof sheeting over with a mineral wool or fibreglass batt off-cut, and sealing with a dense mastic.

Where larger gaps or voids are present, a double skin 13mm plasterboard on framing detail must be installed to continue the separating wall to the underside of roof sheeting, and be packed and sealed as above to form an acoustic seal. This wall detail is recommended to be coordinated with the fire engineer and architect, AND included in the architectural Tender drawing set details. Appropriate inspection and on site QA checking should be carried out to ensure the installation is effective.

5.3 Assessment of Proposed Separating Wall Constructions

5.3.1 Residential Apartment Separating Walls to Public Corridors

Walls directly separating residential apartment from public corridors (and the like) are subject to NCC minimum acoustic performance criteria of Rw50dB ONLY. Preliminary design input is that a concrete or concrete infill (AFS/Ritek)-type wall construction will be used for apartment walls to public corridors. Assuming a minimum thickness of 150mm concrete/concrete infill wall, this type of construction is anticipated to achieve a rating of Rw+Ctr 50 dB, which exceeds requirements.

Requirements are indicated in detailed mark-ups, presented in Appendix B.1.

5.3.2 Separating Walls to Lift Shafts

Separating walls between apartment and lift shaft (or plant rooms) must be designed to achieve ≥Rw 50 dB PLUS incorporate a discontinuous leaf to meet NCC minimum standard;

If principal lift shaft wall is of concrete construction, to minimise spatial encroachment into internal room floor area, discontinuous leaf to be formed from 20 mm clear air gap, 64 mm stud and 13 mm plasterboard lining - Total additional system depth ~84 mm; Or 1 x additional skin of 90 mm brickwork given wet trades on site for load bearing party walls - Total additional depth in this case ~110mm.

Insulation quilt lining in the formed cavity space is not required to meet NCC criteria, though would improve overall separation through lift shaft wall to bedroom, if applied, at low cost per lineal metre.

5.3.3 Separating Walls to Stairwells

Walls directly separating residential apartment and adjacent stairwells must be designed to achieve Rw50dB only, i.e. are not required to incorporate a **discontinuous** leaf in order to comply with the NCC. However, where space allows, the project may wish to include a discontinuous lining to improve noise separation amenity.

In this project, a suitable discontinuous leaf may be formed from 1 x 13mm plasterboard on 64mm stud frame OR 1 x 90 mm brickwork leaf, with 20mm clear air gap between stud frame and stairwell wall. The cavity may be lined with 50mm insulation quilt, min density 11kgm^{-3} to improve airborne sound separation performance at low additional cost.

Requirements are indicated in detailed mark-ups, presented in Appendix B.1.

5.3.4 Perimeter Perpendicular Junctions to Building Envelope Wall

All perpendicular party wall junctions to building envelop (external) walls wall must be sealed air tight with sufficient mass equivalent to abutting separating wall construction to avoid introduction of flanking sound transmission paths which would otherwise negate the airborne sound insulation performance of the installed party wall.

Detailing junction to ALL minimum rated wall junctions with building envelope/facade wall, for example where window sub-frame meets building aperture, MUST be considered during detailed design to ensure adequate seal and control of flanking sound transmission. Section 4.5.2 presents pertinent details at building perimeter junctions.

5.4 Separating Floor Construction – NCC Minimum Requirements

5.4.1 Airborne Sound Transmission

Clause FP5.1 of Section F5 of the *NCC* requires that separating floor constructions be designed to provide resistance to both **airborne** and **impact** sound transmission between residential apartments.

With an in-situ or precast concrete floor system, a minimum depth 200mm slab is considered a "*Deemed-to-Satisfy*" construction for **airborne** sound, and, for impact sound transmission when a soft floor covering is applied.

5.4.2 Separating Floor Requirements - Impact Sound Transmission

Where hard floor coverings are applied, the monolithic nature of a concrete mass floor slab equates to efficient transmission of impact noise, such as footfall, or the movement of furniture. In such cases an additional form of treatment to the bare slab is required to achieve impact sound isolation performance, as distinct from airborne sound separation.

The following demonstrates assessment and compliance of soft and hard floor coverings in all separating floor construction between guest rooms, assuming a min 200mm thick reinforced concrete slab construction. Our minimum recommendations to install appropriate (compliant) treatment(s) under soft and hard floor covering areas in vertically adjacent guest room spaces are as follows:

SOFT FLOOR COVERINGS

Apartments which are finished with a soft floor covering such as carpet on a foam underlay over a min. 200mm thick reinforced concrete slab meets the *"Deemed-To-Satisfy"* provision for impact sound, and can be expected to significantly exceed the level of impact sound insulation performance requirement of ≤62dB $L_{nT,w}$ hence complies.

HARD FLOOR COVERINGS

Tiled floor coverings typically found in apartments' wet area, kitchens and living areas must be addressed by the installation of an engineered solution to isolate at least part of the floor/ceiling construction from direct transmission of impact sound through to receiving apartment units below, and demonstrate compliance with the minimum required performance of 62dB $L_{nT,w}$.

In order to demonstrate compliance, the onus is placed upon a design which can be shown to comply either by the application of a laboratory tested resilient damping layer(s) OR by verification by field performance tests which demonstrate a compliant solution. Typically, two practical approaches are available to achieve effective impact isolation between separating floors using concrete slab construction.

One is the use of resilient matting to partially isolate the tiled floor finish and screed topping from the structural reinforced concrete slab; the second approach would be to incorporate a resilient mounting system to partially isolate any suspending architectural ceiling (where present), sufficient to meet *BCA* minimum performance criteria.

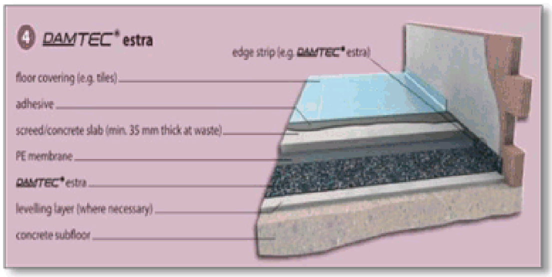
A combination of both resilient matting below the hard floor finish, with insulated suspended ceiling below represents the most reliable treatment to reduce impact noise transfer when dealing with hard floor (timber/stone/tiled) floor finishes.

5.5 Separating Floor Construction – Performance Compliant Detailing Options

As the project is at DA stage, RCP and floor finish information is not yet determined. We have therefore highlighted typical and potential alternative ceiling details which are able to meet the BCA minimum performance criteria for impact sound isolation performance, as appropriate for the concrete slab/sus. ceiling combination(s) which may be proposed as design develops.

5.5.1 Standard Installation for Tiled Floor Areas

Our standard minimum recommended design solution where concrete slab floors have hard floor finish and suspended ceiling below is to install a resilient damping layer in all areas with a hard (i.e. tiled) floor covering, in addition to a suspended plasterboard ceiling with insulated ceiling cavity layer below.

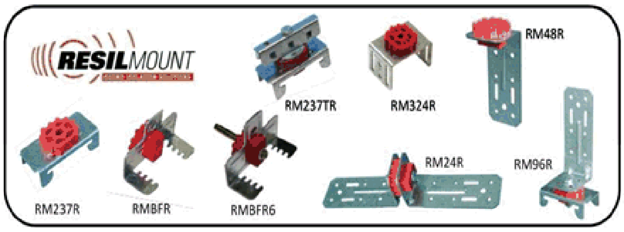


A recommended resilient damping layer product is DAMTEC Estra® at 4mm thickness (or equivalent performing) beneath the screed layer of the tiled floor finish and detailed at floor edges and perimeter junctions as per manufacturer's installation instructions:

The product has been laboratory tested to provide an increase in impact sound insulation performance of Δ19dB L_w when used in conjunction with a standard bare concrete floor[1].

5.5.2 Alternative Installation for Tiled Floor Areas

Alternative solutions to meet the minimum NCC performance exist where resilient matting is not preferred for construction, installation or other non-acoustic factors;



An example of an alternative proprietary system would be resilient hangers systems can be incorporated below the slab to suspended ceilings below to partially isolate impact sound transmission, in conjunction with an insulated ceiling void space.

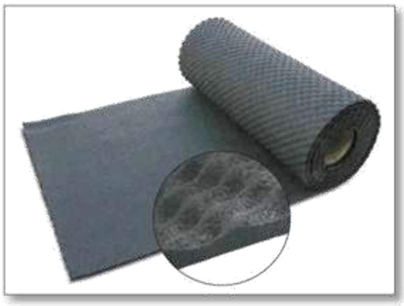
It must be noted that resilient mount systems are not suitable in all circumstances and are particularly limited when isolating vertically adjacent apartments with concrete slab floors, that also have integrally connected concrete perimeter walls, such as found in the AFS/Ritek construction system. In these circumstances, impact sound travels down the concrete walls and is radiated as impact sound from walls UNLESS walls are also appropriately lined with either resiliently mounted or discontinuous plasterboard linings, or insulated cavity linings.

In all instances, systems are designed to meet the NCC minimum criteria, which must be acknowledged as the national design target, below which compliance is not achieved. A number of systems exist which can significantly increase impact sound isolation, to more lower (more stringent) targets, such as those used by hoteliers, and in luxury homes. Such systems are likely to be engineered and make use of one or more resilient floor /ceiling products, in conjunction with concrete floor slab and insulated ceiling voids below.

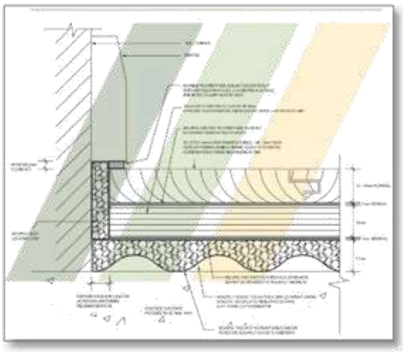
[1] Standard bare concrete floor is defined as 140mm depth, as prescribed in *ISO 140:8 Acoustics – Measurement of sound insulation in buildings and of building elements – Part 8: Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor.*

5.5.3 Upgraded Resilient Matting to Areas with No Suspended Ceiling Void

SKIM COAT CEILINGS BELOW HARD FLOORS



Where the developer may propose skim coat ceilings to u/side of concrete slabs in an apartment unit below, the installation of a heavy-duty resilient matting below any hard floor finish in the unit above is required in order to meet the minimum BCA impact performance. A recommended product is REGUPOL® 6010BA at 17mm thickness (or equivalent performing) beneath the screed layer of the tiled floor finish and detailed at floor edges and perimeter junctions as per manufacturer's installation instructions.

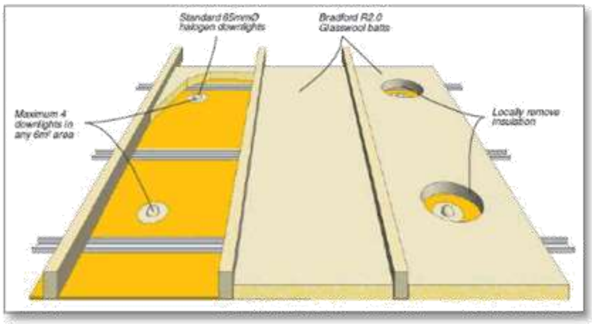


It is important to note that resilient matting must be included under the full extent of tiled areas, including areas where fixed cabinets will be located, to ensure the effectiveness of the product.

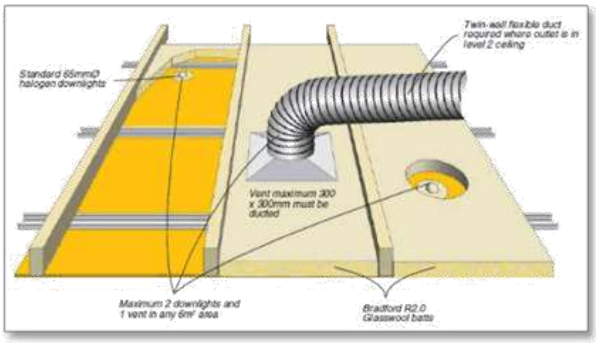
The product has been laboratory tested to provide an increase in impact sound insulation performance of Δ43dB L_w when used in conjunction with a standard bare concrete floor[2]. In practice, degradation due to flanking transmission through structural concrete/masonry walls will reduce tested performance, hence our recommendation to install this higher performing product, which will provide margin for performance degradation on site.

5.5.4 Installation of Downlights and Services in Acoustically Rated Bulkhead Floor/Ceilings

Where plasterboard ceilings are used over wet areas there are typically mechanical exhaust systems, hydraulic pipework and lighting installed above which must be treated appropriately to retain the acoustic performance of the ceiling layer for noise from the apartment unit above, and from resisting sound from the exhaust system and hydraulic pipework systems.



The installation diagrams are an extract from the CSR Redbook and show ideal construction arrangements whereby insulation is cut away around down lights, to a maximum number of 4 lights per 6m² of plasterboard ceiling area to avoid reducing the effectiveness of the plasterboard layer as an acoustic barrier.



For toilet exhaust fan (TEF) terminals, grilles are shown as having a maximum dimension of 300mm x 300mm.

[2] Standard bare concrete floor is defined as 140mm depth, as prescribed in *ISO 140:8 Acoustics – Measurement of sound insulation in buildings and of building elements – Part 8: Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor.*

5.5.5 Coordination with Building Services in Ceiling Voids

Wet area services (e.g. hydraulic and mechanical building services) are also typically installed above or suspended below wet areas, concealed behind suspended plasterboard ceilings. Whilst the addition of a suspended plasterboard ceiling improves both airborne and impact sound, additional treatment will be required for services concealment.

Within concealed services voids over wet areas, a 50mm insulation quilt must be installed, laid loose over the plasterboard layer as per minimum services concealment requirements (R_w+C_{tr} 25dB) presented in Section 5.9.

5.5.6 Balconies over External Terraces/Balconies

The *BCA* performance standards regarding impact sound isolation between apartment spaces applies to **internal** living spaces only and as such, balconies that are directly above terraces/balconies below are not subject to the same airborne and impact sound insulation performance requirements (or any other rigidly defined codes).

A resilient layer may be applied to outdoor balcony areas, at the discretion of the developer, in order to decrease flanking transmission of structure-borne noise which may occur when occupants use the balcony space. The developer may also wish to consider the application of rubber 'feet' on balcony furniture legs as a mechanism to reduce noise from furniture scraping.

5.6 Minimum Standard of Acoustic Separation Performances

5.6.1 Understanding the *BCA* criteria

To assist the project in understanding and interpreting each minimum acoustic rating (e.g. airborne sound transmission R_w+C_{tr}), the implication to the project in terms of pursuing the *BCA* minimum criteria standard, and determining practical project decisions on preferred design performances, the primary minimum performance criteria ratings are broken down below into two streams – airborne and impact sound transmission.

5.6.2 Airborne Sound Transmission

Airborne sound transmission, measured in dB and rated using the $\mathbf{R_w+C_{tr}}$ index is essentially a measurement of how much airborne sound is restricted from passing from one adjacent room to another when tested with high levels of airborne sound, typically generated from a high powered omni-directional loudspeaker. The complex-looking subscript notation simply describes how the test was undertaken, and the process parameters. For the purposes of this report, these can be defined as:

- '**R**' - laboratory measurement of Sound Reduction Index to ISO140:3 1998;
- '**w**' - 'Weighted' describes a single figure value rating which is the principal performance achieved, to be compared to the *BCA* standard for design compliance. The single figure value contains all frequencies (from 125Hz - 3150Hz, or 50z - 5000Hz in extended range results); and finally,
- '**+Ctr**' - which describes an additional spectral adaptation factor, describing the separating construction's (e.g. wall or floor) ability to resist the transmission of low frequency sound (e.g. hum/rumble)

To comply with the *BCA* minimum standard, a construction separating adjacent sole-occupancy units MUST be rated at ≥ $\mathbf{R_w+C_{tr}}$ **50dB** to be deemed COMPLIANT with the *BCA* minimum.

It is important to note that the *BCA* standard is the absolute statutory minimum performance and does not imply or infer inaudibility (i.e. not hearing your neighbours above), nor does it imply that complaint would not be received by a "reasonable" person.

5.6.3 Improving upon BCA Minimum Standards for Airborne Sound Insulation

The *BCA* standard is the current fixed, objective compliance value deemed by the Australian Building Codes Board (ABCB) to be a separation performance which cannot be defaulted below in multi-residential developments. Higher airborne sound separation performance is available as an option to all multi-residential developers, and would require modifications and potential additions to the existing construction build up, such as additional insulation quilt(s), additional cladding mass, and discontinuous structural connections to achieve.

5.6.4 Impact Sound Isolation

The second rating is for **Impact Sound Isolation**, measured in dB and rated using the $\mathbf{L_{n,w}}$ index; This test determines the level of sound generated in the room below from impact generated noise (e.g. footfall, furniture scraping and the like) and is undertaken using a set of weights, mechanically driven by a cam shaft, set to successively fall from a min. 40mm free drop height, onto the floor surface as installed in the apartment above. Again the complex-looking subscript notation describes the test and rating parameters. For the purposes of this report, these can be defined as:

- '**L**' - Level difference (between upper (source) and lower (receiving room) from impact generated sound;
- '**n**' - 'normalised';
- '**w**' - 'Weighted' describes a single figure value rating which is the principal performance achieved, to be compared to the *BCA* standard for the all-important compliance. The single figure value contains all frequencies (from 125Hz - 3150Hz, or 50z - 5000Hz in extended range results)

The separating floor construction MUST be rated at ≤ $\mathbf{L_{n,w}}$ **62dB** to be deemed COMPLIANT with the *BCA* minimum.

There are a number of *Deemed-To-Satisfy* provisions contained within the *BCA*, which nominate carpet as the floor finish. Under test, carpet effectively isolates the falling weights under test conditions, hence a carpeted floor finish significantly exceeds the minimum required rating, providing a high level of impact sound isolation.

Modern aesthetics and the provision of a practical cleaning surface in kitchens/wet areas often dictate tiled flooring as a hard floor surface in such spaces. In this project tile/stone floor finishes are proposed throughout all internal areas other than bedrooms, hence consideration of appropriate treatment options are required to meet the *BCA* minimum standard.

Hard floor surfaces connect directly to the structural floor, promoting the transmission of impact sound downwards into the lower receiving apartment, hence hard floor finishes MUST be isolated from the slab in the first instance. As experienced engineers in both laboratory and field specification and measurement of this parameter, the use of a 200mm slab and insulated suspended ceiling below can meet the minimum requirement as a minimum cost/spec to meet the ≤ $\mathbf{L_{nT,w}}$ **62dB** rating, however an isolation treatment such as resilient matting or resilient mounts are typically specified to further reduce the transmission of impact generated sound.

5.6.5 Improving upon BCA Minimum Standards for Impact Sound Insulation

As with airborne sound insulation, it is important to note that the *BCA* standard is the absolute statutory minimum and does not imply or infer inaudibility (i.e. not hearing your neighbours above), nor does it imply that complaint would not be received by a "reasonable" person. It is simply the current fixed, objective compliance value deemed by the Australian Building Codes Board to be a level which cannot be defaulted below in multi-residential developments.

Higher IMPACT sound isolation performance in tiled floor areas is available as an option to all developers, and would require modifications and potential additions to the existing construction, such as introduction of increase performance isolation matting layer(s), resiliently suspended ceiling layer(s) and build up to achieve

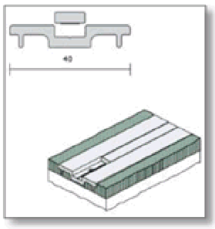
5.7 Additional Minimum Construction Requirements

5.7.1 Entry Door Sets

All entry door sets to guest rooms from entry lobbies must be capable of achieving R_w30dB or greater. This performance can typically be achieved through use of a solid core door, minimum thickness 40mm or greater, hung in a well-fitted door frame and incorporating effective compressible seals at both jambs and at the head of the frame. Brush seals can also be used at the threshold, providing the obstruction to airflow does not circumvent any relief air mechanism, which may be required as part of any mechanical ventilation strategy.

Sealhurst recommend the installation of soft close mechanisms and neoprene pads where apartment entry doors meet door frames to minimise the introduction of intrusive structure-borne noise from the closing or slamming of entry doors being propagated throughout the building.

5.7.2 Plant Room Door Sets



Pending building services design and resultant noise level from equipment/services within "plant" type rooms, robust doorset may be required to contain plant room noise levels. Minimum recommended doorset construction would be 40mm solid core with effective compressible neoprene seals at both jambs and head, and brush or drop seals at the threshold.

To maximise acoustic performance of a 40mm solid core doorset, at each threshold, we recommend a Raven threshold RP66 plate seal be installed (see image right), pending relief air/car park exhaust system strategy from mechanical engineer. A 10 mm rebated edge may also be incorporated to abut and seal against the door frame to ensure effectiveness of the compressible neoprene seals.

5.7.3 Notes Regarding Soft Close Mechanisms to Kitchen Fixed Furniture

In addition to the inclusion of a secondary wall leaf (**discontinuous construction**) between adjacent kitchen spaces, Sealhurst further **recommend** all fixed furniture components such as kitchen tops, cupboards and drawers be fitted using isolating rubber grommet type fixings where structural connection with the wall is apparent, to further isolate transmission of impact sound from worktops into the surrounding structure. All closing cupboards and drawers should be fitted with soft-close mechanisms.

NB – isolating rubber grommet type fixings and soft close mechanisms are **recommended** in all kitchen joinery applications across the development. Benefits include reduced structural noise transmission from cupboard door slams, resulting in an improved sense of privacy, coupled with an increase in the subjective perception of quality within apartment units.

Floor standing whitegoods such as refrigerators and dishwashers should also incorporate an isolation treatment. Fitting rubber castor cups underneath the feet of these items will reduce the direct transmission of noise and vibration into the floor.

5.8 NCC Minimum Requirements for Building Services in Residential Areas

5.8.1 Overview of Requirements

In addition to separating walls and floors, the *NCC* requires shared building services to be acoustically separated from adjacent residential apartment spaces to a performance deemed adequate to meet the minimum NCC criteria, by the provision acoustic "Rw+Ctr" ratings for the concealment of pipe work, service ducts and the like.

As the project is at design development stage, building services designs, locations and connections are as yet to be determined hence a full review is not yet appropriate. The following section advises on applicable criteria and minimum provisions to meet NCC requirements – it is envisaged the project will be assessed at completion of detailed design stage, prior to application for Building Licence [BL] at the appropriate time.

5.8.2 Applicable Criteria

The table below refers the prescription of *Section F5* of the *NCC* regarding minimum airborne sound insulation parameters for building services noise isolation. The criteria relate to acoustic performance for concealed service duct walls (e.g. risers, suspended ceilings and the like) which separate shared building services from individual guest room spaces.

The performance criteria are designed to ensure a minimum level of acoustic amenity is provided for building occupants - minimum acoustic performance(s) for concealed services can be summarised as follows:

Performance Requirement	Applicable To	Mark Up Annotation
R_w+C_{tr} of not less than 40dB between habitable rooms and soil, waste and water supply pipes serving more than one dwelling	Service duct walls passing habitable areas	
R_w+C_{tr} of not less than 25dB between non-habitable rooms and soil, waste and water supply pipes serving more than one dwelling	Service duct walls passing wet areas	

The acoustic performances of such service duct walls and their required constructions can be interpreted as follows, when applied to ceiling voids containing SHARED services:

Clause F5.6 (a) (i):

> *Where plant/ducting/pipes servicing a single unit located above a floor slab, are hung below the slab and separated from the unit below the slab by a suspended ceiling system AND the space below the slab is separating an upstairs space from a downstairs* ***habitable*** *room (i.e. living room, bedroom and the like), the concealment mechanism must achieve* ***R_w+C_{tr} 40dB*** *or greater.*

The minimum performance(s) are also required for shared downpipes and drainage stacks located in cavities or dedicated building services risers which pass adjacent to **habitable** spaces; And,

Clause F5.6 (a) (ii):

> *Where ducts/pipes servicing a single unit above a floor slab, are hung below the slab and separated from the unit below the slab by a suspended ceiling system AND the space below the slab is considered a* ***non-habitable room*** *(i.e. kitchen, bathroom, laundry, WC and the like), the suspended layer must achieve the lesser performance of* ***R_w+C_{tr} 25dB*** *or above.*

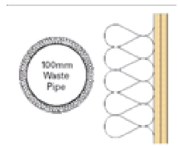
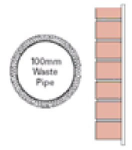
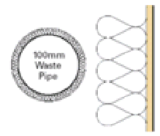
The minimum performance(s) are required for shared downpipes and drainage stacks located in cavities or dedicated building services risers which pass **non-habitable** spaces (e.g. wet areas).

5.9 Building Services Duct Walls - Rated Minimum Constructions in Residential Areas

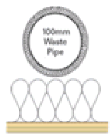
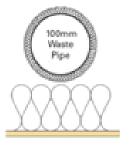
Hydraulic and mechanical services layouts will often show the intention for reticulated pipe and ductwork to be arranged behind concealed layers and routed to vertical services ducts throughout the building. From an acoustic compliance perspective the concealing element must meet the performances/treatments prescribed in the referenced *NCC* Clauses.

The following table(s) present minimum rated services concealment constructions to meet the minimum standard:

5.9.1 Services Concealed in Vertical Ducts

Application	Specification	Schematic	Est. Rating (R_w+C_{tr})	NCC Compliant
Concealment of shared services riser/duct wall, or services to/from an adjacent apartment which are routed next to an adjoining apartment's **HABITABLE AREAS** (living rooms, bedrooms, etc)	Pipe lagged with Soundlag 4525C or equivalent performing pipe lagging material, mounted on anti-vibration pipe clips behind 2 x 13mm plasterboard sheet, with cavity insulation		43dB	COMPLIES
Concealment of shared services, or services to/from an adjacent apartment which are routed next to an adjoining apartment's **HABITABLE AREAS** (living rooms, bedrooms, etc)	Alternative masonry solution - Pipe lagged with Soundlag 4525C or equivalent performing pipe lagging material, mounted on anti-vibration pipe clips behind 1 x 90mm brickwork leaf with render/plaster set over		40dB	COMPLIES
Concealment of shared services riser/duct wall, or services to/from an adjacent apartment which are routed next to an adjoining apartment's **NON-HABITABLE AREAS** (wet areas etc)	Pipe lagged with Soundlag 4525C or equivalent performing pipe lagging material, mounted on anti-vibration pipe clips behind 1 x 13mm plasterboard sheet, with cavity insulation		28dB	COMPLIES

5.9.2 Services Concealed in Horizontal Ducts

Application	Specification	Schematic	Est. Rating (Rw+Ctr)	NCC Compliant
Concealment of shared services, or services to/from an adjacent apartment which are routed over an adjoining apartment's **HABITABLE AREAS** (living rooms, bedrooms etc) *Typically over habitable area ceiling spaces*	Pipe lagged with Soundlag 4525C or equivalent performing pipe lagging material, mounted on anti-vibration pipe clips behind 2 x 10mm plasterboard sheet, with cavity insulation		43dB	COMPLIES
Concealment of shared services, or services to/from an adjacent apartment which are routed over an adjoining apartment's **NON-HABITABLE AREAS** (bathrooms, laundry, WC etc) *Typically over wet area ceiling spaces*	Pipe lagged with Soundlag 4525C or equivalent performing pipe lagging material, mounted on anti-vibration pipe clips behind 10mm plasterboard sheet, with cavity insulation		28dB	COMPLIES

Coordination of minimum concealed services ducts/suspended ceilings is critical in achieving compliance with the minimum requirements of the NCC.

5.9.3 Car Park Exhaust Shaft Walls

Car park exhaust system shafts should be considered a special case where shared services concealment is concerned. Fan systems should be subject to careful design to ensure noise and air flow within the exhaust shafts does not generate excess noise – any shaft wall adjacent to residential apartment space may require an increased separation performance above the minimum recommended to preserve amenity in the finished building.

To avoid potentially unnecessary treatment, Sealhurst recommend car park exhaust shafts are not routed adjacent to residential apartments, where possible. If car park exhaust ducts are routed near to residential spaces, duct wall Rw ratings may need to be increased to above Rw+Ctr 40dB, pending CPEF fan and system design.

5.10 Ancillary Construction Requirements for Concealed Services Duct Walls

The *NCC* makes provision of additional criteria specific to the placement and function of mechanical building services. Specification F5.2 makes the following *'Deemed-To-Satisfy'* provisions under Clause 2:

2. Construction deemed to satisfy

(e) Services

(i) Services must not be chased into concrete or masonry elements

(ii) A door or access panel required to have a certain Rw+Ctr that provides access to a duct, pipe or other service must –

(A) not open into any ***habitable*** *room (other than a kitchen); and*
(B) be firmly fixed such that the rebate or frame is overlapped by the access panel by not less than 10mm, be fitted with a sealing gasket along all edges and be constructed of-

(aa) *wood, particleboard or block board >33mm thick*
(bb) *compressed fibre reinforced cement sheeting >9mm thick*
(cc) *Other suitable material with mass per unit area >24.4 kgm-2*

(iii) A water supply pipe must –

(A) Only be installed in the cavity of a discontinuous construction; and
(B) *In the case of a pipe that serves only one sole-occupancy unit, not be fixed to the wall leaf on the side adjoining any other sole-occupancy unit, and have a clearance of at least 10mm to the other leaf*

(iv) Electrical outlets must be offset from each other –

(A) In masonry walling, not less than 100mm; and
(B) In timber or steel framed walling, not less than 300mm

5.11 Hydraulic Building Services Noise Control

5.11.1 Hydraulic Services Treatments

For the purposes of this report, "hydraulic services" refers to all piping installations relating to sewerage, storm water, hot and cold water supply and gas; "hydraulic services noise treatments" refers to "hydraulic services" which are reticulated in services ducts adjacent to apartments.

5.11.2 Use of Pipe Wrapping

For the avoidance of doubt, ALL hydraulic pipe work (inclusive of down pipes, storm water pipes, hot and cold water supply pipes, drainage and foul waste pipes) reticulated within services ducts/risers/concealed ceiling voids adjacent to apartments is to be wrapped in a suitable loaded vinyl or mineral wool pipe wrapping.

5.11.3 Penetrations into Services Ducts/Riser Walls

All penetrations into services duct risers, plant room walls or any other acoustically rated wall to allow pipe reticulation must be acoustically sealed so as not to introduce degradation to the rated wall acoustic performance. Minimum sealing detail requirements are to pack any gap/void around pipe/duct with fibreglass insulation batt off cuts and then seal with a 10mm dense mastic bead.

Where larger gaps are present, gaps can be filled with 2 x 13mm plasterboard sections cut to fit, and then packed with fibreglass insulation off-cuts and sealed a with a 10mm dense mastic bead.

NB - Expanding foam MUST NOT be used to seal gaps/voids in acoustically rated riser/duct walls, as this can be severely detrimental to the separation performance (R_w) of the wall.

5.11.4 Anti Vibration Pipe Clips

All pipes should be secured in cavities, voids or service risers using resilient pipe clip connections which incorporate an isolating rubber or neoprene collar, to avoid introducing pipe-borne noise into the surrounding structural elements.

5.11.5 Sound Isolation of Pumps

Section F5.7 of the *NCC* states:

> *"A flexible coupling must be used at the point of connection between the service pipes in a building and any other circulating or other pump".*

Therefore all pipe runs connected to hydraulic circulation pumps or similar plant equipment must be connected via flexible couplings to avoid the introduction of structure borne noise through rigid connections.

Sealhurst recommend the following note be appended to the GENERAL NOTES section on all services Hydraulic Services layout drawings for completeness:

(i) It is the responsibility of the Hydraulics Consultant to make provision of flexible couplings to all pumps; And,

(ii) It is the responsibility of the Hydraulics Contractor to install all flexible couplings in accordance with the Specification.

5.12 Mechanical Building Services Noise Control

5.12.1 Car Park Exhaust Fan (CPEF) System

It is anticipated the enclosed basement car parking area will require a mechanical car park exhaust system (CPEF). Noise from the operation of the CPEF, inclusive of fan, ducting, duct routing, and discharge point(s) must be designed so as not to impact the internal noise amenity of residents.

Several options are available from concept design to control internal noise from CPEF systems:

(i) Where possible, locate primary CPEF fans away from apartment areas;
(ii) Select oversized fan to operate at lower duty, subject to mechanical engineer control and minimum air change cycle requirements;
(iii) Ensure system design maintains air flow velocity <9ms^{-1} to avoid turbulent/rumble aero noise;
(iv) Locate ducting away from residential apartment spaces;
(v) Application of internal absorptive duct lining to reduce duct-borne noise;
(vi) Application of in-line attenuators to the inlet and outlet side of the extract fan if determined as required;

In addition to internal noise levels, the CPEF system must also comply with *Environmental Protection (Noise) Regulations 1997* limits at the nearest noise sensitive receiver - see Section 9.

5.12.2 General Exhaust Fans

Noise from the operation of the bin store exhaust system, inclusive of fan, ducting, duct routing, and discharge point(s) must be designed so as not to impact the internal noise amenity of residents.

In addition to internal noise levels, any GEF fans must also comply with *Environmental Protection (Noise) Regulations 1997* limits at the nearest noise sensitive receiver - *see Section* 9.

5.13 Electrical Building Services Noise Control

The following notes are of significance to the acoustic design, to be coordinated with the Electrical design consultant and installation Contractor:

5.13.1 Location of Back-to-Back Sockets in Acoustically Rated Walls

Typical apartment layouts are shown - where apartment types are back-to-back, the following clauses apply:

> *"Electrical outlets must be offset from each other -*
> ***(A) in masonry walling, not less than 100mm; and***
> *(B) in timber or steel framed walling, not less than 300mm."*

Offset can be vertical or horizontal.

5.13.2 Electrical Services Penetrations

All electrical services penetrations into services duct risers, plant room walls or any other acoustically rated wall to allow electrical cable reticulation (including cable trays) must be acoustically sealed. Minimum sealing detail requirements are to pack any gap/void around cable/cable tray penetration with fibreglass insulation batt off cuts and then seal with a 10mm dense mastic bead.

