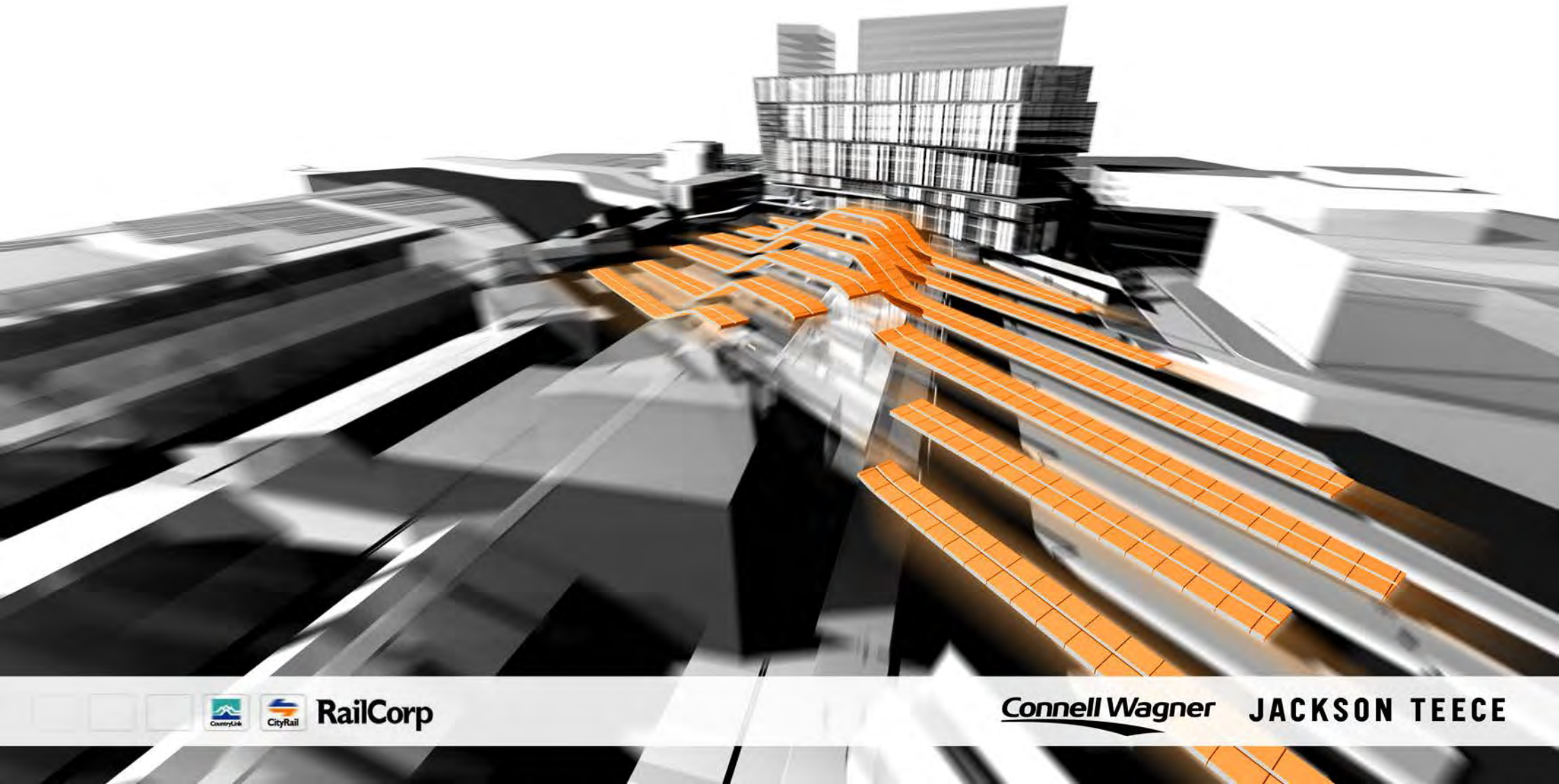
Document 6

Redfern Station Upgrade - Concept Design Study

Part A - Urban Design Report

April 2007



RailCorp

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REDFERN STATION UPGRADE – CONCEPT DESIGN STUDY

PART A – URBAN DESIGN REPORT

APRIL 2007

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Note:

This report is to be read in conjunction with the following reports:

1. Discussion Paper – Selection of Preferred Option(s) March 2007 - Jackson Teece

2. Part B – Engineering Report April 2007 – Connell Wagner

1. INTRODUCTION

The December reports have detailed and costed Option-C that addresses both RailCorp's and RWA's full range of requirements. The early cost for this option is significant and the project team is now seeking viable alternative concept options. This report has been prepared to compare Option C with the newly developed Option D and Option E.

The main design parameters for the above options are as follows:

Option C – Full station redevelopment

This option was developed as part of the Preliminary Assessment Process and presented in the Discussion Paper Revision 1 March 2007. It takes into account the full redevelopment of the station to meet all of RailCorp and RWA objectives.

Option D – Easy Access and F&LS

This option is designed mainly to meet the Easy Access and pedestrian evacuation requirements. Pedestrian congestion and urban design objectives have not been considered for this option.

Option E – Upgrade of interface works in addition to Option D

This option is designed to upgrade the station to meet the Easy Access requirements more satisfactorily than Option D. It takes into account RWA objectives and provides connection with the surrounding areas.

1.1 PROCESS

Jackson Teece developed three options (A, B and C) during the Preliminary Assessment Process, which are documented in the Appendix 4 - Discussion Paper Revision 1 March 2007. These options were prepared to meet the design objectives discussed in the Inception Report (1 September 2006) and presented at the first Stakeholder workshop on the same date.

These design objectives are as follows:

- Improve the image of the station and the quality and comfort of the station environment
- Improve the operation of the station environment
  - Increase the capacity of the station, as much as possible in line with anticipated population and employment growth
  - Facilitate management of paid areas
  - Provide access for people with a disability within and around the station
  - Improve the rail to rail interchange facility
  - Improve passenger circulation/flows
  - Improve safety and security within the station for passengers and employees
  - Provide for emergency platform and station evacuation
- Improve the quality of pedestrian connections between the station and existing and prospective facilities and activities in the area, including to
  - bus stops, taxi ranks, car drop off points
  - Australian Technology Park
  - North Eveleigh
  - Eveleigh Street
  - University of Sydney
  - Redfern Town Centre
- Accommodate cycle movements

- Provide an at grade pedestrian connection from North Eveleigh to Redfern Street.
- Improve the quality of the environment in the vicinity of the station, including its safety and security, and contribute to the revitalisation of the area generally
- Improve the transition between the built environment around the station and that of the surrounding areas
- Create a good functional interface between the station environment and the surrounding urban fabric
- Optimises buildability;
- Consider the heritage significance of the station and its context using the Paul Davies report of 15 February 1996 in the User Requirements Appendix 3 as a base document;
- Be cost effective; and
- Provide for retail and commercial floor plate that:
  - Enlivens and activates the station precinct
  - Provides commercial facilities as envisaged in the RWA Built Environment Plan
  - Considers and seeks to maximise an economic return for RailCorp and/or RWA.

Options A, B and C were assessed against the following design criteria:

Station function & operation

- Pedestrian capacity & flow
- Safety and security including emergency egress
- Comfort of station environment
- Ease of station management
- Disability and Discrimination Act 1992 (DDA) compliance (including subsection 31 - Disability Standards for Accessible Public Transport 2002 (DSAPT)
- Good rail to rail interchange, including Illawarra Relief

Benefit to Redfern

- Image of station
- Heritage conservation
- Quality of pedestrian and cycle connections
- Quality of interface between the station and its context
- Commercial development opportunities

As outlined in the Discussion Paper – Selection of preferred option(s) 16 March 2007, Option C addressed all the selection criteria favourably when compared with Options A and B.

Tenix in their preliminary working report, dated December 2006, indicated that Options A, B and C would have similar cost and constructability issues. As it is also important to compare the preferred Option C with a 'Do Minimum Option', Option D has been developed to satisfy Easy Access and Fire and Life Safety requirements only.

Option E which considers improvements to the pedestrian evacuation and the connections to the surrounding areas has also been considered in this report.

Option C has been further modified after the Discussion Paper to incorporate Tenix's comments regarding cost and constructability.

This report compares the performance of Option C, Option D and Option E.

1.2 PLANNING CONTEXT

The Built Environment Plan (Stage One) (BEP) released in August 2006 by the RWA provides the overall strategic planning direction for the context of the station.

The BEP details a planning framework to facilitate revitalisation of the Redfern-Waterloo area and guide development of key sites by setting parameters for future development. The central element of the town centre will be an upgrade to Redfern Railway Station, and the creation of a civic space that connects the Station to Redfern Street, Regent Street and the ATP through well-defined pedestrian/cycle linkages.

It is envisaged that the Station area will provide for retail and commercial development and an improved north-south pedestrian/cycle link over the rail corridor to North Eveleigh and surrounds.

The Redfern Railway Station site is included within the Redfern-Waterloo Authority Sites (RWA Sites), as identified in Map 3, Part 5 of Schedule 3 of the State Environmental Planning Policy (Major Projects) 2005. In the SEPP Major Projects provides the statutory planning basis to guide future development on the RWA Sites. As per the SEPP Major Projects the Redfern Station site is zoned Special Purpose Zone-Infrastructure and Business Zone-Commercial Core, reinforcing the rail activity and development opportunities adjacent to the Station.

The Commercial Core component permits a maximum height of 3 to 14 storeys and a FSR of 7:1.

Under the EP&A Act and SEPP Major Projects the Minister for Planning is the consent authority for development on the RWA Sites.

1.3 DEVELOPMENT SITE

The land between Marian Street and the existing Illawarra Relief building is considered as a potential Development Site that can be developed independently from the station upgrade. Under the SEPP (Major Projects 2005) this site can achieve an FSR of 7:1 with a maximum height of 14 storeys.

The land is zoned as Business Zone – Commercial Core under the SEPP (Major Projects) 2005 and could be developed to provide commercial and retail uses that would create employment opportunities in the vicinity of the station. Such a development could create an active environment that improves the safety, pedestrian activity and legibility of the area.

Two design options for the development site DS 1 and DS 2 are presented in this report. DS 1 considers building over the Illawarra Relief and in DS 2 the building is setback to have minimal impact on the Illawarra Relief.

For the purpose of this report DS 1 is included with Option C and DS 2 with Option E as the Concourse Level and Platform Level plans need to relate to the station layout and provide connections. But it is possible to combine DS 1 with Option E and DS 2 with Option C with some modifications to Concourse Level and Platform Level plans. Further work needs to be carried out to finalise the concept design for the development site.

2. STUDY AREA

The study area for the Concept Design of Redfern Station is shown in Figure 2.1.

The core study area for the Redfern station redevelopment is defined by Gibbons Street on the east, Lawson Street on the north, Little Eveleigh Street on the west and Marian Street on the south. The park located between Gibbons Street and Rosehill Street is considered to be part of the Core Study area as the fire stairs from the Illawarra Relief will exit into this land. The park will also be used during the construction phase as a construction storage site

Option C and Option E focus on the integration of the new station with the surrounding area, defined as interface areas.

The following interface areas have been identified –

1. Connection of Redfern Street to the Station entrance.
2. Connection of the Station with the Australian Technology Park (ATP) and adjoining existing development.
3. Connection of the Station to the North Eveleigh site and Darlington.
4. Interface of Station to Lawson Street.

Figure 2.1 Study Area

3. EXISTING STATION

3.1 OVERALL ISSUES AND OPPORTUNITIES

The principal issues presented by the existing station and its surroundings are illustrated in Figure 3.1

DDA / DSAPT Compliance

Current station layout does not meet DSAPT (Disability Standards for Accessible Public Transport 2002) requirements and there are no lifts to any of the platforms. Lift and/or ramp access is required to all platforms and station areas.

The station is virtually inaccessible for people who are disabled or less mobile.

Fire and Life Safety

The Pedestrian Evacuation Report prepared by Connell Wagner in March 2007 indicates that the current station layout is not fully compliant with station evacuation times as required by RailCorp Standards and NFPA 130. The NFPA 130 requirements are for a maximum platform load to be cleared within 4 minutes with these passengers clearing the station within 6 minutes. These times are mandatory for sub surface platforms (11/12) and are provided as guidelines for surface platforms.

Egress calculations have been undertaken for the busiest surface platform i.e. Platform 2/3 only as all other surface platforms have greater vertical capacity combined with lower demands. Using NFPA 130 criteria the platform evacuation time is 16.3 minutes and the station evacuation time is 17.4 minutes.

Platform 11/12 has been analysed as it represents Redfern's only sub surface platform. Using NFPA 130 criteria the platform evacuation time is 8.8 minutes and the station evacuation time is 10.7 minutes.

Platform widths and heights

Platforms at the southern end of the station are narrow. This constrains the location of new stairways because there must be a minimum platform width of 2700mm at either side of the new stairs. The white areas on the platforms (as shown on Figure 3.1) indicate the most suitable locations to have stairs that meet the platform clearances.

It is understood that the existing platforms are designed for standard access and would need to be raised to comply with the Level Access requirements.

Station heritage

The heritage items identified in the SEPP (Major Projects) 2005 are the Station Booking office on Lawson Street and the Telecommunications Equipment Centre (Electrical Workshop) located on North Eveleigh.

In 1996, Paul Davies Architects and Heritage Consultants and Wayne McPhee and Associates prepared a Heritage Conservation Report (HCR) to inform the development of a design concept for the station prepared by Devine Erby Mazlin. For the purpose of the Concept Design Study it is considered that this report provides sufficient Heritage analysis and assessment. The HCR graded items on a value scale of 1 to 5, 1 being an item of greatest

significance. The following items were determined to have a value category of 1:

- The office on Platform 1 (Item 2)
- Store building on Platform 1 (Item 3)
- Platform 1 Shelter building (Item 5)
- Main Station Booking Office and shop (Item 7)
- Masonry Tunnel ventilation stacks for the Engine Dive (Items 16,17 and 18)
- Masonry wall to rail bridge on Lawson Street (Item 20)

The Heritage Conservation Report indicates that items graded a value Category 2 should be removed only where the site cannot function adequately if retained. The items include: the Electrical workshop building, Masonry wall on Platform 10, Pedestrian Tunnel on Platform 10, Masonry wall on Platform 1 and Platform structures on Platforms 4/5, 6/7, 8/9 and 10.

The structures on the platforms are a significant constraint to the operation and capacity of the station in that they limit pedestrian movement on the platforms and their location inhibits the planning of any new concourse and the location of lifts and stairs.

Platform Shelters

RailCorp policy on upgrades of major stations is to provide shelter along the full length of the platforms. At present only part of the platforms have shelter. These new shelters have to be designed for installation during track possessions and need to be low maintenance and able to be maintained without the need for track possessions.

The opportunity to provide an improved pedestrian connection between North Eveleigh and Redfern Town Centre

The Redfern-Waterloo Built Environment Plan prepared by RWA (August 2006) identifies a need for a pedestrian overbridge at the southern end of the station that would connect the future North Eveleigh site development with Redfern Town Centre and also improve access for Sydney University students and workers who are significant users of the station. Currently the rail corridor physically disconnects the eastern and western parts of Redfern-Waterloo and limits access to key destinations such as Australian Technology Park (ATP) the University of Sydney and Redfern Town Centre.

Opportunity for future commercial/retail development

Consistent with the Redfern-Waterloo Built Environment Plan and the SEPP (Major Project) 2005 the upgrade of the station has the potential to provide additional development (commercial and retail) and employment opportunities adjacent to the Station. The area along Gibbons Street and Marian Street has been zoned as Business Zone – Commercial Core to facilitate this objective.

Patron and Station Environment

The station currently has poor addresses to the surrounding streets and little integration with the surrounding developments. There is an opportunity to provide a more integrated and physically improved station. This should assist in improving the public domain as well as safety and surveillance within and around the station. There is also the opportunity to provide better bus and rail integration by positioning bus stops in a more accessible location.

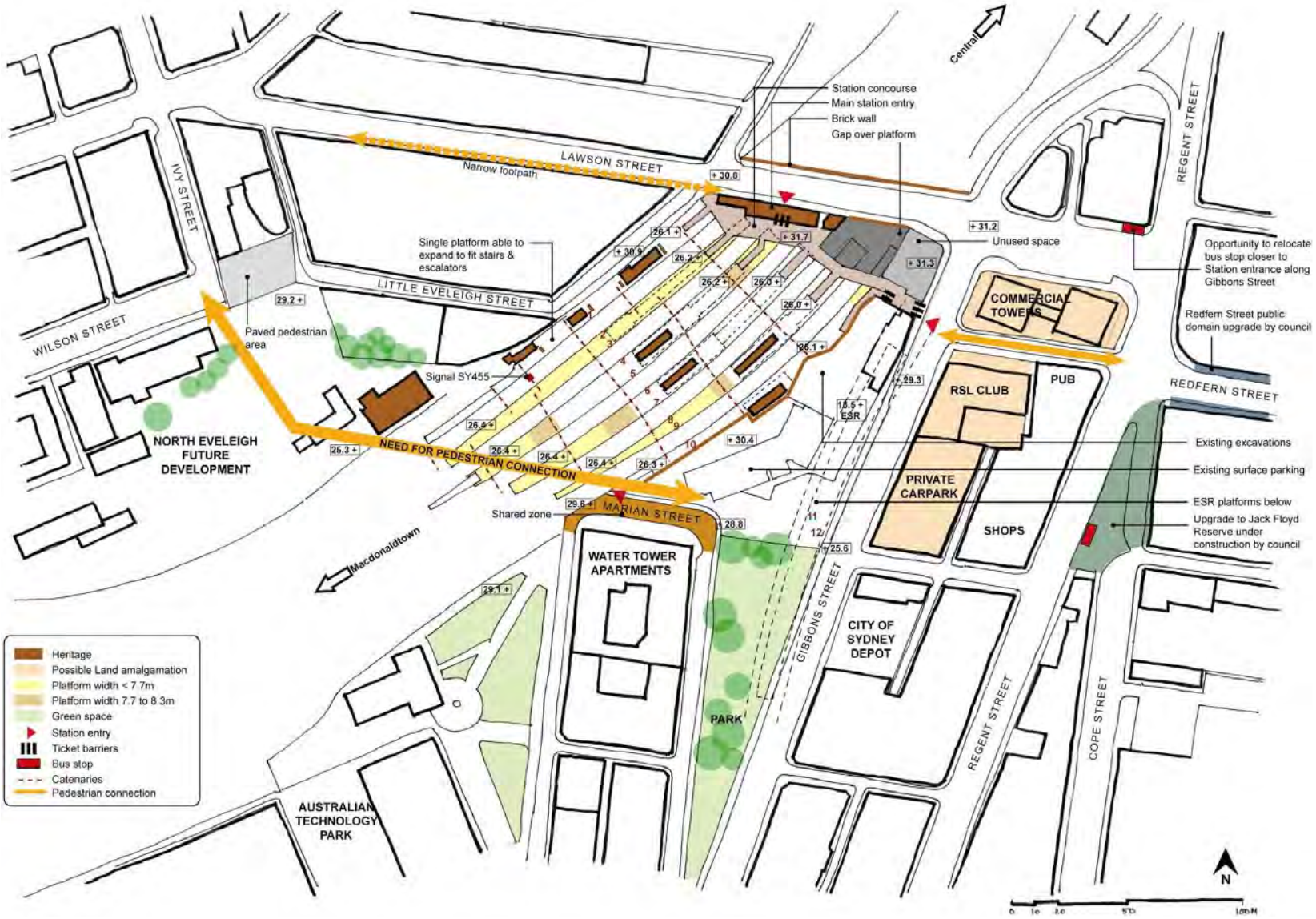

Figure 3.1 Opportunities and Constraints

3.2 SPECIFIC ISSUES

The following specific issues have been addressed in order to compare the existing situation with Option C, Option D and Option E.

3.2.1. DDA ISSUES

Current Station does ***not*** have the following key elements that are required to provide an accessible facility and meet the requirements of the DDA:

- A complying continuous accessible path of travel to meet the requirements of AS1428.1 and the Disability Standards on Accessible Public Transport (DSAPT) at the ***entry*** from the Lawson Street footpath to the concourse area (step included at the change in level)
  Note:
  Movement along the footpath does not meet the intent of the DDA. A clear path 1800mm wide is required to allow 2 wheelchairs to pass and meet the requirements of AS1428.2. This footpath is adjacent to a street with a high volume of traffic.
- An equitable accessible ***path of travel*** linking to adjacent facilities including the bus interchange.
- ***Unisex accessible sanitary facilities*** designed to meet the requirements of AS1428.2 clause 15, and the DSAPT adjacent to gender specific facilities in the concourse area.
- ***Ambulant user cubicles*** in gender specific toilet areas to meet the requirements of AS1428.1 and the DSAPT.
- Complying ***vertical access*** to meet the requirements of the DSAPT and AS1428.1 to each platform from the concourse level. Stairs only are provided.
- ***Stair design*** which includes features to fully comply with the requirements of AS1428.1 including complying handrails and tactile ground surface indicators (TGSI).
- ***Platforms with crossfalls*** that meet the requirements of AS1428.1 clause 5.1, which requires the surface area within a landing or circulation space to not exceed 1:40. Platforms currently include gradients that slope toward platform edge and track.
- Provision of facilities to assist people with hearing impairments, including ***hearing augmentation*** on the public address system as required to meet the DSAPT and BCA.
- An ***equitable path of travel to the ATP*** site along Platform 10. The public currently can access the platform to provide a direct link to the station entry. This path of travel includes stairs .The alternate route along Gibbons Street is significantly longer and could be deemed discriminatory.
- The ***staff facilities*** do not include any provision to facilitate employment of employees with disabilities
- ***Emergency egress*** provisions do accommodate people with a disability
- ***Platform width*** for a number of platforms is less than that required for accessible paths due to the existing platform shelters.

Refer Figure 3.2 for platform clearance near the stairs and Figure 3.3 for safety zone and accessible path.

3.2.2. PEDESTRIAN FLOW

2006 AM peak

Concourse – Some passengers from Platform 1 contribute to congestion by waiting on concourse for next service to Town Hall / Wynyard which leaves from Platform 3 or 5. The rapid descent of these passengers to platform level is a significant contributor to stair congestion. Significant congestion possible should multiple trains arrive in rapid succession.

Platforms

In general the platforms operate at a good Level of Service, there is poor distribution however due to the single stair access towards the ends of the platforms. Platform 3 suffers the worst congestion albeit for a short duration due to the limited platform width, high demand and poor distribution.

Stairs

Platform1 – Most services result in significant congestion on the stairs with queues of up to 44 people on the platform. These queues result in delays in of up to a minute for passengers attempting to leave the platform. The queues that form on the platform last for almost 2 minutes.

Platform 2/3 - The busiest platform in terms of numbers with some services causing queues to form on the approaches to the stairs. The peak queue size is in the region of 38 people causing delays in excess of 60 seconds, there is a queue on the platform for up to 90 seconds at a time, which increases the risk of a subsequent service arriving onto a platform not yet cleared of previous demand.

Platform 4/5 - Most services do not cause congestion. However should 2 services arrive at the same time extensive queues may form at the stairs (up to 70 people) with delays in excess of 90 seconds encountered.

Platform 6/7 - Most services do not cause congestion. However should 2 services arrive at the same time extensive queues may form at the stairs (up to 40 people) with delays in excess of 40 seconds encountered.

Platform 8/9 - No queuing or congestion issues.

Platform 10 – Not currently used for rail services.

Platform 11/12 - Some services result in minor congestion at the base of the UP escalator. These Queues are limited to the UP escalator. However should 2 services arrive at the same time extensive queues may form at the stairs (up to 40 people) with delays of around 30 seconds encountered.

2031 AM Peak

Concourse - Concourse becoming significantly more congested at peak times than 2006. The doubling of patronage through the station may lead to significant queues to form at the gate line contributing to concourse congestion.

Platforms - In general the platforms still operate at a reasonable Level of Service as the increase in demand is partially offset by higher train frequencies. Majority of the congestion is due to the queues for the stairs, which become extensive.

Stairs - Platform1 – Most services result in very significant congestion on the stairs with queues of up to 160 people on the platform resulting in delays in of up to 2 minutes. There are queues on the platform for up to 3 minutes. There is a high possibility of a second train to arrive before the platform is clear.

Platform 2/3 - Most services cause extensive queues to form on the approaches to the stairs. Typical queue duration is frequently in excess of 2 minutes, which increases the risk of a subsequent service arriving onto a platform not yet cleared of previous demand. The peak queue size is in the region of 120 people causing delays in excess of 2 minutes, there is a queue on the platform for over 3 minutes.

Platform 4/5 - Very few services result in queues or congestion in the AM peak. However should 2 services arrive at the same time extensive queues may form at the stairs (up to 95 people) with delays in excess of 100 seconds encountered. These queues have are present for 2.5 minutes which increases the potential for a subsequent train to arrive before the platform is cleared.

Platform 6/7 - Most services result in significant queues of up to 70 people encountering delays of up to a minute. However should 2 services arrive at the same time extensive queues may form at the stairs (up to 112 people) with delays in excess of 90 seconds encountered. The duration of some queues may be greater than 2 minutes which increases the potential for a subsequent train to arrive before the platform is cleared

Platform 8/9 - No queuing or congestion issues

Platform 10 - Not reviewed

Platform 11/12 - Around half the services result in queues forming at the base of the UP escalator. Peak demands caused by multiple arrivals cause significant queues of over 60 people with delays of almost a minute.

3.2.3. FIRE AND LIFE SAFETY

Egress calculations have been undertaken for Platform 2/3 only as all other surface platforms have a greater vertical capacity combined with lower demands. Using NFPA 130 criteria the platform evacuation time is 16.3 minutes and the station evacuation time is 17.4 minutes.

Platform 11/12 has been analysed as it represents Redfern's only sub surface platform. Using NFPA 130 criteria the platform evacuation time is 8.8 minutes and the station evacuation time is 10.7 minutes.

These results are the same as the 2006 results because the NFPA 130 criteria involve the use of theoretical maximum train populations.

3.2.4. OVERHEAD WIRING AND SIGNALLING

On platforms 1 to 10 the stanchions that support the overhead wiring are generally in lines that are at right angles to the tracks. Retaining the existing stanchions and catenaries at their current level would require any new central concourse to be located approximately at RL 34.2 which is 2.5 metres higher than the existing northern Concourse (RL 31.7).

No particular issues noted with signals. Although a number of existing signals would appear to be non-preferred configurations due to space/clearance issues. Sighting and maintenance access to these signals may be sub-standard. Signal SY455 is mounted on a gantry between Platforms 1 and 2. Any new structure over the platforms is likely to have impact on this signal.