Where larger spaces are present, the open penetration area can be filled with 2 x 13mm plasterboard sections cut to fit, and then packed with fibreglass insulation off-cuts and sealed a with a 10mm dense mastic bead.

NB - Expanding foam MUST NOT be used to seal gaps/voids in acoustically rated walls, as this can be severely detrimental to the separation performance (R_w) of the wall.

6 INTERNAL SOUND TRANSMISSION & INSULATION – COMMERCIAL

6.1 Applicable Criteria – Commercial

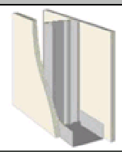
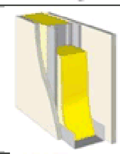
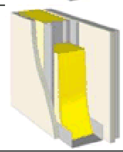
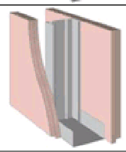
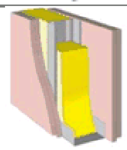
6.1.1 Noise Isolation between Commercial Spaces

Separating partition types and acoustic performance(s) thereof in commercial space(s) are not subject to detailed minimum performance and construction criteria as with residential separating partition design elements. Rather, partitions and respective acoustic performance(s), are determined practically as part of architectural fitout, based upon office room layout and adjacencies of noise-sensitive (or non-noise-sensitive) spaces.

Second (1268m²), Third (799m²) and Fourth (596m²) commercial floor areas are currently being developed as open floor plan areas, pursuant to end-tenant fitout(s) pending lease arrangements to be made as is commercially appropriate for this stage of the development. As such, room layouts are yet to be determined and partition design advice is not yet appropriate. In lieu, a base palette of partition types has been presented which may be useful to development and potential fitout clients, as a means to assess potential costing versus acoustic performance.

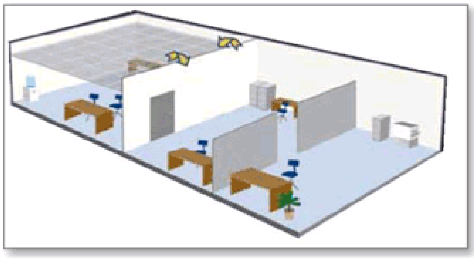
6.1.2 Separating Partitions – Typical Wall Types and Acoustic Performances

The Table below presents typical lightweight partition constructions including acoustic ratings and details where wall types could be appropriately used as internal partitions between "acoustically sensitive" spaces.

Ref	Description	Recommended Use	Est. Rating	Schematic
CSR 010a	76mm steel stud lined both sides with 13mm plasterboard, no insulation; **Nominal width 102mm**	Partitions between non-sensitive spaces e.g. Cleaners Cupboards, Stores etc	**Rw 36 dB**	
CSR 010c	76mm steel stud lined both sides with 13mm plasterboard, cavity lined with 75mm Glasswool insulation, min. density 11kgm^{-3}; **Nominal width 102mm**	Partitions to WC areas, Stairwells and Corridors	**Rw 42 dB**	
CSR 015c	76mm steel stud lined one side with 13mm plasterboard and opposing side with 2 x 13mm plasterboard; Cavity lined with 75mm Glasswool insulation, min. density 11kgm^{-3}; **Nominal width 115mm**	Partitions to typical Meeting Rooms, Open Plan Office space(s), Reception areas etc	**Rw 46 dB**	
CSR 075a	76mm steel stud lined both sides with 13mm plasterboard and opposing side with 2 x 13mm plasterboard, no insulation; **Nominal width 128mm**	Partitions to typical General Office area(s), Meeting Rooms, Open Plan Office space(s), Reception areas etc	**Rw 46 dB**	
CSR 075c	76mm steel stud lined both sides with 13mm plasterboard and opposing side with 2 x 13mm plasterboard; Cavity lined with 75mm Glasswool insulation, min. density 11kgm^{-3}; **Nominal width 128mm**	Partitions to Server Rooms, Private (Higher Specification) Offices, Confidential Areas, Boardrooms and plant rooms	**Rw 52 dB**	

NB - Estimated acoustic ratings (R_w) are based upon a 76mm single steel stud and relate to separating partitions installed to full height, from floor slab to soffit/slab over and sealed both junctions. Suffice "c" defines 75mm Glasswool as insulation quilt, at minimum density 11kgm-3.

6.1.3 Full Height Walls to Underside of Soffit/Roof



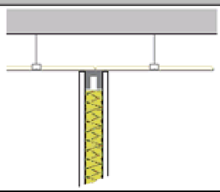
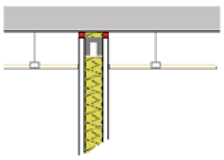
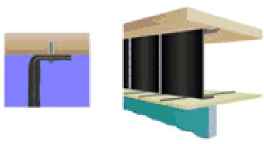
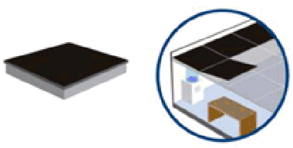
The principal element to consider in terms of confidentiality and maintaining separating wall Rw performance(s) in finished office spaces is transmission via ceiling void. Acoustic separating wall ratings refer full height wall, without gaps or penetrations.

In order to maintain R_w ratings, full height walls or an acoustically equivalent ceiling void barrier must be installed over the line of the rated partition to avoid flanking transmission over the wall apex in the completed space.

Certain wall types, e.g. structural lift shafts and stairwells, are assumed to be full height.

In instances where lightweight wall types are used as office partition walls, the developer/end-client may wish to retain the flexibility of the open plan space by installing separating partitions only up to suspended ceiling level, though may require the specified privacy/separation performance, for example where confidential conversatinos must take place.

In these circumstances, a ceiling void cavity barrier detail must be installed to retain the wall separation performance. The table presented below shows three types of minimum ceiling void detail options, each of which are able to retain the design rating (R_w). The table below presents ceiling void barrier options and implications to the design:

Option	Detail	Schematic	Opinion
Non-Full Height Wall	Partition up to mineral fibre suspended ceiling tile, open over ceiling void above		WALL RATING (Rw) COMPROMISED
Full Height Wall	Partition sealed to slab over, packing any voids with a mineral wool or glass fibre insulation batt off-cut, and sealing with a dense mastic.		RETAINS WALL RATING (Rw)
Ceiling Void Cavity Barrier	Install loaded vinyl ceiling void cavity barrier over on framing detail system, over full extents of partition line. Compressible batts may be installed as an alternative to loaded vinyl		RETAINS WALL RATING (Rw)
Increased Mass Ceiling	Install additional mass layer over ceiling tiles to full extent of room on both sides of separating wall to achieve equivalent separation in situ NB – suitable for small rooms/office pods		RETAINS WALL RATING (Rw)

6.1.4 Walls to Toilet/Wet Areas

Walls to toilets areas should also be full height to avoid flanking transmission of undesirable noise across over roof spaces through ceiling tiles. Service penetrations are to be acoustically treated with a sealing detail where appropriate - this can be achieved on site by packing any gaps/void space around service duct penetrations with a mineral wool or fibreglass batt off-cut, and sealing with a dense mastic.

This detail should be included in the architectural Tender drawing set details, and during site installation, QA checking should be carried out to ensure the installation is effective.

Detailed partition advice can be provided during detailed design, to ensure client and developer performance requirements are delivered in the finished building.

6.1.5 Separating Floor Construction

As with separating partitions in commercial space, floor construction/separation types and acoustic performance(s) are not subject to the detailed minimum performance and construction criteria as with residential separating floor constructions. We understand the floor slab to be of minimum 200mm reinforced concrete construction between vertically adjacent commercial floor areas. In conjunction with mineral fibre ceiling tile finish over services void space, this type of construction will achieve a rating of >Rw 55 dB, which is sufficient.

With regard to impact sound transmission from footfall, or the movement of furniture, a carpeted tile floor covering can be expected to control the level of impact sound by virtue of the isolation of foot fall/furniture movement noise at the source. The carpeted floor tile and mineral fibre ceiling tile finishes are common in commercial office fitout works, and have been used to control reverberation time, as detailed in Section 8.

8 REVERBERATION TIME TARGETS

8.1 Applicable Criteria

8.1.1 AS2107:2000 - Design Reverberation Times

Reverberation Time is a measure of the echoic nature of a room. It is typically measured in 1/3 octave or 1/1 octave bands by creating a loud noise and measuring the time it takes for a standard impulse signal to decay by 60dB. The longer the reverberation time, the more 'echoic' a room sounds.

Acceptable standards for reverberation times is prescribed under *AS2107:2000 Acoustics: Recommended design sound levels and reverberation times in building interiors*. For various commercial building types – we have assumed "General Office" type use for the purposes of establishing reverberation time control targets:

Type of Occupancy	Rev Time (sec)
5 - OFFICE BUILDINGS	
Board and conference rooms	0.6 - 0.8
General office areas	0.4 – 0.6
Private offices	0.6 – 0.8
Rest room and tea rooms	0.4 – 0.6
Toilets	-
6 - PUBLIC BUILDINGS	
Restaurants and cafeterias -	
Cafeterias and food courts	*See Note 3*
Coffee bars	<1.0
Restaurants	<1.0

8.1.2 Reverberation Time Notes

Reverberation time target criteria In the *AS2107:2000* extract over the page above:

"Note 3" states: *"Reverberation Time should be minimised as far as practicable for noise control"; And,*

*"Curve 1"** defines reverberation times determined by the volume of the space.

* Curve 1 refers curves 1, 2 and 3 presented in Figure A1, Appendix A of *AS2107:2000* which "*represent mean reverberation times of spaces which are considered to possess good acoustic qualities*".

Commercial tenancies are shown as commercial offices at this stage of design, an have been assessed as "General Office" spaces to facilitate compliance/compliance advice to meet the targets established under *AS2107:2000*. If specialist requirements are required by the end tenant, in particular, specialist retail functions, specific control of reverberation time, pending determination of their predominant anticipated use, may be required.

Section 8.1.3 presents informative notes on acoustic absorption, with the intention of allowing an informed decision on how to apply the most cost effective treatment for office type spaces.

8.1.3 Application of Acoustic Absorption

The concept of sound absorption can be described as the ability of a material to transform acoustical energy into some other form or energy, usually heat though at lower frequencies the transfer can be to kinetic energy. All materials absorb *some* acoustical energy; some materials such as plasterboard reflect a large portion of the energy that strikes it, whereas other materials such as fibrous insulation will absorb more of the energy.

Alpha (α) is the term used to represent a material's Absorption Coefficient, which mathematically describes the proportion of incident sound energy arriving from all directions that is **not** reflected back into the room i.e. which is absorbed. Alpha (α) ranges between 0 and 1, where 0 is totally reflective and 1 is totally absorptive.

Sound is more readily absorbed at mid-to-high frequencies through fricative (heat) losses, than at low frequencies. This frequency dependent reaction is acknowledged by the measurement of sound absorption coefficients at one third octave band centre frequencies from 125 to 4000 Hz, giving materials a sound absorption "profile" to allow particular material selection.

Example materials and their respective absorption coefficients typically found in office spaces are shown in the table below:

Material Sound Absorption Coefficient (α) Data

Internal Room Finish Material	Octave Band Centre Frequency (Hz)						α_W	Abs. Class
	125	250	500	1000	2000	4000		
Windows (glass facade)	0.10	0.08	0.05	0.04	0.03	0.02	**0.05**	-
Office grade carpet tile, medium pile	0.05	0.15	0.55	0.5	0.5	0.5	**0.45**	D
Plasterboard as suspended ceiling	0.2	0.15	0.15	0.05	0.05	0.05	**0.10**	-
12mm square hole Perforated Plasterboard as suspended ceiling (16% open area)	0.42	0.62	0.7	0.68	0.64	0.64	**0.70**	C
Standard Mineral fibre ceiling tile with nominal 200mm void	0.4	0.6	0.65	0.75	0.8	0.75	**0.75**	C
Acoustic ceiling tile (e.g. Ecophon Master A) with nominal 200mm void	0.45	0.8	0.85	0.9	0.95	0.95	**0.90**	A
Plasterboard wall area	0.2	0.15	0.15	0.1	0.08	0.05	**0.10**	-

Two columns are of note - α_W and Abs Class;

α_W describes an overall weighted value across all frequencies, defining the total absorption rating of the material. **Abs Class** rates the material in terms of A - E with A being the highest absorbing across all frequencies. From the example absorption data presented above, particularly in these two columns, one can derive that the vast majority of acoustic absorption in an office space is provided by the ceiling tile, which therefore makes the selection of ceiling material integral to delivering good standard of room acoustics.

8.1.4 Reverberation Time – General Office Minimum Treatments

We understand that the Ground Floor commercial unit, and Second to Fourth Floor Commercial Floor tenancies have not yet been secured, as is appropriate for this stage of design. The targets assumed for this space are therefore established against "General Office" type space under *AS2107:2000* reverberation tome criteria.

In order to meet reverberation time targets in each prospective commercial tenancy unit, typical treatments are mineral fibre ceiling tiles in a tegular grid over commercial floor area, with office grade carpet tiles as a floor covering. The two parallel absorptive surfaces are sufficient to deliver control of reverberation time in rooms of standard height (e.g. 2.7m) based upon the ratio of volume to m2 area.

A perforated plasterboard treatment with insulated fibre glass (absorbing) quilt laid in the void space over will also provide the reverberation time control, in conjunction with office grade carpet tiles. This ceiling option will offer a slightly greater acoustic barrier performance (over a lightweight ceiling tile) for any ceiling void located FCU units, if installed.

A wide range of alternative architectural and aesthetic ceiling types are available into which acoustically-absorptive material can be integrated – slatted timber, "floating" island ceilings, coffered ceilings or spray-on acoustic finishes to blacked out slab finish over; Each can be incorporated into the architectural fitout and effectively control reverberation time. These design options may be assessed in more detail as the project design and tenants' fit out particulars become better known.

NB - The application of **no ceiling treatment** (e.g. standard plasterboard ceilings) will result in Commercial units which do not meet reverberation time criteria.

9 NOISE EMISSIONS TO ENVIRONMENT

9.1 Applicable Criteria

9.1.1 Environmental Protection (Noise) Regulations (1997)

The *Environmental Protection (Noise) Regulations 1997 (inc amendments)* is the applicable legislation governing all sources of noise which are introduced when the new building is constructed, and **applicable at the nearest noise-sensitive receiver (NSR)**.

The *Regulations1997* prescribe a specific methodology from which to calculate the ANL, which is based upon an appraisal of the percentage Commercial and Industrial land surrounding the nearest noise sensitive receiver (NSR), and the volume and composition of road traffic in the vicinity of 450m (outer) and 100m (inner) boundary areas surrounding the designated NSR.

9.1.2 Determination of Land Use

The area surrounding 26 – 28A Charles Street is mixed use, with the surrounding buildings in the 100-450m radii a mix of commercial uses, converted residential dwellings used as offices and consulting rooms, and small coffee/café operations. Appendix D presents a detailed overview of land use determination(s) used in the calculation of ANL limits.

9.1.3 Identification of Nearest Noise-Sensitive Receiver (NSR)

When calculating an Assigned Noise Level (ANL) limit, one must consider the nearest existing noise-sensitive receiver (NSR), as prescribed under *Schedule 1 Part C, Environmental Protection (Noise) Regulations 1997*, as the defining receiving location for noise emissions from a new development.

The nearest noise-sensitive receiver has therefore been determined to be the neighbouring 4-storey multi-residential building addresed at 24 Charles St, immediately east of the proposed new building.

9.1.4 Separation Distance to NSR

A separation distance of approx. 5m has been determined as the closest separation distance for calculations pertinent to noise propagation.

In order to maximise efficiency of the Assigned Noise Level (ANL) calculation, only the nearest noise sensitive receiver NSR is considered when calculating cumulative noise emissions assessment, unless otherwise stated. The implied logic that all receivers at greater distance(s) will also comply.

9.1.5 Calculated Noise Emission Limits

Percentage commercial (C) land use has been determined as 50.3% of the "Inner Circle" radius, and 40.9% of the "Outer Circle" radius only, not accounting for public roads. Percentage industrial (I) land use has been determined as 0%. Kwinana Freeway and Labouchere Road (South of Riverview St) are both identified as "Major Roads" under EPA guidance classification, with vehicle movements of >150,000 and >15,000 respectively, per annual average weekday (AAWT).

Based upon this calculation methodology, a cumulative Influencing Factor (IF) has been calculated as 7.

The Table below presents the resultant Assigned Noise Level limits, applicable at the nearest NSR:

Part of Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises at locations within 15m of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	**54**	**64**	**74**
	0900 to 1900 hours Sundays and public holidays	**49**	**59**	**74**
	1900 to 2200 hours all days	**49**	**59**	**64**
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	**44**	**54**	**64**
Noise sensitive premises at locations further than 15m of a building directly associated with a noise sensitive use	All hours	**60**	**75**	**80**
Commercial premises	All hours	**60**	**75**	**80**
Industrial and Utility premises	All hours	**65**	**80**	**90**

Appendix D presents the calculation methodology and assumptions used in our assessment.

9.1.6 Noise Source Character

In addition to the ANL limits, particular noise sources can attract additional punitive dB levies based upon the noise source characteristics. *Regulation 7* prescribes that the noise character must be "free" of annoying characteristics - specifically:

(i) tonality (e.g. whining, droning)
(ii) modulation (e.g. cyclical change in character, such as a siren)
(iii) impulsiveness (e.g. banging, thumping)

Penalties apply up to a maximum of +15dB, for tonality (+5dB), modulation (+5dB) and impulsiveness (+10dB), where the noise source is NOT music.

9.2 Potential Noise Emission Sources

9.2.1 Residential A/C Condenser Units

A number of mechanical strategies exist for the Ground Floor commercial and residential apartments to effect heating, cooling and ventilation as required for occupant comfort. Design drawings show intention for residential apartments to be heated/cooled using split system air conditioning, with internal FCU units linked to external CU units located on balconies. The CUs are shown concealed in ventilated store cupboards or in purpose-made ventilated enclosures.

Residential CU systems can be anticipated to be operating after 10pm, hence the most stringent noise emissions limit L_{A10} 44 dB have been applied. Pending mechanical loads and eventual equipment selections, typical Daikin or Mitsubishi units are available with operating sound pressure level ratings of 48 dB(A) at 3m. Such a selection placed within a ventilated enclosed box would be sufficient to reduce this down to a compliant noise emissions level. Selecting a lower sound pressure level rating AC unit will further reduce emissions, hence residential units are anticipated to comply at all times with the applicable EPA *Regulations*.

Typically CUs are not anticipated to be "tonal", generating a steady-state, broadband noise source hence no additional penalties are expected, pending unit selection. Sealhurst recommend mechanical concepts for commercial unit and residential apartments' heating/cooling and ventilation be acoustically reviewed in terms of equipment noise data, to ensure the design is able to comply with EPA requirements.

9.2.2 Commercial A/C Condenser Units

Commercial plant systems are anticipated to be located at roof level – equipment selections and locations will be reviewed and assessed during detailed design to ensure compliance with the applicable *Regulations.* It is anticipated that commercial area plant systems will be used up until evening hours, hence the less stringent limit of L_{A10} 49 dB will be applied at the nearest noise-sensitive receiver.

9.2.3 Car Park Exhaust System Noise

The enclosed integrated car park system will require an exhaust air system capable of generating air change cycles sufficient to maintain air quality within car park areas. Car park exhaust systems can take various forms, pending design and application, though whichever concept is used, systems are typically triggered by CO sensors when combustion engine vehicle exhaust gas concentration reach a certain level. The system fan, and ducted exhaust termination sat atmosphere must be able to comply with the Assigned Noise Level (ANL) limits applicable under the *WA Environmental Protection (Noise) Regulations 1997* as determined in this report.

As the development design progresses to a fixed concept, fan location(s), duct routing and exhaust terminations must be reviewed to ensure noise generated at atmospheric termination(s) are able to comply with the *Regulations*. The system must also present a low noise source during operation to eventual residents at the development itself.

Fan(s) selection must be checked for anticipated tonality, impulsiveness and modulation and acoustically-treated as appropriate to demonstrate compliance with the applicable *Regulations*.

9.2.4 Bin Stores

Noise emissions from atmospheric termination grilles relating to bin stores exhaust fan systems must be able to comply with the Assigned Noise Level (ANL) limits applicable under the *WA Environmental Protection (Noise) Regulations 1997* as determined in this report.

Eventual fan(s) selection must be checked for anticipated tonality, impulsiveness and modulation and acoustically-treated as appropriate to demonstrate compliance with the applicable *Regulations*.

9.2.5 Emergency Fire Pump – Maintenance Operations

Fire pump plant is subject to mandatory routine maintenance operations under AS 1851. Under this guidance, noise emitted is not considered an "occasional problem", therefore noise emissions during such maintenance periods must comply with the Assigned Noise Limits (ANL).

If untreated for noise emissions, diesel fire pumps can generate significant levels of noise (>100dB(A)) which would not comply with the Regulations. Fire pumps are anticipated to be located in the Ground Floor fire pump room which is close to street level – pending mechanical ventilation strategy, pump room doors and/or walls may require ventilation louvers to allow air flow for diesel engine operation which act as noise leak points.

Several options exist to control noise during routine maintenance periods – pending manufacturer, integrated engine covers and exhaust muffler silencers can be added to the fire pump to control noise at source.

Secondary controls can be applied to the Fire Pump room internal surfaces in the form of acoustically absorptive wall and ceiling surface treatments, though would be less effective;

Finally, sealed heavy door sets and ventilation louvers may also require acoustic treatment, pending plant selection and generated noise levels.

To further minimise the risk of potential noise nuisance, routine maintenance testing should be scheduled to occur during weekdays, preferably in the mid-afternoon period, when the applicable noise limits are at their least stringent, and any emissions are likely to be effectively masked the consistent presence of local traffic noise.

9.3 Noise & Vibration during Construction Stage

The project will necessarily undertake a schedule of demolition and forward works to prepare the site for the new construction. This phase of works will inherently cause a period of potentially intrusive noise and vibration to the adjacent (retained) commercial building, and to offsite commercial neighbours.

Strictly speaking, all environmental noise emissions must demonstrate compliance with *Regulation 7* of the *WA Environmental Protection (Noise) Regulations 1997 (inc amendments)* which sets out the prescribed standard for calculating Assigned Noise Level limits for noise emissions, when received at the nearest noise sensitive neighbour.

9.3.1 Extract from Sub-Regulation 13, Clause (6)

In practice, and especially with particular temporary noise sources such as construction works, limits applicable under the *Regulations* can present an impractical target - for such purposes, the legislation affords alternative guidance under *Regulation 13* whereby a noise management plan is to be established to manage and control noise Extract from Regulation 13 Clause (6)

Construction noise and vibration to surrounding residents is usually a condition of Building Permit approvals, and is satisfied by the creation of a suitable noise management plan to outline appropriate mitigation and administrative conditions to control construction noise, to the satisfaction of the approving local Council.

Clause (6) of Regulation 13 sets out the requirements for a Noise Management Plan, which are as follows:

> *....(6) A noise management plan prepared under sub regulation (3) (c) or (4) is to include, but is not limited to -*
>
> *(a) details of, and reasons for, construction work on the construction site that is likely to be carried out other than between 0700 hours and 1900 hours on any day which is not a Sunday or public holiday;*
> *(b) details of, and the duration of, activities on the construction site likely to result in noise emissions that fail to comply with the standard prescribed under regulation 7;*
> *(c) predictions of noise emissions on the construction site;*
> *(d) details of measures to be implemented to control noise (including vibration) emissions;*
> *(e) procedures to be adopted for monitoring noise (including vibration) emissions;*
> *(f) complaint response procedures to be adopted.*

9.3.2 Noise & Vibration Management Plan

Noise management plans engage the Contractor and affected nearby residents in an agreed plan which sets out a responsible and practical route to controlling or preparing for construction noise. A noise management plan can be extremely effective in maintaining good relations with neighbouring properties during potentially disruptive construction phases.

To address the issue of noise and vibration during construction phase, Sealhurst recommend a detailed noise management plan be established in accordance with *Regulation 13*, *Clause (6)* and in conjunction with the Contractor's demolition, forward works and construction schedules, to demonstrate that as much as practicable, a responsible and practical approach has been considered by the D&C team in terms of noise management.

In the event that Council require a more detailed noise management plan during construction phase, Sealhurst are able to prepare detailed noise and vibration management plan documentation for the planning, control and mitigation of noise and vibration during the Forward Works phase of the project.

A noise management plan (NMP) and vibration management plan (VMP) can be established in accordance with *Regulation 13*, *Clause (6)* and in conjunction with the Contractor's forward works and construction schedules, to demonstrate that as much as practicable, a responsible and practical approach will be considered by the D&C team in terms of noise and vibration management.

9.3.3 AS 2436:2010 Guidelines

In lieu of Council request or requirement for a detailed construction noise and vibration management plan, to assist the developer and/or Main Contractor, Section 4.6 of *AS 2436:2010 Guide to noise and vibration control on construction, demolition and maintenance sites* is reproduced in Appendix F.1. Contained therein are generic practical approaches to be employed during construction which will allow compliance with the Standard.

The application of the principles in Section 4.6 of *AS 2436:2010* coupled with a public information service such as flyers to local residents and businesses setting out the extent and duration of potential works is often sufficient to limit potential complaint.

9.3.4 Detailed Noise & Vibration Management Plan

In circumstances where noise and vibration is a particular concern, and practical compliance with the Assigned Noise Level limits is not possible, the legislation affords alternative guidance under *Regulation 13* whereby a noise management plan is to be established to manage and control noise emissions as much as is reasonably practicable, where potential exceedences are identified

In the event that Council require a more detailed noise management plan during construction phase, Sealhurst are able to prepare detailed noise and vibration management plan documentation for the planning, control and mitigation of noise and vibration during the Forward Works phase of the project.

A noise management plan (NMP) and vibration management plan (VMP) can be established in accordance with *Regulation 13*, *Clause (6)* and in conjunction with the Contractor's forward works and construction schedules, to demonstrate that as much as practicable, a responsible and practical approach will be considered by the D&C team in terms of noise and vibration management.

A. SCHEDULES OF INFORMATION

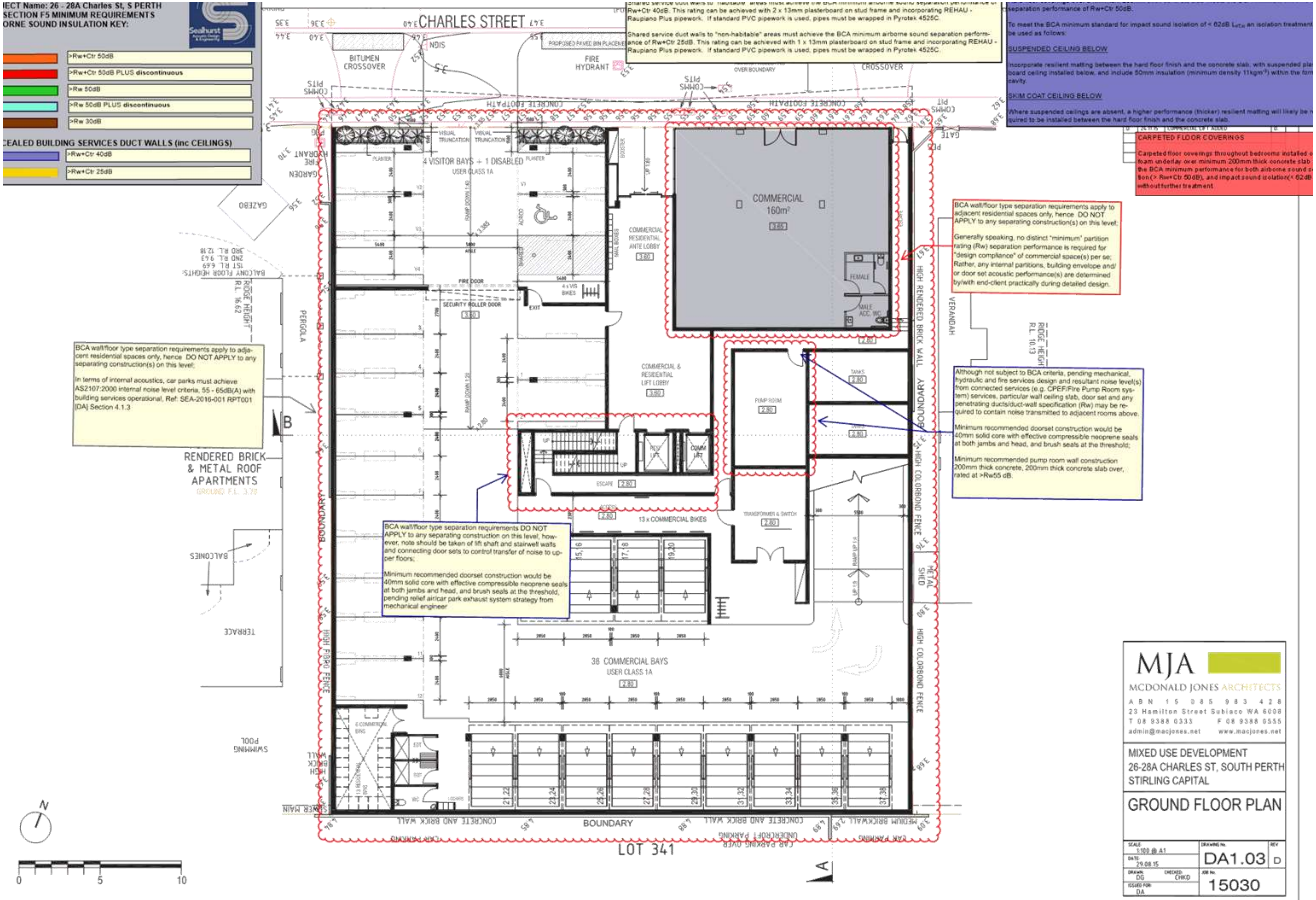
A.1 Architectural Drawings

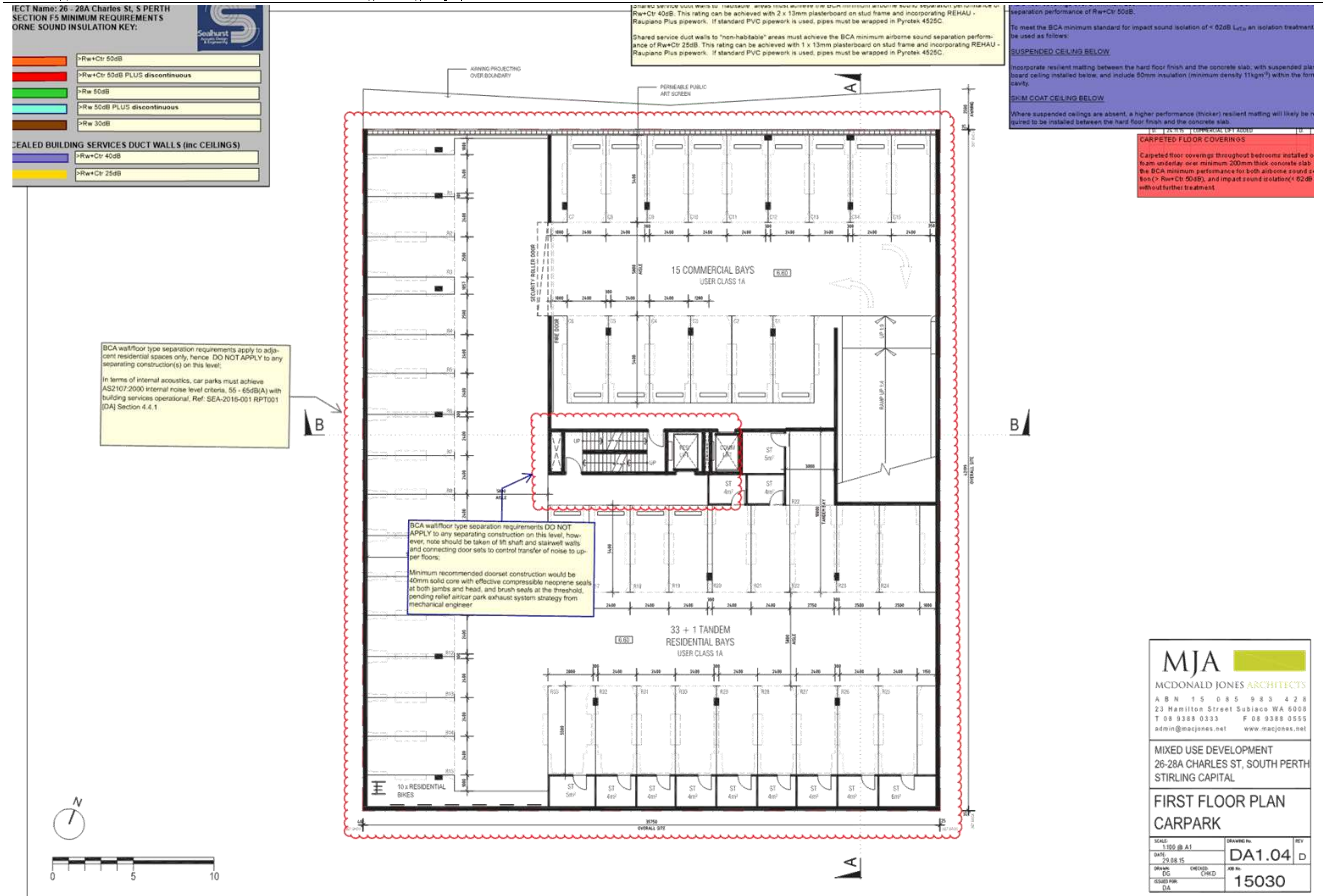
The following DA design drawings have been provided by McDonald Jones Architects and have been used for design development review – acoustic design compliance and advice is based upon the information contained within these drawings:

DWG. REF	TITLE	DATE	REV	ISSUE STATUS
DA1.00	SITE PLAN	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.01	SITE SURVEY	29.08.15	C	**DEVELOPMENT APPROVAL**
DA1.02	OVERSHADOWING DIAGRAM	29.08.15	C	**DEVELOPMENT APPROVAL**
DA1.03	GROUND FLOOR PLAN	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.04	FIRST FLOOR PLAN CARPARK	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.05	SECOND FLOOR PLAN COMMERCIAL	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.06	THIRD FLOOR PLAN COMMERCIAL	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.07	FOURTH FLOOR PLAN COMMERCIAL	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.08	FIFTH FLOOR PLAN RESIDENTIAL	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.09	SIXTH FLOOR PLAN RESIDENTIAL	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.10	SEVENTH FLOOR PLAN RESIDENTIAL	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.11	EIGHTH FLOOR PLAN RESIDENTIAL	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.12	ROOF PLAN	29.08.15	C	**DEVELOPMENT APPROVAL**
DA1.13	DESIGN SECTION AA	29.08.15	C	**DEVELOPMENT APPROVAL**
DA1.14	DESIGN SECTION BB	29.08.15	D	**DEVELOPMENT APPROVAL**
DA1.15	NORTH ELEVATION CHARLES STREET	29.08.15	C	**DEVELOPMENT APPROVAL**
DA1.16	EAST ELEVATION	29.08.15	C	**DEVELOPMENT APPROVAL**
DA1.17	SOUTH ELEVATION	29.08.15	B	**DEVELOPMENT APPROVAL**

B. ARCHITECTURAL MARK UPS

B.1 NCC Compliance - Minimum Wall Requirements & Notes


JECT Name: 26 - 28A Charles St, S PERTH
SECTION F5 MINIMUM REQUIREMENTS
ORNE SOUND INSULATION KEY:
Sealhurst
>Rw+Ctr 50dB
>Rw+Ctr 50dB PLUS discontinuous
>Rw 50dB
>Rw 50dB PLUS discontinuous
>Rw 30dB
EALED BUILDING SERVICES DUCT WALLS (inc CEILINGS)
>Rw+Ctr 40dB
>Rw+Ctr 25dB
Rw+Ctr 40dB. This rating can be achieved with 2 x 13mm plasterboard on stud frame and incorporating REHAU Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
Shared service duct walls to "non-habitable" areas must achieve the BCA minimum airborne sound separation performance of Rw+Ctr 25dB. This rating can be achieved with 1 x 13mm plasterboard on stud frame and incorporating REHAU Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
separation performance of Rw+Ctr 50dB.
To meet the BCA minimum standard for impact sound isolation of < 62dB an isolation treatment be used as follows:
SUSPENDED CEILING BELOW
Incorporate resilient matting between the hard floor finish and the concrete slab, with suspended board ceiling installed below, and include 50mm insulation (minimum density 11kg/m³) within the cavity.
SKIM COAT CEILING BELOW
Where suspended ceilings are absent, a higher performance (thicker) resilient matting will likely be required to be installed between the hard floor finish and the concrete slab.
CARPETED FLOOR COVERINGS
Carpeted floor coverings throughout bedrooms installed over foam underlay over minimum 200mm thick concrete slab the BCA minimum performance for both airborne sound isolation (> Rw+Ctr 50dB), and impact sound isolation (< 62dB without further treatment
CHARLES STREET
BITUMEN CROSSOVER
FIRE HYDRANT
CROSSOVER
CONCRETE FOOTPATH
4 VISITOR BAYS + 1 DISABLED
USER CLASS 1A
COMMERCIAL 160m²
COMMERCIAL RESIDENTIAL ANTE LOBBY
FIRE DOOR
SECURITY ROLLER DOOR
EXIT
4 x VIS BIKES
BCA wall/floor type separation requirements apply to adjacent residential spaces only, hence DO NOT APPLY to any separating construction(s) on this level;
Generally speaking, no distinct "minimum" partition rating (Rw) separation performance is required for "design compliance" of commercial space(s) per se; Rather, any internal partitions, building envelope and/ or door set acoustic performance(s) are determined by/with end-client practically during detailed design.
BCA wall/floor type separation requirements apply to adjacent residential spaces only, hence DO NOT APPLY to any separating construction(s) on this level;
In terms of internal acoustics, car parks must achieve AS2107:2000 internal noise level criteria, 55 - 65dB(A) with building services operational, Ref: SEA-2016-001 RPT001 [DA] Section 4.1.3
COMMERCIAL & RESIDENTIAL LIFT LOBBY
PUMP ROOM
TANKS
Although not subject to BCA criteria, pending mechanical, hydraulic and fire services design and resultant noise level(s) from connected services (e.g. CPEF/Fire Pump Room system) services, particular wall ceiling slab, door set and any penetrating ducts/duct-wall specification (Rw) may be required to contain noise transmitted to adjacent rooms above.
Minimum recommended doorset construction would be 40mm solid core with effective compressible neoprene seals at both jambs and head, and brush seals at the threshold;
Minimum recommended pump room wall construction 200mm thick concrete, 200mm thick concrete slab over, rated at >Rw55 dB.
RENDERED BRICK & METAL ROOF APARTMENTS
PERGOLA
ESCAPE
TRANSFORMER & SWITCH
13 x COMMERCIAL BIKES
BCA wall/floor type separation requirements DO NOT APPLY to any separating construction on this level, however, note should be taken of lift shaft and stairwell walls and connecting door sets to control transfer of noise to upper floors;
Minimum recommended doorset construction would be 40mm solid core with effective compressible neoprene seals at both jambs and head, and brush seals at the threshold, pending relief air/car park exhaust system strategy from mechanical engineer
HIGH RENDERED BRICK WALL
BOUNDARY
HIGH COLORBOND FENCE
VERANDAH
METAL SHED
HIGH FIBRO FENCE
38 COMMERCIAL BAYS
USER CLASS 1A
BOUNDARY
LOT 341
MJA
MCDONALD JONES ARCHITECTS
A B N 1 5 0 8 5 9 8 3 4 2 8
23 Hamilton Street Subiaco WA 6008
T 08 9388 0333 F 08 9388 0555
admin@macjones.net www.macjones.net
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
GROUND FLOOR PLAN
SCALE 1:100 @ A1
DATE 29.08.15
DRAWN DG
CHECKED CHKD
ISSUED FOR DA
DA1.03
D
15030
N
0
5
10


ECT Name: 26 - 28A Charles St, S PERTH
SECTION F5 MINIMUM REQUIREMENTS
ORNE SOUND INSULATION KEY:
>Rw+Ctr 50dB
>Rw+Ctr 50dB PLUS discontinuous
>Rw 50dB
>Rw 50dB PLUS discontinuous
>Rw 30dB
CEALED BUILDING SERVICES DUCT WALLS (inc CEILINGS)
>Rw+Ctr 40dB
>Rw+Ctr 25dB
Rw+Ctr 40dB. This rating can be achieved with 2 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
Shared service duct walls to "non-habitable" areas must achieve the BCA minimum airborne sound separation performance of Rw+Ctr 25dB. This rating can be achieved with 1 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
separation performance of Rw+Ctr 50dB.
To meet the BCA minimum standard for impact sound isolation of < 62dB an isolation treatment be used as follows:
SUSPENDED CEILING BELOW
SKIM COAT CEILING BELOW
CARPETED FLOOR COVERINGS
AWNING PROJECTING OVER BOUNDARY
PERMEABLE PUBLIC ART SCREEN
15 COMMERCIAL BAYS
USER CLASS 1A
SECURITY ROLLER DOOR
FIRE DOOR
RAMP UP 1:4
BCA wall/floor type separation requirements apply to adjacent residential spaces only, hence DO NOT APPLY to any separating construction(s) on this level;
In terms of internal acoustics, car parks must achieve AS2107:2000 internal noise level criteria, 55 - 65dB(A) with building services operational, Ref: SEA-2016-001 RPT001 [DA] Section 4.4.1
BCA wall/floor type separation requirements DO NOT APPLY to any separating construction on this level, however, note should be taken of lift shaft and stairwell walls and connecting door sets to control transfer of noise to upper floors;
Minimum recommended doorset construction would be 40mm solid core with effective compressible neoprene seals at both jambs and head, and brush seals at the threshold, pending relief air/car park exhaust system strategy from mechanical engineer
33 + 1 TANDEM
RESIDENTIAL BAYS
USER CLASS 1A
10 x RESIDENTIAL BIKES
35750
OVERALL SITE
MJA
MCDONALD JONES ARCHITECTS
23 Hamilton Street Subiaco WA 6008
T 08 9388 0333
F 08 9388 0555
admin@macjones.net
www.macjones.net
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
FIRST FLOOR PLAN
CARPARK
1:100 @ A1
29.08.15
DA1.04
D
15030
DA

IECT Name: 26 - 28A Charles St, S PERTH
SECTION F5 MINIMUM REQUIREMENTS
ORNE SOUND INSULATION KEY:

Sealhurst

(orange)	>Rw+Ctr 50dB
(red)	>Rw+Ctr 50dB PLUS discontinuous
(green)	>Rw 50dB
(cyan)	>Rw 50dB PLUS discontinuous
(brown)	>Rw 30dB

EALED BUILDING SERVICES DUCT WALLS (inc CEILINGS)

(purple)	>Rw+Ctr 40dB
(yellow)	>Rw+Ctr 25dB

Rw+Ctr 40dB. This rating can be achieved with 2 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.

Shared service duct walls to "non-habitable" areas must achieve the BCA minimum airborne sound separation performance of Rw+Ctr 25dB. This rating can be achieved with 1 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.

separation performance of Rw+Ctr 50dB.

To meet the BCA minimum standard for impact sound isolation of < 62dB $L_{nT,w}$ an isolation treatment be used as follows:

SUSPENDED CEILING BELOW

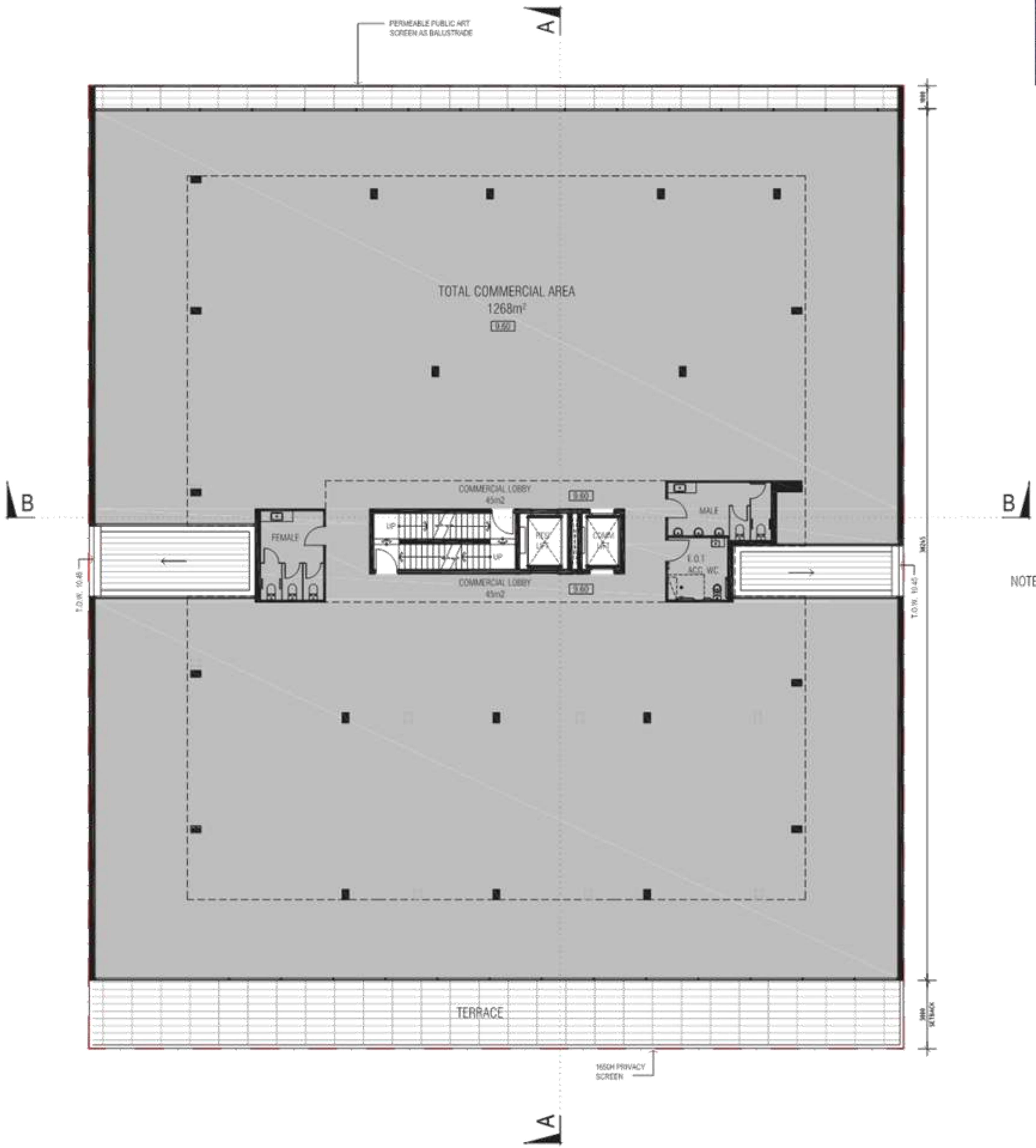
Incorporate resilient matting between the hard floor finish and the concrete slab, with suspended pla board ceiling installed below, and include 50mm insulation (minimum density 11kgm³) within the forn cavity.

SKIM COAT CEILING BELOW

Where suspended ceilings are absent, a higher performance (thicker) resilient matting will likely be re quired to be installed between the hard floor finish and the concrete slab.

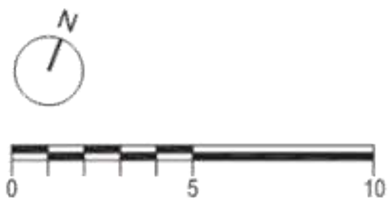
CARPETED FLOOR COVERINGS

Carpeted floor coverings throughout bedrooms installed o foam underlay over minimum 200mm thick concrete slab the BCA minimum performance for both airborne sound s tion (> Rw+Ctr 50dB), and impact sound isolation(< 62dB without further treatment



NOTE: TOILET CALCULATIONS BASED UPON 120 PERSON FLOOR OCCUPANCY

60 MALE	2 PANS, 3 URINALS & 1 HAND BASIN
60 FEMALE	3 PANS & 1 HAND BASIN
	1 UNISEX DISABLED EOT & WC (1 PAN, 1 BASIN & 1 SHWR)



MJA
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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

SECOND FLOOR PLAN
COMMERCIAL

SCALE: 1:100 @ A1	DRAWING No. DA1.05	REV D
DATE: 29.08.15		
DRAWN: DG CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: DA		

JECT Name: 26 - 28A Charles St, S PERTH
SECTION F5 MINIMUM REQUIREMENTS
ORNE SOUND INSULATION KEY:

Sealhurst

(orange)	>Rw+Ctr 50dB
(red)	>Rw+Ctr 50dB PLUS discontinuous
(green)	>Rw 50dB
(cyan)	>Rw 50dB PLUS discontinuous
(brown)	>Rw 30dB

CEALED BUILDING SERVICES DUCT WALLS (inc CEILINGS)

(purple)	>Rw+Ctr 40dB
(yellow)	>Rw+Ctr 25dB

Rw+Ctr 40dB. This rating can be achieved with 2 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.

Shared service duct walls to "non-habitable" areas must achieve the BCA minimum airborne sound separation performance of Rw+Ctr 25dB. This rating can be achieved with 1 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.

separation performance of Rw+Ctr 50dB.

To meet the BCA minimum standard for impact sound isolation of < 62dB $L_{nT,w}$ an isolation treatment be used as follows:

SUSPENDED CEILING BELOW

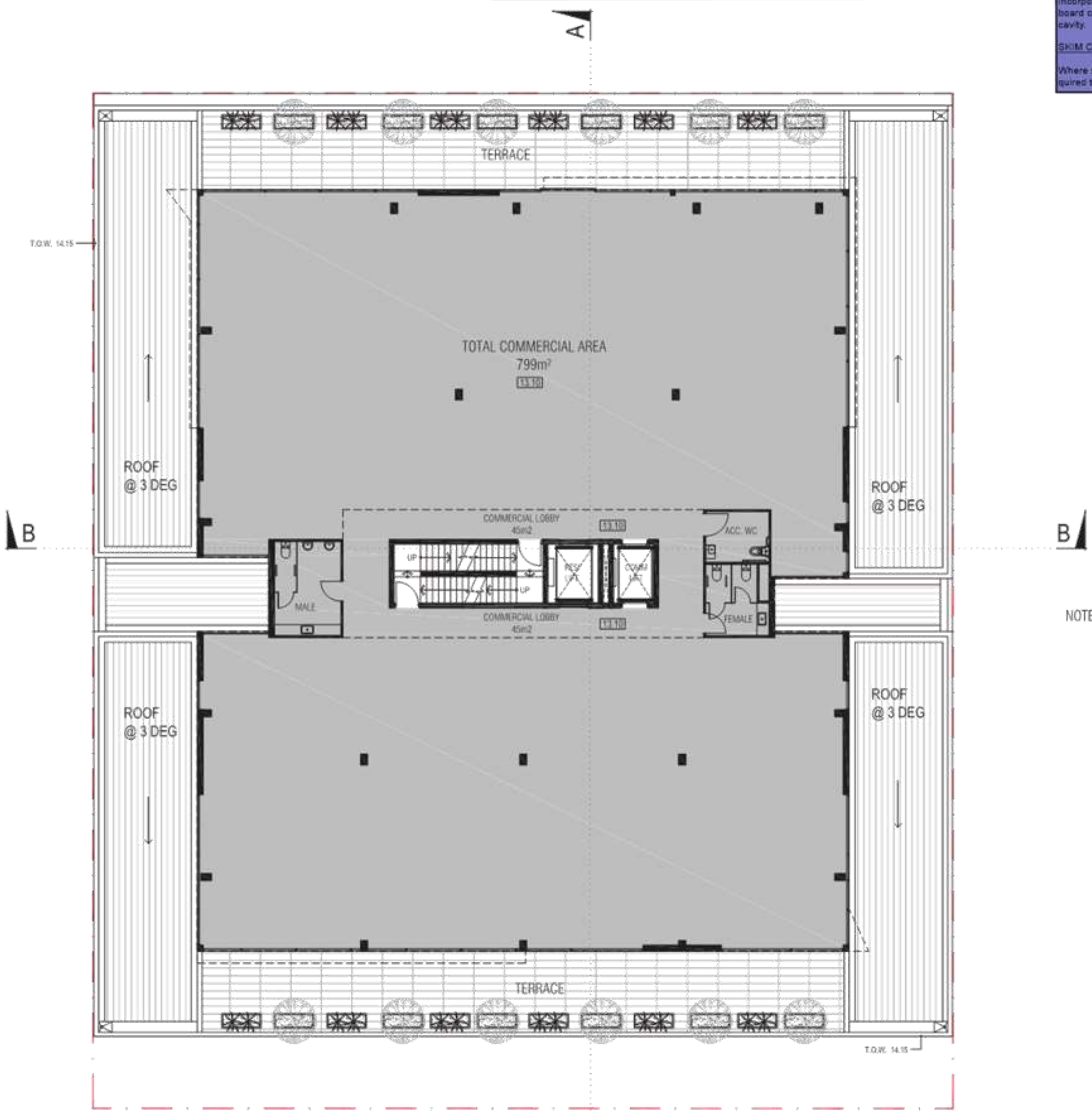
Incorporate resilient matting between the hard floor finish and the concrete slab, with suspended pla board ceiling installed below, and include 50mm insulation (minimum density 11kgm^{3}) within the form cavity.

SKIM COAT CEILING BELOW

Where suspended ceilings are absent, a higher performance (thicker) resilient matting will likely be re quired to be installed between the hard floor finish and the concrete slab.

CARPETED FLOOR COVERINGS

Carpeted floor coverings throughout bedrooms installed o foam underlay over minimum 200mm thick concrete slab the BCA minimum performance for both airborne sound s tion (> Rw+Ctr 50dB), and impact sound isolation(< 62dB without further treatment.



NOTE: TOILET CALCULATIONS BASED UPON 74 PERSON FLOOR OCCUPANCY

37 MALE	1 PAN, 2 URINALS & 1 HAND BASIN
37 FEMALE	2 PAN & 1 HAND BASIN
	1 UNISEX DISABLED WC (1 PAN & 1 BASIN)

N

0 5 10

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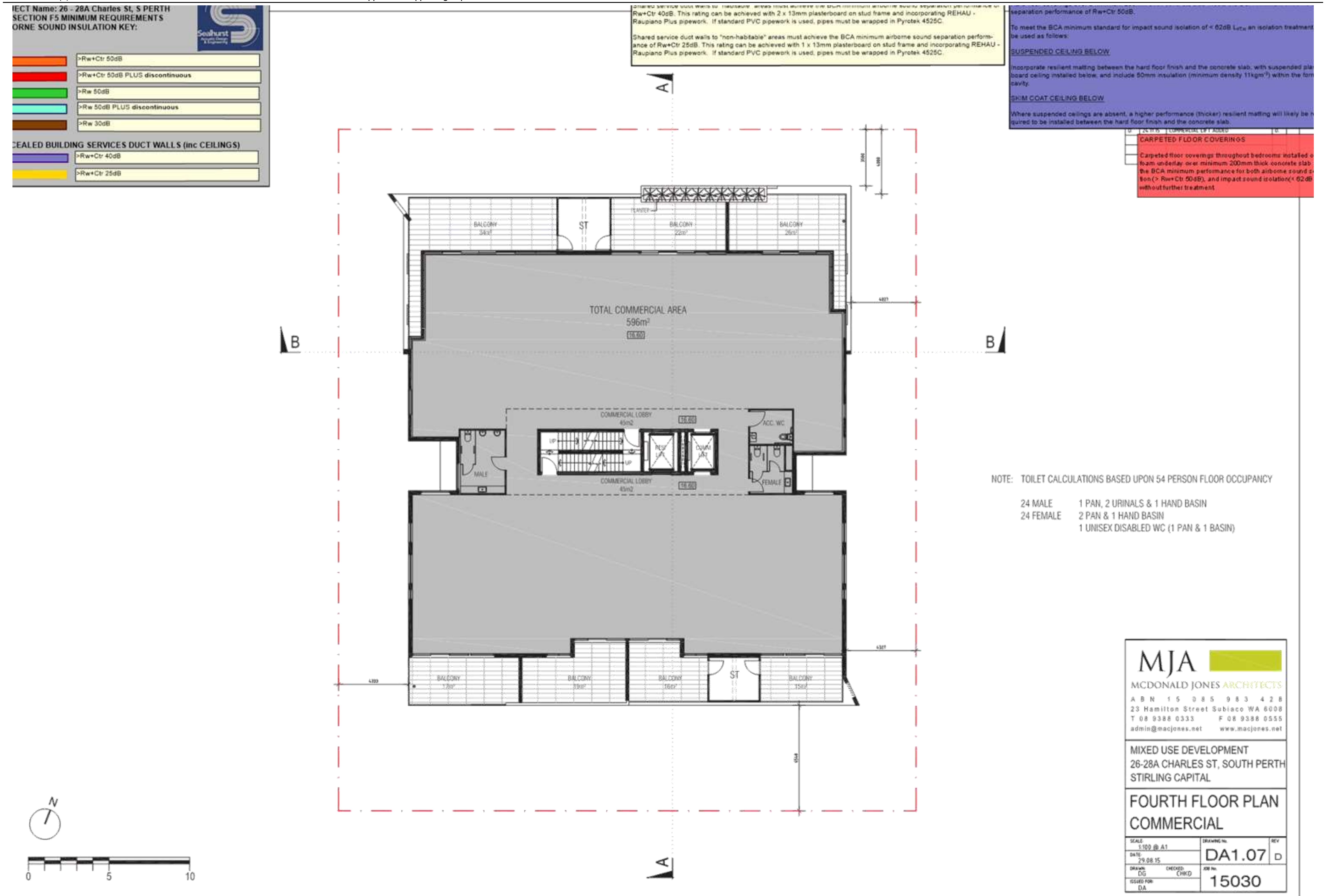
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

THIRD FLOOR PLAN
COMMERCIAL

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: DA
DRAWING No: DA1.06 REV: D
JOB No: 15030


IECT Name: 26 - 28A Charles St, S PERTH
SECTION F5 MINIMUM REQUIREMENTS
ORNE SOUND INSULATION KEY:
Sealhurst
>Rw+Ctr 50dB
>Rw+Ctr 50dB PLUS discontinuous
>Rw 50dB
>Rw 50dB PLUS discontinuous
>Rw 30dB
CEALED BUILDING SERVICES DUCT WALLS (inc CEILINGS)
>Rw+Ctr 40dB
>Rw+Ctr 25dB
Rw+Ctr 40dB. This rating can be achieved with 2 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
Shared service duct walls to "non-habitable" areas must achieve the BCA minimum airborne sound separation performance of Rw+Ctr 25dB. This rating can be achieved with 1 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
separation performance of Rw+Ctr 50dB.
To meet the BCA minimum standard for impact sound isolation of < 62dB an isolation treatment be used as follows:
SUSPENDED CEILING BELOW
Incorporate resilient matting between the hard floor finish and the concrete slab, with suspended board ceiling installed below, and include 50mm insulation (minimum density 11kgm³) within the cavity.
SKIM COAT CEILING BELOW
Where suspended ceilings are absent, a higher performance (thicker) resilient matting will likely be required to be installed between the hard floor finish and the concrete slab.
CARPETED FLOOR COVERINGS
Carpeted floor coverings throughout bedrooms installed foam underlay over minimum 200mm thick concrete slab the BCA minimum performance for both airborne sound tion (> Rw+Ctr 50dB), and impact sound isolation(< 62dB without further treatment
A
B
B
A
BALCONY
ST
BALCONY
BALCONY
PLANTER
TOTAL COMMERCIAL AREA
596m²
COMMERCIAL LOBBY
45m2
ACC. WC
MALE
FEMALE
UP
COMMERCIAL LOBBY
45m2
BALCONY
BALCONY
BALCONY
ST
BALCONY
NOTE: TOILET CALCULATIONS BASED UPON 54 PERSON FLOOR OCCUPANCY
24 MALE 1 PAN, 2 URINALS & 1 HAND BASIN
24 FEMALE 2 PAN & 1 HAND BASIN
1 UNISEX DISABLED WC (1 PAN & 1 BASIN)
N
0
5
10
MJA
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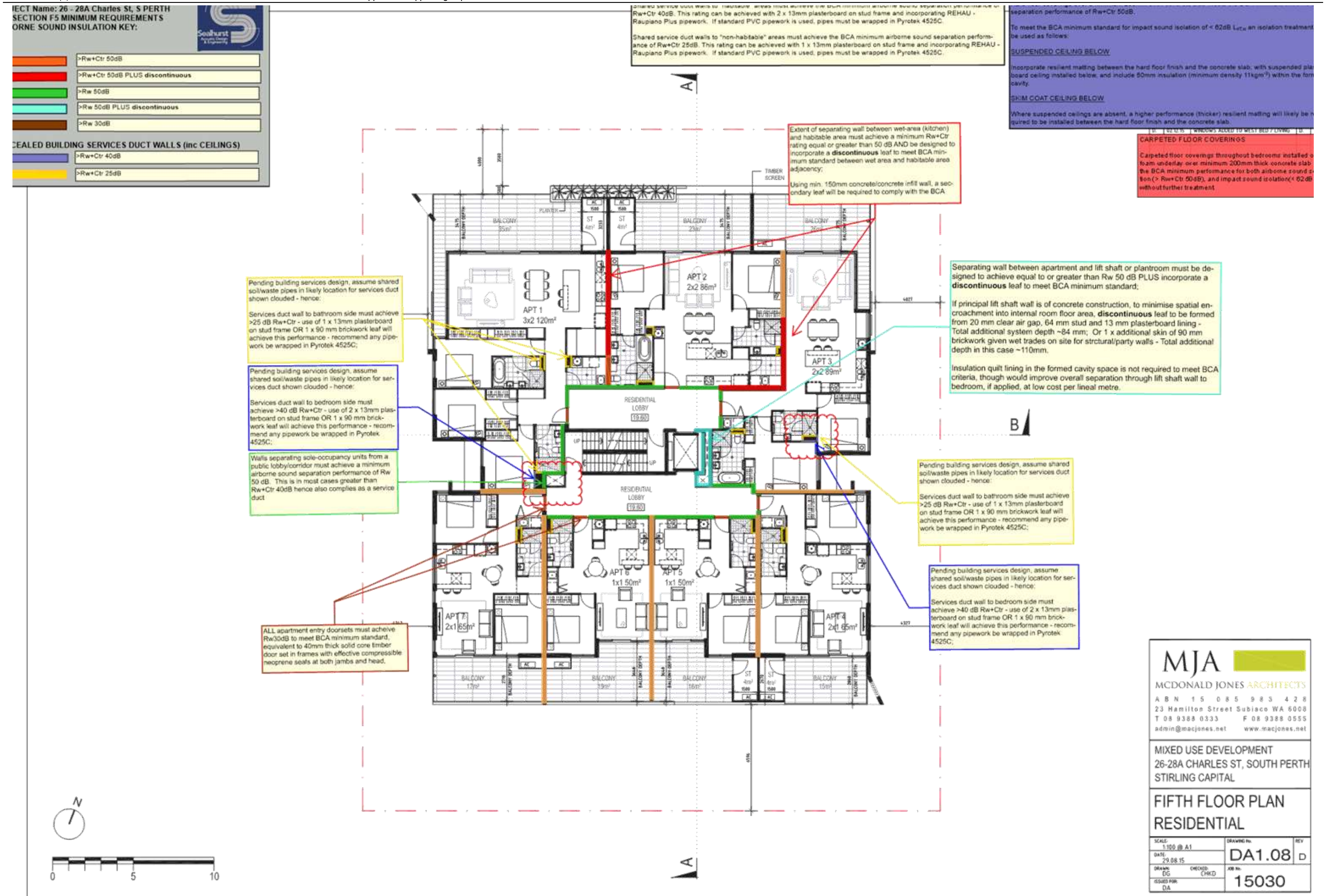
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
FOURTH FLOOR PLAN
COMMERCIAL
SCALE 1:100 @ A1
DATE 29.08.15
DRAWN DG
CHECKED CHKD
ISSUED FOR DA
DRAWING No. DA1.07
REV D
JOB No. 15030