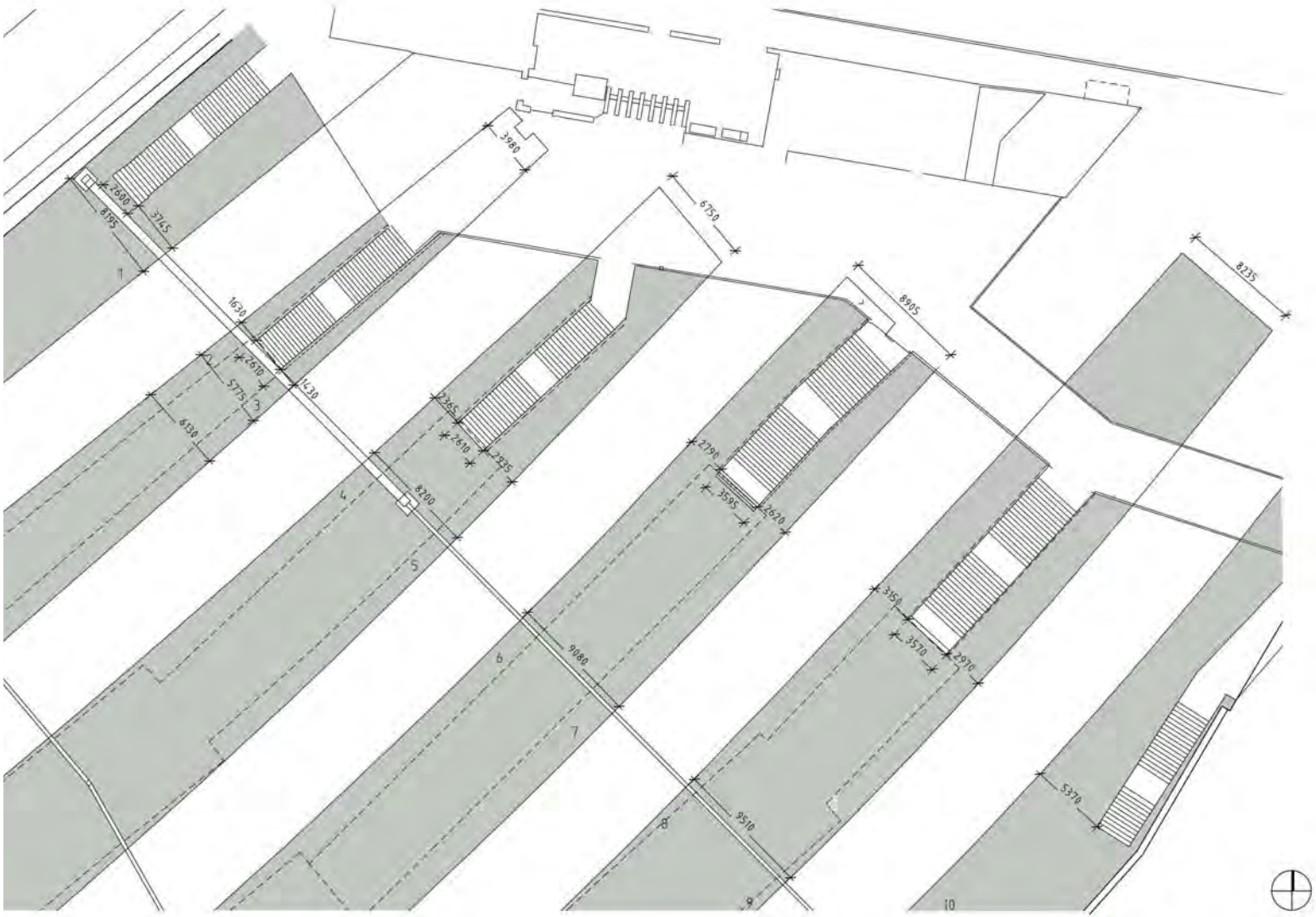

Figure 3.2 Platform clearances near existing stairs

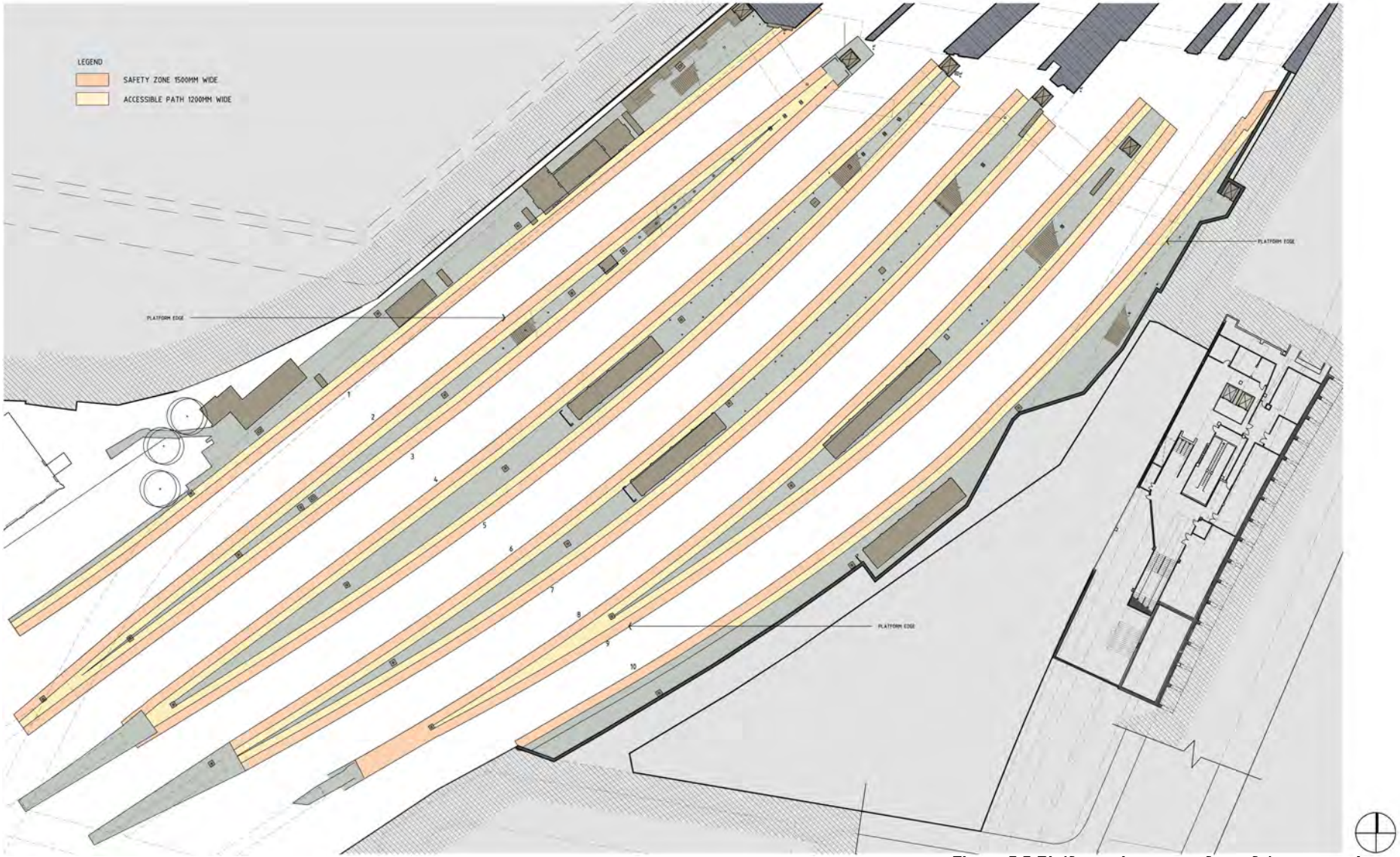

Figure 3.3 Platform clearances for safety zone and accessible path

4. DESCRIPTION OF DESIGN OPTIONS

4.1 OPTION C – FULL STATION REDEVELOPMENT

4.1.1 OVERALL DESCRIPTION

In this option, long term planning needs for the station upgrade, satisfaction of the user requirements, improved safety and security have been given the priority rather than impact on overhead wiring and heritage buildings Figure 4.1 and Figure 4.2.

Refer Appendix 3 for Rail Operational, Interface and Development areas.

Easy Access

- Easy access to all the surface platforms is provided through the lifts located on the new central concourse. The new lifts are located in the centre of the new concourse and allow for sufficient circulation space on the concourse as well as the required clearance on the platforms.
- Access to the Illawarra relief platforms 11/12 is in two stages. From the central concourse a lift goes to platform 10 and than a ramp leads to a new lift over platform 11/12. This path of movement is similar for regular commuters also and hence does not lead to indirect discrimination.

Concourse and Station entry

- Option C proposes a more centrally located new concourse that is parallel to Lawson Street. The concourse has been positioned in a manner to allow for maximum utilisation of the platform width. There are two sets of stairs and a lift for each platform from this central concourse. The existing stairs on the northern concourse are removed.
- The entrance to the station is from the north via a new civic space on Gibbons Street, through a landscape area to the south near Marian Street and through the pedestrian bridge on the west. There are two sets on barriers one located on the east of the concourse accessed through the unpaid concourse connecting Marian and Gibbons Street and the second located to the west of the concourse accessed from the pedestrian bridge.

Refer Appendix 7 for Structural report and drawings for Option C.

Overhead wiring & Signalling

- As this option is designed to provide maximum efficiency in terms of pedestrian circulation and platform distribution the main concourse runs diagonally across the tracks and OHW stanchions. This means two rows of stanchions would have to be removed and catenaries modified to accommodate the new concourse.
- Signal SY455 is affected by the new pedestrian bridge and will have to be reconfigured.

Refer Part B – Engineering report Section 6 for OHW analysis and Section 7 for Signalling analysis.

Access to Illawarra relief

- Access to the Illawarra Relief is through Platform 10. A wide stair on the south of the concourse provides connection to the intermediate concourse tunnel at platform level, which connects to Platform 11/12. There is a screen at the end of the tunnel to direct people toward the stairs and stop them from going to Platform 10.

- There is a possibility of separating the intermediate concourse from Platform 10 by a glass barrier in the future and provide a separate stair for Illawarra Relief if required.
- Two up only escalators and two stairs provide access to Platform 11/12 from a centrally located intermediate concourse.
- New Fire and emergency egress stairs have been provided both at the north and south end of Platform 11/12.

Heritage

- All the platform heritage buildings except on Platform 1 and booking office on Platform 1 would be removed in this option to allow for better positioning of the new concourse and more efficient pedestrian circulation.
- The existing station entrance building on Lawson Street and ventilation stacks on Platform 1 are retained.
- The masonry wall on the Lawson Street overbridge is also retained

Station operation areas

- All the station operation areas are located between the space connecting the paid concourse and the unpaid concourse. This makes the management of the station very efficient and also allows full retail potential on the unpaid concourse.

Interface areas

- A civic space as required by the Redfern-Waterloo Built Environment Plan at the end of Redfern Street would mark the entrance of the station. It would also provide unpaid at-grade connection to Marian Street and Lawson Street.
- Connection to the ATP is through the Marian Street and Cornwallis Street. Marian Street and Cornwallis Street have been terminated at the corner to allow for a generous pedestrian connection from the station entry to the ATP. A complying ramp provides disabled access to the concourse level from Marian Street.
- A pedestrian bridge parallel to the new concourse would connect North Eveleigh to Redfern. The unpaid concourse would provide an at-grade pedestrian connection between Gibbons Street and Marian Street and connect with the new pedestrian bridge. An unpaid pedestrian access east of the existing station entrance provides connection between Lawson Street and the new civic place at the station entrance. This bridge would also provide access to the University of Sydney students as per the RWA Built Environment Plan and form an integrated part of station upgrade.

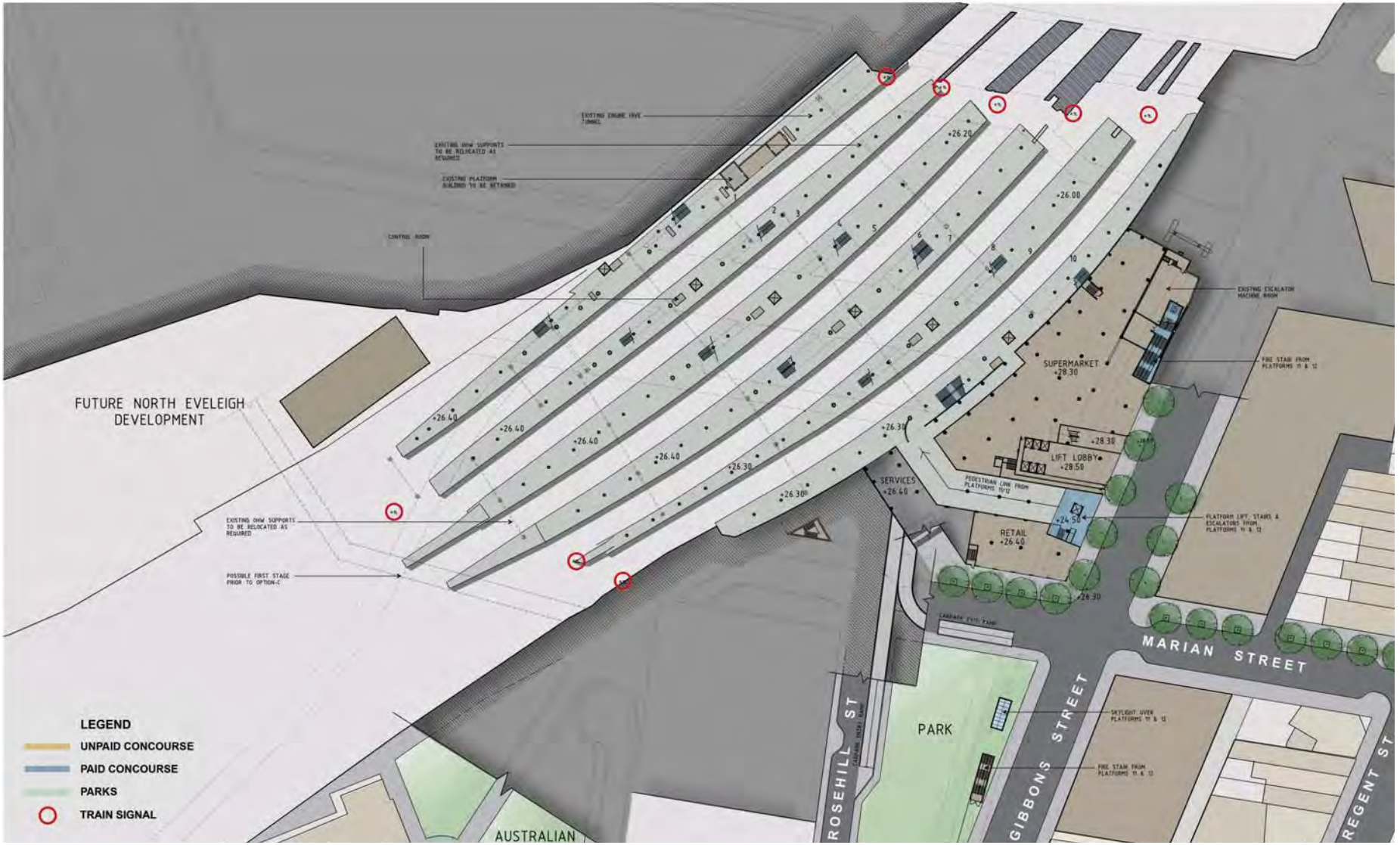

Figure 4.1 - Option C Platform level plan

Figure 4.1 - Option C Concourse level plan

4.1.2 DDA COMPLIANCE

Option C does ***provide*** the following key elements required to provide an accessible facility and goes furthest towards addressing the requirements of the DDA:

- An accessible ***entry*** to the paid concourse meeting the requirements of AS1428.1 and the DSAPT from the proposed Public Plaza, and buses on Gibbons Street and via a 1:20 common walkway for all commuters from the ATP site.
- An alternate additional accessible ***entry*** from North Eveleigh.
- ***Unisex accessible sanitary facilities*** designed to meet the requirements of AS1428.2 clause 15, and the DSAPT adjacent to gender specific facilities on the new concourse area.
- ***Ambulant user cubicles*** in proposed new gender specific toilet areas to meet the requirements of AS1428.1 and the DSAPT.
- Clear***,*** direct paths of travel to assist in ***wayfinding*** and to meet the requirements of DSAPT. In our opinion this would also appear to offer a potentially safer approach to access provision.
- Circulation space on the concourse levels to meet the requirements of AS1428.1and which is not impacted in peak periods by passenger movement.
- ***Lifts*** to provide complying vertical access with features that include:
  - (i) Proposed centrally located positions with complying circulation spaces in the paid concourse area.
  - (ii) Positioning centrally on each platform (nos 1-10) to facilitate access to boarding ramps, reduce distances required to be travelled and facilitate clear vision, ease of wayfinding and potential safety.
  - (iii) An accessible path of travel to the Eastern Suburbs Platform that is for the most part shared with other commuters and provides a more direct path of travel.
- The issues related to the existing reduced ***platform*** width are minimised due to the entry/exit point location.
- Potential full compliance in the provision of ***hearing augmentation*** to meet the requirements of the DSAPT.
- With the topping of platforms the potential to eliminated non-complying ***crossfalls*** within the circulation spaces of the accessible paths of travel on the platforms.
- Potential for provision of equitable facilities in relevant ***staff*** areas.

Despite of all the advantages of Option C it still does not provide full DDA compliance with regards to accessible path on Platform 1 because of the existing platform shelter.

4.1.3 PEDESTRIAN FLOW

2031 AM peak

Concourse - A very good level of service is achieved. No significant congestion is expected on the concourse in 2031 even with multiple train arrivals.

Platforms - In general the platforms operate at a reasonable Level of Service as the increase in demand is partially offset by higher train frequencies. The two sets of stairs spread the design evenly along the platform.

Stairs - Platform 1 – Minor queuing of 11 people with the queue lasting for around 45 seconds.

Platform 2/3 - Some significant queuing is occurring of up to 89 people. Delays of 40 seconds may be encountered and a queue is present for almost 90 seconds.

Platform 4/5 - Typically only very minor queues or congestion in the AM peak. However should 2 services arrive at the same time extensive queues may form at the stairs (up to 64 people) with delays of up to 75 seconds encountered.

Platform 6/7 - Typically only minor queues or congestion in the AM peak. However should 2 services arrive at the same time extensive queues may form at the stairs (up to 37 people) with delays in excess of 40 seconds encountered.

Platform 8/9 - No queuing or congestion issues.

Platform 11/12 - Only very minor queuing (maximum of 8 people) occurs at the foot of the up escalator. A queue of 37 people also occurs at the stair on Platform 10 used by people from Platform 11/12.

For a detailed report refer Part B – Engineering report Section 2.

4.1.4 FIRE AND LIFE SAFETY

The NFPA 130 requirements are for a maximum platform load to be cleared within 4 minutes with these passengers clearing the station within 6 minutes. These times are mandatory for sub surface platforms (11/12) and are provided as guidelines for surface platforms.

Using NFPA 130 criteria the evacuation time for Platform 2/3 is 8.29 minutes and the station evacuation time is 9.62 minutes. This therefore does not meet the guideline NFPA 130 criteria. Whilst platform 2/3 does not meet the NFPA 130 standards, it is possible that a fire engineering solution may be possible. This would involve analysis of the maximum fire load which may occur and the subsequent impact on the platform environment. From this calculation a Required Safe Egress Time (RSET) is calculated and compared to the Available Safe Egress Time (ASET).

Using NFPA 130 criteria the platform 11/12 evacuation time is 3.53 minutes and the station evacuation time is 6.21 minutes. This design does meet the NFPA 130 criteria.

For a detailed Pedestrian evacuation and Fire engineering report refer Part B – Engineering report Section 3.

4.1.5 CONSTRUCTABILITY

- Programme is possession driven (approx 47 months)
- Major OHW works required due to new concourse (resource risk)
- No impact to existing concourse until decommissioned
- Significant disruption to Illawarra Relief concourse and platforms
- Significant disruption to surface platforms (Canopies, new structures and resurfacing)
- Significant temporary works required (Crash deck and temporary access bridge)
- Construction interface with development works by others

4.1.6 COST

Station upgrade -	$143.3m
Development enabling works -	$13.9m
Development works up to RL31.7 -	$ 34.1m
Development works above RL31.7 -	$127.7m
Total -	***$ 319m***

Refer Cost, Constructability and Programming review Revision 3 prepared by Tenix for a full report on cost and constructability.

4.1.8 DEVELOPMENT SITE OPTION DS-1

The proposal for the development site shown in Option-C consists of a 2-storey podium with a 14-storey tower. Option DS-1 considers building over the Illawarra Relief to provide maximum retail space on the concourse and platform levels.

There is retail potential at two levels along Gibbons Street. The retail at platform level is accessed at the corner of Gibbons and Marian Street. There is also a possibility of having a small supermarket at this level accessed from a pedestrian connection between Gibbons Street and the unpaid concourse. Concourse level retail is accessed from the unpaid concourse in front of the station entry.

The total net lettable area of the building is approximately 33,000m^2 with an FSR of approximately 6.8:1. There is approximately 2000m2 of retail on platform level and 1600m2 retail space on concourse level. There are two levels of basement with approximately 141 car parking spaces.

The lift lobby is accessible from Gibbons Street and also from the unpaid concourse allowing appropriate connectivity with public transport. There can also be some retail outlets and cafes in the building at the corner of Lawson Street and Gibbons Street. The new 3-storey commercial building at the corner of Lawson Street and Gibbons Street has been set back to provide for a wide footpath and trees. There would also be retail and cafeterias on ground floor to help make Lawson Street more safe and secure.

Refer Appendix 1 for floor plans of the building, Appendix 2 for Preliminary station views and views of the building, Part B – Engineering report Section 1 for Preliminary service

recommendations and Section 5 for Structural report and drawings for Option C.

4.2 OPTION D – EASY ACCESS AND F&LS

4.2.1 OVERALL DESCRIPTION

This option considers minimum changes to the station in order to address DDA and meet FL&S requirements Figure 4.3 and Figure 4.4. The features of this option are:

Easy access

- Easy access is provided to all the platforms from the existing concourse at the northern end as shown in Figure 4.1. All the lifts have a capacity of 17 people except the lift for Illawarra relief which has a capacity of 13 people due to space constraints.
- Platform 1 - The lift must be elevated 1500mm (1.5m) from the platform level as there is an existing Engine Dive tunnel underneath. A 30 metre disabled access ramp located from the door of lift to platform level is provided.
- Platform 2/3 - A 3 metre long fence at the end of the platform will provide a waiting area for people using the lift. The platform is extended to the south by approximately 8m to compensate for the space taken up by the lift and the waiting area.
- Platform 4 to 10 – Platform 4/5 and 6/7 are extended on the northern to provide access to the lift. A minimum clearance of 3000mm has been provided from the concrete blade wall to the lift in platforms 8/9. On Platform 10 the existing brick retaining wall is modified to provide access to the lift at platform level.
- The location of the lifts at the end of platforms 1 to 9 does not encourage the use of the lifts. These lifts might require collision protection.
- Platform 11/12 - The lift access to Platforms 11/12 is in two stages with a changeover at the existing intermediate concourse level. Lift 1 is located between the escalators and the stairs at concourse level (RL 31.4). This lift descends to the existing intermediate level (RL 25.24), where people must change to the Lift 2. This lift is located on the eastern side of Lift 1 so that it can land at a central location on platforms 11/12. Each lift has a capacity for 13 people which still allows for a stretcher to fit.
- It is noted that these solutions are not ideal and work is continuing to better address the intent of the DDA.

Concourse and Station entry

- The Lawson Street Concourse width remains as existing.
- A 3000 mm extension to the north is required to provide lift access to platform 8/9 in the bridge between the Gibbons Street Concourse and the Lawson Street Concourse. Figure 4.5 shows a section through this extension.

Stairs to Platforms

- Platform 1 – The stairs remain the same as the existing station.
- Platform 2/3 - The width of the platform at the existing landing of the stairs does not allow the clearance of 2700 mm at either side of stairs as indicated in the ***User Requirements.*** The clear width of the existing stairs is 2200mm with 1600mm and 1400mm clearance on either side. In order to meet the clearances, the stairs have been moved south to a central location. The new stair width is 2000 mm with a cleared width of 1700mm. A bridge above the platform will be required to connect the new stairs to the concourse. The bridge will descend 1.4m

from the concourse to avoid conflicts with the OHW support. A single up only escalator 1000mm wide is provided between the stairs and the lift to improve the flow of people. Refer Figure 4.5 for the cross section through the bridge.

- Platform 4/5 and 6/7 - The stairs these platforms will have to be moved to the centre line of the platform to allow a cleared area of 2700mm on each side of the stairs. The canopy supports will be reconfigured to avoid protrusions in the accessible path.
- Platform 8/9 and 10 – There are no modifications required for the stairs to these platforms.

Overhead wiring & Signalling

- Impact on the OHW in this option will be confirmed after electrical clearcences are considered from the cross sections. The OHW portal is likely to be modified because of the new walkway over platform 2/3.
- The construction of over-platform concourse 'fingers' will likely have a negative impact on the achievable signal sighting, particularly for City-bound trains.
- Platform 2/3 and 4/5 lifts may obstruct sighting of signals.
- Each of these issues require further investigation

Access to Illawarra relief

- Access to the Illawarra relief platforms 11/12 is same as the existing condition.
- A 3000 milimetre fire stair has been provided at the southern end of the station. These stairs will exit onto the open space west of Gibbons Street.

Heritage

- All the heritage items within the station have been retained.
- The new pedestrian ramp on Platform 1 might have impact on the existing heritage building on platform 1.
- The brick retaining wall on platform 10 is modified on the northern end of the platform to allow for lift access.

Station operation areas

- Only minor new station operation areas and staff facilities have been provided in the Base Case.

Interface area

- No modification is done to the station surrounding areas in this option.

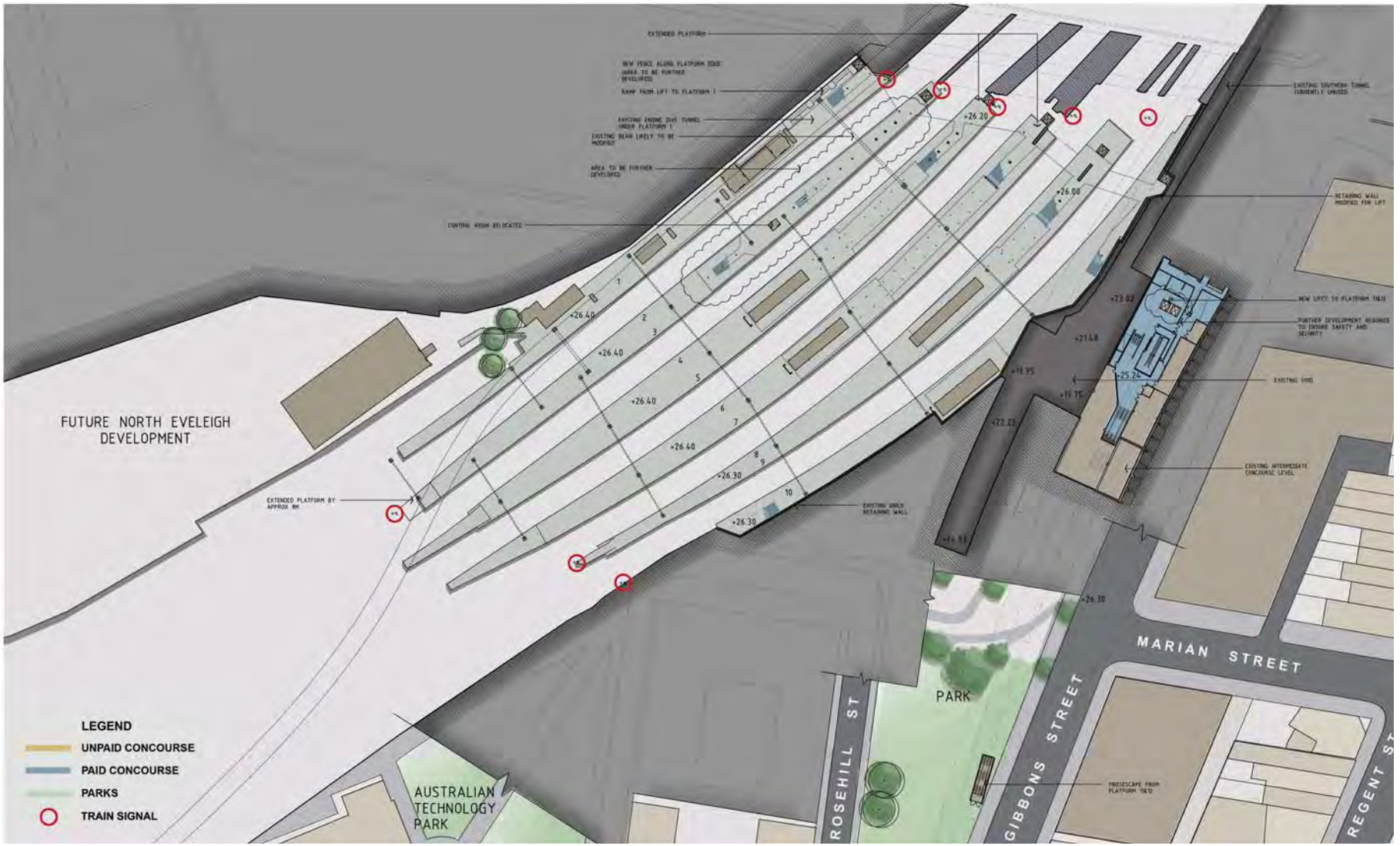

Figure 4.3 - Option D Platform level plan

Figure 4.4 - Option D Concourse level plan

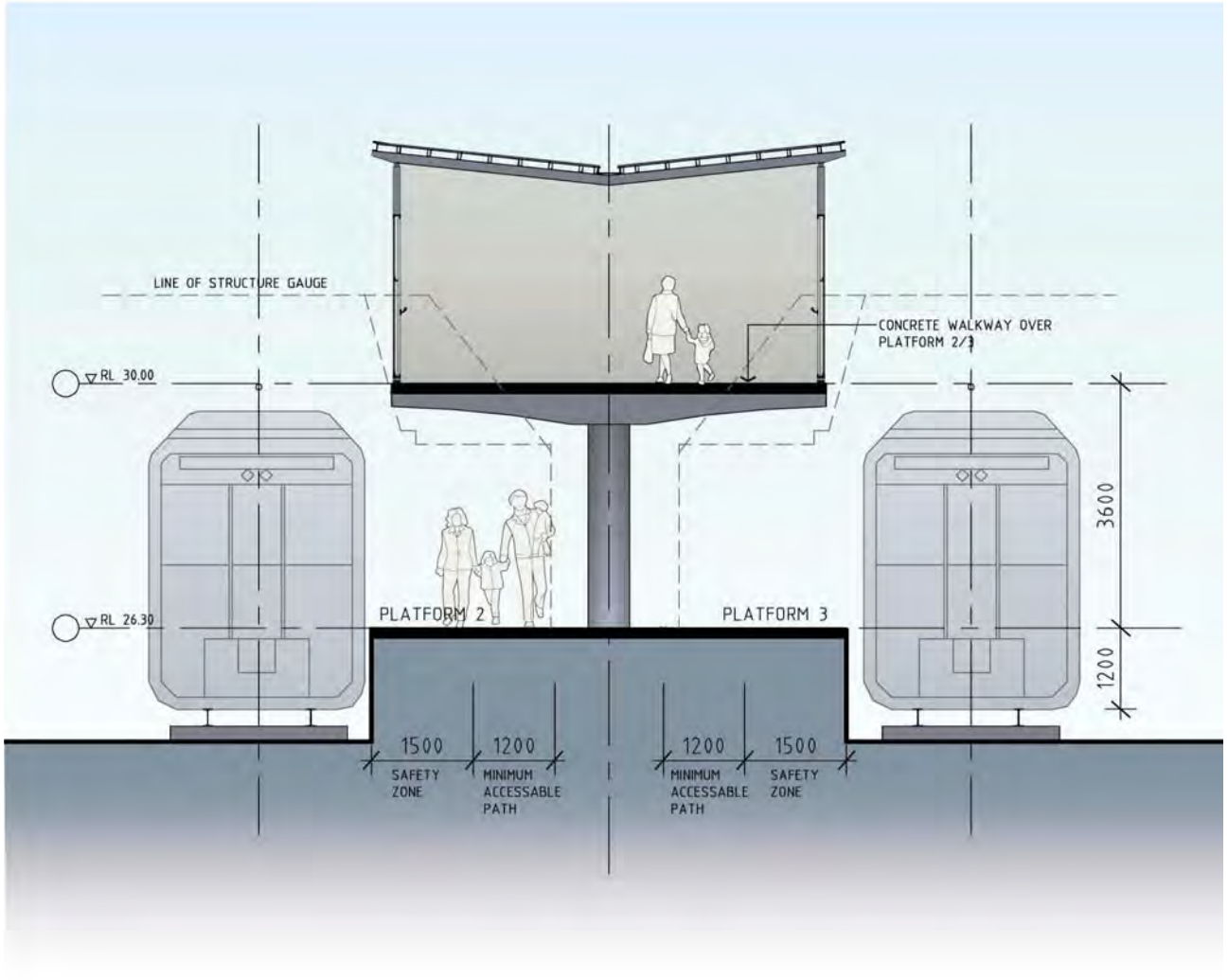

Figure 4.5 Cross section through Platform 2/3

4.2.2 DDA COMPLIANCE

- Option D ***does not provide*** the following key elements required to meet the requirements of the DDA A complying continuous accessible path of travel to meet the requirements of AS1428.1 and the Disability Standards on Accessible Public Transport (DSAPT) at the ***entry*** from Lawson Street footpath to the concourse area (step included at the change in level)

  Note: Movement along the Gibbons Street footpath does not meet the intent of the DDA. A clear path 1800mm wide is required to allow 2 wheelchairs to pass and meet the requirements of AS1428.2. This footpath is adjacent to a street with a high volume of traffic.
- An equitable accessible ***path of travel*** linking to adjacent facilities including the bus interchange.
- Proposed ***lifts*** to each platform do not provide vertical access that meets the intent of the DDA to provide dignified, independent (potentially secure) paths of travel. Issues include:

  (i) Due to the constraints of the existing concourse location it is proposed to locate all lifts at the city end of the platform therefore requiring people using the lifts and requiring assistance to board a train via the boarding ramps to move from the city end of the platform to the middle of the platform. Extensive movement is not desirable for people with low activity levels and the general existing platform widths particularly at peak times will make this transfer along the platform difficult which in our opinion may be interpreted as indirect discrimination.