JECT Name: 26 - 28A Charles St, S PERTH
SECTION F5 MINIMUM REQUIREMENTS
ORNE SOUND INSULATION KEY:
Sealhurst
>Rw+Ctr 50dB
>Rw+Ctr 50dB PLUS discontinuous
>Rw 50dB
>Rw 50dB PLUS discontinuous
>Rw 30dB
CEALED BUILDING SERVICES DUCT WALLS (inc CEILINGS)
>Rw+Ctr 40dB
>Rw+Ctr 25dB
Rw+Ctr 40dB. This rating can be achieved with 2 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
Shared service duct walls to "non-habitable" areas must achieve the BCA minimum airborne sound separation performance of Rw+Ctr 25dB. This rating can be achieved with 1 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
separation performance of Rw+Ctr 50dB.
To meet the BCA minimum standard for impact sound isolation of < 62dB an isolation treatment be used as follows:
SUSPENDED CEILING BELOW
Incorporate resilient matting between the hard floor finish and the concrete slab, with suspended plasterboard ceiling installed below, and include 50mm insulation (minimum density 11kgm³) within the formed cavity.
SKIM COAT CEILING BELOW
Where suspended ceilings are absent, a higher performance (thicker) resilient matting will likely be required to be installed between the hard floor finish and the concrete slab.
CARPETED FLOOR COVERINGS
Carpeted floor coverings throughout bedrooms installed on foam underlay over minimum 200mm thick concrete slab the BCA minimum performance for both airborne sound isolation (> Rw+Ctr 50dB), and impact sound isolation(< 62dB without further treatment
Extent of separating wall between wet-area (kitchen) and habitable area must achieve a minimum Rw+Ctr rating equal or greater than 50 dB AND be designed to incorporate a discontinuous leaf to meet BCA minimum standard between wet area and habitable area adjacency;
Using min. 150mm concrete/concrete infill wall, a secondary leaf will be required to comply with the BCA
TIMBER SCREEN
Separating wall between apartment and lift shaft or plantroom must be designed to achieve equal to or greater than Rw 50 dB PLUS incorporate a discontinuous leaf to meet BCA minimum standard;
If principal lift shaft wall is of concrete construction, to minimise spatial encroachment into internal room floor area, discontinuous leaf to be formed from 20 mm clear air gap, 64 mm stud and 13 mm plasterboard lining - Total additional system depth ~84 mm; Or 1 x additional skin of 90 mm brickwork given wet trades on site for strctural/party walls - Total additional depth in this case ~110mm.
Insulation quilt lining in the formed cavity space is not required to meet BCA criteria, though would improve overall separation through lift shaft wall to bedroom, if applied, at low cost per lineal metre.
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bathroom side must achieve >25 dB Rw+Ctr - use of 1 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bedroom side must achieve >40 dB Rw+Ctr - use of 2 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Walls separating sole-occupancy units from a public lobby/corridor must achieve a minimum airborne sound separation performance of Rw 50 dB. This is in most cases greater than Rw+Ctr 40dB hence also complies as a service duct
ALL apartment entry doorsets must acheive Rw30dB to meet BCA minimum standard, equivalent to 40mm thick solid core timber door set in frames with effective compressible neoprene seals at both jambs and head.
APT 1
3x2 120m²
APT 2
2x2 86m²
APT 3
2x2 89m²
APT 4
2x1 65m²
APT 5
1x1 50m²
APT 6
1x1 50m²
APT 7
2x1 65m²
RESIDENTIAL LOBBY
BALCONY
ST
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MJA
MCDONALD JONES ARCHITECTS
A B N 1 5 0 8 5 9 8 3 4 2 8
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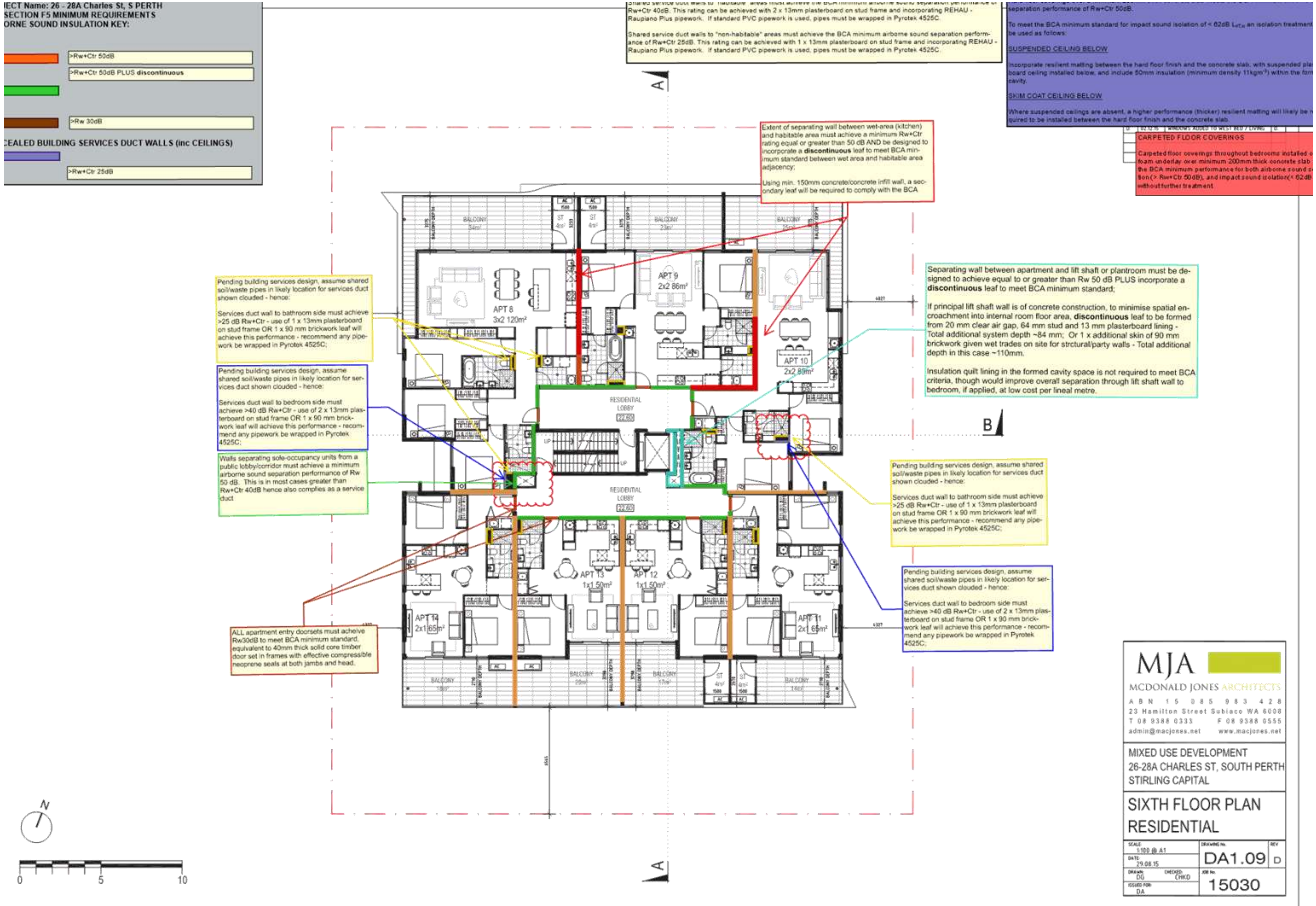
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
FIFTH FLOOR PLAN
RESIDENTIAL
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG
CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.08
REV D
JOB No. 15030


IECT Name: 26 - 28A Charles St, S PERTH
SECTION F5 MINIMUM REQUIREMENTS
ORNE SOUND INSULATION KEY:
>Rw+Ctr 50dB
>Rw+Ctr 50dB PLUS discontinuous
>Rw 30dB
CEALED BUILDING SERVICES DUCT WALLS (inc CEILINGS)
>Rw+Ctr 25dB
Rw+Ctr 40dB. This rating can be achieved with 2 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
Shared service duct walls to "non-habitable" areas must achieve the BCA minimum airborne sound separation performance of Rw+Ctr 25dB. This rating can be achieved with 1 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
separation performance of Rw+Ctr 50dB.
To meet the BCA minimum standard for impact sound isolation of < 62dB an isolation treatment be used as follows:
SUSPENDED CEILING BELOW
Incorporate resilient matting between the hard floor finish and the concrete slab, with suspended board ceiling installed below, and include 50mm insulation (minimum density 11kgm³) within the form cavity.
SKIM COAT CEILING BELOW
Where suspended ceilings are absent, a higher performance (thicker) resilient matting will likely be required to be installed between the hard floor finish and the concrete slab.
CARPETED FLOOR COVERINGS
Carpeted floor coverings throughout bedrooms installed foam underlay over minimum 200mm thick concrete slab the BCA minimum performance for both airborne sound tion (> Rw+Ctr 50dB), and impact sound isolation(< 62dB without further treatment
Extent of separating wall between wet-area (kitchen) and habitable area must achieve a minimum Rw+Ctr rating equal or greater than 50 dB AND be designed to incorporate a discontinuous leaf to meet BCA minimum standard between wet area and habitable area adjacency;
Using min. 150mm concrete/concrete infill wall, a secondary leaf will be required to comply with the BCA
A
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bathroom side must achieve >25 dB Rw+Ctr - use of 1 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bedroom side must achieve >40 dB Rw+Ctr - use of 2 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Walls separating sole-occupancy units from a public lobby/corridor must achieve a minimum airborne sound separation performance of Rw 50 dB. This is in most cases greater than Rw+Ctr 40dB hence also complies as a service duct
APT 8
3x2 120m²
APT 9
2x2 86m²
APT 10
2x2 89m²
RESIDENTIAL LOBBY
RESIDENTIAL LOBBY
APT 13
1x1 50m²
APT 12
1x1 50m²
APT 14
2x1 65m²
APT 11
2x1 65m²
Separating wall between apartment and lift shaft or plantroom must be designed to achieve equal to or greater than Rw 50 dB PLUS incorporate a discontinuous leaf to meet BCA minimum standard;
If principal lift shaft wall is of concrete construction, to minimise spatial encroachment into internal room floor area, discontinuous leaf to be formed from 20 mm clear air gap, 64 mm stud and 13 mm plasterboard lining - Total additional system depth ~84 mm; Or 1 x additional skin of 90 mm brickwork given wet trades on site for strctural/party walls - Total additional depth in this case ~110mm.
Insulation quilt lining in the formed cavity space is not required to meet BCA criteria, though would improve overall separation through lift shaft wall to bedroom, if applied, at low cost per lineal metre.
B
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bathroom side must achieve >25 dB Rw+Ctr - use of 1 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bedroom side must achieve >40 dB Rw+Ctr - use of 2 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
ALL apartment entry doorsets must acheive Rw30dB to meet BCA minimum standard, equivalent to 40mm thick solid core timber door set in frames with effective compressible neoprene seals at both jambs and head.
BALCONY
A
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10
MJA
MCDONALD JONES ARCHITECTS
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23 Hamilton Street Subiaco WA 6008
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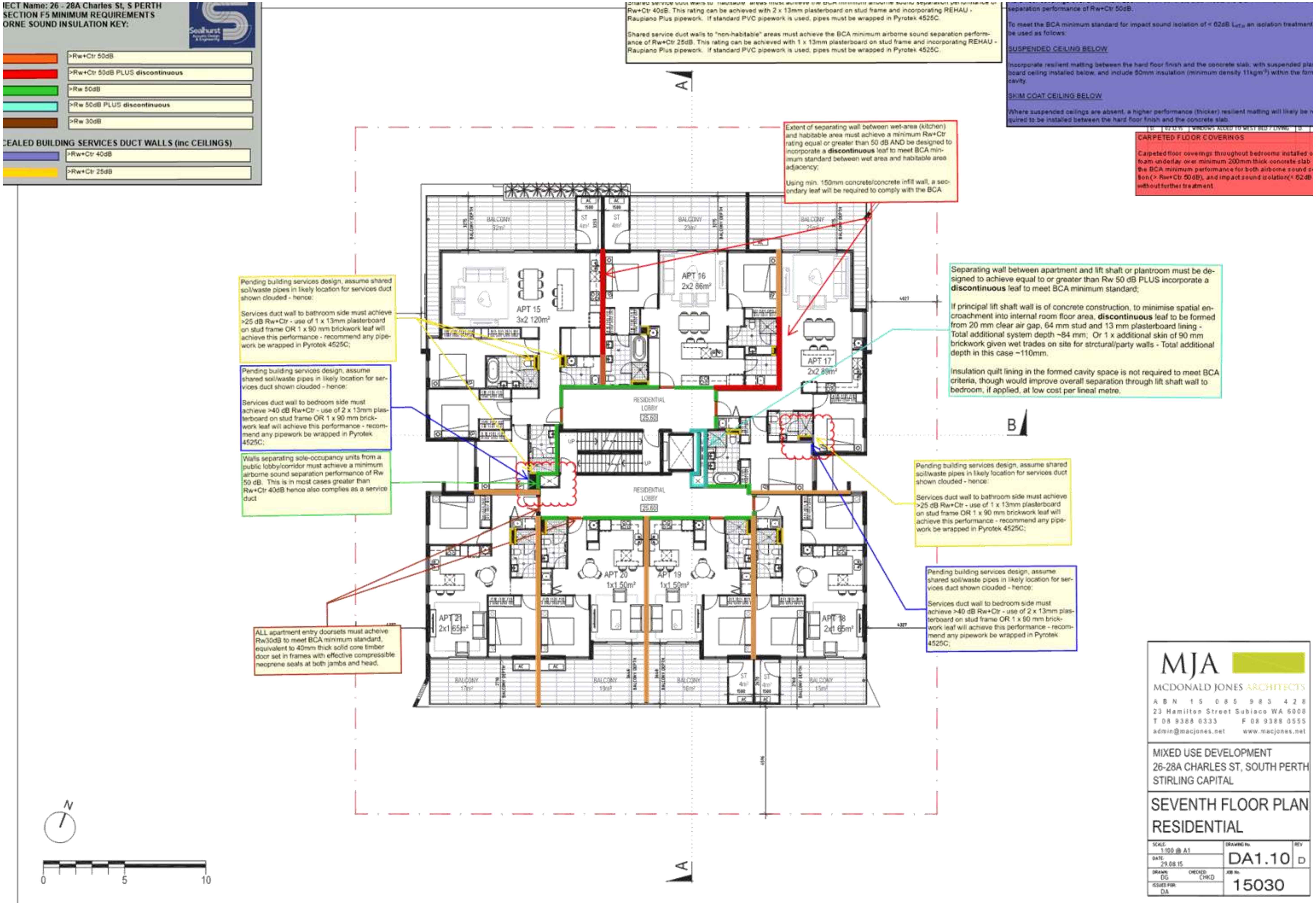
admin@macjones.net www.macjones.net
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
SIXTH FLOOR PLAN
RESIDENTIAL
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG
CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.09
REV D
JOB No. 15030


JECT Name: 26 - 28A Charles St, S PERTH
SECTION F5 MINIMUM REQUIREMENTS
ORNE SOUND INSULATION KEY:
Sealhurst
>Rw+Ctr 50dB
>Rw+Ctr 50dB PLUS discontinuous
>Rw 50dB
>Rw 50dB PLUS discontinuous
>Rw 30dB
CEALED BUILDING SERVICES DUCT WALLS (inc CEILINGS)
>Rw+Ctr 40dB
>Rw+Ctr 25dB
Rw+Ctr 40dB. This rating can be achieved with 2 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
Shared service duct walls to "non-habitable" areas must achieve the BCA minimum airborne sound separation performance of Rw+Ctr 25dB. This rating can be achieved with 1 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
separation performance of Rw+Ctr 50dB.
To meet the BCA minimum standard for impact sound isolation of < 62dB an isolation treatment be used as follows:
SUSPENDED CEILING BELOW
Incorporate resilient matting between the hard floor finish and the concrete slab, with suspended board ceiling installed below, and include 50mm insulation (minimum density 11kgm³) within the cavity.
SKIM COAT CEILING BELOW
Where suspended ceilings are absent, a higher performance (thicker) resilient matting will likely be required to be installed between the hard floor finish and the concrete slab.
CARPETED FLOOR COVERINGS
Carpeted floor coverings throughout bedrooms installed on foam underlay over minimum 200mm thick concrete slab the BCA minimum performance for both airborne sound tion (> Rw+Ctr 50dB), and impact sound isolation(< 62dB without further treatment
Extent of separating wall between wet-area (kitchen) and habitable area must achieve a minimum Rw+Ctr rating equal or greater than 50 dB AND be designed to incorporate a discontinuous leaf to meet BCA minimum standard between wet area and habitable area adjacency;
Using min. 150mm concrete/concrete infill wall, a secondary leaf will be required to comply with the BCA
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bathroom side must achieve >25 dB Rw+Ctr - use of 1 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bedroom side must achieve >40 dB Rw+Ctr - use of 2 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Walls separating sole-occupancy units from a public lobby/corridor must achieve a minimum airborne sound separation performance of Rw 50 dB. This is in most cases greater than Rw+Ctr 40dB hence also complies as a service duct
ALL apartment entry doorsets must acheive Rw30dB to meet BCA minimum standard, equivalent to 40mm thick solid core timber door set in frames with effective compressible neoprene seals at both jambs and head.
Separating wall between apartment and lift shaft or plantroom must be designed to achieve equal to or greater than Rw 50 dB PLUS incorporate a discontinuous leaf to meet BCA minimum standard;
If principal lift shaft wall is of concrete construction, to minimise spatial encroachment into internal room floor area, discontinuous leaf to be formed from 20 mm clear air gap, 64 mm stud and 13 mm plasterboard lining - Total additional system depth ~84 mm; Or 1 x additional skin of 90 mm brickwork given wet trades on site for strctural/party walls - Total additional depth in this case ~110mm.
Insulation quilt lining in the formed cavity space is not required to meet BCA criteria, though would improve overall separation through lift shaft wall to bedroom, if applied, at low cost per lineal metre.
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bathroom side must achieve >25 dB Rw+Ctr - use of 1 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bedroom side must achieve >40 dB Rw+Ctr - use of 2 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
A
B
APT 15
3x2 120m²
APT 16
2x2 86m²
APT 17
2x2 89m²
APT 18
2x1 65m²
APT 19
1x1 50m²
APT 20
1x1 50m²
APT 21
2x1 65m²
RESIDENTIAL LOBBY
RESIDENTIAL LOBBY
BALCONY
ST
4m²
N
0
5
10
MJA
MCDONALD JONES ARCHITECTS
A B N 15 085 983 428
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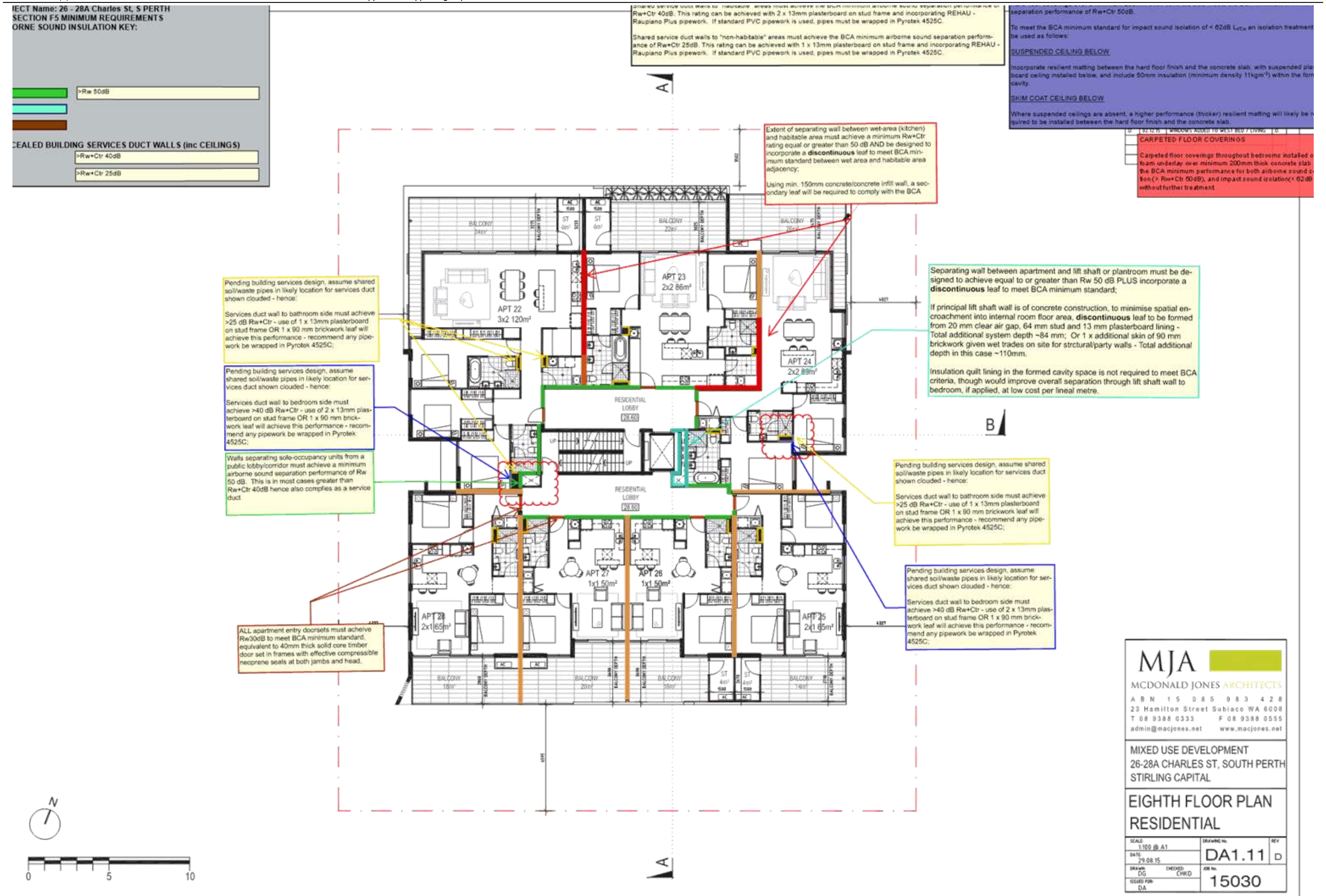
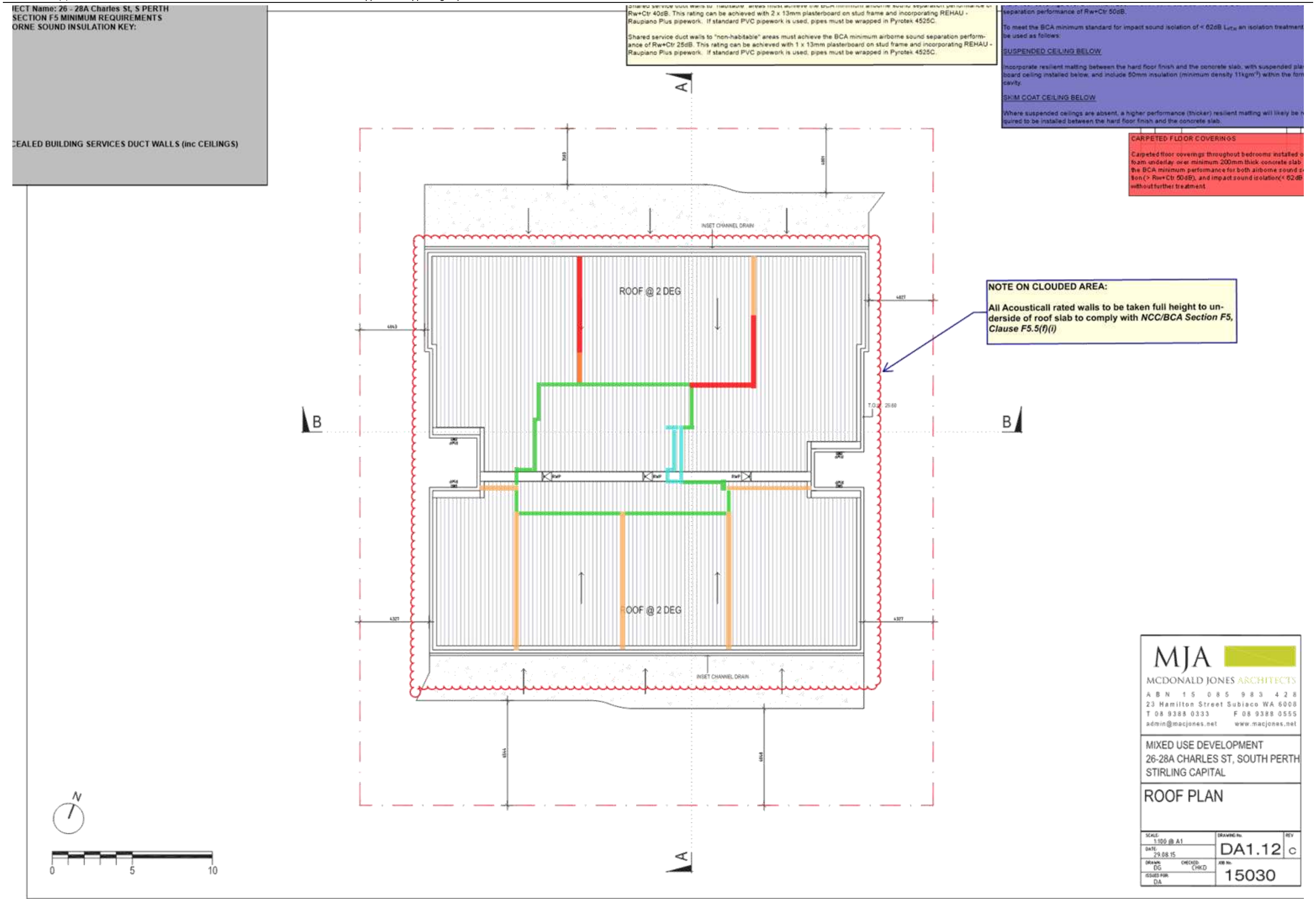
F 08 9388 0555
admin@macjones.net
www.macjones.net
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
SEVENTH FLOOR PLAN
RESIDENTIAL
SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG
CHECKED: CHKD
ISSUED FOR: DA
DRAWING No. DA1.10
REV D
JOB No. 15030


IECT Name: 26 - 28A Charles St, S PERTH
SECTION F5 MINIMUM REQUIREMENTS
ORNE SOUND INSULATION KEY:
>Rw 50dB
CEALED BUILDING SERVICES DUCT WALLS (inc CEILINGS)
>Rw+Ctr 40dB
>Rw+Ctr 25dB
Rw+Ctr 40dB. This rating can be achieved with 2 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
Shared service duct walls to "non-habitable" areas must achieve the BCA minimum airborne sound separation performance of Rw+Ctr 25dB. This rating can be achieved with 1 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
separation performance of Rw+Ctr 50dB.
To meet the BCA minimum standard for impact sound isolation of < 62dB an isolation treatment be used as follows:
SUSPENDED CEILING BELOW
Incorporate resilient matting between the hard floor finish and the concrete slab, with suspended board ceiling installed below, and include 50mm insulation (minimum density 11kgm³) within the cavity.
SKIM COAT CEILING BELOW
Where suspended ceilings are absent, a higher performance (thicker) resilient matting will likely be required to be installed between the hard floor finish and the concrete slab.
CARPETED FLOOR COVERINGS
Carpeted floor coverings throughout bedrooms installed foam underlay over minimum 200mm thick concrete slab the BCA minimum performance for both airborne sound tion (> Rw+Ctr 50dB), and impact sound isolation(< 62dB without further treatment
Extent of separating wall between wet-area (kitchen) and habitable area must achieve a minimum Rw+Ctr rating equal or greater than 50 dB AND be designed to incorporate a discontinuous leaf to meet BCA minimum standard between wet area and habitable area adjacency;
Using min. 150mm concrete/concrete infill wall, a secondary leaf will be required to comply with the BCA
A
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bathroom side must achieve >25 dB Rw+Ctr - use of 1 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bedroom side must achieve >40 dB Rw+Ctr - use of 2 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Walls separating sole-occupancy units from a public lobby/corridor must achieve a minimum airborne sound separation performance of Rw 50 dB. This is in most cases greater than Rw+Ctr 40dB hence also complies as a service duct
APT 22
3x2 120m²
APT 23
2x2 86m²
APT 24
2x2 89m²
RESIDENTIAL LOBBY
APT 27
1x1 50m²
APT 26
1x1 50m²
APT 28
2x1 65m²
APT 25
2x1 65m²
Separating wall between apartment and lift shaft or plantroom must be designed to achieve equal to or greater than Rw 50 dB PLUS incorporate a discontinuous leaf to meet BCA minimum standard;
If principal lift shaft wall is of concrete construction, to minimise spatial encroachment into internal room floor area, discontinuous leaf to be formed from 20 mm clear air gap, 64 mm stud and 13 mm plasterboard lining - Total additional system depth ~84 mm; Or 1 x additional skin of 90 mm brickwork given wet trades on site for strctural/party walls - Total additional depth in this case ~110mm.
Insulation quilt lining in the formed cavity space is not required to meet BCA criteria, though would improve overall separation through lift shaft wall to bedroom, if applied, at low cost per lineal metre.
B
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bathroom side must achieve >25 dB Rw+Ctr - use of 1 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
Pending building services design, assume shared soil/waste pipes in likely location for services duct shown clouded - hence:
Services duct wall to bedroom side must achieve >40 dB Rw+Ctr - use of 2 x 13mm plasterboard on stud frame OR 1 x 90 mm brickwork leaf will achieve this performance - recommend any pipework be wrapped in Pyrotek 4525C;
ALL apartment entry doorsets must acheive Rw30dB to meet BCA minimum standard, equivalent to 40mm thick solid core timber door set in frames with effective compressible neoprene seals at both jambs and head.
N
0 5 10
A
MJA
MCDONALD JONES ARCHITECTS
A B N 15 085 983 428
23 Hamilton Street Subiaco WA 6008
T 08 9388 0333 F 08 9388 0555
admin@macjones.net www.macjones.net
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
EIGHTH FLOOR PLAN
RESIDENTIAL
SCALE 1:100 @ A1
DATE 29.08.15
DRAWN DG
CHECKED CHKD
ISSUED FOR DA
DRAWING No. DA1.11
REV D
JOB No. 15030


IECT Name: 26 - 28A Charles St, S PERTH
SECTION F5 MINIMUM REQUIREMENTS
ORNE SOUND INSULATION KEY:
EALED BUILDING SERVICES DUCT WALLS (inc CEILINGS)
Rw+Ctr 40dB. This rating can be achieved with 2 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
Shared service duct walls to "non-habitable" areas must achieve the BCA minimum airborne sound separation performance of Rw+Ctr 25dB. This rating can be achieved with 1 x 13mm plasterboard on stud frame and incorporating REHAU - Raupiano Plus pipework. If standard PVC pipework is used, pipes must be wrapped in Pyrotek 4525C.
separation performance of Rw+Ctr 50dB.
To meet the BCA minimum standard for impact sound isolation of < 62dB an isolation treatment be used as follows:
SUSPENDED CEILING BELOW
Incorporate resilient matting between the hard floor finish and the concrete slab, with suspended pla board ceiling installed below, and include 50mm insulation (minimum density 11kgm³) within the form cavity.
SKIM COAT CEILING BELOW
Where suspended ceilings are absent, a higher performance (thicker) resilient matting will likely be re quired to be installed between the hard floor finish and the concrete slab.
CARPETED FLOOR COVERINGS
Carpeted floor coverings throughout bedrooms installed o foam underlay over minimum 200mm thick concrete slab the BCA minimum performance for both airborne sound s tion (> Rw+Ctr 50dB), and impact sound isolation(< 62dB without further treatment
A
B
INSET CHANNEL DRAIN
ROOF @ 2 DEG
NOTE ON CLOUDED AREA:
All Acousticall rated walls to be taken full height to underside of roof slab to comply with NCC/BCA Section F5, Clause F5.5(f)(i)
ROOF @ 2 DEG
N
0
5
10
MJA
MCDONALD JONES ARCHITECTS
A B N 15 085 983 428
23 Hamilton Street Subiaco WA 6008
T 08 9388 0333 F 08 9388 0555
admin@macjones.net www.macjones.net
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL
ROOF PLAN
1:100 @ A1
29.08.15
DG
CHKD
DA
DA1.12
C
15030

C. BUILDING FACADE CALCULATION METHODOLOGY

C.1 Calculation Principles

Noise data obtained during the documented survey period and presented herein will provide the basis against which predicted internal noise levels can be calculated and compared against the referenced Australian Standard *AS2107:2000* criteria to assess internal noise amenity and compliance. The process of this evaluation assesses the composite acoustic performance of each façade element (e.g. glazing/frame, building envelope, ventilation opening etc) is calculated and the measured external sound field is said to impinge upon it as direct sound. As all measured noise levels were recorded under 'free-field' conditions, a correction of 2.5dB is applied to linear spectral noise levels when calculating façade performance to account for the façade incidence effect.

From the layouts and elevation drawings the building envelope there are typically two materials capable of transmitting sound into the internal space; Concrete, masonry or other main building structure construction, and a range of framed and sliding glazing elements. Airborne sound transmission through the building structural element is less critical than sound transmission through glazed panels, therefore various acoustic performances of glazing types and thicknesses will be assessed and adjusted in design calculation to effect the most cost-effective design solution, whilst ensuring design compliance is demonstrated.

Corresponding internal noise levels are then predicted using these detailed sound transmission loss calculations through the calculated composite façade performance, with resultant internal levels corrected for radiating (exposed) façade area and internal energy 'losses' associated with transmitted sound undergoing absorption from (proposed) internal room finishes. This assessment is generally conservative to allow for unforeseen variation in eventual performance.

Each façade is also assessed for flanking transmission paths. This includes, but is not limited to, transmission through junctions between structural elements, aperture seals, and transmission through inter-connected elements such as mechanical systems.

In order that an acoustically-robust façade design is achieved, building façade assessment calculations are undertaken using 'worst case' (i.e. highest measured) external noise levels, unless otherwise noted. Calculations are carried out on the most sensitive internal spaces – generally those with the largest glazed area and a low internal absorptive area. This methodology provides an efficient review ensuring all spaces meet or exceed the required standard.

All façade ingress calculations are carried out in accordance with the relevant parts of British and European Standard *BS EN 12354:2000 Building Acoustics – Estimation of acoustic performance of buildings from the performance of elements Part 3: Airborne sound insulation against outdoor sound*, which is the most prevalent calculation methodology in the absence of an equivalent Australian Standard.

D. CALCULATION OF NOISE EMISSIONS LIMITS

An Assigned Noise Level is calculated for each noise sensitive receiver using a combination of environmental factors local to the receiver. A standard set of ANL's exist to provide a base level of acoustic amenity, as shown in the Table below. These levels are modified by an Influencing Factor (IF) to reflect noise sensitivity in the specific environment relative to the subject development.

To calculate the additional Influencing Factor (IF), concentric circles are drawn around the nearest noise-sensitive reception point; one at 450m radius and one at 100m radius. Percentages are calculated for the amount of land area within the circles used for noise emitting purposes (e.g. industrial or commercial uses) which are compared to the total area encompassed by the concentric circles.

Traffic volume is taken into account in order to reach an acceptable ANL, or noise reception level, appropriate for the area in which the receiver is to be situated.

Part of Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises at locations within 15m of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sundays and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises at locations further than 15m of a building directly associated with a noise sensitive use	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and Utility premises	All hours	65	80	90

Calculation of Influencing Factor (IF)

The Influencing Factor (IF) is calculated using the following equation:

Influencing Factor (IF) = I + C + TF

Where;

I = (% of industrial land usage within 100m + %industrial land usage within 450m) x 1 / 10

C = (% of commercial land usage within 100m + %commercial land usage within 450m) x 1 / 20

TF = +6 if there is a major road within 100m of the development
+2 if there is a major road within 450 m of the development
+ 2 if there is a secondary road within 100m of the development

The maximum value the transport factor (TF) can reach is 6;

A major road is defined as having Annual Average Weekday Traffic (AAWT) flows in excess of 15,000 vehicle movements per day. A secondary road is defined as having Annual Average Weekday Traffic (AAWT) flows in excess of 6,000 vehicle movements per day.

Identification of Land Use

The image below shows our calculation of Commercial (C) and Industrial (I) land use in inner (100 m) and outer circle (450m) radii centred on nearest NSR, identified as adjacent 4-storey multi-residential building at 24 Charles Street. Commercial land use is shown light blue outer circle, and red in the inner circle. Kwinana Freeway and Labouchere Road represent “Primary” road transport infrastructure in the outer circle.

ASSIGNED NOISE LEVEL LIMTS – SUMMARY CALCULATION TABLE

Land Use Type & IF Calculation					
Industrial					**"I"**
% Area in Inner Circle	0%				**+0.00**
% Area in Outer Circle	0%				
Commercial					**"C"**
% Area in Inner Circle	50.3%				**+4.56**
% Area in Outer Circle	40.9%				
Roads	**Location**	**Estimated vehicle Movements per day**	**Classification**	**Result**	**"TF"**
Kwinana Freeway	OUTER CIRCLE	>150,000	Major	+2	**4**
Labouchere Road	OUTER CIRCLE	15,000	Major	+2	
INFLUENCING FACTOR					**+8.56**

The resultant IF therefore equals **9**, determining the applicable Assigned Noise Level limits at the NSR.

E. EQUIPMENT CALIBRATION CERTIFICATES

Certificate of Calibration

Certificate No.: 473692023

Object:	Sound Analyser Nor140
Supplier:	Norsonic AS
Type:	Nor140
Serial number:	1406036
Client:	Sealhurst Pty Ltd , Perth ,WEST AUSTRALIA

Calibration complies with the following standard(s)

IEC 61672-1:2002 class 1
IEC 60651 type 1
IEC 60804 type 1
IEC 61260 class 1
ANSI S1.4-1983 (R2001) with amd. S1.4A-1985 class 1
ANSI S1.43-1997 (R2002) class 1
ANSI S1.11-2004 class 1
DIN 45 657, Applicable parts
Norsonic production standard set for the Nor140

Instrumentation used for calibration traceable to:

Electrical Parameters: MT, Norway
Acoustical Parameters: PTB, Germany
Environmental Parameters: IKM, Norway. Justervesenet. Norway

Adjustments: None

Comments: None

Date of calibration:	**Calibration interval recommended**
2014-08-14	2 years

The environmental parameters applicable to this calibration are kept well within limits ensuring negligible deviation on obtained measurement results.

Calibrated by:

Sign. Norsonic PO BOX 24, N-3420 LIERSKOGEN, NORWAY TEL: +47 32 85 89 00

Norsonic AS, P.B 24, 3421 Lierskogen. Visitor address: Gunnersbråtan 2, Tranby, Norway.
Phone +47 32858900 Fax.: +47 32852208. email: info@norsonic.com

Norsonic

Certificate of Calibration

Certificate No.: *CAL 022-2014-4735*

ilac-MRA

NORWEGIAN ACCREDITATION CAL 022

Test object:	Sound Calibrator
Manufacturer:	Norsonic
Type:	1251
Serial no:	34172

Customer:

	Level	Level Stability	Frequency	Frequency Stability	Distortion
Measurement Results:	114,00 dB	0,05 dB	1000,34 Hz	0,00 %	0,41 %
Expanded Uncertainty:	0.11 dB	0.02 dB	1.0 Hz	0.1 %	0.2 %

The stated level is relative to 20μPa.
The stated level is valid at reference conditions.The following correction factors have been applied during the measurement:
Pressure: 0,0005 dB/kPa Temperature: 0,000 dB/°C Relative humidity: 0,000 dB/%RH Load volume : 0,0003 dB/mm3
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a t-distribution with the reported effective degree of freedom corresponds to coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

Records: L:\PROJECTS\CALLAB\PROGRAM\Cal\2014\NOR1251_34172_M1.nmf

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101,325 kPa	23,0 °C	50 %RH
Measurement conditions:	97,030 ± 0,010 kPa	23,8 ± 0,2 °C	48,1 ± 1,0 %RH

Date received for calibration:	
Date of calibration:	2014-08-13
Date of issue:	2014-08-13
Engineer	Terje Hansen
Supervisor	

Terje Hansen

This certificate of calibration is issued by a laboratory accredited by Norwegian Accreditation (NA). NA is one of the signatories to the EA Multilateral Agreement for mutual recognition of calibration certificates (European Co-operation for Accreditation). The accreditation states that the laboratory meets the NA requirements concerning competence and calibration system for all the calibrations contained in the accreditation. It also states that the laboratory has a satisfactory quality assurance system and traceability to accredited or national calibration laboratories. This certificate may not be reproduced other than in full.

Page 1 of 2

Norsonic

NORWEGIAN ACCREDITATION CAL 022

Certificate No.: CAL 022-2014-4735

Preconditioning
The equipment was preconditioned for more than 12 hours at the specified calibration temperature and humidity.

Calibration and verification performed
The performed tests refer to the sections 5.2, 5.3 and 5.5 in IEC 60942 (1997-11): Electro-acoustics - Sound Calibrators. The calibrator has been tested as described in Annex B of the same standard described in the sections B.3.3 for the sound level, B.3.4 for Sound pressure level stability - short-term fluctuations, B.3.5 for frequency and in B.3.6 for total distortion.

Method of Calibration
A detailed description of the calibration procedure is available separately from the calibration laboratory.

Instruments and Program
A complete list of instruments, hardware and software, that has been used for this calibration is separately available from the calibration laboratory.

Traceability
The measured values are traceable to the following laboratories:
Sound Pressure Level: PTB, Germany
Voltage: IKM Laboratorium Norway
Frequency: IKM Laboratorium Norway
Ambient Pressure: Justervesenet, Norway
Temperature: Justervesenet, Norway
Relative Humidity: Justervesenet, Norway

Statement of Conformity
The tested Sound Calibrator has shown to conform with the requirements for periodic tests as described in IEC 60942 (1997-11) Annex B. All required tests have been performed and have demonstrated measurement values, extended by the uncertainty of the measurements, to be within the required range for a Class 1 sound calibrator.

Measurements performed by
NCL
NORSONIC CALIBRATION LABORATORY

Street address: Gunnersbråtan 2, N-3421 Tranby, Norway
Tel.: +47 32858900 Fax.: +47 32852208 email: ncl@norsonic.com
Certificate version 6.0

F. NOISE DURING CONSTRUCTION PHASE

F.1 Extract from Appendix D AS 2436 - Section 4.6

AS2436:2010 Appendix D

Section 4.6

In demolition work alongside occupied premises there should, if possible, be a break in solid connections, e.g. concrete paving, between the working area and the adjoining buildings. This will reduce the transmission of vibration and structure-borne noise. Care should be taken that any such break is of no structural significance in relation to the planned system of demolition. The break could result in premature collapse due to lack of continuity or restraint. Care should be taken not to drop materials from a height either into or out of trucks. The surfaces on to which the materials are being moved should be covered by some resilient material. Particular care should be taken during the loading and unloading of scaffolding. Where material cannot be lowered in skips or by other means, it is recommended that properly constructed and damped chutes be used. The effectiveness of noise enclosures and screens can be partially lost if they are used incorrectly. For example, the noise being enclosed should be directed into and not out of the enclosure. There should also be no reflecting surfaces opposite the open side.

4.5.5 Maintenance of equipment Increases in plant noise are often indicative of future mechanical failure. Regular and effective maintenance of plant and equipment including vehicles is essential and will do much to maintain noise levels near to that of new plant. Maintenance should be carried out only by trained persons. Where maintenance work has to be done at night, precautions may be necessary to minimize any nuisance. Vibration from machinery with rotating parts can be reduced by attention to proper balancing. Frictional noise from the cutting action of tools and saws may be reduced if the tools are kept sharp. Other noises caused by friction in machines, conveyor rollers and trolleys can be reduced by proper lubrication.

4.6 CONTROLLING THE SPREAD OF NOISE

4.6.1 General

If noisy processes cannot be avoided, then the amount of noise reaching the receiver should be minimized. Two ways of doing this are either to increase the distance between the noise source and the receiver or to introduce noise reduction measures such as screens. Physical methods to reduce the transmission of noise between the site works and residences, or other sensitive land uses, are generally suited to works where there is longer-term exposure to the noise. Practices that will reduce noise from the site include: (a) Increasing the distance between noise sources and sensitive receivers. (b) Reducing the line-of-sight noise transmission to residences or other sensitive land uses using temporary barriers (stockpiles, shipping containers and site office transportables can be effective barriers). (c) Constructing barriers that are part of the project design early in the project to afford mitigation against site noise. (d) Installing purpose built noise barriers, acoustic sheds and enclosures.

4.6.2 Distance

Increasing the distance is often the most effective method of controlling noise. This may not be possible where work takes place on fixed structures, e.g. railway tracks. The effect of distance on noise levels is explained in Appendix B. Stationary plant such as compressors and generators can be located away from the work area so as to avoid being close to any noise-sensitive area.

4.6.3 Screening

On sites where distance is limited, the screening of noise may be of benefit and this should be taken into account at the planning stages. Appendix B illustrates the effect of the screen in reducing the noise level and Appendix D describes the performance of different types of acoustic screens and enclosures and the materials they are made of. If structures such as stores, site offices and other temporary buildings are situated between the noisiest part of the site and the nearest dwellings, some of the noise emission from the site can be reduced. If these buildings are occupied, then sound insulation measures may be necessary to protect workers in them.

A hoarding that includes a site office on an elevated structure offers a superior noise reduction when compared with a standard (simple) hoarding. This performance is further enhanced when the hoarding is a continuous barrier. Storage of building materials or the placement of shipping containers between the noise source and any noise-sensitive area may also provide useful screening and the same is true of partially completed or demolished buildings.

Noisy stationary plant can be put in a basement, the shell of which has been completed, provided reverberant noise can be controlled. Where compressors or generators are used in closed areas, it is necessary to ensure that the exhaust gases are discharged directly to the outside air and that there is good cross-ventilation to prevent the build-up of poisonous carbon monoxide fumes and to allow an adequate air supply to maintain efficient running.

Where such noise barriers are not practicable, a worthwhile reduction in noise can be obtained by siting the plant behind and as close as possible to mounds of earth, which may effectively screen the plant from any noise-sensitive areas. These can often be designed into the construction schedule or site arrangement for future landscaping. Water pumps, fans and other plant and equipment that operate on a 24-hour basis may not be a source of noise nuisance by day but can create problems at night. They should therefore be effectively screened either by being sited behind a noise barrier or by being positioned in a trench or a hollow in the ground provided this does not generate reverberant noise. In such cases, however, adequate ventilation should also be ensured.

Long, temporary earth embankments can provide quite an effective noise screen for mobile equipment moving, for example, on a haulage road. When the earthworks are complete, the earth mounds should be removed if possible with smaller, quieter excavators. A noise barrier may be a more reliable method of noise control than the imposition of restrictions on throttle settings. In many cases it will not be practicable to screen earthmoving operations effectively, but it may be possible to partially shield construction plant or to build-in at the early stages protective features ultimately required to screen traffic noise. Where earth noise barriers are not a practical proposition because of lack of space, consideration should be given to the possibility of constructing temporary screens from wood or any of the materials suggested in Appendix D.

The usefulness of a noise barrier will depend upon its length, its height, its position relative to the source and to the listener, and the material from which it is made. A barrier designed to reduce noise from a moving source should extend beyond the last property to be protected to a distance of not less than ten times the shortest measurement from the property to the barrier. A barrier designed to reduce noise from a stationary source should, where possible, extend to a distance beyond the direct line between the noise source and the receiver to a distance equal to ten times the effective barrier height, which is the height above the direct line between source and receiver. If the works are predominately within nominally closed structures, careful consideration should be given to reducing noise breakout at any openings.

4.7 CONTROL OF NOISE AT THE RECEIVER

In cases where noise emissions cannot be adequately controlled at the source or by controlling the spread of noise, consideration should be given to control of noise received at nearby sensitive locations. Provision of treatments at the affected residence or other sensitive land use is normally only suited to addressing noise from longer term construction projects at a stationary site, or where the work site is relatively isolated, or where only a few residences or other sensitive land uses are affected.

Practices that will mitigate the impacts of noise include: (a) Providing localized noise barriers adjacent to the receiving location. (b) Providing acoustic insulation to reduce airborne noise entering buildings, for example, heavyweight glazing or double glazing. (c) Providing ventilation to enable windows and doors to remain closed. (d) Providing access to temporary relocation for noise-affected occupants for short periods, for example, when high noise levels from construction occur at night and there are no feasible and reasonable ways of reducing noise levels.

4.8 CONTROL OF VIBRATION

4.8.1 General

Vibration can be more difficult to control than noise, and there are few generalizations that can be made about its control. It should be kept in mind that vibration may cause disturbance by causing structures to vibrate and radiate noise in addition to perceptible movement. Impulsive vibration can, in some cases, provide a trigger mechanism that could result in the failure of some building component that had previously been in a stable state. It can also trigger annoyance being elevated into action by occupants of exposed buildings, and should therefore be included in planning of communication with impacted communities.

It should be remembered that failures, sometimes catastrophic, can occur as a result of conditions not directly connected with the transmission of vibrations, e.g. the removal of supports from retaining structures to facilitate site access. BS 7385-2 provides information on managing groundborne vibration and its potential effects on buildings.

Where site activities may affect existing structures, a thorough engineering appraisal should be made at the planning stage. General principles of seeking minimal vibration at receiving structures should be followed in the first instance. Predictions of vibration levels likely to occur at sensitive receivers is recommended when these are relatively close, depending on the magnitude of source of the vibration or the distance involved. Relatively simple prediction methods are available in texts, codes of practice or other standards, however it is preferable to measure and assess site transmission and propagation characteristics between source and receiver locations.

Comparison of predicted levels of vibration with preferred or regulatory levels will indicate when either more detailed predictions are required or mitigation of transmitted vibration is advisable or necessary. Guidance in measures available for mitigation of vibration transmitted can be sought in more detailed standards, such as BS 5228-2 or policy documents, such as the NSW DEC Assessing Vibration: A technical guideline.

Identifying the strategy best suited to controlling vibration follows a similar approach to that of noise—of avoidance, control at the source, control along the propagation path, control at the receiver, or a combination of these. It is noted that vibration sources can include stationary plant (pumps and compressors), portable plant (jackhammers and pavement vibrators), mobile plant, pile-drivers, tunnelling machines and activities, and blasting, amongst others. Unusual ground conditions, such as a high water-table, can also cause a difference to expected or predicted results, especially with piling.

G. ACOUSTIC GLOSSARY

Acoustic Measurement Parameter Definitions

dB

Decibel: a logarithmic scale applied to acoustic units such as sound pressure and sound power. Decibels are always the ratio between two numbers. Sound Pressure in Pascals becomes "Sound Pressure Level re $2x10_{-5}$Pa" in decibels. Sound Power in watts becomes "Sound Power Level re 10_{-12}W" in decibels. It is

also used for sound reduction or sound insulation and is the ratio of the amount of sound energy incident upon a partition and the proportion of that energy which passes through the partition. The result is stated as a "decibel reduction".

dB(A)

A- weighting: This is an electronic filter which attenuates sound levels at some frequencies relative to the sound levels at other frequencies. The weighting is designed to produce the relative response of a human ear to sound at different frequencies. The A-weighted sound level is therefore a measure of the subjective loudness of sound rather than physical amplitude. A- weighting is used extensively and is denoted by the subscript A as in L_{A10}, L_{Aeq} etc. (Levels given without the subscript A are linear sound levels without the A- weighting applied, e. g. L_{10}, L_{eq} etc.).

$L_{Aeq,T}$

The "A" weighted equivalent continuous sound pressure level. This may be thought of as the "average" sound level over a given time "T". It is used for assessing noise from various sources: industrial and commercial premises, construction sites, railways and other intermittent noises.

$L_{A90,T}$

The "A" weighted sound pressure level that is exceeded for 90% of the time T. It reflects the quiet periods during that time and is often referred to as the "background noise level". It is used for setting noise emission limits for industrial and commercial premises.

L_{Amax}

The maximum "A" weighted sound pressure level during a given time on fast or slow response.

L_{pA}

The "A" weighted sound pressure Level. The sound pressure level is filtered through a standard frequency weighting known as A-weighting. This filter copies the frequency response of the human ear, so that the resulting sound level closely represents what people actually hear.

R

Is the sound reduction index of a construction element in octave or $_1/_3$ octaves and can only be measured in a laboratory. There must be no flanking transmission.

R'

Is the sound reduction index of a construction element in octave or $_1/_3$ octaves measured on site, and normally includes flanking transmission (ie where sound travels via paths other than straight through the element being tested, such as columns, ducts, along external walls, etc).

R_w

To get the weighted sound reduction index (R_w) of a construction, the R values are measured in octave or 1/3 octave bands covering the range of 100Hz to 3150Hz. The curve is adjusted so that the unfavourable deviation (or shortfall of the actual measurements below this standard curve) averaged over all the octave or 1/3 octave bands is not greater than 2dB. The value of the curve at 500Hz is the R_w.

R'_w

The apparent sound reduction index, which is determined in exactly the same way as the R_w but on site where there is likely to be some flanking transmission.

D

This is the "level difference". It is determined by placing a noise source in one room and measuring the noise levels in that room (the "source room") and an adjacent room (the "receiver room"). The level difference is calculated by simply deducting the "receiver" noise level (dB) from the "source" noise level (dB).

D_w

This is the weighted level difference. D is measured on site in octave or 1/3 octave bands covering the range of 100Hz to 3150Hz. The D values are compared to a standard weighting curve. The curve is adjusted so that the "unfavourable deviation" (or shortfall of the actual measurements below this standard curve) averaged over all the octave or 1/3 octave bands is not greater than 2dB. The D_w is then the value of the curve at 500Hz.

D_{nw}

This is the weighted normalised level difference. D is measured on site in octave or 1/3 octave bands covering the range of 100Hz to 3150Hz. As the level difference is affected by the area of the common wall/ floor and the volume of the receiving room, as well as the amount of absorption in the receiving room, in the case of the $D_{nT,w}$, the results are "normalised" by a mathematical correction to $10m^2$ of absorption (D_n). The same weighting curve as for D_w is used to obtain the single figure: D_{nw}.

Acoustic Performance Guide

$D_{nT,w}$

This is the weighted standardised level difference. D is measured on site in octave or 1/3 octave bands covering the range of 100Hz to 3150Hz. As the level difference is affected by the area of the common wall/ floor and the volume of the receiving room, as well as the amount of absorption in the receiving room, in the case of the $D_{nT,w}$, the results are "standardised" by a mathematical correction a reverberation time, usually 0.5 seconds (D_{nT}). The same weighting curve as for D_w is used to obtain a single figure "$D_{nT,w}$"

$D_{nT(Tmf, max),w}$

This is the weighted BB93 standardised level difference corresponding to a Building Bulletin 93 reference value reverberation time in a receiving room. It is measured on site in accordance with BS EN ISO 140- 4: 1998.

$D_{n,c}$

Suspended ceiling normalised level difference. This is the sound level difference between two rooms, separated by a suspended ceiling, normalised to a reference value of absorption in the receiving room (10m2 for the Laboratory as specified in ISO 140- 9 : 1985). It is measured in 1/3 octave or octave frequency bands.

$D_{n,c,w}$

Weighted suspended ceiling normalised level difference. This is a single number quantity representing the sound reduction between two rooms separated a suspended ceiling. It is obtained by applying specified weightings to the 1/3 octave band suspended ceiling normalised level differences in the frequency range 100Hz to 3150Hz.

C_{tr}

Spectrum adaptation term: Value, in decibels, to be added to a single- number rating (e. g. Rw) to take account of the characteristics of particular sound spectra. Ctr is calculated using an A- weighted urban traffic noise spectrum as defined in BS EN ISO 717- 1 : 1997.

NR

Stands for Noise Rating. (It is NOT noise reduction). It is (e. g. NR30, NR35 etc.) a single number, which represents the sound level in a room and takes account of the frequency content of the noise. The lower the NR value, the quieter the room will be. It is mainly used for assessing noise from mechanical services systems. In leisure developments it is used as a standard for noise break- in to rooms from external noise sources such as traffic.

NC

Stands for Noise Criteria. It is very similar to NR but (e.g. NC30, NC35 etc.) uses slightly different frequency weightings.

NRC

Stands for Noise Reduction Coefficient. The noise reduction coefficient of a material is the average, to the nearest multiple of 0.05, of the absorption coefficients at 250Hz, 500Hz, 1kHz and 2kHz.

α

Stands for Absorption Coefficient, which represents the proportion of incident sound energy arriving from all directions that is not reflected back into the room. It ranges between 0 and 1, where 0 is reflective and 1 is totally absorptive.

α_w

Stands for Weighted Absorption Coefficient. Single- number frequency dependent value which equals the value of the reference curve at 500Hz after shifting it as specified in EN ISO 11654 :1997.

α_p

Stands for practical absorption factor. It is a frequency dependent value of sound absorption coefficient which is based on measurements in one- third- octave bands in accordance with ISO 354 and which is calculated in octave bands in accordance with EN ISO 11654 : 1997. It is the arithmetic mean of the three 1/3 octave sound absorption coefficients within the octave being considered. The mean value is calculated to the second decimal place and rounded in steps of 0.05 up to a value of 1.0.

Class X

Stands for the Absorption Class between 250 and 4kHz, as defined by EN ISO 11654. Class A is the best classification representing the highest level of absorption, and Class E offers to lowest classification.

RT or T_{60}

Reverberation Time is a measure of the echoic nature of a room. It is normally measured in 1/3 octave or 1/1 octave bands by creating a loud noise and measuring the time it takes for that noise to decay by 60dB. The longer the reverberation time, the more 'echoey' a room sounds. For dwellings, a reverberation time of 0.5 seconds or less is normal. Cinema auditoria will have reverberation times of 1.0 second or below when fitted out, but up to 9 seconds at shell completion.

When designing acoustically sensitive areas such as concert halls or lecture theatres, it is necessary to design the room finishes to achieve optimum reverberation times. These will vary depending on the type of activity in the room and the room volume.

T_{mf}

Stands for the arithmetic average of the reverberation times in the 500Hz, 1kHz and 2kHz octave bands, for the type of receiving room, as defined in UK Schools design manual, Building Bulletin 93.

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Technical Memorandum

Title	Charles Street, South Perth Car Parking Management Plan		
Client	Stirling Capital	Project No	CW928800
Date	12/10/2015	Status	Revision B
Author	Daniel Jenkins	Discipline	Traffic and Transport
Reviewer	Ray Cook	Office	Perth

1 Introduction

Cardno was commissioned by Stirling Capital ("the developer") to prepare a Car Parking Management Plan for a proposed mixed-use development at 28A Charles Street in South Perth ("the Site").

The development proposal is for a mixed-use development of commercial and residential uses. It is understood that a Car Parking Management Plan has been requested by the City of South Perth ("the City").

2 Development Proposal

The proposal comprises the following elements:

- 28 residential apartments of varying size: 1 and 3 bedrooms
- 4 commercial tenancies (most probably offices) with a total gross floor area of 2,455 m^2:
  - 160 m^2 on the ground floor;
  - 1,177 m^2 on the second floor;
  - 559 m^2 on the third floor;
  - 559 m^2 on the fourth floor.
- 11 visitor car park bays (5 for residential and 6 for commercial). These include a disabled bay.
- 49 secure commercial bays.
- 34 secure residential bays.
- 4 visitor, 13 commercial and 10 residential bicycle parking spaces.

It should be noted that the above gross floor areas of the commercial development exclude the building cores and lobby spaces.

The car parking is to be arranged as follows:

- Visitor parking on the ground floor, outside of the security gate.
- 37 commercial bays on the ground floor, inside the security gate, comprising 7 standard bays and 15 Parklift car lifts (a hoist system with no pit; effectively vertical tandem bays). The Parklift system will be the 411/5-195, which can accommodate a 4 wheel drive.
- 12 commercial bays on the first floor.

CW928800-TR-M001-B-Charles St Car Park Mgt.docx Page 1

- 34 secure residential parking bays on the first floor. Separated from the commercial bays by a security gate. 6 of these bays will be 3 pairs of tandem bays.

These arrangements are illustrated on the plans in the Annex.

3 Policy Review and Consultation with City

3.1 Policy Review

Cardno have reviewed the following policy documents with regard to parking requirements:

- City of South Perth Town Planning Scheme 6 ("TPS 6")
- Amendment no. 46 to TPS 6 – this amendment included minor variations to Schedule 9 "*Special Control Area SCA1 – South Perth Station Precinct*". (The Site is within SCA1).

These documents prescribe the following minimum parking requirements:

- 0.75 bays per dwelling for single bedroom dwellings;
- 1 occupier bay per dwelling (other than single bedroom dwellings);
- 1 visitor bay per 6 dwellings;
- 1 bay per 50 square metres of gross floor area for non-residential land uses;
- For non-residential land uses, 2 bays for visitors or 10% of the required occupiers' bays, whichever is the greater, marked for the exclusive use of visitors;
- 1 bicycle bay per 3 dwellings in addition to the required car parking bays; and
- 1 bicycle bay per 200 square metres of gross floor area of non-residential plot ratio area.

Given the quantum of development detailed in Section 2, the proposal complies with these requirements.

In addition, there are various requirements in these documents related to issues such as parking concessions; and location of visitor parking in the event that this is not feasible outside the security fence. Neither of these issues apply in this case as the proposal fulfils all requirements.

3.2 Consultation with the City

Cardno consulted with the City (Cameron Howe) by telephone on 9 October 2015, to discuss the required content of the Car Parking Management Plan. A summary of that discussion is as follows:

- There is no need for reciprocal parking arrangements as the proposal complies with parking provision requirements.
- The internal circulation of the car park will be 2-way, as shown on the plans in the Annex.
- Visitor parking will be outside of the security fence but within the Site.
- The car lift (stacker) parking will only be for staff of the commercial premises.
- In view of the above, this Car Parking Management Plan will be a relatively simple one, covering these issues only:
  - Access after hours for commercial premises staff;
  - Management of the car lift (stacker) parking;
  - Residential tandem parking should be for the larger apartments, which are more likely to be multi-car households, such that a pair of tandem spaces are allocated to the same apartment;
  - The Building Manager to be available at all times to deal with issues.

- The above will address the stated concerns of the City.

4 Issues Specific to the Site

In view of the development details, policy documents and consultation with the City, the car parking-related issues related to this Site are as follows:

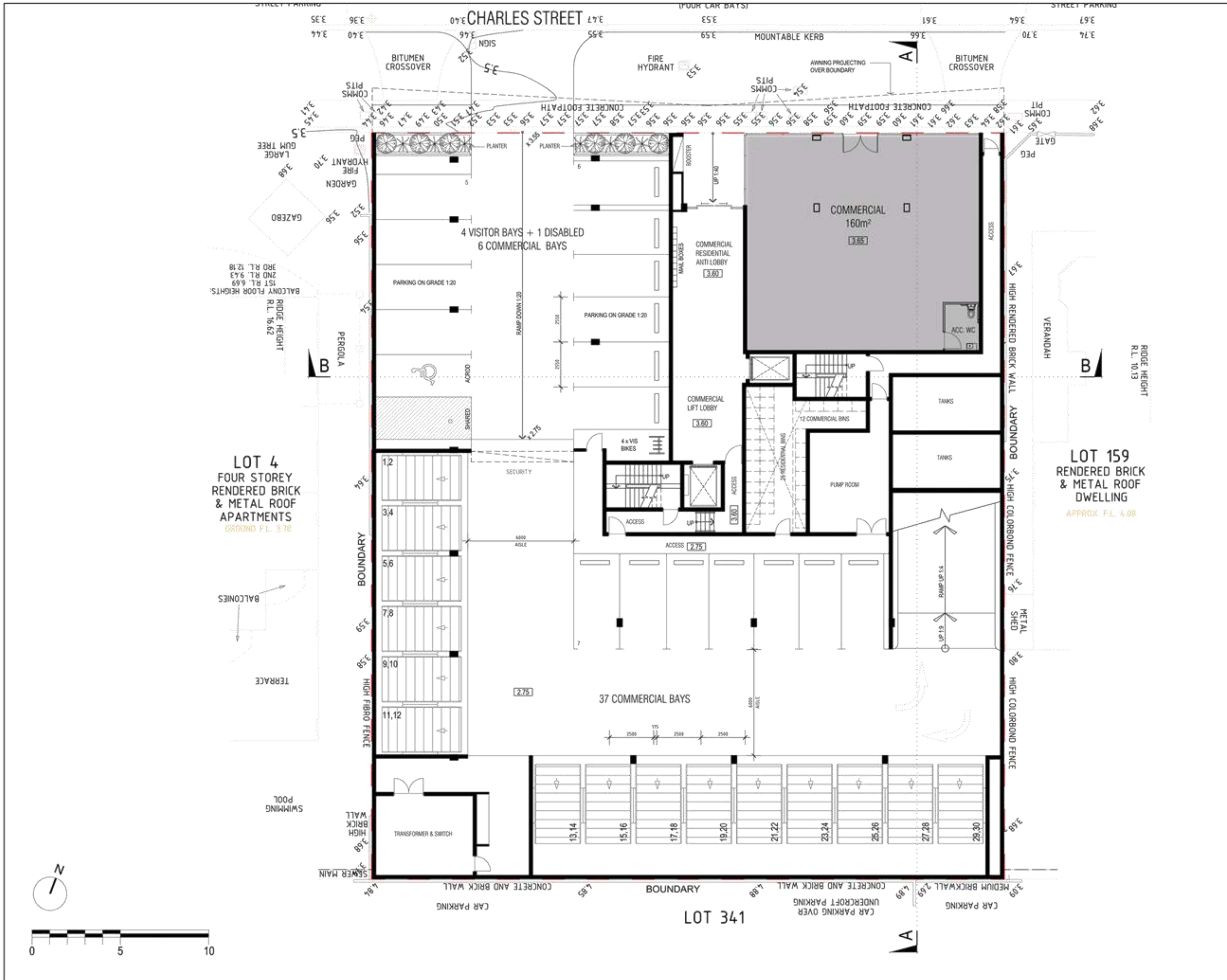
- Access after hours for commercial premises staff;
- Management of the car lift (stacker) parking, to avoid conflict and disruption;
- Management of the residential tandem parking, to avoid conflict and disruption; and
- Availability of management staff.

5 Recommendations

To address the above issues, the following recommendations are made:

1. Access to the secure car parks to be by swipe card, to enable all-hours secure access.
2. Car stackers to be allocated to specific staff; use of the lower part of a pair of stacker bays to be strictly prohibited without prior formal arrangement. Penalties for mis-use could be included within the lease agreements.
3. Pairs of stacker bays to be shared by commercial staff who generally leave at the same time.
4. Sharing commercial bays among the commercial tenants, rather than allocating bays to specific businesses, could enable better pairing of users, e.g. two people from different businesses may be more likely to leave at the same time than two people in the same business. Therefore this greater flexibility may help achieve Recommendation 3 in some instances.
5. Similarly, sharing of the standard commercial bays among the commercial tenants could enable use of a standard (non-stacker) bay when the regular user is absent from work (by prior arrangement).
6. In the event that an occupier of an upper bay in a stacker needs to leave earlier than the occupier of the lower bay, there is the potential for minor, temporary disruption while the occupant of the lower bay exits the bay and waits in the aisle for the upper occupant to leave. As this could disrupt other users of the car park also, the stacker parking should, as much as possible, be allocated to users who have little or no need to travel in and out at other times of the day (besides the start and finish of the working day). For example, staff who are likely to be travelling to frequent external meetings should ideally be allocated standard parking bays.
7. Residential tandem parking to be allocated to the larger apartments, such that any pair of tandem spaces are allocated to the same apartment.
8. The Building Manager must be contactable at all times by a 24-hour phone number.
9. Signage to be installed within car park to explain use of stackers and visitor bays plus contact details for management.

Annex – Development Plans



Before any new construction, alteration or shop fabrication is commenced the contractor must check all drawings and dimensions against the intent of the drawing, and is to notify the superintendent of any discrepancies or omissions which will prevent or inhibit the satisfactory performance of the work. Details indicated on this document apply solely to this project. Such details must not be used out of this context for for other building work without prior discussion with and approval from the person responsible for the original design. Copyright to this drawing is reserved by McDonald Jones Architects Pty Ltd and must not be retained or reproduced without their written permission. This is a CAD drawing, do not amend manually.

NO.	DATE:	AMENDMENT:	
A.	21.09.15	DAC REPORT	A.
B.	12.10.15	DESIGN APPROVAL	B.