  (ii) The lifts are proposed to be located as far off the main paths of travel as possible and are designed to facilitate waiting areas with circulation space to meet the requirements of the DSAPT, but in our opinion, it appears that at peak times the general flow of passengers will impinge on these areas and create potential difficulties for people with disabilities.

  (iii) ***Platform 1*** – Proposed lift entry at platform level is 1500mm above the platform due to the location of the engine dive tunnel in this area which prevents pit excavation. A 30m ramp (gradient 1:14) is required to link the lift to the platform. This will be unsuitable for people with low activity tolerance, including older people and people with luggage and in our opinion could be deemed indirect discrimination.

  (iv) ***Platform 4/5*** – the proposed lift will deliver customers to the city end of the platform in an area behind the stairs without clear views to the centre of the platform required to assist with wayfinding and facilitate safety. In our opinion this could be deemed indirect discrimination for people with disabilities and in particular people with vision and cognitive impairments.

  (v) ***Platform 6/7*** - the proposed lift will deliver customers to the city end of the platform in area behind the stairs without clear views to the facilities located midway down the platform required to assist with wayfinding and facilitate safety. In addition the existing concrete blade pier for the overhead bridge restricts circulation space and clear view in the area. In our opinion this could be deemed as not meeting the intent of the DDA by treating people with disabilities equitably.

(vi) ***Platform 8/9*** - the proposed lift will deliver customers to the city end of the platform in area behind the stairs without clear views to the facilities located midway down the platform required to assist with wayfinding and facilitate safety. In addition the existing concrete blade pier for the overhead bridge located centrally in the lift circulation space restricts circulation space and clear view in the area. In our opinion this could be deemed as not meeting the intent of the DDA by treating people with disabilities equitably.

(vii) ***Eastern Suburbs Platforms*** _ the proposed lift design which is required to accommodate the existing structures in this area necessitates customers changing lift cars on the interim level between the concourse and the platform. This will create unacceptable issues of way finding for people with intellectual disabilities and will be difficult for people with low vision to negotiate. It does not comply with the intent of the DDA.

- ***Platforms with crossfalls*** to meet the requirements of AS1428.1 clause 5.1 which requires the surface area within a landing or circulation space to not exceed 1:40. Crossfall is a basic part of providing DSAPT Part 2 access paths compliance.
  Note:
  Platforms currently include gradients, which slope toward platform edge and track. It is considered that on platform 4/5, in particular have higher slopes towards the track.
- Provision of facilities to assist people with hearing impairments, including ***hearing augmentation*** on the public address system as required to meet the DSAPT and BCA.
- An ***equitable path of travel to the ATP*** site along Platform 10. The public currently can access the platform to provide a direct link to the station entry. This path of travel includes stairs .The alternate route along Gibbons Street is significantly longer and could be discriminatory.
- The ***staff facilities*** do not include any provision to facilitate employment of employees with disabilities
- ***Emergency egress*** provisions do accommodate people with a disability.
- If option to modify platform is not adopted, then potentially ***platforms with crossfalls*** will require the surface area within a landing or circulation space to not exceed 1:40 in order to meet the requirements of AS1428.1 clause 5.1.
  Note:Platforms currently include gradients which slope toward platform edge and track.

4.2.3 PEDESTRIAN FLOW

2031 AM peak

Concourse – The lift serving Platform 2/3 significantly reduces the width of the concourse in front of the Platform 2/3 stairs. Significant congestion would be expected here, especially after the arrival of trains on Platform 2/3, as these passengers are all funnelled in front of the Platform 2/3 stairs.

The mid level concourse to the Platform 2/3 stairs would result in frustration for passengers as the stairs are some way from the main concourse. Passengers would be moving past their train with no opportunity to reach it. The long thin shape has the potential for severe conflict of movement at the top of the stairs, with potentially very frustrated passengers running to the top of the stairs meeting passengers ascending from the platform. This represents poor design and the potential for accidents would be considerable.

Platforms - No significant differences to the existing design. Platform 3 has a slightly better distribution of boarding passengers, as the stairs are more towards the centre of the platform.

Stairs - Congestion for platform 3 is worse than the existing design as the stairs are 300mm narrower than the existing. Their central location results in demand from two directions adding to the congestion. The escalators only serve alighting passengers (the minor flow) and have little impact on congestion. Peak services would have queues in excess of 120 people with delays in excess of 2.5 minutes.

4.2.4 FIRE AND LIFE SAFETY

The only changes to the egress capacity are on Platform 2/3 and 11/12.

Using NFPA 130 criteria the platform 2/3 evacuation time is 12.28 minutes and the station evacuation time is 14.57 minutes.

Platform 11/12 has been analysed as it represents Redfern's only sub surface platform. Using NFPA 130 criteria the platform evacuation time is 4.8 minutes and the station evacuation time is 6.9 minutes.

Whilst both platforms fail the NFPA 130 standards it is possible that a fire engineering solution may be possible. This would involve analysis of the maximum fire load which may occur and the subsequent impact on the platform environment. From this calculation a Required Safe Egress

Time (RSET) is calculated and compared to the Available Safe Egress Time (ASET).

For a detailed Pedestrian evacuation and Fire engineering report refer Part B – Engineering report Section 3.

4.2.5 CONSTRUCTABILITY

- Programme is possession driven (approx 24 months)
- Least impact upon existing rail systems (OHW, signalling etc.)
- Significant disruption to concourse area during works
- Temporary toilet facilities required during remodelling works
- Significant disruption to Platform 2/3
- Some disruption to Illawarra Relief concourse
- Extended shutdown of IR required for new fire stair installation
- Craneage in some possessions will block intersection of Lawson Street and Little Eveleigh Street and will constrict Gibbons Street.

4.2.6 COST

Station upgrade -	$29.5m
Development enabling works -	Not Applicable
Development works up to RL31.7 -	Not Applicable
Development works above RL31.7 -	Not Applicable
Total -	$29.5m

Refer Cost, Constructability and Programming review Revision 3 prepared by Tenix for a full report on cost and constructability.

4.2.7 DEVELOPMENT SITE

Although no construction is proposed for the development site in this option, this does not preclude the site from being developed with a scheme similar to the one indicated in Option E.

4.3 OPTION E – UPGRADE/INTERFACE WORKS IN ADDITION TO OPTION D

4.3.1 OVERALL DESCRIPTION

All the modifications of Option D are incorporated in Option E with the following additions or improvement to the design Figure 4.6 and 4.7.

Refer Appendix 3 for Rail Operational, Interface and Development areas.

Concourse and Station entry

- The width of Lawson Street Concourse is increased by 3 m to the south in order to allow more circulation space around the new lifts.
- Stairs Platforms 1, 2/3, 4/5, 6/7 have been relocated as a result of the widening of the concourse.
- Gibbons Street entrance has been reconfigured to provide a new entry forecourt and to activate the plaza on the corner of Lawson Street and Gibbons Street. A new awning and ticketing facilities have also been provided at this entrance.The set back barrier locations of the reconfigured entry provide a reduced risk for pedestrian and vehicular conflict at Gibbons Street.
- An entrance has also been provided on the southern side to allow for a better connection with ATP and the new development site.

Stairs to platforms

- Stairs Platforms 1, 2/3, 4/5, 6/7 have been moved south because of the widening of the concourse.

Overhead wiring & Signalling

- In addition to the impacts in Option D, OHW near the concourse is likely to be reconfigured because of the extension of the concourse.

Station operation areas

- Some new station operation areas have been provided near the Gibbons Street entrance.

Interface areas

- A new pedestrian bridge at the southern end of the station improves east-west linkages, especially from the North Eveleigh Precinct and the University of Sydney to Marian Street. The bridge is functionally separate from the station, and not integrated with the upgraded station, but there is a possibility of having fire escape stairs at the southern end of the platform that connect to the bridge.
- A 5 metre wide footpath abutting the retaining wall on Platform 10 connects Marian Street with the Gibbons Street station entrance.
- The new Gibbons Street entrance provides a better address to the station at the end of Redfern Street.
- New bus stop is located along Gibbons Street to provide better interchange facility.

4.3.2 DDA COMPLIANCE

Option E does ***not*** provide the following key elements required to provide an accessible facility and meet the requirements of the DDA (see also comments in section 4.2.2):

- A complying continuous accessible path of travel to meet the requirements of AS1428.1 and the Disability Standards on Accessible Public Transport (DSAPT) at the ***entry*** from the Lawson Street footpath to the concourse area (step included at the change in level)
- ***Note: Movement along the footpath does not meet the intent of the DDA. A clear path 1800mm wide is required to allow 2 wheelchairs to pass and meet the requirements of AS1428.2. This footpath is adjacent to a street with a high volume of traffic.***
- Proposed ***lifts*** to each platform do not provide vertical access that meets the intent of the DDA to provide dignified, independent (potentially secure) paths of travel. Issues include:
- Due to the constraints of the existing concourse location it is proposed to locate all lifts at the city end of the platform therefore requiring people using the lifts and requiring assistance to board a train via the boarding ramps are required to move from the city end of the platform to the middle of the platform. Extensive movement is not desirable for people with low activity levels and the general existing platform widths particularly at peak times will make this transfer along the platform difficult.
- ***Platform*** issues as per Option D.
- It would be possible to provide ***staff facilities*** that make provision for employees with disabilities
- ***Emergency egress*** provisions do accommodate people with a disability.
- If option to modify platform is not adopted, then potentially ***platforms with crossfalls*** will require the surface area within a landing or circulation space to not exceed 1:40 in order to meet the requirements of AS1428.1 clause 5.1.
  Note: Platforms currently include gradients that slope toward platform edge and track.

4.3.3 PEDESTRIAN FLOW

2031 AM peak

Concourse - The extended concourse reduces the congestion in front of Platform 2/3 stairs to levels similar to the existing design. The extended ticket area results in a more pleasant environment and a reduced level of congestion. All other comments as per Option D.

4.3.4 FIRE AND LIFE SAFETY

There is no difference in the egress characteristics of Option E compared to Option D without the additional fire stairs to the south of the station connecting to the pedestrian bridge. If the fire stairs are considered the evacuation times will be as shown below.

Using NFPA 130 criteria the evacuation time for Platform 2/3 is 7.53 minutes and the station evacuation time is 9.83 minutes. Using NFPA 130 criteria the evacuation time for Platform 11/12 is 4.8 minutes and the station evacuation time is 6.69 minutes.

Whilst both platforms fail the NFPA 130 standards it is possible that a fire engineering solution may be possible. This would involve analysis of the maximum fire load that may occur and the subsequent impact on the platform environment. From this calculation a Required Safe Egress Time (RSET) is calculated and compared to the Available Safe Egress Time (ASET). It is possible to improve the evacuation times of the surface platforms by adding stairs to the southern end of the platform that would connect with the proposed pedestrian bridge.

For a detailed Pedestrian evacuation and Fire engineering report refer Part B – Engineering report Section 3.

4.3.5 CONSTRUCTABILITY

- Programme is possession driven (approx 36 months)
- Reconfiguration of existing OHW under extended concourse
- Opportunity to reduce impact of works by extending concourse area prior to lift installation works
- Temporary toilet facilities required during remodelling works
- Significant disruption to Platform 2/3
- Significant disruption to surface platforms (Canopies and new control rooms)
- Some disruption to Illawarra Relief concourse
- Extended shutdown of IR required for new fire stair installation
- Craneage in some possessions will block intersection of Lawson Street and Little Eveleigh Street and will constrict Gibbons Street.
- Construction interface with development works by others

4.3.6 COST

Station upgrade -	$55.5m
Development enabling works -	$5.5m
Development works up to RL31.7 -	$27.1m
Development works above RL31.7 -	$120.2m
Total -	$208.3m

Refer Cost, Constructability and Programming review Revision 3 prepared by Tenix for a full report on cost and constructability.

4.3.7 DEVELOPMENT SITE OPTION DS-2

In Option DS-2 the building is setback from Gibbons Street to minimise the impact on Illawarra Relief. The proposal shows a terraced landscaped café forecourt addressing Gibbon St and the corner at Marion St.

The Commercial building has been provided with a separate address from the rail interchange and away from busy Gibbon St to allow taxi pickup drop off while still providing lobby access to the interchange at two levels.

To promote way finding and accessibility, the concourse has been designed to be robust 2 storey high plus spaces, open and airy, naturally lit with views through to spaces and facilities beyond. Pedestrian axis directs patrons to the station and building with cross-site routes to and from the interchange past spaces for retail, restaurants and cafes.

The total net lettable area of the building is approximately 26,880m^2 with an FSR of 6.5:1. There is approximately 1176m^2 of retail space on platform level and 820m^2 of retail space on concourse level. There are two levels of basement with space for approximately 117 cars.

Refer Appendix 1 for floor plans of the building.

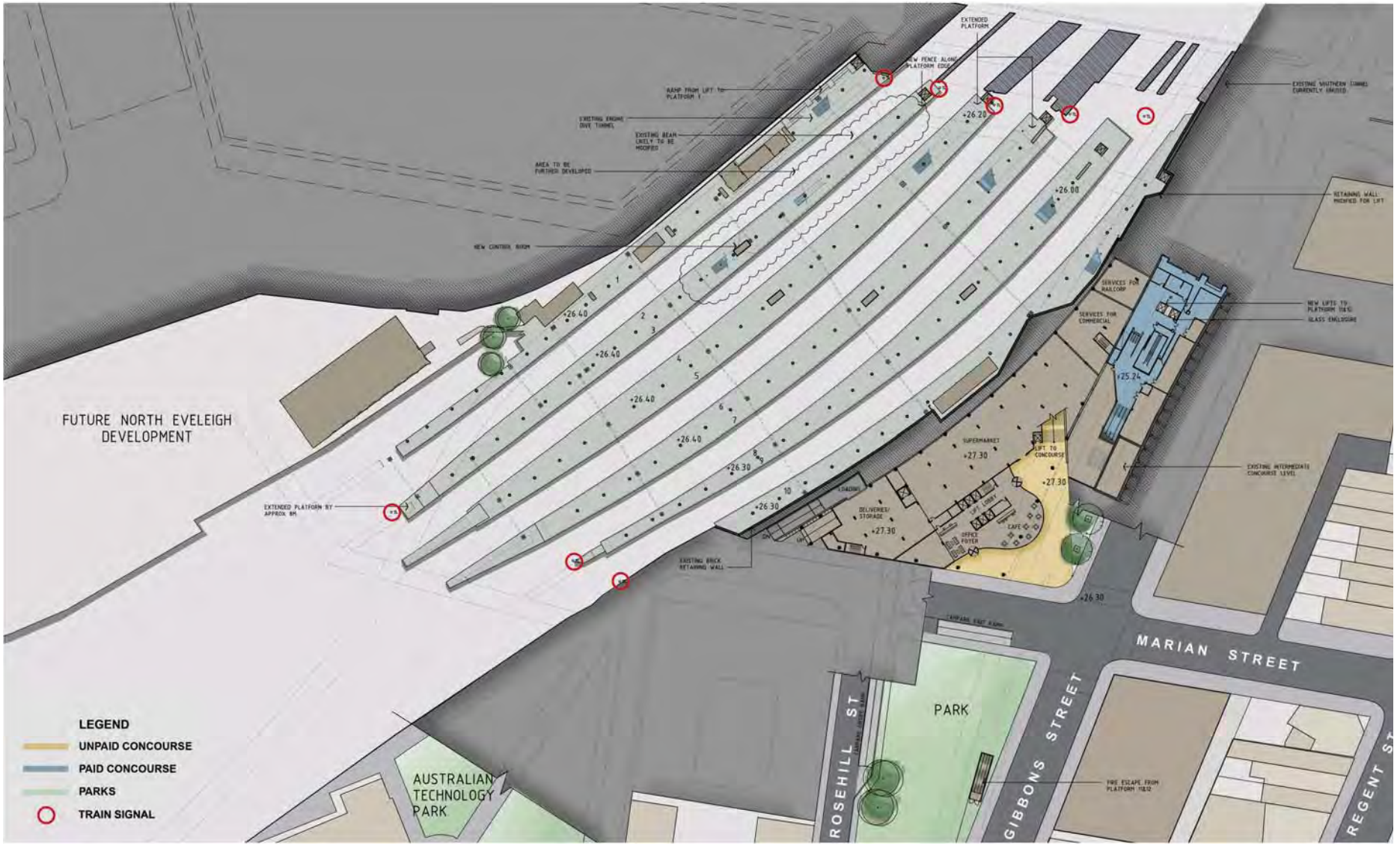

Figure 4.6 - Option E Platform level plan

Figure 4.7 - Option E Platform level plan

5. NON COMPLIANCE WITH THE USER REQUIREMENTS

The non compliance of all the three options with the User requirement Version 1.1 are listed in the table below:

NO.		*OPTION C: FULL STATION REDEVELOPMENT*	*OPTION D – EASY ACCESS AND F&LS*	*OPTION E – UPGRADE/INTERFACE WORKS IN ADDITION TO OPTION D*
3.1	***Station and Surrounds***			
3.1.1	General	Complies with all the general requirements except has a significant impact on station operation during construction.	Does not provide Kiss N Ride facilities, emergency vehicle parking area and new staff facilities.	Does not provide Emergency vehicle parking area and provides very little new staff facilities.
3.1.2	Way Finding, Information, Advertising and Queuing	Provides new way finding systems, signage and addresses all the queuing issues at booking offices and ticketing areas.	Provides only the new signage and way finding systems required under DDA. No other new signage to be installed. Does not provide new seating on the platform, or address any queuing issues.	Provides only the new signage and way finding systems required under DDA. No other new signage to be installed. Does not provide new seating on the platform. Queuing and ticketing issues addressed on the new Gibbons Street entrance but not on the Lawson Street entrance.
3.1.3	Platform	Complies with all the requirements	No modification to platform surfaces and control rooms on the platform except making sure the cross fall is not greater than 1:40 and addition of new tactile indicators	No modifications to platform surfaces except making sure the cross fall is not greater than 1:40 and addition of new tactile indicators. New control rooms on Platforms 2/3, 4/5, 6/7, 8/9.
3.1.4	Concourse	Complies with all the requirements	Does not provide new staff facilities, new cleaning rooms and new garbage facilities.	Provides very little new staff facilities, but does not provide new cleaning rooms and new garbage facilities.
3.1.5	Disability Discrimination Act – Disabled Access	Complies with all the DDA requirements. For detail refer to DDA compliance in the analysis table.	Does not provide level access, new staff areas are not provided and existing areas are not reconfigured, no disabled parking spaces or kiss n ride zones provided. Accessible path clearances not met on all the platforms. For detail refer to DDA compliance in the	Level access provided only on Platform 1 but not on other platforms. Accessible path clearances not met on Platform 1. For detail refer to DDA compliance in the analysis table.

NO.		OPTION C: FULL STATION REDEVELOPMENT	OPTION D – EASY ACCESS AND F&LS	OPTION E – UPGRADE/INTERFACE WORKS IN ADDITION TO OPTION D
			analysis table.	
3.1.6	Vertical Transport	Provides centre loading on all platforms and meets all the requirements.	Does not provide centre loading of platforms.	Does not provide centre loading of platforms.
3.1.7	Ticketing	Complies with all the requirements.	No modification to the existing ticketing facilities.	New ticketing facilities on the Gibbons Street entrance complies with all the requirements.
3.1.8	Public level-Street level RWA	Complies with all RWA requirements.	No new station entrances designed. Does not provide improved connection with ATP, North Eveleigh and University of Sydney. Does not provide for new development in North Eveleigh and Gibbons Street	Improves the connection with ATP satisfactorily but poorly with North Eveleigh and University of Sydney.
3.2	***Conceptual – Safety, Security, Building Services, Heritage***			
3.2.1	Safety	Complies with safety requirements. For details see FL&S section	Fire evacuation times not satisfactory for surface as well as underground platforms. For details see FL&S section	Fire evacuation times not satisfactory for surface as well as underground platforms. For details see FL&S section.
3.2.2	Security	Does not consider blast impact.	Does not consider blast impact.	Does not consider blast impact.
3.2.3	Heritage	Store building and booking office on Platform 1 retained.	All heritage items retained as identified in P Davies and McPhee report.	Platforms shelters on Platforms 4/5, 6/7 and 8/9 removed.
3.3	***Rail Infrastructure***			
3.3.1	General	The option would generally meet all the requirements in this section More detailed work is required to fully assess the impact and extent of the requirement. ,	The option would generally meet all the requirements in this section More detailed work is required to fully assess the impact and extent of the requirement. ,	The option would generally meet all the requirements in this section More detailed work is required to fully assess the impact and extent of the requirement. ,
3.3.2	Track and ROW	The option would generally meet all the requirements in this section More detailed work is required to fully assess the impact and extent of the requirement. ,.	The option would generally meet all the requirements in this section More detailed work is required to fully assess the impact and extent of the requirement. ,	The option would generally meet all the requirements in this section More detailed work is required to fully assess the impact and extent of the requirement. ,

NO.		OPTION C: FULL STATION REDEVELOPMENT	OPTION D – EASY ACCESS AND F&LS	OPTION E – UPGRADE/INTERFACE WORKS IN ADDITION TO OPTION D
3.3.3	Bridge Structures	The option would generally meet all the requirements in this section More detailed work is required to fully assess the impact and extent of the requirement. ,	The option would generally meet all the requirements in this section More detailed work is required to fully assess the impact and extent of the requirement. ,	The option would generally meet all the requirements in this section More detailed work is required to fully assess the impact and extent of the requirement. ,
3.3.4	Electrolysis, earthing and bonding	The option would generally meet all the requirements in this section Further investigations are required to assess compliance.	The option would generally meet all the requirements in this section Further investigations are required to assess compliance.	The option would generally meet all the requirements in this section Further investigations are required to assess compliance.
3.3.5	Pier and Column Protection Requirements	New paid and unpaid concourse and the wall between the IR tunnel and the car park comply with the requirements.	There are no modifications to the Illawarra Relief underground structure. A risk assessment will be required to determine compliance with 3.3.5.2	New pedestrian bridge and the wall between the IR tunnel and the car park comply with the requirements. There are no modifications to the Illawarra Relief underground structure. A risk assessment will be required to determine compliance with 3.3.5.2
3.3.6	Signalling and control Systems	Signal SY455 needs to be relocated.	Might have impact on the access for signals on Platforms 2/3 and 4/5. The lift on the northern end of Platform 2/3 might have an impact on signal sighting.	Might have impact on the access for signals on Platforms 2/3 and 4/5. The lift on the northern end of Platform 2/3 might have an impact on signal sighting.
3.3.7	Power	Additional areas for electrical installations can be located in the vicinity of the development site.	Additional areas for electrical installations can be located within the intermediate levels of the Illawarra Relief Station Building..	Additional areas for electrical installations can be located in the vicinity of the development site or in the intermediate levels of the Illawarra Relief Station Building
3.3.8	High Voltage	No service search has been carried out.	No service search has been carried out.	No service search has been carried out.
3.3.9	1500v Overhead Wiring system	OHW needs to be reconfigured because of the new paid and unpaid concourse.	Further assessment is required to determine the impact on the overhead wiring as a result of the walkway over Platform 2/3.	Further assessment is required to determine the impact on the overhead wiring as a result of the walkway over Platform 2/3 and the extension of the northern concourse. The pedestrian bridge on the southern end of the

NO.		OPTION C: FULL STATION REDEVELOPMENT	OPTION D – EASY ACCESS AND F&LS	OPTION E – UPGRADE/INTERFACE WORKS IN ADDITION TO OPTION D
				station will also have impact on OHW and might need reconfiguring.
3.4	***Maintainability***	Complies with all the requirements.	No new services, storage and cleaners room provided	Complies with all the requirements.
3.5	***Environment and Quality***			
3.5.1	Environment	Complies with all the requirements.	No new garbage facilities and cleaning rooms provided.	No new garbage facilities and cleaning rooms provided.
3.5.2	Quality	Complies with all the requirements.	Complies with all the requirements.	Complies with all the requirements.
3.6	Interface with other rail projects	Complies with all the requirements.	Complies with all the requirements.	Complies with all the requirements.

The non-compliance of all the three options with the Redfern-Waterloo Built Environment Plan objectives are listed in the table below:

	OPTION C - FULL STATION REDEVELOPMENT	OPTION D – EASY ACCESS AND F&LS	OPTION E – UPGRADE/INTERFACE WORKS IN ADDITION TO OPTION D
BEP / Cabinet Objectives			
Pedestrian and cycle connection from Station to Wilson Street (North Eveleigh)	Bridge integrated into Station and part of unpaid area of Station.	No connection provided.	Bridge proposed near southern of the station (opposite Cornwallis Street at entrance to ATP).
Improved connection between ATP, North Eveleigh, Redfern Street, Regent Street to the Station entrance	Connections improved and better integration with paid entrances to Station.	No change to existing.	Connections improved and integrated into proposed development site along Gibbons St.
Provision of public/civic space along Gibbons Street	New public plaza established and integrated into Station unpaid and paid area.	No change to existing.	Existing public space on the corner of Lawson and Gibbons Street maintained and entrance to Station set back from the street to create improved entrance.
Improved public domain promoting better	Design activates Gibbons And Marion	No change to existing.	Design activates Gibbons And Marion

amenity, safety and security	Street with entrance and business activity. The existing station building on Lawson Street is retained with minimal change but is not a station entry.		Street with entrance and business activity. Existing station building remains as a station entry with minimal change
Improved entrance to Station	Complete reconfiguration of all the station entrance with a new entry from Gibbons Street through a public plaza. Opportunity to provide unpaid access from north (Lawson Street) to Station entrance. ATP entrance to paid area on Station improved as Station entrance moved further south towards ATP.	No change to existing.	Maintained location of existing entrance along Gibbons Street but setback from Gibbons St. Lawson Street entrance maintained. ATP connection provided through development.
Identification of developable land along Gibbons and Lawson Streets (at any time).	Developable land prepared.	No developable land prepared.	Developable land prepared.
The future of Lawson Street building identified.	Not maintained as a station entrance. Possibility of converting it into a restaurant or an exhibition space.	Maintained as Station entrance.	Maintained as Station entrance.
Cater to increase patronage resulting from future residential and employment growth in Redfern-Waterloo	Caters for future growth in the area and provides appropriate connections	Caters for future growth in the area but not satisfactorily.	Caters for future growth in the area but not satisfactorily.

6. SUMMARY OF ADVANTAGES AND DISADVANTAGES

	OPTION C: FULL STATION REDEVELOPMENT	***OPTION D – EASY ACCESS AND F&LS***	***OPTION E – UPGRADE/INTERFACE WORKS IN ADDITION TO OPTION D***

Summary of Advantages	• Provides centrally loaded access to all the platforms with a compact central concourse.
	• Meets all the DDA requirements.
	• Provides a strong image for the station
	• Improves quality of service and congestion on the platform and stairs and provides optimum access for rail users.
	• Has the fastest evacuation time for surface platforms and meets NFPA 130 for platforms 11/12.
	• Satisfies BEP Objectives by:
	  • Providing a public space in front of Redfern Street and the built form required by the RWA Built Environment Plan.
	  • Providing good direct access to the University of Sydney, to the ATP and to North Eveleigh.
	  • Providing an unpaid at-grade connection from North Eveleigh to Redfern Street.
	• Providing generous opportunities for retail development
		• The cheapest option to build.
		• Least impact on station operation during construction than Option C
		• Retains all the platform heritage buildings
		• Meets most DDA requirements.
			• Meets BEP Objectives by:
			  • Providing opportunities for retail development
			  • Providing a satisfactory connection from ATP to station.
			  • Providing a civic space at the intersection of Gibbons and Marian Street.
			  • Providing a pedestrian bridge connecting the future North Eveleigh development with Redfern
			New commercial building has less impact on Illawarra relief compared to Option C
			• Meets the basic DDA requirements

Summary of Disadvantages	• Higher capital cost • Requires the reconfiguration of OHW and the relocation of Signal SY455. • All the platform heritage buildings, except on Platform 1, are removed.	• Does not meet all the DDA requirements satisfactorily • Existing concourse would become more congested than it is at the moment with the introduction of lifts. • Does not address congestion and security issues at the existing entrances. • Does not meet NFPA-130 for platforms 11/12, although a fire engineering solution may be possible • Does not provide connections to North Eveleigh future development, ATP, University of Sydney or improve the character of the area	• Does not meet all the DDA requirements satisfactorily. • Provides a new entrance on Gibbons Street, but Lawson Street entrance congested and unsafe, as at present • Connections with North Eveleigh, Australian Technology Park and University of Sydney better than Base case but not satisfactory. • Does not meet NFPA-130 for platforms 11/12, although a fire engineering solution may be possible.