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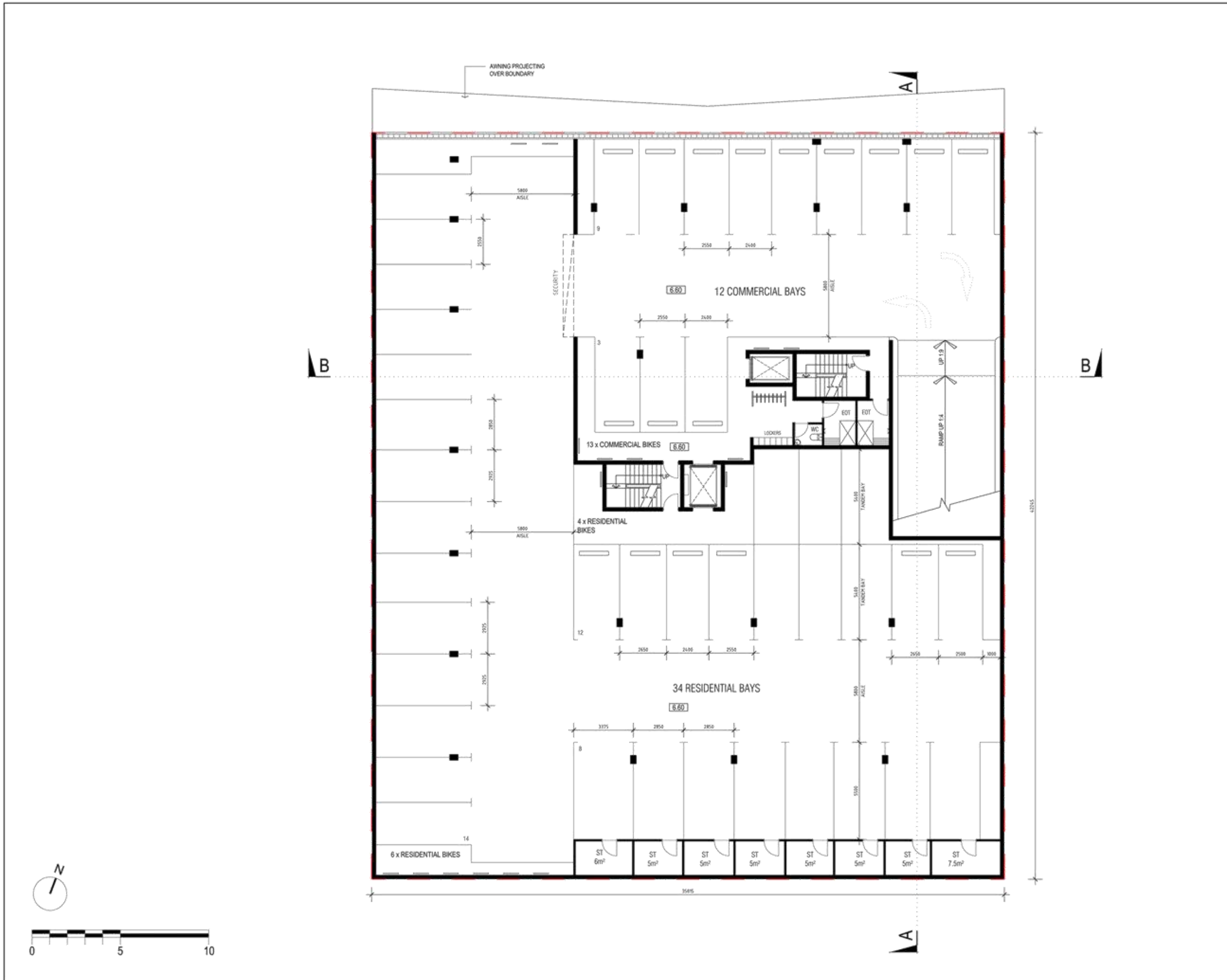
MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

GROUND FLOOR PLAN

SCALE: 1:100 @ A1	DRAWING No. DA1.03	REV B
DATE: 29.08.15		
DRAWN: DG CHECKED: CHKD	JOB No. 15030	
ISSUED FOR: APPROVAL		



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MIXED USE DEVELOPMENT
26-28A CHARLES ST, SOUTH PERTH
STIRLING CAPITAL

FIRST FLOOR PLAN
CARPARK

SCALE: 1:100 @ A1
DATE: 29.08.15
DRAWN: DG CHECKED: CHKD
ISSUED FOR: APPROVAL
DRAWING No. DA1.04 REV B
JOB No. 15030

Data Sheet Wöhr Parklift 411/5

dependent parking
For permanent user only!*

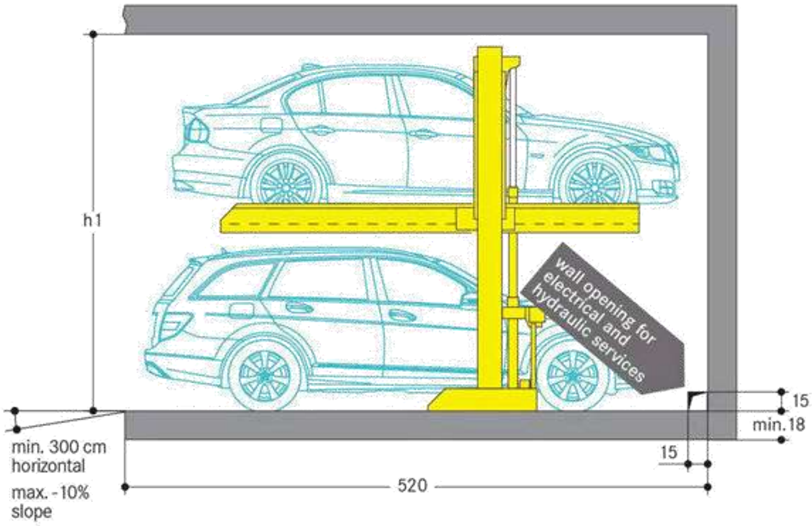
* In case of short time user (e.g. for office-, hotel-, commercial building) only possible on lower platform and only if technically adjusted, ask WÖHR! Or with attendant or valet parking both levels are possible for short time user.

The execution of the installation can only be done with a roofing provided from the customer side or within a building.

Load per platform max. 2000 kg (load per wheel max. 500 kg).

Dimensions in cm

Parklift 411/5



Standard type	Parklift 411/5-155	Parklift 411/5-165	Parklift 411/5-175
Height h 1* single unit	320	330	340
Car height upper level*	150	150	150
Car height lower level	150	160	170

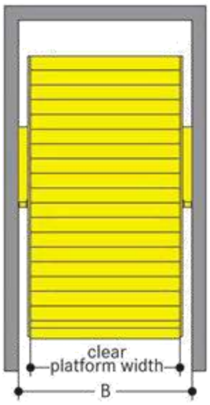
* With greater h 1 height, higher cars can be parked on the upper platform

Comfort type	Parklift 411/5-185	Parklift 411/5-195	Parklift 411/5-205
Height h 1* single unit	350	360	370
Car height upper level*	150	150	150
Car height lower level	180	190	200

* With greater h 1 height, higher cars can be parked on the upper platform

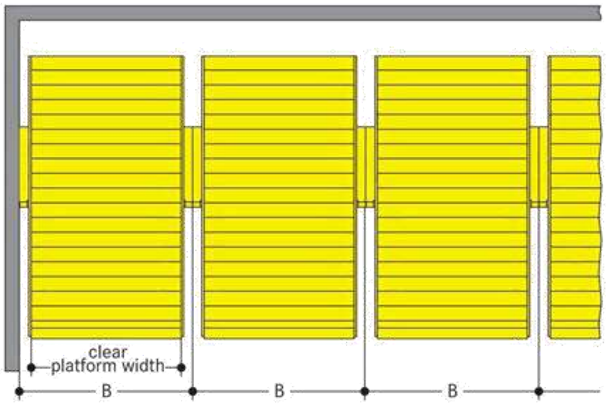
Width dimensions

Single unit



Space required B	gives clear platform width
245	210
255	220
265	230
275	240
285	**250**

Units in a row



Notes

1. Clear platform width of 250 cm for car widths of 190 cm. For large touring sedans we recommend a clear platform width of 250 cm
2. According to ISO 3864 the floor has to be marked with 10 cm wide yellow-black stripes at a distance of 100 cm from the platform edge by the purchaser (see "statics and construction requirements" on page 2).
3. It is not possible to have channels or undercuts and/or concrete haunches along the floor-to-wall joints. In the event that channels or undercuts are necessary, the system width needs to be reduced or the installation width needs to be wider.
4. The manufacturer reserves the right to construction or model modifications and/or alterations. Furthermore, the right to any subsequent part modification and/or variations and amendments in procedures and standards due to technical and engineering progresses in the art or due to environmental regulation changes, are also hereby reserved.

Otto Wöhr GmbH Ölgrabenstrasse 14 Fon +49 [0] 7044 46-0 www.woehr.de

Item	Performance	Quantity	Designation	Position	Frequency
1	by customer	1 unit	electric meter	in the feed cable	
2	by customer	1 unit	fuse or automatic circuit breaker 3 x 16 A slow blow acc. to DIN VDE 0100 p. 430	in the feed cable	1 per power pack
3	by customer	as locally required	acc. to local power supply regulations 3 Ph + N + PE*	feed cable to main switch	1 per power pack
4	by customer	each 10 m	equipotential bonding safety lead-out connection	corner pit floor/ rear wall	
5	by customer	1 unit	equipotential bonding safety compliant to the DIN EN 60204 standard	from the lead-out connection to the system	1 per Parklift
6	by customer	1 unit	marked main switch, lockable to prevent unauthorized switching on	above operating device	1 per power pack
7	by customer	10 m	PVC control cable with marked strands and protective conductor 5 x 1,5²	from main switch to hydraulic power pack	1 per power pack

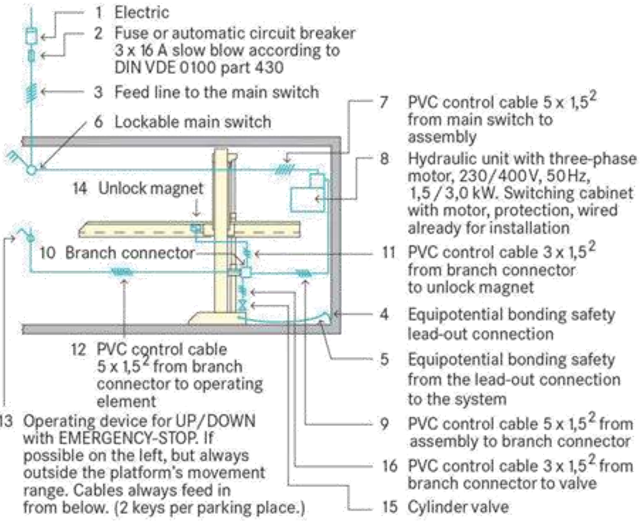
Items 8–16 are included in Wöhr's scope of delivery unless otherwise specified in the offer/order.

* DIN VDE 0100 part 410 + 430 (not under permanent load) 3PH+N+PE (three-phase current) Note: Where a door is used to close the garage, the manufacturer of the door must be consulted before the electric cable is laid.

The electrical components suppliedbythemanufacturer must be connected in accordance with the appropriate wiring diagram and local regulations. German VDE electrical requirements must be adhered to, in order to validate the TÜV tested circuit.

The electrical supply to the power pack(s) must be provided prior to or during installation to enable our fitters to complete their work satisfactorily and to check the correct functioning of the units.

In compliance with the DIN EN 60204 standard provisions, all systems must be connected directly on site with an earthed equipotential bonding. The lead-out connection must be at a 10 m distance!



Noise protection

Basis is the German DIN 4109 "Noise protection in buildings".

With the following conditions required 30 dB (A) in rooms can be provided:

- noise protection package from our accessory
- insulation figure of the construction of min. R'_W = 57 dB
- walls which are bordering the parking systems must be done as single wall and deflection resistant with min. m'= 300 kg/m²
- solid ceiling above the parking systems with min. m'= 400 kg/m²

At differing constructional Aconditions additional sound absorbing measures are necessary.

The best results are reached by separated sole plates from the construction.

Increased noise protection:

If increased noise protection must be provided planning has to be confirmed on a project base by Wöhr (bigger building measurements are required).

Temperature

The installation is designed to operate between +5°and +40°C. Atmospheric Humidity: 50% at +40°C. If the local circumstances differ from the above please contact Wöhr.

Hydraulic power packs

For the accommodation of the hydraulic power packs an additional space is required which will be determinded during the verifications of the drawings, e.g. in a wall recess.

Dimensions

All dimensions shown are minimum. Construction tolerances must be taken into consideration. All dimensions in cm.

Conformity test

All our systems are checked according to EC machinery directive 2006/42/EC and EN 14010.

Railings

If walkways are arranged directly to the side or behind the systems, railings have to be provided acc. EN ISO 13857 by client acc. to local requirements, height min. 200cm.

Maintenance

Regular maintenance by qualified personnel can be provided by means of an Annual Service Contract.

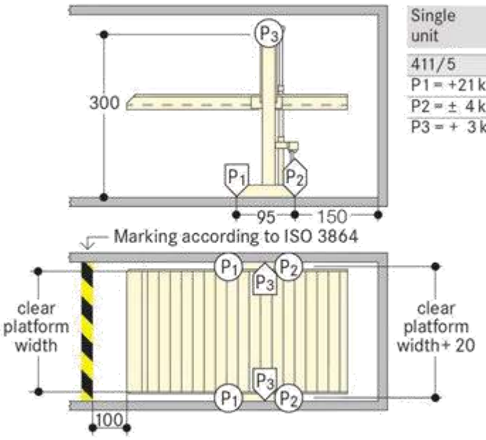
Protection against corrosion

Independent of a maintenance workings has to be carried out acc. to Wöhr Cleaning and Maintenance Instruction regularly.

Clean up galvanized parts and platforms of dirt and road salt as well as other pollution (corrosion danger)!

Pit must be always ventilated and dearated well.

Statics and construction requirements



Single unit
411/5
P1 = +21 kN *
P2 = ± 4 kN
P3 = + 3 kN

*all static loadings include the weight of the car

The units will be fixed on the anchor points with heavy duty anchor bolts to a depth of approx. 10–12cm.

Base plate thikness minimum 18cm! Concrete quality according to the static requirements of the building, but for the dowel fastening we require a concrete quality of min. C20/25.

Special foundations are required with asphalt floors or paving-stones.

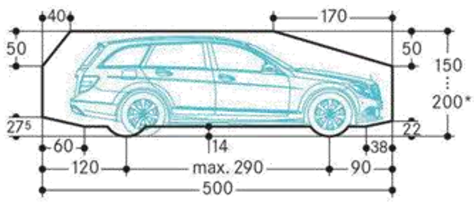
Fire safety

Each and every fire safety requirement and all possible mandatory item(s) and equipment(s) (fire extinguishing systems and fire alarm systems, etc.) are to be provided by the customer.

Notes

In case of lower cars with spoilers, contact Company Wöhr or local agent (see "clearance profile").

Clearance profile (standard car)



* The total car height includes roof rail and antenna fixture must not exceed the mentioned max. height dimension.

28A Charles Street, South Perth

Transport Assessment

CW941900

Prepared for
Stirling Capital Pty Ltd

3 February 2016

Cardno
Shaping the Future

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A	3 Feb 2016	For Issue	Sam Evans	Daniel Jenkins

Table of Contents

Tables

Figures

Appendices

1 Introduction

Cardno Pty Ltd ("Cardno") have been commissioned by Stirling Capital to undertake a Transport Assessment of the proposed mixed-use development at 26-28A Charles Street, South Perth.

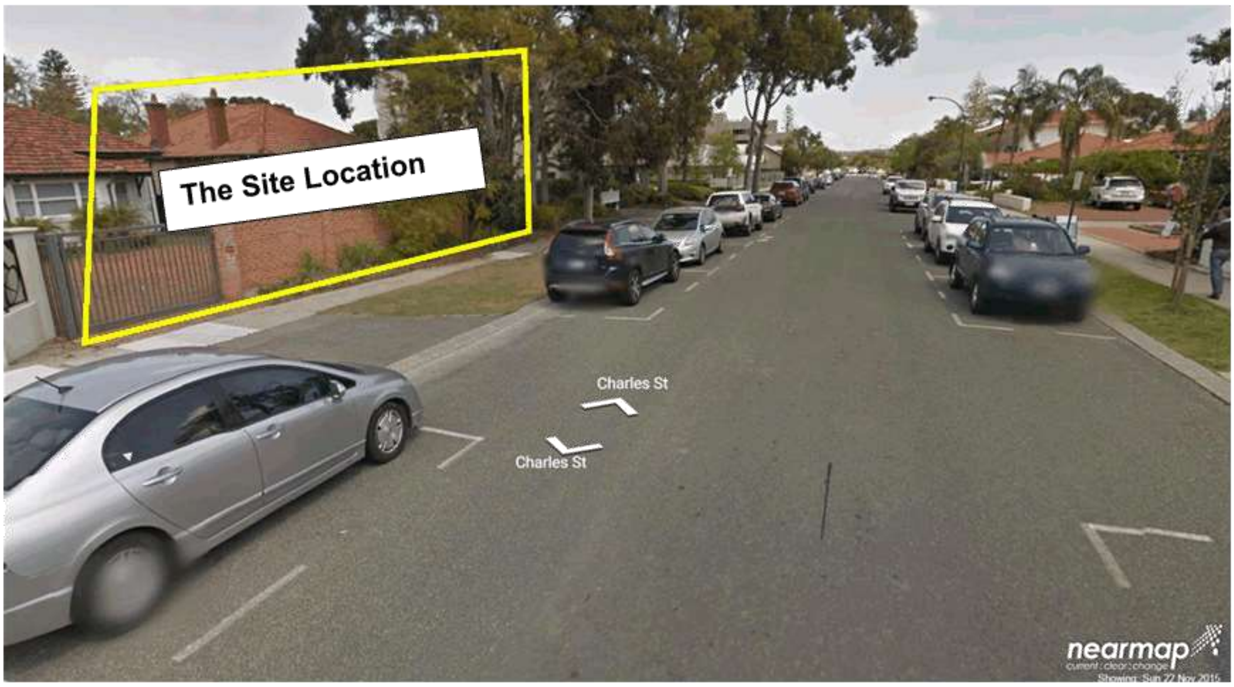
The Proposed Mixed Use Development ('the Site') is on a site area of 1, 515 sqm and consists of 28 residential apartments and 4 commercial tenancies at 26-28A Charles Street, which is within the City of South Perth ('the City').

It is noted that the analysis undertaken as part of this Transport Assessment (TA) assumes a maximum build-out scenario comprised of a total 28 residential apartments and 4 commercial tenancies.

This report has been prepared in accordance with the Western Australian Planning Commission (WAPC) Transport Assessment Guidelines for Developments: Volume 2 – Structure Plans (2006), with the checklist included in **Appendix A**.

It should be noted that a development of this small size does not warrant a Transport Assessment under the WAPC Guidelines as its traffic impact will be negligible and so a less detailed Transport Statement would normally suffice. However the City has requested that all proposed developments in the 'South Perth Station Precinct' should include a full Transport Assessment.

Figure 1-1 Charles Street, South Perth



2 Existing Situation

2.1 Existing Land Uses

There are currently two single storey dwellings on the Site which will be demolished.

2.2 Existing Transport Network

2.2.1 Existing Road Network

Figure 2-1 shows that the Site's frontage and access is on Charles Street. Existing development on Charles Street comprises single residential dwellings and some commercial uses. The classifications of Charles Street and the other surrounding roads are described in **Table 2-1**.

Table 2-1 Summary of Road Hierarchy Classification for Surrounding Roads (Main Roads Functional Hierarchy)

Road Name	Road Classification
Charles Street	Access Road
Labouchere Road	Primary Distributor
Mill Point Road	Primary Distributor
Melville Parade	Access Road

Road classifications are defined in the Main Roads Functional Hierarchy as follows:

Primary Distributors: *These provide for major regional and inter-regional traffic movement and carry large Volumes of generally fast moving traffic. Some are strategic freight routes and all are National or State roads. They are managed by Main Roads.*

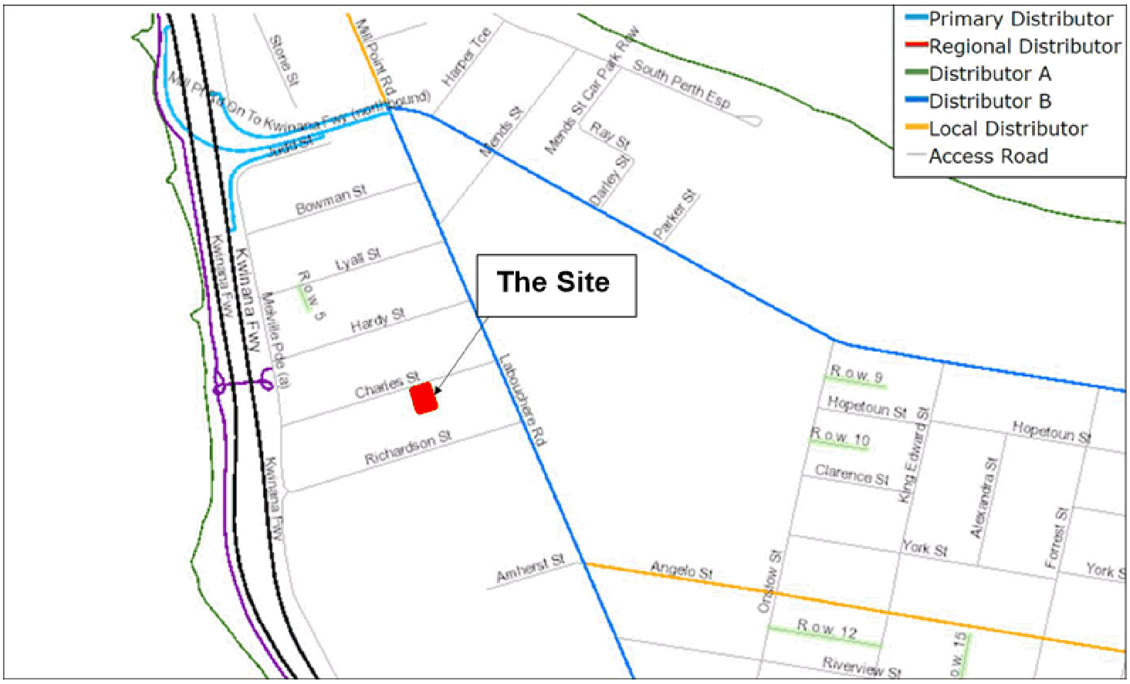
District Distributor A: *These carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property. They are managed by Local Government.*

District Distributor B: *Perform a similar function to District Distributor A but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with a traffic demand in excess of that originally intended. District Distributor A and B roads run between Land-use cells and generally not through them, forming a grid which would ideally space them around 1.5 Kilometres apart. They are managed by Local Government.*

Local Distributors: *Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. They are managed by Local government.*

Access Roads: *Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by Local government.*

Figure 2-1 Road Hierarchy



Source: https://gis.mainroads.wa.gov.au/roadinformationmap

2.2.2 Charles Street

Charles Street, located on the frontage of the development, consists of a two-lane undivided carriageway, unmarked lanes approximately 3m wide and provides on-street parking facilities on both sides of the road. This road is classified as an "Access Road" under the Main Roads Functional Hierarchy (MRFH) with an un-posted (default) speed limit of 50 km/h. Charles Street provides the local road link from the development and the surrounding road network.

2.2.3 Labouchere Road

Labouchere Road, located to the east of the development, consists of a four-lane divided carriageway, with lanes approximately 3 m wide separated by a 1m-2m wide median. This road is classified as a "Primary Distributor" under the MRFH with a posted speed limit of 60 km/h. Labouchere Road provides distribution to major local and state roads.

2.2.4 Mill Point Road

Mill Point Road, located to the north of the development, consists of a four-lane divided carriageway, with lanes approximately 3 m wide separated by a 1m-2m wide median. This road is classified as a "Primary Distributor" under the MRFH with a posted speed limit of 60 km/h. Mill Point Road provides distribution to major local and state roads.

2.2.5 Melville Parade

Melville Parade, located to the west of the development, consists of a two-lane undivided carriageway, with unmarked lanes approximately each 3m wide. This road is classified as an "Access Road" under the MRFH with an un-posted (default) speed limit of 50 km/h. Melville Parade provides parking for people using the pedestrian freeway crossing bridge to the foreshore.

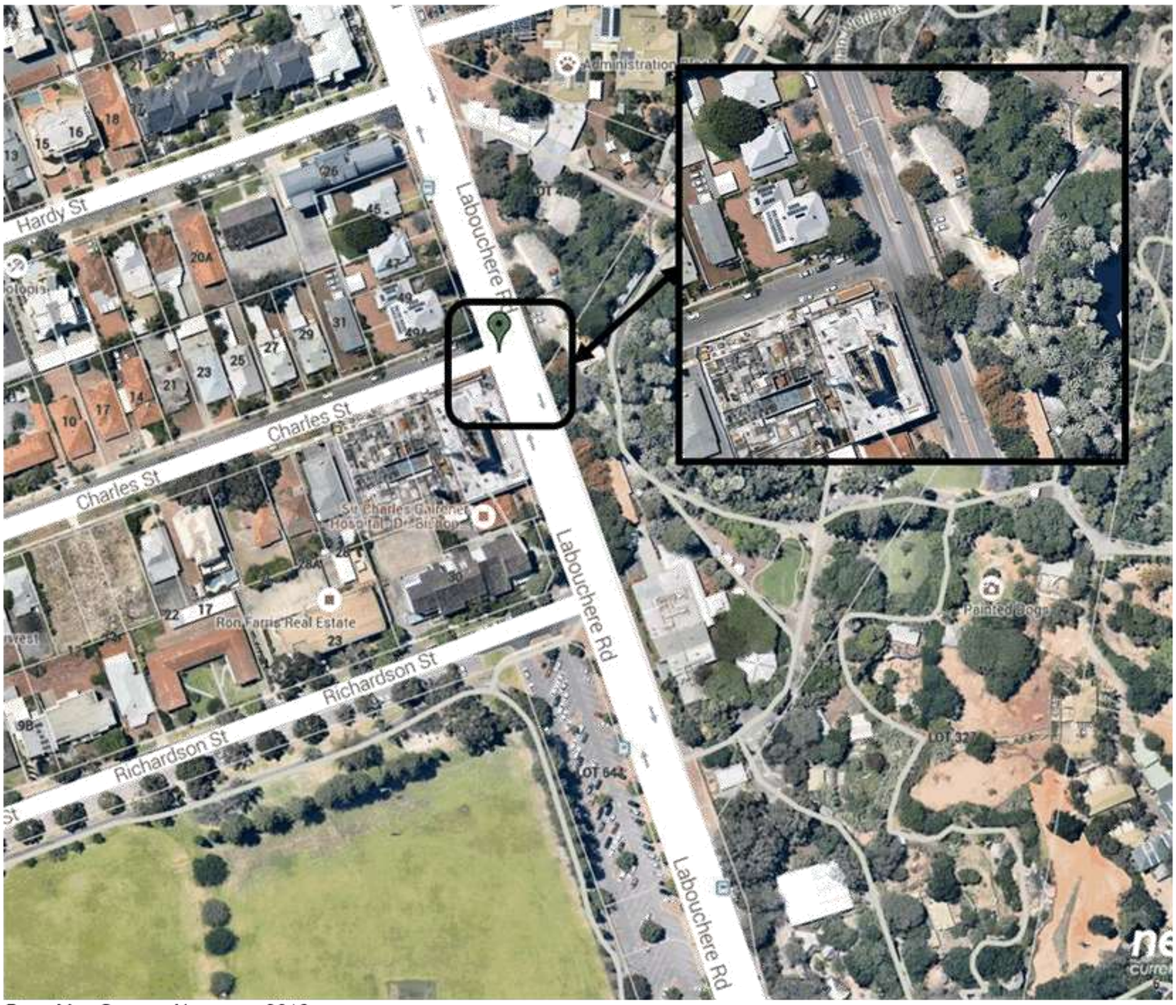
2.3 Intersections

The road intersection within the vicinity of the Site is described in the section below and the location is indicated in **Figure 2-2**.

2.3.1 Charles Street and Labouchere Road

The intersection as shown in the Nearmap extract in **Figure 2-2** is a priority give-way intersection. Charles Street gives way to Labouchere Road as Labouchere Road is the major road at this intersection. There are no marked pedestrian crossings at this intersection, although there is a signalised pedestrian crossing 30m north of Charles Street.

Figure 2-2 Key Intersections adjacent to the Site



Base Map Source: Nearmap, 2016

2.4 Existing Traffic Volumes

The existing traffic volumes for Labouchere Road have been determined from SCATS data supplied by Main Roads WA, taken from the signalised pedestrian crossing 30m north of the Charles Street/Labouchere Road intersection. The existing average daily and peak hour traffic volumes for weekday and weekend are summarised in **Table 2-2**.

Table 2-2 Average Traffic Volumes

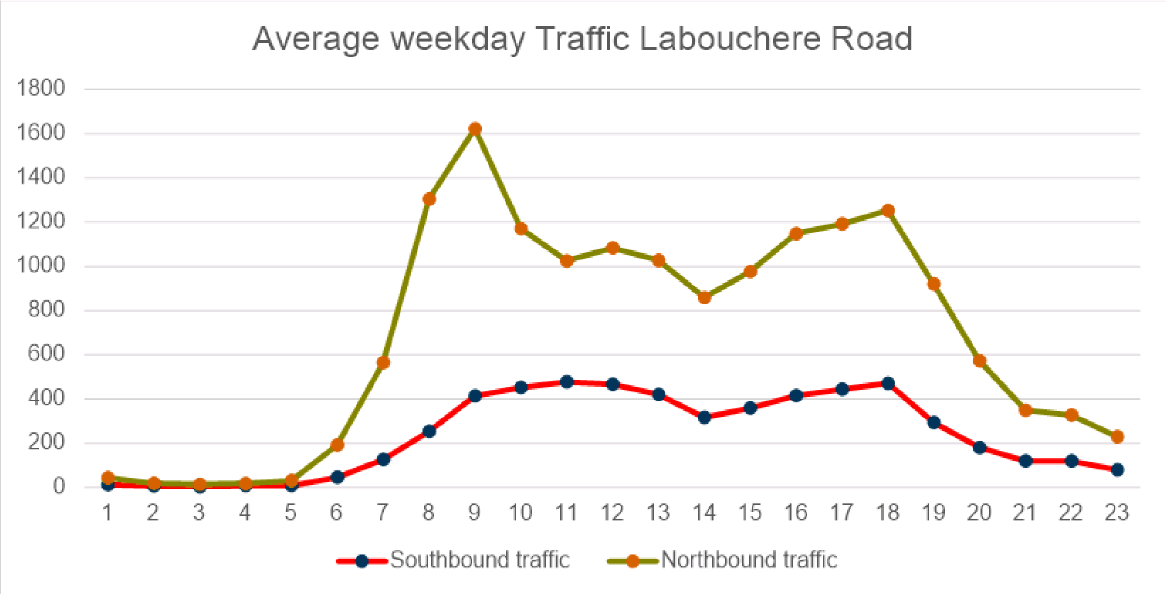
Road	Average Vehicles Per Day		Average AM Peak Hour	Average PM Peak Hour	Average Weekend Peak Hour
	Weekday	Weekend	Weekday	Weekday	Weekend
Labouchere Road near Charles Street	15, 926	11, 352	1, 622	1, 252	999

Source: MainRoads WA, 2016

2.4.1 Labouchere Road Vehicle Counts

The traffic profile for an average weekday for Labouchere Road is shown in **Figure 2-3** and shows the northbound traffic volumes are higher than the southbound traffic volumes. This is likely due to northbound traffic volumes having access to Kwinana Freeway and into Perth CBD.

Figure 2-3 Average Weekday Traffic Labouchere Road



2.5 Existing Speed Limits

The posted speed limits for the roads within and surrounding the Site are shown in **Table 2-3**.

Table 2-3 Posted Speed Limits within the Project Area

Road	Speed Limit km/hour
Charles Street	50
Labouchere Road	60
Mills Point Road	60
Melville Parade	50

2.6 Existing Bus Services

The Department of Transport for Western Australia have established Travel Smart maps for the City and the bus routes near to the Site are 30, 31 and 34, as can be seen in **Figure 2-4** below.

Figure 2-4 Existing Bus Services

Source: Travel Smart, City of South Perth, 2016

The bus routes destinations and frequencies have been summarised in **Table 2-4** below.

Table 2-4 Bus Routes Destinations and Frequencies

Bus Route	Destinations	Frequencies
30	Esplanade Busport – Curtin University Bus Station	Every 30 minutes
31	Esplanade Busport – Redmond St./Howard Pde	Every 30 minutes
34	Esplanade Busport – Cannington Station	Every 15 minutes

Source: Transperth, 2016

As can be seen in **Table 2-4** there are good bus services providing connections to the Perth CBD near the Site. These routes all provide services to the Esplanade Busport from which there are extensive onward connections to many destinations within the Perth Metropolitan Area.

2.7 Walking and Cycling

The Department of Transport for Western Australia have established Travel Smart maps for the City that show both the condition and availability of walking and cycling facilities within the City, as can be seen in **Figure 2-5** below the walking and cycling facilities surround the Site provide good connection for all users.

Figure 2-5 Existing Walking and Cycling facilities

Source: Travel Smart, City of South Perth, 2016

2.8 Existing Attractors and Generators

The major traffic attractors in the area surrounding the Site are the Perth Zoo, Richardson Park, South Perth Bowling Club, Windsor Park and the Swan River; the location of attractors/generators in relation to the Site is shown in **Figure 2-6**.

Figure 2-6 Surrounding attractors/ generators in 400 m radius of the Site

Source: Nearmap, 2015

2.9 Existing Cycling Network

The existing cycling network in the vicinity of the Site is summarised in **Figure 2-7** and shows the connections between the Swan River and the surrounding suburbs. The City has identified deficiencies within the existing cycling network and these can be seen in **Figure 2-7** below.

However, **Figure 2-7** also shows that, while there are some deficiencies in cyclist provision, the overall provision for cyclists is excellent, with easy access to the Principal Shared Path alongside the Kwinana Freeway, which in turn provides access to many other cycle routes within the Perth Metropolitan Area.

Figure 2-7 Existing Cycle Paths near the development

Source: South Perth Bike Plan 2011-2016

2.10 Crash Assessment

Crash data assessment for the five-year period between 1 January 2010 and 31 December 2014 for Charles Street has been undertaken. The data is summarised and presented in **Table 2-5**.

Table 2-5 Crash Statistics along Charles Street between 1st January 2010 and 31st December 2014

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Right Angle	0	0	0	2	2	4
Right turn thru	0	0	0	2	0	2
Total	**0**	**0**	**0**	**4**	**2**	**6**

As presented in **Table 2-5** none of the recorded crashes, close to the Site, resulted in a fatality or injury, also its worth noting that all occurred at the Charles Street/Labouchere Road intersection.

3 Future Transport Network

3.1 South Perth Station Precinct

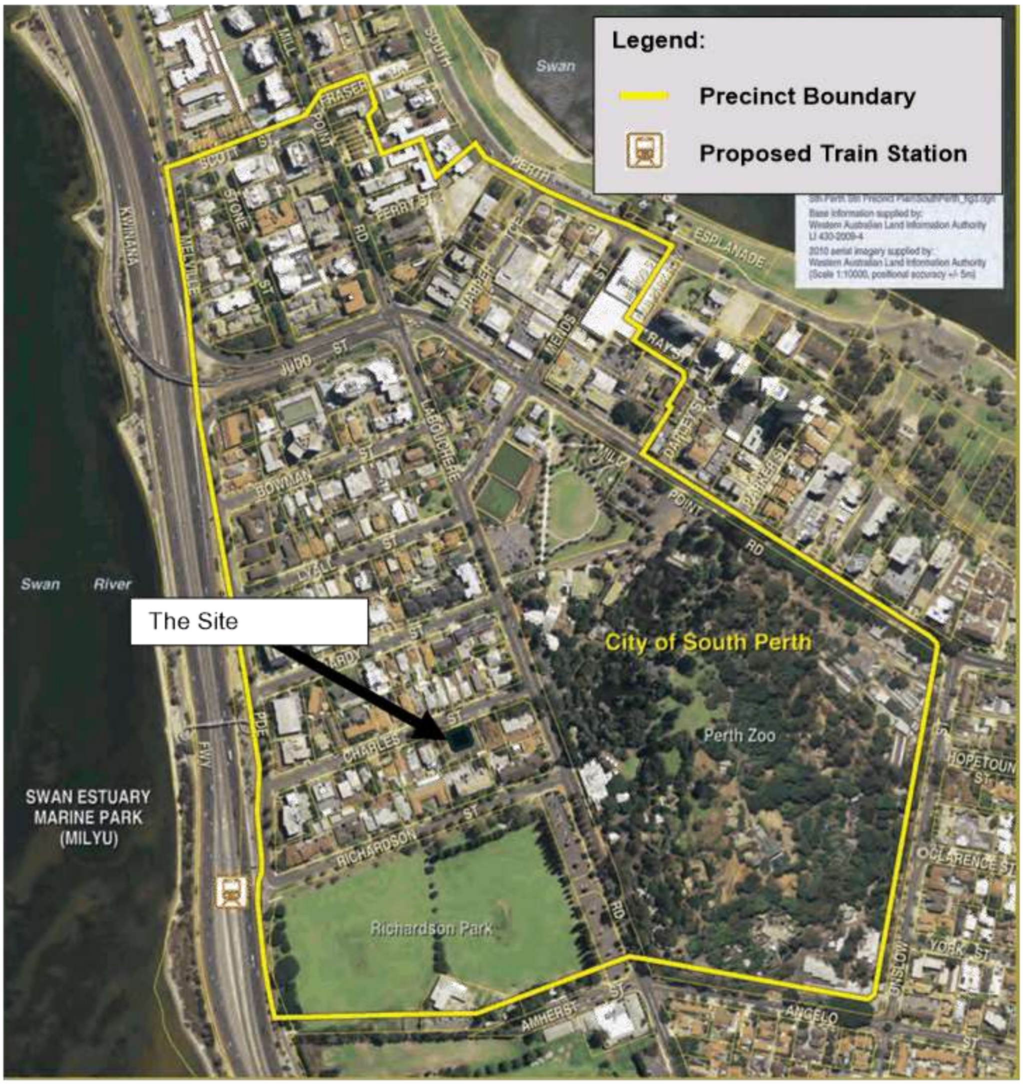
3.1.1 Purpose

The City and the Development of Planning have worked together to develop a plan to create an "*attractive business location featuring a rich choice of employment, public transport options, pedestrian friendly tree-lined streets and also including reminders of South Perth's heritage.*" The South Perth Station Precinct ("the Precinct") is predicted to produce a 29% growth in population, 121 thousand new dwellings, 147 thousand new jobs and 127 thousand people living in the area who contribute to the labour force by 2031.

3.1.2 Precinct Boundary

The Precinct boundary and the proposed South Perth Train Station are shown in **Figure 3-1** below.

Figure 3-1 South Perth Station Precinct Boundary



Source: City of South Perth, 2011

3.1.3 Precinct Plan

The precinct plan is shown in **Figure 3-2** below. It must be noted that currently some of these developments are under construction and some have been completed.

Figure 3-2 South Perth Station Precinct Plan

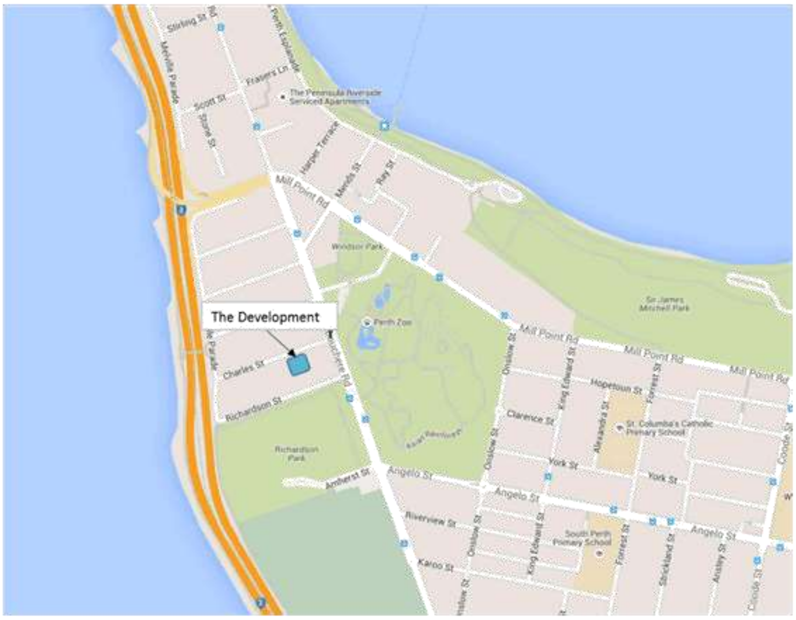
Source: City of South Perth, 2011

4 Proposed Development

4.1 Regional Context

The Site is located approximately 200m to the west of the Perth Zoo. The Site is located at 26-28A Charles Street, South Perth as shown in **Figure 4-1**.

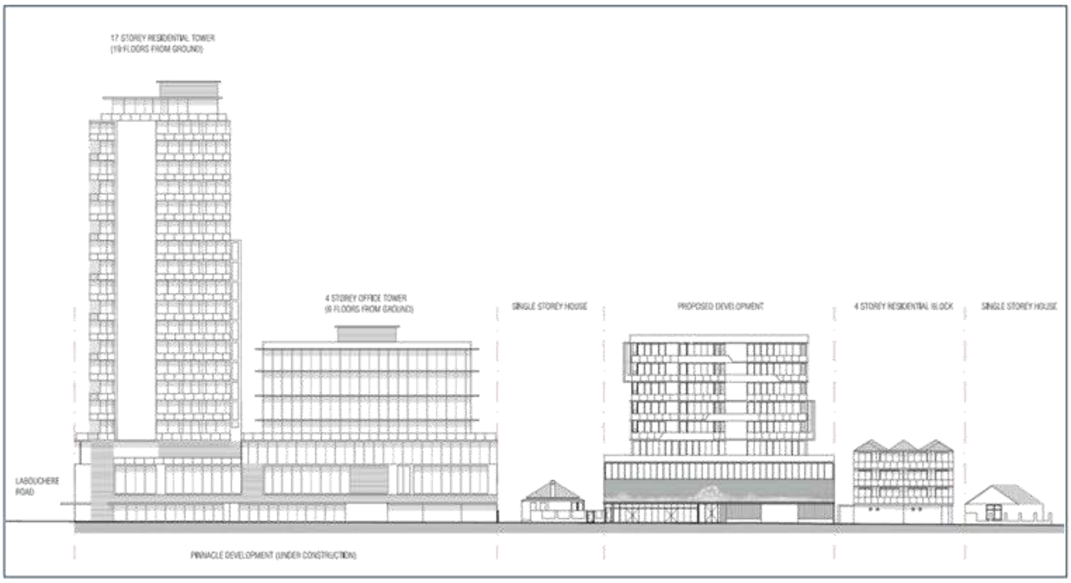
Figure 4-1 Location of the Development



Source: Nearmap

From the City's Development Approval Report, there are some buildings currently under construction within close vicinity of the Site. These buildings are shown in **Figure 4-2** below and are considered in the assessment of trip generation in **Section 5**.

Figure 4-2 Buildings currently being constructed on Charles Street

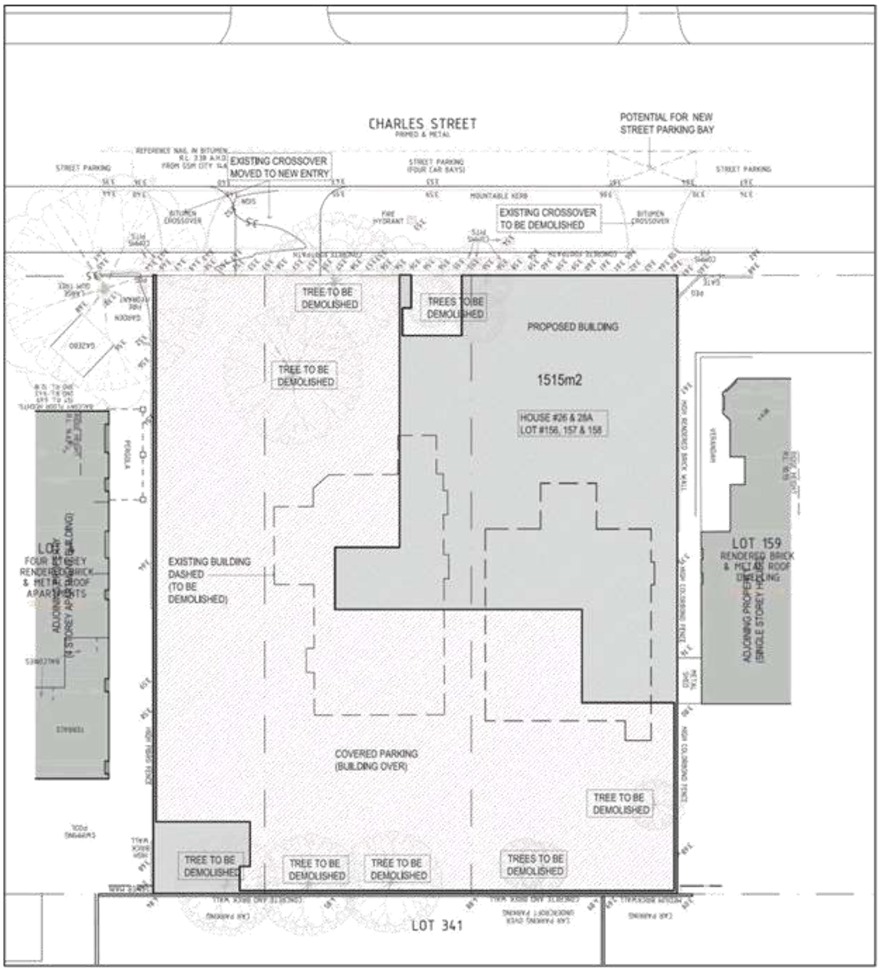


Source: Development Approval Report, 2015

4.2 Proposed Land Uses

The development layout is shown in **Figure 4-3** and **Appendix B**, while a summary of the proposed development yields is provided in **Table 4-1**.

Figure 4-3 The Proposed Development Layout



Source: Development Approval Report, 2015

Table 4-1 Proposed Development Yields

Development Type	Apartment Type and Apartment Area	Number of Apartments	Development Yields (sqm)
Apartments	3 bed x 2 bath = 121m^2	4	484 m^2
	2 bed x 2 bath = 87.5 m^2	8	700 m^2
	2 bed x 1 bath = 65m^2	8	520 m^2
	1 bed x 1 bath = 50m^2	8	400 m^2
Commercial Tenancy			2, 823 m^2
		TOTAL	4, 927 m^2

Source: Submission for Development Application, 2015

5 Analysis of Transport Network

5.1 Access Strategy

Due to the large increase of expected traffic generation as a result of various developments in the locality, the City advised that any assessment needs to be based on the consideration that the Charles Street intersection with Labouchere Road will only accommodate Left in/Left out/right in traffic post-construction and also alternatively Left in/Left out only. This was advised in an email of 8 January 2016 from Paul Edwards to Mina Thomas (both of the City), which was forwarded to Macdonald Jones Architects.

The assessment in this TA has not included for the existing volumes and configuration of the Labouchere Road/Charles Street intersection as the intersection configuration is likely to change and therefore operate differently.

5.2 Traffic Generation

5.2.1 Charles Street

As shown in the South Perth Station Precinct Plan in **Figure 3-2** there are other likely and committed developments along Charles Street before 2031; these developments have been considered in **Sections 5.2.1.1** and **5.2.1.2**.

5.2.1.1 Charles Street 2031 – Development Traffic only

For the subject Site, the lot yields are known and therefore the trip generation rates have been sourced from Institute of *Transport Engineer's Trip Generation Handbook 8th Edition*. Trip generation for the Commercial tenancies has been calculated using the number of car bays provided on-site while residential trip generation is calculated from a per-dwelling trip rate.

Table 5-1 summaries the ITE trip rates for the Development for AM and PM peak periods.

Table 5-1 ITE Trip Generation Rates

Land Use	ITE Code	Weekday Peak hours	
		AM Peak Hour	PM Peak Hour
Mid-rise apartments	223	0.35 per dwelling	0.44 per dwelling
Commercial and Café	-	0.4 per 1 car bay	0.4 per 1 car bay

Trip directionality proportions for the stated land uses have been also sourced from the *ITE Trip Generation Handbook 8th edition* and are shown in **Table 5-2.**

Table 5-2 Generated traffic directional proportions

Land Use	AM Peak hour		PM Peak Hour	
	IN	OUT	IN	OUT
Mid-rise apartments	29%	71%	59%	41%
Commercial and Café	88%	12%	17%	83%

Table 5-3 shows the total number of trips estimated to be generated by the development alone.

Table 5-3 Trip generation by the development

Land Use	AM Peak hour		PM Peak Hour	
	IN	OUT	IN	OUT
Mid-rise Apartments	4	10	10	7
Commercial and Café	19	3	4	18
TOTAL	**23**	**13**	**14**	**25**

5.2.1.2 *Charles Street 2031 – Background Traffic*

For the other likely and committed developments along Charles Street, lot yields are unknown and therefore trip generation has been conservatively estimated based on a rate per square metre from the trip generation of the subject Development in **Table 5-3.**

Taking the total trips generated by the subject Development and determining a generation rate in terms of trips per square metre for the remaining likely and committed Developments along Charles Street, the resultant traffic generation of these other developments has been summarised in **Table 5-4** below. Note that likely and committed developments are taken from the South Perth Station Precinct Plan, as shown in **Figure 3-2** in **Section 3**.

Table 5-4 Trip generation without the development

Storey Height	Generation Rate (trips/sqm)				Total area along Charles Street (sqm)	Total Trips			
	AM		PM			AM		PM	
	IN	OUT	IN	OUT		IN	OUT	IN	OUT
6	0.01	0.0057	0.0062	0.01	15,115	153	86	93	166
8	0.014	0.0076	0.0082	0.015	4,245	57	32	35	62
12	0.02	0.0114	0.0123	0.022	4,070	82	47	50	90
					Total	**293**	**165**	**178**	**318**

Table 5-5 shows the overall total number of trips generated along Charles Street and the percentage of trips made up by the development. As Charles Street is a local Access Road, it is considered that the vast majority of its traffic would be generated by development located on Charles Street itself, with negligible through traffic movements.

Table 5-5 Total trips generated along Charles Street

Generator Type	AM Peak hour		PM Peak Hour	
	IN	OUT	IN	OUT
Committed Developments	293	165	178	318
Subject Development only	23	13	14	25
Total	**316**	**178**	**192**	**343**
Percentage Impact by the subject Development	**7%**	**7%**	**7%**	**7%**

5.2.2 Labouchere Road

To account both for the increase in regional traffic volumes and the traffic generated by other likely and committed developments within the South Perth Station Precinct, it has been assumed for the AM peak hour that northbound traffic on Labouchere Road will increase by 100% to 2031 while southbound traffic on Labouchere Road will increase by 25%. For the PM peak hour, it has been assumed that the opposite directionalities will apply (i.e. an increase of 25% for the northbound traffic volumes and an increase of 100% for the southbound traffic volumes). This is based on a wider traffic model for this area and is considered a robust estimate of growth.

The resulting 2031 volumes for Labouchere Road are summarised in **Table 5-6** below.

Table 5-6 Labouchere Road Volumes (2031)

Peak period	Road Approach	Existing Volumes	Predicted 2031 Volumes
AM	Labouchere Road Northbound	1,208	2,420
	Labouchere Road Southbound	414	520
PM	Labouchere Road Northbound	781	980
	Labouchere Road Southbound	470	940

5.3 Assessment Years

The following two scenarios have been analysed as part of this assessment:

- **2031 Base** – this scenario reflects the traffic volumes from the proposed likely and committed developments along Charles Street accompanied by the expected traffic growth along Labouchere Road as previously mentioned for the year of 2031 to account for the South Perth Station Precinct. This excludes traffic of the subject development and as such is a future base scenario for comparison purposes.
- **2031 Base plus Development** – this scenario reflects the traffic volumes from the proposed likely and committed developments along Charles Street accompanied by the expected traffic growth along Labouchere Road, with the addition of the subject Development's generated traffic.

5.4 Traffic Distribution

To be conservative it has been assumed that all volumes predicted for Labouchere Road will travel through the Charles Street/Labouchere Road intersection and all movements will be split in accordance with the Labouchere Road volumes. The resulting distributed traffic volumes for 2031 with and without the Development have been shown in **Figure 5-1** and **Figure 5-2** respectively.

Figure 5-1 2031 Traffic Distribution Without Development

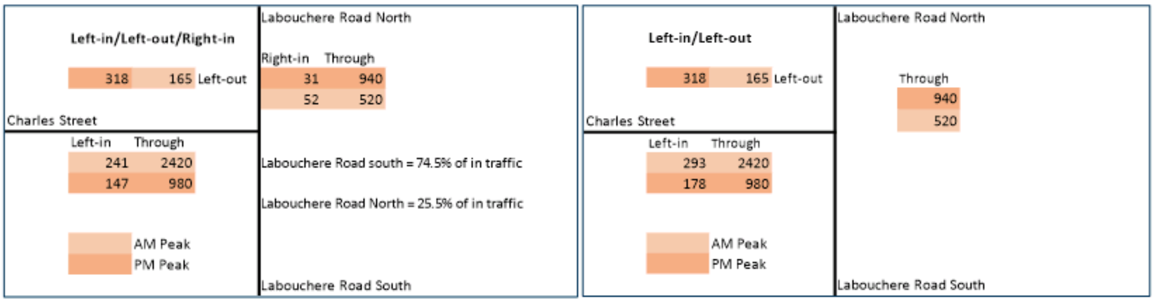
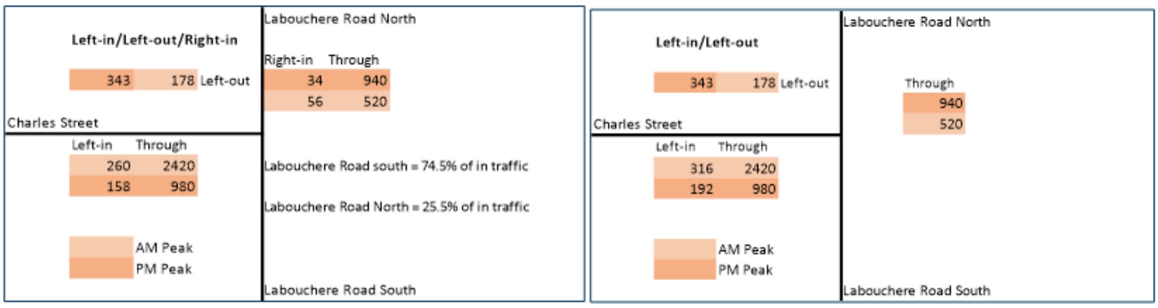


Figure 5-2 2031 Traffic Distribution With Development



5.5 Intersection Performance

The key intersection has been assessed using SIDRA v6.1. The SIDRA models test and assist with determining the most suitable intersection type for the development. The key intersection analysed is:

- Charles Street/Labouchere Road

This program calculates the performance of intersections based on input parameters, including geometry and traffic volumes. The Degree of Saturation (DOS), Average Delay and 95th Percentile Queue operational measures can be evaluated as follows:

Degree of Saturation (DOS): is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity. The generally accepted upper limits for the DOS (where it is considered that the operation of the intersection is constrained) are:

- **0.80:** Un-signalised intersections.
- **0.85:** Roundabouts.
- **0.95:** Signalised intersections.

Level of Service (LOS): is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 Levels of Service (LoS), designated from A to F, the 6 LoS are described in **Table 5-7**.

Average Delay: is the average of all travel time delays for vehicles through the intersection. An un-signalised intersection can be considered to be operated at capacity where the average delay exceeds 40 seconds for any movement.

95th Percentile Queue: is the queue length below which 95% of all modelled queue lengths fall.

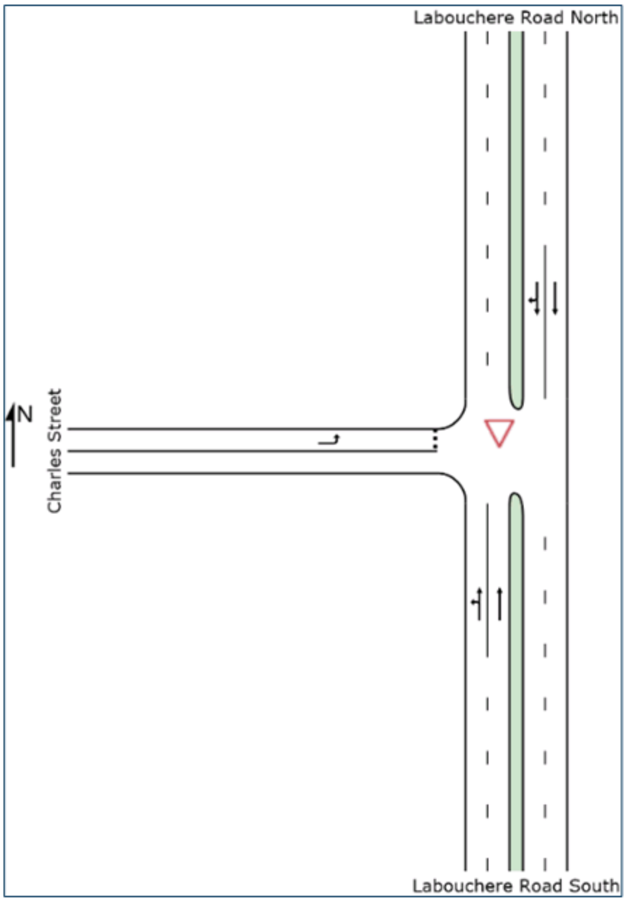
Table 5-7 LOS Summary Table

LOS	Average Intersection Delay – Unsignalised (Seconds)	Average Intersection Delay – Signalised (Seconds)	Description of Intersection Conditions
A	≤ 10	≤ 10	Minimal delays
B	10 – 20	10 – 15	Low level of delay and queuing
C	20 – 35	15 – 25	Occasionally queues develop but traffic flows remain stable and acceptable. For signalised intersections, vehicles occasionally have to wait longer than 1 cycle length to get through the intersection.
D	35 – 55	25 – 35	Delays at intersections may become extensive at times but intersections still clear during times of low demand, thereby preventing excessive queuing.
E	55 – 80	35 – 50	The traffic demand equals to the capacity of the intersection, resulting in long queue lengths and intersection delays. For signalised intersections, the majority of vehicles have to wait longer than 1 cycle length the get through the intersection.
F	≥ 80	≥ 50	The traffic demand exceeds the capacity of the intersection, resulting in excessive queue lengths and delays. For signalised intersections, the majority of vehicles have to wait longer than 1 cycle length the get through the intersection.

5.5.1 Intersection of Charles Street/Labouchere Road Left-in/Left-out/Right-in

The proposed Left-in/Left-out/Right-in intersection layout for the intersection of Charles Street/Labouchere Road has been shown in **Figure 5-3** below.

Figure 5-3 Charles Street/Labouchere Road SIDRA Intersection



The results from the SIDRA analysis have been summarised in **Table 5-8** for the 'without development' scenario and in **Table 5-9** for the 'with development' scenario. The SIDRA results show that, while the intersection will experience low LoS on Charles Street and Labouchere Road north movements, these are expected without the development traffic; the development traffic has minimal impact on the intersection's performance.

Although in the AM period, the queue length for the right turn from Labouchere Road north is shown to increase significantly, the delay in seconds does not experience a proportionally large increase. Furthermore, in both the with-development and without-development scenarios, LoS of F is predicted and DoS of considerably over 1. This is clearly an issue unrelated to the development traffic.

The issue is related to the Labouchere Road capacity originating to the South and East of the Site. This anticipated future demand warrants a predicted signalised intersection at the Angelo Street/Labouchere Road intersection. Thus allowing sufficient gaps in northbound traffic to allow the performance of the small turning volumes in and out of Charles Street.

Table 5-8 SIDRA Intersection Analysis Results For 2031 Without Proposed Development

Intersection Approach		AM Peak Hour				PM Peak Hour			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Labouchere Road South	L	0.69	6	A	0	0.29	6	A	0
	T	0.69	0	A	0	0.29	0	A	0
Labouchere Road North	T	0.27	0	A	0	0.28	0	A	0
	R	8.67	14509	F	537	0.28	18	C	11
Charles Street	L	0.60	26	D	19	0.37	9	A	13

Table 5-9 SIDRA Intersection Analysis Results For 2031 With Proposed Development

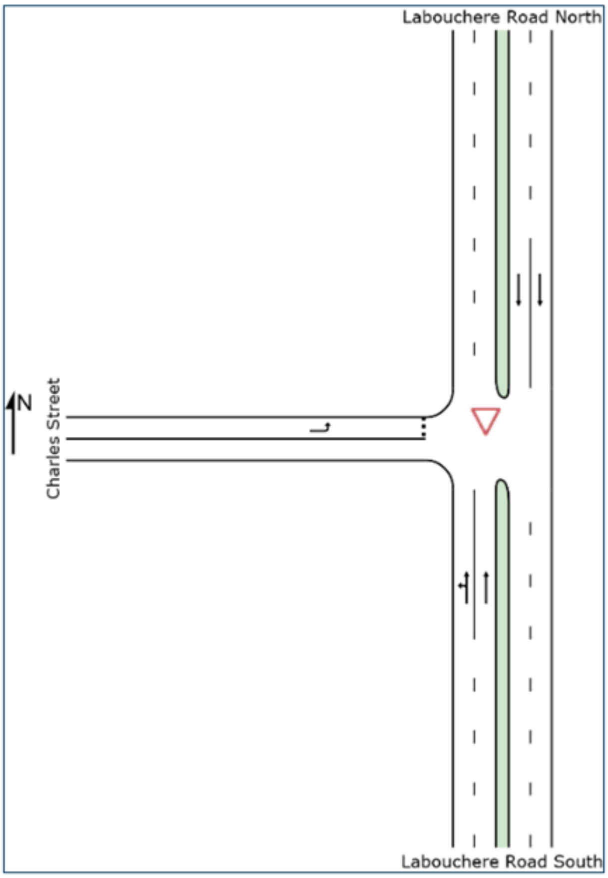
Intersection Approach		AM Peak Hour				PM Peak Hour			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Labouchere Road South	L	0.69	6	A	0	0.29	6	A	0
	T	0.69	0	A	0	0.29	0	A	0
Labouchere Road North	T	0.27	0	A	0	0.29	0	A	0
	R	9.33	15696	F	582	0.29	18	C	12
Charles Street	L	0.64	26	D	21	0.39	9	A	15

Full SIDRA input and output files can be provided on request.

5.5.2 Intersection of Charles Street/Labouchere Road Left-in/Left-out/

The alternative proposed intersection layout for the intersection of Charles Street/Labouchere Road has been shown in **Figure 5-44** below.

Figure 5-4 Charles Street/Labouchere Road SIDRA Intersection



The results from the SIDRA analysis have been summarised in **Table 5-10** for the 'without development' scenario and in **Table 5-11** for the 'with development' scenario. The SIDRA results show that the intersection will perform satisfactorily for both the AM and PM peak hour periods for all scenarios analysed.

Table 5-10 SIDRA Intersection Analysis Results For Without Proposed Development

Intersection Approach		AM Peak Hour				PM Peak Hour			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Labouchere Road South	L	0.74	6	A	0	0.32	6	A	0
	T	0.74	0	A	0	0.32	0	A	0
Labouchere Road North	T	0.14	0	A	0	0.25	0	A	0
Charles Street	L	0.68	30	D	22	0.40	9	A	14

Table 5-11 SIDRA Intersection Analysis Results For With Proposed Development

Intersection Approach		AM Peak Hour				PM Peak Hour			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Labouchere Road South	L	0.74	6	A	0	0.32	6	A	0
	T	0.74	0	A	0	0.32	0	A	0
Labouchere Road North	T	0.14	0	A	0	0.25	0	A	0
Charles Street	L	0.71	31	D	25	0.41	9	A	16

Full SIDRA input and output files can be provided on request.

6 Parking Provision

6.1 Parking Requirements

The parking requirements were previously assessed in a Car Parking Management Plan (CPMP) produced by Cardno in November 2015.

The commercial development quantum has slightly increased since the issue of the CPMP, from 2,612.5 m^2 to 2,823 m^2. As a result, the commercial parking provision is 5 bays short of the total requirement of 57 bays plus 6 visitor bays. Commercial parking provision is proposed at 53 bays plus 5 visitor bays (visitor bays to be shared with the residential element).

However, as detailed in the CPMP, this slight shortfall can be made up for by reciprocal parking as permitted by the Town Planning Scheme 6 ("TPS 6"). Further details can be provided on request. Furthermore, the Site has excellent public transport and cycling connectivity.

6.2 Car Park Layout

The Development's parking bay locations and layouts has been reviewed with reference to the Residential Design Codes of Western Australia ('the Code') and also Australian Standard 2890 part 1 and 6 (AS2890.1 and AS2890.6).

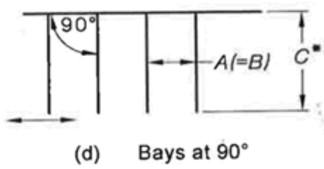
6.2.1 Manoeuvring Areas

The Code requires the manoeuvring areas to be designed in accordance with AS2890.1. AS2890.1 Section 2 has the requirements of an off-street car park which is purely based on the 'User-class' of the car park established from Clause 1.4.

The User-class for the Development is 1A (residential, domestic and employee parking) and therefore the dimensions, as per **Figure 6-1** below, of the car bays are 2.4 metres in width and 5.4 metres in depth. The User class also requires an aisle width of 5.8 metres. Disabled parking dimensions are as per **Figure 6-2**.

From a review of the Development plans and shown in **Figure 6-3** below the Development satisfies these requirements.

Figure 6-1 Australian Standards Standard Parking Dimension requirements



User class (Note 1)	A (Note 3)	B	C_1	C_2	C_3	Aisle width (Note 4)
1	2.4	2.4	5.4	4.8	5.4	6.2
1A	2.4	2.4	5.4	4.8	5.4	5.8
2	2.5	2.5	5.4	4.8	5.4	5.8
3	2.6	2.6	5.4	4.8	5.4	5.8
3A	2.6	2.6	5.4	4.8	5.4	6.6
3A	2.7	2.7	5.4	4.8	5.4	6.2
4	(See Note 5)					

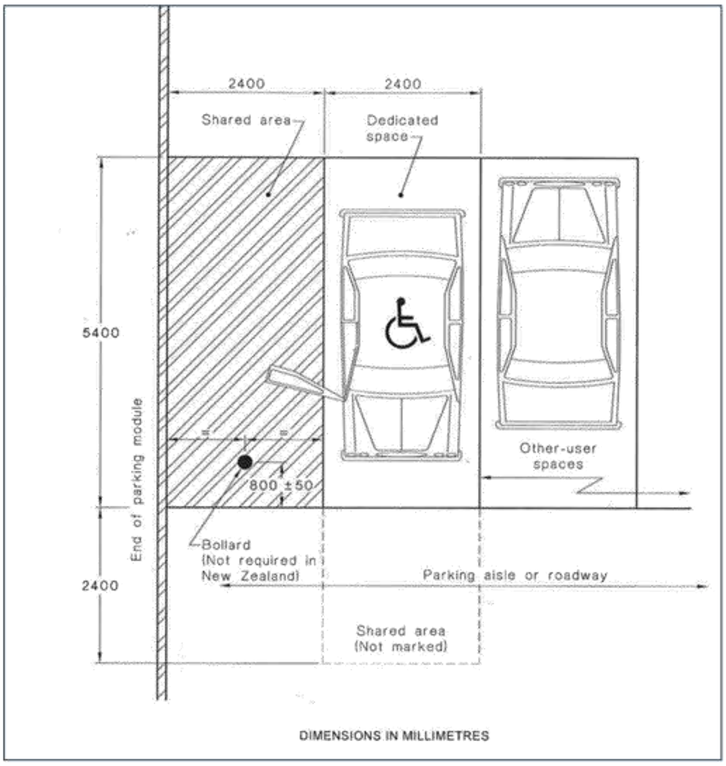
*Dimension C is selected as follows (see Note 6):
- C1—where parking is to a wall or high kerb not allowing any overhang.
- C2—where parking is to a low kerb which allows 600 mm overhang in accordance with Clause 2.4.1(a)(i).
- C3—where parking is controlled by wheelstops installed at right angles to the direction of parking, or where the ends of parking spaces form a sawtooth pattern, e.g. as shown in the upper half of Figure 2.4(b).

For Notes—see over.