Appendix - 1

Development site drawings

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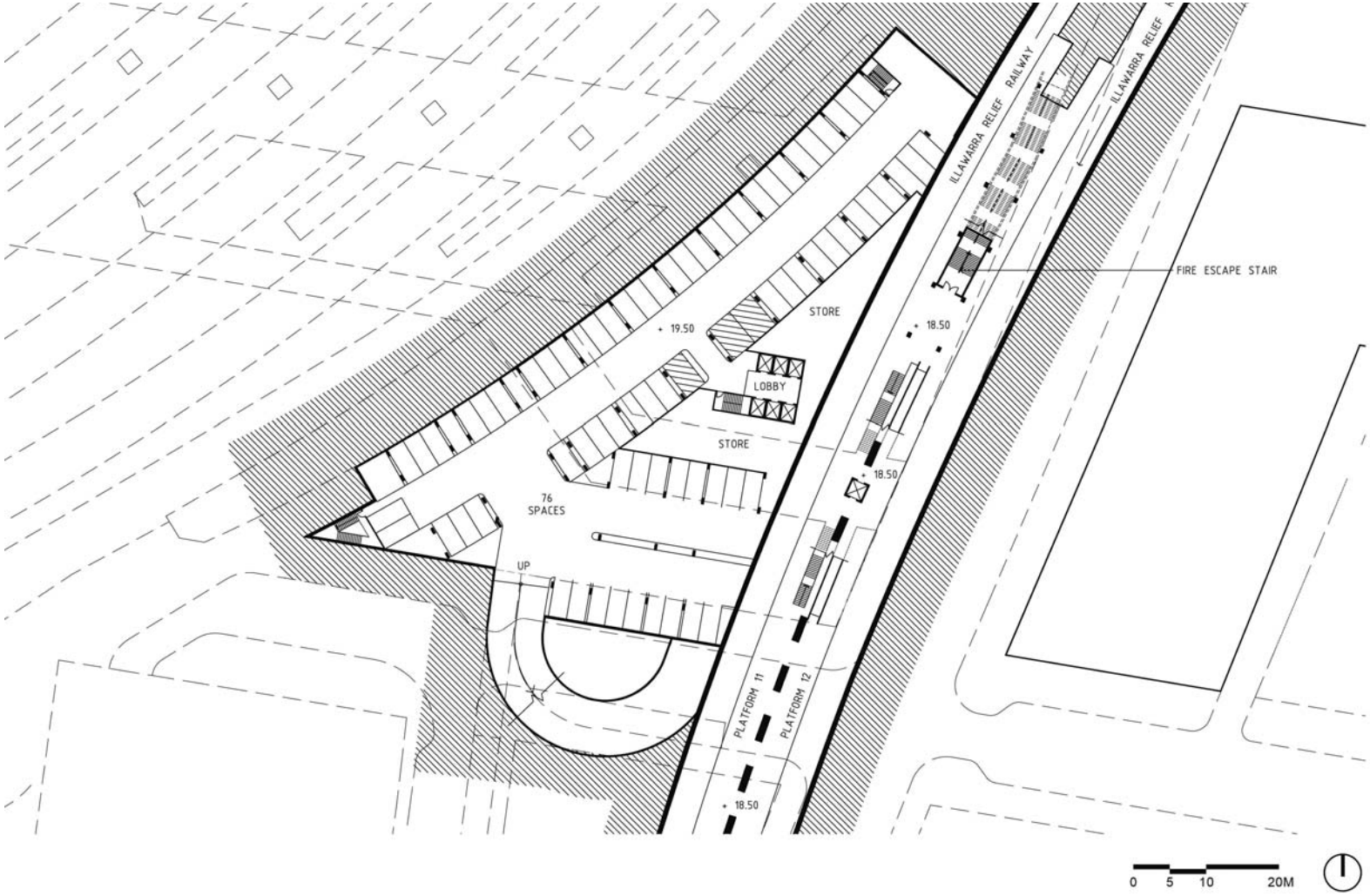
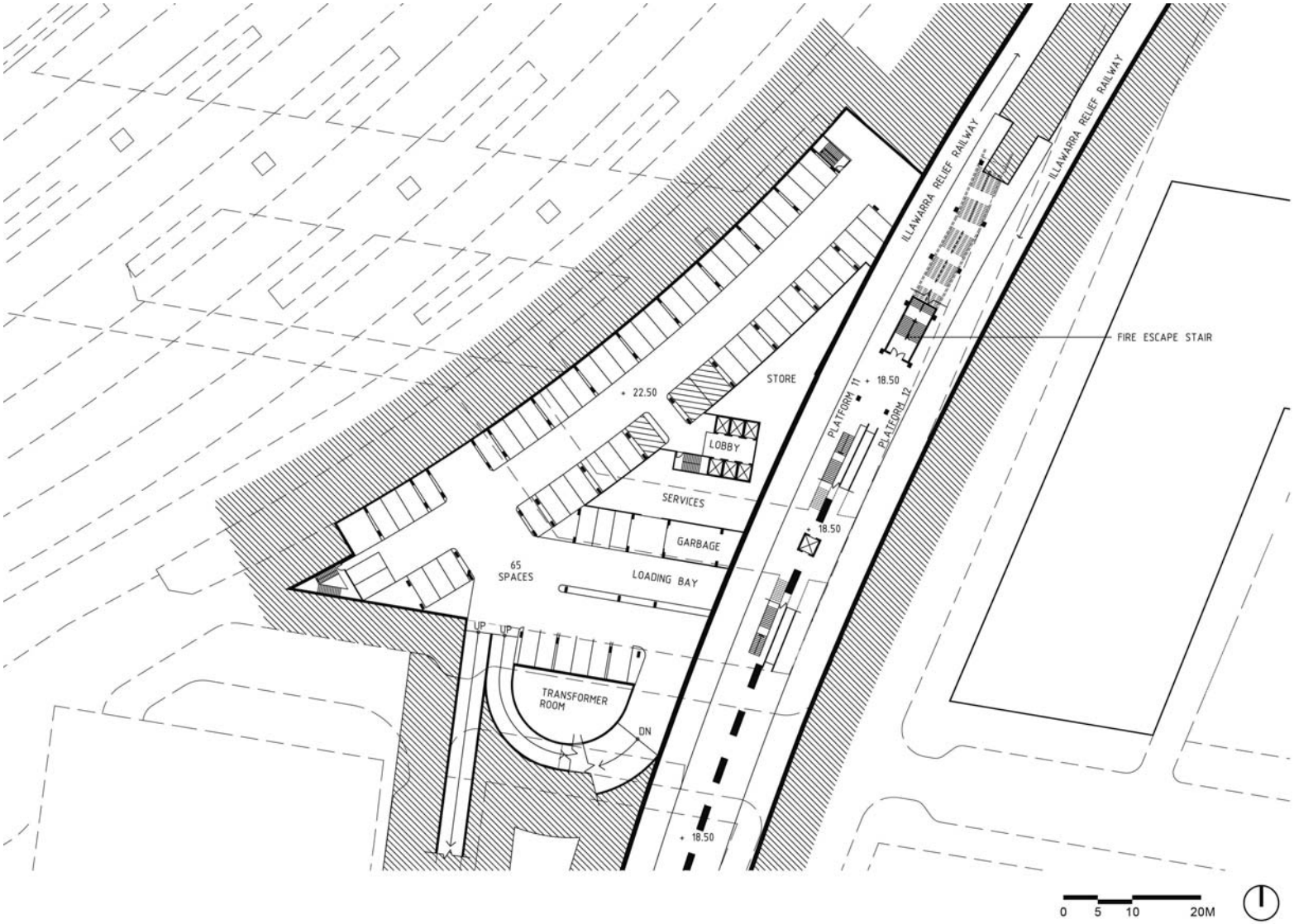
APPENDIX 1: DEVELOPMENT SITE DRAWINGS