DIMENSIONS IN METRES

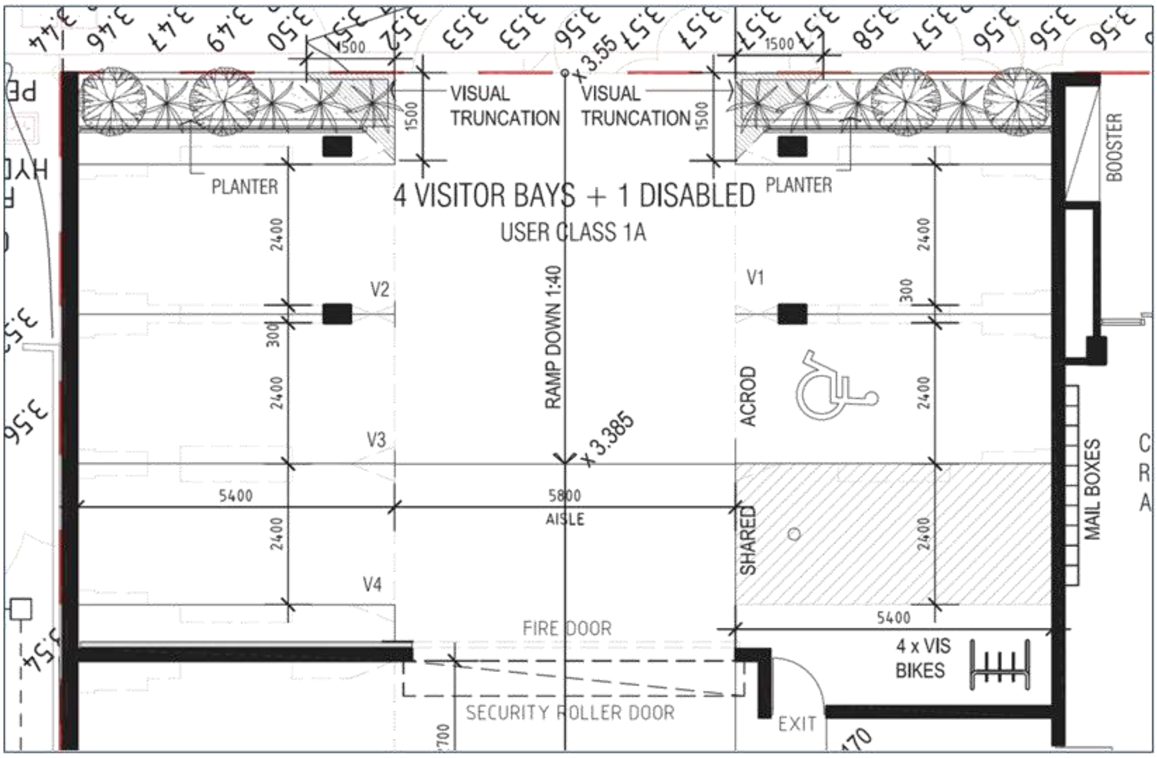
Source: AS2890.1 (2004)

Figure 6-2 Australian Standards Disabled Parking Dimension Requirements



Source: AS2890.1 (2009)

Figure 6-3 The Development Car Parking Bay dimensions



Source: Development Application (2015)

6.2.2 Visitor Parking Bays

The Code has two requirements for the design of visitor parking spaces, these requirements are:

- The spaces are marked and clearly signposted as dedicated for visitor use only, and located close to or visible from the point of entry to the Development; and
- The spaces provide an accessible path of travel for people with disabilities.

In relation to the Development, the visitor bays are not marked but however are separated from the residential and commercial parking by a security roller door.

An accessible path is available down a ramp into the commercial and residential lobby.

6.2.3 Landscaping

As the Development provides undercover parking this requirement is not necessary for consideration.

6.2.4 Concealment

The Code requires that all private car parking spaces be concealed from the street, which is satisfied in the Development.

6.2.4.1 Access onto Charles Street

The Code establishes that vehicular access is "*provided so as to minimise the number of crossovers, to be safe in use and not detract from the streetscape*".

Crossovers

The crossover is the section of driveway between the property boundary and the road kerb. The Development shows one crossover and therefore is succeeding in minimising the number of crossovers.

Safe in Use

The Code gives requirements for the access to the Development as needing to satisfy two conditions.

Condition 1 – Access Provided

The Access way is to be provided in the safest way possible, which would mean providing the access way from the safest street possible. As the Development is situated directly fronting onto Charles Street, this is the only option for access; furthermore, as a local access road, it is suitable for direct property access.

Condition 2 – Two-way Access

The Code makes note that for the Development the designed driveway must allow for a car to enter in forward gear and also exit in forward gear. As the Development allows residents and visitors to enter in forwards, park in a bay then leave in forward gear, the Development satisfies this condition also.

AS2890.1

AS2890.1 also has requirements for the access design has been checked against these requirements; a small modification to the frontage landscaping will be required in order to achieve the visual truncations as detailed in Figure 3.3 of AS2890.1, which are related to visibility of the footpath. A truncation of 2.5 metres by 2 metres is required, with the 2 metres being the distance along the property boundary away from the left edge of the access driveway (left side to an exiting driver) and 2.5 metres being the distance back from the property boundary. The triangular area between the two distances needs to be kept free of obstructions. This is easily achievable with a slight modification to the frontage landscaping.

The sight distance requirements along the frontage *road* (Figure 3.2 of AS2890.1) will be achievable due to the straight alignment of Charles Street and footpath width.

6.2.4.2 Detracting from Streetscape

The Code establishes that vehicular access must be adequately paved and drainage supplied. The Development access consists of a bitumen crossover and is completely undercover meaning the Development satisfies the Codes requirements for this section.

7 Conclusions

The conclusions for the 28A Charles Street Transport Assessment are as follows:

> The Development will contribute less than 5 percent to the overall traffic volumes along Labouchere Road and even less to the wider network.

> SIDRA modelling of the Charles Street/Labouchere Road intersection shows that the development traffic will have a minimal impact on the operation of this intersection. As such, any capacity issues shown (for the Left-in/Left-out/Right-in configuration) are a wider issue, unrelated to this development.

Transport Assessment

APPENDIX

A

WAPC TRANSPORT ASSESSMENT CHECKLIST

Cardno
Shaping the Future

Item	Comments/Proposals
Summary	
Introduction/Background	**Included in Section 1**
Name of applicant and consultant	**Included in Section 1**
Development location and context	**Included in Section 1**
Brief description of development proposal	**Included in Section 1**
Key issues	**Included in Section 1**
Background information	**Included in Section 1**
Development Plan Proposal	**Included in Section 4**
Regional context	**Included in Section 4.1**
Proposed land uses	**Included in Section 4.2**
Table of land uses and quantities	**Included in Section 4.2**
Access arrangements	**Included in Section 5.1**
Parking provision	**Included in Section 6**
End of trip facilities	**NA**
Specific Issues	**NA**
Existing Situation	
Existing site uses (if any)	**Included in Section 2.1**
Existing parking and demand (if appropriate)	**NA**
Existing access arrangments	**NA**
Existing site traffic	**Included in Section 2.2**
Surrounding land uses	**Included in Section 2.8**
Surrounding road network	**Included in Section 2.2.1**
Traffic Management on frontage roads	**Included in Section 2.2**
Traffic flows on surrounding roads (usually AM and PM Peaks)	**Included in Section 2.4**
Traffic flows at major intersections(usually AM and PM Peaks)	**Included in Section 2.3**
Operation of surrounding intersections	**Included in Section 2.3**
Existing pedestrian/cycle networks	**Included in Section 2.7**
Existing public transport services surrounding the development	**Included in Section 2.6**
Crash data	**Included in Section 2.10**

Changes to Surrounding Networks	
Road Network	**Included in Section**
Intersection Layouts and controls	**Included in Section**
Pedestrian/cycle networks and crossing facilities	**Included in Section**
Public Transport services	**Included in Section**
Integration with Surrounding area	
Surrounding major attractors/generators	**Included in Section 2.8**
Proposed changes within 1200m	**Included in Section 3.1**
Travel desire lines from development to these attractors/generators	**Included in Section 5.4**
Adequacy of existing transport networks	**NA**
Deficiencies in existing transport networks	**NA**
Remedial measures to address deficiencies	**NA**
Analysis of Transport Networks	
Assessment year(s) and time period(s)	**Included in Section 5.3**
Development generated traffic	**Included in Section 5.2**
Distribution of generated traffic	**Included in Section 5.4**
Parking supply & demand	**Included in Section 6**
Committed developments and transport proposals	**Included in Section 5.2**
Base and "with development" traffic flows	**Included in Section 5.2.1.1**
Analysis of development accesses	**Included in Section 5.1**
Impact on surrounding roads	**Included in Section 5.2.1.2**
Impact on intersections	**Included in Section 5.5**
Impact on neighbouring areas	**NA**
Traffic noise and vibration	**NA**
Road safety	**NA**
Public transport access	**Included in Section 2.6**
Pedestrian access / amenity	**Included in Section 2.7**
Cycle access / amenity	**Included in Section 2.7**
Analysis of pedestrian / cycle networks	**Included in Section 2.7**
Safe walk/cycle to school (for residential and school site developments only)	**NA**
Traffic management plan (where appropriate)	**NA**
Conclusions	**Included in Section 7**

Aerial Photographs (September 2015)

28 (Left) & 28A (Right) Charles Street - View from Charles Street, facing south east (February 2016)

26 (Left) & 24 (Right) Charles Street - View from Charles Street, facing south east (February 2016)

28A (Left), 26 (Centre) & 24 (Right) Charles Street - View from Charles Street, facing south (February 2016)

28 (Left), 28A (Centre) & 26 (Right) Charles Street - View from Charles Street, facing south east (February 2016)

28 (Left) & 28A (Right) Charles Street - View from Charles Street, facing south west (February 2016)

28A (Left) & 26 (Right) Charles Street - View from Charles Street, facing south (February 2016)

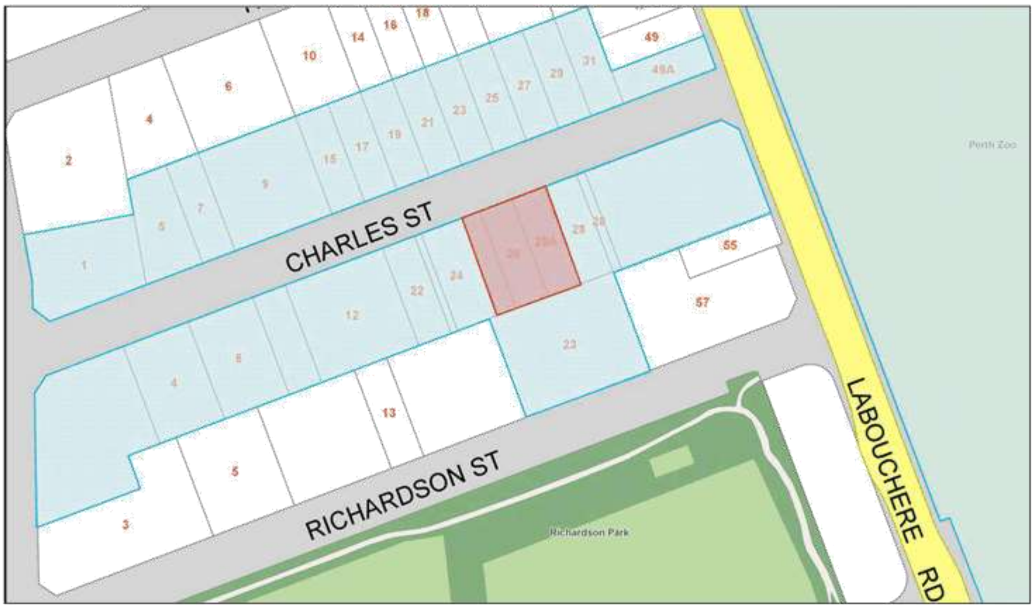
26 Charles Street - View from Charles Street, facing south east (February 2016)

26 (Left) & 24 (Right) Charles Street - View from Charles Street, facing south east (February 2016)

Public Consultation

Public consultation has been undertaken for this proposal to the extent and in the manner required by City Policy P301 'Consultation for Planning Proposals'. Under the "Area 1" consultation method, individual property owners and occupiers were invited to inspect the plans and to submit comments during a minimum 14-day period.

A total of 43 consultation notices were sent, with 3 submissions received, all objecting to the proposal. The map below shows the distribution of the mailed consultation notices:



The table below provides the comments in the submissions received and responses from City officers:

Submitters' Comments	Officer Responses
Summarised comments: • Amendment No. 46 • Dilapidation Report • Noise (Car Park) • Noise / Hot Air (Air Conditioners) • Overshadowing • Street Setback • Side Setback • Traffic • Trees • Visual Privacy	• The DAP is required to have due regard to the advertised Amendment No. 46. Where relevant, further comments on the implications of this Amendment are contained in the City's RAR. • TPS6 does not contain a requirement to prepare a dilapidation report. However, a recommendation can be included as an advice note. • The plans indicate the side podium walls are constructed from a solid material • The Residential AC units are located in enclosures on the balconies. All airconditoners will be required to comply with the noise regulations. • This site is not subject to maximum shadowing restrictions in TPS6. • The nil podium street setback is compliant with the gazetted Scheme requirement. Due to uncertainty over the final outcome of Amendment No. 46, greater street setbacks are unlikely to be applied at this time. • A nil podium side setback is generally required for the whole of the podium in the gazetted Scheme and Amendment No. 46. • In the context of developments within the South Perth Station Precinct this development will have negligible traffic impact compared to those already under construction. • Due to the gazetted Scheme requirements for nil building setbacks on all boundaries, it is not practical for the existing trees on the development site to be retained. • This site is not subject to visual privacy setback requirements. *Note: The applicant has also provided their responses on this submission.*

Submission 1 (Owner/occupier – Charles Street)

Reference is made to the notice, received on 24 November 2015, from the City of South Perth regarding a proposed nine-storey development at 26 & 28A Charles St. South Perth. We wish to provide the following comments on this proposal.

- With zero setbacks on all sides of these properties, this proposal is obviously aimed at circumventing the expressed wishes of Council contained in Amendment No.46 that a street frontage setback of 4 metres is now preferred.
- Even if Amendment No.46 is ratified, zero setback at the western side of the proposed development will significantly impact our well-being and quality of life. Our eastern outlook will be a concrete wall with no morning sunlight.
- Charles Street is already severely impacted by current developments with chaotic traffic and parking as a result of the construction of the Pinnacle apartments. Further building work will worsen the situation.
- A building approval was given for a development at 12-16 Charles Street but, other than the destruction of 3 houses, nothing has been done leaving derelict land suitable only for graffiti vandals. The development at 1 Richardson has had no activity for at least 3 months.
- No attempt has been made by the developer to consult with or obtain the views of neighbouring property owners.
- We respectfully request that this proposed development be delayed until the ratification of Amendment No.46 in order that it can be modified to allow for a front setback of 4 metres.
- Alternatively we request that it be rejected on the basis that it no longer reflects the views of Council.

Submission 2 (Owner/occupier – Charles Street)

I am responding to a notice received on 24 November 2015, from the City of South Perth regarding a proposed nine-storey development at 26 & 28A Charles St. South Perth. I wish to document my strong objections to this proposal.

- The advertised version of Amendment 46, which was unanimously approved by Council, has direct relevance to the proposed development. One of the advertised changes was to re-instate some of the setbacks that were regrettably removed under Amendment 25. Council has acknowledged that this was a mistake and they intend to rectify this. It would be a travesty if this development application was given approval prior to the final decision being made on Amendment 46. The negative impact of a 3-4 story concrete podium wall, being built next to our property without setbacks, is substantial. I ask that approval be deferred until the process for Amendment 46 is completed. I've attached three photos which illustrate the scope of the problem. "Current Street View" shows the current street view of our property as viewed from the eastern boundary. "Proposed Podium Wall" shows the impact that the proposed 3-4 story podium wall will have. "Example Podium Wall" shows an actual example of how the podium wall will look, from the Pinnacles Development on the corner of Charles Street and Labouchere Road.
- The plans for the development have west facing terraces and balconies, all of which look down through my main bedroom windows, and onto my uncovered balcony. In the case of the terrace, it is only 3 metres away. The upper balconies have a slightly bigger setback, but because of their position, they all look backwards into my main bedroom window, and onto my uncovered balcony. They may as well sell tickets for what is going on at the front of my apartment. I thought there were provisions in the regulations that were supposed to stop this type of overlooking. All of the balconies and the terrace in front of my front bedroom window should be screened with opaque material, so that people don't get to 'enjoy the view'.

- Our apartment is a relatively new apartment block, having only being built about 10 years ago. The majority of the owners are the original owners. It is highly unlikely that this building will be redeveloped for at least another 20 years. However, the positioning of the proposed podium wall on our eastern boundary will ensure that our windows on that side of the building will be starved of light for all of those 20 years. Natural light is important in apartments, and ours was designed based on regulations that allowed this. However, we will now be deprived of a substantial amount of natural light that currently enters through the windows on the eastern side of our building. There are no western facing windows in our eastern apartments, so the impact of overshadowing is effectively doubled when it comes to considering these apartments in isolation.
- We currently have plants in the garden on the eastern side of our building, including vegetables. With the positioning of the podium, the garden will be almost permanently in the dark. It will lie at the bottom of a 3-4 story canyon, that will only be 2.8 metres wide at the base. Many of the windows for the eastern apartments also lie in this canyon. It is unreasonable for us not to have direct sunlight for our plants - or residents (which a bigger podium setback would provide).
- The proposed development calls for the demolition of a forest of native trees on the front part of the property. These trees are currently used by many native birds and animals, including cockatoos, kookaburras, magpies and possums. Removing them will deprive the fauna of their homes, and us of their beauty. Magpies are ground feeders, and use the strip of vegetation at the front of this property to feed. Their food sources are already dwindling with the current development under-way. This proposed development will eliminate another important food source (by virtue of the zero metre setback).
- The large concrete foot print of the proposed development, and the elimination of all trees on the property will further increase the urban heat effect. There was an article in The West today (2/12/15) that talked about the importance of Councils retaining trees in areas where people live. This proposed development will have no trees.
- It is **not** clear from the plans where the air conditioning units and vents will go, which makes it difficult for me to determine the potential environmental effects of the noise and hot air outflow. The application should be delayed until it is clearly articulated where the air conditioning units will be placed, so the environmental impacts can be considered by residents.
- It is not clear to me from the plans whether the car park wall is perforated, or whether it is solid concrete on our eastern boundary. This is important, because if it is not solid, there will be substantial noise emanating from cars driving on the ground and first floors. This is immediately adjacent to the main bedrooms on the eastern side of our building. The garage walls MUST be solid concrete to stop the noise from the cars. In the case of apartment 1 in our complex, the bed head and window would literally be 3 metres from the cars. Lots of cars.
- The developer has yet to approach us about their proposed development. They should be made to pay for a dilapidation report of our property, given the size of the footings that will be needed to construct this building. It is highly likely that cracking will occur in our apartments as a result of a very deep hole being dug up against the boundary fence. This should be a condition of any approval given for development.

"Current Street View"

"Example Podium Wall"


"Proposed Podium Wall"

Submission 3 (Owner/occupier – Charles Street)

We are writing to you requesting that you defer approval of the above development until such time as amendment 46 has been passed and some sensibility has returned to the planning and redevelopment of the Railway Precinct.

We are residents at **[street number]** Charles Street South Perth and have been here since completion of our building in November 2003. For twelve years we have enjoyed the village lifestyle of South Perth that I bought into expecting to see out my retirement near the Zoo and the Mends street precinct in comfort and relative quiet. Regrettably a persistent drive to have a train station near the zoo which is amply serviced by buses, ferries and even a train station just the other side of the river, the City is now turning the Station Precinct into a lifeless area of concrete canyons, over crowding and the inability to service the future traffic volumes. What are we trying to do create an area rivalling and competing with the City of Perth? We hardly think that that is necessary.

Wind tunnels without the necessary light created by the zero setbacks we would suggest are not the way to go. Four meter setbacks allowing for some greenery will give the area a much nicer ambiance and allow the residents to not all live on top of each other. Some public space is needed, some light required to keep the balance and allow a feeling of well being.

We would suggest that concrete blocks decorated with aluminium panels at zero setbacks are the last thing required in this area. Multi storey carparks four stories high will create such traffic jams in this area it is difficult to fathom how this will be dealt with.

It seems that this whole concept of rezoning is totally being driven by the greed of developers. Selling out to foreign investors and developers is not in our best interest.

Please council we emplore you to stop any approvals until amendment 46 has been ratified and that at least whilst the ambience of the area will still change it will at least not be quite as drastic and the area will still be liveable. Amendment to the approval for the development at 16-18-20 Charles Street if it has still not yet commenced construction enforcing compliance to amendment 46 will also be of great benefit.

Please councillors lets not destroy South Perth but keep it as a convivial place for all.

Application for Planning Approval Requiring Engineering Comments

To:	Engineering Design
From:	Mr Mina Thomas Planning Officer, Development Services
Dated:	16 November 2015

Property Address:	Lot 156, 157 & 158 (No. 26 & 28A) Charles Street, South Perth
Proposal:	Mixed Development
Application Date:	13 November 2015
ID Number:	11.2015.540.1
Plan Attached:	Yes

General Comment:	Yes
Vehicle Movements:	Yes
Onsite Parking:	Yes
Street Trees:	No
Crossover Design:	No
Verge Treatments:	No
Ground Levels:	No
Lowest point of street: (drainage issue)	No
Bus stop relocation:	No
Other:	Stormwater / gradient & street parking.

ENGINEERING COMMENTS IN RELATION TO ABOVE:

General Comment

Other than a general reference on the Ground Floor Plan DA-03, there is no acknowledgement of the additional work required to construct around and over the existing Water Corporation sewer main located on #26 to #28A Charles Street. Clearly the Water Corporation will have specific requirements over the sewer easement that need to be addressed in any building plan.

Parking and Vehicle Access

Parking bay widths comply with the requirements of TPS 6 although the aisle width is understated at 5.8 metres. From the information supplied there would appear to be no issues with access or internal movement into the parking bays and through the parking areas. Cardno has presented on behalf of the Applicant a Technical Memorandum (Car Parking Management Plan). Engineering Infrastructure has no issues with the content of the memorandum.

Traffic Statement

The Applicant has not submitted a Traffic Statement. Typically for a development that would be expected to generate between 10 vehicles in the peak hour to 100 vehicles (in the peak hour) the Applicant would be expected to submit a Traffic Statement. This development is very likely to just exceed the minimum 10 vehicles in the peak hour and as such it is reasonable to forego the requirement to have a statement prepared as the inevitable conclusion from the consultant will be: *"the development will have no impact on the surrounding streets."* This will be the case if the assessment had been prepared on the basis that the development was isolated from everything occurring around it. The cumulative impact of multiple developments will simply exacerbate an existing situation at the intersection of Labouchere Road and Mill Point Road that has extended queue lengths at

Application for Planning Approval Requiring Engineering Comments

certain times and a low level of service at most times. The situation is however manageable through the existing network albeit with the intersection and signal upgrades previously identified within the GHD Report. In the context of developments within the South Perth Station Precinct this development will have negligible compared to those already under construction.

Stormwater Design Requirements
The development is located within the Mill Point Drainage Precinct as defined in *Policy P354 (Stormwater Drainage Requirements for Proposed Buildings)* and *Management Practice M354*. Within the precinct the allowable means of disposal of stormwater are reuse or via a Private Drainage Connection (PDC) to the street system.
Where discharge to the drainage system via a PDC is selected the Plans submitted for Building Licence will include sufficient detail to satisfy the following:

- *All stormwater drainage facilities will be designed and installed in accordance with Policy P354 (Stormwater Drainage Requirements for Proposed Buildings) and Management Practice M354; and*
- *The stormwater drainage designer must consider and incorporate as appropriate the Principles of Water Sensitive Urban Design (WSUD).*

For the purpose of completing an Application for a PDC the following will apply:

- The discharge from the site as defined in the PDC is the amount of overland flow that would have resulted from the site in an undeveloped form i.e. the site area only;
- The impervious area or effective area for the purpose of calculating the quantity of rainfall discharge will be the plan area including all paths, paved areas etc. plus 50% of the largest vertical wall face;
- The quantity of water to be discharged from the site will be determined by a Hydraulics Engineer or similar using the impervious area calculation above;
- The designer needs to be mindful of the general requirement that all storm water falling on the site must be contained on site and suitably disposed via a controlled outflow to the drainage system;
- Unless otherwise demonstrated and agreed the flow to the street system would be expected to be no greater than 1 litre per second for each 500 square metres of site area;
- Sufficient storage is required on site to cater for the short duration high intensity 100 year storm event with a controlled discharge to the street system, although the designer will need to satisfy themselves that the longer duration but less intense event can still be accommodated within the proposed onsite storage;
- Depending on the method of controlled discharge, if pumping is required the designer must consider the likelihood of a power outage and make provision for the event when determining on site storage;
- With the relatively low flow expected from the site an "orifice plate" may be required to control flow to the prescribed amount if an oversize pipe is used. The discharge pipe is to be fitted with a simple reflux or non-return valve; and
- The Draft WUSD Guidelines require that 300 mm freeboard to building floor levels be provided to accommodate the 1:100 storm event. The alternative is to increase the storage capacity of the collection tanks to meet this target.

Where the street drainage does not extend to the point at which the PDC is required then the developer is required to pay all costs associated with the additional street drainage required. The sizing and location of any additional drainage will be determined by Engineering infrastructure.

An application for a PDC along with the design calculations is to be submitted to Engineering Infrastructure for approval prior to installation. It should be noted that approval of the PDC is conditional on the owner accepting all of the conditions attached to the application including ensuring future owners are informed of the conditions relating to the PDC.

Application for Planning Approval Requiring Engineering Comments

Waste Management Plan

Comments with respect to Waste Management will come from the Coordinator Environmental Health Services after consultation with Engineering Infrastructure.

Having waste bins placed onto the verge area on collection days and then allowing the bins to remain long after collection does not augur well for an attractive streetscape. The City has limited control over collection times and the Applicant has minimal control over the speedy retrieval of the bins following collection. Ideally within the South Perth Station Precinct a collection method not involving the storage of bins on the verge for a kerbside collection should be considered.

Dewatering Management Plan

As dewatering in some form will be required for the basement infrastructure and the on-site stormwater storage tanks the Applicant will be required to prepare a Management Plan for the Office of Water and the Department of Parks and Wildlife (Rivers and Estuaries Division). A copy of the Plan and all relevant correspondence is to be submitted to the City. The Plan will address both the environmental aspects as well as the physical activities of the dewatering operations. The Management Plan is required as part of a Planning Approval if groundwater is to be pumped, via the City's drainage system, into the Swan River as part of the dewatering operation. A method of construction involving perimeter piling or sheet walling that would reduce the volume of dewatering required and minimise the impact on ground water from drawdown must be embraced for the development.

The Dewatering Management Plan would be prepared by a suitably qualified Environmental Consultant who will:

- undertake water testing to ensure the samples satisfy all the criteria;
- commit to a monitoring regime during dewatering to ensure water quality of discharge does not deteriorate; and
- outline a recovery plan should the dewatering operations result in a loss of water quality.

As the downstream outfall to the River is controlled by stormwater pumps the dewatering contractor will be required to ensure that the rate of discharge from the system does not exceed the rated capacity for continuous pumping by the "small jockey pump" forming part of the pumping station.

The dewatering plan to the City will also address the connection to the stormwater system and how the expected flow rate will be met through the existing pump units.

Construction Management Plan

Every person that expects to undertake work from the street is required to produce a Traffic Management Plan in accordance with the Main Roads "*Code of Practice – Traffic Management for Works in the Street*". However as a result of compliancy issues being experienced with the preparation and execution of the Traffic Management Plans and the coordination with multiple projects in close proximity, Engineering Infrastructure will require a Construction Management Plan (CMP) to be submitted for approval. The CMP will address in order all of the following although the list is not exhaustive and may require other matters not listed to be considered. The CMP will provide:

- an appropriately detailed Traffic Management Plan (TMP) that is endorsed by an accredited Road Traffic Manager (RTM);
- the Traffic Management Plan that ensures no works including substantial deliveries of building materials are undertaken during the peak morning hours (7am to 9am and will take into consideration movement through the minor streets off Labouchere Road including Melville Parade;
- detailed information regarding proposed pedestrian treatments, including an approved

3/4

Application for Planning Approval Requiring Engineering Comments

overhead gantry, for all buildings with zero setback at the lower levels and whether the gantries will be required for site offices and/or staff facilities;
- details of how and where building materials will be stored before use on site and whether a Licence to Store Materials on the verge is required;
- an acknowledgement that excavation works (within 3 metres of the road edge) will require 'work zone barriers';
- detailed analysis of how the adjacent road network will best operate during construction;
- project time-lines with appropriate mile-stones (to allow for appropriate coordination and communication to surrounding stakeholders);
- details of proposed treatments for through traffic and construction vehicles in and around site (to allow Ranger Services and Traffic & Design jointly coordinate the best parking outcomes); and
- the proposed route for trucks servicing the site including lay over areas where required (to allow Ranger Services and Traffic & Design jointly coordinate the most appropriate routes for trucks).

Crossing

The general requirement that the footpath is to be continuous through the crossing results in the path section in concrete. However in this location there is an expectation that the "hard landscaping" and pavement upgrade will be detailed on landscape plans and submitted to Engineering Infrastructure for approval by the Landscape Architect. Segmental pavers of a form to be determined (but in line with general principle of "quality streetscapes") will be the footpath material and therefore can be used as the crossing material. The footpath will be defined as continuous through the crossing by change of pattern. Where segmental pavers are used a concrete apron at the kerb line is to be provided. The concrete apron will transition into the adjacent kerbing. The type and form of the kerbing is still to be determined but along with the paving is consistent with the principle of "quality streetscapes".

A crossing application is to be submitted and approved by the City prior to construction and the crossing will be checked for compliance during and post construction.

The City's crossing requirements are provided in the Management Practice M353 "Crossing Construction".

Name:	LES CROXFORD Manager Engineering Infrastructure	Date:	29 January 2016

Environmental Health Services
Planning Approval Comments

Details	
Proposed Development: (Property address)	Lot 156, 157 & 158 (No. 26 & 28A) Charles Street, South Perth
Application: (Type)	Proposed Nine-Storey, Mixed Development
Officer: **Department:**	Jason Jenke Environmental Health Services
Date:	10 December 2015

With reference to the above, the following environmental Health comments apply;

Car park Ventilation
Car park ventilation to be designed to ensure that the carbon monoxide build up in the parking area does not exceed 50 ppm per hour in accordance with the *Health Act (Carbon Monoxide) Regulations 1975*.

Waste Management & Bin Enclosure
The bin enclosure and the waste management plan are based on the City's draft Waste Guidelines for new developments and the waste generation rate calculations are accepted

The following comments are to be noted;

- 2 different ground floor plans have been provided both are referred to as DA1.03 (Rev.B) but both depict the bin store differently (one has 19 bins, the other has 37 bins), **please clarify**.
- The City's recycling collection service operates one collection per fortnight, the waste management plan requires the City to collect recycling twice per week, **and this is not accepted**.
- The bin store is designed to only allow access for 240l bins. Given the size of this development, it would be reasonable to increase the access to the bin store to give future flexibility to sizes of bins being used.
- The number of bins being presented for collection and the space required to present bins does not comply with the City's requirements "The space required for collection from the verge must not exceed one third of the property frontage or 15 receptacles." **This is not accepted**.
- Street parking may restrict access to a kerbside waste collection service. A private onsite service should be considered.

Noise Generally
Given the location of the air conditioning in relation to existing and future residential buildings, **please provide an acoustic report** by a suitably qualified person that demonstrates compliance with the *Environmental Protection Act 1986* and *Environmental Protection (Noise) Regulations 1997.*

Jason Jenke
Environmental Health Officer

From: Jason Jenke
Sent: Tuesday, 22 December 2015 5:27 PM
To: Mina Thomas
Cc: Craig Barker
Subject: 26-28A Charles Street Waste Management Plan - Revised

Hi Mina

This Waste Management Plan is accepted by the City and is to be implemented as per the plan.

Kind regards

Jason Jenke
Environmental Health Coordinator
City of South Perth
(08) 9474 0777

Government of **Western Australia**
Department of **Parks and Wildlife**

Rivers and Estuaries Division

Your ref:	CH2/26&28A
	11.2015.540.1
Our ref:	2015/004670
Enquiries:	Gabrielle Shepherd
Phone:	9278 0910
Email:	gabrielle.shepherd@dpaw.wa.gov.au

City of South Perth
Folder No. 11.2015.540.1
16 DEC 2015
BS CE EH CCR CBLC
PS CC GA CEO MAYOR
FS EI HR RAN

Geoff Glass
Chief Executive Officer
City of South Perth
Cnr Sandgate Road and South Terrace
SOUTH PERTH WA 6151

Attention: Mina Thomas

Dear Mr Glass

CLAUSE 30A(2)B(II) – CONSTRUCTION OF NINE STOREY MIXED USE DEVELOPMENT - LOTS 156, 157 AND 158 (26 AND 28A) CHARLES STREET, SOUTH PERTH

Thank you for providing the Swan River Trust (the Trust) with the opportunity to comment on the above development application received on 18 November 2015.

The Department of Parks and Wildlife has assessed the application on behalf of the Trust, and you are advised that there are no objections to the proposal, subject to the following conditions:

1. Stormwater drainage shall be contained on site, or connected to the local stormwater drainage system, to the satisfaction of the City of South Perth.

ADVICE TO APPLICANT

1. The applicant is advised that if excavation is required for development on the lot, the Department of Parks and Wildlife, Rivers and Estuaries Division's preferred method of construction to reduce the volume of dewatering effluent is the "bathtub method" – i.e. secant piles or similar to create impervious walls and floor prior to excavation of the site.

   The applicant is also advised that a dewatering management plan will be required to be submitted to the Department of Parks and Wildlife, Rivers and Estuaries Division for approval should excavation be proposed.

If you have any queries regarding this matter, please contact Gabrielle Shepherd, Planning Officer, on 9278 0910. In all correspondence please quote the above reference number.

Yours sincerely

Glen McLeod-Thorpe
A/Manager, Statutory Assessments
As delegate of the Swan River Trust
Under Section 28B(2) of the SCRM Act 2006

3 December 2015

Rivers and Estuaries Division
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983
Phone: (08) 9219 9000 Email: rivers.planning@dpaw.wa.gov.au
www.dpaw.wa.gov.au