OPTION DS-1

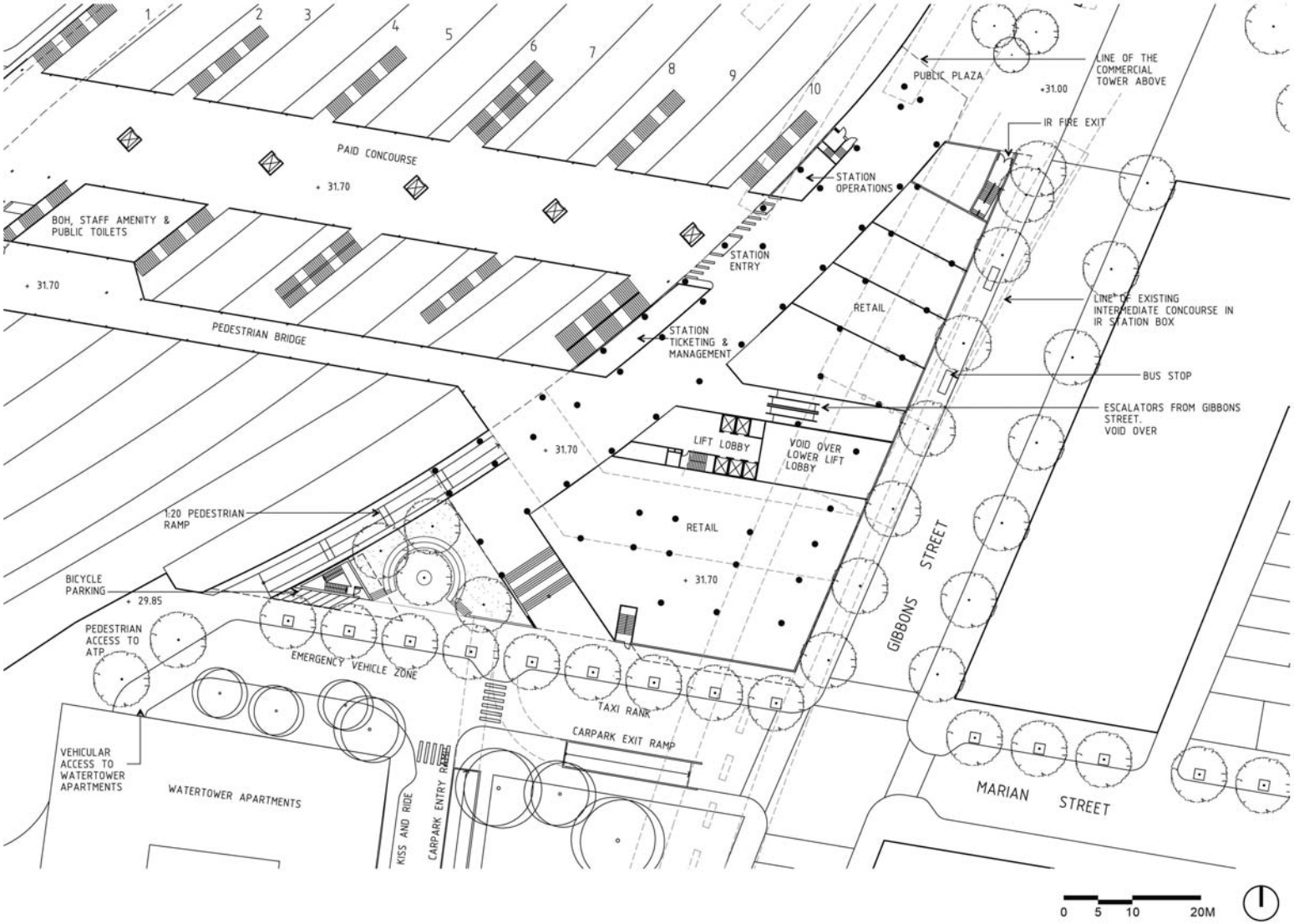


DS-1 Basement Level 2 Plan



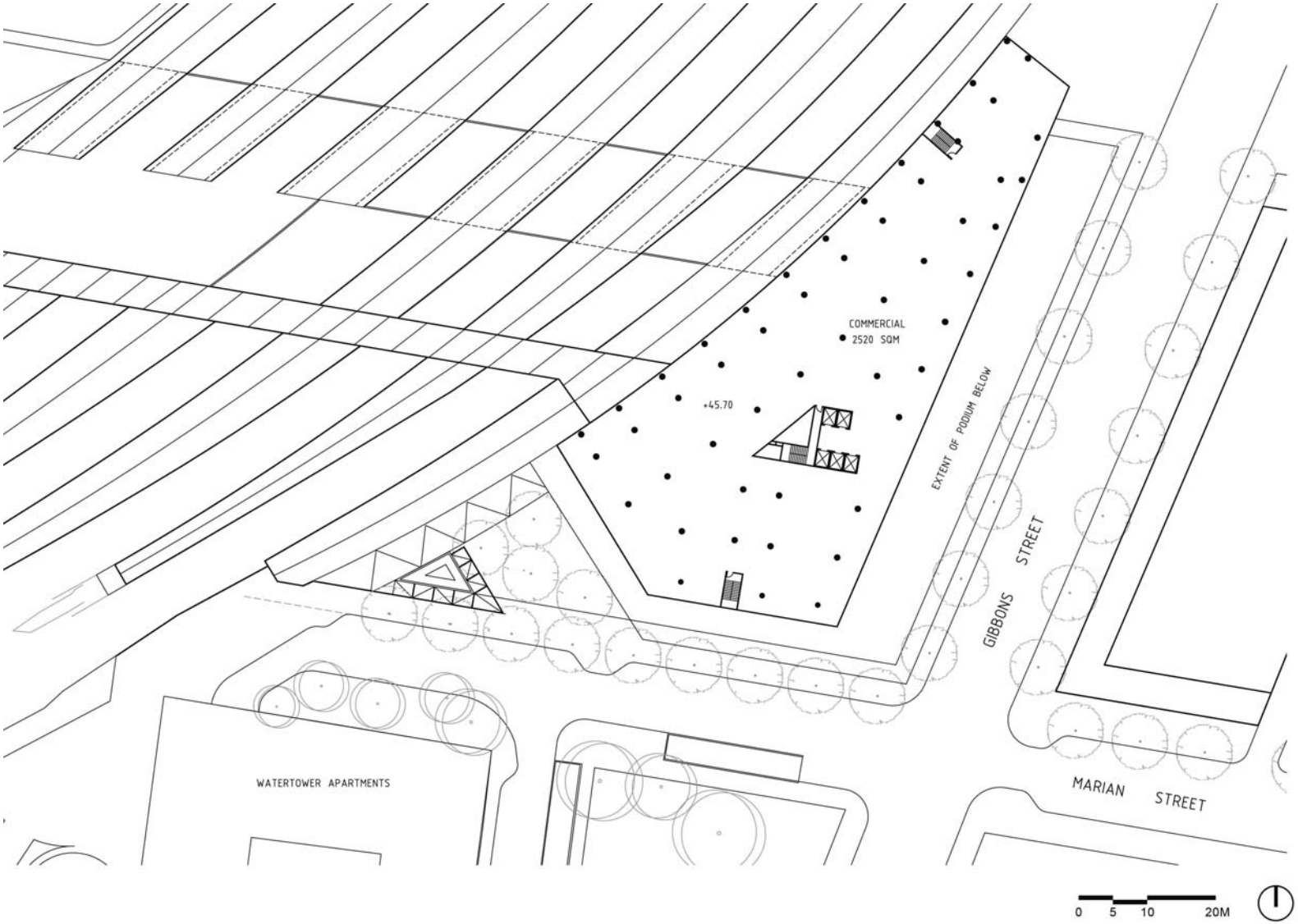
DS-1 Basement Level 1 Plan

DS-1 Platform Level Plan



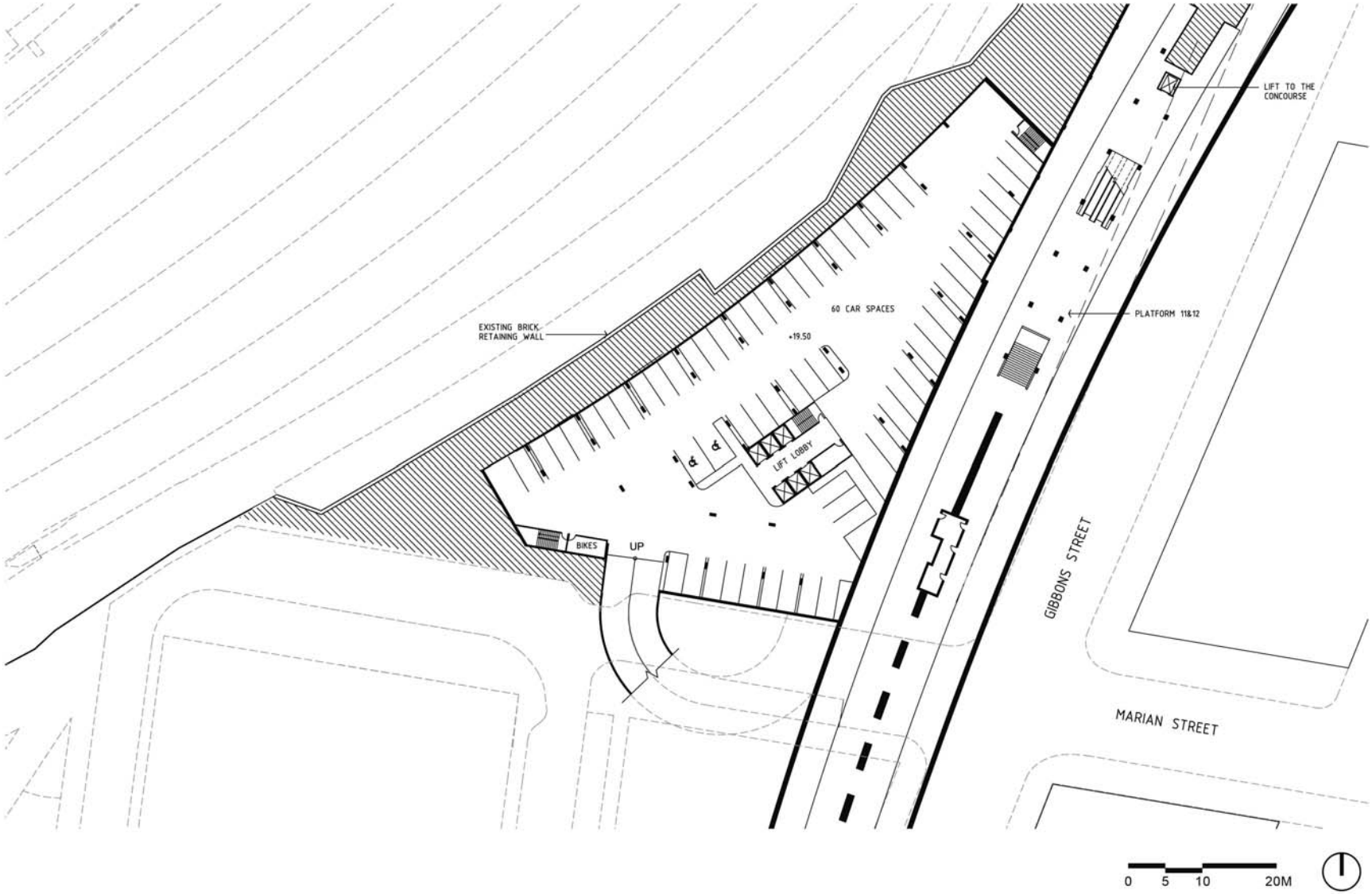
DS-1 Concourse Level Plan

DS-1 Podium Level Plan

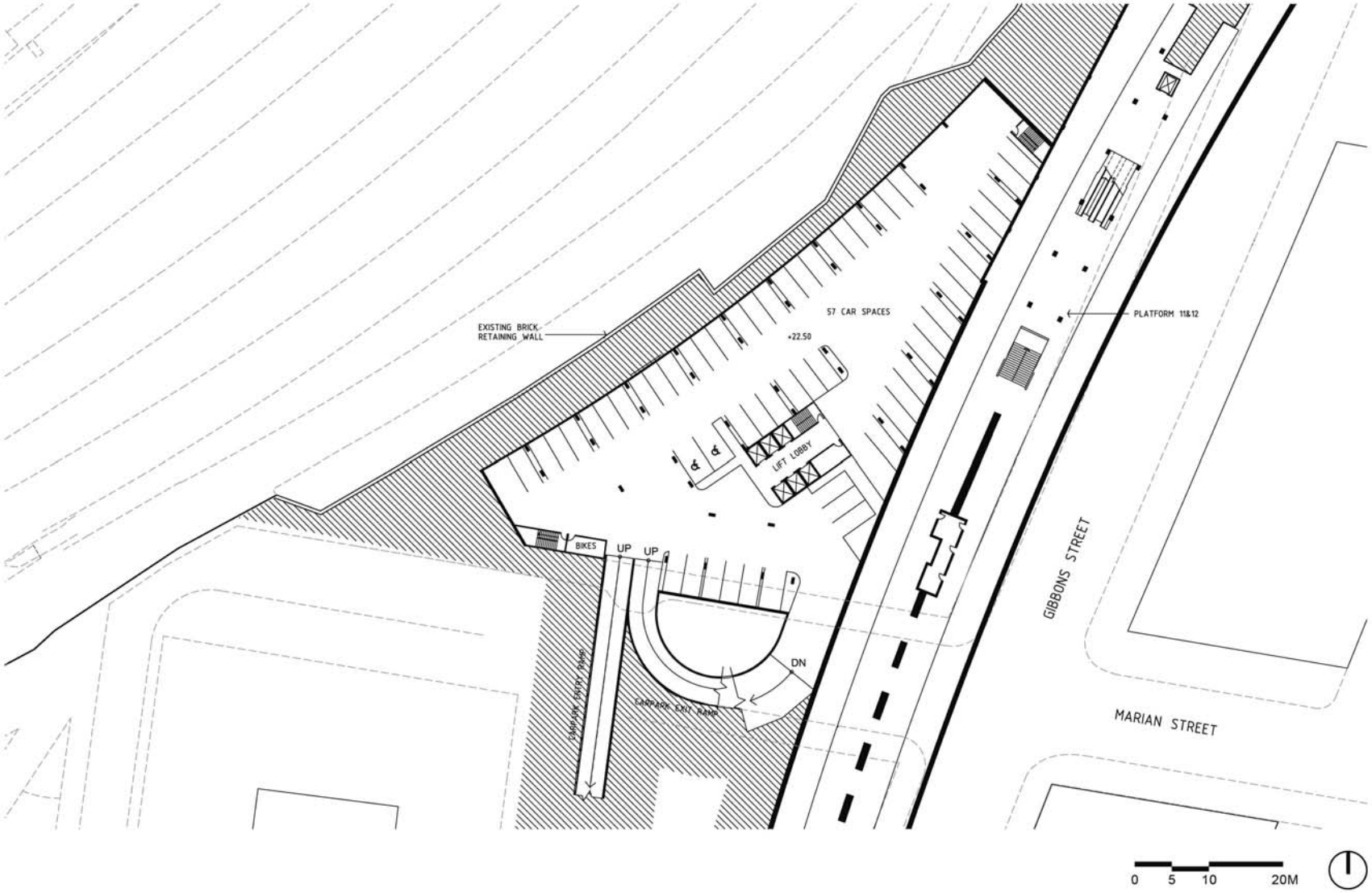


DS-1 Tower Level Plan

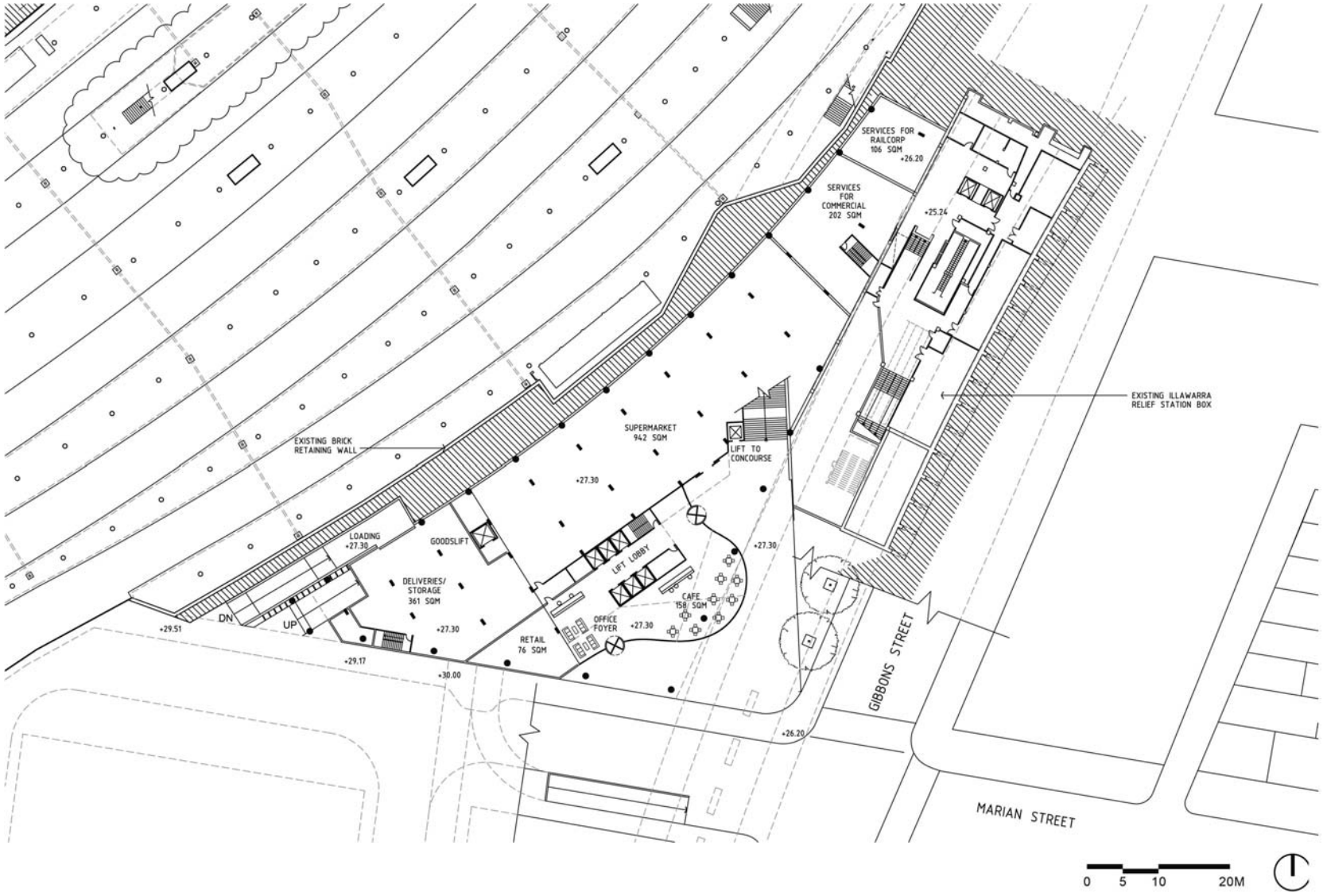
OPTION DS-2



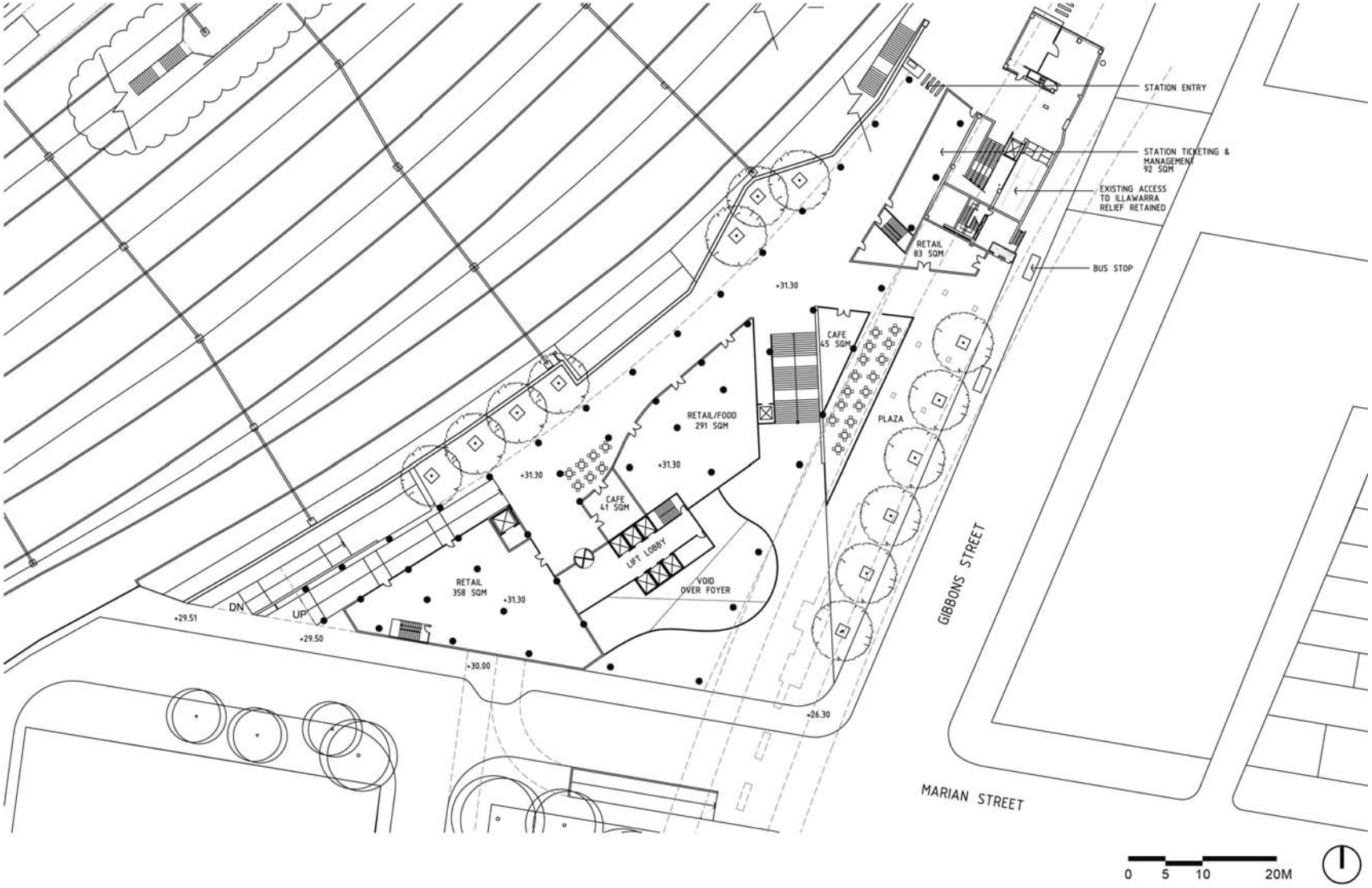
DS-2 Basement Level 2 Plan



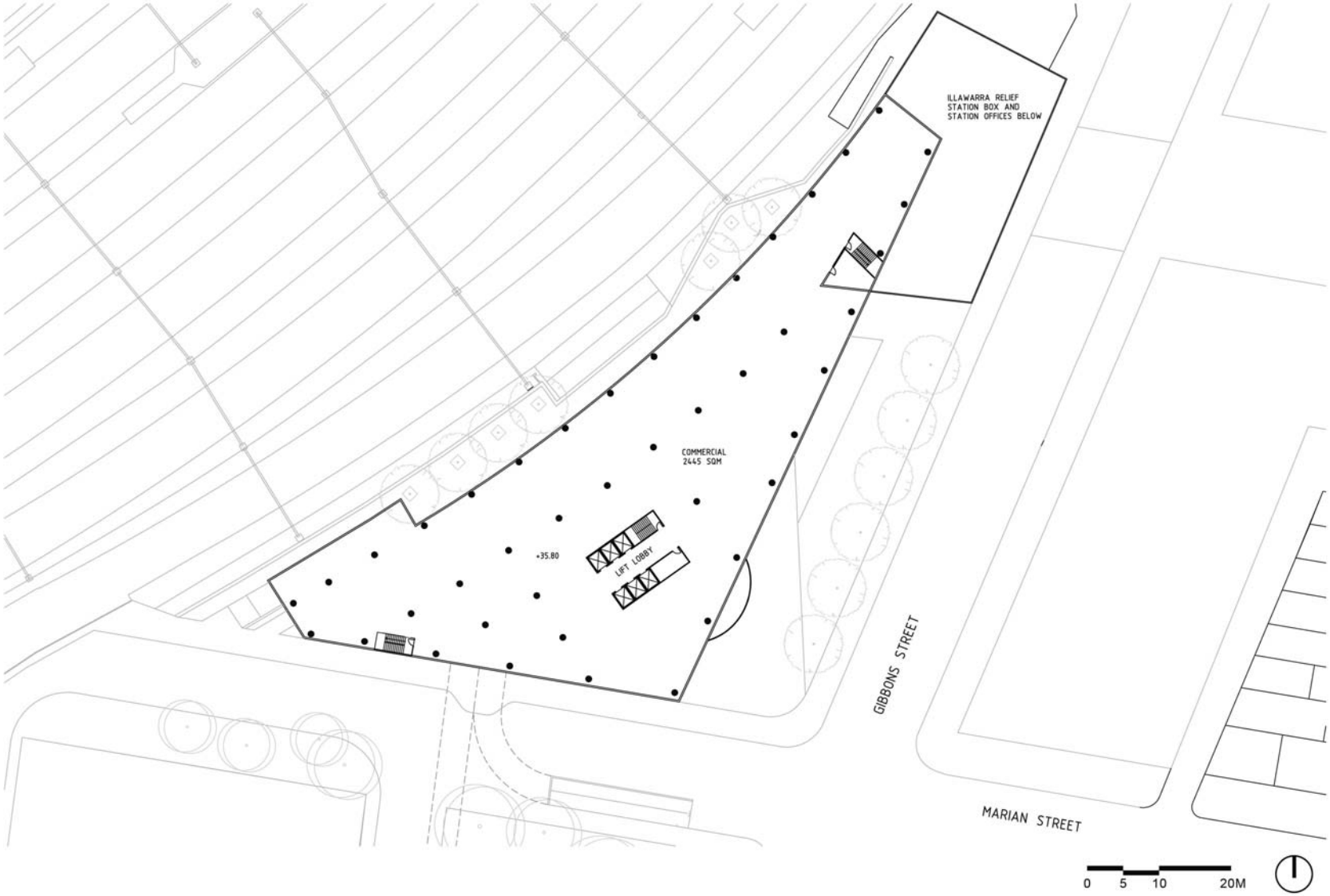
DS-2 Basement Level 1 Plan



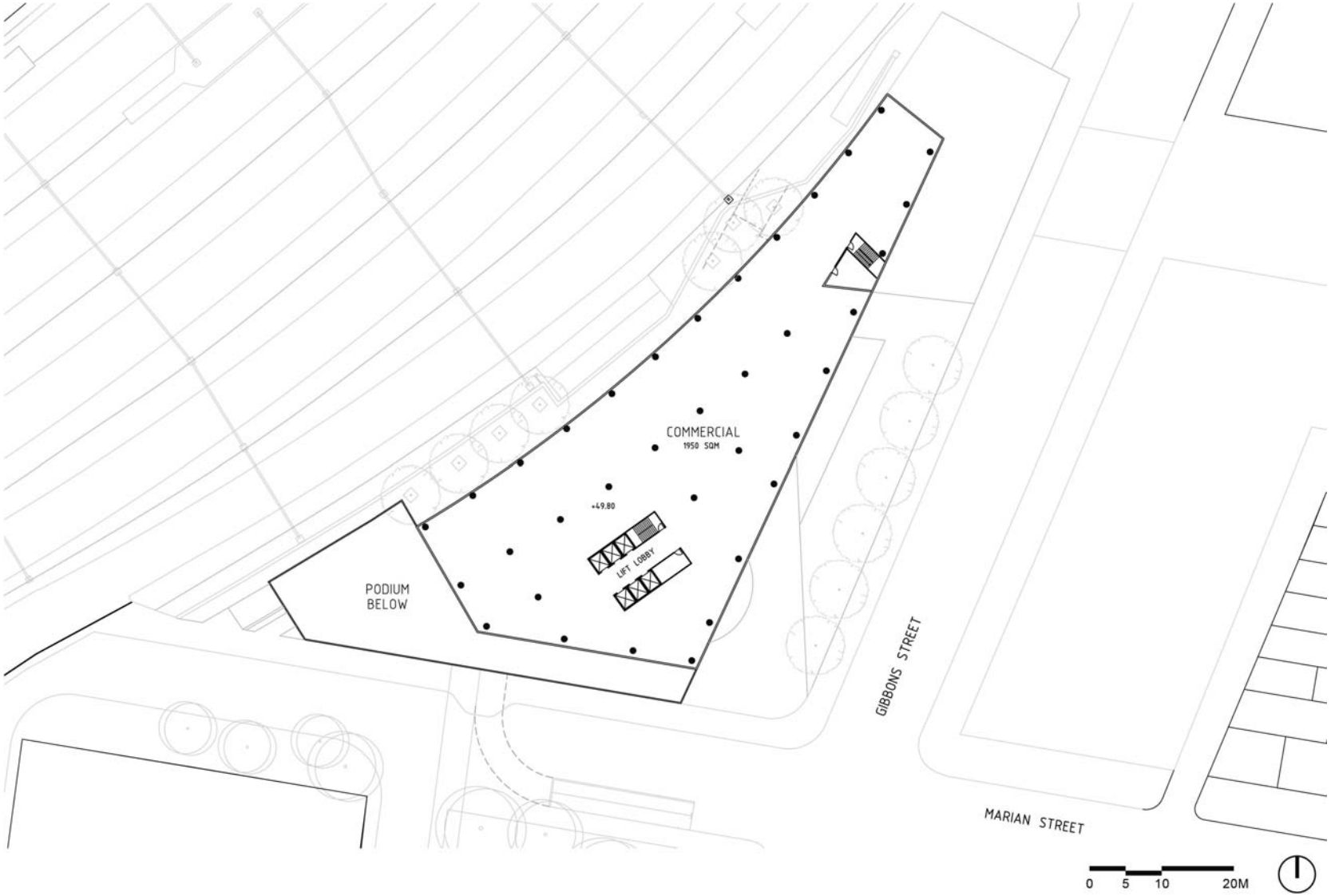
DS-2 Platform Level Plan



DS-2 Concourse Level Plan



DS-2 Podium Level Plan



DS-2 Tower Level Plan

Appendix - 2

Preliminary Station views of Option-C and DS-1

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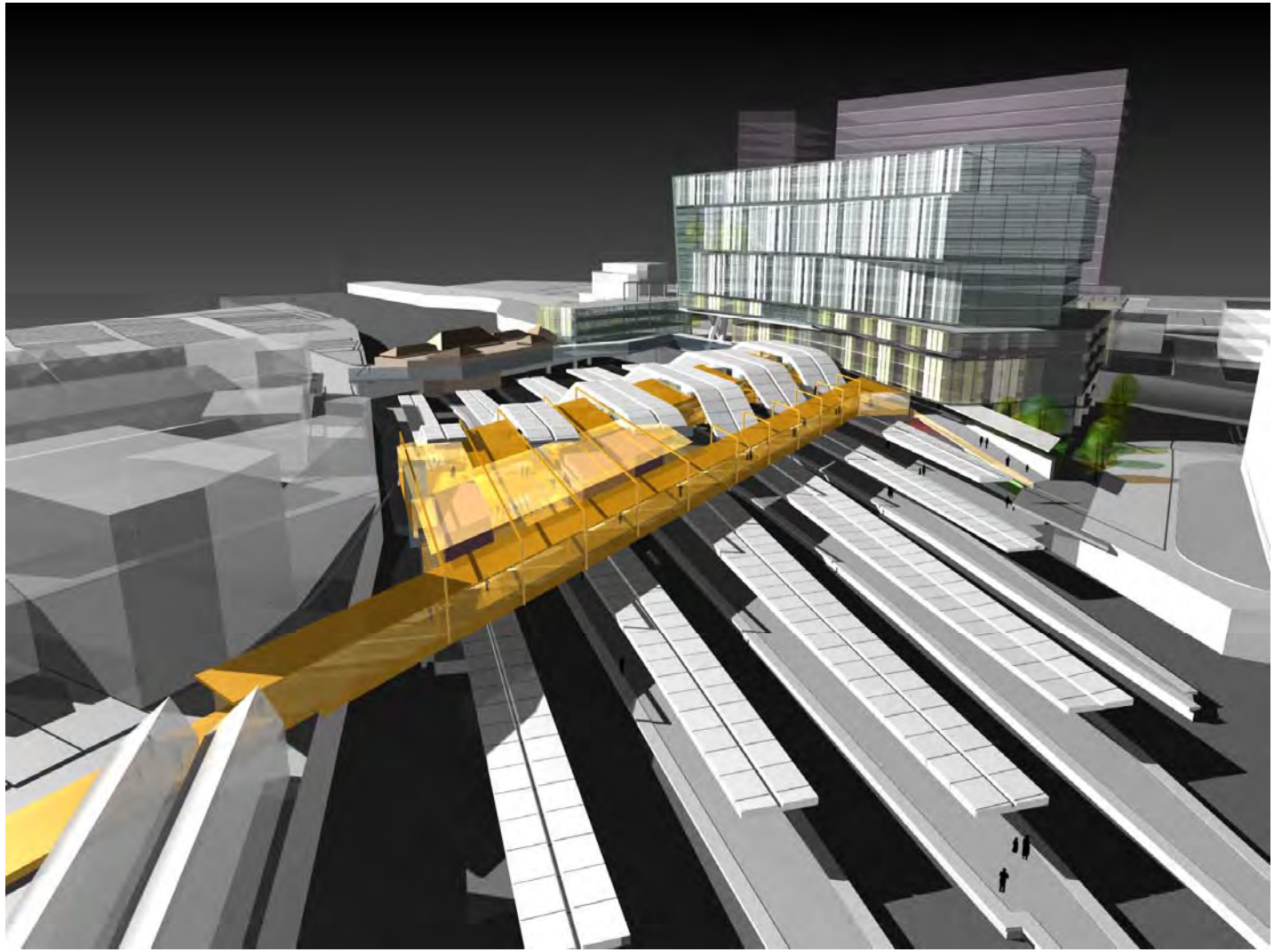
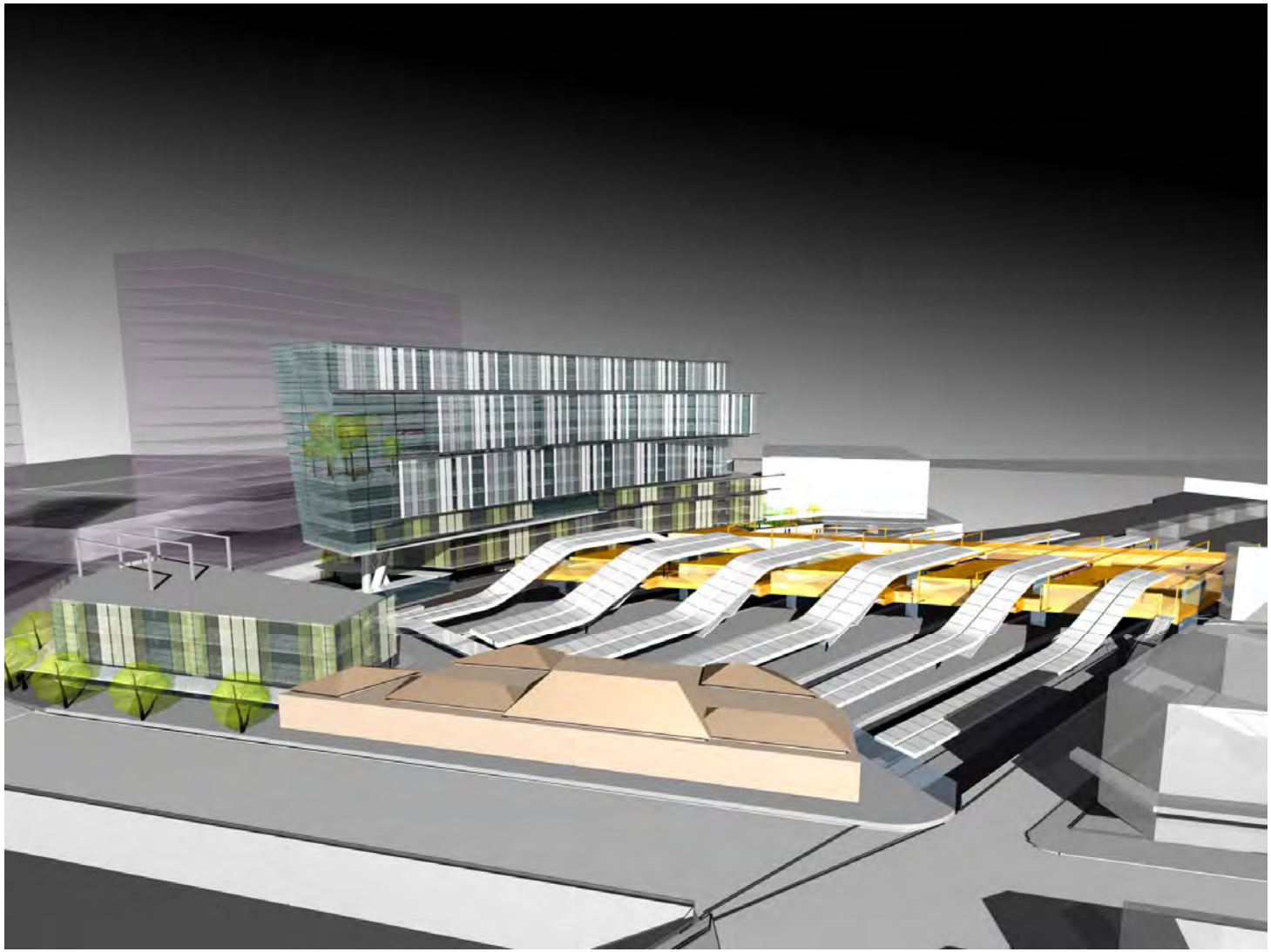
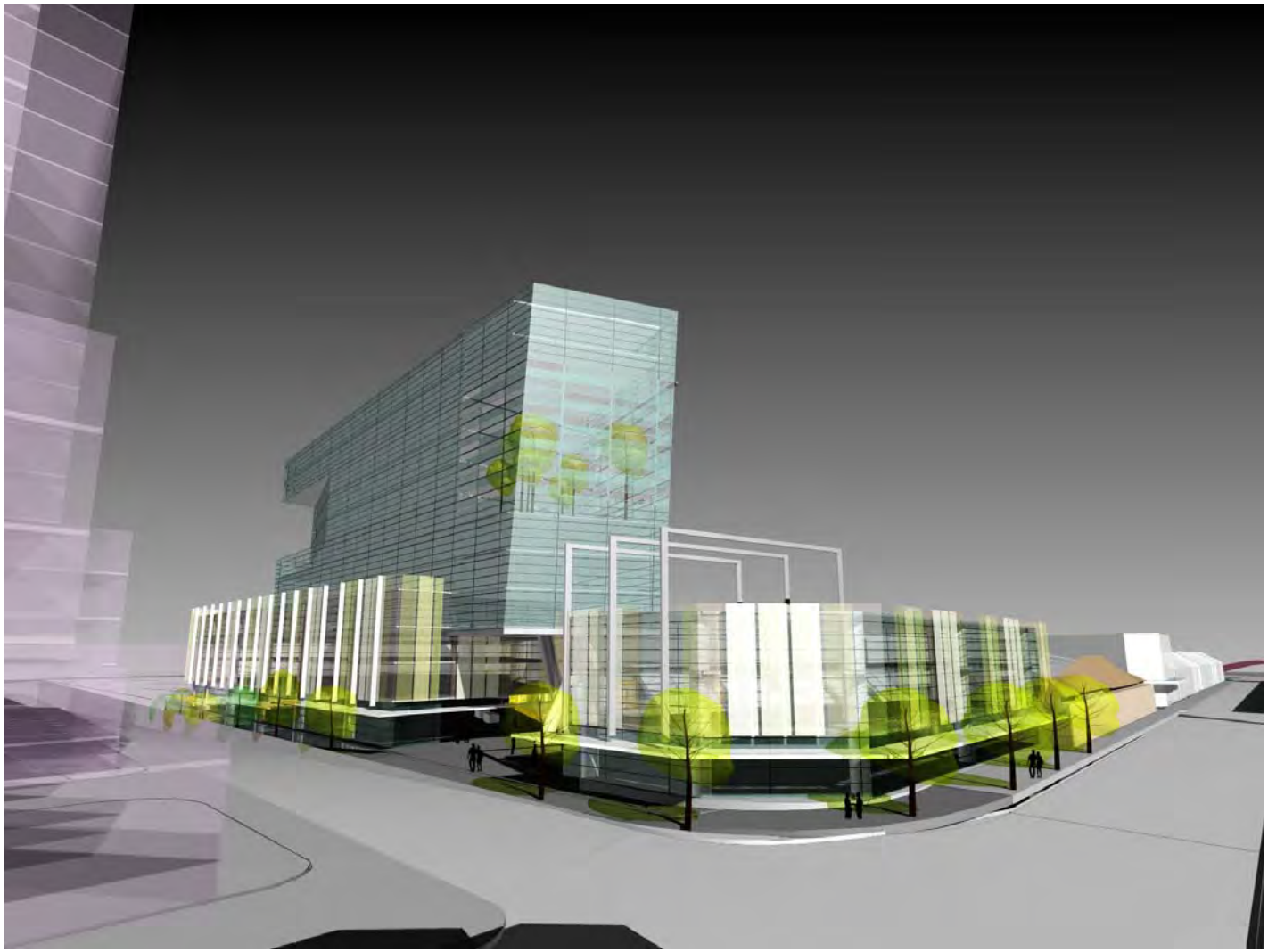
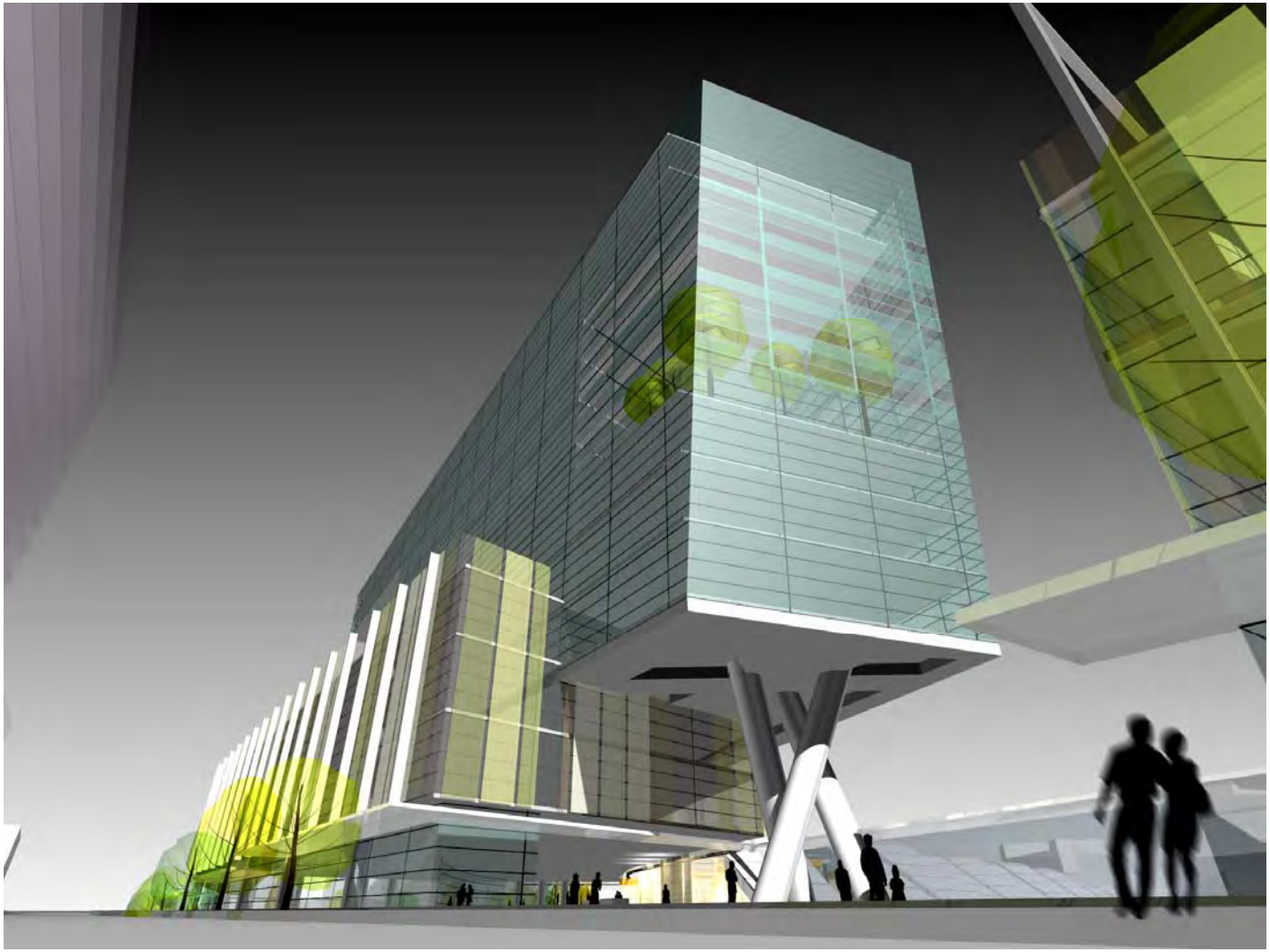
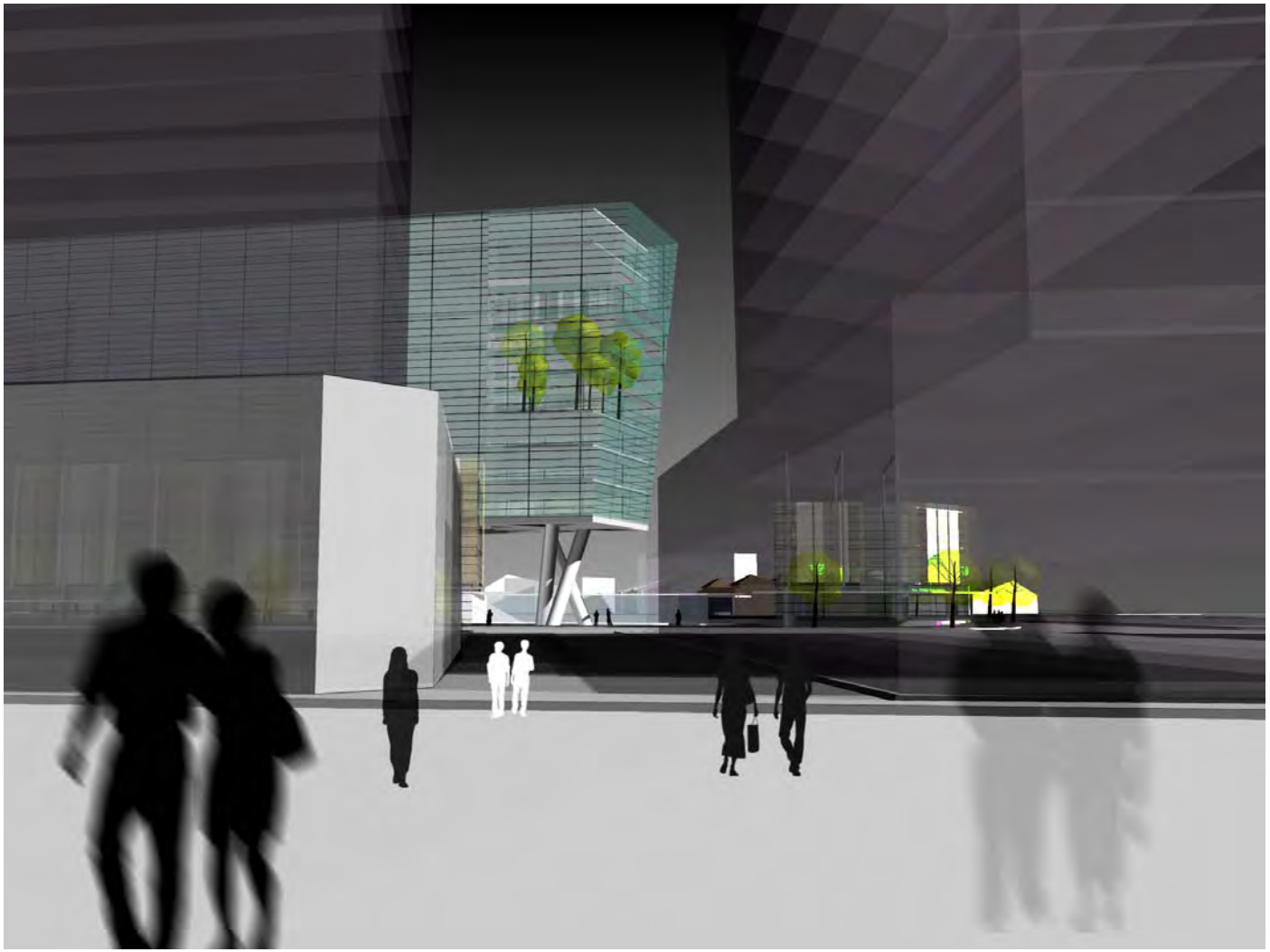
APPENDIX 2: PRELIMINARY STATION VIEWS OF OPTION-C AND DS-1

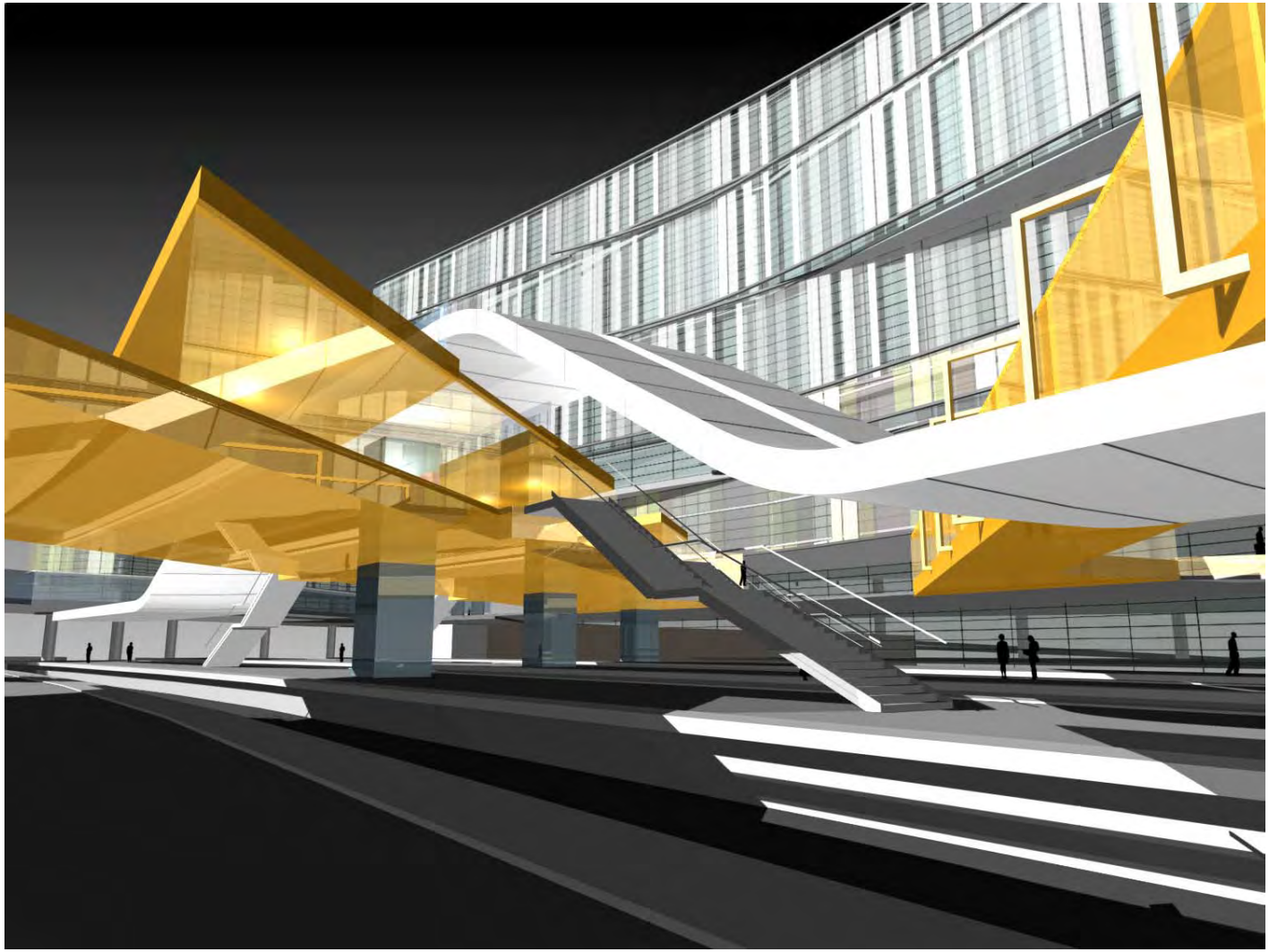












Appendix - 3

Rail Operational, Interface and Development areas

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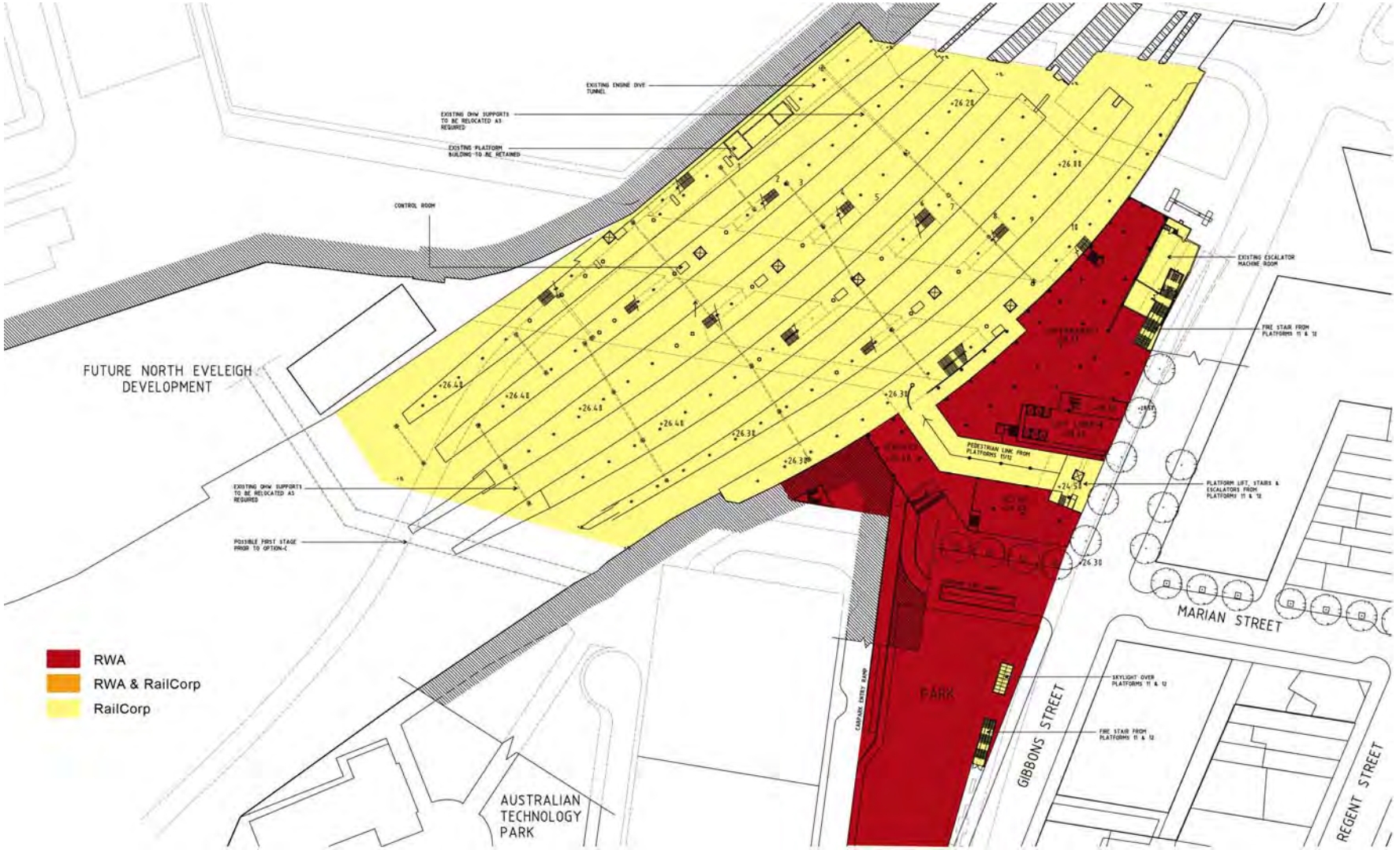
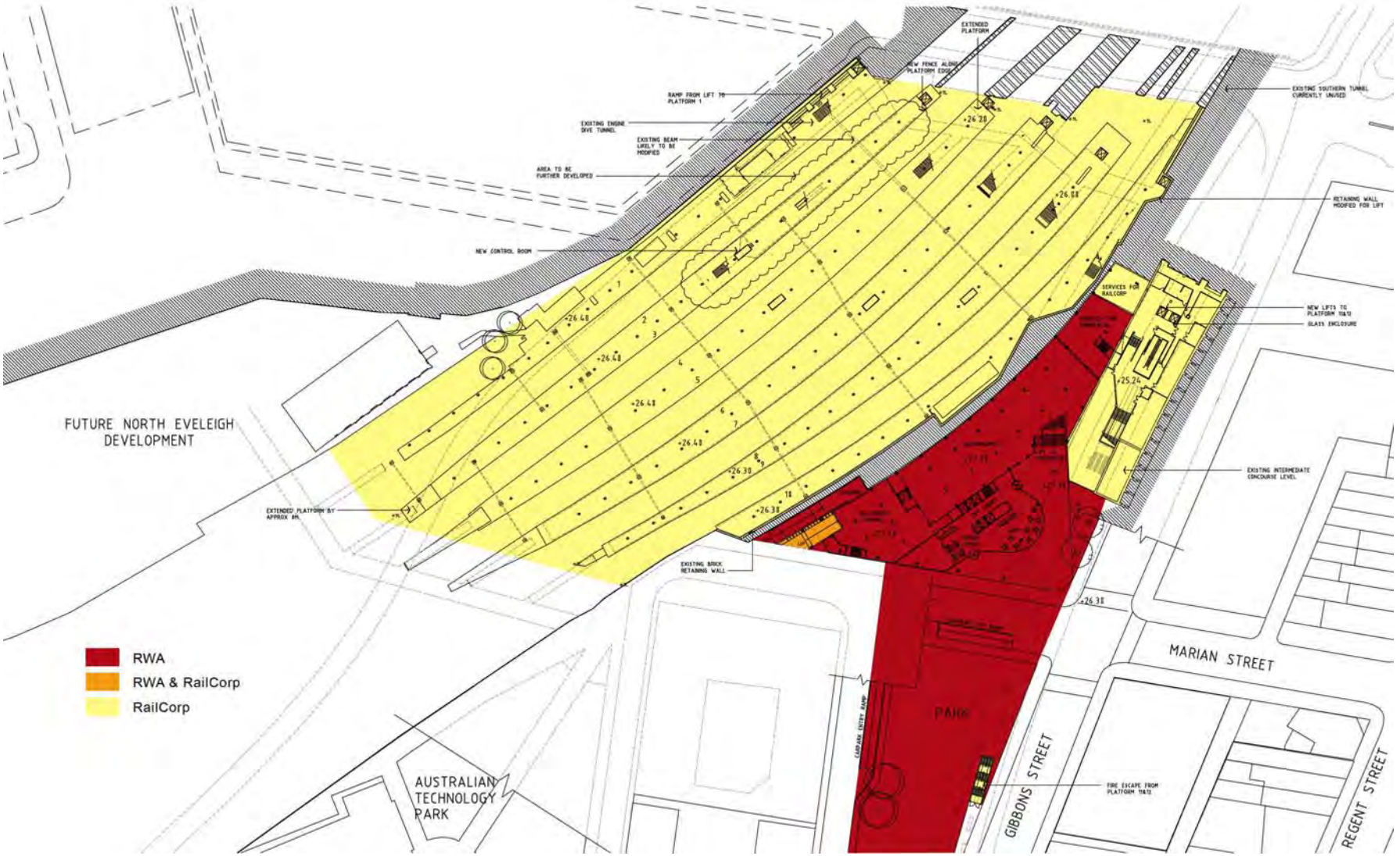
APPENDIX 3: RAIL OPERATIONAL, INTERFACE AND DEVELOPMENT AREAS



Option C – Platform Level Plan

Option C – Concourse Level Plan



Option E – Platform Level Plan

Option E – Concourse Level Plan

Appendix - 4

Discussion Paper - Selection of preferred option(s)

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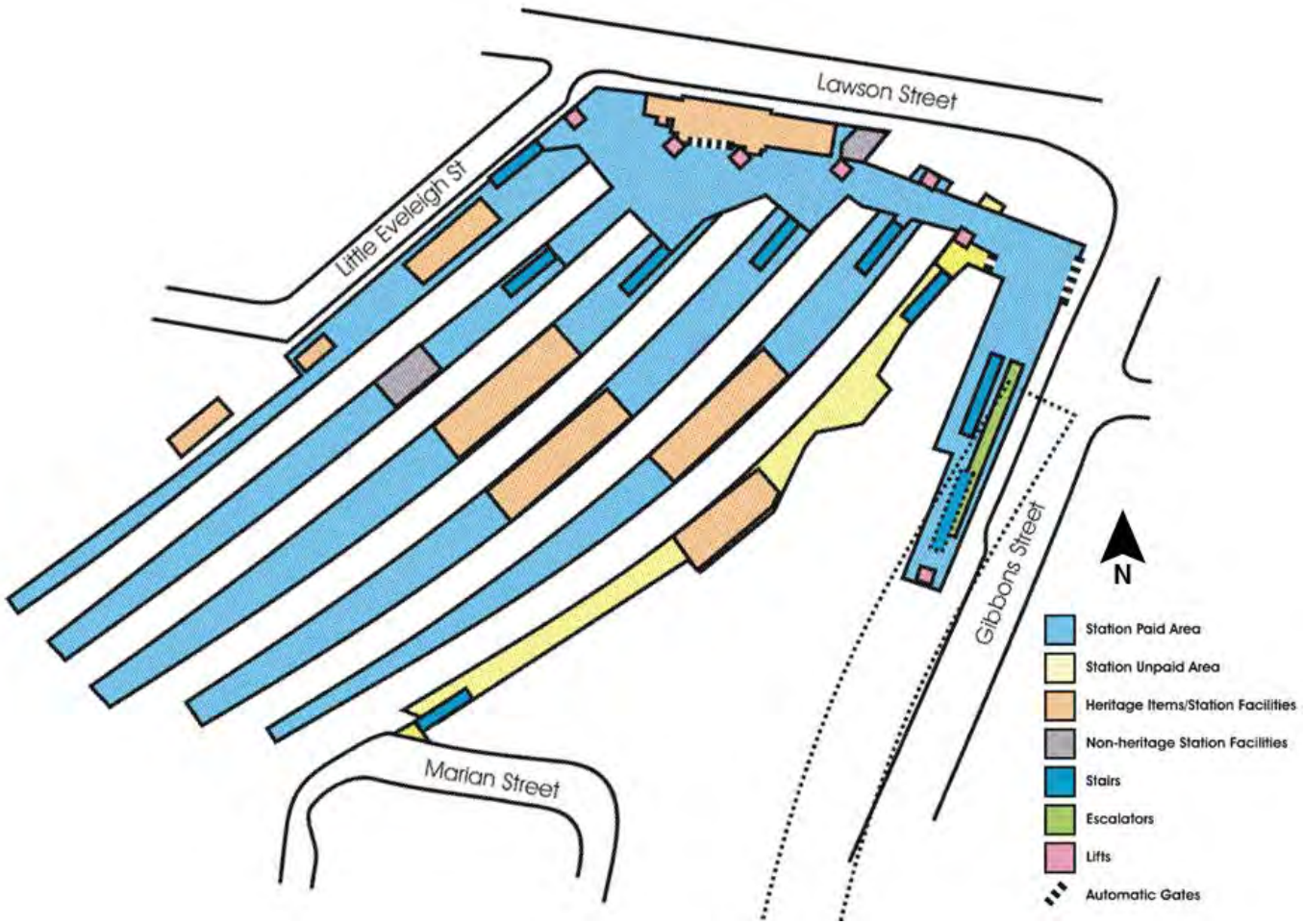

Figure 1.1: Option 1
(Redfern Station Upgrade Options, RailCorp, Mar 2004)

1. REVIEW OF DESIGN OPTIONS

1.1 CONCEPT DESIGN OPTIONS

A range of concept design options, including those developed prior to the commencement of this study, were reviewed in a workshop with the Project Coordination Group on 18th August 2006.

Options generated prior to this study include:

1. Upgrade existing access by introducing new lifts and making the concourse a bit bigger (Figure 1.1)
2. Plaza and development over the northern end of the station between Gibbons and Little Eveleigh Streets (Figure 1.2)
3. Central concourse at the southern end of the station, continued use of the existing concourse and pedestrian connection to Little Eveleigh Street (Figure 1.3)
4. Central concourse at the southern end and a pedestrian connection to North Eveleigh site (Figure 1.4)
5. Southern & northern entrances and southern connection to North Eveleigh site (Figure 1.5)

Further options, developed in this study, include:

6. Combination of options 3 & 5, with a northern entrance at the end of Redfern Street (Figure 1.6)
7. A wider central concourse and stairs/escalators on both sides of it (Figure 1.7)
8. Wider central concourse, no northern stairs to platforms and a plaza (Figure 1.8)
9. New central concourse parallel to Lawson Street with no northern stairs (Figure 1.9)

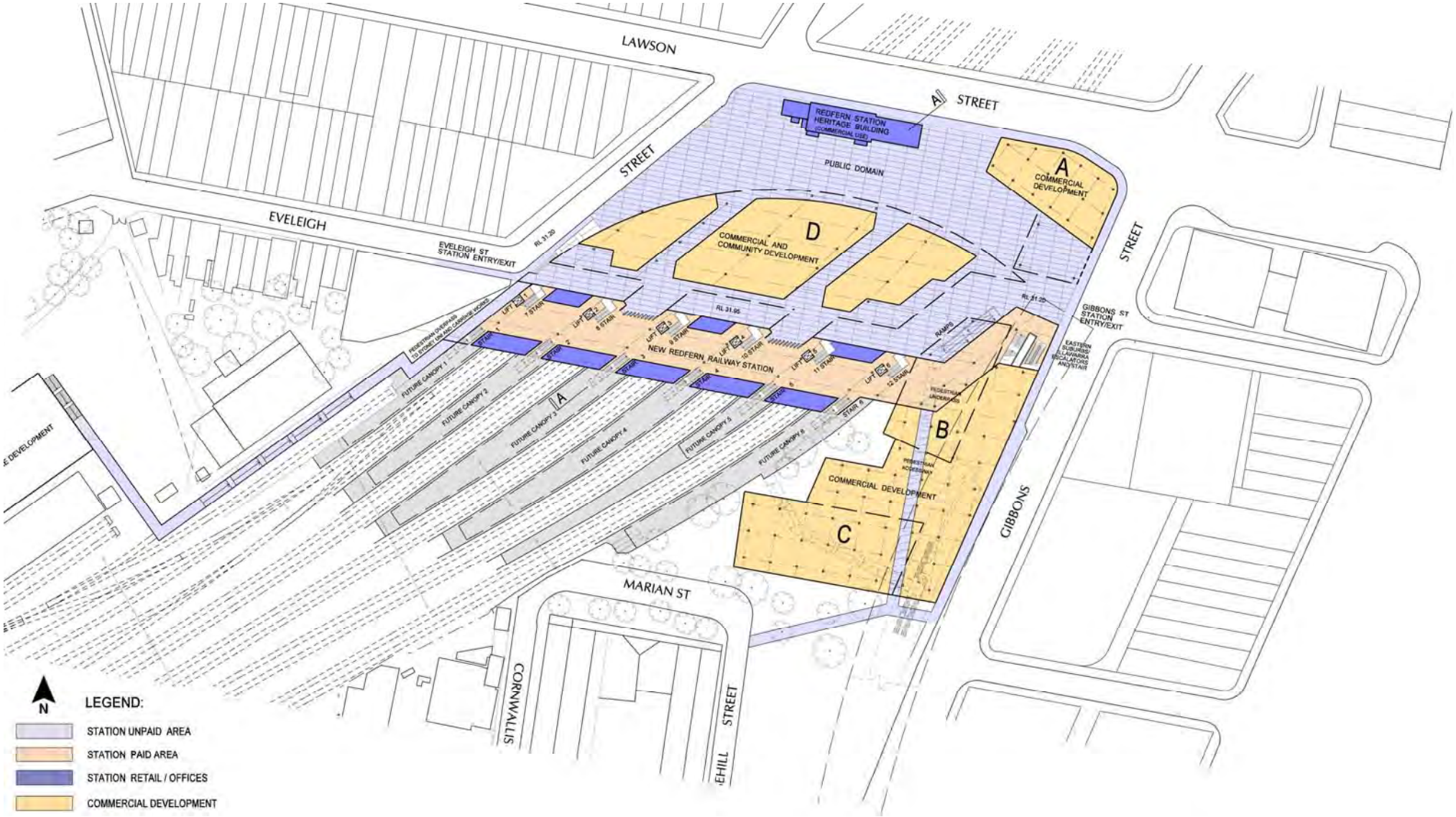

Figure 1.2: Option 2
(Redfern Station Design Development, Stafford Moore Architects, Jan 2004)

Figure 1.3: Option 3
(Redfern Station Design Development, Stafford Moore Architects, Jan 2004)

Figure 1.4: Option 4
(Redfern Station Design Development, Stafford Moore Architects, Jan 2004)

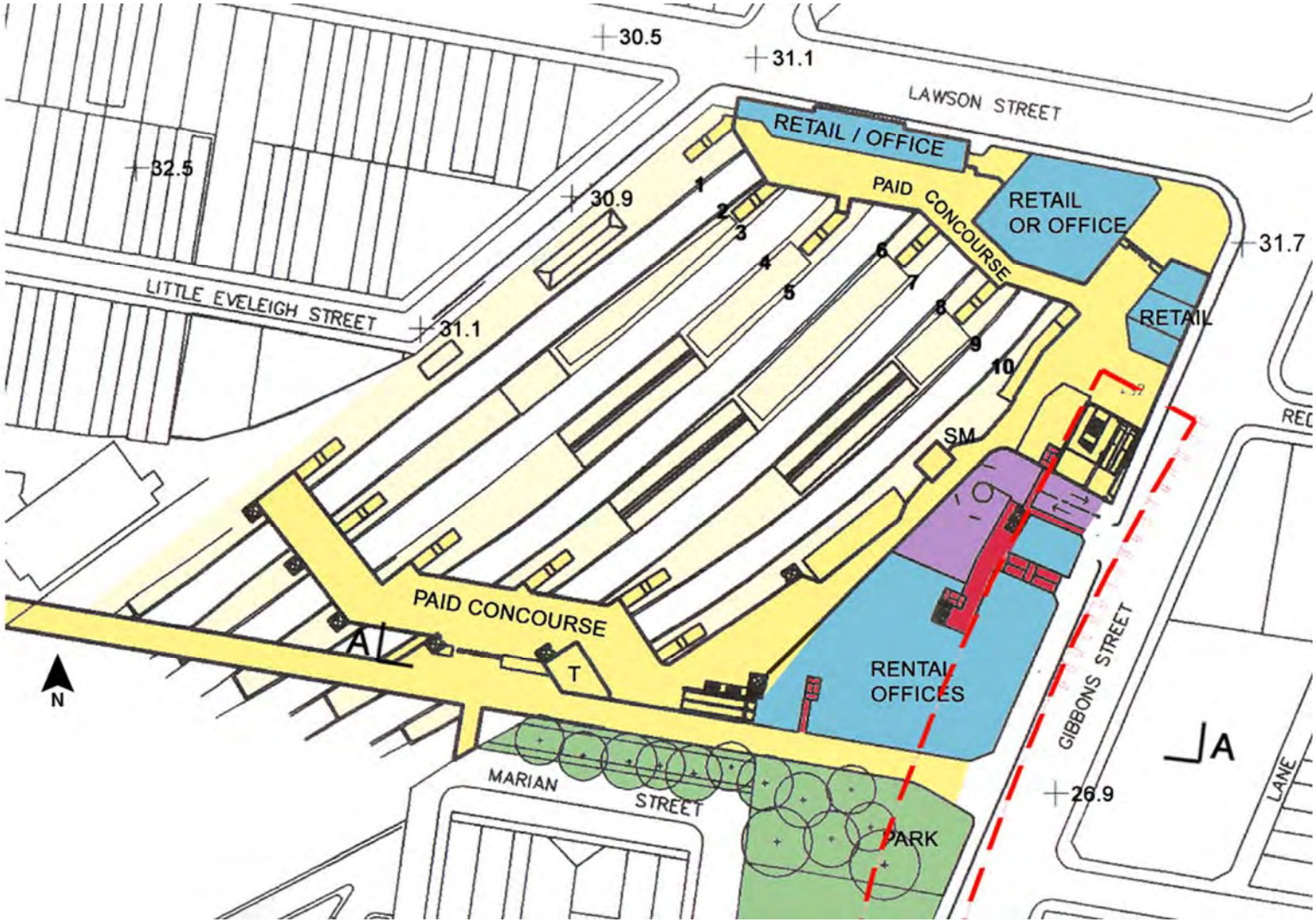

Figure 1.5: Option 5
(Development study for Redfern station, JTCW, Jun 2003)

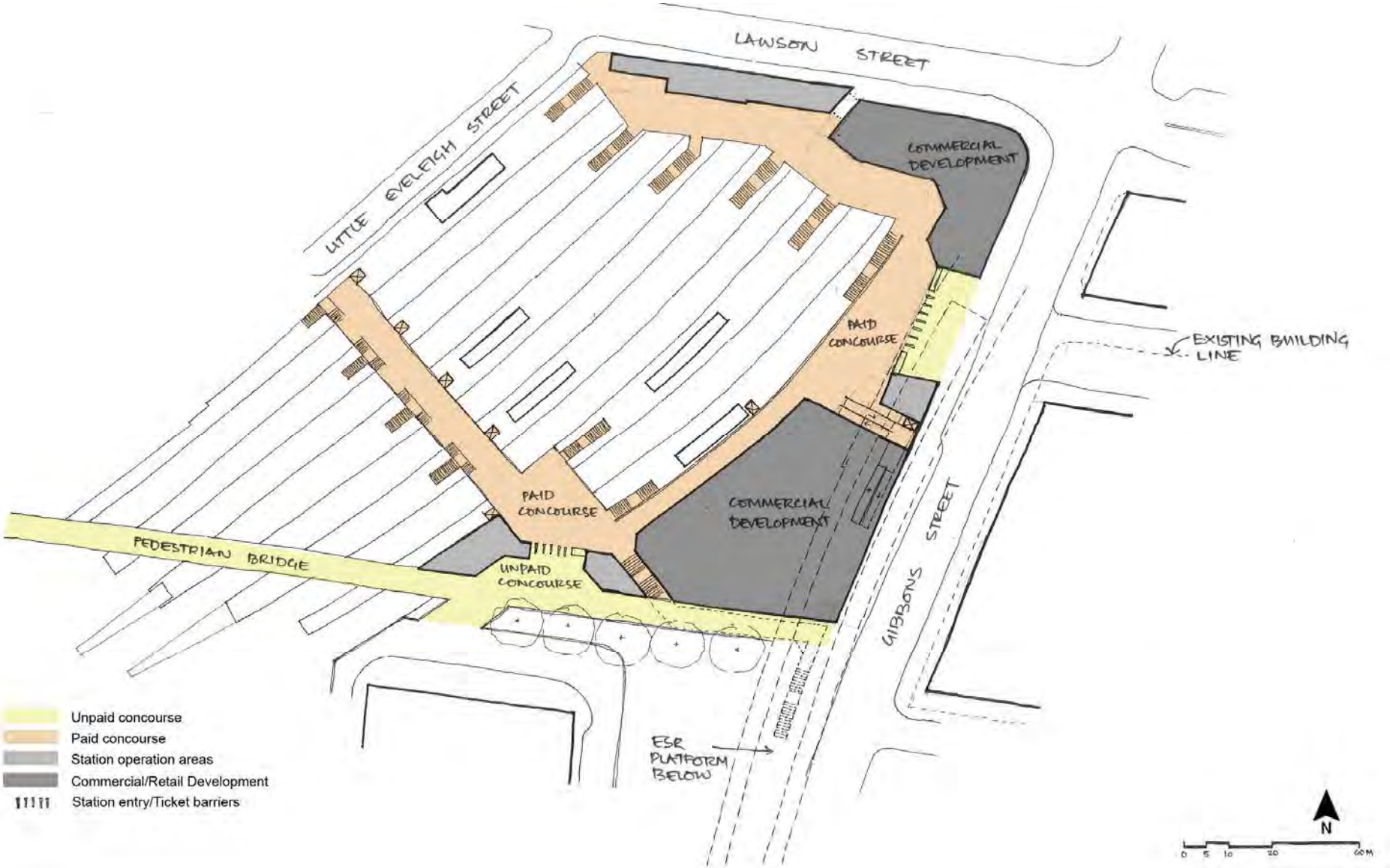

Figure 1.6: Option 6
(New option, combination of Option 3 & 5)

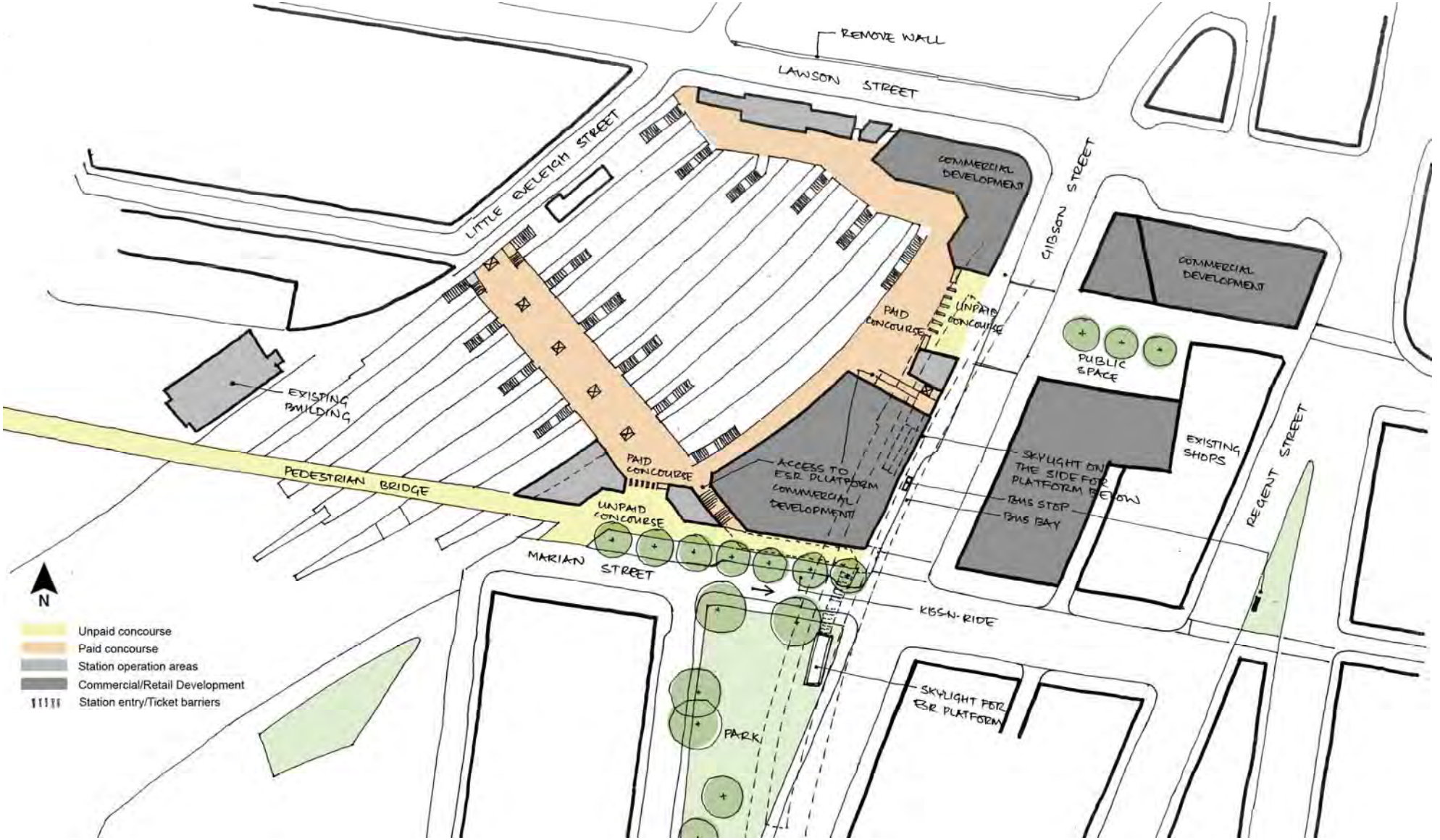

Figure 1.7: Option 7
(New option)

Figure 1.8 – Option 8
(New option)

Figure 1.9: Option 9
(New option)

The advantages and disadvantages of the above options were discussed during the workshop. The main advantages and disadvantages identified for each of the options are listed below:

OPTIONS	***ADVANTAGES***	***DISADVANTAGES***
Option – 1	• Is the lowest cost "do minimum option". • Retain the heritage buildings on the platform and concourse.	• Forecourt and station entry at Gibbons Street has not been resolved. • Difficult to construct while keeping the station functioning. • Does not provide for a pedestrian link between North Eveleigh and Redfern. • Poor pedestrian link to ATP.
Option – 2	• Provides areas for a future commercial development. • Retains booking office building at Lawson Street. • Provides additional public domain/open space.	• Covers in the order of 50% of the surface platforms, which has potential to create an emergency evacuation problem, as these platforms would have to be considered underground platforms and compliant with NFPA 130. • Very expensive and not cost effective. • Pedestrian connection to North Eveleigh not satisfactory. • Does not provide a satisfactory connection to ATP. • All heritage buildings on the platform are removed.
Option – 3	• Addresses the current access and circulation issues to some extent. • Heritage buildings on the platforms and concourse retained.	• Fails to provide access to North Eveleigh • Large area of paid concourse difficult to manage. • Layout of the new concourse very fragmented and unclear. • The new stairs point towards the narrow end of the platform which is not ideal for good distribution of people on the platforms. • L-shaped stairs to the platforms not suitable for efficient movement. • Poor interface with Illawarra Relief Public space on corner of Lawson and Gibbons Street in poor position.
Option – 4	• Same as Option-3Meets circulation and connectivity requirements.	• Same as Option-3. • Connection to North Eveleigh site poor.
Option – 5	• Heritage buildings on the concourse and platforms retained.	• Station entrance at the corner of Lawson Street and Gibbons Street not ideal. • No unpaid concourse connection between Marian Street and Lawson Street corner. The lifts from the

OPTIONS	*ADVANTAGES*	*DISADVANTAGES*
		new concourse do not meet the current platform clearance requirements.
Option – 6	• No access from Lawson Street – a pedestrian safety benefit. • All heritage buildings retained except for the store building on platform 1Provides good connection to ATP. • Direct presence of station entry along Gibbons and Redfern Street.	• New stair pointing towards the narrow end of the platforms which is not desirable. • No public space at the end of Redfern Street as required by the Redfern-Waterloo Built Environment Plan. • Large area of paid concourse makes it difficult to manage and staff.
Option – 7	• Maximum capacity option with 3 sets of stairs landing on each platform. • Marian Street connected to Gibbons Street with new Kiss-'n-Ride facilities. • Heritage building on the concourse and platform 1 retained. • Provides improved station entrance to the east and to ATP.	• The public space at the Gibbons Street entrance across may be overshadowed by the commercial development located at the corner of Lawson Street and Gibbons Street. • Large area of paid concourse makes it difficult to staff and manage. • Does not provide for a civic space as per the Redfern-Waterloo Built Environment Plan.
Option – 8	• New public plaza at the station entrance on Gibbons Street. • Maintenance and security issues would need to be considered.	• Access to the Platforms 2 & 3 from the university side becomes too long as there is no station entry at the western side. • Only one set of stairs to Platform 1. • University bus drop off point would need to be considered. • Poses security and surveillance problems on the northern section of the station. • Only the heritage building on Lawson Street and platform 1 are retained.
Option – 9	• New central concourse parallel to Lawson Street provides adequate clearances for stairs/escalators on all the platforms. • Paid concourse very compact and easy to manage.	• Access to the platforms from the North Eveleigh site too circuitous. • Pedestrian bridge separate from the paid concourse. • Only the heritage building on Lawson Street and platform 1 are retained. • Poses security issues on the pedestrian bridge.

Options 1 to 5 were developed prior to this study and do not generally meet the current objectives and user requirements, so have not been considered further.

With regards to Options 6 to 9:

- Option 6 is the only option that retains the existing heritage buildings and shelters on the platforms.
- Options 7 and 8 meet most of the objectives, but remove all heritage platform buildings except on Platform 1. They also provide a new southern concourse parallel to the OHW stanchions.
- Option 7 has large areas of paid concourse as the stairs on the northern end are retained.[2]
- Option 8 creates a better interface at the Gibbons Street entrance as it creates a public plaza.
- Option 9 provides a new concourse parallel to Lawson Street and also has the best passenger distribution on platforms compared to any other option.

The above options were presented to the PCG in an Options Review Workshop held on 22 Aug 2007. It was decided at the workshop to develop Options 6, 8 and 9 to be presented at the External Stakeholder workshop on 01 Sep 2007. After the stakeholder workshop these options were further developed and renamed Option A, B and C presented in this report.

All the three design options assume the catenaries would be lowered and the system depth reduced to enable a new concourse to be at the same level as the existing concourse and facilitate east-west pedestrian connections.

[2] Pedestrian modelling undertaken as part of the development of the options has revealed that two sets of stairs is sufficient to meet future patronage demand and F&LS requirements. Refer Part B – Engineering report.

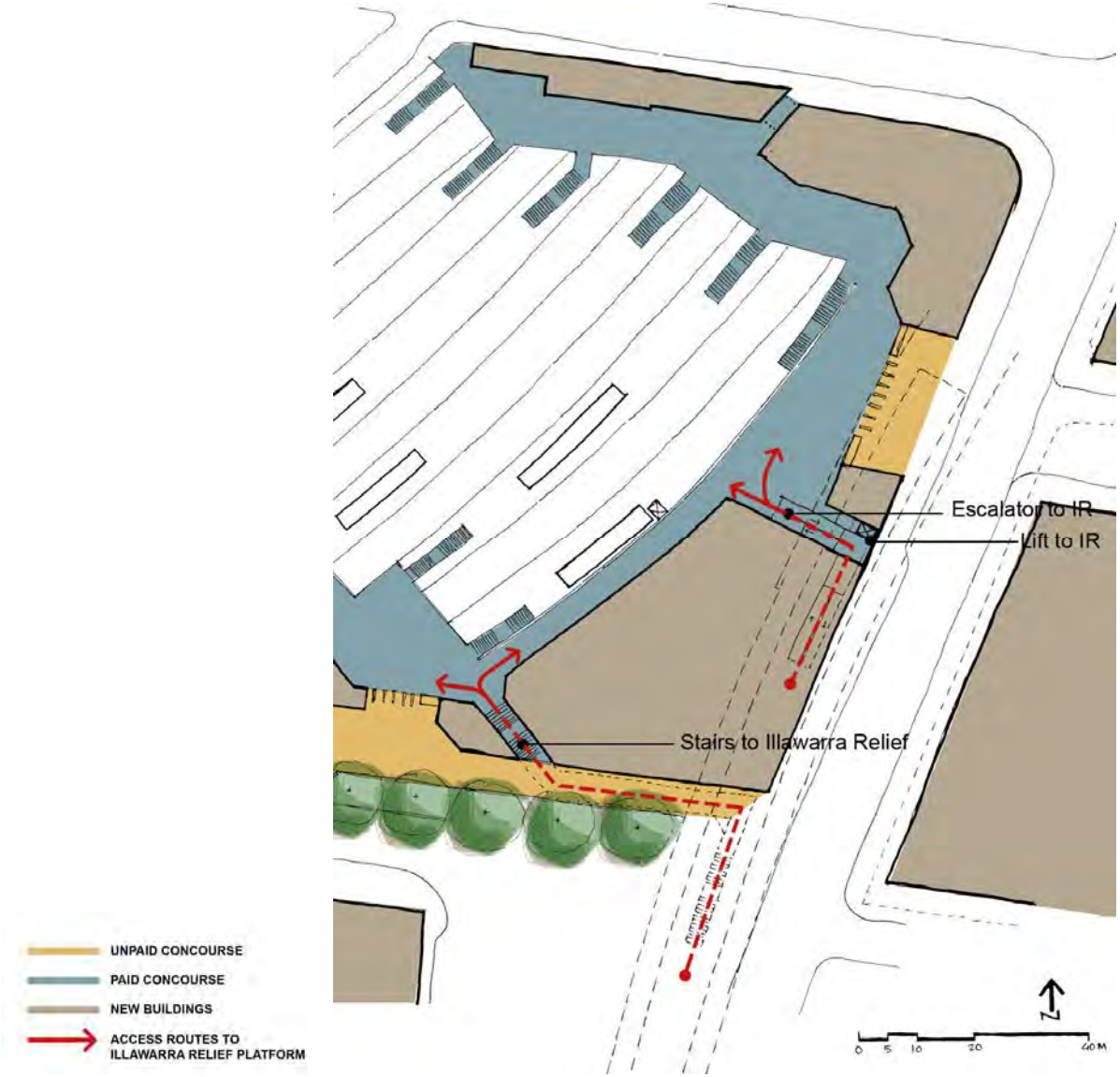

Figure 1.10: Access to Illawarra Relief Option – IR 1

1.2 OPTIONS FOR ACCESS TO ILLAWARRA RELIEF

During the course of the study, four options were developed for the provision of access to and from the Illawarra Relief platforms 11 and 12. These options were derived as a result of various station layouts and dependent upon the size and location of the paid concourse. Hence the station layout in each option is different.

These options are discussed below:

Option – IR 1

Access from the northern end of the station would be provided by a new set of escalators and access from the southern end would be provided by a new set of stairs going down from the southern entrance as shown in Figure 1.10.

As the access to the Illawarra Relief needs to be from the paid concourse, this option does not provide an at-grade unpaid link through the station between North Eveleigh site and Gibbons Street. Also the paid concourse would become very large and would be difficult to manage and staff.

As detailed in Section 2, this layout is used as part of Option A to provide access to Platforms 11/12.

Option – IR 2

A set of barriers on the north and south of the concourse would provide access to the station. A set of stair and escalators east of the barriers would provide access to the Illawarra Relief as shown in Figure 1.11.

As the access to the Illawarra Relief needs to be from the paid concourse, this option would not provide an at-grade unpaid link through the Station between the North Eveleigh site and Gibbons Street. Also the access to the station from North Eveleigh site and Darlington would become very long.

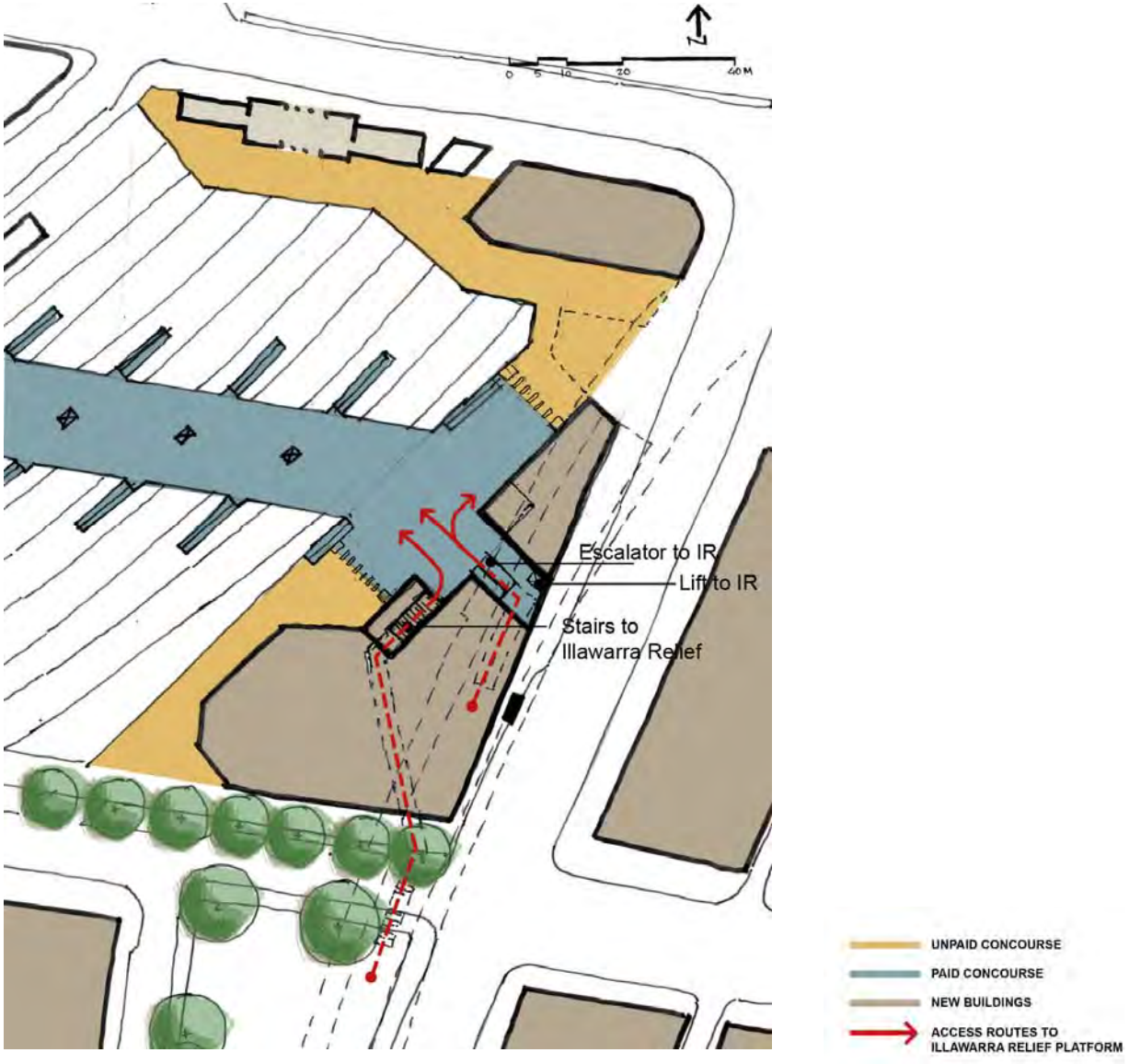

Figure 1.11: Access to Illawarra Relief Option – IR 2

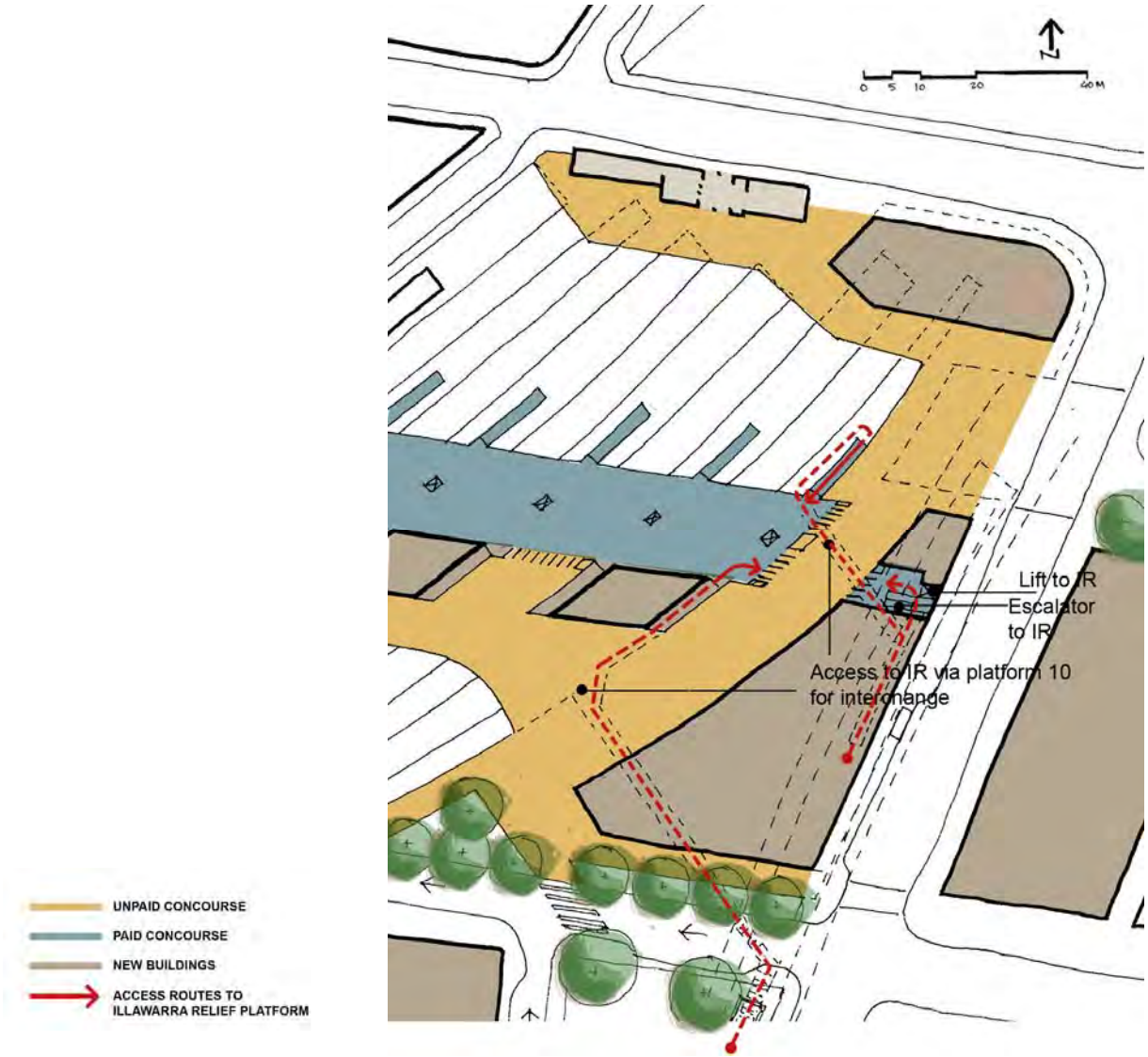

Figure 1.12: Access to Illawarra Relief Option – IR 3

Option – IR 3

This option is a variation of Option IR 2. There would be two access points to the Illawarra Relief, one via a set of barriers on the northern end and the second from platform 10 via a set of stairs on the southern end, as shown in Figure 1.12.

Having a separate barrier for the Illawarra Relief access at the concourse level would allow for an unpaid at-grade connection from the North Eveleigh site to Gibbons Street. This would increase the number of entrances to be staffed and would require passengers interchanging between lines to cross the unpaid concourse and pass through barriers twice.

Option – IR 4

In this Option, as shown on Figures 1.13 & 1.14, access to the Illawarra Relief, Platforms 11/12, would be provided through a passage at Platform 10 level that would be reached by stairs and a lift from the main paid concourse. Stairs and escalators and a lift from this passage would deliver people to the centre of Platform 11/12.

Platform 10 would be wider than at present and the stairs serving it have been designed to provide for the extra demand from the Illawarra Relief. As shown, a screen and signage at the end of the tunnel would be provided to direct people to the stairs and not emerge on Platform 10. It would also be possible to provide additional stairs or escalators adjacent to Platform 10 in the future.

Options IR 1 and IR 2 would provide direct access to Platforms 11/12 from the paid concourse but would not provide an at-grade connection through the station between the North Eveleigh site and Gibbons Street. Option IR 3 provides the at-grade link but still provides direct access to Platforms 11/12. The access in this case is unsatisfactory as discussed earlier and people need to go in and out of the barrier for interchange purpose.

Option IR 4, providing access to Platform 11/12 through Platform 10, is the best solution if the unpaid link between North Eveleigh and Gibbons Street is desired through the station.

Variations of access Option IR 4 to Illawarra Relief are incorporated into the overall station design Options B and C, discussed in Chapter 2, which provide unpaid links between the North Eveleigh site and Gibbons Street.

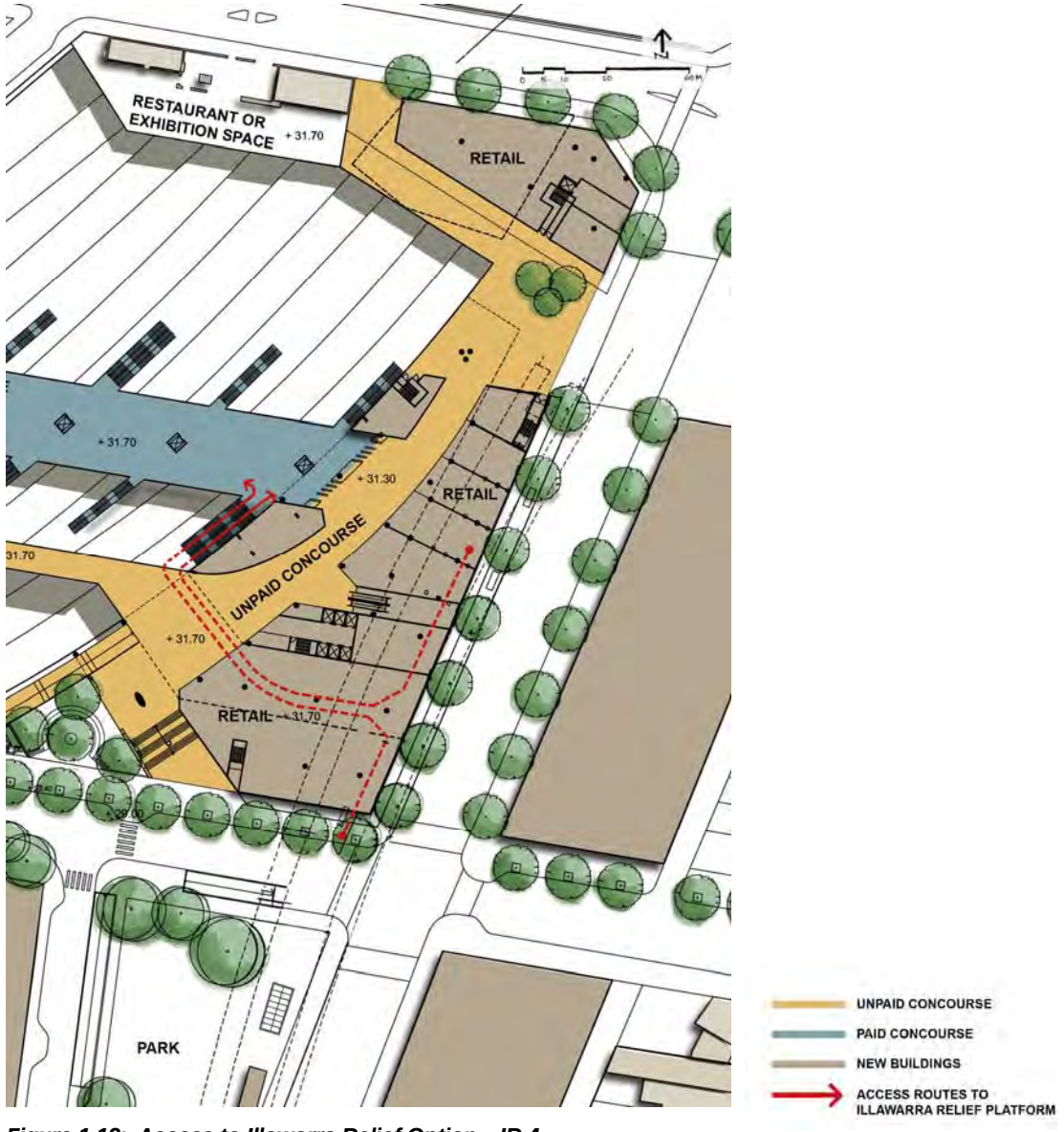

Figure 1.13: Access to Illawarra Relief Option – IR 4

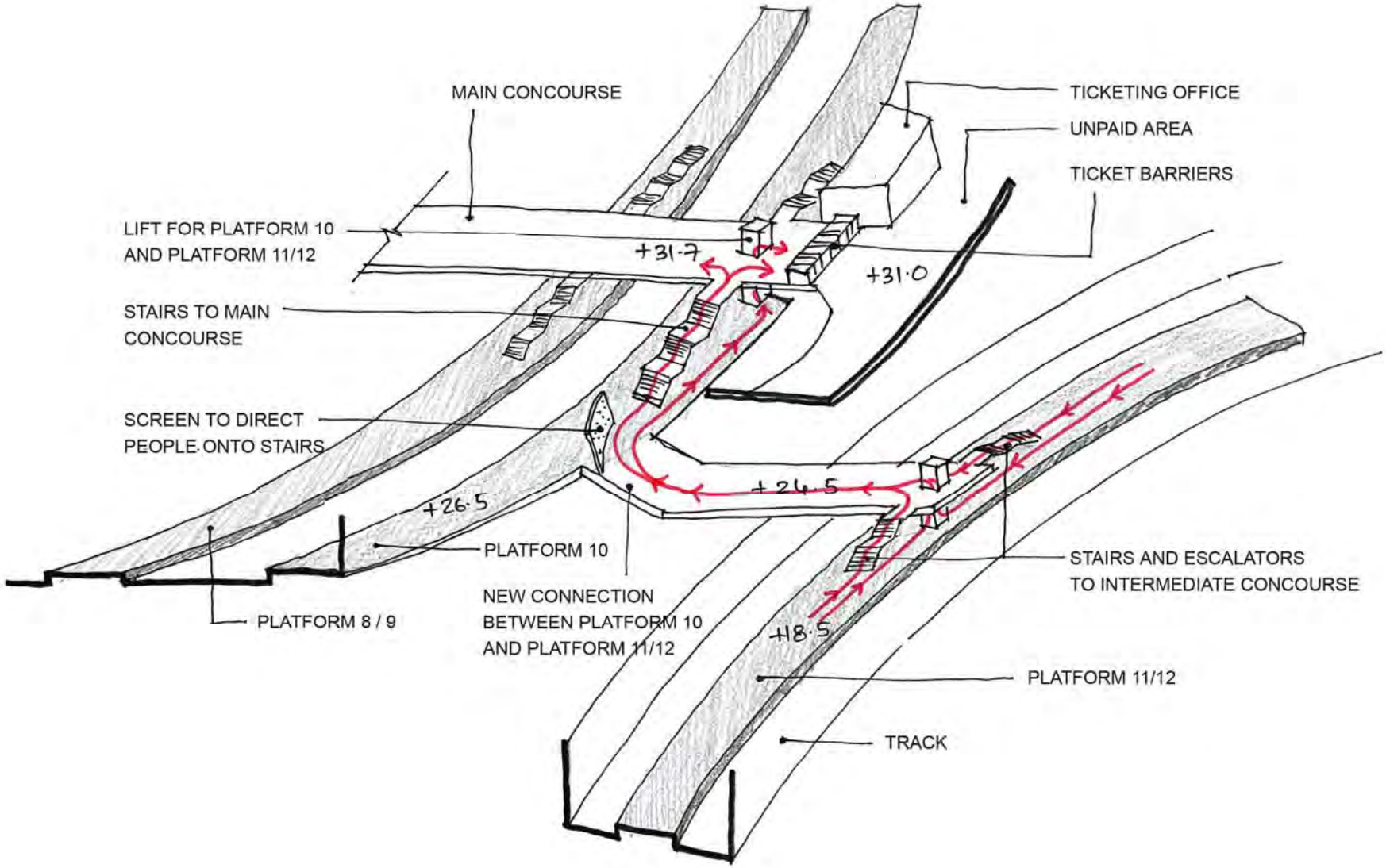

Figure 1.14: Access to Illawarra Relief Option IR-4 Perspective

2. DEVELOPMENT OF DESIGN OPTIONS A, B AND C

As indicated in Section 1.1, Options 6, 8 and 9 (renamed A,B & C) have been further developed, taking into account the comments received at the External Stakeholder Workshop held on 1 Sep 2006.

Option A – New southern concourse, retaining northern concourse and stairs. Retaining shelters on the platforms and booking office on Lawson Street. No civic space on Gibbons Street.

Option B – New southern concourse parallel to the OHW stanchions. Heritage building on Platform 1 and booking office on Lawson Street retained. New civic space along Gibbons Street with some heritage buildings retained.

Option C – New central concourse parallel to Lawson Street. Heritage building on Platform 1 and booking office on Lawson Street retained. New civic space along Gibbons Street.

The proposed commercial development, building services, engineering and fire escape provisions would be constant in all options.

Development Opportunity

The proposed development opportunity above the station on Gibbons Street and the design intent remain the same in all the three options. Artist's impression of the relationship between the proposed building and station are shown in Appendix 2. The proposed building would meet the height and FSR requirements of the SEPP (Major Projects) 2005, with a 4/5-storey high podium and 14-storey high tower. There would be two levels of car park in the basement with space for a total of 140 to 160 cars. Currently there are no parking standards on this site. As a result the City of Sydney parking standards have been used. These require 1 car space per 125sqm of commercial floor area. The proposed development would provide approximately 80 car spaces less than the City of Sydney requirement, however, given the site's close proximity to the Station a lesser amount could be justified. It would be possible to provide additional car spaces by extending the parking under the park to the south, however this may not be commercially viable.

Building services & engineering

Building service requirements for the new station and the proposed development will generally be similar for these options. This issue is discussed further in Part B – Engineering report.

Structural design

The conceptual structural design for the concourse and the proposed development in all three options would be similar as all options have a concourse crossing the tracks. The details of structural design and considerations specific to Option C have been attached as Appendix 1 in Part B – Engineering report..

Fire Life and Safety

All the three options have two sets of stairs from each surface platform. For the Illawarra Relief there would be two fire stairs at each end of the platform plus a similar number of stairs and escalator. Part B - Engineering Report Section 3 details fire and safety requirements for Option C but it would be possible to achieve a similar performance for Option B. Option A will perform less as the southern stairs on the surface platforms will be narrow due to platform clearance requirements.

User requirements and Station Design guide

All three options generally comply with the user requirements and Station Design Guidelines. Options B and C meet all the RailCorp user requirements in terms of capacity and station performance. Option A under performs in these respects. The options have different impacts on heritage buildings that have been highlighted in the description of each of them.

A statement of compliance with the user requirements and Station Design Guidelines is presented in Chapter 4.

Whilst constructability is still being assessed by others, none of the three options would appear to have significant advantages in terms of constructability as all require the overhead wiring to be reconfigured, the building of a new concourse over the tracks, and significant structural works in the Illawarra Relief Station box.

2.1 OPTION A

This option is based on retaining existing heritage buildings/shelters on the platforms while still achieving the broader design objectives for the future use of the station and the broader renewal of Redfern. Retaining the heritage platform buildings is a significant constraint that inhibits planning of the station to accommodate future growth of passenger and other pedestrian movements. The concept has also been designed to minimise impacts on stanchions and overhead wiring, another significant planning constraint (Figure 2.2 Option A)

Concourse & Station entry

Option A retains the existing northern concourse and stairs and proposes a new concourse towards the southern end of the station. The new southern concourse would be parallel to the overhead wiring stanchions and has been positioned to retain the existing heritage structures on the platforms. There is a stair and an elevator per platform from the southern concourse. The new stairs would be oriented towards the narrow end of the platform to retain the existing platform buildings and hence are narrow to meet the clearance requirements on the platforms and hence limit future capacity.

As the northern concourse would be retained for station operation there would be a possibility of retaining the existing station entry on Lawson Street. A new station entrance is proposed along Gibbons Street (opposite Redfern Street) and on Marian Street to provide more direct connections to ATP and Redfern Town Centre. This option proposes three entrances to the station. As the existing entry to the station has been retained there are three entrances to the station.

OHW & Signalling

This option seeks to minimise the impact on OHW and signalling by positioning the concourse at a right angle to the tracks and parallel to the existing stanchions. Only one row of stanchions and catenaries would have to be modified and lowered to accommodate the new concourse. One stanchion on Platform 8/9 would have to be modified to accommodate the new stairs. (Refer Figure 2.2).

Signal SY455 is not directly affected by the new concourse but might need re-organising due to signal sighting issues, which needs to be reviewed by RailCorp technical staff.

Pedestrian circulation

A pedestrian bridge parallel to Marian Street would connect the North Eveleigh site and Darlington (including the University of Sydney) to the Redfern Town Centre.

Access to Illawarra Relief

Access to Illawarra Relief would be as in Option IR-1, as described in Section 1.2.

Heritage

This option would retain all the existing platform heritage buildings, except the store building on platform 1. The booking office on Lawson Street and ventilation stacks on Platform 1 are also retained. Some of the masonry wall on the Lawson Street overbridge is removed to allow for street access to the proposed building on the corner of Lawson and Gibbons Streets. Part of the wall would be retained and incorporated into the proposed building.

Retail potential at the concourse level

There is a limited retail potential at the concourse level due to the large paid concourse. There would be some retail potential along Gibbons Street and Marian Street.

Station operation areas

There would be limited space for station operation areas near the entrance, hence they are located alongside the paid concourse connecting the Marian Street entry and Gibbons Street entry.

Interface areas

Due to a connected northern and southern paid concourse, there is not enough space to provide a civic space at the end of Redfern Street as detailed in the Redfern-Waterloo Built Environment Plan.

Connection to ATP and Darlington (including the University of Sydney) is via Marian Street entrance

A pedestrian bridge parallel to Marian Street, which connects to Wilson Street, provides a link between the Redfern Town Centre and the North Eveleigh site, as well as improved east-west connection over the railway corridor. This would require stairs and ramp or elevator at its western end.

A development at the corner of Lawson Street and Gibbons Street is proposed to activate this corner.

Figure 2.1: Option A - Concourse Level Plan

Figure 2.2: Option A - Impact on OHW

2.2 OPTION B

Long term planning needs for the station upgrade have been put ahead of retaining all the heritage buildings in this option but the planning has still been compromised by minimising, as far as possible, the impact on the stanchions and catenaries by placing the new concourse parallel to the support structure of the catenaries. (Figure 2.3)

Concourse & Station entry

Option B proposes a new southern concourse that is parallel to the overhead wiring stanchions. The concourse has been moved further north than in Option A so as to provide two set of stairs and elevator from the concourse. A small concourse north of the proposed concourse has been provided to access Platform 8/9 and Platform 10, as these platforms are very narrow at their southern end. The existing stairs to the northern concourse are removed making it superfluous to station needs.

Two station entrances are proposed, one along Gibbons Street from a civic space opposite Redfern Street at the northern end of the station, and another from the unpaid pedestrian concourse near Marian Street at the southern end.

OHW & Signalling

Similar to Option A the main concourse in Option B would be positioned perpendicular to the tracks and parallel to the existing stanchions to minimise the impact on OHW. But it is moved further north in order to have two sets of stairs for each platform from the central concourse. Only one row of stanchions will have to be modified and catenaries lowered to accommodate the new central concourse. The small northern concourse will impact on stanchions and catenaries on Platform 8/9 and Platform 10 would have to be modified to accommodate new stairs. One stanchion on the southern end of Platform 2/3 and Platform 1 would have to be modified due to the proposed pedestrian bridge. Refer Figure 2.4 for the impact on OHW wiring.

Signal SY455 would not directly affect the new concourse or pedestrian bridge, but might need re-organising due to signal sighting issues, which need to be reviewed by RailCorp technical staff.

Pedestrian circulation

A pedestrian bridge connecting the North Eveleigh site and the Redfern Town Centre would run parallel to the concourse for half the length and then connect to the North Eveleigh site. An at-grade pedestrian connection would also be provided at the end of the bridge at Marian Street. An unpaid pedestrian access east of the existing station entrance would provide connection between Lawson Street and the new civic space on Gibbons Street.

Access to Illawarra Relief

Access to the Illawarra Relief is a variation of Option IR-4. A set of stairs going to platform 10 connects to an intermediate concourse, which provides access to Platform 11/12. There would be separate stairs providing access to Platform 10 and Platform 11/12 which run in opposite directions for better platform distribution. Hence the intermediate concourse could be separated from platform 10 if required. This entrance is further south than the current entry and provides better distribution of people on the platforms stairs and escalators on both side of the intermediate concourse. Platform 10 has been widened significantly which would allow for more people from the Illawarra Relief. New Fire and emergency egress stairs have been provided both at the north and south end of Platform 11/12.

Heritage

This option retains the booking office on Lawson Street, and office and ventilation stack on Platform 1. The Electrical Workshop building roof will have be modified due to the location of the pedestrian bridge. Some of the masonry wall on the Lawson Street overbridge is removed to allow for street access to the proposed building on the corner of Lawson and Gibbons Streets. Part of the wall is retained and incorporated into the proposed building.

The existing station entry and booking office will not be a part of the station operation and could have other uses such as a restaurant or an exhibition space.

Retail potential at the concourse level

There is an opportunity to locate two levels of retail on Gibbons Street. At the concourse level there is the potential for retail along the unpaid pedestrian concourse and a lower level of retail along Marian and Gibbon Streets. A supermarket could be located at the southern end of the development accessible from the unpaid concourse and Gibbons Street.

There could also be retail outlets and cafes in the building at the corner of Lawson Street and Gibbons Street.

Station operation areas

There is not enough space to provide all the station operation areas near the paid concourse and hence some of them would have to be located near the unpaid concourse connecting Marian Street and Gibbons Street. This would cut down on the valuable retail area and would not be ideal for station management.

Interface areas

A civic space as detailed in the Redfern-Waterloo Built Environment Plan along Gibbons Street marks the northern entrance of the station. It would also provide an unpaid at-grade connection to Marian and Lawson Streets.

Connection to the ATP would be through Marian Street along a footpath at the corner of the Water Tower Apartment. The road at the corner would be narrowed to allow for a proper footpath connecting the ATP. A complying ramp provides disabled access to the concourse level from Marian Street.

The proposed pedestrian bridge would connect to Wilson Street providing improved connection to the North Eveleigh site and Darlington (including the University of Sydney).

A new three storey development at the corner of Lawson Street and Gibbons Street has been set back to provide for a wide footpath and trees. Retail and cafes should be encouraged on the ground floor to improve safety and surveillance along Gibbons and Lawson Streets.

Figure 2.3: Option B - Concourse Level Plan

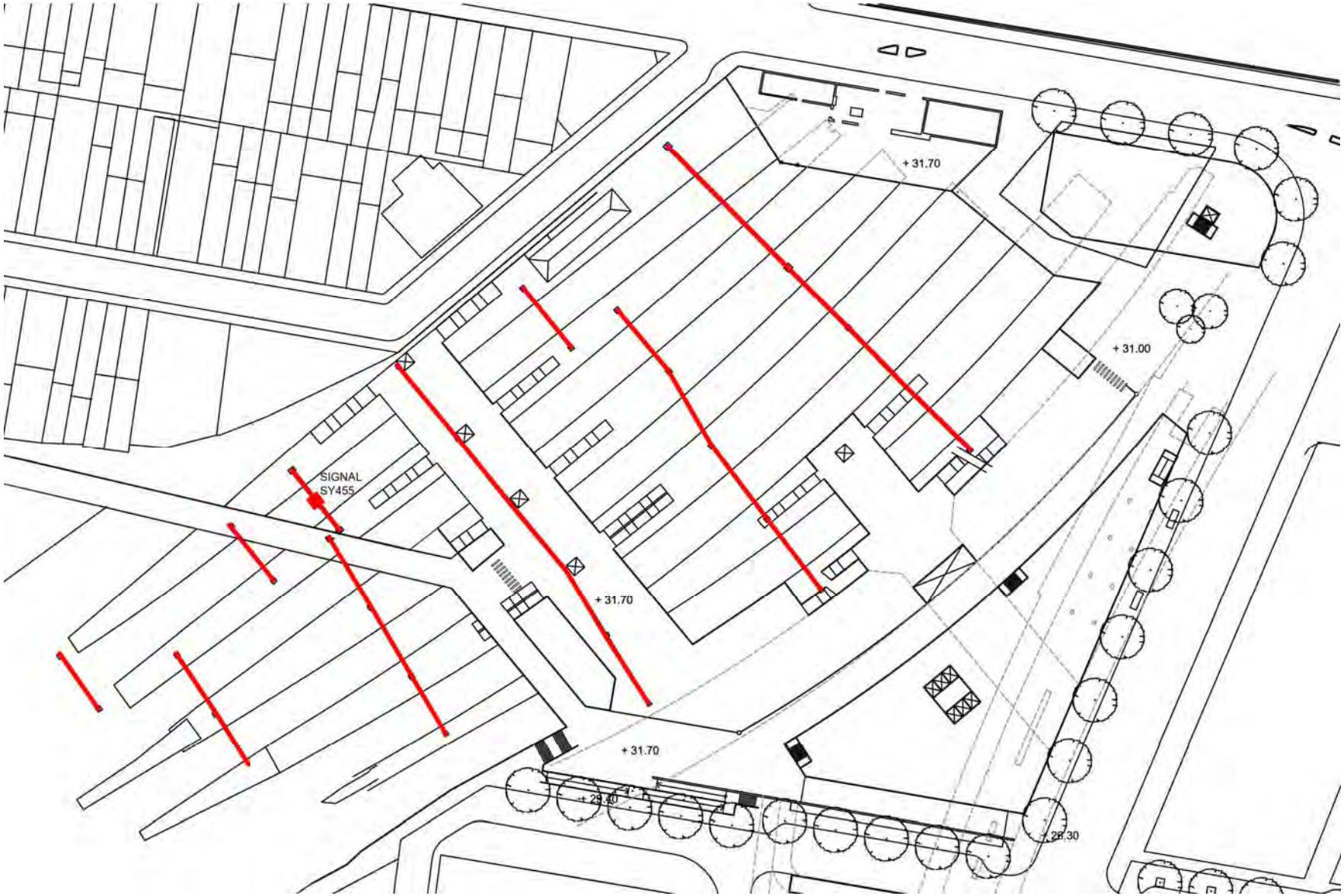

Figure 2.4: Option B - Impact on OHW

2.3 OPTION C

This option best meets the long term planning and design objectives and safety and comfort criteria. Only the significant heritage buildings are retained and there is a major impact on OHW. (Figure 2.5).

Concourse & Station entry

Option C proposes a more centrally located new concourse that is parallel to Lawson Street. The concourse has been positioned in a manner to allow for maximum utilisation of the platform width. There are two sets of stairs and a lift for each platform from this central concourse. The existing stairs on the northern concourse are removed.

The proposed entrances to the station are from the:

1. North via a new civic space on Gibbons Street
2. South via Marian Street
3. West via the pedestrian bridge from Wilson Street.

There are two sets of barriers, one located on the east of the concourse accessed through the unpaid concourse connecting Marian and Gibbons Street and the second located to the west of the concourse, accessed from the pedestrian bridge.

OHW & Signalling

As this option is designed to provide maximum efficiency in terms of pedestrian circulation and platform distribution the main concourse runs diagonally across the tracks and OHW stanchions. Hence two rows of stanchions would have to be removed and catenaries modified to accommodate the new concourse.

Signal SY455 is affected by the new pedestrian bridge and would have to be reconfigured. Refer Figure 2.6 for the impact on OHW and signalling.

Pedestrian circulation

A pedestrian bridge parallel to the new concourse would connect the North Eveleigh site (and Wilson Street) to the Redfern Town Centre. The unpaid concourse would provide an at-grade pedestrian connection between Gibbons and Marian Streets and provide a direct connection to the new pedestrian bridge. An unpaid pedestrian access east of the existing station entrance provides connection between Lawson Street and the new civic space on Gibbons Street.

Access to Illawarra Relief

Access to the Illawarra Relief is as for Option IR 4 which has been discussed in Section 1.2. A wide stair on the south of the concourse would provide connection to the intermediate concourse tunnel at platform level, which connects to Platform 11/12. There is a screen at the end of the tunnel to direct people toward the stairs and prevent them from going directly on to Platform 10. It would, however, be possible to separate the intermediate concourse from Platform 10 with a glass barrier in the future and to provide a separate stair for Illawarra Relief if required. Two up only escalators and two stairs provide access to Platform 11/12 from a centrally located intermediate concourse. New Fire and emergency egress stairs have been provided both at the north and south end of Platform 11/12.

Heritage

This option retains the booking office on Lawson Street and the office and ventilation stack on Platform 1. Some of the masonry wall on the Lawson Street overbridge would be removed to allow for street access to the proposed building on the corner of Lawson and Gibbons Streets. Part of the wall is retained and incorporated into the proposed building. The Electrical Workshop building roof would have to be modified due to the location of the pedestrian bridge and the existing station entry and booking office would not be a part of the station operation and could have other uses such as a restaurant or an exhibition space.

Retail potential at the concourse level

There could be an opportunity to provide retail on the Gibbons Street frontage. At the concourse level there would also be the potential for retail along the unpaid pedestrian concourse and a lower level of retail along Marian and Gibbons Streets. A supermarket could be located at the southern end of the development accessible from the unpaid concourse and Gibbons Street.

There could also be retail outlets and cafes in the building at the corner of Lawson Street and Gibbons Street.

Station operation areas

All the station's operational areas are located between the space connecting the paid concourse and the unpaid concourse. This would enhance the efficiency of station management and allow full retail potential on the unpaid concourse.

Interface areas

A civic space, as detailed in the Redfern-Waterloo Built Environment Plan, along Gibbons Street would mark the entrance to the station. It would also provide unpaid at-grade connection to Marian Street and Lawson Street.

Connection to ATP is from Marian and Cornwallis Streets. Marian and Cornwallis Streets could be closed to traffic to allow for a safer pedestrian environment around the Station entrance.

The proposed pedestrian bridge could connect to Wilson Street, providing improved connection to the North Eveleigh site and Darlington (including the University of Sydney).

A new 3 storey development at the corner of Lawson and Gibbons Streets has been set back to provide for a wide footpath and trees. Retail and cafes should be encouraged on the ground floor to improve safety and surveillance along Gibbons and Lawson Streets.

Figure 2.5: Option C - Concourse Level Plan

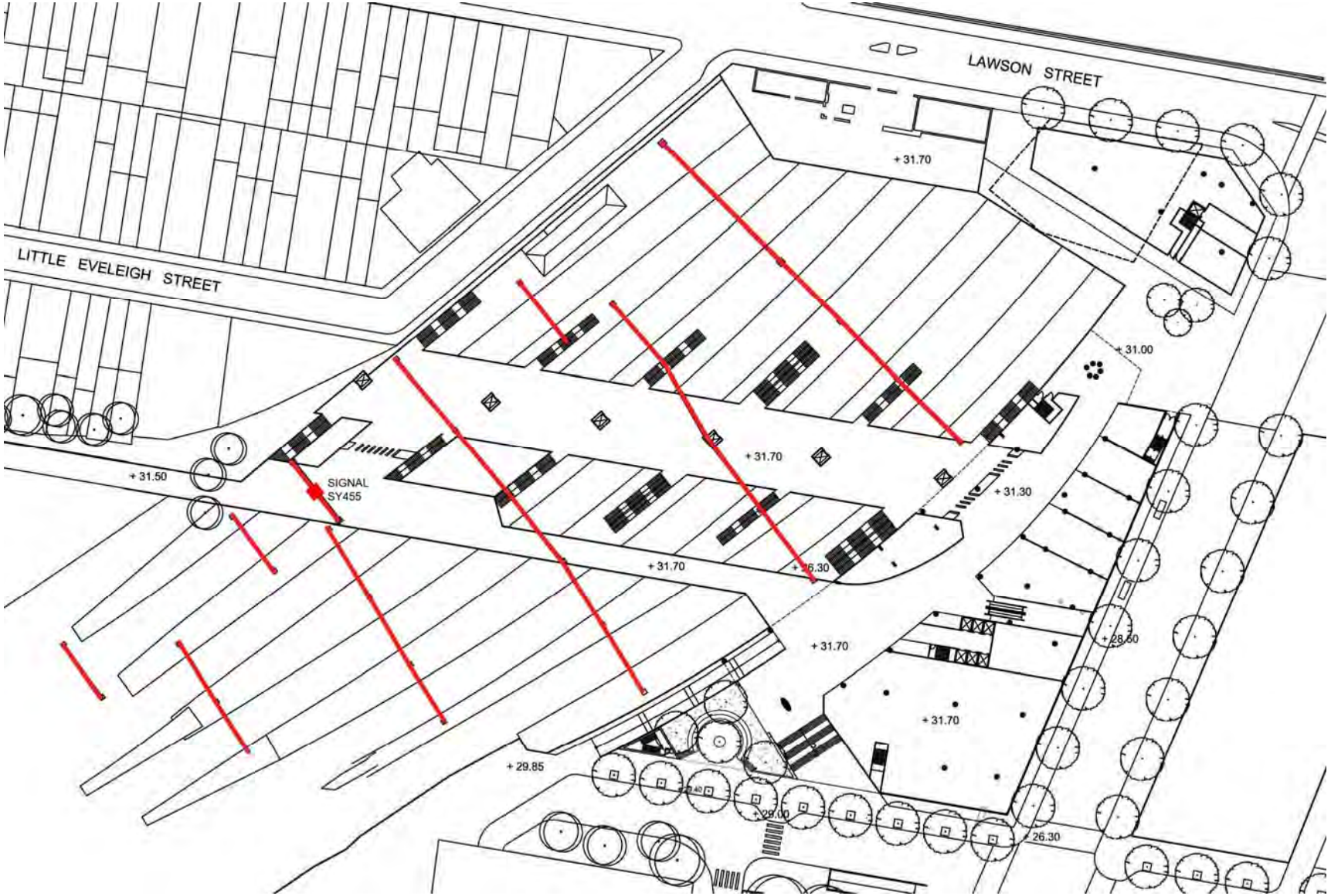

Figure 2.6: Option C - Impact on OHW

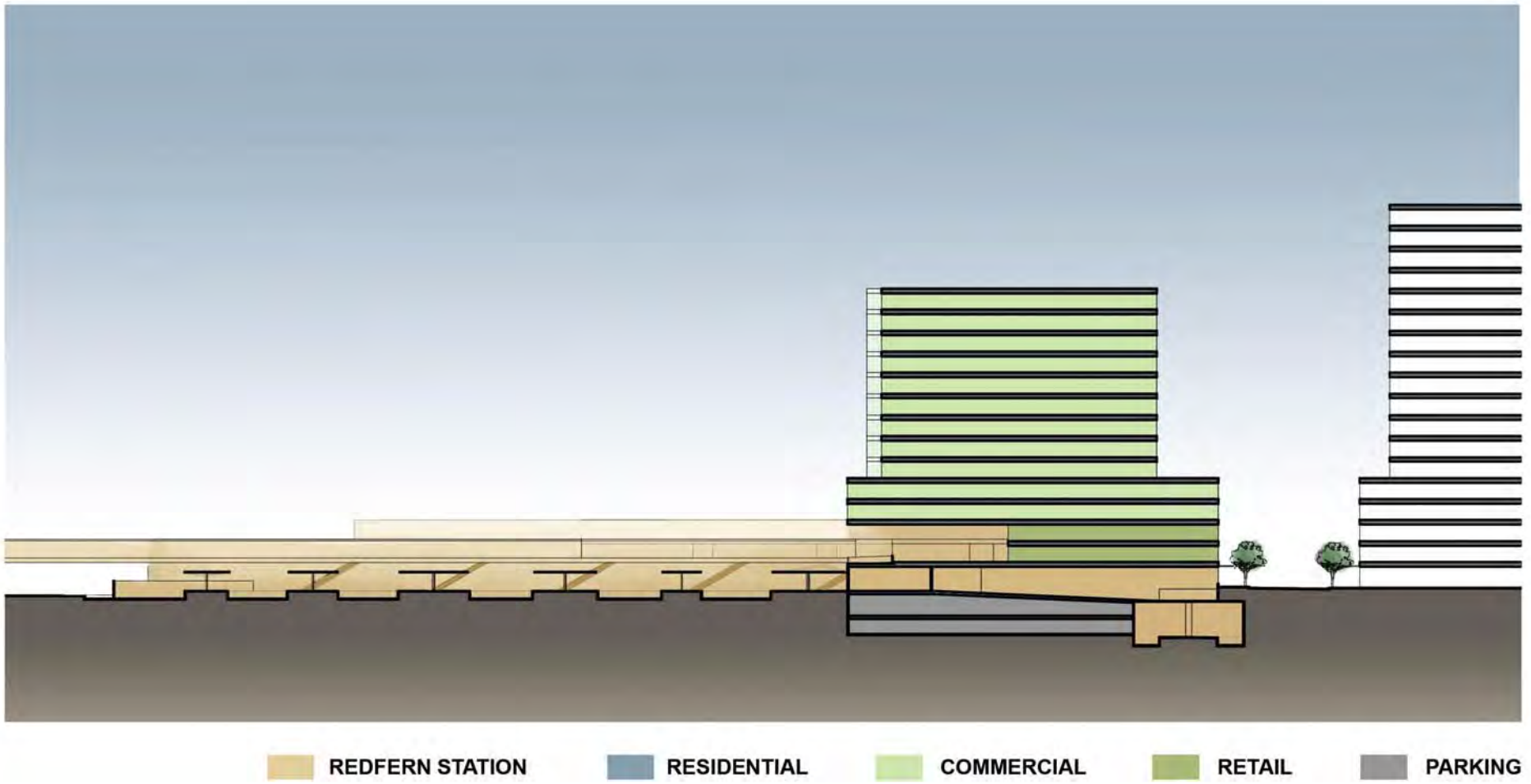

Figure 2.7: Section AA

3. ASSESSMENT OF THE OPTIONS

3.1 ASSESSMENT CRITERIA

The three options have been assessed against the design criteria derived from the design objectives noted in Section 1 of this report. In summary these options improve station function and bring benefit to Redfern.

Station function & operation

- Pedestrian capacity & flow
- Safety and security including emergency egress
- Comfort of station environment
- Ease of station management
- Disabled access (DDA compliance)
- Good rail to rail interchange, including Illawarra Relief

Benefit to Redfern

- Image of station
- Heritage conservation
- Quality of pedestrian and cycle connections
- Quality of interface between Redfern Station and its surrounds
- Development opportunities

The design options have only been assessed against architectural and station operation criteria and not against either value for money or buildability (including interruptions during construction or impact on the platforms) as these tasks follow on after the issue of this Paper. As mentioned in Section 2, engineering and fire life and safety are common to all the options.

3.2 ASSESSMENT OF OPTIONS

The assessment of three options discussed in Section 2 against the design criteria is shown below:

	CRITERIA	OPTIONS		
		A	B	C
		New concourse with minimal impact on existing buildings	New concourse parallel to stanchions	New concourse parallel to Lawson Street
	Station function			
1	Pedestrian capacity & flow			
2	Safety and security			
3	Comfort of station environment; pleasant			
4	Ease of station management			
5	Provides disabled access (DDA compliance)			
6	Good rail to rail interchange, including Illawarra Relief			
7	Satisfaction of user requirements (see Appendix 1)			
8	Fire and life safety			
	Benefit to Redfern			
7	Image of station			
8	Heritage conservation			
9	Quality of pedestrian and cycle connections			
10	Quality of interface between the station and surroundings			
11	Commercial development opportunity at the station			

Table 3.1 – Assessment of options

Legend

Best performer

Satisfactory

Worst performer

The following text should be read in conjunction with Figures 2.1 to 2.5 and Table 3.1 that rank their performance against the 11 criteria cited in Section 1.

STATION FUNCTION AND QUALITY OF ENVIRONMENT

1. ***Pedestrian capacity and flow:*** Option C provides the most direct access to all platforms from a compact paid concourse. The two barriers are located to provide good access from the three primary passenger arrival directions and direct access to the unpaid concourse from The ATP, the North Eveleigh site, Darlington (including the University of Sydney), Redfern Town Centre and Lawson Street. Option B would also work, however, the circulation is not as clear. As noted above, the retention of the existing buildings on the platforms in Option A would severely restrict passenger movement on platforms and the station's overall capacity.

2. ***Safety and security:*** Option C is superior to A and B because the paid and unpaid concourses are easy to supervise from a central location and sight lines are better for safety and surveillance. The unpaid concourse in B and C would both have active retail edges, which would make them safer than A.

3. ***Station comfort:*** B and C provide a civic space along Gibbons Street and retail edge to the unpaid concourse that cannot be provided in A. C provides the clearest circulation and minimum walking distances to/through the Station and to the surrounds.

4. ***Ease of station management:*** The compact layout of C would make C easier to manage than either A or B. B is superior to A in this respect, as the paid concourse is smaller and would be easier to supervise.

5. ***Disabled Access:*** Although this would be provided by all options, it is only available at the southern concourse in option A. In Option B, the provision of complying access from ATP requires the use of "zigzag" ramps, which are avoided in Option C.

6. ***Rail-to-Rail interchange:*** Option B performs the worst in this respect because of the need to walk for substantial distances to gain access to platforms 8 and 9 from all other platforms. The legibility and ease of transfer between platforms in Option C are superior to both A and B.

BENEFITS TO REDFERN

1. ***Image of station:*** Option A is inferior in this respect due to the poor outcome achieved between the retained existing platform buildings and the new stairs, concourse and lifts. The more direct and compact plan of Option C will convey a clearer image than the more complex layout of Option A. All options can provide a more positive urban design context for the station and vastly improve the public environment of the Station and surrounds.

2. ***Heritage conservation:*** Option A is superior in this respect, as the existing platform buildings are retained, as well as the booking office on Lawson Street. However, it can be seen that the retention of buildings on the platforms would severely compromise the capacity and performance of the Station. Options B and C retain the booking office on Lawson Street as well as some buildings on Platform 1.

3. ***Quality of pedestrian and cycle connections provided:*** The configuration of Option C provides excellent level connections in all directions providing legible connections to Redfern Town Centre, ATP and the North Eveleigh site. It also provides easier and more generous access between the ATP and the station concourses. Option A would require stairs and an elevator at the western end of the unpaid concourse bridge. In Option B the east-west pedestrian route is a less direct route and difficult to navigate.

4. ***Quality of the interface between the station and its context:*** Options B and C provide development along Gibbons Street and are consistent with the strategies outlined in the Redfern-Waterloo Built Environment Plan. Option A does not provide a civic space along Gibbons Street, whilst the civic space is provided in Options B and C. Option C is superior to Option B as it provides a substantially better space opposite the Water Tower Apartments along Marian Street. Both B and C provide retail frontages to both Gibbons Street and the unpaid concourse. This cannot be the case with Option A.

5. ***Commercial development opportunities:*** All options provide approximately the same quantity of development floor area along Gibbons Street. The net lettable area for the development site would be approximately 37,000m^2 with approximately 140 to 160 car parking spaces in two levels of basement. Options B and C are superior in that almost double the amount of retail space can be provided with frontages to both the unpaid concourse and Gibbons Street.

4. NON-COMPLIANCE WITH THE USER REQUIREMENTS

NO.		*OPTION - A*	*OPTION - B*	*OPTION - C*
3.1	***Station and Surrounds***			
3.1.1	General	Has a significant impact on station operation during construction and does not provide for emergency vehicle parking.	Has a significant impact on station operation during construction and does not provide for emergency vehicle parking.	Complies with all general requirements except has a significant impact on station operation during construction.
3.1.2	Way Finding, Information, Advertising and Queuing	Provides new way finding systems, signage and addresses all the queuing issues at booking offices and ticketing areas.	Provides new way finding systems, signage and addresses all the queuing issues at booking offices and ticketing areas.	Provides new way finding systems, signage and addresses all the queuing issues at booking offices and ticketing areas.
3.1.3	Platform	Complies with all the requirements except for width adjacent to station buildings and, possibly, platform levels and cross falls.	Complies with all the requirements.	Complies with all the requirements.
3.1.4	Concourse	Complies with all the requirements except the paid concourse is very big and would add to maintenance and management cost.	Complies with all the requirements.	Complies with all the requirements.
3.1.5	Disability Discrimination Act – Disabled Access	Existing station shelters on Platforms 1,4,5,6,7,8 obstruct accessible path and do not comply with DDA requirements.	Complies with all the DDA requirements except existing station shelters on Platforms 1 obstruct accessible path and do not comply with DDA requirements.	Complies with all the DDA requirements except existing station shelters on Platforms 1 obstruct accessible path and do not comply with DDA requirements.
3.1.6	Vertical Transport	Complies with all the requirements.	Provides centre loading on all platforms and meets all the requirements.	Provides centre loading on all platforms and meets all the requirements.
3.1.7	Ticketing	Complies with all the requirements.	Complies with all the requirements.	Complies with all the requirements.
3.1.8	Public level-Street level RWA	Does not provide a civic space along Gibbons Street and at-grade connection from North Eveleigh site to Gibbons Street.	Complies with all RWA requirements.	Complies with all RWA requirements.
3.2	***Conceptual – Safety, Security, Building Services, Heritage***			
3.2.1	Safety	Complies with safety requirements. For details see F&LS section.	Complies with safety requirements. For details see F&LS section.	Complies with safety requirements. For details see F&LS section.
3.2.2	Security	Does not consider blast impact.	Does not consider blast impact.	Does not consider blast impact.

NO.		OPTION - A	OPTION - B	OPTION - C
3.2.3	Heritage	Store building on Platform 1 not retained.	Store building and booking office on Platform 1 not retained.	Store building and booking office on Platform 1 not retained.
3.3	***Rail Infrastructure***			
3.3.1	General	The option would meet the requirement. More detailed work is required to fully assess the impact and extent of the requirement.	The option would meet the requirement. More detailed work is required to fully assess the impact and extent of the requirement.	The option would meet the requirement. More detailed work is required to fully assess the impact and extent of the requirement.
3.3.2	Track and ROW	The option would meet the requirement. More detailed work is required to fully assess the impact and extent of the requirement.	The option would meet the requirement. More detailed work is required to fully assess the impact and extent of the requirement.	The option would meet the requirement. More detailed work is required to fully assess the impact and extent of the requirement.
3.3.3	Bridge Structures	The option would meet the requirement. More detailed work is required to fully assess the impact and extent of the requirement.	The option would meet the requirement. More detailed work is required to fully assess the impact and extent of the requirement.	The option would meet the requirement. More detailed work is required to fully assess the impact and extent of the requirement.
3.3.4	Electrolysis, earthing and bonding	The option would meet the requirement Further investigations are required to assess compliance.	The option would meet the requirement Further investigations are required to assess compliance.	The option would meet the requirement Further investigations are required to assess compliance.
3.3.5	Pier and Column Protection Requirements	New paid and unpaid concourse and the wall between the IR tunnel and the car park comply with the requirements.	New paid and unpaid concourse and the wall between the IR tunnel and the car park comply with the requirements.	New paid and unpaid concourse and the wall between the IR tunnel and the car park comply with the requirements.
3.3.6	Signalling and control Systems	Signal SY455 is not directly affected but might have signal sighting issues.	Signal SY455 needs to be reconfigured.	Signal SY455 needs to be reconfigured.
3.3.7	Power	Additional areas for electrical installations can be located in the vicinity of the development site.	Additional areas for electrical installations can be located in the vicinity of the development site.	Additional areas for electrical installations can be located in the vicinity of the development site.
3.3.8	High Voltage	No service search has been carried out.	No service search has been carried out.	No service search has been carried out.
3.3.9	1500v Overhead Wiring system	OHW needs to be reconfigured because of the new concourse.	OHW needs to be reconfigured because of the new concourse.	OHW needs to be reconfigured because of the new concourse.
3.4	***Maintainability***	Complies with all the requirements.	Complies with all the requirements.	Complies with all the requirements.
3.5	***Environment and Quality***			

NO.		OPTION - A	OPTION - B	OPTION - C
3.5.1	Environment	Complies with all the requirements.	Complies with all the requirements.	Complies with all the requirements.
3.5.2	Quality	Complies with all the requirements.	Complies with all the requirements.	Complies with all the requirements.
3.6	Interface with other rail projects	Complies with all the requirements.	Complies with all the requirements.	Complies with all the requirements.

5. CONCLUSION

From the assessment of the possible options it can be seen that Option A, as a result of the retention of the existing platform buildings on all the platforms, does not perform very satisfactorily against the assessment criteria outlined in Section 3. Options B and C perform much better against all the assessment criteria as the removal of the platform buildings improves the capacity and performance of the Station.

Option C meets the assessment criteria for the station function and benefit to Redfern to a higher level than Option B, but Option B may have a slightly lower capital cost because the concourse is parallel to the OHW stanchions and hence causes less disruption to the relocation and lowering of the existing overhead wiring. The difference in terms of number of stanchions affected would not appear to be significant and hence the cost difference may not be significant but the implementation time to make the changes prior to building the concourse may be longer, depending upon RailCorp's available design and construction resources.

Various alternatives have been considered for the connection to the Illawarra Relief line that were not satisfactory and hence connection through Platform 10 is considered to be the best solution.

Option C addresses all the assessment criteria and is therefore recommended as the preferred option. There are a number of possible variations within this preferred option that will need to be considered in later stages of design development.

Cost and Constructability report prepared by Tenix parallel to the Discussion paper will prompt a review of the options. Any suggestions from Tenix on making the designs more efficient will be incorporated into the next stage of the project.